

# BJC-6000

# SERVICE MANUAL

REVISION 0

**Canon**

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# BJC-6000

## **SERVICE MANUAL**

**Canon**

## **Target Readers**

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# I. ABOUT THIS MANUAL

This manual is divided into five parts containing the information required for servicing the BJC-6000 printer.

## *Part 1: Safety and Precautions*

This part contains information on how to service the unit safely. It is very important, and must be read.

## *Part 2: Product Specifications*

This part outlines the product and its specifications.

## *Part 3: Operating Instructions*

This part explains how to operate the unit properly, how it is installed, and how to use the service mode.

## *Part 4: Technical Reference*

This part outlines the unit operation giving a technical.

## *Part 5: Maintenance*

This part explains maintenance of the unit. It includes details of disassembly / assembly, adjustments required when assembling, troubleshooting procedures, and wiring / circuit diagrams, etc.



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This manual does not contain complete information required for disassembling and assembling the BJC-6000 printer. Please also refer to the separate Parts Catalog.

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## II. TABLE OF CONTENTS

	<b><i>Part 1: SAFETY AND PRECAUTIONS</i></b>
1 - 1	1. SAFETY PRECAUTIONS
1 - 1	1.1 Moving Parts
1 - 2	1.2 Ink Stains
1 - 2	1.2.1 Ink paths
1 - 3	1.2.2 Ink mist
1 - 4	1.3 Live Electrical Parts
1 - 5	2. MACHINE PRECAUTIONS
1 - 5	2.1 BJ Cartridges
1 - 5	2.1.1 BJ cartridge handling
1 - 6	2.1.2 Automatic capping
1 - 6	2.1.3 When not using the printer
1 - 6	2.1.4 Ink's electroconductivity
1 - 7	2.2 Ink Tanks
1 - 7	2.2.1 Unpacking the ink tank
1 - 7	2.2.2 Ink tank handling
1 - 8	2.3 Printer Handling
1 - 8	2.3.1 Spurs
1 - 9	2.3.2 Damage due to static electricity
1 - 10	2.3.3 Ink leakage prevention
1 - 11	3. NOTES ON SERVICING
1 - 11	3.1 EEPROM Data
1 - 12	3.2 Static Electricity
1 - 13	3.3 Disassembly and Reassembly
1 - 14	3.4 Self Diagnosis
	<b><i>Part 2: PRODUCT SPECIFICATIONS</i></b>
2 - 1	1. PRODUCT OUTLINE
2 - 1	1.1 Outline
2 - 2	1.2 Features
2 - 3	1.3 BJ Cartridge
2 - 3	1.3.1 Black BJ cartridge
2 - 3	1.3.2 Color BJ cartridge
2 - 4	1.3.3 Photo BJ cartridge
2 - 4	1.4 BJ Cartridge Container
2 - 5	1.5 Consumables
2 - 5	1.5.1 Black, color, and photo BJ cartridges
2 - 5	1.5.2 Ink tanks
2 - 6	2. SPECIFICATIONS
2 - 6	2.1 General Specifications
2 - 8	2.2 Paper Specifications
2 - 10	2.3 Interface Specifications
	<b><i>Part 3: OPERATING INSTRUCTIONS</i></b>
3 - 1	1. PRINTER SETUP
3 - 1	1.1 Unpacking
3 - 2	1.2 Installation Location
3 - 3	1.3 Installation
3 - 3	1.3.1 Connecting the interface cable
3 - 3	1.3.2 Connecting the power cord
3 - 3	1.3.3 Installing the BJ cartridges

Page	
3 - 9	1.3.4 Aligning the print heads
3 -10	1.4 Names of Parts and Their Functions
3 -11	2. TRANSPORTING THE PRINTER
3 -11	2.1 Transporting the Printer
3 -12	3. PRINTER SERVICE FUNCTIONS
3 -12	3.1 Error Indications
3 -13	3.2 Description of Error Indications
3 -14	3.3 BJ Status Monitor
3 -14	3.3.1 Main functions of the BJ status monitor
3 -14	3.3.2 Items displayed on the BJ status monitor
3 -15	3.4 Function Settings
3 -15	3.4.1 Function settings using the printer driver
3 -16	3.5 Off-Line Operations
3 -16	3.5.1 Cleaning
3 -16	3.5.2 Nozzle check pattern printing
3 -17	3.5.3 Roller cleaning
3 -18	3.6 Service Mode
3 -18	3.6.1 Service mode operations
3 -19	3.6.2 Service/factory test print
3 -20	3.6.3 EEPROM information print
3 -21	3.6.4 Resetting EEPROM
3 -21	3.6.5 Model setting
3 -21	3.6.6 Automatic head position adjustment

#### *Part 4: TECHNICAL REFERENCE*

4 - 1	1. OVERVIEW
4 - 1	1.1 Printer Block Diagram
4 - 2	1.2 Power On Sequence Flowchart
4 - 3	1.3 Flow of Print Signals
4 - 4	1.4 Print Driving
4 - 4	1.4.1 Print drive control
4 - 6	1.4.2 Print drive method
4 - 9	1.5 Power-Off Sequence Flowchart
4 -10	2. FIRMWARE
4 -10	2.1 Interface
4 -10	2.1.1 Compatible mode
4 -11	2.1.2 Nibble mode
4 -12	2.1.3 ECP mode
4 -13	2.2 Print Control
4 -13	2.2.1 Print mode
4 -13	2.2.2 Multi-drop print
4 -13	2.2.3 Photo-print
4 -13	2.2.4 Automatic switching control of printing nozzles
4 -15	2.3 Automatic Printing Position Alignment Function
4 -16	2.4 Pause Between Scanning
4 -16	2.5 Pause Between Pages
4 -16	2.6 Smear Control
4 -16	2.7 Auto Power ON/OFF
4 -16	2.8 Head Overheat Protection
4 -17	3. PRINTER'S MECHANICAL SYSTEM
4 -17	3.1 Overview
4 -17	3.1.1 BJ cartridge unit
4 -17	3.1.2 Carriage unit

Page	
4 -18	3.1.3 Purge unit
4 -18	3.1.4 Paper feed unit
4 -19	3.2 BJ Cartridge
4 -19	3.2.1 Construction of the Black BJ cartridge
4 -20	3.2.2 Construction of the Color/Photo BJ cartridge
4 -21	3.2.3 Construction of the bubble jet head unit
4 -25	3.3 Purge Unit
4 -25	3.3.1 Function of the purge unit
4 -26	3.3.2 Construction of the purge unit
4 -28	3.4 Paper Feed Unit
4 -28	3.4.1 Functions of the paper feed unit
4 -30	3.4.2 Construction of the paper feed unit
4 -32	3.5 Carriage Unit
4 -32	3.5.1 Functions of carriage unit
4 -33	3.5.2 Construction of the carriage unit
4 -36	4 PRINTER'S ELECTRICAL SYSTEM
4 -36	4.1 Overview
4 -37	4.2 Control Unit
4 -37	4.2.1 Control unit block diagram
4 -38	4.2.2 Logic Components
4 -41	4.3 Power Supply Unit
4 -41	4.3.1 Power Supply Unit Block Diagram
4 -41	4.3.2 Construction of Power Supply Unit
4 -42	5. DETECTION FUNCTIONS
4 -42	5.1 Detection with Sensors
4 -42	5.1.1 Home position sensor
4 -42	5.1.2 Paper end sensor
4 -42	5.1.3 Print position sensor
4 -43	5.1.4 Ink sensor
4 -43	5.1.5 Cover sensor
4 -43	5.1.6 Pump sensor
4 -43	5.1.7 Printer temperature sensor (TH201)
4 -44	5.1.8 Head temperature sensor
4 -44	5.2 Other Detection Functions
4 -44	5.2.1 Waste ink amount detection
4 -44	5.2.2 BJ cartridge detection

## *Part 5: MAINTENANCE*

5 - 1	1. MAINTENANCE
5 - 1	1.1 Parts for Periodic Replacement
5 - 1	1.2 List of Consumables
5 - 1	1.3 List of Periodic Maintenance
5 - 2	2. SERVICE TOOLS
5 - 2	2.1 List of Tools
5 - 3	3. APPLYING GREASE
5 - 4	4. DISASSEMBLY AND REASSEMBLY
5 - 4	4.1 Disassembly and Reassembly
5 - 4	4.2 Notes on Disassembly and Reassembly
5 - 4	4.2.1 Unlocking the carriage
5 - 5	4.2.2 Removing the printer unit
5 - 6	4.2.3 Removing the ASF unit
5 - 6	4.2.4 Removing the adjustable bearings supporting the carriage shaft
5 - 7	4.2.5 Paper feed gears
5 - 8	5. ADJUSTMENTS AND SETTINGS
5 - 8	5.1 Adjustments and Settings



5 - 8	5.1.1 EEPROM setting
5 - 8	5.1.2 Carriage belt tension adjustment
5 - 8	5.1.3 ASF gear position adjustment
5 - 8	5.1.4 Head gap adjustment
5 - 9	5.2 Adjustment/Setting Procedures
5 - 9	5.2.1 EEPROM setting
5 - 9	5.2.2 Carriage belt tension adjustment
5 -10	5.2.3 ASF gear position adjustment
5 -11	5.2.4 Head gap adjustment
5 -13	6. TROUBLESHOOTING
5 -13	6.1 Troubleshooting Overview
5 -13	6.1.1 Overview
5 -13	6.1.2 Notes on troubleshooting
5 -15	6.2 Diagnosis
5 -15	6.2.1 Initial flowchart
5 -18	6.2.2 Action
5 -36	7. CONNECTOR POSITIONS AND PIN ASS
5 -36	7.1 Control Board
5 -40	7.2 Carriage Board
5 -43	7.3 BJ Cartridge
5 -44	7.4 AC adapter
5 -44	7.5 DC power supply cable
5 -45	7.6 Carriage Motor
5 -45	7.7 Paper Feed Motor
5 -46	7.8 Ink Sensor
5 -46	7.9 Print Position Sensor
5 -46	7.10 Pump Sensor
5 -47	8. CIRCUIT DIAGRAMS
5 -47	8.1 Parts Layout
5 -47	8.1.1 Control board
5 -48	8.1.2 Carriage board
5 -49	8.2 Circuit Diagrams

## III. ILLUSTRATION INDEX

	<b><i>Part 1: SAFETY AND PRECAUTIONS</i></b>	
1 - 1	Figure 1- 1	The Printer's Moving Parts
1 - 2	Figure 1- 2	Ink Paths
1 - 3	Figure 1- 3	Ink Mist
1 - 4	Figure 1- 4	Live Electrical Parts
1 - 5	Figure 1- 5	BJ Cartridges
1 - 7	Figure 1- 6	Unpacking the Ink Tank
1 - 7	Figure 1- 7	Installing the Ink Tank
1 - 8	Figure 1- 8	Spurs
1 - 9	Figure 1- 9	Damage Due to Static Electricity
1 -10	Figure 1-10	Capping Position
1 -12	Figure 1-11	Control Board and Other Electrical Components
1 -13	Figure 1-12	How to Disengage a Plastic Hook
	<b><i>Part 2: PRODUCT SPECIFICATIONS</i></b>	
2 - 1	Figure 2- 1	Printer Appearance
2 - 3	Figure 2- 2	Black BJ Cartridge
2 - 3	Figure 2- 3	Color BJ Cartridge
2 - 4	Figure 2- 4	Photo BJ Cartridge
2 - 4	Figure 2- 5	BJ Cartridge Container
2 - 5	Figure 2- 6	BJ Cartridges
2 - 5	Figure 2- 7	Ink Tanks
2 - 9	Figure 2- 8	Printable Area
2 -15	Figure 2- 9	Timing Chart (Compatible mode)
2 -16	Figure 2-10	Timing Chart (Nibble mode)
2 -16	Figure 2-11	Timing Chart (ECP mode)
	<b><i>Part 3: OPERATING INSTRUCTIONS</i></b>	
3 - 1	Figure 3- 1	Packaging
3 - 2	Figure 3- 2	Printer Dimensions
3 - 3	Figure 3- 3	Connecting the Interface Cable
3 - 3	Figure 3- 4	Connecting the Power Cord
3 - 4	Figure 3- 5	Removing Head Cap and Tape from BJ Cartridge
3 - 5	Figure 3- 6	Installing BJ Cartridges
3 - 6	Figure 3- 7	Installing the Ink Tanks
3 - 7	Figure 3- 8	Replacing an Ink Tank
3 - 8	Figure 3- 9	Cartridge Container
3 - 9	Figure 3-10	Print Position Adjustment Pattern
3 -10	Figure 3-11	Names of Parts and Their Functions
3 -12	Figure 3-12	Operator Panel
3 -14	Figure 3-13	BJ Status Monitor (Sample)
3 -15	Figure 3-14	Printer Driver Utility (Sample)
3 -17	Figure 3-15	Nozzle Check Pattern Print (Sample for Black/Color Cartridge)
3 -19	Figure 3-16	Service/Factory Test Print
3 -20	Figure 3-17	EEPROM Information Print (Sample)
	<b><i>Part 4: TECHNICAL REFERENCE</i></b>	
4 - 1	Figure 4- 1	Printer Block Diagram
4 - 2	Figure 4- 2	Initial Sequence Flowchart
4 - 3	Figure 4- 3	Flow of Print Signals
4 - 4	Figure 4- 4	Printing Sequence (Black BJ cartridge, HQ mode)
4 - 6	Figure 4- 5	Print Drive Method (Multi-drop, forward direction)

Page		
4 - 7	Figure 4- 6	Print Drive Method (1440 x 720 dpi, forward direction)
4 - 8	Figure 4- 7	Print Drive Method (Reverse direction)
4 - 9	Figure 4- 8	Power-Off Sequence Flowchart
4 -10	Figure 4- 9	Interfacing Timing (Compatible Mode)
4 -11	Figure 4- 10	Interface Timing (Nibble Mode)
4 -12	Figure 4- 11	Interface Timing (ECP mode, reverse transfer)
4 -15	Figure 4- 12	Automatic Printing Position Alignment
4 -17	Figure 4- 13	Printer's Mechanical System
4 -19	Figure 4- 14	Black BJ Cartridge
4 -20	Figure 4- 15	Color/Photo BJ Cartridge
4 -21	Figure 4- 16	Bubble Jet Nozzle (part)
4 -22	Figure 4- 17	Nozzle Arrangement
4 -22	Figure 4- 18	Signal Contacts
4 -25	Figure 4- 19	Purge Unit
4 -26	Figure 4- 20	Purge Unit
4 -27	Figure 4- 21	Pumping Operations
4 -28	Figure 4- 22	Paper Feed Path
4 -29	Figure 4- 23	Paper Thickness Adjustment Mechanism
4 -30	Figure 4- 24	Paper Feed Unit
4 -32	Figure 4- 25	Carriage Unit
4 -33	Figure 4- 26	Carriage Unit
4 -34	Figure 4- 27	BJ Cartridge Maintenance
4 -35	Figure 4- 28	Drive Switching Unit
4 -35	Figure 4- 29	Operation of the Drive Switching Unit
4 -36	Figure 4- 30	Printer's Electrical System
4 -37	Figure 4- 31	Control Unit Block Diagram
4 -37	Figure 4- 32	Control Unit Function Diagram
4 -38	Figure 4- 33	Control Board
4 -41	Figure 4- 34	Power Supply Unit Block Diagram
4 -42	Figure 4- 35	Sensor Positions
4 -43	Figure 4- 36	Ink Sensor

### *Part 5: MAINTENANCE*

5 - 3	Figure 5- 1	Grease Points
5 - 4	Figure 5- 2	Unlocking the Carriage
5 - 5	Figure 5- 3	Removing the Printer Unit
5 - 6	Figure 5- 4	Removing the ASF Unit
5 - 6	Figure 5- 5	Adjustable Bearings Supporting the Carriage Shaft
5 - 7	Figure 5- 6	Feed Gear Unit Precautions
5 - 9	Figure 5- 7	Carriage Belt Tension Adjustment
5 -10	Figure 5- 8	ASF Gear Position Adjustment
5 -11	Figure 5- 9	Head Gap Adjustment (1)
5 -12	Figure 5- 10	Head Gap Adjustment (2)
5 -36	Figure 5- 11	Control Board
5 -40	Figure 5- 12	Carriage Board
5 -43	Figure 5- 13	BJ Cartridge
5 -44	Figure 5- 14	AC adapter
5 -44	Figure 5- 15	DC Power Supply Cable
5 -45	Figure 5- 16	Carriage Motor
5 -45	Figure 5- 17	Paper Feed Motor
5 -46	Figure 5- 18	Ink Sensor
5 -46	Figure 5- 19	Print Position Sensor
5 -46	Figure 5- 20	Pump Sensor
5 -47	Figure 5- 21	Control Board
5 -48	Figure 5- 22	Carriage Board

## IV. TABLE INDEX

Page	<i>Part 3: OPERATING INSTRUCTIONS</i>
3 -12	Table 3- 1 Error Indications
	<i>Part 4: TECHNICAL REFERENCE</i>
4 -14	Table 4- 1 Print Mode List
4 -23	Table 4- 2 Signal Contacts

# *Part 1*

# **SAFETY AND PRECAUTIONS**

Page	
1 - 1	1. SAFETY PRECAUTIONS
1 - 1	1.1 Moving Parts
1 - 2	1.2 Ink Stains
1 - 4	1.3 Live Electrical Parts
1 - 5	2. MACHINE PRECAUTIONS
1 - 5	2.1 BJ Cartridges
1 - 7	2.2 Ink Tanks
1 - 8	2.3 Printer Handling
1 -11	3. NOTES ON SERVICING
1 -11	3.1 EEPROM Data
1 -12	3.2 Static Electricity
1 -13	3.3 Disassembly and Reassembly
1 -14	3.4 Self Diagnosis



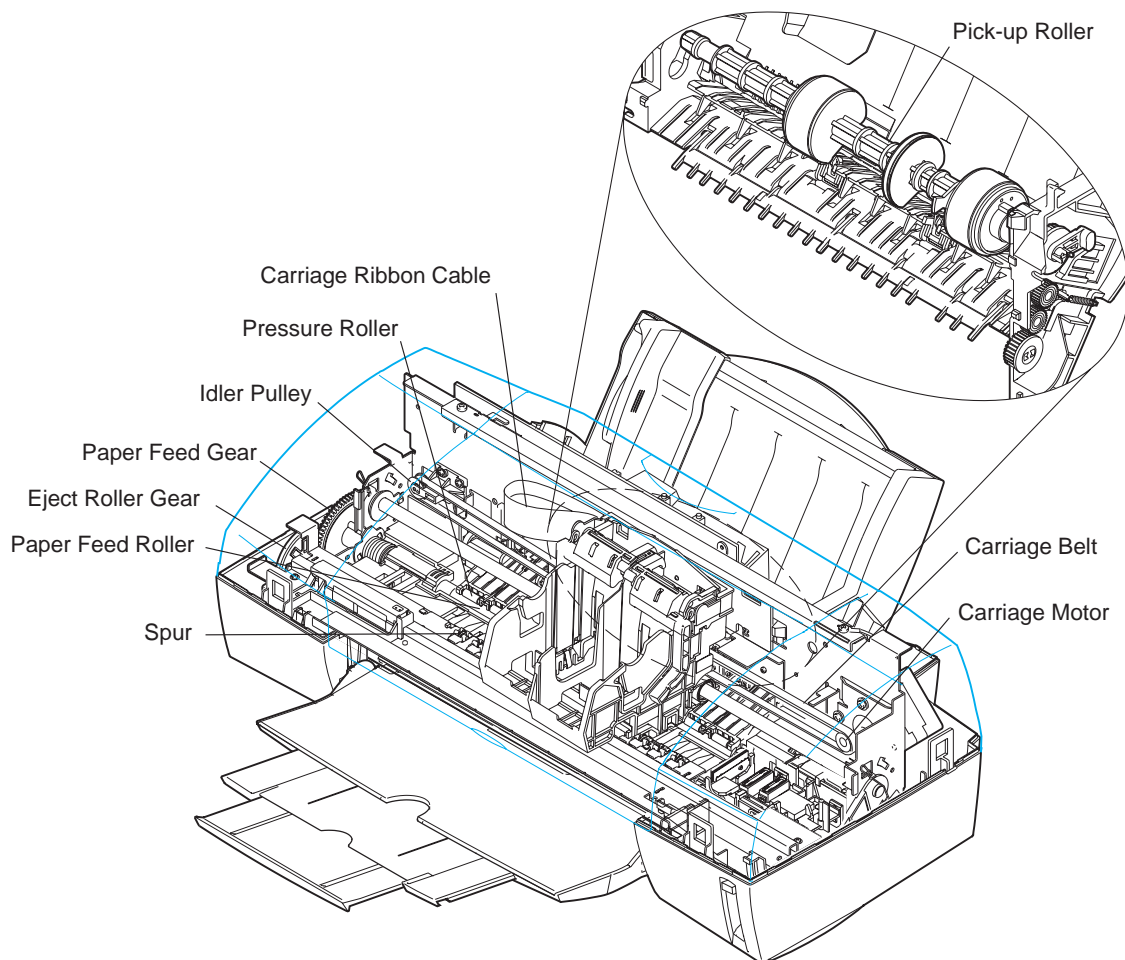
# 1. SAFETY PRECAUTIONS

## 1.1 Moving Parts

Be careful not to get your fingers, hair, clothing, or accessories caught in the moving parts of the printer.

The moving parts are driven either by the carriage motor or paper feed motor. The carriage motor-related moving parts include the carriage, carriage belt, and carriage ribbon-cable. The paper feed motor-related moving parts include the paper feed gears, paper feed rollers, pinch rollers, eject roller gears, spurs, and pick-up rollers.

To prevent injuries, the printer will stop after moving the carriage to the cartridge replacement position if the cover is opened.



**Figure 1-1 The Printer's Moving Parts**

## 1.2 Ink Stains

### 1.2.1 Ink paths

Be careful not to touch the ink paths. Ink on hands could stain the printer, work table, or clothes. The ink paths include the BJ cartridge ink tank outlet, the BJ cartridge ink filters and nozzles, the maintenance jet receiving section, the head caps, the wipers, and the waste ink absorber.



The ink is not harmful to the human body, but contains some organic solvents:

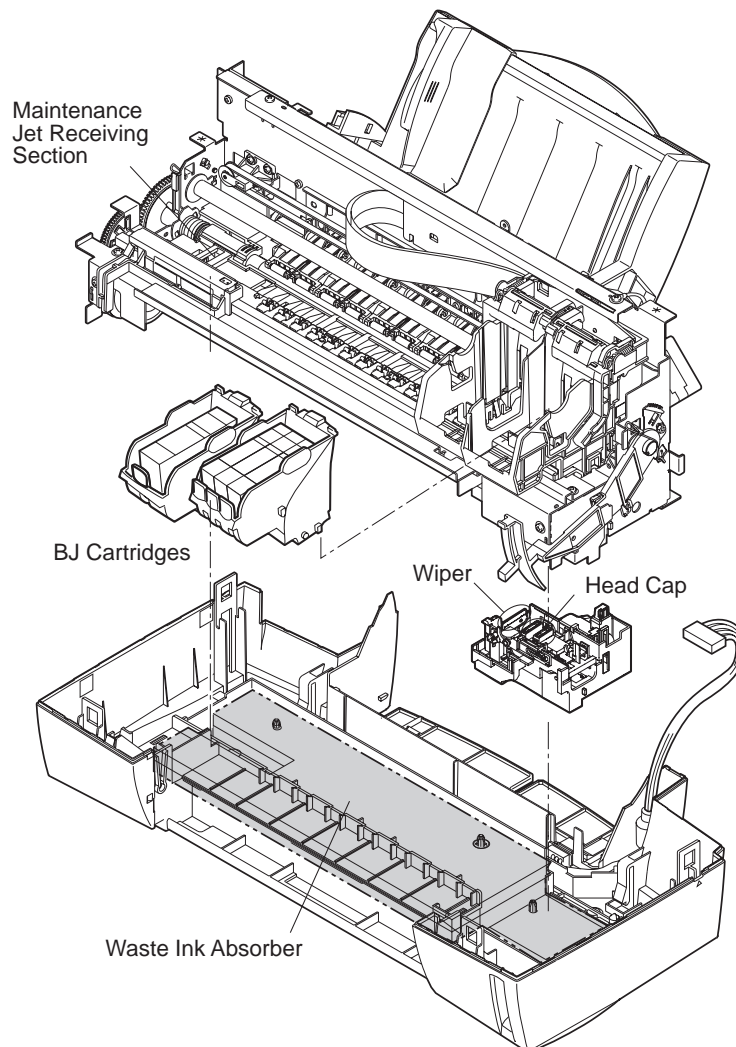
The black ink contains glycerin 56-81-5 and diethylene glycol 111-46-6.

The yellow ink contains glycerin 56-81-5 and isopropyl alcohol 67-63-0.

The cyan, magenta, photo-cyan, photo-magenta and photo-black ink contain glycerin 56-81-5, isopropyl alcohol 67-63-0, ethylene glycol 107-21-1, and diethylene glycol 111-46-6.

Be careful not to get the ink into your mouth or eyes. If the ink gets into your eyes, wash with plenty of water and consult a doctor. In case you have swallowed a large amount of ink, consult a doctor immediately.

The ink contains dyes. If clothing is stained with the ink, the ink may not be removed completely.

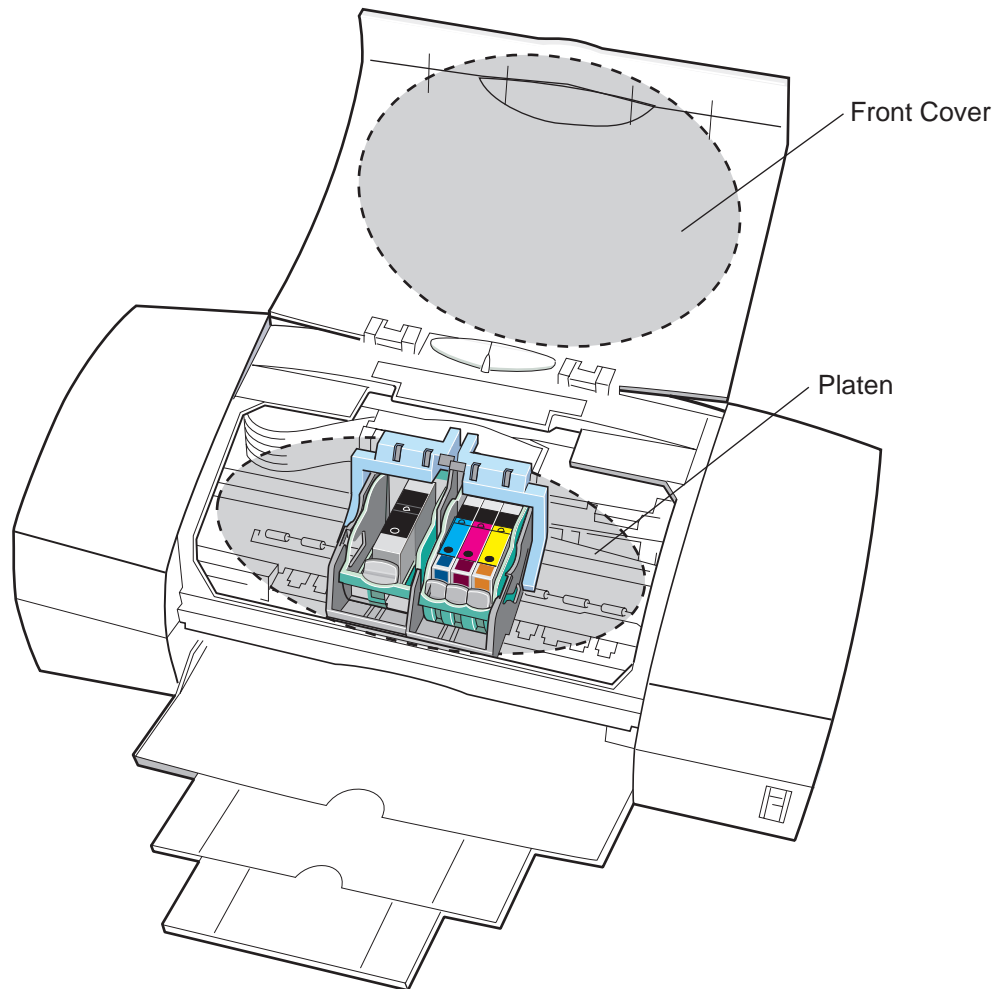


**Figure 1-2 Ink Paths**



### 1.2.2 Ink mist

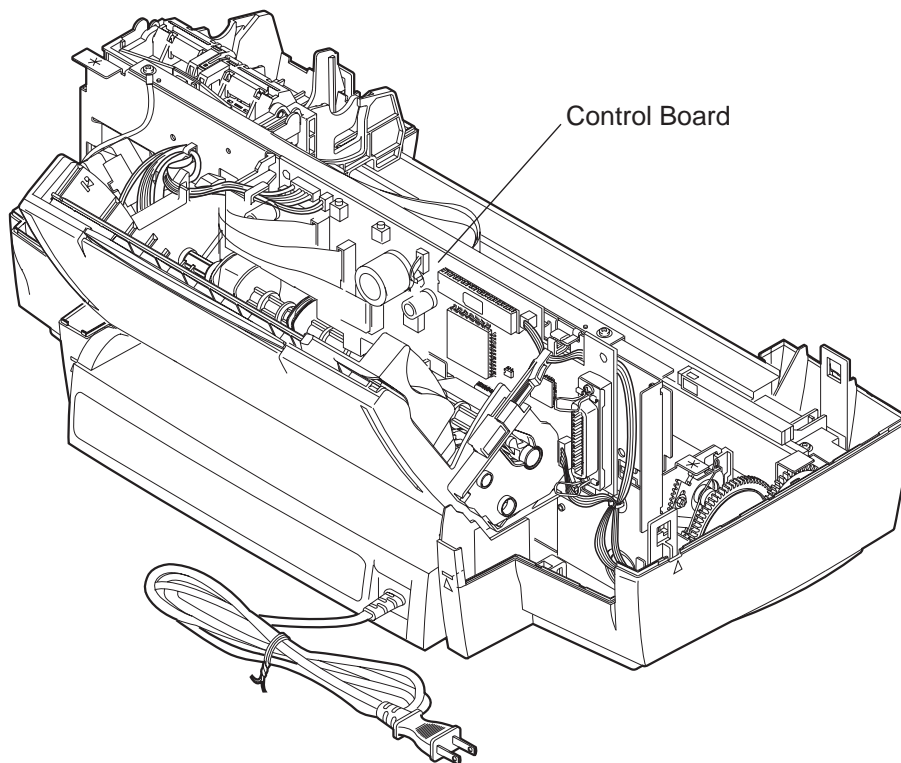
The BJ cartridge ejects ink onto the paper during printing. After the printer is used for a long period or used heavily, part of the ink ejected from the nozzles, or ink mist bouncing back from the paper could accumulate and contaminate the platen, front cover, as well as the periphery of the purge unit. Carefully wipe off the ink mist with a dampened soft cloth so that hands or clothing will not be stained by contaminated parts during servicing.



**Figure 1-3 Ink Mist**

### 1.3 Live Electrical Parts

When the printer is plugged into a wall outlet, the power supply unit of the printer is live, even if the power is switched off with the *POWER* button. Be careful not to get an electric shock or damage sensitive elements if you are checking a live printer with the cover removed.



**Figure 1-4 Live Electrical Parts**

## 2. MACHINE PRECAUTIONS

### 2.1 BJ Cartridges

#### 2.1.1 BJ cartridge handling

Do not unpack the BJ cartridge until you are ready to use it. Before installing the BJ cartridge in the printer, carefully remove the head cap which protects the nozzles, the protective tape, and the protective tank. To prevent the nozzles or other ink paths from clogging, never touch or wipe the nozzles or other ink outlets with your bare hands or tissue paper. After removing the head cap, the protective tape, and the protective tank from a BJ cartridge, promptly install the cartridge in the printer or store it in the cartridge container. Do not reuse head caps or protective tapes which have been removed. The BJ cartridge must be installed in the printer or stored in the cartridge container with its ink tanks installed. If the BJ cartridge is installed or stored with its ink tanks removed, the nozzles could clog due to foreign matter or dried ink. Do not attempt to disassemble or wash the BJ cartridge.



If a nozzle clogs, or ink fails to be fed normally, print quality degrades, and typically a fine horizontal blank line appears in printed images. If cleaning operations do not solve the problem, replace the BJ cartridge with a new one.

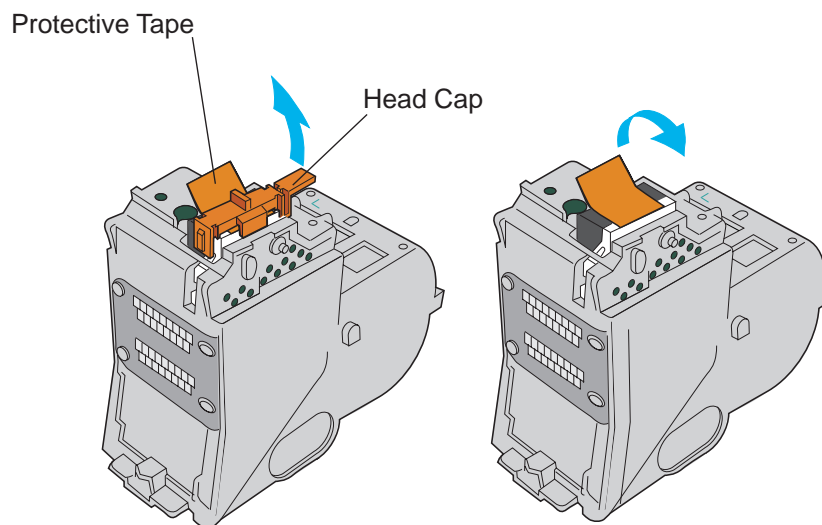


Figure 1-5 BJ Cartridges

### 2.1.2 Automatic capping

When the printer is turned off with the *POWER* button, it automatically caps the BJ cartridge's nozzles to protect them as well as to prevent ink leakage. If the AC cable is unplugged from a wall outlet before the printer is turned off with the *POWER* button, the nozzles will not be automatically capped. In this case, plug in the AC cable again, turn on the printer, and then turn it off with the *POWER* button. The nozzles will be automatically capped.



---

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

---

### 2.1.3 When not using the printer

The BJ cartridge may be either left installed in the printer or stored in the cartridge container. This also applies when carrying, transporting, or storing the printer.



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If the BJ cartridge is left in open air, out of the printer or cartridge container, foreign matter or dried ink may clog the nozzles, resulting in poor print quality.

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### 2.1.4 Ink's electroconductivity

The ink in the BJ cartridge conducts electricity. If ink is spilt in the printer's mechanical parts, use a dampened paper towel to wipe clean. If ink is spilt onto the printer's electrical components, use tissue paper to wipe clean. If ink gets under an IC chip on the control board and cannot be removed thoroughly, replace the control board with a new one.



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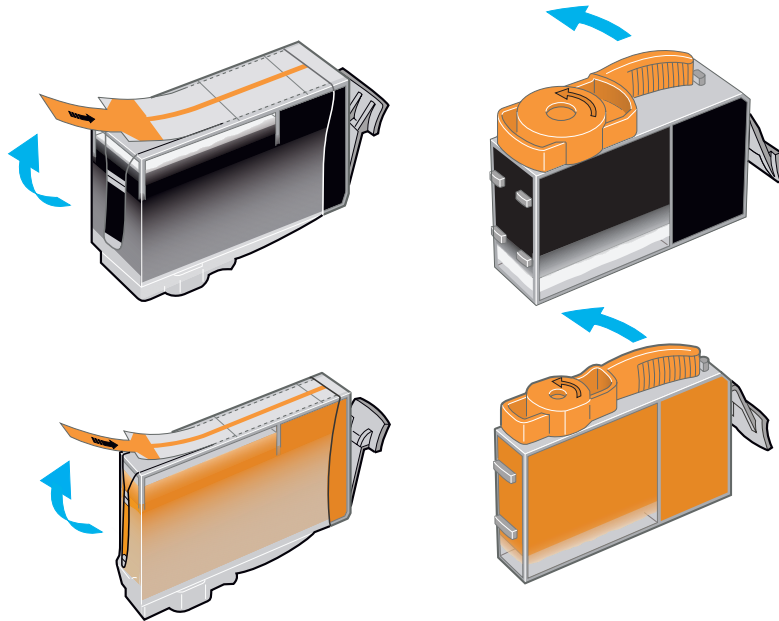
Never plug in the printer if its' electric circuitry is in contact with spilt ink. Otherwise the electric circuitry could be damaged.

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## 2.2 Ink Tanks

### 2.2.1 Unpacking the ink tank

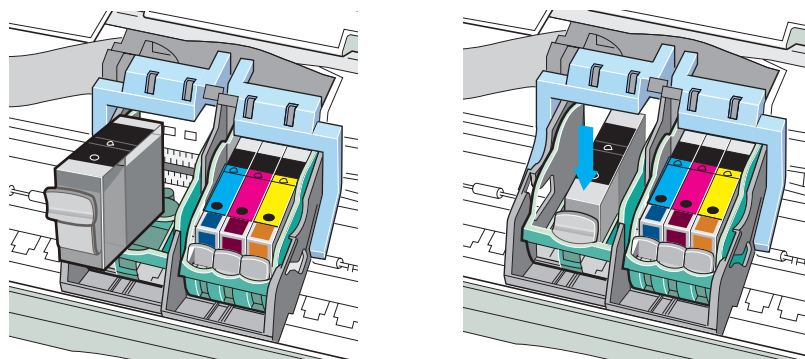
Do not unpack the ink tank until you are ready to use it. When installing it in the BJ cartridge, unpack the ink tank, peel off the vinyl lamination, and remove the cap from the ink outlets.



**Figure 1-6 Unpacking the Ink Tank**

### 2.2.2 Ink tank handling

If the joint of the BJ cartridge connecting to the ink tank supply piece is contaminated, suction of ink into the BJ cartridge could fail. Therefore, never touch the ink tank's ink supply piece. After removing the cap from the ink tank supply piece, promptly install the ink tank in the BJ cartridge to prevent the nozzles from clogging due to dried-ink. Do not remove the ink tank from the BJ cartridge unless you are replacing it.



**Figure 1-7 Installing the Ink Tank**



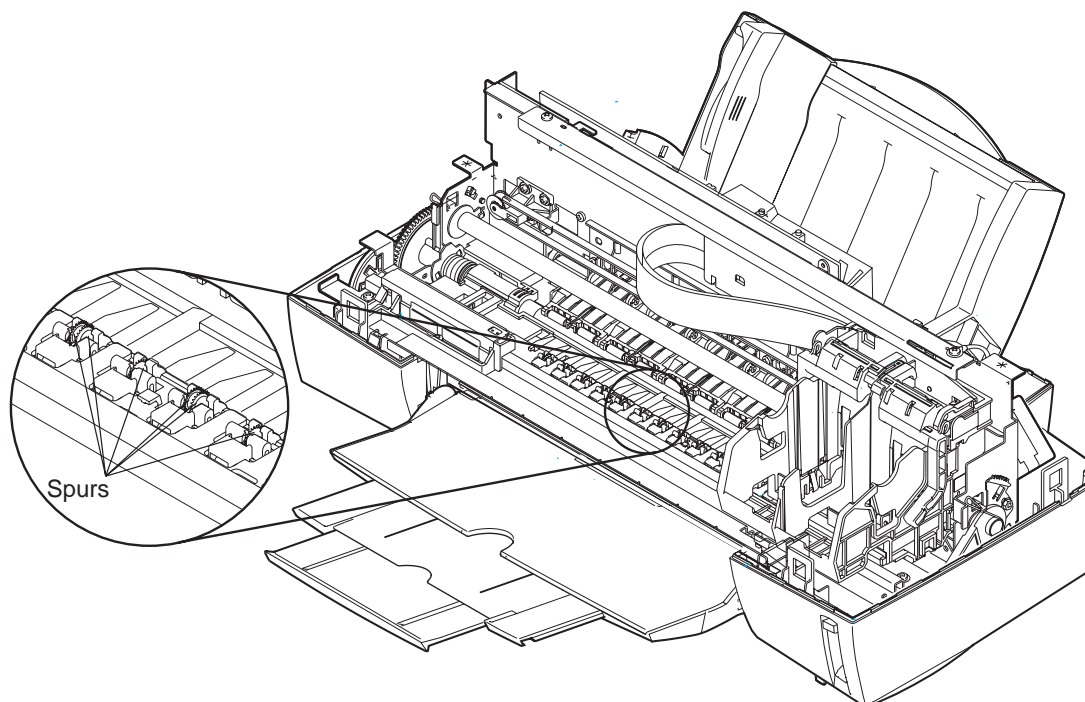
If a nozzle clogs, or otherwise ink fails to be fed normally, print quality degrades, and typically a fine horizontal blank line appears in printed images. If cleaning operations do not solve the problem, replace the BJ cartridge with a new one.

## 2.3 Printer Handling

### 2.3.1 Spurs

Take care not to bend the tips of the spurs. The tips of the spurs make contact with printed paper and are contaminated with ink, but due to their small surface contact area, the tips, cleaned by the spur cleaners, will not stain the printed paper.

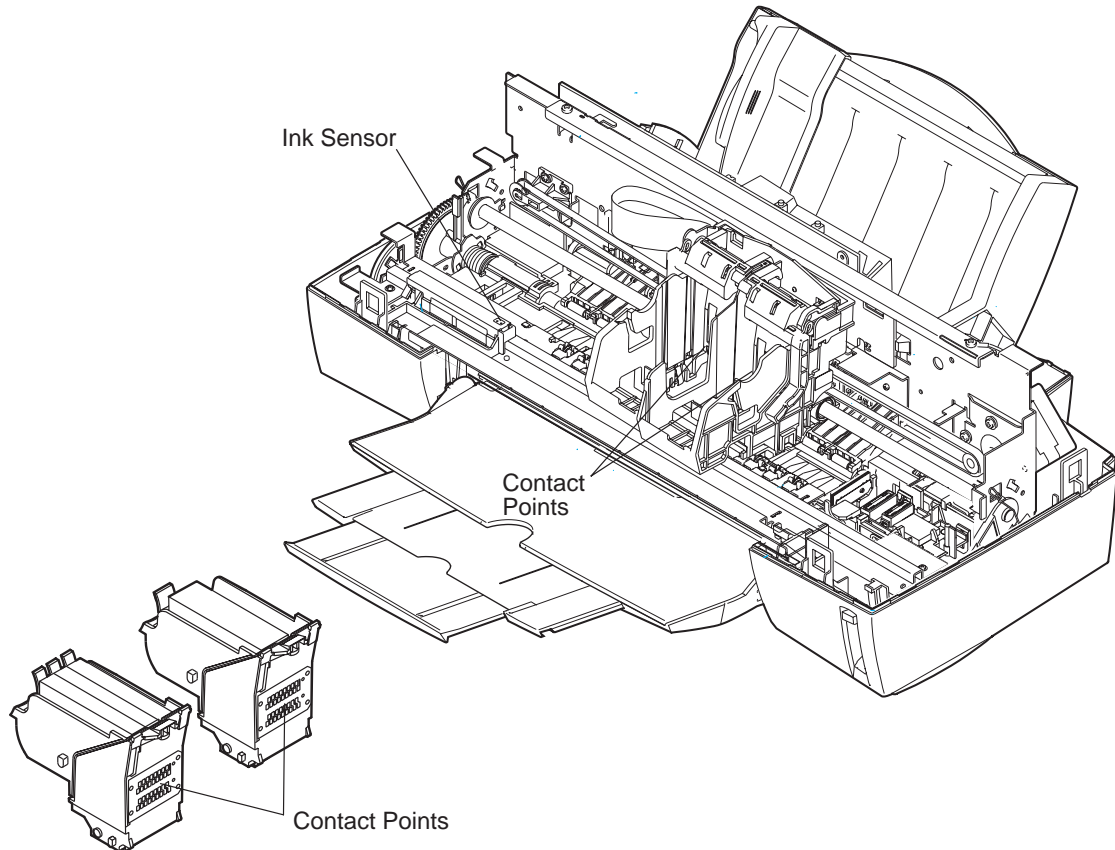
However, if the tips are bent and their surface contact area increases, they collect more ink and are not easily cleaned by the spur cleaners, and thereby stain the printed paper by making dotted lines on it.



**Figure 1-8 Spurs**

### 2.3.2 Damage due to static electricity

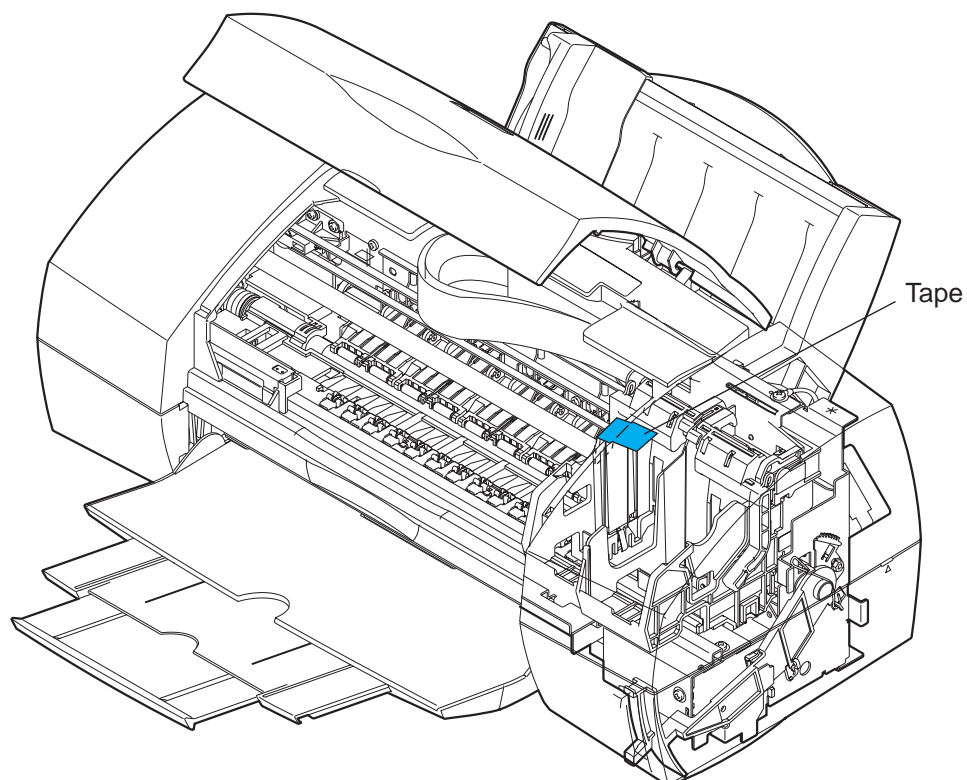
Static electricity may be generated by your clothes rubbing against each other and may accumulate in your body. If you touch electrical elements, the discharge of static electricity could damage them or change their electrical characteristics. For this reason, never touch the sensor contacts or the printer's BJ cartridge contacts.



**Figure 1-9 Damage Due to Static Electricity**

### 2.3.3 Ink leakage prevention

When you turn off the printer using the *POWER* button, the printer moves the carriage to the capping position, caps the nozzles, and locks the carriage in position with the lock arm. If electric power is not available to the printer, during transportation for example, this automatic capping and locking is not available. In this case, manually move the carriage to the capping position and secure it with tape to ready the printer for transportation.



**Figure 1-10 Capping Position**



## 3. NOTES ON SERVICING

### 3.1 EEPROM Data

The printer keeps track of the total sheets printed by each BJ cartridge configuration (Black/Color and Photo/Color) and the total waste ink amount and stores that information in the EEPROM (IC 602) on the logic board. Observe the following precautions during servicing:

#### 1) Before servicing

You can check the EEPROM data with a test print. The total sheets printed by each configuration can provide important information on how much the printer has been used.

#### 2) If the control board (EEPROM) is replaced (or if stored data is cleared by mistake)

Check the waste ink absorber, and replace it with a new one if necessary. If you fail to replace the waste ink absorber in time, the waste ink full alarm might not be issued in time and waste ink could leak (depending on the current ink absorbing capacity of the waste ink absorber). When replacing the logic board (EEPROM) with a new one, be sure to clear the data on the new EEPROM, because the data is not defined.

#### 3) After the waste ink absorber is replaced

After replacing the waste ink absorber, as prompted by the waste ink full alarm, clear the data on the EEPROM.




---

Once cleared, the EEPROM data cannot be restored (cannot be checked with a test print). Always check the EEPROM data with a test print before clearing it. The data includes information on the user settings, the total sheets of printed paper and the total amount of waste ink absorbed. Note that you cannot edit the data from the operator panel.

---



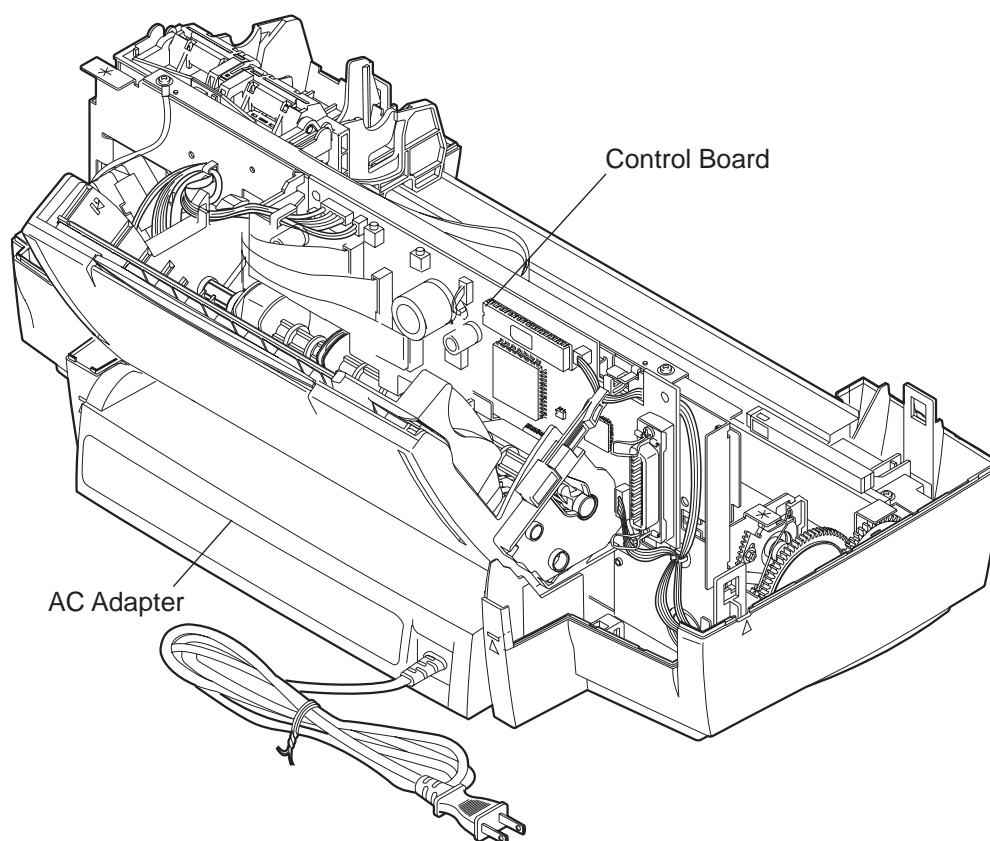

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The printer calculates the total amount of waste ink absorbed based on the estimated usage of the printer. To prevent the capacity of the waste ink absorber from being exceeded, the waste ink full alarm is issued when the waste ink absorber gets full, suspending the operation of the printer. Refer to *Part 3: 3.6.4 Resetting EEPROM* (Page 3-21) for the procedures for checking the EEPROM data with a test print or for clearing the data. Refer to *Part 5: 6. TROUBLESHOOTING* (Page 5-13) for the troubleshooting procedures to be followed when the waste ink full alarm is issued.

---

### 3.2 Static Electricity

Static electricity may be generated by your clothes rubbing against each other and may accumulate in your body. If you touch electrical elements, the discharge of the static electricity could damage them or change their electrical characteristics. To prevent damage due to such electrostatic discharge, ground yourself by touching a metal fitting which is grounded before disassembling or otherwise servicing the printer.

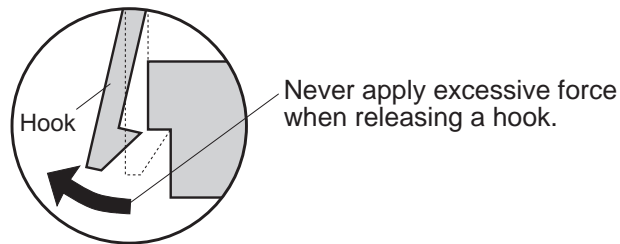


**Figure 1-11 Control Board and Other Electrical Components**

### 3.3 Disassembly and Reassembly

Disassembly and reassembly must be done according to the relevant parts catalog, which illustrates the step-by-step procedures to be followed. Additional notes are provided in *Part5: 4. DISASSEMBLY AND REASSEMBLY* (Page 5-4).

The printer uses many plastic parts. Do not apply excessive force to them. In particular, take care not to break or deform plastic hooks during disassembly.



**Figure 1-12 How to Disengage a Plastic Hook**



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Some plastic parts contain glass fibers to conform to tight dimensional tolerances. Plastic hooks are among such parts, lacking flexibility, and are easily broken. Do not forcibly disengage them using a screwdriver.

---

### **3.4 Self Diagnosis**

The printer has self-diagnosis features to detect hardware defects. The results of the diagnosis are indicated by the *indicator* and *power lamp (flashing)* on the operator panel as well as by the buzzer. For details, refer to *Part 3: 3.1 Error Indications* (Page 3-12).

# *Part 2*

# PRODUCT SPECIFICATIONS

Page	
2 - 1	1. PRODUCT OUTLINE
2 - 1	1.1 Outline
2 - 2	1.2 Features
2 - 3	1.3 BJ Cartridge
2 - 4	1.4 BJ Cartridge Container
2 - 5	1.5 Consumables
2 - 6	2. SPECIFICATIONS
2 - 6	2.1 General Specifications
2 - 8	2.2 Paper Specifications
2 -10	2.3 Interface Specifications



# 1. PRODUCT OUTLINE

## 1.1 Outline

This printer is a desktop business/personal color bubble-jet printer for high speed/high quality use. It accommodates two "drop-modulation" BJ cartridges on its carriage. For high speed use, a pigment-Black BJ cartridge and a Color BJ cartridge combination achieves four-color printing for quality equal to a laser printer. For high quality use, a Color BJ cartridge and Photo BJ cartridge combination achieves six-color printing whose quality is as good as a color photograph. The BJ cartridges use ink tanks which can be replaced individually, and whose tank material is translucent for easier ink level checking, contributing to lower running cost.

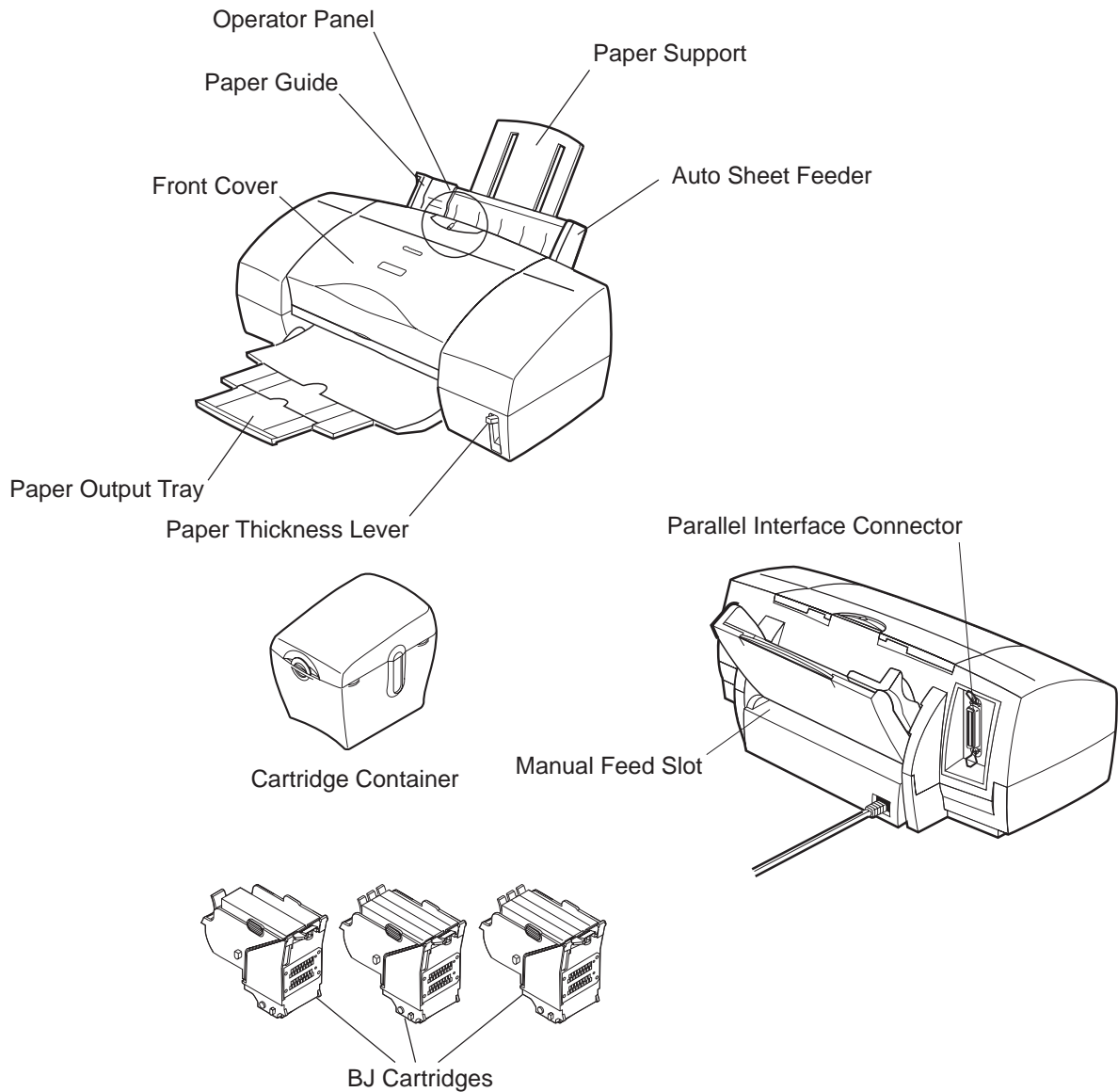


Figure 2-1 Printer Appearance

## 1.2 Features

- Laser-printer quality using pigment black ink
- Dual-cartridge system
  - High quality printing at high speed from a combination of the Black and Color cartridges or the Color and Photo cartridges
  - Black BJ cartridge: Drop modulation, replaceable ink tank (pigment black), 160 nozzle head
  - Color BJ cartridge: Drop modulation, individually replaceable ink tanks (yellow, magenta and cyan), 144 in-line nozzle head (48 nozzles for each of three colors)
  - Photo BJ cartridge: Drop modulation, individually replaceable ink tanks (dye black, photo-magenta and photo-cyan), 144 in-line nozzle head (48 nozzles for each of three colors)
- Individually replaceable ink tanks for high cost performance
  - Black ink tanks: Pigment black ink tank
  - Color ink tanks: Yellow, magenta, and cyan ink tanks
  - Photo ink tanks: Dye black, magenta, and cyan ink tanks
- Ink-out detection, and translucent ink tanks for easier ink level checking
- High speed printing (8.0 PPM black printing or 5.0 PPM color printing in HS mode)
- 1440 x 720 dpi high resolution printing
- Automatic printing position adjustment
  - Ensures accurate printing position regardless of cartridges being used or carriage movement direction
- Supports a wide variety of print media
- Up to A4/Letter full-bleed size paper and banner paper can be used
- Blue Angel compliant

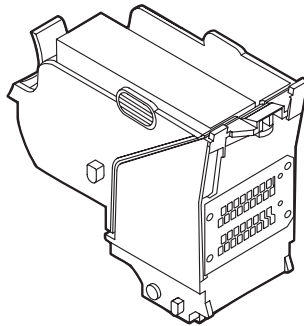


## 1.3 BJ Cartridge

### 1.3.1 Black BJ cartridge

The Black BJ cartridge is to be mounted on the left side of the carriage for high speed color/monochrome printing. It is a disposable print head. It has 160 nozzles and accommodates a replaceable ink tank. It uses drop modulation technology for high speed, high quality printing, where smaller ink-droplets are discharged for low density images and larger ink-droplets for denser images. The pigment black ink is water resistant and allows for dense and sharp text printing.

Replace the ink tank and/or the Black BJ cartridge if the ink-out error is issued or if satisfactory printing cannot be achieved even after the stipulated cleaning and head refreshing operations have been performed. It is recommended to replace any cartridge which is at least six months old, i.e., unpacked at least six months prior. The Black BJ cartridge has a life of approximately 5000 pages, and a new black ink tank provides for approximately 500 pages of a standard 1500 character print pattern in HQ mode.

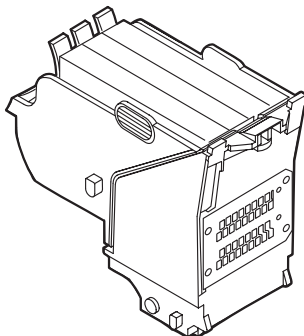


**Figure 2-2 Black BJ Cartridge**

### 1.3.2 Color BJ cartridge

The Color BJ cartridge, mounted on the right side of the carriage, is a disposable print head with 144 in-line nozzles, and accommodates replaceable yellow, magenta and cyan ink tanks. It has 144 nozzles (48 nozzles for each of the three colors), aligned vertically. It uses drop modulation technology for high speed, high quality printing, where smaller ink-droplets are discharged for low density images and larger ink-droplets for denser images. Each color ink is a dye-type.

Replace the relevant ink tank and/or the Color BJ cartridge if the ink-out error is issued or if satisfactory printing cannot be achieved even after the stipulated cleaning and head refreshing operations have been performed. It is recommended to replace any cartridge which is at least six months old, i.e., unpacked at least six months prior. The Color BJ cartridge has a life of approximately 3000 pages and a new color ink tank provides for approximately 280 pages of a 7.5% duty pattern.

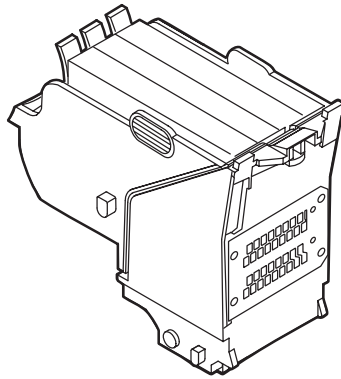


**Figure 2-3 Color BJ Cartridge**

### 1.3.3 Photo BJ cartridge

The Photo BJ cartridge, mounted on the left side of the carriage for photo printing, is a disposable print head with 144 in-line nozzles, and accommodates replaceable photo-black, photo-magenta and photo-cyan ink tanks. It has 144 nozzles (48 nozzles for each of the three colors), aligned vertically. It uses drop modulation technology for high speed, high quality printing, where smaller ink-droplets are discharged for low density images and larger ink-droplets for denser images. The black ink is a dye-type and the photo-cyan and photo-magenta inks are three times lighter in color density than normal color inks.

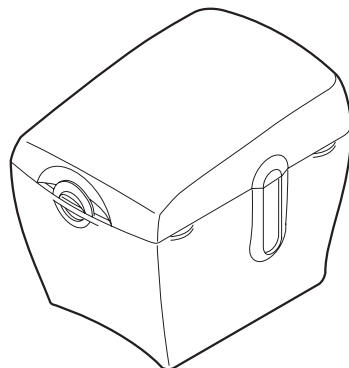
Replace the relevant ink tank and/or Photo BJ cartridge if the ink-out error is issued or if satisfactory printing cannot be achieved even after the stipulated cleaning and head refreshing operations have been performed. It is recommended to replace any cartridge which is at least six months old, i.e., unpacked at least six months earlier. The Photo BJ cartridge has a life of approximately 3000 pages and a new color ink tank provides for approximately 280 pages of a 7.5% duty pattern.



**Figure 2-4 Photo BJ Cartridge**

### 1.4 BJ Cartridge Container

The BJ cartridge container is used to store non-installed BJ cartridges. The lid of the container must be closed fully to prevent the ink in the nozzles of the BJ cartridge from drying out. Each BJ cartridge container can store one Black, Color, or Photo BJ cartridge. Always store a BJ cartridge with its ink tanks installed. The BJ cartridge containers can be connected together.



**Figure 2-5 BJ Cartridge Container**

## 1.5 Consumables

### 1.5.1 Black, color, and photo BJ cartridges

The Black, Color and Photo BJ cartridges for this printer are consumables. The BJ cartridges that come with your printer are identical to the BJ cartridges that are commercially available as consumables, except for the packaging.

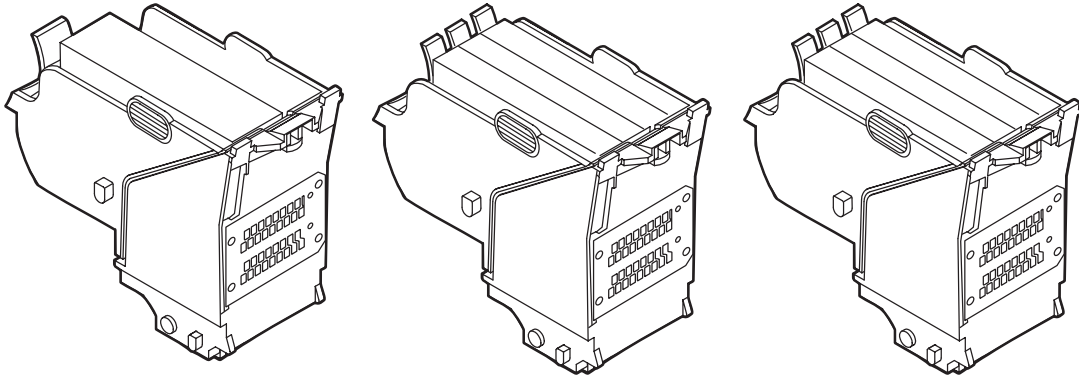


Figure 2-6 BJ Cartridges

### 1.5.2 Ink tanks

The consumable ink tanks include the black ink tanks for the Black BJ cartridge; yellow, magenta and cyan ink tanks for the Color BJ cartridge; and photo-black, photo-magenta and photo-cyan ink tanks for the Photo BJ cartridge. The ink tanks are usable for six months after they are unpacked.

A black ink tank provides for approximately 500 pages of a standard 1500-character text pattern in HQ mode.

A color ink tank provides for approximately 280 pages of a 7.5% duty pattern in HQ mode.

A photo-color ink tank provides for approximately 280 pages of a 7.5% duty pattern in HQ mode.

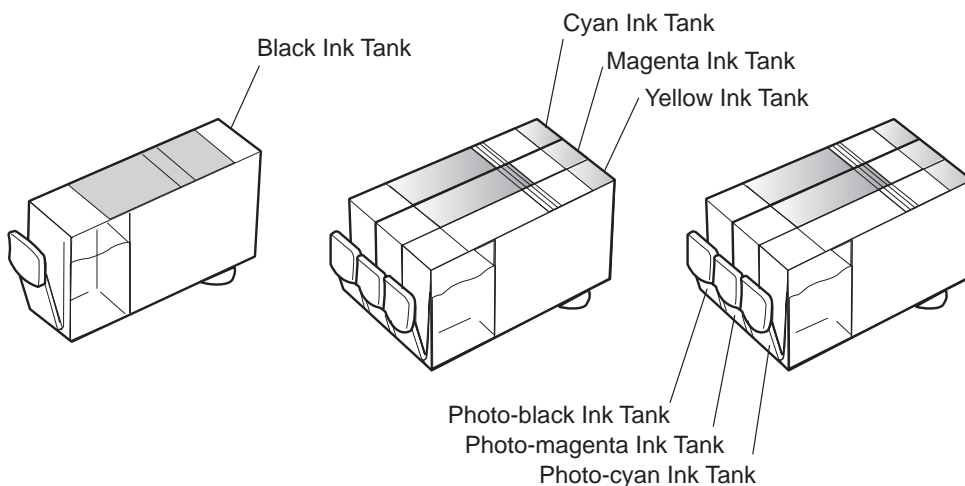


Figure 2-7 Ink Tanks

## 2. SPECIFICATIONS

### 2.1 General Specifications

- |  |  |
|--|--|
| <b>1. Type</b>                                     | Desktop serial color bubble-jet printer  |
| <b>2. Paper feeding method</b>                     | Automatic sheet feeder and manual sheet feed   |
| <b>3. Automatic sheet feeder capacity</b>          |  |
| Plain paper:                                       | 13 mm max. stacking height (about 130 sheets of 64 g/m <sup>2</sup> paper)                         |
| High-resolution paper:                             | 10 mm max. stacking height (about 100 sheets of 64 g/m <sup>2</sup> paper)                         |
| Envelopes (fed longitudinally):                    | 15 envelopes max. (max. 13mm stacking height)  |
| Transparencies:                                    | 30 sheets max.   |
| Back print film:                                   | 10 sheets max.   |
| Government postcard:                               | 40 sheets max.   |
| Glossy photo paper:                                | 10 sheets max.   |
| Gloss photo film:                                  | 1 sheet  |
| Fabric sheets:                                     | 1 sheet  |
| T-shirts transfer:                                 | 1 sheet  |
| <b>4. Printing speed</b>                           |  |
| Black printing:                                    | 788 cps in high speed mode,<br>567 cps in standard speed mode                                      |
| Color printing:                                    | About 1.6 ppm in high speed mode,<br>1.2 ppm in standard speed mode                                |
| Photo printing:                                    | 0.18 ppm in high quality mode  |
| <b>5. Printing direction</b>                       |  |
| HS mode:   | Bi-directional   |
| HQ mode:   | Bi-directional for 360 x 360 dpi.<br>Uni-directional for 720 x 720 dpi                             |
| Fine mode:   | Uni-directional  |
| <b>6. Printing width</b>                           | 218 mm max.  |
| <b>7. Line feed speed</b>                          | Approx. 118 ms   |
| <b>8. Internal print control mode</b>              |  |
|  | Canon extended mode (available when the Canon printer driver is used), no emulation mode available |
| <b>9. Printable characters (for test printing)</b> |  |
| Font:  | Courier  |
| Character set:                                     | Code page 850  |
| <b>10. Buffer size</b>                             | 128 KB   |
| <b>11. Interface</b>                               | IEEE 1284-compatible 8-bit parallel (ECP)  |

**12. BJ cartridges****Black BJ cartridge**

Construction:	Separate ink tank type
Print head:	160 nozzles, in-line
Ink:	Pigment black
Cartridge service life:	Approx. 5000 pages (1500-character, HQ mode)
Ink tank:	Black
Ink tank service life:	Approx. 500 pages (1500-character, HQ mode)
Cartridge weight:	Approx. 60 g (without ink tank)

**Color BJ cartridge**

Construction:	Separate ink tank type
Print head:	144 nozzles, in-line (48 nozzles x 3)
Inks:	Cyan, magenta and yellow
Cartridge service life:	Approx. 3000 pages (7.5% duty, HQ mode)
Ink tanks:	Yellow, magenta and cyan
Ink tank service life:	Approx. 280 pages (7.5% duty, HQ mode)
Cartridge weight:	Approx. 60 g (without ink tanks)

**Photo BJ cartridge**

Construction:	Separate ink tank type
Print head:	144 nozzles in line (48 nozzles x 3)
Inks:	Photo-black, photo-cyan and photo-magenta
Cartridge service life:	Approx. 3000 pages (7.5% duty, HQ mode)
Ink tanks:	Photo-black, photo-cyan and photo-magenta
Ink tank service life:	Approx. 280 pages (7.5% duty, HQ mode)
Cartridge weight:	Approx. 60 g (without ink tanks)

**13. Detection functions**

Cover open:	Yes	Paper detection:	Yes
BJ cartridge installed:	Yes	Ink-out :	Yes
Print position detection:	Yes	Waste ink amount:	Yes
BJ cartridge identification:	Yes	Paper width detection:	No

**14. Acoustic noise during operation**

Approx. 48 dB (A) or lower/ (HQ/HS mode)  
 (Sound pressure level: compliant with ISO9296)

**15. Environmental conditions**

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

**16. Power consumption**

100-120 Vac, 50/60 Hz, approx. 35 W max., approx. 4 W max. in standby mode

**17. External dimensions** 475 (W) x 280 (D) x 200 (H) mm

**18. Weight** 5.9 kg, including BJ cartridges

## 2.2 Paper Specifications

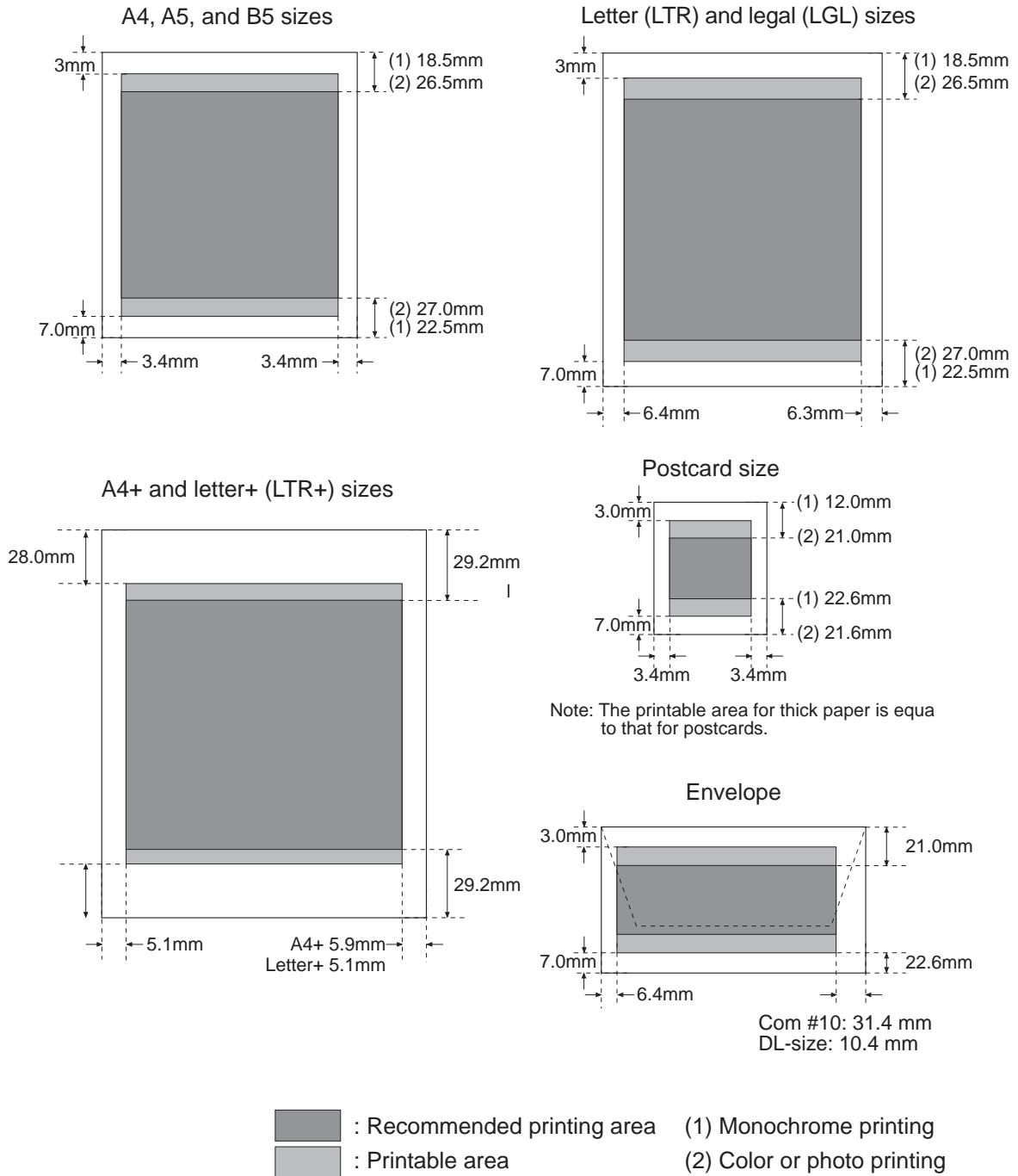
### 1. Paper sizes

A5 (148 x 210 mm)  
A4 (210 x 297 mm)  
A4+ (223 x 356 mm)  
B5 (182 x 257 mm)  
Letter (216 x 279 mm)  
Letter+ (229 x 338 mm)  
Legal (216 x 356 mm)  
Government postcard (100 x 148 mm)  
Envelope  
    Commercial number 10 envelope (9.5" x 4.1")  
    European DL-size (220 x 110 mm)  
Banner paper (203 x 1673 mm to 203 x 1779 mm)  
Free (100 x 100 mm to 216 x 584 mm)

### 2. Paper types

Plain paper  
    Weight: 64 to 105 g/m<sup>2</sup> for auto sheet feeder, 64 to 500 g/m<sup>2</sup> for manual feed  
    Thickness: max. 0.6 mm thick, max. 297 mm long  
Government Postcard  
    weight: max. 190 g/m<sup>2</sup>, max. 0.23 mm thick  
Canon BJ printer High-resolution paper  
Glossy photo paper  
Glossy photo film  
Transparencies  
Back print film  
Banner paper (long type)  
Note: Fan-fold paper or label paper cannot be used.

**3. Printable Area**



**Figure 2-8 Printable Area**

## 2.3 Interface Specifications

### 1) Interface type

IEEE1284-compatible parallel interface

### 2) Data transfer method

8-bit parallel (supporting nibble/ECP mode)

### 3) Signal level

Low level: +0.0 to +0.8 V

High level: +2.4 to +5.0 V

### 4) I/O

Each signal pulled up with +5 V.

### 5) Interface cable

Type: Shielded twisted-pair cable

Wire size: AWG 28 or larger

Length: 2.0 m max.

### 6) Interface connectors

Printer connector: Amphenol 57-40360 or equivalent

Cable connector: Amphenol 57-30360 or equivalent

### 7) I/O 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	P.E.-RET	...
13	SELECT	OUT	31	$\overline{\text{INIT}}$	IN
14	$\overline{\text{AUTO FEED XT}}^{*4}$	IN	32	$\overline{\text{ERROR}}$	OUT
15	N.C.*2	...	33	GND	...
16	INIT	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 +5.0 V through a 3.3 k resistor.

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



**Nibble 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	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	$\overline{\text{DataAvail}}$	OUT
15	N.C.*1	...	33	N.C.*1	...
16	Gnd	...	34	N.C.*1	...
17	Gnd	...	35	N.C.*1	...
18	Vcc	...	36	1284Active	IN

\*1: N.C. means no connection.

**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	$\overline{\text{AckReverse}}$	OUT	30	Signal Gnd	...
13	Xflag	OUT	31	$\overline{\text{ReverseReq}}$	IN
14	HostAck	IN	32	$\overline{\text{PeriphReq}}$	OUT
15	N.C.*1	...	33	N.C.*1	...
16	Gnd	...	34	N.C.*1	...
17	Gnd	...	35	N.C.*1	...
18	Vcc	...	36	1284Active	IN

\*1: N.C. means no connection.

**8) I/O signals****Compatible Mode:** **$\overline{\text{STROBE}}$  (Input)**

This signal asks the printer to read Data 1 to Data 8. This signal becomes valid after the BUSY signal goes "L" and the printer outputs ACKNLG. This signal is normally "H," and the printer receives data after this signal goes "L." This signal must be turned "H" before the printer can start printing.

**Data 1-8 (Input)**

The printer receives data in synchronization with  $\overline{\text{STROBE}}$ . Each bit of data must be maintained for at least 0.5  $\mu\text{s}$  after the rising edge of  $\overline{\text{STROBE}}$ .

 **$\overline{\text{ACKNLG}}$  (Output)**

This signal is returned in response to  $\overline{\text{STROBE}}$ . The host computer can output another  $\overline{\text{STROBE}}$  only after this signal is returned to the host computer. This signal is output regardless of  $\overline{\text{STROBE}}$  when the printer is powered up or when BUSY goes "L" in response to the INIT signal input from the host computer.

**BUSY (Output)**

The printer is BUSY when this signal is "H," and READY when this signal is "L." This signal goes "H" when the printer is receiving data or detects an error (paper out, paper jam, etc.).

 **$\overline{\text{P.E.}}$  (Output)**

This signal goes "H" if the paper feeding operation of the printer fails to feed paper. As this signal goes "H," BUSY goes "H," and SELECT and  $\overline{\text{ERROR}}$  go "L." This signal goes "L" when paper is set and fed. At this time both  $\overline{\text{ERROR}}$  and SELECT go "H." If the paper eject operation fails to eject paper (paper jam), this signal also goes "H," BUSY goes "H," SELECT goes "L," and  $\overline{\text{ERROR}}$  goes "L." Simply removing jammed paper from the printer does not automatically reset this signal.

**SELECT (Output)**

The printer makes this signal "H" when it is READY. If an error occurs (paper out, paper jam, etc.), this signal goes "L."

 **$\overline{\text{AUTO FEED XT}}$  (Input)**

When this signal is "L," the printer is set to the automatic line feed mode (CR=CR+LF). The printer reads this signal only at the time of power-up or initialization in response to the INIT signal.

**INIT (Input)**

When this signal goes "L," the printer is forced to BUSY, and this signal's "L"-to-"H" edge resets the printer. The pulse width of this signal must be at least 50  $\mu\text{s}$  as measured at the printer. After the initializing process, the printer moves its carriage to the home position, enters the 10 cpi mode, and is set in the condition specified by the function settings.

 **$\overline{\text{ERROR}}$  (Output)**

When the printer detects an error (paper out, paper jam, etc.), this signal goes "L" to notify the host computer that the printer is in error.

**SELECT IN (Input)**

When this signal is "H," the DC1/DC3 code is enabled; and when this signal is "L," the DC1/DC3 code is disabled. The printer reads this signal only at the time of power-up or initialization in response to the INIT signal.

**Nibble Mode:****Host Clk (Input)**

This is a STROBE signal for reading Data 1-8. During negotiation, this is the trigger signal for sending the protocol confirmation to the printer.

**Data 1-8 (Input)**

The printer receives data in synchronization with Host Clk. Each bit of data must be maintained for at least 0.5  $\mu$ s after the rising edge of Host Clk.

**Ptr Clk (Output)**

In the reverse data transmission phase, the printer asks the host computer to read data it has sent by making this signal "L." When the host computer has read the data, it acknowledges the receipt of the data by making Host Busy "H."

**Ptr Busy (Output)**

In the reverse data transmission phase, this signal serves as bit 3 and bit 7 of data to be sent.

**Ack Data Req (Output)**

In the reverse data transmission phase, this signal serves as bit 2 and bit 6 of data to be sent. During negotiation, this is the trigger signal for notifying the host computer of the printer's mode settings (whether nibble mode is supported, reverse transmission data is available, etc.).

**Xflag (Output)**

In the reverse data transmission phase, this signal serves as bit 1 and bit 5 of data to be sent. During negotiation, this signal tells the host computer whether or not the printer supports the nibble mode. When the printer supports the nibble mode, it makes this signal "L" in synchronization with the rising edge of Ack Data Req.

**Host Busy (Input)**

In the reverse data transmission phase, the host computer tells the printer that it has already received data by making this signal "L." When the Ptr Clk signal in the received data goes "L," this signal goes "L" in response. In the reverse transmission idle phase, when Ptr Clk goes "L," this signal goes "H" in response, returning to the reverse data transmission phase.

**INIT (Input)**

When this signal goes "L," the printer is forced to BUSY, and this signal's "L"-to-"H" edge resets the printer. This signal is normally "H," and the pulse width of this signal must be at least 50  $\mu$ s as measured at the printer.

**Data Avail (Output)**

In the reverse data transmission phase, this signal serves as bit 0 and bit 4 of data to be sent. During negotiation, this signal tells the host computer whether or not reverse transmission data is available. This signal is output in synchronization with the "H"-to-"L" falling edge of Ack Data Req, which defines the timing for notifying the availability of reverse transmission data.

**1284 Active (Input)**

This signal is used to confirm if the printer is 1284-compatible. Check is done when this signal is "H" and Host Busy is "L." This signal goes "L" in the termination phase.

**ECP Mode:****Host Clk (Input)**

When data is sent from the host computer to the printer, this signal and Periph Ack perform handshaking. The host computer makes this signal "L" to notify that it has output data onto the data bus (Data 1-8). This signal goes "H" in response to the rising edge of Periph Ack. This signal is always "H" in the reverse data transmission phase.

**Data 1-8 (Input/Output)**

These signals are input signals when data is sent from the host computer to the printer. In the reverse data transmission phase, these signals are output signals send data from the printer to the host computer over this data bus.

**Periph Clk (Output)**

This signal is always "H" when data is sent from the host computer to the printer. In the reverse data transmission phase, this signal goes "L" to notify that data has been output to the host computer. This signal goes "H" in response to the "L"-to-"H" rising edge of Host Ack from the host computer.

**Periph Ack (Output)**

When data is to be sent from the host computer to the printer, the printer makes this signal "L" if it is ready to receive data. The printer makes this signal "H" after it has received the data. In the reverse data transmission phase, this signal is used to tell whether the data the printer has output on the data bus is command or data ("L" means command and "H," data).

**Ack Reverse (Output)**

This signal is always "H" when data is sent from the host computer to the printer. In the reverse data transmission phase, this signal is always "L." When the host computer notifies the printer that the forward data transmission phase is to change to the reverse data transmission phase by making  $\overline{\text{Reverse Req}}$  "L," the printer acknowledges the notification by making this signal "L." Likewise, when the host computer notifies the printer that the reverse data transmission phase is to change to the forward data transmission phase by making  $\overline{\text{Reverse Req}}$  "H," the printer acknowledges the notification by making this signal "H."

**X flag (Output)**

This signal is always "H" in ECP mode.

**Host Ack (Input)**

When data is to be sent from the host computer to the printer, this signal is used to tell whether the data the host computer has output on the data bus is command or data ("L" means command and "H," data). In the reverse data transmission phase, this signal and Periph Clk perform handshaking. The host computer notifies the printer that it is ready to receive data by making this signal "L," and makes this signal "H" to notify that it has received the data.

**Reverse Req (Input)**

The host computer makes this signal "L" during a recovery process (re-sending data) in the forward data transmission phase. This signal goes "H" in response to the falling edge of Ack Reverse. The host computer also makes this signal "L" to notify the printer that the forward data transmission idle phase is to change to the reverse data transmission phase (data is to be sent from the printer to the host computer).

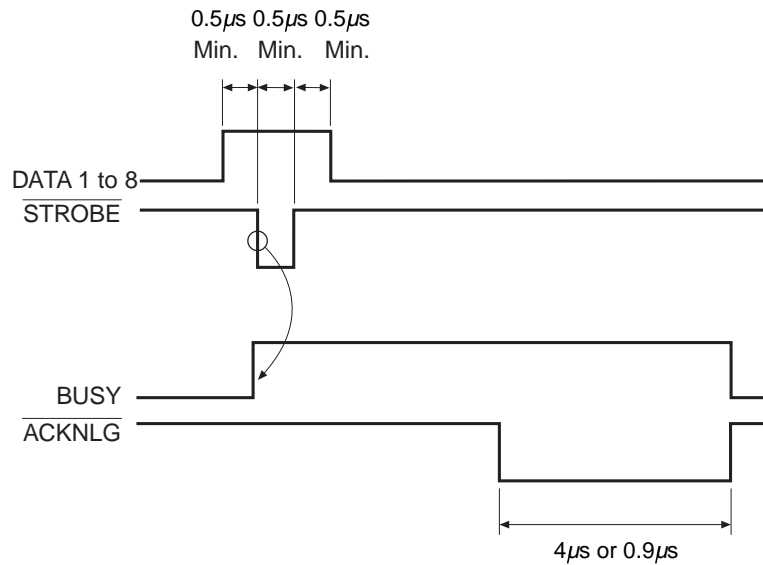
**Periph Req (Output)**

The printer makes this signal "L" to ask the host computer to change the forward data transmission phase to the reverse data transmission phase. When the host computer notifies the printer that the forward data transmission phase is to change to the reverse data transmission phase by making Reverse Req "L," the printer acknowledges by making both this signal and Ack Reverse "H."

**1284 Active (Input)**

This signal goes "H" at the start of negotiation and is always "H" in ECP mode to indicate that bi-directional operation is in effect. When ECP mode is to be terminated, this signal goes "L" and termination phase is entered.

**9) Timing charts**



**Figure 2-9 Timing Chart (Compatible mode)**

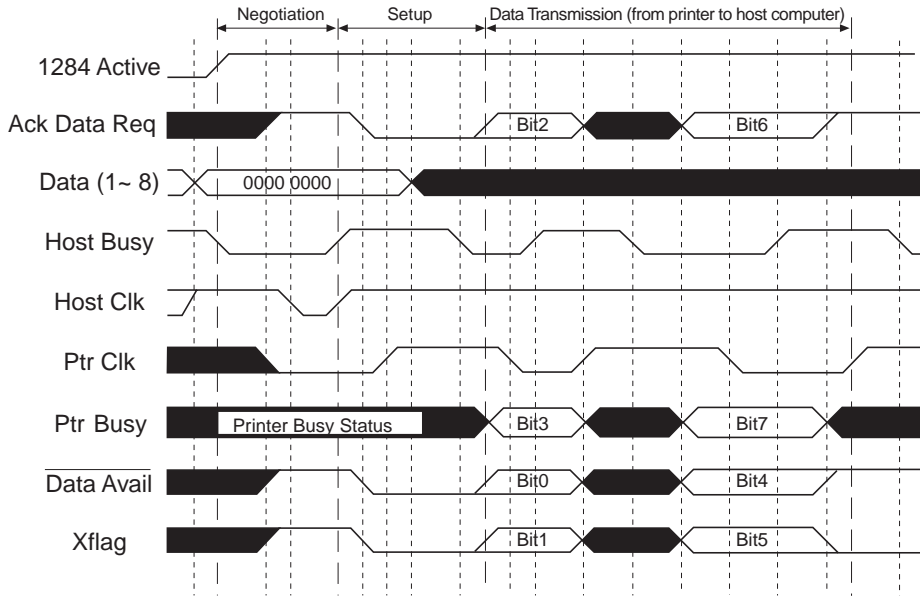


Figure 2-10 Timing Chart (Nibble mode)

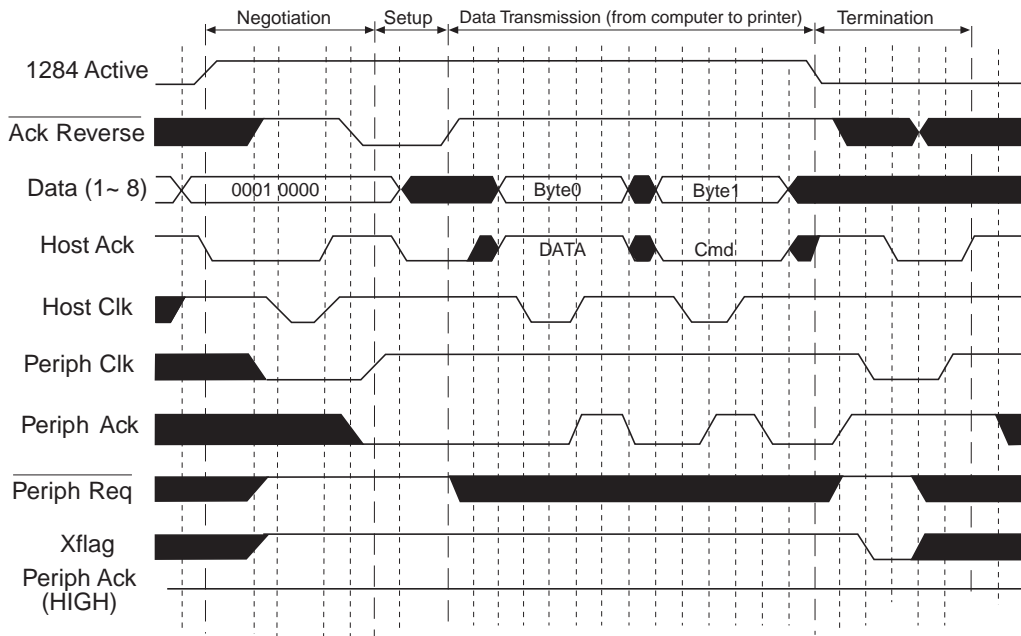


Figure 2-11 Timing Chart (ECP mode)

# *Part 3*

# **OPERATING INSTRUCTIONS**

Page	
3 - 1	1. PRINTER SETUP
3 - 1	1.1 Unpacking
3 - 2	1.2 Installation Location
3 - 3	1.3 Installation
3 -10	1.4 Names of Parts and Their Functions
3 -11	2. TRANSPORTING THE PRINTER
3 -11	2.1 Transporting the Printer
3 -12	3. PRINTER SERVICE FUNCTIONS
3 -12	3.1 Error Indications
3 -13	3.2 Description of Error Indications
3 -14	3.3 BJ Status Monitor
3 -15	3.4 Function Settings
3 -16	3.5 Off-Line Operations
3 -18	3.6 Service Mode





# 1. PRINTER SETUP

## 1.1 Unpacking

After unpacking, make sure the items below are included:

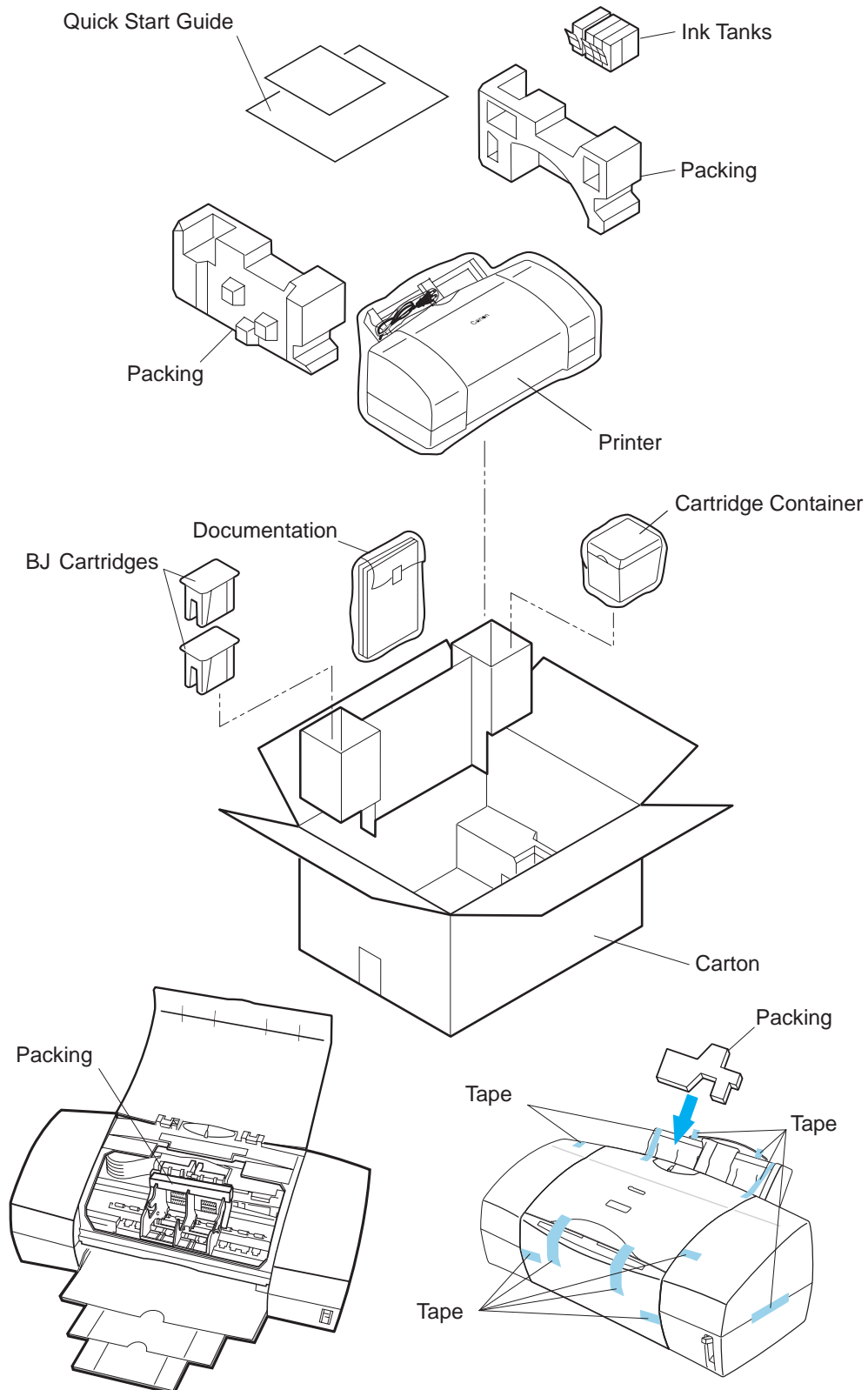
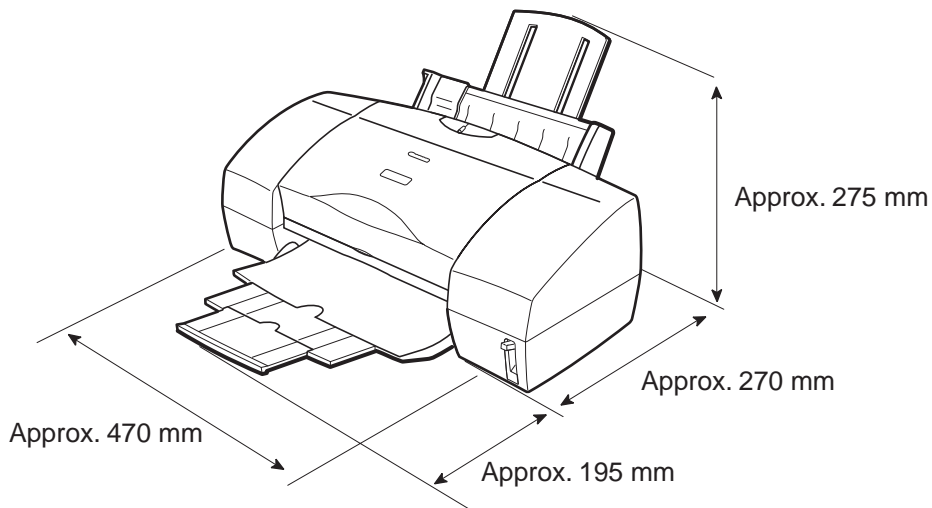


Figure 3-1 Packaging

## 1.2 Installation Location

To ensure optimum performance, install the printer where there is adequate space. The figure below illustrates the printer's outside dimensions.



**Figure 3-2 Printer Dimensions**



---

Use the printer where the ambient temperature is between 5°C and 35°C, and the ambient humidity is between 10% and 90% (no condensation). Install the printer on a stable and horizontal surface free of vibration. Do not install the printer where it is subject to direct sunlight or where it may be subject to rapid fluctuations in temperature, such as close to air conditioners. Also, do not leave the printer in a car where it may be subject to a rapid rise in temperature. Do not install the printer where it may be subject to excessive amounts of dust, or subject to sea breezes or other sources of salinity. Do not install close to a TV set, loudspeaker, or other sources of strong magnetism.

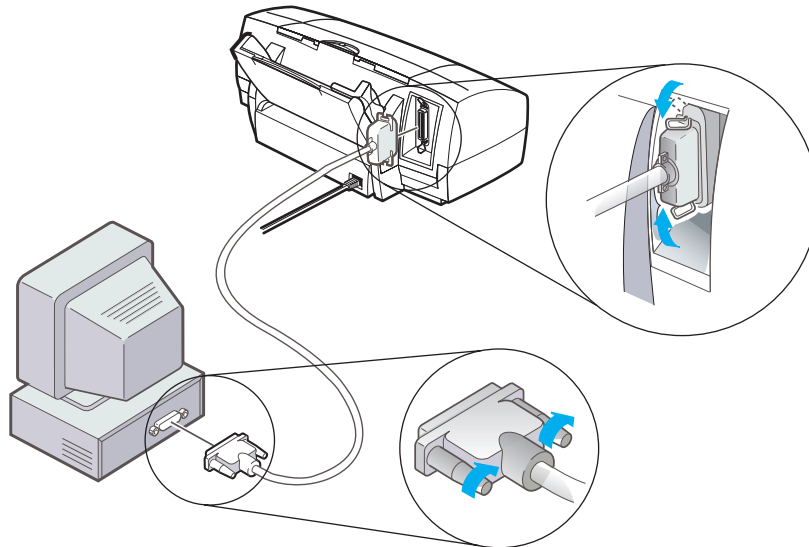
---

## 1.3 Installation

Set up the printer as follows.

### 1.3.1 Connecting the interface cable

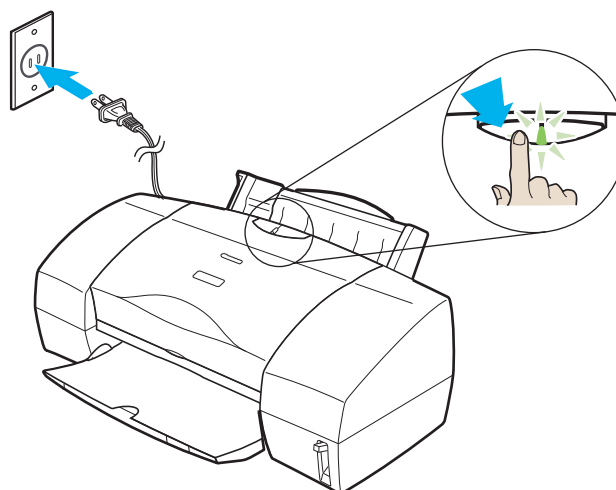
- 1) Make sure both the printer and the computer are switched OFF.
- 2) Connect the interface cable to the interface connector on the printer. Lock the connector clips.
- 3) Connect the other end of the interface cable to the computer.



**Figure 3-3 Connecting the Interface Cable**

### 1.3.2 Connecting the power cord

- 1) Connect the plug of the power cord to a wall outlet.
- 2) Press the printer's *POWER* button. The buzzer sounds and the *POWER* lamp blinks in green indicating that the printer is in the initialization process. After initialization, the *POWER* lamp lights in green. If BJ cartridges are not installed, the *POWER* lamp lights in orange, the buzzer sounds six times, and the carriage moves to the cartridge replacement position.



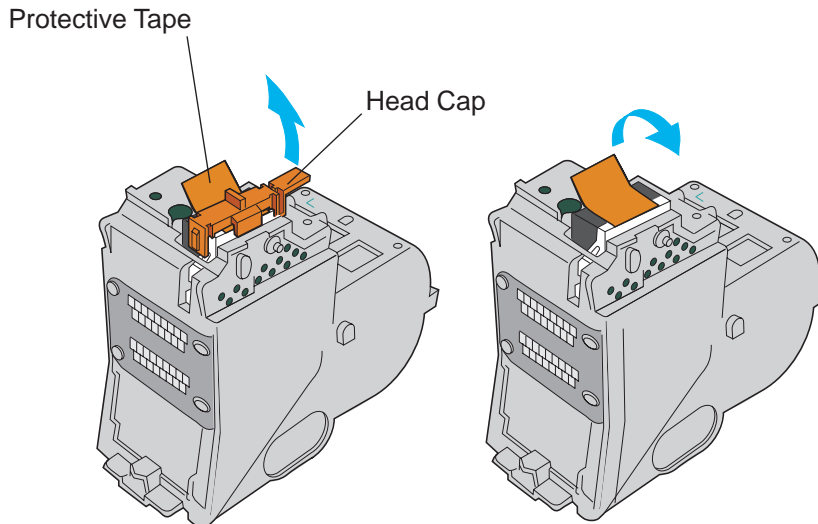
**Figure 3-4 Connecting the Power Cord**

### 1.3.3 Installing the BJ cartridges

This printer can be used with the Black, Color, and Photo BJ cartridges, in the following combinations : Black/Color BJ cartridges or Photo/Color BJ cartridges.

#### a) Removing head protection from the BJ cartridges

Remove the BJ cartridge from its package, and remove the head cap that protects the nozzles, and the protective tape from the cartridge, as shown in the figure below.



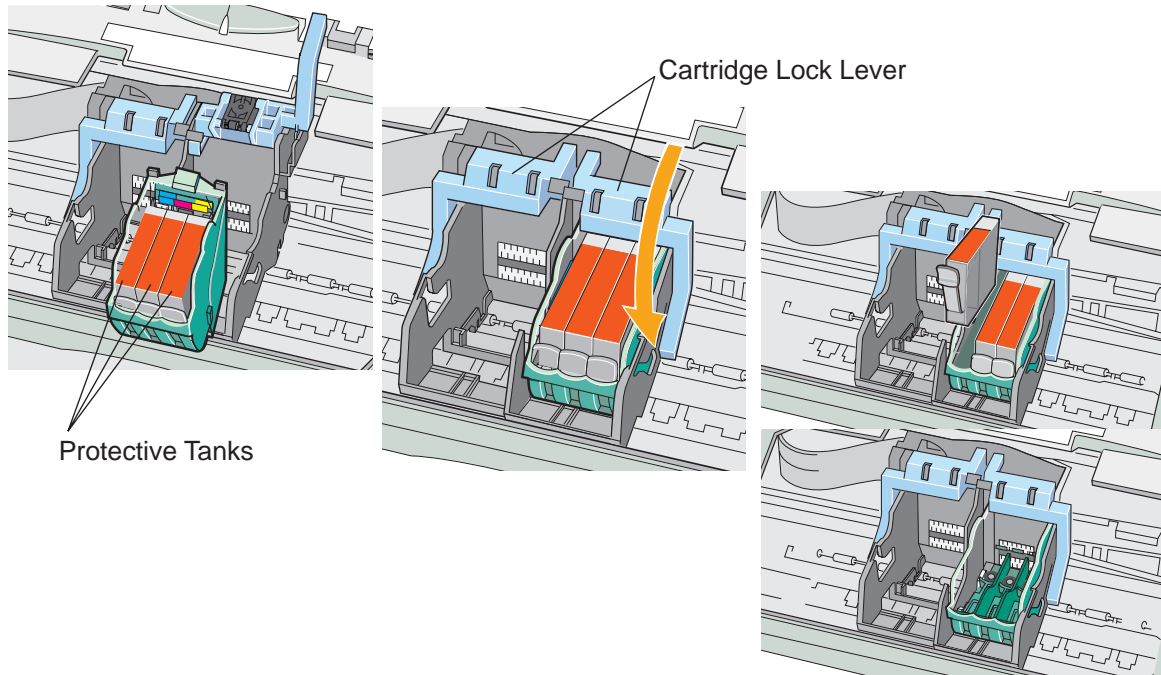
**Figure 3-5 Removing Head Cap and Tape from BJ Cartridge**



Do not reuse head caps or the protective tape that has been removed from a BJ cartridge. It may cause of nozzle clogging or mixing of inks. Be careful not to touch the nozzles when removing the tape, otherwise the nozzles may be damaged or collect dirt, resulting in poor printing. Do not shake the BJ cartridge after removing the head cap and tape, as ink may scatter.

**b) Installing the BJ cartridges**

Open the printer cover to install the BJ cartridges on the carriage. Install the Color BJ cartridge on the right side of the carriage. Install either the Black or Photo BJ cartridge on the left side of the carriage. After installing the BJ cartridges, secure them by lowering the cartridge lock lever. Remove the protective tanks from the BJ cartridges.



**Figure 3-6 Installing BJ Cartridges**



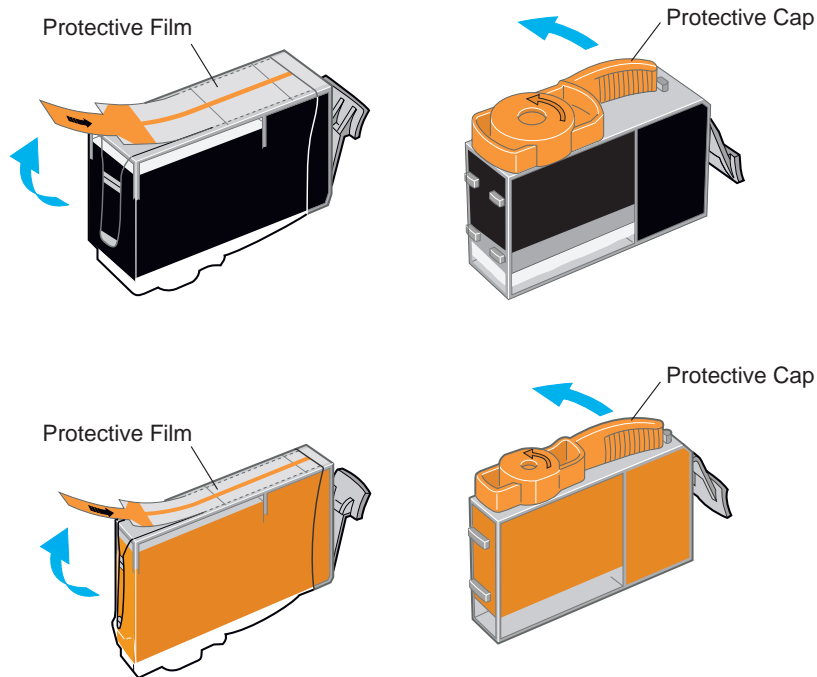
If both the left and right BJ cartridges are not installed correctly, the carriage may fail to return to its home position when the cover is closed. In this case, ensure that the BJ cartridges are installed firmly in the correct position. If the carriage does not return to the home position, refer to *Part 5: 6 TROUBLESHOOTING* (Page 5-13).



If the front cover is left open for ten minutes with both BJ cartridges installed, the buzzer sounds for 30 seconds, and the carriage moves to the capping position to protect the BJ cartridges' nozzles.

**c) Installing the ink tanks**

Peel off the protective film from the ink tank, and slowly turn the protective cap off. Install the ink tanks in the BJ cartridges in the correct positions as indicated by the label affixed inside the printer. When the cover is closed, the printer undergoes the ink tank initializing process (approx. 30 seconds), and the carriage moves to the home position.



**Figure 3-7 Installing the Ink Tanks**



The ink tanks other than the black ink tanks are identical in shape and size. Paying attention to the colors of the ink tanks, install them in their correct positions as indicated by the label affixed inside the printer.

**d) Replacing the BJ cartridges**

When the printer's front cover is opened, the carriage moves to the cartridge replacement position. Raise the cartridge lock lever to remove the BJ cartridge. Replace the cartridge with another one and lower the cartridge lock lever to secure it. When the front cover is closed, the printer starts the BJ cartridge initializing process (approx. 30 seconds). Store the removed cartridge in the cartridge container.



When switched OFF, the printer moves the carriage to the capping position so that it is locked in place by the carriage locking mechanism. Never pull the carriage's ribbon cable to move the carriage. When the buzzer sounds four times and the carriage does not return to the replacement position, even though the front cover is open, the BJ cartridges may have overheated. Close the front cover and wait for a while to let the BJ cartridges cool down naturally before reopening the front cover.

**e) Replacing the ink tanks**

For the Black, Color and Photo BJ cartridges, each ink tank can be individually replaced.

**1) When to replace the ink tank**

Replace the ink tank with a new one if no ink can be seen inside, or as indicated by the ink-out alarm, or if it was unpackaged for more than six months and printing quality does not improve even after several cleanings.



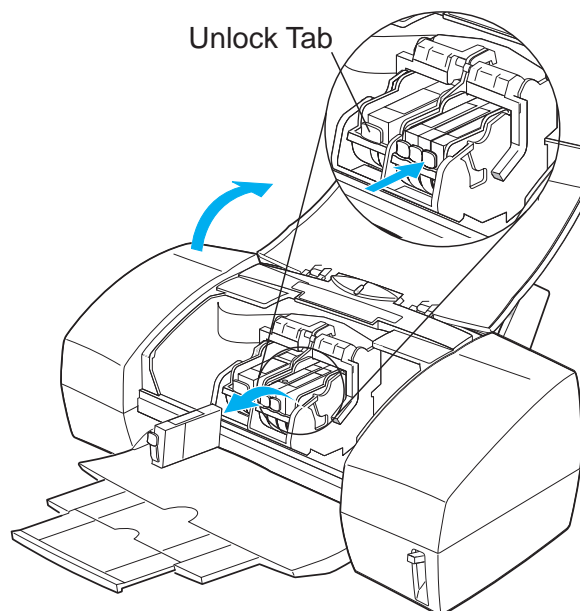
---

If printing quality still does not improve, even with a new ink tank installed, perform cleaning operations 1-5 times. If this does not solve the problem, replace the BJ cartridge.

---

**2) Removing an ink tank**

Open the printer's front cover to have the carriage move to the cartridge replacement position. Press the unlock tab of the ink tank, and remove the ink tank.



**Figure 3-8 Replacing an Ink Tank**



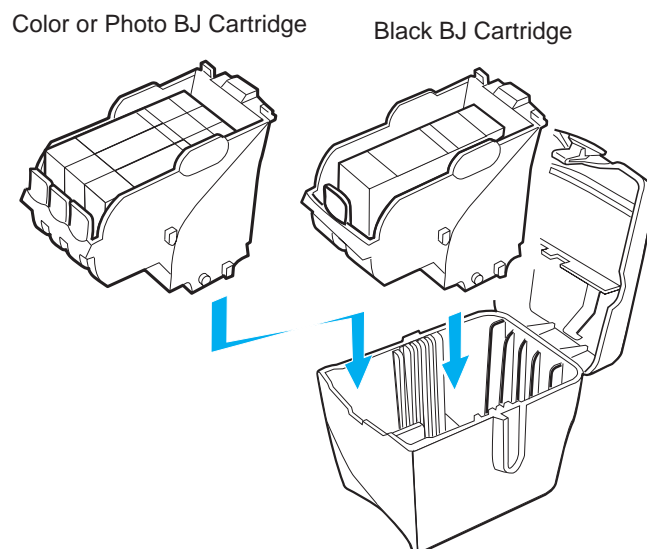
---

The ink supply pieces and nearby areas of the ink tank may be stained with ink. Be careful not to get your hands or clothing stained with ink when replacing the ink tank.

---

**f) Cartridge container**

This printer comes with a BJ cartridge container to store BJ cartridges. Once you have removed a BJ cartridge from the printer, store it in this cartridge container, ink tanks installed in place. If the BJ cartridge is left in open air, its nozzles may be damaged or clogged by dried ink. The cartridge container can hold one Black, Color or Photo BJ cartridge.



**Figure 3-9 Cartridge Container**



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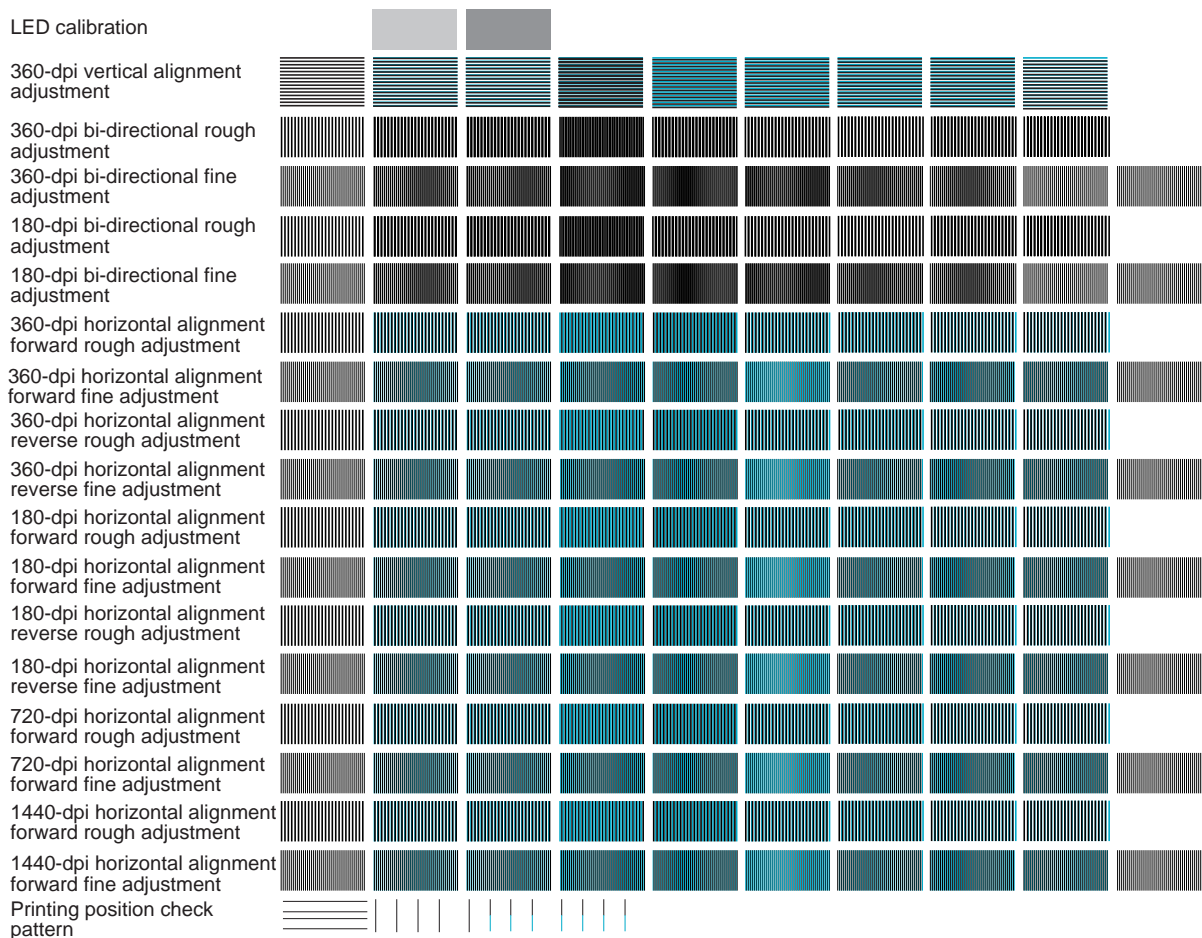
Always store a BJ cartridge in the cartridge container with ink tanks installed in place, otherwise, ink may leak or dry up. Do not shake or drop the cartridge container containing a BJ cartridge, otherwise, ink may leak, or the BJ cartridge or the cartridge container may be damaged.

---



### 1.3.4 Aligning the print heads

As there are two BJ cartridges installed in this printer, even a slight difference in size or seating position between them may result in inaccurate dot placement, and thereby poor printing. To correct this, after installing the BJ cartridges, perform the automatic head position adjustment, one of the utilities the printer driver package provides. If a computer is not available, you can still perform the head position adjustment in service mode. For the procedures, refer to *Part 3: 3.6.1 Service mode operations* (Page 3-18). Set at least one sheet of B5 (or larger) plain paper in the ASF, and select the head position alignment pattern in the test print area of the printer driver's Utility sheet.



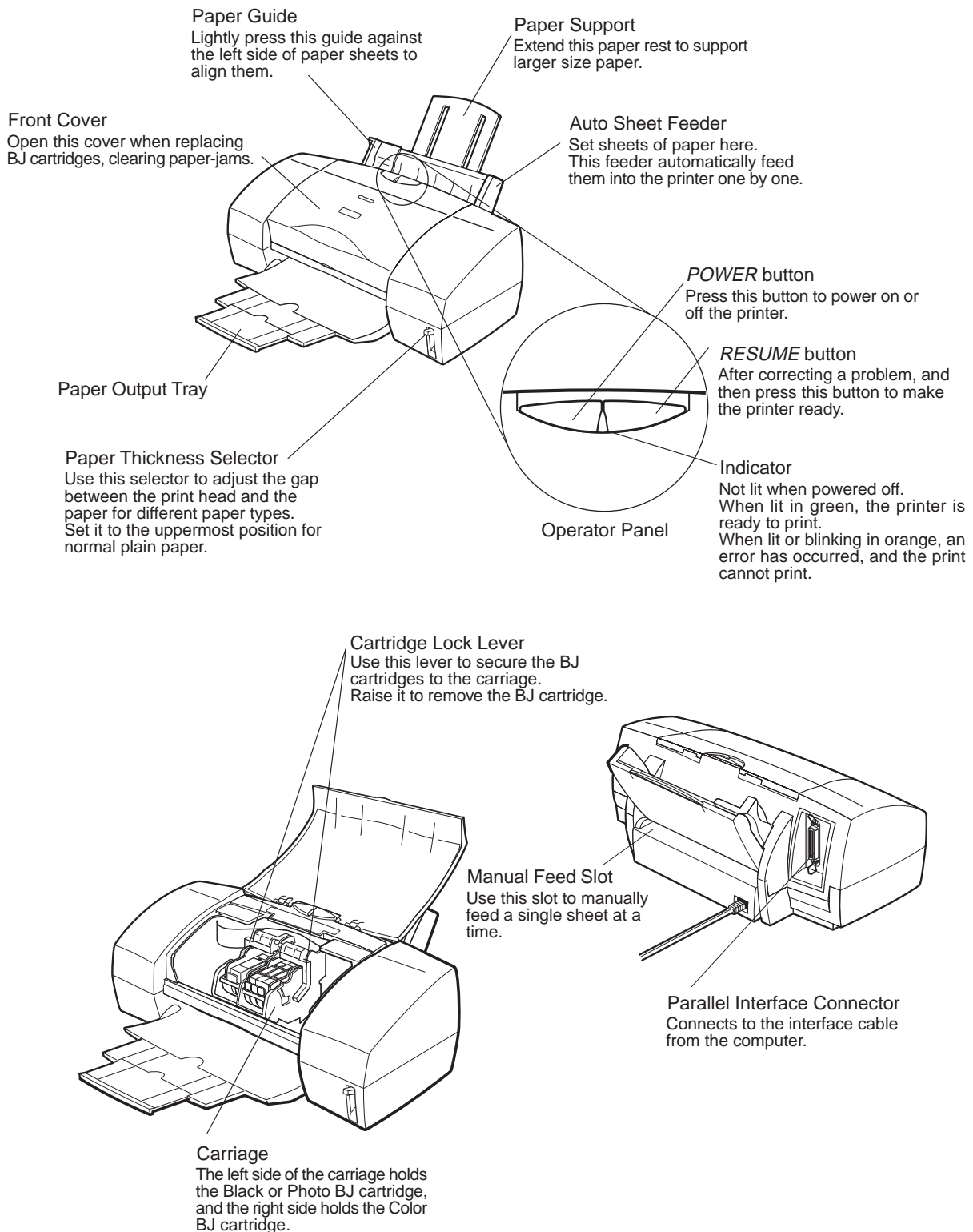
**Figure 3-10 Print Position Adjustment Pattern**



Use paper of B5 size or larger for the automatic head position adjustment, otherwise, the platen may be smeared with ink.

## 1.4 Names of Parts and Their Functions

The main parts of the printer and their functions are illustrated below.



**Figure 3-11 Names of Parts and Their Functions**

## 2. TRANSPORTING THE PRINTER

When carrying or transporting the printer, keep BJ cartridges installed in the printer, or stored in the cartridge container. This prevents the ink from leaking or drying out in the nozzles during transportation. To prevent ink leakage, transport the printer with the ink tanks installed in the BJ cartridge.

### 2.1 Transporting the Printer

When transporting the printer, follow the procedures below:

- 1) Press the *POWER* button to turn off the printer. The *POWER* indicator will go out.
- 2) Disconnect the interface cable.
- 3) Unplug the power cord from the wall outlet.
- 4) Open the front cover and check that the carriage is locked in the capping position (on the right side of printer). If the carriage is not in the capping position, move it manually to the capping position, and secure it there with tape.
- 5) Close the cover.
- 6) Pack the printer in its' original packing in its' original carton. If the original packing materials are not available, wrap the printer with sufficient shock absorbing material.



---

Do not unplug the printer before switching off the printer with the *POWER* button, otherwise, the BJ cartridges' nozzles will not be capped, which may result in ink may leak or dry-out. Do not carry a BJ cartridge and its ink tanks separately.

---

# 3. PRINTER SERVICE FUNCTIONS

## 3.1 Error Indications

This printer displays errors with the indicator lamp and buzzer. Also, when an error occurs during printing, an error code is displayed on the status monitor to indicate the type of the error.

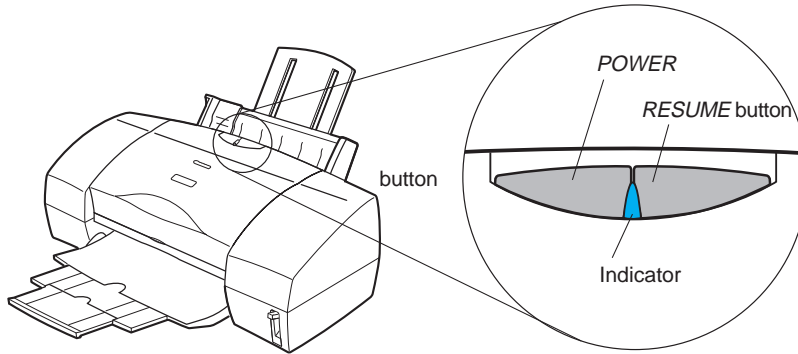


Figure 3-12 Operator Panel

For troubleshooting procedures, refer to *Part 5: 6 TROUBLESHOOTING* (Page 5-13).

TABLE 3-1 ERROR INDICATIONS

Errors	Indicator	Beeps	Error code	Reference page
<b>[Recoverable by user]</b>				
Paper feed error	Lights in Orange	2 times		Page 5-25
Paper jam	Lights in Orange	3 times		Page 5-25
Ink out	Lights in Orange	4 times		Page 5-27
BJ cartridge mis-installed	Lights in Orange	5 times		Page 5-28
No BJ cartridge	Lights in Orange	6 times		Page 5-28
BJ cartridge error	Lights in Orange	7 times		Page 5-28
Waste ink warning	Lights in Orange	8 times		
Auto head adjustment error	Lights in Orange	9 times		Page 5-29
<b>[Unrecoverable by user]</b>				
ROM error	Blinks in Orange 1 time	10 times		Page 5-18
RAM error	Blinks in Orange 2 times	10 times		Page 5-18
EEPROM error	Blinks in Orange 3 times	10 times	6800	Page 5-18
Home position error	Blinks in Orange 4 times	10 times	5100	Page 5-19
Temperature sensor error	Blinks in Orange 5 times	10 times	5400	Page 5-22
Waste ink full error	Blinks in Orange 6 times	10 times	5B00	Page 5-22
Head temperature error	Blinks in Orange 7 times	10 times	5200	Page 5-23
Head temperature sensor error	Blinks in Orange 8 times	10 times	5200	Page 5-23
Cartridge displaced error	Blinks in Orange 9 times	10 times	5600	Page 5-24
<b>[Internal errors]</b>				
Ink sensor error	No indication	None	5910	
Pump sensor error	No indication	None	5C00	

Note: Internal errors are not displayed, but can be checked by printing the EEPROM information (see Page 3-20).

## 3.2 Description of Error Indications

### Errors recoverable by users:

#### 1) Paper feed error

Paper feed operation fails to feed paper.

#### 2) Paper jam error

Paper eject operation of 23 inches still fails to eject the paper.

#### 3) Ink out error

The indicated ink tank is out of ink (ink chamber and sponge).

#### 4) BJ cartridge mis-installed error

The BJ cartridges are not installed in their correct positions.

#### 5) No BJ cartridge error

One or both of the BJ cartridges are not installed.

#### 6) BJ cartridge error

One or both of the BJ cartridges are defective.

#### 7) Waste ink warning

The calculated (and stored in EEPROM) amount of waste ink absorbed has reached 95% of the defined absorbing capacity.

#### 8) Auto head adjustment error

The automatic head position adjustment has failed.

### Errors unrecoverable by users:

#### 9) ROM error

ROM checking during initialization is NG.

#### 10) RAM error

RAM checking during initialization is NG.

#### 11) EEPROM error

Writing to EEPROM has failed.

#### 12) Home position error

The home position sensor is defective (broken circuit) or otherwise fails to detect home position.

#### 13) Temperature sensor error

The thermal sensor (TH201) on the logic board is defective (broken circuit).

#### 14) Waste ink full error

The calculated (and stored in EEPROM) amount of waste ink absorbed has reached the 100% of defined absorbing capacity.

#### 15) Head temperature error

The inside temperature of the BJ cartridge is too high. This error should occur earlier than the head temperature sensor error.

#### 16) Head temperature sensor error

The thermal sensor in the BJ cartridge is defective.

#### 17) Cartridge displaced error

The printer cannot detect the BJ cartridge when the carriage is out of the cartridge replacement position.

#### 18) Ink sensor error

Ink sensor checking during initialization is NG. If this error occurs, no indication is made, but the printer will not check ink level and assumes that the level is normal until the printer is switched off. You can confirm the error by printing the EEPROM information.

#### 19) Pump sensor error

Pump sensor checking during initialization is NG. No indication is made for this error, but it can be confirmed by printing the EEPROM information.

### 3.3 BJ Status Monitor

The BJ status monitor window shows the printer's conditions and print-job progress. You can stop the print-job from this window.

#### 3.3.1 Main functions of the BJ status monitor

- 1) Show the printer's conditions and progress in real-time by means of graphics and messages.
- 2) Display error types and show recommended recovery methods.
- 3) Show the types of the BJ cartridges installed and the ink-out warnings of ink tanks by icon and name.
- 4) Can be used to abort the current print-job.

#### 3.3.2 Items displayed on the BJ status monitor

- 1) Printer designation
- 2) Document name
- 3) Printer conditions (including error codes and recommended recovery methods)
- 4) Date and time of print start
- 5) Progress status
- 6) Number of pages printed
- 7) Print-job abortion
- 8) BJ cartridge identification (icons graphically display the types and positions of installed BJ cartridges, and the ink-out warnings of ink tanks )

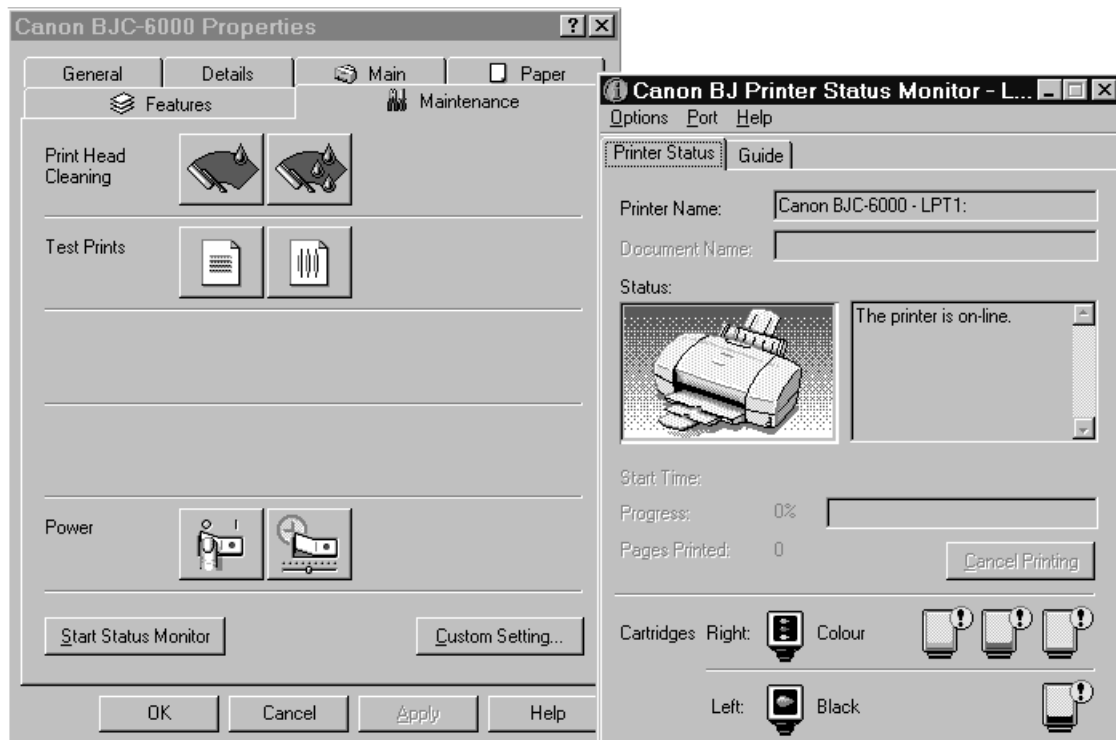


Figure 3-13 BJ Status Monitor (Sample)

### 3.4 Function Settings

As this printer has no physical function selectors, function settings can be set by using the Canon printer driver.

#### 3.4.1 Function settings using the printer driver

The printer driver's utility menu allows such operations and function settings as listed below. In the menu, you can also invoke a special custom menu by, while pressing the shift key, selecting Custom Settings.

- 1) Cleaning
  - 2) Head refreshing
  - 3) Nozzle check pattern printing
  - 4) Head position adjustment
  - 5) Printer power off
  - 6) Automatic power supply setting
  - 7) Launching the status monitor
  - 8) Custom settings
    - Enable ECP mode (disabled by default)
    - Enable high speed printing (enabled by default): Printer's response time (ACKNLG) is changed from 4 to 0.9 ms.
    - Enable pause-between-pages (disabled by default): See Page 4-16.
    - Enable pause-between-scanning (disabled by default): See Page 4-16.
    - Enable automatic head position adjustment following BJ cartridge replacement (disabled by default)
    - Enable manual head position adjustment (disabled by default)
- <In the special custom menu (special-custom/service mode)>
- Economic cleaning (disabled by default): Cleaning operation at power up is omitted if the printer has been switched off for less than 72 hours. Enabling this function is useful for saving ink, especially when the printer's power is provided through the computer (possibility of nozzle clogging increases).
  - Smear control (enabled by default): When the smear control (see Page 4-16) is enabled, ink smearing of ink on paper due to paper-to-paper contact is prevented. Smear control is especially useful for high duty printing on normal plain paper or post cards. When smear control is disabled (and printed sheets are collected directly following printing), throughput increases.

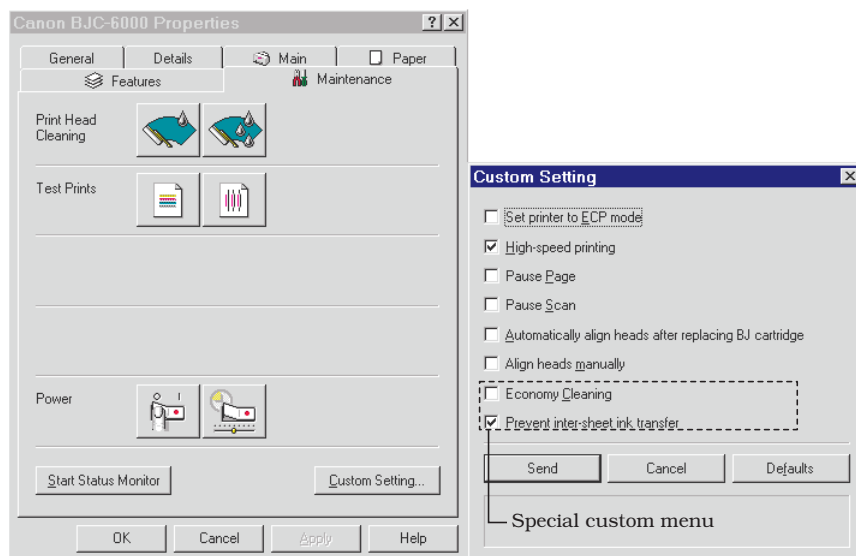


Figure 3-14 Printer Driver Utility (Sample)

### 3.5 Off-line Operations

This printer has three operations which can be performed independent of the computer: To select these operations, while holding down the *RESUME* button, power on the printer by pressing the *POWER* button, confirm the specified number of beeps, and then release the *RESUME* button.

Operations	Number of beeps	Remarks
Cleaning	1 time	
Nozzle check pattern printing	2 times	Printer prints one sheet and powers down.
Roller cleaning	3 times	One cleaning sheet is fed and ejected to clean the rollers.

#### 3.5.1 Cleaning

With the printer powered on, hold down the *RESUME* button and after confirming one beep, release the *RESUME* button. The cleaning operation will start, cleaning both (right and left) print heads. If you want to clean only one print head, connect the printer to the computer, and perform the print-head cleaning from the computer using the printer driver utility.

#### 3.5.2 Nozzle check pattern printing

With the printer powered on, hold down the *RESUME* button and after confirming two beeps, release the *RESUME* button. The nozzle check pattern printing will start, feeding a sheet, which must be of B5 size or larger, from either the auto sheet feeder or the manual feed slot, and print a standard pattern using all nozzles of both installed BJ cartridges. If print defects are detected in the test print, perform print-head cleaning. If five or more cleaning operations fail to solve the problem, replace the BJ cartridge with a new one.

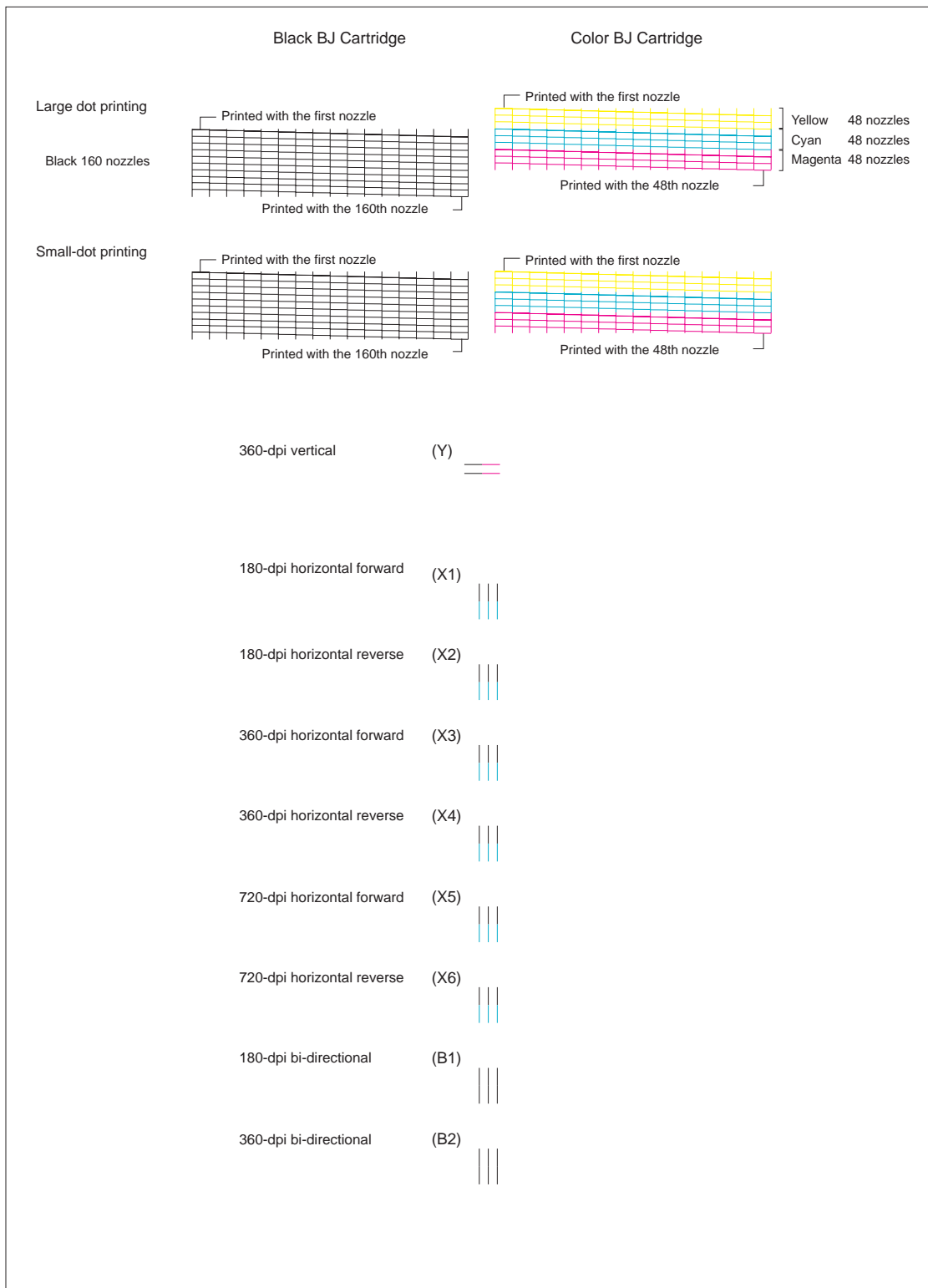


Use paper of B5 size or larger for the nozzle check pattern printing. If you use smaller paper, the platen may be smeared with ink.



To abort the nozzle check pattern printing, press the *POWER* button. The printer will switch itself off after ejecting the paper.





**Figure 3-15 Nozzle Check Pattern Print (Sample for Black/Color Cartridge)**

### 3.5.3 Roller cleaning

With the printer powered on, hold down the *RESUME* button and after confirming three beeps, release the *RESUME* button. The roller cleaning will start, feeding a cleaning sheet from the auto sheet feeder and ejecting it without printing so that paper dust is removed it from the pick-up rollers and paper feed rollers.

### 3.6 Service Mode

This printer has a service mode for service-related settings or performing test printing. The operator panel buttons are used to enter service mode.

#### 3.6.1 Service mode operations

- 1) With the printer powered off, while pressing the *RESUME* button, press the *POWER* button. The buzzer will sound once.
- 2) While holding down the *POWER* button, release the *RESUME* button. Press the *RESUME* button twice in succession, and then release the *POWER* button. (Each time the *RESUME* button is pushed, the buzzer will sound once.) The indicator will blink in green, and then light in green.
- 3) Select one of the following service mode functions by pressing the *RESUME* button the specified number of times.

Press	Indicator	Functions
Zero times	Green	Service/factory test print
1 time	Orange	EEPROM information printing
2 times	Green	EEPROM initializing (reset to default settings, but model setting is not cleared)
3 times	Orange	Waste ink counter clear
4 times	Green	Model setting
5 times	Orange	Automatic head position adjustment operations
6 times or more	Green	Power off

- 4) Execute the function you have selected (except for model setting) by pressing the *POWER* button. The buzzer will sound once. The printer will switch off itself after performing the function.

For the model setting function, select BJF600 or BJC-6000 by pressing the *RESUME* button zero or one time respectively. (The buzzer will sound each time the *RESUME* button is pressed.)

Press	Indicator	Model
Zero times	Green	BJ F600
1 time	Orange	BJC-6000
2 times	...	Reserve

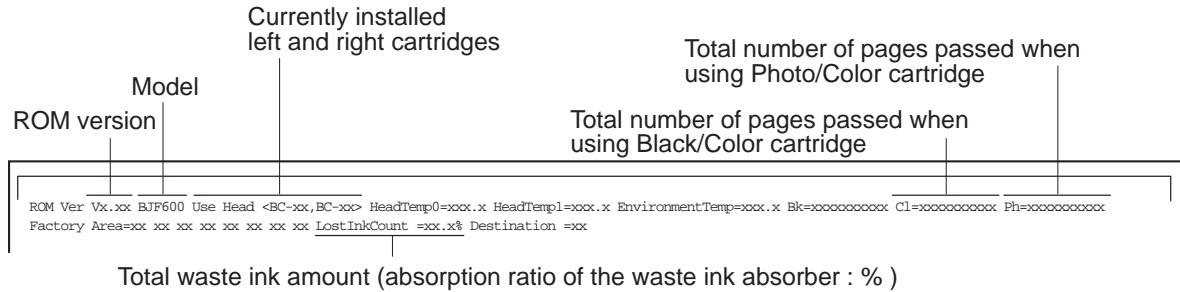
Validate the model you have selected by pressing the *POWER* button. The buzzer will sound once. (The printer will switch off itself after performing the operation.)



Use the Black and Color BJ cartridges for the service/factory test printing. It is not possible to enter Service Mode without cartridges installed. (Also, the Photo and Color BJ cartridges cannot be used for service/factory test printing.) If you have changed the model setting, perform the service/factory test printing for confirmation.

### 3.6.2 Service/factory test print

The service/factory test print displays, in the header portion, such information as the control ROM version, model setting, total sheets passed, and total waste ink absorbed.



**Figure 3-16 Service/Factory Test Print**

### 3.6.3 EEPROM information print

The EEPROM stores such information as function settings, total sheets passed with the Black/Color or Photo/Color cartridges, total waste ink absorbed, and records the last three errors recoverable only by service personnel. The information stored in the EEPROM is printed out as a hexadecimal dump in the EEPROM information print. The EEPROM information is useful especially for knowing how heavily the printer has been used.

```

- EEPROM Information <Hex.> -
Address      +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +A +B +C +D +E +F
00000000    05 20 00 0A 00 00 B8 83 00 0C 9F 40 09 35 1C 28
00000010    00 00 00 00 2A 6A 51 A1 38 54 AA A0 1E 16 DA 3C
00000020    35 6C B7 AB 33 BC E9 71 32 DD 02 0C 00 00 00 00
00000030    14 00 0A 07 04 02 02 02 00 00 00 00 0A 80 00 00
00000040    04 90 00 08 00 00 00 44 00 00 00 44 00 00 00 44
00000050    00 00 00 00 00 00 04 44 00 00 00 00 00 00 02 B9
00000060    00 00 00 1D 00 58 00 1B 00 01 00 2F 00 06 00 00
00000070    00 00 00 00 00 00 08 00 00 08 00 00 08 00 00 08
00000080    00 00 00 72 00 00 00 2E 00 00 00 30 83 00 00 00
00000090    3C 00 00 10 10 0C 0C 08 0C 10 0C 0C 0C 10 0C 0C
000000A0    0C 04 00 08 00 0C 0C 00 FD 07 00 00 04 04 00 00
000000B0    00 00 00 00 04 04 00 00 00 00 00 00 00 00 00 00
000000C0    00 00 00 00 15 0B BB 19 35 1A D5 C6 13 0A 46 61
000000D0    04 19 57 AB 98 1A 72 13 00 45 93 6B 46 34 63 E3
000000E0    35 36 30 30 35 36 30 30 35 36 30 30 FF FF FF F0
000000F0    00 00 00 D6 67 7C 73 FF 01 FF FF FF FF FF FF

```

┌───┬───┬───┬───┐

Last error record

┌───┬───┬───┬───┬───┬───┬───┬───┐

Second error record  
from the last

┌───┬───┬───┬───┬───┬───┬───┬───┬───┬───┐

Third error record  
from the last

Error records are printed, in error code, for the last three errors which are recoverable only by service personnel except for ROM/RAM errors in the order that the latest error first and the oldest error last.

Errors	Error code	ASCII code representation
EEPROM error	6800	36 38 30 30
Home position error	5100	35 31 30 30
Temperature sensor error	5400	35 34 30 30
Waste ink full error	5B00	35 42 30 30
Head temperature error	5200	35 32 30 30
Head temperature sensor error	5200	35 32 30 30
Cartridge displaced error	5600	35 36 30 30
Ink sensor error	5900	35 39 31 30
Pump sensor error	5C00	35 43 30 30

Figure 3-17 EEPROM Information Print (Sample)

### **3.6.4 Resetting EEPROM**

The EEPROM stores such information as function settings, total sheets passed with the Black/Color or Photo/Color cartridge, total waste ink absorbed, and the last three errors recoverable only by service personnel. Because the waste ink full error is based on the data of the total waste ink absorbed as stored in the EEPROM, the Waste Ink Counter must be cleared whenever the waste ink absorber has been replaced. If the control board has been replaced, the new EEPROM must also be initialized. In this case, the waste ink absorber must also be replaced with a new one. For the EEPROM initializing procedure, refer to *Part 3: 3.6.1 Service mode operations* (Page 3-18).

### **3.6.5 Model setting**

The control board of this printer is a common component for different printers. If you have replaced the control board, it is necessary to set the mode setting as initial information. For model setting procedures, refer to *Part 3: 3.6.1 Service mode operations* (Page 3-18). After setting the model setting, perform the service/factory test printing for confirmation.

### **3.6.6 Automatic head position adjustment**

The automatic head position adjustment can be performed off-line (without being connected to a computer). The printer will perform the automatic adjustment in the same way as if the user initiated the adjustment from the computer via the printer driver utility. For details, refer to *Part 3: 1.3.4 Aligning the print heads* (Page 3-9).

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# *Part 4*

## **TECHNICAL REFERENCE**

Page	
4 - 1	1. OVERVIEW
4 - 1	1.1 Printer Block Diagram
4 - 2	1.2 Power On Sequence Flowchart
4 - 3	1.3 Flow of Print Signals
4 - 4	1.4 Print Driving
4 - 9	1.5 Power-Off Sequence Flowchart
4 -10	2. FIRMWARE
4 -10	2.1 Interface
4 -13	2.2 Print Control
4 -15	2.3 Automatic Printing Position Alignment Function
4 -16	2.4 Pause Between Scanning
4 -16	2.5 Pause Between Pages
4 -16	2.6 Smear Control
4 -16	2.7 Auto Power ON/OFF
4 -16	2.8 Head Overheat Protection
4 -17	3. PRINTER'S MECHANICAL SYSTEM
4 -17	3.1 Overview
4 -19	3.2 BJ Cartridge
4 -25	3.3 Purge Unit
4 -28	3.4 Paper Feed Unit
4 -32	3.5 Carriage Unit
4 -36	4. PRINTER'S ELECTRICAL SYSTEM
4 -36	4.1 Overview
4 -37	4.2 Control Unit
4 -41	4.3 Power Supply Unit
4 -42	5. DETECTION FUNCTIONS
4 -42	5.1 Detection with Sensors
4 -44	5.2 Other Detection Functions





# 1. OVERVIEW

## 1.1 Printer Block Diagram

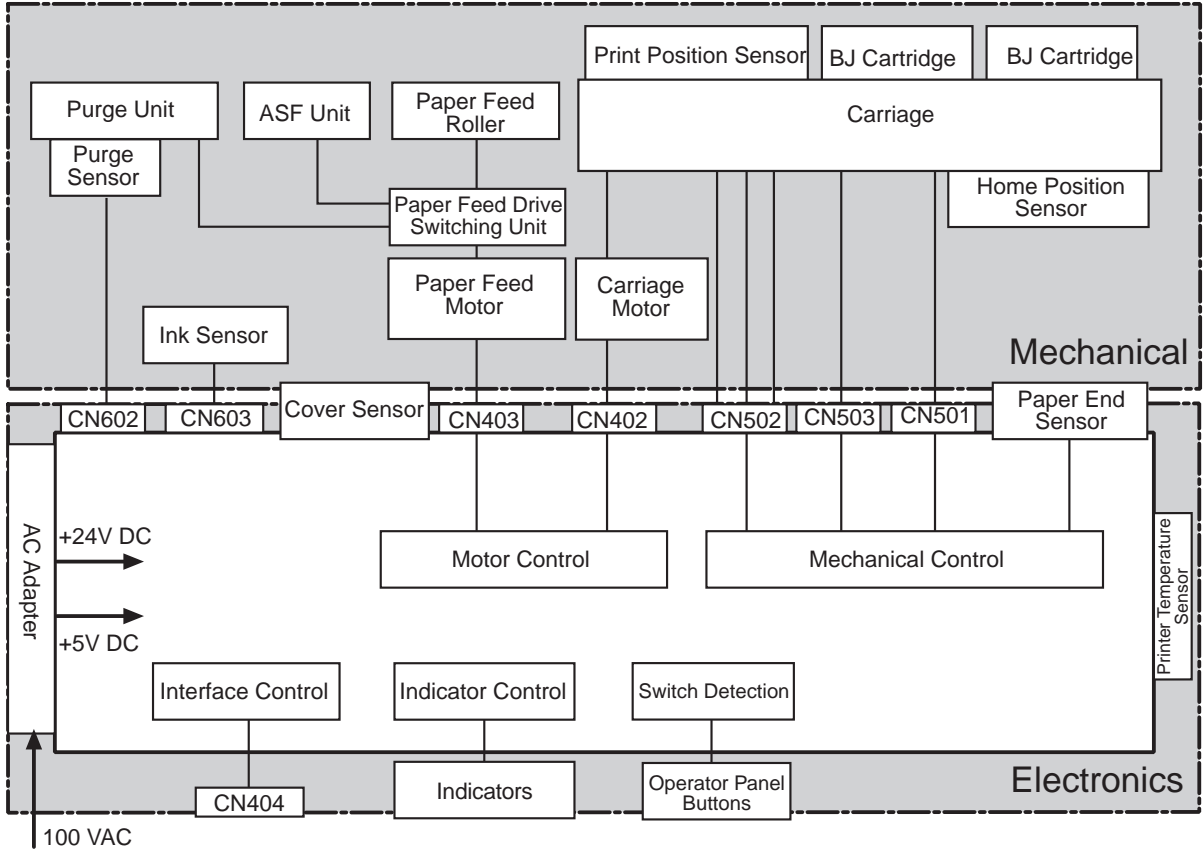


Figure 4-1 Printer Block Diagram

### 1.2 Power On Sequence Flowchart

This flowchart shows the initial sequence this printer goes through from power-on to on-line.

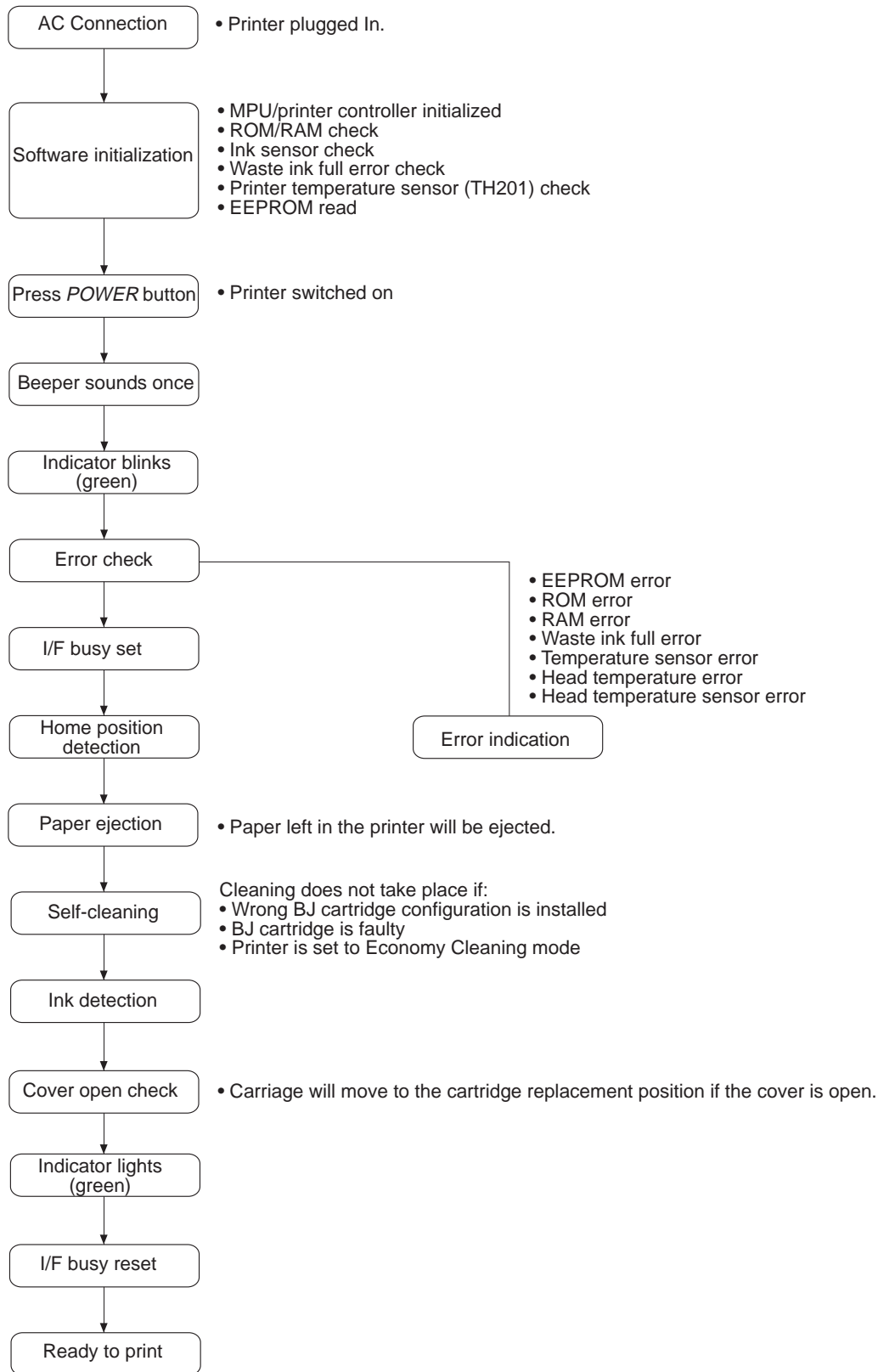


Figure 4-2 Initial Sequence Flowchart

### 1.3 Flow of Print Signals

The following outlines the flow of signals as the printer receives data from the host computer and prints it.

- a) The data from the host computer that contains control commands will be fed into the printer controller via the parallel interface, which is controlled by the printer controller, on the control board. The printer controller sends this data on the dedicated bus to store it in the receive buffer in the DRAM.
- b) The data saved in the receive buffer will be sent to the MPU, where it is separated into control commands and print data according to the data stored in the control ROM. The control commands will be processed in the MPU.
- c) The print data will be extracted into the DRAM's print buffer.
- d) The printer controller, on receiving the Print Start Request, allows the DMA to transfer the print data from the print buffer into the printer controller.
- e) The printer controller then converts the print data into serial data and sends it as print signal to the BJ head. The serial print signal will be converted into one column of parallel print data inside the BJ head. The data, as the print control signal, will be output under the control of the printer controller.
- f) The MPU, while controlling the printer controller, control ROM, and motor driver, and monitoring the status of the BJ head and printer, controls the entire printing operation.

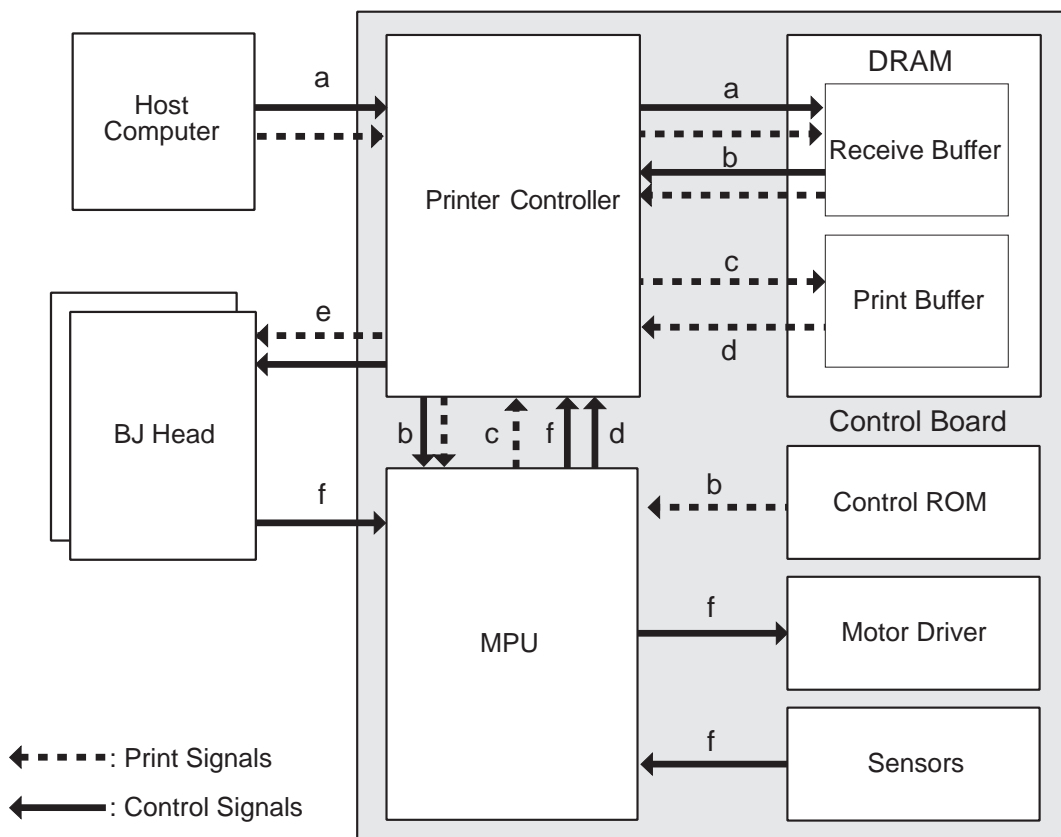


Figure 4-3 Flow of Print Signals

### 1.4 Print Driving

The printer sends the control signals to the head in order to allow the head to discharge ink for printing. These signals consist of the drive control signals that cause ink to be discharged from the head nozzles, and the thermal control signal that controls the head temperature to ensure constant ink discharge.

Both control signals are optimized by the printer controller and sent via the carriage ribbon cable contact section to the head for optimal printing.

#### 1.4.1 Print drive control

##### a) Black BJ cartridge control

The Black BJ cartridge has 160 nozzles. Each nozzle has two heater boards in an array, large and small, one in front, the other in the rear. The front and rear heaters will be controlled to provide multi-drop driving, with both driven simultaneously to discharge a large drop, or with only the small one driven to discharge a small drop. The head's 160 nozzles are divided into 10 blocks (16 nozzles per block), with all blocks driven simultaneously, one nozzle per block in High Speed/Standard mode, or 20 nozzles per block in all other cases.

The Heat ENABLE signals (HENB 0, 1, 2, 3) are the heater board's drive control signals. These signals are always fed to the head during printing, using the Block ENABLE signals (BENB 0,1), Even/Odd ENABLE signal (Even/Odd ENB), and the Heat Select signals (HSEL1A0, 1A1, 1B0, 1B1, 2A0, 2A1, 2B0, 2B1) to select the heaters to turn on. Turning HENB 0 and 2 on drives the Black BJ cartridge's large heater while HENB 1 and 3 drive the small heater. A Heat ENABLE signal consists of a pre-pulse and main pulse so that heater drive pulse width can be adjusted according to the monitored head rank and internal temperature, etc., to always ensure optimum ink discharge.

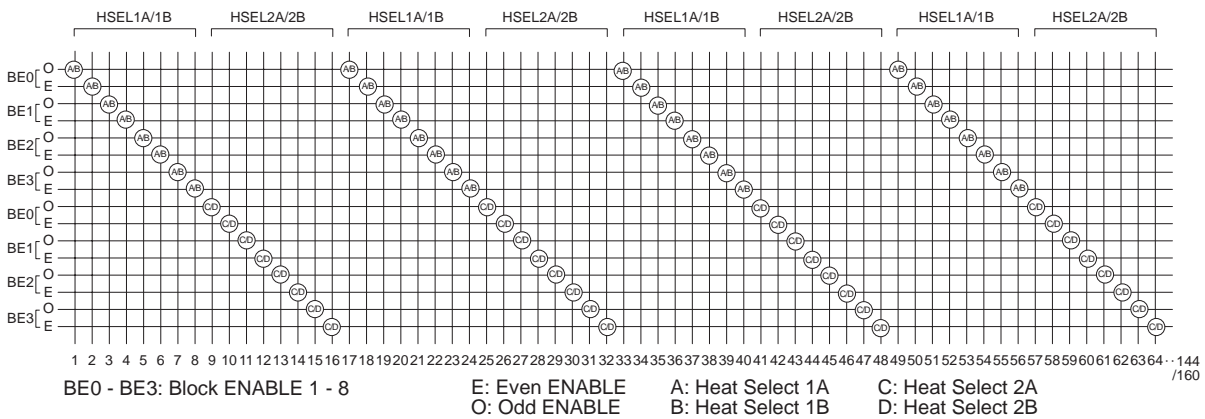


Figure4-4 Printing Sequence (Black BJ cartridge, HQ mode)

**b) Color/Photo BJ cartridge control**

The Color/Photo BJ cartridge has 144 (48 x 3) nozzles. Each nozzle has two heater boards in an array, large and small, one in front, the other in the rear. The front and rear two heaters will be controlled to provide multi-drop driving, with both driven simultaneously to discharge a large drop, or with only the small one driven to discharge a small drop. The head's 144 nozzles are divided into 9 blocks (16 nozzles per block), with all blocks driven simultaneously, with one nozzle per block in the High Speed/Standard mode (for speed), or 18 nozzles per block in all other cases.

The Heat ENABLE signals (HENB 0, 1, 2, 3) are the heater board's drive control signals. These signals are always fed to the head during printing, using the Block ENABLE signals (BENB 0, 1), Even/Odd ENABLE signal (Even/Odd ENB), and the Heat Select signals (HSEL1A0, 1A1, 1B0, 1B1, 2A0, 2A1, 2B0, 2B1) to select the heaters to turn on. HENB 0 and 2 drive the Photo BJ cartridge's rear heater while HENB 1 and 3 drive its' front heater. HENB4 drives the Color BJ cartridge's rear heater, and HENB 3 drives its' front heater. A Heat ENABLE signal consists of a pre-pulse and main pulse so that heater drive pulse width can be adjusted according to the monitored head rank and internal temperature, etc., to always ensure optimum ink discharge.

### 1.4.2 Print drive method

The head can be driven in one of the following six drive methods: 180 x 180 dpi (large dot), 360 x 360 dpi (large dot), 360 x 360 dpi (multi-drop drive), 360 x 360 dpi (large-large dot), 720 x 720 dpi (small dot), and 1440 x 720 dpi (small dot) with the drive method differing depending on whether printing is in the forward or reverse direction. The Block ENABLE, Even/Odd ENABLE, and Heat Select signals are used to select the heater(s) to turn on in the head nozzles.

Note that the head type (Black BJ cartridge, Color BJ cartridge or Photo BJ cartridge) does not influence the type of print drive method.

#### a) 360 x 360 dpi (multi-drop drive, forward direction) control mode

In the multi-drop control mode, two nozzles 8 nozzles apart are driven (one large drop driven and the other small drop driven) to print the large and small dots at 1/360-inch intervals.

- 1) Depending on the Odd/Even and Block ENABLE signals, nozzles No. 8 and No. 16, 8 nozzles apart, selected, using the Heat Select signals, nozzle No. 8 will be heated by the large heater, and No. 16 by the small heater.
- 2) The nozzles next to No. 16 and No. 8, No. 15 and No. 7, will be heated similarly.
- 3) After nozzles No. 8 through No.1 have been heated by the large heater and nozzles No. 16 through No. 9 by the small heater, No. 8 through No. 1 will be heated by small heater and No. 16 through No. 9 by the large heater.

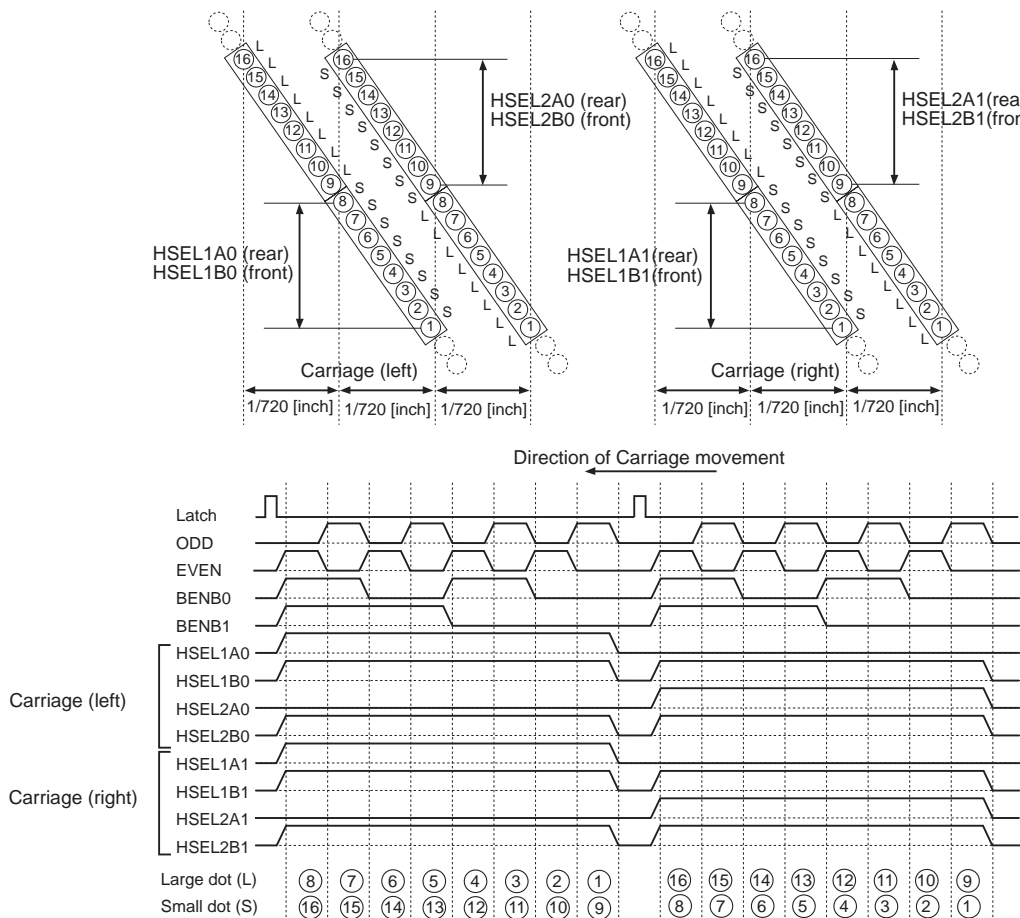


Figure 4-5 Print Drive Method (Multi-drop, forward direction)

**b) 180 x180 dpi (large dot, forward direction) control mode**

In this mode, only 8 out of 16 nozzles in one block will be heated. This allows the carriage to travel faster than it would if all 16 nozzles were heated, resulting in faster printing.

**c) 360 x 360 dpi (large dot, forward direction) control mode**

In this mode, the nozzles that would have been heated simultaneously in a) multi-drop drive will be heated sequentially one at a time from No.16 through No.1.

**d) 720 x 720 dpi (small dot, forward direction) control mode**

In this mode, two nozzles 8 nozzles, apart from the other, will be heated simultaneously, exactly the same way as in a) multi-drop drive mode, except that the two nozzles print with small dots.

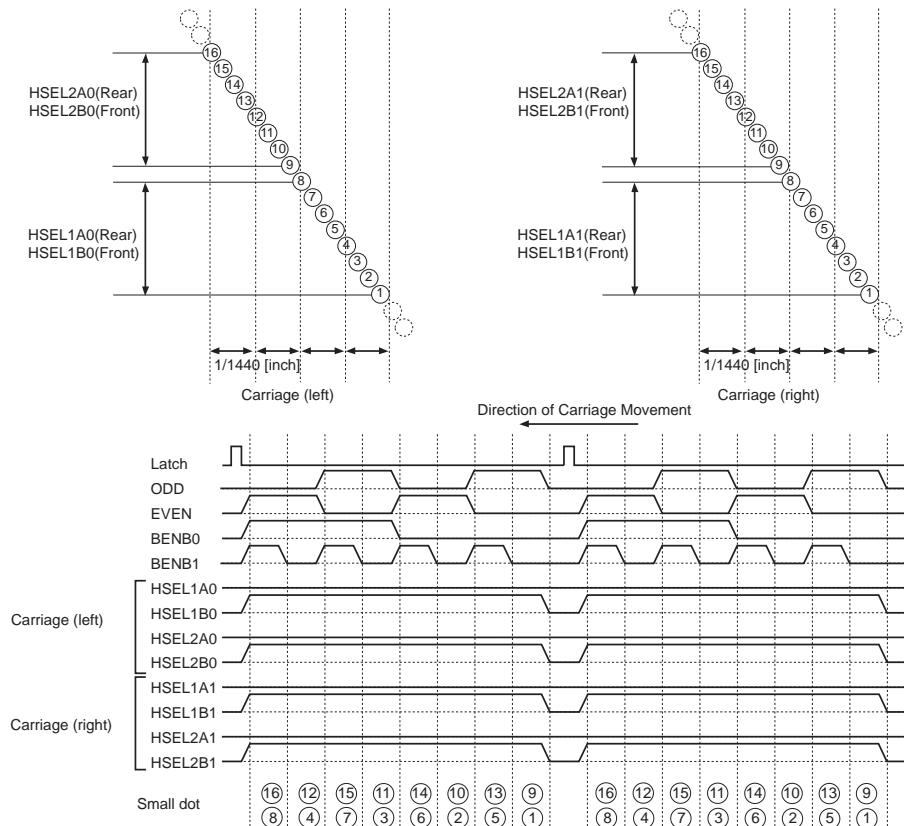
**e) 360 x 360 dpi (large-large dot, forward direction) control mode**

In this mode, two nozzles, 8 nozzles apart from the other, will be heated simultaneously, exactly the same way as in a) multi-drop drive mode, except that the two nozzles print with large dots to increase the printing density.

**f) 1440 x 720 dpi (small-drop drive, forward direction) control mode**

This mode allows nozzles 4 nozzles apart from the other to be driven two at a time, separately, to print small dots at 1/360 intervals.

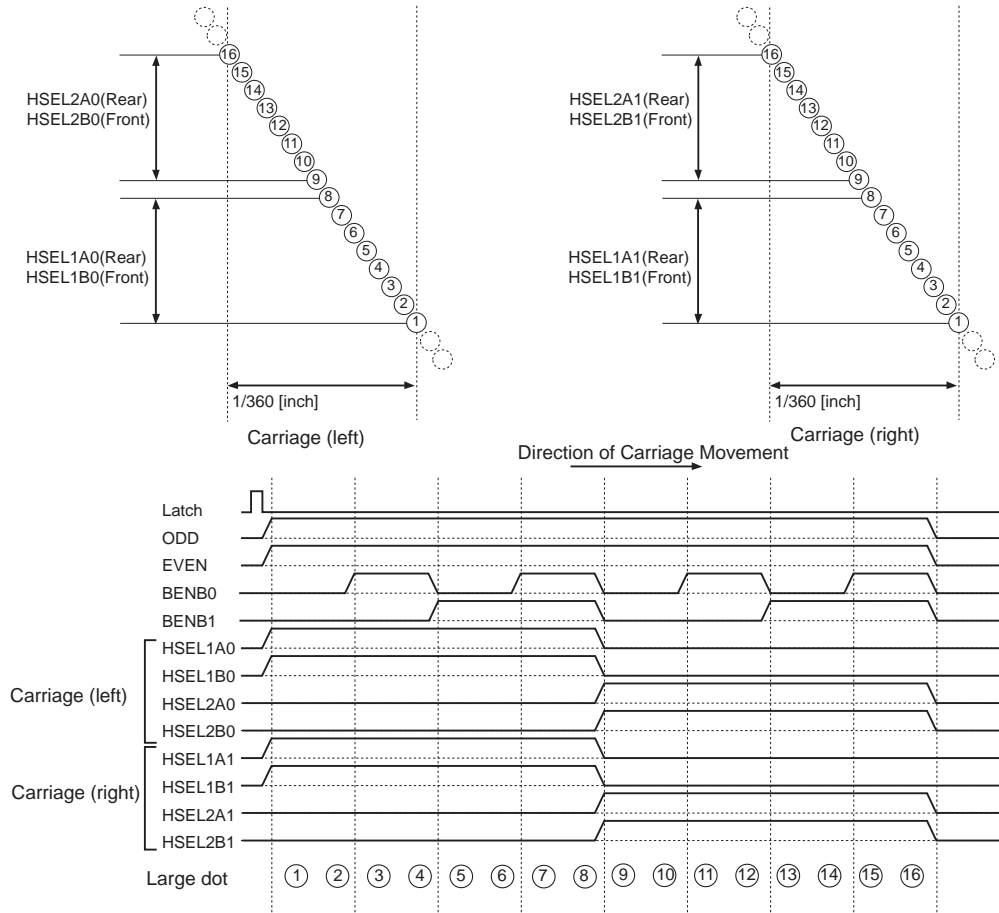
- 1) Odd/Even and Block ENABLE signals cause nozzles No. 16, 12, 8, 4, 4 nozzles apart one from one another to be heated separately, with No. 16 and No. 8 heated first, and then No. 12 and No. 4 next.
- 2) Then nozzles No. 15, 11, 7, and 3 those next to No. 16, 12, 8, 4, will be heated the same way.



**Figure 4-6 Print Drive Method (1440 x 720 dpi, forward direction)**

**g) Reverse direction print mode**

In the reverse direction print mode, printing takes place similarly, except that the nozzles are heated in the reverse order. As such, the signals (ODD/EVEN, BENB) that determine the heating order are driven with timing reversed from that used in forward direction printing.



**Figure 4-7 Print Drive Method (Reverse direction)**



### 1.5 Power-Off Sequence Flowchart

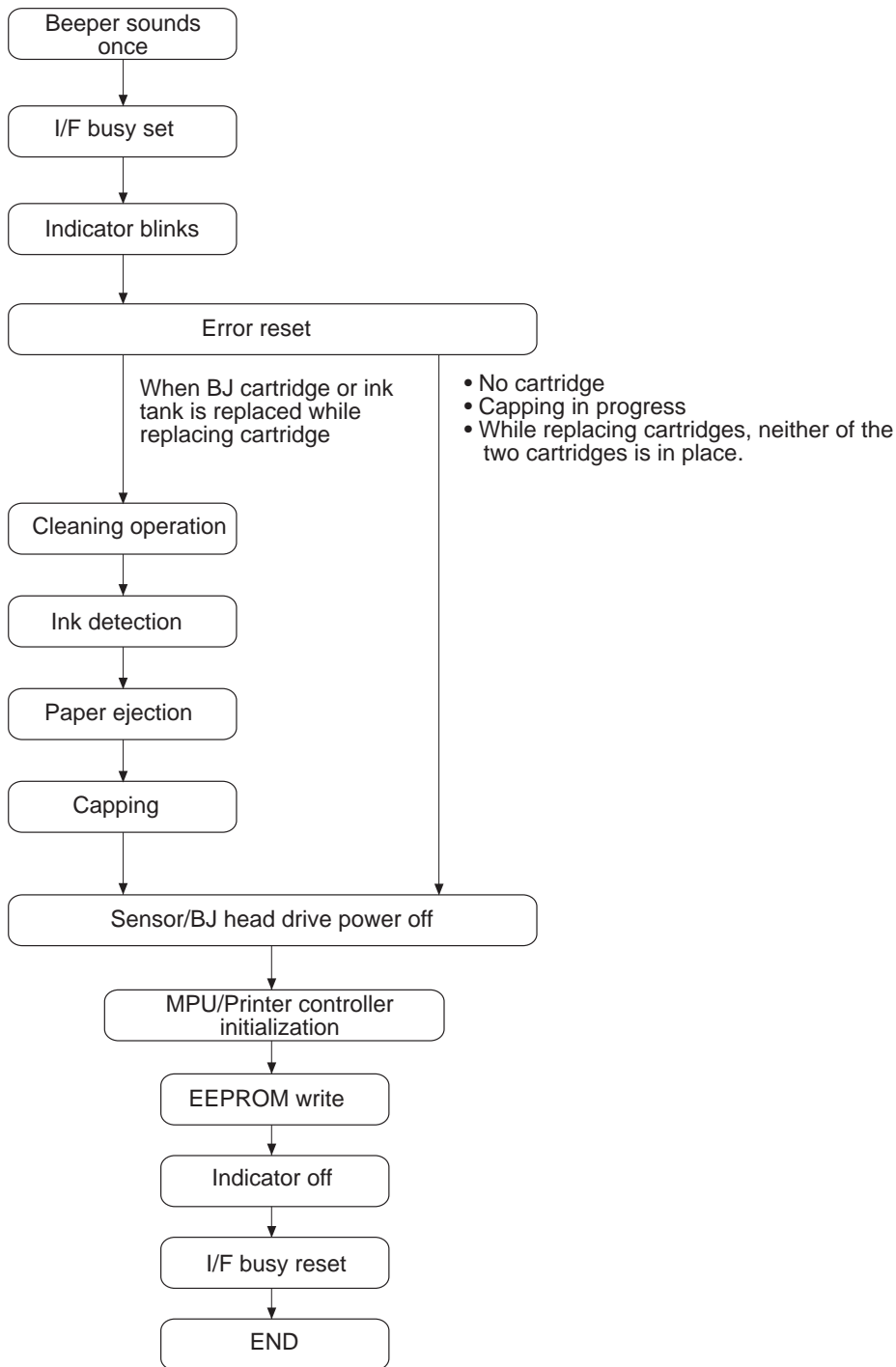


Figure 4-8 Power-Off Sequence Flowchart



Unplugging the power cord to turn off the printer causes the printer to shut off immediately, possibly stopping the capping process before the capping operation is completed. If the printer has been turned off by unplugging the power cord, plug the power cord back in and turn the printer on again, then use the *POWER* button to turn off the printer before unplugging the printer.

## 2. FIRMWARE

### 2.1 Interface

This printer's interface supports compatible mode, nibble mode, and ECP mode in compliance with the IEEE 1284 Parallel Interface Standards. The compatible mode is a uni-directional data transfer protocol similar to the Centronics interface conventional protocol. The nibble mode and ECP mode are bi-directional data transfer protocols used to transfer to the host computer the status data, including the device ID, printer status, etc. The printer uses the compatible mode or the ECP mode (forward transfer) when transferring print data. It should be noted, however, that the computer must be set to ECP mode for the printer to operate in ECP mode.

#### 2.1.1 Compatible mode

In compatible mode, data is transferred in 8 bit units. Data gets transferred by the handshake between the  $\overline{\text{STROBE}}$ ,  $\text{BUSY}$ , and  $\overline{\text{ACKNLG}}$  signals. When data (Data 1-8) and the  $\overline{\text{STROBE}}$  signal are received from the host computer, the printer controller controlling the parallel interface outputs  $\text{BUSY}$  and latches the data on the falling edge of the  $\overline{\text{STROBE}}$  signal. After outputting  $\text{BUSY}$ , the printer controller transfers the latched data into the receive buffer inside the DRAM through the DRAM dedicated bus. When the printer controller is finished writing data into the receive buffer inside the DRAM, it generates the  $\overline{\text{ACKNLG}}$  signal and turns  $\text{BUSY}$  "Low" to indicate it is ready for the next data input. This printer has a short default  $\overline{\text{ACKNLG}}$  to reduce the length of  $\text{BUSY}$  "High," making the printer response time shorter, thus making high speed printing possible.

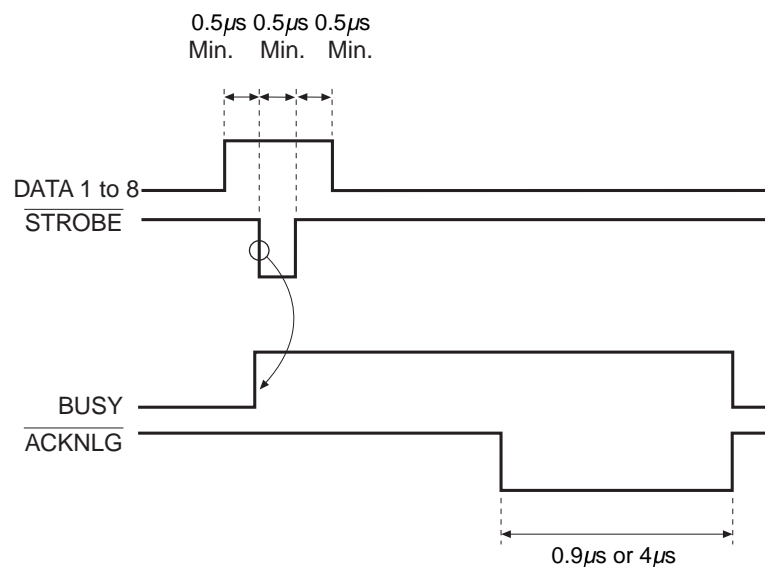


Figure 4-9 Interfacing Timing (Compatible Mode)

### 2.1.2 Nibble mode

The Nibble mode is used to transfer data to the host computer. It is in this mode that the printer sends the printer status data to the host computer. Four input control signals are used for data transfer with handshake between the PtrClk and HostBusy signals.

- 1) The host computer, ready to receive data, causes HostBusy to go low.
  - 2) After acknowledging that HostBusy is low, the printer sends the first four bits of data out on the control signal lines, then makes PtrClk low to indicate that the data is valid.
  - 3) The host computer receives data after PtrClk has fallen, and causes HostBusy to go high when the data has been received.
  - 4) The printer repeats the above process to send the remaining four bits of data out to the host computer.
- (A signal going high or low means it rises or falls.)

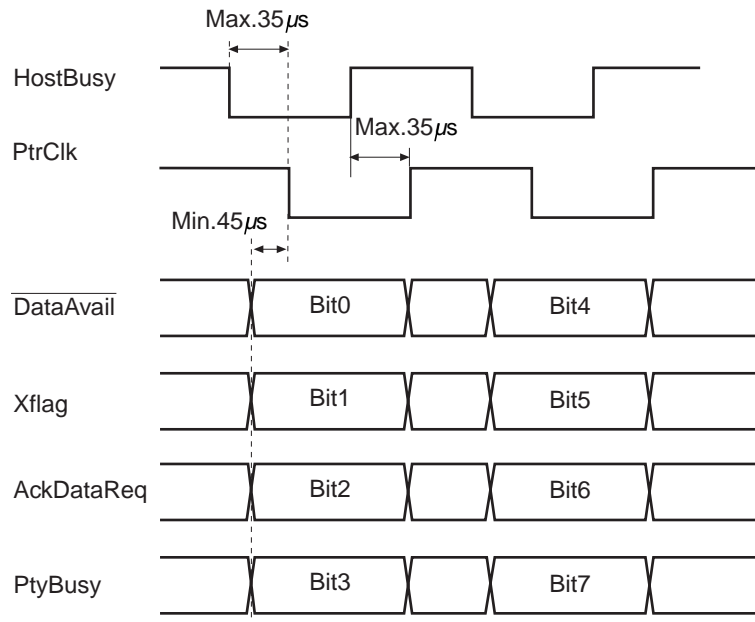


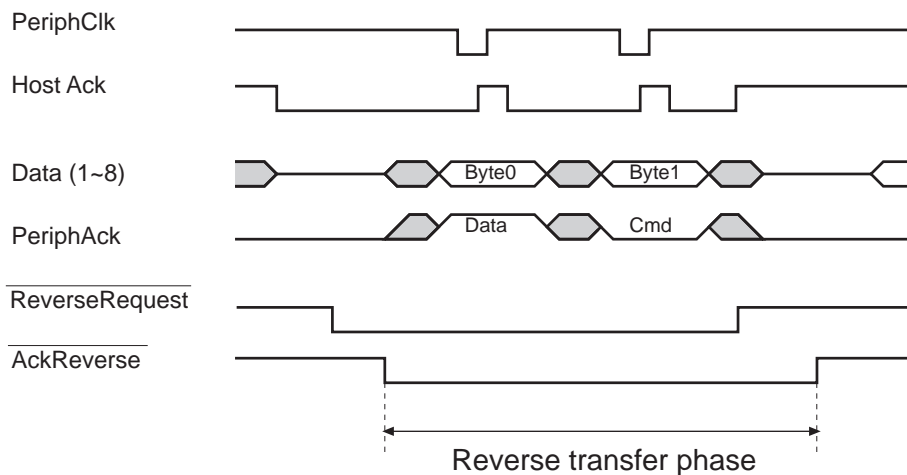
Figure 4-10 Interface Timing (Nibble Mode)

### 2.1.3 ECP mode

The ECP mode allows data to be transferred bi-directionally between the printer and host computer. This mode also allows 2 byte data transfer to provide faster data transmission and reception. It is for this reason that ECP mode is suitable for transferring large amounts of data.

In response to the fall of the  $\overline{\text{ReverseRequest}}$  signal, the direction of the data bus switches from forward data transfer mode to reverse data transfer mode. The forward data transfer mode allows data to be transferred from the host computer to the printer, whereas the reverse data transfer mode allows data to be transferred from the printer to the host computer.

- (1) The host computer causes  $\overline{\text{AckReverse}}$  to go low to request reverse data transfer (data transfer from printer to host computer).
- (2) After confirming  $\overline{\text{AckReverse}}$  is low, the printer causes  $\overline{\text{AckReverse}}$  to go low to indicate that that reverse transfer is possible.
- (3) The printer sends 1 byte of data out on the data lines and causes  $\text{PeriphAck}$  to go high to tell that this data is not command but data. The printer then causes  $\text{PeriphClk}$  to go low to tell that this data is valid.
- (4) After confirming the signal in (3) is received, the host computer causes  $\text{HostAck}$  to go high.
- (5) The printer causes  $\overline{\text{AckReverse}}$  to go high to have the data recorded in the host computer.
- (6) The host computer causes  $\text{HostAck}$  to go high to get ready for the next one byte of data.
- (7) The printer repeats the process above to send the next one byte of data.



**Figure 4-11 Interface Timing (ECP mode, reverse transfer)**

## **2.2 Print Control**

### **2.2.1 Print mode**

The printer adjusts the carriage action and paper feed action according to the installed cartridges, selected print media, printing quality, print data, etc. to ensure high quality printing free from diffusion and density variations. Multiple passes are used to provide staggered print timing with multiple nozzles used to print one luster, so that the quantities of discharge that vary from nozzle to nozzle will be smoothed out to minimize density variations. It is smear-free because it is not until the ink for the last pass printed is fused on the paper that the next pass is printed. Printing can be divided up to a maximum 8 passes, depending on the print media.

### **2.2.2 Multi-drop print**

The BJ cartridges used in this printer incorporate drop-modulation technology, allowing two ink drop sizes, large and small, to be ejected. This allows small dots to be selectively used for printing in low-density areas to lessen granularity, while large dots can be used in high-density areas to offer high speed printing. In the 720 dpi and 1440 dpi print modes, only small dots are used continuously to provide highly detailed printing.

### **2.2.3 Photo-print**

The photo-print uses both the Photo BJ cartridge, which uses low density ink, and the Color BJ cartridge to provide printing with up to 6 colors of ink. By printing in low-density image areas with ink of 1/3 normal ink density (photo-cyan and photo magenta), printing with rich gradation and suppressed graininess is possible. In the photo-print mode, each pixel is converted into a maximum of 4 values (expressed by two bits), so that for each 360 dpi pixel, up to 4 gradations of each color can be printed in a combination of large and small dots. The 6 ink colors of the Photo BJ cartridge and Color BJ cartridge allow a more dynamic range of printing colors, thus providing higher printing density using less ink than would have been possible with 4 low-density ink colors.

### **2.2.4 Automatic switching control of printing nozzles**

When the printer is set to the normal (for speed) plain paper mode (1 path) with the Black BJ cartridge (160-nozzle) installed, the number of nozzles to be used for printing will be automatically set within the nozzle range 48 - 160 during printing according to the image data to be printed. Continuous printing with black will be performed with 160 nozzles, but, in areas with color data, 48 nozzles will be used for printing to prevent running.

**TABLE 4-1 PRINT MODE LIST****Regular Color Ink System (Black/Color BJ Cartridge)**

Paper	High speed	Standard (for speed)	Standard (for quality)		High quality	Highest quality	Printing mode
	180 x 180 (L)	360 x 360 (L)	360 x 360 (L)	360 x 360 (L/S)	720 x 720 (S)	1440 x 720 (S)	Resolution (dpi)*1
	2	2	2	4	2	2	Gradation (/dot)
Plain paper	1 pass/Bi	1 pass/Bi	...	2 pass/Bi	4 pass/Uni	...	*2
Transparencies	...	2 pass/Uni (4 pass)	...	4 pass/Uni (*3)	...	...	
BPF	...	...	6 pass/Uni (4 pass)	6 pass/Uni (*3)	...	...	
Fabric sheet	...	...	...	...	...	...	
Glossy paper	...	...	...	4 pass/Uni	6 pass/Uni (8 pass)	6 pass/Uni (8 pass)	
Glossy film	...	...	...	4 pass/Uni	6 pass/Uni (8 pass)	...	
High-resolution paper	...	2 pass/Bi	...	3 pass/Bi (4 pass)	4 pass/Uni	4 pass/Uni	
Postcard	...	1 pass/Uni	...	3 pass/Bi (4 pass)	4 pass/Uni	...	

(L = large dot, S = small dot ; Bi = bi-directional Uni = uni-directional)

**Photo-color Ink System (Photo/Color BJ Cartridge)**

Paper	High speed	Standard (for speed)	Standard (for quality)		High quality	Highest quality	Printing mode
	180 x 180 (L)	360 x 360 (L)	360 x 360 (L)	360 x 360 (L/L)	360 x 360 (L/S)	720 x 720 (S)	Resolution (dpi)*1
	2	2	2	4	4	2	Gradation (/dot)
Plain paper	1 pass/Bi	1 pass/Bi	...	...	2 pass/Uni	2 pass/Uni	*2
Transparencies	...	2 pass/Uni	...	4 pass/Uni	...	...	
BPF	...	...	...	6 pass/Uni	...	...	
Fabric sheet	...	...	6 pass/Uni	...	...	...	
Glossy paper	...	...	...	...	4 pass/Uni	6 pass/Uni	
Glossy film	...	...	...	...	4 pass/Uni	6 pass/Uni	
High-resolution paper	...	2 pass/Bi	...	...	3 pass/Uni	4 pass/Uni	
Postcard	...	1 pass/Uni	...	...	3 pass/Uni	4 pass/Uni	

(L = large dot, S = small dot ; Bi = bi-directional Uni = uni-directional)

\*1 (large)-printed with large drops; (small)-printed with small drops; (large/small)-printed with large and small drops

\*2 Number of printing passes/Printing direction:

The bracketed numbers indicate the number of passes in gray-scale mode if different.

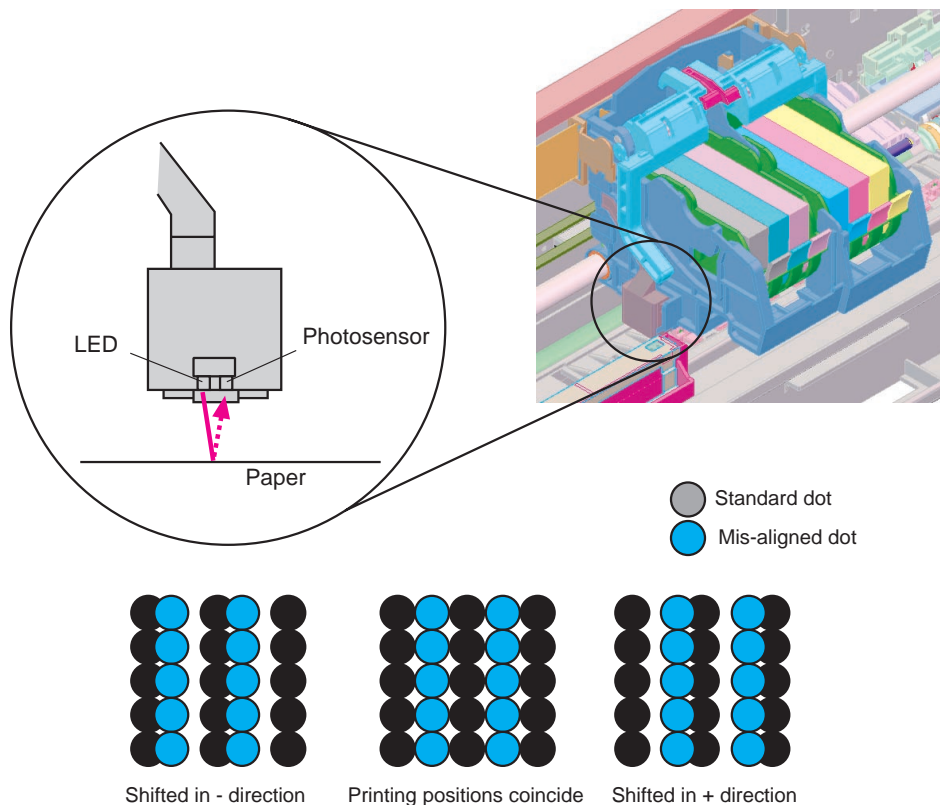
\*3 Printed in 4 pass large/large mode

### 2.3 Automatic Printing Position Alignment Function

This printer features the automatic printing position alignment function so that the difference between the installed left and right BJ cartridges in vertical/horizontal printing position and bi-directional printing position will be automatically adjusted. After the automatic printing position adjustment patterns are printed, each under slightly different conditions, Automatic Printing Position Alignment is performed through the reflection of the patterns by the print position sensor, comprised of a red LED and a photosensor, which is installed on the carriage. The variations in the photosensor output are used to calculate the optimum printing position compensation value. Based on the compensation value obtained, the printer corrects for the difference in vertical/horizontal printing position and bi-directional printing position between the right and left cartridges.

The Auto Printing Position Alignment starts with the calibration of LED and photosensor sensitivity to correct variations between them. Then the difference in vertical printing position between the left and right cartridges will be compensated for, followed by the adjustment of bi-directional printing position for each printing mode, and then the adjustment of the horizontal printing position to the accuracy of  $\pm 1$  pixel, after which finer adjustments will automatically be conducted. The adjustment patterns will be printed in both black and cyan, as a red LED is used as the light source.

For automatic printing position alignment, you must use B5 or larger paper.



**Figure 4-12 Automatic Printing Position Alignment**



Do not perform automatic printing position alignment with the front cover open, as external light may make accurate measurements impossible. For this reason, during servicing, do not perform automatic printing position adjustment with the front cover open or upper cover removed.

## 2.4 Pause Between Scanning

This printer features pause between-scanning to prevent bleeding and white clouding be caused by differences in characteristics between color ink and black ink. This function allows the border between the color ink and black ink to be detected during internal print data processing so that, when detected, an appropriate pause will be imposed on each print mode and color to prevent bleeding. Since this function decreases the printer's throughput, it will only be activated when enabled by the user and when printing on plain paper, for which this type of bleeding occurs easily.

## 2.5 Pause Between Pages

Immediately after ejection, printed paper is left to dry on the paper eject tray naturally. If the next paper is ejected before the previous page has dried completely, ink-smearing may occur. To prevent this, 1-minute pause will be imposed on for all pages before printing starts, to delay paper ejection so the preceding page can dry. This is particularly useful for slow-drying print media such as transparencies.

## 2.6 Smear Control

Immediately after being ejection, printed paper is left to dry on the paper eject tray naturally. The next paper is ejected before the previous page has dried completely, ink-smearing may occur. To prevent this, wait-time is added into the printing process, delaying paper ejection so the preceding page can dry. After printing at high speed with the Black BJ cartridge at high duty on plain paper or postcards, this printer automatically determines both the high duty printing position and time elapsed after printing, to control smearing ( default setting is ENABLE.).

## 2.7 Auto Power ON/OFF

This printer can switch itself on in response to print signals from the host computer and switch itself off if left for a certain period of time without incoming print signals. These settings can be made with the printer driver. When Auto Power ON is enabled, the printer powers on if more than 3 bytes of data are received consecutively. Thus, the interface unit is enabled, even if the printer is switched off. When Auto Power OFF is enabled, the printer powers off if a certain period of time has elapsed without receiving print data from the host computer. If, however, an error exists, paper is in the manual feed slot, or the front cover is open, the printer will not power off.

## 2.8 Head Overheat Protection

If the printer continues to print after ink has run-out, the bubble jet head will overheat. To prevent this, when the head temperature sensor inside the bubble jet head detects a temperature higher than the specified range, overheat protection is performed.

**Protection level 1:** Prevents the user from touching the hot aluminum plate of the head when replacing the bubble jet head by preventing the carriage from moving to the cartridge replacement position for fixed time, even if the front cover is open.

**Protection level 2:** If a further rise in temperature is detected, after printing 1 line of text, the carriage returns to the home position for 3.5 seconds to allow cooling before continuing printing. This protection continues for more than 20 seconds.

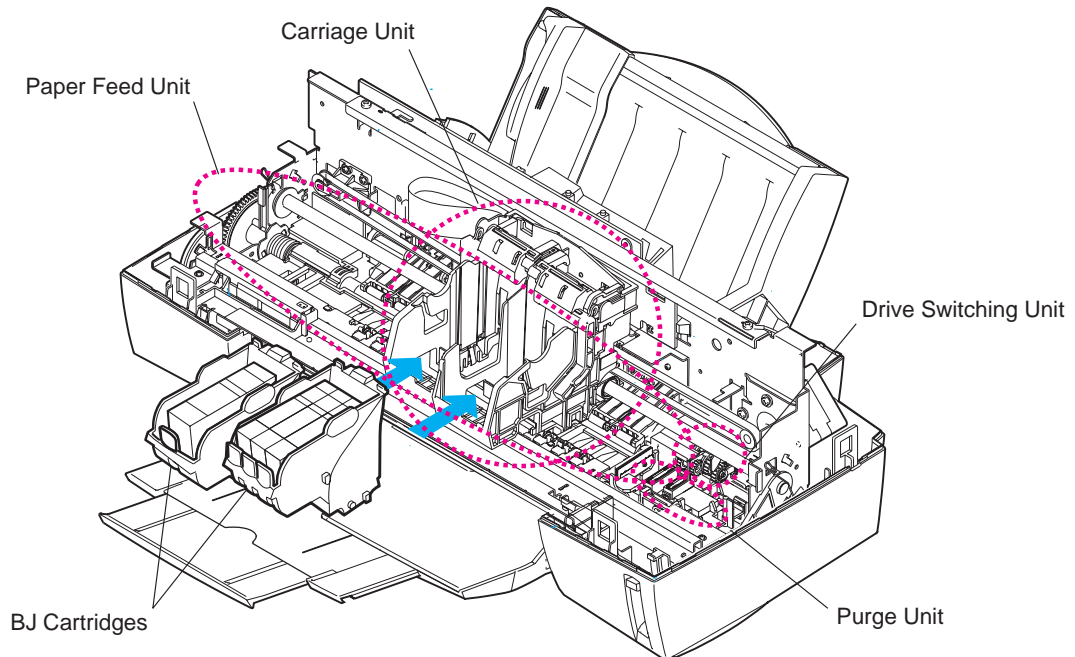
**Protection level 3:** If an even higher rise in temperature is detected, the printer sees this as head temperature error and stops printing. If the problem persists, the printer sees it as a head temperature sensor failure and displays the head temperature error message. The ENABLE TIME can be 5 min., 10 min., 15 min., 30 min., or 60 min.



## 3. PRINTER'S MECHANICAL SYSTEM

### 3.1 Overview

The printer's mechanical system is comprised of the BJ cartridges, carriage unit, purge unit, paper-feed unit, and drive switching unit. The following describes each of these units:



**Figure 4-13 Printer's Mechanical System**

#### 3.1.1 BJ cartridge unit

There are 3 types of BJ cartridges: the Black BJ cartridge with 160 nozzles and a 360 dpi nozzle pitch, the Color BJ cartridge with 48 nozzles and a 360 dpi pitch per color (yellow, magenta, and cyan), and the Photo BJ cartridge with 48 nozzles and a 360dpi nozzle pitch per color (photo-black, photo-magenta, and photo-cyan). The user can install the cartridges in accordance to his/her printing needs. Always install the Color BJ cartridge on the right side of the carriage. The left side of the carriage is for either the Black BJ cartridge or Photo BJ cartridge, depending on the specific printing requirements. Each BJ cartridge has detachable ink tanks, making it possible to replace only the ink tank.

#### 3.1.2 Carriage unit

The carriage, with two BJ cartridges installed in it, moves back and forth, along the horizontal width of the paper, by the carriage belt driven by the carriage motor. The carriage position is controlled by the carriage motor drive pulses after its initial position is detected by the home position sensor mounted on the carriage board. The print signals from the control board will be transmitted via the carriage ribbon cable to the BJ cartridges installed in the carriage. The carriage controls the paper feed motor drive switching unit, driving of the paper feed and purge unit, and switching of the auto-sheet feeder drive. The carriage also controls the position for which capping, wiping, or pumping is performed by the purge unit for BJ cartridge maintenance.

### 3.1.3 Purge unit

The purge unit, driven by the paper feed motor, is comprised of the wiper, pump, cap, and carriage lock unit. The wiper unit keeps the BJ cartridge head face in good condition to ensure high quality printing while the suction function ensures that the ink in the nozzle can be easily discharged. When not in use, the unit protects the BJ cartridge with its cap and secures the carriage by locking it in place.

### 3.1.4 Paper feed unit

The mechanical portion of the paper feed unit is comprised of the pick-up unit, paper feed unit, and paper ejection unit.

#### **Pick-up unit**

Paper is supplied either from the auto-sheet feeder in auto paper feed mode, or from the manual feed slot in manual paper feed mode. The auto-sheet feeder, driven by the paper feed motor, can be loaded with various sizes of paper up to legal size and automatically supplies paper (picks up and delivers the paper to the paper feed unit).

#### **Paper feed unit**

The paper feed unit, driven by the paper feed motor, turns the feed roller to horizontally move the paper beneath the BJ cartridge print head while keeping the paper level on the platen without cockling. To manually feed paper through this printer, use the *RESUME* button, as there is no paper feed knob.

#### **Paper ejection unit**

The printed paper is ejected by the eject rollers into the paper eject tray.

## 3.2. BJ Cartridge

### 3.2.1 Construction of the Black BJ cartridge

The Black BJ cartridge has a 160-nozzle multi-drop bubble jet head and a detachable black ink tank.

#### a) Air path

Keeps the pressure inside the ink tank constant with the external atmospheric pressure.

#### b) Ink chamber

Loaded with black ink. The ink in the ink chamber will be supplied via the sponge to the BJ head. A sensor is used to check for ink.

#### c) Ink sponge

Saturated with black ink.

#### d) Ink supply piece

Supplies constant quantity of ink to the joint between the bubble jet head and ink tank.

#### e) Ink filter

Keeps foreign matter from entering the bubble jet head.

#### f) Bubble jet head

Consists of 160 nozzles and signal contacts. It discharges the ink supplied from the ink tank according to the print signals it receives via the signal contacts. Each nozzle has two heater boards inside, one large and one small, for discharging ink. By controlling the driving of the heater boards, multi-drop driving is conducted.

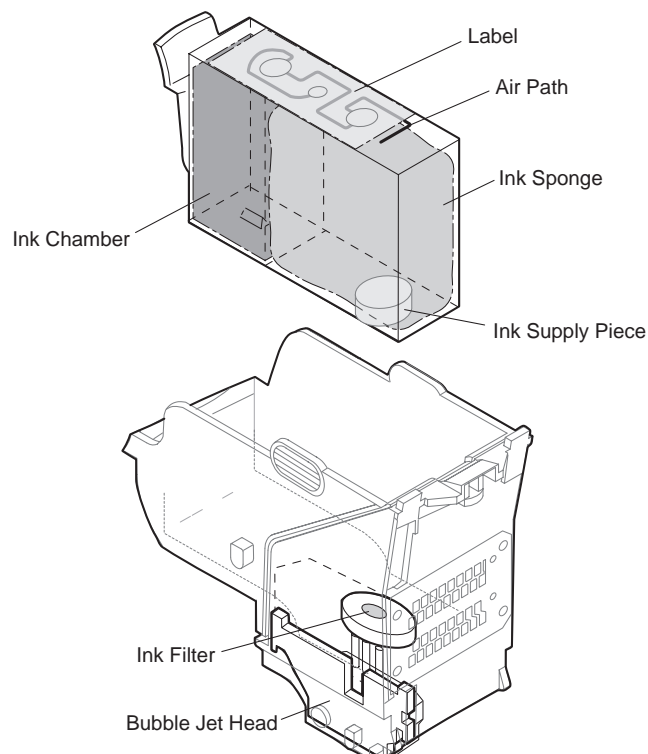


Figure4-14 Black BJ Cartridge

### 3.2.2 Construction of the Color and Photo BJ cartridges

Color and Photo BJ Cartridges come equipped with a multi-drop bubble jet head comprised of 48 nozzles for each of the three colors, for a total of 144 nozzles, and have separate, detachable ink tanks, one for each color.

#### a) Air path

Keeps the pressure inside the ink tank constant with the external atmospheric pressure.

#### b) Ink chamber

Loaded with ink. The ink in the ink chamber will be supplied via the sponge to the BJ head. A sensor is used to check for ink.

#### c) Ink sponge

Saturated with the ink of that color.

#### d) Ink supply pieces

Supplies constant quantity of ink to the joint between bubble jet head and ink tank.

#### e) Ink filter

Keeps foreign matter from entering the bubble jet head.

#### f) Bubble jet head

Consists of 144 nozzles and signal contacts. It discharges the ink supplied color by color from the ink tanks according to the print signals it receives via the signal contacts. Each nozzle has two heater boards inside, one large and one small, for discharging ink. By controlling the driving of the heater boards, multi-drop driving is conducted.

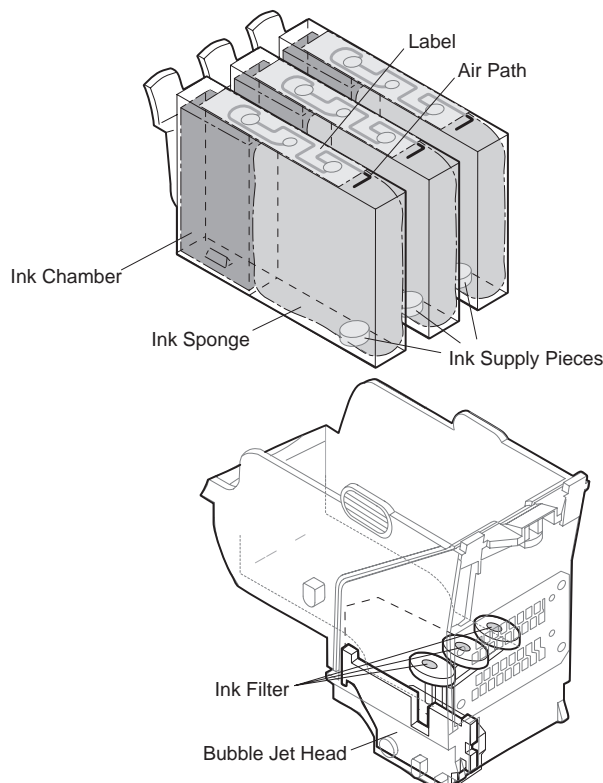


Figure4-15 Color/Photo BJ Cartridge

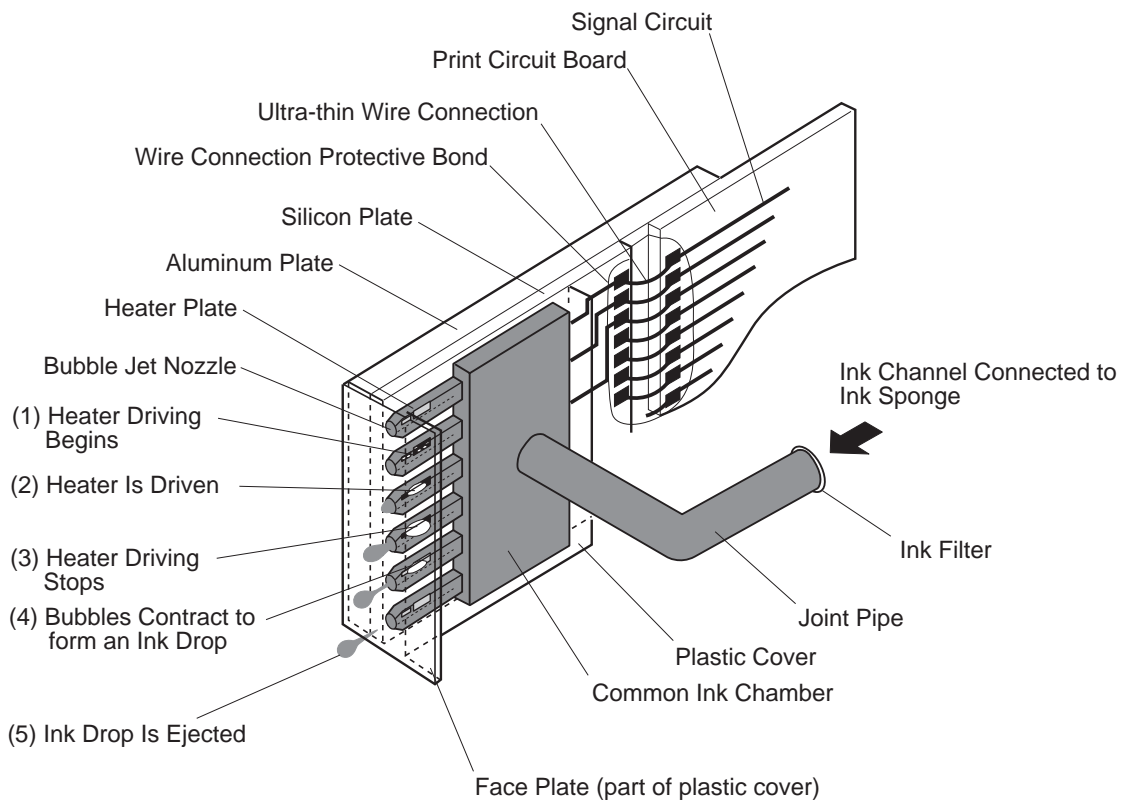
### 3.2.3 Construction of the bubble jet head unit

#### a) Bubble jet nozzle

Ink absorbed in the ink sponge will be filtered through the mesh ink filter, then fed to the bubble jet nozzles via ink pipes. When the head drive current passes through a heater board in a nozzle, the ink will boil, producing bubbles. These small bubbles eventually coalesce into one large bubble. The head drive current will be turned off before the ink drop is discharged from the nozzle, but the after-heat of the heater causes the bubble to grow larger and be discharged from the nozzle tip as an ink drop. The nozzle is replenished with ink after the ink has been ejected.



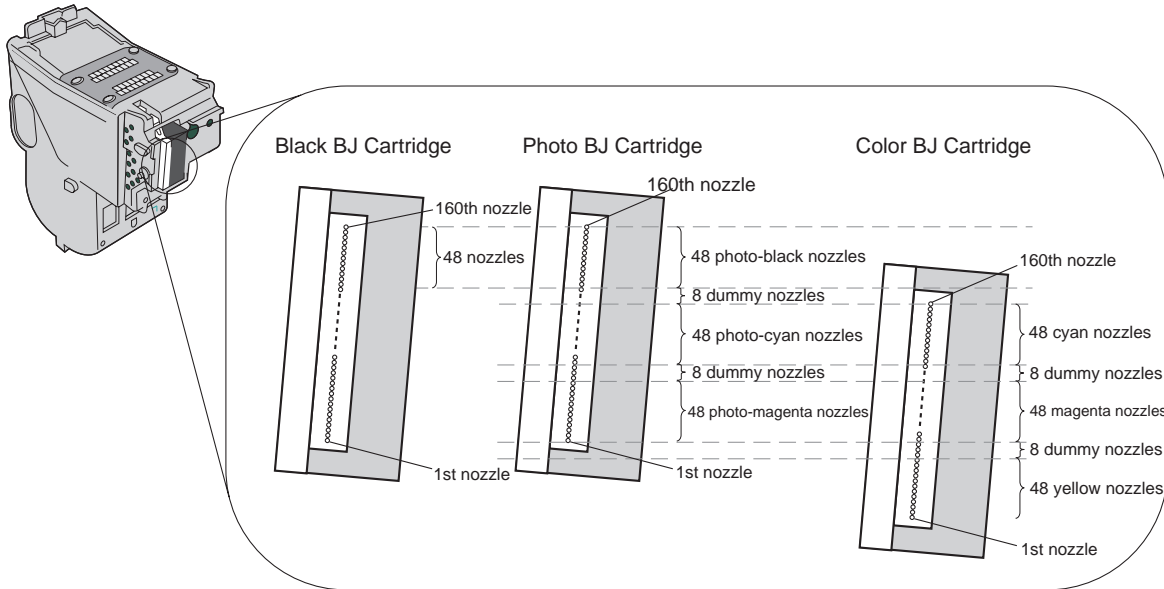
The print head uses semiconductor technology, in which the heaters and I/C circuits are mounted on a silicon plate. This silicon plate with electrical circuitry is bonded to an aluminum base which is then attached to a molded plastic cover with nozzles.



**Figure 4-16 Bubble Jet Nozzle (part)**

**b) Nozzle arrangement**

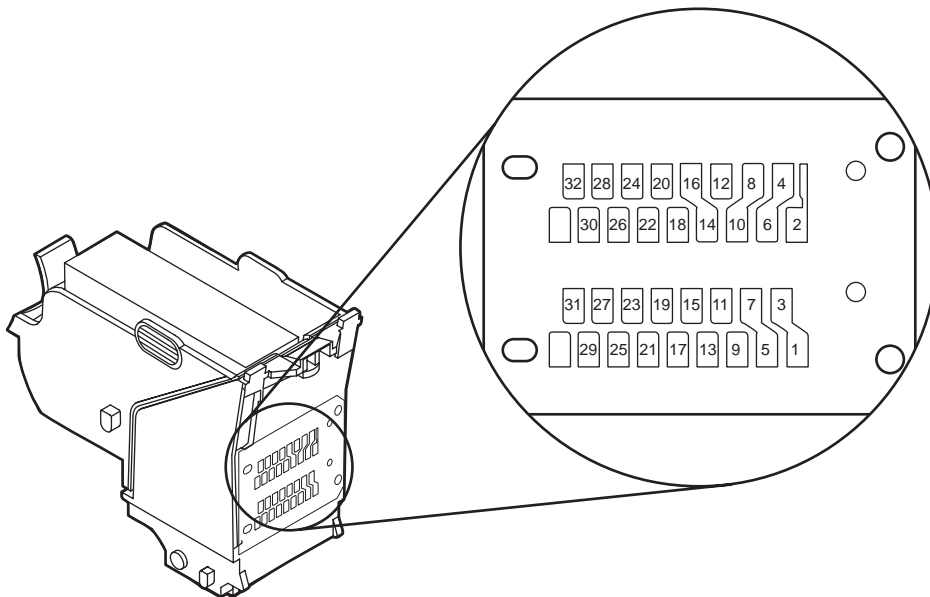
The bubble jet nozzles are lined up vertically at 1/360 inch pitch in one column. Color and Photo BJ cartridge have 8 dummy nozzles separating the nozzles of each color.



**Figure 4-17 Nozzle Arrangement**

**c) Signal contacts**

The bubble jet head signal contacts, in touch with the carriage contacts, transmit control signals such as print signals to the bubble jet nozzles.



**Figure 4-18 Signal Contacts**

TABLE 4-2 SIGNAL CONTACTS

Pin No	Signal	IN/OUT	Function
1, 2, 3	HVH	OUT	Head drive voltage (VH)
4, 6	SUBH0 (SUBH1)	OUT	Sub-heater drive signal
5, 7, 8, 10	VHG	...	GND for Head drive voltage (VHGND)
9	HDATA0 (HDATA1)	IN/OUT	Serial data (including head identification and rank resistance) sent in synchronization with the clock signal (H_CLK)
11	HSEL1B0 (HSEL1B1)	OUT	Rear nozzle heater select signal for upper nozzles (1-8, 17-24, ..., 145-152)
12	HVDD	OUT	Head logic drive voltage (+5 V)
13	HCLOCK0 (HCLOCK1)	IN/OUT	Clock signal for serial data transmission
14, 16	LGND	OUT	GND for head logic drive voltage (HVDD)
15	HSEL1A0 (HSEL1A1)	OUT	Front nozzle heater select signal for upper nozzles (1-8, 17-24, ..., 145-152)
17	HSEL2A0 (HSEL2A1)	OUT	Front nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
18	HSEL2B0 (HSEL2B1)	OUT	Rear nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
19	HLAH	OUT	Serial data latch timing signal
20	ODD	OUT	Odd-number nozzles select signal
21	EVEN	OUT	Even-number nozzles select signal
22	BENB0	OUT	Signal to generate heater enable decoder outputs
23	BENB1	OUT	Signal to generate heater enable decoder outputs
24	HENB0 (HENB4)	OUT	Rear heater drive signal for nozzles 1-112 (or 1-144) Front heater drive signal for nozzles 1-112 (or 1-144)
25	HENB1 (HENB5)	OUT	Rear heater drive signal for nozzles 1-112 (or 1-144) Front heater drive signal for nozzles 1-112 (or 1-144)
26	HENB2 (HENB4)	OUT	Rear heater drive signal for nozzles 113-160
27	HENB3 (HENB5)		Front heater drive signal for nozzles 113-160
28	DIR	OUT	Serial data input/output direction control signal
29	HRSTX	OUT	Reset signal
30	DIA0 (DIA1)	IN	Head temperature (diode) sensor's anode line
31	DIK0 (DIK1)	IN	Head temperature (diode) sensor's cathode line
32	...	...	Not used

The bracketed signal name (.....) is the name used for Color/Photo BJ cartridge if different from that used for Black BJ cartridge.

**d) Cartridge identification**

This printer uses 5 signals, HCLOCK (Pin 13), HDATA (Pin 9), HLAT (Pin 19), HRSTX (Pin 29), and DIR (Pin 28) to communicate serially with the bubble jet head to identify the installed BJ cartridge and the head rank. Bubble jet head heater characteristics are classified into 24 types according to the variations associated with the manufacturing process. The printer compensates for these variations to provide optimum control of ink discharge.

Switching the printer on with either an unrecognizable BJ cartridge installed, or with one BJ cartridge not installed, will cause the carriage to move automatically to the cartridge replacement position. Also, removing a BJ cartridge when the carriage is not in the cartridge replacement position while the printer is switched on will result in a NO BJ CARTRIDGE error.



### 3.3 Purge Unit

#### 3.3.1 Function of the purge unit

The purge unit keeps the BJ cartridge nozzles in good working condition to ensure high printing quality. The unit is designed to provide both capping and cleaning functions.

##### a) Capping

The capping function presses the purge unit's cap against the print head face to prevent the nozzles from drying and becoming contaminated. During capping, a cam is actuated to lock the carriage in place. During printing, capping starts 30 seconds or so after data stops. When printing is not performed, capping takes place after a certain period of time (20 minutes in paper feeding mode, or 30 seconds in other conditions) has elapsed since the last data was received, or when the *POWER* button is used to switch the printer off.

##### b) Cleaning

The cleaning function includes the wiping action to wipe paper fibers or waste ink off the head face plate, and the suction action to suck out ink from the head to refresh the insides of nozzles with new ink, and the maintenance jet action to discharge the ink from the nozzles into the maintenance jet splash guard for removing bubbles from the head or dust around the outlet. The cleaning mechanism becomes activated in the following cases to help maintain high quality printing.

Printer Status		Reference Ink Consumption (mg)		
		Black	Color	Photo
Power ON	Initial power on (1 time only)	0.49	0.75	0.75
	Switched on for the 1st time since connecting to AC (capped)	0.19	0.27	0.27
	Switched on for the 1st time since connecting to AC (not capped)	0.34	0.53	0.53
	72 hours or more elapsed since previous cleaning	0.19	0.27	0.27
Cleaning		0.19	0.27	0.27
Refreshing		0.34	0.53	0.53
Changing BJ cartridge/Ink tank		0.34	0.53	0.53
72 hours or more elapsed since previous cleaning		0.19	0.27	0.27
Before printing banner paper		0.19	0.27	0.27
	(Specified number or more of dots or time elapsed since previous cleaning)			

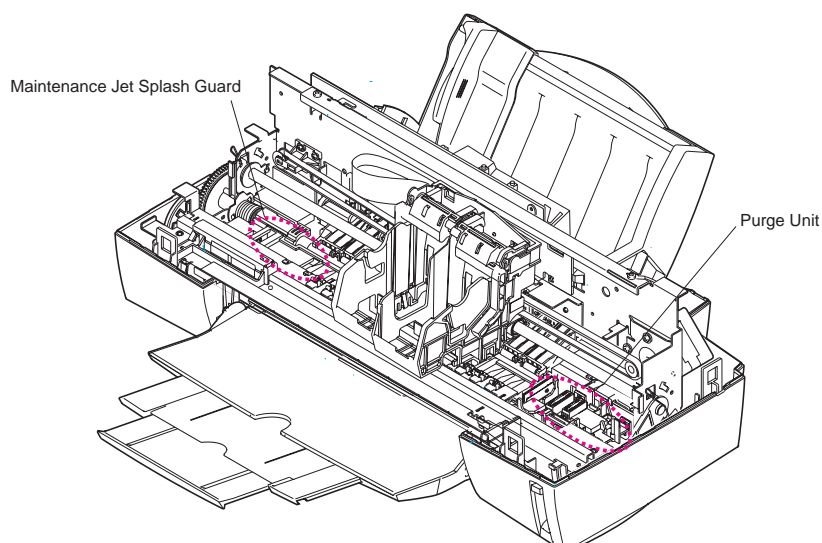
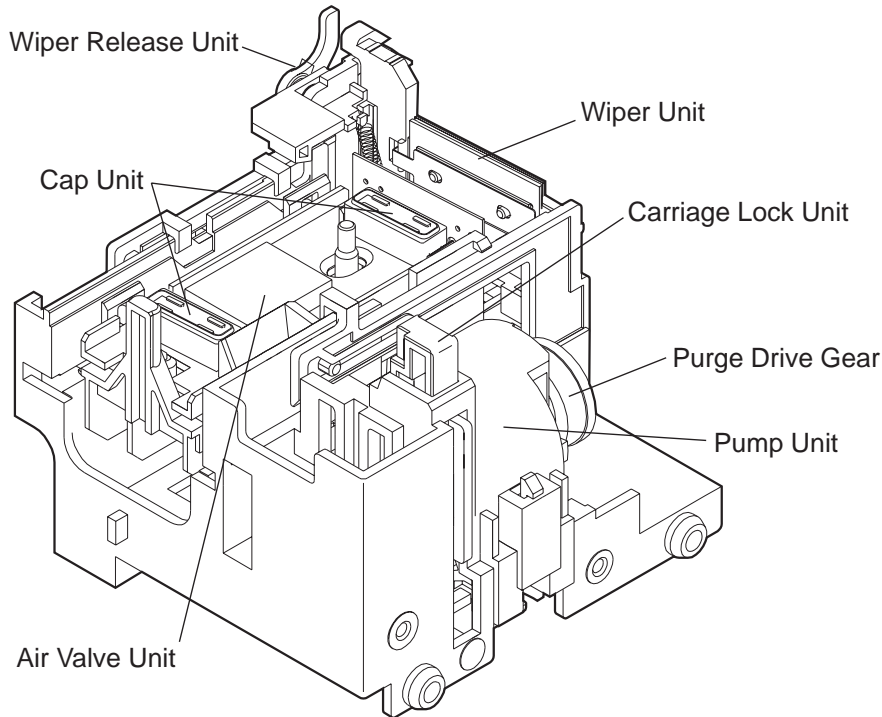


Figure 4-19 Purge Unit

### 3.3.2 Construction of the purge unit



**Figure 4-20 Purge Unit**

#### a) Purge drive gear

Receives the power of the feed roller driven by the paper feed motor via the drive switching unit to drive the pump. The pump roller's position is detected by the pump sensor.

#### b) Wiper unit

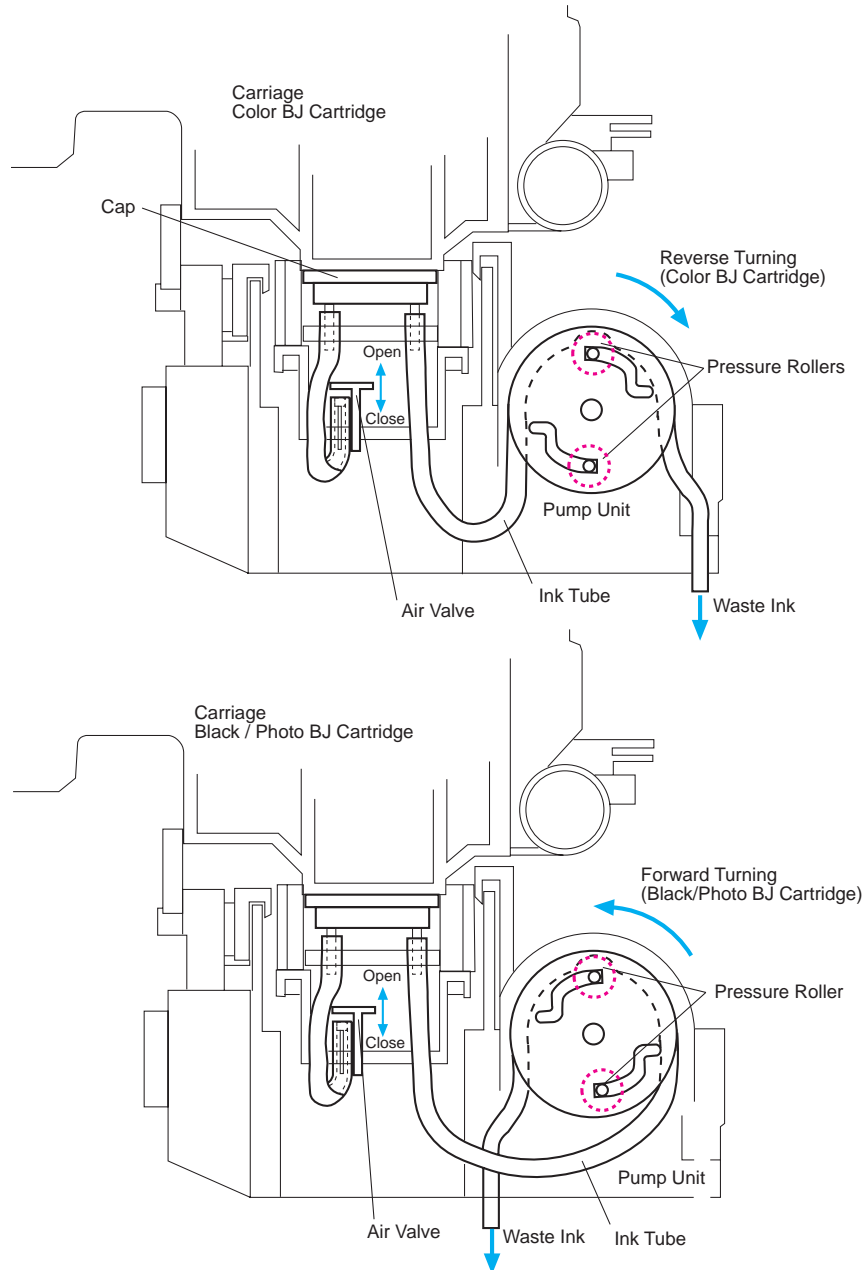
Operates when the carriage travels back and forth. It wipes off surplus ink from the head face plate as the carriage moves right to left at the completion of cleaning. It is constructed of two rubber wipers to enhance wiping performance.

#### c) Cap unit

Uses the same rubber cap for both the capping action to protect the head, and for the pumping action to suck ink. There are two rubber caps, one per BJ cartridge installed on the carriage. Capping occurs by pressing the cap against the head's face plate when the carriage moves to the capping position. The rubber caps in the cap unit are connected to the pump unit and the air valve via the ink tube. During cleaning, the unit sucks ink from the head using the pump. The sucked ink will be sent to the waste ink absorber. After ink suction is completed, the carriage will be moved to the position that opens the air valve and pumping will be performed to suck out waste ink collected in the rubber cap.

**d) Pump**

The pump is a tube pump type that applies the pressure of turning rollers to the ink tube to create negative pressure for sucking ink. Applying the pressure of two turning rollers alternately allows greater control over the amount of ink to be sucked, and helps to reduce the size of the pump unit. With two similar pumps set to turn in opposite directions, changing the rotational direction of the drive gear allows the individual BJ cartridges installed in the carriage to be cleaned separately. The amount of roller turning and the timing of turning are detected and controlled by the pump sensor.



**Figure 4-21 Pumping Operations**

**e) Maintenance jet splash guard**

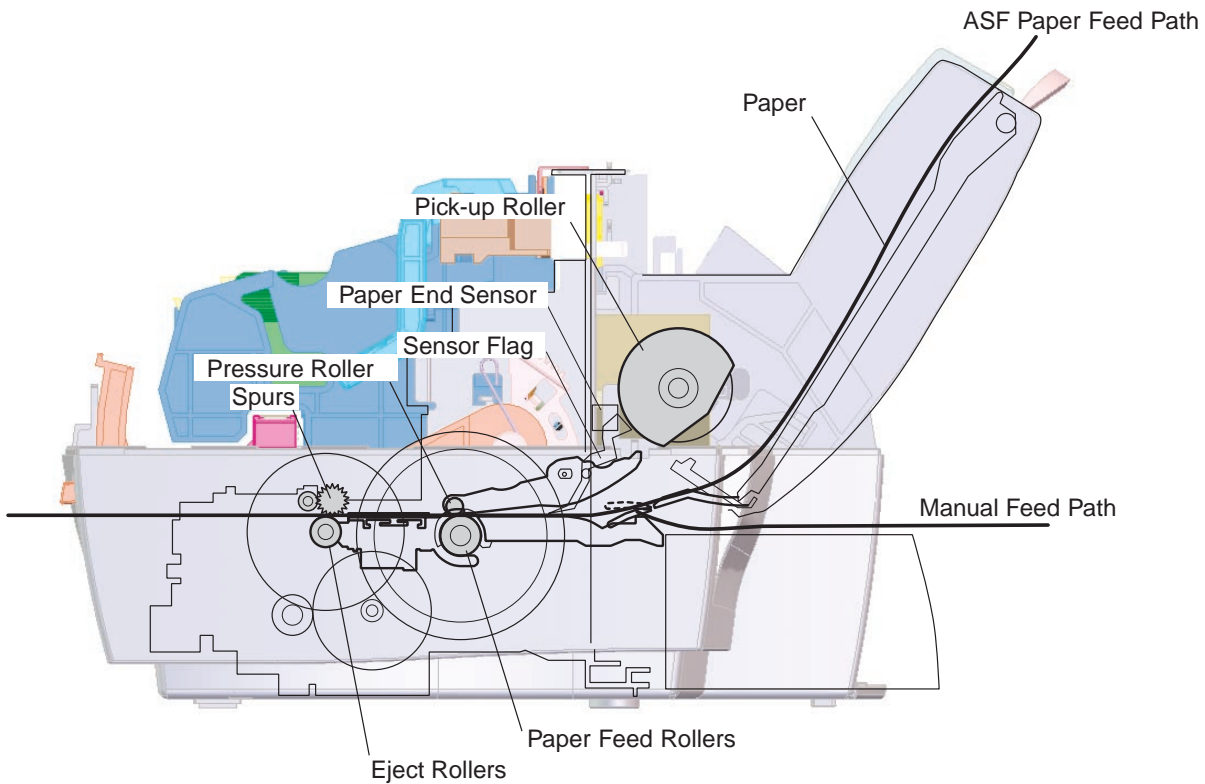
The maintenance jet splash guard receives the maintenance jet ink (test discharge to maintain the nozzle) directly into the waste ink absorber through the hole by the side of the platen.

### 3.4 Paper Feed Unit

#### 3.4.1 Functions of the paper feed unit

##### a) Paper feed function

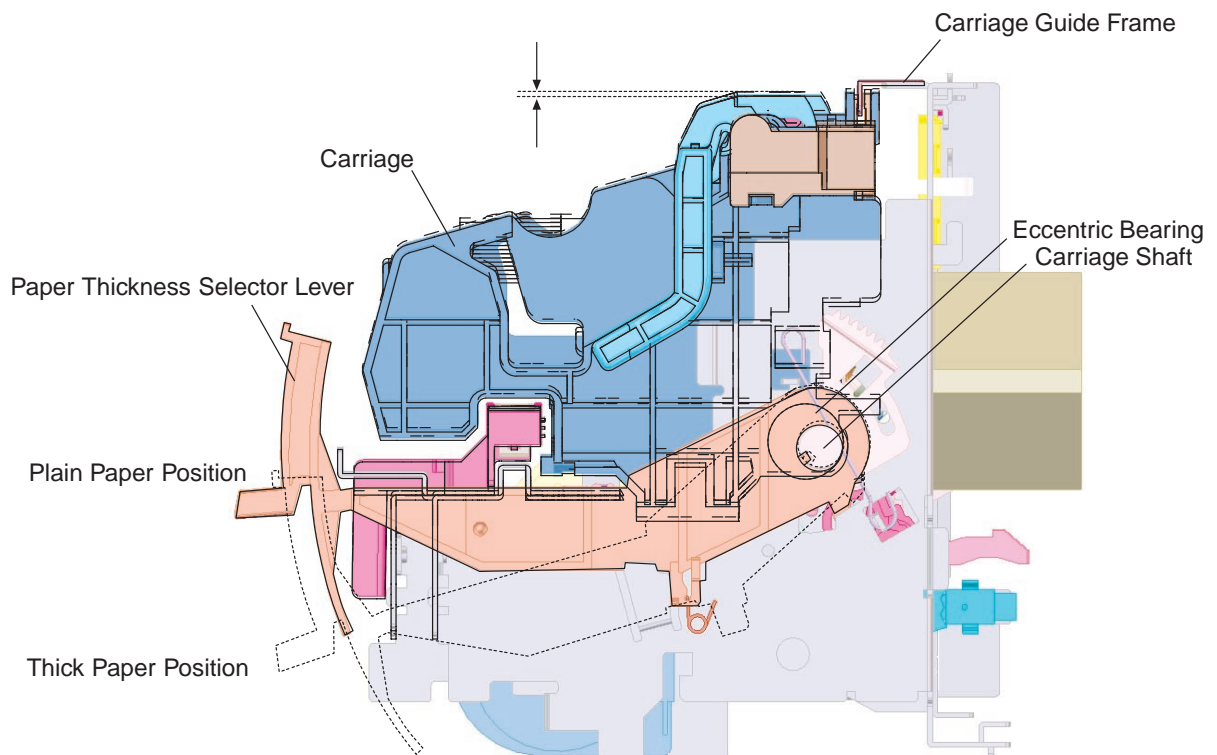
This printer has two paper supply methods, using the auto-sheet feeder in automatic paper feed mode, or the manual feed slot. The built-in auto-sheet feeder, driven by the paper feed motor and loaded with paper, supplies paper into the printer automatically. Also, feeding of postcards and envelopes can be performed automatically without operating a mechanical paper selection lever. Manual paper feeding also can be performed, even if paper is set in the auto-sheet feeder. When paper is detected by the paper end sensor (photointerruptor-type), it will be fed automatically to the print start position on the platen. Paper feeding action during printing is controlled by the control of the paper feed rollers. The printed paper will be ejected from the printer by the paper eject rollers.



**Figure 4-22 Paper Feed Path**

**b) Paper thickness adjustment**

The clearance between the head face of the BJ cartridge and the paper varies with the thickness of the paper. Smaller clearance improves the printing quality however, paper contacting the head face risks spoiling print quality or damaging the BJ cartridge head face. This printer is equipped with a 2-position paper thickness selector to provide constant paper clearance. The carriage shaft is supported by means of an eccentric bearing. The paper thickness selector turns this eccentric bearing to move the carriage up and down in order to adjust the head-to-paper distance.

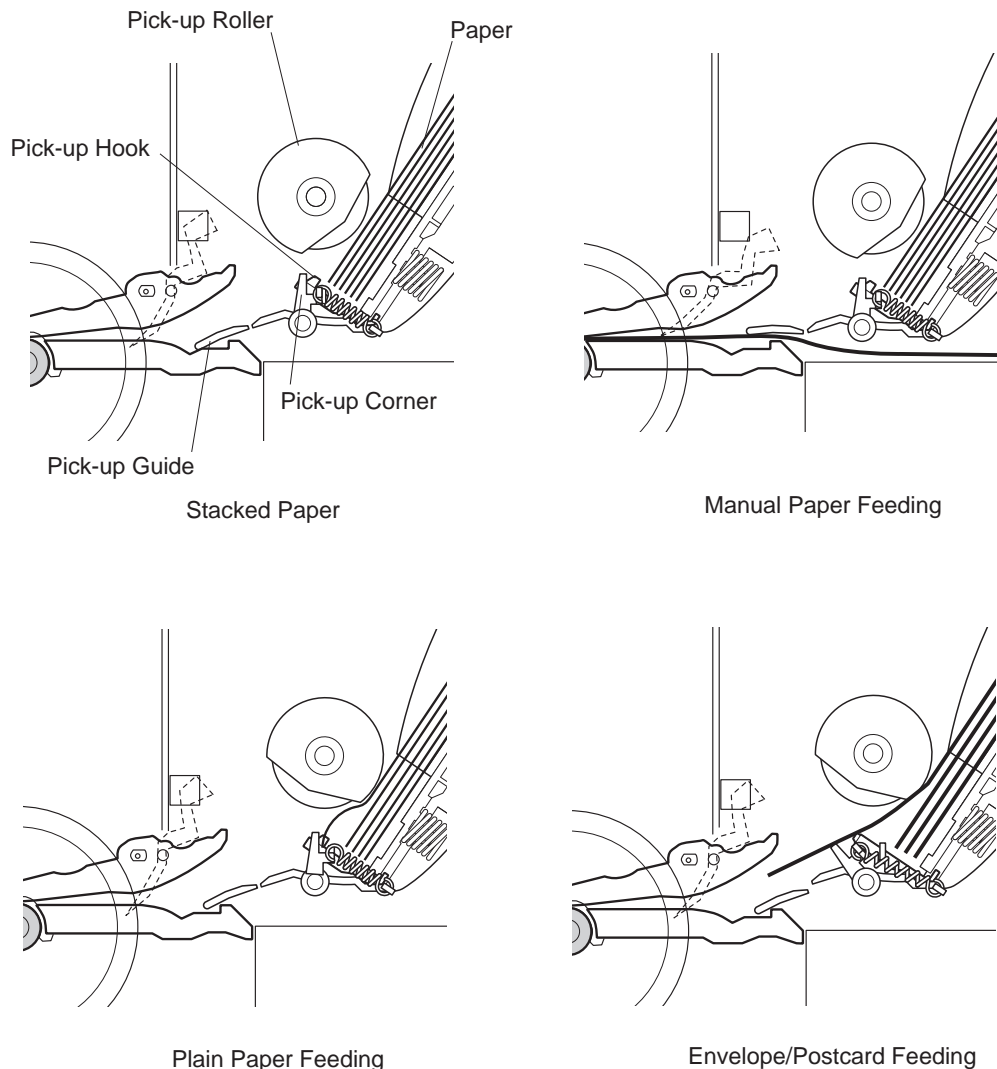


**Figure 4-23 Paper Thickness Adjustment Mechanism**

### 3.4.2 Construction of the paper feed unit

This printer's paper feed unit is mechanically comprised of the pick-up unit, paper feed unit, and the paper eject unit.

#### a) Pick-up unit



**Figure 4-24 Paper Feed Unit**

The auto-sheet feeder for this printer eliminates the need for a mechanical paper-type selector provided the paper satisfies the specifications. As a result, no mechanical selector lever is in the auto-sheet feeder unit. The stacked papers are locked in two places with hooks at the paper's leading edge to prevent paper from skewing or warpage that could cause misfeeding.

Paper feed operation starts when, driven by the paper feed motor, the pick-up roller starts turning. The two hooks at the paper's leading edge will be unlocked, allowing the paper to be loaded onto the sheet feeder and hooked on the separator by one corner. When the pick-up roller starts turning, the paper, with one corner suppressed by the paper separator, will be separated and fed one sheet at a time to the paper feed roller.

If the paper is a resilient type such as an envelope/thick paper (postcards, etc.), it pushes the paper separator over as it gets fed because the paper's resilience is greater than the paper separator spring's return force.

To manually feed paper, the user must insert the paper into the manual feed slot until the paper end sensor detects it. In the manual paper feed mode, the pick-up guide changes its position for the paper to pass through a different path from that in which the auto-sheet feeder is used. As a result, manual paper feed mode is possible even when the auto-sheet feeder is loaded with paper. When the paper pushed in to the paper feed section is detected by the paper end sensor, it will be fed to the print start position.

**b) Paper feed unit**

The printing unit clamps the paper on the platen between the pressure roller/paper feed roller and the spurs/eject roller to provide a constant clearance between the head and the paper. Control of paper feeding during printing is performed by controlling the turning of the high precision ceramic-coated metal paper feed roller. Paper is fed in steps of 1/720 inch.

**c) Paper eject unit**

The printed paper is ejected by the eject roller with its face clamped on the roller by sharp toothed spurs. The paper eject unit consists of the eject roller and the spurs. A cut sheet fed to the print start position will be printed at the platen. The cut sheet is fed by the turning of the paper feed roller and pinch roller, and, after being printed, will be ejected by the eject roller and spurs.

### 3.5 Carriage Unit

#### 3.5.1 Functions of carriage unit

##### a) Mounting BJ cartridges

The carriage secures BJ cartridges mechanically in place and connects them via the carriage ribbon cable to the control board. When the printer is powered off, the carriage will be locked in the capping position.

##### b) Driving the carriage

The carriage, driven by the carriage motor, travels along the horizontal width of the paper using the carriage belt.

##### c) Maintaining BJ cartridges

By controlling the position of the carriage, this printer performs wiping and capping operations on the BJ cartridges.

##### d) Paper feed motor drive switching

By controlling the carriage position, the switching arm of the drive switching unit will be actuated so that the paper feed motor driving paper feed during printing will switch over to driving the purge section or auto-sheet feeder.

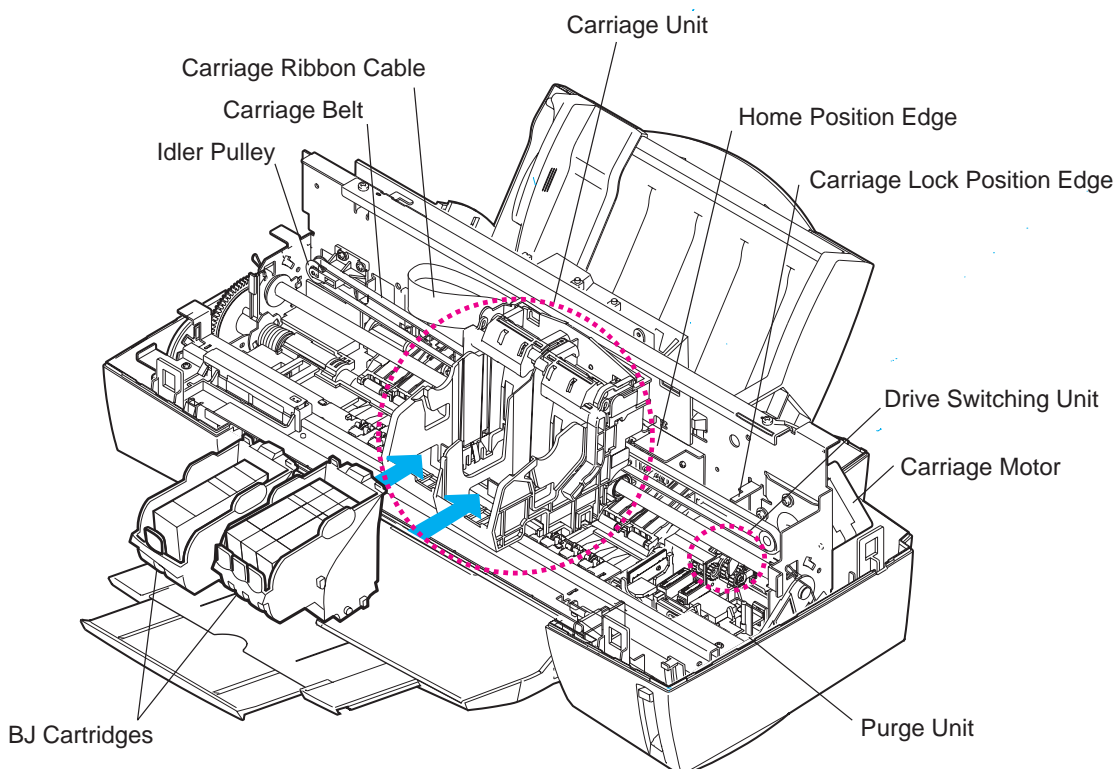
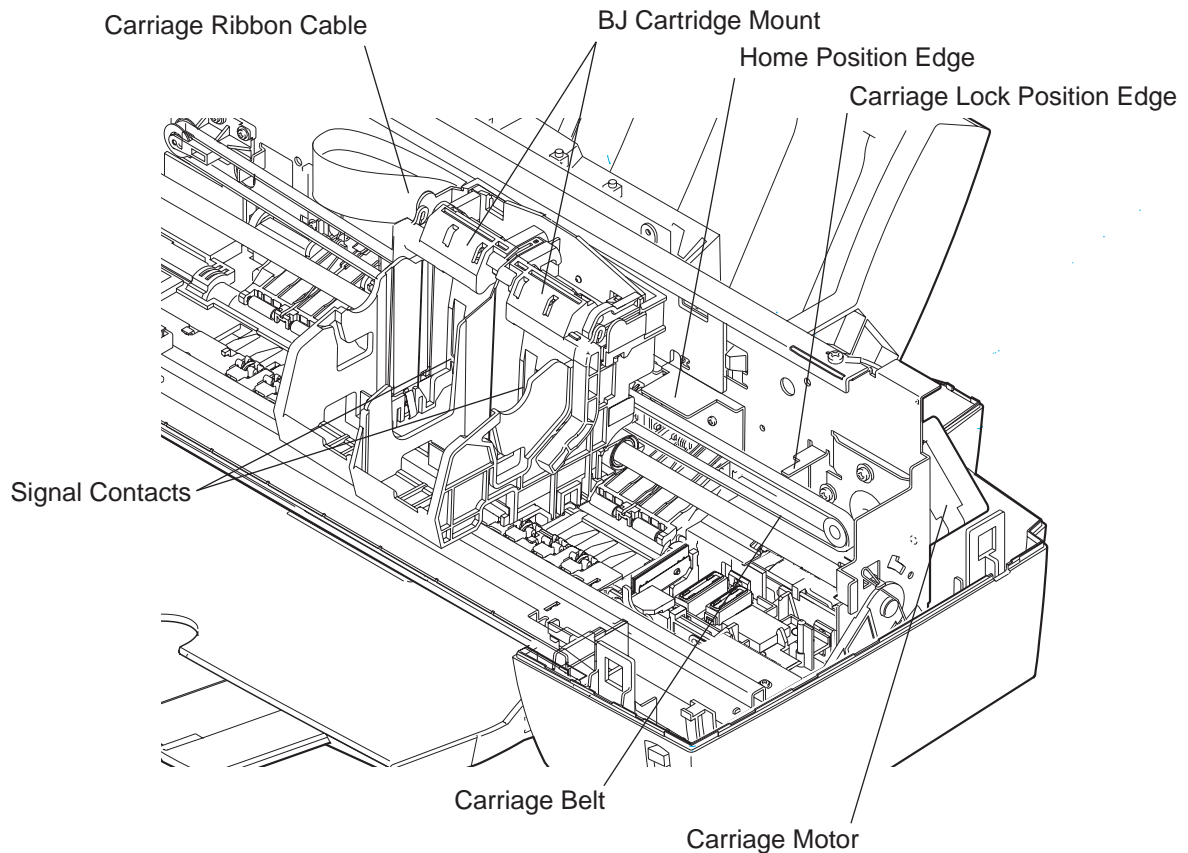


Figure 4-25 Carriage Unit



### 3.5.2 Construction of the carriage unit



**Figure 4-26 Carriage Unit**

#### a) BJ cartridge mount

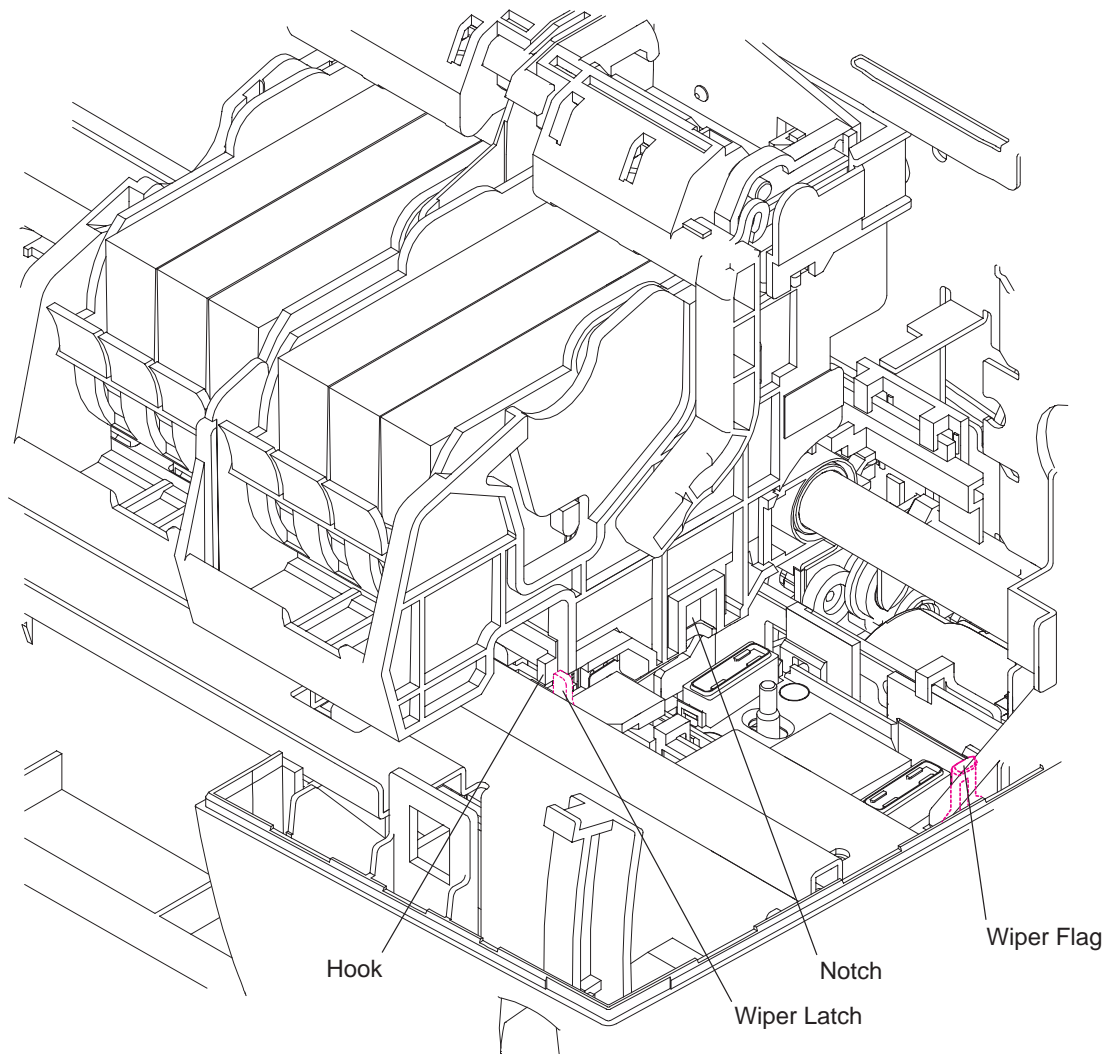
BJ cartridges are secured to the carriage with the BJ cartridge lock lever. When a BJ cartridge is secured in place to the carriage, the carriage board signal contact pad contacts the BJ cartridge signal contacts, allowing print signals to be transmitted from the control board. The home position edge is provided to interrupt the light from the home position sensor on the chassis.

#### b) Carriage drive unit

Mechanical variances between the left and right BJ cartridges in vertical/horizontal and bi-directional printing can be corrected automatically or manually by adjusting printing timing. The carriage motor is a stepping motor that drives the carriage via the carriage belt to travel along the horizontal width of the paper. The carriage will be unlocked when the carriage lock position is detected by the home position sensor (photointerruptor type) located on the rear of the carriage. The carriage is controlled and driven by the stepping pulses fed to the carriage motor once the home position edge is detected as the reference for subsequent position control. The carriage motor is driven by the steady current generated by the motor driver, reducing drive loss and operating noise.

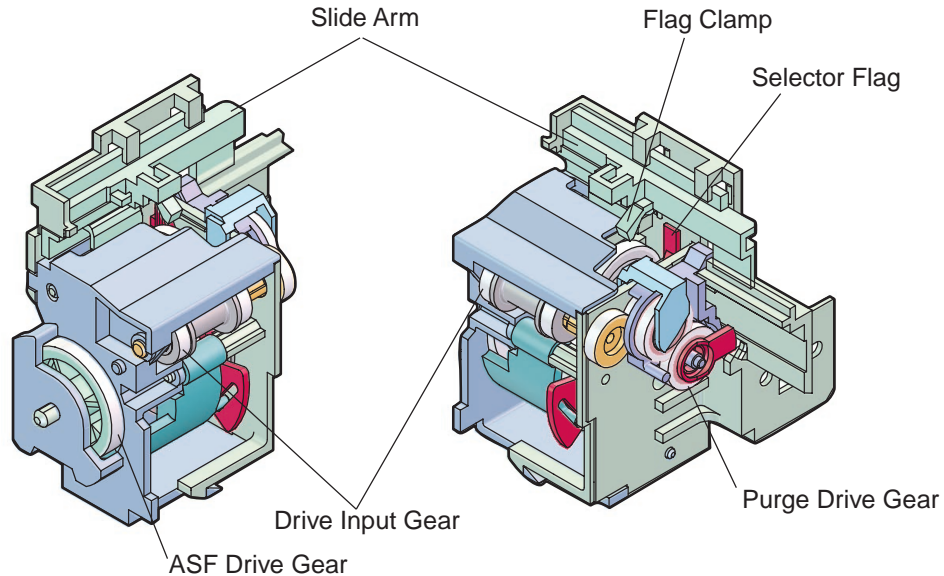
**c) BJ cartridge maintenance**

By controlling the carriage position, wiping and cleaning operations will be performed on the BJ cartridge. During capping, as the carriage travels left to right, the notch on the carriage causes the purge section wiper flag to move, raising the wiper and capping the cartridge. When the carriage travels right to left, the cartridge is wiped clean, after which the hook unit on the carriage unlocks the wiper latch, lowering wiper.

**Figure 4-27 BJ Cartridge Maintenance**

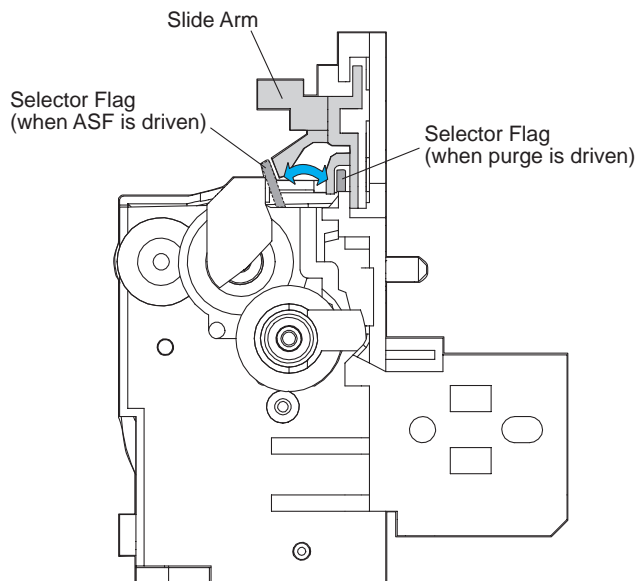
**d) Paper feed motor drive switching unit**

Depending on the carriage position, the drive switching unit switches the paper feed motor's drive power over to drive the purge unit or the auto-sheet feeder. The slide arm that travels in sync with the carriage action controls the operation of the selector flag.



**Figure 4-28 Drive Switching Unit**

When the purge unit is driven, the flag clamp on the slide arm secures the selector flag. Turning the paper feed roller in the direction of paper feed transmits the driving power to the purge unit's drive gear without causing the ASF drive gear to turn. When the auto-sheet feeder is driven, the paper feed unit will be turned in the opposite direction of paper feed once to allow the flag to move toward the slide arm as the selector arm moves to the position where it supports the selector flag. With the selector flag supported, turning the paper feed unit in the direction of paper feed causes the ASF drive gear to start turning, and with it, pick-up operations commence. When the slide arm moves out of the position where it supports the flag, the ASF drive gear automatically stops turning when the pick-up action is complete.



**Figure 4-29 Operation of the Drive Switching Unit**

# 4 PRINTER'S ELECTRICAL SYSTEM

## 4.1 Overview

The electronics of this printer can be functionally divided into the control unit and the power supply unit. The control section converts the input data from the host computer into print signals or printer control signals, and drives the BJ cartridges and motors while monitoring all the sensors. The power supply unit converts the AC power into DC power, and has the control board convert this DC power into each specific voltage supplied to drive motors, ICs, BJ cartridges, etc.

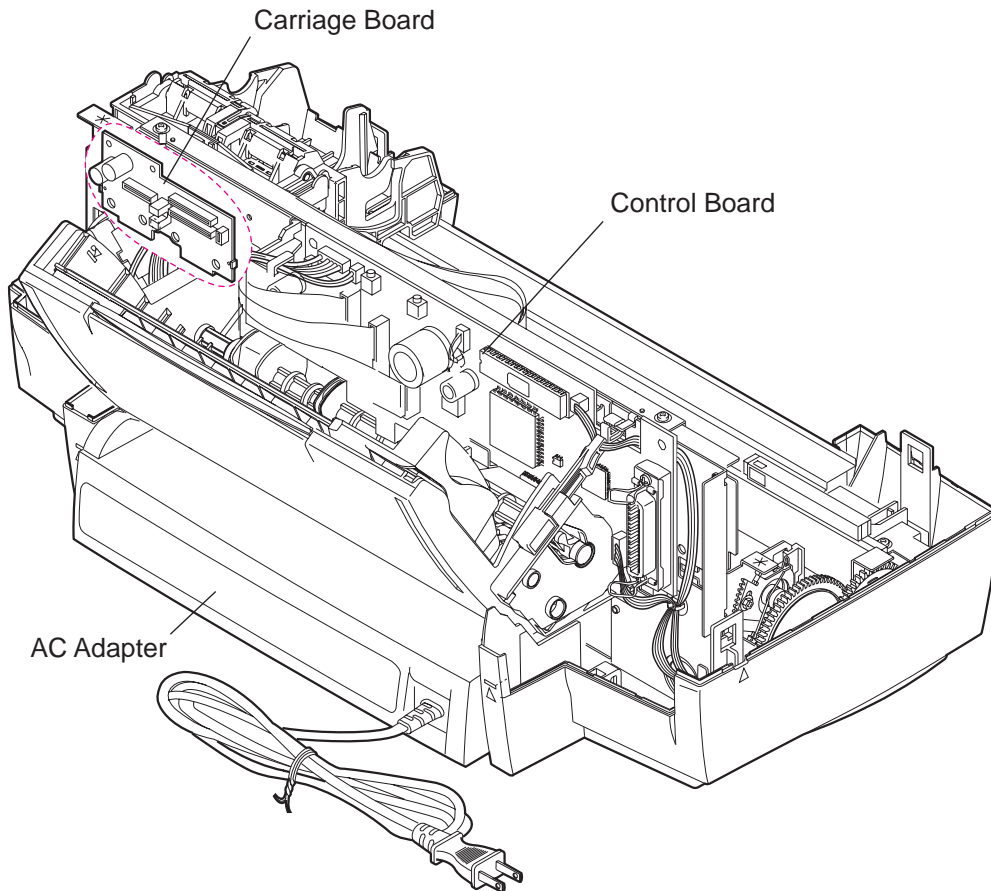


Figure 4-30 Printer's Electrical System

## 4.2 Control Unit

### 4.2.1 Control unit block diagram

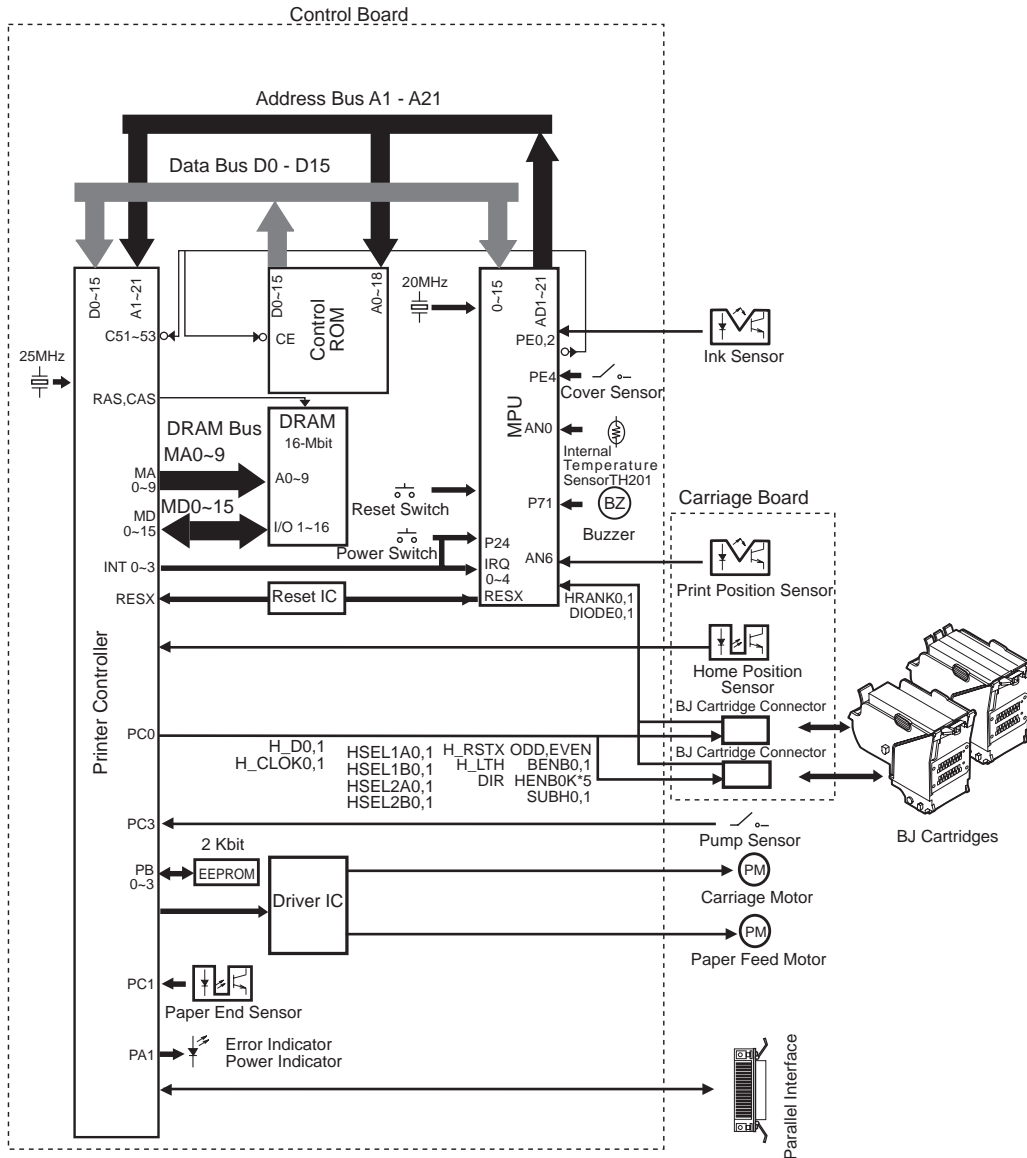


Figure 4-31 Control Unit Block Diagram

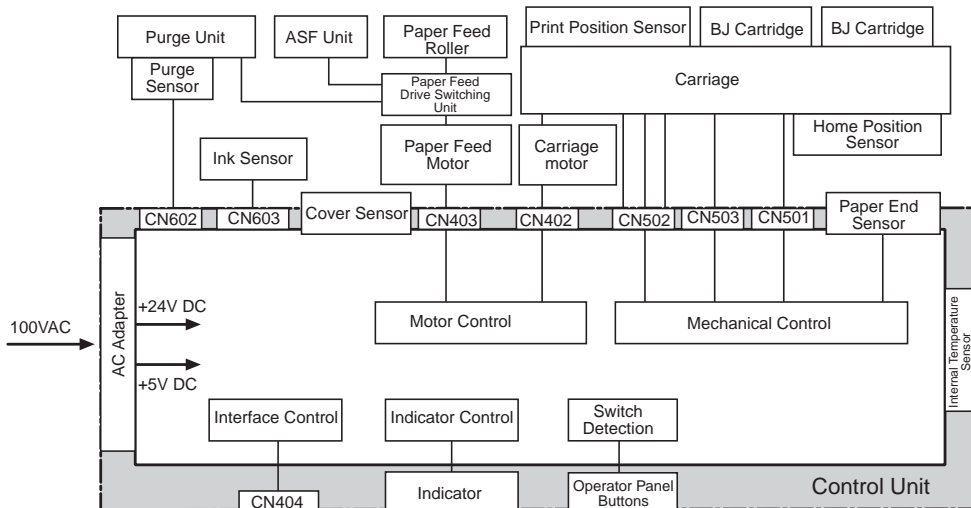
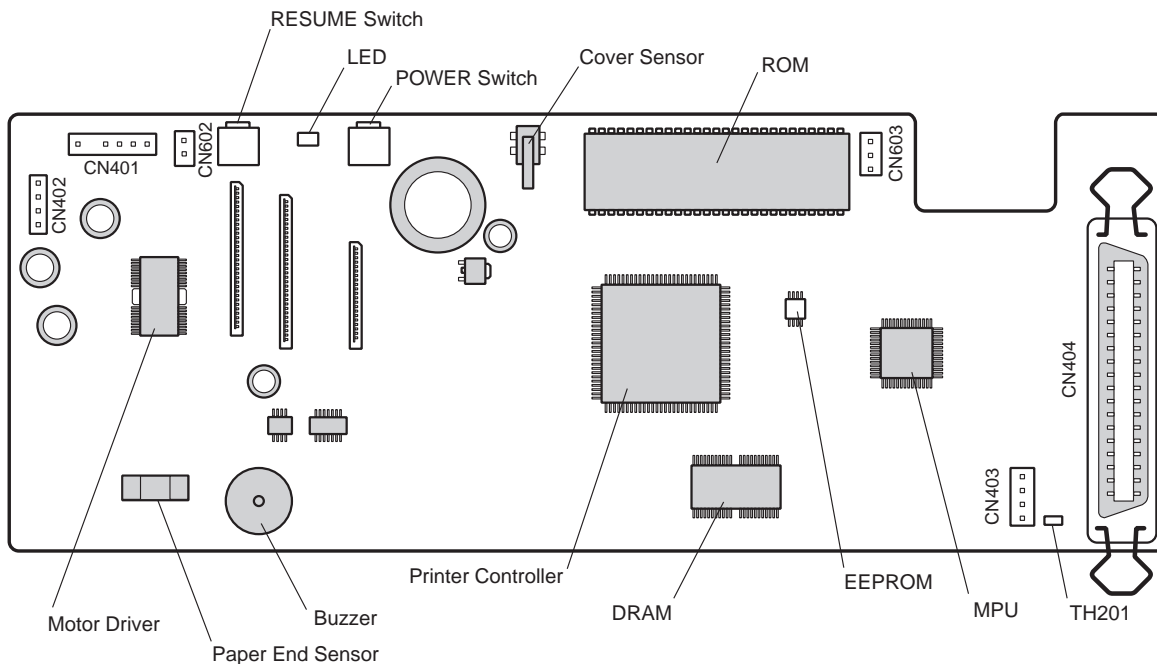


Figure 4-32 Control Unit Function Diagram

## 4.2.2 Logic Components



**Figure 4-33 Control Board**

### a) Printer controller

The printer controller incorporates the interface controller, print head controller, buffer controller, DRAM controller, stepping motor controller and I/O ports and operates in sync with the 25MHz external clock input.

#### Interface controller

Receives 8-bit parallel data sent from the host computer in sync with the data strobe pulse ( $\overline{\text{STROBE}}$ ) through  $\text{BUSY}/\overline{\text{ACKNLG}}$  handshake. Data received from the interface will be stored in the receive buffer in the DRAM and analyzed by the printer controller.

#### Print head controller

Reads the print data from the DRAM's print buffer and converts this parallel data into serial data to send to the print head. At the same time, it counts the printing dots needed to control the variable pulse width of the Heat ENABLE signal (Pre/Main pulse width).

The printer controller's head drive signals include the Odd/Even ENABLE signal, Block ENABLE signal, Heat Select signal, and Heat ENABLE signal. The printer controller uses the Odd/Even ENABLE signal, Block ENABLE signal, and Heat Select signal to select the discharge heaters inside the nozzle by time sharing, and varies the pulse width of the Heat ENABLE signal to determine how long the discharge heater to be heated should remain driven. When the head drive voltage is on, the printer controller also uses the HDATA signal to send the head ID, rank resistor value as 6-bit serial input data from BJ cartridges.

**Buffer controller**

Writes the received data into the DRAM's receive buffer automatically, controls the remaining receive buffer capacity, reads the print buffer automatically, and clears the data that has been read. The print buffer manages two separate areas for the 2 heads.

**DRAM controller**

Performs control of the 16Mbit-DRAM's 16-bit data bus and 10-bit address bus, READ/WRITE control, RAS/CAS control, and REFRESH control, using the bus dedicated to DRAM which is separate from the MPU bus inside the printer controller.

**Stepping motor controller**

Transfers to the driver IC the steady current drive waveforms needed to drive motors. As the motor is sinusously driven, the data to be transferred to the IC is 16-bit/step drive waveform serial data that consists of motor drive current, motor torque setting, phase information, etc.

**Interrupt controller**

The printer controller has 4 interrupt pins on it. The interrupt controller generates parallel I/F, motor drive, and head drive interrupt requests to MPU(IC201). Also, it accepts an interrupt signal from the reset IC.

**I/O port**

Sends indicator lighting and the power supply voltage output control signals as output signals, receives sensor signals from the home position sensor, pump sensor, and paper end sensor as input signals, controls the EEPROM data I/O, and sends the motor driver reset signal as output.

**b) MPU (IC201)**

Incorporates a 32-bit CPU, 6Kbit work RAM, 21-bit address bus port, 16-bit data bus port, interrupt controller, A/D converter, and I/O port. The MPU selects the control ROM, printer controller, or DRAM according to the chip select signal.

**Built-in CPU**

32-bit CPU operates in sync with the 20MHz external clock input.

**Address bus/Data bus**

The 21-bit address bus and 16-bit data bus operate in sync with the 20MHz external clock input.

**Interrupt controller**

Allows the MPU to receive the power on/off interrupt signal, as well as interrupt signals from the printer controller.

**A/D converter**

Detects the following analog signals:

Internal temperature analog signal from the thermistor on the control board.

Head temperature analog signal from the temperature sensors inside the BJ cartridge.

Ink chamber ink detection analog signal from the ink sensor.

Density detection signal from the print position sensor for printing position compensation.

**I/O Port**

Receives the cover sensor signal as input, and sends the lighting signal for the LED inside the print position sensor as output.

**c) DRAM (IC302)**

Controlled by the printer controller, the 16Mbit-DRAM is used as a receive buffer, download buffer, print buffer, and working area.

**d) Motor driver IC (IC401)**

Drives carriage motor and paper feed motor with steady currents generated according to the drive current signal data (serial data) it receives from the printer controller.

**e) EEPROM (IC602)**

Controlled by printer controller, the 2Kbit EEPROM stores in memory the quantity of absorbed waste ink, paper feed count, and BJ cartridge mount/demount count. The contents will be read when the printer is powered on, and written when powered off.

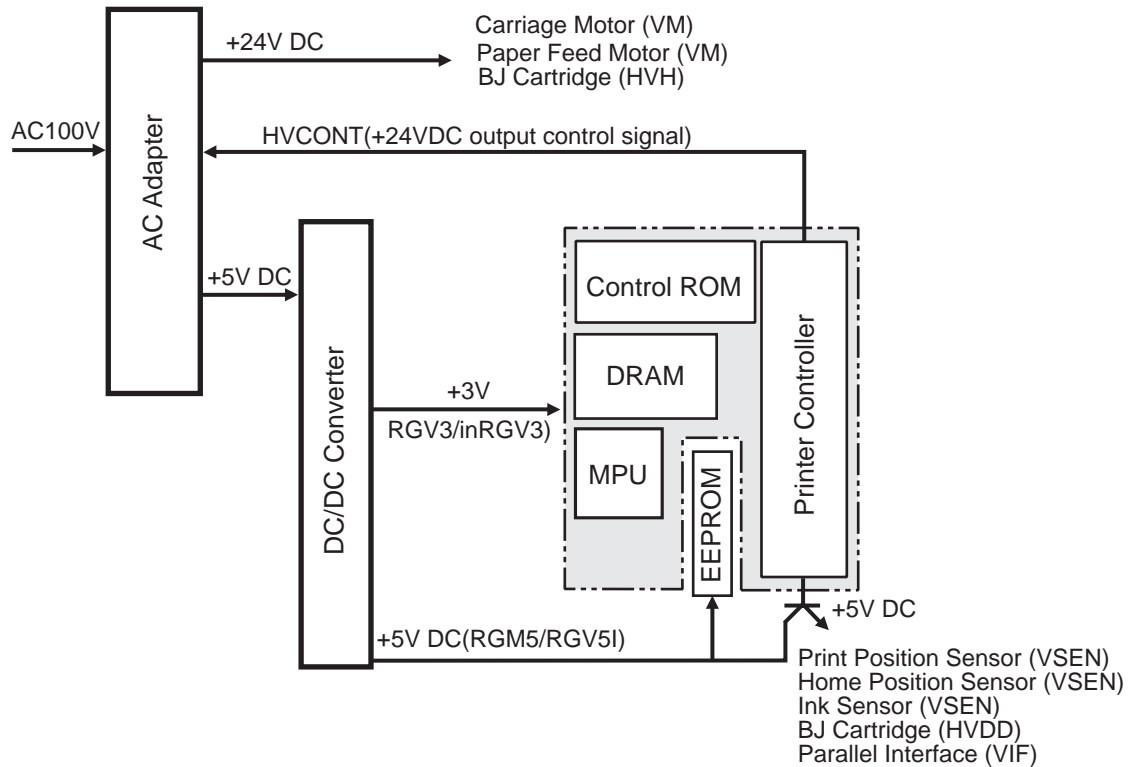
**f) Control ROM (IC202)**

8Mbit ROM containing the programs for controlling this printer.



## 4.3 Power Supply Unit

### 4.3.1 Power Supply Unit Block Diagram



**Figure 4-34 Power Supply Unit Block Diagram**

### 4.3.2 Construction of Power Supply Unit

The power supply unit converts AC power line voltage into DC voltages that drive motors, ICs, BJ cartridges, etc.

#### a) AC adapter

Converts the AC line voltage into 2 groups of DC voltages, +24 VDC, and +5 VDC. The output of +24 VDC is controlled by the output signal (HVCONT) from the printer controller. The +24 VDC is used to drive the head, and carriage motor/paper feed motor as HVH, and VM, respectively. Note that there is no output of HVH if the head is at the replacement position or at home position. The +5 VDC is always output by the adapter. Except for sensors, driver ICs, and BJ cartridges, all hardware components are active while AC power is supplied.

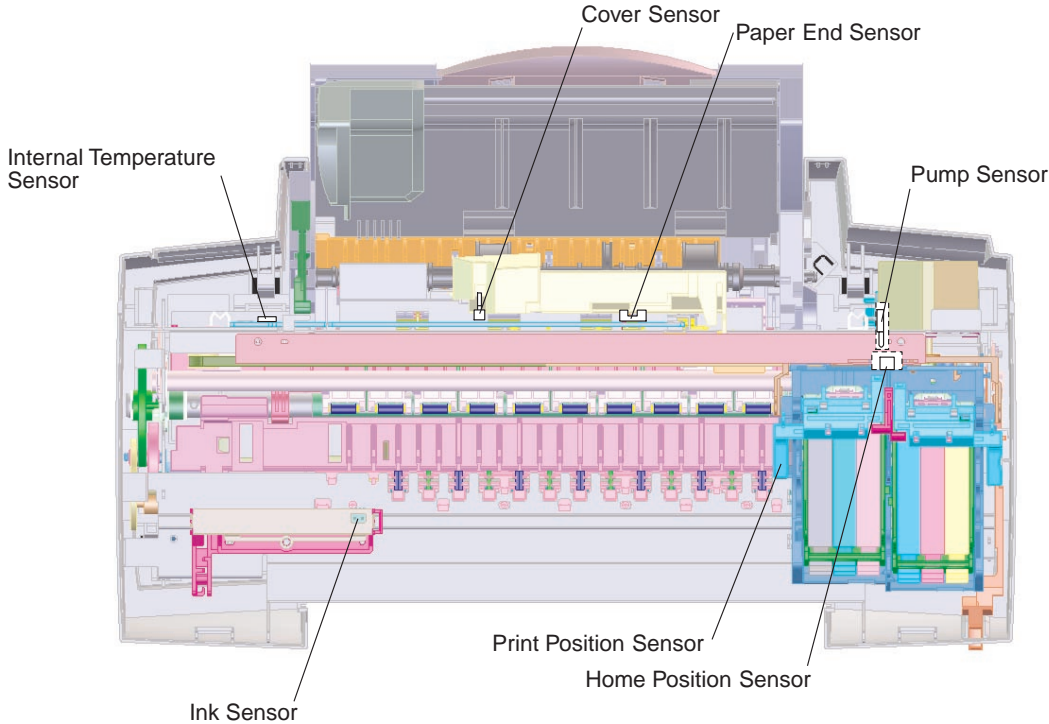
#### b) DC/DC converter

Located on the control board to convert +5V to RGV5/RGV5I(+5 VDC) and RGV3/inRGV3(+3.3 VDC) and output them. RGV5/RGV5I is used as the drive power for EEPROM and reset, and power voltages for HVDD, VIF, and VSEN. Note that the output of power voltages of HVDD, VIF, and VSEN are controlled by printer controller. RGV3/inRGV3 is used as power for the printer controller, MPU, DRAM, and control ROM, and as pull-up for switches. The +3.3VDC is intended to reduce power consumption when the printer is switched off as compared with +5 VDC.

## 5. DETECTION FUNCTIONS

### 5.1 Detection with Sensors

This printer has the following sensors detect the printer's status.



**Figure 4-35 Sensor Positions**

#### 5.1.1 Home position sensor

This photointerruptor-type sensor detects the chassis' home position edge and capping position edge to find the carriage's position. When the carriage finds the capping position edge, the printer confirms capping and locks the carriage. The carriage uses the position detected by the home position edge as the reference to determine its home position.

#### 5.1.2 Paper end sensor

This photointerruptor-type sensor uses its flag to check for the end of the paper passed through the paper feed unit to determine if there is paper. If there is no paper, the paper sensor arm closes the sensor; if there is paper, it opens indicating that there is paper.

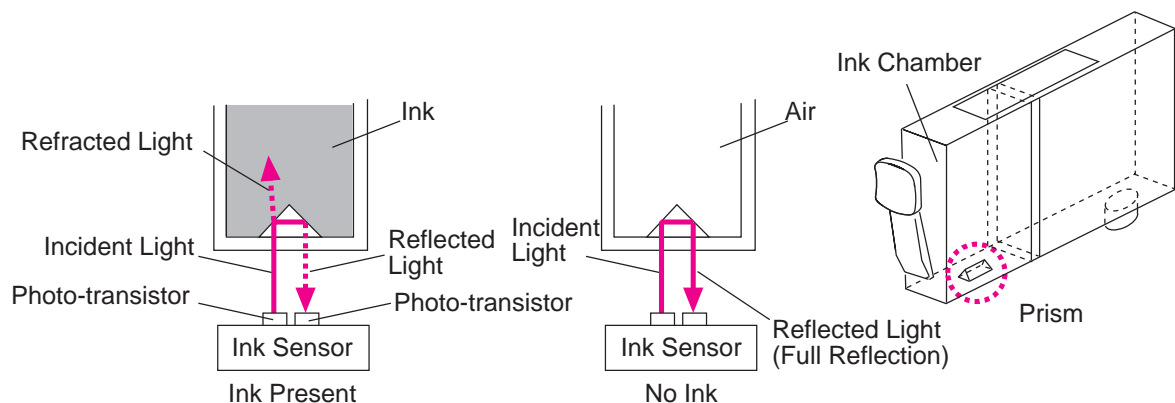
#### 5.1.3 Print position sensor

Consists of a red LED and photosensor, and sees the reflection density of the printing patterns, each printed slightly displaced from one another vertically and horizontally for each printing mode. The voltage varying with the reflection density is fed into the MPU as an analog input which is converted into a digital value by the built-in A/D converter. Based on the calculated compensation value, the printer performs optimum printing position correction for both heads and for bi-directional printing. Be careful not to open the front cover during measurement, as external light may make accurate measurement impossible. For more on automatic printing position compensation, refer to *Part 4: 2.3 Automatic Printing Position Alignment Function* (page 4-15).

### 5.1.4 Ink sensor

Consists of an LED and photosensor to optically check for ink in the ink chamber part of the ink tank. At the ink chamber bottom is a protrusion that acts as a prism. If ink is present in the chamber, the refraction rates of ink and the prism resin are nearly equal, producing less reflection. If there little ink left, the difference in refraction rate between the ink and the resin increases so that more incident light to the sensor will be reflected, thus increasing the intensity of reflected light. The printer decides whether there is any ink in the ink chamber or not based on the difference in the amount of reflection. The MPU, then, detects the voltage varying with reflection, and the the A/D converter converts this analog voltage to a digital value. When the printer decides that there is no ink left in the ink chamber, it generates a message on the status monitor telling that ink is running low in the relevant ink chamber. After the printer has decided that no ink is left, it starts counting the number of dots equivalent to the amount of ink absorbed in the sponge (20% of the ink) to detect "ink-out."

This detection takes place when the power is on, the front cover is closed, after pumping operations are completed, or after a specified number of dots have been printed. Do not open the front cover while measurement is going on, as external light can make accurate measurement impossible. Note that ink tank presence cannot be detected. If no ink tank is installed, the printer will determine that ink is present.



**Figure 4-36 Ink Sensor**

### 5.1.5 Cover sensor

Detects whether the front cover is open or closed. If the printer detects the cover is open, the carriage is moved to the replacement position.

### 5.1.6 Pump sensor

Switch-type sensor that detects the rotational position of the tube type pump. The printer controls the pumping operation based on the detected rotational position of the pump.

### 5.1.7 Printer temperature sensor (TH201)

Located on the control board, this sensor detects the temperature inside the printer to control the print head drive. The thermistor resistance varying with the temperature inside the printer is detected by the MPU as a varying voltage, so the incoming analog values are converted into digital values by the built-in A/D converter.

### 5.1.8 Head temperature sensor

Located inside the print head in the BJ cartridge, this sensor detects the head temperature so that the printer can stop printing when this sensor detects an abnormal temperature rise in the head as a head temperature abnormal error. The diode sensor output varying with the head temperature is detected as a varying voltage, so the incoming analog values are converted into digital values by the built-in A/D converter.

## 5.2 Other Detection Functions

This printer features other detection capabilities as follows:

### 5.2.1 Waste ink amount detection

Discharged ink from maintenance jetting to keep the print head in good working condition, and sucked ink as a result of cleaning is absorbed into the waste ink absorber. If more ink has been discharged than can be absorbed into the absorber, the ink may leak inside the printer. This waste ink amount detection function is provided to prevent ink leakage by estimating the waste ink absorber's capacity to absorb so that it can detect the ink-full condition. The printer calculates the amount of waste ink discharged by maintenance jetting and cleaning, based on the ink dot counter reading for the discharged ink, so that when the estimated waste ink volume reaches 95% of the waste ink absorber's capacity, allowing for evaporated ink, a waste ink warning will be issued on power-up. If this condition continues until the estimated waste ink amount reaches 100%, a "Waste Ink Full" error will be issued.

### 5.2.2 BJ cartridge detection

The detection signals from the index unit, built into the print head heater board, detect the installed BY cartridges. For more, refer to *Part 4: 3.2.3 d) Cartridge identification* (Page 4-24).

# *Part 5*

## **MAINTENANCE**

Page	
5 - 1	1. MAINTENANCE
5 - 1	1.1 Parts for Periodic Replacement
5 - 1	1.2 List of Consumables
5 - 1	1.3 List of Periodic Maintenance
5 - 2	2. SERVICE TOOLS
5 - 2	2.1 List of Tools
5 - 3	3. APPLYING GREASE
5 - 4	4. DISASSEMBLY AND REASSEMBLY
5 - 4	4.1 Disassembly and Reassembly
5 - 4	4.2 Notes on Disassembly and Reassembly
5 - 8	5. ADJUSTMENTS AND SETTINGS
5 - 8	5.1 Adjustments and Settings
5 - 9	5.2 Adjustment/Setting Procedures
5 -13	6. TROUBLESHOOTING
5 -13	6.1 Troubleshooting Overview
5 -15	6.2 Diagnosis
5 -36	7. CONNECTOR POSITIONS AND PIN ASS
5 -36	7.1 Control Board
5 -40	7.2 Carriage Board
5 -43	7.3 BJ Cartridge
5 -44	7.4 AC adapter
5 -44	7.5 DC power supply cable
5 -45	7.6 Carriage Motor
5 -45	7.7 Paper Feed Motor
5 -46	7.8 Ink Sensor
5 -46	7.9 Print Position Sensor
5 -46	7.10 Pump Sensor
5 -47	8. CIRCUIT DIAGRAMS
5 -47	8.1 Parts Layout
5 -49	8.2 Circuit Diagrams



# 1. MAINTENANCE

## 1.1 Parts for Periodic Replacement

Level	Parts for periodic replacement
User	None
Service personnel	None

## 1.2 List of Consumables (for details, see *Part 2: 1-5 Consumables* (page 2-5))

Level	Consumable
User	Black BJ cartridge Color BJ cartridge Photo BJ cartridge Black ink tank for the Black BJ cartridge Cyan, magenta, and yellow ink tanks for the Color BJ cartridge Photo cyan, photo magenta, and black ink tanks for the Photo BJ cartridge
Service personnel	None

## 1.3 List of Periodic Maintenance

Level	Location
User	None
Service personnel	None

## 2. SERVICE TOOLS

### 2.1 List of Tools

Ordinary Tools	Note
Phillips screwdriver	For removing and replacing screws
Phillips screwdriver (about 38 mm long)	For removing and replacing screws for the control board
Blade screwdriver	For removing plastic parts
Long-nose pliers	For removing and replacing springs
Tweezers	For removing and installing flexible cables
Flat brush	For applying grease (one per grease type)
Oil applicator	For applying FLOIL 946P
Multimeter	For troubleshooting

Special Tools (part No.)	Note
1.9-mm gap gauge (QY9-0038-000)	One for head gap adjustment (see Page 5-11)
0.5-mm gap gauge (QY9-0001-000)	One for head gap adjustment (see Page 5-11)
Tension spring (QY9-0043-000)	For carriage belt tension adjustment (see Page 5-9)
Gear key (QY9-0044-000)	For adjusting ASF driving gear position (see Page 5-10)
MOLYKOTE PG-641 grease (CK-0562-000)	For application to specified locations (see Page 5-3)
FLOIL 946P grease (QY9-0045-000)	For application to specified locations (see Page 5-3)



### 3. APPLYING GREASE

Apply greases at the points shown below.

Apply a thin film of grease using the flat brush. For the Carriage Oil Pad, do not use a brush but apply directly.

For disassembly and reassembly procedures, refer to the parts catalog.



Be careful not to contaminate wipers or caps with grease.

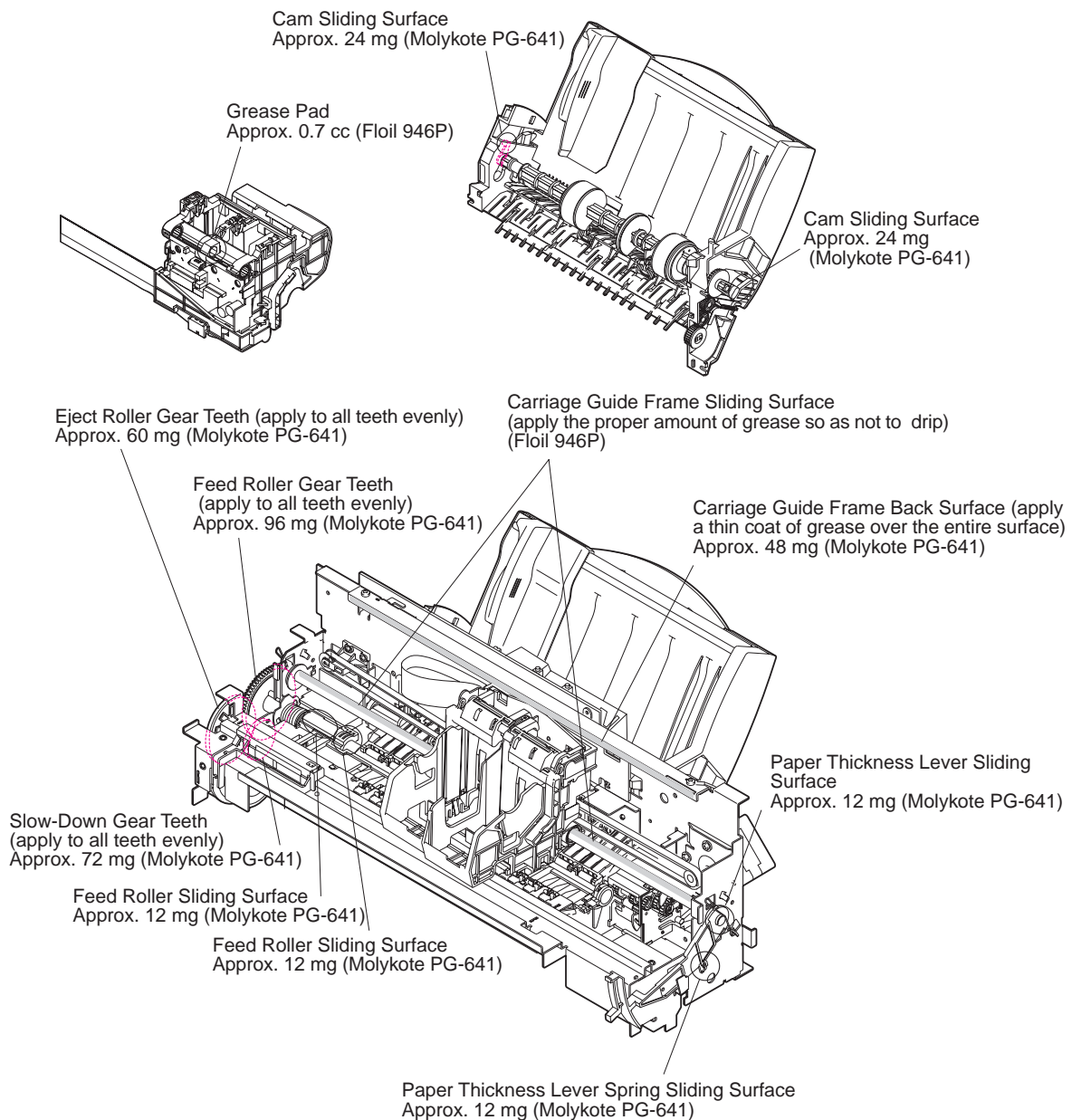


Figure 5-1 Grease Points

## 4. DISASSEMBLY AND REASSEMBLY

### 4.1 Disassembly and Reassembly

When disassembling or reassembling the printer, refer to the parts catalog. The numbers in the parts catalog illustrations indicate the disassembly sequence. The parts catalog also contains close-up diagrams for parts requiring special care during disassembly or reassembly.

### 4.2 Notes on Disassembly and Reassembly

Note the following when disassembling or reassembling the printer (also refer to the parts catalog for additional information).

#### 4.2.1 Unlocking the carriage

When the printer is shipped from the factory (or when the cartridges are installed and the power has been turned off normally), the carriage is locked in the capping position to secure the cartridges during transportation. When the printer is powered on properly, the carriage locking is disabled automatically. If the printer cannot be powered on normally, it will be necessary to manually unlock the carriage. This can be done by turning the paper eject roller gear half a turn (5 indented notches) in the direction of arrow 2 with a flat-blade screwdriver while gently pressing the carriage in the direction of arrow 1. You can also use the carriage key to turn the paper eject roller gear.

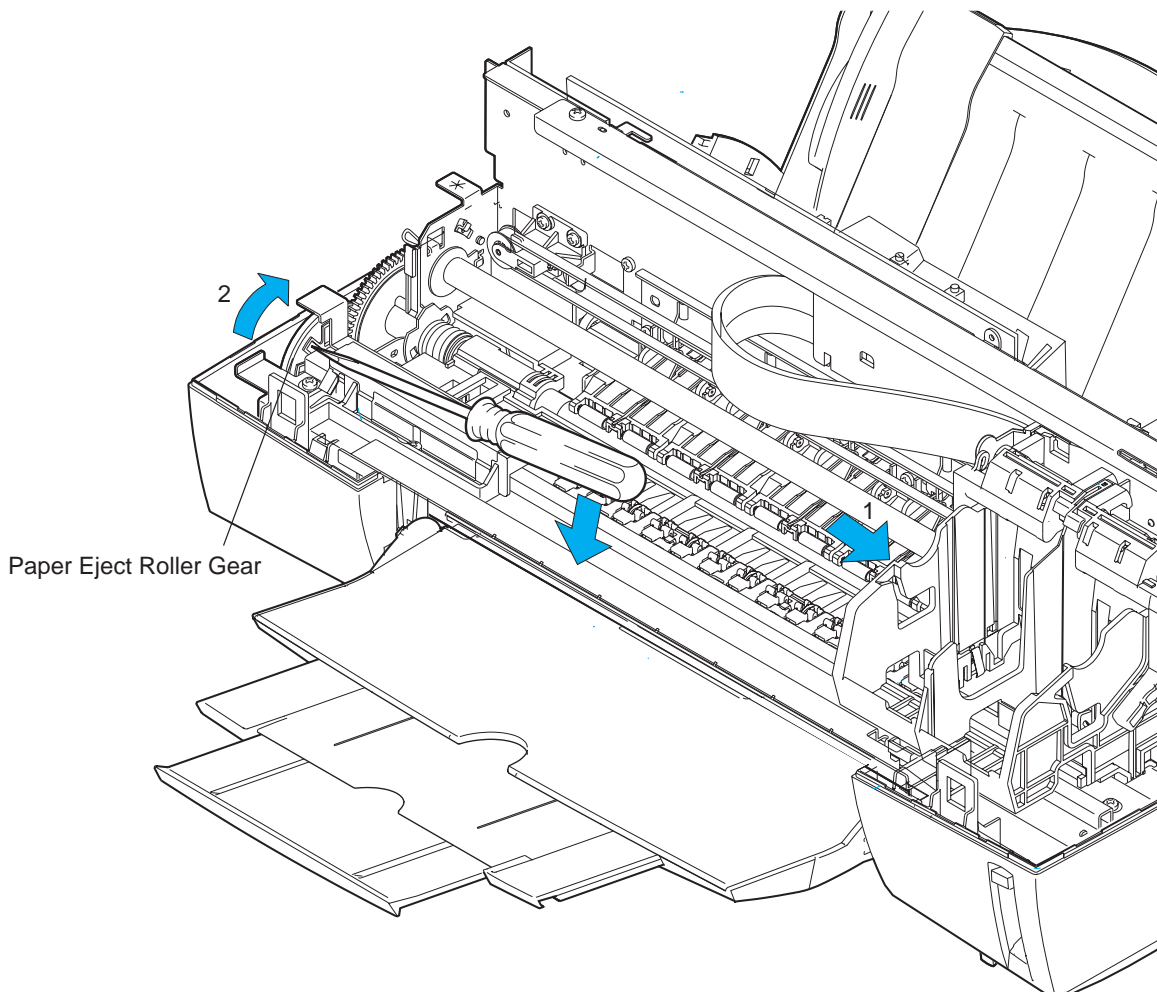


Figure 5-2 Unlocking the Carriage

### 4.2.2 Removing the printer unit

Refer to Figure 5 (page B-9) of the parts catalog.

- 1) Set the paper thickness lever to its lowest position (envelope position).
- 2) Press the locking tab on the right side of the printer in the direction of arrow 1 and slightly lift the right side of the printer unit in the direction of arrow 2, resting it on the boss.
- 3) Likewise press the locking tab on the left side of the printer and slightly lift the left side of the printer unit.
- 4) Holding the printer unit by its front part and the ASF part as illustrated below, first push back the printer unit and then lift it straight up as shown by arrow 3.

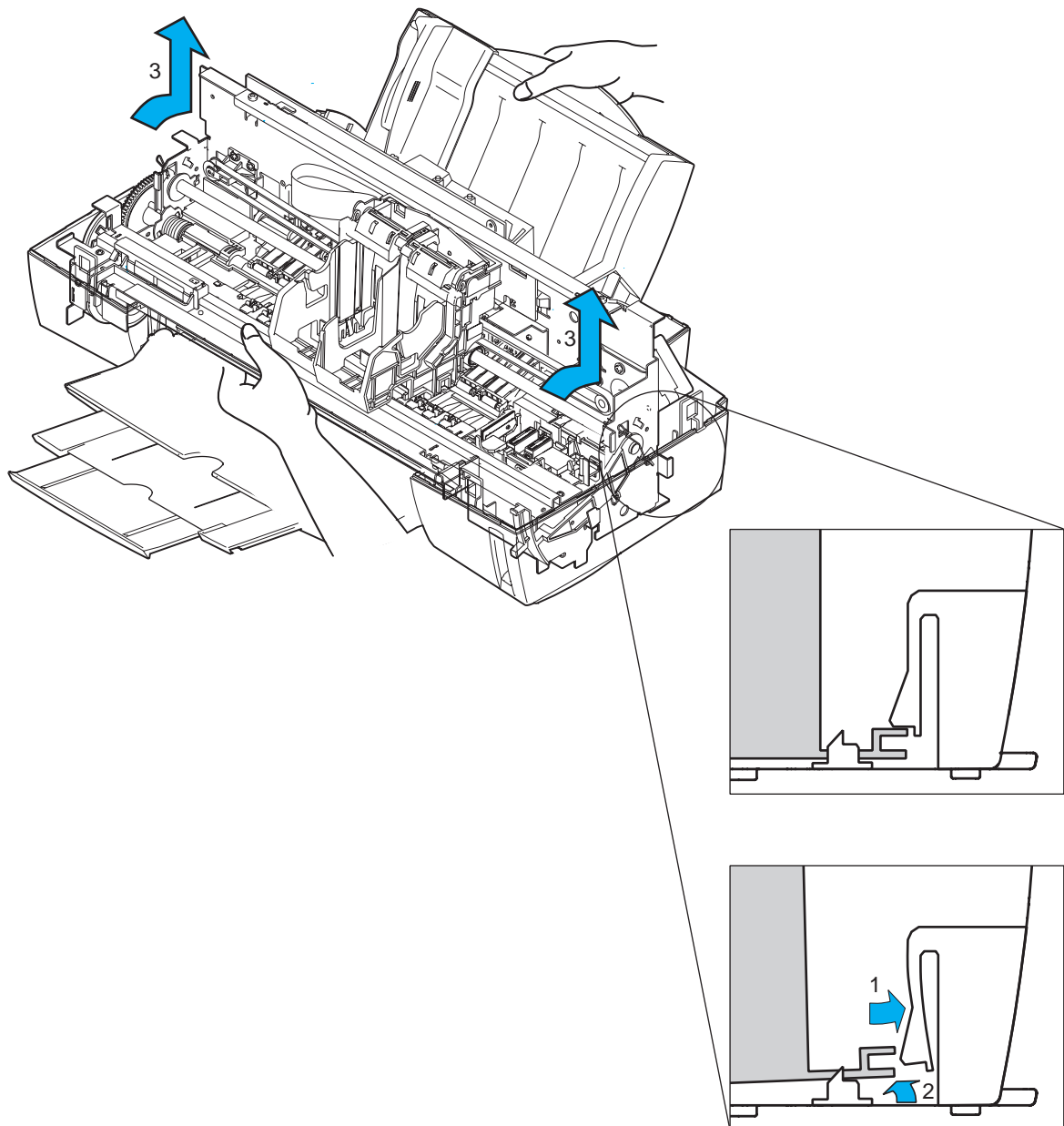
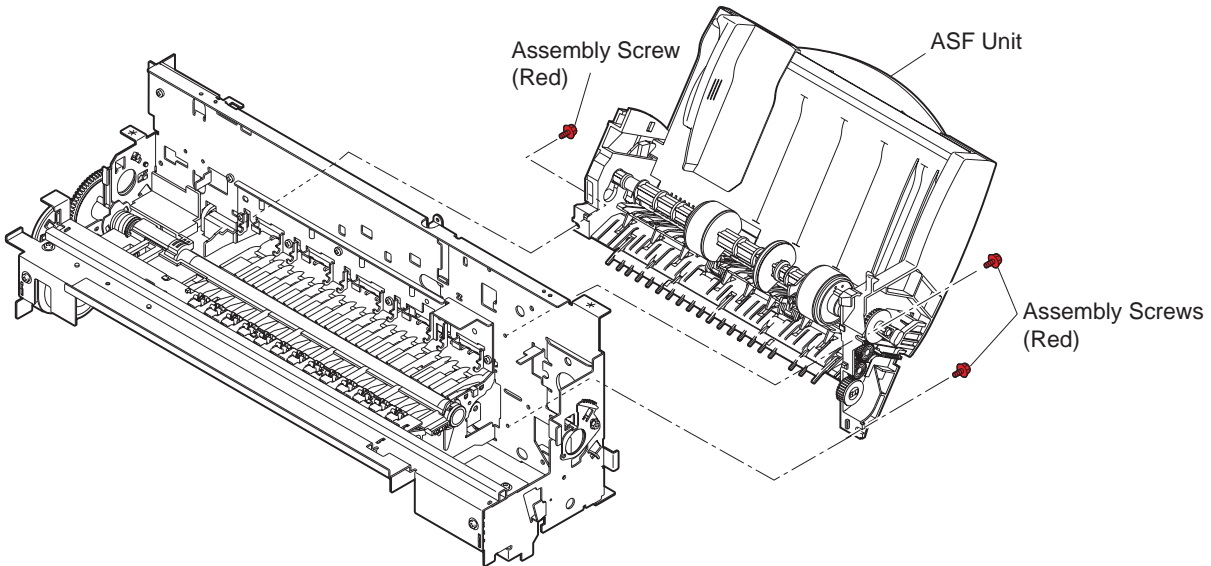


Figure 5-3 Removing the Printer Unit

### 4.2.3 Removing the ASF unit

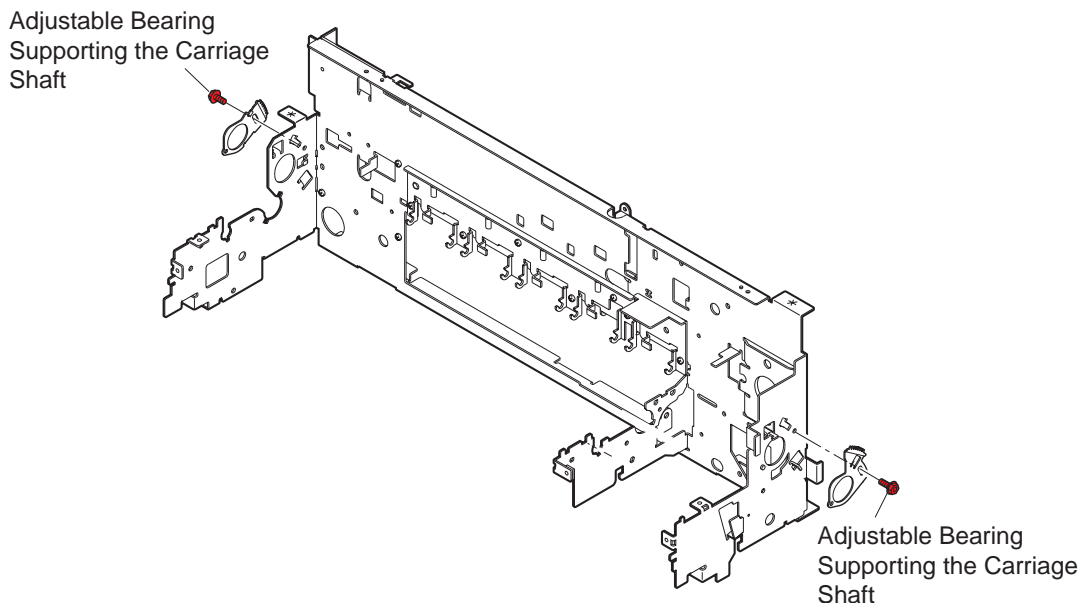
The ASF unit is attached to the printer unit such that the ASF driving gear and the pick-up roller are matched in phase. Once you removed the assembly screws, painted red to protect against careless removal, which fasten the ASF unit to the printer frame, you must readjust the position of the ASF gear with respect to that of the pick-up roller. For the procedure of the ASF gear position adjustment, refer to *Part 5: 5.2.3 ASF gear position adjustment* (page 5-10).



**Figure 5-4 Removing the ASF Unit**

### 4.2.4 Removing the adjustable bearings supporting the carriage shaft

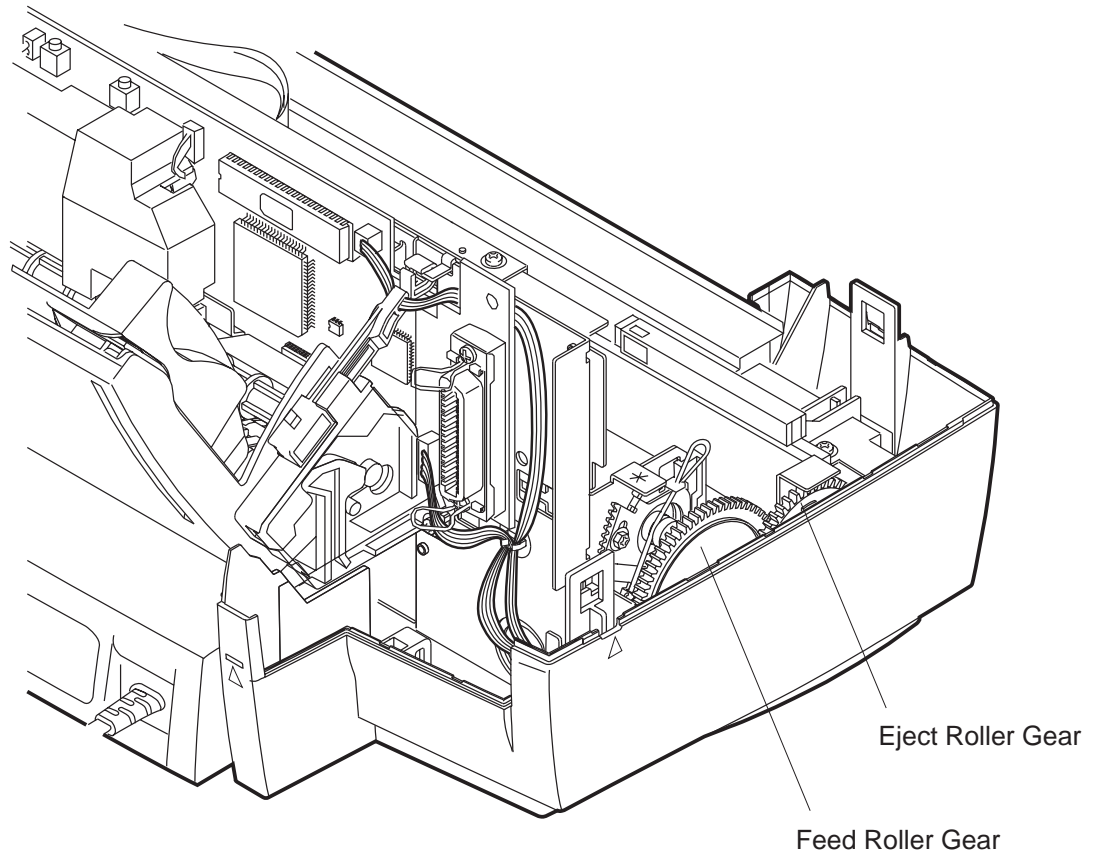
The adjustable bearings supporting the carriage shaft are adjusted and secured to the printer frame so that the ideal head-to-paper gap is maintained for best print quality. Once you have loosened the screws, painted red to protect against careless removal, which fasten the adjustable bearings to the printer frame, you must readjust the position of the bearings for head gap adjustment. For the procedure of the head gap adjustment, refer to *Part 5: 5.2.4 Head gap adjustment* (page 5-11).



**Figure 5-5 Adjustable Bearings Supporting the Carriage Shaft**

### 4.2.5 Paper feed gears

Be careful not to touch the gears in the paper feed unit, especially the paper feed gear, during disassembly or reassembly, because even slight damage to it could affect paper feeding when printing at high resolution.



**Figure 5-6 Feed Gear Unit Precautions**

## 5. ADJUSTMENTS AND SETTINGS

### 5.1 Adjustments and Settings

#### 5.1.1 EEPROM setting

- 1) When the control board is replaced (see Figure 4 of the parts catalog).
- 2) When the waste ink absorber is replaced (see Figure 6 of the parts catalog).

#### 5.1.2 Carriage belt tension adjustment

When the carriage belt is loosened (see Figure 8 of the parts catalog).

#### 5.1.3 ASF gear position adjustment

When the ASF unit is detached (when screws painted red are loosened)(see Figure 10 of the parts catalog).

#### 5.1.4 Head gap adjustment

When the screws securing the adjustable bearings (painted red) that support the carriage shaft are loosened (see Figure 12 of the parts catalog).

## 5.2 Adjustment/ Setting Procedures

### 5.2.1 EEPROM setting

The EEPROM (IC602) on the control board stores total amount of waste ink absorbed, function settings, and other information specific to the printer. If you have replaced the control board, you must initialize the EEPROM of the new control board and change its data as necessary. Since the content of the EEPROM of a replacement control board is not defined, you must always initialize the new EEPROM before use. For the initializing procedure, refer to *Part 3: 3.6.1 Service mode operations* (page 3-18). If you have replaced the control board, you must visually check the waste ink absorber for ink level and replace it if necessary. If the waste ink level is considerably high but the waste ink absorber was not replaced, the waste ink could leak before the printer issues the waste ink full warning.

There is no way to write the total amount of waste ink absorbed, function settings, and other printer-specific information as stored in the old EEPROM into the new EEPROM. The total amount of waste ink absorbed may be reset to 0% but not to any other value.

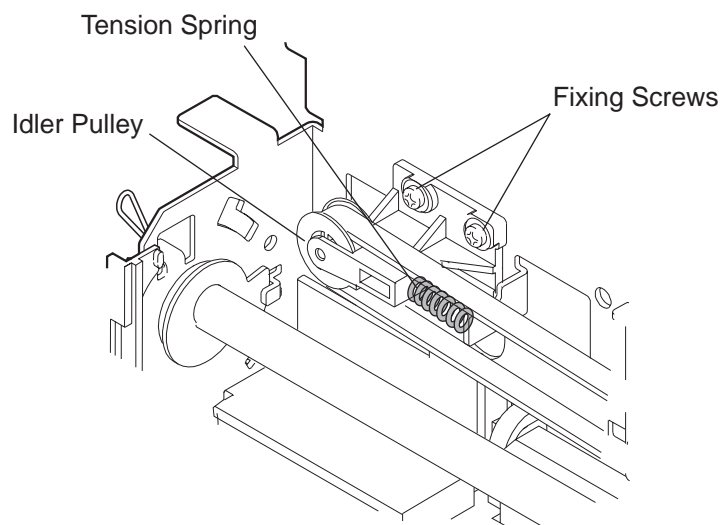
When you have replaced the waste ink absorber, you must clear the waste ink counter of the EEPROM or initialize the EEPROM. For the procedures, refer to *Part 3: 3.6.1 Service mode operations* (page 3-18).



The waste ink full error should not normally occur before the printer's designed life expires (as counted by printed sheets). The error may occur, however, if the printer has been switched on and off very often, the BJ cartridges have been replaced very often, or the printer has been used in unfavorable conditions.

### 5.2.2 Carriage belt tension adjustment

When the carriage belt has been loosened to replace the carriage, or for other reasons, the tension of the carriage belt must be readjusted. Insert the tension spring (QY9-0043-000) in the correct position to adjust the belt tension, and fix the pulley assembly by tightening the fixing screws, and then remove the tension spring.



**Figure 5-7 Carriage Belt Tension Adjustment**

### 5.2.3 ASF gear position adjustment

#### Preparation:

- 1) Reassemble the ASF unit components to the level as when the ASF unit was detached.

#### Adjustment procedure:

- 1) Set the gear key special tool (QY9-0038-000) to the paper eject roller gear.
- 2) Turn the gear key half a turn in the direction of arrow 1.
- 3) Turn the gear key at least a full turn in the direction of arrow 2. Confirm that the ASF drive gear will no longer move. If not, return to step 2) above.
- 4) Turn the pick-up roller shaft until the cam of the ASF unit comes into the position as shown in the figure below.
- 5) Without changing the position of the gears, fix the ASF unit to the printer chassis by tightly screwing the assembly screws (The toothed portion of the paper eject roller gear may be held). Note that you can turn the paper eject roller gear by holding and turning the notches.

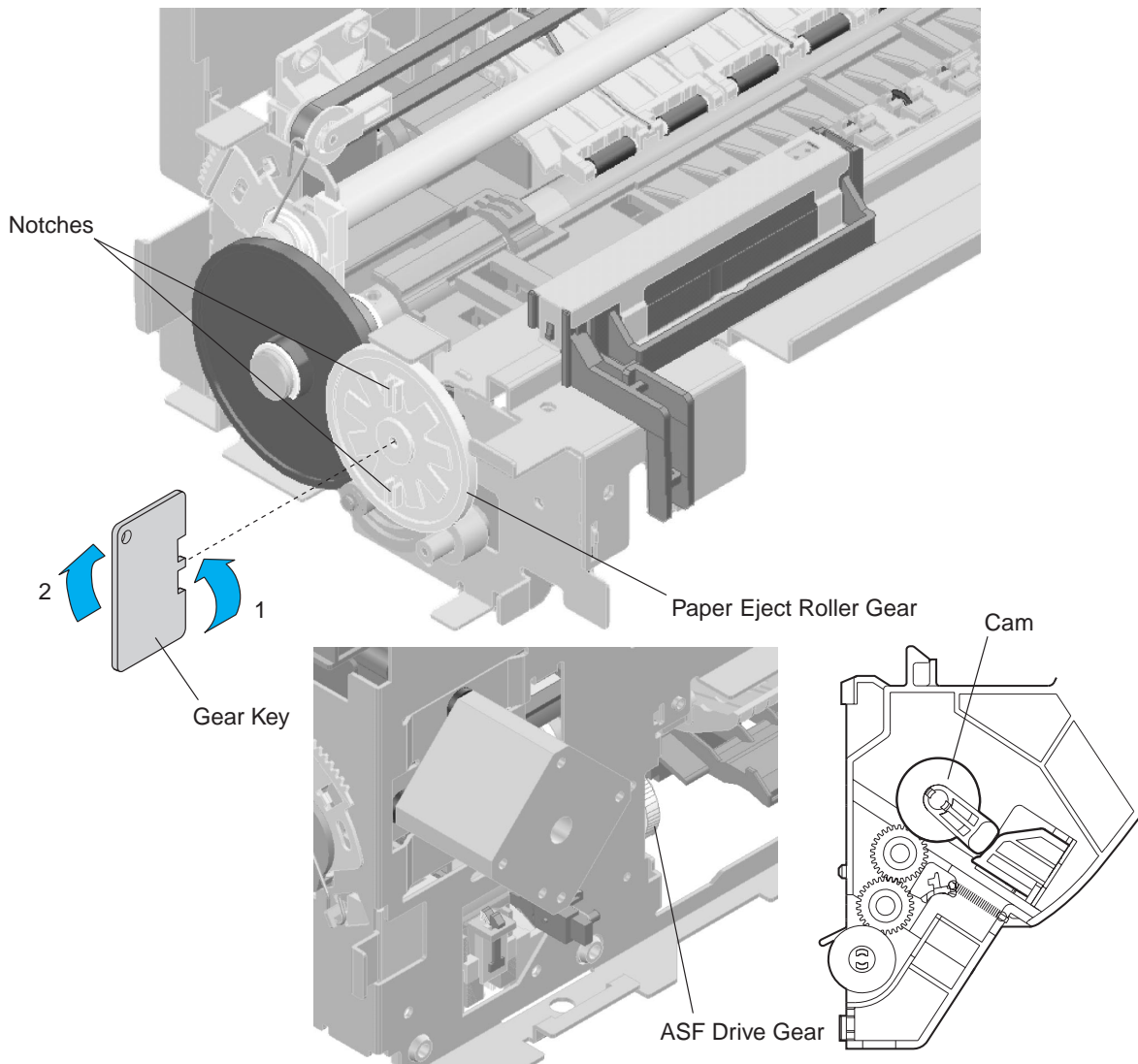


Figure 5-8 ASF Gear Position Adjustment



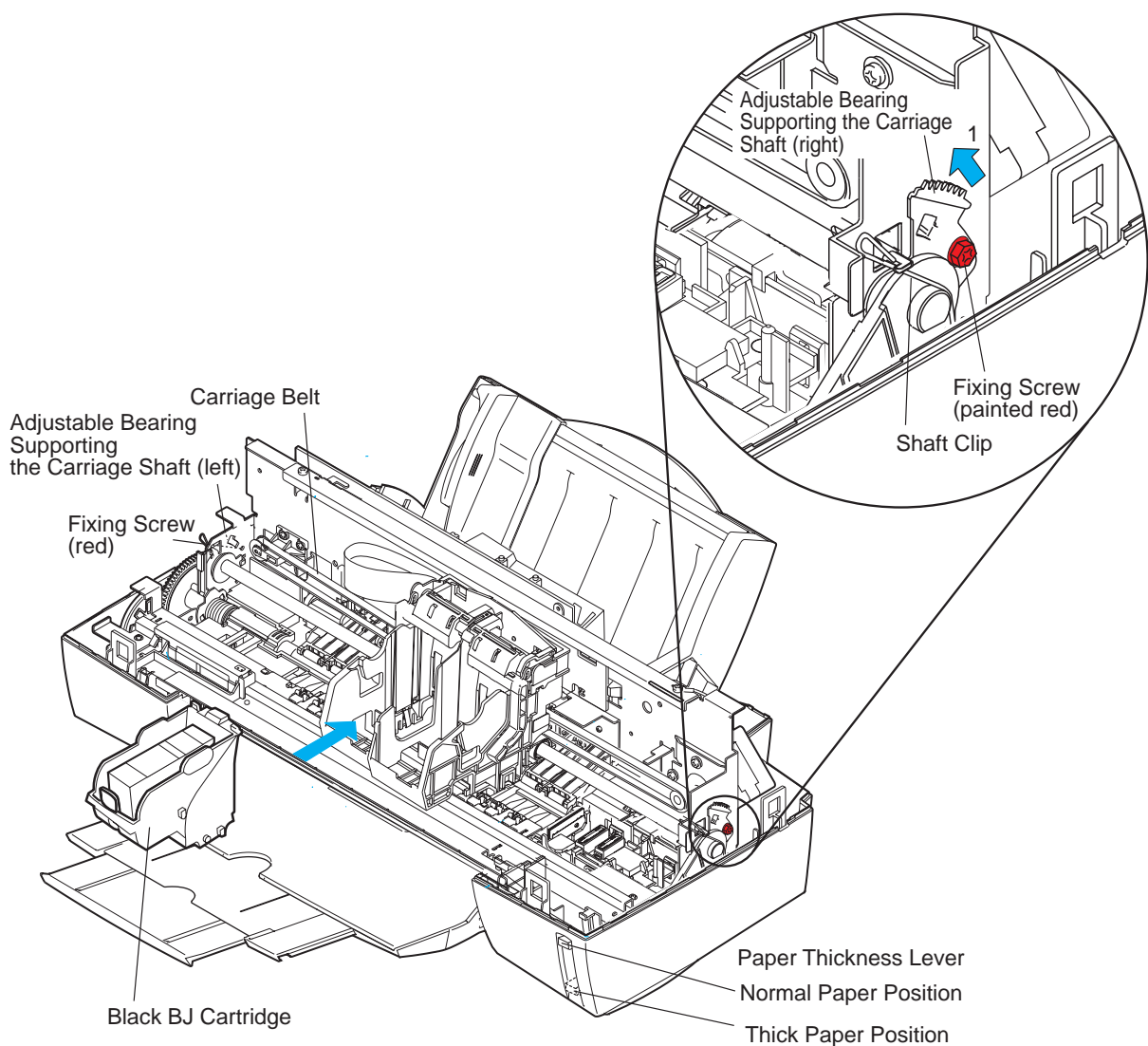
### 5.2.4 Head gap adjustment

#### Preparation:

- 1) Reassemble to the level the top cover is to be put on next.
- 2) Raise both the right and left adjustable bearings supporting the carriage shaft in the direction of arrow 1, and temporarily fix the bearings in that position using the fixing screws (red).
- 3) Remove the right and left shaft clips from the carriage shaft.
- 4) Set the paper thickness selector to the lowest position (thick paper position).



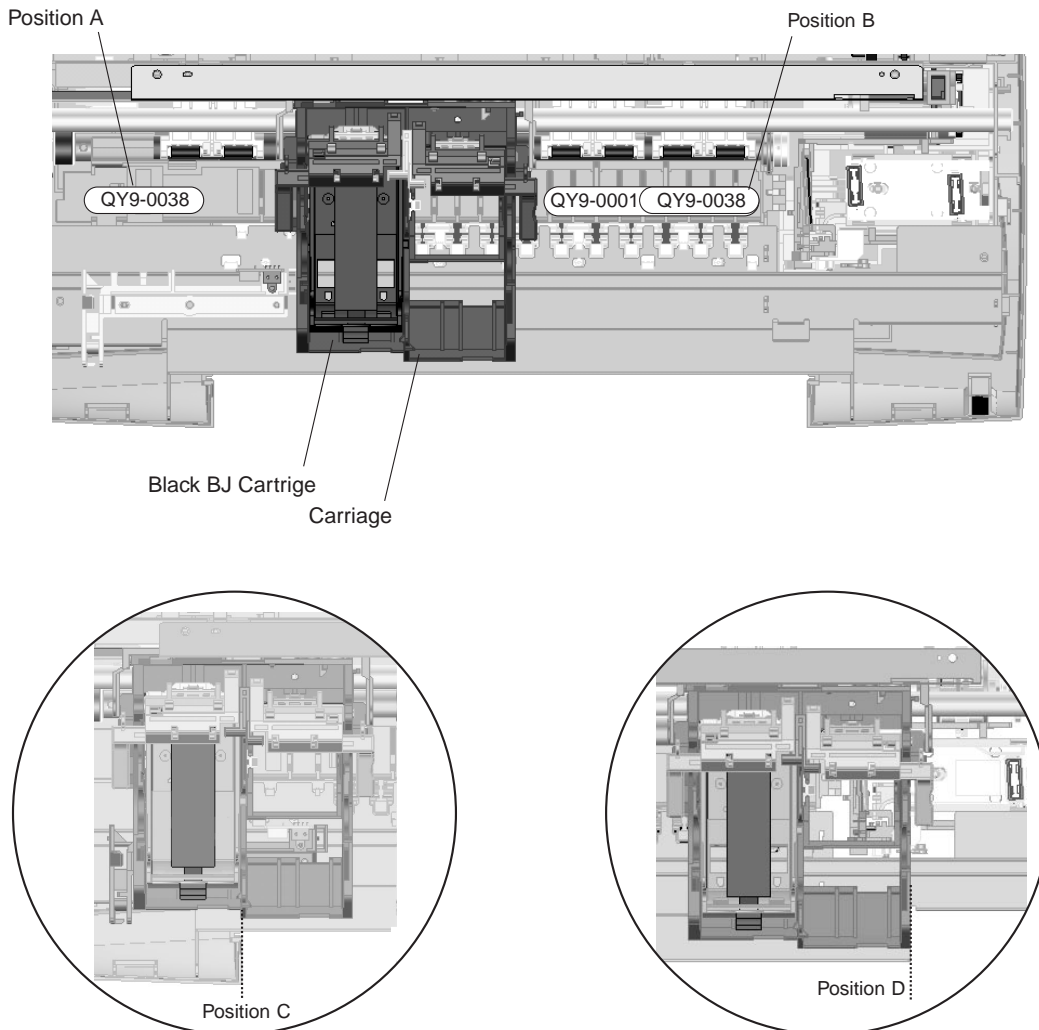
Ensure that the gap gauge is clean and not deformed. Also ensure that the platen is clean.



**Figure 5-9 Head Gap Adjustment (1)**

**Adjustment procedure:**

- 1) Set the 1.9-mm gap gauge (QY9-0038) in position A.
- 2) Move the carriage into position C by moving the carriage belt by hand.
- 3) Install the Black BJ cartridge on the left side of the carriage.
- 4) Slowly loosen, by half a turn, the fixing screw that secures the left adjustable bearing supporting the carriage shaft, and move the paper thickness lever up and down two or three times, and tighten the fixing screw.
- 5) Remove the Black BJ cartridge.
- 6) Put the 0.5mm gap gauge (QY9-0001) and the 1.9mm gap gauge (QY9-0038) stacked together in position B.
- 7) Set the paper thickness lever to the lowest position (thick paper position).
- 8) Move the carriage into position D by moving the carriage belt by hand.
- 9) Install the Black BJ cartridge on the left side of the carriage.
- 10) Slowly loosen, by half a turn, the fixing screw that secures the right adjustable bearing supporting the carriage shaft, and move the paper thickness selector up and down two or three times, and tighten the fixing screw.
- 11) Remove the Black BJ cartridge.
- 12) Repeat steps 1) to 11) again.
- 13) Firmly tighten the right and left fixing screws.
- 14) Reinstall the right and left shaft clips in place.

**Figure 5-10 Head Gap Adjustment (2)**

# 6. TROUBLESHOOTING

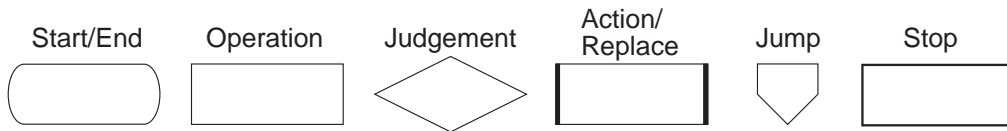
## 6.1 Troubleshooting Overview

### 6.1.1 Overview

This chapter consists of two sections: diagnosis and action. If you do not know the possible cause of the problem, consult the diagnosis section first. If you know the possible cause of the problem, skip to the action section.

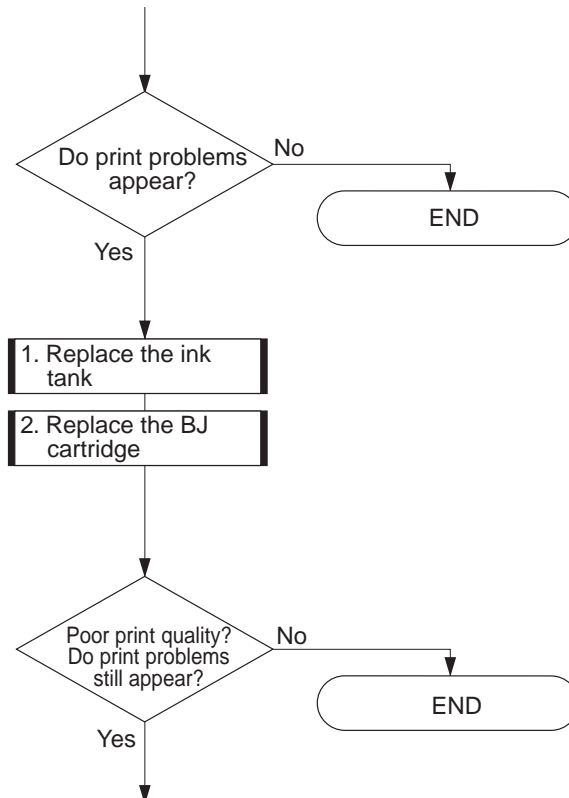
### 6.1.2 Notes on troubleshooting

1. Before starting diagnostic procedures, ensure that all connectors and ribbon cables are correctly connected.
2. If you are diagnosing the problem with the printer's covers removed and with power supplied, be careful not to get an electric shock from the power supply or short-circuit the PC boards.
3. The flowcharts use the following symbols:



4. If you have replaced or repaired a part, be sure to make a test print to check that the problem is corrected. If the indicated measures of a specific step still fail to correct the trouble, try again, skipping to the next step.

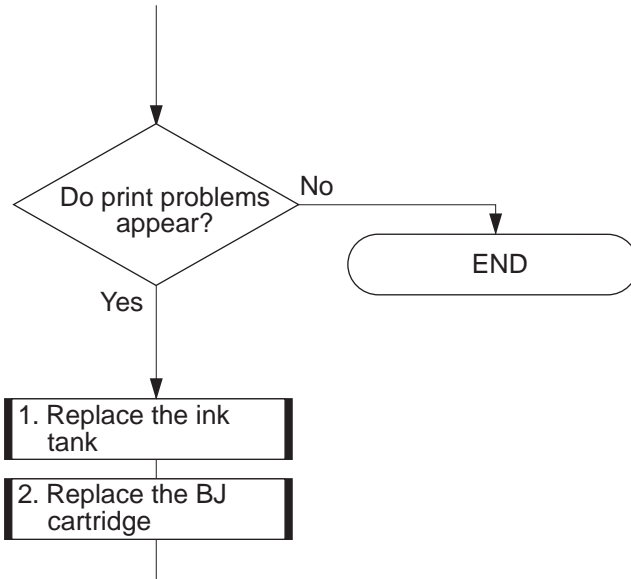
#### Example 1



5. A step in the flowcharts may indicate more than one possible measure you can take. Make a test print for each measure you have taken to check that the problem is corrected. If the measure still fails to correct the problem, proceed to the next measure.

**Example 2**

Replace the ink tank with a new one as measure 1, and make a test print to see if the problem is corrected. If not, replace the whole BJ cartridge as measure 2.



6. After concluding troubleshooting, ensure that all connectors and screws are fixed in place.



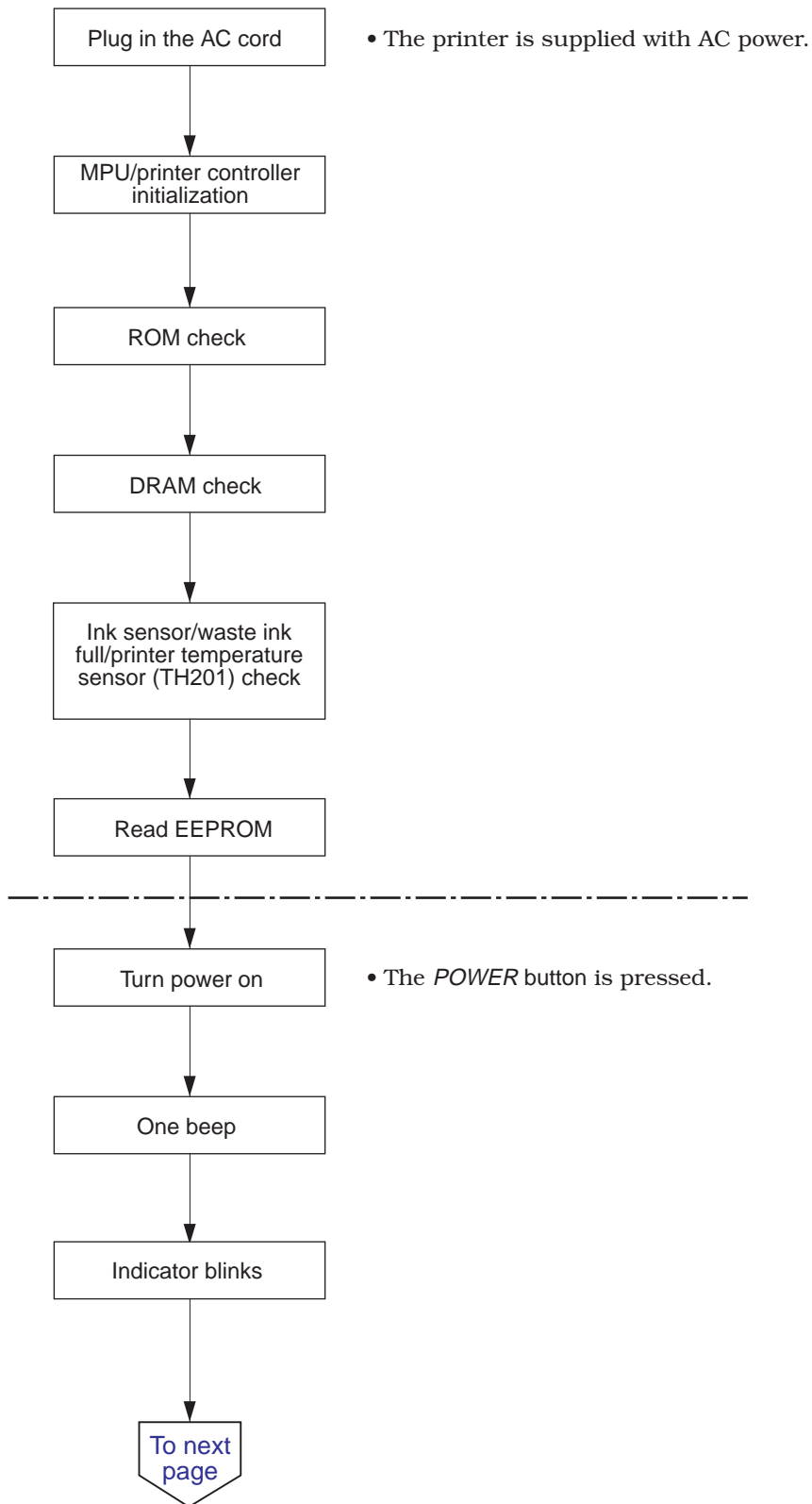
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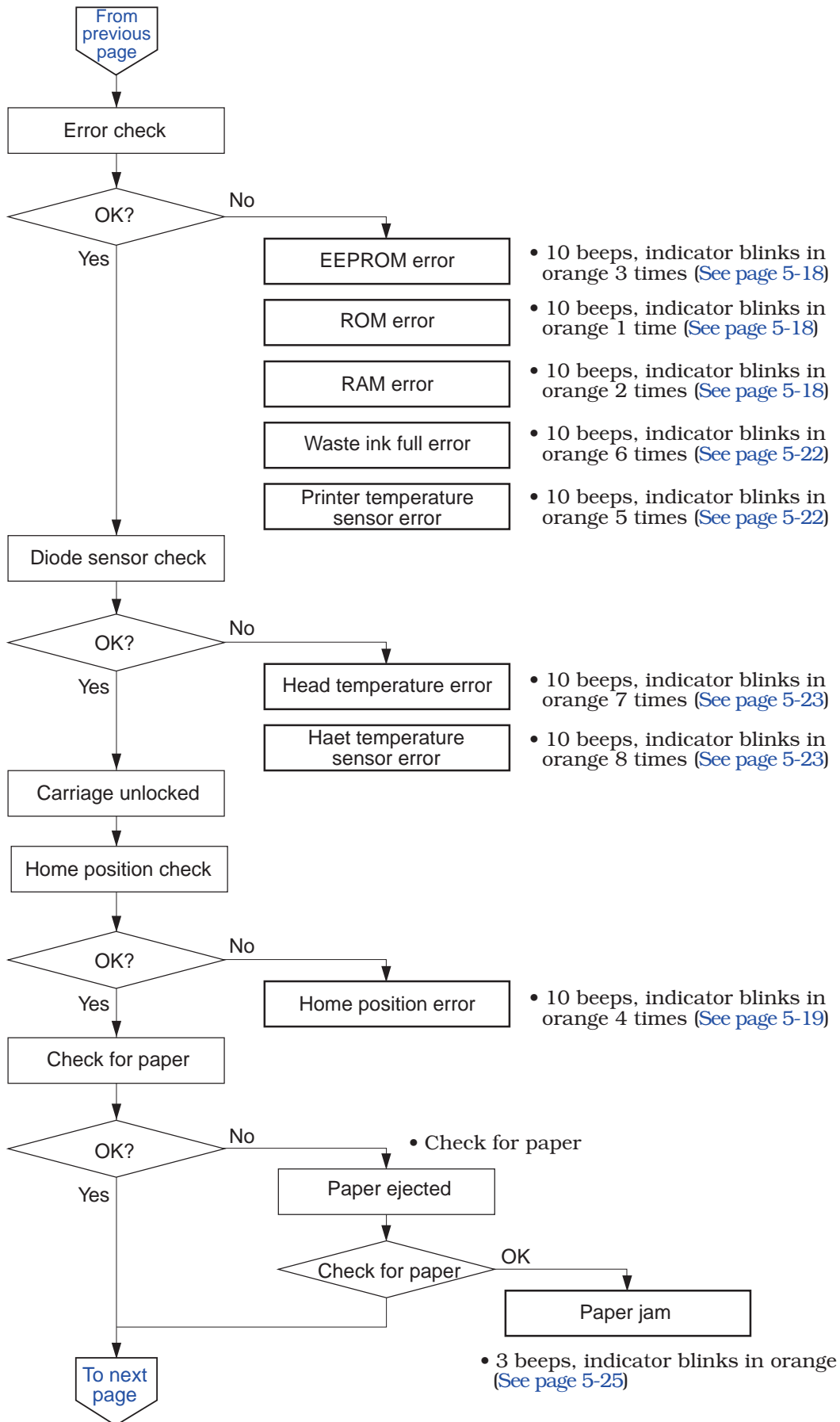
If you have replaced the EEPROM or the whole control board, you must perform EEPROM initialization and function settings. For details, refer to *Part 3: 3.6.1 Service mode operations* (page 3-18).

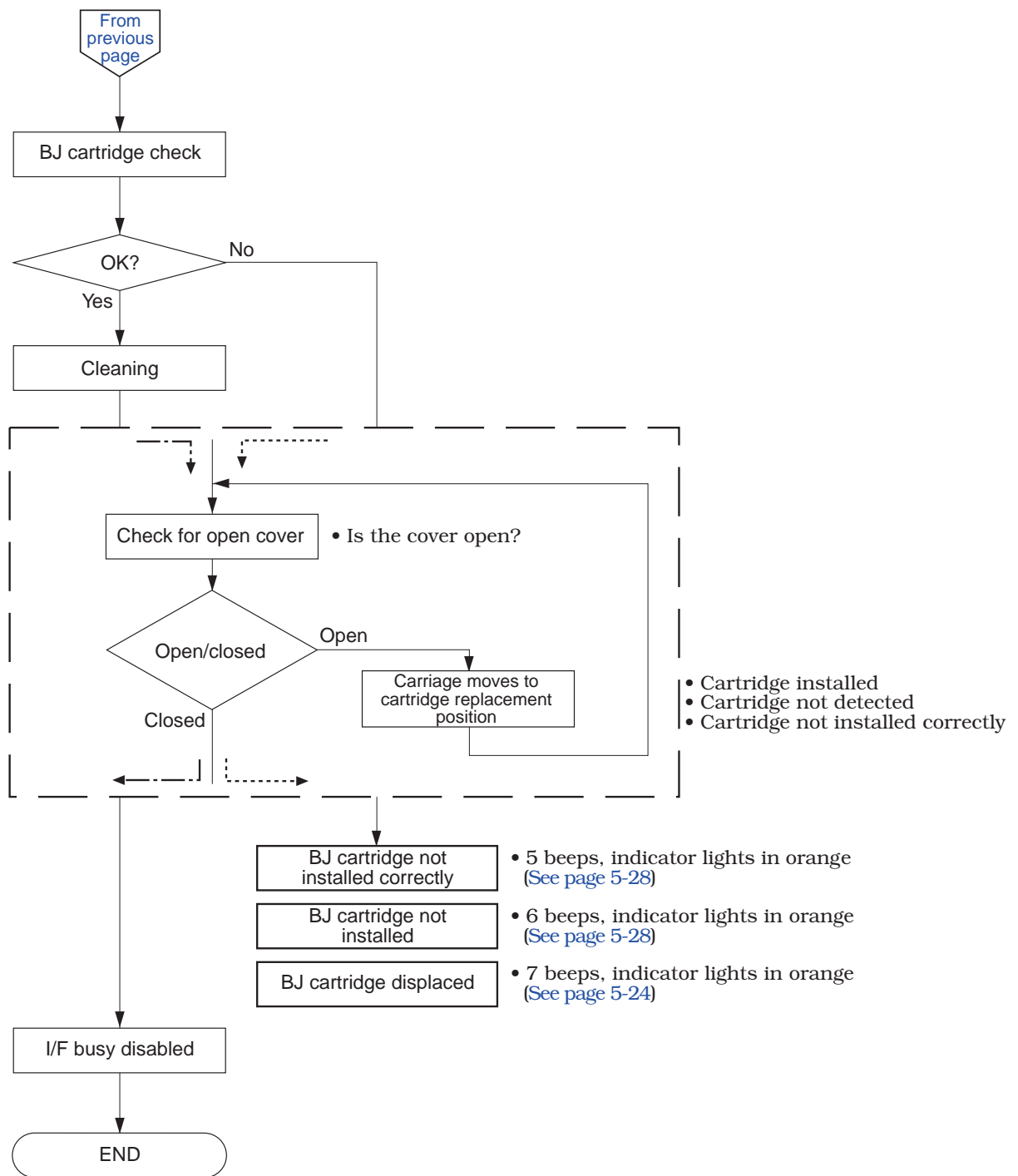
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## 6.2 Diagnosis

### 6.2.1 Initial flowchart







## 6.2.2 Action

### a) Error indications

#### 1. ROM Error

**<Cause>** ROM cannot be read during initialization.

**<Suspected parts>** Control ROM

**<Measure>** Replace the ROM or control board.

#### 2. RAM Error

**<Cause>** RAM cannot be read or written.

**<Suspected parts>** DRAM, print controller

**<Measure>** Replace the control board.

#### 3. EEPROM Error

**<Cause>** EEPROM cannot be written.

**<Suspected parts>** EEPROM, print controller

**<Measure>** Replace the control board.



---

Error indications may fail if the ROM or RAM error occurs.

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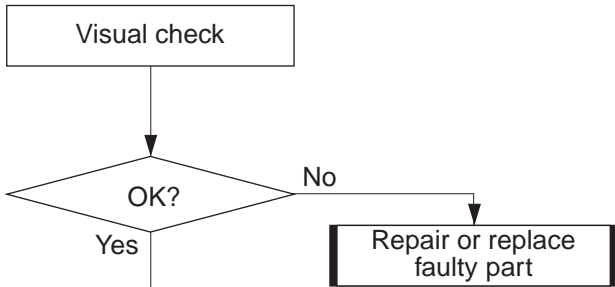


# 4. Home Position Error

**<Cause>** The home position sensor fails to detect the home position.

**<Suspected parts>** Home position sensor, carriage motor, paper feed motor, control board, carriage ribbon cable, and carriage board

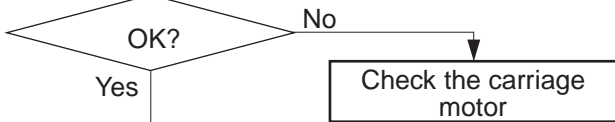
**<Measure>**



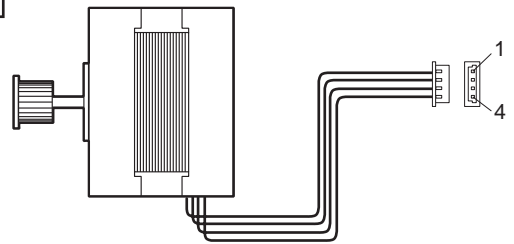
Open the cover and switch on

Check the carriage for smooth motion

Visually check the carriage's motion.

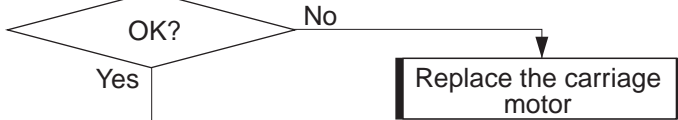


Check the carriage motor



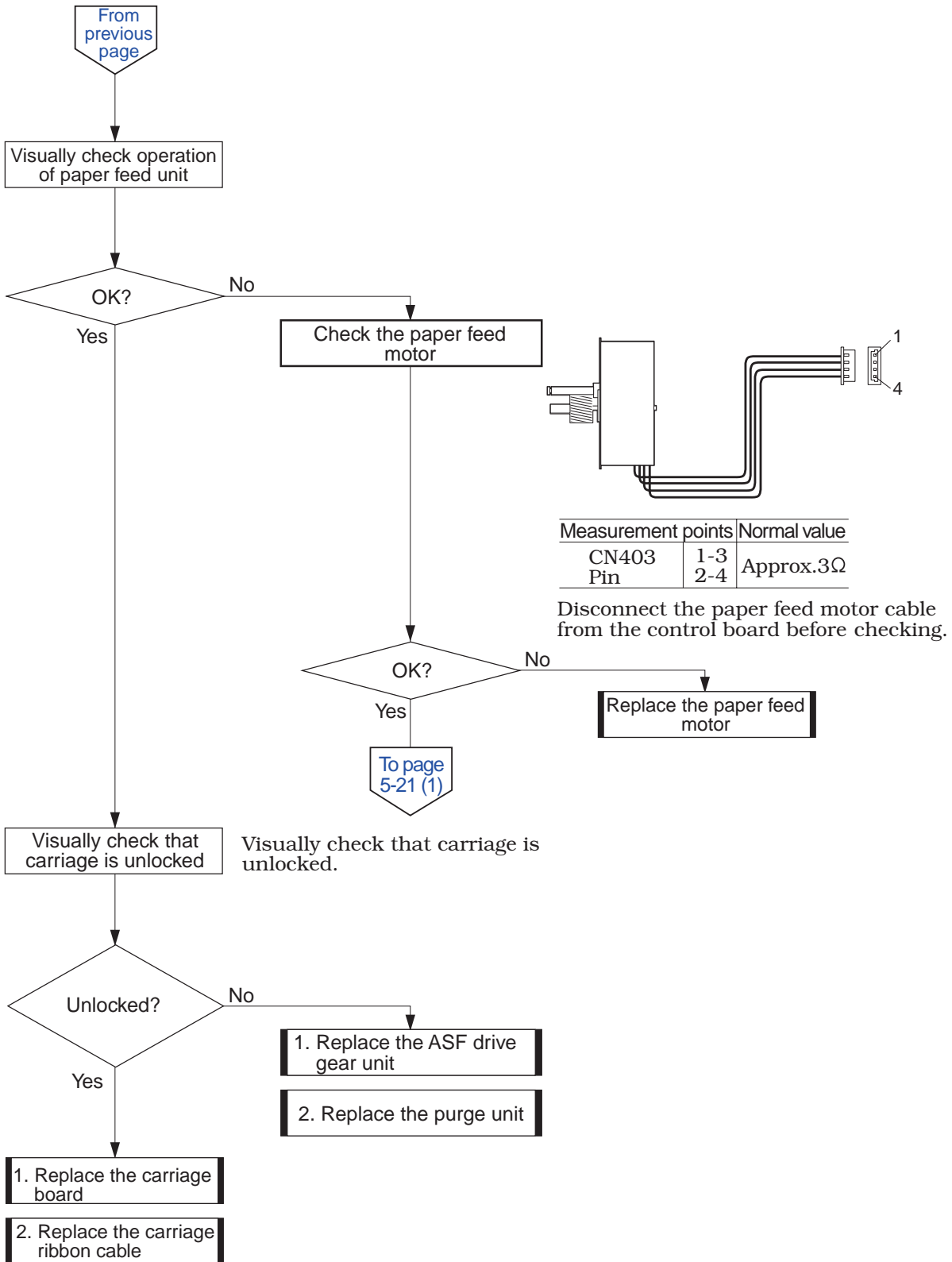
Measurement points	Normal value
CN402	1-3
Pin No.	2-4
	Approx. 3 Ω

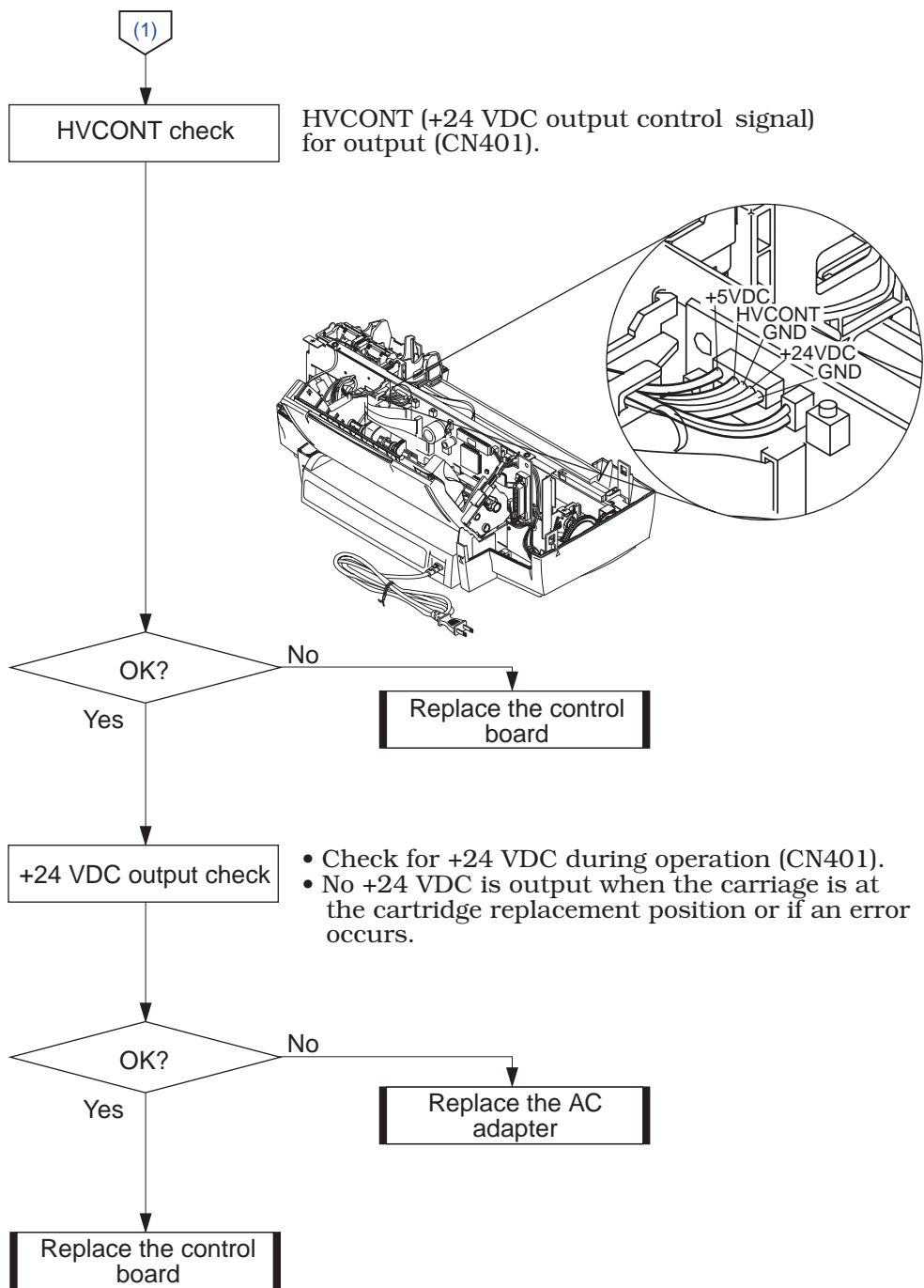
Disconnect the carriage motor cable from the control board before checking.



To page 5-21 (1)

To next page





## 5. Temperature Sensor Error

**<Cause>** The thermistor is defective.  
**<Suspected parts>** Thermistor  
**<Measure>** Replace the control board.

## 6. Waste Ink Full Error

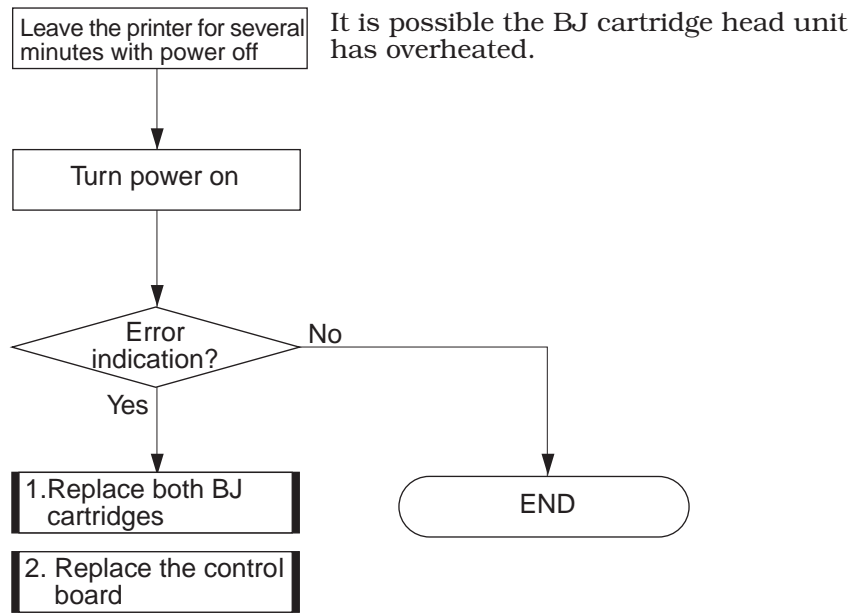
**<Cause>** The calculated amount of waste ink absorbed has exceeded the capacity of the waste ink absorber.  
**<Suspected parts>** Waste ink absorber, control board  
**<Measure>** 1. Reset the EEPROM/replace the waste ink absorber.  
2. Replace the control board.

**7. Head Temperature Error/Head Temperature Sensor Error**

**<Cause>** The print head is too hot.

**<Suspected parts>** BJ cartridge, control board

**<Measure>**

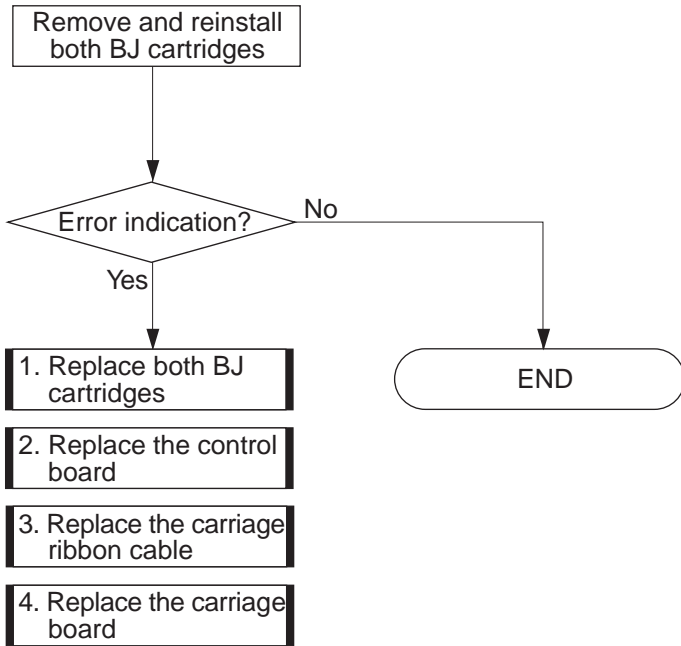


# 8. Cartridge Displaced Error

**<Cause>** The BJ cartridge is out of position at other than the cartridge replacement position.

**<Suspected parts>** BJ cartridge, control board, carriage board, carriage ribbon cable

**<Measure>**



# 9. Paper Feed Error

**<Cause>** • Paper feed operation fails to feed paper.  
 • Paper eject operation fails to eject paper.

**<Suspected parts>** Paper feed section, paper end sensor, control board

### <Measure>

Visually check the paper feed unit

Check for jammed paper or deformed/damaged/broken gears.

OK?

No

Repair or replace faulty parts

Yes

Switch on with the cover open

Check the operation of paper feed unit

Check the paper feed motor, pick-up roller, paper feed roller, and eject roller for movement during initialization. Check for noise. Check the paper feed motor for out-of-step.

OK?

No

Repair or replace

Yes

Replace the control board

Paper feed check

Check that the pick-up roller rotates and the ASF feeds paper normally.

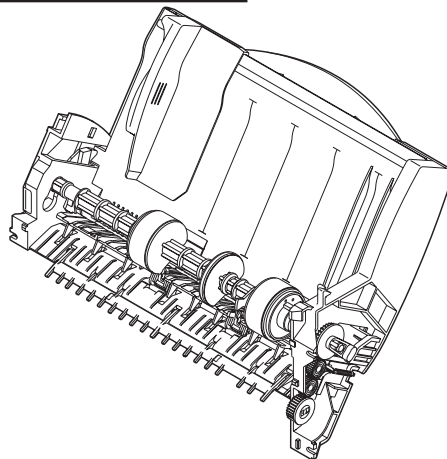
OK?

No

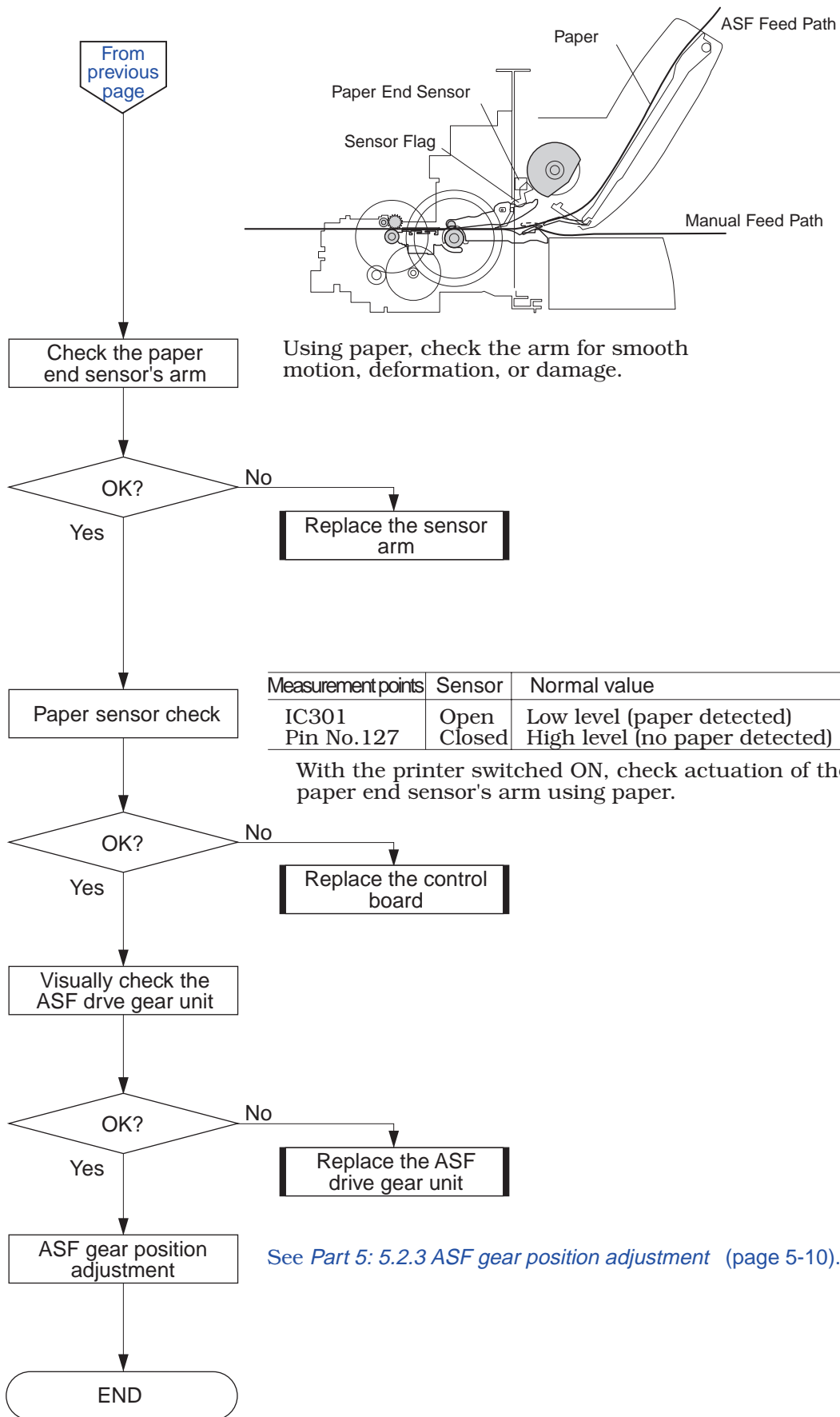
Check the ASF unit

Yes

To next page



Check the pick-up roller's rubber rings and the separation sheet for cleanliness, wear, or degradation. Check the rod cam for engagement. Check the gears for deformation, damage, and phase.

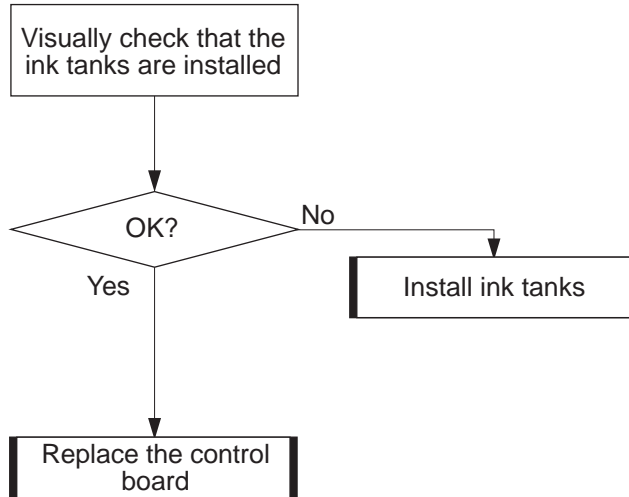




# 10. Ink Out Error

**<Cause>** • The ink tank is empty.  
• EEPROM is defective.  
**<Suspected parts>** Ink tank, EEPROM

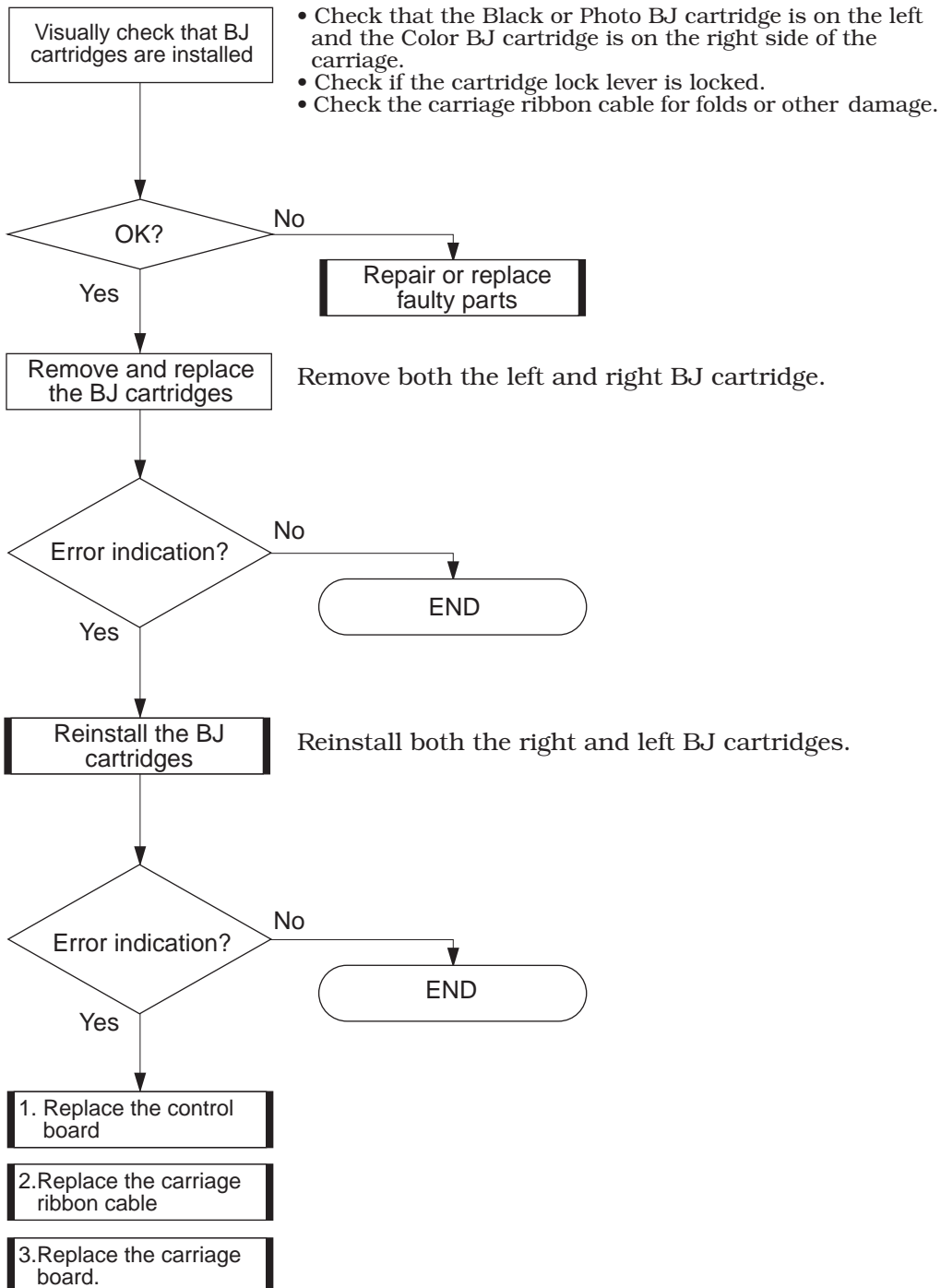
**<Measure>**



**11. BJ Cartridge Error/BJ Cartridge Mis-installed Error/No BJ Cartridge Error**

- <Cause>**
- BJ cartridge not detected.
  - BJ cartridge not installed.
  - BJ cartridge combination wrong.
- <Suspected parts>** BJ cartridges, carriage board, control board, carriage ribbon cable, contacts between BJ cartridge and carriage

**<Measure>**



# 12. Automatic Head Position Adjustment Error

**<Cause>** The automatic head position adjustment has failed.  
**<Suspected parts>** BJ cartridge, ink tank, print position sensor, control board

**<Measure>**

Is the automatic head position adjustment pattern correctly printed?

OK?

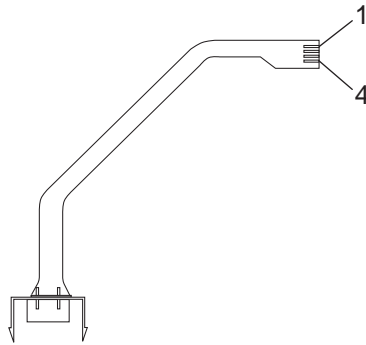
No

Yes

- 1. Cleaning
- 2. Replace the ink tank
- 3. Replace the BJ cartridge

- Black/cyan ink tank
- Black/Color BJ cartridge

Print position sensor check



Measurement points	Sensor	Normal value
Pin No. 1- 2	...	Approx. 2.0V
Pin No. 2- 3	...	Approx. 2.0V

OK?

No

Yes

Replace the print position sensor.

- 1. Replace the carriage
- 2. Replace the control board.

**b) Phenomena**

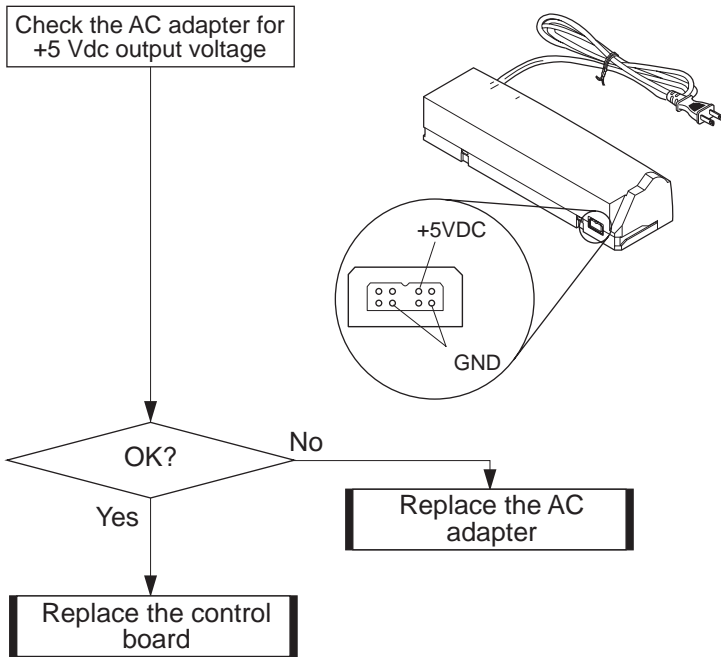
**1. Power Does Not Turn On.**

**<Symptoms>**

- Pressing the *POWER* button fails to switch on the printer.
- Pressing the *POWER* button does not start initialization.

**<Cause>** The AC adapter or the control board is defective.

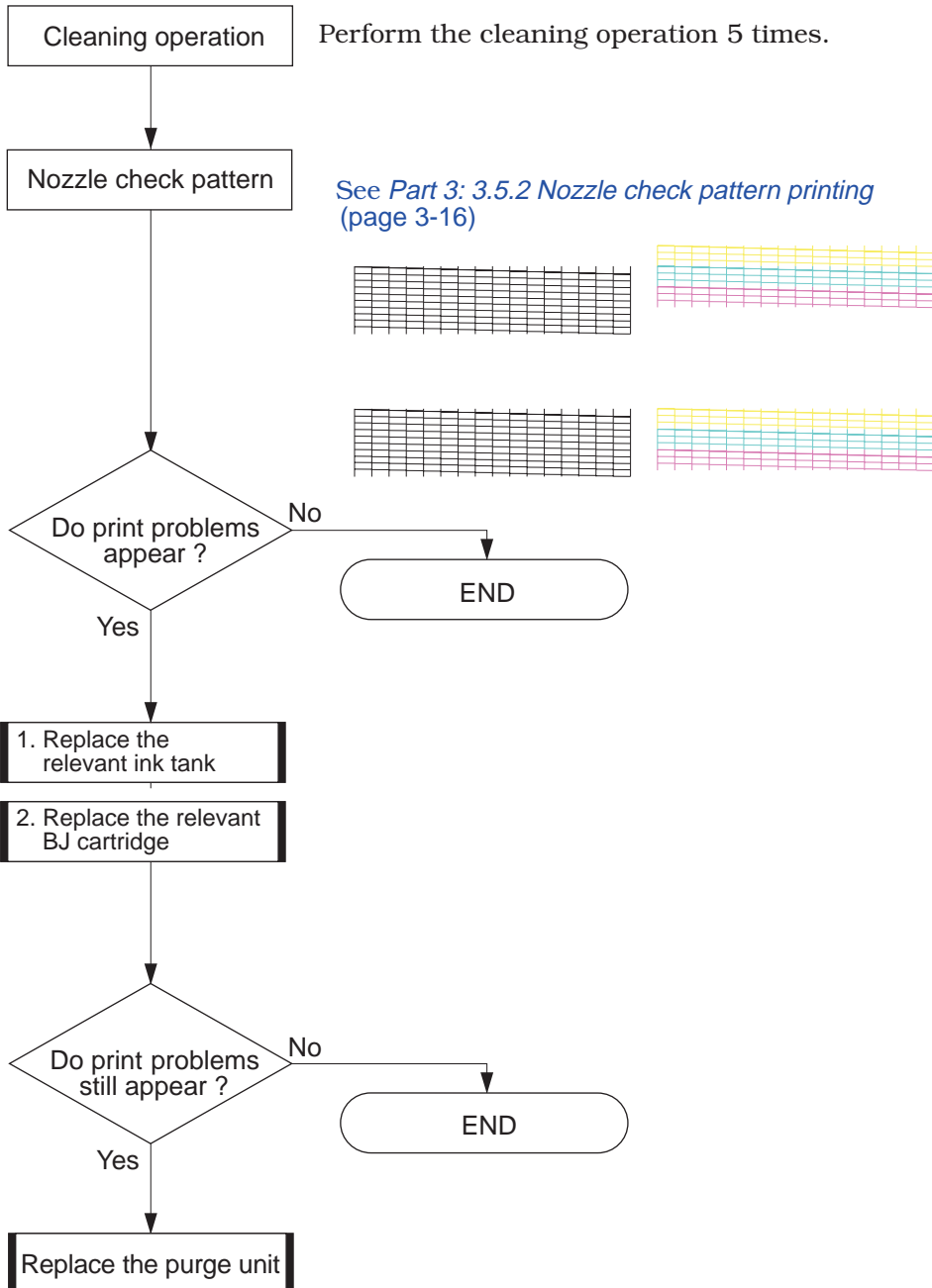
**<Measure>**



## 2. Faulty Printing: No Printing

- <Symptoms>**
- No prints
  - Partial prints
  - No prints for some colors
- <Cause>** The ink tank, BJ cartridge, or purge unit is defective.

### <Measure>



### 3. Faulty Printing: Blank Lines Appear

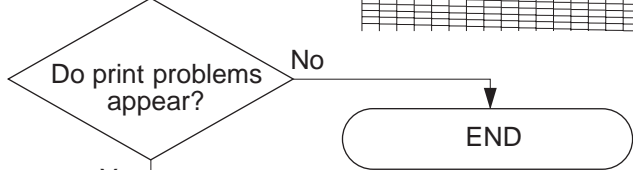
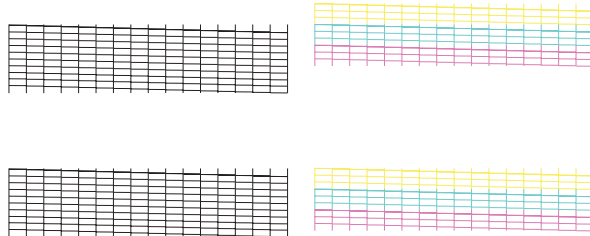
- <Symptoms>**
- Blurred prints
  - Blank lines
  - Specific dot missing

**<Cause>** The BJ cartridge(s), BJ cartridge contact(s), carriage ribbon cable, purge unit, control board or carriage board is defective.

**<Measure>**

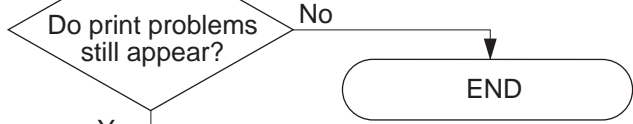
Cleaning operation      Perform the cleaning operation 5 times.

Nozzle check pattern      See *Part 3: 3.5.2 Nozzle check pattern printing* (page 3-16)

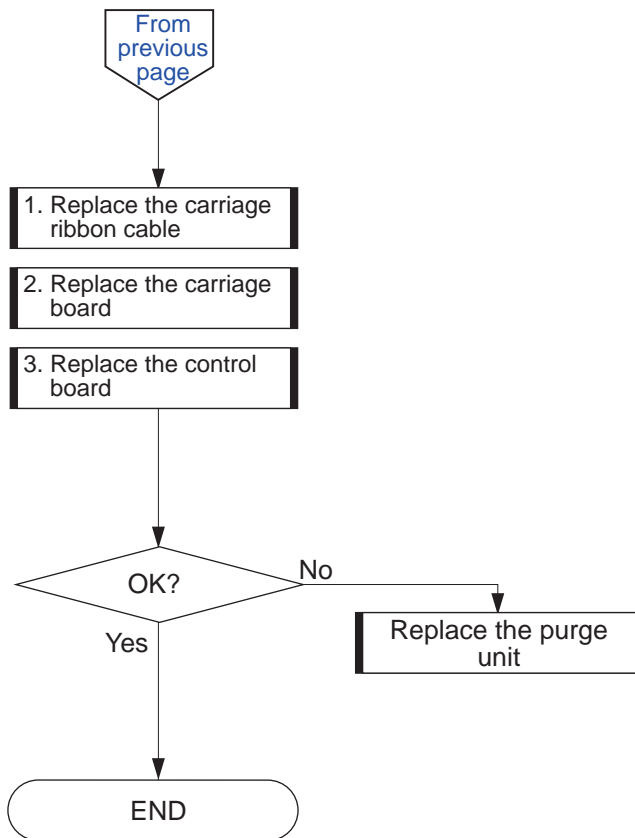


1. Replace the relevant ink tank

2. Replace the relevant BJ cartridge



To next page



## 4. Faulty Printing: Other

Symptoms	Check to see if	Measure
Paper gets dirty	The platen is contaminated with ink mist.	Wipe clean with a damp cloth.
	The paper feed unit is contaminated with ink (paper is contaminated before reaching the platen).	Disassemble the paper feed unit and wipe clean with damp a cloth. Perform test paper feeding several times.
Spur marks appear	The tips of the spurs are deformed.	Replace the spur unit.
Vertical misalignment	The paper thickness selector is wrongly set (positioned).	Correct the setting.
	The printed nozzle check pattern has mis-alignment.	Readjust printing position.

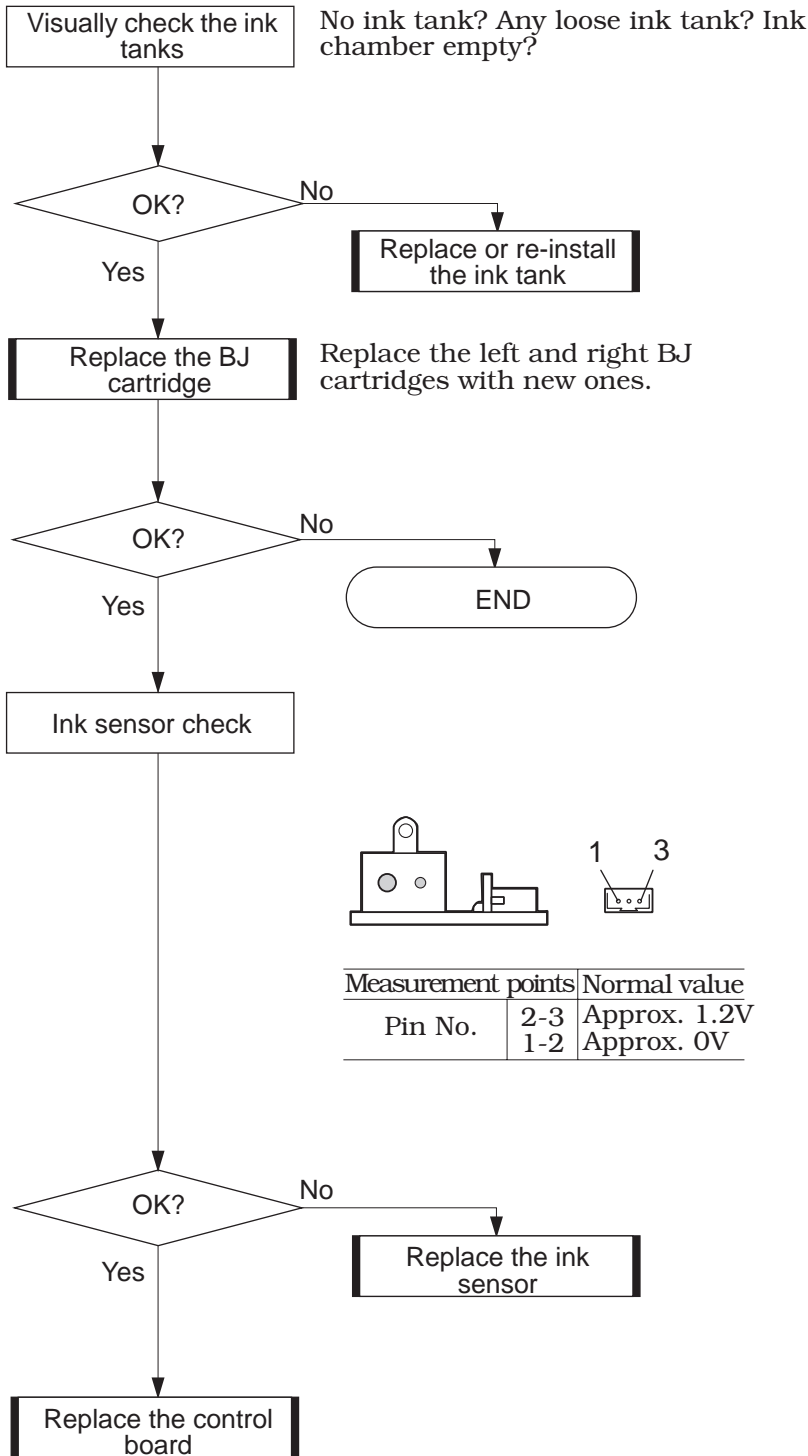


# 5. Ink Out Resulting in no Error

**<Symptoms>** Ink out results in no error.

**<Cause>** The ink tank is empty, or the control board or ink sensor is defective.

**<Measure>**



# 7. CONNECTOR POSITIONS AND PIN ASSIGNMENT

## 7.1 Control Board

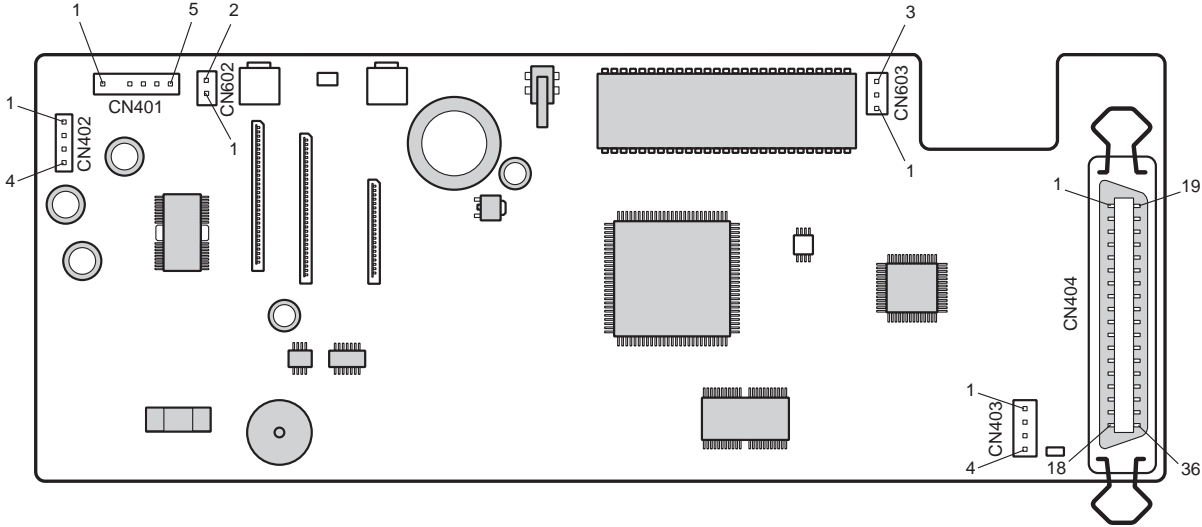


Figure 5-11 Control Board

### CN404 (parallel interface connector)

Pin No	Signal	IN/OUT	Function
1	$\overline{\text{STROBE}}$	IN	See Part 2: 2.3 Interface Specifications (page 2-10).
2	DATA 1	IN/OUT	
3	DATA 2	IN/OUT	
4	DATA 3	IN/OUT	
5	DATA 4	IN/OUT	
6	DATA 5	IN/OUT	
7	DATA 6	IN/OUT	
8	DATA 7	IN/OUT	
9	DATA 8	IN/OUT	
10	$\overline{\text{ACKNLG}}$	OUT	
11	BUSY	OUT	
12	P.E.		
13	GND		
14	GND		
15	SELECT	OUT	
16	$\overline{\text{AUTO FEED XT}}$	IN	
17	+5.0V		
18	$\overline{\text{INIT}}$	IN	
19	$\overline{\text{ERROR}}$	OUT	
20	+5.0V		
21	$\overline{\text{SELECT IN}}$	IN	
22	GND		
23	N.C.		
24	GND		
25	GND		
26	N.C.		

**CN401 (DC power connector)**

Pin No.	Signal	IN/OUT	Function
1	...	IN	+5V DC
2	HVCONT	OUT	+24 VDC output control signal
3	GND	...	GND
4	...	IN	+24V DC
5	GND	...	GND

**CN402 (Carriage motor connector)**

Pin No.	Signal	IN/OUT	Function
1	CRA	OUT	Carriage motor phase A
2	CRB	OUT	Carriage motor phase B
3	$\overline{\text{CRA}}$	OUT	Carriage motor phase $\overline{\text{A}}$
4	$\overline{\text{CRB}}$	OUT	Carriage motor phase $\overline{\text{B}}$

**CN403 (Paper feed motor connector)**

Pin No.	Signal	IN/OUT	Function
1	LFA	OUT	Paper feed motor phase A
2	LFB	OUT	Paper feed motor phase B
3	$\overline{\text{LFA}}$	OUT	Paper feed motor phase $\overline{\text{A}}$
4	$\overline{\text{LFB}}$	OUT	Paper feed motor phase $\overline{\text{B}}$

**CN501 (Carriage ribbon cable connector)**

Pin No.	Signal	IN/OUT	Function
1~8	HVH	OUT	Head drive voltage (VH)
9, 10, 11	SUBH0	OUT	Sub-heater drive voltage (for left cartridge)
12, 13, 14	SUBH1	OUT	Sub-heater drive voltage (for right cartridge)
15~22	...	...	GND
23, 24, 25	HVDD	OUT	Head logic drive voltage
26~28			GND

**CN502 (Carriage ribbon cable connector)**

Pin No.	Signal	IN/OUT	Function
1	HCLOCK0	IN/OUT	Clock signal for serial data transmission
2, 4, 9,	...	...	GND
3	HDATA0	IN/OUT	Serial data (left cartridge) sent in sync. with the clock signal
5	HSEL1A0	OUT	Rear nozzle heater select signal for upper nozzles (1-8, 17-24, ..., 145-152)
6	HSEL1B0	OUT	Front nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
7	HSEL2A0	OUT	Rear nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
8	HSEL2B0	OUT	Front nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
10	HALT	OUT	Serial data latch timing signal
11	ODD	OUT	Odd-number nozzles select signal
12	EVEN	OUT	Even-number nozzles select signal
13	BENB0	OUT	Signal to generate heater enable decoder outputs
14	BENB1	OUT	Signal to generate heater enable decoder outputs
15	HENB0	OUT	Rear heater drive signal for nozzles 1-112
16	HENB1	OUT	Front heater drive signal for nozzles 1-112
17	HENB2	OUT	Rear heater drive signal for nozzles 113-160
18	HENB3	OUT	Front heater drive signal for nozzles 113-160
19	DIR	OUT	Serial data input/output direction control signal
20	HRSTX	OUT	Reset signal
21	SNSG	...	GND
22	DIA0	IN	Head temperature (diode) sensor's anode line
23	DIAK	IN	Head temperature (diode) sensor's cathode line
24	HPA	OUT	Home position sensor pull-up voltage
25	HPC	IN	Home position sensor sense signal
26	REGA	OUT	Print position sensor's LED drive voltage
27	REGC	IN	Voltage input from the print position sensor
28	...	...	Not used.

**CN503 (Carriage ribbon cable connector)**

Pin No.	Signal	IN/OUT	Function
1	HCLOCK1	IN/OUT	Clock signal for serial data transmission
2, 4, 9,	...	...	GND
3	HDATA1	IN/OUT	Serial data (right cartridge) sent in sync. with the clock signal
5	HSEL1A1	OUT	Rear nozzle heater select signal for upper nozzles (1-8, 17-24, ..., 145-152)
6	HSEL1B1	OUT	Front nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
7	HSEL2A1	OUT	Rear nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
8	HSEL2B1	OUT	Front nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
10, 12	HENB4	OUT	Rear heater drive signal for nozzles 1-160
11, 13	HENB5	OUT	Front heater drive signal for nozzles 1-160
14	SNSG	...	GND
15	DIA1	IN	Head temperature (diode) sensor's anode line
16	DIK1	IN	Head temperature (diode) sensor's cathode line
17	...	...	N.C.
18	...	...	Not used.

**CN602 (Pump sensor connector)**

Pin No.	Signal	IN/OUT	Function
1	POMP	IN	Pump sensor sense signal High (sense) /Low
2	...	...	GND

**CN603 (Ink sensor connector)**

Pin No.	Signal	IN/OUT	Function
1	INKS01	OUT	Voltage output from the ink sensor
2	...	...	GND
3	INKS	IN	Ink sensor's LED drive signal

7.2 Carriage Board

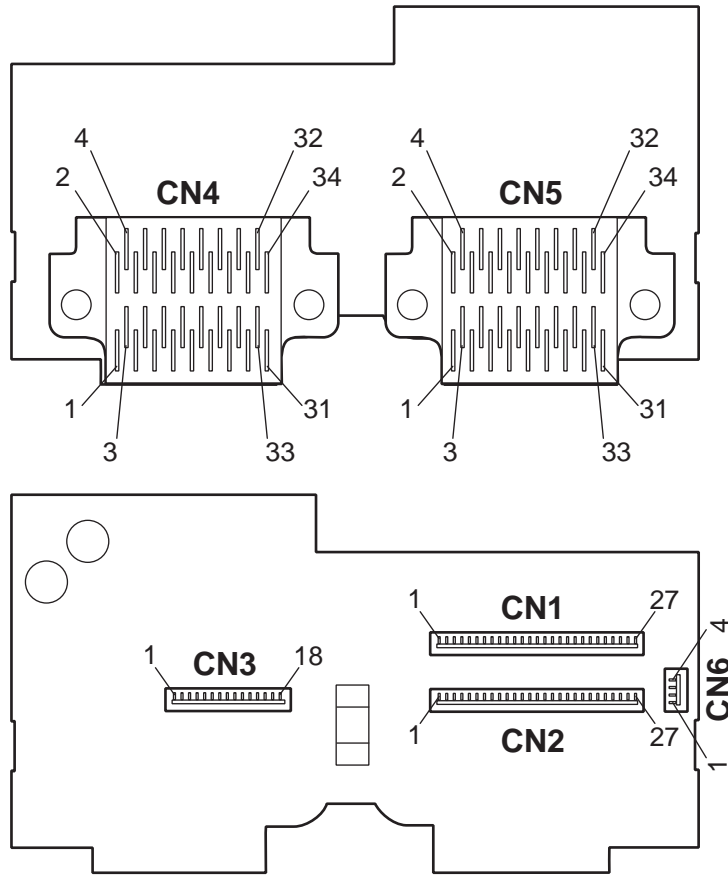


Figure 5-12 Carriage Board

CN1 (Carriage ribbon cable connector)

Pin No.	Signal	IN/OUT	Function
1, 2, 3	LGND	...	GND for logic power supply.
4, 5, 6	HVDD	IN	Head logic drive voltage
7~14	HGND	...	GND for head drive voltage (VH)
15, 16, 17	SUBH1	IN	Sub-heater drive voltage (for right cartridge)
18, 19, 20	SUBH0	IN	Sub-heater drive voltage (for left cartridge)
21~28	HVH	IN	Head drive voltage (VH)

**CN2 (Carriage ribbon cable connector)**

Pin No.	Signal	IN/OUT	Function
1	...	...	Not used.
2	REGC	OUT	Voltage output from the print position sensor
3	REGA	IN	Print position sensor's LED drive voltage
4	HPC	OUT	Home position sensor sense signal
5	HPA	IN	Home position sensor pull-up voltage
6	DIK0	OUT	Head temperature (diode) sensor's cathode line
7	DIA0	OUT	Head temperature (diode) sensor's anode line
8	SNSG	IN	GND
9	HRSTX	IN	Reset signal
10	DIR	IN	Serial data input/output direction control signal
11	HENB3	IN	Front heater drive signal for nozzles 113-160
12	HENB2	IN	Rear heater drive signal for nozzles 113-160
13	HENB1	IN	Front heater drive signal for nozzles 1-112
14	HENB0	IN	Rear heater drive signal for nozzles 1-112
15	BENB1	IN	Signal to generate heater enable decoder outputs
16	BENB0	IN	Signal to generate heater enable decoder outputs
17	EVEN	IN	Even-number nozzles select signal
18	ODD	IN	Odd-number nozzles select signal
19	HALT	IN	Serial data latch timing signal
20, 25, 27	LGND	...	GND for the logic power supply
21	HSEL2B0	IN	Front nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
22	HSEL2A0	IN	Rear nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
23	HSEL1B0	IN	Front nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
24	HSEL1A0	IN	Rear nozzle heater select signal for upper nozzles (1-8, 17-24, ..., 145-152)
26	HDATA0	OUT	Serial data (for right carriage) sent in synchronization with the clock signal
28	HCLOCK0	IN/OUT	Clock signal for serial data transmission

**CN3 (Carriage ribbon cable connector)**

Pin No.	Signal	IN/OUT	Function
1	...	...	Not used
2	N.C.	...	N.C.
3	DIK1	IN	Head temperature (diode) sensor's cathode line
4	DIA1	IN	Head temperature (diode) sensor's anode line
5	SNSG	...	GND
6, 8	HENB5	IN	Front heater drive signal for nozzles 1-160
7, 9	HENB4	IN	Rear heater drive signal for nozzles 1-160
10, 15, 17	LGND	...	GND
11	HSEL2B1	OUT	Front nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
12	HSEL2A1	OUT	Rear nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
13	HSEL1B1	OUT	Front nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
14	HSEL1A1	OUT	Rear nozzle heater select signal for upper nozzles (1-8, 17-24, ..., 145-152)
16	HDATA1	OUT	Serial data (for right cartridge) sent in synchronization with the clock signal
18	HCLOCK1	IN/OUT	Clock signal for serial data transmission

**CN4 (BJ cartridge, left)**

Pin No.	Signal	IN/OUT	Function
1~32			See Page 4-23.
33, 34	...	...	N.C.

**CN5 (BJ cartridge, right)**

Pin No.	Signal	IN/OUT	Function
1~32			See Page 4-23.
33, 34	...	...	N.C.

**CN6 (Print position sensor connector)**

Pin No.	Signal	IN/OUT	Function
1	REGA	IN	Print position sensor's LED drive voltage
2	SNSG	...	GND
3	REGC	IN	Voltage input from the print position sensor
4	LGND	...	GND



### 7.3 BJ Cartridge

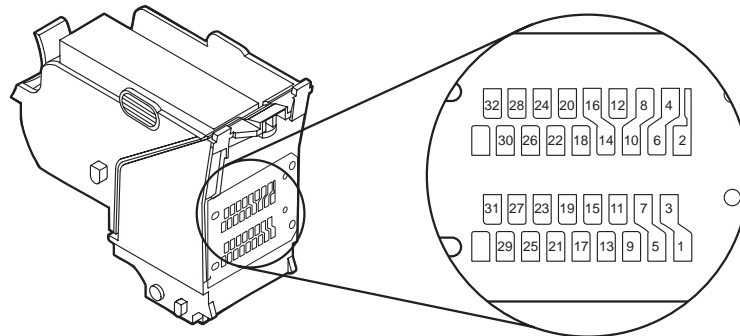
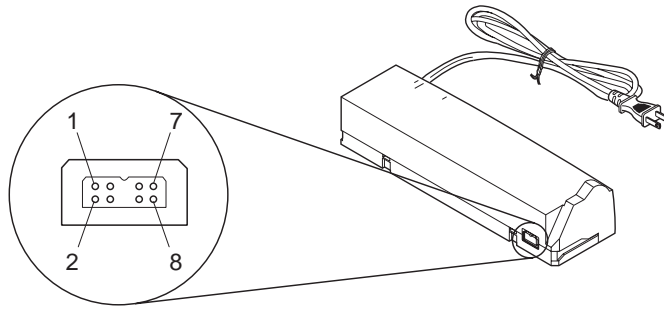


Figure 5-13 BJ Cartridge

Pin No.	Signal	IN/OUT	Function
1, 2, 3	HVH	OUT	Head drive voltage (VH)
4, 6	SUBH0 (SUBH1)	OUT	Sub-heater drive signal
5, 7, 8,	VHG	...	GND for Head drive voltage (VHGND)
10	HDATA0	IN/OUT	Serial data (including head identification and rank resistance)
9	(HDATA1)		sent in synchronization with the clock signal (H_CLK)
11	HSEL1B0 (HSEL1B1)	OUT	Rear nozzle heater select signal for upper nozzles (1-8, 17-24, ..., 145-152)
12	HVDD	OUT	Head logic drive voltage (+5 V)
13	HCLOCK0 (HCLOCK1)	IN/OUT	Clock signal for serial data transmission
14, 16	LGND	OUT	GND for head logic drive voltage (HVDD)
15	HSEL1A0 (HSEL1A1)	OUT	Front nozzle heater select signal for upper nozzles (1-8, 17-24, ..., 145-152)
17	HSEL2A0 (HSEL2A1)	OUT	Front nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
18	HSEL2B0 (HSEL2B1)	OUT	Rear nozzle heater select signal for lower nozzles (9-16, 25-32, ..., 153-160)
19	HDAH	OUT	Serial data latch timing signal
20	ODD	OUT	Odd-number nozzles select signal
21	EVEN	OUT	Even-number nozzles select signal
22	BENB0	OUT	Signal to generate heater enable decoder outputs
23	BENB1	OUT	Signal to generate heater enable decoder outputs
24	HENB0 (HENB4)	OUT	Rear heater drive signal for nozzles 1-112 (or 1-144)
25	HENB1 (HENB5)	OUT	Front heater drive signal for nozzles 1-112 (or 1-144)
26	HENB2 (HENB4)	OUT	Rear heater drive signal for nozzles 113-160
27	HENB3 (HENB5)	OUT	Front heater drive signal for nozzles 113-160
28	DIR	OUT	Serial data input/output direction control signal
29	HRSTX	OUT	Reset signal
30	DIA0 (DIA1)	IN	Head temperature (diode) sensor's anode line
31	DIK0 (DIK1)	IN	Head temperature (diode) sensor's cathode line
32	...	...	Not used.

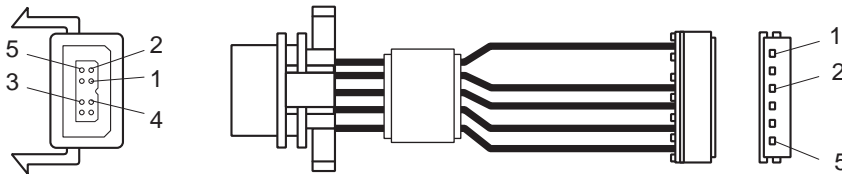
**7.4 AC Adapter**



**Figure 5-14 AC Adapter**

Pin No.	Signal	IN/OUT	Function
1	...	...	N.C
2	...	...	N.C
3	...	...	+24V DC
4	GND	...	GND
5	...	OUT	+5V DC
6	...	...	N.C
7	HVCONT	IN	+24 V control signal
8	GND	...	GND

**7.5 DC Power Supply Cable**



**Figure 5-15 DC Power Supply Cable**

Pin No.	Signal	IN/OUT	Function
1	...	OUT	+5V DC
2	HVCONT	IN	+24 V DC output control signal
3	GND	...	GND
4	...	OUT	+24V DC
5	GND	...	GND

### 7.6 Carriage Motor

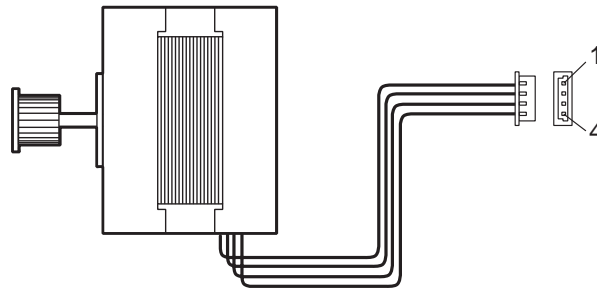


Figure 5-16 Carriage Motor

Pin No.	Signal	IN/OUT	Function
1	CRA	IN	Carriage motor phase A
2	CRB	IN	Carriage motor phase B
3	$\overline{\text{CRA}}$	IN	Carriage motor phase $\overline{\text{A}}$
4	$\overline{\text{CRB}}$	IN	Carriage motor phase $\overline{\text{B}}$

### 7.7 Paper Feed Motor

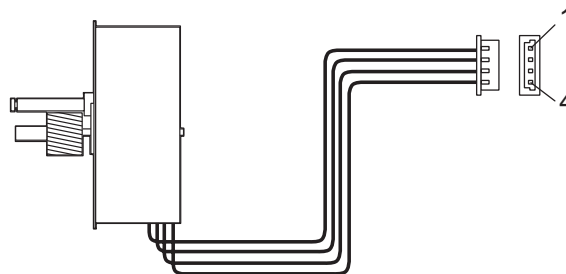
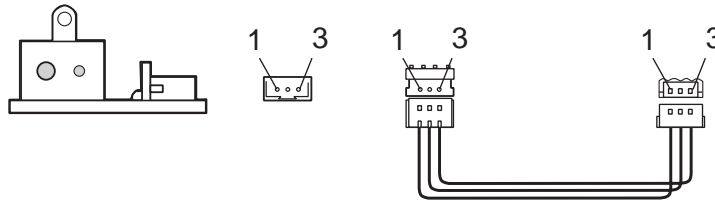


Figure 5-17 Paper Feed Motor

Pin No.	Signal	IN/OUT	Function
1	LFA	IN	Paper feed motor phase A
2	LFB	IN	Paper feed motor phase B
3	$\overline{\text{LFA}}$	IN	Paper feed motor phase $\overline{\text{A}}$
4	$\overline{\text{LFB}}$	IN	Paper feed motor phase $\overline{\text{B}}$

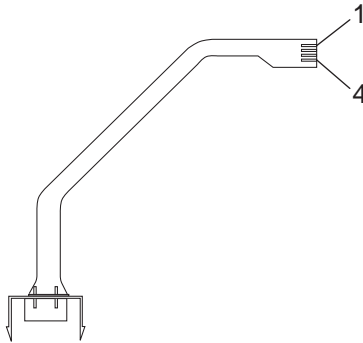
**7.8 Ink Sensor**



**Figure 5-18 Ink Sensor**

Pin No.	Signal	IN/OUT	Function
1	INKS01	OUT	Voltage output from the ink sensor
2	...	...	GND
3	...	...	N.C.

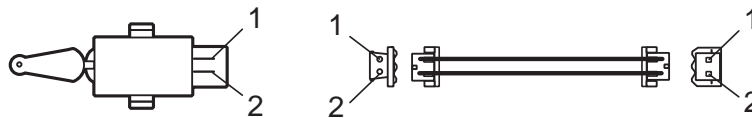
**7.9 Print Position Sensor**



**Figure 5-19 Print Position Sensor**

Pin No.	Signal	IN/OUT	Function
1	REGA	OUT	Print position sensor's LED drive voltage
2	SNSG	...	GND
3	REGC	OUT	Voltage output from the print position sensor
4	LGND	...	GND

**7.10 Pump Sensor**

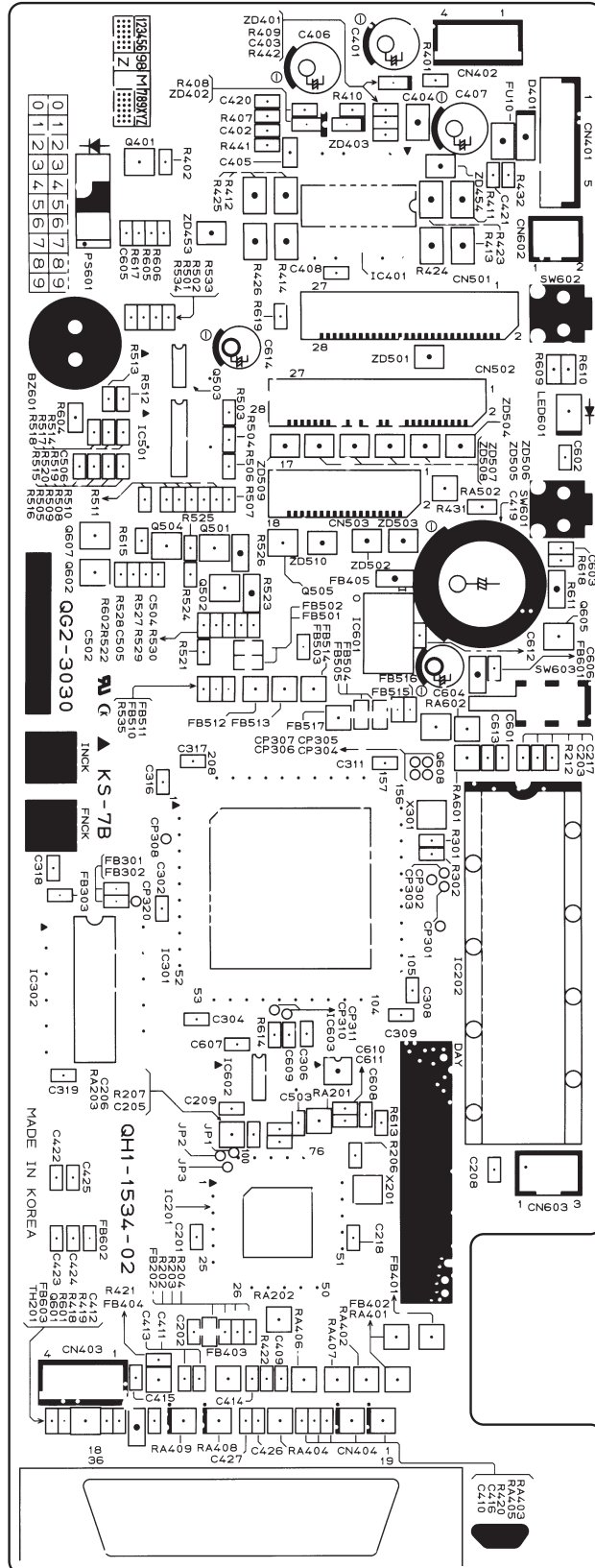


**Figure 5-20 Pump Sensor**

Pin No.	Signal	IN/OUT	Function
1	POMP	OUT	Pump sensor's sense signal High (sense) /Low
2	...	...	GND

# 8. CIRCUIT DIAGRAMS

## 8.1 Parts Layout 8.1.1 Control board



### 8.1.2 Carriage board

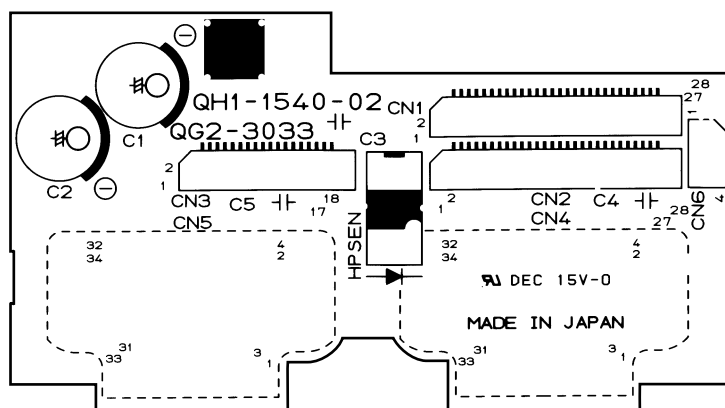
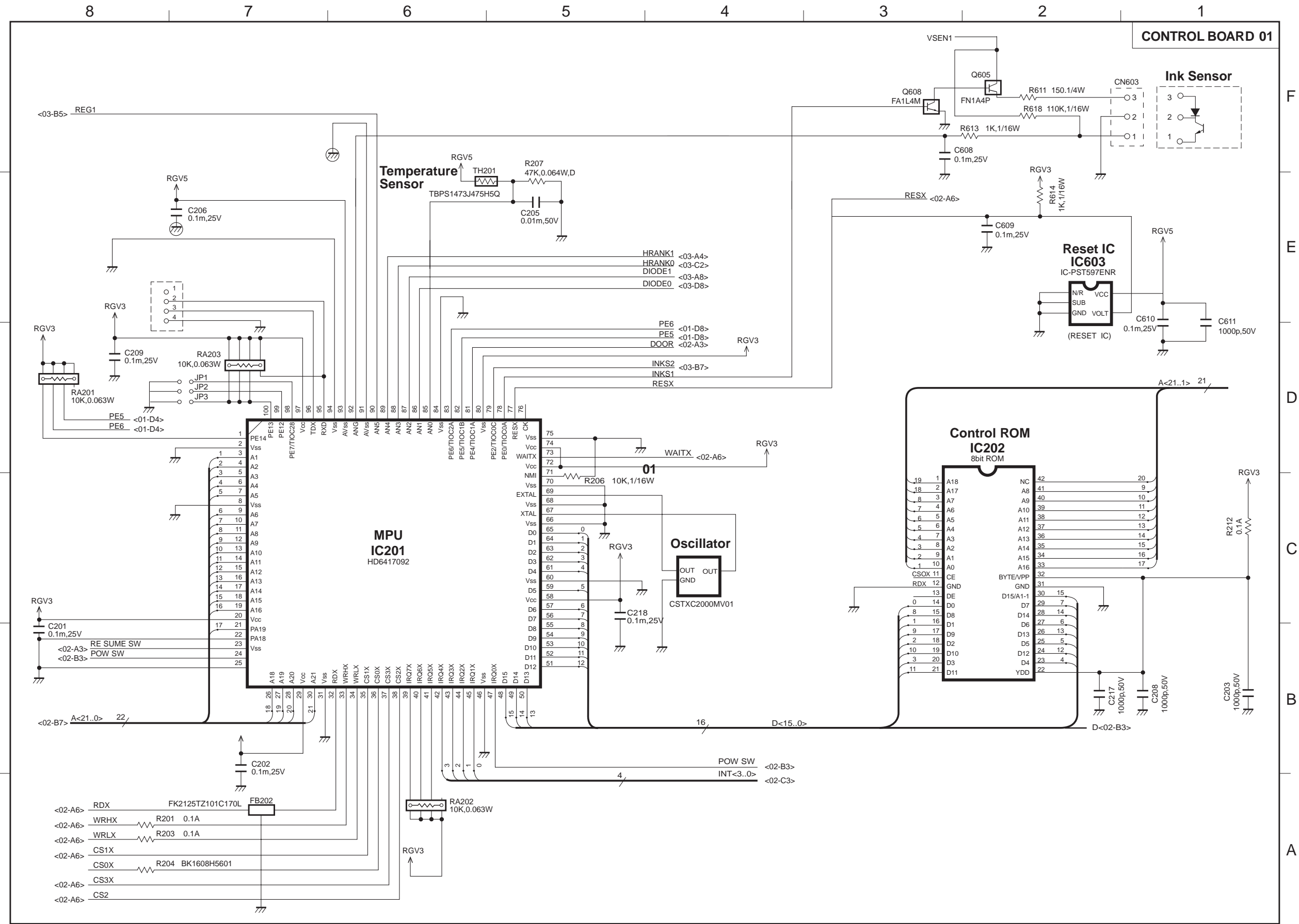
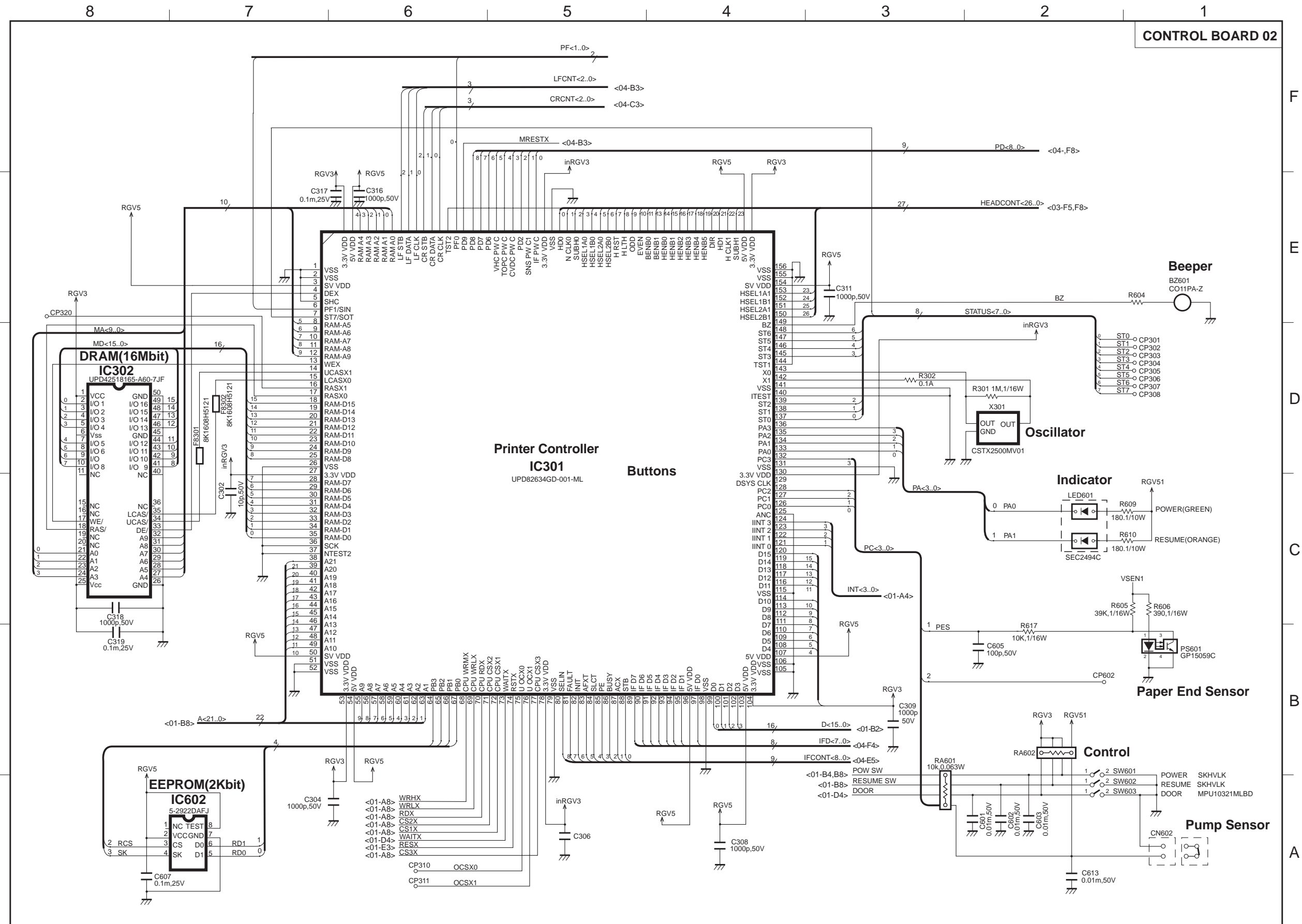


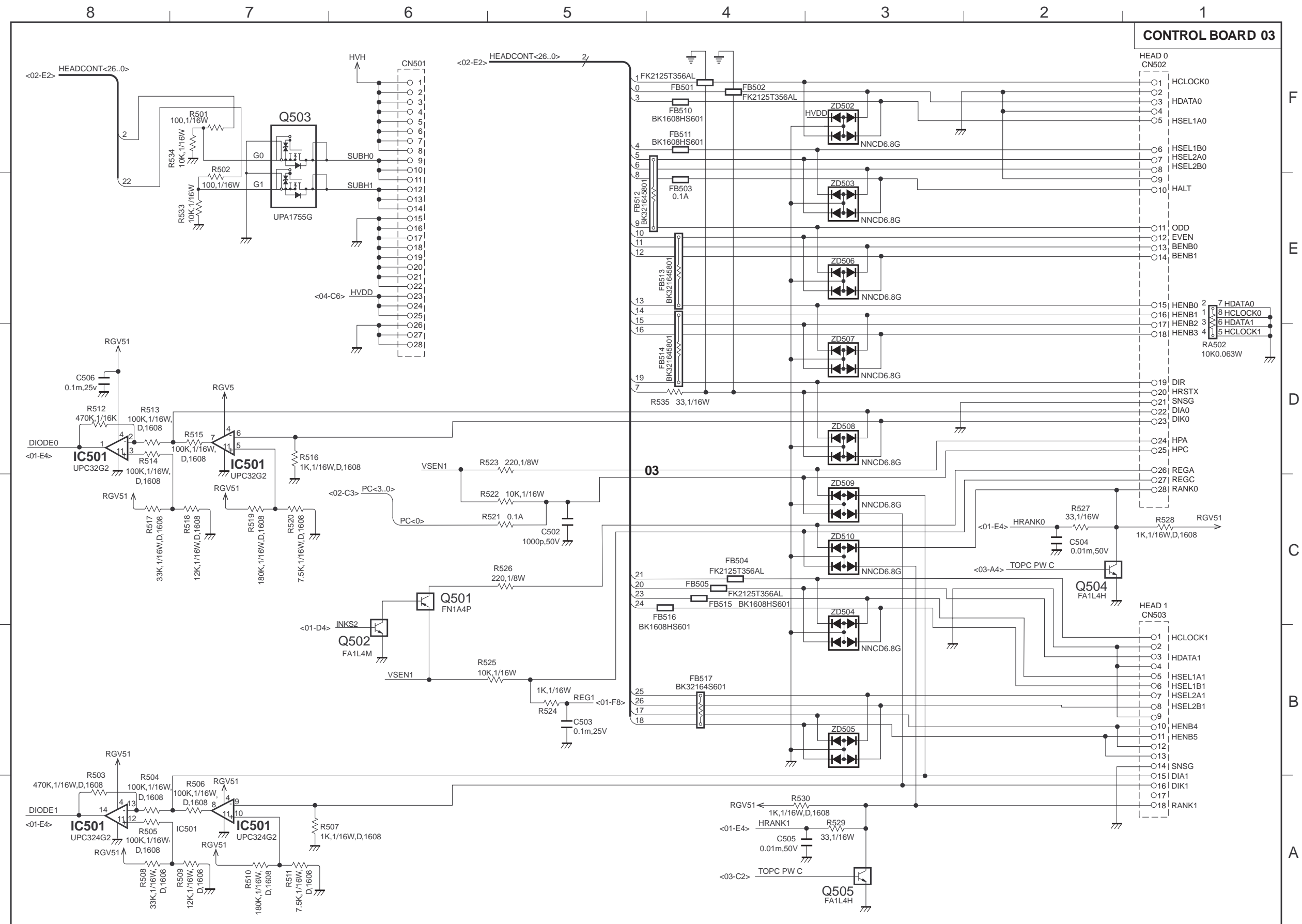
Figure 5-22 Carriage Board

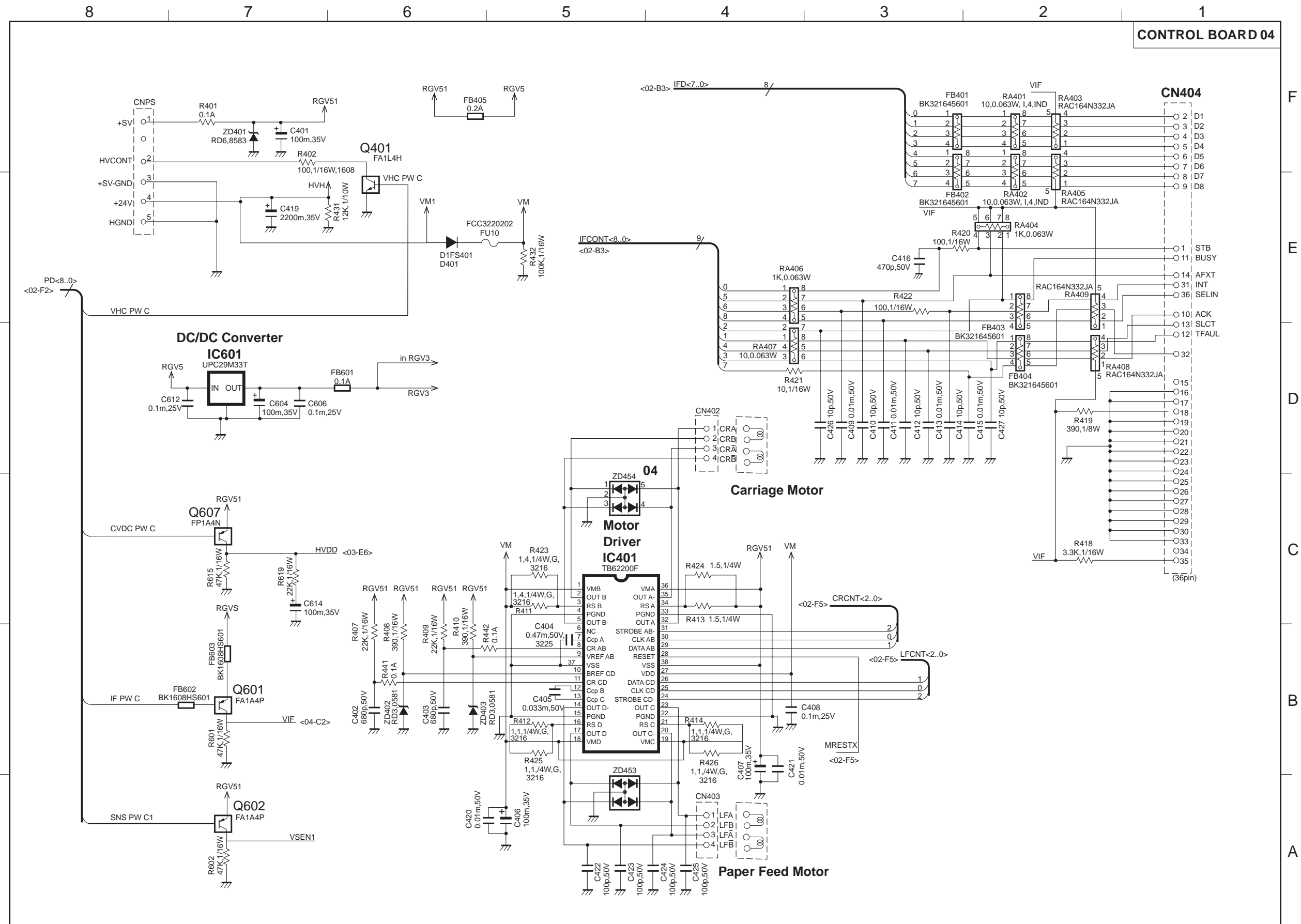
8.2 Circuit Diagrams

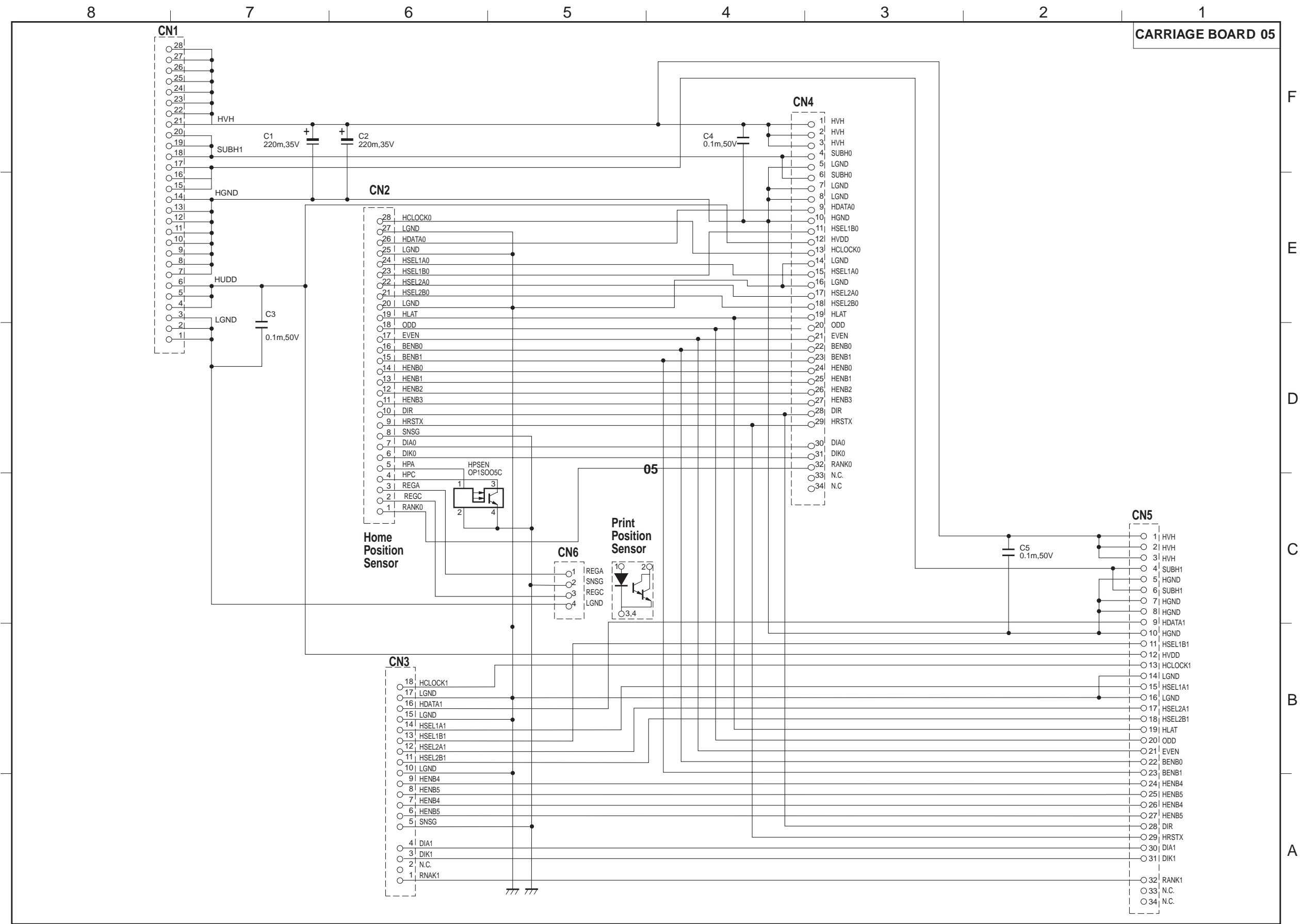


















The printing paper contains  
70% waste paper.

# Canon