BLI Comparative Performance Evaluation

APRIL 2014

Canon imagePROGRAF iPF680 vs Epson SureColor T3000 24"

Canon imagePROGRAF iPF680 and Epson SureColor T3000 24" under test in BLI's European test lab

	Canon imagePROGRAF iPF680	Epson SureColor T3000 24"
Advantage ✔	✔	
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 iPF680 and the 24" Epson SureColor T3000, 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

A very strong overall performer, the Canon imagePROGRAF iPF680 outshone the Epson SureColor T3000 24" in virtually every category evaluated, delivering much higher productivity in both colour and black in all modes tested—particularly in High quality, where it delivered output in less than half the time required for the Epson device—and superior image quality in colour and black modes. Moreover, the iPF680 had the advantage in ink consumption, using less ink for three of the four document tests, with the added bonus of allowing inks to be replenished during operation to maintain productivity and reduce operator downtime. The Epson model offered a number of strong features of its own. Notably, its device feature set includes higher standard and maximum memory capacities than the Canon unit plus an optional 250-GB hard drive (although Canon do offer this option with the iPF685 sister model, which has a 320-GB hard drive), support for a higher print resolution and a much higher ink cartridge capacity, which helps reduce the frequency of replacing them. Another advantage of the Epson model is its lower rated energy consumption—54 watts while printing compared with 140 watts with the Canon model. However, the Canon model only uses 0.5 watts in standby mode (the state in which it is likely to spend more time) which is comparable with the Epson model's standby power consumption of 0.4 watts.

The Canon iPF680 delivered superior overall image quality in both colour and black mode compared with the Epson device; it had a 20.8% larger colour gamut on photo quality paper in High quality setting, and it produced more natural-looking flesh tones, which were reddish in output produced by the Epson unit, and sharper colour business graphics. The Canon's serif and sans serif fonts were clearly legible down to 3-pt. level—while Epson's fonts were only visible down to 6-pt. level—with no breakup. The Epson model's optical density was higher for yellow across all modes, while the Canon model had higher density for black in all modes and cyan and magenta in Standard/High modes. Nor did it suffer from any ink bleed in text and line art when viewed under magnification, unlike the Epson device.

As would be expected, both models delivered excellent results when printing Architectural, Engineering and Construction (AEC), Computer-Aided Design (CAD) and Geographical Information Systems (GIS) graphics; output exhibited a very good level of detail and distinct fine fines, while GIS graphics displayed an excellent depth of field so critical for topographical accuracy. The Canon model also boasts a significant advantage with its unidirectional print driver option. When selected, this option eliminates banding on the Canon iPF680's output, even in Fast mode, which is evident on the Epson device's output across the full width of the image in every mode except Max Quality.

Another notable difference between the two models is how they handle ink and paper outages. When the Epson model runs out paper, it stops, even if it is in the middle of a page, and resumes printing the same page after paper is replenished, thus wasting two half pages. When it is out of paper, the Canon unit pauses, alerts the operator, and after a new roll is installed, prompts the operator to confirm the paper type and prints the interrupted page in full followed by all successive pages, hence only half a page is wasted. Moreover, BLI's analysts noted how easy it was to load new paper rolls on the Canon unit, whereas this process is much more cumbersome with the Epson model. When the Epson T3000 runs out of ink, it stops printing so that the cartridge can be replaced. In contrast, the Canon model continues to print when ink needs replacing, while alerting the user to replace the cartridge, which, importantly, can be done on the fly eliminating any operation downtime.

In conclusion, the Canon imagePROGRAF iPF680 delivered a superior performance in the majority of categories tested over the Epson SureColor T3000 24" model. The Canon model also offers several unique features over the Epson device, such as its unidirectional print capabilities and Canon Direct Print & Share, a free utility that can be downloaded from the company's website that supports direct PDF submission without the need to open an application. In addition, it offers flexibility to retrieve and share files from cloud storage services such as Google Drive and other online solutions—Microsoft SharePoint and AutoCAD 360—via the WebDAV protocol, for printing. No such utility is available with the Epson device.

Colour Image Quality

	Canon imagePROGRAF iPF680	Epson SureColor T3000 24"
Advantage ✔		
Text	✔	
Fine Lines	=	=
Halftone Range	=	=
Halftone Fill	✔	
Solid Density	=	=
AEC Graphics	=	=
GIS Graphics	=	=
Business Graphics	✔	
Photographic Images	=	=
Colour Gamut (plain paper, Fast/Standard settings)	✔	
Colour Gamut (plain paper, High/Max Quality settings)		✔
Colour Gamut (photo paper, High/Max 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, which is available in all modes. The Epson 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 Max Quality. The Canon model, on the other hand, is free from any banding, even in Fast mode, when unidirectional printing is selected.

○ The Epson SureColor T3000 delivered a higher optical density for yellow on plain paper across all quality modes, while the Canon iPF680 had a higher optical density for magenta and cyan.

− When printing on plain paper in High and Max Quality settings, the Epson SureColor T3000 delivered a 4.7% larger colour gamut than did the Canon iPF680, with a CIE volume of 231,073 versus a CIE volume of 220,708 for the Canon model.

+ When printing on plain paper using Canon's Standard quality setting and the Epson SureColor T3000's Quality setting, the colour gamut produced by both models were largely comparable; the Canon model delivered a fractionally (0.02%) larger colour gamut, with a CIE volume of 216,452 compared with a CIE volume of 216,417 for the Epson device. In Fast/Speed mode, the Canon unit delivered the larger colour gamut (3.8% larger).

+ When printing on photo-quality paper using Canon's High quality setting and the Epson SureColor T3000's Max Quality setting, the Canon model delivered a colour gamut 20.8% larger than that of the Epson unit, with an impressive CIE volume of 642,169 compared with 531,496 with the Epson unit.

+ When evaluating text in colour mode, there were a few significant differences between the two models. In all modes, both serif and sans serif fonts were legible down to 3-pt. size with the Canon model, and text was crisp with no breakup. In contrast, fonts produced by the Epson model were legible only down to the 6-pt. level in Speed and Quality modes, and only down to the 8-pt. level in Max Quality, as output suffered from double imaging, even after BLI analysts had run full alignment checks.

+ Notably, the Canon model exhibited no ink bleed in text and line art, whereas there was some ink bleed displayed (under magnification) on the text and fine lines produced by the Epson model.

○ Fine lines produced by both devices remained distinct down to the 0.1-pt. level in Fast/Speed mode; white-on-black fine lines were not visible at all with the Epson device, while the Canon device delivered white-on-black fine lines at the 0.25-pt. level in all modes. In High/Max Quality mode there were no differences between the two models for fine line accuracy.

+ However, the Canon unit produced superior results for fine lines and text when the CAD (Colour Line Drawing) settings were used.

○ Colour halftone range produced by both models was excellent, with distinct transitions between all levels.

+ Colour halftone fill was slightly grainy on plain paper with the Epson model.

○ In Architectural, Engineering and Construction (AEC) graphics in Standard/Quality and High/Max Quality modes, both the Canon and the Epson units produced an excellent level of detail and very distinct fine lines.

○ In Geographic Information Systems (GIS) graphics in High/Max Quality mode on plain paper, both units exhibited a fine level of detail and excellent depth of field.

+ Colour business graphics produced by the Canon iPF680 exhibited sharper details and very good colour saturation when compared with the Epson device.

○ When evaluating photographic images there was very little difference between the two models, with both delivering excellent detailing in dark contrast areas. The Canon unit produced smoother circles and better detailing in light contrast areas, while the Epson unit delivered better saturation.

+ Skin tones produced by the Canon model were more natural-looking, while those produced by the Epson device were distinctly reddish in Speed mode.

+ In summary, BLI judged the Canon iPF680 to be the stronger performer in the colour image quality assessment. While the Epson model offers a higher optical density for yellow and a larger colour gamut on plain paper in High/Max Quality mode, the Canon model delivered higher optical densities for cyan and magenta, as well as the larger colour gamut in three of the four tests, especially on photo quality paper. Both models produced distinct fine lines in AEC drawings and an excellent level of detail and depth of field in GIS graphics. The Epson model suffered from some ink bleed in text and line art when viewed under magnification, but the iPF680 did not, which demonstrates the model's marked improvement over its iPF650 predecessor. Canon's unidirectional printing option is also an advantage, as it eliminated the banding issues that were evident across all output from the Epson device, except with the driver's Max Quality mode.

Black Image Quality

	Canon imagePROGRAF iPF680	Epson SureColor T3000 24"
Advantage ✔		
Text	✔	
Fine Lines	✔	
Halftone Range	=	=
Halftone Fill	✔	
Solid density	✔	
AEC Graphics	=	=
Business Graphics	✔	
Photographic Images	✔	

+ The Canon model delivered higher optical densities for black in all modes tested—Fast, Standard and High.

+ In text output, there was a clear difference between the two models. In all modes, both serif and sans serif fonts produced by the Canon device were legible down to the 3-pt. level with no breakup. However, fonts produced by the Epson model in Speed/Quality modes were legible down to the 6-pt. level, and only to the 8-pt. level in Max Quality mode, with distinct breakup in some characters. These results along with the higher density, gave the Canon model a distinct edge overall.

+ Notably, the Canon model exhibited no ink bleed in text and line art, whereas there was some ink bleed displayed in the text and fine lines produced by the Epson model when viewed under magnification.

+ The Canon unit produced superior results for fine lines and text when the CAD (Monochrome Line Drawing) settings were used, with no overspray.

+ Fine lines in BLI's Line Art test target remained distinct down to the 0.1-pt. level in all modes in the output of both devices, but the Epson model failed to deliver white-on-black fine lines.

○ Circles produced by both models were fully formed and there was no sign of stair-stepping in diagonal lines.

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

+ Halftone fill results in all modes were very good for the Canon device, while the Epson unit was rated only good, as some graininess was visible across all output, even without magnification.

+ The Canon unit delivered darker solids with higher optical density than did the Epson model and no mottling.

○ When evaluating AEC graphics in Standard/Quality and High/Max Quality modes in black, both models delivered very good detail and distinct fine lines.

+ Monochrome business graphics in High/Max Quality quality mode on plain paper were produced more accurately by the Canon model, with smooth halftone gradations and crisp text, whereas some graininess was visible in the output of the Epson unit, even without magnification.

+ The Canon model produced photographic images in High/Max Quality mode on plain paper with smoother gradations than did the Epson model.

+ BLI analysts lauded the Canon device for its superior black image quality; it delivered superior halftone fills, detailed and distinct white-on-black fine lines (which the Epson unit could not produce), smoother gradations in photographic images, higher optical density in all modes, darker solids and text that was legible down to a smaller size (3-pt.), with no breakup. Both models delivered excellent AEC graphics, very good halftone range and smooth circles with no breakup.

Print Productivity

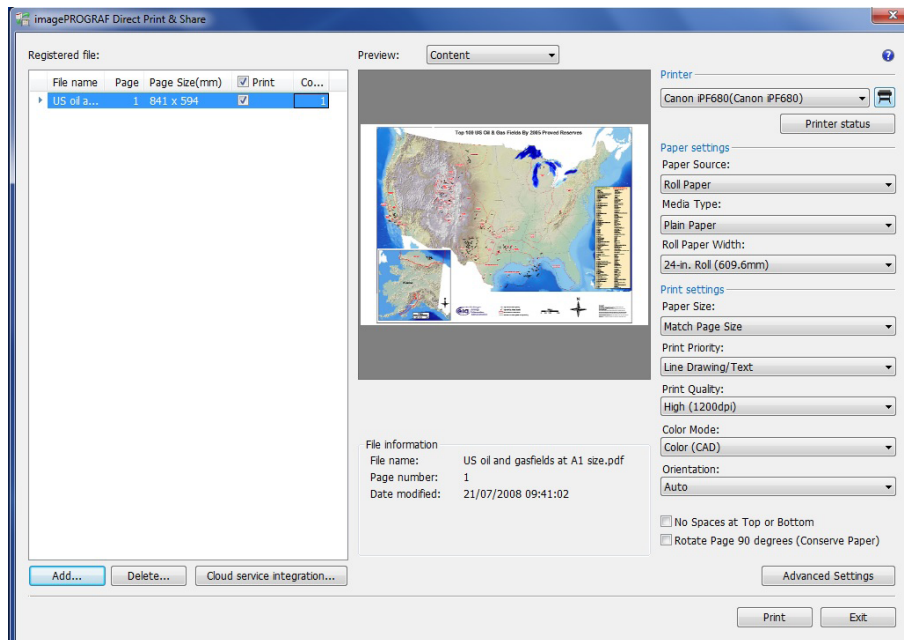|	Canon imagePROGRAF iPF680	Epson SureColor T3000 24"
Advantage ✔		
First Page Out From Ready State	✔	
First Page Out From Weekend Non-Use	=	=
Throughput Speed (fastest mode)	✔	
Throughput Speed (default mode)	✔	
Throughput Speed (highest-quality mode)	✔	
Job Stream (multiple jobs submitted to device in fast succession simulating busy network environment)	✔	

○ One factor having an impact on productivity is the way the Epson SureColor T3000 handles the replacement of ink. When this model runs out of ink, printing has to stop for the cartridge to be replaced, leading to operator downtime. However, printing resumes seamlessly from the same point in the page, with no discernible line or break in output and no difference in image quality, so no ink or paper is wasted.

+ In contrast, the Canon model will continue to print (drawing ink from its sub tank) when ink needs replacing, while its control panel conveniently alerts the user to replace ink as well as provides ink purchasing information. Inks can be replaced while printing is in progress, so there is no operator downtime, plus no ink or paper is wasted.

+ The Epson T3000 stops printing when it runs out of paper. Once a new roll is installed, it resumes printing the remaining portion of the page, thus printing two partial pages. This would have an adverse effect on productivity in longer print runs. In contrast, 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, so less ink and paper is wasted.

+ Both models' output catch tray can stack printed sheets neatly and in the correct sequence, which makes collating output easier and helps to reduce operator intervention and downtime. The Canon unit has the advantage of supporting flat stacking, whereas the Epson unit only supports hanging stacking.

○ The Canon iPF680 delivered a faster first-page-out time of 85.71 seconds after a weekend of non-use, compared with 89.20 seconds for the Epson device. Start-up time before printing commenced was 43.93 seconds for the Canon model, slower than the 15.67 seconds for the Epson unit.

+ Similarly, the Canon iPF680 delivered a faster first-page-out time of just 57.69 seconds from its ready state, compared with 85.94 seconds for the Epson device. Start-up time before printing commenced was 16.37 seconds for the Canon model, a little slower compared with 11.51 seconds for the Epson unit.

+ When printing BLI's job stream, designed to simulate a typical mixed workflow for a large-format unit, the Canon iPF680 was 4.2% faster than the Epson model in Fast/Speed mode, 34.7% faster in Standard/Quality mode, and 52.1% faster in High quality/Max Quality mode.

+ When printing BLI's 12-page DWF test file in colour, the Canon unit was 11.7% faster in Fast/Speed mode, 39.2% faster in Standard/Quality mode, and 54.1% faster in High quality/Max Quality mode when compared with the Epson unit.

+ When printing BLI's 12-page DWF test file in monochrome, the Canon unit was 13.9% faster than the Epson model in Fast/Speed mode, 37.9% faster in Standard/Quality mode, and 54.3% faster in High quality/Max Quality mode than the Epson device.

Direct PDF Print Submission Functionality

	Canon imagePROGRAF iPF680	Epson SureColor T3000 24"
Advantage ✔		
Ease of Use	✔	
Functionality	✔	

+ A free download from Canon's website, the iPF Direct Print & Share utility enables PDFs to be printed without opening Adobe Acrobat. iPF Direct Print & Share 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

+ There is no direct PDF submission functionality available for the Epson device, nor does the company offer cloud storage/connectivity.

Banner Printing

	Canon imagePROGRAF iPF680	Epson SureColor T3000 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.

+ In Speed mode, the Epson SureColor T3000 successfully printed BLI's banner, taking 68.91 seconds to generate a preview; however, an additional 3 minutes, 0.58 seconds were required from the file preview until the banner completed printing and was cut.

Poster Printing

	Canon imagePROGRAF iPF680	Epson SureColor T3000 24"
Advantage ✔		
Image Quality (Fast and Standard modes)	✔	
Image Quality (High/Max Quality modes)	=	=
Productivity	✔	

○ When printing a poster in Fast/Speed mode at 300 dpi, the Canon model took 47.6 seconds to complete the job and the Epson unit took 39.1 seconds, although banding was evident in the output of both models across the full width of the poster. When the Canon model was switched to unidirectional printing, which eliminated the banding, it took 60.14 seconds to print.

+ When printing a poster in Standard/Quality mode at 600 dpi, the Canon model took 62.90 seconds and the Epson unit took 77.17 seconds, but some slight banding was evident with the Epson model in this mode.

+ Printing a poster in High quality (600 dpi) mode on the Canon model took 1 minute, 44.48 seconds, while the printing the same poster in Max Quality (720 x 1440 dpi) mode took the Epson model 3 minutes, 4.18 seconds—a 76.3% longer print time for the Epson model.

○ At these High/Max Quality settings, image quality was equally good on output from both models with vibrant reds, rich colour saturation and clarity of definition.

Ink Consumption

| RESULTS		
Results averaged across three sets of 50-page A1 printing in Fast/ Speed and Standard/Quality Modes	Canon imagePROGRAF iPF680	Epson SureColor T3000 24"
COTTAGE ARCHITECTURAL PLAN (Fast/Speed Mode)		
Average weight of ink used (grams)	19.0 g	15.5 g
Percentage of total ink used averaged across all colours	1.2%	2.7%
COTTAGE ARCHITECTURAL PLAN (Standard/Quality Mode)		
Average weight of ink used (grams)	21.5 g	21.9 g
Percentage of total ink used averaged across all colours	1.3%	3.8%
RETAIL POSTER (Standard/Quality Mode)		
Average weight of ink used	60.3 g	84.5 g
Percentage of total ink used averaged across all colours	3.7%	14.6%
GIS MAP (Standard/Quality Mode)		
Average weight of ink used	41.0 g	59.5 g
Percentage of total ink used averaged across all colours	2.5%	10.3%

— When producing 50 prints of a Cottage Architectural Plan in Fast/Speed Mode, the Canon unit used 22.6% more ink than did the Epson T3000. However, the Canon model used only 1.2% of the ink available, whereas the Epson model used 2.7% of the available ink.

+ When producing 50 prints of a Cottage Architectural Plan in Standard/Quality Mode, the Canon unit used 1.8% less ink than did the Epson SureColor T3000.

+ When printing a Retail Poster in Standard/Quality Mode, the Canon unit used 28.6% less ink than did the Epson T3000, and a percentage of available ink that was nearly three quarters less than that of the Epson device.

+ When printing a GIS Map, the Canon iPF680 used 31.1% less ink compared with the Epson device, and a percentage of available ink that was, again, nearly three quarters less than that of the Epson model.

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

Device Feature Set

— The capacity of the Canon cartridges (130 ml and 300 ml for black, cyan, magenta and yellow) is much lower than those of the Epson model (110 ml, 350 ml and 700 ml), and as a consequence they will need to be replaced more frequently than with the Epson device.

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

+ Canon's ink cartridges are replaceable during operation, which helps to reduce downtime for Canon users.

+ The Canon unit supports a slightly higher maximum cut-sheet media length of 1.6 m compared with 1.5 m for the Epson unit.

○ Both models offer both high-speed USB 2.0 and Gigabit Ethernet connectivity.

+ The Canon device supports easy and quick roll paper set with auto paper feed, while manual paper feed is required with the Epson model, which takes more time.

+ The catch trays of both models enable printed sheets to be stacked very neatly (and in the correct sequence), making collating output much easier. However, the Canon unit has the advantage of supporting flat stacking, whereas the Epson unit only supports hanging stacking.

— The Canon model offers a standard and maximum RAM of 256 MB, while the Epson unit has a standard and maximum RAM of 512 MB, plus an extra-cost optional 250-GB hard drive, which this Canon model doesn't offer. However, the Canon iPF685 sister model comes with a standard 320-GB hard drive and 32-GB virtual memory.

○ The Epson model is a lighter (53 kg versus 56.7 kg) device than the Canon unit.

+ The HP-GL/2 functionality supported by Epson lacks certain features such as Pen Selecting, Centering and Scaling, which are available with the Canon model.

— The Epson model includes a colour LCD, while the Canon model has a monochrome LCD display.

— The Epson SureColor T3000's rated power consumption is much lower than that of the Canon model while printing (54 watts versus Canon's 140 watts).

○ However, in standby mode (where the devices are likely to spend more of their time) the Canon model's power consumption (0.5 W) is comparable with that of the Epson device (0.4 W).

+ Rated noise emissions are lower with the Canon model (47 dB versus 50 dB).

Driver Feature Set

+ The Canon iPF680 has five speed settings (Fast 300, Standard 600, Draft 600, High 600 and 1200), which are matched by three settings with the Epson device (Speed, Quality and Max Quality), although not all speed settings are available with all media types.

○ Both the Canon GARO driver and the Epson ESC/P driver provide a useful overview of the settings for predefined profiles.

+ The Canon driver offers a wider range of seven predefined profiles than the Epson unit, which has only three.

+ The Canon driver supports multi-up (2 to 16) printing, while the Epson driver supports only 2 to 4 multi-up printing.

— However, the Epson driver has a poster mode (4 by 4), which is also offered by the Canon GARO driver (2 by 2).

— The Canon driver enables page stamping (Date, Time, Name and Page Number), but the Epson driver offers a wider range of options, including all the image quality attributes.

○ Both the Epson driver and the Canon GARO driver offer a wide range of built-in adjustments for CMYK balance, brightness, contrast and saturation. ICC profile settings are also available with both drivers—in the case of Canon's GARO driver in its matching tab under Advanced Settings. Canon 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).

— The Epson model provides a useful thumbnail preview for users to check the effects on the image as they make colour adjustments.

+ The Canon driver offers unidirectional printing, even in Fast mode. This means that the printhead travels in only one direction to create the desired image, helping to avoid the banding that's evident across the full width of the image when using the Epson device's bidirectional printhead in every mode except Max Quality.

+ The Canon driver includes the Color 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. Epson users can choose comparable functionality via the extra-cost CopyFactory Utility.

+ 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, helping to save on paper.

○ The Epson driver offers resizing functionality via the Layout Manager utility.

○ The Canon model also offers a plug-in for printing from Microsoft Office applications, which includes useful tools for automatic media resizing, nesting and borderless printing. Epson offers similar software, LFP Print Plug-in for Office, to its users.
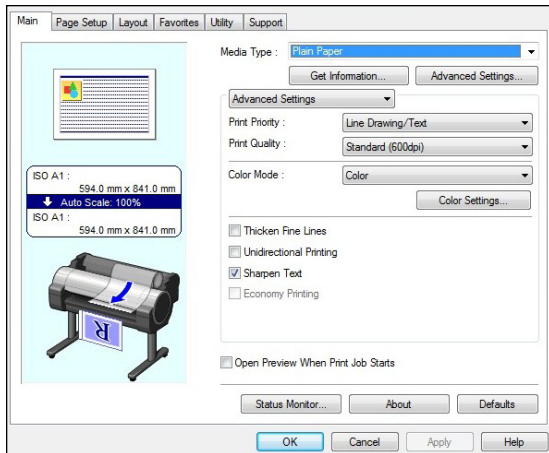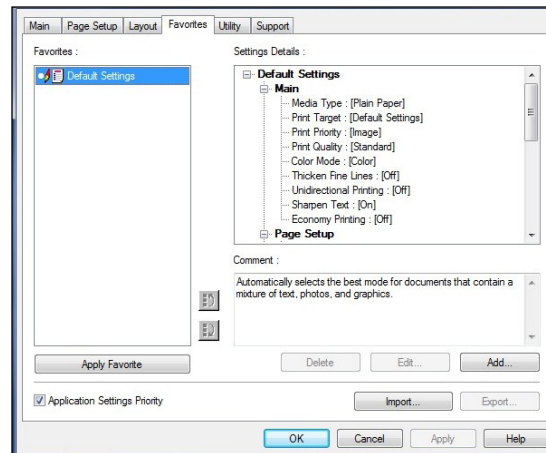
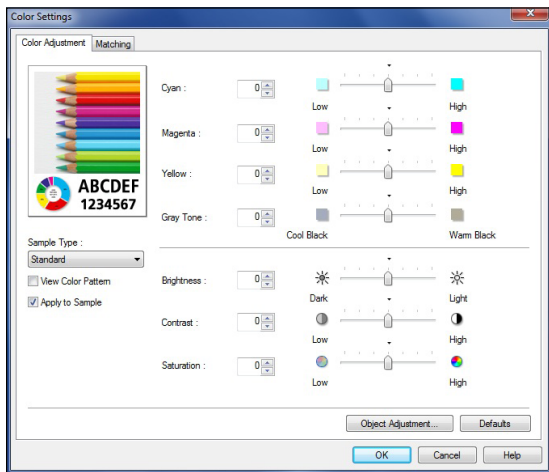**Canon Print Driver Main Tab**
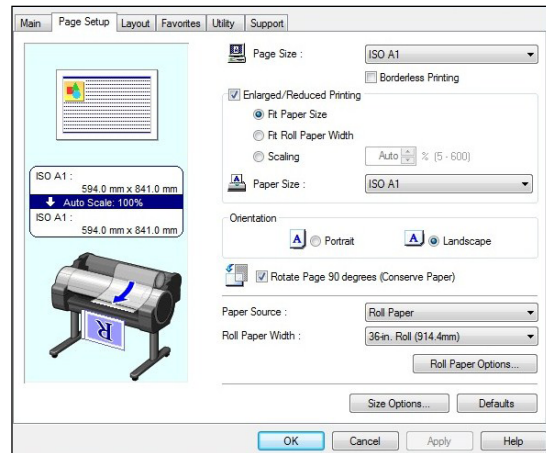
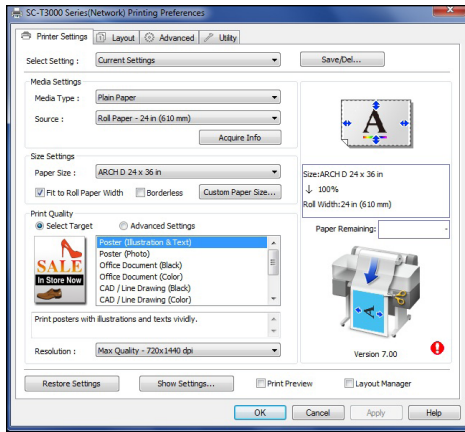**Canon Print Driver Page Setup Tab**
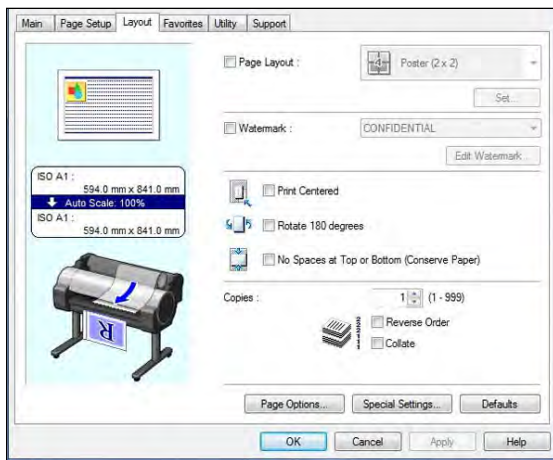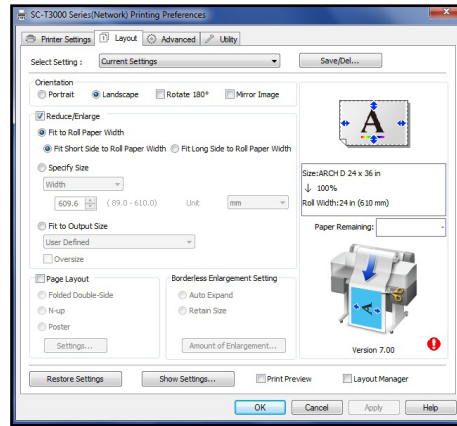

Canon Print Driver Layout Tab

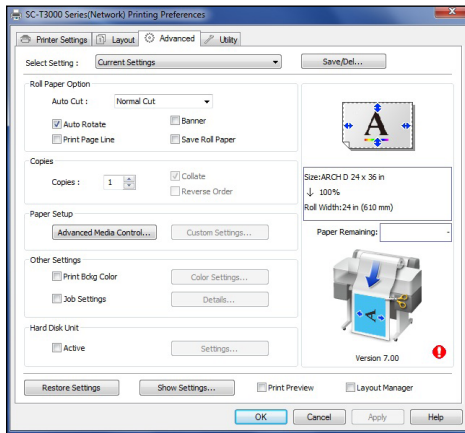**Canon Print Driver Favourites Tab**

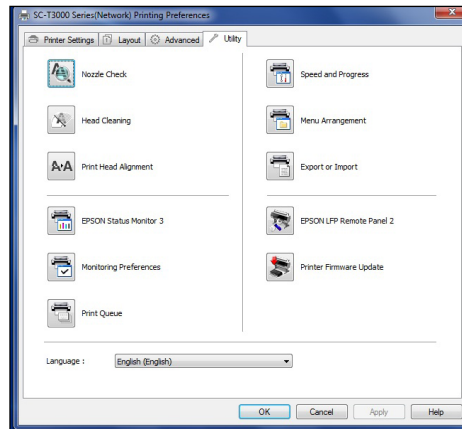**Canon Print Driver Colour Adjustment Tab**

Epson Print Driver Printer Settings Tab

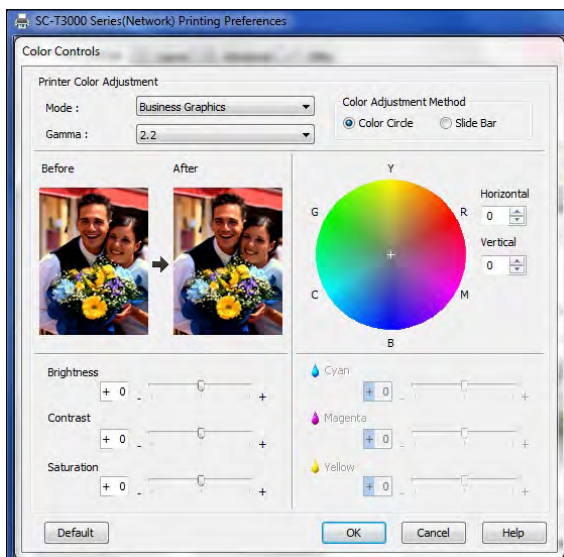**Epson Print Driver Layout Tab**

Epson Print Driver Advanced Settings Tab

Epson Print Driver Utility Tab

Epson Print Driver Colour Controls

SUPPORTING TEST DATA

Job Stream Productivity

Mixed File Types, Same Size

Canon imagePROGRAF iPF680 (time in seconds)		Epson SureColor T3000 24" (time in seconds)	
Fast	784.97	Speed	819.74
Standard	1,031.53	Quality	1,580.62
High	1,842.89	Max Quality	3,849.69

BLI's job stream consists of nine files, including PDF, TIFF and DWF files totalling 19 pages, all 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)			Epson SureColor T3000 24" (time in seconds)		
Fast	Standard	High	Speed	Quality	Max Quality
449.48	625.35	1,161.15	508.78	1,028.56	2,532.06

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)			Epson SureColor T3000 24" (time in seconds)		
Fast	Standard	High	Speed	Quality	Max Quality
437.38	639.63	1,158.28	508.08	1,029.27	2,533.03

The 12-page DWF test file was printed with the Canon driver set to the plain paper/monochrome setting and the EPSON 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)	Epson SureColor T3000 24" (time in seconds)
Time Before Printing Commences	43.93	15.67
First Page Out	85.71	89.20

First-Page-Out Productivity from Ready State

	Canon imagePROGRAF iPF680 (time in seconds)	Epson SureColor T3000 24" (time in seconds)
Time Before Printing Commences	16.37	11.51
First Page Out	57.69	85.94

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 Epson driver set to plain paper and black. 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

Epson SureColor T3000 24"					
Plain Paper					
Speed		Quality		Max Quality	
50%	100%	50%	100%	50%	100%
Cyan 0.56	1.01	0.55	1.00	0.58	1.01
Magenta 0.47	0.85	0.46	0.84	0.48	0.91
Yellow 0.50	0.82	0.50	0.87	0.52	0.91
Black 0.55	1.16	0.54	1.31	0.56	1.32

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 iPF680	Epson SureColor T3000 24"
Plain Paper Fast	190,763	183,742
Plain Paper High	220,708	231,073
Plain Paper Standard	216,452	216,417
Glossy Photo High	642,169	531,496
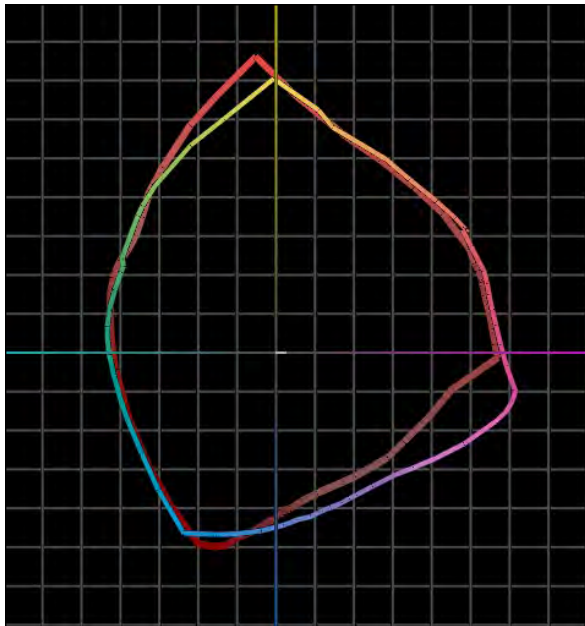
Epson SureColor T3000 24" colour gamut on plain paper in Speed settings (red) versus Canon imagePROGRAF iPF680 colour gamut (shown chromatically) on plain paper in Fast settings.
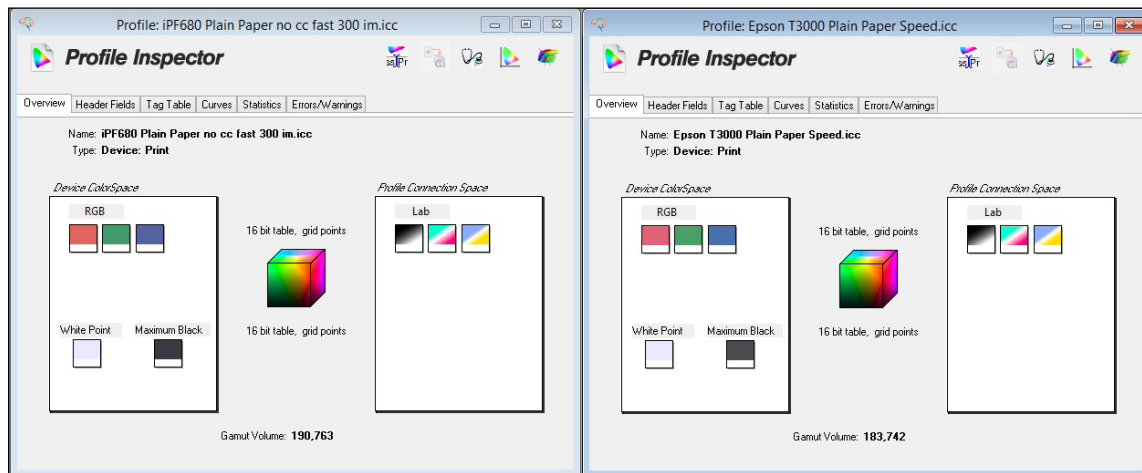
Canon imagePROGRAF iPF680 on plain paper in Fast mode

Epson SureColor T3000 24" on plain paper in Speed mode

Epson SureColor T3000 24" colour gamut on plain paper in Max Quality settings (red) versus Canon imagePROGRAF iPF680 colour gamut (shown chromatically) on plain paper in High quality settings.
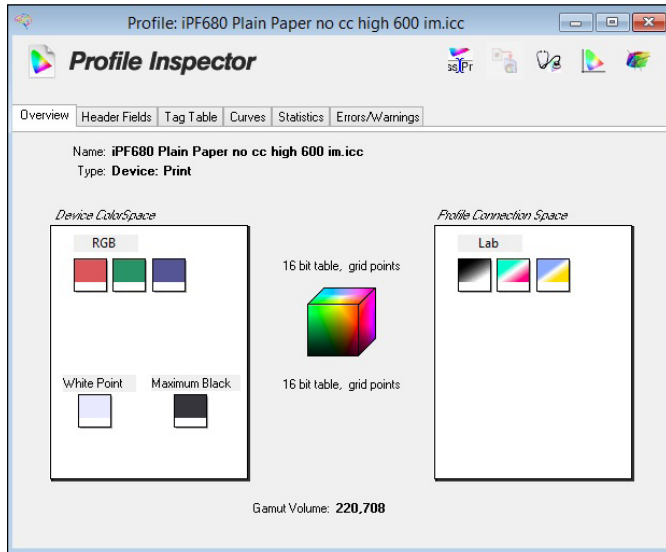
Canon imagePROGRAF iPF680 on plain paper in High quality mode
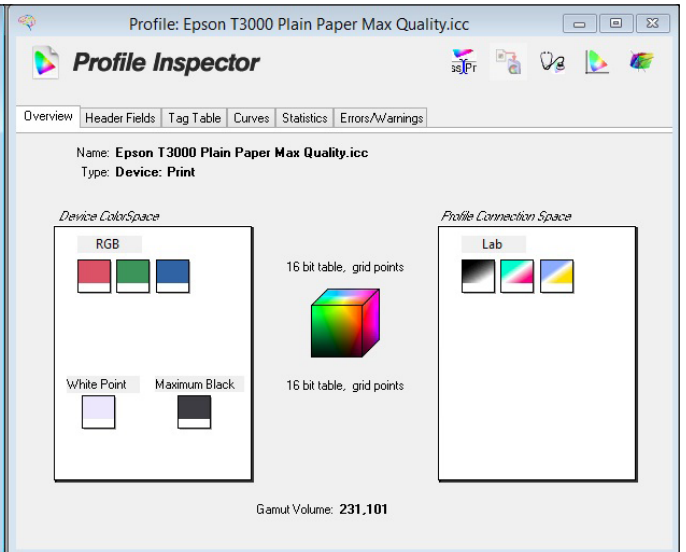
Epson SureColor T3000 24"on plain paper in Max Quality mode

Epson SureColor T3000 24" colour gamut on plain paper in Quality settings (red) versus Canon imagePROGRAF iPF680 colour gamut (shown chromatically) on plain paper in Standard settings.
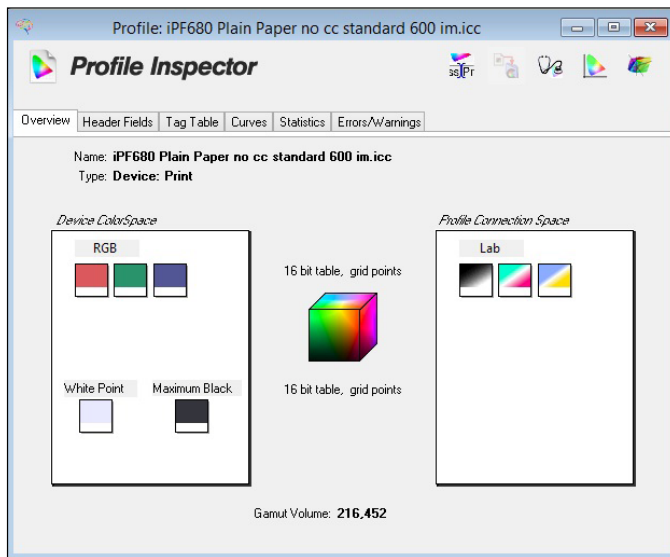
Canon imagePROGRAF iPF680 on plain paper in Standard mode

Epson SureColor T3000 24"on plain paper in Quality mode
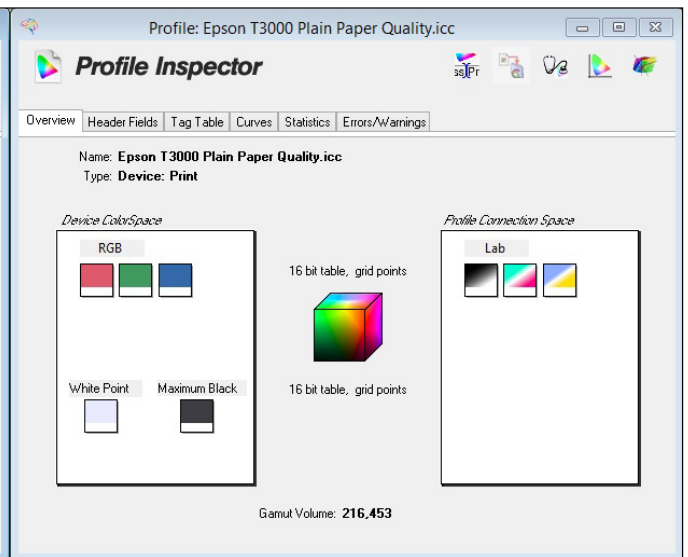
Epson SureColor T3000 24" colour gamut on photo quality paper in Max Quality settings (red) versus Canon imagePROGRAF iPF680 colour gamut (shown chromatically) on photo quality paper in High quality settings.
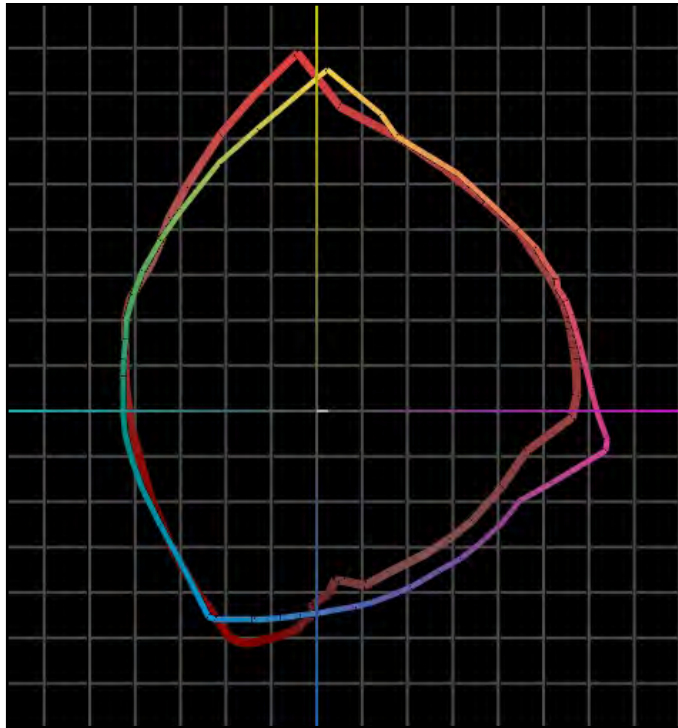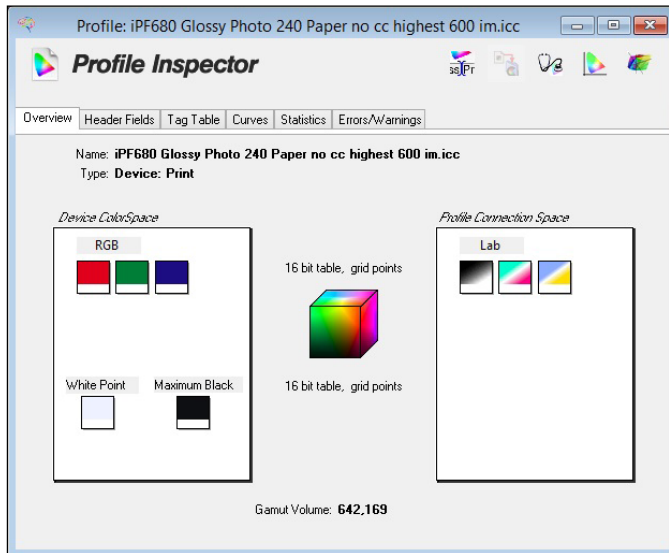

Canon imagePROGRAF iPF680 on photo quality paper in High mode
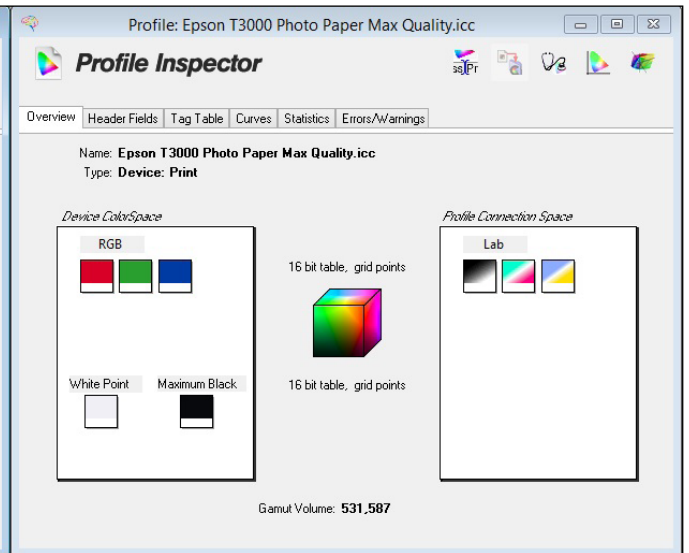
Epson SureColor T3000 24"on photo quality paper in Max Quality mode

Black Print Quality

	Canon imagePROGRAF iPF680			Epson SureColor T3000 24"		
	Fast	Standard	High	Speed	Quality	Max Quality
Density Block						
1	1.42	1.42	1.47	1.22	1.29	1.27
2	1.35	1.43	1.47	1.21	1.32	1.27
3	1.36	1.44	1.45	1.23	1.30	1.24
4	1.35	1.44	1.44	1.21	1.31	1.25

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 and the EPSON driver set to plain paper, greyscale, black ink only. Density was measured using an XRite 508 densitometer.

Device Feature Set

	Canon imagePROGRAF iPF680	Advantage	Epson SureColor T3000 24"
Max. print quality	2400 x 1200 dpi		✔	2880 x 1440 dpi
Number of inks	5			5
Ink tanks replaceable during operation	Yes	✔		No
Ink-drop size	4 picoliter		✔	3.5 picoliter (variable)
Ink cartridge capacity	90 ml, 130 ml MBK (Starter), 130 ml and 300 ml		✔	110 ml, 350 ml, 700 ml
Number of nozzles	MBK: 5,120 nozzles, Other colours: 2,560 nozzles each, 15,360 in total	✔		3,600 (720 per colour)
Number of printheads	1			1
Line accuracy	+/-0.1%			+/-0.1%
Minimum line width	0.02 mm			0.02 mm
Minimum print margins	3 mm			3 mm
Maximum outside diameter of roll paper	150 mm			149.86 mm
Maximum cut-sheet media length	1.6 m	✔		1.5 m
Maximum media width	24 inches			24 inches
Media loading	Top			Front
Optional media handling	Roll holder set			Roll media adapter
Standard RAM	256 MB		✔	512 MB
Maximum RAM	256 MB (iPF685 has 32-GB virtual memory)		✔	512 MB
Hard drive	None (iPF685 has 320-GB HDD)		✔	Optional 250-GB
Interface	10/100/1000Base-T/TX Ethernet, USB 2.0			100Base-TX/1000Base-T Ethernet, USB 2.0
PDL	GARO, HP-GL/2, HP RTL			HP-GL/2, HP RTL, Epson ESC/P
Net weight (unpacked)	56.7 kg			53 kg
Rated power consumption when in standby	0.5 W			0.4 W
Rated power consumption when active	140 W		✔	54 W
Acoustic pressure	Operation: 47 dB (A) or less; Standby: 35 dB (A) or less	✔		Operation: 50 dB (A); Standby: INA
Acoustic power	Operation: 6.4 Bels or less	✔		6.8 Bels

Driver Feature Set

	Canon imagePROGRAF iPF680	Advantage		Epson SureColor T3000 24"
Speed settings	5 (Fast 300, Standard 600, Fast 600, High 600 and 1200)	✔		3 (Speed, Quality, Max Quality), depending on paper chosen
Economy mode	Yes	✔		No
Predefined profiles	7	✔		3
Overview of profile settings provided	Yes			Yes
Media profiles	18 + 5	✔		20
IQ optimized for options	Yes			Yes
Watermark	Yes	✔		No
Sharpen text	Yes			Yes
Thicken fine lines	Yes	✔		No
Mirror image	Yes			Yes
Multi-up printing	Yes, 2 to 16	✔		Yes, 2 and 4
Poster print mode	Yes (2 by 2)		✔	Yes (4 by 4)
Page stamping	Yes (Date, Time, Name, Page Number)		✔	Yes (Date, Time, Document/User/Printer Name, Media Type, Print Quality Level, Resolution, Print Mode, High Speed, Finest Detail, Edge Smoothing, Colour Adjustment and Value, Colour Density)
Image rotation	Yes, auto 180 degrees			Yes, auto 180 degrees
Option to preview before print	Yes			Yes
Link to device web server from driver	No (there is a link to Status Monitor)			Yes, with optional hard drive (there is also a link to Status Monitor 3)
CMYK balance adjustment	Yes			Yes
Brightness adjustment	Yes			Yes
Contrast adjustment	Yes			Yes
Saturation adjustment	Yes			Yes
Advanced colour management options	Yes			Yes
Disable automatic cutter	Yes	✔		No
Unidirectional printing	Yes	✔		No

Ink Consumption

Table 1

Amount of Ink in Each Canon imagePROGRAF 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 Epson SureColor T3000 24" Cartridge (grams)

	Cyan	Yellow	Magenta	Matte Black	Photo Black
Weight of cartridge prior to installation	229.1	227.3	231.1	229.5	228.3
Weight of cartridge at end of life	113.0	113.0	113.0	113.0	113.0
Net weight of ink	116.1	114.3	118.1	116.5	115.3
Total ink weight across five cartridges					580.3

Table 3

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

	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)					19.1

Table 4

Ink Used in Three 50-Page Runs of Cottage Architectural Drawing Test Document (Speed mode) on the Epson SureColor T3000 24" (grams)

	Cyan	Yellow	Magenta	Matte Black	Photo Black
Test Run 1 Net weight of ink used	4.3	0.6	3.2	7.7	0.1
Test Run 2 Net weight of ink used	4.2	0.7	2.9	7.6	0.1
Test Run 3 Net weight of ink used	4.1	0.6	3.0	7.4	0.1
Average amount of ink used across three runs	4.2	0.6	3.0	7.6	0.1
Total ink weight across five cartridges for 50-page run (based on averages)					15.5

Table 5

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

	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 five 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 (Quality mode) on the Epson SureColor T3000 24" (grams)

	Cyan	Yellow	Magenta	Matte Black	Photo Black
Test Run 1 Net weight of ink used	4.9	1.3	3.5	10.9	0.9
Test Run 2 Net weight of ink used	4.7	1.3	3.4	11.3	1.0
Test Run 3 Net weight of ink used	4.7	1.5	3.6	11.6	1.1
Average amount of ink used across three runs	4.8	1.4	3.5	11.3	1.0
Total Ink Weight across five cartridges for 50-page run (based on averages)					22.0

Table 7

Ink Used in Three 50-Page Runs of Retail Poster Test Document on the Canon image-PROGRAF 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 Epson SureColor T3000 24" (grams)

	Cyan	Yellow	Magenta	Matte Black	Photo Black
Test Run 1 Net weight of ink used	23.0	15.7	40.2	5.5	1.0
Test Run 2 Net weight of ink used	22.9	15.6	40.2	5.5	1.0
Test Run 3 Net weight of ink used	22.5	14.3	40.0	5.1	1.0
Average amount of ink used across three runs	22.8	15.2	40.1	5.4	1.0
Total ink weight across five cartridges for 50-page run (based on averages)					84.5

Table 9

Ink Used in Three 50-Page Runs of GIS Map Test Document on the Canon imagePRO-GRAF 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 Epson SureColor T3000 24" (grams)

	Cyan	Yellow	Magenta	Matte Black	Photo Black
Test Run 1 **Net weight of ink used**	29.5	11.2	13.7	3.8	1.1
Test Run 2 **Net weight of ink used**	29.7	11.3	13.8	3.8	1.2
Test Run 3 **Net weight of ink used**	29.8	11.1	13.6	3.7	1.1
Average amount of ink used across three runs	29.7	11.2	13.7	3.8	1.1
Total ink weight across five cartridges for 50-page run (based on averages)					59.5

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 GIS Map, Print Priority settings were set to Image with Quality set to Standard (600 dpi).

The Epson SureColor T3000 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 EPSON-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 Quality (600 dpi) mode for all document types with the exception of the Cottage Architectural Plan, which was tested in both Speed and Quality 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.

Canon imagePROGRAF iPF680: one cartridge was then run to exhaustion and the weight of the empty cartridge was recorded.

Epson SureColor T3000 24": 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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