



TECHNICAL DOCUMENT

Disassembly Instructions

IBM 4019, 4039 and IBM 4049 Style Toner Cartridges

These instructions cover the disassembly of the IBM 4019, 4039 and 4049 style toner cartridges. The purpose of this disassembly is to vacuum out toner that will have spilled inside the cartridge during shipping and/or rough handling, to clean the debris cavity and to fill the toner supply housing with new toner. The disassembly can also be used to examine the internal parts of the cartridge for possible damage should the printing of the cartridge be poor and not correctable by other means.

All three of the IBM 4019, 4039 and the 4049 Laser engines have two different cartridges, a high yield, and a high yield plus for the 4019, a high yield, and a Marathon for the 4039, and a 7k, and a 14k cartridge for the 4049.

For the 4019 engine, the high yield (part # 1380200) has 300g of toner and is rated for 7,000 pages at 5.0% coverage. The high yield plus (Part # 1380520) has 450g of toner and is rated for 9,500 pages at 5.0% coverage.

For the 4039 engine, the high yield (part # 1380850) has 300g of toner and is rated for 7,000 pages at 5.0% coverage. The Marathon cartridge (Part # 1380950) has 500g of toner and is rated for 12,800 pages at 5.0% coverage.

For the 4049 engine, the 7k (part # 1382100) has 250g of toner and is rated for 7,000 pages at 5.0% coverage. The 14k cartridge (Part # 1382150) has 500g of toner and is rated for 14,000 pages at 5.0% coverage.

Required Tools

The tools needed to successfully and safely recharge toner cartridges are as follows:

1) Toner approved vacuum. The Atrix HCTV canister type toner Vac, OR the Atrix AAA toner vacuum.

Some type of approved toner vacuuming system is important. Toner consists of very fine particles that will pass right through a normal vacuum filter and blow out the exhaust.

2) Razor Blade, or sharp 1/4" chisel

3) A small screw driver (Common Style)

4) A Phillips head screwdriver (#1)

5) Needle-nose pliers

6) Small Electronic type wire cutters or nippers

7) 1/8" drill bit and drill

8) Ruler

9) Scotch Pad

10) Hammer

11) Pop Rivet Gun

Materials Needed

1) 4019-Kit, includes hopper cover, recovery blade, retaining blade, electro-static shims, waste hopper strip, and 4 self tapping #4 x 1/4" screws.

NOTE: This kit is for the first recharge only, for the second and subsequent recharges, all you need to replace is the Recovery Blade (Part # RB-4019)

2) 1 Bottle 4039/4049 500g replacement Toner
(use 1/2 bottle for the smaller or 7k cartridges.)

OR

1 Bottle 4019 replacement toner (1 1/2 bottle for the high yield plus cartridge.) 3) 3/4" Scotch brand Magic tape

4) Either 1 Felt-4019 for the 4019 ONLY

OR

1 Felt-4039 for the 4039/4049

5) DPP-K Drum padding powder (Kynar) Do NOT use Zinc Sterate on any cartridge!

6) CT-100 Cotton Swabs

7) FR-8 Isopropyl Alcohol

8) PW-96 Poly Wipes Cotton Pads

9) 2 feet 2" clear packing tape

10) 3- 1/8" diameter, Medium size, Aluminum rivets

11) Long life OPC Drum (Optional)

Note: Drum 4019 has a maximum resolution of 600 Dpi and will not function correctly 1200 Dpi (4049)

Prepare Work Area

1) Before proceeding with the following procedure you should have a work area available with approximately 4' x 3' clear space. It should be covered with some disposable paper since toner will spill on this area. It is recommended that brown craft paper be used and taped to the work area. This will hold the paper in place when trying to vacuum toner from the paper.

2) An empty garbage can with a strong plastic liner should be adjacent to the work area to empty used toner. It should be at least 2' deep to prevent toner from clouding up and over the top of the bag during disposal.

3) Have a few rags available and some disposable paper towels in case of toner spillage. Toner Magnet cloths are perfect for this.

4) The work area should be capable of being ventilated, if by accident toner becomes dispersed into the air. An exhaust fan in one window is recommended for ventilation.

Disassembly

1) Vacuum the exterior of the toner cartridge.

2) Place the cartridge on the bench drum side up (Label face down), and the debris cavity towards you,(gears to your left).

Note: There are two methods that can be used when removing the drum axle plate. The first is using screws, this method works fine on the first cycle but can cause problems during the 2nd cycle. The screw holes tend to widen and the gear plate alignment is lost.

The second method is much better, and is the one we recommend. This method uses Pop Rivets, and does not disturb the original alignment posts.

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FIRST METHOD: (Old Method)

3) Locate the drum axle plate on the left side of the cartridge. This plate is held on with 4 plastic "rivets". Cut one rivet off at a time with a 1/4" chisel, or the razor blade, place the chisel, razor on the rivet and give it a good tap. Before cutting off the next rivet, drill a hole where the rivet was located, and put in the self-tapping screw. Do this for each of the rivets in turn. We have also found it advisable to do opposite rivets. Ex: Start with the top right, go to the bottom left, top left, bottom right. After all four are done, remove the screws and gently pry the drum axle plate loose but not off.

The holes are drilled and screws set now so that everything lines up correctly later on.

CAUTION: Be very careful not to strip these holes! Do not use a power screwdriver and do not over tighten! Over tightening will cause the plate to warp, which in turn will cause the OPC drum to go out of alignment. Once this happens, usually the drum will pull away from the wiper blade, and the cartridge will print shaded copies. The only way to fix this is to loosen the screws, and try to re-align the plate. This is a very time consuming process, and sometimes just cannot be fixed!

SECOND METHOD (Recommended)

With the Razor blade, or Sharp chisel, slice off the heads of all four plastic rivets. With a 1/8" drill bit, drill three holes in the areas indicated in Diagram #1. By drilling the holes separate from the alignment posts, you will have a perfect alignment every time!. When the cartridge is re-assembled, you will insert the Pop Rivets which will hold the cartridge together.

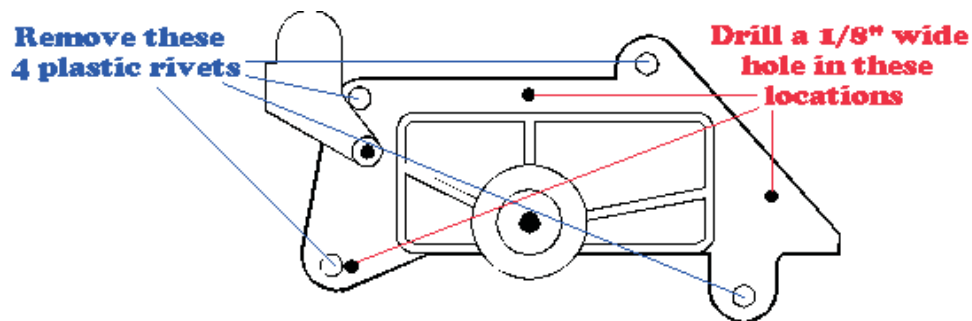


DIAGRAM 1

4) With the drum cover held back toward you, slowly slide the drum axle plate out to the left and remove.

Note: On the older style 4019 cartridges, a small drive gear will either come off or become loose. Remove and set aside. This gear drives the Waste Hopper Packing blade. On the newer 4019, and all 4039/4049 cartridges, this blade and gear have been eliminated.

Remove Photoconductive drum

1) Open the drum cover again and hold open with your right hand. With your left hand pull the gear end of the drum to the left until the right side is free from the Axle pin, (on the 4039/4049 this pin is a gear). Gently lift the drum up and out of the cartridge, and place in a light protected area.

2A) 4019 ONLY: On the right side of the cartridge there is a plastic pin located in the middle of the cartridge and approximately 2" from the blue corona cleaning bar. With a pair of wire cutters, gently grip the pin and PRY it out. Be careful not to cut the pin in half!

2B) 4039/4049 ONLY: On the right side of the cartridge there is a plastic pin, located in the approximate center of the cartridge. This pin is in the same basic position as the 4019, only there is no blue corona cleaning bar.

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NOTE: On both cartridges, this pin may be glued in. With a pair of wire cutters, gently grip the pin and PRY it out. Be careful not to cut the pin in half! Placing a drop of alcohol on the glue end may help dissolve the glue. The Pins are round at the base with an Approximately. 3/8" long square peg coming out of it. The square peg section can be either black or white.

3) Rotate the cartridge so that the toner supply chamber is closest to you. On the right hand side locate the area where the spring connects to the supply chamber. In this open "slot" you will see a small black bushing. Gently pry the bushing out and remove.

Remove Toner Supply Chamber

1) Locate and remove the springs on both sides of the cartridge. Remove only the side connected to the supply chamber, leave the chassis sides connected.

2) Rotate the cartridge so that the debris cavity is closest to you. On the left side of the cartridge there is the black and white clutch drive gear (all black in the 4049). Pull the gear off its shaft and put aside.

3) Behind where the clutch drive gear was, another small black plastic bushing is located. Gently pry off and remove.

4) Push the toner supply chamber away from the corona wire assembly, and lift up approximately 1/2" until it stops.

5) Lift up the right side of the supply chamber and pull to the right. Remove the supply chamber and place aside.

Cleaning the Debris Cavity

1A) 4019 ONLY: The debris cavity is permanently attached to the chassis and corona wire assembly. To keep the corona wire assembly from getting soiled when removing the toner, it is recommended that you cover it with a strip of 3/4" Scotch brand Magic tape.

1B) 4039/4049 ONLY: The debris cavity is also permanently attached to the chassis, but instead of a corona wire, it has a Charge Roller. This roller can be removed by gently prying up on the spring loaded clips on either end. Note that on the right side (gear side), there is a metal contact, this contact must be cleaned. Remove both clips and springs also.

2) The older style 4019 cartridges have a small black gear on the right side of the debris cavity. The newer versions with the plastic Drum Axle Plate do not have this. Make sure to tape this gear in place as it falls off easily and is not easily replaced. Remove the Recovery Blade entirely, and shake the toner out of the debris cavity into the garbage can and vacuum clean. Be very careful not to damage the Wiper blade as this part is not replaceable.

3A) 4019 ONLY: Remove the tape covering the corona wire assembly and vacuum clean. If there is any toner inside, hold the vacuum hose to one end and blow the assembly out with either a compressor or canned compressed air toward the vacuum hose. Do not blow toner into the air.

3B) 4039/4049 ONLY: Carefully remove the Primary Charge Roller (PCR) located next to the Wiper Blade. This is a small rubber roller with metal contacts on both ends.

WARNING: Do not clean this roller with alcohol, as this will remove the conductive coating on the roller. This roller takes the place of the corona wire assembly and it is recommended that it be cleaned with Nu-Finish car polish.

4) To clean the roller with the Nu-Finish car polish, apply a small amount, and buff with a clean lint free cloth until the roller is clean and shines. After the roller has been cleaned, clean the metal ends with alcohol. be careful not to get any of the alcohol on the rubber surface. For best results, we recommend that the roller be allowed to dry overnight before using. Place the PCR in a holder to dry. (A piece of wood with a hole drilled in it works fine).

NOTE: In some of the newer cartridges (In both the 4039, and 4049), there is a new Clear PCR. This PCR has a sticky surface, and should not have Nu-Finish applied to it. We have found it best to wipe this roller with distilled water, and pad it dry with a lint free cotton cloth. This is for the CLEAR PCR ONLY, not the White or Black PCR.

Cleaning the Toner Supply Chamber

- 1) Place the Toner Supply Chamber with the paper covering side up and the Static Roller facing you.
- 2) Carefully cut all four sides of the paper covering along the edge with a new razor blade.
- 3) Vacuum the outside of the chamber including the Static Roller. Be very careful not to scratch it!
- 4) Place the Drive clutch Gear back on its shaft, (white side in). While looking inside the chamber rotate the Clutch Gear And observe the Toner Feed Roller. This roller has both round and flat sections on it.

Rotate the roller until the curved section is facing up, this will serve as a seal so that the toner will not leak out. Vacuum the outside of the Static Roller again but do not turn the gear again. Remove the Clutch Gear and place aside.

- 5) Follow the instructions included in the 4019-Kit, and remove the Static Roller, replace the appropriate blades, and shims. Check the doctor blade spring for the right size.

NOTE: For the 4039 only, bend the spring to 2.25", as compared to the diagram.

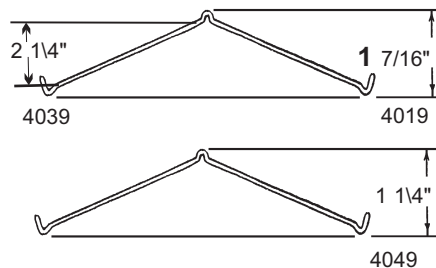
NOTE: For the 4049 only, bend the spring to 1.25", as compared to the diagram.

NOTE: For the 4019 only, bend the spring to 1 7/16", as compared to the diagram.

NOTE: Make sure that the arrow on the spring is facing the same direction it was in when it was removed.

- 6) Fill the hopper with the appropriate toner, place the new replacement cover on the top of the hopper, and tape on with 2" packing tape. Make sure that you keep the folds in the tape on top of the cartridge.

NOTE: Make sure that there are no leaks, and that the tape is securely in place. By using clear tape it is very easy to tell if there are any leaks from under the Hopper Cover. If the Hopper cover has already been taped on the chamber, make sure that you remove all the old tape before replacing the cover.



Replace Toner Supply Chamber and Photoconductive Drum

- 1) Place the Chassis on the bench Label side down with the Debris Cavity toward you.
 - 2) Place the Toner Supply Chamber in the Chassis LEFT SIDE FIRST, the drop in the right side.
- NOTE:** We have found it easier to tape the springs down before installing the Toner Supply Chamber to keep them out of the way.
- 3) Replace the small plastic bushing that sits behind the clutch drive gear. You may have to lift the Toner Supply Chamber slightly in order to get the bushing all the way on its plastic shaft. Press the bushing Completely in with the small flat head screwdriver.
 - 4) Replace the Clutch Drive Gear. Make sure that the gears all mesh properly.
 - 5) With either the small flat head screwdriver or the needle nose pliers, replace both springs on to the Toner Supply Chamber.
 - 6) Rotate the cartridge so that the Toner Supply Chamber is closest to you. On the right side where the Spring connects to the Supply Chamber, is the open "slot" where the last Plastic Bushing goes. With the pair of Needle Nose pliers carefully press the bushing in until it stops and is fully seated.

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7) Replace the plastic pin in the side of the cartridge. This pin is located approximately in the center of the cartridge. On the 4019 it is also approximately 2" from the blue corona cleaning bar.

8) Remove the drum from the light protected area, and blow off any remaining toner with the canned compressed air, and lightly coat with the DPP-K Drum Padding Powder, (Kynar). Do NOT use DPP (Zinc Sterate), this powder will ruin the wiper blade in both cartridges, and will stick to the charge roller in the 4039/4049.

CAUTION: Be very careful not to tilt or shake the can while cleaning as the propellant may spray out of the can and possibly ruin the drum.

9) With the Debris Cavity closest to you, pull the drum cover back and insert the drum right side first. Align the right side with its retaining pin, press in until fully seated, and lower the left side into place. On the 4039 make sure the gear alignment pin is seated properly.

10) **OLDER 4019 CARTRIDGES ONLY:** Replace the small drive gear. This gear is free floating and is installed just below the brown drum gear, small gear side in. Make sure that the small gear meshes with the Waste Paddle drive gear, and the large or outer gear meshes with the brown drum gear.

GEAR ALIGNMENT PLATE METHOD 1: (Old method)

11) Align the Gear Alignment Plate and press in until firmly seated. Secure the plate with the four new self tapping screws.

CAUTION: Be very careful not to strip these holes! Do not use a power screwdriver and do not over tighten! Over tightening will cause the plate to warp, which in turn will cause the OPC drum to go out of alignment. Once this happens, usually the drum will pull away from the wiper blade, and the cartridge will print shaded copies. The only way to fix this is to loosen the screws, and try to re-align the plate. This is a very time consuming process, and sometimes just cannot be fixed!

GEAR ALIGNMENT PLATE METHOD #2 (Recommended)

12) Install the Gear Alignment Plate so that it fits flush with the side of the cartridge, and all four posts are in their respective holes.. Insert the 1/8" medium Aluminum rivet in the Pop Rivet gun, and install the three rivets in the holes drilled previously. See Diagram #1.

13) **4019 ONLY:** Felt-4019 should be used on the fuser wand. This wand has a green handle, and has a smooth surface across the top. IBM has discontinued this wand. All new 4019 cartridges are now shipped with the 4039 style wands.

4039/4049 ONLY: Felt-4039 should be used on the fuser wand. This wand has a black handle, and has an irregular surface on top.

Trouble shooting

Before taking any test prints, there are a few items in the printer that should be maintained to ensure optimum print quality. If these items are not maintained, they could cause print defects that may be incorrectly blamed on the cartridge.

Transfer Corona Wire (4019 Only) In the base of the printer, there is the Transfer Corona Wire. This wire should be cleaned with a cotton swab, slightly dampened with alcohol. If this wire is dirty, the print outs will either be light, or have blank horizontal stripes.

Anti-Static Teeth (ALL); Located next to the transfer corona wire are the anti static teeth. These teeth dissipate the static charge applied by the transfer corona wire to the paper. This helps prevent the paper from sticking to the OPC drum and causing a paper jam. If these teeth are dirty, they should be vacuumed clean, or carefully blown off with a can of clean compressed air.

Transfer Charge Roller (4039/4049 Only); In the base of the printer, there is the Transfer Charge Roller. This is a foam roller that must be kept clean. Be very careful not to touch this roller with any part of your skin. The oils naturally present in your skin, and/or paper dust, and toner dust will contaminate the roller causing light print and/or small white voids in the text.

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Fuser Assembly (ALL); Towards the front of the printer is the Fuser Assembly. This assembly has a felt wand that is used to keep the upper fuser roller clean. this wand should be replaced (or re-felted) every time the toner cartridge is replaced

Ozone Filter (4019 Only); Located in the top lid of the printer is the Ozone filter. This filter should be changed every 30,000 pages or once per year. Which ever comes first. If this filter becomes clogged, it will interfere with the air flow in the printer and can cause the printer to overheat, or print defects to occur.

All of these items just covered, as well as the condition of the toner cartridge effect the print quality and should be checked before taking test prints.

Some of the more common toner cartridge problems are:

Dirty Primary Corona Wire (4019 only); Located inside the toner cartridge, this will show on the test page as Dark Black vertical streaks down the page.

Dirty Primary Charge roller (4039/4049 Only); Located inside the toner cartridge, this will show on the test page as vertical gray streaks down the page, or as a gray background throughout the page.

Dirty PCR Connection (4039/4049 Only); This will show as horizontal dark black bars across the page, or as shading throughout the page

Scratched drum (ALL); this is shown by a very thin, perfectly straight line that runs from the top to the bottom of the test page.

Chipped drum (ALL); This will show as a dot or series of dots that repeat 2 times per page. Any drum defects will repeat 2 times per page based on the drum circumference of 5.2".

Light damaged drum (ALL); This will show up as a shaded area on the test print that should be white. Again this will repeat 2 times per page.

Bad wiper blade (ALL); This will show as either a gray line approximately 1/8" thick, or as shading across the entire page. In either case there will be a film of toner on the drum surface.

Weak Dr. Blade Spring (ALL); This will usually show as shaded areas on one or both sides of the page.

Blank Page (ALL); A totally blank page is usually caused by a broken actuator tab on the cartridge, or by a broken spring loaded flap on the top of the cartridge. In either case, the printer will not give an error code, just blank pages.

Cartridge Printing Theory

The toner cartridge printing process is best explained as a series of steps or stages.

The first stage in the printing process is the conditioning stage. In the 4019 only, the Primary Corona Wire places a uniform negative DC voltage on the OPC drum surface. The amount of the negative DC voltage placed on the drum is controlled by the printers intensity setting. In the 4039, and 4049 cartridges, the Primary Charge Roller places the negative charge on the OPC drum.

In the second stage (also called the imaging section), the laser beam is fired onto the OPC drum surface. The laser beam dissipates the OPC drum charge to ground wherever it strikes the drum, leaving a latent electrostatic image. The OPC drums circumference is 5.2" and therefore makes approximately two revolutions for each printed page.

The third or developing stage is where the toner is developed on the drum by the developing section (or supply chamber), which contains the toner particles. The toner is held to the static roller by a DC voltage supplied by the high voltage power supply. This voltage is controlled by the printers intensity setting, and causes either more or less toner to be attracted by the static roller. This in turn will either increase or decrease the print density. The toner is first fed to the static roller by the feed roller. The amount of toner on the static roller is controlled by the metal doctor blade, which uses pressure to keep the amount of toner on the static roller constant.

As the laser exposed areas of the OPC Drum approach the static 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.

This image is then transferred to the paper as it passes below the drum by the transfer corona wire in the 4019, transfer charge roller in the 4039/4049, which places a positive charge on the back of the paper. This **positive**

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charge causes the negatively charged toner on the drum's surface to be attracted to the page. The small diameter of the drum, combined with the stiffness of the paper causes the paper to peel away from the drum. The static charge eliminator weakens the attractive forces between the negatively charged drum surface, and the positively charged paper. Without this help, thin paper may wrap itself around the drum.

The image is then fused on to the paper by the fuser assembly, which is comprised of the upper and lower fuser rollers. The lower rubber roller presses the page up into the upper roller which then melts the toner into the paper. The upper roller is a hard Teflon coated, heated roller, which is kept clean by a felt wand.

The fourth stage is where the OPC drum is cleaned. On average, approximately 90% of the toner is transferred to the paper during the print cycle. The remaining 10% remains on the OPC drum and is cleaned off the Drum by the wiper blade, guided into the waste chamber by the recovery blade, and stored in the waste chamber.

In the 4019, the OPC drum is now ready to be Conditioned by the Primary Corona wire, and start the print cycle again.

In the 4039 and 4049 cartridges, the final stage is completed by the primary charge roller. This roller now places an AC signal across the OPC drum surface, which will erase any residual charges left on the OPC drum surface. The opc drum is now ready to be conditioned by the PCR's DC signal and start the printing process all over again.

4019, 4039 & 4049 Cartridges

