HP Designjet T120 and T520 ePrinters: HP 711 Printhead and HP 711 inks

Overview

HP Designjet T120 and T520 ePrinters feature the new 4-color HP 711 Printhead and HP 711 Ink Cartridges. More nozzles and a nozzle density of 1,200 nozzles per inch for each color enable the HP Designjet T520 ePrinter series to produce high quality prints twice as fast as the HP Designjet 510 Printer series. The new HP 711 Printhead is designed to last the life of the printer. HP 711 inks use pigment black and dye-based colors to produce a wide color gamut, sharp lines and text, smooth color transitions, and smudge-resistant prints. HP 711 Ink Cartridges are mounted on the printhead carriage and are easy to replace. Intelligence built into Original HP 711 Ink Cartridges interacts with Low-on-Ink and Out-of-Ink sensors in the printhead module to provide dependable results at the end of cartridge life.

Introduction

Since its introduction in 2006, HP Scalable Printing Technology (SPT) has evolved and supported continuous advancement in the capabilities and performance of HP's inkjet writing systems. SPT enables the development of new printheads and inks that deliver higher print quality, higher print speeds, and longer printhead life. These developments are incorporated in new generations of HP Designjet printers.

Recent advances in SPT printhead design, fabrication, and materials technologies has enabled HP engineers to develop a printhead that is designed to last the life of HP Designjet T120 and T520 ePrinters.[1] For users, eliminating printhead replacements means improved printing economy and ease-of-use.

The HP 711 Printhead is part of a module that integrates the four-color HP Thermal Inkjet printhead with ink delivery systems for the four inks. A key design feature is that HP 711 Ink Cartridges are mounted on the printhead carriage and scan with it across the paper.

HP 711 Printhead and HP 711 Ink Cartridges

HP 711 Printhead

The HP 711 printhead represents a significant advance in printing performance, not only in speed but in quality as well. Compared to HP 11 Printheads used in the HP Designjet 510 Printer series, the HP 711 Printhead features more than four times as many nozzles per color with twice as many nozzles per inch (1,200 vs. 600). With a wider print swath,[2] the HP Designjet T520 ePrinter series is twice as fast as the HP 510 Designjet Printer series printing D and A1-size CAD line drawings in as little as 35 seconds.[3] This gives a peak productivity of up to 70 A1 documents per hour.[3]

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[1] In the rare case where the printhead must be replaced, an HP 711 Designjet Printhead Replacement Kit (HP Part C1Q10A) is available. Users can easily replace the printhead themselves without the need for tools or a service call.
[2] *Print swath* is the width of the area that is printed as the printhead scans across the paper. Print swath is the *number of nozzles* divided by the *number of nozzles per inch*. For the HP Designjet T120 and T520 ePrinter series, the print swath is (1,376 nozzles) / (1,200 nozzles per inch) = 1.15 inches (29.1 mm).
[3] Mechanical printing time. Fast mode on plain paper.

The specifications of the new HP 711 Printhead used in the HP Designjet T120 and T520 ePrinter series and the four HP 11 Printheads used in the HP Designjet 510 Printer series are compared in the following table. The HP 711 Printhead offers more *nozzles per inch* for higher quality, and more *nozzles per color* for higher speed. New drop volumes have been optimized for the higher printing resolution of the HP 711 Printhead.

Comparison between HP 711 and HP 11 Printheads

	HP 711: KCMY		HP 11: K, C, M, Y	
	K	C M Y	K	C, M, Y
Ink technology	Pigment (HP 711)	Dye (HP 711)	Pigment (HP 82)	Dye (HP 82)
Nozzles per inch	1,200		600	600
Drop volume (pl)	12	5.5	18	4
Nozzles per color	1,376 each		304	304
Print swath (in/mm)	1.15 / 29.1		0.51 / 12.9	0.51 / 12.9

HP 711 Ink Cartridges are mounted on the HP 711 printhead module. The module has Low-on-Ink (LOI) and Out-of-Ink (OOI) sensors for each ink, pressure regulators, and filters. Directly measuring ink levels produces dependable LOI signals advising the user to prepare for ink cartridge replacement. The OOI signal stops printing to prevent damage to the printhead from running out of ink. Both LOI and OOI are more accurately sensed in a system without the complexity of ink tubes, ink pumps, and remote ink supplies as were used in HP Designjet 510 Printer series.

Building a better printhead

Earlier, non-SPT designs required a separate nozzle plate to be fabricated, aligned, and attached to the silicon chip with its electronics and ink passages. SPT printheads are built as an integrated structure with precise alignment between printhead elements. This allows SPT to produce thousands of identical drop generators on each printhead. The result is more uniform drop volumes and better control of drop trajectories for higher quality prints.

Compared to printers with inks on separate printheads, having all four colors built together on a single silicon chip reduces color-to-color drop volume variations. And, the nozzles for each color ink remain in precise mechanical alignment for the life of the printhead. This built-in color-to-color registration produces excellent narrow color lines and color text, where color-to-color registration is critical to print quality.

All inkjet printers require some ink to be used for printhead cleaning and servicing. The HP 711 Printhead and HP 711 inks were designed together for efficient ink use. Based on testing that considered installation and typical use, printhead servicing in the HP Designjet T120 and T520 ePrinter series requires less than 10% of the ink used for servicing in Canon iPF606/610 and iFP710/720 printers.[4]

Why an Integrated Printhead?

The new HP 711 Printhead represents a decade of improvements in silicon and drop generator design and materials technologies. These advances allowed HP to produce a printhead designed to last for the life of Designjet T120 and T520 ePrinters. This feature minimizes user interaction and downtime for printhead replacement, eliminates the need to manage printheads as a consumable, and reduces writing system costs to the user over the life of the printer. The HP 711 Printhead is more power-efficient than HP 11 Printheads used in the HP Designjet 510 Printer series, so less energy is used to produce a plot.

HP designs printheads, inks, and printers together as a system, and large-format printing systems must satisfy many requirements. These requirements include the following considerations, which address important user needs:

- Printer size and footprint
- Output format
- Throughput
- Printing materials
- Monthly print volume
- Ease-of-use
- Print quality
- Cost of printer
- Color gamut
- Cost of consumables

A printhead designed to last the life of the printer is well-matched to the requirements and user needs met by the HP Designjet T120 and T520 ePrinter series. In other HP Designjet printers, replaceable printheads can provide a better solution to the user's needs when design objectives require higher monthly print volumes, higher throughput, more ink colors (such as light cyan, light magenta, and one or more grays), different types of ink, and when more uneven use of ink colors is expected.
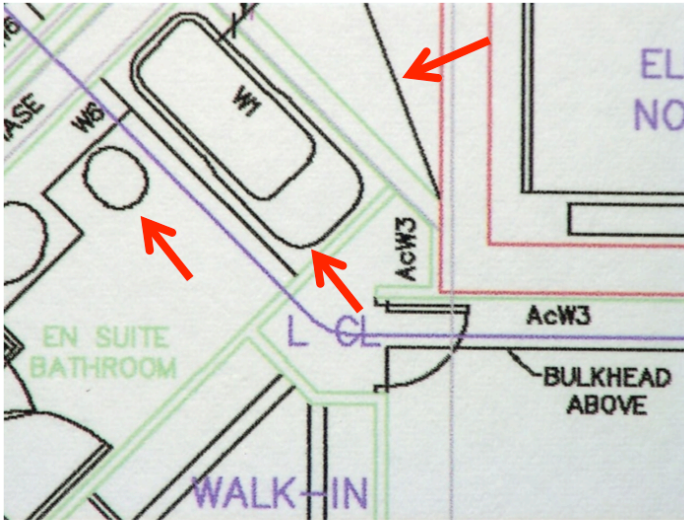
Line and text quality

The HP 711 Printhead and inks can produce a minimum line width of 0.0008 inch (0.02 mm) on photo papers.[5] The guaranteed minimum line width is 0.0028in. (0.07mm),[5] and sharp details can be reproduced up to 2,400 dpi.[6]
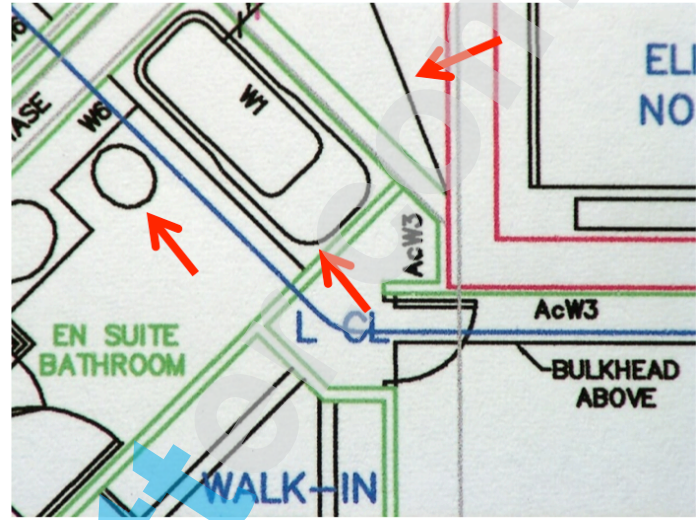
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[4] Based on HP internal testing.
[5] Minimum line width is the minimum addressable by HPGL/2. Guaranteed minimum line width for HP Designjet T120 and T520 ePrinter series per ISO/IEC 13660:200(E) measured on HP Matte Film. Minimum line width is 0.02 mm for HP Designjet T520 ePrinter series and 0.04mm for HP Designjet T120 ePrinter series.
[6] Applies to HP Designjet T520 ePrinter series.

The images in the figures below show microscopic views of print samples from HP Designjet 510 and T520 Printers on HP Universal Bond Paper, printed in Fast mode. The superior output quality from the HP Designjet T520 ePrinter using the HP 711 Printhead and HP 711 inks is evident in the smoothness and sharpness of fine lines and black and color text. The three red arrows highlight typical line quality improvements.
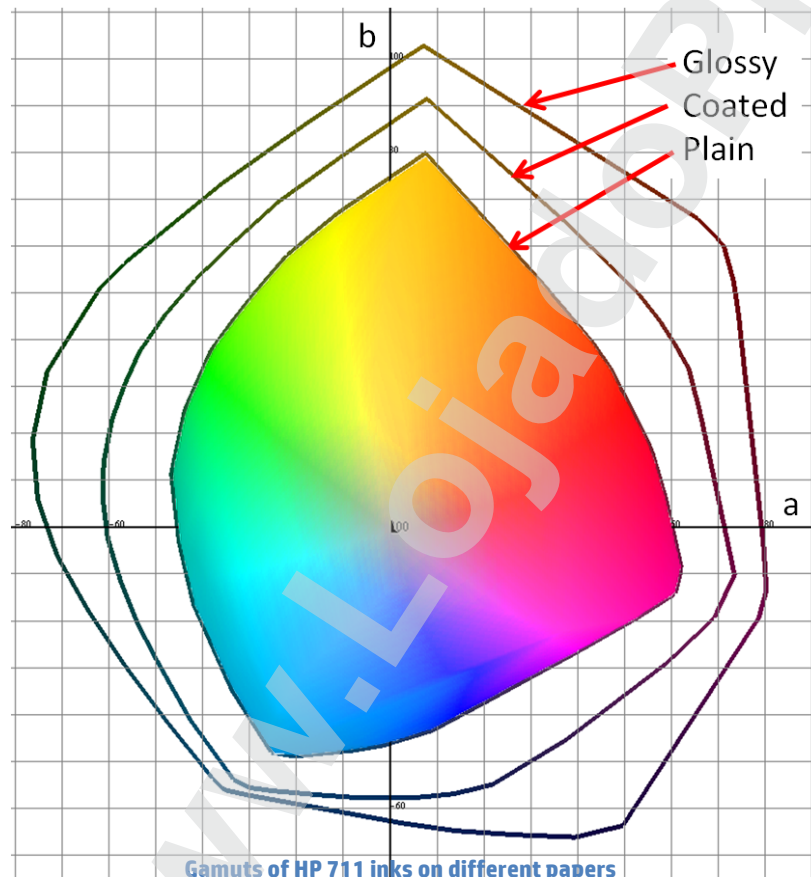

HP Designjet 510 Printer series

HP Designjet T520 ePrinter series

Print samples on HP Universal Bond Paper, Fast mode

HP 711 inks

Gamuts of HP 711 inks on different papers

HP 711 inks have been designed to provide high print quality, high reliability, and long life for HP 711 Printheads. HP 711 inks are fast-drying and smudge-resistant.

HP 711 black pigment ink produces sharp, black lines and text. Black optical densities, measured by the minimum L* value ($L*_{min}$) achieved in the CIE L*ab color space, are listed for three papers in the table below.

Color gamuts[7] for HP 711 inks are shown in the figure at left. The papers, print modes used, and the resulting gamut volumes are listed in the table below.

Black density (as $L*_{min}$) and gamut volumes for HP 711 inks on different papers

Paper	L*min	Gamut volume[7] (cubic CIE L*ab units)
HP Office Plain Paper with ColorLok® (Fast mode)	22.4	278,140
HP Coated Paper (Normal mode)	17	425,478
HP Universal Gloss Photo Paper (Normal mode)	8	671,149

Dye-based HP 711 color inks deliver a wide color gamut across a range of printing materials and produce colors optimized for technical graphics and CAD applications.

HP 771 inks produce superior lines and text and smooth color transitions in images, renderings, and illustrations.

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[7] Standard D50 illuminant and CIE-1931 2-degree observer.

HP color scientists designed new color maps for the HP Designjet T120 and T520 ePrinter series to make the best use of the color performance of HP 711 inks. Color maps translate a color specified in the input file into the amounts of ink needed to reproduce that color on a specific printing material. Compared to the HP Designjet 510 Printer series, the new color maps for the HP Designjet T120 and T520 ePrinter series deliver equal or better color gamuts and smoother color transitions in images and area fills.

HP 711 Ink Cartridges

HP 711 black pigment ink is available in trade as two cartridge series: a standard cartridge delivering 38 ml and large capacity cartridge delivering 80 ml. HP 711 color inks are available in 29 ml individual cartridges and 3 packs.

HP Designjet 510 Printers have HP 11 Ink Cartridges installed in an ink station that doesn't move with the printheads. The printheads are supplied by pumping ink through flexible tubes that move as the printheads scan across the paper. While this system has been proven reliable in service, it adds complexity and more parts to the printer.

HP 711 Ink Cartridges move with the printhead carriage in HP Designjet T120 and T520 ePrinters. No ink tubes and pumps are necessary because the cartridges supply ink directly to the printhead module. This simplifies printer design and gives reliability improvements and cost reductions that are important to the user.

HP 711 Ink Cartridges make efficient use of volume and materials in a compact, lightweight design that offers efficient ink extraction. To improve recyclability, HP 711 Ink Cartridges were designed to use less material and fewer different types of materials. HP 711 Ink Cartridges can be recycled through the HP Planet Partners program.[8]

HP 711 Ink Cartridges are mechanically-keyed and color-coded to ensure that they are inserted into the proper ink slot. Ink cartridges are easily removed by a simple push-to-unlock/pull-to-remove motion and installed by pushing them into their slot until they lock.

Summary

The new 4-color HP 711 Printhead, designed to last the life of HP Designjet T120 and T520 ePrinters, produces high quality at high throughput. It reduces printing costs because it is energy-efficient and eliminates the need to stock and replace consumable printheads.

Pigment-based HP 711 black ink produces high density blacks for crisp text and sharp lines. Precision color-to-color alignment in the HP 711 Printhead and dye-based HP 711 color inks deliver sharp color lines and text, a wide color gamut with smooth color transitions, and fast-drying, smudge-resistant prints.

HP 711 Ink Cartridges are mounted on the printhead carriage. This simplifies printer design, improves system reliability, and makes it easy to replace ink cartridges. Low-on-Ink and Out-of-Ink sensors interact with intelligence built into Original HP 711 Ink Cartridges to provide dependable results at the end of ink cartridge life.

With a 29.1 mm (1.15 inch) print swath and 1,200 nozzles per inch for each color, the HP Designjet T520 ePrinter series produces high-quality documents twice as fast as the HP Designjet 510 Printer series.[3]

For more information

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Current HP driver, support, and security alerts
delivered directly to your desktop

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[8] Visit **www.hp.com/recycle** to see how to participate and for HP Planet Partners program availability; program may not be available in your area. Where this program is not available, consult the Material Safety Data Sheet (MSDS) available at **www.hp.com/go/ecodata** to determine appropriate disposal.