HP® ENTERPRISE M552/M553 SERIES
TONER CARTRIDGE PRINTING THEORY

HP ENTERPRISE M552/553 (508A/X) TONER CARTRIDGE

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By Mike Josiah and the Technical Staff at UniNet

The M552/553 series of multifunction color laser printers are based on a 40-ppm black and color 1200 x 1200 DPI engine, (3600 DPI with RET). The cartridges are an all-in-one type cartridge that consists of the toner supply, drum, and waste chamber.

The basic physical style of this cartridge is similar to others but there are some distinct differences in how the cartridge is built as well as how it works. All will be covered in the instructions.

One major change is in the chip technology. These new cartridges use a technology HP calls CAT which stands for Cartridge Authentication Technology. This feature comes off by default, but if turned on, the user can specify only new genuine HP cartridges can be used. If on, and a remanufactured cartridge with a new aftermarket chip is installed, the printer will not work. It must be turned off. If not, an "Unauthorized Cartridge" message will display.

This system also has an anti-theft feature, which allows the user to lock a set of cartridges to a specific printer. According to HP this helps prevent theft. Once locked if a cartridge is moved to another machine a "Protected cartridge" message will display. This feature is also off by default on new machines.

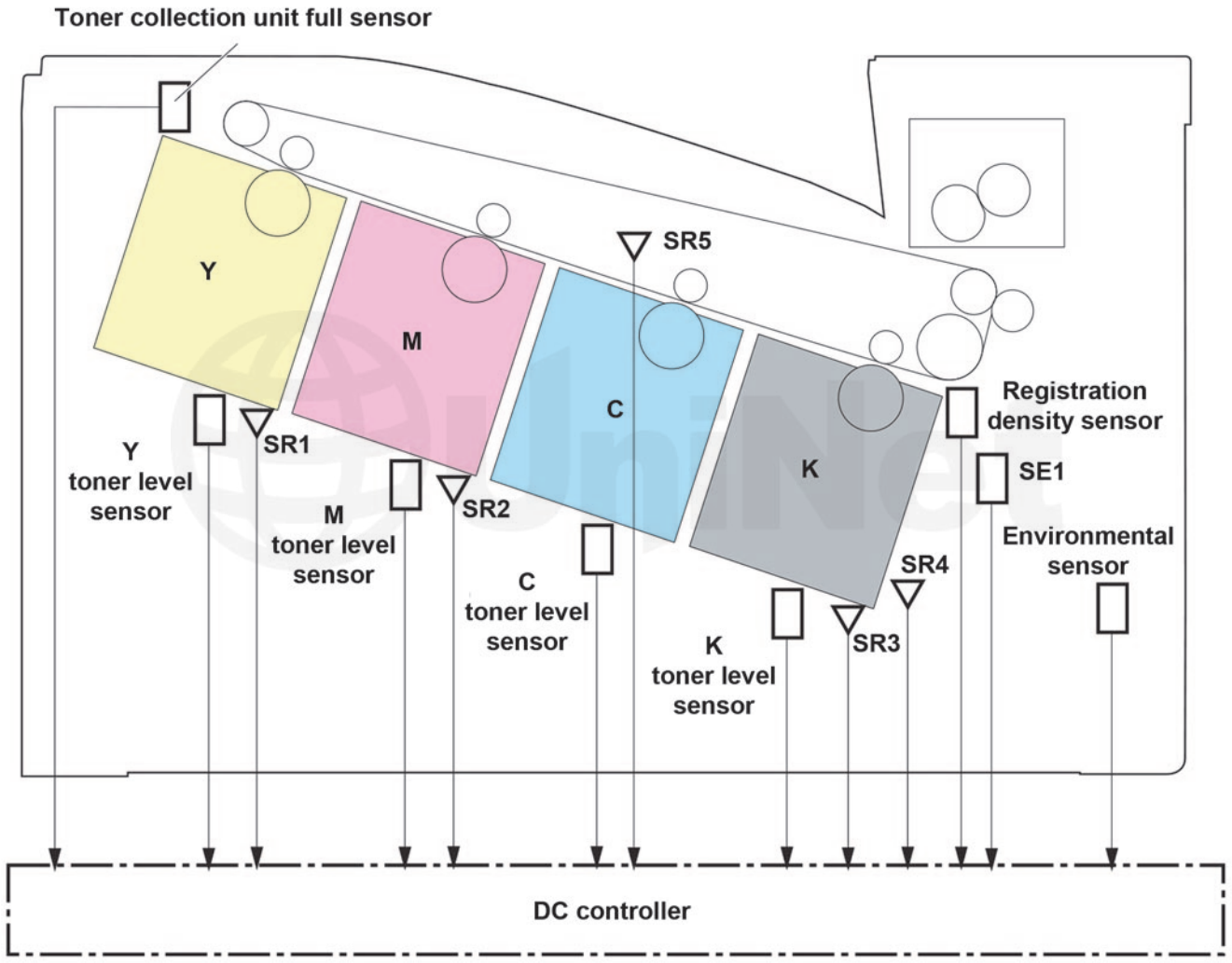
PRINTERS BASED ON THE M553 ENGINE

HP Color LaserJet Enterprise M552n
HP Color LaserJet Enterprise M552dn
HP Color LaserJet Enterprise M552x
HP Color LaserJet Enterprise M553n
HP Color LaserJet Enterprise M553dn
HP Color LaserJet Enterprise M553x

CARTRIDGES USED IN THE M553 ENGINE

CF360A (Black)	**508A**	**6,000 pages**	**USD$150.99 List***
CF360X (Black - High Yield)	**508X**	**12,500 pages**	**USD$291.99 List***
CF361A (Cyan)	**508A**	**5,000 pages**	**USD$188.99 List***
CF361X (Cyan)	**508X**	**9,500 pages**	**USD$291.99 List***
CF362A (Yellow)	**508A**	**5,000 pages**	**USD$188.99 List***
CF362X (Yellow)	**508X**	**9,500 pages**	**USD$291.99 List***
CF363A (Magenta)	**508A**	**5,000 pages**	**USD$188.99 List***
CF363X (Magenta)	**508X**	**9,500 pages**	**USD$291.99 List***
B5S62A (Toner Collection Unit)			**USD$ 17.99 List***

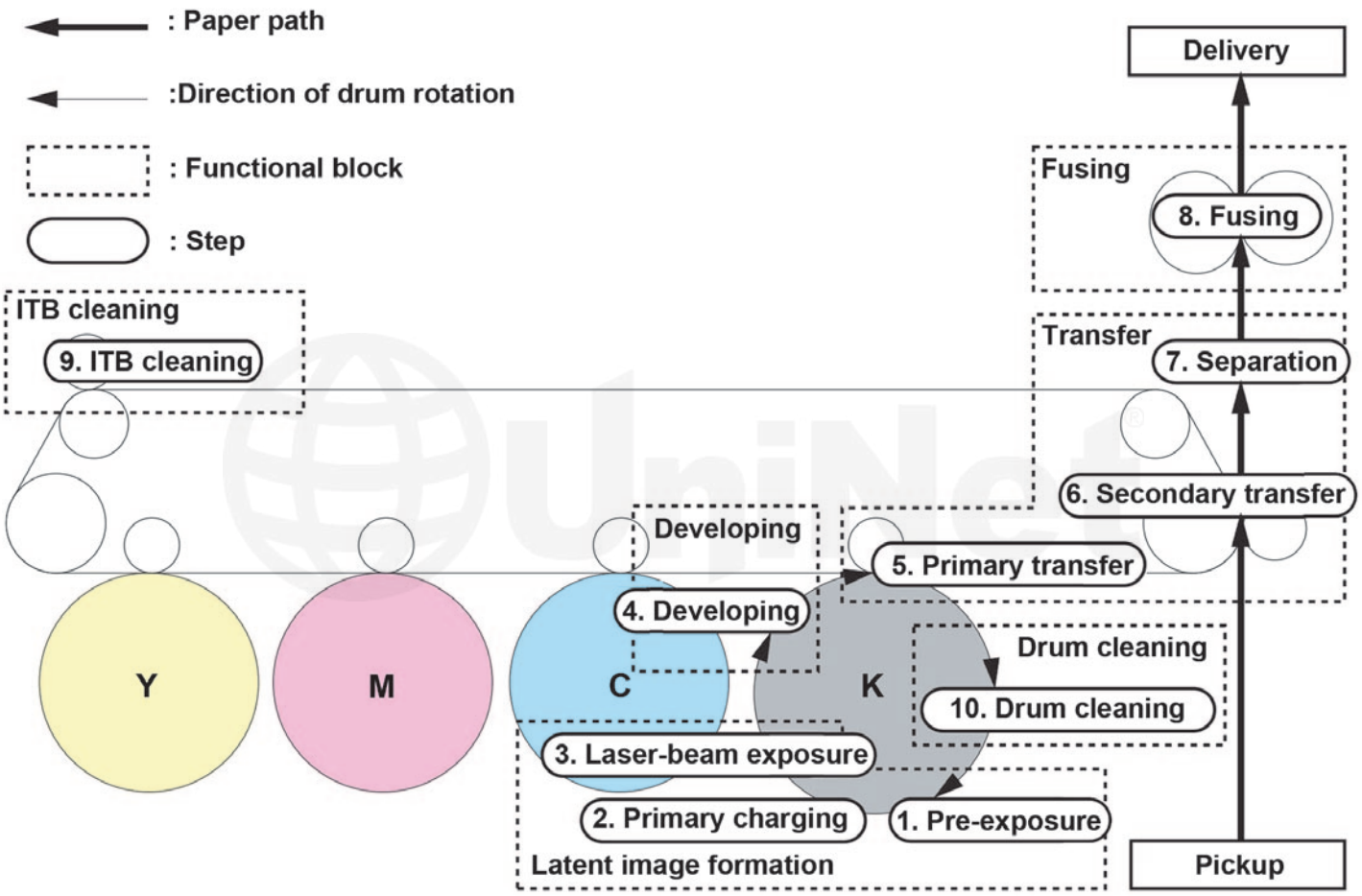
***Pricing (in U.S. American Dollars) current as of October 2015**



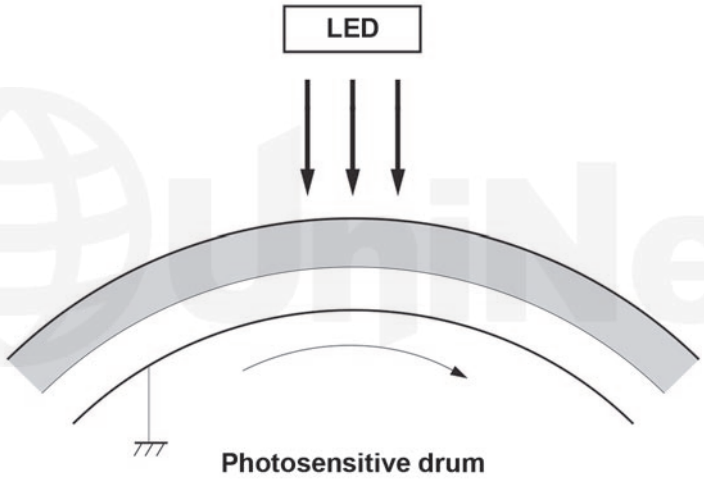
As the **Printing Theory** has changed a bit we are covering it here.

The color toner cartridge printing process happens in a series of stages or steps. For the purpose of this article, we will call them stages.

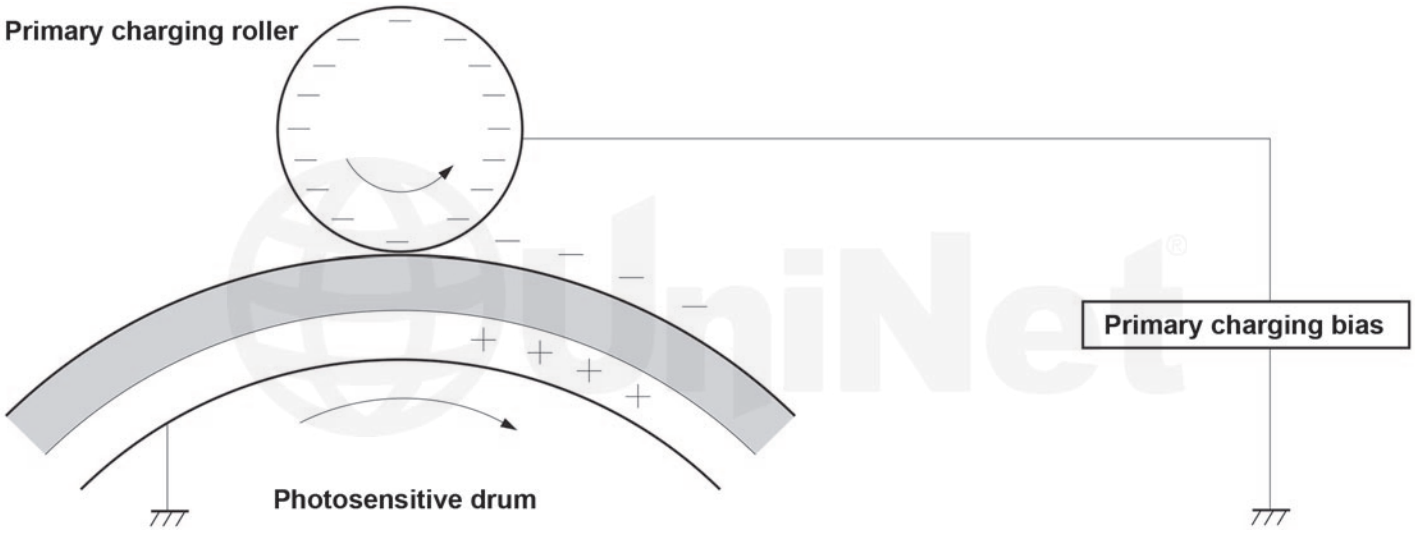
Shown is the basic layout of the cartridges and how they relate to one-another and the printer. Note that the laser units are on the bottom, the cartridges are at an angle, and the ITB is on top.



Shown is the complete image formation process.

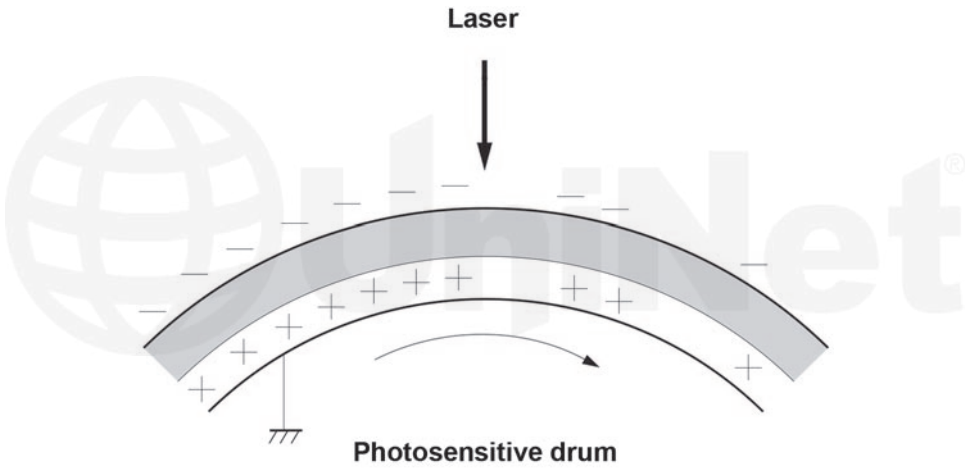


In the **first** stage, light from the pre-exposure LED strikes the drum to remove any residual charges from the drums surface. This LED erases all residual images and charges. In older the machines the PCR ran a DC and an AC voltage. The AC was to help erase any residual voltages. In newer engines the PCR charges the drum only and the LED erases. So if you're getting ghosting and/or backgrounding it's not the PCR but most likely is a dirty LED lamp.

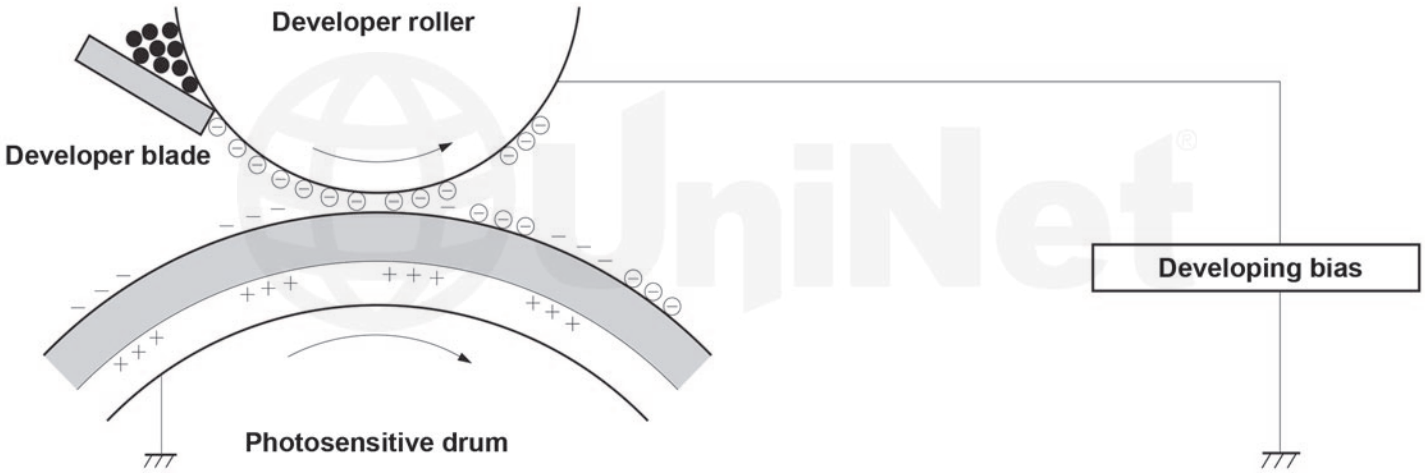


Then the Primary Charge Roller (PCR) places a uniform negative DC voltage on the OPC drum surface.

The amount of the negative DC voltage placed on the drum is controlled by the printer's intensity setting.

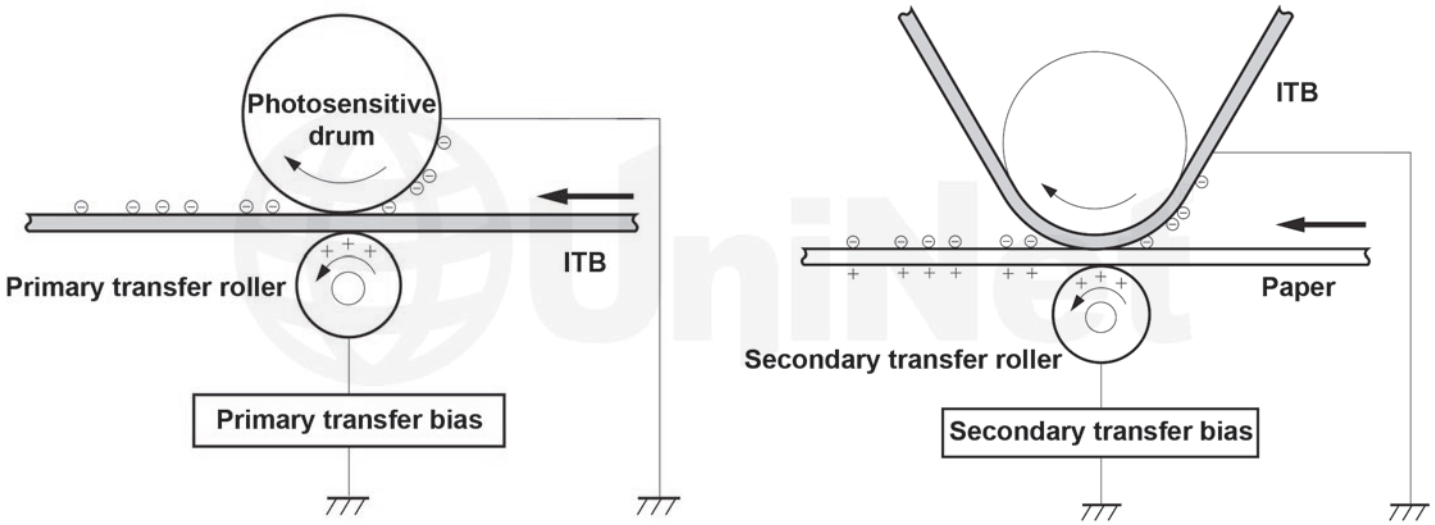


In the **second** stage, a laser beam is fired onto a rotating mirror (called the scanner). As the mirror rotates, the beams are reflected into a set of focusing lenses. The beams then strike the drums surface, reducing the negative charge and leaving a latent electrostatic image on the drum. The areas where the lasers did not strike the drum will retain the higher negative charge.

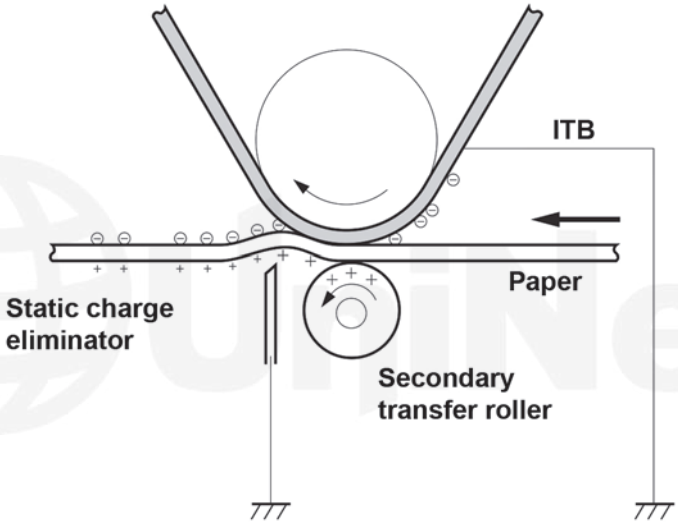


The **third** or **developing** stage is where the toner is developed on the drum by the developing section (or supply chamber), which contains the toner particles. The development stage is actually made up of two steps: toner charging, and the actual development. In the toner charging stage, the toner-stirring blade turns inside the hopper. As it turns, friction causes a negative potential to develop on the toner. In addition, a (foam) feed roller brings the toner to the developer roller and also places a negative charge on the toner. These two charges help ensure a uniform charge on the toner. Once the toner is properly charged, the toner will coat the developer roller. The toner is also held onto and attracted to the developer roller by another negative DC bias voltage. This voltage is controlled by the printer's intensity setting and causes either more or less toner to be attracted by the developer roller. This in turn will either increase or decrease the print density. The amount of toner on the developer roller is controlled by the doctor blade, which uses pressure to keep the amount of toner on the roller constant.

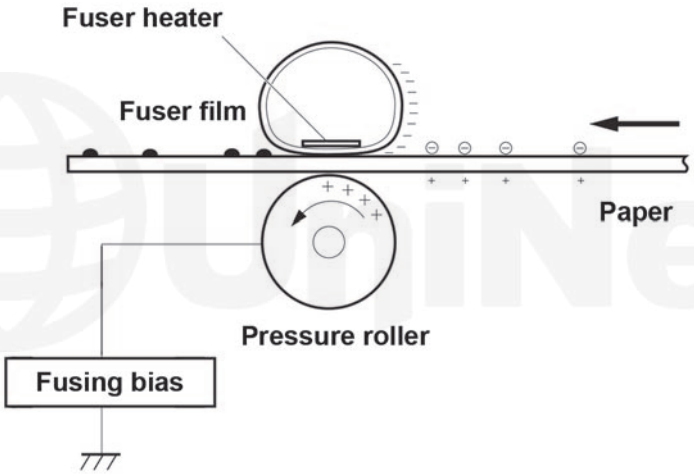
As the laser exposed areas of the OPC drum approach the developer roller, the toner particles are attracted to the drum's surface due to the opposite voltage potentials of the toner, and laser-exposed areas of the OPC drum.



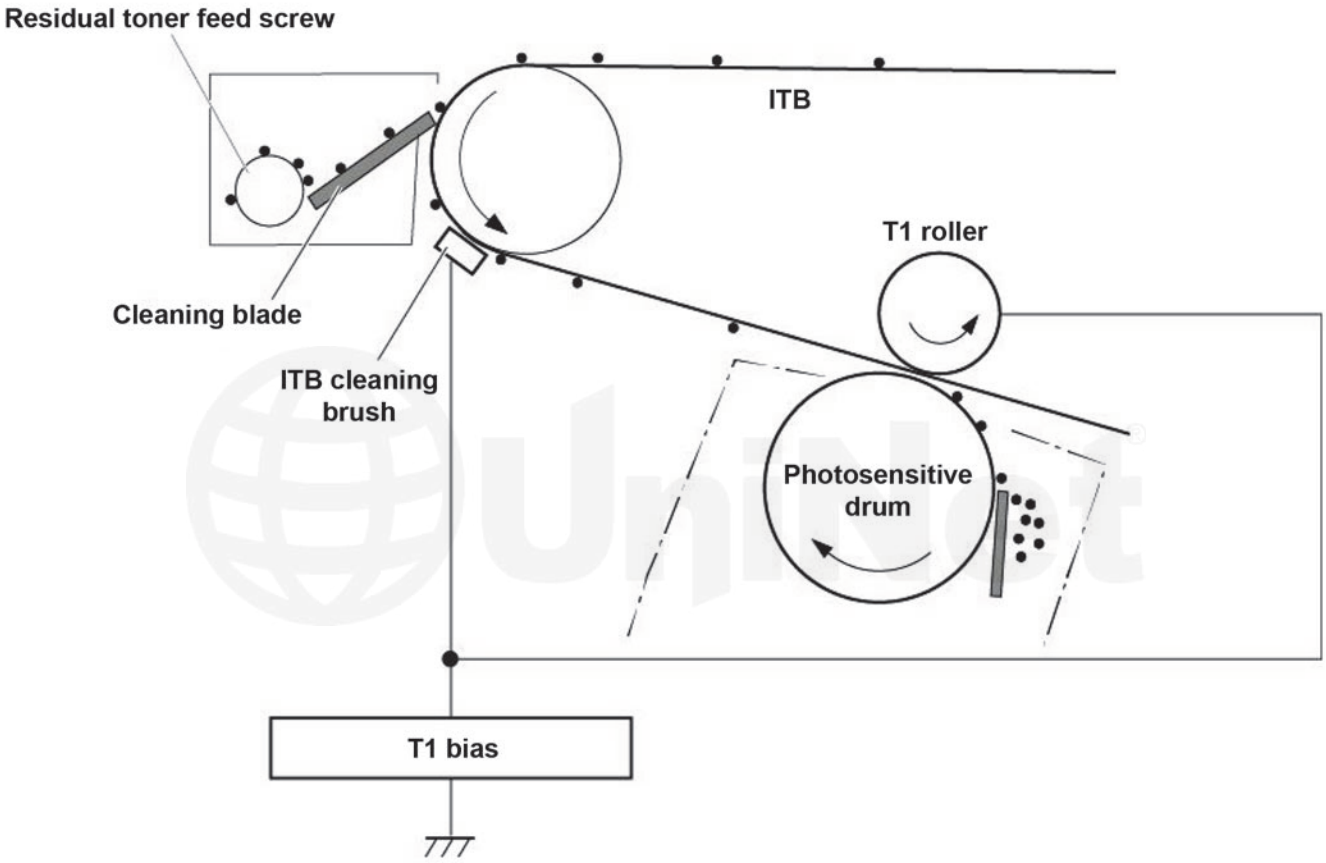
The **fourth** stage is the **transfer** stage. This is where there are some large differences from monochrome printers and also from other color lasers. In the Primary transfer stage the transfer roller, which is located directly opposite each OPC drum, places a positive DC bias charge on the back of the ITB or Image Transfer Belt. Each toner cartridge has a separate transfer charge roller. The image is transferred from the drum directly to the ITB. This process is repeated for each color cartridge in the following order: Yellow, Magenta, Cyan and Black. At the same time, the paper is moving between the Secondary transfer roller and the ITB. As the ITB passes the Secondary transfer roller, the positive charge is picked up, and draws the negatively charged toner off the Belt and onto the paper. Note that this entire process is upside down from most previous HP engines. The ITB and transfer rollers are on top of the OPC drum, not underneath it.



The paper separates from the ITB belt as the belt turns back down to start the process again. The static charge on the back of the paper is decreased with static charge eliminator. This helps stabilize the paper feed, and also prevents toner flares (spots) under low temperature and low humidity conditions.



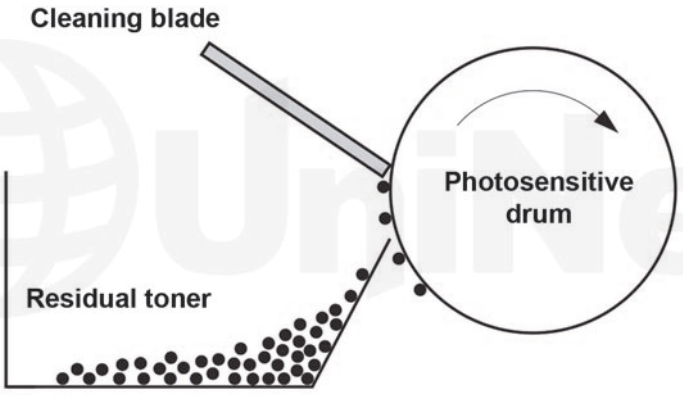
In the **fifth** stage, the image is then fused onto the paper by the fuser assembly. The fuser assembly is comprised of the upper heating assembly and lower pressure roller. The lower pressure roller presses the page up into the upper heating assembly, which then melts the toner into the paper. This heating assembly consists of a flexible sleeve with a ceramic heating coil inside. This type of fuser affords “instant on” fusing with little to no wait time, and low power consumption.



ITB CLEANING

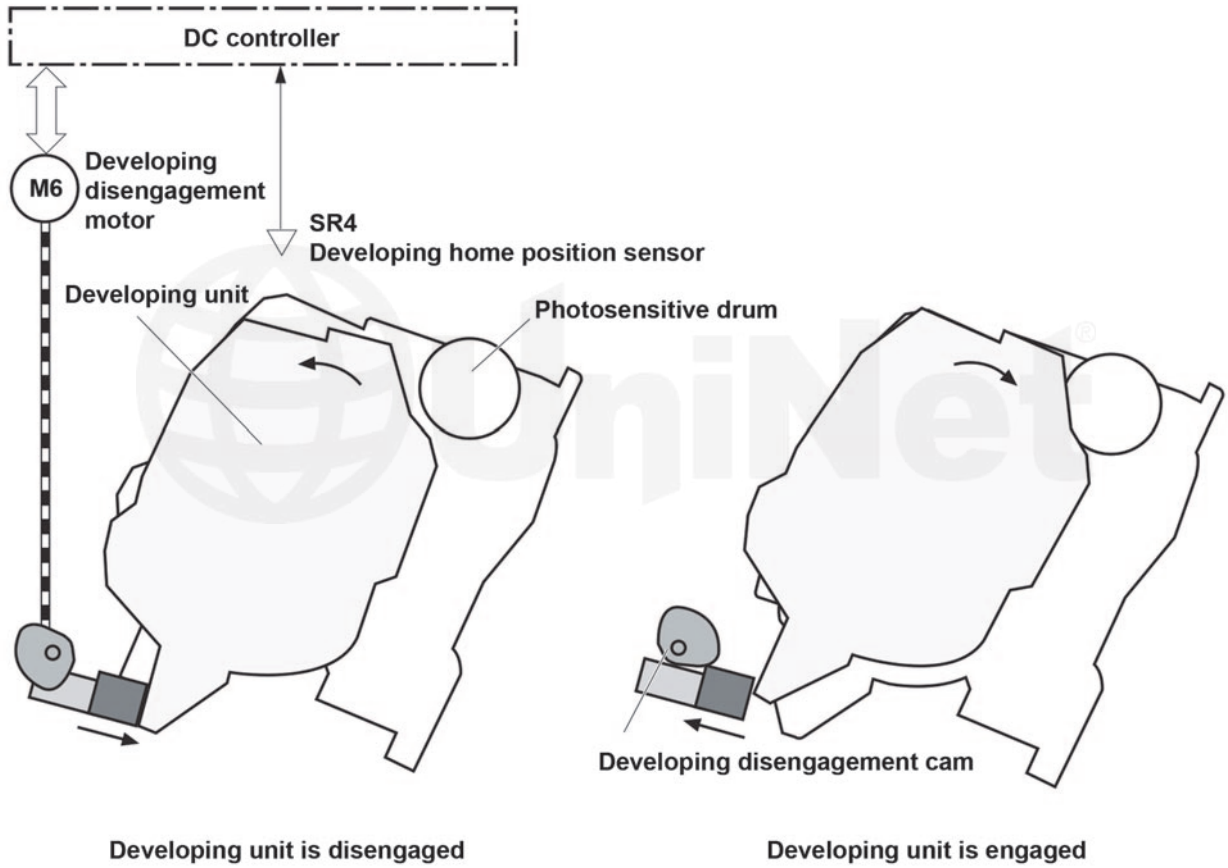
The ITB is cleaned by the ITB cleaning blade.

The ITB wiper blade scrapes off the residual toner and an auger moves the toner to the toner collection box.



OPC DRUM CLEANING

The drum is cleaned after the image is transferred to the paper by the wiper blade. This part is fairly standard; the wiper blade scrapes the toner off the drum, and the recovery blade guides it into the waste chamber.



These printers can print in full color, or in black-only modes.

To print in the black-only mode, the printer disengages the developer rollers in the cyan, magenta, and yellow cartridges

This process also takes place with the Primary transfer rollers and the ITB belt.