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## Apple Color Printer: Self-Maintenance Processes

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### TOPIC -----

The Apple Color Printer implements several self-maintenance features. This article describes these processes.

### DISCUSSION -----

The Apple Color Printer uses low-ink sensors in each cartridge to warn when a cartridge has only 3 grams of ink remaining (each new cartridge contains 30 grams of ink). This warning takes the form of both a dialog from the Print Monitor and a message on the Apple Color Printer control panel. If a cartridge runs dry during a print job, you get notified and the print job continues when you install a fresh cartridge.

In addition to keeping track of cartridge ink level, the Apple Color Printer constantly protects, cleans, and tests its print nozzles. Whenever the printer is idle for at least 12 seconds, the printer caps the ink jet nozzles to prevent the ink from drying in the nozzles. Capping also prevents nozzle leakage and dust contamination.

The system cleaning function occurs after these events:

- Any time you turn on the printer.
- Whenever the printer has been on, but not used during a 24 hour period.
- Whenever you install a new cartridge.

It's also possible to manually start print head cleaning via the printer control panel. The cleaning function is controlled by the purge unit which opposes the print heads. The four step process consists of:

- 1) Capping
- 2) Pumping
- 3) Wiping
- 4) Ejecting extra ink.

During the capping function, a head cap covers the nozzles. The head cap also connects the ink passages of the print head with the purge unit. The purge unit ensures maintenance of the ink jet head unit.

The pumping function takes place when the printer draws ink from the capped bubble jet heads into the purge unit. While clearing the nozzles of impurities, the printer draws fresh ink from the ink subtank. It sends the purged ink into a waste ink absorber within the cartridge. The waste ink absorber consists of a high molecular polymer absorption sheet, and can absorb up to 30 grams of ink.

During the wiping phase of the head cleaning procedure, a head wiper wipes off the nozzle face plate. During the cleaning process, the carriage moves past the wiper (right to left) from the yellow head to the magenta head to the cyan head, and finally to the black head, cleaning away any excess ink drops and paper fiber in its path. The wiper extends 0.2 inches from the face of the purge unit. The cleaning sponge, which extends 0.12 inches out from the purge unit, completes the cleaning process, wiping away the ink impurities the head wiper missed. The cleaning sponge also clears away any excess ink collected on the nozzle faceplate after a long print. The sponge can wipe the head unit when the carriage passes by in either direction.

The printer activates the wiper and sponge at these intervals during a print job:

- Every 30 seconds during a print that lasts at least that long.
- Every time the carriage is returned.
- After printing 1,980 characters.
- As a page is ejected and just before the heads are capped.

Another periodic maintenance process fires ink from all nozzles (64 nozzles per cartridge) while they are capped. The nozzles are fired, not pumped. This process prevents both the nozzles from clogging with ink and the four print heads from mixing (for example, cyan ink slopping over onto the magenta head).

The maintenance firing takes place under the following conditions:

- Before a print job starting, if it's been less than 24 hours since the last print.
- If the internal temperature drops to 25° C or less, and it's been between 1 and 24 hours since the last print.
- When the paper is ejected after a print.
- After the head wiper wipes the head.

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