

SAMSUNG

LASER PRINTER

ML-1600 Series

ML-1610/XBH

Basic Model : ML-1610

SERVICE *Manual*

LASER PRINTER



ML-1610

The keynote of Product

- Speed : 17ppm (Ltr) / 16ppm(A4), 600dpi
- Paper Path : MPF Type Cassette
- Emulation : SPL (ML-1610 / ML-1615P)
- Processor : 150MHz Jupiter4e CPU
- Memory : ML-1610(SDRAM,2MB),
ML-1615P(SDRAM,8MB)
- MP Cassette : 150 pages / Face Down
(50 pages)
- Fuser Design : Lamp Type
- I/O : ML-1610(USB1.1), ML-1615P
(USB1.1+IEEE 1284)
- Machine Life : 50K(pages)

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1. Precautions

The cautions below are items needed to keep in mind when maintaining and servicing.

Please read carefully and keep the contents in mind to prevent accidents while servicing and to prevent the machine from getting damaged.

1.1 Safety Warning

(1) Request service by qualified service person.

Service for this machine must be performed by a Qualified service person. It is dangerous if unqualified service personnel or users try to fix the machine.

(2) Do not rebuild.

Do not attach or change parts discretionary. Do not dissemble, fix or rebuilt it. If so, printer will abnormally work and electric shock or fire may occur.

(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 1(1) laser products, and elsewhere, is certified as a Class I laser product conforming to the requirements of IEC 825.

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.

Warning >> *Never operate or service the printer 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 injury to persons.*



CAUTION - INVISIBLE LASER RADIATION
WHEN THIS COVER OPEN.
DO NOT OPEN THIS COVER.

VORSICHT - UNSICHTBARE LASERSTRAHLUNG,
WENN ABDECKUNG GEÖFFNET.
NICHT DEM STRAHL AUSSETZEN.

ATTENTION - RAYONNEMENT LASER INVISIBLE EN CAS
D'OUVERTURE. EXPOSITION DANGEREUSE
AU FAISCEAU.

ATTENZIONE - RADIAZIONE LASER INVISIBILE IN CASO DI
APERTURA. EVITARE L'ESPOSIZIONE AL
FASCIO.

PRECAUCION - RADIACION LASER IVISIBLE CUANDO SE ABRE.
EVITAR EXPONERSE AL RAYO.

ADVARSEL - USYNLIG LASERSTRÅLNING VED ÅBNING, NÅR
SIKKERHEDSBRYDERE ER UDE AF FUNKTION.
UNDGÅ UDSÆTTELSE FOR STRÅLNING.

ADVARSEL - USYNLIG LASERSTRÅLNING NÅR DEKSEL
ÅPNES. STIRR IKKE INN I STRÅLEN.
UNNGÅ EKSPONERING FOR STRÅLEN.

VARNING - OSYNLIG LASERSTRÅLNING NÅR DENNA DEL
ÄR ÖPPNAD OCH SPÄRREN ÄR URKOPPLAD.
BETRAKTA EJ STRÅLEN. STRÅLEN ÄR FARLIG.

VARO! - AVATTAESSA JA SUOJALUKITUS OHITETTAESSA
OLET ALTTIINA NÄKYMÄTTÖMÄLLE LASER-
SÄTEILYLLE ÄLÄ KATSO SÄTEESEEN.

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 Safety Caution

1.2.1 Noxious Material Precaution

The toner in a printer cartridge contains a chemical material, which may harm human body if it is swallowed. Please keep children out of reach of the toner cartridge.

1.2.2 Electric Shock or fire Precaution

It is possible to get electric shock or burn by fire if you don't follow the instructions of the manual.

- (1) Use exact voltage. Please use an exact voltage and wall socket. If not, a fire or an electric leakage can be caused.
- (2) Use authorized power cord. Do use the power cord supplied with PRINTER. A fire can happen when over current flows in the power cord.
- (3) Do not insert many cords in an outlet. A fire can be occurred due to flow over current in an outlet.
- (4) Do not put water or extraneous matter in the PRINTER. Please do not put water, other liquid, pin, clip, etc. It can cause a fire, electric shock, or malfunction. If this occurs, turn off the power and remove the power plug from outlet immediately.
- (5) Do not touch the power plug with wet hand. When servicing, remove the power plug from outlet. Do not insert or take off it with wet hand. Electric shock can be occur.
- (6) Caution when inserting or taking off the power plug. The power plug has to be inserted completely. If not, a fire can be caused due to poor contact. When taking off the power plug, grip the plug and take it off. If grip the line and pull over, it could be damaged. A fire or electric shock could happen.
- (7) Management of power cord. Do not bend, twist, or bind it and place other materials on it. Do not fix with staples. If the power cord gets damaged, a fire or electric shock can happen. A damaged power cord must be replaced immediately. Do not repair the damaged part and reuse it. A repaired part with plastic tape can be cause a fire or electric shock. Do not spread chemicals on the power cord. Do not spread insecticide on the power cord. A fire or electric shock can be happen due to thinner(weak) cover of the power cord.
- (8) Check whether the power outlet and the power plug are damaged, pressed, chopped, or blazing fire or not. When such inferiorities are found, repair it immediately. Do not make it pressed or chopped when moving the machine.
- (9) Caution when there is thundering or lightning, and being flash of lightening. It causes a fire or electric shock. Take the power plug off there is thunder. Do not touch cable and device when thundering and flash of lightning.
- (10) Avoid the place where is moisture or has dust. Do not install the printer where lots of dust or around humidifier. A fire can occurred. A plug part need to clean well with dried fabric to remove dust. If water drops are dripped on the place covered with dust, a fire can occurred.
- (11) Avoid direct sunlight. Do not install the printer near window where direct contacts to the sunlight. If the machine contacts sunlight long time, the machine cannot work properly because inner temperature of the machine is getting hotter. A fire can occur.
- (12) Turn off the power and take off the plug when smoke, strange smell, or sound from the machine. If you keep using it, a fire can be occurred.
- (13) Do not insert steel or metal piece inside/outside of the machine. Do not put steel or metal piece into a ventilator. An electric shock could happened.

1.2.3 Handling Precautions

If you ignore this information, you could harm machine and could be damaged.

- (1) Do not install it on different levels, or slanted floor.
Please confirm whether it is balanced or not after installation. If it is unbalanced, an accident can be happened due to the machine falling over.
- (2) Be careful not to insert a finger or hair in the rotating unit.
Be careful not to insert a finger of hair in the rotating unit (motor, fan, paper feeding part, etc) while the machine is operating. Once it happens, you could be harmed.
- (3) Do not place a pot containing water/chemical or small metals. If they got caught into the inner side of machine, a fire or electric shock can be occurred.
- (4) Do not install it where lots of moisture or dust exists or where raindrop reaches. A fire or electric shock can be caused.
- (5) Do not place a candlelight, burning cigarette, and etc. on the machine. Do not install it near to heater. A fire can be occurred.

1.2.4 Assembly/Disassembly precaution

When replacing parts, do it very carefully. Memorize the location of each cable before replace parts for reconnecting it afterwards. Memorize. Please perform the steps below before replace or disassembly the parts.

- (1) Check the contents stored in the memory. All the information will be erased after replacing main board.
The information needed to keep has to be written down.
- (2) Before servicing or replacing electric parts, take off plug.
- (3) Take off printer cables and power cord connected to printer.
- (4) Use formal parts and same standardized goods when replacing parts. Must check the product name, part cord, rated voltage, rated current, operating temperature, etc.
- (5) Do not over-force when release or tighten up the plastic parts.
- (6) Be careful not to drop small parts such as screws in the printer.
- (7) Be careful not to change the location of small parts such as screws when assembling and disassembling.
- (8) Remove dust or foreign matters completely to prevent fire of tracking, short, or etc.
- (9) After finished repair, check the assembling state whether it is same as before the repair or not.

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

2.1 Product Overview

Item	Descriptions	Remark
Basic Model	ML-1610	
Series Model	ML-1615P	
Market of Sales	Personal user Laser printer. (Low Price for small work Group.)	
Specification	<ul style="list-style-type: none"> 16ppm (Ltr. 17ppm), Jupiter 4e 150MHz, 2Mbytes SDRAM 1K(initial), 2K(sales) USB 1.1 Model (Compatible with USB 2.0), IEEE 1284 Parallel (ML-1615P) 150pages feeding, 50pages Face Down 	

2.2 Specifications

- Product Specifications are subject to change without notice. See below for product specifications.

2.2.1 General Specifications

Item	Descriptions
Print Method	Electro-photographic Printing
Developing system	Non-Magnetic, Mono-Component Developing System
Print Speed	16 PPM : A4 size 17 PPM (Letter size)
Resolution	True 600 X 600 DPI
Source of Light	Laser diode (LSU : Laser Scanning Unit)
Warm-Up Time	Cold Warm-up : 30sec, Sleep mode : 30 sec
First Print Time	Less than 10 seconds (Ready to 1st page out)
Feed Method	Cassette & Manual
Media Size	76 X 128mm (3 x 5") to 216 X 356mm (8.5 X 14")
Paper thickness	Cassette : 16 ~ 28 lb, Manual Feeder : 16 ~ 43 lb
Size(W X D X H)	358*299*217 mm
Weight	Net : 4.8Kg(30.6lb) with toner cartridge Gross : 7.65Kg(37.7lb)
Acoustic Noise	Stand by : Less than 35 dB Printing : Less than 50 dB
Power save mode	Yes
Toner save mode	Yes
Machine Life	50,000pages

Item	Descriptions	
Periodic Replacing Parts ※Same with Machine Life	Pick Up Roller : 50,000 Pages	
	Transfer Roller : 50,000 Pages	
	Fuser Assembly : 50,000 Pages	
	Toner Sensor	No
	Toner Type	Non-Magnetic Contact System
	Toner Initial	1,000 sheets@ISO 5% coverage
	Toner sale	2,000 sheets@ISO 5% coverage
Cassette	- Paper capacity : 150sheets	
	- Paper weight : 60 ~ 163 g/㎡ / 16 ~ 43 lbs	

2.2.2 Controller

Item	Descriptions
Processor(CPU)	Jupiter 4e 150MHz
Memory	Standard/Max. : 2MB(Max. 2 MB)
	Type : SDRAM
	Expand Memory Slot, Type : NO
	Compression Technology : MET(Memory Enhancement Technology)
(Emulation)	Standard : SPL
	Auto Emulation Sensing : YES
(Interface)	Standard : USB 1.1 Only(Compatible with USB 2.0)
	Option : NO
	Auto Interface Sensing : YES
Font	Type : Windows Fonts
	Number : NO
Test Print	Demo Mode : Press the Demo Key for 2 Seconds
	Configuration Mode : Press the Demo Key for 2 Seconds
	Cleaning Mode : Not Support
	Service Mode : Press the Demo Key when Power on(F/W Download)

※ ML-1615P model : I/O Support(USB 1.1 + IEEE 1284 Parallel port)

2.2.3 Electrical Specification

Item	Descriptions		Remark
Input Voltage	Nominal input voltage	220~240 VAC	
	Input voltage range	198~255 VAC	
	Nominal frequency	50/60 MHz	
	Frequency tolerance	+3Hz	
Power Consumption	Printing : 300W Avg(Max. 500W)		
	Idling : 100W Avg or less		
	Power Save : 10W Avg or less		

2.2.4 Environmental Range

Item	Operating	Storage
Temperature	10~30 oC(50-90 oF)	-20~40 oC (-4~104 oF)
Humidity	20~80%RH	10~80%RH

2.2.5 Toner Cartridge

Item	Descriptions	Remark
Life span	Starter: 1,000 Pages(initial)	A4 Size, ISO 19752 Pattern 5% Coverage SIMPLEX
	Running : 2,000 Pages(sales)	
Developing Method	Non-magnetic Contact Developing	
Charging Method	Conductive Roller Charging	
Toner Empty sensor	No	
Ozone	0.1PPM or less	
Cartridge Style	Single cartridge	

2.2.6 Paper Handling Specifications

Please refer to "Paper Specifications" on user Guide.

2.2.6.1 Input Paper Size

Paper	paper size	Cassette
A4	210 X 297 mm	O
Letter	216 X 279(8.5 X 11")	O
US Folio(Legal13")	216 X 330(8.5 X 13")	O
Legal(Legal14")	216 X 356(8.5 X 14")	O
Executive	184 X 267((7.25 X 10.5")	O
Statement	140 X 216(5.5 x 8.5")	
ISO B5	176 X 250	O
JIS B5	182 X 257	O
A5	148 X 210	O
A6	105 X 148	O
No.10 Env.	105 X 241(4.15 X 9.5")	O(1 sheet)
Monarch Env.	98 X 191(3.87 X 7.5")	O(1 sheet)
DL Env.	110 X 220(4.33 X 8.66")	O(1 sheet)
C5 Env.	162 X 229(6.38 X 9.01")	O(1 sheet)
C6 Env.	114 X 162(4.49 X 6.38")	O(1 sheet)
Transparency(OHP)	A4 or Letter	O(1 sheet)
Label paper	A4 or Letter	O(1 sheet)




2.2.6.2 Input capacity

Item	Descriptions
Cassette	150 sheets

2.2.6.3 Output capacity

Face Down	50 sheets
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2.3 Model Comparison Table

Model Name	ML-1610	ML-1615P	ML-1750
General			
Company	Samsung	Samsung	Samsung
Printing Process			
Print Method:	Electrophotographic Laser	Electrophotographic Laser	Electrophotographic laser
Print Speed	Up to 16ppm in A4, Up to 17ppm in letter	Up to 16ppm in A4, Up to 17ppm in letter	Up to 16ppm(A4) (ML-1510 : 14ppm)
FPOT	10sec	10sec	12sec
Resolution	600*600	600*600	600*600
Duty Cycle, Monthly	up to 5000 prints per month	up to 5000 prints per month	up to 15,000 prints per month
Hardware Software			
Processor Type	Samsung 150MHz	Samsung 150MHz	66MHz RISC(Jupiter3)
Memory	2MB(2MB)	8MB SDRAM(8MB)	8MB SDRAM(2MB)
OS	Win9X/ME/2000/XP/Linux7/Mac OS8.6 ~ 10.3	Win9X/ME/2000/XP/Linux7/Mac OS8.6 ~ 10.3	Win9X/ME/2000/XP/Linux7/Mac OS8.6 이상
Standard Emulations	SPL	SPL	GDI(SPL)
Interface Support			
Standard Interfaces	USB 1.1(Compatible with USB 2.0) Cable Not Supply(KOR,CHINA is Supply)	USB 1.1 IEEE 1284 Parallel	USB 1.1 Cable Not Supply
Optional Interfaces	N/A	N/A	N/A
Paper Handling			
Standard Paper Input	150 Sheets Multi-purpose Tray	150 Sheets Multi-purpose Tray	250 Sheets Multi-Purpose Cassette, Single Sheets Adjustable Manual Feed
Paper Output	Face down : 50 Sheet(TBD)	Face down : 50 Sheet(TBD)	50 Sheet Face Down Tray
Duplexing	Manual	Manual	
Paper Weight :			
- Plain paper	16 to 24 lb. Bond(60 to 90g/m ²)	16 to 24 lb. Bond(60 to 90g/m ²)	16 to 24 lb. Bond(60 to 90g/m ²)
- Thick stock	24 - 90 lb. Index(163g/m ²)	24 - 90 lb. Index(163g/m ²)	24 - 90 lb. Index(163g/m ²)
Physical			
Type	Laser Printer with Internal Controller	Laser Printer with Internal Controller	Laser Printer with Internal Controller
Dimensions w/output tray extended(WxDxH)	358mm x 299mm x 217mm	358mm x 299mm x 217mm	352mm x 372mm x 196mm
Weight(without shipping)	5.75kg	5.5kg	7.05kg(manual book : 7kg)
Carton Dimensions (WxDxH)	455mm x 415mm x 325mm	455mm x 415mm x 325mm	508mm x 425mm x 265mm
Weight(as shipped)	7.65kg	7.65kg	9kg
Electical			
Power Requirements			
Power Consumption	Power Consumption 300W printing, 10W Down Sleep Mode	Power Consumption 300W printing, 10W Down Sleep Mode	Power Consumption 330W printing, 10W Down Sleep Mode
Energy Star* Compliant	Yes	Yes	Yes
Environmental			
Temperature :			
- Operating	10℃ to 32℃	10℃ to 32℃	10℃ to 32℃
- Non-Operating	0℃ to 40℃	0℃ to 40℃	0℃ to 40℃
Humidity :			
- Operating	: 20% to 80% RH	: 20% to 80% RH	: 20% to 80% RH
- Non-Operating	: 20% to 80% RH	: 20% to 80% RH	: 20% to 80% RH
Noise Level :			
Operating	Operating : <50dB(A), Standby : <35 dB(A)	Operating : <50dB(A), Standby : <35 dB(A)	Operating : <52dB(A), Standby : <35 dB(A)
Consumables			
Starter	up to 1,000 pages(A4/Letter) at ISO 5% coverage continuous printing.	up to 1,000 pages(A4/Letter) at ISO 5% coverage continuous printing.	up to 1,000 pages(A4/Letter) at ISO 5% coverage continuous printing.
Replacement	up to 2,000 pages(A4/Letter) at ISO 5% coverage	up to 2,000 pages(A4/Letter) at ISO 5% coverage	up to 3,000 pages(A4/Letter) at ISO 5% coverage

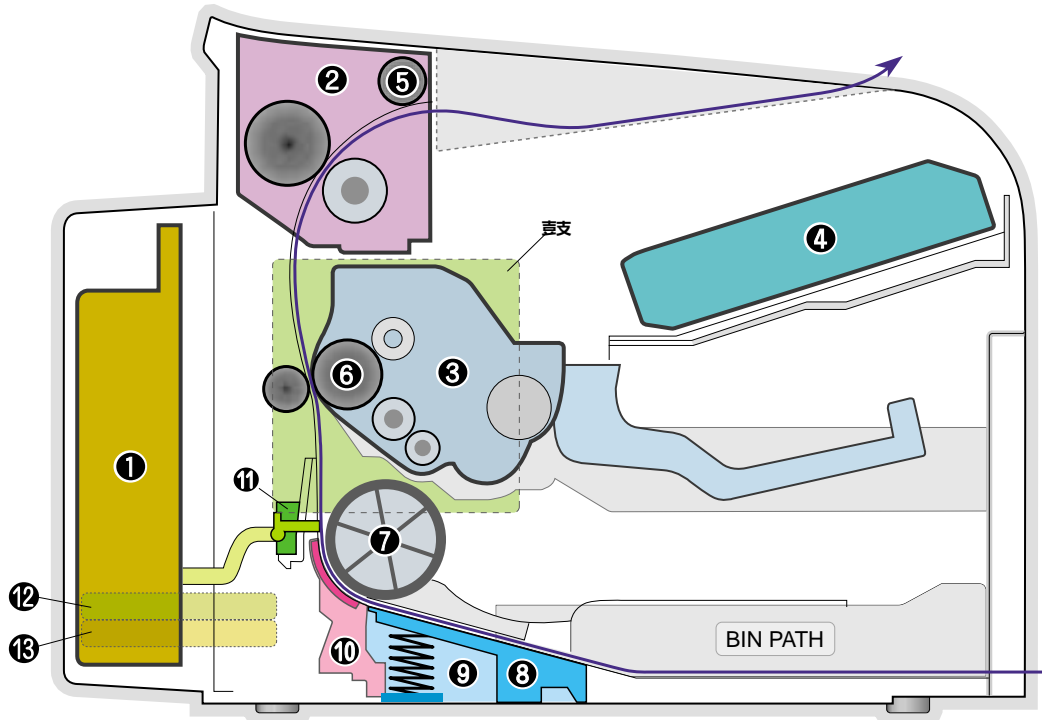
UNIT	Part	Skylark		* Snipe	Note
		ML-1610	* ML-1615	* ML-2010	
Controller	CPU	Jupiter4e(150Mhz)	←	←	▶ Provide built-in Flash Memory(0.5Mb) and LD control bloc, ▶ Based on ARM 940T Core ▶ EPROM
	Memory	2Mbyte	8Mbyte	8Mbyte	▶ Design CAD location to install arbitrarily 2Mbyte or 8Mbyte SDRAM on the PCB.
	PC Interface	USB1.1	Parallel+USB1.1	USB1.1	▶ ML-1615 for CIS
	Motor Drv IC	AN3977	←	←	▶ Skylark/Snipe use the same Motor driver IC.
	PCB	90*90mm, FR4, 2L	90*122.75mm, FR4, 4L	90*90mm, FR4, 2L	▶ Skylark/Snipe use the same PBA. ▶ Installing Chips to both PCB sides
Power	SMPS	+5V(0.8A) +24V(1.5A)	←	+5V(0.8A) +24V(2.0A)	▶ Snipe/Whitney use the same SMPS.
	HVPS	THV(+), MHV, Supply, OPC, DEVE, THV(-)	←	←	▶ Refer to Power Specification
Panel	-	Dual LED/Single LED, Tact S/W	←	←	▶ Need not Panel PCB due to HVPS built-in Panel functions

*. These model are as yet undeveloped.

3. System Overview

3.1 System Outline

■ Paper Path Layout



SMPS

Toner Cartridge

Exit Roller

Pick-Up Roller

KNOCK-UP PLATE DOWN

支 Feed Sensor

支 SMPS

Fuser

LSU

OPC

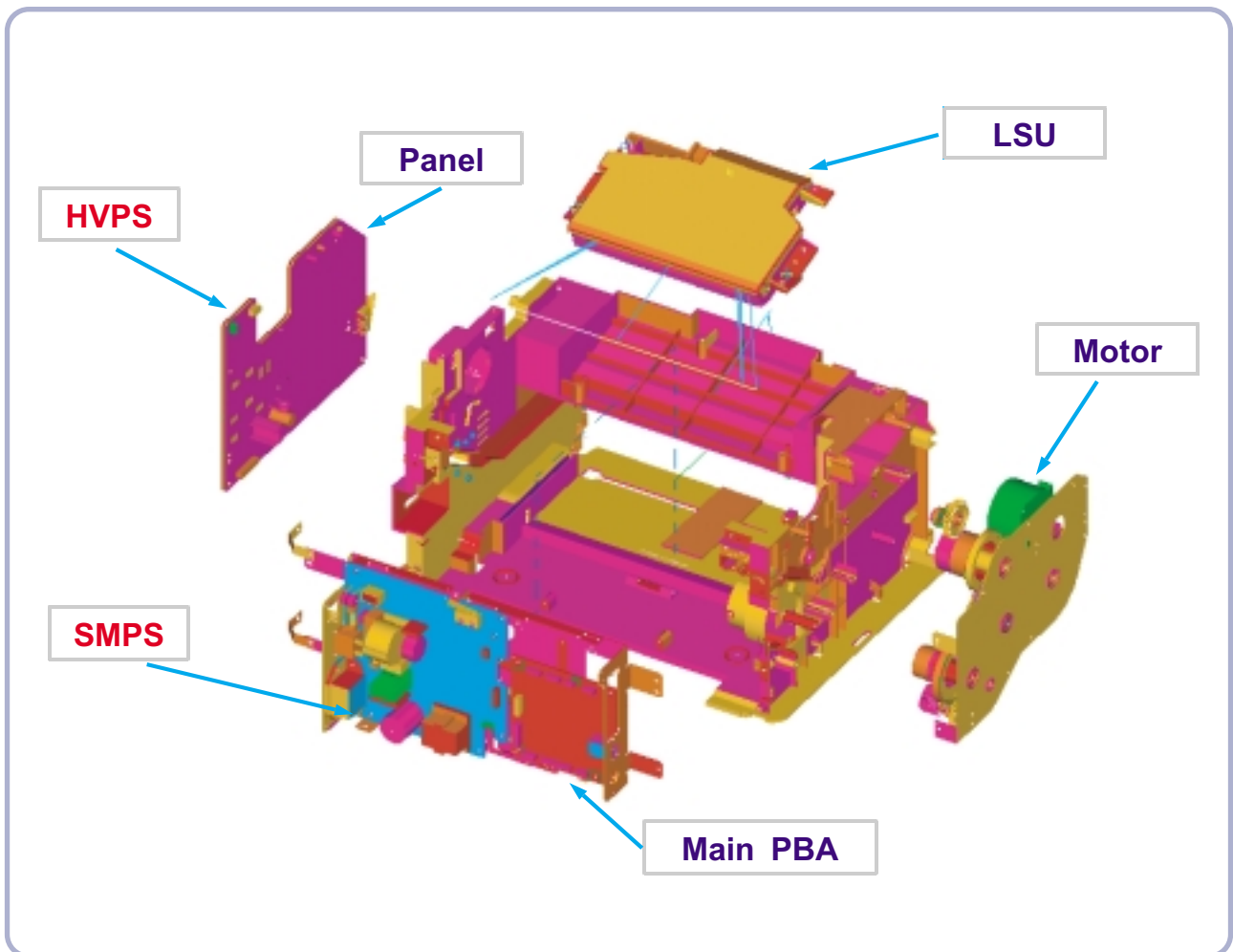
KNOCK-UP PLATE

ASS'Y HOLDER PAD

支 MAIN PBA

支 HVPS

■ Unit Layout



3.1.1 Feeding

There are the C-path type, which loads papers, and the manual feeder, which supplies paper one by one. The cassette has the function pad which separates paper one by one, and it has the sensor function to check the existence of the loading paper.

- 1) Feeding Type : MPF Type
- 2) Feeding Standard : Center Loading
- 3) Feeding Qty : Cassette 150 sheets (75g/㎡, 20lb paper standard)
- 4) Manual 1 sheet (Paper, OHP, Envelope etc.)
- 5) Separating Type : Cassette - Friction Pad Type
- 6) Manual : None
- 7) Driver Type : Driving by Gearing from Main Motor
- 8) Pick_up Roller Driver : Solenoid
- 9) Paper detecting Sensor : Photo Sensor
- 10) Paper Size Sensor : None
- 11) Paper Exit Type : Face Down

3.1.2 Transfer Ass'y

The transfer roller delivers the toner of the OPC drum to the paper.

- The life span : Print over 50,000 sheets (in 16 ~30℃)

3.1.3 Driver Ass'y

It is a power delivery unit by gearing. By driving the motor, it supplies the power to the feeding unit, the fusing unit, and the distributing unit. (Motor drive IC : A3977)

- It is a power delivery unit by gearing : Feeder/Developer ← Motor → Fuser/Exit

3.1.4 FUSER

The fuser is consisted of the Heat Lamp, Heat Roller, Pressure Roller, Thermister and Thermostat. It adheres the toner on the paper with pressure and heat to complete the printing job.

- Life Cycle : 50K(pages)

1) Heat Lamp

- . Heat Lamp Terminal Shape : Terminal Single Type
- . Voltage 120 V : 115 + /- 5 %
220 V : 230 + /- 5 %
- . Capacity : 600 Watt + /- 30 W
- . Life : 3000 Hr

2) Thermostat

- . Thermostat Type : Non-Contact type THERMOSTAT
- . Control Temperature : 150°C ± 5°C

3) Thermistor

- . Thermistor Type : HF-R0060 (SEMITEC 364FL Type)
- . Temperature Resistance : 7 k Ω (180°C)
- . SYSTEM Temperature SETTING
 - Stand by : 165 + /- 5°C
 - Printing : 175 + /- 5°C (5 minutes before)
170°C + /- 5°C (5 minutes after)
 - Overshoot : 200°C or less
 - Overheat : 210°C or less

4) Heat roller

- . Length : 254 mm
- . Valid length : 222 mm
- . GND Type : H/R Bearing Grounding type By SECC Fuser frame

5) Pressure roller

- . Shaft
 - Length : 239.5 mm
- . Rubber
 - Length : 222 mm

6) Paper separation method

Teflon Coating with SUS Plate Claw System

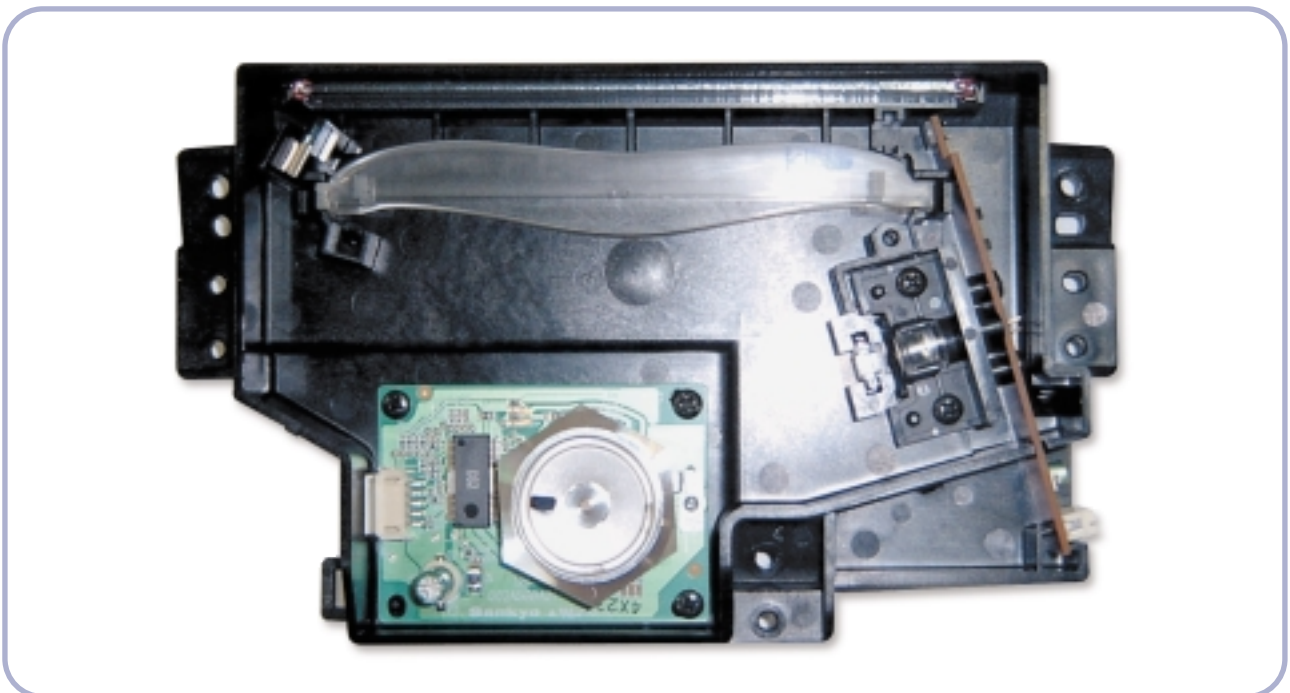
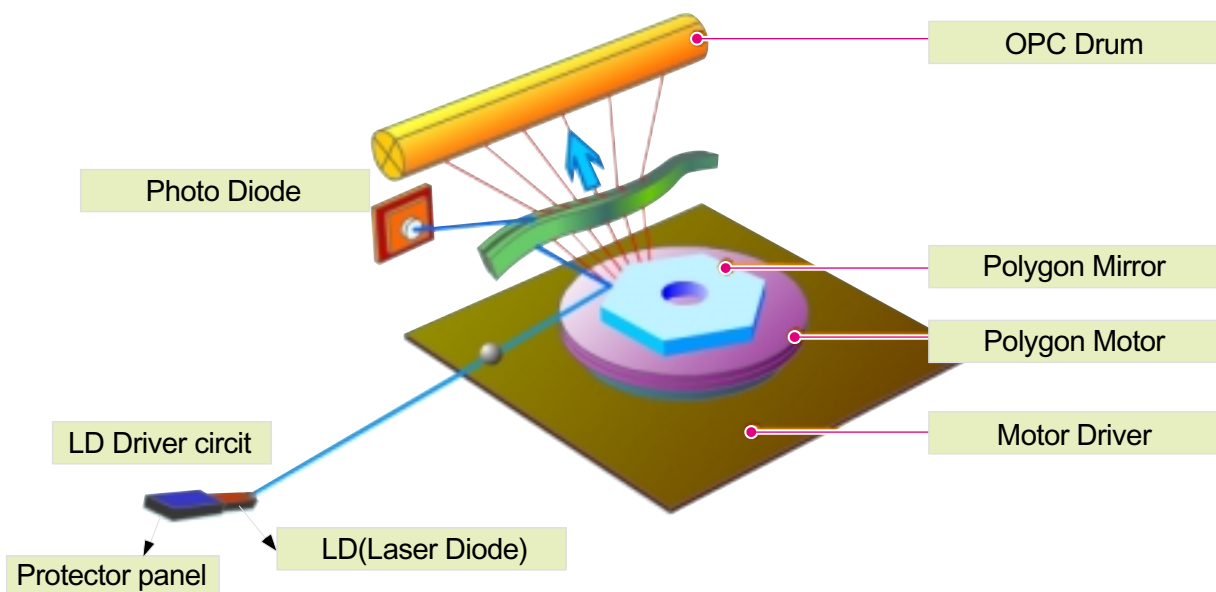
7) Safety Relevant Facts

- . Protecting device when overheating
 - 1st protecting device : H/W cuts off when detecting an overheating
 - 2st protecting device : S/W cuts off when detecting overheating
 - 3st protecting device : Thermostat cuts off the power
- . Safety device
 - The power of Fuser is cut-off after front cover is open.
 - The overheating safety device for customer
 - The surface temperature of the Fuser Cover is under 80°C

3.1.5 LSU (Laser Scanner Unit)

The LSU unit is controlled by video controller. It scans the video data received from video controller with laser beam by using the rotation principle of the polygon mirror to create the latent image on the OPC drum. It is the core part of LBP.

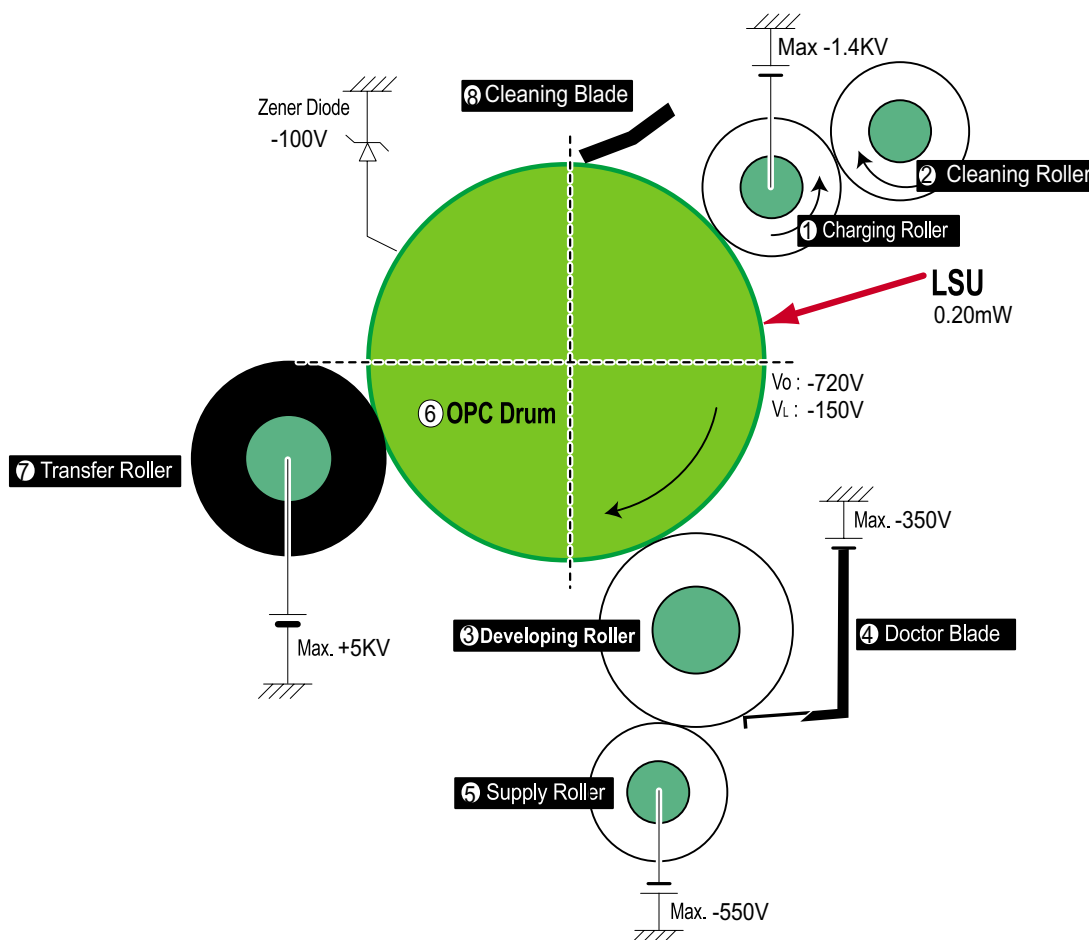
The OPC drum rotates as the same speed as the paper feeding speed. It creates the /HSYNC signal and sends it to the engine when the laser beam of the LSU reaches the end of the polygon mirror, and the engine detects the /HSYNC signal to arrange the vertical line of the image on the paper. After detecting the /HSYNC signal, the image data is sent to the LSU to arrange the its margin on the paper. The one side of the polygon mirror is one line for scanning..



3.1.6 Toner Cartridge

By using the electronic photo process, it creates a visual image. In the toner cartridge, the OPC unit and the developer unit are in a body. The OPC unit has OPC drum and charging roller, and the developer unit has toner, toner cartridge, supply roller, developing roller, and blade (Doctor blade)

- Developing Method: Non magnetic 1 element contacting method
- Toner: Non magnetic 1 element shatter type toner
- The life span of toner: 2,000 sheets (ISO 19752 Pattern/A4 standard)
- Toner Cartridge : Initial(1,000), Sales(2,000)
- Toner remaining amount detecting sensor: None
- OPC Cleaning: Collect the toner by using electric static + FILM OPC
- Management of disusable toner: Collect the toner by using electric static (Clenerless Type- No disusable toner)
- OPC Drum protecting Shutter: None
- Classifying device for toner cartridge: ID is classified by interruption of the frame channel.



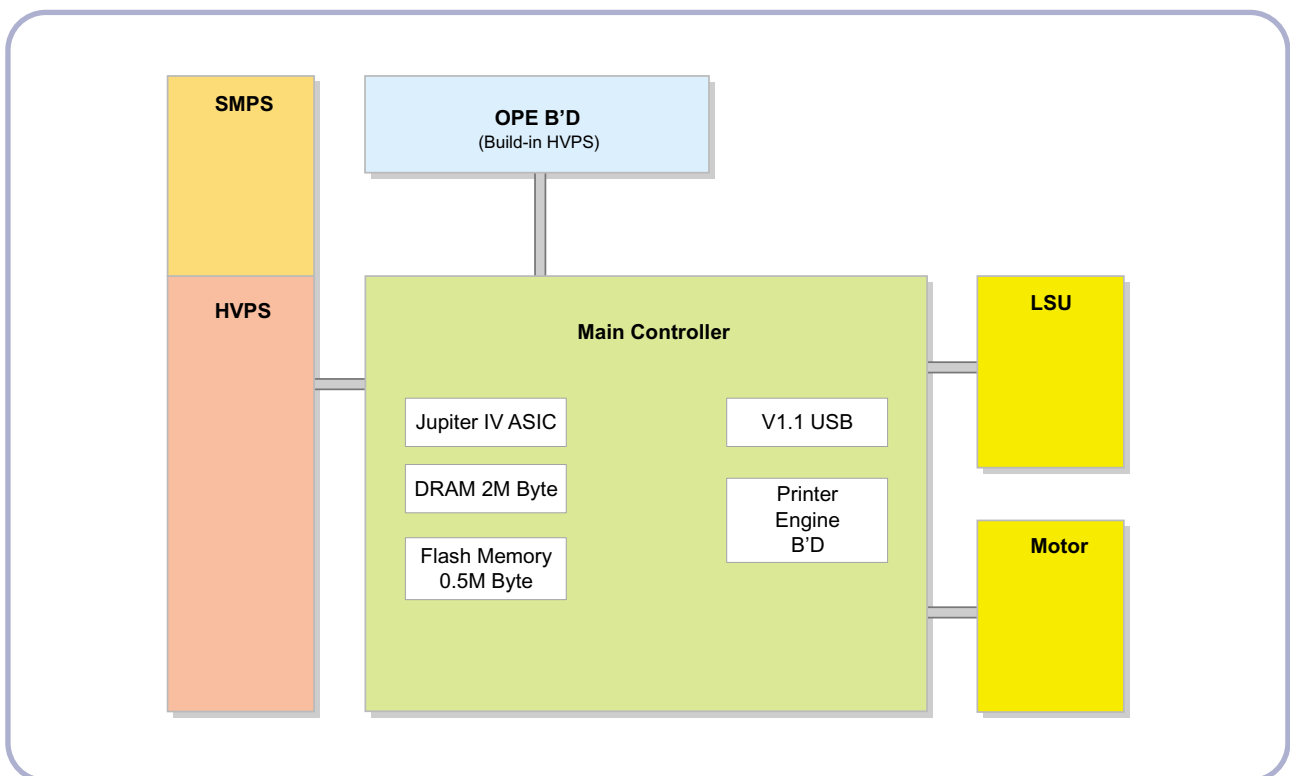
3.2 H/W Structure and Descriptions

3.2.1 H/W Overview

ML-1610 is roughly made up Main Control part and SMPS/HVPS part.

Main Controller uses Jupiter4E for its ASIC, which is on chip micro controller and developed for Low-end Laser Beam Printer.

Jupiter4E provides the integrated printing functions such as Printer video controller, Laser Scan Unit controller, PWM controller and Bi-polar Stepper Motor Controller and has USB interface and built-in Flash memory with 4Mbits capacity.



3.2.1.1. Main Control

ML-1610 of Main Control are composed of CPU and Print and operate follows function by CPU

- Bus Control, I/o
- Handling, each Driver and PC Interface

Main Control operate its full function on the Main B'd and CPU control Controller ASIC and build-in Memory.

3.2.1.2 CPU

Use 32Bit RISC Processor of Jupiter4e, and control system by operating Operation Block of the System Program inside Flash Memory.

- Main Function Block:
 - Completely Integrated System for Embedded Applications,
 - 32 Bit Risc Architecture, Efficient and Powerful ARM9 CPU
 - LSU Interface Module for Interfacing PVC with LSU
 - 2 Channel General Purpose DMA Controller for High Speed I/O
 - Dual Memory Bus Architecture
- Operation Frequency : 150MHz
- Operation Voltage : 3.3V
- POWER ON RESET TIME : 6.6ms below

3.2.1.3 Flash Memory

Store System Program and can be down load System Program through PC Interface

- Capacity : 0.5M Byte
- Access Time : 70 nsec

3.2.1.4 DRAM

When Printing, use Band Buffer, System Working Memory Area .

- 2M capa : 2M Byte basic.
- 2M :Printing System Working Memory Area
- Access Time : 60 nsec

3.2.1.5 ENGINE

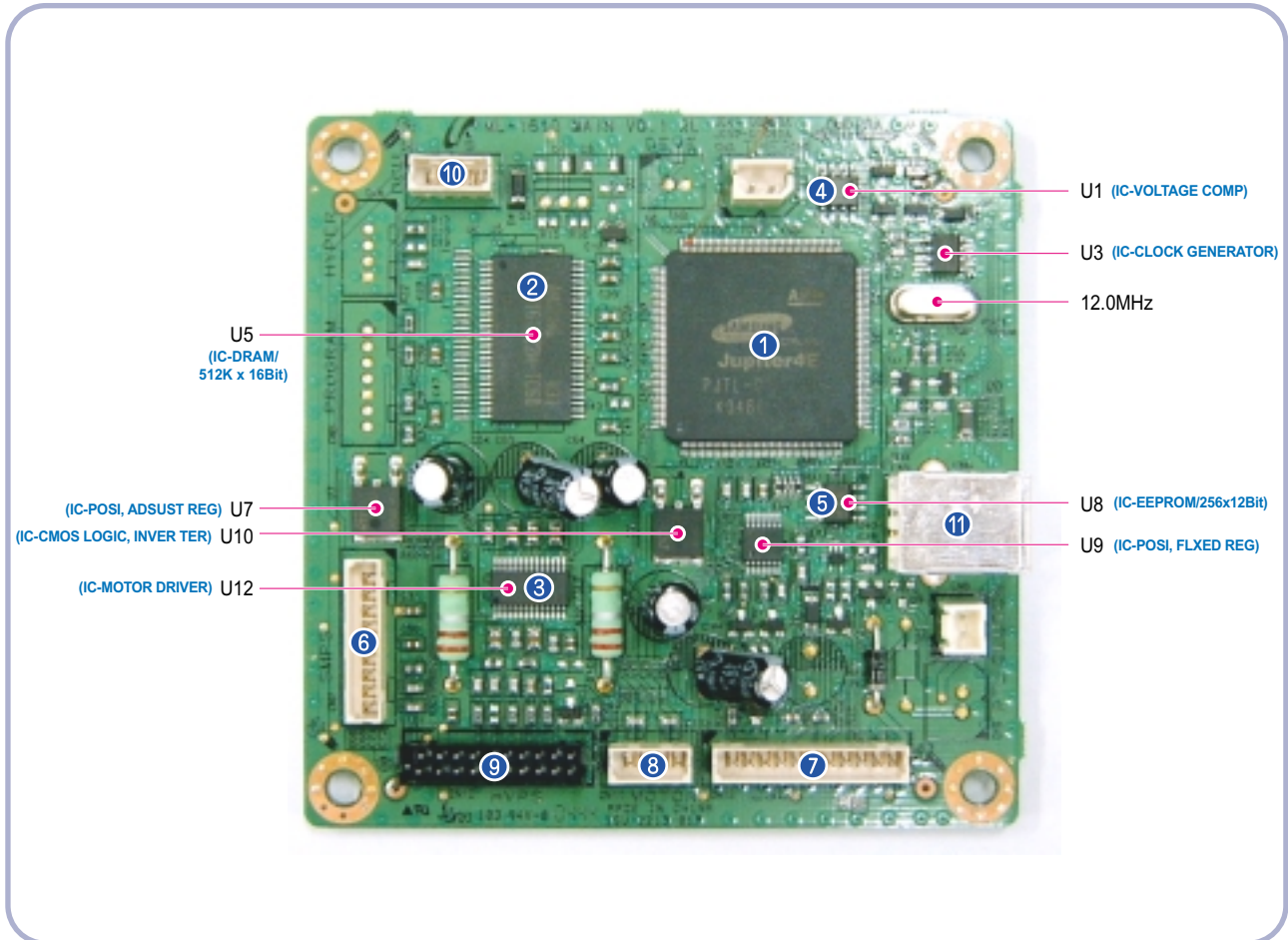
This recording method is electrophography method using LSU, which toner is composed of 1 component and non magnetic.

- 1) Recording Method : LSU(Laser Scanning Unit)
- 2) Printing Speed :16ppm
(In continuing printing base A4, printing pages from 2nd to last during 1min)
- 3) Recording Density : 600 dpi
- 4) Cassette Capa. : Cassette ; 150sheets(75g m² Base),
Manual : N/A((DRIVE Selection : Paper, OHP, Envelop - 1 sheet)
- 5) Paper Size : Cassette ,Manual; Width = 76 ~ 216mm, Length = 125mm ~ 356mm
- 6) Effective recording size
 - A4 : 202 x 291 mm
 - Letter : 208 x 273 mm
 - Legal : 208 x 350 mm
 - Folio : 208 x 325 mm
 - Top Margin : 4.23 ° ± 3 mm
 - Left, Right Margin : 4.23 ° ± 3 mm
- 7) CRU(Toner Cartridge)Life : 2,000pages Printing(A4, 5% Pattern Printing)
- 8) First Print Out Time : within 11sec(Standby)
- 9) Warming up time : within 30sec (Ambient : 25°C)

3.2.2 Main Board

Main Board are composed of Engine and Controller on the one-Board.

Main Board control to send Current Imagedml Video Data to LSU to print and have motor Driving and Circuit for the current driving and also include Paper Exit Sensor, Cover Open s/w, panel s/w.



- ① U6(Jupiter 4E)
 - It is a main CPU and an Asic of Jupiter4E which has a CPU core CLK with over 150MHz and a System bus 45MHz.
 - It use 3.3V for operation voltage and I/O, It uses 80MHz for system bus CLK, Built in Flash Memory.
- ② SDRAM
 - Main memory. SDCLK is 80Mhz.
- ③ A3977
 - It is an Main motor driver IC and controls the motion of main motor.
- ④ Regulator
 - It Supplies the core voltage to CPU by converting 3.3V to 1.3V.
- ⑤ EEPROM(U8 : 93C66)
 - It is an EEPROM with 12C method.
- ⑥ SMPS connector(CN8)
 - It connects SMPS, supplies the power, and delivers the high voltage contol signal, etc. If a harness is not normally connected to this connector, power cannot be supplied.
- ⑦ LSU connector(CN12)
 - It connects a LSU.
- ⑧ DC Motor connector(CN11)
 - It connects an main motor and drive a DC motor.
- ⑨ HVPS connector(CN10)
 - It connects a HVPS.
- ⑩ DCU connector(CN1)
 - It interface a DCU-JIG .
- ⑪ USB connector(CN6)
 - It interface a the printer.

3.2.3 Asic(SPGPm) Specification

3.2.3.1 Introduction

Jupiter4E is One-Chip micro-Controller for Low cost Laser beam Printer.

1. One Chip Laser Beam Printer Controller

- GDI only
- AMBA AHB used for high speed bus transactions between masters and slaves
- AMBA APB used for low speed bus transactions between ARM core and peripherals
- 3 PLLs (2 Dithered PLL and 1 General PLL)
 - first for CPU(150MHz), AHB(75MHz), APB(75MHz),
 - second for USB(48MHz)
 - third for PVC(59MHz)
- 75MHz system operation
- 1.8V power operation
- 3.3V tolerant input and bi-directional I/Os
- SDRAM and IO Address / Data signals multiplexing

2. Integrated ARM940T 32-bit RISC embedded processor core

- 75MHz core frequency operation
- Harvard Architecture Cache : 4KByte Instruction cache, 4KByte Data cache
- Single memory bus architecture

3. Built in Flash Memory

- 4Mbits (128Kx32bits)
- Serial programming mode using flash programmer tool
- Internally flash memory read / write operation support
- Programmable access timing control

4. 32MB Special function Register Area

5. Directly connected to 3 external IO banks (IOC)

- 32 MB size in each IO bank
- Programmable setup, access, hold timing
- Programmable recovery time for slow devices
- Allows to access peripheral devices such as GPIO control logic

6. Directly connected to 1 external ROM bank (ROMC)

- 32 MB size for one ROM bank
- One external flash memory attachable.

7. Directly connected to two SDRAM banks (SDRAMC)

- Extensible architecture
- Two external SDRAM attachable.
- SDRAM controller supports PC-100 and PC-133 SDRAM running at 75MHz
- Up to 32MB per bank.
- Support for SDRAM configurations including programmable column address
- Programmable refresh interval

8. Interrupt Controller (INTC)

- FIQ or IRQ mode operation selectable
- Programmable Interrupt Enable/Disable

9. USB interface

- Version 1.1
- Four 128x8 FIFOs for Data transmission.
- Interrupt based input / output interface, no DMA based interface support
- USB wrapper for AHB interface
- AHB Bus interface

10. Serial port interface (UART)

- Programmable Baud Rate
- 2 channel Independent Full Duplex UART
- Polling, Interrupt based operation support
- Max 16 byte FIFO to handle SIR Bit Rate Speed

11. Printer video controller for LBP engines (PVC)

- 20MHz video rate (Hummingbird 2 : letter - 21 ppm, A4 : 20ppm)
- video data transmitted through LSU Controller

12. Laser Scan Unit (LSU) Controller

- Laser Scan Unit (LSU) Interface for Laser Diode turn on/off timing control
- Sample & hold period generation.
- Auto Power Control for Laser Diode with PID control method using internal 10 bits DAC.
- LSU clock generation
- Brushless DC motor control clock generation

13. ADC Interface

- 4 channels ADC interface for analog devices such as temperature sensor.
- Programmable ADC Clock Cycle.
- Automatic or Manual AD Conversion support.
- 4 Special Function Registers for monitoring the ADC results for 4 channels.

14. PWM Controller

- 4 PWM output ports - THV, BIAS, FAN control and AC ELECTRIFICATION

15. Bi-polar Stepper Motor controller (MOTORC)

- Phase generation for the purpose of paper feeding
- fixed hardware phase and current table
- programmable phase and interval time
- Interrupt based phase change operation

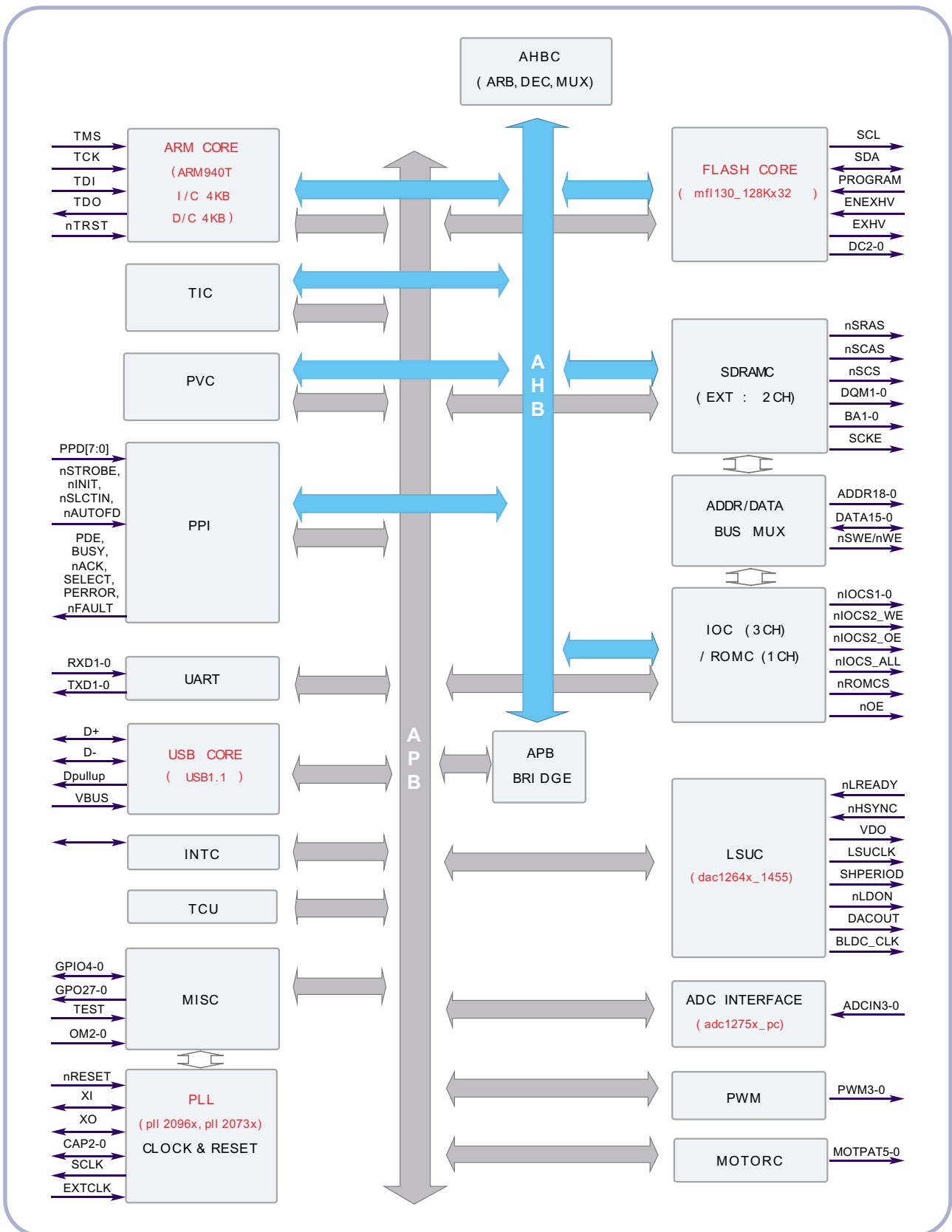
16. Timer

- 3 Independent Programmable Timers
- Watch Dog Timer for S/W Trap

17. Miscellaneous

- Mux controlled 24 GPI, 28 GPO & 5 GPIO ports .
- Mutual exclusive GPO/GPIO ports control by the port control enable register
- Programmable Bus Master Priority.
- Project code added.

3.2.3.2 Jupiter4E Internal Block Diagram



3.2.4 Sensor Controller

3.2.4.1 Paper Feeding/Width

When a paper passes an actuator of a feed sensor unit after feeding a paper into a set, it detects a signal of the photo interrupter and informs the paper feeding status to CPU. After sensing the signal and certain time later, it stores an image data. (Related in Paper Front Edge Adjustment)

If it could not detect the feed sensor within 1 second after feeding a paper, a paper jam0 (CPU#_) occurs. ML-1610 differs from other general printers because it doesn't have a paper empty sensor. It recognizes the paper existing status by using a firmware. If a paper is not fed, it recognizes the state as no paper (Red and Yellow lights turn on among other LEDs). With the same principle, it senses the OPC unit. After OPC unit is mounted, the actuator operates. When it passes the actuator of sensor unit, it detects the signal of the photo interrupter, informs the existing OPC unit to CPU, and then stays at the status.

3.2.4.2 Paper Empty Sensing

The paper empty is detected by the empty sensor mounted to an engine board and the actuator mounted to a frame. Paper senses the on/off time of the empty sensor by using CPU and informs the normal operation status and the jam occurrence status to CPU.

3.2.4.3 Jam Cover/Cover Open Sensing

ML-1610 uses two M/S: one senses the cover open and the other senses the jam cover open.

The cover open sensor is located on the left bottom of HVPS. When the front cover is open, +24V supplied to each unit (DC fan, Solenoid, Main Motor, Polygon Motor Unit of LSU in Fusing Unit, and HVPS) is interrupted.

The jam cover open sensor is located on the left bottom of SMPS. When the jam cover is open, +24V supplied to each unit (DC fan, Solenoid, Main Motor, Polygon Motor Unit of LSU in Fusing Unit, and HVPS) is interrupted.

D0 bit of CPU detects the jam cover open/cover open, and D7 bit of CPU detects the existence of OPC. In this case, it informs the status to user by turning on the red LED among OP panel LEDs.

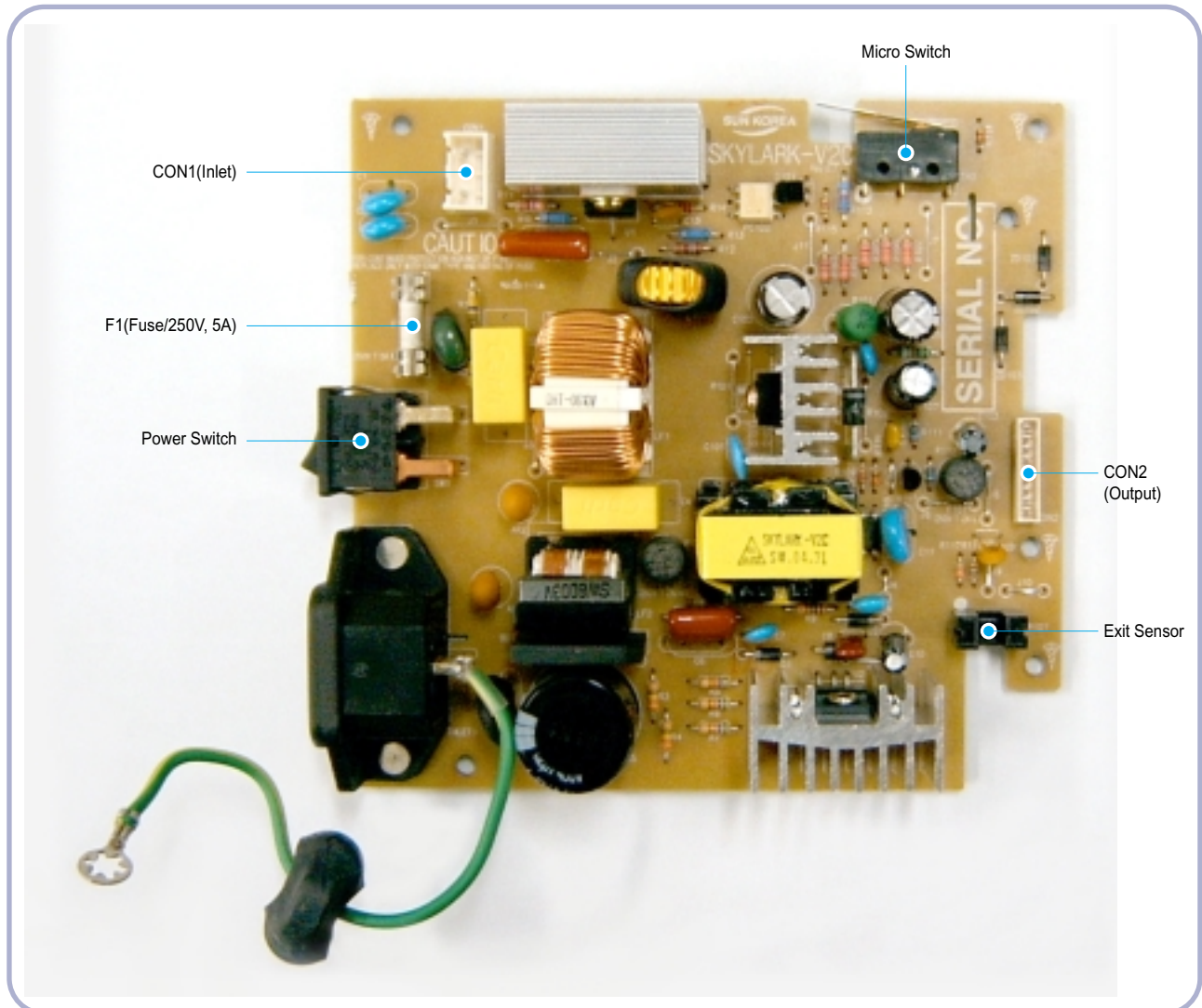
3.2.4.4 Solenoid Driving Circuit

The solenoid consists of two used for paper pick-up and MP signal. D4 bit of CPU turns it on/off, and its driving time is 300ms. The diode protects the drive TR from the pulse (noise) generated by de-energizing operation of solenoid.

3.2.5 SMPS board (Switching Module Power Supply)

The SMPS supplies DC Power to the System.

It takes 110V/220V and outputs the +5V, +24V to supply the power to the main board and other board. It is consisted of the AMPS part, which supplies the DC power for driving the system, and the AC heater control part, which supplies the power to fuser. SMPS has two output channels. Which are 5V and +24V



Pin Signal

<CON2>		Pin No	Pin Name
		1	+24VS2
		2	+24V
		3	+24VS1
		4	+24VS1
		5	+5V
		6	DGND
		7	DGND
		8	P_REGI
		9	FUSER ON

1) SMPS Specification

- AC Input

- ① Input Rated Voltage : AC 220V ~ 240V AC 120V / AC 220V(EXP version)
- ② Input Voltage fluctuating range : AC 90V ~ 135V / AC 180V ~ 270V(EXP version)
- ③ Rated Frequency : 50/60 Hz
- ④ Frequency Fluctuating range : 47 ~ 63 Hz
- ⑤ Input Current : Under 4.0Arms / 2.5Arms
(But, the status when lamp is off or rated voltage is inputted/outputted)

- Rated Output Power

No	Items	CH1	CH2	Remarks
1	Channel	+5V	+24.0V	
2	Connector pin	CON 3 5V PIN : 11, 12 GND PIN : 8, 9	CON 3 24V PIN : 2, 3, 4 GND PIN : 6, 7	
3	Rated Output	+5V \pm 5% (4.75 ~ 5.25V)	+24V \pm 15% (20.4 ~ 27.6V)	
4	Max. Output current	0.8A	1.5A	
5	Peak Loading current	1.0A	2.0A	1ms
6	RIPPLE NOISE Voltage	100mVp-p or less	500mVp-p or less	
7	Maximum output	4W	36W	
8	Peak output	5W	48W	1ms
9	Protection for loading shorage and overflowing current			

- Consumption Power

No	Items	CH1(+5V)	CH2(+24V)	System
1	Stand-by	1.0 A	0.4 A	AVG : 55 Wh
2	PRINTING	1.0 A	2.0 A	AVG : 250 Wh
3	Sleep-Mode	0.8 A	0.4 A	AVG : 10 Wh

- Power Cord Length : 1830° \pm 50mm

- Power Cord Switch : Use

- Feature

- . Insulating Resistance : 100M Ω or more (at DC 500V)
- . Insulating revisiting pressure : Must be no problem within 1 min. (at 1000Vac,10mA)
- . Leaking Current : under 3.5mA
- . Running Current : under 40A PEAK (AT 25°C, COLD START)
under 50A PEAK (In other conditions)
- . Rising Time : within 2Sec
- . Falling Time : over 20ms
- . Surge : Ring Wave 6KV-500A (Normal, Common)

- Environment Condition
 - . Operating temperature range : 0°C ~ 40°C
 - . Maintaining temperature range : -20°C ~ 40°C
 - . Preserving Humidity Condition : 10% ~ 90% RH
 - . Operating atmospheric pressure range : 1atm
- EMI Requirement : CISPR ,FCC, CE, MIC,
- Safty Requirement : IEC950 UL1950, CSA950, C-UL, Semko, EK,CB,
CCC(CCIB),GOST, EPA, Power Save

3.2.6 HVPS board (High Voltage Power Supply)

The HVPS board creates the high voltage of THV/MHV/Supply/Dev and supplies it to the developer part for making best condition to display the image. The HVPS part takes the 24V and outputs the high voltage for THV/MHV/BIAS, and the outputted high voltage is supplied to the toner, OPC cartridge, and transfer roller.

1) Transfer High Voltage (THV+)

- Input Voltage : 24 V DC $\pm 15\%$
- Out Voltage : Max. +1.3KV $\pm 15\%$ (Cleaning, 200 M Ω)
- Out Voltage Trigger : 6.5 μ A
- Input Voltage Variation : $\pm 5\%$ below (Variation 21.6V \neq 26.4V)
Load Variation : \pm % below
- Out Voltage Rising Time : 100 ms Max
- Out Voltage Falling Time : 100 ms Max
- Transfer Variation Voltage on Environment Variation : +650 V (Duty 10%) ~ 5KV (Duty 90%)
- Control Method on environment : THV-PWM ACTIVE, transfer Active signal, of environment sensing voltage is input and get feed back current, and recalculate it to resistance .
- Control method on transfer output voltage : It is controlled by changing its duty of THVPWM Signal as follows. 10% Duty : +650V, 90% Duty : +5KV $\pm 5\%$

2) Charge Voltage (MHV)

- Input Voltage : 24 V DC $\pm 15\%$
- Out Voltage : -1.3KV ~ $\pm 3.2\%$
- Out Voltage Rising Time : 50 ms Max
- Out Voltage Falling Time : 50 ms Max
- Out Voltage Range : 30 M Ω ~ 1000 M Ω
- Output Control Signal (MHV-PWM) : CPU is HV output when PWM is Low

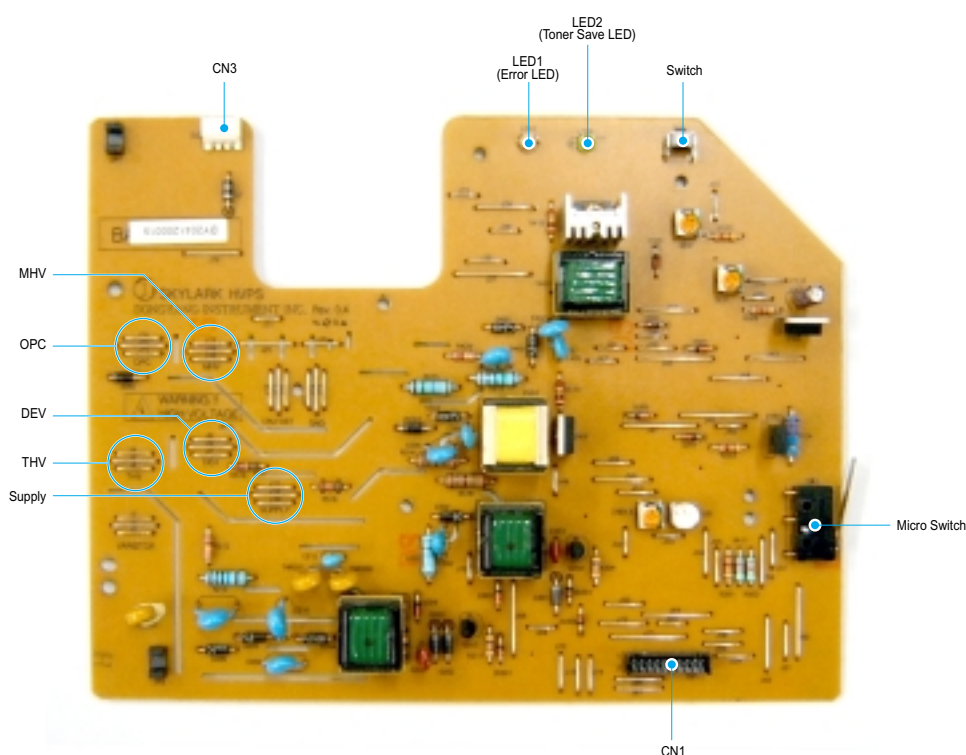
3) Developing Voltage (DEV)

- Input Voltage : 24 V DC $\pm 15\%$
- Output Voltage: -350V $\pm 4.6\%$
- Output Voltage Fluctuation range: PWM Control
- Input contrast of the output stability degree : $\pm 5\%$ or less
- Loading contrast : $\pm 5\%$ or less
- Output Voltage Rising Time : 50 ms Max

- Output Voltage Falling Time : 50 ms Max
- Output Loading range : 10M Ω ~ 1000 M Ω
- Output Control Signal (BIAS-PWM) : the CPU output is HV output when PWM is low.

4) Supply

- Output Voltage : -550 V \pm 8.6%(ZENER using, DEV)
- Input contrast of the output stability degree : under \pm 5 %
- Loading contrast : \pm 5 % or less
- Output Voltage Rising Time : 50 ms Max
- Output Voltage Falling Time : 50 ms Max
- Output Loading range : 10 M Ω ~ 1000 M Ω
- Output Control Signal (BIAS-PWM) : the CPU is HV output when PWM is low.



Input

Pin NO	Signal Name	Remark	Pin NO	Signal Name	Remark
1	+24VS		2	+24VS	
3	+24VS2		4	+24VS2	
5	+3.3V		6	DGND	
7	+5V		8	P_EXIT	
9	THV_PWM		10	THV_EN	
11	MHV_PWM		12	THV_READ	
13	BIAS-PWM		14	FAN	
15	P_EMPTY		16	CRU_DET	
17	KEY_IN		18	TONER_SAVE	
19	ERROR		20	READY	

3.2.7 FUSER AC POWER CONTROL

Fuser(HEAT LAMP) gets heat from AC power. The AV power controls the switch with the Triac, a semiconductor switch. The 'ON/OFF control' is operated when the gate of the Triac is turned on/off by Phototriac (insulating part).

In other words, the AC control part is passive circuit, so it turns the heater on/off with taking signal from engine control part.

When the 'HEATER ON' signal is turned on at engine, the LED of PC1 (Photo Triac) takes the voltage and flashes. From the flashing light, the Triac part (light receiving part) takes the voltage, and the voltage is supplied to the gate of Triac and flows into the Triac. As a result, the AC current flows in the heat lamp, and heat is occurred.

On the other hand, when the signal is off, the PC1 is off, the voltage is cut off at the gate of Triac, the Triac becomes off, and then the heat lamp is turned off.

- 1) Triac (THY1) feature :16A, 600V SWITCHING
- 2) Phototriac Coupler (PC3)
 - . Turn On If Current : 16mA
 - . High Repetive Peak Off State Voltage : Min 600V

3.3 S/W Structure and Descriptions

The purpose of this document is to describe the design specification of the Engine Control F/W for the ML-1610.

3.3.1 Introduction

This Engine Control Firmware is a program that controls LBP Engine of the ML-1610.

This firmware is executed every 10msec as an interrupt routine of the main system. At stand-by state, this firmware monitors the enable print command from the main system. If the enable print command is detected, this firmware controls the Engine Mechanism according to the printing process and paper feeding state. And with the Sleep command or Wake-Up command, this firmware controls the Engine state.

3.3.2 Engine Control F/W Overview

Engine Control F/W is executed every 10msec by timer interrupt of main system. And it consists of 3 control modules.

- Engine Main Control, Interface Control and Sensing & Unit Control Module.

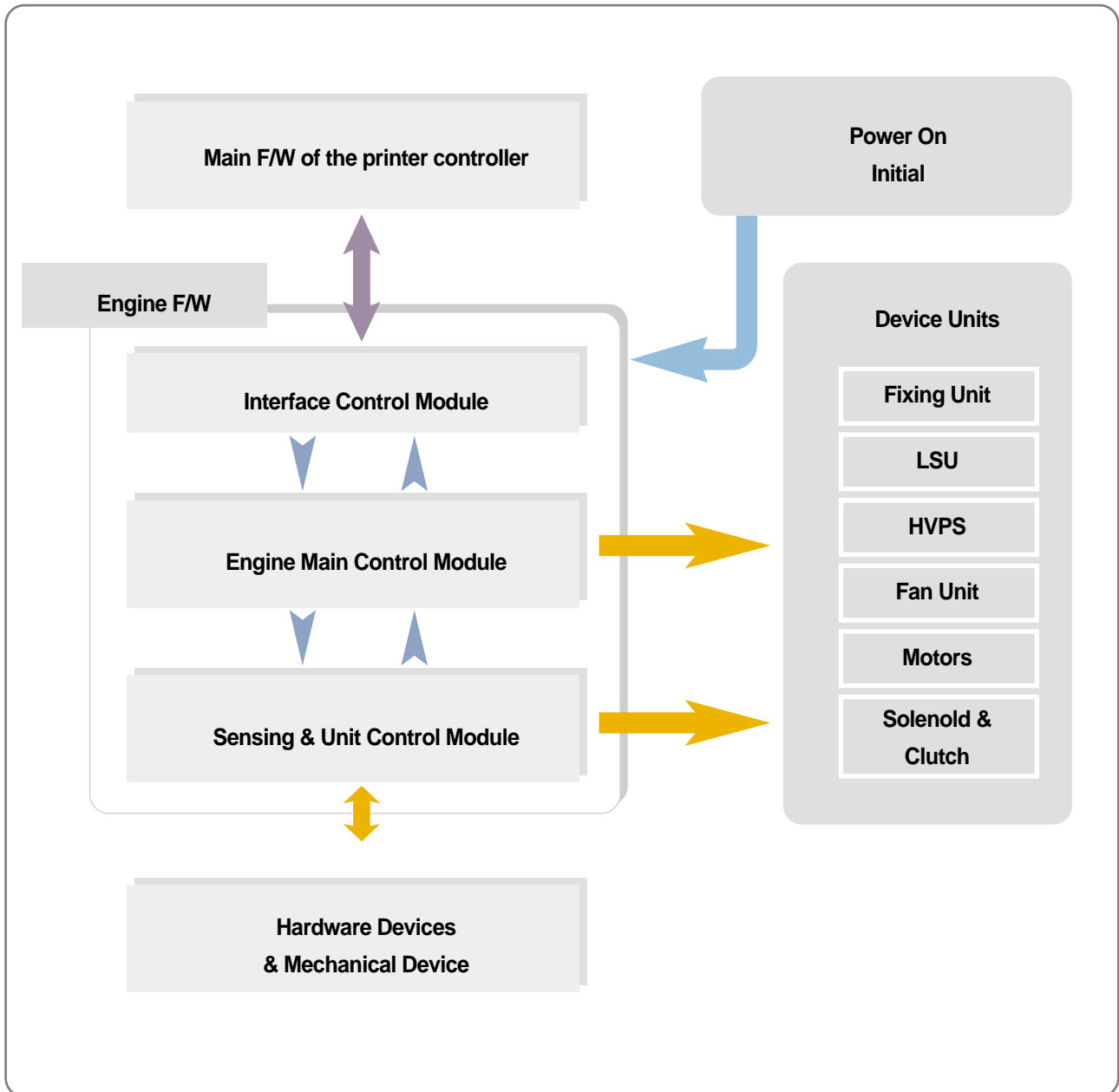
Major operations of the Engine Control F/W are following.

- Control the Pick-Up, Feeding and Discharging of Paper
- Control the LSU
- Control the HVPS for the Developer Process
- Control the Temperature of Fixing unit

Controlling selection to here is added.

- Second Cassette Feeder(SCF) : N/A

- Architecture of Engine Control F/W



3.3.3 F/W Architecture of Engine Control Firmware

- The Engine Control Module is executed every 10msec as interrupt job of main system. There are three control modules, i.e., Engine Main Control Module, Engine Interface Module and Sensing & Unit Control Module.
- Probably from usual state it will be able to rehabilitated a prior to entry error state in error condition it is to confirm. When the if rehabilitation is possible then after rehabilitating it goes back in usual state, else with an error condition it goes in error state. Currently the rehabilitation function of the low heat error , the over heat error and the LSU error is embodied.
- Low Heat Error
When the error occurs, it does not indicate an error. It stores the present temperature and supplies the heat to the fixing unit during the scheduled time. If the temperature goes up after scheduled time, it goes back to a normal state. However, if not, it is formed that an error occurs.
- Over Heat Error
When the error occurs, it informs an error first. It stores the present temperature as well and waits a scheduled time. If the temperature goes down after scheduled time, then it goes back to a normal state. However, if not, it is formed that an error occurs.
- Lsu Error
When the error occurs, it does not indicate an error. It accomplishes printing only again. If even time when it judges an error, it informs an error. Concretely speaking, if the LReady or Hsync error happens, the paper exits out beforehand. And then the engine mode is changed to recovery mode and the engine informs the main system of the engine mode. And the engine checks the LSU error in itself. If the error doesn't happen, the printing job will be proceeding.

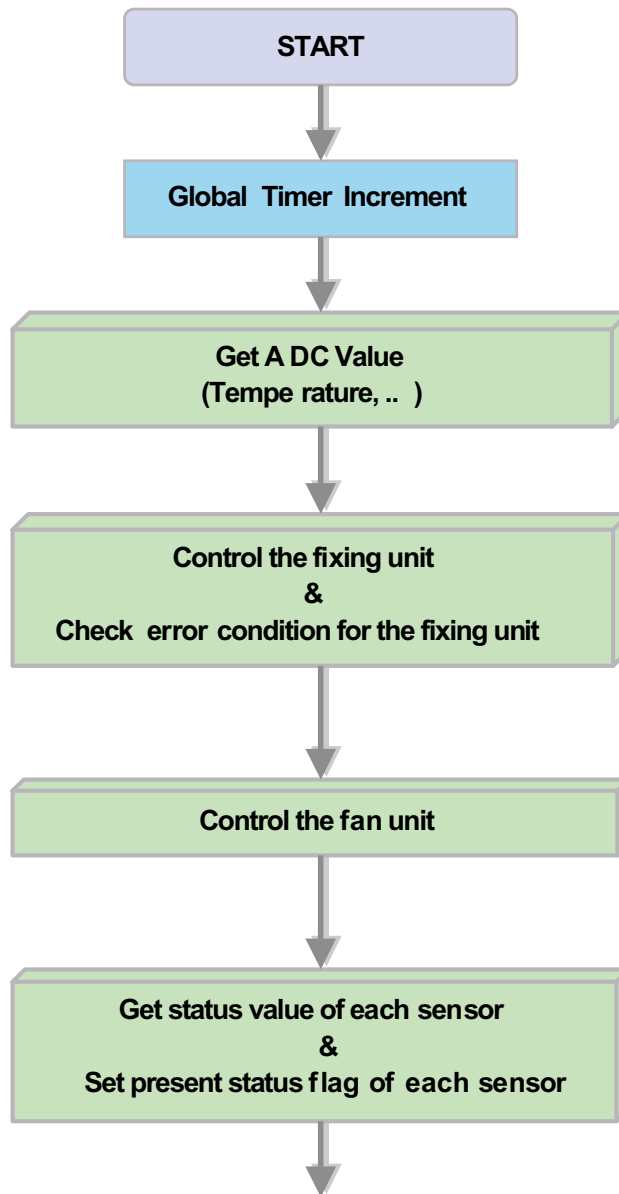
3.3.4 Engine Interface Module Design

Engine Interface Module communicates with the main system in order to receive the command from main system and to transmit the present engine status for the requested status. There are two sub functions. One is a function to receive the command from the main system. The other is a function that informs the main system of the current engine status for the requested item.

3.3.5 Engine Sensing & Unit Control Module Design

Engine Sensing & Unit Control Module consists of 4 sub-functions. The first function is an ADC function that reads the ADC values of the temperature of the fixing unit. The second one is a fixing unit control function. This function regulates the temperature of the fixing unit within a fixed range to be set by the paper type and the number of pages to print out. The third one is a fan control function that controls the fan unit. And the last one sets the flag that describes the present status of each sensor.

- F/W Architecture



3.3.6 LED Behaviors

Ready	LED Error	LED Toner Save	LED Status
ON	OFF	N/A	Ready to receive the data.
SLOW BLINK	OFF	N/A	Receiving the data from the host. In case that toner save mode is ON.
FAST BLINK	OFF	N/A	Printing the page. In case that toner save mode is ON.
N/D	N/D	N/D	Recovery mode
OFF	ON	N/A	Out of paper
BLINK	BLINK	BLINK	Service error (LSU or Fuser error)
N/A	N/A	ON	Toner save mode is ON
N/A	N/A	OFF	Toner save mode is OFF

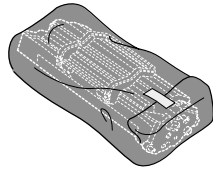
3.3.7 Error LED Operation

Error LED Operation		
All LEDs blink the each time interval.		
Service Error		LED operation
Fuser Error	Open Fuser Error	All LEDs (Toner save LED, Error LED) blink a time interval of 1 second.
	Low Heat Error	All LEDs (Toner save LED, Error LED) blink a time interval of 4 seconds.
	Over Heat Error	All LEDs (Toner save LED, Ready LED and Error LED) blink a time interval of 1 second.
LSU Error	LReady Error	All LEDs (Toner save LED, Ready LED) blink a time interval of 1 second.
	Hsync Error	All LEDs (Toner save LED, Ready LED) blink a time interval of 4 seconds.

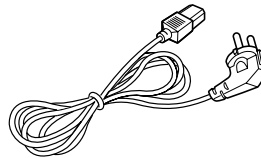
3.4 Initial Product Installation

3.4.1 Accessory List

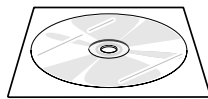
Remove the printer and all accessories from the packing carton. Make sure that the printer has been packed with the following items:



Toner Cartridge



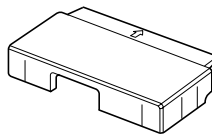
Power Cord



CD-ROM



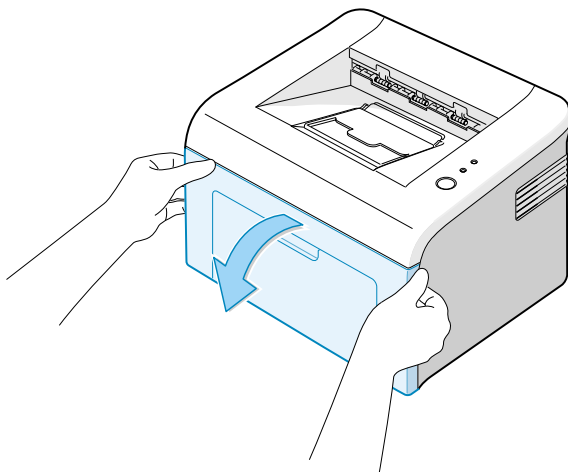
Quick Install Guide



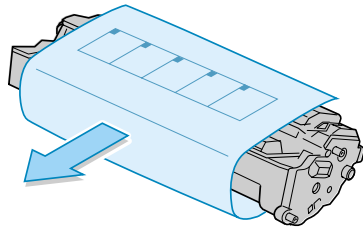
Paper Cover

3.4.2 Installing the Toner Cartridge

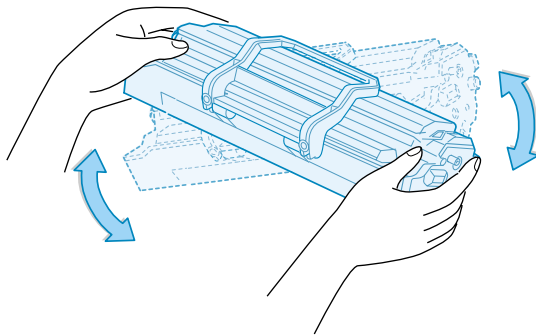
1. Grasp the front cover and pull it toward you to open.



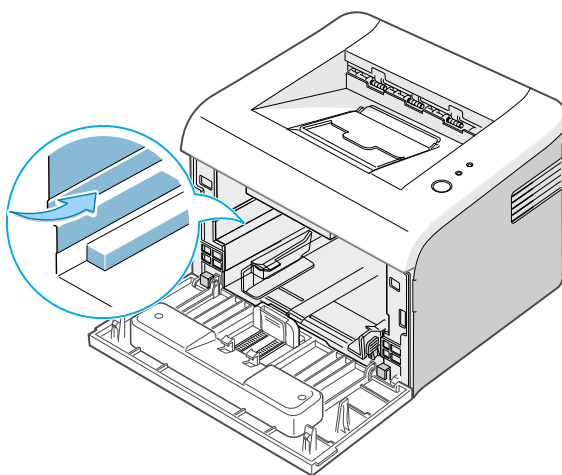
2. Remove the toner cartridge from its bag and remove the paper covering the cartridge.



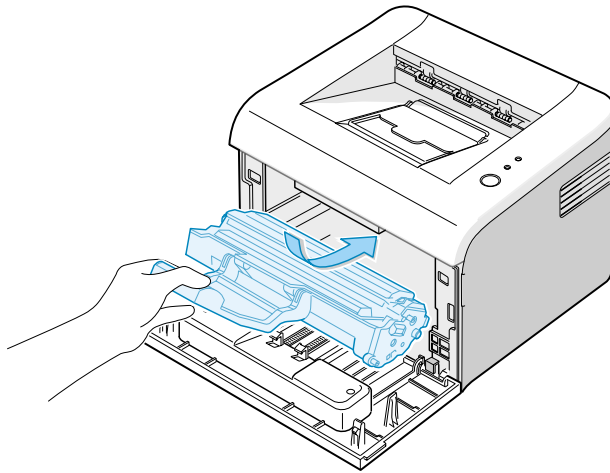
3. Gently shake the cartridge from side to side to distribute the toner evenly inside the cartridge.



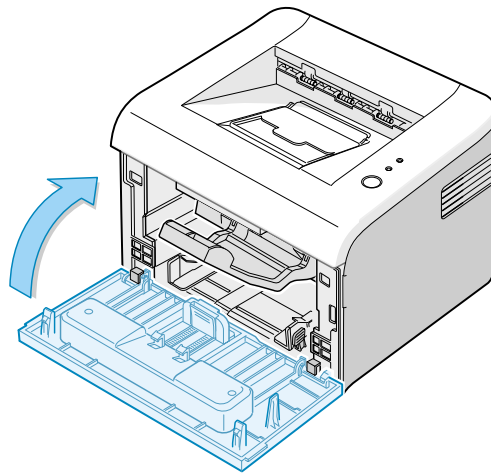
4. Locate the cartridge slots inside the printer, one on each side.



5. Unfold the toner cartridge handle and grasp it. Insert the cartridge in the printer until it snaps into place.



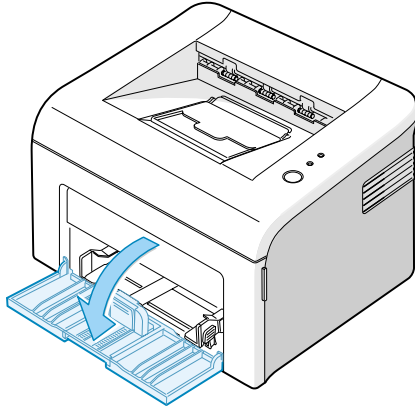
6. Close the front cover. Make sure that the cover is securely closed. If the cover is not firmly closed, printing errors may occur when you print.



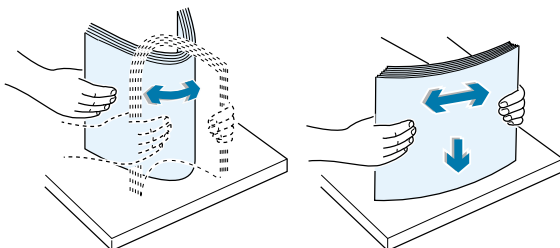
3.4.3 Loading Paper

You can load approximately 150 sheets of paper in the tray.

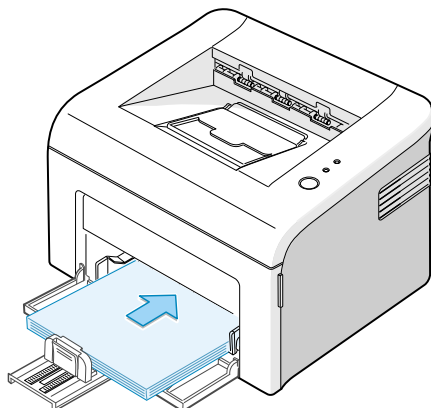
1. Grasp the paper input tray and pull it toward you to open.
Pinch the rear guide and pull it out to extend the tray.



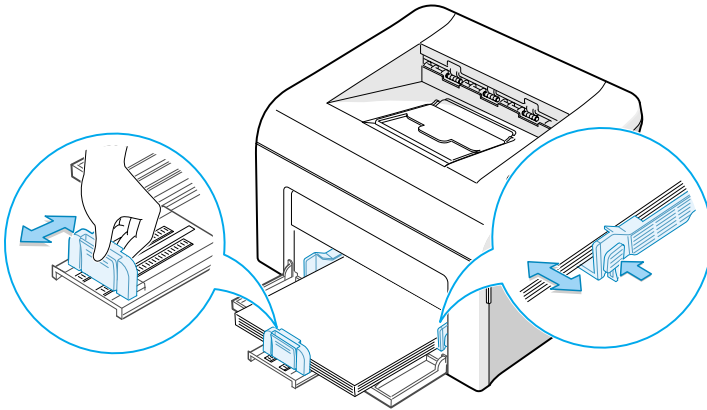
2. Prepare a stack of paper for loading by flexing or fanning them back and forth. Straighten the edges on a level surface.



3. Load paper with the print side facing up. Make sure that all four corners are flat in the tray.



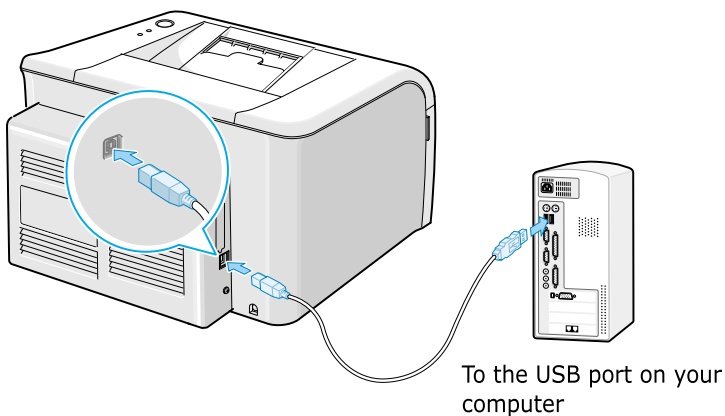
4. Pay attention not to overload paper. Paper overloading may cause paper jams.
5. If necessary, pinch the rear guide to adjust for the paper length and pinch the side guide and slide it to the left flush against the paper.



3.4.4 Connecting a Printer Cable

To print from your computer, you need to connect your printer to your computer with a Universal Serial Bus (USB) cable.

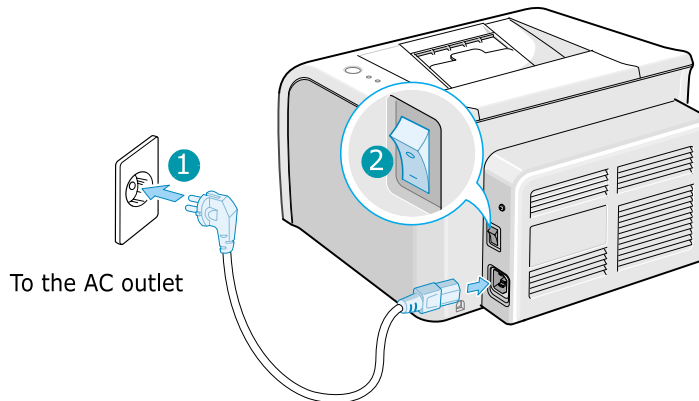
1. Make sure that both the printer and the computer are turned off.
2. Plug the USB printer cable into the connector on the back of the printer.



3. Connect the other end of the cable to the USB port on your computer.
See your computer User's Guide if you need help.

3.4.5 Turning the Printer on

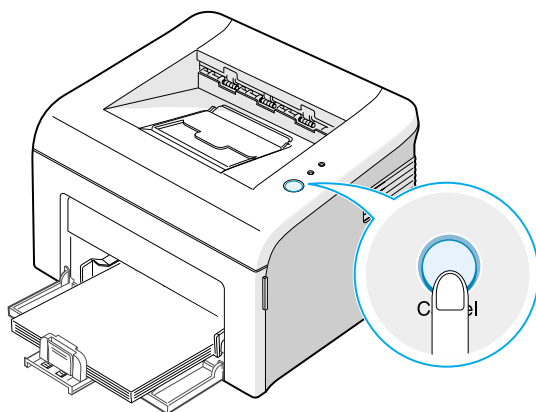
1. To print from your computer, you need to connect your printer to your computer with a Universal Serial Bus (USB) cable.
2. Plug the other end into a properly grounded AC outlet and turn on the printer using the power switch.



3.4.6 Printing a Demo Page

Print a demo page to make sure that the printer is operating correctly.

1. Press and hold down the Cancel button on the control panel for about 2 seconds to print a demo page.



2. The Demo page shows the printer's current configuration.

3.4.7 Installing Printer Software

The supplied CD-ROM contains Windows printing software, Linux printing software, on-line User's Guide and Acrobat Reader to view the User's Guide.

1. If you are printing from Windows

- You can install the following printer software using the CD-ROM.
 - Printer driver for Windows. Use this driver to take full advantage of your printer's features. For details, see Software User Guide.
 - Status Monitor allows you to see the printing status of the printer. For details, see Software User Guide.

2. If you are printing in Linux

- Go to Software User Guide for information about installing the Linux driver.

3. System Requirements

Your machine supports following operating system.

- Windows 98/Me/2000/XP - The following table shows Windows requirements.

Item	Requirements	
Operating System	Window 98/Me/2000/XP	
CPU	Window 98/Me/2000/XP	Pentium II 400 or higher
	Window XP	Pentium II 933 Ghz or higher
RAM	Window 98/Me/2000	64 MB or higher
	Window XP	128 MB or higher
Free Disk Space	Window 98/Me/2000	300 MB or higher
	Window XP	1 GB or higher
Internet Explorer	5.0 or higher	

4. Alignment and Adjustments

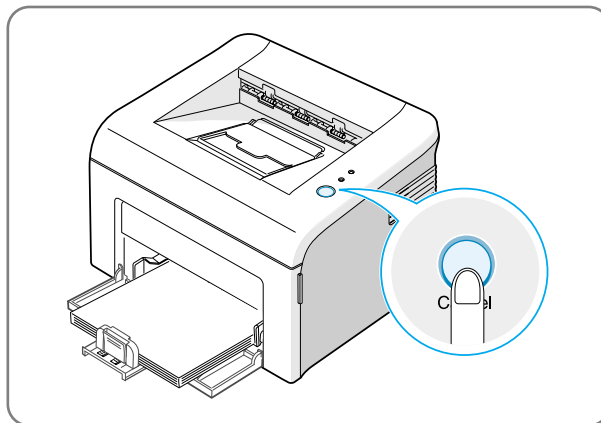
4.1 Sample Pattern

This product has the several sample patterns for maintenance. With the sample patterns, check the existence of the abnormality. The patterns help to regularly maintain the product.

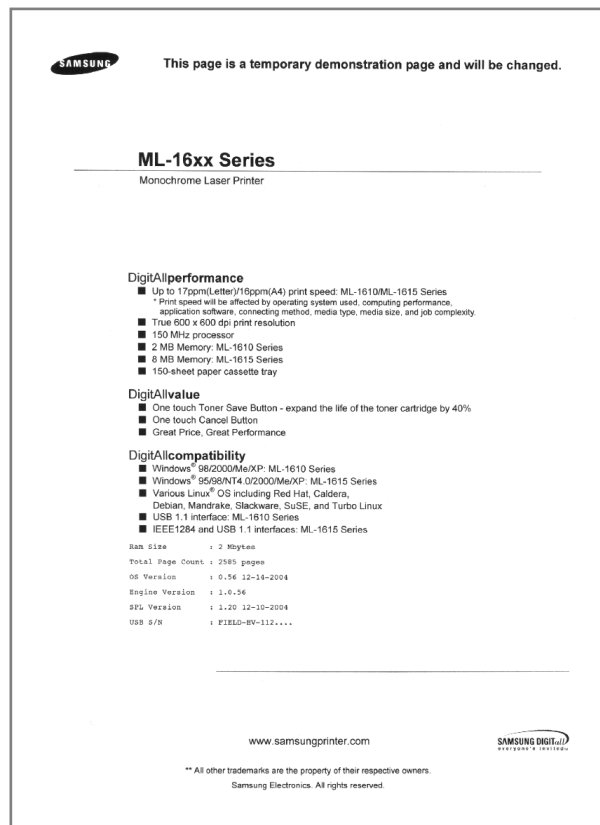
4.1.1 Printing a Demo Page

Print a demo page or a configuration sheet to make sure that the printer is operating correctly.

- 1) Hold down the Cancel button for about 2 seconds to print a demo page.

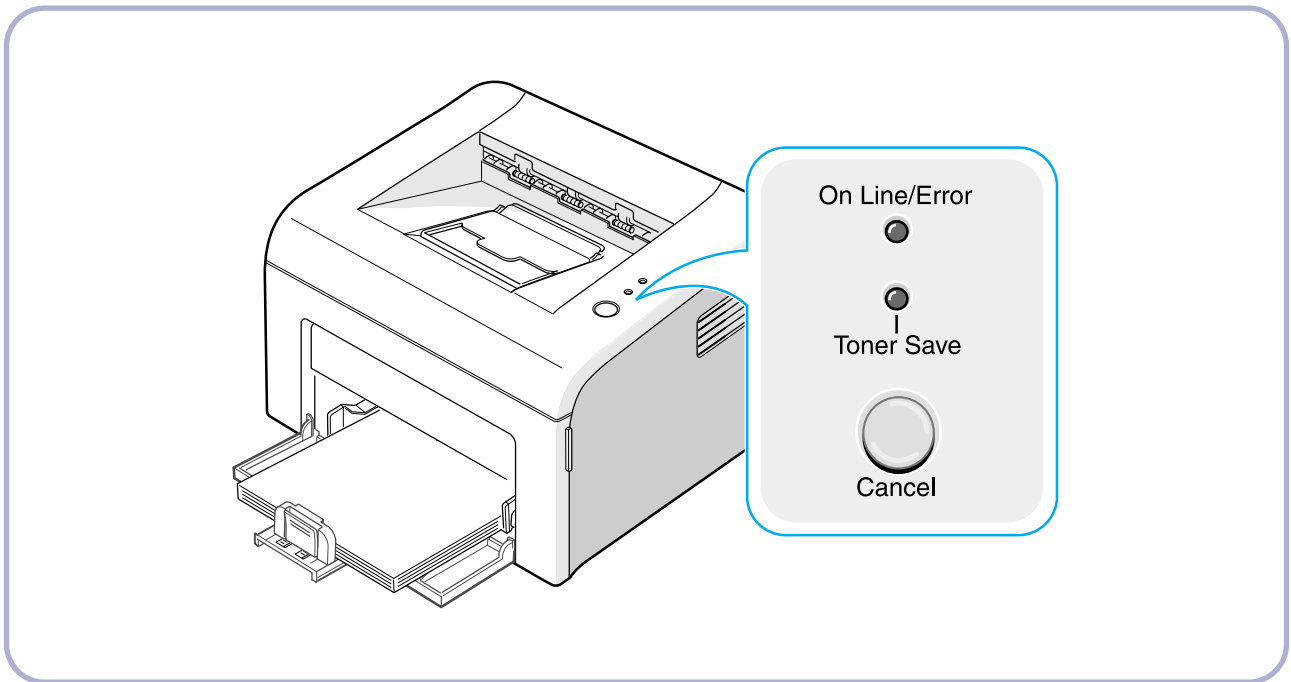


- 2) The Demo page or the configuration sheet shows the printer's current configuration.



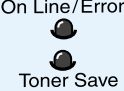


4.2 Control Panel

4.2.1 OP Panel



4.2.2 On Line/Error and Toner Save LEDs

LED	Description
	If the On Line/Error lights green, the printer is ready to print.
	If the On Line/Error lights red, the printer is experiencing an error, such as jammed paper, no paper, the open cover or the empty toner cartridge.
	If you press the Cancel button while the printer is receiving data, the On Line/Error LED blinks red to cancel printing.
	In Manual Feed mode, if there is no paper in the tray, the OnLine/Error LED blinks red. Load paper into the tray and the LED stops blinking.
	If the printer is receiving data, the On Line/Error LED slowly blinks green. If the printer is printing the received data, the On Line/Error LED blinks green fast.
	<p>If you press the Cancel button in Ready mode, this LED is on and the Toner Save mode is enabled.</p> <p>If you press this button once again, this LED is off and the Toner Save mode is disabled.</p>
	If the On Line/Error and Toner Save LEDs blink, your system has some problems.

4.2.3 Cancel button

LED	Description
Printing demo page	In Ready mode, press and hold this button for about 2 seconds until all LEDs blink slowly, and release.
Manual feeding	Press this button each time you load a sheet of paper in the tray, when you select Manual Feed for Source from your software application.
Canceling print job	Press this button during printing. The On Line/Error LED blinks while the print job is cleared from both the printer and the computer, and then return to Ready mode. This may take some time depending on the size of the print job. In Manual Feed mode, you can't cancel the print job by pressing this button.
Toner Save mode on/off	In Ready mode, press this button to turn the Toner Save mode on or off.

4.3 Consumables and Replacement Parts

The cycle period outlined below is a general guideline for maintenance.

The example list is for an average usage of 50 transmitted and received documents per day.

Environmental conditions and actual use will vary these factors.

The cycle period given below is for reference only.

COMPONENT	REPLACEMENT CYCLE
Pick-up Roller	50,000 Pages
Transfer Roller	50,000 Pages
Fuser	50,000 Pages
Toner Cartridge	2,000 Pages(Sales), 1,000 Pages(Initial)

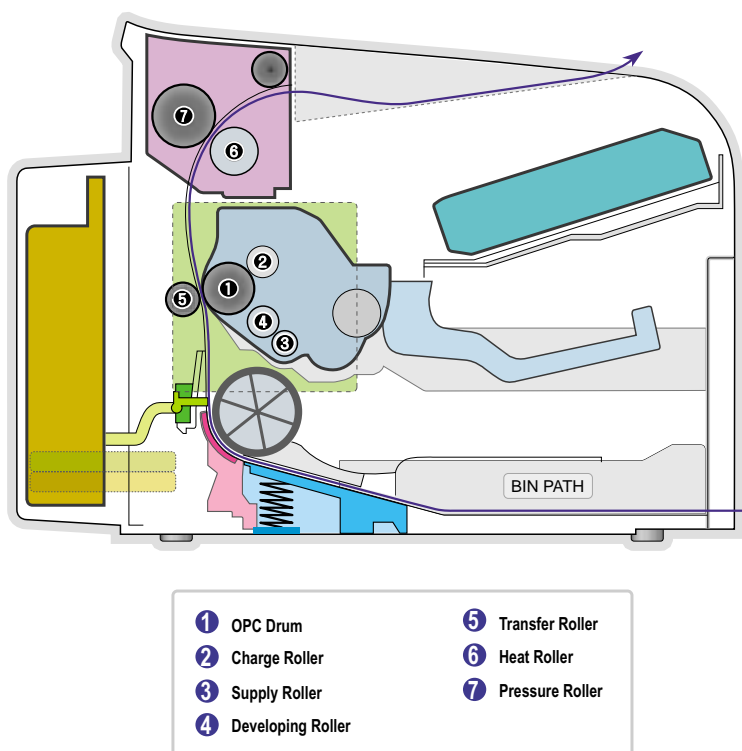
4.4 LED Status Error Message

ERROR	LED Status	DCU CODE
Open Fuser Error	The [Error] LED (red) and the [Toner Save] LED are simultaneously flashing every one-second.	60
Over Heat Error	The [Error] LED (orange) and the [Toner Save] LED are simultaneously flashing every one-second.	68
Low Heat Error	The [Error] LED (red) and the [Toner Save] LED are simultaneously flashing every 4 seconds.	62
LSU not Ready Error (Pmotor Error)	The [Error] LED (green) and the [Toner Save] LED are simultaneously flashing every one-second.	95
LSU Not Ready Error (HSYNC Error)	The printing is stop in the fad status, and the [Error] LED (green) and the [Toner Save] LED are simultaneously flashing every 4 seconds.	96

4.5 Periodic Defective Image

If the delinquent image regularly occurs in the printed-paper, it is due to delinquent or damaged roller. Refer to the table in below and check the condition of the roller.

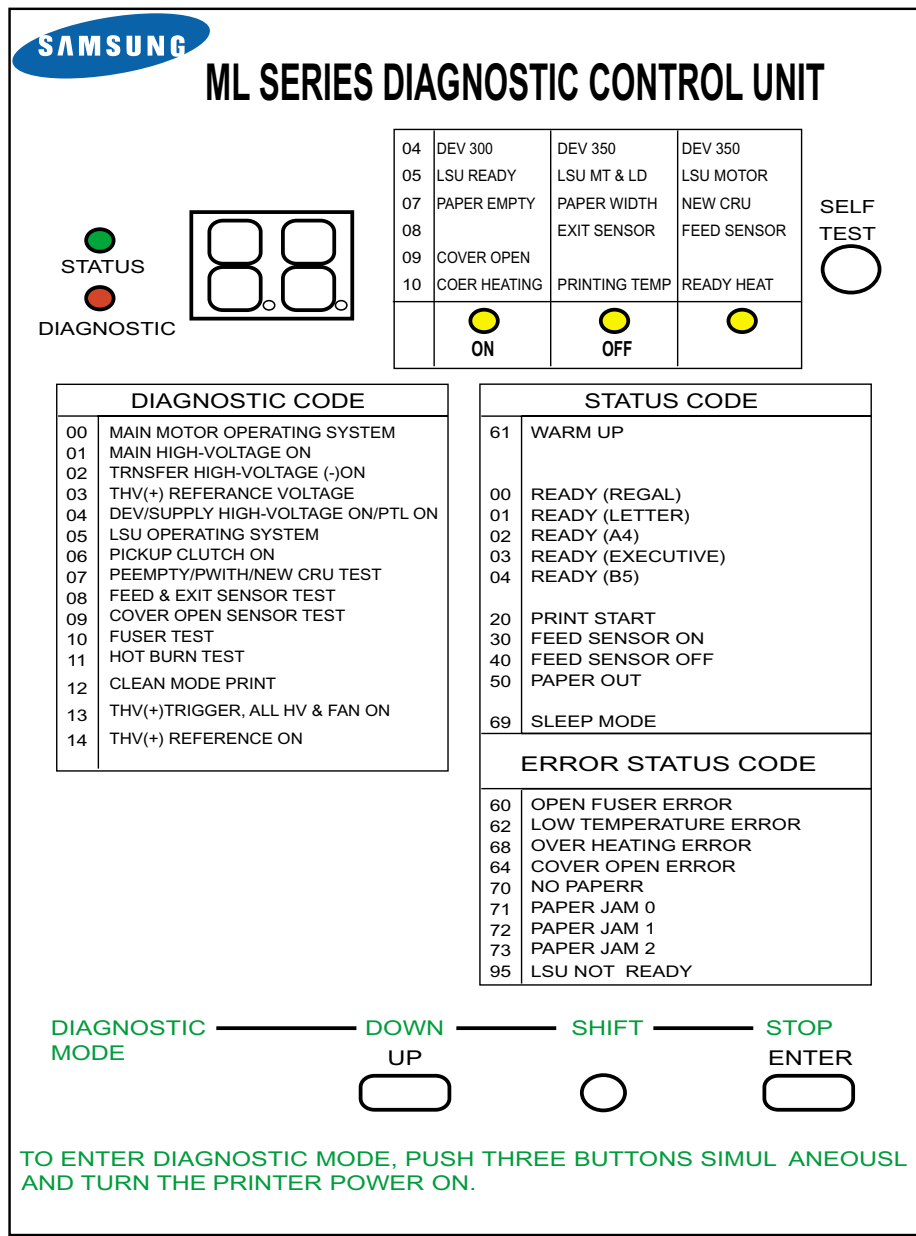
No	Roller	Defective image	Typical defect
1	OPC Drum	75.5mm	white spot on black image or black spot
2	Charge Roller	37.7mm	black spot
3	Supply Roller	47.5mm	light or dark horizontal image band
4	Developing Roller	35.2mm	horizontal image band
5	Transfer Roller	46.2mm	image ghost
6	Heat Roller	63.9mm	Black spot and image ghost
7	Pressure Roller	75.4mm	black spot on the backside



4.6 How to use DCU

4.6.1 DCU Setup

You can examine the malfunction of the printer. To perform DCU, open the front discharge cover and leave the connect the harness wire(10 pin/4 pin) to the CN1(ML-1610) of the Main control board.



4.6.2 Code

Connect DCU to the printer and turn the power on. It show 7 Segment FND on the panel and each code tells the function of the printer.

1) Normal Code

While printing or warming up, it indicate the position of the paper

Code	State	Description
61	Warm up	The printer is on, the cover is open or close.
00~05	Ready(kind of paper)	The printer is ready, the paper is detected when the first paper is printed. 00: Legal ,01: Letter ,02: A4 ,03: EXEC ,04: B5 ,05: Folio, 06: A5/A6
20, 21, 22	Print Start	The engine controller received the print order from the video controller. 20: 1st, 21: MP, 22: SCF
30	Feed Sensor On	The paper is passing out of the Feed Sensor.
40	Feed Sensor off	The paper has passed out of the Feed Sensor.
50	Paper Out	The paper has passed out of Exit Sensor.
69	Sleep Mode	The fuser power turned off to minimize the power consumption.

2) Error Code

When detecting the malfunction, the printing is stopped to indicate error code.

Code	State	Description
60, 62, 68	Fuser Error	The error in the fuser occurred. There is a short circuit in the thermistor and the thermostat while printing, Low Temperature Error occurs. • 60: Open Fuser Error • 62: Low Heat Error • 68: Over Heat Error
64	Cover Open	The Printer Cover is open.
65	CRU Error	The Toner Cartridge not installed,
70	No Paper	No paper in the paper cassette.
71	Paper Jam 0	The front part of paper is jammed between pickup unit and Feed sensor.
72	Paper Jam 1	The front part of paper is jammed between the Discharge sensor and Feed sensor.
73	Paper Jam 2	The front part of paper is jammed just after passing through the discharge sensor.
76	Out Bin Full	The Out bin is filled with paper.
95	LSU Not Ready	LSU Scanner Motor not ready or Hsync signal not output.

4.6.3 Self Diagnostic Mode

If Error code occurs due to malfunction of the printer, perform Self Diagnostic Mode to solve the problem.

The printer works only in the self-test mode to solve the malfunction problem.

To enter the self-test mode, turn the power on pressing the buttons of [Down], [Shift] and [Stop] at the same time. Release the button within 2 or 3 seconds if 78 shows in the DCU. If 00 shows in the DCU, press the button [Up] or [Shift] to select the self+test, and press the button of [Enter] to operate. To stop, press the button of [shift] and [Enter] together.

Code	Description
00	Main Motor Operating System Only the main motor is in operation.
01	Main High Voltage On(THV-) -1400 voltage output by MHV terminal. <i>Caution : High voltage probe should be used.</i>
02	Transfer High Voltage(-)On(THV-) -1000 voltage output by MHV terminal. Caution : High voltage probe should be used.
03	Transfer High Voltage (+)Reference on (THV +) +1300 voltage output by MHV terminal. <i>Caution : High voltage probe should be used.</i>
04	DEV/supply High Voltage : DEV/Supply High Voltage Test. The left one of the three LEDs in the self-test panel is on when DEV high voltage Supply high voltage output by each HV terminal. Press the [Up] button to switch the voltage. The middle and right one of the three LEDs are on and -350 voltage output by DEV HV terminal. <i>Caution : High voltage probe should be used.</i>
05	LSU Operating System The scanning motor of LSU is in operation, the right LED of the three buttons on. Press the [Up] button to Check LD. LD is functioning and the middle button is on. If the LD is normal, all LEDs are on.
06	Pickup clutch on The Solenoid in the printer is in operation. To stop the operation, Press the button [shift] and [Enter] together.

Code	Description
07	<p>Paper Empty Sensor Test :</p> <p>If activate the Actuator of the PEMPTY Sensor, the left and right of the three LEDs are on.</p> <p>Paper Empty Sensor ON/OFF 1st LED ON/OFF</p>
08	<p>Feed & Exit Sensor Test</p> <p>Test the Feed sensor and Discharge sensor in the same way as '07'.</p> <p>Feed Sensor ON/OFF 2nd LED ON/OFF</p> <p>Exit Sensor ON/OFF 3rd LED ON/OFF</p>
09	<p>Cover Open Sensor Test</p> <p>Test the Cover Open Sensor in th same way as code '07'</p> <p>Cover Open Sensor ON/OFF 1st LED ON/OFF</p>
10	<p>Fuser Test</p> <p>If the [Enter] button pressed, the right LED is on and temperature of the fuser is up to READY Mode. If the [Up] button pressed, the middle LED is on and temperature of the fuser is up to Printing Mode.</p> <p>If you press the button once more, the left LED is on and temperature of the fuser is up to overheat Mode.</p>
11	<p>Hot Burn Test</p> <p>If the [enter] button pressed, the printer is continuously printing without detection.</p> <p>Turn the power off to stop operation.</p>
12	<p>Cleaning Mode Print Mode</p> <p>Print the paper to clean the OPC Drum in the Cartridge.</p>
13	<p>THV(+) TRIGGER. ALL HV :</p> <p>All high voltage output by each HV terminal and LSU and the fan is in operation. In this mode, electronic resistance of transfer roller and high voltage is detected.</p>
14	<p>PTL Test : (ML-1610 : not design)</p> <p>Indicates the function of the PTL, same method of the code '07'.</p>
15	<p>Fan Test :</p> <p>Indicates the function of the Fan, same method of the code '07'.</p>
16	<p>Manual Pickup Test :</p> <p>Indicates the function of th Manual Pickup, same method of the code '07'.</p>
17	<p>Manual Sensor Test :</p> <p>Indicates the function of the Manual Sensor, same method of the code '07'.</p>

No.	Function	Enter	Up/Down		Stop	Remark
00	Motor	Motor Run			Motor Stop	
01	MHV	Mhv On			Mhv Off	-1300V
02	THV(-)	Thv Negative On			Thv Negative Off	-1000V
03	THV(+)	Thv On			Thv Off	+1300V
04	DEV	Dev On	Supply	DEV	Dev Off	-350V
			0 : -550V	0 : -350V		
05	LSU	LSU Run	● On	● Off	● Ready	LSU Stop 020mV
06	PickUp	Pickup On			Pickup Off	
07	PEmpty		● Paper	● Empty	●	
08	Sensor		●	● Exit	● Feed	
09	Cover		● Cover	● Open	●	
10	Fuser	Fuser On			Fuser Off	
11	HotBurn	HotBurn On				
12	Clean Print	Clean Printing				
13	Thv Reference		● low	● adequate	● high	
14	PTL	PTL On			PTL Off	PTL
15	FAN	Fan On			Fan Off	
16	Manual Pickup	Manual Pickup On			Manual Pickup Off	
17	Manual Sensor		● Manual	● Sensor	●	

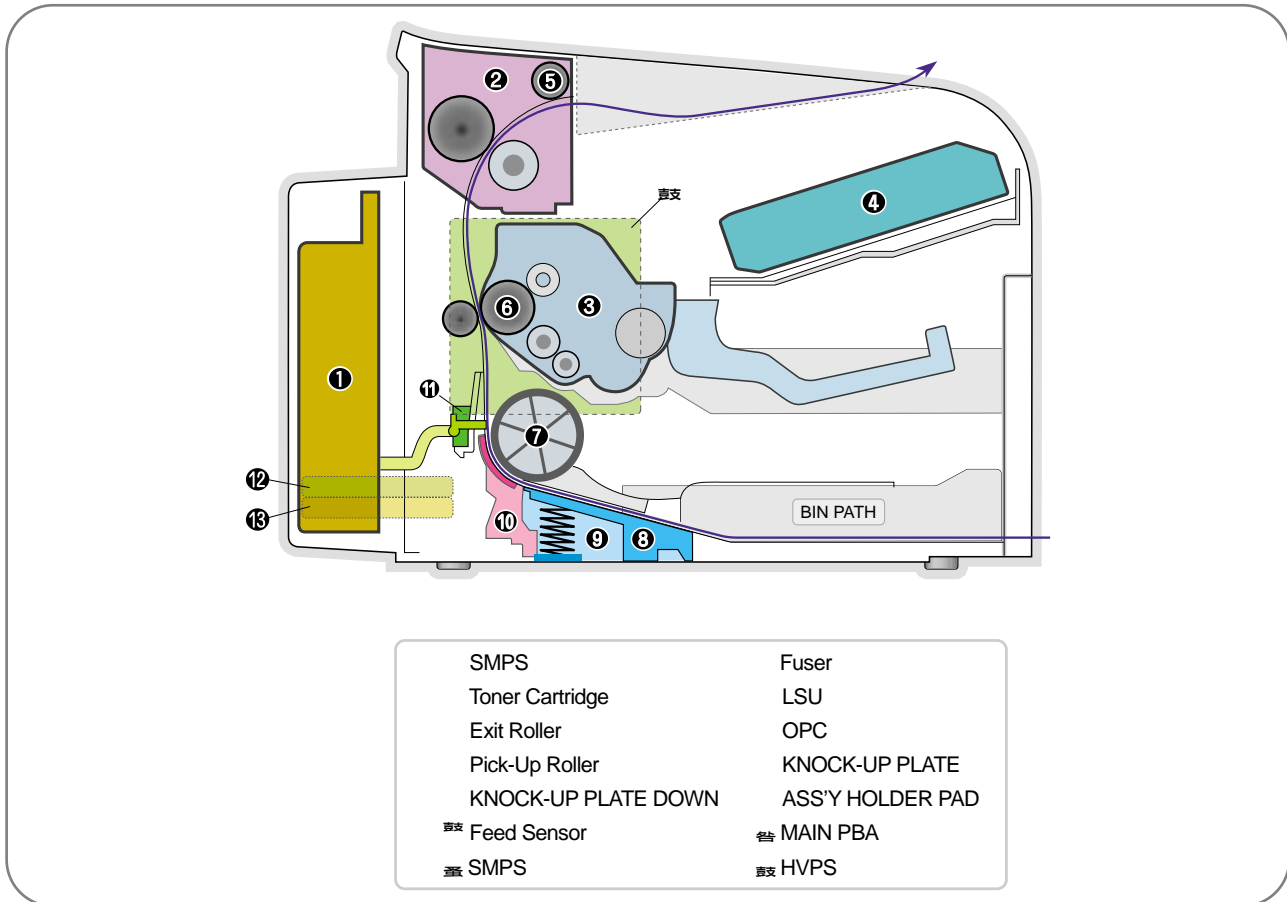
<DCU Function Table>

4.6.4 Self Test Button

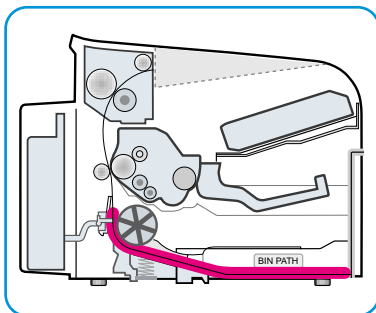
If the Self-Test button pressed, vertical lines are printed.

Turn the power on while pressing this button, '89' shows in the DCU and the printer is warming up. After warming-up the printer is in READY Mode, and '88' shows in the DCU. In this mode, without any detection, the printer begins printing(trial printing and data from the PC). It is convenient to use this mode when the engine malfunction is detected in the control board.

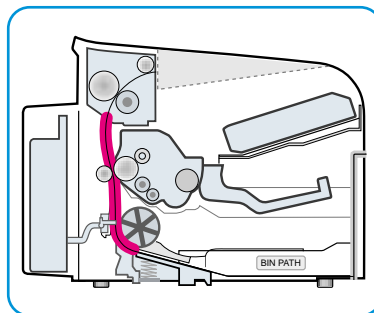
4.7 Paper Path



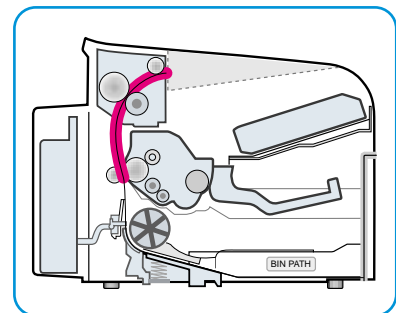
- 1) After taking order, the printer feeds the printing paper from the cassette or manual feeder.
- 2) The paper passes the paper feeding sensor. (Jam 0 occurs if the sensor is not operated after certain time passes)
- 3) The paper passed the paper feeding sensor moves to the paper exit sensor via printing process. (Jam 1 occurs if the sensor is not operated after certain time passes)
- 4) The paper passed the paper exit sensor moves out from the set. (Jam 2 occurs sometime after if the tailing edge of the paper is not coming out from the set after the leading edge of paper passes the paper exit sensor.)



<Jam0>



<Jam1>



<Jam2>

4.7.1 Clearing Paper Jams

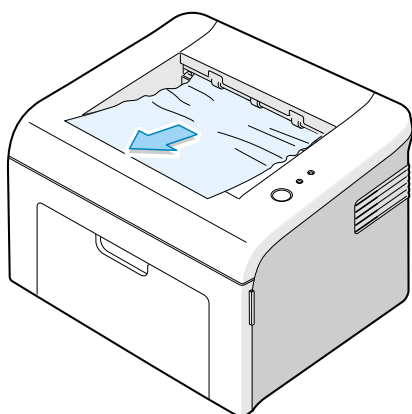
Occasionally, paper can be jammed during a print job. Some of causes include:

- The tray is overfilled.
- The front cover has been opened during a print job.
- Paper that does not meet paper specifications has been used.
- Paper that is outside of the supported size range has been

If a paper jam occurs, the On Line/Error LED on the control panel lights red. Find and remove the jammed paper. If it is invisible, look inside the printer.

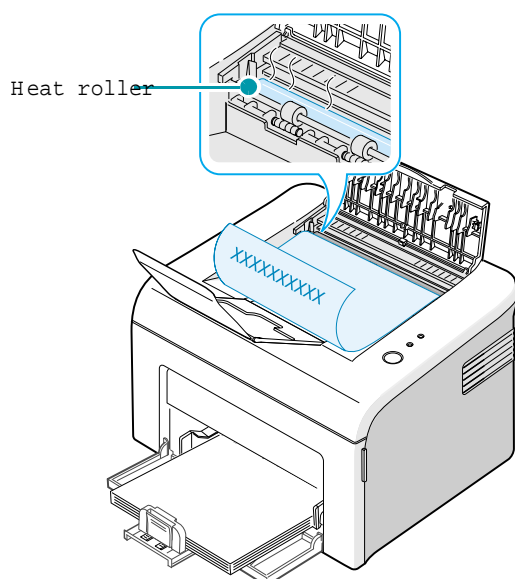
4.7.2 In the Paper Exit Area

1. If the paper jams as it exits to the output tray and a long portion of the paper is visible, pull the paper straight out.

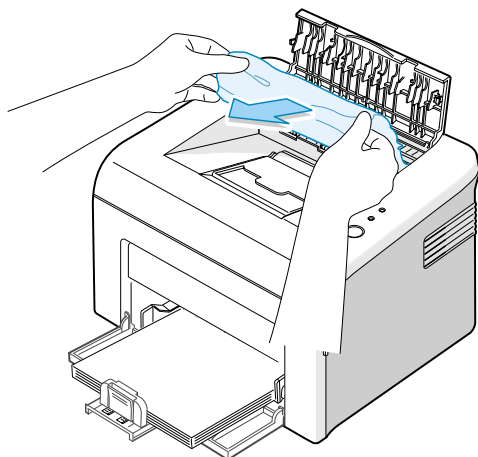


When you pull the jammed paper, if there is resistance and the paper does not move immediately, stop pulling. Continue with the next step.

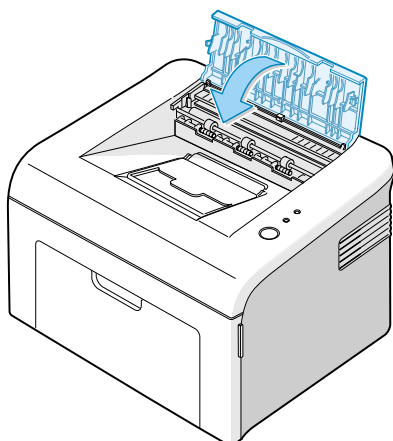
2. Open the top cover and the inner cover.



3. Loosen the paper if it is caught in the heat rollers. Then pull the paper gently out.



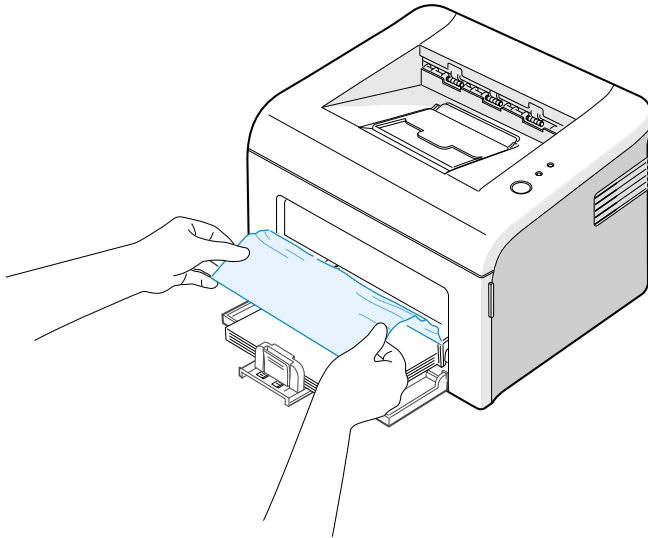
4. Close the inner cover and the top cover.



5. Open and close the front cover. Printing can be resumed.

4.7.3 In the Paper Feed Area

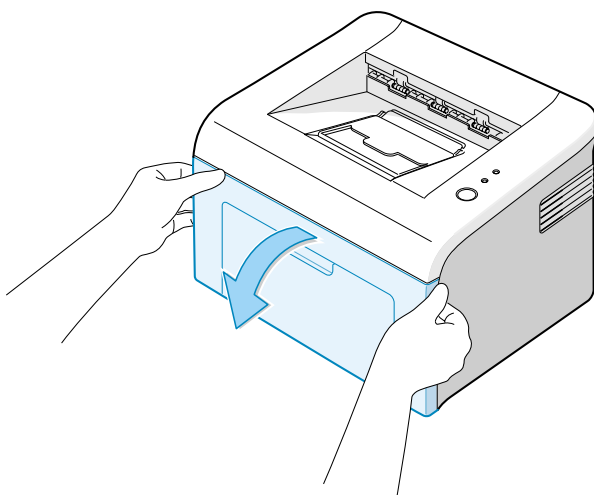
1. Remove any missfeed paper by pulling it out by the visible edge from the tray. Make sure that all of the paper is properly aligned in the tray.



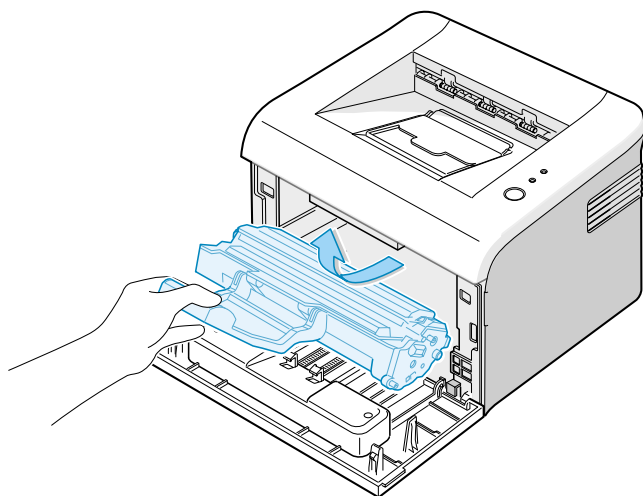
2. Open and close the front cover. Printing can be resumed.

4.7.4 Around the Toner Cartridge

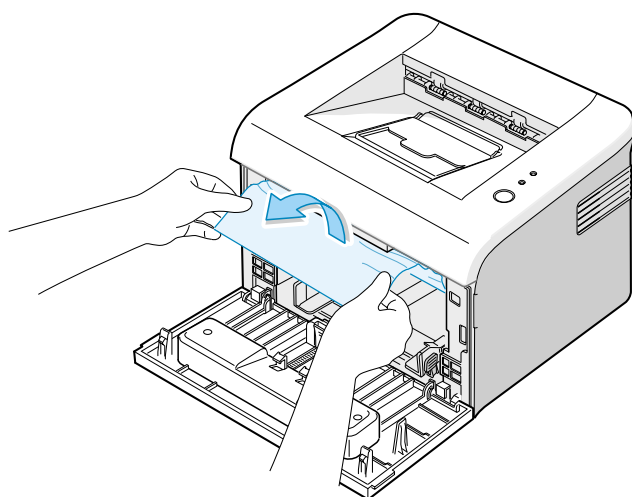
1. Open the front cover.



2. Pull the toner cartridge out and remove it from the printer.



3. Gently pull the paper toward you.



4. Check that there is no other paper in the printer.

5. Reinstall the toner cartridge, and then close the cover. Printing can be resumed.

4.7.5 Tips for Avoiding Paper Jams

By selecting the correct paper types, most paper jams can be avoided.

- Ensure that the adjustable guides are positioned correctly.
- Do not overload the tray.
- Do not remove the paper from the tray while printing.
- Flex, fan and straighten the paper before loading.
- Do not use creased, damp or highly curled paper.
- Do not mix paper types in the input tray.
- Use only recommended print media.
- Ensure that the recommended print side is facing up when loading paper into the input tray.

4.7.6 Solving Print Quality Problems

Print Quality Checklist

Print quality problems can be resolved by following the checklist below.

- Redistribute toner in the toner cartridge
- Clean the inside of the printer
- Adjust the print resolution from the printer properties
- Ensure that the Toner Save mode is off
- Clear general printing problems
- Install a new toner cartridge, and check the print quality

5. Disassembly and Reassembly

5.1 General Precautions on Disassembly

When you disassemble and reassemble components, you must use extreme caution. The close proximity of cables to moving parts makes proper routing a must.

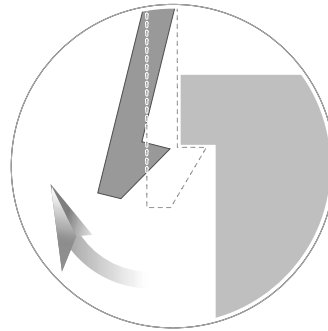
If components are removed, any cables disturbed by the procedure must be restored as close as possible to their original positions. Before removing any component from the machine, note the cable routing that will be affected.

Whenever servicing the machine, you must perform as follows:

1. Check to verify that documents are not stored in memory.
2. Be sure to remove the toner cartridge before you disassemble parts.
3. Unplug the power cord.
4. Use a flat and clean surface.
5. Replace only with authorized components.
6. Do not force plastic-material components.
7. Make sure all components are in their proper position.

Releasing Plastic Latches

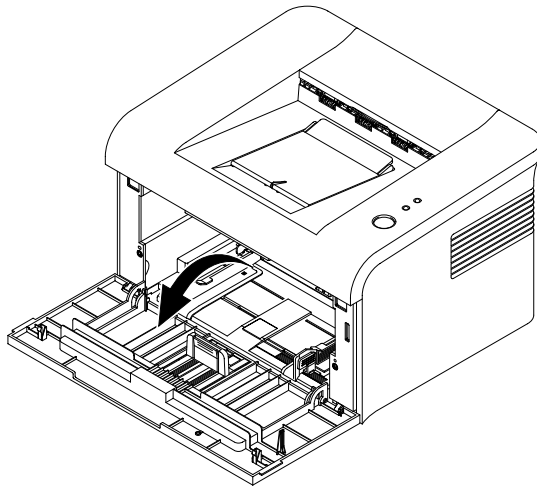
Many of the parts are held in place with plastic latches. The latches break easily; release them carefully. To remove such parts, press the hook end of the latch away from the part to which it is latched.



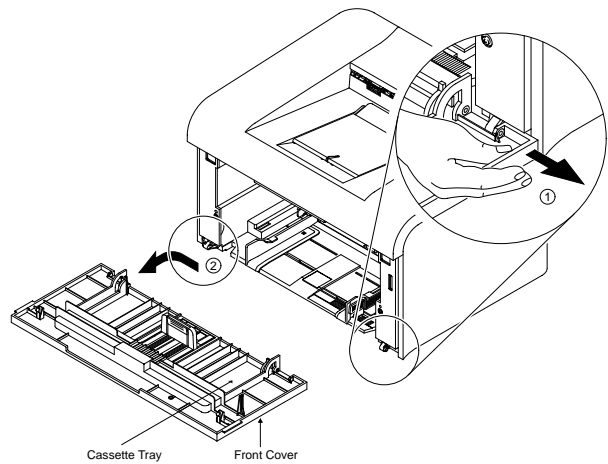
5.2 Disassembly and Reassembly

5.2.1 Front Cover

1. Open the front cover. (The front cover and the cassette tray are assembled with the same assembly.)

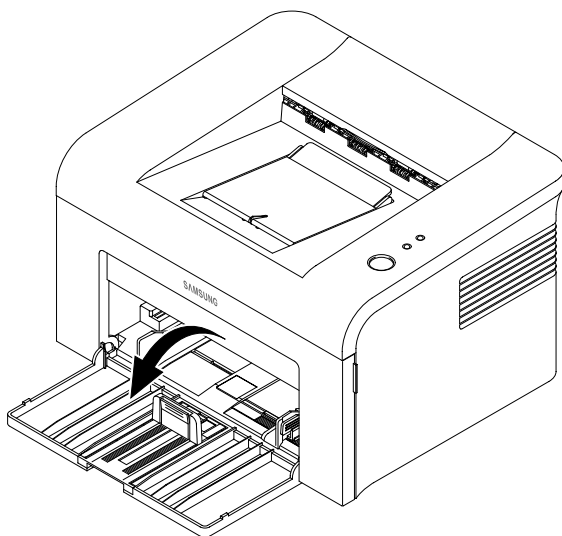


2. Separate the cover from the lock of the frame by pulling the right bottom of the cover toward the arrow direction. Pull out the front cover to the left as shown as below.

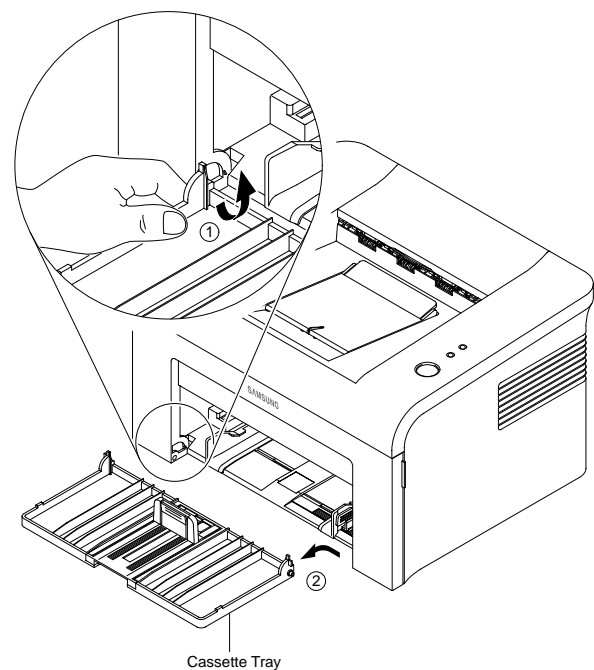


5.2.2 Cassette Tray

1. For separating only cassette tray, open the tray.



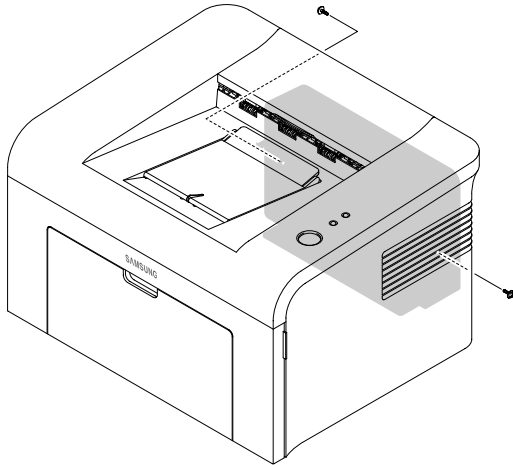
2. Hold the set and lift up the hook on the left bottom toward the arrow direction. Separate the cassette tray by pulling it out to the left as shown as below.



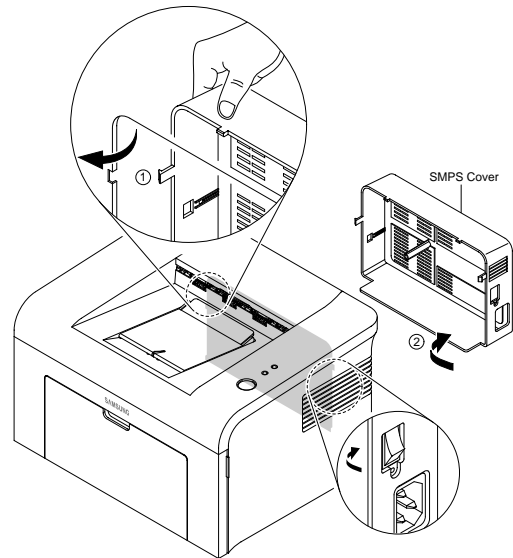
5.2.3 SMPS Cover

1. Release two screws.

(Screw x2: Silver_M3,6003-000196)



2. Separate the lock by holding the left side of the cover and pulling it toward the arrow direction. Remove it with carefulness that the power switch is not hooked on SMPS cover as shown as below.



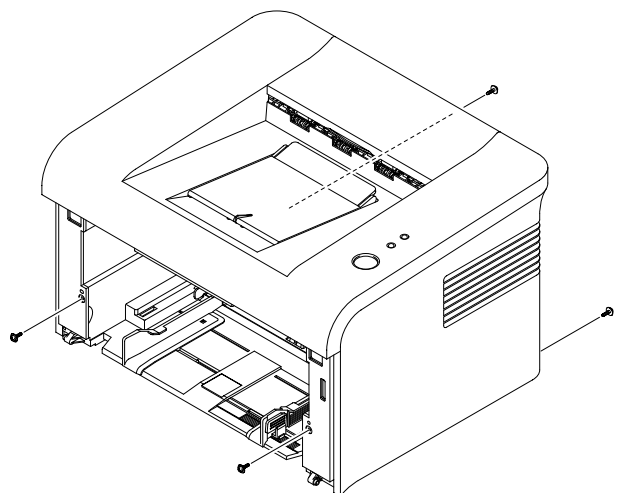
5.2.4 Main Cover

1. Before Disassembling.

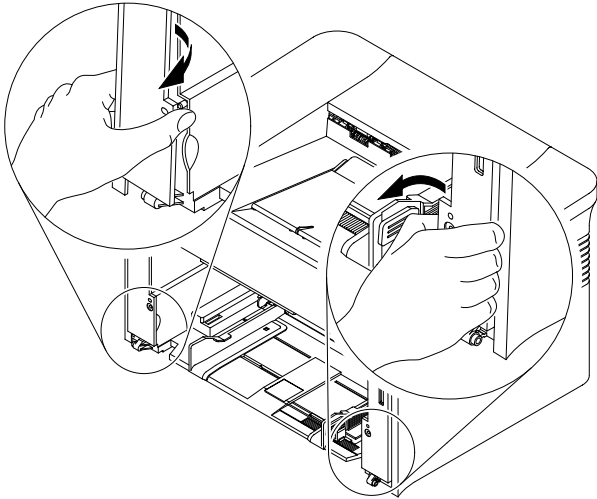
- Separate the front cover. (Refer to 5.2)
- Separate the SMPS cover. (Refer to 5.3)

2. Release 4 screws as shown as below.

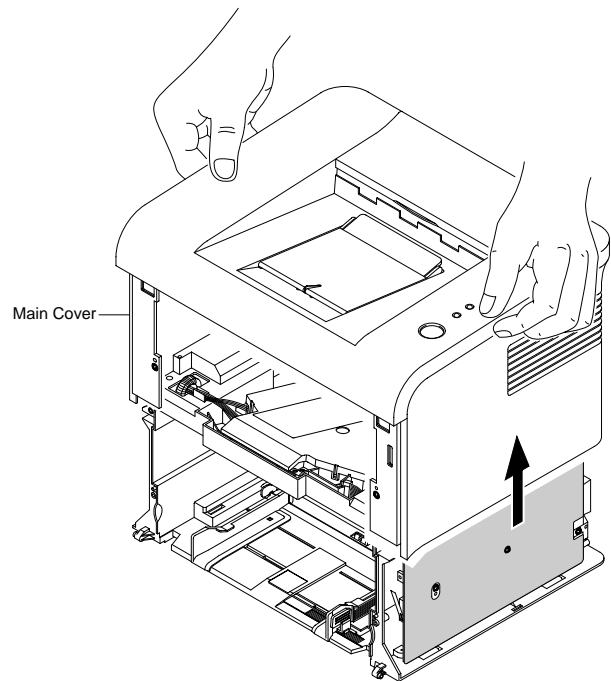
(Screw x 4 : Silver_M3,6003-000196)



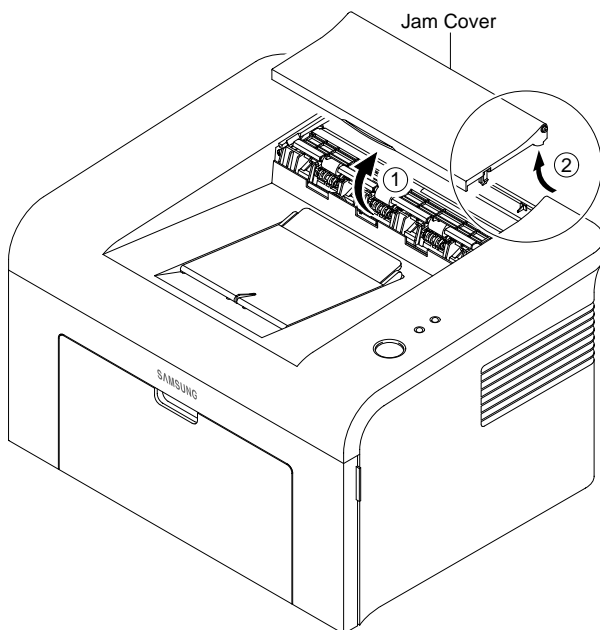
3. Hold the both ends of the cover and pull it up bit by bit toward the arrow direction as shown as below.



4. Separate it by holding the both sides of the main cover and carefully lifting it up.



5. If necessary, remove the jam cover. Open the cover, take out the hook on the right toward the arrow direction, and then take out the jam cover to the right side.



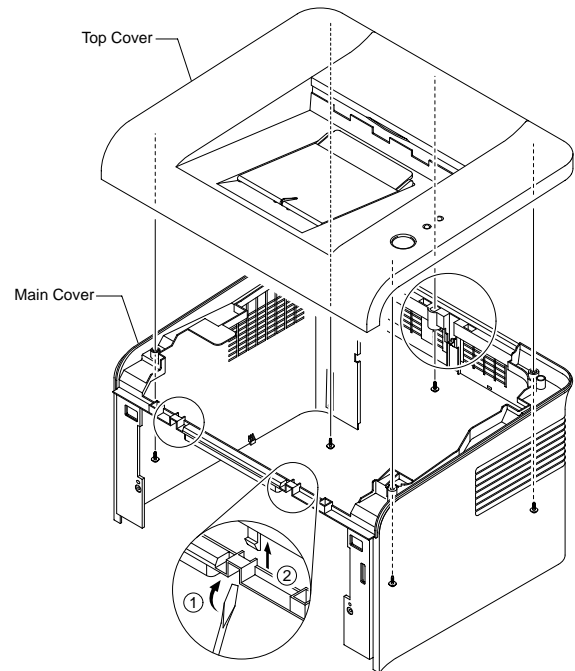
5.2.5 Top Cover

1. Before Disassembling.

- Separate the front cover.(Refer to 5.2)
- Separate the SMPS cover.(Refer to 5.3)
- Separate the Main cover.(Refer to 5.4)

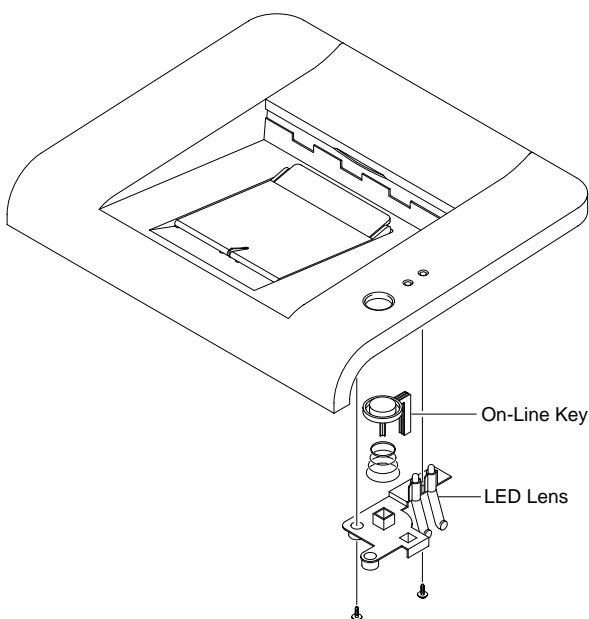
2. For separating the LED lens and the On-Line key,

release the 5 screws connected to the main cover, and then 4 locks on the front and rear of the top cover by using a screw driver. Remove the top cover from the main cover.



3. Unscrew 2 screws from the separated top cover as shown as below, and then separate the LED Lens from the On-Line key.

(Screw x 2: Silver_M3,6003-000196)



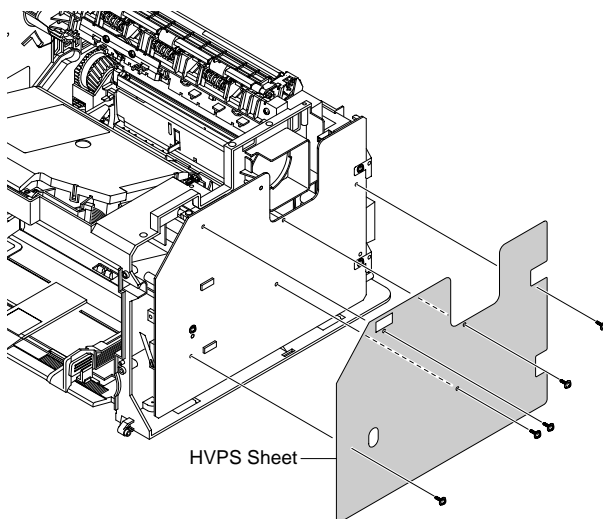
5.2.6 HVPS

1. Before Disassembling.

- Separate the front cover.(Refer to 5.2)
- Separate the SMPS cover.(Refer to 5.3)
- Separate the Main cover.(Refer to 5.4)

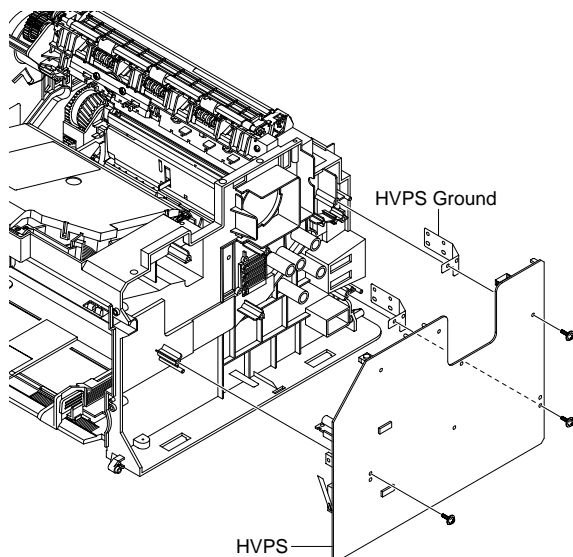
2. Remove the sheet by releasing the 5 screws which connects the HVPS and the Sheet.

(Screw x 3:Gold_M3,6003-000269)

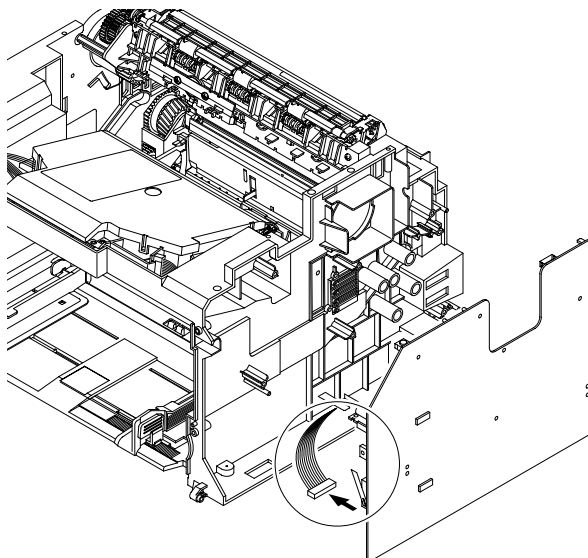


3. Separate the HVPS with HVPS ground from the frame by releasing the remaining 3 screws.

(Screw x 3:Gold_M3,6003-000269)



4. Remove the connector from the separated HVPS.

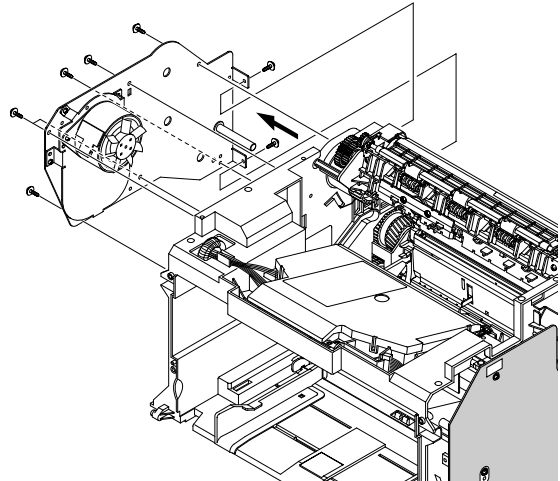


5.2.7 RX Drive

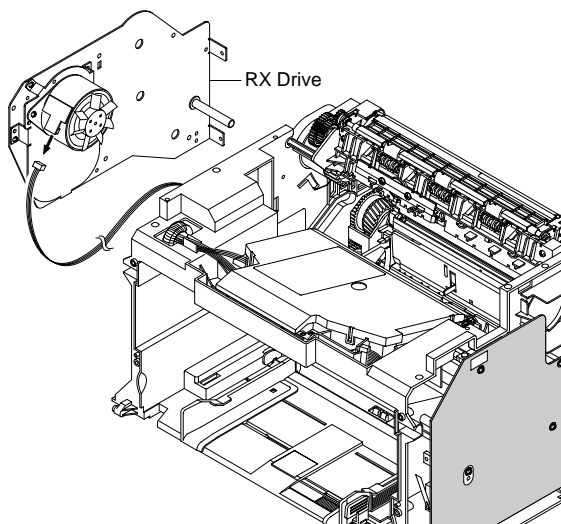
1. Before Disassembling

- Separate the front cover.(Refer to 5.2)
- Separate the SMPS cover.(Refer to 5.3)
- Separate the Main cover.(Refer to 5.4)

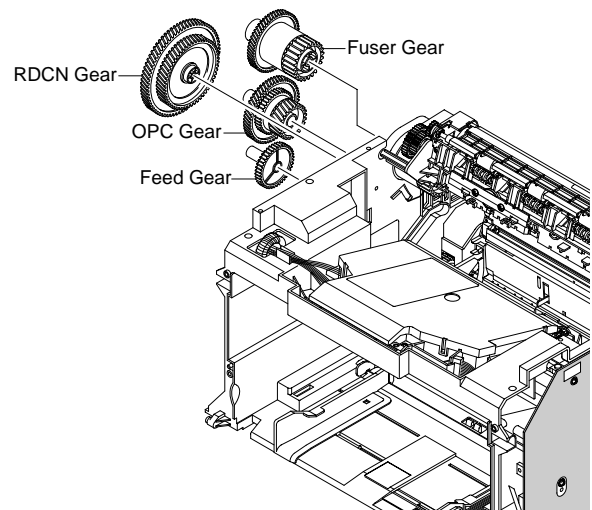
2. Release 2 screws (Screw x 2: Silver_M3,6001-000130) connected to the engine shield and 6 screws (Screw x 6: Gold_M3,6003-000296) connected to the frame. Separate the RX drive by pulling it out toward the arrow direction.



3. Remove the connector from the separated RX drive.



4. After removing the RX drive, RDCN Gear, OPC Gear, Fuser Gear, and Feed Gear can be removed from the frame.

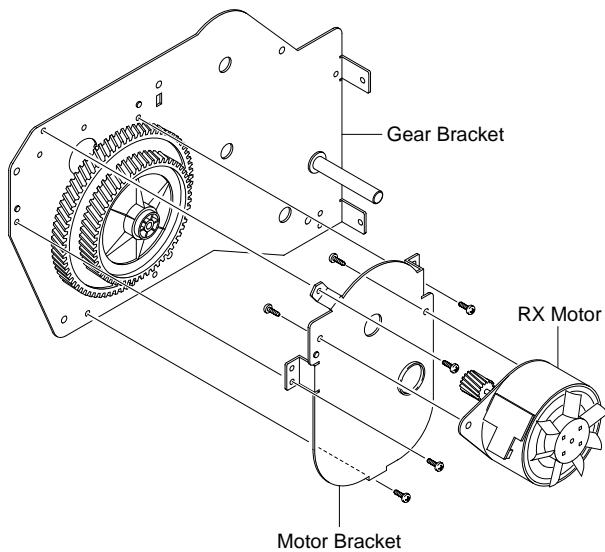


⚠ Note:



Please, be careful not to touch the protruding 4 screws at the outside of the RX drive.

5. When separating the motor, remove the motor bracket first by removing 4 screws as shown as below, and then remove the 2 screws from the motor bracket.

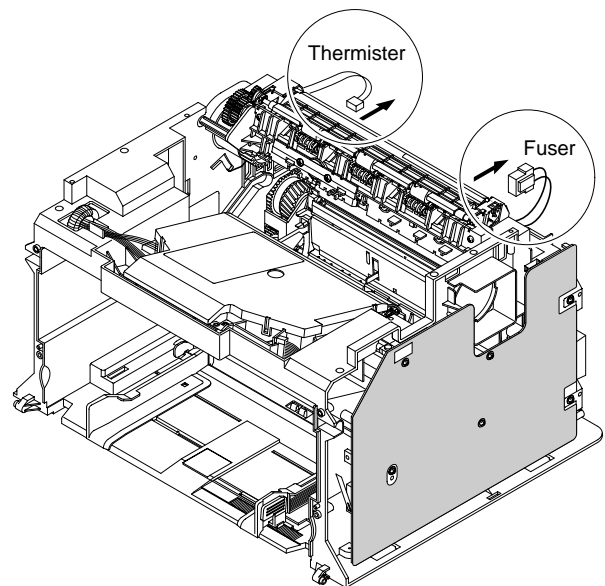


5.2.8 Fuser

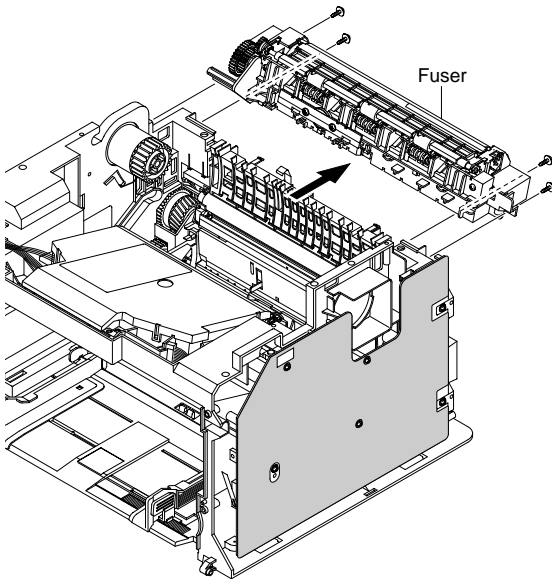
1. Before Disassembling

- Separate the front cover. (Refer to 5.2)
- Separate the SMPS cover. (Refer to 5.3)
- Separate the Main cover. (Refer to 5.4)

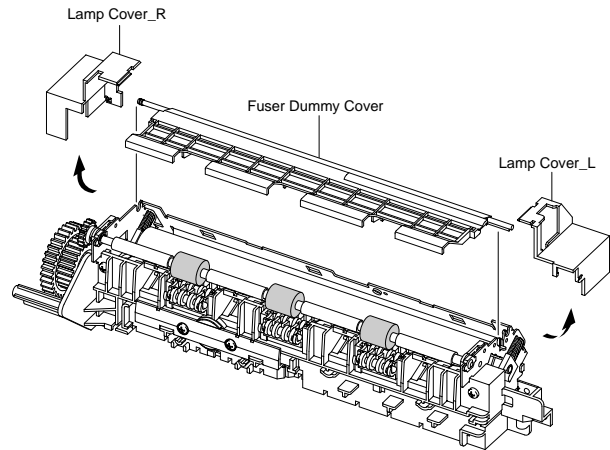
2. Separate 2 connectors from the SMPS and the Main PBA as shown as below.



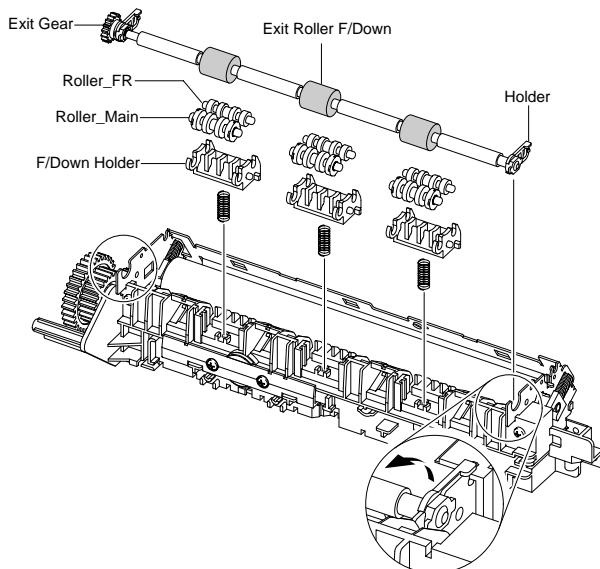
3. Separate the fuser by unscrewing 4 screws on the frame.
(Screw x 4:Gold_M3,6003-000269)



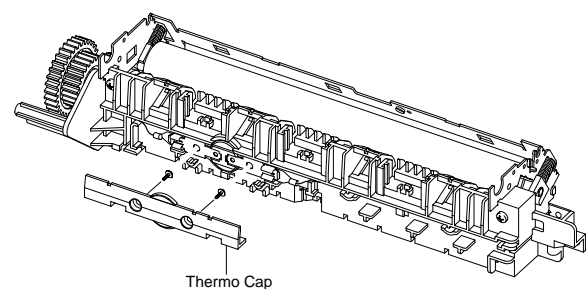
4. After removing the Lamp Cover L/R, separate the Fuser Dummy cover.



5. Separate the Exit roller F/Down and the exit gear (DRV17) by turning the left/right holder connected to the exit roller F/Down to the arrow direction. At this time, roller_main, roller_FR, F/Down Holder, and spring are separated with these.

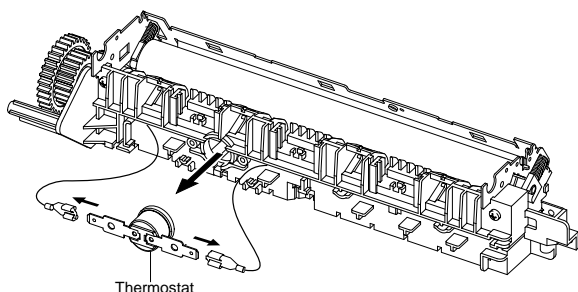


6. Remove the thermo cap by releasing 2 screws as shown as below.
(Screw x 2:Black_M3,6003-000282)

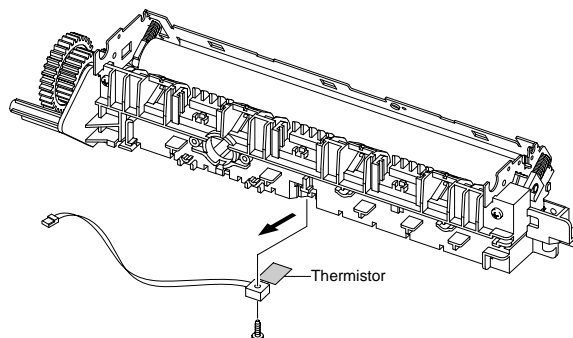


Note : Under the condition that the fuser is connected to the frame, the exit roller F/Down can be separated. However, be careful that the Roller_Main, the Roller_FR, and F/Down Holder could get into the inner frame due to the spring' action.

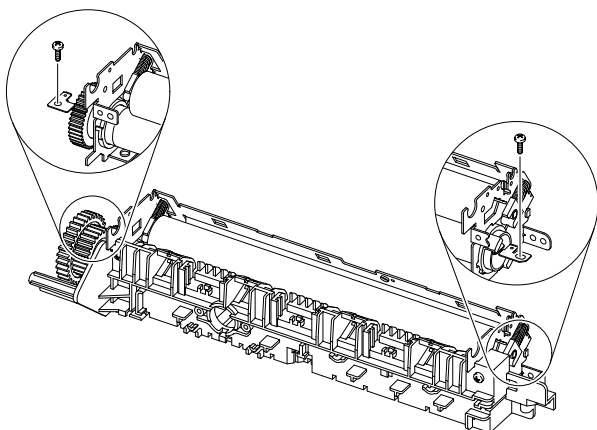
7. After pulling out the thermostat as shown as below, remove the CBF harness from its left/right side.



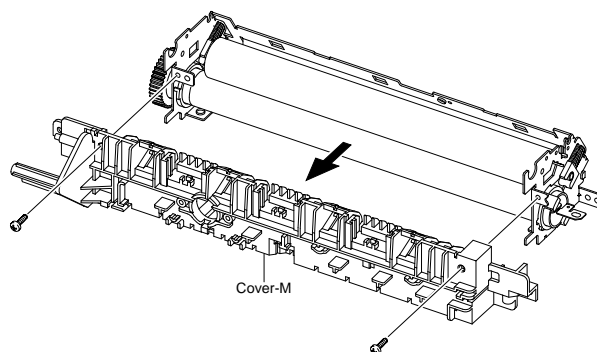
8. Release the screw as shown as below, remove the harness from the cover, and then pull out the thermistor.
(Screw x 1: Black_M3, 6003-000196)



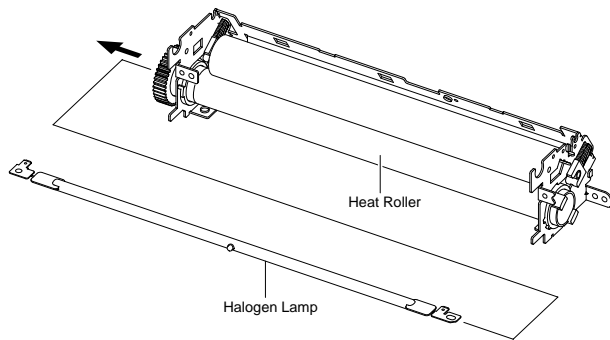
9. After separating the CBF harness connected to the left/right side of the halogen lamp, release 2 screws from the halogen lamp.
(Screw x 2: Black_M3, 6003-000196)



10. Separate the Cover-M by releasing 2 screws as shown as below.
(Screw x 2 : Black_M3, 6003-000196)



11. Remove the halogen lamp from the heat roller by pulling it out to the arrow direction.

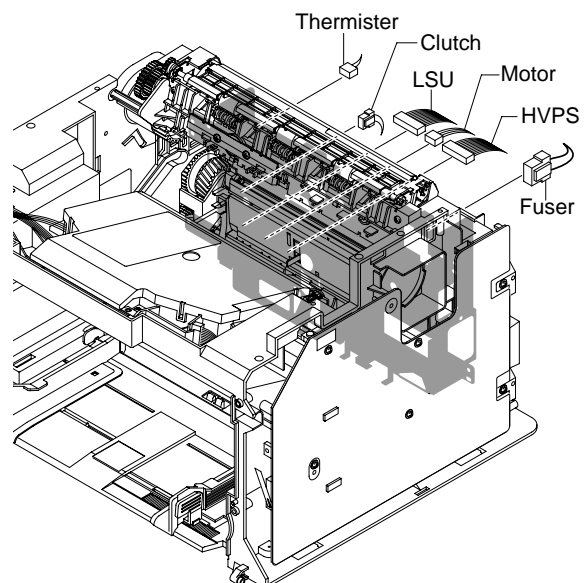


5.2.9 Engine Shield (Including Main PBA and SMPS)

1. Before Disassembling

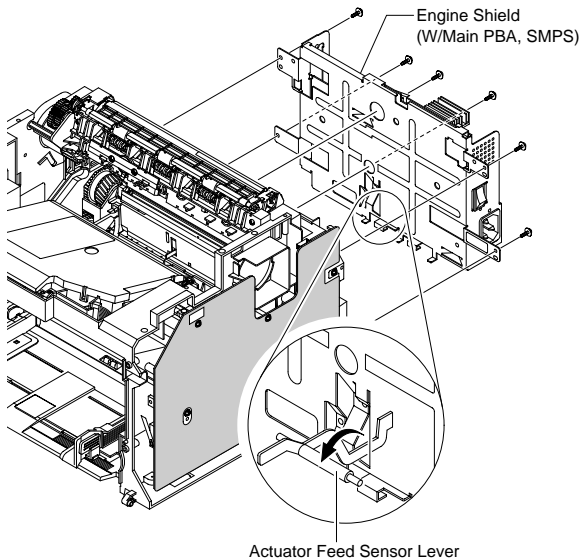
- Separate the front cover.(Refer to 5.2)
- Separate the SMPS cover.(Refer to 5.3)
- Separate the Main cover.(Refer to 5.4)

2. Disconnect all connectors except the connector which connects the SMPS to the Main PBA.



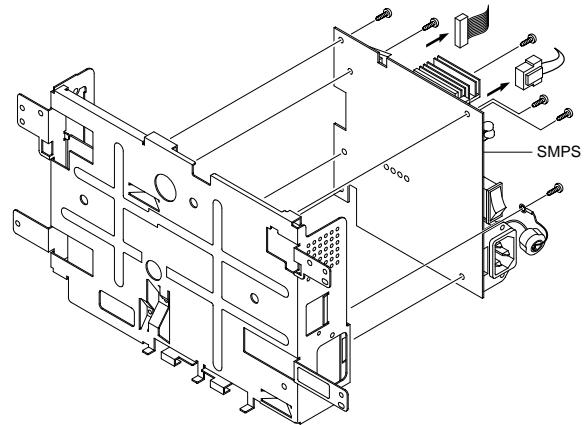
3. Release 6 screws as shown as below, separate the harnesses from the shield, and then separate the engine shield with carefulness of the actuator feed sensor lever.

(Screw x 6: Silver_M3, 6003-000196)



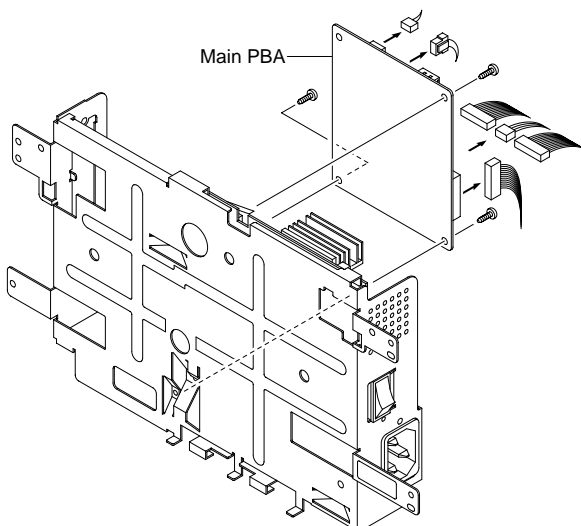
4. For removing only SMPS, perform the follows in order : separate the SMPS cover (Refer to the 5.3), release 5 screws, separate the fuser connector and the main PBA connector, and then take out the SMPS.

(Screw x 5 : Gold_M3, 6003-000269)



5. For removing only Main PBA, perform the follows in order : separate the SMPS cover (Refer to the 5.3), release 3 screws, separate the main PBA connector, and then take out the main PBA.

(Screw x 3 : Gold_M3, 6003-000269)



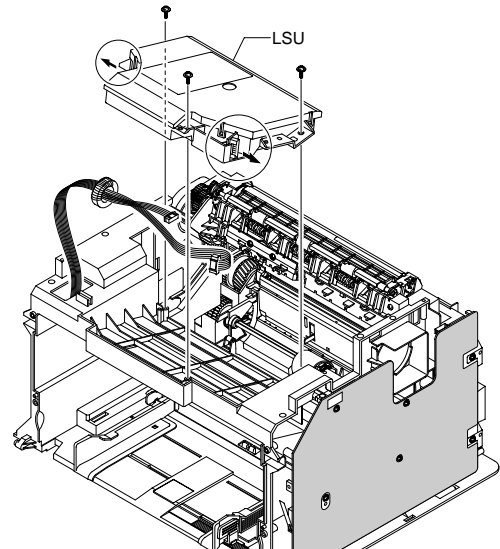
5.2.10 LSU

1. Before Disassembling

- Separate the front cover.(Refer to 5.2)
- Separate the SMPS cover.(Refer to 5.3)
- Separate the Main cover.(Refer to 5.4)

2. Release 3 screws as shown as below, lift up the LSU, and then disconnect 2 connectors from the separated LSU.

(Screw x 2:Silver_M3,6003-000196)



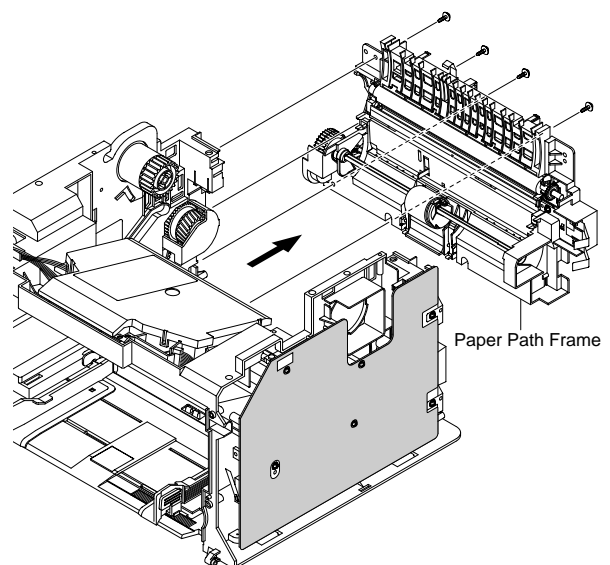
5.2.11 Paper Path Frame

1. Before Disassembling

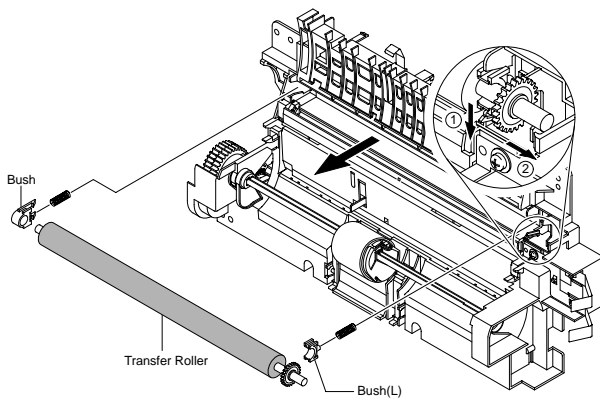
- Separate the front cover.(Refer to 5.2)
- Separate the SMPS cover.(Refer to 5.3)
- Separate the Main cover.(Refer to 5.4)
- Separate the Fuser.(Refer to 5.8)
- Separate the Engine shield.(Refer to 5.9)

2. After releasing 4 screws as shown as below, take it out toward the arrow direction with carefulness of ground and harnesses.

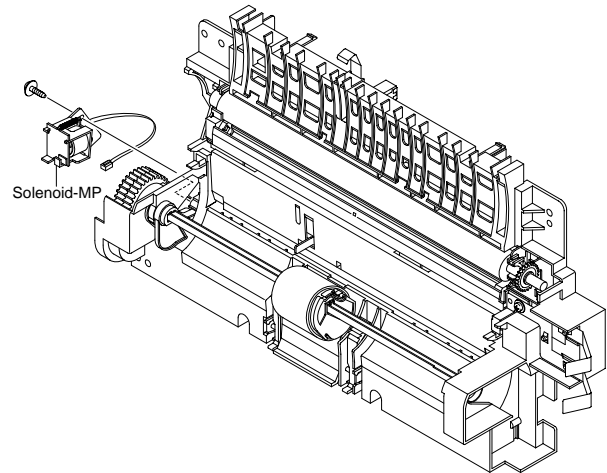
(Screw x 4:Silver_M3,6003-000196)



3. After releasing the 2 hooks from the right side of the frame, take out the transfer roller.
(Screw x 2: Silver-M3, 6003-000196)

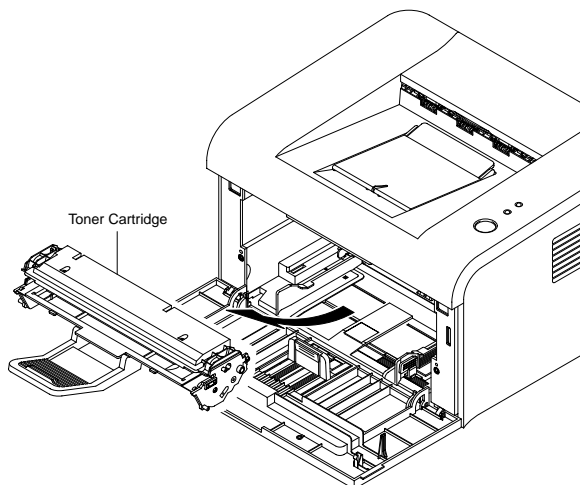


4. Remove the solenoid-MP by releasing the screw from the left side of the frame.
(Screw x 1: Gold_M3, 6003-000301)

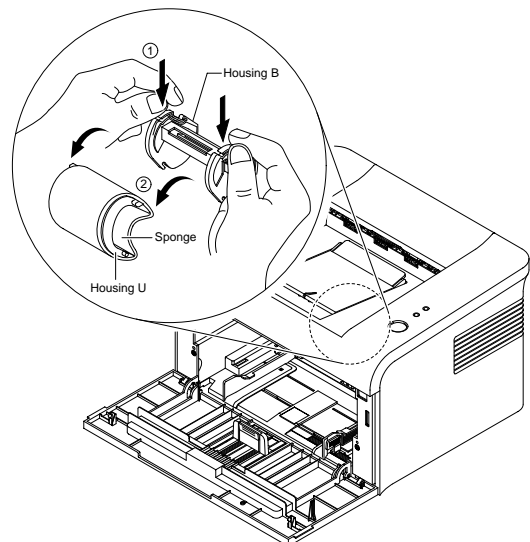


5.2.12 Pick_Up Roller

1. For separating the pick-up roller sponge, open the front cover, and then take out the toner cartridge.



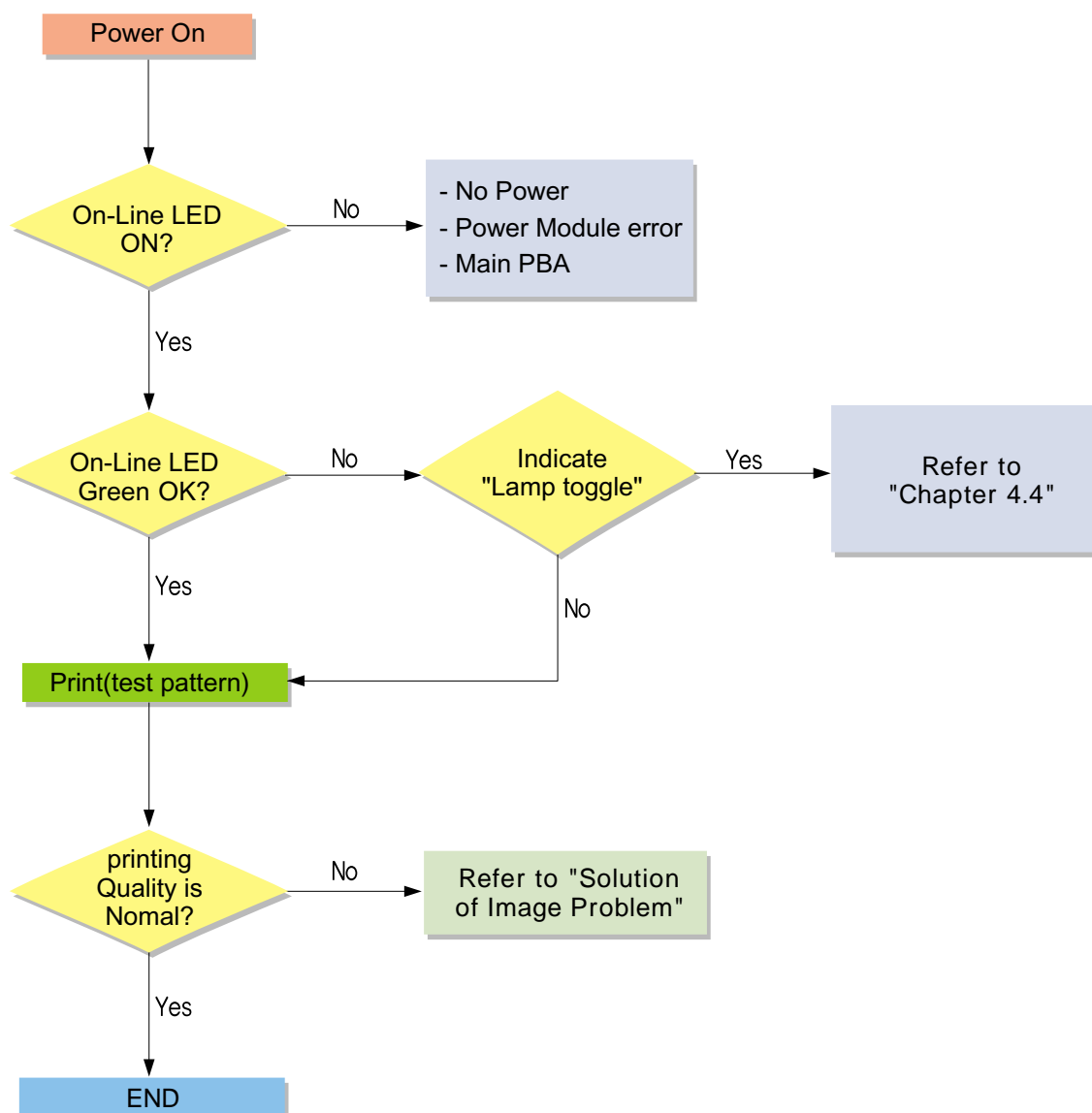
2. While pressing the hooks on the left/right side of the pick-up housing B, pull out the pick-up housing U as shown as below. Then, replace the sponge.



6. Troubleshooting

6.1 Checking Symptoms

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



6.1.1 Basic Check List

1. Check the Power.

- Does "Warming Up" appear on the display?
--> If not check power cable, switch or SMPS.
--> Does the wall socket work?
- Do the Motors or other components initialize (listen for main motor, fan and LSU sounds)?
--> If not or there are none of the normal startup sounds check cable, switch or SMPS.
--> Does the wall socket work?

2. Check the LED of Panel.

- Is there On-Line LED ON?
--> If not check power cable, switch SMPS or Main board.
--> Does the wall socket work?
- Is the abnormal Lamp?
--> Check the main PBA 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 section 6.5 (Page 6-17).

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

6.1.2 Initial Inspection

1. Check Power part

1. The printer does not work no matter how long you wait.
 - A. Is the Power Switch (printer and wall socket) turned on ?
 - B. Is the Power Cord connected to the printer correctly ?
 - C. Is the Power cord connected to the wall socket correctly ?
 - D. Is wall socket working ?
 - E. Is the unit rated at the same voltage as the supply ?
2. Does the Fan work when power is turned on?
 - A. Check the connectors on the SMPS.
 - B. Check the fuses in the SMPS.(F1)

2. Check the Installation Environment.

1. Ensure the installation surface is flat, level and free from vibration.
If necessary move the printer.
2. Ensure that the temperature and humidity of the surroundings are within specification
If necessary move the printer.
3. Ensure that the printer is position away from any air conditioning or other heating or cooling equipment. Also ensure that is not positioned in a direct draft from any air conditioning, fan or open window.
If necessary move the printer.
4. Ensure the printer is not positioned in direct sunlight.
If it is unavoidable use a curtain to shade the printer.
5. Ensure the printer is installed in a clean dust free environment.
Move the printer to clean area if necessary.
6. Some industrial or cleaning processes give of fumes which can affect the printer.
Move the printer away from this type of air pollution

3. Check paper type.

1. Use only paper which is of a suitable quality, weight and size?
See the user guide.

4. Check the overall condition of the printer

1. Is the printer properly maintained ?
Clean the Paper Transport Passages.
Any rollers with dirt surfaces should be cleaned or replaced.

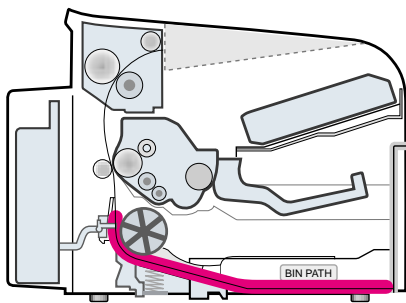
6.2 Bad discharge

6.2.1 Wrong Print Position

- **Description** Printing begins at wrong position on the paper.

Check and Cause	Solution
Wrong sense time caused by defective feed sensor actuator.	Replace the defective actuator

6.2.2 JAM 0

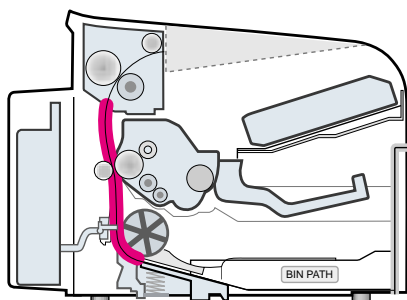


- **Description**

1. Paper is not exited from the cassette.
2. Jam-0 occurs if the paper feeds into the printer.

Check and Cause	Solution
1. Check the Solenoid by using DCU diagnostic mode 06.	1. Replace the solenoid.
2. Check if the pad is loose due to bad sealing of the side-pad.	2. Replace the side-pad Assembly L or R, if necessary.
3. Check the surface of the roller-pickup for foreign matter.	3. Clean with soft cloth dampened with IPA(Isopropyl Alcohol) or water.
4. If the paper feeds into the printer and Jam 0 occurs, perform DCU to check feed-sensor of the engine board.	4. Replace the SMPS, HVPS or Sensor.

6.2.3 JAM 1

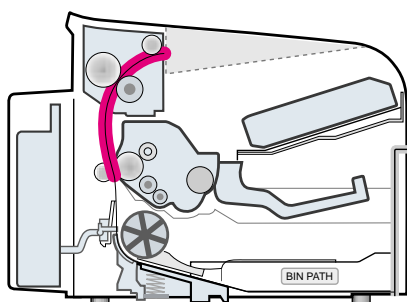


• Description

1. Recording paper is jammed in front of or inside the fuser.
2. Recording paper is stuck in the discharge roller and in the fuser just after passing through the Actuator-Feed.

Check and Cause	Solution
<ol style="list-style-type: none"> 1. If the recording paper is jammed in front of or inside the fuser. (Perform DCU diagnostic code 08) 2. If the recording paper is stuck in the discharge roller and the fuser just after passing through the Actuator-Feed, Feed Actuator may be defective. 	<ol style="list-style-type: none"> 1. Replace the SMPS. 2. Reassemble the Actuator-Feed and Spring-Actuator if the returning is bad.

6.2.4 JAM 2



• Description

1. Recording paper is jammed in front of or inside the fuser.
2. Recording paper is stuck in the discharge roller and in the fuser just after passing through the Actuator-Feed.

Check and Cause	Solution
<ol style="list-style-type: none"> 1. If the paper is completely fed out of the printer, but Jam 2 occurs : Exit sensor is defective. <ul style="list-style-type: none"> • After the paper is completely discharged, actuator Exit should return to the original position to shut the photo-sensor. Sometimes it takes longer hour than it should and does not return. 2. If the paper is rolled in the Fuser Roller: <ul style="list-style-type: none"> • This occurs when a Guide claw is broken away or transformed. • It occurs when the Spring of a Guide claw is broken away or transformed. • It occurs when the Heat-Roller or Pressure-Roller is seriously contaminated with the toner. 3. Paper is accordion in the fuser. 	<ol style="list-style-type: none"> 1. Check if the exit sensor actuator is defective. <ul style="list-style-type: none"> • Check if the actuator exit is unformed (Check if the lever part is unformed in shape). • Check whether burrs occur in the assembly part of the actuator exit or not and if the actuator is smoothly operated. • Check if foreign matters and wire get caught in the actuator exit's operation. 2. If the paper is stuck in the fuser : disassemble the fuser and remove the jammed paper, and clean the surface of the pressure roller with dry gauze. 3. Remove the jammed paper after disassembling the fuser : Clean the surface of the pressure roller with dry gauze. <ul style="list-style-type: none"> • Remove the toner particles stained on the rib. • Check the assemblage and performance of the exit.

6.2.5 Multi-Feeding

- **Description** Multiple sheets of paper are fed at once.

Check and Cause	Solution
1. Solenoid malfunction(the solenoid does not work properly): Perform DCU Diagnostic Code 06.	1. Replace the solenoid if necessary.
2. Pad-Friction is contaminated with foreign matter.(oil...)	2. Clean the pad friction with soft clothe dampened with IPA(Isopropyl Alcohol).
3. The face of paper is blended.	3. Use the smooth paper.

6.2.6 Paper rolled in the Fuser

- **Description** If contaminated at intervals of 57mm on the back of a paper.

Check and Cause	Solution
1. Contamination of the pressure roller or heat roller (Background, Hot off set).	1. After disassembling the fuser, clean contamination between the heat roller and the thermostat and remove the contamination of the pressure roller.
2. Check the claw of the fuser whether it is unfitted.	2. If there is heavy background, repair it by the background troubleshooting method. 3. The surface of the heat roller with IPA or water 4. Check the warp or separation of the sprint claw and the holder plate claw, and then manage it.

6.2.7 Paper rolled in the Toner Cartridge (OPC Drum)

- **Description** Paper is rolled up in the OPC.

Check and Cause	Solution
1. Paper is too much thin. 2. The face of paper is curled.	1. Recommend to use normal paper. 2. How to remove the rolled in the OPC Drum. <ul style="list-style-type: none">• Remove the paper while turning the OPC Drum against the ongoing direction.

6.3 Malfunction

6.3.1 All LEDs blinking (Fuser Error)

- **Description**
1. All the lamps on the operator panel blink.
 2. Gear of the fuser does not work and breaks away melt away.
When printing, motor breaks away from its place due to defective fuser gear.

Check and Cause	Solution
<ol style="list-style-type: none"> 1. Check if the thermostat, AC wire and Heat Lamp is open. 2. Check if the thermistor sensor is in place. 3. Check if the heat lamp works properly. 4. Check if the overheat circuit works properly. 5. The fuser gear is defective due to melting away. 	<ol style="list-style-type: none"> 1. If the thermostat is open replace the fuser and check following items. 2. If the thermistor sensor device is located deep in the sponge, replace the fuser. 3. Check if the circuit of overheat mode works properly. 4. Run DCU mode : Perform DCU diagnostic code 10. 5. Replace Fuser.

6.3.2 All LEDs blinking (Scan Error)

- **Description**
1. All lamps on the operator panel blink.

Check and Cause	Solution
DCU Mode : Perform DCU diagnostic code 05. If the DCU error code 95 is displayed, replace LSU.	<p>Replace LSU.</p> <p>If you cannot solve the problem after you replace LSU, replace the main board.</p>

6.3.3 Not function of the gear of the fuser due to melting away

- **Description** The motor breaks away from its place due to gear melting away.

Check and Cause	Solution
DCU Mode : Check if the Error States '60' '62' '68' occur. Check the operation of Fuser Erasing Lamp On/Off with the Error Code Check -10-.	1. Replace the Fuser. 2. Replace the Main Control board.

6.3.4 Paper Empty

- **Description** The paper lamp on the operator panel is on even when paper is loaded in the cassette.

Check and Cause	Solution
1. Bending or deformation of the actuator of the paper sensor.	1. Replace the defective actuator.
2. The function of the engine board is defective Perform DCU mode : Perform DCU diagnostic code 8.	2. Replace the engine board.

6.3.5 Paper Empty without indication

- **Description** The paper lamp on the operator panel does not come on when the paper cassette is empty.

Check and Cause	Solution
1. Bending or deformation of the actuator of the paper sensor.	1. Replace the defective actuator.
2. The function of the engine board is defective Perform DCU mode : Perform DCU diagnostic code 8.	2. Replace the engine board.

6.3.6 Cover Open

- **Description** The ERROR lamp is on even when the print cover is closed.

Check and Cause	Solution
<ol style="list-style-type: none"> 1. The Hook Lever in the top cover may be defective. 2. Check the connector (Engine B'd↔HVPS) and circuit of the cover switch department in the Main Control board. Perform DCU mode : If Error state '64' occurs, Check the related codes of the Cover Open Error. 	<ol style="list-style-type: none"> 1. Replace the hook lever, if defective. 2. Check the insertion of the Cover Open S/W Connect. 3. Replace the Main Control board or Cover Open S/W.

6.3.7 No lamp on when the cover is open

- **Description** The ERROR lamp does not come on even when the printer cover is open

Check and Cause	Solution
<ol style="list-style-type: none"> 1. Check the connector and circuit of the cover switch department in the Main Control board. Perform DCU mode : If Error state '64' occurs, Check the related codes of the Cover Open Error 	<ol style="list-style-type: none"> 1. Check the insertion of the Cover Open S/W Connect. 2. Replace the Main Control board or Cover Open S/W.

6.3.8 Defective motor operation

- **Description** Main motor is not driving when printing, and paper does not feed into the printer, resulting 'Jam 0'.

Check and Cause	Solution
1. Motor harness or sub PCB may be defective.	1. Check the motor harness, replace it, if defective.
2. Perform DCU diagnostic code 00 and Check the motor operation.	2. Replace the SMPS, if necessary.

6.3.9 No Power

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

Check and Cause	Solution
1. Check if the power input and SMPS output are normal.	1. Replace the power supply cord or SMPS.
2. Check the inferiority of LED-Panel on the front-cover if the LED of Panel does not appear after normal warming-up.	2. Replace the control board. 3. Replace the LED-panel.

6.3.10 Vertical Line Getting Curved

- **Description** When printing, vertical line gets curved.

Check and Cause	Solution
1. If the supply of +24v is unstable in the Main Control board linking with LSU, check drive by DCU Mode : LSU Check -05- LSU Motor on.	1. Replace LSU. 2. Replace the Main Control board.

6.4 Bad Software Environment

6.4.1 The printer is not working (1)

- **Description** While Power turned on, the printer is not working in the printing mode.

Check and Cause	Solution
1. Run Self-Test Mode : Turn the power on while pressing the test printing button for 2 or 3 seconds before printing works.	1. Check the power of the printer and perform the Self-Test. If the test printing works, that means no problems in the printer itself. If the test printing does not work, that means bad functioning of the printer (not because of software). Perform DCU to check the Error Status.
2. Check if the PC and the printer is properly connected and the toner cartridge installed.	2. Replace the printer cable. If the problems not solved even after the cable replaced, check the amount of the remaining tone.
3. Printing is nor working in the Windows.	3. Check if the connection between PC and printer port is proper. If you use windows, check if the printer driver in the controller is set up. If the printer driver is properly set up, check in which program the printing is not working. The best way to find out is to open the memo pad to check the function of printing. If it is not working in a certain program, adjust the setup the program requires. Sometimes, the printout is normal within the Windows basic programs, but it's not working in a particular program. In such case, install the new driver again. If not working in the Windows basic program, Check the setup of the port of CMOS is on ECP. And check the address of IRQ 7 and 378
4. Check if the printer cable is directly connected to peripheral devices	4. If the scanner needs to be connected to the printer, first the remove the scanner from the PC to see if the printer is properly working alone.

6.4.2 The printer is not working (2)

• **Description**

After receiving the printing order, no response at all or the low speed of printing occurs due to wrong setup of the environment rather than malfunction of the printer itself.

Check and Cause	Solution
1. Secure more space of the hard disk.	1. Not working with the message 'insufficient printer memory' means hard disk space problem rather than the RAM problem. In this case, provide more space for the hard disk. Secure more space using the disk utilities program.
2. Printing error occurs even if there is enough space in the hard disk.	2. The connection of the cable and printer port is not proper. Check if the connection is properly done and if the parallel port in CMOS is rightly set up.
3. Check the parallel-port-related items in the CMOS Setup.	3. As a printer port, Select ECP or SPP among SPP(Normal), ECP, and EPP modes(increase printing speed) SPP normal mode support 8-bit data transfer, while ECP Mode transfer the 12-bit data.
4. Reboot the system to print.	4. If the regular font is not printing, the cable or the printer driver may be defective. Turn the PC and printer off, and reboot the system to print again. If not solved, double-click the printer in my computer. If the regular fonts are not printed this time again, the cable must be defective so replace the cable with new one.

6.4.3 Abnormal Printing

• **Description**

The printing is not working properly even when the cable has no problem.
(even after the cable is replaced)

If the printer won't work at all or the strange fonts are repeated, the printer driver may be defective or wrong setup in the CMOS Setup.

Check and Cause	Solution
1. Set up the parallel port in the CMOS SETUP.	1. Select SPP(Normal) or ECP LPT Port the among ECP, EPP or SPP in the CMOS Setup.
2. Printer Driver Error.	2. Check the printer in My Computer.(to see if the printer driver is compatible to the present driver or delete the old driver, if defective and reinstall the new driver)
3. Error message from insufficient memory. (The printing job sometimes stops or due to insufficient virtual memory, but it actually comes from the insufficient space of the hard disk.)	3. Delete the unnecessary files to secure enough space of the hard disk and start printing job again.

6.4.4 SPOOL Error

• Description

To spool which stands for "simultaneous peripheral operations online" a computer document or task list (or "job") is to read it in and store it, usually on a hard disk or larger storage medium so that it can be printed or otherwise processed at a more convenient time (for example, when a printer is finished printing its current document).

Check and Cause	Solution
1. Insufficient space of the hard disk in the directory assigned for the basic spool.	1. Delete the unnecessary files to provide more space to start printing job.
2. If the previous printing error not solved.	2. If there are some files with the extension name of ****.jnl, Delete them and Reboot the Windows to restart printing job.
3. When expected to collide with other program.	3. Shut down all other programs except the current one, if possible.
4. When an application program or the printer driver is damaged.	4. Delete the printer driver completely and reinstall it.
5. When some files related to OS are damaged or virus infected.	5. After rebooting the computer, check for viruses, restore the damaged files and reinstall the program to do the printing job.
6. Memory is less than suggested one.	6. Add up enough memory to the PC.

⚠ How to delete the data in the spool manager.

In the spool manager, the installed drivers and the list of the documents waiting to be printed are shown. Select the document to be deleted and check the delete menu.

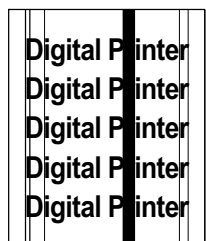
If you intend to delete the current document being printed, the data being transferred to the printer will be put out and then the document is removed. Before choosing the document, the menu is still inactive.

Or put the document out of the list and repeat the routine as in the above or finish the spool manager.

6.5 Bad image

6.5.1 Vertical Black Line and Band

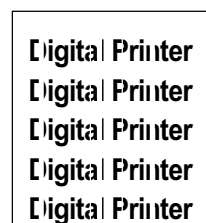
- **Description**
1. Straight thin black vertical line occurs in the printing.
 2. Dark black vertical band occur in the printing.



Check and Cause	Solution
<ol style="list-style-type: none"> 1. Damaged develop roller in the Developer. Deformed Doctor-blade or cleaning-blade. 2. Scratched surface of the discharge roller in the developer. 3. Partly depression or deformation on the surface of the transfer roller. 	<ol style="list-style-type: none"> 1. If causes 1 and 2 occur in the developer cartridge, replace the developer and try to print out. 2. Replace the transfer roller if occurred as No. 3.

6.5.2 Vertical White Line

- **Description**
- White vertical voids in the image.



Check and Cause	Solution
<ol style="list-style-type: none"> 1. Foreign matter stuck onto the window of internal lenses of LSU mirror. 2. Foreign matter or toner particles between the developer roller and blade. (In case the life of the developer has been expired, white lines or light image occur in front of the image.) 3. It may occur when Burr and foreign substances are on the window of the developer frame. 4. If the fuser is defective, voids occur periodically at the top of a black image. 	<ol style="list-style-type: none"> 1. Foreign matter stuck onto the window : Clean the LSU window with recommended cleaner(IPA) Clean the window with a clean cotton swab. 2. Foreign matter in the LSU : Open the cover of LSU and clean with a cotton swab on the surface of the reflex mirror. 3. No 3. : Remove the foreign matter and burr of the exposure window. (Developer cartridge) 4. No. 4. : Open the front cover and check ribs that corresponds to the position of the voids. Remove if found. 5. If the problems are not solved, replace the developer cartridge.

6.5.3 Horizontal Black Band

• Description

1. Dark or blurry horizontal stripes occur in the printing periodically.
(They may not occur periodically.)

Digital Printer

Digital Printer

Digital Printer

Digital Printer

Digital Printer

Check and Cause	Solution
<ol style="list-style-type: none"> 1. Bad contacts of the voltage terminals to developer. 2. The rollers of developer may be stained. OPC Drum = 75.5mm Charge Roller = 37.7mm Supply Roller = 47.5mm Develop Roller = 35.2mm Transfer Roller = 46.2mm Heat Roller = 63.9mm Pressure Roller = 75.4mm 	<ol style="list-style-type: none"> 1. Clean each voltage terminal of the Charge, Supply, Develop and Transfer roller. (remove the toner particles and paper particles) 2. Clean the right Gear that has relatively small gap of the teeth in the OPC. 3. If the malfunction persists, replace the developer.

6.5.4 Black/White Spot

• Description

1. Dark or blurry black spots occur periodically in the printing.
2. White spots occur periodically in the printing.

Digital Printer
 Digital Printer
 Digital Printer
 Digital Printer
 Digital Printer

Check and Cause	Solution
<ol style="list-style-type: none"> 1. If dark or blurry black spots occur periodically, the rollers in the Developer may be contaminated with foreign matter or paper particles. (Charge roller : 37.7 mm interval OPC drum : 75.5 mm interval) 2. If faded areas or voids occur in a black image at intervals of 75.5 mm, or black spots occur elsewhere, the OPC drum surface is damaged. 3. If a black image is partially broken, the transfer voltage is abnormal or the transfer roller's life has expired. 	<ol style="list-style-type: none"> 1. Run OPC cleaning Mode Print and run the Self-test 2 or 3 times. 2. In case of 75.5 mm interval unremovable in 1, cleanly remove foreign substances stuck on the OPC location equivalent to black spots and white spots with a dry duster. 3. The transfer roller guarantees 50,000 sheets printing. If the roller's life is expired, replace it. 4. In case of 37.7 mm interval unremovable in 1, take measures as to replace the developer cartridge and try to print out. 5. Clean the inside of the set against the paper particles and foreign matter in order not to cause the trouble.

6.5.5 Light Image

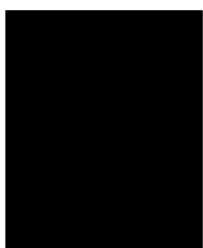
- **Description** The printed image is light, with no ghost.

Digital Printer
Digital Printer
Digital Printer
Digital Printer
Digital Printer

Check and Cause	Solution
1. Develop roller is stained when the toner of developer cartridge is almost consumed.	1. Check if the Toner Save mode is off.
2. Ambient temperature is below than 10°C.	2. Replace the developer cartridge and try to print out.
3. Bad contact caused by the toner stains between the high voltage terminal in the HVPS and the one in the set.	3. Wait 30 minutes after printer is powered on before you start printing.
4. Abnormal output from the HVPS.	4. Clean up the contaminated area by the toner.
	5. Replace the HVPS if the problems are not solved by the above four directions.

6.5.6 Dark Image or a Black

- **Description** The printed image is dark.



Check and Cause	Solution
1. No charge voltage in the engine board. (Perform DCU diagnostic code 01)	1. Clean the high voltage charge terminal.
2. Charge voltage is not turned on due to the bad contacts between power supply in the side of the Developer and charge terminal of HVPS.	2. Check the state of the connector which connects the engine board and HVPS.
	3. Replace the HVPS if not solved by the above direction 1 and 2.

6.5.7 Uneven Density

- **Description** Print density is uneven between left and right.

Digital Printer
Digital Printer
Digital Printer
Digital Printer
Digital Printer

Check and Cause	Solution
<ol style="list-style-type: none"> 1. 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, or the transfer roller bushing or holder is damaged. 2. The toner level is not even on the developer roller due to the bad blade. 	<ol style="list-style-type: none"> 1. Replace both the left and right Spring Holder. 2. Occur in the developer cartridge, replace the developer and try to print out.

6.5.8 Background

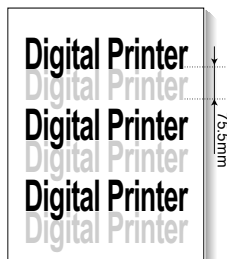
- **Description** Light dark background appears in whole area of the printing.

Digital Printer
Digital Printer
Digital Printer
Digital Printer
Digital Printer

Check and Cause	Solution
<ol style="list-style-type: none"> 1. Does character exist less than 2% per a page, and hasn't it been used long time? 2. Does recycle paper be used? 3. Has the life span of the developer ended? 4. Is the movement(Up and Down) of the transfer roller smooth? 5. Is the HVPS normal? 	<ol style="list-style-type: none"> 1. The toner cartridge is basically designed to print 2,000 sheets with 5% image. 2. The B/S is not guaranteed if using recycle paper. 3. Replace the developer when the life span of it has been ended. 4. Clean the bushing part of the transfer roller. 5. If the problem is still not solved, replace the developer.

6.5.9 Ghost (1)

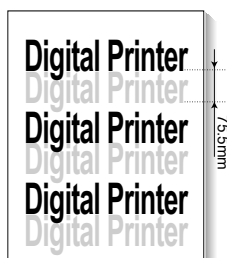
- **Description** Ghost occurs at 75.5 mm intervals of the OPC drum in the whole printing.



Check and Cause	Solution
1. Bad contacts caused by contamination from toner particles between high voltage terminal in the main body and the electrode of the Developer.	1. Clean the terminals when contaminated by toner particles.
2. Bad contacts caused by contamination from toner particles between high voltage terminal in the main body and the one in the HVPS board.	2. Occur in the developer cartridge, replace the developer and try to print out.
3. The life of developer is expired.	3. Replace the engine board if not solved by the above directions 1-2.
4. Transfer roller lifetime(50.000 sheets) has expired.	4. If not solved by the direction 3, check the transfer roller lifetime and replace it.
5. Abnormal low temperature(below 10°C).	5. Wait about 1 hour after power on before using printer.

6.5.10 Ghost (2)

- **Description** Ghost occurs at 75.5 mm intervals of the OPC drum in the whole printing.
(When printing on card stock or transparencies using manual feeder)



Check and Cause	Solution
When printing on card stock thicker than normal paper or transparencies such as OHP, higher transfer voltage is required.	Select 'Thick Mode' on paper type menu from the software application and after using returning to the original mode is recommended.

6.5.11 Ghost (3)

- **Description** White ghost occurs in the black image printing at 47.5mm intervals.



Check and Cause	Solution
<ol style="list-style-type: none"> 1. The life of the developer may be expired. 2. The abnormal voltage and bad contact of the terminal of the supply roller 	<ol style="list-style-type: none"> 1. Occur in the developer cartridge, replace the developer and try to print out. 2. Check the approved voltage of the supply roller and contact of the terminal and adjust if necessary.

6.5.12 Ghost (4)

- **Description** Ghost occurs at 47.5mm(or 63.9mm) intervals.



Check and Cause	Solution
The temperature of the fuser is maintained high.	<ol style="list-style-type: none"> 1. Disassemble the fuser and remove the contaminated toner particles on the roller and clean the foreign matter between Thermistor and Heat roller. (⚠ Caution : can be deformed)

6.5.13 Stains on the Face of Page

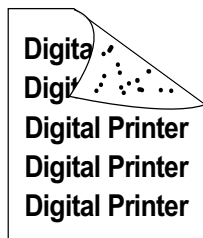
- **Description** The background on the face of the printed page is stained.



Check and Cause	Solution
<ol style="list-style-type: none"> 1. Toner leakage due to improperly sealed developer. 2. If the transfer roller is contaminated, stains on the face of page will occur. 	<ol style="list-style-type: none"> 1. Replace the developer cartridge. 2. If the transfer roller is contaminated, run PC Cleaning Mode Print 2 or 3 times. And perform Self-Test 2 or 3 times to remove contamination.

6.5.14 Stains on Back of Page

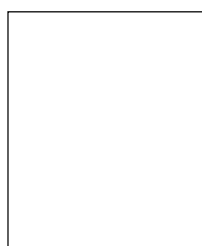
- **Description** The back of the page is stained at 47 mm intervals.



Check and Cause	Solution
1. Transfer roller is contaminated.	1. Perform the OPC Cleaning Mode Print 2 or 3 times. Run Self-Test to remove the contamination of the transfer roller.
2. Pressure roller is contaminated.	2. Replace the transfer roller if contaminated severely. 3. Disassemble the fuser and clean the H/R(Heat Roller) and P/R(Pressure roller). And check the area between H/R and Thermistor. If contaminated, clean the area not to be deformed.

6.5.15 Blank Page Print out (1)

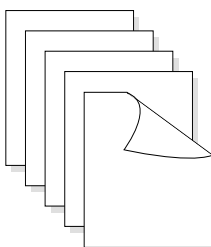
- **Description** Blank page is printed.



Check and Cause	Solution
Bad ground contacts in OPC and/or developer.	Remove contamination of the terminals of the developer and the unit.

6.5.16 Blank Page Print out (2)

- **Description**
1. Blank page is printed.
 2. One or several blank pages are printed.
 3. When the printer turns on, several blank pages print.



Check and Cause	Solution
1. Bad ground contacts in OPC and/or developer.	1. Remove contamination of the terminals of the developer.
2. Abnormal solenoid.	2. Perform the engine self test using DCU to check if the Solenoid is normal.(refer to code 06) 3. If not solved by the above directions 1-2, Replace the engine board. 4. Turn the power off, delete the data of PC and try printing again.

7. Exploded Views and Parts List (ML-1610/XBH)

Contents

7.1 Main Assembly	p.7-2
7.2 Frame Assembly	p.7-4
7.3 Fuser Unit	p.7-6
7.4 Paper Path Assembly	p.7-8

Part Number & Description format.

Part numbers and descriptions are defined according to a company standard. The information below will help you to understand the part number format and assist when ordering spare parts.

- There are two types of Part number format.

●●●●—●●●●●●	ex) 2007-007961	R-CHIP
■●●●—●●●●●■	ex) JB96-01268A	ELA UNIT-COVER TOP
It shows part specific		
(● : number ■ : letter)		

Type 1 : This format is used throughout Samsung on all product ranges.
Typically it is used for small components and electronic parts.

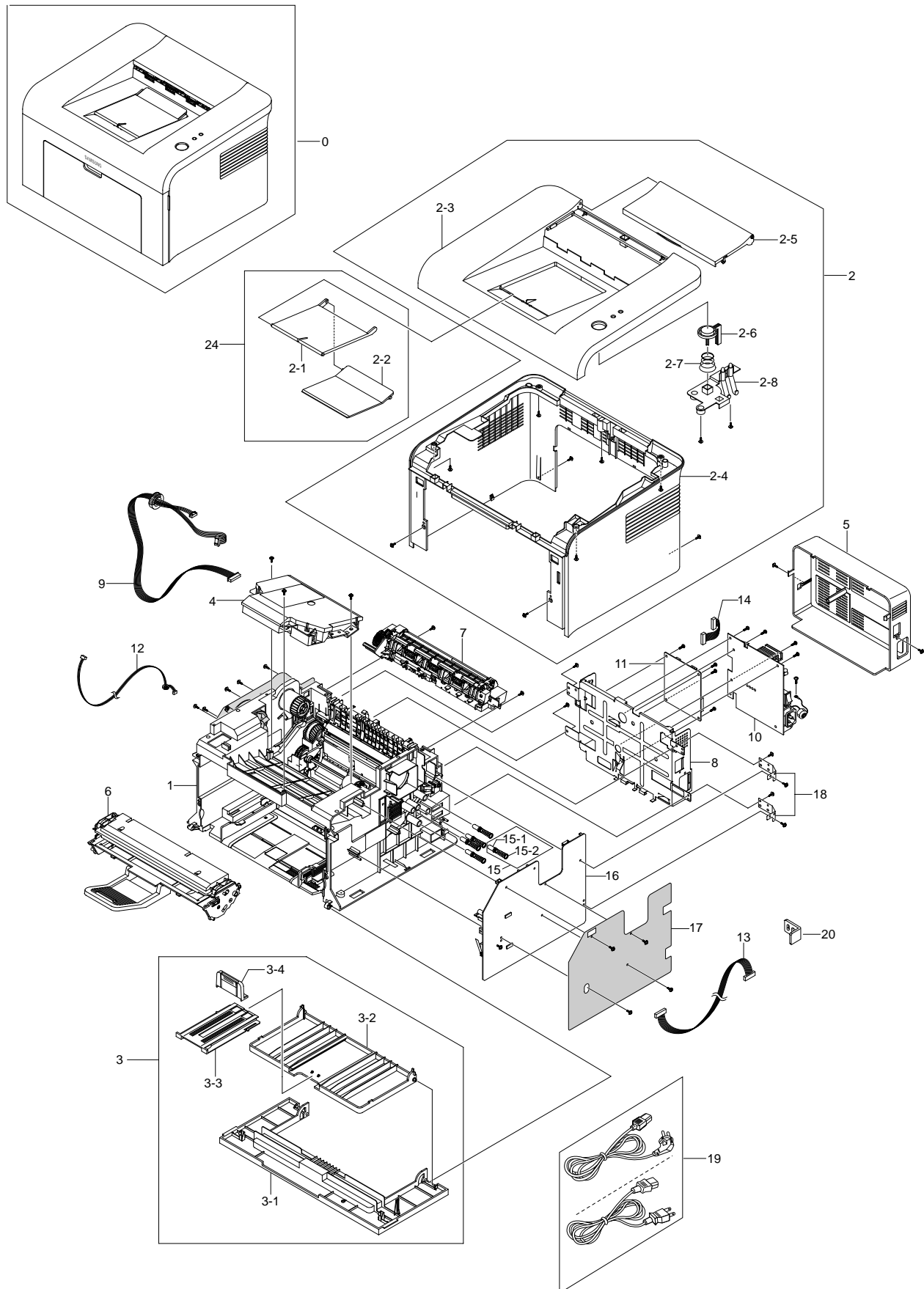
Type 2 : This format is controlled by individual Samsung Divisions and is used on specific products, typically for mechanical parts. Type 2 format part numbers fall into 2 categories:

- **A/S privately used part** : It is only used for A/S .
- **Ass'y part** : Assemblies consisting of 2 or more parts. Also used for Service manuals, user guides and diagrams.

• Ass'y parts and A/S privately used Parts can be distinguished by the part Code and Description. They are always Type 2 format. The 2 leading characters indicate private or assembly parts.

DIVISION	PART CODE	DESCRIPTION
A/S Private	**81-***** (JB81-00039A)	AS-***** (AS-USE)
ASS'Y Part	**75-***** (JB75-00068A)	MEC-***** (MEC-CHUTE)
ASS'Y Part	**92-***** (JB92-01131A)	PBA ***** (PBA MAIN-CONTROLLER)
ASS'Y Part	**97-***** (JB97-01089A)	MEA ***** (MEA UNIT-PULLEY IDLE)

7.1 Main Assembly



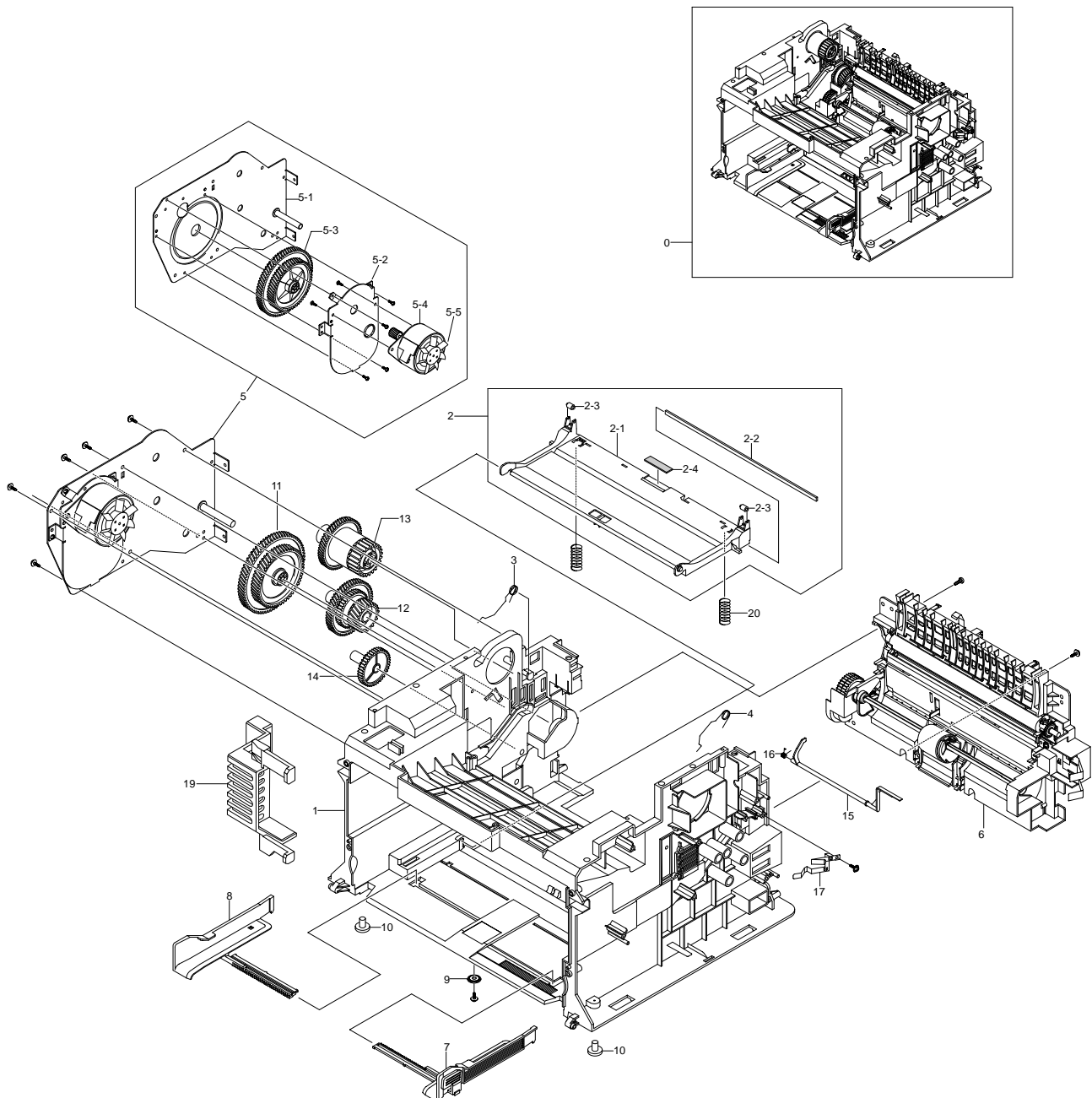
Main Assembly Parts List

SA : Service Available

O : Service available X : Service not available

No.	Location	SEC.Code	Description	Q'ty	SA	Remark
7.1-0	-	ML-1610/XBH	SET	-	-	
7.1-1	F2090	JC96-03349A	ELA UNIT-FRAME_LOWER	1	SA	
7.1-2	T4062	JC97-02177A	MEA UNIT-COVER MAIN	1	SA	
7.1-2-1	Z5090	JC61-01155A	GUIDE-M-STACKER_RX	1	SA	
7.1-2-2	Z5092	JC61-01156A	GUIDE-M-SUB STACKER	1	SA	
7.1-2-3	Z2168	JC63-00618A	COVER-M_TOP	1	SNA	
7.1-2-4	Z2198	JC63-00619A	COVER-M-MAIN	1	SNA	
7.1-2-5	D0027	JC63-00620A	COVER-M-JAM	1	SA	
7.1-2-6	K0045	JC64-00184A	KEY-M-ONLINE	1	SNA	
7.1-2-7	A1013	JC66-00816A	LEVER-M-ACTUATOR JAM	1	SA	
7.1-2-8	W3274	JC67-00079A	LENS-M_LED	1	SNA	
7.1-3	Z2409	JC97-02176A	MEA UNIT-COVER FRONT	1	SA	
7.1-3-1	Z2146	JC63-00616A	COVER-M_FRONT(DEVE)	1	SNA	
7.1-3-2	K3955	JC63-00617A	TRAY-M-CASSETTE	1	SNA	
7.1-3-3	E5013	JC63-00628A	TRAY-M-EXTENSION LARGE	1	SNA	
7.1-3-4	E5014	JC63-00629A	TRAY-M-EXTENSION SMALL	1	SNA	
7.1-4	L7012	JC59-00023A	UNIT-LSU	1	SA	
7.1-5	S7009	JC63-00621A	COVER-M-SMPS	1	SA	
7.1-6	T2060	JC96-03355B	ELA UNIT-DEVE KIT_2K;	1	SNA	
7.1-7	F4038	JC96-03401A	ELA HOU-FUSER 220V	1	SA	AC220V
7.1-8	E2108	JC63-00632A	SHIELD-P-ENGINE	1	SNA	
7.1-9	L7002	JC39-00406A	CBF HARNESS-LSU	1	SA	
7.1-10	S7050	JC44-00081A	SMPS-(V2C)	1	SA	AC110V
7.1-11	Z1024	JC92-01640A	PBA MAIN-USB_ONLY	1	SA	
7.1-12	M2053	JC39-00405A	CBF HARNESS-MOTOR	1	SA	
7.1-13	H1098	JC39-00400A	CBF HARNESS-HVPS	1	SA	
7.1-14	H1247	JC39-00402A	CBF HARNESS-SMPS	1	SA	
7.1-15	K3197	JC96-01672A	ELA UNIT-TERMINAL TR L	5	SA	
7.1-15-1	Z4197	JC61-00031A	SPRING ETC--HV LARGE	1	SA	
7.1-15-2	S4027	JC70-40912A	ICT-SHAFT HV LARGE	1	SA	
7.1-16	S7027	JC44-00079A	HVPS-SKYLARK	1	SA	
7.1-17	D2132	JC63-00722A	HEET-HVPS	1	SA	
7.1-18	K3232	JC63-00631A	GROUND-P-HVPS	2	SNA	
7.1-19	K2903	3903-000067	CBF-POWER CORD 220V	1	SA	
7.1-20	P5151	JC61-01170A	PLATE-P-CHANNEL	1	SA	

7.2 Frame Assembly



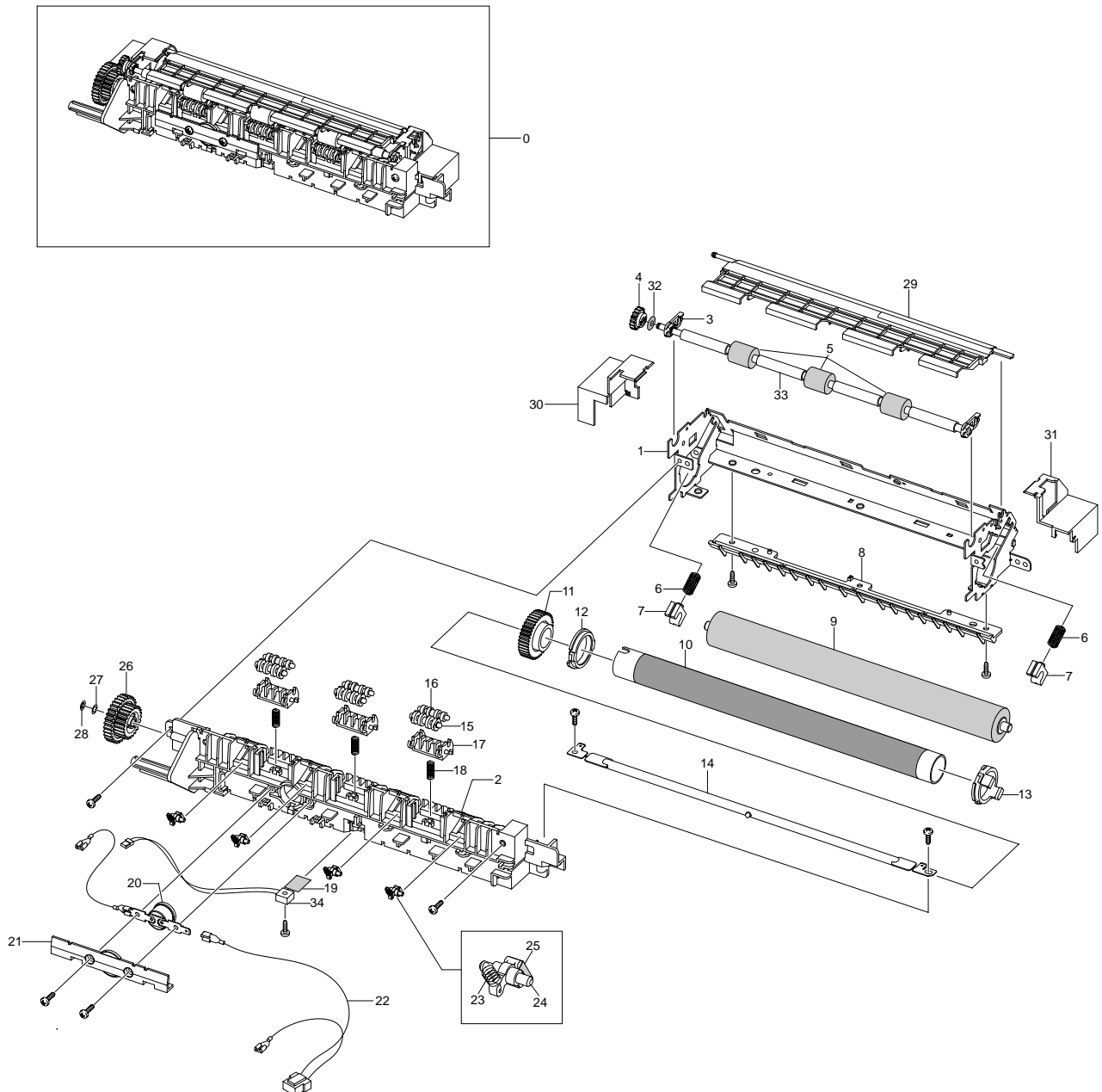
Frame Assembly Parts List

SA : Service Available

O : Service available X : Service not available

No.	Location	SEC.Code	Description	Q'ty	SA	Remark
7.2-0	F2090	JC96-03349A	ELA UNIT-FRAME_LOWER	1	SA	
7.2-1	B0080	JC61-01152A	FRAME-M-BASE	1	SNA	
7.2-2	K3602	JC97-02218A	MEA UNIT-PLATE KNOCK_UP	1	SA	
7.2-2-1	K5002	JC61-01158A	PLATE-M-KNOCK_UP	1	SA	
7.2-2-2	P2158	JC66-00720A	SHAFT-P-CORE;ML-1750,SECC 1.6T,220,-,-,-	1	SNA	
7.2-2-3	K5006	JC72-01004A	PMO-IDLE KNOCK UP MP	2	SA	
7.2-2-4	K5007	JC74-00011A	MPR-PAD KNOCK UP MP	1	SNA	
7.2-3	Z4271	JC61-01258A	SPRING ETC-TORSION DEVE_L	1	SA	
7.2-4	Z4272	JC61-01259A	SPRING ETC-TORSION DEVE_R	1	SA	
7.2-5	D4030	JC96-03518A	ELA UNIT-RX DRIVE	1	SA	
7.2-5-1	B4025	JC61-01153A	BRACKET-P-GEAR	1	SNA	
7.2-5-2	M2048	JC61-01154A	BRACKET-P-MOTOR	1	SNA	
7.2-5-3	G0383	JC66-00804A	GEAR-RDCN 139/83	1	SA	
7.2-5-4	P2119	JC31-00020D	MOTOR BLOWER-STEP 7.5	1	SA	
7.2-5-5	K4023	JC72-00825A	PMO-IMPELLER_DRV	1	SNA	
7.2-6	B0101	JC97-02175A	MEA UNIT-FRAME PAPER PATH	1	SA	
7.2-7	K2015	JC70-00500A	ADJUST-M-CASSETTE_R	1	SA	
7.2-8	K2014	JC70-00499A	ADJUST-M-CASSETTE_L	1	SA	
7.2-9	G0369	JG66-40003A	GEAR-PINION;SF4000,POM,WHT,M1,Z1	1	SA	
7.2-10	F1011	JC61-00836A	FOOT-FRONT;ML-1750,NBR,D7,-,12,-,-	2	SA	
7.2-11	G0381	JC66-00805A	GEAR-RDCN 113/83	1	SA	
7.2-12	D4047	JC66-00806A	GEAR-OPC DR 76/38/29	1	SA	
7.2-13	F4086	JC66-00807A	GEAR-FUSER DR 63/35	1	SA	
7.2-14	F6076	JC66-00808A	GEAR-FEED DR 41	1	SA	
7.2-15	K3816	JC66-00822A	LEVER-M-ACTUATOR_EMPTY	1	SA	
7.2-16	Z4274	JB61-00076A	SPRING ETC-TORSION DOC (CC2-F);SCX-1110F	1	SA	
7.2-17	D4053	JC63-00622A	GROUND-P-OPC	1	SA	
7.2-18	D4084	6107-001240	SPRING-CS	2	SNA	
7.2-19	A0003	JC67-00110A	CAP-M-MOTOR	1	SNA	
7.2-20	B2030	JC61-00025A	SPRING-CS-CHARGE APOLLO;SF-5100,	2	SNA	

7.3 Fuser Unit



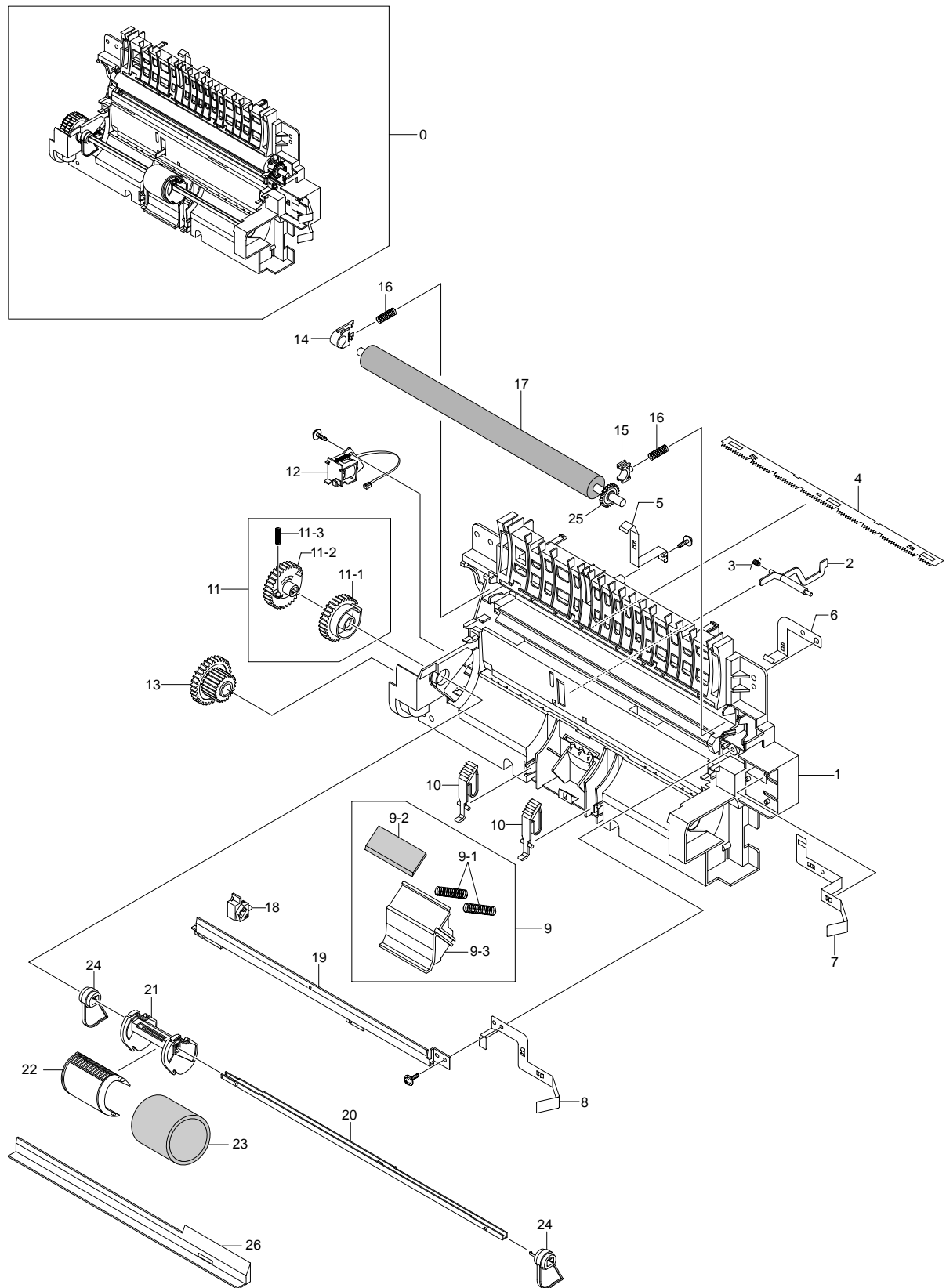
Fuser Unit Parts List

SA : Service Available

O : Service available X : Service not available

No.	Location	SEC.Code	Description	Q'ty	SA	Remark
7.3-0	F4038	JC96-03401A	ELA HOU-FUSER 220V	1	SA	AC 220V
7.3-1	F2122	JC61-01162A	FRAME-P-FUSER	1	SNA	
7.3-2	Z2149	JC63-00615A	COVER-M_FUSER	1	SNA	
7.3-3	H4027	JC61-01177A	HOLDER-M-EXIT R	2	SA	
7.3-4	E4038	JC66-00810A	GEAR-EXIT_DRV17	1	SNA	
7.3-5	H4026	JC61-01172A	HOLDER-M-EXIT F/DOWN	3	SNA	
7.3-6	D4085	6107-001168	SPRING-CS	2	SNA	
7.3-7	P6004	JC66-10901A	BEARING-PRESSURE/R;ML-165,PPS,5,-,14.8	2	SA	
7.3-8	K3960	JC61-00595A	GUIDE-M-INPUT;ML-1400,PET+GF30%,,-,,-,BL	1	SNA	
7.3-9	P6014	JC66-00600A	ROLLER-PRESSURE	1	SA	
7.3-10	H2010	JC66-00601A	ROLLER-HEAT	1	SA	
7.3-11	F4094	JC66-00564A	GEAR-FUSER, Z37;ML-1710,HTN51G35HSL,0.8,	1	SA	
7.3-12	K2879	JC61-00589A	BUSH-M-HR L;ML-1400,PPS,-,-,-,V0	1	SNA	
7.3-13	K2880	JC61-00590A	BUSH-M-HR R;ML-1400,PPS(RBA313N, CONDUCT	1	SA	
7.3-14	K2297	4713-001202	LAMP-HALOGEN, 230V	1	SA	AC 230V
7.3-15	R1083	JC66-00824A	ROLLER-M-EXIT MAIN	3	SNA	
7.3-16	R1084	JC66-00830A	ROLLER-M-EXIT FR	3	SNA	
7.3-17	D4085	6107-001168	SPRING-CS	2	SNA	
7.3-18	D4086	6107-001163	SPRING-CS;SUS304-WPB,-,PI0.4,D3.9,L13,-,	3	SA	
7.3-19	W3071	1404-001298	HERMISTOR-NTC;7KOHM,-,3370K,0.3MW/C	1	SA	
7.3-20	K4279	JC47-00005B	THERMOSTAT-150	1	SA	
7.3-21	H1089	JC39-00404A	CBF HARNESS-FUSER JOINT	1	SA	
7.3-22	H1085	JC39-00403B	CBF HARNESS-FUSER(220V)	1	SA	
7.3-23	B2031	JC61-00064A	SPRING-CLAW;ML-5200A,SUS 304 WPB	4	SNA	
7.3-24	H4031	JC61-00584A	HOLDER-M-PLATE CLAW;ML-1400,PET+GF30%,	4	SA	
7.3-25	H4032	JC61-00605A	PLATE-P-CLAW;ML-1400,SUS304-CSP,0.1,-,-,	4	SNA	
7.3-26	E4039	JC66-00801A	GEAR-EXIT_DR38/25	1	SNA	
7.3-27	S2004	6031-001051	WASHER-PLAIN;M4,ID4.1,OD7.0,T0.1	1	SNA	
7.3-28	D4086	6107-001163	SPRING-CS;SUS304-WPB,-,PI0.4,D3.9,L13,-,	3	SA	
7.3-29	Z2194	JC63-00637A	COVER-M-FUSER-DUMMY	1	SNA	
7.3-30	L1014	JC63-00639A	COVER-M-LAMP-L	1	SNA	
7.3-31	L1015	JC63-00638A	COVER-M-LAMP-R	1	SNA	
7.3-32	D4088	6044-000001	RING-CS;ID3,OD3,T0.25,BLACK,SUS304	1	SNA	
7.3-33	E4159	JC66-00826A	ROLLER-EXIT F/DOWN	1	SA	
7.3-34	H4087	JC67-00085A	CAP-M-THERMO	1	SNA	

7.4 Paper Path Unit



Paper path Unit Parts List

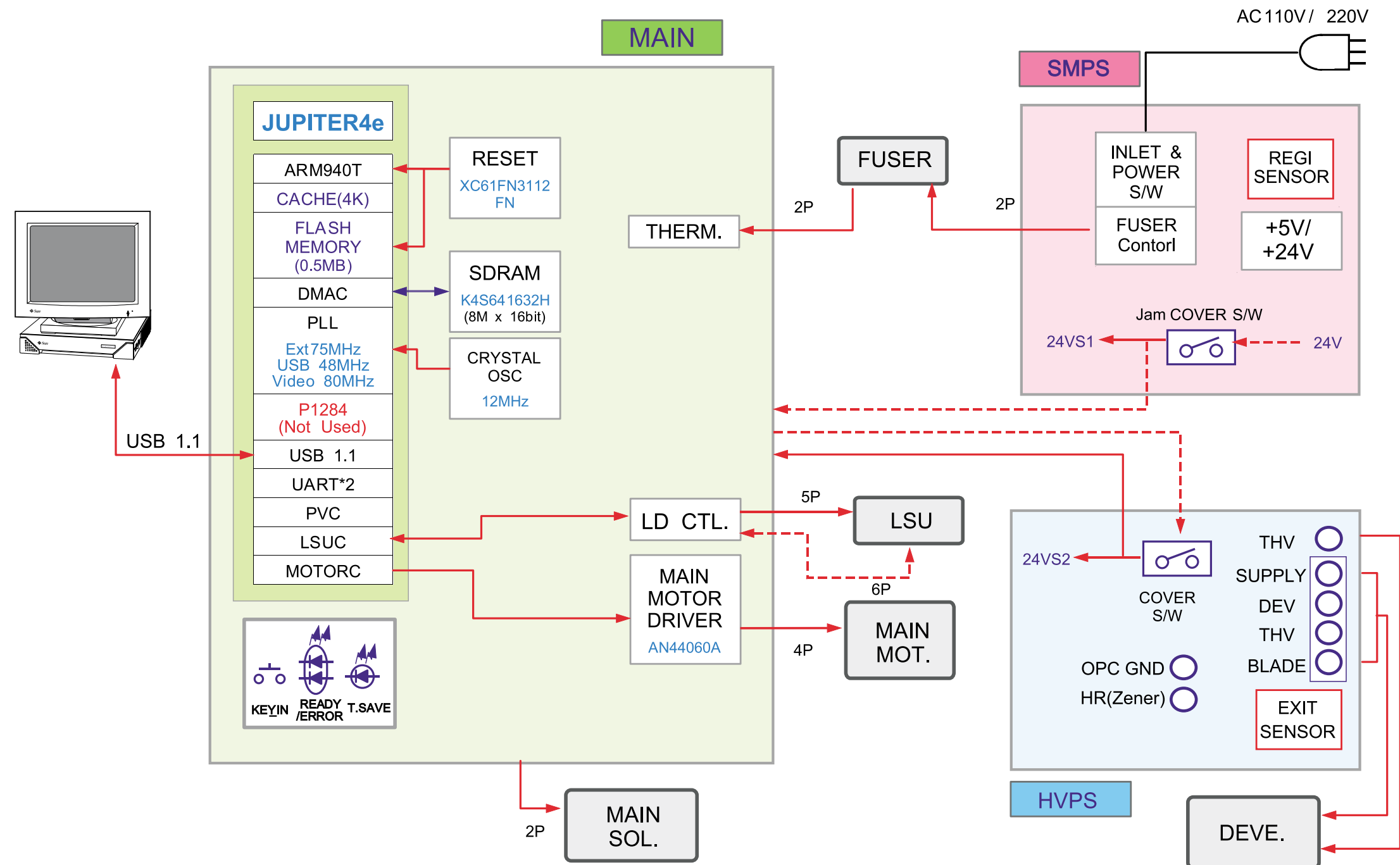
SA : Service Available

O : Service available X : Service not available

No.	Location	SEC.Code	Description	Q'ty	SA	Remark
7.4-0	B0101	JC97-02175A	MEA UNIT-FRAME PAPER PATH	1	SA	
7.4-1	G2069	JC61-01161A	GUIDE-M-PAPER PATH	1	SA	
7.4-2	E7006	JC66-00814A	LEVER-ACTUATOR FEED SENSOR	1	SA	
7.4-3	Z4209	JB61-00107A	OPRING ETC-LEVER SENSOR;SF-430,SUS304	1	SA	
7.4-4	K3377	JC70-10232A	IPR-PLATE SAW	1	SA	
7.4-5	W3076	JC63-00625A	GROUND-P-VARISTOR	1	SNA	
7.4-6	W3077	JC63-00624A	GROUND-P-ZENER	1	SNA	
7.4-7	W3078	JC63-00623A	GROUND-P-THV	1	SNA	
7.4-8	W3079	JC63-00626A	GROUND-P-SAW	1	SNA	
7.4-9	P0015	JC97-02217A	MEA UNIT-HOLDER_PAD	1	SA	
7.4-9-1	Z4137	JC61-70911A	SPRING ETC-EXIT ROLL FD;ML-165,SUS304 WP	2	SA	
7.4-9-2	R1049	JC69-00846A	PAD-FRICTION	1	SNA	
7.4-9-3	H4029	JC61-01169A	HOLDER-M-PAD	1	SA	
7.4-10	R1120	JC66-00815A	LEVER-M-KICKER P/U	2	SNA	
7.4-11	P2093	JC97-02179A	MEA UNIT-PICK UP GEAR	1	SA	
7.4-11-1	P2056	JC66-00803A	GEAR-PICK_UP B	1	SA	
7.4-11-2	P2057	JC66-00802A	GEAR-PICK_UP A	1	SA	
7.4-11-3	D4089	6107-001167	SPRING-CS	1	SA	
7.4-12	S8014	JC33-00015B	SOLENOID-MP_R2;-;SCX-4720F,DC24V,	1	SA	
7.4-13	F6071	JC66-00809A	GEAR-FEED 35/19	1	SA	
7.4-14	K2886	JC61-00588A	BUSH-M-TR L;ML-1400,POM(M90-44),-,-,BL	1	SA	
7.4-15	K3856	JC72-00102A	PMO-BUSHING_TR(L);SF-5100,POM ,B	1	SA	
7.4-16	Z4277	JC61-70940A	SPRING ETC-TR(12)	2	SNA	
7.4-17	T3014	JC66-00725A	ROLLER-TRANSFER;SCX-4100,NBR FOAM,φ15	1	SA	
7.4-18	H4041	JC61-00583A	HOLDER-PTL;ML-1400,ABS,-,-,BLK,-	1	SA	
7.4-19	K3367	JC70-00307A	IPR-P-EARTH TRANSFER;ML-1400,SECC	1	SA	
7.4-20	P2160	JC66-00829A	SHAFT-P-PICK_UP	1	SA	
7.4-21	P2067	JC61-01151A	HOUSING-M-PICK_U	1	SNA	
7.4-22	P2068	JC61-01173A	HOUSING-M-PICK_UP B	1	SNA	
7.4-23	P2148	JC73-00211A	RUBBER-PICK_UP	1	SA	
7.4-24	P2042	JC66-00811A	CAM-M-PICK_UP	2	SA	
7.4-25	G0448	JC66-00813A	GEAR-TRANSFER	1	SA	
7.4-26	-	JC61-01281A	BRACKET-P-BAR_PICK-UP;	1	SNA	

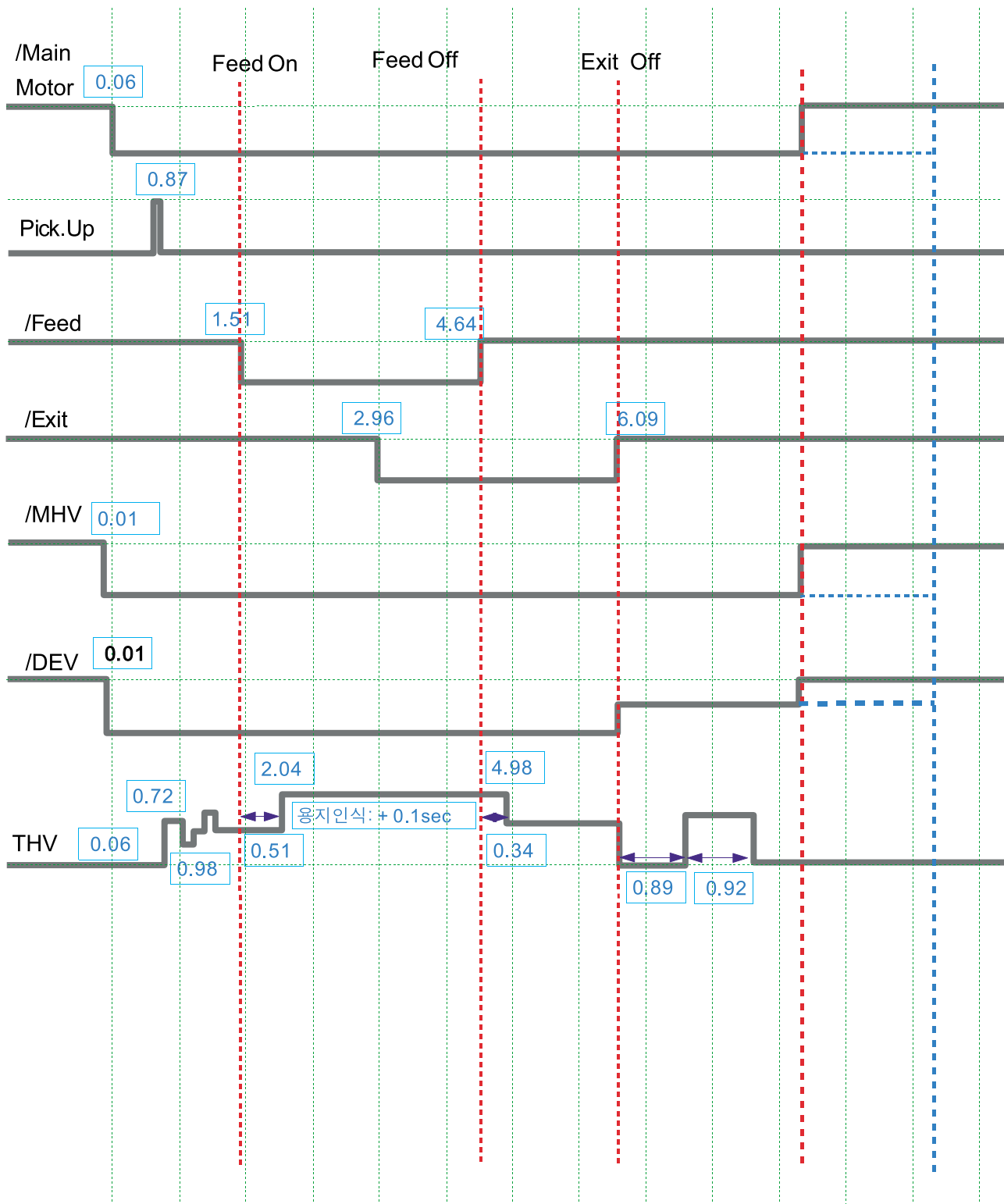
8. Block Diagram

8.1 System Block Diagram

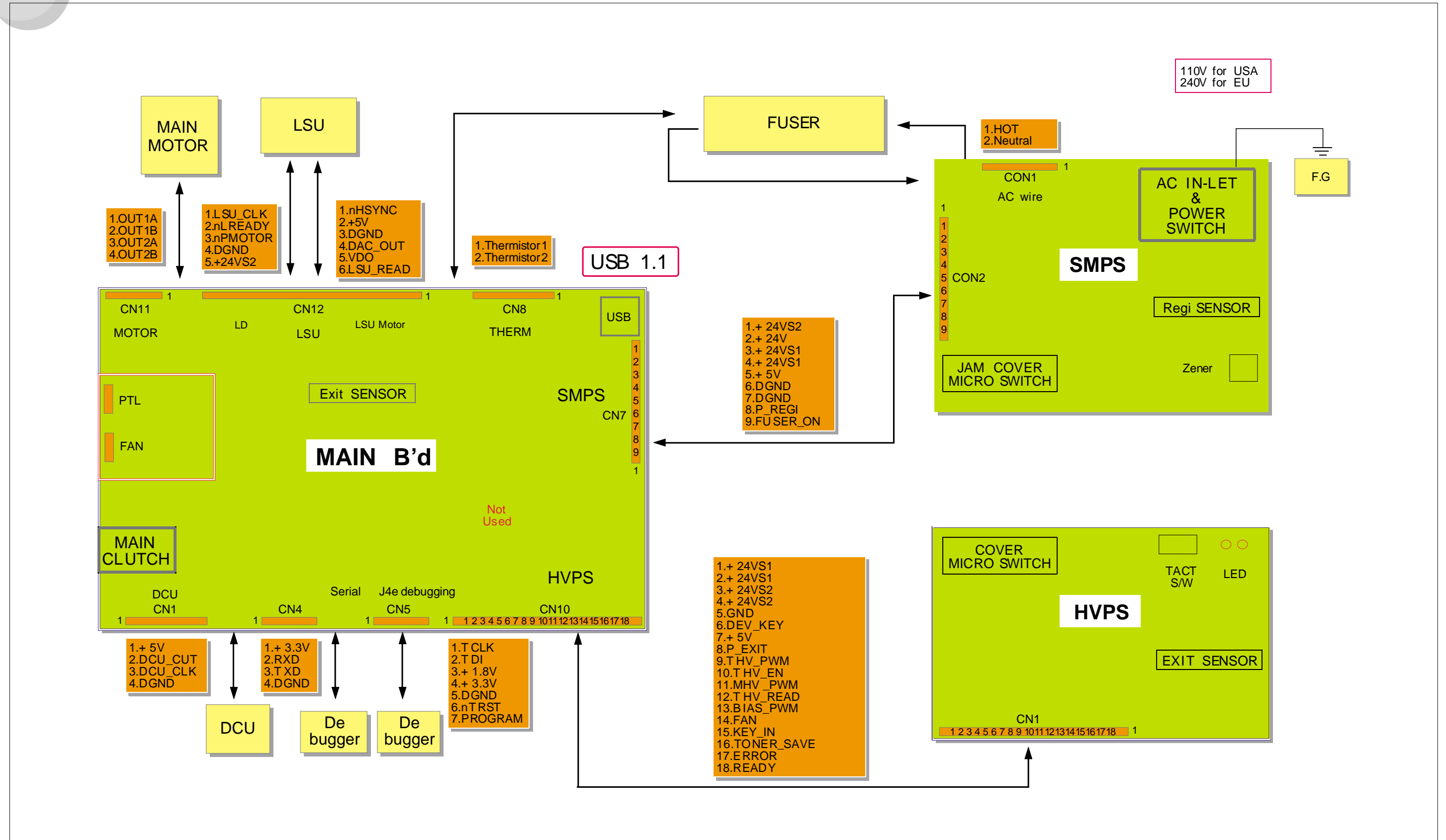


8.2 System Timing Chart

<1PagePrinting-A4 from cassette>



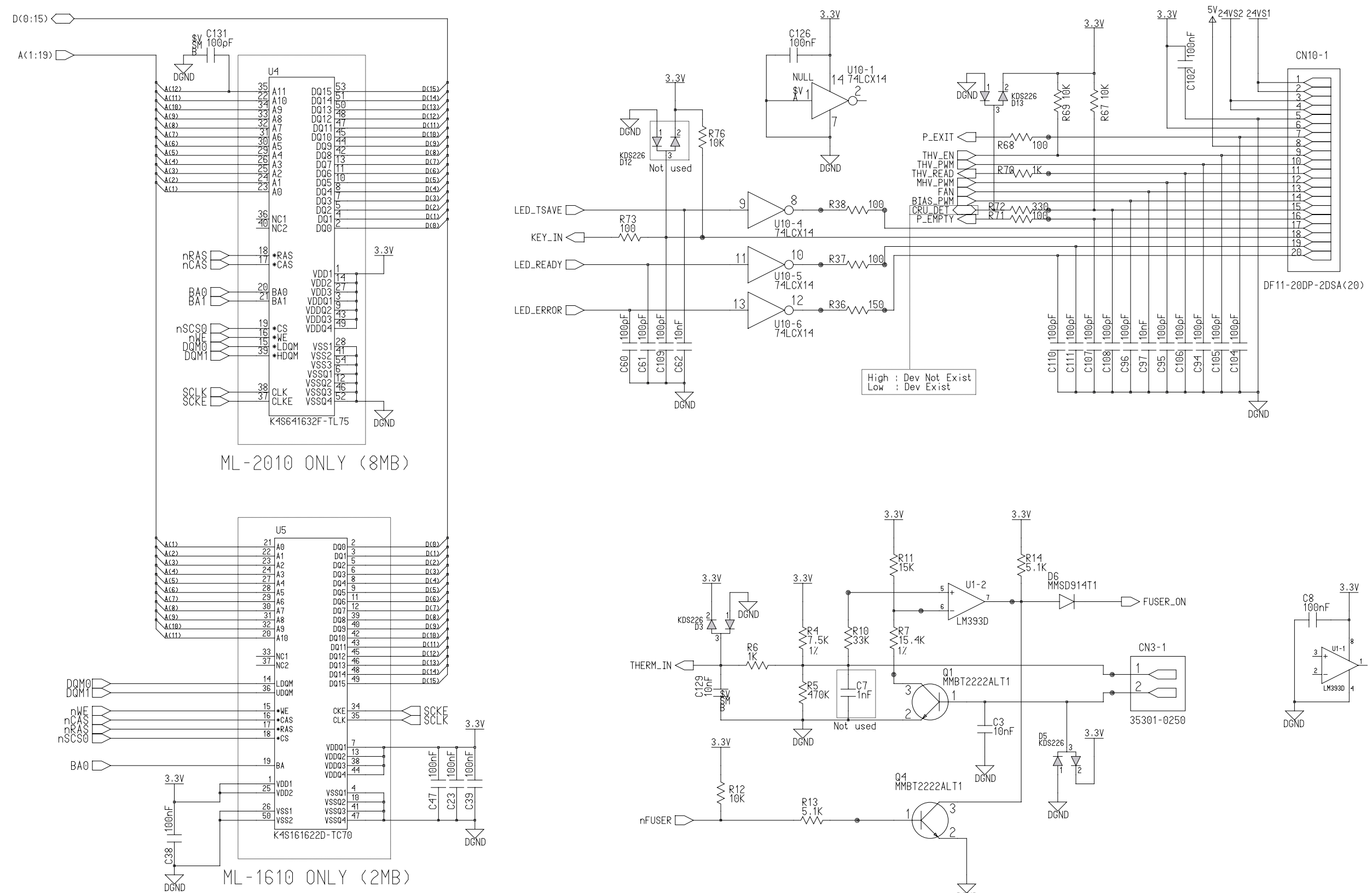
9. Connection Diagram



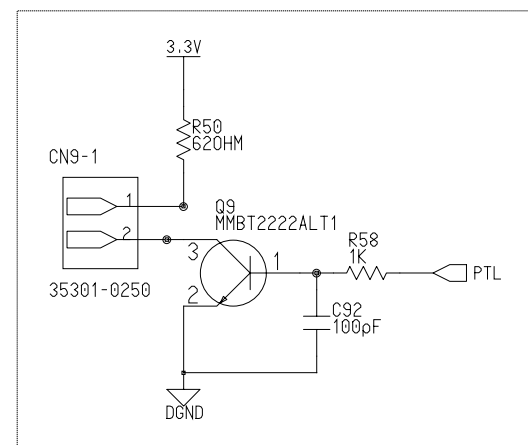
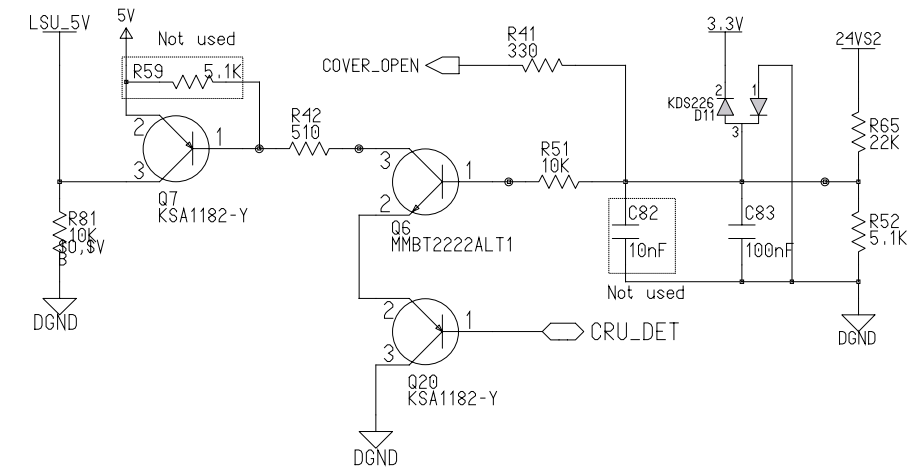
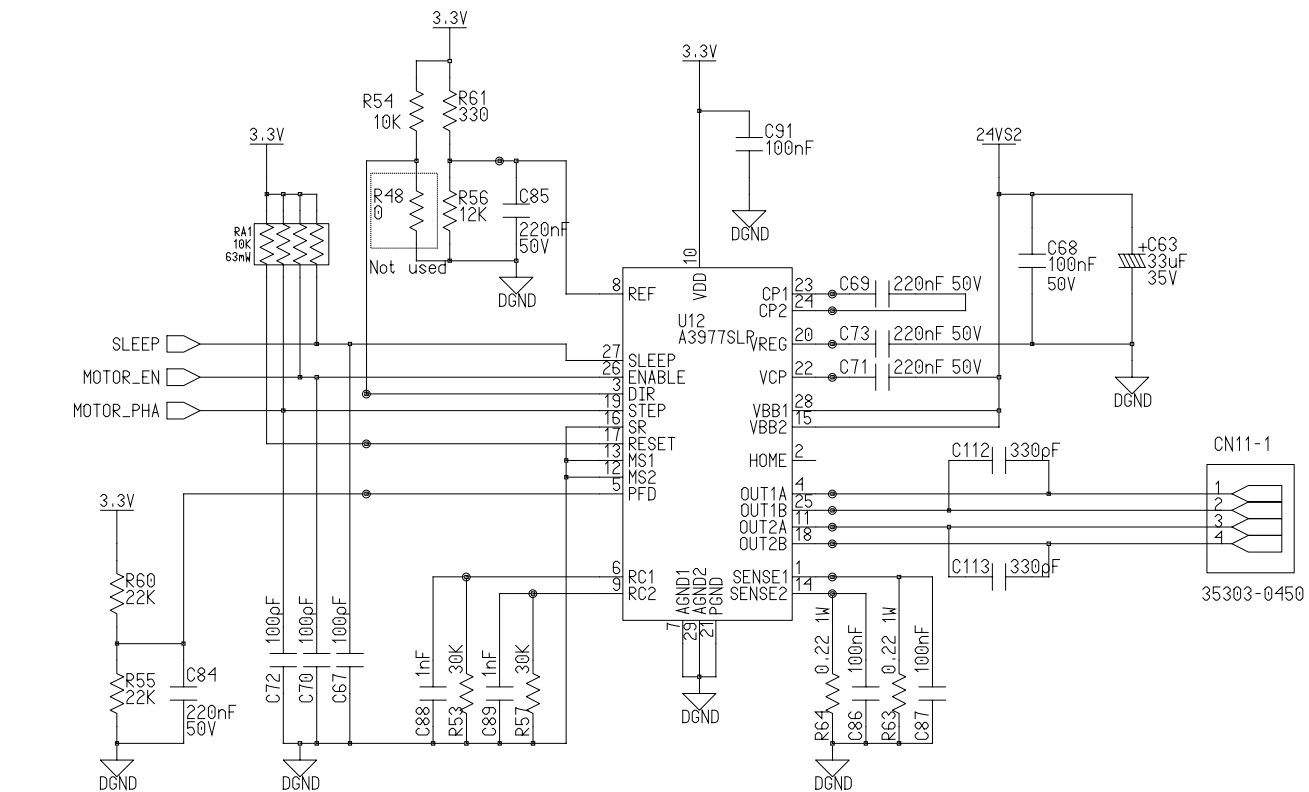
10.1 Main Board(1/4)



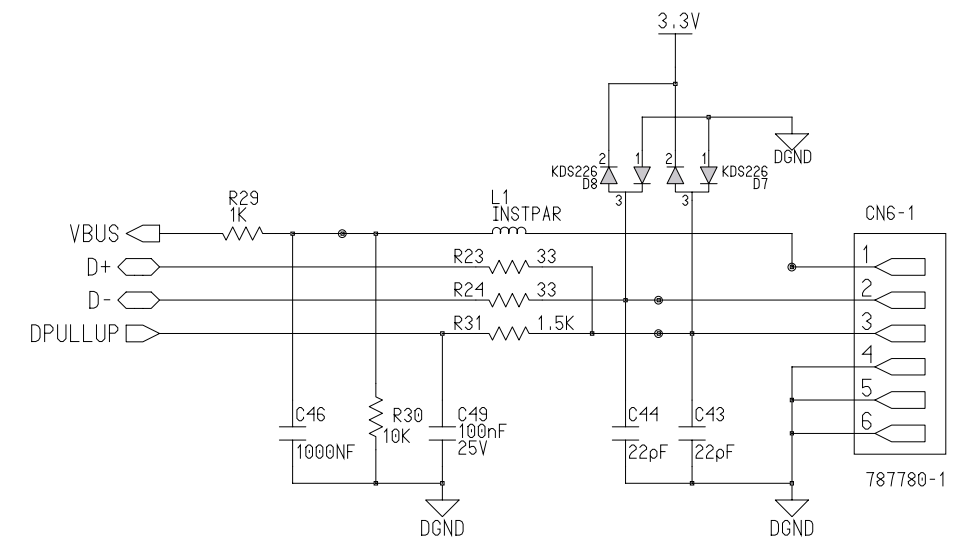
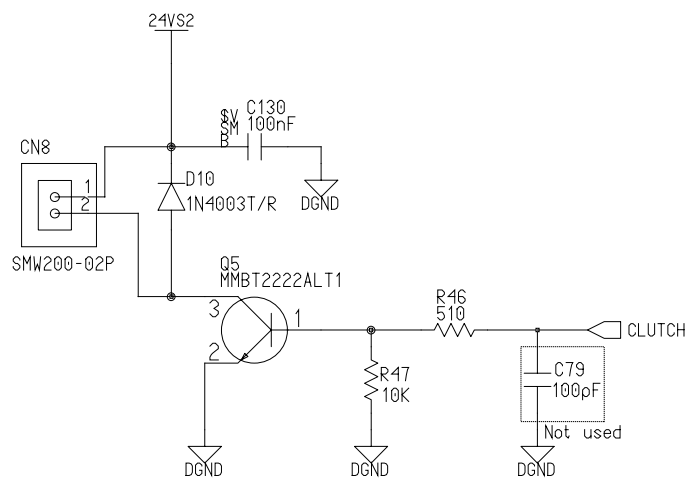
Main Board(2/4)



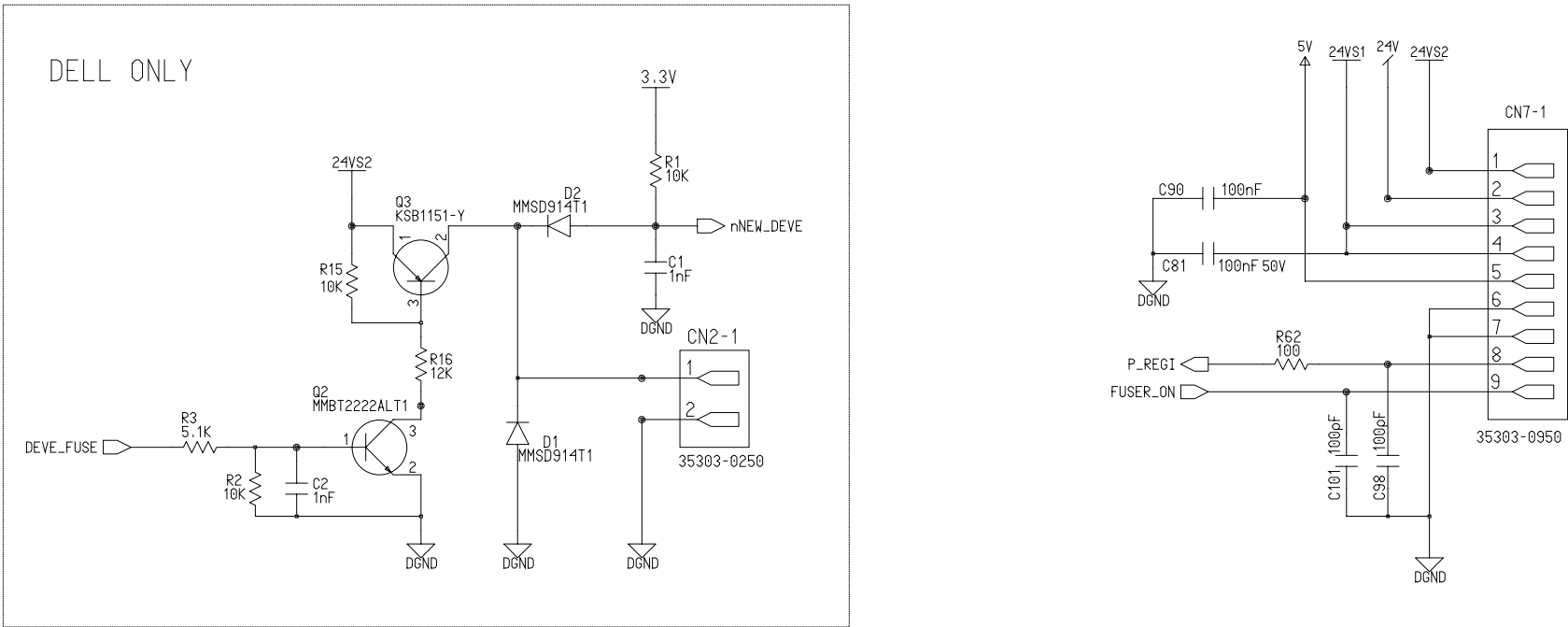
Main Board(3/4)



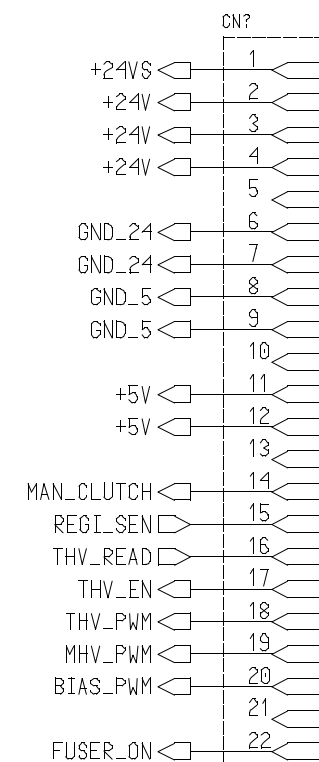
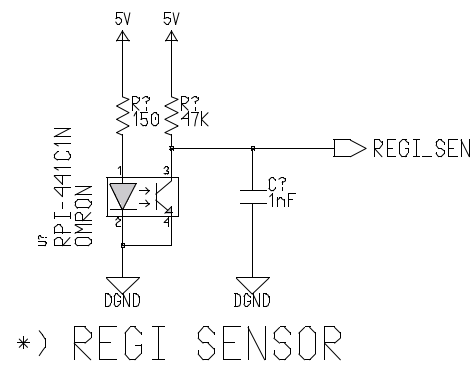
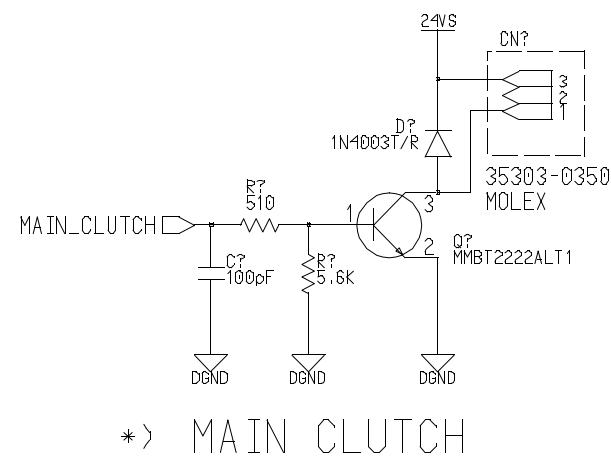
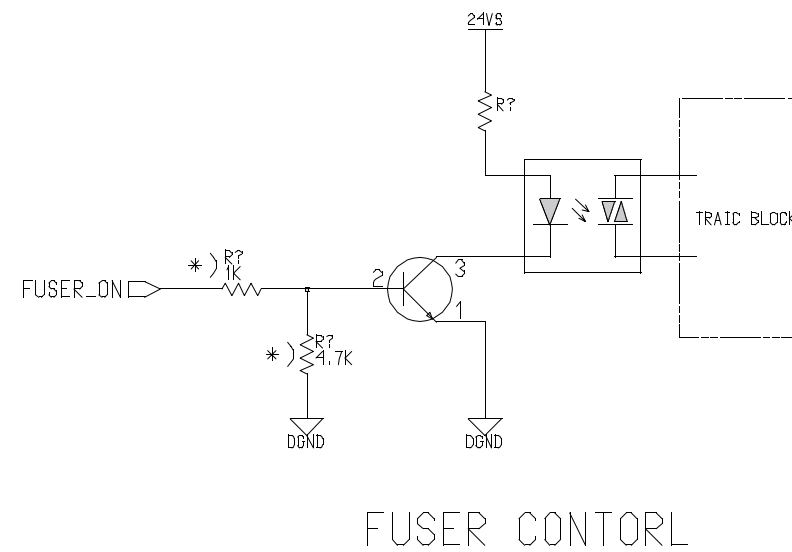
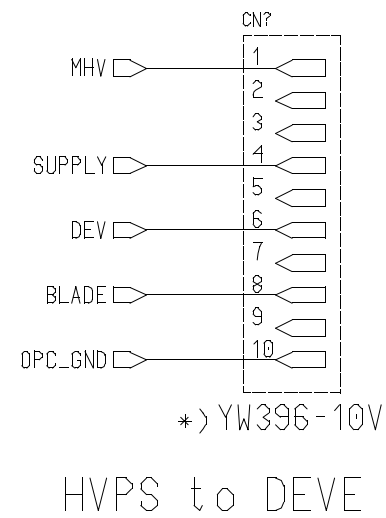
Not used



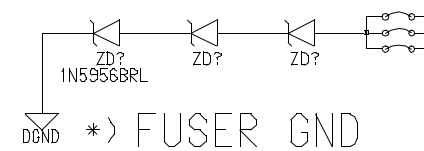
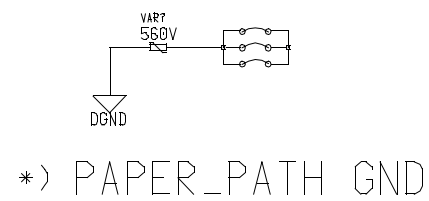
Main Board(4/4)



10-2 Connector Circuit Diagram

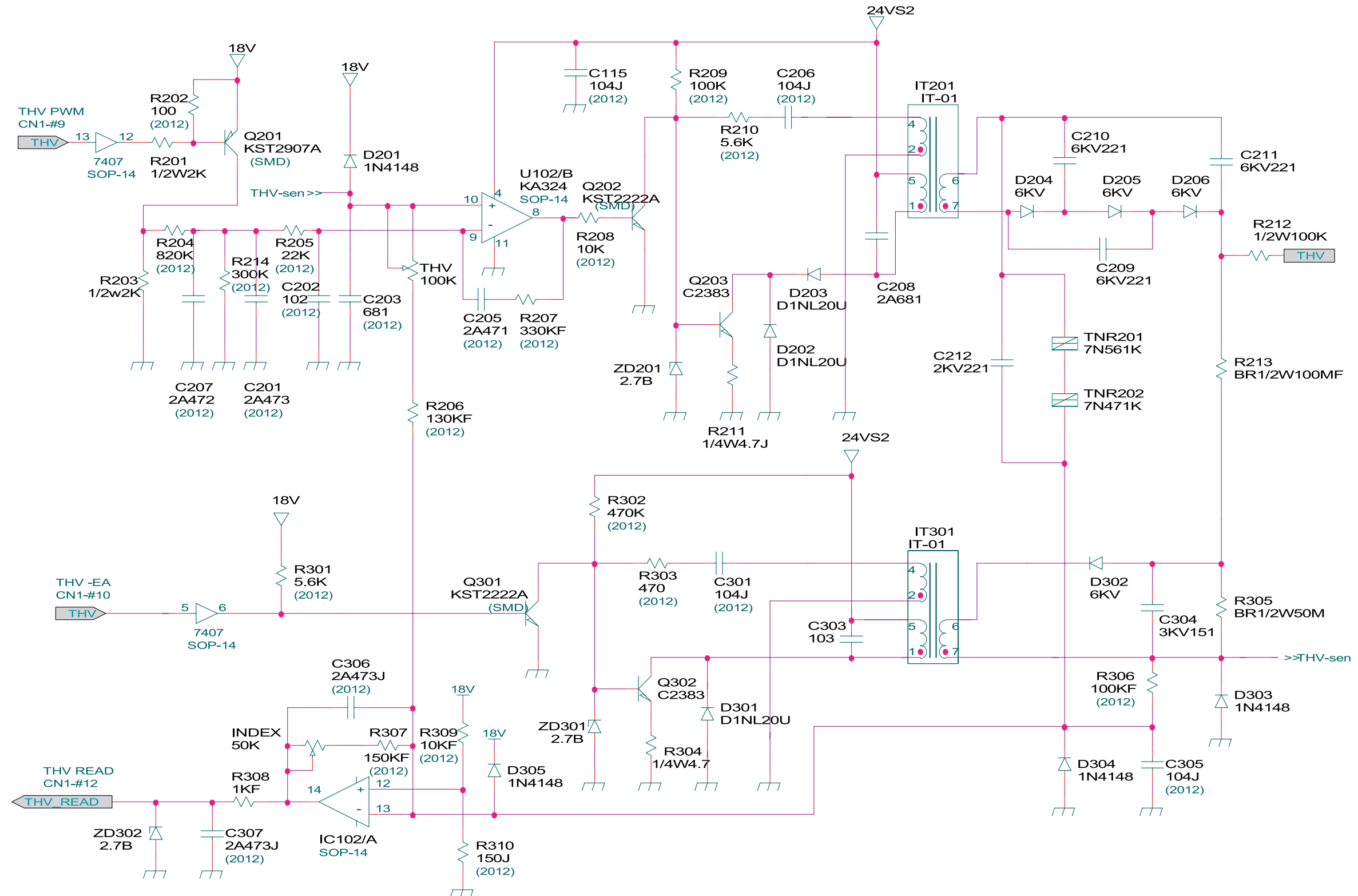


00-6232-022-807-800
*) SMPS/HVPS TO MAIN

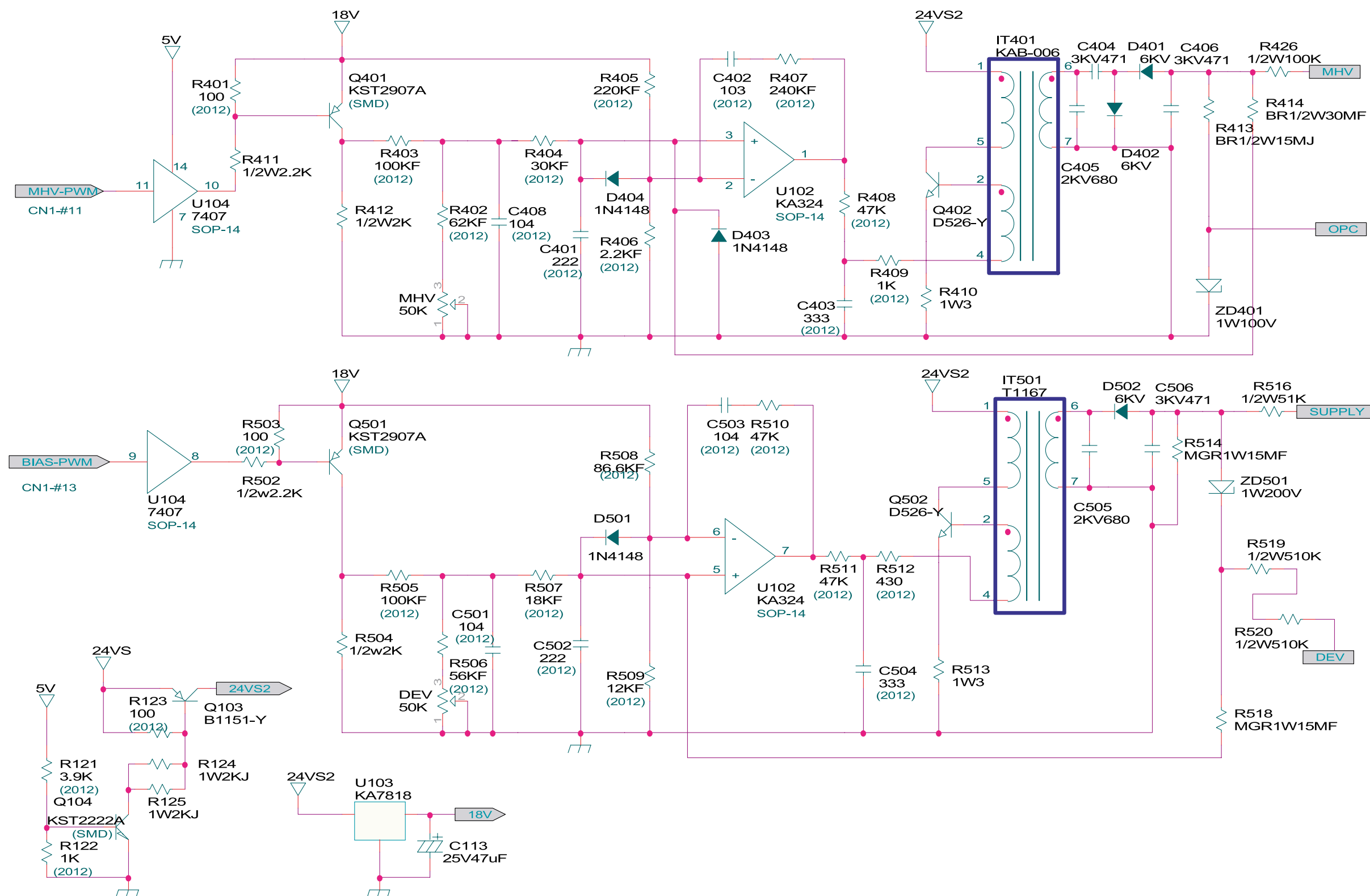




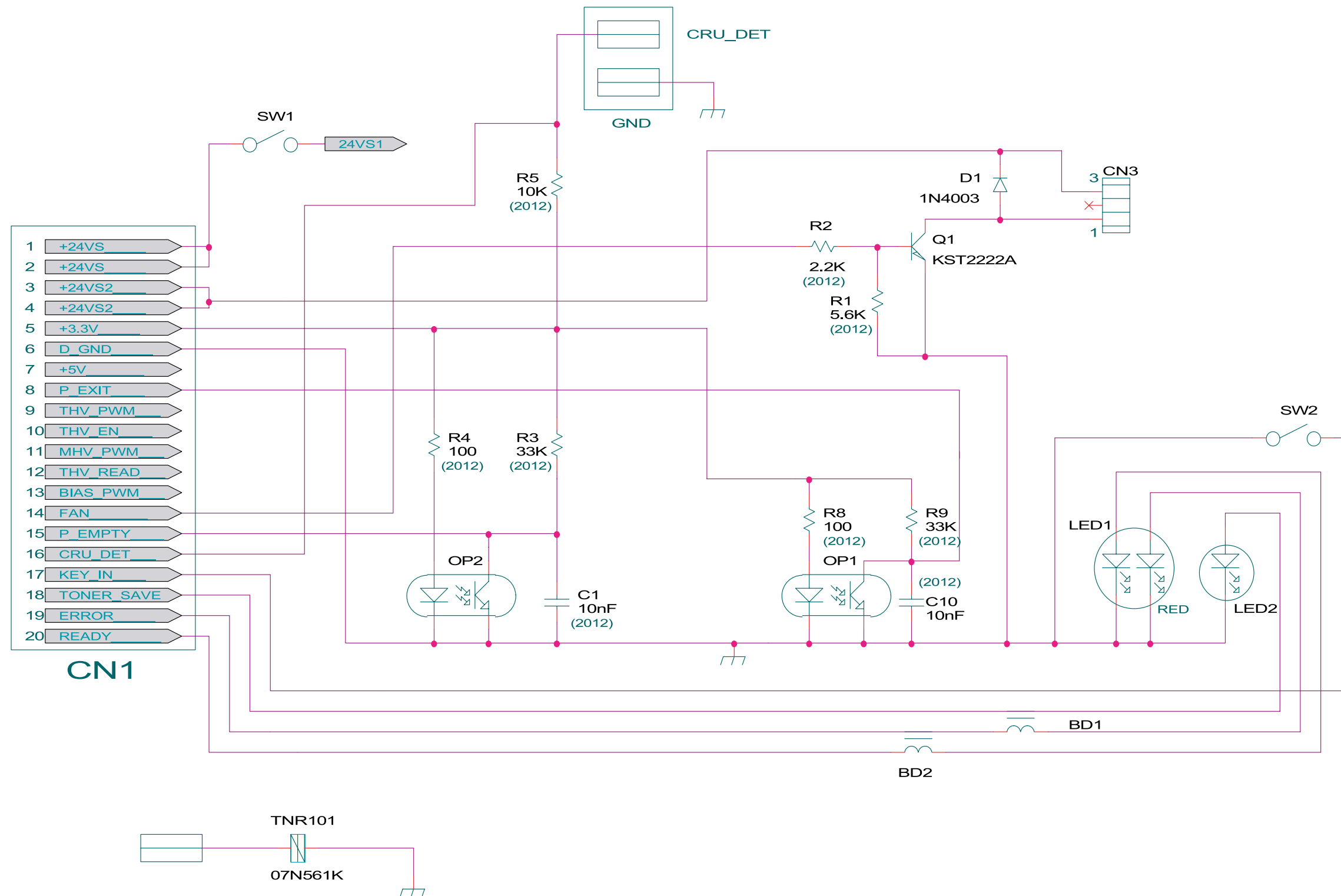
10-4 HVPS Circuit Diagram(1/3)



HVPS Circuit Diagram(2/3)



10-4 HVPS Circuit Diagram(3/3)



11. Reference Information

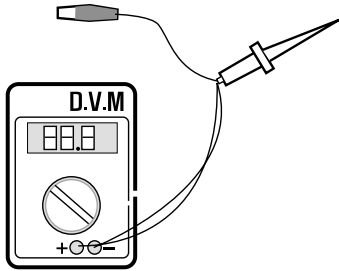
This chapter describes the reference information for applying this training manual, and it is consisted of the tool list, the abbreviation table, the outline of model, and so on.

11.1 Troubleshooting Tool

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

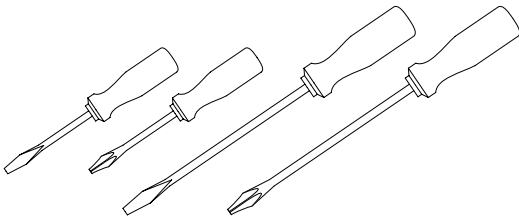
• DVM(Digital Volt Meter)

Standard : Indicates more than 3 digits.



• Driver

Standard : "-" type, "+" type (M3 long, M3 short, M2 long, M2 short).



• Tweezers

Standard : For general home use, small type.



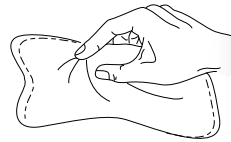
• Cotton Swab

Standard : For general home use, for medical service.

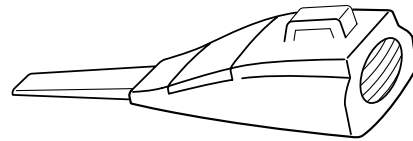


• Cleaning Equipments

Standard : An IPA(Isopropyl Alcohol)dry wipe tissue or a gentle neutral detergent and lint-free cloth.



• Vacuum Cleaner

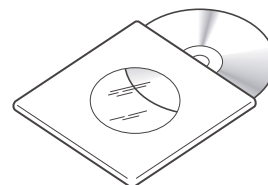


• Spring Hook

Standard : For general use



• Software (Driver) installation CD ROM



11.2 Acronyms and Abbreviations(1)

The table below explains the abbreviations and acronyms used in this service manual. Where abbreviations or acronyms are used in the text please refer to this table.

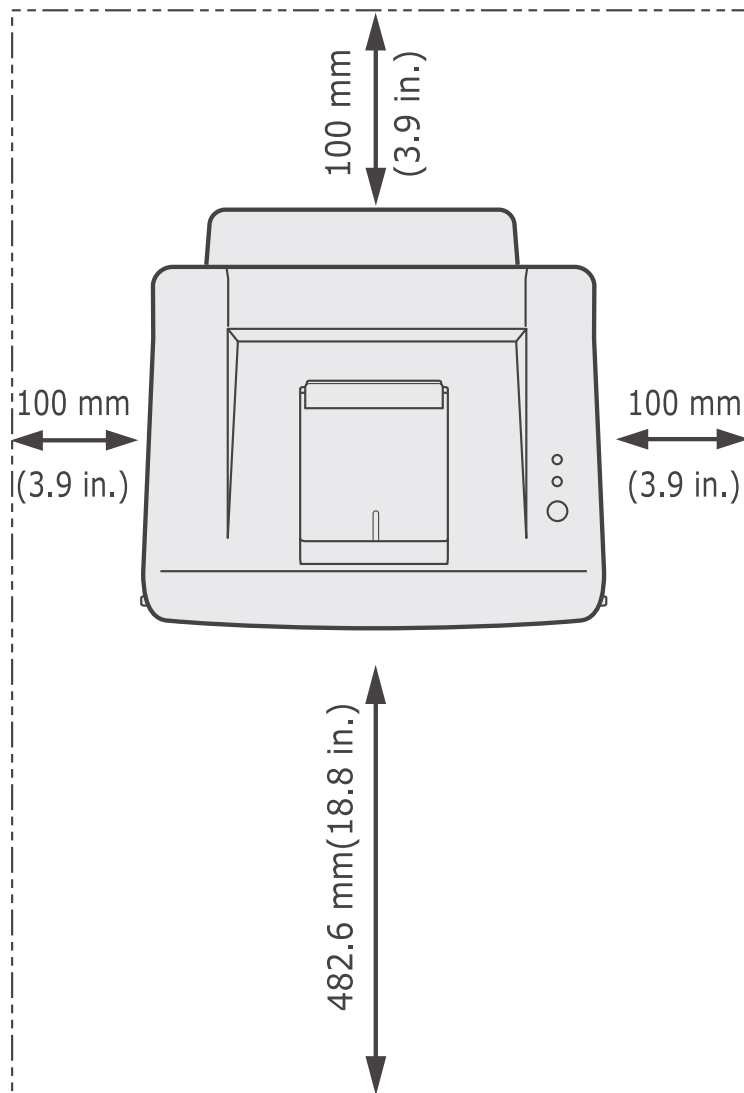
Abbreviations	Explanation
AP	Access Point
AC	Alternating Current
APC	Auto Power Control
ASIC	Application Specific Integrated Circuit
ASSY	assembly
BIOS	Basic Input Output System
BLDC	Brush-less Direct Current
CMOS	Complementary Metal Oxide Semiconductor
CN	connector
CON	connector
CPU	Central Processing Unit
dB	decibel
dbA	decibel A
dBm	decibel milliwatt
DC	direct current
DCU	Diagnostic Control Unit
DPI	Dot Per Inch
DRAM	Dynamic Random Access Memory
DVM	Digital Voltmeter
ECP	Enhanced Capability Port
EDC	Embedded Diagnostic control
EEPROM	Electrically Erasable Programmable Read Only Memory
EMI	Electro Magnetic Interference
EP	electrophotographic
EPP	Enhanced Parallel Port
FPOT	First Printout Time
F/W	firmware
GDI	graphics device interface
GND	ground
HBP	Host Based Printing
HDD	Hard Disk Drive
H/H	High temperature and high marshy place
HV	high voltage
HVPS	High Voltage Power Supply
I/F	interface
I/O	Input and Output
IC	integrated circuit
IDE	Intelligent Drive electronics or Imbedded Drive Electronics

Acronyms and Abbreviations(2)

Abbreviations	Explanation
IEEE	Institute of Electrical and Electronics Engineers. Inc
IPA	Isopropyl Alcohol
IPM	Images Per Minute
LAN	local area network
lb	pound(s)
LBP	Laser Beam Printer
LCD	Liquid Crystal Display
LED	Light Emitting Diode
L/L	Low temperature and low marshy place
LSU	Laser Scanning Unit
MB	megabyte
MHz	megahertz
MPF	Multi Purpose Feeder
NIC	Network Interface Card
N/N	Normal temperature and normal marshy place
NVRAM	nonvolatile random access memory
OPC	Organic Photo Conductor
OPE	Operate Panel Equipment
PBA	Printed Board Assembly
PCL	Printer Command Language , Printer Control Language
PDL	Page Discription Language
PPM	Page Per Minute
PPS	Pulse Per Second
PS	Post Script
PTL	Pre-Transfer Lamp
PWM	Pulse Width Modulation
Q-PID	Quick Printer Initiating Device
Q'ty	quantity
RAM	Random Access Memory
ROM	Read Only Memory
SCF	Second Cassette Feeder
SMPS	Switching Mode Power Supply
SPGP	Samsung Printer Graphic Processor
SPL	Samsung Printer Language
Spool	Simultaneous Peripheral Operation Online
SW	switch
sync	synchronous or synchronization
USB	Universal Serial Bus
WECA	Wireless Ethernet Compatibility Alliance

11.3 Selecting printer locations

- Leave enough room to open the printer trays, covers, and allow for proper ventilation. (see diagram below)
- Provide the proper environment :
 - A firm, level surface
 - Away from the direct airflow of air conditioners, heaters, or ventilators
 - Free of extreme fluctuations of temperature, sunlight, or humidity
 - Clean, dry, and free of dust

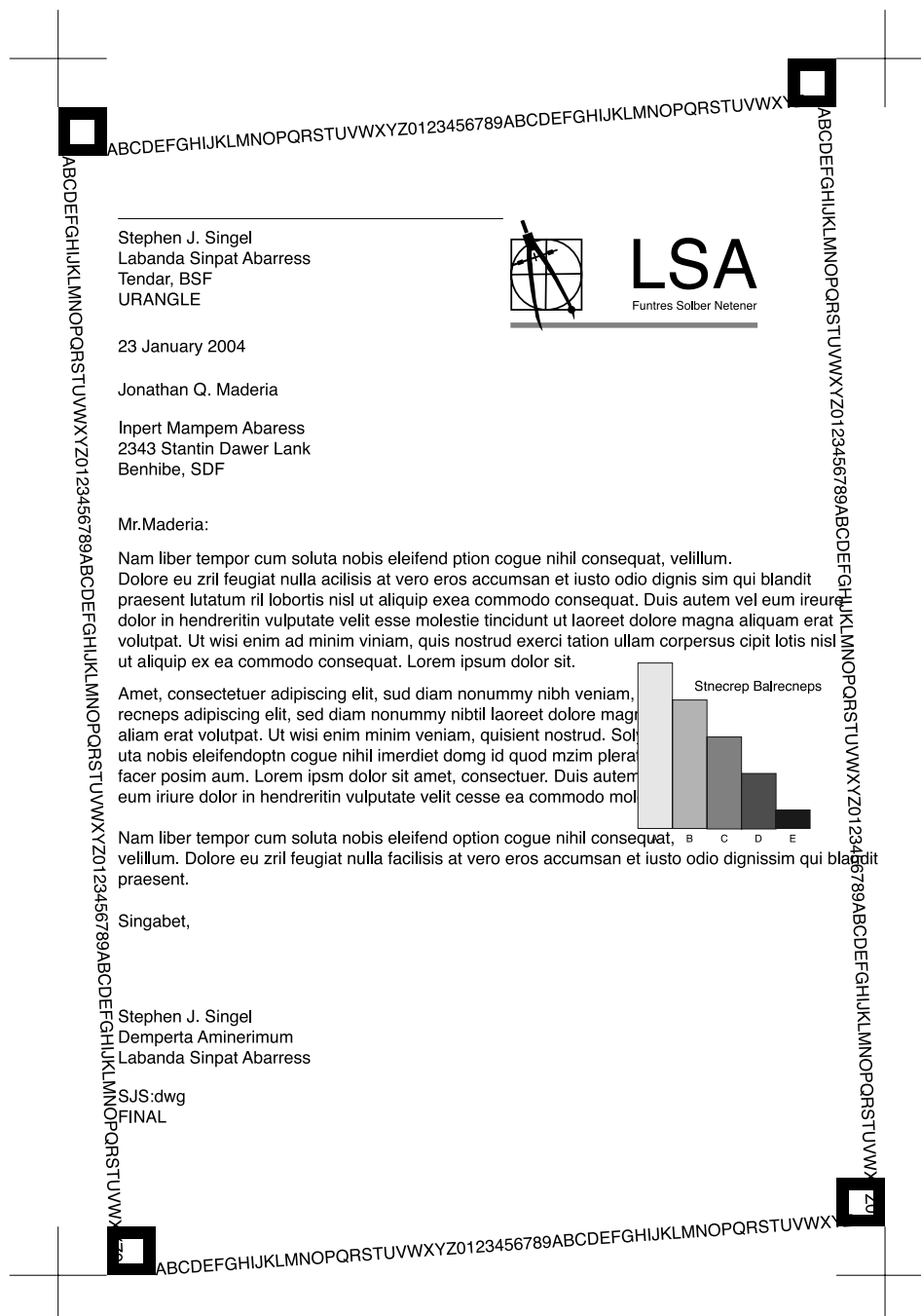


11.4 Sample Tests Patterns

The sample patterns shown below are the standard test patterns used in the factory.

The life of the toner cartridge, developer cartridge and printing speed are measured with the pattern shown below (5%). The A4 ISO 19752 standard pattern samples are reproduced reduced to 70% of the actual A4 size.

A4 ISO 19752 Standard Patterns

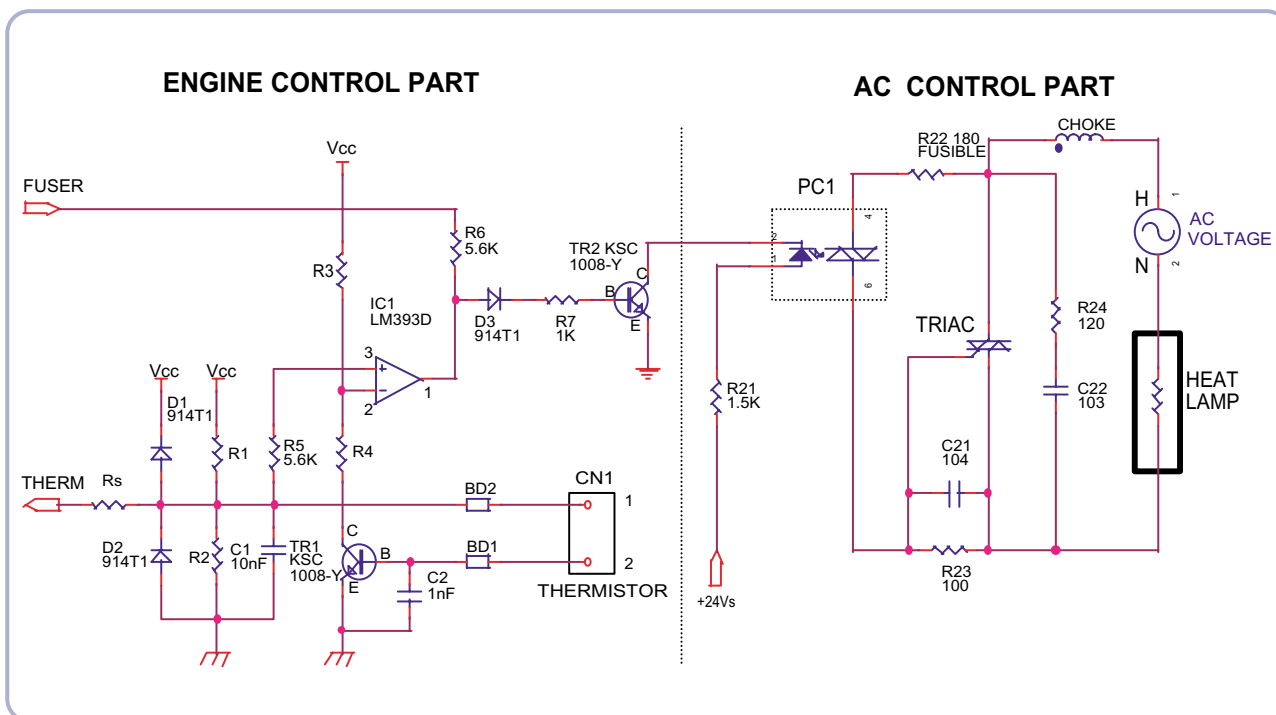


12. Circuit Description

12.1 Engine Controller

The engine controller module consists of a motor controller, a PWM controller, a LSU I/F controller, and an ADC I/F controller.

12.1.1 Heater Control



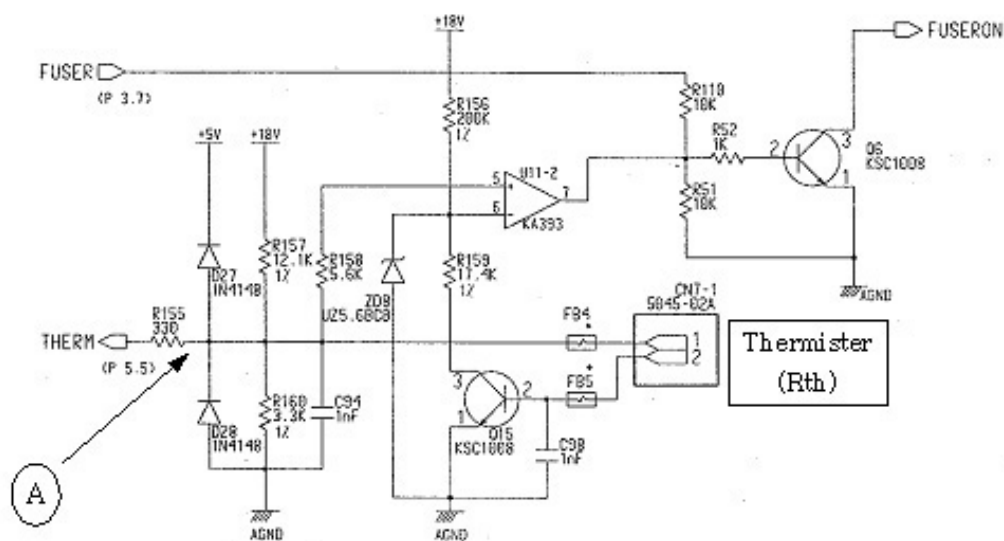
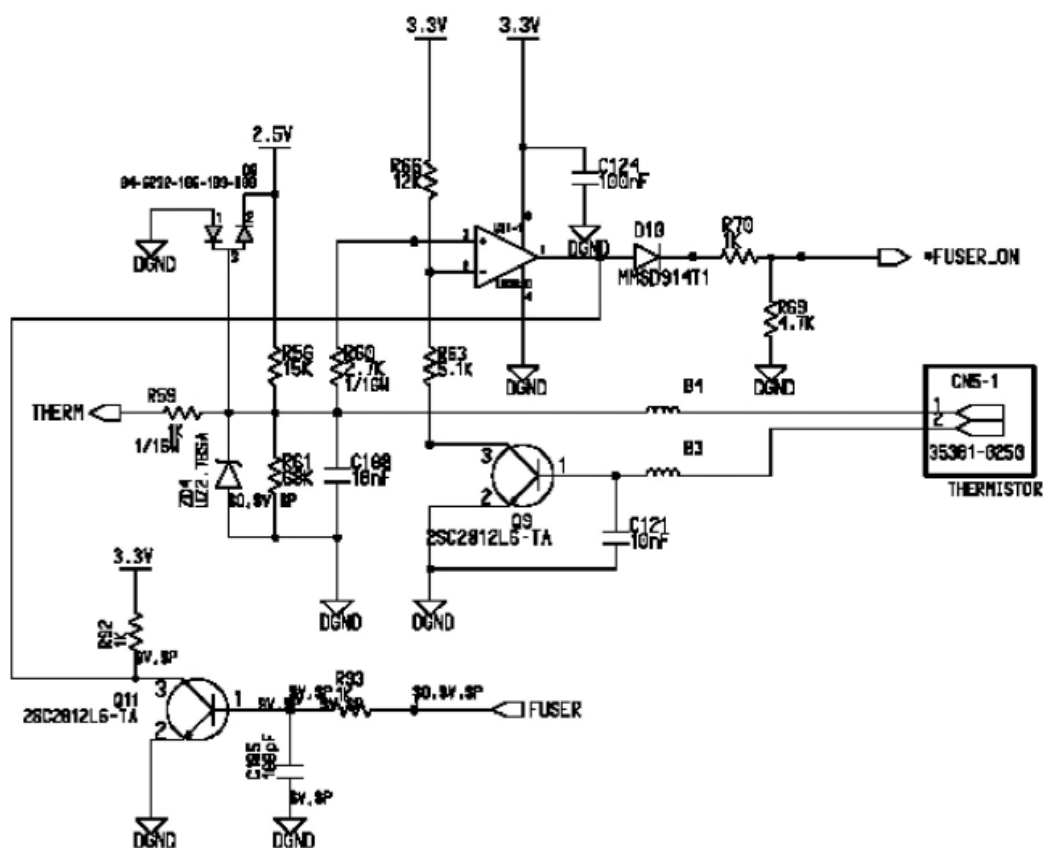
The heat lamp radiates heat by using AC power. The AC power is a TRIAC (a semiconductor switch device) which controls a switch. The 'ON/OFF' control is completed by turning on/off a gate of the TRIAC through a photo TRIAC which is insulation part.

If explaining more detail about the AC control part, it consists of passive circuit ; therefore, it turns on/off the heater by receiving the signal from the engine control part. If the heater signal is turned on at the engine, electricity flows in as the LED of the PC1 (Photo TRIAC) is connected. Then, it emits light.

By this light, the TRIAC unit, a light receiving unit, becomes on, and electricity is supplied to the gate of the TRIAC. Then, the TRIAC is turned on. As a result, AC current flows in a heat lamp, and the heat lamp radiates heat.

On the other contrary, if the signal is turned off, the PC1 becomes off, and the TRIAC is turned off due to no electricity at the gate of the TRIAC. Consequently, the heat lamp is turned off.

- Special Feature of TRIAC (THY 1): 16A, 600V SWITCHING
- Phototriac Coupler (PC3)
 - Turn On If Current: 15mA~50mA (Design: 16mA)
 - High Repeive Peak Off State Voltage: Min 600V

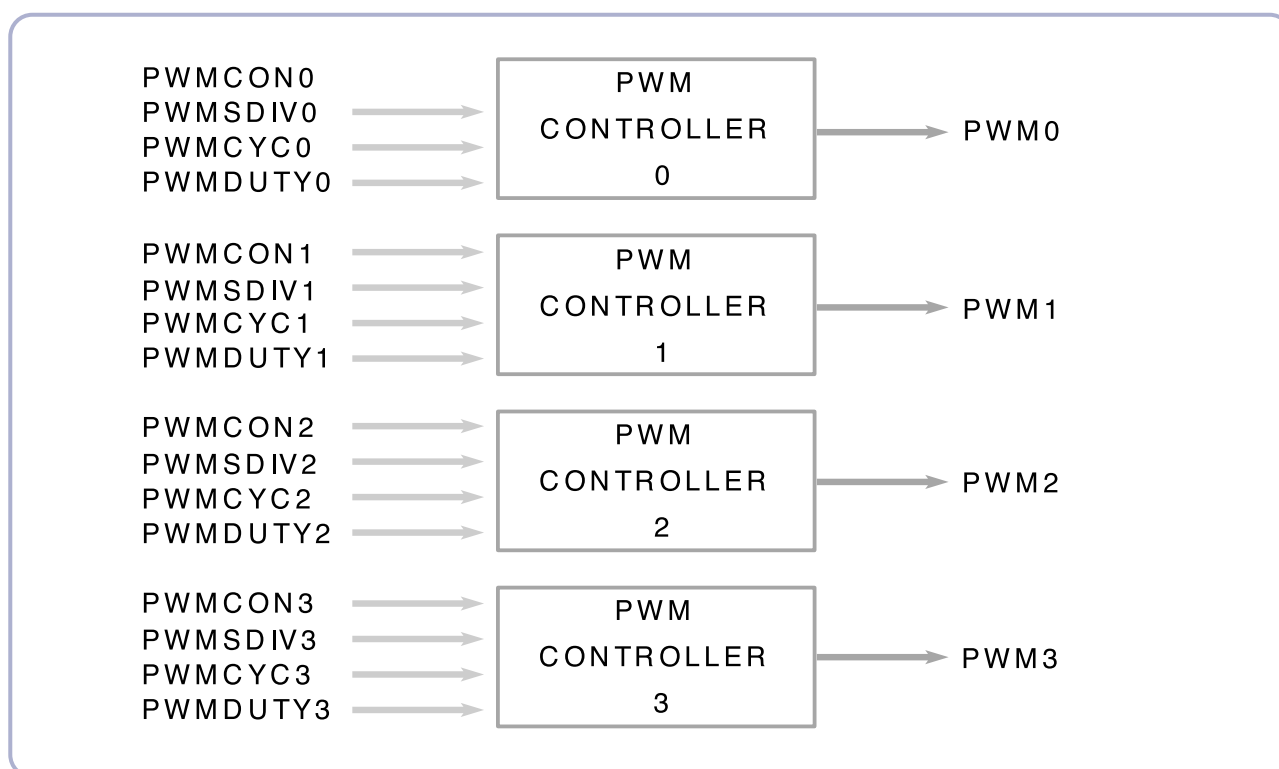


- Explanation about the condition of Normal Operation
 - If the fuser (P3.7) port becomes high, the Q6 is activated. A heat lamp starts operating by the activity. As the temperature of the heat lamp is increased, the resistance value of the thermister is decreased. Therefore, the electric potential of the circled A becomes low.
 - On/Off operation of the Q6 is only controlled by the fuser (P3.7) port because 5(+) of the U11(Comparator) is always higher than 6 (-) within the normal control temperature rage.
- Functions of the Malfunction Protection:
 - If the fuser port (P3.7) is turned on regardless of controlling due to system malfunction, the temperature of the heat roller goes abnormally high. At this time, the resistance value of the thermister becomes low.
 - When the resistance value of the thermister becomes low, the electric potential of the circled A gets low, and when the temperature goes over the certain temperature, the comparator (U11) gets a low output. As a result, even though the fuser port is abnormally activated, it is disable to be over the regular temperature. For maintaining a regular temperature, a protect circuit consists in it (This protection is set up to start operating at the rage between 205°~210°)

12.1.2 PWM Controller

■ Function Description

PWM TIMER consists of each sub block which has various functions. The sub block is divided based on this block diagram. The entire diagram of the PWMTIMER is organized as below.



PWM TIMER OPERATION is figured out if calculating PHCLK by the value selected by the register setting and the divider. PHCLK is created by count block at the PWM TIMER

12.1.3 Motor Driver

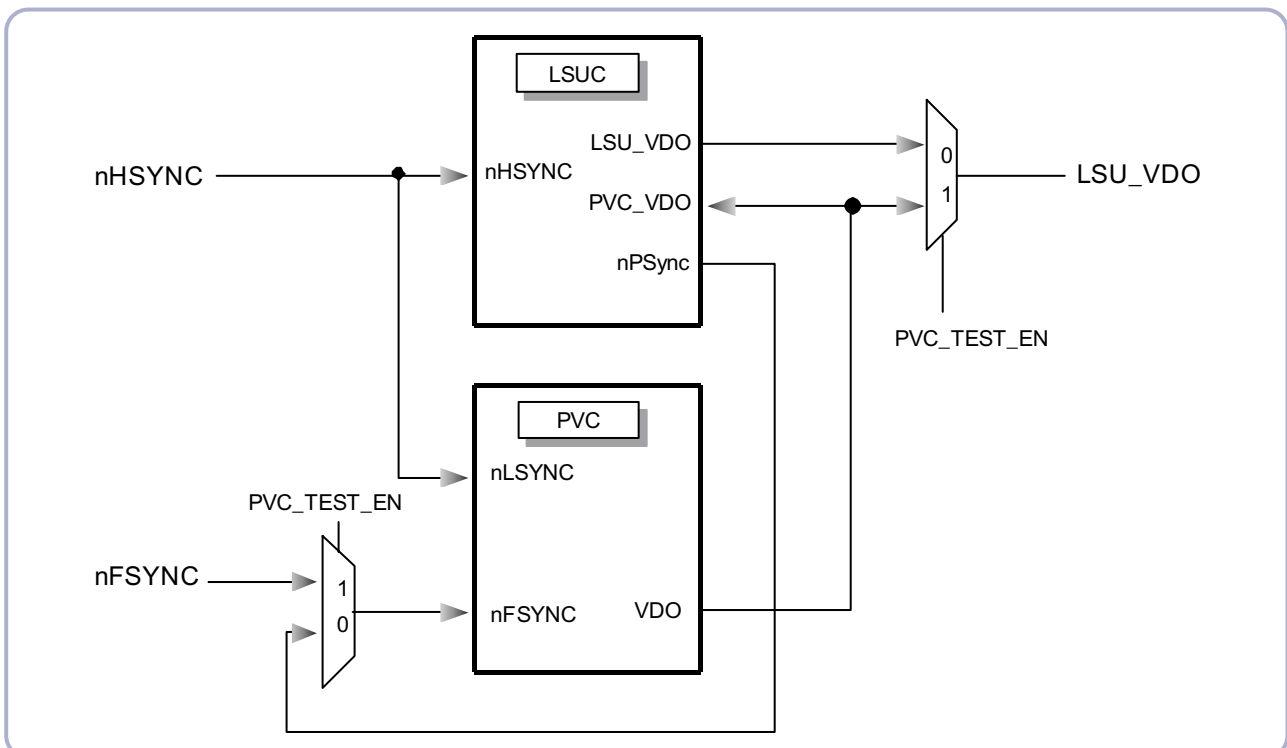
A motor drive circuit is decided when selecting a driver IC. (Supplied by vendor) ML1610 uses the motor driver IC of AN44060. However, the sensing resistance R_s value and the Vreference resistance value are variable according to the motor drive current value.

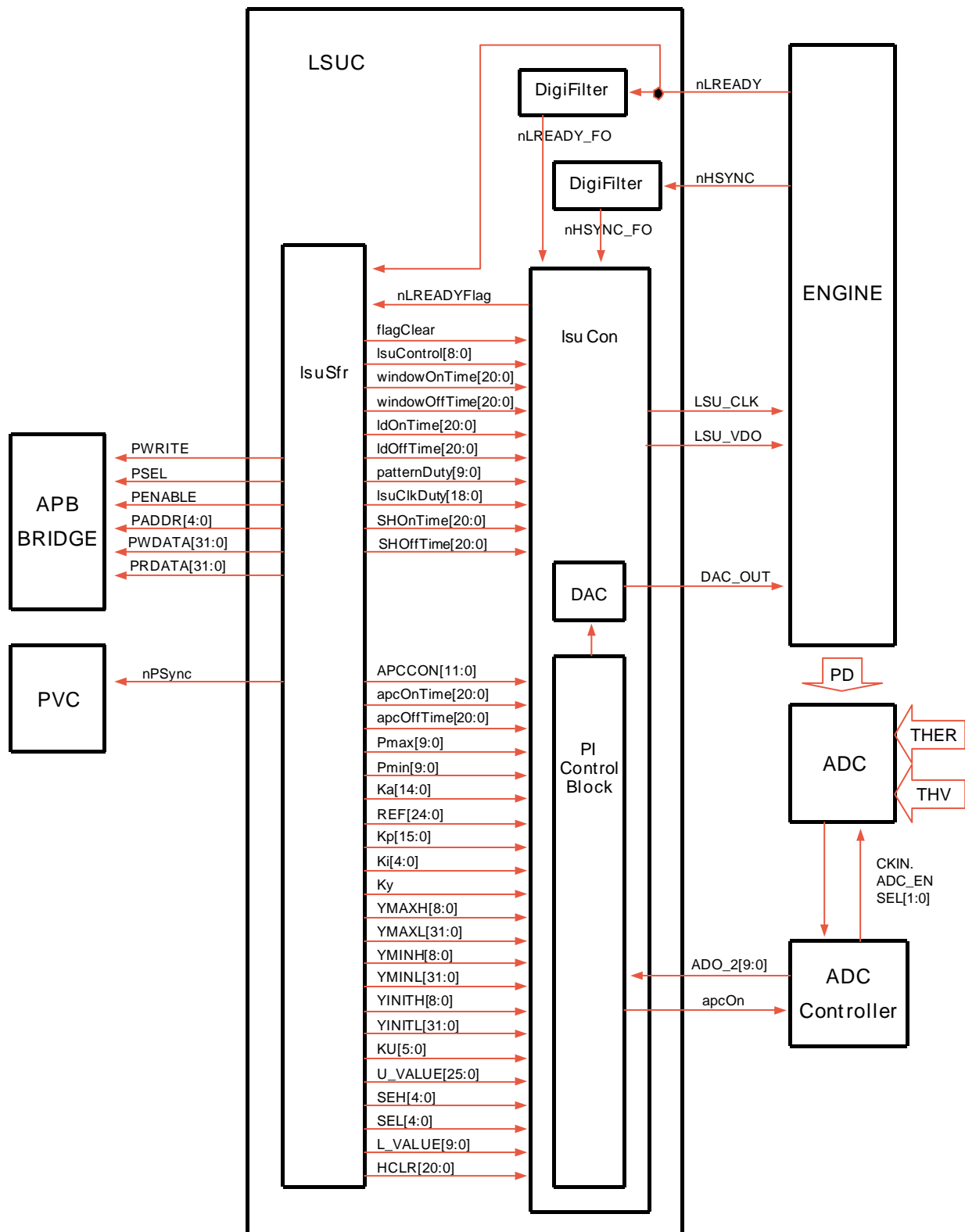
12.1.4 LSU Controller

The laser scanning unit controller (LSUC) of Jupiter4E is a block for interface between PVC block and LSU. LSUC sends the video data received from PVC and the laser diode turn On/Off signal created by inner 21 bit counter to the laser diode of LSU. LSU creates the horizontal sync signal (nHSYNC) by sensing the inputted diode turn on/off signal with the attached sensor. nHSYNC is inputted to PVC and LSUC as a signal that informs the beginning of one line. Also, LSU makes the activity of nLREADY signal (ready to print) low when the polygon motor becomes regularly rotating. LSU can recognize the regular rotation status of the polygon motor by reading nLREADYFlag bit in SFR. Once the polygon motor regularly rotates, it sends the page sync signal (nPSync) to PVC by writing '1' at LSUCON[5] in LSUC, and PVC starts operating for one page printing. After that, every time nHSYNC signal is created, PVC senses the signal and outputs the video data (PVC_VDO) to LSUC. At this time, LSUC creates the video window (Printing area) and masks it on the video data sent by PVC. LSUC sends the completed video data (LSU_VDO) to the laser diode in LSU.

Also, LSUC supplies LSU_CLK, created by counting the system clock with the operation clock source of LSU, for the use of substitution for oscillator. The SFR is set up in IsuSfr block by receiving the bus control signal from APB bus, and the settled register values are redelivered to IsuCon block. IsuCon block creates a signal for controlling the laser diode of LSU and outputs it to a pad. The digital filter module is a digital filter to provide against the noise loaded in nHSYNC and nLREADY signal which directly get into the chip. It is three layer filter, and the delay time is 3*System Clock Time.

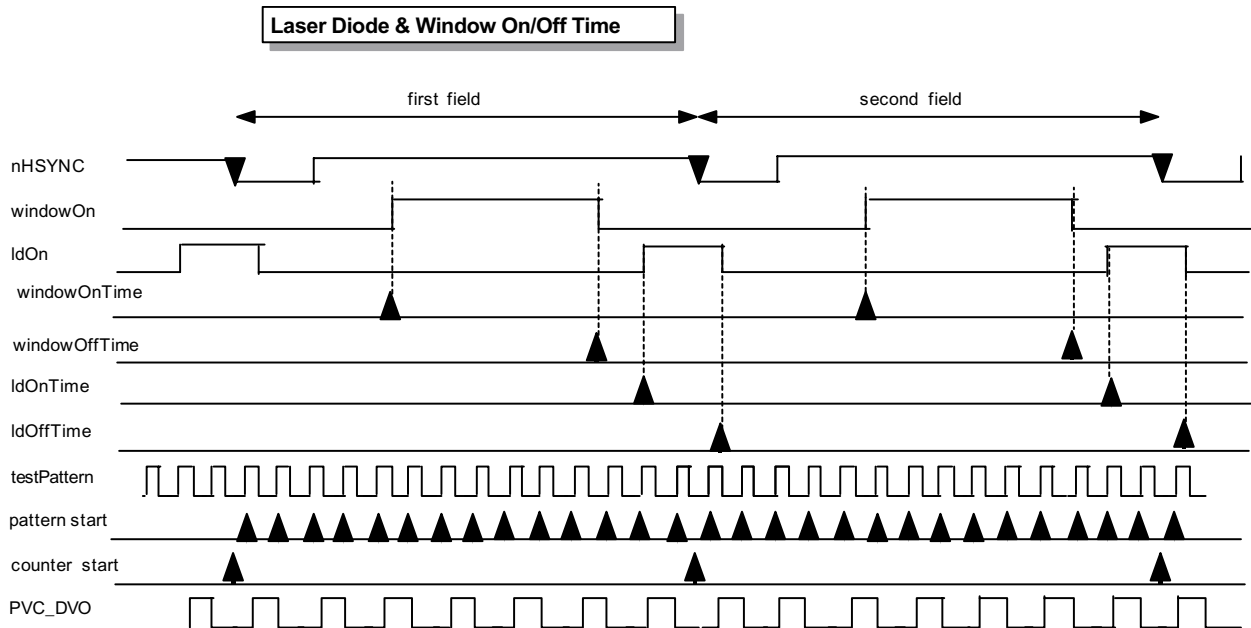
The interface between PVC and LSUC is shown in the picture.





The main signals used in LSU Controller are shown in the table.

Name	Direction	Description
PVC-VDO	I	The video data output from PVC.
nLREADY	I	Its activity becomes low as the polygon motor of LSU gets the regular speed.
nHSYNC	I	It informs the beginning of one line. It is the same as nLSYNC of PVC.
nPSync	O	It is inputted to nFSync of PVC.
LSU_VDO	O	The completed video data output by masking video window on PVC_VOD.



12.1.5 ADC Controller

Jupiter4E ADC Controller has 3 analog input channels.

It automatically converts the 3 channels in turns with 10 bit 500KSPS `adc1275x_pc`, and also it makes the conversion on the desired time by manually controlling STC of the register. After finishing the conversion, it makes the interruption to be pending. When AD conversion of 3rd channel ends for the PI Control of LSU, it sends the 10bit digital data converted with the latch short pulse signal to LSUC.



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