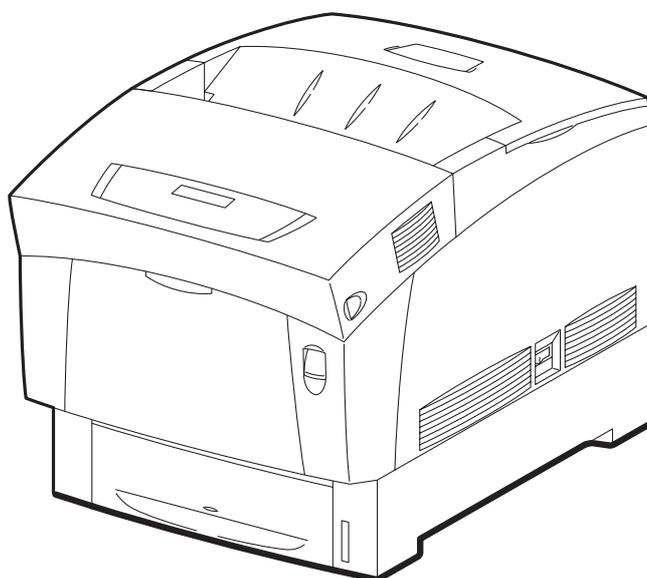




Brother Color Laser Printer **SERVICE MANUAL**

MODEL: HL-4000CN



Read this manual thoroughly before maintenance work.

Keep this manual in a convenient place for quick and easy reference at all times.

January 2002
SM-PRN027

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PREFACE

This service manual contains basic information required for after-sales service of the color laser printer (here-in-after referred to as "this machine" or "the printer"). This information is vital to the service technician to maintain the high printing quality and performance of the printer.

This service manual covers the HL-4000CN color laser printer.

This manual consists of the following chapters:

CHAPTER I : SPECIFICATIONS

Specifications, etc.

CHAPTER II : INSTALLATION

Installation conditions and installation procedures.

CHAPTER III : STRUCTURE OF SYSTEM COMPONENTS

Basic operation of the mechanical system, the electrical system and the electrical circuits and their timing information.

CHAPTER IV : ASSEMBLY / DISASSEMBLY

Procedures for replacement of the mechanical system parts.

CHAPTER V : TROUBLESHOOTING

Description of error messages on the control panel, troubleshooting image failure, etc.

CHAPTER VI : DIAGRAMS

CHAPTER VII : PLUG / JACK (P/J) CONNECTOR LOCATIONS

Information in this manual is subject to change due to improvement or re-design of the product. All relevant information in such cases will be supplied in service information bulletins (Technical Information).

A thorough understanding of this printer, based on information in this service manual and service information bulletins, is required for maintaining its print quality performance and for improving the practical ability to find the cause of problems.

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REGULATIONS

LASER SAFETY (FOR 120 V MODEL ONLY)

This printer is certified as a Class I laser product under the U.S. Department of Health and Human Services (DHHS) Radiation Performance Standard according to the Radiation Control for Health and Safety Act of 1968. This means that the printer does not produce hazardous laser radiation.

Since radiation emitted inside the printer is completely confined within protective housings and external covers, the laser beam cannot escape from the machine during any phase of user operation. However, the machine contains 5-milliwatt, 700-800 nanometer wavelength, GaAlAs laser diodes. Direct (or indirect reflected) eye contact with the laser beam might cause serious eye damage. Safety precautions and interlock mechanisms have been designed to prevent any possible laser beam exposure to the operator.

FDA REGULATIONS (FOR 120 V MODEL ONLY)

U.S. Food and Drug Administration (FDA) has implemented regulations for laser products manufactured on and after August 2, 1976. Compliance is mandatory for products marketed in the United States. The label shown on the back of the printer indicates compliance with the FDA regulations and must be attached to laser products marketed in the United States.

<p>MANUFACTURED: BROTHER INDUSTRIES, LTD. 15-1 Naeshiro-cho, Mizuho-ku, Nagoya, 467-8561 Japan This product complies with FDA radiation performance standards, 21 CFR Subchapter J.</p>

Caution:

Use of controls, adjustments or the performance of procedures other than those specified in this manual may result in hazardous radiation exposure.

IEC 60825 SPECIFICATION (FOR 220-240 V MODEL ONLY)

This printer is a Class 1 laser product as defined in IEC 60825 specifications. The label shown below is attached in countries where required.



This printer has a Class 3B Laser Diode which emits invisible laser radiation in the Scanner Unit. The Scanner Unit should not be opened under any circumstances.

Caution: Use of controls, adjustments or the performance of procedures other than those specified in this manual may result in hazardous radiation exposure.

 CLASS 3B 780nm 5mWmax	注意	開いセリインターロックを無効にすると不可視のレーザー放射を受けます。直射放射や散乱放射に、目や皮膚が、さらされないこと。
	CAUTION	INVISIBLE LASER RADIATION WHEN OPEN AND INTERLOCKS DEFEATED. AVOID EXPOSURE TO BEAM.
	PRECAUCIÓN	RADIACION LASERICA INVISIBLE CUANDO SE ABRA Y ANULE EL INTERBLOQUEO. EVITE LA EXPOSICION DIRECTA AL HAZ
	VARNING	OSYNLIG LASERSTRÅLNING NÄR DENNA DEL ÄR ÖPPNAD OCH SPÄRREN ÄR URKOPPLAD. STRÅLEN ÄR FARLIG.
ADVARSEL	USYNLIG LASERSTRÅLNING NÄR DEKSEL APNES OG SIKKERHEDSLAS BRYTES. ØNNGA EKSPONERING FOR STRÅLEN.	
ADVARSEL	USYNLIG LASERSTRÅLNING VED ÅBNING NÄR SIKKERHEDSAFBRYDERE ER UDE AF FUNKTION. UNDGÅ UDSÆTTELSE FOR STRÅLING.	
VARO!	NÄKYMATON, AVATTAESSA JA SUOJALUKITUS OHJETTAESSA OLET ALTTIINA NÄKYMÄTTÖMÄLLE LASERSÄTEILYLLE. ÄLÄ KATSO SÄTEESEEN.	
VORSICHT!	UNSICHTBARE LASERSTRÄHLUNG, WENN ABDECKUNG GEÖFFNET UND SICHERHEITSVERRIEGELUNG ÜBERBRÜCKT. NICHT IN DER STRAHL BLICKEN.	
ATTENTION	EMISSION DE RADIATION LASER INVISIBLE QUAND L'APPAREIL EST OUVERT ET LORSQUE LA SECURITE EST NEUTRALISEE. EVITER DE S'EXPOSER AU RAYON LASER	

For Finland and Sweden

LUOKAN 1 LASERLAITE

KLASS 1 LASER APPARAT

Varoitus! Laitteen käyttäminen muulla kuin tässä käyttöohjeessa mainitulla tavalla saattaa altistaa käyttäjän turvallisuusluokan 1 ylittävälle näkymättömälle lasersäteilylle.

Varning –Om apparaten används på annat sätt än i denna Bruksanvisning specificerats, kan användaren utsättas för osynlig laserstrålning, som överskrider gränsen för laserklass 1.

Internal laser radiation

Max. Radiation Power	10 mW
Wave Length	770 nm-808 nm
Laser Class	Class IIIb (Accordance with 21 CFR Part 1040.10) Class 3B (Accordance with IEC60825)

SAFETY

To prevent possible accidents during maintenance operation, you should observe strictly the "Warning" and "Caution" information in this manual.

Dangerous operations and operations out of range of this manual should be absolutely avoided.

Generally various processes not covered by this manual may be required in actual operation, which should be performed carefully always giving attention to safety.

Caution

Use of controls or adjustment or performance of procedures other than those specified in this manual might result in hazardous radiation exposure.

Disconnect device

This printer must be installed near a power outlet that is easily accessible. In case of emergencies, you must disconnect the power cord from the power outlet to shut off the power completely.

Caution for batteries

Do not replace the battery. There is a danger of explosion if the battery is incorrectly replaced. Do not disassemble, recharge or dispose of in by fire. Used batteries should be disposed of according to local regulations.

Power Source

Keep the power supply off during maintenance operation to prevent electric shock, burns and other damages. Keep the power plug disconnected during the maintenance operation. If the power supply should be kept connected for measurement of voltage or other similar reasons, sufficient care should be given to prevent electric shock, by following the procedures of this manual.

WARNING

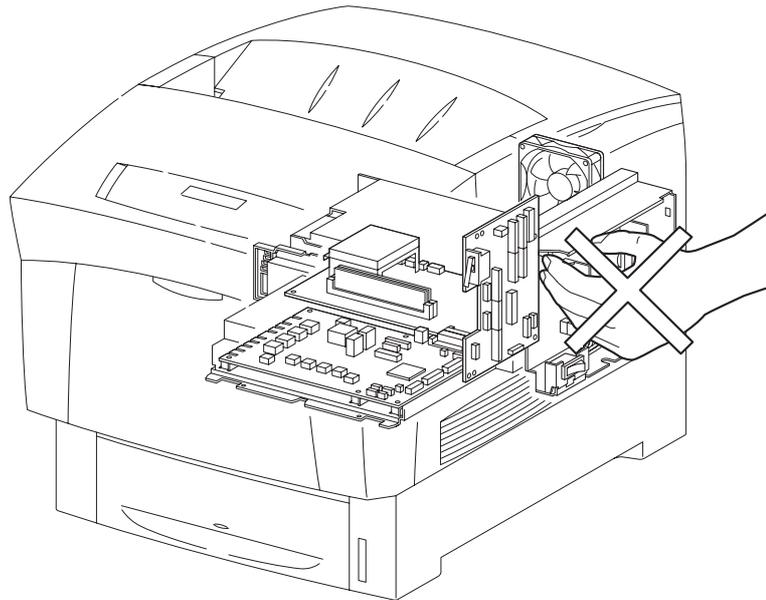
While the printer is ON, never touch live parts if not required absolutely.

WARNING

Power is supplied to the power switch / inlet (LVPS ASSY) even while the printer is off. Never touch its live components.

WARNING

Do not touch live parts unless otherwise specified.



Driving Units

When servicing gears or other driving units, be sure to turn them OFF and plug off. Drive them manually when required.

WARNING

Never touch the gears or other driving units while the printer is running.

High-temperature Units

When servicing high-temperature units (securing unit, etc.), be sure to turn them OFF to prevent burns, injuries and other troubles, remove the power plug and start service processes after they have cooled down enough.

WARNING

Immediately after completion of operation, they are still hot. Start services after more than 40 minutes.

Laser Beams

WARNING

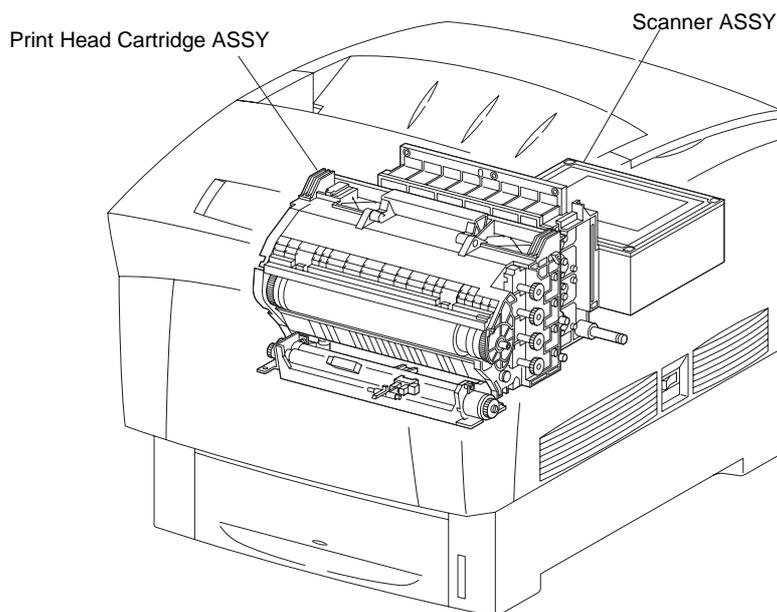
- *If your eyes are exposed to laser beams, you may lose your eyesight.*
- *Never open the cover if warning label for laser beams is attached there.*
- *Before disassembling and reassembling this laser printer, be sure to turn it OFF.*
- *When servicing this laser printer while it is running, be sure to follow the procedures specified in this manual.*
- *You should understand the features of the laser beams which are capable of having an injurious action on the human body, not to extend the danger over the workers as well as other people around the printer.*

Note:

I Laser beams have features as follows:

- *Frequencies are smaller in width than other beams (sun and electric bulbs) and phases are uniform so that high monochromatic and convergence performance can be obtained and thin beams of light can reach places at a long distance.*
- *Due to the high convergence, beams are concentrated in high density and high temperature, which is dangerous to human body.*

Reference: Laser beams of this laser printer is invisible rays which you cannot see.



ACRONYMS

In this manual, the manual specific acronyms are used in addition to the generally used ones. The table below contains typical acronyms that are used throughout this manual.

ADC	Automatic Density Control	AG	Analog Ground
AUX.	Auxiliary	B/W	Black and White
BCR	Bias Charge Roll	CART.	Cartridge
BUR	Back Up Roll	CL.	Clutch
CCW	Counter Clock Wise	CLK	Clock
CLN	Cleaning (or Cleaner)	CRU	Customer Replaceable Unit
CR	Charge Roll	CW	Clock Wise
CRUM	CRU Monitor	DTS	Detack Saw
DB	Developing Bias	FDR	Feeder
FG	Frame Ground	FRU	Field Replaceable Unit
Hex	Hexadecimal	I/F	Interface
IDT	Intermediate Drum Transfer	ID	Image Density (or Identification)
L/H	Left Hand	L/P	Low Paper
LD	Laser Diode	LEF	Long Edge Feed
MSI	Multi Sheet Inserter	N/F	Normal Force
N/P	No Paper	NVM	Non Volatile Memory
OPC	Organic Photo Conductor	P/H	Paper Handling
PCDC	Pixel Count Dispense Control	PPM	Prints Per Minute
Pixel	Picture Cell	PWB	Printed Wiring Board
PV	Print Volume	REGI.	Registration
R/H	Right Hand	RTN	Return
SEF	Short Edge Feed	SG	Signal Ground
SNR	Sensor	SOL.	Solenoid
SOS	Start Of Scan	SPI	Scans Per Inch
SYNC.	Synchronous	T/A	Take Away
TC	Toner Concentration	TEMP.	Temperature
TR	Transfer	TRANS.	Transport
WDD	Wide Range Dynamic Damper	YMCBk	Yellow, Magenta, Cyan, Black
XERO.	Xerographic		

Service call procedures

1. Notes Before Work

1.1 Safety notes

To prevent an accident during maintenance, follow warnings and precautions strictly. Avoid dangerous work.

1. Power supply

To prevent an electric shock, burn, or injury, turn off the power and unplug the power cable before maintenance work. If it is inevitable to keep the power on for voltage measurement, take the greatest care not to receive an electric shock.

2. Drive

Never inspect or lubricate drive components such as gears when the machine is in operation.

3. Heavy parts

The machine weighs 35.3 kg. When lifting the machine, get a firm footing and bend your knees to avoid possible injuries to your back.

4. Safety devices

Ensure the safety functions of safety devices for preventing mechanical accidents (fuses, circuit breakers, and interlock switches) and for safe user operations (panels and covers). Do not make mechanical alterations that may impair the safety functions.

5. Parts mounting and removal

Parts and covers may have sharp edges. Do not touch the edges readily. If your fingers or hands become greasy, wipe off the grease well. Do not pull out a part cable forcibly but gradually.

6. Specified tool

Follow instructions if a tool is specified.

7. Organic solvents

Use the drum cleaner and other organic solvents carefully with the following notes in mind:

- Keep the room well ventilated not to breathe in vapor a lot or continuously.
- The solvents are inflammable liquids. Do not put them close to or into a fire or do not heat their containers.
- Avoid storing the solvents near a naked fire or sparks because they may catch fire.

8. Irregular use of machine

When altering the machine, submit an application for irregular use in advance.

1.2 Other notes

Do maintenance work correctly and efficiently with the following notes in mind:

1. Reference materials

Read the related technical information (SB, FTI, FTO and so on) well and do maintenance work systematically.

2. Disassembling

Before removing parts for disassembling, check the normal mounting status in advance.

3. Mounting and adjustment

Do not start up the machine immediately after finishing part mountings and adjustments. Check that there are no tools or parts left inside the machine or on assy.

4. Handling of replaced parts and consumables

Do not discard of replaced parts and consumables at the customer site.

After replacing the following consumables, be sure to attach the U tag to the replaced one and recover.

Drum cartridge

Color toner cartridges

As to parts to be recycled, enter necessary data into the U tag and recover the parts.

5. General Notes

Be careful not to disturb the customer's daily work.

Color toner dropped on the floor is hardly cleaned. Place the drop cloth on the floor when maintaining the inside of the machine to protect carpets and floors.

Put wastes, consumables, and replaced parts into a plastic or paper bag and obtain the permission of the customer to throw them away.

Be sure to enter the field work contents and the replaced consumables and parts into the Machine Log Book.

HL-4000CN weighs 35.3 kg.

When moving the equipment, make sure that there are two or more persons carrying it.

For details, see the installation procedure on page II-1.

2. Workflow in the Field

< Initial Actions >

1. Question the Customer for details about the system malfunction.
2. Note down the meter count.
3. Inspect the rejected print and determine the machine condition.
4. Check the Machine Log Book.

< For UM visit >

1. Perform the Level 1 troubleshooting.
2. Perform the troubleshooting.
3. Print any Internal Test Pattern to check the print quality. (See page V-51)
4. Feed paper from each tray, and clean or replace the feed role as required.
5. Repair any secondary problems that would prevent the machine from running.
6. Perform the trim activities.

< For SM visit >

1. Print any Internal Test Pattern to check the print quality. (See page V-51)
2. Feed paper from each tray, and clean or replace the feed role as required.
3. Repair any secondary problems that would prevent the machine from running.
4. Perform the trim activities.

< Final Actions >

1. Check the machine overall operation and function.
2. Check the machine appearance and consumables.
3. Perform the operator training as required.
4. Record the performed action in the Machine Log Book and Service Report.
5. Store the sample printouts in the Machine Log Book.

3. Trim Activity

Trim activities for HL-4000CN should be made within every SM/UM, mainly for maintaining the machine performance. There is no service call performed only for the trim activity.

3.1 Trim activity procedure

1. Check the overall operation before performing the trim activity.
 Print any Internal Test Pattern to output three patterns: all colors of 20 % each, halftone and grid.
 All colors of 20 % each: IBT belt, scratches on the drum surface, and fusing problem are checked.
 Halftone pattern: Low density area reproduction problem, color balance and fusing problem are checked.
 Grid pattern: Color registration problem and fusing problem are checked.
 * See page V-51 for test pattern output method.
2. Clean the interior of the machine.
 Clean toner contamination and paper dust in the paper path area.
 (Operator area should be cleaned carefully.)
3. Check the periodic replacement parts(consumable parts). Replace as required.
4. Safety check.
 Check the Power Cord for damage or loose connection.
5. After 1 to 4 above completes, do the following overall operation checks.
 Machine operation
 Print quality
 Meter reading

3.2 Mechanical consumables and periodic replacement parts

A mechanical consumable should be replaced after checking the printed sheets count during trim action.

<Mechanical consumables>

Consumable	Product Code	Number of sheets that can be printed*1
Black Toner Cartridge	TN-11BK	8.5K
Cyan Toner Cartridge	TN-11C	6K
Magenta Toner Cartridge	TN-11M	6K
Yellow Toner Cartridge	TN-11Y	6K
Print Head Cartridge	PH-11CL	30K
Transfer Roll Cartridge (with Toner Collector Bottle)	TR-11CL	25K

*1: Condition

Paper size: A4 or LETTER

Toner coverage: 5%

Ratio of B/W to color: 1: 1

Average number of sheets printed at onetime: 4 sheets

<Parts for periodic replacement>

Consumable	Replacement interval	Remarks
Fuser Unit	100K prints	
Retard Roll	100K prints	

3.3 Trim checklist

C: Check and if necessary clean, replace, or replenish.

A: Always check and clean.

R: Replace at specified intervals.

* See page V-51 for the test pattern output method.

No.	Work item	Each time	100K	Rep & Adj No.	Description
1.1	Check before work (Mechanical noise check)	C			- Start up the machine to see that no abnormal noise occurs
1.2	Check before work (Test pattern output)	C			- Output the internal test patterns to check the print quality. (Check uneven darkness, deletion, and drum of belt damage with each 20% pattern and reproducibility of low darkness with the document reproducibility pattern.)
2	Cleaning inside the machine (Paper transport system cleaning) Retard Roll	C	R		- Clean any loose toner and paper dust from the paper transport path and jam sensors. - Clean especially the operator area. - Check and clean the MSI field roll.
3.1	Fuser ASSY	A	R		- Check that the H. Roll and P. Roll are not scratched. Replace them when necessary.
3.2	Print Head Cartridge	A	30K		- Visual check only. Do not touch.
3.3	Transfer Roll Cartridge Unit ASSY	C	18K		- Visual check only. Do not touch.
4	Safety check	A			- Check the power plug for loose connection. - Check the power cable for crack or explosion of its conductor. - Check that the extension cable of an insufficient capacity or a nonstandard power cable (ex. table tap) is not used. - Check that the power cable is not connected to the same outlet as some other cables.
5.1	Check after work (Print quality check)	C			- Output the internal test patterns to see that the print quality satisfies the standards.
5.2	Check after work (Machine operation check)	C			- Check paper feed and noise.
5.3	Check after work	C			- Create Machine Log Book and a service report.



CAUTION

Do not touch the print head cartridge or transfer roll cartridge unit directly by hand.

Do not use a drum cleaner or other solvents. (It will take time for the machine to recover.)

CHAPTER I

SPECIFICATIONS

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CHAPTER I SPECIFICATIONS

1. PRODUCT NAME

Product Name	Product Code	Model

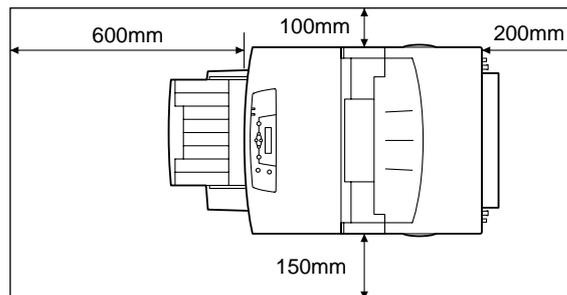
2. DIMENSIONS / WEIGHT (MAIN UNIT)

Width (mm)	Depth (mm)	Height (mm)	Weight (kg)
439	590*	445	35.5kg or less (with CRU)

*: with the manual tray folded

3. SPACE REQUIREMENTS

The printer has vents on the sides and the rear. Install the printer with clearances of 150 cm on the right, 100 cm on the left, and 200 cm on the rear.



4. PRINTER SYSTEM CONFIGURATION

4.1 Outline of the Printer

1) Host computer

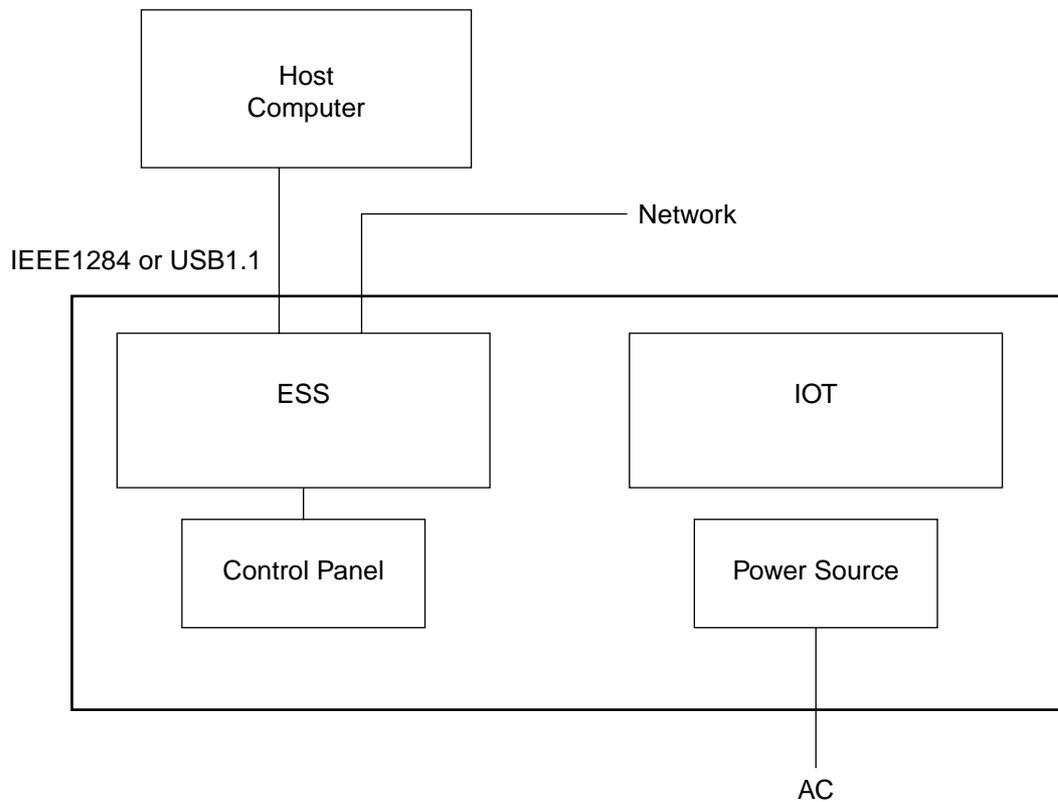
The target host is a personal computer (PC98, IBM PC-AT compatible, or Macintosh) connected directly and also through a network.

2) ESS

The ESS interprets print information (control code data, character code data, graphics data, and image data) sent from the host computer into video data and sends it to the IOT.

3) IOT

The ESS prints received video data for viewing. This unit uses the A4-size 600/1200 dpi laser xerography system.



4.2 IOT Function Outline

Configuration	Contents
Recording section	- Color 16PPM, Monochrome 16PPM - 600dpi (standard speed), 1200dpi (half speed)
Recording System	- OPC drum, 4-tandem cartridges , electro-photographic system using intermediate transfer rolls
Developer	- 2-component
Toner	- Chemical toner (black, yellow, magenta, cyan)
Exposure System	- Semiconductor laser, simultaneous scanning by 4 beams
Fusing System	- Heat fusing of the free belt nip system
CRU (consumables)	- Black toner cartridge - Yellow toner cartridge - Magenta toner cartridge - Cyan toner cartridge - Drum cartridge - Transfer roll cartridge
Paper Source	- Internal 500 sheets feeder unit - MSI unit (100 sheets) - 500 sheets x 2 feeder unit (optional)
Paper Exit	- Face down output tray (250 sheets)
Duplex	- Internal Duplex
Control Panel	- LCD: 16 digits x two rows - Button: 8 - LED: 5 - MIMIC: supported
LVPS	- 100/120/220 VAC, 50/60Hz power source

4.3 ESS Standard Configuration

Item	Contents
CPU	QED RM5261A 350MHz
Memory	RAM: Standard 64MB, 320MB max One 144pin SO-DIMM slot installed ROM: 4MB Flash ROM (On Board) (for program) 8MB Mask ROM (On Board) (for fonts) HDD: For electronial sorting: 10GB or more IDE HDD (optional)
External Interface	<ul style="list-style-type: none"> - Parallel connection interface <ul style="list-style-type: none"> : IEEE1284-compliant (compatible, nibble, ECP) - USB1.1 - Network connection interface <ul style="list-style-type: none"> : 100BASE-TX supported (10BASE-T compatible)
Network Protocol	<ul style="list-style-type: none"> - LPD - Port9100 - IPP - FTP (only for firmware update) - NetWare (SPX/IPX) (with optional network expansion card installed) - Apple Talk (Ether Talk) (with optional network expansion card installed) - SMB over TCP/IP (with optional network expansion card installed) - SMB over NetBEUI (with optional network expansion card installed) - DHCP - HTTP (EWS) - SNMP

5. OPTIONAL PRODUCTS

No.	Product Name	Product Code	Remarks
1	2 Tray Module	LT-40CL	
2	Hard Disk	HD-40CL	
3			
4			
5			
6			
7			
8			
9			