BROTHER® HL 4040 • TN-110 • TN-115
CARTRIDGE REMANUFACTURING INSTRUCTIONS

BROTHER® HL 4040 COLOR LASER PRINTER

TN-110 TONER CARTRIDGE

3232 West El Segundo Blvd., Hawthorne, California 90250 USA • Ph +1 424 675 3300 • Fx +1 424 675 3400 • techsupport@uninetimaging.com • www.uninetimaging.com

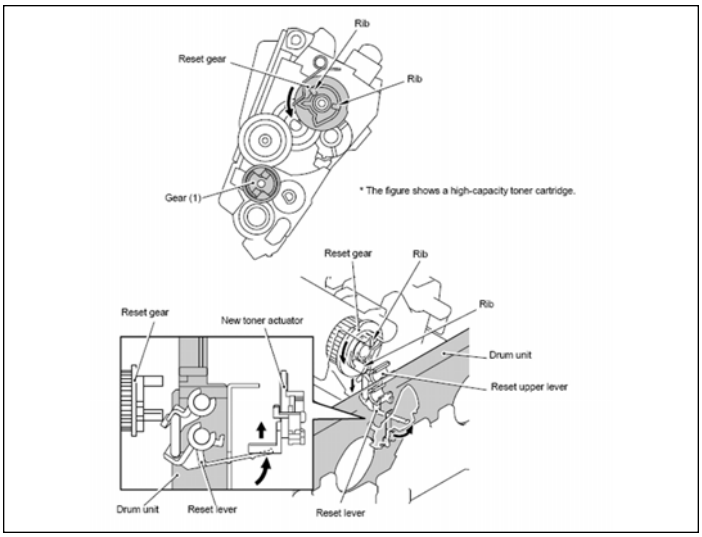
REMANUFACTURING THE BROTHER HL 4040 SERIES TONER CARTRIDGES TN-110/TN-115 COLOR TONER CARTRIDGES

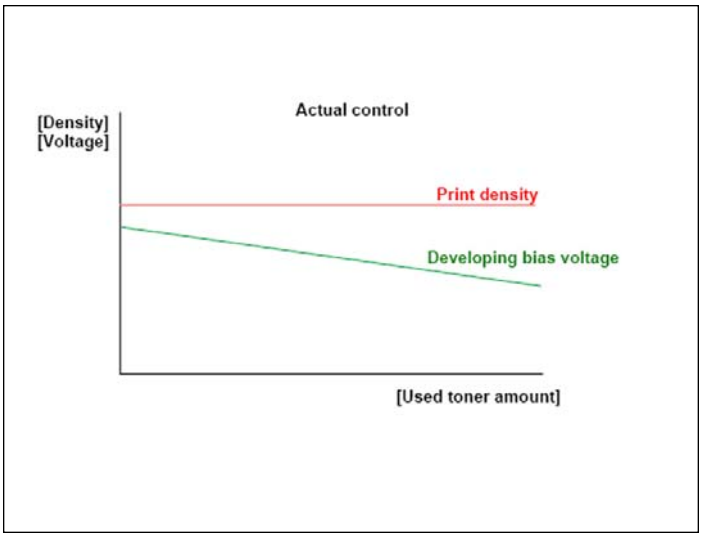
By Mike Josiah

The Brother HL-4040 printer engine is based on a new 21ppm black and color, 2400 x 600 DPI color laser engine. The machines come standard with 64Mb expandable to 576Mb of memory, and all run off a 300 MHz processor. With print speeds of 21ppm and a list price starting at $299.00 USD, these machines are becoming very popular.

The toner cartridges do not have a reset chip on them, but do have a reset gear that must be positioned properly for the machine to accept it as a new cartridge. From my research, the starter cartridges that initially came with new printers (TN-110) did not come with rest gears, but all the new starters I have seen now do. The proper reset positions of the gears will be covered later in this instruction.

As with some of the Brother monochrome cartridges, there are different reset gears used for the LY and HY cartridges. **Figures 1 and 2** (below) show the new toner detection system and the developer bias voltages when a new cartridge is installed:

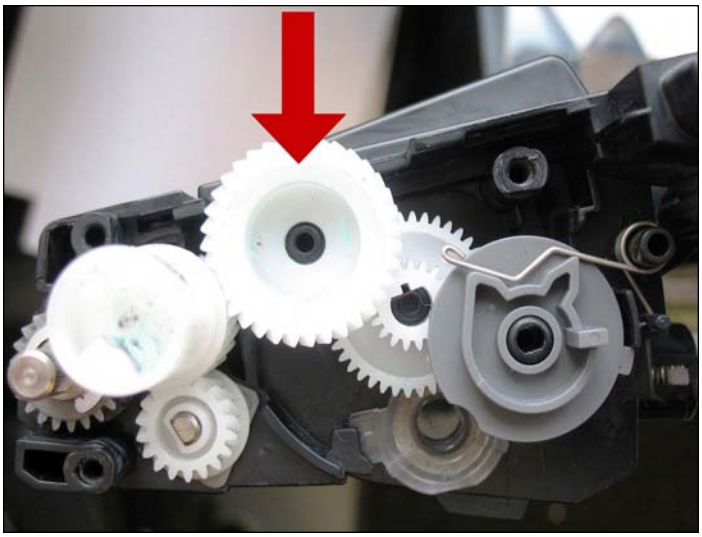




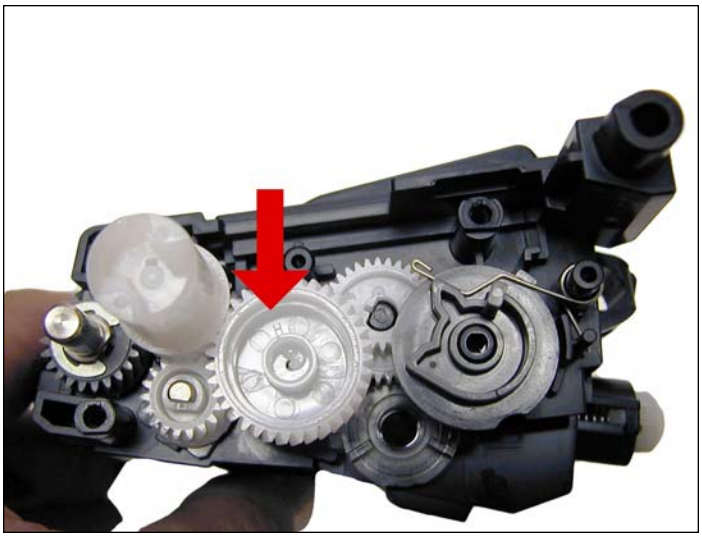
When the printer senses a new toner cartridge, the bias voltage is set to a high voltage. As the cartridge is used, the bias voltage is reduced gradually down to a lower voltage. This process is necessary because according to Brother, a new toner cartridge has a tendency to print light. As the cartridge is used, the density increases. To keep the density level even throughout its life, the density bias voltage is reduced accordingly. (See Figure #2) This is why there are two different reset gears. For the low life cartridge, the gear has one rib and the bias voltage is reduced over the life of 2,500/1,500 pages. For the high yield cartridge, the gear has two ribs the bias voltage is reduced over 5000/4000 pages. Each time a new cartridge is installed, Gear #1 (Figure #1) engages the gear train. The rib on the reset gear pushes down on the upper reset lever which is attached to the drum unit. This lever turns and pushes up the new cartridge actuator. The bias voltage is then reset, and the cartridge page count is reset to zero.
While the cartridge yield is stated in pages printed, it actually is based on the revolutions of the developer roller. The upper limit for the HY black is 111,000 revolutions or 6000 pages x 18.5 revolutions. Brother factors in 18.5 revolutions per page to account for the actual # of revolutions when printing plus the idle rotation revolutions that occur when the printer is on and idle. Since the stated yield of the HY black cartridge is 5,000 pages at 5% coverage. The upper limit allows for less toner per page to be used before the printer stops printing.

When the printer is in a monochrome print mode VS a color print mode, the C, M, and Y cartridge developer rollers are disengaged so that only the black developer roller has any revolutions.

There are also different versions of the TN-110 as far as the non-reset gears in the cartridge itself. The initial cartridges had an idle gear positioned above the gear train, and the newer cartridges have the idle gear positioned below. This only matters if you want to convert a LY TN-110 to a HY TN-115 cartridge. Because of the gear positioning, the older style cartridges with the idle gear on top of the gear train, cannot be converted to a HY. The diameter of the gears is smaller in the old version, and cannot handle the stress of a HY load. There are no problems converting the new style cartridges.



The old style TN-110...



and the new style...

Current machines released so far are:
HL-4040CN, HL-4050CDN, HL-4070CDW, DCP-9040CN, DCP-9045CDN, MFC-9440CN and MFC-9840CDW.

There are two different yielding series of toner cartridges available for these machines, the **TN-110** and the **TN-115**. The yields of the cartridges as well as the various worldwide versions are listed as follows:

NORTH AMERICA

TN-110 K	2,500 pages
TN-110 C/M/Y	1,500 pages
TN-115 K	5,000 pages
TN-115 C/M/Y	4,000 pages

EUROPE, MIDDLE EAST, AFRICA

TN-130 K	2,500 pages
TN-130 C/M/Y	1,500 pages
TN-135 K	5,000 pages
TN-135 C/M/Y	4,000 pages

JAPAN

TN-190 C/M/Y	1,500 pages (A4)
TN-190 K	2,500 pages (A4)
TN-195 C/M/Y	4,000 pages (A4)
TN-195 K	5,000 Pages (A4)

SOUTH AMERICA (Except Argentina)

TN-110 K	2,500 pages
TN-110 C/M/Y	1,500 pages
TN-115 K	5,000 pages
TN-115 C/M/Y	4,000 pages

ASIA, AUSTRALIA

TN-150 K	2,500 pages
TN-150 C/M/Y	1,500 pages
TN-155 K	5,000 pages
TN-155 C/M/Y	4,000 pages

CHINA

TN-170 K	2,500 pages
TN-170 C/M/Y	1,500 pages
TN-175 K	5,000 pages
TN-175 C/M/Y	4,000 pages

ARGENTINA

TN-115 K	5,000 pages
TN-155 C/M/Y	4,000 pages

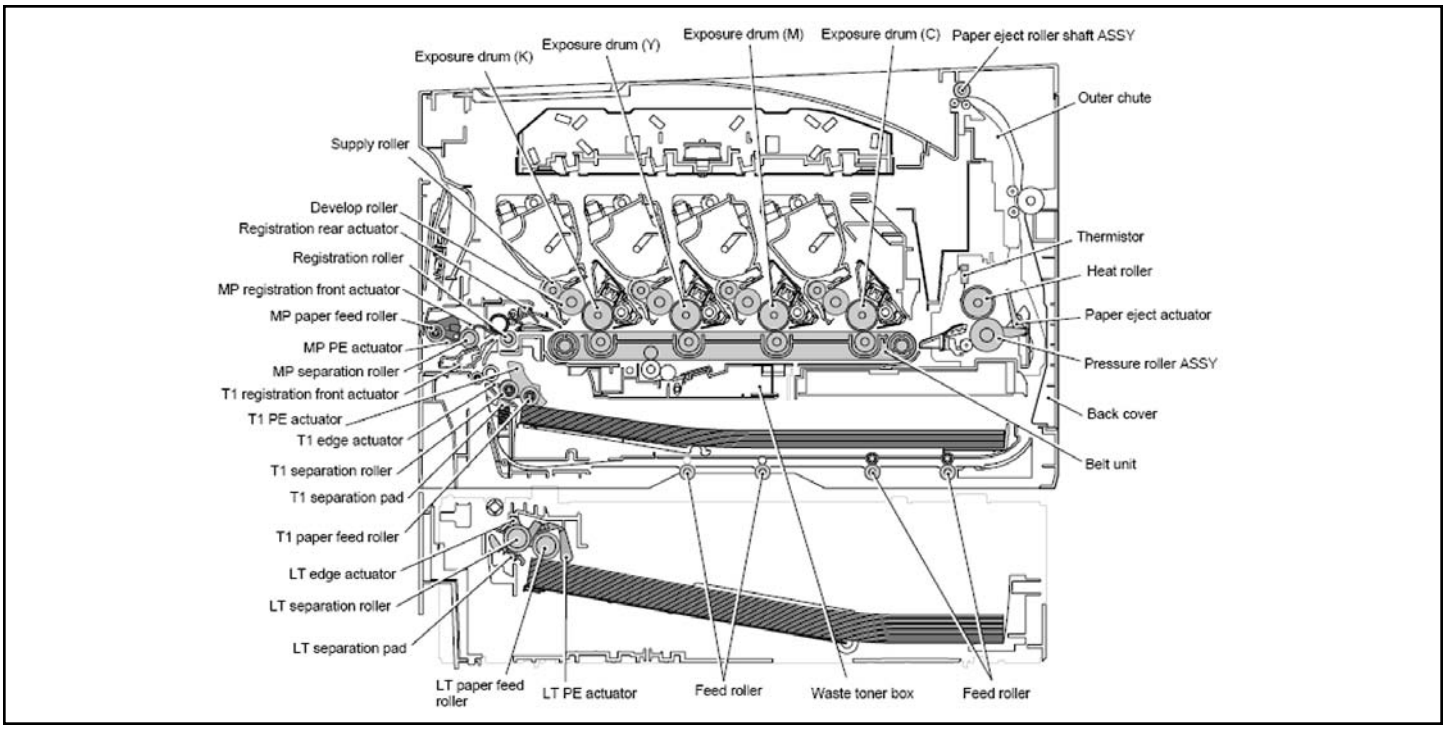
The drum unit is new as well (Part # DR-110CL) and is rated for 17,000 pages. This unit has 4 separate drums laid out in line. It will be covered in a future article. Other consumables are the Transfer belt rated for 50,000 pages, and the waste toner box which is rated for 20,000 pages.

SUMMIT TECHNOLOGIES

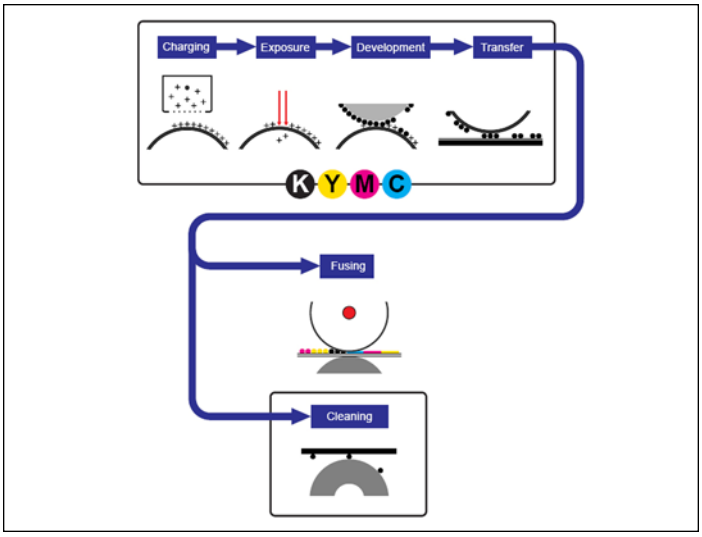
UniNet IMAGING INC.

3232 West El Segundo Blvd., Hawthorne, California 90250 USA • Ph +1 424 675 3300 • Fx +1 424 675 3400 • techsupport@uninetimaging.com • www.uninetimaging.com

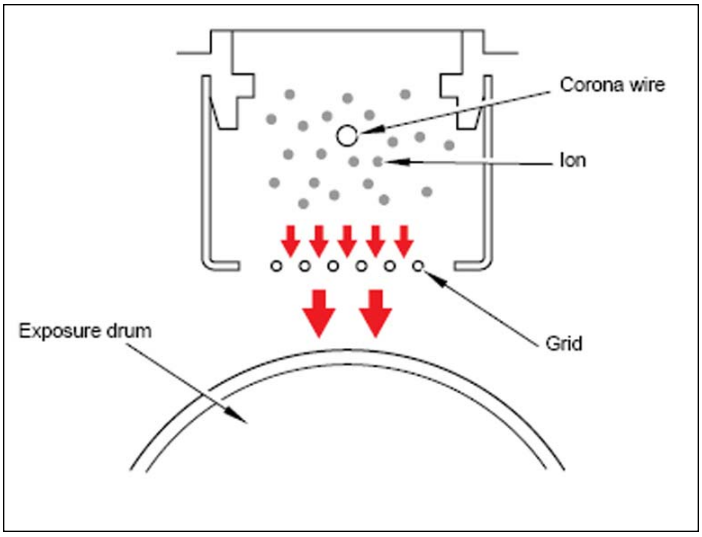
If you're familiar with Brother cartridges, you know they do not work like other manufacturers cartridges. This series of printers is no exception. Because of that, we will cover the **printing theory** here.



Above, a broad overview of the printing process and the component locations. As you can see, these machines use a single pass type system.

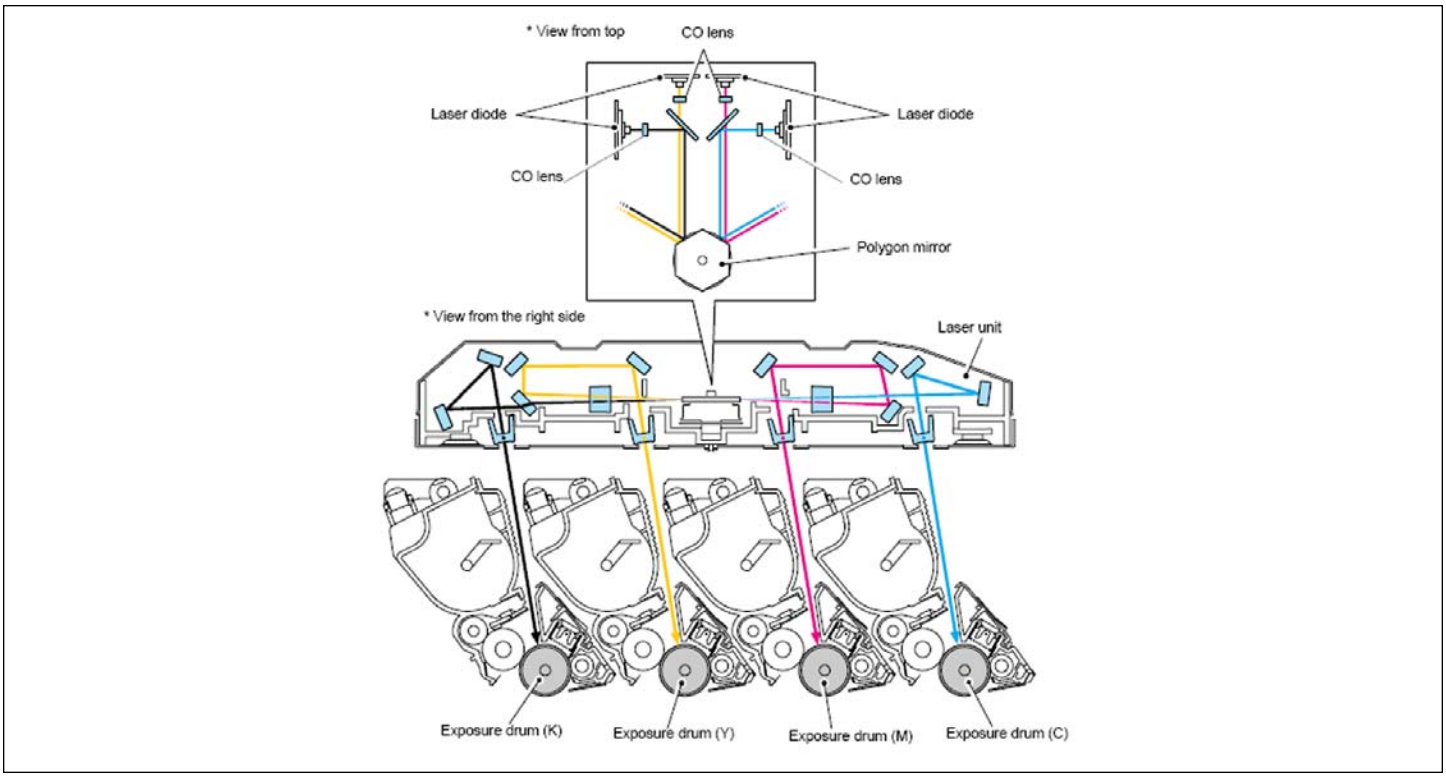


This simple diagram shows the 6 basic steps in the printing process.



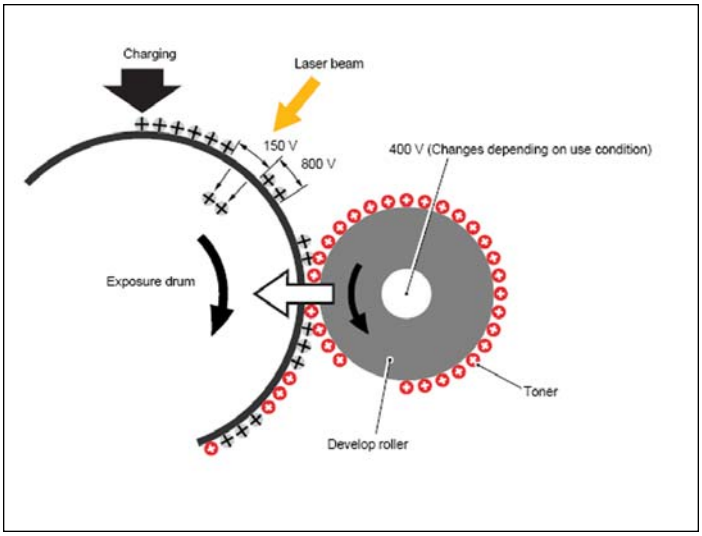
In the **first stage**, the Primary Corona Wire places a uniform 870VDC voltage on the Corona wire grid which then charges the OPC drum surface. The amount of the DC voltage placed on the drum is controlled by the printer's intensity setting.

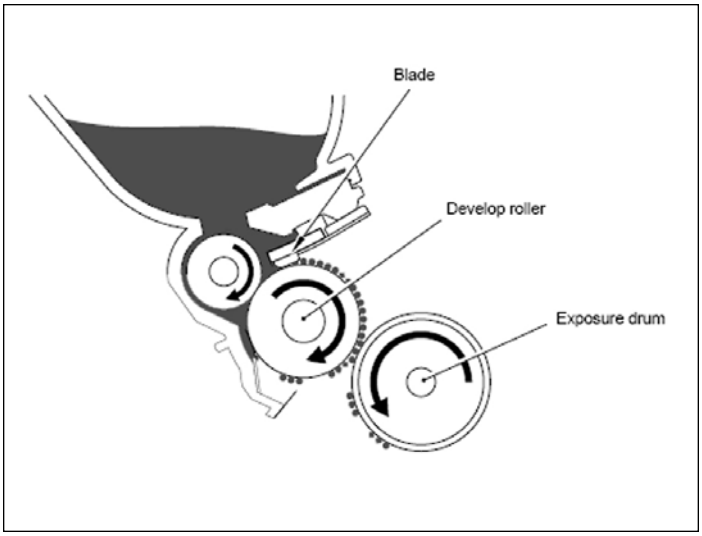
3232 West El Segundo Blvd., Hawthorne, California 90250 USA • Ph +1 424 675 3300 • Fx +1 424 675 3400 • techsupport@uninetimaging.com • www.uninetimaging.com



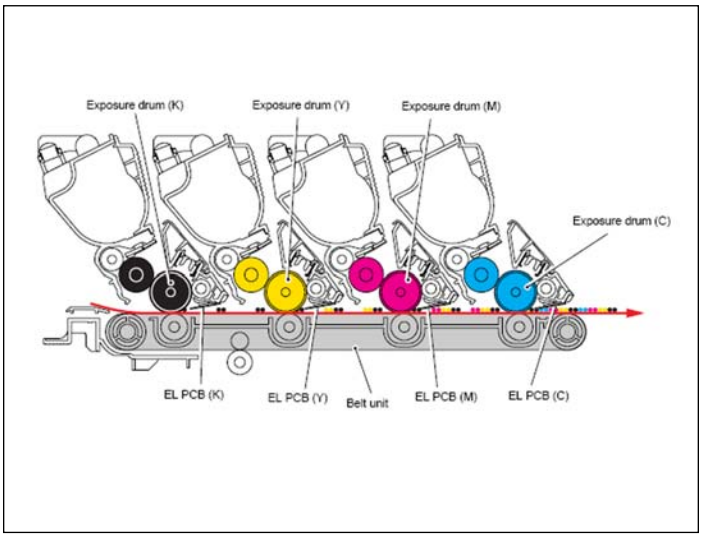
While most manufactures have switched over their production to PCR's to eliminate ozone health issues, Brother states that the amount of ozone expelled from the printer is less than 3.0 mg/h and therefore not harmful to the human body and that applicable safety standards have been complied with.

In the **second stage**, each color laser beam is fired onto a rotating mirror (called the scanner). In this system, 4 separate beams are focused through a series of lenses, bounced off a mirror and then to the scanner motor or polygon mirror as listed in the diagram. The beam then strikes the drums surface, reducing the charge and leaving a latent electrostatic image on the drum. The areas where the laser did not strike the drum will retain the higher charge. This Brother system uses 4 separate laser units and one scanner mirror. The top of the illustration above shows the top view of the different lasers, while the bottom half shows the view from the right side.

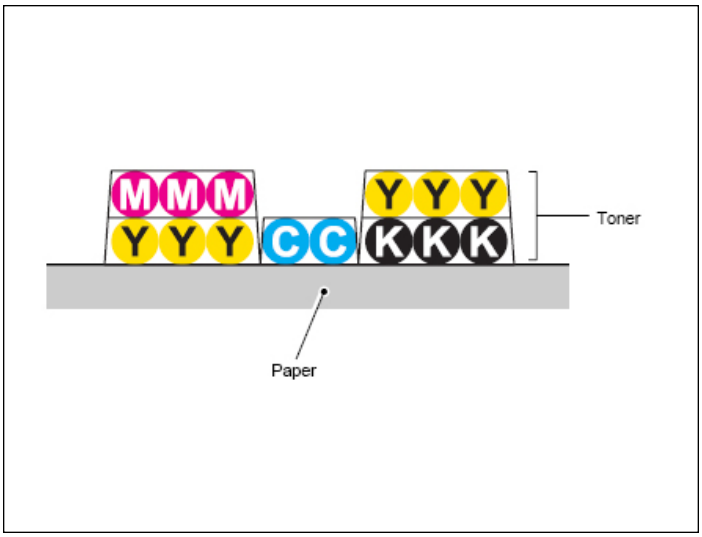




As the laser exposed areas of the OPC Drum approach the developer roller, the toner particles are attracted to the drum's surface due to the opposite voltage potentials of the toner, and laser exposed areas of the OPC drum.

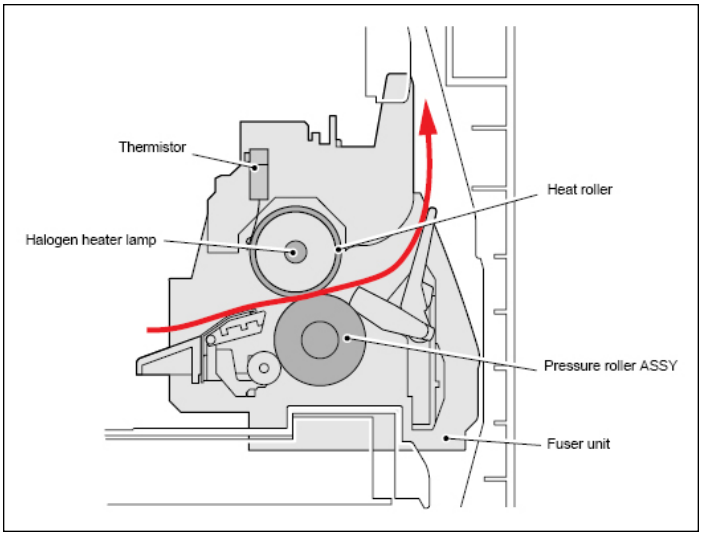


The **fourth stage** is the transfer stage. In the transfer stage the transfer roller which is located directly opposite each OPC drum, places a positive DC bias charge on the back of the Image Transfer Belt. Each toner cartridge has a separate transfer charge roller. The image is transferred from the drum directly to the paper. This process is repeated for each color cartridge in the following order: Black, Yellow, magenta, and cyan.

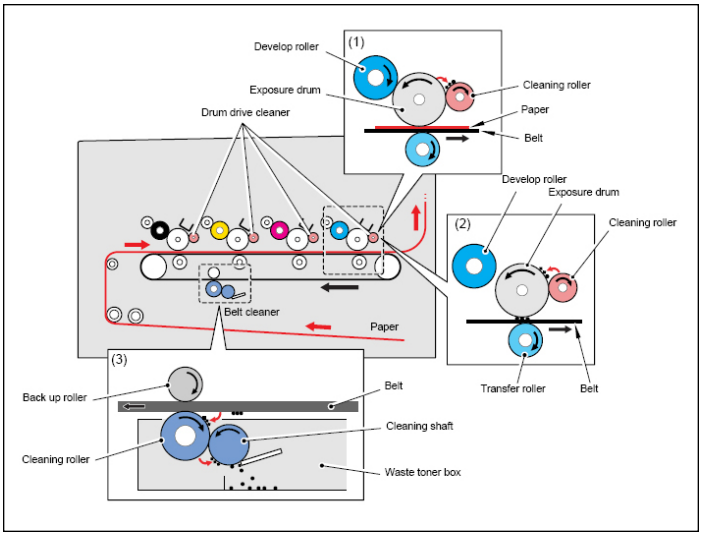


This illustration shows how the different basic colors are stacked to get different colors.

After the transfer takes place, the printer turns on a set of LED lamps that irradiate the drums surface to keep the surface potential constant. This step helps eliminate ghost images.



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 roller and lower pressure roller. The lower pressure roller presses the page up into the upper heating roller which then melts the toner into the paper. This heating assembly consists of a hard metal coated roller with a halogen lamp inside.



The **sixth stage** is where the drum is cleaned. The drum is cleaned after the image is transferred to the paper by a cleaning roller. this roller uses a DC voltage to attract the residual toner off the drum. After the cleaning roller has cleaned the drum, the Dc potential is raised and the toner is then transferred back to the drum, where it is then transferred to the image transfer belt. The waste tone is then cleaned off the belt by the belt cleaning roller, and stored in the belt waste chamber.

While this is taking place, the developer roller is moved away from the drum so that it is not contaminated by the waste toner. This cleaning system while somewhat similar to other brother systems is different in that none of the waste toner is recycled back into the new toner supply.

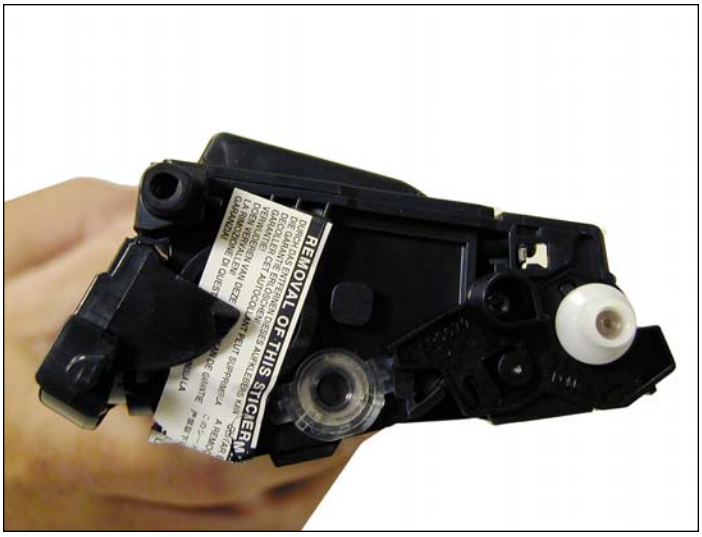
How to run test pages, printer trouble shooting, as well as common cartridge problems will be covered at the end of this article.

Required Tools

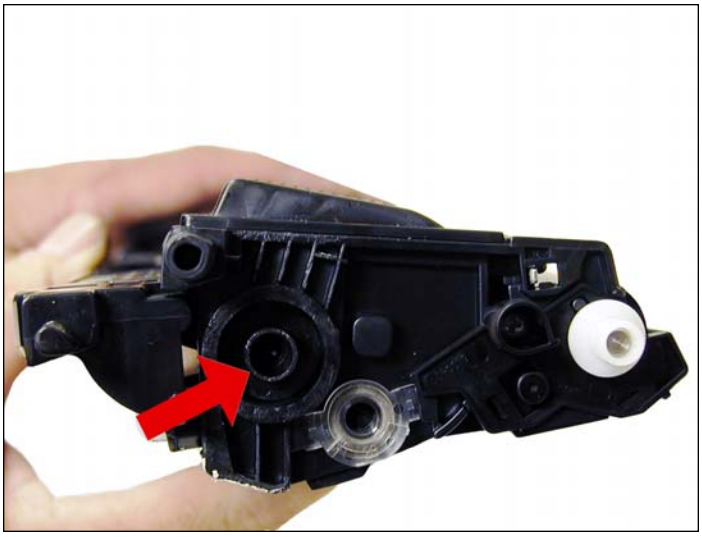
1. Toner approved vacuum
2. Phillips Head Screwdriver
3. Small Common Screwdriver
4. Needle nose pliers

Required Supplies

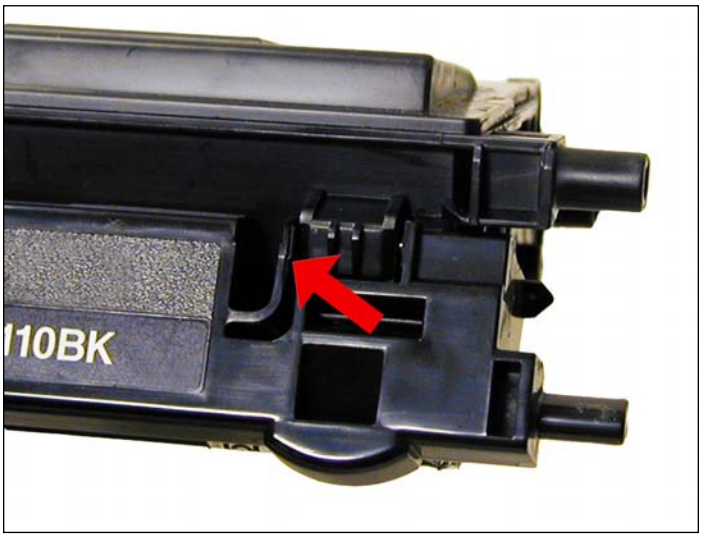
1. Brother HL-4040 Toner Choose the correct color and gram weight for your cartridge
2. Reset gear for the older starter cartridge or if converting a LY to a HY cartridge (See text)
3. Lint free cotton cloths
4. Toner magnet cloths

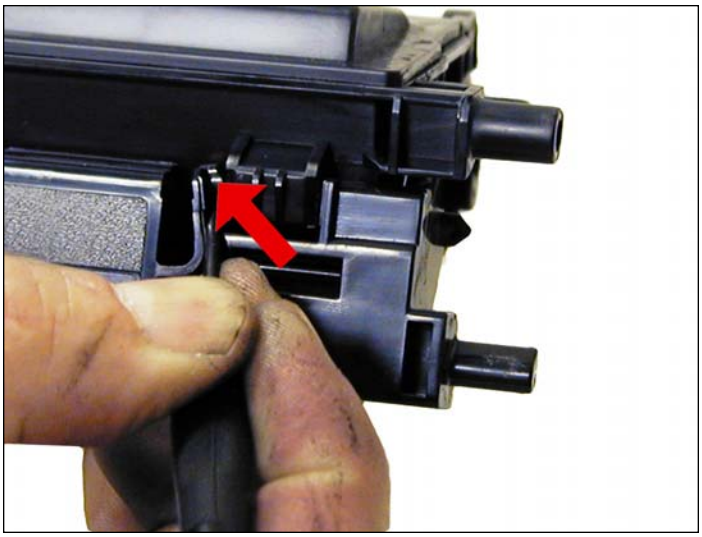


1. Vacuum the exterior of the cartridge. Be careful not to damage the developer roller as it is exposed.

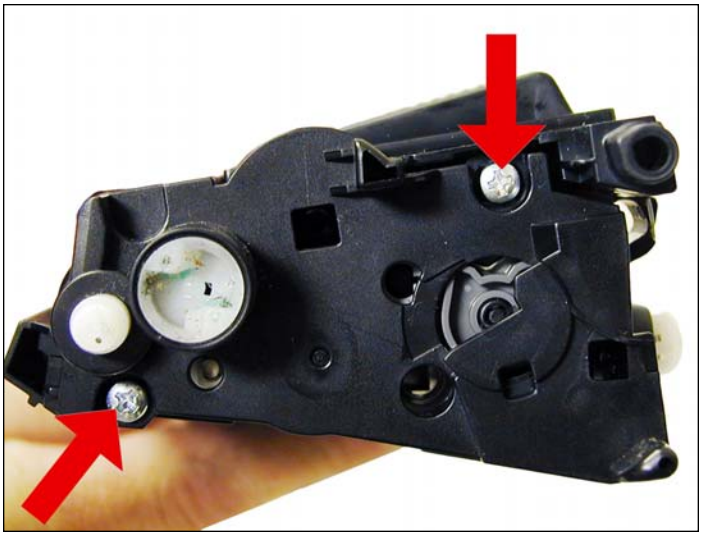


2. Remove the fill plug from the toner cartridge. Dump the remaining toner and vacuum/blow out the cartridge. There will probably be a label over the fill plug. It comes off with a little alcohol and a lint free cloth or cotton swab.

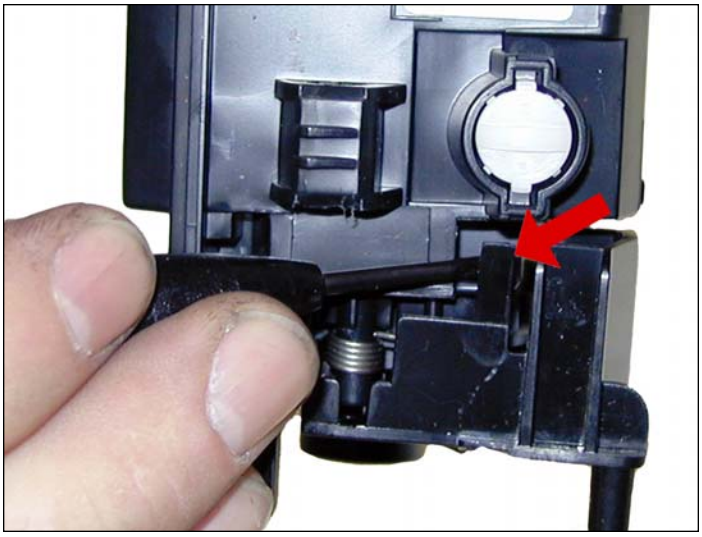




3. Remove the handle by sliding the handle to the right and pulling back on the tab with your finger.



4. With the handle facing you, remove the 2 screws on the left end cap.

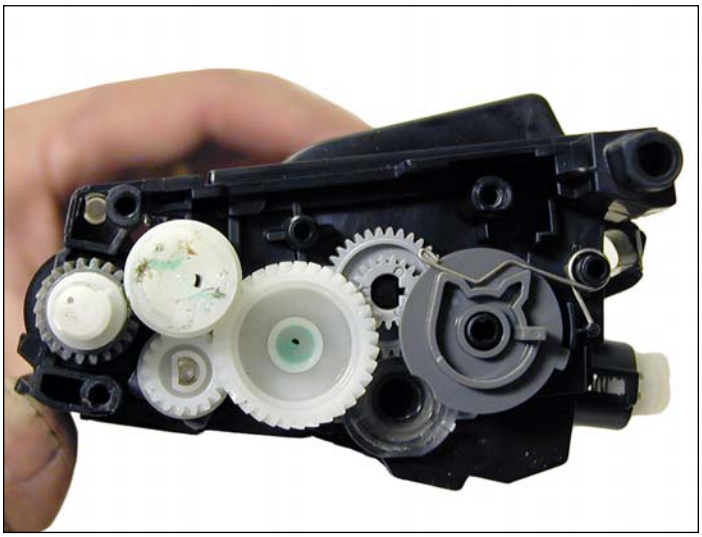


5. Lift up on the tab indicated and remove the end cap.

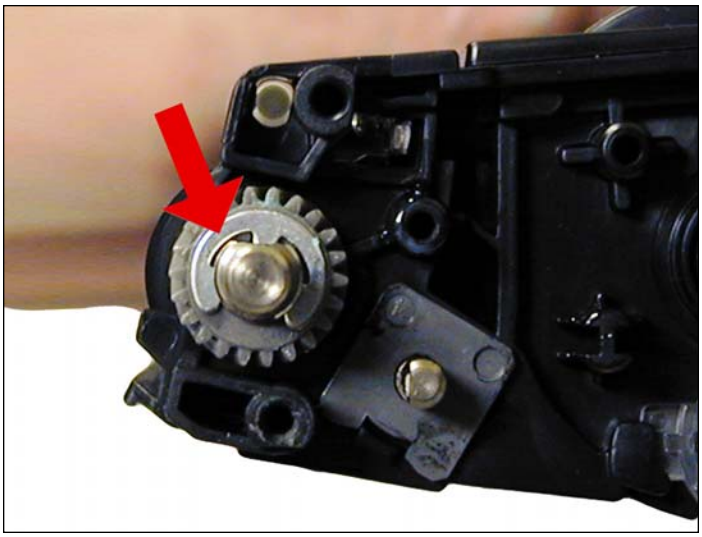
SUMMIT TECHNOLOGIES

UniNet IMAGING INC.

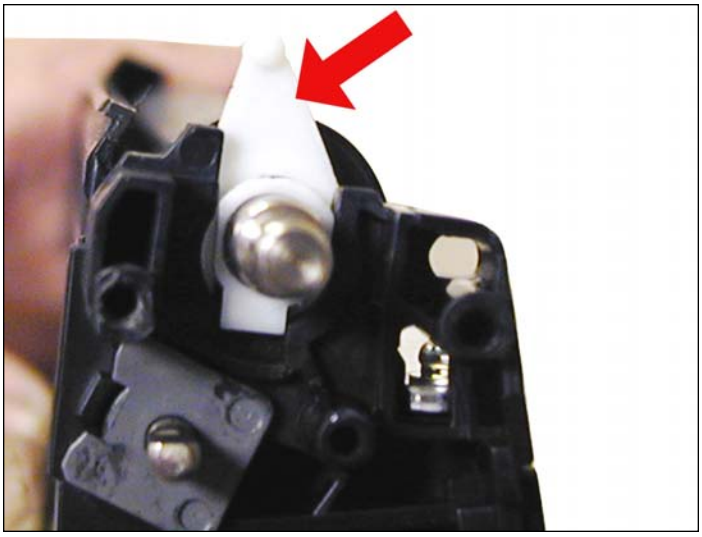
3232 West El Segundo Blvd., Hawthorne, California 90250 USA • Ph +1 424 675 3300 • Fx +1 424 675 3400 • techsupport@uninetimaging.com • www.uninetimaging.com



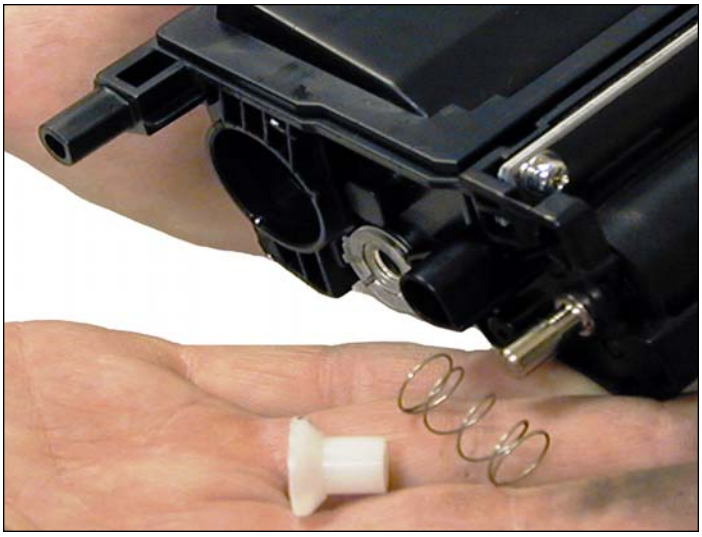
6. Remove all the gears and reset spring.



7. Remove the E-ring and developer roller gear.



8. Move the white plastic locking tab on the right side of the developer roller to the up position.

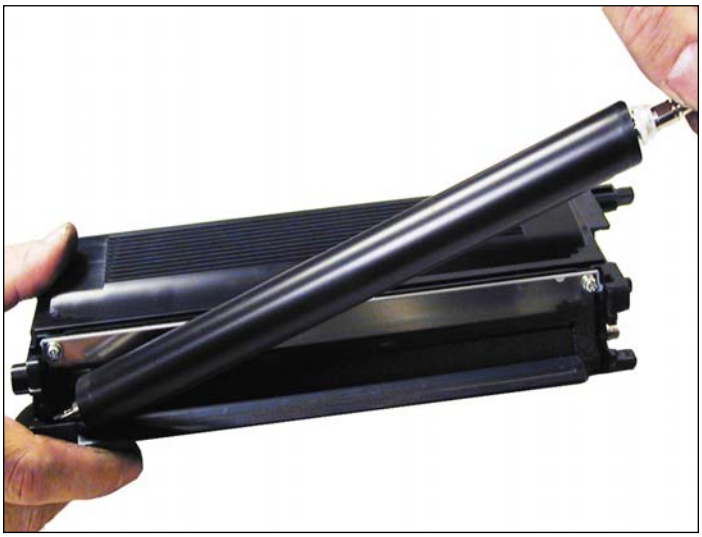


9. Gently pry off the white bushing on the opposite side of the developer roller. Be careful not to lose the spring!

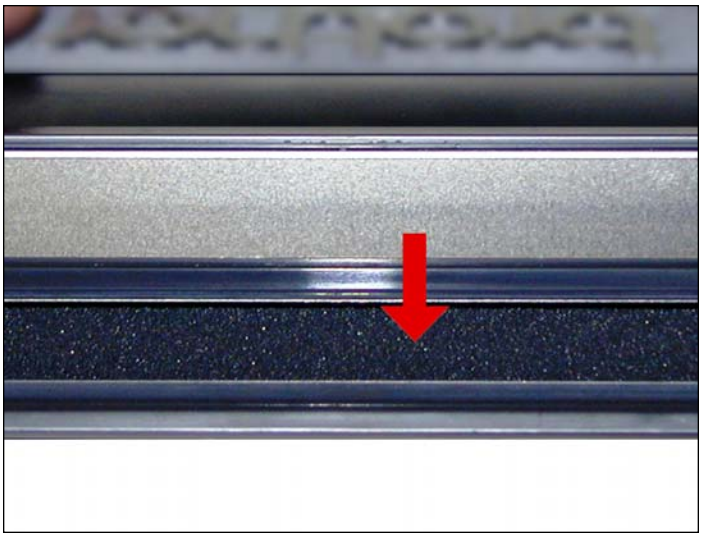
SUMMIT TECHNOLOGIES

UniNet IMAGING INC.

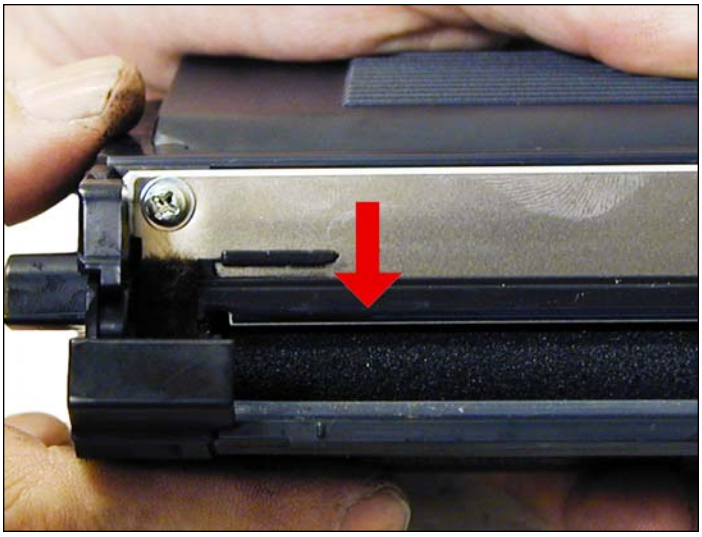
3232 West El Segundo Blvd., Hawthorne, California 90250 USA • Ph +1 424 675 3300 • Fx +1 424 675 3400 • techsupport@uninetimaging.com • www.uninetimaging.com



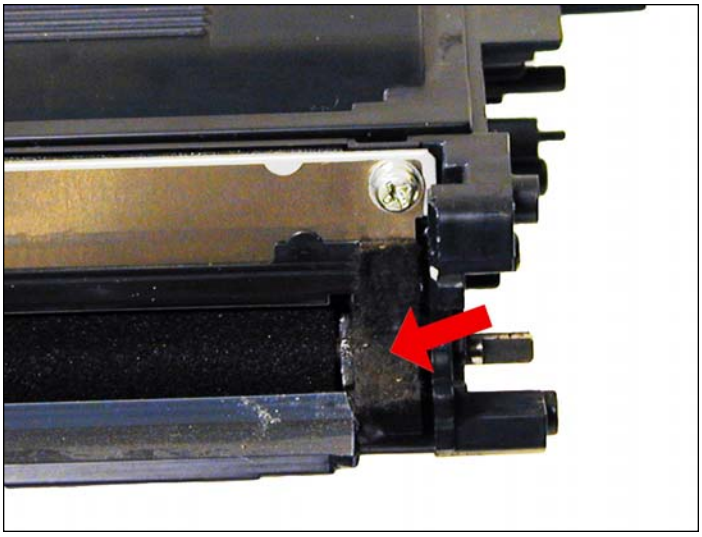
10. Remove the developer roller.



11. Vacuum/blow the cartridge clean. Be sure to rotate the foam feed roller so it is fully cleaned.

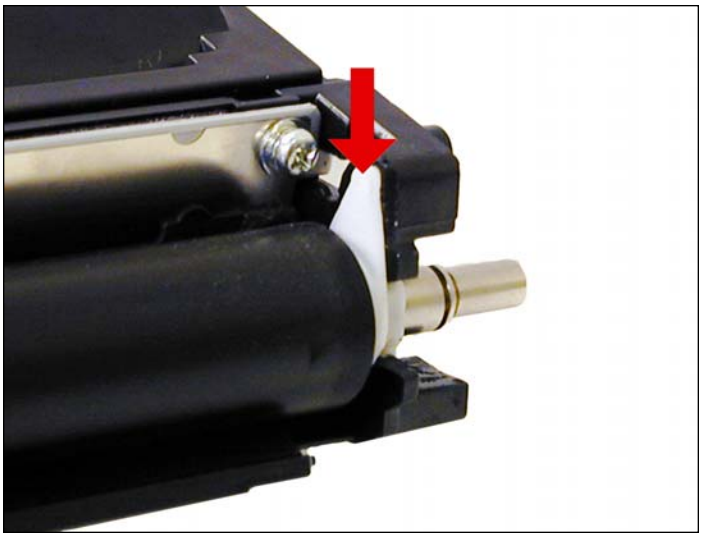


12. Vacuum/blow the doctor blade. We do not recommend that the doctor blade be removed as the developer roller felt seals will be disturbed. Once a new blade is available, great care will have to be taken not to tear the seals causing a leak. The doctor blade can be easily cleaned by blowing the excess toner off, and wiping down with a lint free cloth. Be very careful not to leave any lint behind and do not use any chemicals to clean it!



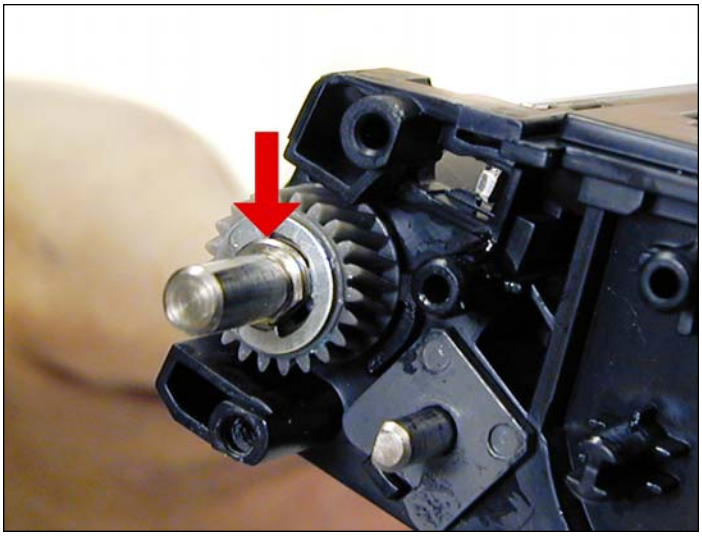
13. Inspect the magnetic roller felts. If they are compressed, (shiny) rough them up with a small screwdriver.

14. Clean the developer roller with a lint free cloth. Do not use any chemicals to clean the roller. A dry, clean, lint free cloth will work fine.



15. Re-install the developer roller long shaft side to the gear side, and white lock pointing up. Turn the lock towards the doctor blade until it locks in place.

16. Install the spring and bushing on the non gear side of the roller. Make sure the bushing moves freely.

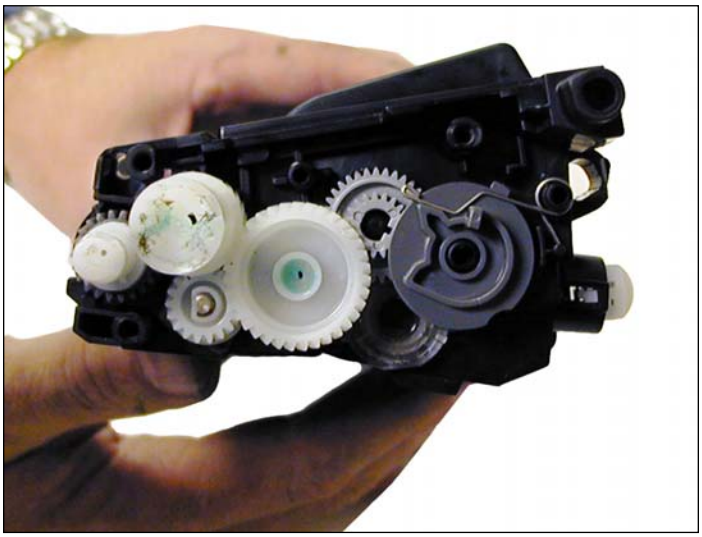


17. Install the developer roller gear and E-ring.

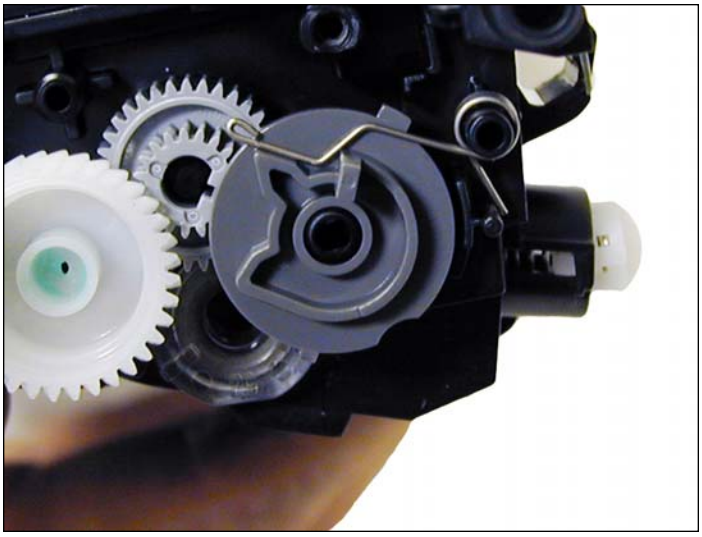
SUMMIT TECHNOLOGIES

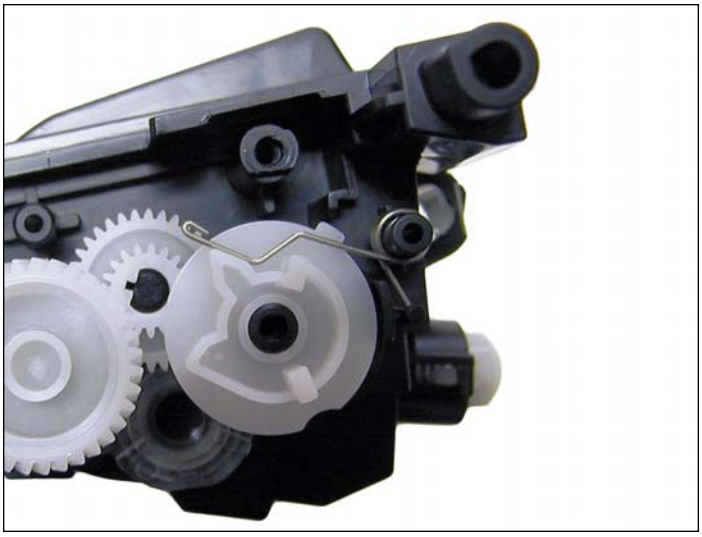
UniNet IMAGING INC.

3232 West El Segundo Blvd., Hawthorne, California 90250 USA • Ph +1 424 675 3300 • Fx +1 424 675 3400 • techsupport@uninetimaging.com • www.uninetimaging.com



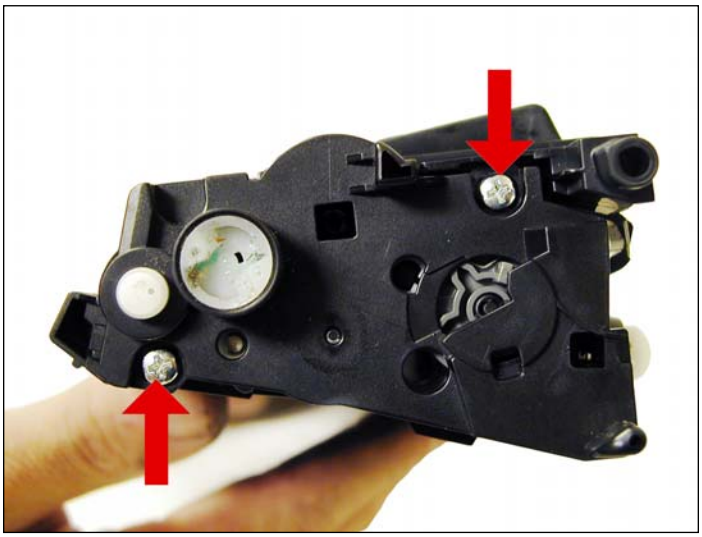
18. Clean the gears, making sure that they have no toner on them. This is a good time to also check the gear shafts to make sure there is enough grease. If the shafts appear dry, or the grease is contaminated with toner, clean the shaft and inside of the gear. Replace the grease with white lithium grease.





19. Set the reset gear and spring as shown. The tail of the spring fits into a notch at the base of the gear. There are different gears for the TN-110 and TN-115. Each should be set as shown.

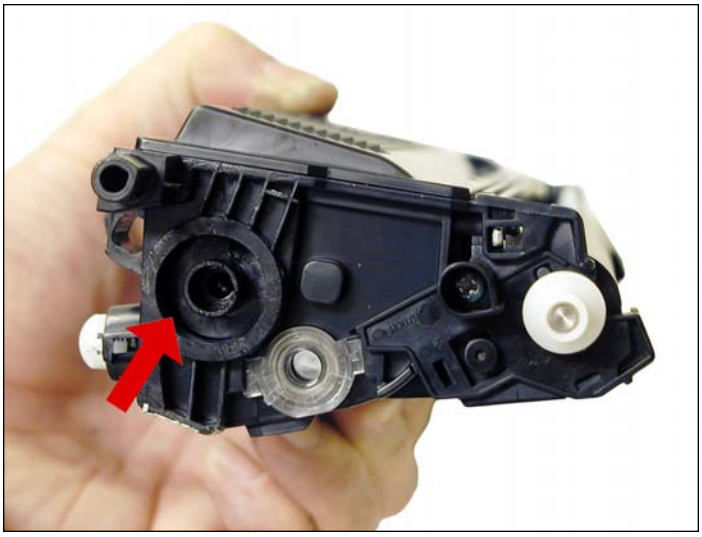
3232 West El Segundo Blvd., Hawthorne, California 90250 USA • Ph +1 424 675 3300 • Fx +1 424 675 3400 • techsupport@uninetimaging.com • www.uninetimaging.com



20. Install the gear cover plate, and two screws.

21. Install the cartridge handle.

22. Fill the cartridge with the appropriate color and amount of Brother HL-4040 toner.



23. Replace the fill plug.

SUMMIT TECHNOLOGIES

UniNet IMAGING INC.

3232 West El Segundo Blvd., Hawthorne, California 90250 USA • Ph +1 424 675 3300 • Fx +1 424 675 3400 • techsupport@uninetimaging.com • www.uninetimaging.com

24. Wipe the cartridge down to remove any remaining toner dust.

25. Install the developer roller cover. This is important as the developer roller is exposed and is easily damaged or contaminated.

PRINTING TEST PAGES

Printer Setting pages:

1. Press the OK button 3 times while the printer is in the READY state.

2. The printer will show “Print Settings/printing” on the LCD. The HL-4040/4050 will run 3 pages; the HL-4070 will run 4 pages.

Drum Cleaning page:

1. Press the UP or DOWN arrows until “Maintenance 31” shows on the display.

2. Press OK - The display shows “drum Cleaning”

3. Load the cleaning sheet into the MP tray

4. Press GO - The cleaning process is started!

MACHINE TROUBLE SHOOTING

All the machine error codes are in plain English so there is no need to go into them here.

REPETITIVE DEFECT CHART

Developer roller	37.4mm
OPC Drum	75.0mm
Upper fuser roller	78.5mm
Lower Pressure roller	78.5mm

3232 West El Segundo Blvd., Hawthorne, California 90250 USA • Ph +1 424 675 3300 • Fx +1 424 675 3400 • techsupport@uninetimaging.com • www.uninetimaging.com