Technical brief

Original HP toner cartridge: A look inside[1]

HP LaserJet Pro M102, M104, M203, MFP M130, MFP M132, MFP M227, and HP LaserJet Ultra MFP M230

Up to 70% of the printing technology is in the Original HP toner cartridge system[2]

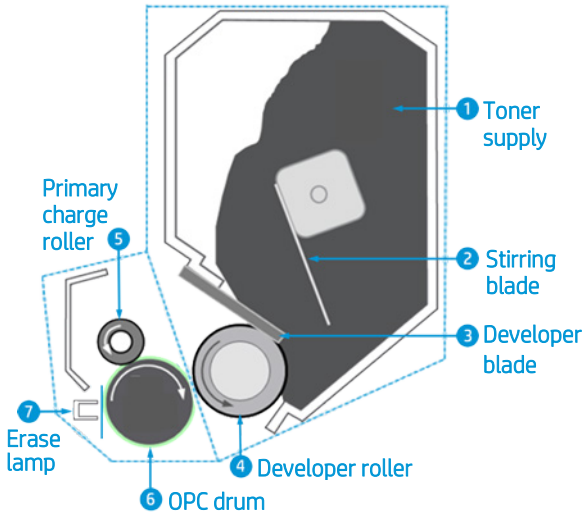
The heart of the print system

There's much more to an Original HP toner cartridge than meets the eye. In fact, the HP toner cartridge is really at the heart of your HP LaserJet printer. It operates at its full potential when all components are working in harmony with each other. Original HP toner cartridge systems are meticulously designed for seamless and optimised performance. In contrast, non-HP (refilled, remanufactured, or new build compatible) cartridges are drilled, taken apart, re-glued, or cloned. When you purchase non-HP cartridges, you run the risk of faulty operation and poor print performance. This is why it's best to stick with HP technology.

Two-part cartridge design

Some HP LaserJet printers use a two-part cartridge while others use a one-part, unified design. This brief looks specifically inside the HP monochrome two-part print cartridge and how it works with your HP LaserJet printer as an integrated system to achieve the highest quality and reliability. Did you know that up to 70% of the printing technology is contained inside the Original HP cartridge system?[1] The HP cartridge system, with its toner supply, is designed to precise specifications for the device speed, size, charging characteristics, fusing properties, environmental conditions, and desired paper types. These specifications help ensure you get the legendary reliability and print quality you expect from HP.

Just as the cartridge system is the heart of the print system, the toner is the heart of the cartridge system. When cartridge components are not working seamlessly together with the toner to achieve optimal charge and performance, reliability and print quality suffer. HP employs leading-edge technology and precision manufacturing processes to create toner cartridges that produce exceptional results. This brief describes the electrophotographic (EP) printing process, the components involved, and likely trouble spots that could cause defects and failures when using a non-HP cartridge.



Two-part cartridge system made of imaging drum cartridge and toner supply cartridge

1. Toner supply

Toner is stored in the toner supply cartridge. For HP LaserJet printers, there is no such thing as a universal toner. No single type of toner will function reliably and consistently in all devices. Toner properties are unique and scientifically blended to be compatible with a given printer's speed, fusing temperatures, and toner charge and magnetism requirements. Original HP toners are proprietary and not available for others to source on the market. Aftermarket competitors would be hard-pressed to precisely duplicate the chemical and physical properties of the HP toner. As a result, the toner in non-HP cartridges can over- or under-charge and transfer differently compared to Original HP toner. The result is that either too much or too little toner is transferred to the paper, and print quality suffers. Fusing properties determine gloss levels and adherence to the media. Non-HP toner may not produce the best images and can cause toner smears on the media.

2. Stirring blade

When the cartridge is at rest between prints, the toner settles. The weight of the toner particles causes them to compress. When printing, it's important to have air circulating, so the toner can move freely. HP cartridges include a set of stirring blades that keep the toner aerated and flowing freely inside cartridges during printing. After you select "print," the initially settled toner is stirred and lifted toward the developer roller while it is aerated and partially charged. Remanufacturers often reuse stirring blades. Over time, they may lose their strength and ability to rotate, leaving unused toner in the hopper.

3. Developer blade (doctor blade)

Toner accumulates on the developer roller and passes under the developer blade (doctor blade), which distributes a layer of toner to a consistent height. A negative charge is generated on the toner through the process of mixing in the hopper and then by friction as it passes under the developer blade (tribocharging). In devices with higher print speeds, it is critical that the toner can be uniformly charged fast enough to keep pace with the print speed.

The toner and its additives also act as a lubricant on the developer blade to prevent streaks, noise, and other defects. Reusing a blade can cause these defects because the blade may be worn and dirty or have debris caught under it. A blade can also become misaligned, causing one side of the page to print darker than the other, or exert incorrect pressure, causing other defects.

[1] Intended for Approved Countries only.
[2] Based on Original HP monochrome two-part cartridges and the electrophotographic process steps required to print a page.

4. Developer roller

This roller has a magnetic core surrounded by a non-magnetic sleeve that attracts toner particles onto its surface and transfers them onto the surface of the organic photoconductor drum (OPC), forming a full image of the printed page. The amount of toner on the roller is controlled by the developer blade, which precisely controls the depth of the toner layer. As the developer roller rotates, the negatively charged toner is attracted to the OPC by the difference in voltage between the roller and the discharged image areas on the drum. The discharged areas are not positively charged; instead, they are less negative than the developer roller, creating an attraction of toner to the discharged areas. The toner is repelled from the areas on the OPC drum that the laser did not strike, because it has a higher negative charge than the developer roller.

Thin seals are used along the roller and around the gears to prevent toner from leaking. The seals are not normally replaced by remanufacturers and can easily be damaged during the remanufacturing process, resulting in toner leaks.

The roller sleeve can also be easily damaged, so if it isn't replaced during the remanufacturing process—or if a roller is misaligned—it can cause banding or repetitive defects on prints.

5. Primary charge roller (PCR)

This multi-layered charge roller applies a uniform, high-voltage negative charge on the OPC drum to level out any remaining charge from the last image and to re-charge the drum to receive a new image. Reused PCRs can be damaged, causing non-uniform charging, or under-charging of the OPC. Similarly, new aftermarket PCRs used in remanufactured or new build compatible cartridges may not be precisely matched to the drum. PCR defects show up on the printed page. The PCR and OPC must be aligned—variation in contact between these two parts could seriously impact print quality.

6. OPC drum

The OPC drum (or imaging drum) is a thin-walled aluminium cylinder, coated with specially pigmented photoconductive substances. The laser is used to discharge a latent image of the printed page onto the charged OPC surface. Development occurs when the negatively charged toner is transferred to the lower charged laser exposed areas.

The toner is transferred from the surface of the OPC to the paper by a biased transfer roller (a printer component). This process applies a positive charge to the non-printed side of the paper, which attracts the negatively charged toner from the OPC onto the paper. The toner image is electrostatically held in place on the surface of the paper and is then passed through the fusing unit within the printer, where toner is permanently fixed to the paper by applying heat and pressure.

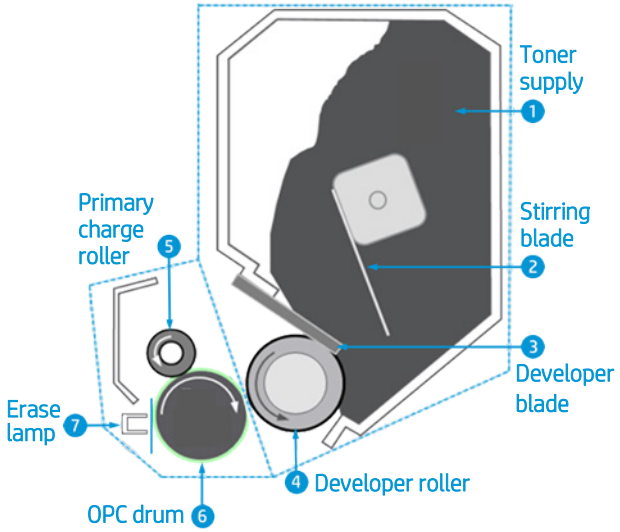
OPCs are designed to work with the printer's laser and other cartridge components (toner, developer roller, PCR). An aftermarket drum may not be matched with the other cartridge system components. A used image drum can also have problems such as scratches or other surface defects; or the drum coating may be significantly worn down in thickness. Image drums experience both mechanical wear and electrical aging, and have a limited life. Worn drums will reduce the quality of the final printed pages.

7. Erase lamp

To help ensure uniform density and consistent images with every print, the cartridge employs another step to discharge the entire OPC surface before the next print cycle. This step prevents the charge pattern from the previous latent image from producing a light repeat (ghost) image on the next sheet of paper. This is accomplished by placing a small light pipe inside the cartridge, which is illuminated by the engine.

Cleanerless process

Unlike some other toner cartridges, there is no cleaning blade or waste hopper in this two-part toner cartridge system. Toner particles left behind and other debris picked up during transfer are moved back into the toner hopper. Because magnetic forces are used to load the toner to the developer sleeve, all non-toner waste settles to the bottom of the system. During the life of a cartridge, the non-toner waste material is kept out of the print process by not being attracted magnetically to the developer sleeve. In a remanufactured cartridge system, any remaining waste material must be thoroughly removed before any fresh toner is introduced to the system. The balance between the total amount of toner and the waste collected is one of the life-limiting parameters for good cartridge performance. Because waste material is mixed with the main toner supply, non-system-optimised toner can deeply degrade performance.



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