TOSHIBA

BASIC MANUAL

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GENERAL PRECAUTIONS REGARDING THE SERVICE

The installation and service shall be done by a qualified service technician.

1. **Transportation/Installation**
   - Be sure not to hold the movable parts or units (e.g. the control panel, ADU or RADF) when transporting the equipment.
   - The equipment must be grounded for safety.
   - Select a suitable place for installation. Avoid excessive heat, high humidity, dust, vibration and direct sunlight. Install the equipment making sure that the original glass is level.
   - Provide proper ventilation since the equipment emits a slight amount of ozone.
   - To insure adequate working space for the copying operation, keep a minimum clearance of 80 cm (32") on the left, 80 cm (32") on the right and 10 cm (4") on the rear.
   - The equipment shall be installed near the socket outlet and shall be easily accessible.
   - Be sure to fix and plug in the power cable securely after the installation so that no one trips over it.
   - When the equipment is used after the option is removed, be sure to install the parts or the covers which have been taken off so that the inside of the equipment is not exposed.

2. **General Precautions at Service**
   - Be sure to turn the power OFF and unplug the power cables during service (except for the service should be done with the power turned ON).
   - Unplug the power cable and clean the area around the prongs of the plug and socket outlet once a year or more. A fire may occur when dust lies on this area.
   - When the parts are disassembled, reassembly is the reverse of disassembly unless otherwise noted in this manual or other related documents. Be careful not to install small parts such as screws, washers, pins, E-rings, star washers, harnesses in the wrong places.
   - Basically, the equipment should not be operated with any parts removed or disassembled.
   - The PC board must be stored in an anti-electrostatic bag and handled carefully using a antistatic wrist strap since the ICs on it may be damaged due to static electricity.

     Caution: Before using the antistatic wrist strap, unplug the power cable of the equipment and make sure that there are no charged objects which are not insulated in the vicinity.

- Avoid expose to laser beam during service. This equipment uses a laser diode. Be sure not to expose your eyes to the laser beam. Do not insert reflecting parts or tools such as a screwdriver on the laser beam path. Remove all reflecting metals such as watches, rings, etc. before starting service.
- Be sure not to touch high-temperature sections such as the exposure lamp, fuser unit, damp heater and areas around them.
- Be sure not to touch high-voltage sections such as the chargers, transfer belt, 2nd transfer roller, developer, high-voltage transformer, exposure lamp control inverter, inverter for the LCD backlight and power supply unit. Especially, the board of these components should not be touched since the electric charge may remain in the capacitors, etc. on them even after the power is turned OFF.
- Make sure that the equipment will not operate before touching potentially dangerous places (e.g. rotating/operating sections such as gears, belts pulleys, fans and laser beam exit of the laser optical unit).
- Be careful when removing the covers since there might be the parts with very sharp edges underneath.
- When servicing the equipment with the power turned ON, be sure not to touch live sections and rotating/operating sections. Avoid exposing your eyes to laser beam.
- Use designated jigs and tools.
- Use recommended measuring instruments or equivalents.
- Return the equipment to the original state and check the operation when the service is finished.
- Be very careful to treat the touch panel gently and never hit it. Breaking the surface could cause malfunctions.
- Do not leave plastic bags where children can get at them. This may cause an accident such as suffocation if a child puts his/her head into a bag.
  Plastic bags of options or service parts must be brought back.

3. General operations
- Check the procedures and perform them as described in the Service Manual.
- Make sure you do not lose your balance.
- Avoid exposure to your skin and wear protective gloves as needed.

4. Important Service Parts for Safety
- The breaker, IH coil, door switch, fuse, thermostat, thermofuse, thermistor, batteries, IC-RAMs including lithium batteries, etc. are particularly important for safety. Be sure to handle/install them properly. If these parts are short-circuited and their functions become ineffective, they may result in fatal accidents such as explosion or burnout. Do not allow a short-circuit and do not use the parts not recommended by Toshiba TEC Corporation.

5. Cautionary Labels
- During servicing, be sure to check the rating plate and cautionary labels such as “Unplug the power cable during service”, “CAUTION. HOT”, “CAUTION. HIGH VOLTAGE”, “CAUTION. LASER BEAM”, etc. to see if there is any dirt on their surface and if they are properly stuck to the equipment.

6. Disposal of the Equipment, Supplies, Packing Materials, Used Batteries and IC-RAMs
- Regarding the recovery and disposal of the equipment, supplies, packing materials, used batteries and IC-RAMs including lithium batteries, follow the relevant local regulations or rules.

7. When the option has been installed:
- When the EFI printer board has been installed, be sure to unplug the power cable before performing maintenance and inspection, otherwise troubles such as a communication error may occur.

Caution:
Dispose of used batteries and IC-RAMs including lithium batteries according to this manual.
Attention:
Se débarrasser de batteries et IC-RAMs usés y compris les batteries en lithium selon ce manuel.
Vorsicht:
Entsorgung der gebrauchten Batterien und IC-RAMs (inclusive der Lithium-Batterie) nach diesem Handbuch.

CONTENTS

1. OUTLINE

This manual describes basic features of the MFP (Multifunction Peripherals). Refer to the Service Manual or Service Handbook for the specific features of each model.

1.1 About MFPs

MFP is a device that performs a variety of functions based on a copier including at least one of the following:

- Scan
- Printer
- FAX
- e-Filing

1.2 Types and Features of Options

The types of options that can be installed to an MFP are shown below.
Some options are equipped as a standard device while others are not set as an option. Check Service Manual for options available for each model.

Type	Name	Function
Options related to original feeding	Reversing Automatic Document Feeder	This option automatically scans both sides of an original.
	Automatic Document Feeder	This option automatically scans only one side of an original.
	Original Cover	This option holds an original placed on the original glass. This is required when neither the RADF or the ADF is installed.
Options related to paper feeding C	Paper Feed Pedestal	This option consists of multiple drawers (except for some models) to be used in combination with the drawers of an MFP, making three or four drawers available. This enables users to select different media types or paper sizes simultaneously by placing them in each drawer.
	Large Capacity Feeder	This option feeds a large amount of paper at one time. Although the paper sizes available are limited, thousands of sheets of paper can be placed in it.

Type	Name	Function
Options related to exiting	Finisher	This option exits paper according to a function selected; copier, fax or printer. When the copier or the printer function is selected, paper can be made to exit, and in addition, be sorted and stapled.
	Bridge Kit	This option is used in combination with the Finisher and transports paper from the inner receiving section to the Finisher.
	Job Separator	This option has stacks of paper exit by sliding each stack one by one alternately, so that the stacks will be separated.
	Offset Tray	This option is used in combination with an inner receiving tray type MFP. The printed paper exits in the inner side of the MFP. This cannot be installed together with the Finisher.
	Hole Punch Unit	This option punches filing holes on the paper which has exited.
	Hanging Finisher	This option is installed directly to an MFP, similar to hanging onto it.
	Saddle Stitch Finisher	This option automatically stitches a stack of paper at its center.
Options related to communication	FAX Unit	This option extends the fax functions, enabling a direct fax transmission from an MFP to a facsimile. An additional unit to increase fax lines can be installed to it.
	Wireless LAN module	This option enables wireless LAN communication.
	Bluetooth module	This option enables Bluetooth communication.
	Antenna	This option is installed for wireless LAN or Bluetooth communication.
Options related to a network	Printer/Scanner Kit	This option extends the printer and the scanner functions.
	Printer Kit	This option extends the printer function.
	Scanner Kit	This option extends the scanner function.
	Data overwrite Enabler	This option enables the data overwriting function.
	IP Sec Enabler	This option enables the IP Sec function.
	Meta Scan Enabler	This option enables the MetaScan function.
	External Interface Enabler	This option enables the Embedded Web Browser function.
	e-BRIDGE ID Gate	This option is used for user authentication with a noncontact IC card (FeliCa/Mifare).
	Unicode Font Enabler	This option contains the ISO character codes (fonts).
	Hardcopy Security Kit	This kit is used to embed a security pattern in the background of a document to be printed. So when a printed document with a security pattern is copied, preset text or graphics will appear in the background of the copy.

1.3 Definition of terms

This manual describes basic features of the MFP (Multifunction Peripherals). Refer to the Service Manual or Service Handbook for the specific features of each model.

ADF	ADF is an abbreviation for "Automatic Document Feeder". This scans multiple originals that are placed on it, one sheet at a time.
ADU	ADU is an abbreviation for "Automatic Duplexing Unit". This reverses paper whose one side is already printed and enables printing on the other side.
ASIC	ASIC is an abbreviation for "Application Specific Integrated Circuit". This is an IC chip based on an exclusive design, mounting several circuits (functions) integrated in one chip to save space.
DPI	Dots Per Inch: This refers to the number of pixels per 1 inch (2.54 cm). The larger the value is, the higher the resolution.
DIP-SW	DIP-SW is an abbreviation for "Dual In-line Package Switch", a unit in which several small slide switches are aligned in line. This is mounted in a PC board to be used for various settings.
EFI	This refers to printer controllers manufactured by Electronic For Imaging Inc.
EPU	EPU is an abbreviation for "Electrophotographic Process Unit", consisting of the developer unit, main charger unit, drum cleaner unit and such.
FUS	FUS is an abbreviation for "Fuser unit." The toner image that has been transferred onto the paper is fused into place by the fuser unit.
IH	IH is an abbreviation for "Induction Heating". It is a heating method using electromagnetic induction, and also called "High-frequency induction heating" or "electromagnetic induction heating"
LCF	LCF is an abbreviation for "Large Capacity Feeder", a paper feeding unit that can load thousands of sheets of paper. Some of them are installed in the MFP as an option, and others have a paper feeding tray and a paper adding tray, called Tandem LCF
LSU	Laser Optical Unit
OPC (Drum)	OPC is an abbreviation for "Organic Photo Conductor".
PFP	PFP is an abbreviation for "Paper Feed Pedestal", an optional multiple-drawer unit.
RGB	RGB is an additive mixture in which red, green, and blue light are added together to reproduce a variety of colors. It represents the initials of the three additive primary colors. It is used for image reproduction in CRT, LCD and digital cameras.
RADF	RADF is an abbreviation for "Reversing Automatic Document Feeder". This scans multiple originals that are placed on it, sheet by sheet, on both sides.
STF	STF is an abbreviation for "Satellite Thermal capacity roller within Fuser unit".
TBU	TBU is an abbreviation for "Transfer Belt Unit." It consists of components including the transfer belt and the rollers. The toner image formed on the drum is transferred onto the transfer belt; this is known as primary transfer.
TRU	TRU is an abbreviation for "Transfer Unit." It is capable of transferring a toner image from either the drum or the transfer belt onto the paper. TRU is used for secondary transfer in MFPs equipped with a transfer belt or for primary transfer in black MFPs (all but a few models).
YMC	YMC is a subtractive mixture in which paints are mixed or color inks are laid together to print in color. It represents the initials of the thee subtractive primary colors, yellow magenta and cyan.

1.4 Mechanism of MFPs

MFPs fall into two types; black MFPs and color MFPs. Each of them adopts a transfer method as follows

Type	Positions of the OPC and the developer unit	Transferring	Layout¨
Black MFP	-	Direct transfer system	A
Color MFP	Revolver system	Indirect thermal transfer system.	B
	Tandem system	Direct transfer system	C
		Indirect thermal transfer system.	D

Revolver system	An image is formed on one OPC by switching the developer units, and colors are overlaid on the surface of the indirect transfer belt (serial processing).
Tandem system	Four OPCs are aligned in parallel, and four colors form an image simultaneously (parallel processing).
Direct transfer system	An image is transferred directly from OPC to paper.
Indirect thermal transfer system	After being formed on the transfer belt, an image is transferred to paper.

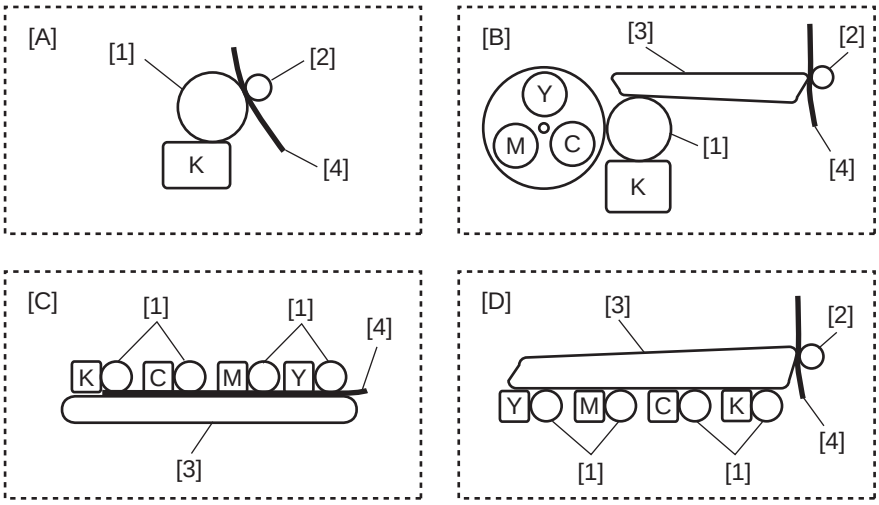


Fig. 1-1

*Y, M, C and K show the developer unit of each color.
[1] Drum
[2] 2nd transfer roller
[3] Transfer belt
[4] Paper

1.5 HDD Memory Map

An HDD for data storage or processing is installed in almost all MFPs.
In addition, a page memory or main memory for image processing purposes is also installed. (In some models, the value for these memories are inclusive.)
The table below shows the capacity and the available space (value) of the HDD and the memories for each model.

(1) Black MFP

Category	Item	Unit	e-STUDIO 280 series, e-STUDIO 450 series	e-STUDIO 282 series, e-STUDIO 452 series	e-STUDIO 600 series	e-STUDIO 600 series	e-STUDIO 855 series	e-STUDIO 455 series
HDD	HDD	GB	40	40	40	80	80	80
Copy	Memory copy	GB	4	4	4	30	6	10
Box	e-Filing	GB	5	5	5	10	7	9.5
	Public box	Box	1	1	1	1	1	1
	User box	Box	200	200	200	200	200	200
	Folders per box	Folder	100	100	100	100	100	100
	Documents per box	Document	400	400	400	400	400	400
	Pages per document	Page	200	1000	1000	1000	200	200
	Number of maximum jobs	Job	20	20	20	20	20	20
Scan	Scan to File	GB	4	4	4	10	7	9.5
	Pages per job	Page	1000	1000	2000	2000	2000	1000
	Number of maximum jobs	Job	20	20	20	20	20	20
FAX	FAX Transmission	GB	0.24	0.5	0.5	0.5	3.5	3.5
	FAX Reception	GB	0.12	0.12	0.12	0.12	0.5	0.5
Print	Printer Data Spool	GB	1.3	2	2	2	7	7
	Pages per job	Job	1000	1000	1000	1000	2000	1000
	Number of maximum jobs	Job	1000	1000	1000	1000	1000	1000
	Job area	GB	0.85	2	2	2	7	7
	Pages per job	Job	1000	1000	1000	1000	2000	1000
	Number of maximum jobs	Job	1000	1000	1000	1000	1000	1000

Category	Item	Unit	e-STUDIO 456 series	e-STUDIO 856 series	e-STUDIO 306LP	e-STUDIO 507 series	e-STUDIO 857 series	e-STUDIO 527S series
HDD	HDD	GB	80	80	80	320	320	320
Copy	Memory copy	GB	22 *1	22 *1	22 *1	30 *5	30 *5	30 *5
Box	e-Filing	GB	27 *2	27 *2	27 *2	200 *2	200 *2	200 *2
	Public box	Box	1	1	1	1	1	1
	User box	Box	200	200	200	200	200	200
	Folders per box	Folder	100	100	100	100	100	100
	Documents per box	Document	400	400	400	400	400	400
	Pages per document	Page	200	200	200	200	200	200
	Number of maximum jobs	Job	899	899	899	899	899	899
Scan	Scan to File	GB	27 *2	27 *2	27 *2	200 *2	200 *2	200 *2
	Pages per job	Page	1000	1000	1000	1000 *6	1000 *6	1000 *6
	Number of maximum jobs	Job	899	899	899	899	899	899
	Scanning temporary	GB	22 *1	22 *1	22 *1	30 *5	30 *5	30 *5
FAX	FAX Transmission	GB	1 *3	1 *3	1 *3	1 *3	1 *3	1 *3
	FAX Reception							
Print	Printer Data Spool	GB	9	9	9	30 *5	30 *5	30 *5
	Pages per job	Job	1000	1000	1000	*4	*4	*4
	Number of maximum jobs	Job	1000	1000	1000	1000	1000	1000
	Job area	GB	9	9	9	30 *5	30 *5	30 *5
	Pages per job	Job	1000	1000	1000	*4	*4	*4
	Number of maximum jobs	Job	1000	1000	1000	1000	1000	1000

*1: Summed up the values of "Memory Copy" and "Scanning temporary"
*2: Summed up the values of "e-filing" and "Scan to file". Other data such as F-code and image logs are stored under this partition.
*3: Summed up the values of "FAX Transmission" and "FAX Reception"
*4: Available until the storage disk becomes full
*5: Summed up the values of "Memory Copy", "Scanning temporary", "Printer Data Spool" and "Job area"
*6: "Scan to Email" is not included. The maximum number of the Email transmission jobs is 100.

Category	Item	Unit	e-STUDIO 307LP
HDD	HDD	GB	320
Copy	Memory copy	GB	30 *5
Box	e-Filing	GB	200 *2
	Public box	Box	1
	User box	Box	200
	Folders per box	Folder	100
	Documents per box	Document	400
	Pages per document	Page	200
	Number of maximum jobs	Job	899
Scan	Scan to File	GB	200 *2
	Pages per job	Page	1000 *6
	Number of maximum jobs	Job	899
	Scanning temporary	GB	30 *5
FAX	FAX Transmission	GB	1 *3
	FAX Reception		
Print	Printer Data Spool	GB	30 *5
	Pages per job	Job	*4
	Number of maximum jobs	Job	1000
	Job area	GB	30 *5
	Pages per job	Job	*4
	Number of maximum jobs	Job	1000

*1: Summed up the values of "Memory Copy" and "Scanning temporary"
*2: Summed up the values of "e-filing" and "Scan to file". Other data such as F-code and image logs are stored under this partition.
*3: Summed up the values of "FAX Transmission" and "FAX Reception"
*4: Available until the storage disk becomes full
*5: Summed up the values of "Memory Copy", "Scanning temporary", "Printer Data Spool" and "Job area"
*6: "Scan to Email" is not included. The maximum number of the Email transmission jobs is 100.

(2) Color MFP

Category	Item	Unit	e-STUDIO 4511 series	e-STUDIO 341c series	e-STUDIO 3510c series	e-STUDIO 4520C series, e-STUDIO 6520C series	e-STUDIO 4540C series, e-STUDIO 6540C series
HDD	HDD	GB	80	80	80	80	80
Copy	Memory copy	GB	16	24.5	10	14	22 *1
Box	e-Filing	GB	10	10	12.5	14	27 *2
	Public box	Box	1	1	1	1	1
	User box	Box	200	200	200	200	200
	Folders per box	Folder	100	100	100	100	100
	Documents per box	Document	400	400	400	400	400
	Pages per document	Page	200	200	200	200	200
	Number of maximum jobs	Job	20	20	20	20	899
Scan	Scan to File	GB	5	10	10	10	27 *2
	Pages per job	Page	1000	1000	2000	2000	1000
	Number of maximum jobs	Job	20	20	20	20	899
	Scanning temporary	GB	4	4	5	5	22 *1
FAX	FAX Transmission	GB	0.24	0.24	0.5	3.5	1 *3
	FAX Reception	GB	0.12	0.12	0.2	0.5	
Print	Printer Data Spool	GB	3.15	4	9	7	9
	Pages per job	Job	1000	1000	1000	1000	1000
	Number of maximum jobs	Job	1000	1000	1000	1000	1000
	Job area	GB	1	4	9	7	9
	Pages per job	Job	1000	1000	1000	1000	1000
	Number of maximum jobs	Job	1000	1000	1000	1000	1000

*1: Summed up the values of "Memory Copy" and "Scanning temporary"
*2: Summed up the values of "e-filing" and "Scan to file"
*3: Summed up the values of "FAX Transmission" and "FAX Reception"

The above table shows the available space (value) for each function. Besides the HDD allocated space, there are limitations on the number of files.
Therefore, if the number of files exceeds the upper limit, even though enough free space is left, no further processing may be performed, and consequently an error may occur.

Notes:

The capacity of the HDD does not always coincide with the total amount of allocated space because some space has been occupied for a specific purpose such as the system area.

Category	Item	Unit	e-STUDIO 2550C series (SSD)	e-STUDIO 2550C series (HDD)	e-STUDIO 5055C series	e-STUDIO 6570C series	e-STUDIO 407CS series
HDD	HDD	GB	8 (SSD)	320	320	320	320
Copy	Memory copy	GB	1.4 *1	30 *5	30 *5	30 *5	30 *5
Box	e-Filing	GB	-	200 *2	200 *2	200 *2	200 *2
	Public box	Box	-	1	1	1	1
	User box	Box	-	200	200	200	200
	Folders per box	Folder	-	100	100	100	100
	Documents per box	Document	-	400	400	400	400
	Pages per document	Page	-	200	200	200	200
	Number of maximum jobs	Job	-	899	899	899	899
Scan	Scan to File	GB	-	200 *2	200 *2	200 *2	200 *2
	Pages per job	Page	*4	1000	1000 *6	1000 *6	1000 *6
	Number of maximum jobs	Job	449	899	899	899	899
	Scanning temporary	GB	1.4 *1	30 *5	30 *5	30 *5	30 *5
FAX	FAX Transmission	GB	0.1 *3	1 *3	1 *3	1 *3	1 *3
	FAX Reception						
Print	Printer Data Spool	GB	1.4 *1	30 *5	30 *5	30 *5	30 *5
	Pages per job	Job	*4	*4	*4	*4	*4
	Number of maximum jobs	Job	500	1000	1000	1000	1000
	Job area	GB	-	30 *5	30 *5	30 *5	30 *5
	Pages per job	Job	*4	*4	*4	*4	*4
	Number of maximum jobs	Job	500	1000	1000	1000	1000

*1: Summed up the values of "Memory Copy", "Scanning temporary" and "Printer Data Spool"
*2: Summed up the values of "e-filing" and "Scan to file". Other data such as F-code and image logs are stored under this partition.
*3: Summed up the values of "FAX Transmission" and "FAX Reception"
*4: Available until the storage disk becomes full
*5: Summed up the values of "Memory Copy", "Scanning temporary", "Printer Data Spool" and "Job area"
*6: "Scan to Email" is not included. The maximum number of the Email transmission jobs is 100.

The above table shows the available space (value) for each function. Besides the HDD allocated space, there are limitations on the number of files.
Therefore, if the number of files exceeds the upper limit, even though enough free space is left, no further processing may be performed, and consequently an error may occur.

Notes:

The capacity of the HDD does not always coincide with the total amount of allocated space because some space has been occupied for a specific purpose such as the system area.

1.6 Adjustments

This section describes the types and purposes of adjustments.
Principally, there are 2 types of adjustment: mechanical adjustment and image quality adjustment.
Mechanical adjustment is performed when parts are replaced or defective conditions are encountered.
Note that the replacement of parts or the developer material may also involve image quality adjustment.

(1) Mechanical adjustment

Category	Name	Purpose
RADF	RADF position adjustment	Adjusts the installation position of the RADF every time it is installed.
	RADF height adjustment	Adjusts the height of the RADF every time it is installed.
	Skew adjustment	Adjusts the installation position of the roller to protect a scanned original from being skewed.
	Leading edge position adjustment	Aligns the leading edge position of an original to that of the printed image.
	Horizontal position adjustment	Corrects misalignment between an original and the printed image in a horizontal direction.
	Copy ratio adjustment	Corrects a difference in dimensions between an original and the printed image.
	RADF opening/closing sensor adjustment	Adjusts the position to detect the opening and closing of the RADF.
Scanner	Carriages-1 and -2 positions adjustment	Adjusts the position of the carriages by taking up the slack of the carriage wire.
	Lens unit position adjustment	Adjusts the position of the lens unit to eliminate any difference in dimensions between an original and the printed image.
Developer unit	Doctor-to-sleeve gap adjustment	Adjusts the gap between the developer sleeve and the doctor blade.
High-voltage transformer (HVT)	High-voltage transformer adjustment	Monitors and adjusts the output of each bias when the HVT is replaced.
TBU	Transfer belt adjustment due to environmental factors	Corrects image distortion caused by the expansion and contraction of the transfer belt due to temperature and humidity changes.
	Gap adjustment between TBU drive gears	Adjusts the gap between the TBU and the drive gears to prevent the disengagement of the gear teeth.
	TBU parallelism adjustment	Adjusts the parallelism of the TBU and the 2nd transfer roller.
LSU	Adjustment of tilted image at the leading edge of the paper	Adjusts the installation position of the LSU to correct image distortion or skew resulting from improper positioning of the LSU.
Fuser unit	Separation plate gap adjustment	Adjusts the gap between the fuser belt and the separation plate to avoid paper jamming.
Drawer	Adjustment of sheet sideways deviation caused by paper feeding	Corrects any misalignment between an original and the printed image.
Developer unit	Auto-toner sensor adjustment	Adjusts the sensor every time the developer material is replaced.

Category	Name	Purpose
Registration section	Adjustment of paper alignment at the registration roller	Corrects any misalignment between an original and the printed image.
Printer section	Printer related adjustment	Adjusts the image dimensions to prevent the printed image from being distorted.
Scanner section	Scanner section adjustment	Performs adjustment to prevent a scan image from being distorted.

(2) Image quality adjustment

Category	Name	Purpose
Image	Image quality adjustment	Performs the adjustments for the copy, printer, scanner, and fax features individually, including the automatic gamma adjustment, density adjustment, and background adjustment. These should only be performed at the request of a customer.

1.7 Firmware Update

The firmware contained in the equipment is updated to further improve its performance or capabilities. It is strongly recommended to keep updating the software in order to maintain the performance of the equipment, extend its capabilities and eliminate defects.

(1) Update procedure
There are 2 main ways of updating the firmware.

A: Using the download jig
B: Using the USB media

Remarks:

The download jig is available as a service part.
Commercially available USB media can be used.

In general, use the download jig only if firmware updating with USB media is not allowed or supported.
When updating the firmware with the download jig, it is necessary to remove the cover from the equipment and then insert the jig directly into the desired PC board.
As a result, the firmware needs to be updated from one PC board to another.
In addition, a ROM writer is required first to write update data to the download jig.

On the other hand, when using USB media for firmware updating, first write updating data to the USB media.
Once the USB media, where the data have been written, have been inserted into the USB port on the equipment, data downloading will be started.
In addition, it is possible to update the firmware on multiple PC boards together.
Therefore, it is strongly recommended to update the firmware with USB media.

(2) Update procedure (flow)

Step	Using USB media	Using the download jig
1	Prepare the USB media.	Prepare the download jig.
2	Obtain the update program or data.	Obtain the update program or data.
3	Write the data from a PC to the USB media.	Write the data from a PC to the download jig via a ROM writer.
4	Insert the USB media into the equipment.	Open the cover of the equipment. Insert the jig into the PC board to update.
5	Firmware updating is started.	Firmware updating is started.
6	-	Repeat steps 2 through 5 to update the firmware on other PC boards.

Notes:

Refer to the Service Manual of the model in use for further information regarding the update procedure and precautions.

1.8 Preventive Maintenance

1.8.1 Overview

The purpose of preventive maintenance (PM) is to maintain the quality of the equipment not only by regular inspection and cleaning but also by replacement of the parts at specified intervals according to the maintenance contract. Preventive maintenance parts are packed in kit form, known as PM kits, by units or the number of pages printed before replacement. This increases the parts replacement efficiency.

1.8.2 Preventive maintenance parts (PM parts)

Preventive maintenance parts (PM parts) refer to the parts that need replacing on a regular basis in order to maintain the performance of the equipment. PM parts are marked with "PM" in the disassembly procedure. In addition, the preventive inspection table shows the replacement cycle (or the number of pages printed before replacement). For further information, refer to the Service Manual. The PM cycle is determined based on the PM part with the shortest replacement cycle.

1.8.3 Overhaul

An overhaul of the equipment is required after a specified number of pages have been printed or after a specified time period has elapsed. In an overhaul, the consumables are replaced. Besides that, the drive section is greased, and the individual parts of the equipment are inspected or cleaned. Preventive maintenance is scheduled to be performed multiple times (2 to 10 times) prior to an overhaul.

1.8.4 Conceptual drawing

The figure below shows the relationship between the PM parts and an overhaul.

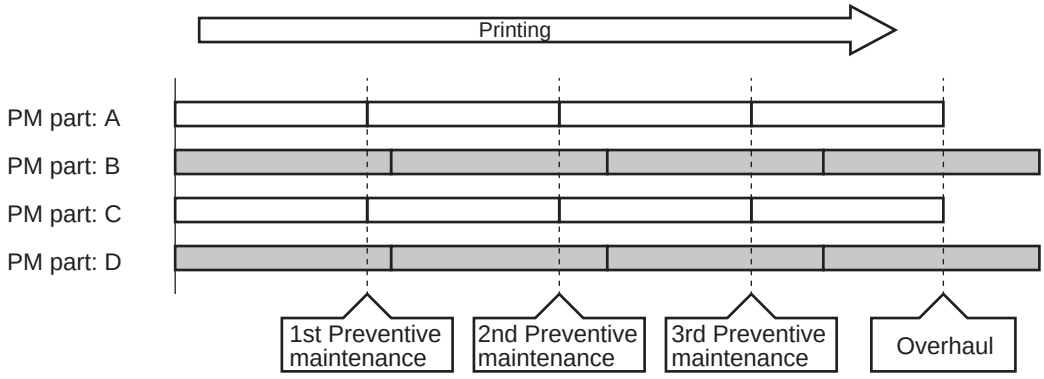


Fig. 1-2

The above figure just shows an example. Refer to the Service Manual of the model in use for further information regarding the overhaul or PM cycle.

2. COPY PROCESS

2.1 General Description

2.1.1 Expression of Colors

A variety of colors can be expressed by mixing the three primary colors: Yellow, magenta and cyan. Red can be created by mixing yellow and magenta; blue can be created by mixing magenta and cyan; green is created by mixing cyan and yellow; and mixing all the three primary colors allows you to obtain black.

The color MFP has better reproducibility because black toner is added to the mixture of the above three colors at the proper ratio.

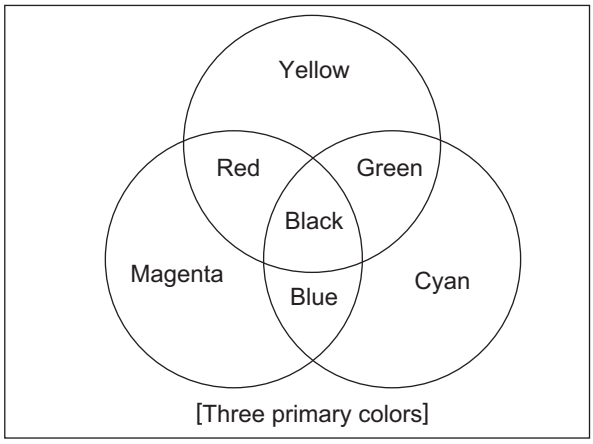


Fig. 2-1

2.1.2 4-Step Copy Process

In the TOSHIBA color MFP, 4 color process units (EPU), which include a drum, a developer unit and a main charger, for yellow, magenta, cyan and black are placed in parallel. Colors are developed in the order of Yellow (Y) -> Magenta (M) -> Cyan (C) -> Black (K). An image with the 4 developed colors is transferred on the transfer belt by layering the colors one by one (1st transfer). Then the image is formed on a sheet by being transferred from the transfer belt by the 2nd transfer roller (2nd transfer).

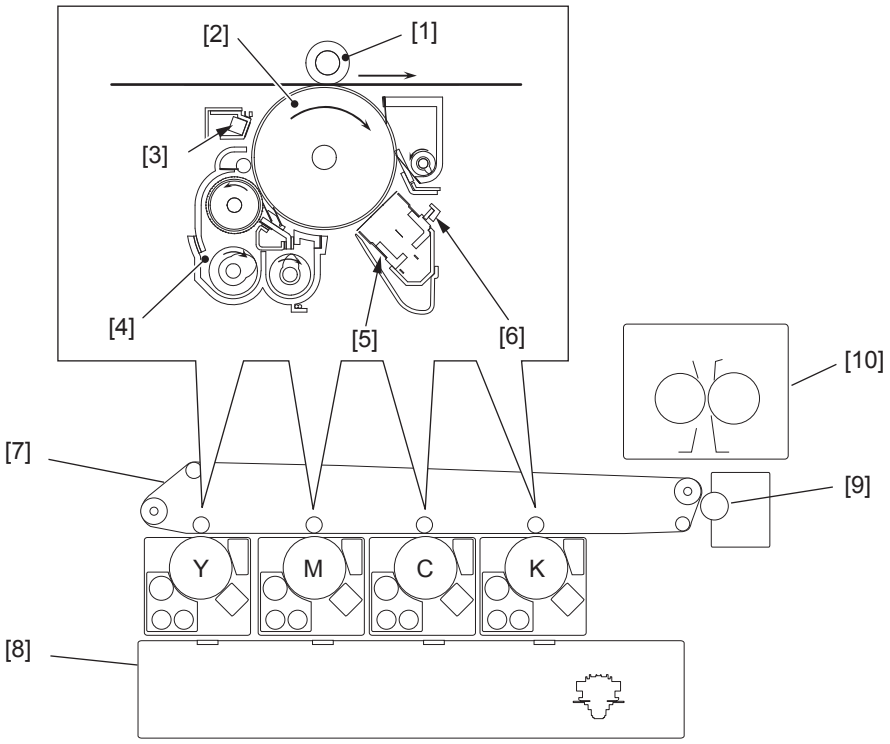


Fig. 2-2

[1] 1st transfer roller
[2] Photoconductive drum
[3] Drum surface potential sensor
[4] Developer unit
[5] Main charger
[6] Discharge LED
[7] Transfer belt
[8] Laser optical unit
[9] 2nd transfer roller
[10] Fuser unit

2.2 Description of Operation

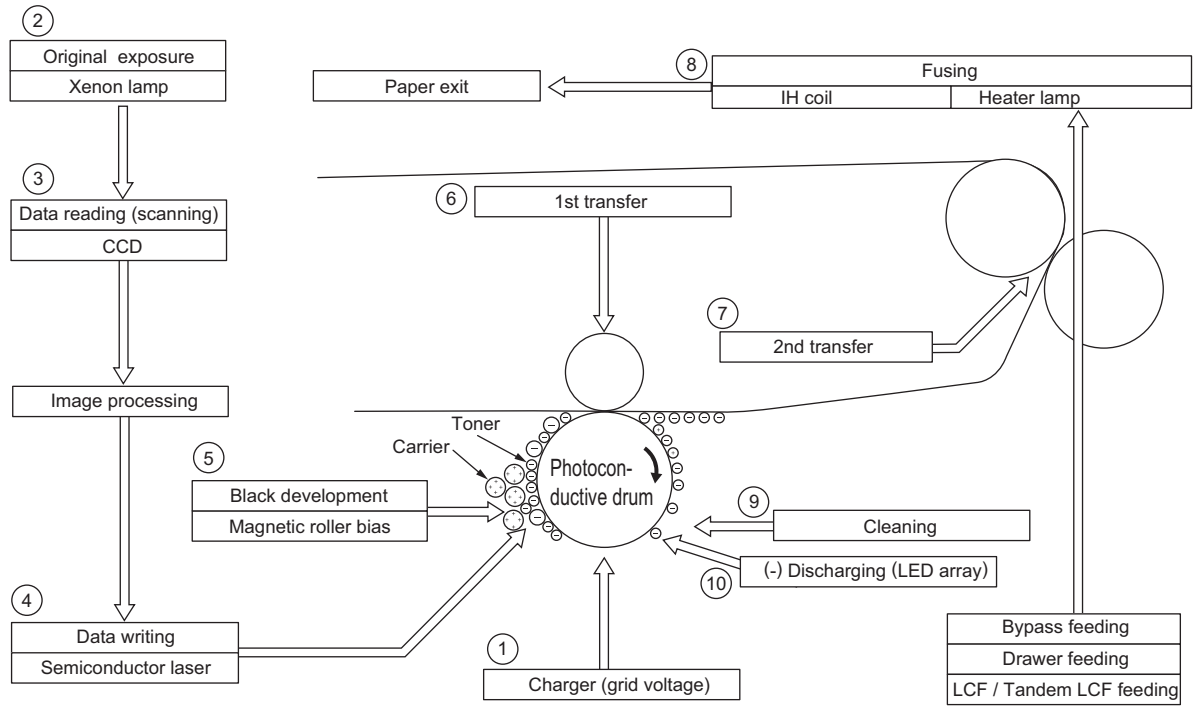


Fig. 2-3

(1) Charging: Places a negative charge on the surface of the photoconductive drum.

↓

(2) Original exposure: Converts images on the original into optical signals.

↓

(3) Data reading: The optical image signals are read into CCD and converted into electrical signals.

↓

(4) Data writing: The electrical image signals are changed to light signals (by laser emission) which expose the surface of the photoconductive drum.

↓

(5) Development: Negatively-charged toner is made to adhere to the photoconductive drum, producing a visible image.

↓

(6) 1st transfer: Transfers the visible image (toner) on photoconductive drum to the transfer belt.

↓

(7) 2nd transfer: Transfers the visible image (toner) on the transfer belt to paper.

↓

(8) Fusing: Fuses the toner image to the paper by applying heat and pressure.

↓

(9) Blade cleaning: While scraping off the residual toner from the drum by the blade.

↓

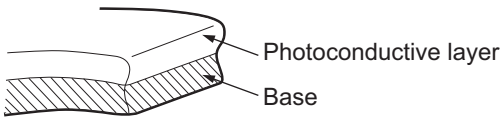
(10) (–) Discharging: Eliminates the residual (–) charge from the surface of the photoconductive drum.

2.3 Functions

[A] Photoconductive drum

The photoconductive drum consists of two layers.
The outer layer is a photoconductive layer made of an organic photoconductive carrier (OPC), and the inner layer is an aluminum conductive base in a cylindrical form.
The photoconductive carrier has a special property: when it is exposed to light, the electrical resistance it possesses increases or decreases with the strength of the light.
Example:

- Strong incident light→Decreases resistance (works as a conductor.)
- Weak incident light→Increases resistance (works as an insulator.)

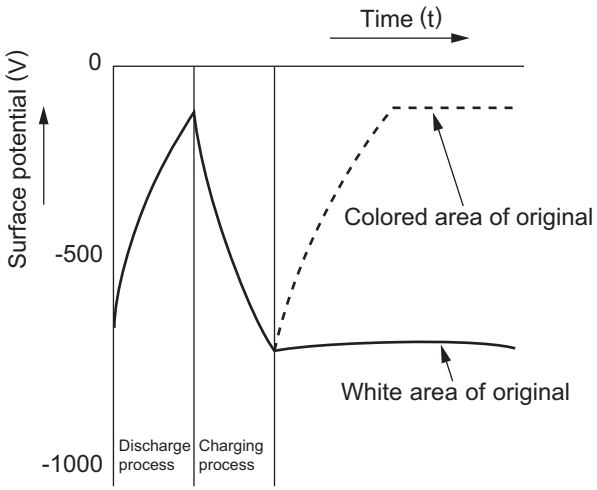


Structure of the photoconductive drum
(Example of OPC)

Fig. 2-4

[A-1] Formation of electrostatic latent images

In the processes of charging, data reading, data writing, and discharging described below, the areas on the drum corresponding to colored areas on the original are deprived of negative charge, while the areas on the drum corresponding to white areas retain the negative charge. Thus it forms a negative charge image on the drum surface.
As this negative charge image on the drum is not visible to the human eye, it is called an “electrostatic latent image.”



Electric potential of the photoconductive drum

Fig. 2-5

[B] Charging

Charging is a process to apply charge evenly to the drum surface.
The needle electrode produces negative corona discharge, which is controlled by the grid so that the drum surface is evenly charged with negative potential.
The surface potential on the drum is determined by the grid potential and is controlled to a fixed value by the grid control circuit.

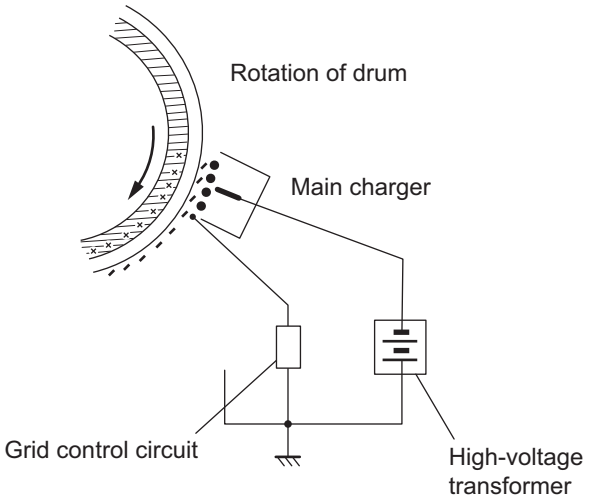


Fig. 2-6

[C] Data reading (scanning)

Data reading is a process of illuminating the original with light and converting the reflected light into electrical signals.
The light reflected from the original is directed to the Charge Coupled Device (CCD) and this optical image information is converted to electrical signals (image signals), which are then transmitted to the image processing section via the scanning section control PC board.
The CCD for color processing has RGB filters provided over its surface, which allow the CCD to read the light amount in the respective ranges of wavelength. The image data corresponding to the respective RGB colors is then transmitted to the image processing section.

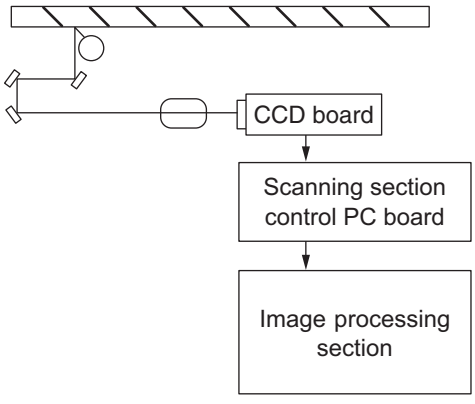


Fig. 2-7

(Example)

CCD light receiving amount	Value of image signals to be output
Light	255
	Difference between "light " and "dark" is divided into 256 steps.
Dark	0

Fig. 2-8

[D] Data writing

Data writing is a process of converting the image signals transmitted from the image processing section into light signals and exposing the drum surface with the light signal.
Namely, the image signals transmitted from the image processing section are converted into optical signals (laser emission) by the semiconductor laser element, which are then used to expose the drum surface, thus forming an electrostatic latent image there.

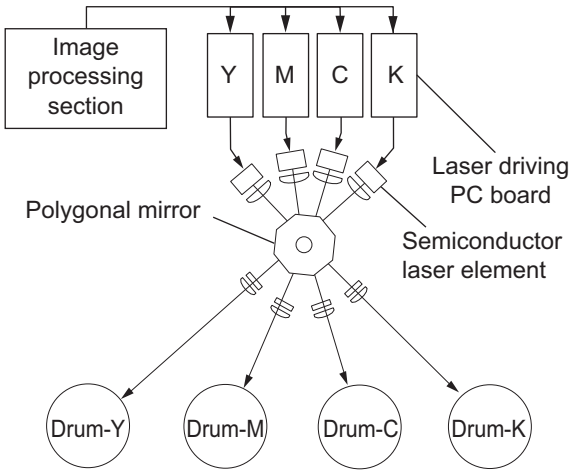


Fig. 2-9

[E] Development

Development is a process of making the electrostatic latent images visible to the eye (visible image). Developer material is supplied to the photoconductive drum surface by means of a magnetic roller, allowing the toner in the developer material to adhere to the areas on the drum surface where the potential is lower than the developer bias which is applied to the magnetic roller (reverse development).

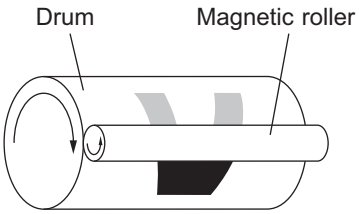


Fig. 2-10

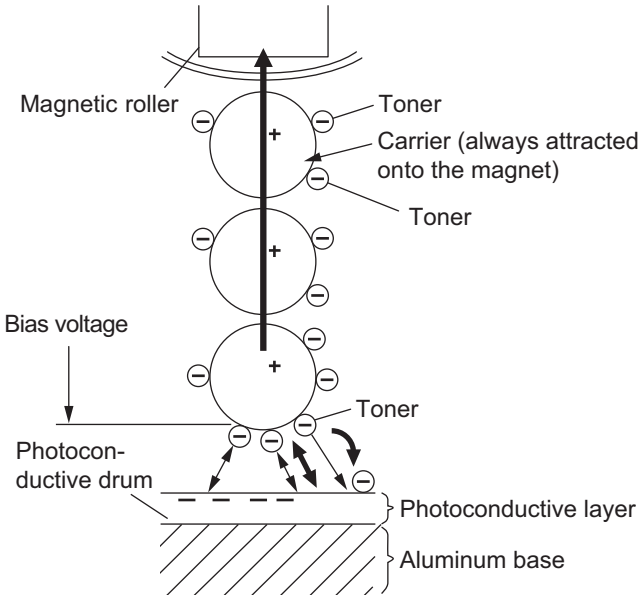


Fig. 2-11

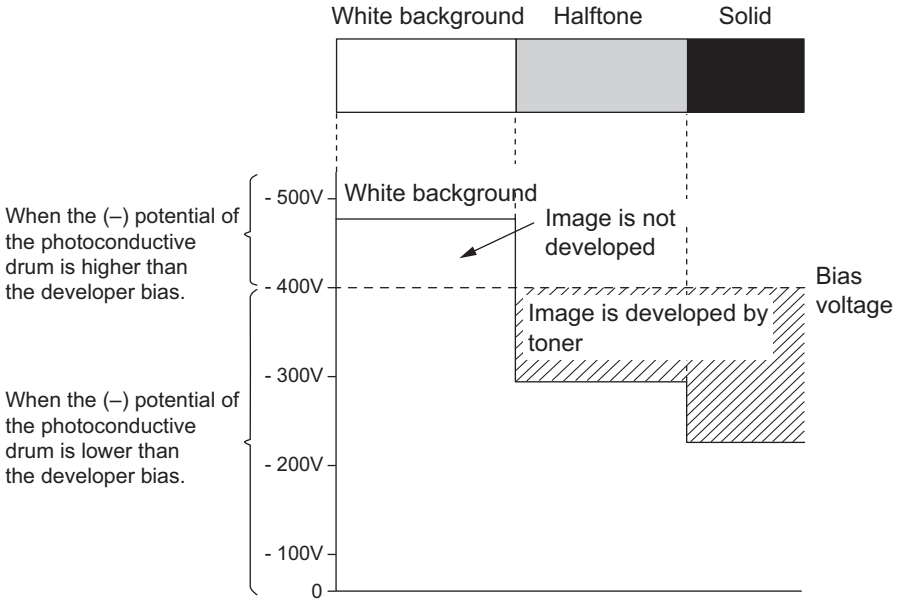


Fig. 2-12

[E-1] About developer material

The developer material is comprised of a mixture of toner and carrier. The toner is charged to a negative polarity and the carrier to a positive polarity, due to the friction with each other caused by mixing.

Carrier is 5 to 10 times as large as toner.

Toner: Mainly consists of resin and coloring.

Carrier: Consists of ferrite, and over its surface resin coating to provide consistent frictional electrification.

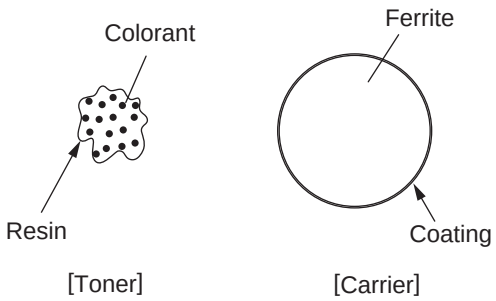


Fig. 2-13

[E-2] Magnetic roller

- Magnetic brush development technique

Inside magnetic rollers, the south and north poles are arranged as shown in the figure below. The developer material forms a brush-like fluff which contacts the photoconductive drum surface.

↓

This is caused by the lines of magnetic force between the south and north poles.

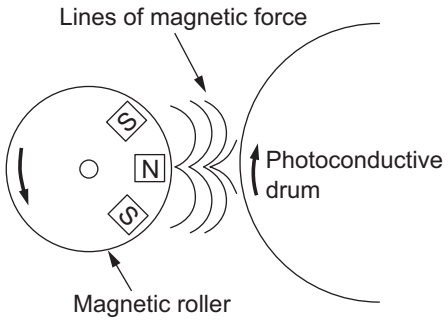


Fig. 2-14

[F] 1st transfer

1st transfer is a process of transcribing the toner image (visible image) formed on the photoconductive drum to the transfer belt. A positive bias is applied to the 1st transfer roller, causing the transfer belt to be positively charged. This in turn helps to form an electric field E between the transfer belt (positive) and the photoconductive layer of the photoconductive drum (grounded), thus making the toner image transferred to the transfer belt. In the copy process of the color MFP, images are transferred in the order of Y->M->C->K on the transfer belt.

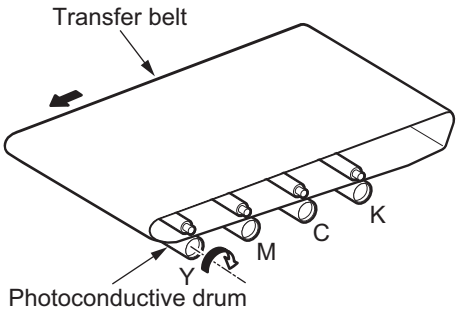


Fig. 2-15

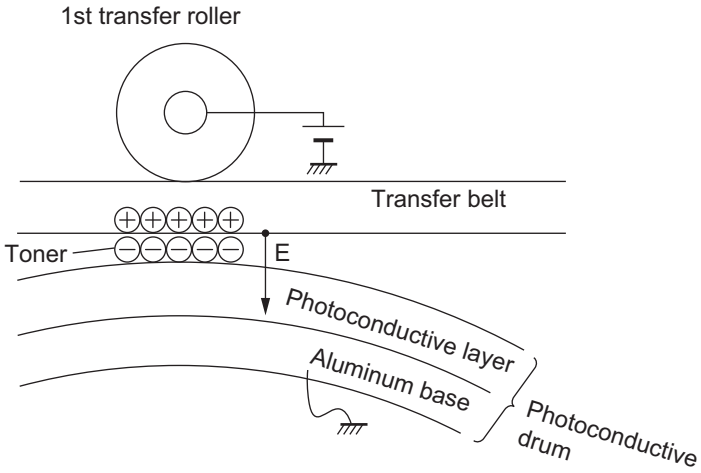


Fig. 2-16

[G] 2nd transfer

An electric field is formed between the 2nd transfer roller and the 2nd transfer facing roller, which generates a paper polarization and thus the toner is transferred from the belt to the paper.
When the negative bias is applied to the 2nd transfer facing roller, the 2nd transfer roller is charged (positive), and thus the toner is transferred from the belt to paper.

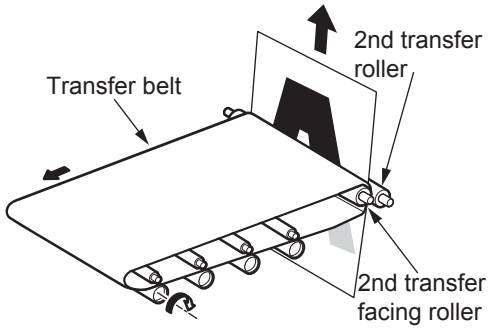


Fig. 2-17

[H] Fusing process

Fusing is a process of melting the toner on the paper and fixing it firmly onto the paper.
Method:
The softening point of the toner (main component: resin) is 105-120°C.

↓

(Heat) Toner is melted by the fuser belt.

+

(Pressure) The pressure roller is pressed against the fuser belt by the springs to increase adherence of the melted toner to the paper.

↓

The paper is subjected to the heat and pressure when passing through the fuser belt and the pressure roller.

↓

(Fusing) The toner on the paper is fused to it.

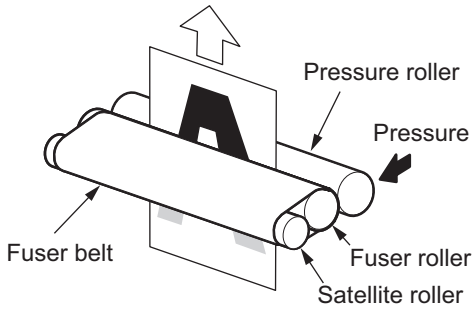


Fig. 2-18

[I] Cleaning

When toner is transferred from the transfer belt (or the OPC) to paper, a small amount remains on the transfer belt (or the OPC). As remaining toner lowers the image quality, it must be scraped off. This operation is called cleaning.
The edge of the cleaning blade is pressed against the photoconductive drum surface to scrape off residual toner.

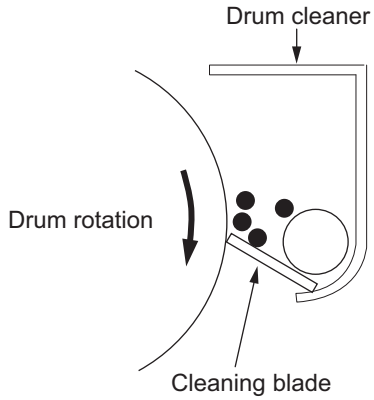


Fig. 2-19

[J] (–) Discharging process

Discharging is a process of eliminating the (–) charge remaining on the photoconductive drum before the next charging process.
If the charge remaining on the photoconductive drum is not eliminated, the following phenomenon would occur:

(–) charge remaining on the photoconductive drum surface causes uneven application of the charge for the next copying.
↓
The next copy obtains a double image. (The preceding image remains.)

To prevent this:
The entire surface of the photoconductive drum is flooded with light by the discharge LED array.
↓
The photoconductive drum becomes electrically conductive.
↓
All of the (–) charge remaining on the photoconductive drum is conducted away to ground.
↓
Preparation for the next copying process is completed.

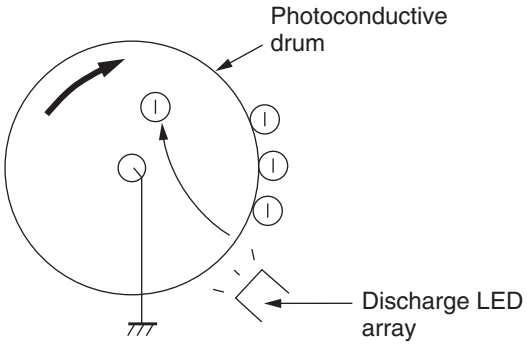
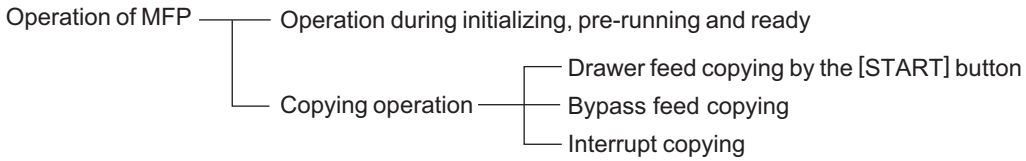


Fig. 2-20

3. GENERAL OPERATION

3.1 Overview of Operation

The statuses of basic operations of the MFP are explained below.



3.2 Description of Operation

3.2.1 Warming-up

1. Initialization
   → Power ON
   → IH coils / Heater lamps ON
   → The set number “1”, reproduction ratio “100%” and “Wait Warming Up” are displayed.
   → Fan motors ON
   → Initialization of laser optical system
   - The polygonal motor rotates at high speed.

   → Initialization of feeding system
   - Each drawer tray goes up.
   - Tandem LCF tray goes up.

   → The pre-running operation is stopped after a specified time.
   → Initialization of process unit system (process unit related section)
   - The 2nd transfer roller moves to the releasing position.
   - The transfer belt moves to the releasing position.
   - The needle electrode cleaner moves to the home position.

   → Drum phasing
   - The drum motor is turned ON.
   - The transfer belt motor is turned ON.

   → Cleaning of transfer belt
   - (Performs color registration control.)*1
   - (Performs drum surface potential sensors control.)*1
   - (Performs image quality control.)*1

   → Initialization of scanning system
   - The carriage moves to the home position.
   - The carriage moves to the peak detection position.
   - The exposure lamp is turned ON.
   - Peak detection (the white color is detected by the shading correction plate)
   - The exposure lamp is turned OFF.

   → The polygonal motor rotates at low speed.
   → “READY (WARMING UP)” is displayed.

2. Pre-running operation
   The pre-running operation is started at the corresponding starting timing or when the temperature of the pressure roller surface becomes pre-running.
   → The fuser motor is turned ON.
   - Fuser roller rotation.

3. When the temperature of the fuser belt and pressure roller surfaces becomes sufficient for fusing,
   → The IH coil / Heater lamps is turned OFF.
   → “READY” is displayed.
   → The polygonal motor rotates at high speed for 30 seconds.

*1: Image quality control and color registration control should be performed only at a change of environment or at periodical maintenance.

3.2.2 Ready (ready for copying)

→ Buttons on the control panel enabled
→ When no button is pressed for a certain period of time,
- The set number “1” and reproduction ratio “100%” are displayed. The equipment returns to the normal ready state.

→ The fuser unit repeats rotation and stopping

3.2.3 Drawer feed copying (1st drawer paper feeding)

1. Press the [START] button.
   → “READY” changes to “COPYING”.
   → The exposure lamp is turned ON
   → The scan motor is turned ON. → Carriages-1 and -2 move forward.
   → The polygonal motor rotates at high speed.
   → The drum motor, transport motor, transfer belt motor 2nd transfer motor, developer unit motor, developer unit mixer motor, fuser motor and exit motor are turned ON.
   - The drum, transfer belt, fuser unit, developer unit and exit roller are driven.

2. Drawer paper feeding
   → The fans are rotated at high speed and feed motor is turned ON.
   - The pickup roller, feed roller, separation roller and transport roller start to rotate.
   → Paper reaches the 1st drawer feed sensor.
   - The 1st drawer feed sensor is turned ON.
   → Paper reaches the registration roller
   - The registration sensoris turned ON and aligning is performed.
   → The feed motor is turned OFF after a certain period of time.

3. After a certain period of time passed from the carriage operation
   → The registration motor is turned ON after a certain period of time. → Paper is transported to the transfer area.
   → The copy counter operates.

4. Completion of scanning
   → The exposure lamp is turned OFF.
   → The Scan motor is turned OFF.
   → The Registration motor is turned OFF (after the trailing edge of the paper passed the registration roller).
   → “READY (PRINTING)” is displayed.

5. Printing operation
   1) Color printing operation
   → The drum motor, transfer belt motor 2nd transfer motor and discharge LED-Y, -M, -C, -K ON.
   → The main charger bias is turned ON.
   → The transfer belt cam motor is turned ON.
   - The 1st transfer rollers (Y, M and C) contact the transfer belt.
   → The YMCK developer bias (DC), developer unit motor and developer unit mixer motor is turned ON.
   → The 2nd transfer motor is turned ON. → The clutches are turned ON/OFF.
   - The 2nd transfer roller contact the transfer belt.
   → The 2nd transfer bias is turned ON.
   → The YMC and K developer bias (AC) are turned ON.
   → Laser emission (yellow image)
   → The 1st transfer bias (Y) is turned ON.
   - 1st transfer of yellow image (The yellow image is transferred to the transfer belt.)
   → The 1st transfer bias (Y) is turned OFF.
   → Laser emission (magenta image)
   → The 1st transfer bias (M) is turned ON.
   - 1st transfer of magenta image (The magenta image is transferred to the transfer belt.)
   → The 1st transfer bias (M) is turned OFF.
   → Laser emission (cyan image)
   → The 1st transfer bias (C) is turned ON.
   - 1st transfer of cyan image (The cyan image is transferred to the transfer belt.)
   → The 1st transfer bias (C) is turned OFF.
   → Laser emission (black image)
   → The 1st transfer bias (K) is turned ON.
   - 1st transfer of black image (The black image is transferred to the transfer belt.)
   → The 1st transfer bias (K) is turned OFF.
   → The transfer belt cam motor is turned OFF.
   - The 1st transfer rollers (Y, M and C) are released from the transfer belt.
   → 2nd transfer of YMCK image (The YMCK image on the transfer belt is transferred to the paper.)
   → The main charger is turned OFF.
   → The developer unit motor, developer unit mixer motor and developer bias (YMC and K) are turned OFF.
   → The 2nd transfer motor is turned ON. → The clutches are turned ON/OFF.
   - The 2nd transfer roller is released from the transfer belt.
   → The 2nd transfer bias is turned OFF.
   → Drum phasing
   → The drum motor, transfer belt motor, 2nd transfer motor and discharge LED-Y, -M, -C, -K OFF.
   → 2nd transfer roller reverse rotating

2) Black printing operation

→ The drum motor, transfer belt motor, 2nd transfer motor and discharge LED-K ON.
→ The main charger bias is turned ON.
→ The K developer bias (DC), developer unit motor and developer unit mixer motor are turned ON.
→ The 2nd transfer motor is turned ON. → The clutches are turned ON/OFF.
- The 2nd transfer roller contacts the transfer belt.

→ The 2nd transfer bias is turned ON.
→ The K developer bias (AC) is turned ON.
→ Laser emission (black image)
→ The 1st transfer bias (K) is turned ON.
- 1st transfer of black image (The black image is transferred to the transfer belt.)

→ The 1st transfer bias (K) is turned OFF.
→ 2nd transfer of K image (The K image on the transfer belt is transferred to the paper.)
→ The main charger is turned OFF.
→ The developer unit motor, developer unit mixer motor and developer bias (K) are turned OFF.
→ The 2nd transfer motor is turned ON. → The clutches are turned ON/OFF.
- The 2nd transfer roller is released from the transfer belt.

→ The 2nd transfer bias is turned OFF.
→ Drum phasing
→ The Drum motor , transfer belt motor, 2nd transfer motor and discharge LED-K OFF.
→ 2nd transfer roller reverse rotating

6. Paper exiting

→ The exit sensor detects the trailing edge of the paper.
→ The toner recovery auger and discharge LED OFF.
→ The drum motor, developer unit mixer motor, transfer belt motor, 2nd transfer motor, transport motor, developer unit motor, fuser motor and exit motor are turned OFF.
→ The polygonal motor rotates at low speed.
→ The drum, fuser unit and developer unit are stopped.
- The fans return to rotate at the normal rotation speed.

→ “READY” is displayed and the equipment enters into the ready mode.

3.2.4 Bypass feed copying

1. Place paper on the bypass tray.
   → The bypass paper sensor is turned ON.
   - "Ready for bypass feeding" is displayed.
   → The carriages move to their home position.

2. Press the [START] button.
   → "Ready for bypass feeding" changes to "COPYING".
   → Exposure lamp (EXP) ON
   → Scan motor ON → Carriages-1 and -2 move forward.
   → The drum motor, transfer belt motor, 2nd transfer motor, transport motor , developer unit motor, developer unit mixer motor fuser motor and exit motor are turned ON.
   - The drum, transfer belt, fuser unit, developer unit and exit roller are driven.

3. Bypass feeding
   → The fans rotate at high speed.
   → The bypass motor is turned ON.
   - The bypass pickup roller is lowered.
   → The bypass pickup solenoid is turned ON.
   - The bypass pickup roller, feed roller and separation roller start to rotate.
   → Aligning operation
   → Paper reaches the registration roller.
   → After a certain period of time, the bypass motor is turned OFF.

4. Hereafter, operations (3) through (6) are repeated.

3.2.5 Interruption copying

1. Press the [INTERRUPT] button
   → LED "INTERRUPT" is turned ON.
   → Copying operation in progress is temporarily stopped, and the carriages-1 and -2 return to their appropriate positions.
   → "Job interrupted job 1 saved" is displayed.
   → Automatic density and reproduction ratio 100% are set. The set number remains the same.

2. Select the desired copy condition

3. After interruption copying is finished:
   → "Press interrupt to resume job 1" is displayed.
   → LED "INTERRUPT" is turned OFF by pressing the [INTERRUPT] button, and the equipment returns to the status before the interruption.
   → "Ready to resume job 1" is displayed.

4. Press the [START] button
   The copying operation before the interruption is resumed.

3.3 Detection of Abnormality

When something abnormal has occurred in the equipment, symbols corresponding to the type of abnormality are displayed.

3.3.1 Types of abnormality

1. Toner needs to be supplied or the paper is incorrectly set
   (A) Add paper
   (B) Paper misfeed in bypass
   (C) No toner in the cartridge

2. The paper is jammed or the waste toner box is full
   (D) Misfeed in equipment
   (E) Waste toner box replacement

3. A system problem occurs
   (F) Call for service

3.3.2 Description of abnormality

[A] Add paper

- [In case of the equipment drawer or PFP drawer] (When no drawer is installed)
  Drawer not detected
  ↓
  Drawer is not installed:
  Drawer is installed but there is no paper in it:
  ↓
  No paper
  ↓
  A signal sent to the control circuit
  ↓
  Drawer area of the control panel blinks
  (When the drawer is selected)
  ↓
  [START] button is disabled.

[In case of the equipment, tandem LCF] (When a drawer is installed)
Based on the combination of the tray-up motor movement and the status of the tray-up sensor and empty sensor, The CPU detects the presence of paper.

- When the power is turned ON or tandem LCF drawer is inserted (When the power is turned ON or The equipment drawers are inserted).
  LCF performs initialization.
  ↓
  Detects the presence of paper
  Tray-up motor ON - The tray goes up
  ↓
  At this time, the tray-up sensor and LCF empty sensor are OFF.
  → When the tray-up sensor is not turned ON within a fixed period of time, it means that the tray is in an abnormal condition
  "Add paper" is displayed regardless of the presence/absence of paper.
  → Cleared by turning the power ON/OFF

  → The tray-up sensor is turned ON within a fixed period of time
  - The tray-up motor stops.

  At this time, if the empty sensor is
  ON: It is judged that there is paper.
  OFF: It is judged that there is no paper.
  ↓
  The drawer area of the control panel blinks.
  (When the drawer is selected)

- When the paper in the drawer runs short during copying,
  → The tray-up sensor is turned OFF.
  → The tray-up motor is turned ON. - The tray goes up.
  → The tray-up sensor is turned ON.
  → The tray-up motor is stopped.

- The empty sensor is turned OFF during copying in spite of the tray-up sensor being ON
  ↓
  It is judged that there is no paper.
  ↓
  The drawer area of the control panel blinks.
  (When the drawer is selected)
  ↓
  The copying operation is stopped.

[B] Paper misfeed in bypass

- [In case of the equipment drawer or PFP drawer] (When no drawer is installed)
- During bypass feeding
  The bypass motor is turned ON
  ↓
  The registration sensor is turned ON
  * The registration sensor is not turned ON within a fixed period of time (E120).
  ↓
  Bypass misfeeding
  ↓
  The bypass misfeed symbol is displayed.
  ↓
  The copying operation is disabled.
  ↓
  Solution: The bypass sensor is turned OFF when you remove the paper from the bypass tray.

[C] No toner in the cartridge

- Toner density becomes low
  Auto-toner sensor detects the absence of toner
  ↓
  Toner supplying for a specified time: Toner motor ON
  ↓
  Not reaching the specified toner density: Auto toner sensor
  ↓
  Control circuit→Toner cartridge replacement display:
  Color copying is not accepted if the Y/M/C toner cartridge replacement display appears.(Black copying is accepted.)
  Copying is not accepted if the toner K cartridge replacement display appears.
  Solution: Replace the toner cartridge with new one.
  Toner is supplied → copying operation enabled

- Toner remaining amount decreased
  Toner remaining amount decreasing detection: Toner sensor
  ↓
  Toner supplying for a specified time: Toner motor and toner motor ON
  ↓
  Toner sensor does not detect “full”.
  ↓
  Control circuit→Toner cartridge empty display:
  The auto toner sensor detects that the density is not reached and color/black copies can be made until the toner cartridge empty status is determined
  Solution: Replace the toner cartridge with new one.

[D] Misfeed in equipment

- The exit sensor detects jamming of the leading edge of the paper.

  ↓

  The registration motor is turned ON

  ↓ Regulation time

  Exit sensor turned ON
  If the exit sensor is not turned ON after the regulation time,

  ↓

  Paper jam (E010)→ The copying operation is stopped.

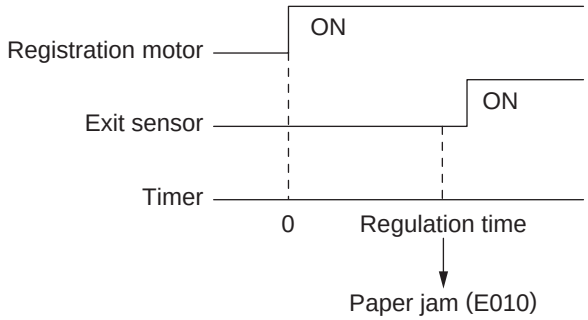


Fig. 3-1

- The exit sensor detects jamming of the trailing edge of the paper.

  The registration motor is turned OFF

  ↓ Regulation time.

  The exit sensor turned OFF
  If the exit sensor is not turned OFF after the regulation time,

  ↓

  Paper jam (E020)→ The copying operation is stopped.

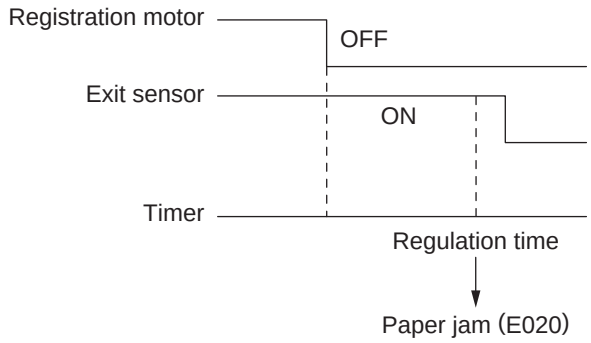


Fig. 3-2

- The 2nd transfer side paper clinging detection sensor detects jamming of the paper.

  The registration motor is turned ON

  The transfer belt paper clinging detection sensor is turned ON

  ↓

  If the 2nd transfer side paper clinging detection sensor is not turned ON in a fixed period of time,

  ↓

  Paper jam (E011)→ The copying operation is stopped.

- Immediately after the power is turned ON

  ↓

  Any of the sensors on the paper transport path detects paper (ON).

  ↓

  Paper jam (E030)

- The registration sensor detects jamming of the leading edge of the paper:
  The registration sensor is not turned ON within a fixed period of time after the leading edge of the paper passed the transport roller.

↓

Paper jam (E120, E200, E210, E300, E330 and E3C0)

- During paper feeding from the ADU:
  The registration sensor is not turned ON within a fixed period of time after the ADU motor is turned ON.

  ↓

  Paper jam (E110)

- During paper transporting from the ADU:
  The duplexing unit path sensor do not detect the paper at the fixed timing.

  ↓

  Paper jam (E510 and E520)

- During paper feeding from the equipment or the PFP:
  The registration sensor is not turned ON within a fixed period of time after the feed clutch is turned ON.

  ↓

  Paper jam (E220, E310, E320, E340 to E360, E3D0 and E3E0: The error code differs depending on the paper source.)

[E] Waste toner box replacement

- The waste toner box is full of used toner

  ↓

  Waste toner box full detection sensor ON

  ↓

  “Dispose of used toner” is displayed

- The waste toner box full detection sensor is turned ON during printing

  ↓

  Printing is stopped after the paper being printed has exited
  Solution: Replace the waste toner box with a new one and close the waste toner box cover.

[F] Call for service

Check the error code displayed on the control panel when “Call for service” appears, and deal with the abnormality referring to the error code table.

4. CONTROL PANEL

4.1 General Description

The control panel consists of button switches and touch-panel switches to operate the equipment and select various modes, and LEDs and an LCD to display the state of the equipment or the messages. When the operator's attention is required, graphic symbols light or blink with messages explaining the condition of the equipment in the LCD panel. When paper jams and "Call for service" occur, error codes are also displayed to notify users of the problem.

Example

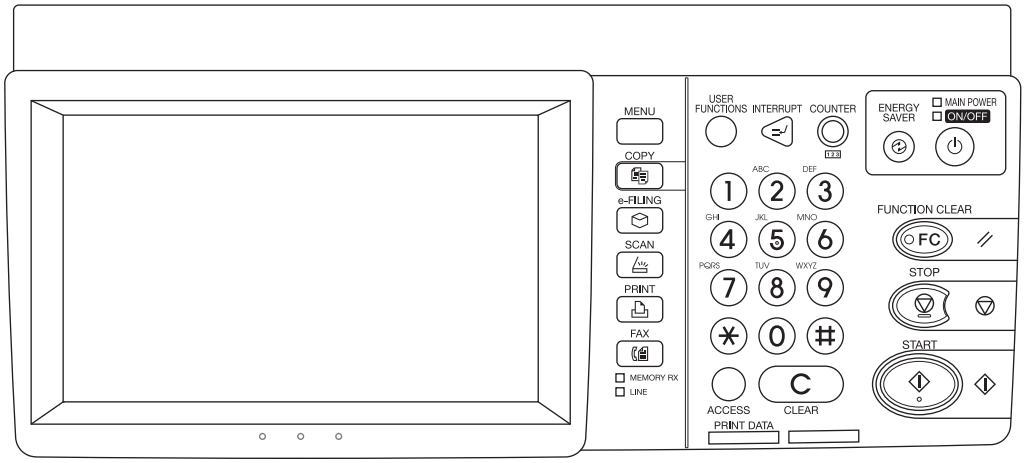


Fig. 4-1

4.2 Items Shown on the Display Panel

4.2.1 Display

1. Basic display
   Displays buttons and messages.

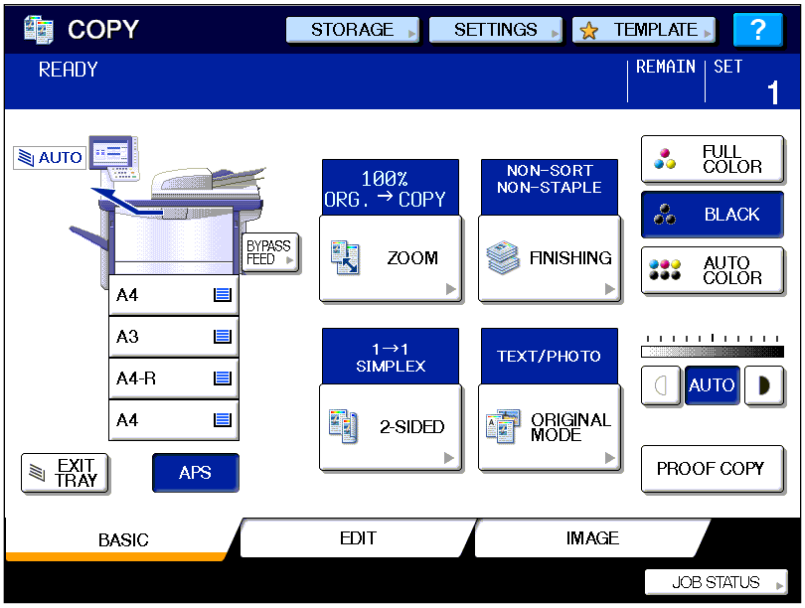


Fig. 4-2

2. Paper jam / service call display
   Displays error code, paper jam position and guidance for cleaning paper jams, etc.

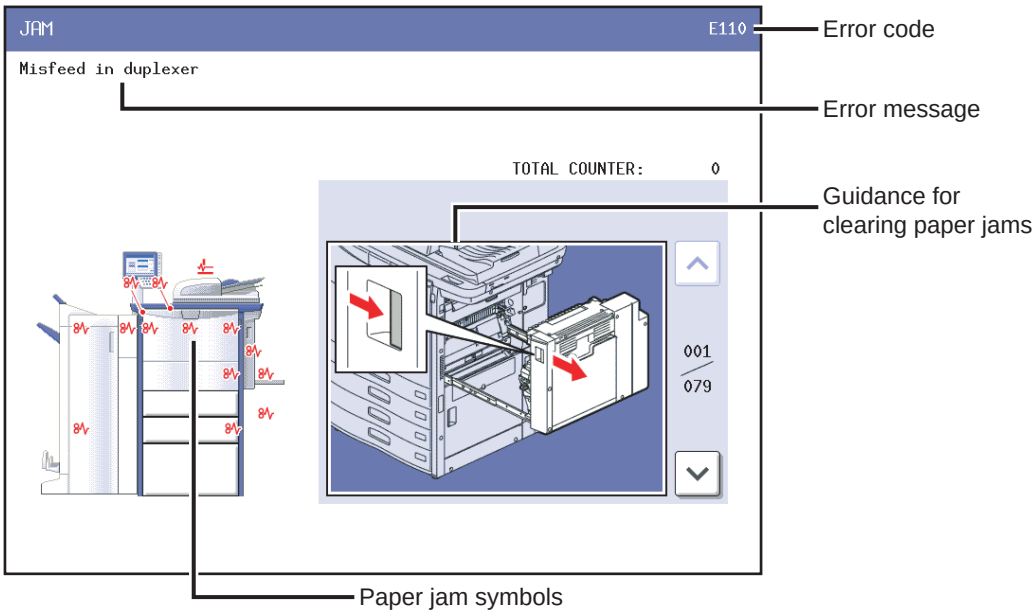


Fig. 4-3

4.2.2 Message

Major messages displayed during operations are shown below. These messages may differ depending on the features or options mounted.

No.	Message	State of equipment	Note
1	-	Power is OFF (at Sleep Mode)	Press the [START] button or function button to clear
2	Saving energy - press START button	At Energy Saving Mode	Press the [START] button to clear
3	Wait Warming Up	Scanner warming up • Displayed until the equipment becomes ready to start scanning	Auto Start can be set
4	Wait Warming Up Auto Start	Scanner warming up • Displayed when Auto Start is set	Press the [STOP] button to clear the Auto Start.
5	WAIT	Displayed when performing the controlling function to keep the equipment at the best condition	
6	Wait adding toner	Supplying toner • Equipment becomes the toner supply state	Recovers when the toner supply has finished
7	Performing Auto Calibration	Displayed at image quality control	Recovers when the image quality control has finished
8	READY	Ready for copying • Waiting for the operation	
9	READY Press START button to copy	Copying job interrupted	Press the [START] button to resume copying or press [MEMORY CLEAR] button to delete the job
10	READY (WARMING UP)	Scanner warming up • Ready to scan the original	
11	READY (PRINTING)	Printing out the data • Scanning is enabled	
12	READY (ADDING TONER)	Supplying toner • Scanning is enabled	
13	READY (INNER TRAY FULL) or (RECEIVING TRAY FULL)	Inner tray in the equipment is full • Scanning is enabled	When the bridge unit is installed Resumes printing by removing paper from the tray
14	READY (CHECK STAPLER)	No staples in finisher • Scanning is enabled	Cleared by supplying staples
15	READY (CHECK STAPLER)	Stapling jam occurred in finisher	
16	READY (CHECK SADDLE STITCH STAPLER)	No staples in saddle stitcher • Scanning is enabled	Cleared by supplying staples
17	READY (ADD PAPER) Press JOB STATUS button	No paper in drawer • Scanning is enabled	Cleared by supplying papers
18	READY (FINISHER FULL)	Finisher is full of paper • Scanning is enabled	Resumes printing by removing paper from the finisher
19	READY (HOLE PUNCH DUST BIN IS FULL)	Punching dust box is full • Scanning is enabled	Resumes printing by removing punching dust from the dust box
20	READY (SADDLE STITCH TRAY FULL)	Saddle stitcher tray is full of paper • Scanning is enabled	
21	READY (CHANGE DRAWER TO CORRECT PAPER SIZE)	Incorrect paper size setting	
22	READY (Performing Auto Calibration)	Displayed during image quality control adjustment Scanning is enabled.	

No.	Message	State of equipment	Note
23	Ready for bypass feeding	Paper is set on the bypass tray	
24	COPYING	At the copying state	
25	Auto Start	Auto Start is set during printing	Cleared by pressing the [FUNCTION CLEAR] button
26	Close Large Capacity Feeder	LCF drawer is not installed when feeding from LCF is set	Cleared by installing LCF drawer
27	Close Large Capacity Feeder Door	LCF cover is open when feeding from LCF is set	Cleared by closing the cover
28	Place Doc. Feeder in the down position	RADF is open when original is placed on RADF	Cleared by closing RADF
29	Place originals in the document feeder	Displayed when the conditions are set and the [START] button is pressed with no original placed	Cleared by setting the original
30	Change direction of original	Displayed when the direction of original placed is different from the setting	
31	Place last %d originals in doc. feeder entrance tray	Paper jam occurred during copying (RADF scanning)	
32	Cannot copy this original	Displayed when the original which is not allowed to be copied is placed	Not printed out
33	Add paper	Displayed when the paper in selected drawer is running out	
34	Cannot duplex this size	Displayed when the paper size which is not specified for duplex copying is set	
35	Cannot use this media type	Displayed when the paper size which is not specified for the functions such as stapling or hole punching is set	
36	Copy size: A4/LT only	Displayed when the paper size which is not specified for “Book-type duplex copying” or “Dual-page” is set	
37	Copy size: A4/LT and A4-R/LT-R	Displayed when the paper size which is not specified for “Rotate Sort”	
38	CHANGE DRAWER TO CORRECT PAPER SIZE	Displayed when the selected paper size is not in the drawer	
39	Change drawer to correct media type	Displayed when the selected media type is not in the drawer	
40	Select a paper size for bypass feeding	Displayed when paper size needs to be specified for bypass feeding such as duplex copying	
41	Place the blank sheets in bypass tray and select the paper size	Displayed when no paper is in the selected feeder at Cover Copying Mode	
42	Place the blank sheets in the same direction as the originals	Displayed when the direction of cover page is different from that of other pages at Cover Copying Mode	
43	Place the same size blank sheets as the originals	Displayed when the paper size of cover page is different from that of other pages at Cover Copying Mode	
44	Place insertion sheets in the bypass tray and select the paper size	Displayed when no insertion sheet is in the selected drawer at Sheet Insertion Mode	
45	Select the same size insert1 sheets as the originals	Displayed when the size of insertion sheet (sheet 1) is different from that of other pages at Sheet Insertion Mode	

No.	Message	State of equipment	Note
46	Select the same size insert2 sheets as the originals	Displayed when the size of insertion sheet (sheet 2) is different from that of other pages at Sheet Insertion Mode	
47	Set insert1 sheets in the same direction as the originals	Displayed when the direction of insertion sheet (sheet 1) is different from that of other pages at Sheet Insertion Mode	
48	Set insert2 sheets in the same direction as the originals	Displayed when the direction of insertion sheet (sheet 2) is different from that of other pages at Sheet Insertion Mode	
49	Set transparency film in A4/ LT direction	Displayed when the selected paper size is other than A4/LT at OHP mode	
50	CHECK PAPER IN LARGE CAPACITY FEEDER	Papers in LCF are set incorrectly	
51	CANNOT PUNCH THIS SIZE PAPER	Displayed when the selected paper size is not specified for hole punching	
52	Remove paper from the finisher	Displayed when the paper sizes are mixed at Staple Sorting Mode	
53	Cannot staple this size	Displayed when the paper size is not specified for stapling at Staple Sorting Mode	
54	Remove paper from the saddle stitch unit	Finisher is full of papers	
55	Examine stapler	Trouble in the stapler unit in finisher	
56	Check staple cartridge	No stapler in finisher section	
57	Check staple cartridge in the saddle stitch unit	No stapler in saddle stitch unit	
58	Job interrupted job 1 saved	Interrupt copying is accepted	
59	Ready to resume job 1	Interrupt copying is cancelled (finished)	
60	Cannot use AMS mode	Displayed when reproduction ratio is set to be over 200% at AMS Mode on RADF	Set the reproduction ratio 200% or below manually
61	More than 200% is not available	Displayed when reproduction ratio is set manually to be over 200% on RADF	Set the reproduction ratio 200% or below
62	Updated the template setting	Displayed when the template stored is recalled by pressing [TEMPLATE] button	
63	Enter Department Code	Displayed when a button is pressed while the department management setting is available	
64	Cannot copy BLACK mode Check DEPARTMENT COUNTER	Displayed when the number of printouts exceeds the limit number of department counter	
65	Cannot copy FULL COLOR mode Check DEPARTMENT COUNTER	Displayed when the number of printouts exceeds the limit number of department counter	
66	Cannot copy TWIN COLOR mode Check DEPARTMENT COUNTER	Displayed when the number of printouts exceeds the limit number of department counter	
67	Cannot copy Check DEPARTMENT COUNTER	Displayed when the number of printouts exceeds the limit number of department counter	

No.	Message	State of equipment	Note
68	Not enough memory to store original(s) Will you print out stored originals?	Displayed for confirming with the user whether to copy the data stored in the memory in its full state	Displayed only in Copying Function
69	Not enough memory to store original(s) Will you send stored originals in?	Displayed for confirming with the user whether to send the FAX data stored in the memory in its full state	Displayed only in FAX Function
70	Not enough memory to store original(s) Will you save stored originals in?	Displayed for confirming with the user whether to save the scanning data stored in the memory in its full state	Displayed only in FAX Function
71	The number of originals exceeds the limits Will you copy stored originals?	Displayed for confirming with the user whether to copy the data stored in the memory when the number of originals exceeds 1000 sheets	Displayed only in Copying Function
72	The number of originals exceeds the limits. Will you send stored originals?	Displayed for confirming with the user whether to send the FAX data stored in the memory when the number of originals exceeds 1000 sheets	Displayed only in FAX Function
73	The number of originals exceeds the limits. Will you save stored originals?	Displayed for confirming with the user whether to save the scanning data stored in the memory when the number of originals exceeds 1000 sheets	Displayed only in Scanning Function
74	Install new Black toner cartridge	No black toner in the cartridge	Displayed when black toner is running out even if other toner still remain. Copying not enabled
75	Install new Yellow toner cartridge	No yellow toner in the cartridge	Black copying is available Other button functions are available
76	Install new Magenta toner cartridge	No magenta toner in the cartridge	Black copying is available Other button functions are available
77	Install new Cyan toner cartridge	No cyan toner in the cartridge	Black copying is available Other button functions are available
78	Install new Y and M toner cartridge	No yellow and magenta toner in the cartridges	Black copying is available Other button functions are available
79	Install new Y and C toner cartridge	No yellow and cyan toner in the cartridges	Black copying is available Other button functions are available
80	Install new M and C toner cartridge	No magenta and cyan toner in the cartridges	Black copying is available Other button functions are available
81	Install new color toner cartridge	Three colors of toner are running out in the cartridges	Black copying is available Other button functions are available
82	Time for periodic maintenance ****	PM cycle Displayed at the time for maintenance Copying is available	
83	READY (CHANGE DRAWER TO CORRECT MEDIA TYPE)	Displays when the printing is stopped because of media type mismatch	
84	PRESS [BASIC] and select normal paper size	Displays the warning that the copy is not enabled when any drawer but bypass feed is selected at Cover Sheet Mode or Sheet Insertion Mode.	
85	Misfeed in copier Press [HELP]	Paper jam in the equipment Displayed when paper jam occurred in the equipment	Remove the paper in the equipment according to the messages displayed on the panel.
86	Call for service	Displayed when motor, sensor, switch, etc. do not work properly	Turn OFF the power and solve the problem, then turn ON the power.

No.	Message	State of equipment	Note
87	Please try again after a while	Displayed when the Department Code can no be keyed in immediately after power-ON.	Leave it for a while and key in the code again
88	Set standard size	Displayed when the paper size which is not acceptable is set (depends on the setting)	Reset the paper size
89	Change from this mode Count over, cannot store anymore	Displayed for confirming with the user whether to copy the data stored in the memory when the number of originals exceeds 1000 sheets in copying one set of originals using the ADF in the non-sort or sort mode; paper exits on the tray except finisher tray 2 in the sort mode.	Reduce the number of the originals to be scanned so as to be less than 1000, and then try again
90	TRU Box needs to be replaced (Please make a service call)	The TRU waste toner box is full	Replace it with a new TRU waste toner box
91	Time for Developer (*) Maintenance (Please make a service call)	The color developer material indicated by an asterisk deteriorates and needs to be replaced.	Check the present number of the performance index in the PM support mode and replace the corresponding color developer material.
92	BLACK TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the black toner is detected abnormally and also when the black toner cartridge is locked	
93	YELLOW TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the yellow toner is detected abnormally and also when the yellow toner cartridge is locked	
94	MAGENTA TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the magenta toner is detected abnormally and also when the magenta toner cartridge is locked	
95	CYAN TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the cyan toner is detected abnormally and also when the cyan toner cartridge is locked	
96	YM TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the YM toner is detected abnormally and also when the YM toner cartridge is locked	
97	YC TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the YC toner is detected abnormally and also when the YC toner cartridge is locked	
98	YK TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the YK toner is detected abnormally and also when the YK toner cartridge is locked	
99	MC TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the MC toner is detected abnormally and also when the MC toner cartridge is locked	
100	MK TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the MK toner is detected abnormally and also when the MK toner cartridge is locked	
101	CK TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the CK toner is detected abnormally and also when the CK toner cartridge is locked	

No.	Message	State of equipment	Note
102	YMC TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the YMC toner is detected abnormally and also when the YMC toner cartridge is locked	
103	YMK TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the YMK toner is detected abnormally and also when the YMK toner cartridge is locked	
104	YCK TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the YCK toner is detected abnormally and also when the YCK toner cartridge is locked	
105	MCK TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the MCK toner is detected abnormally and also when the MCK toner cartridge is locked	
106	YMCK TONER NOT RECOGNIZED. SHAKE THE CARTRIDGE, INSTALL IT AGAIN.	Displayed when a rotation of the YMCK toner is detected abnormally and also when the YMCK toner cartridge is locked	
107	BLACK TONER NOT RECOGNIZED.	Displayed when the black toner is a non-genuine one	
108	YELLOW TONER NOT RECOGNIZED.	Displayed when the yellow toner is a non-genuine one	
109	MAGENTA TONER NOT RECOGNIZED.	Displayed when the magenta toner is a non-genuine one	
110	CYAN TONER NOT RECOGNIZED.	Displayed when the cyan toner is a non-genuine one	
111	YM TONER NOT RECOGNIZED.	TDisplayed when the YM toner is a non-genuine one	
112	YC TONER NOT RECOGNIZED.	Displayed when the YC toner is a non-genuine one	
113	YK TONER NOT RECOGNIZED.	Displayed when the YK toner is a non-genuine one	
114	MC TONER NOT RECOGNIZED.	Displayed when the MC toner is a non-genuine one	
115	MK TONER NOT RECOGNIZED.	Displayed when the MK toner is a non-genuine one	
116	CK TONER NOT RECOGNIZED.	Displayed when the CK toner is a non-genuine one	
117	YMC TONER NOT RECOGNIZED.	Displayed when the YMC toner is a non-genuine one	
118	YMK TONER NOT RECOGNIZED.	Displayed when the YMK toner is a non-genuine one	
119	YCK TONER NOT RECOGNIZED.	Displayed when the YCK toner is a non-genuine one	
120	MCK TONER NOT RECOGNIZED.	Displayed when the MCK toner is a non-genuine one	
121	YMCK TONER NOT RECOGNIZED.	Displayed when the YMCK toner is a non-genuine one	
122	READY (Check the staples in the stapler.)	Displayed when the stapler is not in its normal state. (A warning for preventing staple jams)	

4.3 Relation between the Equipment State and Operator's Operation

The relations between the statuses of the MFP and operations are shown below. The displayed contents may differ depending on the features or the options mounted.

Operation	During READY status	During warming-up	Auto job start reserved	Scanning original/ Scanning original and printing out the copy
Press [ENERGY SAVER] button	Switches to energy saving mode	Display not changed	Display not changed	Display not changed
Press [INTERRUPT] button	Switches to interrupt mode	Display not changed	Display not changed	Display not changed (LED blinking)
Press [FUNCTION CLEAR] button after setting the copy mode	Copy mode is cleared after the copy mode is set	Copy mode is cleared after the copy mode is set	Auto job start cancelled	Display not changed
Press [STOP] button	Display not changed	Display not changed	Auto job start cancelled	Scanning or printing out stops, and "READY Press START to copy" and "MEMORY CLEAR" are displayed
Press [CLEAR] button after setting the copy mode	Number of printouts changes to 1 while the setting remains unchanged after the copy mode is set	Number of printouts changes to 1 while the setting remains unchanged after the copy mode is set	Display not changed	Display not changed
Press [CLEAR] button after keying in numbers (digital keys)	Number keyed in changes to 1 after being entered	Number keyed in changes to 1 after being entered	Display not changed	Display not changed
Press [FAX] button	Displays FAX screen	Display not changed	Display not changed	Display not changed
Press [COPY] button	Display not changed	Display not changed	Display not changed	Display not changed
Press [SCAN] button	Displays SCAN screen	Display not changed	Display not changed	Display not changed
Press [USER FUNCTIONS] button	Displays USER FUNCTIONS screen	Display not changed	Display not changed	Display not changed
Press [START] button with the original set on RADF	Displays "COPYING"	"Wait Warming Up Auto Start" is displayed	Display not changed	Display not changed

Operation	Printing out the copy	During paper jam	When interrupting	When displaying HELP screen	During energy saving mode
Press [ENERGY SAVER] button	Display not changed	Display not changed	Display not changed	Switches to energy saving mode	Energy saving mode is cleared and displays BASIC screen
Press [INTERRUPT] button	Display not changed (LED blinking)	Display not changed	Returns to the status before interrupting	Switches to interrupting mode	Display not changed
Press [FUNCTION CLEAR] button after setting the copy mode	Copy mode is cleared after the copy mode is set	Display not changed	Copy mode is cleared after the copy mode is set	Displays BASIC screen after the copy mode is set and then cancelled	Display not changed
Press [STOP] button	Printing out stops, and “READY Press START to copy” and “MEMORY CLEAR” are displayed	Display not changed	Display not changed	Display not changed	Display not changed
Press [CLEAR] button after setting the copy mode	Number of printouts changes to 1 while the setting remains unchanged after the copy mode is set	Display not changed	Number of printouts changes to 1 while the setting remains unchanged after the copy mode is set	Number of printouts changes to 1 while the setting remains unchanged after the copy mode is set	Display not changed
Press [CLEAR] button after keying in numbers (digital keys)	Number keyed in changes to 1 after being entered	Display not changed	Number keyed in changes to 1 after being entered	Number keyed in changes to 1 after being entered	Display not changed
Press [FAX] button	Displays FAX screen	Display not changed	Display not changed	Displays FAX screen	Displays FAX screen
Press [COPY] button	Display not changed	Display not changed	Display not changed	Display not changed	Displays COPY screen
Press [SCAN] button	Displays SCAN screen	Display not changed	Display not changed	Displays SCAN screen	Displays SCAN screen
Press [USER FUNCTIONS] button	Displays USER FUNCTIONS screen	Display not changed	Display not changed	Displays USER FUNCTIONS screen	Display not changed
Press [START] button with the original set on RADF	Displays “COPYING” and RADF starts feeding	Display not changed	Displays “COPYING” and RADF starts feeding	Displays “COPYING” and RADF starts feeding	Energy saving mode is cleared and displays BASIC screen

4.4 Self-diagonsis modes

The self-diagnostic mode enables you to check or adjust the status of the equipment. You can enter it by pressing the following buttons.

Mode	For start	Contents
Control panel check mode	[0] + [1] + [POWER]	All LEDs on the control panel are lit, and all the LCD pixels blink.
Test mode	[0] + [3] + [POWER]	Checks the status of input/output signals.
Test print mode	[0] + [4] + [POWER]	Outputs the test patterns.
Adjustment mode	[0] + [5] + [POWER]	Adjusts various items.
Setting mode	[0] + [8] + [POWER]	Sets various items.
Setting mode	[5] + [C] + [POWER]	Initializes HDD or database.
List print mode	[9] + [START] + [POWER]	Prints out the data lists of the codes 05 and 08, PM support mode, pixel counter, error history, firmware upgrade log and power ON/OFF log, and also outputs them in a CSV format.
PM support mode	[6] + [START] + [POWER]	Clears each counter.
Firmware update mode	[4] + [9] + [POWER]	Performs firmware update with USB media
	[8] + [9] + [POWER]	Performs firmware update with download jig.
Password reset mode	[4] + [8] + [9] [POWER]	Resets both the admin and the Service Tech passwords.

How to enter each mode
While simultaneously pressing the two digital keys assigned to each mode (e.g. [0] and [5]), use the main power switch to turn the power ON.
When the authentication screen appears, press [OK]. (Enter the password, if one has been set.)

Notes: To exit from Adjustment mode and Setting modde

- Shut down the equipment. When the power should be turned OFF, be sure to shut down the equipment by pressing the [ON/OFF] button for a few seconds.
- Buttons mounted may differ according to the model. Follow instructions for the model that you use.

Remarks: Types of passwords

- Admin password
  This password enables settings and operations (including the change of a Service Tech Password) permitted only for administrators.
- Service Tech Password
  This password enables settings and operations in self-diagnostic modes and service UI. (The same password is used for both of the self-diagnostic modes and the service UI.)

4.5 Error Cord

When some kind of trouble occurs in the MFP, an error code is displayed on the LCD screen on the control panel to figure out what it is.
It is classified as follows.

Errors beginning with "E" (E-error):	E110, E120, etc.	An error, which occurs if paper transport is checked by a sensor and the process is not performed within a specified time This is mainly caused by a defective part related to paper transport.
Errors beginning with "C" (C-error):	C470, C130, etc.	An error, which occurs if the set operation is not correctly performed, such as a fixed temperature does not reach the defined range within the set period If an E-error occurs several times (mainly 3 times), it may become a C-error.
Errors beginning with "F" (F-error):	F010, F200, etc.	A system-related error, which occurs if an update of firmware or accessing to a memory fails
Errors beginning with a number:	1F10, 3E50, etc.	A network-related error.

Errors should be basically cleared following the procedure below.

1. Check which error code is displayed on the LCD screen.
2. Perform troubleshooting for the error code described in Service Manual or Service Handbook for the corresponding model.
3. When an error code for paper jamming is displayed, this error can be cleared by removing the paper jammed in the equipment.
4. Some errors can be cleared by turning the power OFF and then back ON, or opening and closing the front cover.
5. If an error code indicating a toner cartridge is not detected is displayed, open and close the front cover. If the equipment detects that a toner cartridge is installed, the error is cleared.

5. SCANNER

5.1 General Description

In the scanning section, the surface of the original is irradiated with a direct light and the reflected light is led through mirrors, a lens and a slit to CCD. A lens and a slit to CCD where optical-to-electrical conversion is performed, converting the optical image data into an electrical (analog) signal. This analog signal is changed to a digital signal, which then undertakes various corrective processes necessary for image formation. After that, arithmetic operation is performed on the digital signal, which is then transmitted to the data writing section.

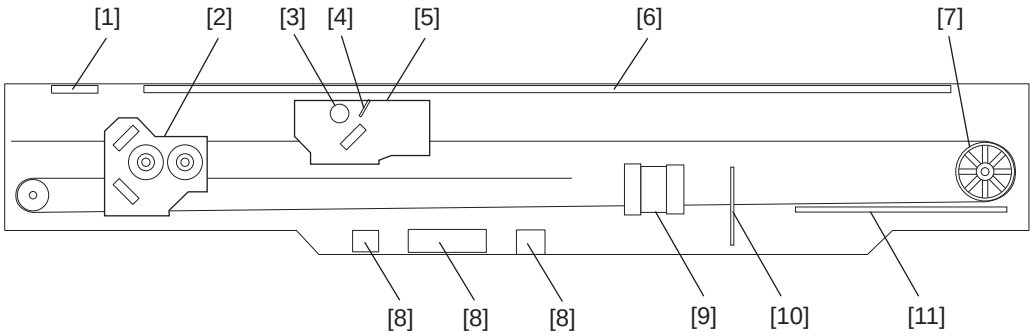


Fig.5-1

[1] RADF original glass
[2] Carriage-2
[3] Exposure lamp
[4] Reflector
[5] Carriage-1
[6] Original glass
[7] Drive pulley
[8] Automatic original detection sensor
[9] Lens
[10] CCD board
[11] SLG board

5.2 Construction

Scanner	
Original glass	Original glass
	RADF original glass
Carriage-1	Exposure lamp
	Inverter board
	Reflector
	Mirror-1
Carriage-2	Mirror-2
	Mirror-3
Lens unit	
CCD driving PC board	
Automatic original detection sensor	
Driving section	Scan motor • Wire drive • Driving the carriage-1 and carriage-2
Other	Scanning section control PC board
	Carriage home position sensor
	Platen sensor)
	Rubber damper
	SLG board cooling fan
	Exposure lamp cooling fan
	Scanner unit cooling fan

5.3 Functions

The following shows the construction and purpose of the scanning system:

1. Original glass
   This is a glass for placing original. The light from the exposure lamp is irradiated to the original through this glass.
   The ADF original glass is used when original is read with the Automatic Document Feeder. Original is transported on the ADF original glass by the Automatic Document Feeder, and the transported original is read under the ADF original glass by the carriage. Do not use such solvents as alcohol when cleaning the surface of the ADF original glass, because it is coated so as not to be scratched by originals.

2. Carriage-1
   Carriage-1 consists of the exposure lamp, Inverter board, reflector, mirror, etc. It is driven by the scan motor and scans an original on the glass.

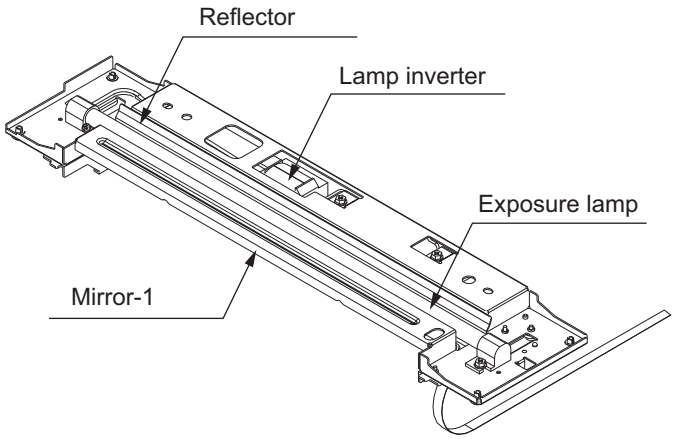


Fig.5-2

- Exposure lamp
  This lamp is the light source to irradiate the original on the glass.

- Inverter board
  Controls lighting of the exposure lamp.

- Reflector
  This is a plate to efficiently direct the light from the exposure lamp to the surface of the original on the glass.

- Mirror-1
  This mirror directs the light reflected from the original to the mirror-2 described later.

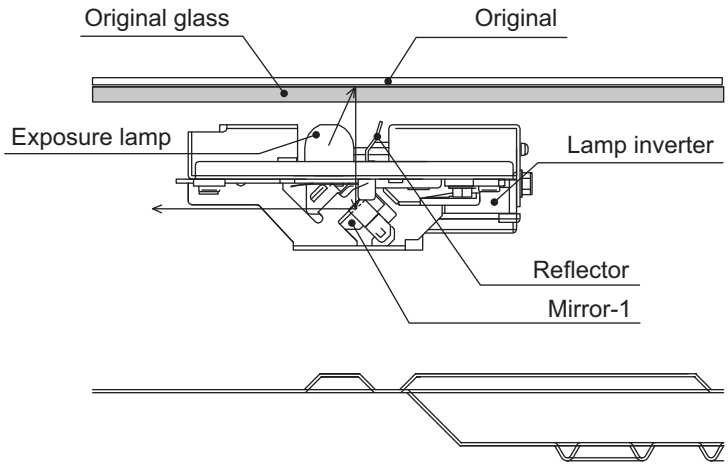


Fig.5-3

3. Carriage-2
   Carriage-2 mainly consists of the mirror-2, mirror-3, etc. and directs the reflected light from the mirror-1 through the mirrors-2 and -3 to the lens.
   This carriage is driven by the same scan motor as that for the carriage-1 at half the scanning speed of the carriage-1 (The scanning distance is also half that of the carriage-1).

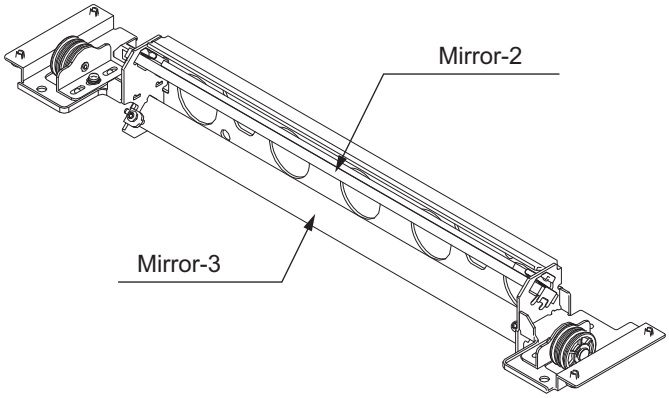


Fig.5-4

4. Lens unit
   The light reflected from the mirror-3 is led to the CCD placed at the focal point of the lens which is fixed in a position.

5. CCD driving PC board
   Processes such as signal amplification, signal integration and A/D conversion are applied on the electrical signal which was converted by CCD.

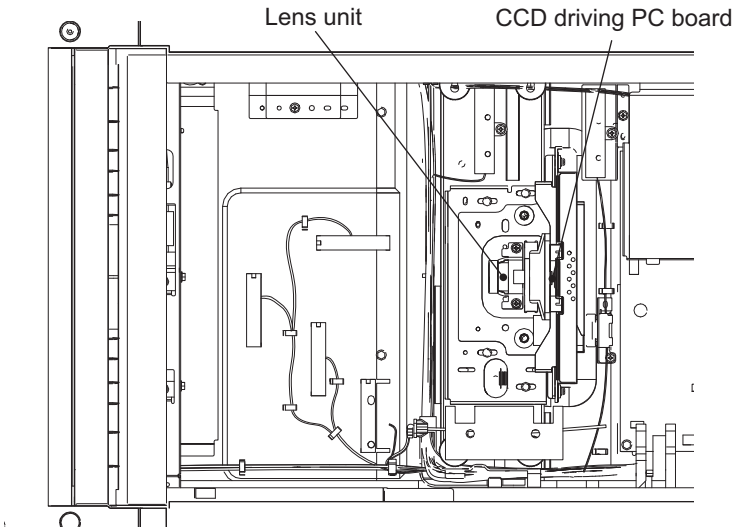


Fig.5-5

6. CCD
   Models with a color scanner use either a 3-line CCD consisting of 3 color devices (red, green and blue) or a 4-line CCD consisting of 3 color devices (red, green and blue) plus 1 black device.
   In a 3-line CCD, color devices covered with corresponding color filters (red, green and blue) are arranged in 3 lines. Meanwhile, a 4-line CCD consists of 3-line color devices covered with corresponding color filters (red, green and blue) plus 1 black device with no filter are arranged in 4 lines. These color filters perform color separation.

7. Scanning section control PC board
   This is a board to perform the image correction, such as the shading correction and 3-line correction, and control the scan motor and exposure lamp.

8. Automatic original detection sensor
   The size of an original placed on the glass is instantly detected using the automatic original detection sensors fixed on the base frame without moving the carriage-1.

5.4 Description of Operation

5.4.1 Scanning operation

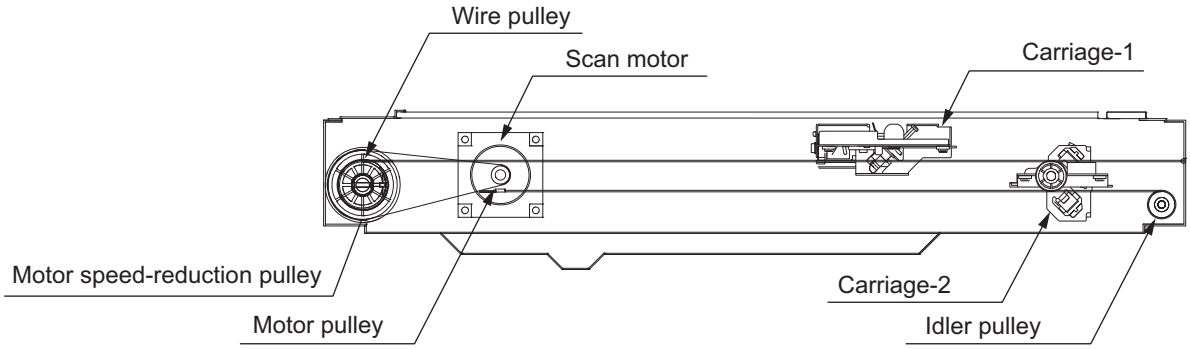


Fig.5-6

- Scanning of an original placed on the original glass
  This motor drives the carriages-1 and -2 through the timing belt and carriage wire. First, the scan motor drives the carriages-1 and -2 to their respective home positions. The home positions are detected when the carriage-1 passes the home position sensor. When the [START] button is pressed, the both carriages start to move and scan the original on the glass.

- Scanning of an original placed on the RADF
  The carriage-1 stays at the shading position during shading correction, and at the scanning position during scanning operation.

5.5 Electric Circuit Description

5.5.1 Exposure Lamp Control Circuit

[1] General description

Control circuit for the exposure lamp consists of the following two blocks:

1. Lighting device for the exposure lamp (Inverter board)
   Turns ON/OFF the exposure lamp.

2. CCD board
   This circuit converts the reflected light amount from the original surface and the shading correction plate to electrical signals. The exposure amount is controlled in two ways:
   - White reference formation - reads the reflected light amount from the white shading correction plate
   - Black reference formation - reads the light amount at the regulation position with the exposure lamp lights OFF

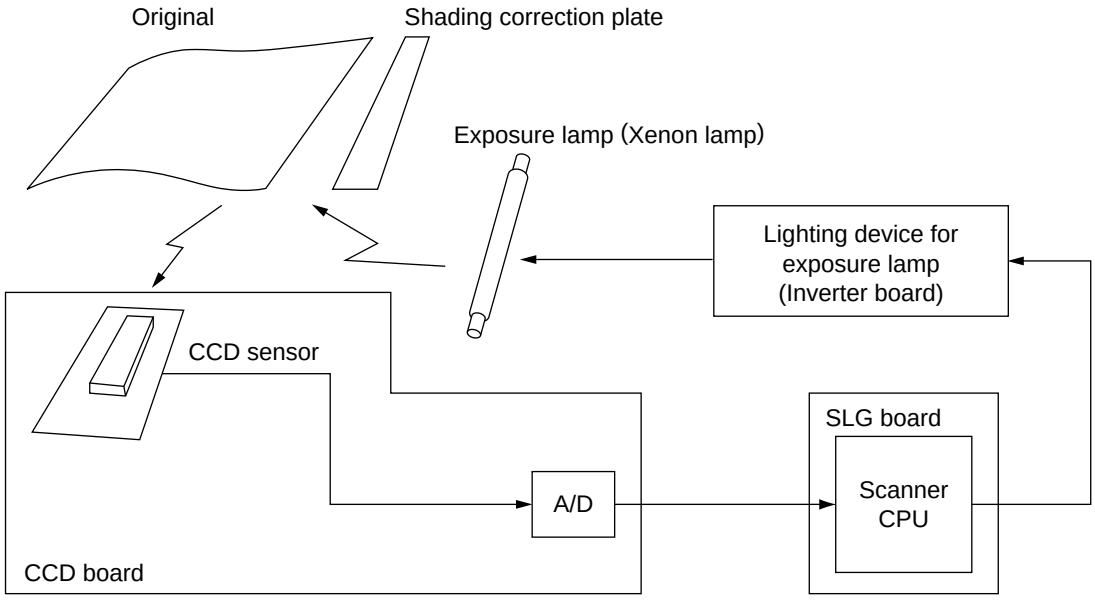


Fig.5-7

5.5.2 General Description of CCD Control

[1] Shading correction

Signal voltages read by the CCD have the following characteristics:

1. Light source has a variation in its light distribution.

2. Since the light beam reflected from the original is converged using a lens, the light path is the shortest at the center of the CCD and the longest at ends. This causes difference in the amount of light reaching the CCD (i.e. the light amount is maximum at the CCD center, gradually decreases toward ends).

3. Each of the multiple elements varies in its opto-electronic conversion efficiency.

5.5.3 Automatic Original Size Detection Circuit

This circuit detects the size of original (standard sizes only) using the reflection type photosensors arranged on the base frame of the scanner unit.

[A4 Series]

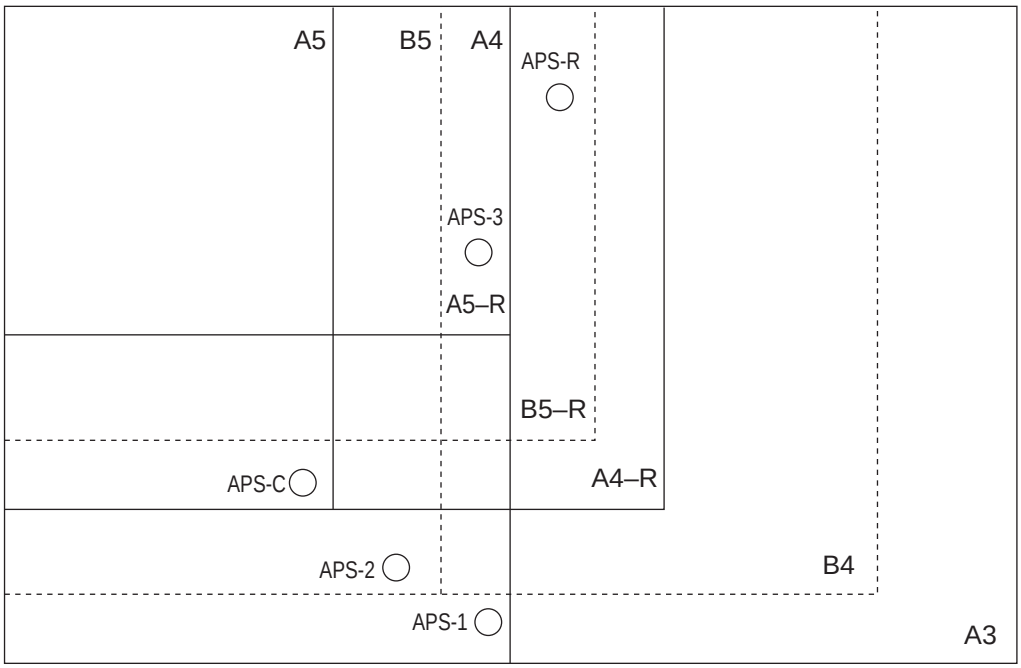


Fig.5-8

[LT Series]

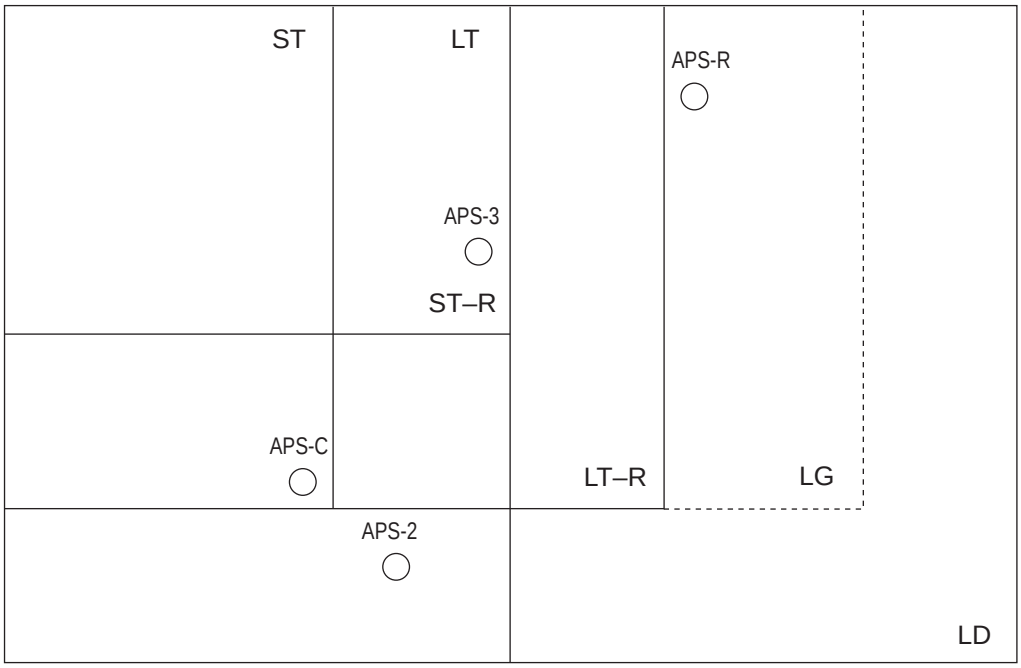


Fig.5-9

6. IMAGE PROCESSING

6.1 General Description

The following diagram shows the process from the input data to writing data on the photoconductive drum surface.

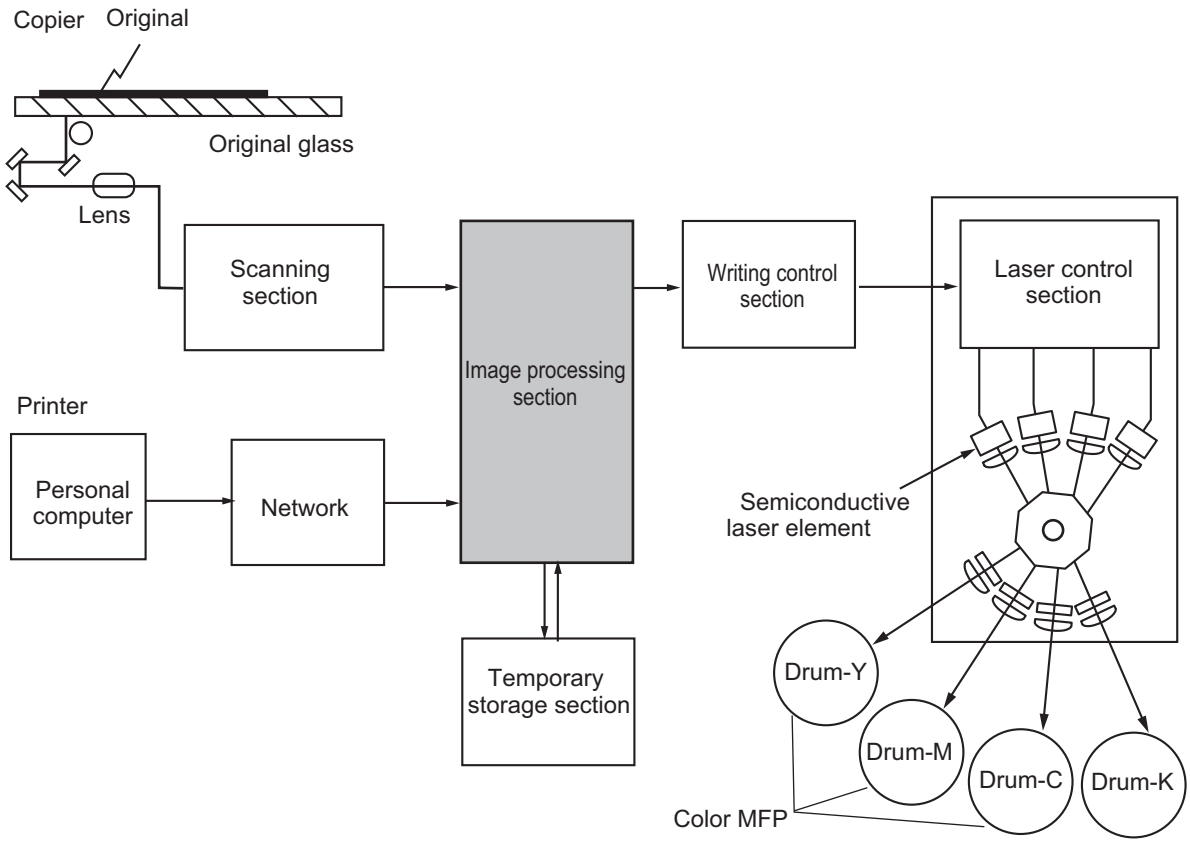


Fig.6-1

Notes:
Only the drum-K is installed in the black MFP.

Image of an original placed on the original glass is scanned by the optical system. The CCD (Charge Coupled Device) reads the optical image signals and converts them into the electrical signals. The electrical signals are amplified and undergo analog-to-digital conversion, then are changed into digital signals. Shading correction (correction of variance in CCD elements and the light source) is performed and the digital signal is output as an image signal from the scanning control section.
The image processing section inputs the image signal from the scanning control section and applies various image processing on the signal, then transmits the output result to the writing control section.

7. LASER OPTICAL UNIT

7.1 General Description

The laser optical unit radiates the laser beam onto the photoconductive drum responding to the digital image signals transmitted from the scanner, USB, network, etc. to create the latent image. Image signal is converted into the light emission signal of the laser diode on the laser driving PC board (LDR), then radiated on the drum through the optical elements such as cylinder lenses, polygonal mirror and fθ lens. The unit must not be disassembled in the field as they are very sensitive to dust and finely adjusted at the factory.

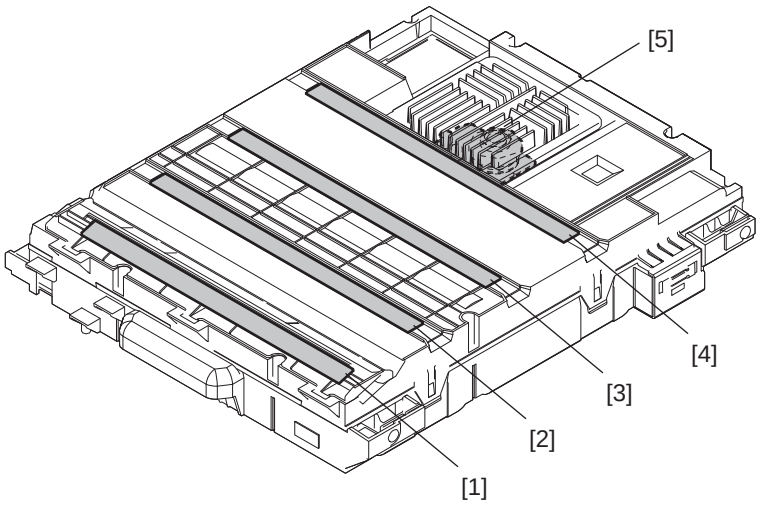


Fig. 7-1

[1] Slit glass-Y
[2] Slit glass-M
[3] Slit glass-C
[4] Slit glass-K
[5] Polygonal motor

7.2 Structure

Laser optical unit	
Laser emission unit	Laser diode)
	Fine focus lens
	Aperture
	Cylinder lens
	Laser driving PC board)
Polygonal motor unit	Polygonal motor
	Polygonal mirror
	Polygonal motot cover / base
fθ lens-1	
fθ lens-2	
Mirror	
Slit glass	
H-sync signal detection PC board	

1. Laser emission Unit
   This unit consists of the laser diode, finite focus lens, aperture and cylinder lens.
   - Laser diode
     This laser diode features low droop, small laser variation and low threshold current.
     The aperture limits the primary and secondary scanning laser beam shapes at the laser irradiation position.
     Laser diode radiates the laser beams responding to the laser emission control (ON/OFF) signals from the laser driving PC board (LDR). Laser beams which passed through the finite focus lens are focused on the drum surface.

     The following figure shows the laser beam being emitted from the apertures of the laser diode.
     A single-beam array laser diode is mainly used for the laser emission unit; however, some models adopt a four-beam array type laser diode for faster radiation.
     Four-beam array type: Four laser beams are emitted from one color laser diode.

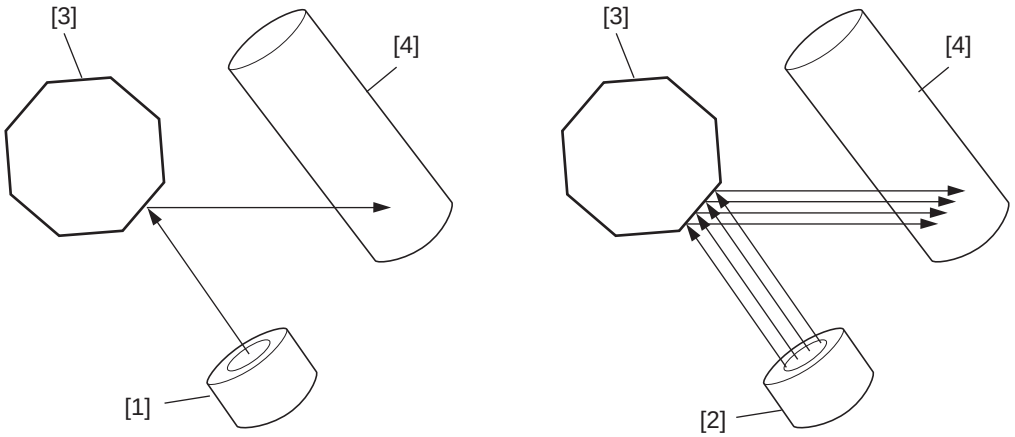


Fig. 7-2

[1] Laser diode(1-beam)
[2] Laser diode(4-beam)
[3] Polygonal motor
[4] Drum

2. Polygonal motor unit
This unit consists of the polygonal motor, polygonal mirror and polygonal mirror cover.

a. Polygonal motor
This motor rotates the polygonal mirror in high speed. The DC motor controls the rotation speed of the mirror motor:

b. Polygonal mirror
This mirror reflects the emitted laser beams (four beams per color).
As the polygonal mirror is rotated by the polygonal motor, the reflected laser lights moves in sync with the rotation. The direction of the movement is the primary scanning direction of the image. One scan is performed on one plane of the polygonal mirror.
As the polygonal motor has eight planes, eight scans are performed in one rotation.

c. Polygonal mirror cover / base
Polygonal mirror cover reduces the windage loss and noise, prevents adhesion of foreign matters onto the mirror surface and releases heat.

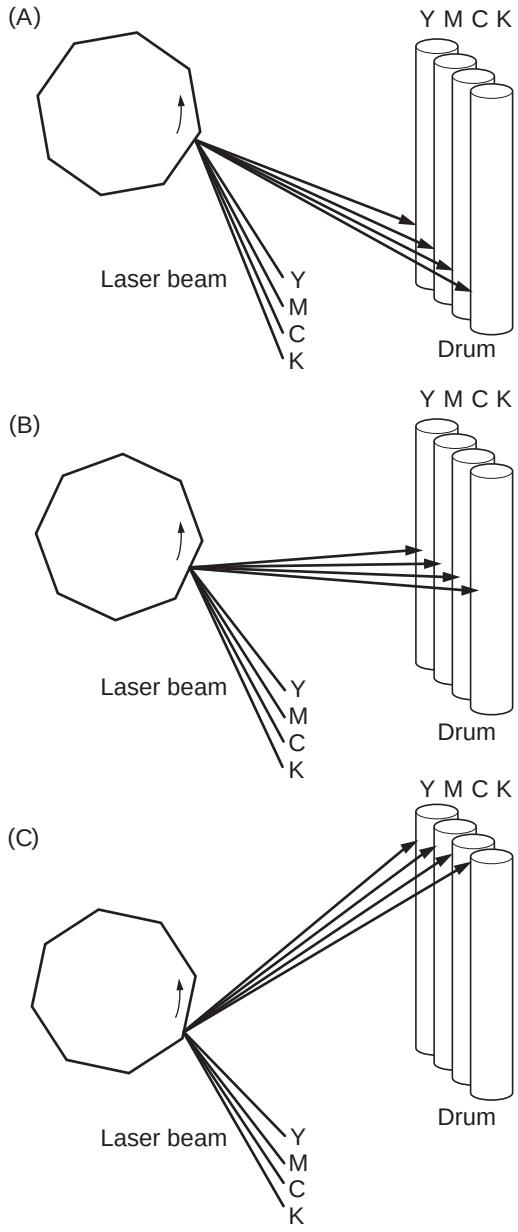


Fig. 7-3

The above images show the laser beams reflecting off the polygonal mirrors.
One scan is completed by one completion of steps (A) to (C).
One scan is performed on one plane of the polygonal mirror.
Eight scans can be performed in one rotation.

3. fθ lenses-1 and -2
   These two lenses perform the following adjustment on the laser beams reflected by the polygonal mirror.

   a. Uniform-velocity scanning
      Since the polygonal mirror is rotating at a uniform velocity, the laser beam reflected from the mirror scans over the drum surface at a uniform angular velocity; namely, the pitch between the dots on the drum is wider at both ends than at the center of the scanning range. The fθ lenses help to correct this difference, making all the dot-to-dot pitches equal on the drum surface.

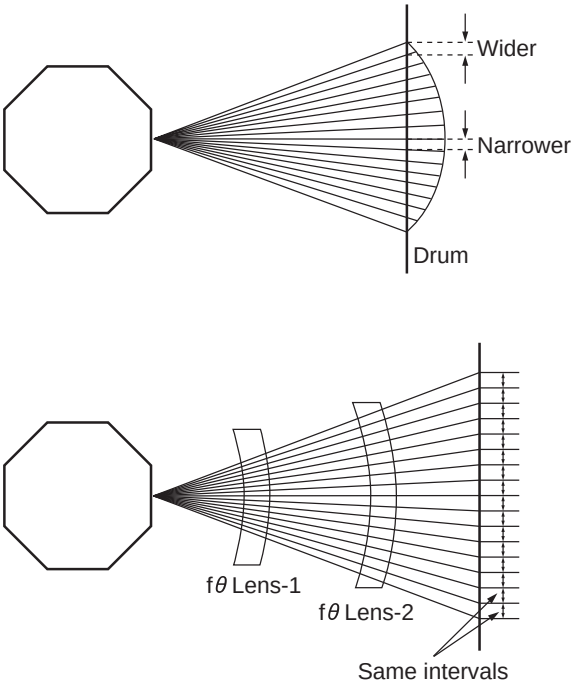


Fig. 7-4

   b. Face tilt correction
      The reflecting face of the polygonal mirror is tilted slightly to one side against the perfect vertical. Horizontal deviation of the laser light which is caused by the tilt is corrected.

   c. Sectional shape of laser beam
      The shape of the laser beam spotted on the drum is adjusted.

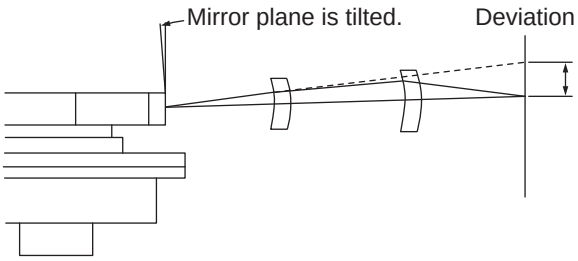


Fig. 7-5

4. H-Sync signal detection PC board
   The laser light which is started to be scanned from one of the reflected plane of the polygonal mirror is reflected by the H-Sync detection mirror and enters the PIN diode on the H-Sync signal detection PC board. The primary scanning synchronizing signal is generated based on this reflection.

5. Slit glass
   The slit glass is located where the laser beams are output from the laser optical unit, and it protects the unit from dust.
   Also, the shutter is attached to the upper side of the slit glass in order to prevent toner or dust from adhering to the slit glass, and it is normally closed. It is closed/opened by the shutter motor. It is opened just before the laser beams are emitted and it closes just after the emission is finished.
   If toner or dust adheres to the slit glass, images are affected. Clean the slit glass with a brush attached to the shutter.

6. Reflecting mirrors
   These reflecting mirrors reflect and lead the laser beams scanned by the polygonal mirror and corrected by the fθ lenses to the drum. The laser beams of Y, M, C and K colors are directed to the drum by respectively different routes using one mirror for Y color beam and three each for M, C and K color beams.

7. Mirror motor
   At each of the third reflecting mirrors for M, C and K color laser beams, a mirror motor is installed to make tilt adjustment for the mirror. The parallel correction for the four scanning lines is performed by adjusting the tilt of mirrors in the following manner:
   a. A test pattern is written on the transfer belt. This is read by the Image position aligning sensors to recognize the error in scanning lines.
   b. With the Y color scanning line as a standard, a mirror motor installed at each of the M, C and K color beam mirrors is driven to adjust the degree of laser beam parallelization by inclining the mirror.

7.3 LED print head

1. LED print head
   This uses an LED as its light source for radiating direct light onto the photoconductive drum.

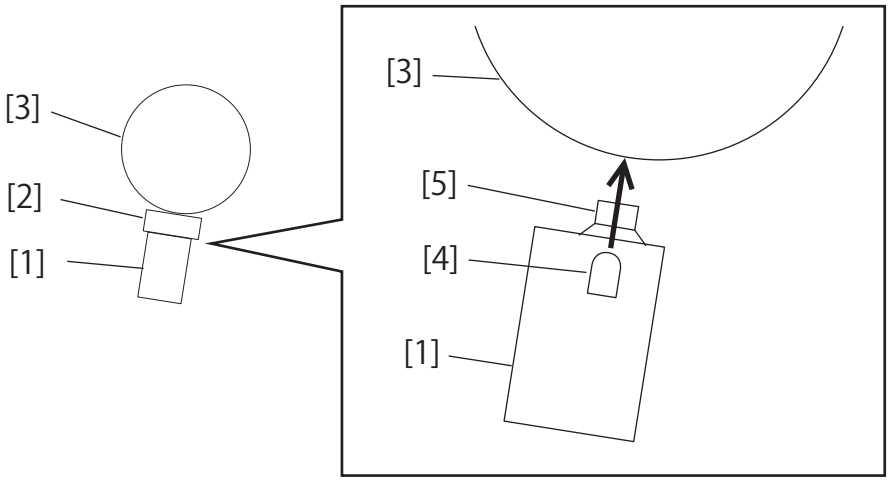


Fig. 7-6

[1] LED print head
[2] LED gap spacer (front/rear)
[3] Drum
[4] LED
[5] Lens

2. Difference between the laser unit and the LED head
   To form images, the laser unit diffuses light from its light source using lenses, reflects the light onto the reflecting mirrors and exposes the photoconductive drum to the reflected light. On the other hand, the LED print head emits light from its LEDs arranged in a line directly onto the photoconductive drum.
   Therefore the LED print head has advantages such as more space-saving, requiring fewer parts, easier adjustment, longer life, less noise and a shorter light path, compared with the laser unit. However, the LED print head has some points for which special care must be taken in image processing, such as an uneven light output or the necessity of strict control of the distance between the LED print head and the photoconductive drum.

8. PAPER FEEDING SYSTEM

8.1 General Descriptions

This chapter explains how the system works to pick up paper from the drawer or bypass tray and transport it to the 2nd transfer position.
The paper feeding system mainly consists of the pickup roller, feed roller, separation roller, transport roller, registration roller, bypass paper sensor, drawer empty sensor, bypass feed sensor, drawer feed sensor, registration sensor and drive system for these components. The above rollers are driven by the transport motor, feed motor, feed/transport motor and registration motor, etc.

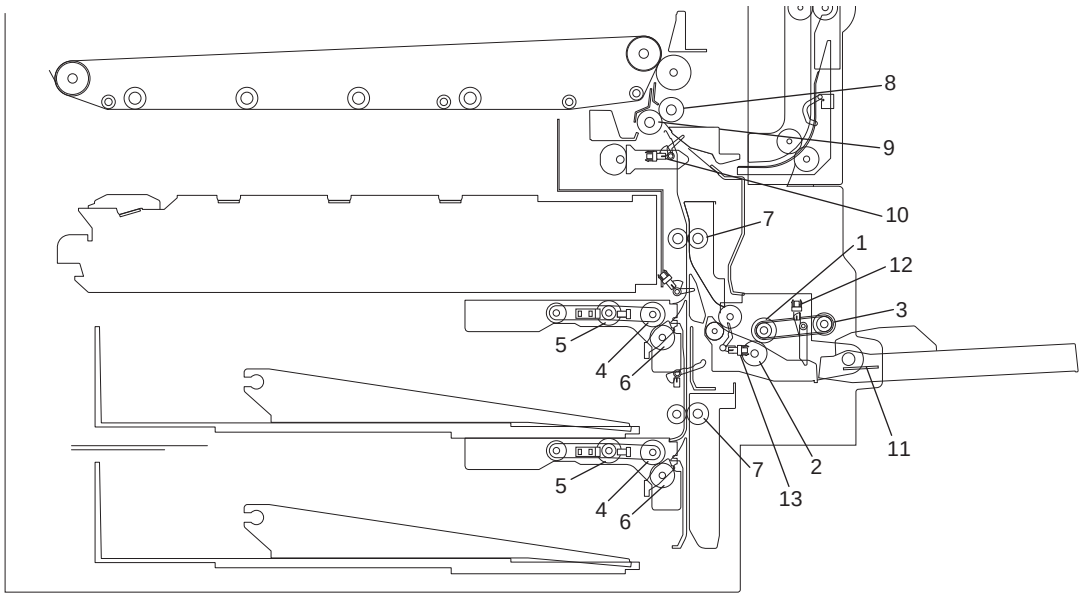


Fig.8-1

No.	Name
1	Bypass feed roller
2	Bypass separation roller
3	Bypass pickup roller
4	Drawer feed roller
5	Drawer separation roller
6	Drawer pickup roller
7	Drawer transport roller
8	Registration roller (rubber roller)
9	Registration roller (metal roller)
10	Registration sensor
11	Bypass paper size detection sensor
12	Bypass paper sensor
13	Bypass feed sensor
14	Bypass separation pad

<Tandem LCF model>

The composition of the 1st and the 2nd drawers of the Tandem LCF model is the same as that of the 4-drawer model.
The 3rd and the 4th drawers are not installed but instead the Tandem LCF is installed.

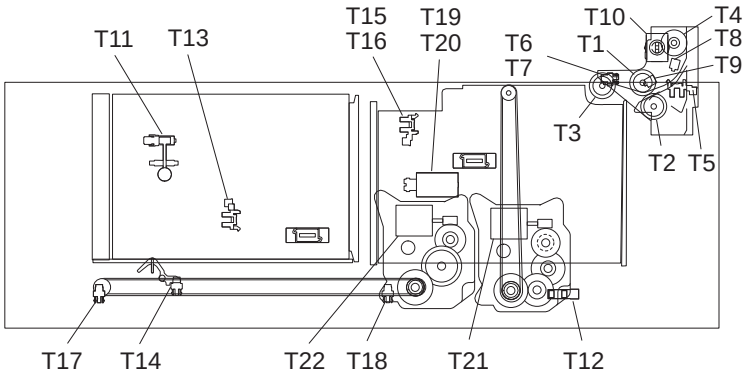


Fig.8-2

No.	Name	No.	Name
T1	Tandem LCF feed roller	T12	Tandem LCF bottom sensor
T2	Tandem LCF separation roller	T13	Standby side tray detection sensor
T3	Tandem LCF pickup roller	T14	Standby side empty sensor
T4	Tandem LCF transport roller	T15	Stopper opening/closing detection sensor (front)
T5	Tandem LCF detection sensor	T16	Stopper opening/closing detection sensor (rear)
T6	Tandem LCF empty sensor	T17	End fence home position sensor
T7	Tandem LCF tray-up sensor	T18	End fence stop position sensor
T8	Tandem LCF transport sensor	T19	Stopper opening/closing solenoid (front)
T9	Tandem LCF feed sensor	T20	Stopper opening/closing solenoid (rear)
T10	Tandem LCF solenoid	T21	Tandem LCF tray-up motor
T11	Standby side tray paper amount detection sensor	T22	Tandem LCF end fence motor

8.2 Composition

Feeding system	
1st / 2nd / 3rd / 4th drawer feeding unit	Drawer pickup roller
	Drawer feed roller
	Drawer separation roller
	Drawer transfer roller
	Drawer feed sensor
	Drawer transport sensor
	Drawer tray-up sensor
	Drawer empty sensor
	Drawer detection sensor
Bypass feeding unit	Bypass pickup roller
	Bypass feed roller
	Bypass separation roller
	Bypass separation pad
	Bypass paper roller
	Bypass feed sensor
	Bypass transport sensor
	Bypass pickup solenoid
	Bypass motor
Drive section, other	Drawer transport clutch
	Drawer feed clutch
	Transport motor
	Feed motor
	Feed/transport motor
	Registration motor
	Registration roller
	Registration sensor
	Transfer belt paper clinging detection sensor
	Tray-up motor
Tandem LCF	Tandem LCF pickup roller
	Tandem LCF feed roller
	Tandem LCF separation roller
	Tandem LCF transport roller
	Tandem LCF feed sensor
	Tandem LCF transport sensor
	Tandem LCF pickup solenoid
	Tandem LCF end fence motor
	Tandem LCF tray-up motor

8.3 Functions

1. Pickup roller (drawers, bypass tray and Tandem LCF)
   This roller draws out paper from the bypass tray, a drawer or the Tandem LCF and transports it to the feed roller.
   The bypass pickup roller moves up and down to feed paper from the bypass tray.

2. Feed roller (Drawers and bypass feed)
   This roller is placed against the separation roller. It transports the paper from the pickup roller to the transport roller.

3. Separation roller (Drawers and bypass feed)
   This roller is placed against the feed roller. When two sheets of paper or more are transported from the pickup roller, the load of the torque limiter of the separation roller is heavier than the frictional force between the sheets. As the result, the separation roller is stopped and the lower paper is not advanced any further. When only one sheet is transported from the pickup roller, the separation roller rotates following the feed roller.

4. Transport roller (Drawers and bypass feed)
   This roller transports the paper sent from the feed roller to the registration roller.

5. Registration roller
   Paper transported from the transport roller is pushed against the registration roller which aligns the leading edge of the paper.
   Then, the registration rollers rotate to transport the paper to the transfer unit.

6. Bypass paper sensor
   This sensor detects if paper is set in the bypass tray. If it is, bypass feeding always comes before drawer feeding.

7. Empty sensor
   This is a transmissive-type sensor and detects the availability of paper in the drawer by using an actuator. When there is no paper in the drawer, the actuator blocks the light path of the sensor, and the sensor determines that there is no paper.

8. Feed sensor
   This sensor detects if the leading edge or trailing edge of the paper has passed the feed roller. It also detects jamming such as misfeeding.

9. Transport sensor
   This is a reflective sensor whose purpose is to directly detect if paper is set or not, without using any device such as a sensor arm. Transport sensor detects if the leading edge or trailing edge of paper passed the transport roller. They also detects jams like misfeeding.

10. Registration sensor
    This sensor detects that the leading edge of the paper has reached the registration roller and the trailing edge of the paper has passed the registration roller.

11. Drawer tray-up sensor
    This sensor stops the tray at the predetermined height when the tray is moved up. When the tray-up sensor is turned ON, the tray-up motor is turned OFF to stop the upward movement of the tray.

12. Drawer detection sensor
    This sensor detects if the drawer is fully inserted.

13. Feed clutch (3rd drawer / 4th drawer

This is a clutch used to transmit the drive from the feed/transport motor to the drawer pickup roller and drawer feed roller.

14. Drawer transport clutch (3rd drawer / 4th drawer)
This is a clutch used to transmit the drive from the feed/transport motor to the transport roller. When the clutch is turned ON, the transport roller rotates at high speed to transport paper.

15. Feed/transport motor
This motor drives the pickup rollers, feed rollers and transport rollers of the drawers and bypass tray.

16. Registration motor
This motor drives the registration roller. This stepping motor transports paper in the transfer direction in time with the image transfer to align the paper with the leading edge of the image.

17. Tray-up motor-1/-2
When this motor rotates normally, the tray in the 1st drawer moves up, and when the motor rotates reversely, the tray in the 2nd drawer moves up.

18. Bypass motor
This stepping motor drives the bypass pickup roller, feed roller and transport roller.

19. Bypass pickup solenoid
This is a solenoid to move down the bypass pickup roller.

20. Bypass paper size detection sensor
This sensor works directly with the sidewalls of the bypass tray to detect the paper width on the tray.

21. Media sensor
This sensor is installed only in some models.
The media sensor detects the thickness of paper that is fed only from feeding devices other than the bypass tray. The sensor has 2 functions as follows:
(1) The sensor classifies plain paper (16.8 to 27.6 lb.) into plain paper 1 (relatively thin plain paper) and plain paper 2 (relatively thick plain paper) and controls fusing temperature accordingly.
(2) The sensor judges if a users media type setting is correct according to the thickness measurement result by itself. When the sensor judges that the setting is not correct, printing automatically stops. (Error code: E071-E076 (Media type mis-setting jam))
Even though media types are classified with its paper weight in general, the thickness of paper is not always proportional to the paper weight. Therefore the sensor makes the equipment stop printing only when a users media type setting is obviously incorrect.
Whether enabling or disabling the function (2) above can be switched in the code 08-4598.
In case the media sensor fails, no error code is displayed. In this case, as for the function (1) above, paper set in the code 08-4599 is automatically selected, and the function (2) above is automatically disabled. Therefore the malfunction of the media sensor does not affect the equipments operation and thus printing is not disturbed.
The media sensor malfunction is detected with the output value of the sensor. If an abnormal value is output, the sensor is judged as in a faulty condition. This status is recorded in an error history. (Error code: CFA0 or CFA1 (Media sensor detection abnormality))
Even if the error CFA0 or CFA1 occurred, the media sensor outputs values again after the equipment was recovered from the sleep mode or its power was turned OFF and then back ON. If the output value is normal, the sensor then returns to its normal detection status.
Do not bring a magnet or other magnetized materials closer to the media sensor because it measures minute displacement amounts with magnetoresistance change.

8.4 Description of Operation

8.4.1 Drive of rollers

The drive of each motor in the paper feeding area activates the paper transfer roller through the gears, pulleys and clutches.

8.4.2 Operation of bypass pickup roller

When the bypass pickup solenoid is turned ON, the plunger is pulled, and then the lever is rotated. The pickup arm is then brought down with its own weight. When the bypass pickup solenoid is turned OFF, the pickup arm is brought up by the spring force.
The driving force transmitted through the bypass motor is transmitted to the bypass feed roller through the shaft and then to the bypass pickup roller through the timing belt. The roller is rotated by this driving force.

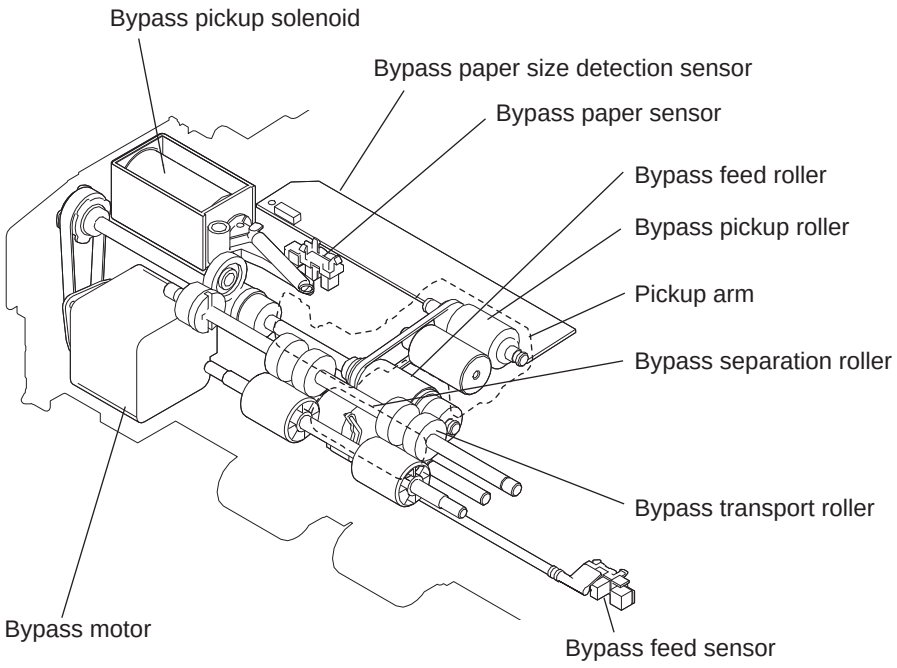


Fig.8-3

8.4.3 Operation of drawer pickup roller

When the drawer is inserted, the protrusion at the rear side of the drawer pushes the lever to the direction of A. Then the pickup roller and roller holder are lowered by the spring force.

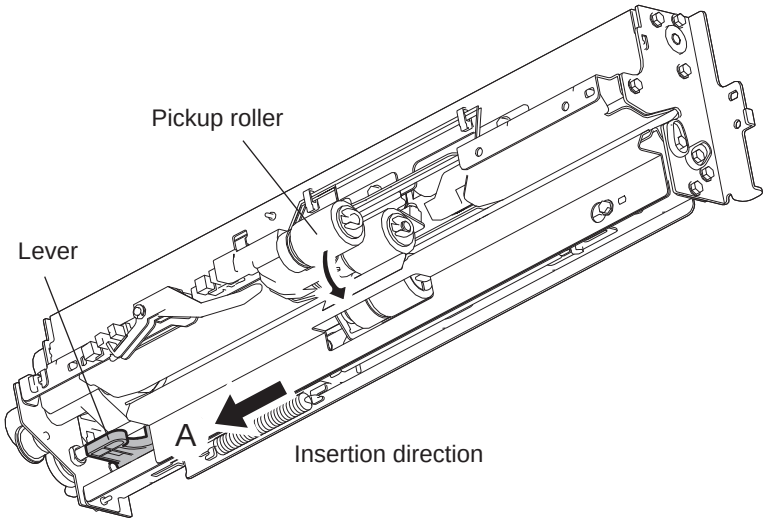


Fig.8-4

8.4.4 Separation of paper

The sheets of paper in the drawers are separated by the separation roller so that they can be picked up one by one. The separation roller unit consists of the feed roller, separation roller, spring joint, etc., as shown below.
The feed roller is rotated by the feed clutch in the direction of the white arrow at the same timing as the pickup roller rotation.
The Fig.8-9 shows how duplicate feeding is prevented: Since the friction between two sheets is small, the lower sheet is not transported any further while the upper sheet is transported by the feed roller in the direction of the black arrow.

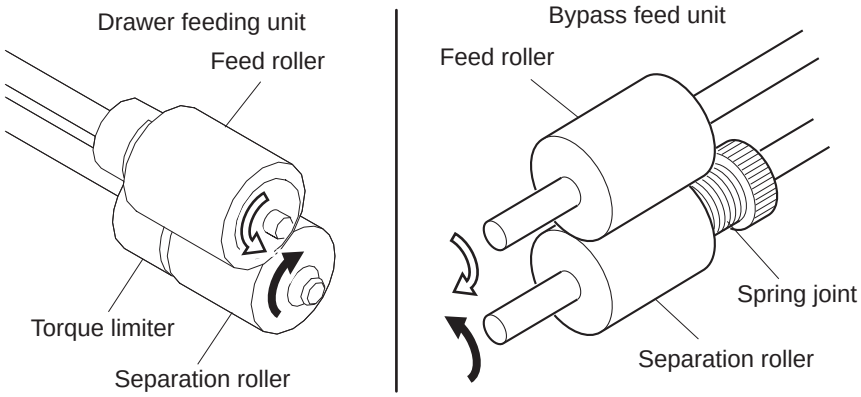


Fig.8-5

[Example]
When only one sheet enters between the rollers: Since the transporting force of the feed roller is greater than the braking force of the separation roller, the separation roller follows the feed roller, making the sheet go forward to the registration roller.
When two sheets enter between the rollers at the same time:
Since the transporting force of the feed roller and the breaking force of the separation roller are greater than the frictional force between two sheets, the paper A is transported to the direction of the black arrow and the paper B is braked by the separation roller and is not transported any further.

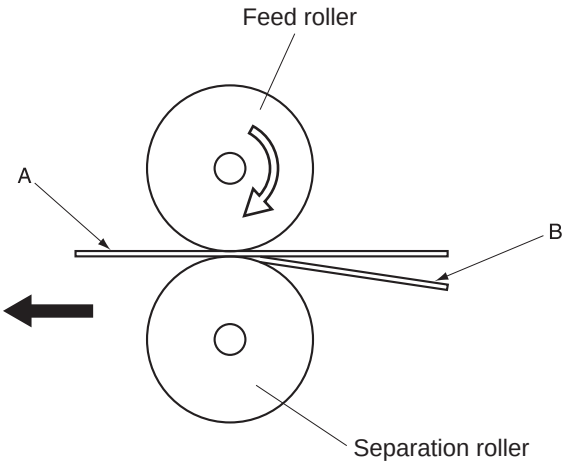


Fig.8-6

8.4.5 General operation

[A] From power-ON to ready status

1. When the equipment is turned ON, the tray-up motor-1 is activated and the 1st drawer tray starts to rise. When the tray-up sensor is turned ON (L→H), the tray-up motor-1 is turned OFF, and the tray is stopped. At this time, if the empty sensor is OFF (L), it is judged that there is no paper in the drawer. If the empty sensor is ON (H), there is paper in the drawer. The tray stops at raised position regardless of availability of paper. The tray-up motor-1 then starts to rotate in reverse and the 2nd drawer is raised. The 2nd drawer tray is stopped in the same manner as the 1st drawer tray was. Then whether paper exists in the drawer or not is detected. (The detection is performed in the same manner in the 3rd drawer, 4th drawer and Tandem LCF.)

2. If the drawer is not completely inserted when the equipment is turned ON, the tray for that drawer is not raised. When the drawer is inserted completely, the tray is raised and checks the availability of the paper.

3. If either of the sensors on the transport path is ON (means there is paper on the transport path) when the equipment is turned ON, it is determined that a paper jam has occurred and no operation is enabled until the paper is removed.

[B] Ready status

1. After the tray is moved up and availability of paper is checked as described above, the equipment enters the ready status.
   At ready status, the tray remains at raised position.

2. When a drawer is inserted or removed at ready status, the tray is raised again to check the availability of paper.

[C] Bypass feeding

- The bypass paper sensor detects availability of paper.
- The bypass pickup solenoid is turned ON and the bypass pickup roller is lowered.
- The bypass motor is turned ON and then the bypass pickup roller, bypass feed roller and bypass transport roller are rotated and start feeding.
- The leading edge of paper turns ON the bypass feed sensor and bypass pickup solenoid is turned OFF. Then the bypass pickup roller is raised.
- The leading edge of paper turns ON the registration sensor and the paper is aligned by the registration roller.
- The bypass motor is turned OFF, and then the bypass pickup roller, bypass feed roller and bypass transport roller are stopped.
- The registration motor is turned ON and the paper is transported to the 2nd transfer position.

[D] Drawer feeding

- The feed motor and transfer motor are turned ON, and the pickup roller, feed roller and transport roller are rotated to start feeding paper.
- Passing of the leading edge of the paper turns ON the drawer feed sensor, then the transport sensor is turned ON.
- Passing of the leading edge of the paper turns ON the registration sensor and the paper is aligned by the registration roller.
- The transport motor is turned OFF and the transport roller is stopped.
- The registration motor and transport motor are turned ON and the paper is transported to the transfer position.

9. PROCESS UNIT RELATED SECTION

9.1 General description

The color MFP has 4 process units (EPU: Electrographic Processing Unit). Each process unit consists of the drum cleaner unit and developer unit which are unified, and it corresponds to the image forming process of Y, M, C and K colors. This chapter describes the development (developer unit) which is a process of making toner adhere to the drum.
The developer material which is comprised of a mixture of toner and carrier, and is filled in the developer unit of each color. The toner is charged to a negative polarity and the carrier to a positive polarity, due to the friction with each other caused by mixing in the developer unit. The charged toner is supplied to the photoconductive drum surface by means of a magnetic roller, allowing it to adhere to the areas on the drum surface where the potential is lower than the developer bias which is applied to the magnetic roller. Through this process, the latent images are formed on the photoconductive drum surface.

- Process unit (Color MFP)

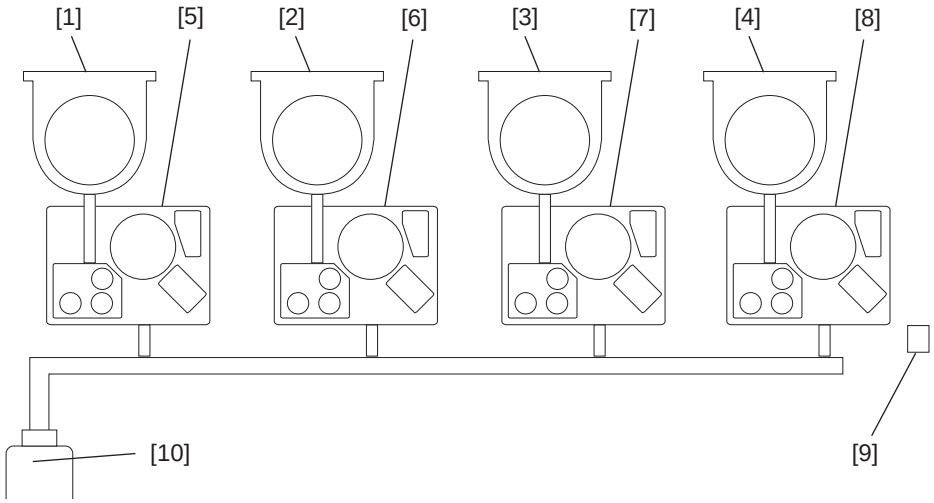


Fig. 9-1

[1] Toner cartridge(Y)
[2] Toner cartridge(M)
[3] Toner cartridge(C)
[4] Toner cartridge(K)
[5] Process unit(Y)
[6] Process unit(M)
[7] Process unit(C)
[8] Process unit(K)
[9] Temperature/Humidity sensor
[10] Waste toner box

- Process unit (Detail)

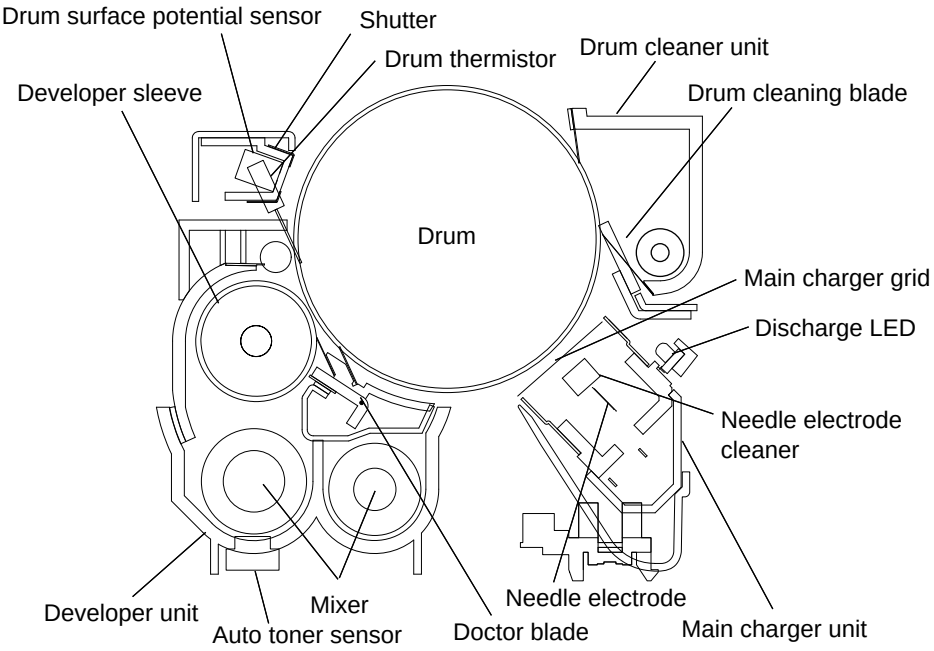


Fig. 9-2

9.2 Composition

Process unit (Y, M, C, K)	Drum cleaner unit	Drum
		Cleaning blade
		Recovery blade
		Blade side seal
		Toner recovery auger
	Main charger unit	Main charger grid
		Needle electrode
		Needle electrode cleaner
		Discharge LED
	V0 sensor unit	Drum surface potential (V0) sensor
		V0 sensor shutter solenoid
		Drum thermistor-Y, -K
		Needle electrode cleaner motor
		Needle electrode cleaner detection sensor
		Main charger ozone exhaust fan
		Auger lock detection sensor
	Developer unit	Developer material
		Auto-toner sensor
		Developer sleeve (Magnetic roller)
		Doctor blade
		Mixer
Drive section, other	Temperature/Humidity sensor	
	Ozone filter	
	Ozone suctioning fan	
	High-voltage transformer	
	Developer unit motor-K/-YMC	
	Developer unit mixer motor-K/-YMC	
	Drum motor-K/-YMC	
	Toner filter	
	Scattered toner suctioning fan	
	EPU cooling fan	

9.3 Functions

1. Drum
   Drum is made of a cylindrical aluminum base coated with a thin film of organic photosensitive (photoconductive) substance. Photoconductive object becomes insulative (high electrical resistance) when it is not exposed to lights and becomes conductive (low electrical resistance) when it is exposed to lights. This object is called photoconductor.

2. Drum cleaner unit
   - Cleaning blade
     This blade is pressed against the drum surface with a constant force by pressure springs, and scrapes off the residual toner on the drum surface.
   - Recovery blade
     This blade prevents the toner which was scraped off by the cleaning blade from being scattered to the outside.
   - Toner recovery auger
     This auger carries the residual toner scraped off to the waste toner box.

3. Main charger
   The main charger consists of insulated terminals having a U-shaped section and a needle electrode attached between them When a high voltage is applied to the needle electrode, the air around it is charged (ionized). The ionized air then flows into the drum causing it to be charged. This phenomenon is called “corona discharge”. At the same time, a control bias is applied to the main charger grid to control the charging amount. In a dark place, negative charge is evenly applied onto the drum surface by the corona discharge and this grid. In addition, a cleaner is installed to clean up the blot attached on the needle electrode.
   - Difference between the needle electrode and the charger wire
     The needle electrode has aligned needles and their points perform the corona discharge. These points (electrodes) discharge toward the drum in one direction to realize the more efficient discharging comparing to the charger wire which discharges in a radial direction. Therefore, the needle electrode enables to reduce the ozone amount.

4. Drum thermistor
   Since the photoconductive characteristic of the drum surface changes depending on the temperature of the drum surface, the drum thermistor detects the temperature of the drum surface and controls to gain the charging potential according to the environment.

5. Discharge LED
   Discharge is a process to decrease or eliminate the static electricity on the drum surface.
   The electrical resistance of the photosensitive layer is decreased by the light, and the residual charge on the drum surface is neutralized and eliminated (cleaned). Electrical potential of the drum surface is fixed to a certain amount before the drum is charged.

6. Temperature/humidity sensor
   This sensor measures the environment inside the equipment. The values of the temperature and humidity detected inside the equipment are output to the LGC board.

7. Ozone filter
   Ozone produced by corona discharge of the main charger is exhausted through this filter.
   The catalyzer of the ozone filter degrades the ozone.

8. Ozone suctioning fan
   This fan sucks in air contains ozone generated by the main charger and exhausts it through the ozone filter-1.

9. High-voltage transformer

A circuit generates the output control voltage Vc of the main charger bias, main charger grid bias, 1st transfer roller bias, 2nd transfer roller bias, and developer bias.

10. Drum motor-K
    This motor drives the K drum.
    The drive of the motor is transmitted with the gear from the drum motor to the K drum.
    To align the phases of the K drum and color drums and enhance the color registration accuracy, the signal change of the color drum phase sensor and the K drum phase sensor works as a trigger to stop the motor.
    For further color registration accuracy, the gears are precisely assembled.

11. Drum motor-YMC
    These motors drive the Y, M and C drums.
    The drive of the motor is transmitted with the gear from the drum motor to the M (C) drum and then to the Y drum.
    To align the phases of the K drum and color drums and enhance the color registration accuracy, the signal change of the color drum phase sensor and the K drum phase sensor works as a trigger to stop the motor.
    For further color registration accuracy, the gears are precisely assembled.

12. Developer unit motor-K
    This motor drives the auger to carry waste toner gathered with the K developer magnetic roller and K cleaning blade to the waste toner transport path.
    To maintain the rotational speeds of the photoconductive drum and the developer magnetic roller at a specified ratio, the developer unit motor rotates at a speed proportionate to the paper transport speed for special modes such as the thick paper mode.
    The drive of the motor is transmitted with the gear, and the motor is connected to the developer unit with a coupling.

13. Developer unit mixer motor-K
    This motor drives a mixer to mix and transport K developer material.
    The rotational speed of this motor is constant in any mode because the transport amount of the developer material must be stable in any special mode such as the thick paper mode.
    The drive of the motor is transmitted with the gear, and the motor is connected to the developer unit with a coupling.

14. Developer unit motor-YMC
    These motors drive the auger to carry waste toner gathered with the YMC developer magnetic rollers and YMC cleaning blades to the waste toner transport path.
    To maintain the rotational speeds of the photoconductive drum and the developer magnetic roller at a specified ratio, the developer unit motor rotates at a speed proportionate to the paper transport speed for special modes such as the thick paper mode.
    The drive of the motor is transmitted with the gear, and the motor is connected to the developer unit with a coupling.

15. Developer unit mixer motor-YMC
    These motors drive a mixer to mix and transport YMC developer materials.
    The rotational speed of these motors is constant in any mode because the transport amount of the developer material must be stable in any special mode such as the thick paper mode.
    The drive of the motor is transmitted with the gear, and the motor is connected to the developer unit with a coupling.

16. Developer material
The developer material consists of the carrier and toner. The carrier is made of electrically conductive ferrites which is 30-100 µm and the toner is made of the resin particle which is approx. 6.8 µm. Normally developer material does not need to be replaced periodically. However, replacement may be needed depending on the use condition.

17. Mixer
The carrier and toner are frictionized each other when the developer material is stirred. Then the carrier is positively charged (+) and the toner is negatively charged (–), and the toner is adhered by the electrostatic force.

18. Developer sleeve (Magnetic roller)
These aluminum rollers have magnets inside. The developer material is pulled by these magnets to form a magnetic brush. The magnets are fixed at their position so that only the sleeve rotates. By this rotation, the developer material is transported to the developer sleeve. Then the magnetic brush formed at the developer sleeve sweeps over the drum surface and thus development is performed.

19. Doctor blade
The doctor blade controls the amount of the developer material from the developer sleeve so that the magnetic brush of the developer material can contact with the drum surface properly.

20. Auto-toner sensor
To print out a precise image, the proportion (toner density ratio) of the carrier and the toner in the developer material needs to be always constant. The magnetic bridge circuit in the black auto-toner sensor detects the toner ratio in the developer material. Toner is supplied from the toner cartridge when that contained in the developer material starts to run out.

21. Toner motor
These motors drive the paddles and auger in the toner cartridge and transport the toner filled in the cartridge to the developer unit. Each toner cartridge of Y, M, C and K mounts one toner motor correspondingly.

22. Waste toner transport motor
The waste toner transport motor rotates the auger in the corresponding unit and transports the waste toner which exits from each YMCK developer unit and the transfer belt cleaner unit, as well as the waste developer material which exits from each YMCK developer unit.

23. Auger lock detection sensor
This sensor detects locking of the waste toner transport auger. When the waste toner transport auger is locked due to the overload or malfunction of the motor, this sensor detects it and the service call (CD71) occurs.

24. Waste toner amount detection sensor
The waste toner amount detection sensor is a transmissive sensor whose purpose is to detect the amount of waste toner in the waste toner box.
This sensor detects when the amount of waste toner has reached approx. 80% of the toner full.

25. Waste toner box full detection sensor
The waste toner box full detection sensor is a transmissive sensor whose purpose is to check the sensor section at the side of the waste toner box. When the Waste toner box becomes full of waste toner and the accumulated waste toner shields the sensor path, this sensor detects that the waste toner box is full.

26. Waste toner box
    This collects the residual toner scraped off on the drum surface by the cleaning blade and residual toner scraped off on the transfer belt by the transfer belt cleaning blade.
    Developer material discharged in SR development is also recovered into the waste toner box.

27. Waste toner box detection sensor
    This sensor detects if the waste toner box is set and whether the waste toner box cover is opened or closed.

28. Toner filter
    This collects toner scattered out of the developer unit (developer sleeve).

29. Scattered toner suctioning fan
    This fan sucks in toner scattered out of the developer unit (developer sleeve) and collects it through the toner filter.

30. Toner cartridge paddle rotation detection sensor-K/C/M/Y
    These sensors detect the rotational status of the paddle of each toner cartridge. The rotational status can be detected with an slit of gear rotating together with the paddle.

31. Drum surface potential sensor
    This sensor is installed only in some models.
    The drum surface potential sensor measures the surface potential of the drum when the drum is charged. Based on the measured value, this sensor controls the main charger grid bias voltage, and thus can control the drum surface potential accurately.

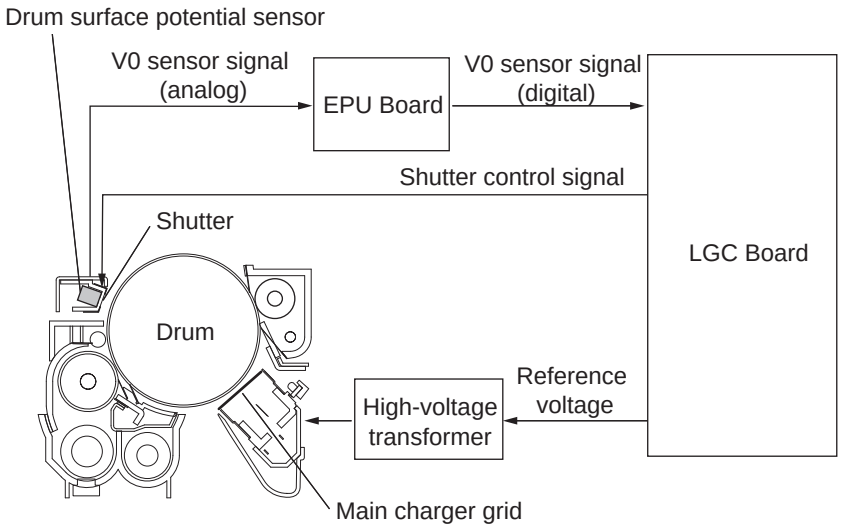


Fig. 9-3

10. TRANSFER UNIT

10.1 General Descriptions

Transfer is a process of dealing a toner image from the photoconductive drum onto paper.
A toner image formed on the photoconductive drum is temporarily transferred onto the transfer belt, and the toner image is then transferred from the transfer belt onto paper. The first transfer from the drum to the transfer belt is called the 1st transfer, and the second transfer from the transfer belt to paper is called the 2nd transfer. To form a color image, the images of yellow (Y), magenta (M), cyan (C) and black (K) are transferred and overlaid on the transfer belt in order, and then the overlaid images are transferred onto paper.
After the completion of the 2nd transfer, the residual toner on the transfer belt is scraped off by the transfer belt cleaning blade and then transported to the waste toner box.

The figure below is an example for the configuration of the transfer unit. Parts or mechanisms shown below may not installed in some models.

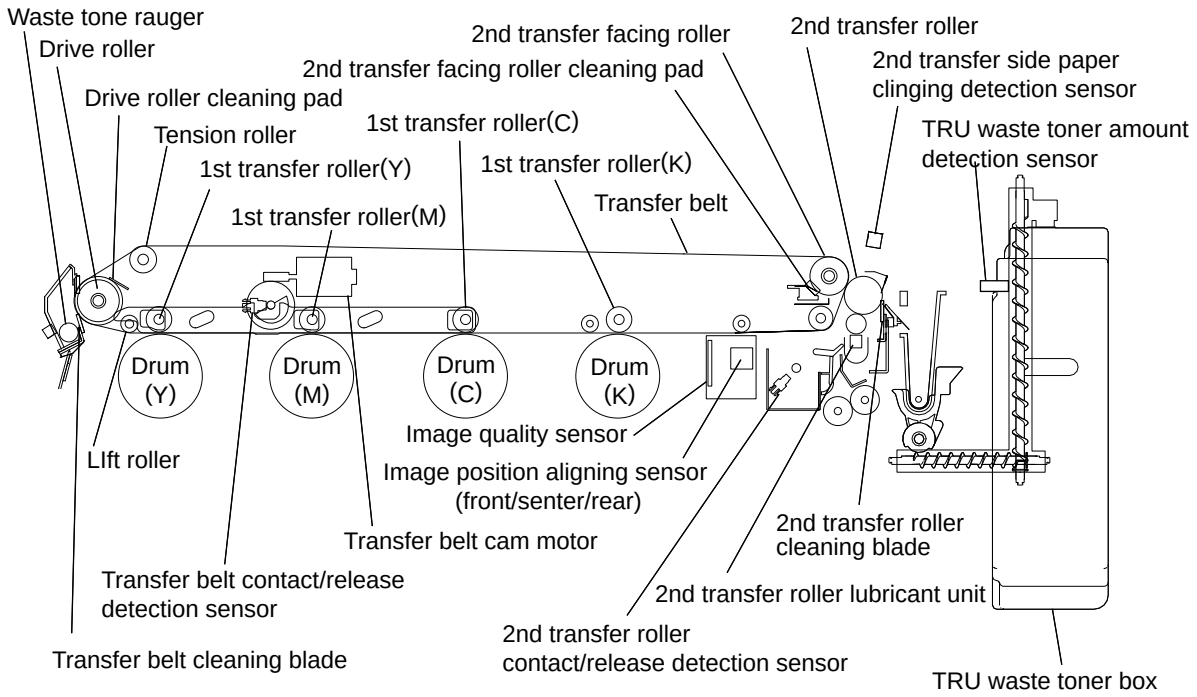


Fig.10-1

10.2 Composition

Transfer belt unit	Transfer belt
	1st transfer roller
	Drive roller
	Tension roller
	2nd transfer facing roller
	Lift roller
	Idling roller
	Transfer belt cam motor
	Transfer belt contact/release detection sensor
	2nd transfer facing roller cleaning pad
	Drive roller cleaning pad
Transfer belt cleaning	Transfer belt cleaning blade
	Transfer belt cleaner side seal
Transfer belt motor	
2nd transfer unit	2nd transfer roller
	2nd transfer roller lubricant unit
	TRU waste toner box
	TRU waste toner amount detection sensor
	2nd transfer side paper clinging detection sensor
Image position aligning sensor (front / center/rear)	
2nd transfer roller contact/release detection sensor	
Image quality sensor	
2nd transfer motor	

10.3 Functions

1. Transfer belt
   This belt, made of electrical resistance resin, is formed in a highly-precise technique. The drive of the transfer belt motor rotates the drive roller and thus the transfer belt is rotated.

2. 1st transfer roller
   When the 1st transfer bias from the high-voltage transformer is applied to this roller, a toner image is transferred from the photoconductive drum onto the transfer belt. The spring of this roller presses the transfer belt and the photoconductive drum to contact each other.

3. Drive roller
   This roller rotates the transfer belt with the drive transmitted from the transfer belt motor.

4. Tension roller
   This roller applies tensile force to the transfer belt with its spring.

5. 2nd transfer facing roller
   This roller contacts with the 2nd transfer roller, holding the transfer belt between them to nip paper. When the 2nd transfer bias (negative polarity) is applied from the high-voltage power supply to the 2nd transfer facing roller, a toner image is transferred onto paper.
   To clean off the toner adhered on the 2nd transfer roller, positive bias is applied on the 2nd transfer facing roller to transport the positively charged toner on the 2nd transfer roller to the transfer belt.

6. Lift roller
   This roller retains the contacting position of the transfer belt and the photoconductive drum. When only a black (K) image is being transferred, the transfer belt cam motor lifts up the 1st transfer rollers of yellow (Y), magenta (M) and cyan (C), together with this roller.

7. Idling roller
   This roller retains the contacting position of the transfer belt and the photoconductive drum.

8. Transfer belt cam motor
   This motor lifts up the 1st transfer rollers (Y), (M) and (C) when only a black (K) image is being developed. Installed in the transfer belt unit, this motor drives the cam and also moves the linked lever to lift up the 1st transfer rollers (Y), (M) and (C).

9. Transfer belt contact/release detection sensor
   This sensor installed in the transfer belt unit detects the timing to apply stop the transfer belt cam motor, and also detects if the 1st transfer rollers are at their contacting or releasing position.

10. Transfer belt cleaning blade
    This blade removes the residual toner, paper dust or foreign objects on the transfer belt surface. It is pressed onto the transfer belt unit by its spring. The recovery blade and urethan seal prevent the removed residual toner or other objects from leaking out of the transfer belt cleaning unit.

11. Used toner auger
    This auger transports the residual toner, paper dust or foreign objects scraped off by the transfer belt cleaning blade to the waste toner box.

12. Transfer belt motor
    This two-phase stepping motor drives the drive roller of the transfer belt unit and the used toner auger.

13. 2nd transfer roller

This metal roller, covered with sponge and an NBR tube, is located to face the 2nd transfer facing roller through the transfer belt. When the registration motor is rotated reversely, the drive from the registration motor is transmitted to this roller through the cam and arm, and thus this roller contacts with or releases from the transfer belt.

14. 2nd transfer roller contact/release detection sensor
    This photointerrupter detects if the 2nd transfer roller is contacted with or released from the transfer belt.

15. 2nd transfer paper clinging detection sensor
    This sensor detects thin paper clinging to the transfer belt. When a sheet of thin paper which is not allowed in the specification is fed, this thin paper may cling to the transfer belt. The clung paper causes a service call because it cannot be removed in a normal jam releasing process. This sensor forestalls such case and helps to remove it as a normal paper jam.

16. TRU waste toner amount detection sensor
    his sensor detects the amount of waste toner in the TRU waste toner box. When waste toner occupies approx. 80% of the TRU waste toner box, the sensor judges that the TRU waste toner box is almost full.
    When the specified number of sheets of paper have been printed since then, a message appears warning the user that the TRU waste toner box is full.

10.4 General description of operation

10.4.1 Printing in the color modes

[A] 1st transfer

1. Printing starts and the photoconductive drums, developer units and transfer belt start the rotation.

2. The 1st transfer rollers (Y), (M) and (C) move to a position contacting with the photoconductive drum, with the transfer belt nipped between them.

3. A voltage is applied through the 1st transfer roller (Y) and a toner image on the photoconductive drum (Y) is transferred onto the transfer belt.

4. A voltage is applied through the 1st transfer roller (M) and a toner image on the photoconductive drum (M) is transferred onto the transfer belt to be overlaid on the toner image (Y).

5. A voltage is applied through the 1st transfer roller (C) and a toner image on the photoconductive drum (C) is transferred onto the transfer belt to be overlaid on the toner images (Y) and (M).

6. A voltage is applied through the 1st transfer roller (K) and a toner image on the photoconductive drum (K) is transferred onto the transfer belt to be overlaid on the toner images (Y), (M) and (C).

7. When the printing operation is completed, the 1st transfer rollers of Y, M and C move to a position released from the drum.

[B] 2nd transfer

1. The 2nd transfer roller waits at the position released from the transfer belt during the equipment's waiting period.

2. Printing starts and then the 2nd transfer roller moves to the position contacting with the transfer belt.

3. The transfer belt rotates and then a toner image on the transfer belt surface is moved to the 2nd transfer position.

4. The registration rollers align paper and then the paper is transported to the 2nd transfer roller.

5. A bias is applied to the 2nd transfer roller and then the toner image on the transfer belt surface is transferred onto the transported paper.

6. After the completion of the 2nd transfer, the 2nd transfer roller is escaped to the releasing position.

7. When the toner image has been transferred onto the paper in the 2nd transfer process, the residual toner on the transfer belt is scraped off by the transfer belt cleaning blade.

10.4.2 Printing in the black mode

[A] 1st transfer

1. Printing starts (The 1st transfer rollers (Y), (M) and (C) have moved to the position released from the photoconductive drum.)

2. The photoconductive drum (K), developer unit (K) and transfer belt start the rotation.

3. A voltage is applied through the 1st transfer roller (K) and a toner image on the photoconductive drum (K) is transferred onto the transfer belt.

4. Completion of printing.

[B] 2nd transfer

1. The 2nd transfer roller waits at the position released from the transfer belt during the equipment's waiting period.

2. Printing starts and then the 2nd transfer roller moves to the position contacting with the transfer belt.

3. The transfer belt rotates and then a toner image on the transfer belt surface is moved to the 2nd transfer position.

4. The registration rollers align paper and then the paper is transported to the 2nd transfer roller.

5. A bias is applied to the 2nd transfer roller and then the toner image on the transfer belt surface is transferred onto the transported paper.

6. After the completion of the 2nd transfer, the 2nd transfer roller is escaped to the releasing position.

7. When the toner image has been transferred onto the paper in the 2nd transfer process, the residual toner on the transfer belt is scraped off by the transfer belt cleaning blade.

10.4.3 Color registration control

IIn the color MFP, the color registration control method is used to correct any registration deviation in any of the four colors. This color registration control is performed during warming-up, and at fixed intervals. The aim of controlling at fixed intervals is to correct deviation in the relative positions of the laser optical system components caused by the rise of the temperature inside the equipment after warming-up. However, there are cases such as when the equipment is turned ON again immediately after it is turned OFF, it may not be necessary to correct deviation in the relative positions of the laser optical system components caused by the rise of the temperature inside the machine after warming-up. For such cases, the temperature of the fuser belt is checked when the power is turned ON, and if it is within the allowable temperature range, color registration control at the warming-up will be omitted. Also the temperature of drum (K) thermistor is checked at the fixed intervals. If the difference between the temperature at the last color registration control and the current temperature is within the allowable range, color registration control will be omitted.

Color registration control is performed in the following order.

1. A built-in 4-color test pattern is printed on the transfer belt several times.*

2. The printed test pattern is scanned by the image position aligning sensors (front/center/rear)* to measure the amount of deviation among the four colors several times.
   * The location and the number of the sensors differ depending on the model.

3. The amount of deviation thus measured is arithmetically operated on by the microcomputer.

4. The deviation amount is judged from the result of calculation, and then the correction for the laser write position (correction of primary and secondary scanning deviation) and the tilt angle adjustment of laser beam reflection mirrors will be made.

5. After the correction is made, the amount of deviation is checked whether it is within-spec or not. If the value is within-spec, the color registration control will be completed, and if it is out-of-spec, the color registration control will be restarted from step 1).

   * After the test patterns are printed, if the specified number of data is unable to be read successfully, an error (CA00: Image position alignment abnormality) is generated.

The test patterns for the 4 colors illustrated below are regarded as one set. Several sets are printed directly onto the transfer belt, and the pitch of the test patterns is measured by the color registration sensors.
Corrections will be made after four types of deviation are calculated according the measurement: parallel deviation in the secondary-scanning direction; deviation of write start position in the primary-scanning direction; deviation of reproduction ratio in the primary-scanning direction and tilt deviation

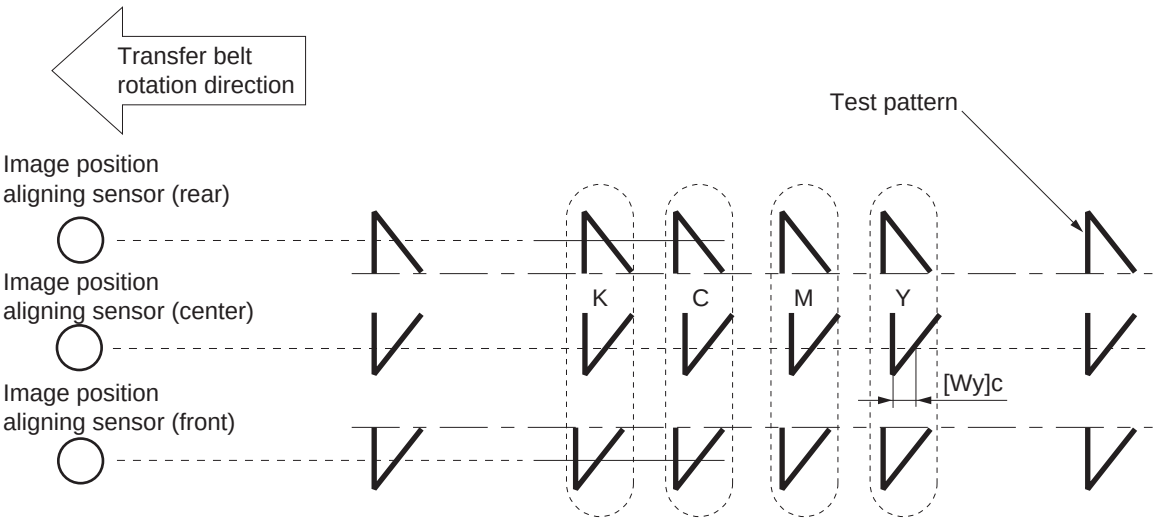


Fig.10-2

Deviation	Object of Correction
Parallel deviation in the secondary-scanning direction	Laser write start position (secondary-scanning direction)
Deviation of write start position in the primary-scanning direction	Laser write start position (primary-scanning direction)
Deviation of reproduction ratio in the primary-scanning direction	Image writing frequency (fine-tuned wave)
Partial shift in reproduction ratio (primary scanning direction)	Image writing frequency (modulated wave)
Tilt deviation	Angle of reflection mirror in the laser unit

Because the color registration control of the equipment optimizes the laser write start position to correct the deviation of the 4 colors that appears uniformly on the paper, it cannot correct the following deviations that fluctuate.

- Deviation caused by drum rotation errors
  Deviation in the secondary-scanning direction at fixed intervals caused by eccentricity of the driving parts from the drum motor to the drum, or etc.

- Deviation caused by fluctuations in transfer belt speed
  Fluctuating deviation in the secondary-scanning direction resulted from fluctuations in transfer belt speed caused by eccentricity of the driving parts from the transfer belt motor to the transfer belt drive roller, as well as by slippage between the transfer belt and the transfer belt drive roller

- Deviation caused by meandering of the transfer belt
  Fluctuating deviation in the primary-scanning direction caused by meandering of the transfer belt

11. IMAGE QUALITY CONTROL

Image quality control is divided into image quality process control and image quality TRC control. When the e-BRIDGE Controller is installed, the image quality TRC control is performed with a single test pattern, and when the EFI Printer Board (optional) is installed, it is performed with 2 test patterns.

11.1 General Description

The image quality control is performed with the signal outputs from the image quality sensor.
In the image quality control, image forming conditions or image processing conditions are automatically adjusted so as to minimize the change in the image density or tone reproduction caused by the fluctuation of the use environment or the life of the supply items.
At first, the image quality sensor emits light in order to output the reflected light amount voltage with no toner image formed on the transfer belt.
This reflected light amount voltage is then converted analog-to-digital to be output to the LGC board as a reflected light amount signal. The light amount voltage of the light source of the sensor is adjusted so that the output value of the reflected light amount signal will correspond with a value set in advance.
Next, a test pattern is developed on the transfer belt, and the reflected light amount signal output from the developed test pattern is detected as the toner amount for a toner image. This series of operations is the scanning of a toner image (detection of the output value).
3 test patterns are provided for scanning this toner image. Each of them is used to determine the following conditions:

1. Image quality process control test pattern
   The toner image of the test pattern is scanned and the image forming conditions are determined to be approximated to the preset value.
2. Image quality TRC control test pattern
   The toner image of the test pattern is scanned and the image processing conditions are determined according to the value output from the toner image.
3. Image quality TRC control test pattern for the EFI Printer Board (optional)
   (Only for the equipment with the EFI Printer Board (optional) installed.)
   The toner image of the test pattern is scanned and the image processing conditions are determined according to the value output from the toner image.

In addition, a shutter operated by the Image quality shutter solenoid is equipped on the light receiving/ emitting surfaces to prevent stain to the sensor.

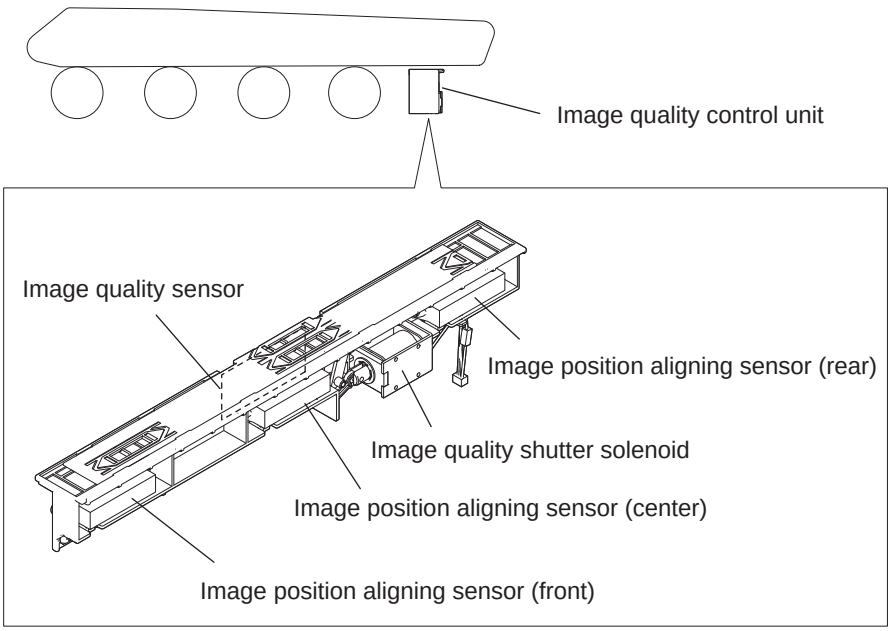


Fig.11-1

11.2 Composition

Image quality sensor:	Projects the amount of light on the transfer belt and outputs the voltage corresponding to the reflected light amount from the transfer belt or the toner image on the transfer belt.
Laser optical system:	Performs test pattern exposure (for toner image formation).
Image forming process:	Performs charging, laser exposing and developing processes.

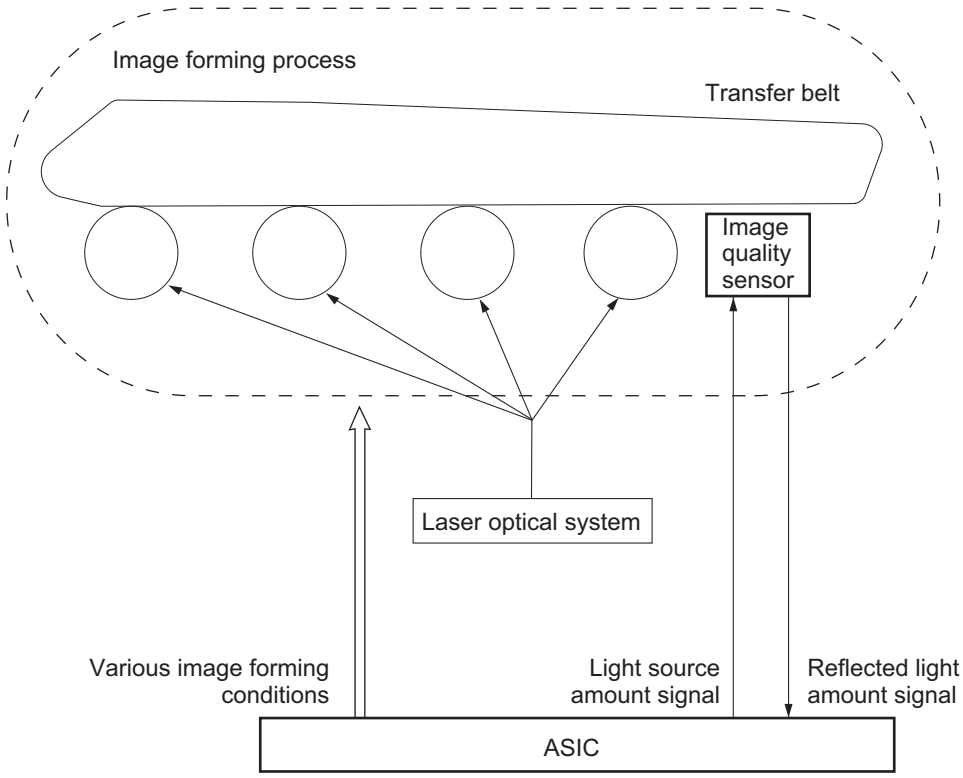


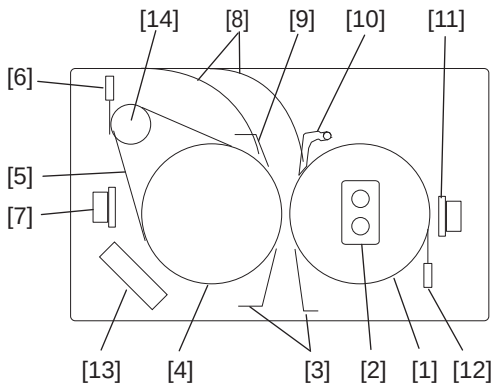
Fig.11-2

12. FUSER UNIT

12.1 General Description

The fuser unit fuses the toner image transferred to paper using the IH coil or heater lamp.
When paper is transported to the fuser unit, toner is fused by applying heat and pressure on the paper with the fuser roller (or fuser belt) and the pressure roller.
The paper is then transported to the bridge unit or the exit tray.
The fuser unit consists of the fuser belt, fuser roller, IH coil, pressure roller, separation fingers, separation plate, thermopiles, thermistors, thermostats, sensor etc.
The rollers in the fuser unit are driven by the fuser motor.

IH type



Heater Type

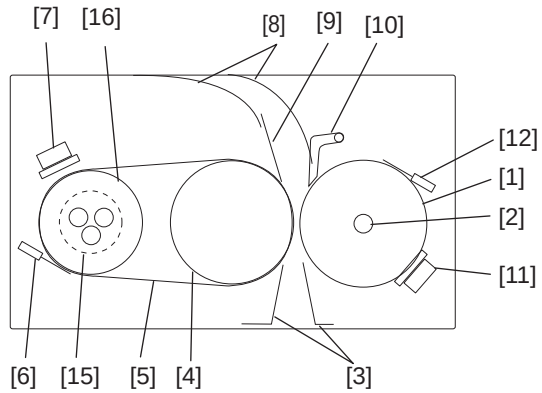


Fig.12-1

[1] Pressure roller
[2] Pressure roller heater lamp
[3] Entrance guide
[4] Fuser roller
[5] Fuser belt
[6] Fuser belt thermistor
[7] Fuser belt thermostat
[8] Paper guide
[9] Separation plate
[10] Separation fingers
[11] Pressure roller thermostat
[12] Pressure roller thermistor
[13] IH coil
[14] Satellite roller / Heat pipe roller
[15] Heater lamp
[16] Heat roller

12.2 Composition

Fuser belt section	Fuser belt
	Fuser belt guide
	Fuser roller
	Satellite roller / Heat pipe roller
	Fuser belt center thermostat
	Fuser belt side thermostat
	Fuser belt edge thermistor
	Fuser belt center thermopile
	Fuser belt side thermopile
	Fuser belt rotation detection sensor
	Separation plate
Pressure roller section	Pressure roller
	Separation fingers
	Pressure roller heater lamp
	Pressure roller center thermistor
	Pressure roller side thermistor
	Pressure roller edge thermistor
	Pressure roller center thermostat
	Pressure roller contact / release clutch
	Pressure roller contact / release detection sensor
IH coil section	IH coil
	IH board
	IH board cooling fan
Drive section / Others	Fuser motor
	Exit paper cooling fan (rear)
	Fuser unit jam releasing LED

12.3 Functions

1. Fuser belt
   - IH coil
     The fuser belt couples the fuser roller with the satellite roller (or the heat pipe roller) and conducts heat generated by the IH coils to paper to melt toner on the paper.
   - Heater lamp
     The fuser belt couples the fuser roller with the heat roller and transfers the heat that is conducted from the heat roller heated by the heater lamp to the paper to cause the toner on it to melt.

   The thinness of the fuser belt enables a reduction in the warming up time and mode changing time. To prevent the fuser belt having toner adhere to it, its surface is fluorinated.

2. Fuser roller
   The fuser roller is pressed against the pressure roller with the fuser belt between them. Due to this pressure between the fuser roller and the pressure roller, heat conduction to the paper is enhanced so that the toner melts more easily and is absorbed into the paper. In order to improve the fusing ability, a sponge roller is employed for the fuser roller in order to expand its nip width.

3. Satellite roller
   The satellite roller rotates the fuser belt together with the fuser roller to stabilize the belt surface temperature.

4. Fuser belt center thermostat (THMO4) / Fuser belt side thermostat
   If the fuser belt becomes abnormally hot as a result of problems such as thermopile malfunction, the thermostats cut off the power supply to the IH coil by having their bimetal open the joint.
   The thermostats for the equipment are safety devices to detect abnormal operation. When the thermostats detect any abnormal temperature, they must be replaced as well as any other damaged parts in the fuser unit.

5. Fuser belt edge thermistor
   This thermistor is a contact type one located in the non-feeding area (where paper does not pass) of the fuser belt to detect the surface temperature of the belt. The temperature in this area may be elevated without any heat absorption to the paper, since it does not pass through this area.
   This thermistor detects the temperature elevation to prevent the heat deterioration of the fuser unit parts and is not related to the temperature control of the fuser belt.

6. Fuser belt center thermopile / Fuser belt side thermopile
   The thermopiles are infrared elements to detect the surface temperature of the fuser belt. They are non-contact type thermopiles in order not to damage the paper contact surface of the fuser belt. Both thermopiles are fixed on each of the front and rear sides of the frame to detect the temperature of the edges and center of the fuser belt for controlling the IH coils.These thermopiles detect the surface temperature of the fuser belt and maintain it in a certain range between the lower limit causing poor fusing and the upper limit causing high temperature offsetting. When the surface temperature of the fuser belt is lower than the preset one, they turn ON the power supply to the IH coils, and when it is higher than the preset one, they shut off the supply.

7. Fuser belt rotation detection sensor
   This sensor detects any abnormality of the fuser roller such as “rotation stop” to prevent any part of the fuser roller and the fuser belt from being heated continuously by the IH coil and thus damaged.

8. Separation plate
   This plate separates paper on which toner is already fused from the fuser belt. To prevent damage to the fuser belt surface, the separation plate is constructed so that it does not contact with the fuser belt. The gap between the separation plate and the fuser belt is adjusted to fall within a certain range because if the separation plate is too close to the fuser belt, it may damage the belt and if too far, it may fail to separate the paper from the fuser belt and thus a paper jam may occur.

9. Pressure roller
   This is a rubber roller which ensures a proper nip width between the pressure roller and the fuser roller or the fuser belt. Toner is fused onto the paper while it is being transported because the springs of the pressure roller press the fuser roller or the fuser belt.

10. Pressure roller heater lamp
    These are halogen lamps located inside of the pressure roller in order to stabilize the surface temperature of the pressure roller to maintain the fusing temperature at a required level for fusing toner by turning its drive circuit ON or OFF.
    The heater lamp consists of a center heater lamp for heating up the center of the pressure roller and a side heater lamp for both ends of this roller.
    A sub heater lamp may also be installed to assist in heating.

11. Separation fingers
    Five separation fingers are installed to contact with the pressure roller under a low load to prevent paper from adhering to it.

12. Pressure roller center thermistor / Pressure roller side thermistor
    The thermistors detect the surface temperature of the pressure roller and control the pressure roller lamp. These non-contact type thermistors are used in order not to damage the paper contact surface of the pressure roller.

13. Pressure roller edge thermistor
    This is a contact type thermistor located in the non-feeding area (where paper does not pass) of the pressure roller to detect the surface temperature of the pressure roller. The temperature in this area may be elevated without any heat absorption to the paper, since it does not pass through this area. This thermistor detects the temperature elevation to prevent the heat deterioration of fuser unit parts and is not related to the temperature control of the fuser belt.

14. Pressure roller center thermostat / Pressure roller side thermostat
    These thermostats cut off the power supply to the heater lamps by opening their bimetallic joint if the pressure roller surface becomes abnormally hot as a result of problems such as thermistor malfunction. The thermostats for the equipment are safety devices to detect abnormal operation. When the thermostats operate after detecting any abnormal temperature, they must be replaced as well as any other damaged parts in the fuser unit.

15. Pressure roller contact / release clutch
    This clutch is turned ON to transmit the reversing rotation of the fuser motor to the release cam to separate halfway the pressure roller from the fuser belt. The reason why they are separated halfway is to reduce the load on the pressure roller and the fuser roller by half except in the warming up period and during printing. Also, any jammed paper in the nip of the fuser unit is easily removed if they are separated halfway.

16. Pressure roller contact / release detection sensor
    This sensor detects the home position of the pressure roller. It checks this by contacting and releasing the roller every time after the power is turned ON or a jam is released.

12.3.1 Heat source section

1. IH coil
   This coil generates a magnetic field with the electric current which has flowed into it. Then the eddy current is made to flow into the fuser belt, and thus heating it.
   Its temperature can be controlled more accurately than that of the heater lamp.

2. IH board
   This board controls the temperature of the fuser belt by regulating the high-frequency current conducted to the IH coil.

3. IH board cooling fan
   The fan installed in the board cover cool down the IH board.

4. Heater lamp
   These are lamps for heating the heat roller. There are the center and side heater lamps in each heating section. A sub heater lamp may also be installed to assist in heating.

12.3.2 Fuser drive section

1. Fuser motor
   This motor drives the fuser unit.

2. Exit paper cooling fan
   This fan cools down exiting or reversed paper in the bridge unit and reduces the heat conduction to the scanner. It also suppresses condensation, which occurs when the paper moisture is evaporated by the fuser unit, to avoid exposing paper to water.

12.4 Description of Operation

The fuser belt is located between the fuser roller and the pressure roller. The fuser roller is pressed with the spring force from the pressure roller side, and it is rotated by the drive of the fuser motor. The fuser belt rotates together with these rollers. Then paper transported to the fuser unit section is held between the fuser belt and the pressure roller and toner is fused on the paper by means of heat and pressure from them. After this, the separation plate separates the paper from the fuser belt. Then the paper is transported to the bridge unit.

The fuser unit is heated by the IH coil or heater lamp. The halogen lamps located inside of the pressure roller are turned ON or OFF by the drive circuit to maintain the fusing temperature at the required level for fusing toner and to stabilize the surface temperature of the pressure roller. The fuser belt center thermopile and the fuser belt side thermopile control the surface temperature of the fuser belt. If any temperature abnormality (service call) is detected, the power supply relay within the FIL board and the power supply unit is turned off.
This in turn shuts off the power supply to the IH coils or heater lamp, simultaneously to whole units, except for the control panel.
If the temperature abnormality is still not resolved due to such problems as thermopile malfunction, the fuser belt center thermostat or the fuser belt side thermostat are opened to shut off the power supply to the IH coils or heater lamp.

The pressure roller center thermistor and the side thermistor control the temperature of the pressure roller. If any temperature abnormality is detected, the power supply relay within the FIL board and the power supply unit are shut off. This in turn shuts off the power supply to the center heater lamp, the side heater lamp and the sub heater lamp (only for the triple type), simultaneously to whole units, except for the control panel.
If the temperature abnormality is still not resolved due to problems such as thermistor malfunction, the pressure roller center thermostat and the pressure roller side thermostat are opened to shut off the power supply to all the heater lamps.

In order to secure the life and quality of the fuser belt, fuser roller and pressure roller until their periodic replacement and accessibility for JAM clearance, the pressure roller is kept halfway separated from the fuser belt at prewarming, sleep, transportation, and JAM.
The pressure roller is kept separated halfway from the fuser belt as a result of the turning ON the pressure roller contact/release clutch by the transmission of the reversing rotation of the fuser motor to the cam driving section and the rotation of the release cam.

13. DUPLEX SECTION

13.1 General Description

The Automatic Duplexing Unit (ADU) is a unit to reverse paper so that images can be printed on both sides of paper automatically.
There are two reversing methods; one is a stacking method that temporarily stacks paper whose one side is already printed and then reverses it, and the other is a stackless method that prints both sides of the paper without stacking it.
Currently the stacking method is rarely used because the printing speed would be slow.
When printing on one side of the paper is finished, it is transported to the ADU by the bridge unit or the exit/reverse roller. Then the paper is reversed while it passes the ADU, and it is sent to the registration section. (The arrows in the figure below show the direction of paper transport.)
The ADU motor drives the ADU.

- Stackless method (A)

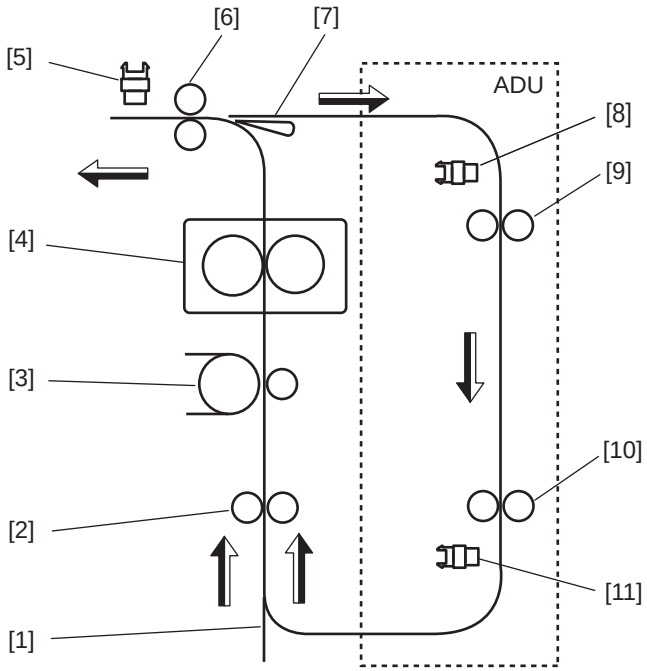


Fig.13-1

[1] Transport path
[2] Registration roller
[3] Transfer area
[4] Fuser unit
[5] Reverse path sensor
[6] Exit / transport roller
[7] Flapper
[8] Duplexing unit path entrance sensor
[9] ADU transport roller-1
[10] ADU transport roller-2
[11] Duplexing unit path exit sensor

13.2 Composition

Duplexing unit	Duplexing unit path entrance sensor
	Duplexing unit path exit sensor
	Duplexing unit interlock switch
	Duplexing unit cover opening/ closing detection sensor
	ADU board
	Reverse roller
	ADU transport roller-1
	ADU transport roller-2
	ADU motor
	Fuser transport sensor

13.3 Functions

13.3.1 Duplexing unit

1. Reverse path sensor
   This sensor detects that paper is being transported from the bridge unit to the duplexing unit.

2. Reverse roller
   This roller transports paper from the bridge unit to the duplexing unit.

3. Duplexing unit path entrance sensor
   This sensor detects that paper is transported at the entrance of the duplexing unit.

4. Duplexing unit path exit sensor
   This sensor detects that paper is transported at the exit of the duplexing unit.

5. Fuser transport sensor
   This sensor detects that paper is being transported from the fuser unit.

6. Duplexing unit interlock switch
   This switch detects the opening/closing status of the duplexing unit.

7. Duplexing unit cover opening / closing detection sensor
   This sensor detects the opening/closing status of the duplexing unit cover.

8. ADU transport roller-1/ ADU transport roller-2
   This roller transport paper in the duplexing unit to the registration roller.

9. ADU motor
   This motor drives the duplexing bridge transport roller and the ADU transport roller to transport paper to the duplexing unit.

10. ADU board
    This board controls the operations of the duplexing unit.

13.4 Description of Operations

When the duplex printing mode is selected, first the print data of the back side of the original are printed on the back side of the fed paper, and then the printed paper is transported from the fuser unit to the bridge unit.
After the printed paper has passed, the flap is lowered to transport the paper to the ADU.
The printed paper is made to enter the transport path via the ADU, and its print side is switched from the back to the front. In a sequence of these operations, both sides of the paper can be printed.

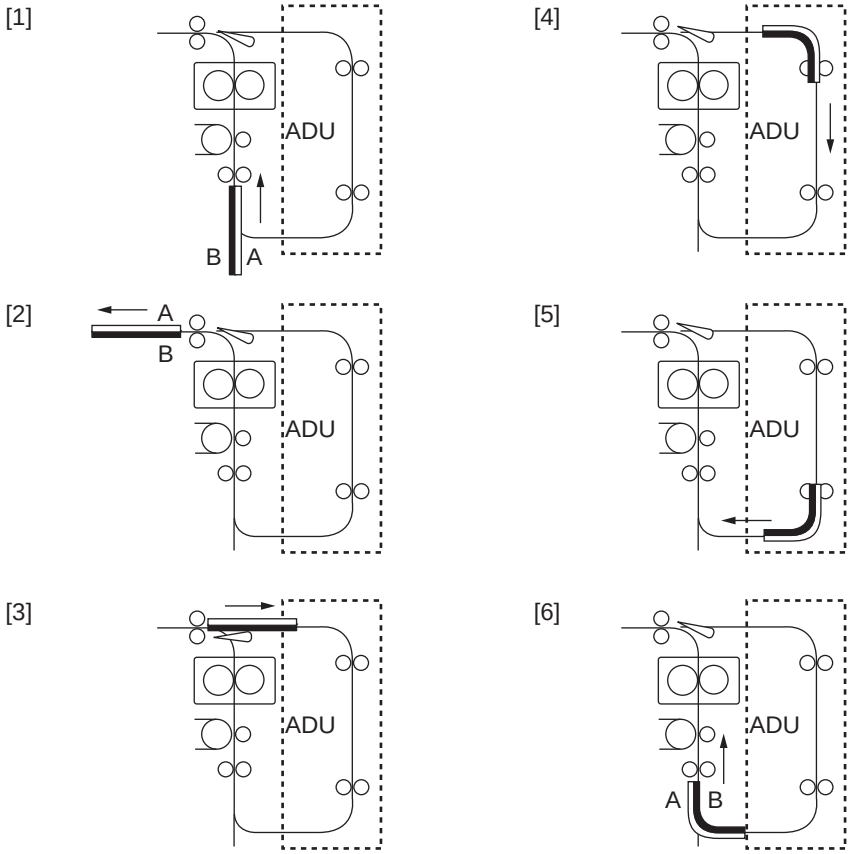


Fig.13-2

13.5 Method

The transport path of paper in the stackless method (A) is explained in 13.1. Those for the stackless method (B) and the stacking method are explained as below.

- Stackless method (B)

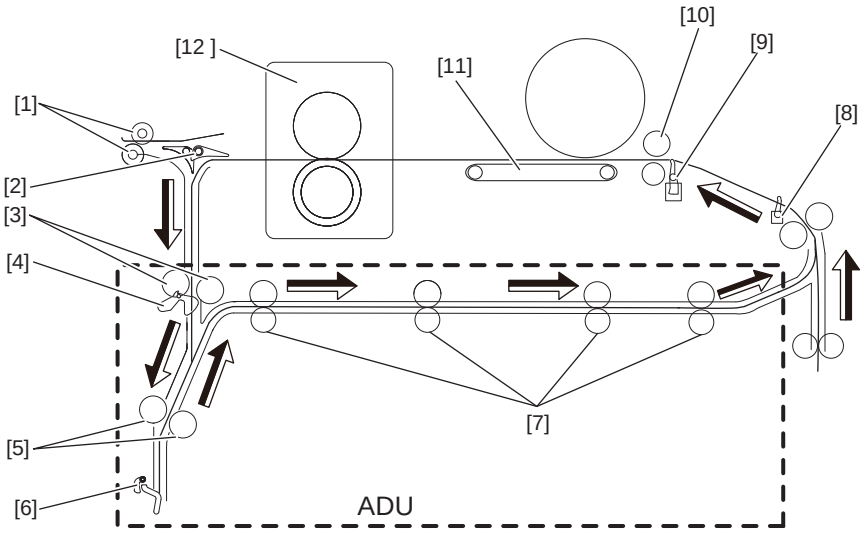


Fig.13-3

[1] Exit roller
[2] Exit/reverse gate
[3] Reverse path roller-1
[4] Reverse path sensor-1
[5] Reverse path roller-2
[6] Reverse path sensor-2
[7] ADU transport roller-1/2/3/4
[8] Intermediate transport sensor
[9] Registration sensor
[10] Registration roller
[11] Transfer area
[12] Fuser unit

- Stacking method

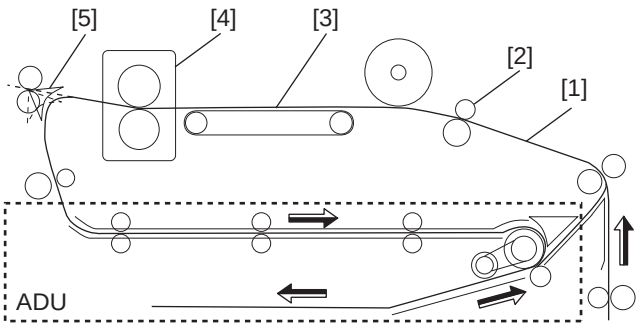


Fig.13-4

[1] Transport path
[2] Registration roller
[3] Transfer area
[4] Fuser unit
[5] Reverse path sensor

14. EXIT SECTION

14.1 General Description

The paper exit unit transports paper transported from the fuser unit or the bridge unit to the exit tray or the finisher.
When paper is to exit to the exit tray, the paper exit unit performs processing which should be done prior to that happening.
When paper is to exit to the options such as the finisher, the paper exit unit performs the processing which should be done prior to that happening.

The inner receiving tray unit lets paper exit on the inner receiving tray of the equipment. If paper exits to the optional Finisher, it does so through the bridge unit.
There are two types of paper exit unit; one is an inner receiving tray (paper exiting inside of the equipment), and the other is an external receiving tray (including the exit tray of the equipment).

- Inner receiving tray type
  The inner receiving tray unit lets paper exit on the inner receiving tray of the equipment. If paper exits to the optional Finisher, it does so through the bridge unit. This type is mainly adopted in low- or mid- speed models.

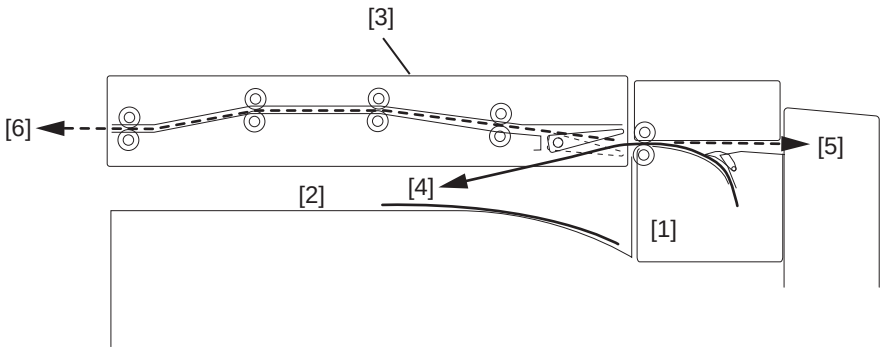


Fig.14-1

[1] Fuser unit
[2] Inner receiving tray
[3] Bridge unit (Option)
[4] The inner receiving tray lets paper exit on the inner receiving tray of the MFP.
[5] Paper is transported to the ADU in the duplex printing mode.
[6] Paper is transported to the Finisher (optional) if it is installed.

- External receiving tray type
  The external receiving tray unit lets paper exit to an exit tray installed outside of the equipment or the optional Finisher. This type is mainly adopted in high-speed models.

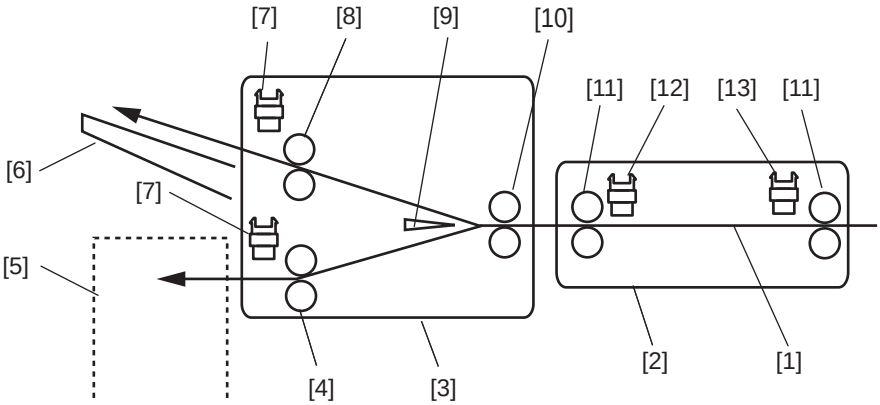


Fig.14-2

[1] Transport path
[2] Bridge unit
[3] Paper exit
[4] Lower exit roller
[5] Finisher unit (Option)
[6] Exit tray
[7] Paper exit sensor
[8] Upper exit roller
[9] Flapper
[10] Transport roller
[11] Bridge unit transport roller
[12] Bridge unit path exit sensor
[13] Bridge unit path entrance sensor

14.2 Composition

Paper exit unit	Upper paper exit sensor
	Upper exit tray paper full detection sensor
	Lower paper exit sensor
	Reverse section stationary jam detection sensor
	Reverse path cover switch
	Upper paper exit roller
	Lower paper exit roller
	Exit section cooling fan-1
	Exit motor
Bridge unit	Bridge unit entrance sensor
	Bridge unit exit sensor
	Bridge unit transport roller
	Bridge unit transport motor
	Reverse motor

14.3 Functions

14.3.1 Paper exit unit

1. Upper paper exit sensor
   This sensor detects that paper is transported to the upper exit tray.

2. Upper exit tray paper full detection sensor
   This sensor detects the full status of the upper exit tray.

3. Lower paper exit sensor
   This sensor detects that paper is transported to the lower exit tray.

4. Reverse section stationary jam detection sensor
   This sensor detects the presence of paper in the reverse path section when a paper jam occurs.

5. Reverse path cover switch
   This switch detects the opening/closing status of the reverse path cover.

6. Upper paper exit roller
   This roller transports paper transported from the bridge unit to the upper exit tray.

7. Lower paper exit roller
   This roller transports paper transported from the bridge unit to the lower exit tray.

8. Exit section cooling fan
   These fans cool down paper which exits to the exit section.

9. Exit motor
   This motor drives the upper and lower exit rollers to make paper exit.

14.3.2 Bridge unit

1. Bridge unit entrance sensor
   This section detects that paper is being transported at the entrance of the bridge unit.

2. Bridge unit exit sensor
   This section detects that paper is being transported at the exit of the bridge unit.

3. Bridge unit transport roller
   This roller transports paper being transported from the fuser unit to the exit section.

4. Bridge unit trransport motorr
   This motor drives the transport roller of the bridge unit.

5. Reverse motor
   This motor drives the roller which transports the reversed paper.

14.4 Description of Operations

Paper brought from the fuser unit to the bridge unit or the paper exit unit is then transported to either the upper or lower exit tray of the paper exit unit by means of the exit rollers. Paper is transported to the upper exit tray as the default. To transport paper to the lower exit tray, solenoid-1 is turned OFF in order to lower the flapper. The bridge unit transports paper from the fuser unit to the paper exit unit. It also transports paper to the duplexing unit during duplex printing.
Paper jams are detected by means of the transport sensors in the bridge unit and paper exit unit.

REVISION RECORD

Ver.06

Ver 06	
Page	**Contents**
GENERAL PRECAUTIONS	The descriptions have been added.
1-6	Notes have been added.
1-7	e-STUDIO307LP series has been added. Notes have been added.
1-9	Notes have been added.

Ver.05

Ver 05	
Page	**Contents**
GENERAL PRECAUTIONS	The descriptions have been added.
1-6	e-STUDIO507 series, e-STUDIO857 series, and e-STUDIO527S series have been added.
1-8	e-STUDIO6570C series and e-STUDIO407CS have been added. The descriptions of e-STUDIO2550C series, e-STUDIO5055C series have been changed.
13-5	The descriptions of the ADU stackless method have been added.

Ver.04

Ver 04	
Page	**Contents**
GENERAL PRECAUTIONS	The descriptions have been added.
1-6	The descriptions have been added.
1-7	The descriptions have been added.
1-8	"e-STUDIO3555C series" has been changed to “e-STUDIO5055C series”.
4-7	The descriptions of No.92 to No.101 have been corrected.
4-8	The descriptions of No.102 to No.106 have been corrected.

Ver.03

Ver 03	
Page	**Contents**
-	The trademark has been added.
1-6	e-STUDIO456 series, e-STUDIO856 series, and e-STUDIO306LP have been added.
1-8	e-STUDIO3555C series have been added.
4-6	Notes have been added to No.68 and 71.
Back cover	The address has been changed.

Ver.02

Ver 02	
Page	**Contents**
1-7	e-STUDIO2050C series has been added
5-5	“CCD” has been added
7-6	“LED print head” has been added

Ver.01

Ver 01	
Page	**Contents**
1-2	Unicode Font Enabler and Hardcopy Security Kit has been added
1-3	FUS, TBU, TRU have been added
1-5	“1.5 HDD Memory Map” has been added
1-7	“1.6 Adjustments” has been added
1-9	“1.7 Firmware Update” has been added
1-10	“1.8 Preventive maintenance” has been added

Ver.00

Ver 00	
Page	**Contents**
-	First version

TOSHIBA

TOSHIBA TEC CORPORATION

1-11-1, OSAKI, SHINAGAWA-KU, TOKYO, 141-8562, JAPAN