

# BROTHER® HL-2240 • 2270 • TN420 • 450 TONER CARTRIDGE REMANUFACTURING INSTRUCTIONS



BROTHER® TN450 TONER CARTRIDGE

# REMANUFACTURING THE BROTHER HL-2240/2270 SERIES TN420/450 TONER CARTRIDGES

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Released in November 2010, the Brother HL-2270 printer engine is based on a new 24/27 ppm, 1200 dpi laser engine. These machines have a first page out in less than 8.5 seconds, and come standard with 8 Mb or 32 Mb of memory depending on the machine. The HL-2270DW printers also have duplexing built in. Our HL-2270DW machine came with a starter cartridge which is rated for 700 pages (a low yield TN cartridge without a reset gear).

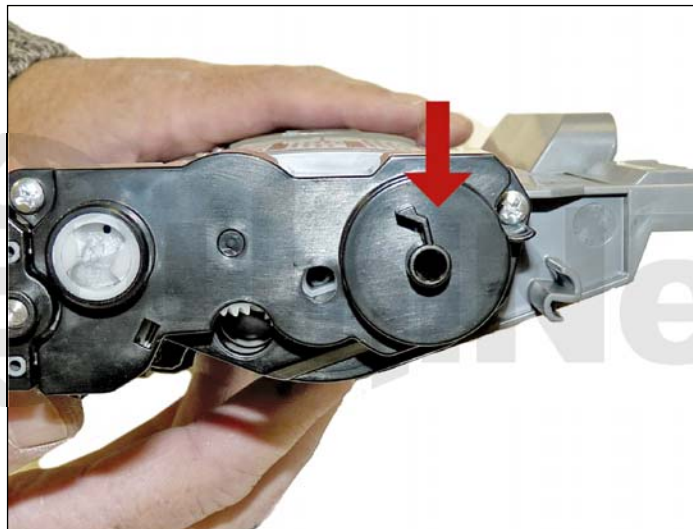
The first section of this article covers the theory behind these cartridges. The first three paragraphs have some interesting information on the reset gears and how they work. The drum cartridges in this engine have had a major change which effects the cleaning of the toner cartridge. This is all explained in the theory section.

## CURRENT MACHINES RELEASED SO FAR

<b>DCP-7055</b>	<b>DCP-7060D</b>	<b>DCP-7065D</b>	
<b>HL-2130</b>	<b>HL-2220</b>	<b>HL-2230</b>	<b>HL-2240</b>
<b>HL-2240D</b>	<b>HL-2270DW</b>	<b>HL-2280DW</b>	
<b>MFC-7360N</b>	<b>MFC-7460DN</b>	<b>MFC-7860DW</b>	

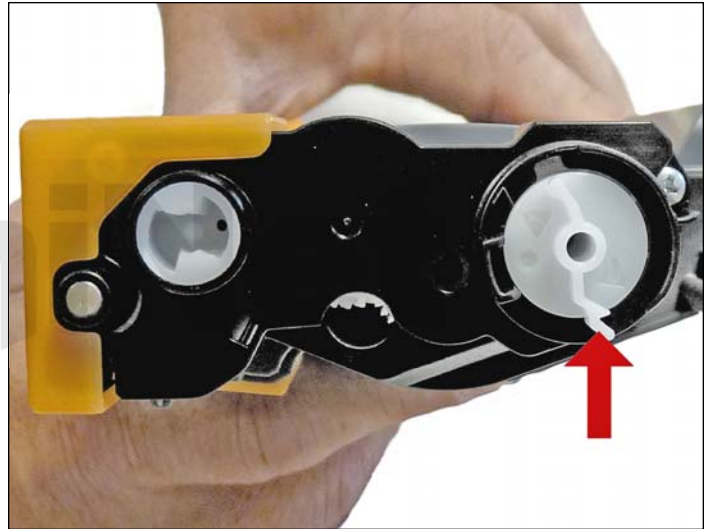
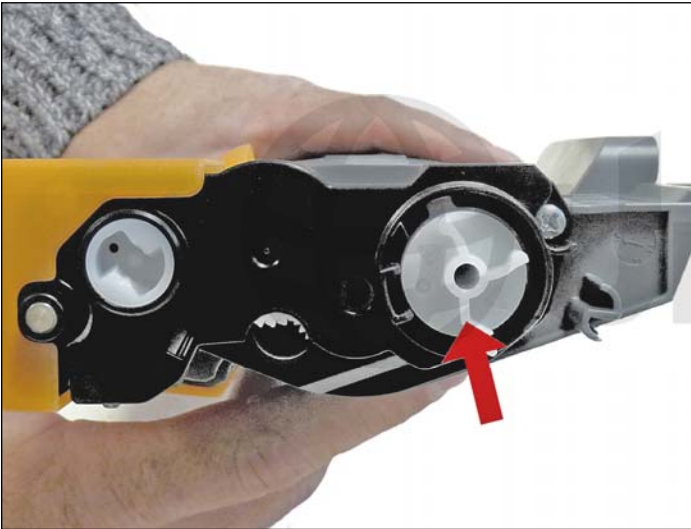
Besides the starter cartridge, there are two different yielding toner cartridges available for these machines: the **TN420** and **450** (TN2210/2220 Europe). The **TN420** cartridge is rated for 1,200 pages at 5%, and the **TN450** is rated for 2,600 pages at 5%. The **drum unit DR420** (DR-2200 Europe) is new as well, and is rated for 12,000 pages. It will be covered in a separate article.

The fuser assembly, paper feed assembly and laser units all have a stated life of 50,000 pages. The printer itself is rated for 50,000 pages, so basically when these parts are done so is the printer.



There is a reset gear (pictured here) that resets the printer each time a new toner cartridge is installed.

In our machine, the starter cartridge was marked just "TN" and had the reset gear section completely blocked off.



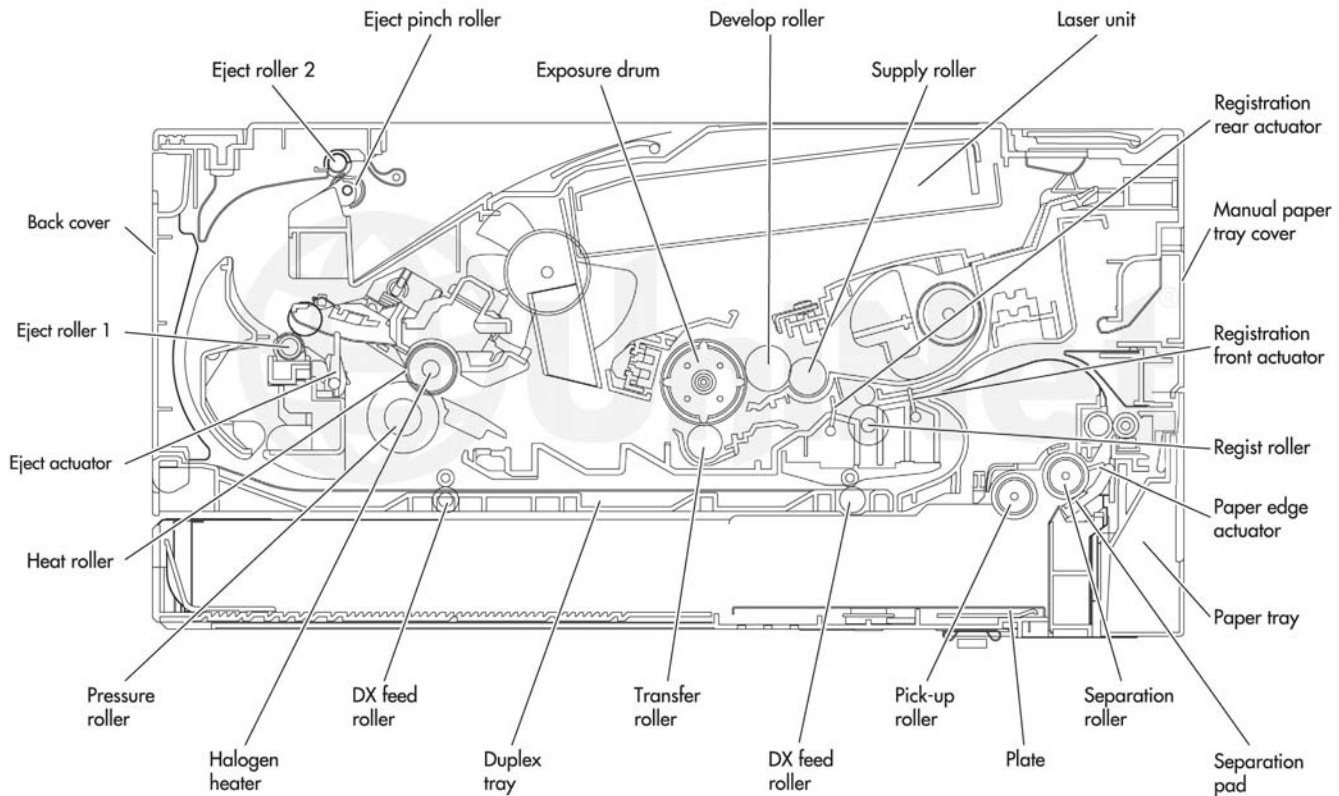
In order to recycle starter cartridges, the proper reset gear and the end cap must be replaced. Both the TN420 and the TN450 cartridges use different reset gears. The TN420 gears have three flags on them, versus two flags for the TN450. That is how the machine knows if there is a standard or high yield cartridge installed. New reset gears and an end cap are available, so that low yield cartridges can be made into high yield, and starter cartridges can be recycled into either one.



These cartridges also use a completely new developer roller cover, as shown here.

An interesting point in the reset process is what happens in addition to the counter being reset. 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 gradually reduced down. 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. Each time a new cartridge is installed, the bias voltage is reset to the high voltage point, and the cartridge page count is reset to zero. Since different yields would dictate different decreases in density over time, Brother uses different reset gears. This was also done in other Brother cartridges, but after a time Brother just went with the high yield gear for both cartridges. Time will tell on what they do with these cartridges.

## FRONT SIDE



The above diagram shows how the toner and drum cartridges relate (position-wise) to the rest of the printer.

### BASIC BROTHER PRINT THEORY

**IMPORTANT!!!** Brother print systems have always been different, and this one is no exception. It's even different from the traditional Brother systems. In the past, the drum cartridge had a "charge brush" that attracted the waste toner to it, and at the correct time repelled it to the drum so the developer roller could pick it back up. This cartridge has done away with this charge brush! There is no mention of any theory in the service manual, so we are looking into (many of) Brother's patents to see how this works now.

Our personal educated guess is that the developer roller has always put the toner out there for the drum to print with, and they have always picked up the waste toner from the charge brush through the drum. We believe that Brother has just eliminated the "middle man" so to speak. The developer roller still presents the good toner in the same way, but it is also picking up the waste, all at almost the same time. Time will tell, but if this is how it works, then the multi use life of the drum cartridge has been greatly extended. This is a simpler, but also timing wise, much more complicated system. As we investigate further, we will update these instructions again.

The cartridge theory below has been modified to fit the explanation above. We also left in the charge brush theory so you see what the previous potential issues were. This is all important to know as failure to clean the toner cartridges properly causes backgrounding. I believe this will still be the case, but the culprit this time will be the developer roller, instead of the charge brush. It is more important than ever to clean out the toner cartridge properly, and to also make sure the developer roller is clean. There are dedicated brother developer roller cleaners on the market that are perfect for this. We do not recommend any kind of alcohol as it will remove some of the conductive layer and cause issues with density and now also backgrounding.

The cleaning section of typical Brother drum cartridges, consists of a "cleaning brush" and a recovery blade. This brush has two opposite charges placed on it during the print cycle. The first attracts any remaining toner off the drum. The second repels the toner off the brush back onto the drum where it then transfers back into the toner cartridge. This is all done in a timing sequence that does not interfere with the printing process. If the cleaning brush becomes contaminated with bad toner that will not charge, the brush will not be able to clean itself and backgrounding will occur. It seems to be the nature of contaminated toner that it will accept most of the charge to be cleaned off the drum, but it will not accept the charge that would allow the brush to clean itself off at all. A properly working cleaning brush will at any given time have only a small amount of toner on it. Once contaminated, toner will accumulate, which will only cause the problems to get worse.

Since the developer roller actually contacts the drum, some toner is transferred back into the supply of the toner cartridge. Once you print with a bad toner cartridge, the drum unit will become contaminated. Even when you change out the toner with a good properly recycled or new OEM cartridge, the drum unit will transfer some of the bad toner back into the good toner cartridge, which will again cause backgrounding. Both cartridges will be contaminated again.

The DR420 drum cartridge, since it does not use a charge brush, has the reverse charge on the developer roller which allows it to pick up the waste toner from the drum. Again, it will be critical for the developer roller to be clean!

The rest of the print theory is the same as previous engines: the remaining 80 grams, or so, of "toner" in the toner cartridge is just below the bare minimum that can maintain the proper charge level. When the "change toner" light comes on, the toner will not charge up to the proper level and will cause the backgrounding. As the toner cartridge reaches the end of its useful life, the printer senses the low charge level in the toner supply and will try to keep the charge level up. This constant charging keeps an almost "empty" cartridge from backgrounding. Once the printer cannot get the remaining toner up to the minimum charge, the "change toner" light comes on. The cartridge at this point will still be printing properly. If you were to take that same cartridge out of the machine for a few days, and then put it back in the printer without doing anything to it, the cartridge will shade. This will happen because the charge level that the printer was trying so hard to keep up has dissipated out and the materials left can no longer accept a proper charge.

### WHAT DOES THIS ALL MEAN?

1. Make sure that your cartridge technicians thoroughly clean out the supply chamber of the toner cartridge.
2. In the event that they forget, and you have a shading cartridge. The toner must be completely cleaned out again (do not use the toner over!) and NEW fresh toner MUST be installed.
3. The developer roller must be cleaned with a dedicated developer roller cleaner.

According to our tests, there will be approximately 50-60 grams of toner left when the cartridge is spent, which is normal. The remaining toner, however as stated above, is waste-only and must be thrown out, or there will be backgrounding issues.

How to run test pages, printer troubleshooting, common cartridge problems, as well as how to read the cartridge serial number will be covered at the end of this article.

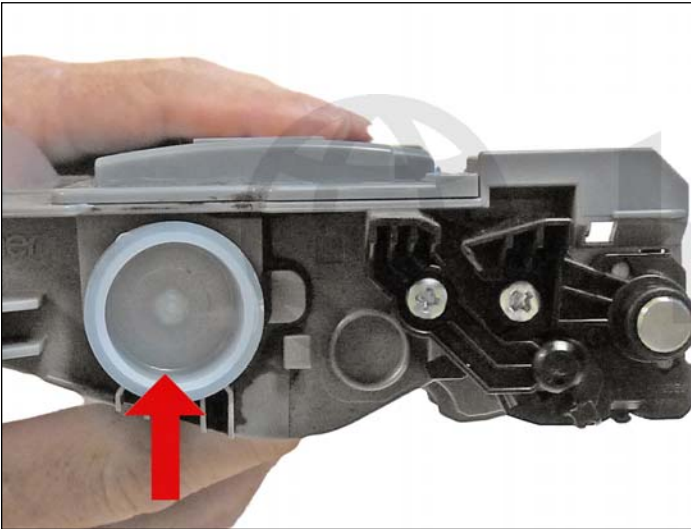
### REQUIRED TOOLS

1. Toner approved vacuum
2. Phillips head screwdriver
3. Small common jeweler's screwdriver
4. Needle nose pliers

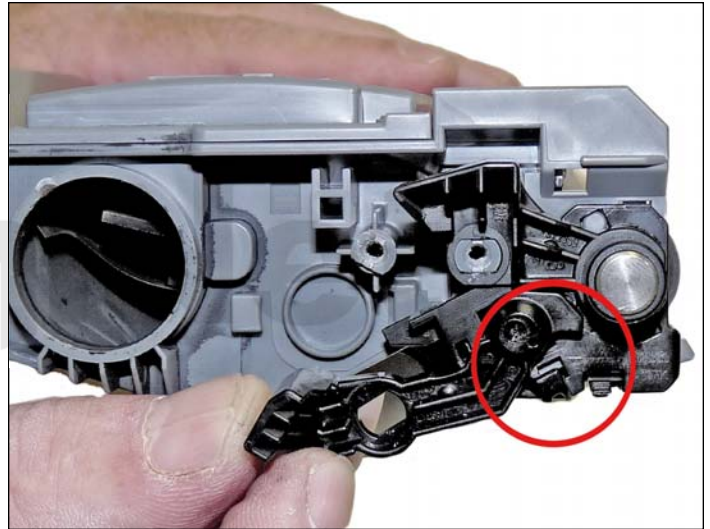
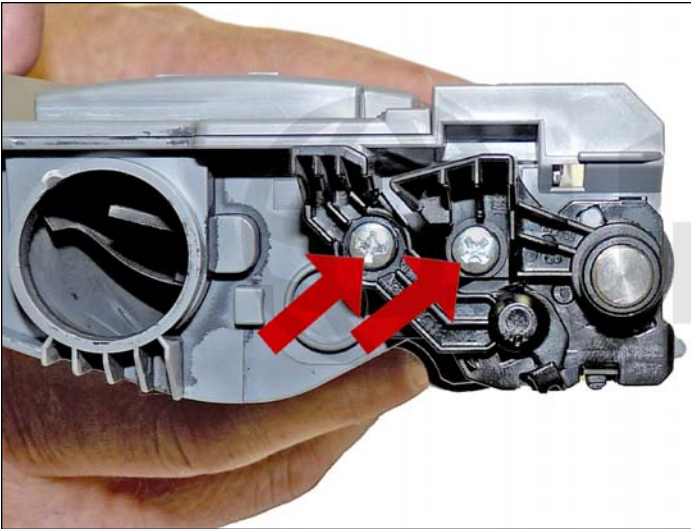
### REQUIRED SUPPLIES

1. Dedicated black toner for use in Brother TN420/450
2. Developer roller cover
3. Lint-free cotton cloths
4. Toner magnet cloths
5. White lithium grease





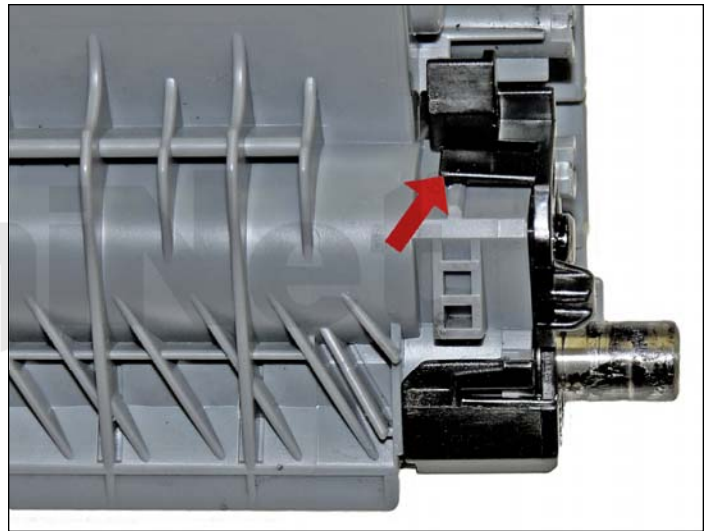
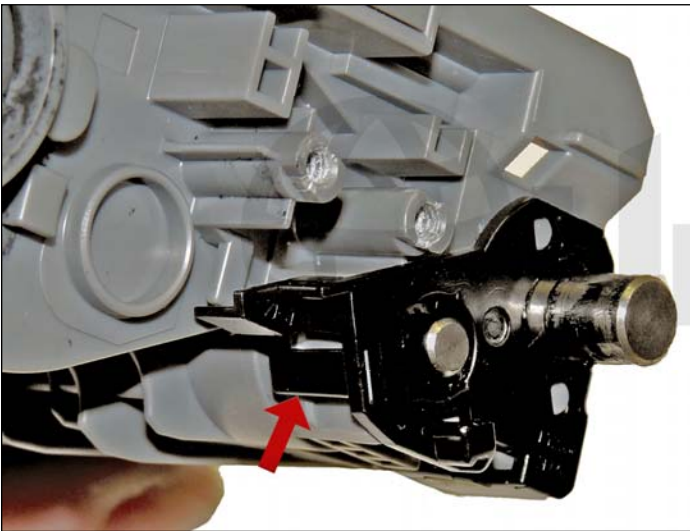
1. Vacuum the exterior of the cartridge. Remove the fill plug from the toner cartridge. Dump the remaining toner and vacuum/blow out the cartridge. Even though on these cartridges the gears are covered, we have found it best to keep one hand over the gear side to protect them.



2. On the non-gear side of the developer roller, remove the two screws.

Remove the two plastic arms.

The smaller arm needs to be turned to release the lock.

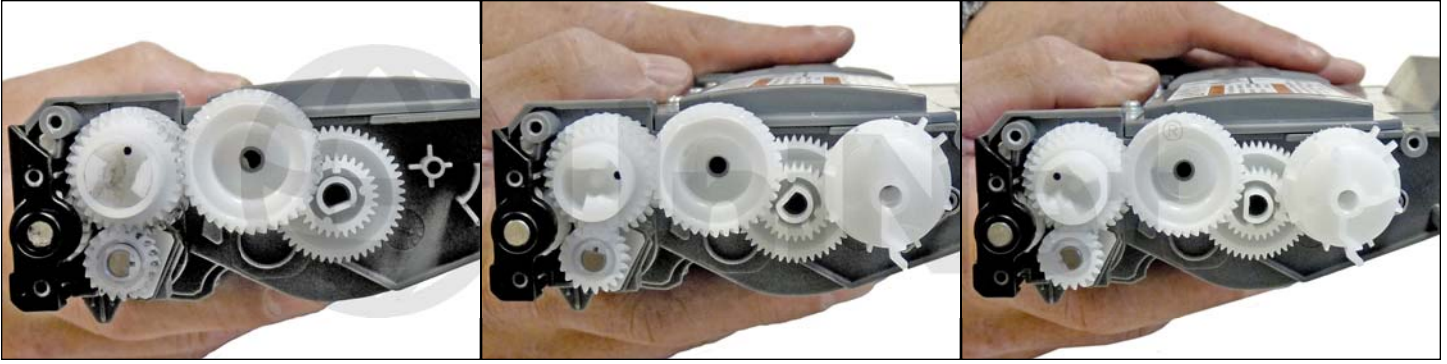


3. Remove the drum axle plate by lifting up on the two tabs as indicated.

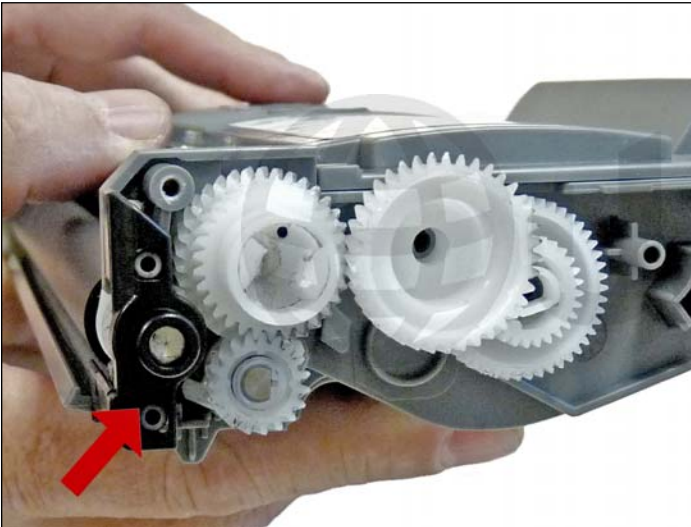
Pry the plate off.



4. On the gear side, remove the two screws and cover plate.



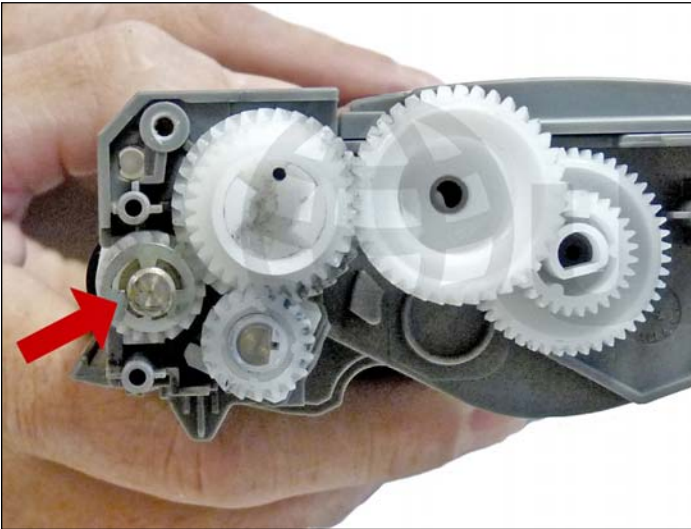
5. The reset gear is spring loaded and must be positioned correctly for the printer to accept a new cartridge. Our printer came with a starter cartridge that did not have a reset gear, and the end cap blocked us from adding a new one in. Starter cartridges will need to have a reset gear and replacement end cap before they can be used. As stated before, the TN420 and TN450 cartridges both have different reset gears. All three types are shown here.



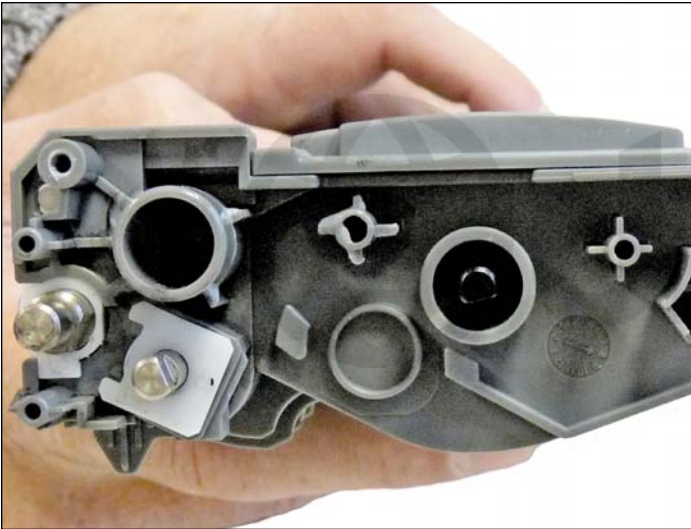
6. Remove the black plastic spacer from the developer roller shaft.

Press in on the back tab to release.



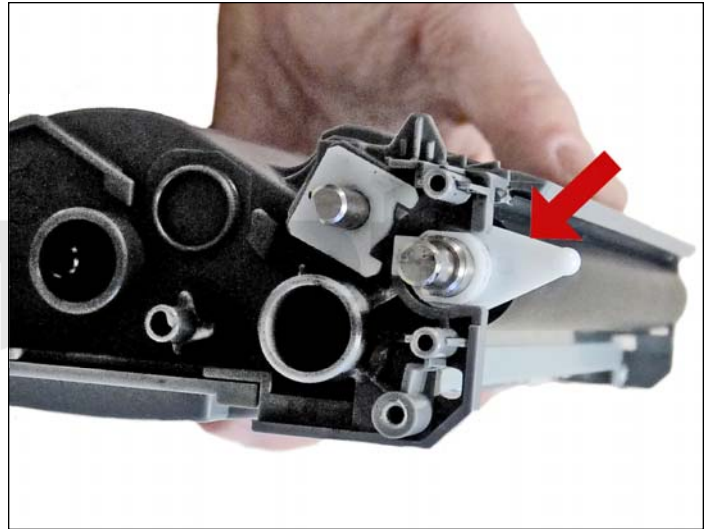
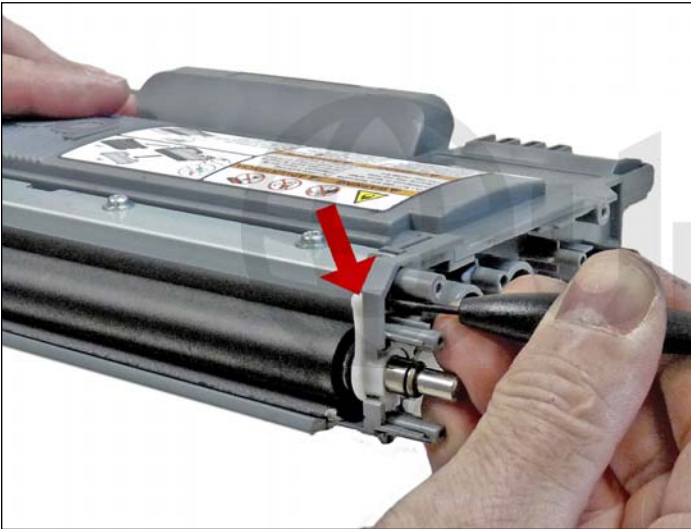


7. Remove the E-Ring.



8. Remove all the remaining gears.

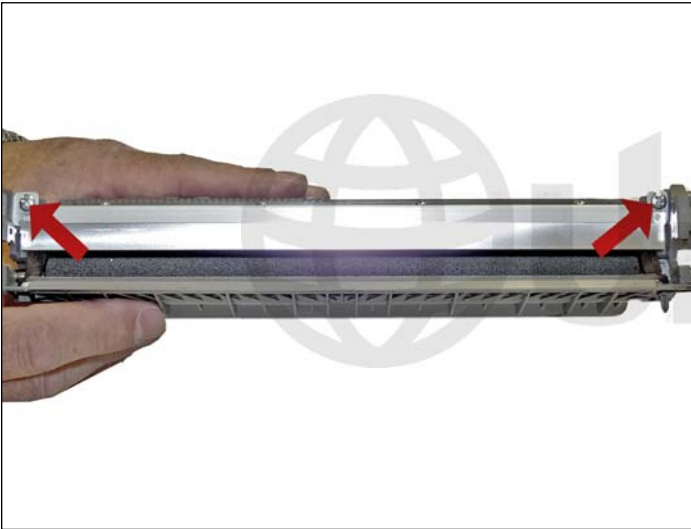
Do not lose the reset gear spring!



9. On the gear side of the developer roller, press in on the locking tab, and rotate the developer roller lock up.

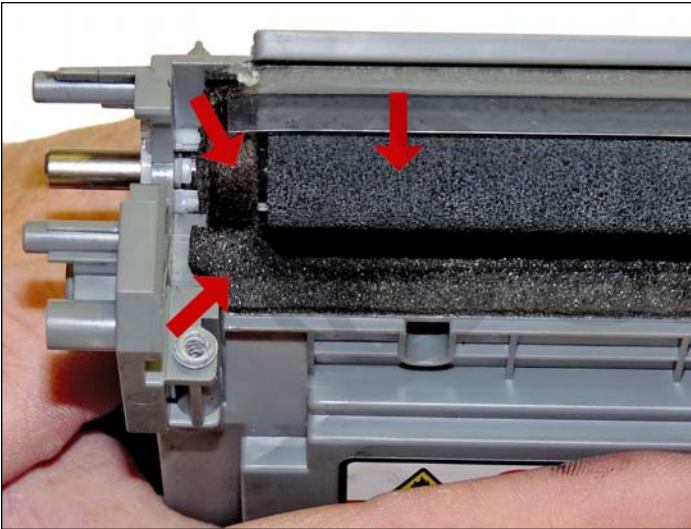


10. Remove the developer roller.



11. Remove the two doctor blade screws and the doctor blade.

Unlike previous TN cartridges, the doctor blade is not physically attached to the seals, so it can be removed for cleaning.



12. Completely remove all remaining toner from the toner hopper, foam feed roller, and the doctor blade foam seals.





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



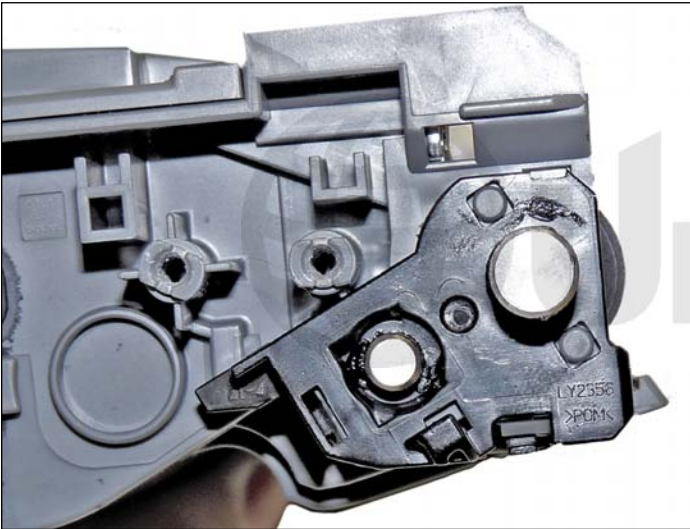
14. Carefully wipe the doctor blade down with a lint-free cloth. Be very careful not to bend or damage the blade in any way. Install the blade and two screws.



15. Clean the developer roller with a lint-free cloth and a dedicated developer roller cleaner for Brother rollers. Do not use any chemicals other than a dedicated cleaner for Brother rollers to clean the roller. Re-install the developer roller long-shaft side to the gear side, with the white lock pointing up. Turn the lock towards the doctor blade until it locks in place.

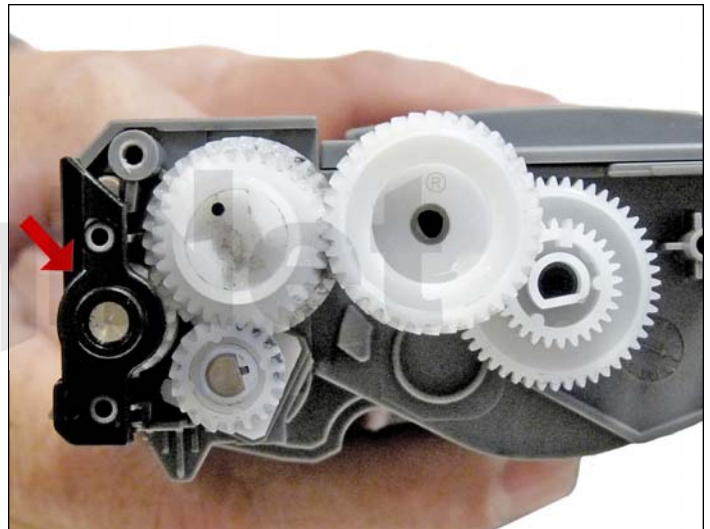
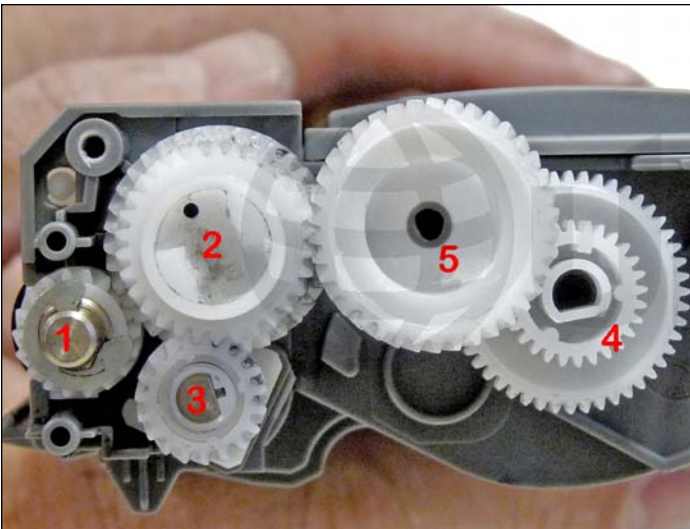




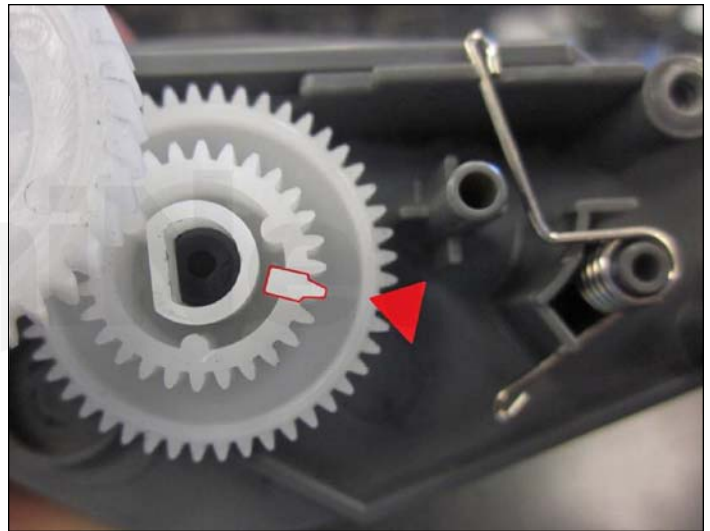
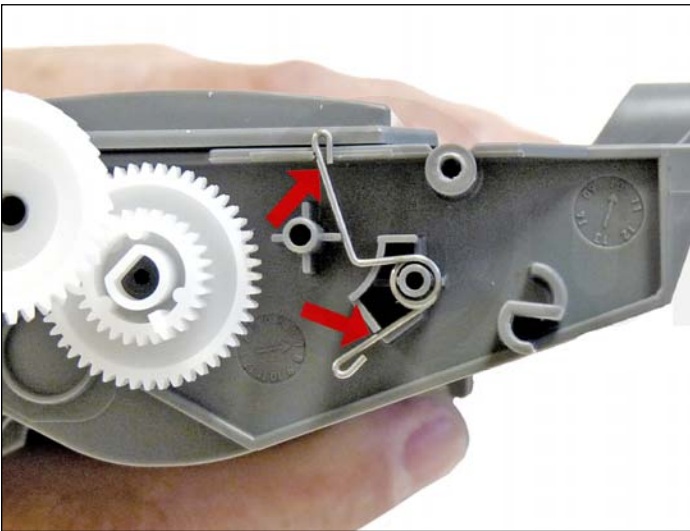


16. Install the non-gear side axle plate.

Make sure the tabs lock in place.



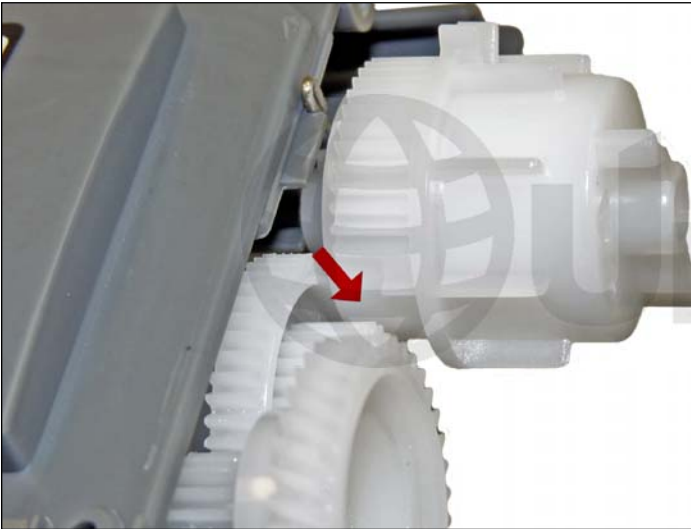
17. Clean the gears, making sure that they have no toner on them. This is a good time to also check the gear shafts to make sure there is enough grease. If the shafts appear dry, or the grease is contaminated with toner, clean the shaft and inside of the gear. Replace the grease with white lithium grease. Install the developer roller gear, E-ring, black axle spacer, and the rest of the gears in the order shown. Make sure all the gears are meshing properly.



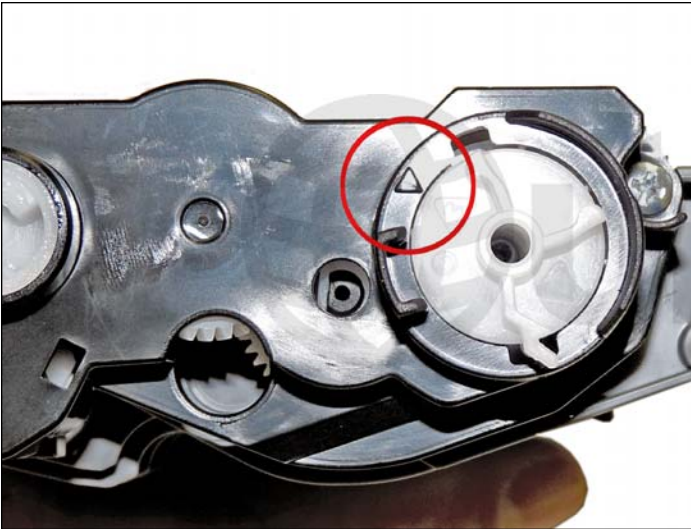
18. Set the reset gear spring as shown, ensure the actuator gear is in the following position



19. Depending on the cartridge you have, set the reset gears as shown for the TN420 (left image) and TN450 (right image).



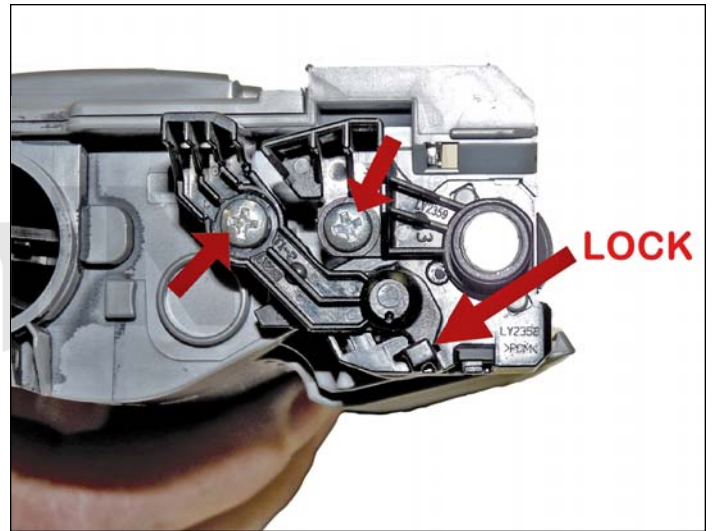
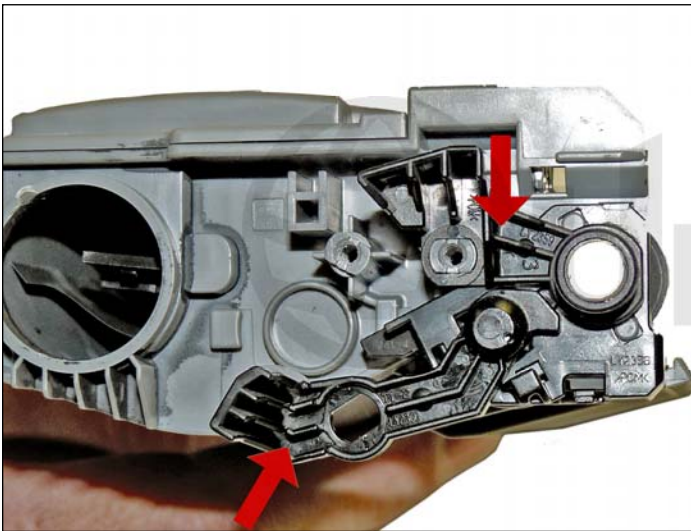
Note that the gear teeth are not meshed when set, which is how it should be. The gear is spring loaded and will turn when driven by the printer.



20. Install the gear cover plate, and two screws as shown for the TN420 (left image), or for the TN450 (right image).

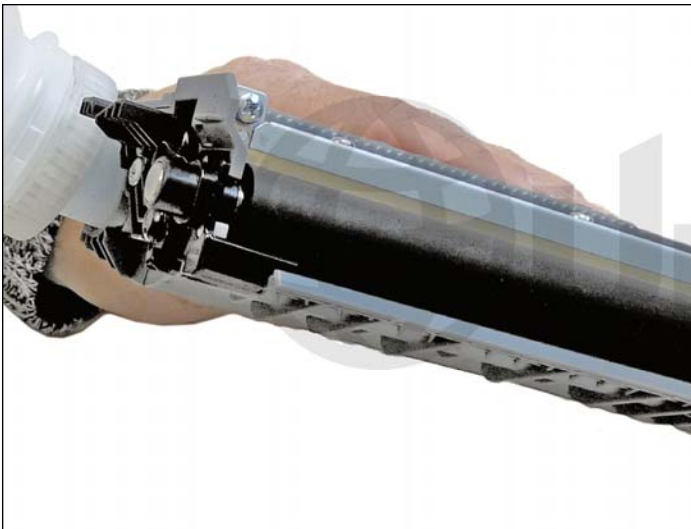
Make sure the black arrow on the cover is aligned with the white arrow marked #3 on the TN420 gear, or #1 on the TN450 gear.



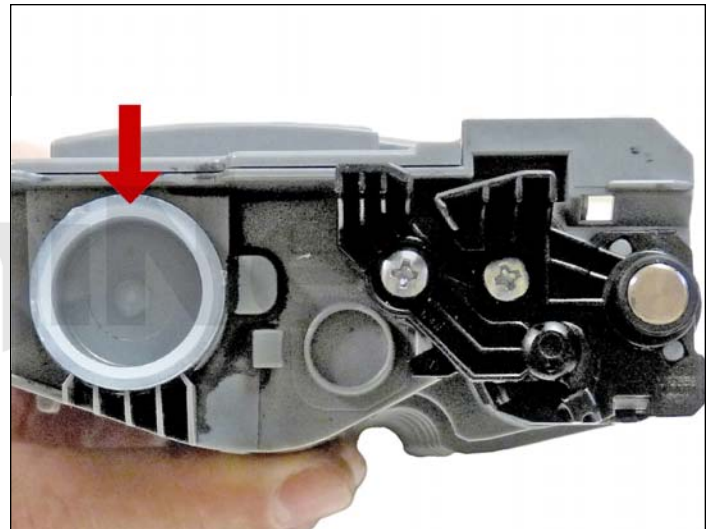


21. On the non-gear side, install the two plastic arms and screws.

The smaller arm is installed last and has to be turned from the bottom up, so that the lock engages.



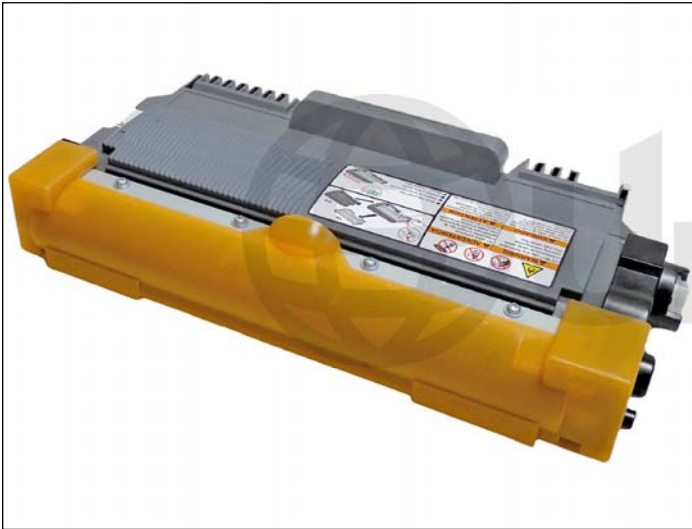
22. Fill the cartridge with the proper gram load of black toner for use in Brother TN420/450 (low or high yield).



23. Replace the fill plug.

Wipe the cartridge down to remove any remaining toner dust.





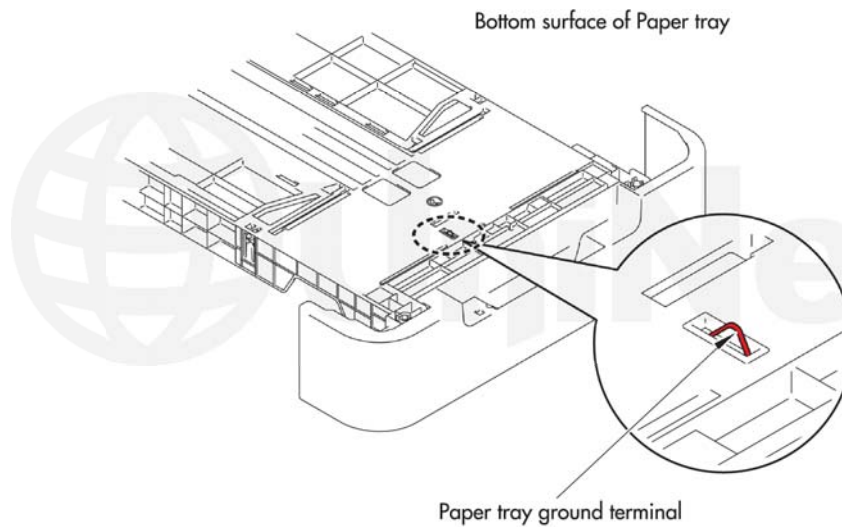
24. Install the developer roller cover.

### TEST PAGES

1. Press the “GO” Button three times, within three seconds, with the front cover closed and the “READY” light on.
2. A printer settings page will print

### DEFECT CHART

<b>OPC Drum</b>	<b>94.2 mm</b>
<b>Upper fuser roller</b>	<b>53.4 mm</b>
<b>Lower Pressure roller</b>	<b>78.5 mm</b>
<b>Developer roller</b>	<b>32.5 mm</b>



**NOTE:** If you are experiencing horizontal black streaks, and changing cartridges does not help, look in the bottom of the paper tray. There is a small metal ground terminal. If it gets bent or dirty, it can cause this.