

# HP LaserJet and HP Color LaserJet Series Printers - Information about Ozone Emissions

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## Overview

As laser printing has become more popular, HP Color LaserJet and LaserJet series printer emissions have raised concern. Much of the information (or lack of information) has caused undue alarm about the use of these products. Emissions from these printers are below the standard levels established by various regulatory agencies and standard-setting organizations. The following information addresses the issues surrounding ozone and provides a better understanding of what ozone is, its effects, how it is measured and what can be done to control it.

**NOTE:** The HP LaserJet IIP, IIP Plus, and IIP series printers generate ozone emissions far below 0.1 parts per million while printing. The HP LaserJet IISi, 4, and 4M series printers do not emit ozone at any time. The reason is that none of these printers have corona wires.

## Sources of ozone

Ozone is a pure oxygen molecule containing three atoms of oxygen instead of two. Ozone is present in the air, but the highest concentration is found in the earth's upper atmosphere. Ultraviolet radiation creates the primary source of ozone. Other sources of ozone are created by electrical discharges and are what people detect when they say they "smell electricity." Some people sense this smell near electric motors, high voltage lines, or after lightning storms.

The ozone generated by some laser printers and photocopiers is a by-product of the electro-photographic process and is generated when the corona assemblies place charges onto photo-conductive materials. In the case of HP Color LaserJet and LaserJet series printers, this ozone is generated only while printing (while the coronas are energized). No ozone is generated when the HP LaserJet series printer is in standby mode.

## Effects of ozone

The ability to detect the odor of ozone varies greatly among people. Likewise, the sensitivity of people to ozone is different. Ozone can cause eye, nose, throat, and lung irritation. It can also cause headaches and dryness of the eyes, nose, and throat. The smell of ozone in low concentrations is often described as sweet. In higher concentrations, however, it is more pungent. Most people are not affected by ozone emissions from a laser printer.

The ozone generated by laser printers has a very short life span and decomposes back to oxygen very rapidly. In the average office, ozone concentrations usually will not last longer than a few minutes.

## Air emissions and regulations

HP characterizes the ozone emissions from all printer platforms to commercial release of the products. These systems are tested by printing on multipurpose paper in controlled environmental chambers, and the ozone emission rates are directly determined. These rates are subsequently used to calculate the concentration of ozone expected in an office environment with low air ventilation, but with a high printing rate.

These ozone concentrations are then compared to worldwide occupational exposure limits, as well as more stringent indoor air quality guidelines. Specifically, the US OSHA Permissible Exposure Limit of 0.2 milligrams per cubic meter, and the GREENGUARD ecolabel criteria of 0.02 mg/m<sup>3</sup> are referenced. In considering ozone concentrations in the "default" office scenario mentioned above, the few older printer models (and the HP Color LaserJet 8500 series printer) with required filters are well below the PEL, and the newer printer models generally yield non-detectable results.

## Typical ozone emissions (mg/m<sup>3</sup>) for recent HP Color LaserJet and LaserJet series printers

US OSHA PEL *	GREENGUARD*	HP LaserJet 2100, 2200, and 2300 series printers	HP LaserJet 4000, 4050, 4100, 5000 and 5100 series printers	HP LaserJet 4500, 4550, 4600, 4650, and 5500 series printers***	HP LaserJet 8100, 8150 and 9000 series printers***	HP Color LaserJet 8500 and 8550 series printers***	HP Color LaserJet 9500 series printers
0.200	0.020	<0.001	<0.001	<0.001	0.003	0.016	0.004

\*US OSHA PEL is the regulatory limit for occupational exposures - significant worldwide limits are generally very similar to this value.

\*\*GREENGUARD criteria for the US ecolabel program is the maximum concentration allowed for a "low-emitting" printer.

\*\*\*Reported values are based on the concentration of ozone determined by the following factors:

- A 32 cubic meter room
- With 0.8 air changes per hour
- Printing on multipurpose paper for two hours, over an eight hour day

## Customer/employer responsibility

The customer needs to ensure that a printer is installed in a work environment that will ensure its safe operation. In general, the system should be located in an open area that provides good ambient air movement and an adequate distance from the user (not situated directly adjacent to the exhaust vent).

In an occupational environment, the employer is responsible for ensuring that actual ozone concentrations are below limits specified in the recognized workplace safety regulations. The employer may want to analyze the ambient air in the immediate area.

## Conditions for printer set-up and operation

For use associated with the printer operation, see the *User Manual* that comes with the printer. Also, the following steps are suggested to minimize any remote issues with ozone:

- Ensure proper ventilation for the printer
- Ensure proper office conditions with regard to humidity
- Observe the proper site locations for the printer to ensure proper air movement and ventilation within the work area
- Ensure the direction of the printer exhaust is not in close proximity or pointed towards an individual
- Where a filter is utilized, ensure replacement at suggested intervals

## Changing ozone filters

**NOTE:** The products NOT in the following table use a different technology that does not generate measurable amounts of ozone, therefore an ozone filter is not necessary.

All the HP LaserJet series printers listed below use an ozone filter. For the products that are listed, the following information on ozone filters is applicable. HP recommends that the ozone filters be replaced every three to four years or 50,000 pages, whichever occurs first, to ensure that the printer is operating at

its safest level. The filters do not wear out; however, they can become clogged with dust, which greatly reduces their effectiveness. The chart below defines which HP LaserJet printer models have filters that can be user-installed and those that need to be installed by authorized HP LaserJet series printer service personnel.

Product	Product Number	Filter	User Replaceable?
HP LaserJet series printer	HP 2686A (discontinued)	FA2-5664-020CN (discontinued)	No
HP LaserJet 500 Plus series printer	HP 2686D (discontinued)	FA2-5664-020CN (discontinued)	No
HP LaserJet Series II series printer	HP 33440 (discontinued)	RG1-1753-000CN	No*
<b><i>(Manufactured before Aug. 1988)</i></b>			
HP LaserJet Series II series printer	HP 33440 (discontinued)	RF1-2130-000CN	Yes
<b><i>(Manufactured after Aug. 1988)</i></b>			
HP Color LaserJet 8500 series printer	HP C3983A	RB1-9807-000CN (large) RB1-9808-000CN (small)	Yes
HP LaserJet 2000 series printer	HP 2684A/D/P (discontinued)	FA2-5541-000CN (discontinued)	No
HP LaserJet IID series printer	HP 33447 (discontinued)	RF1-2130-000CN	Yes
HP LaserJet III series printer	HP 33449 (discontinued)	RF1-2130-000CN	Yes
HP LaserJet IIID series printer	HP 33459 (discontinued)	RF1-2130-000CN	Yes

\* Part number RG1-1753-000CN provides a new user-replaceable ozone filter housing (so that the filter can be user-replaceable) and a replacement filter (part number RF1-2130-000CN). HP recommends that authorized HP Color LaserJet and LaserJet series printer service personnel install this kit.

**NOTE:** There are no special disposal requirements for ozone filters. Because ozone decomposes back to oxygen rapidly, no hazards are associated with used ozone filters. The filter is simply a carbon screen that acts as a catalyst. The filter itself contains no ozone.

## Conclusion

HP's goal is to continually improve its products to make a positive contribution to the environment. HP also aims to inform its customers of all pertinent information concerning the use and safety of its products. However, the customer is ultimately responsible for making sure the work place is safe and comfortable. If an abnormal operating condition exists, such as those described above, it is the customer's responsibility to correct the situation.