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Remanufacturing the Brother HL 6050 Toner Cartridges
(TN-670 in North America, TN-4100 in Europe)

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0349

Released in May 2004, the Brother HL-6050 printer engine is based on a new 25ppm, 1200 DPI laser engine. This is the latest engine based on the Brother HL-1240 (TN-460) engine. The TN-670 cartridge is one of the larger cartridges in this series we have seen to date. Only the HL-7050 (TN-700) is larger. In addition to the toner being different, the cartridge is built differently as well. The stated yield on these cartridges is 7500 pages at 5% coverage. Because of the higher print speed and yield, the cartridge is built more robustly.

These cartridges also have a gear driven reset lever that actuates another lever inside the printer. This gear driven lever must be set correctly for the printer to accept the cartridge as new. Figures 1 & 2 show the proper reset position of the lever. Figures 3 shows the reset lever inside the machine

The first section of this article covers the theory behind these cartridges. If you are already familiar with the pitfalls of the HL-1240 cartridges, there is nothing new in the theory here. If you are not however, it would be best to read through this section. It may save you a few very frustrating hours.

As of the time of this writing, (June 2004) only three machines have been released using this engine:

HL-6050
HL-6050D
HL-6050DN

Unlike most of the other Brother engines, only one high yield cartridge has been released to date. The standard, TN-670 (TN-4100 Europe) holds 220g and is rated for 7,500 pages. The drum unit is new as well, Part # DR-600 (DR-4000 Europe). It will be covered in a future article.

As with all brother cartridges in this series, these cartridges routinely leave as much as 90 grams of toner in the supply chamber, all the while showing toner out and refusing to print! Shaking the cartridge at this point will only get you another 25-30 pages at the most before the printer shuts down again.

The remaining toner (90g or so!), MUST be completely removed from the supply chamber before adding new toner. Failure to do this will cause back grounding. In addition to contaminating the toner cartridge, this will also contaminate the cleaning section of the drum cartridge, which in turn will contaminate the toner cartridge again. A vicious cycle!

The cleaning section of the drum cartridge consists of a "cleaning brush" and a recovery blade. The cleaning 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 back grounding 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 back grounding. Both cartridges will be contaminated again.

The remaining 90g 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 back grounding. As the toner cartridge reaches the end of it's 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 back grounding. 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 with out doing anything to it, the cartridge will background. 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 drum unit at that point has to be taken apart and cleaned out with emphasis on the cleaning brush area. This is a very simple process but very necessary once contaminated.

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

SUPPLIES REQUIRED

- Brother 6050 Black Toner (220g) Lint free cotton cloths
- Toner magnet cloths
- White Lithium Grease

TOOLS REQUIRED

- Toner approved vacuum or compressed air cleaning system (Recommended)
- Phillips Head Screwdriver
- Small Common Screwdriver
- Needle nose pliers

DISASSEMBLY

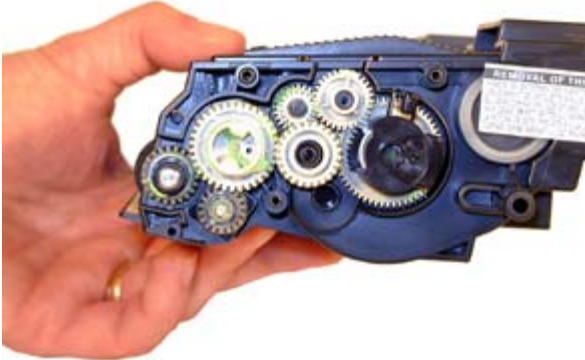Figures 1 & 2 show the proper reset position of the lever. Figures 3 shows the reset lever inside the machine

Figure 1

Figure 2

Figure 3

1) Remove the fill plug from the toner cartridge. Dump the remaining toner and vacuum/blow out the cartridge. Make sure that the gear area is clean. Leaving any toner in the teeth of the gears may cause a tooth to be damaged and

cause a clicking noise. We have found it best to use compressed air to clean them out, but to also keep one hand over the gears to protect them. See Figure 4

2) On the NON GEAR side of the developer roller, pry off the white spring loaded plastic axle. See Figure 5

3) Remove the two screws and two tabs on the developer roller end plate and pry off. See Figures 6, 7, & 8

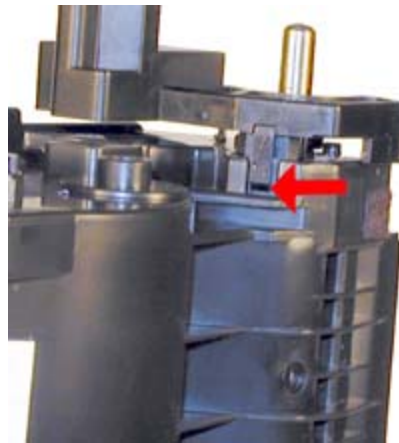*Figure 4*

Figure 5

Figure 6

Figure 7

4) On the GEAR SIDE, remove the three screws and cover plate. See Figure 9

5) Remove the reset lever and gears. Make sure not to get any toner on them. See Figures 10 & 11
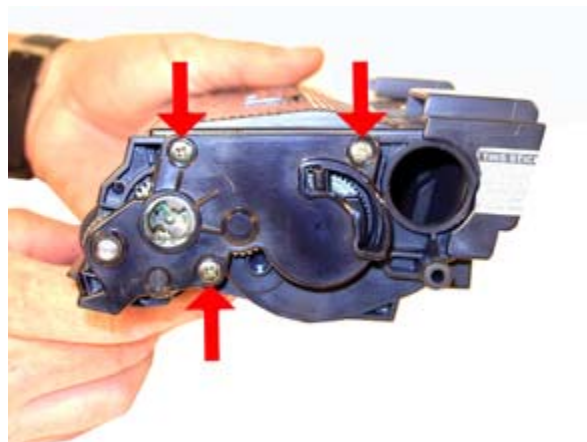
Figure 8

Figure 9

| *Figure 10* | *Figure 11* |

6) Remove the black axle. See Figure 12

7) Remove the E-Ring, and small gear. See Figure 13

8) On the doctor blade side of the developer roller, there is another small plate that is located on the end of the roller and inside the plastic wall of the cartridge. From the outside of the wall locate a small round hole. Press in the round tab located inside the hole. While pressing in turn the plate up so that the plate and roller are free. See Figure's 14 & 15

| *Figure 12* | *Figure 13* |

| *Figure 14* | *Figure 15* |

9) Remove the developer roller assembly. See Figure 16

10) Vacuum the doctor blade and foam feed roller clean. We do not recommend that the doctor blade be removed or the developer roller felt seals 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! Do NOT use any chemicals of this blade. Brother toner is very touchy, and will most probably react with whatever is used. See Figure 17

11) Inspect the magnetic roller felts. If they are compressed, (shiny) rough them up with a small screwdriver. See Figure 18

12) Clean the developer roller. If there is any type of white or blue coating on the roller, clean it off with a dedicated Brother developer roller cleaner. Do not use just any chemical to clean these rollers as it may react with either the roller sleeve, or the toner. Only a tested dedicated cleaner should be used. See Figure 19

Figure 16

Figure 17

Figure 18

Figure 19

13) Re-install the developer roller, inside end plate first. Turn the inside plate so that it locks in place. See Figure 20

14) Install the developer roller gear, E-ring, and black axle. See Figure 21

15) Clean the gears, making sure that the fine toothed gears 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.

16) Install the gears and the reset lever in its proper position. Make sure all the gears are meshing properly. See Figure 22

17) Install the gear cover plate, and three screws. See Figure 23
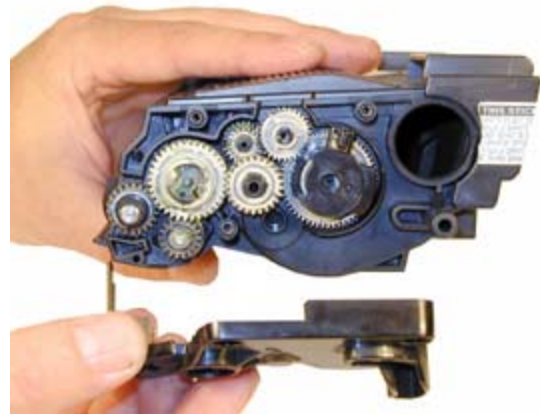

Figure 20

Figure 21

Figure 22

Figure 23

18) Make sure that the reset lever is in the proper position. See Figure 24

19) On the non gear side, install the developer roller end cap and two screws. Make sure that the tabs lock into place. See Figure 25

20) Install the spring-loaded white axle. See Figure 26

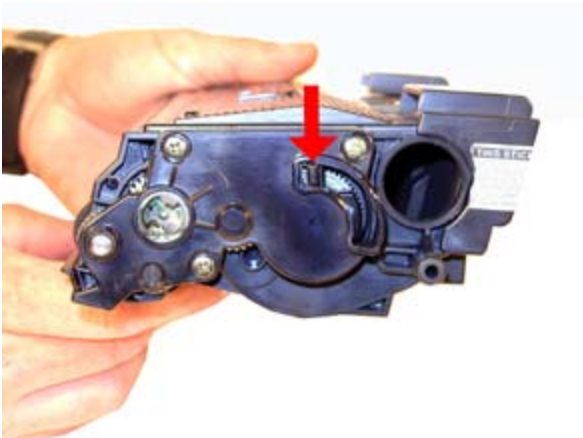21) Fill the cartridge with Brother 6050 Black Toner. See Figure 27

Figure 24

Figure 25

Figure 26

Figure 27

22) Replace the fill plug. See Figure 28

23) Wipe the cartridge down to remove any remaining toner dust.

24) Install the protective developer roller cover. See Figure 29

25) The back handle can be released by removing the three screws. This seems to be an easier and cheaper way to make different cartridges for other printer manufacturers. While none have been released to date (June 2004) with this modification, there is a good chance that there will be. See Figures 30 & 31
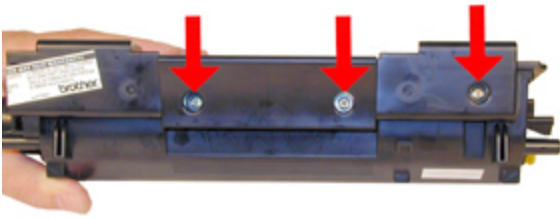
Figure 28

Figure 29

Figure 30

Figure 31

TEST PAGES

There are a series of test pages that can be run from the printer control panel.

With the printer in the READY state, Press the "+ ARROW" one time until INFORMATION appears on the display.

Press "ENTER"

Press the "+ ARROW" two times for the Print Test page

Three times for the Demo Page,

Four times for the Print File page,

Or five times for the Print Font Page.

Press "ENTER" once you have selected the page you wish to print.

DENSITY

To change the density of the machine, press the "+ ARROW" three times until QUALITY appears on the display.

Press "ENTER"

Press the "+ ARROW" four times for the DENSITY setting. "0" is the mid factory standard setting. The range is from +6 for the darkest to -6 for then lightest.

MACHINE TROUBLE SHOOTING

As with many machines these days, the error messages are in text, and for the most part are self-explanatory.

COMMON TONER CARTRIDGE PROBLEMS

As some problems can be caused by both the toner cartridge as well as the drum cartridge, we have listed both here.

"Toner Life End" message does not go away: Make sure reset gear lever is in the proper position.

Back-grounding: Toner cartridge and Drum cartridge; by far the most common problem with these cartridges, there are three major common causes.

1) The first is contaminated toner. If the old toner in the toner cartridge was not fully cleaned out, a shaded background will result usually over the entire page. This can also be caused by a contaminated cleaning brush in the drum cartridge, which is directly related to a bad toner cartridge. (See cartridge theory at the beginning of this article).

2) If the developer roller in the toner cartridge is worn, it will tend to pull too much toner, and back-grounding will result. This normally happens only on cartridges that have been recycled a few times. A normal roller will have a somewhat mottled look, and the texture should be smooth. If the roller has lines, small cracks, or just doesn't look right, don't use it.

A dirty developer roller can also cause this. If the roller has a white or bluish coating, it must be cleaned. Be sure to use only a dedicated Brother developer roller cleaner. Any other type of cleaner will probably react with the toner and cause another set of problems.

3) Another back-grounding issue can result from the toner being used. Not all aftermarket toners will work together. This is because there is always a small amount of toner left on the drum cartridge cleaning brush. Most aftermarket toners will work over the OEM, but not all will work over another aftermarket toner. If your cartridges work in house but background out in the field, it can be that the drum unit has failed, or that another aftermarket toner was used previous to yours. Check with your vendor to make sure that your toner will work on top of another (all) aftermarket brand(s).

Clicking: Toner Cartridge; On the left side of the cartridge there is a series of gears with fine teeth. While these teeth are not as fine as the TN-460 teeth, they can still cause an issue. If any toner gets on these teeth during the cleaning process, and is not cleaned off, the toner can cause a tooth to break, and clicking will result. We have found it best to keep one hand over the gear train when blowing the cartridge out and when filling it, that way the gears stay clean. If they do get toner on them, clean the gears and the shafts with alcohol, and lubricate with fine (white lithium) grease. Both the shafts and teeth need to be lubricated.

Clicking gears can also result from toner not specifically designed for the TN-6050 being used. If the toner particles are not uniform, the toner will not flow easily, and the mixing auger inside the toner cartridge can bind, causing a tooth to break.

Dark Black Vertical Streaks: Drum cartridge; This is normally caused by either a dirty primary corona wire, or the blue corona wire cleaner is not in its "home" position on the left side of the cartridge.

Gray Vertical Streaks: This is normally caused by a groove in the developer roller. If the roller has a groove worn in it, it must be either replaced, or re-surfaced by a company that specializes in this.

Light Print: Drum cartridge; Can be caused by a dirty or worn Transfer Roller. These rollers are located inside the cartridge. In our tests, they should last at least 2-3 cycles.

Black or white horizontal Lines: Toner cartridge and Drum cartridge; Black lines normally appear when there is a build up of toner, White when there is a dead spot, or contamination of the roller. If the lines repeat every 94 mm (approx. 3 3/4"), the drum is bad, or dirty. If they appear every 39mm (approx. 1 9/16"), the developer roller in the toner cartridge is bad or dirty.

Solid Black Pages: Drum cartridge; Bad drum ground contact, probably from the drum axle shaft to the contact gear inside the drum.

Perfectly straight thin black lines down the page: Drum cartridge; Scratched drum.

Black dots that repeat every 94mm (3 3/4"): Drum cartridge; Bad drum, or something is stuck to the drum surface.