

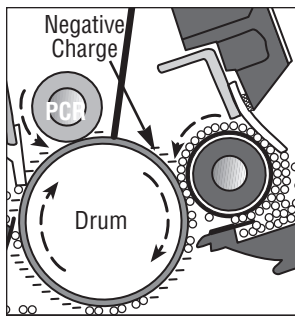
# The Basics of Electrophotography

## For Canon-based Systems

The accepted definition of electrophotography, as listed in the Random House Unabridged Dictionary (1993), is “photography using electric rather than chemical processes to transfer an image onto paper, as in xerography”. Xerography is then identified as “an electrostatic printing process for copying text or graphics whereby areas on a sheet of paper corresponding to the image areas of the original are sensitized with a charge of static electricity so that, when powdered with a toner carrying an opposite charge, only the charged areas retain the toner, which is then fused to the paper to make it permanent”. So how is this accomplished (in plain english)?

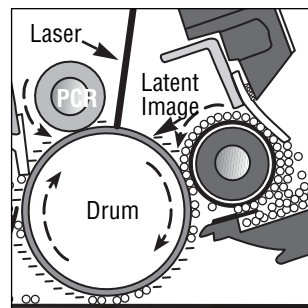
There are basically seven (7) steps in the process, once the laser printer or copier has been turned on and gone through a short warming-up period. This allows time for the **upper fuser roller** to heat to the proper fusing temperature, and will vary with the type of equipment being used. The seven steps, for Canon-based systems, are as follows:

### The Seven Step Imaging Process



#### 1 Charging

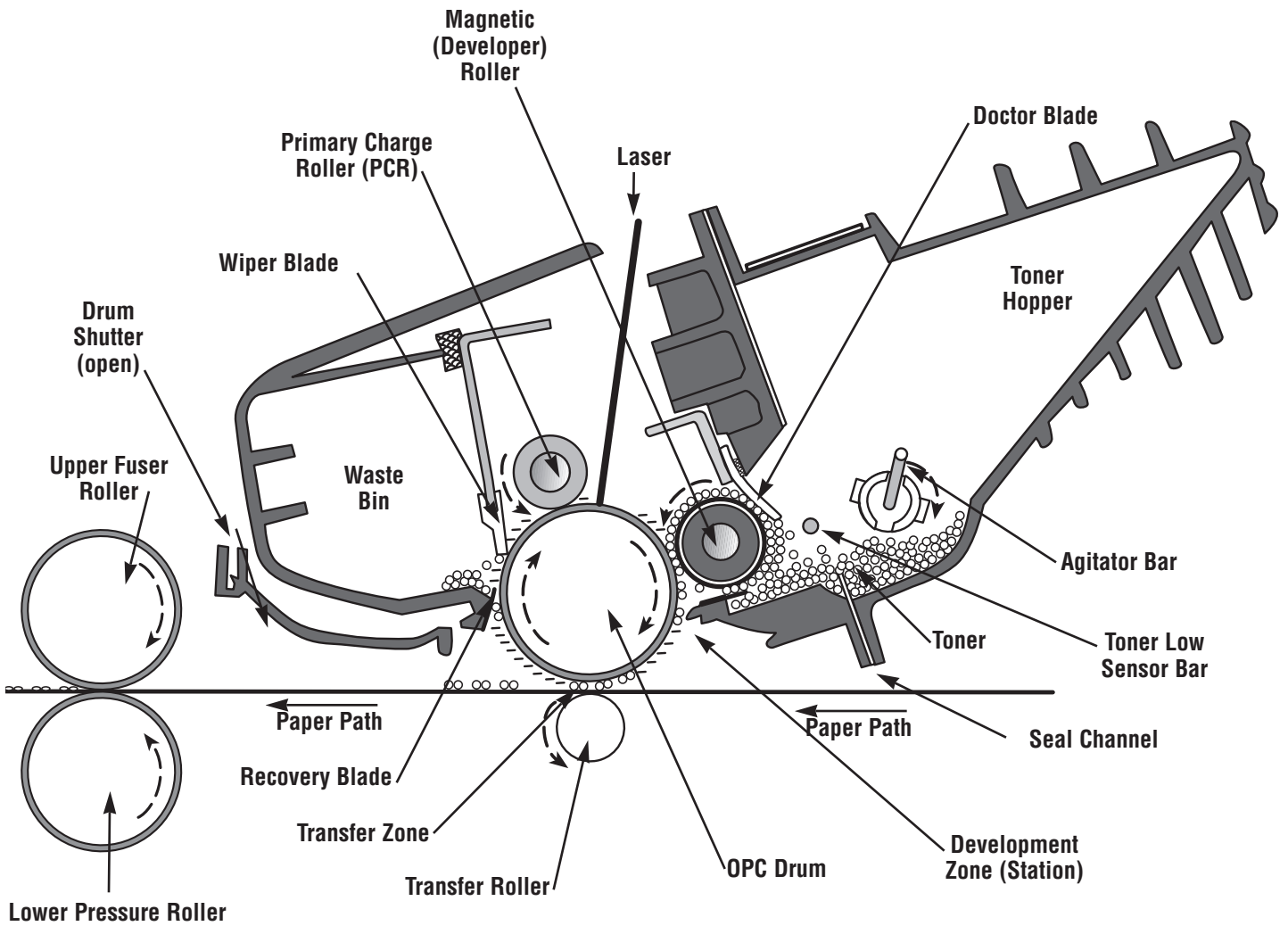
The process begins with the charging of the **organic photo conductor** (OPC drum) by the **primary charge roller** (PCR). A constant flow of electrical current from the PCR produces an even blanket of negative charge on the surface of the rotating drum.



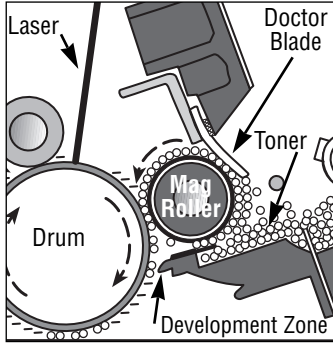
#### 2 Exposure

The **laser** passes through an opening in the cartridge and focuses on the evenly charged drum surface. As the drum rotates the focused beam of the laser scans across the drum, emitting light and discharging the drum in the pattern of the image and/or characters to be printed. This “writing to the drum” leaves a positively charged **latent image** on the drum surface (it’s there, but you can’t see it yet).

The illustration below is a schematic view of the EX/LJ4, LJ5 cartridge imaging components from the left side of the cartridge. The cartridge is oriented as it would appear installed in the printer.



# The Seven Step Imaging Process

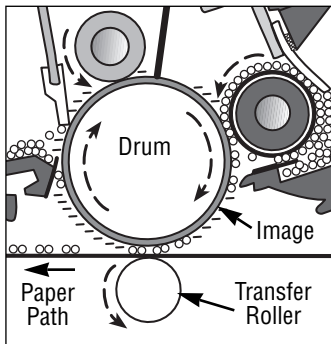


### 3 Development

There is a small gap between the **doctor blade**, or “leveling blade”, and the **magnetic developer roller** (mag roller). As toner is magnetically attracted to the mag roller it bunches up behind the doctor blade, trying to get through this

gap. The friction created by these bunched particles rubbing against one another results in a negative charge build-up on the individual toner particles. This is called the “*triboelectric charge*”.

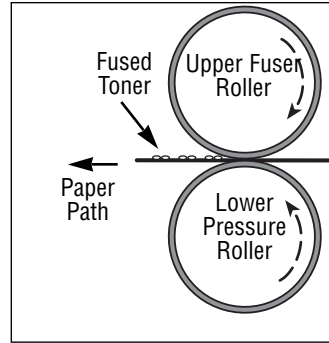
Since both the toner and mag roller are charged negatively the toner is repelled (pushed) toward the positively charged areas of the drum (the latent image). The negatively charged areas of the drum (blank areas) also repel toner, leaving only the image on the drum dusted with toner particles. This occurs in an area of the cartridge called the **development zone** or development station.



### 4 Transferring

The **transfer roller**, which carries a positive charge, is located inside the printer and is not a part of the cartridge. The paper travels on a path between the OPC drum and this roller. The toner-covered image on the surface of the drum is moved down toward the

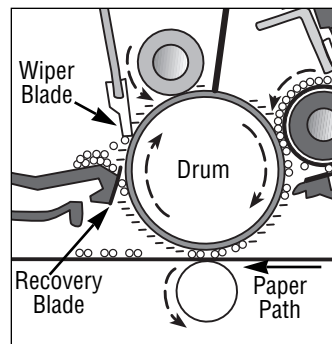
paper by the rotation of the drum. The positive charge of the transfer roller attracts the negatively charged toner, pulling it off the drum and down onto the paper.



### 5 Fusing

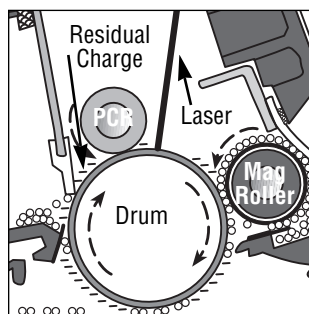
The paper, along with the transferred toner image, then travels beyond the transfer roller, and outside of the cartridge. Here it becomes sandwiched between the fuser assembly, composed of an **upper fuser roller** and a **lower pressure roller**. Heat is

applied by the upper roller, fusing the toner into the paper, while the lower roller applies pressure, imbedding the toner into the paper fibers. The paper cools as it exits the printer with the clean image fixed to the page. If the paper is removed before it has passed between these two rollers, as when a paper jam occurs, the image can be easily wiped or even blown off the paper.



### 6 Cleaning

As the drum continues to rotate it passes under the **wiper blade**, which removes debris (excess toner, paper fibers, etc.) from the drum. The **recovery blade**, located at the base of the waste bin acts as a toner dam, catching the debris as it falls from the drum and wiper blade. Also called a “catcher” or “scavenger blade” the recovery blade prevents excess toner, paper fibers, carrying agents and other foreign materials from falling out of the waste bin onto the paper.



### 7 Erasure

The PCR “erases” any remaining positive charge from the OPC drum by applying a uniform negative surface charge to the drum. This removes the image and cleans, or “blanks” the drum for its next pass under the laser, where it will be written with the next image.

## Terms and Definitions

### **Agitator Bar**

A thin metal bar that rotates inside the toner hopper, moving toner towards the development station.

### **Development Station**

The area of the cartridge where toner is transferred from the toner hopper to the latent image on the OPC drum using the mag roller and doctor blade.

### **Doctor Blade**

Uniformly meters the amount of toner reaching the mag roller. Also called a "metering blade" or "leveling blade", it is made of a precision ground metal base and a flexible blade. The doctor blade is instrumental in helping the toner particles achieve their negative charge build-up.

### **Drum Shutter**

When the cartridge is not installed in the printer the shutter remains closed to protect the OPC drum from possible damage from scratches, exposure to light, etc..

### **Laser**

The concentrated beam of light that "writes" the image to the OPC drum, one line at a time.

### **Lower Pressure Roller**

A printer component. Applies pressure to the paper as it passes through the printer to help fix the toner onto the paper.

### **Magnetic Developer Roller (mag roller)**

A coated aluminum sleeve rotating around a stationary magnet, the mag roller attracts toner, which is held onto the sleeve by the inner magnet. Together the mag roller and doctor blade charge the toner. Also called a "developer roller".

### **OPC Drum**

Delivers the toner to the paper. Carries an opposite charge from that of the mag roller in order to attract the toner from the mag roller.

### **Paper Path**

The direction in which the paper moves through the printer.

### **Primary Charge Roller (PCR)**

Uniformly charges the OPC drum., which "erases" the image and prepares it to be written with the next image. Also called the PCR, charge roller, roller, or the "eraser".

### **Pull Tab (not shown)**

A plastic tab attached to the seal pull strip to enable the end user to remove the seal pull strip, releasing toner into the development station.

### **Recovery Blade**

Acts as a dam at the base of the waste bin, preventing the toner, paper fibers and other materials from falling out of the waste bin onto the paper. Also called a "catcher blade" or "scavenger blade".

### **Seal (not shown)**

A rigid gasket base with a seal attached, which acts as a toner dam to prevent leakage during shipping. The base is attached to the toner hopper sealing surface, and is removed by the user upon installation of the cartridge.

### **Seal Channel**

The area between the mag roller and hopper sections in which a seal is installed. The seal also lies in this channel, and is removed through this opening upon installation of the cartridge in the printer.

### **Toner**

Made up of iron oxide, silicates, coloring and iron oxide (carrying agents), this is the material that makes up the printed image.

### **Toner Hopper**

Area of the cartridge where the unused toner is stored.

### **Toner Low Sensor Bar**

A metal bar which acts as an antenna to detect low toner volume in the hopper. Once a signal from the antenna reaches a specified value, the printer displays a toner low warning for the printer operator.

### **Transfer Roller**

A printer component, pulls the toner down to the paper by way of a magnetic charge opposite to that of the OPC drum.

### **Upper Fuser Roller**

A printer component, applies heat to the paper to fix the toner to the paper.

### **Waste Bin**

Area of the cartridge where the excess toner, paper fibers and other materials are deposited by the recovery blade. Also called a "waste hopper" or "dust bin".

### **Wiper Blade**

Cleans excess materials that were not transferred to the paper from the OPC Drum, depositing them into the waste bin. Also called a "cleaning blade", it is made of a metal base and polyurethane blade.



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