BLI Comparative Performance Evaluation

APRIL 2014

Canon imagePROGRAF iPF680 vs HP Designjet T520 24"

Canon imagePROGRAF iPF680 and HP Designjet T520 24" under test in BLI's European test lab

	Canon imagePROGRAF iPF680	HP Designjet T520 24"
Advantage ✔		
Colour Image Quality	✔	
Black Image Quality	✔	
Colour Print Productivity	✔	
Black Print Productivity	✔	
Direct PDF Submission Functionali-ty	=	=
Banner Printing	✔	
Poster Printing	✔	
Ink Consumption	✔	
Device Feature Set	✔	
Print Driver Feature Set	✔	

TEST OBJECTIVE

Buyers Laboratory LLC (BLI) was commissioned by Canon Europe to conduct confidential document imaging device performance testing on the Canon imagePROGRAF iPF680 and the 24" configuration of the HP Designjet T520, and produce a report comparing the relative strengths and weaknesses of the two products in terms of image quality, productivity, ink consumption, direct PDF submission, device feature set, driver functionality, and banner and poster printing. All testing was performed in BLI's test facility in Wokingham, UK.

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Executive Summary

The Canon imagePROGRAF iPF680 gave a very good overall performance in BLI's testing, delivering significantly higher productivity in both colour and black modes than the HP Designjet T520 24" model, especially in High/Best quality modes, as well as superior media handling and a richer driver feature set. The Canon model also had the advantage in ink consumption, using less ink for two of the three document types used in the test. Another benefit of the Canon model that boosts user productivity and reduces waste is how it handles ink and paper outages. When the HP model runs out of ink or paper, it stops and cancels the entire job in progress, even if it's in the middle of a 50-page print run, forcing users to set up the job again once ink or paper is replenished and resume the job from the page on which the job was interrupted. The Canon model, in contrast, continues to print when ink needs replacing, while alerting the user to replace the cartridge, which can be done while printing is in progress. When it's out of paper, the Canon unit pauses and alerts the operator. After a new roll is installed, it prompts the operator to confirm the paper type and then it continues to print the interrupted page in full followed by all successive pages.

The Canon iPF680 offers a number of image quality improvements over its iPF650 predecessor in both colour and black modes, giving it a clear advantage over the HP model overall. The Canon model delivers a 44.1% larger colour gamut (with an impressive CIE volume of 642,169 compared with 445,672 for the HP model) when printing on photo-quality paper, while the HP model's colour gamut is larger on plain paper in Standard and High quality modes, but not in Fast mode. The Canon model also produced more natural-looking flesh tones, which were reddish in output produced by the HP unit. Although the HP model's optical density was higher for black and yellow, the Canon unit had higher densities for cyan and magenta. Moreover, it had a clear advantage when printing text, with crisper fonts and it produced superior results for fine lines, circles and text when the CAD (Line Drawing) settings were used. Another important advantage enjoyed by the Canon iPF680 is the unidirectional printing selection in the driver, available even in Fast mode, helping it to avoid the banding that's evident across the full width of the image when using the HP device's bidirectional printhead in every mode except Best.

In a few respects, results were mixed. For example, the HP Designjet T520 consumes less energy while printing—less than 35 watts compared with 140 watts with the Canon model—but this is likely to be outweighed by energy consumption in standby mode (where it is likely to spend more time) in which the Canon unit only uses 0.5 watts in standby mode compared with 4.5 watts for the HP device. In addition, while both models support direct PDF submission without the need to open an application and both allow files to be retrieved from cloud storage for printing, HP's ePrint & Share offers better functionality in some respects, including support for printing from Apple or Android smartphones or tablets, full access to the Adobe PDF font library and direct submission of DWF files—all of which the Canon Direct Print & Share utility lacks. However, HP's ePrint & Share requires users to register as users of the ePrint & Share Library and the HP ePrint & Share Printing tool by creating a separate account with a unique password for each on HP's ePrint & Share Web Center (server), which BLI analysts found to be a more tedious and time-consuming process than with iPF Direct Print & Share. Canon users who are registered with Google Drive will have instant access to its hierarchical folder system, in contrast to the flat file structure of HP's ePrint & Share.

Overall, the Canon imagePROGRAF iPF680 delivered a superior performance in virtually all categories tested, with better image quality, much greater productivity in all quality modes, superior poster productivity, lower ink consumption and a more feature-rich driver than the HP Designjet T520 24" model.

Colour Image Quality

	Canon imagePROGRAF iPF680	HP Designjet T520 24"
Advantage ✔		
Text	✔	
Fine Lines	=	=
Halftone Range	=	=
Halftone Fill	✔	
Solid Density	✔	
AEC Graphics	✔	
GIS Graphics	=	=
Business Graphics	=	=
Photographic Images	=	=
Colour Gamut (plain paper, Fast mode)	✔	
Colour Gamut (plain paper, Standard/High quality settings)		✔
Colour Gamut (photo paper, High/Best quality settings)	✔	

+, — and ○ represent positive, negative and neutral attributes, respectively.

\+ One factor influencing overall image quality is the Canon model's option of using unidirectional printing, even in Fast mode. The HP model offers only bidirectional printing, which means that the printhead travels in both directions over the image, creating a noticeable pattern of banding across the full width of the image in all modes except Best quality. Output produced by the Canon model, on the other hand, is free from any banding in all modes when unidirectional printing is selected.

\+ Although the HP Designjet T520 delivered higher optical density for yellow on plain paper in Best mode, the Canon iPF680 had higher densities in all three quality modes for cyan and magenta.

○ When printing on plain paper, the HP Designjet T520 24" delivered a larger colour gamut in Standard and High quality settings, but the Canon unit delivered a higher gamut in Fast mode.

\+ However, when printing on photo quality paper using Canon's High quality setting and the HP Designjet T520's Best quality setting, the Canon model delivered a colour gamut 44.1% larger than that of the HP unit, with an impressive CIE volume of 642,169 compared with 445,672 for the HP device.

\+ When evaluating text in colour mode there were clear differences between the two models. In all modes, both serif and non-serif fonts were legible down to 3-pt. size with the Canon model, with crisper characters and no breakup. In contrast, fonts were only legible down to the 6-pt. size in output produced by the HP model in Fast and in Best modes, and down to the 5-pt. size in Normal quality output produced by the HP unit. Users should note that the Canon unit produces superior results for fine lines and text when the CAD (Colour Line Drawing) settings are used.

○ Fine lines produced by both devices remained distinct down to the 0.1-pt. level (black on white) and the 0.25-pt. level (white on black) in all modes except the HP model's Best quality mode, in which lines had poorer definition below the 0.25-pt. level when compared with the same output in its Normal mode.

\+ Circles were distinct down to 0.1-pt. size with the Canon model, even in Fast mode, with none of the stair-stepping that the HP model displayed in Fast mode. As with text, the HP model's output was noticeably better in its Normal quality mode than its Best quality mode.

\+ When printing Architectural, Engineering and Construction (AEC) graphics in Normal/Standard and High/Best modes, the Canon unit delivered better detail and more distinct fine lines than the HP device.

○ When printing Geographic Information Systems (GIS) graphics in High/Best mode, both the HP and Canon units delivered a fine level of detail and very good depth of field.

○ The colour business graphics output produced by both the HP and Canon devices exhibited sharp details and very good colour saturation.

○ When comparing photographic images, there was little difference between the output produced by the two models, with the HP model delivering better detail in dark contrast areas and the Canon unit delivering better detail in light contrast areas.

\+ Skin tones produced by the Canon model were more natural-looking, while those produced by the HP device were slightly reddish.

○ BLI's overall assessment of colour image quality is that, thanks to a marked improvement over the iP650 model, the iPF680 was a clear overall winner. Although the HP model offers higher optical density for yellow, and a larger colour gamut on plain paper in two modes, the Canon device has higher optical density for cyan and magenta. The Canon device also delivered a much (44.1%) larger colour gamut on photo quality paper, better detail and distinct fine lines in AEC drawings and more natural-looking skin tones, plus the option of using unidirectional printing to avoid the banding that was clearly present across all HP output except in Best mode.

Black Image Quality

	Canon imagePROGRAF iPF680	HP Designjet T520 24"
Advantage ✔		
Text	✔	
Fine Lines	=	=
Halftone Range	=	=
Halftone Fill	✔	
Solid density	=	=
AEC Graphics	✔	
Business Graphics	=	=

○ The HP model delivered higher optical densities for black in Fast and Normal modes, while the Canon unit produced higher black density than the HP model in Best mode.

\+ There was a marked improvement in text output over that of the Canon model's predecessor, with text being more crisp. In all modes, both serif and non-serif fonts were legible down to the 3-pt. size with no breakup, whilst with the HP unit, fonts were only legible down to the 5-pt. size in Fast, Normal and Best mode.

○ The Canon unit produced better results for fine lines and text when the CAD (Monochrome Line Drawing) settings were used. Note that these settings are not available to HP users.

○ Fine lines in BLI's Line Art test target remained distinct down to the 0.1-pt. level in all modes on both devices.

○ Both models delivered an excellent halftone range—from the 10% to 100% dot-fill levels in all modes.

\+ The Canon device's output was rated very good in all modes for halftone fill, whilst the HP unit's was rated only good as some banding was visible across output in the direction of the printhead.

— The HP unit delivered darker solids with a higher optical density than solids produced by the Canon model, except in Fast mode where the Canon model produced output of the same density.

\+ In black AEC graphics output in Normal/Standard and High/Best modes, the Canon unit delivered superior detail and more distinct fine lines than the HP device.

○ Monochrome business graphics output in Best/High quality mode on plain paper were produced very accurately by both models, with smooth halftone gradations.

\+ The Canon model produced better overall black image quality than did the HP model, with crisper text, superior halftone fills, more distinct fine lines in AEC graphics and smoother gradations in photographic images. The HP unit, however, delivered darker solids and a higher optical density in all modes except Fast. The Canon unit produced superior results than HP for fine lines and text when the CAD (Monochrome Line Drawing) settings were used.

Print Productivity

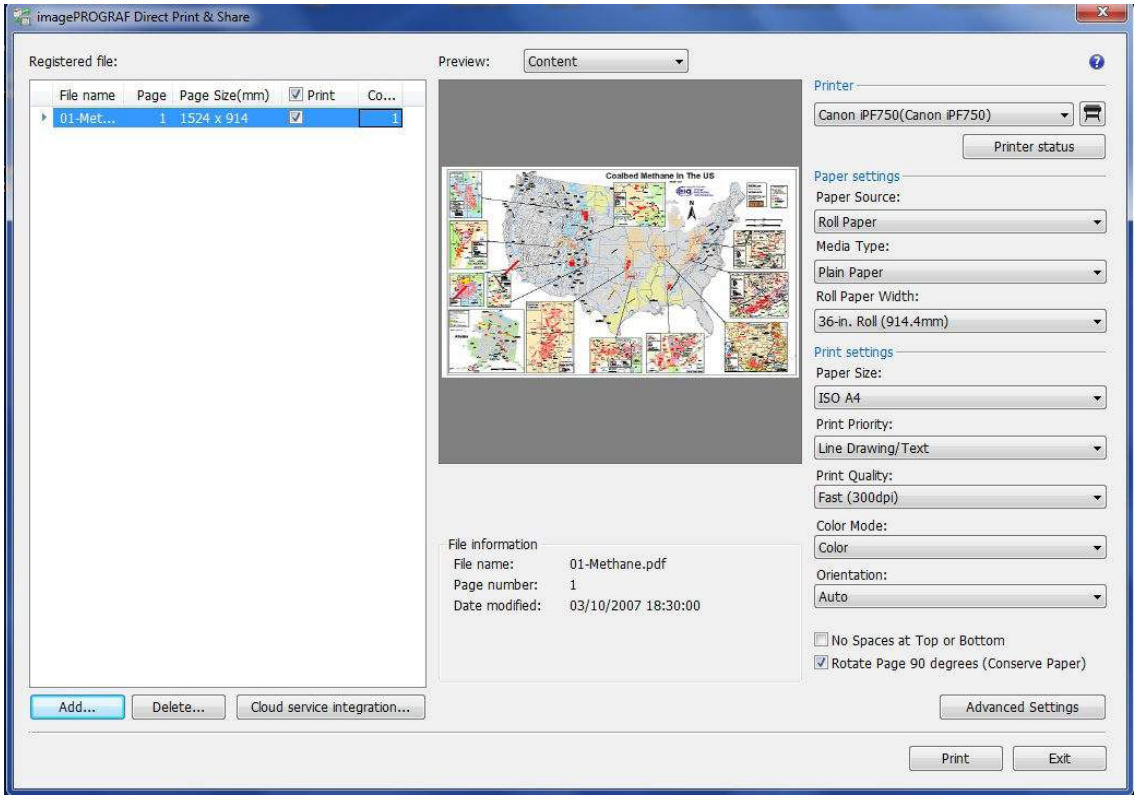
	Canon imagePROGRAF iPF680	HP Designjet T520 24"
Advantage ü		
First Page Out	✔	
Throughput Speed (fastest mode)	✔	
Throughput Speed (default mode)	✔	
Throughput Speed (highest-quality mode)	✔	
Job Stream (multiple jobs submitted to device in fast succession simulating busy network environment)	✔	

+ When the HP model runs out of ink or paper, it stops and cancels the entire job in progress, even in the middle of a multi-page print run, forcing users to resubmit the job once ink or paper is replenished. This has a negative impact on productivity, since the operator must determine the last page printed and then resubmit the job from that point. The Canon model, in contrast, will continue to print (drawing ink from its sub tank) when ink needs replacing, and the control panel conveniently alerts the user to replace ink, a procedure that can be carried out while printing is in progress. When the Canon unit runs out of paper, it pauses and alerts the operator. After a new roll is installed, the operator is prompted to confirm the paper type, after which the job will continue printing from the beginning of the interrupted page.
+ Since printing is not interrupted when a Canon cartridge is depleted, it is expected that less ink and paper will be wasted by the Canon model than the HP.
+ The Canon's output catch tray can stack printed sheets more neatly (and in the correct sequence) than HP's catch basket which tends to mix up pages which have fallen askew. This makes collating output much easier with the Canon model and helps to reduce operator intervention and downtime.
+ The Canon iPF680 delivered a faster first-page-out time of 85.71 seconds after a weekend of non-use, compared with 117.40 seconds for the HP device. Start-up time before printing commenced was 43.93 seconds for the Canon model, slower than the 29.94 seconds for the HP unit.
+ The Canon iPF680 delivered a faster first-page-out time of just 57.69 seconds from its ready state, compared with 98.91 seconds for the HP device. Start-up time before printing commenced was 16.37 seconds for the Canon model, compared with 14.10 seconds for the HP unit.
+ When printing BLI's job stream, designed to simulate a typical mixed workflow for a large-format unit, the Canon iPF680 was 40.6% faster than the HP model in Fast mode, 41.8% faster in Standard/Normal mode, and 77.4% faster in High quality/Best mode.
+ When printing BLI's 12-page DWF test file in colour, the Canon unit was 31.8% faster in Fast mode, 44.8% faster in Standard/Normal mode, and 78.4% faster in High quality/Best mode when compared with the HP unit.
+ When printing BLI's 12-page DWF test file in monochrome, the Canon unit was 33.7% faster than the HP model in Fast mode, 5.1% faster in Standard/Normal mode, and 78.4% faster in High quality/Best mode.

Direct PDF Print Submission Functionality

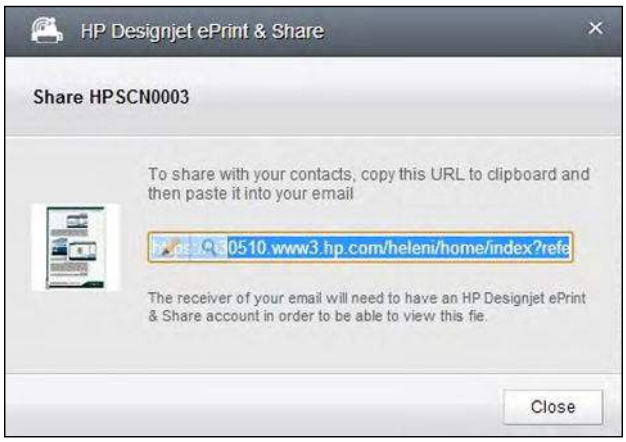
	Canon imagePROGRAF iPF680	HP Designjet T520 24"
Advantage ✔		
Ease of Use	✔	
Functionality	=	=

- A free download from Canon's website, the iPF Direct Print & Share utility enables printing of PDFs without having to open Adobe Acrobat and it also allows users to retrieve files from cloud storage for printing.
- The latest version (v2.0) of iPF Direct Print & Share (not tested with this model) supports "Shortcut Print" functionality which defines several print settings via a desktop icon. Files are automatically printed with the predefined setting with a simple drag-and-drop operation on the icon. Multiple desktop icons can be created for different print settings.



Canon's iPF Direct Print & Share utility

— HP's ePrint & Share Web services software provides the same direct PDF submission and cloud storage retrieval functionality for the HP device but also supports printing from Apple or Android smartphones or tablets, and automatically saves copies of work to the cloud. It also provides access to the full Adobe PDF font library and supports direct submission of DWF files, features that the Canon utility lacks.



+ HP's ePrint & Share requires users to sign up to the ePrint & Share Library and the HP ePrint & Share Printing tool by creating a separate account for each on HP's ePrint & Share Web Center (server), each with their own passwords, which BLI analysts found to be a more tedious and time-consuming process than with iPF Direct Print & Share. Canon users who are registered with Google Drive will have instant access to its hierarchical folder system, in contrast to the flat file structure of HP's ePrint & Share.

Banner Printing

	Canon imagePROGRAF iPF680	HP Designjet T520 24"
Advantage ✔		
Ease of Use	✔	
Productivity	✔	

+ The Canon iPF680 successfully printed BLI's 24" x 70" banner (originally a 4,955-KB PDF file) in Fast mode, taking just 24.0 seconds to generate a preview, and a further 1 minute, 48.34 seconds from preview to final paper cut.

+ The HP T520 was unable to print any portion of the banner, with a message appearing on the display indicating 'Out of memory… the printer cannot complete this job'.

Poster Printing

	Canon imagePROGRAF iPF680	HP Designjet T520 24"
Advantage ✔		
Image Quality (Fast and Normal modes)	✔	
Image Quality (High/Best modes)	=	=
Productivity	✔	

○ When printing a poster in Fast mode at 300 dpi, the Canon model took 47.6 seconds to complete the job and the HP unit took 51.95 seconds, although some banding was evident across the full width of the poster with both models. When the Canon model was switched to unidirectional printing, which eliminated the banding, it took 60.14 seconds to print.

+ When printing posters in Standard/Normal mode at 600 dpi, the Canon model took 62.90 seconds and the HP unit took 88.22 seconds, but no banding was evident with either model in this mode.

+ Printing posters in High quality (600 dpi) mode on the Canon model took 1 minute, 44.48 seconds, while the HP model in Best quality (1200 dpi) mode took 6 minutes, 21.87 seconds—over three times longer than with the Canon model.

○ At these High/Best settings both models delivered very good image quality when printing posters with vibrant reds and excellent colour saturation.

Ink Consumption

RESULTS		
Results averaged across three tests of 50-page A1 printing in Fast and Standard / Normal Modes.	Canon imagePROGRAF iPF680	HP Designjet T520 24"
COTTAGE ARCHITECTURAL PLAN (Fast Mode)		
Average weight of ink used (grams)	19.0g	17.7 g
Percentage of total ink used averaged across all colours	1.2%	10.1%
COTTAGE ARCHITECTURAL PLAN (Standard / Normal Mode)		
Average weight of ink used (grams)	21.5 g	21.5 g
Percentage of total ink used averaged across all colours	1.3%	12.2%
RETAIL POSTER (Standard / Normal Mode)		
Average weight of ink used	60.3 g	75.0 g
Percentage of total ink used averaged across all colours	3.7%	42.7%
GIS MAP (Standard / Normal Mode)		
Average weight of ink used	41.0 g	52.6 g
Percentage of total ink used averaged across all colours	2.5%	29.9%

— When producing 50 prints of a Cottage Architectural Plan in Fast Mode, the Canon unit used 7.3% more ink than did the HP T520. However, the Canon model used only 1.2% of the ink available, whereas the HP model used 10.1% of the available ink.

○ When producing 50 prints of a Cottage Architectural Plan in Standard/Normal Mode, the Canon unit used exactly the same amount of ink as the HP T520. However, the Canon model used only 1.3% of the ink available, whereas the HP model used 12.2% of the available ink.

+ When printing a Retail Poster in Standard/Normal Mode, the Canon unit used 19.6% less ink than did the HP T520.

+ When printing a GIS Map, the Canon iPF680 used 22.1% less ink compared with the HP device.

+ As noted earlier, the fact that the Canon cartridges can be run to exhaustion without interrupting the print process means that less ink and paper are likely to be wasted by the Canon model than by the HP T520.

Device Feature Set

+ The Canon cartridges for black, cyan, magenta and yellow are available in two capacities—130 ml and 300 ml—which are both higher than the capacity of the HP model's cartridges (29 ml for cyan, magenta and yellow; 38ml and 80 ml for black). Consequently, they will need replacing much less frequently than with the HP device.

+ If the Canon device detects that printhead nozzles are in danger of clogging, it will automatically start a cleaning routine. This task would have to be done manually with the HP unit, although BLI analysts did not encounter any nozzle clogging issues with either unit during testing.

+ Ink cartridges can be replaced during operation with the Canon model but not with the HP device, helping to reduce downtime for Canon users.

+ The Canon unit supports a larger diameter of roll paper (150 mm as opposed to 100 mm with the HP device), a higher maximum media thickness (0.8mm compared with HP's 0.3mm), and a higher maximum cut-sheet media length of 1.6 m compared with 914 mm for the HP unit.

+ Canon's output catch tray can stack printed sheets more neatly than the HP catch basket, making collating output much easier because sheets are stacked in the correct sequence.

— The HP device offers a larger standard and maximum RAM of 1 GB, compared with 256 MB for the Canon iPF680.

— The HP T520 is a more compact, lightweight device than the Canon model, weighing in at just 34 kg versus 56.7 kg for the Canon unit.

— Unlike the Canon device, the HP model is WiFi-enabled.

— The HP model includes a colour touchscreen, while the display on the Canon model is a non-touchscreen LCD monochrome display.

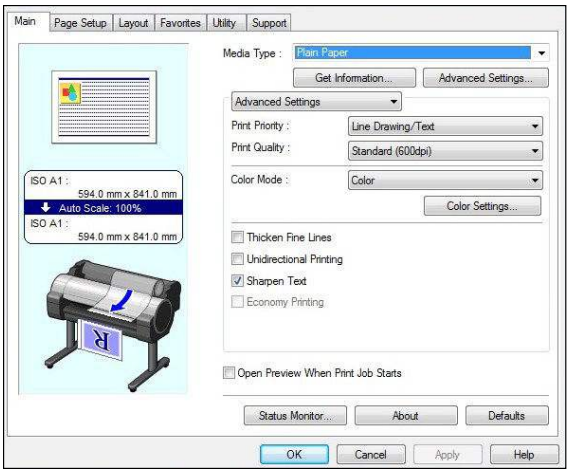
— The HP T520's power consumption (less than 35 W) is lower than the Canon model (140W) while printing.

+ However, in standby mode, the Canon model's power consumption (0.5 W) is much lower than the HP device (5.0 W).

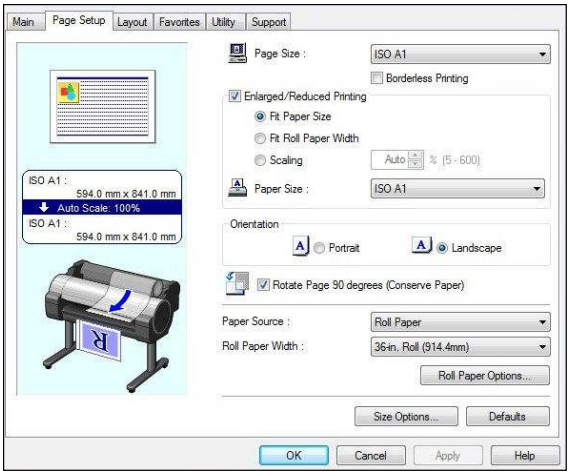
+ Noise emissions are fractionally lower with the Canon device (47 dB versus 48 dB with the HP model).

Driver Feature Set

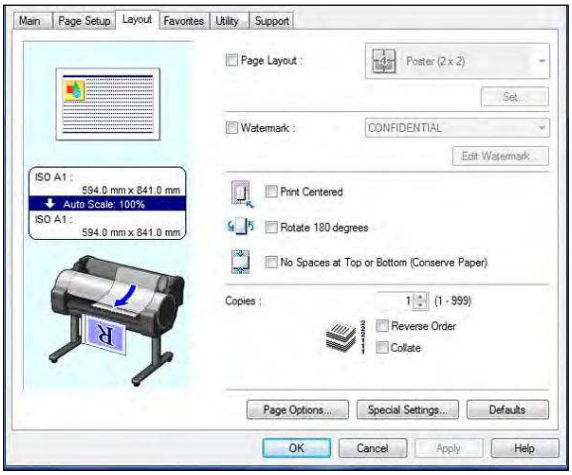
+ The Canon iPF680 has five speed settings (Fast 300, Standard 600, Fast 600, High 600 and 1200), as opposed to three with the HP device (Fast, Normal and Best). Note: not all speed settings are available with all media types.
+ The Canon GARO driver provides an overview of the settings for predefined profiles, unlike HP's HP-GL/2 driver.
+ The Canon driver offers a wider range of seven predefined profiles, compared with five with the HP unit.
+ The Canon driver supports multi-up (2 to 16) printing, which the HP driver doesn't support.
+ The Canon GARO driver has a poster mode (2 by 2) that is not available from the HP driver.
+ Unlike the HP driver, the Canon driver offers page stamping (Date, Time, Name and Page Number).
+ The Canon GARO driver offers a wider range of built-in adjustments for CMYK balance, brightness, contrast and saturation than the HP-GL/2 driver. ICC profile settings are also available in the GARO driver's matching tab under Advanced Settings. Operators can select four matching modes (driver, ICC, driver ICM and host ICM matching) and choose one of four rendering methods (auto, perceptual, colorimetric or saturation). Note that a wide range of colour management profiles are available when the HP driver and colour management tools (from the Printing Preferences menu) are downloaded from HP's website (as of March 2014), plus the ability to preview images before printing—features which were not included in the Startup driver disk supplied to BLI with the device.
+ The Canon driver offers the choice of unidirectional printing, even in Fast mode. This means that the printhead travels in only one direction to create the desired image, helping it to avoid the banding that's evident across the full width of the image when using the HP device's bidirectional printhead in every mode except Best.
+ The Canon driver includes the Colour imageRUNNER Enlargement Copy Mode utility, which enables users to integrate a Canon small-format MFP device with the iPF680. Documents scanned by the Canon MFP are automatically routed to a hot folder that is monitored by the driver of the iPF680. The image is then resized and printed, offering a fast, easy-to-use poster creation tool for office users.
+ The Canon driver also includes a Free Layout nesting tool that enables files—even files created with different applications—to be scaled, resized, or grouped together as a single job from the printer driver. Images can be dragged and dropped to their desired locations and printed together on a single page to save on paper.
+ A plug-in for printing from Microsoft Office applications offered by the Canon driver includes useful tools for automatic media resizing, nesting and borderless printing.



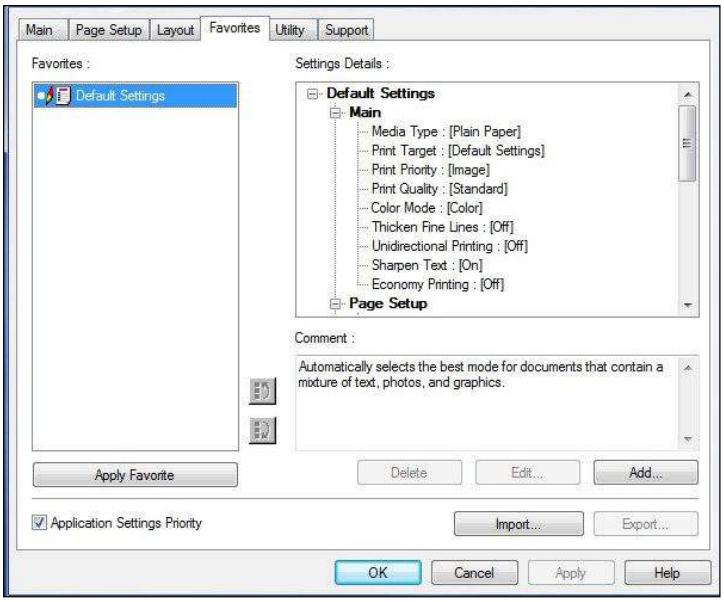
Canon Print Driver Main Tab



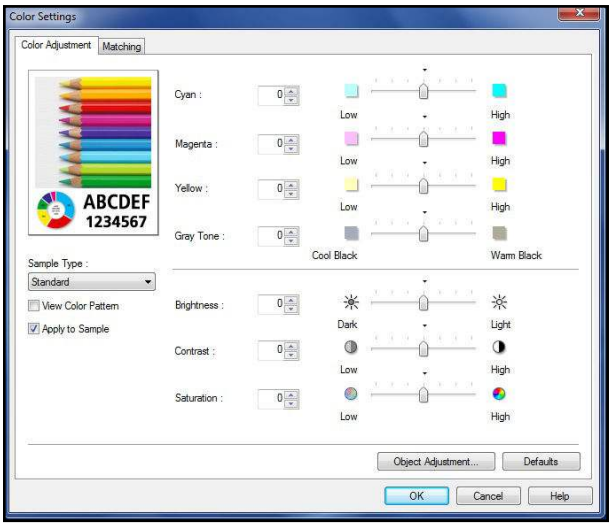
Canon Print Driver Page Setup Tab



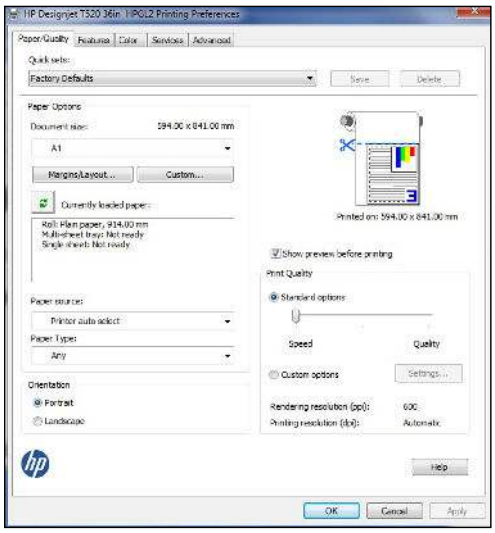
Canon Print Driver Layout Tab



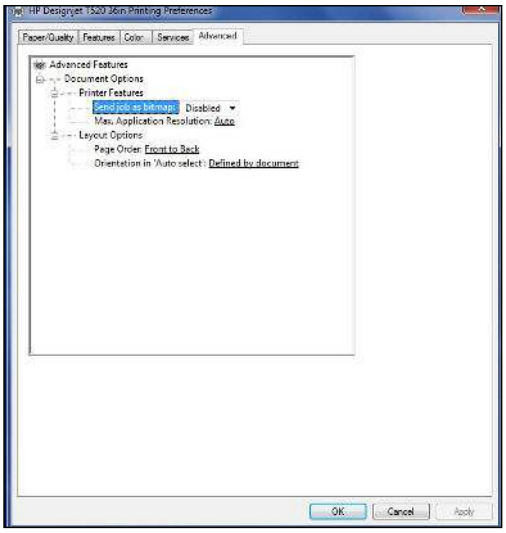
Canon Print Driver Favourites Tab



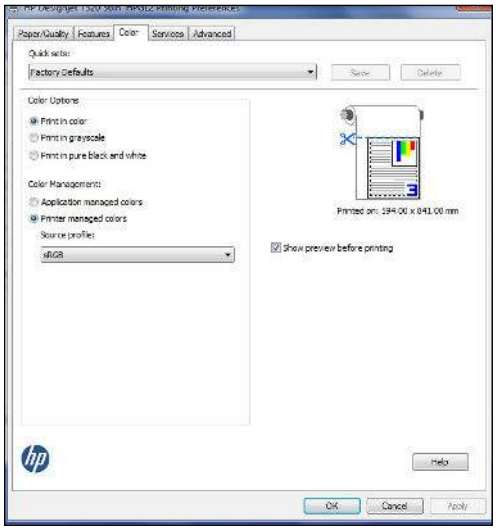
Canon Print Driver Colour Adjustment Tab



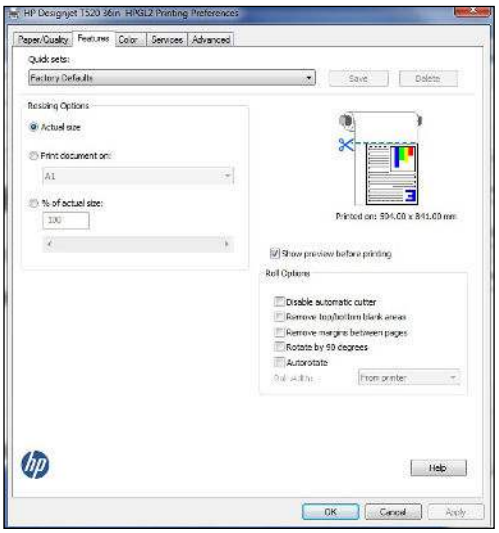
HP Print Driver Paper Quality Tab



HP Print Driver Advanced Settings Tab



HP Print Driver Colour Settings Tab



HP Print Driver Features Tab

SUPPORTING TEST DATA

Job Stream Productivity

Mixed File Types, Same Size

Canon iPF680 (time in seconds)		HP Designjet T520 24" (time in seconds)	
Fast	784.97	Fast	1,322.03
Standard	1,031.53	Normal	1,772.19
High	1,842.89	Best	8,140.90

BLI's job stream consists of nine files, including PDF, TIFF and DWF files totalling 19 pages, all at Arch D-size. This test replicates the type of traffic a typical wide-format device might experience in a real-world, multi-user environment. All of the files are submitted to the controller in a specific order and sent to the printer as a group, at which time the stopwatch begins; timing ends when the last page of the last file exits the device. Both devices were loaded with 610 mm rolls.

Colour Productivity

Canon imagePROGRAF iPF680 (time in seconds)			HP Designjet T520 24" (time in seconds)		
Fast	Standard	High	Fast	Normal	Best
449.48	625.35	1,161.15	659.53	1,132.18	5,386.81

The 12-page DWF test file was printed using the device driver set to the plain paper/colour setting. Both devices were loaded with 610-mm rolls. The actual time indicated is the time it took to RIP, image and deliver all pages of the test document to the collection bin.

Monochrome Productivity

Canon imagePROGRAF iPF680 (time in seconds)			HP Designjet T520 24" (time in seconds)		
Fast	Standard	High	Fast	Normal	Best
437.38	639.63	1,158.28	659.79	674.02	5,371.54

The 12-page DWF test file was printed with the Canon driver set to the plain paper/monochrome setting and the HP driver set to plain paper, greyscale, black ink only. Both devices were loaded with 610-mm rolls. The actual time indicated is the time it took to RIP, image and deliver all pages of the test document to the collection bin.

First-Page-Out Productivity after a Weekend of Non-Use

	Canon imagePROGRAF iPF680 (time in seconds)	HP Designjet T520 24" (time in seconds)
Time Before Printing Commences	43.93	29.94
First Page Out	85.71	117.40

First-Page-Out Productivity from Ready State

	Canon iPF680 (time in seconds)	HP Designjet T520 24" (time in seconds)
Time Before Printing Commences	16.37	14.10
First Page Out	57.69	98.91

First-page-out times are achieved by sending an Arch D-size PDF file to print, timed from release to page out, with the Canon driver set to the plain paper/monochrome setting and the HP driver set to plain paper, greyscale, black ink only. Both devices were loaded with 610-mm rolls.

Colour Print Quality

Colour Optical Density Evaluation

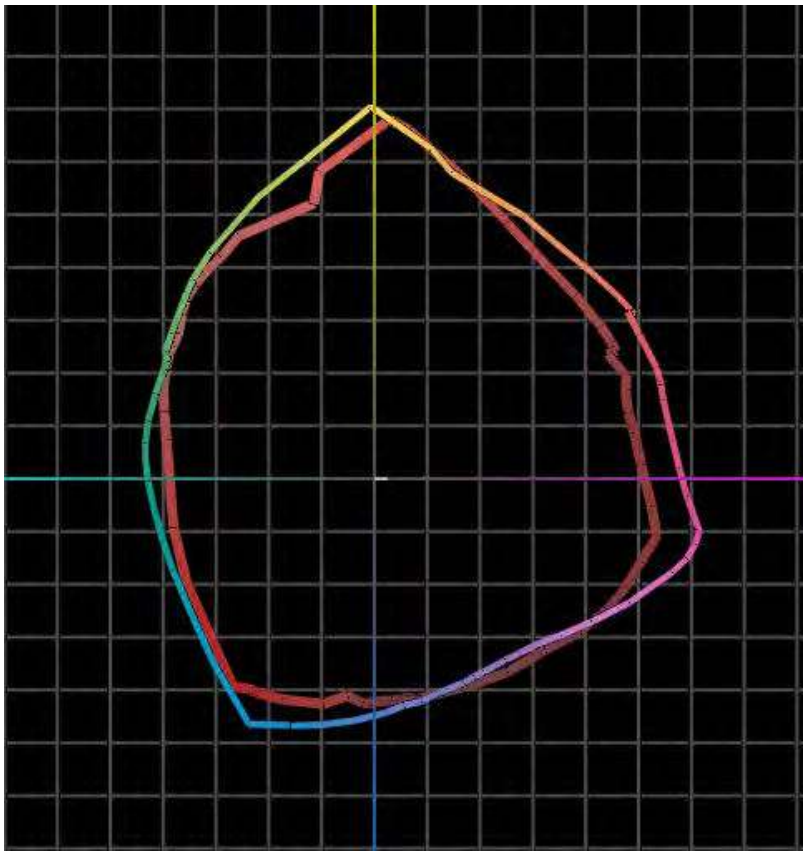
Canon imagePROGRAF iPF680						
Plain Paper						
	Fast		Standard		High	
	50%	100%	50%	100%	50%	100%
Cyan	0.49	1.05	0.53	1.11	0.50	1.13
Magenta	0.46	0.98	0.50	1.04	0.50	1.10
Yellow	0.38	0.77	0.42	0.83	0.40	0.86
Black	0.65	1.35	0.72	1.44	0.70	1.46

HP Designjet T520 24"						
Plain Paper						
	Fast		Normal		Best	
	50%	100%	50%	100%	50%	100%
Cyan	0.41	0.75	0.45	0.85	0.52	0.97
Magenta	0.54	0.82	0.59	0.84	0.59	0.98
Yellow	0.57	0.76	0.62	0.85	0.61	0.96
Black	0.56	1.46	0.61	1.50	0.60	1.37

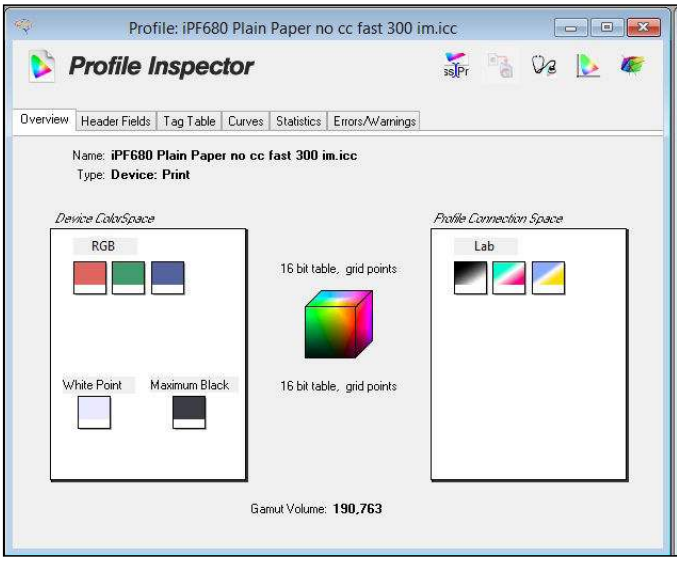
Note: Colour density readings were assessed by printing an IT8 test file on plain paper in default colour settings at all quality settings available and measuring the density of 100% dot fill and 50% dot fill using an XRite 508 densitometer.

Colour Gamut Comparison

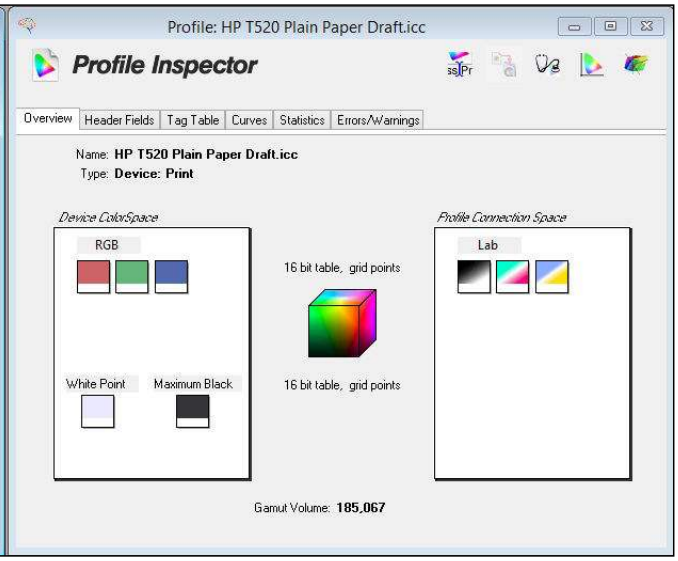
Media Type/Settings	Canon iPF 680	HP T520
Plain Paper Fast	190,763	184,939
Plain Paper Standard	216,452	220,244
Plain Paper High	220,708	243,589
Glossy Photo Best	642,169	445,672



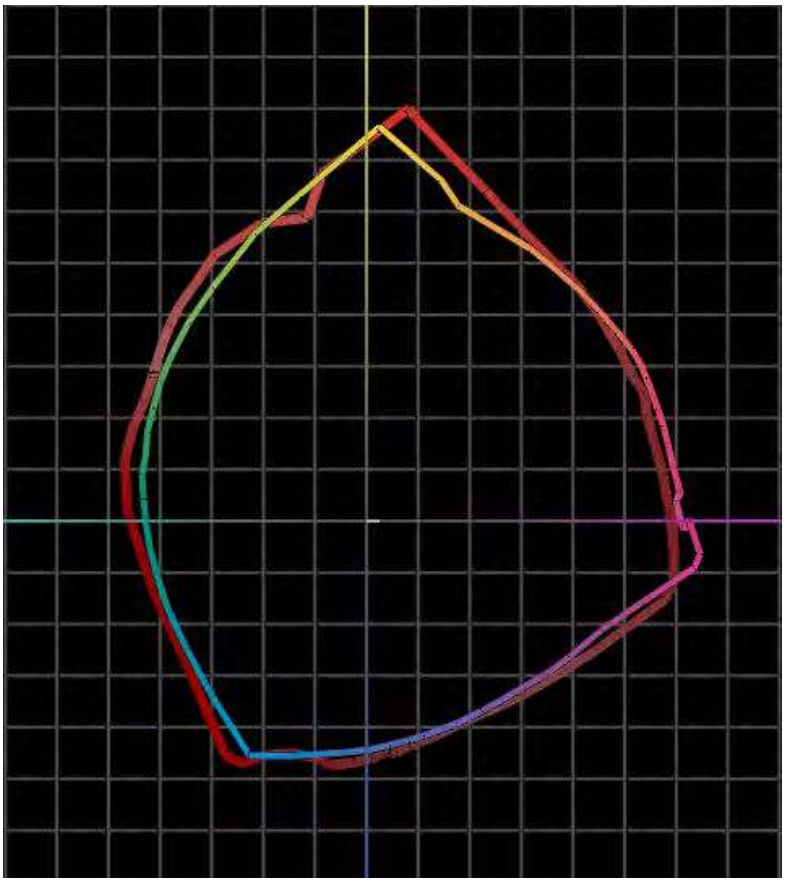
HP Designjet T520 24" colour gamut on plain paper in Fast setting (red) versus Canon imagePROGRAF iPF680 colour gamut (shown chromatically) on plain paper in Fast setting.



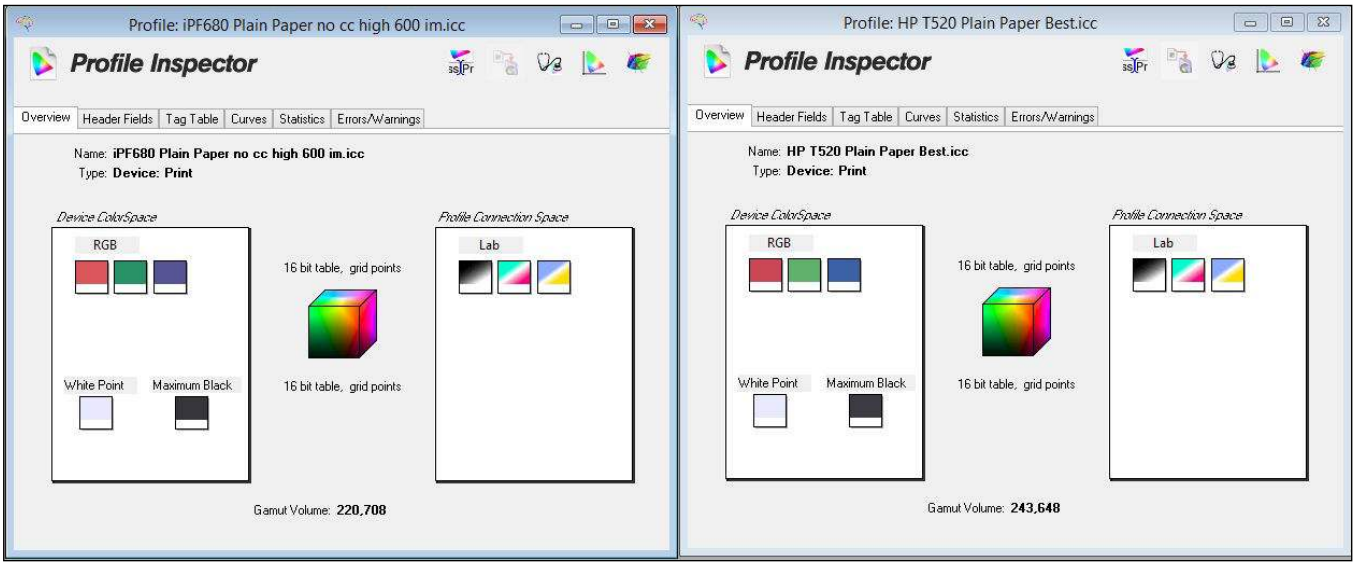
Canon iPF680 on plain paper (Fast Setting)



HP Designjet T520 24" on plain paper (Fast Setting)

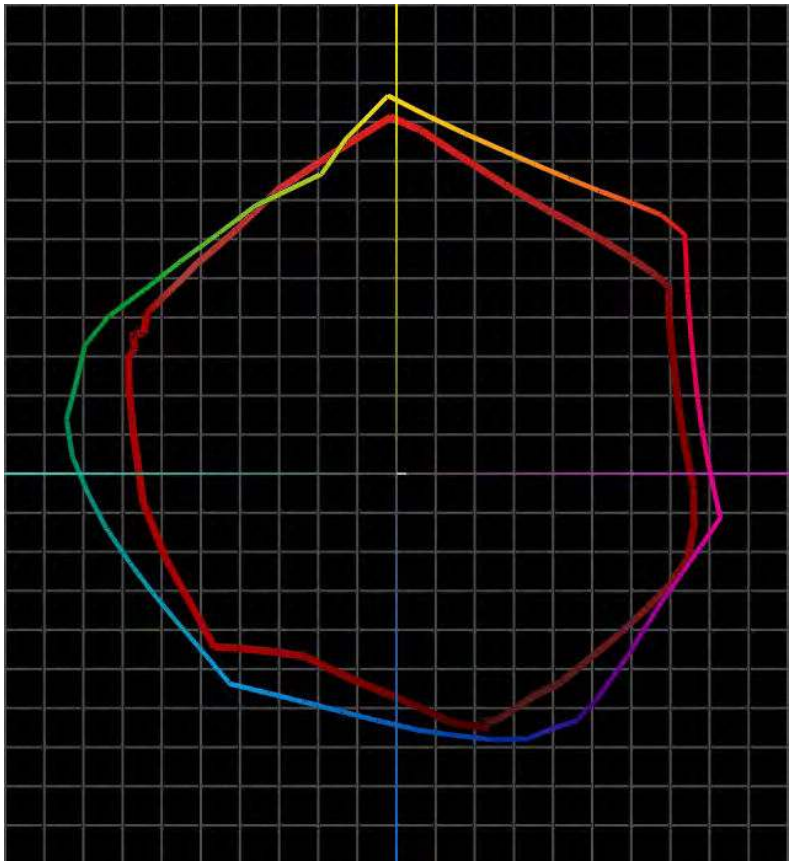


HP Designjet T520 24" colour gamut on plain paper in Best setting (red) versus Canon imagePROGRAF iPF680 colour gamut (shown chromatically) on plain paper in High quality setting.

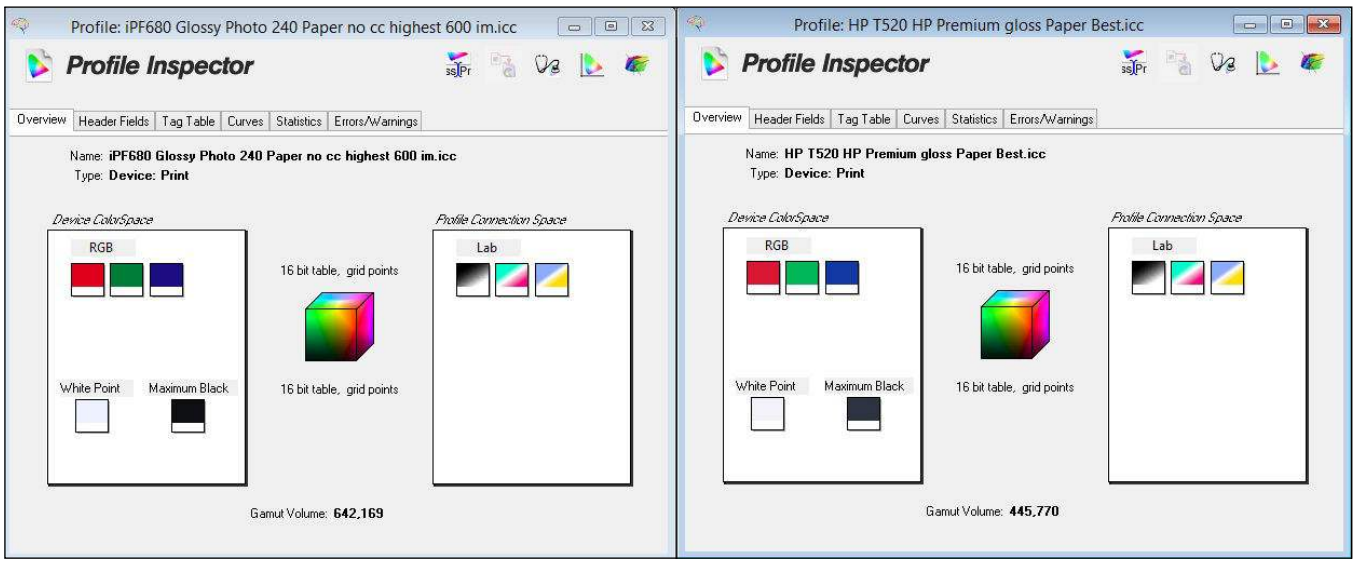


Canon iPF680 on plain paper (High quality)

HP Designjet T520 24"on plain paper (Best quality)



HP Designjet T520 24" colour gamut on glossy photo quality paper in Best quality setting (red) versus Canon imagePROGRAF iPF680 colour gamut (shown chromatically) on glossy photo quality paper in High quality setting.



Canon iPF680 on glossy photo quality paper

HP Designjet T520 24" on photo quality paper

Black Print Quality

	Canon imagePROGRAF iPF680			HP Designjet T520 24"		
	Fast	Standard	High	Fast	Normal	Best
Density Block						
1	1.42	1.42	1.47	1.35	1.52	1.48
2	1.35	1.43	1.47	1.36	1.51	1.48
3	1.36	1.44	1.45	1.36	1.50	1.48
4	1.35	1.44	1.44	1.35	1.52	1.49

Note: Solid black density measurements are based on four readings taken from a BLI proprietary PDF test target file corresponding to four different 100% solid black locations on the output. The output was assessed at all quality settings available, with the Canon driver set to plain paper/monochrome setting, HP driver set to plain paper, greyscale, black ink only. Density was measured using an XRite 508 densitometer.

Device Feature Set

	Canon imagePROGRAF iPF680	Advantage		HP Designjet T520 24"
Max. print quality	2400 x 1200 dpi			2400 x 1200 dpi
Number of inks	5	✔		4
Ink tanks replaceable during operation	Yes	✔		No
Ink-drop size	4 picoliter	✔		CMY- 5.5 picoliter K – 12 picoliter
Ink cartridge capacity	90 ml - CMYK, 130ml - MBk (Starter), 130 ml and 300 ml	✔		CMY – 29ml, K – 38ml (Starter), 80ml
Number of nozzles	MBK: 5,120 nozzles, Other colours: 2,560 nozzles each	✔		1,376 each
Number of printheads	1			1
Line accuracy	+/-0.1% or less			+/-0.1%
Minimum line width	0.02 mm			0.02 mm
Minimum print margins	3 mm	✔		5 mm
Maximum outside diameter of roll paper	150 mm	✔		100 mm
Maximum cut-sheet media length	1.6 m	✔		914 mm
Maximum media thickness	0.8mm	✔		0.3mm
Maximum media width	24 inches			24 inches
Media loading	Top			Front
Optional media handling	Roll holder set	✔		None
Standard RAM	256 MB		✔	1 GB (Virtual)
Maximum RAM	256 MB		✔	1 GB (Virtual)
Hard drive	None			None
Interface	USB 2.0, 10/100Base-TX,1000Base-T			USB 2.0, 100Base-T, WiFi
PDL	GARO, HP-GL/2, HP RTL			HP-GL/2, HP RTL, HP PCL 3, GUI, JPEG, CALS G4
Net weight (unpacked)	56.7 kg		✔	34 Kg
Power consumption when in standby	0.5 W	✔		4.5 W
Power consumption when active	140 W		✔	<35 W
Acoustic pressure	Operation: 47 dB (A) or less; Standby: 35 dB (A) or less	✔		Operation: 48 dB (A); Standby: 16 dB (A)
Acoustic power	Operation: 6.4 Bels or less	✔		6.5 B (A) active

Driver Feature Set

	Canon imagePROGRAF iPF680	Advantage		HP Designjet T520 24"
Speed settings	5 (Fast 300, Standard 600, Fast 600, High 600 and 1200)	✔		3 (Fast, Normal, Best)
Economy mode	Yes			Yes
Predefined profiles	7	✔		5 (Default, CAD, GIS, Photo, B/W Photo)
Overview of profile settings provided	Yes	✔		No
Media profiles	18 + 5			23
IQ optimized for options	Yes			Yes
Watermark	Yes	✔		No
Sharpen text	Yes			Yes (Max detail setting)
Thicken fine lines	Yes			Yes (Max detail setting)
Mirror image	Yes	✔		No
Multi-up printing	Yes, 2 to 16	✔		No
Poster print mode	Yes (2 by 2)	✔		No
Page stamping	Yes (Date, Time, Name, Page Number)	✔		No
Image rotation	Yes – auto 180 degrees			Yes – auto 90 degrees
Option to preview before print	Yes			Yes*
Link to device Web server from driver	No (there is a link to Status Monitor)			No
CMYK balance adjustment	Yes	✔		No
Brightness adjustment	Yes	✔		No
Contrast adjustment	Yes	✔		No
Saturation adjustment	Yes	✔		No
Advanced colour management options	Yes			Yes
Disable automatic cutter	Yes			Yes
Unidirectional printing	Yes	✔		No
Integration with MFP	Yes	✔		No

*When driver is downloaded from HP's website.

Ink Consumption

Table 1

Amount of Ink in Each Canon iPF680 Cartridge (grams)

	Cyan	Magenta	Yellow	Matte Black	Black
Weight of cartridge prior to installation	401.4	396.8	397.1	398.9	403.3
Weight of cartridge at end of life	75.0	75.0	75.0	75.0	75.0
Net weight of ink	326.4	321.8	322.1	323.9	328.3
Total ink weight across five cartridges					1,622.5

Table 2

Amount of Ink in Each HP Designjet T520 24" Cartridge (grams)

	Cyan	Magenta	Yellow	Black
Weight of cartridge prior to installation	58.4	58.4	58.7	134.1
Weight of cartridge at end of life	28.2	28.2	28.2	49.2
Net weight of ink	30.2	30.2	30.5	84.9
Total ink weight across four cartridges				175.8

Table 3

Ink Used in Three 50-Page Runs of Cottage Architectural Drawing Test Document on the Canon iPF680 (grams) in Fast Mode

	Cyan	Magenta	Yellow	Matte Black	Black
Test Run 1 Net weight of ink used	2.6	1.6	1.3	12.8	1.1
Test Run 2 Net weight of ink used	3.0	1.8	1.6	11.6	1.2
Test Run 3 Net weight of ink used	2.7	1.9	1.4	11.2	1.2
Average amount of ink used across three runs	2.8	1.8	1.4	11.9	1.2
Total ink weight across five cartridges for 50-page run (based on averages)					19.0

Table 4

Ink Used in Three 50-Page Runs of Cottage Architectural Drawing Test Document on the HP Designjet T520 24" (grams) in Fast Mode

	Cyan	Magenta	Yellow	Black
Test Run 1 Net weight of ink used	4.1	2.4	1.1	11.0
Test Run 2 Net weight of ink used	3.9	2.3	0.8	10.3
Test Run 3 Net weight of ink used	3.5	2.2	0.9	10.7
Average amount of ink used across three runs	3.8	2.3	0.9	10.7
Total Ink Weight across four cartridges for 50-page run (based on averages)				17.7

Table 5

Ink Used in Three 50-Page Runs of Cottage Architectural Drawing Test Document on the Canon iPF680 (grams) in Standard/Normal Mode

	Cyan	Magenta	Yellow	Matte Black	Black
Test Run 1 Net weight of ink used	2.1	2.9	1.4	13.4	2.2
Test Run 2 Net weight of ink used	2.4	2.0	1.6	13.4	1.4
Test Run 3 Net weight of ink used	2.6	1.9	1.3	14.7	1.2
Average amount of ink used across three runs	2.4	2.3	1.4	13.8	1.6
Total ink weight across six cartridges for 50-page run (based on averages)					21.5

Table 6

Ink Used in Three 50-Page Runs of Cottage Architectural Drawing Test Document on the HP Designjet T520 24" (grams) in Standard/Normal Mode

	Cyan	Magenta	Yellow	Black
Test Run 1 Net weight of ink used	6.5	3.1	1.2	12.3
Test Run 2 Net weight of ink used	5.9	2.5	0.7	11.6
Test Run 3 Net weight of ink used	6.1	2.5	0.7	11.5
Average amount of ink used across three runs	6.2	2.7	0.9	11.8
Total ink weight across four cartridges for 50-page run (based on averages)				21.5

Table 7

Ink Used in Three 50-Page Runs of Retail Poster Test Document on the Canon iPF680 (grams)

	Cyan	Magenta	Yellow	Matte Black	Black
Test Run 1 Net weight of ink used	12.5	29.5	9.3	8.5	1.1
Test Run 2 Net weight of ink used	12.2	29.1	8.3	9.6	0.9
Test Run 3 Net weight of ink used	11.8	28.9	8.2	9.9	1.1
Average amount of ink used across three runs	12.2	29.2	8.6	9.3	1.0
Total ink weight across five cartridges for 50-page run (based on averages)					60.3

Table 8

Ink Used in Three 50-Page Runs of Retail Poster Test Document on the HP Designjet T520 24" (grams)

	Cyan	Magenta	Yellow	Black
Test Run 1 Net weight of ink used	14.8	29.9	24.2	7.5
Test Run 2 Net weight of ink used	14.9	29.0	24.3	7.7
Test Run 3 Net weight of ink used	14.1	28.9	23.4	6.3
Average amount of ink used across three runs	14.6	29.3	24.0	7.2
Total ink weight across four cartridges for 50-page run (based on averages)				75.0

Table 9

Ink Used in Three 50-Page Runs of GIS Map Test Document on the Canon iPF680 (grams)

	Cyan	Magenta	Yellow	Matte Black	Black
Test Run 1 Net weight of ink used	14.2	9.1	8.2	7.7	1.6
Test Run 2 Net weight of ink used	14.7	9.2	8.7	8.0	0.9
Test Run 3 Net weight of ink used	13.4	9.3	8.0	8.6	1.3
Average amount of ink used across three runs	14.1	9.2	8.3	8.1	1.3
Total ink weight across five cartridges for 50-page run (based on averages)					41.0

Table 10

Ink Used in Three 50-page Runs of GIS Map Test Document on the HP Designjet T520 24" (grams)

	Cyan	Magenta	Yellow	Black
Test Run 1 Net weight of ink used	20.6	10.7	15.2	4.6
Test Run 2 Net weight of ink used	20.7	11.0	15.3	5.9
Test Run 3 Net weight of ink used	20.9	12.8	16.0	4.0
Average amount of ink used across three runs	20.7	11.5	15.5	4.8
Total ink weight across four cartridges for 50-page run (based on averages)				52.6

Ink Consumption Test Methodology Overview:

Buyers Lab's ink consumption analysis was conducted using three document types (architectural plan, retail poster and GIS map). Each document was formatted as a PDF and sized at ISO A1 except for the Cottage Architectural Plan, which was formatted as a DWF file.

The Canon imagePROGRAF iPF680 was installed in BLI's lab with the latest level of firmware (as of March 2014) and connected to a Windows 7 workstation using a 1000BaseT TCP/IP connection. The device was left in default configuration throughout testing. The Canon GARO driver was used for all testing and was left in default colour setting configuration, with media selection set to plain paper and the image set to print at actual size. For the Cottage Architectural Drawing, Print Priority settings were set to Line Drawing/Text with Quality set to Fast and Standard (600 dpi). For the Retail Poster and the GIS map, Print Priority settings were set to Image with Quality set to Standard (600 dpi).

The HP Designjet T520 24" was installed in BLI's lab with the latest level of firmware (as of March 2014) and connected to a Windows 7 workstation using a 1000BaseT TCP/IP connection. The device was left in default configuration throughout testing. The Windows HP-GL2 driver was used for all testing and was left in default colour setting, with media selection set to plain paper and the image set to print at actual size. Quality was set to Normal (600 dpi) mode for all document types with the exception of the Cottage Architectural Plan, which was tested in both Fast and Normal modes.

Before installing the ink cartridges, BLI technicians weighed and recorded the weight of each with all packaging removed. At the end of each 50-print test run, the cartridges were weighed again and the resulting weight of ink used for the test run calculated for each colour. To ensure that the sub-tank on the Canon model did not affect results, a procedure was followed to ensure that the sub-tank level was at its maximum before the print run commenced and again after the print run was completed, thereby ensuring that ink replenishment of the sub-tanks was taken into account for each print run. For both models, one cartridge was then run to exhaustion and the weight of the empty cartridge was recorded.

The percentage of ink used per cartridge was calculated by dividing the net weight of ink used in the print run by the overall weight of ink in each cartridge and multiplying by 100.

The percentage of total ink used per printer was calculated by adding the percentages used of each of the cartridges and dividing by the number of cartridges.

Test Environment

Testing was conducted in BLI's European test lab, in an atmospherically controlled environment monitored by a 24/7 Dickson Temperature/RH chart recorder, ensuring that typical office conditions were maintained. All paper used in testing was allowed to acclimatize inside the facility for a minimum of 12 hours before being used.

Test Equipment

BLI's dedicated test network in Europe, consisting of Windows 2007 servers, Windows 7 workstations, 10/100/1000BaseTX network switches and CAT5e/6 cabling.

Test Procedures

The test methods and procedures employed by BLI in its lab testing include BLI's proprietary procedures and industry-standard test procedures. In addition to a number of proprietary test documents, BLI uses industry-standard files including an IT8 test file and an ASTM monochrome test document for evaluating black image quality. In addition to a visual observation, colour print quality and gamut size are evaluated using a profile software tool from Colour Confidence that was read using an EFI ES-1000 colour spectrophotometer and analysed using Chromix ColorThink Pro 3.0 software. Density of black and colour output was measured using an X-Rite 508 densitometer.

About Buyers Laboratory LLC

Buyers Laboratory LLC (BLI) is the world's leading independent provider of analytical information and services to the digital imaging and document management industry. For more than 50 years, buyers have relied on BLI to help them differentiate products' strengths and weaknesses and make the best purchasing decisions, while industry sales, marketing and product professionals have turned to BLI for insightful competitive intelligence and valued guidance on product development, competitive positioning and sales channel and marketing support. Using BLI's web-based bliQ and Solutions Center services, 40,000 professionals worldwide create extensive side-by-side comparisons of hardware and software solutions for more than 15,000 products globally, including comprehensive specifications and the performance results and ratings from BLI's unparalleled Lab, Solutions and Environmental Test Reports, the result of months of hands-on evaluation in its US and UK labs. The services, also available via mobile devices, include a comprehensive library of BLI's test reports, an image gallery, hard to find manufacturers' literature and valuable tools for configuring products, calculating total cost of ownership (TCO) and annual power usage. BLI also offers consulting and private, for-hire testing services that help manufacturers develop and market better products and consumables.

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