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HP4-R2 TRAINING

DUPLICATOR ENGINE

COURSE OVERVIEW

- The course is broken up into several modules. This section outlines these modules.
- The course covers the HP4-V2 and the optional peripherals. Software is covered in separate courses.
- The mechanisms are very similar to the Pink Gold/HP4 and Silver duplicator series.

Course Overview

- **Product Outline**
- **Specifications**
- **Installation**
- **Operation**
- **Machine Overview**
- **Scanning**
- **Image Processing**

PRODUCT OUTLINE

- ❒ The model will be introduced to the class.
- ❒ The optional peripherals will be introduced to the class.
- ❒ The product concept, sales points, and targets will be presented.

SPECIFICATIONS

- ❒ Significant items will be discussed.

INSTALLATION

- ❒ The class will install their machines and the peripherals.
- ❒ The class will learn how to access SP modes and user tools.
- ❒ The class will study how to upgrade the firmware.

OPERATION

- ❒ This part of the course will cover some points about operating the machine.

MACHINE OVERVIEW

- ❒ The components will be discussed.
- ❒ The paper feed path and printing process will be outlined.

SCANNER

- ❒ The scanner mechanism will be discussed.

IMAGE PROCESSING

- ❒ This section explains the image processing done inside this machine.

Course Overview

- **Master Ejection**
- **Master Feed**
- **Drum**
- **Paper Feed**
- **Paper Delivery**
- **Maintenance**
- **Troubleshooting**
- **Optional ADF**

MASTER EJECT

- ❒ This section explains how the used master is removed from the drum before the new master is wrapped around the drum.

MASTER FEED

- ❒ This section explains how the new master is wrapped around the drum.

DRUM

- ❒ This section describes drum drive, ink supply, and the detection of masters on the drum.

PAPER FEED

- ❒ This section describes the paper feed, printing pressure, and paper table mechanisms.

PAPER DELIVERY

- ❒ This section explains how the printed page is fed out of the machine.

MAINTENANCE

- ❒ PM is described briefly.

TROUBLESHOOTING

- ❒ Basic points concerning service codes, diagnostics, and other troubleshooting tools will be covered.

OPTIONAL ADF

- ❒ The mechanisms of the optional ADF will be explained.

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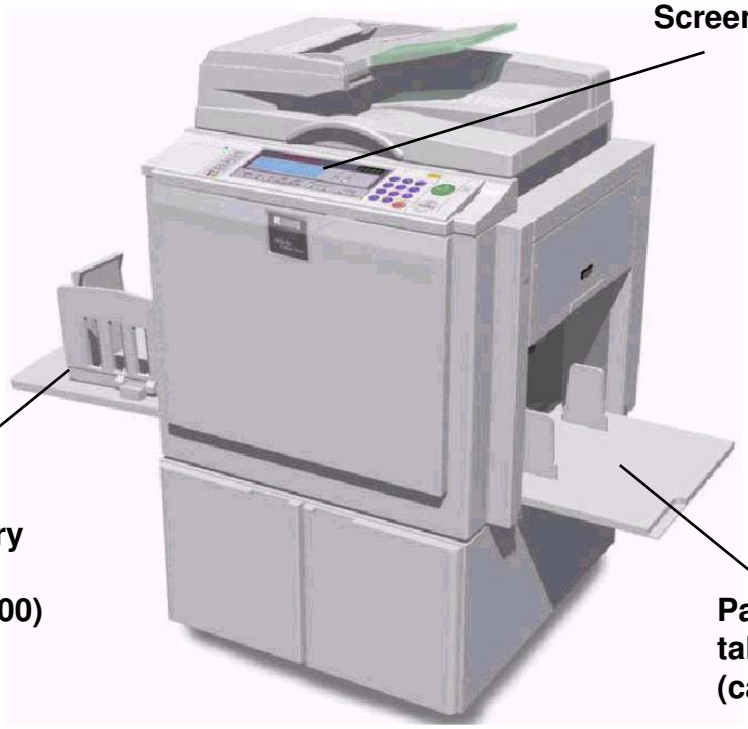
DUPLICATOR ENGINE

PRODUCT OUTLINE

PRODUCT CONCEPTS AND MAIN SALES POINTS

Appearance



❒ The LCD is not a touch-panel.

Product Concept

- **Mid-range model with more capabilities than current models in this range**
  - Replacement for the HP4 and Pink Gold models
  - The engine is based on the Pink Gold series.

Options

- **50-sheet Document Feeder**
- **Colour Drum**
- **A4 Drum (black only)**
- **Tape Dispenser**
- **Platen Cover**

- **There is no sorter, Opal, or LCS.**
- **The drums cannot be used with the Opal or HQ-Opal.**

❒ Introduce the range of available options.
- ➢ The document feeder is the same as used with the Sapphire 2 and HP4.
- ➢ The tape dispenser is almost the same as used with previous models. It is modified for RoHS compliance.
- ➢ The platen cover is the same type as used with previous models.

Platen Cover/ADF

- **The customer needs one of the above options.**
- **This is because a platen cover is not installed at the factory.**

Sales Points

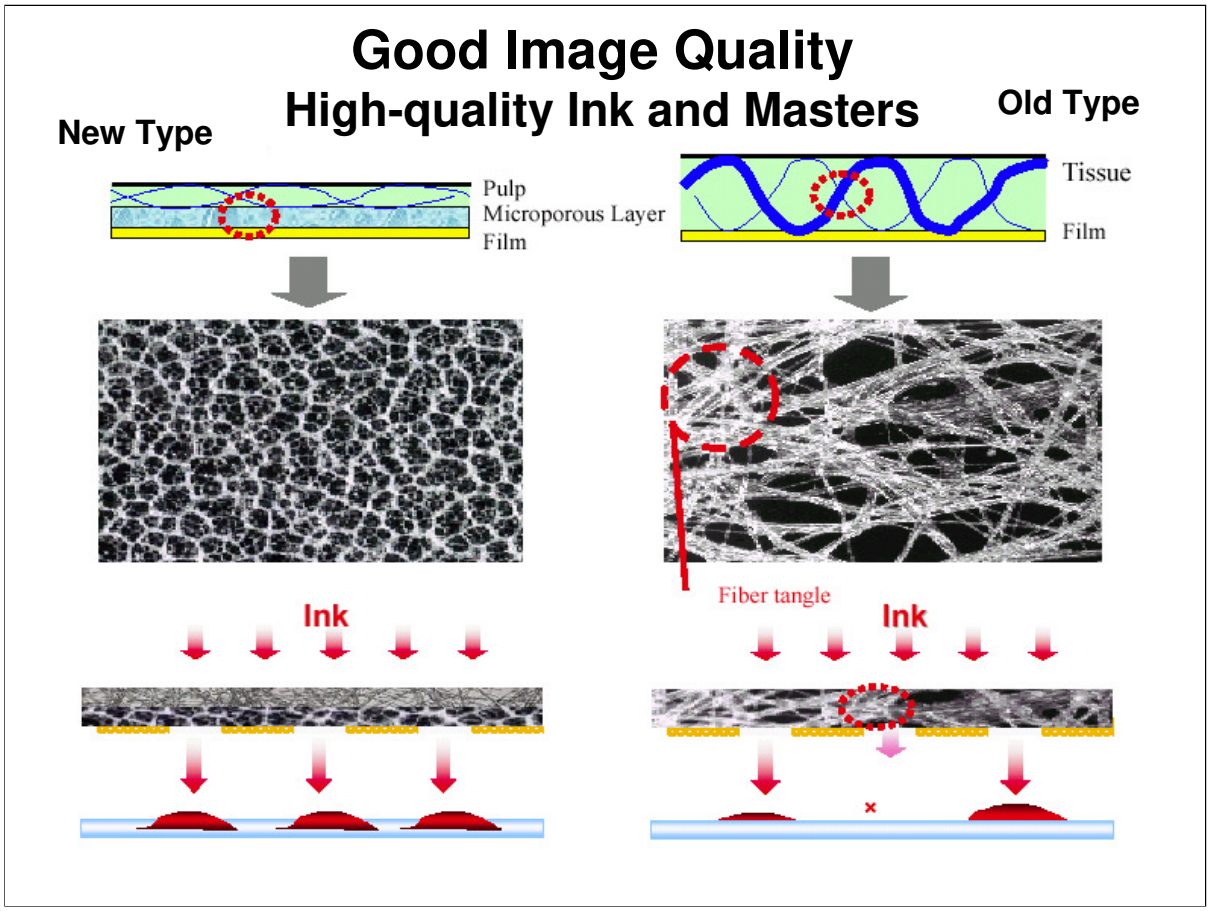
- **Good image quality**
  - High-quality ink and masters
- **Quiet**
  - Sound-proofing materials are added to areas where noise occurs
  - Noise-generating mechanisms are modified
- **Reliable**
  - Improved paper delivery table
  - Paper feed retry

❒ Ink and masters: Same as the HP4
❒ Slightly quieter than HP4, because of these modifications
❒ Paper delivery table: The new mechanisms from the Emerald are used.

Sales Points

- **Energy saving**
- **User-friendly**
  - Four-line LCD screen
  - Exchangeable ‘Master Making’ and ‘Print’ keys

❒ The controller is a new model.



- Same as the HP4.

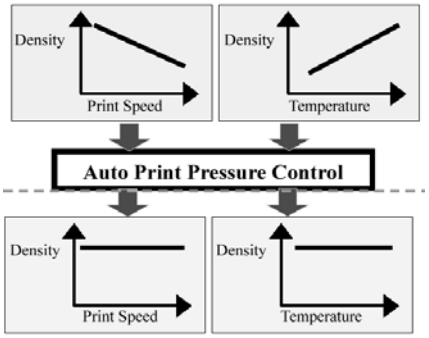
- In older models, fibres in the master were sometimes tangled. This blocked the flow of ink through the master to the paper.
- The new master is improved. Also there is an additional porous layer, the film is thicker, and the holes in the master are sharper.
- In addition, the ink percolates through the master more evenly.

Good Image Quality
High-quality Ink and Masters

- **As a result**
  - Better solid fill-in
  - Smoother halftone and photo images
    - In addition to the improved master and ink, image processing is similar to that used in black-and-white copiers. This means that all types of originals (text, photo, text/photo) can be reproduced accurately.
  - No set-off, no print-through, drastic reduction or roller marks and stains
    - Good-quality duplex and colour printing become possible
  - Lower ink consumption by 20% from the Pink Gold
    - This is in spite of the better solid fill-in. Ink supply to the paper is more accurately controlled because of the smaller holes and the properties of the new ink. As a result, there is less waste.
  - Durability of masters is increased from 2,000 prints per master to 4,000 prints per master

❒ Same as the HP4.

Good Image Quality
Auto Print Pressure Control



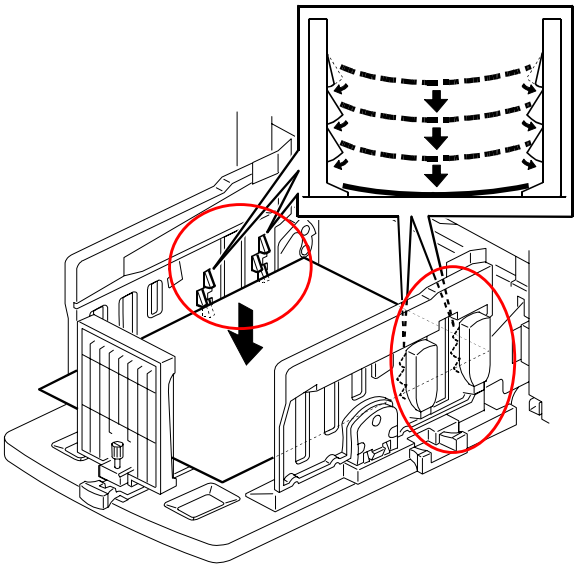
Temperature	Printing Speed	Pressure Level
Low	High	Strong
High	Low	Weak

- **Without auto print pressure control:**
  - The print is paler if the print speed is faster
  - The print is darker if the temperature is higher
- **There is a thermistor near the drum to detect temperature.**
- **The machine automatically changes the print pressure, based on the print speed and the temperature, to keep a constant image density.**

❒ Same as the HP4.

Reliability

Paper Delivery Table



- **Improved paper delivery table: Plates are attached on each side**
- **The tabs on the inner sides of the plates catch the edges of the paper.**
- **Because of this, the paper falls more slowly onto the delivery table.**
- **This reduces ink stains on the rear sides and stacks the pages more evenly.**
- **The user can move these plates to one of two positions, depending on the paper type.**

❒ This mechanism also improves paper alignment.

Reliability
Paper Feed Retry

- **Paper feed retry**
  - If the registration sensor does not detect the paper feeding into the machine, the feed mechanism tries again.

❒ Same as the HP4.

Energy-saving

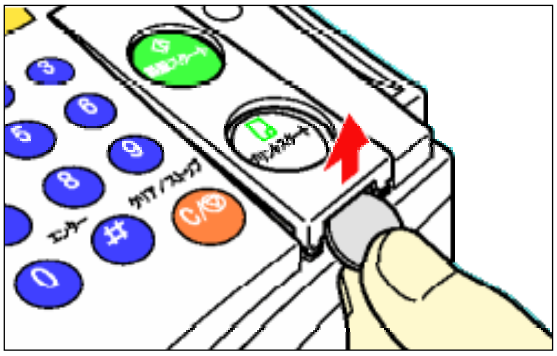
- **This model has energy saver and auto-shut off modes, like photocopiers.**
- **Compliance with directives on hazardous materials (RoHS) and waste (WEEE).**

❒ Auto off mode is new for this series.

User-friendly
Operation Panel

- **Four-line LCD (not a touch-screen)**
- **Improved operation panel design**
  - Important buttons near the screen
  - Not often used buttons under a cover at the left side of the operation panel

User-friendly
Exchangeable Keys



- **A technician can exchange the 'Master Making' and 'Print' keys.**
  - Some customers may prefer the keys to be exchanged.
- **The functions of the two keys automatically change when you do this.**

❒ The procedure is in section 3.2.3 of the service manual.

YIELD AND RELIABILITY TARGETS

Supply Yield Targets

- **Masters**
  - The master rolls are compatible with the HP4.
    - A3 drum: 200 masters/roll
    - Optional A4 drum: 315 masters/roll
    - 4,000 prints/master
- **Ink (black, coloured)**
  - The ink cartridge is compatible with the HP4.
    - 600 ml/cartridge

Ink Type

❒ For more details on ink consumption, see ‘Handout 1 – Ink Consumption’.

Reliability Targets

- **Maximum copies per master**
  - 4,000
- **Monthly Print Volume**
  - Average: 50k
  - Maximum: 170k
- **Estimated Unit Life**
  - 10,000k prints, 30k masters, or 5 years
- **PM Cycle**
  - 1200k or 6 months
- **MCBC**
  - 240k

Serviceability Targets

- **Maintenance Time**
  - 6-months PM: 20 minutes
  - 12-months PM: 50 minutes
  - EM: 40 minutes
- **Installation Time**
  - Mainframe: 20 to 30 minutes
  - ADF: 10 minutes

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HP4-R2 TRAINING

DUPLICATOR ENGINE

SPECIFICATIONS

❒ Go through the machine's specifications. Emphasize the points listed on the slides.

Specifications 1

- **Resolution**
  - Thermal head: 400 dpi
  - Scanning: 400 x 400 dpi
    - CCD resolution (main-scan) is 600 dpi, but the circuits change this to 400 dpi
- **Original Size**
  - Maximum 300.8 x 432 mm / 11.8" x 17.0“
    - With ADF
      - Max. 297 mm × 864 mm, 11.7" × 34.0"
      - Min. 149 mm × 210 mm, 5.9" × 8.3“
- **ADF Capacity**
  - 50 sheets (80 g/m^2 , 20 lb)
  - 7.5 mm, 0.3" stack height

ADF Capacity

❒ The ADF is an option.

Specifications 2

- **Printing Area**
  - A3 drum: 290 x 410 mm / 11.4" x 16.1"
  - A4 drum: 290 x 200 mm / 11.4" x 7.8"
- **Acceptable Paper Sizes**
  - Maximum: 297 x 432 mm / 11.6" x 17.0"
  - Minimum: 70 x 148 mm / 2.8" x 5.9“
- **Copy Paper Weight**
  - 47.1 ~ 209.3 g/m^2, 12.5 ~ 55.6 lb

Specifications 3

- **Printing Speeds:**
  - 60, 75, 90, 105, 120 sheets/minute
- **Master Processing Time (at 100% size, platen mode)**
  - Less than 24 seconds (A4)
  - Less than 29 seconds (A3)
- **Master Eject Box Capacity:**
  - 65 masters
- **Paper Feed Table Capacity: 1000 sheets**
- **Paper Delivery Table Capacity: 1000 sheets**

Specifications 4

- **Master roll specifications**
  - Thermal master roll type:
    - 320 mm width, 110 m/roll (A3 master roll)
  - Yield:
    - 200 masters/roll (A3 Drum)
    - 315 masters/roll (A4 Drum)
  - Maximum run length per master:
    - 4,000 prints

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HP4-R2 TRAINING

DUPLICATOR ENGINE

INSTALLATION

- ❒ Install at least one machine with all options as a complete system.

Service Manual, section 1.1

- ❒ Go over the environment, machine level, minimum space, and power requirements of the machine before proceeding with installation.

Service Manual, section 5.1

SERVICE PROGRAM MODE

- ❒ Make sure that the class understands the following.
  - ➢ How to enter service program mode (SP mode). This is now the same as for copiers.
  - ➢ How to select a program number.
  - ➢ How to change an SP mode setting.
  - ➢ How to exit service mode.

Main Body

- **Install the machine.**
  - When you lift the machine, always use the carrying handles, as explained in the manual.
  - If you install the optional table, make sure to attach the machine to the table with the screws (see the note in the service manual).
    - If you do not do this, the machine could fall over if the platen cover or ADF is open.
- **After you install the machine, supply ink to the drum.**
  - Press the “Economy Mode” key while holding down the “0” key.

Service Manual, section 1.2.1

❒ Have the trainees install the machine, following the procedure in the manual.
❒ After installing, supply ink to the drum, as shown on the slide.

Options

- **Platen cover**
- **ADF, and ADF stabilizers**
  - You must install the stabilizers, or the machine could fall over if the ADF is open
- **Tape dispenser**
  - If you install the tape dispenser, turn on the power switch of the dupicator first, then the power switch for the tape dispenser.
- **Optional drum**
  - For A4 drums, only black ink is supported.
  - Do not touch the dip switches on the ink detection boards in side the drum. These tell the machine what type of drum it is.
- **Interface board**

Service Manual, sections 1.2.2 to 1.2.6

❒ Make sure that the power cord is unplugged before installing any of these options.

Interface Board

❒ This is for connecting to the PC controller. It is a new type, not compatible with older models. Also, the controller is not available at the time of writing this course.

❒ The machine detects the interface board automatically. There is no SP mode to adjust.

Optional Drum

Service manual, section 4.3.4

❒ Section 4.3.4 of the service manual shows the dip switch settings for each drum type.

Key counter

❒ There are a lot of key counter installation SPs in the manual, but no installation procedure. Why? This is because the key counter is not officially supported for this model outside Japan.

Updating the Firmware

- **SP 8-1: Copies firmware from a flash memory card to the machine.**
  - SP 8-2: Copies firmware from the machine to a flash memory card.
- **SP 1-70: Displays the part number and suffix of the current firmware**
- **SP 1-73: Displays the main firmware version.**

Service manual, section 5-9-2

❒ Ask the class to install the latest firmware.

Other SP Modes

- **SP3-1: Input the present time**
- **SP3-2: Input the telephone number for service**
- **SP3-4: Input the installation date**

❒ Input the data for these SPs at installation, depending on your service policy.

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HP4-R2 TRAINING

DUPLICATOR ENGINE

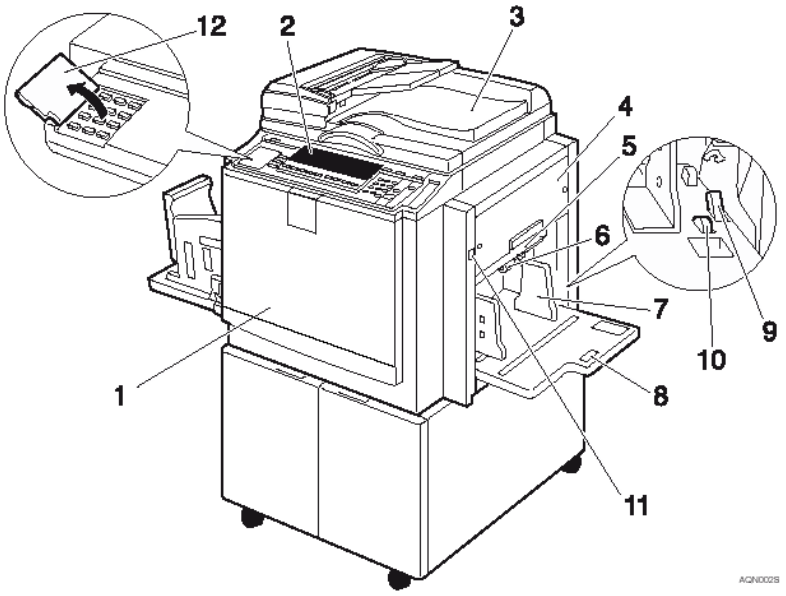
OPERATION

- ❒ This part of the course will deal with general operation and copying.
- ❒ Teach and demonstrate procedures from the operation manuals. Select the items to be taught in the class in accordance with the experience level of the trainees.
- ❒ Have the class follow this part of the course using the operation manual. Page numbers are not quoted in the Instructor's Guide, as the author has no control over operation manual layout. However, the description follows the order of sections in an almost completed draft copy.
- ❒ Let the trainees practice operating the machine in all copy modes and using all optional peripherals for copying.

COMPONENTS

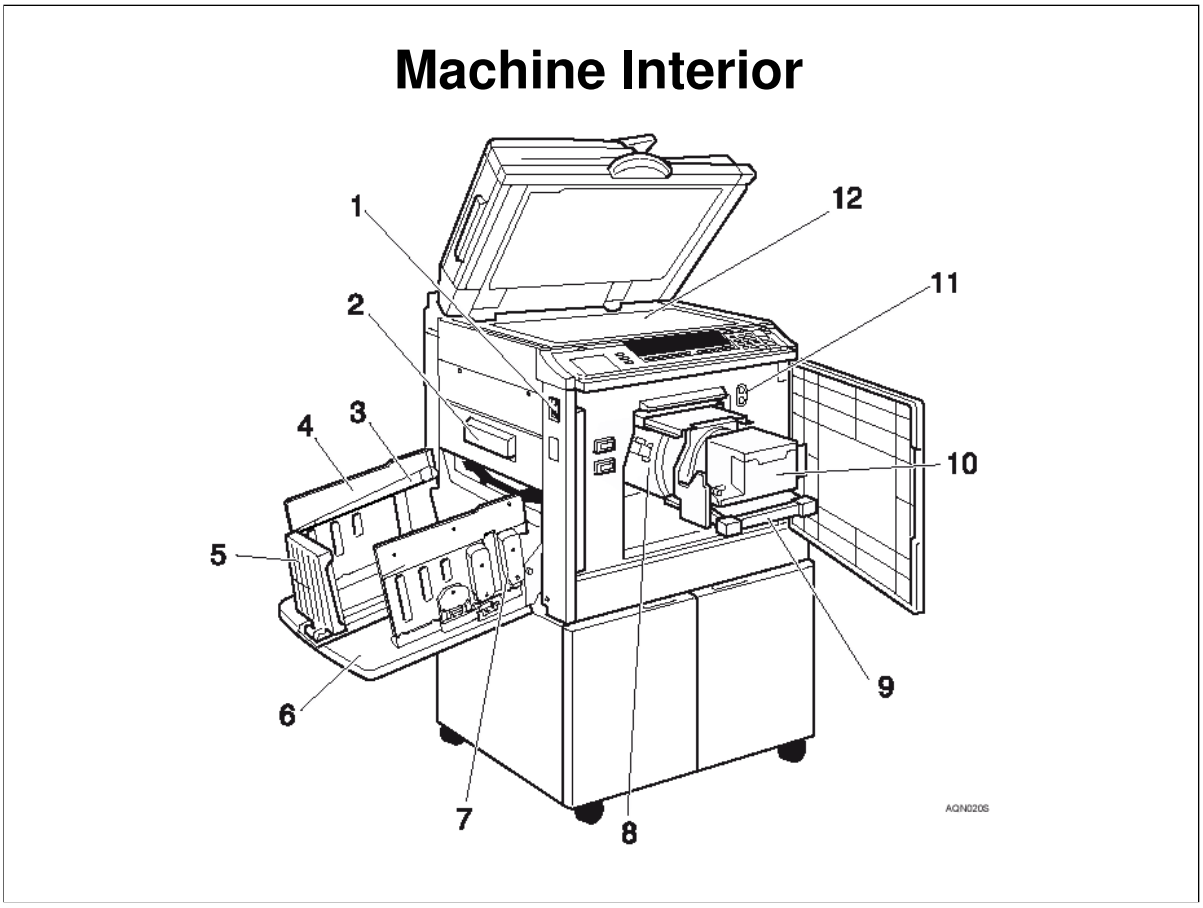
❒ This section explains the machine's components from the user's point of view.

Machine Exterior



Operation Manual, Machine Exterior

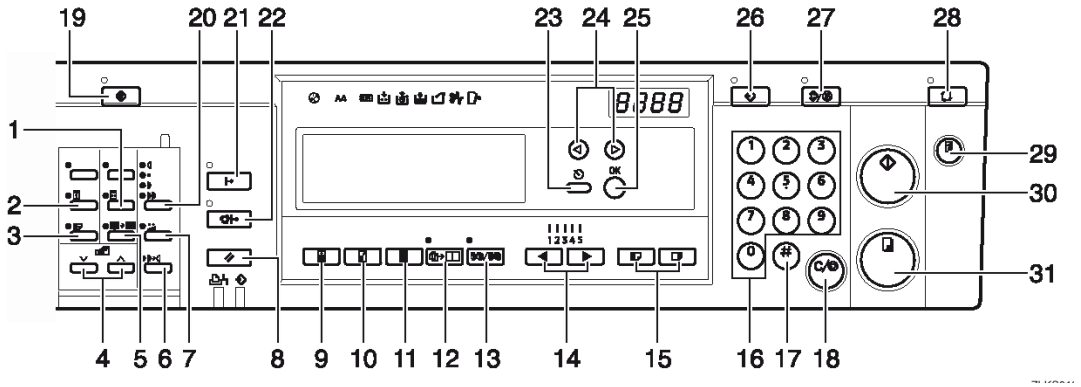
- Go over the major components of the machine from the user's point of view.
- Be sure that the class understand the following components
  - 4. Master tray: Open here to replace the master roll
  - 5. Lower master tray: Open here to remove a master jam
  - 6. Feed roller pressure lever: Adjusts the feed roller contact pressure on the paper stack – There is also a technician adjustment for separation roller pressure (see the Paper Feed section of the course).
  - 9. Paper feed side plate lock lever: Use to lock or unlock the paper feed side plates.
  - 10. Side tray fine adjusting dial: Use to shift the paper feed tray sideways, to move the image sideways on the paper.
  - 11. Paper feed tray down key: Press to lower the paper feed tray.
  - 12. 'Behind' cover: There are some keys below this cover. These are called 'special features' – we will see these features later in this section (for example, Economy Mode).



Operation Manual, Machine Interior

- ❒ Go over this briefly.
- ❒ The document feeder is an option.
- ❒ Be sure that the class understand the following components
  - ➢ 3. Paper alignment wings: Lift or lower the wings according to the type of paper used, to stack the paper neatly. This will be explained more in the Paper Delivery section.
  - ➢ 4. Paper delivery side plates: Use to align the prints on the paper delivery tray.
  - ➢ 7. Chocks: Use to adjust the buffer fins. This will be explained more in the Paper Delivery section.
  - ➢ 9. Drum unit lock lever: Lift to unlock and pull out the drum unit.
  - ➢ 10. Ink holder: Set the ink cartridge in this holder.
  - ➢ 11. Drum position indicator: The drum can be removed when the green lamp is on, but not when the red lamp is on.

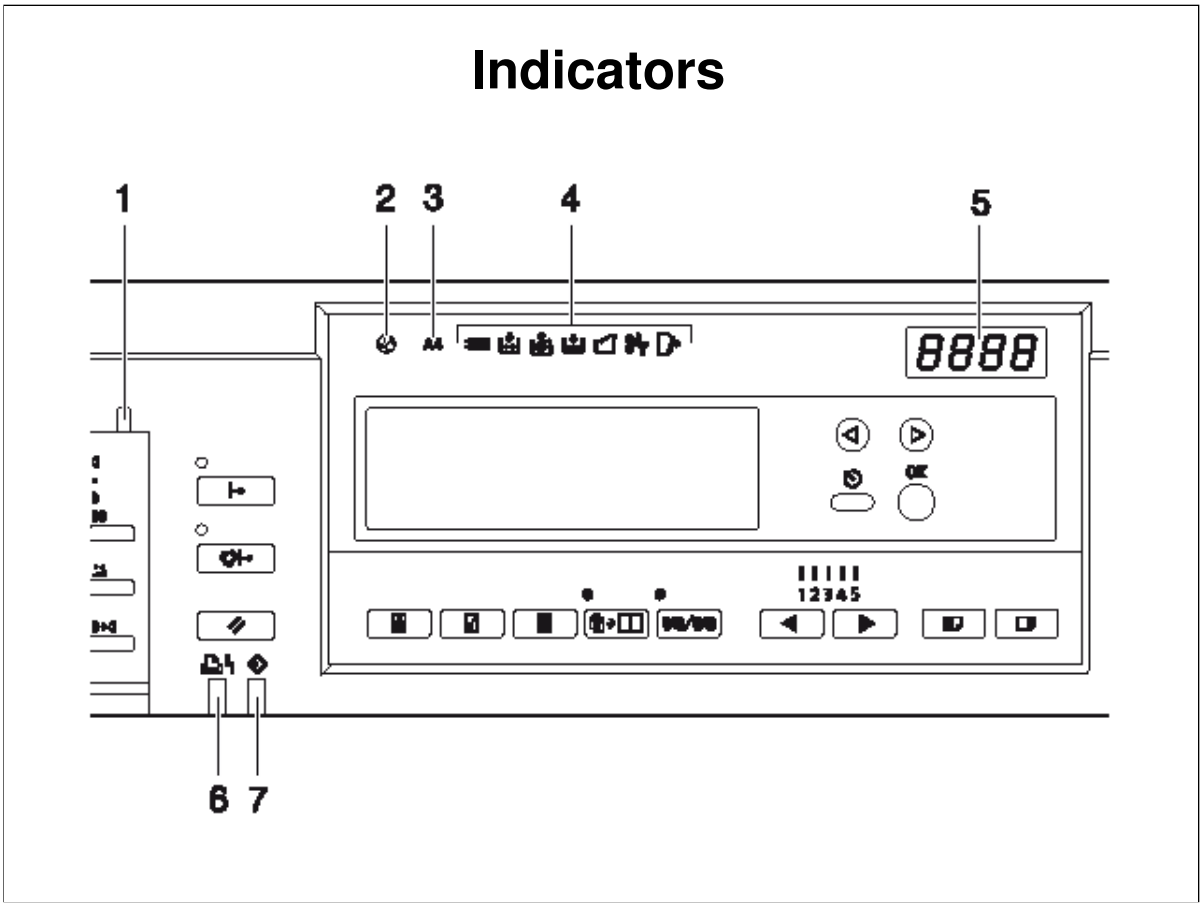
Operation Panel



Operation Manual, Control Panel

Keys

- ❒ Make sure that the class are familiar with the operation panel keys.
- ❒ There may be some keys that are not be familiar to photocopier technicians. These keys are used to access the various features of this machine. The features will be mentioned later in this section.



Operation Manual, Control Panel

Indicators

- ❒ Make sure that the class are familiar with the operation panel indicators.
- ❒ Be sure that the class understand the following items.
  - ➢ 1. Special feature indicator: Lets you know when one or more of the keys under the cover at the left of the operation panel (item 12) has been selected.
  - ➢ 2. Colour drum indicator: Lets you know that a colour drum is installed, and that the machine is ready for colour printing.
  - ➢ 3. A4 drum indicator: Lets you know that an A4 drum is installed.

PREPARING TO PRINT

❒ This section explains some basic points about originals and copy paper, and how to set up the machine.

Originals

- **Note that some types of originals may not be detected properly.**
- **Originals should not have dark areas or bold characters right at the leading edge, or the prints may have dirty edges.**
- **Note that there is a 5 mm margin at the leading edge of the original and a 2 mm margin at the trailing edge which will not be copied, even if the original is positioned correctly.**

Operation Manual, Operation

Notes Concerning A3

- **If you use an A3 original, use a reproduction ratio to reduce the image size, to make sure that you get all of the image on the copy paper.**
- **When you use A3, 11" × 17" and 209.3 g/m2 , 55.6 lb paper, slow the printing speed down to Setting 1, 2 or 3.**

Dealing with Paper Curl

	Right	Wrong
Thin Paper		
Thick Paper		

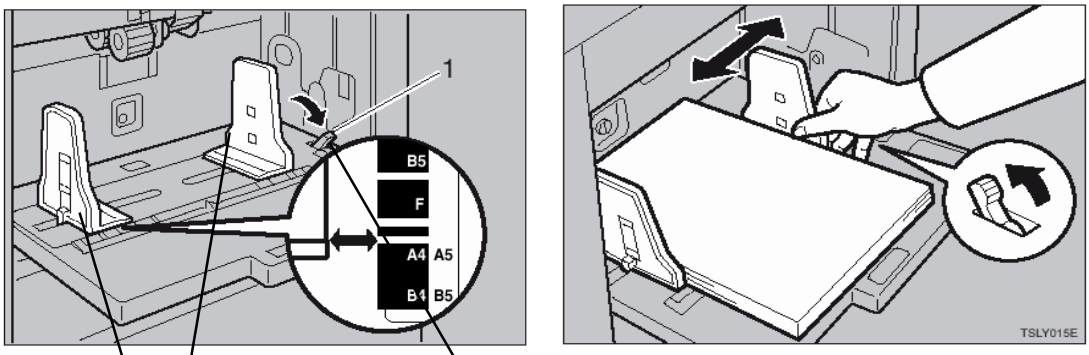
TPEY990E

Operation Manual, Operation, Print Paper

Printing Paper

❒ Note the recommended sizes and types of paper.

Paper Feed Table



Side Fences

Lock Lever

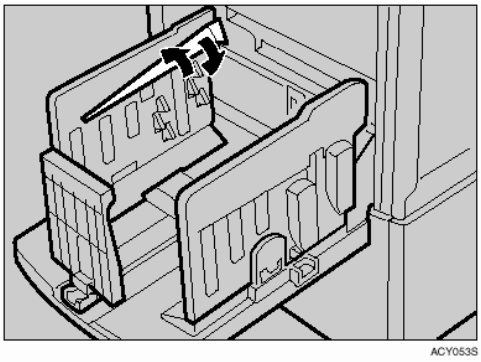
Operation Manual, Operation, Printing Preparations

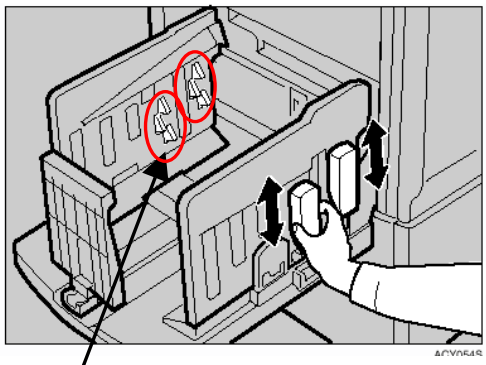
- ❒ Note the correct way to set up the feed table.
- ❒ Raise the lock lever before you move the side fences. Then lock the side fences after you add paper.

Paper Delivery Table
Overview

- **These items can be adjusted.**
  - Side and end plates: Move these to the correct paper size
  - Paper alignment wings
  - Chocks (buffer fins)
- **These items must be adjusted manually.**

Paper Delivery Table
Adjustments





Chocks

Buffer Fins

Paper Alignment Wings
Three settings:
Up, Down, 45 degrees

Operation Manual, Operation, Printing Preparations

- Note the correct way to set up the delivery table.
- In this machine, the side and end fences are not the only items to adjust.
  - The paper alignment wings and chocks must be adjusted to match the paper size and thickness.
  - The correct settings are shown in the operation manual.
- What is the purpose of these?
  - The paper alignment wings keep the paper's shape so that it drops onto the tray flat and not all curled up.
  - The tabs (called the 'buffer fins') on the inner surfaces of the chocks catch the edges of the paper, so that the paper falls more slowly. This prevents ink stains on the rear side of the prints.

Paper Delivery Table

Recommended Settings

Paper Weight	Paper Size	Paper align-ment wings	Chocks
128 g/m², 34 lb or thicker	A3 ▭, 11" × 17" ▭, B4 JIS ▭	Lower the wings.	Down
	A4 ▭ ▯, B5 JIS ▭ ▯	Lower the wings.	Down
52.3 g/m² – 128 g/m², 13.9 lb to 34 lb	A3 ▭, 11" × 17" ▭, B4 JIS ▭	Raise the wings fully.	Up
	A4 ▭ ▯, B5 JIS ▭ ▯	Raise the wings to about 45 degrees.	Up
52.3g/m², 13.9 lb or thinner	A3 ▭, 11" × 17" ▭, B4 JIS ▭	Raise the wings to about 45 degrees.	Down
	A4 ▭ ▯, B5 JIS ▭ ▯	Raise the wings to about 45 degrees.	Down

- **This table, from the operation manual, shows the recommended settings for each paper type.**

Folding up the Paper Feed and Paper Delivery Tables

- **Study the correct procedures in the operation manual, to prevent damage to the machine.**

Operation Manual, Operation, After Printing

BASIC PRINTING PROCEDURE

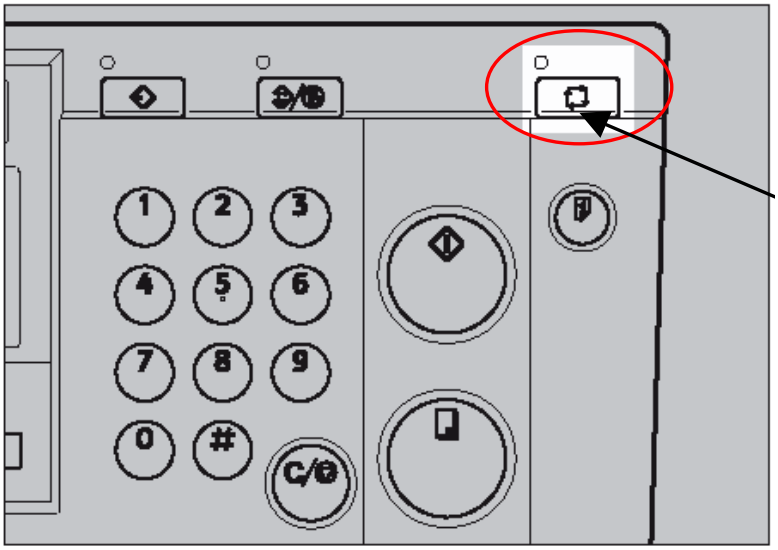
❒ This explains the basic procedure for how to make copies.

Auto Cycle On or Off

- **The basic printing procedure depends on whether Auto Cycle is on or off.**

❒ Go on to the next slide.

Auto Cycle



- **Faster copying of a series of originals**
- **No pause between originals, so no proof copies can be made**
- **Default: On (User Tools – System Settings – Mode Setting – Auto Cycle)**

- ❒ Auto Cycle allows faster copying of a series of originals.
- ❒ Auto Cycle On is the default setting, and the Print button is lit.
- ❒ To make a master, put your original in the ADF or on the glass. When you close the platen cover, or when the ADF detects the original, the Master Making key lights (or, you can press the Master Making key before you place the original).
- ❒ With the optional ADF, each page is scanned and copied automatically without any operator intervention needed.
- ❒ Proof copies cannot be made with the Proof key in this mode.

Printing Procedure
Auto Cycle Enabled

- **Place the original**
- **Press the Master Making key**
  - Makes the master and the prints

Operation Manual, Basics, Basic Procedure

❒ Very easy, but you cannot make trial prints or proof prints.

Printing Procedure
Auto Cycle Disabled

- **Place the original**
- **Make sure that the master making key is lit, then press the Master Making key**
  - Makes the master and a trial print
    - The trial print primes the ink supply
- **Then, press the Proof key (optional step)**
  - Makes a test print
    - Allows image position adjustment
- **To start the print run, press the Print key**
  - Starts printing

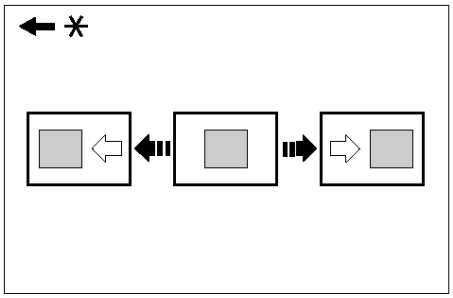
❒ Note the various stages of the printing process.
❒ Press the Master Making key to make the master.
  ➢ A trial print is made. Use this to check the condition of the master.
  ➢ The trial print also serves to prime the ink supply mechanism, so that the first print will have enough ink.
❒ Press the Proof key to make a test print.
  ➢ This can be used to check the image position and adjust if necessary. The trial print is not suitable for this.
❒ Press the Print key to start printing.

Auto Document Feeder

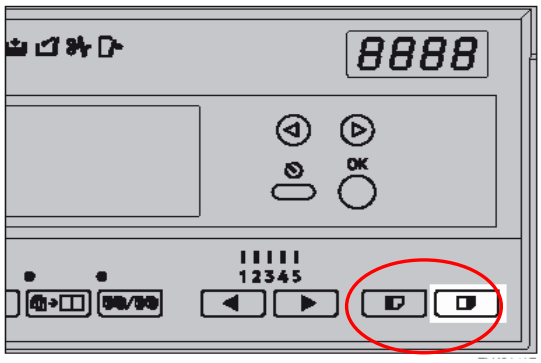
- **Up to 50 sheets, face-up**
- **Use Auto Cycle mode to allow non-stop copying**

- ❒ Up to 50 originals can be placed in the feeder.
- ❒ Use the Auto Cycle feature to make sets of copies of more than one page. Otherwise, you will have to press the Print key for every original.

Adjusting the Image Position
Forwards and Backwards



* Paper feed direction



- **Adjustment in both directions done at the operation panel**
- **This changes the registration motor timing.**
- **No dials or levers to adjust**

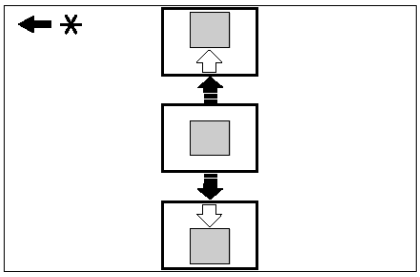
Operation Manual, Basics, Sample Print and Adjustment

❒ There are two ways, both done with the image positioning keys.

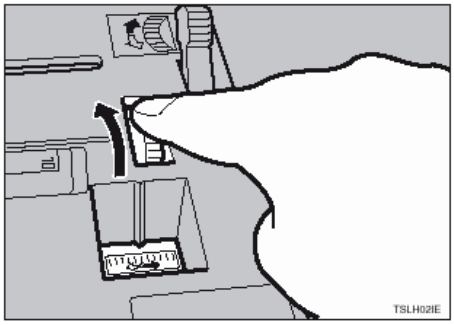
- ➢ Shifting forward or backward: This alters the registration motor start timing and turns the pressure cylinder (which has the paper clamper attached to it). This will be explained in the Image Up/Down Shift section of the course.

  Always leave a 10 mm gap at the leading edge, or paper may wrap around the drum.
- ➢ Shifting from left to right: This moves the outer drum sleeve to the left or right. This will be explained in the Drum section of the course.

Adjusting the Image Position
Left and Right

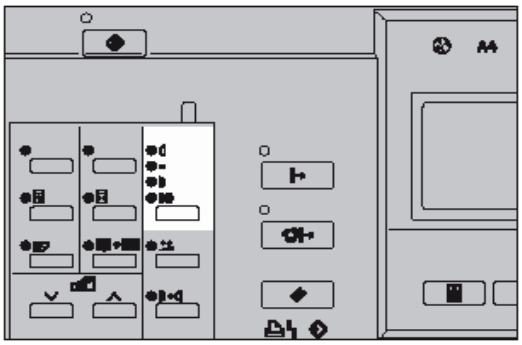


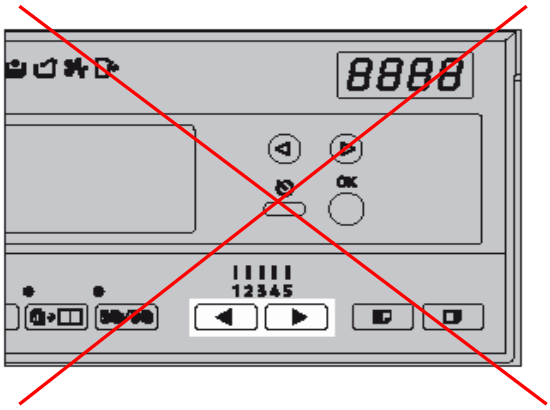
* Paper feed direction



- **Side table adjustment dial**
- **This moves the paper feed table to the left or right.**
- **In the diagram, the image is moved to the right.**

Adjusting the Image Density





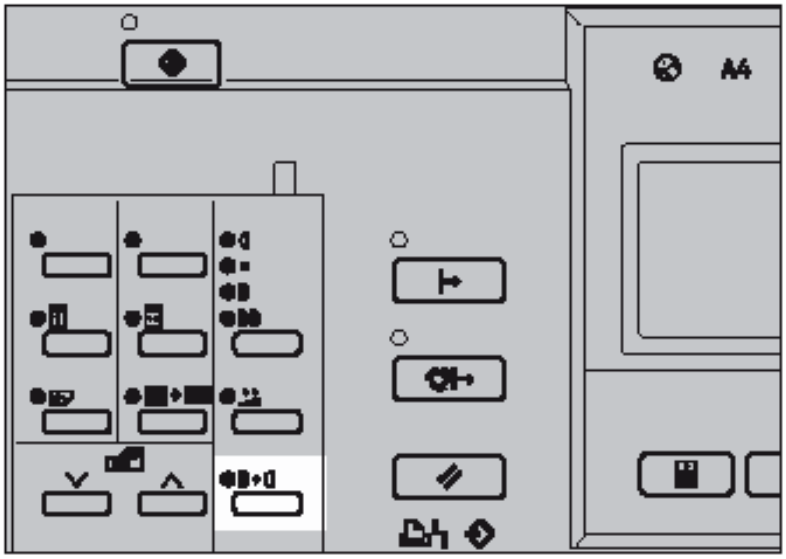
Before Making a Master:
Image Density Key

After Making a Master:
Not possible in this model.

Operation Manual, Operation, Adjusting the Print Image Density

- In this model, if you adjust the printing speed, the machine automatically adjusts the printing pressure to keep a constant image density on the printout.
- Because of this, you cannot change the print speed to adjust the ink density.
  - For details, see ‘Adjustable Printing Pressure’ in the Paper Feed section of this course.

Tint Mode

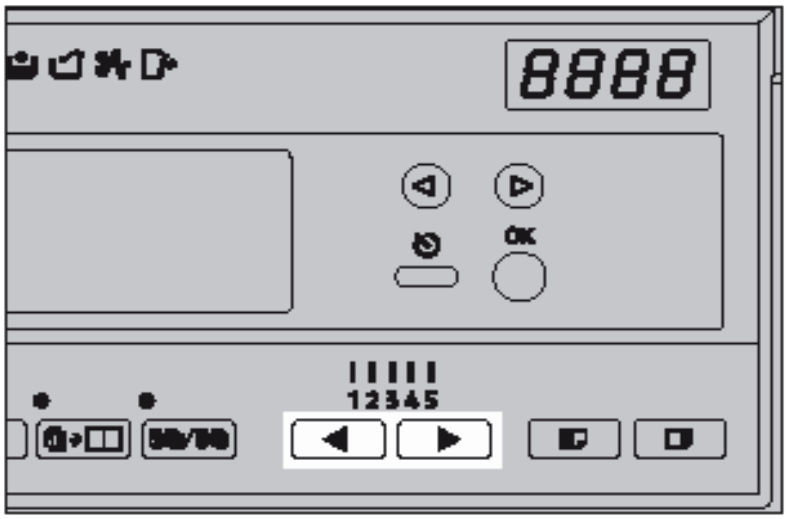


- **Converts black to grey**
- **Required for the Japanese market**

❒ This converts all black areas of the original to grey.

- ➢ This is a requirement for the Japanese market, for cultural reasons (certain events, such as funerals, require the use of grey instead of black).

Adjusting the Printing Speed



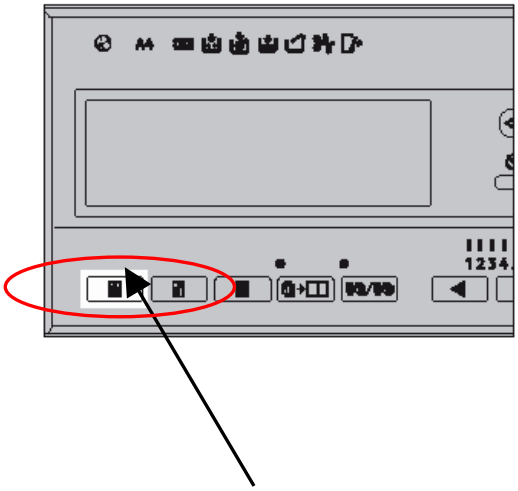
- **60, 75, 90, 105, or 120 sheets/minute**
- **When you use A3, 11" × 17" and 209.3 g/m2 , 55.6 lb paper, slow the printing speed down to Setting 1, 2 or 3.**
  - Default: 90

❒ Note the five possible speeds.

❒ A lower speed applies more ink to the paper.

- ➢ It also stops prints from being thrown over the end of the delivery table.
- ➢ Lower speeds are also useful in low temperature conditions if the ink is not flowing well.

Selecting the Original Type



- **Photo, Text, Text/Photo, Pencil**

Press this to change the original type. Then select with the arrow keys

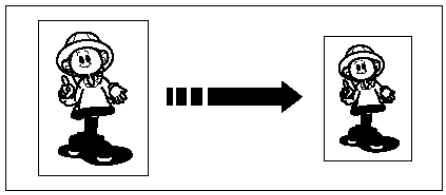
Operation Manual, Operation, Type of Original

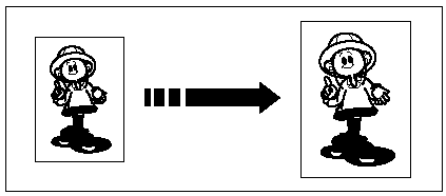
- ❒ Note the four possible modes.
- ❒ For originals with letter and photo areas, letter/photo mode can be used.

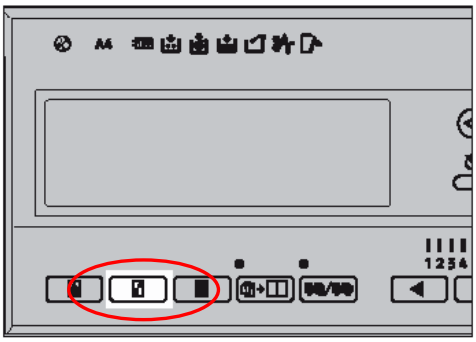
FEATURES

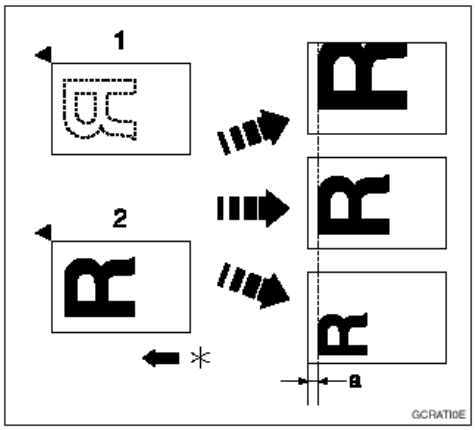
❒ This explains some of the features that are available with this machine.

Preset Reduce/Enlarge









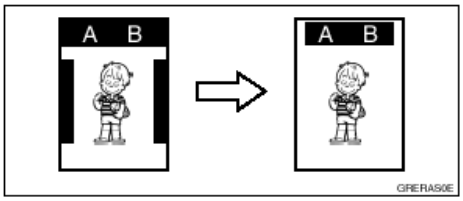
1. When using the exposure glass
2. When using the optional document feeder

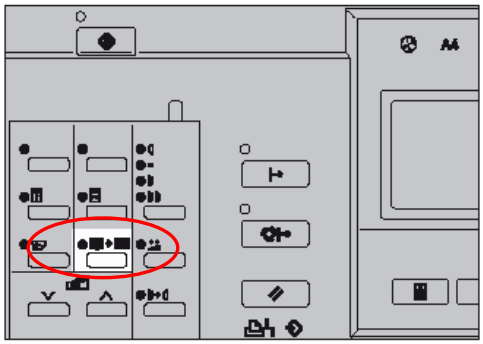
- **Reduction: 4 settings**
- **Enlargement: 3 settings**

- Note the fixed reproduction ratios available for this machine.
  - There is no way to customize this with alternative ratios.
- The leading edge does not shift, but the centre does shift (see the top right drawing on the slide).
- Note that 93% is a good setting to use if the original has dark borders. This will prevent dirty edges on prints.

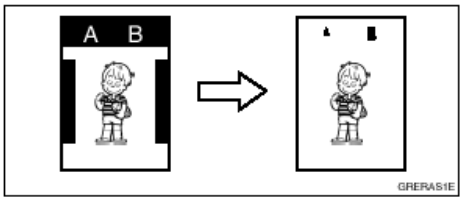
Edge Erase

❖ With Edge Erase mode





❖ Without Edge Erase mode

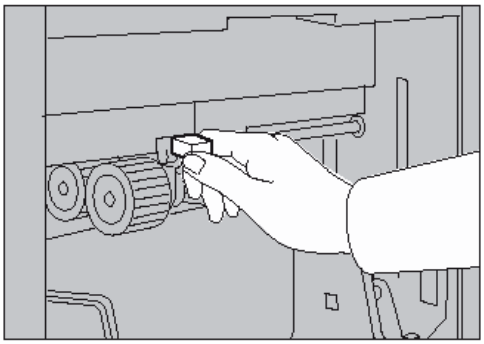


■ **Edge erase only**

- No Centre Erase

❒ Erasing the border is useful when tidying up copies of book originals.
❒ The default margins can be adjusted using user tools.
❒ There is no Centre Erase feature.

Thick and Thin Paper



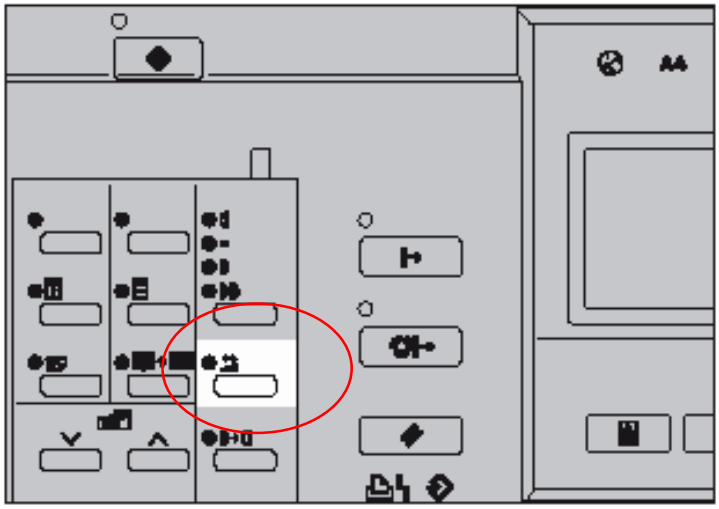
	Metric Version	Inch Version
Thick	127.9 — 209.3g/m^2	34.0 — 55.6 lb
Standard	52.3 — 127.9g/m^2	13.9 — 34.0 lb
Thin *1	47.1 — 52.3g/m^2	12.5 — 13.9 lb

*1 When the paper is smaller than B5 JIS, $5^1/_2$" × $8^1/_2$" and heavier than 81.4 g/m^2 (21.6 lb), use the Thin paper position.

- **This lever controls the paper feed pressure.**
- **A decal on the machine shows the correct position for the lever for each paper type.**

❒ There is more about this lever in the Paper Feed scetion.

Economy Mode

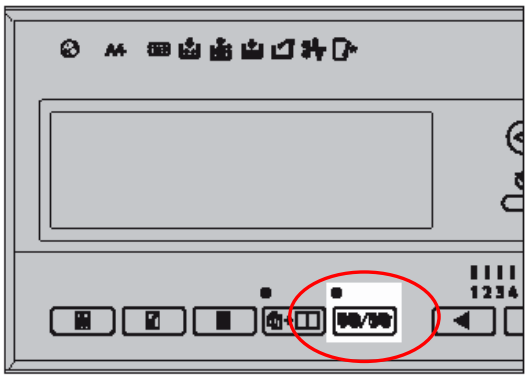


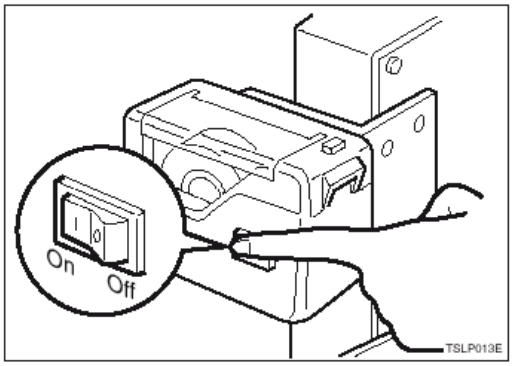
■ **Reduced thermal head energy**

- Makes smaller holes in the master, so less ink is used

❒ This uses less ink, so the prints will be lighter.

Class Modes





- **Use the Class Settings to make different numbers of prints from the same original.**
- **You can also make the same number of prints from more than one original.**
- **This feature is useful for teachers who frequently make multiple print sets (notes, handouts, tests, etc) for their classes.**
- **If you will use the optional tape dispenser, switch it on.**

Operation manual, Operation, Memory/Class

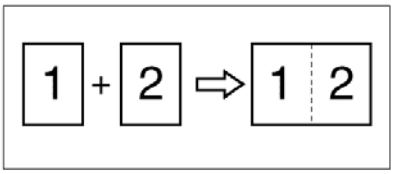
❒ The diagram on the right shows you how to switch on the tape dispenser.

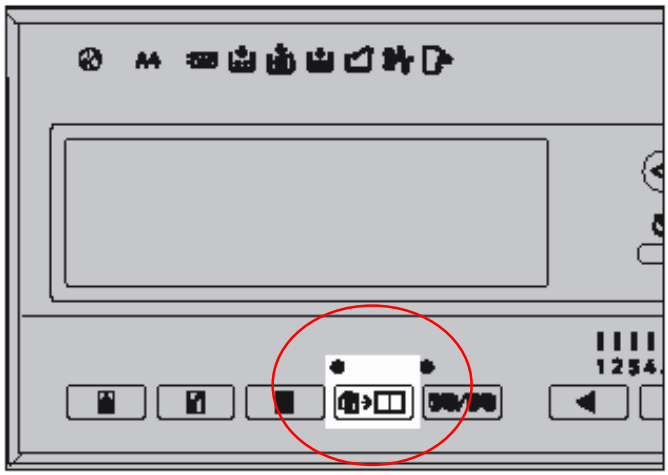
Class Modes

- **Class /Year**
  - Makes prints from the same originals for all registered classes and years.
  - This mode allows you to store the number of students in each class in the machine's memory before-hand.
- **Memory Mode**
  - Normal memory mode: From a multi-page original, make a different number of copies of each original
  - Stack memory mode: From a single page, make some stacks with a different number of copies in each stack
- **Class mode**
  - Makes the same number of prints from the same original for more than one class. You must enter the number of prints and the number of classes.

❒ This slide shows the different class modes that are available with this machine.

Combine Two Originals



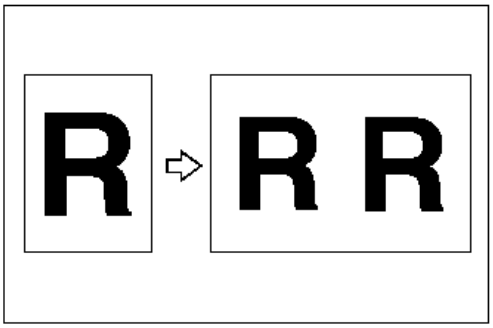


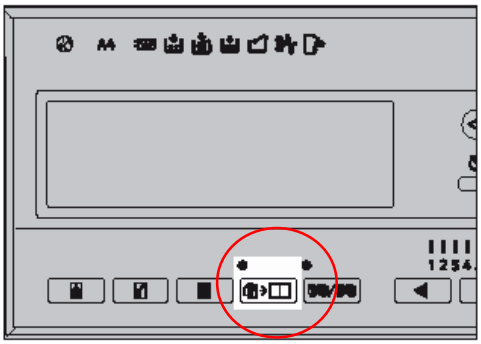
- **Prints two originals on one page**
- **Press the indicated button, then select ‘Combine 2’.**
- **The feature is not cancelled at the end of the job. This could be a problem. To make sure that the feature is cancelled at the end of the job, change the setting of the following user tool to ‘Cancel’: Mode Setting – Cancel Comb.**

Operation manual, Operation, Combine

❒ Two originals can be combined and printed on one page.
❒ The image settings for the 1st and 2nd originals can be different.
❒ Note that there are some restrictions on master length and image margins.

Repeat

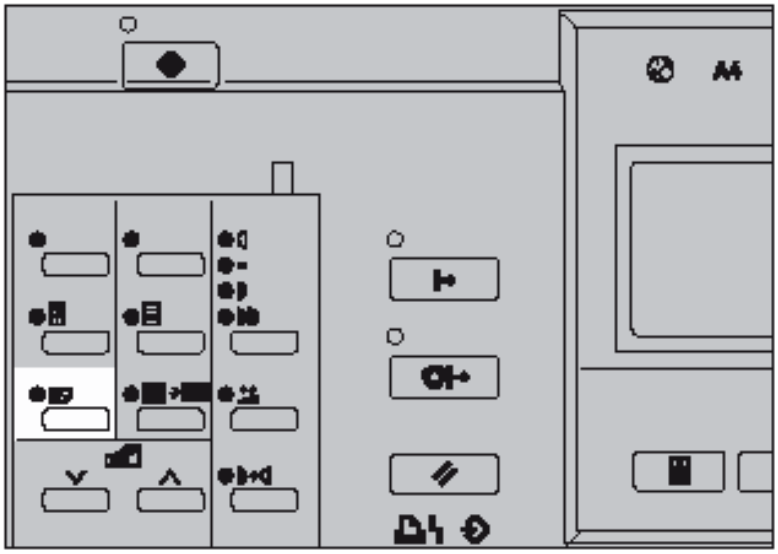




- **This prints two copies of the original on one sheet of copy paper.**
- **You cannot use the ADF for this function.**
- **Press the indicated button, then select ‘Repeat 2’.**
- **The feature is not cancelled at the end of the job. This could be a problem. To make sure that the feature is cancelled at the end of the job, change the setting of the following user tool to ‘Cancel’: Mode Setting – Cancel Comb.**

❒ Use the same button as the Combine Two Originals function.

Skip Feed

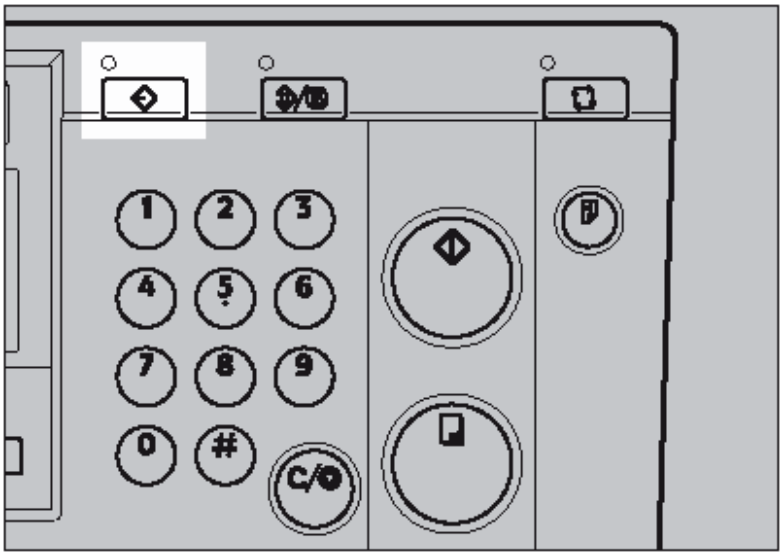


- **Makes the drum turn a few times between prints**
- **This lets the ink on the last print dry before the next is delivered**

Operation manual, Operation, Skip Feed

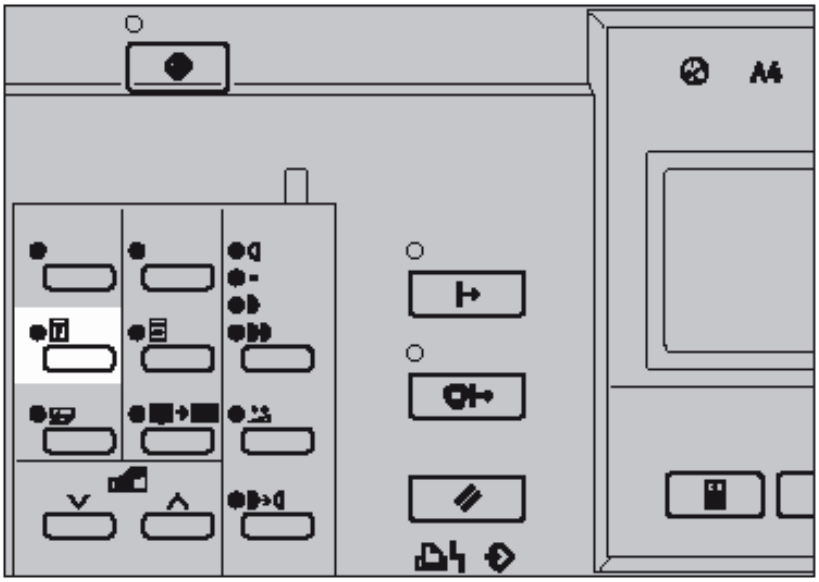
- ❒ Use this if ink is making the back sides of prints dirty.
- ❒ The drum will rotate one or more extra times between pages, giving the user the chance to remove the prints one by one (a larger number of drum rotations also allows the ink to dry).
- ❒ The number of drum rotations can be adjusted at the operation panel.
  - ➢ The default is two rotations. This default can be changed with a user tool.

Programs



- **Up to 9 programs of frequently used settings can be stored.**

Security Mode



- **Prevents other users from making prints with your master**

❒ This prevents others from making prints using the master that you left on the drum.

- ➢ Normally, the user can walk up to the machine and make prints of the master that happens to be on the drum. Security mode prevents this.

Security Mode

- **After Security mode is set:**
  - You cannot press the {Proof} key or the {Print} key
  - You cannot pull out the drum unit.
- **Security mode cannot be cleared by turning off the main switch.**
- **Security mode will be cancelled when you set a new original and press the {Master Making} key.**
- **You can use SP 8-18 to temporarily cancel security mode.**
  - When SP8-18 is “ON”, the drum rotates to the home position. You can pull the drum unit out of the machine. At this time, the display on the operation panel changes to white-on-black.
  - Turn SP8-18 “OFF”, after you repair/inspect the machine.

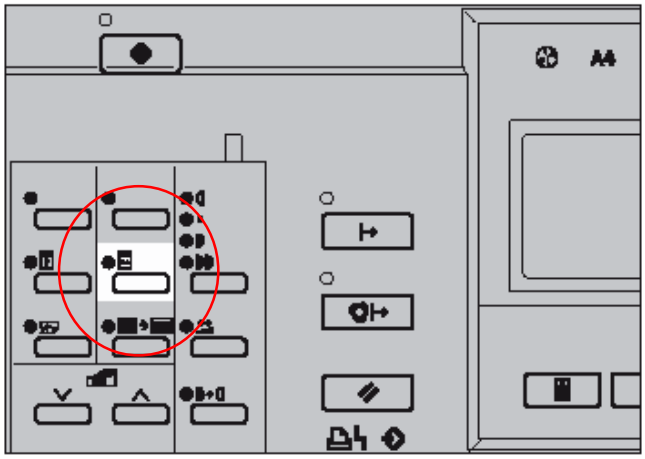
User Codes

- **There are some three-digit codes that can be allocated to authorized users.**
  - See the operation manual for a list of these codes.
  - Allocate one to each authorized user.
- **To use this feature, turn it on with a user tool:**
  - User Tools – Admin Mode – Set User Code
  - After it is turned on, you must enter a code before you can use the machine.

Operation Manual, Service Program Mode

- Describe these codes briefly if the class is not familiar with them.
- There are some fixed codes. Allocate one to each user.
  - The codes are listed in the manual. Anyone who is serious about this feature will have to black out that part of the manual so that unauthorized people cannot use the machine by inputting one of the codes written in the manual.

Quality Start



- **If the machine is not used for a long time, or when you change to a drum that has not been used recently, the ink on the drum may dry up.**
- **This might affect the print quality. To solve this problem, you can have the machine carry out a few idle spins of the drum before a print run.**

❒ You can change the number of spins. User Tools: Mode Setting - Idling for Q.Mode”

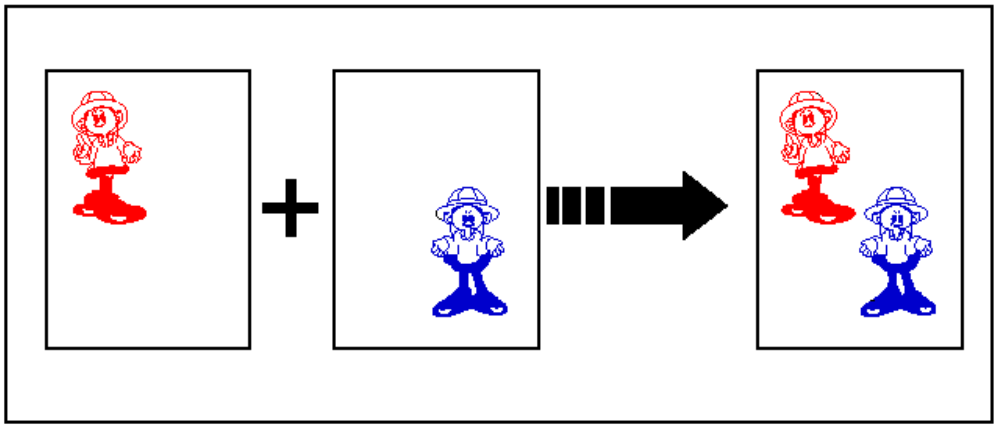
- ➢ The number of spins can be set from 1 to 5.
- ➢ The default is 2.

Auto Quality Start

- **You can program the machine to automatically carry out idle spins. This is called Auto Quality Start.**
- **To use this function, you must turn it on with a user tool: Mode Setting – Setting Q.Mode**

❒ You can specify the number of idle spins according to the length of time that the machine was not used: User Tools - Mode Setting –No. of Q.Start.

Colour Drum

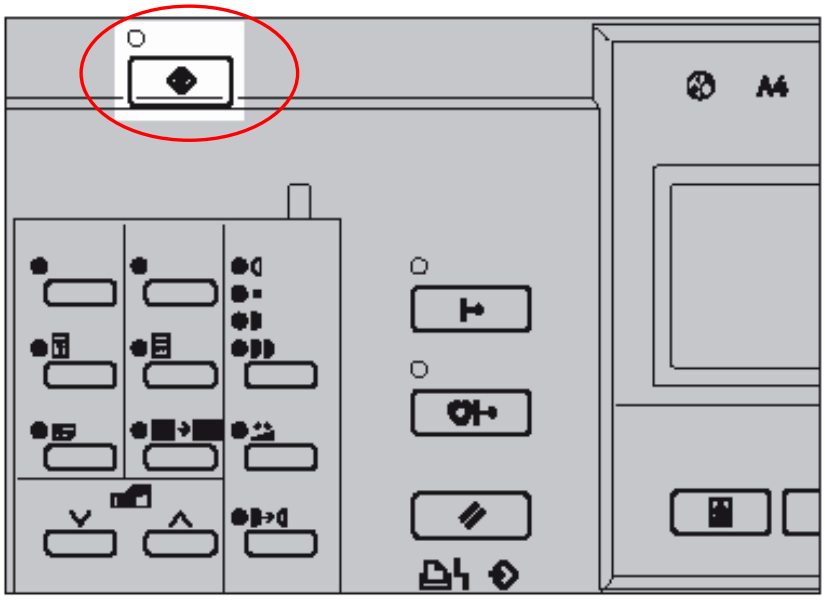


- **Use a separate drum for each colour.**
- **Several colours of ink are available.**

- A range of coloured inks are available.
- You need a separate drum for each colour.
- To make multicoloured copies, you have to prepare a separate original for each colour

USER TOOLS AND SP MODES

User Tools



Operation Manual, User Tools, Accessing the User Tools

❒ Make sure that the trainees know how to enter user tools mode.

Energy Saver Modes

- **You can select one of two modes:**
  - Energy Saver Mode
    - The display goes off.
    - Printing from a computer is possible.
    - To operate the machine, press the operation switch, or place originals on the exposure glass or in the ADF.
  - Auto Off Mode
    - The machine turns off. The power switch is turned off by a solenoid.
    - To operate the machine, turn the main switch on.

Energy Saver Modes

- **To select either Energy Saver or Auto Off mode:**
  - User Tools – System Settings – Mode Setting – Energy Saver Option
- **The machine will go into the selected mode after this timer runs out**
  - User Tools – System Settings – Timer Setting – Energy Saver Timer
  - Default: 3 minutes
- **You can also switch the machine off automatically at a set time every day**
  - User Tools – System Settings – Timer Setting – Auto Off Timer

Administrator Tools

- **User Tools – System Settings – Administrator Tools**
- **Machine use can be monitored with user codes.**
- **There is no key operator code.**
- **Windows Authentication and other security functions are not used.**

User Tools

- **System Settings – Set Operation Mode**
  - Min Quantity, Max Quantity: These let you put minimum and maximum limits on the number of prints per original
  - Class Display: For companies and other organizations, the “Class/Year” format may be inappropriate. You can change the wording of the Class Mode feature to ‘Department’.

❒ In these slides, we will look at user tools that were not discussed earlier.

User Tools

- **System Settings – Mode Settings**
  - Ignore Paper Size: If you are making prints on custom size paper and the original image does not entirely appear on the print, select “Ignore”. The machine will not detect the paper length.
  - No Orig Size (ADF): Use this if you are using non-standard original sizes in the ADF.
  - Longer Paper: Enables the use of copy paper longer than 432mm, 17.0".

User Tools

- **System Settings – Administrator Tools**
  - Set User Code : User codes. Off/on
  - Restricted Access: If set to ‘On’, a key counter must be inserted to use the machine.

SP Modes 1

- **2-1: Default print speed**
- **2-2: Default image position**
- **2-22: Double count-up for master and print counters if A3 is used**
- **2-60: Makes outlines of vector images**
- **6-27 to 6-30: Master making density (for various original modes)**

❒ Have the class try out various settings to see the effects.

TROUBLESHOOTING

Replenishing Supplies and Troubleshooting

- **Study the procedures in the Operation Manual.**

Operation Manual, Replenishing Supplies/Troubleshooting

- ❒ Have the trainees look through these sections of the operation manual.
- ❒ They must be familiar with all the covers and levers etc that are used to replenish supplies, clear jams, and so on.
- ❒ This section of the manual also contains troubleshooting hints for users.

RICOH

HP4-R2 TRAINING

DUPLICATOR ENGINE

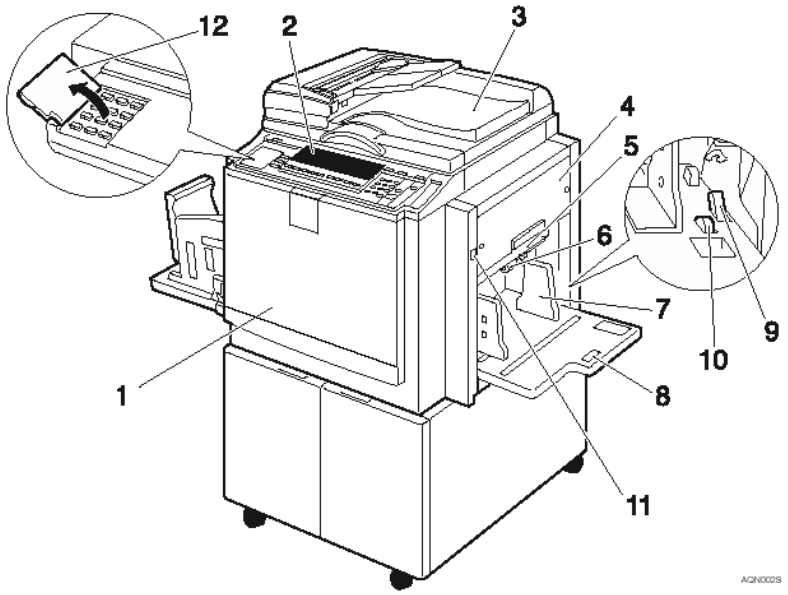
OPERATION

- ❒ This part of the course will deal with general operation and copying.
- ❒ Teach and demonstrate procedures from the operation manuals. Select the items to be taught in the class in accordance with the experience level of the trainees.
- ❒ Have the class follow this part of the course using the operation manual. Page numbers are not quoted in the Instructor's Guide, as the author has no control over operation manual layout. However, the description follows the order of sections in an almost completed draft copy.
- ❒ Let the trainees practice operating the machine in all copy modes and using all optional peripherals for copying.

COMPONENTS

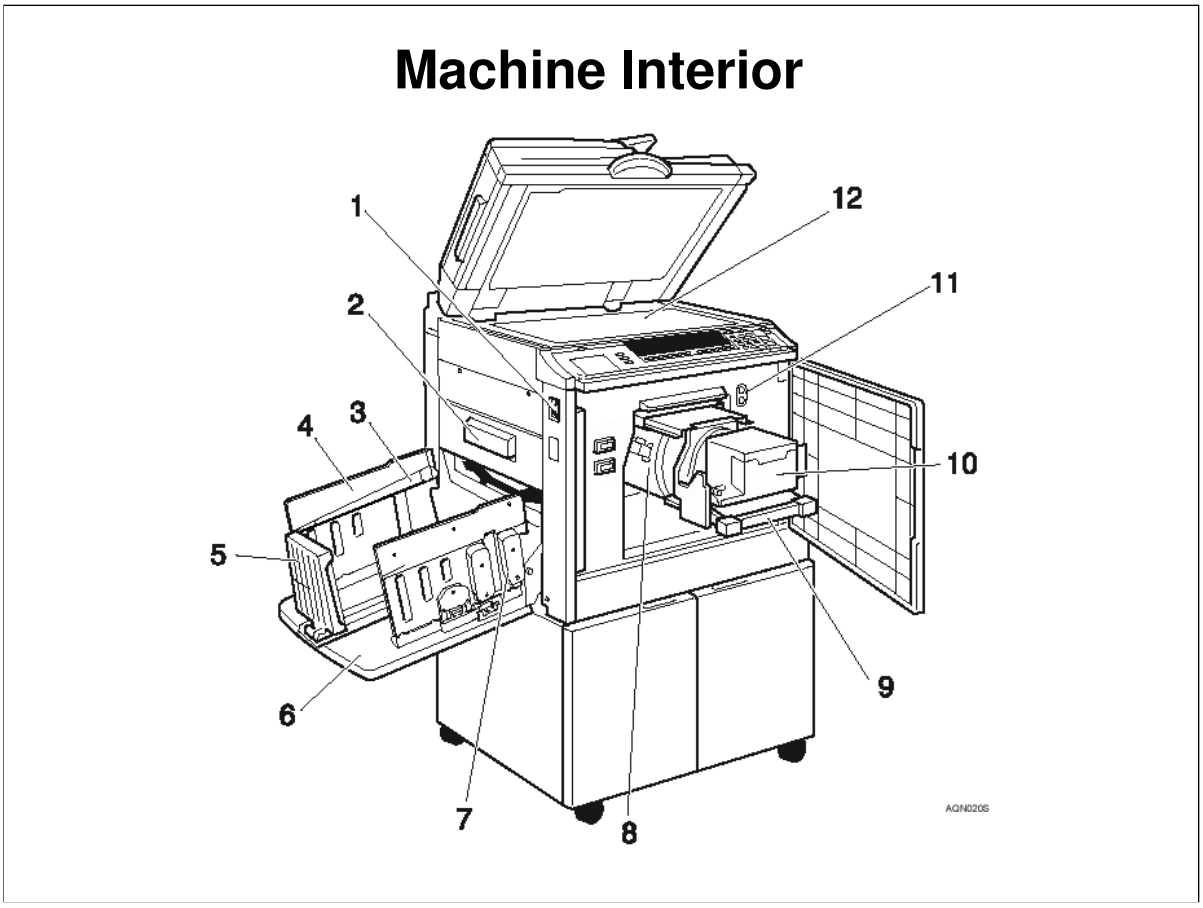
❒ This section explains the machine's components from the user's point of view.

Machine Exterior



Operation Manual, Machine Exterior

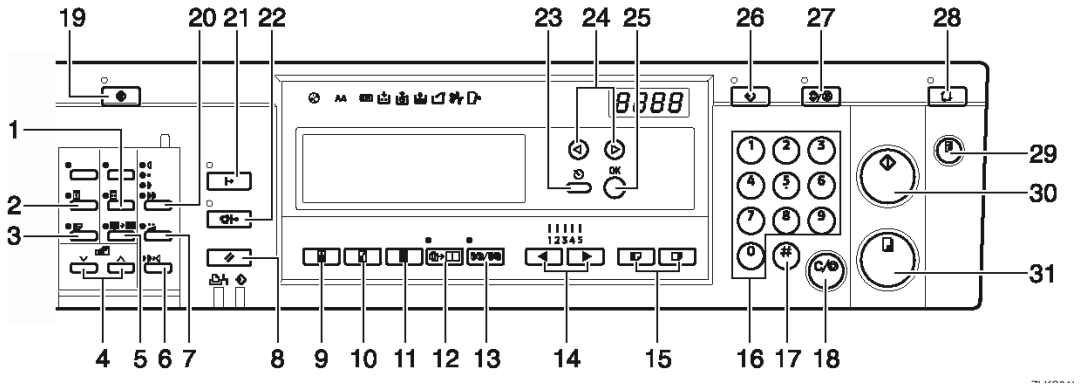
- Go over the major components of the machine from the user's point of view.
- Be sure that the class understand the following components
  - 4. Master tray: Open here to replace the master roll
  - 5. Lower master tray: Open here to remove a master jam
  - 6. Feed roller pressure lever: Adjusts the feed roller contact pressure on the paper stack – There is also a technician adjustment for separation roller pressure (see the Paper Feed section of the course).
  - 9. Paper feed side plate lock lever: Use to lock or unlock the paper feed side plates.
  - 10. Side tray fine adjusting dial: Use to shift the paper feed tray sideways, to move the image sideways on the paper.
  - 11. Paper feed tray down key: Press to lower the paper feed tray.
  - 12. 'Behind' cover: There are some keys below this cover. These are called 'special features' – we will see these features later in this section (for example, Economy Mode).



Operation Manual, Machine Interior

- ❒ Go over this briefly.
- ❒ The document feeder is an option.
- ❒ Be sure that the class understand the following components
  - ➢ 3. Paper alignment wings: Lift or lower the wings according to the type of paper used, to stack the paper neatly. This will be explained more in the Paper Delivery section.
  - ➢ 4. Paper delivery side plates: Use to align the prints on the paper delivery tray.
  - ➢ 7. Chocks: Use to adjust the buffer fins. This will be explained more in the Paper Delivery section.
  - ➢ 9. Drum unit lock lever: Lift to unlock and pull out the drum unit.
  - ➢ 10. Ink holder: Set the ink cartridge in this holder.
  - ➢ 11. Drum position indicator: The drum can be removed when the green lamp is on, but not when the red lamp is on.

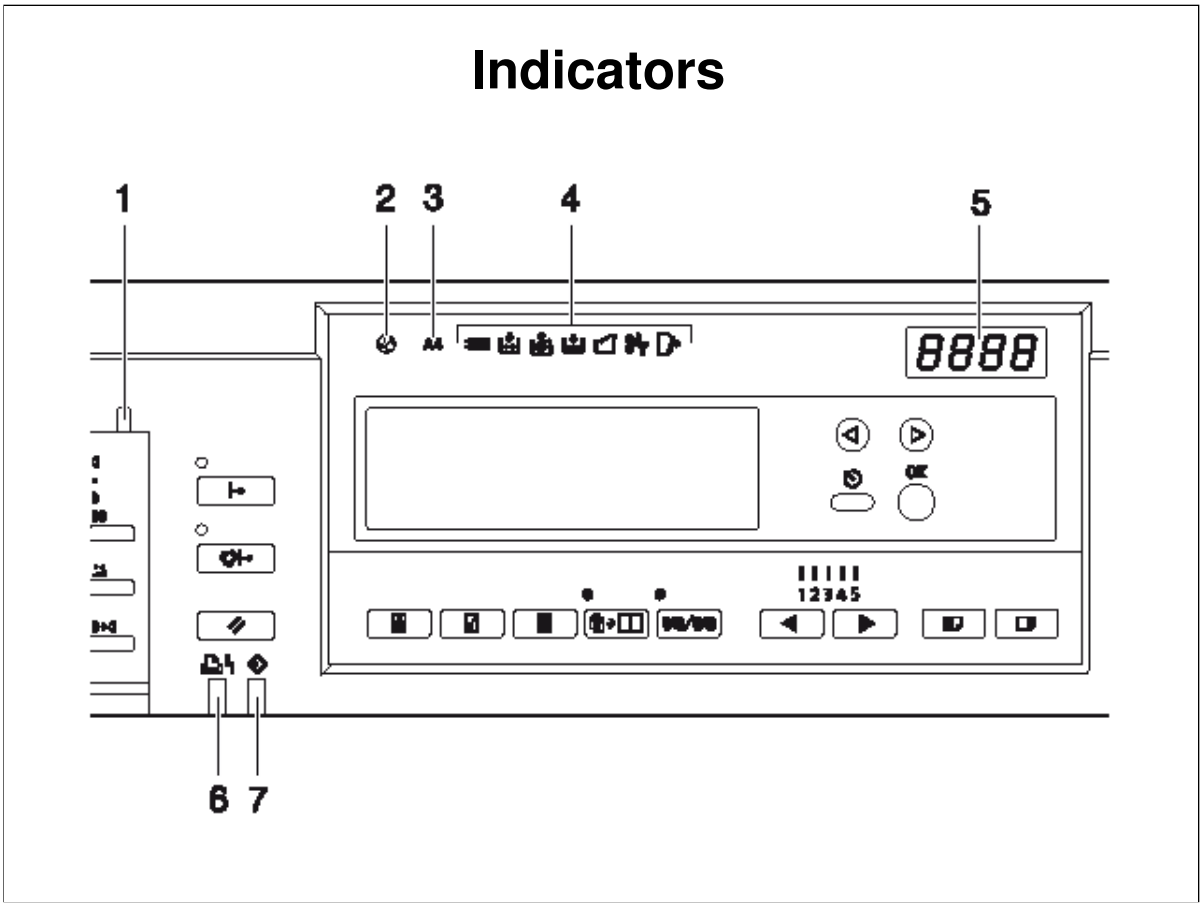
Operation Panel



Operation Manual, Control Panel

Keys

- ❒ Make sure that the class are familiar with the operation panel keys.
- ❒ There may be some keys that are not be familiar to photocopier technicians. These keys are used to access the various features of this machine. The features will be mentioned later in this section.



Operation Manual, Control Panel

Indicators

- ❒ Make sure that the class are familiar with the operation panel indicators.
- ❒ Be sure that the class understand the following items.
  - ➢ 1. Special feature indicator: Lets you know when one or more of the keys under the cover at the left of the operation panel (item 12) has been selected.
  - ➢ 2. Colour drum indicator: Lets you know that a colour drum is installed, and that the machine is ready for colour printing.
  - ➢ 3. A4 drum indicator: Lets you know that an A4 drum is installed.

PREPARING TO PRINT

❒ This section explains some basic points about originals and copy paper, and how to set up the machine.

Originals

- **Note that some types of originals may not be detected properly.**
- **Originals should not have dark areas or bold characters right at the leading edge, or the prints may have dirty edges.**
- **Note that there is a 5 mm margin at the leading edge of the original and a 2 mm margin at the trailing edge which will not be copied, even if the original is positioned correctly.**

Notes Concerning A3

- **If you use an A3 original, use a reproduction ratio to reduce the image size, to make sure that you get all of the image on the copy paper.**
- **When you use A3, 11" × 17" and 209.3 g/m2 , 55.6 lb paper, slow the printing speed down to Setting 1, 2 or 3.**

Dealing with Paper Curl

	Right	Wrong
Thin Paper		
Thick Paper		

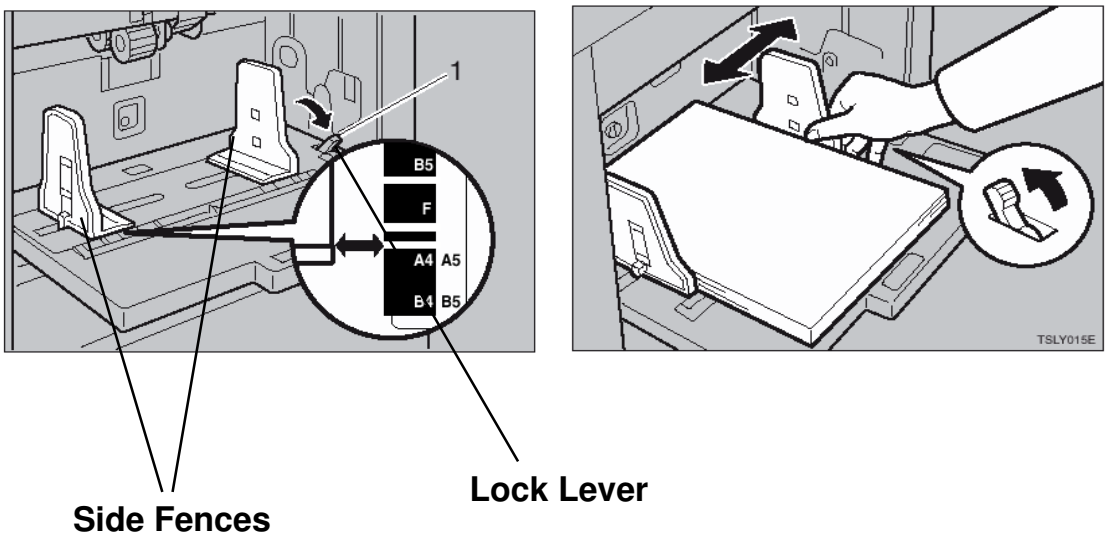
TPEY990E

Operation Manual, Operation, Print Paper

Printing Paper

❒ Note the recommended sizes and types of paper.

Paper Feed Table



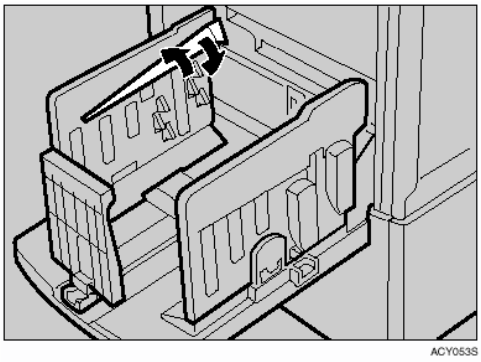
Operation Manual, Operation, Printing Preparations

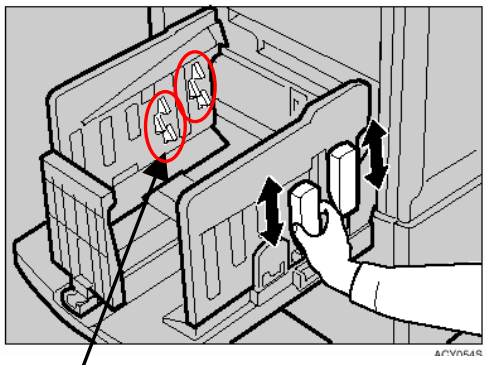
- ❒ Note the correct way to set up the feed table.
- ❒ Raise the lock lever before you move the side fences. Then lock the side fences after you add paper.

Paper Delivery Table
Overview

- **These items can be adjusted.**
  - Side and end plates: Move these to the correct paper size
  - Paper alignment wings
  - Chocks (buffer fins)
- **These items must be adjusted manually.**

Paper Delivery Table
Adjustments





Chocks

Buffer Fins

Paper Alignment Wings
Three settings:
Up, Down, 45 degrees

Operation Manual, Operation, Printing Preparations

- Note the correct way to set up the delivery table.
- In this machine, the side and end fences are not the only items to adjust.
  - The paper alignment wings and chocks must be adjusted to match the paper size and thickness.
  - The correct settings are shown in the operation manual.
- What is the purpose of these?
  - The paper alignment wings keep the paper's shape so that it drops onto the tray flat and not all curled up.
  - The tabs (called the 'buffer fins') on the inner surfaces of the chocks catch the edges of the paper, so that the paper falls more slowly. This prevents ink stains on the rear side of the prints.

Paper Delivery Table

Recommended Settings

Paper Weight	Paper Size	Paper align-ment wings	Chocks
128 g/m², 34 lb or thicker	A3 ▭, 11" × 17" ▭, B4 JIS ▭	Lower the wings.	Down
	A4 ▭ ▯, B5 JIS ▭ ▯	Lower the wings.	Down
52.3 g/m² – 128 g/m², 13.9 lb to 34 lb	A3 ▭, 11" × 17" ▭, B4 JIS ▭	Raise the wings fully.	Up
	A4 ▭ ▯, B5 JIS ▭ ▯	Raise the wings to about 45 degrees.	Up
52.3g/m², 13.9 lb or thinner	A3 ▭, 11" × 17" ▭, B4 JIS ▭	Raise the wings to about 45 degrees.	Down
	A4 ▭ ▯, B5 JIS ▭ ▯	Raise the wings to about 45 degrees.	Down

- **This table, from the operation manual, shows the recommended settings for each paper type.**

Folding up the Paper Feed and Paper Delivery Tables

- **Study the correct procedures in the operation manual, to prevent damage to the machine.**

Operation Manual, Operation, After Printing

BASIC PRINTING PROCEDURE

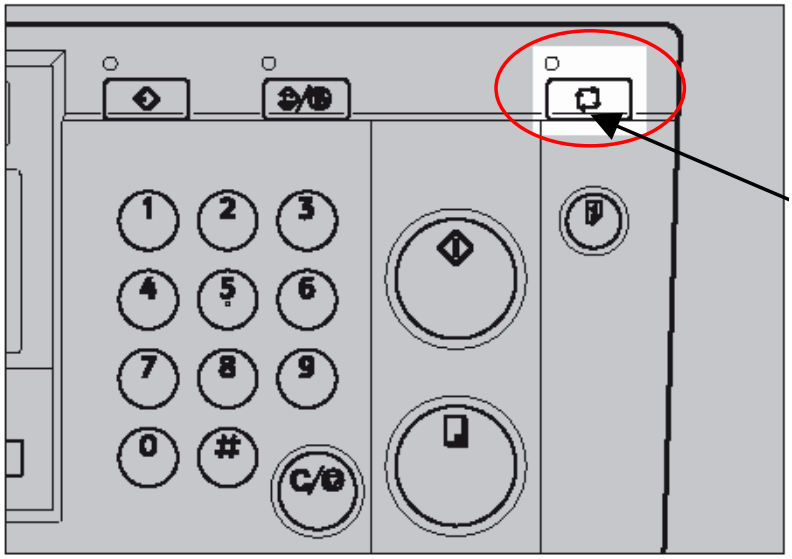
❒ This explains the basic procedure for how to make copies.

Auto Cycle On or Off

- **The basic printing procedure depends on whether Auto Cycle is on or off.**

❒ Go on to the next slide.

Auto Cycle



- **Faster copying of a series of originals**
- **No pause between originals, so no proof copies can be made**
- **Default: On (User Tools – System Settings – Mode Setting – Auto Cycle)**

❒ Auto Cycle allows faster copying of a series of originals.
❒ Auto Cycle On is the default setting, and the Print button is lit.
❒ To make a master, put your original in the ADF or on the glass. When you close the platen cover, or when the ADF detects the original, the Master Making key lights (or, you can press the Master Making key before you place the original).
❒ With the optional ADF, each page is scanned and copied automatically without any operator intervention needed.
❒ Proof copies cannot be made with the Proof key in this mode.

Printing Procedure
Auto Cycle Enabled

- **Place the original**
- **Press the Master Making key**
  - Makes the master and the prints

Operation Manual, Basics, Basic Procedure

❒ Very easy, but you cannot make trial prints or proof prints.

Printing Procedure
Auto Cycle Disabled

- **Place the original**
- **Make sure that the master making key is lit, then press the Master Making key**
  - Makes the master and a trial print
    - The trial print primes the ink supply
- **Then, press the Proof key (optional step)**
  - Makes a test print
    - Allows image position adjustment
- **To start the print run, press the Print key**
  - Starts printing

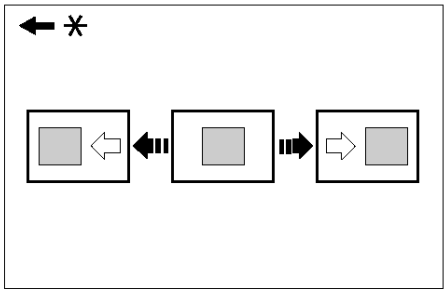
❒ Note the various stages of the printing process.
❒ Press the Master Making key to make the master.
  ➢ A trial print is made. Use this to check the condition of the master.
  ➢ The trial print also serves to prime the ink supply mechanism, so that the first print will have enough ink.
❒ Press the Proof key to make a test print.
  ➢ This can be used to check the image position and adjust if necessary. The trial print is not suitable for this.
❒ Press the Print key to start printing.

Auto Document Feeder

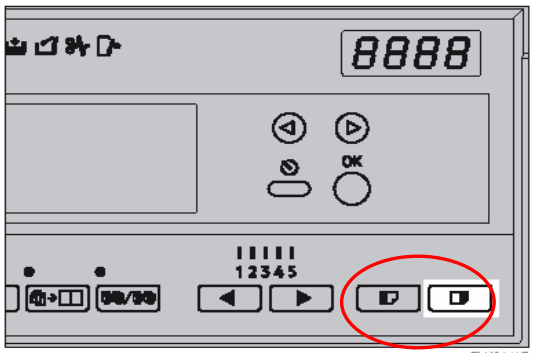
- **Up to 50 sheets, face-up**
- **Use Auto Cycle mode to allow non-stop copying**

- ❒ Up to 50 originals can be placed in the feeder.
- ❒ Use the Auto Cycle feature to make sets of copies of more than one page. Otherwise, you will have to press the Print key for every original.

Adjusting the Image Position
Forwards and Backwards



* Paper feed direction



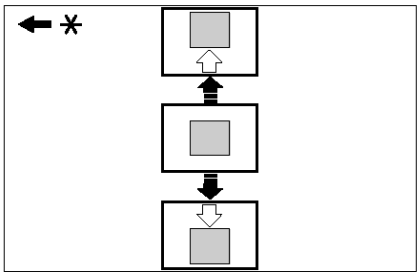
- **Adjustment in both directions done at the operation panel**
- **This changes the registration motor timing.**
- **No dials or levers to adjust**

Operation Manual, Basics, Sample Print and Adjustment

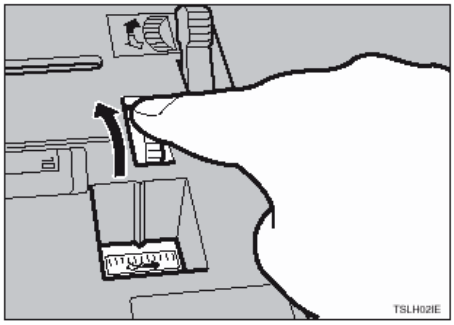
- There are two ways, both done with the image positioning keys.
  - Shifting forward or backward: This alters the registration motor start timing and turns the pressure cylinder (which has the paper clamper attached to it). This will be explained in the Image Up/Down Shift section of the course.

    Always leave a 10 mm gap at the leading edge, or paper may wrap around the drum.
  - Shifting from left to right: This moves the outer drum sleeve to the left or right. This will be explained in the Drum section of the course.

Adjusting the Image Position
Left and Right

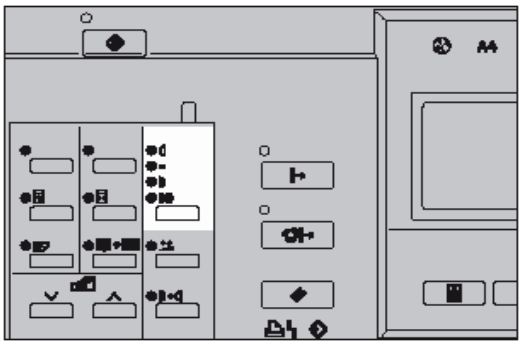


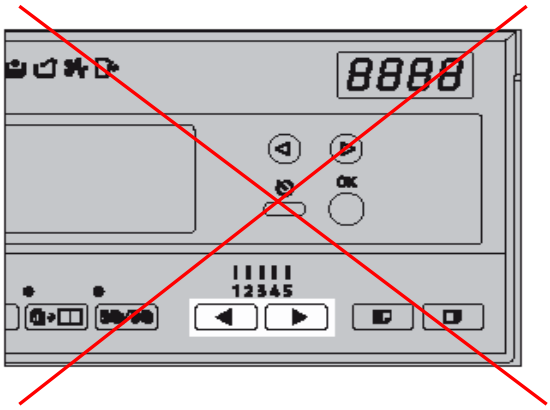
* Paper feed direction



- **Side table adjustment dial**
- **This moves the paper feed table to the left or right.**
- **In the diagram, the image is moved to the right.**

Adjusting the Image Density





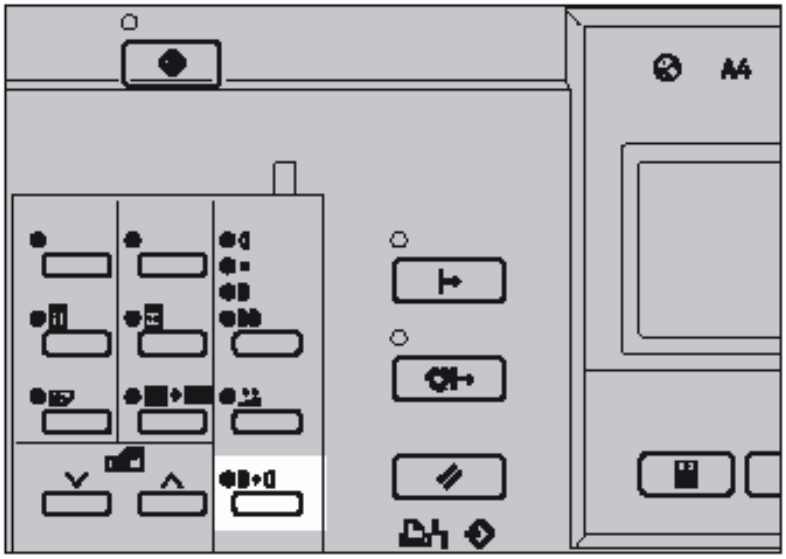
Before Making a Master:
Image Density Key

After Making a Master:
Not possible in this model.

Operation Manual, Operation, Adjusting the Print Image Density

- In this model, if you adjust the printing speed, the machine automatically adjusts the printing pressure to keep a constant image density on the printout.
- Because of this, you cannot change the print speed to adjust the ink density.
  - For details, see 'Adjustable Printing Pressure' in the Paper Feed section of this course.

Tint Mode

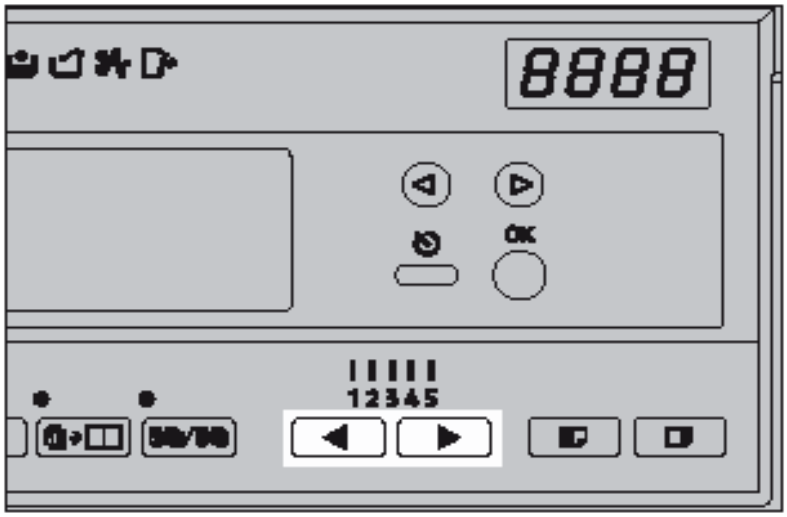


- **Converts black to grey**
- **Required for the Japanese market**

❒ This converts all black areas of the original to grey.

- ➢ This is a requirement for the Japanese market, for cultural reasons (certain events, such as funerals, require the use of grey instead of black).

Adjusting the Printing Speed



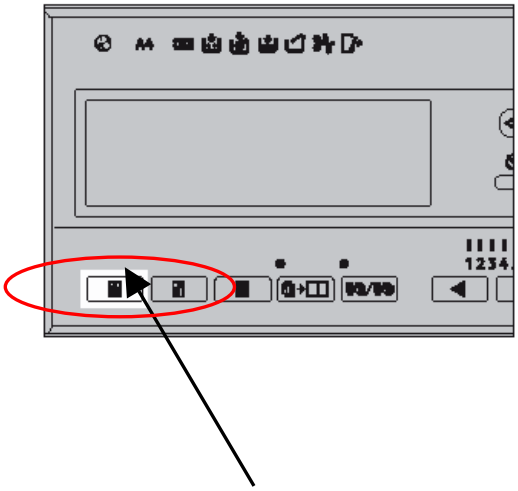
- **60, 75, 90, 105, or 120 sheets/minute**
- **When you use A3, 11" × 17" and 209.3 g/m2 , 55.6 lb paper, slow the printing speed down to Setting 1, 2 or 3.**
  - Default: 90

❒ Note the five possible speeds.

❒ A lower speed applies more ink to the paper.

- ➢ It also stops prints from being thrown over the end of the delivery table.
- ➢ Lower speeds are also useful in low temperature conditions if the ink is not flowing well.

Selecting the Original Type



- **Photo, Text, Text/Photo, Pencil**

Press this to change the original type. Then select with the arrow keys

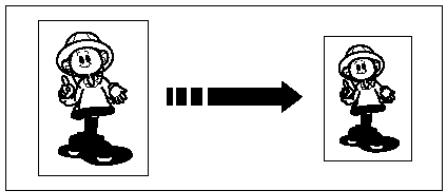
Operation Manual, Operation, Type of Original

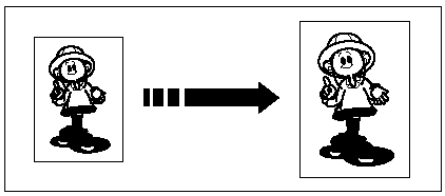
- ❒ Note the four possible modes.
- ❒ For originals with letter and photo areas, letter/photo mode can be used.

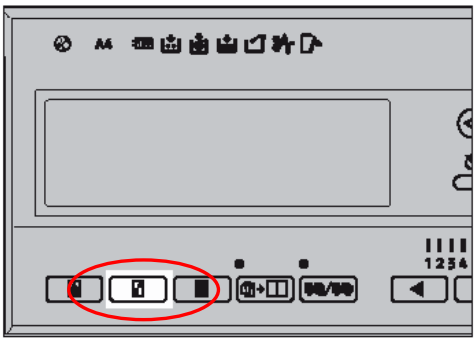
FEATURES

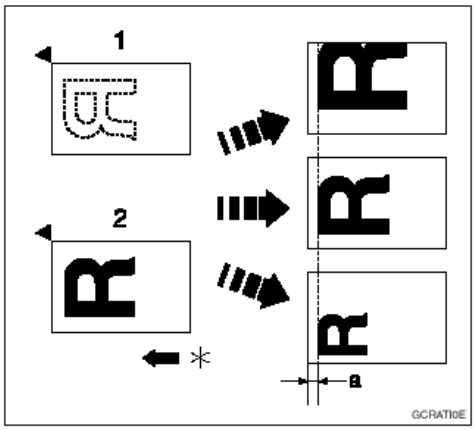
- This explains some of the features that are available with this machine.

Preset Reduce/Enlarge









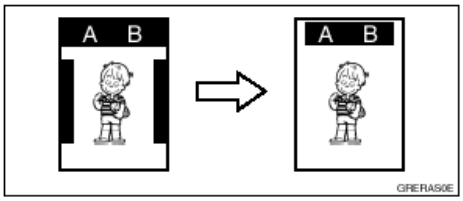
1. When using the exposure glass
2. When using the optional document feeder

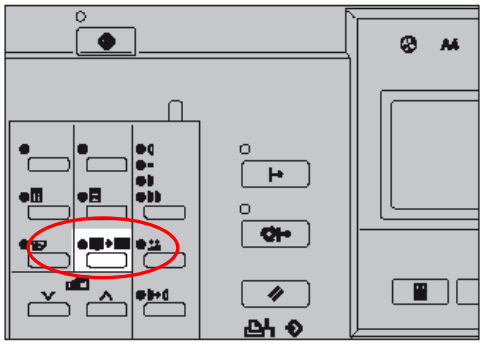
- **Reduction: 4 settings**
- **Enlargement: 3 settings**

- ❒ Note the fixed reproduction ratios available for this machine.
  - ➢ There is no way to customize this with alternative ratios.
- ❒ The leading edge does not shift, but the centre does shift (see the top right drawing on the slide).
- ❒ Note that 93% is a good setting to use if the original has dark borders. This will prevent dirty edges on prints.

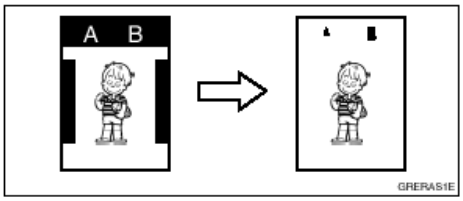
Edge Erase

❖ With Edge Erase mode





❖ Without Edge Erase mode

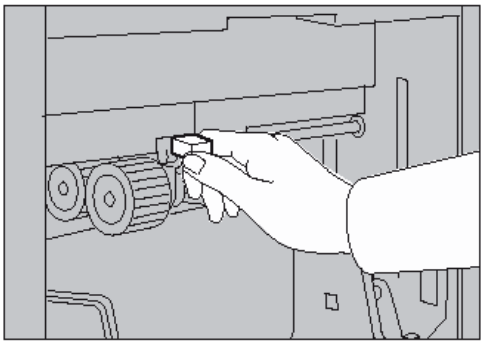


■ **Edge erase only**

- No Centre Erase

❒ Erasing the border is useful when tidying up copies of book originals.
❒ The default margins can be adjusted using user tools.
❒ There is no Centre Erase feature.

Thick and Thin Paper



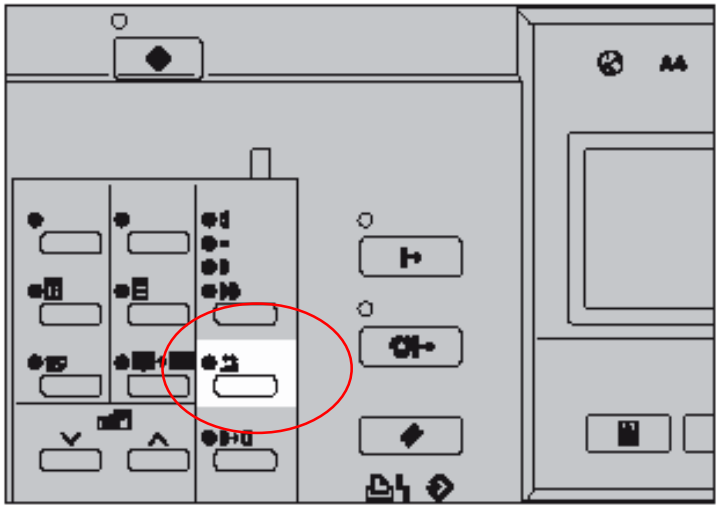
	Metric Version	Inch Version
Thick	127.9 — 209.3g/m^2	34.0 — 55.6 lb
Standard	52.3 — 127.9g/m^2	13.9 — 34.0 lb
Thin *1	47.1 — 52.3g/m^2	12.5 — 13.9 lb

*1 When the paper is smaller than B5 JIS, $5^1/_2$" × $8^1/_2$" and heavier than 81.4 g/m^2 (21.6 lb), use the Thin paper position.

- **This lever controls the paper feed pressure.**
- **A decal on the machine shows the correct position for the lever for each paper type.**

❒ There is more about this lever in the Paper Feed scetion.

Economy Mode

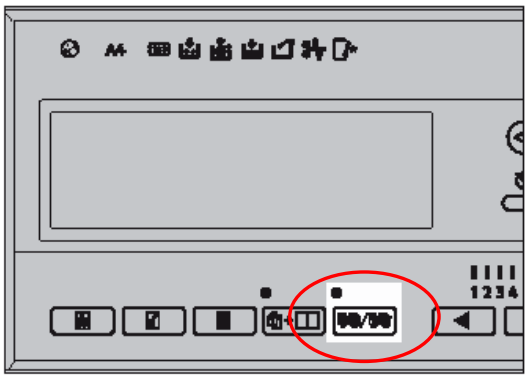


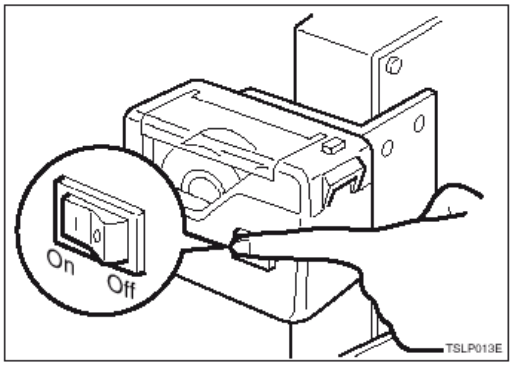
■ **Reduced thermal head energy**

- Makes smaller holes in the master, so less ink is used

❒ This uses less ink, so the prints will be lighter.

Class Modes





- **Use the Class Settings to make different numbers of prints from the same original.**
- **You can also make the same number of prints from more than one original.**
- **This feature is useful for teachers who frequently make multiple print sets (notes, handouts, tests, etc) for their classes.**
- **If you will use the optional tape dispenser, switch it on.**

Operation manual, Operation, Memory/Class

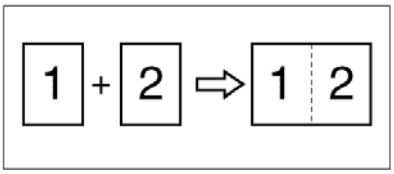
❒ The diagram on the right shows you how to switch on the tape dispenser.

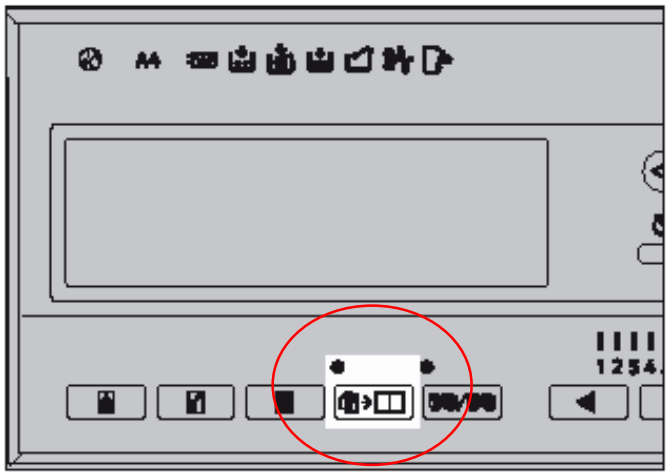
Class Modes

- **Class /Year**
  - Makes prints from the same originals for all registered classes and years.
  - This mode allows you to store the number of students in each class in the machine's memory before-hand.
- **Memory Mode**
  - Normal memory mode: From a multi-page original, make a different number of copies of each original
  - Stack memory mode: From a single page, make some stacks with a different number of copies in each stack
- **Class mode**
  - Makes the same number of prints from the same original for more than one class. You must enter the number of prints and the number of classes.

❒ This slide shows the different class modes that are available with this machine.

Combine Two Originals



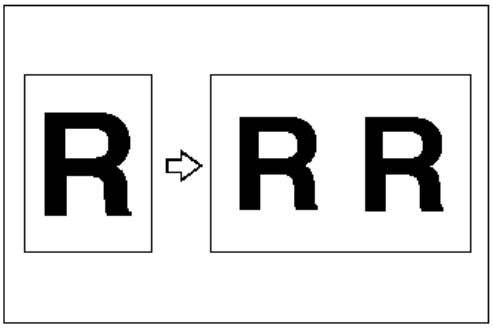


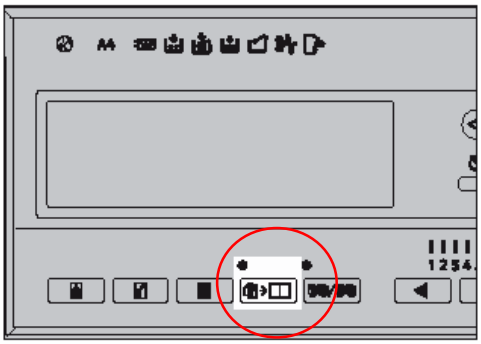
- **Prints two originals on one page**
- **Press the indicated button, then select ‘Combine 2’.**
- **The feature is not cancelled at the end of the job. This could be a problem. To make sure that the feature is cancelled at the end of the job, change the setting of the following user tool to ‘Cancel’: Mode Setting – Cancel Comb.**

Operation manual, Operation, Combine

❒ Two originals can be combined and printed on one page.
❒ The image settings for the 1st and 2nd originals can be different.
❒ Note that there are some restrictions on master length and image margins.

Repeat

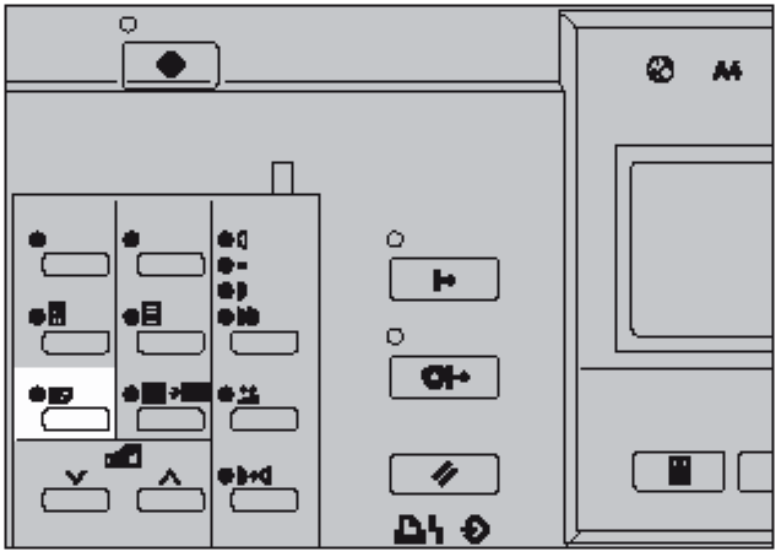




- **This prints two copies of the original on one sheet of copy paper.**
- **You cannot use the ADF for this function.**
- **Press the indicated button, then select ‘Repeat 2’.**
- **The feature is not cancelled at the end of the job. This could be a problem. To make sure that the feature is cancelled at the end of the job, change the setting of the following user tool to ‘Cancel’: Mode Setting – Cancel Comb.**

❒ Use the same button as the Combine Two Originals function.

Skip Feed

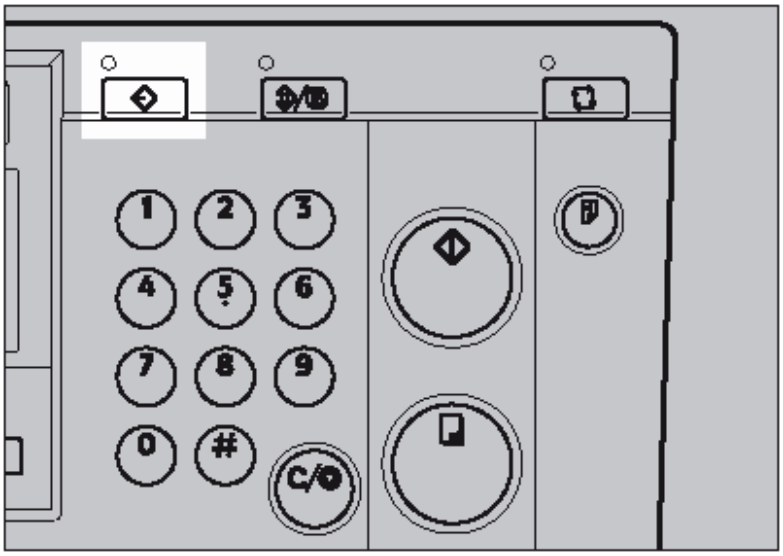


- **Makes the drum turn a few times between prints**
- **This lets the ink on the last print dry before the next is delivered**

Operation manual, Operation, Skip Feed

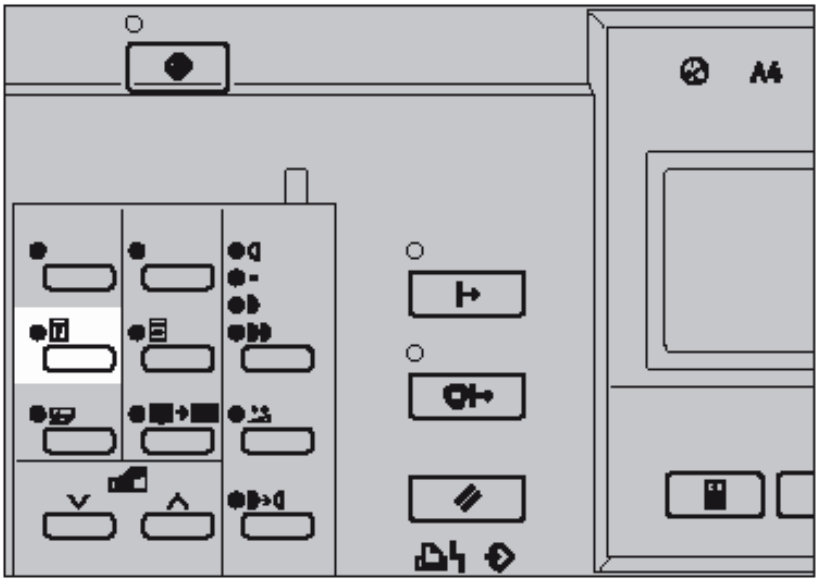
- Use this if ink is making the back sides of prints dirty.
- The drum will rotate one or more extra times between pages, giving the user the chance to remove the prints one by one (a larger number of drum rotations also allows the ink to dry).
- The number of drum rotations can be adjusted at the operation panel.
  - The default is two rotations. This default can be changed with a user tool.

Programs



- **Up to 9 programs of frequently used settings can be stored.**

Security Mode



- **Prevents other users from making prints with your master**

❒ This prevents others from making prints using the master that you left on the drum.

- ➢ Normally, the user can walk up to the machine and make prints of the master that happens to be on the drum. Security mode prevents this.

Security Mode

- **After Security mode is set:**
  - You cannot press the {Proof} key or the {Print} key
  - You cannot pull out the drum unit.
- **Security mode cannot be cleared by turning off the main switch.**
- **Security mode will be cancelled when you set a new original and press the {Master Making} key.**
- **You can use SP 8-18 to temporarily cancel security mode.**
  - When SP8-18 is “ON”, the drum rotates to the home position. You can pull the drum unit out of the machine. At this time, the display on the operation panel changes to white-on-black.
  - Turn SP8-18 “OFF”, after you repair/inspect the machine.

User Codes

- **There are some three-digit codes that can be allocated to authorized users.**
  - See the operation manual for a list of these codes.
  - Allocate one to each authorized user.
- **To use this feature, turn it on with a user tool:**
  - User Tools – Admin Mode – Set User Code
  - After it is turned on, you must enter a code before you can use the machine.

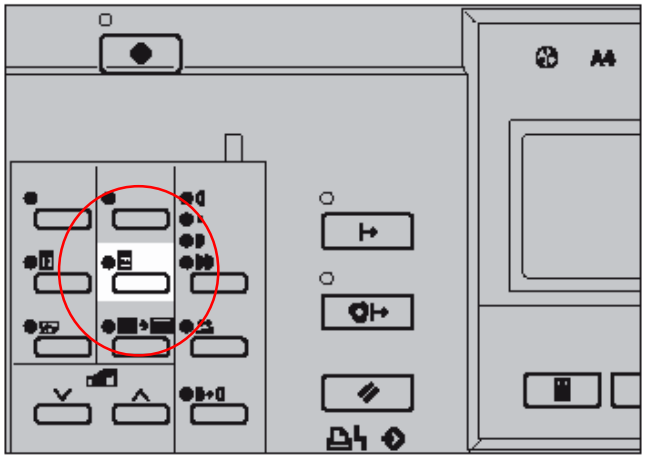
Operation Manual, Service Program Mode

❒ Describe these codes briefly if the class is not familiar with them.

❒ There are some fixed codes. Allocate one to each user.

➢ The codes are listed in the manual. Anyone who is serious about this feature will have to black out that part of the manual so that unauthorized people cannot use the machine by inputting one of the codes written in the manual.

Quality Start



- **If the machine is not used for a long time, or when you change to a drum that has not been used recently, the ink on the drum may dry up.**
- **This might affect the print quality. To solve this problem, you can have the machine carry out a few idle spins of the drum before a print run.**

❒ You can change the number of spins. User Tools: Mode Setting - Idling for Q.Mode"

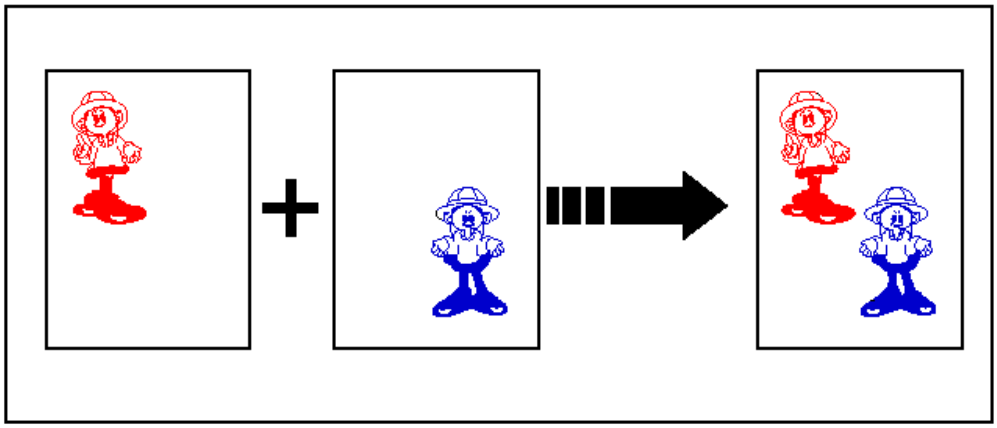
- ➢ The number of spins can be set from 1 to 5.
- ➢ The default is 2.

Auto Quality Start

- **You can program the machine to automatically carry out idle spins. This is called Auto Quality Start.**
- **To use this function, you must turn it on with a user tool: Mode Setting – Setting Q.Mode**

❒ You can specify the number of idle spins according to the length of time that the machine was not used: User Tools - Mode Setting –No. of Q.Start.

Colour Drum

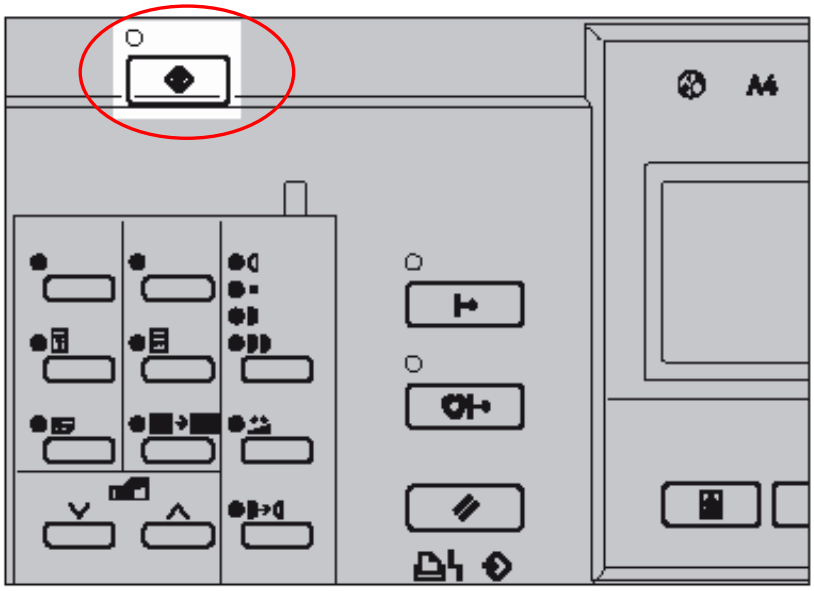


- **Use a separate drum for each colour.**
- **Several colours of ink are available.**

- A range of coloured inks are available.
- You need a separate drum for each colour.
- To make multicoloured copies, you have to prepare a separate original for each colour

USER TOOLS AND SP MODES

User Tools



Operation Manual, User Tools, Accessing the User Tools

❒ Make sure that the trainees know how to enter user tools mode.

Energy Saver Modes

- **You can select one of two modes:**
  - Energy Saver Mode
    - The display goes off.
    - Printing from a computer is possible.
    - To operate the machine, press the operation switch, or place originals on the exposure glass or in the ADF.
  - Auto Off Mode
    - The machine turns off. The power switch is turned off by a solenoid.
    - To operate the machine, turn the main switch on.

Energy Saver Modes

- **To select either Energy Saver or Auto Off mode:**
  - User Tools – System Settings – Mode Setting – Energy Saver Option
- **The machine will go into the selected mode after this timer runs out**
  - User Tools – System Settings – Timer Setting – Energy Saver Timer
  - Default: 3 minutes
- **You can also switch the machine off automatically at a set time every day**
  - User Tools – System Settings – Timer Setting – Auto Off Timer

Administrator Tools

- **User Tools – System Settings – Administrator Tools**
- **Machine use can be monitored with user codes.**
- **There is no key operator code.**
- **Windows Authentication and other security functions are not used.**

User Tools

- **System Settings – Set Operation Mode**
  - Min Quantity, Max Quantity: These let you put minimum and maximum limits on the number of prints per original
  - Class Display: For companies and other organizations, the “Class/Year” format may be inappropriate. You can change the wording of the Class Mode feature to ‘Department’.

❒ In these slides, we will look at user tools that were not discussed earlier.

User Tools

- **System Settings – Mode Settings**
  - Ignore Paper Size: If you are making prints on custom size paper and the original image does not entirely appear on the print, select “Ignore”. The machine will not detect the paper length.
  - No Orig Size (ADF): Use this if you are using non-standard original sizes in the ADF.
  - Longer Paper: Enables the use of copy paper longer than 432mm, 17.0".

User Tools

- **System Settings – Administrator Tools**
  - Set User Code : User codes. Off/on
  - Restricted Access: If set to ‘On’, a key counter must be inserted to use the machine.

SP Modes 1

- **2-1: Default print speed**
- **2-2: Default image position**
- **2-22: Double count-up for master and print counters if A3 is used**
- **2-60: Makes outlines of vector images**
- **6-27 to 6-30: Master making density (for various original modes)**

❒ Have the class try out various settings to see the effects.

TROUBLESHOOTING

Replenishing Supplies and Troubleshooting

- **Study the procedures in the Operation Manual.**

Operation Manual, Replenishing Supplies/Troubleshooting

- ❒ Have the trainees look through these sections of the operation manual.
- ❒ They must be familiar with all the covers and levers etc that are used to replenish supplies, clear jams, and so on.
- ❒ This section of the manual also contains troubleshooting hints for users.

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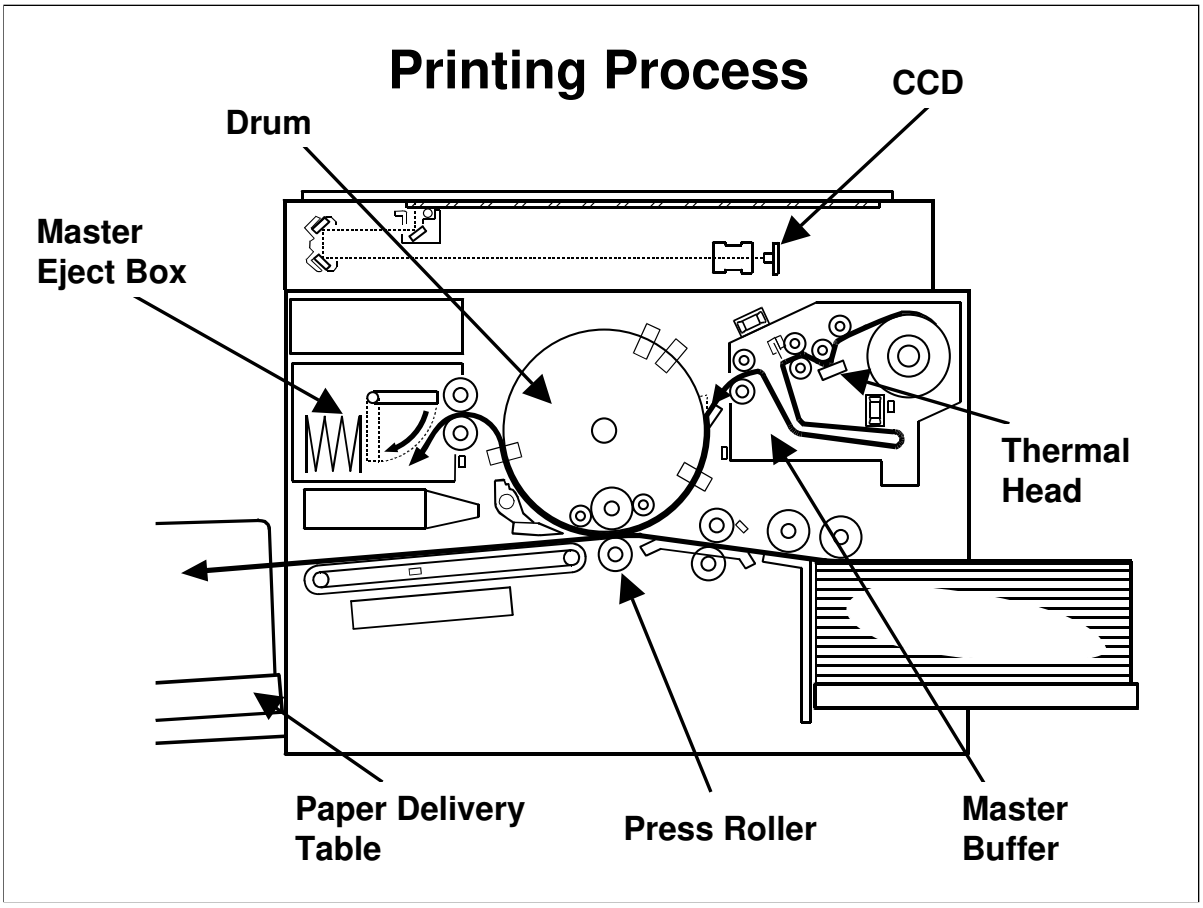
HP4-R2 TRAINING

DUPLICATOR ENGINE

MACHINE OVERVIEW



Outline the printing process. Point out the following:

- ❒ First, the used master still wrapped round the drum is ejected and fed into the eject box.
- ❒ A xenon lamp illuminates the original, and reflected light passes to a CCD.
- ❒ The CCD output is digitally processed and sent to the thermal head to make the new master.
- ❒ Before the master is wrapped around the drum, it is stored in the master buffer duct.
- ❒ Ink transfers from the drum to the paper. The press roller pushes the paper against the drum.
- ❒ The paper is removed from the drum with pawls and an air knife, and fed out to the delivery table.

Service Manual, section 6.1.1

- ❒ Point out the major units.
- ❒ Demonstrate the original, master, and paper feed paths.

Electrical Components

- **Study the electrical component layout, the point-to-point diagram, and the component descriptions list.**
- **Make sure that you can find the components on the diagrams and in the machine.**

Introduce the point-to-point and electrical component layout diagrams.

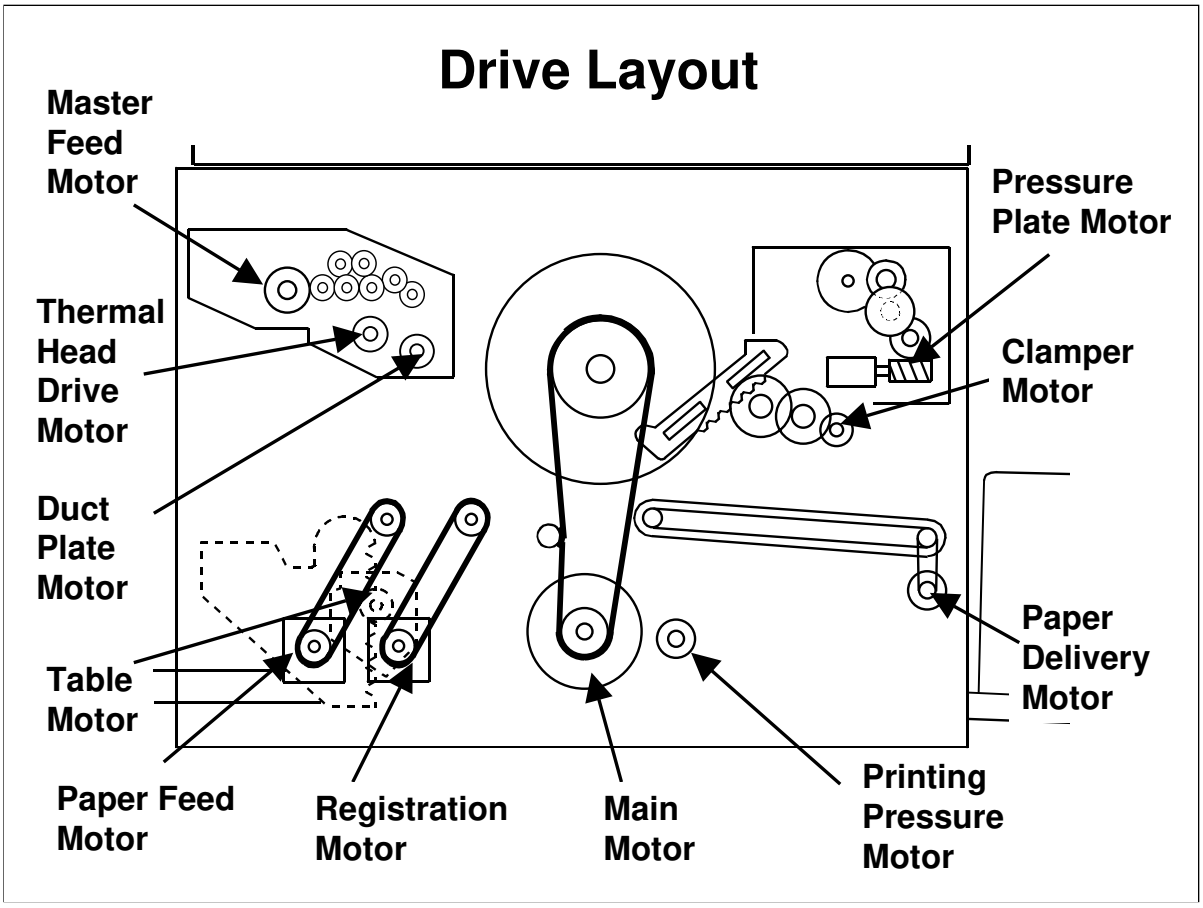
- ❒ Go through the electrical component list in the service manual. Have the trainees locate the electrical components on the machines and on the p-to-p diagram.
- ❒ Have the trainees remove the covers and locate the major components of the copier main body.
- ❒ Point out as many of the components on the list as you think necessary. At least, draw attention to the following components:

Major Components

- ❒ SBU board: Contains a CCD for scanning the original
- ❒ Master making unit
- ❒ Thermal head
- ❒ Drum
- ❒ Master eject box

PCBs

- ❒ Main processing unit (MPU): Controls the machine and carries out image processing; also contains the ink detection circuits
- ❒ Power supply unit



Service Manual, section 6.1.3

Demonstrate the major drive paths in the machine.

- ❒ Main motor – Drum
- ❒ Paper feed motor – Paper feed mechanism
- ❒ Master feed motor – Master making unit
- ❒ Clamper motor – Master clamper
- ❒ Table motor – Paper feed table
- ❒ Paper delivery motor – Transport belts
- ❒ Registration motor – Registration roller
- ❒ Thermal head driving motor – Moves the thermal head away from the platen roller, so that it can be removed
- ❒ Duct plate motor – Opens and closes the duct plate at the entrance to the master buffer duct
- ❒ Printing pressure motor – Adjusts the printing pressure to compensate for temperature and printing speed.

PCB Replacement

- **MPU Board**
  - After you replace the board:
    - Remove the RAM from the old board and put it on the new board
    - Adjust the sensors
      - Duct jam sensor
      - Master edge sensor
      - 2nd drum master sensor
      - Master end sensor
- **RAM**
  - If you install a new MPU RAM, you must do the image adjustments (service manual, section 3.3.6).
- **PSU Board**
  - After you replace the board:
    - Adjust the thermal head voltage

Service Manual, section 3.2.4, 3.2.5, 3,3,6

❒ In this machine, it is not necessary to do the ink detection adjustment after you replace the MPU. This is because the circuits for the adjustment are in the drum, and not on the MPU board.

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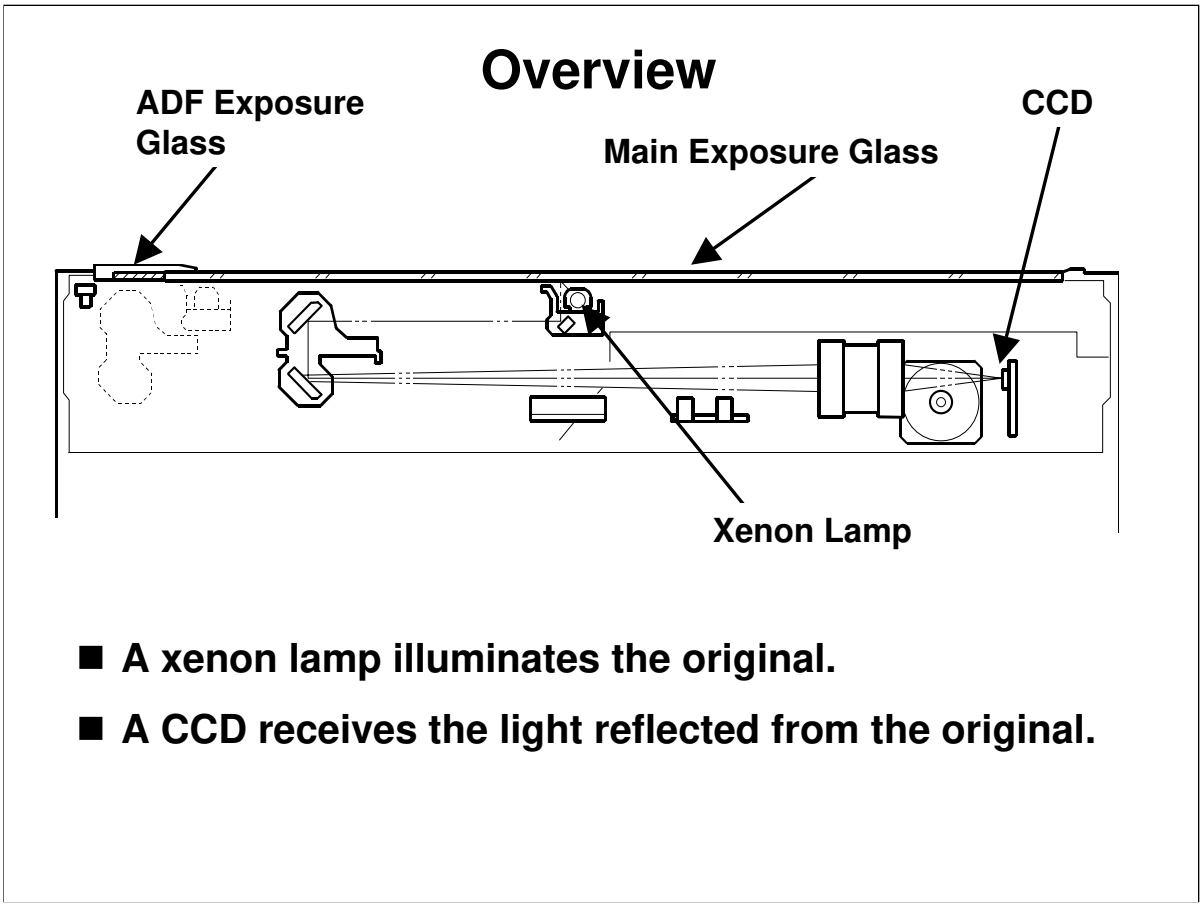
DUPLICATOR ENGINE

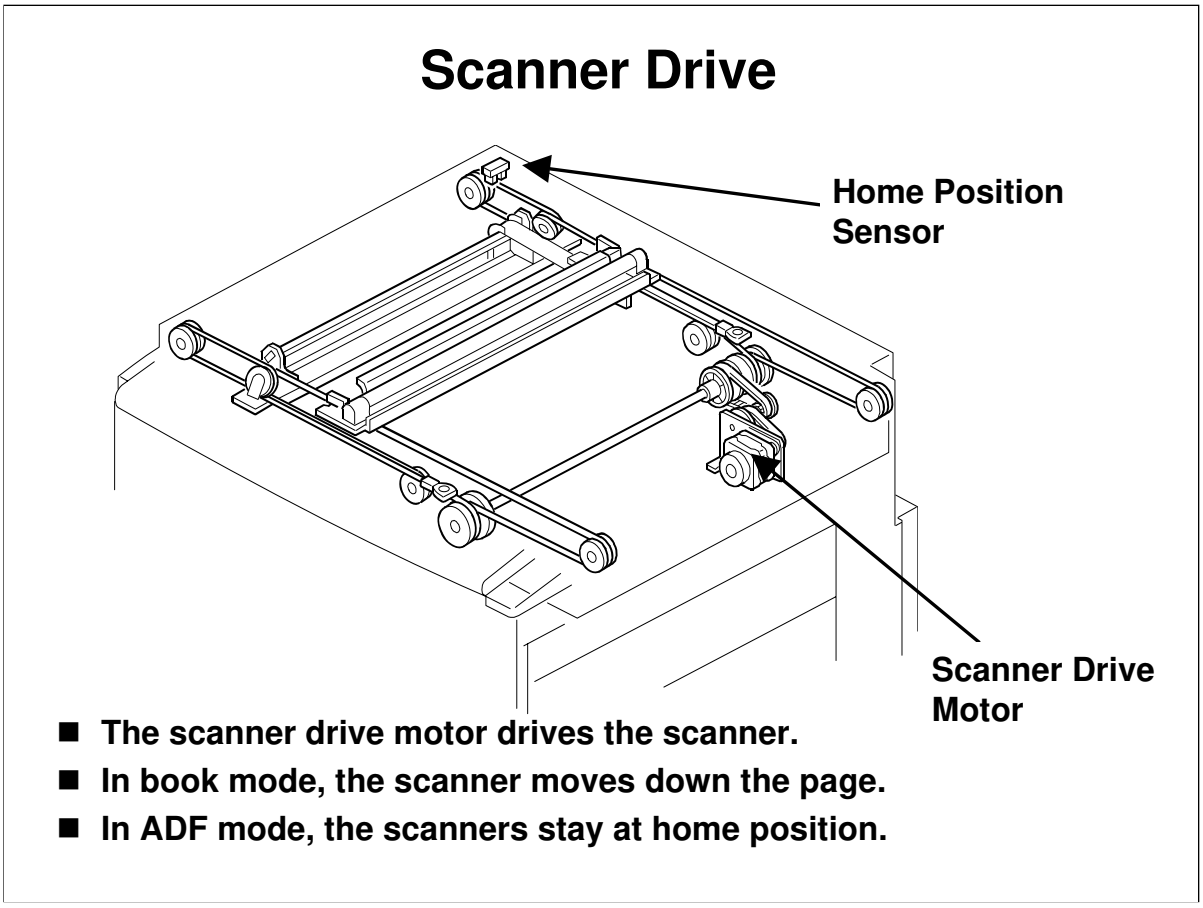
SCANNER

❒ The document feeder is an optional peripheral. It will be described in a separate section of the course.



Service Manual, section 6.3.1

❒ The exposure lamp is a xenon lamp.
❒ Light reflected from the original is reflected onto a CCD.



❒ The scanner drive motor (a stepper motor) drives the scanner.

Book Mode

❒ The scanner motor moves the scanner down the exposure glass.

❒ Changing the scanner drive motor speed enlarges and reduces the image in the sub-scan direction. (Note the SP mode adjustment for sub-scan magnification.)

- ➢ Enlargement/reduction in the main scan direction is done by image processing circuits on the MPU.

ADF Mode

❒ The scanner stays at home position, while the ADF motor feeds the original past it.

❒ Changing the ADF motor speed enlarges and reduces the image in the sub-scan direction. (Note the SP mode adjustment for sub-scan magnification.)

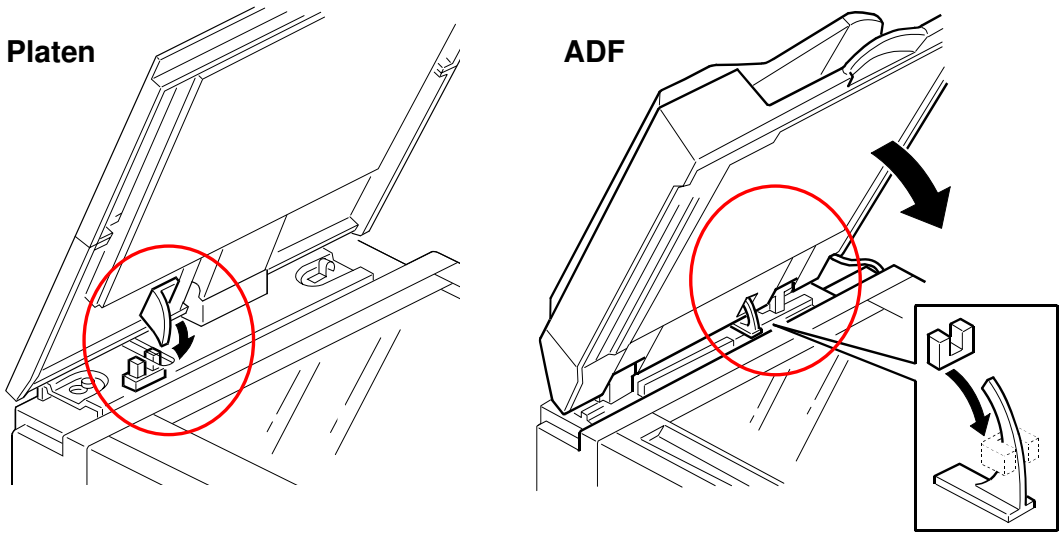
- ➢ Enlargement/reduction in the main scan direction is done by image processing circuits on the MPU.

❒ In this machine, a wire is used instead of a timing belt. Wires are more difficult to replace, but copy quality is better (less jitter).

Original Size Detection (Platen Mode)

- **There is no original size detection.**

Size Detection Timing



- **Platen cover - When the platen cover sensor is activated**
- **Optional ADF - When the DF position sensor is activated**
- **Covers open - When the Start key is pressed**

The slide explains the timing for reading the sensors (if they are being used).

- The sensors are read when the platen has been closed to about 15 cm above the exposure glass.
- If the ADF is used for scanning, the ADF sensors detect the original size.

Service Remarks

- **Do not touch the xenon lamp while it is on.**
- **Calibrate the SBU (SP 6-31) if the MPU RAM or white plate is replaced.**
  - Do this with the other image adjustments, after you replace the RAM on the MPU board, or after you replace the white plate above the exposure glass.
  - For the procedure: Service manual, sections 5.7.3 and 5.7.4

❒ We will study the correct procedure for SBU calibration in the Image Processing section.

Replacement

- **Do the procedures in section 3.3 of the service manual.**

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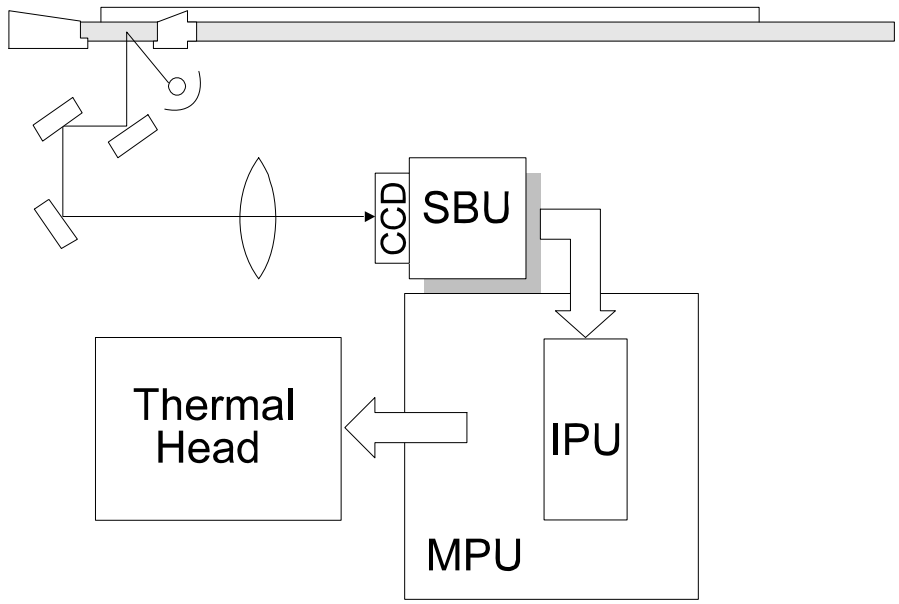
HP4-R2 TRAINING

DUPLICATOR ENGINE

IMAGE PROCESSING

- This section gives a brief outline of image processing.
- There are very few adjustments for the technician in this model. Because of this, detailed questions from the class should not be encouraged; a detailed description of image processing techniques will not be provided in this instructors guide.
- The thermal head will also be described briefly.

Overview



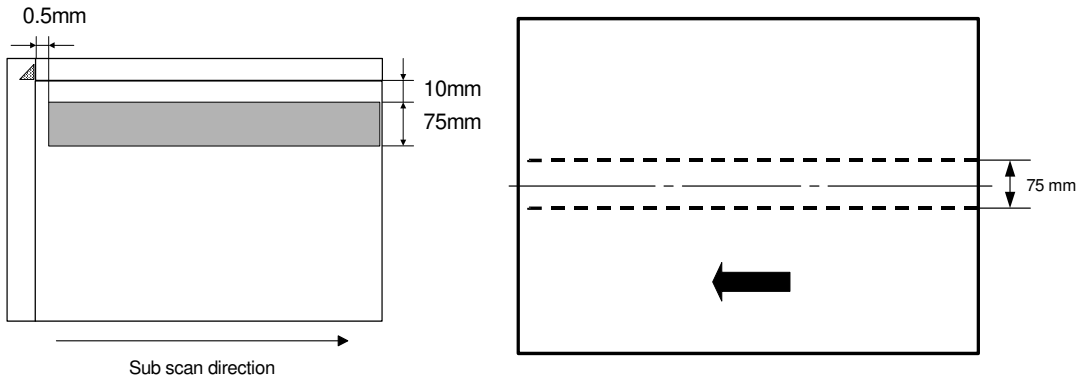
Service Manual, section 6.4.1

- Image processing is done by the ECU board.
- The SBU sends 8-bit digital data to the MPU board.
  - The A/D conversion circuits inside the SBU convert the analog input from the CCD into 8-bit digital data.
  - The CCD is 600 dpi.
- The MPU board sends the data to the thermal head for printing on the master.

Original Types

- **There are four basic original types**
  - Text
  - Photo
  - Text/Photo
  - Pencil
- **The image processing that is used depends on the selected original type.**

Auto Background Correction

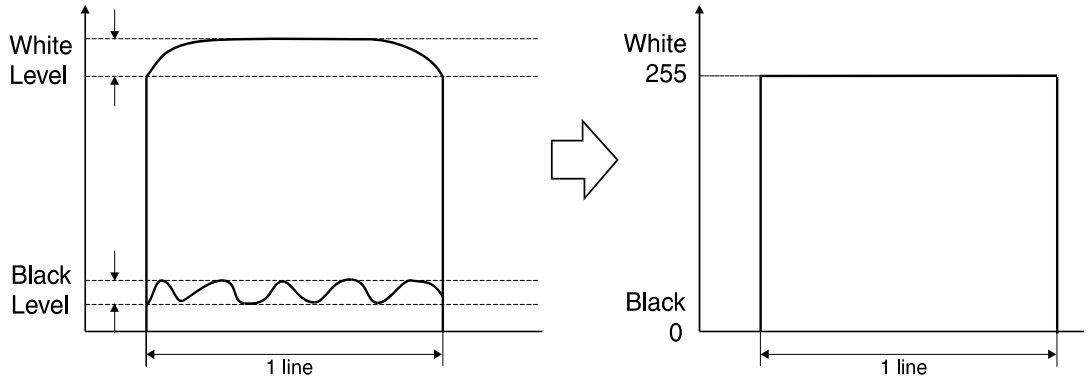


Platen **ADF**

- **Prevents the original's background from appearing on copies**
- **Disabled by default (enable with user tool User Tools – Mode Setting – Background on/off)**

- ❒ This process prevents background from appearing on copies.
- ❒ The machine takes peak white data taken from the indicated locations while the scanner moves down the page.
- ❒ If the original's background is gray, the density of the gray area becomes the white level for that original, and the gray background does not appear on the copy.
- ❒ The reference value for A/D conversion in the SBU for a particular scan line is the peak white level for that scan line.
- ❒ Because peak level data is taken for each scan line, auto background correction compensates for changes in background density down the page.
- ❒ Note that auto background correction is disabled by default. If the user needs this feature, it must be enabled with the user tool.

Auto Shading



- **Corrects the image signal for CCD and scanner irregularities**
- **Done at the start of each page.**

The white level correction compensates for:

- ❒ Loss of brightness towards the ends of the exposure lamp
- ❒ Variations in sensitivity among elements of the CCD
- ❒ Distortions in the light path

The black level correction compensates for:

- ❒ Variations in response to the dummy black pixels with time

Filtering

- **MTF**
  - Emphasizes sharpness. The filter can be adjusted to make lines sharper in either the main scan or sub scan direction.
  - To adjust the strength of the filter, use SP 6-32 to 37. There are adjustments for each original type
  - Used with Letter, Letter/Photo, and Photo.
  - Also used if Tint mode is selected.
- **Smoothing**
  - Makes raster images more clear. Text and lineart can be blurred.
  - Used in Photo mode only.
  - No adjustments

Service Manual, sections 6.4.2 and 6.4.3

Filtering

- MTF sharpens the image.
- MTF counteracts reductions to the original's contrast that occur during scanning.
- A stronger filter gives sharper lines, but can lead to moiré.

Thermal Head

- **Writes the processed image data on the master**
- **Resolution: 400 dpi**
- **Power: Comes from the PSU**
- **Overheat protection: Thermistor**
- **Can be damaged if used when humidity is high**

Service Manual, section 6.4.5

- The processed image data is printed by the thermal head, to produce a master.
- This machine uses a 400 dpi thermal head.
- A thermistor protects the thermal head from overheating.
  - Cut off temperature: 54 °C
- The resistance of the elements in the thermal head varies for each thermal head. Because of this, the thermal head voltage must be adjusted whenever a new thermal head or power supply board is installed.
- Note that the thermal head can be damaged if it is used when humidity is high.

Thermal Head Energy

- **The temperature in the drum has an effect on the thermal head energy.**
  - This can be disabled with SP 2-39 (for black ink), SP 2-40 (colour ink), or 2-43 (A4 drum).
  - There is a thermistor in the drum to measure the temperature.
  - The energy will be reduced at higher temperatures.
- **The energy is calculated from the settings of SP 2-41 (A3 drum), 2-42 (economy mode), 2-44 (A4 drum), or 2-45 (A4 drum, economy mode).**

SP Modes

- **2-60: Bold text for letter mode, on/off**
- **6-27 to 6-30: Master making density with the various original type settings**
- **6-31: SBU calibration**
  - Do this with the other image adjustments, after you replace the MPU RAM, or after you replace the white plate above the exposure glass.
  - For the procedure: Service manual, section 5.7.4
- **6-32 to 6-37: MTF filter settings**
  - For details: Service manual, section 5.7.5

❒ After you replace the RAM on the MPU board, you must do a lot of image adjustments. The SBU calibration is last. We will see this on the next slide.

Image Adjustment

- **If you must adjust the image position on the prints, do the image adjustments in the order that is given in the service manual.**
  - Service manual, section 5.7.3
- **If you replace the RAM on the MPU board (or if you install a new MPU and do not use the RAM from the old board), you must do these image adjustments.**

❒ If you wish, ask the class to do these adjustments.

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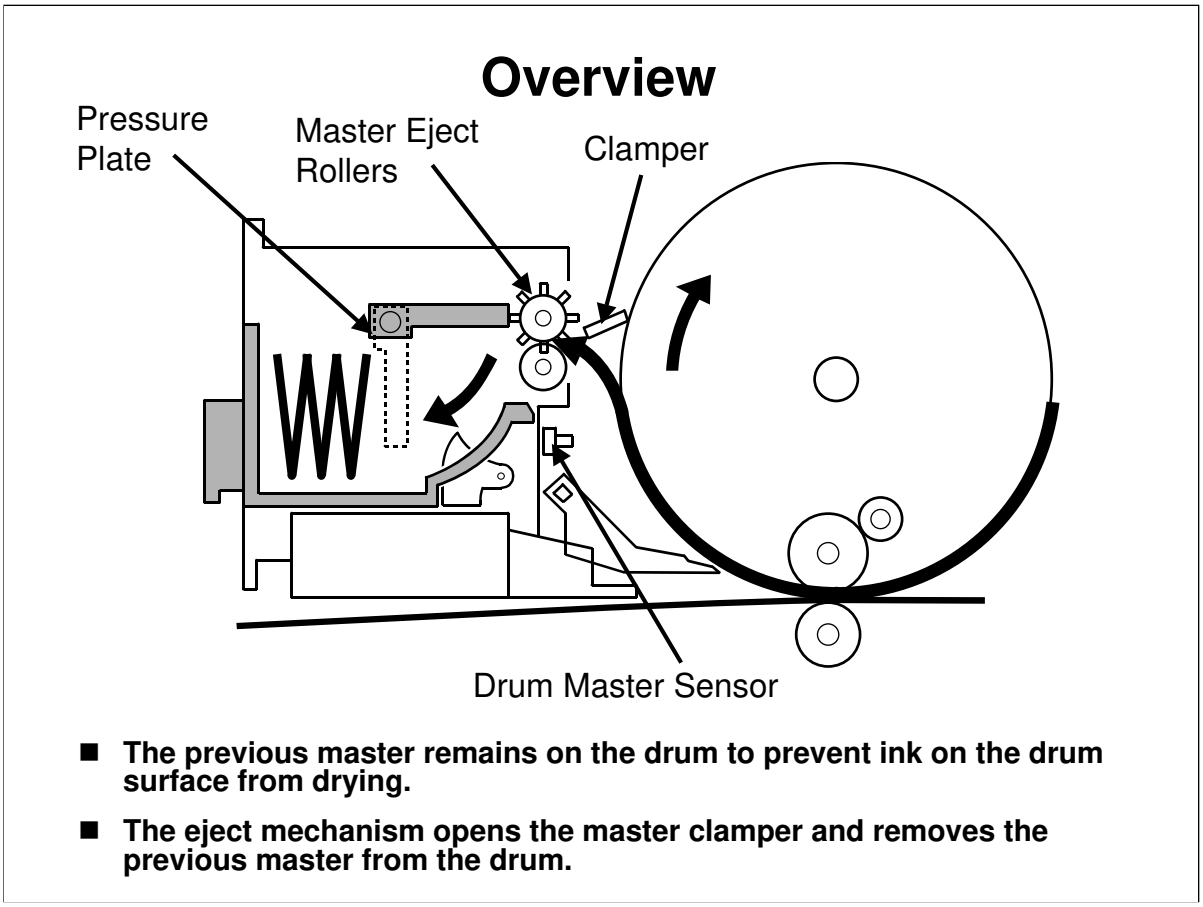
HP4-R2 TRAINING

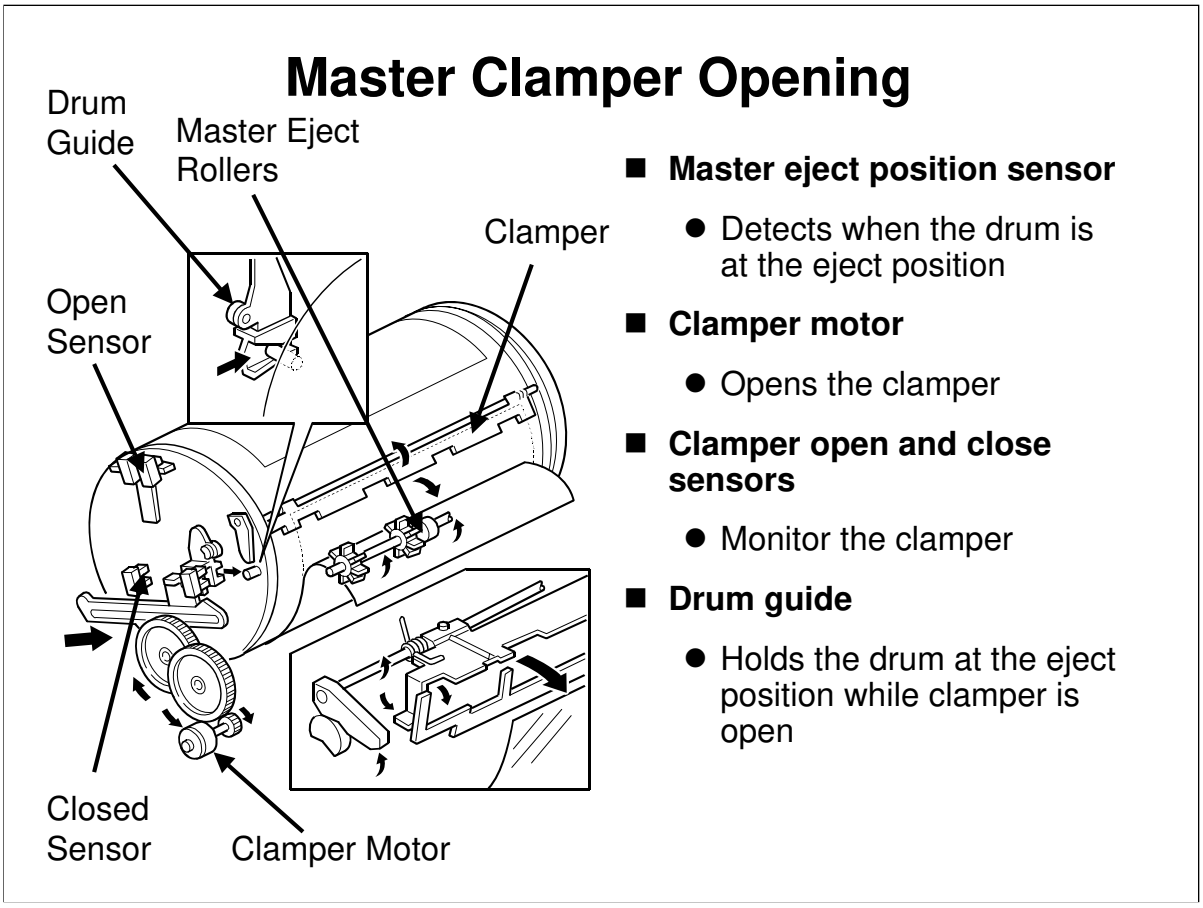
DUPLICATOR ENGINE

MASTER EJECTION



Service Manual, section 6.2.1

- After printing, the used master remains on the drum to prevent ink drying on the drum.
- The drum master sensor checks whether there is a master on the drum.
  - For a new machine, there is no master on the drum. The eject process is skipped.
- The drum turns to the master eject position.
- The master clamper opens and the master eject rollers pick up the leading edge.
- The clamper closes again.
- The drum turns at 30 rpm and the eject rollers feed the used master into the eject box.
- After one and a half drum rotations, the pressure plate compresses the used master into the box.



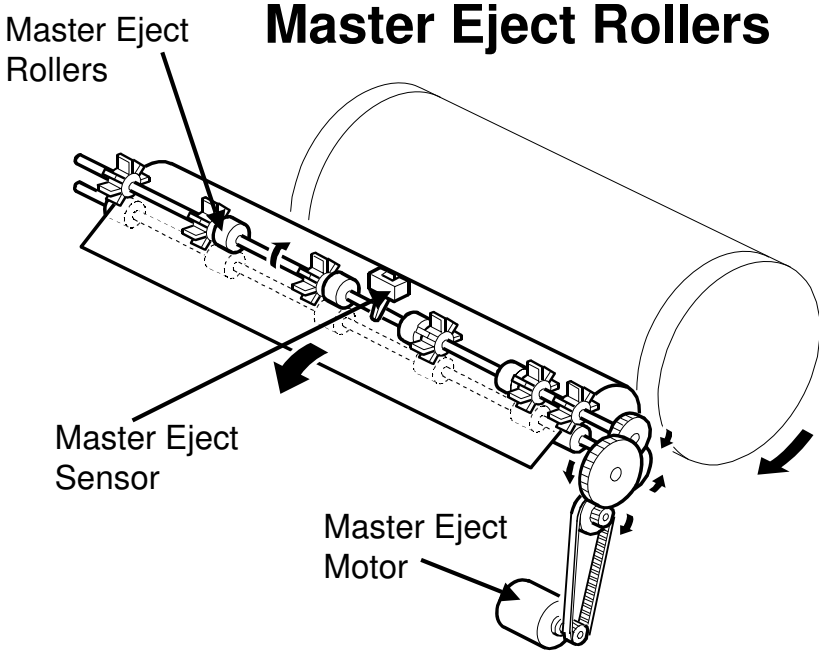
Service Manual, section 6.2.2

Opening the Clamp

- ❒ Describe the mechanism. The main points are on the slide.

Locking the Drum

- ❒ At the same time as the clamper opens, the drum guide engages the pin at the rear of the drum.
- ❒ The clamper closes again when the eject rollers have grabbed the leading edge of the old master.
- ❒ When the clamper closes, the drum guide releases the pin and the drum can turn again.



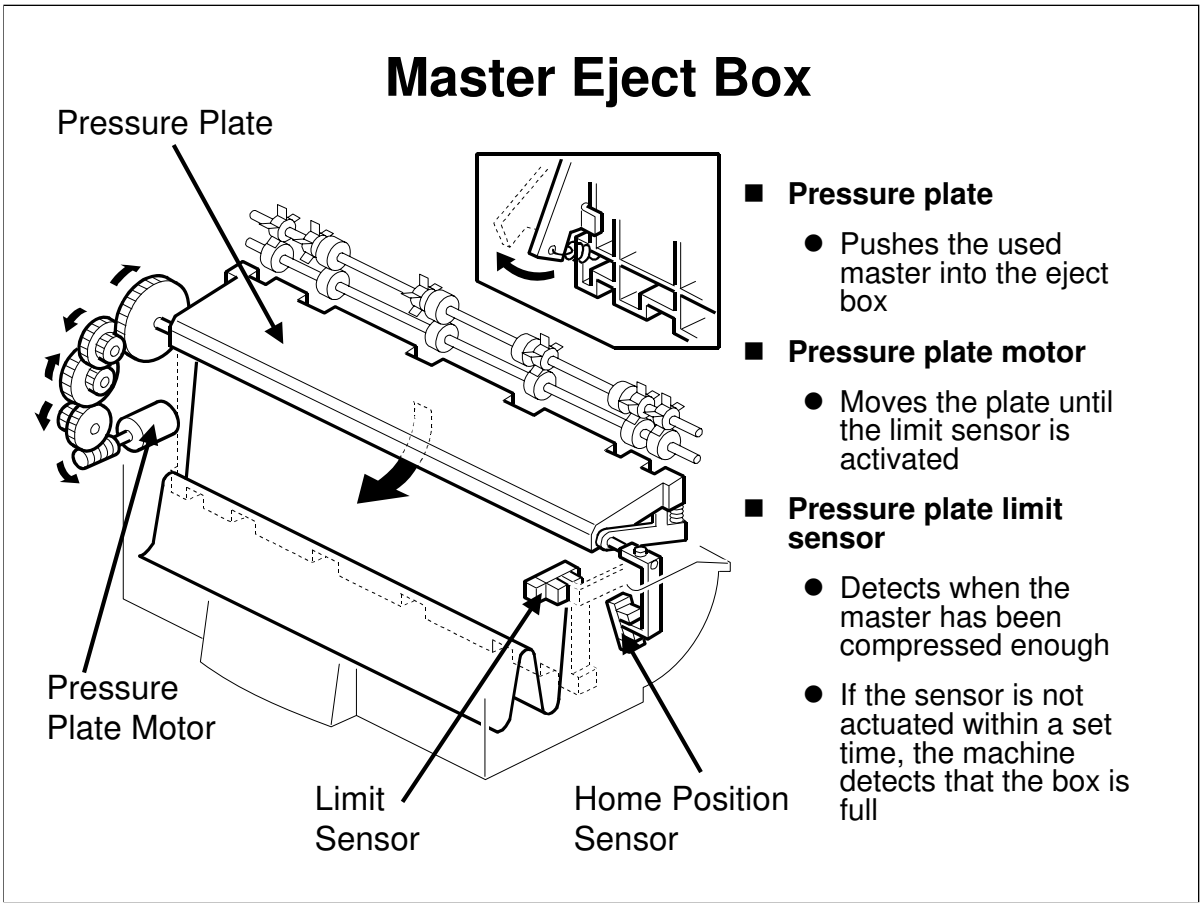
- **The master eject motor drives these rollers.**
- **After the master has been pulled off, the drum turns to the master feed position, then stops.**
- **The master eject sensor checks for jams**

Service Manual, section 6.2.3

❒ An independent motor drives these rollers.

❒ Go over the sequence.

- Clamper motor: Opens the clamper
- Master eject motor: Picks up the leading edge, then stops
- Clamper motor: Reverses to close the clamper
- Master eject motor: Feeds the master into the eject box while the drum turns slowly (30 rpm)
- When the drum gets to the master feed position: Master eject motor and drum motors stop.



Service Manual, section 6.2.4

- ❒ Go over the mechanism. The main points are on the slide.
- ❒ The pressure plate returns to home position after master making and cutting.
- ❒ Explain how the machine uses the pressure plate limit sensor to detect that the master box is full.

Replacement

- **Master eject unit (service manual, section 3.4)**

❒ Have the class remove and replace the parts on the slide.

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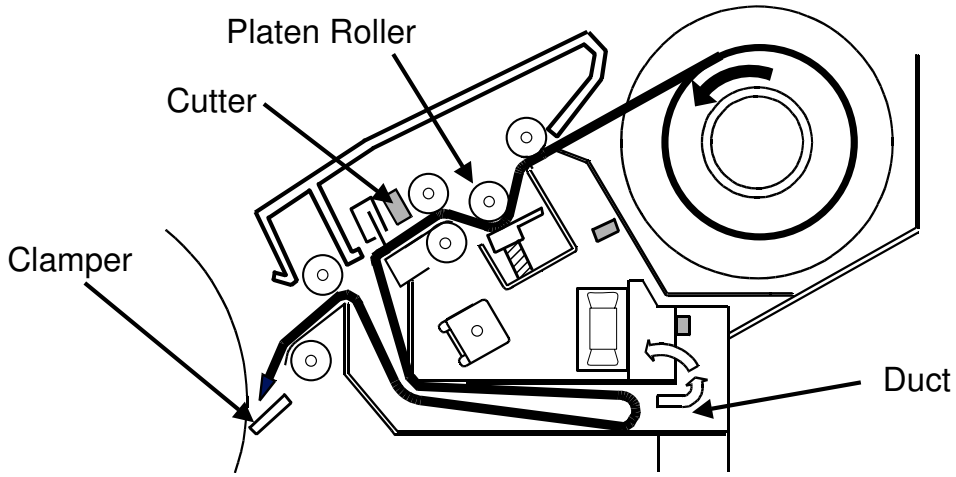
HP4-R2 TRAINING

DUPLICATOR ENGINE

MASTER FEED

Overview



- **The platen roller feeds the new master to the drum.**
- **Before the previous master is ejected, the new master is stored in the master buffer duct.**
- **After the previous master is ejected, the drum turns to the master feed position.**
- **The master clamper catches the leading edge, and the drum turns to wrap the new master around it.**
- **The cutter cuts the master to the correct length.**

Service Manual, section 6.5.1

❒ After the used master has been ejected, the drum turns to the master feed position.

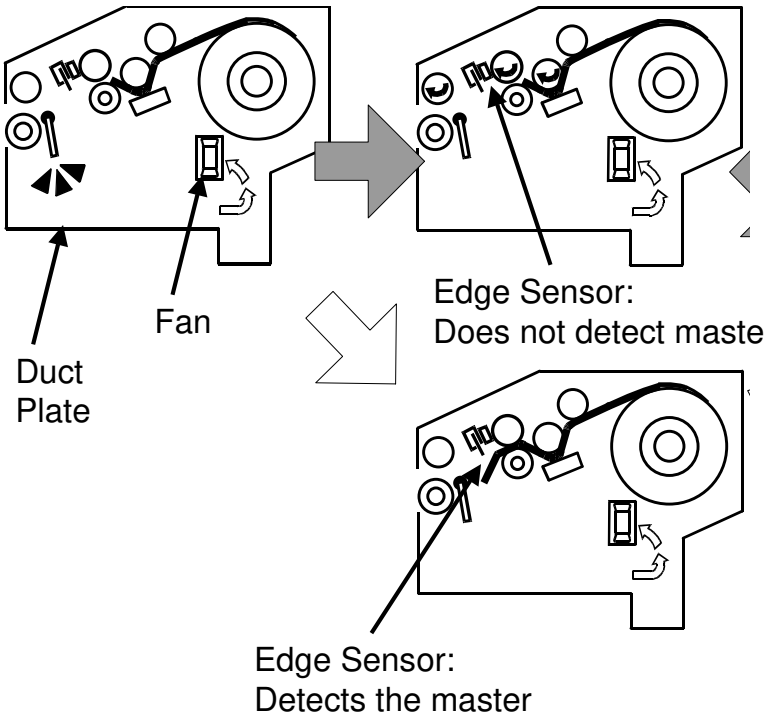
❒ The new master is then fed to the drum. The main steps are listed on the slide.

Automatic Master Set Positioning
Overview

- **The machine automatically moves the leading edge of the master to the correct position.**
- **The master feed motor and master edge sensor are used for this process.**
- **The leading edge is not cut.**

❒ The next few slides explain the mechanism.

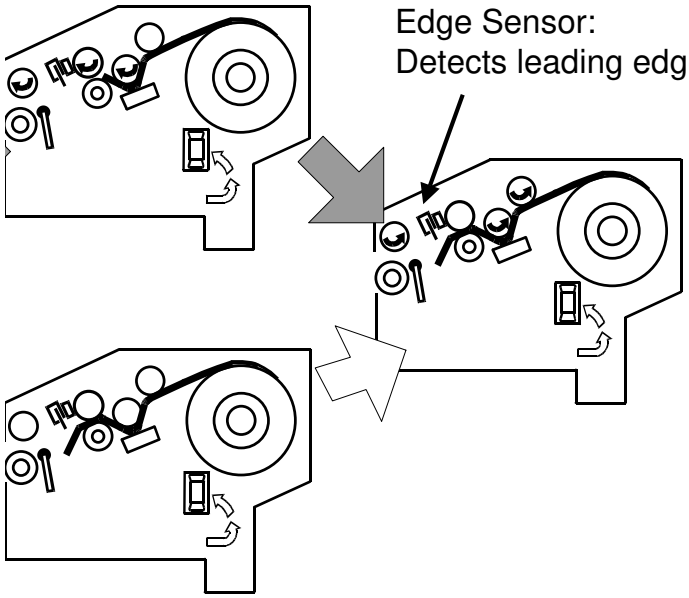
Automatic Master Set Positioning - 1



- **The duct plate opens and the master vacuum fans turn on.**
- **If the master edge sensor detects the master, the master feed motor does not start.**
- **If the sensor does not detect the master, the motor feeds 40 mm.**

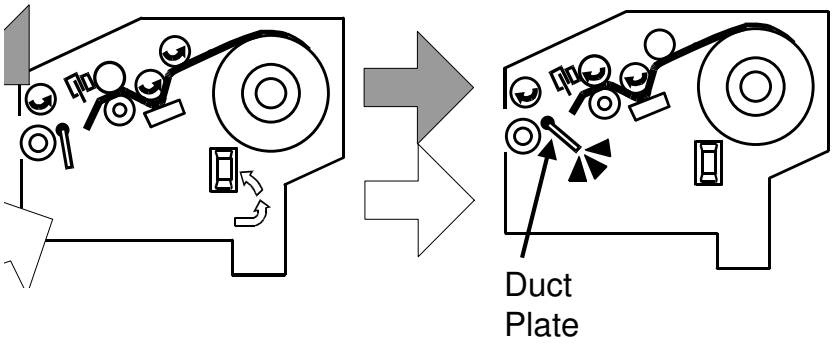
❒ If the master edge sensor does not detect the master (grey arrow), the rollers start to turn.
❒ If the master edge sensor detects the master (white arrow), the rollers do not turn.

Automatic Master Set Positioning - 2



- **Then the motor reverses until the edge sensor detects the leading edge of the master.**
- **The master is now at the correct position.**

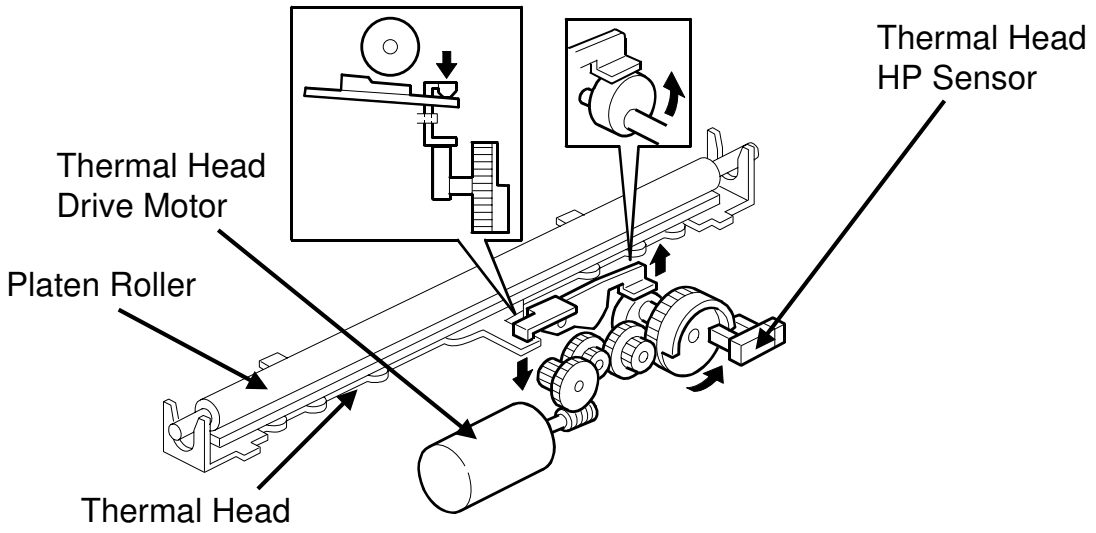
Automatic Master Set Positioning - 3



- **Then, the duct plate goes back to the middle position.**

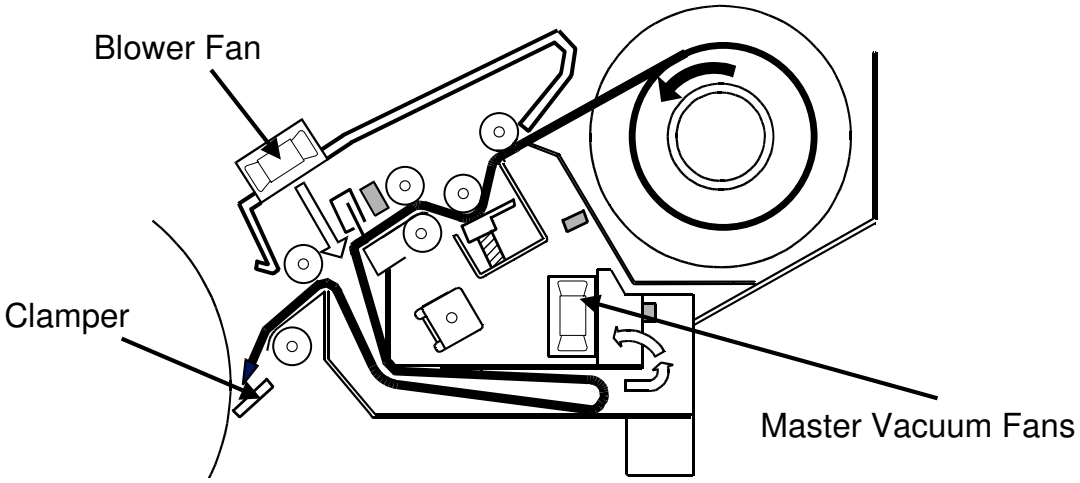
❒ The duct plate has four positions. We will see these later.

Thermal Head Up/Down Movement



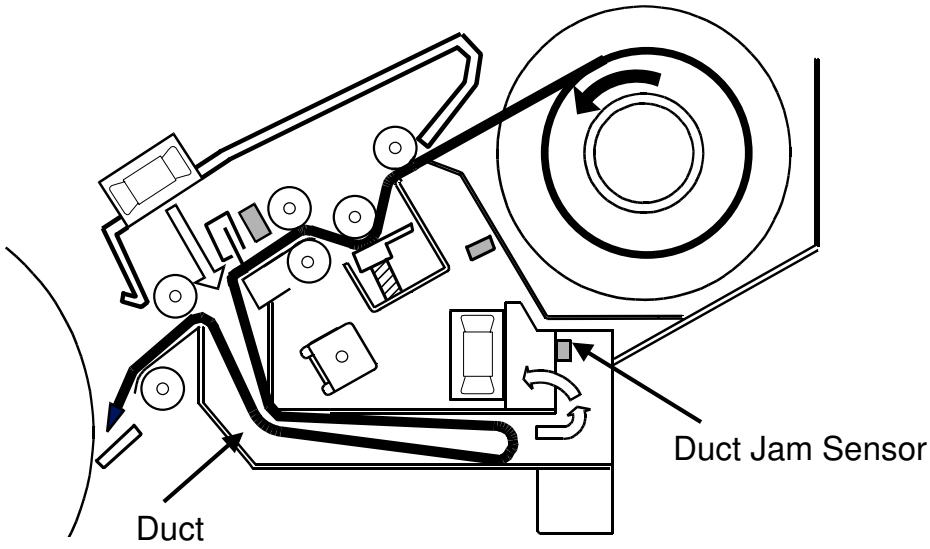
- **The thermal head only contacts the platen roller during master making.**
- **Before the master is made, the thermal head drive motor moves the thermal head up against the platen roller.**
- **The thermal head HP sensor detects when the thermal head is at home position, away from the platen roller.**

Master Buffer - 1



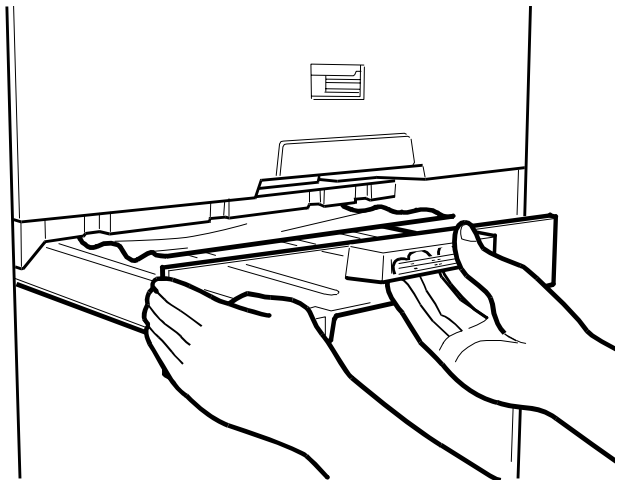
- **Before the previous master is fully ejected, three master vacuum fans suck the new master into the duct.**
  - The blower fan keeps the folds of the master separated in the duct.
- **After the drum gets to the master making position, the master is fed from the duct until the clamper catches the leading edge of the master.**

Master Buffer - 2



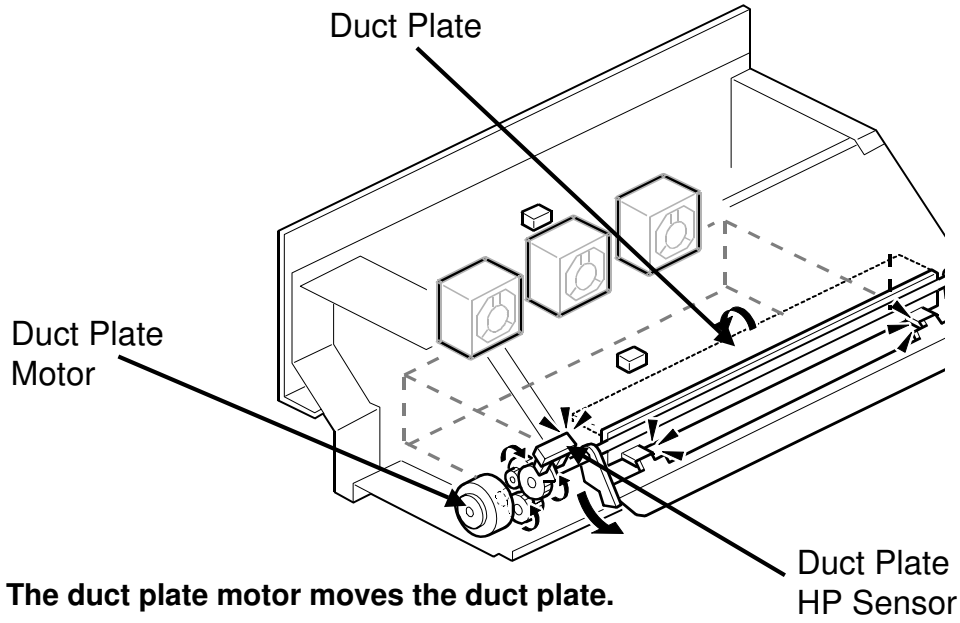
- **Then the drum starts to turn and the new master is pulled out of the duct.**
- **The duct jam sensor detects if the master gets stuck in the duct.**

Master Duct Jam Removal



- **Open the lower master tray and remove the jammed master.**

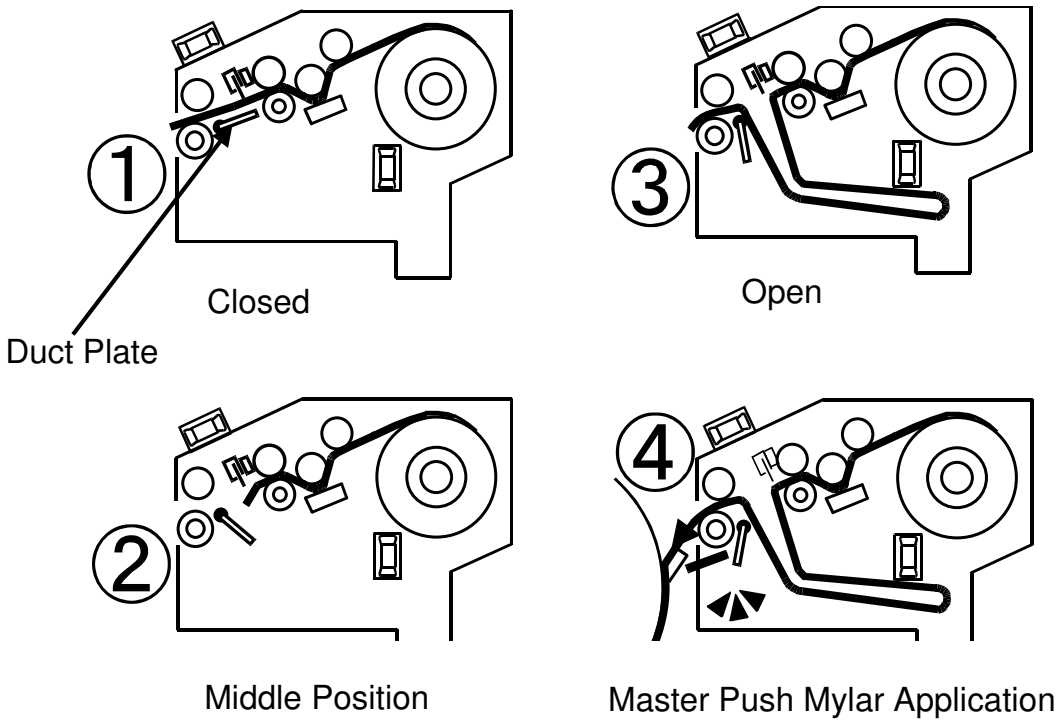
Duct Plate Mechanism - Drive



- **The duct plate motor moves the duct plate.**
- **The duct plate has four stopping positions.**
- **The duct plate HP sensor detects when the duct plate is open**

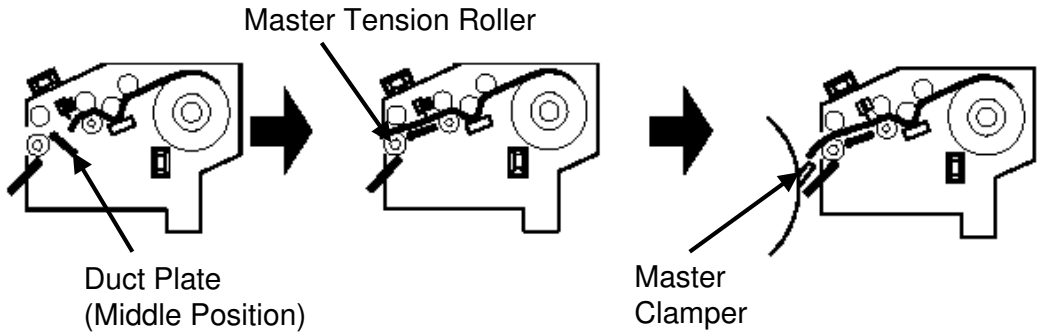
❒ Four positions – see the next slide.

Duct Plate Mechanism – Four Positions



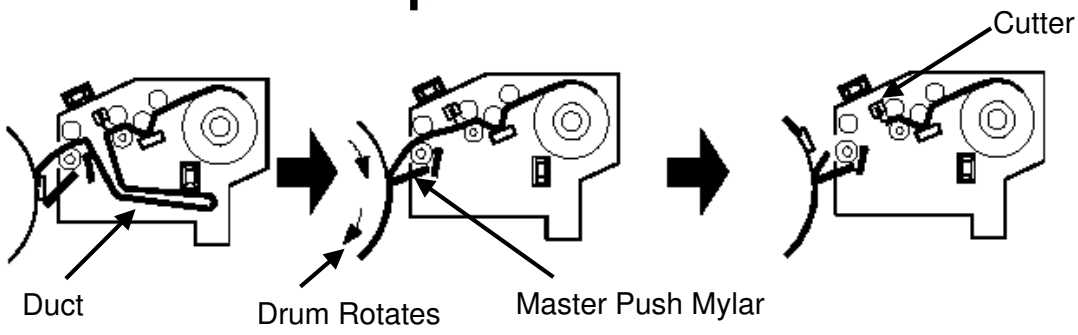
- The master push mylar makes sure that the master contacts the drum properly all across its width, and this makes sure that ink is distributed through the master correctly.
- We will see the mylar mechanism in more detail later.

Duct Plate Operation Procedure - 1



- **Before printing, the duct plate is in the middle position.**
- **When the master is fed, the duct plate closes.**
  - The master tension roller catches the leading edge of the master.
  - Then, the master clamper opens.

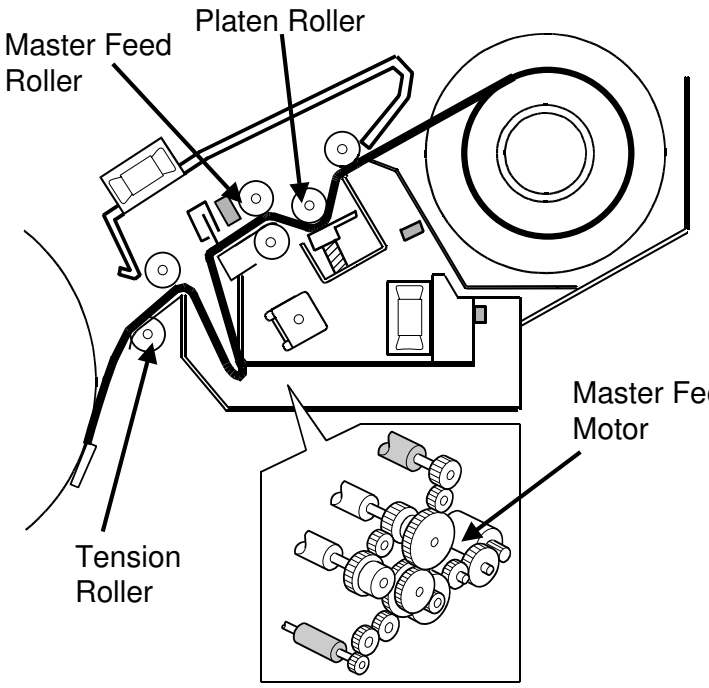
Duct Plate Operation Procedure - 2



- **When the master clamper opens, the duct plate goes to the open position. The master is fed into the duct.**
- **When the drum starts to rotate, the duct goes to the 'master push mylar application' position.**
  - The drum pulls the mylar out of the duct.
  - The mylar flattens the master against the drum.
- **After the master is wrapped around the drum, the cutter cuts off the master.**

❒ The diagram in the middle shows the situation a long time after the drum starts to rotate.

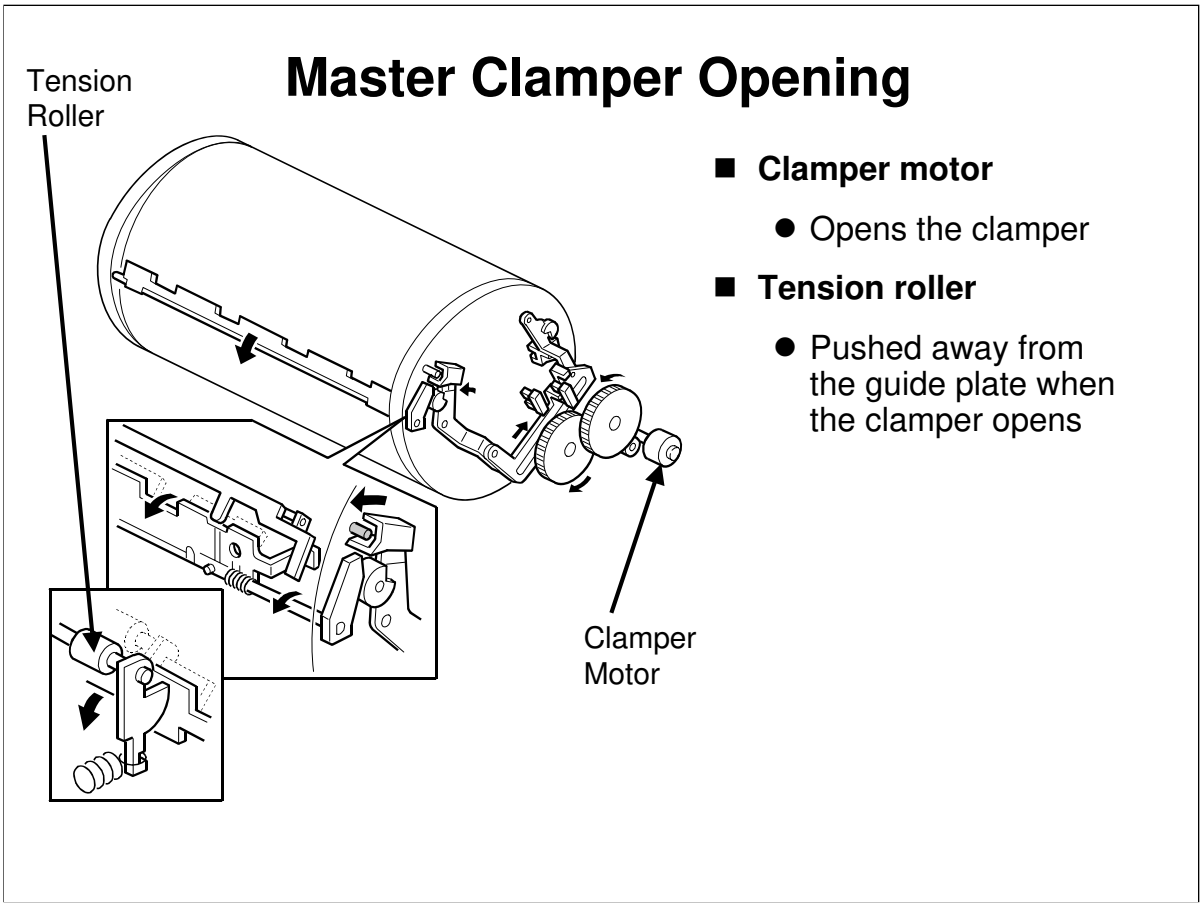
Master Feed



- **The master feed motor drives the platen roller and the master feed roller.**
- **The drum turns at 15 rpm.**
- **The tension roller prevents creases in the master during wrapping around the drum.**

❒ The master is fed into the open clamper.
  - ➢ The master buckles downwards. This prevents shocks caused when the clamper is closed from travelling back to the thermal head area.

❒ The clamper closes, then the drum turns slowly.
❒ Drum rotation turns on and off to keep a buckle in the master.
❒ The tension roller keeps the master tight while it is being wrapped around the drum.

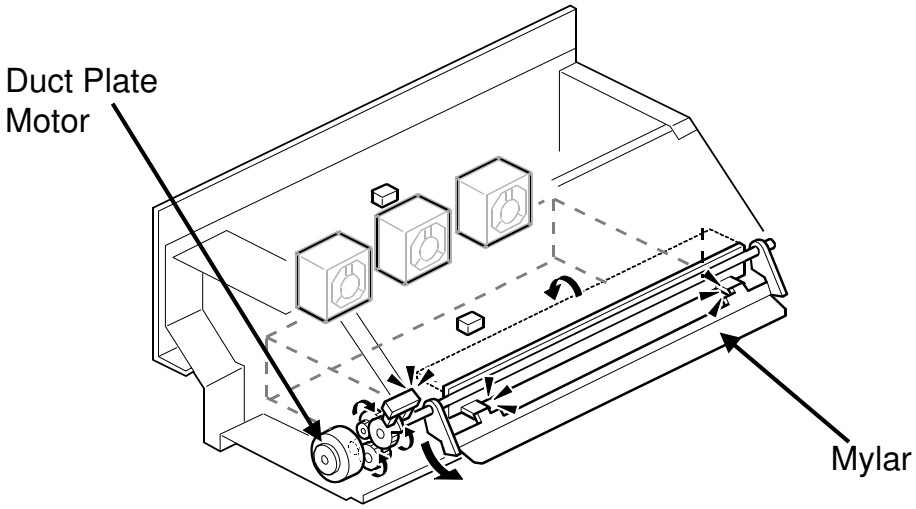


Service Manual, section 6.5.8

When the clamper opens, the tension roller in the master feed unit is pushed out of the way.

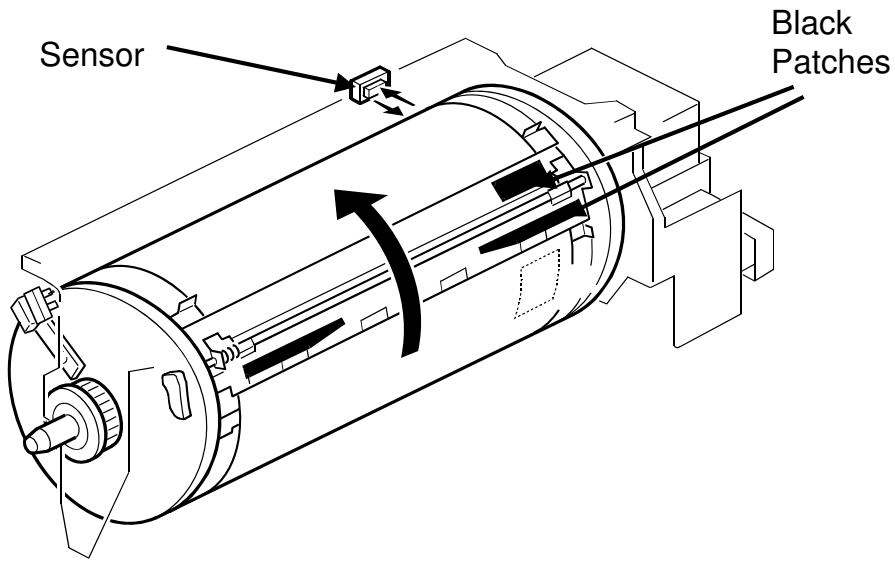
- ❒ The tension roller is normally pushing against the guide plate, to keep the master tight while it is being wrapped around the drum.
- ❒ However, this roller must be moved out of the way to feed the master into the clamper. The tension roller arms do this.
- ❒ Two sensors detect whether the clamper is open or closed.

Master Push Mylar



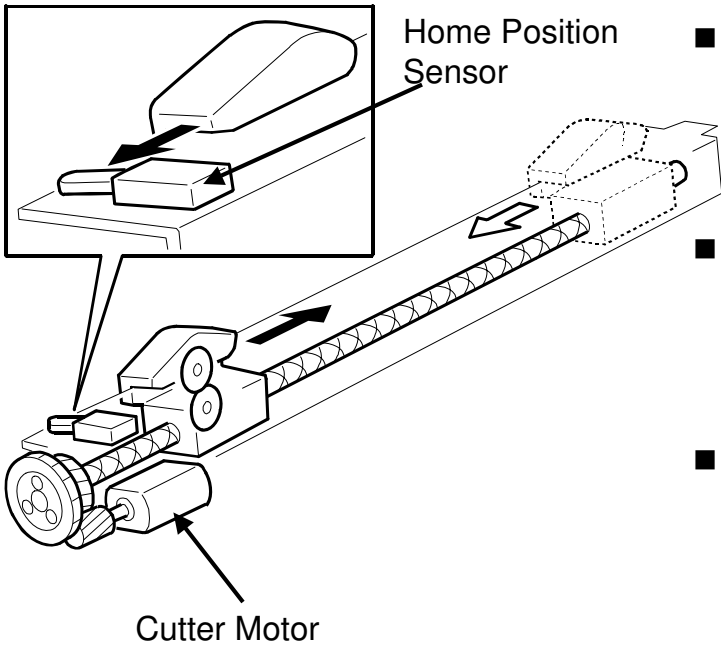
- **The duct plate motor pushes the mylar into contact with the master to flaten it against the surface of the drum. This makes sure that ink is applied correctly through the master.**
  - The motor moves the duct plate to the ‘mylar application position’.

2nd Drum Master Sensor



- **There are black patches on the clamper and on the drum.**
- **If the sensor detects a black patch, then there is no master on the drum, and the master push mylar will not be applied to the drum.**

Cutter



- **Two cutter blades**
  - Cut the master as the cutter moves towards the rear of the machine
- **Cutter motor**
  - Only turns one way, but the double-spiral shaft returns the cutter to the front
- **Home position sensor**
  - Detects when the cutter has returned to the front

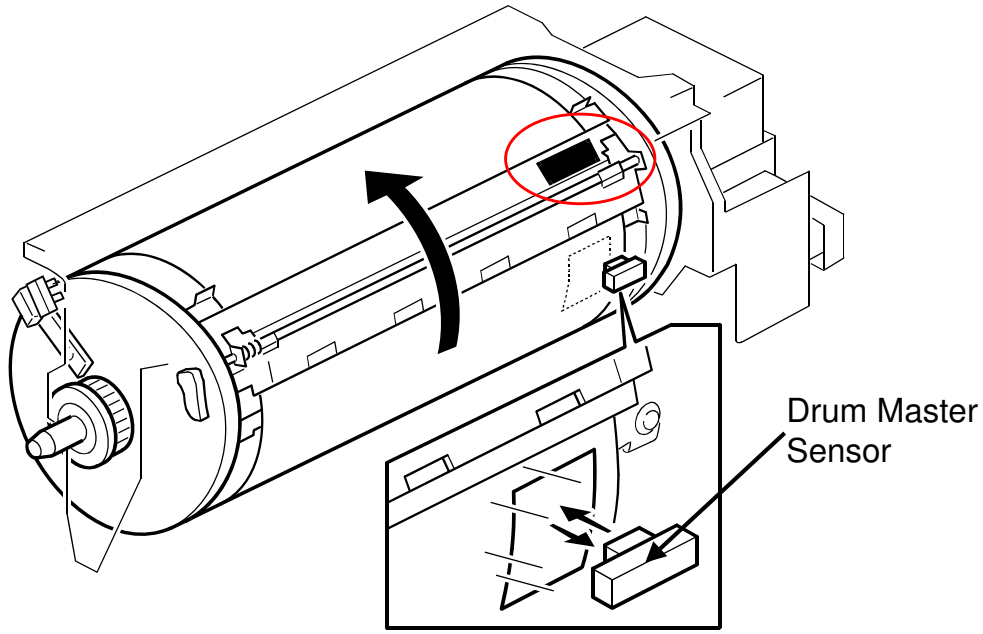
Service Manual, section 6.5.12

- ❒ Describe the cutter briefly. The main points are on the slide.
- ❒ When the master has been made, it is fed to the drum.
- ❒ When the master feed motor stops, the cutter cuts the master.
- ❒ After cutting, the drum continues turning to wrap the rest of the master.
- ❒ The leading edge of the master roll remains at the cutting position, ready to make the next master.
- ❒ When a new roll is placed in the machine, the leading edge is automatically fed to the standby position, as explained earlier. Therefore, the user must always put the in the correct position at installation. The machine does not cut off the leading edge of the new roll.

Re-cutting

- **If the CPU cannot detect a signal from the master eject position sensor signal within 5.0 seconds after the main motor turns on at the start of master making, this could be because of an error in master cutting.**
  - The signal from the sensor would indicate that the drum is at home position.
- **So the cutter tries to cut the master again.**
- **If the CPU still cannot detect a signal from the master eject position sensor when the main motor starts, E-06 (Main Motor error) occurs.**

Jam Detection



■ **The drum master sensor checks for a jam when the drum is at the master eject position.**

Service Manual, section 6.5.10

❒ There are no sensors in the master feed path.
❒ The drum master sensor checks for a master feed jam after master making.
❒ If the sensor cannot detect the black patch on the clamper, it means that a master is covering it. If this happens, a jam is detected.

Service Remarks

- **Do not touch the thermal head elements with bare hands (clean with alcohol).**
- **Remove foreign materials from the platen roller and master roll area.**
- **Do not touch the master surface with bare hands**
- **Do not touch the connector terminals with bare hands.**
- **Adjust the thermal head voltage after installing a new thermal head or power supply board.**

SP Modes

6-60: Master return value

- The auto adjustable master set mechanism automatically moves the leading edge of the master to the correct position after the user installs a master roll.
- This position can be adjusted with SP 6-60. This SP adjusts the amount that the machine feeds the master after it detects the leading edge of the master.

Service manual, section 5.7.7

Replacement and Adjustment
Thermal Head

- **Thermal head replacement**
  - You must release the thermal head with SP 5-74. If you do not do this, you cannot remove the thermal head.
  - After you install a new thermal head, you must do the thermal head voltage adjustment
- **Thermal head voltage adjustment**
  - This must be done every time the thermal head or power supply board is replaced.

❒ First, we shall go over some important points (on the next three slides). Then, the class will do the procedures.

Service Manual, section 3.5.2

Thermal Head

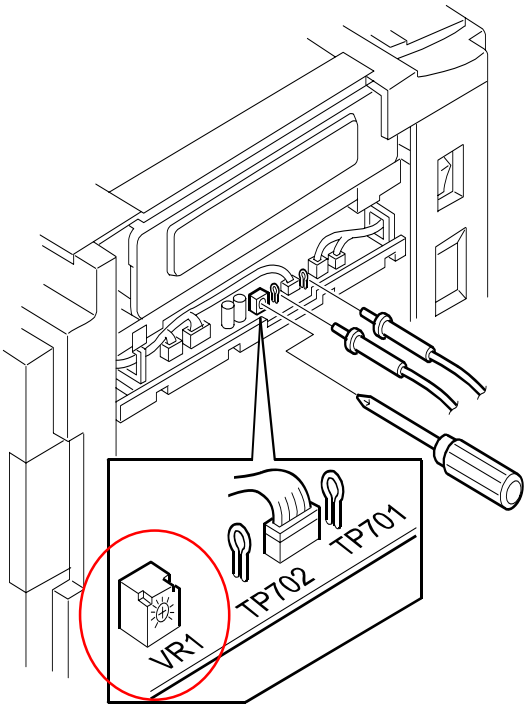
❒ Installation is a bit tricky. Make sure that the class can install the thermal head correctly.

Thermal Head Voltage Adjustment

❒ See the next slide for details.

Replacement and Adjustment
Thermal Head Voltage Adjustment

- **Connect the oscilloscope**
  - Connect the positive terminal to TP701.
  - Connect the negative terminal to TP702.
- **Do not short the two terminals.**
- **Select SP 5-12 and press Start.**
- **Turn VR1 slowly, until the output voltage is the same as the value on the decal.**
  - There is a tolerance of +0 and –0.1 Volt



Service Manual, section 3.5.10

- If the two test probes touch each other, the board will be damaged.
- Turn VR1 slowly. If too much voltage is applied suddenly, the board will be damaged.
- VR1 and the test points are on the PSU. Therefore, if a new PSU is installed, the adjustment must be done.

Replacement and Adjustment
Sensor Adjustments

- **Adjust these sensors after you change the MPU.**
  - Duct jam sensor
  - Master edge sensor
  - 2nd drum master sensor
  - Master end sensor

Service Manual, section 3.5.6 to 3.5.9

Sensor Adjustments

- ❒ Do these every time the MPU has been changed.
- ❒ This adjustment must be done even if the old RAM is placed on the new board. This is because the adjustments are controlled by VRs on the board (hardware), not memory contents.

Replacement and Adjustment

- **Do the procedures in section 3.5 of the service manual.**

Service Manual, section 3.5.1. to 3.5.5

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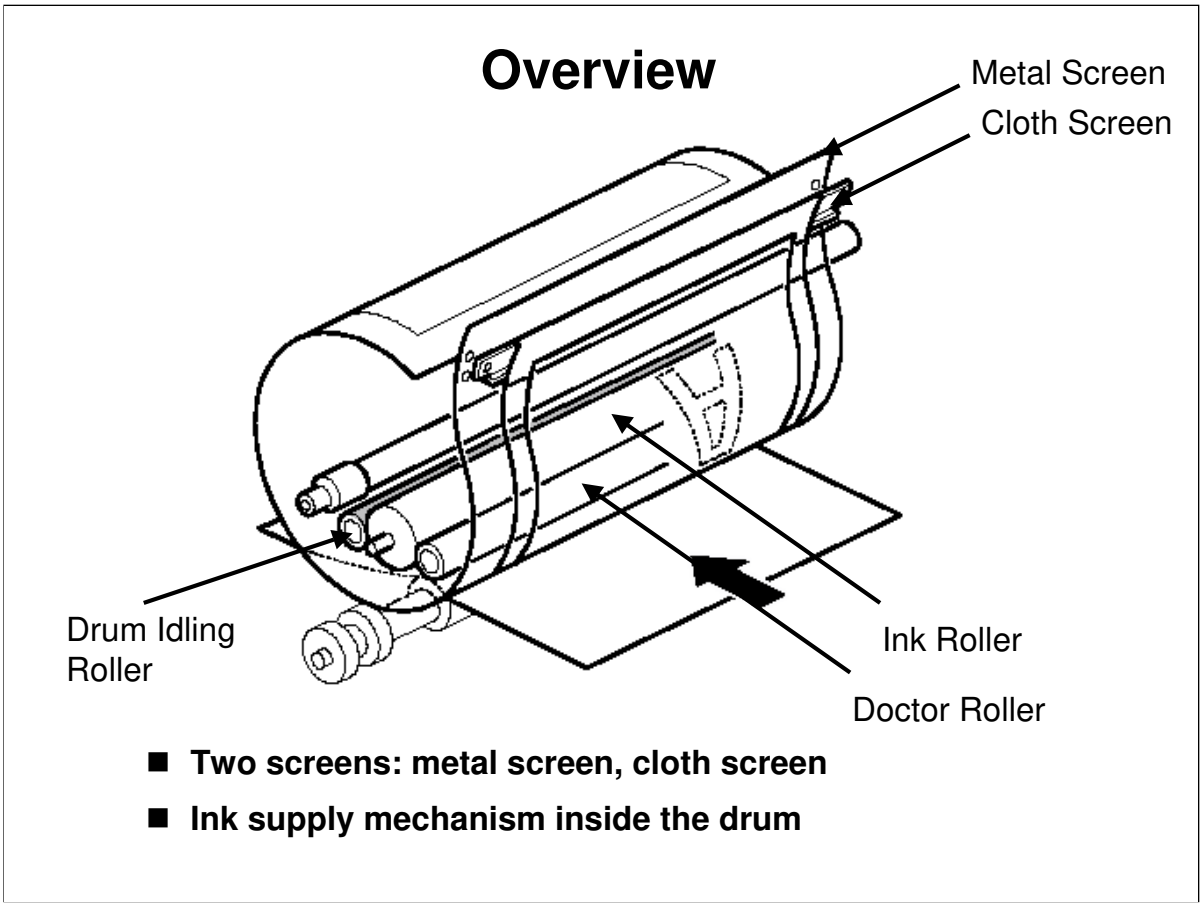
HP4-R2 TRAINING

DUPLICATOR ENGINE

DRUM

❒ This section describes the drum, including ink supply.

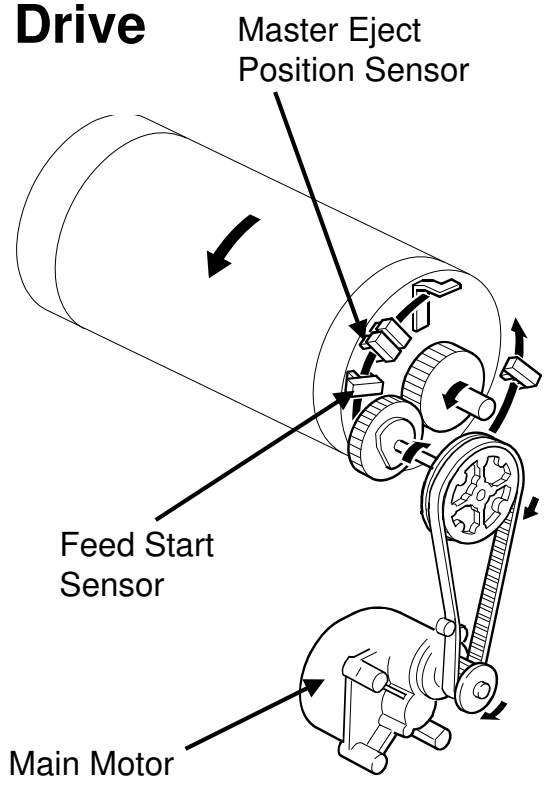


Service Manual, section 6.6.1

❒ Go over the basic points in the manual.

Drum Drive

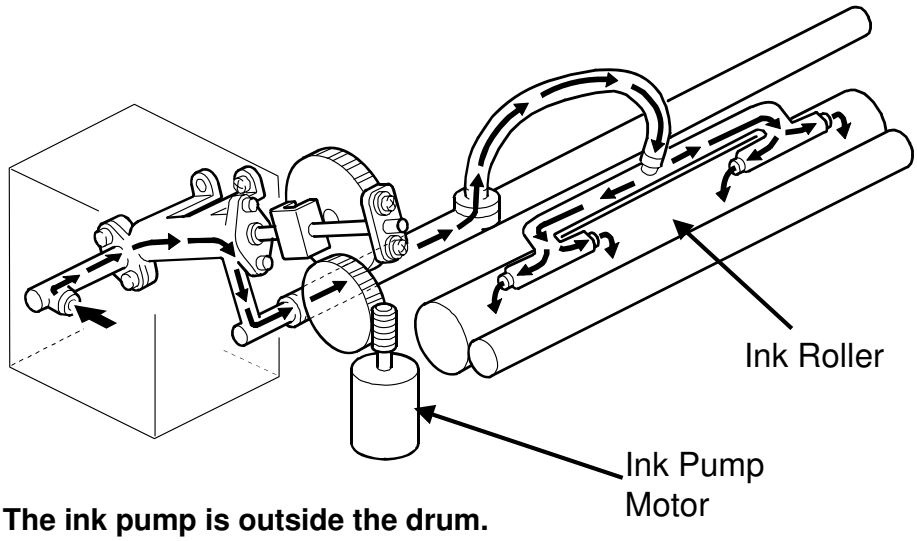
- **Driven by the main motor**
  - Only turns clockwise
- **Two stopping positions: master eject position, master feed position**
  - Master eject position: Detected using the main motor encoder and the master eject position sensor
  - Master feed position: Detected using the feed start timing sensor & main motor encoder



Service Manual, section 6.6.2

- ❒ The drum only turns clockwise.
- ❒ Main motor speed and drum stop positions are monitored by the encoder on the motor.
- ❒ Paper exit timing sensor, 2nd feed timing sensor: These tell the cpu when to check for paper jams

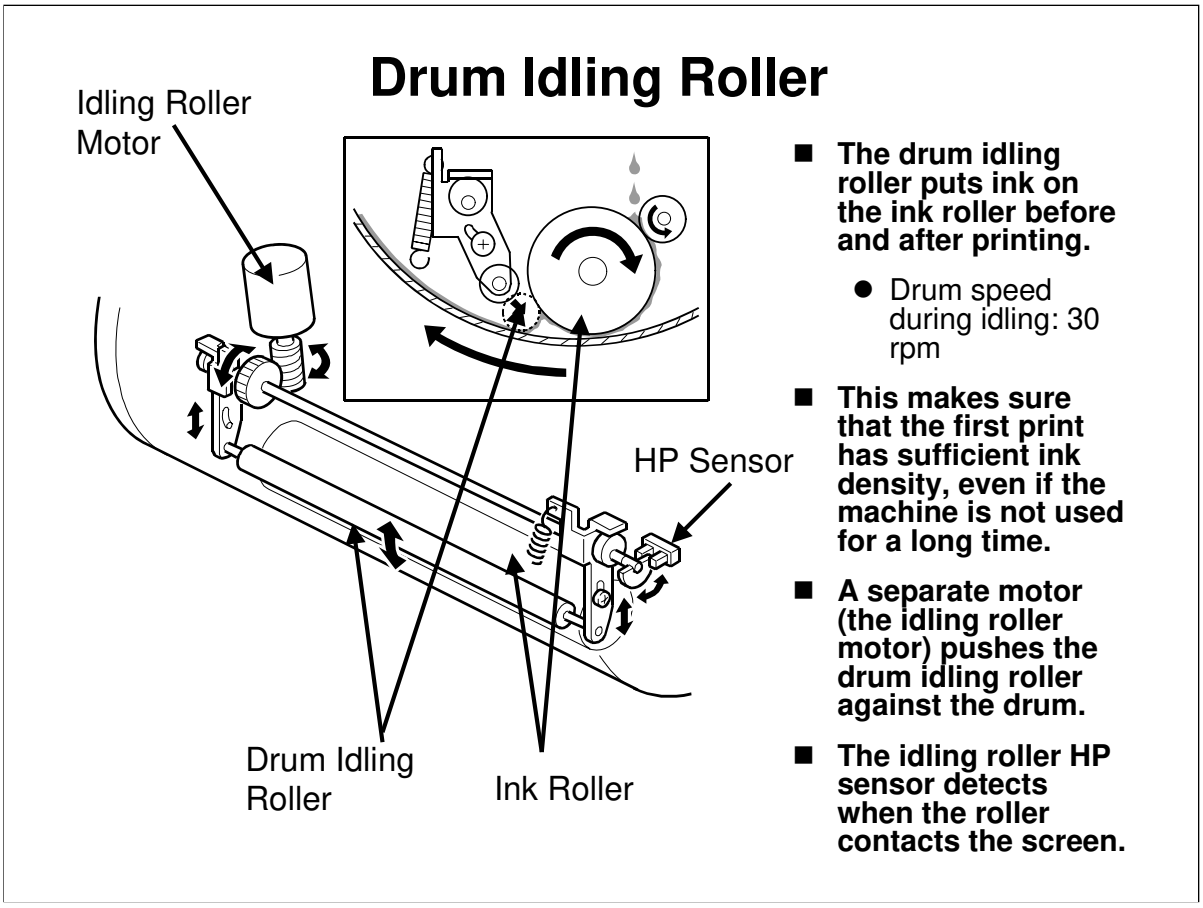
Ink Supply



- **The ink pump is outside the drum.**
- **The ink pump motor drives the gears and piston that pumps the ink.**
- **Ink comes out onto the ink roller through 4 openings in the ink distributor.**

Service Manual, section 6.6.3

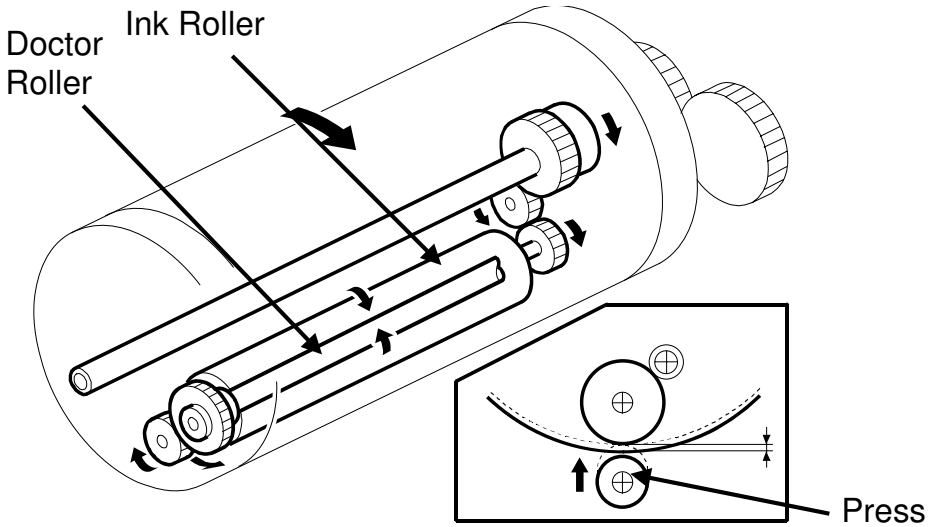
❒ Describe this briefly.



Service Manual, section 6.6.5

❒ The number of rotations made during idling depends on the temperature, and on how long the machine has been unused.
  ➢ See the table in the service manual.

Ink Roller

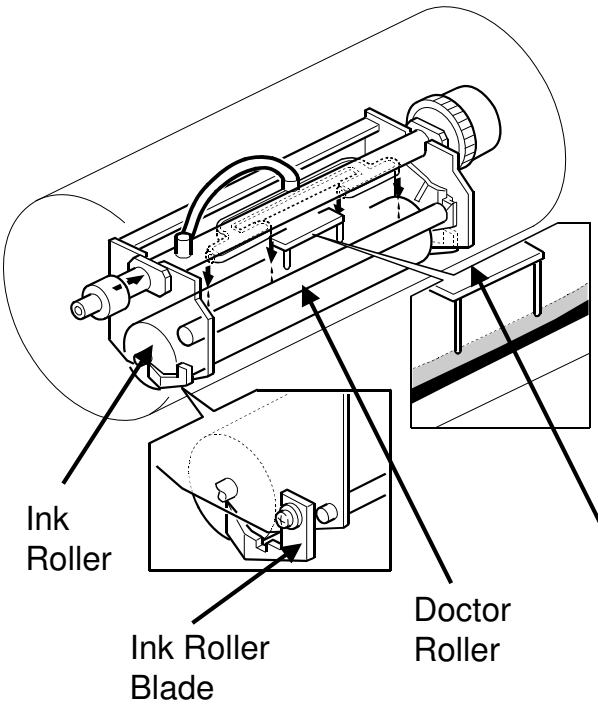


- **Doctor roller: Ensures even ink thickness on the ink roller.**
- **Ink roller drive gear: Prevents the ink roller from being reversed manually.**
- **Press roller: Presses the master against drum screen & ink roller.**
- **Ink goes through the holes in the drum and master to the paper.**

Service Manual, section 6.6.4

- ❒ Describe the mechanism. The main points are on the slide.
- ❒ The ink roller only touches the screens when the press roller moves up to press the paper against the drum. It does not touch the screens when the machine is not printing.
- ❒ The drum never reverses, but the user may reverse it by hand. The ink roller drive gear (one-way gear) prevents the ink roller from turning in reverse at that time. If the ink roller reverses, ink will spill out from between the ink and doctor rollers, and make a mess inside the drum.

Ink Supply Control



- **The ink detection pins detect the ink level.**
- **If the level is low, the ink supply motor turns on.**
- **If the level stays low for 30 seconds, the machine detects ink end.**
- **The ink roller blade removes ink at the edges of the roller.**
- **To supply ink to a new drum:**
  - Press the “Economy Mode” key while holding down ‘0’.

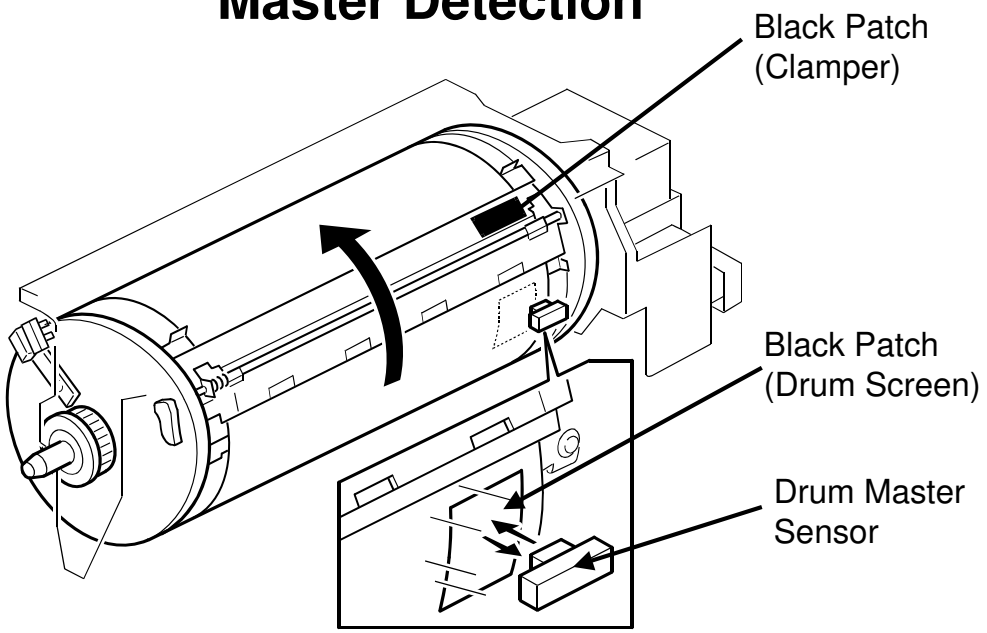
Service Manual, section 6.6.7

❒ Describe the mechanism. The main points are on the slide.

❒ Note the ink supply mode, which is useful when installing a new drum.

➢ This turns the drum for 60 seconds, to supply ink to the new drum to prepare it for printing.

Master Detection



- **Black patch on the drum: If a master covers this black patch, the machine detects that there is a master on the drum. If no master is detected, the master eject process is skipped.**
- **Black patch on the clamper: If a master covers this black patch, there was an error during cutting, and the master is double-wrapped around the drum.**

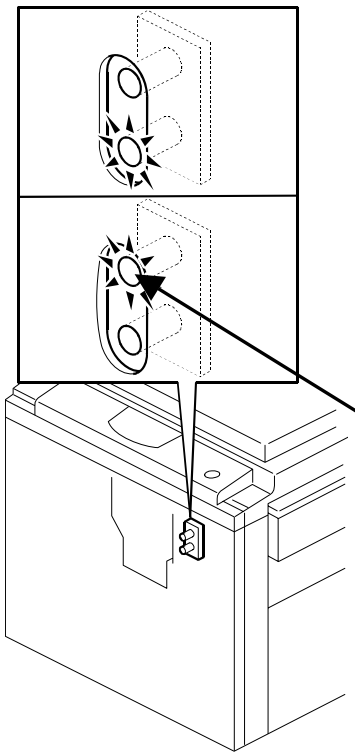
Service Manual, section 6.5.10

❒ Describe this briefly. The main points are on the slide.

❒ If the drum master sensor detects the black patch on the drum, the machine detects that there is no master on the drum. In this case, the master eject process is skipped.

❒ If the drum master sensor detects the black patch on the clamper, the machine detects that the master was not cut correctly and is double-wrapped around the drum. The machine tries to cut again. If it fails, a jam condition occurs.

Drum Home Position Detection



- **The drum home position sensor detects when the drum is at home position.**
- **Then, the green LED lights.**
- **This green light tells the user that the drum can be removed.**
- **If the red light is lit, the drum cannot be removed.**

Service Manual, section 6.6.8

Service Remarks

- **Make sure that the main motor pulley is put back in the correct position.**
- **Do not adjust the doctor roller gap.**
- **Make sure the drum master clamper springs are put back properly.**
- **Do not get ink on the inner surface of the clamping plate.**
- **Clean the clamping plate with a soft cloth and water only.**
- **Do not disassemble the ink roller unit.**
- **Adjust the plunger position after replacing the ink pump.**

Replacement

- **Do the procedures in section 3.8 of the service manual.**
  - Drum cloth screen
  - Drum master clamper
  - Drum metal screen
  - Ink roller unit
  - Idling roller motor
- **Before you start these procedures:**
  - Remove the ink around the ink roller. To do this, set SP2-10 (ink detection) to OFF, and feed paper until ink ends.
- **After finishing the required procedures in this section:**
  - Do not forget to return SP2-10 to the default (ink detection on).

Service Manual, section 3.8

❒ Have the class remove and replace the parts on the slide.

Drum Screens/Drum Master Clamper

❒ It is best not to put the drum upside down. However, it is more convenient for removing the screens. But ink must be removed first.

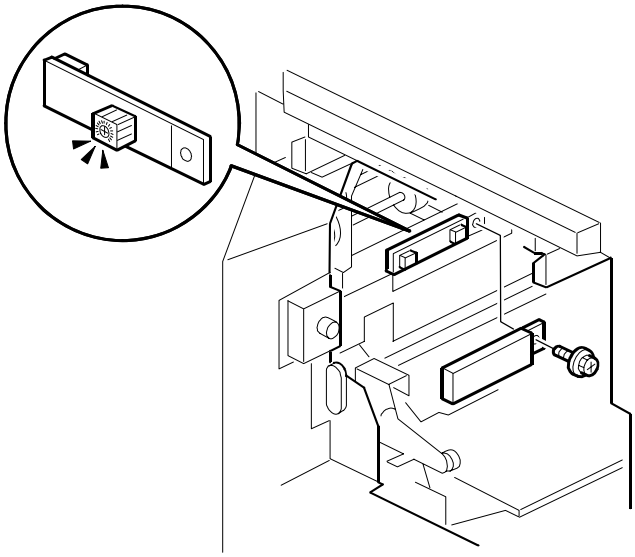
❒ Use SP 2-10 and feed paper until there is no more ink.

❒ Don't forget to enable ink detection again afterwards.

Ink Roller Unit

❒ Do not disassemble this unit.

Drum Master Sensor



- **A VR was added for this sensor. Do not use it in the field. It is for factory use only.**

Adjustment

- Ink pump (plunger position)
- Ink detection
- Main motor pulley position
- Main drive timing belt tension

Service Manual, section 3.8

- ❒ Have the class try the adjustments on the slide.

Doctor Roller Gap

- ❒ There is a procedure in the manual. However, do not try it in the field.

Ink Pump Plunger Position

- ❒ Do this after replacing the ink pump.

Ink Detection

- ❒ The ink must be removed from the ink roller with SP 2-10, as explained on the previous slide.
- ❒ The adjustment value is not kept in the RAM, so putting the old RAM on the new board will not restore the old setting.

Main Motor Pulley Position

- ❒ This must be adjusted whenever the pulley is removed.

Main Motor Timing Belt Tension

- ❒ This must be adjusted whenever the timing belt is removed.

SP Modes

- **SP 2-28, 2-29, 2-38: Idling <u>after printing</u>**
  - Ensures that the first print has sufficient ink density if the machine was not used for a long time.
  - Also, when the customer continuously prints small numbers (1 to 3 prints), ink leaks occur from the trailing edge of the drum.
  - For details on how these three SPs work together, see section 5.3.4
- **SP 2-36: Idling <u>after master making</u>**
  - Ensures that the first print has sufficient ink density if the machine was not used for a long time.
  - For details on this SP, see section 5.3.9

❒ Note the timing of the idling for the SPs on this slide.
❒ During idling, the drum idling roller is pressed against the inner surface of the drum.

SP Modes

- **SP 2-34: Increases the image density of trial prints.**
  - This SP was added because trial print images are lighter than with other models.
  - For details on this SP, see section 5.3.7
- **SP 2-100: Wraps a blank master around the drum.**
  - Useful when you remove a drum and keep it out of the machine for a long time.
- **SP 6-40: Ink detection adjustment**
  - Do this if the machine does not detect a no ink condition correctly.
  - See section 5.7.2 for the correct operating procedure.

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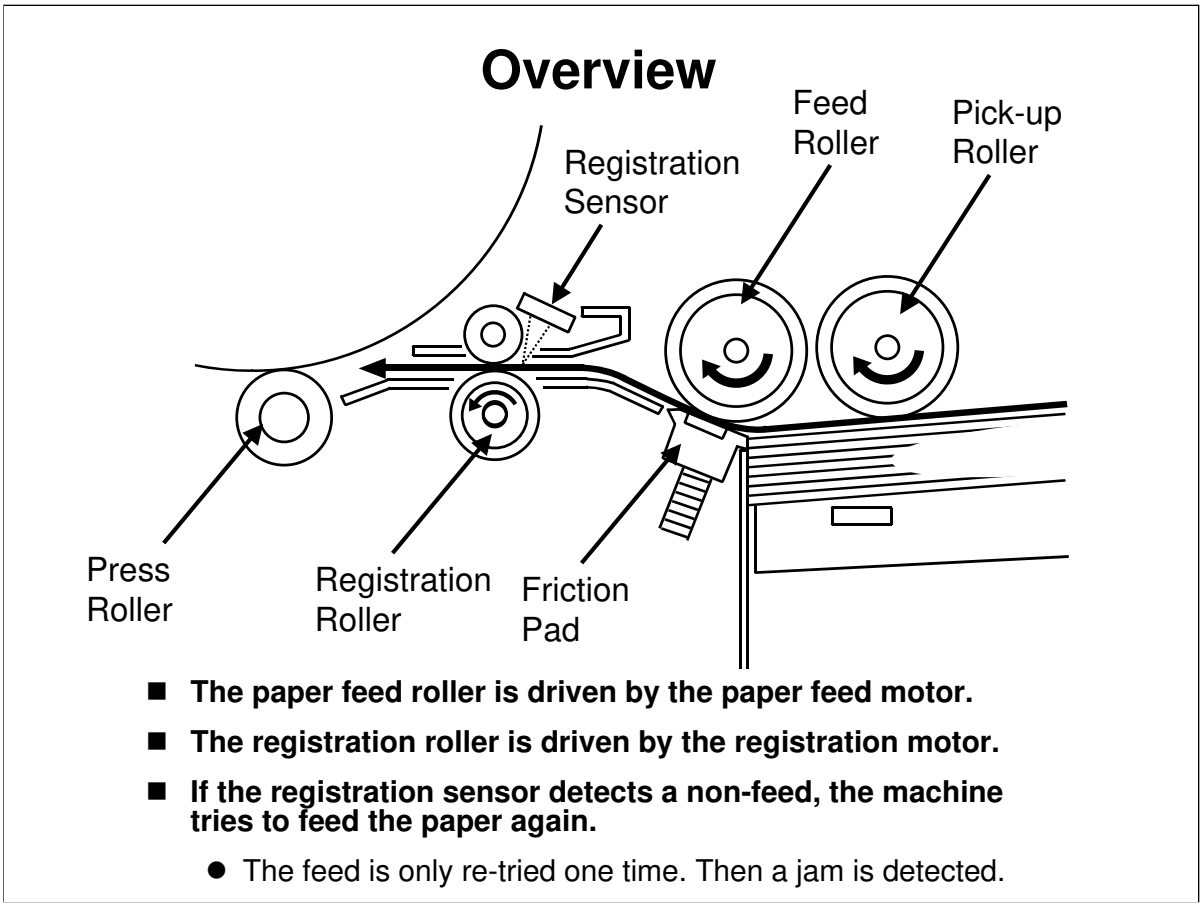
HP4-R2 TRAINING

DUPLICATOR ENGINE

PAPER FEED

❒ This section explains how paper is fed to the drum and how printing pressure is applied.



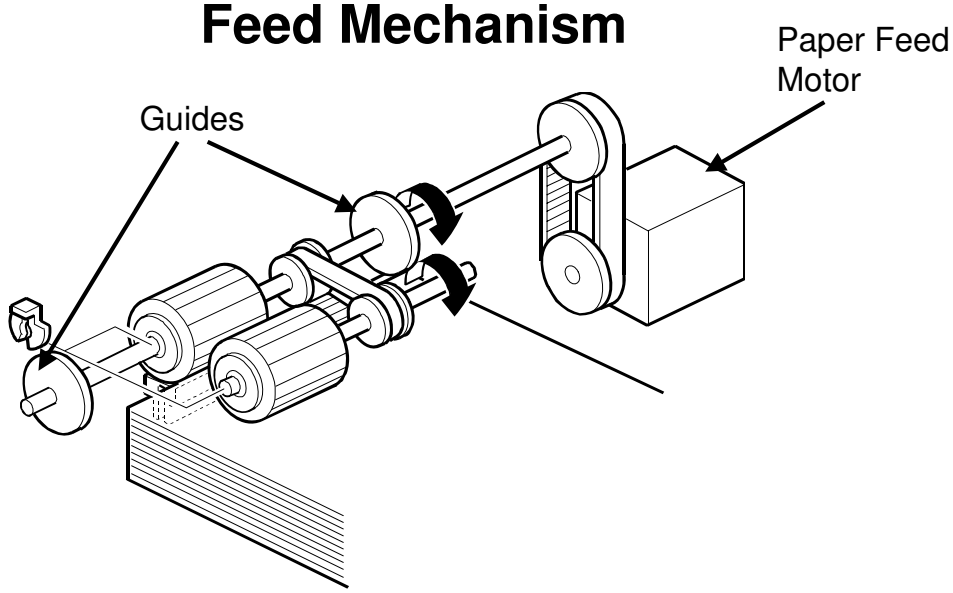
Service Manual, section 6.7.1

❒ The feed roller and friction pad only allow one sheet to pass into the machine.

❒ The registration roller feeds the paper to the drum. It synchronizes the leading edge of the paper with that of the master on the drum.

❒ If the registration sensor detects a non-feed, the machine tries again. However, if the machine detects a non-feed the second time, the jam indicator lights.

Feed Mechanism



- **The paper feed motor drives the pick-up and feed rollers.**
  - The motor turns on when the actuator on the drum turns on the feed start timing sensor.
- **The guides help to feed paper that is not perfectly flat.**

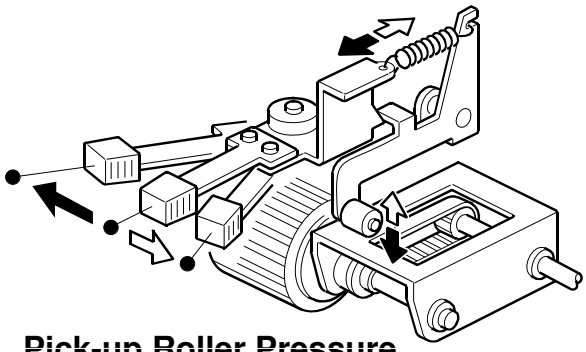
Service Manual, section 6.7.2

❒ Describe the mechanism. The main points are on the slide.

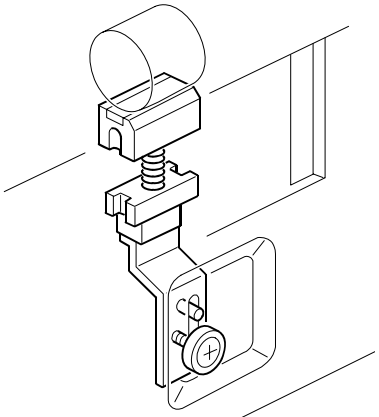
Re-feeding

- **If the registration sensor detects a non-feed, the machine tries again. However, if the machine detects a non-feed the second time, the jam indicator lights.**
- **This mechanism can cause registration errors of up to 5 mm. If the customer is not happy, you can disable re-feeding with SP 2-33.**

Feed & Separation Pressure



Pick-up Roller Pressure



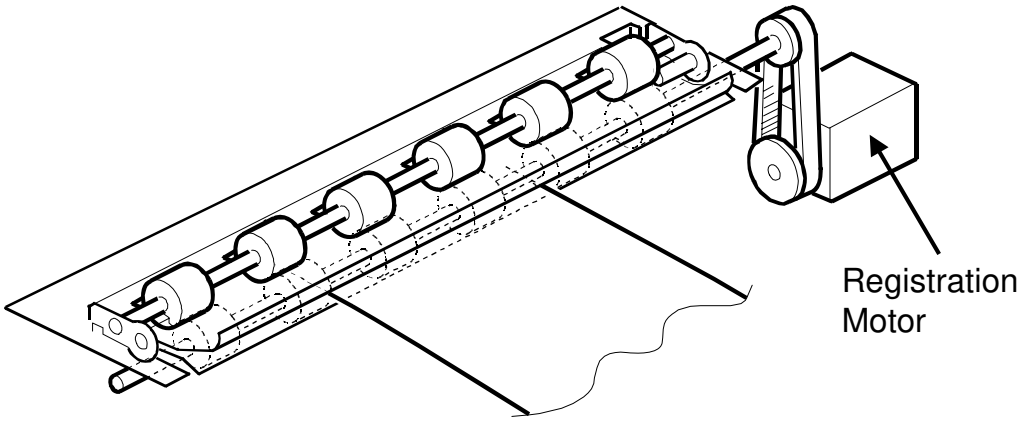
Separation Pressure

- **Pick-up roller pressure**
  - The user can adjust with the lever.
  - There are three positions (from left to right: thick paper, normal, thin paper)
- **Separation pressure**
  - Technician adjustment only

Service Manual, section 6.7.3

- ❒ Describe these adjustments. The main points are on the slide.
- ❒ If there are paper feed problems, adjust the pick-up roller pressure first. If that does not work, try the separation roller pressure.
- ❒ The default positions are:
  - ➢ Feed roller lever: Middle position
  - ➢ Friction pad screw: Lower position

Registration Roller Drive

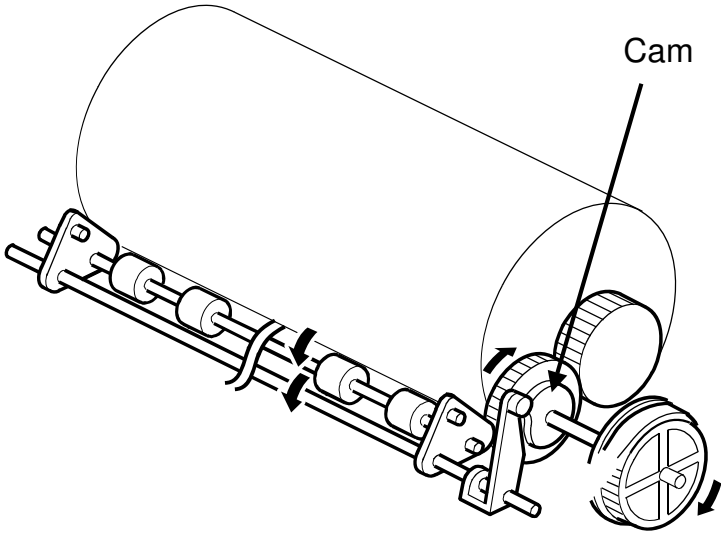


- **The registration motor drives the lower roller.**
  - The motor speed depends on the printing speed selected by the user.
  - The motor start timing depends on the image up/down shift position setting selected by the user.
  - The motor stops when the paper reaches the press roller.

Service Manual, section 6.7.4, Registration Roller Drive

❒ Describe this briefly. The main points are on the slide.

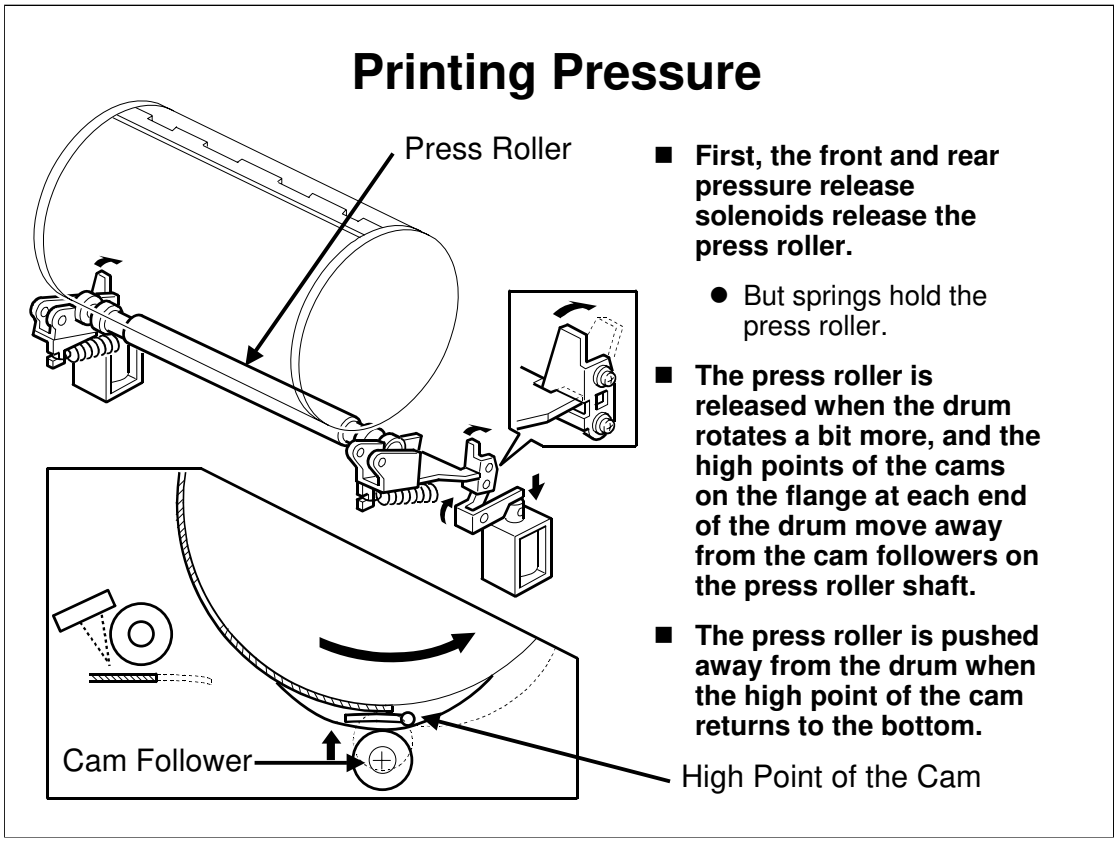
Registration Roller Up/Down



- **The cam on the drum drive gear lifts the upper registration roller when the paper is between the drum and press roller.**
- **This prevents the registration rollers from interfering with paper feed by the drum and press roller.**

Service Manual, section 6.7.4, Registration Roller Up/Down

❒ Describe this briefly. The main points are on the slide.

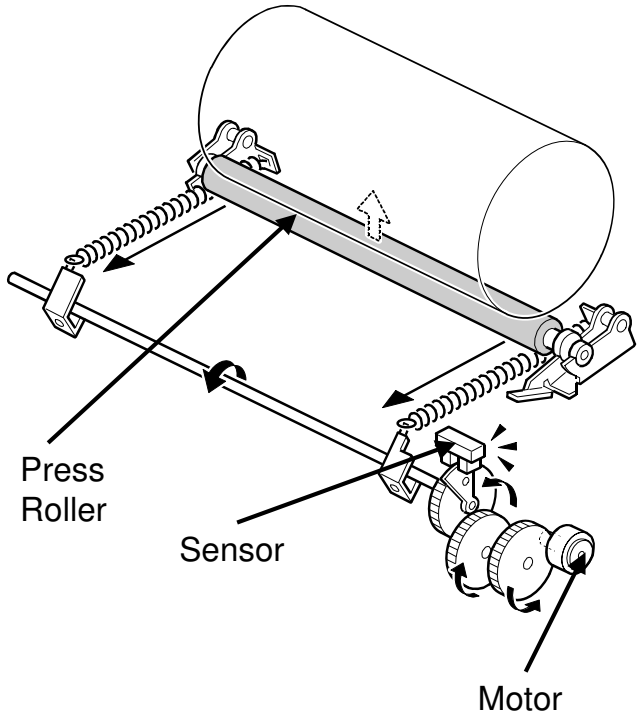


Describe the mechanism. The main points are as follows.

- ❒ When the machine is not printing:
  - ➢ The solenoids are off, and the press roller is locked in place away from the drum.
- ❒ When the first sheet is fed:
  - ➢ The solenoids turn on, but the roller is still locked in place due to some strong springs.
- ❒ When the clamper reaches the press roller position:
  - ➢ The cam follower is at the high point of the cam on the drum flange (there is one cam at the front and one at the rear of the drum)
  - ➢ The press roller is released from the stoppers when the cam follower comes off the high point of the cam.
  - ➢ The press roller must not contact the drum until the clamper has been rotated away from the bottom.
- ❒ When the clamper turns past the press roller position:
  - ➢ The press roller moves up into contact with the drum, as the high points of the cams on the drum flanges move away from the cam followers.
  - ➢ The press roller presses the paper against the drum.
  - ➢ The pres roller moves away from the drum (and the clamper) when the high point of the cam reaches the cam follower again.
- ❒ If the registration sensor fails to detect paper:
  - ➢ The solenoids do not turn on.

For more details, see the file 'Printing Pressure Mechanism.pdf', that is supplied with this course. This is part of the Silver service manual.

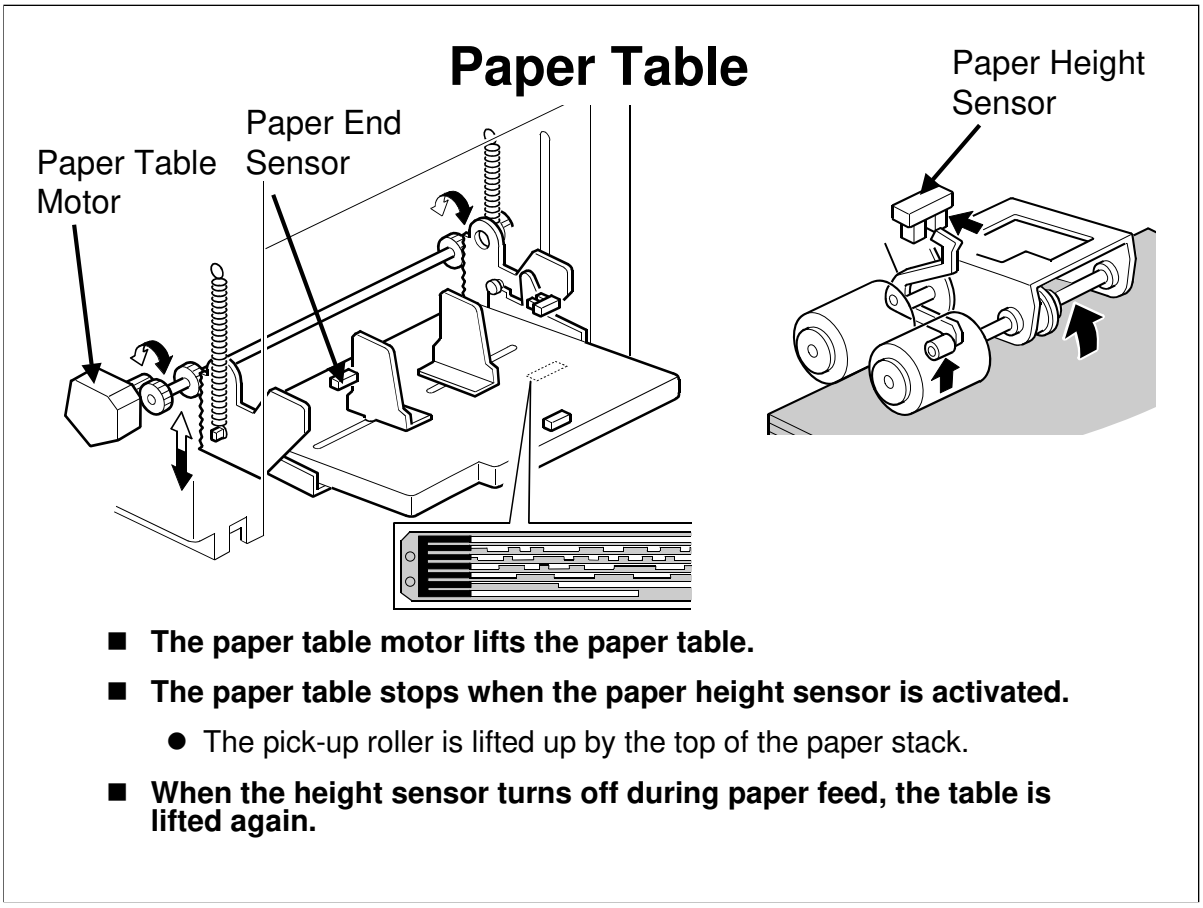
Adjustable Printing Pressure



- **The printing pressure motor automatically adjusts the printing pressure.**
  - The adjustment depends on the temperature and the selected printing speed.
  - The pressure is applied through two springs.
- **The printing pressure sensor detects the amount of pressure that is applied.**
  - There are 5 levels.

Service Manual, section 6.7.5

- ❒ For details of the amount of pressure applied for each condition, see the service manual.
- ❒ SP 2-35 adjusts the printing pressure for all conditions at the same time.
- ❒ SP 6-70 to 6-87 can be used to fine-tune the pressure for each condition.



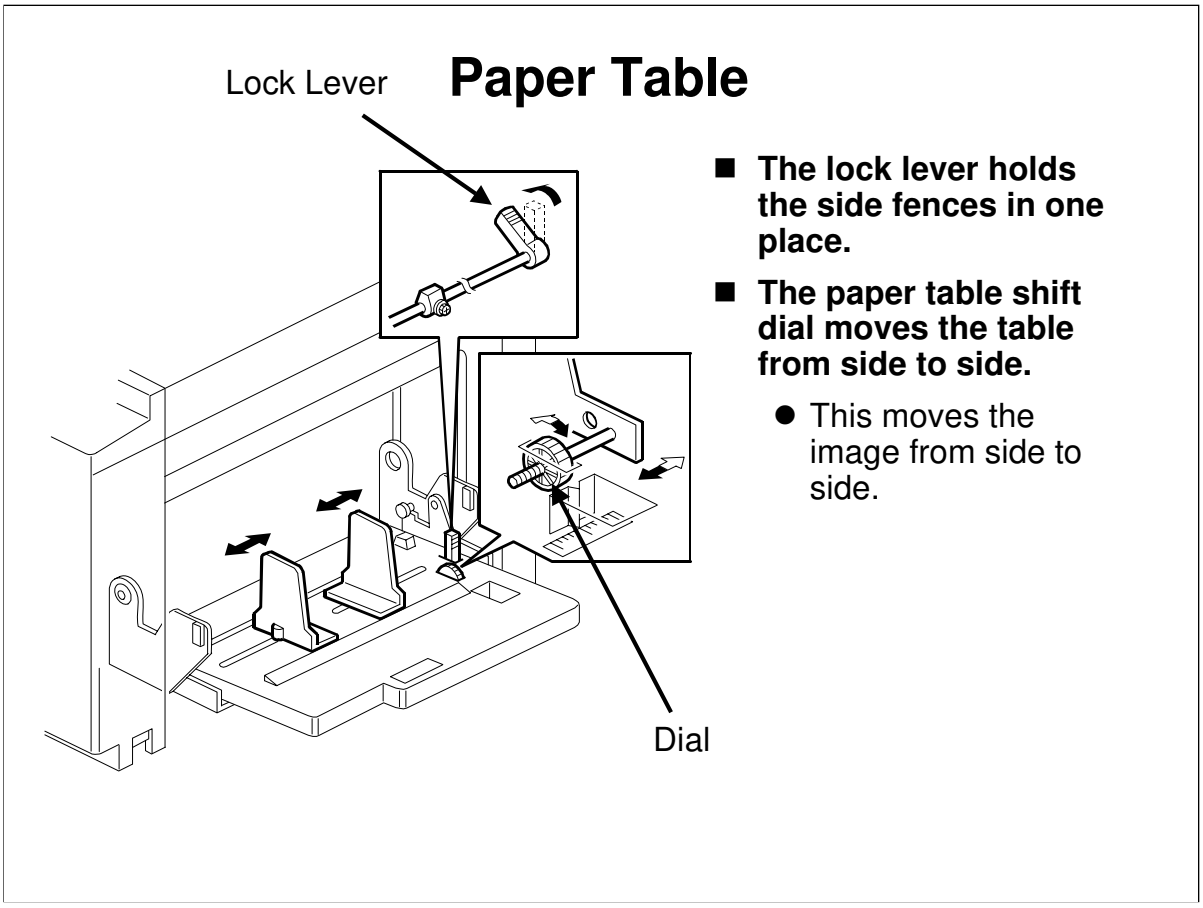
Service Manual, section 6.7.7, Table lifting/lowering

Lifting and Lowering

- ❒ Describe how the paper table motor and paper height sensor keep the top of the stack at the correct height for paper feed.
- ❒ The table lower limit sensor detects when the table has reached its lowest position.

Paper End

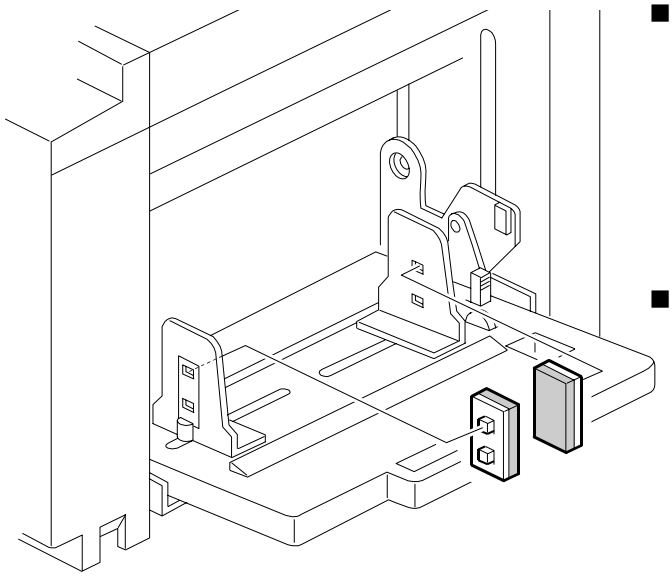
- ❒ Point out the paper end sensor, under the paper table.



Service Manual, section 6.7.7, Table side fences and side-to-side shift

- ❒ Describe the side fences and the lock lever.
- ❒ Describe the side-to-side shift mechanism (paper table shift dial).

Paper Table



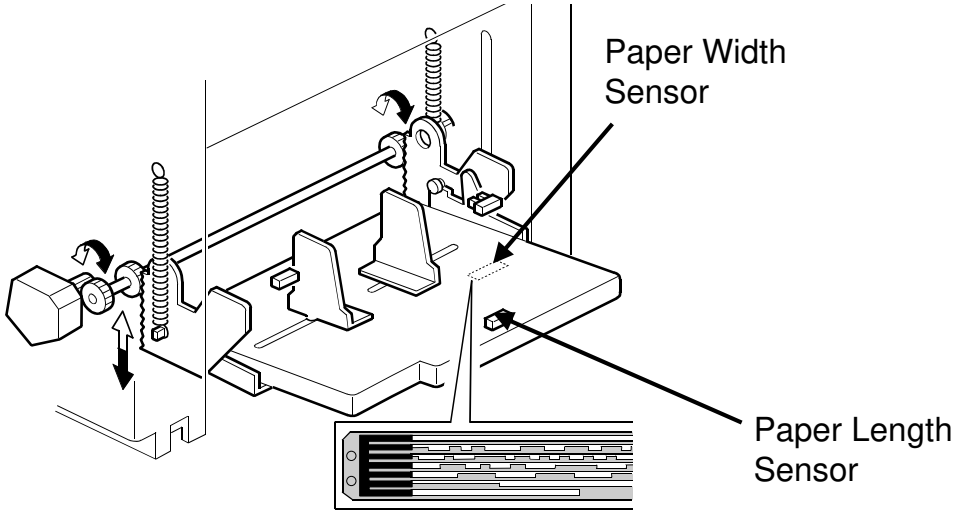
- **These friction pads are special service parts for customers who have problems with multiple feeds.**
  - Can be useful for thin paper
- **These pads are not included in the accessories.**

❒ Describe this briefly.

❒ It is normally used only for very thin paper. For normal types of paper, adjusting the feed and separation pressures should solve most feed problems. However, if the user is having problems with thin paper, ask them to install these pads.

❒ In the Silver and Pink Gold, these were accessories. In the HP4 and HP4 V2, they are special service parts only.

Paper Table



- **The width and length sensors detect the paper size.**

Service Manual, section 6.7.7, Table lifting/lowering

Service Remarks

- **Make sure that the friction pad base is put in the correct way around.**
- **Make sure that the paper feed and separation rollers are installed the correct way around.**
- **Do not touch the surfaces of the rollers with bare hands.**
- **After replacing the registration roller, do the registration roller clearance adjustment.**

SP Modes

- **2-95: Paper table standby position**
  - If set to 'high', the paper table takes less time to go up from the standby position to the printing position.
- **6-20: Adjusts the amount of buckle at the registration roller, to correct skew during paper feed**
  - Normally not used. For details, see section 5.7.6
- **6-21: Adjusts the amount of registration (applied for all speeds)**
- **6-100 to 6-107: Fine-tunes the amount of registration, for each speed**
  - For the correct operating procedure, see section 5.7.9

Replacement

- **Do the procedures in sections 3.6 and 3.7 of the service manual.**
  - Paper feed roller
  - Pick-up roller
  - Friction pad
  - Paper width detection board
  - Press roller

Service Manual, sections 3.6 and 3.7

❒ Have the class remove and replace the parts on the slide.

Rollers and Friction Pad

❒ Make sure to install these parts the correct way around.

Press Roller

❒ Be careful not to get hurt by the sudden upward movement of the press roller when the arm is disengaged.

Adjustment

- **Separation pressure**
  - Feed pressure: See the Operation section
- **Press roller lock lever**
- **Printing pressure**
  - This is a mechanical adjustment for the basic printing pressure.
  - The machine automatically adjusts this basic printing pressure for drum temperature and printing speed.
  - There are also SPs to adjust the pressure if print density is not correct.
    - SP 6-70 to 6-87: Adjusts the printing pressure for each set of conditions individually
    - SP 2-35: Adjusts the printing pressure by the same amount for all conditions

Service Manual, sections 3.6 and 3.7

- ❒ Have the class do the adjustments on the slide.

Feed and Separation Pressure

- ❒ These adjustments are commonly used for products using the friction pad separation method.
- ❒ They look very easy, but it is not easy to get them right. They are delicate adjustments, and they both affect each other. Because of this, it is not easy to get good results. So please stress to the class that they should not touch them normally.
- ❒ However, the following explanation gives a broad outline of how to adjust them if it becomes necessary.
  - ➢ General Comment: Basically, adjust the feed pressure first. If that does not work, try the separation pressure.

Feed Pressure (user adjustment)

- ❒ For non-feed problems, increase the feed pressure.
- ❒ For multi-feed problems, decrease the feed pressure.

Separation Pressure (technician adjustment)

- ❒ For non-feed problems, decrease the separation pressure.
- ❒ For multi-feed problems, increase the separation pressure.

Press Roller Lock Lever

- ❒ Adjust this if the press roller is not contacting the drum properly, leading to insufficient transfer of ink, even though there is ink in the cartridge.
- ❒ This adjustment is needed when the lock levers at front and rear cannot be released by the solenoids at the same time.

Printing Pressure Adjustment

- ❒ The purpose of this is to improve the image density especially in solid fill areas.
- ❒ The procedure in section 3.7.3 is the basic adjustment for the mechanism. In addition, if there are image density problems, you can adjust printing pressure with

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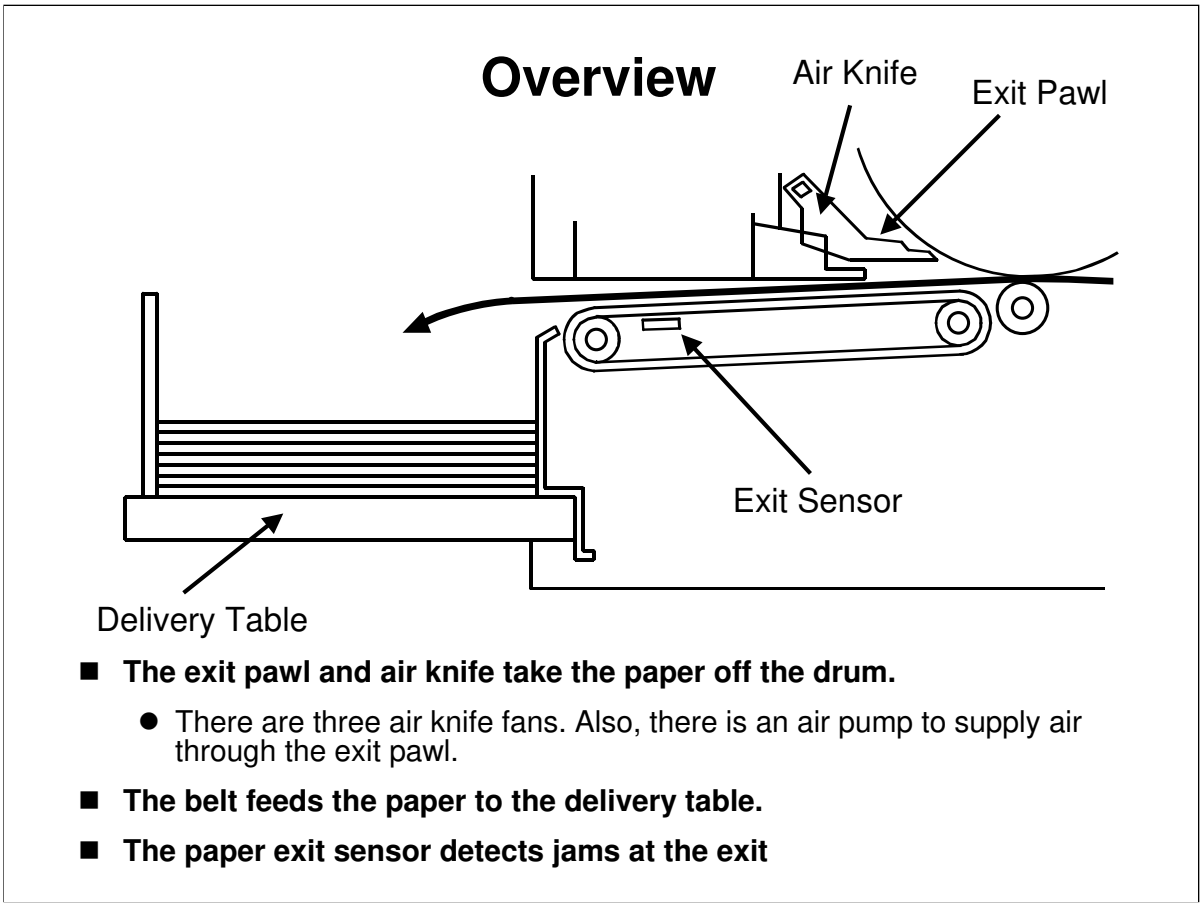
HP4-R2 TRAINING

DUPLICATOR ENGINE

PAPER DELIVERY

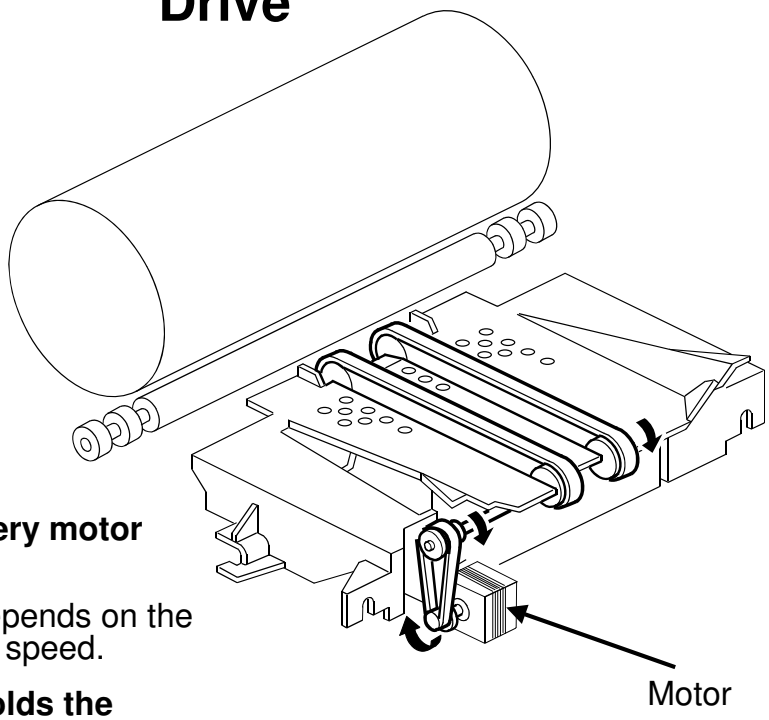
❒ This section explains how paper is fed out of the machine to the delivery table.



Service Manual, section 6.8.1

❒ Describe this briefly. The main points are on the slide.

Drive

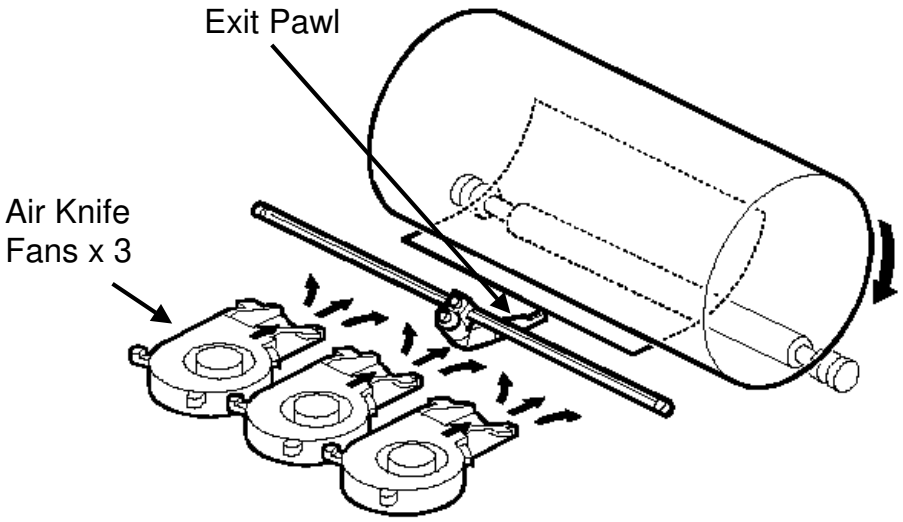


- **The paper delivery motor drives the belts.**
  - The speed depends on the selected print speed.
- **A suction fan holds the paper against the belts.**

Service Manual, section 6.8.2

❒ Describe this briefly. The main points are on the slide.

Air Knife

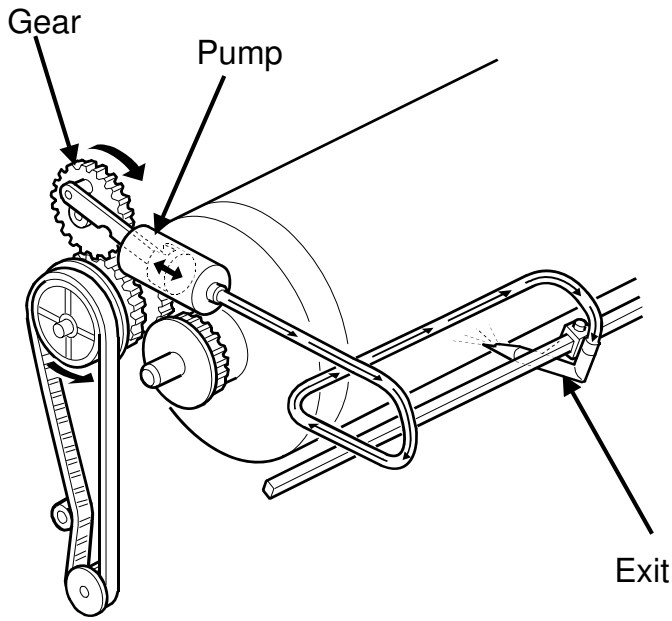


- **The exit pawl and the air knife remove the paper from the drum.**
- **The air is supplied continuously throughout the job.**
  - The fans start when the print start key is pressed or after the cutter cuts the master.

Service Manual, section 6.8.3

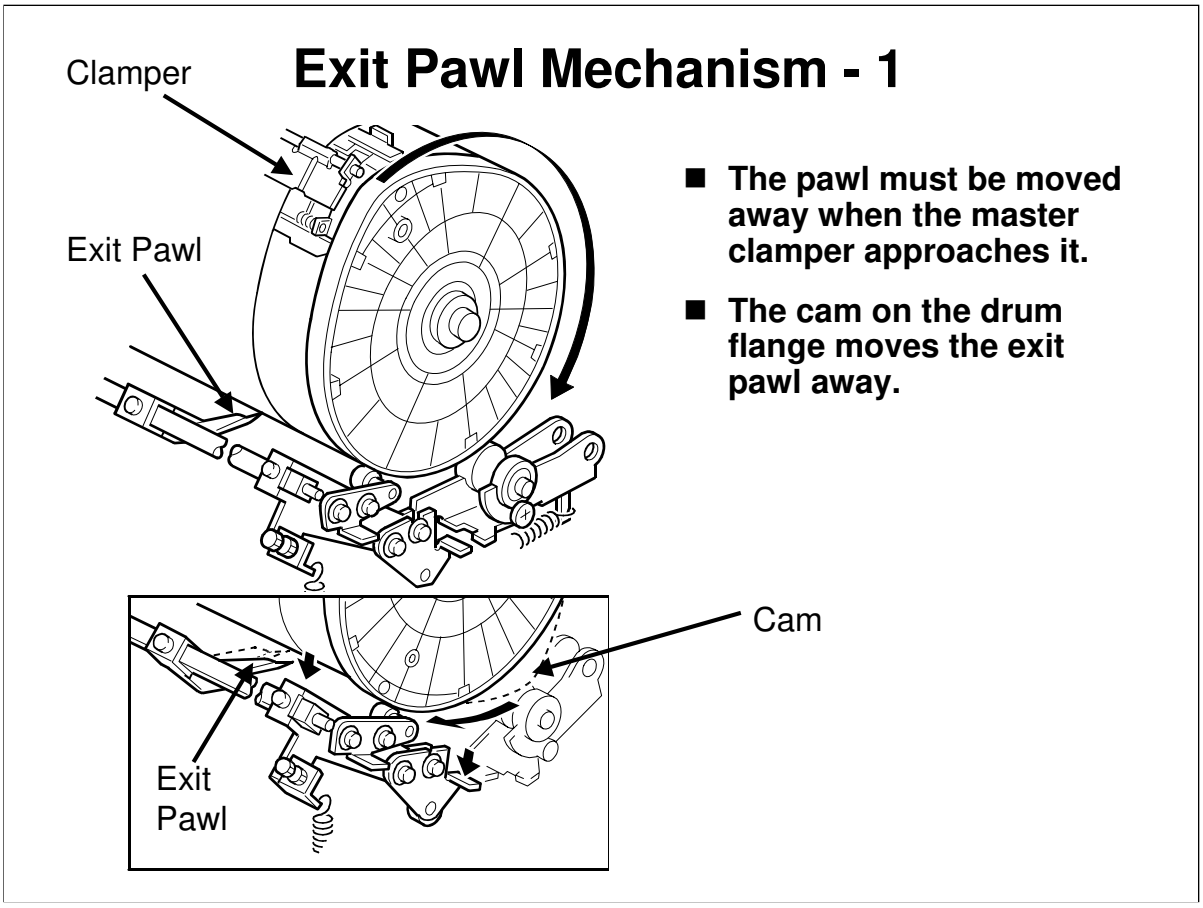
❒ Describe this briefly. The main points are on the slide.

Exit Pawl Air Pump



- **The main motor drives this pump through the pump gear.**
- **Air from the pump goes out through a nozzle in the exit pawl.**
- **This air helps to separate the paper from the drum.**

Service Manual, section 6.8.3

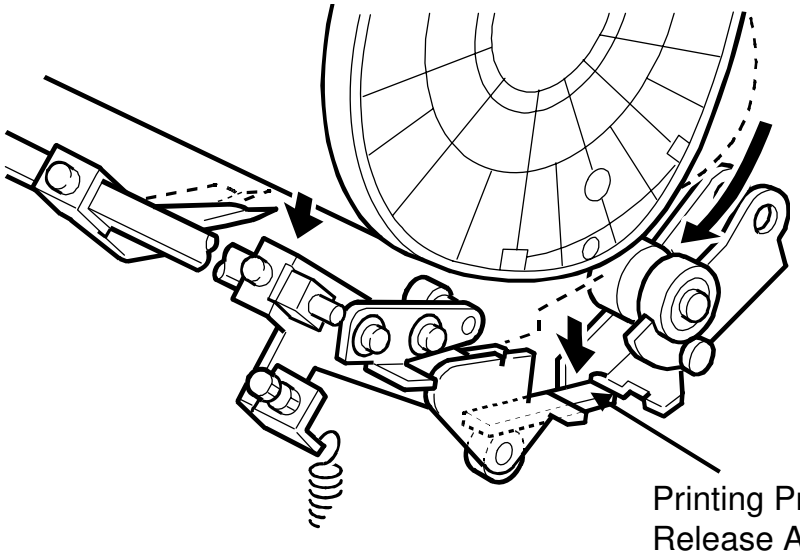


Service Manual, section 6.8.4

- When printing starts:
  - The pawl moves near the drum when the printing pressure is applied (the pawl shaft is moved by press roller lifting mechanism, discussed earlier).
- During printing:
  - The exit pawl is close to the drum to prevent paper wrapping jams.
  - The tension from the spring keeps the pawl up against the drum.
- However, when the clamper approaches, the pawl must be moved away. This is done as follows:
  - The exit pawl shaft has cam followers at each end. These ride on the drum flanges.
  - When the clamper approaches, the high point of the cam approaches the cam follower, and the exit pawl moves away from the drum.

Continued on the next slide

Exit Pawl Mechanism - 2



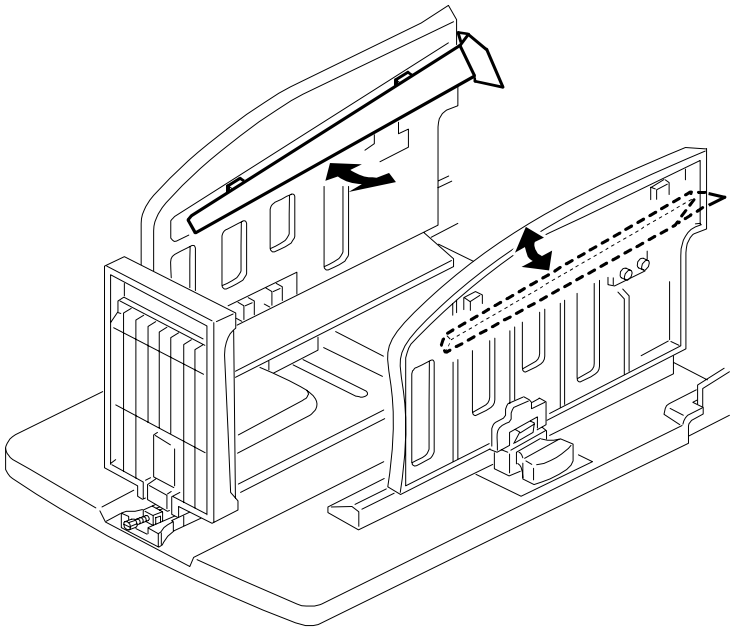
- **When the machine is not printing:**
  - The printing pressure release arm holds the pawl shaft down

Service Manual, section 6.8.4

When printing is finished:

- ❒ The printing pressure release arm holds the exit pawl shaft down, so the pawl stays down even though the high point of the cam has moved away.
- ❒ The drum flange also moves the press roller, as described in Paper Feed. Point out the press roller cam follower at this time.

Delivery Table – Alignment Wings

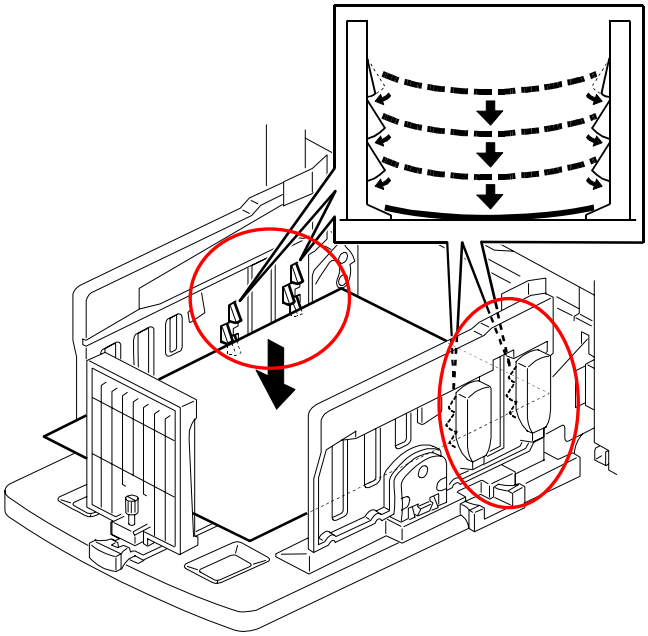


- **Change the angle by moving the guide manually.**
- **Helps to stack the paper more evenly on the table.**

Service Manual, section 6.8.5

- ❒ Describe this briefly. The main points are on the slide.
- ❒ Do not confuse these paper alignment wings (on the paper delivery table; must be adjusted manually) with the paper delivery wings (inside the machine; cannot be adjusted manually).
- ❒ There are no adjustment knobs.
- ❒ The operation manual gives the recommended settings for each paper type (we discussed this in the Operation section of the course).

Paper Delivery Table Plates



- **The tabs (called 'buffer fins') on the inner sides of the plates catch the edges of the paper.**
- **Because of this, the paper falls more slowly onto the delivery table.**
- **This reduces ink stains on the rear sides and stacks the pages more evenly.**
- **The user can move these plates to one of two positions, depending on the paper type.**
  - The operation manual has recommended settings for different paper types.

Service Manual, section 6.8.6

- These plates are called 'Chocks' in the operation manual.
- For the recommended settings, refer to Operating Instructions – Basics – Printing Preparations – Using the Paper Feed Tray and Delivery Table.
  - We studied this already in the Operation section of the course.

Replacement

- **Do the procedures in section 3.9 of the service manual.**
  - Paper delivery unit
  - Fan motor

Service Manual, section 3.9

❒ Have the class remove and replace the parts listed on the slide.

Adjustment

- **Exit pawl adjustment**
  - Clearance
  - Drive timing
- **Air pump alignment**

Service Manual, section 3.9

❒ Have the class try these adjustments.

Exit Pawl Adjustment

❒ The two parts of the exit pawl adjustment must be done in the order as shown on the slide.

❒ Do these adjustments if:

- There are paper wrap jams because the pawls are too far away
- If the pawls are damaging the drum, because they are too close
- If the pawls are being damaged by the master clamper

SP Modes

- **2-37: Paper delivery motor speed**

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HP4-R2 TRAINING

DUPLICATOR ENGINE

MAINTENANCE

PM

- **Two types of PM interval**
  - Based on time: 6 months is the basic interval
  - Based on print count: 1.2 M prints is the basic interval
- **There are no PM counters to reset.**

Service Manual, section 2

- ❒ Draw the attention of the class to the maintenance table.
- ❒ There are two types of PM interval, as shown on the slide.
- ❒ You might wish to have the trainees do a maintenance procedure on their machines

Operation Manual, Remarks, Maintaining the Machine

Maintenance by the User

- ❒ Note the items of user maintenance.
  - ➢ Exposure glass
  - ➢ Platen cover
  - ➢ Paper feed roller
  - ➢ ADF platen cover sheet

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HP4-R2 TRAINING

DUPLICATOR ENGINE

TROUBLESHOOTING

- ❒ This section goes over the troubleshooting tools built into the machine.
- ❒ In the field, technicians will have to think for themselves and draw on their own experiences. However, the procedures in the manual will give some ideas for where to start to look when a particular problem occurs.

Service Manual, section 4.1

Error Codes

- ❒ Make sure that the class is aware of this table.

Service Manual, section 4.2

Electrical Component Defects

- ❒ These tables contains symptoms that occur when an electrical component is defective.

Service Manual, section 4.3

Test Points/Dip Switches/LEDs

- ❒ Draw the attention of the class to these tables.
- ❒ Many of these have already been mentioned in the various adjustment procedures in previous sections.

Symptom Troubleshooting

Service Manual, section 4.4

- ❒ Make sure that the class knows about the contents of this section of the manual. This is based on experience with other models in this series.

Operation Manual, Troubleshooting

- ❒ Ask the class to look through this section of the operation manual.

Reset Procedures

- **SP 7-1: This resets all SP settings except for the following SP numbers.**
  - SP2-20: Destination settings
  - SP3-01: Present time
  - SP6-xx: Adjustments

SP Modes - Tests

- **2-11 to 2-15: Switches sensors on/off**
- **4-xx: Input tests**
- **5-xx: Output tests**
  - 6-50 to 6-53: Displays the output voltages from sensors. Used to adjust the sensors.
- **8-10: Test pattern printout**
- **8-19: ADF test**
- **8-20: Scanner free run**
- **8-21: Paper feed at 15 rpm (with paper)**
- **8-22: Paper feed at 15 rpm (without paper)**
- **8-30: Operation panel test**

❒ 8-21: 'rpm' is the number of revolutions per minute for the drum.

SP Modes - Counters

- **1-1: Total master counter**
- **1-20: Total print counter**
  - 7-3: Clears the total counters
- **1-50 to 1-61: Jam counters**
  - 7-4: Clear the jam and error counters

SP Modes - Others

- **1-72: Displays the machine serial number**
- **1-80: Displays the error code history (the last 40 error codes)**
- **1-81: Displays the service telephone number**

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HP4-R2 TRAINING

OPTIONAL DOCUMENT FEEDER

PURPOSE OF THIS SECTION

- ❒ The mechanisms in the optional document feeder will be described.
- ❒ This option does not have a reversing mechanism.
- ❒ The document feeder is the same as the one used with the Sapphire 2. If all the class members are familiar with this device, you can skip this part of the class.

Overview

- **Feeds originals past the DF exposure glass while scanning**
- **No inverter unit**

- The DF exposure glass is a narrow glass to the left of the exposure glass.
- The ADF does not use the main exposure glass, unless the user selects book mode and places the originals on the glass (in which case, the ADF mechanism isn't used - just the cover).

Specifications

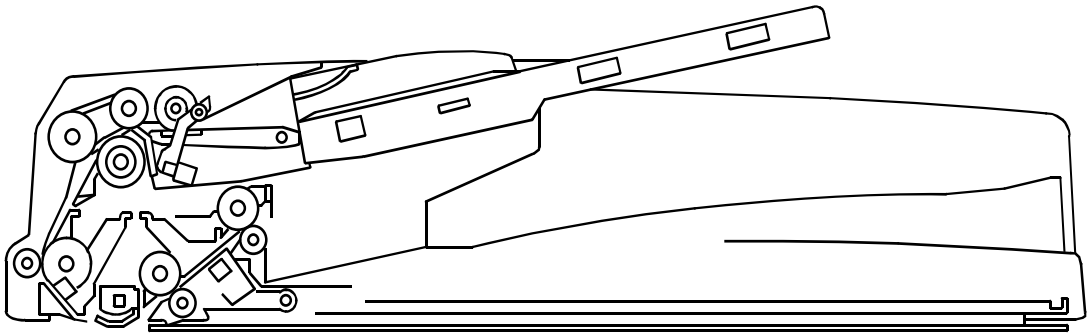
- **Table Capacity**
  - 50 sheets (80 g/m 2 , 20 lb)
- **Original Standard Position**
  - Centre
- **Separation**
  - FRR

SPECIFICATIONS

DF Service manual, page 1

- ❒ The table capacity is 50 sheets.
- ❒ The original standard position is at the centre.

Mechanical Component Layout

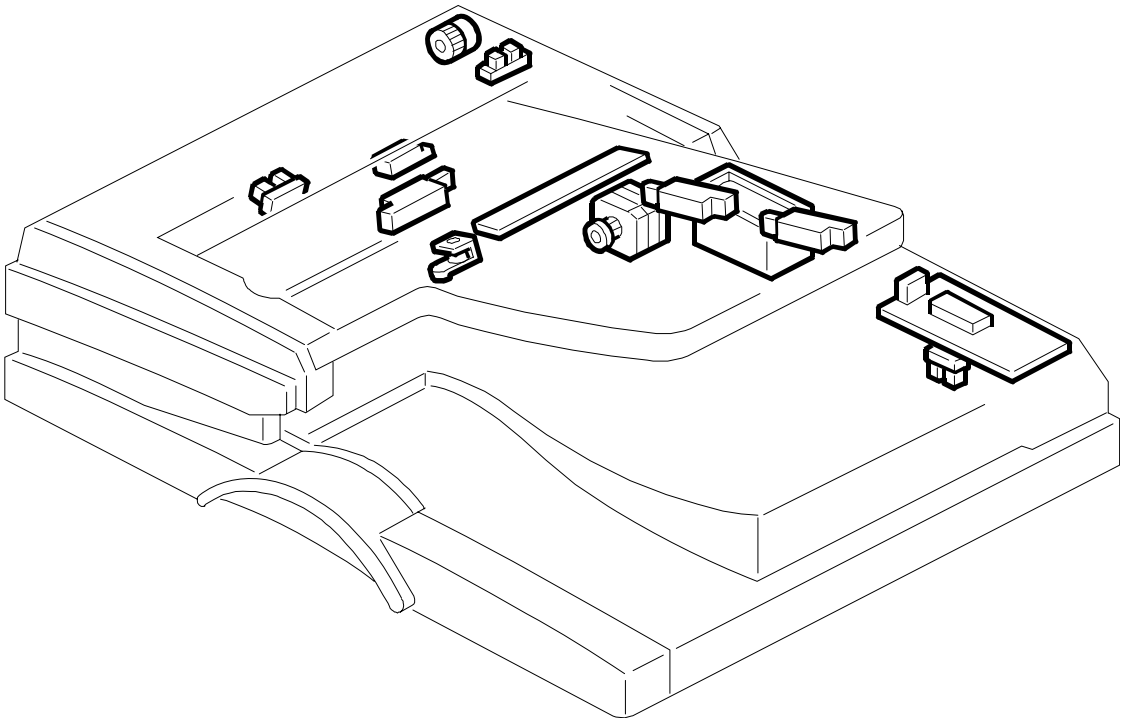


MECHANICAL COMPONENT LAYOUT

DF Service manual, page 2

- ❒ Point out the locations of the major components.
- ❒ The functions of the components can be dealt with in the detailed description sections.

Electrical Component Layout

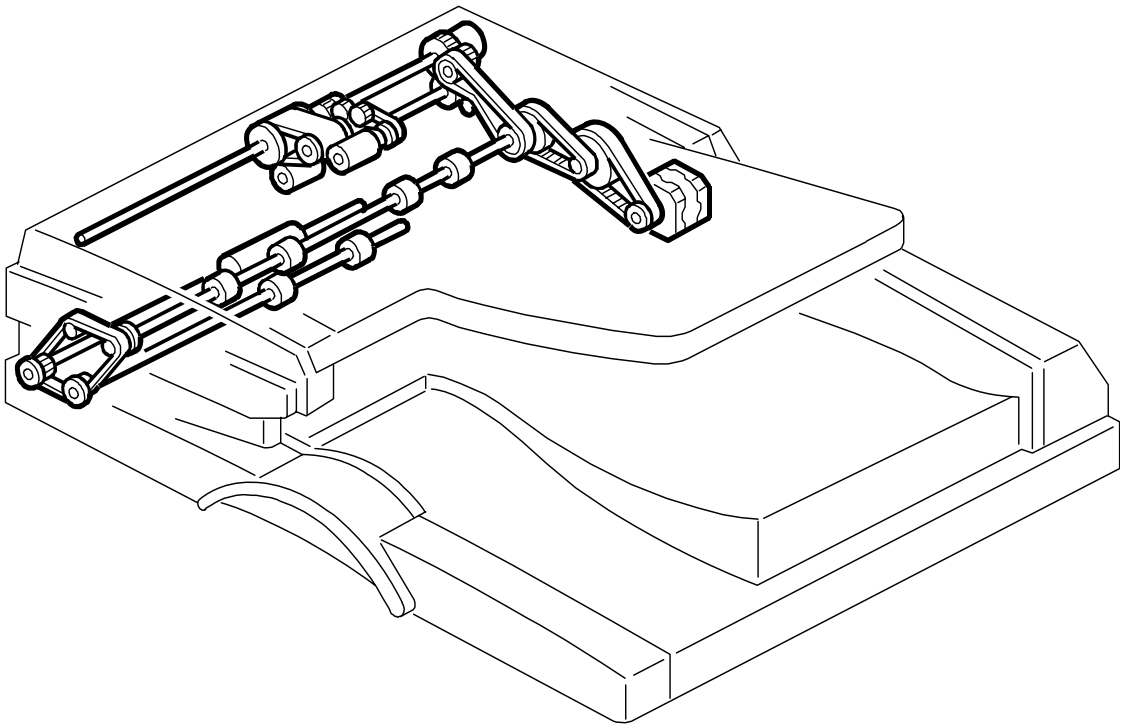


ELECTRICAL COMPONENT LAYOUT

DF Service manual, pages 3 and 4

- There is one new component, the trailing edge sensor.
  - During one-to-one copying, copy paper is fed to the registration roller in advance, to increase the copy speed. This new sensor monitors the stack of originals in the feeder, and detects when the trailing edge of the last page has been fed in. This stops the copier from feeding an unwanted extra sheet of copy paper.
- In addition, the original width sensor is slightly different from the sensors used in previous models.
  - It uses an electrode plate, with terminals attached to the document guides. The sensor output changes when the user slides the guides to match the document width. Of course, this means that the wrong width will be detected if the user doesn't position the guides correctly.
  - The DF open sensor only detects when the DF is opened. The platen cover sensor triggers the APS sensors.

Drive Layout

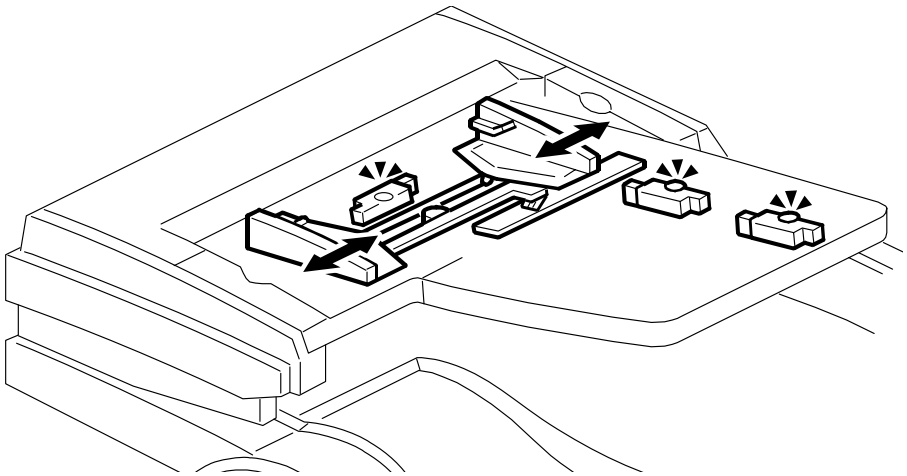


DRIVE LAYOUT

DF Service manual, page 5

- ❒ Point out the locations of the major components.
- ❒ The functions of the components can be dealt with in the detailed description sections.

Original Size Detection

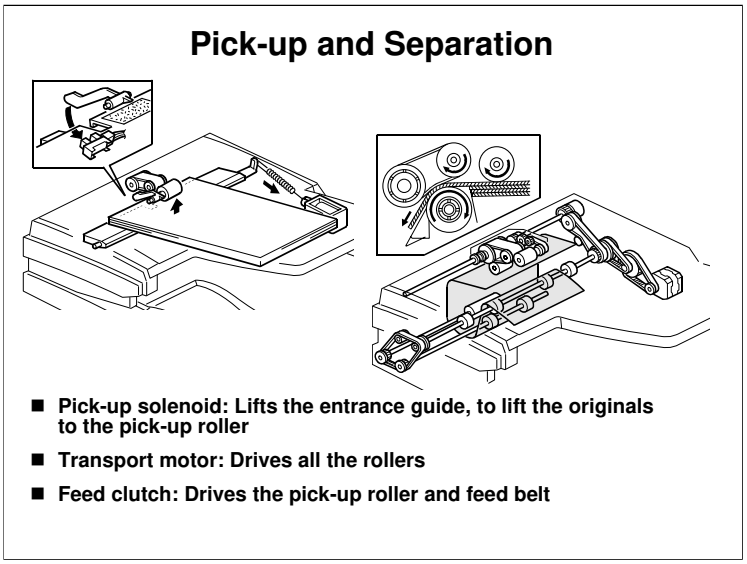


- **One width sensor, and two length sensors**
  - Width sensor: Output depends on the guide position
- **Trailing edge sensor: Detects the trailing edge of the final original, to stop the machine from feeding in unwanted copy paper**

ORIGINAL SIZE DETECTION

DF service manual, page 6

- ❒ The width sensor is a new type. There are four possible outputs.
- ❒ Make sure that the class understands the purpose of the trailing edge sensor.



PICK-UP AND SEPARATION

DF service manual, page 8

- ❒ The main points of this mechanism are on the slide.
- ❒ However, to understand it properly, look at the timing chart supplied as an appendix. The main points are as follows.
  - ➢ The transport motor has two speeds. It feeds the first original to the glass quickly, but is slower for scanning (the speed during scanning depends on the reproduction ratio).
  - ➢ The second original feeds in while the first one is still scanning – the pick-up solenoid controls the timing (unless the stamp is being used, when the clutch and solenoid both turn off/on).
  - ➢ The DF clutch stays on all the time, so it does not control original feed-in. However, if the stamp is being used, it turns off during scanning, and turns on to feed in the next page after the previous page has been stamped.
  - ➢ The original trailing edge sensor detects the trailing edge of the last original going in before the original set sensor does.

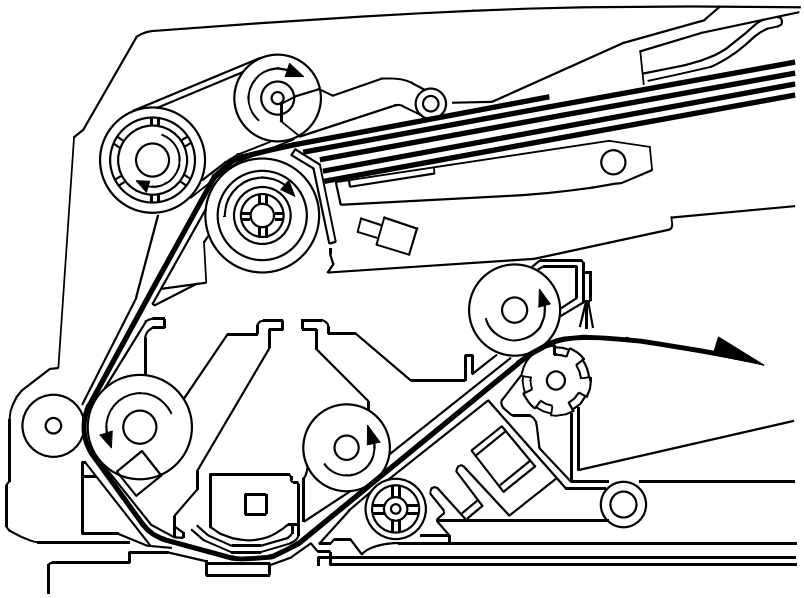
    The original set sensor already detects the presence of an original. Why not use that sensor? Why do we need an extra sensor?

    In this machine, the copier speeds up the copy rate by feeding copy paper into the machine in advance. The purpose of the original trailing edge sensor is to inform the copier that there are no more pages waiting to be scanned. The copier can then stop further sheets of copy paper from being fed in.

    Look at the component diagram. The original set sensor is near the scan line, to inform the CPU that an original has been placed firmly into the feeder and is ready to be scanned. This is too far into the machine to inform the CPU early enough to stop feeding the extra sheet of copy paper.

    The trailing edge sensor is much nearer the trailing edge of the stack, giving enough warning to the CPU when the last page of the original is on its way in.

Original Transport and Feed-out



- **Transport motor: Feeds the original through the scanner**
- **Motor speed depends on the reproduction ratio**

ORIGINAL TRANSPORT AND EXIT

DF service manual, page 9

- ❒ Show the path of paper through the ADF.
- ❒ Point out the DF exposure glass.
- ❒ Go over the points on the slide.
- ❒ The original stops at the registration sensor. However, there is no registration like in the paper feed path (the feed motor in the ADF has stopped, so there is no skew correction). The purpose of stopping here is for timing, so that the original can be fed in at the correct time to synchronize with the rest of the copy process.

Replacement

- Separation roller
- Pick-up roller
- Feed belt
- Original set sensor
- Original width, length, and trailing edge sensors
- Feed cover and DF open sensors
- Feed clutch, pick-up solenoid, and transport motor
- Registration sensor

REPLACEMENT

DF service manual, pages 11 to 17

❒ Have the class do the procedures on the slide.

Handout 1 – Ink Consumption

The number of copies per cartridge is obviously a more practical value.

Ink consumption is directly related to the following:

Printing speed (more ink is consumed at low speeds)
Temperature (more ink is consumed at high temperatures)
Image area (more ink is consumed with larger images)
Paper absorbency (more ink is consumed with more absorbent paper)
Copies per original (more ink is consumed if this is low)
Drum size (more ink is consumed for larger drums)

The number of copies per cartridge can be estimated using the following formula.

$$X = \frac{A \times Y}{B + (Y \times Z)}$$

X: Copies per cartridge

A: Amount of ink in the cartridge

Y: Average number of copies per original

Z: Ink consumed per copy

B: Ink consumed per ejected master

A: Amount of ink per cartridge

For the Silver, this is 600 g

Z: Ink consumed per copy

The following matrix shows ink consumption (gram) per square meter (m^2) for Model HP4-R2.

	A3 Drum		A4 Drum	
	Standard	Economy mode	Standard	Economy mode
	90cpm	90cpm	90cpm	90cpm
10°C 20% humidity	4.1	3.4	TBA	TBA
23°C 65% humidity	**4.1**	3.4	TBA	TBA
30°C, 90% humidity	4.0	3.2	TBA	TBA

Example

Z: Ink consumption per copy (A3 drum, A4 paper [Type 6200], 6% chart, printing speed:90 cpm, Standard mode)

Z = **4.1** x (0.21 x 0.297) x 0.06 = 0.015g

B: Ink consumed per ejected master

The amount of ink discarded with the ejected master is a major factor in the ink consumption.

For the HP4 R2, the average consumption is as follows (23°C,65% humidity).

A3 drum: 4.8 (g)
A4 drum: 2.3 (g)

Sample Ink Yield Calculation Results (normal temperatures, normal printing)

30 copies per original: X = (600 x 30) / {4.8 + (30 x 0.015)} = 3,429 copies

50 copies per original: X = (600 x 50) / {4.8 + (50 x 0.015)} = 5,405 copies

100 copies per original: X = (600 x 100) / {4.8 + (100 x 0.015)} = 9,523 copies

200 copies per original: X = (600 x 200) / {4.8 + (200 x 0.015)} = 15,385 copies