Custom Test Report

BLI Comparative Performance Evaluation

JANUARY 2015

Canon imagePROGRAF iPF670 vs. HP Designjet T520 24"

Canon imagePROGRAF iPF670

HP Designjet T520 24"

Advantage ✔	Canon imagePROGRAF iPF670	HP Designjet T520 24"
Colour Image Quality	✔	
Black Image Quality	✔	
Colour Print Productivity	✔	
Black Print Productivity	✔	
Direct PDF Submission Functionality	=	=
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 iPF670 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

BLI's test shows the Canon imagePROGRAF iPF670 model to be the clearly superior product in the aspects of performance covered, delivering significantly higher productivity in both colour and black modes than the HP Designjet T520 24" model, especially in High/Best quality modes (where it was consistently four times faster than the HP model), as well as superior media handling and a richer device and driver feature set. The Canon model also had the overall 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 (drawing ink from its sub-tank), 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 iPF670 offers a number of image quality advantages over the HP model in both colour and black modes. The Canon model delivers a 30.0% larger colour gamut (with an impressive CIE volume of 636,679 compared with 445,672 for the HP model) when printing on photo-quality paper, and it also delivers a larger colour gamut than the HP model on plain paper in Normal and Fast modes, while the HP model's colour gamut is larger on plain paper in Best quality mode. The Canon model also produced more natural-looking skin tones, which were reddish in output produced by the HP unit. Although the HP model's optical density was higher for black in Best and Normal modes and yellow in Best mode, the Canon unit's output had higher densities in all quality modes for cyan and magenta. Moreover, the Canon iPF670 had a clear advantage when printing text, with crisper fonts, and it produced superior results for circles and text (but not fine lines) when the CAD (Line Drawing) settings were used. Another important advantage enjoyed by the Canon iPF670 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 24" consumes less energy while printing—less than 35 watts compared with 140 watts with the Canon model—but in standby mode (where it is likely to spend more time) the Canon unit uses only 0.5 watts 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 some functionality not offered by Canon, including automatic saving to the cloud of all printjobs. However, BLI analysts found the process for registering for ePrint & Share to be more tedious and time-consuming than for 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 iPF670 delivered a superior performance in virtually all categories tested, with superior image quality, much greater productivity in all quality modes, superior poster productivity, lower ink consumption, a stronger device feature set and a more feature-rich driver than the HP Designjet T520 24" model.

Colour Image Quality

Advantage ✔	Canon imagePROGRAF iPF670	HP Designjet T520 24"
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/Normal settings)	✔	
Colour Gamut (plain paper, High/Best 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 24" delivered higher optical density for yellow on plain paper in Best mode (but comparable density in the other two modes), the Canon iPF670 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 using Best quality settings, but the Canon unit delivered a higher gamut in Standard and Fast modes.

\+ 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 30.0% larger than that of the HP unit, with an impressive CIE volume of 636,679 compared with 445,672 for the HP device.

\+ There were clear differences between the two models in text output in colour mode. In all modes, both serif and sans serif fonts produced by the Canon model were crisper than those of the HP model and legible down to 3-pt. size with no breakup. In contrast, although sans serif fonts produced by the HP unit almost matched Canon's, serif fonts produced by the HP model were legible only down to the 6-pt. size in all quality modes.

○ Users should note that the Canon unit produces better results for fine lines and text when the CAD (Colour Line Drawing) settings are used, as does the HP unit with its CAD settings.

○ 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 white on black lines had poorer definition below the 0.25-pt. level when compared with the same output produced in its Normal mode. Black on white fine lines were rated very good for the HP model and good for the Canon unit in all quality modes.

\+ Circles produced by both models were distinct down to 0.1-pt. size, even in Fast mode, with no evidence of stair-stepping. However, 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 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.

○ Little difference was seen in the photographic image output of the two models in High/Best modes, with both models delivering excellent detail in dark contrast areas and good colour saturation.

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

○ The Canon iPF670 produced the 1x1 pixel grid in CMY with no quality issues, and coverage was excellent and consistent across all colours. The HP T520 delivered comparable coverage to that of the Canon unit.

\+ Overall, the Canon model emerges as the stronger performer in BLI's assessment of colour image quality. It delivered a finer level of detail in colour AEC graphics, more natural-looking skin tones, smoother circles in High/Max quality mode and larger colour gamuts in all but one of the gamut tests when compared with the HP model. While the HP device offers higher optical density for yellow, more distinct black on white fine lines and a larger colour gamut on plain paper in High/Best mode, the Canon iPF670 had the advantage in density for cyan and magenta, 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

Advantage ✔	Canon imagePROGRAF iPF670	HP Designjet T520 24"
Text	✔	
Fine Lines	=	=
Halftone Range	=	=
Halftone Fill	✔	
Solid density	=	=
AEC Graphics	✔	
Business Graphics	=	=

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

○ The HP model delivered slightly higher optical densities for black in Standard/Normal mode, while the Canon unit produced higher black density than the HP model in Fast mode. In High/Best mode the results were comparable.

+ In all modes, both serif and sans-serif fonts were legible down to the 3-pt. size with the Canon model, with no breakup, whilst fonts produced by the HP unit were legible only down to the 4-pt. size in Fast and Normal mode, and only down to the 5-pt. level in Best mode.

○ 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 halftones over the whole range—from the 10% to 100% dot-fill levels in all modes.

+ The Canon device's halftone fill output was rated good in all modes, whilst the HP unit's was rated only fair in Speed and Quality modes as some graininess was visible across all output.

+ 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 High/Best quality mode on plain paper was produced very accurately by both models, with distinct halftone gradations and no graininess.

+ 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 and other graphics and smoother circles. The HP model was unable to match the Canon in delivering consistently legible fonts at the smallest (3-pt.) font size, and it displayed some graininess in its halftone fills.

Print Productivity

Advantage ✔	Canon imagePROGRAF iPF670	HP Designjet T520 24"
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)	✔	

+ The Canon iPF670 delivered a faster first-page-out time of 84.74 seconds after a weekend of non-use, compared with 117.40 seconds for the HP device. Start-up time before printing commenced was 36.99 seconds for the Canon model, slower than the 29.94 seconds for the HP unit.

+ The Canon iPF670 delivered a faster first-page-out time of just 58.89 seconds from its ready state, compared with 98.91 seconds for the HP device. Start-up time before printing commenced was 10.81 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 iPF670 was 43.8% faster than the HP model in Fast mode, 41.2% faster in Standard/Normal mode, and more than four times faster in High quality/Best mode.

+ When printing BLI's 12-page DWF test file in colour, the Canon unit was 34.5% faster in Fast mode, 44.3% faster in Standard/Normal mode, and more than four times 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 34.6% faster than the HP model in Fast mode, 8.9% faster in Standard/Normal mode, and more than four times faster in High quality/Best mode.

+ 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.

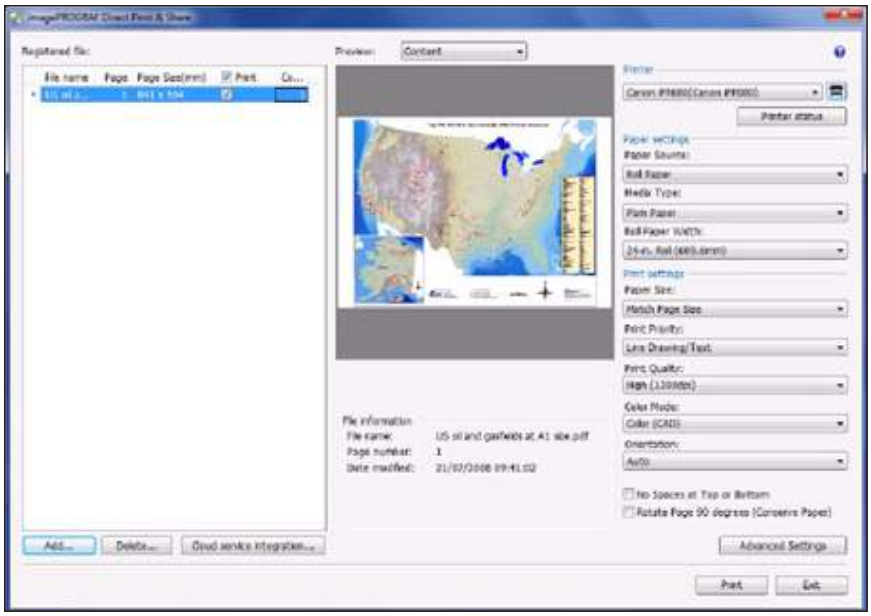
+ Since printing is not interrupted when a Canon cartridge is depleted, it is expected that less ink and paper will be wasted by the Canon model than by the HP model.

Direct PDF Print Submission Functionality

Advantage ✔	Canon imagePROGRAF iPF670	HP Designjet T520 24"
Ease of Use	✔	
Functionality	=	=

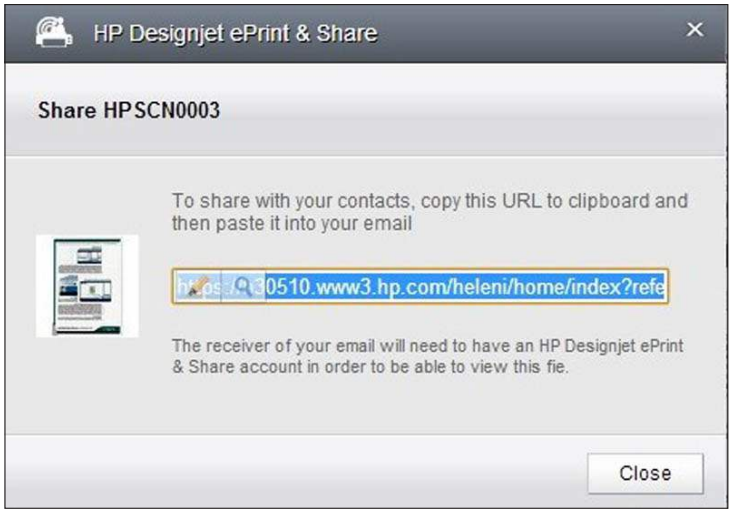
○ A free download from Canon's website, the iPF Direct Print & Share utility enables printing of PDFs without having to open Adobe Acrobat and it also allows users to retrieve files from cloud storage for printing.

+ The latest version (v2.0) of iPF Direct Print & Share supports "Shortcut Print" functionality, which enables users to set up several print settings represented by a desktop icon. Files are automatically printed with the predefined settings when users drag-and-drop them on to the icon. Multiple desktop icons, each with different settings, can be created for various different jobs.



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 and also supports printing from Apple or Android smartphones or tablets, and automatically saves copies of work to the cloud.



+ 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 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

Advantage ✔	Canon imagePROGRAF iPF670	HP Designjet T520 24"
Banner printing capability	✔	
Productivity	✔	

+ The Canon iPF670 successfully printed BLI's x 70" banner (originally a 4,955-KB PDF file) in Fast mode, taking just 22.76 seconds to generate a preview, and a further 1 minute, 50.60 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

Advantage ✔	Canon imagePROGRAF iPF670	HP Designjet T520 24"
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 33.6 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 (less so with the Canon model). When the Canon model was switched to unidirectional printing, which eliminated the banding, it took 59.94 seconds to print.
+ When printing a poster in Standard/Normal mode at 600 dpi, the Canon model took 57.68 seconds and the HP unit took 88.22 seconds. While no banding was evident in the poster produced by the Canon model, slight banding was evident in the output of the HP model in this mode.
+ The Canon model printed a poster in High quality (600 dpi) mode in 1 minute, 40.65 seconds, while the HP model in Best quality (1200 dpi) required 6 minutes, 21.87 seconds—over three times longer than with the Canon model—to print the poster.
+ At these High/Best settings the Canon model delivered superior image quality when printing posters, with vibrant, saturated reds and excellent detail.

Ink Consumption

RESULTS		
Results averaged across three sets of 50-page A1 printing in various modes (specified below)	**Canon imagePROGRAF iPF670**	**HP Designjet T520 24"**
COTTAGE ARCHITECTURAL PLAN (Fast Mode)		
Average weight of ink used (grams)	22.5g	17.7 g
COTTAGE ARCHITECTURAL PLAN (Standard/Normal Mode)		
Average weight of ink used (grams)	24.4 g	21.5 g
RETAIL POSTER (Standard/Normal Mode)		
Average weight of ink used	67.1 g	75.0 g
GIS MAP (Standard/Normal Mode)		
Average weight of ink used	38.9 g	52.6 g

— When producing 50 prints of a Cottage Architectural Plan in Fast Mode, the Canon unit used 27.1% more ink than did the HP T520. In Standard/Normal Mode, the Canon unit used 13.5% more ink than the HP T520.

+ When printing a Retail Poster in Standard/Normal Mode, the Canon unit used 10.5 % less ink than did the HP T520.

+ When printing a GIS Map, the Canon iPF670 used 26.0% 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 black, cyan, magenta and yellow cartridges are all available in 130-ml capacities, which is a much higher capacity than those for the HP model's cartridges (29 ml for cyan, magenta and yellow; 38ml (starter) 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 (0.8 mm compared with HP's 0.3 mm), and a higher maximum cut-sheet media length of 1.6 m compared with 914 mm for the HP unit.

○ The catch baskets of both models enable most printed sheets to be stacked neatly, with the Canon model offering the advantage of flat stacking. However, there was little to distinguish between the two models when the media approached the end of the roll, as the tightly curled output from both models had a tendency to spill out of the basket.

— The HP device offers a larger standard and maximum RAM of 1 GB, compared with 256 MB for the Canon iPF670.

— The HP T520 is a more compact, lightweight device than the Canon model, weighing in at just 34 kg versus 53.7 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 while printing (less than 35 W) is lower than that of the the Canon model (140W).

+ However, in standby mode, the Canon model's power consumption (0.5 W) is much lower than that of 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 iPF670 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).

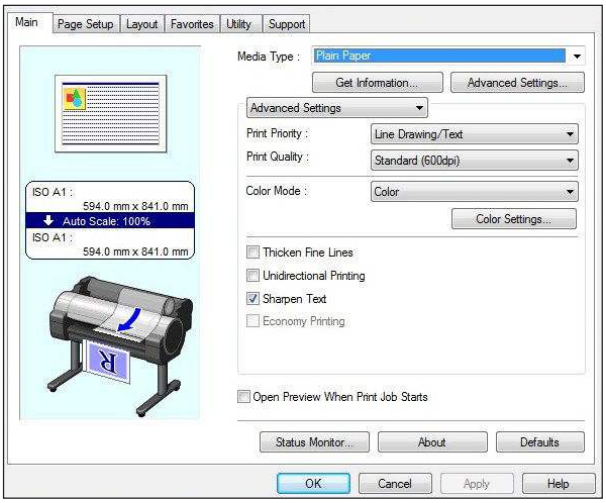
+ The Canon GARO driver offers a wider range of built-in adjustments for CMYK balance, brightness, contrast and saturation than the HP-GL/2 driver. ICC profile settings are also available in the GARO driver's matching tab under Advanced Settings. Operators can select four matching modes (driver, ICC, 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.

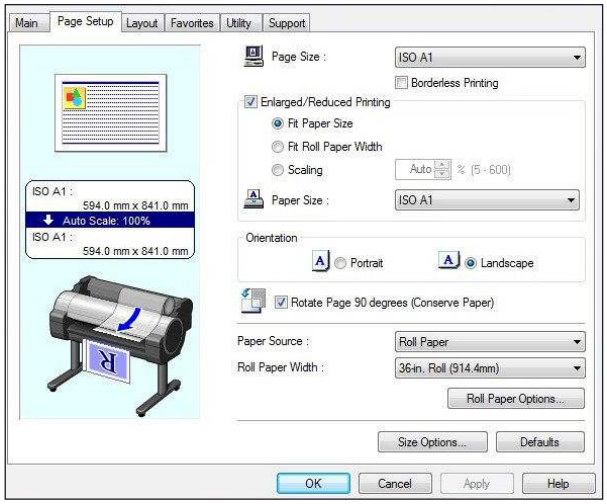
+ The Canon driver Extra Kit (available as a free download) includes the Colour imageRUNNER Enlargement Copy Mode utility, which enables users to integrate a Canon small-format MFP device with the iPF670. Documents scanned by the Canon MFP are automatically routed to a hot folder that is monitored by the iPF670 driver. The image is then resized and printed, offering a fast, easy-to-use poster creation tool for office users.

+ The Canon driver Extra Kit 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.

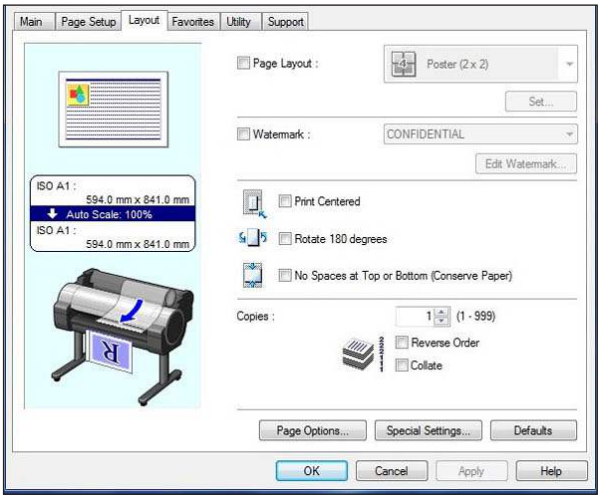
+ A plug-in for printing from Microsoft Office applications offered by the Canon driver includes useful tools for automatic media resizing, nesting and borderless printing.



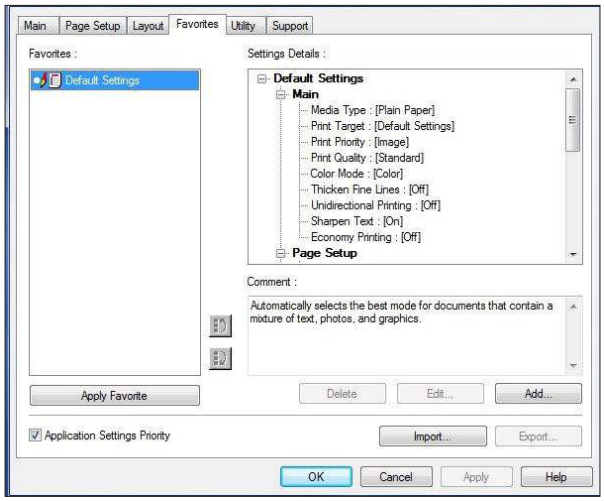
Canon Print Driver Main Tab



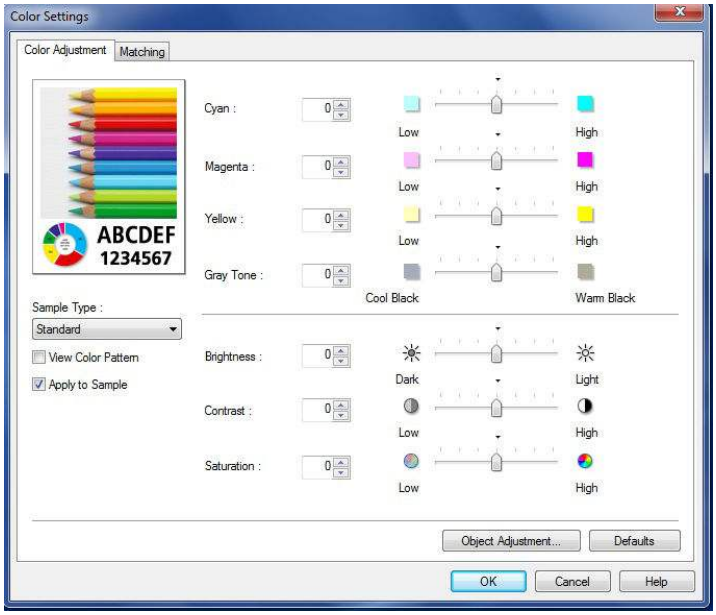
Canon Print Driver Page Setup Tab



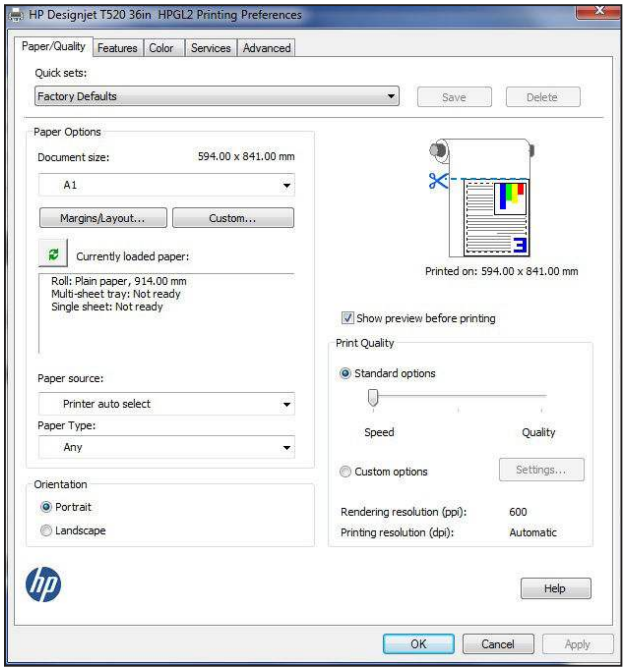
Canon Print Driver Layout Tab



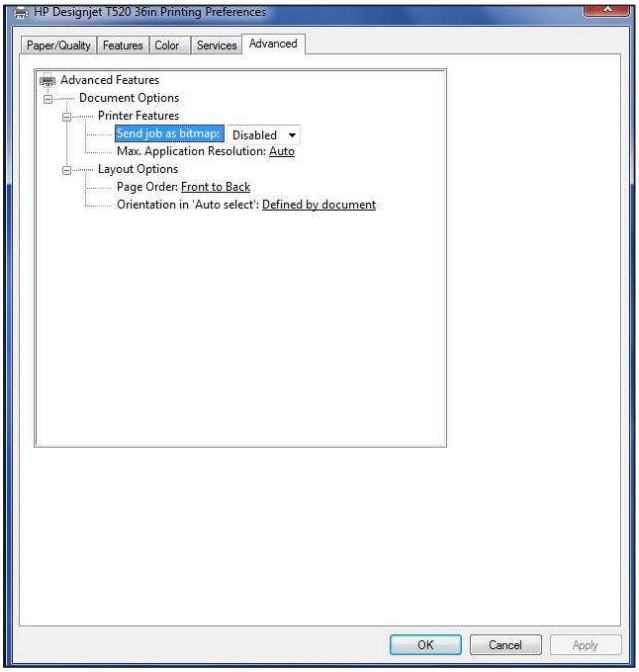
Canon Print Driver Favourites Tab



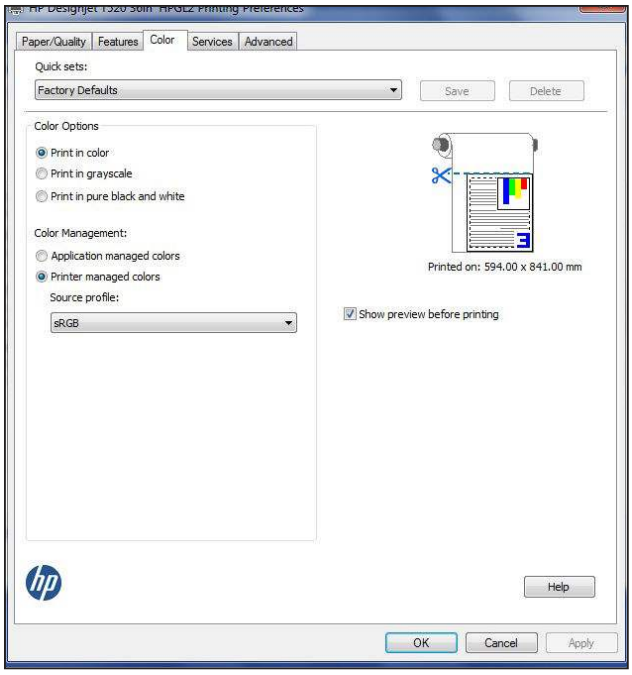
Canon Print Driver Colour Adjustment Tab



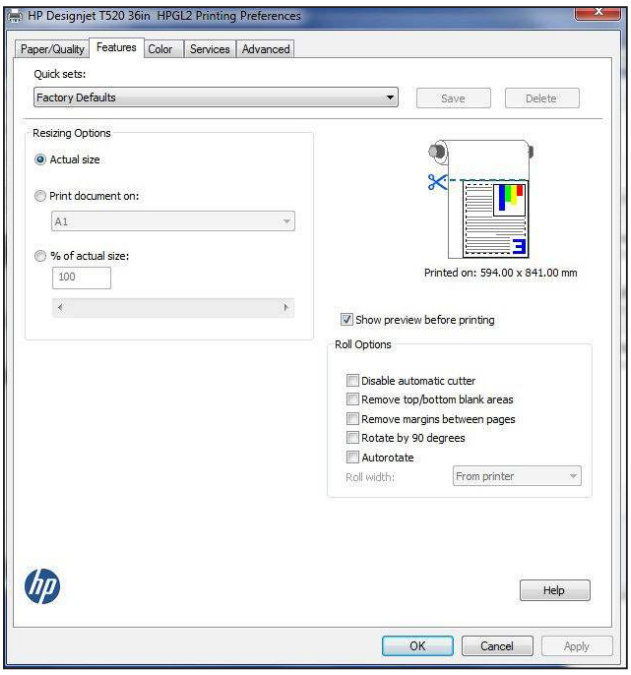
HP Print Driver Paper Quality Tab



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 imagePROGRAF iPF670 (time in seconds)			HP Designjet T520 24" (time in seconds)		
Fast	Standard	High	Speed	Quality	Max Quality
742.62	1,041.77	1,847.17	1,322.03	1,772.19	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 iPF670 (time in seconds)			HP Designjet T520 24" (time in seconds)		
Fast	Standard	High	Fast	Normal	Best
431.87	630.66	1151.17	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 iPF670 (time in seconds)			HP Designjet T520 24" (time in seconds)		
Fast	Standard	High	Fast	Normal	Best
431.51	614.30	1150.35	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 iPF670 (time in seconds)	HP Designjet T520 24" (time in seconds)
Time Before Printing Commences	36.99	29.94
First Page Out	84.74	117.40

First-Page-Out Productivity from Ready State

	Canon imagePROGRAF iPF670 (time in seconds)	HP Designjet T520 24" (time in seconds)
Time Before Printing Commences	10.81	14.10
First Page Out	58.89	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 Image Quality

Colour Optical Density Evaluation

Canon imagePROGRAF iPF670 Plain Paper						
	Fast		Standard		High	
	50%	100%	50%	100%	50%	100%
Cyan	0.54	1.02	0.62	1.12	0.59	1.11
Magenta	0.52	0.96	0.61	1.06	0.60	1.08
Yellow	0.43	0.77	0.50	0.86	0.49	0.86
Black	0.55	1.41	0.65	1.49	0.64	1.46

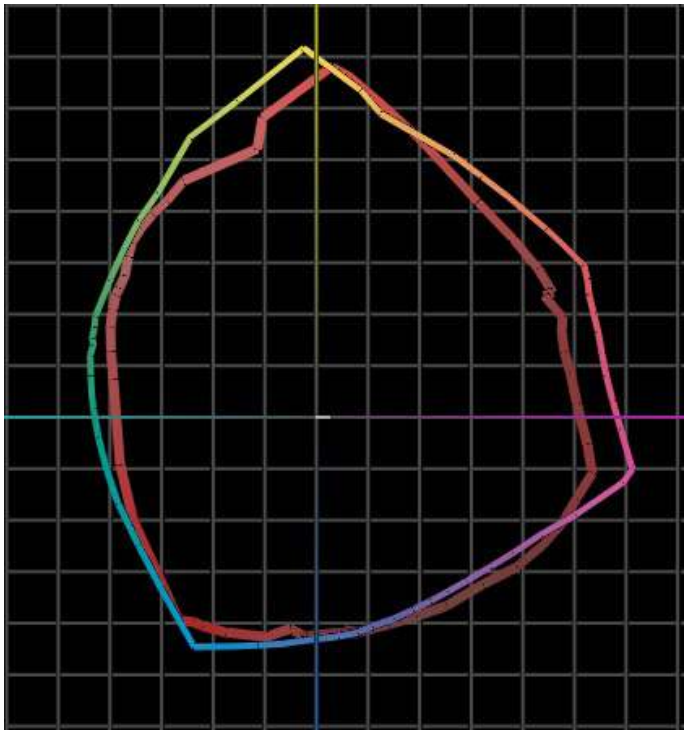
HP Designjet T520 24" Plain Paper						
	Speed		Quality		Max Quality	
	50%	100%	50%	100%	50%	100%
Cyan	0.41	0.75	0.45	0.85	0.52	0.97
Magenta	0.54	0.82	0.59	0.84	0.59	0.98
Yellow	0.57	0.76	0.62	0.85	0.61	0.96
Black	0.56	1.46	0.61	1.50	0.60	1.37

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.

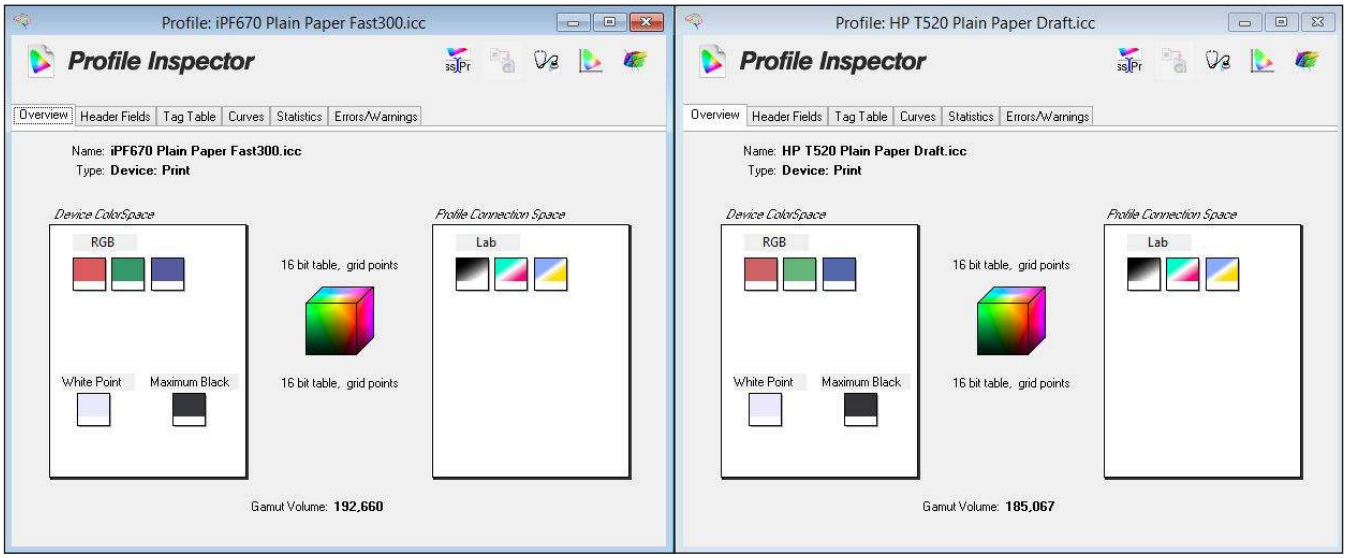
Colour Gamut Comparison

Media Type/Settings	Canon imagePROGRAF iPF670	HP Designjet T520 24"
Plain Paper Fast	192,660	184,939
Plain Paper Standard	224,444	220,244
Plain Paper High	231,389	243,589
Glossy Photo Best	636,679	445,672

Colour Gamut Comparison

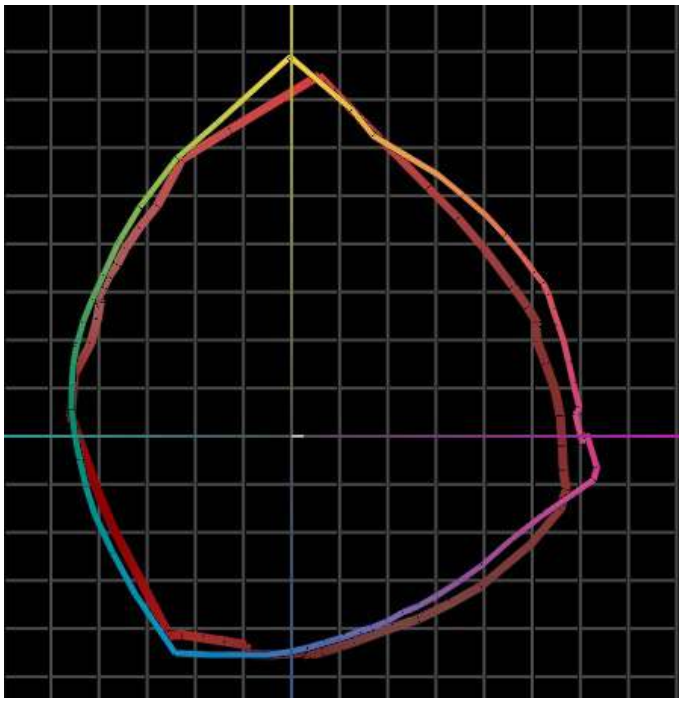


HP Designjet T520 24" colour gamut on plain paper in Fast setting (red) versus Canon imagePROGRAF iPF670 colour gamut (shown chromatically) on plain paper in Fast setting.

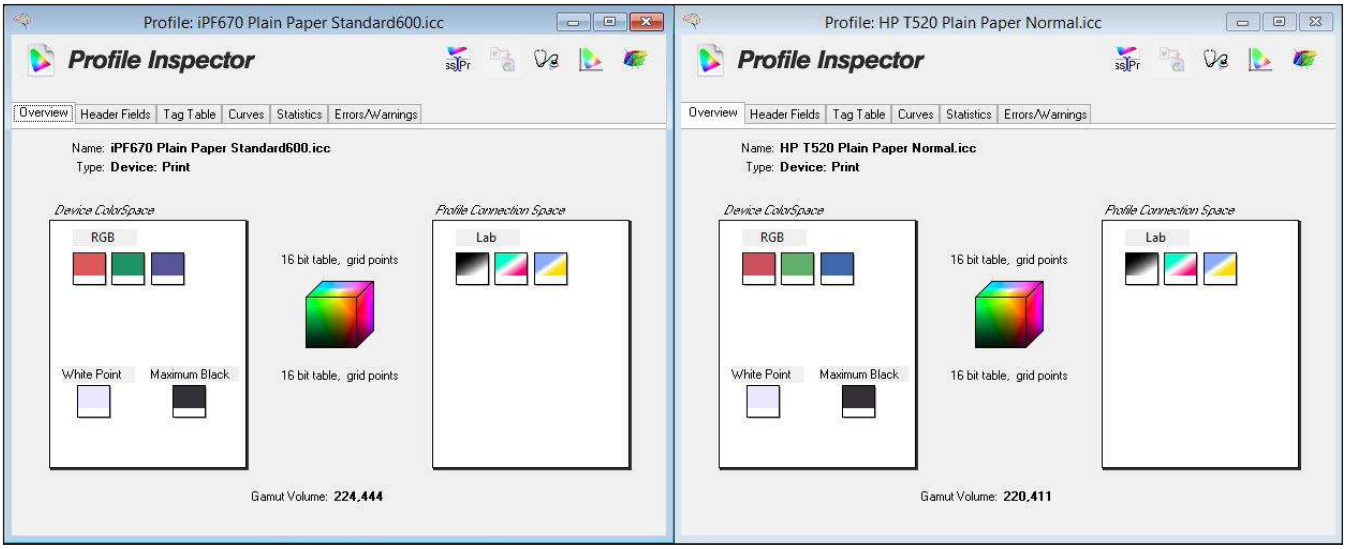


Colour gamut profiles for Canon iPF670 (left) on plain paper (Fast Setting) and HP Designjet T520 24"(right) on plain paper (Fast Setting).

Colour Gamut Comparison

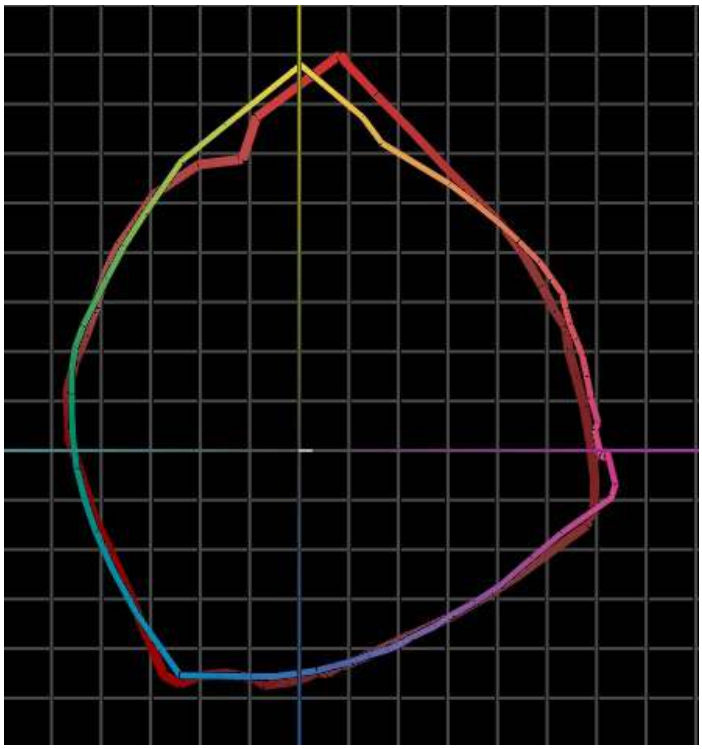


HP Designjet T520 colour gamut on plain paper in Normal setting (red) versus Canon imagePROGRAF iPF670 colour gamut (shown chromatically) on plain paper in Standard quality setting.

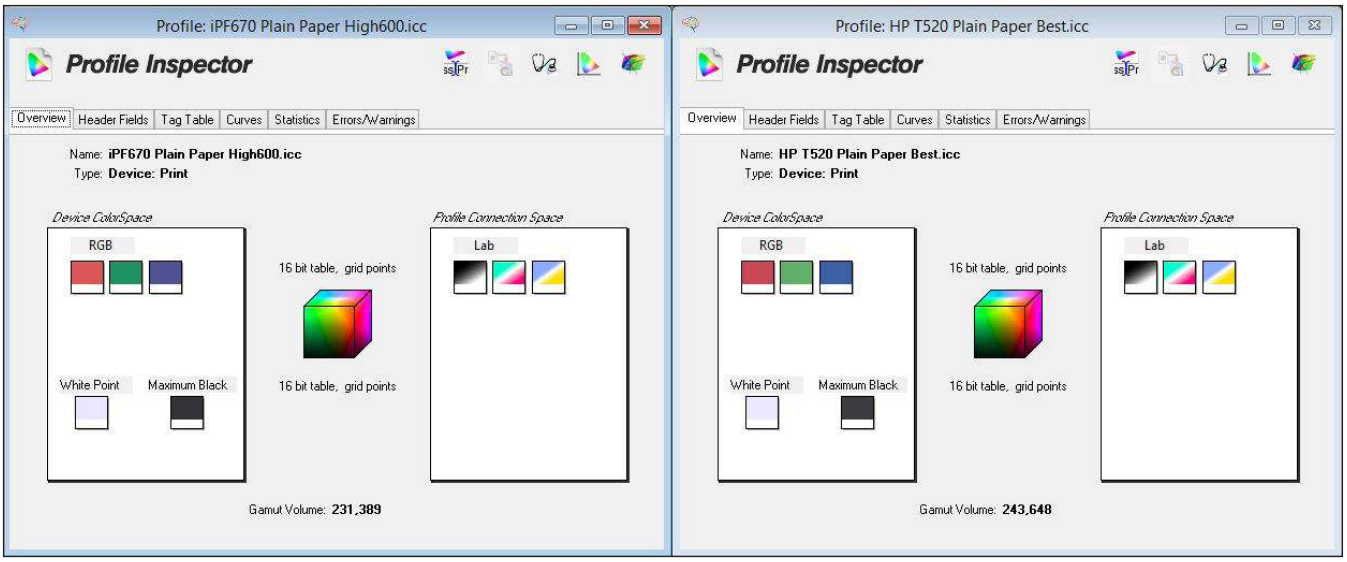


Colour gamut profiles for Canon iPF670 (left) on plain paper (Standard setting) and HP Designjet T520 24"(right) on plain paper (Normal setting).

Colour Gamut Comparison

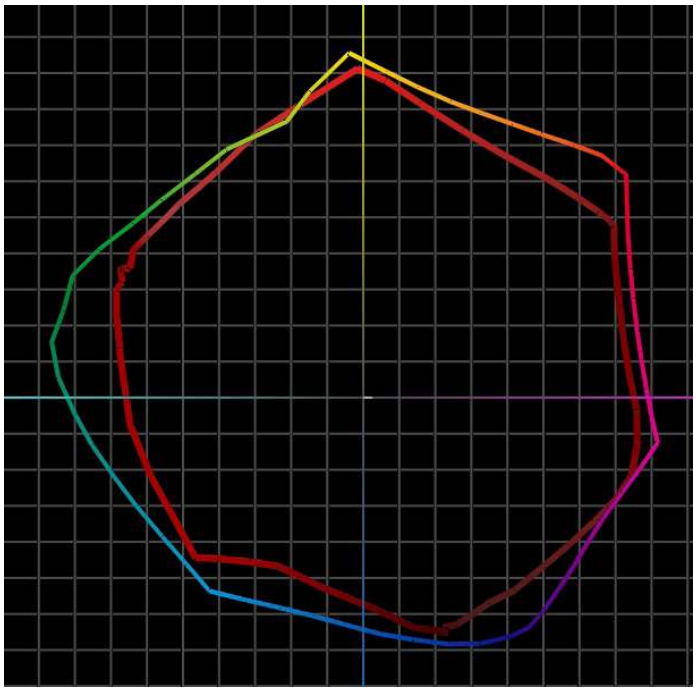


HP Designjet T520 colour gamut on plain paper in Best setting (red) versus Canon imagePROGRAF iPF670 colour gamut (shown chromatically) on plain paper in High quality setting.

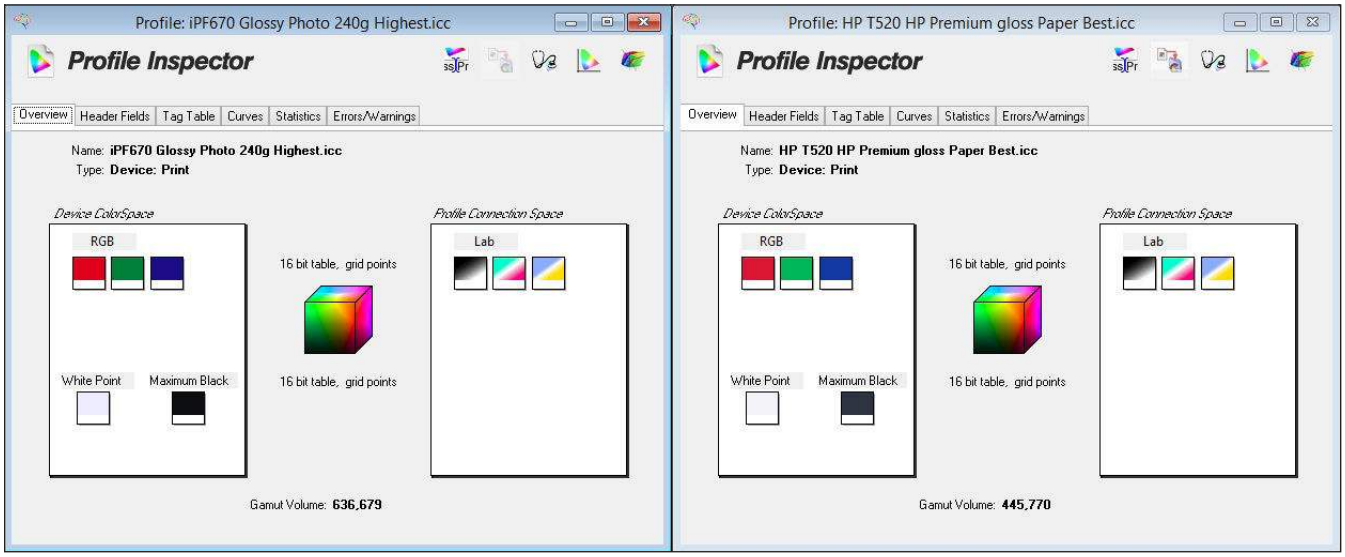


Colour gamut profiles for Canon iPF670 (left) on plain paper (High Quality setting) and HP Designjet T520 24"(right) on plain paper (Best setting).

Colour Gamut Comparison



HP Designjet T520 colour gamut on glossy photo quality paper in Best quality setting (red) versus Canon imagePROGRAF iPF670 colour gamut (shown chromatically) on glossy photo quality paper in High quality setting.



Colour gamut profiles for Canon iPF670 (left) on glossy photo paper (High Quality setting) and HP Designjet T520 24"(right) on glossy photo paper (Best setting).

Black Image Quality

	Canon imagePROGRAF iPF670			HP Designjet T520 24"		
	Fast	Standard	High	Speed	Quality	Max Quality
Density Block						
1	1.40	1.48	1.48	1.35	1.52	1.48
2	1.42	1.48	1.47	1.36	1.51	1.48
3	1.42	1.48	1.48	1.36	1.50	1.48
4	1.41	1.46	1.46	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 iPF670	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	130ml per colour	✔		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

	Canon imagePROGRAF iPF670	Advantage		HP Designjet T520 24"
Optional media handling	Roll holder set	✔		None
Standard RAM	256 MB		✔	1 GB
Maximum RAM	256 MB		✔	1 GB
Hard drive	None			None
Interface	USB 2.0, 10/100Base/1000Base-T/TX			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)	53.7 kg (with stand)			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 iPF670	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 print profiles	7	✔		5 (Default, CAD, GIS, Photo, B/W Photo)
Overview of profile settings provided	Yes	✔		No
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*

	Canon imagePROGRAF iPF670	Advantage		HP Designjet T520 24"
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 imagePROGRAF iPF670 Cartridge (grams)

	Cyan	Magenta	Yellow	Matte Black 1	Matte Black 2	Black
Weight of cartridge prior to installation	175.5	173.4	173.6	175.1	171.4	176.3
Weight of cartridge at end of life	45.0	45.0	45.0	45.0	45.0	45.0
Net weight of ink	130.5	128.4	128.6	130.1	126.4	131.3
Total ink weight across six cartridges						775.3

Table 2

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

	Cyan	Yellow	Magenta	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 iPF670 (grams) in Fast Mode

	Cyan	Magenta	Yellow	Matte Black 1	Matte Black 2	Black
Test Run 1 Net weight of ink used	3.6	2.4	2.2	6.7	6.7	2.0
Test Run 2 Net weight of ink used	3.4	2.1	1.8	6.4	6.5	2.0
Test Run 3 Net weight of ink used	3.6	2.2	1.7	6.3	6.1	1.9
Average amount of ink used across three runs	3.5	2.2	1.9	6.5	6.4	2.0
Total ink weight across six cartridges for 50-page run (based on averages)						22.5

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	Yellow	Magenta	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 iPF670 (grams) in Standard/Normal Mode

	Cyan	Magenta	Yellow	Matte Black 1	Matte Black 2	Black
Test Run 1 Net weight of ink used	3.9	2.2	1.6	7.0	7.5	1.8
Test Run 2 Net weight of ink used	3.7	2.3	1.5	7.5	7.9	1.6
Test Run 3 Net weight of ink used	4.4	2.4	2.2	7.4	6.9	1.5
Average amount of ink used across three runs	4.0	2.3	1.8	7.3	7.4	1.6
Total ink weight across six cartridges for 50-page run (based on averages)						24.4

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	Yellow	Magenta	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 Ink Used in Three 50-Page Runs of Retail Poster Test Document on the Canon iPF670 (grams)

	Cyan	Magenta	Yellow	Matte Black 1	Matte Black 2	Black
Test Run 1 Net weight of ink used	13.1	29.5	13.4	4.4	4.3	1.7
Test Run 2 Net weight of ink used	13.5	30.0	13.8	4.9	4.9	1.8
Test Run 3 Net weight of ink used	12.8	28.9	12.7	5.1	4.9	1.7
Average amount of ink used across three runs	13.1	29.5	13.3	4.8	4.7	1.7
Total ink weight across six cartridges for 50-page run (based on averages)						67.1

Table 8

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

	Cyan	Yellow	Magenta	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 iPF670 (grams)

	Cyan	Magenta	Yellow	Matte Black 1	Matte Black 2	Black
Test Run 1 Net weight of ink used	14.2	7.8	7.1	3.0	2.9	1.7
Test Run 2 Net weight of ink used	14.8	8.4	7.9	3.9	3.7	2.0
Test Run 3 Net weight of ink used	14.3	8.2	7.8	3.2	3.4	2.4
Average amount of ink used across three runs	14.4	8.1	7.6	3.4	3.3	2.0
Total ink weight across six cartridges for 50-page run (based on averages)						38.9

Table 10

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

	Cyan	Yellow	Magenta	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 iPF670 was installed in BLI's lab with the latest "01-00" level of firmware (as of November 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 November 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 a BLI 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 and 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 Inc.

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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