

HP® LASERJET PRO 300 • 400

TONER CARTRIDGE REMANUFACTURING INSTRUCTIONS



HP® LASERJET PRO 300/400 TONER CARTRIDGE

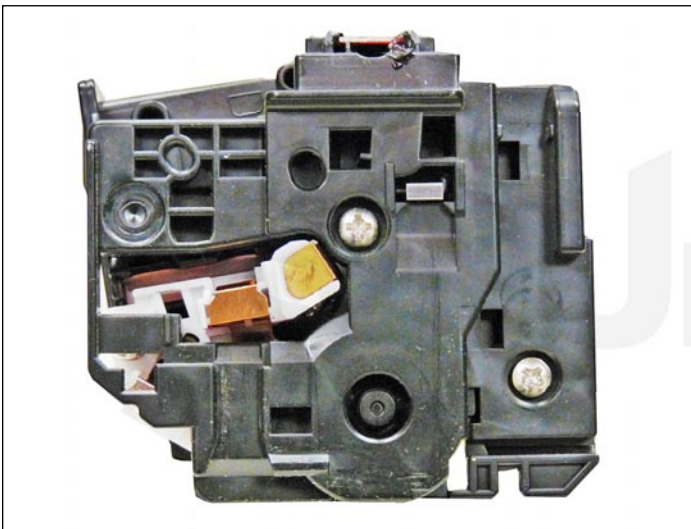
REMANUFACTURING THE HP LASERJET PRO 300/400 BLACK & COLOR TONER CARTRIDGES

By Mike Josiah and the Technical Staff at UniNet

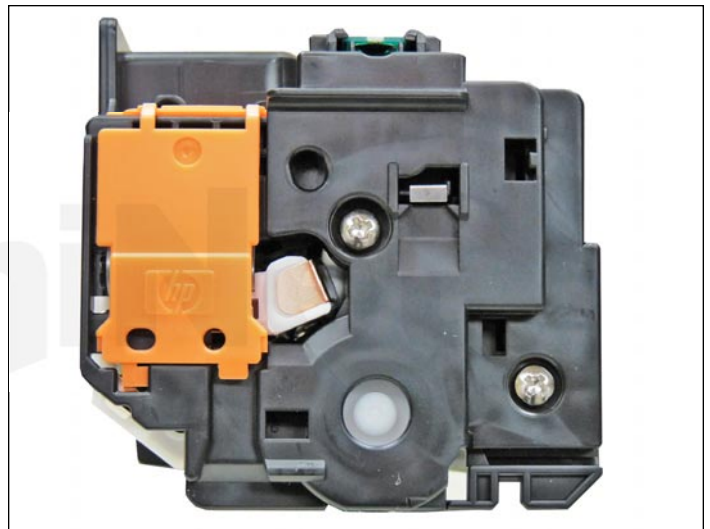
First released in March 2012, the Pro 300 series of color laser printers are based on a ppm (depending on the model) black and color, 600 DPI engine (3600 DPI with Resolution Enhancement Technology, or RET), with a first page out in less than 17 seconds. The Pro 300 cartridges are all-in-one types that consist of the toner supply, drum, and waste chamber. These machines are replacing the CP2025 and CM2320 series. In fact other than a few new features, the machines and cartridges are very similar.



HP Laserjet Pro 300/400 toner cartridge.



HP CP2025 contact end cap.



HP Pro 300 contact end cap.



HP CP2025 gear end cap.



HP Pro 300 gear end cap.

New machines ship with starter cartridges rated for 1,400 pages so users will run out of toner fairly quickly. Note that the CP2025 only came with 1,200-page starter cartridges.

The new features are ePrint, AirPrint and Wireless Direct enabled. You can print wirelessly from pretty much any wireless device including a smart phone!

These cartridges also use new chips that should be replaced each cycle.

PRINTERS BASED ON THE PRO 300 ENGINE

HP LaserJet Pro 300 Color MFP M375nw

HP LaserJet Pro 400 Color MFP M475dw

HP LaserJet Pro 400 Color MFP M475dn

HP LaserJet Pro 400 Color M451dn

HP LaserJet Pro 400 Color M451dw

HP LaserJet Pro 400 Color M451nw

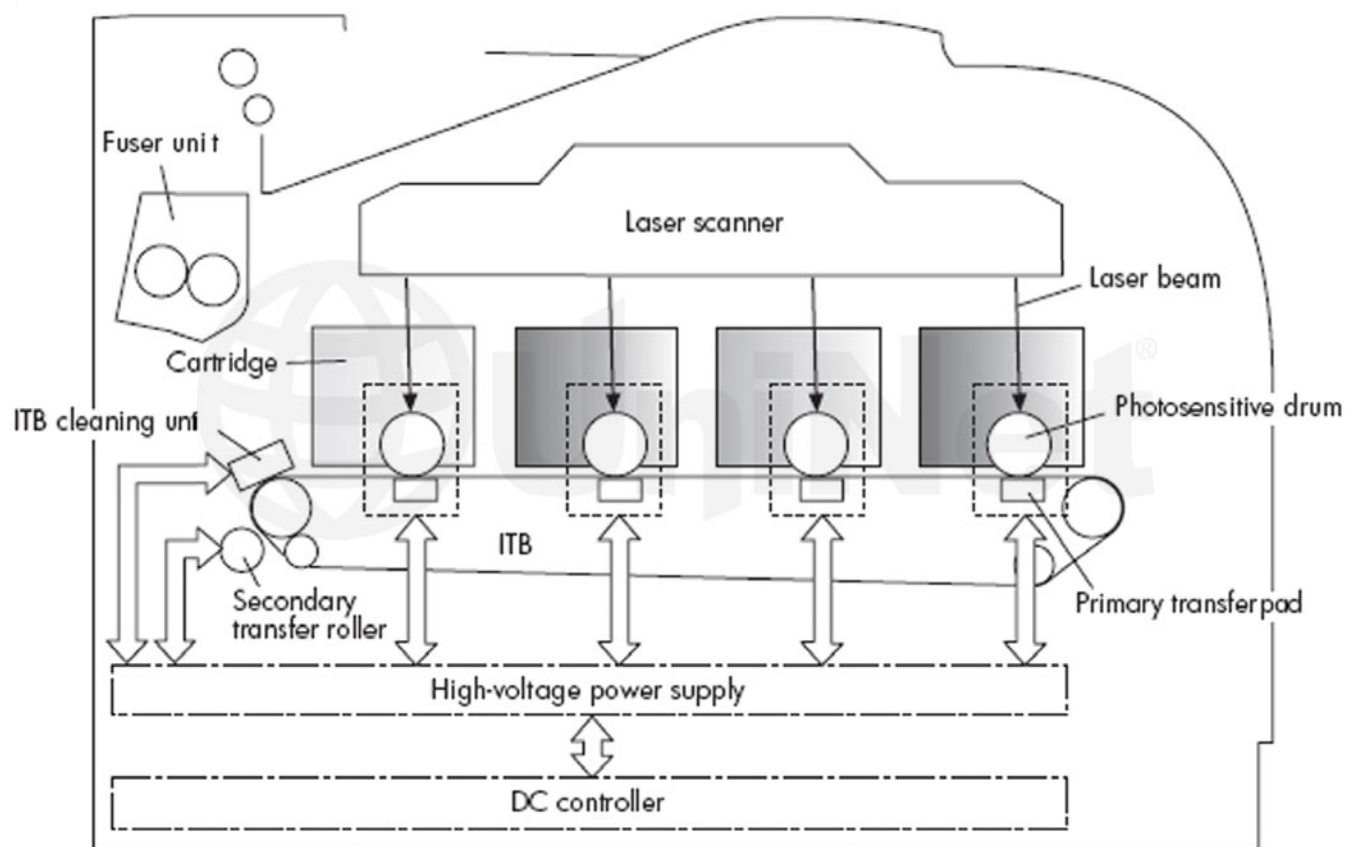
The cartridges used in these machines have two names and part numbers.

The series (305) and the actual part numbers as follows:

Black Low Yield	HP 305A	CE410A2,200 pages	\$83.99* USD
Black High Yield	HP 305X	CE410X4,000 pages	\$103.99* USD
Cyan	HP 305A	CE411A2,600 pages	\$119.99* USD
Magenta	HP 305A	CE412A2,600 pages	\$119.99* USD
Yellow	HP 305A	CE413A2,600 pages	\$119.99* USD

***High Yield black cartridge works in all current models. Pricing, in U.S. American Dollars, current as of April 2012.**

Cartridges are similar but slightly different from the HP Color LaserJet CP2025 CC530-CC533A cartridges. Converting the CP2025 cartridges to the new Pro 300 cartridges will be covered in the instructions. These new cartridges also use chemical toner.

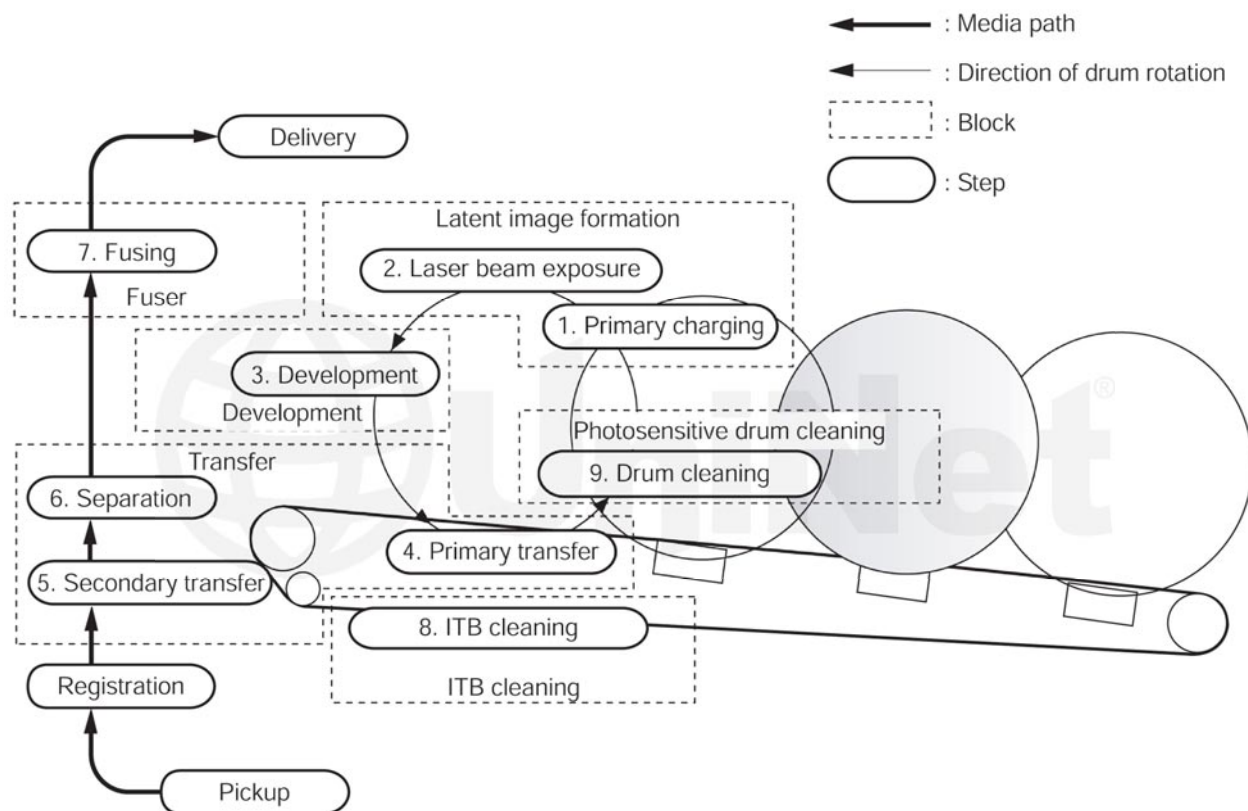


HP PRO 300/400 COLOR PRINTING THEORY

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 above is the basic layout of the cartridges, and how they relate to one-another and the printer.

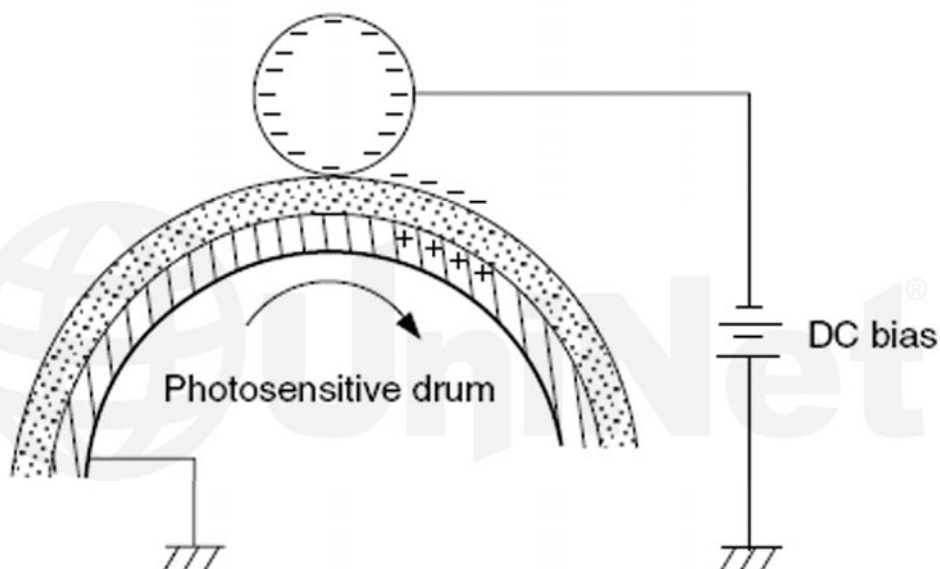
Note that while this is still a single-pass system, the layout is completely different from any previous Canon/HP machines.

Shown above is the complete image formation process.



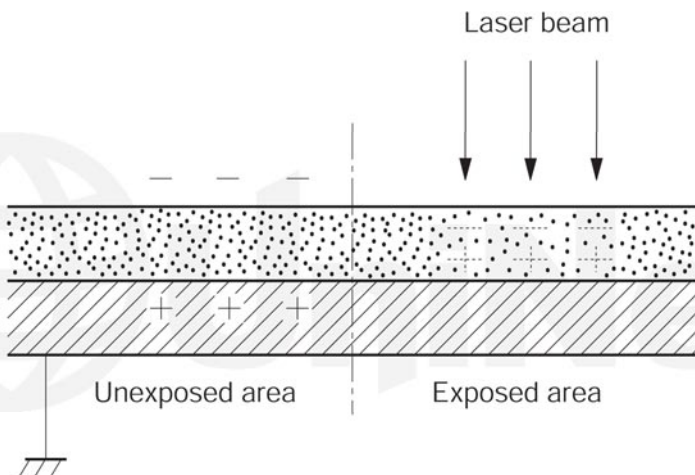
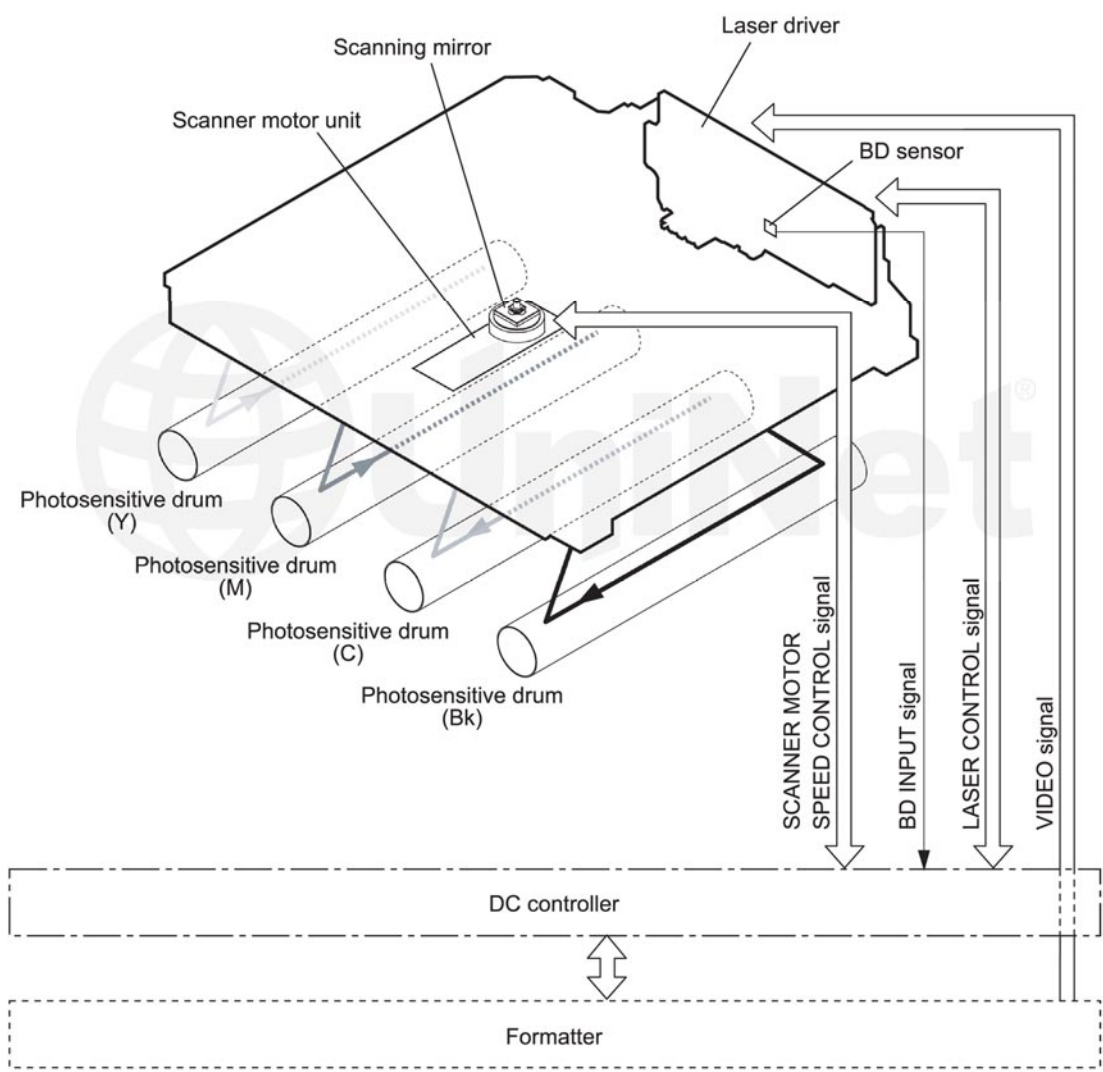
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Shown above is the complete image formation process.

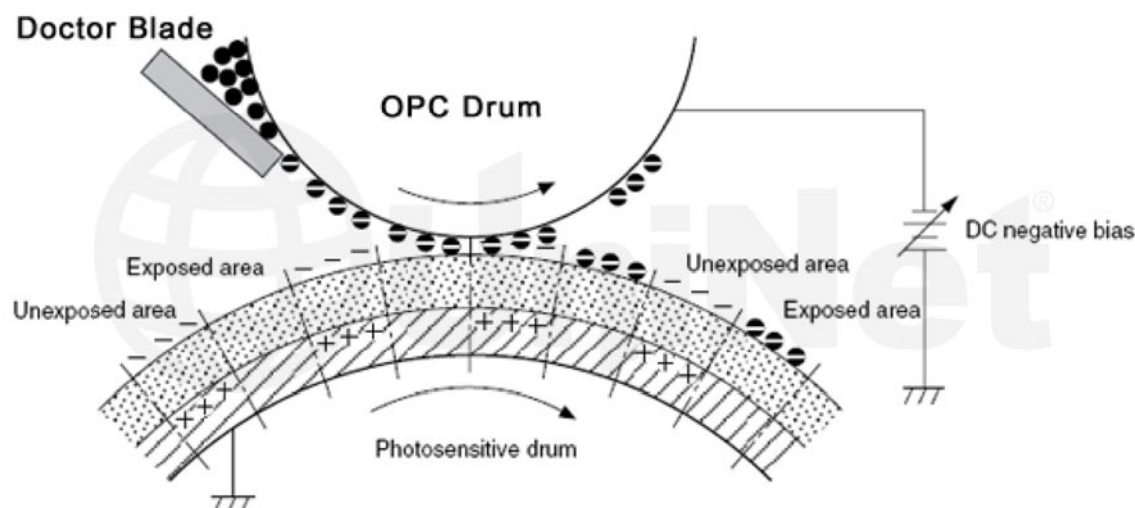


In the **first** stage, the Primary Charge Roller (PCR) places a uniform negative DC voltage on the OPC drum surface.

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

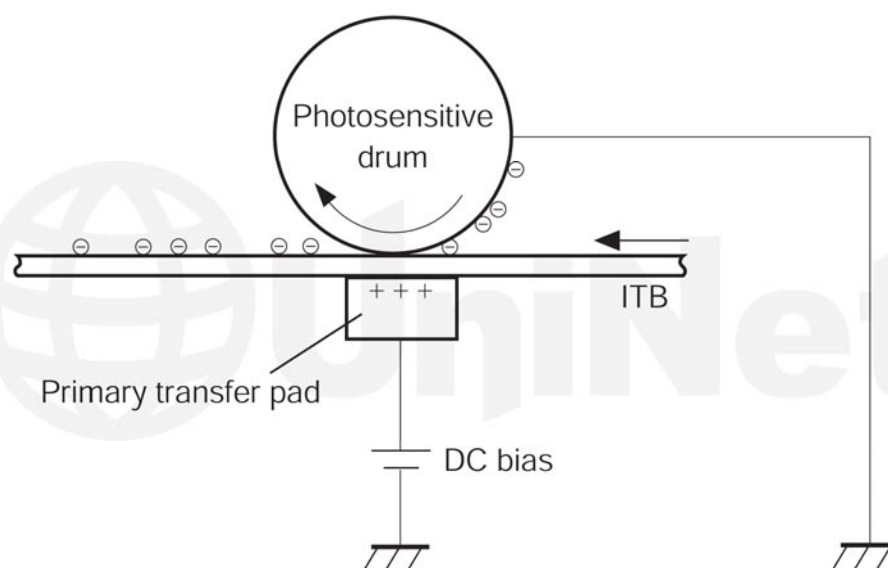


In the **second** stage, the laser beam is fired onto a rotating mirror (called the scanner). As the mirror rotates, the beam is reflected into a set of focusing lenses. The beam then strikes the drums surface, reducing the negative charge and leaving a latent electrostatic image on the drum. The areas where the laser did not strike the drum will retain the higher negative charge. Technology has advanced tremendously in these machines, as there is one laser/scanner unit for all four colors. The laser/scanner unit contains one scanning motor and mirror with four separate lasers.

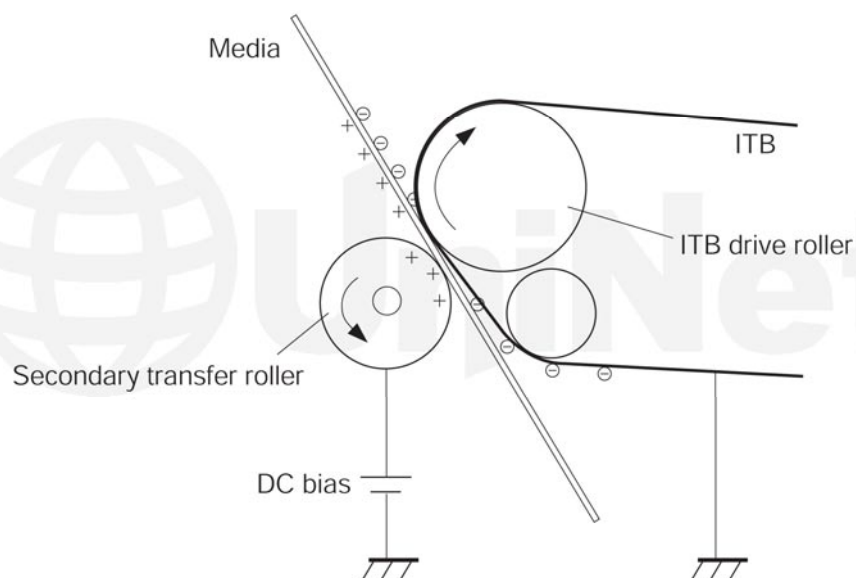


The **third** or developing stage is where the toner is developed on the drum by the developing section (or supply chamber), which contains the toner particles. The development stage is actually made up of two steps: toner charging, and the actual development. In the toner charging stage, the toner-stirring 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.

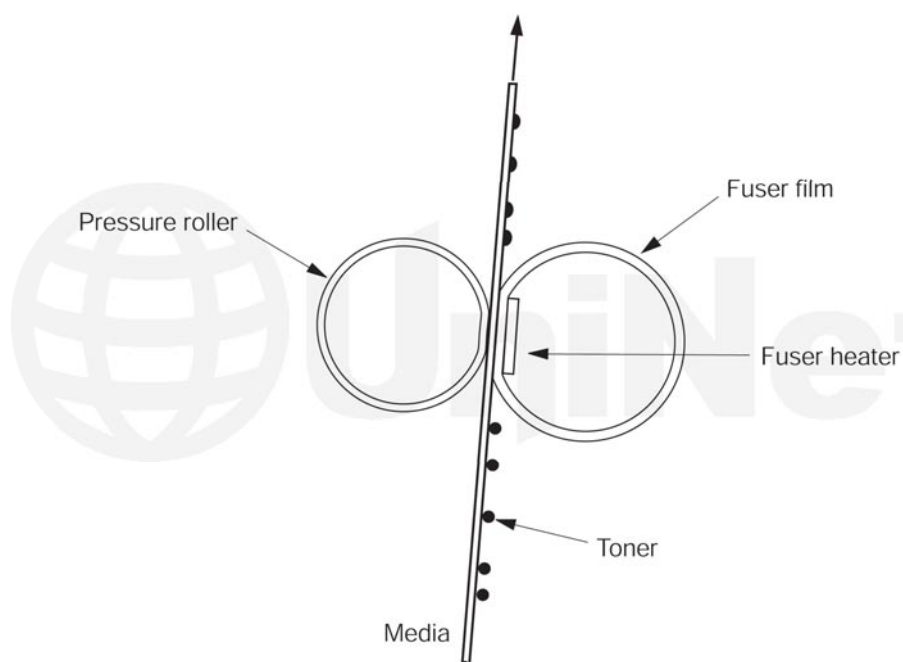
As the laser exposed areas of the OPC drum approach the developer roller, the toner particles are attracted to the drum's surface due to the opposite voltage potentials of the toner, and laser-exposed areas of the OPC drum.



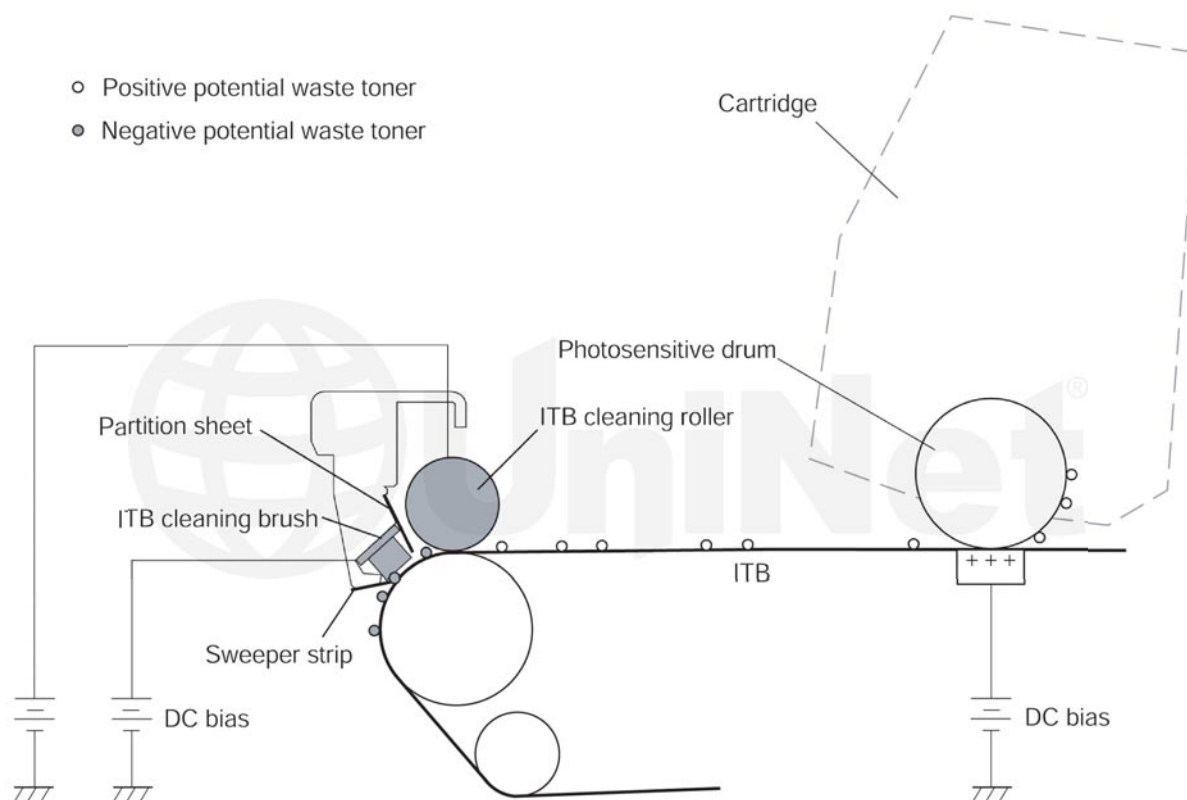
The **fourth** stage is the transfer stage. This is where there are some large differences from monochrome printers and also from other color lasers. In the Primary transfer stage, the transfer pad (not a roller in this case) which is located directly opposite each OPC drum, places a positive DC bias charge on the back of the ITB or Image Transfer Belt. Each toner cartridge has a separate transfer charge pad. 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.



The paper separates from the ITB belt as the belt reaches the top of its path and 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.

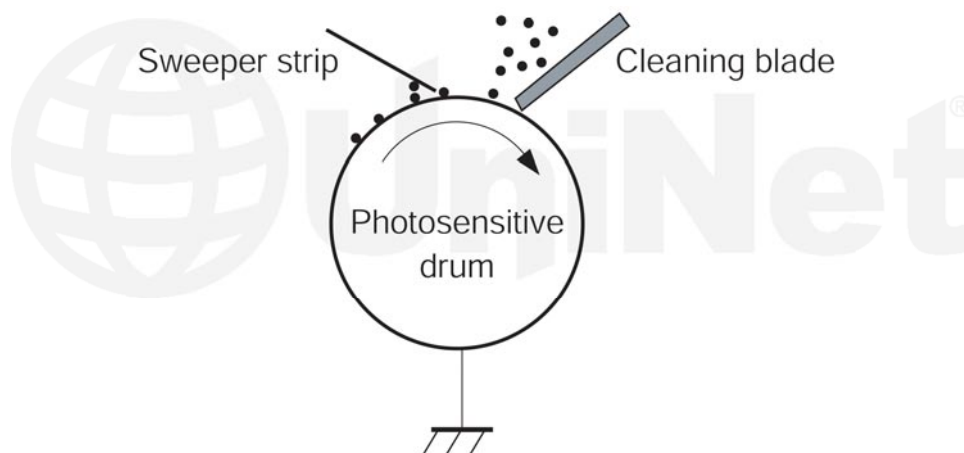


In the **fifth** stage, the image is then fused onto the paper by the fuser assembly. The fuser assembly is comprised of the upper heating assembly and lower pressure roller. The lower pressure roller presses the page up into the upper heating assembly, which then melts the toner into the paper. This 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 both the ITB cleaning roller, and the ITB cleaning brush. Both the roller and brush have a DC positive bias placed on them, which in turn places a positive DC bias on the residual toner. The residual toner is then picked up by the OPC drum (because of the positive bias) and then cleaned off the drum by the wiper blade.



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.

PRINTER CALIBRATION

At the start of all this is the cartridge detection process, toner level detection, and then the calibration cycle. The printer will calibrate itself whenever the printer is turned on (within 15 minutes), when a new toner cartridge is installed, and after 48 hours of run time. Calibration consists of a solid block and halftone of each color being printed to the ITB. As the printed areas get to the top of the belt, a sensor will detect them, measure the density, and adjust the printer accordingly. All of the calibration time settings are user controllable.

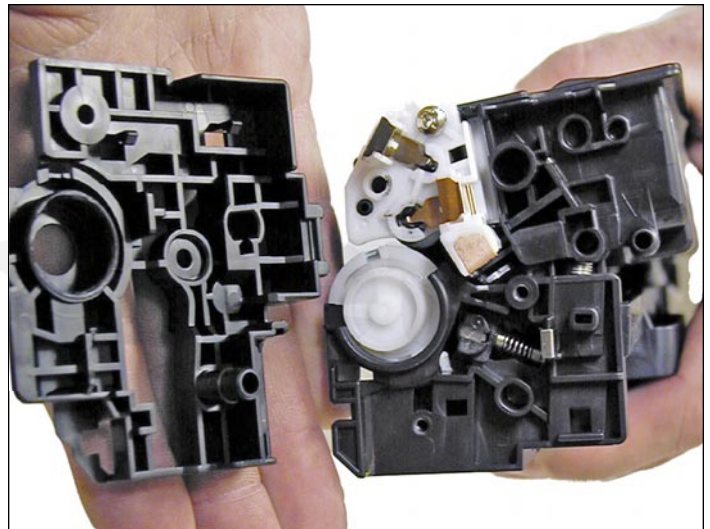
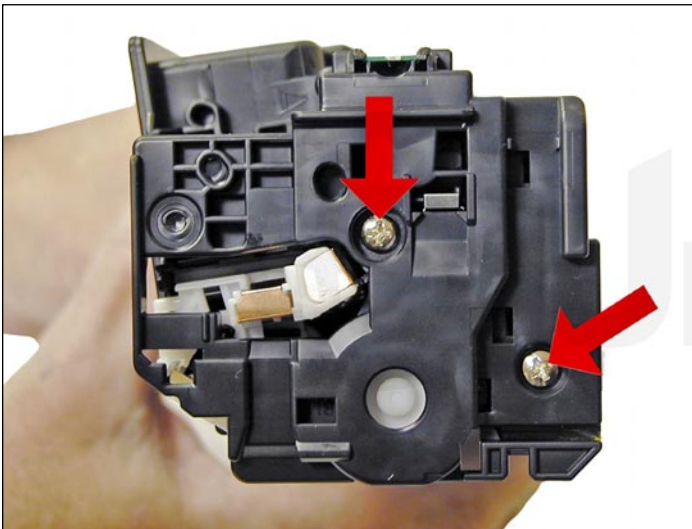
Taking test prints, cartridge troubleshooting as well as minor printer troubleshooting will be covered at the end of this article.

REQUIRED TOOLS

1. Toner approved vacuum
2. A small screwdriver (common style)
3. A Phillips head screwdriver
4. Needle nose pliers

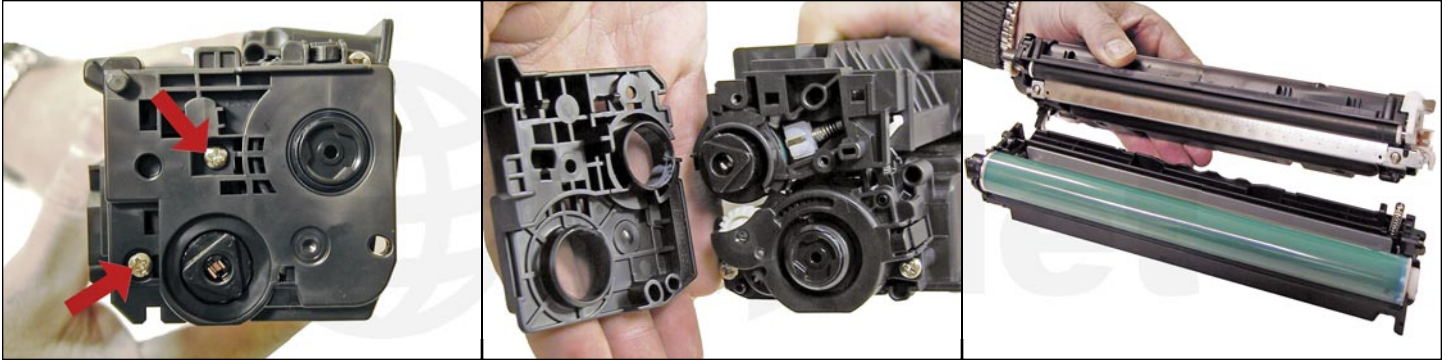
REQUIRED SUPPLIES

1. Replacement color toner for use in the HP Pro 300/400 cartridges
2. New replacement chip
3. New Long Life Drum
4. New Wiper Blade
5. New toner feed roller (optional)
6. New PCR (optional)
7. New doctor blade (optional)
8. Drum cover
9. Lint free cloths
10. Conductive grease



1. With the label on top and facing you, remove the two screws from the left side end cap.

Remove the end cap.



2. On the right side, remove the two screws and end cap.

Be-careful! The two halves will start to separate, and the drum will come loose!



3. Flip the waste chamber upside down, and remove the drum.

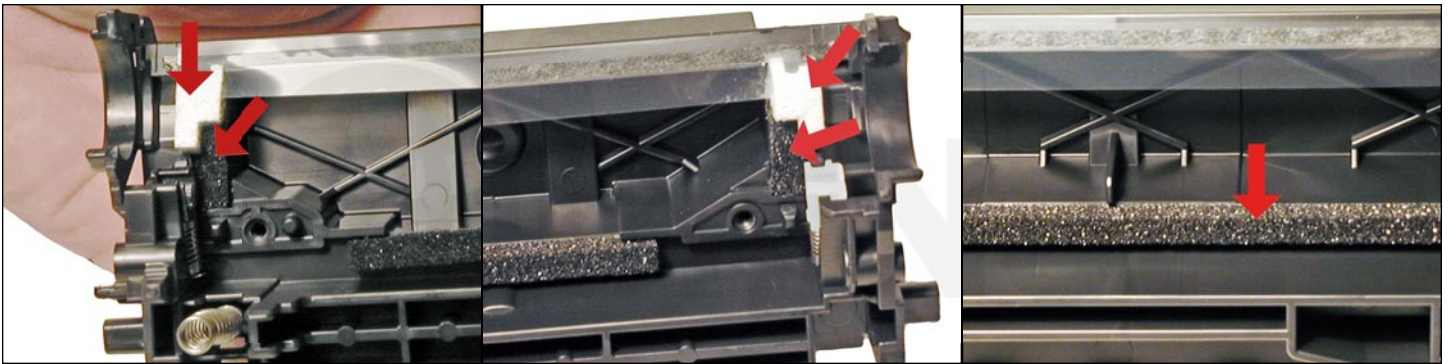


4. Remove the PCR.

Clean with your preferred PCR cleaner, and place aside.

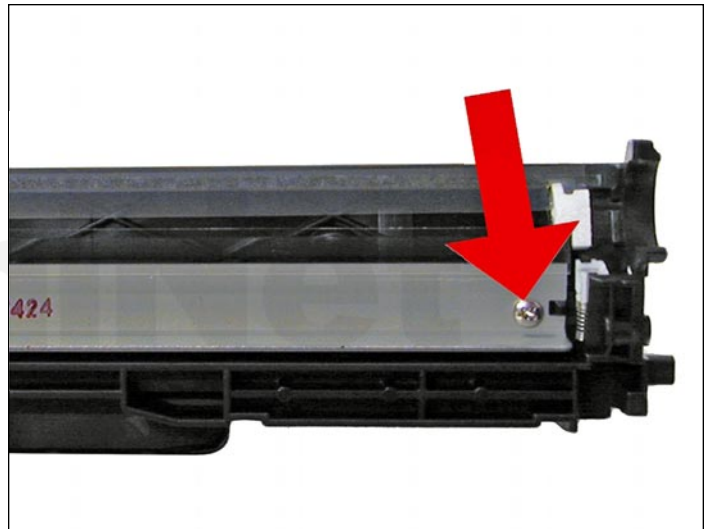
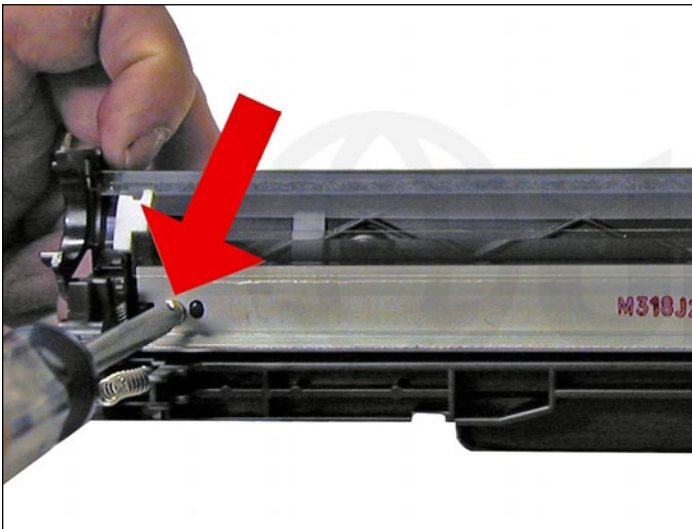


5. Remove the two screws and wiper blade.



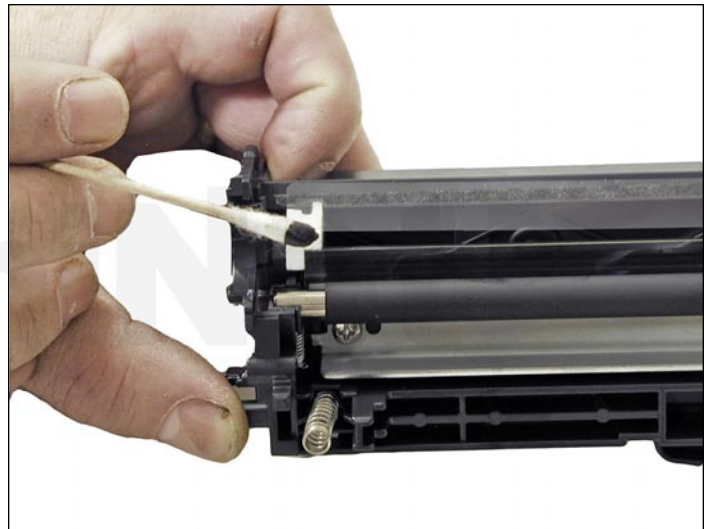
6. Clean out all the waste toner from the chamber.

Make sure all the wiper blade seals are clean.



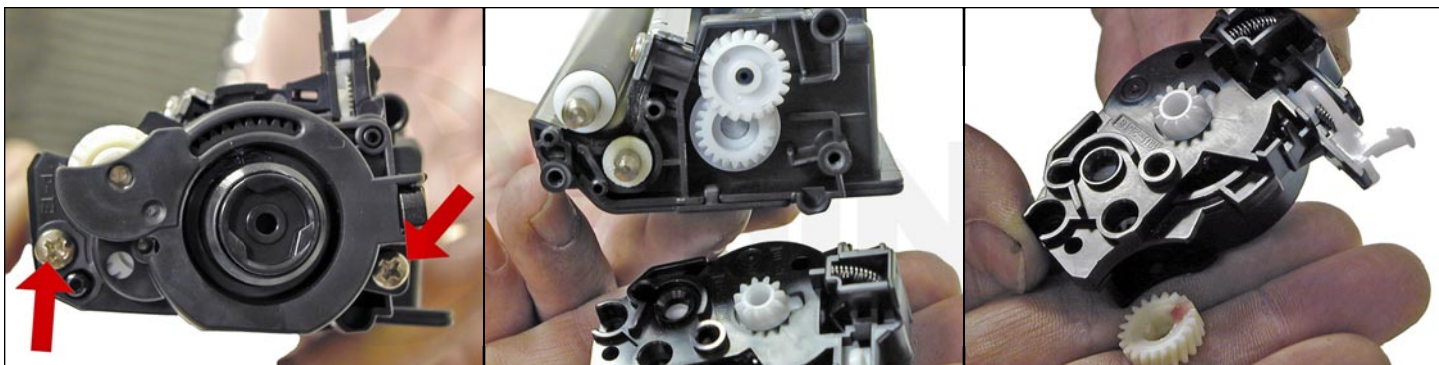
7. Coat the new wiper blade with your preferred lubricant and install.

Install the two screws.

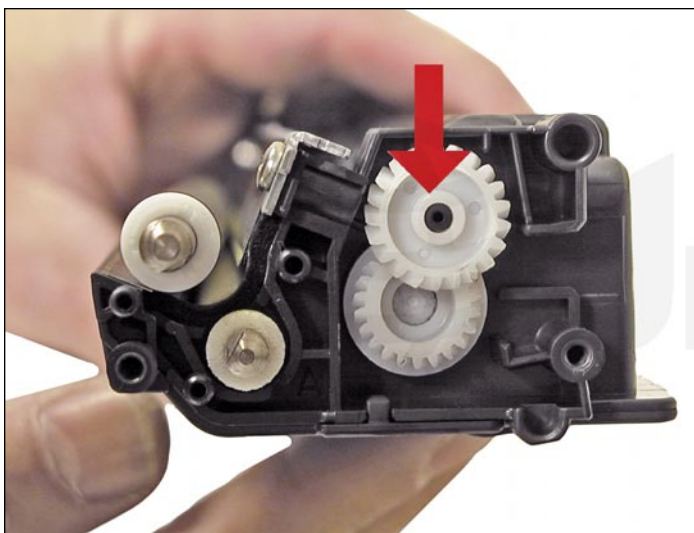


8. Install the cleaned PCR.

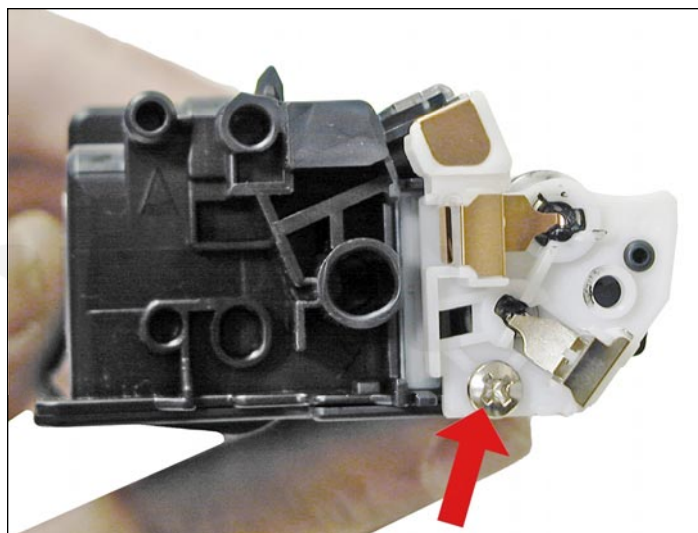
Make sure to place a small amount of conductive grease on the black PCR holder.



9. On the supply chamber, remove the two screws from the gear side end cap. Lift up on the tab as shown and carefully work the end cap off the hopper. The end cap contains a set of gears, and the drive gear for the developer roller will come loose. Be careful not to lose the gear! Also on this end cap is a spring loaded arm assembly. This arm we believe locks the cartridge in place once the tray is inserted and the cover closed.



10. Remove the idle gear as shown. Leave the other gear in place as it will not come off, and is very difficult to match back up with the toner auger shaft inside the hopper.

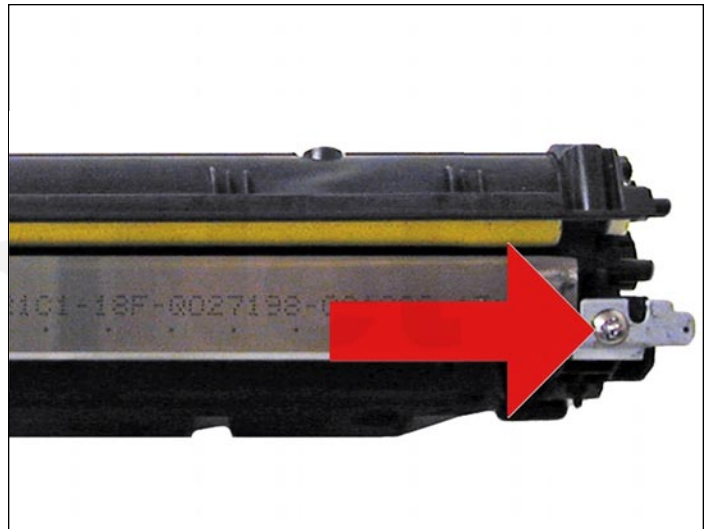
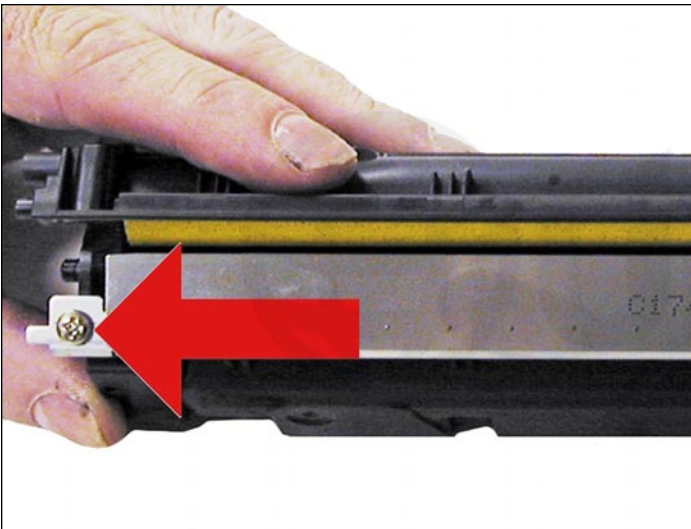


11. Remove the screw on the contact side end cap.

Remove the end cap.



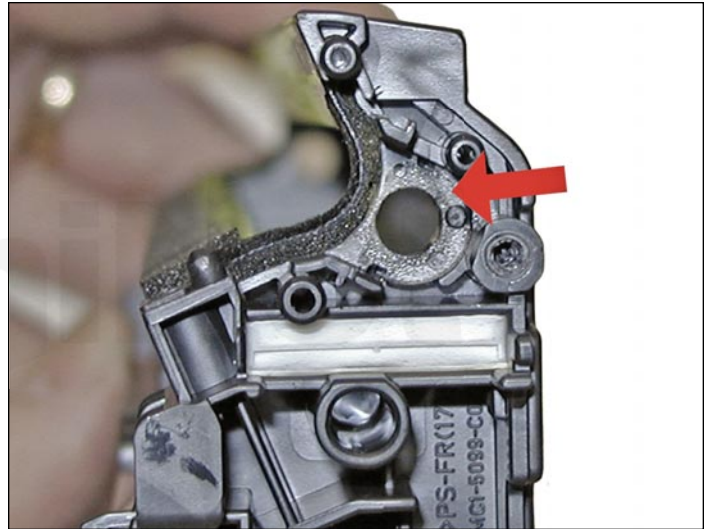
12. Slide the developer roller over, and remove.



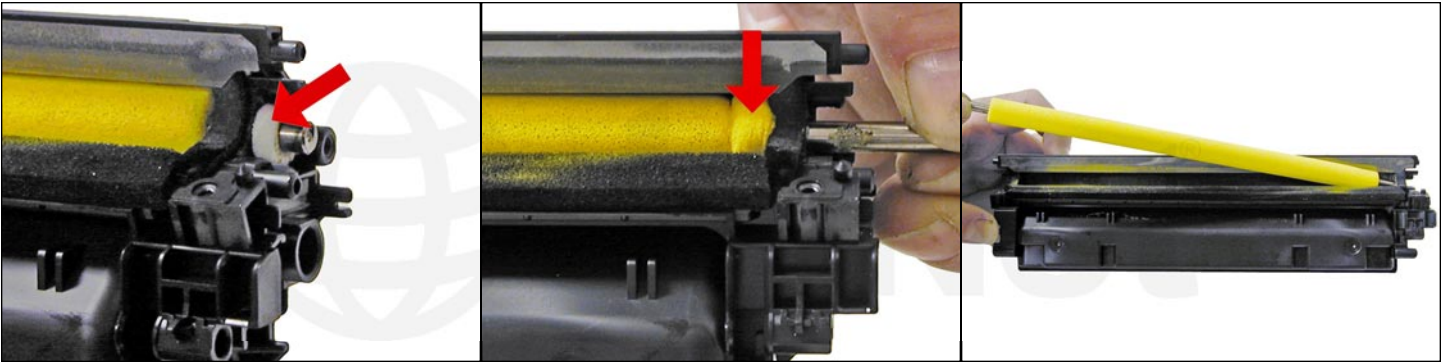
13. Remove the two screws and doctor blade.



14. At this point, while tight, you can clean and fill the hopper with appropriate color toner.



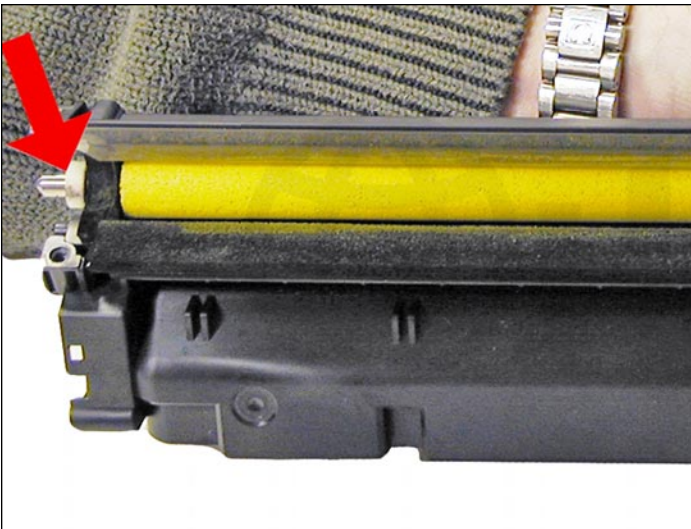
NOTE: HP/Canon created a bit of a block for us here. The clear bushing, located on the right side of the hopper is glued in.



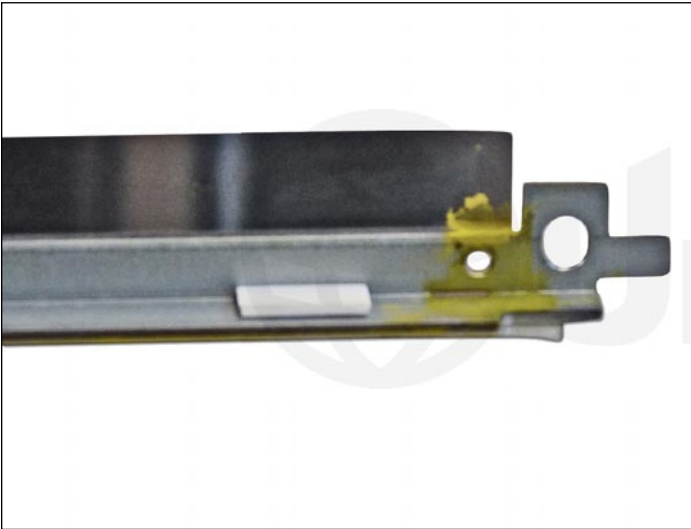
The opposite side bushing is integral to the hopper. If you wish to install a seal, change the feed roller, or just have better access to the hopper, the feed roller must be pulled over to one side, compressing the foam. First remove the two white felt seals. This has no affect on the printing at all.



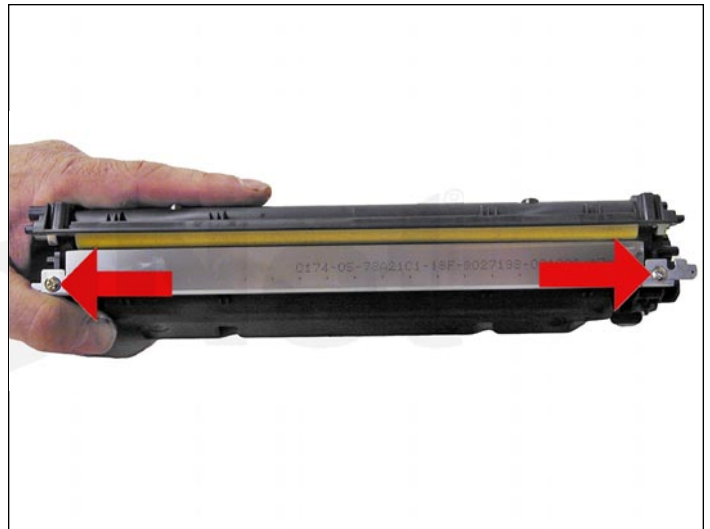
15. If you have not already done so, fill the hopper with the appropriate color toner and install the feed roller.



16. Install the two white felt seals on the feed roller shaft.

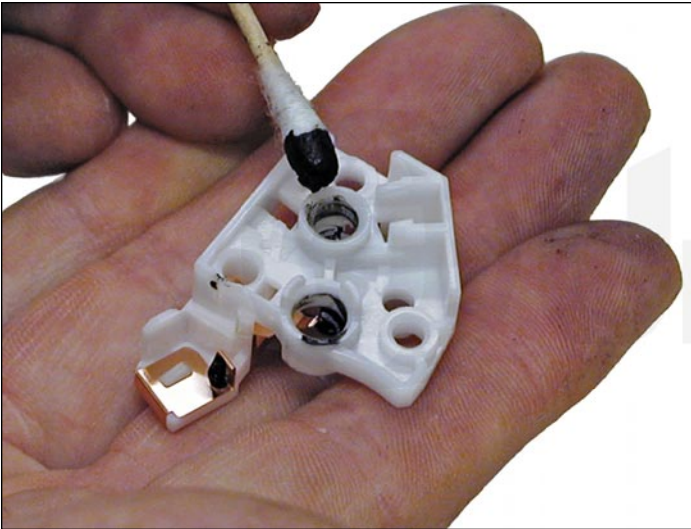


In order for the cartridge to print correctly, the doctor blade must be gapped. The easiest way is to install dedicated shims on the back edge of the doctor blade. Not on the top or screw side, but on the small back edge. The shims control the distance from the doctor blade, not the height.

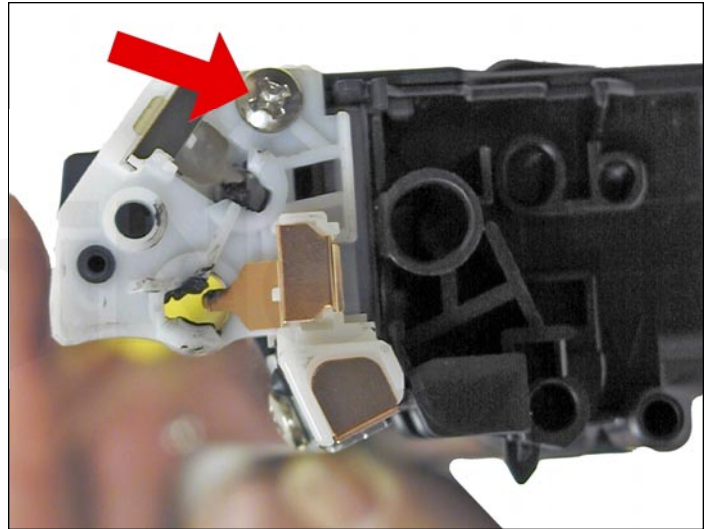


17. Clean the doctor blade foam seal.

Install the doctor blade and two screws.



18. Clean the contact on the contact end cap with a cotton swab and alcohol. Replace the conductive grease with fresh grease. Remember, more is NOT better with this grease.



19. Replace the contact end cap and screw.



20. Install the developer roller.



21. Replace the idle gear as shown.



22. Install the gear end cap and screws.

Turn the developer roller so it mates properly with the drive gear.

Make sure the spring arm works!



NOTE: If you are replacing the drum, the gears will need to be changed over from the OEM to the new.

Step 1: With a Jewelers screwdriver, pry off the metal crimped ends on both sides of the gears.



Step 2: Place the drum in a metal vice (or use vice grips) approximately 2" back from the gear, and slowly tighten the vice. The gear should pop out easily. This is the best method you can use on the OPC drums, which have a weighted slug in the center, or when the drum has closed end hubs as this one does.

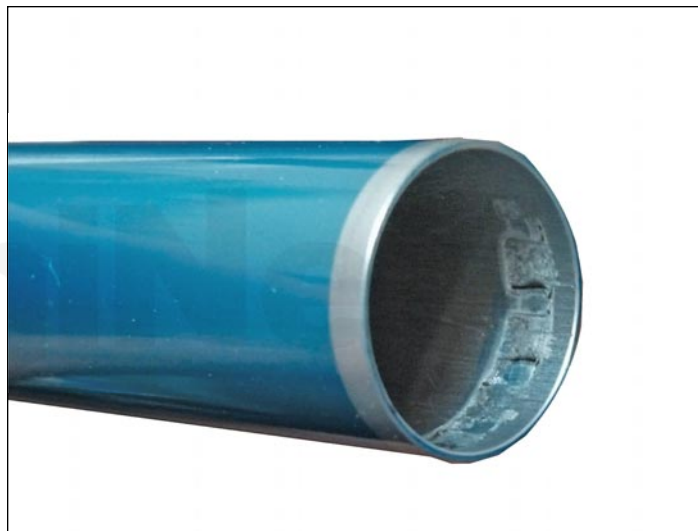


Step 3: Remove any old adhesive from the gears, and straighten out any damage done to the contact gears' metal contacts. Removing the adhesive can be done with a small sharp common screwdriver. The glue comes off easily.



Step 4: Install the gears on the new drum as follows.

A. Inspect the metal contacts on the contact gear. Make sure that the contacts will make proper contact with the inside of the OPC drum.



B: Locate the side of the drum on which you are going to place the contact gear.

C: Lightly sand the INSIDE of the OPC where the metal parts of the contact gear will meet. This will insure a good electrical contact.



D: "Dry fit" the contact gear in the OPC drum and check for a good contact with an Ohm meter. The reading should be a direct short, or no more than 1 or 2 Ohms.

NOTE: When checking the contact, place one lead on the drum axle contact and the other on the edge of the drum. This way, you will not have to pierce the coating that is on the OPC surface. Radio Shack (or similar electronics stores) carries cheap Ohm meters for less than \$10.00 USD, and the sales people will normally be glad to show you how to use it.



E: Place a few (3-4) small drops of super glue strategically around the inside edge of the OPC drum. Make sure you leave a blank area for the metal contacts!



F: Insert the contact gear.



G: Check for continuity again with the Ohm meter.

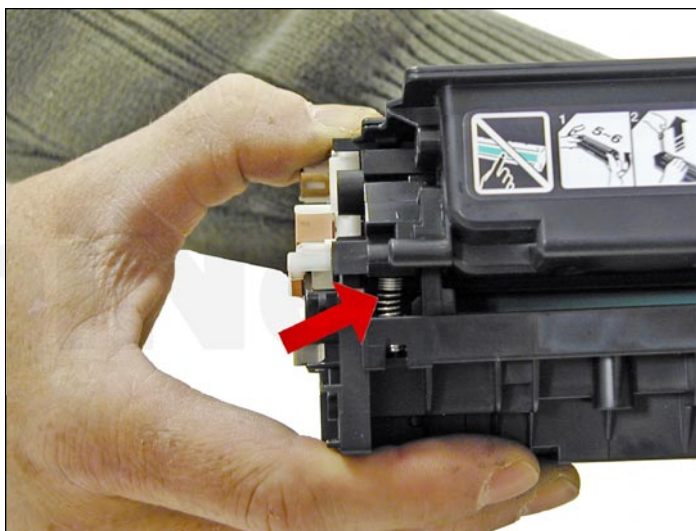
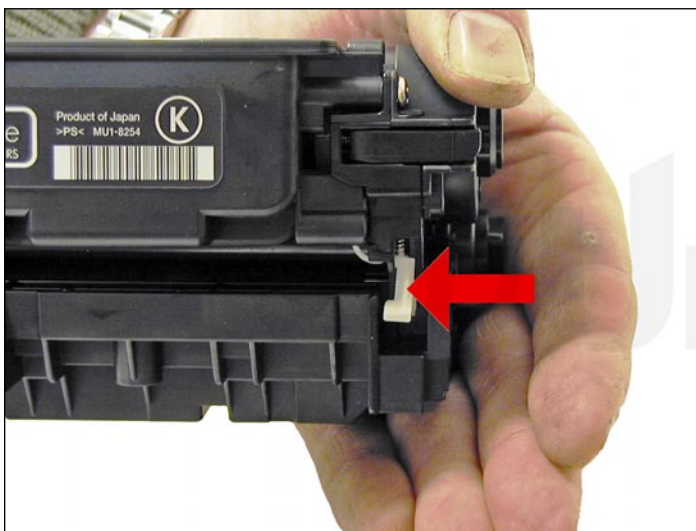


H: Repeat **Steps E and F** for the drum hub.

NOTE: Be very careful not to place the metal contacts in direct contact with the glue, as this will interfere with the proper grounding of the drum, and the cartridge will not print properly, (solid black pages). It is also very important to NOT put any glue on the gear, as the chances of it dripping out onto the drum surface and ruining it are high. Placing the glue inside the drum tube works much better.

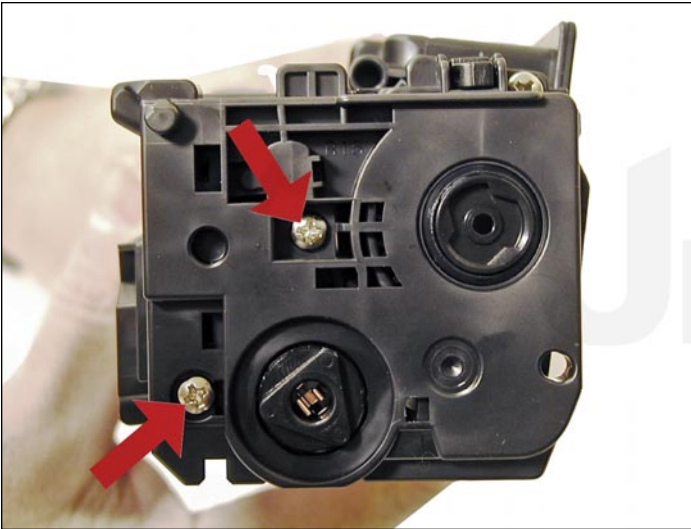


23. Coat the drum with your preferred lubricant and install the drum in the waste hopper.

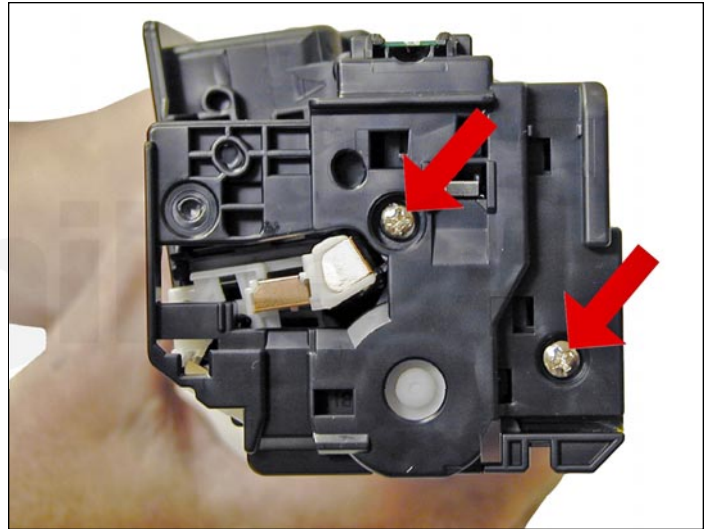


24. Hold the two halves together.

Align the spring on one side and the spring-loaded arm on the other.



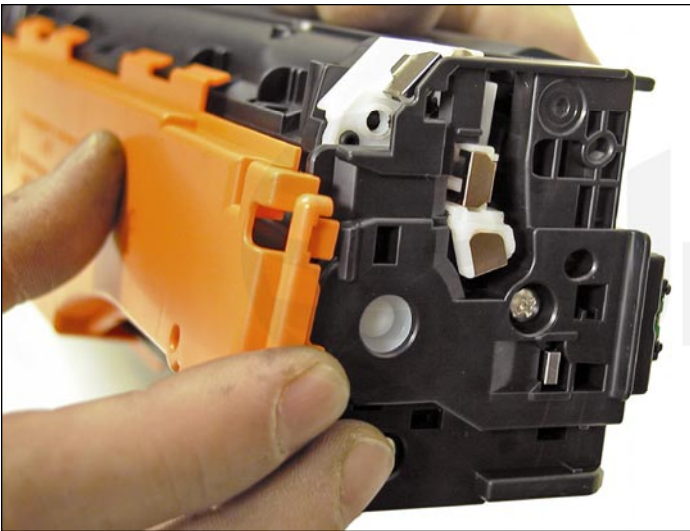
25. Install the outer gear side and cap and two screws.



26. Install the remaining outer end cap on the contact side of the cartridge and two screws.

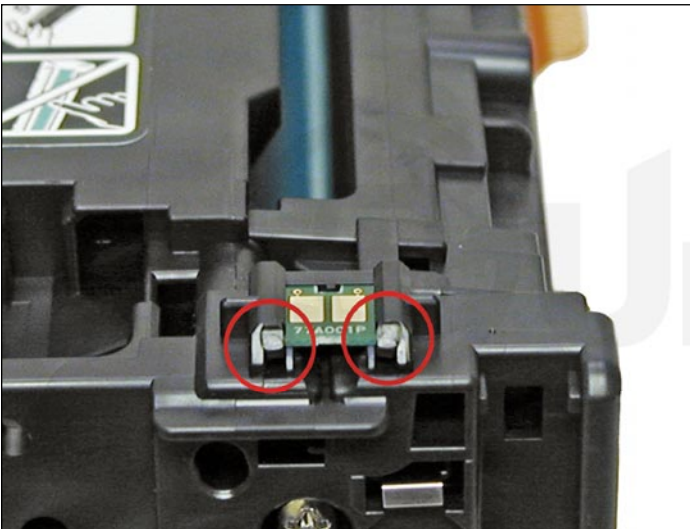


27. If you wish to convert a CP2025 cartridge to a Pro 300, all that needs to be done is change the end caps. Replacement conversion end caps are now available for this purpose.

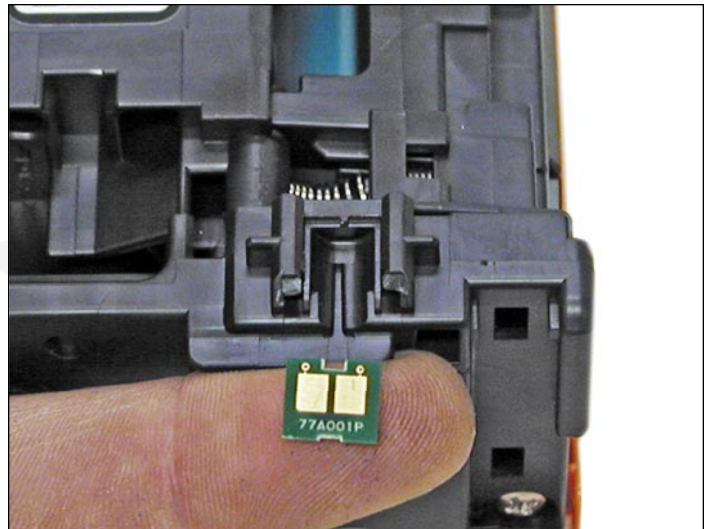


28. Install the drum cover on to the cartridge.

Spread the two halves apart slightly so it fits properly.



29. Remove the chip by cutting the plastic off the edges of both sides of the chip.



30. Remove and replace the chip.

If the new replacement chip is loose in the slot.

Close off the top edges with small amounts of hot glue.

TAKING TEST PRINTS

1. Press OK to open the menus.
2. Press the left or right arrow until "REPORTS" appears on the display.
3. Press OK.
4. Press the left or right arrow until the report you want is shown.
5. Press OK.
6. There are multiple reports to choose from:
Demo page, Menu, Configuration, Supplies status, Font, Color usage, diagnostics and more are available.
7. Press X to exit the menus.

REPETITIVE DEFECT CHART

ITB drive roller:	78.0 mm
OPC drum:	75.0 mm
Fuser pressure roller:	63.0 mm
Transfer rollers:	58.0 mm
Fuser sleeve:	58.0 mm
Registration roller:	44.0 mm
Primary charge roller:	38.0 mm
Developer roller sleeve:	22.0 mm

SOME OF THE MORE COMMON PRINTER ERROR MESSAGES

Most of the error messages are in plainly explained, but some are numeric only. We have listed the more common ones here.

10.000X:	Supply Error. Chip cannot be read or cartridge is not properly installed.
10.0000:	Black chip error
10.0001:	Cyan chip error
10.0002:	Magenta chip error
10.0003:	Yellow chip error

10.100x:	Supply error. Cartridge/Chip is missing.
10.1000:	Black cartridge/chip missing
10.1001:	Cyan cartridge/chip missing
10.1002:	Magenta cartridge/chip missing
10.1003:	Yellow cartridge/chip missing

50.XX:	Fuser Error
50.1000:	Low temperature fuser error
50.2000:	Slow fuser error
50.3000:	High temperature fuser error
50.4000:	Fuser heater wire failure
50.5000:	Fuser low temp subtherm failure
50.5000:	Fuser high temp subtherm failure

CALIBRATE NOW

Sometimes the only way to fix print quality issues is to force a calibration.

1. Open the "HP ToolboxFX" menu.
2. Click the "SYSTEM" tab then click on the "PRINT QUALITY" link.
3. In the area for color calibration, select "CALIBRATE NOW" check box.
4. Click "APPLY" to start the process.