2. Product spec and feature

2.1 Product Specifications

2.1.1 Product Overview

Item	Descriptions
Basic Model	CLP-310/315
Series Model	CLP-310N : Network Model CLP-315W : Wireless Model
Main Specification	1. Speed • Up to 16 ppm in A4 (17 ppm in Letter) • Up to 4 ppm in A4 (4 ppm in Letter) 2. Printing Resolution • Max. 2400x600 dpi effective output 3. Processor • Chorus3 (360Mhz, CLP-315W), Jupiter (360Mhz, CLP-310/315/310N) 4. Printer Language Emulations • SPL-Color 5. Memory • FLASH ROM 2MB : CLP-310/315 4MB : CLP-310N 8MB : CLP-315W • DDR2 SDRAM 32MB : CLP-310/315/310N 64MB : CLP-315W 6. Interfaces • One USB port • One 10/100 BaseT network connector • One IEEE 802.11 b/g wireless LAN 7. Control Panel • No LCD, 1 keys and 6 LEDs 8. Toner cartridge • Black : 1K (initial) / 1.5K (sales) • Color : 0.7K (initial) / 1K (sales) 9. Color • There are two kinds of colors. (Gray and Black)  

2.1.2 Prouduct Specification

Specifications are correct at the time of printing. Product specifications are subject to change without notice. See below for product specifications.

2.1.2.1 General Print Engine

Item		CLP-310/315	CLP-310N/CLP-315W
Print Speed	Simplex	B&W : 17ppm@Letter	B&W : 17ppm@Letter
		16ppm@A4	16ppm@A4
		Color : 4ppm@A4,.Letter	Color : 4ppm@A4,.Letter
	Duplex	NA	NA
Print Emulation		SPL-C	SPL-C
Auto Emulation Sensing		NA	NA
Font	Type	NA	NA
	Number	NA	NA
Power Save		Yes (5/10/15/30/60/120min.)	Yes (5/10/15/30/60/120min.)
Resolution	Normal	Up to 2400X600dpi Class (Default 1200x600 dpi)	Up to 2400X600dpi Class (Default 1200x600 dpi)
		Optical: 600x600 Dpi	Optical: 600x600 Dpi
	RET	NA	NA
Toner Save		NA	NA
FPOT	From Ready	Less than 26 sec (Color)	Less than 26 sec (Color)
		Less than 14 sec (B&W)	Less than 14 sec (B&W)
	From Idle	Less than 57 sec (Color)	Less than 57 sec (Color)
		Less than 45 sec (B&W)	Less than 45 sec (B&W)
	From Cold Boot	Less than 57 sec (Color)	Less than 57 sec (Color)
		Less than 45 sec (B&W)	Less than 45 sec (B&W)
Duplex Print		NA	NA
Printable Area		210 x 297 mm (A4)	210 x 297 mm (A4)
		216 x 279 mm (Letter)	216 x 279 mm (Letter)
		216 x 355.6 mm (Legal)	216 x 355.6 mm (Legal)
Print Margin		Side Margin: 4.23±2mm	Side Margin: 4.23±2mm
		Top Margin: 4.23±3mm	Top Margin: 4.23±3mm

2.1.2.2 Controller & S/W

Item		CLP-310/315	CLP-310N/CLP-315W
MPU		Jupiter (360Mhz)	310N : Jupiter (360Mhz) 315W : Chorus3 (360Mhz)
Memory	Standard / Max.	32MB / 32MB	32MB / 32MB
	Type	DDR2 SDRAM	DDR2 SDRAM
	Expand Memory Slot & Type	NA	NA
	Compression Technology	YES	YES
Supporting OS		Microsoft Windows: 2000/2003/XP(Include 64bit),Vista Linux(Printer only)OS: Red Hat 8~9, Fedora Core 1~4 Mandrake 9.2~10.1 SuSE 8.2~9.2	Microsoft Windows: 2000/2003/XP(Include 64bit),Vista MacOS:10.3,10.4 MacOS:10.3,10.4 Linux(Printer only)OS: Red Hat 8~9, Fedora Core 1~4 Mandrake 9.2~10.1 SuSE 8.2~9.2
Default Driver		SPL-C	SPL-C
Driver feature		Microsoft Windows: -Watermark -N-up printing -Poster printing -Manual Dulpex -Quality(Best,Normal,Draft) -Color mode(Color, Gray scale) -Device Color Support -Color Management Support [Mac] -N-up printing -Quality(Best,Normal,Draft) -Color mode(Color, Gray scale) [Linux] - N-up printing -Quality(Best,Normal,Draft) [Common] -N/W Install during driver install	Microsoft Windows: -Watermark -N-up printing -Poster printing -Manual Dulpex -Quality(Best,Normal,Draft) -Color mode(Color, Gray scale) -Device Color Support -Color Management Support [Mac] -N-up printing -Quality(Best,Normal,Draft) -Color mode(Color, Gray scale) [Linux] - N-up printing -Quality(Best,Normal,Draft) [Common] -N/W Install during driver install
WHQL		Windows 2000 including vista	Windows 2000 including vista

Item	CLP-310/315	CLP-310N/CLP-315W
Language Locallization	[Windows] - Korean,English,French,Germa N,Italian,Spanish,Russian,Dutch, E.Portuguese,B.Portuguese,Fi Nish,Swedish,Norwegian,Danish S.Chinese,T.Chinese,Polish, Hungarian,Greek,Czech,Turkish [Mac] - Korean,English,French,Germa N,Italian,Spanish [Linux] - English Only	[Windows] - Korean,English,French,Germa N,Italian,Spanish,Russian,Dutch, E.Portuguese,B.Portuguese,Fi Nish,Swedish,Norwegian,Danish S.Chinese,T.Chinese,Polish, Hungarian,Greek,Czech,Turkish [Mac] - Korean,English,French,Germa N,Italian,Spanish [Linux] - English Only
Smart Panel	USB	310N : USB/Network 315W : USB/Network/Wireless Network
	Default Install	Default Install
Network Management	NA	Set IP.SWAS &SWS (Linux, Mac not support, SWAS&SWS need I explorer 5.0 or Higher) NA Management
Smart Thru	NA	Smart Thru 4

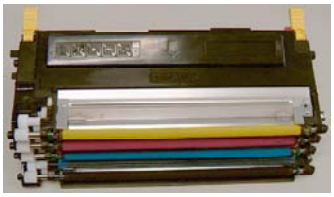
2.1.2.3 Interface

Item		CLP-310/315	CLP-310N/CLP-315W
Interface	Parallel	NA	NA
	USB	USB 2.0	USB 2.0
	Network	NA	Ethernet 10/100 base Tx
	Wireless	NA	802.11 b/g (only 315W)
Network Interface	Protocol	NA	TCP/IP,IPP,SNMPv2
	Network OS	NA	- Microsoft Windows: 98/ME/2000/XP(32/64Bit) 2003 Server(32/64Bit)/ Vista - Mac OS: 10.3,10.4(Printing OnTCP/IP) - Linux OS: Red Hat 8~9, Fedora Core 1~4 Mandrake 9.2~10.1 & Suse 8.2~9.2 - Unix HP-UX, Solaris,SunOS SCO UNIX
User Interface	LCD	NA	NA
	OP UI	Key 1 EA, LED 6EA	Key 1 EA, LED 6EA
	Sound UI	NA	NA

2.1.2.4 Paper Handling

Item		CLP-310/315	CLP-310N/CLP-315W
Capacity	Cassette	150sheets@75g/㎡ (Max) Envelop ; 5 Sheets Transparency ; 1 Sheets Label , thick paper ; 10 Sheets	150sheets@75g/㎡ (Max) Envelop ; 5 Sheets Transparency ; 1 Sheets Label , thick paper ; 10 Sheets
	MP Tray	NA	NA
	Option Cassette	NA	NA
Output Capacity		Face Down: 100Sheets/20lb Envelop ; 5 Sheets Transparency ; 1 Sheets Label , thick paper ; 10 Sheets	Face Down: 100Sheets/20lb Envelop ; 5 Sheets Transparency ; 1 Sheets Label , thick paper ; 10 Sheets
Output Full Sensing		No	No
Duplex		NA	NA
Paper Type	Cassette	A4, A5,A6, Letter, Legal, Executive, Folio, ISO B5, JIS B5	A4, A5,A6, Letter, Legal, Executive, Folio, ISO B5, JIS B5
		Transparency;(Mono Print Only)	Transparency;(Mono Print Only)
	MP Tray	NA	NA
	Option Tray	NA	NA
Paper Weight	Cassette	16~43 lb. (60 to 163g/㎡)	16~43 lb. (60 to 163g/㎡)
Paper Path	Standard output	Bottom to Top Front (FIFO)	Bottom to Top Front (FIFO)
	Straight Through	NA	NA
Paper Size	Max	216 x 355.6mm(8.5”x14”)	216 x 355.6mm(8.5”x14”)
	Min	76 x 160mm(3”x6.3”)	76 x 160mm(3”x6.3”)
Jam Rate	Cassette	1/3,000	1/3,000
Multi-Feed Rate	Cassette	1/1,500	1/1,500
Printing Skew	Top	1.5/201.4mm (Cassette)	1.5/201.4mm (Cassette)
	Side	2.0/270.4mm (Cassette)	2.0/270.4mm (Cassette)

2.1.2.5 Consumables

Item	Image	Pages Printed	Part number	Remark
Black Toner cartridge		Approx. Initial : 1,000 Pages* Sales : 1,500 Pages*	CLT-K409S(Black)	CRU
Color Toner cartridge		Approx. Initial : 700 Pages* Sales : 1,000 Pages*	CLT-C409S(Cyan) CLT-M409S(Magenta) CLT-Y409S(Yellow)	
Imagine unit		Approx. 24000 images*	CLT-R409	
Waste Toner		Mono: Approx. 2500 images Color: Approx. 2500 images	CLT-W409	
Pick-up roller		Approx. 50,000 pages	JC97-03028A	FRU
Fuser unit		Approx. 100,000 black pages or 50,000 color bages	JC96-05492B(110V)	
			JC96-05491B (220V)	
T2 roller		Approx. 10,000 pages	JC97-03046A	
ITB		Approx. 100,000 black pages or 50,000 color bages	JC96-04840A	

* Average A4-/letter-sized page count based on Std. ISO 19798 of individual colors on each page.
  Usage conditions and print patterns may cause results to vary.

2.1.2.6 Reliability & Service

Item	CLP-310/315	CLP-310N/CLP-315W
Max Monthly Duty	20,000 image (Color: 16,000/ Mono: 4,000)	20,000 image (Color: 16,000/ Mono: 4,000)
SET Life Cycle	100,000image or 5 years whichever comes first	100,000image or 5 years whichever comes first
MTBF	40,000 images (color 32,000 images and black 8,000 images : total 40,000 image)	40,000 images (color 32,000 images and black 8,000 images : total 40,000 image)
MTTR	<30 min.	<30 min.
Real-time Clock	No	No
System record	Total image count Total page count (color/mono) Imaging unit Information Transfer roller life Transfer belt life Toner information Tray roller life	Total image count Total page count (color/mono) Imaging unit Information Transfer roller life Transfer belt life Toner information Tray roller life
Minimum System Requirement	Pentium-II 400MHZ, 64MB RAM, 300MB HDD, Internet Explorer 5.0	Pentium-II 400MHZ, 64MB RAM, 300MB HDD, Internet Explorer 5.0

2.1.2.7 Environment

Item		CLP-310/315	CLP-310N/CLP-315W
Power Consumption	Ready	Less than 160W	Less than 160W
	Average	Less than 350W (Currency:5A(110V)/3A(220V)	Less than 350W (Currency:5A(110V)/3A(220V)
	Max/Peak	700W/1KW	700W/1KW
	Sleep/Power off	Less than 8.4W	Less than 8.4W
Power Supply	Input Voltage	Low Voltage : 110 ~ 127VAC High Voltage : 220 ~ 240VAC	Low Voltage : 110 ~ 127VAC High Voltage : 220 ~ 240VAC
	Input Frequency	50 / 60Hz(+/- 3Hz)	50 / 60Hz(+/- 3Hz)
Noise	Printing	Mono : 46dBA Color : 48dBA	Mono : 46dBA Color : 48dBA
	Standby	Background noise level	Background noise level
	Sleep	Background noise level	Background noise level
Warm Up Time	From Cold Status (At rated volt)	Less than 35 seconds	Less than 35 seconds
Temperature	Operating	10~32.5℃	10~32.5℃
	Storage (Un-Packed)	5~35℃	5~35℃
	Storage (Packed)	-20~50℃	-20~50℃
Humidity	Operating	20 ~ 80% RH	20 ~ 80% RH
	Storage (Un-Packed)	20 ~ 80% RH	20 ~ 80% RH
	Storage (Packed)	10~90% RH	10~90% RH
Altitude		Normal: 0~3000ft (0~1000m)	Normal: 0~3000ft (0~1000m)
		High: 3001~6600ft(~2000m)	High: 3001~6600ft(~2000m)
		Higher: 6601~9900ft(~3000m)	Higher: 6601~9900ft(~3000m)
		Highest;9901~13000ft(~4000m)	Highest;9901~13000ft(~4000m)

2.1.2.8 Accessory

Item		CLP-310/315	CLP-310N/CLP-315W
Quick setup guide		Yes	Yes
Owner's manual		Yes	Yes
S/W CD ROM		1 : for Driver	1 : for Driver
			2 : for Network
S/W	1 CD for Driver, SmarThru 4	1 CD for Driver, SmartThru 4, EUG	1 CD for Driver, SmartThru 4, EUG
Toner Cartridge		4 EA (0.7K/0.5K yield ISO 19752 5% Coverage)	4 EA (0.7K/0.5K yield ISO 19752 5% Coverage)
Power Cable		1 EA	1 EA
Printer Cable		1 EA	1 EA

2.1.3 Model Comparison Table

	Samsung CLP-310	Samsung CLP-300	HP CLJ 1600	HP LJ 1022
Image				
Speed	16/4 ppm	16/4 ppm	8/8 ppm -> 12/10 ppm (E)	18 ppm
processor	360 MHz	300 MHz	264 MHz	266 MHz
Memory	32 MB	32 MB	16 MB	8 MB
Print Language	SPL-C	SPL-C	GDI	PCL5e
Input	150 sheets CST	150 sheets CST	250 sheets CST, 1 Manual	150 sheets MP, 10 Manual
Duplex	Manual	Manual	Manual	Manual
Interface	USB 2.0	USB 2.0	USB 2.0	USB 2.0
Size (mm)	388 x 314 x 237	350x315x250	407 x 453 x 370	370 x 245 x 241
Weight	11 kg	13 kg	18.4 kg	5.5 kg
Noise	45 dBA	49 dBA	47 dBA	-
Toner (Black/ Color)	1.5 K/1K	2K/1K	2.5 K/2K	2K

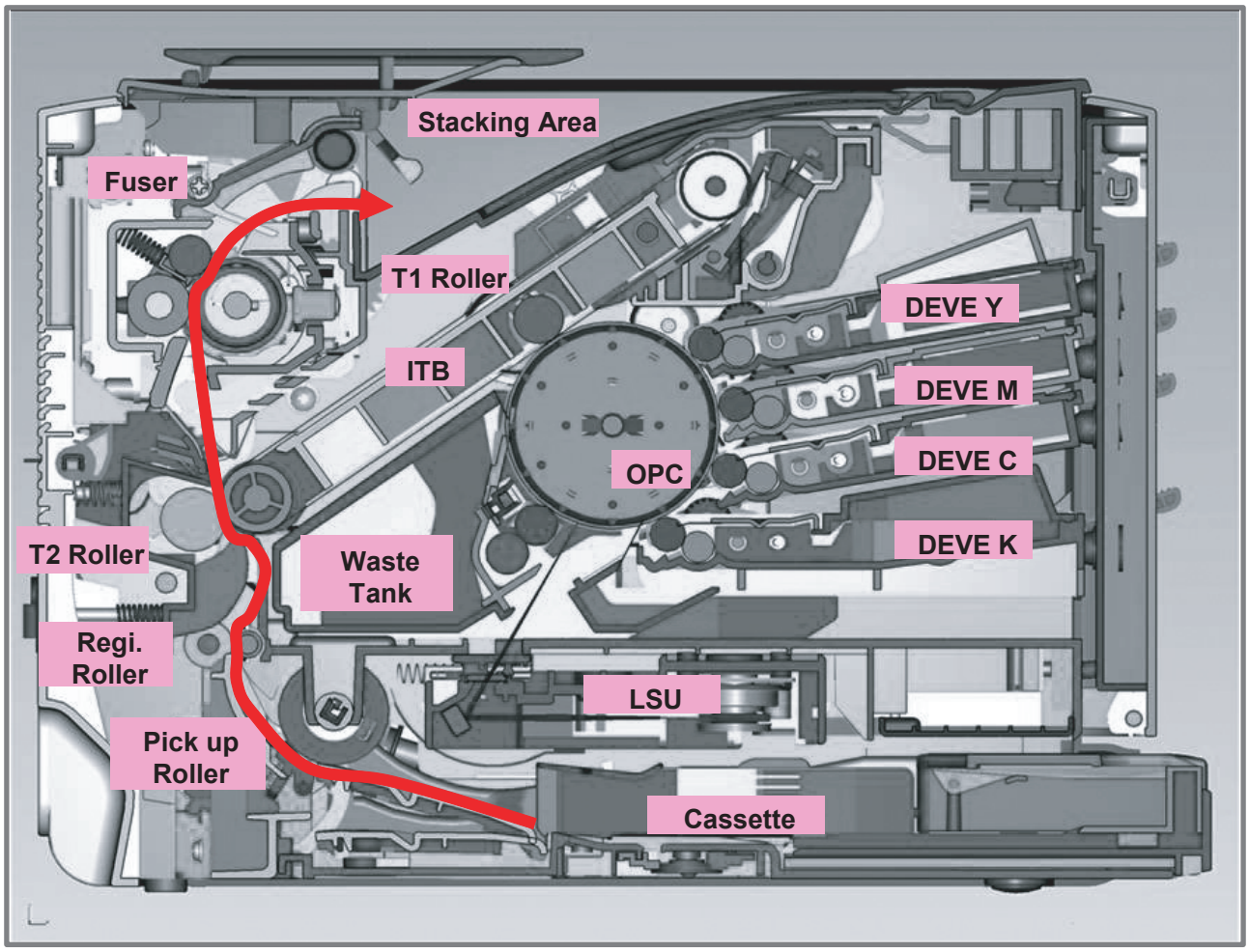
2.2 System Overview

This chapter describes the functions and operating principles of the main components.

2.2.1 System Structure

The Printer function consists of the Engine part and the Main Controller part, and the Engine part consists of the Mechanical part comprising a Frame, Feeding, Developing, Driving, Transferring, Fusing, and Cabinet and the Electrical part comprising a SMPS, a HVPS, a LSU, and some facilities in the Main Controller to control the Engine part for printing.

2.2.1.1 Main Parts of System



① **Cassette**

- Feeding Method : Cassette Type
- Feeding Standard : Center Loading
- Feeding Capacity : Cassette 150 Sheets(75g/㎡, 20lb Pa per Standard)
- No Manual Feeder
- Paper Detecting Sensor : Photo Sensor (Empty, Registration, Exit)
- Paper Size Sensor : None

② **LSU(Laser Scan 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.

- Consisted of LD(Laser Diode) and Polygon Motor Control.

Error	Phenomenon
Polygon Motor Error	The Rotation of Polygon Motor can not reach stable
Hsync Error	Though the rotation of Polygon Motor reach stable, the signal of Hsync is not occurred

③ **2nd Transfer Ass'y**

- The life span: Print over 100,000 sheets (in 15~30)
- Specification: Similar to CLP-300 Series

④ **Fuser Ass'y**

This unit consists of Heat Roller, a Thermostat and a Thermistor. It melts and fuses the toner, transferred by the transfer roller onto the paper, by applying pressure and high temperature to complete printing job.

* Heat Lamp : Kunckle Type
* Fusing system : 3-Roll Fusing type
  - Heat roller : Pipe type (Lamp inside)
  - Pressure roller
  - Pressure roller Shaft
* Thermistor - Temperature-Measuring Device
* Thermostat - Critical Temperature-Detecting Device
* The life span – 100k(black)/color(25k)

Thermostat

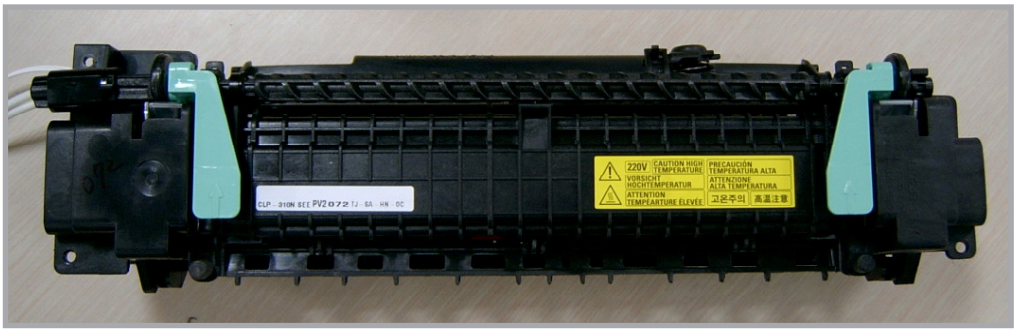
When a heat lamp is overheated, a Thermostat cuts off the main power to prevent over-heating.
- Non-Cotact type Thermostat

Heat roller

The heat roller transfers the heat from the lamp to apply a heat on the paper. The surface of a heat roller is coated with Teflon, so toner does not stick to the surface.

Pressure roller

A pressure roller mounted under a heat roller is made of a silicon resin, and the surface also is coated with Teflon. When a paper passes between a heat roller and a pressure roller, toner adheres to the surface of a paper permanently.



⑤ & ⑥ **ITB(Intermediate Transfer Belt) & 1st Transfer Roller**

- The life span: Print over 100,000 Images
- The ITB unit includes 1st Transfer Roller

⑦ & ⑧ **OPC(Organic Photo-Conductor) & Developer**

- The life span: Print over 50,000 Images (Both)
- Imagine Unit consists of 4 kinds of Developer , OPC, and Deve. Main Frame

⑨ **Toner Kits**

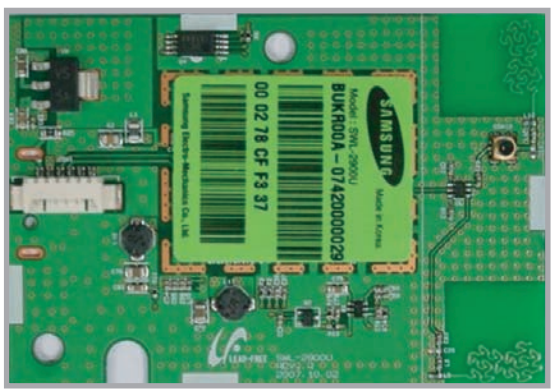
- The life span: Color -> 1000 images (Std. ISO 19798 Print-Out)
  Black -> 1500 images (Std. ISO 19798 Print-Out)

⑩ **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.
- The Main Motor is similar to CLP-300 Series Main Motor.

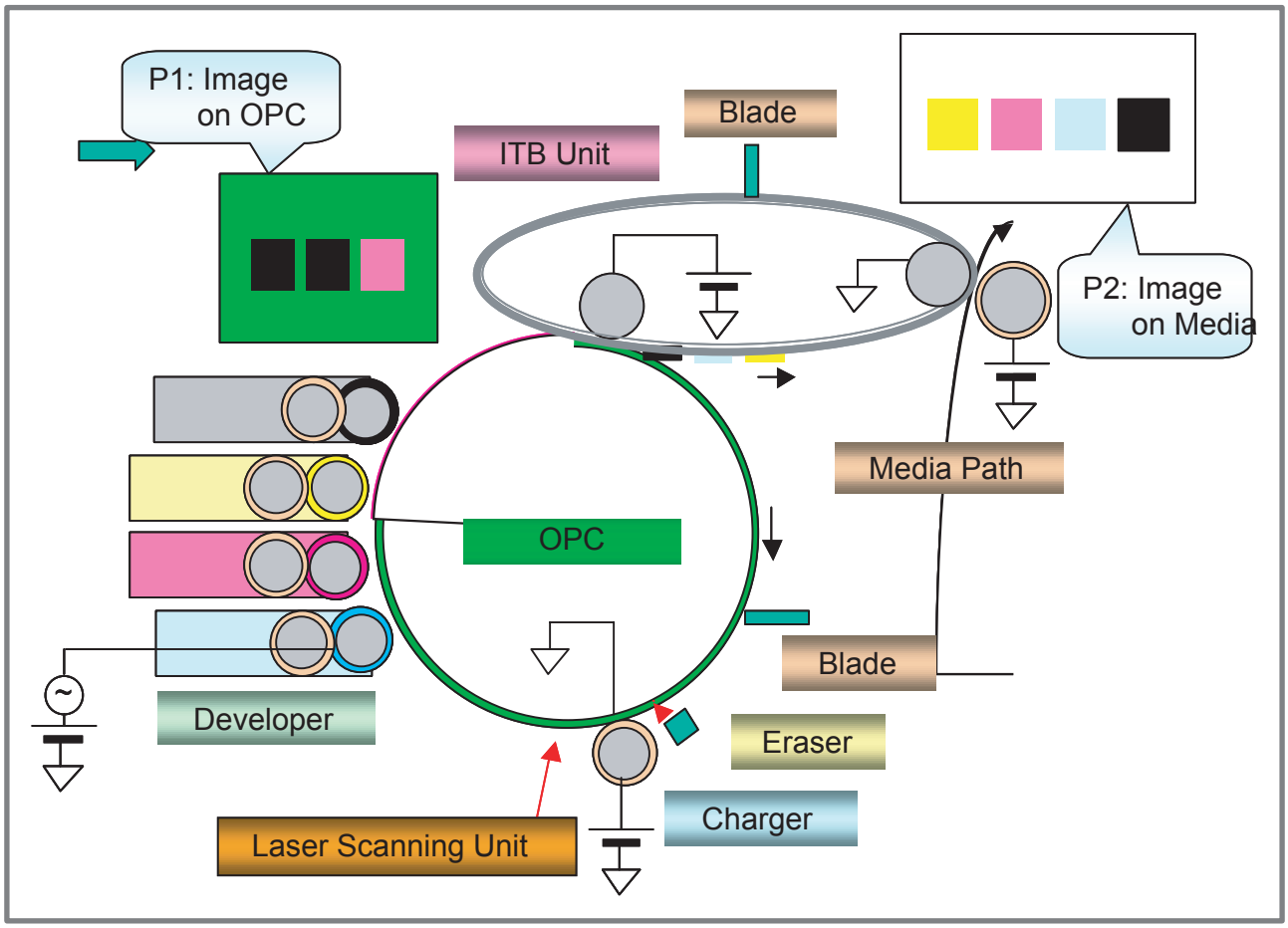
⑪ **Wireless PBA (Only CLP-315W)**

- CLP-315W model has a Wireless PBA to use wireless network.



2.2.1.2 EP Process

- Structure of EP Process



① Charging

- Conductive Roller charging
- Applied voltage : -1.1kV
- Charge acceptance : -520V
- OPC coating thickness : 21um
- OPC diameter : Φ60mm
- Eraser system

1. Organic Photoconductor is charged to uniform voltage by conductive roll charging method
2. No ozone is produced because corona is not used
3. Charger roll is cleaned with cleaning roll
4. Toner remained on OPC after T1 process is cleaned by cleaning blade and retrieved into waste toner box by auger and belt driving mechanism

② Exposing

- One polygon motor (6 facet)
- Single beam LD (1ea)
- LD wavelength : 785nm
- Polygon motor rpm : 29685
- LSU energy : 0.25uJ/cm^2
- OPC exposed potential : -50V

1. Exposing is implemented by laser striking on to OPC with uniform potential
2. Laser beam is modulated according to image to be printed that is from PC
3. Latent Image is formed on OPC, which is developed with toner

③ Developing

- Non-magnetic, mono component
- Non-contact development
- Developing bias : DC + AC
- AC peak to peak : 1.5 ~ 2.0kV
- Roller diameter : Φ10mm
- Process speed ratio : 1.2 (OPC=1.0)
- Color order : Y -> M -> C -> K

1. Only latent image formed by exposing process is developed with toner
2. AC + DC Voltage is being used to develop toner into latent image on OPC because non-contact developing method is adopted
3. Y, M, C, and K Images are sequentially developed onto OPC and transferred onto Intermediate Transfer Belt (hereafter ITB) to form a color image on ITB
4. Toner Bottles are used to supply toner into developer compartment
5. Toner level is being sensed to control toner supply from toner bottle to developer

④ Transfer 1

- Multi-pass transfer
- Indirect transfer
- Transfer voltage : 0.5 ~ 2.0kV (controllable)
- Roller diameter : Φ14mm
- Transfer unit life : 100K images

1. Developed Image on OPC is transferred onto ITB by T1 Process
2. T1 Voltage is positive which attract toner to ITB
3. 4 times of T1 process is required to make a color image on ITB, which means multi-pass process
4. ITB has a hole as a fiducial mark for timing. Engine control for color image is synchronous with it, ITB Home Sensing Signal

⑤ Transfer 2

- Indirect transfer
- Transfer voltage : 1 ~ 4.0kV (controllable)
- Roller diameter : Φ18.6mm
- Transfer unit life : 100 K images

1. Color image formed on ITB is transferred onto media by T2 process
2. T2 voltage is also positive to get color image moved onto media
3. Toner remained on ITB after T2 process is cleaning by ITB cleaning blade and collected and
4. Transported and retrieved into waste toner box by auger and belt driving system
5. T2 Roll is engaged when color image is being transferred onto media. Otherwise it is disengaged. Clutch is used for driving T2 Roll engagement and disengagement

⑥ Fusing

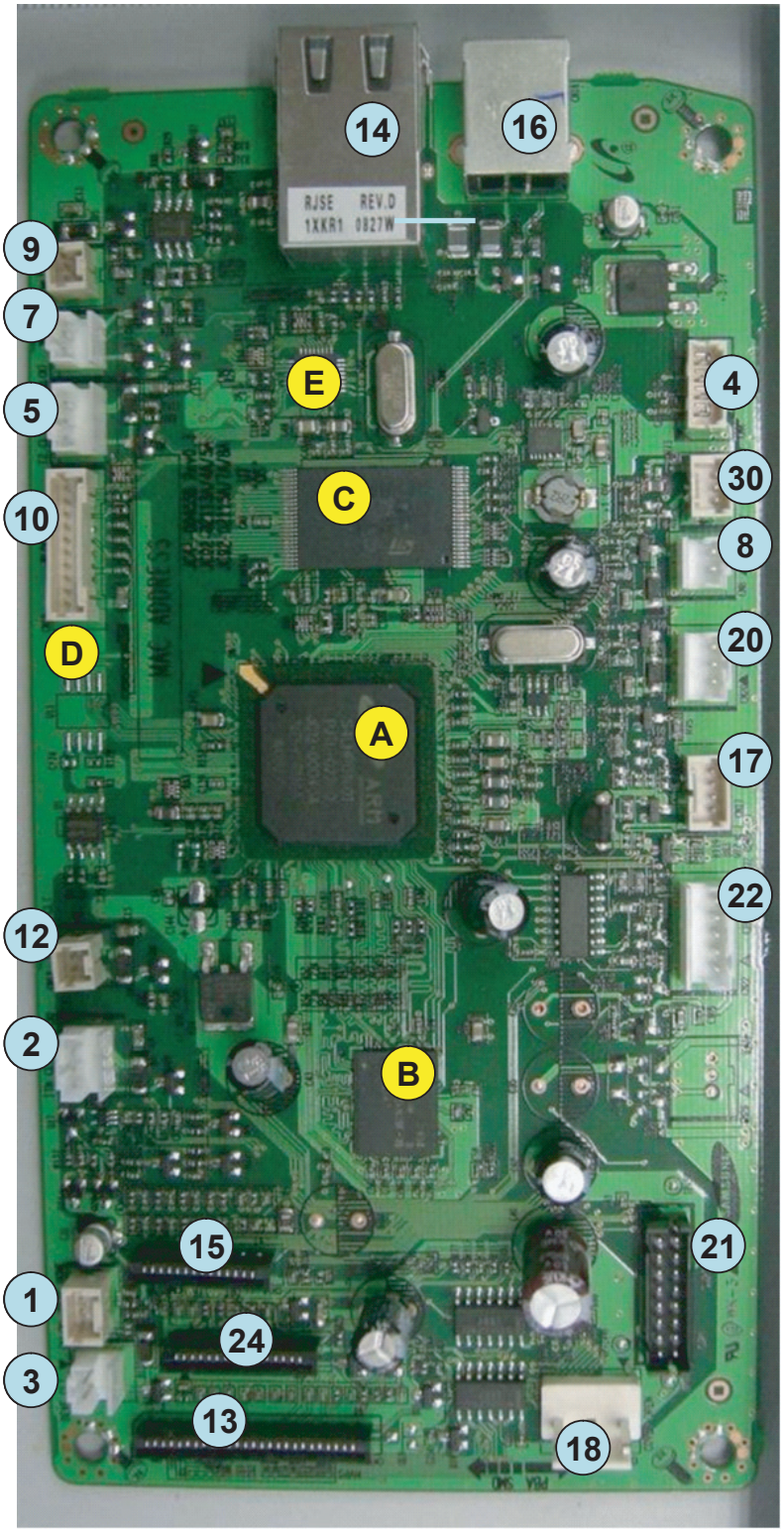
- 3 Roll system
  -> short warm-up time (35sec)
- Post Pressure Roll

1. Color Image on media is melted down and fixed into media by fusing process

2.2.2 Main PBA Description

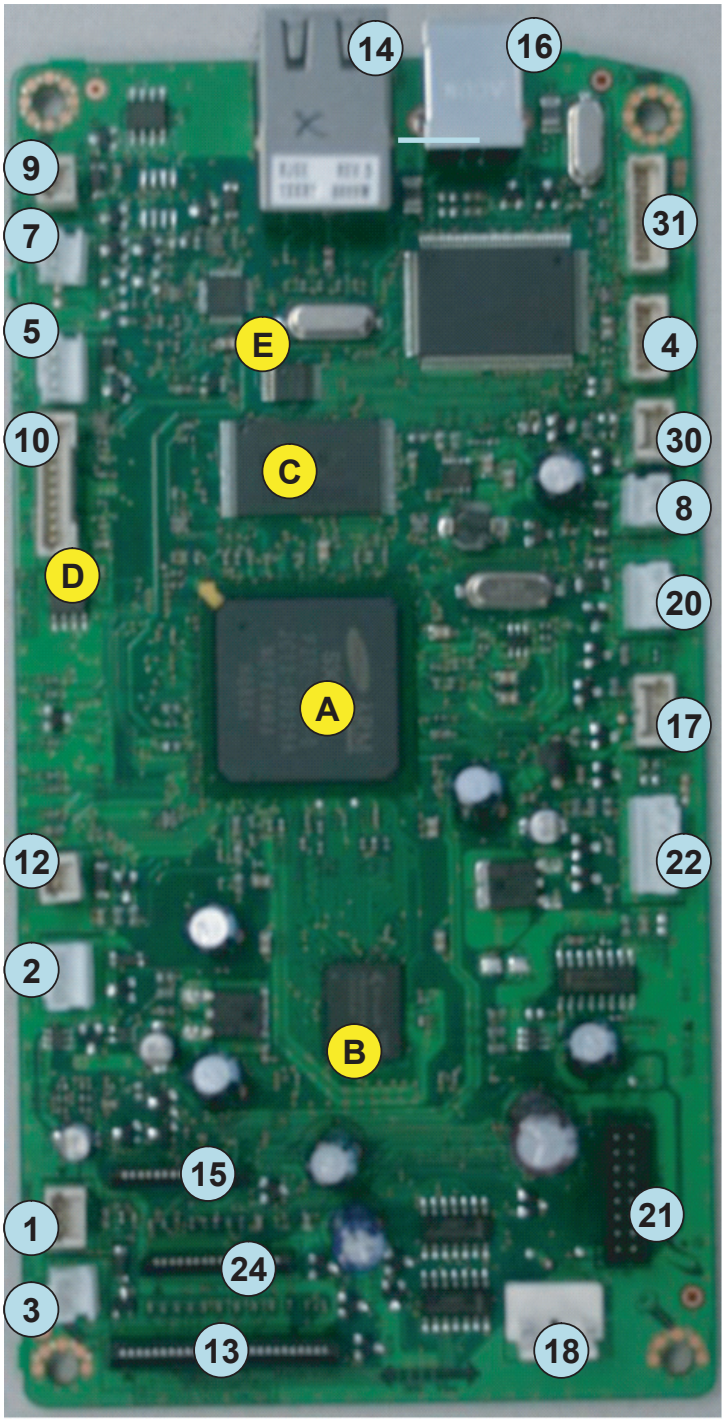
2.2.2.1 Main Controller PBA

- CLP-310N (VE model)



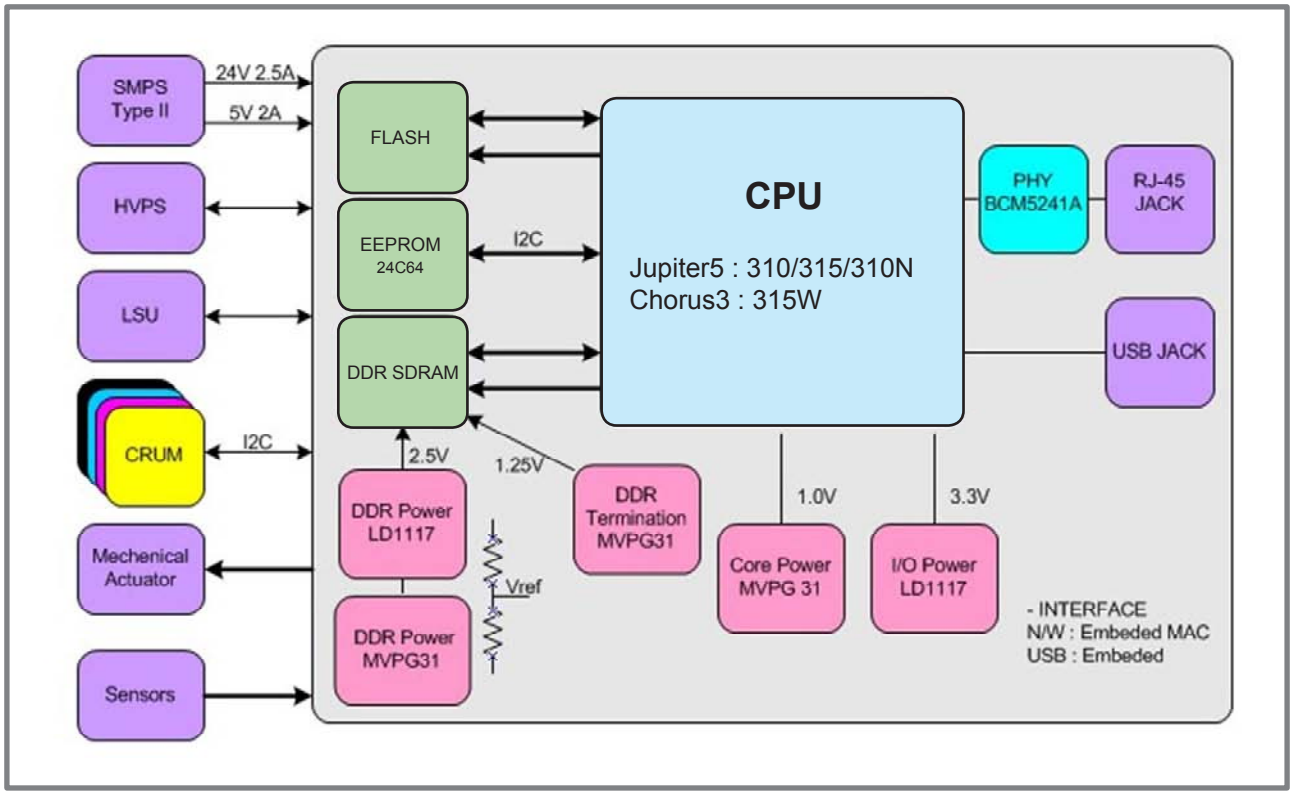
NO.	NAME
1	Deve home CON.(3P)
2	ITB CLT(3P)
3	Deve CLT(2P)
4	Debug(4P)
5	T2 CLT(2P)
7	Fuser(2P)
8	Regi CLT.(2P)
9	Fuser CLT.(2P)
10	BLDC Motor(10P)
12	ITB Tension(3P)
13	HVPS(26P)
14	Wired N/W Con. (14P)
15	OPE & ITB (15P)
16	USB Con. (6P)
17	Key PTL(10P)
18	Cover OPEN (2P)
19	Pickup CLT (2P)
20	Pickup CLT. (3P)
21	SMPS (16P)
22	CRUM Con. (5P)
24	LSU Con.(16P)
30	Empty. (3P)
NO.	NAME
A	CPU(Jupiter5)
B	DDR2 (32MB)
C	NOR FLASH(2MB or 4MB)
D	EEPROM
E	PHY Chip

- CLP-315W



NO.	NAME
1	Deve home CON.(3P)
2	ITB CLT(3P)
3	Deve CLT(2P)
4	Debug(4P)
5	T2 CLT(2P)
7	Fuser(2P)
8	Regi CLT.(2P)
9	Fuser CLT.(2P)
10	BLDC Motor(10P)
12	ITB Tension(3P)
13	HVPS(26P)
14	Wired N/W Con. (14P)
15	OPE & ITB (15P)
16	USB Con. (6P)
17	Key PTL(10P)
18	Cover OPEN (2P)
19	Pickup CLT (2P)
20	Pickup CLT. (3P)
21	SMPS (16P)
22	CRUM Con. (5P)
24	LSU Con.(16P)
30	Empty. (3P)
31	W-LAN PBA
NO.	NAME
A	CPU(Chorus3)
B	DDR2 (64MB)
C	NOR FLASH(8MB)
D	EEPROM
E	PHY Chip

2.2.2.3 Main PBA Description



Jupiter5(or Chorus3)
A Proprietary SoC, CHORUS3, executes and controls all jobs and functions to be required for printing. To do these all jobs, the CHORUS3 incorporates all H/W blocks as follows.

- CPU Core ARM 926ESJ, I/D-Cache 16/16KB , Up to 400MHz
- System Bus Internally 32-bit width, Up to 120MHz
- MEM Controller DDR1/2, 16-bit width, 166MHz, 4-Bank, 128MB Space/bank
- ROM Controller 16-bit width, 4-bank, 16MB Space/bank
- CODEC Controller JBIG 4-ch Decoder and 2-ch Encoder, 1-ch JPEG
- Image Processor Processing Scan Image
- MAC Controller 10/100Mbps Full IEEE 802.3 Compatibility
- USB Controller USB2.0, Device or Host
- UART Controller
- I2C Controller
- Interrupt Controller
- Misc. Controller ADC, DAC, PWM, Step Motor Control and so on
- Voltage Core 1.0V, I/O 3.3V
- Package 416PBGA

Flash Memory
Used to store System Programs including the Operating System.

- Type NOR Flash
- Bus 16-bit width
- Size : 2MB (CLP-310/315)
  4MB (CLP-310N)
  8MB (CLP-315W)

System Memory
Used as a Printing buffer for printing, a Scan buffer for scanning, a ECM Buffer for System Working Area.

- Type DDR1 SDRAM
- Bus 16-bit 166MHz
- Size 32MB (310/315/310N) / 64MB(315W)

CRU Control
Used to store the printing and operating information into a Security EEPROM in 4 CRUs, Y,M,C and K Imaging Cartridge, respectively by the CHORUS3.

- Access I2C Bus Ch.2 400KHz
- Security Size 2K-bit

System Information Control
Used to store the system operating information needed at printing into a EEPROM in the Main Controller by the CHORUS3.

- Access I2C Bus Ch.1 400KHz
- EEPROM Size 64Kbit

OPE Interface
Used to control the OPE by the CHORUS3. Through CHORUS3's GPIO pins, all LEDs and Keys in the OPE are controlled.

I/O Port
Used to receive or transmit some data from/to the Host.

- USB Device USB2.0 High speed 480Mbps
- Network Ethernet 10/100-Base Tx

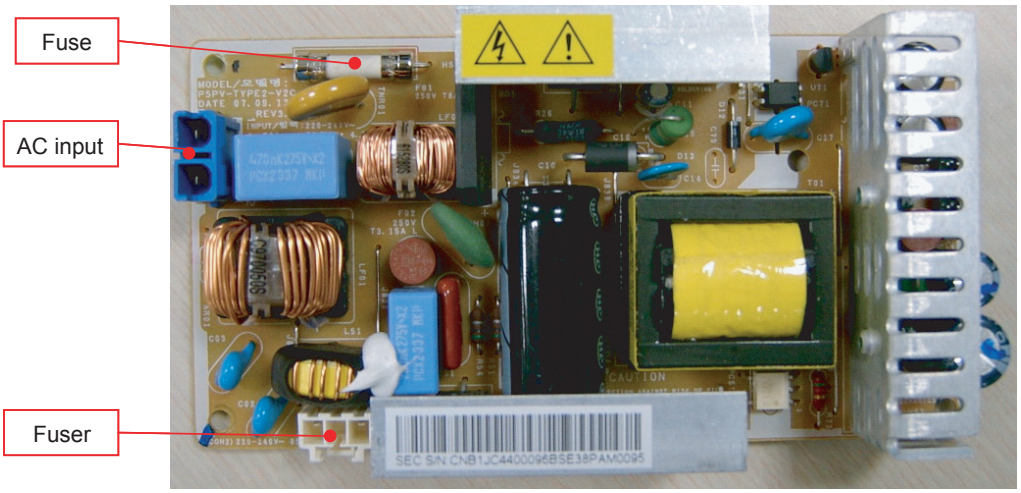
(note) The Network only equipped at CLP-310N/315N, not CLP-310/315.

Engine Control
Used to control all parts to be required at printing by the CHORUS 3.

- Sensors Paper Empty
  Paper Registration
  Waste Toner Bottle
  Paper Exit
  Temperature sensors
  Etc.
- Clutches(Solenoid) Paper Pick Up
  Paper Registration
  Etc.
- Motor 1 BLDC
- LSU
- Fuser Control the Fuser's temperature
- HVPS Control the high voltage outputs
- ADC Reading the Fuser's temperature and the high voltage outputs' feedback
- Cover Open Sensing

2.2.2.4 SMPS(Switching Mode Power Supply) PBA

SMPS is the power source of the entire system. It is assembled by an independent module, so it is possible to use for common use. It is mounted at the side of the set. It is consisted of the SMPS part which supplies the DC Power for driving the system and the AC Heater control part which supplies the AC Power to the Fuser. The SMPS has two DC output channels, +5V and +24V.



AC Input

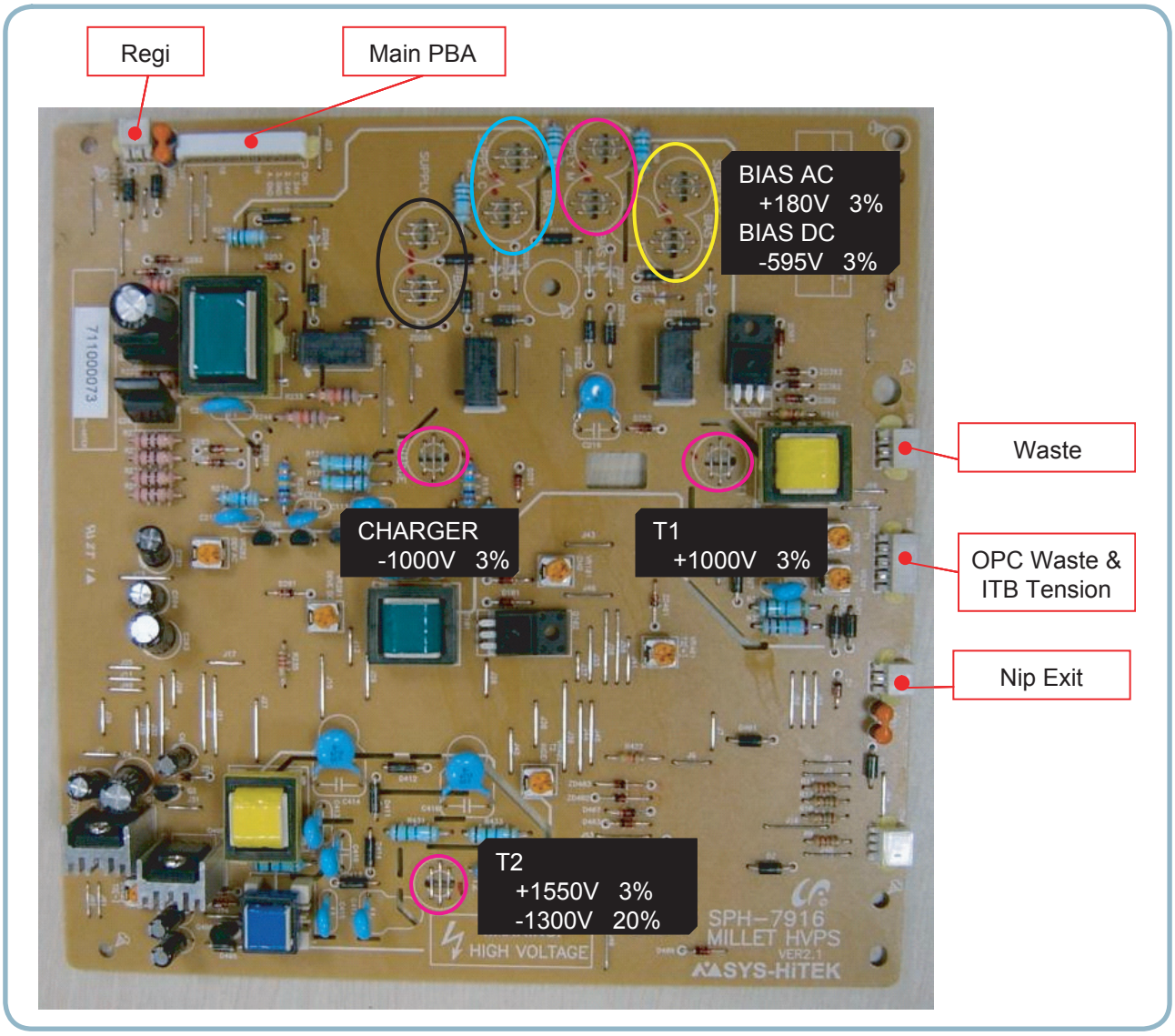
Input Rated Voltage	AC 110V~127V, AC 220V~240V AC 120V/AC 220V(EXP version)
Input fluctuating range	AC 99V~135V, AC 198V~264V
Rated Frequency	50/60 Hz
Frequency Fluctuating	47~63 Hz
Input Current	< 4.0Arms, 2.0Arms

Rated Output Power

No	Item	CH1	CH2	Remark
1	Channel Name	+5V	+24.0V	
2	Connector Pin	CON 3 5V Pin: 11,13,15 GND Pin: 12,14,16	CON 3 24V Pin:3,5,7,9 GND Pin:4,6,8,10	
3	Rated Output	+5V ±5% (4.75~5.25V)	+24V ±10% (21.6~26.4V)	
4	Max. Output Current	2 A	2.4 A	
5	Peak Loading Current	2.2 A	2.7 A	1ms
6	Ripple Noise	<100mVp-p	<500mVp-p	
7	Maximum Output	10.2W	60W	
8	Peak Output	11W	64.8W	1ms
9	Protection for loading shortage and overflowing current	Shut down or Fuse Protection	Shut down or Output Voltage Drop	

2.2.2.5 HVPS(High Voltage Power Supply) PBA

The HVPS creates the high voltages for T1(+), T2(+,-), Charger(-), DEV, and SUPPLY and then, supplies these voltages to the Developer part for making best condition to print. The HVPS part takes the 24V and outputs the high voltages and then, the high voltages are supplied to the Toner, OPC Cartridge, and Transfer Belt and Roller.



1) Charger Voltage : Charger
- Function: voltage that charges OPC surface up to -500V~ -800V.
- Output voltage: -1.0KV ~ -2.0KV DC 3%
- Error type: if the voltage fails to be output to Charger Roll, OPC surface will not be charged, and the toner on the developer roller will be transferred to OPC Drum, printing black paper.

2) 1st Transfer High Voltage : T1(+)
- Function: voltage necessary for transferring toner developed on OPC Drum surface onto ITB.
- Output voltage: Max +2.0KV 3%(Duty variable, no load)
- ERROR type: if T1(+) output fails, the toner on OPC drum will not be transferred to ITB normally and the image will be blurred.

3) 2nd Transfer High Voltage : T2(+)
- Function: voltage used to transfer the toner primarily transferred on ITB again onto paper.
- Output voltage: Max +5.0KV 3%(Duty variable, no load)
- ERROR type: if T2(+) output fails, the toner on ITB will not be transferred to paper normally and the image will be blurred.

4) T2 Cleaning Voltage : Clean : T2(-)
- Function: prevent reverse side of paper from being dirtied, by recovering the negatively charged toner remaining at Transfer Roller and sending it onto ITB.
- Output voltage: with no feedback control, output fixed voltage(-1300V 15%)
- ERROR type: reverse side of paper will be dirtied.

5) Supplying Voltage : Supply AC+DC(-)
- Function: voltage that makes toner to develop on the area exposed by LSU by means of potential difference, output will be the voltage of AC+DC overlapped form.
- Output voltage: AC 600V ~ 2000V p-p 1.5%
  DC -50V ~ -600V DC 3%
- ERROR type: 1. if supply is GND, density will be extremely low.
  2. if supply is floating (for insecure terminal contact), density will be down so slightly that it is impossible to make out with naked eyes.

6) Developing Voltage : Deve AC+DC(-)
- Function: voltage that supplies toner to Developing Roller
- Output voltage: AC 250V ~ 1650Vp-p 1.5% (supply voltage is connected to ZENER Diode 350V)
  DC -50V ~ -600V DC 3%
- ERROR type: 1. if Deve is GND, density will be extremely down.
  2. if Deve is floating (for insecure terminal contact), density will be extremely down.

2.2.3 CRUM

The CLP-310N engine will be equipped with electronics that can read and write data into NVRAMs otherwise known as CRUMs that reside within 1) C, M, Y, K Toner cartridges.
The CRUM has a company ID, and electronics logo.
The toner CRUM also identifies the type of toner cartridge (Standard or High Capacity). The CRUMs contain fixed data such as the low warning point, specified life point, and hard stop point (on toner)
and also store the current life count (pages count, pixels count, images count) and % of usage (gas gauge) data.

■ In the case of Refill Toner Install

1) Perception of Refill Cartridge (when power is on or the cover is closed)
   End of Life / life span data initialization -> judge to be Refill Cartridge
   End of Life / life exhausted (simple refill) -> stop printing caused by life exhaustion

2) Operating
   It is impossible to control appropriate development parameters, for there s no toner specification data.
   It runs with the setting of default development parameter. (Image quality will be degraded, for the lack of appropriate respond to the change of time and environment.)

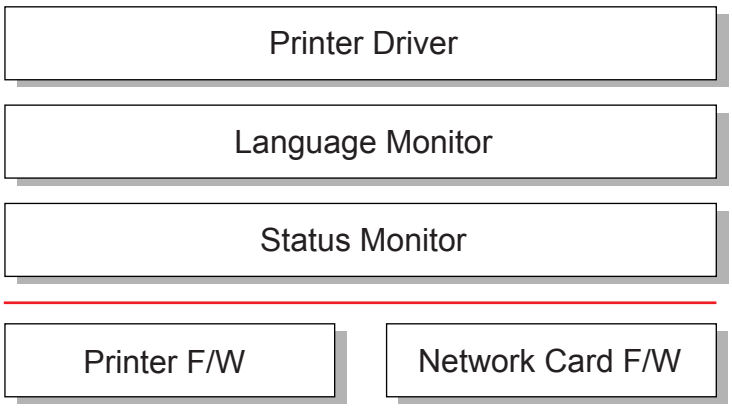
■ Process after CRU life expiration

1) Record the information of End of Life.
2) Clear some information of Operation Area.
   -> Supplier/Model Name/MFC date/Serial Number (Manufacture Information)
   -> Let cartridge refiller initialize manufacture information and life span information.

2.3 S/W Structure and Descriptions

2.3.1 Architecture

The belt CRUM interface board is a transmission belt CRUM interface board of the photoelectric Dry Color Laser Printer, mounted on the printer body, making it possible to physically combine the body and the belt CRUM board.



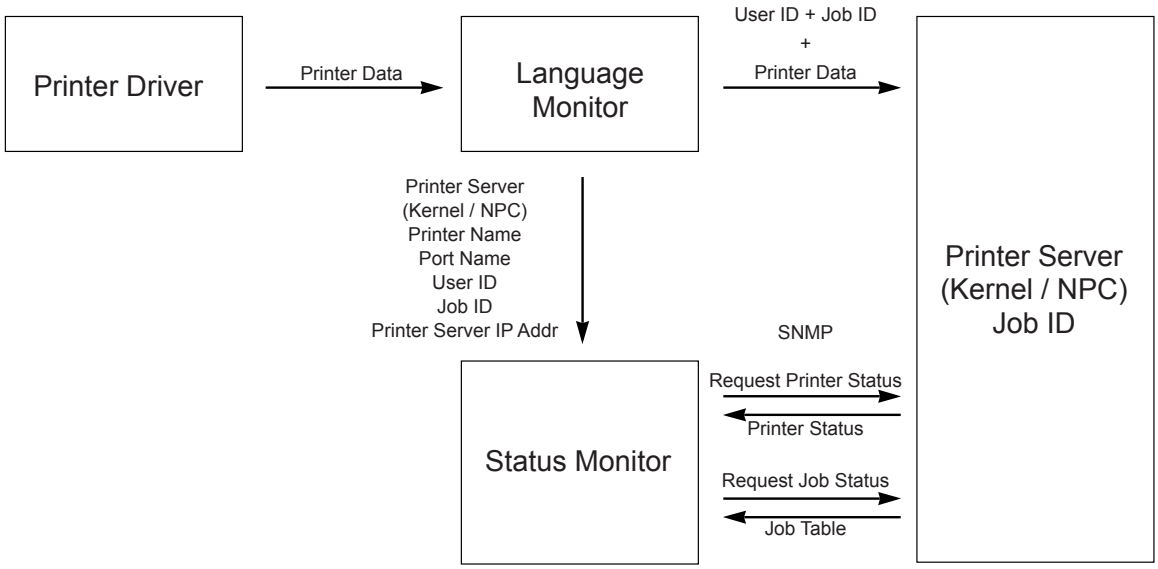
2.3.2 Language Monitor

Language Monitor is a part of the Printer Driver and the Windows Spool System. The main roll of the Language Monitor is that sends a job start message to the Status Monitor. Therefore the Status Monitor can start polling to get the printer status.
The second roll is that sends the job information such as User ID and Job ID to the Status Monitor and the Printer F/W. Hence the Status Monitor can stop polling because the Printer F/W informs the Status Monitor that printing job is complete.

2.3.3 Status Monitor

Status Monitor has no user interface. It shows only HTML help when any error occurs during printing jobs.

2.3.4 Network Interface



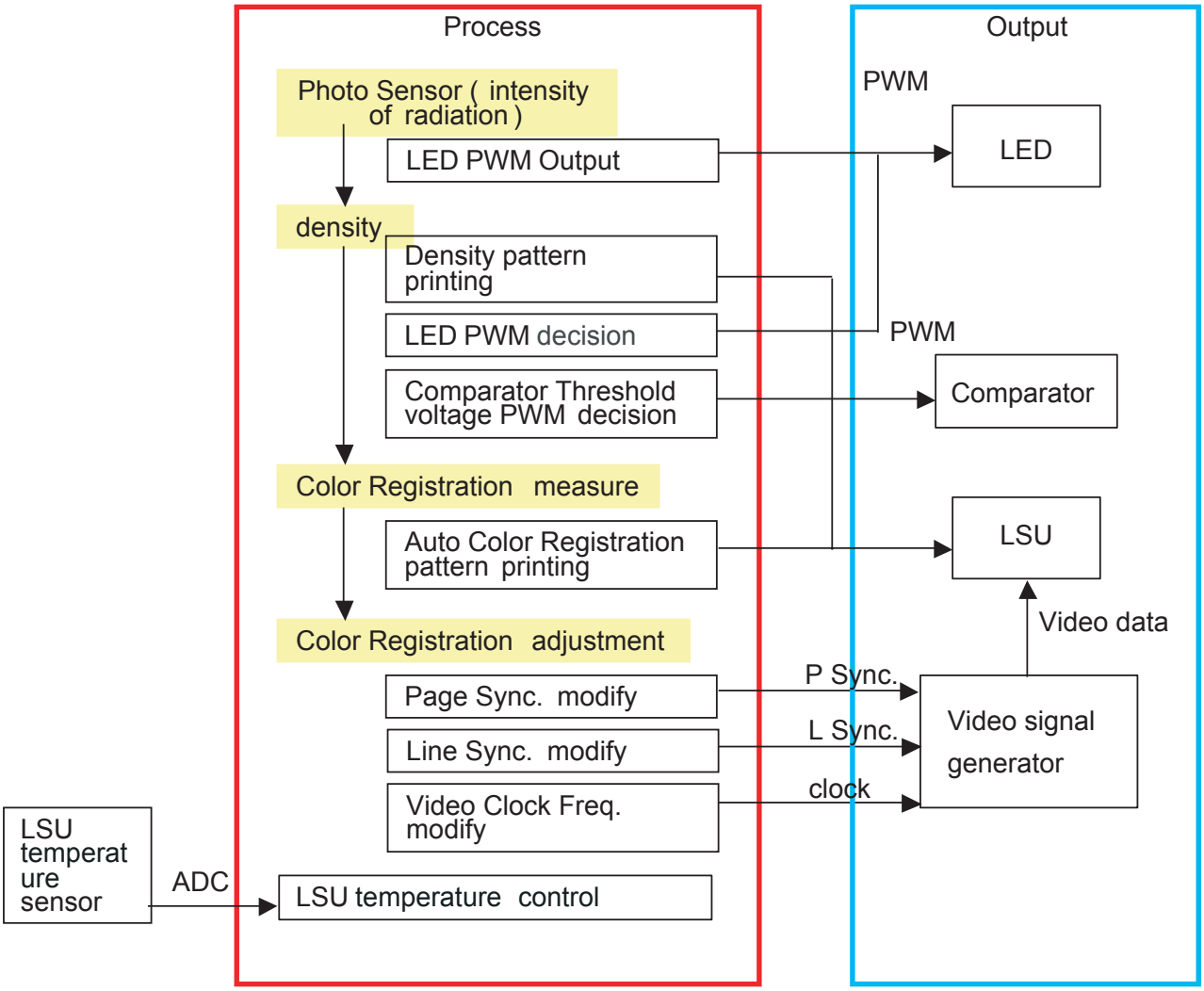
Status Monitor Data Flow

After polling is started, Status Monitor has to know when it stops the polling. For this reason, the Network Printer Server should inform of completing job when the printing job is finished.
When Status Monitor requests a job status, the Printer Server returns the job table that contains user id, job id, and job status (printing or complete or canceled).

2.3.5 Printer Driver <-> Status Monitor

The Printer Driver and the Status Monitor can set/get some data to the system registry to share the Status Monitor information such as the polling interval.
When the user wants to set the option of the Status Monitor manually, he or she can set it using the Printer Driver User Interface. So, if the user set option that the Status Monitor is disabled, the Status Monitor can's show HTML Help to the user although the error has occurred while printing.

2.3.6 System F/W Flow



2.3.7 Alarm Shortage

	90 ~ 100 %	100 ~ 110 %	110 %~
Toner (C,M,Y,K)	Ready Yellow Toner Low	Replace Yellow Toner	Yellow Toner Exhausted
Transfer Belt	Replace Transfer Belt Soon	Replace Transfer Belt	
Fuser	Replace Fuser Soon	Replace Fuser	
Pickup Rollers (MP/Tray1/Tray2)		Replace MP Pick-Roller	

2.3.8 Error status

1. Missing/Invalid Consumables
   - Install Cyan (Magenta, Yellow, Black) Toner
   - Install Transfer Belt
   - Invalid Cyan (Magenta, Yellow, Black) Toner
   - Invalid Transfer Belt

2. Paper JAM
   - Jam 0 In MP(Tray1, Tray2)
   - Jam Inside Printer
   - Jam In Exit Area

3. Cover
   - Cover Open : Message toggles between
     “Cover Open” and “Install Transfer Belt”
   - SCF Cove Open

4. Service Call : Unrecoverable Error
   - Engine LSU Error
   - Main Motor Error
   - Engine Fuser Over(Low) Heat Error + Open Heat Error
   - Transfer Belt Error

5. Others
   - Ready IP Conflict

2.3.9 CRUM Overview

- Stands for “Customer Replaceable Unit Monitor”

- EEPROM, SAMSUNG CRUM is used for CRUM Memory.

- CRUM stores various information on consumables (including consumables’ life).

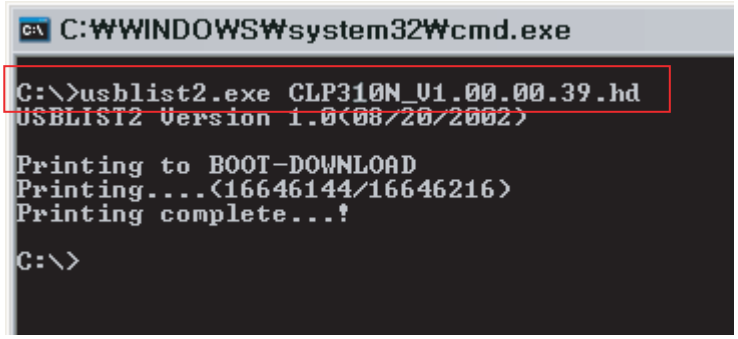
- In CLP-31x Series, total four CRUM’s are used
  (four on toner cartridges)

CRUM stores the following information

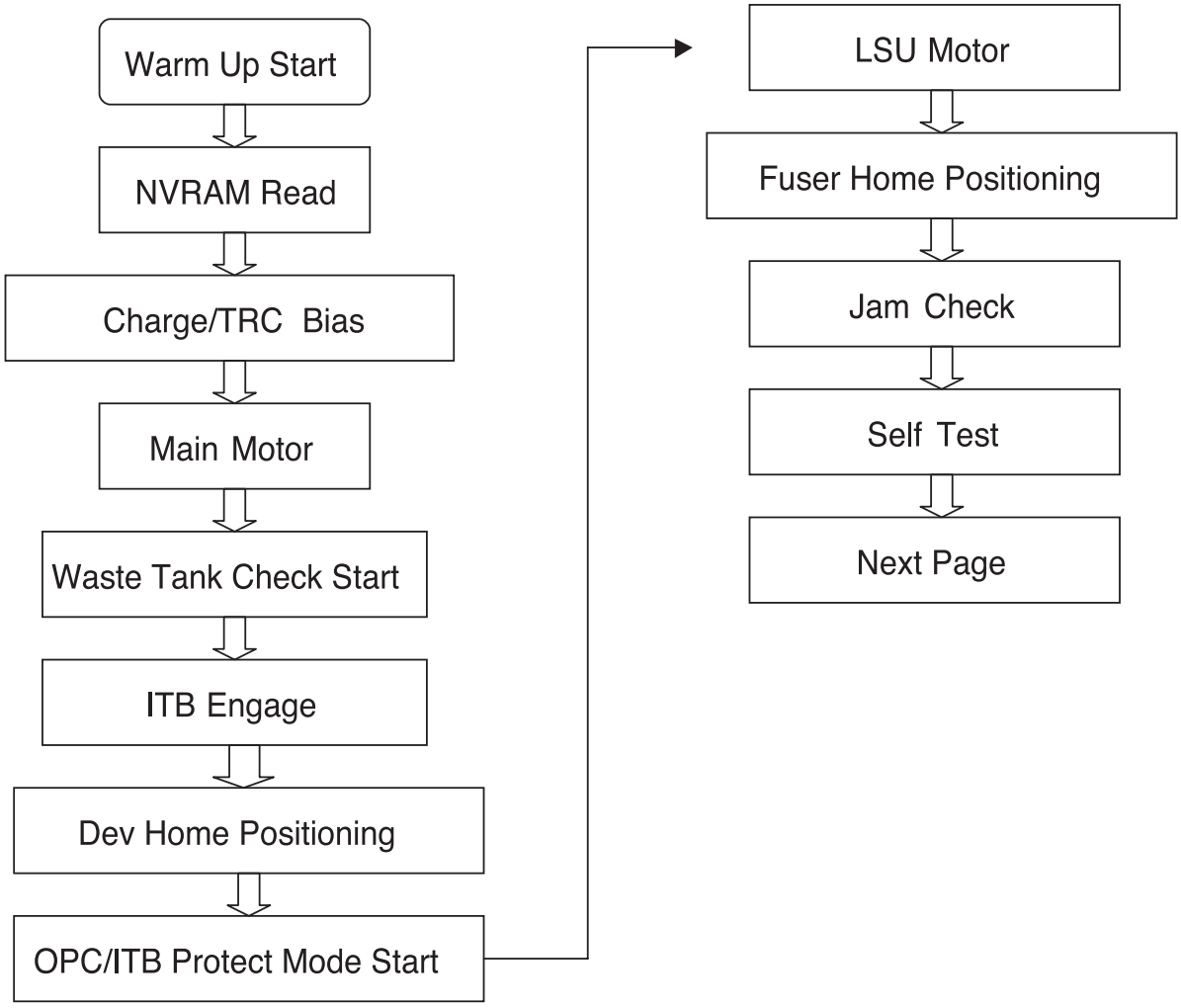
• Model Name
• Supplier ID
• Serial Number
• Company ID
• MFG Date
• Capacity
• Page Count
    - Toner Cartridge and Transfer Belt
    - Indicates how many pages are printed by using the consumable
• Dot Count
    - Toner Cartridge Only
    - Indicates how many dots are printed by using the toner cartridge
• Image Count
• Model ID

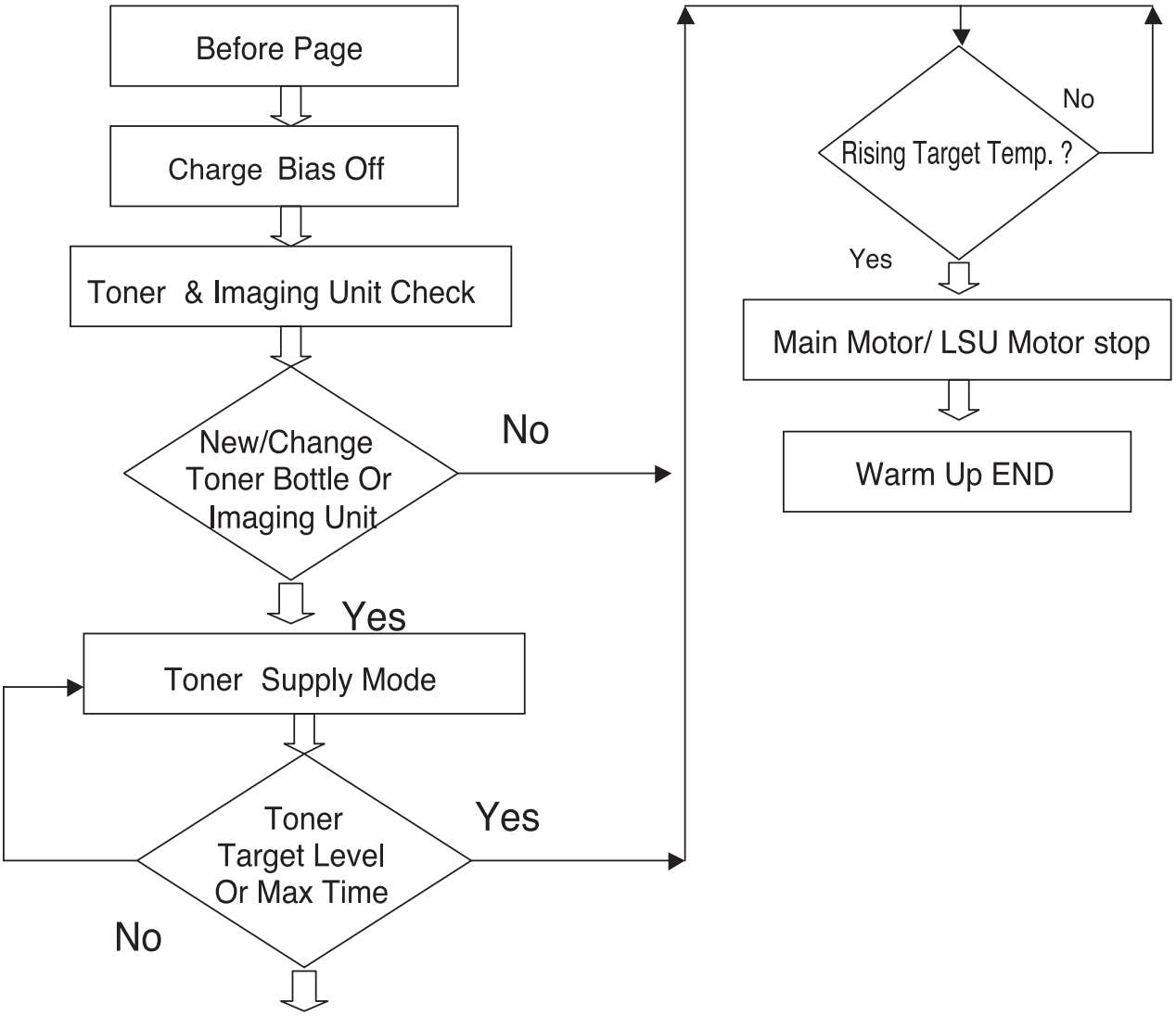
2.3.10 FW Upgrade

• Via USB or Network (SWS/SWAS)
• You can upgrade F/W via USB or Network whenever the printer is “Ready”
• Make sure connecting Printer to the computer with a USB cable
• Via Using F/W Download Mode :
  Step 1) Power on while pressing the STOP Key
  Step 2) Press STOP Key more time and the status LED is on as Green.
  Step 3) Download F/W via USB



2.3.11 Initailize Flow




Before Page
Charge Bias Off
Toner & Imaging Unit Check
New/Change Toner Bottle Or Imaging Unit
No
Yes
Toner Supply Mode
Toner Target Level Or Max Time
Yes
No
Rising Target Temp. ?
No
Yes
Main Motor/ LSU Motor stop
Warm Up END