RICOH

M109
Service Training

Ti-P1

Slide 1

Version 1.1

This course explains the low-end color A3 printer Ti-P1.

Version 1.1: Changes were made to the following slides

3, 12, 13, 17, 19, 22, 24, 34, 35, 44, 47, 49, 50, 65, 97, 101, 107, 117, 118

This section provides an overview of the machine, and the options that can be installed.

What Models are there in the Series?

- **Ti-P1a (M109)**
  - 32 ppm
- **Low-end A3 printer**
- ***GW+ Controller (2012 Autumn)***
- **Contains PostScript3, Gigabit Ethernet, duplex unit, and bypass tray as standard equipment.**
- **Main points**
  - LED print head
  - QSU fusing unit
  - Eco night sensor
  - Maintenance can be done by users

Slide 3

No additional notes

Appearance

- Up to three one-tray feed units can be installed (not shown here).
- Duplex and bypass are standard.
- There are no finishers.
- There is no external USB/SD card slot by the operation panel.

Slide 4

No additional notes

Options: Paper Feed

		Also used with these new models:	Similar to:	Note
One-tray paper feed unit (M406): TK2000	New			500 sheets

Slide 5

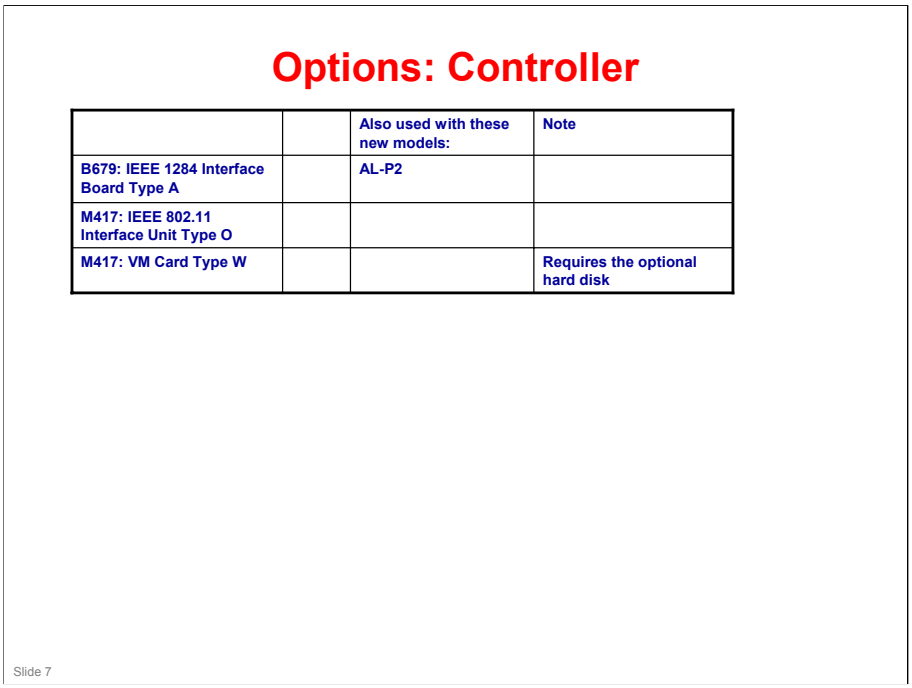
- There are no finishers.

Options: Printer

		Note
D417: Camera Direct Print Card Type L		
M417: IPDS Unit Type C730		
M417: SD card for NetWare Printing Type M		
M417: Hard Disk Drive Option Type C730		160 GB
M417: Memory Unit Type N 1GB		

Slide 6

- There is no RPCS driver.



Options: Controller

		Also used with these new models:	Note
B679: IEEE 1284 Interface Board Type A		AL-P2	
M417: IEEE 802.11 Interface Unit Type O			
M417: VM Card Type W			Requires the optional hard disk

Slide 7

- No Bluetooth option
- VM card: requires optional HDD

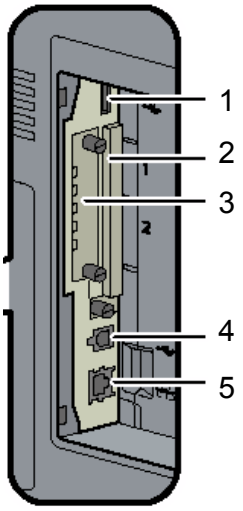
Controller Options
Memory Upgrade Options

- **Optional hard disk**
  - 160 GB
- **Memory**
  - Standard memory: 512 MB
  - Upgrades: 1 GB memory card option
    - » There is only one slot for memory. To upgrade to 1 GB, remove the standard 512 GB memory and install the 1 GB memory option.
  - Max possible memory: 1 GB

Slide 8

No additional notes

Ports on the Controller Board



1. **USB port A: Connect external devices such as a digital camera, a card authentication device, etc.**
   - Use of a digital camera requires the Camera Direct Print option.
2. **Expansion card slots: Remove the cover to install SD cards.**
3. **Optional interface board slot: Insert an optional wireless LAN interface board or IEEE 1284 interface board.**
4. **USB port B: Use a USB cable to connect the printer to a computer.**
5. **Ethernet port: Use a network interface cable to connect the printer to a network.**

Slide 9

- Board Slot: One of the following can be installed.
  - IEEE 802.11a/g Interface Unit Type J or IEEE 802.11g Interface Unit Type K
  - IEEE 1284 Interface Board Type A
- The SD Card slots are discussed in more detail on the next few slides.
- Use of a digital camera requires the Camera Direct Print SD card option.
- There is a mini USB slot behind the screw above item 4 in the diagram. This is for designer purposes only.

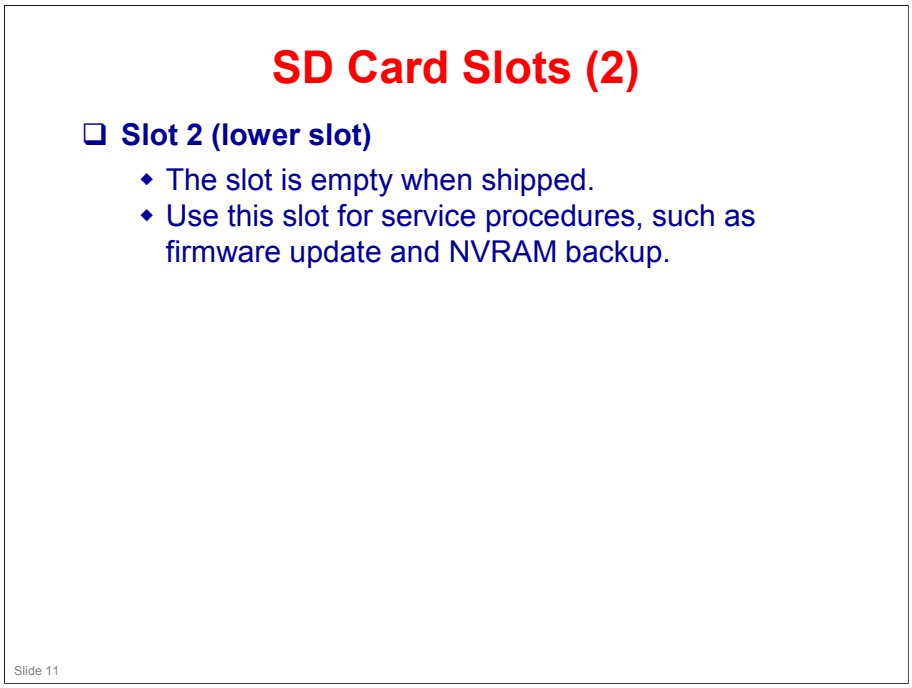
SD Card Slots (1)

- **Slot 1 (upper slot):**
  - The slot is empty when shipped
  - Use when installing the following options
    - » Camera direct print
    - » SD card for Netware printing
    - » VM card
  - If the number of options that you wish to install is more than the number of available SD card slots, move them onto one SD card.
    - » Destination card: SD slot 1
  - If more than one SD card options must be merged, and the VM card is one of them, the VM card must be the target SD card.
    - » The VM card option cannot be moved.

Slide 10

Installation > Controller Options

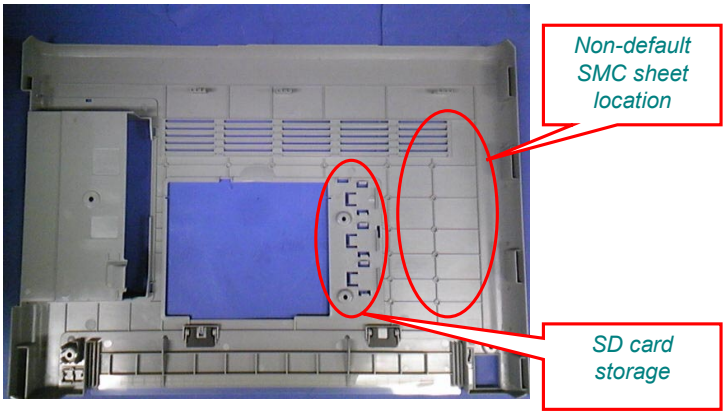
- PDF Direct/PCL/PostScript 3 are pre-installed in the Controller Firmware.



No additional notes

No additional notes

SD Card Storage Location



- **Store the original SD cards here (back side of the rear cover) after you move the application to another card.**
- ***The non-default page is attached to the back side of the rear cover.***

Slide 13

- The rear cover must be removed to access these storage locations.

How to Enter SP Mode

- **There are two methods**
  - Press the Up/Down arrow keys simultaneously for more than 3 seconds, then press OK.
  - While turning the power on, press Suspend/Resume and Escape at the same time

Slide 14

No additional notes

Using SP Mode

- **Accessing the Required Program**
  - Use the "Up/Down arrow" keys to scroll through the menu listing.
    - 1. Service: Controller service modes
    - 2. Engine: Engine service modes
    - 3. End: Exit service mode
  - To select an item, press the "OK" key. Then the sub-menu appears.
  - Scroll through the sub menu items using the left and right arrow keys.
  - To go back to a higher level, press the "Escape" key.
- **Inputting a Value or Setting for a Service Program**
  - Enter the required program mode as explained above. The setting appearing on the display is the current setting.
  - Select the required setting using the left and right arrow keys, then press the "OK" key. The previous value remains if the "OK" key is not pressed.
- **Exiting Service Mode**
  - Select "End" from the service mode main menu, then press the "OK" key.

Slide 15

No additional notes

This section provides an overview of the main specifications.

General Specifications - 1

- **Printing Speed (A4, 81/2" x 11" LEF):**
  - 32 ppm, black/color
- **First Print Time (A4/81/2" x 11" LEF):**
  - Black: 7.5 s or less
  - Color: 9.8 s or less
- **Warm-up Time**
  - 20 s or less
- **Resolution (Engine):**
  - 300 dpi x 300 dpi, 600 dpi x 600 dpi, 1,200 x 1,200dpi, 600 dpi x 1,200 dpi equivalent, 600 x 2,400dpi equivalent,
- **Power Consumption**
  - Maximum: *1400W* (NA version), 1300W (EU, AP, CHN versions)
  - Energy Saver: 1.0 W or less (in Sleep mode)

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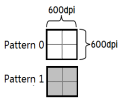
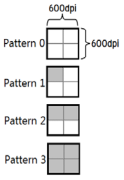
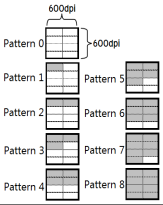
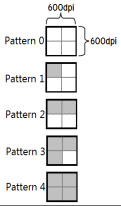
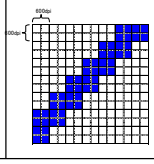
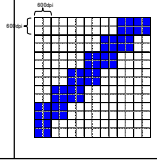
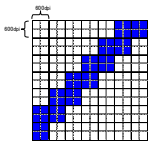
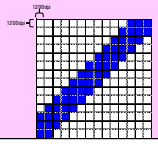
No additional notes

Resolution

		600x600dpi	600x1200dpi equivalent	600x2400dpi equivalent	1200x1200dpi
1	Characteristic	High speed transaction	-	Variety of gradation	High resolution
2	Print speed	Normal	Normal	Normal	Normal
3	Real resolution	600dpi	600dpi	600dpi	1200dpi
4	Gradation (Bit pattern)				
4	Line per inch	134 LPI	134 LPI	168 LPI	190 LPI
5	Photograph	Not suitable	Just about acceptable	Rich gradation, most suitable for photographs and images.	Suitable
	Character/ Line	Just about acceptable 	Just about acceptable 	Just about acceptable 	Fine dots, most suitable for characters and lines. 

Slide 18

No additional notes

General Specifications - 2

- **Input Tray Capacity**
  - Standard Tray: 250 sheets
  - Bypass tray: 100 sheets
  - Optional Paper Feed Unit: 500 sheets
  - Maximum 1,850 sheets total capacity (Std tray + Option x 3 + Bypass)
- **Output Tray Capacity (Face down)**
  - Up to 200 sheets
- **Paper Size:**
  - Standard tray: A3/DLT SEF – A6/HLT LEF
    - » Non-standard sizes: Width: 90 - 297 mm (3.5" - 11.7"), Length: 148 - 432 mm (5.8" - 17.0")
  - Optional tray: A3/DLT SEF – A5/HLT LEF
    - » Non-standard sizes: Width: 139.7 - 297 mm (5.5" - 11.7"), Length: 182 - 432 mm (7.2" - 17.0")
  - Bypass tray: A3/DLT SEF – A6/HLT LEF
    - » Non-standard sizes: Width: 64 - 297 mm (2.5" - 11.7"), Length: 127 - 1260 mm (5.0" - 49.6")
  - Duplex: A3/DLT SEF – A6/HLT LEF
    - » *Non-standard sizes: Width: 100 - 297 mm (3.9" - 11.7"), Length: 148 - 432 mm (5.8" - 17.0")*
- **Paper Weight**
  - Standard Tray: 56 - 220 g/m^2 (15 lb. Bond - 80 lb. Cover)
  - Bypass tray: 56 - 256 g/m^2 (15 lb. Bond - 140 lb. Index)
  - Duplex: 56 - 163 g/m^2 (15 lb. Bond - 90 lb. Index)
  - Optional Paper Feed Unit: 56 - 220 g/m^2 (15 lb. Bond - 80 lb. Cover)

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No additional notes

General Specifications - 3

- **Memory**
  - Standard: 512 MB, Maximum: 1GB
  - HDD: Optional 160GB
- **Interface**
  - Standard: Gigabit Ethernet (1000/100/10BASE-T), USB2.0, USB2.0-Host
  - Option: IEEE1284/ECP, IEEE802.11a/b/g/n
- **PDL**
  - Standard: PCL6/5c, PostScript3, PDF Direct
  - Option: PictBridge, IPDS, *Netware*

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No additional notes

Targets

APV, per month	2k
Color Ratio	50%
MPBF (Mean Prints Between Failure)	45k
Call ratio (Mainframe)	0.044
Estimated Unit Life	600k or 5 years whichever comes first

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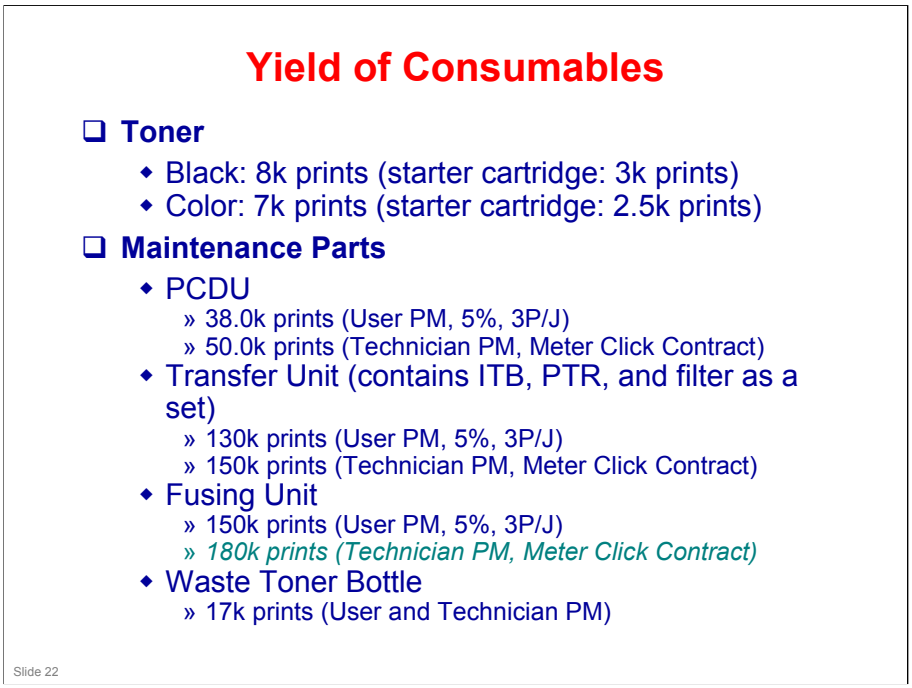
No additional notes



- Toner yields: 5% coverage, 3p/j

- User PM: This product has been designed for user maintenance. The maintenance parts in the slide above have been prepared as supplies. User maintenance is basically done by replacing these supplies
- Technician PM: If the printer is used at its target APV (2.0k prints), technicians do not need to replace any PM parts. For high PV users, however, technicians should replace the above maintenance parts when the counters reach their targets.

- Near-end for the maintenance parts can be selected by a user tool. The settings are:
  - 0: Notify Sooner: 875 pages before the end
  - 1 (default): Normal: 625 pages before the end
  - 2: Notify Later: 375 pages before the end

Black-and White Priority Mode

- **If this function is switched on with a user tool, color process control is not done for black-and-white printing. It is only done when the customer starts a color printing job.**
  - Menu > System> B&W Print Priority

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- This function is the same as the Pe and Md series.

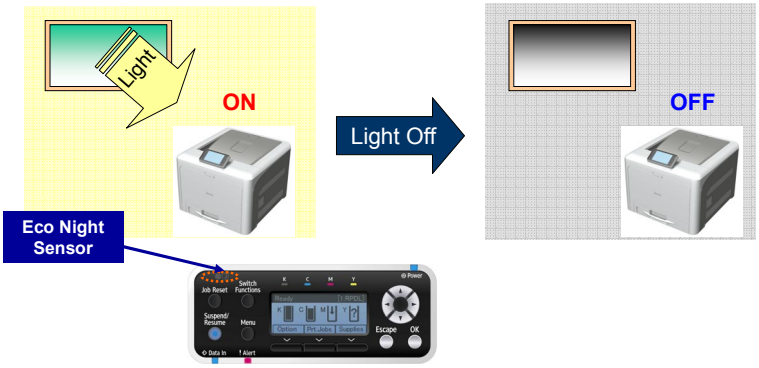
Curl Prevention Mode

- **If the customer switches this function on:**
  - Pre-rotation of the fusing unit is done before the first print.
  - Printing speed is reduced.
  - *Menu > Maintenance> Curl Prevention*

Slide 24

No additional notes

Eco Night Sensor - 1



- **The machine saves electricity by automatically turning off the main power (or entering sleep mode) when the room is dark.**
  - Ambient light is detected by the Eco Night Sensor on the operation panel.
  - The sensor is a translucent circular window 4 mm in diameter
- **This will prevent waste of electricity when people forget to turn off the machine.**
- **The feature has been improved: you can now also have the machine turn the power on when the room gets lighter.**

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No additional notes

Eco Night Sensor - 2

- **The Eco night sensor function can be enabled or disabled with the following user tool.**
  - Enable/disable with [Menu button] > [System] > [ECO Night Sensor] > [Off Mode Setting]
  - There are three settings:
    - » Inactive: The sensor is not used
    - » Power off: The machine uses the sensor to detect when to turn off the power (this is the default setting)
    - » Power off then on: The machine uses the sensor to detect when to turn off the power, and when to turn it back on again
- **The timer to turn off the power is set from 1 to 120 min.**
  - Select with [Menu button] > [System] > [ECO Night Sensor] >[Timer to Turn Off]
  - The timer is reset if the ambient light level increases, printing is done, or any key is pressed before the specified time elapses.
  - There is a similar setting (Timer to Turn On) to fix the time waited by the machine to turn on after an increase in light is detected.
- **The Eco night sensor has five brightness sensitivity levels (trigger thresholds).**
  - Select with [Menu button] > [System] > [ECO Night Sensor] > [Brightness Sensor Level]
  - 1 is the darkest setting
  - There is a setting for turning off the power and another setting for turning it on.

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No additional notes

Eco Night Sensor - 3

- **If the controller is executing a process, the Light Detect Function activates after the process is completed.**
- **Light Detect also cannot activate if printing stopped due to a lack of paper or a paper jam.**
- **If a spooled print job is stored in the machine, the machine cannot activate Light Detect.**
- **After the Light Detect Function turns off the power, the machine cannot power on by itself if Timer to Turn On is disabled. To power on the machine, the main power switch has to be turned on manually.**
  - If Timer to Turn On is enabled, then the machine will turn itself on when the ambient light increases above a set level.

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No additional notes

Weekly Timer

- **This new feature allows you to set times for when the machine automatically turns the power on and off. You can set different times for each day of the week.**
- **Control this feature with [Menu button] > [System] > [Weekly Timer].**
  - Daily (Web Preset Time): Only one set of times can be input, and these are used for each day of the week.
  - Day of Week (Preset Time): Different times can be input for each day of the week.
  - Inactive: Default setting. This feature is not used.
  - If you select 'Daily' or 'Day of the Week', you have to input the power on and power off times with Web Image Monitor.

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No additional notes

Safe Shutdown

- **This is the only power switch on the machine.**
- **When you use this to turn the power off, 'Please Wait' is displayed, while the machine checks the following:**
  - File system in HDD, memory, SD card, USB memory are safe.
  - Paper is not left in the machine's paper path (except if a jam occurred immediately before the power off).
  - All print jobs and access logs are saved.
- **Then the power turns off.**

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No additional notes

Forced Shutdown

- If the machine freezes, hold this switch down for 6 seconds.
- However, this method can damage the hard disk or controller board, or cause data loss.
- Forced shutdown should only be carried out when in contact with a call center operator, or by a technician, after explaining the risk of the operation to the customer.
- If the normal shutdown process will not function correctly, an ASIC on the CTL board might be broken. In this case, a technician visit is necessary.

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No additional notes

No additional notes

PM by User or Technician

- User PM: This product has been designed for user maintenance. The maintenance parts on the next slide have been prepared as supplies. User maintenance is basically done by replacing these supplies.
- Technician PM: If the printer is used at its target APV (2.0k prints), parts with a life of 120k or more will not need to be replaced within the normal life of the machine. For high PV users, however, technicians should replace the parts when the counters reach their targets.

Slide 32

No additional notes

Maintenance Parts

- **PCDU**
  - 38.0k prints (User PM, 5%, 3P/J)
  - 50.0k prints (Technician PM)
- **Transfer Unit (contains ITB and paper transfer roller)**
  - 130k prints (User PM, 5%, 3P/J)
  - 150k prints (Technician PM)
- **Fusing Unit**
  - 150k prints (User PM, 5%, 3P/J)
  - 180k prints (Technician PM)
- **Waste Toner Bottle**
  - 17k prints (User and Technician PM)

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- Toner yields: 5% coverage, 3p/j

Near-end Alert for Maintenance Parts

- **Near-end for the maintenance parts can be selected by a user tool.**
  - Menu button > Maintenance > General Settings > Replacement Alert
- **The settings are:**
  - *Notify Sooner*
  - *Normal (default)*
  - *Notify Later*
- ***The settings can be made for the following parts:***
  - Toner, PCDU (black), PCDU (color), waste toner bottle, transfer belt unit, fusing unit

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Approximate number of prints that can be made with each setting:

- 0: Notify Sooner: 875 pages before the end
- 1 (default): Normal: 625 pages before the end
- 2: Notify Later: 375 pages before the end
- The number of prints is a reference value based on the following conditions: A4, LEF, Color ratio 50%, 3 prints/job, Each color 5% on the original, Serial printing. The actual amount (replacement cycle) fluctuates due to conditions such as: paper size, paper type, page orientation, contents of original, number of pages per job in serial printing, and the number of times that process control and MUSIC are done. The numbers are based on drum rotation.
- For example, if there are fewer prints per job, the part will need to be replaced earlier.

What Happens at the End Alert?

- **For toner cartridges and the waste toner bottle, when the end limit arrives, the machine stops and printing is prohibited.**
- **For the PCDUs, image transfer unit, and fusing unit, printing can continue even after the end limit *(end of life)*.**
- **Alert messages are shown in all cases except the following:**
  - Meter click setting is off (default): Alert message always shown
  - Meter click setting is on: Alert message not shown for PCDUs, image transfer unit, and fusing unit
    - » Alerts for these can be enabled with SP mode.

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No additional notes

Other PM - PM Table

- **Do the following, depending on the type of service contract.**
  - Cleaning at 100k
    - » Components in the paper feed path
    - » Do not use alcohol.
    - » See the PM table in the service manual for details.
  - Replacement at 100k
    - » Bypass feed roller and friction pad
  - Replacement at 180k
    - » Main feed roller and friction pad

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No additional notes

Machine Life

- The target APV is 2k per month.
- The life of the machine is 5 years, which the same as 120k with the above APV.
- So parts with a life of 120k or more will not need to be replaced within the normal life of the machine.
- However, cleaning for some parts is specified at 100k in the PM table.

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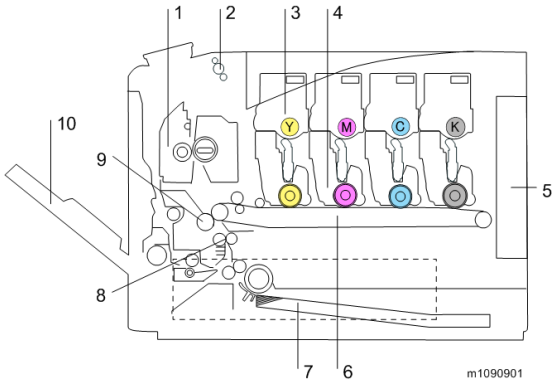
No additional notes

Now we have a look inside the machine. This first section has a quick look at where the main components are located.

Component Layout

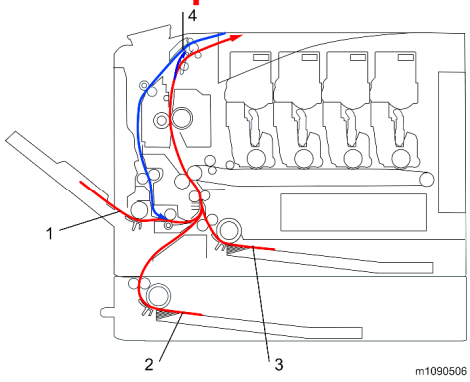


1. Fusing Unit
2. Paper Exit/Reverse Roller
3. Toner Bottle
4. PCDU
5. Engine Board and Controller Board
6. Image Transfer Belt Unit
7. Paper Feed Tray
8. Registration Roller
9. Transfer Roller
10. Bypass Tray Unit

Slide 39

No additional notes

Paper Path

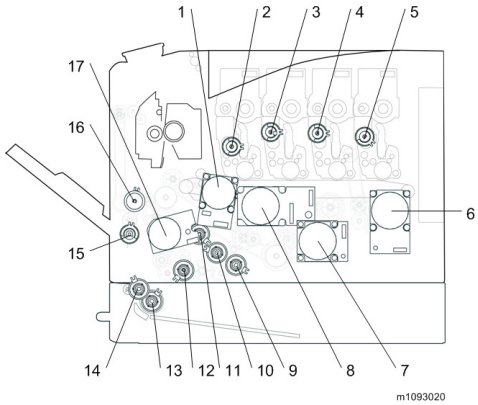


1. Bypass Tray
2. Optional Paper Feed Tray
3. Standard Paper Feed Tray
4. Duplex Feed Path

Slide 40

No additional notes

Drive Components



1. Image Transfer Unit Motor
2. Toner Supply Clutch (Y)
3. Toner Supply Clutch (M)
4. Toner Supply Clutch (C)
5. Toner Supply Clutch (K)
6. Drum Motor: K
7. Fusing Motor
8. Drum Motor: CMY
9. Paper Feed Clutch
10. Relay Clutch
11. ITB (Image Transfer Belt) Contact Clutch
12. Registration Clutch
13. Paper Feed Clutch
14. Grip Roller Clutch
15. Duplex Intermediate Clutch
16. Bypass Clutch
17. Paper Feed Motor

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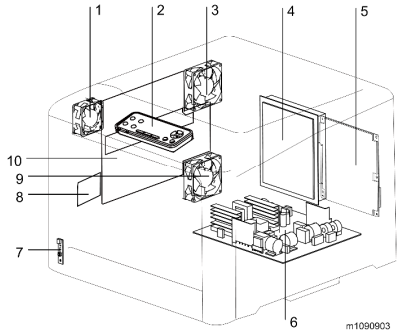
No additional notes

Major Electrical Components



1. Fusing Fan
2. Operation Panel
3. Cooling Fan
4. Controller Board
5. Engine Board
6. PSU
7. Main Power Switch
8. High Voltage Supply Board (Separation)
9. PSU Fan
10. High Voltage Supply Board

Slide 42

No additional notes

Main Circuit Boards

- **EGB (Engine Board): Controls the engine, the controller interface, image processing, color registration adjustment (MUSIC), input/output, interfaces with the optional units, and the operation panel.**
- **CTL (GW+ Controller): Controls the interface between the operation panel and EGB, and applications. The controller connects to the EGB through the PCI Bus**
- **PSU: This unit supplies DC voltage.**
- **HVP (High Voltage Power supply): This unit supplies high voltages.**
  - There are two boards. A small separate board provides power to the discharge plate, which separates paper from the transfer belt and paper transfer roller.

Slide 43

No additional notes

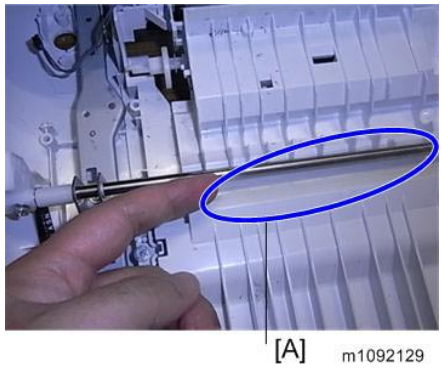
Before Servicing the Machine

- **Before you start to remove parts from the machine, do the following for your safety and to prevent damage to the machine:**
  - Turn off the power using the safe shutdown procedure.
  - Then disconnect the power cord *and press the power switch again to discharge the remaining current.*

Slide 44

- If you are in a training class, or have access to the machine while doing this course, look through these next few slides before you do the procedures, to make sure you are familiar with these important points.

Removing the Front Cover Unit

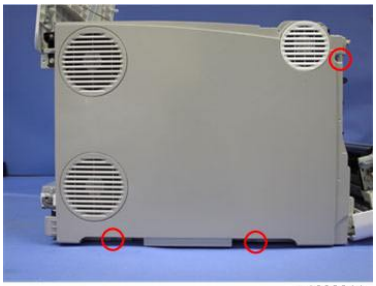


- **This is a long procedure. It is only needed if the front cover must be replaced. But we include it in the service manual just in case.**
- **The main point is to make sure that you don't break the mylar [A].**

Slide 45

- The mylar is available as a service part.

Removing the Left Cover



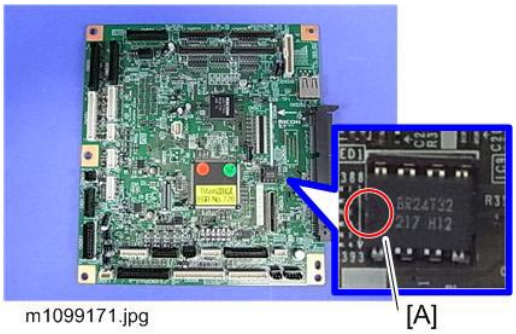
m1092014

- Remove the waste toner bottle before you remove the left cover. Otherwise the waste toner bottle could fall over and toner may be spilled.

Slide 46

No additional notes

Replacing the EGB



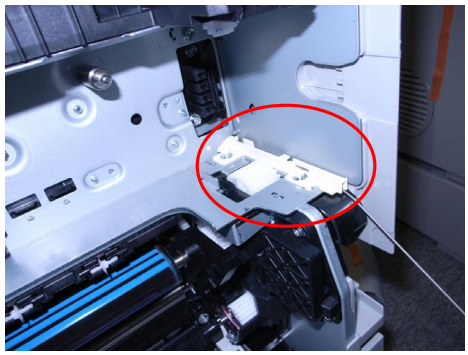
m1099171.jpg

- Remove the *EEPROM* from the old EGB and install it on the new EGB.
- The mark [A] must point to the left side of the board.

Slide 47

No additional notes

Don’t Touch These Screws



- This photo shows some screws painted in white.
- You can see these after the fusing unit is removed from the printer.
- The wire is connected to the front cover. The tension is determined by the screws. They should not be loosened.

Slide 48

No additional notes

Replacing the *EEPROM* on the EGB - 1

- **When replacing the *EEPROM* on the Engine Board, please check the following points:**
  - If a near end alert for the fusing unit, paper transfer roller unit, or PCDU is displayed, replace them with new units before carrying out *EEPROM* replacement. Not doing so may cause image quality problems or SC490.
  - If the Waste Toner Bottle is near full, replace it with a new one. Not doing so may cause toner overflow.
  - After replacing the *EEPROM*, check that there is no image quality problem. If an image quality problem occurs, do not try to fix it by putting the old *EEPROM* back, but make adjustments so that they are stored in the new *EEPROM*.

Slide 49

No additional notes

Replacing EEPROM on the EGB - 2

If the NVRAM download/upload feature cannot be used, do the following steps;

1. Login to the machine using the factory SP mode (Cover open).

Set these SPs in the factory SP mode.

- 5-807-001 "Machine Type Area Selection"*<- NA:"2", EU:"3", CN: "5"*
- 5-807-002 "Machine Type Model Selection" *<-Set "1"*
- 5-930-001 "Meter Click Charge" <-Set the value on the latest SMC sheet
- 5-988-001 "Maintenance ID" <-Set the value on the latest SMC sheet
- 5-988-002 "Brand ID" <-Set the value on the latest SMC sheet
- 5- 811-001 "Machine Info Set: Serial No."<-Input the 5-811-002 value from the SMC sheet
- 5-801-002 Execute "Engine Memory Clear"

2. Power OFF, then power ON. Login to the normal SP mode.
Input values from the latest SMC sheet

- 3-333-001 to 3-333-006 "TM (ID) sensor (right) adjustment value"
- 3-334-001 to 3-334-006 "TM (ID) sensor (left) adjustment vale"
- 1-001-013 to 1-001-020 "Sub scan direction registration"
- 1-002-001 to 1-002-003 "Main scan direction registration"
- 1-003-001 to 1-003-012 "Paper buckle adjustment"

3. Close Cover, then do the following steps in this order.

1. 2-111-002 Execute "Line position adjustment factory mode"
2. 3-011-001 Execute "Normal Process Control"
3. 2-185-002 Input "1" in "Margin Position: Base Calculation Flag"
4. 2-111-001 Execute "Line position adjustment normal mode"
5. 2-185-002 Input "1" in "Margin Position: Base Calculation Flag"
6. 2-111-003 Execute "Line position adjustment Black mode"

Ready to use the machine

Slide 50

- After doing this, the machine will work. However, the counters for the supply parts will be wrong. So, to get the counters to match the machine condition, all supply parts (PCDU, toner, ITB, PTR, fusing unit) should be replaced and the counters reset.

Replacing the Controller Board

m1099170.jpg

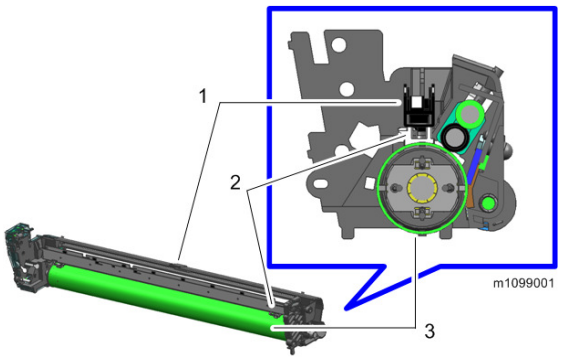
- Remove the NVRAM from the old board and install it on the new one.
- The mark [A] must point down.
- Do not change any of the DIP switch settings.

Slide 51

- This is a GW+ controller board.

This section explains how a latent image is written on the drum.

Overview

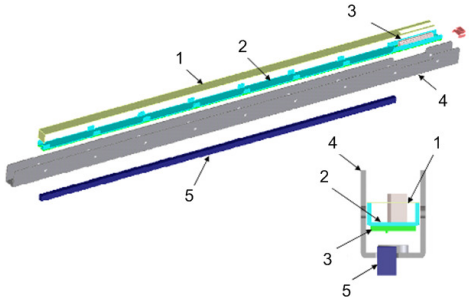


- An LED array [1] writes the latent image on the OPC [3].
- Each OPC (K, C, M, Y) has its own LED array.
  - These arrays are identical.
- A spacer [2] on the drum keeps the LED array at the correct distance from the OPC for correct focus.
- The LED writing method contributes to machine downsizing, and is superior to the LD writing method in image quality, noise reduction, and energy saving.

Slide 53

No additional notes

Components of the LED Array

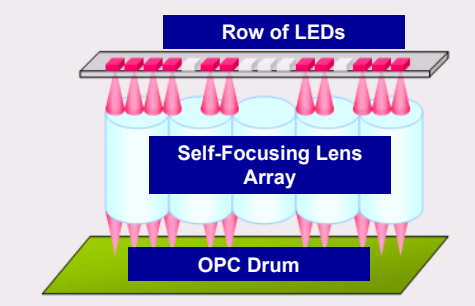


- **The LED array consists of the following parts.**
  1. Sheet
  2. Base
  3. LED board
  4. Frame
  5. SLA (Self-focusing Lens Array)
- **The LED array is replaced as one complete unit. The individual components shown above cannot be replaced in the field.**

Slide 54

No additional notes

Detailed Structure of the LED Array



- Tiny LEDs capable of creating images at 1200 dpi are arranged in a line. Light beams emitted by the LEDs are focused using the Self-focusing Lens Array (SLA), creating an image on the OPC drum.
- Each LED head has 36 LED chips on board, and each chip has a line of LEDs 8mm in length.
- If a vertical line 8mm in width appears on the image parallel to the direction of paper feed, it may be caused by a broken LED chip. Exchange the LED head with one of the other colors to troubleshoot the symptom.

Slide 55

No additional notes

Notes Concerning the LED Array

- **Image position adjustment**
  - Horizontal (main scan): Adjusted by moving the image position
  - Vertical (sub scan): The timing for the start of writing is changed.
  - There are no mechanical adjustments.
  - Start timing can be adjusted
- **LED light intensity**
  - An EEPROM on the LED head contains data which controls the light intensity of each element.
  - There is no adjustment.
- **Adjustment after replacement**
  - The EEPROM on the new LED array contains data on the characteristics of the LED array. No adjustment is needed by the technician.

Slide 56

No additional notes

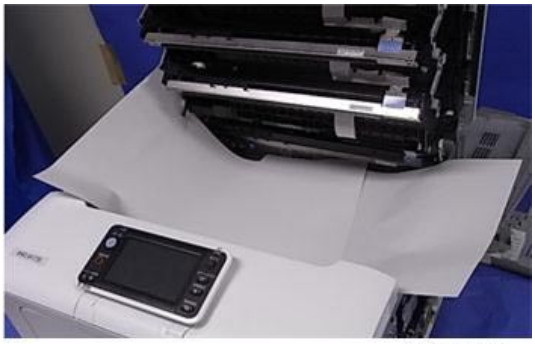
Troubleshooting Notes

- **The LED heads are the same for all CMYK colors.**
  - So it is possible to find which LED head has the problem by swapping them with one another.
- **The LED spacer contacts the OPC to keep the correct distance between the LED head and the drum for focusing.**
  - The spacer contacts the OPC, so it will gradually wear out. If the PCDU is used for longer than its normal yield, the LED may gradually start to lose its focus.

Slide 57

No additional notes

Removing an LED Head



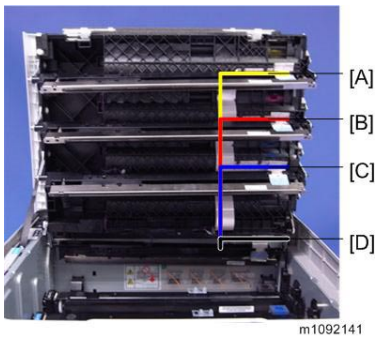
m1092191

- **After you open the upper inner cover, cover the PCDUs with a sheet of paper, to prevent foreign objects from falling into the PCDUs.**

Slide 58

- If you are in a training class, or have access to the machine while doing this course, look through these next few slides before you do the procedures, to make sure you are familiar with these important points.

Connecting the LED Arrays



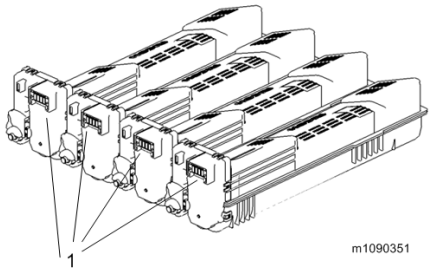
- When you connect up the flat cables from the EGB to the LED arrays, make sure that you arrange them correctly.

Slide 59

No additional notes

This section explains the components of the toner cartridge and the PCDU.

Toner Cartridges



- Each toner cartridge contains the toner bottle and toner supply mechanisms.
- Projections on the right side of the toner cartridge ensure each cartridge is always inserted into the correct position.
- The toner cartridges are arranged in the order of Y, M, C, and K as viewed from the front of the machine.
- Each toner cartridge has an ID chip [1] that contains information such as product information and the number of prints. This ID chip also informs the machine when the cartridge is a new one.

Slide 61

- ID chip information can be checked in SP mode.
  - SP7-931: Toner Bottle Bk
  - SP7-932: Toner Bottle C
  - SP7-933: Toner Bottle M
  - SP7-934: Toner Bottle Y

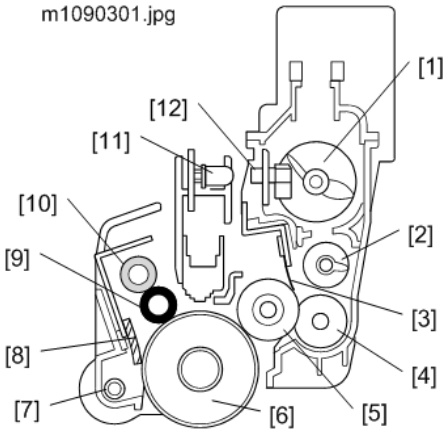
Shutters

- Each cartridge has two shutters. Toner will not leave the cartridge until both shutters are open.
- The first shutter opens when the cartridge is installed in the machine. A projection on the machine opens the shutter.
- The second shutter is controlled by the toner supply clutch.
- Each cartridge has its own toner supply clutch.

Slide 62

No additional notes

PCDU Layout



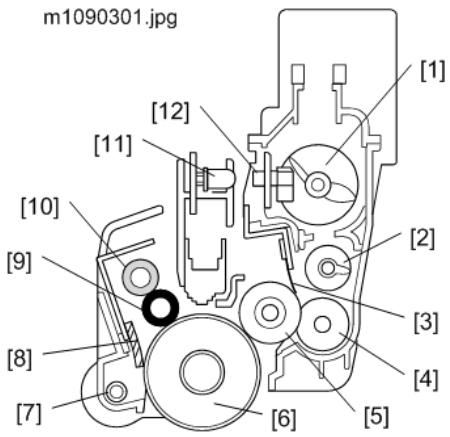
- **The PCDU contains the charge roller, photoconductor, development mechanism, and cleaning unit.**

1. Upper Mixing Coil
2. Lower Mixing Coil
3. Development Blade
4. Toner Supply Roller
5. Development Roller
6. OPC Drum
7. Waste Toner Collection Coil
8. OPC Cleaning Blade
9. Charge Roller
10. Charge Roller Cleaner
11. Toner End Sensor (mounted on the LED array)
12. Toner End Detection Window

Slide 63

No additional notes

Toner Supply Mechanism



- When the toner supply clutch turns on, a coil in the toner cartridge rotates to transfer toner to the bottle exit and then the PCDU. Toner which falls into the PCDU is transferred to the development section by the upper mixing coil [1].

Slide 64

No additional notes

Toner Near End (TNE), Toner End (TE)

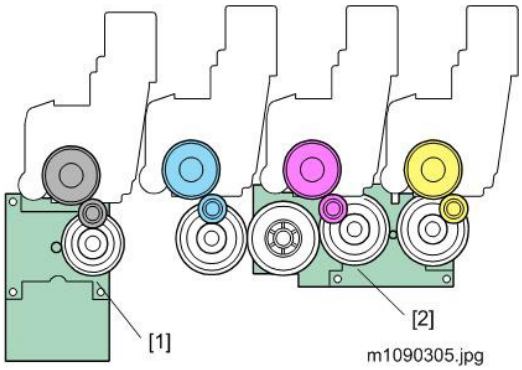
- **The TE sensors are mounted on the LED arrays.**
- **They monitor toner supply through the TNE detection windows in the PCDUs.**
- **TNE is detected when the TE sensor detects non-supply of toner. Then the near-end status is written to the ID chip.**
- **Then, the toner end alert is shown after a certain number of prints is made (the following are reference values based on 3 prints/job, color ratio 50%, 5% coverage for each color).**
  - *Normal (Before 5 days): 625 pages*
  - *Notify Later (Before 3 days): 375 pages*
  - *Notify Sooner (Before 7 days): 875 pages*
  - Users can set *"Normal / Notify Sooner / Notify Later".* The default is "Normal".
- **Then, the toner end status is written to the ID chip.**

Slide 65

Approximate number of prints that can be made with each setting:

- 0: 875 pages before the end
- 1 (default): 625 pages before the end
- 2: 375 pages before the end
- The number of prints is a reference value based on the following conditions: A4, LEF, Color ratio 50%, Each color 5% on the original, Serial printing. The actual amount (replacement cycle) fluctuates due to conditions such as: paper size, paper type, page orientation, contents of original, number of pages per job in serial printing, and the number of times that process control and MUSIC are done. The numbers are based on drum rotation.
- For example, if there are fewer prints per job, the toner will need to be replaced earlier.

PCDU Drive

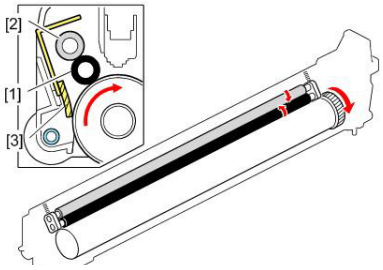


- The PCDUs are driven by the drum motor (K) [1], and the drum motor (CMY) [2].

Slide 66

No additional notes

Drum Charge and Cleaning

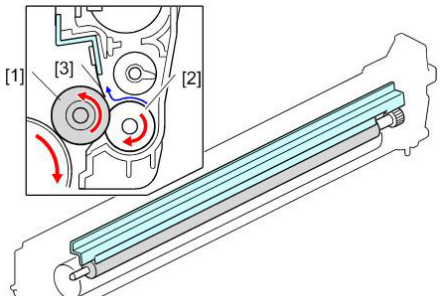


- **This machine uses a charge roller [1]. The charge roller gives the drum surface a negative charge.**
- **The machine automatically controls the charge roller voltage when process control is executed.**
- **The charge roller cleaner [2] which always touches the charge roller, cleans the charge roller.**
- **The OPC cleaning blade [3] removes the waste toner on the OPC.**

Slide 67

- The high voltage supply board, which is at the left side of the machine, applies dc and ac voltage (at a constant current) to the roller. The ac voltage helps to make sure that the charge given to the drum is as constant as possible.

Development

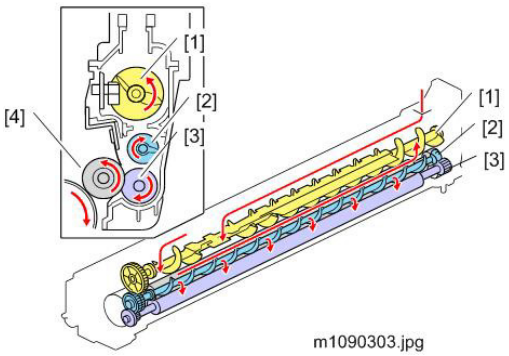


- The development mechanism contains the development roller [1], the toner supply roller [2], and the development blade.
- The toner supply roller [2] provides the development roller [1] with toner.
- The development blade [3] keeps the toner attached to the development roller [1] flat.

Slide 68

No additional notes

Mixing



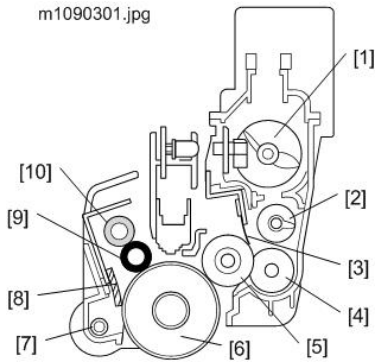
m1090303.jpg

- The toner moves as shown in the above drawing.
- The upper mixing coil [1] moves the toner to the left side.
- The lower mixing coil [2] moves toner to the right side.
- Finally, the toner supply roller [3] supplies toner to the development roller [4].

Slide 69

No additional notes

Waste Toner Collection



- **Toner waste within each PCDU is collected by the waste toner collection coil [7] and sent down to the waste toner bottle.**

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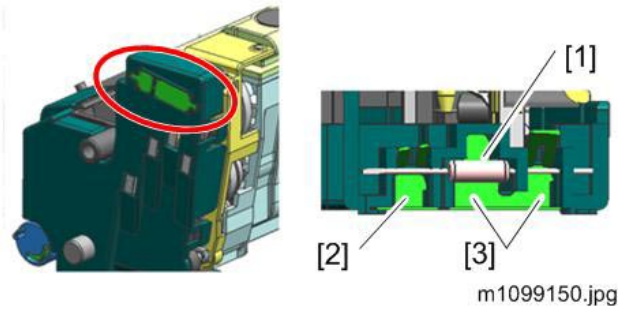
- The waste toner collection mechanism will be explained in more detail later.

New PCDU Detection



m1099150.jpg

- A three-point terminal on the side of the cover detects when a new PCDU is inserted.
- If a new PCDU comes into contact with the terminal, a fuse resistor is opened, and the machine detects the new PCDU.
- When either the user or technician installs a new PCDU, the counter resets automatically. There is no need to reset any counters.

Slide 71

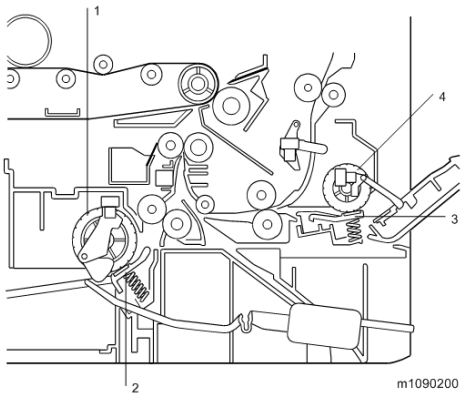
1. Fuse Resistor
2. New PCDU Detection
3. Set Detection and New PCDU Detection

This section explains how paper is fed through the machine.

Overview

- **The machine has a paper tray and a bypass tray.**
  1. Paper Feed Roller
  2. Friction Pad
  3. Bypass Feed Roller
  4. Bypass Friction Pad

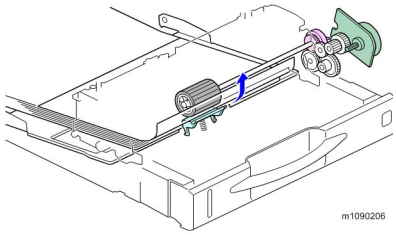
The rollers are replaced by technicians only. They are not part of the user PM procedure. There are no counters to reset.



Slide 73

No additional notes

Drive



- To start paper feed, the machine turns on the paper feed clutch, and the paper feed roller rotates.
- The friction pad ensures that only the top sheet is fed.
- When the paper activates the registration sensor, the paper feed clutch turns off.
- When the toner image on the transfer belt is at the correct position, the registration clutch turns on to feed the paper to the image transfer unit.

Slide 74

No additional notes

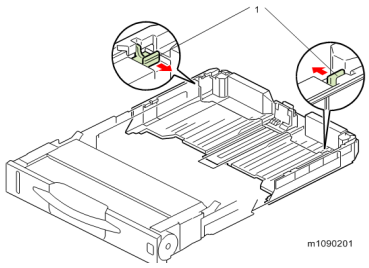
Paper End Detection

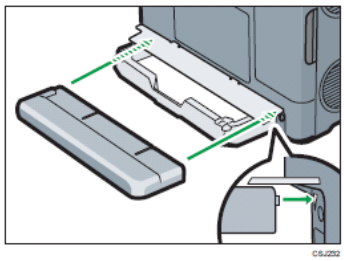
- If the tray becomes empty, a feeler enters a cutout in the bottom plate, and the paper end sensor at the other end of this feeler turns on.

Slide 75

No additional notes

Adjustable Cassette



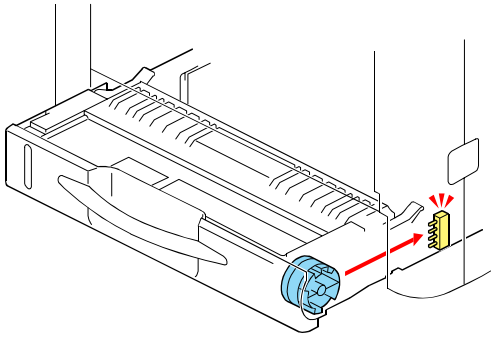


- When shipped from the factory, sizes up to A4 SEF can be loaded in the cassette.
- To support paper sizes larger than A4 SEF, unlock the tray extension lock ([1] in the diagram on the left) to extend the tray, and then place the paper feed cover on the tray.

Slide 76

No additional notes

Paper Size Detection



- The paper size switch detects actuators attached to the paper size dial.
- The customer must select the correct paper size with this dial.

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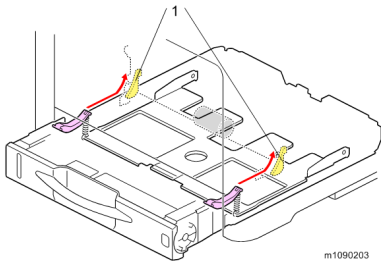
No additional notes

Bottom Plate Lift

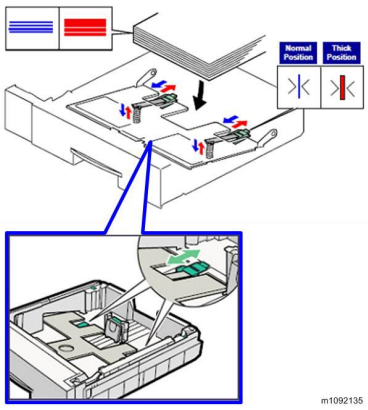


- When you slide the paper feed tray into the unit, the bottom plate arm [1] slides along the sloping guide of the main frame, and then the bottom plate is pushed upward by the spring.
- As a result, the lifted bottom plate presses the sheet on the top of the stack up against the paper feed roller.

Slide 78

No additional notes

Optional Paper Tray Unit



- **The main differences from the standard tray are:**
  - The paper size dial rotates in a different manner.
  - There is a lever to change between thick paper and thin paper. It is operated by sliding two green tabs in the base.
    - » When loading paper with a thickness of 164 g/m2 (44lb.) or more, slide the lever backwards.
    - » When loading paper with a thickness of 163 g/m2 (43lb.) or less, slide the lever towards the front.
    - » Failure to do this can cause misfeed or double feed.

Slide 79

No additional notes

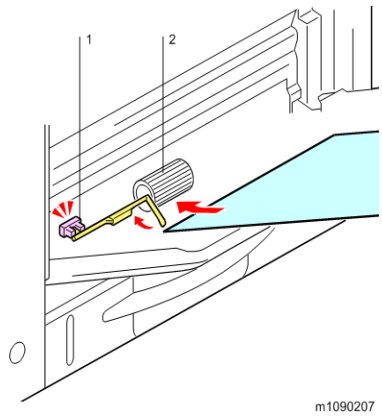
Bypass Feed Bottom Plate Mechanism

- The bottom plate has an automatic lifting system.
- When the paper feed motor rotates in reverse, a one-way clutch transfers the drive to the bottom plate lifting system of the bypass tray.
- A cam (on the left as you face the machine) starts rotating to lift the bottom plate up and down.
- The bottom plate position sensor detects up/down movement of the bottom plate by detecting a sensor actuator on the left side of the cam.
  - Sensor ON: Bottom plate is down
  - Sensor OFF: Bottom plate is rising

Slide 80

No additional notes

Bypass Feed

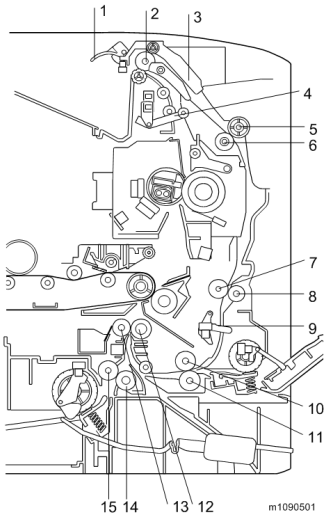


- **Bypass feed uses a feed roller and friction pad mechanism.**
  1. Bypass Paper End Sensor
  2. Bypass Feed Roller
- **When paper is loaded into the tray, the end sensor turns on (the light beam passes through).**
- **When the sensor is on, the bottom plate goes down. When it is off, the bottom plate goes up.**

Slide 81

No additional notes

Vertical Feed Path

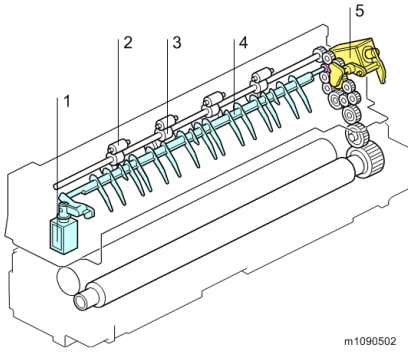


1. Paper Exit Sensor Feeler
2. Paper Exit/Reverse Roller
3. Junction Gate
4. Paper Exit Full Sensor Feeler
5. Duplex Entrance Roller (Drive)
6. Duplex Entrance Roller (Driven)
7. Duplex Intermediate Roller (Drive)
8. Duplex Intermediate Roller (Driven)
9. Duplex Feed Sensor Feeler
10. Duplex Exit Roller (Drive)
11. Duplex Exit Roller (Driven)
12. Registration Roller (Drive)
13. Registration Roller (Driven)
14. Transport Roller (Relay)
15. Driven Roller (Relay)

Slide 82

No additional notes

Duplex and Exit

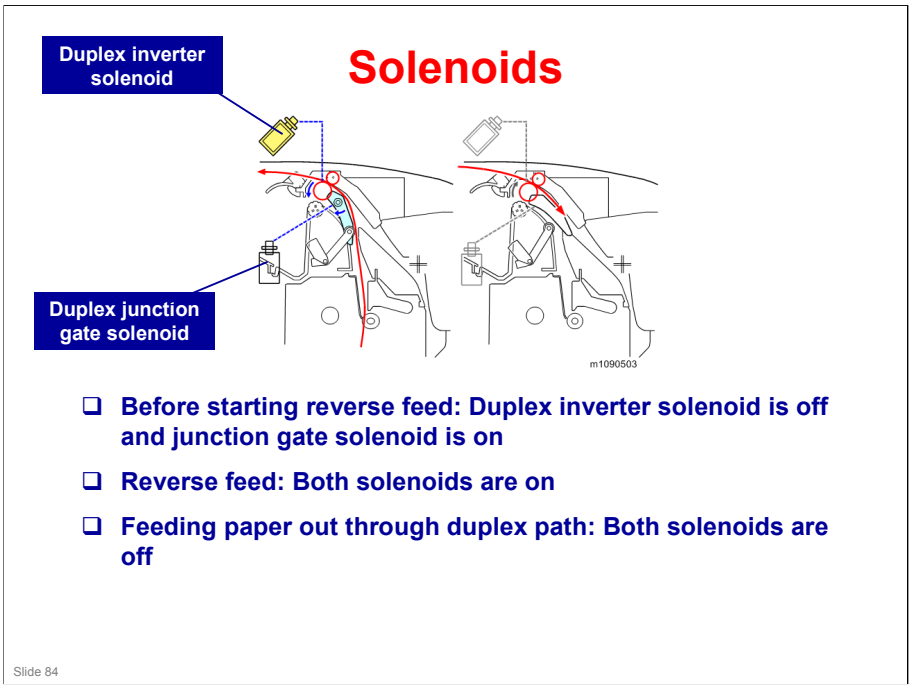


1. Duplex Junction Gate Solenoid
2. Driven Roller (Relay)
3. Paper Exit/Reverse Roller
4. Duplex Junction Gate
5. Duplex Inverter Solenoid

- The fusing motor drives the fusing and paper exit rollers.
- The paper feed/transport motor drives the duplex entrance, intermediate, exit rollers.
- The paper exit/reverse roller has no clutch, and is driven by the fusing motor.
- The two solenoids control movement of the junction gate and rotation of the paper exit/reverse roller.

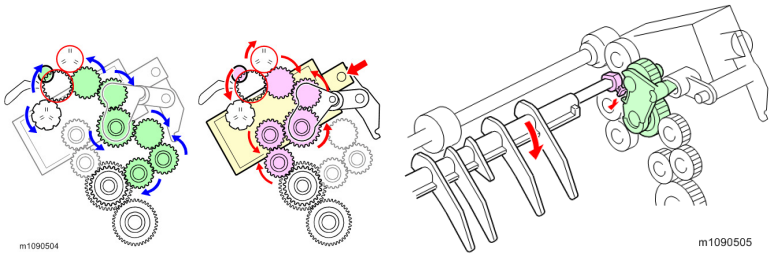
Slide 83

1. Duplex Junction Gate Solenoid
2. Driven Roller (Relay)
3. Paper Exit/Reverse Roller
4. Duplex Junction Gate
5. Duplex Inverter Solenoid



No additional notes

Stopper Gear

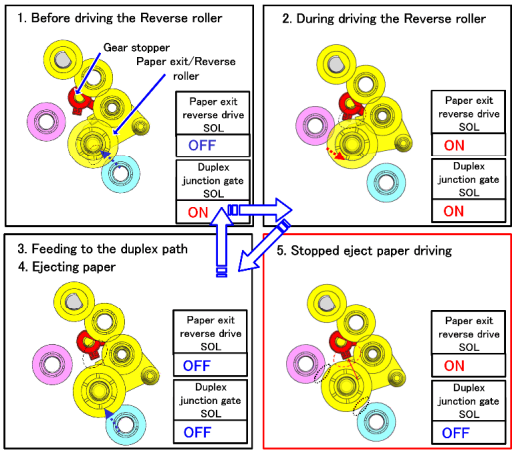


- When the duplex inverter solenoid turns on, the stopper gear engages.
- The stopper gear stops the inverter roller from rotating but the fusing unit continues to rotate.
- This mechanism is necessary because the fusing motor drives the inverter roller, but there is no electromagnetic clutch.

Slide 85

No additional notes

Solenoid Operation

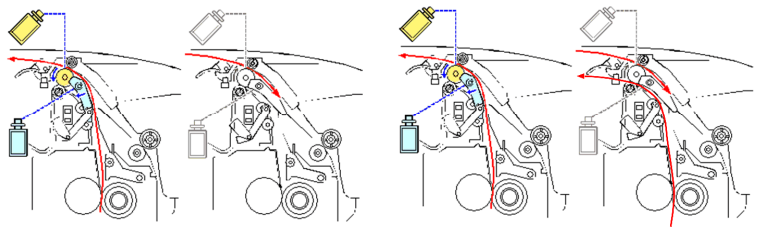


- **This diagram shows how the solenoids switch drive between the various gears during different phases of the feed-out/inverter operation.**

Slide 86

No additional notes

Duplex Interleaving



1. Sheet 1 is fed as shown on the left, with side 1 printed on it.
2. Then it is fed back into the machine, where it waits at the duplex intermediate roller (controlled by the duplex intermediate clutch).
3. While sheet 1 waits there, sheet 2 is fed up along the same path as the first sheet, with side 3 printed on it.
4. Then, while sheet 2 is being fed back into the machine, sheet 1, now with side 2 also printed on it, comes back up to the exit. It feeds out below the inverter roller at the same time that sheet 2 feeds back into the machine above the inverter roller.

Slide 87

- Duplex Intermediate Roller (Drive): Item 7 in the diagram on the Vertical Feed Path slide a few slides ago.

Print Speed During Duplex Printing

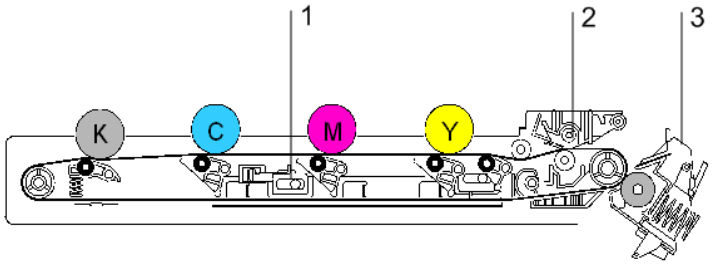
- **Sheets 298 mm or longer require a longer interval between sheets, to ensure that interleaving can be done. This may result in decreased productivity.**
  - Print speed may drop to 60% at the maximum.
- **Sheets with a length of 195 to 297 mm also require a longer interval in order to avoid jams caused by sheets colliding in the duplex feed path. This results in decreased productivity. However, this only applies to duplex printing where the sheets are fed from Tray 4.**
  - Print speed may drop to 50% at the maximum.

Slide 88

No additional notes

This section explains how the developed image is transferred from the drum to the paper.

Overview

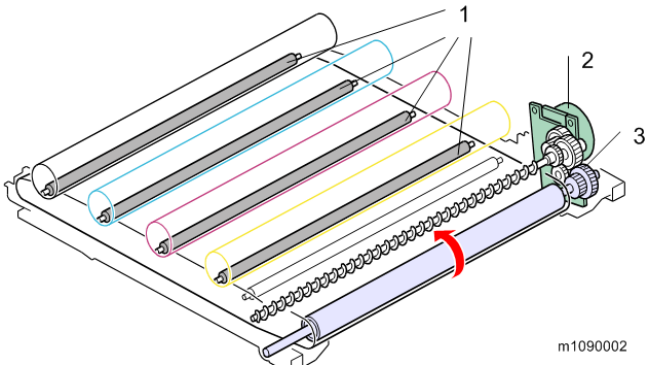


- The transfer section consists of three units: the Image Transfer Unit [1], the Image Transfer Belt Cleaning Unit [2], and the Transport Unit [3].

Slide 90

No additional notes

Image Transfer Belt Unit

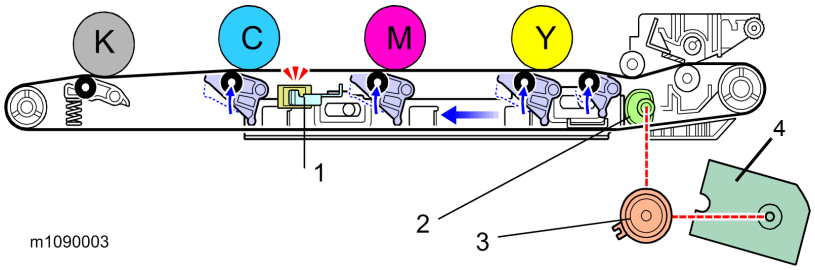


- The ITB motor [2] drives the ITB drive roller [3] via a gear to drive the image transfer belt.
- The image transfer belt rollers [1] apply transfer bias to pull toner from the photoconductor to the paper.

Slide 91

No additional notes

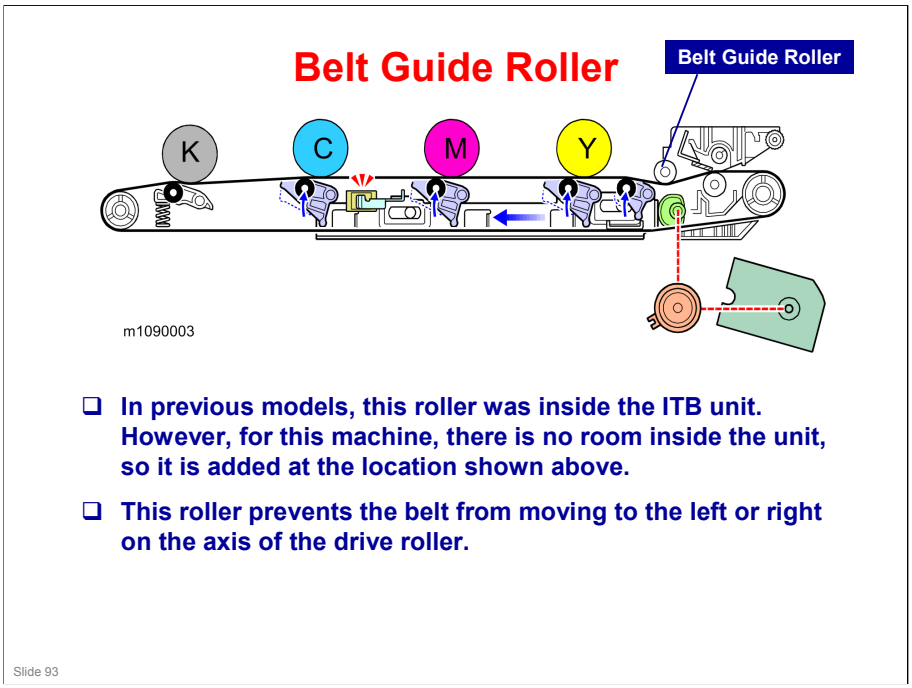
Transfer Belt Contact Mechanism



- For monochrome printing, the image transfer belt is disengaged from the color drums.
- The transfer belt contact sensor [1] detects the status of the image transfer belt.
- The transfer belt contact clutch [3] transfers the drive from the transfer motor [4], and drives the mechanism through a cam [2], to move the transfer belt into contact or away from the color drums.

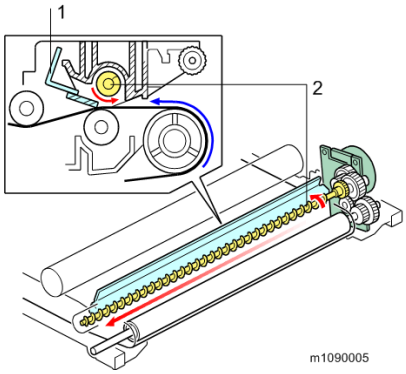
Slide 92

No additional notes



- Lab tests have shown that this roller does not require cleaning at PM.

Transfer Belt Cleaning

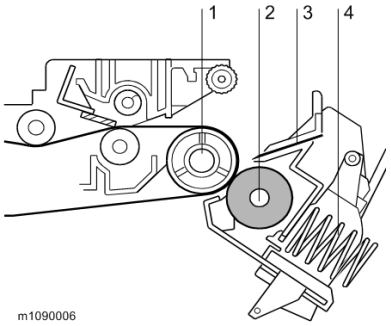


- The transfer cleaning blade [1] removes remaining toner from the belt surface.
- The waste toner transport coil [2] carries this toner to the left side of the ITB unit.

Slide 94

No additional notes

Paper Transfer Roller Unit



- The bias applied to the paper transfer roller [2] pulls the toner off the ITB and onto the paper.
- The paper transfer roller is always pressed into contact with the ITB by a spring [4].
- When a sheet of paper goes between the transfer roller and the transfer belt, the transfer roller turns with the paper.
- The discharge plate [3] removes static charge from the paper that was applied during transfer.

Slide 95

No additional notes

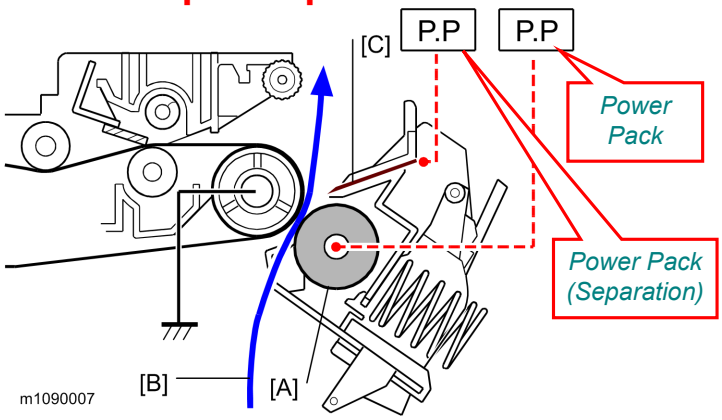
Transfer Roller Cleaning

- **Toner may transfer to the roller surface following a paper jam or if the paper is smaller than the image. Periodic cleaning of the roller is required to prevent this toner from migrating back to the rear of new printouts.**
- **The machine cleans the roller at the following times:**
  - After initial power on.
  - After clearing of a copy jam
  - At the end of a job, if at least 10 sheet have been printed since the last cleaning
- **The machine first supplies a negative cleaning current (about -4 mA) to the transfer roller, causing negatively charged toner on the roller to move back to the drum. It then applies a positive cleaning current (+5 mA) to the roller, causing any positively charged toner to migrate back to the drum.**

Slide 96

No additional notes

Paper Separation



- During paper transfer, the transfer roller [A] applies a static charge to the paper [B].
- The electric field generated by the discharge plate [C] grounds any remaining static charge after passing the transfer roller unit.

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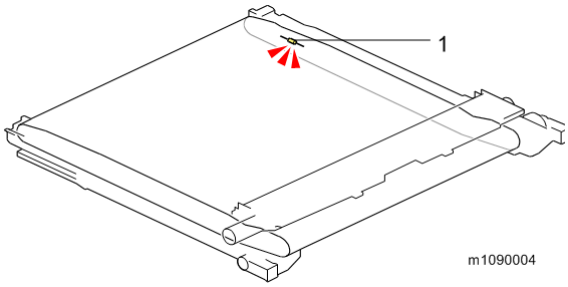
No additional notes

New ITB Unit Detection



- If the machine detects an unbroken fuse [1] immediately after the ITB unit is installed, the machine blows the fuse, and resets the life counter for the ITB.
- Immediately after this, the machine detects a blown fuse, and the life counter starts.
- The paper transfer roller is also replaced at the same time, if the user PM kit is used.
- However, if the only one of the parts is changed, counters must be reset as explained later in this part of the course.

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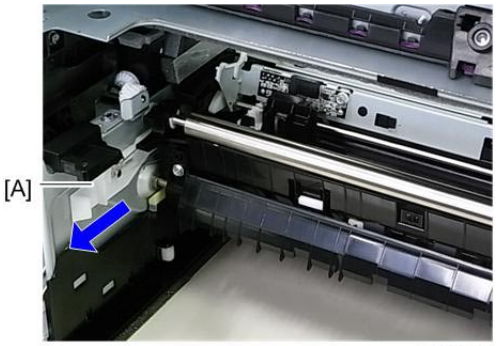
- The machine checks for replacement detection at the following three times:
  - Turning on the Main power
  - Returning from sleep mode
  - Closing the Front Cover or Upper Cover

Putting the ITB Unit Back in the Machine



- **Before you install the image transfer belt, make sure that the white lever [A] is pulled out to the position shown in this photo.**

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- If you are in a training class, or have access to the machine while doing this course, look through these next few slides before you do the procedures, to make sure you are familiar with these important points.

Installing a New ITB Unit

- **Print out the logging data using SP5-990-004 before you replace the part.**
- **The counter for the Image Transfer Belt Unit must be reset after installing a new one.**
  1. Execute SP7-804-017 and SP7-804-060
  2. Turn off the power of the machine, and then turn it back on.
- **This only applies to parts installed by service technicians.**
- **The part for replacement by users has a new unit detection mechanism.**

Slide 100

If you are replacing the image transfer belt unit

- SP7-804-017 (PM Counter Clear ITB Unit)
- SP7-804-060 (PM Counter Clear Life: ITB Unit)
- If you are replacing the image transfer belt unit, you should execute SP7-804-017, for correct control depending on the rotation distance. But, if you execute only SP7-804-017, the counter for displaying the unit life is not cleared. So you must also clear the counter by executing SP7-804-060 (PM Counter Clear Life: ITB Unit).

Installing a New Paper Transfer Roller

- **Print out the logging data using SP5-990-004 before you replace the part.**
- **The counter for the Paper Transfer Roller must be reset after installing a new one.**
  1. Execute SP7-804-022 and SP7-804-061
  2. Turn off the power of the machine, and then turn it back on.
- **This only applies to replacement by service technicians.**
- ***The Paper Transfer Roller as a supply part is kitted together with the Image Transfer Belt unit and does not require counter reset, since it will be replaced at the same time as the Image Transfer Belt Unit.***

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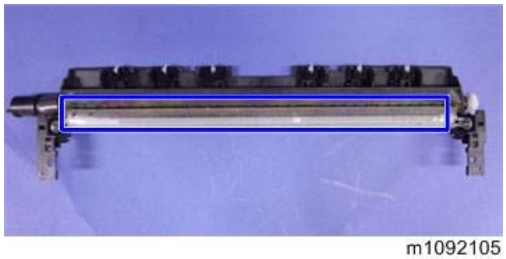
If you are replacing the paper transfer roller

- SP7-804-022 (PM Counter Clear PTR Unit)
- SP7-804-061 (PM Counter Clear Life: PTR Unit)
- If you are replacing the paper transfer roller, you should execute SP7-804-022, for correct control depending on the rotation distance. But, if you execute only SP7-804-022, the counter for displaying the unit life is not cleared. So you must also clear the counter by executing SP7-804-061 (PM Counter Clear Life: PTR Unit).

Installing a New Transfer Belt Cleaning Unit



m1092105

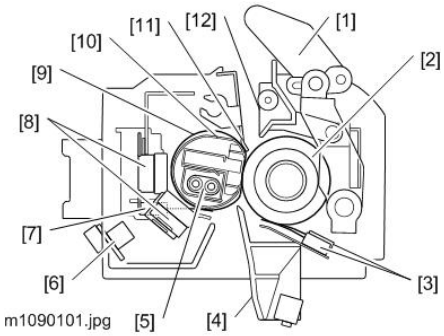
- When you change the transfer belt cleaning unit, dust the new one with toner as a lubricant.

Slide 102

No additional notes

This section explains how the image is fused to the paper.

Overview



- **This machine uses a QSU (Quick Start Up) type of fusing unit.**
  - Two fusing lamps [5] inside a pipe [10] heat a fusing belt [9].
- **This type of fusing saves energy and allows the use of a wider range of paper types than a traditional fusing unit.**
- **Also, the larger nip reduces image blurring.**

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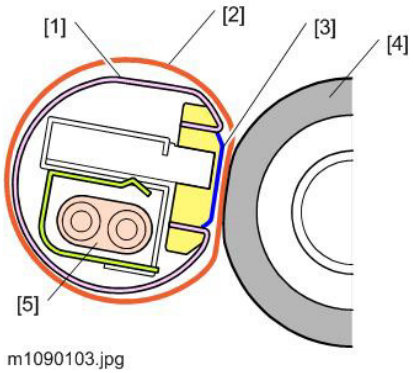
1. Pressure Release Lever
2. Pressure Roller
3. Pressure Roller Thermistors (Center/End)
4. Fusing Entrance Guide
5. Fusing Lamps
6. Thermopile
7. Thermistor (End of the fusing belt)
8. Thermostat
9. Fusing Belt
10. Heating Pipe
11. Stripper Plate
12. Fusing Exit Guide

Quick Start-up (QSU) System



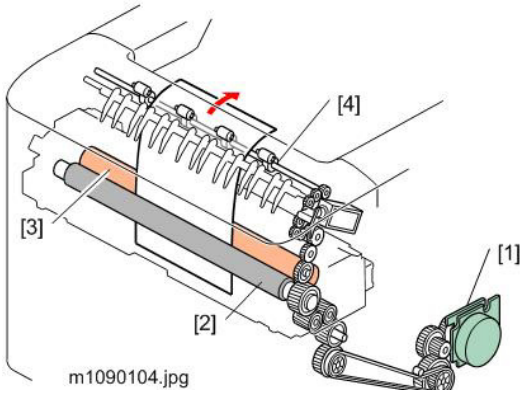
m1090103.jpg

- **1. Heating Pipe**
  - Conducts heat from the fusing lamps to the fusing belt.
- **2. Fusing Belt**
  - Rotates by friction with the pressure roller. The space between the heating pipe and the fusing belt is lubricated to reduce friction, so that the belt will rotate smoothly.
- **3. Nip Band Shaping Parts**
  - Located beneath the fusing belt to shape the nip band where the fusing belt contacts the pressure roller.
- **4. Pressure Roller**
  - The pressure roller is driven by the fusing exit motor. At the contact with the fusing belt, the pressure roller fuses the image to the paper and feeds the paper out of the fusing unit.
- **5. Fusing Lamp**
  - This consists of two halogen heaters. One heats the center. The other heats both ends.

Slide 105

No additional notes

Fusing Unit Drive



- The fusing motor [1] drives the pressure roller [2], fusing belt [3], and the exit roller [4].

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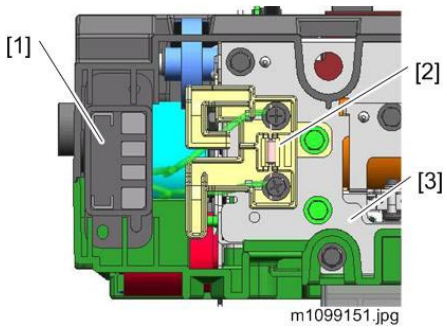
No additional notes

New Unit Detection



- This is done using a fuse [2] on the rear frame [3] of the fusing unit. *[1] is the fusing unit drawer.*
- There is no service part; the technician uses the same part as the user PM kit to replace the fusing unit. So there is no counter to reset.

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- [1] is the fusing unit drawer.

Pressure Release

- A pressure release mechanism makes it easy to remove paper jams in the fusing unit.
- The pressure lever is released when the front cover opens, and the pressure roller separates from the fusing belt due to a spring.

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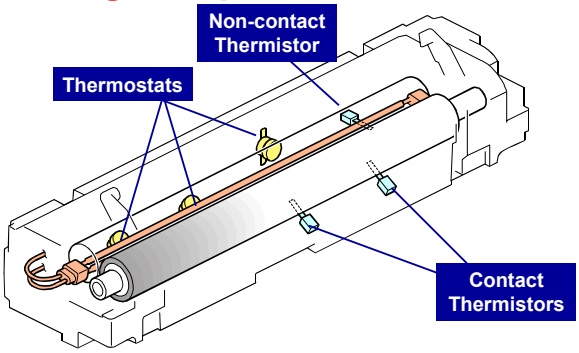
No additional notes

Fusing Temperature Control



- Thermostats and a non-contact thermistor monitor the fusing belt temperature.
- Two contact thermistors monitor the pressure roller temperature.
- The thermostat is a safety switch.

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No additional notes

Fusing Temperature Control
Warming-up Mode

- **Fusing warm-up begins after the machine power is switched on.**
- **The fusing lamps heat without roller rotation until the temperature reaches the "pre-rotation start temp."**
  - There is no roller rotation, in order to heat the lubricant between the heating pipe and the fusing belt so that the pressure roller rotation will move the belt.
- **Then, the fusing motor turns on, until the fusing temperature reaches the "start-up temperature" (also called the "reload temperature").**

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No additional notes

Fusing Temperature Control
Print Mode

- The fusing temperature increases to the “print ready temperature”, and printing starts.
- To reduce energy consumption, the fusing lamps turn off before the last sheet of paper passes completely through the fusing nip band.
- After printing, the roller continues to turn, to prevent temperature overshoot after printing.
- After a certain time, the mode changes to the wait mode.

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No additional notes

Fusing Temperature Control
Wait Mode

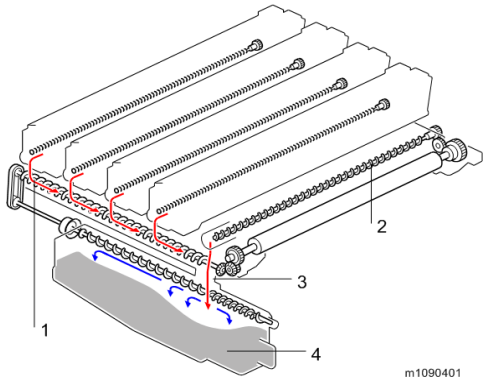
- The fusing lamps and the fusing motor turn OFF after a certain time passes after the temperature has fallen to the print ready temperature.
- At regular intervals, the fusing motor rotates for a short time at slow speed.
- The fusing motor stops when the machine is in Sleep Mode.

Slide 112

No additional notes

This section explains how the unused toner is collected from the drum and the master belt.

Overview



- Toner waste from the PCDUs is carried to the waste toner duct [1], and then to the front of the unit by a coil, and from there, it is moved down to the waste toner bottle.
- Toner waste from the ITB Unit is carried to the left side of the unit by the ITB waste toner collection coil [2] and then down to the waste toner bottle [4] via the same opening [3] as used for toner waste from the PCDUs.

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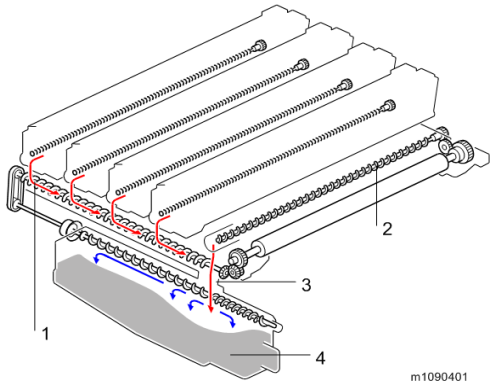
No additional notes

Drive



- The ITB waste toner collection coil [2] is driven via the drive roller in the image transfer unit.
- The coil in the waste toner duct [1] is driven via the gear on the left of the image transfer unit.
- The coil inside the waste toner bottle distributes the toner evenly inside the bottle.

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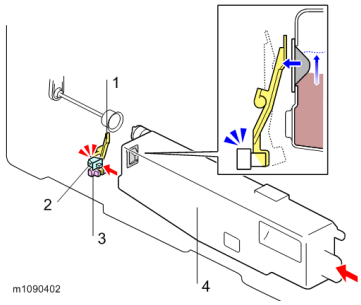
No additional notes

Waste Toner Bottle Set Sensor



- **The waste toner bottle set sensor [2] detects the presence of the waste toner bottle [4].**
- **There is no bottle replacement detection feature. If the bottle full sensor is off and the bottle set sensor is on, the machine indicates that the waste toner bottle is usable.**

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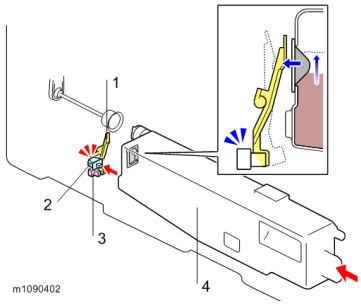
- For details on items 1 and 3 in the diagram, see the next slide.

Waste Toner Bottle Full Sensor



- When waste toner exceeds a certain amount, the rubber portion on the inner part of the waste toner bottle swells. This exerts pressure on the feeler [1], and the waste toner bottle full sensor [3] is turned on. At this time, the machine detects that the bottle is nearly full.
- After the bottle is detected to be nearly full, the machine uses a pixel count to detect when the waste toner bottle is full.
- The required pixel count between near-full and full can be adjusted with an *SP3-800-017* or a User Tool.

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No additional notes

Toner Bottle Full

- **The pixel count corresponds to a number of sheets that can be printed after indicating near full. However, these are reference values based on certain specified machine use conditions.**
  - *Normal: 625 pages*
  - *Notify Later: 375 pages*
  - *Notify Sooner: 875 pages*
- **The default is Normal. Users can change with a user tool.**
  - » *Maintenance > General Settings > Replacement Alert:*

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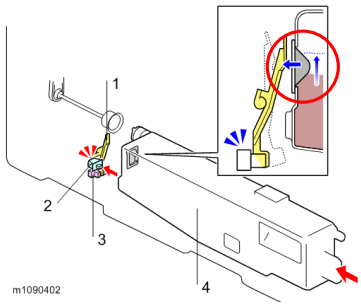
- The number of sheets that can be printed is a reference value when performing continuous printing of A4-size LEF originals at a coverage of 5% for each color and at a color ratio of 50%.
- The actual replacement frequency depends on usage, and is influenced by factors including paper size, paper type, paper feed direction, content, the number of sheets continuously printed per job and adjustments to maintain the quality of printing.

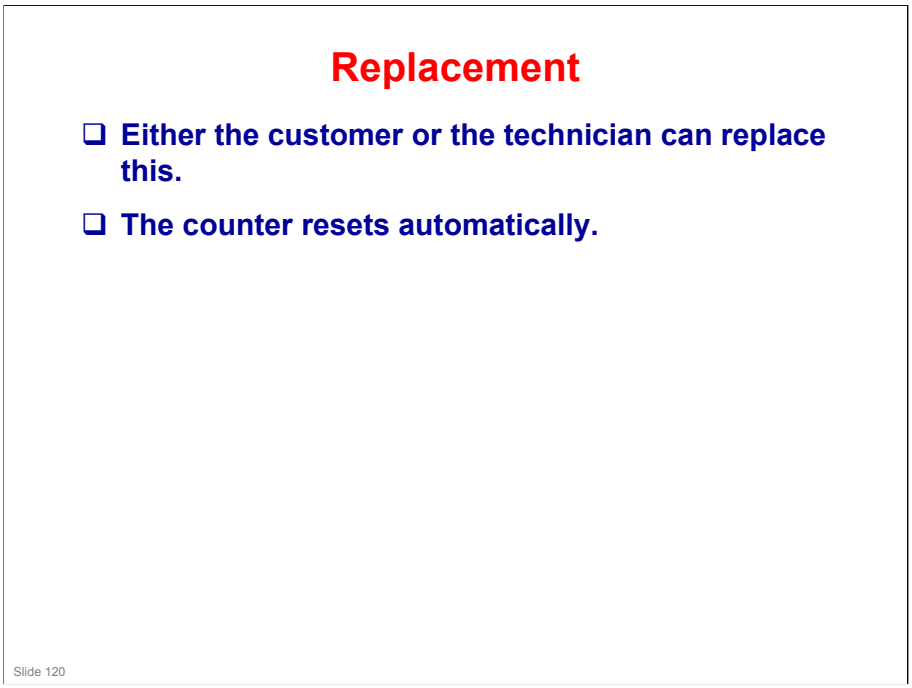
Lubricant



- A small amount of yellow toner is applied to the rubber component shown above with a red circle.
- Do not touch this rubber, or you may remove the lubricant. If you do wipe it off, apply some yellow toner.

Slide 119

No additional notes



No additional notes

This section briefly explains Auto Color Calibration (ACC) and MUSIC.

Processes

- **Process control**
  - Development bias control
  - Toner supply control
- **MUSIC**
  - The toner mark sensors (TM (ID) sensors) read patches made on the ITB, and the machine corrects color image registration based on the sensor readings.
  - The patches are made on the left and right of the ITB.
  - MUSIC is done automatically at specific times.
- **IBACC (Image transfer Belt ACC)**
  - IBACC does halftone correction by detecting the density of a gradation patch formed on the Image Transfer Belt.
  - While conventional ACC (Auto Color Calibration) prints a test chart and feeds back the density detected by the scanner, IBACC does all the operations inside the printer.
  - The TM (ID) sensors are used for this function.
  - IBACC can be executed by the user at any time, using the Auto Color Calibration function. At this time, MUSIC is done, then process control, then IBACC.

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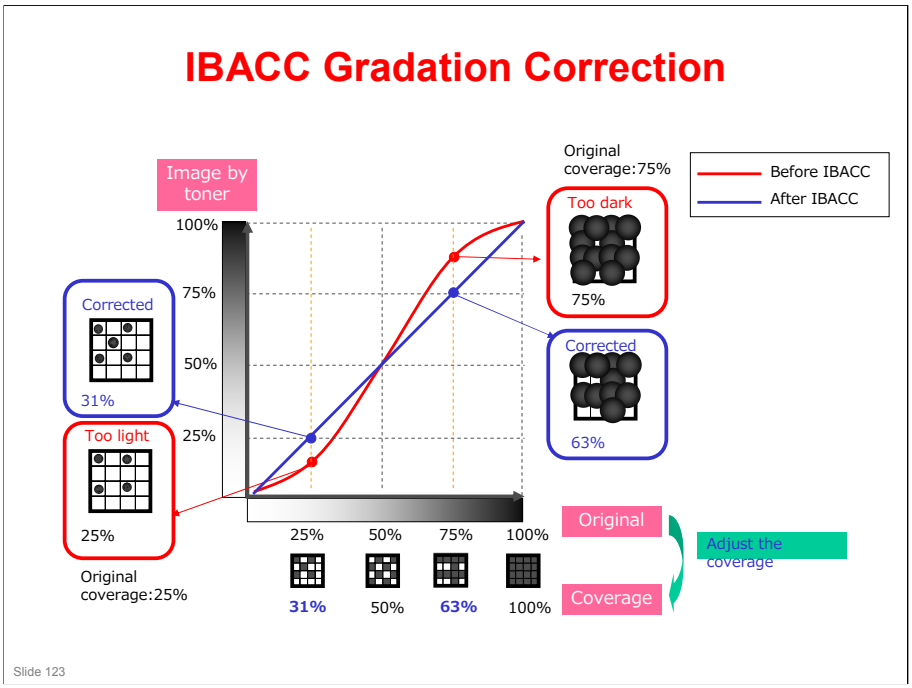
No additional notes



- Before IBACC, the machine's response is shown by the red curve. IBACC changes the response so that it is more linear, as shown by the blue line. However, the machine's response may drift away from linear with time. At this time, IBACC should be done again.

TM (ID) Sensor

m1099124.jpg

- **Below the image transfer belt [1], there are two TM (ID) (Toner Mark) sensors.**
- **These are used for MUSIC. They also act as ID sensors for use during process control and IBACC.**
- **Note that the sensor seen on the left [A] (as viewed from the front of the machine) is called the right TM (ID) sensor (TM sensor: R), and the one on the right [B] is called the left TM (ID) sensor (TM sensor: L).**
  - This will be important when we replace the TM (ID) sensors.
- **Sensors can be replaced individually (the service part consists of one sensor).**

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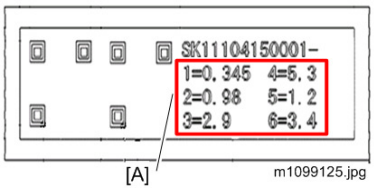
No additional notes

Replacing the TM (ID) Sensors - 1



- **Before replacement:**
  - Each sensor has a label with some numbers on it [A].
  - These numbers must be input into SP mode before you turn off the power and replace the old TM (ID) sensor.
  - As you look from the front of the machine:
    - » The sensor on the left is TM (ID) sensor: R. These values must be input into SP 3-333.
    - » The sensor on the right is TM (ID) sensor: L. These values must be input into SP 3-334.

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No additional notes

Replacing the TM (ID) Sensors - 2

- **After replacement:**
  - Execute SP3-011-004 (Adjustment manual exe. Full Music / process control)
  - If there is something wrong with the image after SP execution, make sure that input values are registered in the correct SPs.

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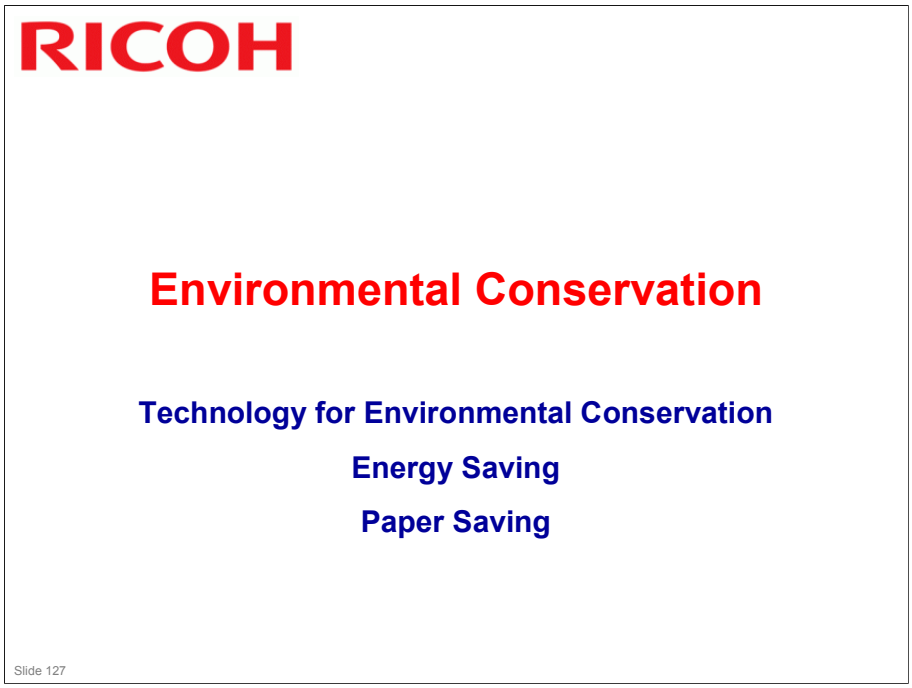
No additional notes



- This section explains the technology used in this machine for environmental conservation, and the default settings of related functions.

Technology for Environmental Conservation

**: New or modified function
*: Has this function
Blank: Does not have this function

Environmental Technology/Feature	Description	New model Ti-P1	
1. QSU	- Reduction of warm-up time (Energy saving) - Reduction of CO_2 emissions	*	
2. Hybrid QSU			
3. IH QSU			
4. Paper-saving features	- Allows documentation to be managed digitally, cutting down on paper consumption. - Improves machine productivity when printing out duplex (double-sided) images.	*	
5. High-speed duplex output	- Improves machine productivity when printing out duplex (double-sided) images	*	
6. Ozone reduction design	- Low ozone emissions	*	
7. Sphere chemical toner	-Energy saving - Conservation of materials/resources (reduced toner consumption)	**	
8. Noise reduction design	- Low noise	*	
9. Minimization of harmful substances	- Minimization of harmful substances	*	
10. Environmentally-friendly toner bottle	- Conservation of materials/resources	*	
11. Toner recycling			
12. Recycle-friendly design		*	
13. Eco Night Sensor	- Automatic machine shut-down in the dark - Reduction of CO_2 emissions	**	
14. Weekly Timer	- Automatic machine shut-down - Reduction of CO_2 emissions	**	

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- This slide explains what technologies are used for conserving the environment in this product.

Brief Descriptions of the Technologies

- **1. QSU (Quick Start-up)**
  - This technology reduces both the amount of energy consumed while in Standby mode (the Ready condition) is reduced, as well as the time it takes for the machine to warm up to the Ready condition.
  - This is made possible through the utilization of dual fusing lamp heating, low fusing point toner, a pressure roller with a "sponge" surface layer, and a thin surface layer hot roller.
- **2. Hybrid QSU**
  - This technology adds an additional circuit to conventional QSU Technology, which allows the benefits of reduced energy consumption and reduced warm-up time described above to be extended to high-speed machines.

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No additional notes

Brief Descriptions of the Technologies

- **3. IH QSU**
  - This technology incorporates IH (Inductance Heating) technology into conventional QSU technology, which allows the benefits of reduced energy consumption and reduced warm-up time to be extended to color machines.
- **4. Paper-saving features**
  - 1) The duplex (double-sided) and Combine features reduce paper consumption.
    2) The Document Server and other electronic document management features reduce paper consumption by offering an electronic method for storing and managing important documents.

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No additional notes

Brief Descriptions of the Technologies

- **5. High-speed duplex output**
  - 1) Enables high-speed duplex printing through the utilization of the Duplex Interleaf and high-speed Inverter Transport features.
  - 2) Enables quick printing of duplex jobs through the use of Duplex Scanning.
- **6. Ozone reduction design**
  - Greatly reduces the machine's ozone emissions to near-zero levels by utilizing:
    1) A charge roller/belt instead of a corona wire
    2) An image transfer roller/belt instead of a corona wire-based transfer system

Slide 131

No additional notes

Brief Descriptions of the Technologies

- **7. Sphere chemical toner**
  - This allows the toner to fuse at a lower temperature, which reduces the impact on the environment and contributes to achieving even higher image quality than before.

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No additional notes

Brief Descriptions of the Technologies

- **8. Noise reduction design**
  - 1) The machine and its components are designed to minimize the overall noise generated by the machine. As a result, all noise levels conform to the local laws and regulations as well as user requirements in each market in which the products are sold.
  - 2) Reduces the noise generated by the polygon mirror motor.
- **9. Minimization of harmful substances**
  - 1) Products sold in the EU conform to the RoHS Directive.
  - 2) Products sold in China conform to China's version of the RoHS Directive.
  - 3) In addition, Ricoh imposes strict internal standards for limiting the presence of harmful substances.

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No additional notes

Brief Descriptions of the Technologies

- **10. Environmentally-friendly toner bottle**
  - A changeover from PS/PP/HDP to PET plastics allows approximately 40 percent by weight of the toner bottle to be recycled, and also reduces CO_2 emissions that occur during the toner bottle manufacturing process.
- **11. Toner recycling**
  - Enables effective use of resources by recycling (reusing) the toner left over on the drum surface after image transfer.
- **12. Recycle-friendly design**
  - To maximize the recycling ratio of machine and component materials, as well as the ease of performing the recycling in the field, machine sections and components are designed so that the recyclable parts can be separated out easily.
  - In addition, components are designed so that they can be reused for as long as possible after the machine has reached its operational lifetime.

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No additional notes

Brief Descriptions of the Technologies

- **13. Eco Night Sensor**
  - The machine saves electricity by automatically turning off the main power (or entering sleep mode) when the room is dark.
    - » Ambient light is detected by the Eco Night Sensor on the operation panel.
    - » The sensor is a translucent circular window 4 mm in diameter
  - This will prevent waste of electricity when people forget to turn off the machine.
- **14. Weekly Timer**
  - This new feature allows the customer to set times for when the machine automatically turns the power on and off. You can set different times for each day of the week.

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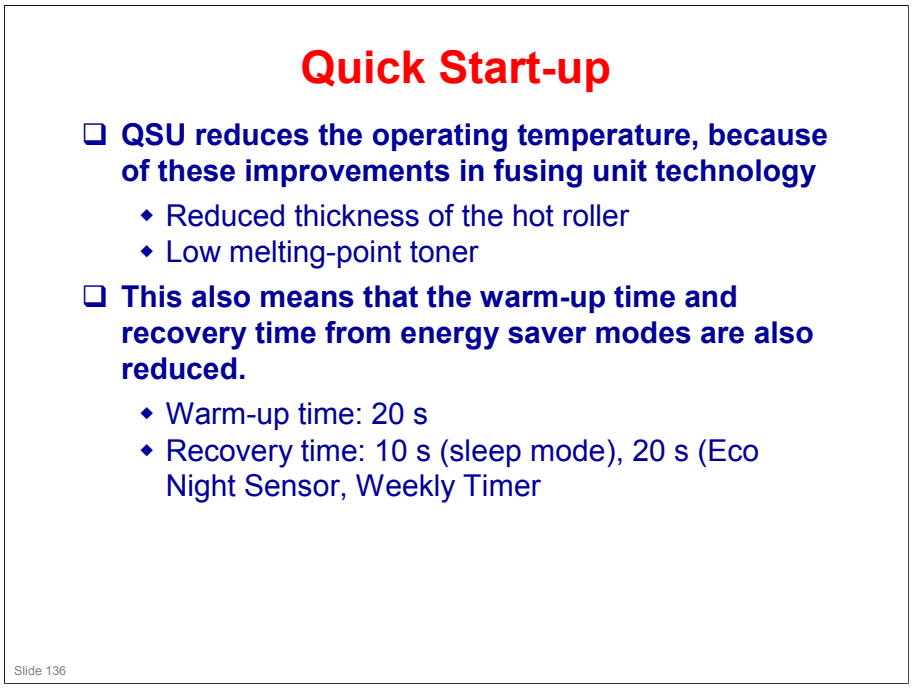
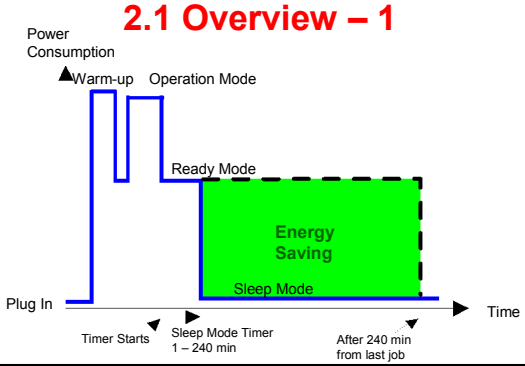
No additional notes



- Through major reductions in warm-up time and recovery time from energy saver modes (Low power, Off/Sleep), QSU (Quick Start Up) Technology has eliminated the traditional trade-off between energy saving and convenience of speed.
- The IH (induction heating) method used in the Apollon series is also a part of this technology.

2. Energy Saving

2.1 Overview – 1



Energy Saver Modes	Description
Sleep Mode	No power is supplied to the printing engine, and almost none to the controller.

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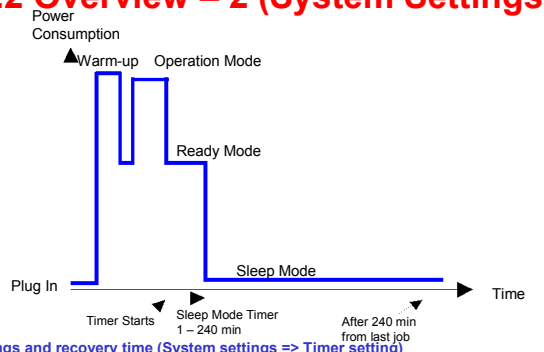
- When the machine is not being used, the machine enters energy saver mode to reduce the power consumption by turning off the LCD of the operation panel and lowering the fusing temperature.
- The area shaded green in this diagram represents the amount of energy that is saved when the timers are at the default settings. If the timers are changed, then the energy saved will be different. For example, if the timers are all set to 240 minutes, the green area will disappear, and no energy is saved before 240 minutes expires.
- Power consumption during warm-up may be much higher than shown in this diagram.

2. Energy Saving
2.2 Overview – 2 (System Settings)



1) Timer settings and recovery time (System settings => Timer setting)

Mode	Timer	Default	Setting range	Recovery time
Sleep Mode	Sleep Mode Timer	1 min.	1 to 240 min.	10 sec.

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- The user can set this timer with User Tools: User Tools > System settings > Timer Setting > Sleep Mode Timer
- We recommend that the default settings should be kept.
  - If the customer requests that these settings should be changed, please explain that their energy costs could increase, and that they should consider the effects on the environment of extra energy use.
  - If it is necessary to change the settings, please try to make sure that the timer is not too long. Try with a shorter setting first, such as 30 minutes, then go to a longer one (such as 60 minutes) if the customer is not satisfied.
  - If the timers are all set to the maximum value, the machine will not begin saving energy until 240 minutes has expired after the last job. This means that after the customer has finished using the machine for the day, energy will be consumed that could otherwise be saved.
  - If you change the settings, the energy consumed can be measured using SP8941, as explained later in this presentation.
- Power consumption during warm-up may be much higher than shown in this diagram.

2. Energy Saving
2.2 Energy Saver Mode: Condition of LEDs

❑ **Condition of LEDs on the operation panel**

Mode	Alert LED	LCD Display
Sleep Mode	On	Message is shown

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No additional notes

2. Energy Saving
2.2 Energy Saver Mode: Sleep Mode – 1

- The machine enters sleep mode when the sleep mode timer runs out after the last job.
- When the machine enters sleep mode, no power is supplied to the printing engine, and almost none to the controller.
- Recovery time
  - 10 seconds

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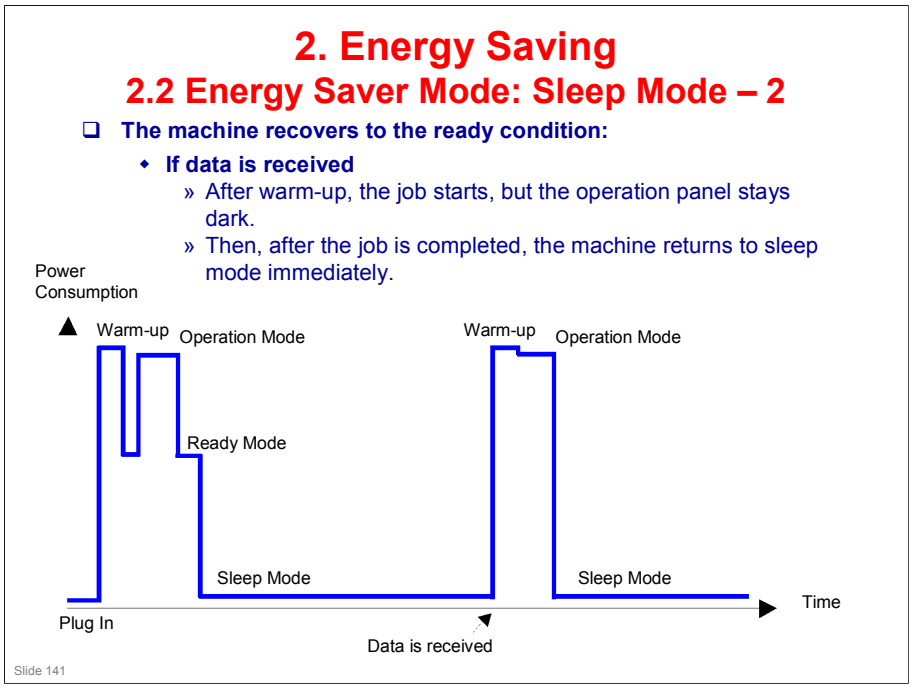
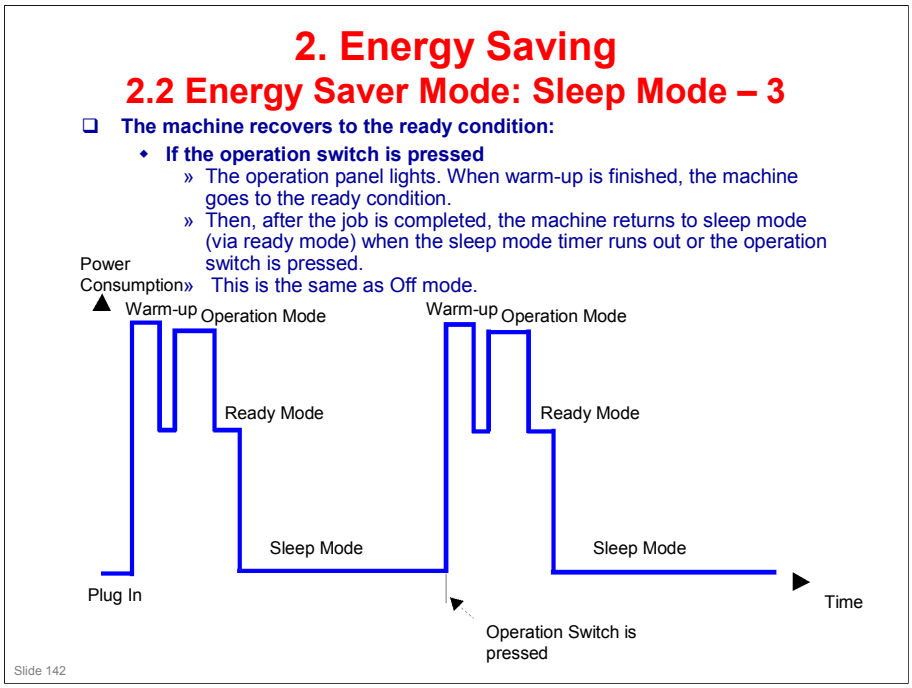
No additional notes



- This timing chart shows what happens if data is received while the machine is in sleep mode.
- Power consumption during warm-up may be much higher than shown in this diagram.



- This timing chart shows what happens if the operation switch is pressed while the machine in sleep mode.
- Power consumption during warm-up may be much higher than shown in this diagram.

2. Energy Saving

2.3 Energy Save Effectiveness – 1

- **With the data from SP 8941:Machine Status, and the power consumption values from the specifications, we can estimate the amount of energy that is used by the machine.**
  - 8941-001: Operating mode time
  - 8941-002: Standby mode time
  - 8941-004: Low power mode time
  - 8941-005: Off/sleep mode time
- **This should only be used as a reference value, because the power consumption specifications are measured in a controlled environment with a constant power supply.**
- **To get an exact measurement at the customers site, a watt meter must be used to measure the actual energy consumed.**

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No additional notes

2. Energy Saving

2.3 Energy Save Effectiveness – 2

(1) At the start of the measurement period, read the values of SP 8941:001-005 (Machine Status), measured in minutes.

(2) At the end of the measurement period,read the values of SP 8941:001-005 (Machine Status), measured in minutes.

(3) Find the amount of time spent in each mode. (Subtract the earlier measurement from the later measurement and convert the result to hours.)

(4) Power consumption figures for each model are acquired from "Publication System of MSDS_&_PEI (PRODUCT ENVIRONMENT INFORMATION)" database.
Example:

Mode/condition	Power consumption:
Operating mode	NA: 543W, EU: 565W
Ready mode / Energy Save	51W / 1W max
Low power mode	20W max
Sleep mode	1W max

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Low power mode (fusing off mode) is disabled by default. It can be enabled with a user tool.

2. Energy Saving
2.3 Energy Save Effectiveness – 3

(5) Multiply this by the power consumption spec for each mode and convert the result to kWh (kilowatt hours)

(6) This is a simulated value for power consumed.

Example calculations:

Mode/condition	SP8941: Machine Status	Time at Start (min.) (1)	Time at End (min) (2)	Running time (hour) (2) – (1)/60 = (3)	Power Consumption Spec. (W) (4)	Power consumption (KWH) (3) x (4)/1000 = (5)
Operating	001: Operating Time	21089	21386	4.95	NA: 543W EU: 565W	NA: 2.69 EU: 2.80
Stand by (Ready)	002: Standby Time	306163	308046	31.38	51	1.60
Energy save	003: Energy Save Time	0	0	0	1	0
Low power	004: Low power Time	71386	75111	62.08	20	1.24
Sleep	005: Off mode Time	508776	520377	193.35	1	0.19
Total (6)						NA: 5.72 EU: 5.83

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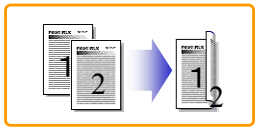
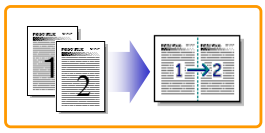
No additional notes

3. Paper Saving
3.1 Measuring the Paper Consumed – 1

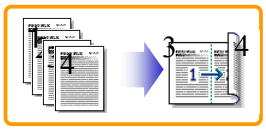
1. Duplex: Reduce paper volume in half!



2. Combine: Reduce paper volume in half!



3. Duplex + Combine: Using both features together can further reduce paper volume by 3/4!



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No additional notes

3. Paper Saving
3.1 Measuring the Paper Consumed – 2

- **To check the paper consumption, look at the total counter and the duplex counter.**
  - Total counter : SP 8581 001
  - Single-sided with duplex mode : SP 8421 001
  - Double-sided with duplex mode : SP 8421 002
  - Book with with duplex mode : SP 8421 003
  - Single-sided with combine mode : SP 8421 004
  - Duplex with combine mode : SP 8421 005
- **The total counter counts all pages printed.**
- **The duplex and combine counter counts all pages printed with duplex and combine mode.**

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No additional notes

3. Paper Saving
3.1 Measuring the Paper Consumed – 3

- **How to calculate the paper reduction ratio, when compared with Single-sided copying, with no 2-in-1 combine mode**
- **Paper reduction ratio (%) = Number of sheets reduced: A/Number of printed original images: B x 100**
  - Number of sheets reduced: A
    = Output pages in duplex mode/2＋ Number of pages in Single-sided with combine mode + Number of pages in Duplex with combine mode x 3/2
    A = (②+③+④)/2 + ⑤+⑥ x 3/2
  - Number of printed original images: B
    = Total counter＋ Number of pages in Single-sided with combine mode ＋ Number of pages in Duplex with combine mode
    B = ①+⑤+⑥

① **Total counter**	**: SP 8581 001 (pages)**
② **Single-sided with duplex mode**	**: SP 8421 001 (pages)**
③ **Double-sided with duplex mode**	**: SP 8421 002 (pages)**
④ **Book with with duplex mode**	**: SP 8421 003 (pages)**
⑤ **Single-sided with combine mode**	**: SP 8421 004 (pages)**
⑥ **Duplex with combine mode**	**: SP 8421 005 (pages)**

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In the above formula:

- Sheet: A sheet of paper
- Page: A side of a sheet of paper. In duplex mode, one sheet is two pages
  - Output page: One side of a sheet of output paper
- Original Image: An image of one original page (or, an image of one side of a two-sided original)
  - For one sheet of output paper in two-in-one copying, four original pages are copied onto two output pages.

The End