SAMSUNG

Mono Laser Printer

ML-451x / 501x series
ML-451xND/ ML-501xND
(Ver 1.01)

SERVICE MANUAL

Mono Laser Printer

Contents

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Refer to the service manual in the GSPN (see the rear cover) for more information.

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1. Precautions

In order to prevent accidents and damages to the equipment please read the precautions listed below carefully before servicing the product and follow them closely.

1.1. Safety warning

1) Only to be serviced by a factory trained service technician.

   High voltages and lasers inside this product are dangerous. This product should only be serviced by a factory trained service technician.

2) Use only Samsung replacement parts.

   There are no user serviceable parts inside the product. Do not make any unauthorized changes or additions to the product as these could cause the product to malfunctions and create an electric shocks or fi re hazards.

3) Laser Safety Statement

   The printer is certified in the U.S. to conform to the requirements of DHHS 21 CFR, chapter 1 Subchapter J for Class I(1) laser products, and elsewhere is certified as a Class I laser product conforming to the requirements of IEC 60825-1. Class I laser products are not considered to be hazardous. The laser system and printer are designed so there is never any human access to laser radiation above a Class I level during normal operation, user maintenance or prescribed service condition.

   • Wavelength: 800 nm

   • Beam divergence

       - Paraller: 11 degrees

       - Perpendicular: 35 degrees

   • Maximum power of energy output: 12 mW

⚠ **WARNING**

Never operate or service the product with the protective cover removed from Laser/Scanner assembly. The reflected beam, although invisible, can damage your eyes.

When using this product, these basic safety precautions should always be followed to reduce risk of fire, electric shock, and personal injury.

CAUTION   - CLASS 3B LASER RADIATION WHEN OPEN
                AVOID EXPOSURE TO THE BEAM.
DANGER   - LASER RADIATION AVOID DIRECT
                EXPOSURE TO BEAM.
DANGER   - RADIATIONS INVISIBLES DU LASER EN CAS
                D'OUVERTURE. EVITER TOUTE EXPOSITION
                DIRECTE AU FAISCEAU.
VORSICHT - UNSICHTBARE LASERSTRAHLUNG, WENN
                ABDECKUNG GEÖFFNET.
                NICHT DEM STRAHL AUSSETZEN.
ATTENZIONE - RADIAZIONE LASER INVISIBILE IN CASO DI
                APERTURA. EVITARE L'ESPOSIZIONE AL FASCIO.
PRECAUCIÓN - RADIACIÓN LASER INVISIBLE CUANDO SE ABRE.
                EVITAR EXPONERSE AL RAYO.
PERIGO   - RADIAÇÃO LASER INVISÍVEL AO ABRIR. EVITE
                EXPOSIÇÃO DIRECTA AO FEIXE.
GEVAAR   - ONZICHTBARE LASERSTRALEN BIJ GEOPENDE
                KLEP. DEZE KLEP NIET OPENEN.
ADVARSEL - USYNLIG LASERSTRÅLNING VED ÅBNING.
                UNDGÅ UDSAETTELSE FOR STRÅLNING.
ADVARSEL. - USYNLIG LASERSTRÅLNING NÄR DEKSEL
                ÅPNES. UNNGÅ EKSPONERING FOR STRÅLEN.
VARNING - OSYNLIG LASERSTRÅLNING NÄR DENNA DEL
                ÄR OPPEN. STRÅLEN ÄR FARLIG.
VAROITUS - NÄKYMÄTÖNTÄ LASERSÄTEILYÄ AVATTAESSA.
                VARO SUORAA ALTISTUMISTA SÄTEELLE.
注 意 - 严禁揭开此盖, 以免激光泄露灼伤
주   의 - 이 덮개를 열면 레이저광에 노출될 수 있으므로
                주의하십시오.

1.2. Caution for safety

1.2.1. Toxic material

This product contains toxic materials that could cause illness if ingested.

1) Please keep imaging unit and toner cartridge away from children. The toner powder contained in the imaging unit and toner cartridge may be harmful, and if swallowed, you should contact a doctor.

1.2.2. Electric shock and fire safety precautions

Failure to follow the following instructions could cause electric shock or potentially cause a fire.

1) Use only the correct voltage, failure to do so could damage the product and potentially cause a fire or electric shock.

2) Use only the power cable supplied with the product. Use of an incorrectly specified cable could cause the cable to overheat and potentially cause a fire.

3) Do not overload the power socket, this could lead to overheating of the cables inside the wall and could lead to a fire.

4) Do not allow water or other liquids to spill into the product, this can cause electric shock. Do not allow paper clips, pins or other foreign objects to fall into the product, these could cause a short circuit leading to an electric shock or fire hazard.

5) Never touch the plugs on either end of the power cable with wet hands, this can cause electric shock. When servicing the product, remove the power plug from the wall socket.

6) Use caution when inserting or removing the power cord. When removing the power cord, grip it firmly and pull. The power cord must be inserted completely, otherwise a poor contact could cause overheating leading to a fire.

7) Take care of the power cable. Do not allow it to become twisted, bent sharply around corners or wise damaged. Do not place objects on top of the power cable. If the power cable is damaged it could overheat and cause a fire. Exposed cables could cause an electric shock. Replace the damaged power cable immediately, do not reuse or repair the damaged cable. Some chemicals can attack the coating on the power cable, weakening the cover or exposing cables causing fire and shock risks.

8) Ensure that the power sockets and plugs are not cracked or broken in any way. Any such defects should be repaired immediately. Take care not to cut or damage the power cable or plugs when moving the machine.

9) Use caution during thunder or lightning storms. Samsung recommends that this machine be disconnected from the power source when such weather conditions are expected. Do not touch the machine or the power cord if it is still connected to the wall socket in these weather conditions.

10) Avoid damp or dusty areas, install the product in a clean well ventilated location. Do not position the machine near a humidifier or in front of an air conditioner. Moisture and dust built up inside the machine can lead to overheating and cause a fire or cause parts to rust.

11) Do not position the product in direct sunlight. This will cause the temperature inside the product to rise possibly leading to the product failing to work properly and in extreme conditions could lead to a fire.

12) Do not insert any metal objects into the machine through the ventilator fan or other part of the casing, it could make contact with a high voltage conductor inside the machine and cause an electric shock.

13) ⚠ When replacing the SMPS board, please wait 5 minutes after unplugging the power cord, then replace it. You can get a shock by the electric discharge.

1.2.3. Handling precautions

The following instructions are for your own personal safety to avoid injury and so as not to damage the product.

1) Ensure the product is installed on a level surface, capable of supporting its weight. Failure to do so could cause the product to tip or fall.

2) The product contains many rollers, gears and fans. Take great care to ensure that you do not catch your fingers, hair or clothing in any of these rotating devices.

3) Do not place any small metal objects, containers of water, chemicals or other liquids close to the product which if spilled could get into the machine and cause damage or a shock or fire hazard.

4) Do not install the machine in areas with high dust or moisture levels, beside on open window or close to a humidifier or heater. Damage could be caused to the product in such areas.

5) Do not place candles, burning cigarettes, etc on the product, These could cause a fire.

1.2.4. Assembly and Disassembly precautions

1) Replace parts carefully and always use Samsung parts. Take care to note the exact location of parts and also cable routing before dismantling any part of the machine. Ensure all parts and cables are replaced correctly. Please carry out the following procedures before dismantling the product or replacing any parts.

2) Ensure that power is disconnected before servicing or replacing any electrical parts.

3) Disconnect interface cables and power cables.

4) Only use approved spare parts. Ensure that part number, product name, any voltage, current or temperature rating are correct.

5) When removing or re-fitting any parts do not use excessive force, especially when fitting screws into plastic.

6) Take care not to drop any small parts into the machine.

7) Handling of the OPC Drum

   •   The OPC Drum can be irreparably damaged if it exposed to light. Take care not to expose the OPC Drum either to direct sunlight or to fluorescent or incandescent room lighting. Exposure for as little as 5 minutes can damage the surface of the photoconductive properties and will result in print quality degradation. Take extra care when servicing the product. Remove the OPC Drum and store it in a black bag or other lightproof container. Take care when working with the Covers (especially the top cover) open as light is admitted to the OPC area and can damage the OPC Drum.

   •   Take care not to scratch the green surface of OPC Drum Unit. If the green surface of the Drum Cartridge is scratched or touched the print quality will be compromised.

1.2.5. Disregarding this warning may cause bodily injury

1) Be careful with the high temperature part.

   The fuser unit works at a high temperature. Use caution when working on the printer. Wait for the fuser to cool down before disassembly.

2) Do not put finger or hair into the rotating parts.

   When operating a printer, do not put hand or hair into the rotating parts (Paper feeding entrance, motor, fan, etc.). If do, you can get harm.

3) When you move the printer.

   This printer weighs 6kg including toner cartridge and cassette. Use safe lifting and handling techniques. Use the lifting handles located on each side of the machine. Back injury could be caused if you do not lift carefully.

4) Ensure the printer is installed safely.

   The printer weighs 6kg, ensure the printer is installed on a level surface, capable of supporting its weight. Failure to do so could cause the printer to tip or fall possibly causing personal injury or damaging the printer.

5) Do not install the printer on a sloping or unstable surface. After installation, double check that the printer is stable.

1.3. ESD precautions

Certain semiconductor devices can be easily damaged by static electricity. Such components are commonly called "Electrostatically Sensitive (ES) Devices" or ESDs. Examples of typical ESDs are: integrated circuits, some field effect transistors, and semiconductor "chip" components. The techniques outlined below should be followed to help reduce the incidence of component damage caused by static electricity.

⚠ **CAUTION**

Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.

1) Immediately before handling a semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, employ a commercially available wrist strap device, which should be removed for your personal safety reasons prior to applying power to the unit under test.

2) After removing an electrical assembly equipped with ESDs, place the assembly on a conductive surface, such as aluminum or copper foil, or conductive foam, to prevent electrostatic charge buildup in the vicinity of the assembly.

3) Use only a grounded tip soldering iron to solder or desolder ESDs.

4) Use only an "anti-static" solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ESDs.

5) Do not use Freon-propelled chemicals. When sprayed, these can generate electrical charges sufficient to damage ESDs.

6) Do not remove a replacement ESD from its protective packaging until immediately before installing it. Most replacement ESDs are packaged with all leads shorted together by conductive foam, aluminum foil, or a comparable conductive material.

7) Immediately before removing the protective shorting material from the leads of a replacement ESD, touch the protective material to the chassis or circuit assembly into which the device will be installed.

8) Maintain continuous electrical contact between the ESD and the assembly into which it will be installed, until completely plugged or soldered into the circuit.

9) Minimize bodily motions when handling unpackaged replacement ESDs. Normal motions, such as the brushing together of clothing fabric and lifting one's foot from a carpeted floor, can generate static electricity sufficient to damage an ESD.

2. Product Specifications and Description

2.1. Specifications

2.1.1. Product Overview

	1) Speed
	    • ML-451x series: 45 ppm in letter (43 ppm in A4)
	    • ML-501x series : 50 ppm in letter (48 ppm in A4)
	2) Printing Resolution
	    • Max. 1200 x 1200 dpi effective output
	3) Processor
	    • 600 MHz
	4) Printer Emulation
	    • PCL5e / PCL6 / PS3/ XPS / PDF / EPSON / IBM ProPrinter
	5) Memory
	    • ML-451x series : 128 MB / 640 MB
	    • ML-501x series : 256 MB / 768 MB
	6) Interfaces
	    • High Speed USB 2.0
	    • 1 GB Ethernet
	7) Toner Cartridge
	    • ML-451x Series : 7K / 15K
	    • ML-501x Series : 7K / 15K / 20K
	8) Various Optional Units
	    • ML-451x Series : Optional Memory, SCF
	    • ML-501x Series : Optional Memory, SCF, Mass Storage Device, Mailbox, Finisher

2.1.2. Specifcations

Product specifications are subject to change without notice.

2.1.2.1. General Specifications

Item		ML-451x series	ML-501x series
General	Size (W*D*H) without optional	418 x 435 x 358 mm (16.5 x 17.1 x 14.1 inches)	418 x 435 x 358 mm (16.5 x 17.1 x 14.1 inches)
	Weight with consumables	26.45 Kg (58.31 lbs)	26.45 Kg (58.31 lbs)
	I/O Interface	USB2.0 , USB HOST2.0, NW(10/100/1G)	USB2.0 , USB HOST2.0, NW(10/100/1G)
Noise Level	Printing	54 dBA	54 dBA
	Ready	30 dBA	30 dBA
Temperature	Operation	10 to 30 °C (50 to 86 °F)	10 to 30 °C (50 to 86 °F)
	Storage (Packed)	-20 to 40 °C (-4 to 104°F)	-20 to 40 °C (-4 to 104°F)
Humidity	Operation	10 to 85% RH	10 to 85% RH
	Storage (Packed)	5 to 90% RH	5 to 90% RH
Power rating	110 volt models	AC 110~127 V	AC 110~127 V
	220 volt models	AC 220~240V	AC 220~240V
Power consumption	Average operating mode	Less than 850 W	Less than 900 W
	Ready mode	Less than 12 W	Less than 15 W
	Power save mode	Less than 4.5 W	Less than 4.5 W
Machine Life	Printing Volume (Set AMPV)	4,000 sheets / month	5,000 sheets / month
	Max Monthly Duty Cycle	150K	200K
Controller		Samsung Dual Core 600MHz	Samsung Dual Core 600MHz
Device Memory	Std.	128 MB	256 MB
	Max	640 MB	768 MB
Control Panel		4 Line Text Graphic LCD	• 5010ND/ 5012ND : 4 Line Text Graphic LCD • 5015ND/ 5017ND : TFT LCD (Touch Screen)

2.1.2.2. Print Specifications

Item		ML-451x series	ML-501x series
Print Speed	Simplex	45 ppm (Letter) / 43 ppm (A4)	50 ppm (Letter) / 48 ppm (A4)
	Duplex	29 ipm (Letter) / 28 ipm (A4)	33 ipm (Letter) / 31 ipm (A4)
Print Language		PCL5e, PCL6 IBM ProPrinter, EPSON, PostScript3, PDF Direct V1.7, XPS v1.0	PCL5e, PCL6 IBM ProPrinter, EPSON, PostScript3, PDF Direct V1.7, XPS v1.0
Power Save		Yes	Yes
Resolution	Optical	600 x 600 dpi	600 x 600 dpi
	Enhanced	1200 x 1200 dpi	1200 x 1200 dpi
Toner Save		Yes	Yes
FPOT	From ready	As fast as 7 sec	As fast as 7 sec
	From sleep	Less than 14.5 sec	Less than 14.5 sec
Duplex Print		Yes	Yes
Non-Printable Area	Other Media	Top & Bottom : 4.23 mm (0.2") from edge Left & Right: 3 mm (0.11") from edge	Top & Bottom : 4.23 mm (0.2") from edge Left & Right: 3 mm (0.11") from edge
	Envelope	Top & Bottom: 10 mm (0.4") from edge Left & Right: 10 mm (0.4") from edge	Top & Bottom: 10 mm (0.4") from edge Left & Right: 10 mm (0.4") from edge

2.1.2.3. Paper Handling Specifications

Item		ML-451x series	ML-501x series
Main Tray	Capacity	- Plain Paper: 520 sheets @ 20lb (80g/m²) - envelopes: 50 sheets	- Plain Paper: 520 sheets @ 20lb (80g/m²) - envelopes: 50 sheets
	Media sizes	Letter, Legal, Oficio, Folio, A4, JIS B5, ISO B5, Executive, A5, Statement, Envelope B5, Envelope COM-10, Envelope DL, Envelope C5, Custom(98.6*210 ~ 216*356)	Letter, Legal, Oficio, Folio, A4, JIS B5, ISO B5, Executive, A5, Statement, Envelope B5, Envelope COM-10, Envelope DL, Envelope C5, Custom(98.6*210 ~ 216*356)
	Media types	Plain Paper, Thin Paper, Bond, Punched, Pre-Printed, Recycled, Envelope, Transparency, Label, Card Stock, Letter head, Thick, Cotton, Colored, Archive, Extra Thick	Plain Paper, Thin Paper, Bond, Punched, Pre-Printed, Recycled, Envelope, Transparency, Label, Card Stock, Letter head, Thick, Cotton, Colored, Archive, Extra Thick
	Media weight	- Supported Weight: 60 ~ 163 g/m² - Plain Paper: 60~120 g/m² - Thin Paper: 60 g/m² (16 lb) - Bond: 105~120 g/m² (28~32 lb) - Punched: 60~90 g/m² (16~24 lb) - Pre-Printed : 60~90 g/m² (16~24 lb) - Recycled : 90~105 g/m² (20~24 lb) - Envelope : 75~90 g/m² - Transparency : 138~146 g/m² (16~24 lb) - Label : 120~150 g/m² - Letterhead : 90 g/m² cotton paper	- Supported Weight: 60 ~ 163 g/m² - Plain Paper: 60~120 g/m² - Thin Paper: 60 g/m² (16 lb) - Bond: 105~120 g/m² (28~32 lb) - Punched: 60~90 g/m² (16~24 lb) - Pre-Printed : 60~90 g/m² (16~24 lb) - Recycled : 90~105 g/m² (20~24 lb) - Envelope : 75~90 g/m² - Transparency : 138~146 g/m² (16~24 lb) - Label : 120~150 g/m² - Letterhead : 90 g/m² cotton paper

Item		ML-451x series	ML-501x series
Bypass tray	Sensing	- H/W Install Detect: Yes - Paper Empty : Yes - Paper Type Detect: No - Paper Size Detect: Yes	- H/W Install Detect: Yes - Paper Empty : Yes - Paper Type Detect: No - Paper Size Detect: Yes
	Capacity	- Plain paper : 100 sheets @ 20lb (80g/m²) - Transparency : 20 sheets - Envelopes : 10 sheets - Labels : 10 sheets - Thick (163 ~220 g/m²) : 10 sheets - Transparency : 20 sheets	- Plain paper : 100 sheets @ 20lb (80g/m²) - Transparency : 20 sheets - Envelopes : 10 sheets - Labels : 10 sheets - Thick (163 ~220 g/m²) : 10 sheets - Transparency : 20 sheets
	Media sizes	- 76.2 x 127 mm (3" x 5") ~ 216 x 356 mm (8.5" x 14") - Banner Size Printing : 216mm x 900mm	- 76.2 x 127 mm (3" x 5") ~ 216 x 356 mm (8.5" x 14") - Banner Size Printing : 216mm x 900mm
	Media type	Printer Default, Plain Paper, Thick Paper, Thin Paper, Bond Paper, Color Paper, CardStock, Labels, Transparency, Envelope, Preprinted, Cotton, Recycled Paper, Archive, Extra Thick	Printer Default, Plain Paper, Thick Paper, Thin Paper, Bond Paper, Color Paper, CardStock, Labels, Transparency, Envelope, Preprinted, Cotton, Recycled Paper, Archive, Extra Thick
	Media weight	16~58 lb (60 to 220 g/m²)	16~58 lb (60 to 220 g/m²)
	Sensing	Paper empty sensor	Paper empty sensor
Optional Cassette tray (Second Cassette)	Capacity	Plain Paper: 520 sheets @ 20lb (80 g/m²)	Plain Paper: 520 sheets @ 20lb (80 g/m²)
	Media sizes	Letter, Legal, Oficio, Folio, A4, JIS B5, ISO B5, Executive, A5, Statement, Custom(98.6*210 ~ 216*356)	Letter, Legal, Oficio, Folio, A4, JIS B5, ISO B5, Executive, A5, Statement, Custom(98.6*210 ~ 216*356)
	Media types	Plain Paper, Thin Paper, Bond, Punched, Pre-Printed, Recycled, Transparency, Label, Card Stock, Letterhead, Thick, Cotton, Colored, Archive, Extra Thick	Plain Paper, Thin Paper, Bond, Punched, Pre-Printed, Recycled, Transparency, Label, Card Stock, Letterhead, Thick, Cotton, Colored, Archive, Extra Thick
	Media weight	- Supported Weight: 60 ~ 163 g/m² - Plain Paper: 60~120 g/m² - Thin Paper: 60 g/m² (16 lb) - Bond: 105~120 g/m² (28~32 lb) - Punched: 60~90 g/m² (16~24 lb) - Pre-Printed : 60~90 g/m² (16~24 lb) - Recycled : 90~105 g/m² (20~24 lb) - Transparency : 138~146 g/m² (16~24 lb) - Label : 120~150 g/m² - Letterhead : 90 g/m² cotton paper	- Supported Weight: 60 ~ 163 g/m² - Plain Paper: 60~120 g/m² - Thin Paper: 60 g/m² (16 lb) - Bond: 105~120 g/m² (28~32 lb) - Punched: 60~90 g/m² (16~24 lb) - Pre-Printed : 60~90 g/m² (16~24 lb) - Recycled : 90~105 g/m² (20~24 lb) - Transparency : 138~146 g/m² (16~24 lb) - Label : 120~150 g/m² - Letterhead : 90 g/m² cotton paper
	Sensing	- H/W Install Detect: Yes - Paper Empty : Yes - Paper Type Detect: No - Paper Size Detect: Yes	- H/W Install Detect: Yes - Paper Empty : Yes - Paper Type Detect: No - Paper Size Detect: Yes
Out put Stacking (Main set)	Face Down	500 sheets @ 20lb (80 g/m²)	500 sheets @ 20lb (80 g/m²)
4bin mail box	Face Down	N/A	400 sheets @ 20lb (80 g/m²) (100 sheet 4-bin)

Item		ML-451x series	ML-501x series
Offset catch tray	Capacity	N/A	500 sheets @ 20lb (80 g/m²) 20 sheet stapler
Automatic duplex	Supporting	YES	YES
	Media sizes	A4, Letter, Legal, folio, Oficio	A4, Letter, Legal, folio, Oficio
	Media types	Plain Paper, Thin Paper, Thick Paper	Plain Paper, Thin Paper, Thick Paper
	Media weight	60 ~ 120g/ (16 ~ 32lb)	60 ~ 120g/ (16 ~ 32lb)

2.1.2.4. **Software and Interface Specifications**

Item		ML-451x series	ML-501x series
Driver	Default Driver	PCL	PCL
	Supporting OS	WINDOW 2000/ XP(32/64bit)/ 2003 Server(32/64bit)/ Vista(32/64bit)/ 2008 Server(32/64bit)/ 7/ 2008 Server R2	WINDOW 2000/XP(32/64bit)/2003 Server(32/64bit)/Vista(32/64bit)/2008 Server(32/64bit)/7/2008 Server R2
		Linux - RedHat Enterprise Linux WS 4, 5 (32/64 bit) - Fedora 5, 6, 7, 8, 9, 10, 11, 12, 13 (32/64 bit) - SuSE Linux 10.1 (32 bit) - OpenSuSE 10.2, 10.3, 11.0, 11.1, 11.2 (32/64 bit) - Mandriva 2007, 2008, 2009, 2009.1, 2010 (32/64 bit) - Ubuntu 6.06, 6.10, 7.04, 7.10, 8.04, 8.10, 9.04, 9.10, 10.04 (32/64 bit) - SuSE Linux Enterprise Desktop 10, 11 (32/64 bit) - Debian 4.0, 5.0 (32/64 bit)	Linux - RedHat Enterprise Linux WS 4, 5 (32/64 bit) - Fedora 5, 6, 7, 8, 9, 10, 11, 12, 13 (32/64 bit) - SuSE Linux 10.1 (32 bit) - OpenSuSE 10.2, 10.3, 11.0, 11.1, 11.2 (32/64 bit) - Mandriva 2007, 2008, 2009, 2009.1, 2010 (32/64 bit) - Ubuntu 6.06, 6.10, 7.04, 7.10, 8.04, 8.10, 9.04, 9.10, 10.04 (32/64 bit) - SuSE Linux Enterprise Desktop 10, 11 (32/64 bit) - Debian 4.0, 5.0 (32/64 bit)
		Mac OS X 10.3~10.6	Mac OS X 10.3~10.6
		UNIX Sun Solaris 9,10 (x86, SPARC) HP-UX 11.0, 11i v1, 11i v2, 11i v3 (PA-RISC, Itanium) IBM AIX 5.1, 5.2, 5.3, 5.4	UNIX Sun Solaris 9,10 (x86, SPARC) HP-UX 11.0, 11i v1, 11i v2, 11i v3 (PA-RISC, Itanium) IBM AIX 5.1, 5.2, 5.3, 5.4
	WHQL	WINDOW 2000/XP(32/64bit)/2003 Server(32/64bit)/Vista(32/64bit)/2008 Server(32/64bit)/7/2008 Server R2	WINDOW 2000/XP(32/64bit)/2003 Server(32/64bit)/Vista(32/64bit)/2008 Server(32/64bit)/7/2008 Server R2
Application	Smart Panel	Install Default (Supporting OS is same with driver.)	Install Default (Supporting OS is same with driver.)
	Network Management	- Set IP, SWAS 5.0 & SWS 2.0, CounThru 3.0 - SWAS Plug-In - Job Accounting, Driver Management Plug-in, Device Map Plug-in	- Set IP, SWAS 5.0 & SWS 2.0, CounThru 3.0 - SWAS Plug-In - Job Accounting, Driver Management Plug-in, Device Map Plug-in
	AnyWeb Print	YES	YES
Interface	Parallel	IEEE 1284b Parallel Option Connector	IEEE 1284b Parallel Option Connector
	USB	High Speed USB 2.0 • Device 1 port • Host 1 port (Rear 1)	High Speed USB 2.0 • Device 1 port • Host 2 port (Rear 1, Front 1)
	Wired Network	10/100/1000 Base TX	10/100/1000 Base TX
	Wireless Network	N/A	N/A

2.1.2.5. Network Specifications

Item		ML-451x series	ML-501x series
Protocol	TCP/IP	TCP/IPv4/IPv6, HTTP, SNMPv1/v2c/v3, SMTP, IPSec, DNS/WINS, DDNS, DHCP, SSL/TLS, BOOTP, AutoIP, Standard TCP/IP printing, LPR, IPP, UPnP(SSDP), Bonjour, Telnet, WSD, SLP, SetIP	TCP/IPv4/IPv6, HTTP, SNMPv1/v2c/v3, SMTP, IPSec, DNS/WINS, DDNS, DHCP, SSL/TLS, BOOTP, AutoIP, Standard TCP/IP printing, LPR, IPP, UPnP(SSDP), Bonjour, Telnet, WSD, SLP, SetIP
	Others	HTTPs, IPPs, 802.1x (EAP-MD5, EAP-MSCHAPv2, PEAP, TLS), IPSec	HTTPs, IPPs, 802.1x (EAP-MD5, EAP-MSCHAPv2, PEAP, TLS), IPSec
Supporting OS	Windows	• Microsoft Windows 2000/ XP(32/64bits)/ 2003 Server(32/64bits)/ Vista(32/64bits)/ 2008 Server(32/64bit)/ 7/ 2008 Server R2	• Microsoft Windows 2000/ XP(32/64bits)/ 2003 Server(32/64bits)/ Vista(32/64bits)/ 2008 Server(32/64bit)/ 7/ 2008 Server R2
	Mac	• Mac OS 10.3~10.6	• Mac OS 10.3~10.6
	Linux	• RedHat 8 ~ 9(32bit)/ Enterprise Linux WS 4, 5(32/64bit) • Fedora Core 1 ~ 7 (32/64bit) • SuSE 8.2 ~ 10.2/ Enterprise Desktop 9~10 (32/64bit) • Madrake 9.2 ~ 10.1 (32/64bit) • Mandriva 2005 ~ 2007 • Ubuntu 6.06 ~ 7.04 • Debian 3.1 ~ 4.0	• RedHat 8 ~ 9(32bit)/ Enterprise Linux WS 4, 5(32/64bit) • Fedora Core 1 ~ 7 (32/64bit) • SuSE 8.2 ~ 10.2/ Enterprise Desktop 9~10 (32/64bit) • Madrake 9.2 ~ 10.1 (32/64bit) • Mandriva 2005 ~ 2007 • Ubuntu 6.06 ~ 7.04 • Debian 3.1 ~ 4.0
	Novell	• Netware 5.x, 6.x (TCP/IP Only)	• Netware 5.x, 6.x (TCP/IP Only)
	Others (Unix)	• Sun Solaris 8,9,10 (SPARC/x86) IBM AIX 5.x (6.1) IBM Linux (System P) HP-UX 11i (PA-RISC/IA-64) (11.11/11.20/11.22/11.23/11.31)	• Sun Solaris 8,9,10 (SPARC/x86) IBM AIX 5.x (6.1) IBM Linux (System P) HP-UX 11i (PA-RISC/IA-64) (11.11/11.20/11.22/11.23/11.31)

2.1.2.6. Consumables

Item		ML-451x series	ML-501x series
Toner Cartridge	Model Name	MLT-D307S / MLT-D307L / MLT-D307E	MLT-D307S / MLT-D307L / MLT-D307E
	Yield	• Standard : Average Cartridge Yield 7K standard pages. • High yield : Average Cartridge Yield 15K standard pages. • Extra High Yield: Average cartridge Yield 20K standard pages. * Declared cartridge yield in accordance with ISO/IEC 19752.	• Standard : Average Cartridge Yield 7K standard pages. • High yield : Average Cartridge Yield 15K standard pages. • Extra High Yield: Average cartridge Yield 20K standard pages. * Declared cartridge yield in accordance with ISO/IEC 19752.
Imaging Unit	Model Name	MLT-R307	MLT-R307
	Yield	Approx. 60,000 pages	Approx. 60,000 pages

2.1.2.7. Maintenance Parts

Item		ML-451x series	ML-501x series
Pick-Up roller	Yield	Approx. 100,000 pages	Approx. 100,000 pages
	Part Code	JC97–02259A	JC97–02259A
Retard roller	Yield	Approx. 100,000 pages	Approx. 100,000 pages
	Part Code	JC97–02259A	JC97–02259A
Forward roller	Yield	Approx. 100,000 pages	Approx. 100,000 pages
	Part Code	JC97–02259A	JC97–02259A
Transfer roller	Yield	Approx. 100,000 pages	Approx. 100,000 pages
	Part Code	JC93–00393A	JC93–00393A
Fuser unit	Yield	Approx. 100,000 pages	Approx. 100,000 pages
	Part Code	• JC91–01028A (220V) • JC91–01029A (110V)	• JC91–01028A (220V) • JC91–01029A (110V)

⚠️ **NOTE**

It will be affected by the operating system used, computing performance, application software, connecting method, media type, media size and job complexity.

2.1.2.8. Option

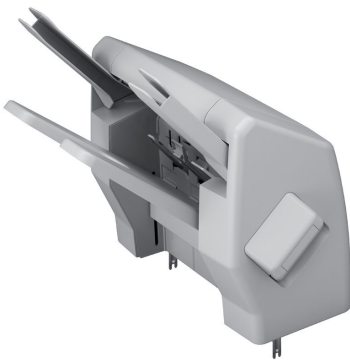| Item	Model Name	Support	
		ML-451x series	ML-501x series
512 MB Optional Memory	ML-MEM170	O	O
SCF (Option Tray)	ML-S5010A (Wave type)	O	O
	ML-S5012A (Flat type)	O	O
Mass Storage Device	ML-HDK425		O
Short Stand	ML-DSK65S		O
Finisher (Stacker & Stapler)	ML-OCT65		O
Multbin mailbox	ML-MBT65		O

⚠ NOTE

- ML-451x series can install only 1 optional tray, but ML-501x series can install max. 4 optional trays.

- Production of finisher and mailbox is discontinued.('15.June) Also, the machine which were produced since June 9th, 2015 need to be reworked to compatible with finisher and mailbox.

2.1.2.9. Finisher and Mail box specifications

⚠️ **NOTE**

ML-451x series does not support the finisher and mail-box.

General specification

Item	Finisher	Mailbox
Image		
Size [W X D X H]	410 X 408 X 453 mm	351 X 365 X 421 mm
Weight	9 Kg	5 Kg
Input Power	24V±10, 5±5	24V±10, 5±5
Rating Current	24.0 V, 3.0 A (Peak 4.5A for 25ms MAX.) 5.0 V, 1.0 A	24.0 V, 3.0 A (Peak 4.5A for 25ms MAX.) 5.0 V, 1.0 A
Noise (Run continuous audible noise)	Less than 53 dB	Less than 53 dB
Temperature	- Operating : 10℃ ~ 32.5℃ - Storage : -20℃ ~ 60℃	- Operating : 10℃ ~ 32.5℃ - Storage : -20℃ ~ 60℃
Humidity	- Operating : 15 % ~ 80 %RH - Storage : 10% ~ 95%RH	- Operating : 15 % ~ 80 %RH - Storage : 10% ~ 95%RH
Stacking	Stacker Tray: 500 sheet	400 sheet with 20lb sheet (100 sheets/bin)
Stapling	– 50 sheet stapling with 20lb sheet – 5000 staples per a stapler cartridge	N/A
Paper Size	Length (148~357mm) × Width (148~216mm)	Length (148~357mm) × Width (98~216mm)
Paper Weight	60~163 g/(16~43 lb)	60~163 g/(16~43 lb)
Machine life	1,000,000 sheets or 5 years	1,000,000 sheets or 5 years

Media Size & Mechanism Constraint

Paper Size					Finisher			Mailbox
Paper	Width x Length (mm)		Width x Length (Inch)		stack	staple	offset	stack
Letter	215.9	× 279.0	8.5	× 11.00	●	●	●	●
Legal	215.9	× 355.6	8.5	× 14.00	●	●	●	●
Folio	216	× 330.0	8.5	× 13.00	●	●	●	●
A4	210	× 297.0	8.27	× 11.69	●	●	●	●
JIS B5	182	× 257.0	7.17	× 10.12	●	●	●	●
ISO B5	176	× 250.0			●	X	●	●
Executive	184.2	× 266.7	7.25	× 10.50	●	●	●	●
A5	148.5	× 210.0	5.85	× 8.27	●	X	●	●
Statement	139.7	× 215.9	5.5	× 8.50	X	X	X	●
A6	105	× 148.5	4.13	× 5.85	X	X	X	●
Post Card 4x6	101.6	× 152.4	4	× 6.00	X	X	X	●
Hagaki (Postcard)	100	× 148.0	3.94	× 5.83	X	X	X	●
Envelope Monarch	98.4	× 190.5	3.88	× 7.50	X	X	X	●
Envelope COM-10	105	× 241.0	4.12	× 9.50	X	X	X	●
Envelope DL	110	× 220.0	4.33	× 8.66	X	X	X	●
Envelope C5	162	× 229.0	6.38	× 9.02	X	X	X	●
Envelope C6	114	× 162.0			X	X	X	●
Custom	98	× 182.0	3.86	× 7.17	X	X	X	●
	182	× 216.0	7.17	× 8.50	●	●	●	●

2.1.3. Model Comparison Table

	Samsung ML-5010ND	Samsung ML-4551ND	HP LJ-P4014
Image			
Speed	48 ppm (A4)	43 ppm (A4)	48 ppm (A4)
Processor	600 MHz	500 MHz	540 MHz
Memory (Std/Max)	128 / 640 MB	128 / 512 MB	128 MB / 640 MB
MP/Cassette	100 / 520 sheets	100 / 500 sheets	100 / 500 sheets
SCF / HCF	4 x 520 SCF, No HCF	3 x 500 SCF, No HCF	2 x 500 SCF / 1500 HCF
Duplex	Std.	Std.	Std.
Toner Yield	7K / 15K / 20K	10K / 20K	10K
Interface	- High speed USB 2.0 - Ethernet 10/100/1000 Base TX	- High speed USB 2.0 - Ethernet 10/100 Base TX	- High speed USB 2.0 - Ethernet 10/100/1000 Base TX - Wireless LAN (Option)
LCD	4-Line	2-Line	4-Line
Main Box /Finisher	Option	N/A	Option

2.2. Product Description

2.2.1. Front View

> ⚠️ **NOTE**
>
> - This illustration may differ from your machine depending on its model.
>
> - Some features and optional goods may not be available depending on model or country.
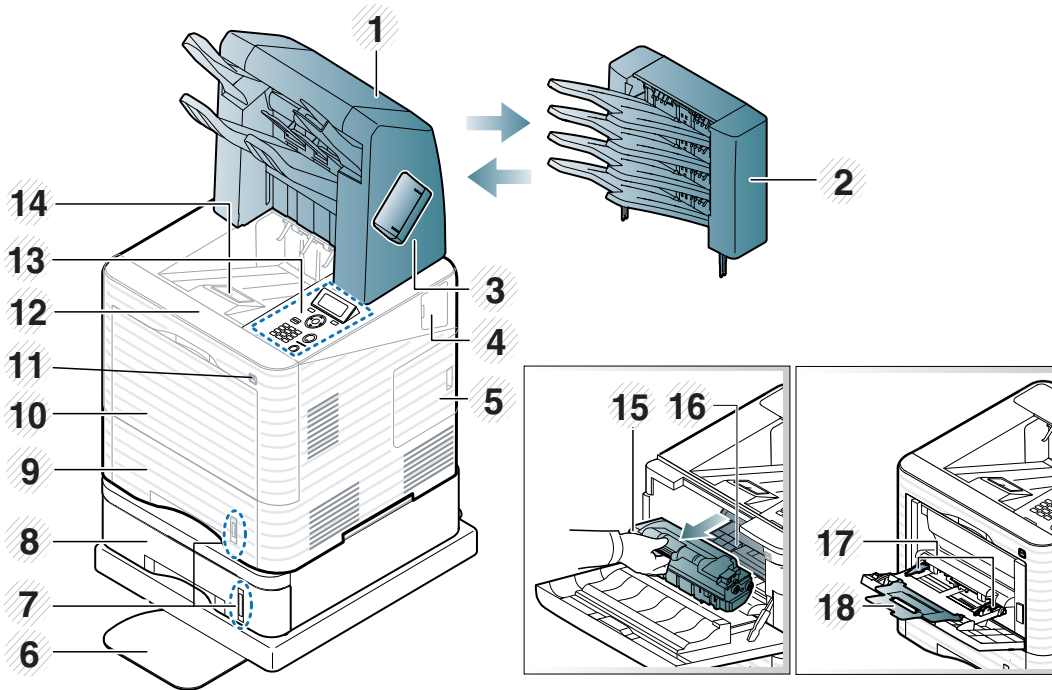
| 1	Finisher (Stacker & Stapler)	10	Multi-purpose tray cover
2	Mailbox	11	USB memory port
3	Stapler cover	12	Front cover
4	Optional wireless cover	13	Control panel
5	Control board cover	14	Output tray
6	Short stand	15	Toner cartridge
7	Paper level indicator	16	Imaging unit
8	Optional tray	17	Multi-purpose tray paper width guides
9	Tray1	18	Muti-purpose tray extension

2.2.2. Rear View

⚠️ **NOTE**

- This illustration may differ from your machine depending on its model.

- Some features and optional goods may not be available depending on model or country.
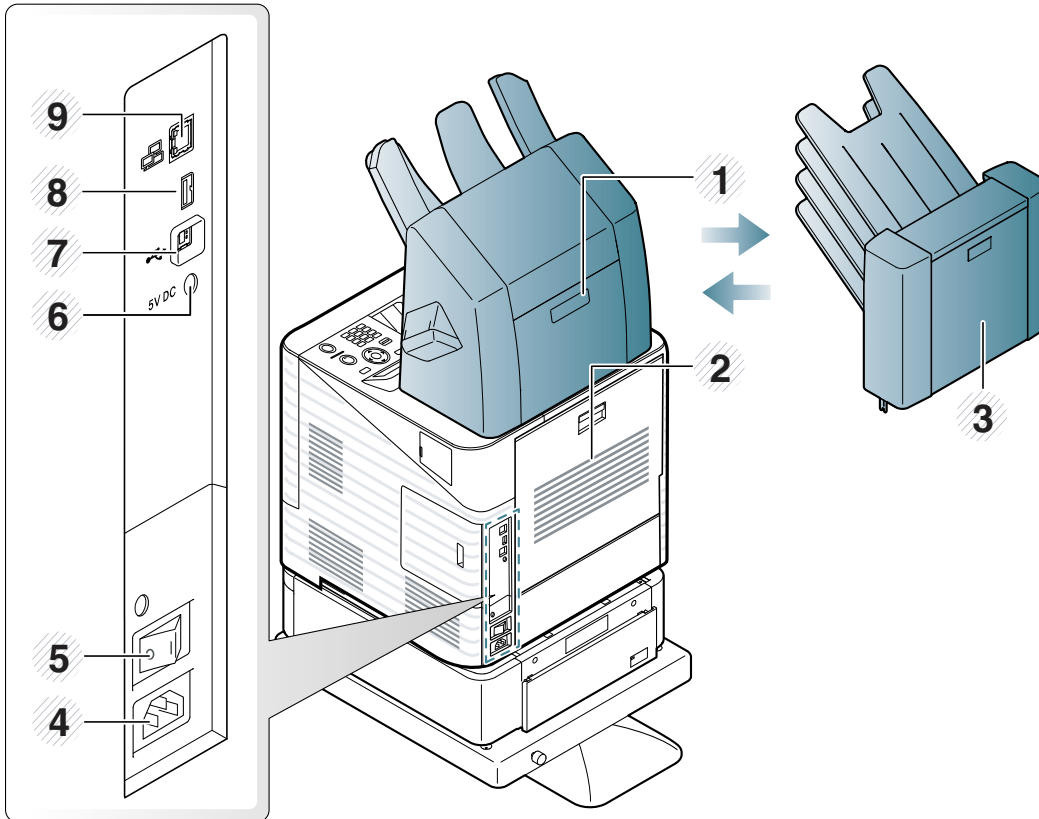
1	Finisher cover (Stacker & Stapler)	6	IEEE 1284 parallel connector
2	Rear cover	7	USB port
3	Mailbox cover	8	USB memory port
4	Power receptacle	9	Network port
5	Power switch		

2.2.3. Paper Path

The following diagram displays the path the paper follows during the printing process.
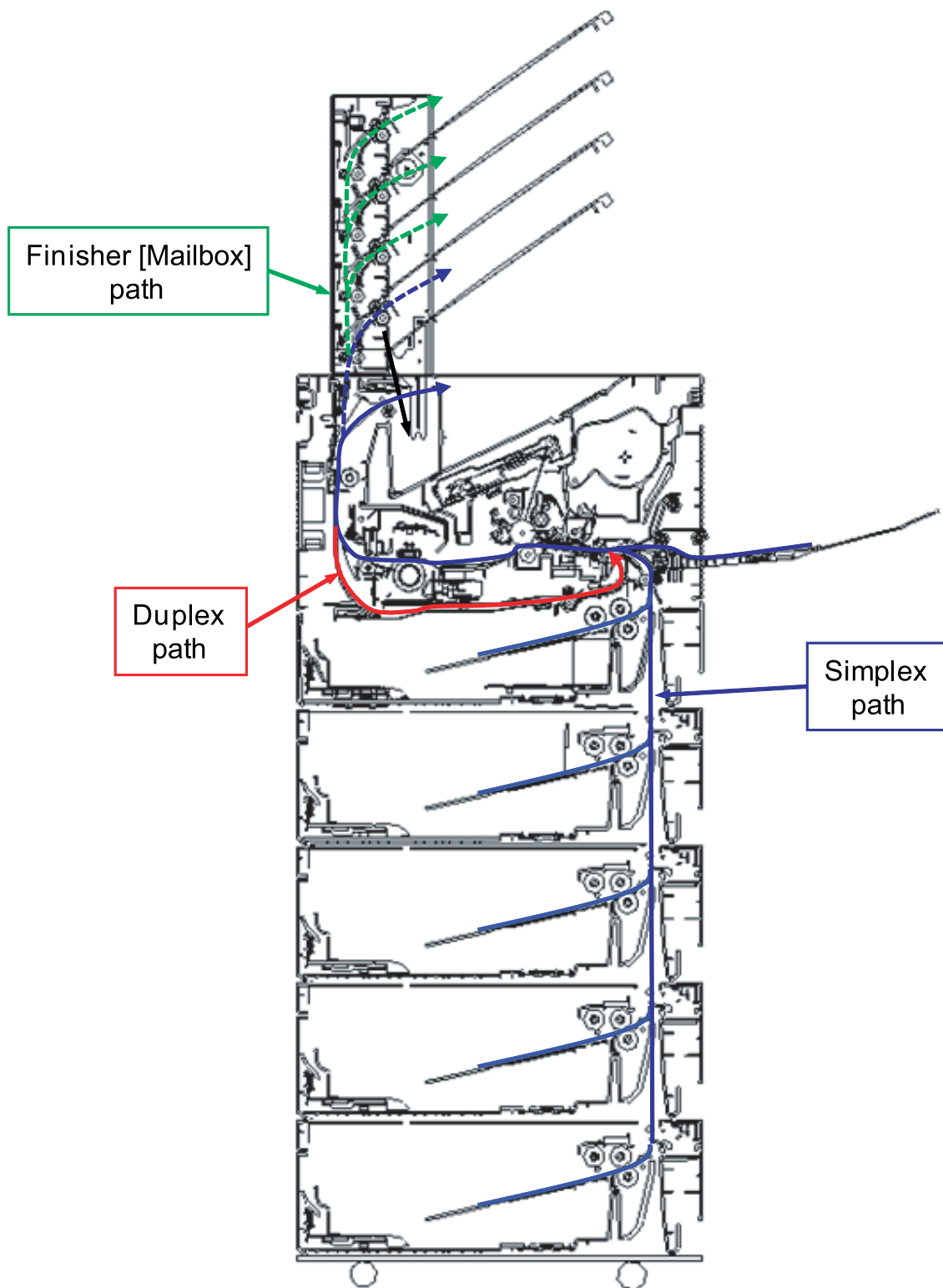
2.2.4. System Layout
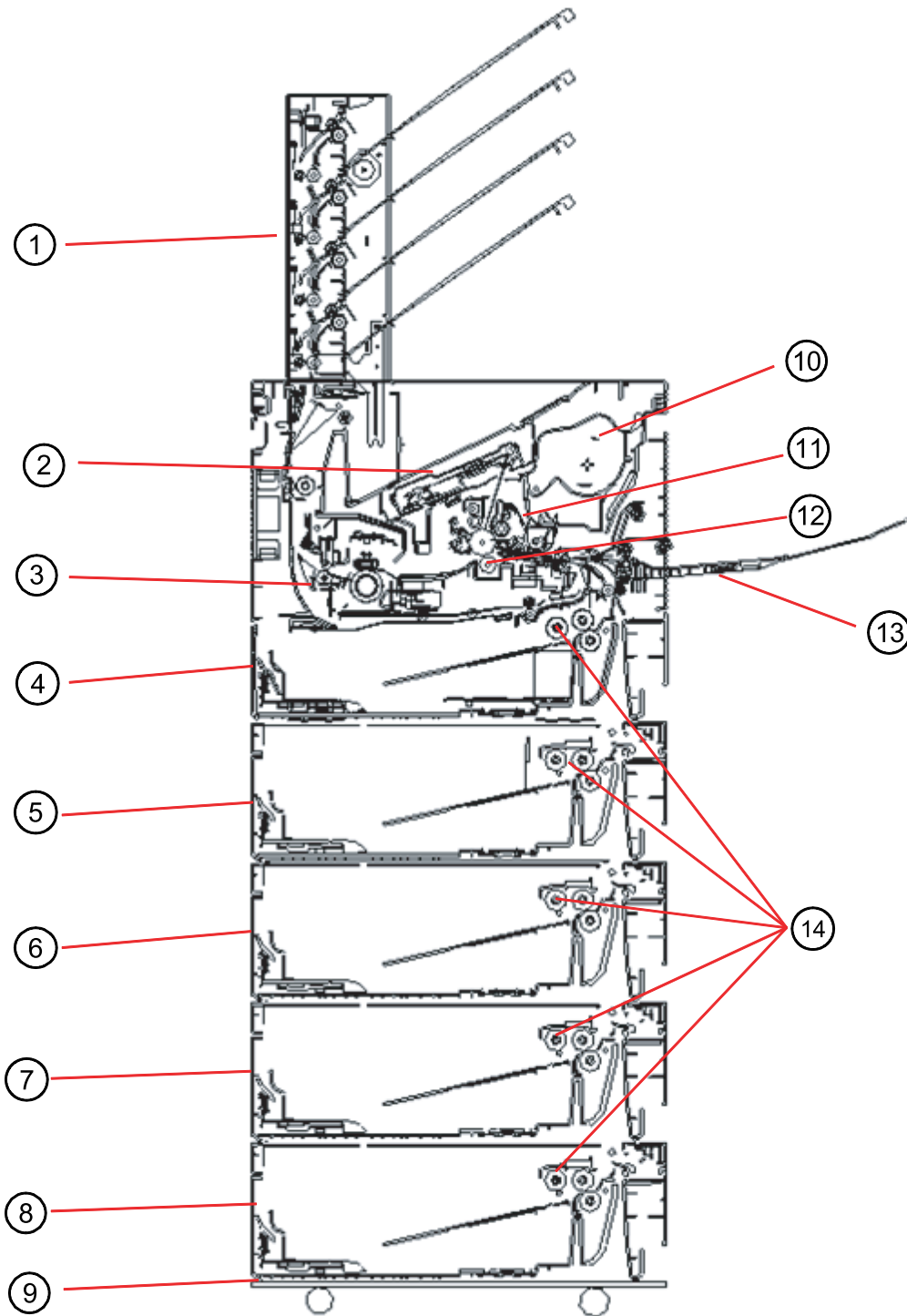
1	Mail Box or Finisher	6	3rd Tray (Optional)	11	Imaging Unit
2	Laser Scanning Unit	7	4th Tray (Optional)	12	Transfer Unit
3	Fuser Unit	8	5th Tray (Optional)	13	MP Tray
4	1st Tray	9	Stand	14	Pick-Up rollers
5	2nd Tray (Optional)	10	Toner Cartridge		

2.2.5. Feeding System

This section describes how the system picks up paper from the Paper tray or Multi-Purpose (MP) tray and transports it to the transfer position. The paper feeding system mainly consists of the Pickup roller, Registration roller, Transfer roller, Feed roller, Drive system for these components, and many sensors.

2.2.5.1. Feeding System Overview

The following diagrams display the feeding system for ML-451x/501x series.

2.2.5.2. Main components and functions
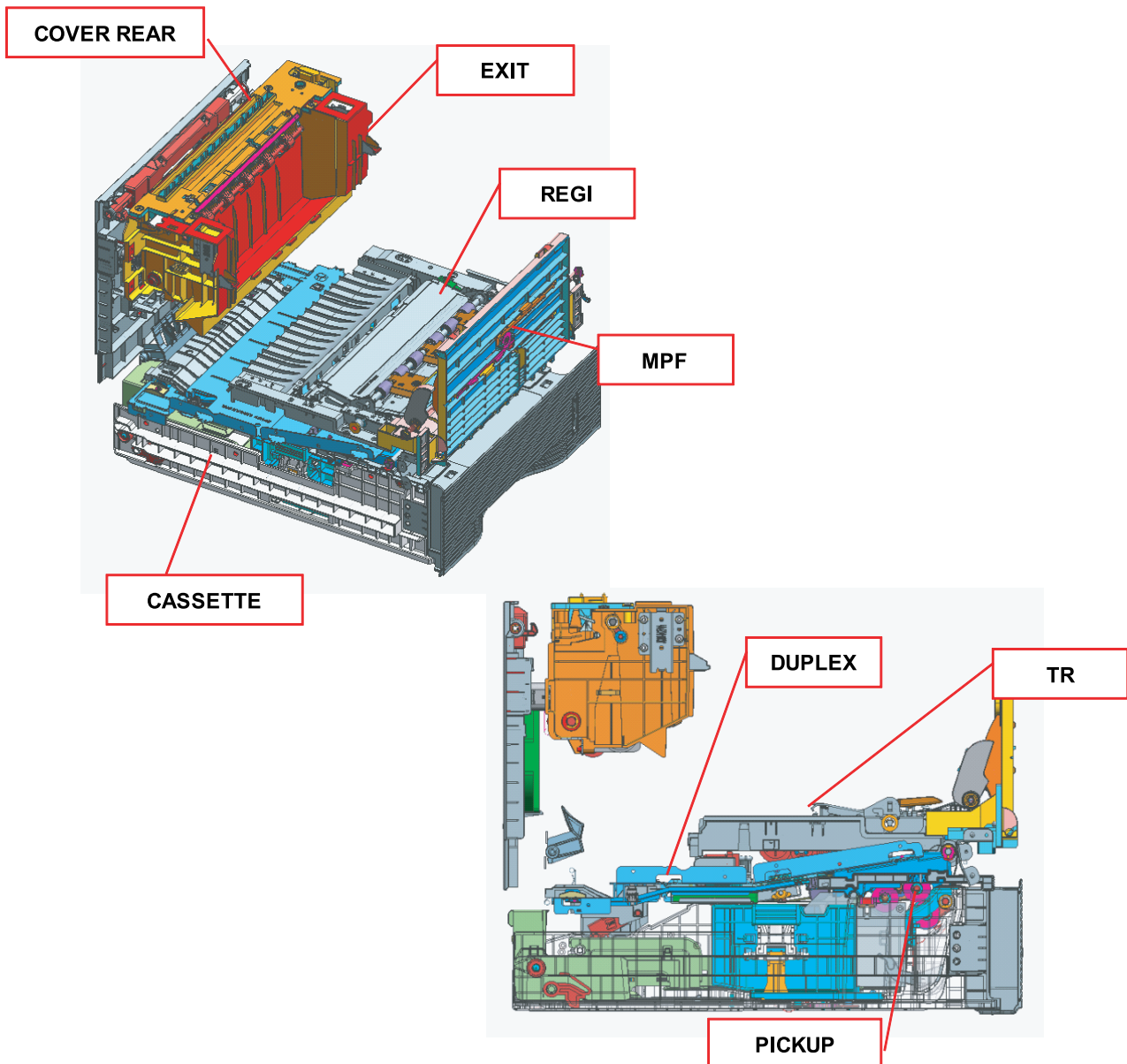
1	Tray1	11	MP Tray Pick up / Retard / Forward rollers	21	Exit sensor
2	Tray2	12	Tray1 Feed roller	22	Exit roller1
3	Tray3	13	Tray2 Feed roller	23	Exit roller2
4	Tray4	14	Tray3 Feed roller	24	Exit roller3
5	Tray5	15	Tray4 Feed roller	25	Duplex drive roller
6	Tray1 Pick up/ Retard/ Forward rollers	16	Tray5 Feed roller	26	Duplex Sensor
7	Tray2 Pick up/ Retard/ Forward rollers	17	Registration sensor	27	Main bin full sensor
8	Tray3 Pick up/ Retard/ Forward rollers	18	Registration roller	28	Mail box or Finisher
9	Tray4 Pick up/ Retard/ Forward rollers	19	Transfer roller		
10	Tray5 Pick up/ Retard/ Forward rollers	20	Fuser Belt		

- **Pick-Up Rollers (Tray1~5, MP Tray)**

  This rollers pick up the paper from the tray 1~5 or MP tray and transport it to the feed roller.

- **Forward Rollers (Tray1~5, MP Tray)**

  This roller is placed against the retard roller. It transports the paper from the pickup roller to the feed roller.

- **Retard Roller (Tray1~5, MP Tray)**

  This roller is placed against the forward roller. When two sheets of paper or more are transported from the pickup roller, the load of the torque limiter of the retard roller is heavier than the frictional force between the sheets. As a result, the retard roller is stopped and the lower paper does not advance any further. When only one sheet is transported from the pickup roller, the retard roller rotates following the forward roller.

- **Feed Roller**

  This roller transports the paper sent from the forward roller to the registration roller.

- **Registration Roller**

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

- **MP tray paper sensor**

  This sensor detects whether paper is set in the MP tray. When it is, MP tray feeding always comes before tray 1~5 feeding.

- **Empty Sensor (Tray1~5)**

  This sensor detects the availability of paper in the tray by using an actuator. When there is no paper in the tray, the actuator blocks the light path of the sensor, and the sensor determines that there is no paper.

- **Feed Sensor**

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

- **Registration Sensor**

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

2.2.5.3. Paper Tray

The paper trays consist of the Main trays (Tray1), Optional trays (Tray2~5), and one Multi-Purpose (MP) tray. The MP tray is located on the right side of the machine and allows feeding of specialty media stock, envelopes, and custom size paper. Paper size is set using the Paper Guides in each tray.
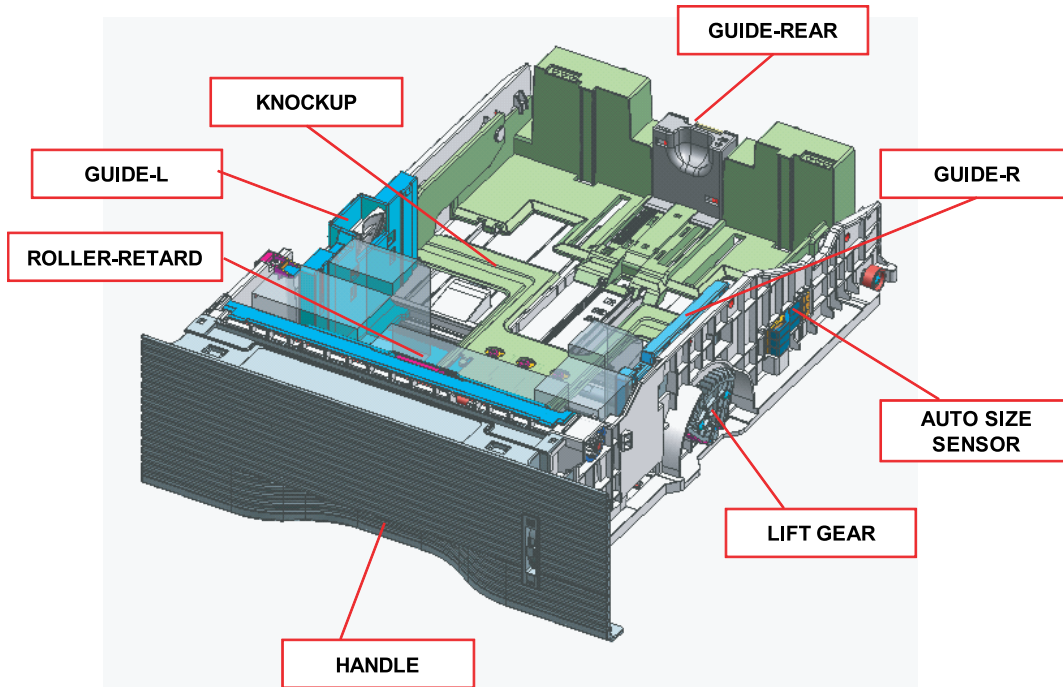

Specification

- Structure : Cassette type

- Capacity : 520 Sheets (80g/ standard paper)

- Available paper
    - Plain paper : A6, Statement, A5, Executive, B5, A4, Letter, Folio, Officio, Legal
    - Auto detect: A5, Executive, B5, A4, Letter, Folio, Legal (7 Types)
    - Special Paper : Envelop, Label, Cardstock (50 sheets)

- Weight : plain paper 60 ~ 163g/

- Plate knock up Lift type : Lift Motor + Up Limit Sensor

2.2.5.4. Pick-Up unit

When pickup takes place, the pickup roller transports the paper. The KNOCK-UP moves up by the elevating motor and the pick up roller comes into contact with the paper. The forward roller and the retard roller serve to make sure that a single sheet of paper is moved to the paper path, and the paper is moved as far as the registration roller by the work of the vertical path roller.

ROLLER-PICKUP

ROLLER-FORWARD

ACTUATOR-PAPER EMPTY
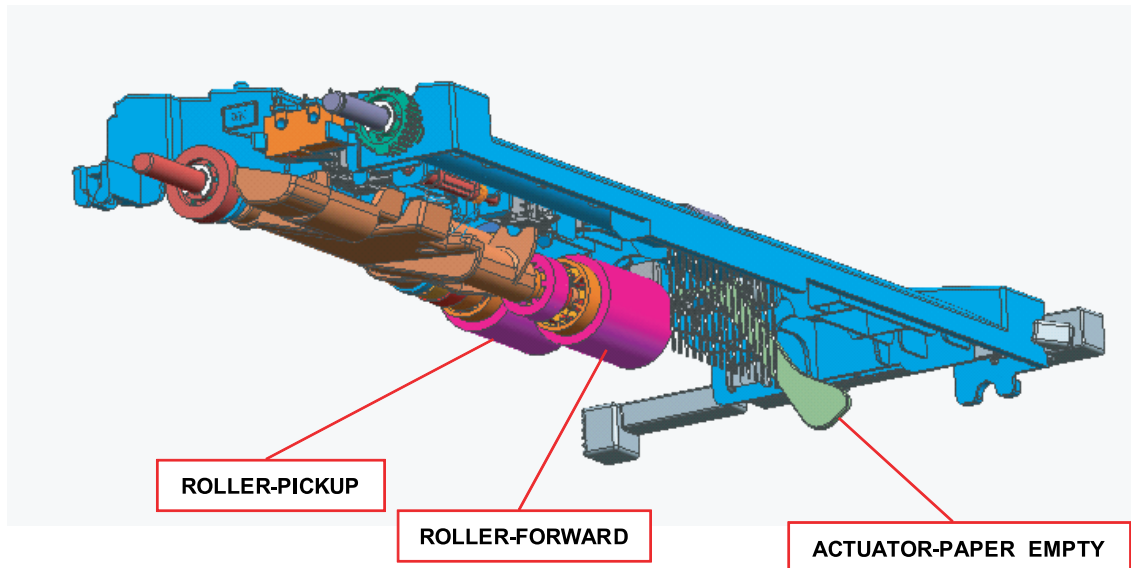
2.2.5.5. Registration Unit

The registration roller is driven by the main motor. The registration clutch is located between the registration roller and the main motor, and controls the registration roller to move the paper and an image on the drum at the predetermined registration point.
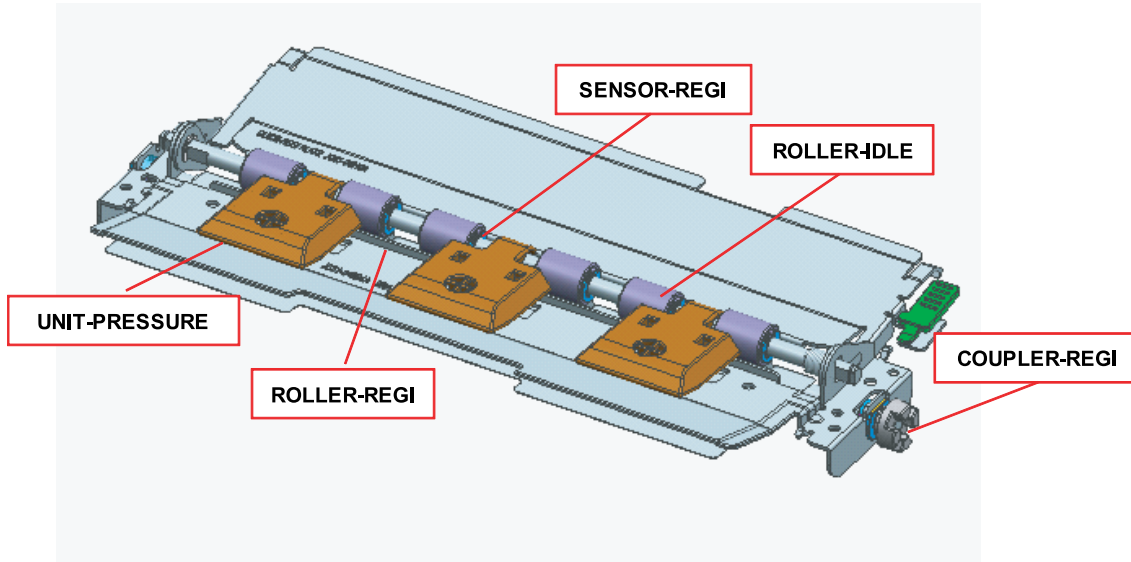
Registration Varience

- **Top Margin**
  - Less than 1.0 mm (Simplex, Duplex Short)
  - Less than 2.0 mm (Duplex Long)

- **Side Margin**
  - Less than 1.5 mm (Simplex, Duplex Short)
  - Less than 2.5 mm (Duplex Long)

- **Dog Ear, Trees, Nicks, Wrinkling**
  - Plain Paper   : 1/5,000
  - Special Media : 1/3,000

- **Top Skew (Horizontal Skew) @ 180 mm**
  - Less than 1.0 mm (Simplex, Duplex Short)
  - Less than 1.5 mm (Duplex Long and SCF)

- **Side Skew (Vertical Skew) @ 260 mm**
  - Less than 1.5 mm (Simplex, Duplex Short)
  - Less than 2.0 mm (Duplex Long and SCF)

## 2.2.5.6. Multi-Purpose Feeder Unit
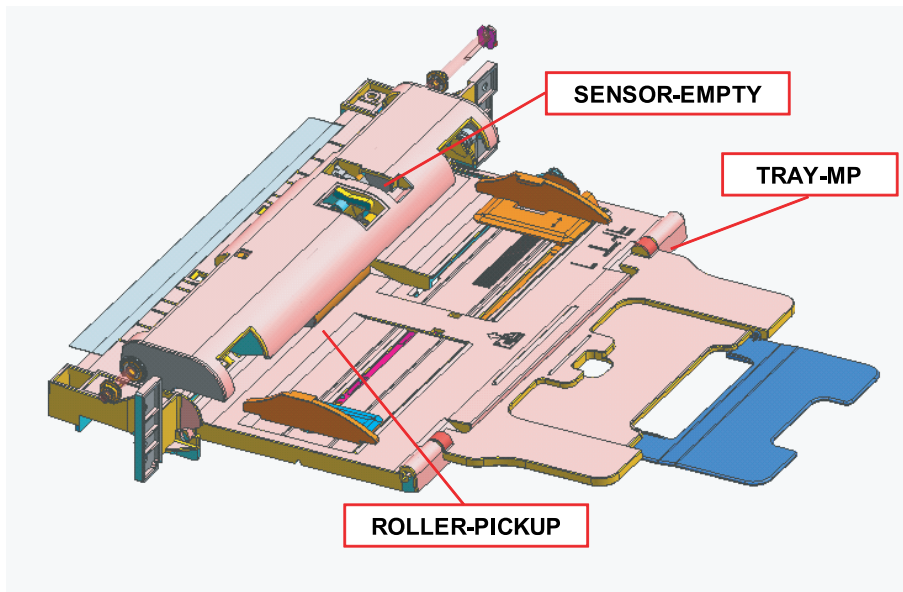
Specification

- Tray capacity : 100 sheets (80g/ standard paper)

- Media Size : Max 8.5"×14" (215.9×355.67) / Min 3"×5" (76.2x127)

- Media weight : Plain paper 60 ~ 220g/

- Feeding speed : 43 ppm (ML-451x series), 48 ppm (ML-501x series) in A4 LEF (Long Edge Feeding)

2.2.6. Image Creation

This section describes the image creation process used by the printer.

2.2.6.1. Printing Process Overview
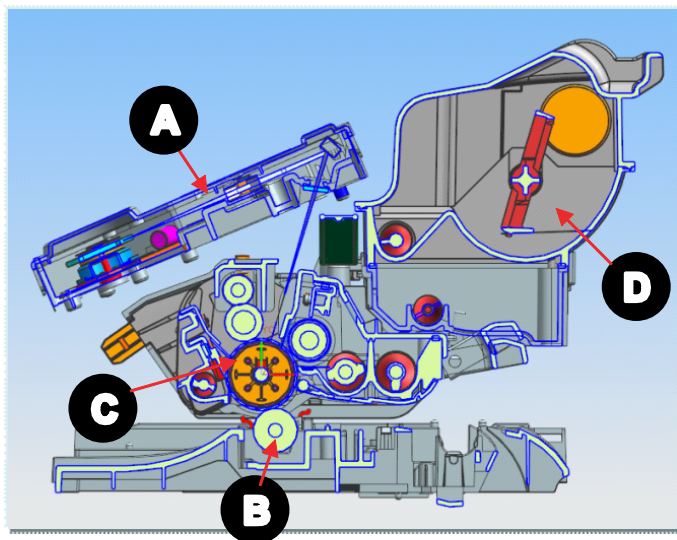
- A : Laser Scanning Unit (LSU)
- B : Transfer Roller
- C : OPC Drum
- D : Toner Cartridge

The printing system of this product includes the LSU with 2 laser beams, the imaging unit, the toner cartridge and the transfer unit.

The Imaging unit consists of a Drum unit and Development unit. The Drum unit has an OPC drum, Charge roller, and Cleaning blade.

The OPC drum [C] is charged with a negative voltage by the Charge roller and is exposed by the light from the LSU (Laser Scanning unit) [A]. The light produced by the laser creates a latent image by discharging on the surface of the OPC drum. The negatively charged toner is attracted to the latent drum image due to an electric field. The toner (visible image) on the OPC drum is transferred to the paper by the positive bias applied to the first transfer roller [C]. The toner cartridge [D] supplies with the toner to the development unit.

Process Steps

1) **OPC drum charge**: The Charge roller gives the drum a negative charge.

2) **Laser Exposure** : Light produced by a laser diode is projected on the charged OPC through the lens and mirrors.

3) **Development**: This machine uses a dual-component development system . The magnetic roller carries negatively charged toner to the latent image on the drum surface.

4) **Transfer**: The transfer roller opposite the OPC drums transfers toner from the drums to the transfer media (e.g. paper, OHP film, etc).

5) **Cleaning for OPC drum**: The cleaning blade removes remaining toners on the drum surface after image transfer to the paper.

6) **Quenching for OPC drum**: Discharging the drum is done by illuminating the whole area of the drum with the LED lamps at the end of every job.

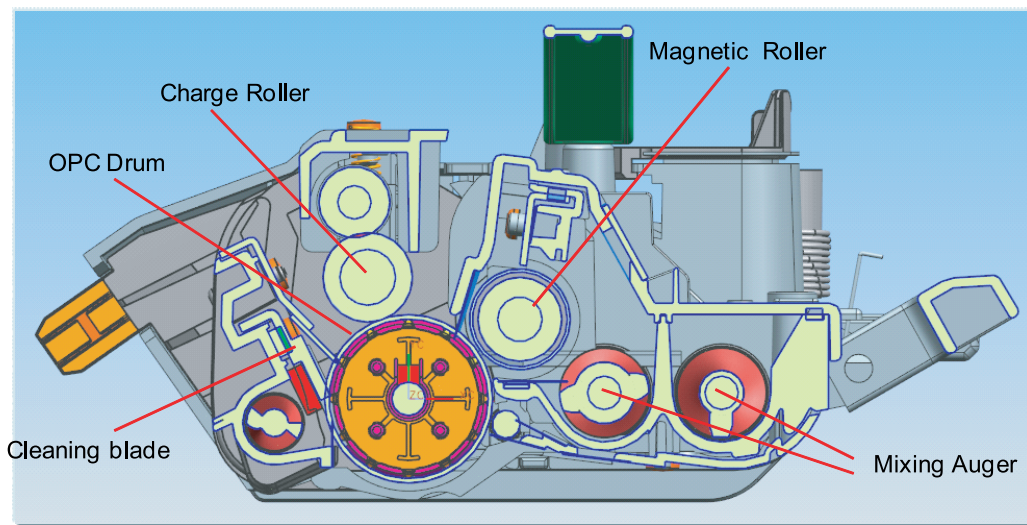## 2.2.6.2. Imaging Unit

1) Imaging Unit Overview

The imaging unit consists of OPC drum unit and the development unit. The OPC drum unit has an OPC drum, a charge roller which charges the OPC and cleaning blade. The development unit has a magnetic roller, two mixing augers, developer, a Dr-blade and a TC (Toner Concentration) sensor.

The diameter of the drum is 30 mm (circumference: about 94.2 mm).

The developing gap between a drum and the corresponding magnetic roller cannot be adjusted because they assembled as one Imaging unit in the factory.

The cleaning blade removes remaining toner on the drum surface.

The CRUM chip in the image unit stores the data about the Imaging unit.

2) Development

This printer uses a dual-component development system and has a imaging unit (which is included in the drum unit). The new unit contains 200g of magnetic toner carrier that is supplied to the magnetic roller [A] by the two mixing augers [B] and is attracted onto the surface of the roller. The diameter of the magnetic roller is 18.2 mm.

The imaging unit has a TC (Toner Concentration) Sensor that is used for controlling toner density range. The imaging unit is equipped with a CRUM in which some information about the imaging unit is stored.

[A] Magnetic Roller

[B] Mixing Auger

[B] Mixing Auger

[C] TC Sensor
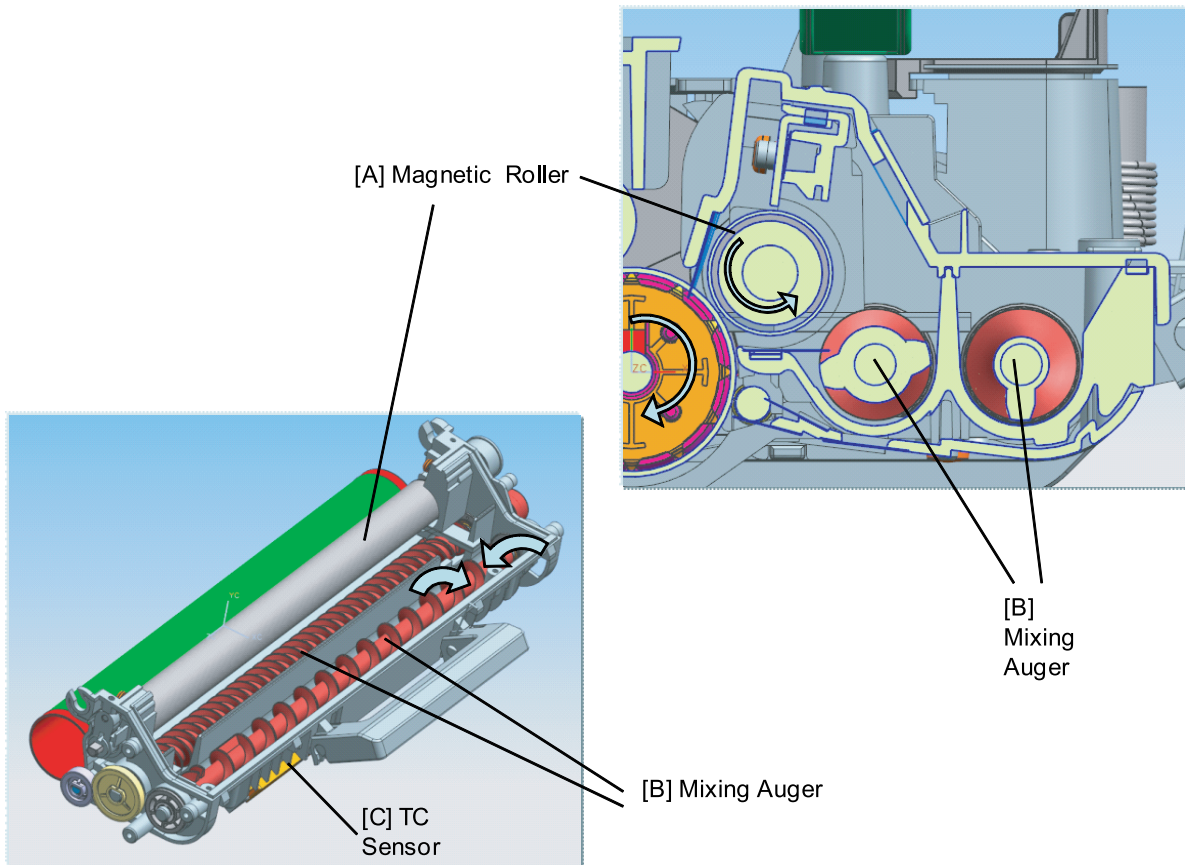
Two mixing augers [B] circulate the developer forward and backward to mix the carrier and toner well.

This job occurs at the following times:

- During TC calibration
- During development job

2.2.7. Fuser Unit

This section describes the image fusing process used by the printer.

2.2.7.1. Fuser Unit Overview

The fuser unit of the this machine used the instant fusing system. This has a faster warm-up time than a conventional fusing and pressure roller system.

The drum-fuser belt is made of 3 thin layers that can be heated by the halogen lamp inside more quickly. The pressure roller are made of soft silicone rubber, which flatten slightly, increasing the fusing nip. The drum-fuser belt contains 2 fusing lamps. One lamp, center heating lamp, heats the center and the other lamp, side heating lamp, heats the ends in the axial direction.

NC sensors (non-contact type thermistors) is located in the front area of the drum-fuser belt and controls the temperature. One NTC thermistor and two thermostats are located at the center and side. They protects the fusing system from overheating.

Temperature is normally controlled by turning on and off the center heating lamp and side heating lamp, respectively, corresponding to predetermined target temperatures.
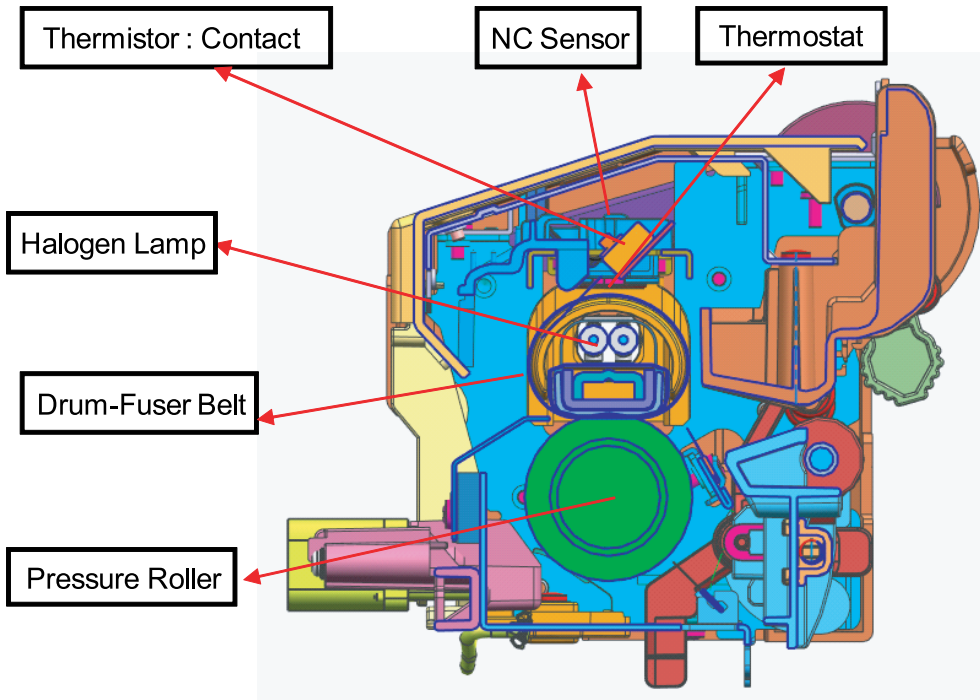
2.2.7.2. Fuser Unit Main Components

The Fuser unit includes the following components:

1) **Center heater lamp (LAMP1) / Side heater lamp (LAMP2)**

   These halogen lamps heat the drum-fuser belt. The center heater lamp (LAMP1) and the side heater lamp (LAMP2) are lit alternately to heat the drum-fuser belt. Each heater lamp has its coil in a different location. The coil of the center heater lamp (LAMP1) is in the center, those of the side heater lamp (LAMP2) are on both sides. The heater lamps are fixed inside of the drum-fuser belt so that they will not rotate separately.

2) **Drum-fuser belt**

   The drum-fuse belt conducts heat generated by the heater lamp to the toner and paper. The thin fuser belt reduces warming up time and mode changing time. To prevent the fuser belt from adhering to the toner, the surface of the fuser belt is fluorinated. The Rigid assembly contacts with the nip inside fuser-belt. To check the proper width between the fuser belt and the pressure roller, it is pressed on pressure roller by the spring.

3) **Pressure roller**

   The pressure roller is a rubber roller which ensures proper nip width between the pressure roller and fuser belt. It is controlled by the external drive mechanism.
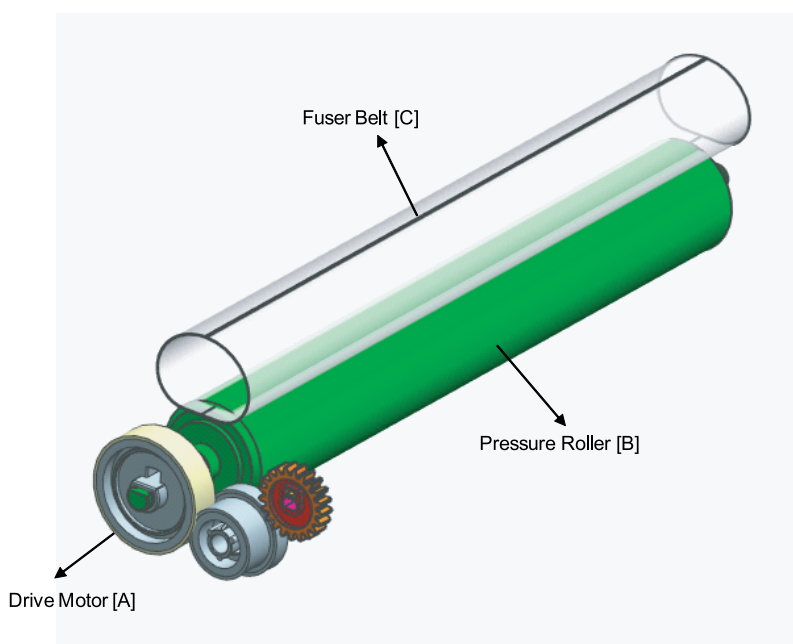
4) **NC sensor**

   NC sensor detects the surface temperature of the center and controls the heater lamps.

5) **Thermostat**

   These thermostats cut off the power supply to the heater lamps by opening the circuit when the fuser belt becomes abnormally hot as a result of problems such as a NC sensor malfunction. These thermostats are used to prevent abnormal operation. When the thermostat is triggered, it must be replaced
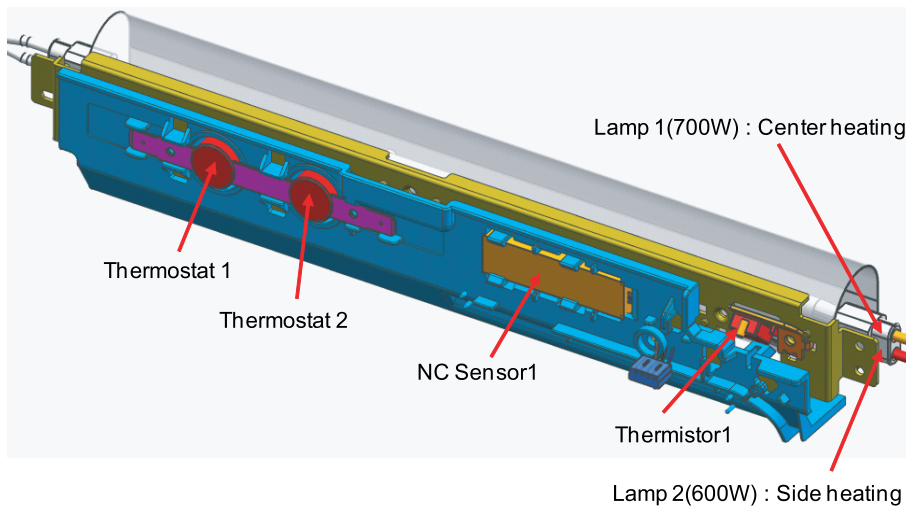
2.2.7.3. Fuser Drive

The Drive Motor [A] drives the Pressure roller [B] through the gear train. The fuser belt [C] is driven by pressure with the pressure roller.

2.2.7.4. Temperature Contorl

When the main switch turns on, the CPU turns on the fusing lamp. The lamp stays on until the NC sensors detect the standby temperature. Then the CPU raises the temperature up to the printing temperature.

Lamp 1(700W) : Center heating
Thermostat 1
Thermostat 2
NC Sensor1
Thermistor1
Lamp 2(600W) : Side heating

Overheat Protection

The CPU cuts power to the fusing lamp in the following cases:

• The fuser belt temperature detected by the NC sensor becomes higher than the standard for overheat.

• The heating temperature detected by the thermistor becomes higher than the standard for overheat.

The following components are destroyed when thermistor overheat protection fails:

• Two thermostats for the fuser belt get into line with the common ground line of the fusing lamp.

• If one of the thermostat temperatures becomes higher than 190°C, it opens and cuts power to the fusing lamp. If the other thermostat temperature becomes higher than 190°C, it also opens and cuts power to the fusing lamp.

2.2.8. Laser Scanning Unit

2.2.8.1. Laser Scanning Unit Overview

The Laser Scanning Unit (LSU) consists of one polygon motor and one LD (Laser Diode), and forms a latent image on the surface of OPC drum. For this process, there is a C-DOE lens, F-Theta Lens, reflective mirror (that changes laser beam path), the cover glass for protecting the LSU from contamination. Also, LD PBA is located to the front for interface.

The PD sensor located in LD PBA detects the scanning start line and generates the horizontal sync signal (Hsync).

The picture below shows the main components for LSU.

⚠ **NOTE**

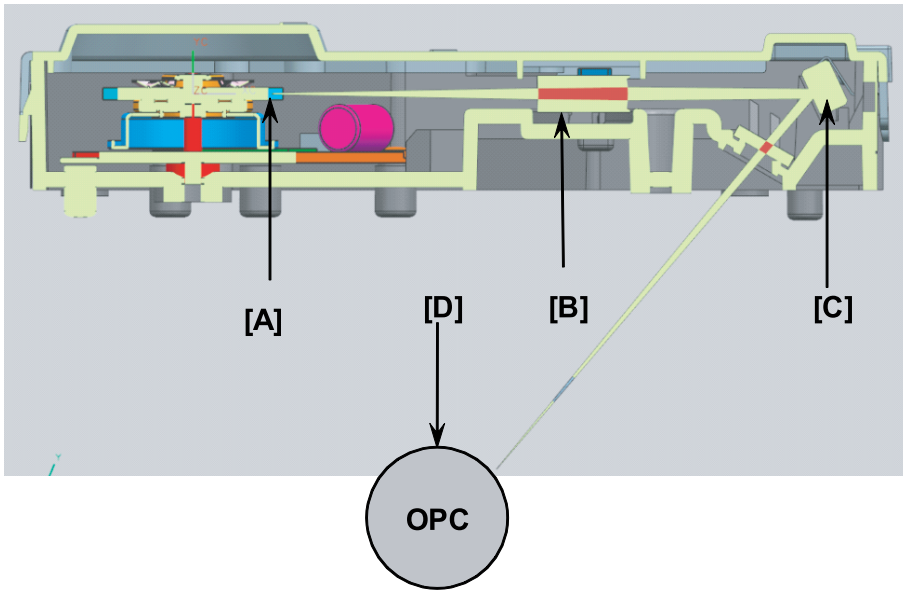The LSU is the optical precision device. Please handle it carefully and do not remove the cover.
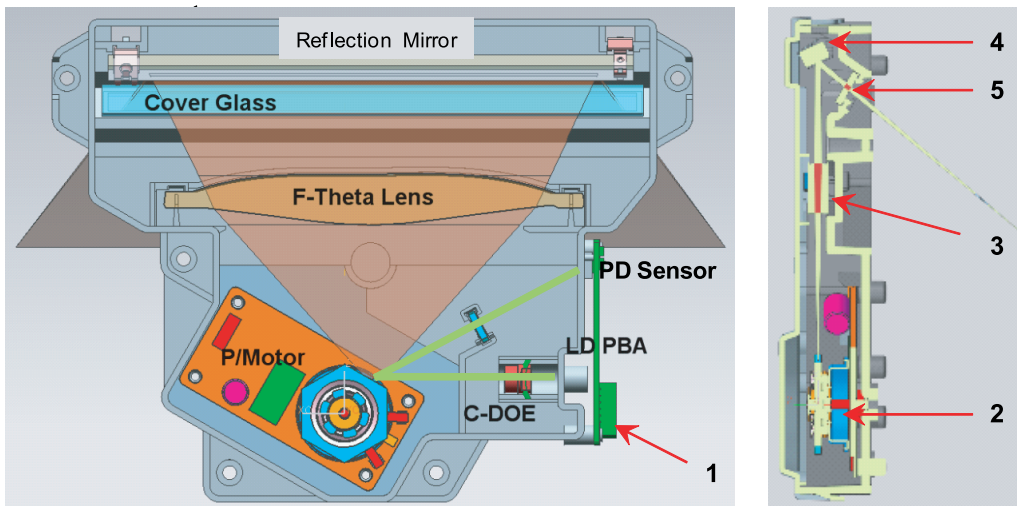
1	LD PBA
2	P/Mirror Motor
3	F-Lens
4	Reflect Mirror
5	Cover Glass

- **Information**

  Part Code : JC97-03877A [LSU]

2.2.8.2. Laser Scanning Optical Path

The laser beam is reflected from the mirror [A] and passes through F-theta lens. And then its direction is changed by the reflection mirror [C]. It is transferred to OPC.

This LSU is the common device for ML-451x series and ML–501x series. The polygon motor speed is controlled by the main CPU.

The LD unit generating the laser beam has the dual beam laser diode with 780nm wavelength. It is controlled by the LD drive IC.

Mode	ML-501x series	ML-451x series	Remark
LD Unit	Laser Diode : Dual Beam Drive IC : for Dual Beam LD LD PBA : 48/43ppm common use	Laser Diode : Dual Beam Drive IC : for Dual Beam LD LD PBA : 48/43ppm common use	
P/Motor Speed	34,035 rpm	30,476 rpm	
Process Speed	288.17 mm/sec	258.03 mm/sec	
H/W interface	LD Harness : 14 Pin FFC P/Motor Harness : 5 Pin FFC	LD Harness : 14 Pin FFC P/Motor Harness : 5 Pin FFC	

2.2.9. Drive System

This section describes the printer drive system parts and process.

2.2.9.1. Drive Motors

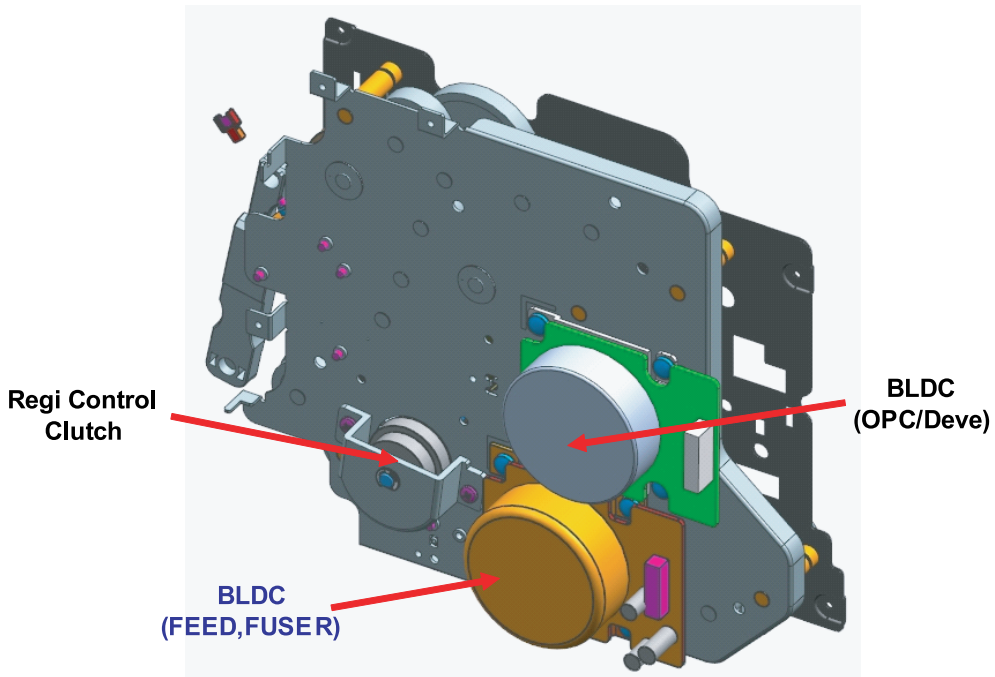The following diagram displays the locations of the printer drive motors.
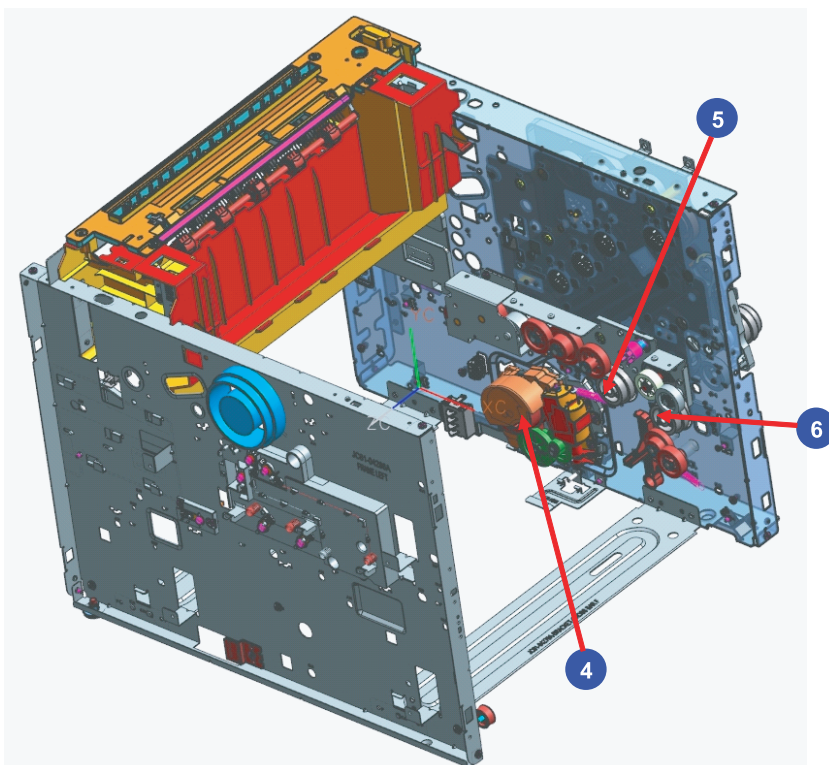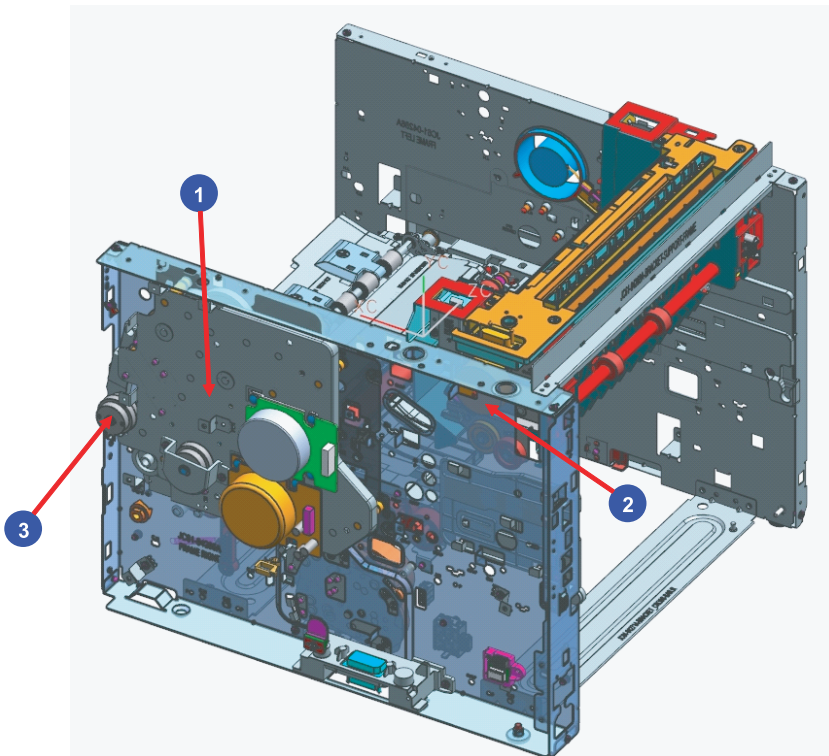
No.	Motor	Motor Type	Qty	Function
1	DRIVE MAIN	BLDC	1	OPC, DEVE driving
		BLDC	1	Feed, Fuser driving
		DC	1	Toner driving
		E-Clutch	1	Regi. Shaft driving
2	DRIVE EXIT	PM-STEP	1	Exit Roller driving
		E-Clutch	1	Fuser pressure driving
3	MP	E-Clutch	1	MP Pick up shaft driving
4	DRIVE FEED	DC	1	CST elevating driving
5	DUPLEX	E-Clutch	1	Duplex driving
6	PICK UP	E-Clutch	1	Pick-Up driving

2.2.9.2. Main Drive Unit(OPC, DEVE, Toner, Fuser, Regi.)

Front View

Regi Control Clutch

BLDC (OPC/Deve)

BLDC (FEED,FUSER)

Rear View

Agitator Coupling

Deve Coupling

Toner Coupling

OPC Coupling

DC (Toner Supply)
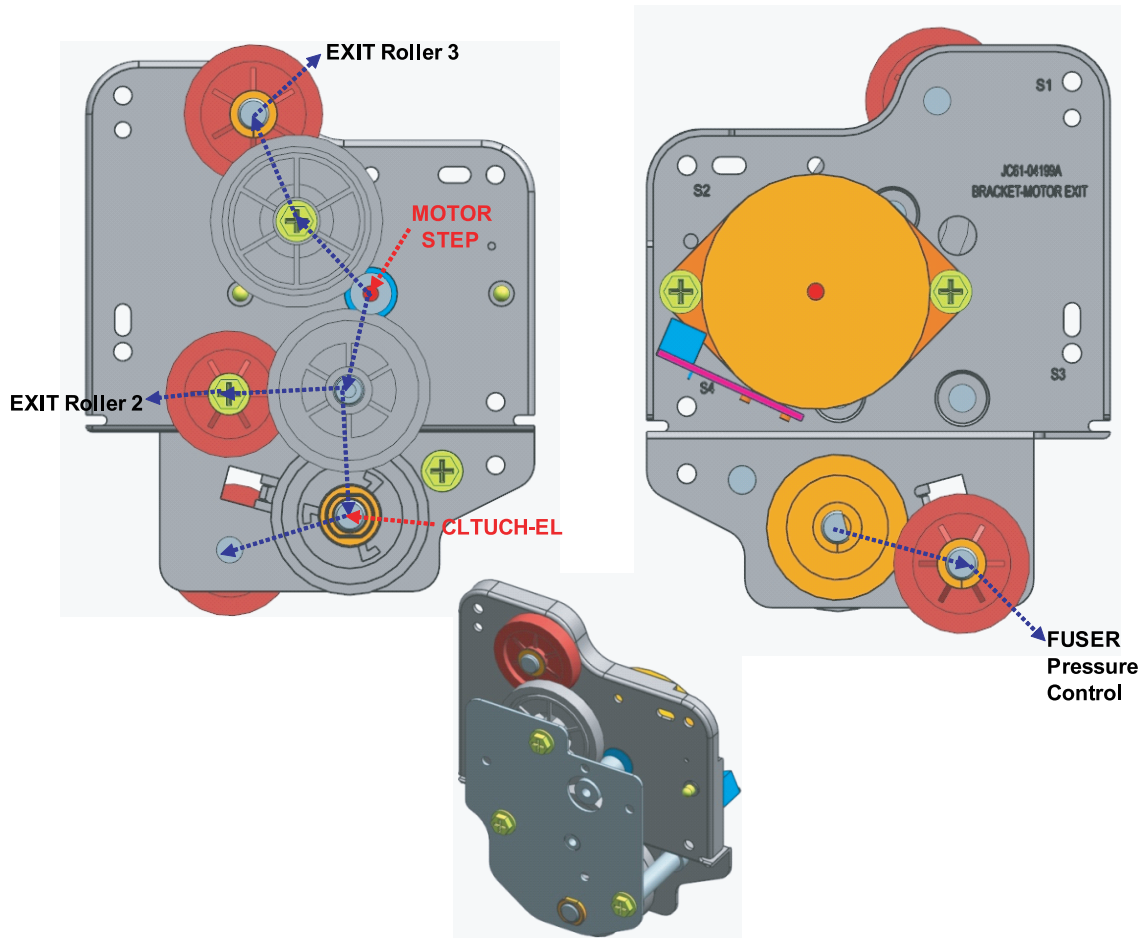
Regi Coupling
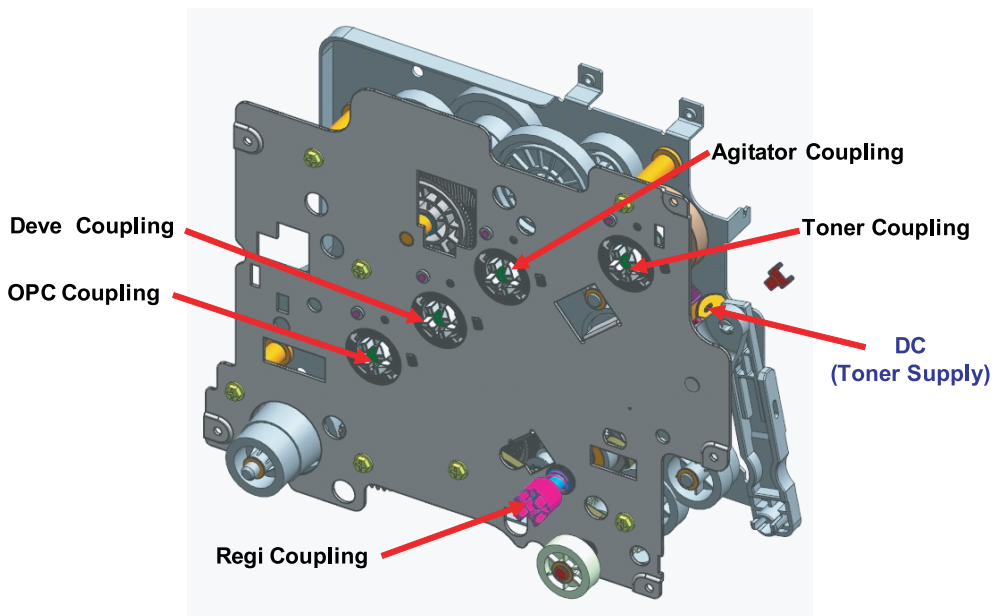
- **Information**
  - Part Code : JC93-00348A [DRIVE MAIN]

2.2.9.3. Exit Drive Unit

The following is a diagram of the Exit drive.

- **Information**
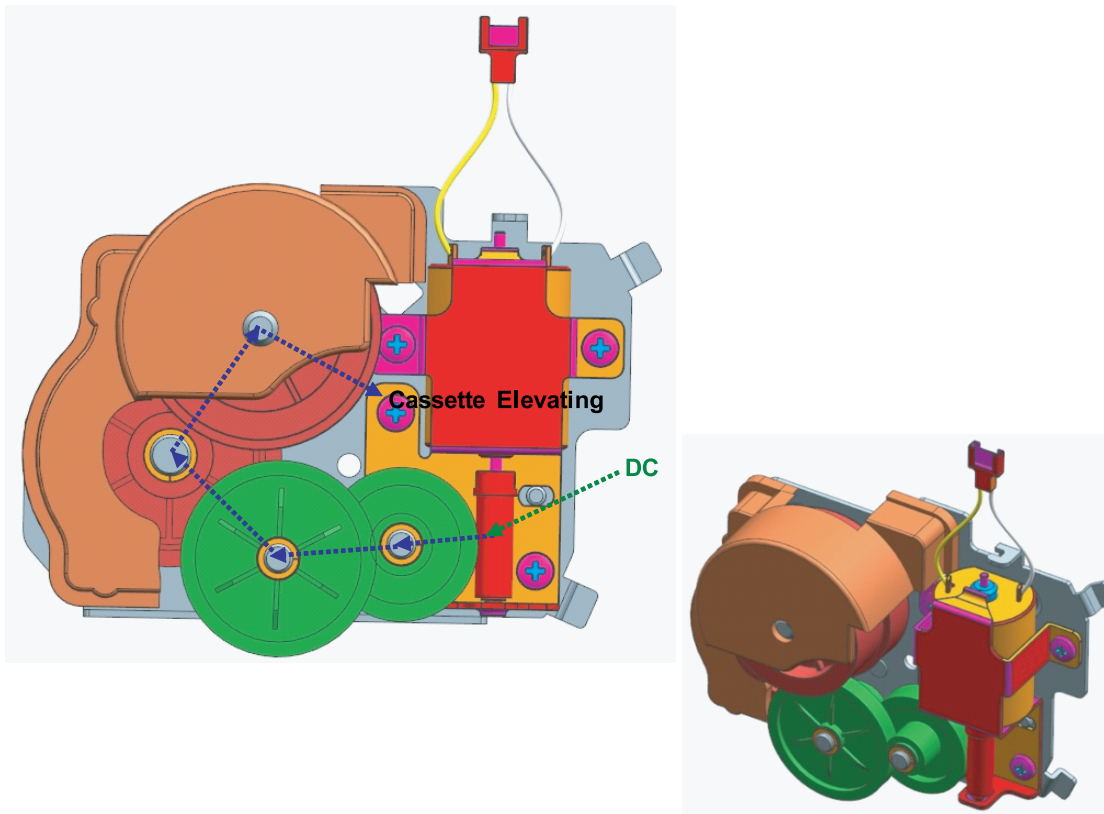   - Part Code : JC93-00349A [DRIVE EXIT]

Power Train

It is driven by step motor.

- Step motor → Gear → Gear → Exit Roller 3 driving

- Step motor → Gear → Gear → Exit Roller 2 driving

- Step motor → Gear → E-Clutch → Gear → Gear → Fuser pressure driving

2.2.9.4. Tray Lifting Drive Unit

The following diagram displays the tray lifting drive unit :

Tray lifting is operated by the DC motor.

- **Power Train**
  - DC motor → Gear → Gear → Gear → Gear → Tray lifting

2.2.10. Hardware Configuration

The ML-451x/501x series Electrical Circuit System consists of the following:

- Main controller

- OPE controller

- SMPS board

- FDB board

- HVPS board

- Joint board

- Eraser board

- Cover Open board

- Toner/DEVE CRUM IF board

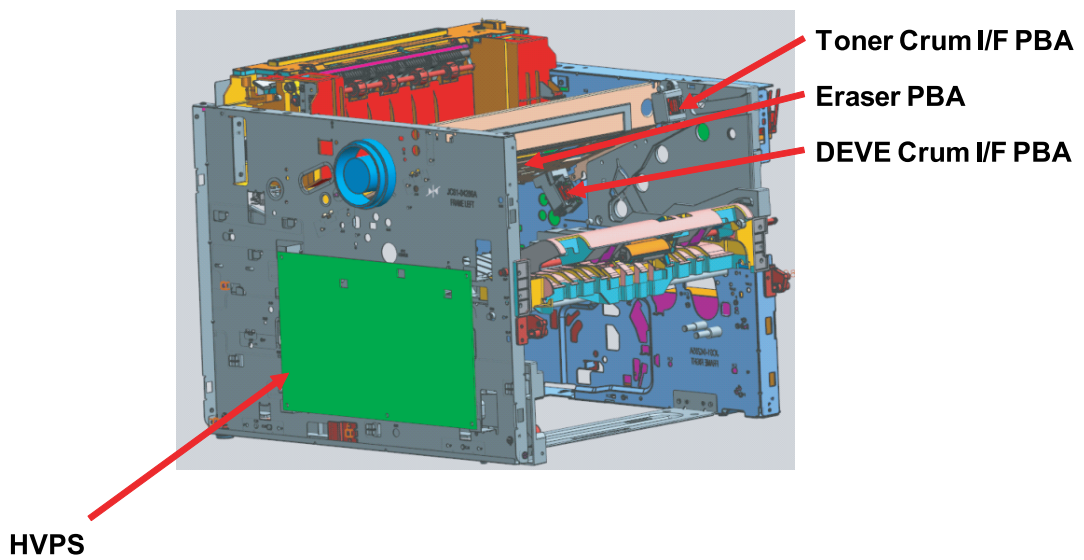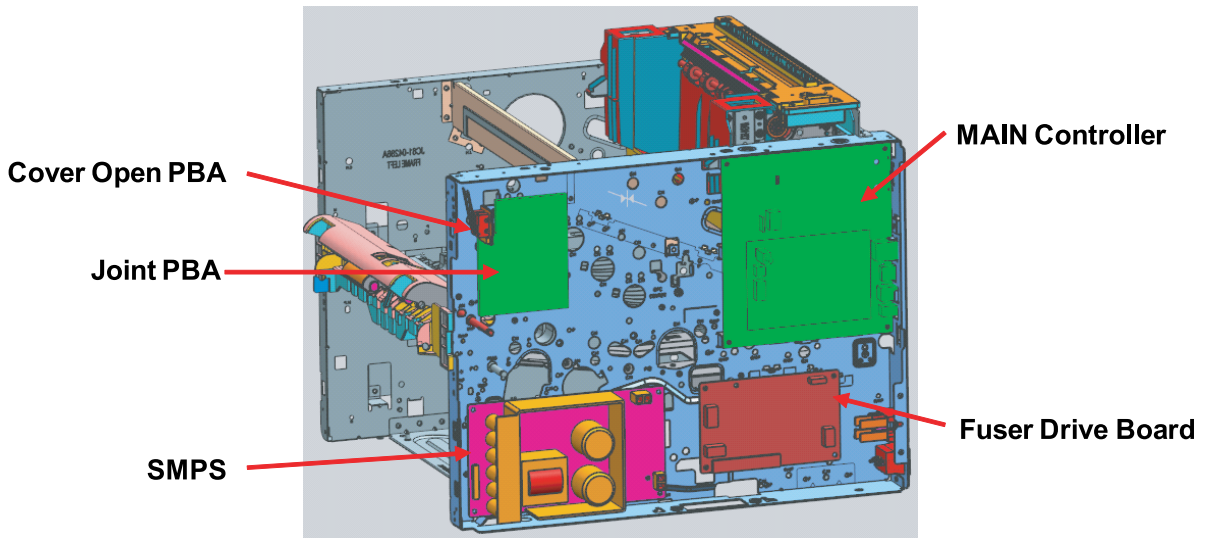### Diagram of the ML-451x/501x series Electrical Circuit
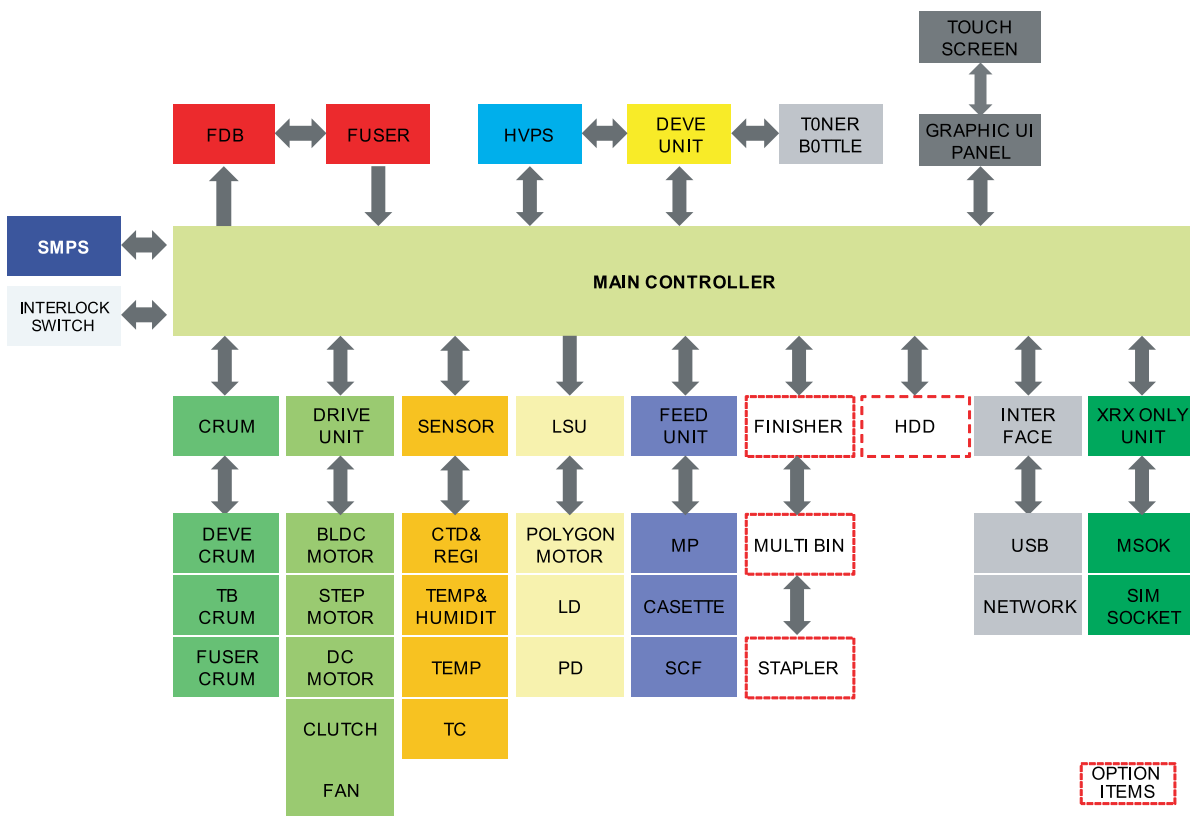
ML-451x/501x series main controller has adopted the Chorus4 one chip solution to control the printer engine. It receives print data from the USB Device/Host/Ethernet.

ML-451x/5010/5012 series has adopted the 4–line graphic LCD, ML-5015/5017 series has adopted the 4.3 inch TFT LCD (GUI).
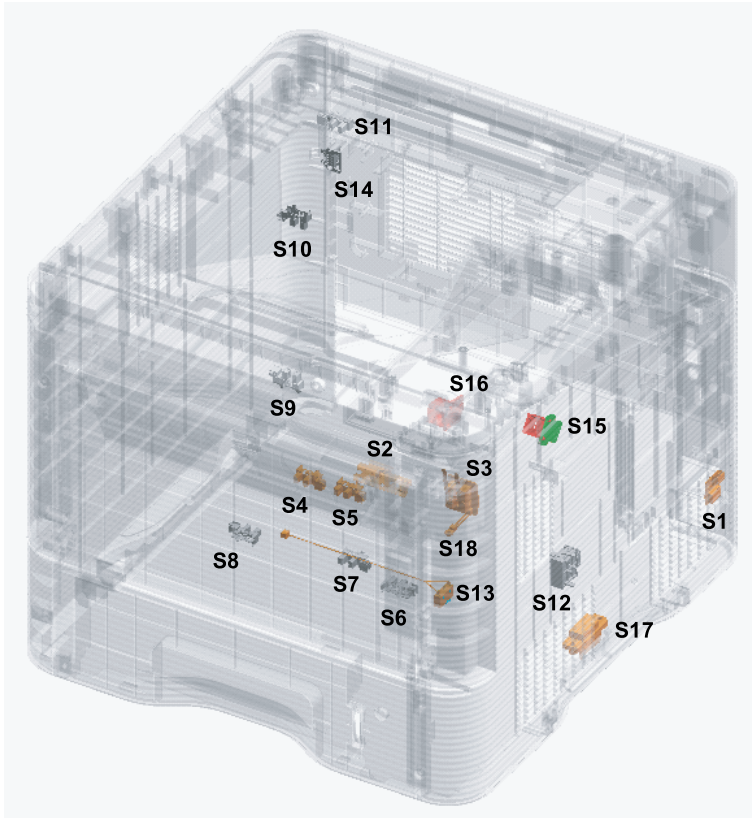
For optional tray, ML-451x series can install only 1 optional tray, but ML-501x series can install max. 4 optional trays.

Circuit Board Location

The following diagrams show the locations of the printer circuit boards:

Cover Open PBA
Joint PBA
SMPS
MAIN Controller
Fuser Drive Board

Toner Crum I/F PBA
Eraser PBA
DEVE Crum I/F PBA
HVPS

Sensor Location

Ref.	Description	Part Number	Controller PCB	Function
S1	SENSOR-HUMIDITY	JC32-00005A		Humidity detection
S2	SENSOR CTD	JC32-00014A		
S3	SWITCH FRONT COVER	JC92-02371A		
S4	PHOTO-INTERRUPTER (Regi. sensor)	0604-001325		Paper detection
S5	PHOTO-INTERRUPTER (Feed sensor)	0604-001325		Paper detection
S6	PHOTO-INTERRUPTER (Duplex Rdy. sensor)	0604-001325		
S7	PHOTO-INTERRUPTER (Uplimit sensor)	0604-001325	PBA-ENGINE	Paper detection
S8	PHOTO-INTERRUPTER (Paper empty sensor)	0604-001325	ML-451x : JC92-02354A	Paper detection
S9	PHOTO-INTERRUPTER (Exit sensor)	0604-001325	ML-5010/5012	Paper detection
S10	PHOTO-INTERRUPTER (Envelope sensor)	0604-001325	: JC92-02354B	Envelope pressure detection
S11	PHOTO-INTERRUPTER (Binfull sensor)	0604-001325	ML-5015/5017 : JC92-02354C	BIN FULL detection
S12	SENSOR-PAPER SIZE	JC34-00001A		Paper size detection
S13	SWITCH-LIMIT UPPER	JC39-01443A		Pickup position detection
S14	CONNECTOR-REAR COVER	JC39-01431A		
S15	PBA-DEVE-CRUM	JC92-02163A		
S16	PBA-TCRUM_IF	JC92-01963A		
S17	CONNECTOR-SCF	JC39-01441A		
S18	SENSOR-INNER TEMPERATURE	1404-001417		

Motor and Clutch location
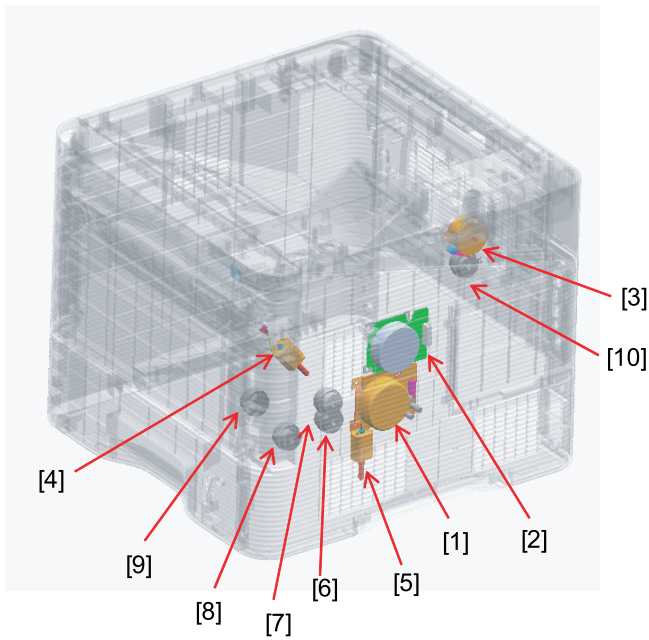
1	Main Motor	6	Duplex Clutch
2	OPC Motor	7	Registration Clutch
3	Exit Motor	8	Cassette Pick up Clutch
4	Toner Supply Motor	9	MP Pick up Clutch
5	Knock-Up elevating motor	10	Envelope pressure clutch

Fan Location
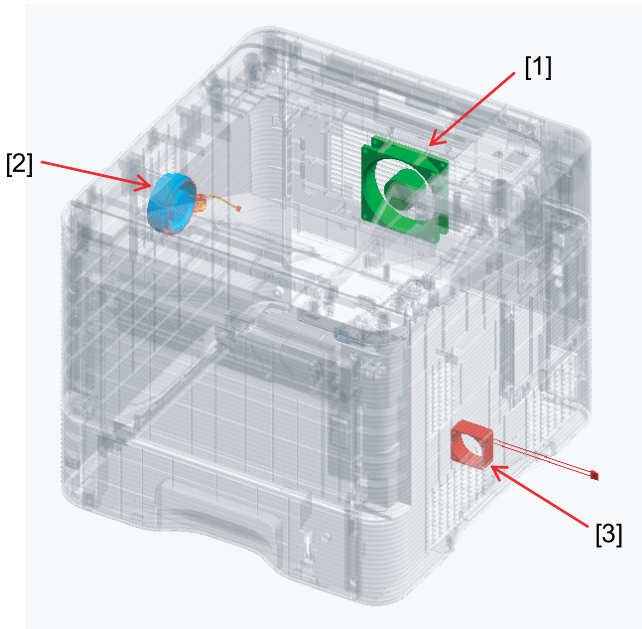
| 1	Main Fan
2	LSU Fan
3	SMPS Fan

2.2.10.1. Main Controller

The Main Controller, which is used to process the printable video data and system, has adopted the Chorus4 one chip solution.

It has adopted the DDR2 on board 2Component as the system memory. ML-451x series memory size is 128MB, and ML-501x series momory size is 256MB. Additionally, 512MB option memory can be installed for all models.

It supports the optional hard disk drive through the Sata Block. The LPEC1 for controlling the sensor and drive is connected to the LOCAL in the main controller.

It supports the USB device 1ch, Host 1ch, Giga Network 1ch. It has the optional Micom(Attiny25) for protecting the IFS2 fuser unit.
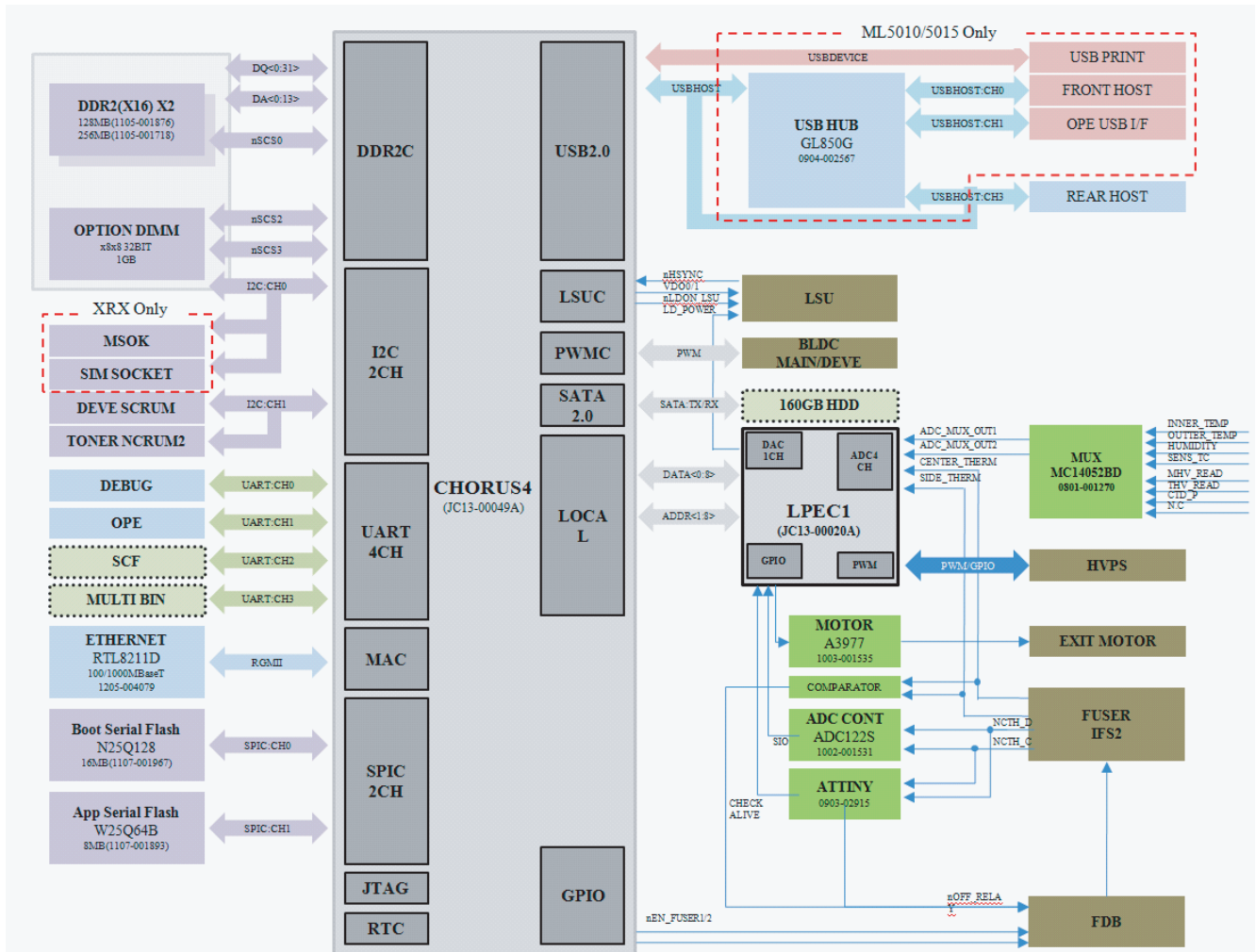
Main controller connection information
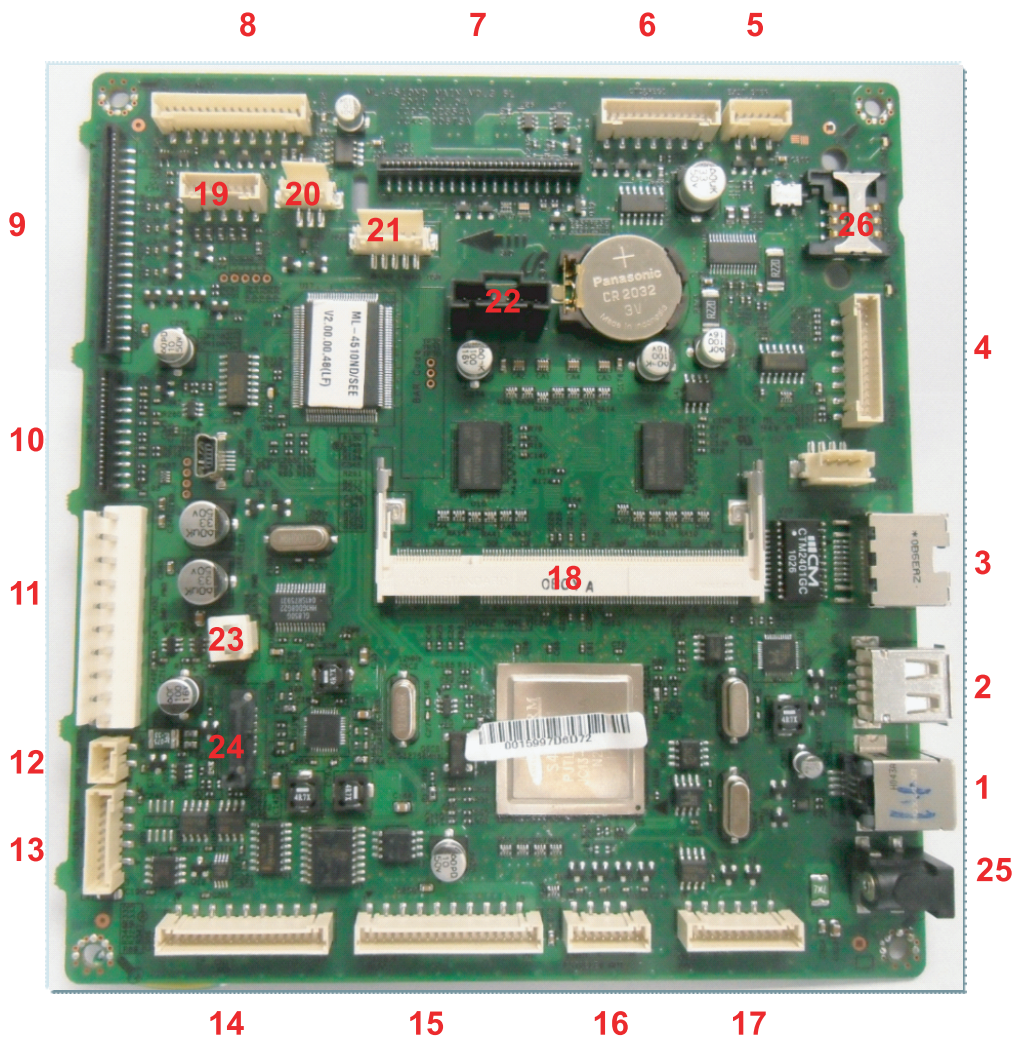
- **Information**
  - Part Code
    - ML-451xND series
      - JC92–02354A : /SEE
      - JC92–02354B : /XAX, /XAA
      - JC92–02354E : /XIL
      - JC92–02354F : /ETS, /STS, /XEV, /XIP, /XSA, /XSG, /XSS
      - JC92–02354G : /XAZ, /XPE
    - ML-5010/5012ND series
      - JC92–02355A : /SEE, /XET
      - JC92–02355B : /XAX, /XAA
      - JC92–02355F : /ETS, /STS, /TED, /XEV, /XFA, /XIP, /XSA, /XSG, /XSS
      - JC92–02355G : /XAZ, /XBG, /XPE
    - ML-5015/5017ND series
      - JC92–02356A : /SEE
      - JC92–02356B : /XAA
      - JC92–02356E : /ETS, /STS, /TED, /XEV, /XFA, /XIP, /XSG, /XSS
      - JC92–02356G : /XAZ, /XBH, /XPE

- PBA name : PBA-MAIN

- **Connection**

1	USB Device	14	SCF
2	USB Host(rear)	15	BLDC Main/Deve
3	Gigabit Network	16	Cst Paper Size sensor
4	Finisher/MailBox (ML-5010, ML-5015)	17	FDB
5	EXIT Step Motor	18	DDR2 SoDimm
6	CTD, Regi sensor	19	Operation Panel
7	HVPS	20	4.3inch LCD USB I/F(5015 only)
8	Toner/DEVE Crum/TC	21	Front USB(5010/5015 only)
9	Interface PBA	22	MSOK(Xerox Model Only)
10	LSU	23	SATA Power
11	SMPS	24	SATA Signal
12	SMPS(24V_remote)	25	5V DC Jack
13	Fuser Thermistor	26	SIM Socket (Xerox Model Only)

SO-DIMM PBA

The SO-DIMM PBA is the system memory module of the Main Controller. It is used for the operating system, some system application programs, and it stores some print data from the USB and Network port (scanned images, copy data, fax data and printable video data, etc.). The SO-DIMM PBA includes the following features:

- 512MB capacity (expandable to 1GB)
- 32-bit non ECC DDR2 200MHz speed.

⚠ **NOTE**

Only this memory can be installed to the main controller.

- **Information**
    - SEC-CODE : JC92-02087C
    - PBA Name : DDR2 RAM DIMM

2.2.10.2. OPE Controller

There are 2 OPE controller types depending on its model. ML-451x and 5010/5012 models have adopted the CMOS controller for 4–line LCD. ML-5015/5017 models are composed of the controller, 64MB DDR memory, Touch OPE PBA with 32MB Flash Memory, OPE Key PBA.

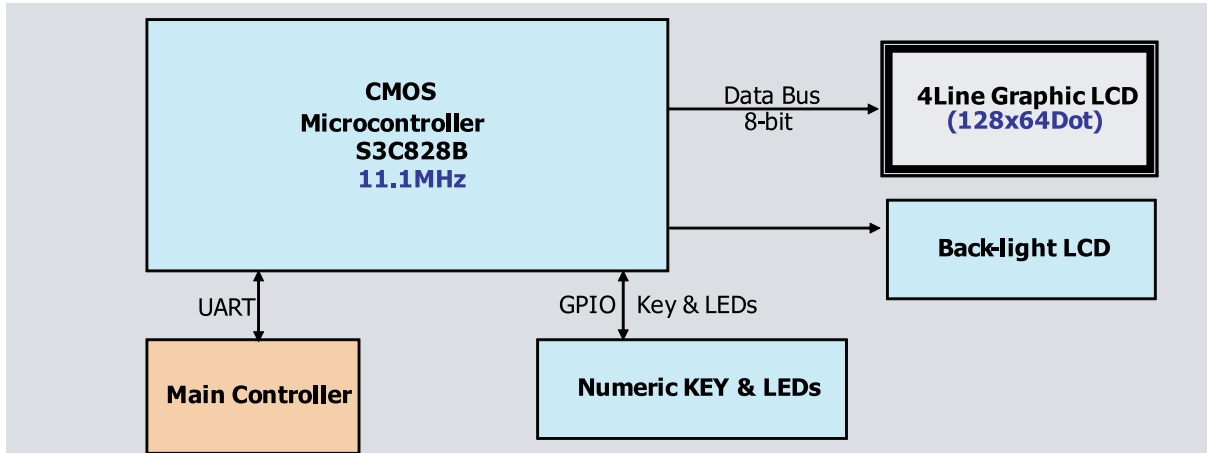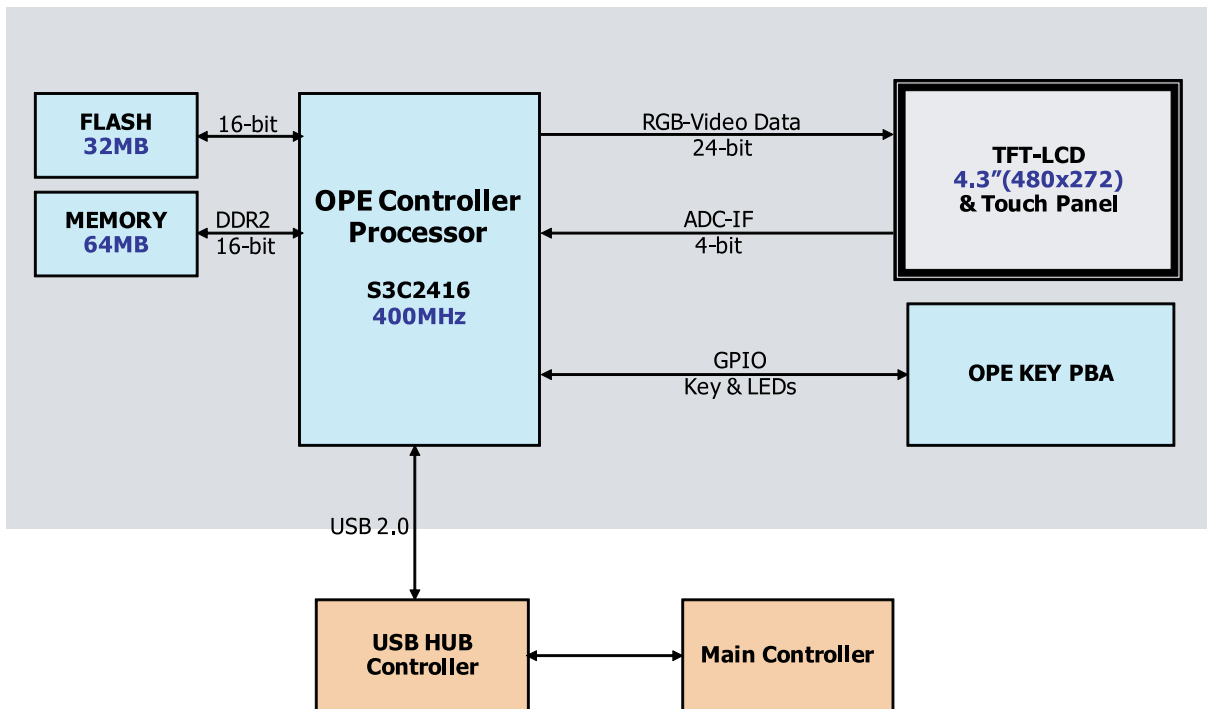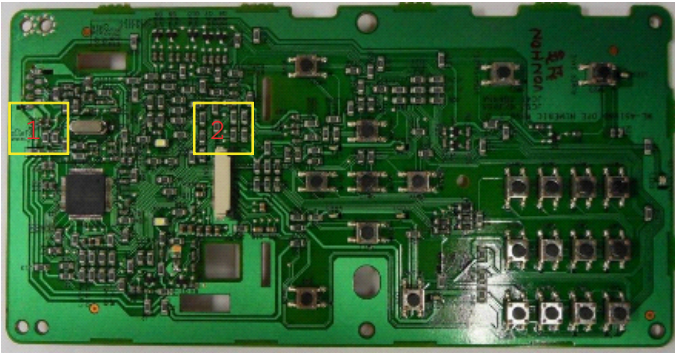**Diagram of OPE controller (ML-451x/5010/5012 only)**

Diagram of OPE controller (ML-5015/5017 only)

Numeric OPE PBA (ML-451x, ML-5010/5012 only)

- **Information**
  - SEC-Code : JC92–02380A
  - PBA Name : Numeric OPE

- **Connection**

1	Main IF
2	LCD IF

Touch OPE PBA (ML-5015/5017 only)
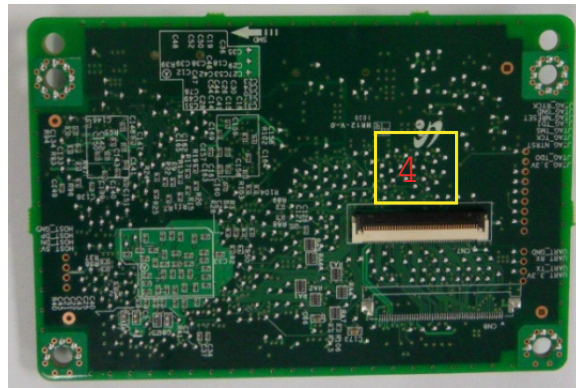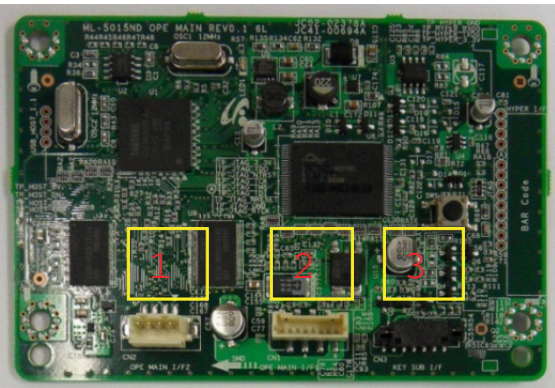
- **Information**
  - SEC-Code : JC92–02378A
  - PBA Name : Numeric OPE

- **Connection**

1	Main IF (USB)	3	OPE Key IF
2	Main IF	4	LCD IF

OPE Key PBA (ML-5015/5017 only)
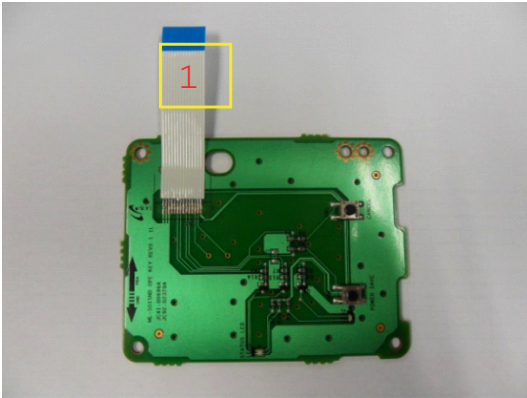
- **Information**
  - SEC-Code : JC92–02379A
  - PBA Name : OPE KEY

- **Connection**

| 1	Touch OPE PBA IF FFC Cable

2.2.10.3. SMPS and FDB Board

The SMPS (Switching Mode Power Supply) Board supplies electric power to the Main Board and other boards. The voltage provided includes +5V, and +24V from a 110V/220V power input. It has safety protection modes for over current and overload.

The FDB(Fuser Drive Board) controls the halogen lamps in the fuser unit to provide the stable power.
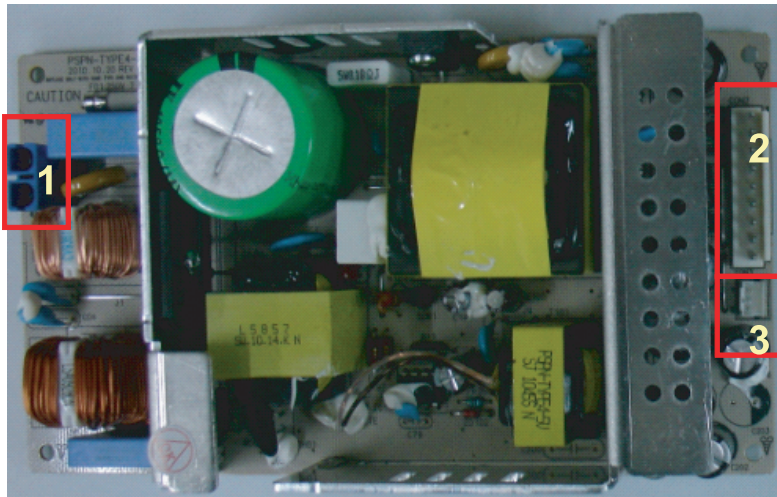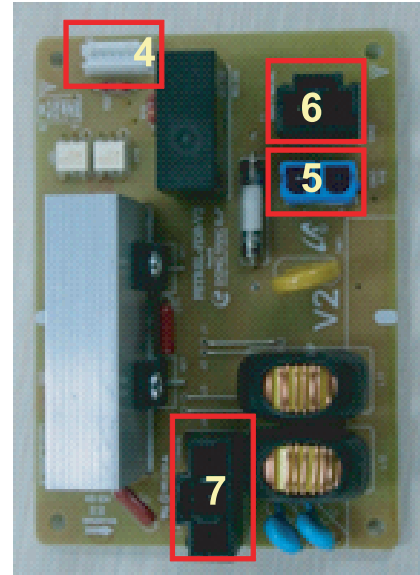
SMPS   **FDB**

- **Specification**

    General Input / Output Voltage

    1) AC 110V (90V ~ 135V) / AC 220V (180V ~ 270V)

    2) Input Current: 13.7A (110V) / 6.8A (220V)

    3) Output Power(SMPS+FDB) : 1500W (SMPS : 200W, FDB : 1300W)
        -   SMPS : DC 5V (20W) / DC 24V (180W)
        -   FDB : AC Lamp1 : 700W / AC Lamp2 : 600W

- **Information**
    - SMPS

	110V	220V
SEC Code	JC44–00091C	JC44–00092C
PBA Name	SMPS V1	SMPS V2

    - FDB

	110V	220V
SEC Code	JC44–00203A	JC44–00204A
PBA Name	FDB V1	FDB V2

- **Connection**

1	INPUT AC
2	OUTPUT_DC(to DC POWER PBA)
3	SMPS Control Signal (from Engine PBA)
4	Fuser_Control Signal (from Engine PBA)
5	INPUT_AC
6	INPUT_AC
7	OUTPUT_AC(to AC Lamp1,2)

◆ Input / Output connector

SMPS, AC Input Connector(CN1)		
PIN ASSIGN	PIN NO	Description
1	AC_L	AC Input
2	AC_N	

SMPS,DC Output Connector(CN2)		
PIN ASSIGN	PIN NAME	Description
1	+5V1	Power
2	GND	5V Ground
3	+5V2	Power
4	+GND	24V Ground
5	+24V1	Power
6	GND	24V Ground
7	+24V2	Power
8	GND	24V Ground
9	+24V3	Power

SMPS,Signal Connector2(CN3)		
PIN ASSIGN	PIN NAME	Description
1	GND	Ground
2	24V_ON_OFF	SMPS Control
3	GND	Ground

FDB, Signal Connector1(CN1)

PIN ASSIGN	PIN NAME	Description
1	24VS1	Power
2	Heater_ON1	Lamp1 Control Signal
3	Heater_ON2	Lamp2 Control Signal
4	Zero_Crossing	Phase_Control Signal
5	Relay_ON/OFF	FDB ON_OFF
6	GND	Ground

FDB, AC Input Connector(CN2)

PIN ASSIGN	PIN NO	Description
1	AC_L	AC Input
2	Acne	

FDB, AC Input Connector(CN3)

PIN ASSIGN	PIN NO	Description
1	AC_L	AC Input
2	AC_N	

FDB, AC Input Connector(CN4)

PIN ASSIGN	PIN NO	Description
1	LAMP1	AC Output (to Lamp)
2	LAMP2	
3	COMMON	

2.2.10.4. HVPS Board

HVPS (High Voltage Power Supply) Unit generates high-voltage channels which includes THV, MHV, DEVE AC, DEVE DC, Fuser-bias and SAW.
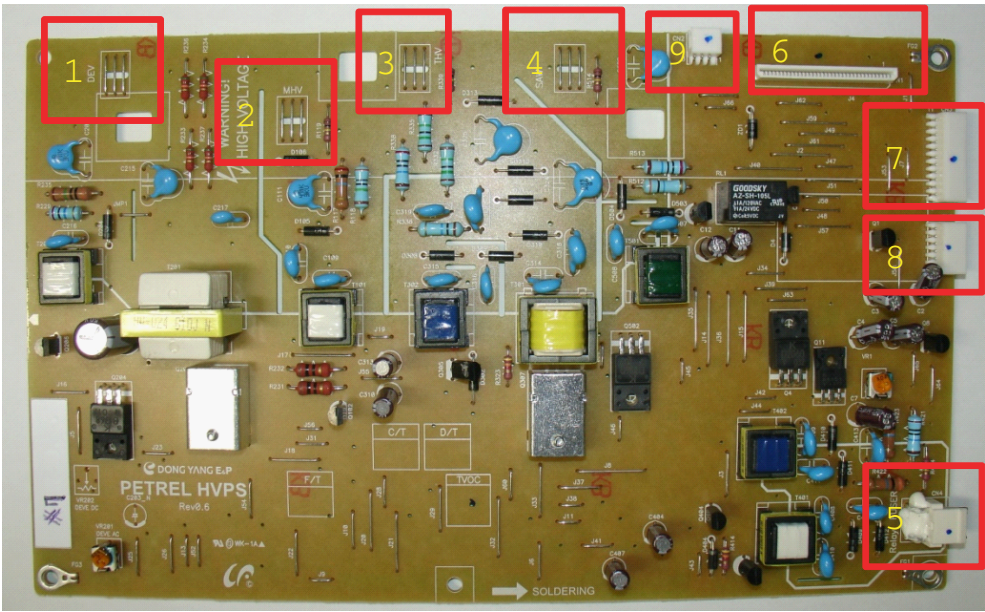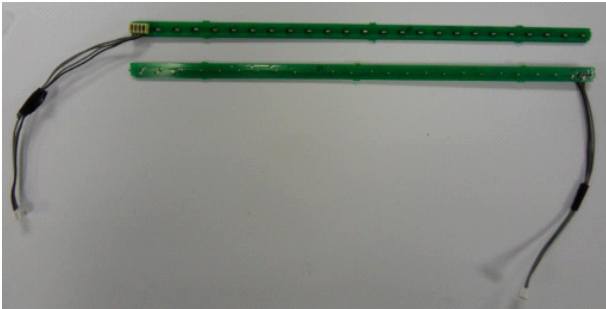

- Information
  - SEC-CODE : JC44-00202A
  - PBA Name : HVPS MONO

- Connection

1	DEV	4	SAW	7	Rear Fan
2	MHV	5	Fuser Bias	8	NSENS
3	THV	6	HVPS Input	9	LSU Fan

2.2.10.5. Eraser PBA

Eraser PBA is comprised of many LED components. Each LED is used for erasing negative charges on the surface of the drum after printing.
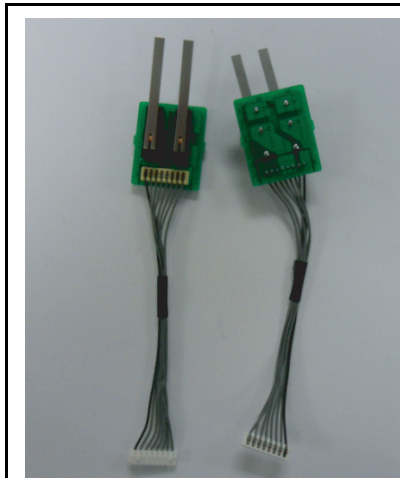

- **Information**
  - SEC-CODE : JC92-02373A
  - PBA Name : Eraser

2.2.10.6. Cover-Open PBA

This board cuts off and supply DC power when the front cover is opened or closed. It has the 24V power interlock function for safety.
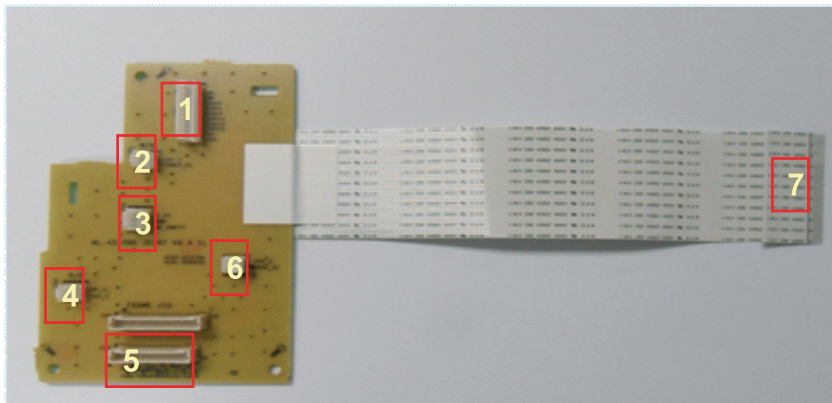

- **Information**
  - SEC-CODE : JC92-02371A
  - PBA Name : Cover-Open
- **Connection**

1	5VL
2	5V
3,4,5	24VS
6,7,8	24V

2.2.10.7. Joint PBA

The Joint PBA provides the interface for clutch, sensor, motors.

- **Information**
  - SEC-CODE : JC92-02374A
  - PBA Name : Joint PBA
- **Connection**

| 1	Cover-Open IF
2	Toner DC Motor IF
3	MP Sensor IF
4	MP Clutch IF
5	Paper Senor IF, Pickup & Dulpex Clutch IF
6	Regi Clutch IF
7	Main IF FFC Cable

2.2.10.8. Deve Crum Joint PBA

The Deve Crum Joint PBA is the interface PBA between the Imaging Unit and the system.

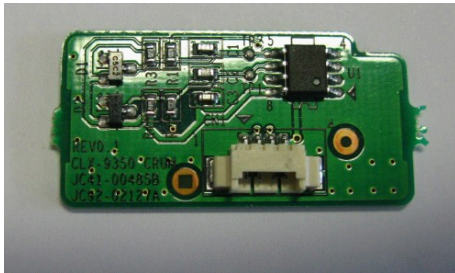|	• **Information**
	• SEC-CODE : JC92-02163A
	• PBA Name : DEVE CRUM JOINT

2.2.10.9. Toner Crum Joint PBA

The Toner Crum Joint PBA is the interface PBA between the Toner Cartridge and the system.

- **Information**
  - SEC-CODE : JC92-01963A
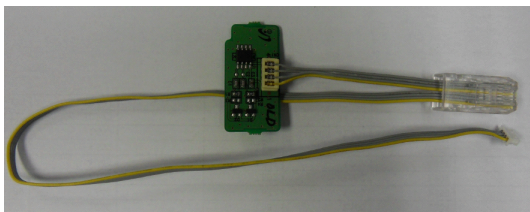 - PBA Name : TONER CRUM I/F
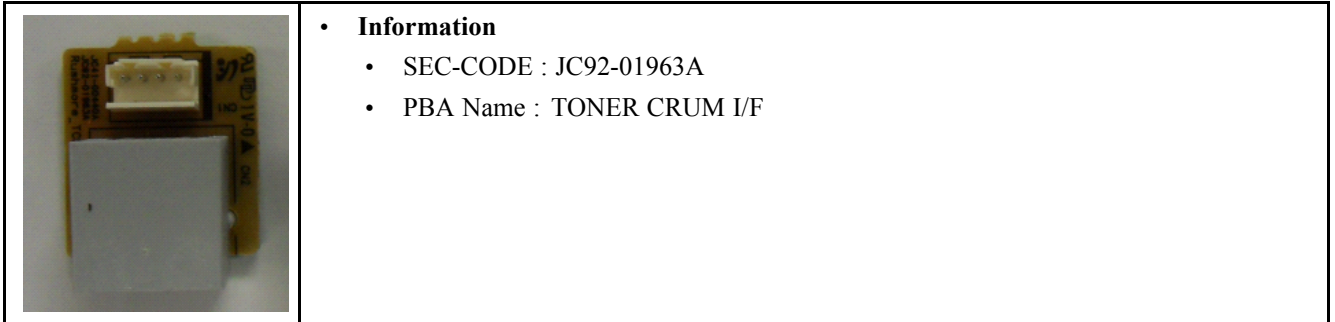
2.2.10.10. Toner Crum PBA

The Crum PBA includes CRU memory for Deve and Bottle Unit Life Cycle counting.

- **Information**
  - SEC-CODE : JC92-02345A
  - PBA Name : TONER CRUM

2.2.10.11. Deve Crum PBA

The Deve Crum PBA is the interface PBA between the main controller and imaging unit. It provides the interface for Crum, TC sensor.
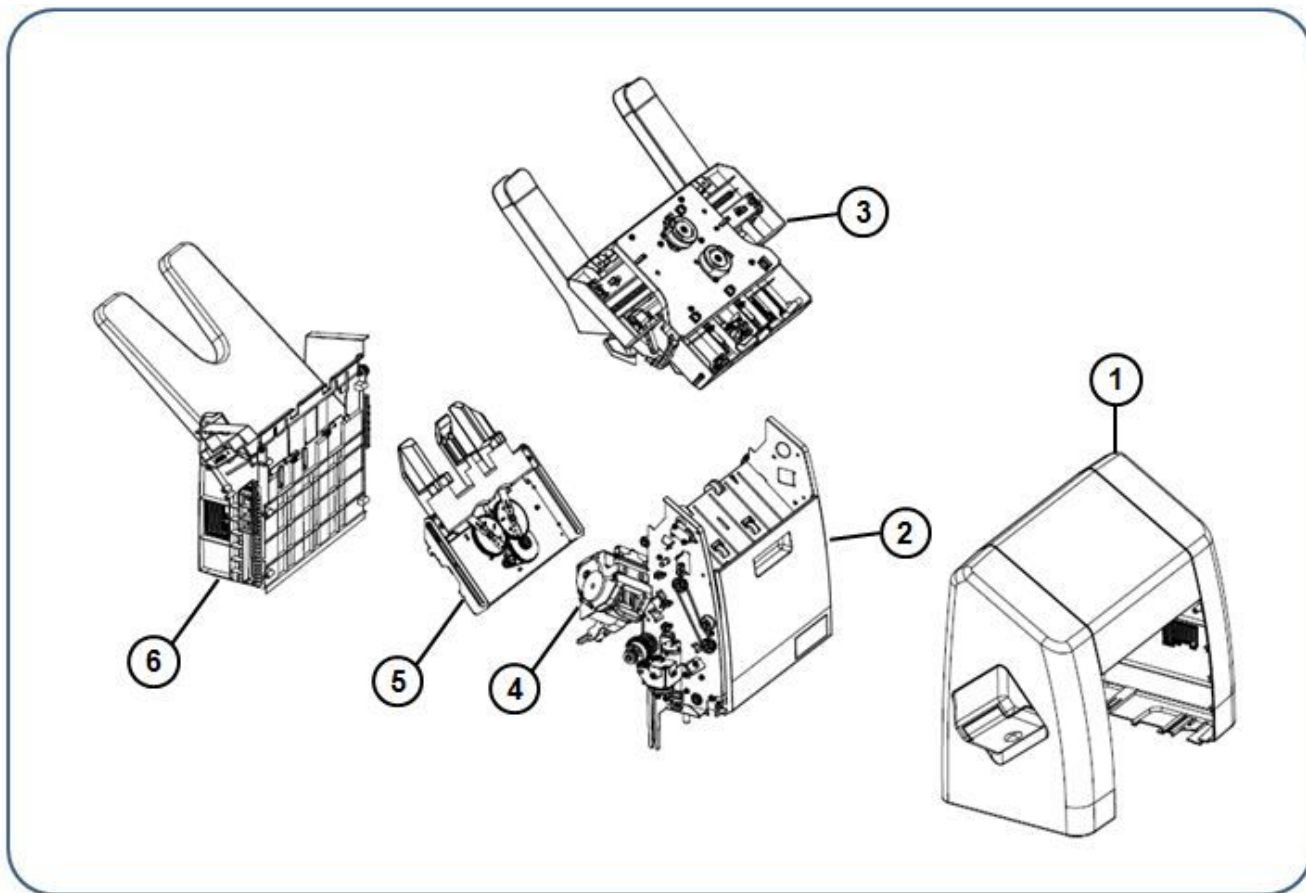

- **Information**
  - SEC-CODE : JC92-02371A
  - PBA Name : DEVE CRUM I/F

2.2.11. Finisher

### 2.2.11.1. Finisher System Configuration

Finisher is consists of 6 main units. The function of each unit is following :

| 1	Exterior Unit	This is the finisher exterior.
2	Feed Unit	This unit transports the paper to the temper unit.
3	Tamper Unit	This unit aligns the paper and transports the aligned papers to the tray.
4	Stapler Unit	This unit staples the paper.
5	Endfence Unit	This unit is the base level for aligning paper.
6	Stacker Unit	This unit is stacks the output papers.

2.2.11.2. Layout and Paper path

The following diagram displays the cross sectional view.
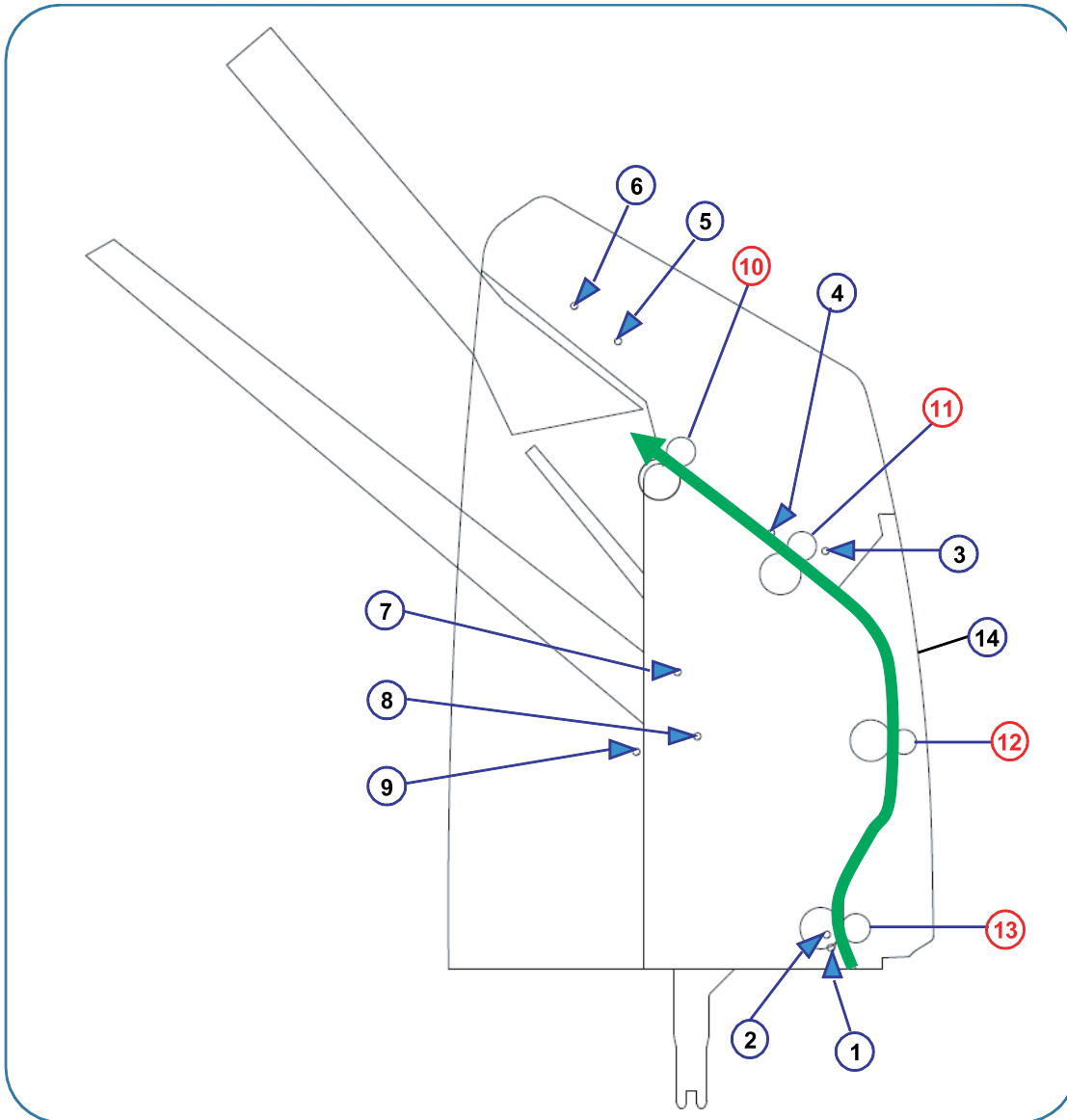
| No.	Name	No.	Name
1	Entrance Sensor	8	Level Sensor
2	Diverter Sensor	9	Stacker Full Sensor
3	Jam Guide Sensor	10	Roller Feed Exit
4	Exit Sensor	11	Roller Feed Middle Upper
5	Tamper Home Sensor (Front)	12	Roller Feed Middle Lower
6	Tamper Home Sensor (Rear)	13	Roller Feed Entrance
7	Extension Tray Home Sensor	14	Guide Left Jam Clear

2.2.11.3. Electrical parts location

The following diagram displays the electrical parts such as sensor and motor.
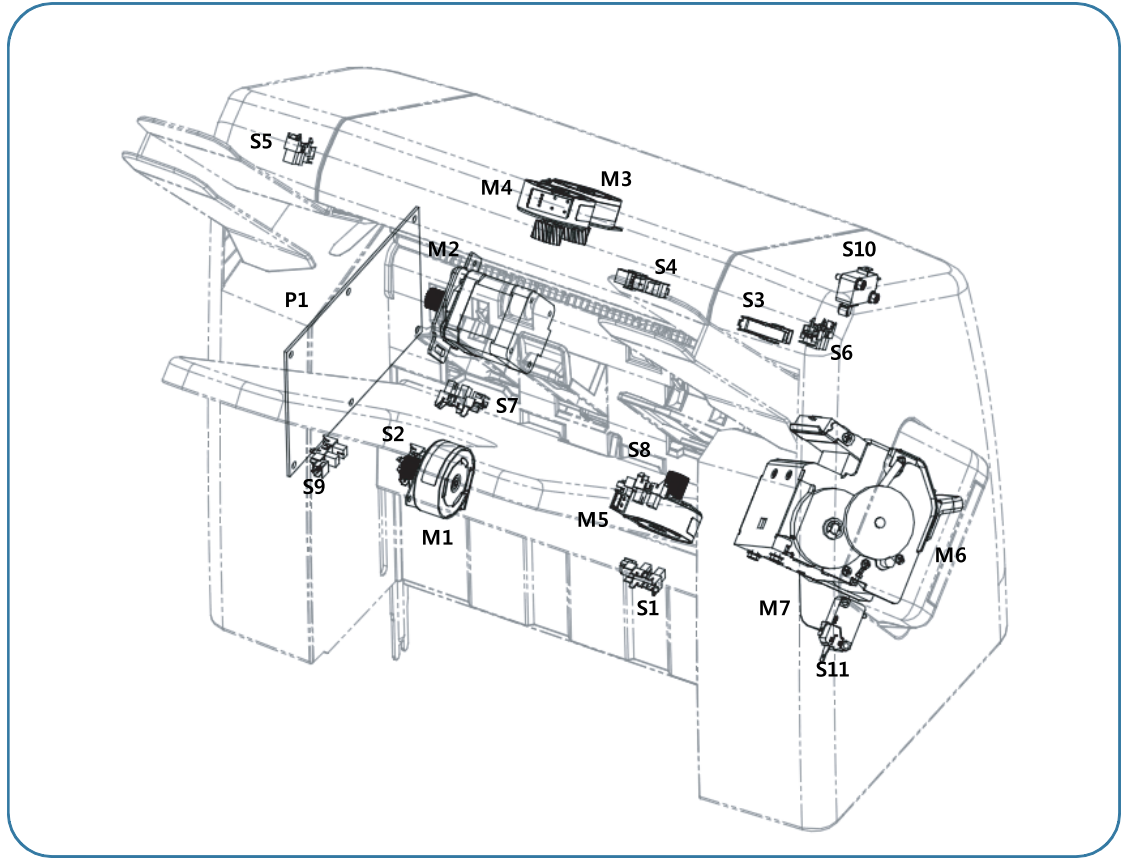
S1	JC81-07420A	AS-SENSOR:KIT5011C	Entrance Sensor
S2	JC81-07420A	AS-SENSOR:KIT5011C	Diverter Sensor
S3	JC81-07420A	AS-SENSOR:KIT5011C	Jam Guide Sensor
S4	JC81-03480A	AS-SENSOR:KIT5011C	Exit Sensor
S5	JC81-07420A	AS-SENSOR:KIT5011C	Tamper Home Sensor (Front)
S6	JC81-07420A	AS-SENSOR:KIT5011C	Tamper Home Sensor (Rear)
S7	JC81-07420A	AS-SENSOR:KIT5011C	Extension Tray Home Sensor
S8	JC81-07420A	AS-SENSOR:KIT5011C	Level Sensor
S9	JC81-07420A	AS-SENSOR:KIT5011C	Stacker Full Sensor
S10	MSW3 3143	MICRO SWITCH:VP333A-4D	Staple Safety Switch
S11	MSW3 3113	MICRO SWITCH:VP333A-1D	Cover Open Switch
M1	JC81-03478A	ASSY:PM MOTOR:S2M20T	Feed Entrance Motor
M2	JC81-03479A	ASSY:HB MOTOR:S2M19T	Feed Exit Motor
M3	HF10 3139	ASSY:PM MOTOR:M08Z18	Front Tamper Motor
M4	HF10 3139	ASSY:PM MOTOR:M08Z18	Rear Tamper Motor
M5	JC81-03478A	ASSY:PM MOTOR:S2M20T	Extension Tray Motor
M6	JC81-03475AB	STAPLER:EH-C590SS	Stapler Motor
M7	JC81-08264A	AS-DC MOTOR:2738:S2M12T:PCB	Stacker Moving Motor
P1	HF10 8200	PCB ASSY:MAIN:HF-FIN	Finisher PCB

2.2.11.4. Finisher main board

The following diagram displays the connection information of the finisher main board.
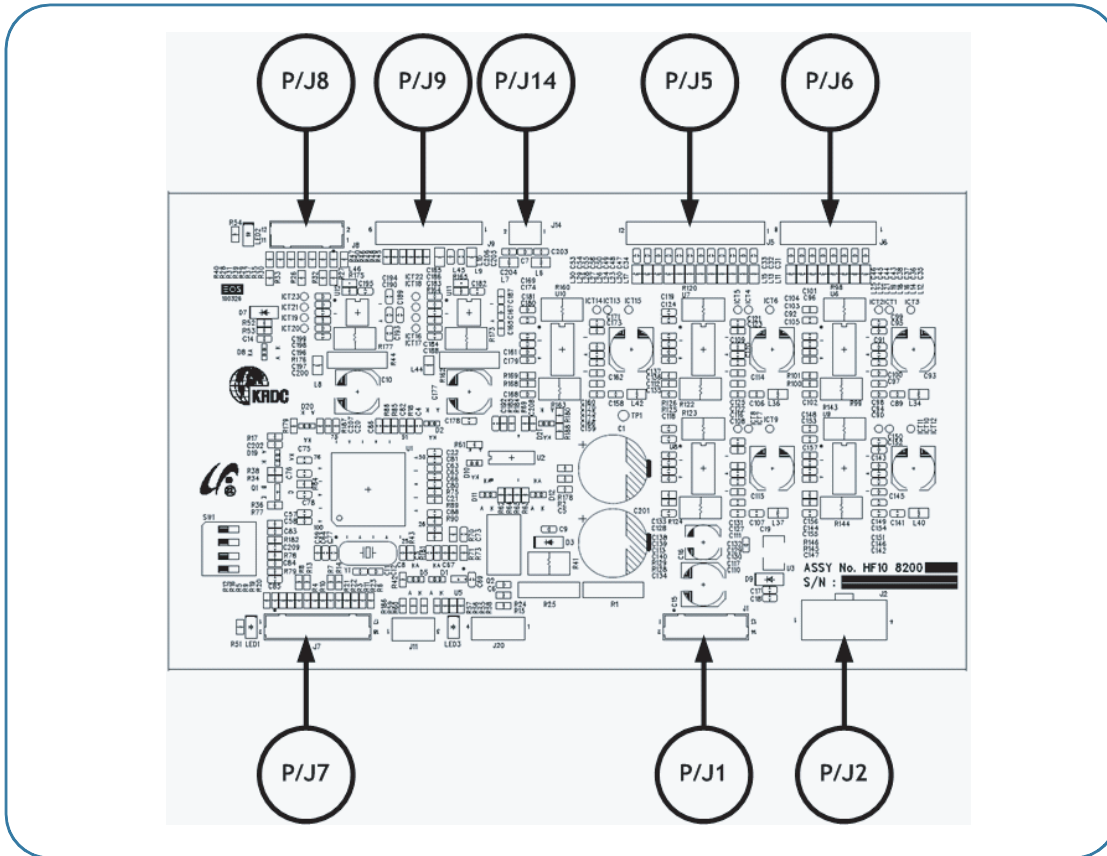

| Connector Number	Name
P/J1	PSU (+24V, +5V), ENGINE INTERFACE
P/J2	Stapler Door/Safety Switch
P/J5	Feeding Motors and Extension Tray Motor
P/J6	Tamper Motors
P/J7	Stacker, Extension Tray, Diverter, Entrance Sensors
P/J8	Exit, Jam Cover, Tamper Sensors
P/J9	Stapler Motors and Sensors
P/J14	Stacker Motor

2.2.12. Mail box

2.2.12.1. Mail box layout

The following diagram displays the cross sectional view.
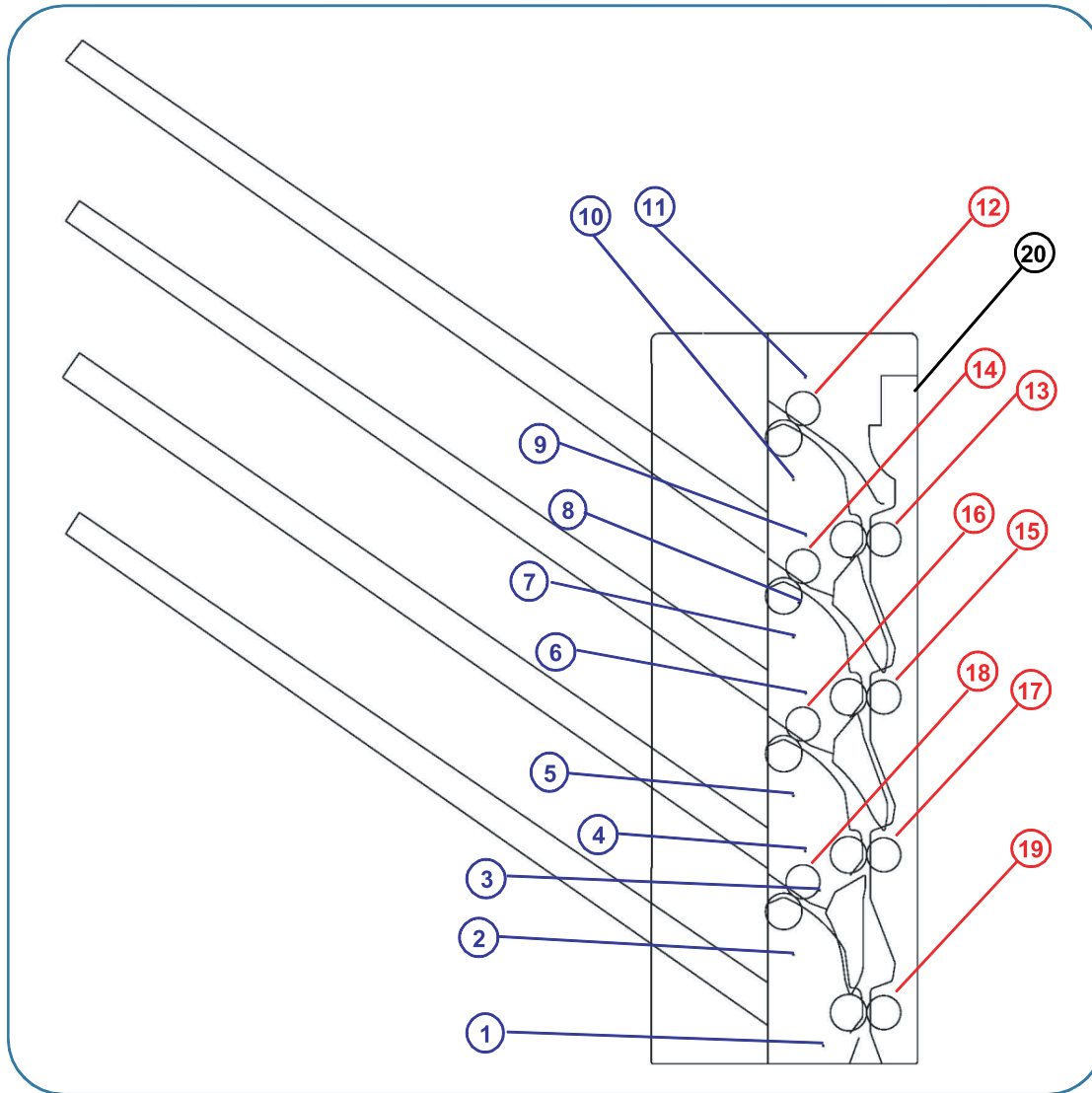
| No.	Name	No.	Name
1	Entrance Sensor	11	Full Sensor :Bin#4
2	Exit Sensor : Bin#1	12	Exit Roller : Bin#4
3	Lower Gate Sensor	13	Feed Roller : Bin#4
4	Full Sensor :Bin#1	14	Exit Roller : Bin#3
5	Exit Sensor : Bin#2	15	Feed Roller : Bin#3
6	Full Sensor :Bin#2	16	Exit Roller : Bin#2
7	Exit Sensor : Bin#3	17	Feed Roller : Bin#2
8	Upper Gate SensorLevel Sensor	18	Exit Roller : Bin#1
9	Full Sensor :Bin#3	19	Feed Roller : Bin#1
10	Exit Sensor : Bin#4	20	AS-COVER JAM FRAME ASSY

2.2.12.2. Electrical parts location

The following diagram displays the electrical parts such as sensor and motor.
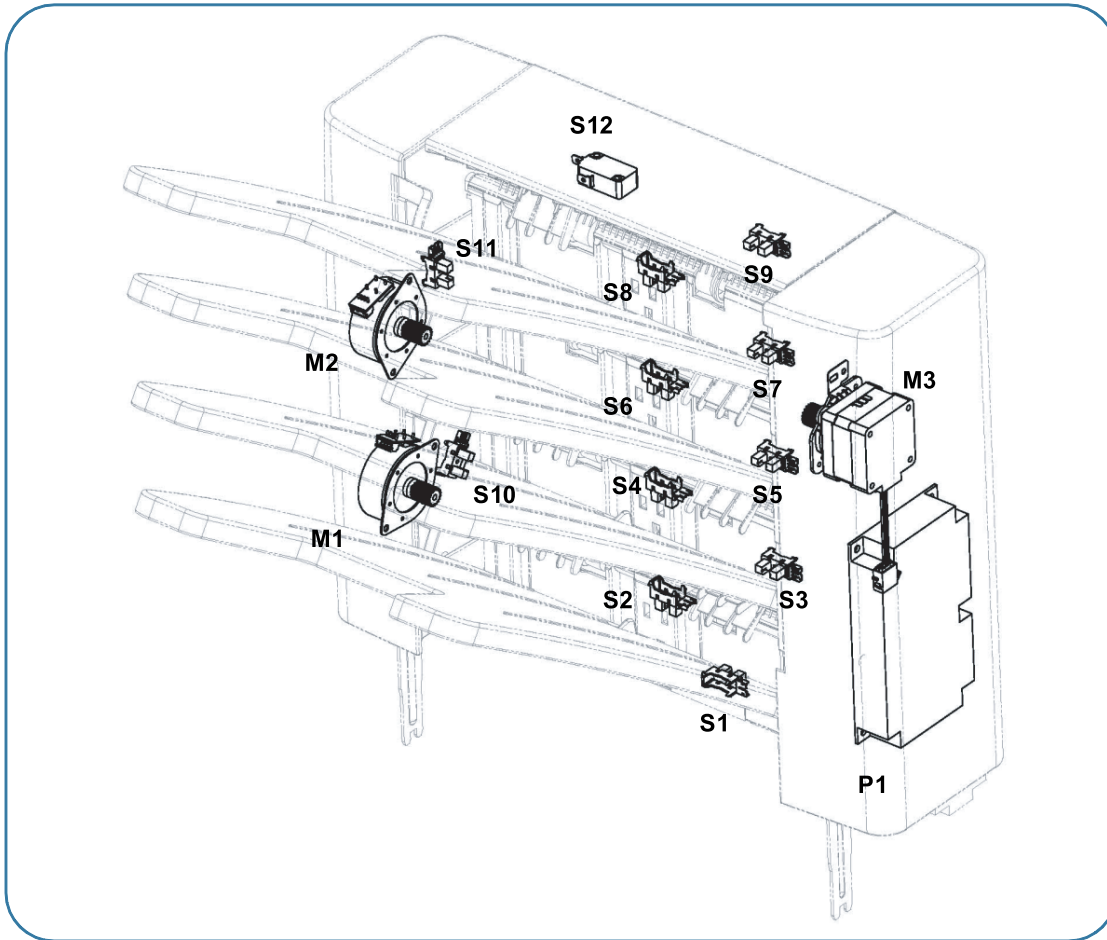
S1	0604-001095	PI SENSOR:GP1S73P2	Entrance Sensor
S2	0604-001095	PI SENSOR:GP1S73P2	Exit Sensor : Bin#1
S3	0604-001095	PI SENSOR:GP1S73P2	Full Sensor : Bin#1
S4	0604-001095	PI SENSOR:GP1S73P2	Exit Sensor : Bin#2
S5	0604-001095	PI SENSOR:GP1S73P2	Full Sensor : Bin#2
S6	0604-001095	PI SENSOR:GP1S73P2	Exit Sensor : Bin#3
S7	0604-001095	PI SENSOR:GP1S73P2	Full Sensor : Bin#3
S8	0604-001095	PI SENSOR:GP1S73P2	Exit Sensor : Bin#4
S9	0604-001095	PI SENSOR:GP1S73P2	Full Sensor : Bin#4
S10	0604-001095	PI SENSOR:GP1S73P2	Lower Gate Sensor
S11	0604-001095	PI SENSOR:GP1S73P2	Upper Gate Sensor
S12	JC81-03469A	MICRO SWITCH:VP333A-0D	Door Open Switch
M1	JC81-07280A	SEPARATE MOTOR:SUB ASSY	Lower Gate Motor
M2	JC81-07280A	SEPARATE MOTOR:SUB ASSY	Lower Gate Motor
M3	JC81-07281A	HB MOTOR:FEED:SUB ASSY	Feed Motor
P1	JC81-07277A	AS-PCB ASSY MAIN	Mailbox PCB

2.2.12.3. Mail box main board

The following diagram displays the connection information of the mail box main board.
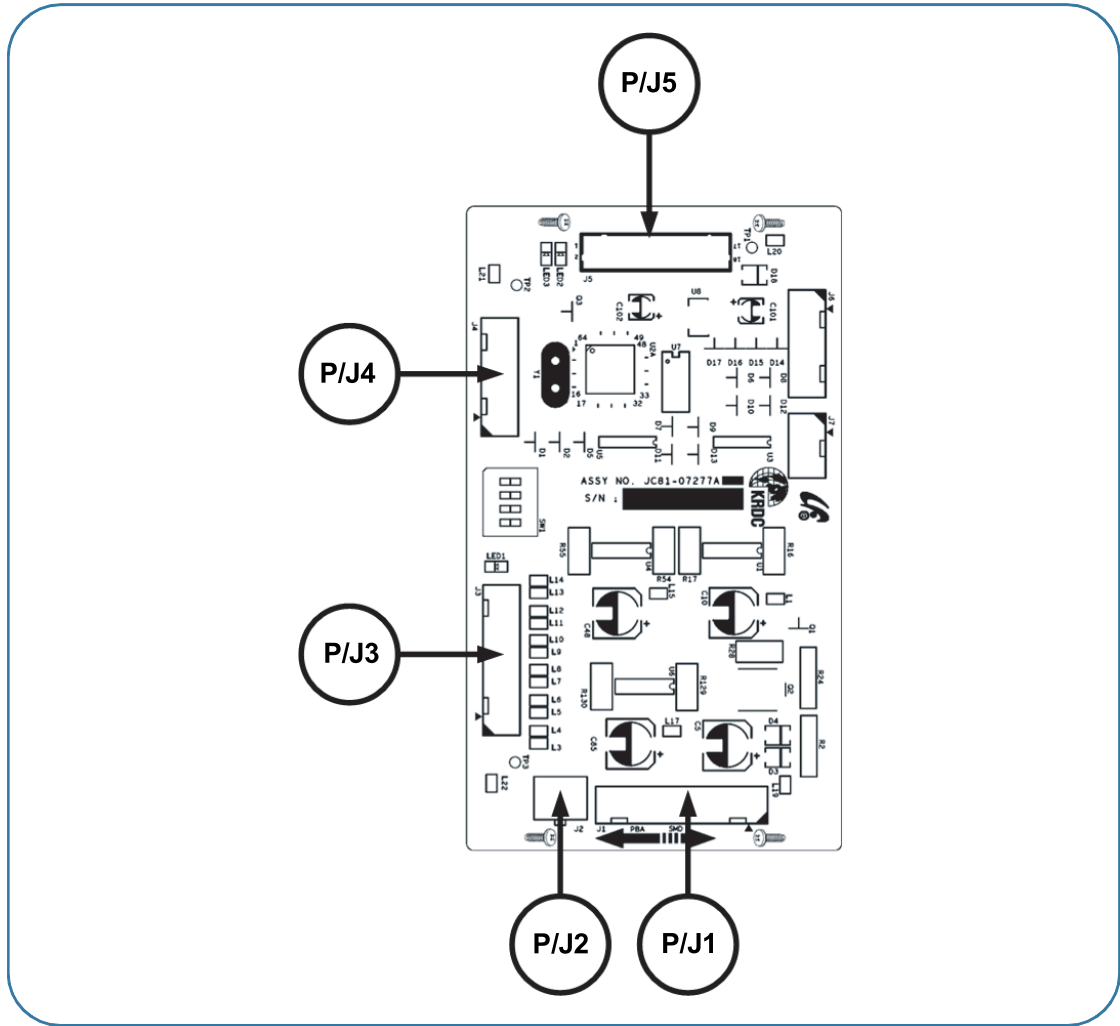
Connector Number	Name
P/J1	PSU (+24V, +5V), ENGINE INTERFACE
P/J2	Door Switch
P/J3	Feeding Motor and Upper Gate Motors
P/J4	Entrance, Upper Gate Sensors
P/J5	Exit, Full Sensors

3. Disassembly and Reassembly

3.1. Precautions when replacing parts

3.1.1. Precautions when assembling and disassembling

- Use only approved Samsung spare parts. Ensure that part number, product name, any voltage, current or temperature rating are correct. Failure to do so could result in damage to the machine, circuit overload, fire or electric shock.

- Do not make any unauthorized changes or additions to the printer, these could cause the printer to malfunction and create electric shock or fire hazards.

- Take care when dismantling the unit to note where each screw goes. There are 19 different screws. Use of the wrong screw could lead to system failure, short circuit or electric shock.

- Do not disassemble the LSU unit. Once it is disassembled dust is admitted to the mirror chamber and will seriously degrade print quality. There are no serviceable parts inside.

- Regularly check the condition of the power cord, plug and socket. Bad contacts could lead to overheating and firfe. Damaged cables could lead to electric shock or unit malfunction.

3.1.2. Preautions when handling PBA

Static electricity can damage a PBA, always used approved anti-static precautions when handling or storing a PBA.

- **Precautions when moving and storing PBA**

  1) Please keep PBA in a conductive case, anti-static bag, or wrapped in aluminum foil.

  2) Do not store a PBA where it is exposed to direct sunlight.

- **Precautions when replacing PBA**

  1) Disconnect power connectors first, before disconnecting other cables.

  2) Do not touch any soldered connections, connector terminals or other electronic parts when handling insulated parts.

- **Precautions when checking PBA**

  1) Before touching a PBA, please touch other grounded areas of the chassis to discharge any static electrical charge on the body.

  2) Take care not to touch the PBA with your bare hands or metal objects as you could create a short circuit or get an electric shock. Take extra care when handling PBAs with moving parts fitted such as sensors, motors or lamps as they may get hot.

  3) Take care when fitting, or removing, screws. Look out for hidden screws. Always ensure that the correct screw is used and always ensure that when toothed washers are removed they are refitted in their original positions.

3.1.3. Releasing Plastic Latches

Many of the parts are held in place with plastic latches. The latches break easily; release them carefully.

To remove such parts, press the hook end of the latch away from the part to which it is latched.

3.2. Screws used in the printer

The screws listed in the table below are used in this printer. Please ensure that, when you disassemble the printer, you keep a note of which screw is used for which part and that, when reassembling the printer, the correct screws are used in the appropriate places.

Part Code	Location	Description	Qty
6002-000440	CASSETTE	SCREW-TAPPING;PWH,+,2,M3,L8,ZPC(BLK),SWRCH18A	11
6003-000196	CASSETTE	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	4
6003-000269	CASSETTE	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	3
6002-000440	CASSETTE-SIDE RIGHT	SCREW-TAPPING;PWH,+,2,M3,L8,ZPC(BLK),SWRCH18A	2
6003-000196	FUSER	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	3
6003-000261	FUSER	SCREW-TAPTYPE;BH,+,-,B,M3,L6,ZPC(WHT),SWRCH18A,-	11
6003-000269	FUSER	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	25
6006-001193	FUSER	SCREW-MACHINE;PH,+,WSP,M3,L10,ZPC(WHT),SWRCH18A,	1
6003-000269	FRAME-BASE	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	44
6003-000196	EXIT	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	20
6009-001665	DRIVE EXIT	SCREW-HEX;HWH,+,M3,L6,ZPC(WHT),SWRCH18A,C TYPE	5
6003-000196	DUPLEX	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	3
6003-000269	DUPLEX	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	11
6009-001492	DUPLEX	SCREW-HEX;HWH,+,M3,L8,NI PLT,SWRCH18A,S,RF	4
6001-000545	DUPLEX-FEEDER LOWER	SCREW-MACHINE;PH,+,M3,L4,NI PLT,SWRCH18A,FP,-	2
6003-000196	FRAME-LEFT	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	3
6003-000269	FRAME-LEFT	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	9
6002-000440	FRAME-GUIDE CASSETTE LEFT	SCREW-TAPPING;PWH,+,2,M3,L8,ZPC(BLK),SWRCH18A	1
6003-000196	FRAME-TERMINAL FUSER	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	1
6003-000196	FRAME-RIGHT	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	2
6003-000269	FRAME-RIGHT	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	18
6003-000196	DRIVE-FEED	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	3
6003-000269	DRIVE-FEED	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	4
6003-000196	FRAME-GUIDE CASSETTE RIGHT	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	1
6003-000196	FRAME-UPPER	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	2
6003-000196	FRAME-MAIN	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	13
6003-000269	FRAME-MAIN	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	37
6003-000269	DRIVE MAIN	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	12
6003-000301	DRIVE MAIN	SCREW-TAPTYPE;BH,+,S,M4,L6,ZPC(WHT),SWRCH18A	8
6009-001665	DRIVE MAIN	SCREW-HEX;HWH,+,M3,L6,ZPC(WHT),SWRCH18A,C TYPE	7
6003-000196	FRAME-GUIDE OPC RIGHT	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	2
6003-000196	FRAME-MIDDLE	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	13

Part Code	Location	Description	Qty
6003-000282	FRAME-SENSOR CTD	SCREW-TAPTYPE;BH,+,-,B,M3,L8,ZPC(BLK),SWRCH18A,-	2
6003-000196	FRAME-TERMINAL	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	5
6003-000269	FRAME-FEED IDLE	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	2
6003-000196	COVER-SMPS	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	2
6003-000196	COVER-REAR	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	5
6006-001078	COVER-FRONT	SCREW-TAPTYPE;PH,+,WSP,B,M3,L10,ZPC(WHT),SWRCH18A	2
6003-000196	COVER-TOP	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	1
6003-000282	LSU	SCREW-TAPTYPE;BH,+,-,B,M3,L8,ZPC(BLK),SWRCH18A,-	5
6003-000196	OPE-4.3LCD	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	6
6003-000269	OPE-4.3LCD	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	4
6003-000196	MAINLINE	SCREW-TAPTYPE;PWH,+,B,M3,L10,NI PLT,SWRCH18A	6
6003-000269	MAINLINE	SCREW-TAPTYPE;BH,+,-,S,M3,L6,ZPC(WHT),SWRCH18A,-	21
6003-000301	MAINLINE	SCREW-TAPTYPE;BH,+,S,M4,L6,ZPC(WHT),SWRCH18A	5
6009-001492	MAINLINE	SCREW-HEX;HWH,+,M3,L8,NI PLT,SWRCH18A,S,RF	4

3.3. Replacing the maintenance parts

3.3.1. Fuser Unit

⚠️ **CAUTION**

The temperature gets very hot in the vicinity of the fuser unit. When replacing it, take necessary precautions so you don't get burned. Before replacing it, make sure that fuser unit has cooled.

1. Open the rear cover. While opening the rear cover at a 45° angle, lift up the right side of the rear cover, Then take off the rear cover.
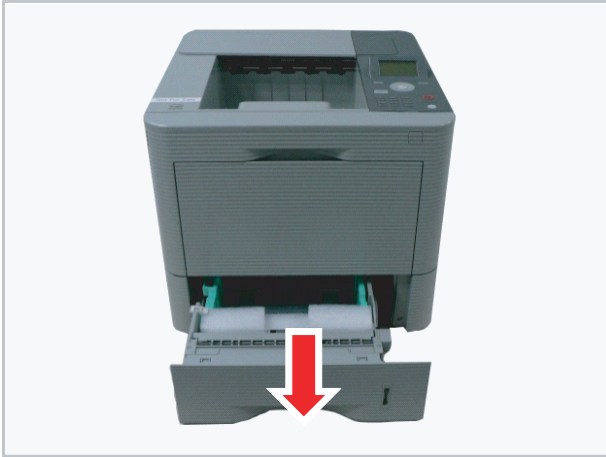

2. Remove 4 screws.
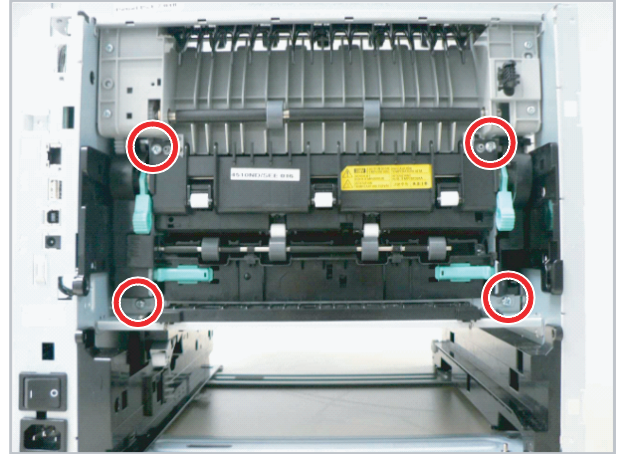
3. Lift up the both levers. Then take off the fuser unit.
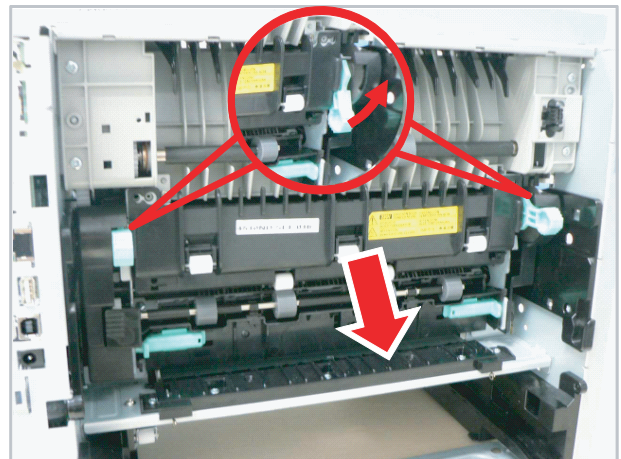
3.3.2. Pick up / Forward roller

1. Remove the cassette.

2. Remove the pick up and forward roller as shown image.
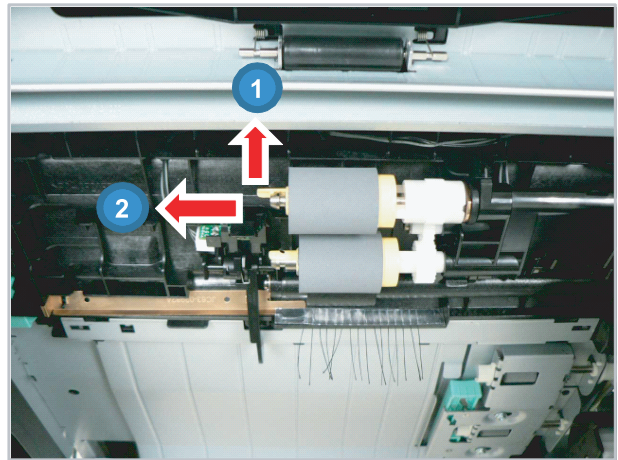
3.3.3. Transfer roller

1. Open the front cover. Remove the toner cartridge and imaging unit.

2. Push the both handles to the direction of arrow. Take off the transfer roller.
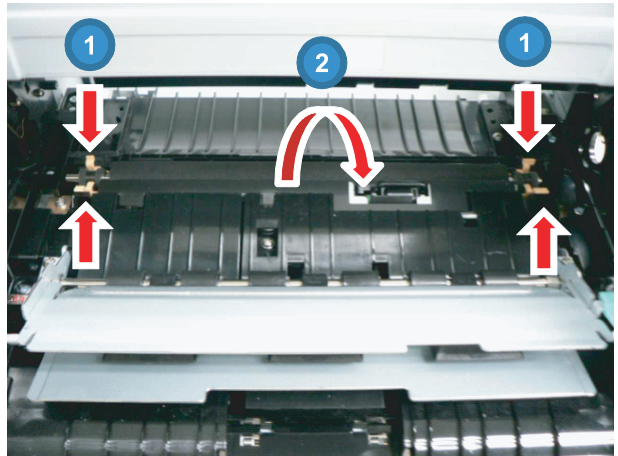
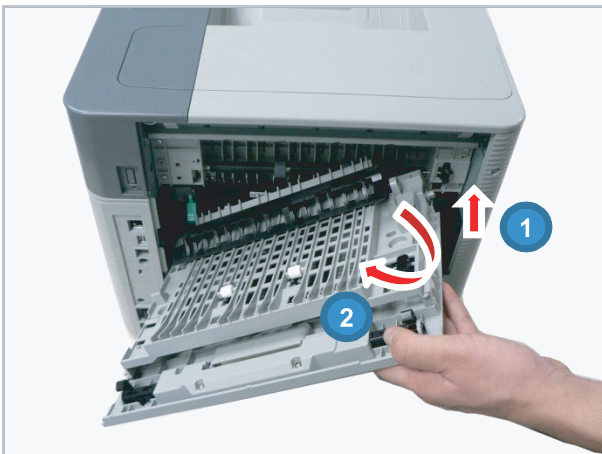# 3.4. Replacing the main svc parts

3.4.1. Cover

1. Remove the cassette.
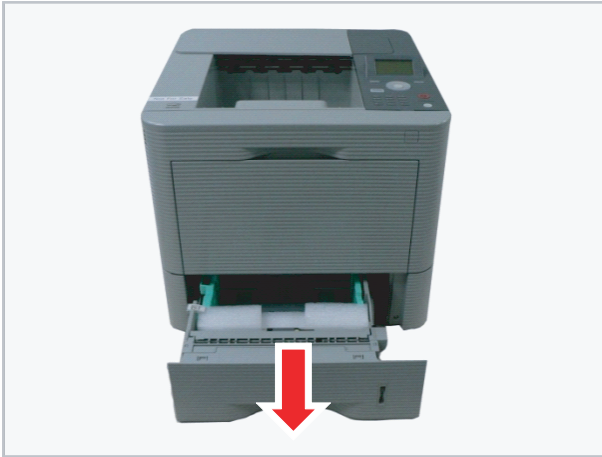
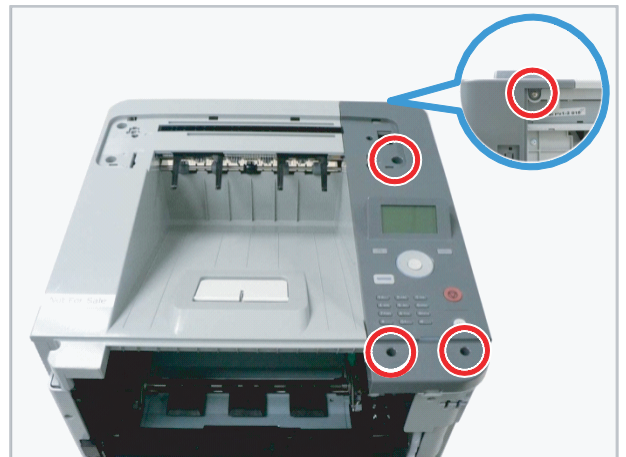**2.** Remove the linker. And remove the front cover by releasing hooks from both sides.
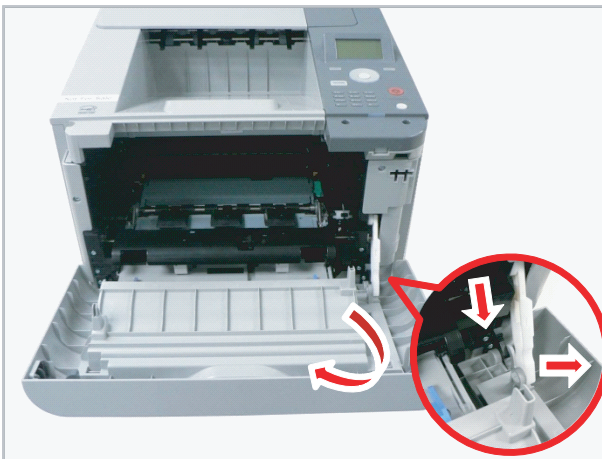
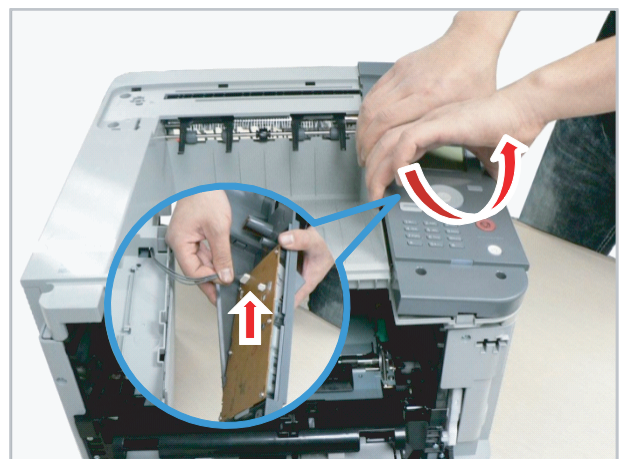**3.** Open the rear cover. Lift up the right side and release the rear cover.

4. Remove the option cover.
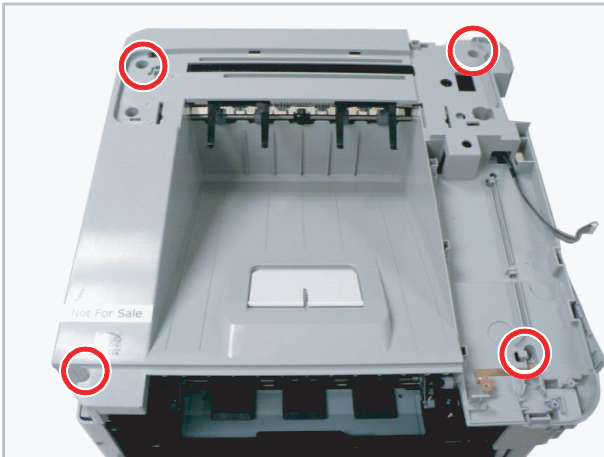

5. Remove 4 screw securing the OPE unit.
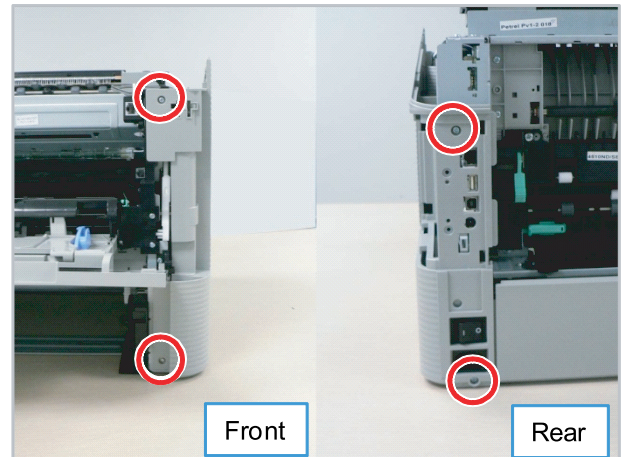

6. Release the OPE unit. Unplug the connector.

7. Remove 4 screws securing the top cover.

8. Lift up and release the top cover.

9. Remove the main board cover.

10. Remove 4 screws securing the right cover.

Front   Rear

11. Remove the rear dummy cover.
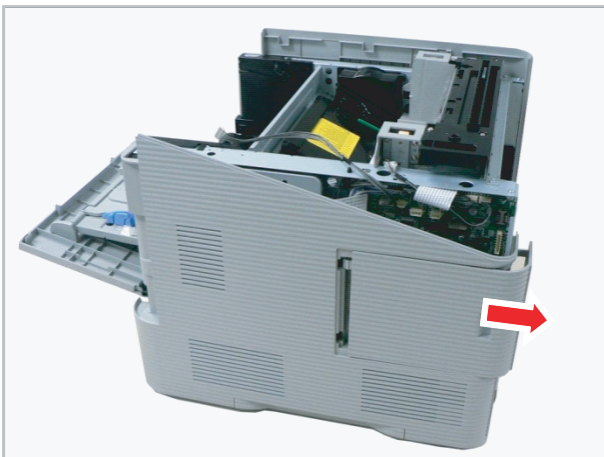
12. Release the right cover.
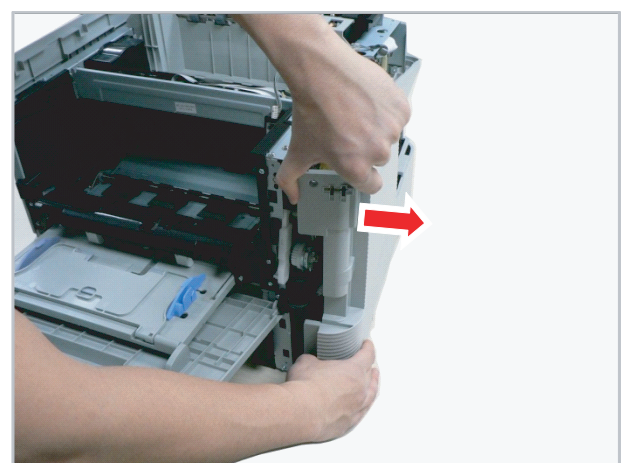
13. Remove 4 screws securing the left cover.

Front   Rear
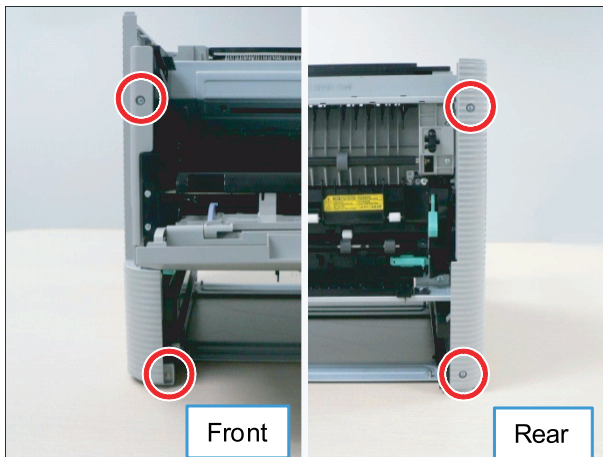
14. Release the left cover.
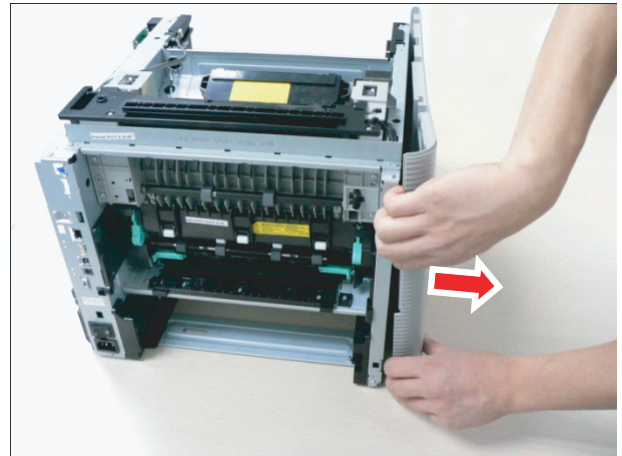
3.4.2. Main Board

1. Remove the right cover.

2. Unplug all connectors on main board.

3. Remove 4 screws.

4. Release the main board.
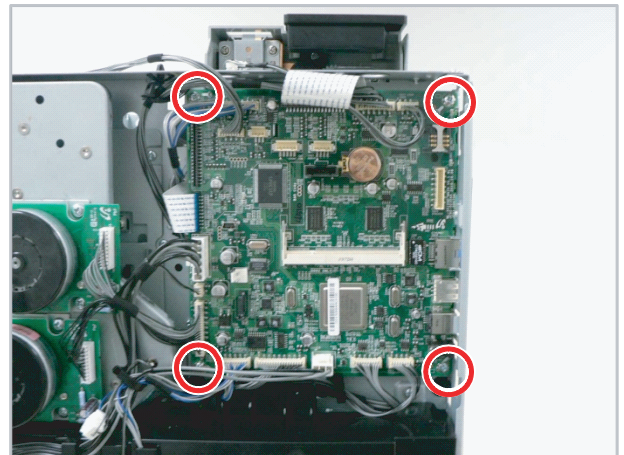
3.4.3. Joint PBA

1. Remove the right cover.

2. Unplug all connectors on main board.

3. Remove 4 screws.

4. Release the Joint PBA.

3-9
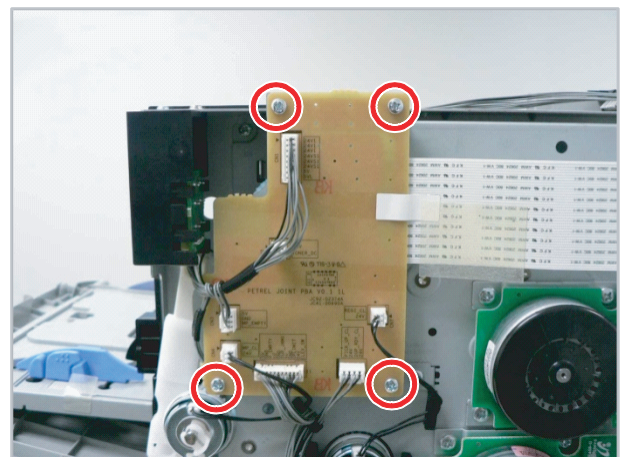
3.4.4. SMPS and FDB(Fuser Drive board)

1. Remove the right cover.

2. Remove 3 screws securing the SMPS cover..

3. Release the SMPS cover after unplugging the connector.

4. Unplug all connector on the FDB. Remove 3 screws. And release the FDB.
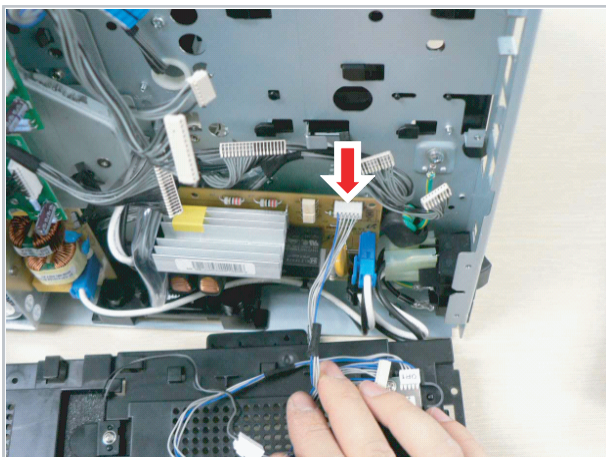
5. Unplug all connector on the SMPS board. Remove 3 screws. And release the SMPS board.
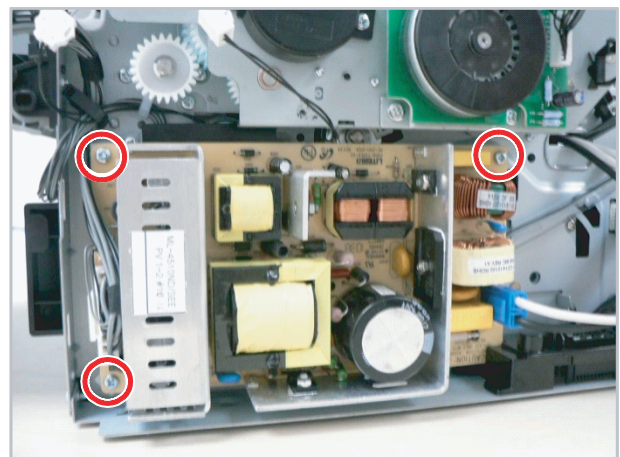
3.4.5. OPC and Main motor

1. Remove the right cover.

2. Unplug the connector on the OPC motor. Remove 4 screws, then release the OPC motor.

3. Unplug the connector on the Main motor. Remove 4 screws, then release the Main motor.
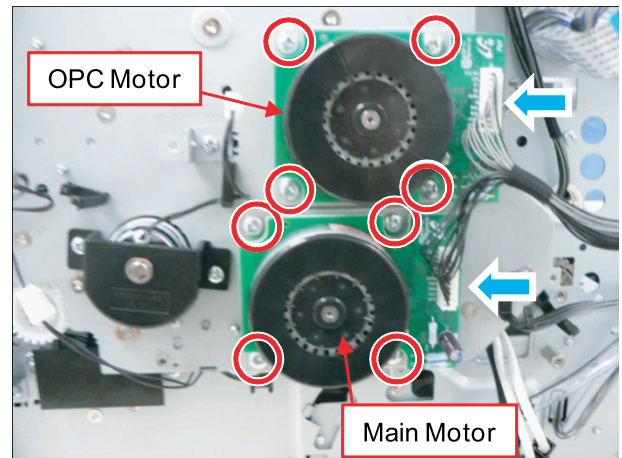
3.4.6. Main Drive unit

1. Remove the right cover.

2. Remove the Joint PBA.

3. Remove the SMPS cover.

4. Remove the MP clutch and the Gear.

5. Release the Main drive unit after removing 5 screws.
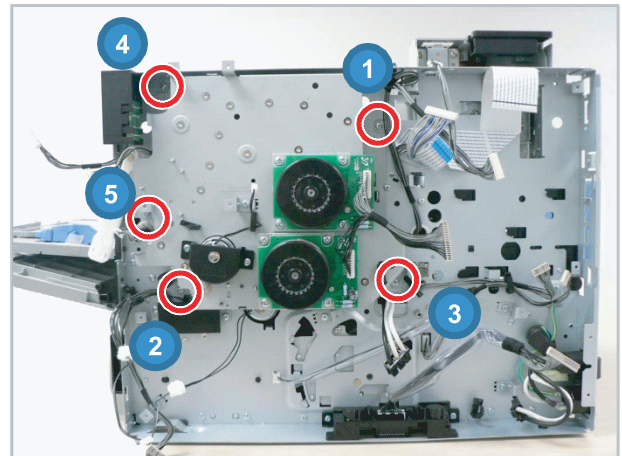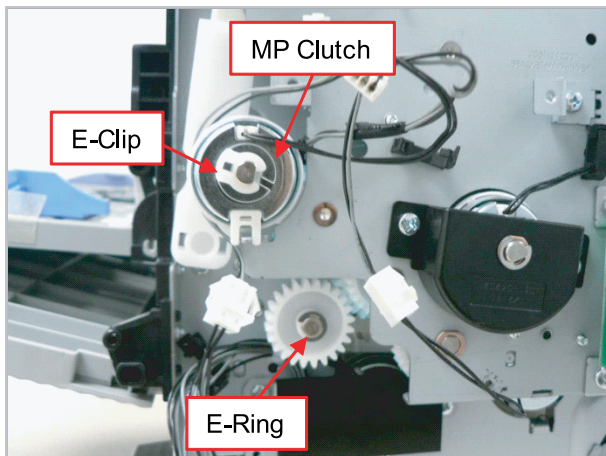
⚠ NOTE

When reassembling the main drive unit, tighten 5 screws in order as shown above.

3.4.7. Duplex and Pick up clutch

1. Remove the right cover.

2. Remove the main drive unit.

3. Remove the clutch bracket after removing 2 screws.
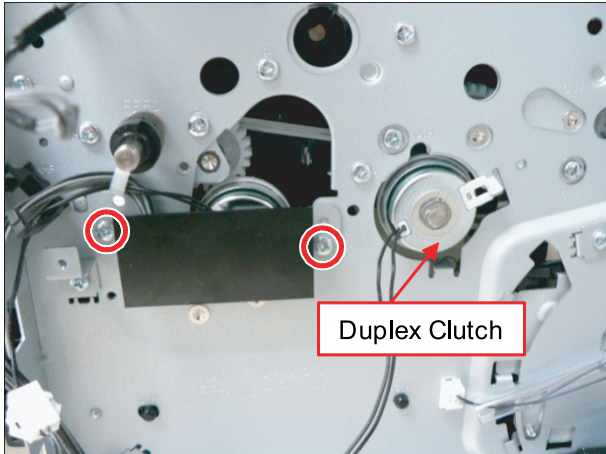
Duplex Clutch

4. Remove the pick up clutch. Remove the duplex clutch after removing the E-ring.

Pick up Clutch
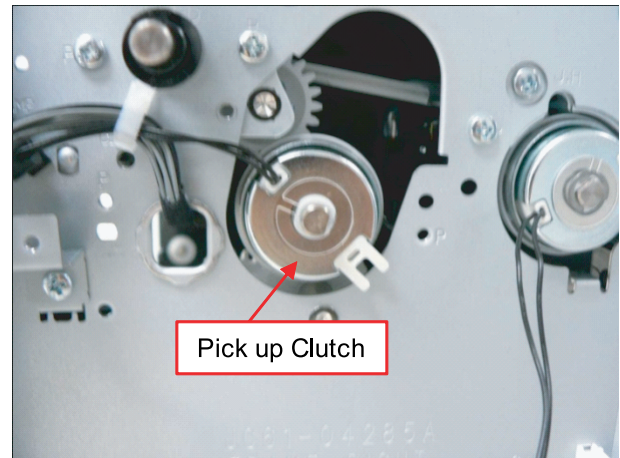
3.4.8. HVPS Board

1. Remove the left cover.

2. Remove the 4 screws.

3. Unplug all connectors on the HVPS board.

4. Release the HVPS board.
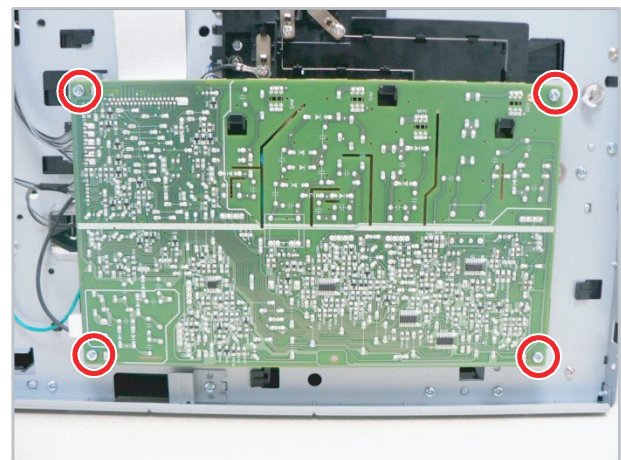
3.4.9. Exit Unit

1. Remove all covers and fuser unit.

2. Remove the bracket after removing 2 screws.

> ⚠️ **NOTE**
>
> When reassembling the exit unit, first tighten these screws to secure the frame and bracket.

3. Remove the 4 screws from the rear.

4. Remove 2 screws. Release the Exit unit after pull it to the rear slightly.
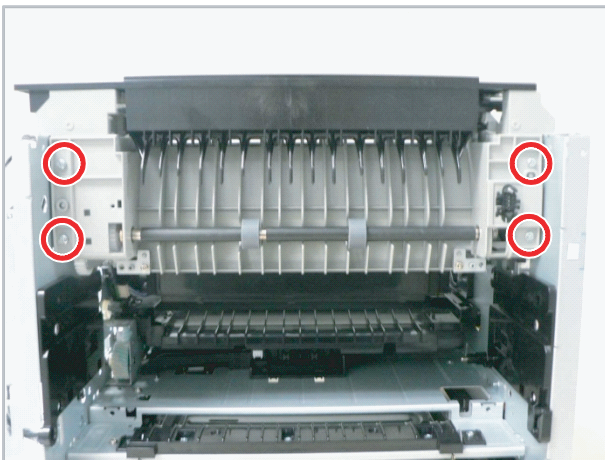
3.4.10. LSU (Laser Scanning Unit)

1. Remove the top cover.

2. Take the flat cable off.

3. Remove 4 screws and 2 harness. Release the LSU.
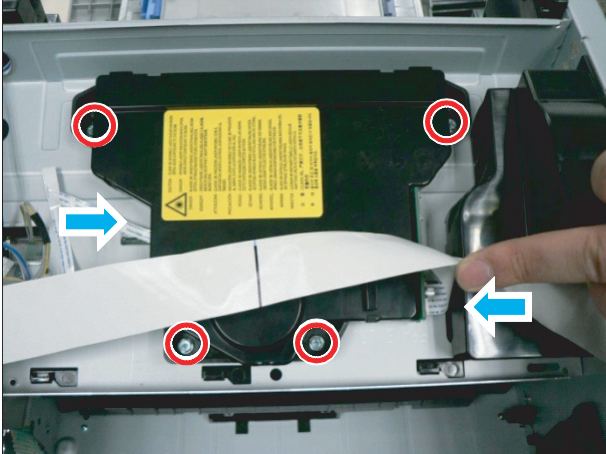
> ⚠ **NOTE**
>
> When reassembling the LSU, position the harness center line to the arrow on the LSU.

3.4.11. Eraser Lamp PBA

1. Remove the top cover.

2. Remove the LSU.

3. Remove 1 screw and push 1 hook.

4. Pull the eraser lamp PBA to the left slightly. And then release it.
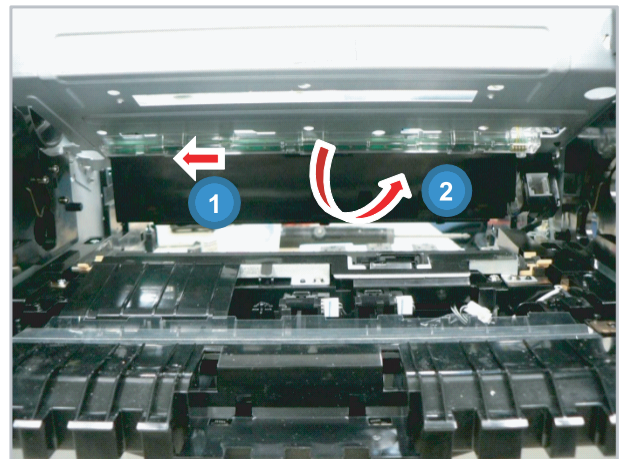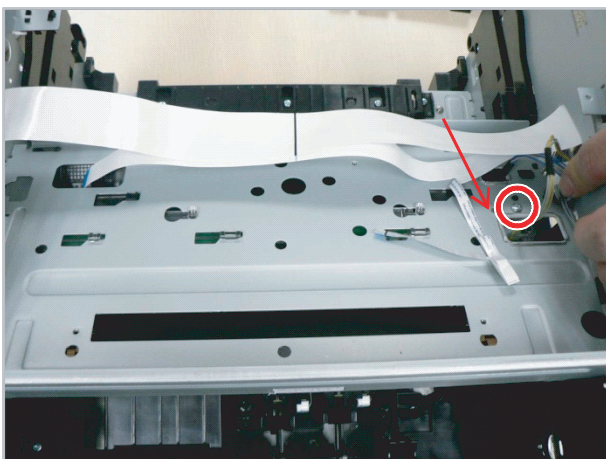
3.4.12. Cover Open PBA

1. Remove the right cover and top cover.

2. Release the Cover Open PBA after removing 2 screws.
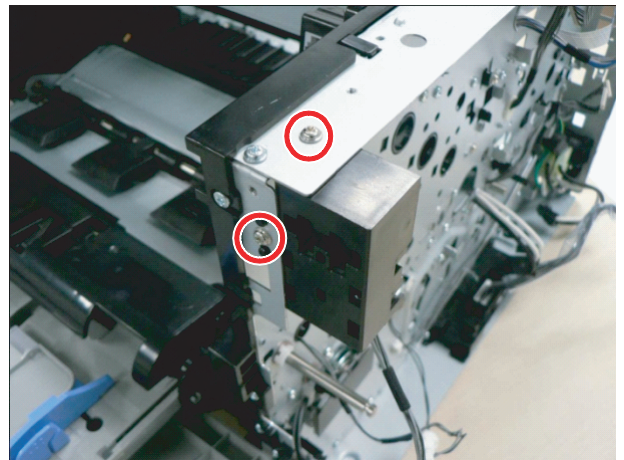
3.4.13. Disassembling Pick up assy

> ⚠️ **NOTE**
>
> Before disassembling Pick up assy, have to disassemble the parts on the following bookmark 3.3.13.1 ~ 3.3.13.8.

3.4.13.1. Left Cover

1. Remove 2 screw in the rear.

2. Remove 3 screw in the front.
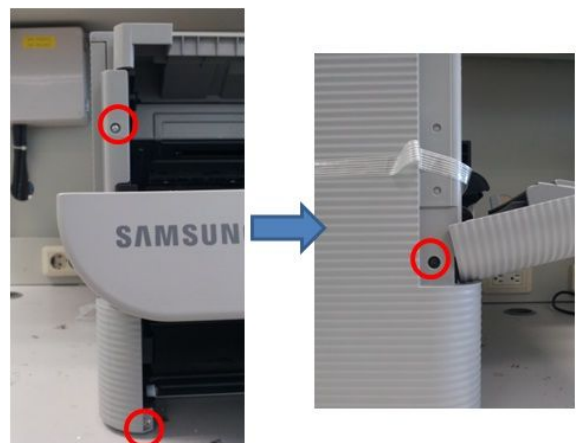
3. Release Left Cover after removing the screws.

3.4.13.2. Cassette Guide L

1. Remove 4 screw securing HVPS.
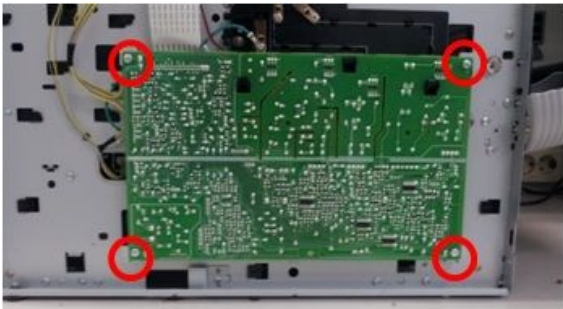
2. Remove 5 screw.
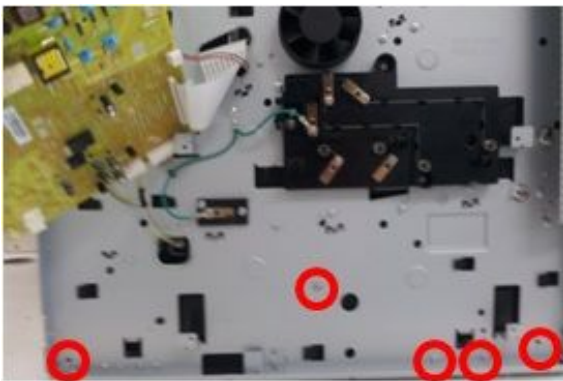
3. Pull and release the Cassette Guide L while pushing its 2 poles.
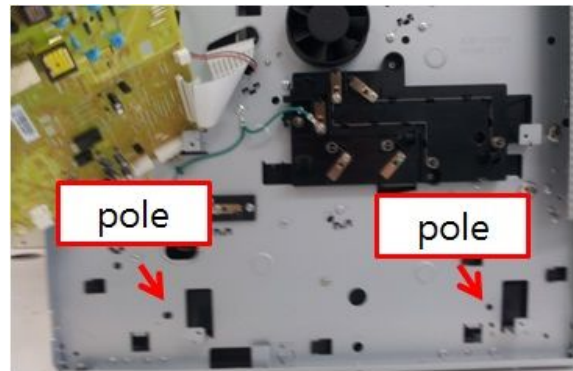
3.4.13.3. Right Cover

1. Release Cover-Dummy.

2. Remove 2 screw in the rear.

3. Remove 2 screw in the front.

4. Release the right cover.
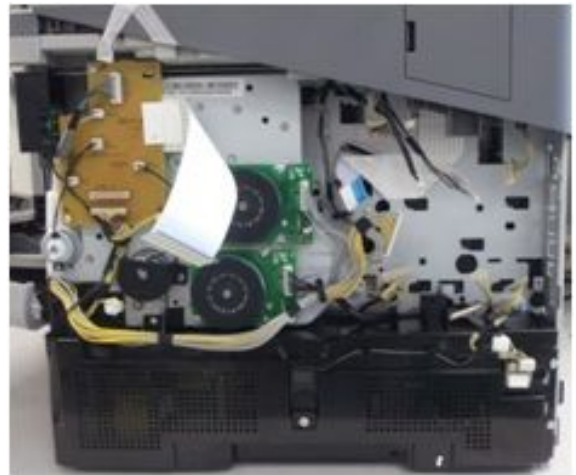
3.4.13.4. Cover-SMPS and SMPS

1. Remove 4 screw securing Cover-SMPS.

Release Cover after removing the screw
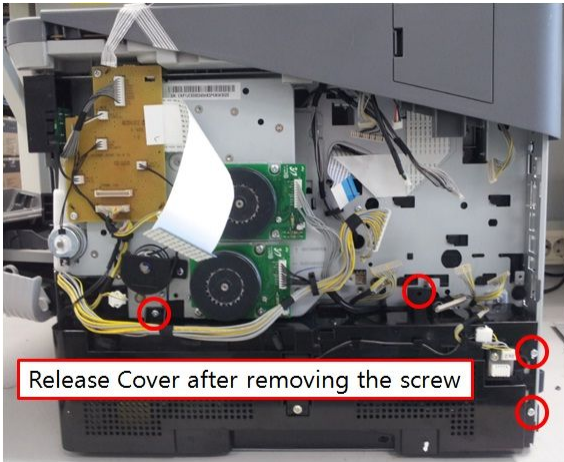
2. Remove 3 screw securing SMPS.

3.4.13.5. Drive Assy

1. Don't completely release Drive after removing the
screw. Make a only space for releasing Clutch.
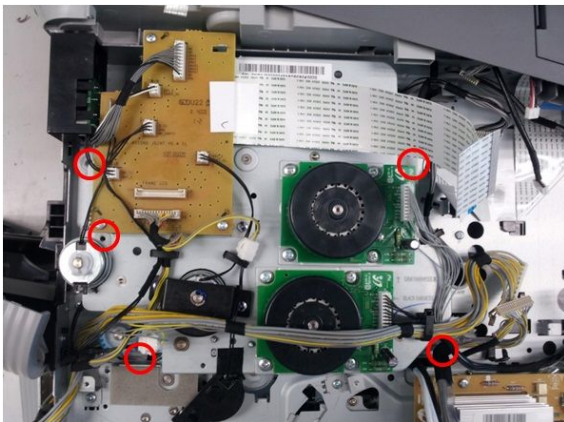
3.4.13.6. Pick up and Duplex Clutch

1. Release the cover after removing the screws for each
cover
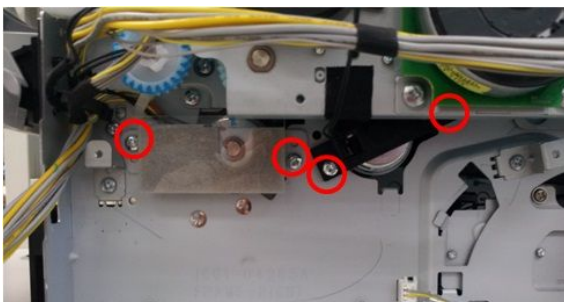
2. Release each Clutch.
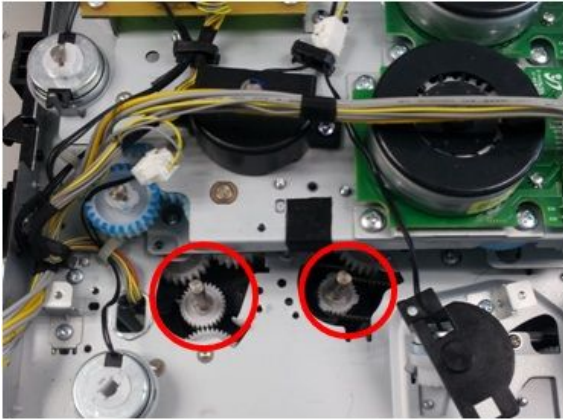
3. Release Duplex belt.

3.4.13.7. Screw

1. Remove 2 screw.
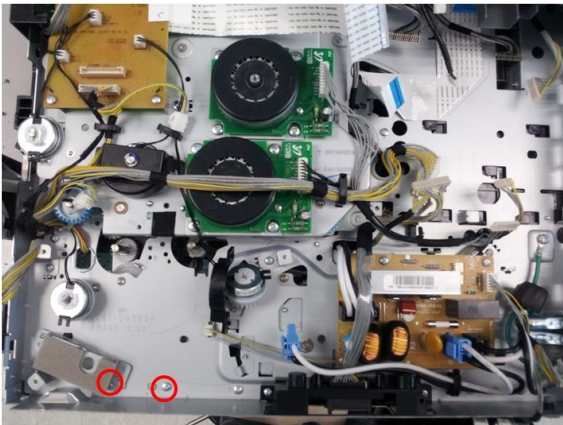
3.4.13.8. Bracket Cross Bar and Pick up Harness

1. Release 2 harness.
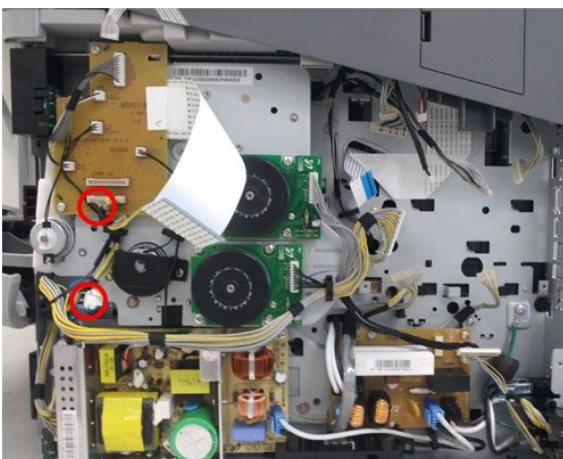
2. Release Bracket Cross Bar.

3.4.13.9. Pick up assy

1. Release the gear after removing the washer

2. Release Pick Up Assy after removing 4 screw.
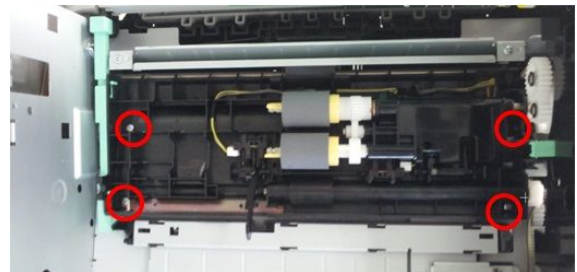
3. Disassembly completion.

3.5. Finisher

3.5.1. Cover

1. Remove 4 screws.

2. Open the jam guide. Remove 2 screws.

3. Remove the finisher rear cover.
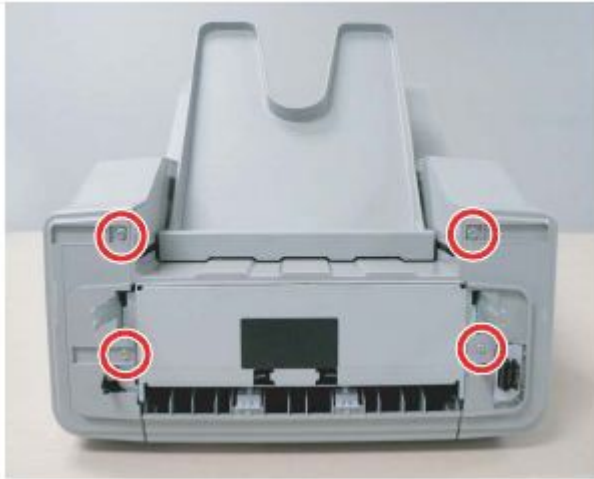
4. Remove the staple cartridge.

5. Remove the finisher front cover.

3.5.2. Stapler Ass'y

1. Remove the finisher front cover.

2. Remove 3 screws. Unplug 2 connectors. And remove the Stapler Ass'y.
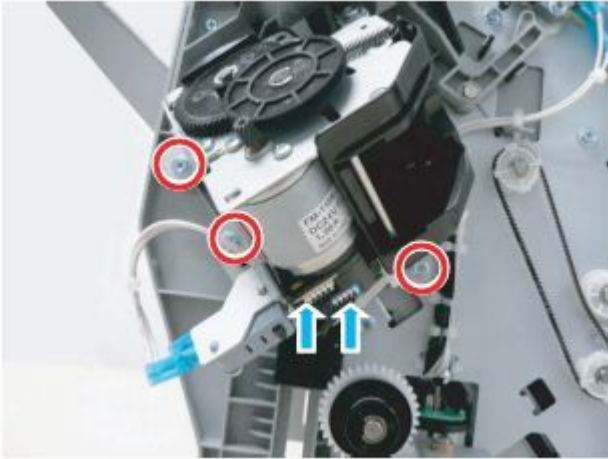
3.5.3. Safety sensor

1. Remove the finisher front cover.

2. Remove 2 screws. Unplug 2 connectors. And remove the Safety sensor.
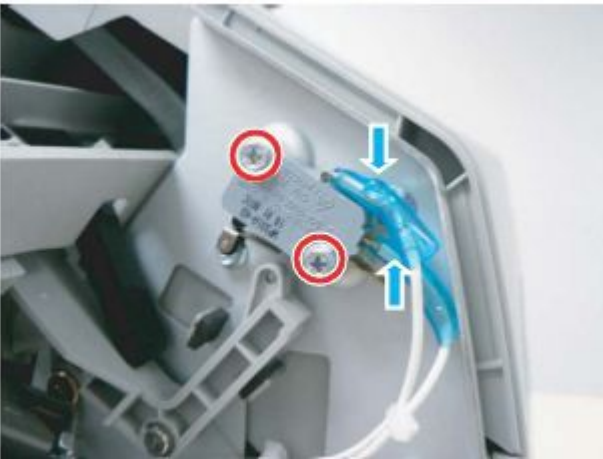
3.5.4. Tamper Ass'y

1. Remove the finisher front/rear cover.

2. Release the Jam guide after removing both bushes.

3. Remove 2 screws securing the safety sensor.
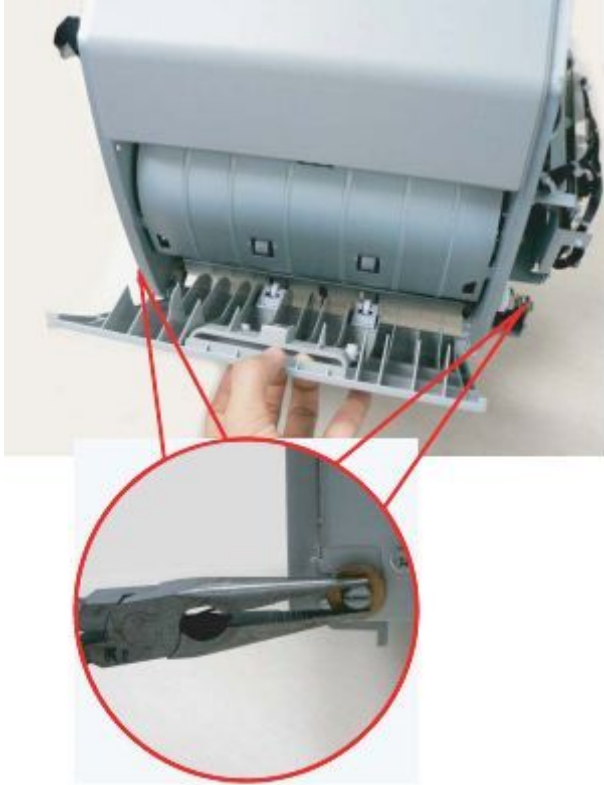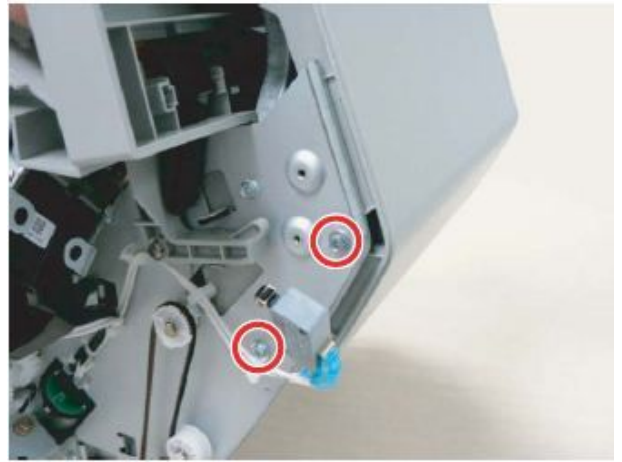
4. Remove 2 screws.

5. Remove 2 screws from the opposite.
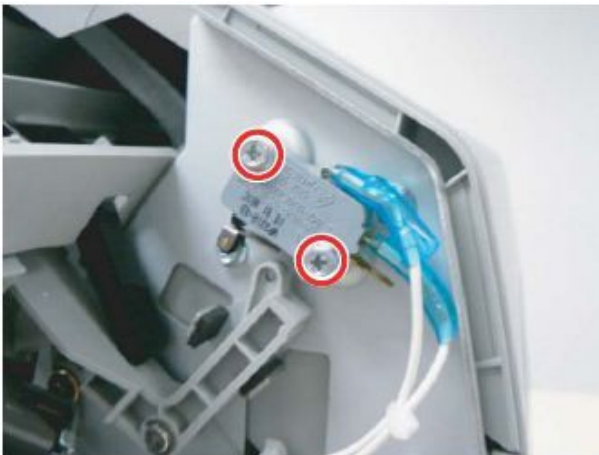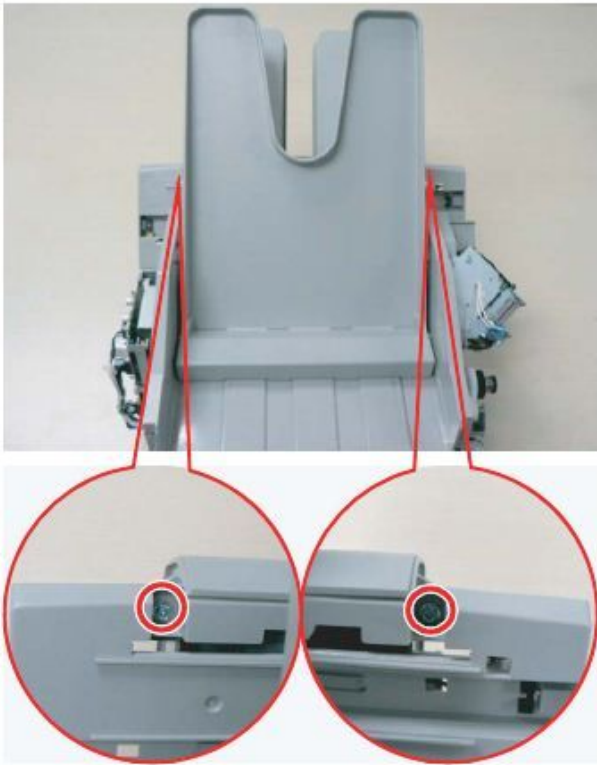
6. Remove 2 screws.

7. Remove the finisher top cover.
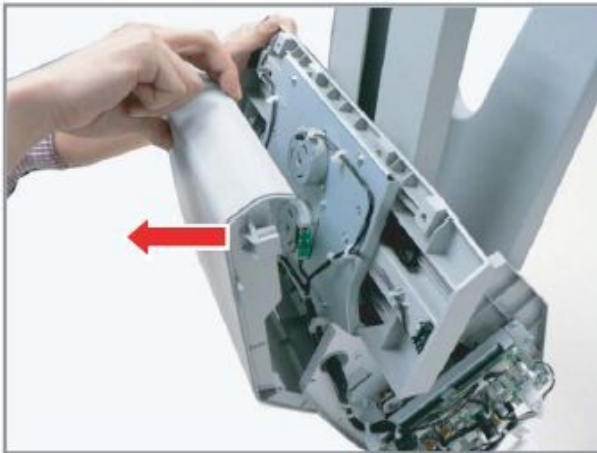
8. Remove the Tamper Home Sensor after unplugging the connector.
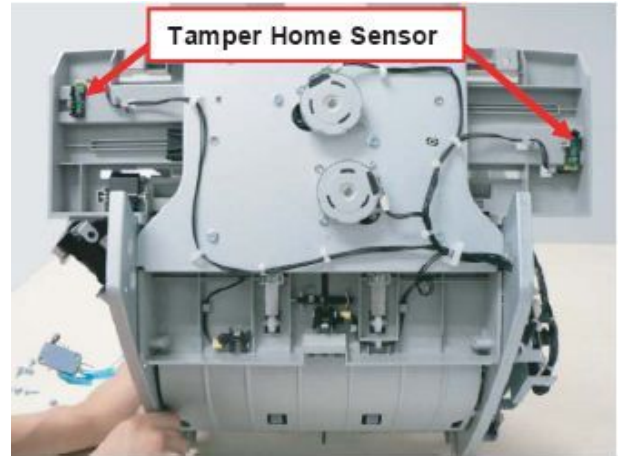
9. There are 2 temper motors. To remove a tamper motor, remove 2 screws and 1 connector.
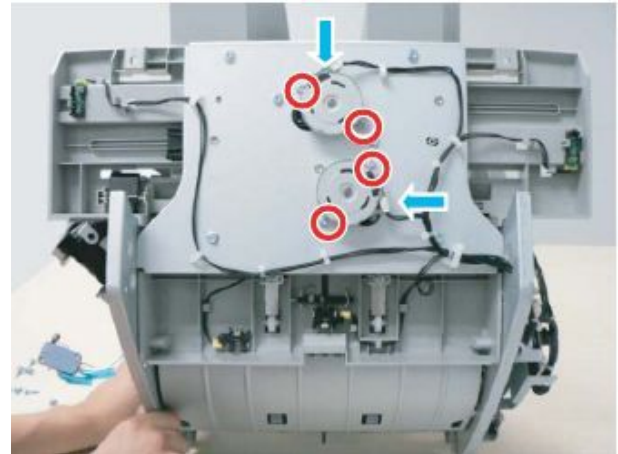
10. To remove the door open sensor and exit sensor, unplug the connector.
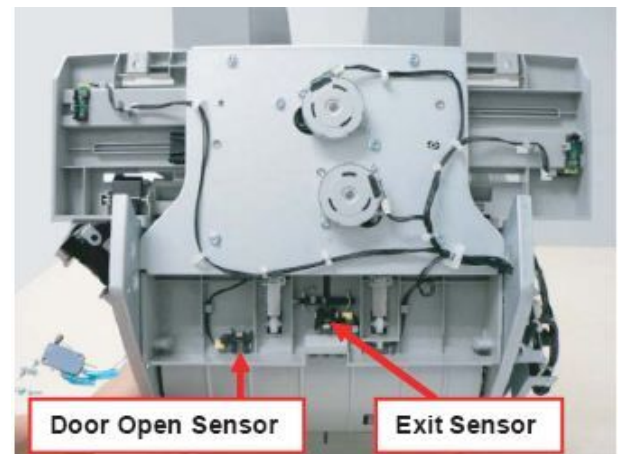
3.5.5. Finisher main board

1. Remove the finisher rear cover.

2. Remove the finisher main board after removing 5 screws and all connectors.
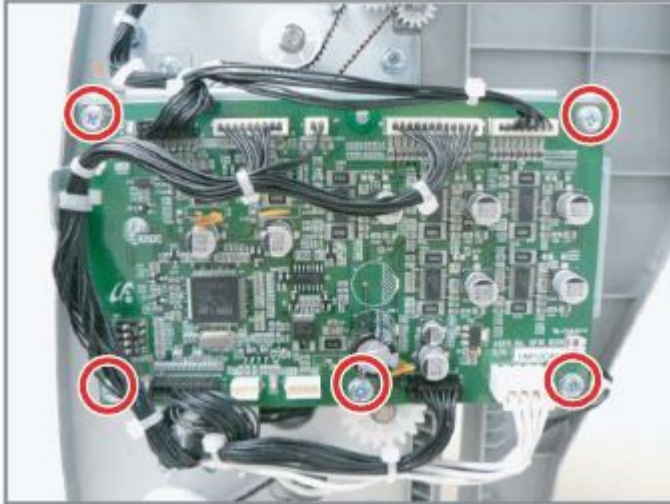
3.5.6. Diverter Assy

1. Remove the finisher rear cover.

2. Remove the Diverter Sensor after unplugging the connector.

3. Remove the One-Way Bearing after removing 3 E-rings and spring.
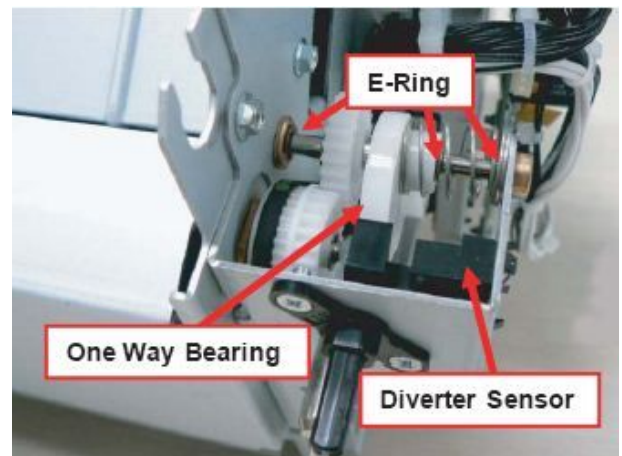
3.5.7. Stacker Motor

1. Remove the finisher front cover.

2. Remove 2 screws.

3. Unplug the connector.
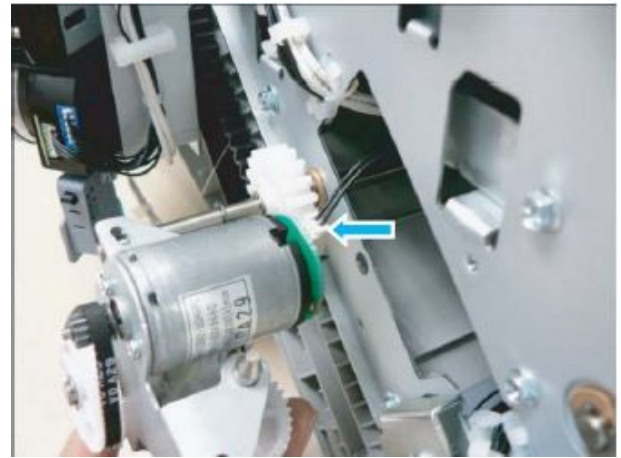
3.6. Mail box

1. Remove the Stacker tray (4 EA).
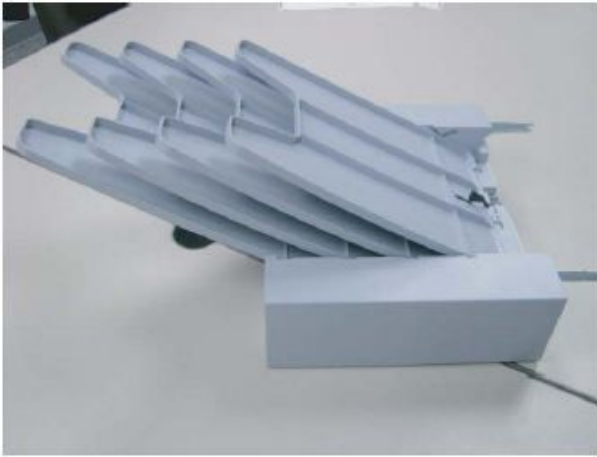
2. Remove 2 screws to separate front/rear cover.

3. Remove the front cover. Separate the rear cover after unplugging the connector.
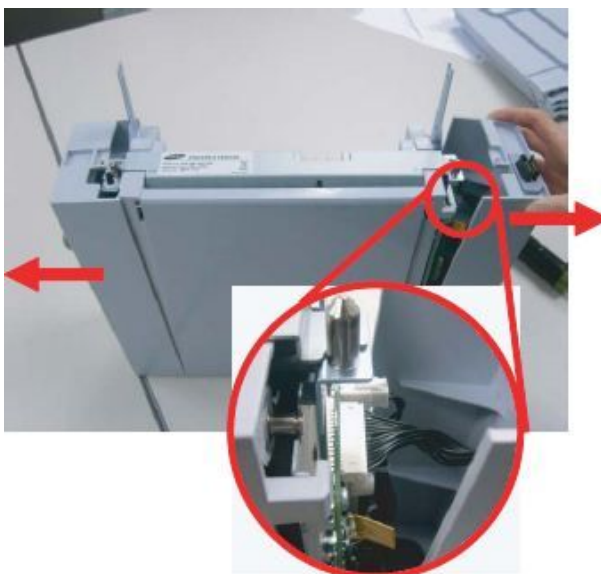
4. Remove the jam cover.

5. Remove the top cover after remove 4 screws.
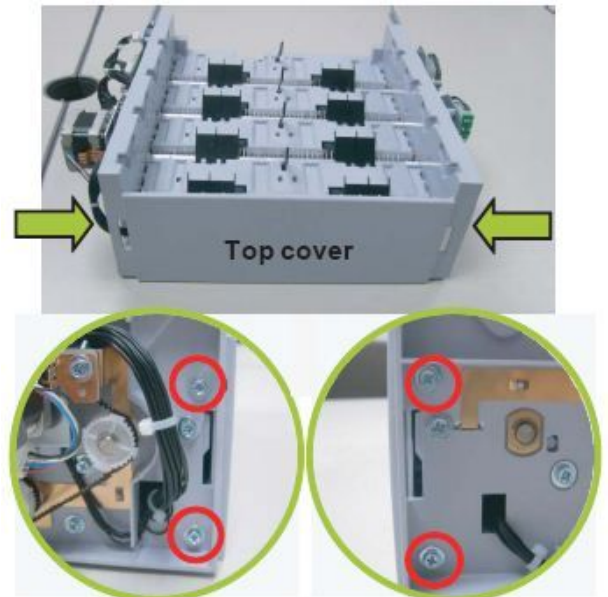
6. Open the Assy Shield TOP. If necessary, remove switch or sensor.

7. To remove the Motor, remove 4 screws and 4 connectors.

8. Remove the 2 SPUR Gear after remove screw.
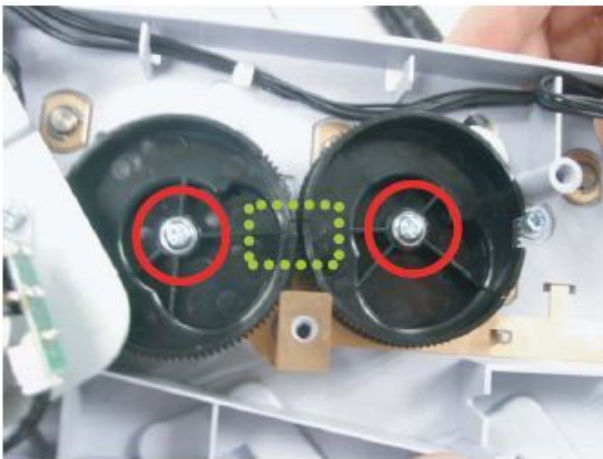
> ⚠️ **NOTE**
>
> When re-assembling these, align the groove of both gears.

9. Separate the bracket and main board after remove 5 screws.
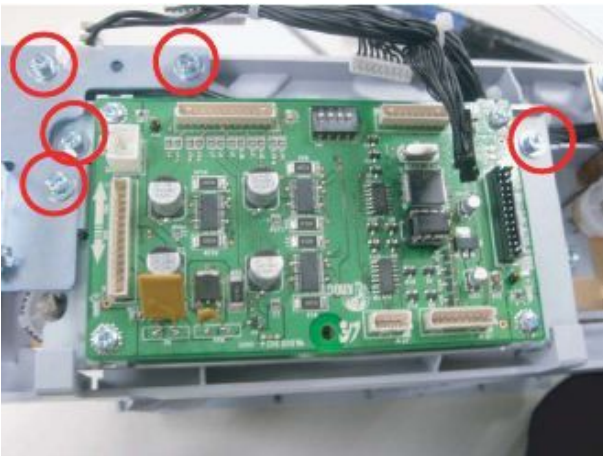
10. Remove the SPUR Gear after remove screw.
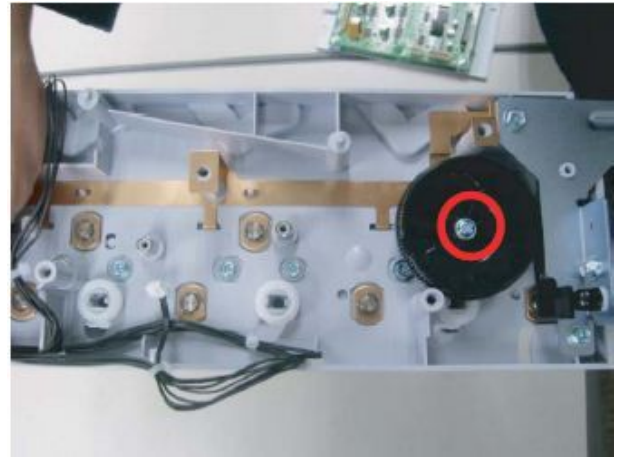
11. There are 3 Ass'y actuator shields. This manual describes disassebmly procedure for middle shield. Remove 2 screws(green color) from the front.

12. Remove 2 screws (green color) from the rear.
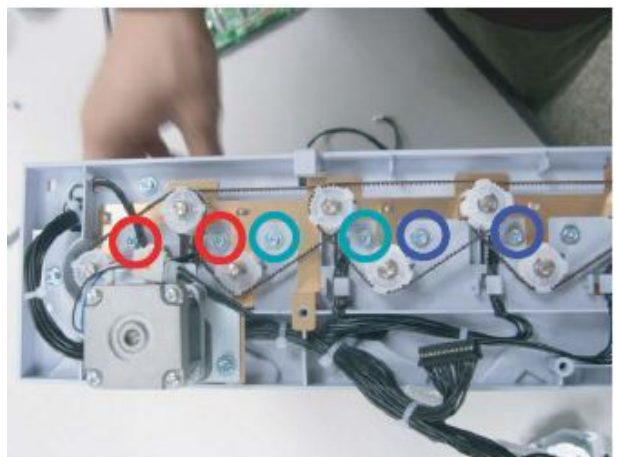
13. Remove the ROLLER:STACKER.

14. Remove the SEPARATE:PAWL:FEED by unhooking the side.
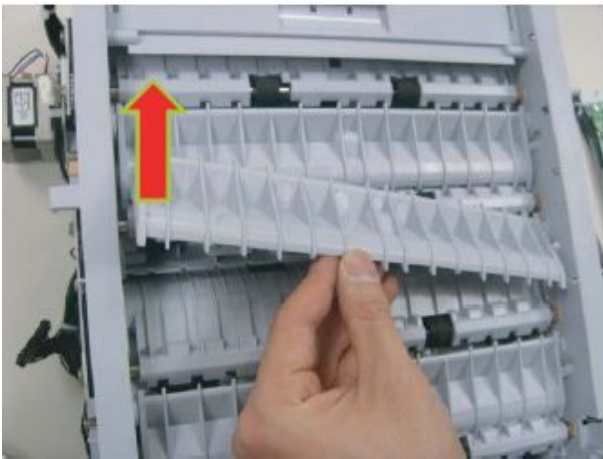
15. Push the Ass'y actuator shield to the direction of arrow. And Separate it from the opposite side.

16. Done.
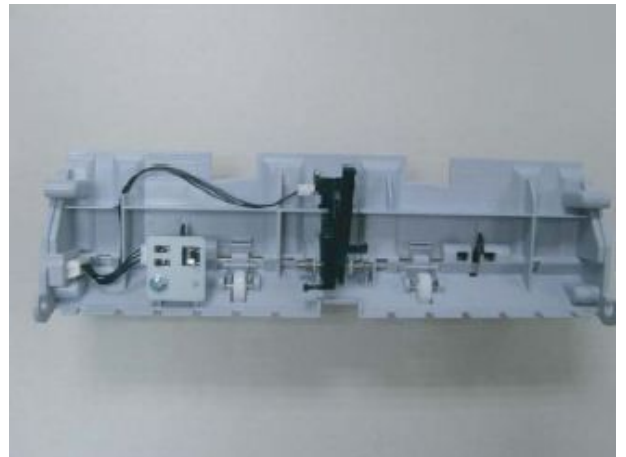
4. Alignment and Troubleshooting

4.1. Alignment and Adjustment

This chapter describes the main functions for service, such as the product maintenance method, the test output related to maintenance and repair, Jam removing method, and so on. It includes the contents of user manual.

4.1.1. Control Panel

⚠ **NOTE**

This control panel may differ from your machine depending on its model. There are various types of control panels.

Type A (ML-451x/5010/5012 series)
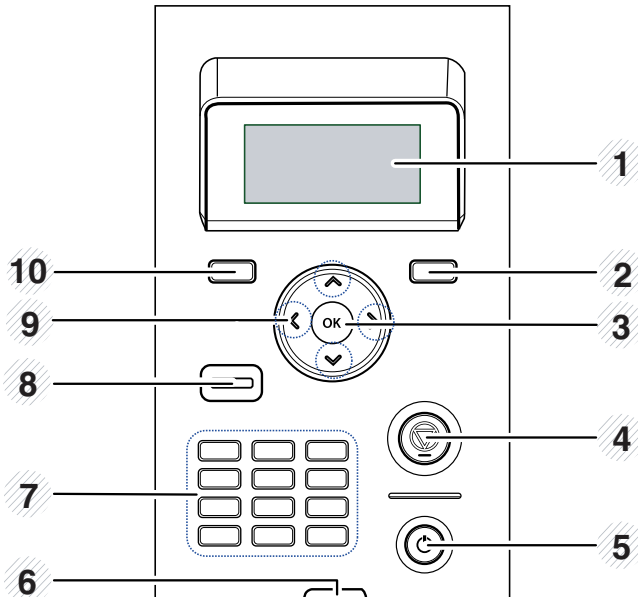
1	Display	Shows the current status and prompts during an operation.
2	🗎 (Menu)	Enters menu mode and scrolls through the available menus.
3	OK	Confirms the selection on the display.
4	⊘ (Cancel)	Stops an operation at any time.
5	⏻ (Power)	You can turn the power on and off with this button.
6	‹·›/⚠ (Status LED)	Shows the status of your machine.

7	Numeric Keypad	Use the keypad to enter numbers and characters.
8	Eco	Enters eco mode to reduce toner consumption and paper usage.
9	Arrows	Navigates available values by moving to the next or previous options.
10	↶ (Back)	Sends you back to the upper menu level.

Type B (ML-5015/5017 series)
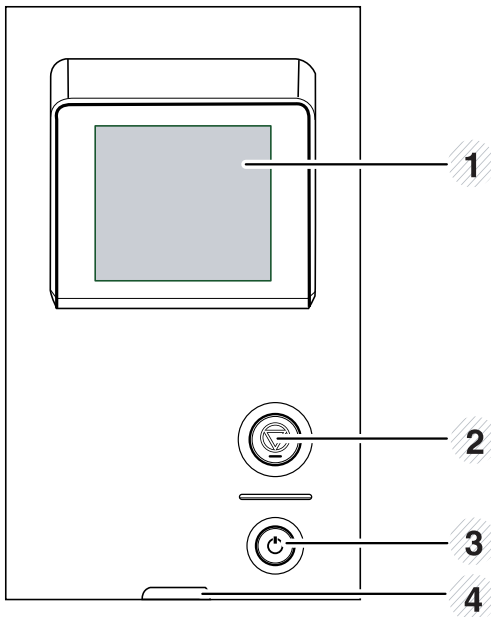
1	Display	Shows the current status and prompts during an operation.
2	⊘ (Cancel)	Stops an operation at any time.
3	⏻ (Power)	You can turn the power on and off with this button.
4	‹··›/⚠ (Status LED)	Shows the status of your machine.

4.1.2. Understanding the status LED

The color of the LED indicates the machine's current status.

> ⚠ **NOTE**
>
> • Some LEDs may not be available depending on model or country.
>
> • To resolve the error, look at the error message and its instructions from the troubleshooting part.
>
> • You also can resolve the error with the guideline from the computers's Samsung Printer Status or Smart Panel program window.

LED	Status		Description
‹··›/⚠	Off		The machine is off-line.
	Green	Blinking	• When the backlight slowly blinks, the machine is receiving data from the computer. • When the backlight blinks rapidly, the machine is printing data.
		On	The machine is on-line and can be used.
	Red	Blinking	• A minor error has occurred and the machine is waiting for the error to be cleared. Check the display message. When the problem is cleared, the machine resumes. For some models that does not support the display screen on the control panel, this feature is not applicable. • Small amount of toner is left in the cartridge. The estimated cartridge life* of toner is close. Prepare a new cartridge for replacement. You may temporarily increase the printing quality by redistributing the toner.
		On	• A toner cartridge has almost reached its estimated cartridge life*. It is recommended to replace the toner cartridge. • The cover is opened. Close the cover. • There is no paper in the tray. Load paper in the tray. • The machine has stopped due to a major error. • A paper jam has occurred.

*Estimated cartridge life means the expected or estimated toner cartridge life, which indicates the average capacity of print-outs and is designed pursuant to ISO/ IEC 19752. The number of pages may be affected by operating environment, printing interval, graphics, media type, media size and the percentage of image area. Some amount of toner may remain in the cartridge even when red LED is on and the printer stops printing.

4.1.3. JAM Removal

> ⚠️ **NOTE**
>
> To avoid tearing the paper, pull the jammed paper out slowly and gently.

4.1.3.1. In Tray1

1. Open and close the front cover. The jammed paper is automatically ejected from the machine. If the paper does not exit, refer to next blow.

2. Pull out the tray 1.

3. Remove the jammed paper by pulling in the direction shown. To avoid tearing the paper, pull it out gently and slowly.
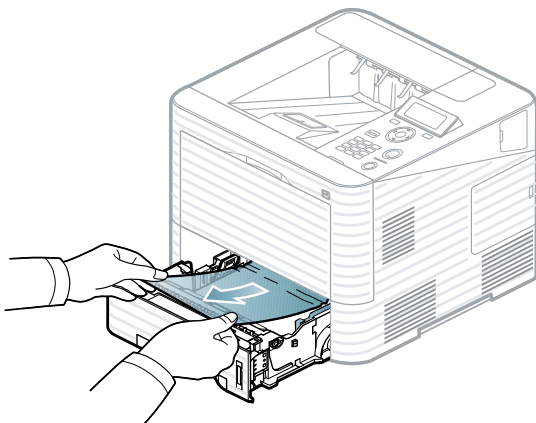
If the paper does not move when you pull, or if you do not see the paper in this area, check the fuser area around the toner cartridge.

4. Insert tray 1 back into the machine until it snaps into place.

4.1.3.2. In Optional Tray

1. Pull out the optional tray.
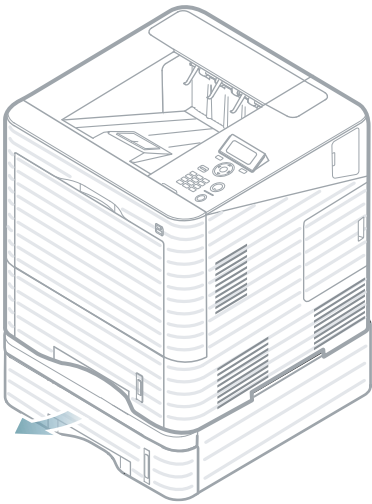
2. Remove the jammed paper by pulling in the direction shown. To avoid tearing the paper, pull it out gently and slowly.

If the paper does not move when you pull or if you do not see the paper in this area, stop and go to the next step.
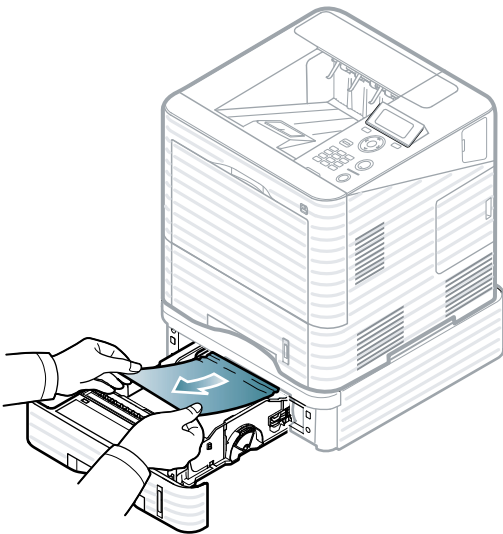
3. Pull tray 1 half-way out. Pull the jammed paper straight up and out.
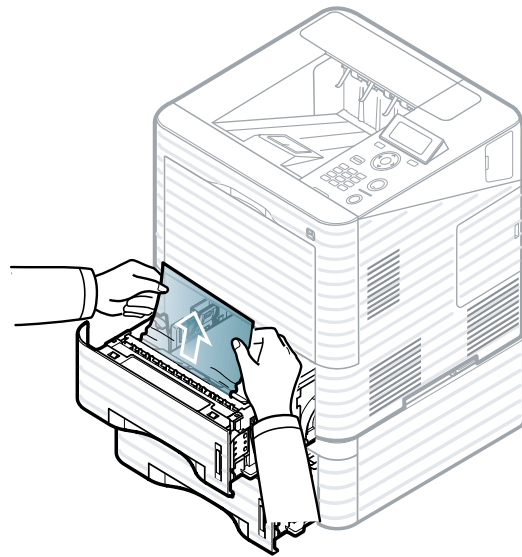
4. Insert the trays back into the machine.
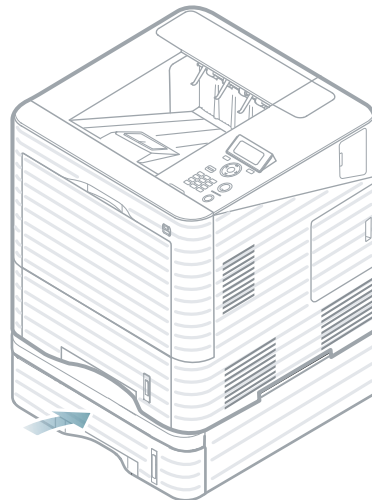
4.1.3.3. In the multi-purpose tray

1. If the paper is not feeding properly, pull the paper out of the machine.
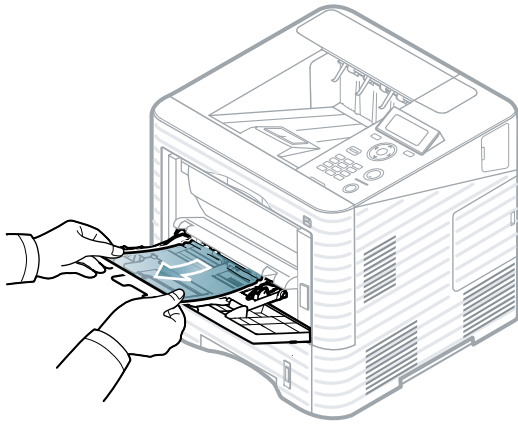
3. Open and close the front cover to resume printing.
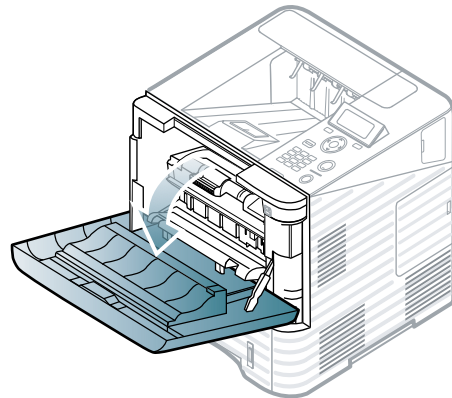
2. Close the MP tray.
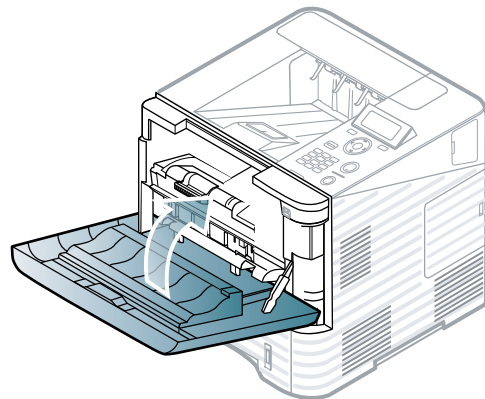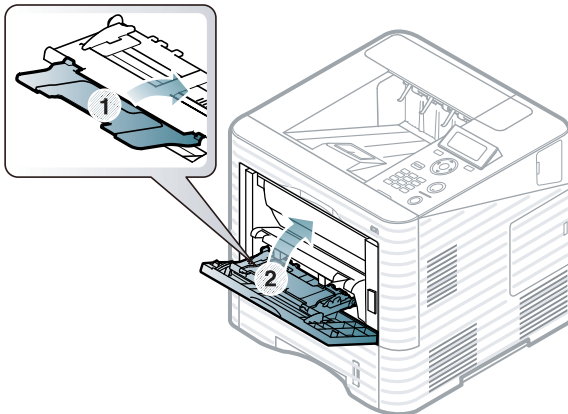
If the paper does not move when you pull or if you do not see the paper in this area, stop and go to the next step.

4.1.3.4. Inside the machine

1. Open the front cover.
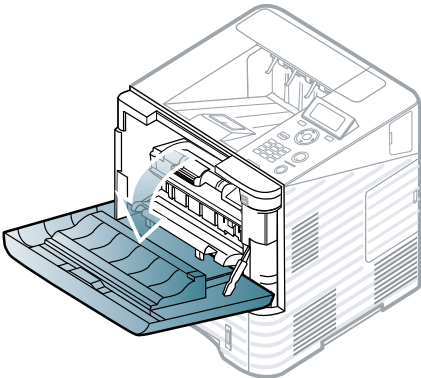
2. Pull the toner cartridge out.
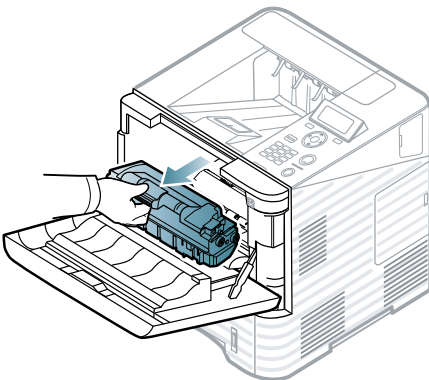
3. Pull the imaging unit out.
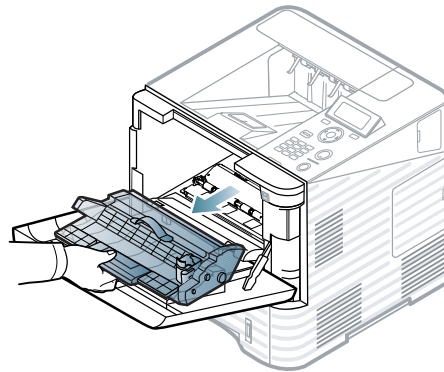
⚠ **CAUTION**

- **Do not touch the green surface of the imaging unit.**

- **To prevent damage to the imaging unit, do not expose it to light for more than a few minutes. Cover it with a piece of paper, if necessary.**

4. Carefully lift up the guide feed as shown below.
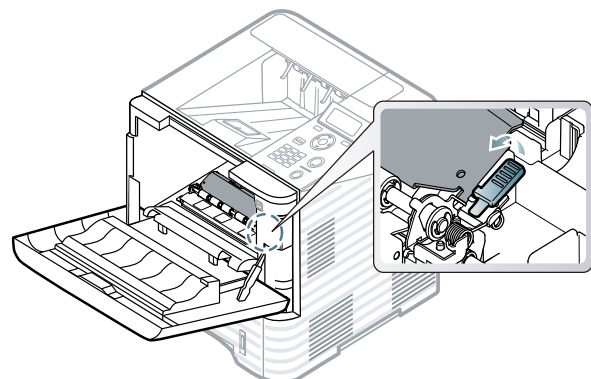
5. Remove the jammed paper by pulling in the direction shown. To avoid tearing the paper, pull it out gently and slowly.
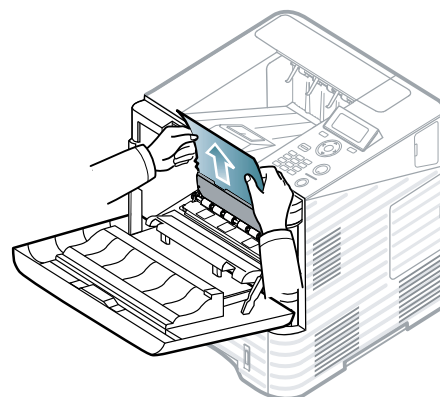
6. Flip down the guide feed.
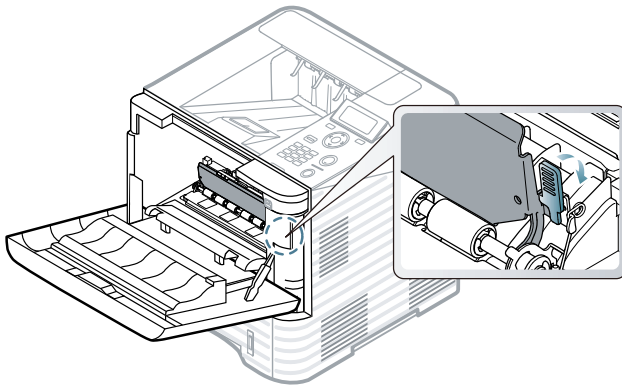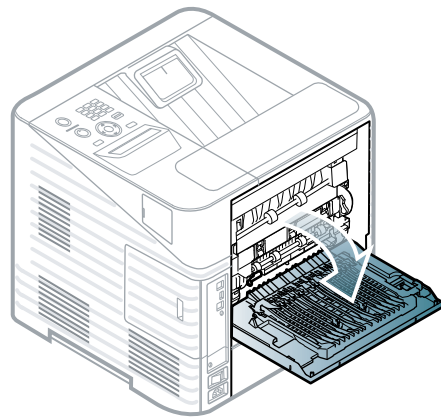
7. Reinsert the imaging unit and toner cartridge.

8. Close the front cover to resume printing.

9. Open the rear cover.
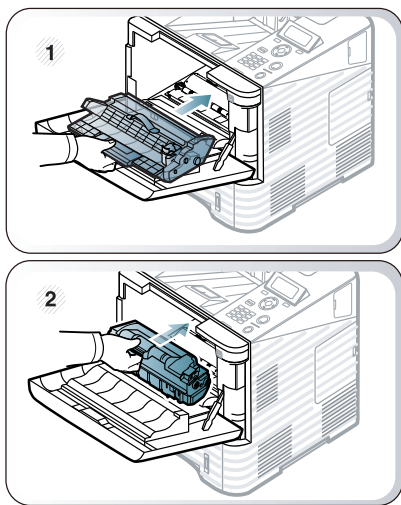
10. By opening the fuser lever, loosen the jammed paper. Then gently pull the paper straight out.
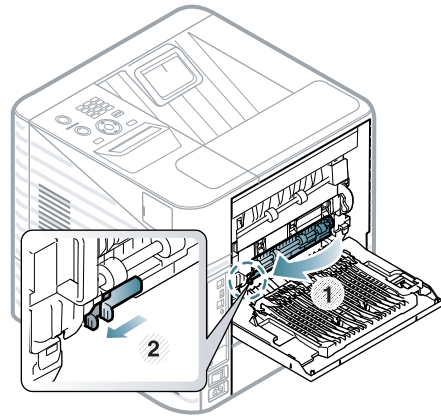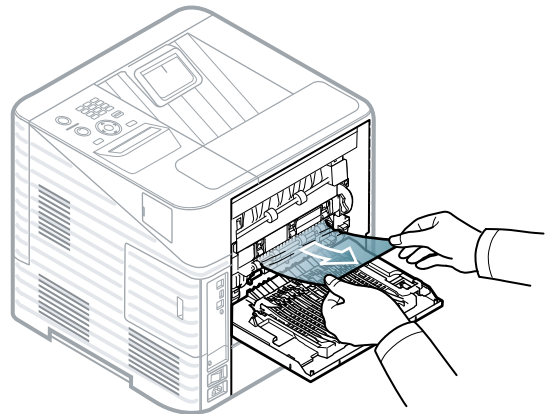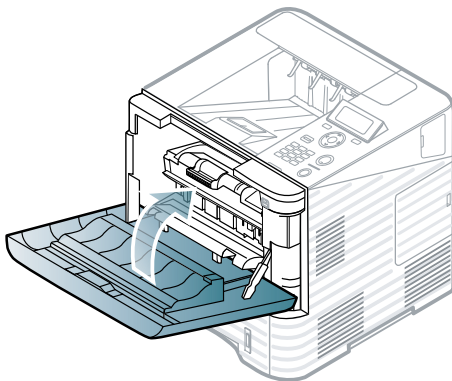
11. Put the fuser levers to their original position.
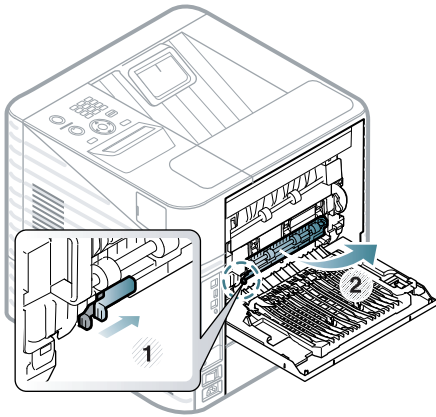
12. Close the rear cover. Printing automatically resumes.
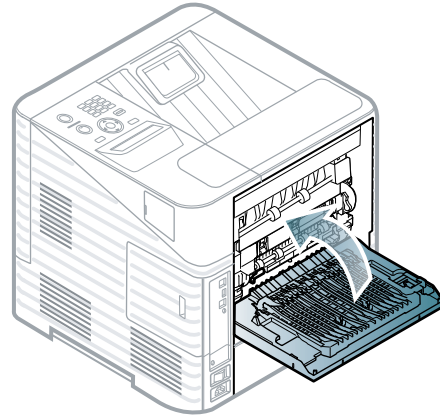
4.1.3.5. In the exit area

1. Remove the jammed paper by pulling in the direction shown. To avoid tearing the paper, pull it out gently and slowly.
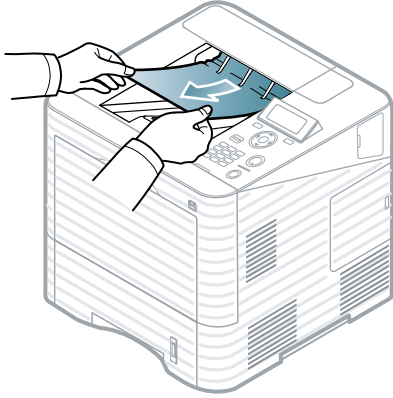
If you do not see the jammed paper or if there is any resistance when you pull, stop and go to the next step.

2. Open the rear cover.
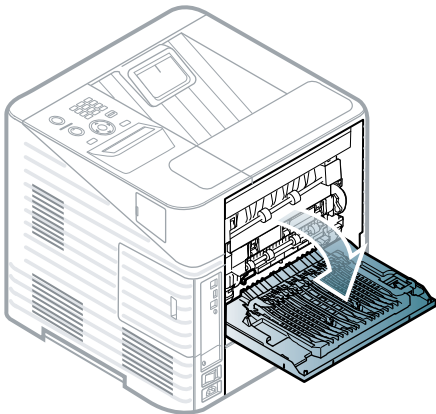
3. Gently pull the paper straight out.
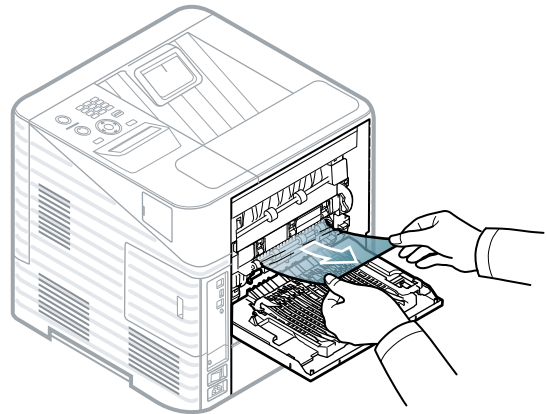
4. Close the rear cover. Printing automatically resumes.
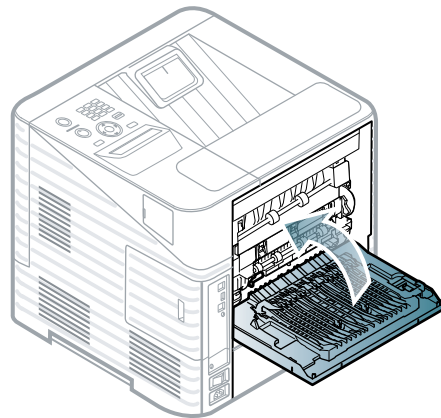
4.1.3.6. Paper jam in front of the finisher

1. Open the finisher's rear cover.
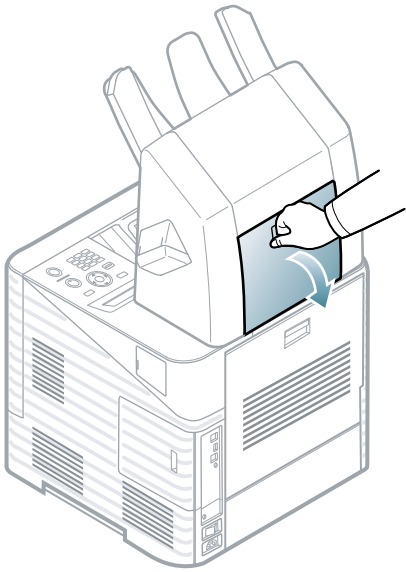
2. Open the machine's rear cover.
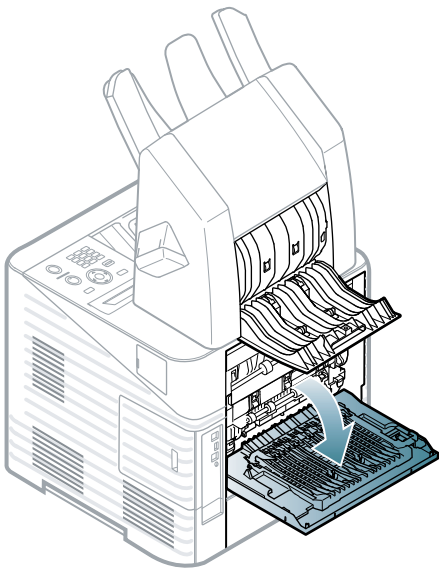
3. Locate the jammed paper and remove it. The jammed paper might be inside the finisher or the machine. To avoid tearing the paper, pull it out gently and slowly.
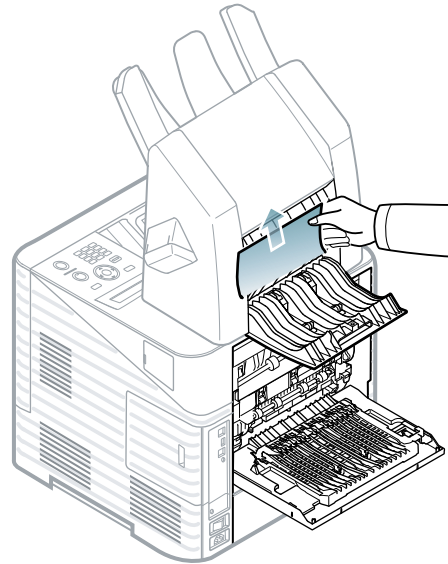
4. Close the finisher's rear cover and machine's rear cover.
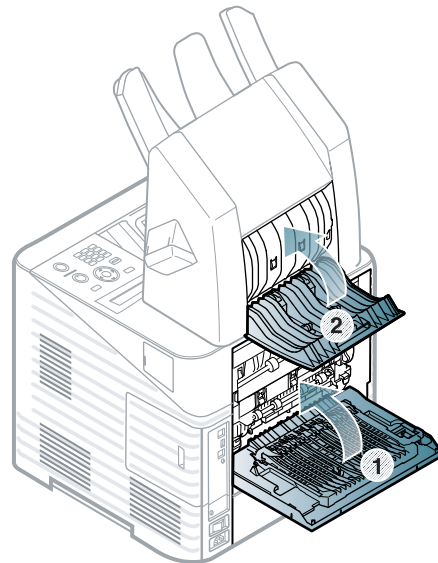
4.1.3.7. Paper jam inside the finisher

1. Open the finisher's rear cover.
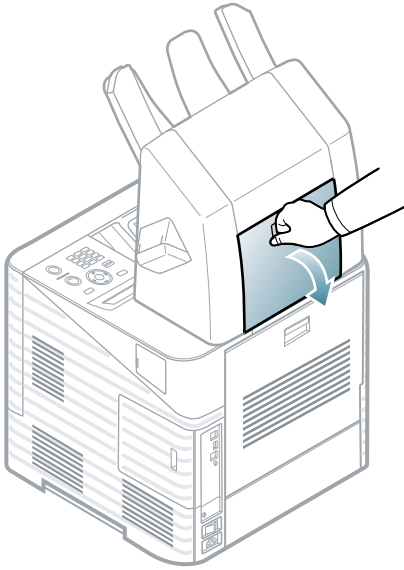
2. Remove the jammed paper by pulling in the direction shown. To avoid tearing the paper, pull it out gently and slowly.
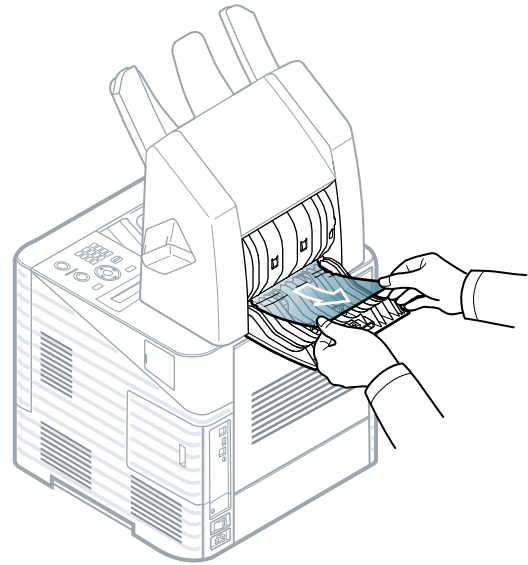
3. Close the finisher's rear cover.
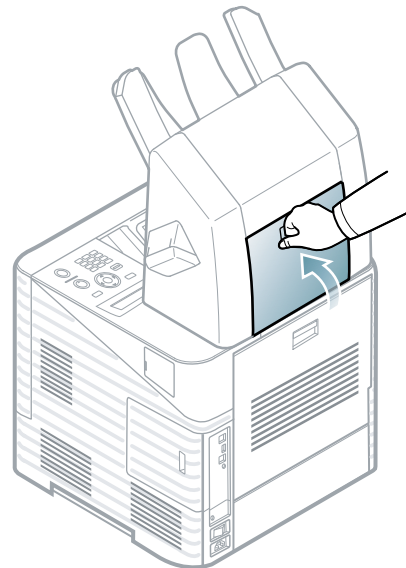
4.1.3.8. Paper jam at the exit of the finisher

1. Remove the jammed paper by pulling in the direction shown. To avoid tearing the paper, pull it out gently and slowly.
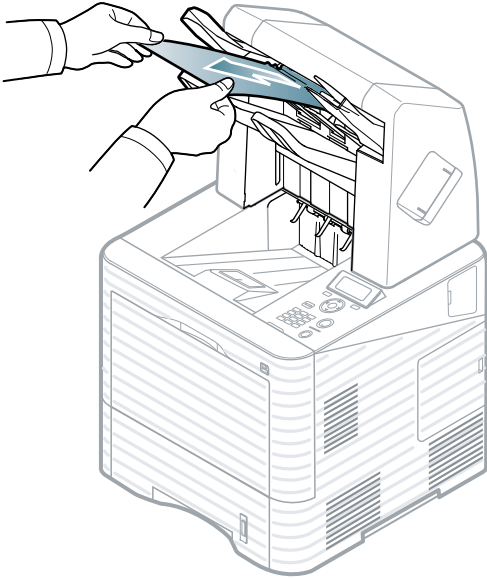
2. Close the finisher's rear cover.
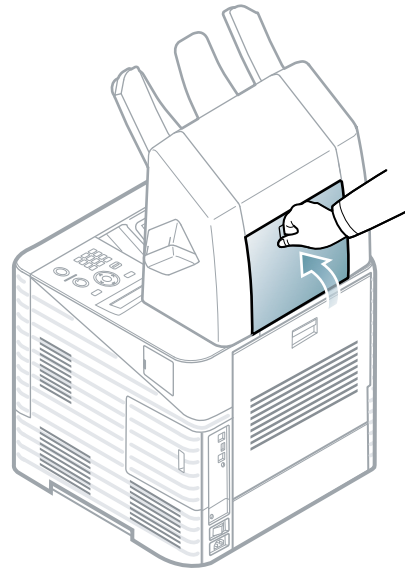
4.1.3.9. Paper jam in front of the multi-bin mailbox
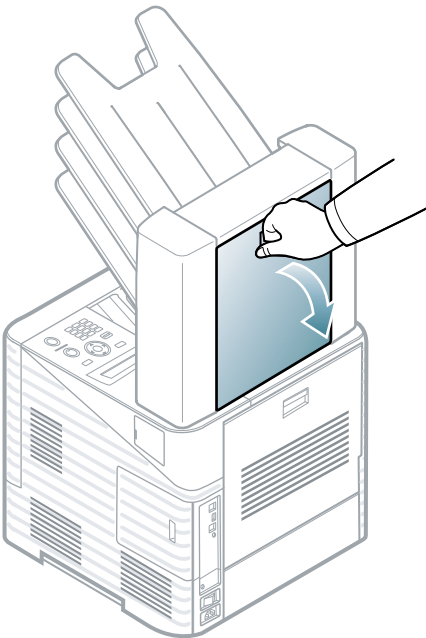
1. Open the mailbox's rear cover.

2. Open the machine's rear cover.
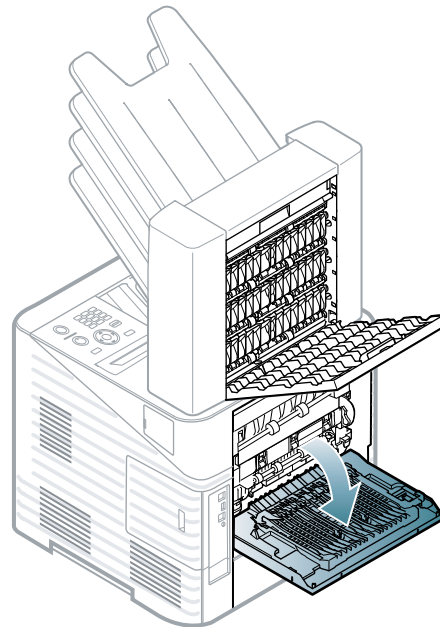
3. Locate the jammed paper and remove it. The jammed paper might be inside the mailbox or the machine. To avoid tearing the paper, pull it out gently and slowly.
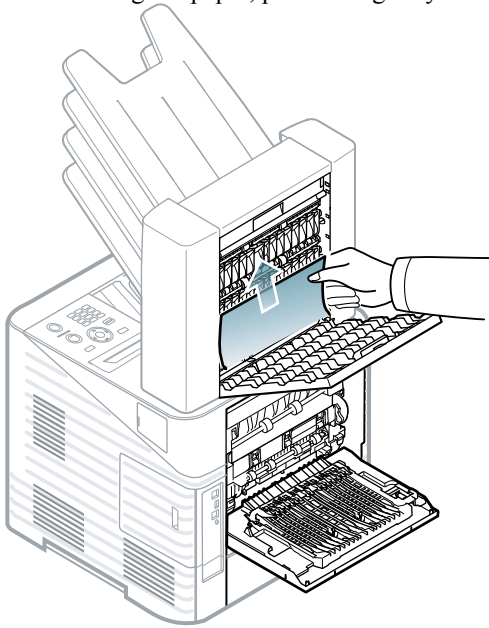
4. Close the mailbox's rear cover and machine's rear cover.
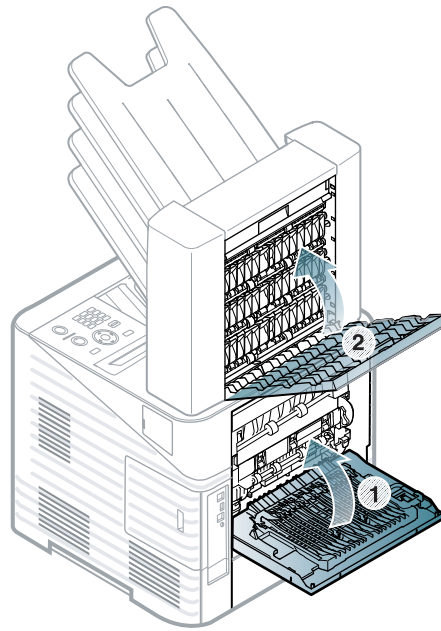
4.1.3.10. Paper jam inside the multi-bin mailbox
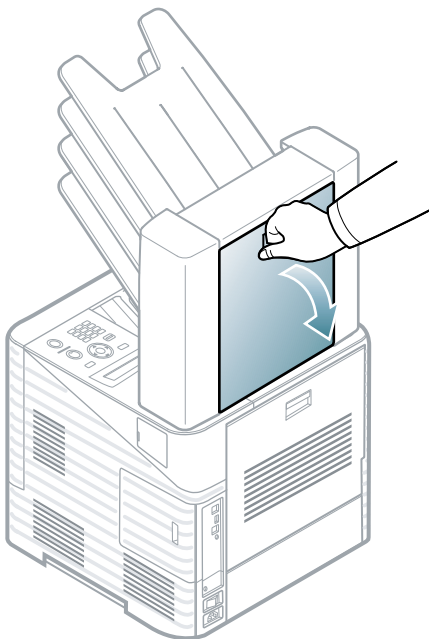
1. Open the mailbox's rear cover.

2. Remove the jammed paper by pulling in the direction shown. To avoid tearing the paper, pull it out gently and slowly.
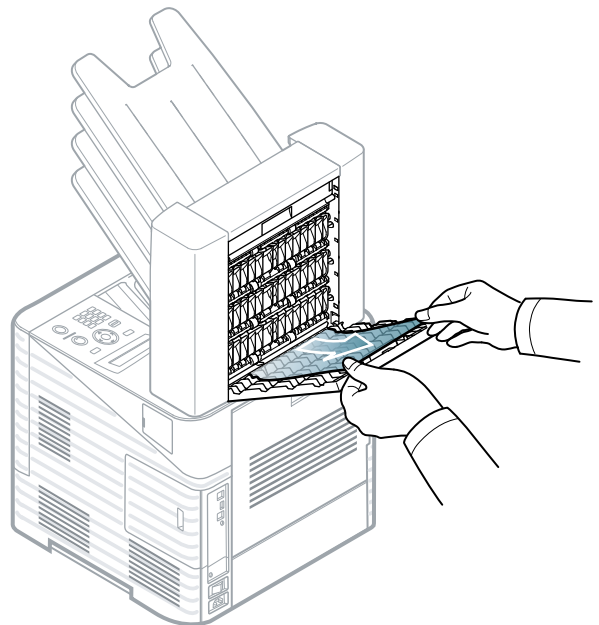
3. Close the mailbox's rear cover.
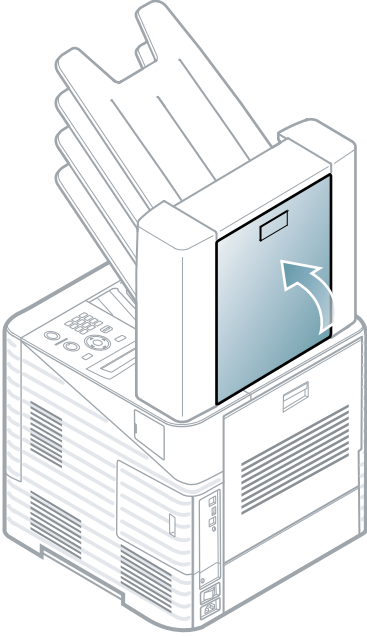
4.1.3.11. Paper jam at the exit of the multi-bin mailbox

1. Remove the jammed paper by pulling in the direction shown. To avoid tearing the paper, pull it out gently and slowly.

2. Open and close the mailbox's rear cover to resume printing.
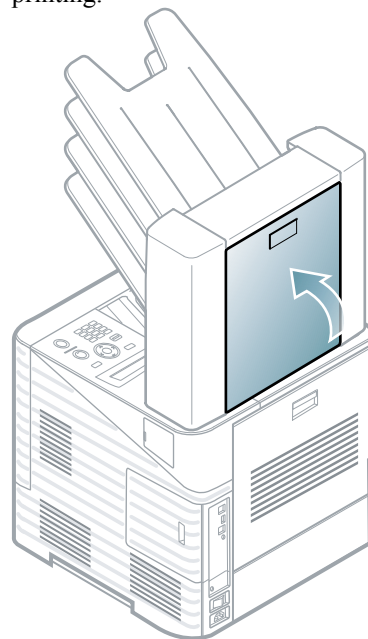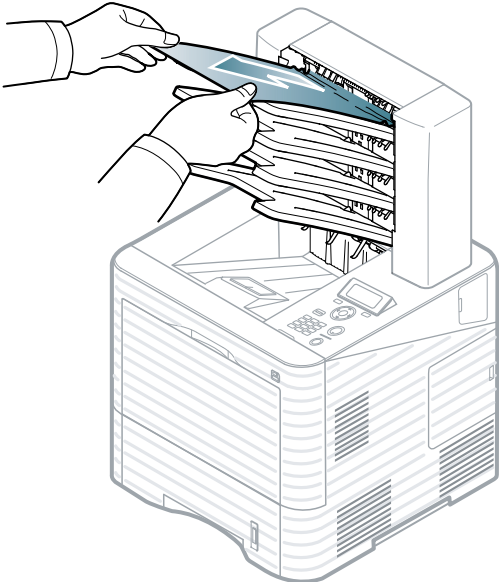
4.1.4. Useful menu items for service

Monitoring the supplies life

- **ML-451x Series and ML-5010/5012 Series**

    1) Press the Menu botton on the control panel.

    2) Press Admin Setup > OK > Maintenance > OK.

    3) Press Supplies Info. > OK.

    4) Select the option you want, then press OK.

- **ML-5015/5017 Series**

    1) Press Setup from the Main screen.

    2) Press System > Next > Maintenance > Supplies Info..

    3) Press the option you want.

    4) Press the home icon to return to the Standby mode.

Setting the toner low alert

If the amount of toner in the cartridge is low, a message or LED informing the user to change the toner cartridge appears. You can set the option for whether or not this message or LED appears.

- **ML-451x Series and ML-5010/5012 Series**

    1) Press the Menu botton on the control panel.

    2) Press Admin Setup > OK > Maintenance > OK.

    3) Press Toner Low Alert > OK.

    4) Select the option you want, then press OK.

- **ML-5015/5017 Series**

    1) Press Setup from the Main screen.

    2) Press System > Next > Maintenance.

    3) Press Toner Low Alert.

    4) Press the option you want.

    5) Press the home icon to return to the Standby mode.

Altitude adjustment

Print quality is affected by atmospheric pressure, which is determined by the height of the machine above sea level. The following information will guide you on how to set your machine for the best print quality.

Before you set the altitude value, determine the altitude where you are.

1 **High 3**
2 **High 2**
3 **High 1**
4 **Normal**
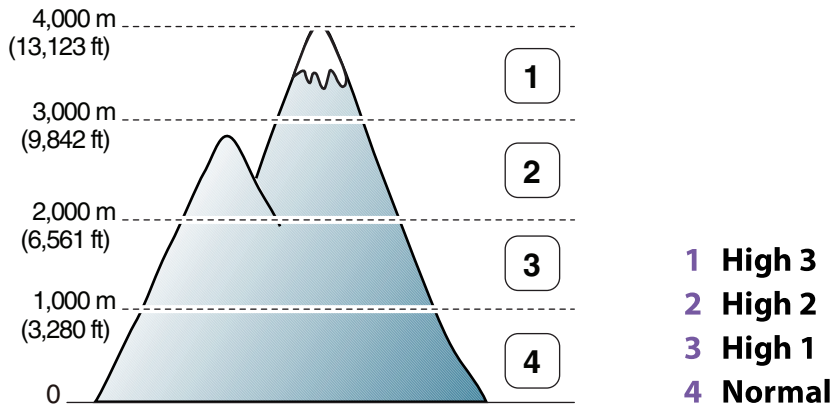
- For windows user, use the Samsung Easy Printer Manager.

- For Macintosh, Linux, or Unix OS user, use the Smart Panel.

⚠️ **NOTE**

- If your machine is connected to the network, you can set the altitude via SyncThru™ Web Service.

- You can also set the altitude in System Setup option on the machine's display.

4.1.5. Periodic defective image

If an image defects appears at regular intervals on the printed-paper, it is due to a faulty or damaged roller.

Refer to the table below and check the condition of the appropriate roller.
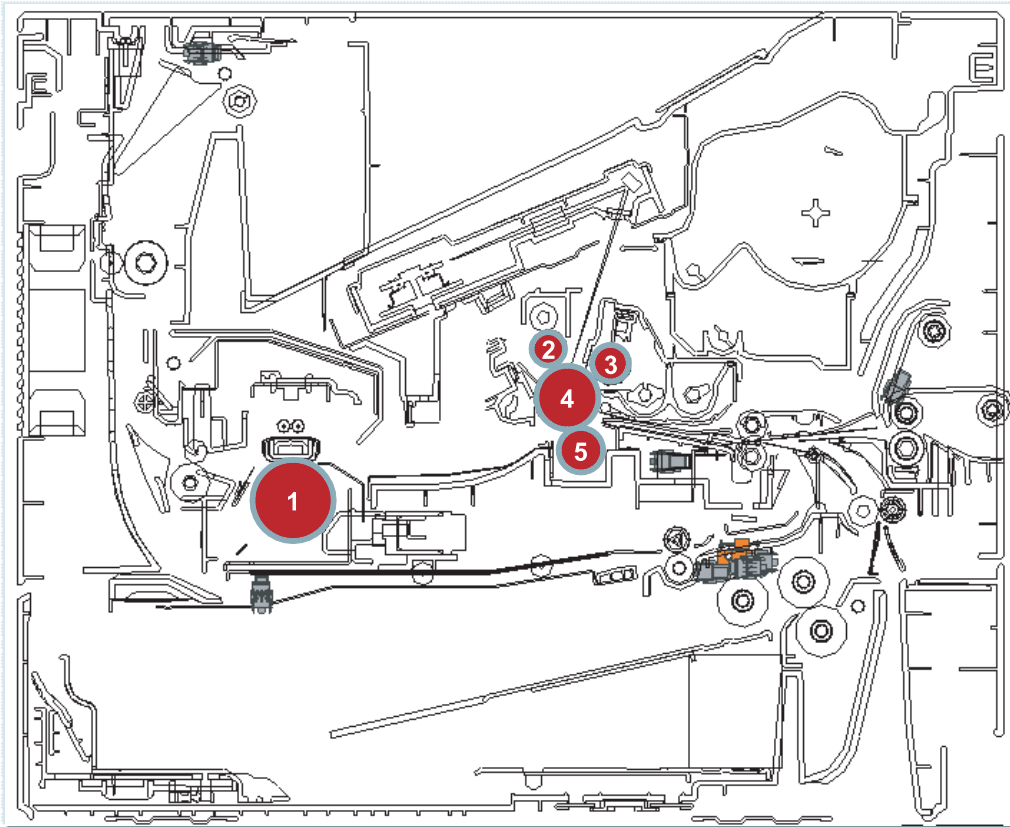
	Roller	Period (mm)	Phenomenon	Defective part
1	Pressure Roller		Background	Fuser
2	Charging Roller	44 mm	Black Spot and line and periodic band	Imaging unit
3	Magnetic Roller	56.6 mm	White spot, Horizontal black band	
4	OPC Drum	94.2 mm	White and Black Spots	
5	Transfer Roller	56.5 mm	Ghost, Damaged image by abnormal transfer	Transfer roller

4.1.6. Useful management tools

4.1.6.1. Using Samsung Easy Printer Manager (Windows only)

Samsung Easy Printer Manager is a Windows-based application that combines Samsung machine settings into one location. Samsung Easy Printer Manager combines device settings as well as printing environments, settings/actions and launching. All of these features provide a gateway to conveniently use your Samsung machine. Samsung Easy Printer Manager provides two different user interfaces for the user to choose from: the basic user interface and the advanced user interface. Switching between the two interfaces is easy: just click a button.

> ⚠️ **NOTE**
>
> Internet Explorer 6.0 or higher is the minimum requirement for Samsung Easy Printer Manager.

Understanding Samsung Easy Printer Manager

To open the program:

Select StartPrograms or All Programs > Samsung Printers > Samsung Easy Printer Manager.

The Samsung Easy Printer Manager interface is comprised of various basic sections as described in the table that follows:

No	Area	Description
1	Printer List	The printer list displays the installed printer icons on your computer.
2	Printer Information	This area gives you general information about your machine. You can check information, such as the machine's model name, IP address (or Port name), and machine status. ⚠️ **NOTE** User's Guide button : This button opens Troubleshooting Guide when an error occurs. You can directly open the necessary section in the user's guide.

3	Application Information	Includes links for changing to the advanced settings, preference, help, and about.
4	Quick links	Displays Quick links to machine specific functions. This section also includes links to applications in the advanced settings.
5	Contents Area	Displays information about the selected machine, remaining toner level, and paper. The information will vary based on the machine selected. Some machines do not have this feature.
6	Order Supplies	Click on the Order button from the supply ordering window. You can order replacement toner cartridge(s) from online.

Advanced settings user interface overview

The advanced user interface is intended to be used by the person responsible for managing the network and machines.

- **Device Settings**

  You can configure various machine settings such as machine setup, paper, layout, emulation, network, and print information.

- **Alert Settings**

  This is menu includes settings related to error alerting.
  - **Printer Alert** : Provides settings related to when alerts will be received.
  - **Email Alert** : Provides options relating to receiving alerts via email.
  - **History Alert** : Provides a history of device and toner related alerts.

- **Job Accounting**

  Provides querying of quota information of the specified job accounting user. This quota information can be created and applied to devices by job accounting software such as SyncThru™ or CounThru™ admin software.

4.1.6.2. Using Samsung Printer Status (Windows only)

[The Samsung Printer Status is a program that monitors and informs you of the machine status.]

> ⚠️ **NOTE**
>
> - The Samsung Printer Status window and its contents shown in this user's guide may differ depending on the machine or operating system in use.
>
> - Check the operating system(s) that are compatible with your machine (see Basic guide).

Samsung Printer Status overview

If an error occurs while operating, you can check the error from the Samsung Printer Status. Samsung Printer Status is installed automatically when you install the machine software.

You can also launch Samsung Printer Status manually. Go to the Printing Preferences , click the Basic tab > Printer Status button.

These icons appear on the Windows task bar:

Icon	Mean	Description
	Normal	The machine is in ready mode and experiencing no errors or warnings.
	Warning	The machine is in a state where an error might occur in the future. For example, it might be in toner low status, which may lead to toner empty status.
	Error	The machine has at least one error.

1	Toner Level	You can view the level of toner remaining in each toner cartridge. The machine and the number of toner cartridge(s) shown in the above window may differ depending on the machine in use. Some machines do not have this feature.
2	Alert Settings	Select the settings you want from the options window.
3	Order Supplies	You can order replacement toner cartridge(s) from online.
4	Troubleshooting	You can directly open the troubleshooting section in the user's guide.
5	Close	Close the window.

4.1.6.3. Using Smart Panel (Macintosh and Linux only)

Smart Panel is a program that monitors and informs you of the machine's status, and allows you to customize the machine's settings. For Macintosh, Smart Panel is installed automatically when you install the machine software. For Linux, you can download Smart Panel from the Samsung website.

> ⚠️ **NOTE**
>
> • The Smart Panel window and its contents shown in this user's guide may differ depending on the machine or operating system in use.
>
> • Check the operating system(s) that are compatible with your machine

Smart Panel overview

If an error occurs while operating, you can check the error from the Smart Panel. You can also launch Smart Panel manually.

Macintosh		Click this icon the Smart Panel icon on the menu bar.
Linux		Double-click the Smart Panel icon in the Notification Area.

1	Toner Level	You can view the level of toner remaining in each toner cartridge. The machine and the number of toner cartridge(s) shown in the above window may differ depending on the machine in use. Some machines do not have this feature.
2	Buy Now	You can order replacement toner cartridge(s) from online.
3	User's Guide	You can view the online User's Guide. ⚠️ **NOTE** This button opens the Troubleshooting Guide when an error occurs. You can directly open the troubleshooting section in the user's guide.
4	Printer Setting	You can configure various machine settings in the Printer Settings Utility window. Some machines do not have this feature ⚠️ **NOTE** If you connect your machine to a network, the SyncThru™ Web Service window appears instead of the Printer Settings Utility.

Changing Smart Panel's settings

Right-click in Linux or in Mac OS X click on the Smart Panel icon and select Options. Select the settings you want from the Options window.

4.1.7. Updating Firmware

This chapter includes instructions for updating the printer firmware. You can update the printer firmware by using one of the following methods :

- Update the firmware by using the USB port.

- Update the firmware by using the Network.

4.1.7.1. Update the firmware by using the USB port

Upgrading preparations

- usblist2.exe : Tool which sends firmware data to printer.

- Firmware file to update.

Upgrade Procedure

1) Turn the machine off.

2) Connect USB cable to printer.

3) Turn the machine on. Check if the printer is the ready status.

4) Drag the firmware file and Drop down on the usblist2.exe.
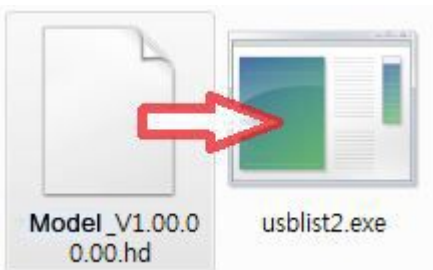
And then firmware update will be started automatically.

5) When upgrading is completed, machine will be automatically reboot.

4.1.7.2. Update the firmware by using the network

Upgrading preparations

- Wired or Wireless Network connection is established.

- Firmware file to update

Upgrade Procedure

1) Open the Web-browser and input IP address of machine. Click "Login".
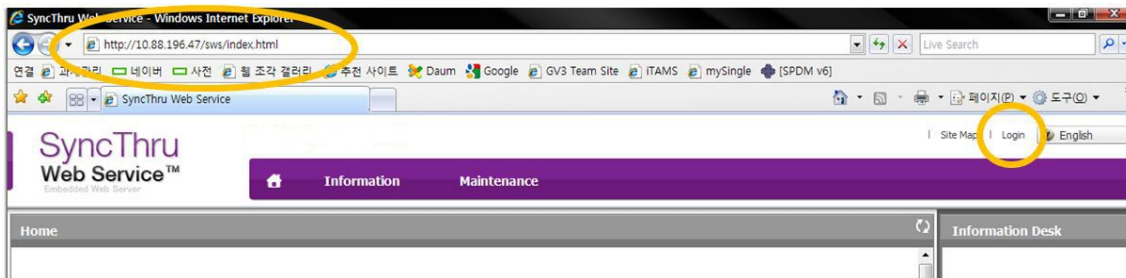
2) Log-in Admin Mode. (ID: admin, PW: sec00000)
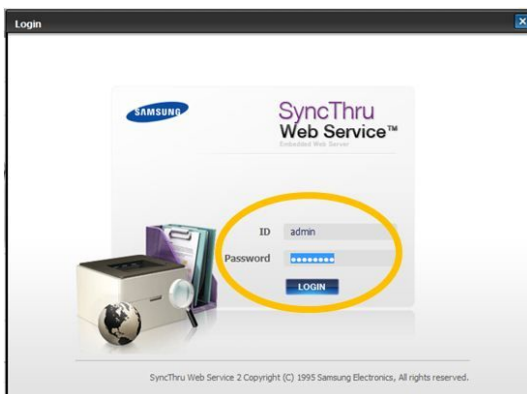
⚠ **CAUTION**

Please, change SWS Default ID and Password for system security in case of your first connection

⚠ **NOTE**

If the machine supports 'Direct Print', you can enable this function using the SWS menu. The default configuration is 'Disabled' for your security

3) Select Maintenance menu and click "upgrade wizard"
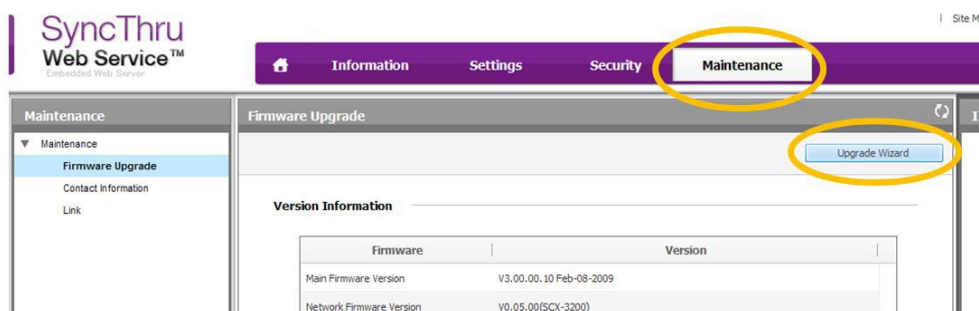
4) Select firmware file using "browser" button and press next button.

Firmware Upgrade Wizard

Select a file

Firmware File

File: C:[_____] Browse

«Previous   Next »   Cancel
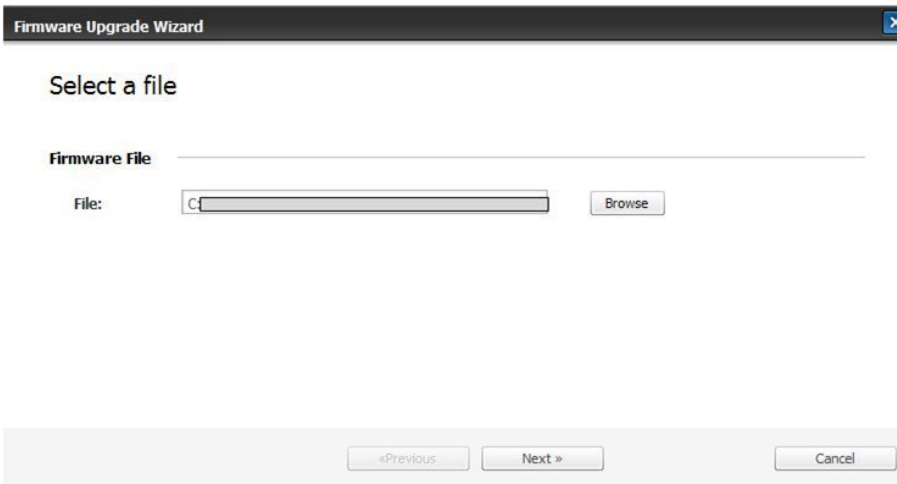
5) SyncThru will check verify firmware file and compare version and press next button.

Firmware Upgrade Wizard

Verifying

Verifying firmware. Please wait.

«Previous   Next »   Cancel

Firmware Upgrade Wizard

Check Firmware Version

New Firmware Versions

Firmware	New Version	Current Version	
Main Firmware	V3.00.	V3.00.	

To process firmware upgrade, click [Next] button below

«Previous   Next »   Cancel
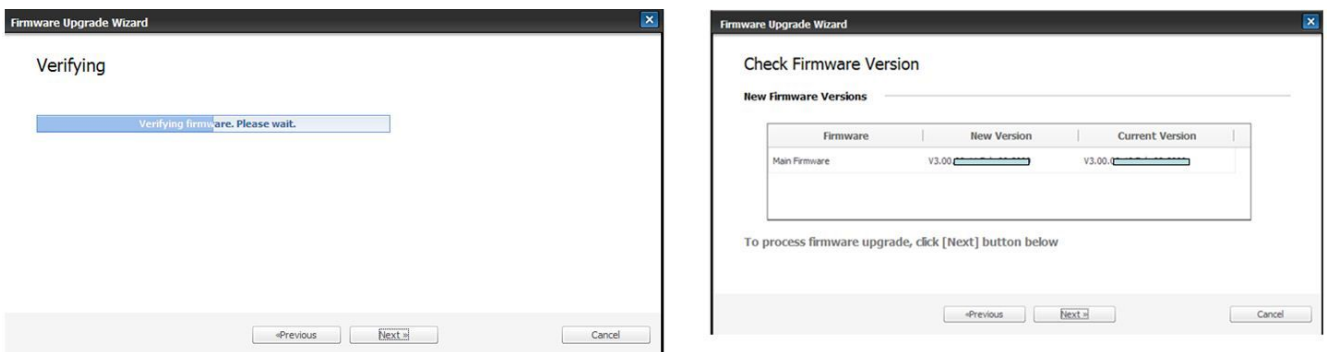
6) Machine starts upgrading. SyncThru will return home page after upgrading is completed.

Firmware Upgrade Wizard

Uploading

Uploading firmware. Please wait.

«Previous   Next »   Cancel
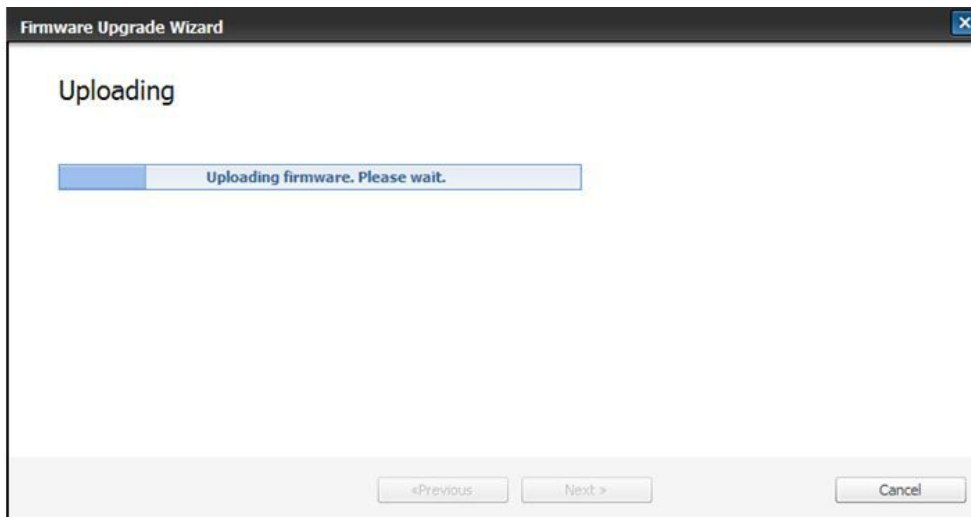
4.1.8. Tech Mode

4.1.8.1. Entering the Tech Mode

In service (tech) mode, the technician can check the machine and perform various test to isolate the cause of a malfunction. While in Tech mode, the machine still performs all normal operations.

To enter the Tech Mode

- **ML-451x/5010/5012 series**

To enter the Tech Mode, press "Menu + # + 1 + 9 + 3 + 4" in sequence

- **ML-5015/5017 series**

While pressing the "Cancel" button, press the triangle button on LCD.
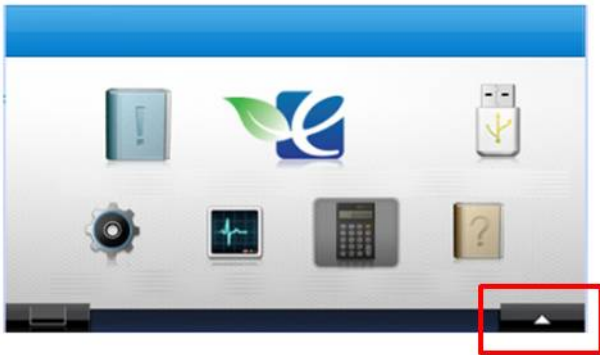
4.1.8.2. Tech Mode Menu

- **ML-451x/5010/5012 series**

Depth 1	Depth 2	Depth 3	Depth 4
Data Setup	Storage Device Setup	Storage Device Format	Formatting…
	Counter Reset	Fuser	
		Pickup Roller	Tray 1
			Tray 2
			Tray 3
			Tray 4
			Tray 5
			MP Tray
		Retard Roller	Tray 1
			Tray 2
			Tray 3
			Tray 4
			Tray 5
			MP Tray
		Transfer Roller	
	Toner Low Level	[1~30]: 10 %*	
	Paper Substitution	Off *	
		On	
Report	Configuration	Printing…	
	Suppilies Info	Printing…	
	Usage Counter	Printing…	
	Error Information	Printing…	
	Job Duty	Printing…	
	ID Control History	Printing…	
EDC Mode	NVM Read/ Write	⚠ **NOTE** Refer to NVM Read/Write table.	
	NVM Initialize	Initialize Now	
	Test Routines	⚠ **NOTE** Refer to Test Routines table.	

- **ML-5015/5017 series**

Depth 1	Depth 2	Depth 3	Depth 4	Depth 5
Information	General	Machine Serial Number		
		Network IP Address		
	Software Version	Set Version		
		Main Controller		
		User Interface		
		Network Controller		
	Report	Configuration		
		Supplies Information		
		Usage Counter		
		Error Information		
		Job Duty		
		ID Control History		
Test Routine	Copier	NVM Read/Write	⚠ **NOTE** Refer to NVM Read/Write table.	
		Test Routine	⚠ **NOTE** Refer to Test Routines table.	
	Other	Toner Low Level	[1-30]% : 10	
		Counter Reset	Fuser	
			Pickup Roller	Tray 1
				Tray 2
				Tray 3
				Tray 4
				Tray 5
				MP Tray
			Transfer Roller	
		Paper Substitution	Off	
			On	
		Format Mass Storage Device		

4.1.8.3. Tech Mode Menu description

1) Data Setup

- **Storage Device Setup (Format mass storage device)**

  This menu can format the storage device in the machine.

- **Counter Reset**

  This menu can reset the counts for the Fuser, Pickup roller, Retard roller, or Transfer roller. When replacing these parts, you must do this menu.

- **Toner Low Level**

  When the toner remains less than setting up level, the machine notify user of toner low.

- **Paper Substitution**

  Between A4 and Letter size paper, print job can be executed without paper mismatch message, when the setting value is "On".

2) Report

- **Configuration**

  It shows various SW version and current machine setting status.

- **Supplies Information**

  It shows consumable unit life status and toner using status.

- **Usage Counter**

  It shows printing usage by paper size and type.

- **Error Information**

  It shows various kinds of errors which can be occurred in machine. It also store history error count how many errors are issued.

- **Job Duty**

  It shows printing usage by print job duty.

3) EDC Mode

- **NVRAM Read/Write**

  This menu can change a configuration value for engine firmware.

| Code | Display | | Meaning | Default | Max/Min | Remark |
	GUI	4–Line LUI				
104-0000	Pick up roller Life Page Counter	0000-Pick Rol Life	Pick up roller Life Page Counter	0	100K/0	
104-0020	Retard Roller Life Page Counter	Retard Rol Life	Retard roller Life Page Counter	0	100K	
104-0021	T2 Retard Roller Life Page Counter	T2 Retard Rol Life	T2 Retard Roller Life Page Counter	0	100K	
104-0022	T3 Retard Roller Life Page Counter	T3 Retard Rol Life	T3 Retard Roller Life Page Counter	0	100K	
104-0023	T4 Retard Roller Life Page Counter	T4 Retard Rol Life	T4 Retard Roller Life Page Counter	0	100K	
104-0024	T5 Retard Roller Life Page Counter	T5 Retard Rol Life	T5 Retard Roller Life Page Counter	0	100K	

Code	Display GUI	Display 4–Line LUI	Meaning	Default	Max/Min	Remark
104-0030	T2 Pick-Up Roller Life Page Counter	0030-T2 Pick Rol Life	T2 Pick-Up Roller Life Page Counter	0	100K/0	
104-0040	T3 Pick-Up Roller Life Page Counter	0040-T3 Pick Rol Life	T3 Pick-Up Roller Life Page Counter	0	100K/0	
104-0050	T4 Pick-Up Roller Life Page Counter	0050-T4 Pick Rol Life	T4 Pick-Up Roller Life Page Counter	0	100K/0	
104-0051	T5 Pick-Up Roller Life Page Counter	0051-T5 Pick Rol Life	T5 Pick-Up Roller Life Page Counter	0	100K/0	
104-0061	Bypass PickUp Roller Life Page Counter	0061-MP Pick Rol Life	Bypass PickUp Roller Life Page Counter	0	100K	
104-0190	Transfer Roller Life Page Counter	0190-Trans Rol Page	Transfer Roller Life Page Counter	0	100K	
104-0210	Fuser Life Page Counter	0210-Fuse Life Page	Fuser Life Page Counter	0	100K/0	100000 / 0
105-0030	MHV DC Black (MHV Bias Control)	0030-MHV DC K	Charger HV Black DC Duty	300	600/0	0 = -300, 600 = 300
106-0030	Deve DC Black (Deve Bias Control)	0030-Deve DC K	Deve DC Black	300	600/0	0 = -300, 600 = 300
106-0070	Deve VPP Black	0070-Deve VPP K	Deve VPP Black	300	600/0	0 = -300, 600 = 300
106-0110	Deve AC Black	0110-Deve AC K	Deve AC Black	300	600/0	0 = -300, 600 = 300
106-0120	Deve AC Frequency	0120-Deve AC Freq	Deve AC Frequency	3000	6000/0	0 = -3000, 600 = 3000
107-0030	Transfer1 High Voltage(THV) Black (THV Bias Control)	0030-THV K	Transfer1 HV Black Duty	300	600/0	0 = -300, 600 = 300
107-0120	Saw Plate Duty (Detack Bias Control)	0120-Saw Plate	Saw Plate Duty	250	900/50	
107-0170	Transfer1 High Voltage(THV) Duplex Black (THV Bias Control)	0170-THV K_Dup	Transfer1 HV Black Duplex Duty	300	600/0	0 = -300, 600 = 300
110-0070	LD Power Black (LD Light Level Black)	0070-LD Power K	Black LD Power at Normal Speed	200	400/0	0 = -200, 400 = 200
111-0030	Toner Vcon Black	0030-Toner Vcon K	Toner Vcon Black	665	900/50	

Code	Display		Meaning	Default	Max/Min	Remark
	GUI	4–Line LUI				
111-0170	Toner Target Black	0170-Toner Target K	Black target TC sensor value	558	900/50	
111-0230	ID Sensor Control Voltage	0230-ID Con Voltage	ID Sensor Control Voltage	755	900/50	
111-0240	ID Control 100% Target	0240-ID Con Compen 100%	ID Control Compensation 100% Target	300	600/0	0 = -300, 600 = 300
111-0250	ID Control 60% Target	0250-ID Con Compen 60%	ID Control Compensation 60% Target	300	600/0	0 = -300, 600 = 300
111-0260	ID Control 30% Target	0260-ID Con Compen 30%	ID Control Compensation 30% Target	300	600/0	0 = -300, 600 = 300

- **Test Routines**

  This menu can perform the operation test for the main components.

Code	Display	Meaning	State Displayed	Related Components
100-0000	Main BLDC Motor	Main BLDC Motor is On/Off	On[Off]	Engine
100-0010	Main BLDC Motor Ready	Detect if Main BLDC Motor runs at normal speed	High[Low]	Engine
100-0061	Black DEV Motor	Black DEV BLDC Motor is On/Off	On[Off]	Engine
100-0071	Black DEV Motor Ready	Detect if Black DEV BLDC Motor runs at normal speed	High[Low]	Engine
100-0120	Exit Motor Forward Fast	Exit Motor Forward Fast On/Off	On[Off]	Engine
100-0131	Exit Motor Backward	Exit Motor Forward Backward On/Off	On[Off]	Engine
100-0140	Duplex Motor Forward	Duplex Motor Forward On/Off	On[Off]	Engine
100-0160	Duplex Fan1 Run	Start/Stop Duplex Fan1 run	On[Off]	Engine
100-0170	Duplex Fan2 Run	Start/Stop Duplex Fan2 run	On[Off]	Engine
100-0200	T1 Elevating Motor	T1 Elevate Motor On/Off	On[Off]	Engine
100-0260	SMPS Fan Run	Start/Stop Deve. Fan run	On[Off]	Engine
101-0000	Bypass Feed Clutch	Engages drive to pick up a paper from bypass Tray(MP Tray).	On[Off]	Engine
101-0010	T1 Pick-Up Clutch	Engages drive to pick up a paper from tray1.	On[Off]	Engine
101-0020	T2 Pick-Up Clutch	Engages drive to pick up a paper from tray2. (Optional)	On[Off]	Engine
101-0030	T3 Pick-Up Clutch	Engages drive to pick up a paper from tray3. (Optional)	On[Off]	Engine
101-0040	T4 Pick-Up Clutch	Engages drive to pick up a paper from tray4. (Optional)	On[Off]	Engine
101-0041	T5 Pick-Up Clutch	Engages drive to pick up a paper from tray5. (Optional)	On[Off]	Engine

Code	Display	Meaning	State Displayed	Related Components
101-0050	Registration Clutch	Engages drive to registartion rolls.	On[Off]	Engine
101-0190	Out-Bin Full Sensor	Detect when a paper is at Duplex Ready sensor.	High[Low]	Engine
102-0000	Tray1 Home Position	Detect when tray1 is closed.	Closed[Opened]	Engine
102-0010	T1 Paper Empty Sensor	Detect when paper is in Tray1.	High[Low]	Engine
102-0020	T1 Size1 sensor	Detects whether auto size1 sensor of tray1 is high or low.	High[Low]	Engine
102-0030	T1 Size2 sensor	Detects whether auto size2 sensor of tray1 is high or low.	High[Low]	Engine
102-0040	T1 Size3 sensor	Detects whether auto size3 sensor of tray1 is high or low.	High[Low]	Engine
102-0050	T1 Stack Height Sensor	Detects if paper in tray1 is elevated to the sensor.	High[Low]	Engine
102-0070	Tray2 Home Position	Detect when tray2 is closed.	Closed[Opened]	Engine
102-0080	T2 Paper Empty Sensor	Detect when paper is in tray2.	High[Low]	Engine
102-0090	T2 Size1 sensor	Detects whether auto size1 sensor of tray2 is high or low.	High[Low]	Engine
102-0100	T2 Size2 sensor	Detects whether auto size2 sensor of tray2 is high or low.	High[Low]	Engine
102-0110	T2 Size3 sensor	Detects whether auto size3 sensor of tray2 is high or low.	High[Low]	Engine
102-0120	T2 Stack Height Sensor	Detects if paper in tray2 is elevated to the sensor.	High[Low]	Engine
102-0140	Tray3 Home Position	Detect when tray3 is closed.	Closed[Opened]	Engine
102-0150	T3 Paper Empty Sensor	Detect when paper is in tray3.	High[Low]	Engine
102-0160	T3 Size1 sensor	Detects whether auto size1 sensor of tray3 is high or low.	High[Low]	Engine
102-0170	T3 Size2 sensor	Detects whether auto size2 sensor of tray3 is high or low.	High[Low]	Engine
102-0180	T3 Size3 sensor	Detects whether auto size3 sensor of tray3 is high or low.	High[Low]	Engine
102-0190	T3 Stack Height Sensor	Detects if paper in tray3 is elevated to the sensor.	High[Low]	Engine
102-0210	Tray4 Home Position	Detect when tray4 is closed.	Closed[Opened]	Engine
102-0220	T4 Paper Empty Sensor	Detect when paper is in tray4.	High[Low]	Engine
102-0230	T4 Size1 sensor	Detects whether auto size1 sensor of tray4 is high or low.	High[Low]	Engine
102-0240	T4 Size2 sensor	Detects whether auto size2 sensor of tray4 is high or low.	High[Low]	Engine
102-0250	T4 Size3 sensor	Detects whether auto size3 sensor of tray4 is high or low.	High[Low]	Engine

Code	Display	Meaning	State Displayed	Related Components
102-0260	T4 Stack Height Sensor	Detects if paper in tray4 is elevated to the sensor.	High[Low]	Engine
102-0470	Tray5 Home Position	Detect when tray4 is closed.	Closed[Opened]	Engine
102-0480	T5 Paper Empty Sensor	Detect when paper is in tray4.	High[Low]	Engine
102-0490	T5 Size1 sensor	Detects whether auto size1 sensor of tray4 is high or low.	High[Low]	Engine
102-0500	T5 Size2 sensor	Detects whether auto size2 sensor of tray4 is high or low.	High[Low]	Engine
102-0510	T5 Size3 sensor	Detects whether auto size3 sensor of tray4 is high or low.	High[Low]	Engine
102-0520	T5 Stack Height Sensor	Detects if paper in tray4 is elevated to the sensor.	High[Low]	Engine
102-0280	Bypass Paper Empty Sensor	Detects when paper is in Bypass Tray(MP Tray).	High[Low]	Engine
102-0290	Feed Sensor	Detect when a paper is at Feed sensor.	High[Low]	Engine
102-0300	T2 Feed Sensor (or Door Open)	Detect when a paper is at T2 Feed sensor. (optional)	High[Low]	Engine
102-0320	T3 Feed Sensor (or Door Open)	Detect when a paper is at T3 Feed sensor. (optional)	High[Low]	Engine
102-0340	T4 Feed Sensor (or Door Open)	Detect when a paper is at T4 Feed sensor. (optional)	High[Low]	Engine
102-0341	T5 Feed Sensor (or Door Open)	Detect when a paper is at T5 Feed sensor. (optional)	High[Low]	Engine
102-0360	Regi. Sensor	Detect when a paper is at Regi. sensor.	High[Low]	Engine
102-0370	Exit Sensor	Detect when a paper is at Exit. sensor.	High[Low]	Engine
102-0380	Duplex Jam1 Sensor	Detect when a paper is at Duplex Jam1 sensor.	High[Low]	Engine
102-0400	Stapler Detection Sensor	Detect if Stapler is installed.	High[Low]	Engine[Finisher]
102-0410	Stapler Enable	Enable/Disable Stapler.	On[Off]	Engine[Finisher]
102-0440	Rear Cover Sensor	Detect status of Rear cover.	Closed[Opened]	Engine
105-0030	Black MHV Bias	Black MHV bias voltage on at normal drive level	On[Off]	Engine
105-0070	Black MHV Bias Read	Black Detect what the MHV value is on the MHV Roller	Numeric 3 digits	Engine
105-0130	Zener_OPC	Black MHV AC bias voltage on at normal drive level	On[Off]	Engine
106-0030	Black Dev Bias	Black Dev bias voltage on at normal drive level	On[Off]	Engine
106-0031	Black Dev AC Bias	Black Dev bias AC voltage on at normal drive level	On[Off]	Engine
107-0030	Black THV Bias	Black THV bias voltage on at normal drive level	On[Off]	Engine

Code	Display	Meaning	State Displayed	Related Components
107-0031	Black THV(-) Bias	Black THV bias voltage on at normal drive level	On[Off]	Engine
107-0070	Black THV Bias Read	Detect what the THV value is on the THV Roller	Numeric 3 digits	Engine
107-0110	Detach Bias	Detect bias voltage on at normal drive level	On[Off]	Engine
107-0150	PTL1	Pre Transfer Lamp 1	On[Off]	Engine
109-0000	Fuser Temperature A	Detects what the temperature A is on fuser.	Numeric 3 digits	Engine
109-0010	Fuser Temperature B	Detects what the temperature B is on fuser.	Numeric 3 digits	Engine
109-0030	Fuser Motor Forward	Fuser Motor Forward On/Off	On[Off]	Engine
109-0050	Fuser Bias	Fuser bias voltage on at normal drive level	On[Off]	Engine
109-0052	Fuser Bias Minus	Fuser bias voltage on at normal drive level	On[Off]	Engine
109-0110	Fuser Crum Read1	Detect if the life of fuser1 is exhausted.	High[Low]	Engine
109-0140	Fuser Gap Home Sensor	Detect if the fuser press is located Home position.	High[Low]	Engine
110-0000	LSU Motor1 Run Ready	Detects if LSU motor1 runs at normal speed.	High[Low]	Engine
110-0060	LSU Motor1 Run	LSU Motor1 On/Off	On[Off]	Engine
110-0110	LSU LD Power4	LSU LD4 Power On/Off (black)	On[Off]	Engine
110-0120	LSU Fan1 Run	Start/Stop LSU Fan Run	On[Off]	Engine
111-0030	Toner Dispense Motor Black	Toner Dispense(Supply) Motor On/Off	On[Off]	Engine
111-0070	Toner Sensor Black	TC sensor in developer tank.	Numeric 3 digits	Engine
111-0080	ID Sensor	Start ID sensor sensing On/Off	On[Off]	Engine
111-0090	ID Sensor Check	Display ID sensor reading value	Numeric 3 digits	Engine
113-0010	Entrance Motor	Entrance Motor run as IOT Speed	On[Off]	Engine[Finisher]
113-0020	Exit Motor	Exit Motor run as IOT Speed	On[Off]	Engine[Finisher]
113-0040	Front Jog Home	Front Jogger move Home	On	Engine[Finisher]
113-0050	Front Jog Stand	Front Jogger move to Stand	On	Engine[Finisher]
113-0060	Rear Jog Home	Rear Jogger move Home	On	Engine[Finisher]
113-0070	Rear Jog Stand	Rear Jogger move to Stand	On	Engine[Finisher]
113-0080	Support Finger Home	Supporter move Home	On	Engine[Finisher]
113-0090	Support Finger Stand	Supporter move to Stand	On	Engine[Finisher]
113-0110	Stacker Down	Stacker down to bottom	On	Engine[Finisher]
113-0120	Stacker Up	Stacker up to Stacking position	On	Engine[Finisher]
113-0130	Stapler	Staple when no cartridge	On	Engine[Finisher]
113-0140	Entrance Sensor	Detect paper at paper feeding area.	High[Low]	Engine[Finisher]
113-0150	Exit Sensor	Detect paper at paper exit area.	High[Low]	Engine[Finisher]

Code	Display	Meaning	State Displayed	Related Components
113-0170	Front Jog Home Sensor	Detect Front Jog Home position	High[Low]	Engine[Finisher]
113-0180	Rear Jog Home Sensor	Detect Rear Jog Home position	High[Low]	Engine[Finisher]
113-0190	Support Finger Home Sensor	Detect Support-Finger Home position	High[Low]	Engine[Finisher]
113-0220	Stacker Top Sensor	Detect Stacker Top position	High[Low]	Engine[Finisher]
113-0230	Stacker Bottom Switch	Detect Staple Bottom position	High[Low]	Engine[Finisher]
113-0240	Staple Home Sensor	Detect Staple Home position	High[Low]	Engine[Finisher]
113-0250	Staple Ready Sensor	Detect Staple Ready to clinching.	High[Low]	Engine[Finisher]
113-0260	Low Staple Sensor	Detect Staple Low	High[Low]	Engine[Finisher]
113-0280	Finisher Door Switch	Detect Finsher Door Open or Close	High[Low]	Engine[Finisher]
113-0310	Diverter Motor	Entrance Motor run the other direction to Feeding <1 rotation>	On[Off]	Engine[Finisher]
113-0320	Diverter Home Sensor	Detect Diverter Home sensor	High[Low]	Engine[Finisher]
113-0330	Jam Cover Sensor	Detect Jam Cover is closed	High[Low]	Engine[Finisher]
113-0340	Safety Switch	Detect Safety Switch is on or off	High[Low]	Engine[Finisher]
116-0050	Feed Motor	Feed Motor run as IOT Speed	On[Off]	Engine[Mailbox]
116-0060	Upper Diverter Motor	Upper Diverter Round Trip between three positions	On[Off]	Engine[Mailbox]
116-0070	Lower Diverter Motor	Lower Diverter Round Trip between three positions	On[Off]	Engine[Mailbox]
116-0080	Entrance Sensor	Detect paper at paper feeding area.	High[Low]	Engine[Mailbox]
116-0090	Bin1 Full Sensor	Detect paper full at paper exit area of Bin 1	High[Low]	Engine[Mailbox]
116-0100	Bin2 Full Sensor	Detect paper full at paper exit area of Bin 2	High[Low]	Engine[Mailbox]
116-0110	Bin3 Full Sensor	Detect paper full at paper exit area of Bin 3	High[Low]	Engine[Mailbox]
116-0120	Bin4 Full Sensor	Detect paper full at paper exit area of Bin 4	High[Low]	Engine[Mailbox]
116-0130	Bin1 Empty Sensor	Detect paper empty on Bin 1 tray	High[Low]	Engine[Mailbox]
116-0140	Bin2 Empty Sensor	Detect paper empty on Bin 2 tray	High[Low]	Engine[Mailbox]
116-0150	Bin3 Empty Sensor	Detect paper empty on Bin 3 tray	High[Low]	Engine[Mailbox]
116-0160	Bin4 Empty Sensor	Detect paper empty on Bin 4 tray	High[Low]	Engine[Mailbox]
116-0170	Upper Diverter Home Sensor	Detect Upper Diverter in Home position	High[Low]	Engine[Mailbox]
116-0180	Lower Diverter Home Sensor	Detect Lower Diverter in Home position	High[Low]	Engine[Mailbox]
116-0190	Cover Open Sensor	Detect Cover is closed	High[Low]	Engine[Mailbox]

4.2. Truobleshooting

4.2.1. Procedure of checking the symptoms

Before attempting to repair the printer first obtain a detailed description of the problem from the customer.

```
        Power On
           │
           ▼
       ◇ OPE LED ───No──▶  - No Power
         ON? ◇              - Power Module error
           │                - Main PBA
          Yes
           │
           ▼
       ◇ OPE LED ───No──▶  Red LED on /    ──Yes──▶  See the troubleshooting
         Green OK? ◇         Error message            for error code
           │                 is displayed.
          Yes
           │
           ▼
       Print (test page)
           │
           ▼
       ◇ Printing ───No──▶  Refer to "Solution
         quality is          of Image Problem"
         nomal? ◇
           │
          Yes
           │
           ▼
         END
```
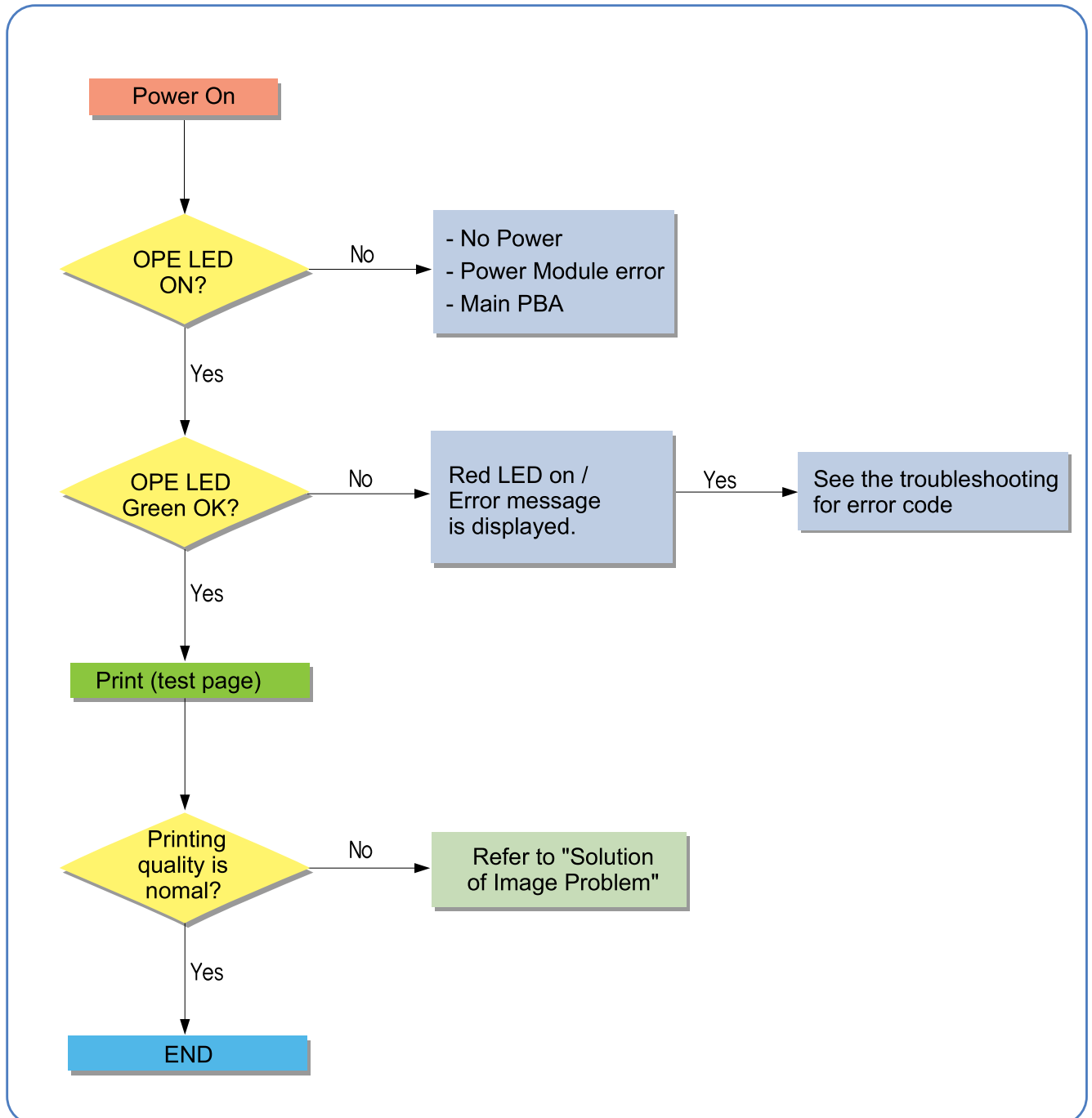
4.2.1.1. Basic Check List

1) **Check the Power.**

   - Check that the power switch is turned on.

   - Check that the power cable is plugged into the outlet and the printer.

   - Check the voltage of the power outlet.

2) **Check the LED of Panel.**

   - Is there OPE LED ON?
     › If not check power cable, switch SMPS or Main board.

   - Is the abnormal Lamp?
     › Check the Main board and cable harness.

3) **Check the Paper Path**

   - Is there a Paper Jam?
     › Remove any paper fragments caught in the paper path.

   - Paper Jam occurs repeatedly at a specific point in the Paper Path
     › Open the fuser cover, Jam clear.
     › Dismantle the machine and carefully inspect the region where the jam occurs.
       (Especially, check if paper fragments are caught in the Fuser

4) **Print the Information Page (Configuration).**

   - Try printing a test page from a computer.
     › If there is an error check cables and driver installation.

5) **Check the Print Quality.**

   - Is there are a Print Quality Problem?
     › Refer to image quality problem section.

6) **Check consumables (toner etc.).**

   - Using the keys print the Test Pattern.
     › Expected life of various consumable parts, compare this with the figures printed and replace as required

4.2.2. Error Code and Troubleshooting

Error code and messages appear on LCD Panel display to indicate the machine's status or errors.

Also, error in machine can be checked through "Event Log Information" report.

Error Code	Error Message	Troubleshooting Page
A1-1110	Actuator Motor Failure : #A1-1110. Turn off then on.	Page 4–41
A1-2110	Actuator Motor Failure : #A1-2110.	Page 4–41
A3-3312	Actuator Sensor Failure : #A3-3312. Turn off then on.	Page 4–42
C1-1110	Prepare new toner cartridge.	Page 4–43
C1-1120	Replace with new toner cartridge.	Page 4–43
C1-1140	End of life, Replace with new toner cartridge.	Page 4–43
C1-1311	Toner Cartridge Failure: #C1-1311. Install toner cartridge again.	Page 4–43
C1-1411	Toner cartridge is not installed. Install the cartridge.	Page 4–44
C1-1512	Toner cartridge is not compatible. Check users guide.	Page 4–44
C3-1110	Prepare new imaging unit.	Page 4–45
C3-1120	Replace with new imaging unit.	Page 4–45
C3-1140	End of life, Replace with new imaging unit.	Page 4–45
C3-1312	Imaging Unit Failure: #C3-1312. Install imaging unit again.	Page 4–45
C3-1330	Imaging Unit Failure: #C3-1330. Install imaging unit again.	Page 4–46
C3-1512	Imaging unit is not compatible. Check users guide.	Page 4–46
H1-1210	Paper jam in Tray 2.	Page 4–47
H1-1222	Tray 2 cassette is pulled out. Insert it properly.	Page 4–49
H1-1230	Input System Failure: #H1-1230. Check Tray 2 connection.	Page 4–50
H1-1240	Tray 2 is not installed. Install the tray.	Page 4–50
H1-1252	Paper is empty in Tray 2. Load paper.	Page 4–52
H1-1253	Input System Failure #H1-1253 : Pull Tray 2 out and insert it.	Page 4–53
H1-1310	Paper jam in Tray 3.	Page 4–47
H1-1322	Tray 3 cassette is pulled out. Insert it properly.	Page 4–49
H1-1330	Input System Failure: #H1-1330. Check Tray 3 connection.	Page 4–50
H1-1340	Tray 3 is not installed. Install the tray.	Page 4–50
H1-1352	Paper is empty in Tray 3. Load paper.	Page 4–52
H1-1353	Input System Failure #H1-1353 : Pull Tray 3 out and insert it.	Page 4–53
H1-1410	Paper jam in Tray 4.	Page 4–47
H1-1422	Tray 4 cassette is pulled out. Insert it properly.	Page 4–49
H1-1430	Input System Failure: #H1-1430. Check Tray 4 connection.	Page 4–50
H1-1440	Tray 4 is not installed. Install the tray.	Page 4–50
H1-1452	Paper is empty in Tray 4. Load paper.	Page 4–52
H1-1453	Input System Failure #H1-1453 : Pull Tray 4 out and insert it.	Page 4–53
H1-1510	Paper jam in Tray 5.	Page 4–47
H1-1522	Tray 5 cassette is pulled out. Insert it properly.	Page 4–49
H1-1530	Input System Failure: #H1-1530. Check Tray 5 connection.	Page 4–50

Error Code	Error Message	Troubleshooting Page
H1-1540	Tray 5 is not installed. Install the tray.	Page 4–50
H1-1552	Paper is empty in Tray 5. Load paper.	Page 4–52
H1-1553	Input System Failure #H1-1553 : Pull Tray 5 out and insert it.	Page 4–53
H2-1100	Paper jam inside of finisher	Page 4–55
H2-1101	Paper jam in front of finisher	Page 4–57
H2-1102	Paper jam inside of finisher	Page 4–58
H2-1200	Paper jam inside of finisher	Page 4–59
H2-1300	Paper jam at exit of finisher	Page 4–59
H2-1302	Paper jam at exit of finisher	Page 4–61
H2-1710	Finisher Failure #H2-1710. Check finisher	Page 4–62
H2-1711	Finisher Failure #H2-1711. Check finisher	Page 4–62
H2-1720	Finisher Failure #H2-1720. Check finisher	Page 4–64
H2-1721	Finisher Failure #H2-1721. Check finisher	Page 4–64
H2-1730	Finisher Failure #H2-1730. Check finisher	Page 4–66
H2-1731	Finisher Failure #H2-1731. Check finisher	Page 4–66
H2-1750	Finisher Failure #H2-1750. Check finisher	Page 4–67
H2-1751	Finisher Failure #H2-1751. Check finisher	Page 4–67
H2-1752	Finisher Failure #H2-1752. Check finisher	Page 4–69
H2-1753	Finisher Failure #H2-1753. Check finisher	Page 4–67
H2-1760	Finisher Failure #H2-1760. Check finisher	Page 4–71
H2-1800	Finisher Failure #H2-1800. Check finisher	Page 4–73
H2-1A20	Finisher door is open. Close it.	Page 4–75
H2-1A32	Too much paper in finisher stacker. Remove printed paper.	Page 4–78
H2-1A50	Finisher Failure #H2-1A50. Check finisher connection.	Page 4–79
H2-1A62	Staple cartridge is low. Replace it.	Page 4–80
H2-1A63	Staple cartridge is empty. Replace it.	Page 4–80
H2-1A70	Finisher Failure #H2-1A70. Check finisher.	Page 4–67
H2-1A80	Finisher Failure #H2-1A80. Check finisher.	Page 4–71
H2-4100	Paper Jam in front of mailbox. Remove paper.	Page 4–82
H2-4101	Paper Jam inside of mailbox. Remove paper.	Page 4–84
H2-4102	Paper Jam inside of mailbox. Remove paper.	Page 4–84
H2-4200	Paper Jam in front of mailbox bin 1. Remove paper.	Page 4–86
H2-4201	Paper Jam at mailbox bin 1. Remove paper.	Page 4–86
H2-4202	Paper Jam at mailbox bin 1. Remove paper.	Page 4–88
H2-4300	Paper Jam in front of mailbox bin 2. Remove paper.	Page 4–86
H2-4301	Paper Jam at mailbox bin 2. Remove paper.	Page 4–86
H2-4302	Paper Jam at mailbox bin 2. Remove paper.	Page 4–88
H2-4400	Paper Jam in front of mailbox bin 3. Remove paper.	Page 4–86
H2-4401	Paper Jam at mailbox bin 3. Remove paper.	Page 4–86
H2-4402	Paper Jam at mailbox bin 3. Remove paper.	Page 4–88

Error Code	Error Message	Troubleshooting Page
H2-4500	Paper Jam in front of mailbox bin 4. Remove paper.	Page 4–86
H2-4501	Paper Jam at mailbox bin 4. Remove paper.	Page 4–86
H2-4502	Paper Jam at mailbox bin 4. Remove paper.	Page 4–88
H2-4700	Mailbox Failure #H2-4700. Check mailbox.	Page 4–90
H2-4701	Mailbox Failure #H2-4701. Check mailbox.	Page 4–90
H2-4710	Mailbox Failure #H2-4710. Check mailbox.	Page 4–92
H2-4711	Mailbox Failure #H2-4711. Check mailbox.	Page 4–92
H2-4A20	Mailbox door is open. Close it.	Page 4–94
H2-4A32	Too much paper in mailbox bin 1. Remove printed paper	Page 4–96
H2-4A35	Too much paper in mailbox bin 2. Remove printed paper	Page 4–96
H2-4A38	Too much paper in mailbox bin 3. Remove printed paper	Page 4–96
H2-4A3C	Too much paper in mailbox bin 4. Remove printed paper	Page 4–96
H2-4A50	Mailbox Failure #H2-4A50. Check mailbox connection	Page 4–96
M1-1110	Paper jam in tray 1.	Page 4–97
M1-3122	Tray 1 cassette is pulled out. Insert it properly.	Page 4–97
M1-4111	Input System Failure #M1-4111 : Pull tray 1 out and insert it.	Page 4–97
M1-5112	Paper is empty in tray 1. Load paper.	Page 4–98
M1-5612	Paper is empty in MP tray. Load paper.	Page 4–98
M2-1110	Paper jam inside of machine.	Page 4–99
M2-2210	Paper jam at the inside of duplex path.	Page 4–100
M2-2310	Paper jam at the bottom of duplex path.	Page 4–101
M3-1110	Paper jam in exit area.	Page 4–102
M3-2130	Too much paper in output bin tray. Remove printed paper.	Page 4–102
S2-4210	Front door is open. Close it.	Page 4–103
S2-4610	Rear door is open. Close the door.	Page 4–104
S6-3123	This IP address conflicts with that of other system. Check it.	Page 4–105
S6-3128	802.1x authentication failed. Please Contact the System Administrator.	Page 4–105
U1-2115	Fuser Unit Failure #U1-2115 : Turn off then on.	Page 4–106
U1-2116	Fuser Unit Failure #U1-2116 : Turn off then on.	Page 4–106
U1-2117	Fuser Unit Failure #U1-2117 : Turn off then on.	Page 4–109
U1-2320	Fuser Unit Failure #U1-2320 : Turn off then on.	Page 4–111
U1-2330	Fuser Unit Failure #U1-2330 : Turn off then on.	Page 4–111
U1-2340	Fuser Unit Failure #U1-2340 : Turn off then on.	Page 4–114
U2-1111	LSU Failure: #U2-1111. Turn off then on.	Page 4–117
U2-1113	LSU Failure: #U2-1113. Turn off then on.	Page 4–118

► **Error Code**

A1-1110

► **Error message**

Actuator Motor Failure : #A1-1110.

► **Symptom**

Main BLDC motor does not work normally.

► **Troubleshooting method**

1) Turn off the machine then on.

2) If the problem persists, replace the fuser unit. (Refer to 3.3.1 Fuser unit.)

3) If the problem persists, replace the Main drive unit. (Refer to 3.4.6 Main Drive unit.)
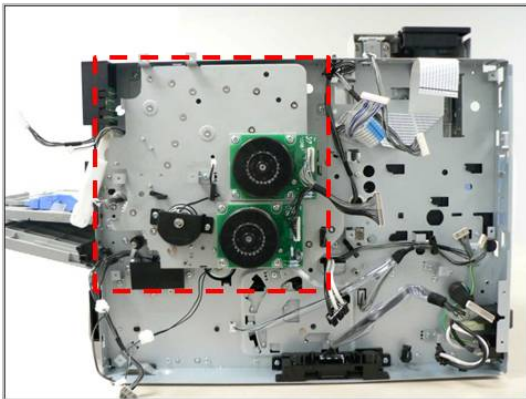
► **Error Code**

A1-2110

► **Error message**

Actuator Motor Failure #A1-2110.

► **Symptom**

OPC BLDC motor does not work normally.

► **Troubleshooting method**

1) Turn off the machine then on.

2) If the problem persists, replace the imaging unit.

3) If the problem persists, replace the Main drive unit. (Refer to 3.4.6 Main Drive unit.)
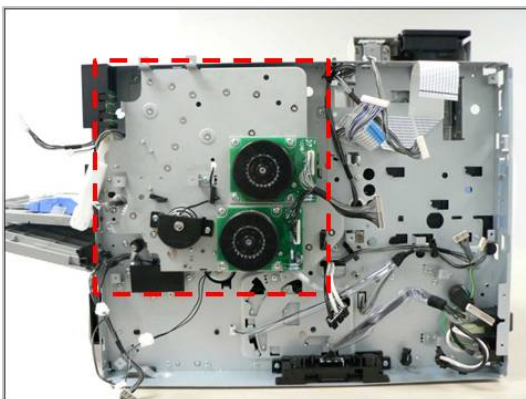
► **Error Code**

A3–3312

► **Error message**

Actuator Sensor Failure #A3-3312

► **Symptom**

The external temperature sensor has detected the abnormal value.

► **Troubleshooting method**

1) Turn off the machine off then on.

2) Enter the tech mode. Check the output of the temperature sensor.

3) Check the harness connection between the temperature sensor (S1) and the main board.
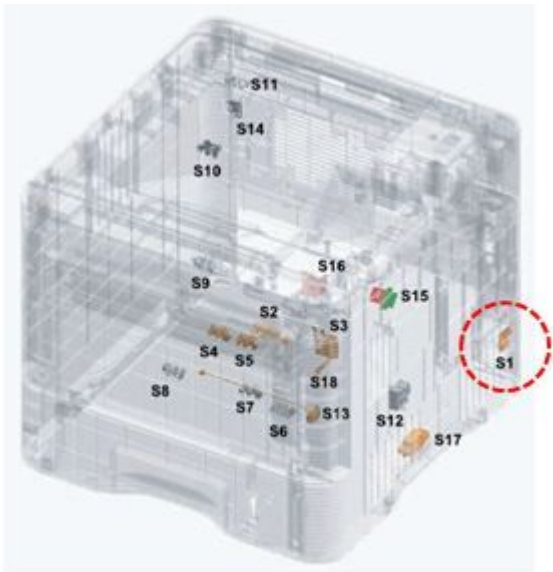
4) If the harness is OK, check the No.4 pin voltage of the sensor. (Normal range : 0 ~ 2V)

5) If the value is 3.3V, replace the sensor.

6) If the value is in normal range, replace the main board.

► **Error Code**

C1–1110

► **Error message**

Prepare new toner cartridge.

► **Symptom**

The remaining toner in cartridge is low.

► **Troubleshooting method**

Check the life remaining of the toner cartridge.
If its life is at the end, turn the machine off and replace the toner cartridge with new one.

► **Error Code**

C1–1120

C1–1140

► **Error message**

Replace with new toner cartridge.

End of life, Replace with new toner cartridge.

► **Symptom**

The remaining toner in cartridge is empty.

► **Troubleshooting method**

Check the life remaining of the toner cartridge.
If its life is at the end, turn the machine off and replace the toner cartridge with new one.

► **Error Code**

C1–1311

► **Error message**

Toner Cartridge Failure: #C1-1311. Install toner cartridge again.

► **Symptom**

The imaging unit does not get enough toner from the toner cartridge.

► **Troubleshooting method**

1) Turn the machine off then on.

2) Remove the toner cartridge.

   Thoroughly roll the cartridge three or four times to distribute the toner evenly inside the cartridge. And reinstall the toner cartridge.

3) Try to print out the sample page more than 20 pages.

4) Check the toner cartridge.

   • Check if the toner cartridge is installed correctly.

   • Check if the toner seal is removed perfectly.

   • Check if the toner supply shutter between the toner cartridge and the imaging unit works normally.

5) Replace the toner cartridge. Print out the sample page.

6) Check if the toner supply motor works normally.

► **Error Code**

C1–1411

► **Error message**

Toner cartridge is not installed. Install the cartridge.

► **Symptom**

The toner cartridge is not installed properly.

► **Troubleshooting method**

1) Open the front cover.

2) If the toner cartridge is not installed, install it. Try to test the machine again.

3) If the toner cartridge is installed, remove it. Check if the modular jack is contaminated or broken.

4) Clean the modular jack or replace the toner cartridge.

5) If it is OK, check the CN22 harness connection on the main board.

6) If the harness is defective, replace it.

7) Turn the machine off then on. Try to test the machine.

► **Error Code**

C1–1512

► **Error message**

Toner cartridge is not compatible. Check users guide.

► **Symptom**

Toner cartridge is not compatible.

► **Troubleshooting method**

Install the genuine samsung toner cartridge.

► **Error Code**

C3–1110

C3–1120

C3–1140

► **Error message**

Prepare new imaging unit.

Replace with new imaging unit.

End of life, Replace with new imaging unit

► **Symptom**

The remaining life of the imaging unit is less than 10% of its life. / The remaining life of the imaging unit is less than 0% of its life.

► **Troubleshooting method**

Check the life remaining of the imaging unit.
If its life is at the end, turn the machine off and replace the imaging unit with new one.

► **Error Code**

C3–1312

► **Error message**

Imaging Unit Failure: #C3-1312. Install imaging unit again.

► **Symptom**

Toner sensor is defective. The machine can't detect the sensor signal in the imaging unit normally.

► **Troubleshooting method**

1) Install the genuine samsung imaging unit.

2) If the imaging unit is already installed, check the following.

   • Reinstall the toner cartridge and imaging unit.

   • Check if the CRUM connector is normal.

   • Turn the machine off then on.

► **Error Code**

C3–1330

► **Error message**

Imaging Unit Failure: #C3-1330. Install imaging unit again.

► **Symptom**

The imaging unit is not installed properly.

► **Troubleshooting method**

1) Open the front cover.

2) If the imaging unit is not installed, install it. Try to test the machine again.

3) If the imaging unit is installed, remove it. Check if the modular jack is contaminated or broken.

4) Clean the modular jack or replace the imaging unit.

5) If it is OK, check the CN22 harness connection on the main board.

6) If the harness is defective, replace it.

7) Turn the machine off then on. Try to test the machine.

► **Error Code**

C3–1512

► **Error message**

Imaging unit is not compatible. Check users guide.

► **Symptom**

Imaging unit is not compatible.

► **Troubleshooting method**

Install the genuine samsung imaging unit.

► **Error Code**

H1–1210

H1–1310

H1–1410

H1–1510

► **Error message**

Paper Jam in Tray2

Paper Jam in Tray3

Paper Jam in Tray4

Paper Jam in Tray5

► **Symptom**

A jammed paper has occurred in the option cassette. (SCF unit)

► **Troubleshooting method**

1) Remove the jammed paper. If the problem persists, check the followings.

2) Check if the paper is loaded in the SCF tray properly.

3) Check if the roller is defective or worn out.
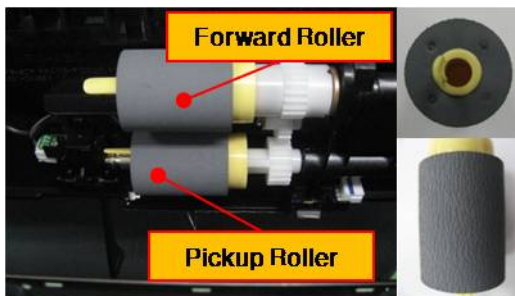
4) Check if the Empty/ Pick up/ Regi-Act sensor is working properly.
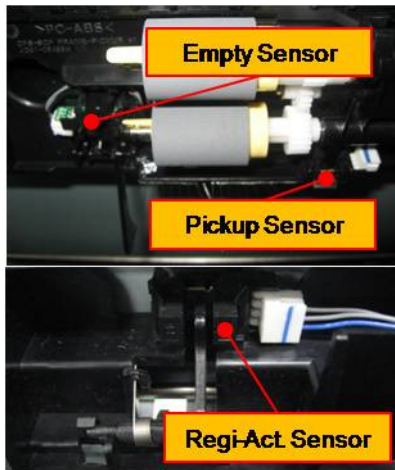
5) Check if the main board/ motor/ clutch connector are connected properly.
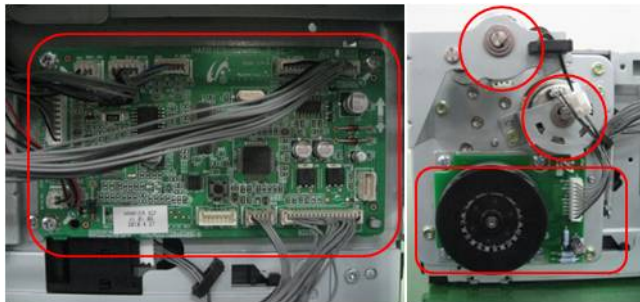
6) Check if the AS-SPRING_ES is deformed or assembled properly.
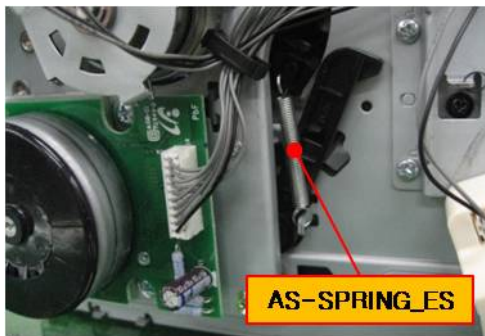
7) Check if the Press D-cut of the Gear-Lifting is broken.
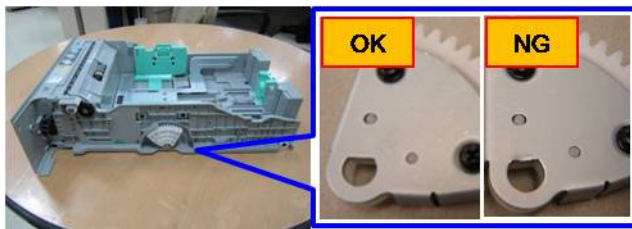
8) If the problem persists after checking No. 1~7, replace the SCF main board.

9) If the problem persists, replace the Drop connector harness.

► **Error Code**

H1–1222

H1–1322

H1–1422

H1–1522

► **Error message**

Tray2 cassette is pulled out. Insert it properly.

Tray3 cassette is pulled out. Insert it properly.

Tray4 cassette is pulled out. Insert it properly.

Tray5 cassette is pulled out. Insert it properly.

► **Symptom**

A optional cassette (SCF) is pulled out.

► **Troubleshooting method**

1) Check if the optional cassette is inserted properly. Remove the cassette then re-install it.

2) Check if the Signal-Switch is deformed or broken. If it is defective, replace it.

Cassette detect
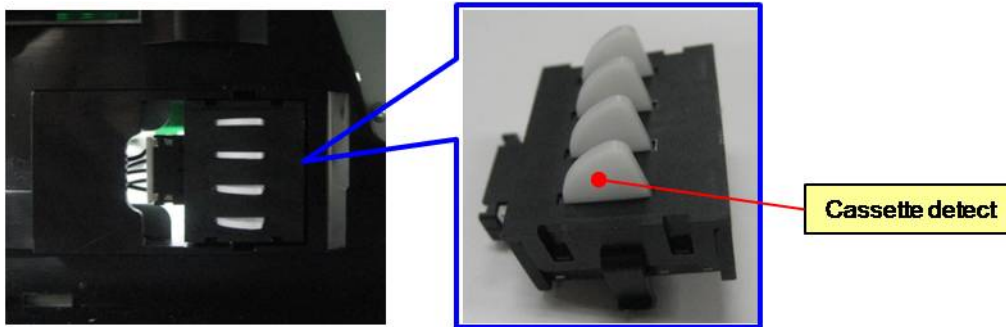
► **Error Code**

H1–1230

H1–1240

H1–1330

H1–1340

H1–1430

H1–1440

H1–1530

H1–1540

► **Error message**

Input System Failure: #H1-1230. Check Tray 2 connection.

Tray 2 is not installed. Install the tray.

Input System Failure: #H1-1330. Check Tray 3 connection.

Tray 3 is not installed. Install the tray.

Input System Failure: #H1-1430. Check Tray 4 connection.

Tray 4 is not installed. Install the tray.

Input System Failure: #H1-1530. Check Tray 5 connection.

Tray 5 is not installed. Install the tray.

► **Symptom**

The communication error between the machine and option cassette has occurred.

► **Troubleshooting method**

1) Turn the machine off then on.

2) Check if the option tray harness on main board is connected properly. Reconnect or replace the harness.
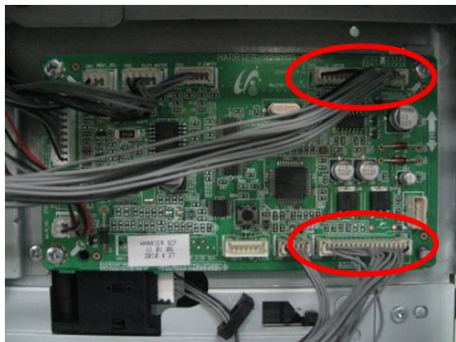
3) Check if the SCF draw connector is broken.

---
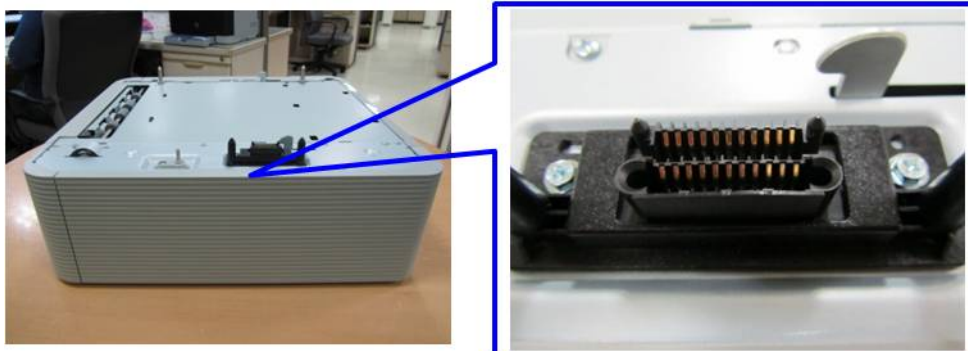
4) If the problem persists, replace the SCF main board.
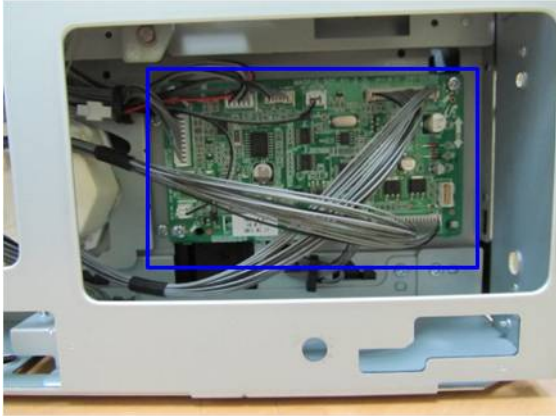
► **Error Code**

H1–1252

H1–1352

H1–1452

H1–1552

► **Error message**

Paper Empty in Tray2

Paper Empty in Tray3

Paper Empty in Tray4

Paper Empty in Tray5

► **Symptom**

Paper in the optional cassette is empty.

► **Troubleshooting method**

1) Check if the paper in optional cassette is loaded. Load the paper.

2) Check if the empty actuator and empty sensor are assembled properly.
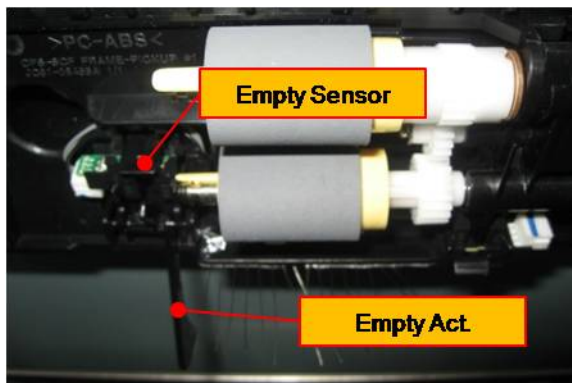
3) If the empty actuator is defective, replace it.

4) If the problem persists after replacing the empty actuator, replace the empty sensor.

► **Error Code**

H1–1253

H1–1353

H1–1453

H1–1553

► **Error message**

Input System Failure #H1-1253 : Pull Tray 2 out and insert it.

Input System Failure #H1-1353 : Pull Tray 3 out and insert it.

Input System Failure #H1-1453 : Pull Tray 4 out and insert it.

Input System Failure #H1-1553 : Pull Tray 5 out and insert it.

► **Symptom**

The paper in the optional cassette is not picked up.

► **Troubleshooting method**

1) Check if the Gear-Idle Lift is broken.
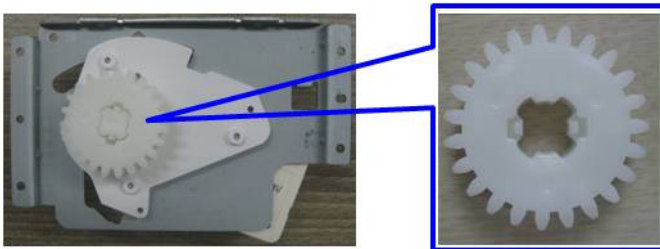
2) Check if the Signal-Switch is operated properly. If it is defective, replace it.
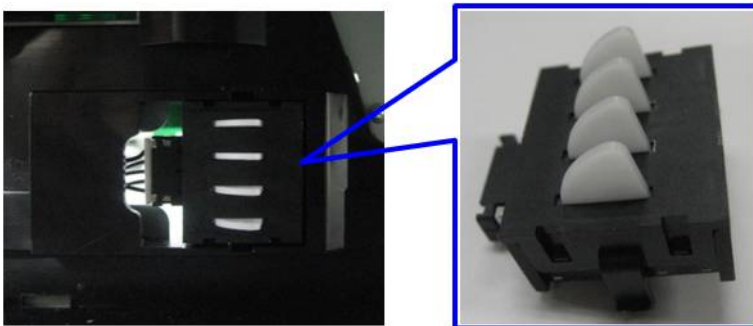
3) Check if the Lift-Motor connector is connected properly.

4) Check if the Press D-Cut of the Gear-Lifting is deformed or broken.
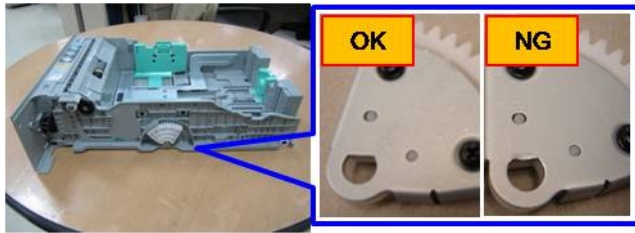
5) If the problem persists, replace the Lift-Motor.

► **Error Code**

H2-1100

► **Error message**

Jam inside Finisher

► **Symptom**

IOT Exit Roller grabs the paper. Or Finisher Feeding Motors Stopped. Or Finisher Entrance Sensor damaged or harness damaged. Or Finisher Main Board damaged.

► **Troubleshooting method**

1) Check Jam Occurrence in IOT. If the IOT roller is grabbing the paper, it's IOT fault

2) Check the Main Board Harness Connection.

3) Check Finisher Entrance operation & harness connection.

4) Check Finisher Feeding Entrance Motor Harness Connection and operation.

5) Check Finisher Feeding Exit Motor Harness Connection and operation.

6) If the same problem happens after checking 1~5, Replace the Finisher main board.

7) If the same problem happens after checking 6, replace the Finisher harnesses.

► **Error Code**

H2-1101

► **Error message**

Jam front of Finisher

► **Symptom**

Paper jam in IOT. Or Finisher Diverter operation not well. Or IOT Deflector Damaged. Or Finisher Entrance Sensor not working (Finisher Entrance Sensor Damaged, Harness connection not well, Main Board damaged)

► **Troubleshooting method**

1) Check Jam Occurrence in IOT.

2) Check IOT Deflector part's operation.

3) Check the Main Board Harness Connection.
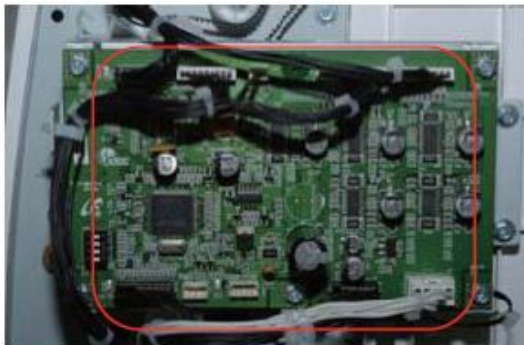
4) Check Finisher's Entrance operation & harness connection.

5) Referring to H2-1800, Check the Finisher Diverter operation.

6) If the same problem happens after checking 1~5, Replace the Finisher main board.

7) If the same problem happens after checking 6, replace the Finisher harnesses.

► **Error Code**

H2-1102

► **Error message**

Jam inside Finisher

► **Symptom**

Paper exists covering Finisher Entrance Sensor. Or Finisher Entrance Sensor Damaged or harness connection not well. Or Finisher Main Board damaged

► **Troubleshooting method**

1) Check if there is a jammed paper inside Finisher.

2) Check the Main Board Harness Connection.

3) Check Finisher Entrance operation & harness connection.

4) If the same problem happens after checking 1~3, Replace the Finisher main board.

5) If the same problem happens after checking 4, replace the Finisher harnesses.

► **Error Code**

H2–1200

H2–1300

► **Error message**

Jam inside Finisher

Jam exit of Finisher

► **Symptom**

IOT Exit Roller grabs the paper. Or Finisher Feeding Motors Stopped. Or Finisher Exit Sensor damaged or harness damaged. Or Finisher Main Board damaged

► **Troubleshooting method**

1) Check Jam Occurrence in IOT. If the IOT roller is grabbing the paper, it's IOT fault.

2) Check the Main Board Harness connection.
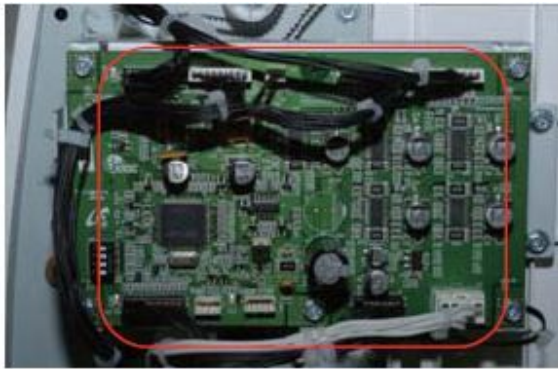
3) Check Finisher Exit Sensor operation & harness connection.

4) Check Finisher Feeding Entrance Motor harness connection and operation.

5) Check Finisher Feeding Exit Motor Harness connection and operation.

6) If the same problem happens after checking 1~5, Replace the Finisher main board.

7) If the same problem happens after checking 6, replace the Finisher harnesses.

► **Error Code**

H2–1302

► **Error message**

Jam exit of Finisher

► **Symptom**

Paper exists covering Finisher Exit Sensor. Or Finisher Exit Sensor Damaged or harness connection not well. Or Finisher Main Board damaged

► **Troubleshooting method**

1) Check if there is a jammed paper on the feeding path of Finisher.

2) Check the Main Board harness connection.
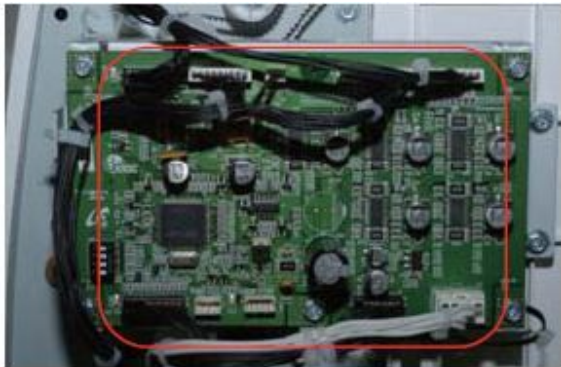
3) Check Finisher Exit sensors' operation & harness connection.

4) If the same problem happens after checking 1~3, Replace the Finisher main board.

5) If the same problem happens after checking 4, replace the Finisher harnesses.

► **Error Code**

H2–1710

H2–1711

► **Error message**

Error: #H2-1710 / Finisher Failure: #H2-1710. Check finisher

Error: #H2-1711 / Finisher Failure: #H2-1711. Check finisher

► **Symptom**

Front Jogger Home Sensor, Front Jogger Motor harness connection not well or damaged, Main Board damaged.

► **Troubleshooting method**

1) Check the Main Board Harness Connection.
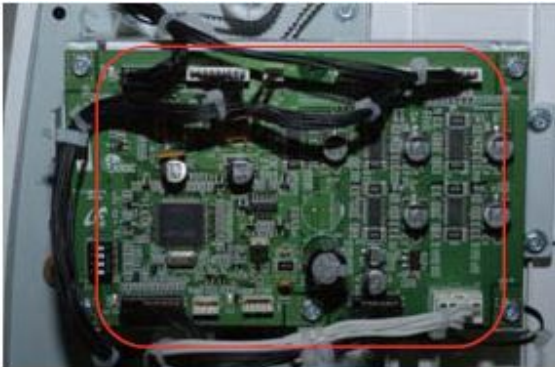
2) Check the Finisher Front Jogger Home Sensor's harness connection.
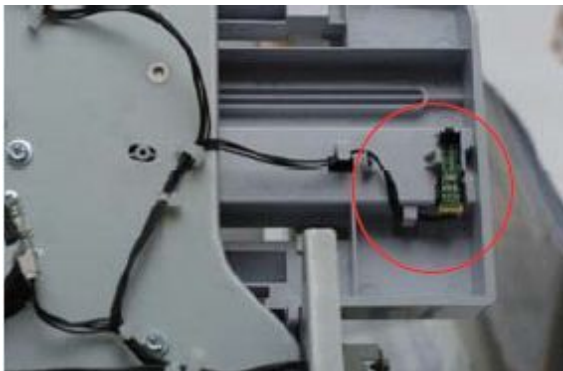
3) Check the Finisher Front Jogger Motor's Harness Connection and operation.

4) Check if Front jogger part is contaminated.
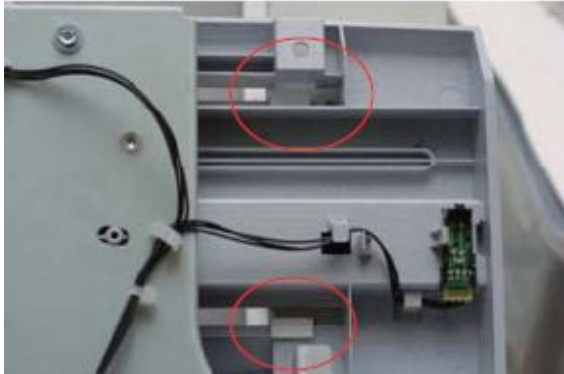
5) If the same problem happens after checking 1~4, Replace the Finisher main board.

6) If the same problem happens after checking 5, Replace the Finisher harnesses.

► **Error Code**

H2–1720

H2–1721

► **Error message**

Error: #H2-1720 / Finisher Failure: #H2-1720. Check finisher

Error: #H2-1721 / Finisher Failure: #H2-1721. Check finisher

► **Symptom**

Rear Jogger Home Sensor, Rear Jogger Motor harness connection not well or damaged, Main Board damaged.

► **Troubleshooting method**

1) Check the Main Board Harness Connection.
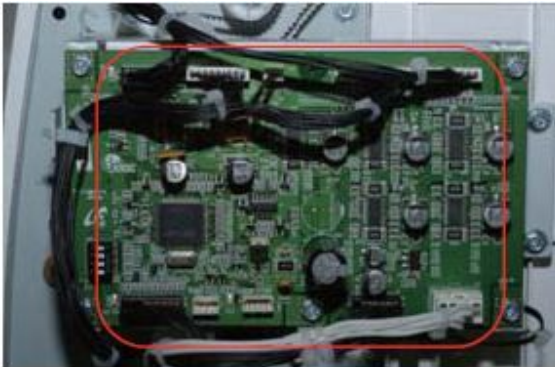
2) Check the Finisher Rear Jogger Home Sensor's harness connection.

3) Check the Finisher Rear Jogger Motor's harness connection and operation.

4) Check if Rear jogger part is contaminated, broken or binding.
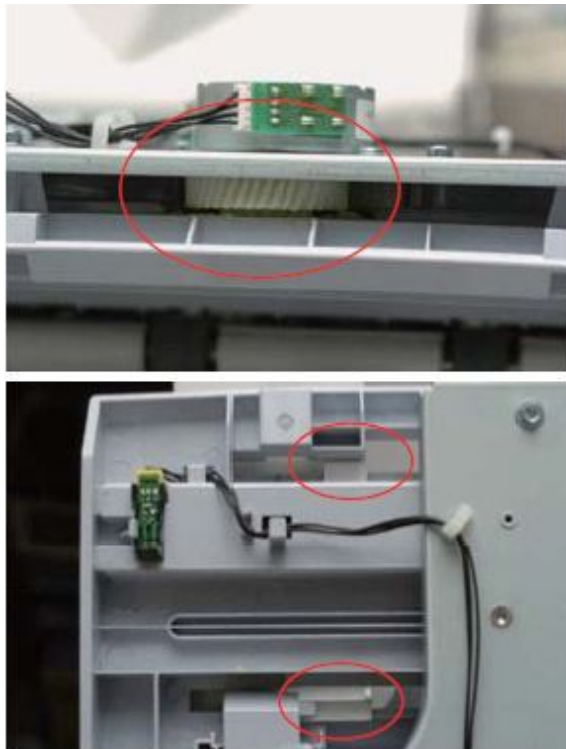
5) If the same problem happens after checking 1~4, Replace the Finisher main board.

6) If the same problem happens after checking 5, Replace the Finisher harnesses.

► **Error Code**

H2–1730

H2–1731

► **Error message**

Error: #H2-1730 / Finisher Failure: #H2-1730. Check finisher

Error: #H2-1731 / Finisher Failure: #H2-1731. Check finisher

► **Symptom**

Support Finger Home Sensor, Support Finger Motor harness connection not well or damaged, Main Board damaged.

► **Troubleshooting method**

1) Check the Main Board Harness Connection.
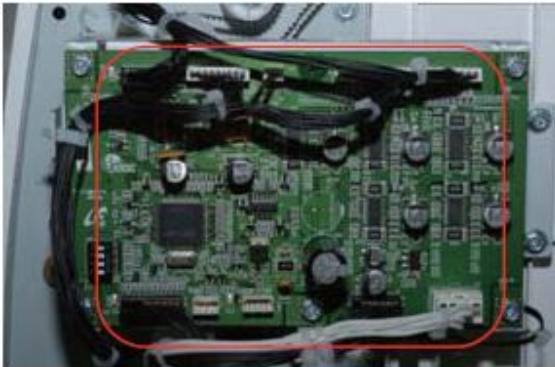
2) Check the Finisher Support Finger Home Sensor's Harness Connection.

3) Check the Finisher Support Finger Motor's Harness Connection and operation.

4) If the same problem happens after checking 1~3, Replace the Finisher main board.

5) If the same problem happens after checking 4, Replace the Finisher harnesses.

► **Error Code**

H2–1750

H2–1751

H2–1753

H2–1A70

► **Error message**

Error: #H2-1750 / Finisher Failure: #H2-1750. Check finisher

Error: #H2-1751 / Finisher Failure: #H2-1751. Check finisher

Error: #H2-1753 / Finisher Failure: #H2-1753. Check finisher

Error: #H2-1A70 / Finisher Failure: #H2-1A70. Check finisher

► **Symptom**

Stapler harness connection loose. Or Cartridge set sensors are damaged, Or Main Board is damaged.

► **Troubleshooting method**

> ⚠ **NOTE**
>
> Make sure that the staple strips on top of the stack are complete and flat. Remove any partial strips and any strips that are bent.

1) Check the Main Board Harness Connection.
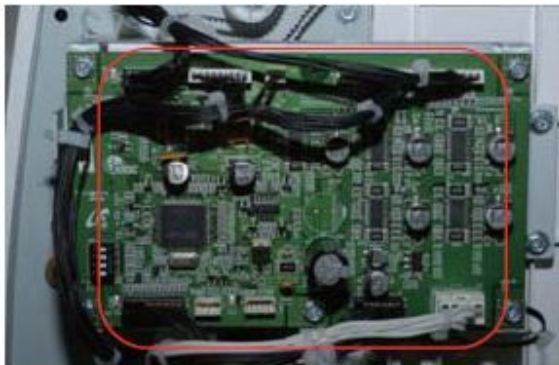
2) Check the Stapler harness connections.
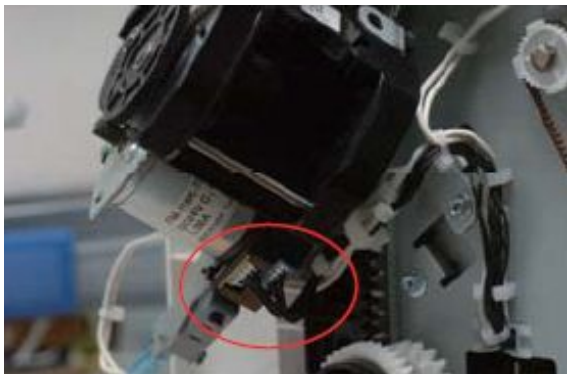
3) Check if staples are stuck in Stapler Head area and damage of Stapler itself.

4) If the same problem happens after checking 1~3, Replace the Finisher main board.

5) If the same problem happens after checking 4, Replace the Finisher Stapler.

6) If the same problem happens after checking 5, Replace the Finisher harnesses.

► **Error Code**

H2–1752

► **Error message**

Error: #H2-1752 / Finisher Failure: #H2-1752. Check finisher

► **Symptom**

Safety Switch Harness connection is loose. Main Board is damaged.

► **Troubleshooting method**

1) Check the Main Board harness connection.
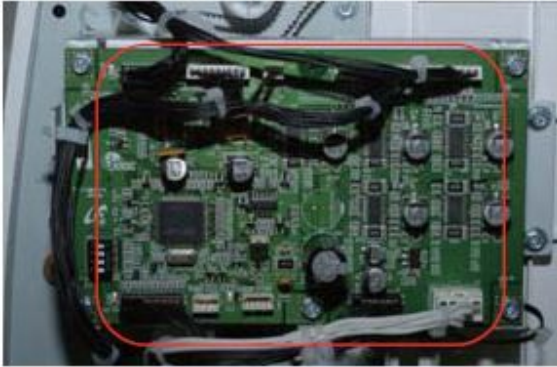
2) Check the Safety Switch harness connection.

3) Check the Safety Unit's operation. Check the switch is clicked when the Safety Link moves.

4) Check the Safety Unit's operation using Rear Jogger. The same "switch ON/OFF" operation should be followed.
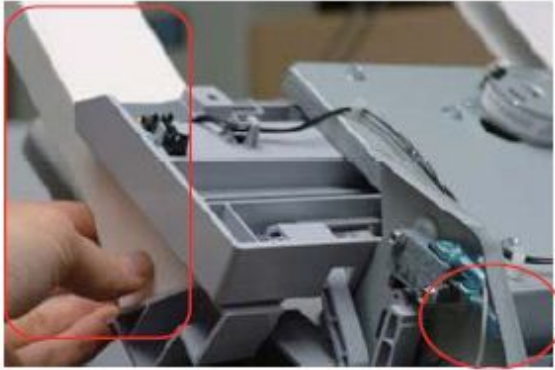
5) Check the Safety Unit's operation. When Rear Jogger stands at the position having the Shield and Rear Jogger met, the Safety Switch should be ON.

6) If the same problem happens after checking 1~5, Replace the Finisher main board.

7) If the same problem happens after checking 6, Replace the Finisher harnesses.

► **Error Code**

H2–1760

H2–1A80

► **Error message**

Error: #H2-1760 / Finisher Failure: #H2-1760. Check finisher

Error: #H2-1A80 / Finisher Failure: #H2-1A80. Check finisher

► **Symptom**

Stacker Level sensor, Stack Full sensor, Stacker Motor harness connection loose or damaged, Main Board is damaged.

► **Troubleshooting method**

1) Check the Main Board harness connection.
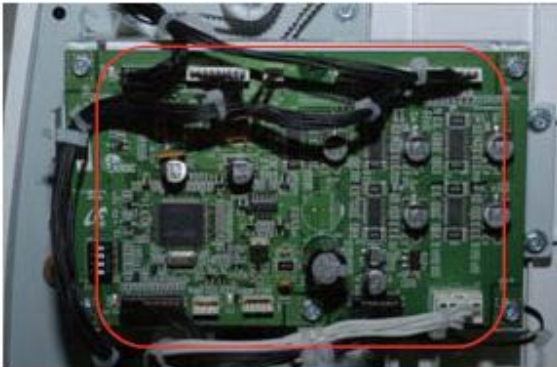
2) Check the Stacker Level Sensor's harness connection and Actuator's operation & its Spring behind the wall.
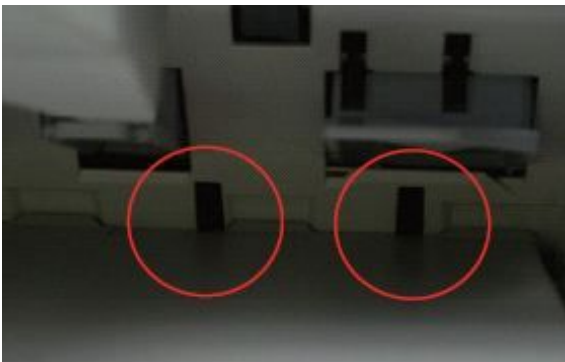
3) Check the Stacker Motor Harness Connection and operation.
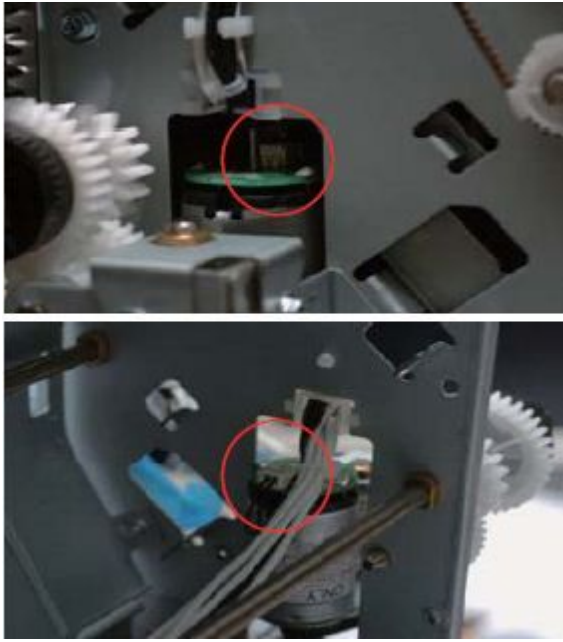
4) Check the Stack Full Sensor Connection and operation.

5) If the same problem happens after checking 1~3, Replace the Finisher main board.

6) If the same problem happens after checking 4, replace the Finisher harnesses.

► **Error Code**

H2–1800

► **Error message**

Error: #H2-1800 / Finisher Failure: #H2-1800. Check finisher

► **Symptom**

Diverter Motor, Sensor harness connection loose or damaged. Main Board Damaged. IOT's Deflector damaged.

► **Troubleshooting method**

1) Check the Main Board Harness Connection.
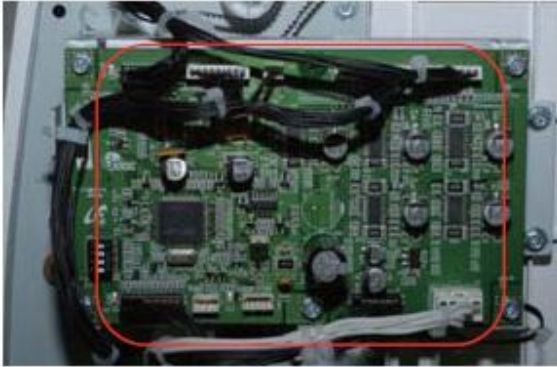
2) Check the IOT's Deflector operation.

3) Check Diverter sensor harness connection.

4) Diverter Motor Harness Connection and operation.

5) Check if Diverter Unit is not contaminated.

6) If the same problem happens after checking 1~5, Replace the Finisher main board.

7) If the same problem happens after checking 6, replace the Finisher harnesses.

► **Error Code**

H2–1A20

► **Error message**

Finisher door / Open Finisher door is open. Close it

► **Symptom**

Jam Cover is opened, Jam Cover is not assembled properly or Jam Cover Flag is damaged, Stapler Door is opened, Stapler Door Micro Switch is not assembled properly or Stapler Door Flag is damaged, Harness is damaged. Main Board is damaged, door flag is damaged.

► **Troubleshooting method**

1) Check if the Jam Cover and Stapler door is closed firmly.

2) Check if Mounting Part not damaged

- Male part in Finisher
- Female part in IOT

3) Check the Main Board harness connection.
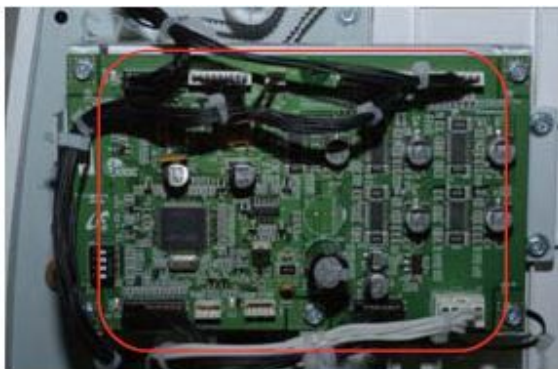
4) Check the Stapler Door Switch harness connection.
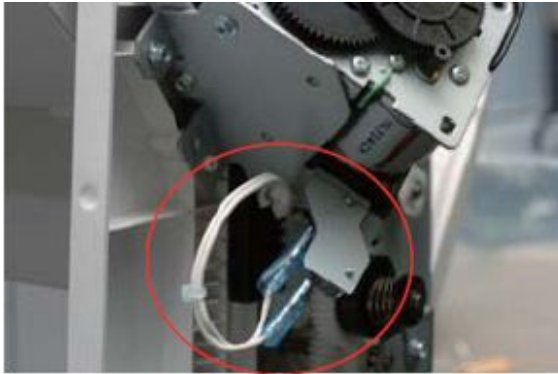
5) Check if the Stapler Door flag is damaged.

6) Check the Jam Cover Sensor harness connection.

7) Check if the Jam Cover flag is damaged

8) If the same problem happens after checking 1~7, Replace the Finisher main board.

9) If the same problem happens after checking 8, replace the Finisher harnesses.

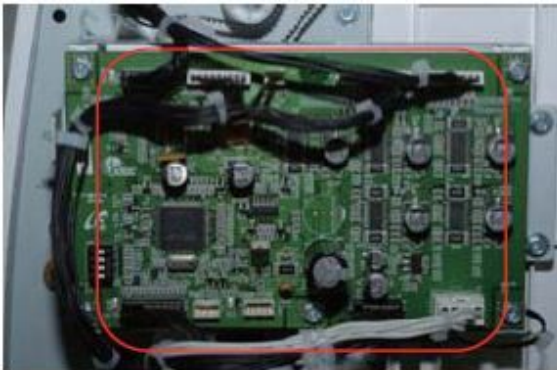► **Error Code**

H2–1A32

► **Error message**

Finisher stacker Full / Too much paper in finisher stacker. Remove printed paper

► **Symptom**

Finisher Full detecting sensor is damaged, harness connection loose or damaged, Main Board is damaged.

► **Troubleshooting method**

1) Check the Stacker Tray's Full Sensor Connection and check if Flag is damaged - The sensor must not be covered besides the full detecting flag.

2) Check Finisher Main Board Harness Connection.
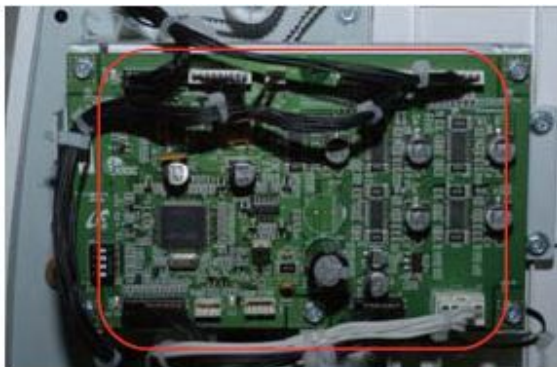
3) If the same problem happens after checking 1~2, Replace the Finisher main board.

4) If the same problem happens after checking 3, Replace the Finisher harnesses.

► **Error Code**

H2–1A50

► **Error message**

Error: #H2-1A50 / Finisher Failure: #H2-1A50. Check finisher

► **Symptom**

Interface Cable Connection not well or Interface Cable(Harness) damaged, Main Board damaged.

► **Troubleshooting method**

1) Check if Mounting Part is not damaged
   - Male part in Finisher
   - Female part in IOT

2) Check the Main Board Harness Connection.
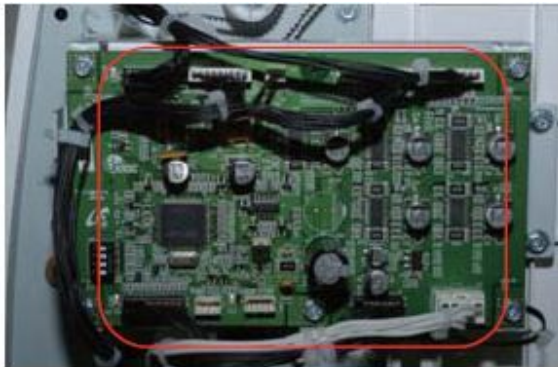
3) If the same problem happens after checking 1~2, Replace the Finisher main board.

4) If the same problem happens after checking 3, Replace the Finisher harnesses.

► **Error Code**

H2-1A62

H2–1A63

► **Error message**

Staple Low / Staple cartridge is low. Replace it

Staple Empty / Staple cartridge is empty. Replace it

► **Symptom**

The front cover or the top cover is not securely latched or the transfer belt is not installed.

► **Troubleshooting method**

1) Check if the cartridge exists.

2) Check if the cartridge is inserted firmly.

3) Check if staples in cartridge are in some level.

   - With such level like the below picture or lower during POPO (Power off power on), The sensor detects it "empty".
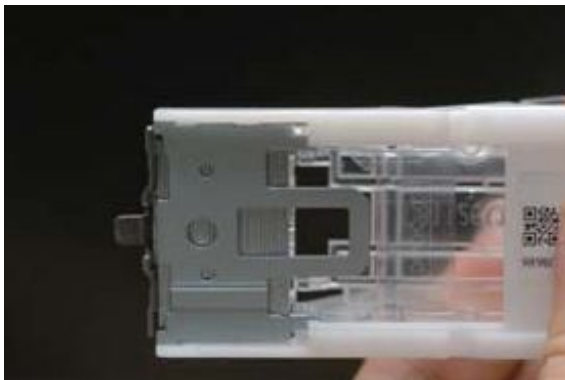
> ⚠️ **NOTE**
>
> Make sure that the staple strips on top of the stack are complete and flat. Remove any partial strips and any strips that are bent.

4) Check the Stapler harness connection.

5) Check the Cartridge Set sensors' operation.

6) Check the Main Board Harness Connection.
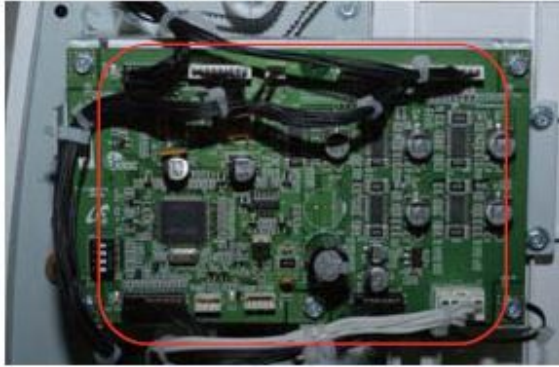
7) If the same problem happens after checking 1~6, replace the Finisher main board.

8) If the same problem happens after checking 7, replace the Finisher Stapler.

9) If the same problem happens after checking 8, replace the Finisher harnesses.

► **Error Code**

H2–4100

► **Error message**

Jam front of mailbox

► **Symptom**

Paper jam in IOT. Or Mailbox Lower Diverter operation is not working properly. Or IOT Deflector is damaged. Or Mailbox Entrance Sensor is not working (Mailbox Entrance Sensor Damaged, Harness connection loose, Main board is damaged)

► **Troubleshooting method**

1) Check Jam Occurrence in IOT.

2) Check IOT Deflector part's operation.

3) Check Mailbox Main Board Harness connection.

4) Check Mailbox Entrance operation & harness connection.
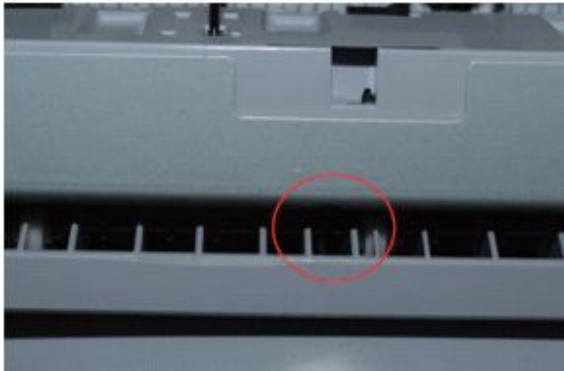
5) Refer to the Lower Diverter fault.

6) If the same problem happens after checking 1~5, Replace the mailbox main board.

7) If the same problem happens after checking 6, Replace the mailbox harnesses.

► **Error Code**

H2–4101

H2–4102

► **Error message**

Jam inside mailbox

► **Symptom**

IOT Exit Roller grabs the paper. Paper exists covering Mailbox Entrance Sensor. Or Mailbox Feeding Motor Stops. Or Mailbox Entrance Sensor damaged or harness damaged. Or Mailbox Main Board damaged.

► **Troubleshooting method**

1) Check Jam Occurrence in IOT.

   If the IOT roller is grabbing the paper, it's IOT fault.

2) Check Mailbox Main Board Harness connection.

3) Check Mailbox Entrance operation & harness connection.

4) Check Mailbox Feeding Motor Harness connection and operation.
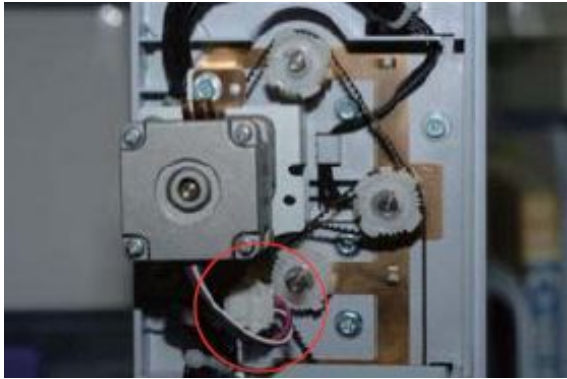
5) If the same problem happens after checking 1~4, replace the mailbox main board.

6) If the same problem happens after checking 5, replace the mailbox harnesses.

► **Error Code**

H2–4200

H2–4201

H2–4300

H2–4301

H2–4400

H2–4401

H2–4500

H2–4501

► **Error message**

Jam front of bin 1

Jam at mailbox bin 1

Jam front of bin 2

Jam at mailbox bin 2

Jam front of bin 3

Jam at mailbox bin 3

Jam front of bin 4

Jam at mailbox bin 4

► **Symptom**

IOT Exit Roller grabs the paper. Or Mailbox Feeding Motor Stops. Or Mailbox Entrance Exit Sensor damaged or Mailbox Gate doesn't work or harness damaged. Or Mailbox Main Board damaged.

► **Troubleshooting method**

1) Check Jam Occurrence in IOT.

   - If the IOT roller is grabbing the paper, it's IOT fault.

2) Check Mailbox Main Board Harness connection.

3) Check Mailbox Exit-related Sensors operation & harness connection.
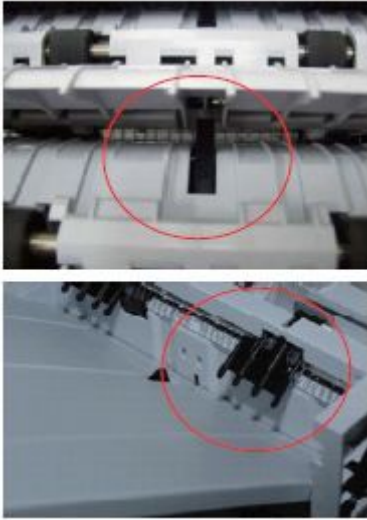
4) Check Mailbox Feeding Motor Harness Connection and operation.
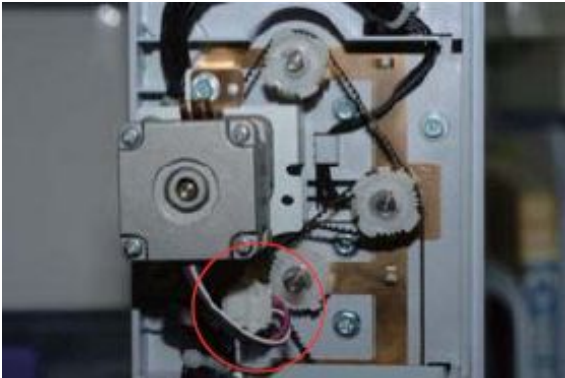
5) Referring to Upper Diverter Fault, check the Upper Diverter's operation.

6) Referring to Lower Diverter Fault, check the Lower Diverter's operation

7) If the same problem happens after checking 1~6, replace the mailbox main board.

8) If the same problem happens after checking 7, replace the mailbox harnesses.

► **Error Code**

H2–4202

H2–4302

H2–4402

H2–4502

► **Error message**

Jam at mailbox bin 1

Jam at mailbox bin 2

Jam at mailbox bin 3

Jam at mailbox bin 4

► **Symptom**

Paper exists covering Mailbox Exit Sensor. Or Mailbox Exit Sensor is damaged or harness connection loose. Or Mailbox Main board is damaged.

► **Troubleshooting method**

1) Check if there is a jammed paper on the feeding path of Mailbox.

2) Check Mailbox Main Board Harness connection.

3) Check Mailbox Bin1 Exit-related sensors' operation & harness connection.
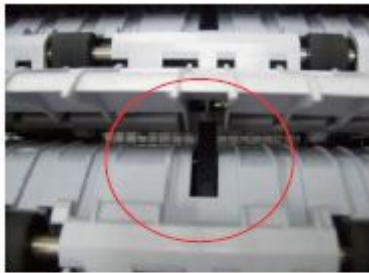
4) If the same problem happens after checking 1~3, replace the mailbox main board.

5) If the same problem happens after checking 4, replace the mailbox harnesses.

► **Error Code**

H2–4700

H2–4701

► **Error message**

Error: #H2-4700 / Mainbox Failure: #H2-4700. Check mailbox

Error: #H2-4701 / Mainbox Failure: #H2-4701. Check mailbox

► **Symptom**

Upper Diverter Motor or Upper Diverter Sensor is not assembled properly or damaged. Harness is damaged. Main Board is damaged.

► **Troubleshooting method**

1) Check Upper Diverter Motor harness connection.

2) Check Upper Diverter Sensor harness connection.

3) Check Mailbox Main Board harness connection.

4) Check Upper Diverter operation.

5) Check Mailbox Gate operation.

6) If the same problem happens after checking 1~5, replace the mailbox main board.

7) If the same problem happens after checking 6, replace the mailbox harnesses.

► **Error Code**

H2–4710

H2–4711

► **Error message**

Error: #H2-4710 / Mainbox Failure: #H2-4710. Check mailbox

Error: #H2-4711 / Mainbox Failure: #H2-4711. Check mailbox

► **Symptom**

Lower Diverter Motor or Lower Diverter Sensor is not assembled properly or damaged. Harness is damaged. Main Board is damaged.

► **Troubleshooting method**

1) Check Lower Diverter Motor harness connection.

2) Check Lower Diverter Sensor Harness connection.

3) Check Mailbox Main Board harness connection.

4) Check Lower Diverter operation.

5) Check Mailbox Gate operation.

6) If the same problem happens after checking 1~5, replace the mailbox main board.

7) If the same problem happens after checking 6, replace the mailbox harnesses.

► **Error Code**

H2-4A20

► **Error message**

Mailbox door Open / Mail door is open. Close it

► **Symptom**

Rear Door is opened, Micro Switch is not assembled properly or damaged, Harness is damaged. Main Board is damaged, door flag is damaged.

► **Troubleshooting method**

1) Check the Rear Door Closed firmly.

2) Check Mailbox Main Board Harness connection.

3) Check the Rear Door Switch Harness connection.

4) Check if the Mailbox cover flag is damaged.

5) If the same problem happens after checking 1~4, replace the mailbox main board.

6) If the same problem happens after checking 5, replace the mailbox harnesses.

► **Error Code**

H2-4A32

H2-4A35

H2-4A38

H2-4A3C

► **Error message**

Mailbox bin 1 full / Too much paper in bin 1. Remove printed paper

Mailbox bin 2 full / Too much paper in bin 2. Remove printed paper

Mailbox bin 3 full / Too much paper in bin 3. Remove printed paper

Mailbox bin 4 full / Too much paper in bin 4. Remove printed paper

► **Symptom**

Mailbox Full detecting sensor damaged, harness connection loose or damaged, Main Board is damaged.

► **Troubleshooting method**

1) Check the Bin's Full Sensor Connection and Actuator's operation.
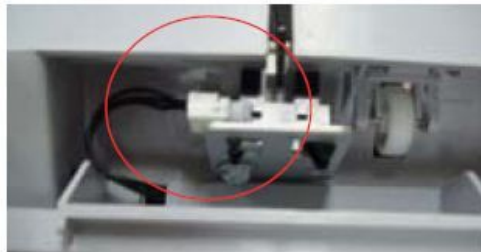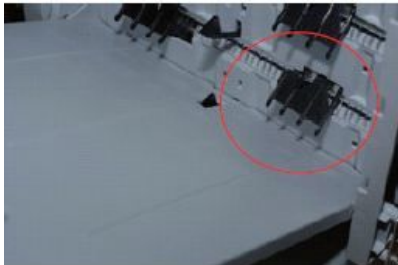
2) Check Main Board Harness connection.

3) If the same problem happens after checking 1~2, replace the mailbox main board.

4) If the same problem happens after checking 3, replace the mailbox harnesses.

► **Error Code**

H2-4A50

► **Error message**

Error: #H2-4A50 / Mainbox Failure: #H2-4A50. Check mailbox

► **Symptom**

A communication problem has occurred at mailbox.

► **Troubleshooting method**

1) Check the connection between machine and mailbox.

► **Error Code**

M1–1110

► **Error message**

Paper jam in tray 1.

► **Symptom**

The jammed paper has occurred in the tray1.

► **Troubleshooting method**

1) Clear the jammed paper. If the problem persists, check the following.

2) Check if the pick up/ forward/ retard roller is contaminated or worn out. Clean or replace it if necessary.

3) Check if there are any obstacles or contamination in the paper path.

► **Error Code**

M1–3122

► **Error message**

Tray 1 cassette is pulled out. Insert it properly.

► **Symptom**

Tray1 is not installed properly.

► **Troubleshooting method**

1) Install the tray1. If the tray1 is already installed, remove and reinstall it.

2) Check if the paper size sensor is working properly.

3) Check if the harness connection is normal.

► **Error Code**

M1–4111

► **Error message**

Input System Failure #M1-4111 : Pull tray 1 out and insert it.

► **Symptom**

The paper has jammed in the path or can't be fed.

► **Troubleshooting method**

1) Check if the pick up/ forward/ retard roller is contaminated or worn out. Replace the defective roller.

2) Check if each sensor is working properly.

3) Check if there is any jammed paper in the path. Remove it.

4) When loading the paper, adjust the paper guide.

► **Error Code**

M1–5112

► **Error message**

Paper is empty in tray 1. Load paper.

► **Symptom**

Paper is empty in Tray1. The status LED is red.

► **Troubleshooting method**

1) Check if the paper is loaded in tray1. Load the paper.

2) Check if the empty sensor and empty actuator are assembled correctly.

3) If the empty sensor or empty actuator is defective, replace it.

4) If the problem persists, replace it.

► **Error Code**

M1–5612

► **Error message**

Paper is empty in MP tray. Load paper.

► **Symptom**

Paper is empty in MP Tray. The status LED is red.

► **Troubleshooting method**

1) Check if the paper is loaded in MP tray. Load the paper.

2) Check if the MP empty sensor and MP empty actuator are assembled correctly.

3) If the MP empty sensor or MP empty actuator is defective, replace it.

4) If the problem persists, replace it.

► **Error Code**

M2–1110

► **Error message**

Paper jam inside of machine.

► **Symptom**

The paper has jammed at the feed sensor.

► **Troubleshooting method**

1) Check if the feed sensor connector is connected properly.
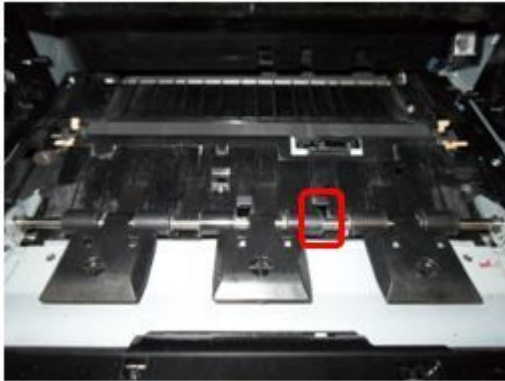
2) Check if the Regi. roller is contaminated or worn out.
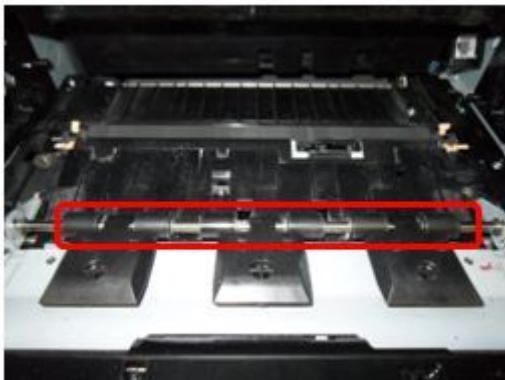
3) Check if there are any obstacles or contamination in the paper path.

► **Error Code**

M2–2210

► **Error message**

Paper jam at the inside of duplex path.

► **Symptom**

The paper did not enter the duplex path and has jammed.

► **Troubleshooting method**

1) Check if the exit actuator works normally.

2) Check if the exit motor and duplex clutch works normally and its connector is connected properly.

3) Check if there are any obstacles or contamination in the duplex path.

► **Error Code**

► **Error Code**

M2–2310

► **Error message**

Paper jam at the bottom of duplex path.

► **Symptom**

The paper has jammed in the duplex path.

► **Troubleshooting method**

1) Check if the duplex clutch works normally and its connector is connected properly.

2) Check if the Regi. actuator works normally.
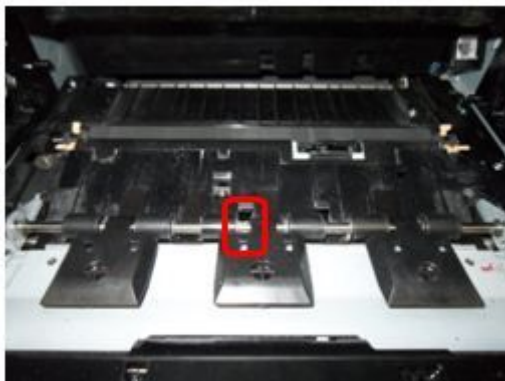
3) Check if the Regi. roller pressure is normal.

► **Error Code**

M3–1110

► **Error message**

Paper jam in exit area.

► **Symptom**

The paper has jammed in the exit path.

► **Troubleshooting method**

1) Check if there are any obstacles or contamination in the exit area.

2) Check if the exit motor works normally. If it is defective, replace it.

► **Error Code**

M3–2130

► **Error message**

Too much paper in output bin tray. Remove printed paper.

► **Symptom**

The paper is full on the output bin.

► **Troubleshooting method**

1) Remove the paper on the output bin.

2) Check if the bin full sensor connector is connected properly.
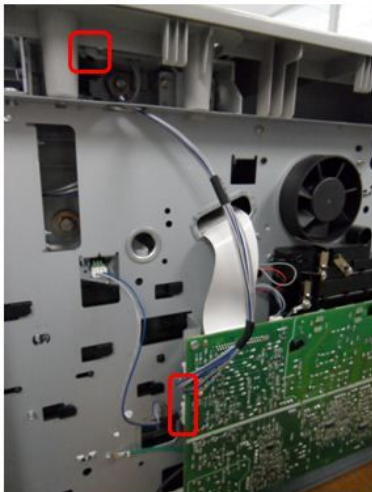
► **Error Code**

S2–4210

► **Error message**

Front door is open. Close it.

► **Symptom**

The front door is open./ The front door is closed but this error does not disappear.

► **Troubleshooting method**

1) Picture1 — No.1 : Check if the switch contact on the door is deformed.

2) Picture2 — No.1 and 2 : Check if the harness connection is normal.

3) Picture2 — No.3 : Check if the micro switch is assembled with hook.

4) Picture3 — No.1 : Open the front cover. Check if the message is changed when pushing the mirco switch.

5) If the micro switch does not work normally, check that its lever is deformed. If it is defective, replace it.
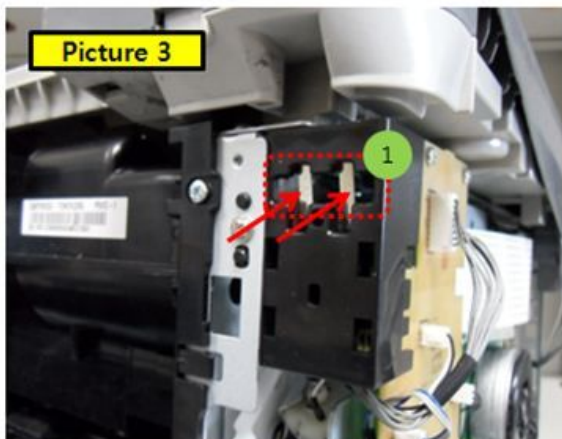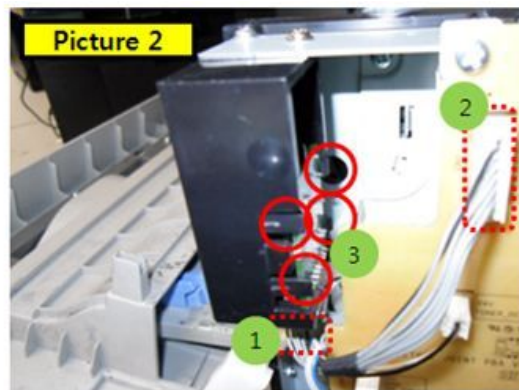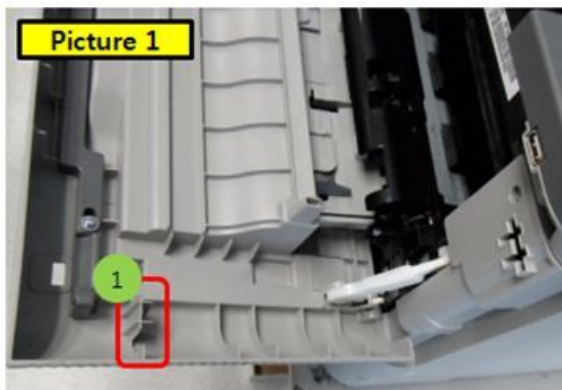
► **Error Code**

S2–4610

► **Error message**

Rear door is open. Close it.

► **Symptom**

The Rear door is open. / The front door is closed but this error does not disappear.

► **Troubleshooting method**

1) Check if the rear cover is closed perfectly.

2) Picture1 — No.1 : If the relay connector of the rear cover is broken, replace it.

3) Picture2 — No.1 and 2 : Check if the harness connecting the relay connector is defective.
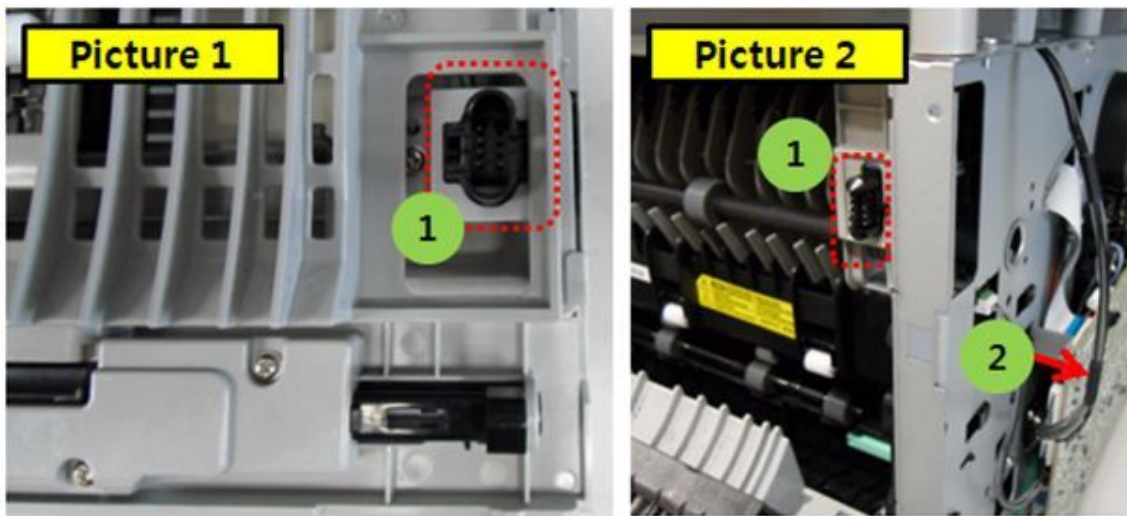
► **Error Code**

S6-3123

► **Error message**

This IP address conflicts with that of other system. Check it.

► **Symptom**

IP address conflicts with that of other system.

► **Troubleshooting method**

Change the machine's IP address.

► **Error Code**

S6-3128

► **Error message**

802.1x authentication failed. Please Contact the System Administrator.

► **Symptom**

Can not get the authentication from server after setting up to 802.1x on SWS. Can not access to network.

► **Troubleshooting method**

Check if the Authentication method is selected properly.
Check if the User Name/Password is entered properly.

► **Error Code**

U1–2115

U1–2116

► **Error message**

Fuser Unit Failure #U1-2115 : Turn off then on.

Fuser Unit Failure #U1-2116 : Turn off then on.

► **Symptom**

The fuser unit can't control the pressure device.

► **Troubleshooting method**

1) Open the rear cover. Lift up the right side and release the rear cover.

2) Check if the Actuator Cam Photo sensor is assembled correctly.
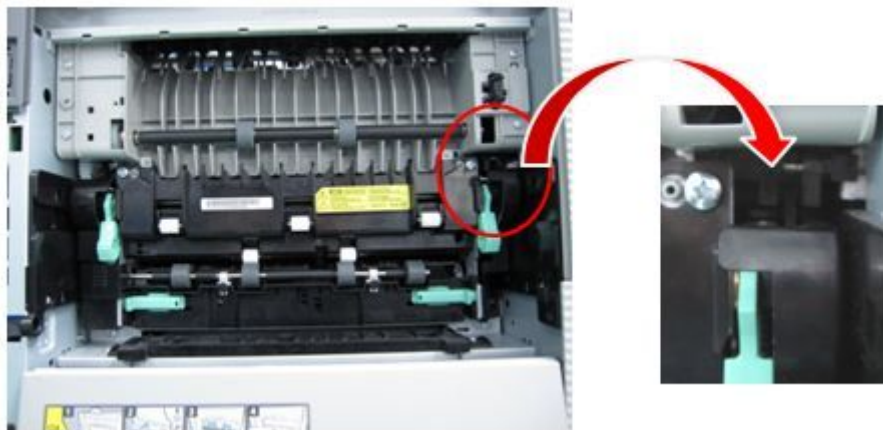
3) If there is no problem, remove 4 screws.

4) Lift up the both levers. Then take off the fuser unit.

5) Check if the exit sensor is assembled correctly.
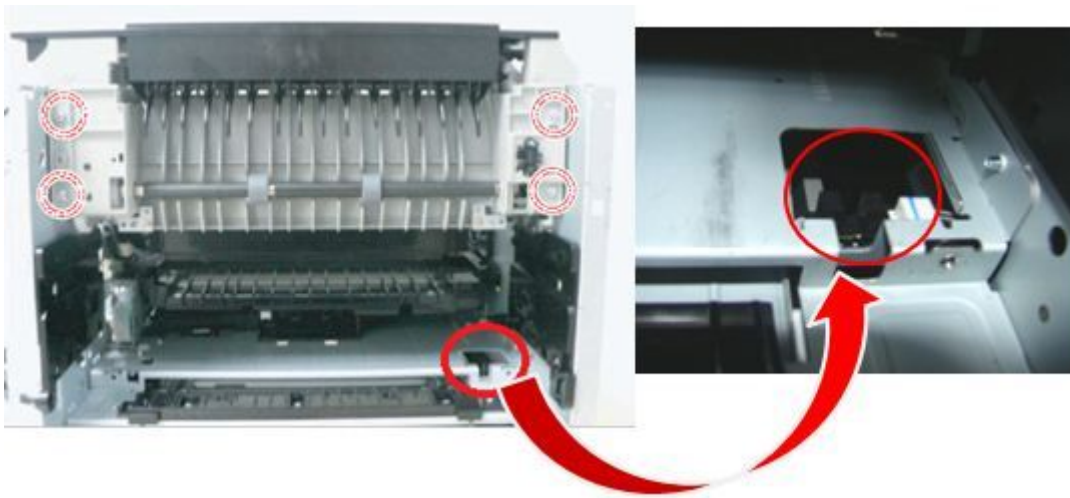
6) Check if the photo sensor harness is connected correctly.

7) Remove the fuser side cover L/R. Check if the Actuator can, Gear cam are assembled correctly.

8) If there is no problem for above steps, assemble and reinstall fuser unit. Then turn the machine on.

9) If the same error persists, install the firmware again.

10) If the same error persists, replace the fuser unit with new one.

11) If the same error persists, replace the main board.

► **Error Code**

U1–2117

► **Error message**

Fuser Unit Failure #U1-2117 : Turn off then on.

► **Symptom**

The machine can't detect that the fuser unit is installed.

► **Troubleshooting method**

1) After checking the fuser installation, turn the machine off then on.

2) Open the rear cover. Lift up the right side and release the rear cover.

3) If there is no problem, remove 4 screws.

4) Lift up the both levers. Then take off the fuser unit.
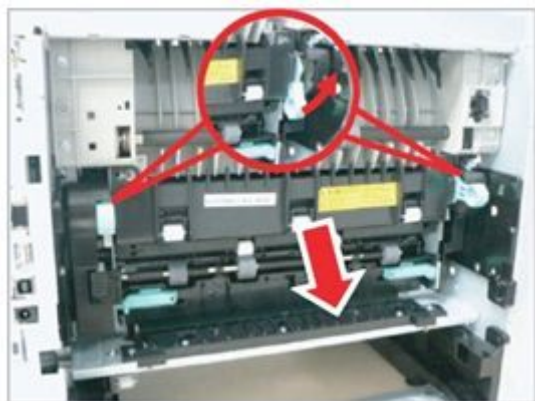
5) Check if the FUSE is assembled correctly.
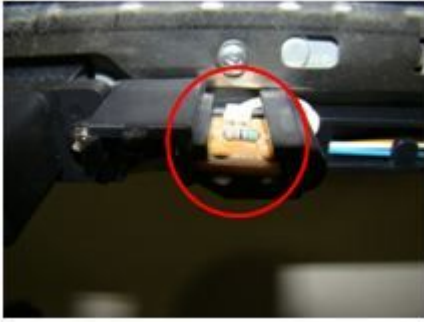
6) If there is no problem for above steps, assemble and reinstall fuser unit. Then turn the machine on.

7) If the same error persists, you cut the fusible resistor by the nippers.

8) If the same error persists, replace the main board.

► **Error Code**

U1–2320

U1–2330

► **Error message**

Fuser Unit Failure #U1-2320 : Turn off then on.

Fuser Unit Failure #U1-2330 : Turn off then on.

► **Symptom**

Fuser Open heat error or Low heat error has occurred.

► **Troubleshooting method**

1) After checking the fuser installation, turn the machine off then on.

2) Open the rear cover. Lift up the right side and release the rear cover.

3) If there is no problem, remove 4 screws.

4) Lift up the both levers. Then take off the fuser unit.

5) Remove the Frame-cover-upper after removing 2 screws. And measure the thermostat continuity. Check if the thermostat is opened.

6) Measure the LAMP-HALOGEN resistance value from the center and both sides. Check if it has the continuity.

Center Lamp   Side Lamp

7) Check if the Draw-connector harness is correct. Check its color.

8) Check if 2 thermistor connectors are connected properly.
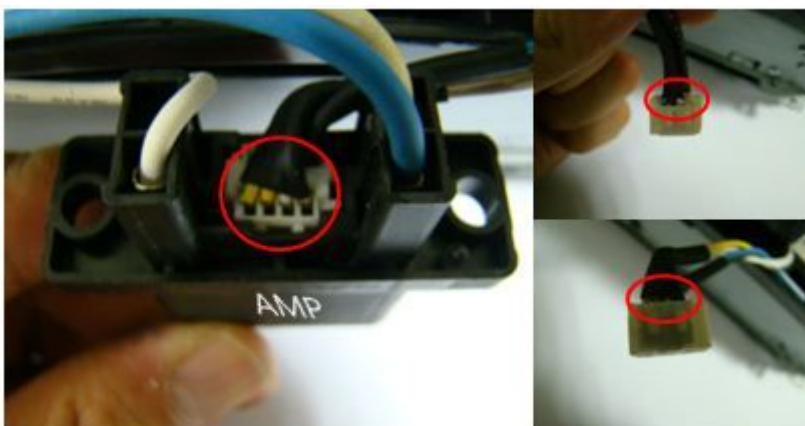
9) Remove the thermistor. Check if the thermistor has curled as shown below. If there is any contamination on the film, clean it.

> ⚠️ **CAUTION**
>
> **Be careful not to be scratched or curled the film.**
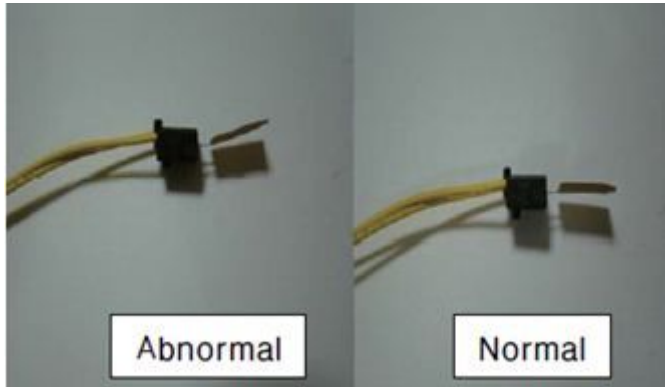
10) Check if the thermistor connector on the main board is connected properly.

11) Check if the FDB connector is connected properly.

12) Check if the voltage in user environment is in this range (80V ~ 140V, 160V ~ 260V).

13) If there is no problems for above steps, update the firmware.

14) Replace the FDB. If the problem persists, replace the main board.

► **Error Code**

U1–2340

► **Error message**

Fuser Unit Failure #U1-2340 : Turn off then on.

► **Symptom**

Fuser Over heat error has occurred.

► **Troubleshooting method**

1) After checking the fuser installation, turn the machine off then on.

2) Open the rear cover. Lift up the right side and release the rear cover.

3) If there is no problem, remove 4 screws.

4) Lift up the both levers. Then take off the fuser unit.

5) Remove the Fuser Side-cover-R. Check the surface on Drum-fuser belt and Pressure roller. If there is any overheated mark, replace fuser unit.

6) Check if the Draw-connector harness is correct. Check its color.

7) Check if 2 thermistor connectors are connected properly.
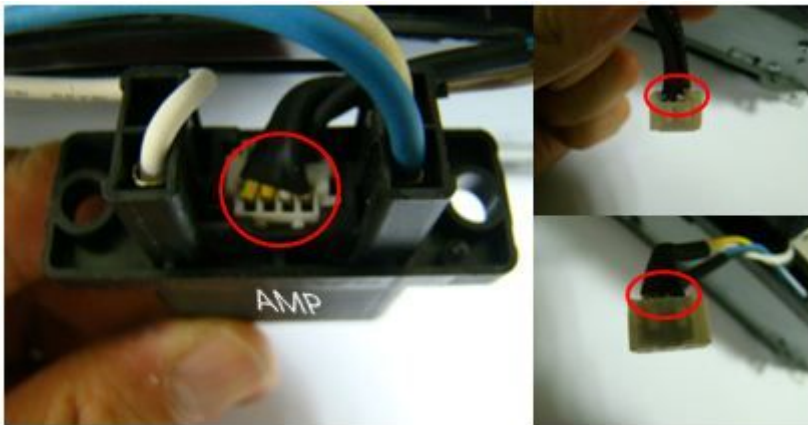
8) Remove the thermistor. Check if the thermistor has curled as shown below. If there is any contamination on the film, clean it.

⚠ **CAUTION**

Be careful not to be scratched or curled the film.
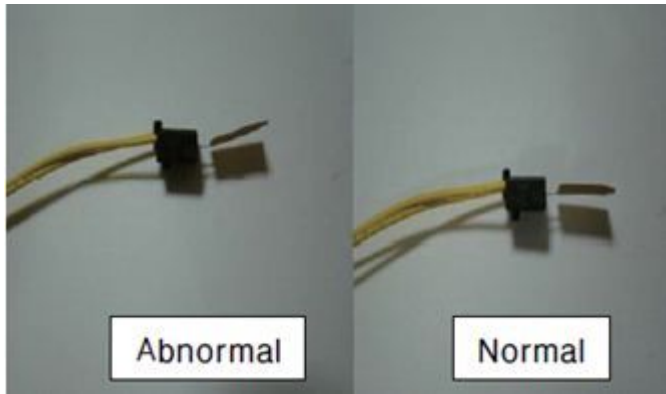
9) Check if the thermistor connector on the main board is connected properly.

10) Remove the FDB. Check the Triac short on FDB. Measure the transistor resistance for each terminal. If there is any problem, replace the FDB.

11) If the problem persists, replace the main board. If the fuser unit is damaged, replace it with new one.

► **Error Code**

U2–1111

► **Error message**

LSU Failure: #U2-1111. Turn off then on.

► **Symptom**

LSU motor does not work normally. (nREADY LSU signal detection error)

► **Troubleshooting method**

1) Turn the machine off then on.

2) If the problem persists, check the followings.

3) Execute the LSU motor test in EDC mode. Check LSU motor operation sound.

4) If there is no sound, remove the right cover. Check if the FFC cable on main board (CN18) is connected properly. (Picture-1)
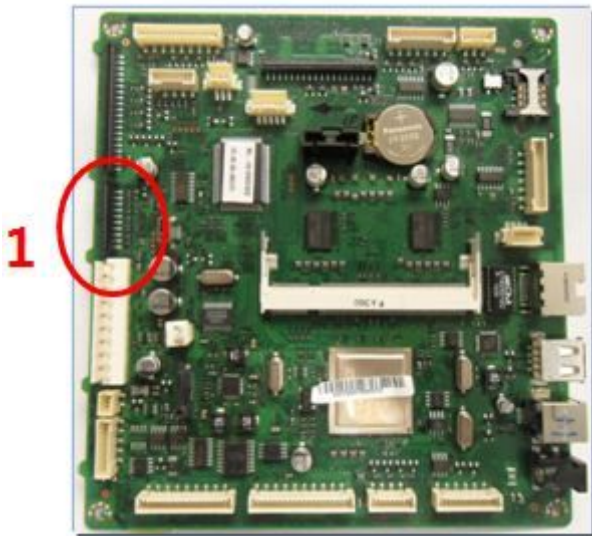
5) It it is OK, remove the top cover. Check if the LSU connector is connected properly. (Picture-3)

6) Check if the LSU harness is defective.

7) Reconnect the LSU harness and then execute the LSU motor test again.

8) If the LSU motor is not operated, replace the LSU.

9) If the LSU motor is not operated after replacing the LSU, replace the main board.

► **Error Code**

U2–1113

► **Error message**

LSU Failure: #U2-1113. Turn off then on.

► **Symptom**

LD (Laser Beam Detect) signal is abnormal.

► **Troubleshooting method**

1) Turn the machine off then on.

2) If the problem persists, check the followings.

3) Execute the LSU motor test in EDC mode. Check LSU motor operation sound.

4) If there is no sound, remove the right cover. Check if the FFC cable on main board (CN18) is connected properly. (Picture-1)
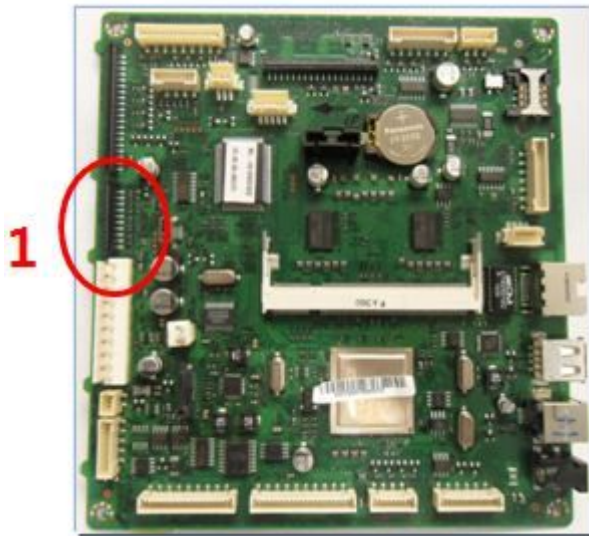
5) It it is OK, remove the top cover. Check if the LSU connector is connected properly. (Picture-3)

6) Check if the LSU harness is defective.

7) Reconnect the LSU harness and then execute the LSU motor test again.

8) If the LSU motor is not operated, replace the LSU.

9) If the LSU motor is not operated after replacing the LSU, replace the main board.

4.2.3. Image quality problem

1) **Vertical Black Line and Band**

   Description : Straight thin black vertical line occurs in the printed image.

Check and cause	Solution
• Damaged develop roller in the Imaging Unit. Deformed Doctor-blade or cleaning-blade. • Scratched surface of the charge roller in the imaging unit.	Replace the imaging unit.
Partly depression or deformation on the surface of the transfer roller.	Replace the transfer roller.

2) **Vertical White Line**

   Description : White vertical voids occurs in the printed image.

Check and cause	Solution
Foreign matter stucks onto the window of internal lenses of LSU mirror.	Clean the LSU window with recommended cleaner (IPA). Clean the window with a clean cotton swab.
The life of the imaging unit has been expired	Replace the imaging unit.
Some foreign substances are on the window of the imaging unit frame.	Remove the foreign matter of the exposure window.
If the fuser is defective, voids occur periodically at the top of a black image.	Open the rear cover. Reinstall the fuser unit.

3) **Horizontal Black Band**

Description : Dark of blurry horizontal stripes occur in the printing periodically.

Check and cause	Solution
Bad contacts of the voltage terminals to imaging unit.	Clean each voltage terminal of the Charge, Magnetic, Imaging unit and Transfer roller. (remove the toner particles and paper particles)
The rollers of developer may be stained. — OPC Drum = 94.2 mm — Charge Roller = 44 mm — Magnetic Roller = 56.6 mm	Replace the imaging unit.

4) **Black and White spot**

Description : Dark or blurry black spots occur periodically in the printing.

Check and cause	Solution
If dark or blurry black spots occur periodically, the rollers in the Imaging unit may be contaminated with foreign matte or paper particles. (Charge roller : 44 mm interval / OPC drum : 94.2 mm interval)	Clean each voltage terminal of the Charge, Magnetic, Imaging unit and Transfer roller. (remove the toner particles and paper particles)
If faded areas or voids occur in a black image at intervals of 94.2 mm, the OPC drum surface is damaged.	Replace the imaging unit.
If a black image is partially broken, the transfer voltage is abnormal or the transfer roller's life has expired.	• If the transfer roller's life is expired, replace it. • Clean the inside of the set against the paper particles and foreign matter in order not to cause the trouble.

5) **Light image**

Description : The printed image is light, with no ghost.

Check and cause	Solution
Toner cartridge life is expired.	Replace the toner cartridge.
HVPS terminal is contaminated.	Clean the contaminated terminal.
The output from the HVPS is abnormal.	Replace the HVPS board.

6) **Dark or Black page**

Description : The printed image is dark or black.

Check and cause	Solution
Check if the high voltage terminal is contaminated.	Clean the high voltage terminal.
The charging roller is defective.	Replace the imaging unit.
The output from the HVPS is abnormal.	Replace the HVPS board.

7) **Uneven Density**

Description : Print density is uneven between left and right.

Check and cause	Solution
• The pressure force on the left and right springs of the transfer roller is not even. • The springs are damaged. • The transfer roller is improperly installed.	1) Remove the transfer roller Assy. 2) Check if the transfer roller Assy has any wrong part. 3) Replace the transfer roller Assy.

The toner level is not even on the imaging unit roller due to the bad blade.	Replace the imaging unit.

8) **Background**

Description : Light dark background appears in whole area of the printing.

Check and cause	Solution
Does recycle paper be used?	Use the proper papers.
The life of the imaging unit has been expired	Replace the imaging unit.
The output from the HVPS is abnormal.	Replace the HVPS board.

9) **Ghost**

Description : Ghost occurs at 94.2 mm intervals of the OPC drum.

Check and cause	Solution
The high voltage terminal is contaminated.	Clean the high voltage terminals.
The life of the imaging unit has been expired	Replace the imaging unit.
The life of the transfer roller has been expired.	Replace the transfer roller.

10) **Stains on back of page**

Description : The back of the page is stained.
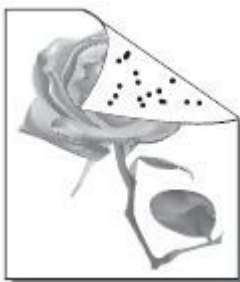
Check and cause	Solution
Transfer roller is contaminated.	Replace the transfer roller.

11) **Blank page**

Description : The back of the page is stained.

Check and cause	Solution
The ground contact of the imaging unit is bad.	Clean the ground terminal of the imaging unit. If the problem persists, replace the imaging unit.
LSU is defective.	Replace the LSU.
The connection between the main board and HVPS board is bad.	Reconnect the harness. If the main board or HVPS board is defective, replace it.

12) **Partial image void**

Description : The partial void occurs in the printed page.

Check and cause	Solution
The printer is not installed on flat ground.	Install the printer on flat ground. Print 10 sample pages for test.
The developer circulation in the imaging unit is bad.	1) Shake the imaging unit 2~3 times from right to left. Reinstall the imaging unit. Print 10 sample pages for test. 2) If the problem persists, replace the imaging unit.
The contact between imaging unit and transfer roller is bad.	Check if the imaging unit and transfer roller are installed properly.

4.2.4. Other errors

1) **Multi-Feeding**

Description : Multiple sheets of paper are fed at once.

Check and Cause	Solution
The pick up clutch does not work normally.	Replace the pick up clutch.
The Pick up/ Retard/ Forward roller are contaminated or worn out.	• Clean the contaminated roller with soft cloth with Isopropyl Alcohol. • If the roller is worn out, replace it.

2) **No power**

Description : When system power is turned on, all lamps on the operator panel do not come on.

Check and Cause	Solution
SMPS board is defective.	Replace the SMPS board.
OPE harness or OPE board is defective.	1) Check the OPE harness connection. 2) If the OPE board is defective, replace it.

5. System Diagrams

5.1. Block Diagram

5.2. Connection Diagram1

Main Board

CN 26
TONER CRUM &DUP_SOL (1.5mm)

DGND	1
SCL1	2
SDA1	3
3.3V_CRUM	4
DUP_REV_SOL	5
24V2	6

DEVE CRUM PBA

SL

CN 22
DEVE CRUM & TC & ENV_MOT SENSOR (1.5mm)

PWM_TC	1
24V1	2
SENS_TC	3
DGND	4
DGND	5
SCL1	6
SDA1	7
3.3V_CRUM	8
3.3VP	9
DGND	10
nSENS_ENV_MOT	11

T/C Sensor
JC32-00010A

DEVE CRUM PBA

Envelop Motor Sensor
3
2
1

CN 33
EXIT STEP MOT (2.0mm)

STEP_EXIT_B	1
STEP_EXIT_NB	2
STEP_EXIT_NA	3
STEP_EXIT_A	4

STEP M1

CN 11
OPE USB I/F (2.0mm 48H ONLY)

DN_OPE	1
DP_OPE	2
DGND	3

OPE PANEL PBA
Petrel_GUI: 4.3 inch + power key

CN 3
OPE I/F(1.5mm)

5V	1
3.3V	2
PANEL_TXD	3
PANEL_RXD	4
nRESET_PANEL	5
KEY_CLICK	6
nPOWER_SW	7
DGND	8

OPE PANEL PBA
Petrel 45ppm: 4 Line + Navigation key + power key

CN 7
FRONT UBS I/F (2.0mm)

VBUS_C4_HOST	1
DN_FRONT_HOST	2
DP_FRONT_HOST	3
DGND	4
DGND	5

CN 6
CTD & REGI & FEED SENSOR (1.5mm)

CTD_LED_OFF	1
CTD_S(N.C)	2
DGND	3
5VC	4
CTD_P	5
3.3VP	6
DGND	7
nSENS_REGI	8
5VP	9
DGND	10
nSENS_FEED	11
INNER_TEMP	12
DGND	13

CTD Sensor

REGI Sensor

FEED Sensor

INNER TEMP SENSOR

CN 28
STACKER(1.5mm)

MULTI_BIN_RXD	1
MULTI_BIN_TXD	2
5VP	3
5VP	4
24V2	5
24V2	6
24V2	7
DGND	8
DGND	9
DGND	10
DGND	11
nDETECT_MULTI_BIN	12
nCMD_REQ_MULTI_BIN	13
nRESET_MULTI_BIN	14

J-7
J-6
J-5
J-4
J-3
J-2
J-1
J-14
J-13
J-12
J-11
J-10
J-9
J-8

Duplex Reverse Solenoid

5.3. Connection Diagram2

Interlock B'd

Toner Supply DC Motor CCW

MP Empty Sensor

MP Clutch

CONNECTION PBA

CN 1 (292166-8) COVER OPEN

1	24V1
2	24V1
3	24V1
4	24VS1
5	24VS1
6	24VS1
7	5V
8	5VS

CN 2 (292166-2) Toner Supply Motor

| 1 | 24V2 |
| 2 | EN_TONER_MOTOR |

CN 3 (292166-3) MP Empty Sensor

1	5V_MP_PWR
2	DGND
3	nSENS_MP_EMPTY

CN 4 (292166-2) MP Clutch

| 1 | MP_CL |
| 2 | 24V2 |

CN 8 CONNECTION PBA IF (FFC)

24V1	1
24V1	2
24V1	3
24V1	4
24V1	5
24VS1	6
24VS1	7
24VS1	8
24VS1	9
24VS1	10
5V	11
5VS	12
EN_TONER_MOTOR	13
5V_MP_PWR	14
DGND	15
nSENS_MP_EMPTY	16
MP_CL	17
5V_PAPER_PWR	18
DGND	19
nSENS_P_EMPTY	20
5V_DUP_PWR	21
DGND	22
nSENS_DUP_JAM1	23
5V_UP_PWR	24
DGND	25
nSENS_UPLIMIT	26
24VS1	27
ELEV_SW_ON	28
PICKUP_CL	29
DUP_RDY_CL	30
REGI_CL	31
24V2	32
24V2	33
24V2	34
DGND	35
DGND	36
DGND	37
DGND	38
(N.C)	39
(N.C)	40

CN 10 CONNECTION PBA IF (FFC)

1	24V1
2	24V1
3	24V1
4	24V1
5	24V1
6	24VS1
7	24VS1
8	24VS1
9	24VS1
10	24VS1
11	5V
12	5VS
13	EN_TONER_MOTOR
14	5VP
15	DGND
16	nSENS_MP_EMPTY
17	MP_CL
18	5VP
19	DGND
20	nSENS_P_EMPTY
21	5VP
22	DGND
23	nSENS_DUP_JAM1
24	5VP
25	DGND
26	nSENS_UPLIMIT
27	24VS1
28	ELEV_SW_ON
29	PICKUP_CL
30	DUP_RDY_CL
31	REGI_CL
32	24V2
33	24V2
34	24V2
35	DGND
36	DGND
37	DGND
38	DGND
39	(N.C)
40	(N.C)

Main board

CN 5 (1-292486-1) EMPTY & DUP JAM

1	5V_PAPER_PWR
2	DGND
3	nSENS_P_EMPTY
4	5V_DUP_PWR
5	DGND
6	nSENS_DUP_JAM1
7	5V_UP_PWR
8	DGND
9	nSENS_UPLIMIT
10	24VS1
11	ELEV_SW_ON

CN 6 (292166-4) Pick-up / Duplex Clutch

1	PICKUP_CL
2	24V2
3	DUP_RDY_CL
4	24V2

CN 7 (292166-2) Regi Clutch

| 1 | REGI_CL |
| 2 | 24V2 |

CN 14 ERASER I/F (FFC)

1	EN_ERASE
2	nERASER_ABNOMAL I0
3	nERASER_ABNOMAL I1
4	(N.C)

Eraser PBA

Paper Empty Sensor

Duplex Jam Sensor

Paper Up-Limit Sensor

Interlock Switch

Pick-Up Clutch

Duplex Ready Clutch

Regi Clutch

LSU

CN 1 LSU VIDEO DATA I/F (FFC)

VCC	1
H_SYNC	2
GND	3
VIDEO1+	4
VIDEO1-	5
GND	6
SPL/HOLD1	7
SPL/HOLD2	8
GND	9
VIDEO2+	10
VIDEO2-	11
GND	12
ENABLE	13
LD_POWER	14

CN 2 LSU MOTOR I/F (FFC)

CLOCK	1
LD	2
START/STOP	3
GND	4
VCC(24V)	5

CN 18 LSU VIDEO DATA I/F (FFC)

1	5VL
2	nHSYNC
3	DGND
4	VDO0_DP
5	VDO0_DN
6	DGND
7	nSH_LSU_1
8	nSH_LSU_2
9	DGND
10	VDO1_DP
11	VDO1_DN
12	DGND
13	nLDON_LSU
14	LD_POWER1

CN 15 LSU MOTOR I/F (FFC)

1	CLK_LSUMOT
2	nREADY_LSU
3	LSU_MOT_EN
4	DGND
5	24VS1

WNIC Option Kit

CN 20 WNIC USB I/F(MINI USB)

1	3.3V
2	DN_WNIC
3	DP_WNIC
4	DGND
5	DGND

LSU FAN JC31-00115A

CN 2 LSU FAN(2.0mm)

1	FB_LSU_FAN(N.C)
2	DGND
3	PWM_LSU_FAN

ENV_Sensor 0604-001325

Exit Sensor 0604-001325

CN 5 REAR COVER I/F(2.0mm)

1	3.3V
2	DGND
3	nSENS_ENVELOP
4	3.3V
5	DGND
6	nSESN_EXIT

HVPS PBA

CN 1 MAIN I/F (FFC)

PWM_DEV_AC	1
PWM_DEV_VPP	2
nEN_DEV_AC	3
3.3VP	4
24VS1	5
24VS1	6
DGND	7
DGND	8
DGND	9
DGND	10
nEN_THV	11
PWM_THV	12
nEN_FUSER_BIAS	13
PWM_FUSER_BIAS	14
PWM_SAW	15
3.3VP	16
(N.C)	17
FB_REAR_FAN1	18
MHV_READ	19
THV_READ	20
PWM_DEV_DC	21
PWM_MHV	22
DC_ENV_EN	23
DC_ENV_DIR	24
DC_ENV_BRK	25
PWM_LSU_FAN	26
24VS1	27
nSENS_EXIT	28
PWM_REAR_FAN	29
REAR_COVER_OPEN	30
nSENS_BIN_FULL	31
DGND	32
nSENS_ENV_MOT	33
PWM_REAR_FAN2	34
FB_REAR_FAN2	35

CN 13 HVPS I/F (FFC)

1	PWM_DEV_AC
2	PWM_DEV_VPP
3	nEN_DEV_AC
4	3.3VP
5	24VS1
6	24VS1
7	DGND
8	DGND
9	DGND
10	DGND
11	nEN_THV
12	PWM_THV
13	nEN_FUSER_BIAS
14	PWM_FUSER_BIAS
15	PWM_SAW
16	3.3VP
17	(N.C)
18	FB_REAR_FAN1
19	MHV_READ
20	THV_READ
21	PWM_DEV_DC
22	PWM_MHV
23	DC_ENV_EN
24	DC_ENV_DIR
25	DC_ENV_BRK
26	PWM_LSU_FAN
27	24VS1
28	nSENS_EXIT
29	PWM_REAR_FAN
30	REAR_COVER_OPEN
31	nSENS_BIN_FULL
32	DGND
33	nSENS_ENV_MOT
34	PWM_REAR_FAN2
35	FB_REAR_FAN2

REAR FAN1 JC31-00088A

REAR FAN2 JC31-00088A

045626-0008   045579-0008

CN 5 REAR COVER I/F(2.0mm)

1	PWM_REAR_FAN1
2	FB_REAR_FAN1
3	DGND
4	PWM_REAR_FAN2
5	FB_REAR_FAN2
6	DGND
7	DGND
8	REAR_COVER_OPEN
9	3.3V
10	DGND
11	nSENS_BIN_FULL

REAR Cover Open Sensor

Bin_Full Sensor 0604-001325

5.4. Connection Diagram3

5.5. Connection Diagram4

Main board

CN 24	
SATA POWER (2.0mm) (48 Only)	
5V	1
DGND	2

CN 23	
SATA SIGNAL (48 Only)	
DGND	1
SATA_TX_P	2
SATA_TX_N	3
DGND	4
SATA_RX_N	5
SATA_RX_P	6
DGND	7
DGND	8
DGND	9

CN 2	
UBS DEVICE	
VBUS_C4_DEVICE	1
DN_C4_DEVICE	2
DP_C4_DEVICE	3
DGND	4
FGND	5
FGND	6

CN 5	
REAR USB HOST I/F(FDI)	
VBUS_REAR_HOST	1
DN_REAR_HOST	2
DP_REAR_HOST	3
DGND	4
FGND	5
FGND	6

CN 27	
JTAG	
3.3V	1
TDO	2
nTRST	3
TCK	4
TMS	5
TDI	6
nRESET	7
DGND	8

CN 16	
GIGABIT ETHERNET(RJ-45)	
DGND	1
1.8V	2
MDIP3	3
MDIN3	4
MDIP2	5
MDIN2	6
MDIP1	7
MDIN1	8
MDIP0	9
MDIN0	10
3.3V	11
LED1	12
3.3V	13
LED0	14
FGND	15
FGND	16

CN 21	
DEBUGGER	
3.3V	1
DEBUG_TXD	2
DEBUG_RXD	3
DGND	4

CN 31	
JACK DC-POWER	
5V	1
(N.C)	2
DGND	3
DGND	4

PARALLEL OPTION

CN 19	
CST & ELEV MOT (1.5mm)	
CST_OPEN	1
P_SIZE3	2
P_SIZE2	3
DGND	4
P_SIZE1	5
(NC)	6
ELEV_SW_ON(24V)	7
EN_ELEV_MOT	8

PAPER SIZE MODULE
(NEW, Harrier) JC34-00001A

1	MT
2	

Elavating DC motor
CCW

CN 12	
BLDC (1.5mm)	
BLDC_DEVE_DIR	1
BLDC_DEVE_CLK	2
nBLDC_DEVE_READY	3
BLDC_DEVE_EN	4
BLDC_DEVE_GAIN	5
BLDC_DEVE_BRAKE	6
DGND	7
DGND	8
24VS1	9
24VS1	10
BLDC_MAIN_DIR	11
BLDC_MAIN_CLK	12
nBLDC_MAIN_READY	13
BLDC_MAIN_EN	14
5VP	15
BLDC_MAIN_BRAKE	16
DGND	17
DGND	18
24VS1	19
24VS1	20

10	CW/CCW
9	CLK
8	READY
7	SS
6	+5V
5	BRAKE
4	PGND
3	PGND
2	+24V
1	+24V

BLDC
MT

BLDC DEVE

10	CW/CCW
9	CLK
8	READY
7	SS
6	+5V
5	BRAKE
4	PGND
3	PGND
2	+24V
1	+24V

BLDC
MT

BLDC MAIN

6. Reference Information

This chapter contains the tools list, list of abbreviations used in this manual, and a guide to the location space required when installing the printer. A definition of test pages and Wireless Network information definition is also included.

6.1. Tool for Troubleshooting

The following tools are recommended safe and easy troubleshooting as described in this service manual.

DVM (Digital Volt Meter)	**Cleaning Equipments**
Standard : Indicates more than 3 digits.	Standard : An IPA (Isopropyl Alcohol) dry wipe tissue or a gentle neutral detergent and lint-free cloth.
Driver	**Vacuum Cleaner**
Standard : "-" type, "+" type (M3 long, M3 short, M2 long, M2 short).	
Tweezers	**Spring Hook**
Standard : For general home use, small type.	Standard : For general use
Cotton Swab	**Software (Driver) installation CD ROM**
Standard : For general home use, for medical service.	

6.2. Glossary

The following glossary helps you get familiar with the product by understanding the terminologies commonly used with printing as well as mentioned in this user's guide and service manual.

802.11	802.11 is a set of standards for wireless local area network (WLAN) communication, developed by the IEEE LAN/MAN Standards Committee (IEEE 802).
802.11b/g/n	802.11b/g/n can share same hardware and use the 2.4 GHz band. 802.11b supports bandwidth up to 11 Mbps, 802.11n supports bandwidth up to 150 Mbps. 802.11b/g/n devices may occasionally suffer interference from microwave ovens, cordless telephones, and Bluetooth devices.
Access point	Access Point or Wireless Access Point (AP or WAP) is a device that connects wireless communication devices together on wireless local area networks (WLAN), and acts as a central transmitter and receiver of WLAN radio signals.
ADF	An Automatic Document Feeder (ADF) is a scanning unit that will automatically feed an original sheet of paper so that the machine can scan some amount of the paper at once.
AppleTalk	AppleTalk is a proprietary suite of protocols developed by Apple, Inc for computer networking. It was included in the original Macintosh (1984) and is now deprecated by Apple in favor of TCP/IP networking.
BIT Depth	A computer graphics term describing the number of bits used to represent the color of a single pixel in a bitmapped image. Higher color depth gives a broader range of distinct colors. As the number of bits increases, the number of possible colors becomes impractically large for a color map. 1-bit color is commonly called as monochrome or black and white.
BMP	A bitmapped graphics format used internally by the Microsoft Windows graphics subsystem (GDI), and used commonly as a simple graphics file format on that platform.
BOOTP	Bootstrap Protocol. A network protocol used by a network client to obtain its IP address automatically. This is usually done in the bootstrap process of computers or operating systems running on them. The BOOTP servers assign the IP address from a pool of addresses to each client. BOOTP enables 'diskless workstation' computers to obtain an IP address prior to loading any advanced operating system.
CCD	Charge Coupled Device (CCD) is a hardware which enables the scan job. CCD Locking mechanism is also used to hold the CCD module to prevent any damage when you move the machine.
Collation	Collation is a process of printing a multiple-copy job in sets. When collation is selected, the device prints an entire set before printing additional copies.
Control Panel	A control panel is a flat, typically vertical, area where control or monitoring instruments are displayed. They are typically found in front of the machine.
Coverage	It is the printing term used for a toner usage measurement on printing. For example, 5% coverage means that an A4 sided paper has about 5% image or text on it. So, if the paper or original has complicated images or lots of text on it, the coverage will be higher and at the same time, a toner usage will be as much as the coverage.
CSV	Comma Separated Values (CSV). A type of file format, CSV is used to exchange data between disparate applications. The file format, as it is used in Microsoft Excel, has become a de facto standard throughout the industry, even among non-Microsoft platforms.
DADF	A Duplex Automatic Document Feeder (DADF) is a scanning unit that will automatically feed and turn over an original sheet of paper so that the machine can scan on both sides of the paper.
Default	The value or setting that is in effect when taking a printer out of its box state, reset, or initialized.
DHCP	A Dynamic Host Configuration Protocol (DHCP) is a client-server networking protocol. A DHCP server provides configuration parameters specific to the DHCP client host requesting, generally, information required by the client host to participate on an IP network. DHCP also provides a mechanism for allocation of IP addresses to client hosts.
DIMM	Dual Inline Memory Module (DIMM), a small circuit board that holds memory. DIMM stores all the data within the machine like printing data, received fax data.

DLNA	The Digital Living Network Alliance (DLNA) is a standard that allows devices on a home network to share information with each other across the network.
DNS	The Domain Name Server (DNS) is a system that stores information associated with domain names in a distributed database on networks, such as the Internet.
Dot Matrix Printer	A dot matrix printer refers to a type of computer printer with a print head that runs back and forth on the page and prints by impact, striking an ink-soaked cloth ribbon against the paper, much like a typewriter.
DPI	Dots Per Inch (DPI) is a measurement of resolution that is used for scanning and printing. Generally, higher DPI results in a higher resolution, more visible detail in the image, and a larger file size.
DRPD	Distinctive Ring Pattern Detection. Distinctive Ring is a telephone company service which enables a user to use a single telephone line to answer several different telephone numbers.
Duplex	A mechanism that will automatically turn over a sheet of paper so that the machine can print (or scan) on both sides of the paper. A printer equipped with a Duplex Unit can print on both sides of paper during one print cycle.
Duty Cycle	Duty cycle is the page quantity which does not affect printer performance for a month. Generally the printer has the lifespan limitation such as pages per year. The lifespan means the average capacity of print-outs, usually within the warranty period. For example, if the duty cycle is 48,000 pages per month assuming 20 working days, a printer limits 2,400 pages a day.
ECM	Error Correction Mode (ECM) is an optional transmission mode built into Class 1 fax machines or fax modems. It automatically detects and corrects errors in the fax transmission process that are sometimes caused by telephone line noise.
Emulation	Emulation is a technique of one machine obtaining the same results as another. An emulator duplicates the functions of one system with a different system, so that the second system behaves like the first system. Emulation focuses on exact reproduction of external behavior, which is in contrast to simulation, which concerns an abstract model of the system being simulated, often considering its internal state.
Ethernet	Ethernet is a frame-based computer networking technology for local area networks (LANs). It defines wiring and signaling for the physical layer, and frame formats and protocols for the media access control (MAC)/data link layer of the OSI model. Ethernet is mostly standardized as IEEE 802.3. It has become the most widespread LAN technology in use during the 1990s to the present.
EtherTalk	A suite of protocols developed by Apple Computer for computer networking. It was included in the original Macintosh (1984) and is now deprecated by Apple in favor of TCP/IP networking.
FDI	Foreign Device Interface (FDI) is a card installed inside the machine to allow a third party device such as a coin operated device or a card reader. Those devices allow the pay-for-print service on your machine.
FTP	A File Transfer Protocol (FTP) is a commonly used protocol for exchanging files over any network that supports the TCP/IP protocol (such as the Internet or an intranet).
Fuser Unit	The part of a laser printer that fuses the toner onto the print media. It consists of a heat roller and a pressure roller. After toner is transferred onto the paper, the fuser unit applies heat and pressure to ensure that the toner stays on the paper permanently, which is why paper is warm when it comes out of a laser printer.
Gateway	A connection between computer networks, or between a computer network and a telephone line. It is very popular, as it is a computer or a network that allows access to another computer or network.
Grayscale	A shades of gray that represent light and dark portions of an image when color images are converted to grayscale; colors are represented by various shades of gray.
Halftone	An image type that simulates grayscale by varying the number of dots. Highly colored areas consist of a large number of dots, while lighter areas consist of a smaller number of dots.
HDD	Hard Disk Drive (HDD), commonly referred to as a hard drive or hard disk, is a non-volatile storage device which stores digitally-encoded data on rapidly rotating platters with magnetic surfaces.

IEEE	The Institute of Electrical and Electronics Engineers (IEEE) is an international non-profit, professional organization for the advancement of technology related to electricity.
IEEE 1284	The 1284 parallel port standard was developed by the Institute of Electrical and Electronics Engineers (IEEE). The term "1284-B" refers to a specific connector type on the end of the parallel cable that attaches to the peripheral (for example, a printer).
Intranet	A private network that uses Internet Protocols, network connectivity, and possibly the public telecommunication system to securely share part of an organization's information or operations with its employees. Sometimes the term refers only to the most visible service, the internal website.
IP address	An Internet Protocol (IP) address is a unique number that devices use in order to identify and communicate with each other on a network utilizing the Internet Protocol standard.
IPM	The Images Per Minute (IPM) is a way of measuring the speed of a printer. An IPM rate indicates the number of single-sided sheets a printer can complete within one minute.
IPP	The Internet Printing Protocol (IPP) defines a standard protocol for printing as well as managing print jobs, media size, resolution, and so forth. IPP can be used locally or over the Internet to hundreds of printers, and also supports access control, authentication, and encryption, making it a much more capable and secure printing solution than older ones.
IPX/SPX	IPX/SPX stands for Internet Packet Exchange/Sequenced Packet Exchange. It is a networking protocol used by the Novell NetWare operating systems. IPX and SPX both provide connection services similar to TCP/IP, with the IPX protocol having similarities to IP, and SPX having similarities to TCP. IPX/SPX was primarily designed for local area networks (LANs), and is a very efficient protocol for this purpose (typically its performance exceeds that of TCP/IP on a LAN).
ISO	The International Organization for Standardization (ISO) is an international standard-setting body composed of representatives from national standards bodies. It produces world-wide industrial and commercial standards.
ITU-T	The International Telecommunication Union is an international organization established to standardize and regulate international radio and telecommunications. Its main tasks include standardization, allocation of the radio spectrum, and organizing interconnection arrangements between different countries to allow international phone calls. A -T out of ITU-T indicates telecommunication.
ITU-T No. 1 chart	Standardized test chart published by ITU-T for document facsimile transmissions.
JBIG	Joint Bi-level Image Experts Group (JBIG) is an image compression standard with no loss of accuracy or quality, which was designed for compression of binary images, particularly for faxes, but can also be used on other images.
JPEG	Joint Photographic Experts Group (JPEG) is a most commonly used standard method of lossy compression for photographic images. It is the format used for storing and transmitting photographs on the World Wide Web.
LDAP	The Lightweight Directory Access Protocol (LDAP) is a networking protocol for querying and modifying directory services running over TCP/IP.
LED	A Light-Emitting Diode (LED) is a semiconductor device that indicates the status of a machine.
MAC address	Media Access Control (MAC) address is a unique identifier associated with a network adapter. MAC address is a unique 48-bit identifier usually written as 12 hexadecimal characters grouped in pairs (e. g., 00-00-0c-34-11-4e). This address is usually hard-coded into a Network Interface Card (NIC) by its manufacturer, and used as an aid for routers trying to locate machines on large networks.
MFP	Multi Function Peripheral (MFP) is an office machine that includes the following functionality in one physical body, so as to have a printer, a copier, a fax, a scanner and etc.
MH	Modified Huffman (MH) is a compression method for decreasing the amount of data that needs to be transmitted between the fax machines to transfer the image recommended by ITU-T T.4. MH is a codebook-based run-length encoding scheme optimized to efficiently compress white space. As most faxes consist mostly of white space, this minimizes the transmission time of most faxes.
MMR	Modified Modified READ (MMR) is a compression method recommended by ITU-T T.6.

Modem	A device that modulates a carrier signal to encode digital information, and also demodulates such a carrier signal to decode transmitted information.
MR	Modified Read (MR) is a compression method recommended by ITUT T.4. MR encodes the first scanned line using MH. The next line is compared to the first, the differences determined, and then the differences are encoded and transmitted.
NetWare	A network operating system developed by Novell, Inc. It initially used cooperative multitasking to run various services on a PC, and the network protocols were based on the archetypal Xerox XNS stack. Today NetWare supports TCP/IP as well as IPX/SPX.
OPC	Organic Photo Conductor (OPC) is a mechanism that makes a virtual image for print using a laser beam emitted from a laser printer, and it is usually green or rust colored and has a cylinder shape. An imaging unit containing a drum slowly wears the drum surface by its usage in the printer, and it should be replaced appropriately since it gets worn from contact with the cartridge development brush, cleaning mechanism, and paper.
Originals	The first example of something, such as a document, photograph or text, etc, which is copied, reproduced or translated to produce others, but which is not itself copied or derived from something else.
OSI	Open Systems Interconnection (OSI) is a model developed by the International Organization for Standardization (ISO) for communications. OSI offers a standard, modular approach to network design that divides the required set of complex functions into manageable, self-contained, functional layers. The layers are, from top to bottom, Application, Presentation, Session, Transport, Network, Data Link and Physical.
PABX	A private automatic branch exchange (PABX) is an automatic telephone switching system within a private enterprise.
PCL	Printer Command Language (PCL) is a Page Description Language (PDL) developed by HP as a printer protocol and has become an industry standard. Originally developed for early inkjet printers, PCL has been released in varying levels for thermal, dot matrix printer, and laser printers.
PDF	Portable Document Format (PDF) is a proprietary file format developed by Adobe Systems for representing two dimensional documents in a device independent and resolution independent format.
PostScript(PS)	PostScript (PS) is a page description language and programming language used primarily in the electronic and desktop publishing areas. - that is run in an interpreter to generate an image.
Printer Driver	A program used to send commands and transfer data from the computer to the printer.
Print Media	The media like paper, envelopes, labels, and transparencies which can be used in a printer, a scanner, a fax or, a copier.
PPM	Pages Per Minute (PPM) is a method of measurement for determining how fast a printer works, meaning the number of pages a printer can produce in one minute.
PRN file	An interface for a device driver, this allows software to interact with the device driver using standard input/output system calls, which simplifies many tasks.
Protocol	A convention or standard that controls or enables the connection, communication, and data transfer between two computing endpoints.
PSTN	The Public-Switched Telephone Network (PSTN) is the network of the world's public circuit-switched telephone networks which, on industrial premises, is usually routed through the switchboard.
RADIUS	Remote Authentication Dial In User Service (RADIUS) is a protocol for remote user authentication and accounting. RADIUS enables centralized management of authentication data such as usernames and passwords using an AAA (authentication, authorization, and accounting) concept to manage network access.
Resolution	The sharpness of an image, measured in Dots Per Inch (DPI). The higher the dpi, the greater the resolution.
SMB	Server Message Block (SMB) is a network protocol mainly applied to share files, printers, serial ports, and miscellaneous communications between nodes on a network. It also provides an authenticated Interprocess communication mechanism.

SMTP	Simple Mail Transfer Protocol (SMTP) is the standard for e-mail transmissions across the Internet. SMTP is a relatively simple, text based protocol, where one or more recipients of a message are specified, and then the message text is transferred. It is a client server protocol, where the client transmits an email message to the server.
SSID	Service Set Identifier (SSID) is a name of a wireless local area network (WLAN). All wireless devices in a WLAN use the same SSID in order to communicate with each other. The SSIDs are case-sensitive and have a maximum length of 32 characters.
Subnet Mask	The subnet mask is used in conjunction with the network address to determine which part of the address is the network address and which part is the host address.
TCP/IP	The Transmission Control Protocol (TCP) and the Internet Protocol (IP); the set of communications protocols that implement the protocol stack on which the Internet and most commercial networks run.
TCR	Transmission Confirmation Report (TCR) provides details of each transmission such as job status, transmission result and number of pages sent. This report can be set to print after each job or only after failed transmissions.
TIFF	Tagged Image File Format (TIFF) is a variable-resolution bitmapped image format. TIFF describes image data that typically come from scanners. TIFF images make use of tags, keywords defining the characteristics of the image that is included in the file. This flexible and platform-independent format can be used for pictures that have been made by various image processing applications.
Toner Cartridge	A kind of bottle or container used in a machine like a printer which contains toner. Toner is a powder used in laser printers and photocopiers, which forms the text and images on the printed paper. Toner can be fused by a combination of heat/pressure from the fuser, causing it to bind to the fibers in the paper.
TWAIN	An industry standard for scanners and software. By using a TWAINcompliant scanner with a TWAIN-compliant program, a scan can be initiated from within the program. It is an image capture API for Microsoft Windows and Apple Macintosh operating systems.
UNC Path	Uniform Naming Convention (UNC) is a standard way to access network shares in Window NT and other Microsoft products. The format of a UNC path is: \\<servername>\<sharename>\<Additional directory>
URL	Uniform Resource Locator (URL) is the global address of documents and resources on the Internet. The first part of the address indicates what protocol to use, the second part specifies the IP address or the domain name where the resource is located.
USB	Universal Serial Bus (USB) is a standard that was developed by the USB Implementers Forum, Inc., to connect computers and peripherals. Unlike the parallel port, USB is designed to concurrently connect a single computer USB port to multiple peripherals.
Watermark	A watermark is a recognizable image or pattern in paper that appears lighter when viewed by transmitted light. Watermarks were first introduced in Bologna, Italy in 1282; they have been used by papermakers to identify their product, and also on postage stamps, currency, and other government documents to discourage counterfeiting.
WEP	Wired Equivalent Privacy (WEP) is a security protocol specified in IEEE 802.11 to provide the same level of security as that of a wired LAN. WEP provides security by encrypting data over radio so that it is protected as it is transmitted from one end point to another.
WIA	Windows Imaging Architecture (WIA) is an imaging architecture that is originally introduced in Windows Me and Windows XP. A scan can be initiated from within these operating systems by using a WIAcompliant scanner.
WPA	Wi-Fi Protected Access (WPA) is a class of systems to secure wireless (Wi-Fi) computer networks, which was created to improve upon the security features of WEP.
WPA-PSK	WPA-PSK (WPA Pre-Shared Key) is special mode of WPA for small business or home users. A shared key, or password, is configured in the wireless access point (WAP) and any wireless laptop or desktop devices. WPA-PSK generates a unique key for each session between a wireless client and the associated WAP for more advanced security.

WPS	The Wi-Fi Protected Setup (WPS) is a standard for establishing a wireless home network. If your wireless access point supports WPS, you can configure the wireless network connection easily without a computer.
XPS	XML Paper Specification (XPS) is a specification for a Page Description Language (PDL) and a new document format, which has benefits for portable document and electronic document, developed by Microsoft. It is an XML-based specification, based on a new print path and a vector-based device-independent document format.

6.3. The Sample Pattern for the Test

The life of the toner cartridge and the printing speed are measured using the pattern shown below.

ISO 19752 standard pattern

6.4. Selecting a location

Select a level, stable place with adequate space for air circulation. Allow extra space for opening covers and trays.

The area should be well-ventilated and away from direct sunlight or sources of heat, cold, and humidity. Do not set the machine close to the edge of your desk or table.

Clearance space

- Front: 326 mm (enough space so that the paper tray can be removed)

- Back: 100 mm (enough space for ventilation)

- Right: 100 mm (enough space for ventilation)

- Left: 100 mm (enough space for ventilation)

6.5. Document Revision List

Version	Date	Page	Description
1.00	25/Apr/2011	-	Release
1.01	27/Dec/2016	P.6–10	Add Document Revision List
		P.2–9	Add note for production suspension of the finisher and mailbox.

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