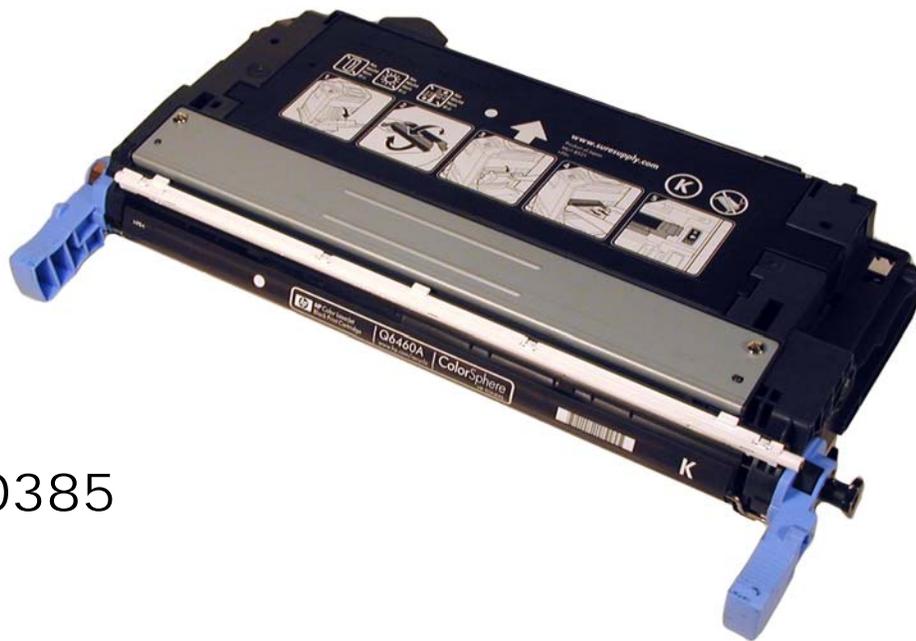


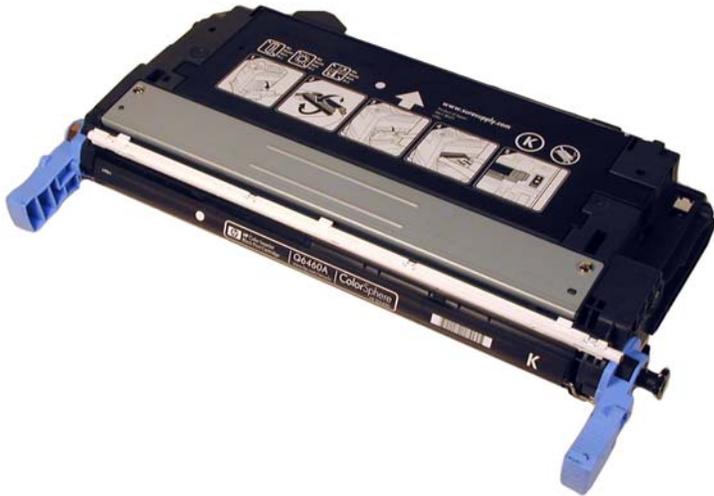
THE HP 4700/4730 AND CP4005 BLACK AND COLOR TONER CARTRIDGES



DOC# 0385

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Remanufacturing the HP 4700/4730 and CP4005 Black and Color Toner Cartridges



The HP 4700/4730 Toner Cartridge

First released in October 2005, the HP-4700 series of color laser printers are based on a 31 ppm 600 Dpi engine. (3600 DPI with RET). A short time later the 4730 MFP machines were released with basically the same specs, but now as an mfp machine. The in September 2006, the CP-4005 was released. All three series use virtually the same cartridges. The differences being the chips and the amount of toner inside (yield). The 4700 cartridges consist of the toner supply, drum, and waste chamber. Like the CLJ-3600 these machines use an in-line, or single pass system. All four cartridges are stacked on top of one another and each color develops its own image which is transferred to the paper by the transfer belt. This type of system is faster, and allows for a higher quality print.

These cartridges have some interesting features. Instead of shipping locks that are removed and thrown away by the user, they have 2 small white plastic clips that are automatically disengaged when the cartridge is installed. These cartridges also have a self removing seal system. The seal winds itself up on a small roller inside the cartridge. These items will be shown later in the article.

The printers based on the 4700 engine are the:

HP Color LaserJet 4700n
HP Color LaserJet 4700dn
HP Color LaserJet 4700dtn
HP Color LaserJet 4700ph+

HP Color LaserJet 4730 mfp
HP Color LaserJet 4730x mfp
HP Color LaserJet 4730xs mfp
HP Color LaserJet 4730xm mfp

HP Color LaserJet CP4005n
HP Color LaserJet CP4005dn

The cartridges used in the 4700 machines are the:

Q5950A (Black)	11,000 pages at 5%	\$248.00 List
Q5951A (Cyan)	10,000 pages at 5%	\$352.00 List
Q5953A (Magenta)	10,000 pages at 5%	\$352.00 List
Q5952A (Yellow)	10,000 pages at 5%	\$352.00 List

The cartridges used in the 4730 machines are the:

Q6460A (Black)	12,000 pages at 5%	\$196.00 List
Q6461A (Cyan)	12,000 pages at 5%	\$422.00 List
Q6463A (Magenta)	12,000 pages at 5%	\$422.00 List
Q6462A (Yellow)	12,000 pages at 5%	\$422.00 List

The cartridges used in the CP4005 machines are the:

CB400A (Black)	7,500 pages at 5%	\$225.00 List
CB401A (Cyan)	7,500 pages at 5%	\$335.00 List
CB403A (Magenta)	7,500 pages at 5%	\$335.00 List
CB402A (Yellow)	7,500 pages at 5%	\$335.00 List

As you can see from these prices (Current as of April 2007), these are very profitable cartridges to remanufacture.

The basic workings of these cartridges are similar to the 3600 series, but some advances have been made. Because of that we are including the cartridge theory here.

HP-4700 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. **Figure 1** shows the basic layout of the cartridges and how they relate to one-another and the printer.

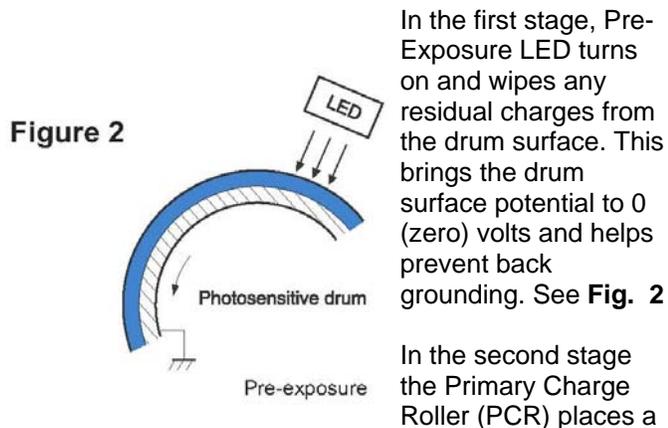
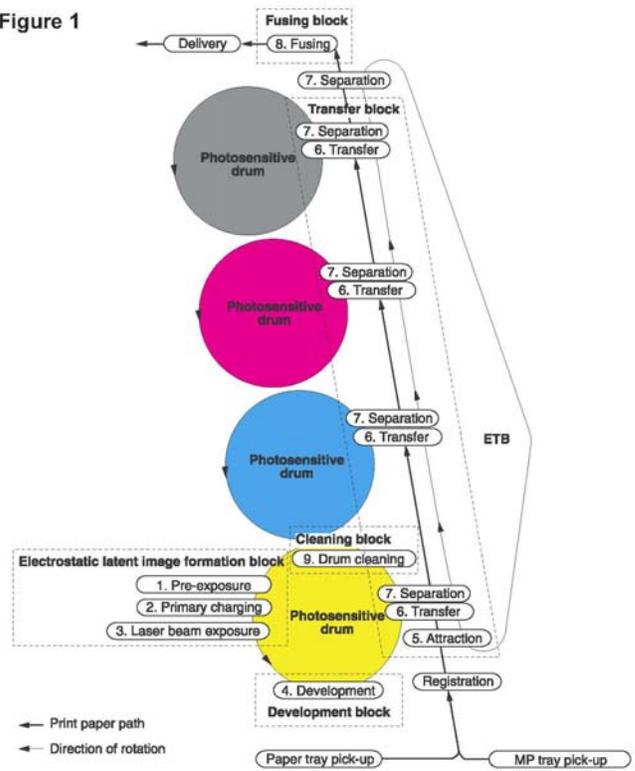
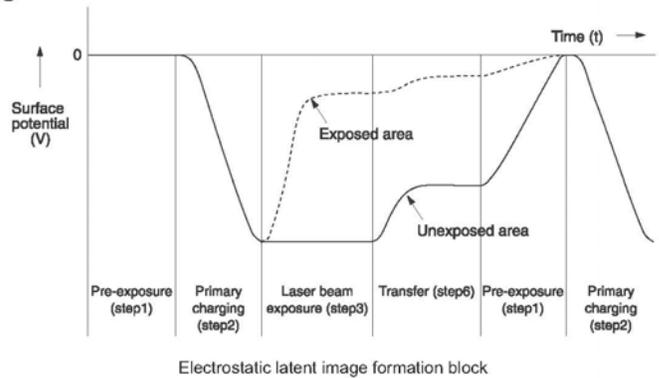


Figure 1

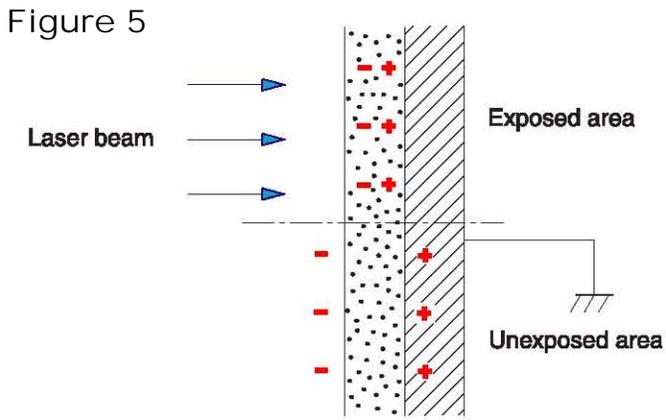
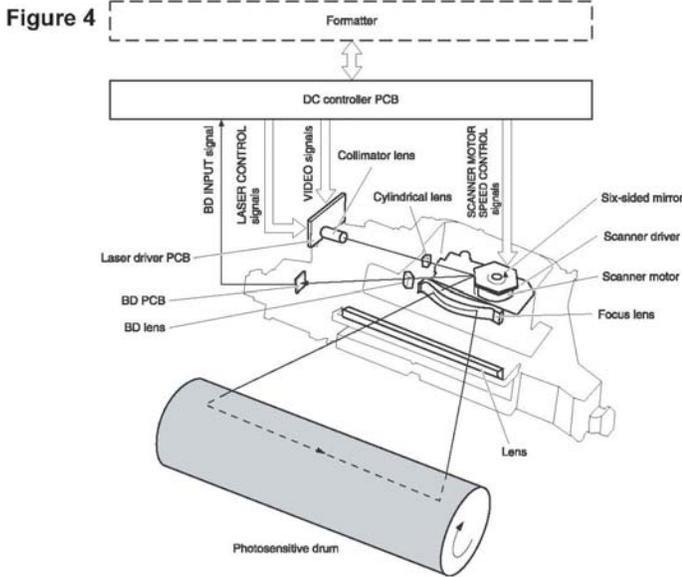


uniform negative DC voltage on the OPC drum surface. The amount of the negative DC voltage placed on the drum is controlled by the printer's intensity setting. See **Figure 3**

Figure 3



In the third 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. Each color cartridge has its own laser and scanner units. See **Figures 4 & 5**

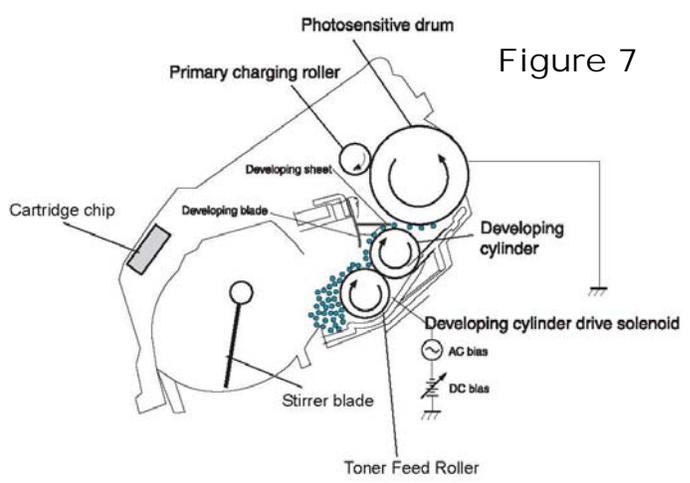
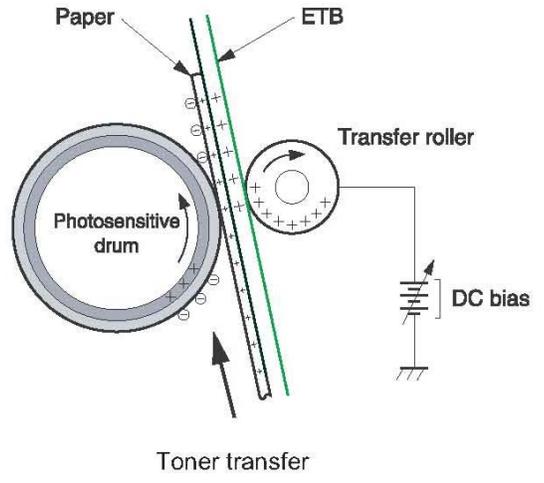


The fourth or developing stage is where the toner is developed on the drum by the developing section (or supply chamber), which contains the toner particles. The development stage is actually made up of two steps: toner charging, and the actual development. In the toner charging stage, the toner stirring 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 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 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. Attached to the Dr. Blade is an orange Mylar type film called the developing sheet. This sheet improves the print quality, and helps prevent toner scatter.

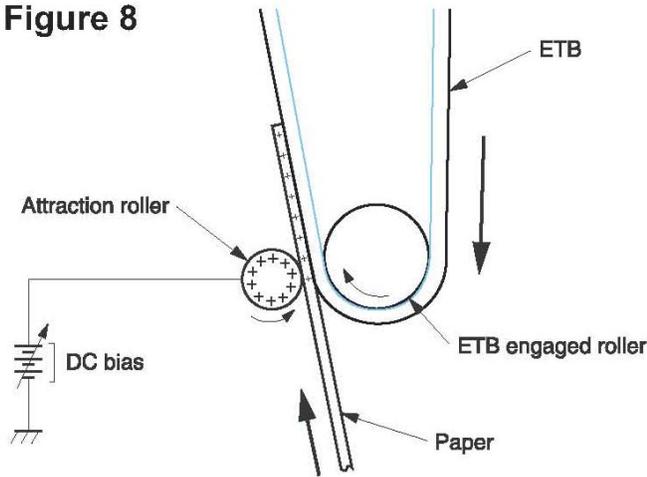
As the laser exposed areas of the OPC Drum approach the developer roller, the toner particles are attracted to the drum's surface due to the opposite voltage potentials of the toner, and laser exposed areas of the OPC drum. See **Figures 6 & 7**

Figure 6



The fifth stage is the transfer stage. This is where there are some large differences from monochrome printers. The first step in the transfer stage is where the attraction roller places a positive DC bias which charges the paper positively to make the negatively charged toner easier to transfer onto the paper during the transfer operation. See **Figures 8 & 9**

Figure 8

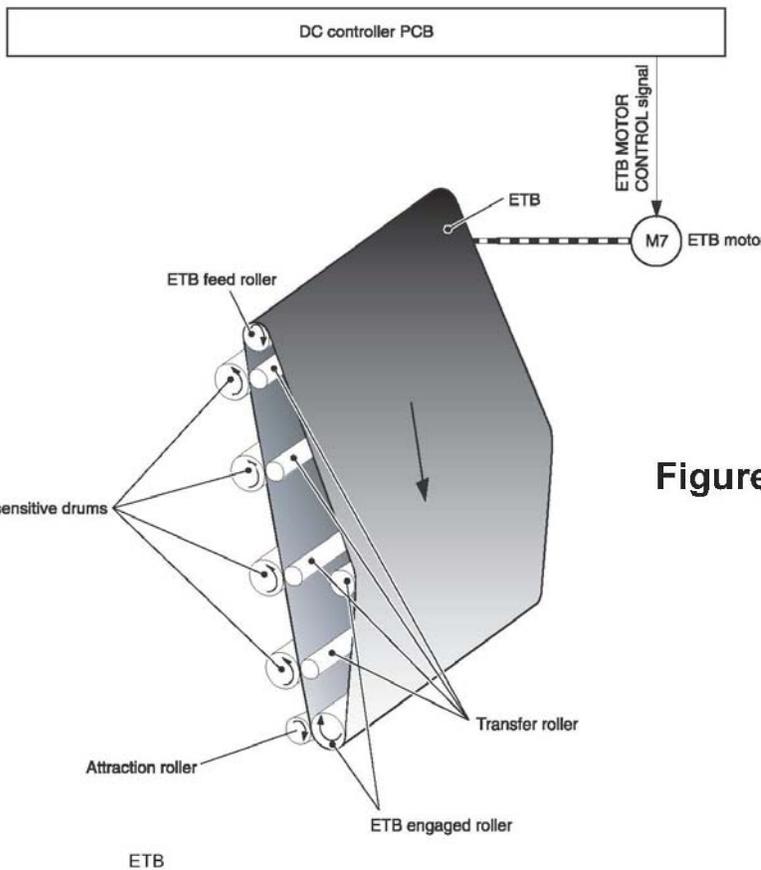


Attaching the media to the ETB

drum and the ETB. As the ETB passes the transfer charging roller, the positive charge is picked up, and draws the negatively charged toner off the drum onto the paper. This process is repeated for each color cartridge. As the toner piles onto the paper, the positive charge on the paper weakens as the paper runs through each cartridge. For this reason, the charge is increased on the transfer charging roller for each successive color.

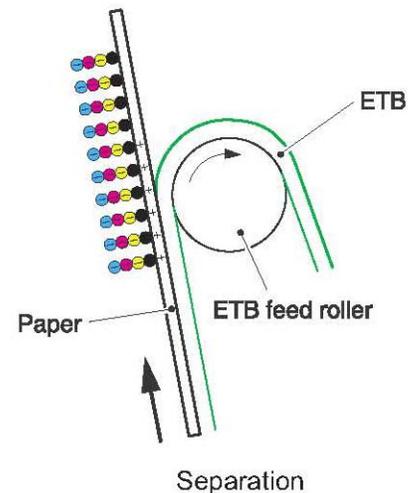
The paper separates from the ETB belt as the belt reaches the top of its path and turns back down to start the process again. The static charge on the back of the paper is decreased with static charge eliminator. This helps stabilize the paper feed, and also prevents toner flares (spots) under low temperature and low humidity conditions. See **Figure 10**

Figure 9



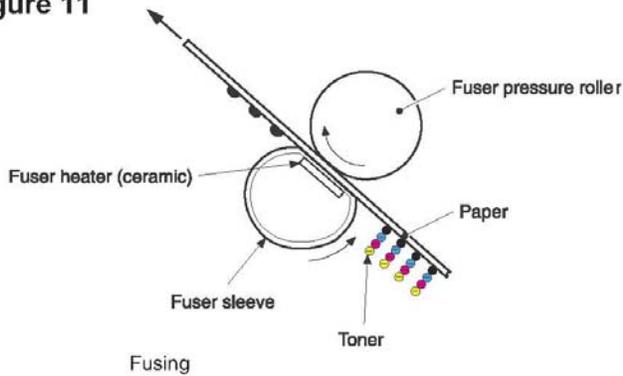
In the sixth stage, the image is then fused onto the paper by the fuser assembly. The fuser Assembly is comprised of the heating assembly and pressure roller. The pressure roller presses the page up into the heating assembly which then melts the toner into the paper. The heating assembly consists of 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. See **Figure 11**

Figure 10



The transfer roller (which is located directly opposite each OPC drum), then places a positive DC bias charge on the back of the ETB or transfer belt. Each toner cartridge has a separate transfer charge roller. At the same time, the paper is moving between the OPC

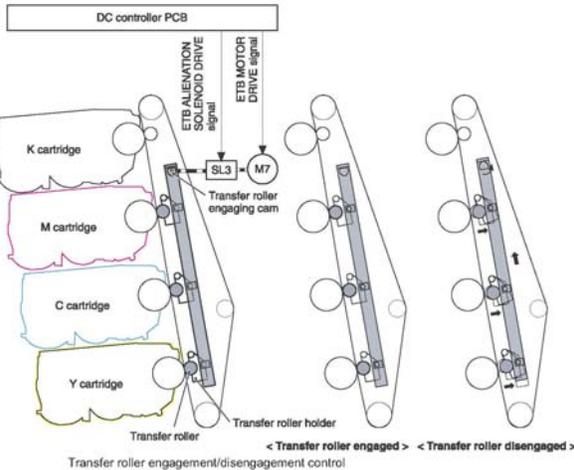
Figure 11



OPC Drum/ETB Cleaning:

The drum and ETB are both cleaned after the image is transferred to the paper. A DC negative bias voltage applied to the drum and both a negative and a positive voltage applied to each of the four color transfer rollers. This brings a potential difference between the drum and ETB so that both the positive and negatively charged residual toner is repelled from the ETB and returned to the OPC drum. The developer roller is disengaged from the OPC drum during cleaning to prevent contamination. The drum is then cleaned off 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. See **Figures 12 & 13**

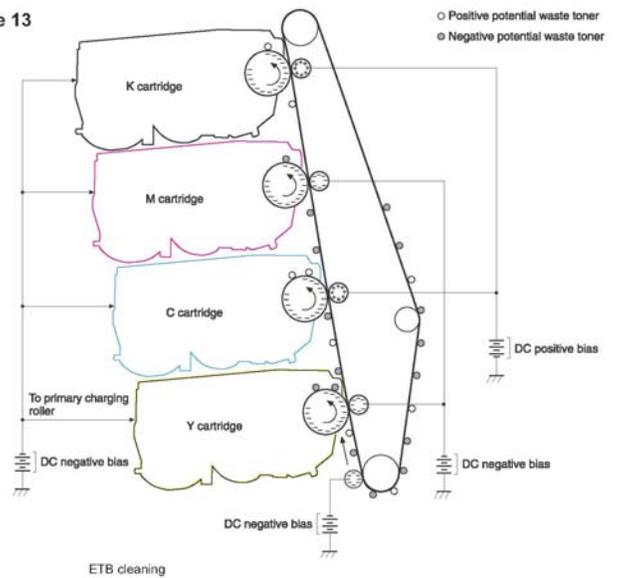
Figure 12



Printer Calibration:

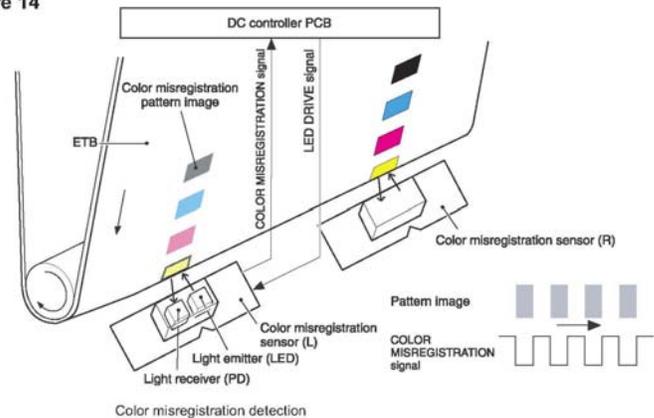
At the start of all this is the calibration cycle. The printer will calibrate itself whenever the printer is turned on, when a new toner cartridge is installed, after 48 hours of run time, and at 150 page intervals. Calibration consists of a solid block and halftone of each color being printed

Figure 13



to the ETB. 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. See **Figure 14**

Figure 14



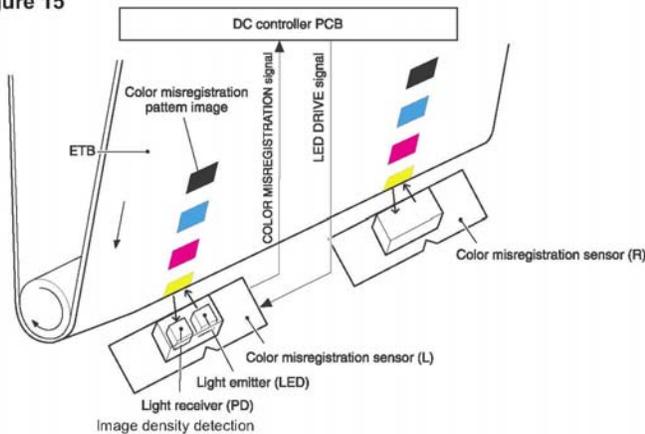
There is also what HP calls the color “misregistration” detection. This is where pattern images are printed to the AETB and detected by various sensors. This is done to correct for any registration problems that may be occurring. See **Figure 15**

In addition these machines also monitor temperature and humidity. The DC Controller will adjust the print voltages depending on the environment.

Cartridge Presence Detection:

These printers use two types of cartridge detection. Chip detection, and drum detection.

Figure 15



For the chip, the printer reads the data stored on the chip and detects the presence of the cartridge. If the data is correct, the cartridge is recognized. If for some reason this check fails, the printer will move to the drum detection.

For the drum detection the printer measures the timed torque of the drum drive. The DC controller stops the drum motor after a specific time period, if the motor stops within a prescribed period of time, the cartridge is detected. If the motor keeps turning longer than that specified time (no load). The absence of a cartridge is reported to the formatter, and all printing functions stop.

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 screw driver (Common Style)
- 3) A Phillips head screwdriver
- 4) Flush cutting wire cutters
- 5) Needle Nose Pliers
- 6) Spring Hook

Supplies Required

- 4700/4730/CP4005 Dedicated Color Toner
- New replacement chip (Dedicated to each cartridge type)
- New Long Life 4700 Drum
- New Wiper Blade
- New toner feed roller [Optional]
- New PCR [Optional]
- New Doctor Blade [Optional]
- New replacement adhesive seal

- Silicon caulk (Phenoseal/GE 100% silicon caulk works best)
- Lint free Cloths
- Conductive grease

1) Shave away the plastic lip that surrounds the hinge pins with a sharp sturdy razor knife. Dig out around the pin until you can grasp it with your flush cutting wire cutters. Only cut deep enough so that you can remove the pin. If too deep a hole is made, the hinge pin may not fit properly, and allow the two halves to move away from each other. Note that there is a long pin on the gear side, and a short on the contact side. **Fig. 16 & 17**

Figure 16

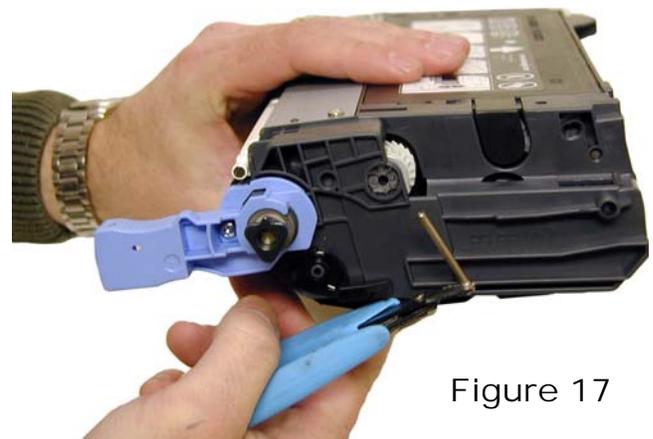


Figure 17

2) Unhook the spring from the bottom left of the contact side of the cartridge. The top half will stay under the blue handle. See **Figure 18**

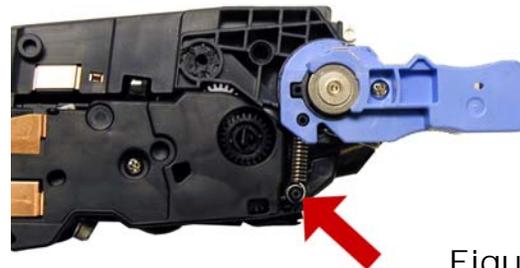


Figure 18

3) Separate the two halves. See **Figure 19**

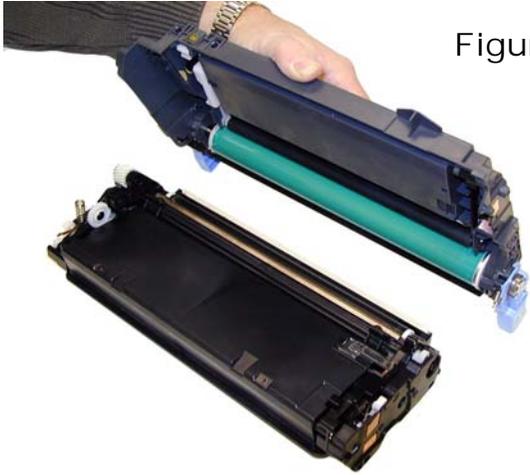


Figure 19

4) On the waste chamber drive gear side remove the Phillips head screw, and blue handle. See **Figure 20**



Figure 20

5) Remove the spring loaded drum cover arm. Do not lose the spring! See **Figures 21 & 22**



Figure 21



Figure 22

6) Remove the drum cover by pulling the metal bars out of their slots. See **Figure 23**



Figure 23

7) With the pin punch, carefully tap the pin out from the internal drum hub, and from the external drive gear. These pins are in tight and are hard to remove. We have found a pin punch to be the best tool as these pins are in much tighter than in previous cartridges, and wire cutters will distort the pins. See **Figures 24, 25 & 26**

8) Remove the drive gear and metal bearing from the drum axle. Pull the drum axle out from the cartridge. Be careful of the drum as it will come loose. See **Figures 27 & 28**

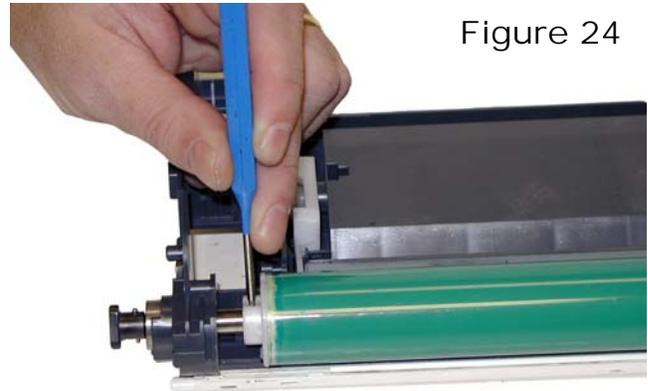


Figure 24

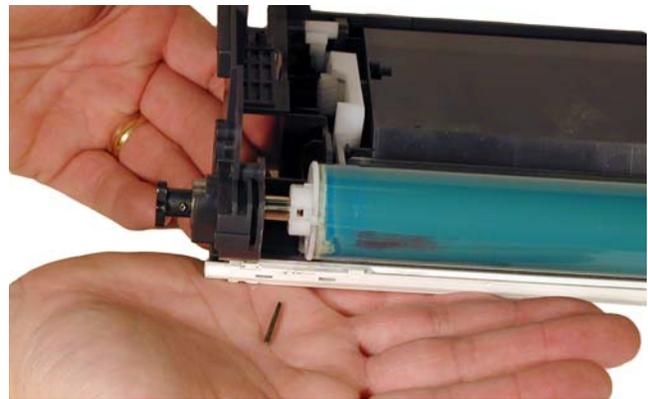


Figure 25

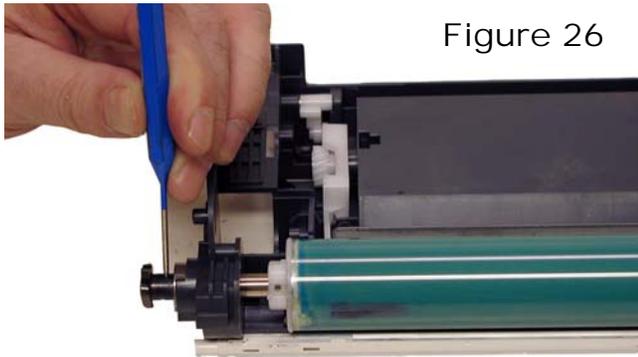


Figure 26

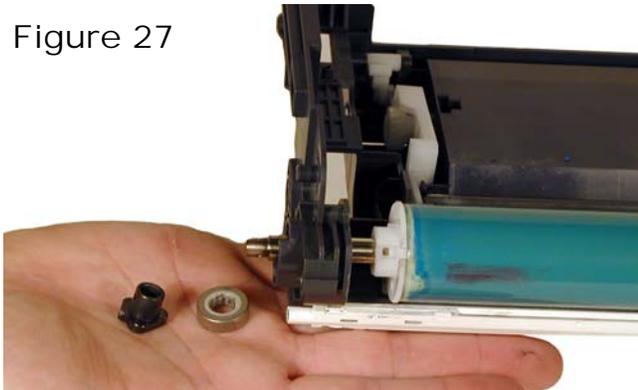


Figure 27



Figure 28

9) Remove the drum. See **Figure 29**



Figure 29

10) On the PCR, note the coating of conductive grease on both sides of the roller. Normally this is only on one side. For these cartridges it needs to be on both. See **Figure 30**.

11) Lift up both sides of the PCR from the holders. Remove the PCR stabilizers from the PCR. The Stabilizers are pinned in the cartridge and cannot be



Figure 30

unclipped like previous cartridges. Remove the PCR. See **Figures 31 & 32**



Figure 31

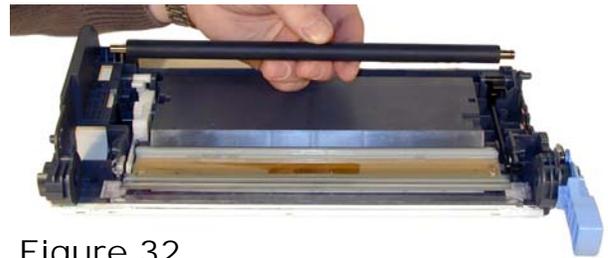


Figure 32

12) Take the razor knife again and slide the blade along the back edge of the wiper blade. Keep the blade along the metal so the grey sealing material is separated from the blade. See **Figure 33**

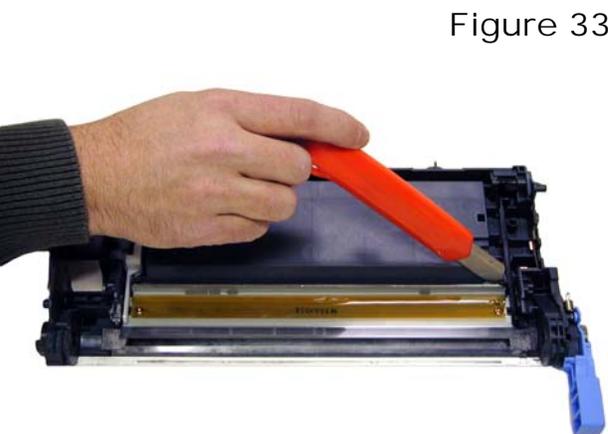


Figure 33

13) Remove both screws from the wiper blade. Be careful not to damage the orange Mylar type film on the blade. According to HP, this film assembly helps prevent toner scatter. See **Figure 34**

Figure 34



to the waste chamber. Make sure that the drive gear is driving the plate. See **Figure 37 & 38**

Figure 37

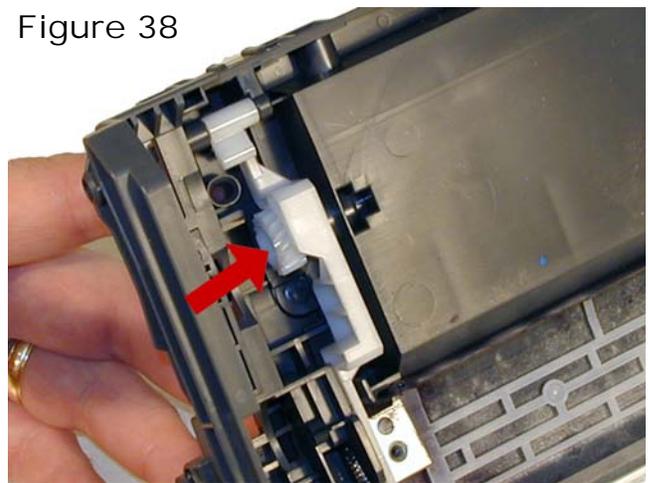


14) Remove the Wiper Blade. See **Figure 35**

Figure 35

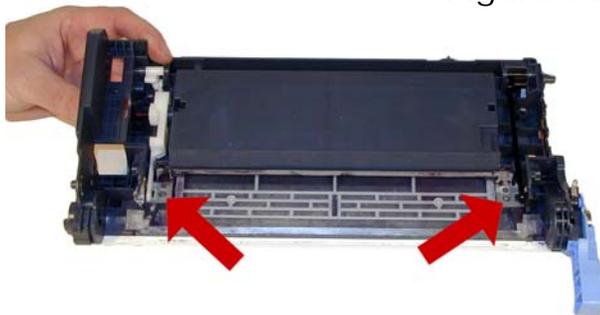


Figure 38



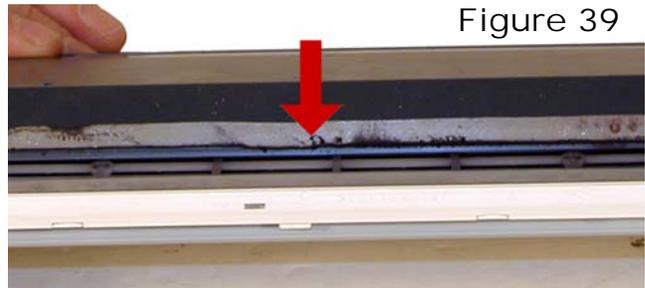
15) Dump out and vacuum any remaining toner from the hopper. The waste toner must be removed from the wiper blade opening. Try to keep the toner from getting on the grey wiper blade seal. Do not lose the wiper blade shims! See **Figure 36**

Figure 36



17) Check the grey wiper blade seal, if it is sticky, it can be re-used. If it is not, and you cleaned it with alcohol, it must be removed, and replaced with a good silicon sealer. (See supplies needed at start of article). See **Figure 39**

Figure 39



16) These cartridges have a simple auger/plate system that moves the waste toner from behind the wiper blade

18) Lubricate the new wiper blade with your preferred lubricant. Install the blade and 2 screws. Make sure the wiper blade seal (which ever type you are using) seals along the back edge of the blade. See **Figure 40**

Figure 40



19) Clean off the old conductive grease from the PCR ends, and clean the PCR. Coat both ends of the PCR with a small amount of new conductive grease. Place the plastic stabilizers on the shaft, and install the assembly in the cartridge. See **Figures 41 & 42**

Figure 41

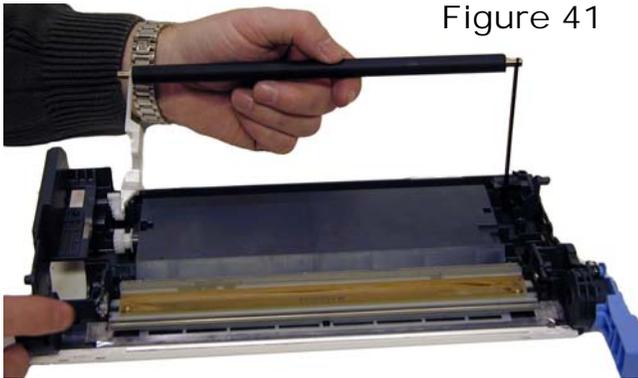
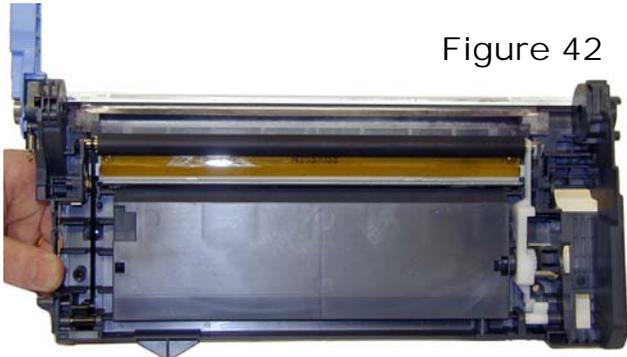
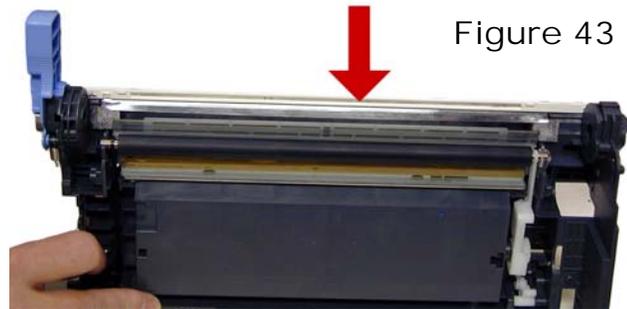


Figure 42



20) Clean the white and clear plastic bar that sits on the edge of the waste chamber. This part is how the pre-exposure light gets to the drum and must be clean. See **Figure 43**

Figure 43



21) Install the drum in the cartridge, large hub side to the NON contact side. See **Figure 44**

Figure 44



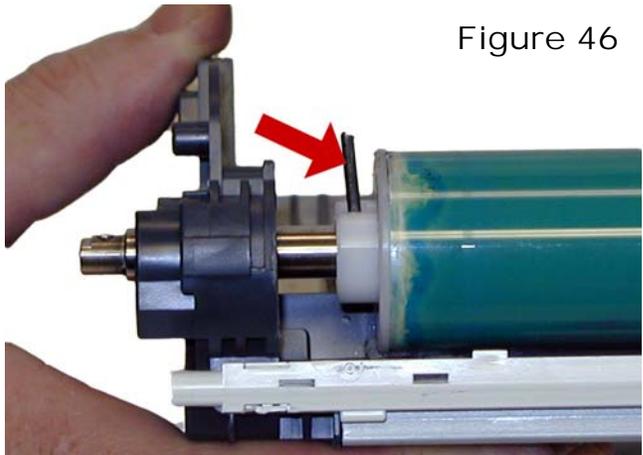
22) Slide the drum axle in from the contact side. Make sure you do not damage the copper drum contacts. Both tabs must be in contact with the axle. See **Figure 45**

Figure 45



23) Align the drum hub and axle so that the holes line up. Insert the larger of the two metal pins and tap into place with the pin punch. Make sure the pin is centered on the axle. See **Figure 46**

Figure 46



24) Install the metal bearing, drive gear and pin onto the drum axle. Tap the pin into place with the pin punch. Using a small block of wood as a brace under the drive gear will make installing the pin easier. See **Figures 47 & 48**

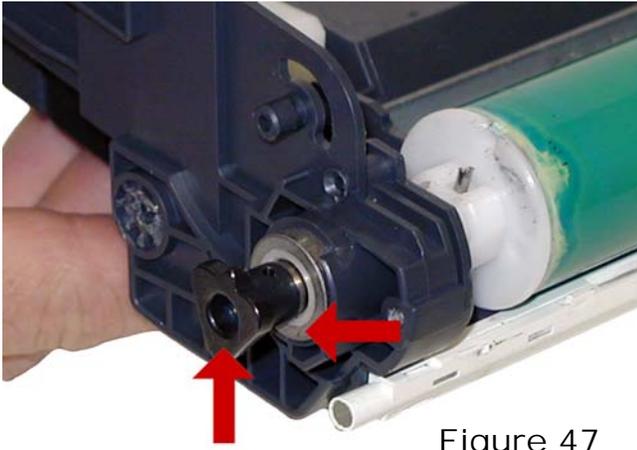


Figure 47

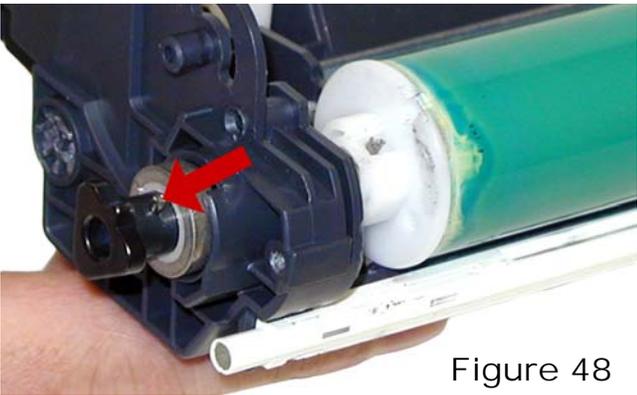


Figure 48

25) On the non-gear side, install the blue handle and screw. See **Figure 49**



Figure 49

26) Install the drum cover bars, plastic arm and spring onto the cartridge. The arm does not have a typical notch to hold the spring when installing. The larger tail part of the spring sits against the plastic just behind the blue handle. See **Figures 50, 51 & 52**



Figure 50

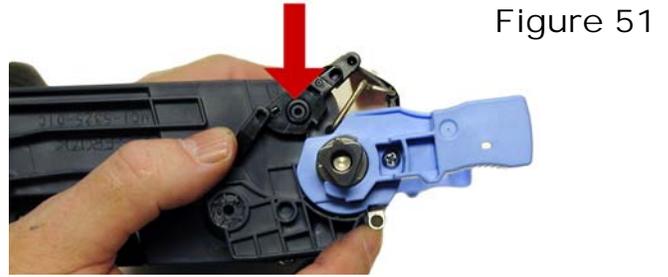


Figure 51



Figure 52

27) Place the waste chamber aside.

28) On the contact side of the toner supply, remove the 2 screws and end cap. See **Figures 53 & 54**

Figure 53

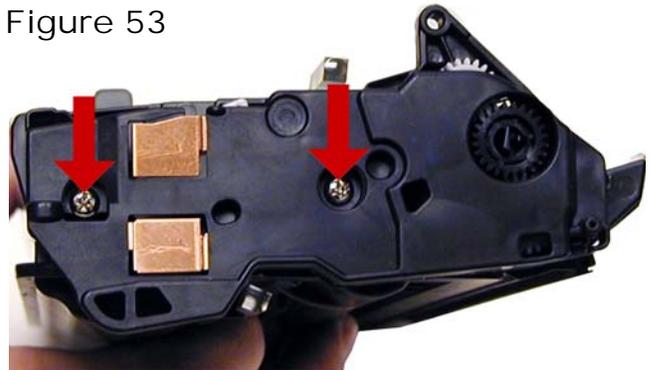
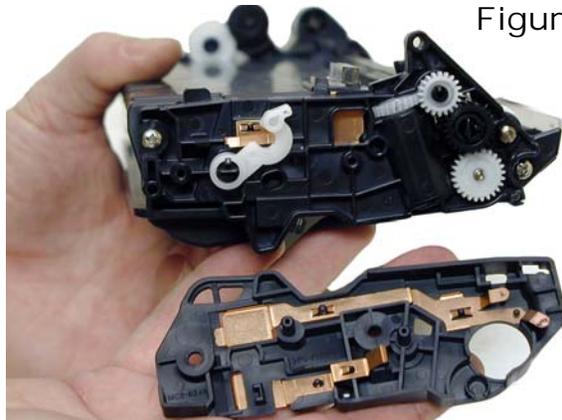


Figure 54



29) Remove the three gears. See **Figure 55**

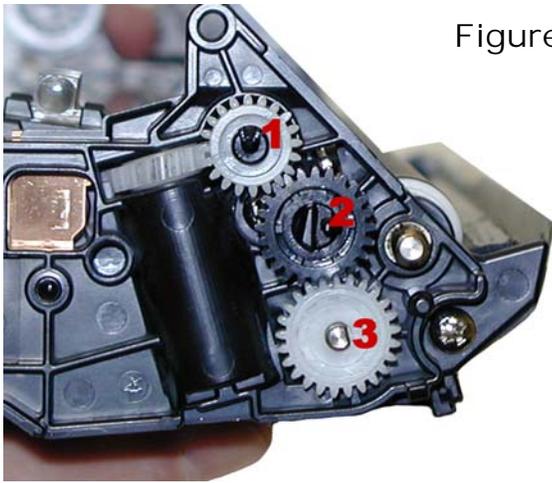


Figure 55

30) Remove the three screws from the inner end cap/ bearing plate. Remove the inner end cap. See **Figures 56 & 57**

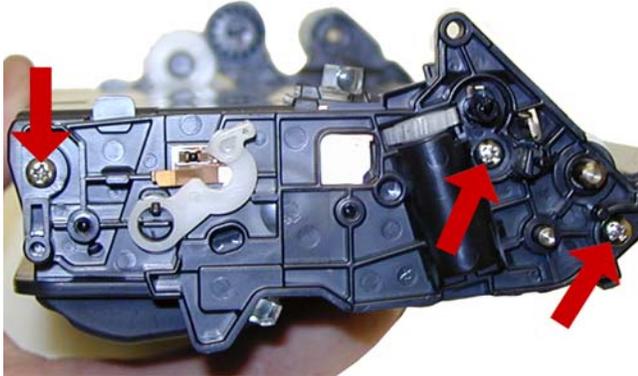


Figure 56

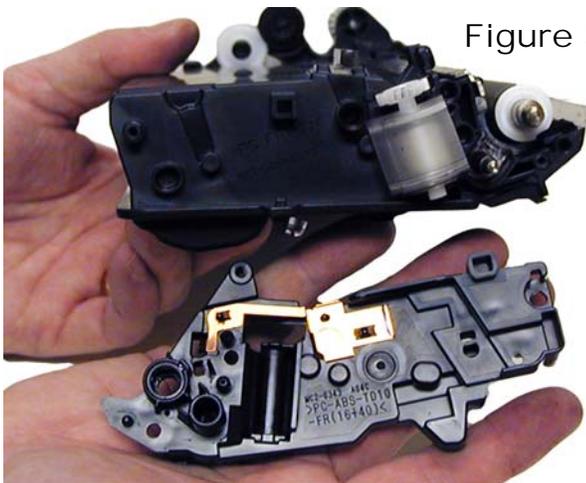


Figure 57

31) Slide the developer roller out from the cartridge. There is no need to remove the gear side end cap or gears. See **Figures 58**



Figure 58

32) Remove the two screws on the doctor blade. Remove the blade. See **Figure 59**



Figure 59

33) Vacuum out any remaining toner from the hopper. We don't recommend dumping it out as the toner will get all over the hopper. It is hard to clean off. Remove the coil spring from the hopper by the gears so it does not get lost. See **Figure 60**



Figure 60

34) Vacuum the feed roller clean. Until new felt seals are available for the developer roller, we do not recommend that the feed rollers be removed. Re-using old seals that have been removed may cause leaks See **Figure 61**



Figure 61

35) These cartridges do not have a fill plug and must be filled through the developer roller opening. Fill the hopper with the correct amount of dedicated 4700/4730/CP4005 toner. See **Figure 62**



Figure 62

36) When a seal becomes available you will need to install it now. They are currently under development and should be available as you read this. Note the seal take up reel. This reel automatically turns and removes the seal from the toner hopper. When the new seal is available, the old seal will have to be removed, and the new one attached to the reel. See **Figure 63**



Figure 63

37) Install the Doctor blade and 2 screws. See **Fig. 64**



Figure 64

38) Wipe the developer roller down with a clean lint free

cloth. We do not recommend that any chemicals be used at this time. Testing is still on going to see what if anything can be used. Install the cleaned developer roller in the hopper keyed end first. Spin it until it is fully seated in the drive gear. See **Figures 65 & 66**



Figure 65

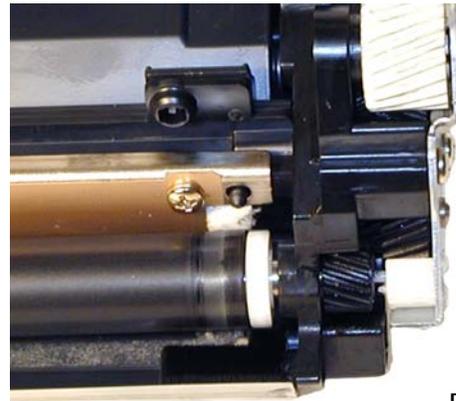


Figure 66

39) Clean the old conductive grease from the contacts on the inner end cap, and replace with new. Use the same amount of grease that you removed. If too much is used, it can attract toner dust and actually insulate the contact instead of enhance it. Install the inner end cap and three screws. See **Figures 67 & 68**

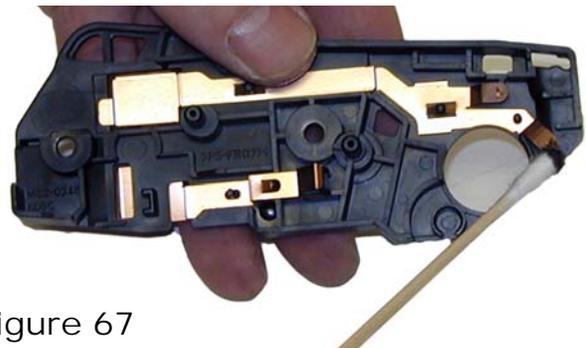


Figure 67

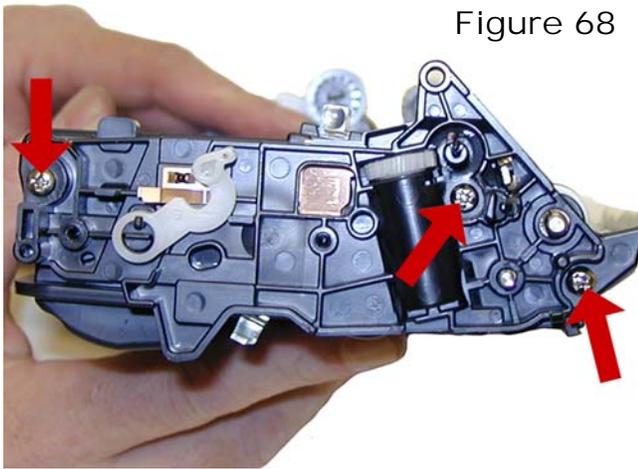


Figure 68

40) Install the three gears as shown. See **Figure 69**

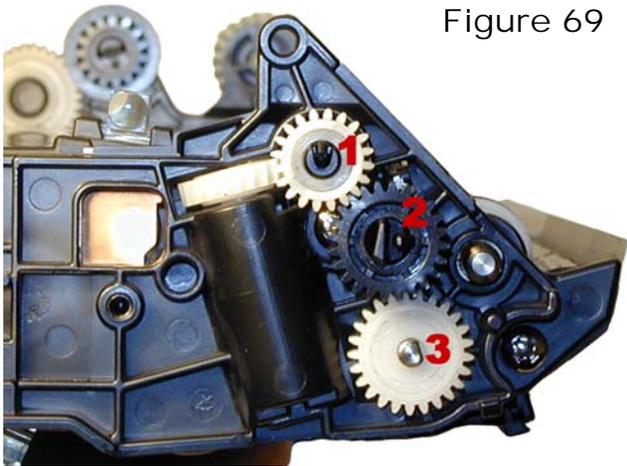


Figure 69

41) Clean the old conductive grease from the contacts on the outer end cap, and replace with new. The same rules as stated above on this grease apply here. Install the outer end cap and two screws. See **Figure 70**

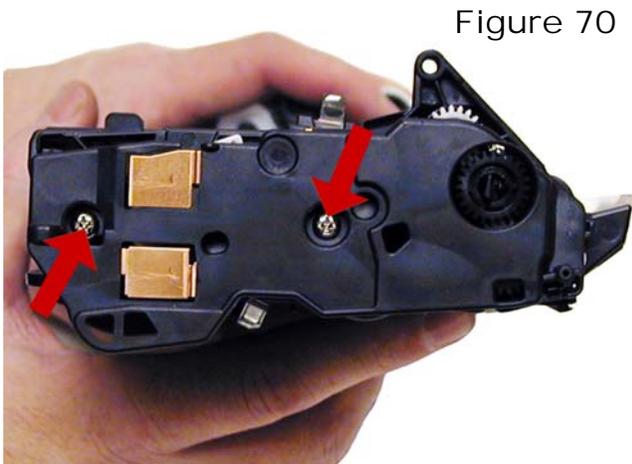


Figure 70

42) Install the coil spring. See **Figure 71**

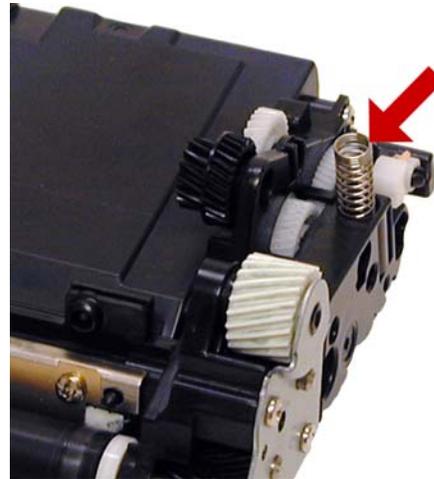


Figure 71

43) Place the supply chamber onto the waste chamber. See **Figure 72**



Figure 72

44) Align the two halves and install the hinge pins, short pin to the non-gear side, and long pin to the gear side. See **Figures 73 & 74**

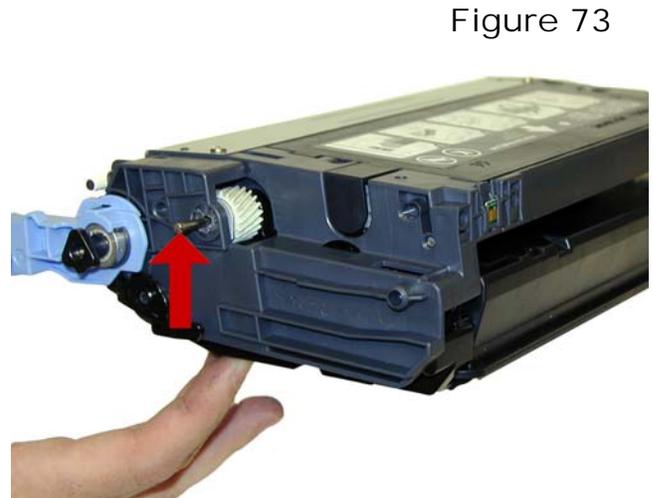


Figure 73

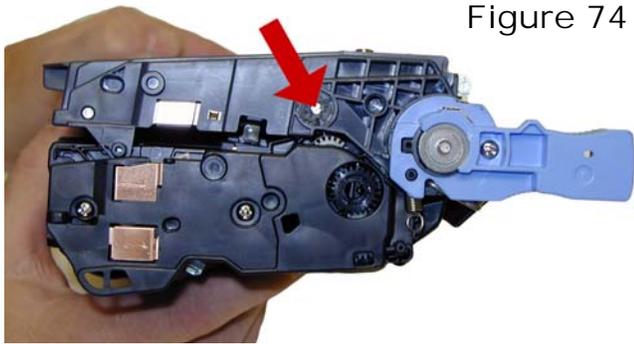


Figure 74

45) Install the spring from under the blue handle on the contact side of the cartridge. See **Figure 75**

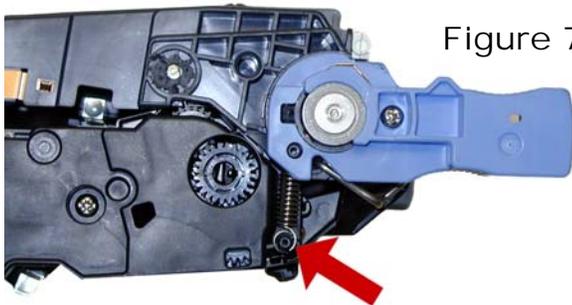


Figure 75

46) Check to make sure the drum cover closes properly. See **Figure 76**



Figure 76

44) Set the two shipping locks on each side of the cartridge. The shipping locks are built in on these cartridges. When the cartridge is installed, the locks will open. Make sure you reset them after the cartridge has been tested. The shipping locks help keep the developer roller from getting a flat spot, which will cause horizontal voids in the print. See **Figures 77 & 78**



Figure 77

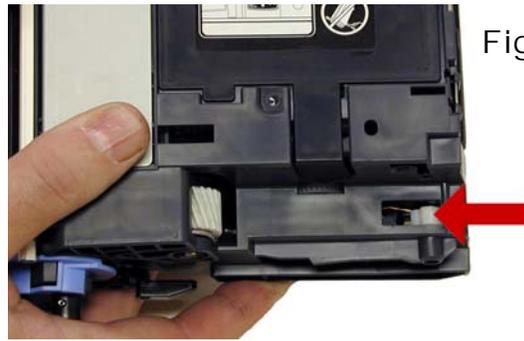


Figure 78

45) Clean the two clear plastic Toner low lenses on the supply chamber. See **Figures 79 & 80**



Figure 79



Figure 80

46) Replace the chip on the cartridge. Be sure to use the correct color chip for your cartridge. See **Figure 81**

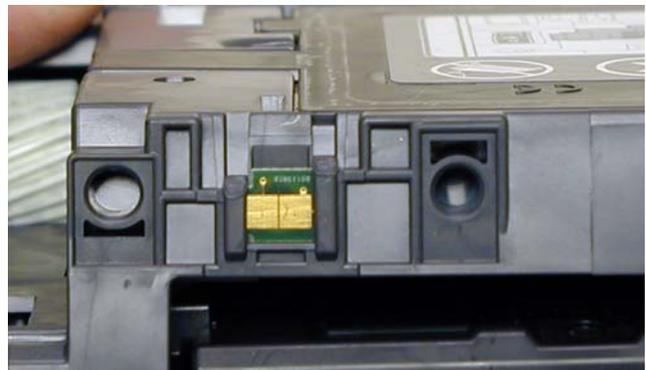


Figure 81

Taking Test Prints

Configuration Page

Press the MENU button
Press the down arrow until "INFORMATION" appears on the display. Press SELECT.
Press the down arrow until "CONFIGURATION" appears on the display.
Press SELECT.

Supplies Status Page

Press the MENU button
Press the down arrow until "INFORMATION" appears on the display. Press SELECT.
Press the down arrow until "SUPPLIES STATUS" appears on the display.
Press SELECT.

Repetitive Defect Chart:

Face Down Delivery Roller	25.0mm	Back of page
Black Developer Roller	34.3mm	Front of page
Fuser Delivery roller	37.0mm	Back of page
Primary Charge Roller	37.7mm	Front of page
ETB Transfer Rollers	37.7mm	Front of page

(If the defect is one color only, check the PCR. If it is in all colors, check the ETB rollers)

Color Developer Roller	38.5mm	Front of page
Toner Feed Rollers	42.7mm	Front of page
Registration Sub Roller	47.0mm	Back of page
Registration Roller	55.0mm	Back of page
Media Attaching roller	75.0mm	Front of page
Fuser Sleeve	76.0mm	Front of page
Paper Tray Feed Roller	77.0mm	Back of page
Paper Tray Separation Roller	77.0mm	Back of page
Paper Tray Pickup Roller	77.0mm	Front of page
Fuser Pressure Roller	81.0mm	Front of page
OPC Drum	94.2mm	Front of page

Cartridge Troubleshooting:

Primary Charge Roller (PCR); The primary charge roller if dirty will show on the test print as vertical gray streaks down the page, or as a gray background throughout the page. If there is any physical damage, it will repeat at intervals of 37.7mm.

A Dirty PCR Connection will result in dark black horizontal bars across the page, or as shading throughout the page.

A Scratched Drum will show up as a very thin, perfectly straight line that runs from the top to the bottom of the test page.

A Chipped Drum will result in a dot or series of dots that repeat at 94.2mm intervals

A Damaged Developer Roller Sleeve will either leave a mark or a blank spot (depending on the type of damage) at intervals of 34.3mm for the black and 38.5 for the color.

A Light Damaged Drum will show up as a shaded area on the test print that should be white. Again this will repeat at intervals of 94.2mm.

A Bad Wiper Blade will result in vertical gray lines down the page, or as shading across the entire page. In either case there will be a film of toner on the drum surface.

Some of the more common Printer Error Messages:

10.000x Supply Error: Chip cannot be read or cartridge is not properly installed

10.00.00 Black cartridge
10.00.01 Cyan cartridge
10.00.02 Magenta cartridge
10.00.03 Yellow cartridge

10.XX.YY Cartridges NOT engaged

10.92.00 Black cartridge
10.92.01 Cyan cartridge
10.92.02 Magenta cartridge
10.92.03 Yellow cartridge

50.X Fuser Error

For X = 1 Low Fuser Temp.
For X = 2 Slow Fuser
For X = 3 High Fuser Temp.
For X = 6 Open Fuser
For X = 7 Fuser pressure Release Failure
For X = 8 Low Fuser sub-thermistor

temperature

For X = 9 High Fuser sub-thermistor

temperature

51.2X Printer Error

For X = 0 Black Scanner error
For X = 1 Cyan Scanner error
For X = 2 Magenta Scanner error
For X = 3 Yellow Scanner error

Calibrate Now

If you are experiencing problems with color in the printouts, the "Calibrate Now" feature can be run. This "quick" calibration takes about 1 minute. This procedure does not always fix the issue, but it can. There is also a full calibration, but that should only be run when major parts have been replaced like the ETB or Scanner have been replaced.

Press the MENU button

Press the down arrow until "CONFIGURE DEVICE" appears on the display.

Press SELECT.

Press the down arrow until "PRINT QUALITY" appears on the display.

Press SELECT.

Press the down arrow until "QUICK CALIBRATE NOW" appears on the display

Press the "SELECT" to start the calibration.

