brother®

FACSIMILE EQUIPMENT
SERVICE MANUAL

MODEL: FAX3550/3650/8000P/8200P
MFC4450/4550/4550plus
MFC6550MC/7550MC/7650MC
MFC9000/9500

PREFACE

This publication is a Service Manual covering the specifications, construction, theory of operation, and maintenance of the Brother facsimile equipment. It includes information required for field troubleshooting and repair—disassembly, reassembly, and adjustment—so that service personnel will be able to understand equipment function, to rapidly repair the equipment and order any necessary spare parts.

To perform appropriate maintenance so that the facsimile equipment is always in best condition for the customer, the service personnel must adequately understand and apply this manual.

This manual is made up of six chapters and appendices.

CHAPTER I.	**GENERAL DESCRIPTION**
CHAPTER II.	**INSTALLATION**
CHAPTER III.	**THEORY OF OPERATION**
CHAPTER IV.	**DISASSEMBLY/REASSEMBLY AND LUBRICATION**
CHAPTER V.	**MAINTENANCE MODE**
CHAPTER VI.	**ERROR INDICATION AND TROUBLESHOOTING**
APPENDICES	**Circuit Diagrams**

This manual describes the model and its versions to be destined for major countries. The specifications and functions are subject to change depending upon each destination.

SAFETY INFORMATION

Laser Safety (110 - 120V Model only)

This printer is certified as a Class 1 laser product under the US 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 the protective housings and external covers, the laser beam cannot escape from the machine during any phase of user operation.

CDRH Regulations (110 - 120V Model only)

The Center for Device and Radiological Health (CDRH) of the US Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States. The label shown below indicates compliance with the CDRH regulations and must be attached to laser products marketed in the United States.

The label for Japanese products

MANUFACTURED: AUGUST   1998   K

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.

CHAPTER I.

GENERAL DESCRIPTION

CONTENTS

1. EQUIPMENT OUTLINE

1.1 External Appearance and Weight

The figure below shows the equipment appearance and approximate dimensions.

251 (H)

452 (D)

383 (W)
(excluding the handset)

(Unit: mm)
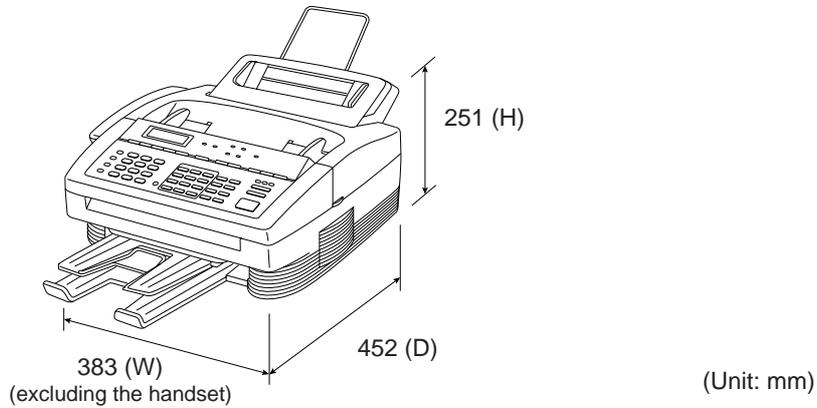
Weight: Machine proper Approx. 8.5 kg (excluding the drum unit and toner cartridge)

In package Approx. 13.5 kg (FAX3550/3650/8000P/8200P)
Approx. 14 kg (MFC4450/4550/4550plus/6550MC/7550MC/
7650MC/9000/9500)

1.2 Components

The equipment consists of the following major components:

Multi-purpose sheet feeder

Drum unit with toner cartridge loaded

Laser unit

Handset

Gear drive unit

Low-voltage power supply ASSY

Bottom plate

Top cover

Control panel ASSY

Heat-fixing unit

Inner cover

Main cover

Scanner frame ASSY

NCU PCB ASSY

Main PCB

Relay PCB

High-voltage power supply ASSY

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2. SPECIFICATIONS

MODEL	FAX3550	MFC4550	MFC6550MC	MFC7550MC
COLOR	1267	1138	1138	1138
PRINTER	Option			
Engine	—	HL-720	HL-730	HL-730
PPM	—	6	6	6
dpi	—	600 x 600	600 x 600	600 x 600
Paper Capacity	200	200	200	200
Standards	—	Windows GDI (600x600)	Windows GDI (600x600)	Windows GDI (600x600)
Emulation	—	No	PCL4 (300x300)	PCL4 (300x300)
Memory (Typical)	—	512 KB	512 KB	1 MB
Memory (Min.)	—	300 KB	400 KB	1 MB
Fonts Resident	—	No	24-bit map (PCL4 Comp)	24-bit map (PCL4 Comp)
Fonts Disk Based	—	No	Yes	Yes
Paper Handling	LTR, LGL, A4	LTR, LGL, EXE, A4, B5, A5	LTR, LGL, EXE, A4, B5, A5	LTR, LGL, EXE, A4, B5, A5
Multi-purpose Sheet Feeder	Custom Size (2.85x5-8x14) Envelope (BL/C5/COM 10/Mona)	Custom Size (2.85x5-8x14) Envelope (BL/C5/COM 10/Mona)	Custom Size (2.85x5-8x14) Envelope (BL/C5/COM 10/Mona)	Custom Size (2.85x5-8x14) Envelope (BL/C5/COM 10/Mona)
Printer Driver	—	Windows 3.1, 95 Driver with Auto Installer Program	Windows 3.1, 95 Driver with Auto Installer Program	Windows 3.1, 95 Driver with Auto Installer Program
Toner Life (5%/page)	2200 pages	2200 pages	2200 pages	2200 pages
Utility Software	—	—	RPC	RPC
SCANNER	Option			
Color/Mono	—	Mono	Mono	Mono
Gray Scale	—	64	256	256
dpi	—	400 x 400	600 x 600	600 x 600
Twain	—	Yes	Yes	Yes
ADF Capacity (pages)	(30)	30	30	30
Formats	—	TIFF/BMP (by M/L)	TIFF/BMP (by M/L)	TIFF/BMP (by M/L)
OCR	—	Option	Yes	Yes
COPY				
dpi	200 x 400	200 x 400	600 class	600 class
No. of Copies	1-99	1-99	1-99	1-99
Sorting	No	No	Yes	Yes
Reduction/Enlargement	50-200%	50-200%	50-200%	50-200%
FAX				
Modem	ROCKWELL V12	ROCKWELL V12	ROCKWELL V24	ROCKWELL V24
Modem Speed	14400 bps (FAX only)	14400 bps (FAX only)	14400 bps (FAX only)	14400 bps (FAX only)
CCITT Group	G3	G3	G3	G3
Coding Method	MH/MR/MMR	MH/MR/MMR	MH/MR/MMR	MH/MR/MMR
Transmission Speed	6 sec.	6 sec.	6 sec.	6 sec.
Input/Output Width	8.5"/8.5"	8.5"/8.5"	8.5"/8.5"	8.5"/8.5"
LCD Size	16 x 1	16 x 2	16 x 2	16 x 2
Super Fine	Yes (Send only)	Yes (Send only)	Yes (Send only)	Yes
Gray Scale	64	64	64	64
Smoothing	Yes	Yes	Yes	Yes
Handset	Yes	Yes	Yes	Yes
One-touch Dial	20 x 2	12 x 2	12 x 2	12 x 2
Speed Dial	100	36	36	100
Telephone Index	Yes	Yes	Yes	Yes
Contrast	Super L/Auto/Super D	Super L/Auto/Super D	Super L/Auto/Super D	Super L/Auto/Super D
Multi-resolution Transmission	Yes	Yes	Yes	Yes
FAX/TEL Switch	Yes	Yes	Yes	Yes
Distinctive Ringing	Yes	Yes	Yes	Yes
Caller ID	Yes	Yes	Yes	Yes
Next FAX-reservation	Yes	Yes	Yes	Yes
Help	Yes	Yes	Yes	Yes
TAD Interface	Yes	Yes	Yes	Yes

MODEL	FAX3650	MFC4450	MFC4550plus	MFC7650MC
COLOR	1267	1138	1138	1138
PRINTER	Option			
Engine	—	HL-720	HL-720	HL-730
PPM	—	6	6	6
dpi	200 x 200	600 x 600	600 x 600	600 x 600
Paper Capacity	200	200	200	200
Standards	Windows GDI (200x200)	Windows GDI (600x600)	Windows GDI (600x600)	Windows GDI (600x600)
Emulation	—	No	PCL4 (300x300)	PCL4 (300x300)
Memory (Typical)	—	512 KB	512 KB	1 MB
Memory (Min.)	—	300 KB	400 KB	600 KB
Fonts Resident	—	No	24-bit map (PCL4 Comp)	24-bit map (PCL4 Comp)
Fonts Disk Based	—	No	Yes	Yes
Paper Handling	LTR, LGL, A4	LTR, LGL, A4, B5, A5	LTR, LGL, A4, B5, A5	LTR, LGL, A4, B5, A5
Multi-purpose Sheet Feeder	—	Custom Size (2.85x5-8x14) Envelope (BL/C5/COM 10/Mona)	Custom Size (2.85x5-8x14) Envelope (BL/C5/COM 10/Mona)	Custom Size (2.85x5-8x14) Envelope (BL/C5/COM 10/Mona)
Printer Driver	—	Windows 3.1, 95 Driver with Auto Installer Program	Windows 3.1, 95 Driver with Auto Installer Program	Windows 3.1, 95 Driver with Auto Installer Program
Toner Life (5%/page)	2200 pages	2200 pages	2200 pages	2200 pages
Utility Software	—	—	RPC	RPC
SCANNER	Option			
Color/Mono	—	Mono	Mono	Mono
Gray Scale	—	64	64	256
dpi	—	400 x 400	400 x 400	600 x 600
Twain	—	Yes	Yes	Yes
ADF Capacity (pages)	—	30	30	30
Formats (Import)	—	TIFF/BMP/PCX/DCX/BTF/BTX/UNI	TIFF/BMP/PCX/DCX/BTF/BTX/MAX	TIFF/BMP/PCX/DCX/BTF/BTX/MAX
Formats (Export)	—	TIFF/BMP/UNI	TIFF/BMP/MAX	TIFF/BMP/MAX
OCR	—	Option	Yes	Yes
COPY				
dpi	200 x 400	200 x 400	200 x 400	600 class
No. of Copies	1-99	1-99	1-99	1-99
Sorting	Yes	No	No	Yes
Reduction/Enlargement	50-200%	50-200%	50-200%	50-200%
FAX				
Modem	ROCKWELL V12	Toshiba	ROCKWELL V12	ROCKWELL V24
Modem Speed	14400 bps (FAX only)	9600 bps (FAX only)	14400 bps (FAX only)	14400 bps (FAX only)
CCITT Group	G3	G3	G3	G3
Coding Method	MH/MR/MMR	MH/MR/MMR	MH/MR/MMR	MH/MR/MMR
Transmission Speed	6 sec.	9 sec.	6 sec.	6 sec.
Input/Output Width	8.5"/8.5"	8.5"/8.5"	8.5"/8.5"	8.5"/8.5"
LCD Size	16 x 1	16 x 2	16 x 2	16 x 2
Super Fine	Yes	Yes	Yes	Yes
Gray Scale	64	64	64	64
Smoothing	Yes	Yes	Yes	Yes
Handset	Yes	No	Yes	Yes
One-touch Dial	20 x 2	12 x 2	12 x 2	12 x 2
Speed Dial	100	36	36	100
Telephone Index	Yes	Yes	Yes	Yes
Contrast	Super L/Auto/Super D	Super L/Auto/Super D	Super L/Auto/Super D	Super L/Auto/Super D
Multi-resolution Transmission	Yes	Yes	Yes	Yes
FAX/TEL Switch	Yes	Yes (with External)	Yes	Yes
Distinctive Ringing	Yes	Yes (with External)	Yes	Yes
Caller ID	Yes	No	Yes	Yes
Next FAX-reservation	Yes	Yes	Yes	Yes
Help	Yes	Yes	Yes	Yes
TAD Interface	Yes	Yes	Yes	Yes

MODEL	FAX8000P	MFC9000	MFC9500	FAX8200P
COLOR	1138	1138	1138	1138
PRINTER	Option			Option
Engine	—	HL-730	HL-730	—
PPM	—	6	6	—
dpi	—	600 x 600 (GDI) / 300 x 300 (PCL4)	600 x 600 (GDI) / 300 x 300 (PCL4)	—
Paper Capacity	200	200	200	200
Standards	—	Windows GDI	Windows GDI	—
Emulation	—	PCL4	PCL4	—
Memory (Typical)	—	512 KB	512 KB	—
Memory (Min.)	—	400 KB	400 KB	—
Fonts Resident	—	24-bit map (PCL4 Comp)	24-bit map (PCL4 Comp)	—
Fonts Disk Based	—	Yes	Yes	—
Paper Handling	A4, B5, A5	A4, B5, A5	A4, B5, A5	A4
Multi-purpose Tray	Custom Size (73x127-126x350 mm) Envelope (DL/C5/COM 10/Mona)	Custom Size (73x127-216x350 mm) Envelope (DL/C5/COM 10/Mona)	Custom Size (73x127-216x350 mm) Envelope (DL/C5/COM 10/Mona)	—
Printer Driver	—	Windows 3.1, 95 Driver with Auto Installer Program Mac Driver (Option)	Windows 3.1, 95 Driver with Auto Installer Program Mac Driver (Option)	—
Toner Life (5%/page)	2200 pages	2200 pages	2200 pages	2200 pages
Utility Software	—	Remote Priter Console (RPC)	Remote Priter Console (RPC)	—
SCANNER	Option			Option
Color/Mono	—	Mono	Mono	—
Gray Scale	—	256	256	—
dpi	—	600 x 600	600 x 600	—
Twain	—	Yes	Yes	—
ADF Capacity (pages)	30	30	30	—
Formats	—	TIFF/BMP	TIFF/BMP	—
OCR	—	Option	Yes	—
COPY				
dpi	200 x 400	300 x 400	300 x 400	200 x 400
No. of Copies	1-99	1-99	1-99	1-99
Sorting	Available with optional memory	Yes	Yes	Yes
Reduction/Enlargement	50-200%	50-200%	50-200%	50-200%
FAX				
Modem	ROCKWELL V12	ROCKWELL V12	ROCKWELL V24	ROCKWELL V12
Modem Speed	14400 bps (FAX only)	14400 bps (FAX only)	14400 bps (FAX only)	14400 bps (FAX only)
CCITT Group	G3	G3	G3	G3
Coding Method	MH/MR/MMR	MH/MR/MMR	MH/MR/MMR	MH/MR/MMR
Transmission Speed	6 sec.	6 sec.	6 sec.	6 sec.
Input/Output Width	8.5"/8.5"	8.5"/8.5"	8.5"/8.5"	8.5"/8.5"
LCD Size	16 x 1	16 x 2 (STN)	16 x 2 (STN)	16 x 1
Super Fine (Send)	Yes	Yes	Yes	Yes
Super Fine (Receive)	Available with optional memory	Available with optional memory	Available with optional memory	Yes
Gray Scale	64	64	64	64
Smoothing	Yes	Yes	Yes	Yes
Handset	No	No	No	No
One-touch Dial	20 x 2	12 x 2	12 x 2	20 x 2
Speed Dial	100	100	100	100
Telephone Index	Yes	Yes	Yes	Yes
Contrast	Light/Auto/Dark	Light/Auto/Dark	Light/Auto/Dark	Light/Auto/Dark
Multi-resolution Transmission	Yes	Yes	Yes	Yes
FAX/TEL Switch	Yes	Yes	Yes	Yes
Distinctive Ringing	Yes	Yes	Yes	—
Caller ID	Yes (U.K., Sweden, Holland and France)	Yes (U.K., Sweden, Holland and France)	Yes (U.K., Sweden, Holland and France)	Yes (U.K., Sweden, Holland and France)
Next FAX-reservation	Yes	Yes	Yes	Yes
Help	Yes	Yes	Yes	Yes
TAD Interface	Yes	Yes	Yes	Yes

MODEL	FAX3550	MFC4550	MFC6550MC	MFC7550MC
FAX				
Coverpage	Yes, Super	Yes, Super	Yes, Super	Yes, Super
Polling Type	Std/Del/Seq	Std/Del/Seq	Std/Del/Seq	Std/Del/Seq
Receive password	Yes	Yes	Yes	Yes
Delayed Transmission	Yes, 3 timings	Yes, 3 timings	Yes, 3 timings	Yes, 3 timings
Call Reservation	Yes	Yes	Yes	Yes
Callback Message	Yes	Yes	Yes	Yes
Page Memory (TX)*	300 KB (30 pgs: MMR)	200 KB (20 pgs: MMR)	300 KB (30 pgs: MMR)	700 KB (70 pgs: MMR)
Out-of-paper Reception*	400 KB (40 pgs: MMR)	400 KB (40 pgs: MMR)	600 KB (60 pgs: MMR)	1.5 MB (150 pgs: MMR)
Super Quick Scan	Yes	Yes	Yes	Yes
Auto Reduction	Yes	Yes	Yes	Yes
ECM	Yes	Yes	Yes	Yes
Broadcasting	Yes	Yes	Yes	Yes
Multi Transmission	Yes	Yes	Yes	Yes
MESSAGE CENTER				
TAD Feature	No	No	Yes (Hardware & PC)	Yes (Hardware & PC)
ICM Recording Time	No	No	Hardware: 15 min.	Hardware: 30 min.
Paging	No	No	Yes (Hardware & PC)	Yes (Hardware & PC)
Toll Saver	No	No	Yes (Hardware & PC)	Yes (Hardware & PC)
OGM	No	No	Yes (Hardware & PC)	Yes (Hardware & PC)
Mail Box	No	No	Yes (PC only)	Yes (PC only)
Fax-on-demand	No	No	Yes (PC only)	Yes (PC only)
Voice-on-demand	No	No	Yes (PC only)	Yes (PC only)
FAX Forwarding	Yes	Yes	Yes	Yes
FAX Retrieval	Yes	Yes	Yes	Yes
MACHINE MEMORY	0.75 MB	0.75 MB	1 MB	2 MB
OPTIONAL MEMORY (FAX & PRINTER FLEX)	1 or 2 MB	1 or 2 MB	1 or 2 MB	1 or 2 MB
PC FAX (Send/Receive)	Option	Yes (by M/L)	Yes (by M/L)	Yes (by M/L)
Standard	—	Class 1, 2	Class 1, 2	Class 1, 2
DATA MODEM	No	No	No	No
INTERFACE				
Printer Interface	—	Centronics parallel (w/o cable) MULTI-FUNCTION LINK PRO	Centronics parallel (w/o cable) MULTI-FUNCTION LINK PRO	Centronics parallel (w/o cable) MULTI-FUNCTION LINK PRO
PC Interface	RS-232C (8-pin modular connector) MULTI-FUNCTION LINK	—	—	—
Extended I/O Interface	—	—	RS-232C and RS-422 (supported by an optional serial interface board RS-100M)	RS-232C and RS-422 (supported by an optional serial interface board RS-100M)
Simultaneous				
Sends FAX and Prints	—	Yes	Yes	Yes
Receives FAX and Prints	—	Yes	Yes	Yes
Receives FAX and Scans	—	Yes	Yes	Yes
Prints and Scans	—	Yes	Yes	Yes
Receives FAX and Copies	—	Yes	Yes	Yes
Prints and Copies	—	Yes	Yes	Yes

* CCITT#1 Chart in the Standard Mode, MMR

MODEL	FAX3650	MFC4450	MFC4550plus	MFC7650MC
FAX				
Coverpage	Yes, Super	Yes, Super	Yes, Super	Yes, Super
Polling Type	Std/Del/Seq	Std/Del/Seq	Std/Del/Seq	Std/Del/Seq
Delayed Transmission	Yes, 13 timings	Yes, 3 timings	Yes, 3 timings	Yes, 13 timings
Call Reservation	Yes	Yes (with External)	Yes	Yes
Callback Message	Yes	Yes	Yes	Yes
Page Memory (TX)*	1 MB (100 pgs: MMR)	300 KB (30 pgs: MMR)	300 KB (30 pgs: MMR)	800 KB (80 pgs: MMR)
Out-of-paper Reception*	1.1 MB (110 pgs: MMR)	600 KB (60 pgs: MMR)	600 KB (60 pgs: MMR)	1.0 MB (100 pgs: MMR)
Super Quick Scan	Yes	Yes	Yes	Yes
ECM	Yes	Yes	Yes	Yes
Broadcasting	Yes	Yes	Yes	Yes
Multi Transmission	No	Yes	Yes	No
MESSAGE CENTER				
ICM Recording Time	No	No	No	Hardware: 30 min.
Paging	Yes (Hardware & PC)	Yes (Hardware & PC)	Yes (Hardware & PC)	Yes (Hardware & PC)
Toll Saver	No	No	No	Yes (Hardware & PC)
OGM	No	No	No	Yes (Hardware & PC)
Mail Box	No	No	Yes (PC only)	Yes (PC only)
Fax-on-demand	No	No	No	Yes (PC only)
Voice-on-demand	No	No	No	Yes (PC only)
FAX Forwarding	Yes	Yes	Yes	Yes
FAX Retrieval	Yes	Yes	Yes	Yes
MACHINE MEMORY	2 MB	1 MB	1 MB	2 MB
OPTIONAL MEMORY (FAX & PRINTER FLEX)	1 or 2 MB	No	1 or 2 MB	1 or 2 MB
PC FAX (Send/Receive)	Option	Yes (by M/L)	Yes (by M/L)	Yes (by M/L)
Standard	—	SMSI	SMSI	SMSI
DATA MODEM	No	No	No	No
INTERFACE				
Printer Interface	—	Centronics parallel (w/o cable) MULTI-FUNCTION LINK PRO	Centronics parallel (w/o cable) MULTI-FUNCTION LINK PRO	Centronics parallel (w/o cable) MULTI-FUNCTION LINK PRO
PC Interface	RS-232C (8-pin modular connector) MULTI-FUNCTION LINK	—	—	—
Extended I/O Interface	—	—	—	RS-232C and RS-422 (supported by an optional serial interface board RS-100M)
Simultaneous				
Sends FAX and Prints	—	Yes	Yes	Yes
Receives FAX and Prints	—	Yes	Yes	Yes
Receives FAX and Scans	—	Yes	Yes	Yes
Prints and Scans	—	Yes	Yes	Yes
Receives FAX and Copies	—	Yes	Yes	Yes
Prints and Copies	—	Yes	Yes	Yes

* CCITT#1 Chart in the Standard Mode, MMR

MODEL	FAX8000P	MFC9000	MFC9500	FAX8200P
FAX				
Coverpage	Yes, Super	Yes, Super	Yes, Super	Yes, Super
Polling Type	Std/Del/Seq/Sec	Std/Del/Seq/Sec	Std/Del/Seq/Sec	Std/Del/Seq/Sec
Receive password	Yes/Plus	Yes/Plus	Yes/Plus	Yes/Plus
Delayed Transmission	Yes, 3 timings	Yes, 3 timings	Yes, 3 timings	Yes, 3 timings
Call Reservation	Yes	Yes	Yes	Yes
Callback Message	Yes	Yes	Yes	Yes
Page Memory (TX)*	300 KB (30 pgs: MMR)	300 KB (30 pgs: MMR)	300 KB (30 pgs: MMR)	1 MB (100 pgs: MMR)
Out-of-paper Reception*	400 KB (40 pgs: MMR)	600 KB (40 pgs: MMR)	600 KB (60 pgs: MMR)	1.1 MB (110 pgs: MMR)
Super Quick Scan	Yes	Yes	Yes	Yes
Auto Reduction	Yes	Yes	Yes	Yes
ECM	Yes	Yes	Yes	Yes
Broadcasting	Up to 140 destinations	Up to 124 destinations	Up to 124 destinations	Up to 190 destinations
Multi Transmission	Yes	Yes	Yes	Yes
MESSAGE CENTER				
TAD Feature	No	No	Yes (Hardware & PC)	No
ICM Recording Time	No	No	Hardware: 15 min.	No
Paging	No	No	Yes (Hardware & PC)	No
Toll Saver	No	No	Yes (Hardware & PC)	No
OGM	UK/SWISS/AUS/GER	UK/SWISS	Yes (Hardware & PC)	UK/SWISS/GER
Mail Box	No	No	Yes (PC only)	No
Fax-on-demand	No	No	Yes (PC only)	No
Voice-on-demand	No	No	Yes (PC only)	No
FAX Forwarding	Yes	Yes	Yes	Yes
FAX Retrieval	Yes	Yes	Yes	Yes
MACHINE MEMORY	0.75 MB	1 MB	1 MB	2 MB
OPTIONAL MEMORY (FAX & PRINTER FLEX)	1 or 2 MB	1 or 2 MB	1 or 2 MB	1 or 2 MB
PC FAX (Send/Receive)	Option	Yes	Yes	Option
Standard	—	Class 2	Class 2	—
DATA MODEM	No	No	No	No
INTERFACE				
Printer Interface	—	Centronics parallel (w/o cable) MULTI-FUNCTION LINK PRO	Centronics parallel (w/o cable) MULTI-FUNCTION LINK PRO	—
PC Interface	RS-232C (8-pin modular connector) CONNECT 5000 INTERFACE	—	—	RS-232C (8-pin modular connector) CONNECT 5000 INTERFACE
Extended I/O Interface	—	RS-232C and RS-422 (supported by an optional serial interface board RS-100M)	RS-232C and RS-422 (supported by an optional serial interface board RS-100M)	—
Simultaneous				
Sends FAX and Prints	—	Yes	Yes	—
Receives FAX and Prints	—	Yes	Yes	—
Receives FAX and Scans	—	Yes	Yes	—
Prints and Scans	—	Yes	Yes	—
Receives FAX and Copies	—	Yes	Yes	—
Prints and Copies	—	Yes	Yes	—

* CCITT#1 Chart in the Standard Mode, MMR

CHAPTER II.

INSTALLATION

CONTENTS

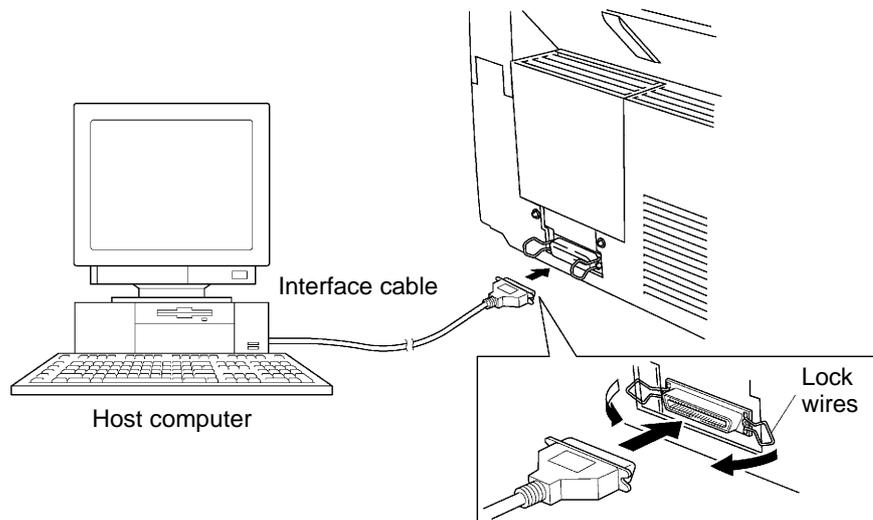# 1. INSTALLING THE UPDATE DATA TO THE FACSIMILE EQUIPMENT

If the program version is updated or the main PCB is replaced, install the update program onto the flash ROM of the main PCB.

The program installation requires a host computer satisfying the following requirements:

- CPU   Pentium 75 or higher
- RAM   8MB or greater (16MB recommended for Windows® 95)
- OS   Windows® 3.1/3.11 or Windows® 95

Connecting the equipment to your computer

(1)   Make sure that the equipment's power cord is unplugged from a wall socket.

(2)   Make sure that your computer is powered off.

(3)   Connect the interface cable to the parallel interface port on the back of the equipment and secure it with the lock wires.

(4)   Connect the other end of the interface cable to the printer port of your computer and secure it with the two screws.

(5)   Power on your computer.

(6)   Plug the equipment's power cord into a wall socket.

Interface cable

Host computer

Lock wires

Installing the update data onto the flash ROM of the facsimile equipment

(1)   Load the floppy disk which stores the update data and transfer utility into the floppy disk drive of your computer.

       (Or, copy the update data and transfer utility onto the same directory of the hard disk.)

(2)   Click the Start button, point to Programs, and then click MS-DOS Prompt to open an MS-DOS window.

(3)   Type the drive letter where the update data and transfer utility are located. If it is a floppy disk drive, type `A:\` from the command line and press the **ENTER** key.

(4)   Check that your computer is connected with the facsimile equipment correctly.

(5)   To start the transfer utility transmitting the update data to the flash ROM of the facsimile equipment, type the following:

```
A:\ICEN filename /b
```

Then press the **ENTER** key.

The equipment beeps and shows the "CONNECTING" on the LCD for one second.

Then, the equipment shows the "DOWNLOADING" on the LCD and starts receiving data downloaded from the host computer.

During downloading, the equipment beeps *intermittently*.

Upon completion of the downloading, the equipment beeps *continuously*.

CHAPTER III.

THEORY OF OPERATION

CONTENTS

1. OVERVIEW

PC/AT

MAC

Control panel

RS-232C (Modular connector)

Centronics parallel interface

RS-232C

RS-422

Optional serial interface (Extended I/O connector)

[FAX3550/3650/ 8000P/8200P]

[MFC4450/ 4550/4550plus/ 6550MC/7550MC/7650MC/ 9000/9500]

[MFC6550MC/7550MC/ 7650MC/9000/9500]

Fax Control Section

Laser Printing Control Section

Printer data

Fax data

Line

NCU

Handset

Speaker

Scanner unit
- LED array
- CCD unit
- Scanner motor

Laser printing unit

Charging, exposing, developing, transferring, erasing, and heat-fixing processes

- Electrical charger
- Laser unit (including the polygon motor)
- Laser-sensitive drum
- Developer roller
- Transfer roller
- Eraser lamp
- Heater roller
- Main motor

Paper feeding mechanism

Low- and high-voltage power supplies

AC

2. MECHANISMS

The equipment is classified into the following mechanisms:

■ SCANNER MECHANISM
– Document feeding and ejecting mechanism
– Document scanning mechanism

■ LASER PRINTING MECHANISM
– Paper pulling-in, registration, feeding, and ejecting mechanisms
– Print process mechanism (consisting of charging, exposing, developing, transferring, and erasing processes)
– Heat-fixing mechanism

■ SENSORS AND ACTUATORS
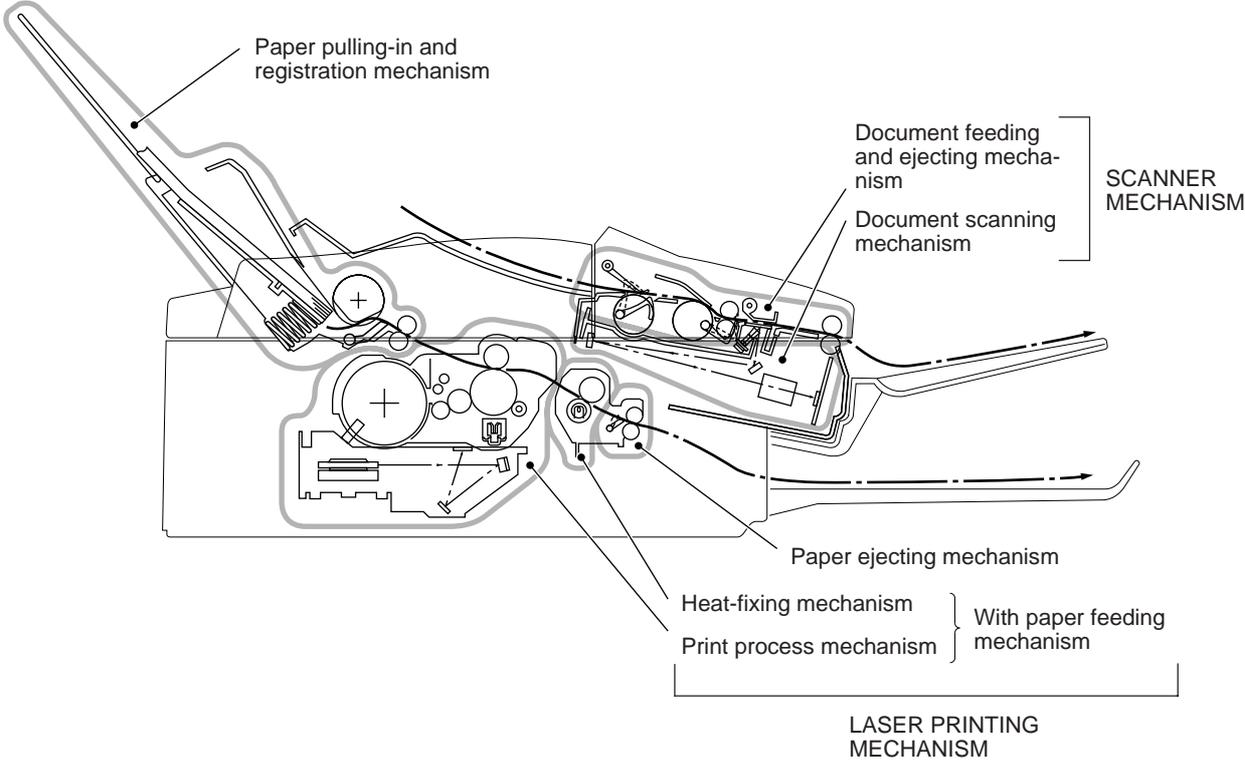
2.1 Scanner Mechanism
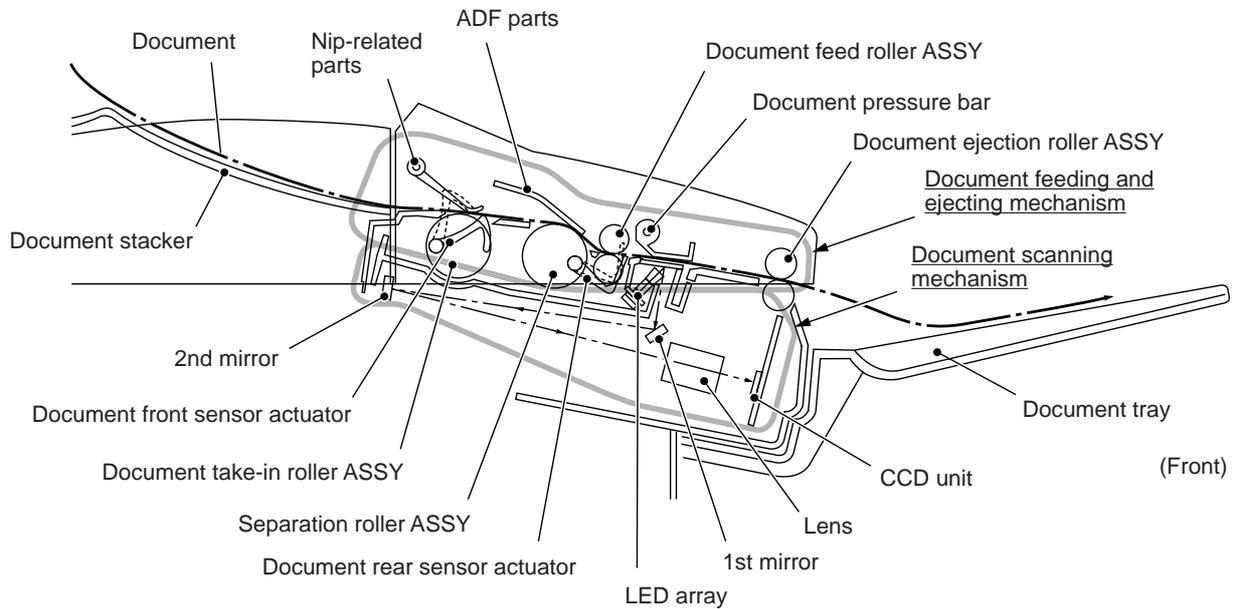
2.1.1 Document feeding and ejecting mechanism

This mechanism consists of the document stacker, automatic document feeder (ADF), document feed roller ASSY, and document sensors. (For details about the sensors, refer to Section 2.3.)

If the operator sets documents on the document stacker and starts the scanning operation, the scanner motor rotates so that the ADF (which consists of the document take-in roller ASSY, separation roller ASSY, ADF parts and nip-related parts) feeds those documents into the equipment, starting from the bottom sheet to the top, page by page. Each document advances with the document feed roller ASSY to the scanner, and then it is fed out of the equipment with the document ejection roller ASSY.
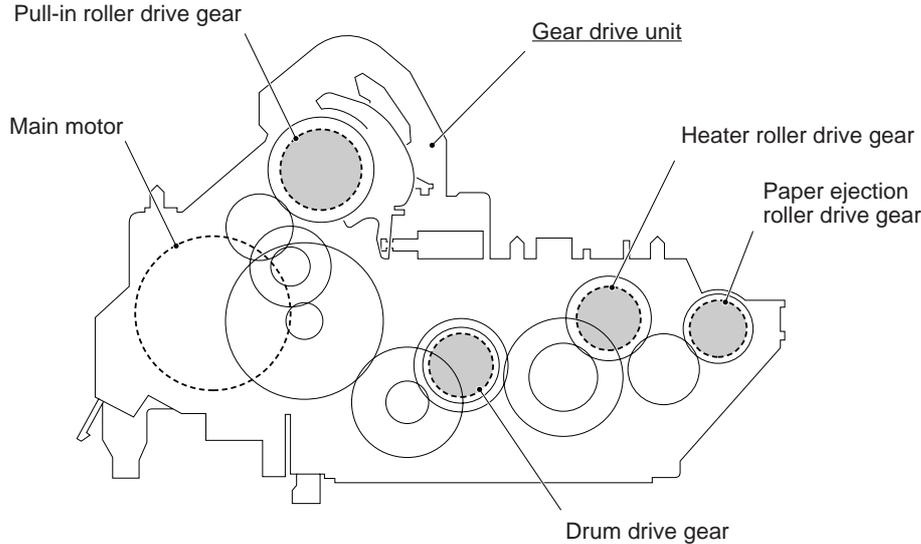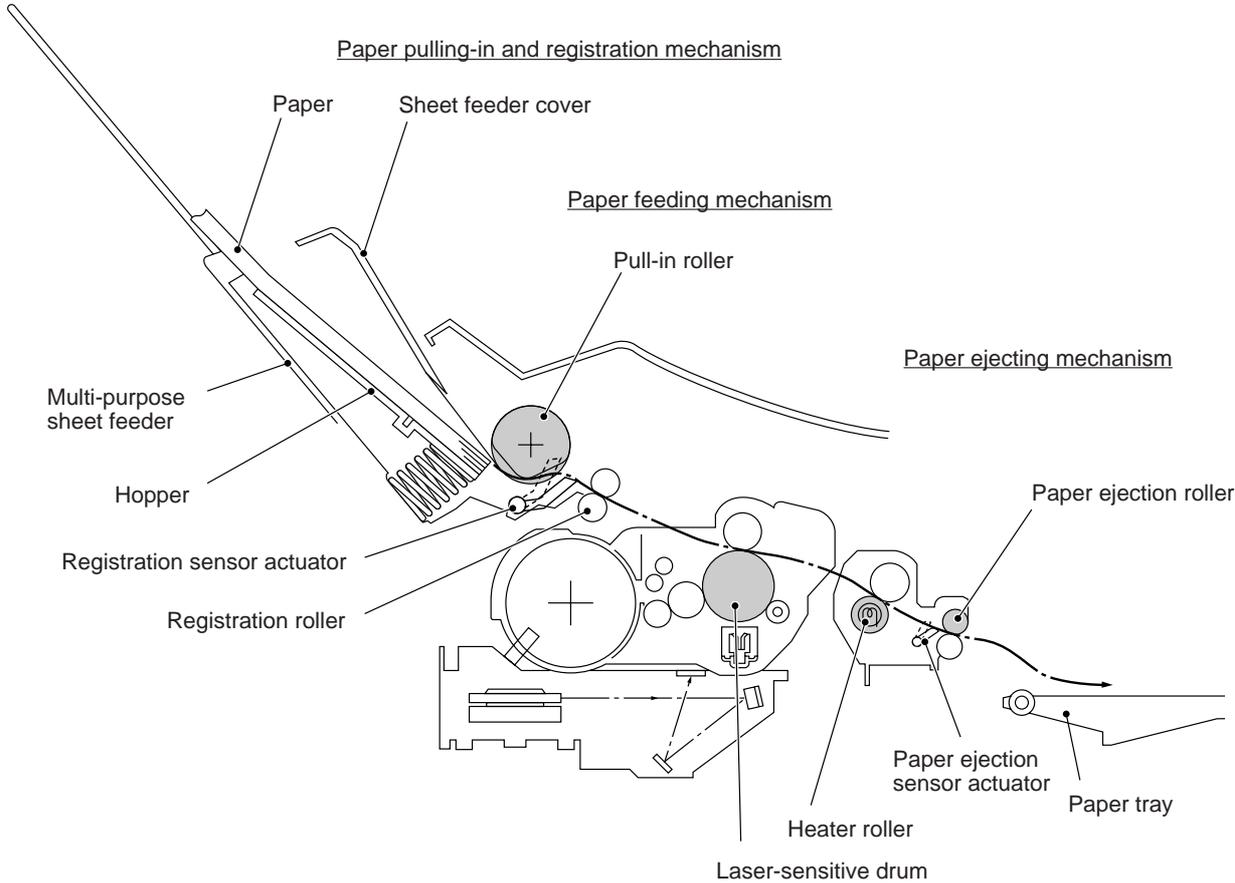
2.1.2 Document scanning mechanism

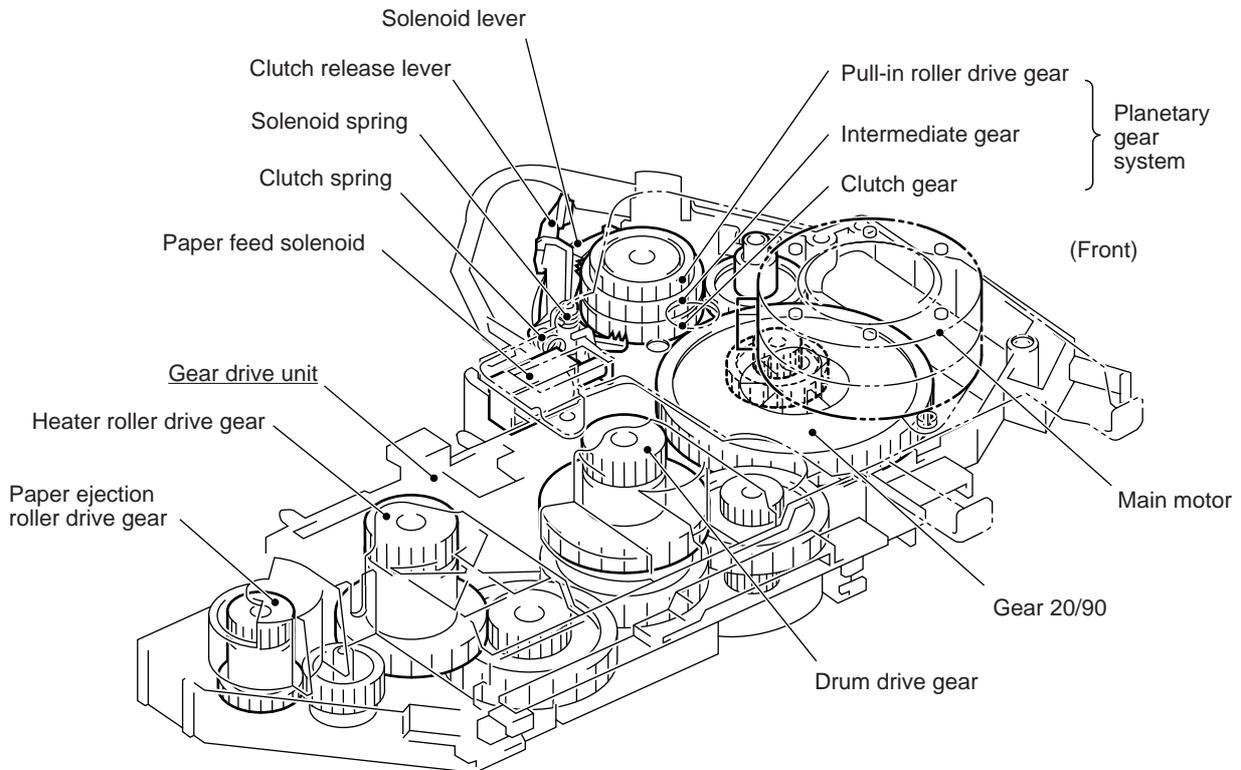The scanner uses a charge coupled device (CCD) image sensor.

As illustrated above, the LED array illuminates a document and the reflected light of the scanned image data is transmitted via the mirrors into the lens which reduces the scanned data so as to form the image on the CCD.

2.2 Laser Printing Mechanism

2.2.1 Paper pulling-in, registration, feeding, and ejecting mechanism

Paper pulling-in and registration mechanism

Paper

Sheet feeder cover

Paper feeding mechanism

Pull-in roller

Paper ejecting mechanism

Multi-purpose sheet feeder

Hopper

Paper ejection roller

Registration sensor actuator

Registration roller

Paper ejection sensor actuator

Paper tray

Heater roller

Laser-sensitive drum

Pull-in roller drive gear

Gear drive unit

Main motor

Heater roller drive gear

Paper ejection roller drive gear

Drum drive gear

Paper pulling-in and registration mechanism

Solenoid lever

Clutch release lever

Solenoid spring

Clutch spring

Paper feed solenoid

Pull-in roller drive gear

Intermediate gear

Clutch gear

Planetary gear system

(Front)

Gear drive unit

Heater roller drive gear

Paper ejection roller drive gear

Main motor

Gear 20/90

Drum drive gear

The paper pulling-in and registration mechanism consists of the pull-in roller gear (incorporated in the multi-purpose sheet feeder), planetary gear system, paper feed solenoid, solenoid lever, clutch release lever, and registration sensor. (For the details about the sensor, refer to Section 2.3.)

If the main motor rotates clockwise, the rotation is transmitted to the intermediate gear of the planetary gear system. As the intermediate gear rotates, the pull-in roller drive gear also rotates since the clutch gear is locked by the solenoid lever and the clutch release lever. Accordingly, the pull-in roller in the multi-purpose sheet feeder rotates to pull in paper into the equipment, a sheet at a time.

If the paper feed solenoid is retracted and the clutch release lever is operated according to the cam profile of the pull-in roller gear so as to release the clutch gear, the clutch gear rotates and the pull-in roller drive gear does not rotate. In this way, the clutch gear switches the transmission of the motor rotation on and off to the pull-in roller drive gear.

The solenoid on/off timing and the clutch release lever timing allow this mechanism to pull in a sheet and register it against the registration roller.

Paper feeding and ejecting mechanism

If the main motor rotates clockwise, the rotation is transmitted via the gear train to the drum drive gear, heater roller drive gear, and paper ejection roller drive gear.
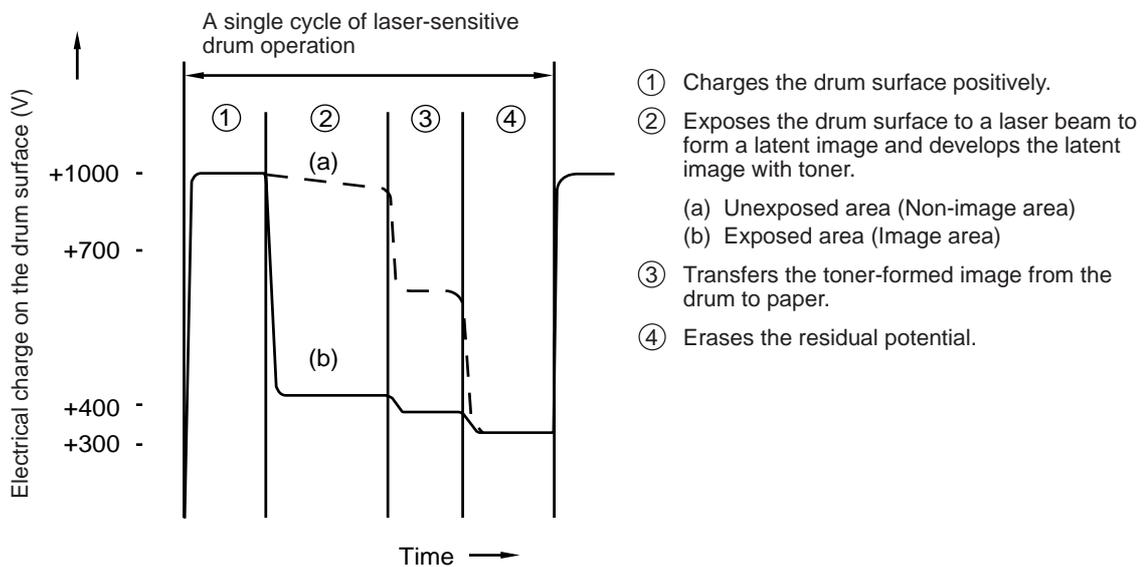
After the paper passes through the heat-fixing process, it will be ejected onto the paper tray.

If the leading edge of the paper pushes up the actuator of the paper ejection sensor, the photo sensor becomes opened, signaling the start of paper ejection. If the trailing edge has passed through the sensor actuator, the sensor becomes closed, signaling the completion of paper ejection. Then, the main motor stops rotation.

2.2.2   Print process mechanism
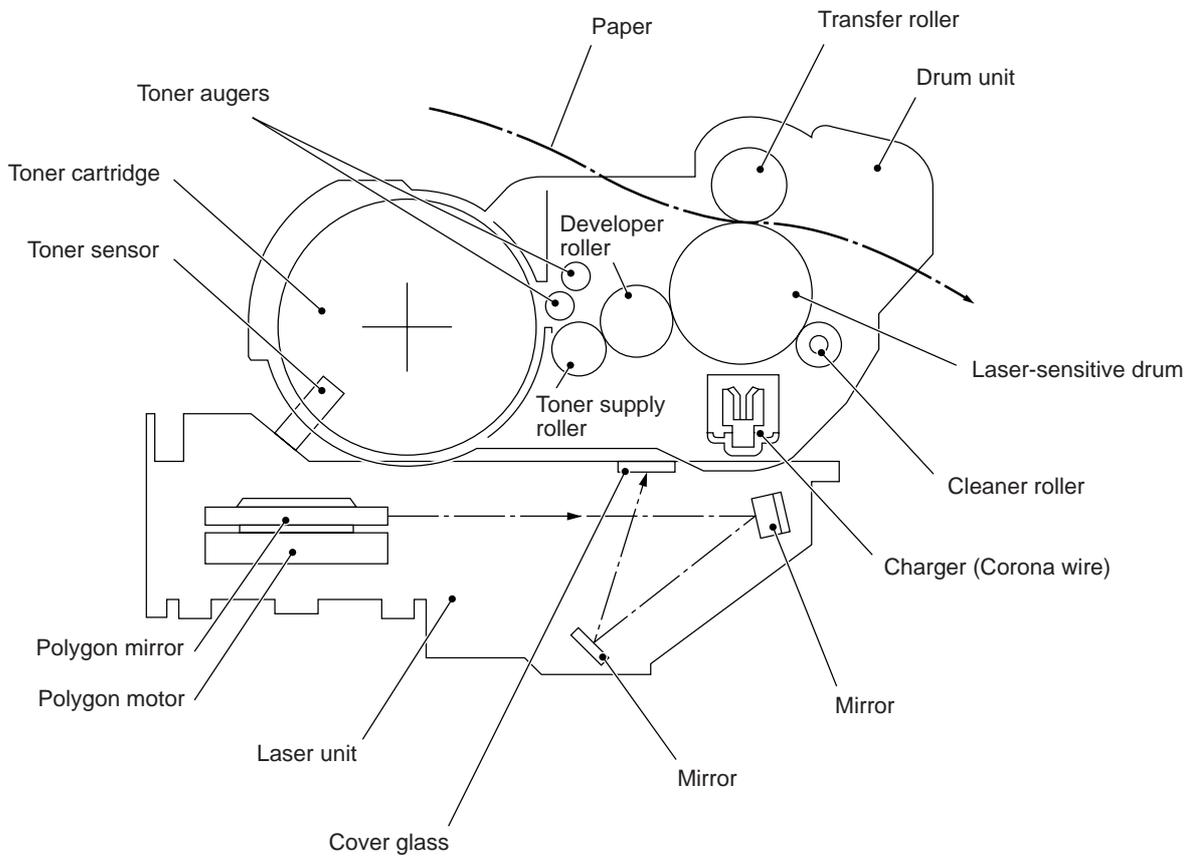
The print process unit works with laser beam, electrical charges, and toner. The graph below shows the transition of electrical charge on the surface of the laser-sensitive drum through the five processes: charging, exposing, developing, transferring, and erasing processes.

A single cycle of laser-sensitive drum operation

① Charges the drum surface positively.

② Exposes the drum surface to a laser beam to form a latent image and develops the latent image with toner.

   (a) Unexposed area (Non-image area)
   (b) Exposed area (Image area)

③ Transfers the toner-formed image from the drum to paper.

④ Erases the residual potential.

Electrical charge on the drum surface (V)

+1000
+700
+400
+300

(a)
(b)

Time

(1) Charging process

The high-voltage power supply applies DC bias to the corona wire to generate ion on the grid. The ion uniformly charges the surface of the laser-sensitive drum to approx. 1000V which is kept by the varister grounding the grid to the frame.
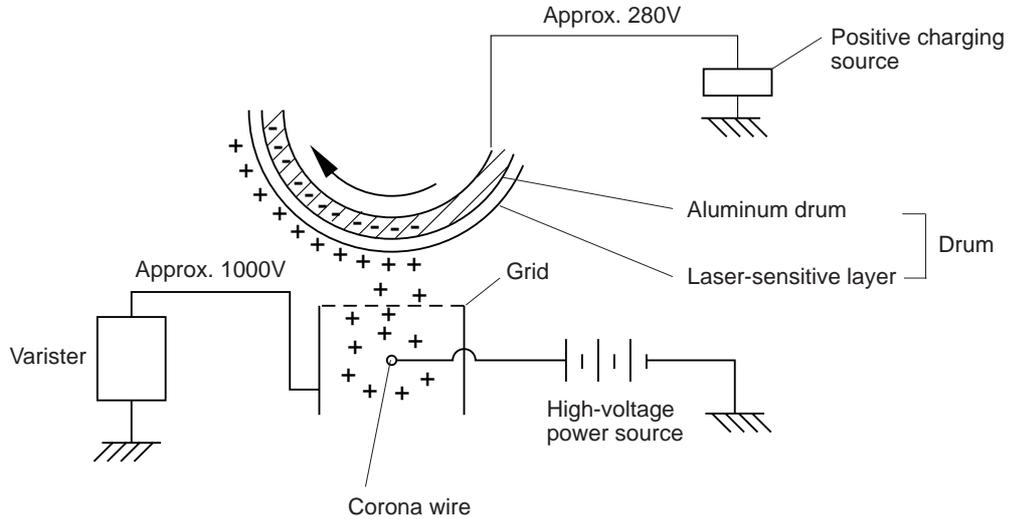
(2) Exposing process

When the laser-sensitive drum holds a positive electrical charge, the laser beam issued from the laser unit scans the drum according to the print image to expose the drum surface for neutralizing the spots where black should be, forming an electrostatic latent image.
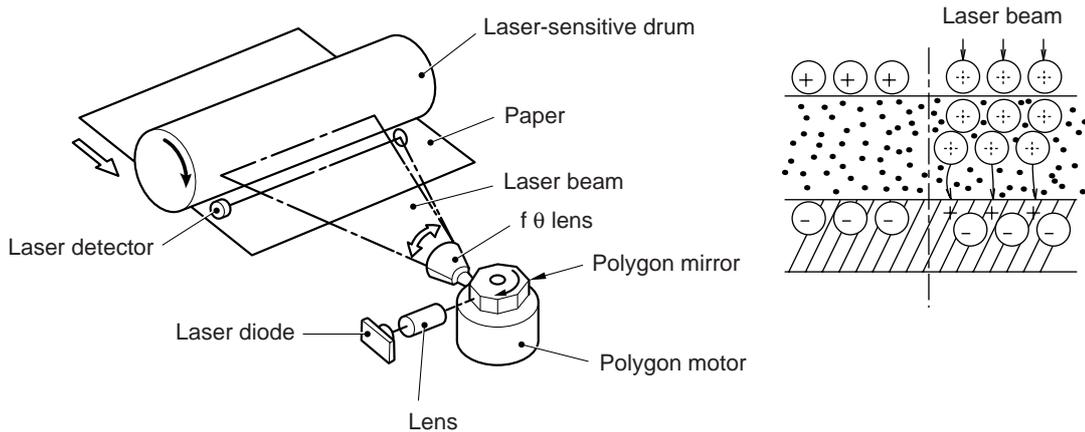
(3) Developing process

The developing process develops an electrostatic latent image formed on the drum in the exposing process, into a toner image.

The developer roller attracts the toner particles fed from the toner cartridge by the toner supply roller, and then conveys them to the contact section with the laser-sensitive drum.

On the contact section between the developer roller and drum, the positive toner particles stick to the neutralized spots on the drum according to the principles of attraction and repulsion, transforming a latent image into a toner image.

The toner augers (which agitate toner particles in the chamber) and the blade allow toner particles to be fed onto the developer roller at an even thickness.
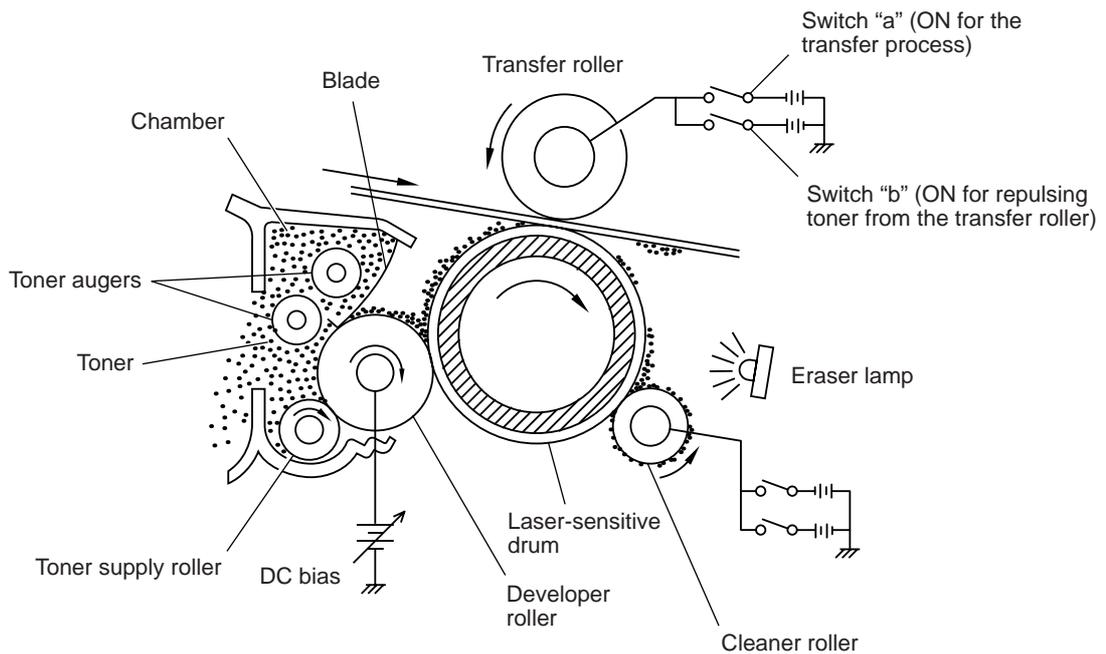
(4) Transferring process

When a paper passes between the drum and the transfer roller, the switch "a" (see the above illustration) is turned on to negatively charge the transfer roller. The toner is positive, so the toner image formed on the drum will be transferred onto the paper according to the same principle as for the developing process.

If the toner image fails to stick to the paper due to paper jam or other errors, it will stick to the transfer roller. To repulse this toner, the switch "b" (see the above illustration) is turned on to positively charge the transfer roller. The toner returns from the transfer roller to the drum.
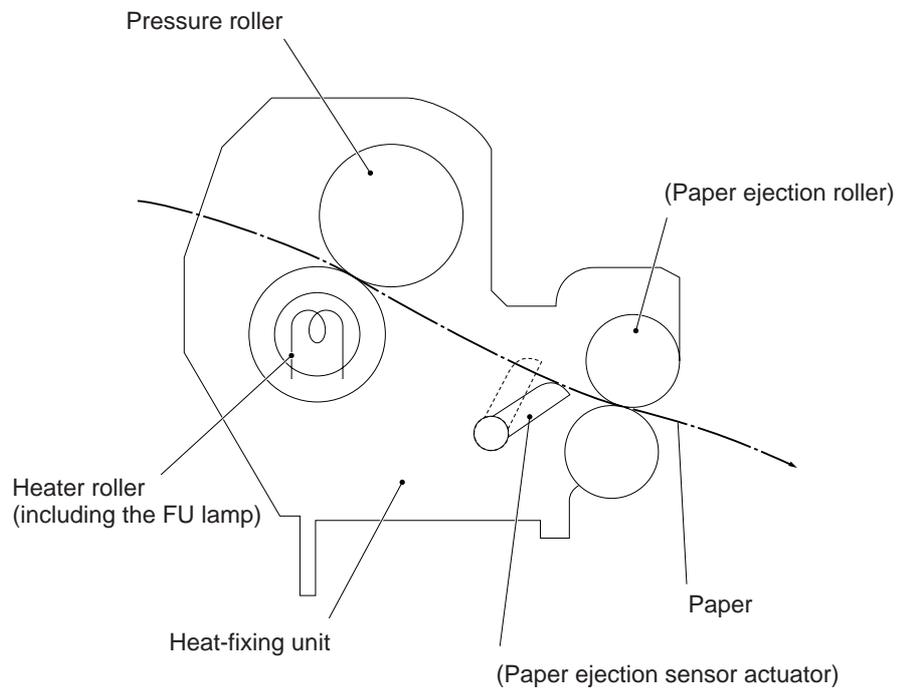
Cleaning the drum

In the transferring process, not all the toner particles on the drum are transferred onto the paper but some toner particles remain on the drum. The cleaner roller cleans the drum surface and collects the residual toner. When printing starts or during non-printing, the toner collected on the cleaner roller will be discharged onto the drum and returned to the chamber through the developer roller for recycling in the subsequent developing process.

(5) Erasing process

The eraser lamp emits light to expose the drum surface, which erases the residual electrical charge.

2.2.3   Heat-fixing mechanism

Pressure roller

(Paper ejection roller)

Heater roller
(including the FU lamp)

Paper

Heat-fixing unit

(Paper ejection sensor actuator)

As the paper passes between the heater roller and the pressure roller in the fixing unit, the heater roller fuses the toner on the paper.
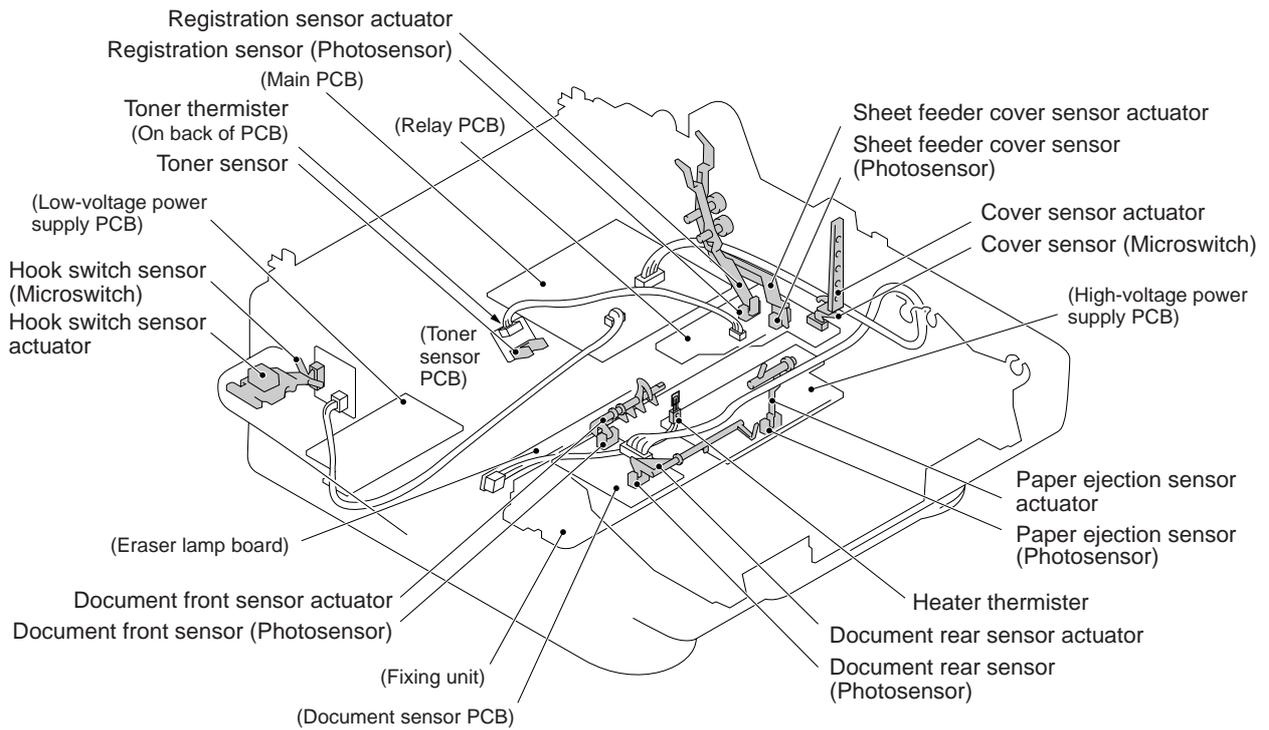
2.3 Sensors and Actuators

This equipment has ten sensors: two microswitches, six photosensors and two thermisters as described below.

Sensor name	Type	Located on
Hook switch sensor	Microswitch	Hook switch PCB
Cover sensor	Microswitch	Relay PCB
Registration sensor	Photosensor (PC1)	Relay PCB
Sheet feeder cover sensor	Photosensor (PC2)	Relay PCB
Paper ejection sensor	Photosensor (PC1)	High-voltage power supply PCB
Document front sensor	Photosensor (PC1)	Document sensor PCB
Document rear sensor	Photosensor (PC2)	Document sensor PCB
Toner sensor	Photosensor (PH1)	Toner sensor PCB (on the laser unit)
Toner thermister	P1	Toner sensor PCB (on the laser unit)
Heater thermister	__	Fixing unit

- Hook switch sensor which detects whether the handset is placed on the handset mount.
- Cover sensor which detects whether the top cover is closed.
- Registration sensor which detects the leading and trailing edges of paper, which allows the controller to determine the registration timing and check paper jam.
- Sheet feeder cover sensor which detects whether the sheet feeder cover is closed.
- Paper ejection sensor which detects whether the recording paper goes out of the equipment.
- Document front sensor which detects the presence of documents.
- Document rear sensor which detects the leading and trailing edges of pages to tell the control circuitry when the leading edge of a new page has reached the starting position and when the scan for that page is over.
- Toner sensor which detects whether there is toner or a toner cartridge is loaded.
- Toner thermister which detects the temperature of the toner cartridge.
- Heater thermister which detects the temperature of the heater roller of the fixing unit.

These photosensors are a photointerrupter consisting of a light-emitting diode and a light-sensitive transistor. Each of them has an actuator separately arranged as shown on the next page.

Registration sensor actuator
Registration sensor (Photosensor)
(Main PCB)
Toner thermister
(On back of PCB)
Toner sensor
(Low-voltage power supply PCB)
Hook switch sensor (Microswitch)
Hook switch sensor actuator
(Relay PCB)
(Toner sensor PCB)
Sheet feeder cover sensor actuator
Sheet feeder cover sensor (Photosensor)
Cover sensor actuator
Cover sensor (Microswitch)
(High-voltage power supply PCB)
Paper ejection sensor actuator
Paper ejection sensor (Photosensor)
(Eraser lamp board)
Document front sensor actuator
Document front sensor (Photosensor)
(Fixing unit)
(Document sensor PCB)
Heater thermister
Document rear sensor actuator
Document rear sensor (Photosensor)

Location of Sensors and Actuators