

BJC-5000

SERVICE MANUAL

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BJC-5000

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 and specification.

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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Part 1

SAFETY AND PRECAUTIONS

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1. SAFETY PRECAUTIONS

1.1 Moving Parts

Be careful not to get fingers, hair, clothing, or personal accessories caught in the moving parts of the printer. There are several moving parts, driven by the carriage motor and by the paper feed motor.

Moving parts driven by the carriage motor:

Carriage belt, idler pulley, and carriage.

Moving parts driven by the paper feed motor:

Feed roller, pressure rollers, spurs, pick-up roller, slow down gear, eject roller, and transmission roller.

Also note that the spurs are made of metal and have sharp edges. Do not touch the spurs, especially with bare hands. Serious injury could be caused by touching the spurs unintentionally.

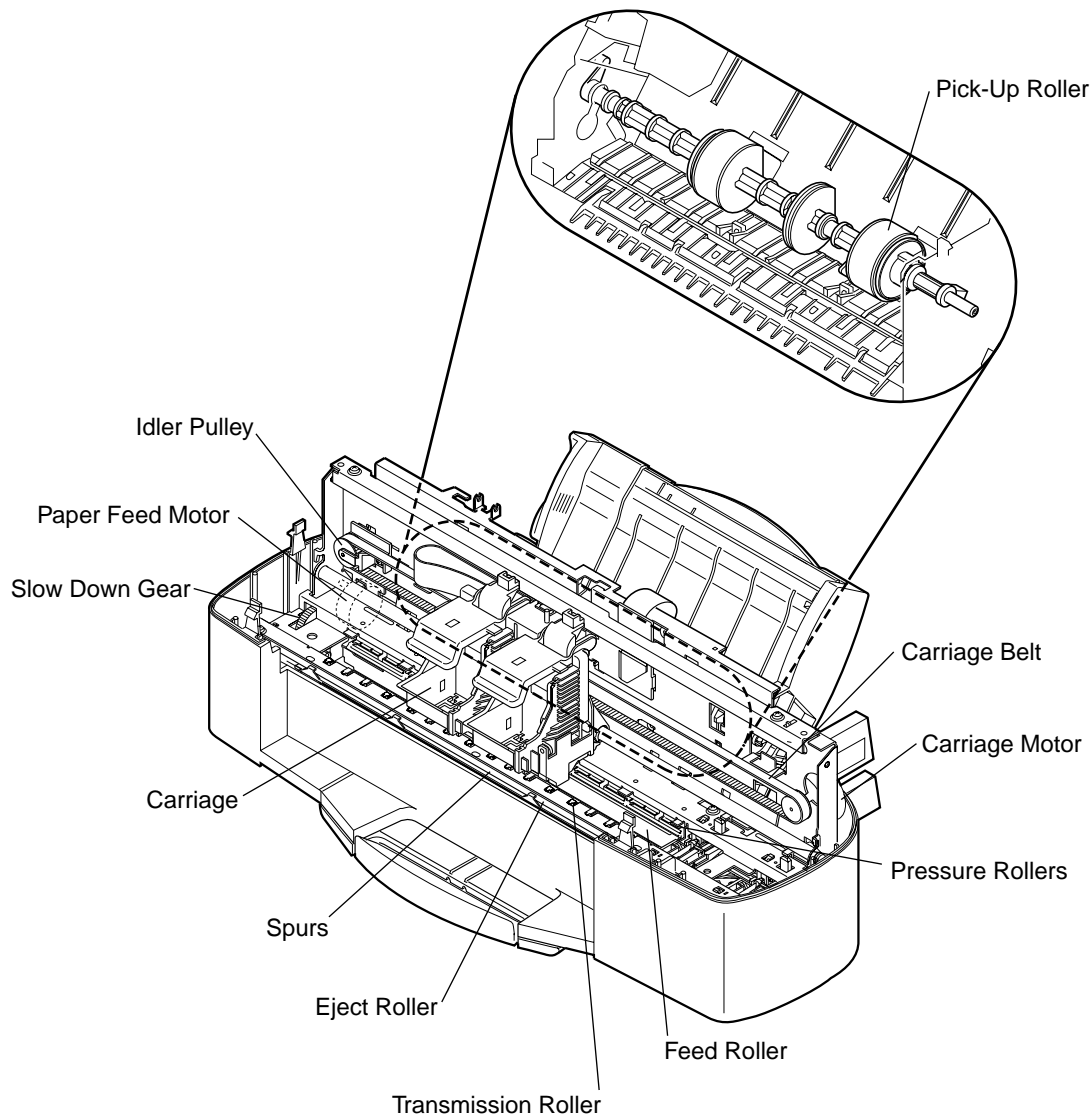


Figure 1-1 Moving Parts of the Printer

1.2 Ink Stains

1.2.1 Ink path

Do not touch the ink path during repairs or maintenance to avoid getting ink stains on the printer, work table, hands, and clothing.

The ink flow path consists of the BJ cartridge nozzles, head cap, head wiper, maintenance jet receiving section, waste ink tube, and waste ink absorber.

The ink flow path of the color BJ cartridges consists of ink outlets and joint pipes. Do not touch the ink flow path also, to avoid ink stains.

When the purge unit is removed, waste ink could spill out from the unit's waste ink flow path. When repairing or replacing this unit, stop up the waste ink flow path with a paper towel to prevent the ink from spilling out.



Caution!

Although the ink is non-toxic, it contains organic solvents.

BC-23: Diethylenglycol 111-46-5, glycerin 56-81-5

BC-21e: Isopropyl alcohol 67-63-0, glycerin 56-81-5

BC-22e Photo: Isopropyl alcohol 67-63-0, glycerin 56-81-5, ethylenglycol 107-21-1

BC-20 (reference): Isopropyl alcohol 67-63-0, glycerin 56-81-5, ethylenglycol 107-21-1

Never get ink in your eyes and mouth. If any ink should get into your eyes, wash them out with plenty of water and consult a doctor. If a large quantity of ink is swallowed accidentally, consult a doctor immediately. Provide the doctor with the information printed on the BJ cartridge package or label. Since the ink contains dyes, any ink stain on clothing, etc. shall be permanent.

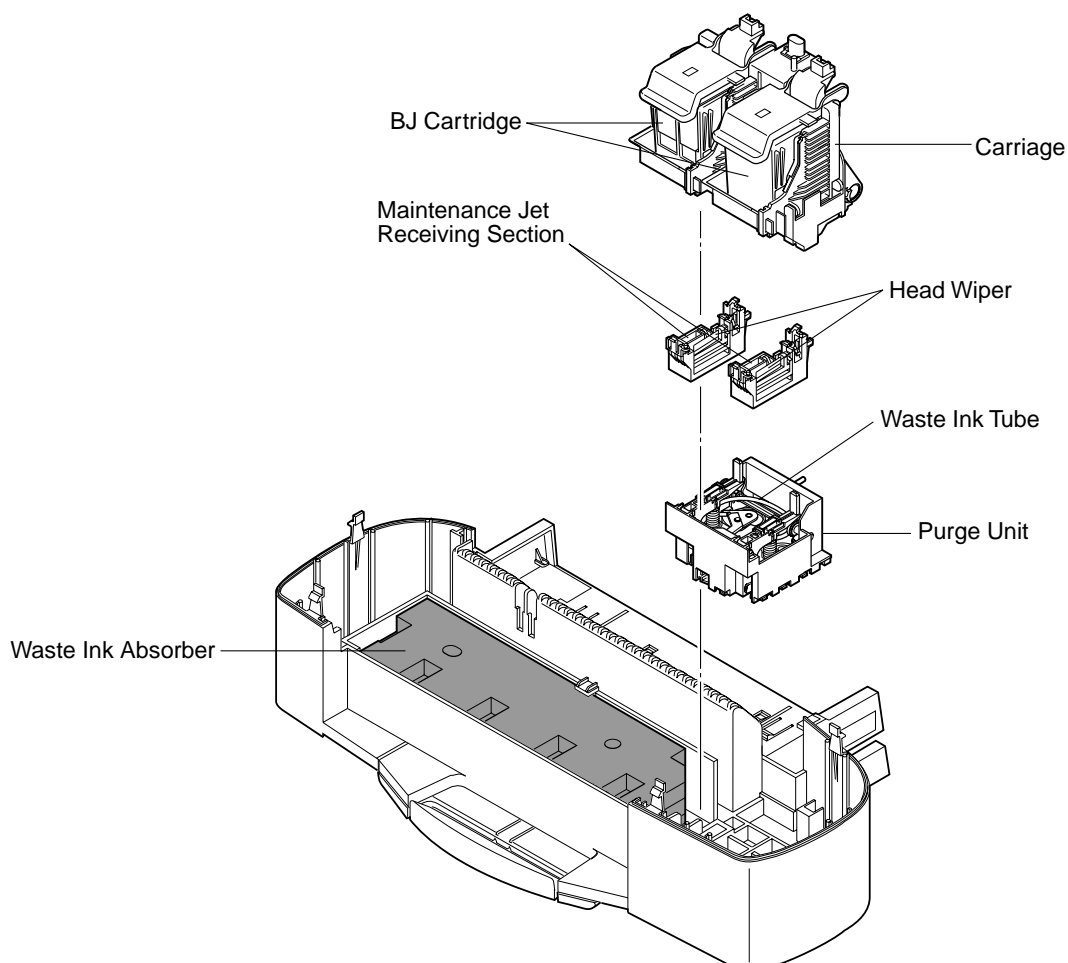


Figure 1-2 Ink Path

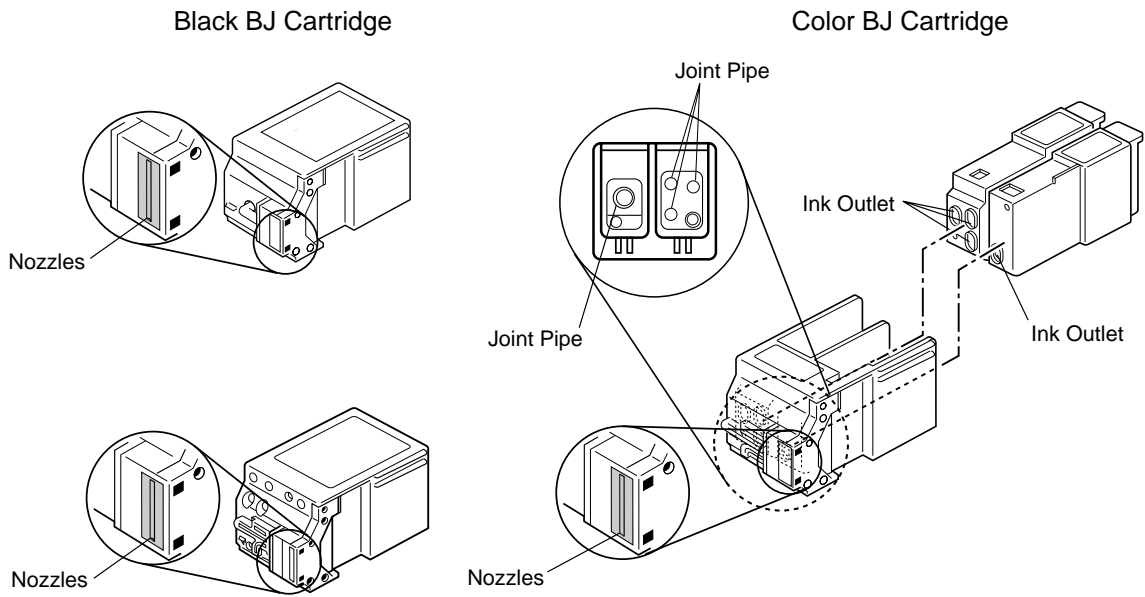


Figure 1-3 Ink Path of the BJ Cartridge

1.2.2 Ink mist

The BJ cartridge ejects ink onto the paper to print. During prolonged or heavy-duty use of the printer, small amounts of ink mist which splatter off the printing paper during printing can be deposited on the inside of the *front cover* and *platen*. Ink on these parts can cause stains on the printing paper, hands, or clothing. Wipe the ink off these parts periodically with a soft moist cloth.

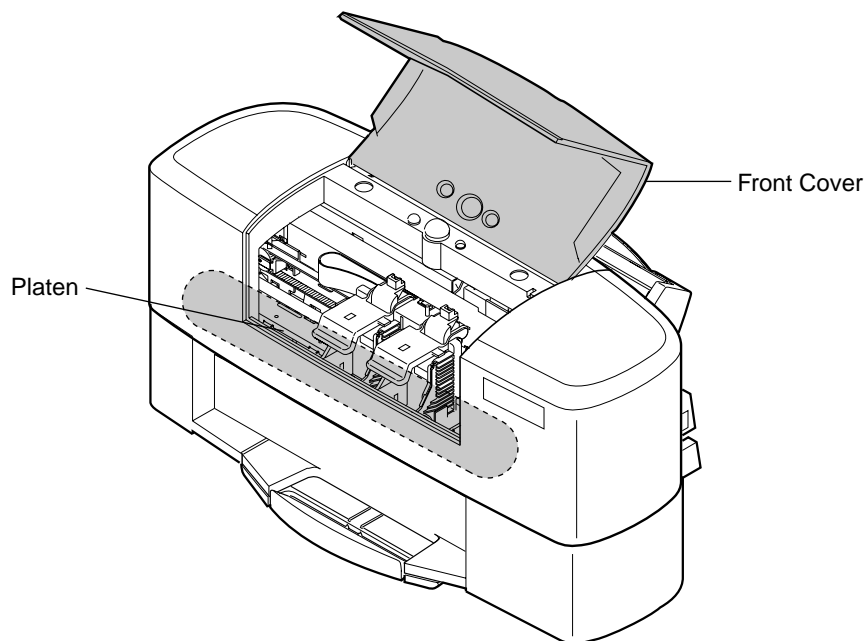


Figure 1-4 Ink Mist

1.3 BJ Cartridge Heat-Up

Do not touch the aluminum plate of the BJ cartridge. This aluminum plate heats up during printing. It will become very hot during prolonged and continuous printing sessions or when printing is attempted even after the cartridge has run out of ink.

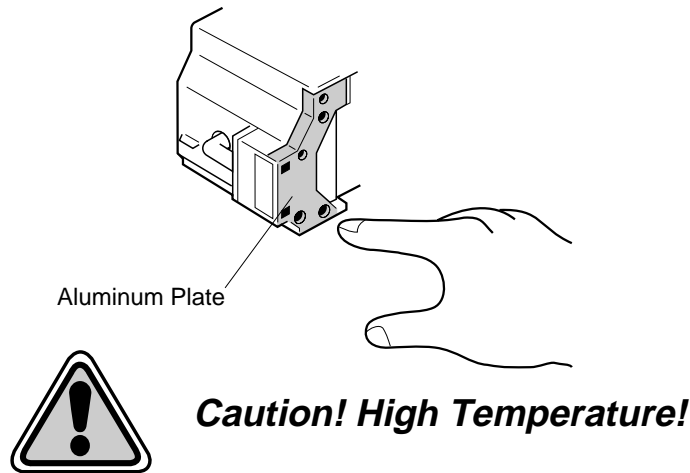


Figure 1-5 BJ Cartridge Aluminum Plate



This printer is provided with a protective mechanism for the overheating of the BJ cartridge. A head temperature (diode) sensor in the BJ cartridge detects the temperature levels for activating the protection mechanism. To prevent the user from touching the hot aluminum plate of the head when the head temperature becomes high, the carriage will not move to the cartridge replacement position even when the user opens the *front cover*. During this time, the printer beeps 5 times and the indicator lights in orange. If this happens, wait for a while and then either press the *RESUME* button or close the *front cover* once and open it again. If the head temperature increases further, printing will be stopped due to the head temperature error.



REF.

When the printer stops printing due to a head temperature error, follow the required troubleshooting procedure in “Part 5: 6, TROUBLESHOOTING” (page 5-12).

2. MACHINE PRECAUTIONS

2.1 Handling BJ Cartridges

2.1.1 Unpacking the BJ cartridge

Do not unpack the BJ cartridge until it is ready to be used. Before installing the BJ cartridge in the printer, remove the protective head caps from the nozzles and peel off the protective tape as shown in the figure below.

Never re-use the removed protective head caps and protective tape. This could cause printing troubles.

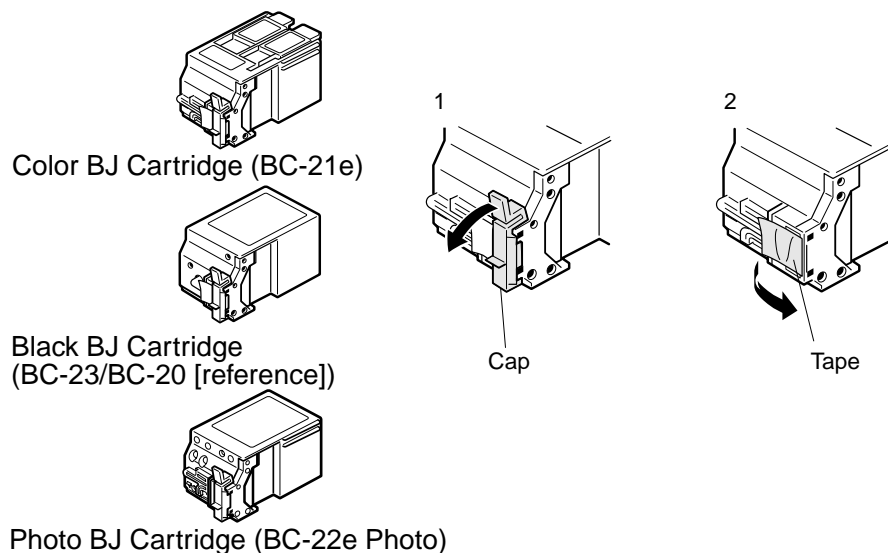


Figure 1-6 Removing the Head Cap and Protective Tape

2.1.2 Preventing clogged nozzles

Never touch the nozzles of the BJ cartridge or wipe them with tissue paper. Any foreign substance could easily clog the nozzles. Also, handle the inner joint pipe of the color BJ cartridge carefully to avoid clogging it and thus blocking the ink feed. To prevent clogging the nozzles with foreign substances and dried-out ink, install the BJ cartridge in the printer after the head cap and protective tape are removed (so that the printer caps the nozzles). When storing the BJ cartridge, make sure the nozzles of the cartridge are capped or store the cartridge in the BJ cartridge container. Foreign substances on the nozzles or dried up ink will result in poor ink suction. Never disassemble or assemble the BJ cartridge and do not wash it.



When the nozzles are clogged, white streaks will appear across the printed areas periodically. If this problem persists even after cleaning, replace the BJ cartridge with a new one.

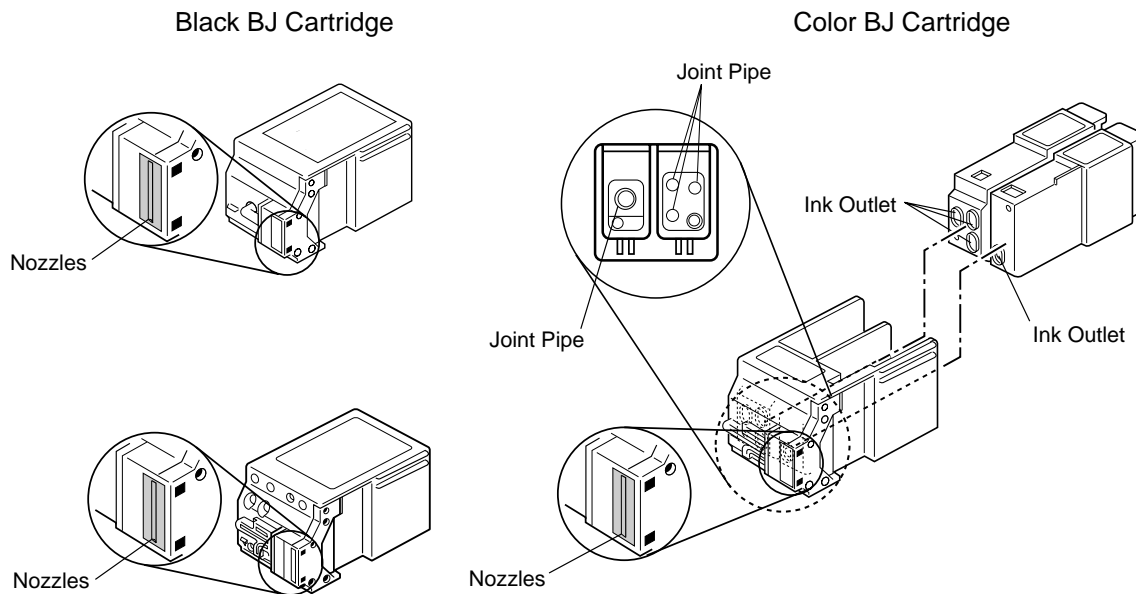


Figure 1-7 BJ Cartridge

2.1.3 Power on/off

When the printer is turned off with the *POWER button*, the printer automatically caps the nozzles of the BJ cartridge for their protection and to prevent ink leakage.

If the AC power cord of the AC adapter is unplugged unintentionally and the printer is turned off without pressing the *POWER button*, the nozzles may not be capped. In such cases, plug in the AC power cord of the AC adapter, turn on the power of the printer, and then press the *POWER button* to turn it off again.



If the nozzles are not capped properly, the ink may either dry out and clog the nozzles or leak out.

2.1.4 When not using the printer

Leave the BJ cartridge in the printer or store it in the BJ cartridge container when the printer is not in use. Also keep the BJ cartridge installed in the printer or store it in the BJ cartridge container while carrying, transporting, or storing the printer.



If the BJ cartridge is removed from the printer and left lying about, printing defects may occur when it is used again due to clogging of nozzles and dried-out ink. If the BJ cartridge is removed to relocate the printer, ink could leak out from the cap section.

2.1.5 Ink electroconductivity

The ink in the BJ cartridge is electroconductive. If the ink leaks into the printer's mechanical parts, use a paper towel to wipe off completely. If the ink leaks into the printer's electrical parts, use a tissue paper to wipe off completely. If ink is spilled under the IC chips on the printed circuit board (PCB) and is difficult to clean, replace the PCB.



Do not connect the AC power cord when ink has leaked into the electrical parts. This could damage the circuitry.

2.2 Handling Ink Cartridges (Color BJ Cartridge)

2.2.1 Unpacking the ink cartridge

Do not unpack an ink cartridge until it is ready to be used. Before installing it in the color BJ cartridge, remove the ink cartridge from its' package and remove the cap that covers the ink outlets.

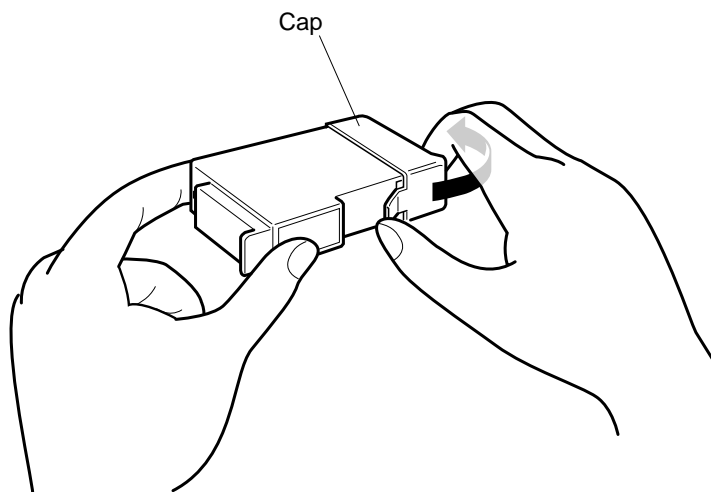


Figure 1-8 Removing the Ink Cartridge Cap

2.2.2 Protecting the ink cartridge

To prevent poor ink suction due to the attachment of foreign substances to the joint pipes connected to the BJ cartridge, never touch the ink outlets of the ink cartridge. After removing the cap from the ink cartridge, immediately install the ink cartridge in the BJ cartridge to prevent the nozzles from clogging due to dried-out ink. Do not remove an ink cartridge from the BJ cartridge unless it needs to be replaced.

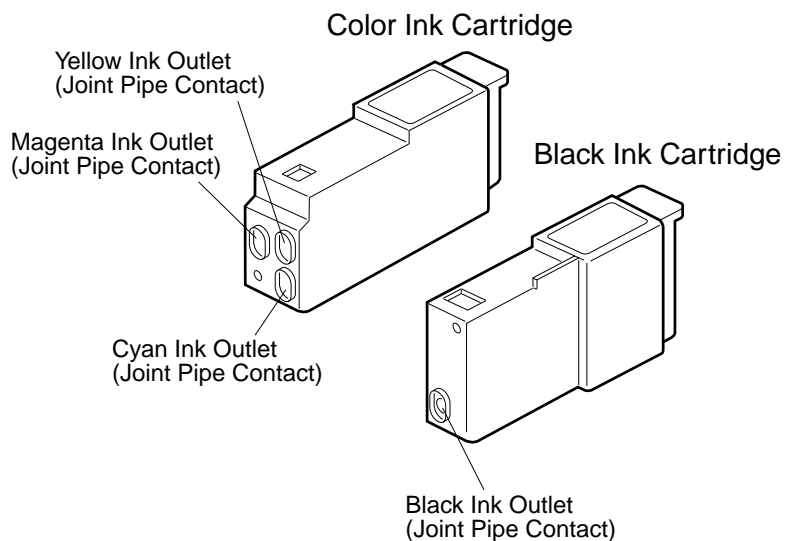


Figure 1-9 Ink Outlets (Ink Cartridge)

2.3 Printer Precautions

2.3.1 Preventing deformation of the spur tip

Do not touch the tips of the spurs. The spurs transfer and eject the paper after printing. They have a delicate structure and could be easily deformed. Since the tip of the spurs have a very small contact surface with the paper, the ink adhering to the spurs is minimal. The spur cleaner wipes off the adhered ink from the spurs to prevent smudges on the paper. If the spurs are touched and the tip of the spurs become deformed, the contact surface with the paper might increase, causing more ink to adhere to each spur. As a result, should the spur cleaner fail to wipe the ink from the spurs completely, a dotted-line smear may be printed on the paper or a trace may be produced. If this happens, replace the spur unit with a new one.

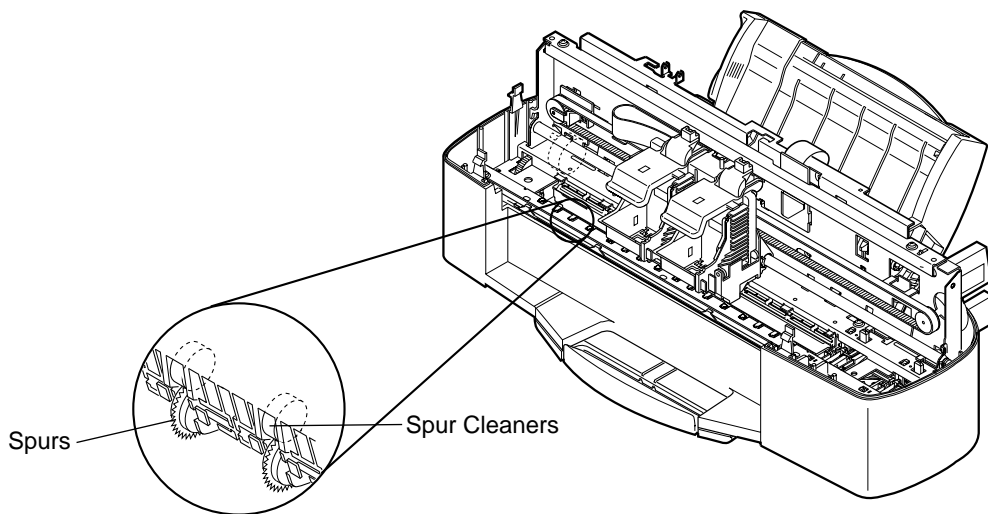


Figure 1-10 Spurs

2.3.2 Static electricity damage prevention

Never touch the electrical contacts to the cartridge of the carriage ribbon cable. Any static electricity produced by clothing and friction could damage the electrical components or change their electrical characteristics.

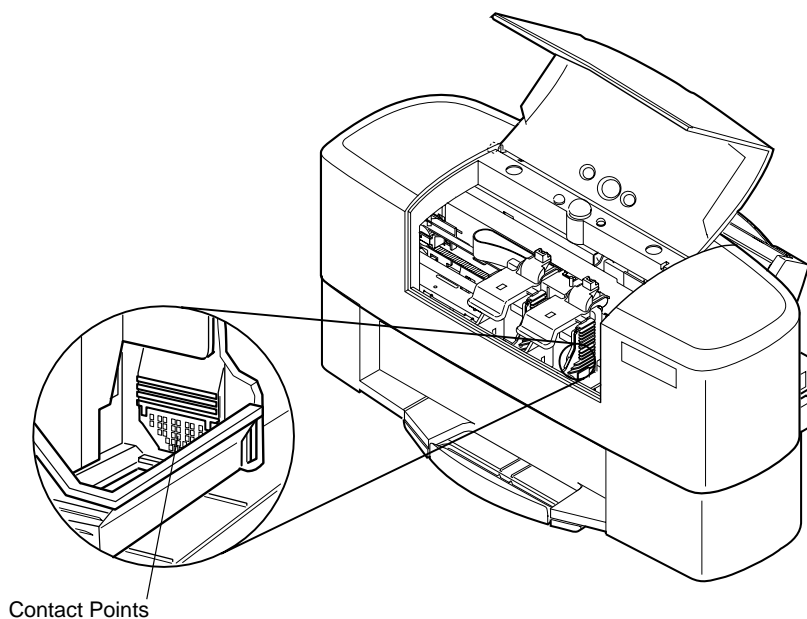


Figure 1-11 Electrical Contacts of Carriage Ribbon Cable

2.3.3 Ink leakage prevention

Transport, pack, or store the printer with the BJ cartridge installed in the printer. Otherwise, the ink in the purge unit could flow backward and spill out inside the printer. Before packing the printer, make sure the carriage is at the capping position (the right end of the carriage shaft).

The nozzles of the BJ cartridge are automatically capped when the printer is turned off by pressing the *POWER button*. Do not unplug the AC power cord of the AC adapter before turning off the printer with the *POWER button*. Otherwise, the printer will be stopped without capping the nozzles, which could cause ink leaks and ink bonding. In case this happens, plug in the AC power cord, turn on the printer by pressing the *POWER button*, turn it off by pressing the *POWER button*, and then unplug the AC power cord again.

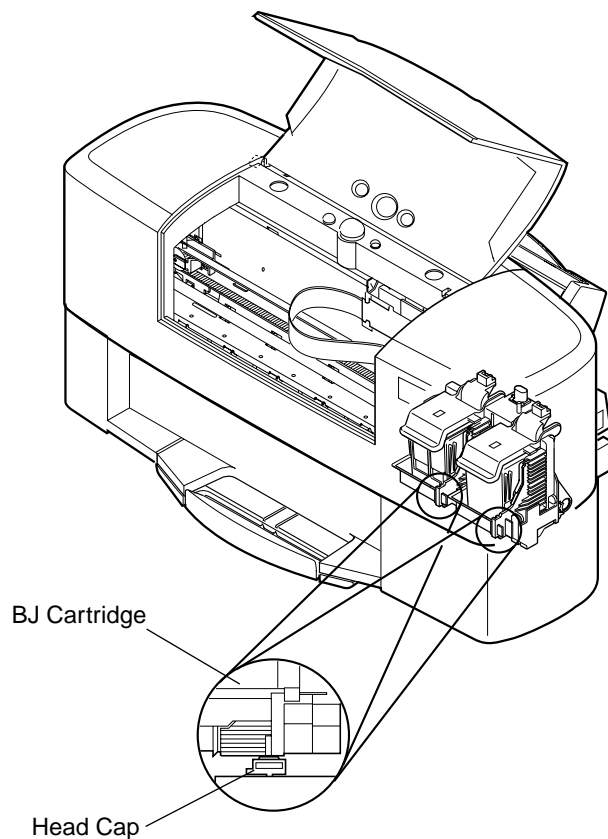


Figure 1-12 Capping Position

3. MAINTENANCE SERVICE PRECAUTIONS

3.1 EEPROM Data Precautions

This printer keeps track of various function settings, the total number of sheets printed, and the total waste ink amount. Such information is stored in the EEPROM on the logic board. Heed the following precautions during maintenance servicing.

1) **Before servicing**

Check the data stored in the printer with a test print (only for the total number of sheets printed) and a service information print in the Service Mode. The total number of sheets printed can provide an idea of how much the printer has been used.

2) **When the logic board (EEPROM) is replaced or if the memory data was unintentionally reset**

Check the waste ink absorbers, replace them if necessary, and set the total waste ink amount counter according to instructions in “Part 5: 4.3, Logic Board and Waste Ink Absorber Replacement Cautions” (page 5-6). The waste ink counter total can be set to 0% (clearing the data), 25%, 50%, and 75%. If this task is neglected, a “waste ink full” error may not occur even when the waste ink amount exceeds the full capacity and waste ink may start leaking, depending on the waste ink amount already absorbed by the waste ink absorbers.

The memory data in the replacement logic board (EEPROM) is not defined. After replacing the logic board (EEPROM), reset the EEPROM. Check the above waste ink absorbers and set the total waste ink amount counter. After resetting the EEPROM, install the black BJ cartridge and calibrate the auto-alignment sensor. If the calibration is not performed, an EEPROM error will occur when the printer is turned on.

3) **After waste ink absorber replacement**

If the waste ink absorbers are replaced when the “waste ink full” error or another error occurs, reset the total waste ink amount counter of the EEPROM.



Once the memory data of EEPROM is reset, the data cannot be checked by a test print in the Service Mode. To check the stored data, be sure to execute a test print in the Service Mode before resetting the EEPROM. When the EEPROM is reset, all data including the various settings, total number of sheets printed, and total waste ink amount are reset. The total number of sheets printed cannot be incremented using the control panel.



This printer keeps track of the estimated waste ink amount based on the condition of printer usage immediately after the printer is started. To prevent ink leakage due to the waste ink absorption capacity being exceeded, the printer stops printing and displays an error when the waste ink amount nears the full waste ink absorption capacity. The printer operation can be restarted by pressing the *RESUME* button. If the printer is used in this condition, the “waste ink full” error is displayed. See “Part 3: 3.4 Service Mode” (page 3-18) for information about checking the memory data using a test print or the Service Mode and for resetting procedure. If the printer operation stops due to “waste ink full” or other errors, follow the required troubleshooting procedure in “Part 5: 6, TROUBLESHOOTING” (page 5-12).

3.2 Static Electricity Precautions

Static electricity produced by friction of clothing could damage the electrical parts or change their electrical characteristics. Before disassembling the printer to perform any servicing, touch a metallic object that is properly grounded to discharge any built-up static electricity. For example, a wrist strap can be used to discharge built-up static electricity.

Before discharging built-up static electricity, do not touch electrical parts such as the logic board and contacts to the BJ cartridge of the carriage ribbon cable while the carriage ribbon cable is connected to the logic board (see Figure 1-11).

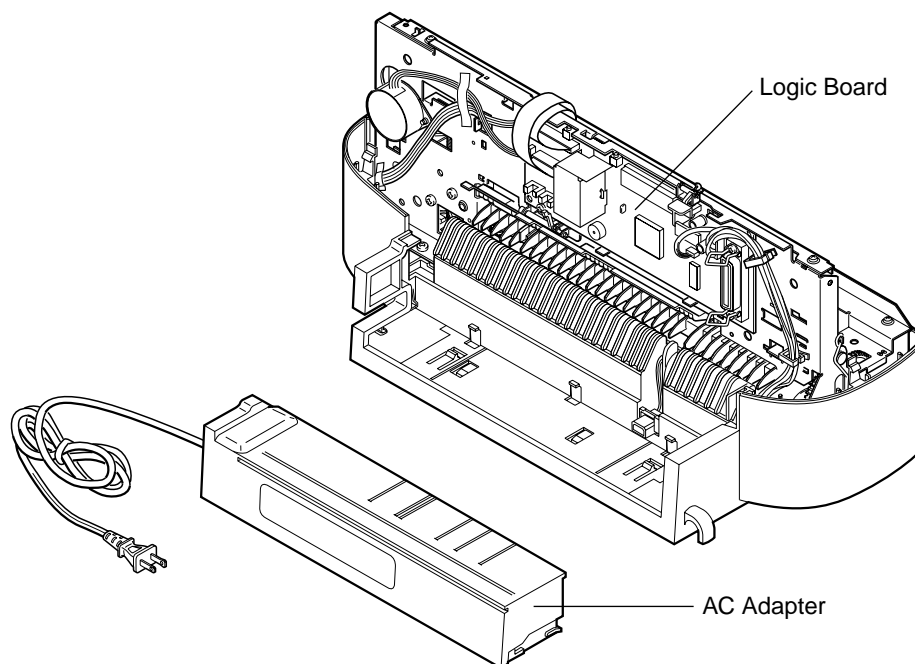


Figure 1-13 Electrical System of Printer

3.3 Disassembly and Assembly Precautions

The printer has a large number of plastic parts. When you disassemble the printer, be very careful not to break or bend the plastic hooks.



Some plastic parts are made of highly rigid material containing glass fibers to improve precision. Such material have low viscosity, however, and the plastic hooks can break easily. When you disassemble the printer, use a screwdriver and do not apply excessive force on the plastic hooks.

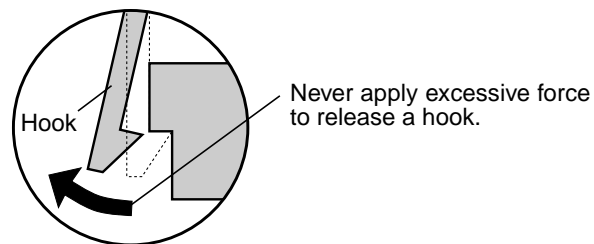


Figure 1-14 Releasing the Plastic Hooks

3.4 Built-in Self-Diagnosis

The printer is provided with a self-diagnosis feature which analyzes hardware defects. The results of the self-diagnosis are shown by the indicators and the beeper. See "Part 3: 3.1, Error Indications" (page 3-14) for more information.



Part 2

PRODUCT SPECIFICATIONS

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2 - 1	1. PRODUCT OUTLINE
2 - 1	1.1 Product Outline
2 - 2	1.2 Features
2 - 3	1.3 BJ Cartridge
2 - 5	1.4 Dual Cartridge System
2 - 5	1.5 BJ Cartridge Container
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2 - 7	2. SPECIFICATIONS
2 - 7	2.1 Printer Specifications
2 - 9	2.2 Paper Specifications
2 -12	2.3 Interface Specifications

1. PRODUCT OUTLINE

1.1 Product Outline

This desktop color printer achieves high-speed printing by means of a dual cartridge system. It also realizes maximum 1440 (vertical) x 720 (horizontal) dpi high-resolution printing by using the printer driver to perform the main data processing.

Moreover, this printer achieves high image printing by adopting a “drop modulation technology” in the color BJ cartridge and photo BJ cartridge. High-density monochrome printing is offered with a black BJ cartridge that adopts a newly developed ink. The reproduction of color graduations has been improved through the combined use of these cartridges.

In addition, the printing environment is further expanded by the possibilities of printing on up to A3-size paper and banner (long paper) printing by manual feeding. This is a high-performance standard machine.

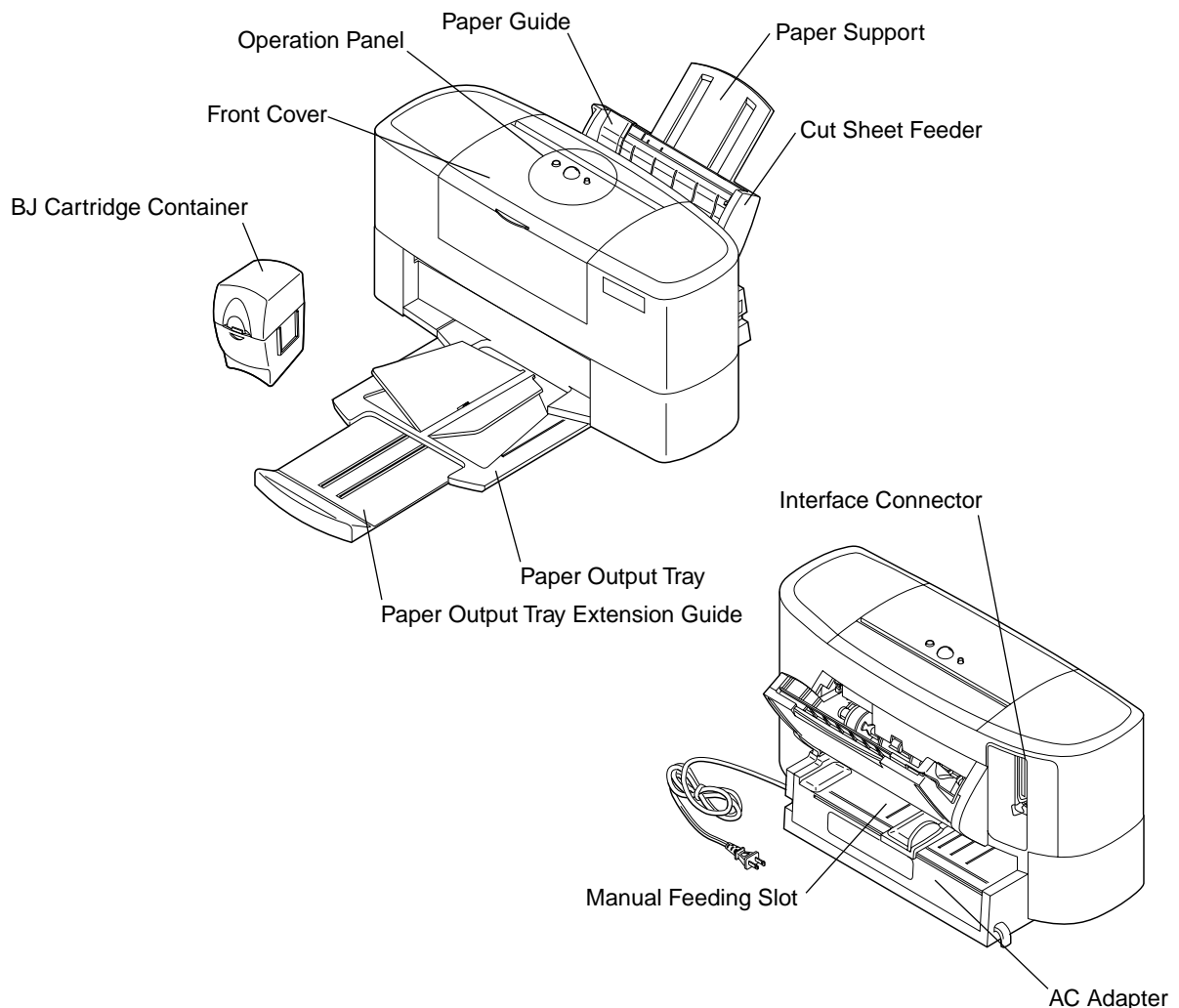


Figure 2-1 Printer Appearance

1.2 Features

1. High-speed printing by dual cartridge system
2. High-resolution printing of maximum 1440 (vertical) x 720 (horizontal) dpi
3. Easy-to-replace, high-speed and high-quality printing-compliant BJ cartridge
 - Color BJ Cartridge (BC-21e): Adopts a drop modulation technology. Has separate ink tanks (Bk) (Y+M+C) and head with 136 nozzles in a vertical line; 64 nozzles (Bk) + 24 nozzles x 3 (Y, M, C).
 - Black BJ Cartridge (BC-23): 128-nozzle and head single unit type (high-density type)
 - Photo BJ Cartridge (BC-22e Photo): Drop modulation technology has been adopted. 136-nozzle and head single unit type
 - Black BJ Cartridge (BC-20 [reference]): 128-nozzle and head single unit type
 - Ink cartridge: Black ink cartridge and tricolor (Y, M, C) ink cartridge (3-color ink single unit)

(The previous model Color BJ Cartridge (BC-21) and Photo BJ Cartridge (BC-22 Photo) that are not compliant with the drop modulation technology cannot be used.)
4. The auto-alignment function which corrects the printing position displacement of the left and right cartridges and printing direction displacement caused by bi-directional printing has been provided to achieve image maintenance.
5. Exclusive Windows machine using a dedicated driver. Emulation is not supported.
6. A BJ cartridge container is supplied with the printer for storing the removed BJ cartridge.
7. ECP mode compliant.
8. Banner printing capabilities.
9. Built-in automatic cut sheet feeder without paper lever.
10. Improved operability. Provides an automatic head-to-paper distance adjustment mechanism (no paper thickness adjustment lever). Also, the cartridge comes to the replacement position when the cover is opened (no cartridge button).
11. Built-in AC adapter for power supply. (Assembled at the factory before shipment.)
12. Can print on up to A3-size paper by manual feed. (Up to A4/LTR-size full bleed with ASF.) When printing on A3-size paper, only the left BJ cartridge is used. (Either monochrome or color printing is enabled and photo printing is disabled when using A3-size paper.)
13. The printer driver supports an automatic power off feature.
14. The printer can achieve high resolution printing because the main data processing is performed by the printer driver. Note on the other hand that this printer requires a more advanced host computer operating environment.
 - 1) Windows95/98
 - 2) CPU: Min. 166MHz
 - 3) RAM: Min. 16MB
 - 4) HDD: Min. 40MB of free space
 - 5) Printer port: ECP/DMA

1.3 BJ Cartridge

1.3.1 Color BJ cartridge (BC-21e)

The color BJ cartridge BC-21e for color printing is disposable. The color BJ cartridge has a printhead with 136 nozzles and a replaceable ink cartridge (two types, black and color).

When the ink runs out or more than 6 months have elapsed since the cartridge was removed from the package, or if the print quality does not improve even after cleaning the head five times or more, replace the ink cartridge with a new one.

Also, if the print quality does not improve following replacement of the ink cartridge and after cleaning the head five times or more, replace the BJ cartridge. Since the three color inks are integrated, the entire color ink cartridge must be replaced when one color ink runs out.

The drop modulation technology minimizes print graininess by using small-size dots for printing in low density areas. On the other hand, it maintains the printing speed and achieves high-quality printing by using large-size dots effectively in high density areas. A total of 136 head nozzles are provided in a row: 24 nozzles for yellow ink, 24 nozzles for magenta ink, 24 nozzles for cyan ink, and 64 nozzles for black ink.

The printer can print out approximately 225 sheets with black ink (1500-character standard text pattern in the Standard mode) and approximately 100 sheets with color ink (7.5% duty per color pattern in the Standard mode).

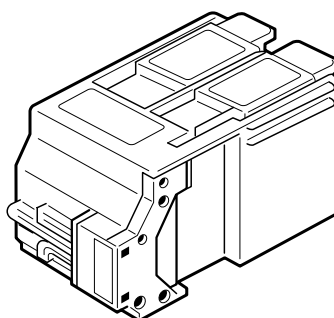


Figure 2-2 Color BJ Cartridge (BC-21e)

1.3.2 Black BJ cartridge (BC-23)

The black BJ cartridge BC-23 for ultra-high-speed monochrome printing is disposable. The cartridge consists of a printhead with 128 nozzles and an ink cartridge.

When the ink runs out or more than 6 months have elapsed since the cartridge was removed from the package, or if the print quality does not improve even after cleaning the head five times or more, replace the BJ cartridge with a new one.

High-density monochrome printing is enabled with the black BJ cartridge which uses a newly developed ink. The printer can print approximately 900 sheets with the black BJ cartridge (1500-character standard text pattern in the Standard mode).

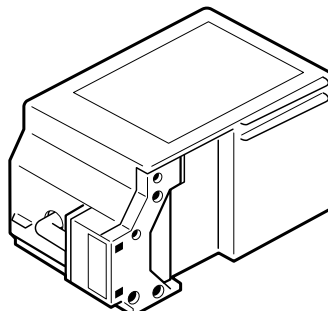


Figure 2-3 Black BJ Cartridge (BC-23)

1.3.3 Black BJ cartridge (BC-20) (reference)

The black BJ cartridge (BC-20) for ultra-high-speed monochrome printing is disposable. The cartridge consists of a printhead with 128 nozzles and an ink cartridge.

When the ink runs out or more than 6 months have elapsed since the cartridge was removed from the package, or if the print quality does not improve even after cleaning the head five times or more, replace the BJ cartridge with a new one.

The printer can print approximately 900 sheets with the black BJ cartridge (1500-character standard text pattern in the Standard mode).

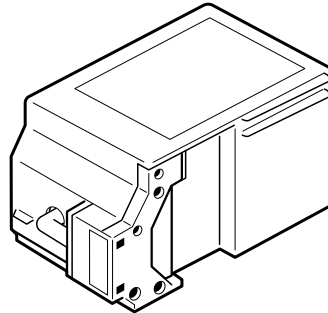


Figure 2-4 Black BJ Cartridge (BC-20 [reference])

1.3.4 Photo BJ cartridge (BC-22e Photo)

The photo BJ cartridge (BC-22e Photo) for photo printing is disposable. The photo BJ cartridge consists of a printhead with 136 nozzles and an ink cartridge.

When the ink runs out or more than 6 months have elapsed since the cartridge was removed from the package, or if the print quality does not improve even after cleaning the head five times or more, replace the BJ cartridge with a new one. Since the four color inks are integrated, the entire photo BJ cartridge must be replaced when one color ink runs out.

The drop modulation technology minimizes graininess by using the small-size dots for printing in low density areas. On the other hand, it maintains the printing speed and achieves high-quality printing by using the large-size dots effectively in high density areas. A total of 136 head nozzles are provided in a row: 24 nozzles for yellow ink, 24 nozzles for magenta ink, 24 nozzles for cyan ink, and 64 nozzles for black ink.

The printer can print approximately 50 sheets with the photo BJ ink cartridge (Photo Standard mode). Use high resolution paper for printing.

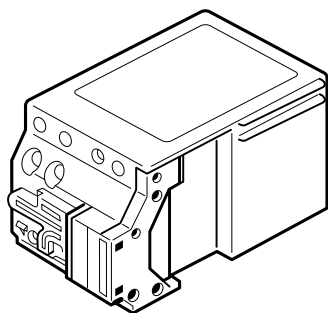


Figure 2-5 Photo BJ Cartridge (BC-22e Photo)

1.4 Dual Cartridge System

This printer has two BJ cartridges installed on the carriage to minimize the moving distance of the carriage during printing and thus improving printing speed. This system is called the dual cartridge system. The BJ cartridge can be used with the following combinations.

- 1) BC-23 & BC-23 (BC-20 & BC-20 [reference]): Head configuration to achieve the highest speed during monochrome printing.
Resolution: Plain paper (High Mode: 720x720dpi, Standard Mode: 360x360dpi)
Resolution: Other specified papers (High Mode: 1440x720dpi, Standard Mode: 720x720dpi)
- 2) BC-21e & BC-21e: Head configuration to achieve the highest speed during color printing.
Resolution: Plain paper (High Mode: 720x720dpi, Standard Mode: 360x360dpi)
Resolution: Other specified papers (High Mode: 1440x720dpi, Standard Mode: 720x720dpi)
- 3) BC-21e & BC-23 (BC-21e & BC-20 [reference]): Head configuration to achieve the optimal balance in monochrome and color printing.
Resolution: Plain paper (High Mode: 720x720dpi, Standard Mode: 360x360dpi)
Resolution: Other specified papers (High Mode: 1440x720dpi, Standard Mode: 720x720dpi)
- 4) BC-21e & BC-22e Photo*: Head configuration to obtain the highest print quality.
Resolution: Plain paper (High Mode: 1440x720dpi, Standard Mode: 720x720dpi)
Resolution: Other specified papers (High Mode: 1440x720dpi, Standard Mode: 720x720dpi)

*: The BJ cartridge combinations 3) and 4) can be used by installing the BC-21e cartridge on the left side of the carriage. The BC-23, BC-21e, and BC-20 (reference) cartridges can be installed independently on the left side of the carriage for printing. If the right BJ cartridge ink run-out is detected when Auto Head Alignment is executed from the printer driver, printing is performed using the left BJ cartridge. When printing on A3-size paper, only the left BJ cartridge is used for printing.

1.5 BJ Cartridge Container

The BJ cartridge container is used for storing the BJ cartridge when it is removed from the printer. When you store a BJ cartridge in the container, be sure to close the cover tightly.

A single BJ cartridge container can store either of the following cartridges: BJ cartridge (BC-23) or black BJ cartridge (BC-20 [reference]), color BJ cartridge (BC-21e), or photo BJ cartridge (BC-22e Photo). Store the color BJ cartridge with the ink cartridge is installed in it. The BJ cartridge containers can be coupled together.

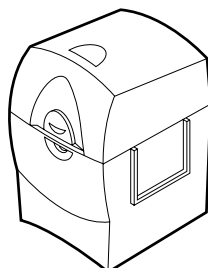
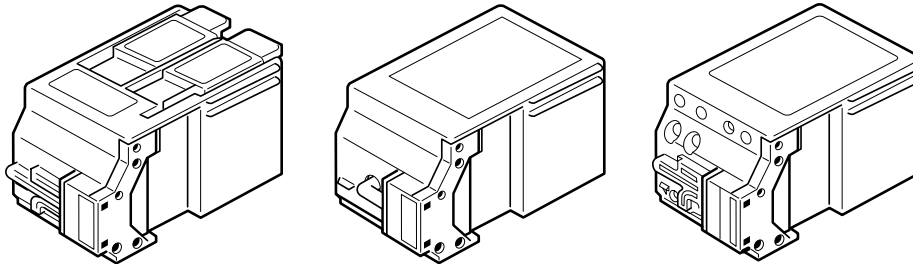


Figure 2-6 BJ Cartridge Container

1.6 Consumables

1.6.1 BJ cartridge (Black, Color, Photo)

The consumable black BJ cartridge (BC-23 and BC-20 [reference]), color BJ cartridge (BC-21e), and photo BJ cartridge (BC-22e) available in the market are identical to those supplied with the printer. Only their packages are different.



Color BJ Cartridge

Black BJ Cartridge

Photo BJ Cartridge

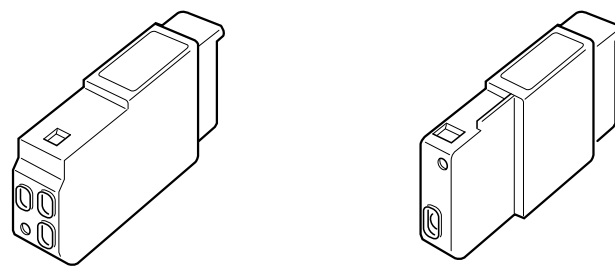
Figure 2-7 BJ Cartridges

1.6.2 Ink cartridge (BC-21e Color BJ Cartridge only)

The two types of consumable ink cartridges available in the market are the black ink cartridge and color ink cartridge. They are identical to those mounted in the color BJ cartridge (BC-21e). Either cartridge can be used for half a year after the seal is opened. The number of sheets that can be printed are as follows.

Black ink cartridge: Approx. 225 sheets (Standard mode) (1500-character standard text pattern)

Color ink cartridge: Approx. 100 sheets (Standard mode) (7.5% duty per color pattern)



Color Ink Cartridge

Black Ink Cartridge

Figure 2-8 Ink Cartridges

2. SPECIFICATIONS

2.1 Printer Specifications

1. Type

Desktop serial color bubble jet printer

2. Paper feeding method

Auto feeding and manual feeding

3. Cut sheet feeder capacity

Plain paper:	Max. thickness 13 mm (Approx. 130 sheets of paper)
64g/m ²	
High resolution paper:	Max. 100 sheets
OHP film:	Max. 30 sheets
Back print film:	Max. 10 sheets
Envelopes:	Max. 15 envelopes (Commercial number-10 and European DL-size envelopes)
Glossy photo paper:	1 sheet
T-shirt transfers:	1 sheet
Fabric sheet:	1 sheet

A3-size paper can be loaded 1 sheet at a time through the manual feeding slot.
Two to six sheets of banner paper can be loaded from the manual feeding slot.

4. Paper weight

Automatic feeding: 64 to 105g/m² (17 lbs to 28 lbs)
Manual feeding: 64 to 550g/m² (17 lbs to 146 lbs), Max. thickness 0.8 mm

5. Printing speed (burst speed)

Monochrome printing (BC-21e × 2): 360cps (10 cpi)
Monochrome printing (BC-20 × 2/BC-23 × 2): 720cps (10 cpi)

6. Printing direction

Bi-directional and uni-directional (The print direction is automatically changed according to the print mode.)

7. Max. printing width

ASF: 215.9 mm (8.5")
Manual feeding: 290.2 mm (11.4")

8. Line feed speed

Approx. 120ms/line (128/360" line)

9. Built-in printing control mode

Canon extended (native) mode

10. Line feed pitch (n: programmable)

n/360", n/720", n/1440"

11. Buffer

Print buffer: Approx. 512kB

12. Interface

IEEE 1284-compatible bi-directional parallel interface
(Compatible/nibble/ECP modes are supported.)

13. BJ cartridge**Color BJ cartridge (BC-21e)**

Type: Color BJ cartridge with separate ink tanks
 Printhead: 136 nozzles (vertically-lined), Blk (64 nozzles) + Y, M, C (24 nozzles × 3)
 Ink colors: Black, cyan, magenta, yellow
 Service life: Approx. 225 sheets (in the standard mode with 1500-character pattern) with a black cartridge
 Approx. 100 sheets (in the standard mode) with a color cartridge (7.5% duty per color pattern)

Weight: Approx. 85g (3.0 oz) (including black and color ink tanks)

Black BJ cartridge (BC-23 and BC-20 [reference])

Type: Black BJ cartridge with ink tank inside
 Printhead: 128 nozzles (vertically-lined)
 Ink colors: Black
 Service life: Approx. 900 sheets (in the standard mode) per cartridge
 Weight: Approx. 85g (3.0 oz)

Photo BJ cartridge (BC-22e Photo)

Type: Color BJ cartridge with ink tanks inside
 Printhead: 136 nozzles (vertically-lined), Blk (64 nozzles) + Y, M, C (24 nozzles × 3)
 Ink colors: Black, cyan, magenta, yellow
 Service life: Approx. 50 sheets (in the photo standard mode) per cartridge
 Weight: Approx. 80g (2.8 oz)

14. Sensor functions

Paper run-out:	Provided
Installation of cartridge:	Provided
Cartridge identification:	Provided
Waste ink amount:	Provided
Cover open:	Provided
Ink run-out:	Provided*
Paper width:	None

*A function is provided to determine whether the ink has run out by a specific pattern printed from the driver. There is no function, however, to notify the run out of ink during a normal printing operation.

15. Acoustic noise level

Approx. 48 dB(A)/standard mode (Sound pressure level: Compliant with ISO 9296)

16. Environmental conditions

Operating temperature: 5 °C to 35 °C (41 °F to 95 °F)
 Operating humidity: 10% to 90% RH (no condensation)
 Storage temperature: 0 °C to 35 °C (32 °F to 95 °F)
 Storage humidity: 5% to 90% RH (no condensation)

17. Power source

	Voltage/Frequency	Power consumption	Stand-by status
USA/Canada	AC 120V 60 Hz	Max. 40 W	Approx. 6 W
UK/Australia	AC 240V 50 Hz		
Europe	AC 230V 50 Hz		

18. Dimensions

498 mm (W) × 280 mm (D) × 222 mm (H)

19. Weight

Approx. 5.3kg (11.6 lbs) (including two BJ cartridges)

2.2 Paper Specifications**2.2.1 Paper size**

A3 (297 mm × 420 mm)

A4 (210 mm × 297 mm)

A4+ (224 mm × 336 mm)

A5 (148 mm × 210 mm)

B4 (257 mm × 364 mm)

B5 (182 mm × 257 mm)

Letter (216 mm × 279 mm)

Letter+ (229 mm × 338 mm)

Legal (216 mm × 356 mm)

Commercial number 10 envelope (241 mm × 105 mm)

European DL-size envelope (220 mm × 110 mm)

Banner Paper (210 mm × 297 mm, 216 mm × 279 mm)

Tabloid (279 mm × 432 mm)

2.2.2 Paper type

Plain paper (Letter, Legal, A3, A4, A5, B4, B5)

Color bubble jet paper (Canon Bubble Jet Paper LC-301/Letter, Legal, A3, A4)

High resolution paper (Canon High Resolution Paper HR-101/Letter, A3, A4)

Glossy photo paper (Canon Glossy Photo Paper GP-201/Letter, A4)

High gloss film (Canon High Gloss Film HG-201/Letter, A3, A4)

OHP film (Canon Transparency Film CF-102/Letter, A4)

Back print film (Canon Back Print Film BF-102/Letter, A3, A4)

Fabric (Canon Fabric Sheet FS-101/Legal)

Banner (Canon Banner Paper BP-101/Letter, A4)

Envelopes (Commercial Number-10 or European DL-size envelopes)

T-shirt transfers (Canon T-Shirt Transfers TR-201/Letter, Tabloid)

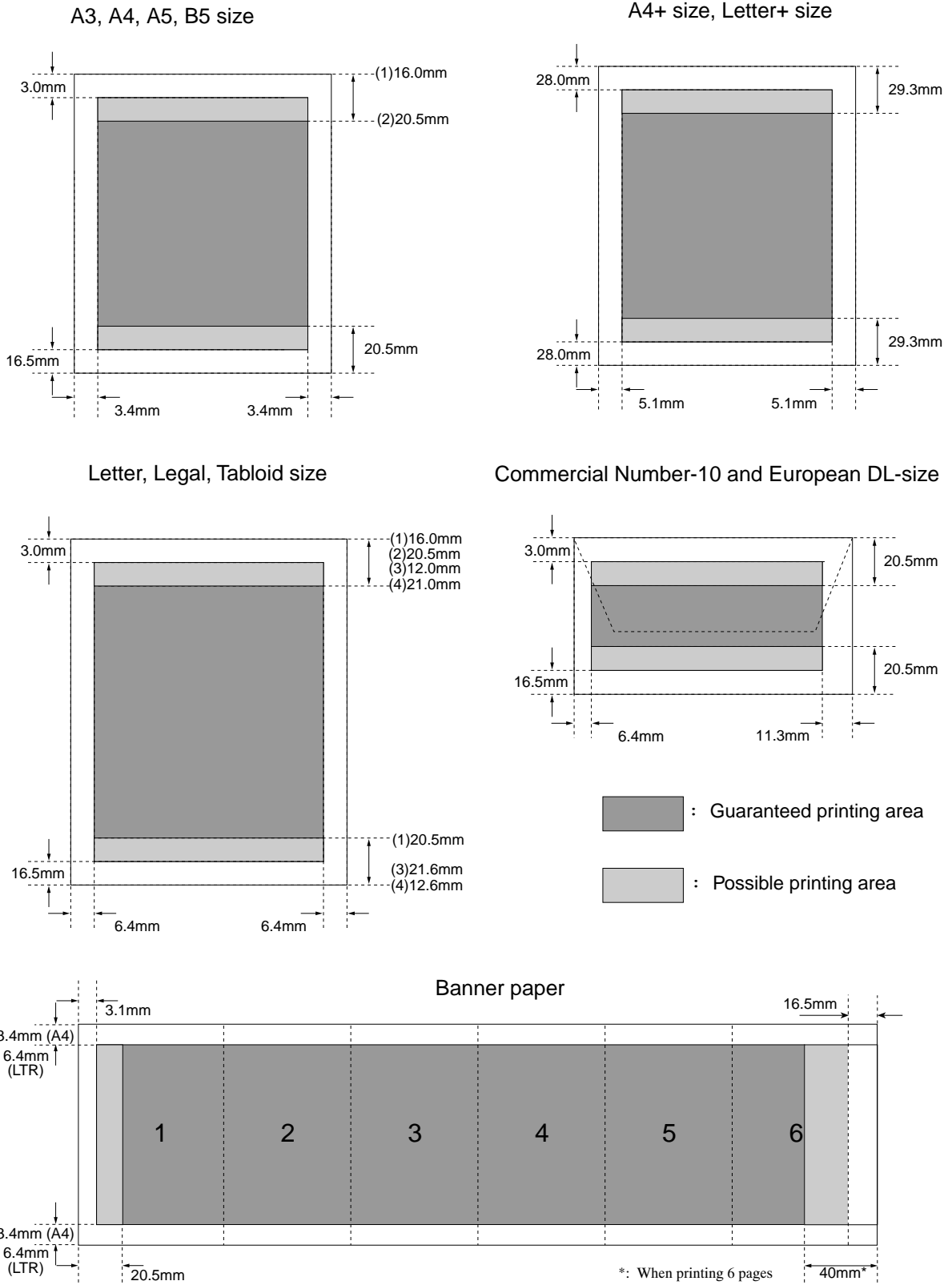
2.2.3 Cut sheet feeder sheet loading capacity

Plain paper:	Max. 13 mm (Approx. 130 sheets of 64g/m ² paper)
High resolution paper:	Max. 100 sheets
OHP film:	Max. 30 sheets
Back print film:	Max. 10 sheets
Envelopes:	Max. 15 envelopes
Glossy photo paper:	1 sheet
T-shirt transfers:	1 sheet
Fabric:	1 sheet



A3-size paper can be loaded from the manual feeding slot 1 sheet at a time. Two to six sheets of banner paper can be loaded from the manual feeding slot.

2.2.4 Printing area



- (1) Printed with the black BJ cartridge
- (2) Printed with the color BJ cartridge or the photo BJ cartridge
- (3) Printed with the black BJ cartridge on Legal-size paper
- (4) Printed with the color BJ cartridge or the photo BJ cartridge on Legal-size paper

Figure 2-9 Printing Area

2.3 Interface Specifications

- 1) **Interface type**
IEEE1284-compatible bi-directional parallel interface
- 2) **Data transfer**
8-bit parallel transfer (Supports the Compatible mode/Nibble mode/ECP mode.)
- 3) **Signal voltage levels**
Low: 0.0V to +0.8V
High: +2.4V to +5.0V
- 4) **Input/output**
Each signal pulled up with +5V.
- 5) **Interface cable**
Type: Twisted-pair double shielded cable
Material: American Wire Gauge (AWG) No. 28 or larger
Length: Max. 2.0m (6.6 feet)
- 6) **Interface connectors**
On printer: Amphenol 57-40360 (or equivalent)
On cable: Amphenol 57-30360 (or equivalent)
- 7) **Input/output signals and pin assignment**

Compatible mode

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	$\overline{\text{INIT-RET}}$...
13	SELECT	OUT	31	$\overline{\text{INIT}}$	IN
14	$\overline{\text{AUTO FEED XT}}$	IN	32	$\overline{\text{ERROR}}$	OUT
15	N.C ^{*2}	...	33	GND	...
16	GND	IN	34	N.C ^{*2}	...
17	GND	...	35	+5.0V ^{*3}	...
18	+5.0V ^{*4}	...	36	$\overline{\text{SELECT IN}}$	IN

*1. All-RETs are connected to GND.

*2. N.C means no connection.

*3. The level is pulled up with +5.0V through 3.3k resistor.

*4. The level is pulled up with +5.0V through 390 resistor.

Nibble mode

No.	Signal	I/O	No.	Signal	I/O
1	HostClk	IN	19	Signal Gnd	...
2	Data1	OUT	20	Signal Gnd	...
3	Data2	OUT	21	Signal Gnd	...
4	Data3	OUT	22	Signal Gnd	...
5	Data4	OUT	23	Signal Gnd	...
6	Data5	OUT	24	Signal Gnd	...
7	Data6	OUT	25	Signal Gnd	...
8	Data7	OUT	26	Signal Gnd	...
9	Data8	OUT	27	Signal Gnd	...
10	PtrClk	OUT	28	Signal Gnd	...
11	PtrBusy	OUT	29	Signal Gnd	...
12	AckDataReq	OUT	30	Signal Gnd	...
13	Xflag	OUT	31	$\overline{\text{INIT}}$	IN
14	HostBusy	IN	32	DataAvail	OUT
15	Not Defined	...	33	Not Defined	...
16	Gnd	...	34	Not Defined	...
17	Gnd	...	35	Not Defined	...
18	Vcc	...	36	1284Active	IN

ECP mode

No.	Signal	I/O	No.	Signal	I/O
1	HostClk	IN	19	Signal Gnd	...
2	Data1	IN/OUT	20	Signal Gnd	...
3	Data2	IN/OUT	21	Signal Gnd	...
4	Data3	IN/OUT	22	Signal Gnd	...
5	Data4	IN/OUT	23	Signal Gnd	...
6	Data5	IN/OUT	24	Signal Gnd	...
7	Data6	IN/OUT	25	Signal Gnd	...
8	Data7	IN/OUT	26	Signal Gnd	...
9	Data8	IN/OUT	27	Signal Gnd	...
10	PeriphClk	OUT	28	Signal Gnd	...
11	PeriphAck	OUT	29	Signal Gnd	...
12	AckReverse	OUT	30	Signal Gnd	...
13	Xflag	OUT	31	$\overline{\text{ReverseReq}}$	IN
14	HostAck	IN	32	PeriphReq	OUT
15	Not Defined	...	33	Not Defined	...
16	Gnd	...	34	Not Defined	...
17	Gnd	...	35	Not Defined	...
18	Vcc	...	36	1284Active	IN

8) Input/output signals**Compatible Mode****STROBE [Input]**

This signal is used to read Data1 to Data8. This signal becomes valid after the BUSY signal goes from HIGH to LOW and the printer outputs an $\overline{\text{ACKNLG}}$ signal. This signal is normally HIGH and the printer receives data after the signal goes LOW.

DATA1 to 8 [Input]

The printer receives data on the $\overline{\text{STROBE}}$ signal. The status of each bit of this signal must be maintained for at least 280 ns from the leading edge of the $\overline{\text{STROBE}}$ signal.

 $\overline{\text{ACKNLG}}$ [Output]

This signal is a response signal to the $\overline{\text{STROBE}}$ signal. The host computer cannot output the next $\overline{\text{STROBE}}$ signal until this signal is output. When the power is turned on or when the BUSY goes from HIGH to LOW for the input of the INIT signal, this signal is sent regardless of the $\overline{\text{STROBE}}$ signal.

BUSY [Output]

When this signal is HIGH, the printer is BUSY; when it is LOW, the printer is READY. This signal goes from LOW to HIGH when data is received or when an error occurs (paper-out, paper jam).

P.E. [Output]

If the printer is unable to feed paper even when the feeding operation is executed by the printer, this signal goes from LOW to HIGH. At this time, the BUSY signal goes HIGH and the $\overline{\text{SELECT}}$ and $\overline{\text{ERROR}}$ signals go LOW. The signal goes LOW when the paper is set and fed. At this time, the $\overline{\text{ERROR}}$ and $\overline{\text{SELECT}}$ signals go from LOW to HIGH.

SELECT [Output]

When the printer is READY, this signal goes HIGH. This signal goes LOW when an error occurs (paper-out, paper jam).

AUTO FEED XT [Input]

When this signal is LOW, the automatic line feed mode (Carriage Return and Line Feed) is effective. The printer can read this signal only when the printer is turned on or is initialized by the $\overline{\text{INIT}}$ signal.

INIT [Input]

When this signal goes LOW, the printer is put on BUSY. The printer is reset when the signal goes from LOW to HIGH.

The pulse width of this signal must be at least 50 μs at the printer side.

 $\overline{\text{ERROR}}$ [Output]

This signal goes LOW when the printer detects an error and thus notifies the host computer that the printer is put in the error status (paper-out, paper jam).

 $\overline{\text{SELECT IN}}$ [Input]

When this signal is HIGH, the printer is put in the online status.

Nibble Mode**Host Clk [Input]**

$\overline{\text{STROBE}}$ signal to read Data 1 to Data 8.

Negotiation phase:

Trigger signal to send the compatible protocol to the printer.

Data 1 to Data 8 [Input]

The printer receives data on the Host Clk signal. The state of each bit of this signal must be maintained for at least 0.5 μs from the leading edge of the Host Clk signal.

Ptr Clk [Output]

Reverse data transmission phase:

The printer requests the host computer to read the data after the Ptr Clk signal goes HIGH to LOW. After reading the data, the host computer notifies the printer of completion of data receiving by making the Host Busy signal go LOW to HIGH.

Ptr Busy [Output]

Reverse data transmission phase:

Used for bit 3 and bit 7 of the transmission data.

Ack Data Req [Output]

- Reverse data transmission phase:

Used for bit 2 and bit 6 of the transmission data.

- Negotiation phase:

Used for the trigger signal to inform the host computer of the printer conditions (whether it supports the nibble mode or not, whether the reverse transmission data is present or not, etc.).

Xflag [Output]

- Reverse data transmission phase:

Used for bit 1 and bit 5 of the transmission data.

- Negotiation phase:

Informs the host computer whether the printer supports the nibble mode or not. Indicates that the printer supports nibble mode when this signal is LOW, synchronizing with the leading edge of the Ack Data Req signal.

Host Busy [Input]

- Reverse data transmission phase:

Indicates that the host computer is already receiving data from the printer when this signal is LOW. After that, when the Ptr Clk signal in the received data goes HIGH to LOW, this signal synchronizes with the Ptr Clk signal and goes to HIGH.

- Reverse standby phase:

This signal goes LOW to HIGH after the Ptr Clk signal goes HIGH to LOW, and enters the reverse data transmission phase again.

INIT [Input]

When this signal goes HIGH to LOW, the printer is put in the BUSY status and reset after INIT goes LOW to HIGH. This signal is normally HIGH and the pulse width must be at least 0.5 μ s at the printer side.

DataAvail [Output]

- Reverse data transmission phase:

Used for bit 0 and bit 4 of the transmission data.

- Negotiation phase:

Informs the host computer whether there is reverse transmission data or not. Synchronizes with the falling edge of the LOW pulse of the Ack Data Req signal which is the timing indicating that there is reverse transmission data.

1284 Active [Input]

This signal confirms whether the printer is a 1284-compatible device when this signal is HIGH and the Host Busy signal is LOW. It goes HIGH to LOW with the termination phase.

ECP Mode**Host Clk [Input]**

This signal handshakes with the $\overline{\text{PeriphAck}}$ (BUSY) signal when data is transferred from the host computer to the printer. When this signal goes HIGH to LOW, it means that the data is output on the data buses (Data 1 to Data 8). The signal goes LOW to HIGH in response to the leading edge of the $\overline{\text{PeriphAck}}$ (BUSY) signal.

Reverse data transmission phase:

This signal remains HIGH.

Data 1 to Data 8 [Input/Output]

This signal is used as an input signal when data is transferred from the host computer to the printer.

Reverse data transmission phase:

This signal is used as an output signal and the printer outputs data to the host computer using these data buses.

Periph Clk [Output]

This signal remains HIGH when data is transferred from the host computer to the printer.

Reverse data transmission phase:

This signal goes HIGH to LOW to indicate that data is output to the host computer.

The signal goes LOW to HIGH in response to the leading edge of HIGH pulse of the HostAck (AUTO FEED XT) signal of the host computer.

Periph Ack [Output]

This signal goes HIGH to LOW when the printer is ready to receive data from the host computer while transferring the data from the host computer to the printer. It goes LOW to HIGH when the printer receives data from the host computer.

Reverse data transmission phase:

Indicates whether the data sent from the printer to the data bus is a command or data. (LOW: Command, HIGH: Data)

Ack Reverse [Output]

This signal remains HIGH when data is transferred from the host computer to the printer.

Reverse data transmission phase:

This signal remains LOW.

The $\overline{\text{Reverse Req}}$ (INIT) signal is a switching request from the host computer which goes HIGH to LOW to request a switch from the forward data transmission phase to the reverse data transmission phase. In response to the falling edge of the $\overline{\text{Reverse Req}}$ signal, Ack Reverse signal goes HIGH to LOW to indicate that the switching request has been accepted.

When the switching from the reverse data transmission phase to the forward data transmission phase takes place, Ack Reverse signal goes LOW to HIGH to indicate that the switching request has been accepted, in response to the leading edge of the $\overline{\text{Reverse Req}}$ (INIT) signal which is a switching request from the host computer.

X flag [Output]

This signal remains HIGH in the ECP mode.

Host Ack [Input]

This signal goes from LOW to HIGH when data is transferred from the host computer to the printer.

Reverse data transmission phase:

This signal handshakes with the Periph Clk (ACKNLG) signal. When the host computer is ready to receive data from the printer, this signal goes HIGH to LOW. After the data is received, the signal goes LOW to HIGH.

Reverse Req [Input]

This signal goes HIGH to LOW to perform a recovery process (data re-transmission) during data transmission from the host computer to the printer. (Win 95 LPT. VXD does not perform a recovery process.) In response to the falling edge of the Ack Reverse (PE) signal, this signal goes LOW to HIGH. When switching from the idle state of the forward data transmission phase to the reverse data transmission phase, this signal goes HIGH to LOW (during data transmission from the printer to the host computer).

Periph Req [Output]

If a reverse data transmission is requested by the printer during forward data transmission, this signal goes HIGH to LOW. When the host computer switches from forward data transmission to reverse data transmission, this signal goes LOW to HIGH together with the Ack Reverse (PE) signal, in response to the falling edge of the Reverse Req (INIT) signal which is a switching request from the host computer.

1284 Active [Input]

This signal goes LOW to HIGH when the negotiation phase starts. It remains HIGH during the ECP mode to indicate that the operation is performed in the bi-directional mode. To quit ECP, this signal goes HIGH to LOW to enter the termination phase.

9) Timing

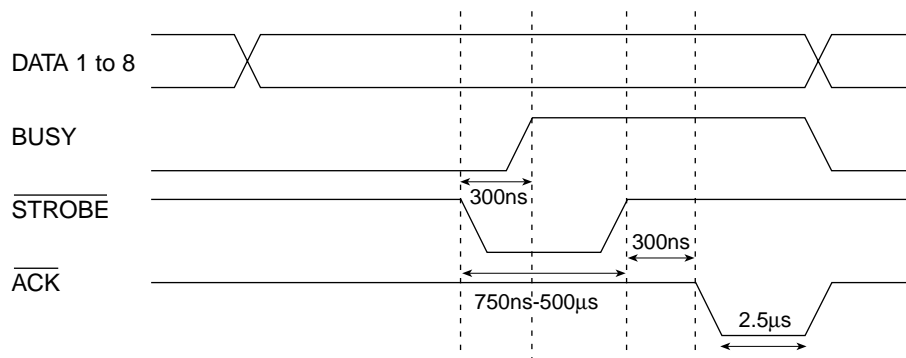


Figure 2-10 Timing Chart (Compatible Mode)

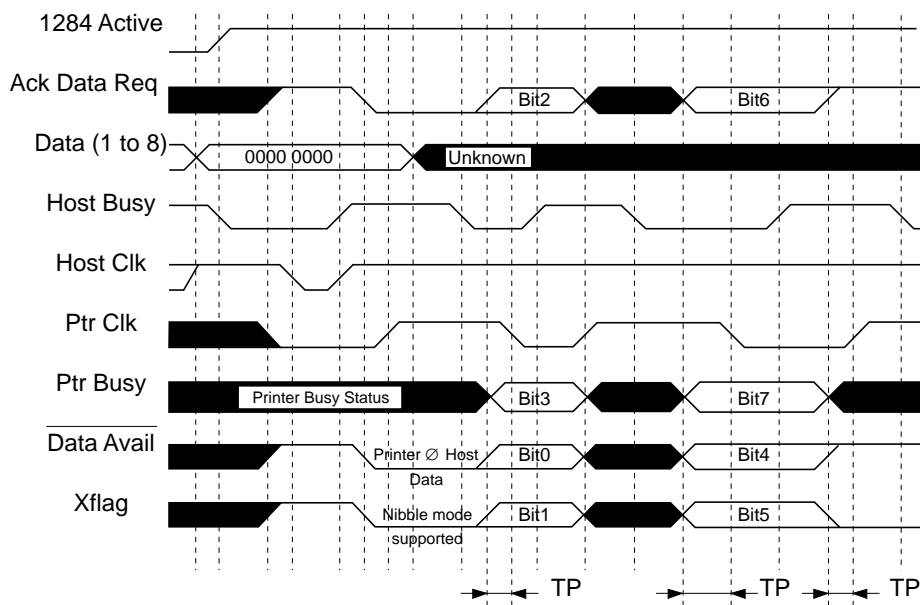


Figure 2-11 Timing Chart (Nibble Mode)

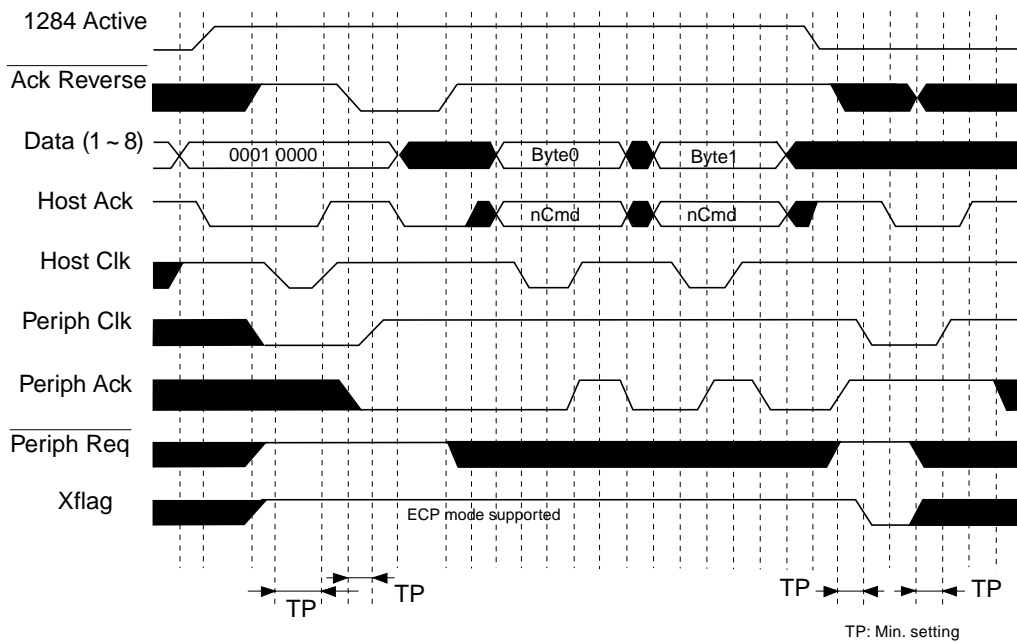


Figure 2-12 Timing Chart (ECP Mode)

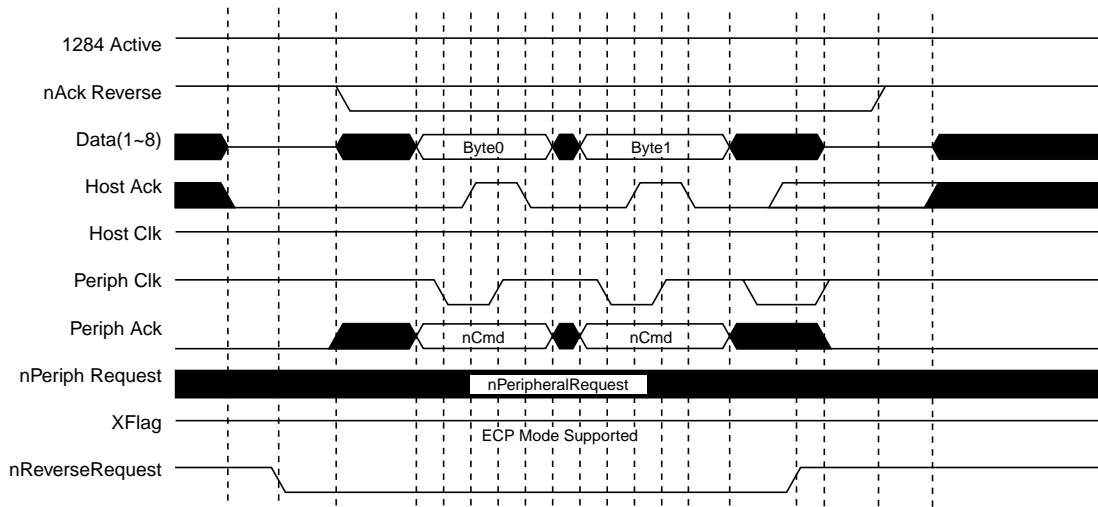
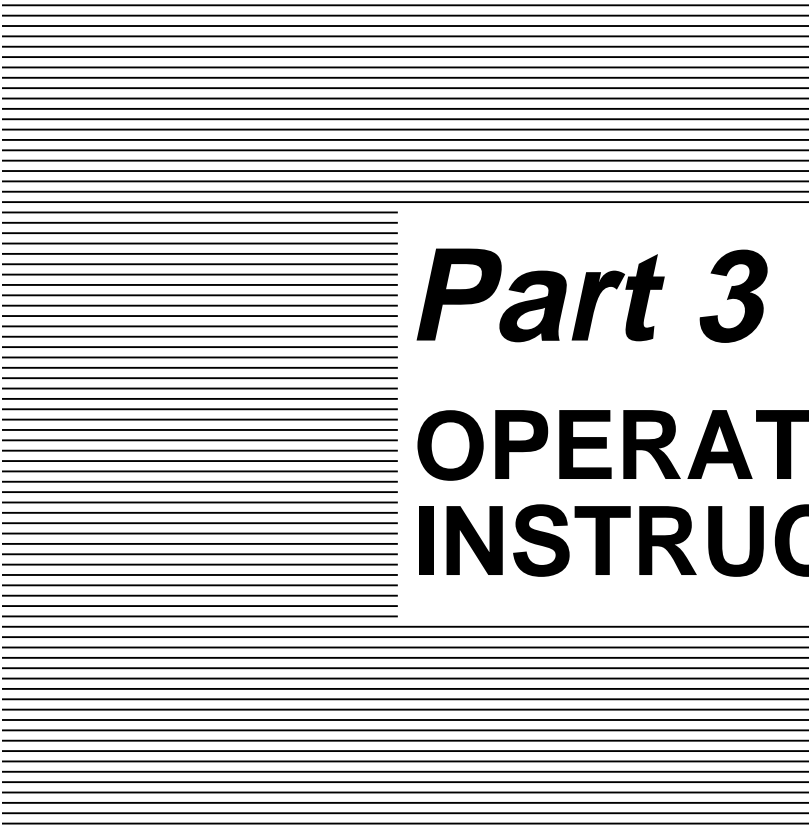


Figure 2-13 Timing Chart (ECP Mode/Reverse Mode)

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Part 3

OPERATING INSTRUCTIONS

Page	
3 - 1	1. PRINTER SETUP
3 - 1	1.1 Unpacking and Inspection
3 - 2	1.2 Site Selection
3 - 3	1.3 Setup Procedure
3 - 9	1.4 Turning the Printer On/Off
3 -10	1.5 Paper Settings
3 -11	1.6 Banner Print
3 -12	1.7 Names of Parts and Their Functions
3 -13	2. TRANSPORTING THE PRINTER
3 -13	2.1 Carrying the Printer
3 -13	2.2 Transporting the Printer
3 -14	3. PRINTER SERVICING FUNCTION
3 -14	3.1 Error Indications
3 -16	3.2 Cleaning the BJ Cartridge
3 -17	3.3 Self-Test Printout
3 -18	3.4 Service Mode
3 -20	3.5 Service Mode Print Sample

1. PRINTER SETUP

1.1 Unpacking and Inspection

After unpacking the printer, make sure the items below are included.

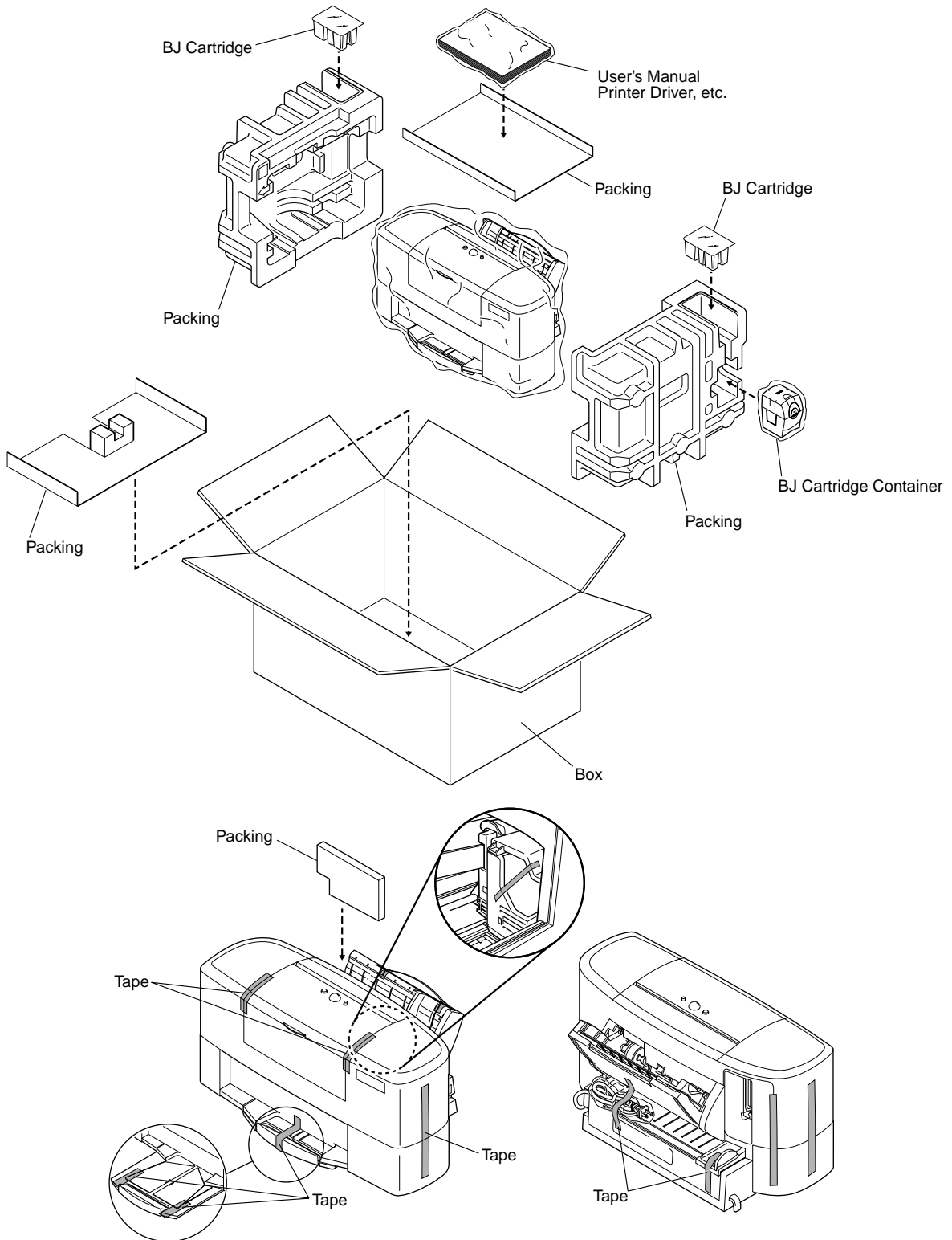


Figure 3-1 Unpacking

1.2 Site Selection

Set up the printer in a place with enough room for easy operation. The dimensions of the printer when it is set up are shown below.

For banner printing, leave a space about the size of an A4-size paper between the edge of the desk and the printer. Also, leave enough space at the back of the printer to set the banner paper.

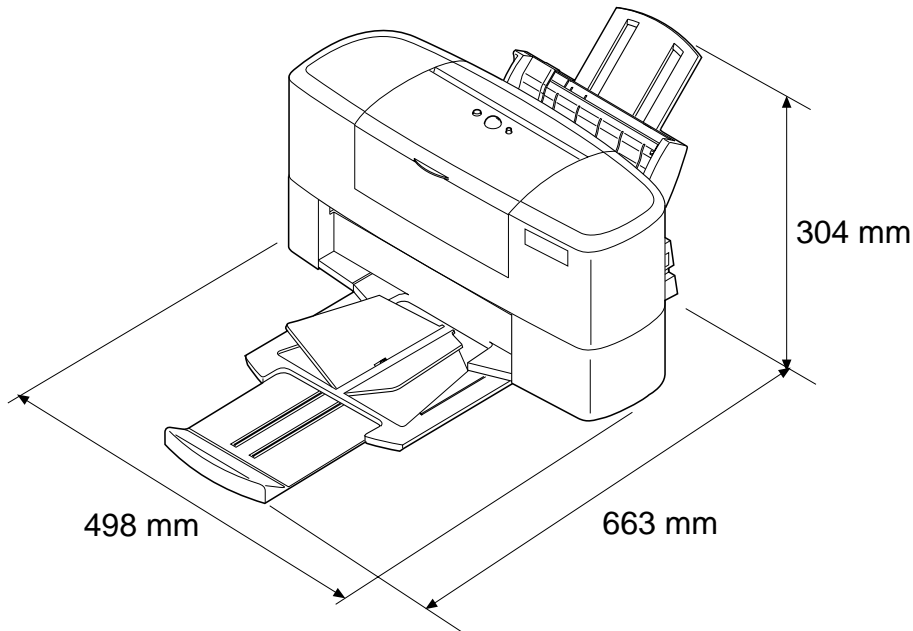


Figure 3-2 Printer Site Selection Dimensions



- Operate the printer under the following environmental conditions:
 - Ambient temperature: 5 °C to 35 °C
 - Relative humidity: 10% to 90% (no condensation)
- Do not place the printer in direct sunlight.
- Do not set up the printer in a place where the temperature changes suddenly, such as near air conditioners.
- Do not leave the printer in a place where the temperature goes up rapidly, such as inside a car.
- Do not expose the printer to dust and sea breeze which carries salt.
- Do not set up the printer near electrical products that contain a magnet or generate a magnetic field.
- Set up the printer on a sturdy, level surface.
- Do not set up the printer in a place subject to vibration.

1.3 Setup Procedure

Use the following procedure to set up the printer.

1.3.1 Connecting the interface cable

- 1) Make sure both the printer and the computer are turned off.
- 2) Connect one end of the interface cable to the parallel interface connector on the back of the printer.
After connecting the cable, fasten the locking clips to secure it.
- 3) Connect and fix the other end of the interface cable to the interface connector on the computer.

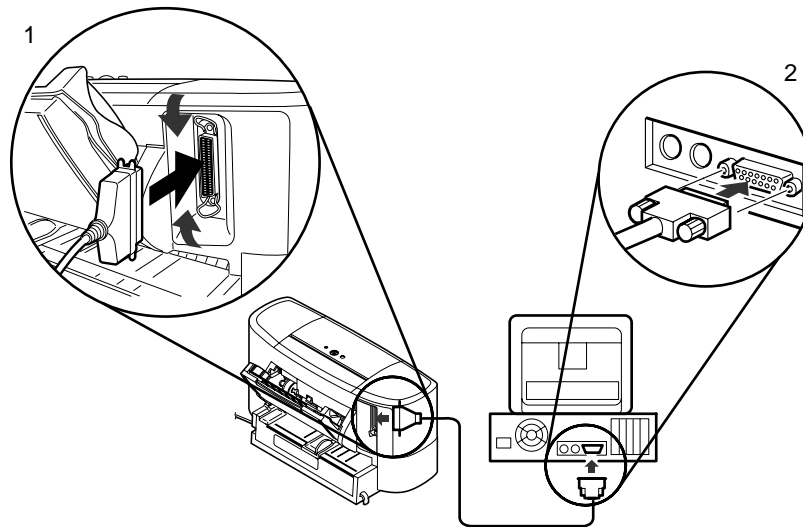


Figure 3-3 Connecting the Interface Cable

1.3.2 Connecting the AC power cord

Plug the AC power cord into the AC power jack on the printer. (The AC adapter is installed in the printer at the factory prior to shipment.)

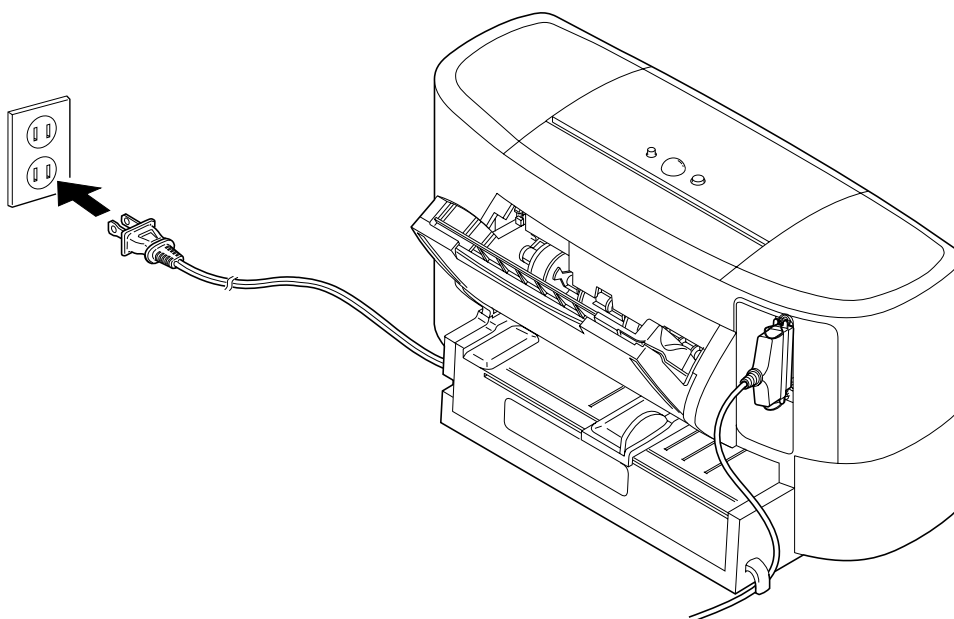


Figure 3-4 Connecting the AC Power Cord

1.3.3 Turning on the printer

Before turning on the printer, first turn on the computer and other peripheral equipment (if any). Make sure the AC power cord is plugged in properly, and then press the *POWER* button to turn on the printer. When the printer is turned on, it runs the initializing operations and the carriage moves to the cartridge replacement position (printer center). At this time, the *indicator* blinks in green to indicate that the printer is ready for the BJ cartridge installation.

1.3.4 Installing the BJ cartridge

Four types of cartridges can be installed in the printer: Black BJ Cartridges (BC-23 and BC-20 [reference]), Color BJ Cartridge (BC-21e), and Photo BJ Cartridge (BC-22e Photo).

See "Part 2: 1.4 Dual Cartridge System" (page 2-5) for the combinations of cartridges which can be installed on both sides of the carriage.

1) Removing the BJ cartridge protectors

Take out the BJ cartridge from its package and remove the head cap and tape on the nozzles as shown in the figure.

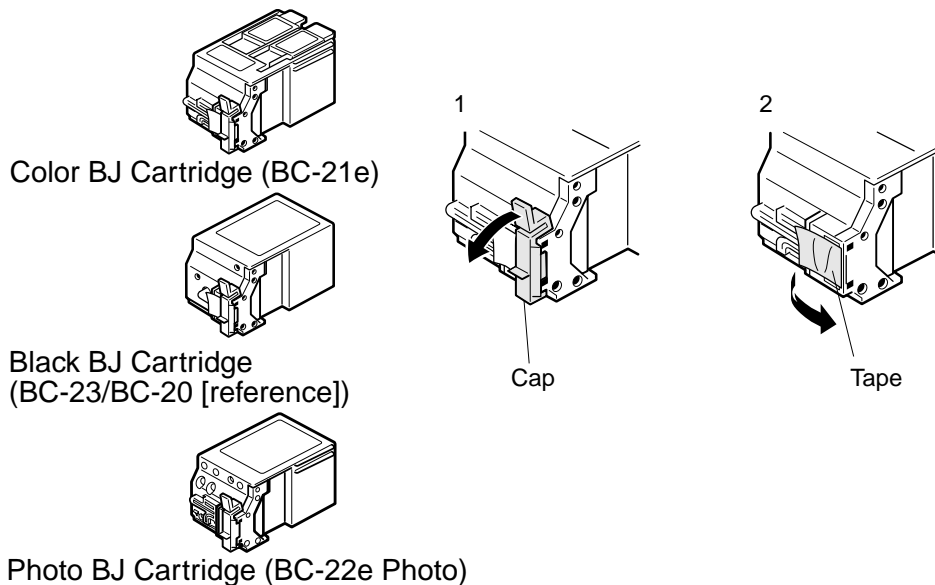


Figure 3-5 Removing the BJ Cartridge Protectors



Do not reuse the protective head cap and tape. Any foreign substance on the cap or tape could mix with the ink and cause printer trouble. Carefully peel off the protective tape on the printer head without touching the head. If the head is damaged or if foreign substances stick to the head, printing errors could occur.

Do not shake the BJ cartridge after removing the head cap and protective tape. Shaking the cartridge will cause the ink to splatter.

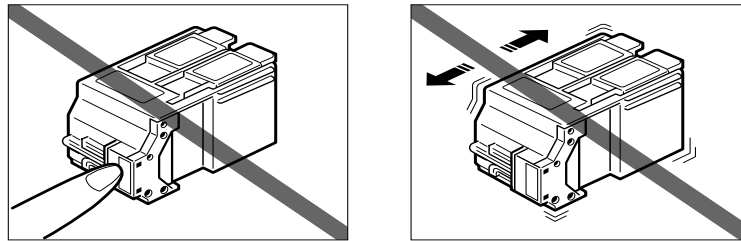


Figure 3-6 BJ Cartridge Handling Precautions

2) Installing the BJ cartridge

Open the *front cover* of the printer and flip up the cartridge lock lever. Insert the BJ cartridge into the carriage and push down the cartridge lock lever to lock the cartridge in place. When you close the *front cover*, the carriage moves to the capping position.



If the BJ cartridge is not installed properly when you close the *front cover*, the carriage will not return to the capping position. If the *front cover* is not closed properly, the carriage will not return to the home position either.

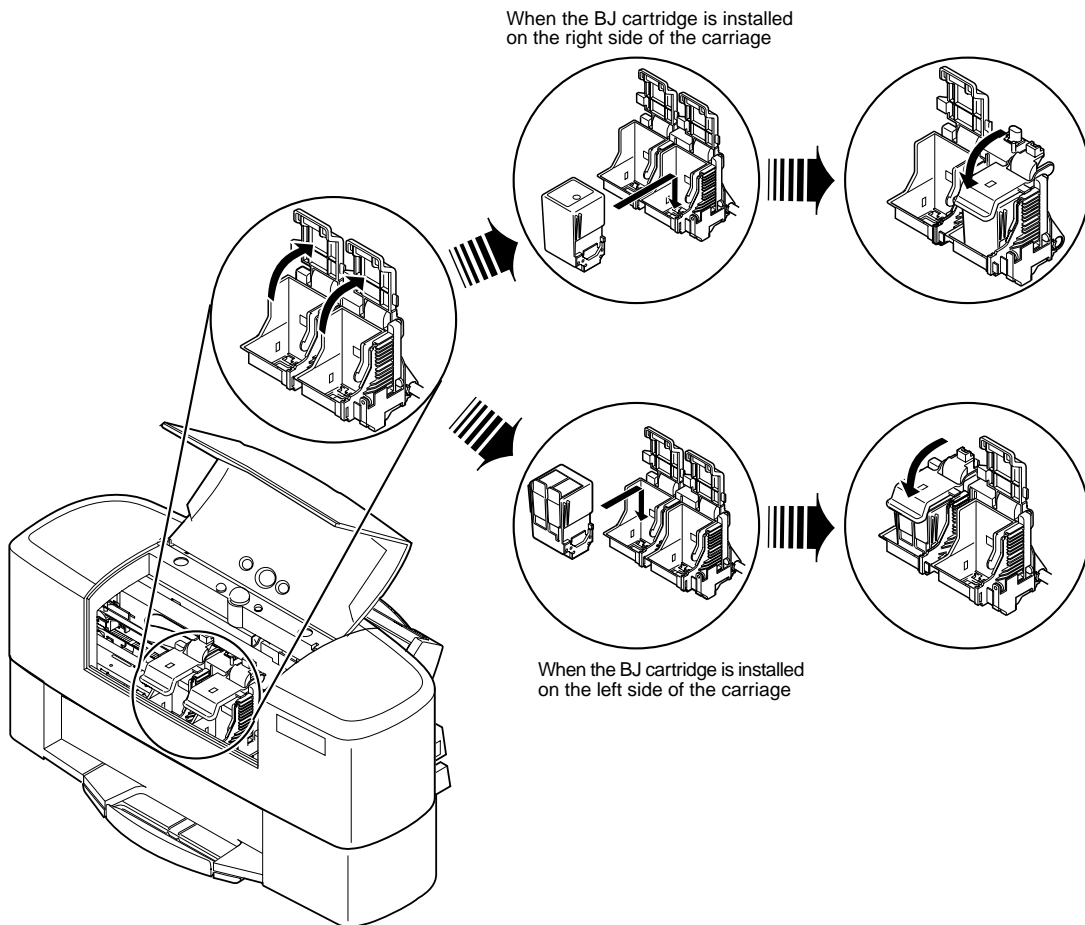


Figure 3-7 Installing the BJ Cartridge

3) Replacing the BJ cartridge

Open the *front cover* of the printer. The carriage moves to the replacement position (printer center). Flip up the cartridge lock lever and remove the BJ cartridge. Install another cartridge using the procedure in the previous section 2). Store the BJ cartridge (Color, Black, and Photo) removed from the printer in the supplied BJ cartridge container.



If the printer has been operating for a prolonged period, the aluminum plate of the BJ cartridge will get very hot. If it is hot, opening the *front cover* will activate the protective function. The beeper will sound five times and the carriage will not move the cartridge replacement position. Wait a few minutes before attempting to replace the BJ cartridge. The carriage will not move to the replacement position even if you open the *front cover* during an ongoing printing operation or error occurrence.

1.3.5 Replacing the ink cartridge

When a color BJ cartridge is used, the ink cartridge must be replaced. Use the following procedure to replace the ink cartridge.

1) When to replace the ink cartridge

When the ink runs out or more than 6 months have elapsed since the cartridge was removed from the package, or if the print quality does not improve even after cleaning the head five times or more, replace the ink cartridge with a new one. Since the three color inks are integrated, the entire color ink cartridge must be replaced when one color ink runs out.

If the print quality does not improve following replacement of the ink cartridge and after cleaning the head five times or more, replace the color BJ cartridge.

2) Removing an ink cartridge

Open the *front cover* to move the carriage to the cartridge replacement position. Flip up the cartridge lock lever as described in 1.3.4-3), "Replacing the BJ cartridge" (page 3-6). Then, pull out the upper portion of the ink cartridge to be replaced to remove it as shown in the figure below. There will be ink on and around the ink outlets of the ink cartridge. Remove the ink cartridge carefully to avoid smears on hand and machine.

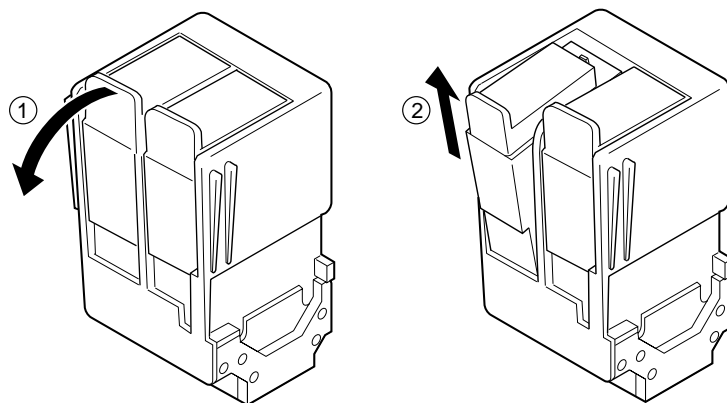


Figure 3-8 Removing the Ink Cartridge

3) Installing an ink cartridge

Take out the new ink cartridge (option) from its package and remove the cap covering the ink outlets as shown in the figure below. Install the ink cartridge by following the removal procedure in reverse. After installing the ink cartridge, close the *front cover* to return the carriage to the capping position.

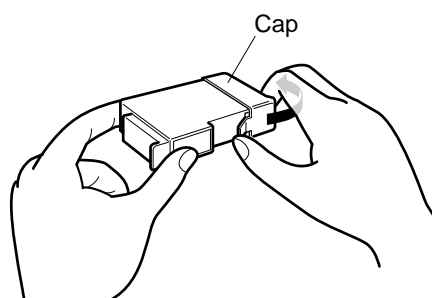


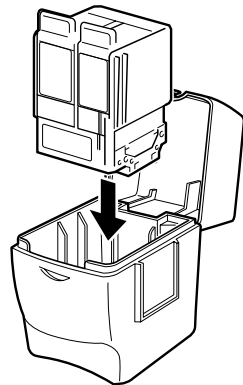
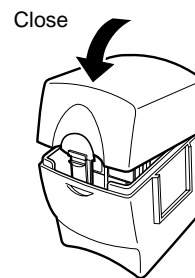
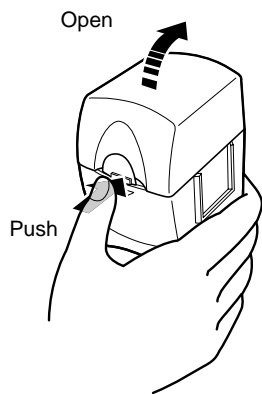
Figure 3-9 Removing the Ink Cartridge Cap

1.3.6 BJ cartridge container

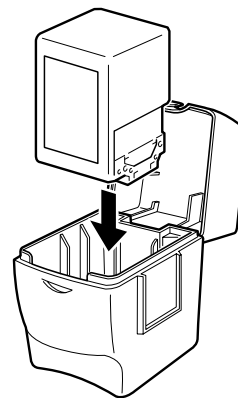
A BJ cartridge container for storing the BJ cartridge is supplied with the printer. Be sure to store a BJ cartridge in this container after it is removed from the printer. The container can store any one of the black BJ cartridges (BC-23 and BC-20 [reference]), color BJ cartridge (BC-21e) and photo BJ cartridge (BC-22e Photo).



- Store the color BJ cartridge (BC-21e) without removing the black and color ink cartridges inside it.
- Do not shake or drop the BJ cartridge container. Ink could leak out.



Storing the Color BJ Cartridge



Storing the Black or Photo BJ Cartridge

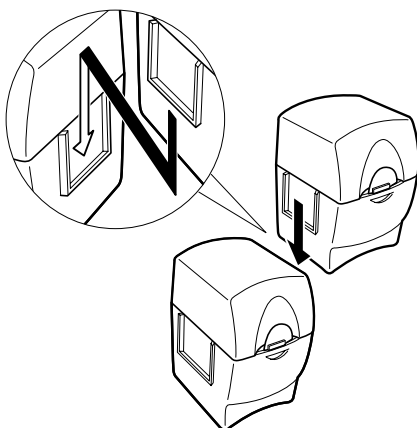


Figure 3-10 BJ Cartridge Container

1.4 Turning the Printer On/Off

1.4.1 Turning the printer on

With the printer plugged in to a power source, press the *POWER button* to turn on the printer. When the printer turns on, it starts the initializing operation.

If a BJ cartridge is not installed, the *indicator* blinks in green to indicate that the printer is ready to have the BJ cartridge installed and the carriage will move to the cartridge replacement position. If a BJ cartridge is already installed, the *indicator* will light in green to indicate that the printer is in standby status.

When the printer is turned on after more than 72 hours have passed since the last head cleaning (the first head cleaning is performed 24 hours after a color BJ cartridge is installed), it automatically carries out head cleaning. The *indicator* blinks in green while head cleaning is performed.

1.4.2 Turning the printer off

Press the *POWER button* to turn off the printer.

When the printer is turned off, it executes a power-off sequence operation to cap the nozzles of the BJ cartridge for their protection and to prevent ink leakage. The *indicator* blinks in green to indicate that the power-off sequence is under progress.

When the power-off sequence is complete, the *indicator* goes out. Make sure the *indicator* is off first before unplugging the AC power cord.



Never turn off the printer by unplugging the AC power cord before pressing the *POWER button*. This will cause the printer to turn off before it can cap the BJ cartridge and as a result the ink will leak out or dry out and clog the nozzles.

If the AC power cord has been unplugged to turn off the printer, plug in the AC power cord, press the *POWER button* to turn on the printer, and then turn it off again.

If the *POWER button* is pressed while the head is being cleaned, the *indicator* continues blinking in green until the head cleaning is completed. After cleaning is completed, the BJ cartridge is capped and the printer turns off. Any error occurring after the power-off sequence starts is ignored and the printer is turned off.

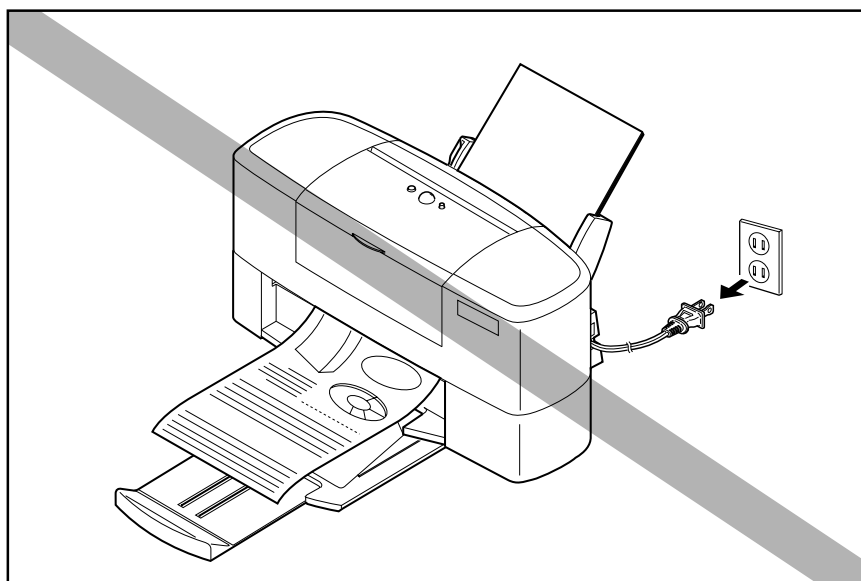


Figure 3-11 Caution! Do not unplug the AC power cord without pressing the POWER button first

1.5 Paper Settings

To achieve optimal print quality according to the paper to be used, use either automatic feeding using the sheet feeder or manual feeding by feeding paper from manual feeding slot at the back of the printer. This printer has no mechanical paper selection lever and paper-pitch adjustment lever. If the paper meets the required specifications, it can be fed in accordance with the paper thickness without carriage position adjustment and so on.

Table 3-1 Printer Paper Setting

Media		Size	Feed Method	Sheet Feeder Loading Capacity
Plain paper	Weight 64 to 105 g/m ²	A3/A4/A5/LTR/LGL	Auto/Manual	Max. 13 mm
Bubble Jet Paper	LC-301	A3/A4/LTR/LGL	Auto/Manual	Max. 13 mm
High Resolution	HR-101	A3/A4/LTR	Auto/Manual	Max. 100 sheets
Glossy photo paper	GP-201	A4/LTR/A4+/LTR+	Auto/Manual	1 sheet
High gloss film	HG-201	A3/A4/LTR	Manual	--
OHP film	CF-102	A4/LTR	Auto/Manual	Max. 30 sheets
Back print film	BF-102	A4/LTR	Auto/Manual	Max. 10 sheets
Fabric sheet	FS-101	Vertical 241 x Horizontal 356 mm	Auto/Manual	1 sheet
Envelopes	COM#10	Vertical 241.3 x Horizontal 105 mm	Auto/Manual	Max. 15 sheets
	DL-size	Vertical 220 x Horizontal 110 mm	Auto/Manual	Max. 15 sheets
Banner paper	BP-101	A4/LTR	Manual	--
Thick paper	Weight 106 to 550 g/m ² (Thickness: Max. 0.8 mm)	Vertical 210 to 420 x Horizontal 150 to 297 mm	Manual	--

* A3-size paper can be loaded only through the manual feeding slot.

* Banner paper can be loaded for 2 to 6 sheets.

1.6 Banner Print

When printing on banner paper, after cutting the paper to the appropriate length (2-6 sheets) set the paper to move in a direct path through the printer using the manual feed slot on the printer rear side, not the ASF.

Each top margin for banner printing is set to 0 mm at the start of printing. To avoid printing on the platen, however, printing will start 3 mm from the initial top margin. Set an extra sheet at the end in case the bottom edge is not printed on the last page. Banner printing uses a large quantity of ink. To avoid ink run out in the middle of printing, it is recommended to use a new ink cartridge right from the start of banner printing.

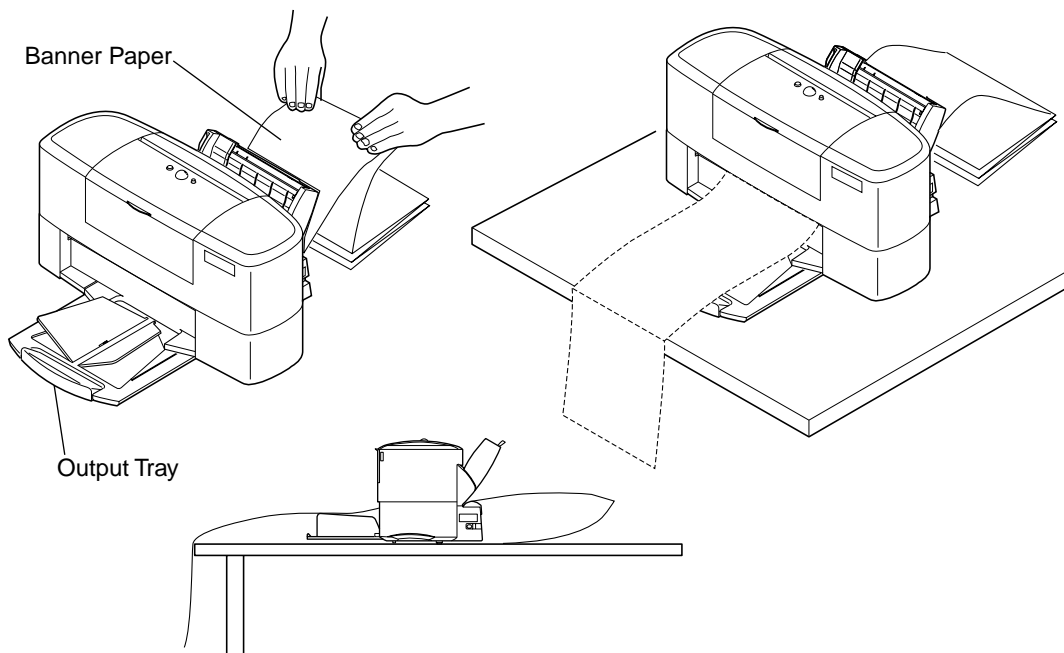


Figure 3-12 Banner Print

1.7 Names of Parts and Their Functions

The names of the printer parts and their functions are described below.

Paper Support

Supports a stack of paper loaded in the cut sheet feeder. Pull it out to support the paper in accordance with the paper size.

Cut Sheet Feeder

Holds a stack of paper. The number of sheets to be set varies depending on the thickness and type of the paper.

Paper Guide

Set the paper guide flush against the left edge of the cut sheets in the cut sheet feeder so that the paper can be fed straight.

Control Panel

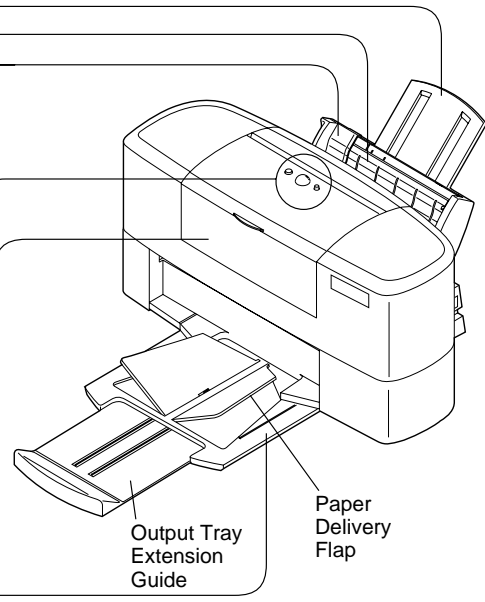
See the figure below.

Front Cover

Open the front cover to replace the BJ cartridge and ink cartridge, or remove jammed paper.

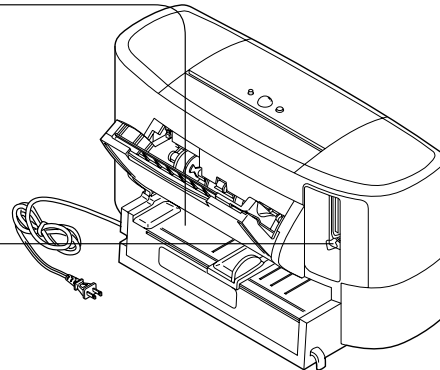
Paper Output Tray

The printed sheets are output to this tray. To receive a long printed paper, pull out the out put tray extension guide before starting the printing operation. The paper delivery flaps stand up automatically when the paper output tray is pulled out.



Manual Feeding Slot

Insert paper into this slot to feed the paper manually.



Parallel Interface Connector

Connect the interface cable here.

Control Panel

POWER Button

Turns the printer on or off.

Indicator

Indicates the power on and off statuses of the printer. This indicator lights or blinks in green while the printer receives data from the host and when it is warming-up. It lights and blinks in orange when an error occurs.

RESUME button

Press this button to recover from an operator error. Also, press this button for two seconds or more to start the head cleaning.

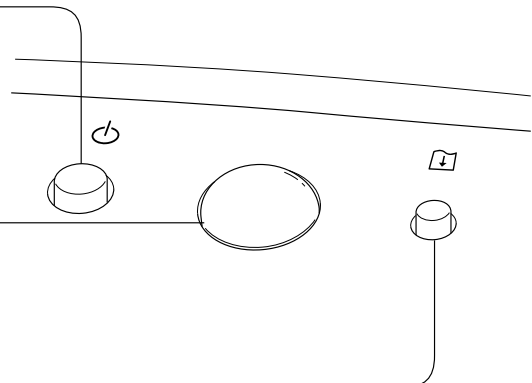


Figure 3-13 Names of Parts and Their Functions

2. TRANSPORTING THE PRINTER

To carry or transport the printer, keep the BJ cartridge installed in the printer or stored in the BJ cartridge container. This will prevent printing defects caused by ink leakage or dried out ink on the nozzles of the BJ cartridge.

2.1 Carrying the Printer

Follow the procedure below to move the printer.

- 1) Press the *POWER button* to turn off the printer. When the power is turned off, the *indicator* goes out.
- 2) Disconnect the interface cable.
- 3) Unplug the AC power cord from the AC outlet.
- 4) Make sure that the BJ cartridge is at the capping position (the right end of the printer). If the cartridge is not at the capping position, move the carriage to the capping position by hand. (See “Part 5: 4.2.3 Unlocking the carriage lock” on page 5-6 for details on the manual capping method.)



Never turn off the printer by unplugging the AC power cord without first pressing the *POWER button*. Otherwise, the printer is turned off before it can cap the BJ cartridge. Also, do not carry a BJ cartridge removed from the printer by itself. If the BJ cartridge is not capped, the ink may leak or dry out in the nozzles.

2.2 Transporting the Printer

Follow the procedure below to transport the printer.

- 1) Disconnect the interface cable and unplug the AC power cord as described in 2.1, “Carrying the Printer.”
- 2) Make sure that the carriage is locked at the capping position (the right end of the printer). If the carriage is not at the capping position, move the carriage to the capping position by hand (See “Part 5: 4.2.3 Unlocking the carriage lock on page 5-6 for locking of the carriage.)
- 3) Repack the printer in its original box and packing materials.

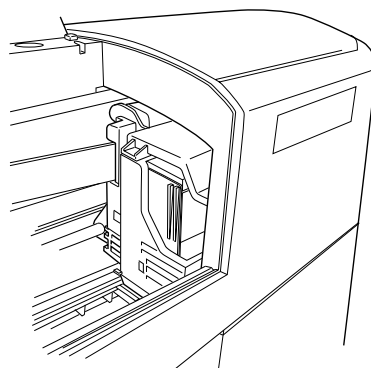


Figure 3-14 Carriage Capping Position



If the original packing materials are not available, use a sufficient amount of shock-absorbent material to pack the printer.

3. PRINTER SERVICING FUNCTION

3.1 Error Indications

This printer notifies errors with the indicator lamp and beeper.

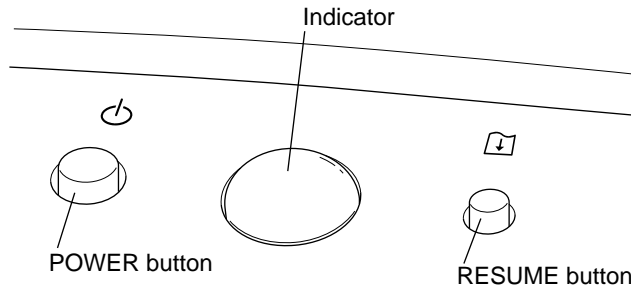


Figure 3-15 Control Panel

Table 3-2 Error Indications

State	Indicator	Beeper
<i>[Errors that can be corrected by a user]</i>		
Feed paper error/paper jam error	Lights in orange	Twice
Left-head recognition error	Lights in orange	3 times
Right-head recognition error	Lights in orange	4 times
High head temperature warning (during head replacement)	Lights in orange	5 times
Waste ink full warning	Lights in orange	6 times
<i>[Errors that cannot be corrected by a user]</i>		
Home position error	Alternately blinks in green once and orange twice.	7 times
Cleaning error	Alternately blinks in green once and orange 3 times.	7 times
Sheet feeder error	Alternately blinks in green once and orange 4 times.	7 times
Temperature sensor error	Alternately blinks in green once and orange 5 times.	7 times
Waste ink full error	Alternately blinks in green once and orange 6 times.	7 times
Head temperature error	Alternately blinks in green once and orange 7 times.	7 times
Sub-heater error	Alternately blinks in green once and orange 8 times.	7 times
BJ cartridge not found error	Alternately blinks in green once and orange 9 times.	7 times
EEPROM error	Alternately blinks in green once and orange 10 times.	7 times
ROM error	Alternately blinks in green once and orange 11 times.	7 times
RAM error	Alternately blinks in green once and orange 12 times.	7 times

The errors listed in Table 3-2 are described below.

Errors that can be corrected by a user

- 1) **Feed paper error**
The paper cannot be fed properly even by the paper feed operation.
Corrective action: Load the paper and press the *RESUME button*.
- 2) **Paper jam error**
The paper cannot be ejected even by the paper eject operation.
Corrective action: Remove the paper and press the *RESUME button*.
- 3) **Left-head recognition error**
Left side BJ cartridge failure or incompatible BJ cartridge.
Corrective action: Install the designated BJ cartridge.
- 4) **Right-head recognition error**
Right side BJ cartridge failure or incompatible BJ cartridge.
Corrective action: Install the designated BJ cartridge.
- 5) **High head temperature warning (during head replacement)**
The head temperature is found to be too high when BJ cartridge replacement is attempted. (At this time, the carriage will not move to the replacement position.)
Corrective action: Leave the printer to cool down for a while and then press the *RESUME button*. Or, close the front cover once and then open it again.
- 6) **Waste ink full warning**
The total waste ink amount recorded by the EEPROM is approaching the specified limit.

Errors that cannot be corrected by a user

Corrective action: Press the *POWER button* and turn off the printer.

- 7) **Home position error**
The home position of the carriage cannot be detected.
- 8) **Cleaning error**
The head cleaning or capping detection at the capping position is irregular.
- 9) **Sheet feeder error**
The initial position of the pick-up roller cannot be detected.
- 10) **Temperature sensor error**
The reading of the temperature sensor (TH1) on the logic board is irregular.
- 11) **Waste ink full error**
The total waste ink amount recorded by the EEPROM has exceeded the specified limit.
- 12) **Head temperature error**
The temperature in the BJ cartridge has exceeded the specified limit.
- 13) **Sub-heater error**
The sub-heater in the BJ cartridge is not operating properly.
- 14) **BJ cartridge not found error**
The printer cannot detect the BJ cartridge. Only the BJ cartridge replacement operation is detected.
- 15) **EEPROM error**
The EEPROM check has recognized some kind of irregularity.
- 16) **ROM error**
The ROM check fails when the AC power cord is plugged in (during the initializing operation). (At this time, the indicator may not light to indicate the error.)

17) RAM error

The RAM check fails when the AC power cord is plugged in (during the initializing operation). (At this time, the indicator may not light to indicate the error.)

3.2 Cleaning the BJ Cartridge

When a print quality problem such as blurred or white lines on the printout occurs, execute a self-test printout to check whether the nozzles on the BJ head are clogged. If they are clogged, use the following procedure to clean the BJ cartridge to recover the clogged nozzles. (See 3.3, "Self-Test Printout" on page 3-17 for the self-test printout procedure.)

- 1) Turn on the printer. Press and hold the *RESUME* button for 2 seconds or more. The cleaning starts. (The *indicator* blinks in green during cleaning.)
- 2) When the cleaning is completed, the *indicator* stops blinking and lights in green. (The cleaning time varies depending on the type and the number of BJ cartridges, and takes approximately 35 to 75 seconds.) After the cleaning, execute a self-test printout again to make sure that the nozzles on the BJ head are cleaned.

The printer automatically executes the cleaning operation at the following times:

- 1) When the printer is turned on by pressing the *POWER* button for the first time after connecting the AC power cord.
- 2) After a BJ cartridge or ink cartridge is replaced.
- 3) When the printer is turned on after more than 72 hours have passed since the head cleaning was performed last.
- 4) When the printer starts printing after more than 72 hours have passed since the head cleaning was performed last.
- 5) After printing a prescribed number of dots when the cleaning operation is not been executed during this time.
- 6) When the cartridge is left at the cartridge replacement position for more than 10 minutes.
- 7) When the printer is turned on while the nozzles of the BJ cartridge are not capped.
- 8) After more than 24 hours have passed since the color BJ cartridge or photo BJ cartridge was replaced.

3.3 Self-Test Printout

This printer provides a self-test printout function which can be executed without connecting the printer to a computer.

After turning on the printer, press and hold down the *POWER button*. When the beeper sounds once, release the *POWER button*. The self-test printout will start. To end the self-test printout function, press either the *RESUME button* or the *POWER button* to turn off the printer. The printing stops and the printed paper is ejected.

If you continue to hold down the *POWER button* until the beeper sounds twice when you turn on the printer, the self-test printout function will not be executed and the printer starts in the normal operation mode.

The self-test printout prints the following information on 1 page.

- ROM version
- Total number of pages passed
- Nozzle check pattern

After printing the above information, the printer returns to normal printing standby status.



Use A4/LTR-size paper for the self-test printouts. The self-test printout function requires the A4/LTR-size paper width. If you use narrower paper, ink will be smeared on the platen.

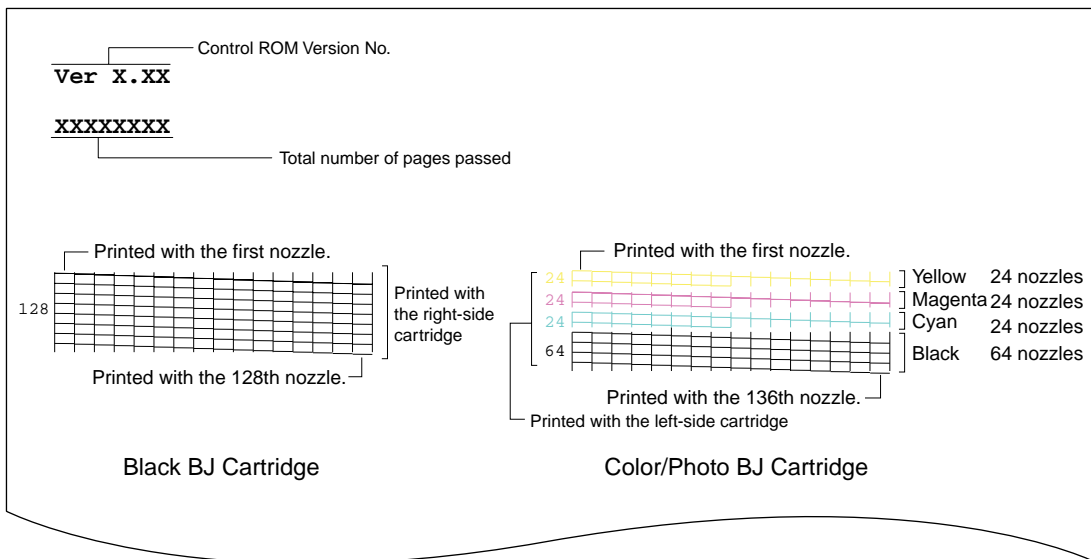


Figure 3-16 Self-Test Printout (Sample)

3.4 Service Mode

The printer starts the service mode when the control buttons are pressed. To avoid data loss by misoperation, use the service mode only when necessary.

Use the following procedure to start the service mode.

- 1) Press and hold down the *RESUME* button, and then press the *POWER* button. The indicator starts blinking in green.
- 2) While the indicator is blinking, press the *RESUME* button twice. After the initializing operation, the beeper sounds once to indicate that the service mode has started.
- 3) After the indicator stops blinking and lights in green, press the *RESUME* button for the specified number of times depending on the function you wish to perform (see *Table 3-3 Service Mode* below). (Every time you press the *RESUME* button, the beeper sounds once. The indicator lights in green and orange alternately.)
- 4) Press the *POWER* button to execute the specified function. (Excluding the First Time Flag ON/OFF function.)

Table 3-3 Service Mode

Function	No. of times RESUME is pressed	Indicator	Remarks
(Enters the normal operation mode.)	0 times (RESUME is not pressed.)	Lights in green	Beeper sounds twice and printer enters the normal operation mode.
Ripple pattern print	Once	Lights in orange	Continuous printing in A4-size paper width. Stops printing when the printer is turned off.
Service information print	Twice	Lights in green	After printing the pattern, the printer is automatically turned off.
Auto alignment sensor calibration	3 times	Lights in orange	After printing the pattern, the printer is automatically turned off. (Black BJ cartridge must be installed.)
Waste ink counter data clear	4 times	Lights in green	After executing the function, the printer is automatically turned off.
Waste ink counter setting 25%	5 times	Lights in orange	After executing the function, the printer is automatically turned off.
Waste ink counter setting 50%	6 times	Lights in green	After executing the function, the printer is automatically turned off.
Waste ink counter setting 75%	7 times	Lights in orange	After executing the function, the printer is automatically turned off.
First Time Flag ON/OFF	8 times	Lights in green	See the note below.*
Carriage/LF operation test	9 times	Lights in orange	The test stops when the printer is turned off.
EEPROM all clear	10 times	Lights in green	After executing the function, the printer is automatically turned off.

*: When you press the *POWER* button in step 4 of the above operation, the indicator lights in orange if the First Time Flag is set to ON, and it lights in green if the flag is set to OFF. After this operation, when the *RESUME* button is pressed, the ON and OFF setting is switched, and then the printer is turned off automatically. If you press the *POWER* button, not the *RESUME* button, the printer will turn off automatically without changing the ON/OFF setting.



Do not execute “EEPROM all clear” function unnecessarily. The EEPROM stores data such as the various settings, total number of pages passed, number of times the BJ cartridge was replaced, and total waste ink amount. Once the EEPROM is cleared, all the data will be lost and cannot be reset excepting the waste ink counter. Execute the “EEPROM all clear” function only when it is necessary and you are absolutely sure. After executing the “EEPROM all clear” function, always execute the “Auto alignment sensor calibration” function. Unless you execute this function, an EEPROM error will occur when the printer is turned on. Also, after executing the “EEPROM all clear” function, check the waste ink amount and either replace the waste ink absorber or set the waste ink counter to 25%, 50%, or 75%, depending on the condition. Check the ink penetration rate for the entire waste ink absorber as a guideline to determine the waste ink counter setting value.

3.5 Service Mode Print Sample

3.5.1 Ripple Pattern

Regardless of the BJ cartridge installed, the same pattern is printed repeatedly. When you press the *POWER* button, the printer finishes printing. When you press the *RESUME* button, the printer stops printing temporarily. To resume printing, press the *RESUME* button again.



Figure 3-17 Ripple Pattern Sample

3.5.2 Service Information Printing

Prints the nozzle check pattern and printer setting conditions/operating status. The nozzle check pattern on the left is printed with the BJ cartridge installed on the right side of the carriage, and the pattern on the right is printed with the BJ cartridge installed on the left side of the carriage.

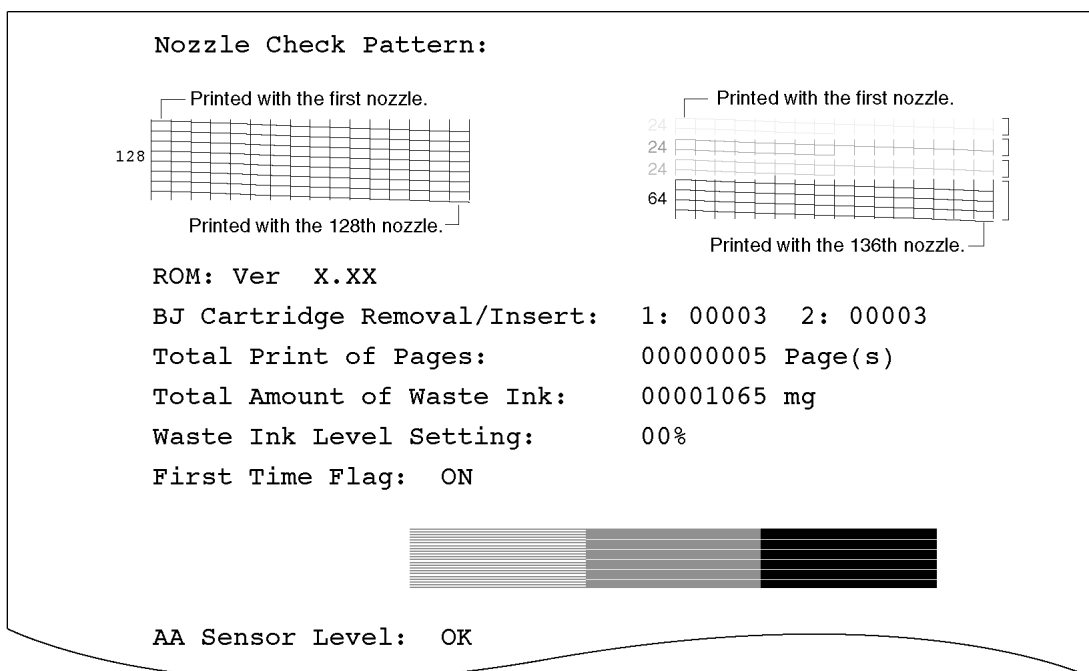


Figure 3-18 Service Information Printing Sample

Part 4

TECHNICAL REFERENCE

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1. OVERVIEW

1.1 Printer Block Diagram

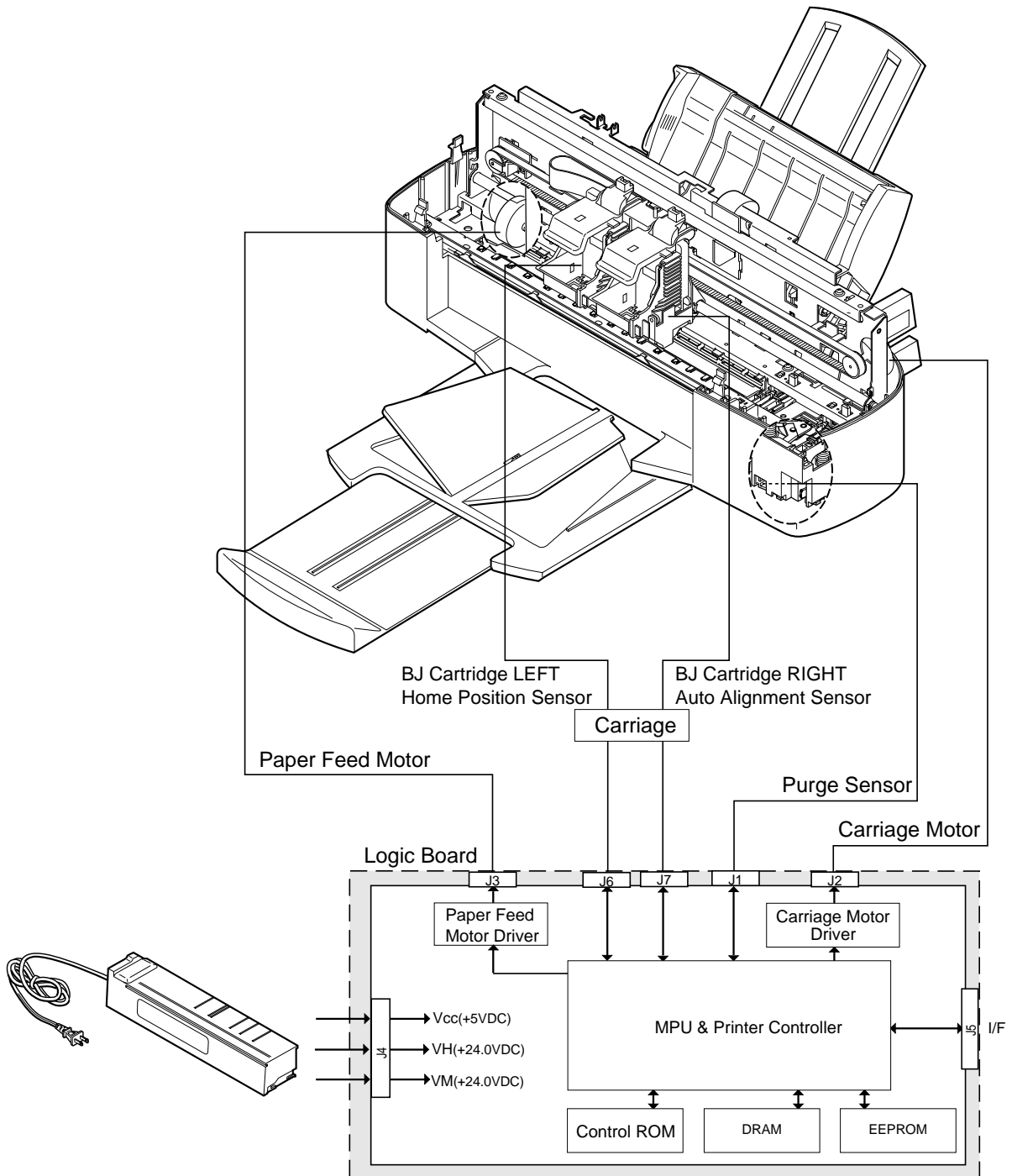


Figure 4-1 Printer Block Diagram

1.2 Initialization Sequence Flowchart

The flowchart below shows the initialization process from when the printer is turned on to when it goes online.

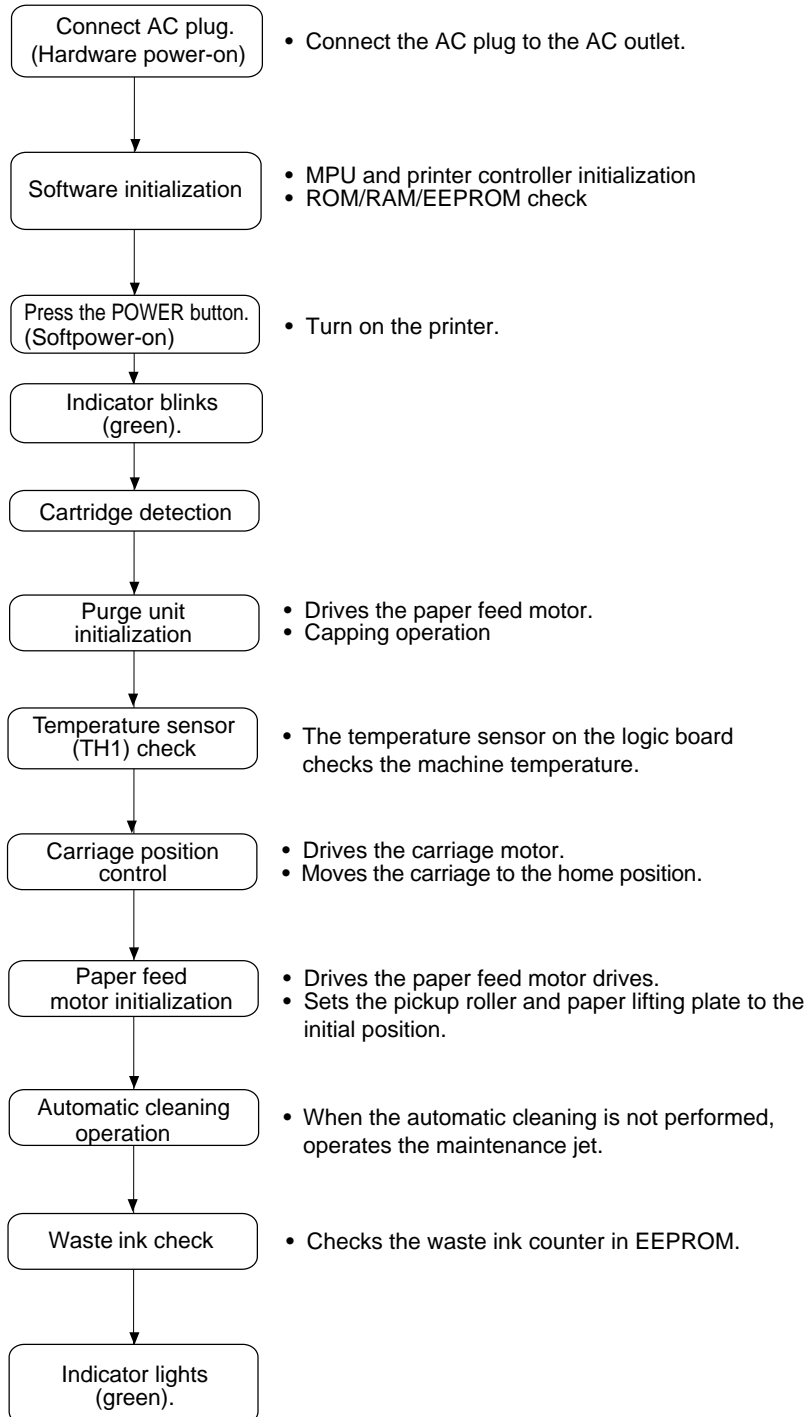


Figure 4-2 Initialization Sequence Flowchart

1.3 Print Signal Flow

1.3.1 Data between host computer and printer

Conventionally, control functions were provided by a printer's firmware. For this printer, however, these control functions are processed by the printer driver on the computer.

Conventional printers receive the image data in the raster direction (horizontal direction data) which is created on the printer driver. The printer converts the raster direction image data it receives into column data (vertical direction data) and then executes printing.

The printer driver on the host computer handles all processes until column data creation and then the printer receives this column data and prints it. Thus, high speed printing is realized because the printer does not need to convert the raster data into column data before printing.

1.3.2 Print Signal Flow in the Printer

The print signal flow from when the printer receives the print data to when printing is executed is described below.

- a) The printing information (column data matching with the nozzle arrangement of the built-in printhead) including control signals output by the host computer is loaded through the parallel interface into the MPU & printer controller on the logic board. The printing information is separated into control commands and print data based on the data stored in the control ROM. The control commands are processed in the MPU & printer controller. The print data is stored in the DRAM print buffer.
- b) The MPU & printer controller outputs the print data to the bubble jet head in the form of print signals. In the bubble jet head, the print data is converted from serial signals to parallel print data for each printed line. Printing is performed as the MPU & printer controller is controlled by the print control signals.
- c) The MPU & printer controller monitors the status of the bubble jet head and printer and uses the control ROM and motor drivers to manage all printing driver controls.

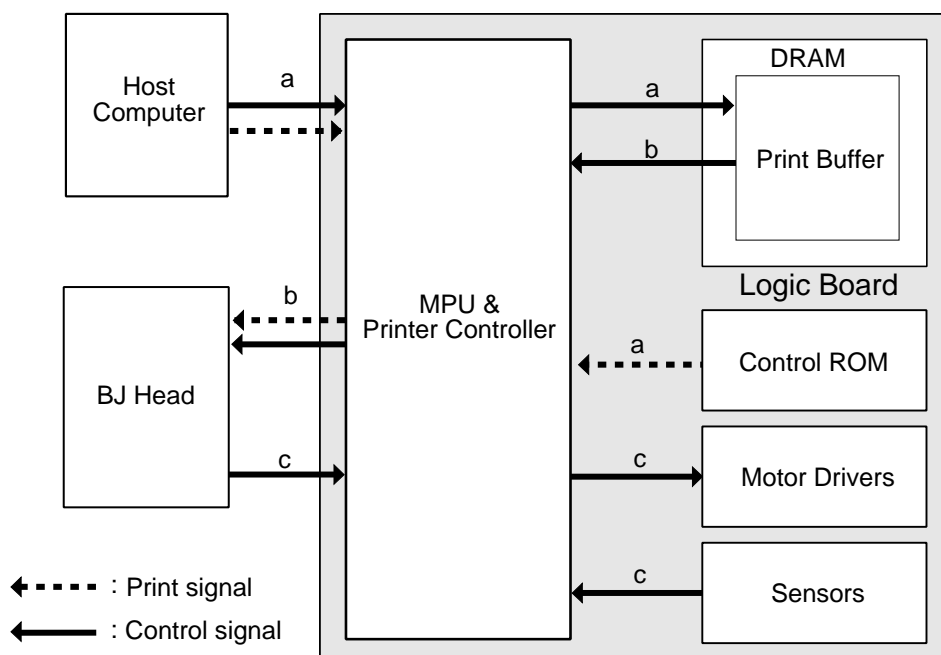


Figure 4-3 Print Signal Flow

1.4 Print Drive

To discharge ink from the head for printing, the printer outputs control signals from the printer controller to the BJ head.

The control signals consists of the drive control signal for discharging ink from the head's nozzles and the temperature control signal for adjusting the head's temperature so that the ink discharge is uniform.

To achieve best printing results, both these control signals are optimized by the MPU & printer controller and sent from the carriage ribbon cable's signal contacts to the BJ head.

The drive frequency varies depending on the printing mode and installed BJ cartridge.

1.4.1 Print drive control

a) Black BJ cartridge drive control

The black BJ cartridge drive control is performed by dividing the head's 128 nozzles into 8 blocks (16 nozzles per block). These blocks are further divided into odd and even blocks (8 nozzles per odd/even block). Ink is simultaneously discharged either from all odd block nozzles or from all even block nozzles. Control signals for the odd block nozzles are block enable signals 1, 2, and 3 (BENB 1, 2, 3). Control signals for the even block nozzles are the even/odd enable signals (Even/Odd ENB).

Heat enable 0 and 1 (HENB 0, 1), which are the heater drive control signals for discharging the ink, are comprised of a pre-pulse and main pulse. To achieve optimum ink discharge constantly, internal conditions such as the head's rank, printer temperature, and head temperature are monitored and the heater drive pulse width is varied before the pulse is output. Furthermore, the print drive signal from the printer controller is transferred to the shift resistor in the BJ head according to the HLATCH timing. When the print drive signal (HDATA) is latched and the print control and heater drive control signals are output together, the heater for the corresponding nozzles is driven and ink is discharged.

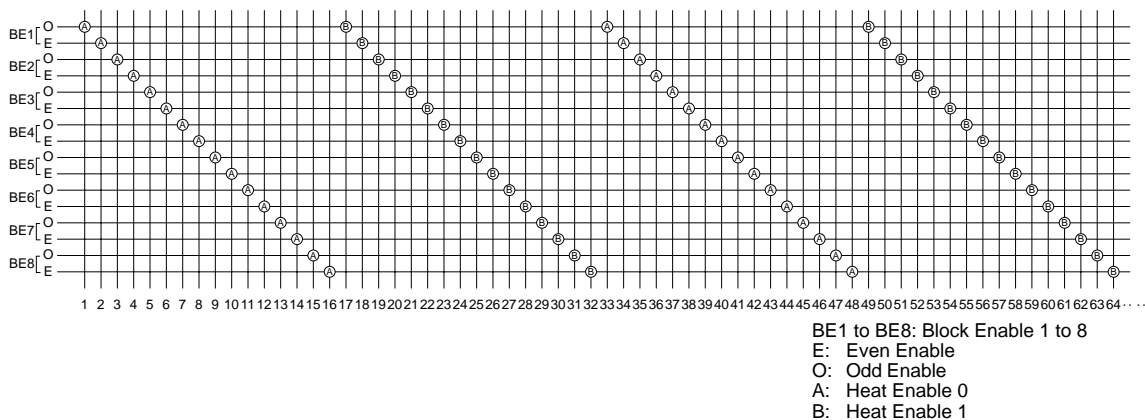


Figure 4-4 Printing Sequence (Black BJ Cartridge/Standard Mode)

b) Color BJ cartridge (multi-drop) drive control

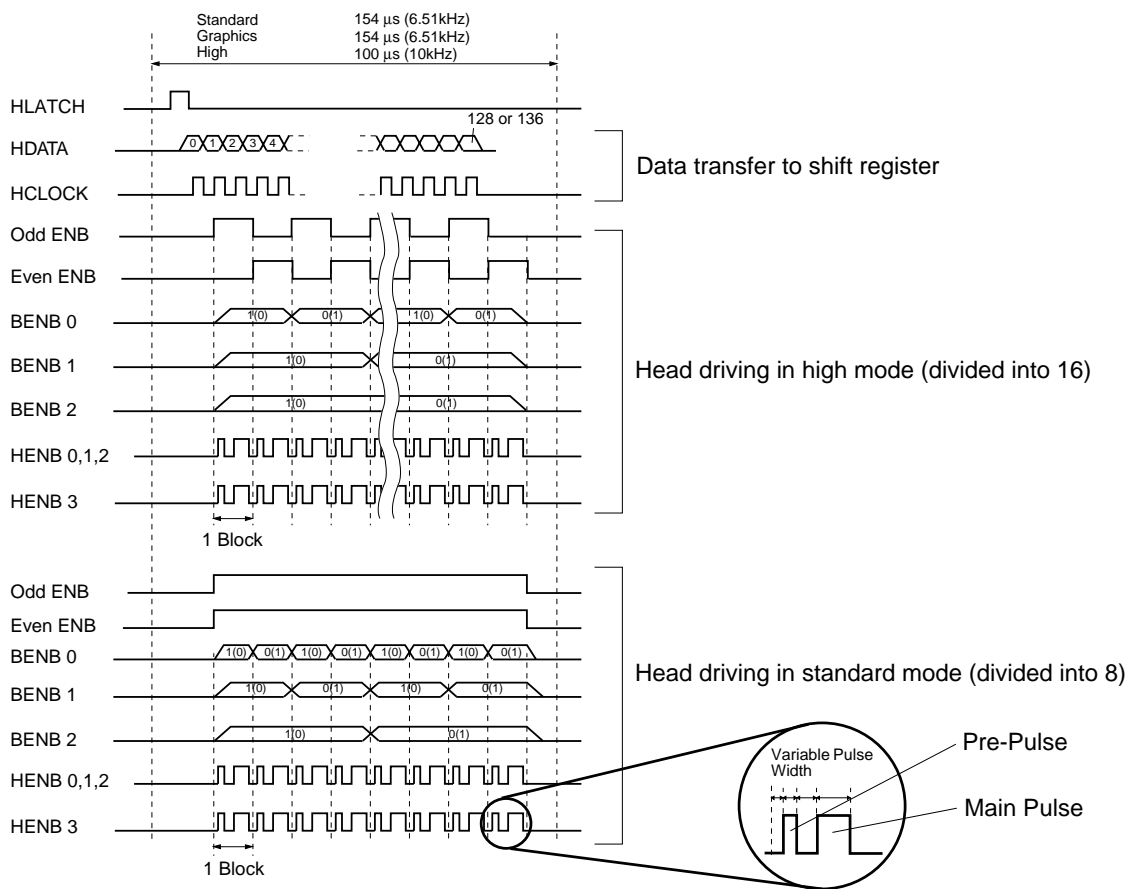
The printhead of the multi-drop type color BJ cartridge has 136 nozzles and each nozzle has two heater boards at the front and back. The multi-drop drive is performed by appropriately using these front and back heaters.

The sequence of ink discharge is as follows. The 136 nozzles in the head are divided into 8 blocks (16 nozzles per block) and each block is separated into two functional units (8 nozzles per unit). Ink is sequentially discharged from each unit. The nozzles for discharging ink are selected by block enable signals (BENB 1, 2, 3) and

even/odd enable signals (Even/Odd ENB). The heat enable signals (HENB 0, 1, 2, 3) are the heat drive control signals for the heater boards.

In the drop modulation mode, the HENB0 signals drive the heater at the back of the black nozzles; the HENB1 signals drive the heater in the front of the black nozzles; the HENB2 signals drive the heater in the front of the color nozzles; and the HENB3 signals drive the heater at the back of the color nozzles.

The heat enable signals are comprised of a pre-pulse and main pulse. To achieve optimum ink discharge constantly, internal conditions such as the head's rank, printer temperature, and head temperature are monitored and the heater drive pulse width is varied before the pulse is output.



The signals HENEB 0, 1, 2, and 3 are driven independently when the multi-drop type color BJ cartridge is used. The names of signals for the LEFT and RIGHT BJ cartridges are different.
 LEFT BJ cartridge: HENB 0L, 1L, 2L, 3L
 RIGHT BJ cartridge: HENB 0R, 1R, 2R, 3R

Figure 4-5 Print Signals

1.5 Power-Off Sequence Flowchart

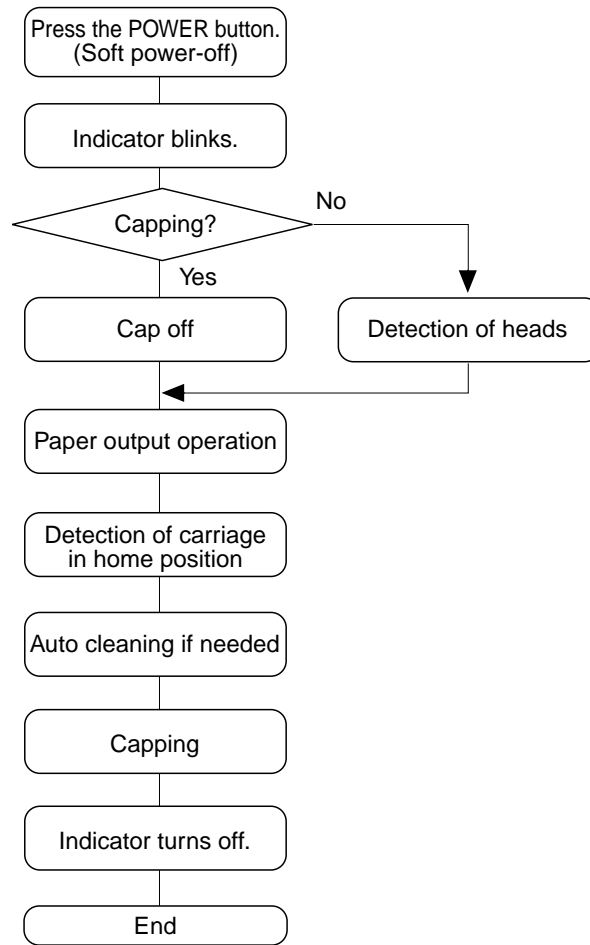


Figure 4-6 Power-Off Sequence Flowchart



Never turn off the printer by unplugging the AC power cord or AC adapter before pressing the *POWER* button. This will cause the printer to interrupt the power-off sequence and turn off before it can cap the BJ cartridge head. If the AC power cord or AC adapter has been unplugged to turn off the printer, plug it in again, press the *POWER* button to turn on the printer, and turn it off. Then, unplug the AC power cord or AC adapter.

2. FIRMWARE

2.1 Interface

This printer supports the compatible mode, nibble mode, and ECP mode which are compliant with the bidirectional Centronics interface standard (IEEE P1284).

The compatible mode is the same as the conventional Centronics interface-compliant protocol. When the printer operates as a printer, data is transferred in the compatible mode or ECP mode. The nibble mode is used for transferring status data such as the device ID and printer status to the host computer during printer operation. To use the nibble mode or ECP mode, the setting in the host computer must either be the nibble mode or ECP mode.

2.1.1 Compatible mode

The parallel interface for the compatible mode transfers data in 8-bit blocks. Data is transferred with the $\overline{\text{STROBE}}$, BUSY , and $\overline{\text{ACKNLG}}$ handshake signals.

When the printer receives the data (Data 1 to 8) and $\overline{\text{STROBE}}$ signal from the host computer, the printer controller which is controlling the parallel interface outputs the BUSY signal and latches the data at the falling edge of the $\overline{\text{STROBE}}$ signal. After the BUSY signal is output, the printer controller loads the latched data from the DRAM bus into the receive buffer of the DRAM. After the printer controller finishes writing data in the receive buffer of the DRAM, it outputs the $\overline{\text{ACKNLG}}$ signal and makes the BUSY signal LOW. Then, it waits for the next data input from the host computer.

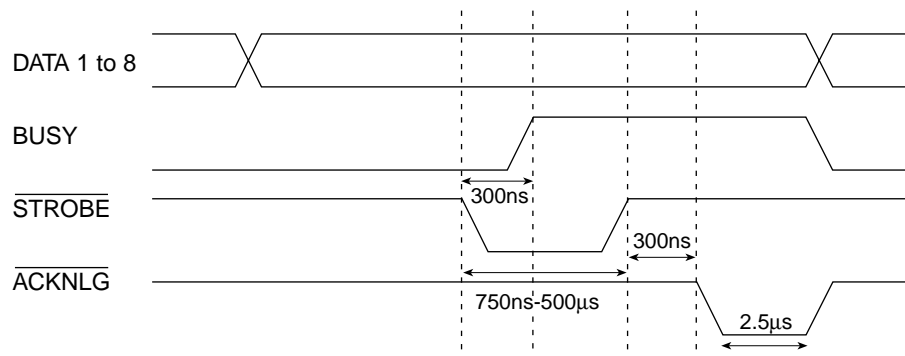


Figure 4-7 Interface Timing (Compatible Mode)

2.1.2 Nibble mode

In the nibble mode, the printer transfers data twice to the host computer in 4-bit blocks. The data is transferred with the PtrClk signal and HostBusy signal handshakes.

After the printer confirms the falling edge of the HostBusy signal, it prepares the 8-bit data, makes the PtrClk signal go from HIGH to LOW, and outputs the lower 4 bits on the control signal line. After the PtrClk signal goes from HIGH to LOW, the host computer loads the data and makes the HostBusy signal go from LOW to HIGH. After the printer confirms the falling edge of the HostBusy signal for the second time, it outputs the higher 4 bits on the control signal line.

If there is no data to be sent to the host computer after the HostBusy signal goes from LOW to HIGH, the printer makes the DataAvail signal go from LOW to HIGH and is put on standby status for the next data transfer. (The falling edge indicates a LOW and the rising edge indicates a HIGH.)

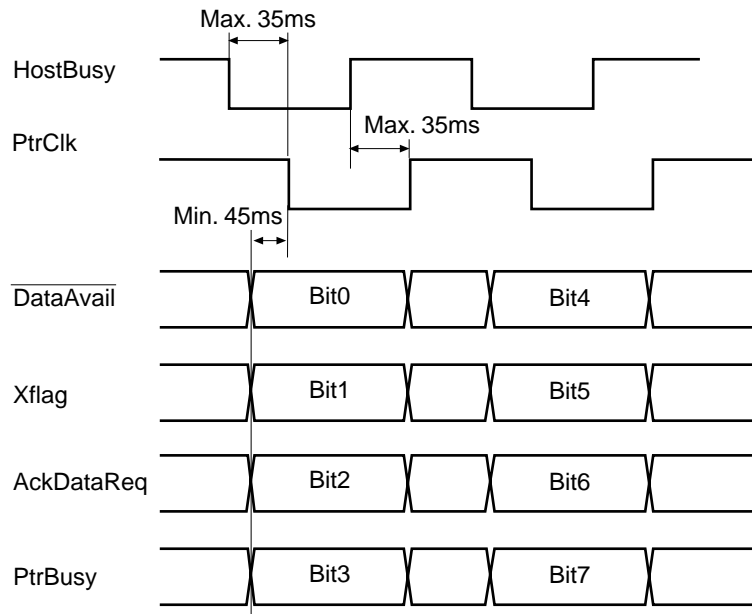


Figure 4-8 Interface Timing (Nibble Mode)

2.1.3 ECP mode

In the ECP mode, the printer transfers 8-bit data all at once and therefore it can send and receive data in high speed. This mode is suitable for sending and receiving large volumes of data.

When the $\overline{\text{AckReverse}}$ signal goes from HIGH to LOW in response the $\overline{\text{ReverseReq}}$ signal going from HIGH to LOW, the data bus direction changes from forward data transfer (which sends data from host computer to printer) to reverse data transfer (which sends data from printer to host computer).

During the reverse data transfer phase, the printer makes HostAck go from HIGH to LOW when it detects the rising edge of PeriphClk.

When the host computer is able to receive data from the printer, HostAck goes from HIGH to LOW; and when it receives data, HostAck goes from LOW to HIGH.

(The falling edge indicates a LOW and the rising edge indicates a HIGH.)

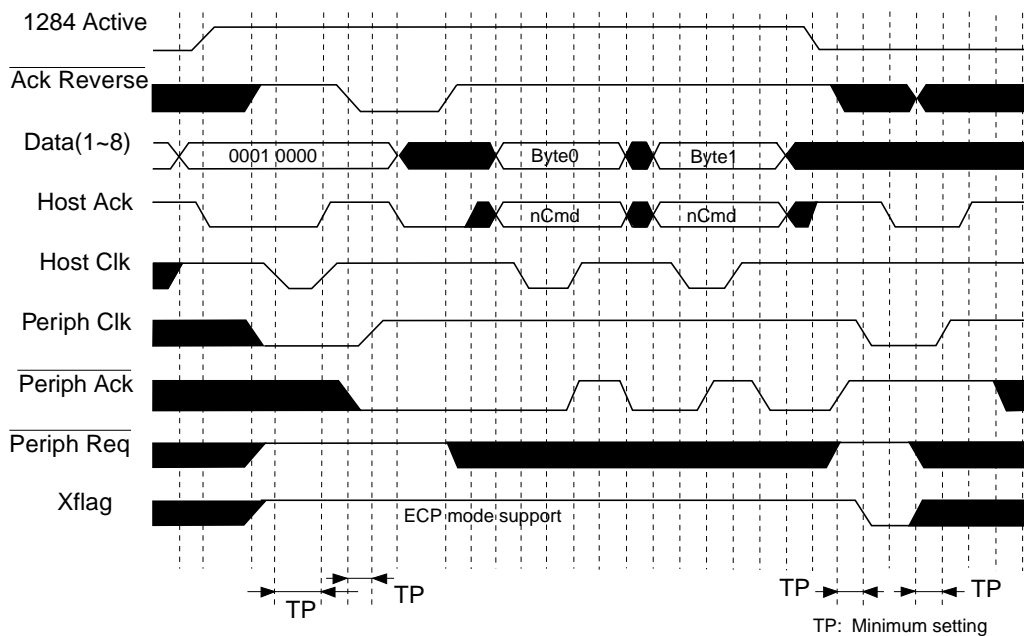


Figure 4-9 Interface Timing (ECP Mode)

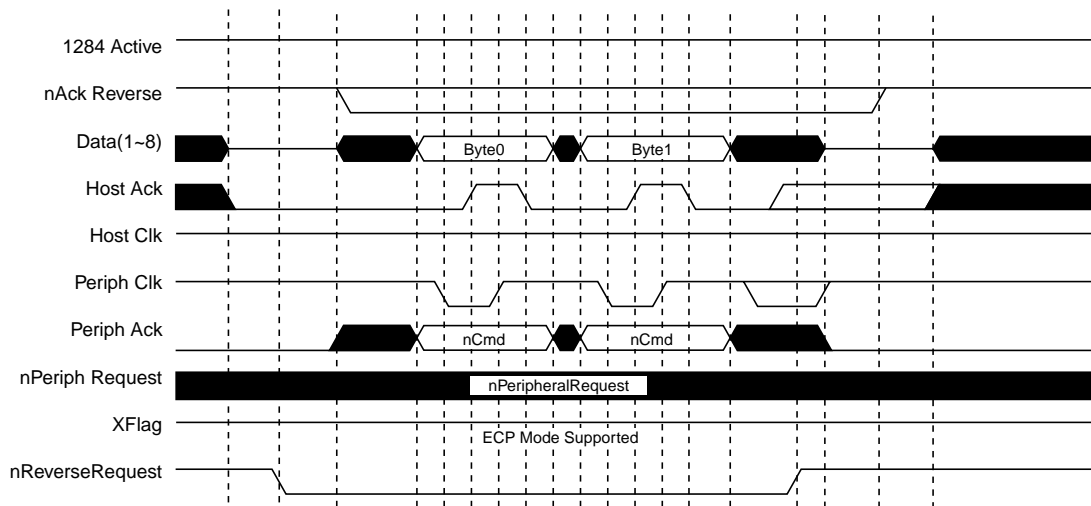


Figure 4-10 Timing Chart (ECP Mode/Reverse Mode)

2.2 Printing System

Control functions are provided by conventional printers. In this printer, however, these control functions are mostly processed by the printer driver of the host computer. With conventional printers, image data in the raster direction (horizontal direction data) is created on the printer driver and the printer side receives this data. Consequently, the image data in raster direction received by the printer is converted into column data (vertical direction data) by the printer and the printing is executed. The printer driver on the host computer handle all processes until the creation of column data matching the printhead installed in the printer. Then, the printer receives this column data and prints it. (The printer reads the printhead ID and automatically notifies the host computer of the printhead configuration.) Thus, this printer achieves high speed printing because it does not need to convert raster data into column data and can print the data as it is.

2.3 Printing Modes

2.3.1 Printing mode

This printer varies the printing method, such as carriage movement and bubble jet head driving frequency, in accordance with the cartridge installed, the selected medium, the selected printing mode, the resolution, and the print data in order to achieve high-quality printing without any bleeding or shifting in the printout. When color printing is performed using a single pass, the different colors printed at the same time overlap, often causing the colors to run. By printing with two or more delayed passes, there is less color bleeding because the color printed immediately before is relatively stable by the time the next color is printed over it. When print data is processed internally by the printer, the data is recognized and the number of ink nozzles to be used by the black ink is automatically changed. Characters are printed by taking preventive measures for bleeding and white mist which are generated at the borders because the characteristics of the color and black inks differ. This process is carried out as follows: During internal processing by the printer, the borders where the color and black inks meet are identified. Cyan and black ink are mixed in the printed black portion to suit the distance and density of the black and color dots.

2.3.2 Photo print mode

The photo print mode can be used to obtain a print quality with rich gradation that reduces granularity by printing several times on the same dot using the Photo BJ cartridge which contains a light density ink. The printer driver divides the pixel data into 4 values (not printed, print 1 dot, print 2 dots, and print 3 dots) enabling each pixel to be printed using up to 4 gradations. When the color cartridge and photo auto cartridge are installed, high-quality print is achieved by using 7 types of inks (cyan, magenta, yellow, black, photo cyan, photo magenta and photo black). In addition, an improved gray color reproduction has been provided by the use of 2 types of black inks.

2.3.3 Multi-drop print mode

The color cartridge uses drop modulation technology to print large and small dots efficiently so that the granularity of low density portions can be reduced. The photo cartridge of this machine prints small dots only.

Table 4-1 Printing Modes and Driving Method

Head Combination		Print Mode					
Left	Right	Media	Standard	Graphics	High	Photo Standard	Photo/High
BC-23 (BC-20)	None	Plain Paper	360 x 360 dpi 1 pass Bi-directional 6.51kHz	360 x 360 dpi 1 pass Uni-directional 6.51kHz	720 x 720 dpi 2 pass Uni-directional 10kHz	N/A	N/A
		Other Paper	720 x 720 dpi 2 pass Uni-directional 10kHz	N/A	1440 x 720 dpi 4 pass Uni-directional 10kHz	N/A	N/A
BC-23 (BC-20)	BC-23 (BC-20)	Plain Paper	360 x 360 dpi 1 pass Bi-directional 6.51kHz	360 x 360 dpi 1 pass Uni-directional 6.51kHz	720 x 720 dpi 2 pass Uni-directional 10kHz	N/A	N/A
		Other Paper	720 x 720 dpi 2 pass Uni-directional 10kHz	N/A	1440 x 720 dpi 4 pass Uni-directional 10kHz	N/A	N/A
BC-21e	None	Plain Paper	360 x 360 dpi 1 pass Bi-directional 6.51kHz	360 x 360 dpi 1 pass Uni-directional 6.51kHz	720 x 720 dpi 2 pass Uni-directional 10kHz	N/A	N/A
		Other Paper	720 x 720 dpi 2 pass Uni-directional 10kHz	N/A	1440 x 720 dpi 4 pass Uni-directional 10kHz	N/A	N/A
BC-21e	BC-21e	Plain Paper	360 x 360 dpi 1 pass Bi-directional 6.51kHz	360 x 360 dpi 1 pass Uni-directional 6.51kHz	720 x 720 dpi 2 pass Uni-directional 10kHz	N/A	N/A
		Other Paper	720 x 720 dpi 2 pass Uni-directional 10kHz	N/A	1440 x 720 dpi 4 pass Uni-directional 10kHz	N/A	N/A
BC-21e	BC-23 (BC-20)	Plain Paper	360 x 360 dpi 1 pass Bi-directional 6.51kHz	360 x 360 dpi 1 pass Uni-directional 6.51kHz	720 x 720 dpi 2 pass Uni-directional 10kHz	N/A	N/A
		Other Paper	720 x 720 dpi 2 pass Uni-directional 10kHz	N/A	1440 x 720 dpi 4 pass Uni-directional 10kHz	N/A	N/A
BC-21e	BC-22e	Plain Paper	360 x 360 dpi 1 pass Bi-directional 6.51kHz	360 x 360 dpi 1 pass Uni-directional 6.51kHz	720 x 720 dpi 2 pass Uni-directional 10kHz	720 x 720 dpi 2 pass Uni-directional 10kHz	1440 x 720 dpi 4 pass Uni-directional 10kHz
		Other Paper	720 x 720 dpi 2 pass Uni-directional 10kHz	N/A	1440 x 720 dpi 4 pass Uni-directional 10kHz	720 x 720 dpi 2 pass Uni-directional 10kHz	1440 x 720 dpi 4 pass Uni-directional 10kHz

2.4 Cartridge Automatic Adjustment Function

When the installed printhead is changed, the printer notifies the printer driver of the new printhead configuration.

The printer driver displays a pop-up message which advises a user to perform the head alignment before starting the printing. When the maintenance tab on the driver “Align Printheads” is selected, the printer prints the automatic head alignment pattern and corrects the print position automatically.

While printing the automatic head alignment pattern, the printer detects run-out of ink, displacements of the left and right cartridges which could occur due to the dual cartridge system, and density errors using the auto-alignment sensor on the carriage. The printer sends the detected information to the printer driver of the host computer. The printer driver performs an automatic adjustment of the head nozzle alignment and automatic density correction of the left and right heads based on the information sent from the printer and controls the printing accordingly. When ink runs out, the message is displayed on the printer driver.

2.4.1 Automatic correction of head nozzle alignment

The printer driver receives and interprets the information about the correlation between the print data and head nozzle. With this information, head characteristics can be corrected by the printer driver. The following adjustments are performed.

a) Alignment of vertical and horizontal directions

When printing is performed with dual cartridges, the auto-alignment sensor detects the displacement of the dot alignment in the vertical and horizontal directions of both heads, and the printer driver corrects it.

b) Alignment of printing direction

When bi-directional printing is performed, the print position when the head prints in the forward direction tends to differ from the print position when the head prints in the backward direction. This displacement could result in a poor print image. The printer driver corrects the print position error in the horizontal direction which is detected by the auto-alignment sensor so that high quality can be maintained, even during high-speed bi-directional printing.

2.4.2 Automatic density correction of left/right cartridge

When the left and right cartridges are the same, if the auto-alignment sensor of the printer driver detects a difference in the density during a printing operation between the left and right cartridges, the printer driver automatically corrects the density based on the detection result.

If the ink of the right printhead has run out, the printer prints using only the left printhead.

2.5 Data Separation Function

The data separation function is available only when printing is performed using the dual cartridge system where 2 cartridges are installed on the carriage and the same cartridge is installed in both heads. This function determines whether the left or right head is used for printing each pixel. This function efficiently divides the area printed by the left and right cartridges, and achieves the proper gradation by printing over several times at the borders between both cartridges where print quality tends to vary.

2.6 Ink Smear Control

Immediately after a printed sheet is ejected from the printer, the ink dries in a natural state on the paper output tray. If the next printed sheet is ejected before the ink dries properly, the ink may be smeared. To prevent ink smears, a wait period is applied during printing so that the ejection of every sheet is delayed to allow more time for the ink on the preceding sheet to dry.

When a black BJ cartridge (whose printing speed is faster) is used and high duty printing is performed, the printer automatically determines the high duty printing position and the time elapsed from the start of printing.

The ink smear control is not performed when a color BJ cartridge is used for printing.

2.7 Head Overheating Protection Control

If the ink runs out and the printing operation is continued, the bubble jet head can become extremely hot. If the head temperature sensor in the bubble jet head detects a temperature higher than the designated temperature limit, head overheating control is executed.

Protection level 1:

This level prevents the user from touching the aluminum plate of the bubble jet head when the bubble jet head is replaced. This protection function does not allow cartridge replacement for a set period of time.

Protection level 2:

If a still higher temperature is detected, the carriage is returned to the home position every time one line is printed and the printer is put in standby state for 3.5 seconds to control the temperature increase. This control continues for 20 seconds or more.

Protection level 3:

If the temperature continues to increase, a head temperature error occurs. This stops the printing operation.

2.8 Auto Power-Off

This printer provides an auto power-off function which automatically turns off the printer when print signals are not sent from the host computer for over a preset idle period. These settings can be made from the printer driver.

When the auto power-off function is set to "enable," the printer is turned off if print data is not sent from the host computer for over a preset idle period. The idle period settings available are 10, 30, and 60 minutes.

3. PRINTER MECHANICAL SYSTEM

3.1 Overview

This section describes the printer's mechanical components.

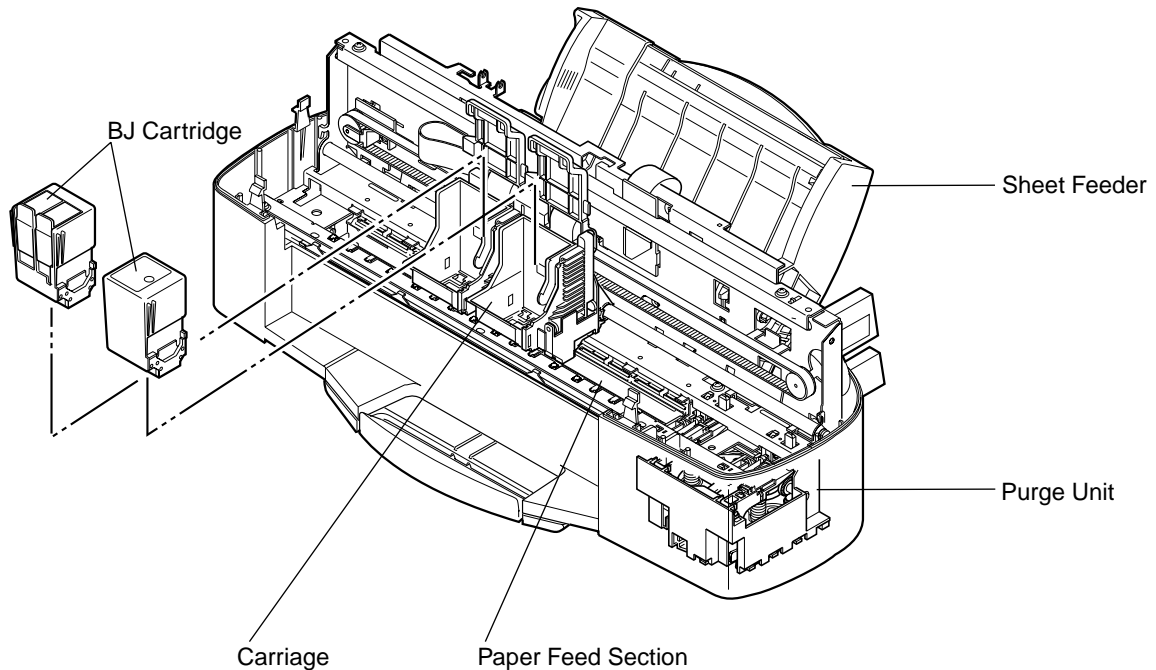


Figure 4-11 Mechanical System of Printer

3.1.1 Mechanical components

1) BJ cartridge

A user replaces and installs the BJ cartridges as required. The black and photo BJ cartridges are integrated and use the same head. The color BJ cartridge has separate replaceable ink cartridges.

2) Purge section

The purge section helps maintain high-quality printing by capping and wiping the face of the BJ cartridge. The absorption function recovers the conditions that allow the ink in the nozzles to be discharged easily.

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

The purge unit is driven by the paper feed motor. It absorbs the ink of the BJ cartridge and removes the ink in the cap. When the printer is not in use, the purge unit caps the nozzles of the BJ cartridge for protection.

The wiper unit provides a wiping function to wipe the head face and the maintenance jet receiving function.

3) Carriage

The carriage is moved horizontally back and forth across the paper by the carriage belt driven by the carriage motor. The print signals from the logic board are transmitted to two BJ cartridges installed on the carriage via the carriage cable. The carriage performs switching control of the paper feed motor (control of the stay unit's slide lock lever) to switch the motor's drive between the paper feed/purge unit and the sheet feeder.

4) Paper feed mechanism and sheet feeder

The built-in sheet feeder is driven by the paper feed motor and each paper sheet loaded in the sheet feeder is picked up and fed into the paper feed mechanism.

The paper feed mechanism driven by the paper feed motor turns the feed rollers to feed the paper vertically.

3.2 BJ Cartridge

3.2.1 Black BJ cartridge structure

The black BJ cartridge has a 128-nozzle printhead. The printhead and ink cartridge are assembled in a single cartridge body.

1) Cartridge cover

A plastic cover is attached to the cartridge body to prevent ink from leaking inside the cartridge.

As the ink is consumed, the pressure inside the cartridge decreases relative to the atmospheric pressure. This makes it harder for the ink to be supplied to the head. To prevent this, the cartridge cover is provided with a pressure adjusting hole for maintaining constant pressure inside the cartridge body.

2) Ink sponge

The sponge is soaked with black ink. It is compressed and stored in the cartridge body.

3) Cartridge body

The plastic case connects the ink sponge with the bubble jet head unit via the ink filter.

4) Bubble jet head unit

Ink is discharged through 128 bubble jet nozzles in accordance with the print signals received through the signal contact.

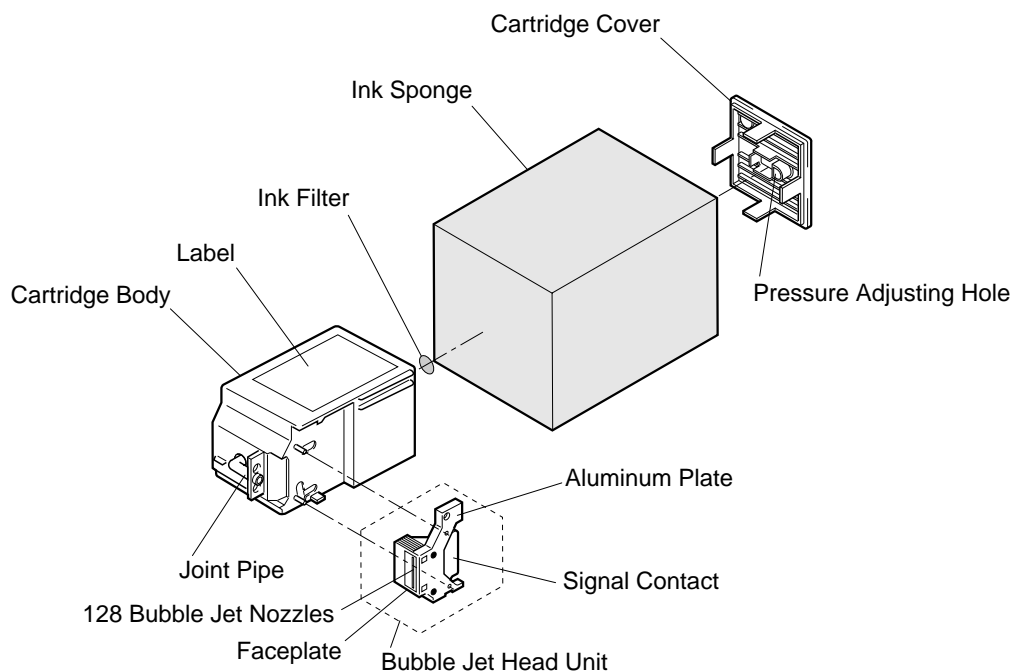


Figure 4-12 Black BJ Cartridge Structure

3.2.2 Color BJ cartridge structure

The color BJ cartridge is attached to a printhead with 136 nozzles (including 24 nozzles each for yellow, magenta, and cyan inks and 64 nozzles for black ink). The ink cartridge (one cartridge for black, and one cartridge for yellow, magenta, and cyan inks) is replaceable by separating it from the printhead.

1) Pressure adjusting plate

As the ink is consumed, the pressure inside the cartridge decreases relative to the atmospheric pressure. This makes it more difficult for the ink to be supplied to the head. To prevent this, the BJ cartridge provides an air hole for maintaining constant pressure inside the cartridge body.

2) Ink sponge

Each ink color (black, cyan, yellow, magenta) is soaked in its own separate sponge. The cyan, yellow, and magenta sponges are compressed and stored in the same color ink cartridge body.

3) Ink suppliers

The ink suppliers supply ink from the ink sponges to the joint sections of the cartridge at a constant pressure.

4) Ink cartridge body

The plastic case connects the ink sponges with the color BJ cartridge via the ink suppliers.

5) Rubber sheet

The rubber sheet seals the joint sections between the ink cartridge and BJ cartridge.

6) Ink passage section

This is a passage through which ink flows from the ink cartridge to the Bubble Jet head unit.

7) Bubble jet head unit

The inks of the four colors are supplied separately from the ink cartridges to the 136 bubble jet nozzles. Ink for each color is discharged through the 136 nozzles in accordance with the print signals received through the signal contacts.

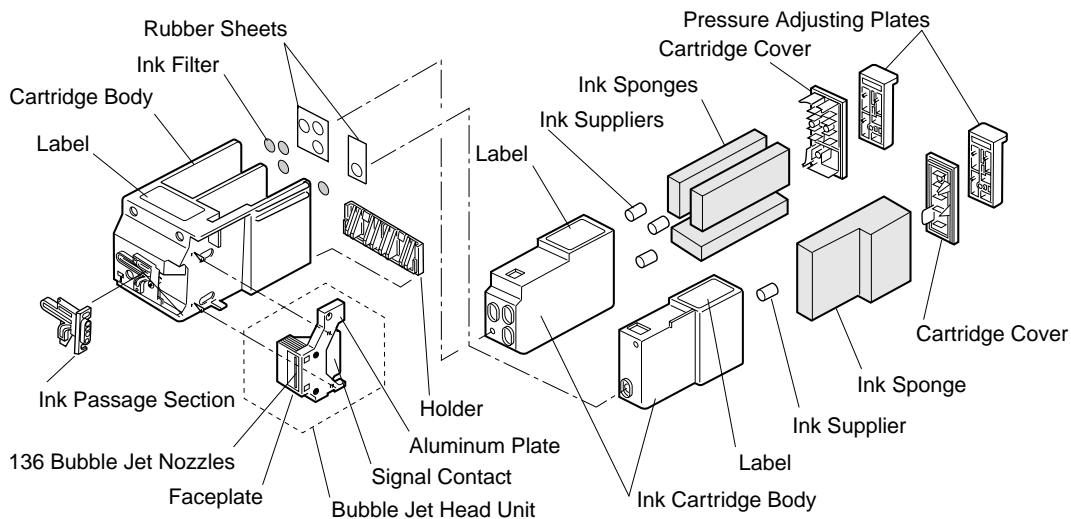


Figure 4-13 Color BJ Cartridge Structure

3.2.3 Photo BJ cartridge structure

The photo BJ cartridge is attached to a printhead with 136 nozzles (including 24 nozzles each for yellow, magenta, and cyan inks and 64 nozzles for black ink). The ink cartridge (one cartridge for black, and one cartridge for yellow, magenta, and cyan inks) is replaceable by separating it from the printhead.

1) Pressure adjusting plate

As the ink is consumed, the pressure inside the cartridge decreases relative to the atmospheric pressure. This makes it harder for the ink to be supplied to the head. To prevent this, the BJ cartridge provides an air hole for maintaining constant pressure inside the cartridge body.

2) Ink sponge

Each ink color (black, cyan, yellow, magenta) is soaked in its own separate sponge. The cyan, yellow, and magenta sponges are compressed and stored in the same color ink cartridge body.

3) Cartridge body

The plastic case connects the ink sponge with the bubble jet head unit via the ink filter.

4) Ink passage section

This is a passage through which ink flows from the ink cartridge to the head unit.

5) Bubble jet head unit

The inks of the four colors are supplied separately from the ink cartridges to the 136 bubble jet nozzles. Ink for four colors is discharged through the 136 nozzles in accordance with the print signals received through the signal contacts.

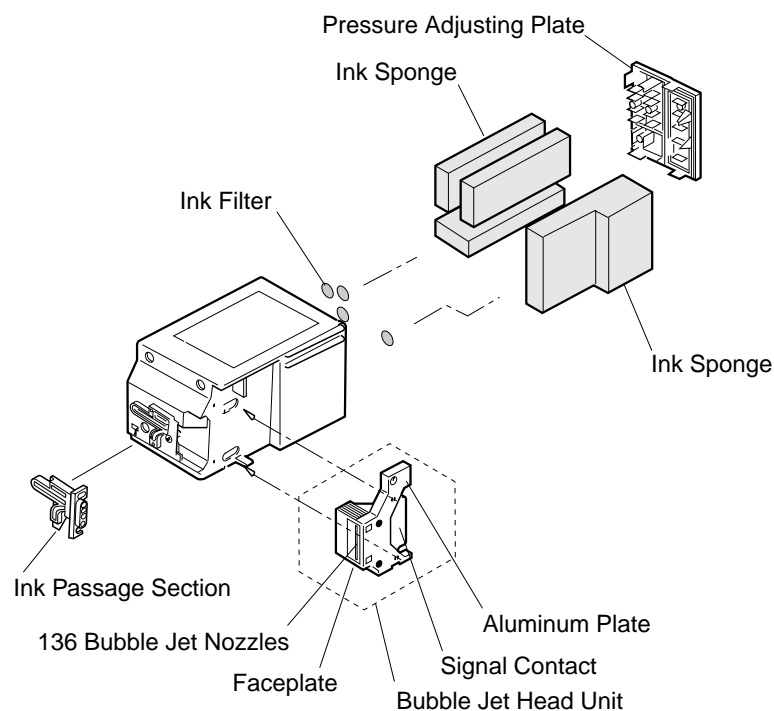


Figure 4-14 Photo BJ Cartridge Structure

3.2.4 Bubble head unit structure

1) Bubble jet nozzles

The ink held by the ink sponge goes through a mesh-type ink filter and flows to the bubble jet nozzles via the ink passage of the cartridge body.

When the head-drive current is supplied to the heater board, the ink boils and produces several ink bubbles. Eventually, only one ink bubble is formed by boiling. The head-drive current is turned off before an ink droplet leaves the nozzle. The bubbling, however, continues with the residual heat of the heater and causes ink droplets to be discharged from the tips of the nozzles.

After an ink droplet is discharged, the nozzle is replenished with more ink from the ink sponge.



The heater board of the printhead holds the heater and its circuits which are formed on a silicon plate using semiconductor technology. The silicon plate which contains these electrical circuits is bonded to an aluminum base. A plastic cover molded to fit the nozzles is also provided.

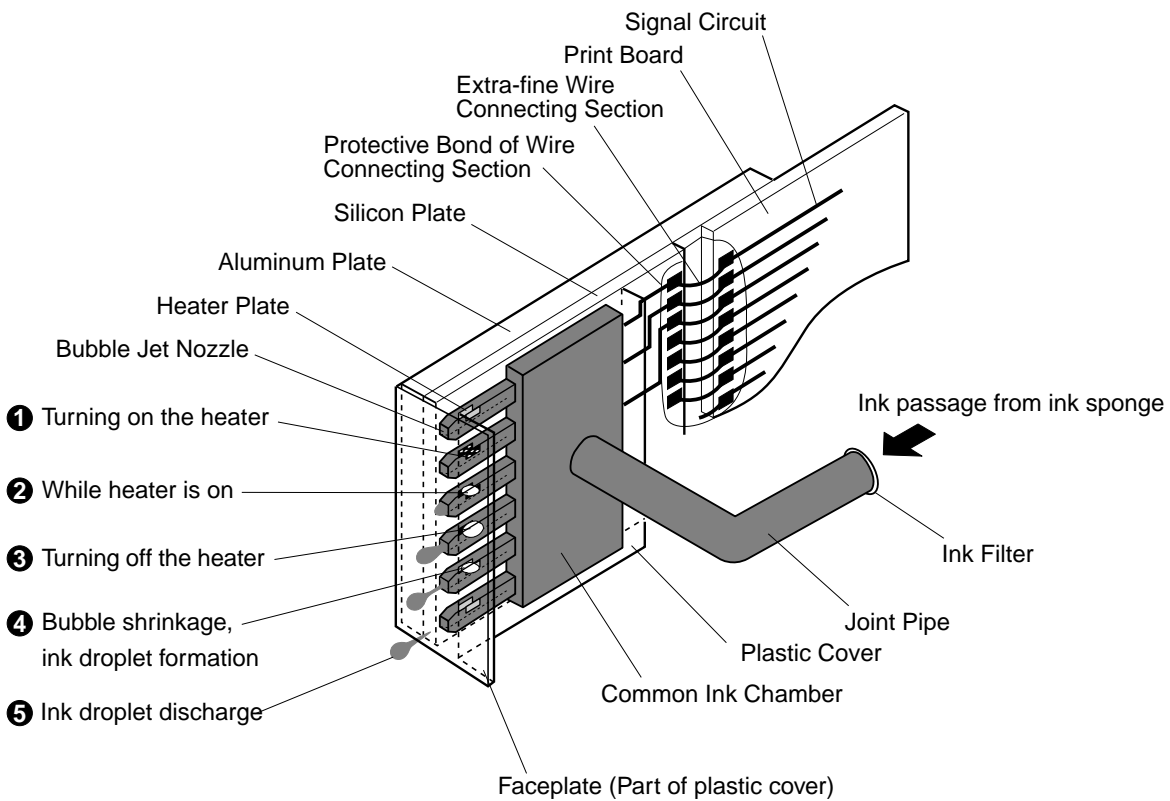


Figure 4-15 Bubble Jet Nozzles (Partial View)

2) Nozzle arrangement

The bubble jet nozzles are placed 1/360 inch apart in a vertical array.

The black BJ cartridge has 128 nozzles. On the color and photo BJ cartridges, the first 24 nozzles are used for yellow ink, the second 24 nozzles for magenta ink, the third 24 nozzles for cyan ink, and the remaining 64 nozzles for black ink. The color and photo BJ cartridges have a total of 136 nozzles.

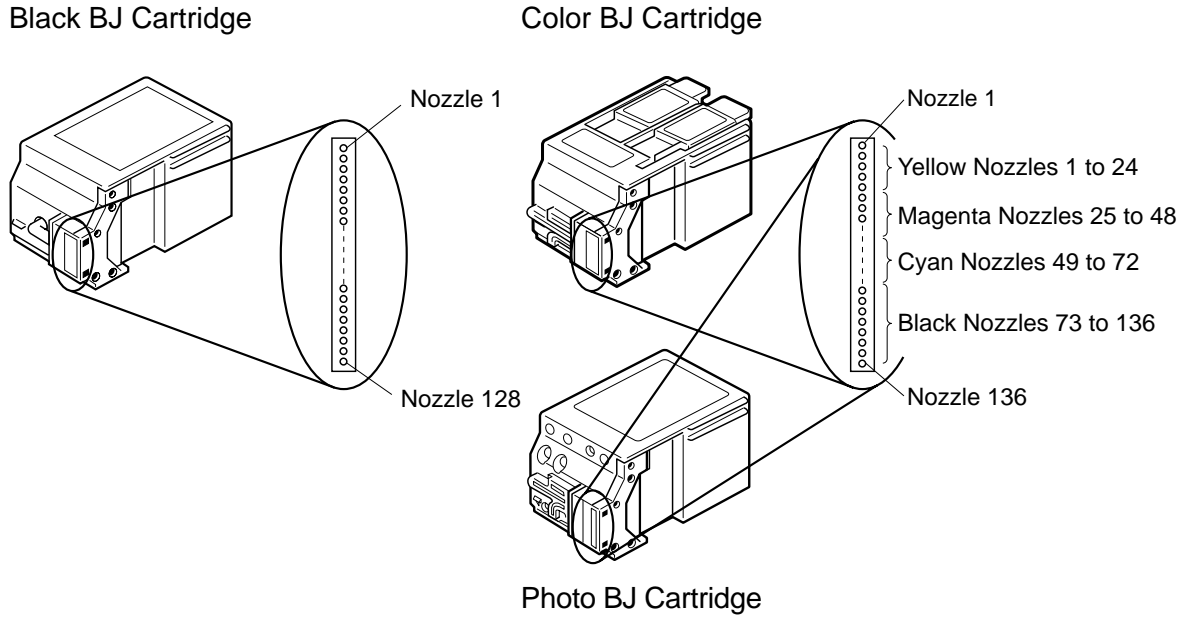


Figure 4-16 Nozzle Arrangement

3) Signal contact (contact pad)

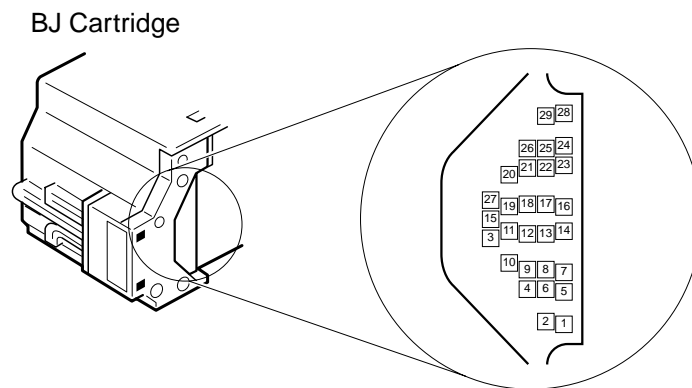


Figure 4-17 Contact Pad

Table 4-2 List of BJ Cartridge Signal Contacts

No.	Signal	Type	Description
1, 2	VHG	GND	GND for head driver voltage VH
3	HT0	IN	Temperature control heater drive signal
4	HT1	IN	Temperature control heater drive signal
5, 6	HVH	OUT	Head drive voltage (ink discharge heater, temperature control heater, sub-heater driver)
7	W-HT	OUT	Sub-heater drive signal
8	INKS1	...	Not used
9	TOP	IN	Rank resistance detection signal
10	DIODEA	OUT	Head temperature sensor (diode) anode
11	ID0	IN	BJ cartridge recognition signal
12	ID1	IN	BJ cartridge recognition signal
13	INKS2	IN/OUT	BJ cartridge recognition signal
14	HVss	GND	GND for printhead logic driver voltage HVdd
15	HENB0	OUT	Heat enable
17	HENB1	OUT	· Black BJ cartridge: Uses only pin Nos. 15 and 17. · Color/photo BJ cartridge: Uses all pins.
27	HENB2	OUT	
18	HENB3	OUT	
16	Even ENB	OUT	Heat enable for even-number nozzles
19	Odd ENB	OUT	Heat enable for odd-number nozzles
20	BENB1	OUT	Signal used for generating output signal of block enable decoder
21	BENB2	OUT	Signal used for generating output signal of block enable decoder
22	BENB3	OUT	Signal used for generating output signal of block enable decoder
23	HVdd	OUT	IC driver voltage (+5V)
24	HCLK	OUT	Print data transfer signal
25	HLATCH	OUT	Timing signal for latching print data of shift resistor
26	HRES	OUT	Latch reset signal
28	HDATA	OUT	Print data
29	DIODEK	IN	Head temperature sensor (diode) cathode



Pin Nos. 1 to 29 are connected to the BJ cartridge (same for left and right cartridges). Pin Nos. 30 to 32 of the left cartridge are connected to the home position sensor of the carriage. Pin Nos. 30 to 32 of the right cartridge are connected to the auto-alignment sensor of the carriage.

4) Circuit diagram

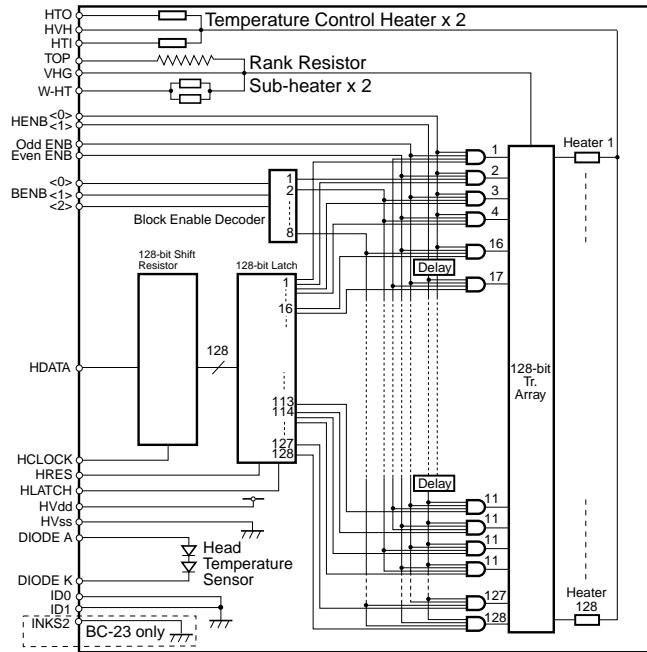
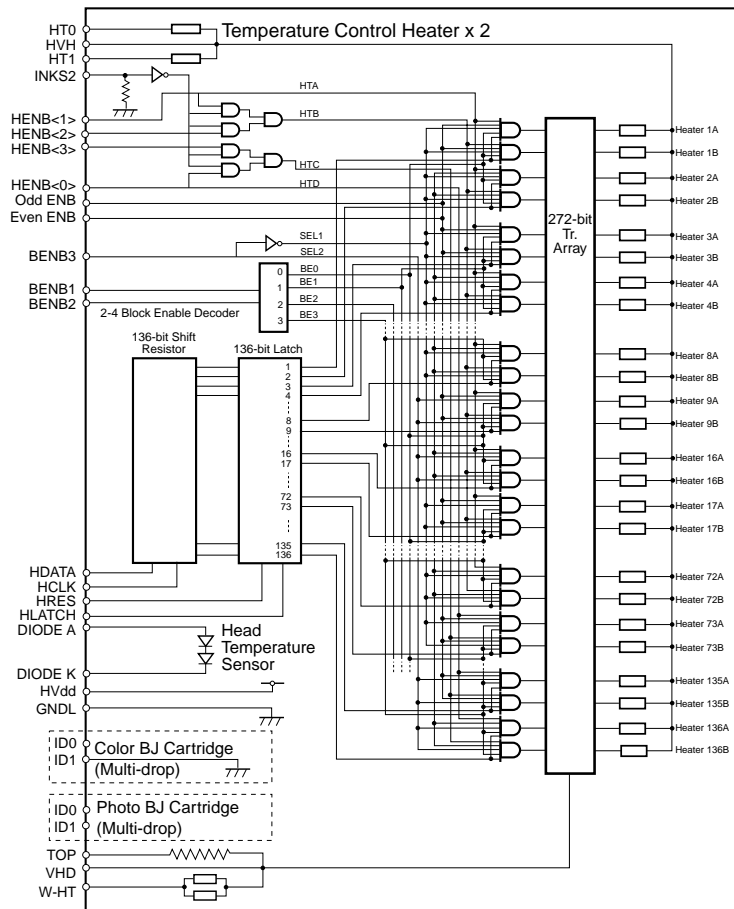


Figure 4-18 Bubble Jet Head Driver Block Diagram (Black BJ Cartridge)



Color BJ cartridge (Multi-Drop) and photo BJ cartridge (Multi-Drop) have the same circuit configuration except for the ID1 connection.

Figure 4-19 Bubble Jet Head Driver Block Diagram (Color/Photo BJ Cartridge) (Multi-Drop)

- **128-bit/136-bit shift resistor**
Stores the print data (HDATA) transferred from the logic board using the HCLOCK timing.
- **128-bit/136-bit latch**
Latches the print data (HDATA) converted by the 128-bit/136-bit shift resistor.
- **Block enable decoder**
After the BENB (block enable) 1, 2, and 3 code signals are input, the specified heat timing signal is output. The heat timing signal is divided into eighths.
- **Heater (1 to 128 and 1 to 136)**
The heater boils the ink to produce bubbles required for the nozzles to discharge ink. The heater heats the bubble jet nozzles. Heating is performed with the timing signal produced by the block enable decoder, the even number nozzle heat enable (EvenENB), odd number nozzle heat enable (OddENB), and heat enable (HENB0 to 3) signals.
- **Sub-heater**
This heater maintains optimum conditions in the nozzle for discharging ink.
- **Temperature control heater**
This heater controls the head temperature to stabilize the ink discharge amount.
- **Rank resistor**
To perform optimum ink discharge control, manufacturing inconsistencies in the heater characteristics of each BJ cartridge are categorized into 13 types which are identified by changing the rank resistance value. The printer receives the differences in the rank resistance as voltage values from the analog port of the MPU, and detects them after analog to digital conversion. The heater's characteristics are thus recognized.
- **Head temperature sensor**
The temperature changes occurring in the heaters of the nozzles are detected by the diode to prevent the bubble jet head from overheating.
- **Cartridge ID**
The BJ cartridge type is recognized through combinations of ID0, ID1, and INKS2.

5) Ink cartridge detection and identification feature

This printer detects the presence of a BJ cartridge by the two resistance values of TOP (pin 9) and DIODEA (pin 10) of the cartridge signal contacts. When the resistance value of TOP is 750 Ω or less and that of DIODEA is not 0 Ω , the printer decides that the cartridge is installed. When the resistance values of these pins do not comply with the above values, the printer decides that the cartridge is not installed.

When the printer detects the BJ cartridge, the installed BJ cartridge is identified (black, color, or photo BJ cartridge) based on ID0 (pin 11), ID1 (pin 12), and INKS2 (pin 13) of the cartridge signal contacts.

If the printer is turned on without the BJ cartridge (for example, if a user turns on the printer immediately after unpacking the printer), the carriage automatically moves to the cartridge replacement position regardless of its previous position. Also, if the printer is on and the cartridge is removed without replacement, an BJ cartridge not installed error will occur.

Table 4-3 Head Installation Status and Signal Detection

	ID0	ID1	INKS2	TOP
Black BJ cartridge (BC-23)	Low	Low	Low	Min. 60 Ω
Photo BJ cartridge (BC-22e Photo)	Low	High	Low	
Color BJ cartridge (BC-21e)	High	Low	Low	
Black BJ cartridge (BC-20 [reference])	Low	Low	High	

High: Signal detected

Low: No signal detection (by printer)

3.3 Purge Unit

3.3.1 Purge unit functions

The purge unit of this printer has two caps: the left cap performs both cleaning and capping and the right cap is used exclusively for capping.

1) Capping function

The capping function prevents the nozzles from drying out and ink from leaking by pressing the cap of the purge unit against the face of the printhead.

If print data is not received for 60 seconds during a printing operation, the purge unit wipes the printhead face.

If the printer is turned on but not in printing status, the purge unit will cap the printhead if print data is not received for 5 seconds to 2 minutes, or if the *POWER button* is pressed to turn off the printer,.

2) Cleaning function

The cleaning function maintains the high print quality of the printhead by cleaning the printhead under the conditions given in Table 4-4.

The cleaning operation includes: 1) wiping of paper shreds and ink residue from the printhead face plate, 2) absorption to suck out ink from the printhead to refresh the inside of the nozzles with fresh ink, and 3) maintenance jet to prevent inconsistencies in printing caused by unused nozzles.

Since only the left cap performs cleaning, clean BJ cartridges individually when 2 BJ cartridges are installed on the carriage. Note also that you cannot clean only one of the BJ cartridges.

Table 4-4 Ink Consumption During Cleaning (as a Guideline)

When the Black BJ Cartridge is installed	Approximate Ink Consumption
During BJ cartridge replacement	Approx. 0.2 g
Power on for the first time after connecting the AC power cord	Approx. 0.2 g
Power on after 72 hours or more since last cleaning	Approx. 0.2 g
When the printed dot count exceeds designated number of dots	Approx. 0.2 g
Button pressed for cleaning	Approx. 0.2 g
When the Color/Photo BJ Cartridge is installed	Approximate Ink Consumption
During BJ cartridge replacement	Approx. 0.4 g
Power on for the first time after connecting the AC power cord	Approx. 0.4 g
Power on after 72 hours or more since last cleaning	Approx. 0.4 g
During ink cartridge replacement	Approx. 0.4 g
When cartridge is left at cartridge replacement position for over 10 minutes	Approx. 0.4 g
When cartridge is at cartridge replacement position and the printer is turned off	Approx. 0.4 g
When the printed dot count exceeds designated number of dots	Approx. 0.4 g
Button pressed for cleaning	Approx. 0.4 g
24 hours or more after the BJ cartridge or ink cartridge was replaced	Approx. 0.4 g

3.3.2 Purge unit structure

1) Purge drive gear

The feed roller driven by the paper feed motor operates the purge drive gear via the transmission gear. The purge drive gear in turn operates the cam which controls capping. The position of the cam is transmitted by the purge sensor flag and detected by the purge sensor.

2) Wiper unit

When the carriage moves from left to right, the wiper unit retracts to a position where it does not come in contact with the head. When the carriage moves from right to left, however, the wiper unit wipes ink from the BJ cartridge faceplate under the following conditions: 1) when the printer is turned on and off, 2) once every 60 seconds (or after discharging more than the designated number of dots) during printing, 3) after the paper feed operation, 4) after a cleaning operation, and 5) when the cap is opened or closed.

3) Capping unit

The purge unit of this printer is equipped with two caps: the left cap which performs both ink absorption and capping, and the right cap which is used exclusively for capping.

After the carriage moves to the capping position, the capping unit presses the cap of the purge unit against the face of the printhead to cap the printhead when the purge drive gear is driven.

The left cap is equipped with a waste ink tube and sucks ink from the BJ cartridge during cleaning by means of a pumping operation. The sucked ink is sent to the waste ink absorber of the base unit. After ink is sucked, the carriage is moved to the left from the capping position and the pumping operation is performed again to discharge the waste ink accumulated in the rubber cap and waste ink tube to waste ink absorbers.

4) Maintenance jet receiving section

The maintenance jet receiving section takes in ink (for test discharge to maintain the nozzles' working condition) discharged from the BJ cartridge.

5) Pump unit

This unit features a tube pump system which sucks ink by using a rotational roller to apply pressure to the waste ink tube and thus generating negative pressure. The waste ink tube is connected to the left cap only.

6) Slide lock pin

The slide lock pin is interlocked with the transmission arm and switches the motor of the paper feed motor.

When the carriage moves farther right from the home position, the hook provided at the back of the carriage slides the slide lock pin toward the right to unlock the transmission arm.

The use of the transmission gear motor is switched between the purge drive or sheet feeder drive depending on the direction of rotation of the paper feed motor when the transmission arm is unlocked.

7) Carriage lock pin

The carriage lock pin is assembled with the capping unit in a single unit. It fixes the carriage from the underside so that the carriage does not move toward either side from the capping position when the cap is pressed against the BJ cartridge face.

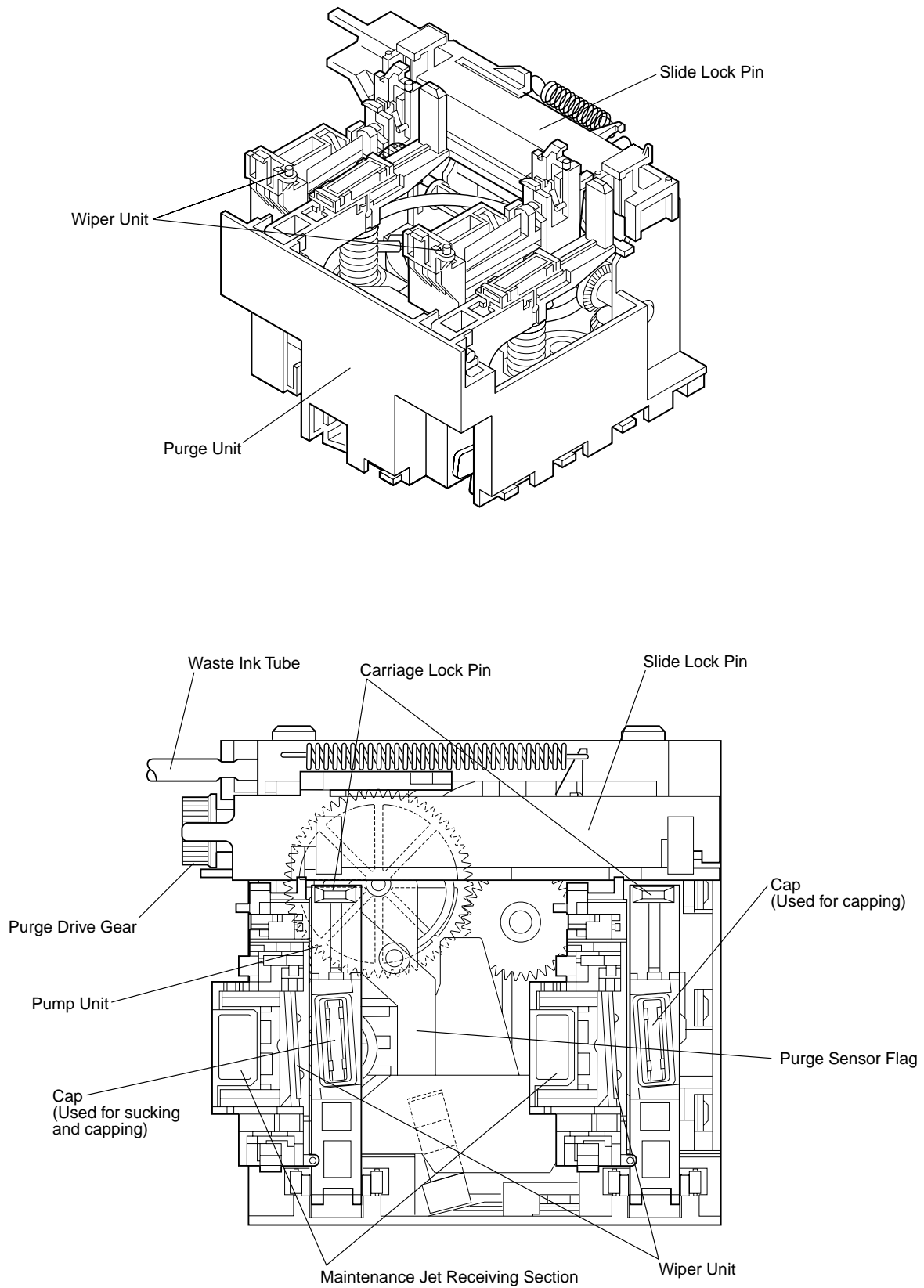


Figure 4-20 Purge Unit

3.4 Carriage

3.4.1 Carriage function

1) printhead installation

The BJ cartridge is fixed mechanically to the carriage and connected to the logic board with the carriage ribbon cable.

2) Carriage driver

The carriage motor and carriage belt moves the carriage horizontally across the paper.

3) Paper feed motor driver switching

When the carriage moves farther right from the capping position, the transmission arm is unlocked by sliding the slide lock pin of the purge unit. The paper feed motor used for feeding paper during printing can be switched to drive the purge unit and sheet feeder.

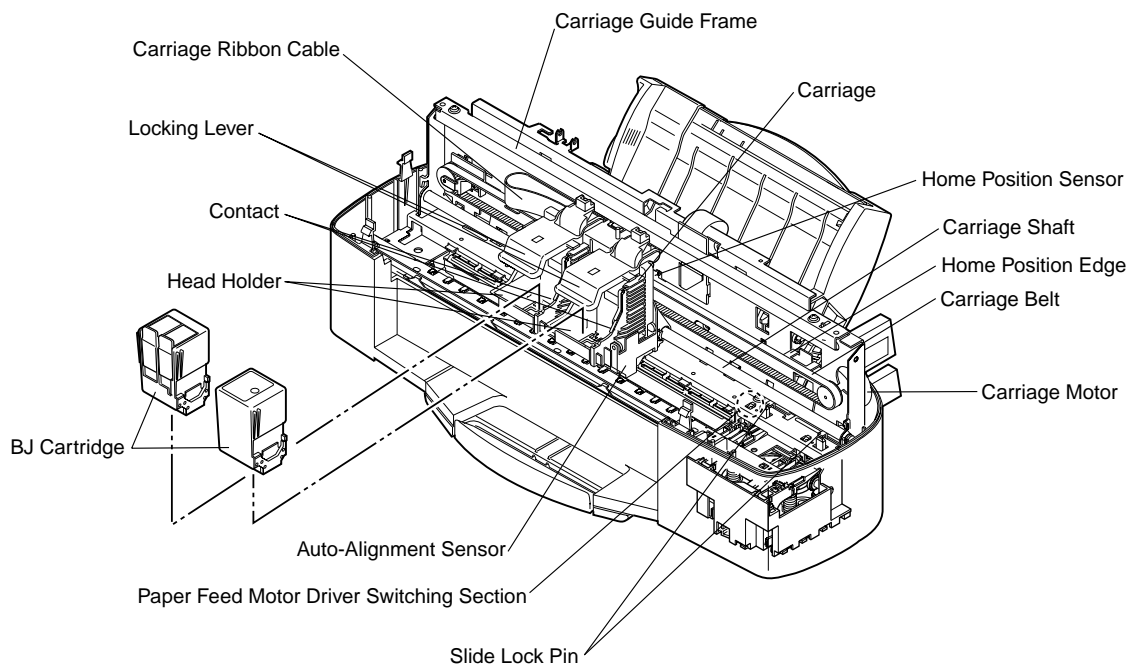


Figure 4-21 Carriage

3.4.2 Carriage structure

1) BJ cartridge attachment section

Two BJ cartridges can be installed on the carriage of this printer.

The two cartridge holders on both sides move with the locking lever which fixes the BJ cartridge to the carriage.

When a BJ cartridge is fixed to the carriage, the carriage ribbon cable signal contacts are pressed against the bubble jet head signal contacts and the printing signal is transmitted from the logic board.

2) Carriage driver section

The stepping-type carriage motor drives the carriage horizontally across the paper with the carriage belt. The photo interrupter's home position sensor provided at the back of the carriage detects the home position edge as the initial position. Then, the carriage is controlled by a stepping pulse sent to the carriage motor.

The nozzles of the BJ cartridge are positioned at the maintenance jet receiving section when the carriage is located at the home position.

3) Paper feed motor switching section

The paper feed motor drives either the purge unit, paper feed, or sheet feeder according to the position of the carriage. When the carriage is not at the extreme right end position of the printer, the slide lock pin of the purge unit will lock the transmission arm operation.

When the carriage is moved farther right from the capping position (extreme right end position of the printer), the slide lock pin is unlocked. Switching of the rotation direction of the paper feed motor in the unlocked state selects whether the purge unit or sheet feeder is driven by the paper feed motor. If the feed roller turns in the feed direction while the slide lock pin is unlocked, the transmission arm gear is rotated until it reaches the sheet feeder drive gear, and the paper feed motor drives the sheet feeder.

If the feed roller is rotated in the direction opposite of feeding while the slide lock pin is unlocked, the transmission arm gear is rotated until it reaches the purge drive gear, and the paper feed motor drives the purge unit.

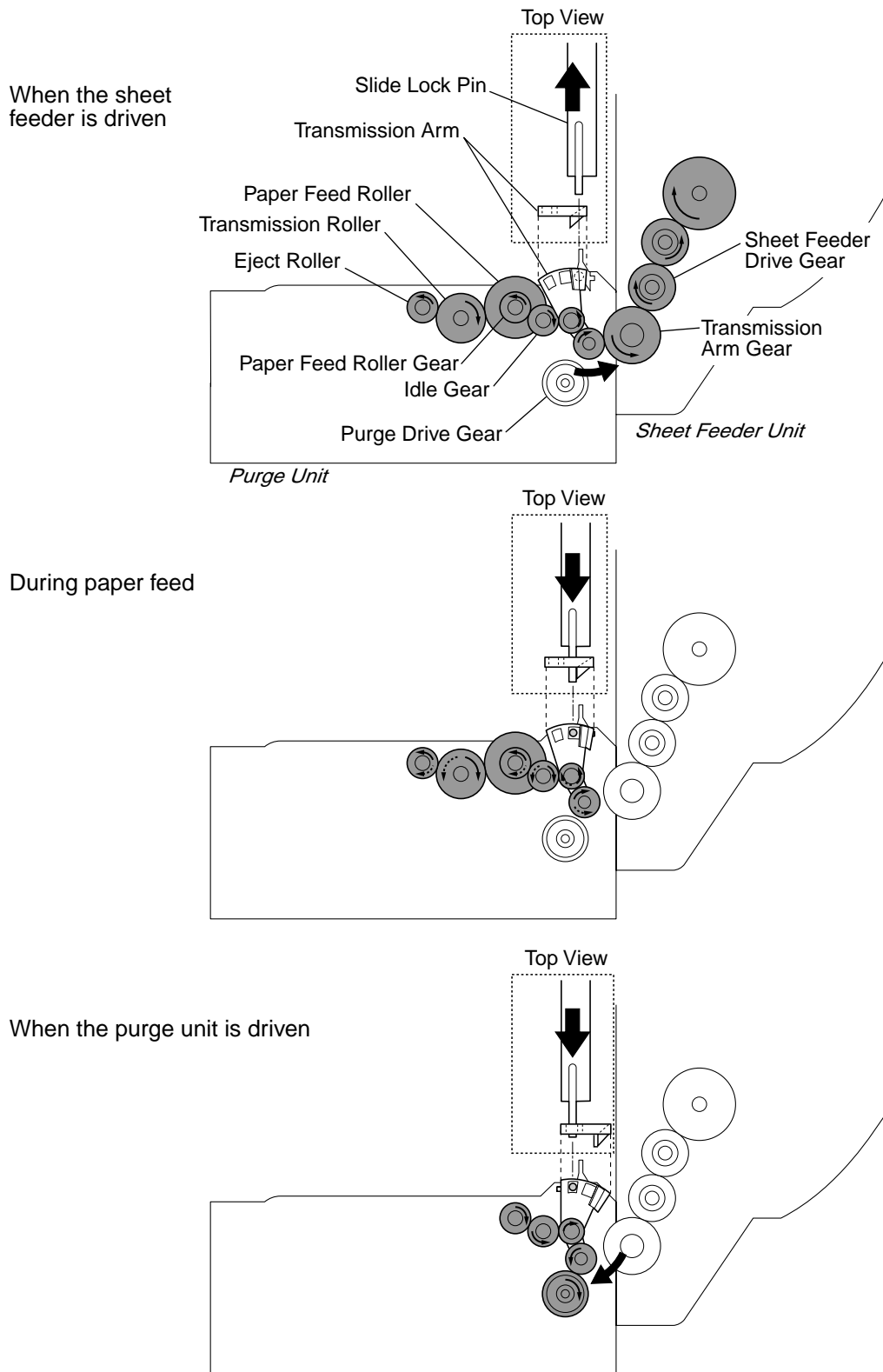


Figure 4-22 Paper Feed Motor Power Switching

3.5 Paper Feed/Cut Sheet Feeder

3.5.1 Paper feed/cut sheet feeder function

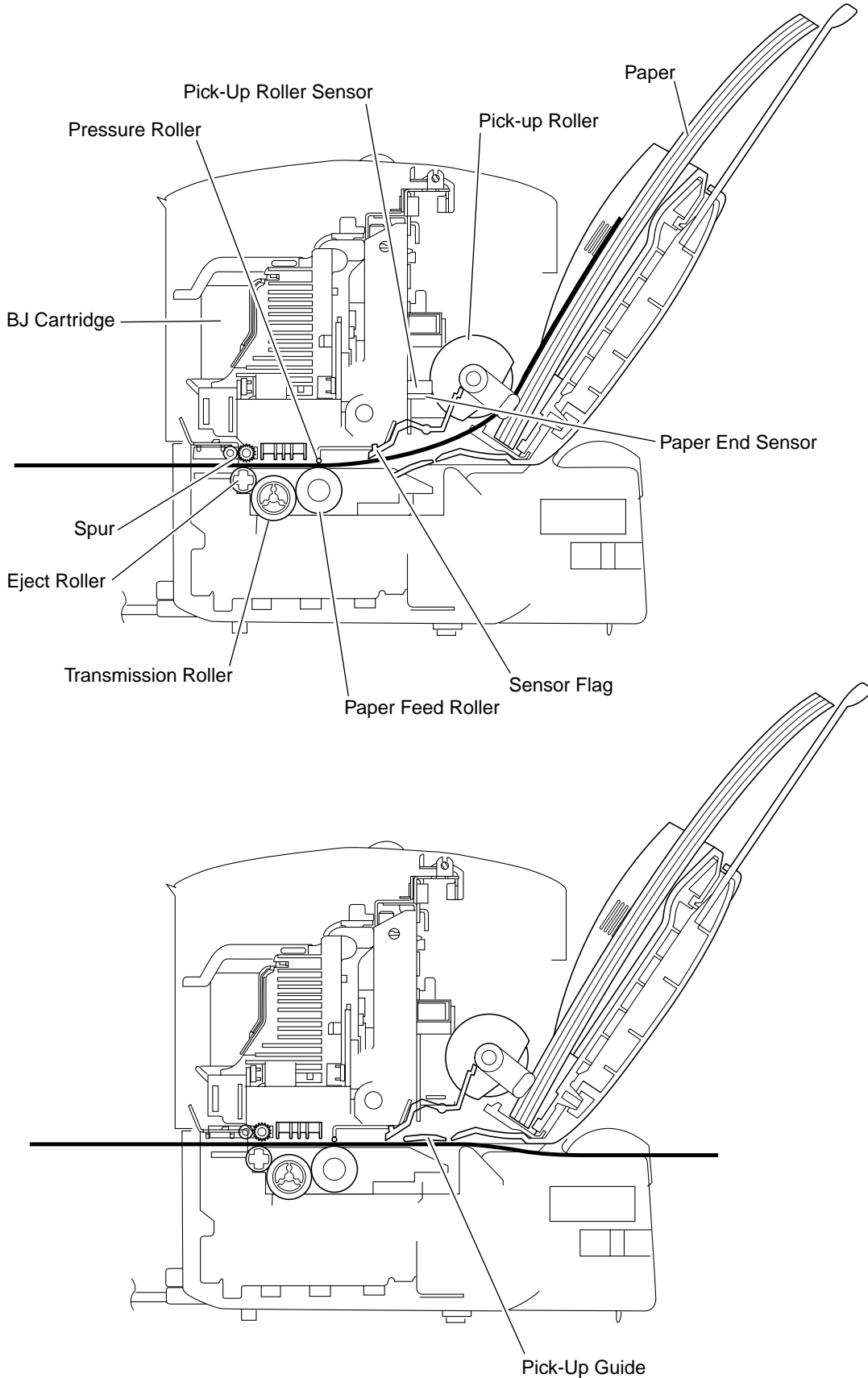


Figure 4-23 Paper Feed

1) Paper feed mechanism

The paper feed mechanism can supply paper in two ways: automatically from the cut sheet feeder and manually from the manual feeding slot. The built-in cut sheet feeder is driven by the paper feed motor. Paper is stacked in the sheet feeder and fed automatically. Even postcards and envelopes can be fed automatically without mechanical operation (a user does not have to operate the paper selection lever). When paper is loaded in both the cut sheet feeder and manual feeding slot, priority is given to the manual feeding slot.

When the paper is sensed by the paper end sensor of the photo interrupter, it is fed automatically by the paper feed roller until it reaches the starting position for printing on the platen.

The paper feed is controlled during printing by controlling the rotation speed of the paper feed roller.

After printing, the paper is delivered out by the eject roller.

2) Automatic printhead and paper clearance adjustment function

The paper feed roller and eject roller are pulled up by the coil spring from a lower position to a higher position toward the pressure roller and spur respectively, a consistent clearance is maintained between the printhead face and paper regardless of the paper thickness.

As a result this printer allows a user to print without switching the carriage position according to the print paper thickness.

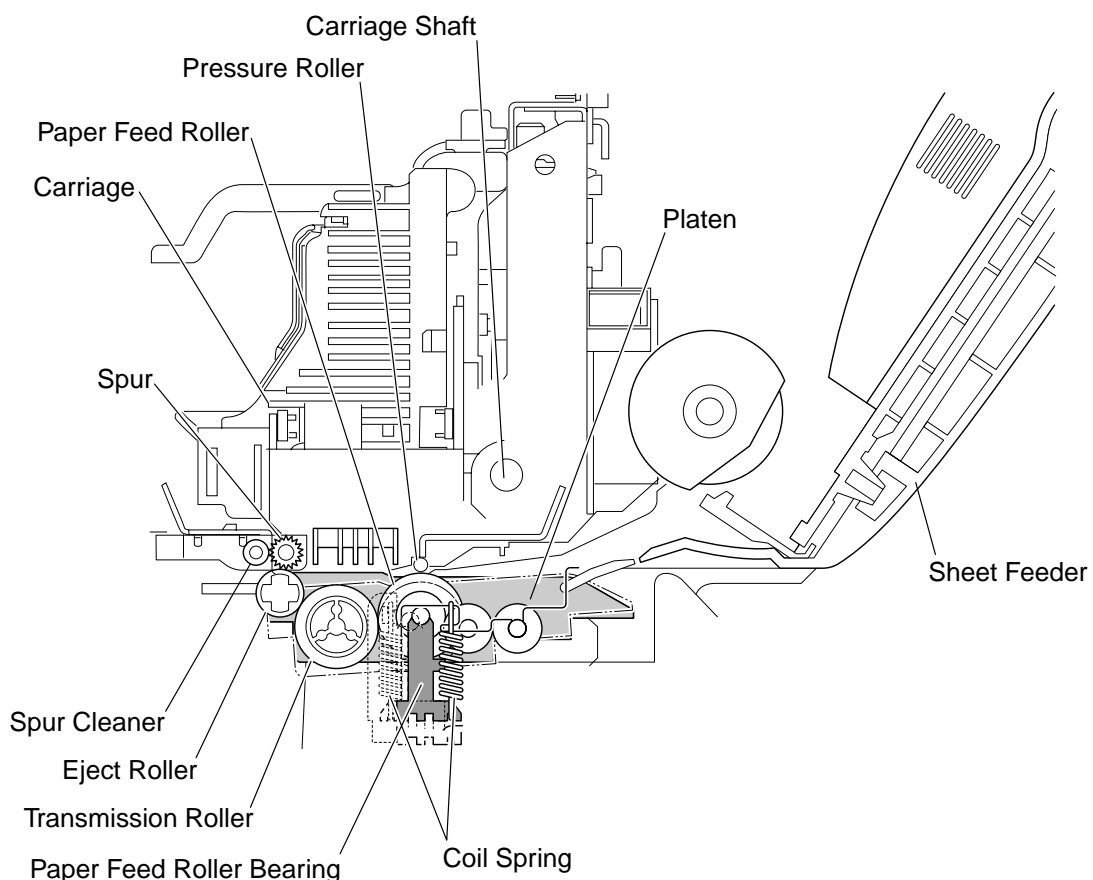


Figure 4-24 Automatic Printhead and Paper Clearance Adjustment

3.5.2 Sheet feeder structure

This printer has no mechanical paper selection lever on the cut sheet feeder. If the paper meets the required specifications, it can be fed without carriage position adjustment etc. according to the paper thickness.

The paper is loaded in the cut sheet feeder under the condition where the two leading edge positions and left corner are caught by the pick-up corner and pick-up hook. The pick-up roller starts rotating when the paper feed motor drives the sheet feeder gear and the printer starts printing.

Paper such as plain paper is fed when it is caught by the pick-up corner and pick-up hook and then pushed into the paper feed section. When thick paper such as envelopes and postcards is fed, the paper is stiffer than the return force of the pick-up hook spring and pick-up corner spring. Therefore, the pick-up hook and pick-up corner are pressed down to feed the paper.

Initial position of the pick-up roller is detected when the flag is sensed by the pick-up roller sensor of the photo interrupter on the logic board.

When paper is sensed by the paper end sensor, it is fed automatically until it reaches the print starting position.

If paper is not sensed even when the paper feed operation is executed, a paper not loaded or paper jam error will occur.

During manual feeding, a user must insert a paper through the manual feeding slot until it reaches the position where the paper end sensor detects the paper. In the manual feed mode, the paper passes through a different paper path from that used by the automatic paper feed mode of the cut sheet feeder. This makes it possible to give priority to manually fed paper, even when paper is loaded in the cut sheet feeder.

Paper pushed into the paper feed section is fed to the print starting position after it has been sensed by the paper end sensor.

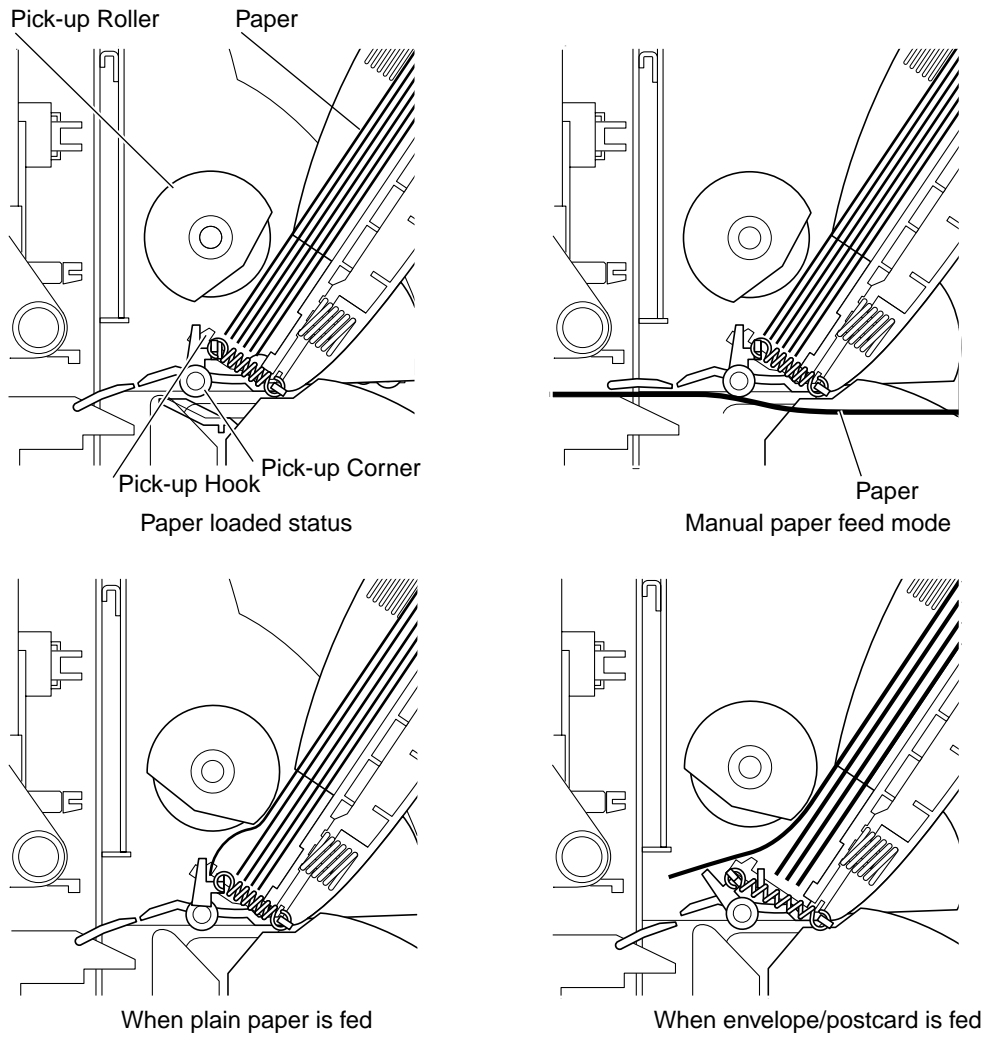


Figure 4-25 Paper Separator

4. PRINTER ELECTRICAL SYSTEM

4.1 Overview of Printer Electrical System

The electrical system functions are handled by the logic section or power supply. The logic section converts data from the interface into print signals or printer operation signals, drives the BJ cartridge and motors, and monitors the sensor statuses.

The power supply unit converts the AC input power supply into DC driving power for the logic board, motor, head and other parts.

When AC power is being supplied to the printer, all printer hardware components are active except for the following: heater power supply VH and Vcc of the head; power supply of photo interrupters (5) total; and head rank circuit.

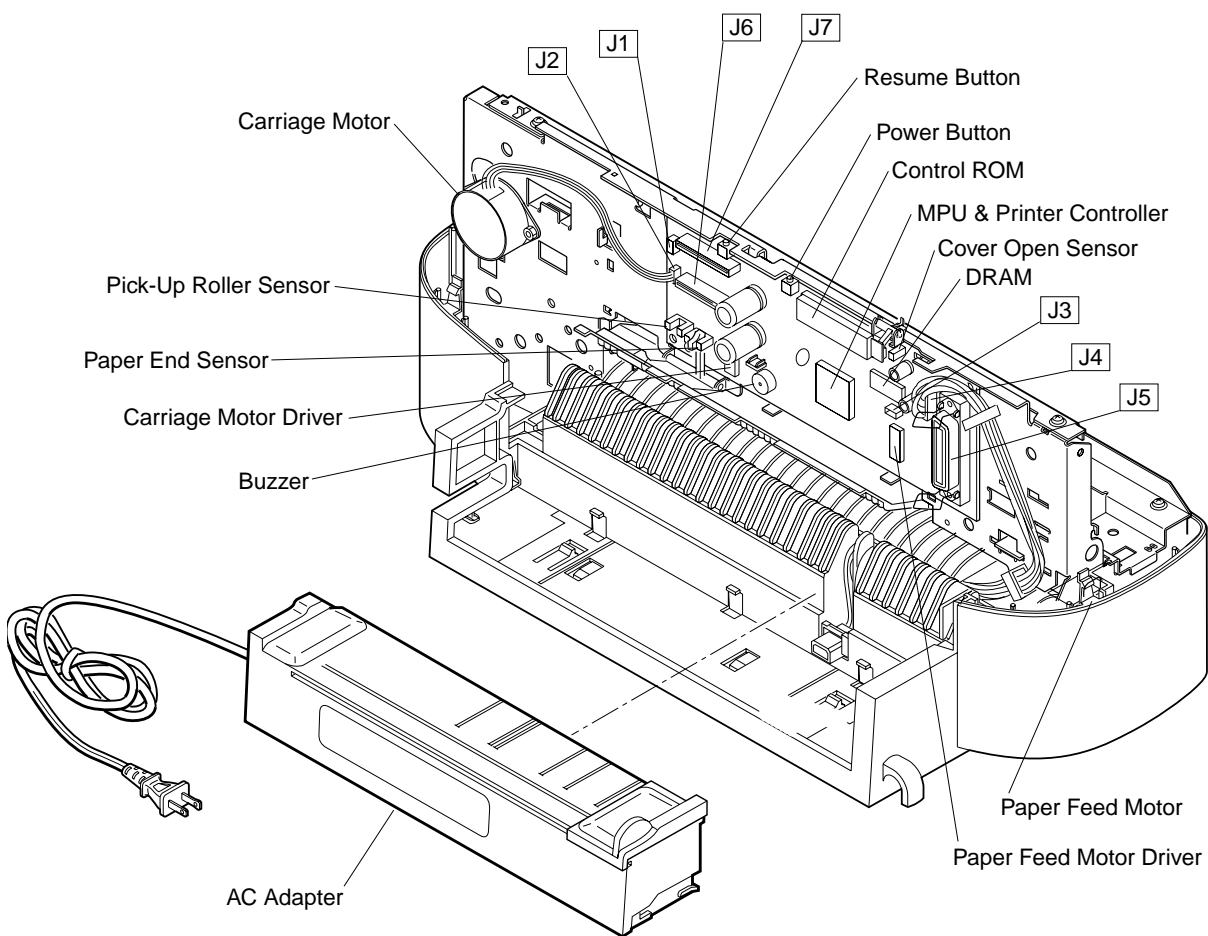


Figure 4-26 Printer Electrical System

4.2 Logic Section
4.2.1 Logic section block diagram

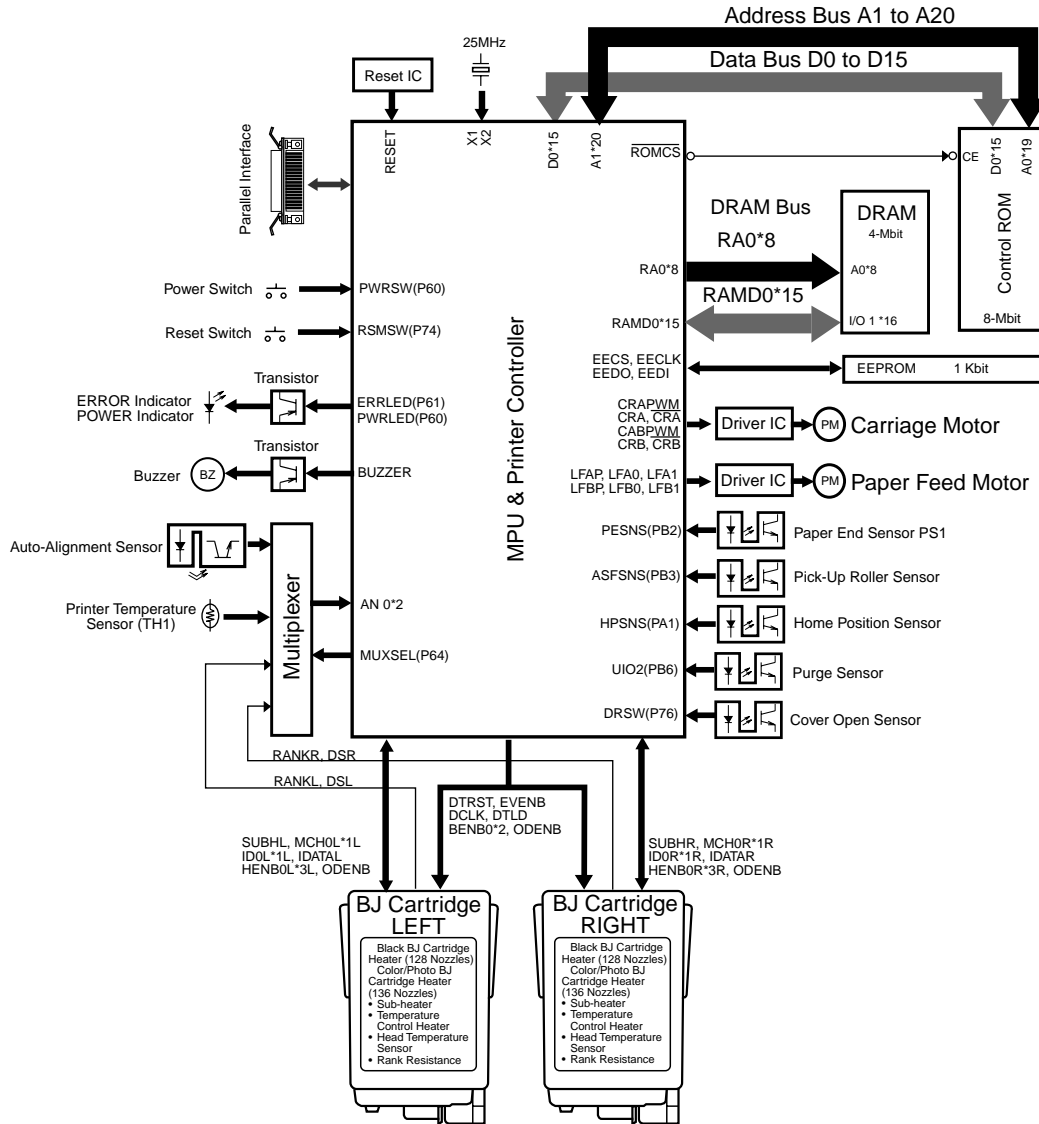
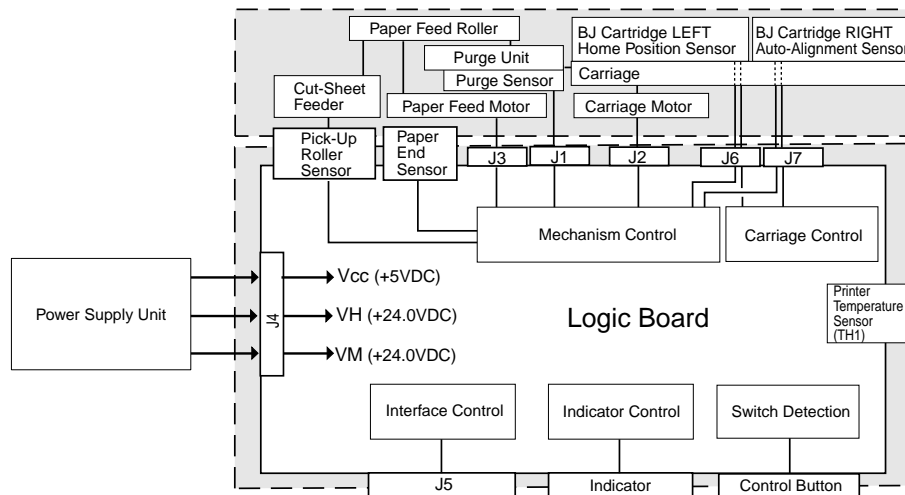


Figure 4-27 Logic Board Block Diagram



Electrical Section

Figure 4-28 Printer Block Diagram

4.2.2 Logic section components

1) MPU & printer controller

The MPU contains a 16-bit CPU, 512K-byte work RAM, 24-bit address bus port, 16-bit data bus port, stepping motor controller, A-D converter, interface controller, printhead controller, buffer controller, DRAM controller, EEPROM controller, I/O ports, and other components.

Built-in CPU

The 16-bit CPU operation is synchronized with a 25MHz external clock input.

Address bus

Bits A1 to A20 of the 24-bit address bus port are connected to an 8M-bit control ROM (the 4 bits from A21 to A23 and A0 are not used). Chip selection of the control ROM is performed by the read signal output by the MPU & printer controller.

Data bus

Like the address bus, the 16-bit data bus port is also connected to the 8M-bit control ROM.

Stepping motor controller

The stepping motor controller outputs the two-phase excitation drive signals of the carriage motor and paper feed motor.

A-D converter

The following analog signals are detected after they pass through the built-in A-D converter:

AN0: The printer's internal temperature, print position information, and ink reflection density are detected by the thermistor on the logic board selected by the multiplexer, and the auto-alignment sensor on the carriage.

AN1: The head temperature and head rank in the RIGHT BJ cartridge are detected by the rank resistor and head temperature sensor in the RIGHT BJ cartridge selected by the multiplexer.

AN2: The head temperature and head rank in the LEFT BJ cartridge are detected by the rank resistor and head temperature sensor in the LEFT BJ cartridge selected by the multiplexer.

Interface controller

The interface controller receives, from the computer, 8-bit parallel data which is synchronized with the data strobe pulse ($\overline{\text{STROBE}}$) through the $\text{BUSY}/\overline{\text{ACKNLG}}$ handshake. It also controls other interface signals.

Data received through the interface is stored in the DRAM's receive buffer and analyzed by the MPU & printer controller.

When the printer initialization signal $\overline{\text{INIT}}$ is input through the interface to the MPU & printer controller, the MPU & printer controller output a BUSY signal. Also, after the print data in the print buffer is printed, the printer is initialized.

DRAM controller

The DRAM controller controls the 9-bit address/16-bit data bus of the 4M-bit DRAM, and also performs the read/write control, RAS/CAS control, and refresh control.

Buffer controller

The buffer controller automatically writes and reads the print buffer in the DRAM, manages the remaining capacity of the print buffer, and clears the data after it is read.

Printhead controller

The printhead controller sends the print data read from the print buffer in the DRAM to the printhead. At the same time, the printed dots are counted for variable control of the HeatENB signal pulse width (Pre/main pulse width). The head-driving signals consist of block enable signals (BENB 0, 1, 2) and odd/even enable signals (ODENB/EVENB) which are used in common for both LEFT and RIGHT BJ cartridges, and heat enable signals (HENBOL, 1L, 2L, 3L for LEFT; HENBOR, 1R, 2R, 3R for RIGHT) which are used separately for the LEFT and RIGHT BJ cartridges. The block enable signals and odd/even enable signals specify the block for the time-shared drive. The heat enable signals control the conduction time of the eject heater.

I/O port

Signals for the setting statuses determined by the *POWER* button, *RESET* button, auto-alignment sensor, head temperature sensor, head ID, paper end sensor, home position sensor, pick-up roller sensor, and purge sensor are input through the input ports.

Signals for operations such as *POWER* indicator, *ERROR* indicator, buzzer, BJ cartridge detection, and head-driving voltage control are output from the output ports.

3) Control ROM (U2)

The 8M-bit control ROM contains the printer control program.

4) DRAM (U11)

Controlled by the MPU & printer controller, the 4M-bit control DRAM is used as a print buffer and working area.

5) Reset IC (U6)

This IC detects the power voltage when power is turned on or during an instantaneous power failure and resets the MPU & printer controller.

6) EEPROM (U10)

Controlled by the MPU & printer controller, the 1K-bit Electrically Enable and Programmable ROM (EEPROM) stores various function settings, the total count of printed sheets, and total waste ink amount.

7) Multiplexer (U3)

Triple 2-channel Analog Multiplexer. It has three identical circuits which select and output either one of the 2 analog inputs made by the MUXSEL output from the MPU & printer controller.

When MUXSEL is “Low,” inputs “X0, Y0, Z0” are selected; and when MUXSEL is “High,” inputs “X1, Y1, Z1” are selected. These inputs are then output to AN0, AN1, and AN2 respectively.

X0: Auto-alignment sensor on the carriage

X1: Thermistor on the logic board

Y0: Head temperature sensor in the RIGHT BJ cartridge

Y1: Rank resistor in the RIGHT BJ cartridge

Z0: Head temperature sensor in the LEFT BJ cartridge

Z1: Rank resistor in the LEFT BJ cartridge

8) Paper feed motor driver (U9)

Controlled by the MPU & printer controller, the paper feed motor driver drives the paper feed motor (controlled by the two-phase exciter) with a constant-voltage bipolar drive. The driving IC contains two identical driving circuits.

9) Carriage motor driver (U5)

Controlled by the MPU & printer controller, the carriage motor driver drives the carriage motor (controlled by two-phase exciter) with a constant-voltage bi-polar drive. The peak current value is set and driven in accordance with the switching signal from the MPU & printer controller. The driving IC contains two identical driving circuits.

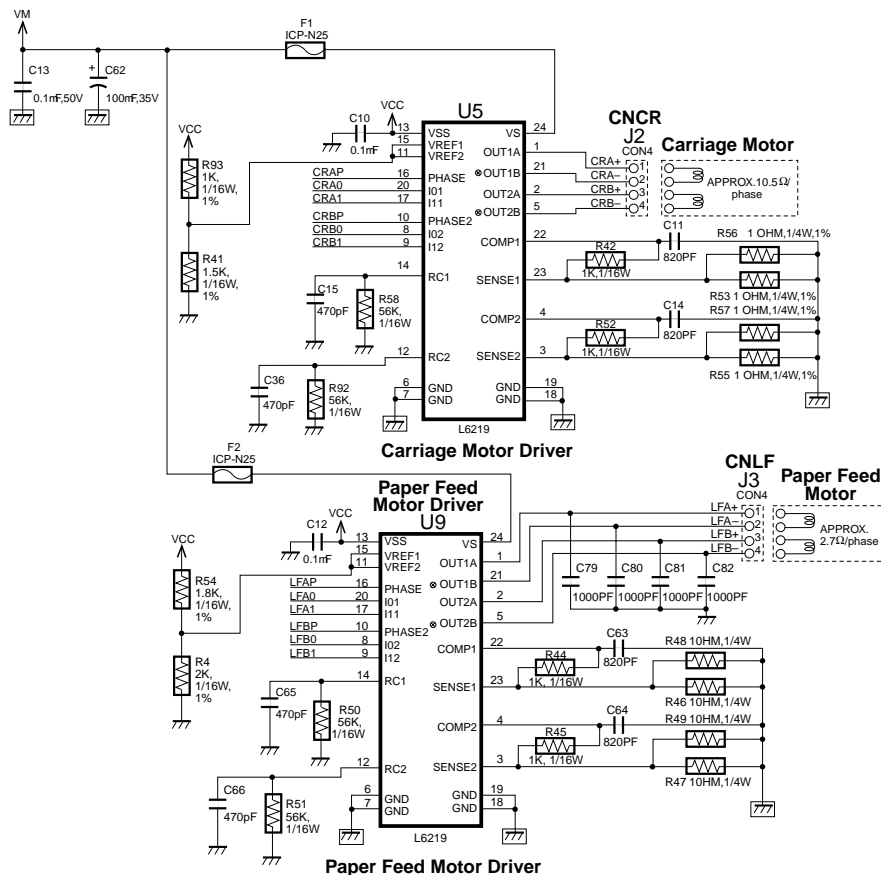


Figure 4-29 Motor-Driving Circuit

5. SENSOR FUNCTIONS

The printer has a pick-up roller sensor, paper end sensor, home position sensor, purge sensor, cover open sensor, printer temperature sensor, head temperature sensor, and auto-alignment sensor.

The printer is also provided with a waste ink absorption amount detection function which counts and stores the waste ink absorption amount in the EEPROM and issues an error signal when the waste ink absorber becomes full.

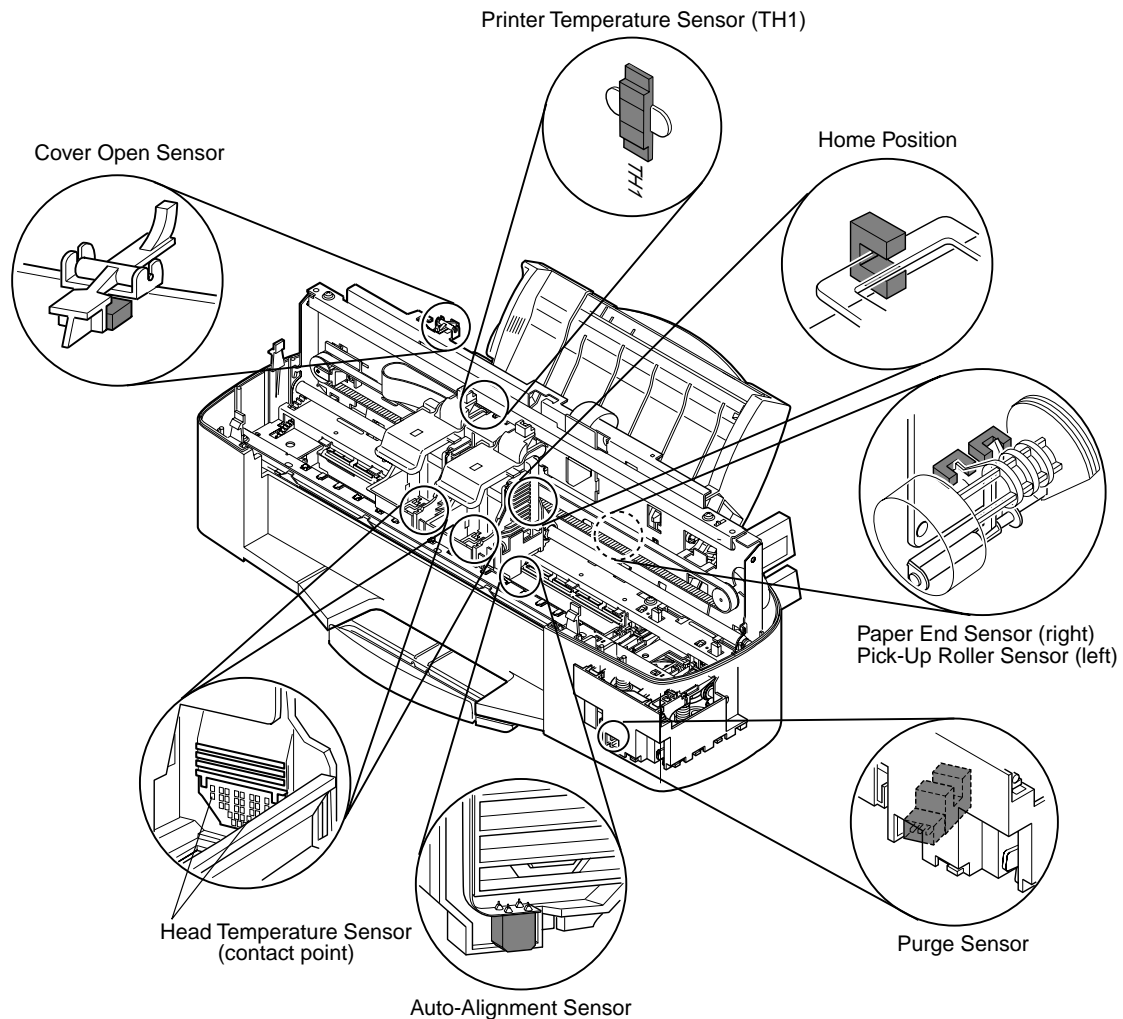


Figure 4-30 Sensors

5.1 Pick-Up Roller Sensor

The photo interrupter-type pick-up roller sensor detects the initial position of the sheet feeder pick-up roller. When the initial position is detected, the flag interrupts the sensor and the sensor detection status is activated.

5.2 Paper End Sensor

The photo interrupter-type paper end sensor uses the paper sensor arm's flag to detect the presence of paper when the front edge of the paper sheet passes through the paper feeding mechanism. The sensor is closed by the paper sensor arm when there is no paper, and opened (paper is recognized) when paper is detected.

5.3 Home Position Sensor

The photo interrupter-type home position sensor senses the home position edge and detects the carriage position. After the edge is detected, the carriage moves to the right. The position where the maintenance jet is executed becomes the home position.

5.4 Purge Sensor

The photo interrupter-type purge sensor uses a flag in the purge unit to detect the capping position. When the capping position is detected, the sensor is interrupted and the sensor detection status is activated.

5.5 Cover Open Sensor

The photo interrupter-type cover open sensor detects the front cover open/close status. When the front cover is closed, a flag interrupts the sensor and the sensor detection status is activated.

5.6 Printer Temperature Sensor

The printer temperature sensor on the control board is a thermistor which detects the printer's internal temperature. The thermistor resistance fluctuates with any temperature change. This change in resistance is detected as a change in the voltage by the MPU & printer controller. The analog value input to the MPU & printer controller is converted into a digital value by the internal A-D converter to detect the temperature. After the printer temperature is detected, the head-driving control and head temperature adjustment signals control are performed accordingly.

5.7 Head Temperature Sensor

The head temperature sensor in the printer is a diode sensor which detects the head's internal temperature. Temperature changes in the printer are detected by the MPU & printer controller as voltage-level changes.

The analog value input to the MPU & printer controller is converted into a digital value by the internal A-D converter. The digital value is used for stopping the head operation if the head temperature increases abnormally.

5.8 Auto-Alignment Sensor

The auto-alignment sensor consists of the LED and photo diode. The light of LED is reflected on a printing paper and read by the photo diode. The auto-alignment sensor detects the ink density difference between LEFT and RIGHT printheads and print position (vertical, horizontal, skew) by the changed amount of reflection density while printing the auto-head alignment pattern. This information is also used by the printer driver for automatic adjustment during printing. The sensor detects the run-out of the printhead ink, though only when the auto-head alignment pattern is printed.

5.9 Waste Ink Amount Detection

Waste ink is discharged during head maintenance and absorbed by the waste ink absorber. If the amount of waste ink discharged exceeds the absorption capacity of the waste ink absorber, ink might leak from the printer. To prevent ink from leaking, the waste ink absorber capacity is estimated and detected when full.

The waste ink is discharged during the maintenance jet and cleaning operations. The amount of waste ink discharged by the maintenance jet and cleaning operations is estimated by the count value of the ink dot counter. Then the waste ink amount is calculated, taking into consideration the amount of evaporated ink. When the calculated waste ink amount approaches the preset full capacity of the waste ink absorber, a waste ink alarm occurs; if it exceeds the full capacity of the waste ink absorber, a waste ink-full error occurs.

Table 4-5 List of Sensor Functions

Sensor Function	Description	Status
Paper detection	Detected by the paper sensor.	Provided
Paper width detection	N.A.	Not provided
Home position detection	Detected by the home position sensor.	Provided
Cover open detection	Detected by the cover open sensor.	Provided
Cartridge detection	Detected by the head rank resistance and head temperature sensor.	Provided
Ink cartridge detection	N.A.	Not provided
BJ cartridge identification	Identified by the head's ID0, ID1, and INKS2.	Provided
Waste ink amount detection	Calculated with the maintenance jet dot count.	Provided
Printhead LEFT/RIGHT print position detection	Detected by the auto-alignment sensor during printing Provided of auto-head alignment pattern (and making adjustment).	Provided
Printhead LEFT/RIGHT ink density difference detection	Detected by the auto-alignment sensor during printing Provided of auto-head alignment pattern (and automatic adjustment).	Provided
No ink detection	Detected by the auto-alignment sensor during printing Provided of the auto-head alignment pattern only.	Provided

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Part 5

MAINTENANCE

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5 - 1	1. Maintenance
5 - 1	1.1 Parts for Regular Replacement
5 - 1	1.2 Consumables
5 - 1	1.3 Periodic Maintenance
5 - 2	2. SERVICE TOOLS
5 - 2	2.1 List of Tools
5 - 3	3. GREASE APPLICATION
5 - 4	4. DISASSEMBLY AND REASSEMBLY
5 - 4	4.1 Disassembly and Reassembly
5 - 4	4.2 Disassembly and Reassembly Cautions
5 - 6	4.3 Logic Board and Waste Ink Absorber Replacement Cautions
5 - 8	5. ADJUSTMENTS
5 - 8	5.1 Adjustment Point
5 - 8	5.2 When Adjustment is Required
5 - 9	5.3 Adjustment Procedure
5 -12	6. TROUBLESHOOTING
5 -12	6.1 Troubleshooting
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5 -34	7. LOCATION AND SIGNAL ASSIGNMENT
5 -34	7.1 Logic Board
5 -37	8. CIRCUIT DIAGRAMS
5 -37	8.1 Parts Layout
5 -39	8.2 Circuit Diagrams

1. MAINTENANCE

1.1 Parts for Regular Replacement

Level	Part
User	None
Service personnel	None

1.2 Consumables

Level	Consumable
User	Black BJ cartridge (BC-23 and BC-20 [reference]) Color BJ cartridge (BC-21e) Photo BJ cartridge (BC-22e Photo) Ink cartridge (BCI-21 Black/BCI-21 Color)
Service personnel	None

1.3 Periodic Maintenance

Level	Periodic Maintenance
User	None
Service personnel	None

2. SERVICE TOOLS

2.1 List of Tools

Ordinary Tool	Use
Phillips screwdriver	For removing screws
Blade screwdriver	For removing plastic parts
Tweezers	For installing and removing coil springs
Multi-meter	For troubleshooting

Special Tool (Parts Number)	Use
Gap gauge 1.9mm (QY9-0038-000)	For adjusting the head gap
Tension spring (QY9-0039-000)	For adjusting the carriage belt tension
Black BJ cartridge	Procure as special servicing tool. Do not use the black BJ cartridge of a user
Grease MOLYKOTE PG641 (CK-0562-000)	Apply to the specified place as shown in Figure 5-1

3. GREASE APPLICATION

Use the special tool to apply the grease at the points and amounts shown below.

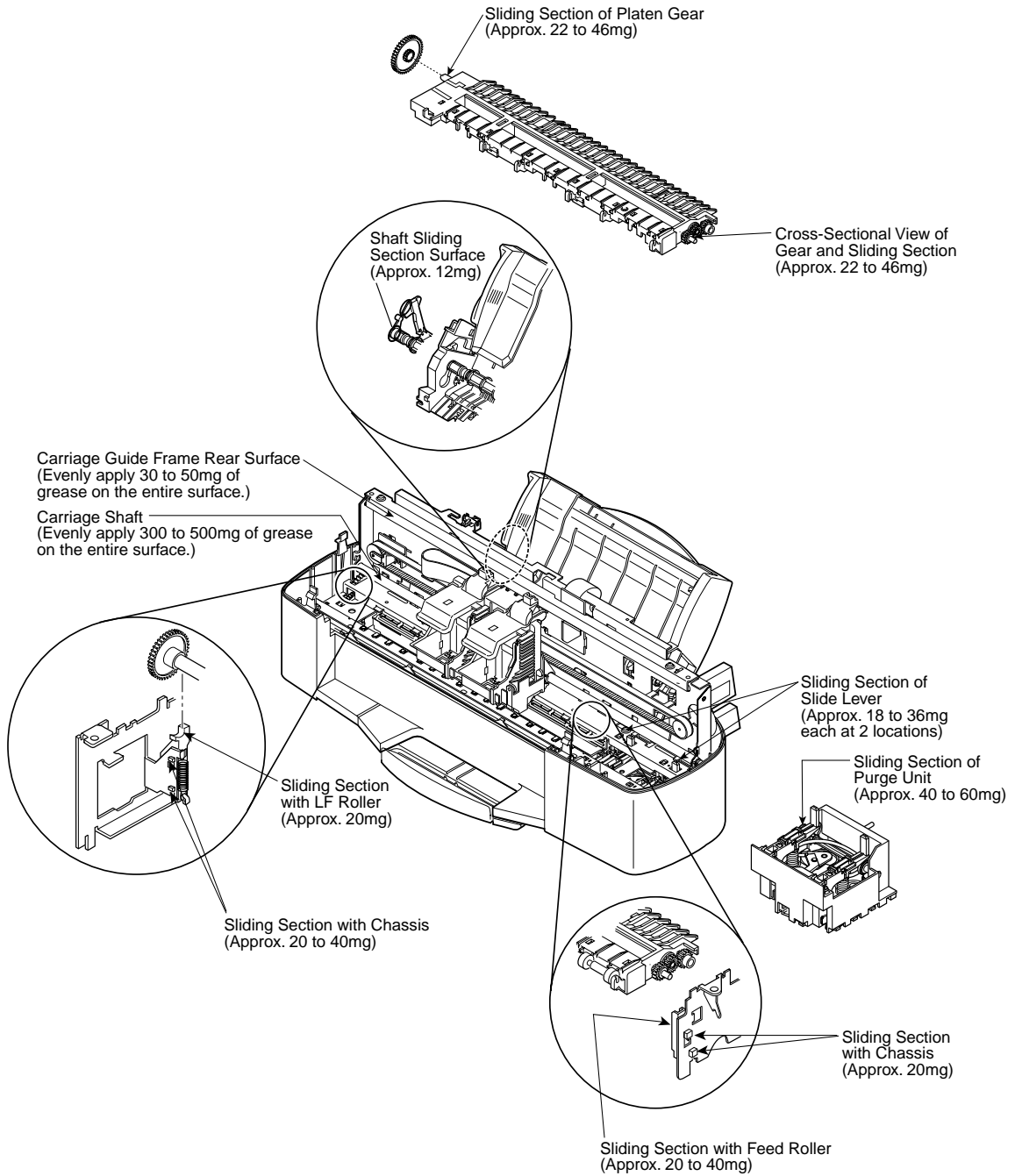


Figure 5-1 Grease Application Points

4. DISASSEMBLY AND REASSEMBLY

4.1 Disassembly and Reassembly

When disassembling or reassembling the printer, refer to the parts catalog. The figure numbers in the parts catalog are provided in the order of disassembly. Close-up diagrams are also provided for parts where you need to exercise caution during disassembly and reassembly.

4.2 Disassembly and Reassembly Cautions

When disassembling or reassembling the printer, heed the following cautions.

4.2.1 Fastening screws of idler pulley assembly

When the screws of the idler pulley assembly are loosened during removal of the carriage or other maintenance services, be sure to use the tension spring (QY9-0039-000) listed as a special tool for the installation procedure.

Before fixing the screws, move the carriage 3 times sideways to stabilize the belt tension. After fixing the screw, be sure to remove the tension spring.

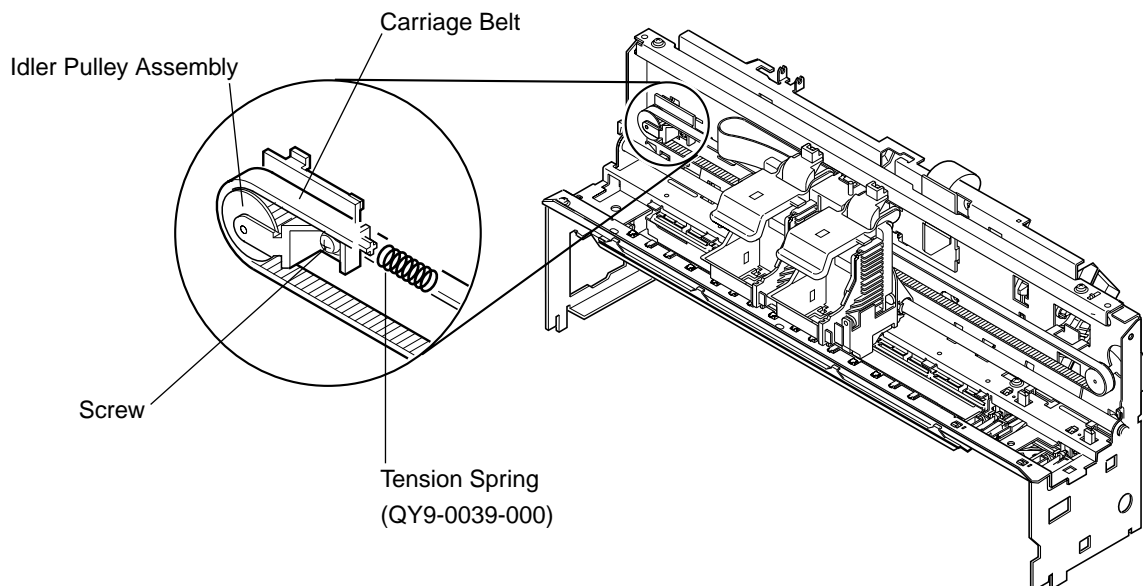


Figure 5-2 Idler Pulley Assembly

4.2.2 Carriage guide frame installation

The carriage guide frame adjusts the head gap between the BJ cartridge nozzles and platen to obtain optimum printing quality. It is mounted on the printer frame. The head gap must be adjusted only when the carriage guide frame position on the printer frame is changed.

The screws fastening the carriage guide frame are painted red so that they are not loosened during servicing. If the carriage guide frame position is changed unintentionally, follow the procedure in "5. ADJUSTMENTS" (page 5-8) to adjust the head gap.

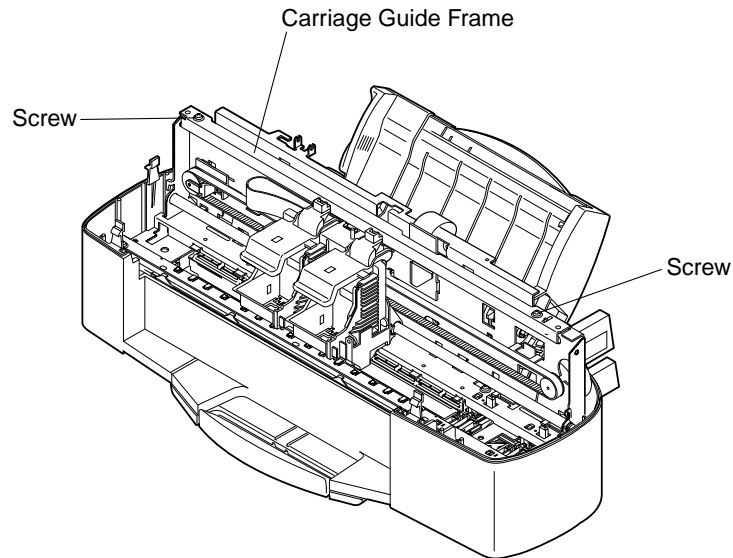


Figure 5-3 Carriage Guide Frame

4.2.3 Unlocking the carriage lock

The carriage is normally locked at the capping position when the printer is turned off. This feature is provided by the carriage lock mechanism in the purge unit. It prevents the carriage from moving from the capping position during transportation or being moved by hand to assure that normal printhead protection (capping) is performed. If the carriage moves when the printer turned on during servicing, unplug the AC power cord to unlock the carriage. If the printer is not turned on or the carriage does not move, follow the procedure below to unlock the carriage lock manually. You can also lock the carriage manually when you transport the printer.

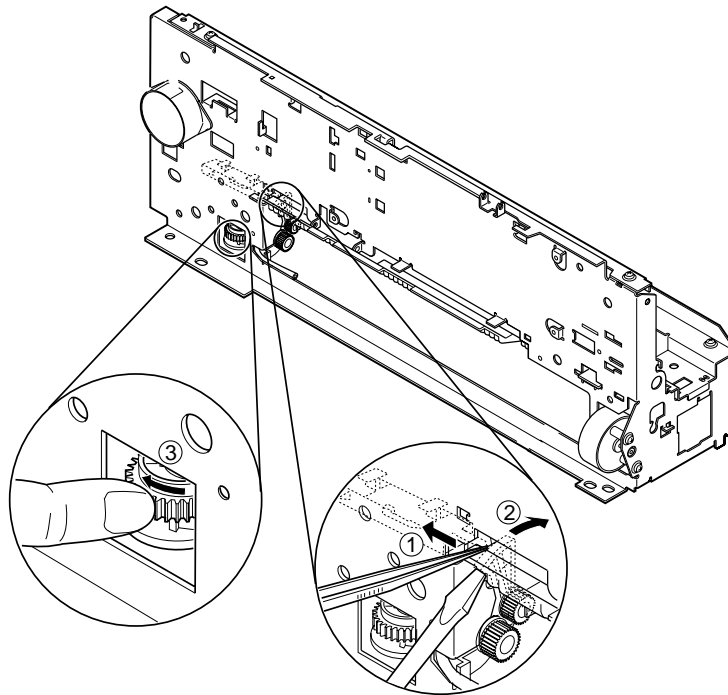


Figure 5-4 Unlocking the Carriage Lock

4.3 Logic Board and Waste Ink Absorber Replacement Cautions

4.3.1 Logic board replacement cautions

The logic board's EEPROM stores the various settings, waste ink amount, total count of printed sheets, and other data related to the printer. The data stored in the logic board's EEPROM, excepting the total waste ink amount setting (25%, 50%, 75%), cannot be rewritten into the new EEPROM after the logic board is replaced.

The data in the EEPROM installed on a replacement logic board is unclear. After the logic board/EEPROM is replaced, clear the EEPROM. After clearing the EEPROM, calibrate the auto-alignment sensor as described in "Part 3: 3.4 Service Mode" (page 3-18).

When replacing the logic board (clearing the EEPROM), visually check the amount of waste ink in the waste ink absorber. Replace the waste ink absorber or set the total waste ink amount as required. Depending on the amount of waste ink already absorbed in the waste ink absorber, ink may leak from the printer even before a waste ink-full warning or waste ink-full error is output. (See "Part 3: 3.4 Service Mode" on page 3-18 for setting the waste ink amount.)

However, it is not necessary to replace the waste ink absorber or set the waste ink amount if the printer has been in use for less than 2 weeks and less than 50 pages have been printed out.



The waste ink absorber consists of three layers. When the printer is first used, most of the waste ink is absorbed by the lower waste ink absorber layer. The amount of waste ink in the upper layer of the waste ink absorber rises as the waste ink amount increases.

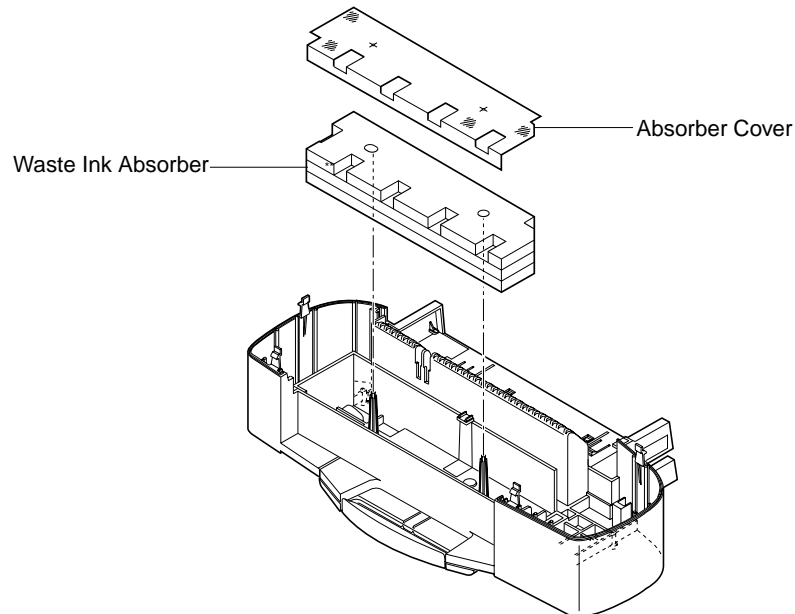


Figure 5-5 Waste Ink Absorber

4.3.2 Cautions after replacing the waste ink absorber

After a waste ink-full error (warning) occurs and the waste ink absorber is replaced, reset the waste ink counter in the Service Mode. (See "Part 3: 3.4 Service Mode" on page 3-18.)



When a waste ink-full error (warning) occurs, it can be assumed that the printer has printed more sheets than its service life called for. However, this also depends on how many times the cartridge has been replaced and the usage conditions. When a color/photo BJ cartridge is used, more ink is consumed due to head maintenance compared to a black BJ cartridge. Therefore, the waste ink amount will also be more.

5. ADJUSTMENTS

5.1 Adjustment Point

Only the distance (head gap) between the BJ cartridge's nozzles and platen needs to be adjusted to the designated value (approximately 1.9mm) to ensure optimum printing quality. This adjustment is done by moving the carriage guide frame fixing position forward or backward.

The adjustment is necessary only when loosening the red screw which secures the carriage guide frame.

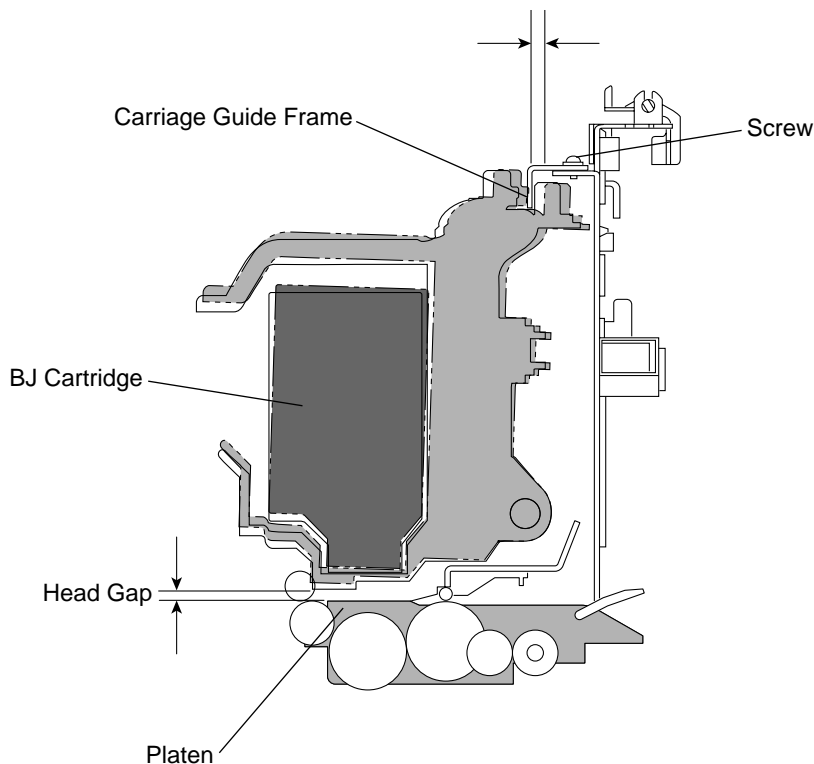


Figure 5-6 Head Gap Adjustment

5.2 When Adjustment is Required

If the carriage guide frame fixed to the printer frame is repositioned, the head gap must also be adjusted. The fixing screws are painted red so that they are not loosened unintentionally.

5.2.1 Tools required for adjustment

Table 5-1 Tools Required for Head Gap Adjustment

Tool	Use
Gap gauge 1.9 mm (QY9-0038-000)	For adjusting the head gap
Black BJ cartridge	Procure as special servicing tool. Do not use the black BJ cartridge of a user.

5.3 Adjustment Procedure

5.3.1 Preparation

- 1) Remove the upper case unit.
- 2) Turn on the printer under the condition where no BJ cartridge is installed in the carriage. (At this time, the carriage will move to position A.)
- 3) Disconnect the power cord.
- 4) Push in the carriage guide frame as indicated by arrows in Figure 5-7 and lightly fix the frame with screws A and B.
- 5) Install a black BJ cartridge (procured for servicing) on the left of the carriage.



Before making the adjustment, make sure that the gap gauge is not deformed and there are no foreign particles on it and the platen. The platen has a structure which enables it to move up and down vertically while maintaining a fixed distance between the head and paper depending on the paper thickness. When the printer is turned on and initialization starts, the LF motor rotates in the normal direction. This operation will set the platen in the normal position of no paper loaded condition. Do not press the platen down during adjustment.

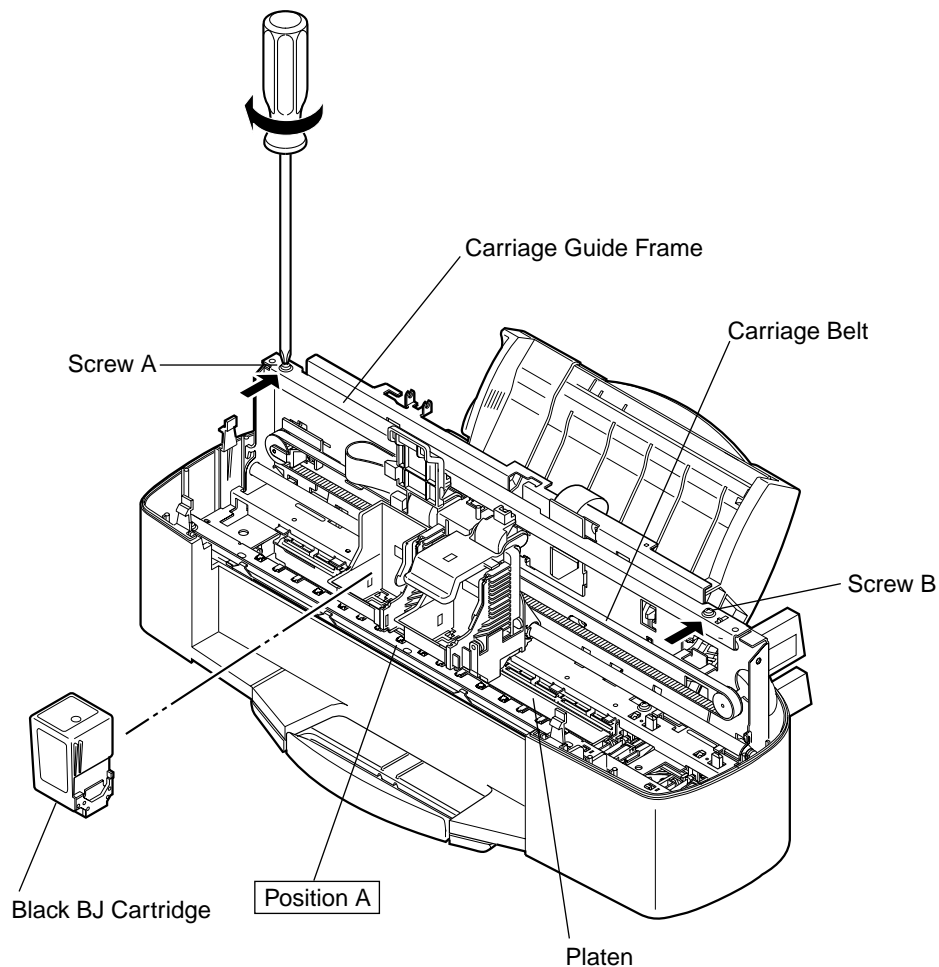


Figure 5-7 Adjustment Preparation

5.3.2 Adjustment

- 1) Place the gap gauge at position B.
- 2) Move the carriage to position B.
- 3) Gradually loosen screw A until the carriage guide frame moves forward under its own weight using screw B as a pivot.
- 4) Lightly push the screw A end of the carriage guide frame once or twice and check that the carriage guide frame pivots around the screw B as indicated by arrows in Figure 5-9.

If it does not return to the original position, you have fixed screw B too tight. If the screw B end moves as well, then screw B is too loose. Fix the carriage guide frame lightly again and repeat the procedure from step 1).

- 5) Lightly fix screw A.
- 6) Lightly push the screw A end of the carriage guide frame once or twice and check that the carriage guide frame moves around screw B as shown by the arrows figure 5-9.

If it does not return to the original position, screw B is too tight. And if the screw B end moves as well, then the screw B is too loose. Refasten the carriage guide frame lightly again and repeat the procedure from *step 1*).

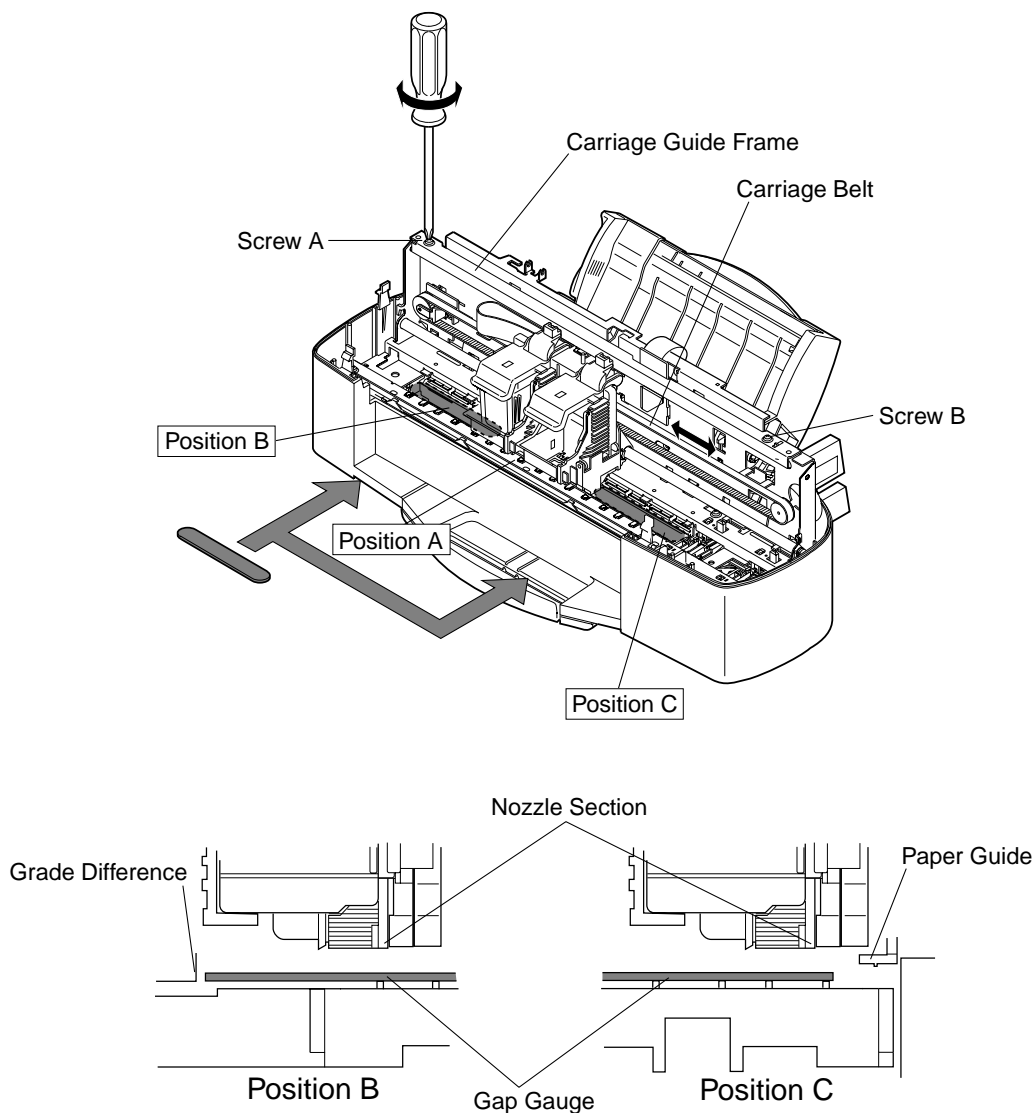


Figure 5-8 Head Gap Adjustment (1)

- 6) Move the carriage to position A, and then place the gap gauge at position C.
- 7) Move the carriage to position C.
- 8) Gradually loosen screw B until the carriage guide frame moves forward under its own weight using screw A as a pivot.
- 9) Lightly push the screw B end of the carriage guide frame once or twice and check that the carriage guide frame pivots around screw A as indicated by the arrows shown in Figure 5-9.
If it does not return to the original position, you have fixed screw A too tight. If the screw A end moves as well, then screw A is too loose. Fix the carriage guide frame lightly again and repeat the procedure from step 1).
- 10) Lightly fix screw B.
- 11) After moving the carriage to position A, place the gap gauge at position B.
- 12) Repeat the procedure from 2) to 13) twice.
- 13) Gradually tighten screws A and B alternately.

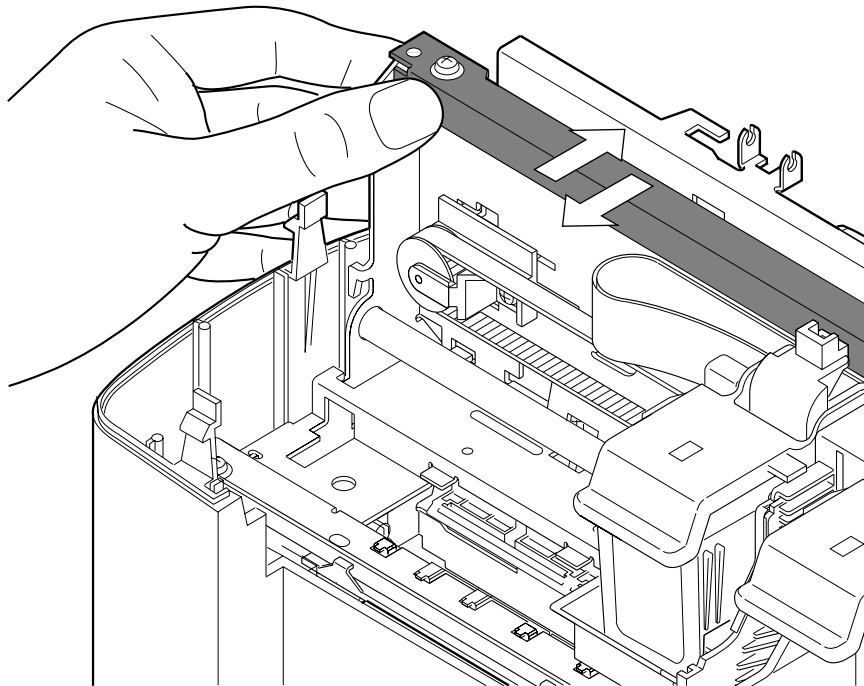


Figure 5-9 Head Gap Adjustment (2)



Do not use move the carriage by hand. It may cause the carriage guide frame to shift. To move the carriage, move the carriage belt manually instead.

6. TROUBLESHOOTING

6.1 Troubleshooting

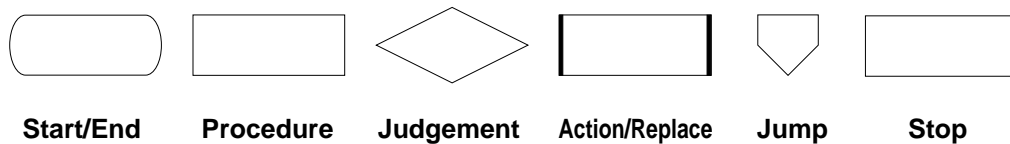
6.1.1 Overview

This chapter consists of the following two sections on subsequent pages: “Error condition diagnosis” for diagnosing a problem when the cause is unknown and “Symptoms” for resolving problems whose causes are known.

In the case of an unknown problem, diagnose the problem. If the cause is known, follow the corrective actions to resolve the problem.

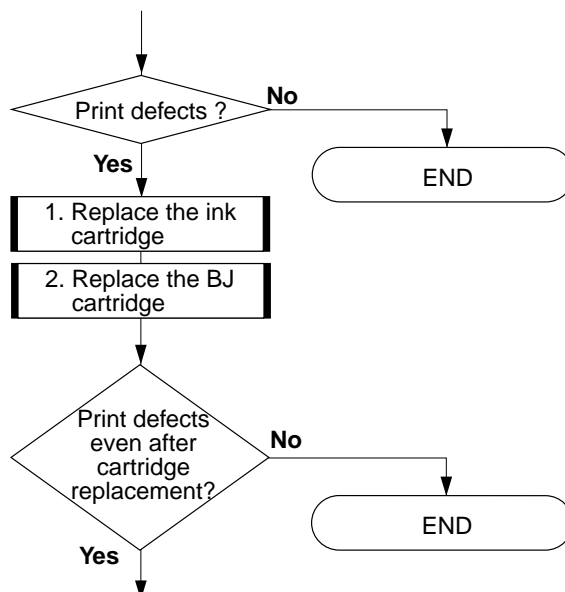
6.1.2 Troubleshooting cautions

1. Before troubleshooting, make sure the connectors and ribbon cable are properly connected. Especially if a problem occurs at random, be sure to check the connections thoroughly.
2. When servicing the printer with its outer casing removed and the AC adapter connected, beware of electrical shocks and PCB short circuiting.
3. Troubleshooting is described in flowchart form. The following symbols are used in the flowcharts.



4. If there is a problem with the printing quality or paper feeding, first check whether the installation site and paper meet the required specifications. Also check whether the printer settings are correct and paper is loaded properly.
5. After replacing parts or repairing the printer, be sure to make a test print to confirm that the problem has been fixed. If the problem still persists, troubleshoot again without the steps already executed.

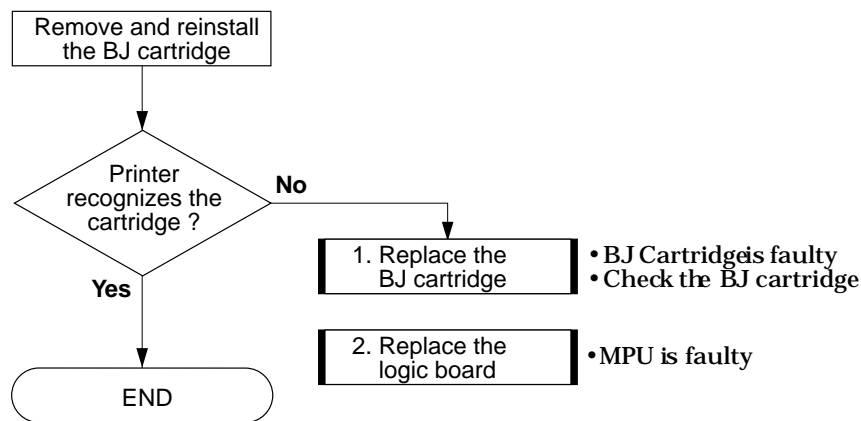
Example 1



6. In some cases, several corrective actions are successively indicated in “Error condition diagnosis” and “Symptoms.” These are steps that must be followed to resolve the problems. After you perform each corrective action step, make a test print to confirm whether the problem has been fixed. If the problem persists, perform the next step.

Example 2

Corrective action 1: After replacing the BJ cartridge, execute a test printout to check whether the problem has been fixed. If the problem persists, perform the next step (corrective action 2), which calls for replacement of the logic board.



7. Ink cartridge replacement as a corrective action is only applicable when the color BJ cartridge has produced the “Symptom.” When using the black BJ cartridge for troubleshooting, advance to the next step.
8. After finishing troubleshooting, be sure to reconnect connectors and tighten any loosened screws.

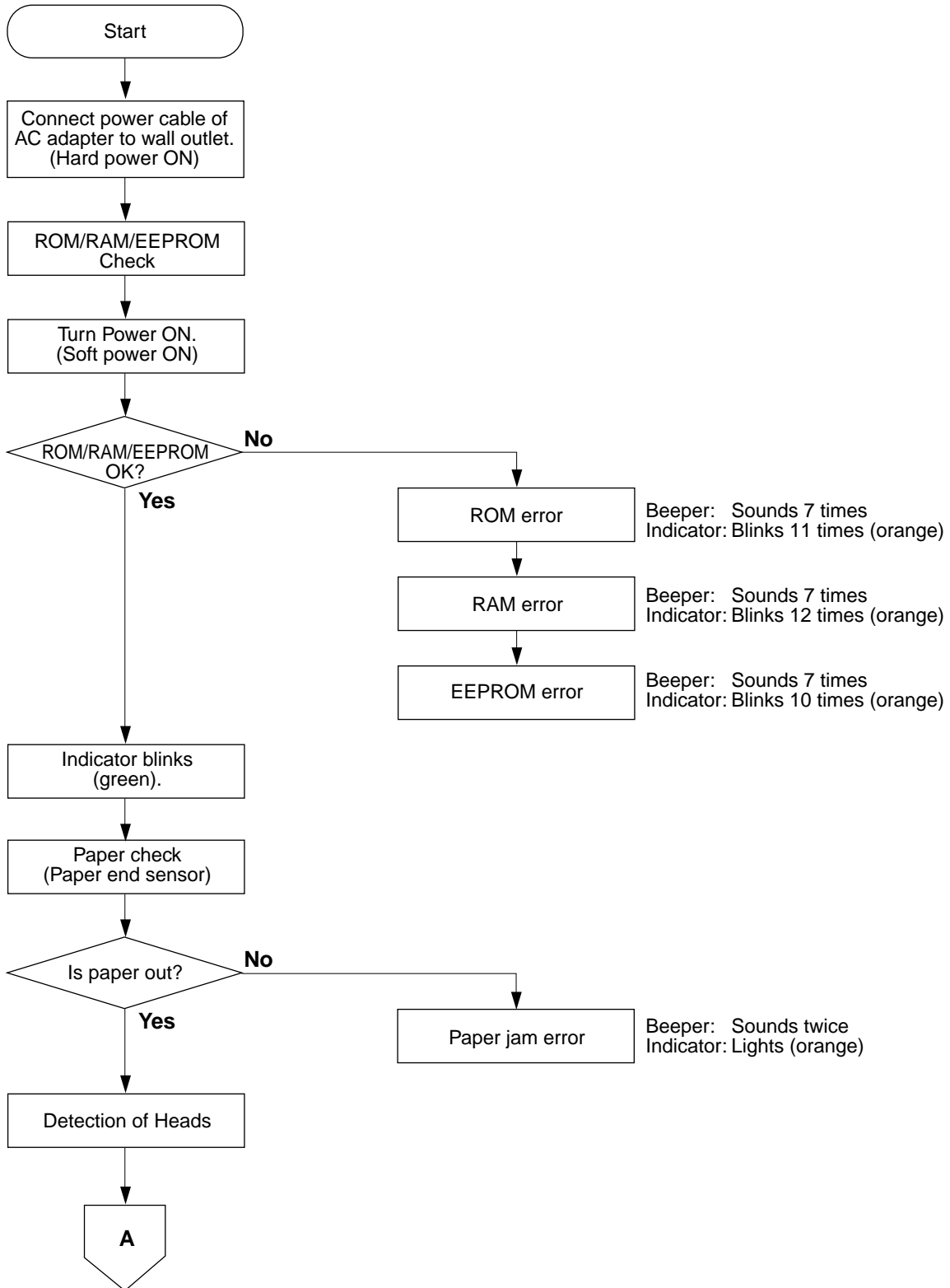


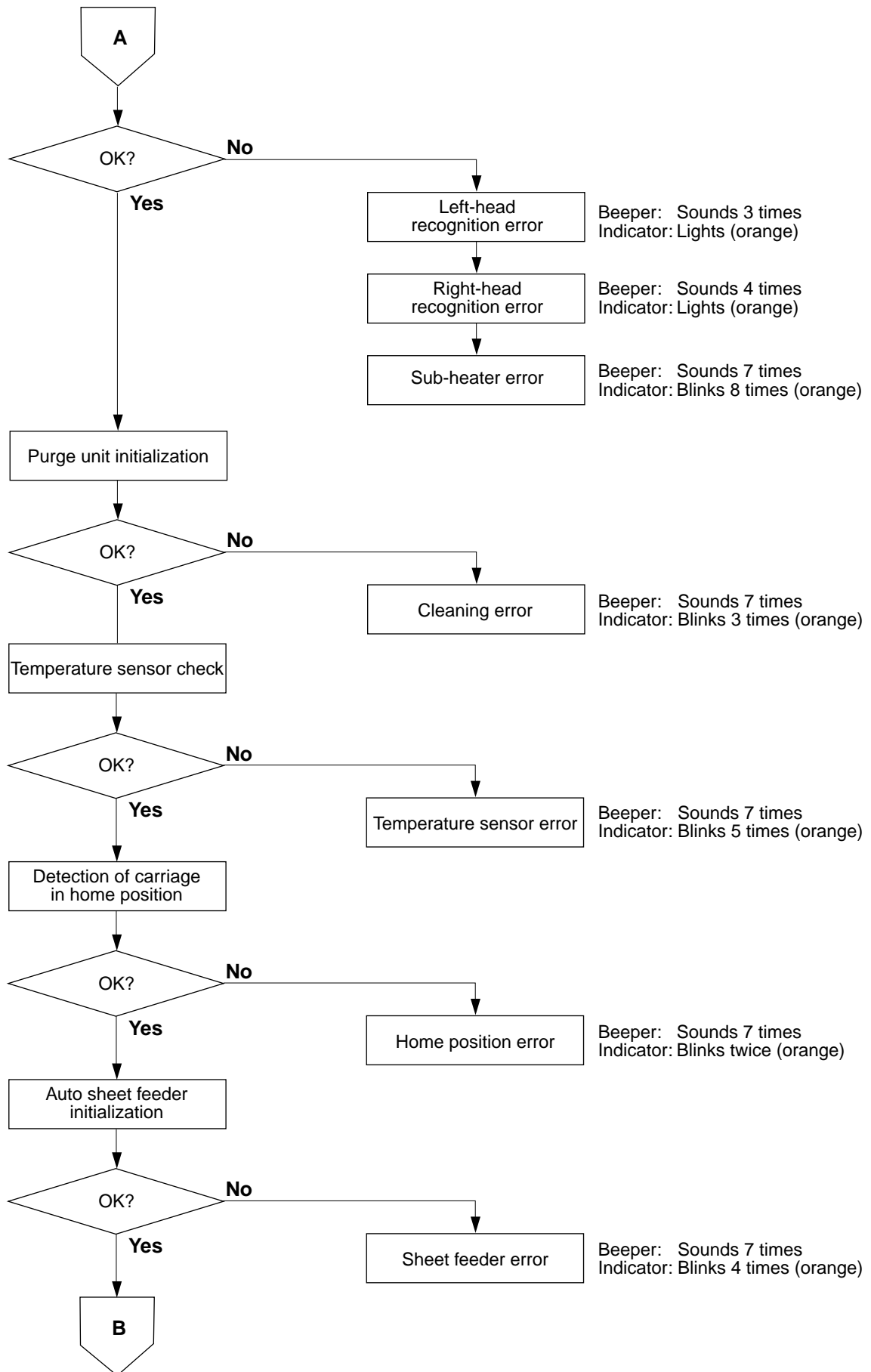
When replacing the control board, be sure to execute the EEPROM all clear and AA sensor calibration and check the waste ink absorption amount of the waste ink absorber. In addition, replace the waste ink absorber or set the waste ink amount according to the requirement. Refer to “Part 3: 3.4 Service Mode” (page 3-18) and “Part 5: 4.3 Logic Board and Waste Ink Absorber Replacement Cautions” (page 5-6).

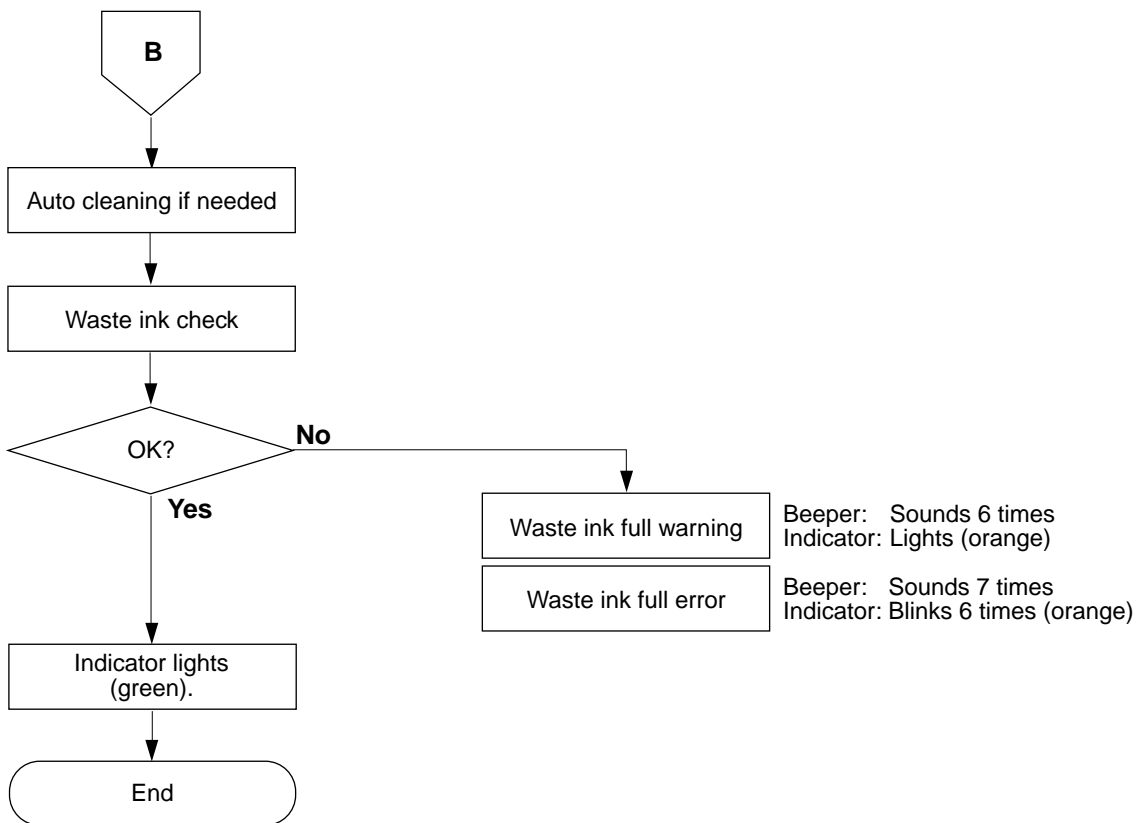
6.2 Error Condition Diagnostics

6.2.1 Diagnostic flowcharts

Power ON Sequence Flowchart







6.2.2 Error recovery

a) Error display

1. ROM Error

<Cause> During initialization, the contents in the ROM cannot be read.

<Suspected Parts> Control ROM

<Corrective Action> Replace the logic board.

2. RAM Error

<Cause> RAM reading and writing is not being performed properly.

<Suspected Parts> DRAM

<Corrective Action> Replace the logic board.

3. EEPROM Error

<Cause> EEPROM reading and writing is not being performed properly.

The auto alignment sensor has never been calibrated.

<Suspected Parts> EEPROM

<Corrective Action> Replace the logic board.

Calibrate the auto-alignment sensor.



When a RAM error or ROM error occurs, the exact error may not be displayed correctly. When replacing the logic board, execute the “EEPROM all clear” function in Service mode, then calibrate the auto alignment sensor. In addition, check the amount of waste ink absorbed by the waste ink absorber in the bottom case unit. If necessary, also replace the waste ink absorber or set the waste ink counter value in Service mode. (See Part 5, “4.3 Logic Board and Waste Ink Absorber Replacement Cautions.”)

4. Home Position Error

<Cause> The home position cannot be detected.
<Suspected Parts> Home position sensor, carriage motor, logic board, carriage ribbon cable, carriage belt, carriage shaft, idler pulley

<Corrective Action>

Visual check of carriage drive mechanism

Check for any paper jams, carriage belt wear/deterioration/dislocation, deformation of the carriage or carriage guide frame, scratching or bending in the carriage shaft, deterioration/damage of idler pulley, etc.
 Move the carriage with your hands and check to see if it moves smoothly. (See "4.2.3 Unlocking the Carriage for how to unlock the carriage")
 Check that there is no abnormal noise.

Correct ?

No

Repair/replace a faulty part(s).

Yes

Carriage motor operation check

Does it turn during initialization?
 Is it out of synchronization?

Correct ?

No

Carriage motor check

Measuring points	Pin No.	Normal reading
J2	1-2 3-4	Approximately 10.5 Ω

Correct ?

No

Replace the carriage motor.

Yes

Replace the logic board.

Home position sensor check

Measuring points	Pin No.	Sensor	Normal reading
J6	30	Open Closed	Low level High level (Home position sensed)

While the power is on, manually move the carriage and check to see if it is sensed at the home position.

Correct ?

No

Replace the carriage unit

- The home position sensor is faulty
- The carriage ribbon cable is broken.

Yes

Replace the logic board.

- The MPU and printer controller are faulty.

5.Cleaning Error

<Cause> Cleaning or capping is not executed properly or not detected.

<Suspected Parts> Purge unit, purge sensor, purge sensor cable, paper feed motor, paper feed drive power transmission section, logic board

<Corrective Action>

Visual check of paper feed system operation

During initialization, do the paper feed motor, feed roller, eject roller, etc., rotate? Any abnormal noises? Is the paper feed motor out of synchronization?

Correct ?

No

- 1. Repair/Replace a faulty part(s).
- 2. Replace the logic board.

Yes

Purge sensor cable check

- Check to see if the purge sensor cable connectors (which are located at both the purge sensor and the logic board) are connected properly and check the joint cable conductivity.

Correct ?

No

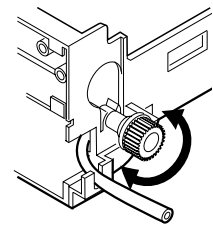
Re-connect/Replace the purge sensor cable.

Yes

Purge unit check

- Remove the purge unit from the printer, and fully rotate the drive gear by hand in both directions to check that it moves smoothly.
- Check the purge sensor.

Measuring points	Pin No.	Sensor	Normal reading
J1	2, 3	Open	Low level
		Close	High level



- While the power is on, remove the purge unit, then check the measuring points by rotating the drive gear manually to open and close the sensor.

Correct ?

No

Replace the purge unit.

Yes

Check/Repair the paper feed motor drive switching mechanism

Check to see if each gear or slide lock lever is deformed or damaged and if any spring is dislocated. See Part 4 "3.4.2 Paper Feed Motor Drive Switching Section" on page 4-29.

6. Sheet Feed error

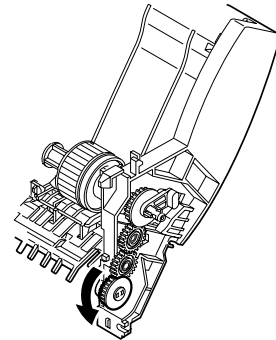
<Cause> The home position of the pick-up roller cannot be detected.

<Suspected Parts> Sheet feeder unit, pick-up roller, paper feed motor drive transmission sensor, slide lock lever, logic board

<Corrective Action>

Check the sheet feeder unit operation.

- Remove the sheet feeder unit, then manually rotate the drive gear fully to check to see if the parts such as the pick-up roller operate smoothly.



Correct ?

No

Yes

Repair/Replace the sheet feeder unit.

Check the paper feed motor drive transmission gear located at the platen section.

- With your eyes, check the appearance and movement of the paper feed roller, which is the drive transmission section of the paper feed motor, and the gear which is located on the drive switching mechanism.

- At the same time, check to see if the slide lock lever which locks the drive switching section operates smoothly. See *Part 4 "3.4.2 Paper Feed Motor Drive Switching Section"* on page 4-29.

Correct ?

No

Yes

Repair/Replace a faulty part(s).

Replace the logic board.

- The pick-up roller sensor is faulty.
- The MPU and printer controller are faulty.

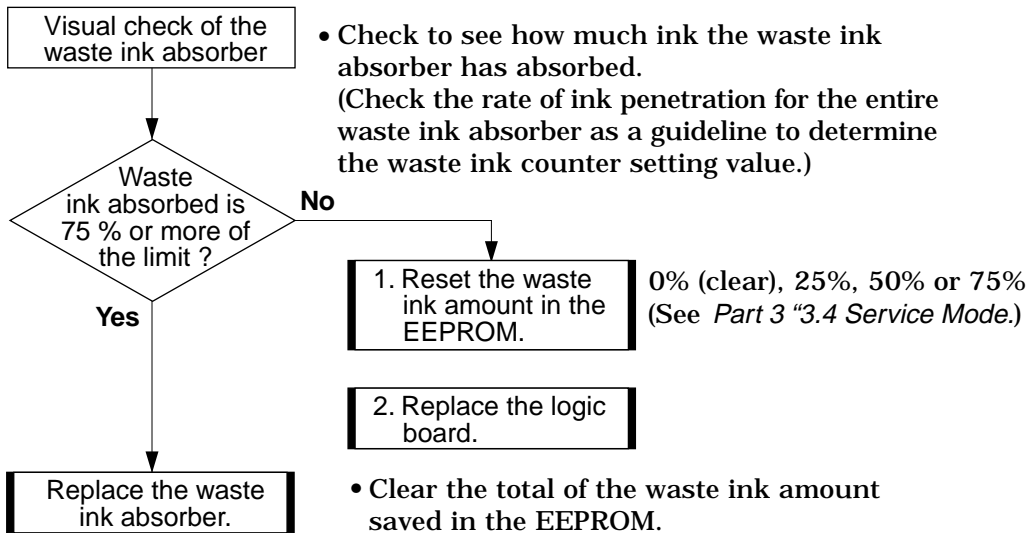
7. Machine Temperature Error

<Cause> The thermistor is abnormal.
<Suspected Parts> Thermistor
<Corrective Action> Replace the logic board.

8. Waste Ink-Full Warning/Error

<Cause> The waste ink absorbers' estimated waste ink amount has reached 95% (Warning) or 100% (Error).
<Suspected Parts> Waste ink absorbers, logic board

<Corrective Action>



9. Head Temperature Error

<Cause> The head temperature is abnormally high.
<Suspected Parts> BJ cartridge, logic board

<Corrective Action>

When you use two BJ cartridges on both the right and left sides, follow the flow below for each BJ cartridge.

Turn off the power with the POWER button, and wait several minutes.

Since the head temperature may be very high, do not touch the carriage.

Remove/install the BJ cartridge.

Power on

Error displayed?

No

END

• Faulty BJ cartridge connection

1. Replace the ink cartridge.

2. Replace the BJ cartridge.

Check the connector cable.

• Carriage ribbon cable

Correct?

No

Replace the carriage unit.

Replace the logic board.

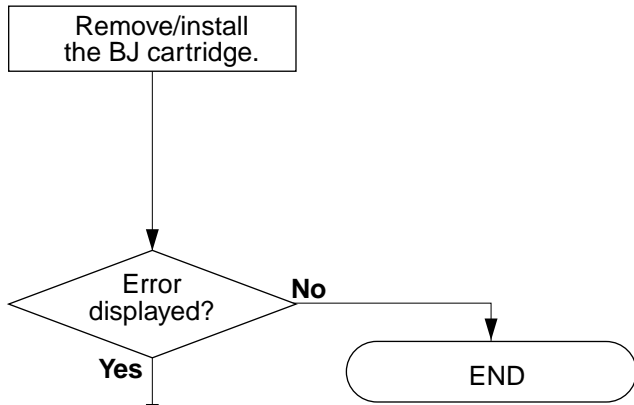
10. Sub Heater error

<Cause> The sub heater which is located inside the BJ cartridge cannot be driven.

<Suspected Parts> BJ cartridge, logic board, carriage unit

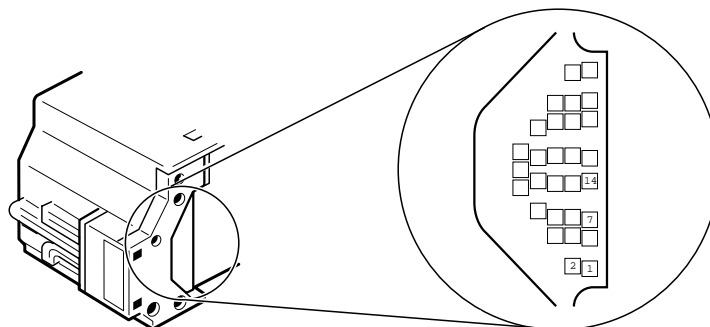
<Corrective Action>

When you use two BJ cartridges on both the right and left sides, follow the flow below for each BJ cartridge.

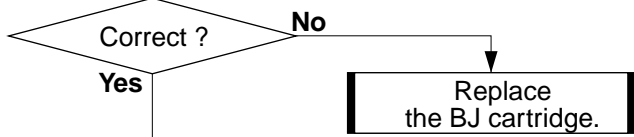


If the BJ cartridge or carriage contact side is soiled with ink mist and the like, clean or replace it.

Check the BJ cartridge conductivity.



Pin 1, 2, 14: GND terminals
Pin 7: Sub heater drive signal terminal



1. Replace the logic board.

2. Replace the carriage unit.

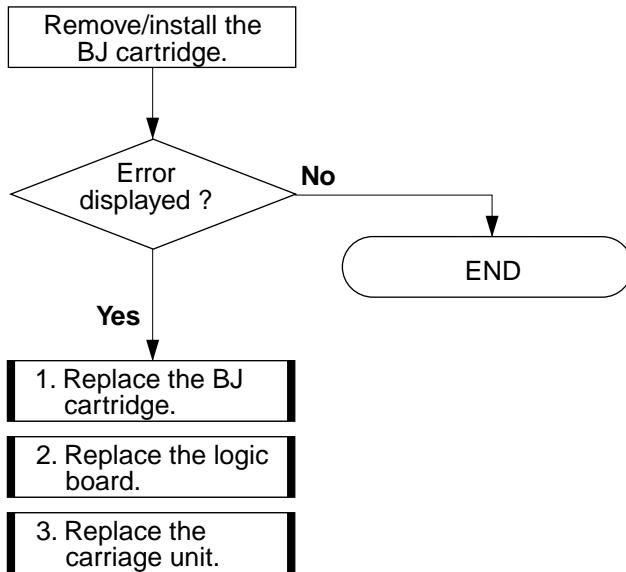
11. Cartridge Displaced Error

<Cause> The BJ cartridge is off from a position where the cartridge may not be replaced.

<Suspected Parts> BJ cartridge, logic board, carriage unit

<Corrective Action>

When you use two BJ cartridges on both the right and left sides, follow the flow below for each BJ cartridge.



12. Paper Feed Error/Paper Jam

<Cause>

- The paper feed operation is executed but the paper is not fed.
- The paper eject operation is executed but the paper is not ejected.

<Suspected Parts> Sheet feeder unit, pick-up roller sensor, paper end sensor, logic board.

<Corrective Action>

Visual check of the paper feed mechanism

With your eyes, check for paper jams. Check for gear deformation or damage.

Correct ?

No

Repair/replace a faulty part(s).

Yes

Check the paper feed operation.

During initialization, do the paper feed motor, pick-up roller, feed roller, eject roller, etc., rotate? Any abnormal noises? Is the paper feed motor out of synchronization?

Correct ?

No

Repair/replace a faulty part(s)

Yes

Replace the logic board.

Check the paper feed operation.

Is the paper fed properly from the sheet feeder when the pick-up roller rotates?

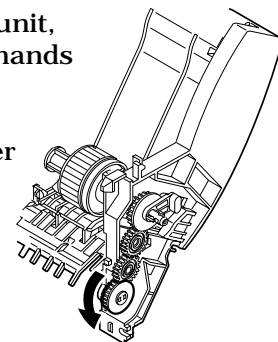
Correct ?

No

Check the sheet feeder unit.

Yes

Remove the sheet feeder unit, and operate it with your hands to check. Check any contamination, wear or deterioration of the rubber ring or separation sheet of the pick-up roller, and deformation or damage of a gear, etc.



Correct ?

No

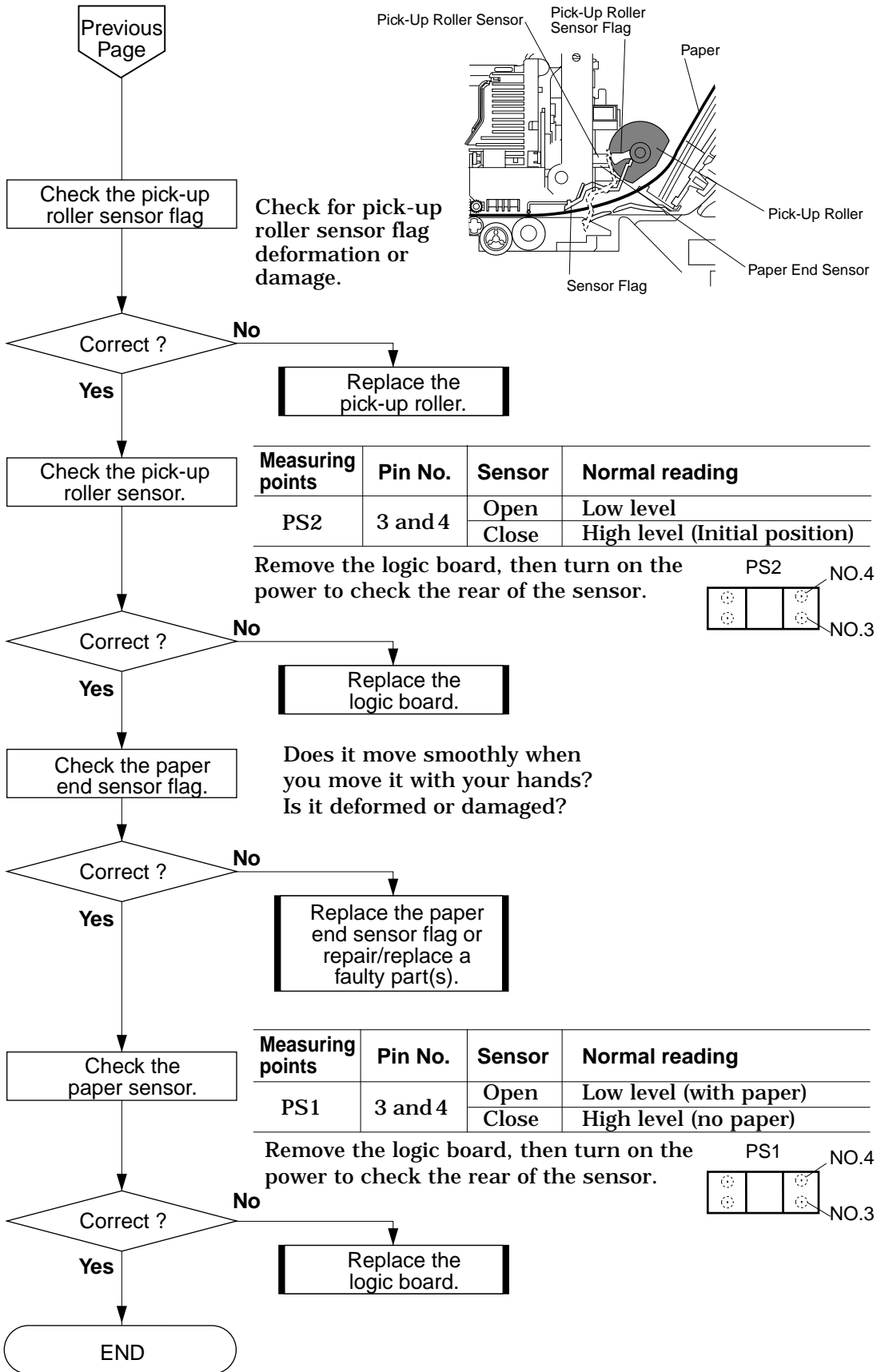
Replace the sheet feeder unit.

Yes

Check/Replace the paper feeder motor drive switching section.

Check for deformation or damage of each gear and the slide lock lever, and removed springs. See Part 4 "3.4.2 Paper Feed Motor Power Switching Section" on page 4-29.

Next Page



13 Right Head Recognition Error

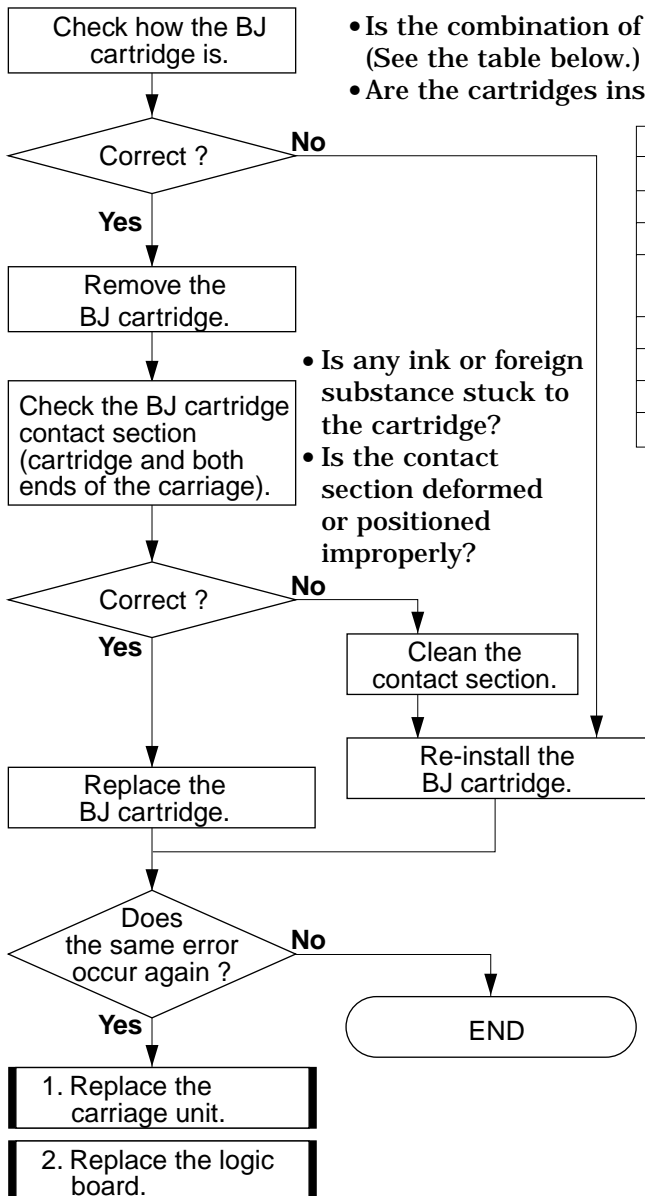
- <Cause>**
1. The BJ cartridge recognition ID error is detected.
 2. The rank resistance error of the head is detected.
 3. The resistance error of the head temperature sensor is detected.

<Suspected Parts> BJ cartridge, carriage unit, carriage cable, logic board

14. Left Head Recognition Error

<Corrective Action>

The right head recognition error is not displayed in the same manner as the left head recognition error is (see Part 3, "3.1 Error Indications"). Check to see on which head the error occurred, then follow the flow below to perform the corrective action of the appropriate head.



- Is the combination of the installed cartridges appropriate? (See the table below.)
- Are the cartridges installed properly?

Left BJ cartridge	Right BJ cartridge
BC-23	BC-23
BC-20 (reference)	BC-20 (reference)
BC-21e	BC-21e
BC-21e	BC-23 (BC-20 as reference)
BC-21e	BC-22e Photo
BC-23	None
BC-20 (reference)	None
BC-21e	None

- Is any ink or foreign substance stuck to the cartridge?
- Is the contact section deformed or positioned improperly?

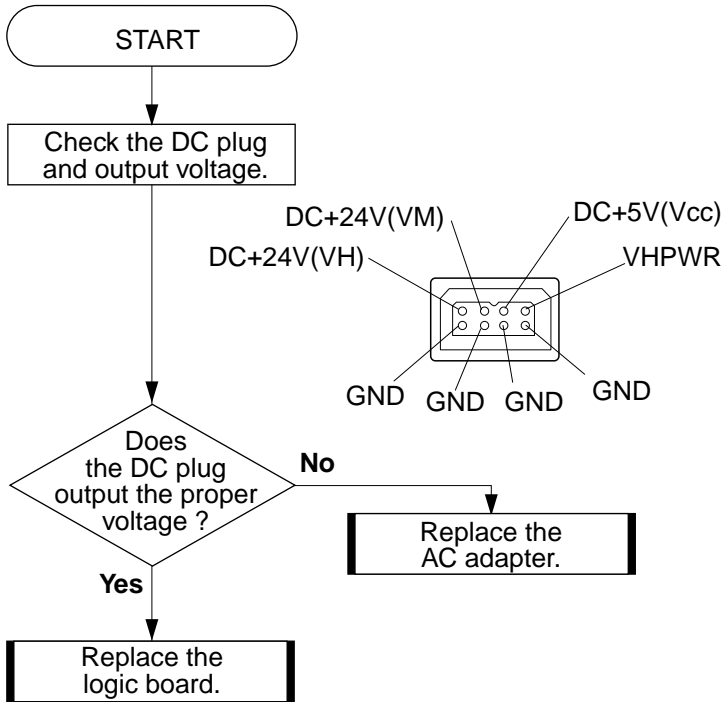
Symptoms

1. The Power Does Not Turn On

<Symptom> The power does not turn on even though you press the POWER button.

<Cause> The AC adapter and/or logic board is (are) faulty.

<Corrective Action>

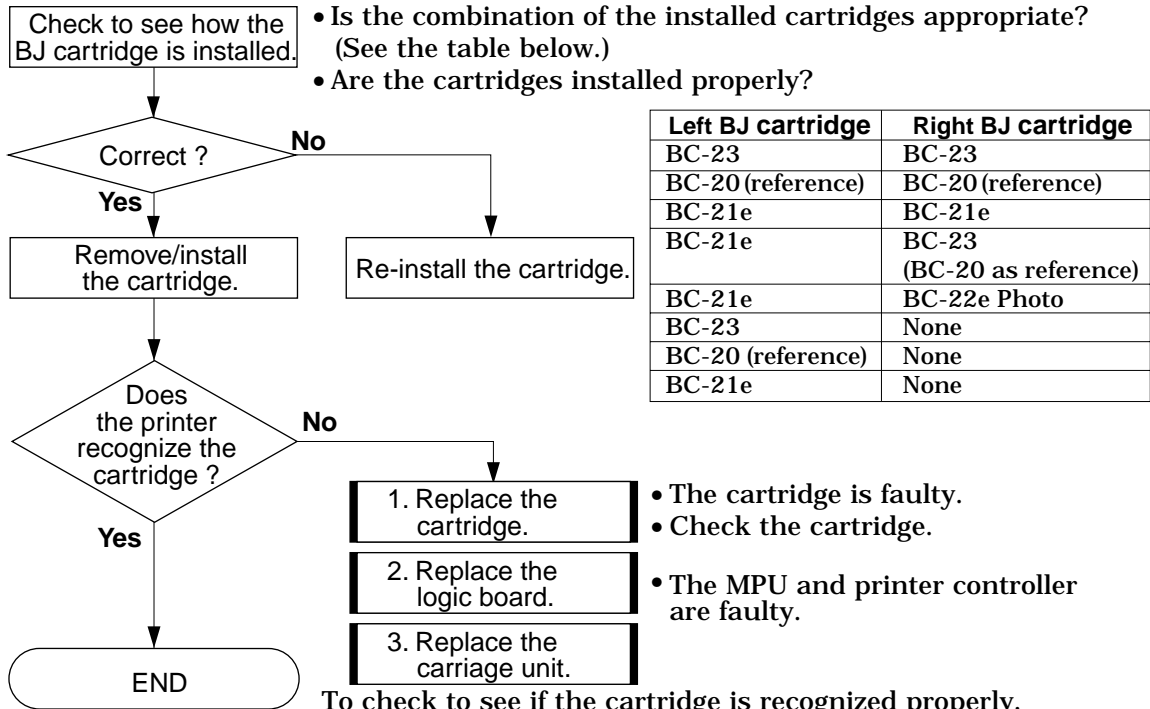


2. The Printer Does Not Recognize The Cartridge

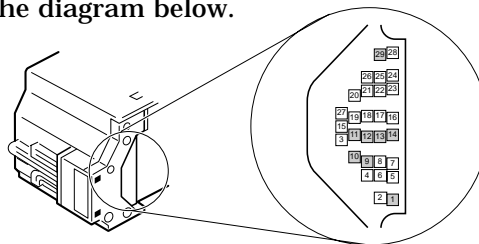
- <Symptom>**
- The cartridge installed is not recognized.
 - The cartridge installed is recognized incorrectly.
- <Cause>**
- Faulty contact between the cartridge and carriage.
 - The cartridge, carriage cable and/or logic board is (are) faulty.
 - The combination of the right and left BJ cartridges installed is incorrect.

<Corrective Action>

When you install two BJ cartridges on the right and left sides, follow the flow below to perform the corrective action for each cartridge respectively.



To check to see if the cartridge is recognized properly, check for conductivity at the check points indicated in the diagram below.



Black BJ Cartridge (BC-23)

Measuring points	Normal reading	
Pin No.	11-14	
	12-14	Approximately 0Ω
	13-14	Approximately 0Ω
	1-9	Approximately 60 to 750 Ω

Color BJ Cartridge (BC-21e)

Measuring points	Normal reading	
Pin No.	11-14	∞
	12-14	Approximately 0Ω
	13-14	Approximately 0Ω
	1-9	Approximately 60 to 750 Ω

Photo BJ Cartridge (BC-22e Photo)

Measuring points	Normal reading	
Pin No.	11-14	∞
	12-14	∞
	13-14	Approximately 0Ω
	1-9	Approximately 60 to 750 Ω

Black BJ Cartridge (BC-20 [reference])

Measuring points	Normal reading	
Pin No.	11-14	Approximately 0Ω
	12-14	Approximately 0Ω
	13-14	∞
	1-9	Approximately 60 to 750 Ω

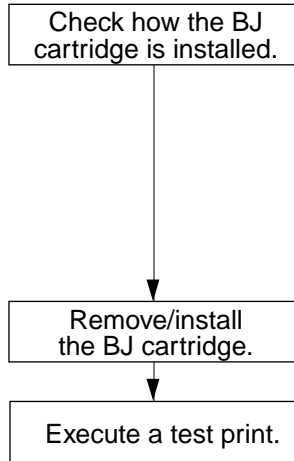
Pins No.10-29 should not be 0 Ω. (This applies to all BJ cartridges.)

3. Faulty Printing <1>: No Printing

- <Symptom>**
- The printer does not print at all.
 - Printing stops halfway.
 - Only a certain color is not printed.
- <Cause>**
- The ink has run out or the BJ cartridge is faulty.
 - The logic board, carriage cable and/or purge unit is (are) faulty.

<Corrective Action>

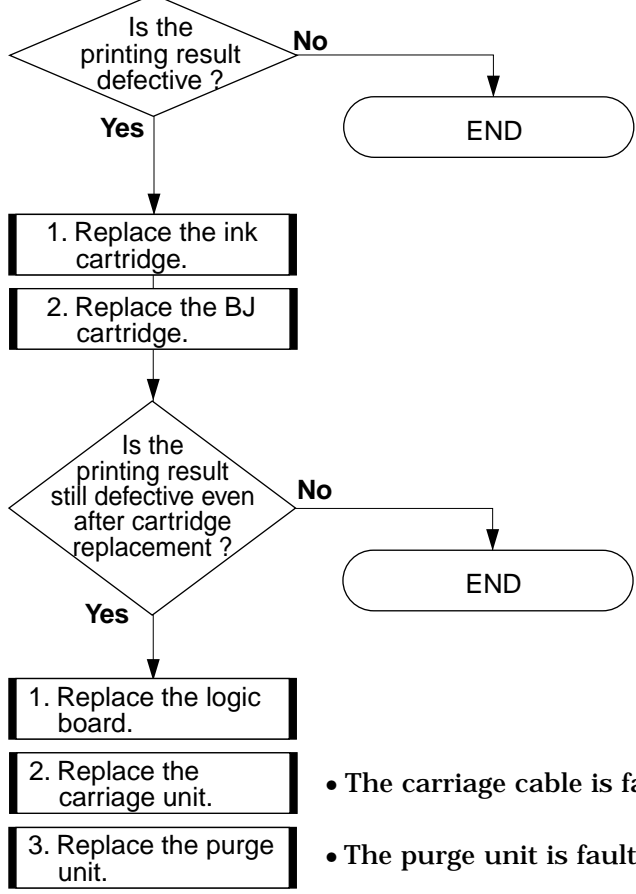
When you install two BJ cartridges on the right and left sides, follow the flow below to perform the corrective action for each cartridge respectively.



- Is the combination of the installed cartridges appropriate? (See the table below.)
- Are the cartridges installed properly?

Left BJ cartridge	Right BJ cartridge
BC-23	BC-23
BC-20 (reference)	BC-20 (reference)
BC-21e	BC-21e
BC-21e	BC-23 (BC-20 as reference)
BC-21e	BC-22e Photo
BC-23	None
BC-20 (reference)	None
BC-21e	None

While the printer is turned on, hold down the **POWER** button for one beep. Then release the **POWER** button to print out the test pattern.



- The carriage cable is faulty.
- The purge unit is faulty.

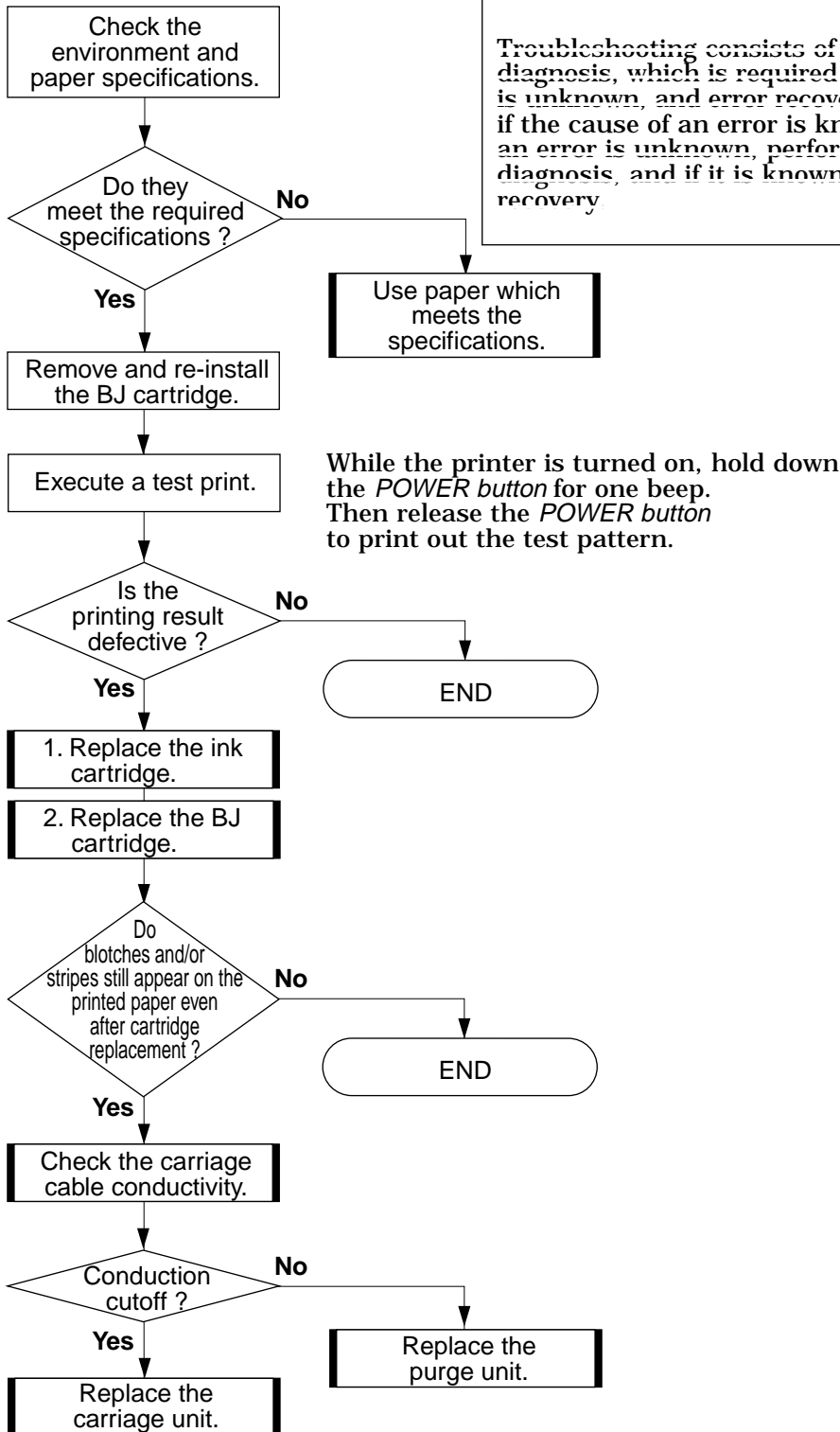
4. Faulty Printing <2>: Stripes Appear

- <Symptom>**
- There is blotching.
 - There are white stripes on the printed paper.
 - There are certain dots not printed.
- <Cause>**
- The BJ cartridge or cartridge contacts is/are faulty.
 - The carriage cable is faulty.
 - The purge unit is faulty.

<Corrective Actions>

White stripe sample

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 Faulty Printing <3>: Other Print Problems

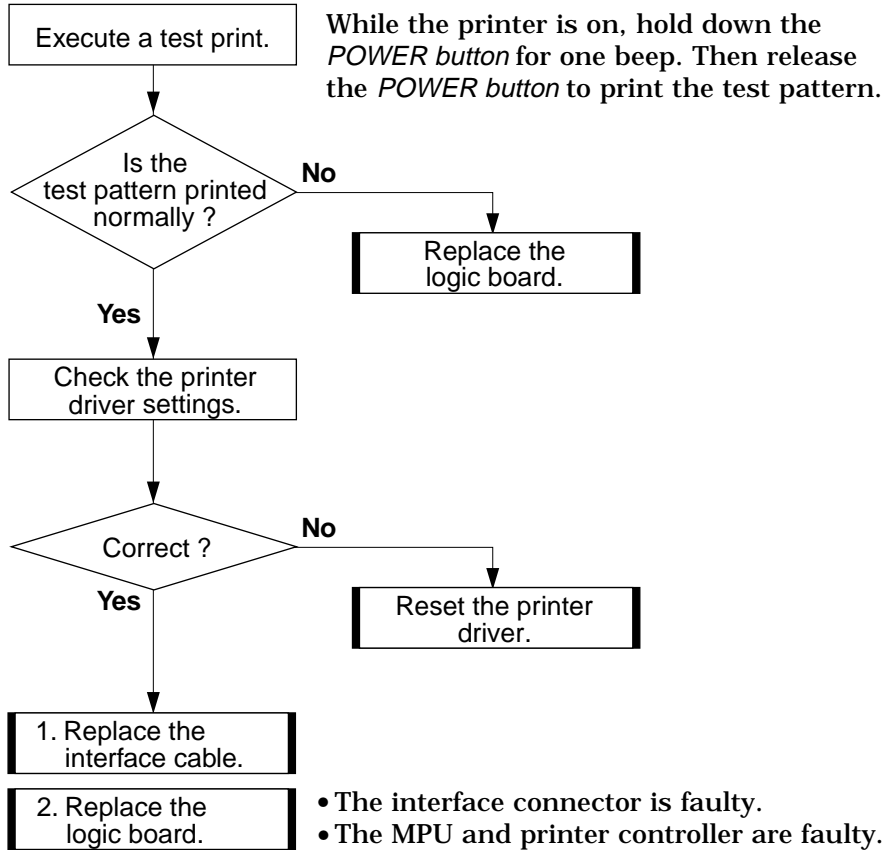
Symptom	Check item	Corrective action
Paper contamination	Ink mist on the platen	Use a piece of soft cloth lightly dampened with water to clean the platen.
	Ink has dried up around the head nozzles. (No paper stain occurs by paper feeding or ejecting but occurs during printing only.)	Clean the head nozzles and their surroundings several times. If the problem persists, replace the BJ cartridge.
	Ink has clogged or paper bits have stuck around the head wiper or head capping area of the purge unit.	Replace the purge unit or wiper unit.
	Ink has adhered to the paper transport system (Paper is already contaminated before it reaches the platen.)	Disassemble the paper transport system, then use a piece of soft cloth lightly dampened with water to clean the platen.
Spur tracks appear.	Ink has adhered to the spurs.	Use a soft toothbrush to clean the spurs.
	The spurs are deformed.	Replace the spurs.
Lines are not ruled properly.	The BJ cartridge has been installed incorrectly.	Reinstall the BJ cartridge correctly.
	The head is not aligned properly.	Use the printer driver to perform the automatic head alignment operation.
	The problem occurs when your BJ cartridge (which may cause this problem) is installed in a normally-operating printer.	Replace the BJ cartridge.
	The head gap has not been adjusted to the regulated value (You cannot check to see if this gap is appropriate*).	Adjust the head gap (<i>See "5. Adjustments" on page 5-8</i>).
Corrugated printing	The carriage guide frame is deformed.	Replace the carriage guide frame.
	Frictional wear between the carriage base and the carriage shaft.	Replace the carriage unit.
Print quality is not uniform.	The head has not been aligned properly.	Use the printer driver to perform the automatic head alignment operation.
	Insufficient cleaning / Ink run-out / Faulty BJ cartridge	Perform the cleaning operation several times, then execute a test print. Replace the BJ cartridge.
The printout is either too light or too dark.	Check the printing mode. The BJ cartridge is faulty.	Set the desired printing mode. Replace the BJ cartridge.
The printing darkness is unbalanced.	The head has not been aligned properly.	Use the printer driver to perform the automatic head alignment operation.

* It is difficult to check the head gap. Readjust the head gap, then check whether it fixes this problem.

6. Faulty Interface

- <Symptom>**
- No printing.
 - An unspecified color is printed.
- <Cause>**
- The printer driver is not set properly.
 - The interface cable is faulty.
 - The logic board located at the printer is faulty.

<Corrective Action>



7. LOCATION AND SIGNAL ASSIGNMENT

7.1 Logic Board

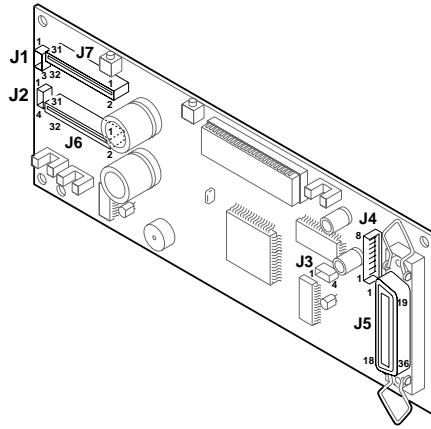


Figure 5-10 Logic Board

J6 (Carriage cable connector)

Pin No.	Signal name	IN/OUT	Description
1	VHGND	...	GND for the head drive voltage VH
2	VHGND	...	GND for the head drive voltage VH
3	MCH0	IN	Driver signal for the temperature control heater
4	MCH1	IN	Driver signal for the temperature control heater
5	VH	OUT	Head drive voltage
6	VH	OUT	Head drive voltage
7	SUBH	OUT	Sub heater drive signal
8	RSV1	...	Not used
9	RANK	IN	Detection signal for rank resistance
10	DIA	OUT	Head temperature sensor (diode) anode
11	ID0	IN	Cartridge detection signal
12	ID1	IN	Cartridge detection signal
13	IND	...	Cartridge detection signal
14	LGND	...	GND for the head logic drive voltage HVdd
15	HENB0	OUT	Heat enable (Y)
16	EVENB	OUT	Even nozzle heat enable
17	HENB1	OUT	Heat enable (M)
18	HENB3	OUT	Heat enable (Black)
19	ODENB	OUT	Odd nozzle heat enable
20	BENB0	OUT	Signal for generating the block enable decoder output signal
21	BENB1	OUT	Signal for generating the block enable decoder output signal
22	BENB2	OUT	Signal for generating the block enable decoder output signal
23	VCC	OUT	IC drive voltage (+ 5V)
24	DCLK	OUT	Print data transfer signal
25	DTLD	OUT	Timing signal for print data to be latched
26	DTRST	OUT	Latch reset signal
27	HENB2	OUT	Heat enable (C)
28	IDATA	OUT	Printing data
29	DIK	IN	Head temperature sensor (diode) cathode
30	HPO	IN	Home position sense signal High (sense)/Low
31	HHPG	...	GND
32	HPA	OUT	Photo LED drive signal

J7 (Carriage cable connector)

Pin No.	Signal name	IN/OUT	Description
1	VHGND	...	GND for the head drive voltage VH
2	VHGND	...	GND for the head drive voltage VH
3	MCH0	IN	Driver signal for the temperature control heater
4	MCH1	IN	Driver signal for the temperature control heater
5	VH	OUT	Head drive voltage
6	VH	OUT	Head drive voltage
7	SUBH	OUT	Sub heater drive signal
8	RSV1	...	Not used
9	RANK	IN	Detection signal for rank resistance
10	DIA	OUT	Head temperature sensor (diode) anode
11	ID0	IN	Cartridge detection signal
12	ID1	IN	Cartridge detection signal
13	IND	...	Cartridge detection signal
14	LGND	...	GND for the head logic drive voltage HVdd
15	HENB0	OUT	Heat enable (Y)
16	EVENB	OUT	Even nozzle heat enable
17	HENB1	OUT	Heat enable (M)
18	HENB3	OUT	Heat enable (Black)
19	ODENB	OUT	Odd nozzle heat enable
20	BENB0	OUT	Signal for generating the block enable decoder output signal
21	BENB1	OUT	Signal for generating the block enable decoder output signal
22	BENB2	OUT	Signal for generating the block enable decoder output signal
23	VCC	OUT	IC drive voltage (+ 5V)
24	DCLK	OUT	Print data transfer signal
25	DTLD	OUT	Timing signal for print data to be latched
26	DTRST	OUT	Latch reset signal
27	HENB2	OUT	Heat enable (C)
28	IDATA	OUT	Printing data
29	DIK	IN	Head temperature sensor (diode) cathode
30	AAO	IN	AA sensor sense signal (Analog input)
31	AAA	OUT	Photo LED drive signal
32	AAG	...	GND

J1 (Purge sensor connector)

Pin No.	Signal name	IN/OUT	Description
1	PSVCC	OUT	Photo LED drive signal
2	GND	...	GND
3	U102(PB6)	IN	Purge sensor sense signal High (sense) / Low

J2 (Carriage motor connector)

Pin No.	Signal name	IN/OUT	Description
1	CRA+	OUT	Carriage motor phase A+
2	CRA-	OUT	Carriage motor phase A -
3	CRB+	OUT	Carriage motor phase B +
4	CRB-	OUT	Carriage motor phase B -

J3 (Paper feed motor connector)

Pin No.	Signal name	IN/OUT	Description
1	LFA+	OUT	Paper feed motor phase A +
2	LFA-	OUT	Paper feed motor phase A -
3	LFB+	OUT	Paper feed motor phase B +
4	LFB-	OUT	Paper feed motor phase B -

J4 (DC power connector)

Pin No.	Signal name	IN/OUT	Description
1	VH	IN	+24 VDC
2	GND	...	GND
3	VM	IN	+24 VDC
4	GND	...	GND
5	VCC	IN	+5 VDC
6	GND	...	GND
7	VHPWR	OUT	VH power supply for the print head heater, ON (High)/OFF signal
8	GND	...	GND

J5 (Interface connector)

Pin No.	Signal name	IN/OUT	Description
1	STB	IN	See Part 2 for details.
2	DATA1	IN	
3	DATA2	IN	
4	DATA3	IN	
5	DATA4	IN	
6	DATA5	IN	
7	DATA6	IN	
8	DATA7	IN	
9	DATA8	IN	
10	ACK	OUT	
11	BUSY	OUT	
12	PE	OUT	
13	SLCT	OUT	
14	AFXT	IN	
15	N.C.	...	
16	S-GND	...	
17	F-GND	...	
18	+5 V	...	
19	STB-GND	...	
20	D1-GND	...	
21	D2-GND	...	
22	D3-GND	...	
23	D4-GND	...	
24	D5-GND	...	
25	D6-GND	...	
26	D7-GND	...	
27	D8-GND	...	
28	ACK-GND	...	
29	BUSY-GND	...	
30	INT-GND	...	
31	INT	IN	
32	FAULT	OUT	
33	S-GND	...	
34	N.C.	...	
35	+5 V PU	...	
36	SELIN	IN	

8. CIRCUIT DIAGRAMS

8.1 Parts Layout 8.1.1 Logic board

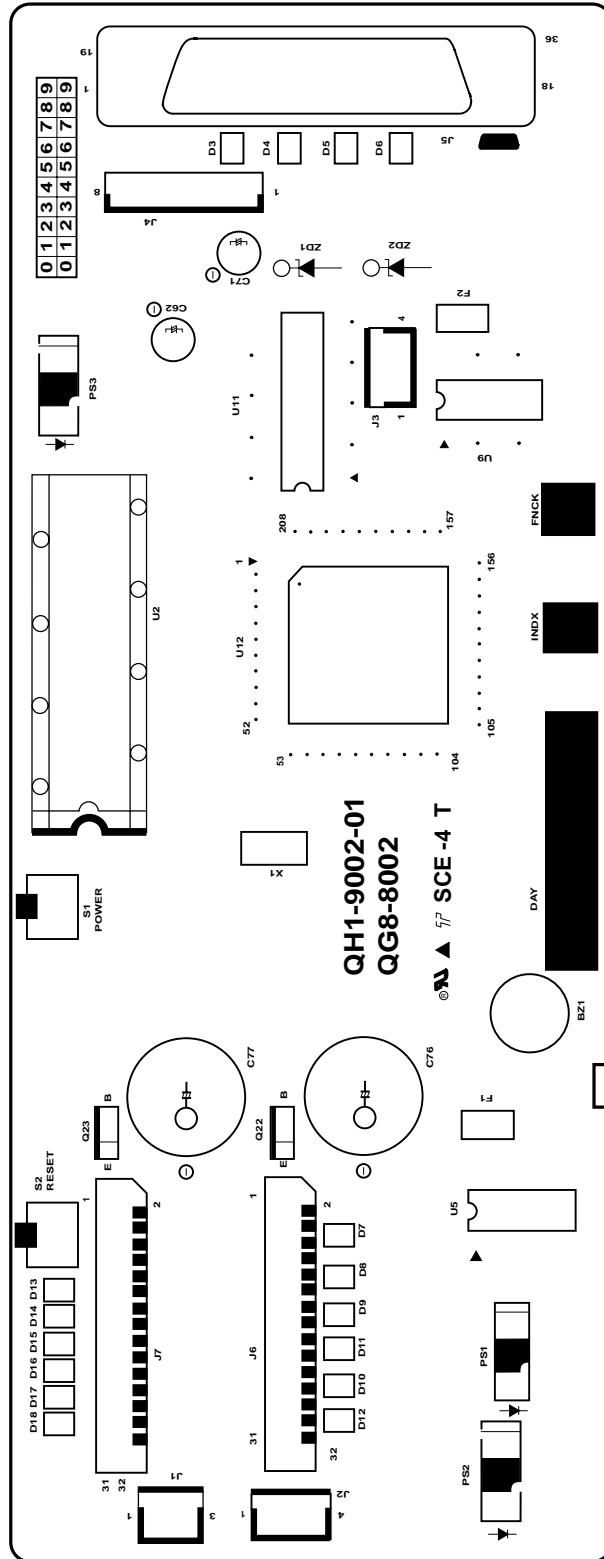


Figure 5-11 Logic Board (Top View)

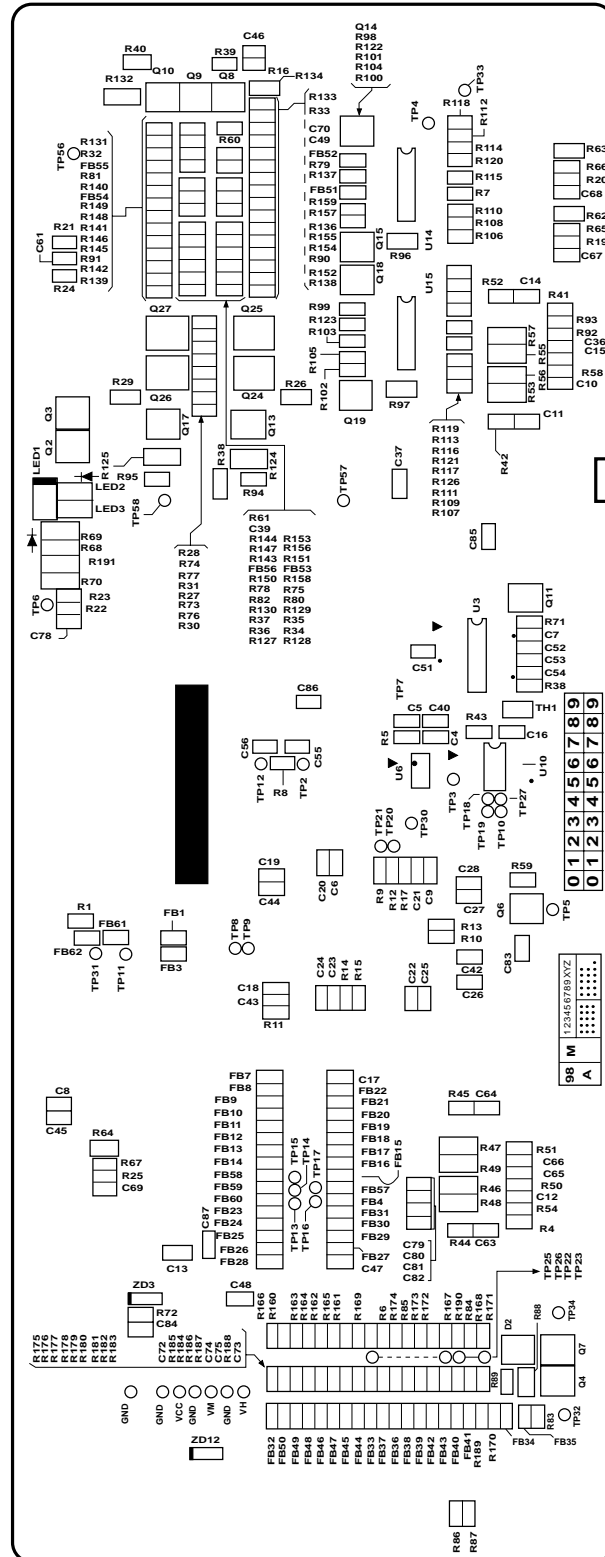
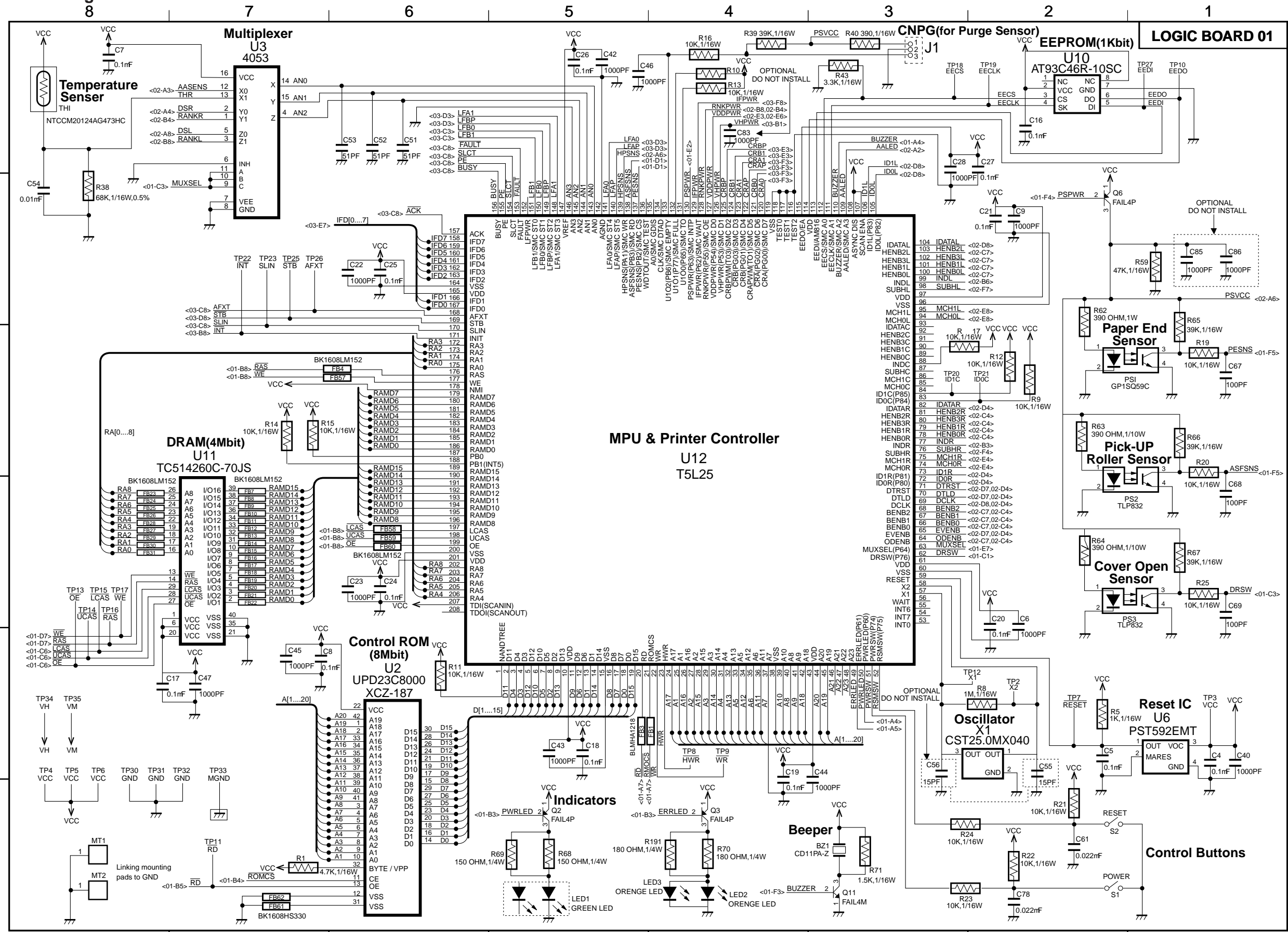
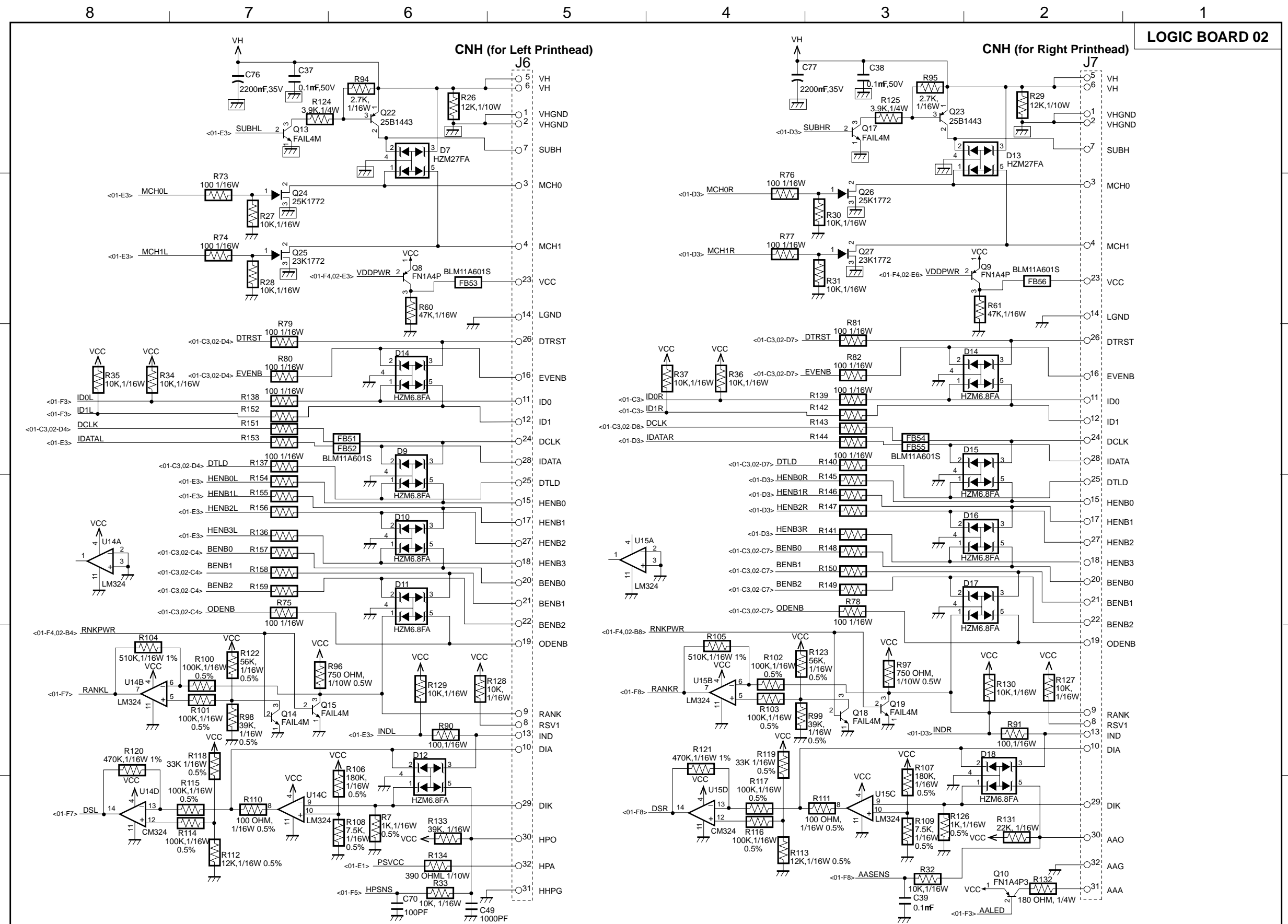
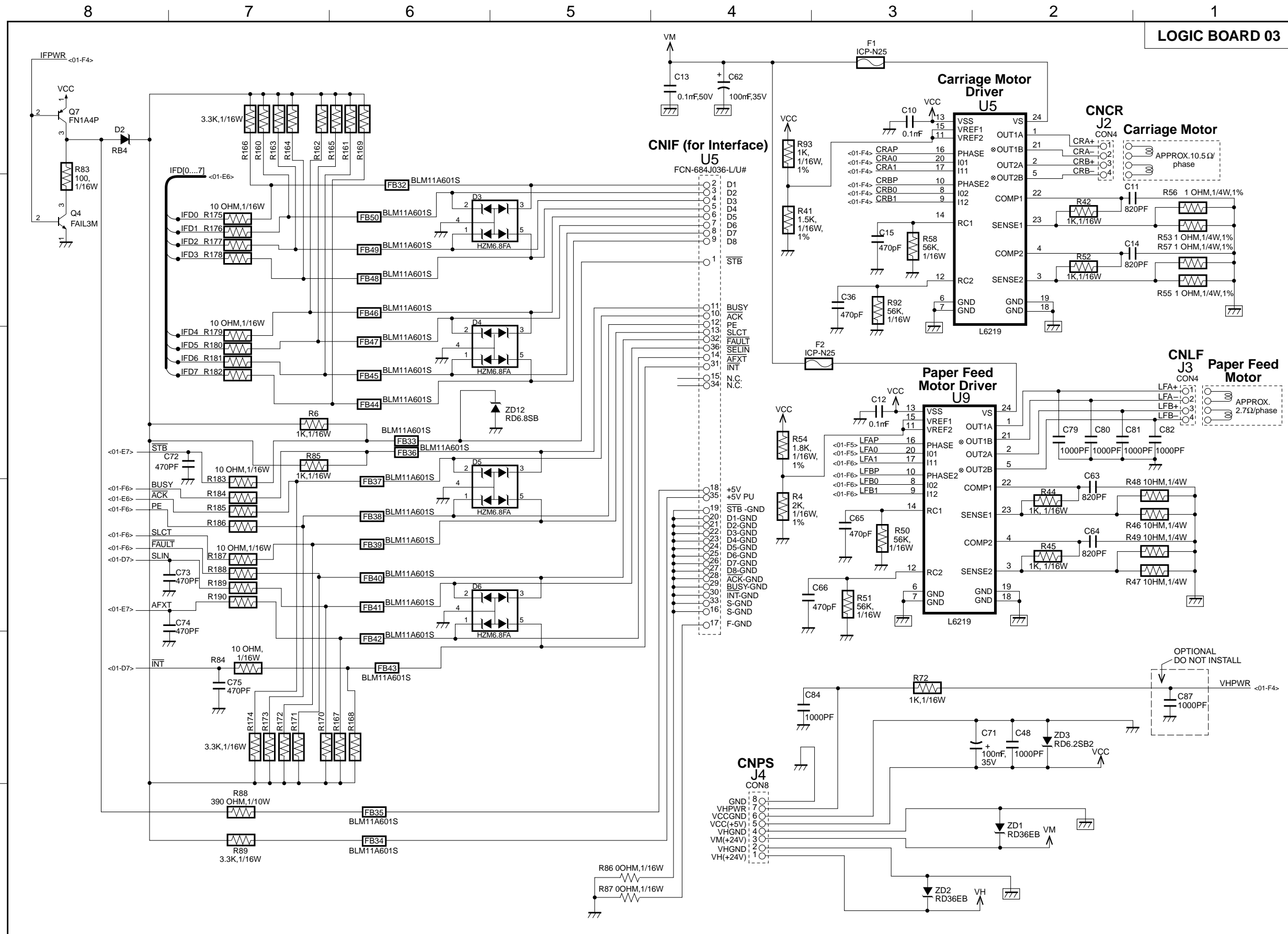


Figure 5-12 Logic Board (Bottom View)

8.2 Circuit Diagrams









The printing paper contains
70% waste paper.

Canon