Comparative Performance Evaluation

MAY 2013

Canon imagePROGRAF iPF6450 vs. Epson Stylus Pro 7900

Advantage ✔	Canon imagePROGRAF iPF6450	Epson Stylus Pro 7900
Colour Print Quality	✔	
Black Print Quality	✔	
Print Productivity	✔	
Ink Consumption	✔	
Device Feature Set	✔	
Print Driver Feature Set	✔	
Spectrophotometer Functionality	✔	
Colour Stability using calibration link	✔	
Printhead Reliability / Cleaning Routines	✔	

Canon imagePROGRAF iPF6450

Epson Stylus Pro 7900

TEST OBJECTIVE

Buyers Laboratory LLC (BLI) was commissioned by Canon Europe to conduct confidential document imaging device performance testing on the Canon imagePROGRAF iPF6450 with Spectrophotometer and the Epson Stylus Pro 7900 with Spectroproofer, and produce a report comparing the relative strengths and weaknesses of the two products in terms of image quality, productivity, ink consumption, device feature set, driver functionality, spectrophotometer functionality, colour stability, printhead stability and cleaning routines. All testing was performed in BLI's test facility in Wokingham, UK.

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Executive Summary

The Canon imagePROGRAF iPF6450 gave an outstanding performance in BLI's testing, delivering higher productivity, superior image quality, lower ink consumption and a stronger device and driver feature set when compared with the Epson Stylus Pro 7900. The Epson model delivers smaller (but variable) ink-drop sizes, has a larger ink cartridge capacity and lower power consumption while printing (but not in standby mode).

As would be expected of two models aimed at the Graphic Arts (GA) marketplace, both units delivered excellent image quality overall, with the Canon iPF6450 showing a noticeable improvement over the previous generation iPF6350 model. The Canon iPF6450 delivered an 8.1% higher colour gamut on Photo paper, crisper text, less stair-stepping in diagonal lines and less colour drift than the Epson unit to give it the edge overall.

An outstanding feature offered by both models is the option of attaching an X-Rite Spectrophotometer (which Epson calls a SpectroProofer) to guarantee colour consistency and to automate workflows for colour calibration, target measurement and media profile generation when used in conjunction with software tools offered by both companies. Epson offers Look Up Table (LUT) technology for spot colour optimization, increased gamut size and verification of colour difference from the test targets. Canon's innovative Media Configuration Tool, in conjunction with the Colour Calibration Management Console utility offers an important advantage over the Epson software in that it can also be used to check colour consistency across a whole range of compatible large-format devices, even those in remote locations—a significant advantage for proofing in the Graphic Arts, Photography and Advertising industries where colour consistency across devices is a paramount concern. In BLI's testing, the Canon model's SU-21 Spectrophotometer achieved an astonishingly low Delta E variation of 0.6 when the FOGRA39 colour patch was printed on the iPF6450 and the iPF 8400. Canon's free Colour Calibration Management Console utility also enables administrators to monitor the calibration status of each connected unit remotely. The utility displays a progress bar for each media type to indicate when a colour calibration should be conducted, and features a Delta E threshold setting whose default value is 2.0 on a scale of 0.4 to 5.0, ensuring that a low colour difference is maintained over time.

The test included an ink consumption evaluation, in which BLI assessed the cost of printing with three different document types in Standard/Quality mode on semi-gloss 250-gsm proofing media, on plain paper and on 250-gsm semi-gloss photo media. In all of BLI's ink consumption print runs, the Canon imagePROGRAF iPF6450 used significantly less ink in terms of net weight and a far lower percentage of available ink in the cartridge than the Epson Stylus Pro 7900.

The Canon model also offers a number of print driver feature advantages over the Epson model, including more media profiles and colour adjustment options. Canon's Color imageRUNNER Enlargement Copy Mode allows users to integrate with a smaller-format MFP to produce enlarged poster-size copies, although this functionality is matched by Epson's CopyFactory Utility.

Colour Image Quality

Advantage ✔	Canon imagePROGRAF iPF6450	Epson Stylus Pro 7900
Text	=	=
Fine Lines	✔	
Halftone Range	=	=
Halftone Fill	=	=
Solid Density	=	=
Colour Drift across FOGRA39	✔	
Consistency of three skin tones		✔
Consistency of neutral grey	=	=
Business Graphics	=	=
Photographic Images	=	=
Colour Gamut	✔	

○ All image quality testing was done with Canon's own Proofing Semi-glossy 195-gsm media and Epson's own 240-gsm proofing media, with print priority set to Proof and quality set to High on the Canon model, and the Epson model set to Quality (720 dpi).

○ As would be expected of two models aimed at the Graphic Arts (GA) marketplace, both units delivered a very high standard of output in colour, with only slight differences in some respects, with the Canon iPF6450 showing a noticeable improvement over the previous generation iPF6350 model.

+ The Canon iPF6450 and the Epson 7900 displayed clear formation of fonts in colour mode down to 3-point size. There was very little visual difference in clarity of text when viewed with and without magnification, but Canon's fonts were crisper than those from the Epson device.

+ The Canon iPF6450 produced the 1x1 pixel grid in CMY without error, whereas the Epson 7900 failed to deliver consistent coverage across the grid.

+ Both devices delivered excellent vertical and horizontal fine lines down to 0.1 size but the Epson device showed a significant amount of stair-stepping in diagonal lines compared with only a slight amount of stair-stepping with the Canon model.

○ Both models delivered an impressive range of halftone fills in colour mode, with distinct transitions between all levels.

○ The two models produced optical densities that were virtually identical for cyan and black, while the Canon unit had a slightly higher density for magenta and the Epson device had a slightly higher density for yellow.

○ Both Canon and Epson models exhibited natural looking skin tones in photographic images.

— When evaluating the consistency with which different skin tones were delivered, the Canon model displayed slightly greater variance with two of the three skin shades when compared with the Epson model.

○ Neutral grey consistency was the same for both models, with equally low variance across the page with ultra-low Delta E values that would not be discernible to the naked eye.

+ During BLI's colour drift analysis, the Canon model displayed a mean Delta E drift of just 1.6, compared with the Epson device's mean drift of 6.5. In the colour drift analysis, the FOGRA39 media wedge is submitted to print before and after productivity and ink consumption tests, and measured using EFI Colour Verifier software. When FOGRA39 patches taken before the ink consumption test were compared with the FOGRA39 master, the Canon delivered a lower mean Delta E of 5.5 than the Epson unit's mean Delta E, which was 9.9.

+ The Canon device's colour gamut was marginally (0.16%) larger than that achieved by the Epson model when printed on proofing/semi-gloss media in highest quality settings, but 8.1% higher on photo quality paper.

○ BLI analysed a wide range of colour and greyscale regions in business graphics and photographic images output by both devices and found them to be comparable overall, with excellent fine details in light and dark contrast areas.

Black Image Quality

Advantage ✔	Canon imagePROGRAF iPF6450	Epson Stylus Pro 7900
Text	✔	
Fine Lines	✔	
Halftone Range	=	=
Halftone Fill	=	=
Solid density	=	=
Business Graphics	=	=
Photographic Images	=	=

+ In black mode, the Canon iPF6450 and the Epson Stylus Pro 7900 again displayed clear formation of fonts down to the 3-point size, but the Canon model's fonts were noticeably crisper than those from the Epson device.

+ The Canon iPF6450 produced the 1x1 pixel grid in black without error, whereas the Epson 7900 could not deliver consistent coverage across the grid.

+ Both devices delivered excellent vertical and horizontal fine lines in black down to the 0.1 size but the Epson device showed a significant amount of stair-stepping in diagonal lines compared with only a slight amount of stair-stepping with the Canon model.

○ Both models delivered an excellent range of halftone fills, with distinct transitions between all levels.

○ The devices shared honours in terms of solid optical density in black, but the Epson model showed less variance across the test target.

○ BLI analysed a wide range of monochrome and greyscale output in business graphics and photographic images from both models and found them to be comparable overall, with excellent fine details in both light and dark contrast areas.

Print Productivity

Advantage ✔	Canon imagePROGRAF iPF6450	Epson Stylus Pro 7900
First Page Out From Ready State (Fast/Speed)	✔	
First Page Out From Ready State (Standard/Quality)	✔	
First Page Out From Ready State (High/Max Quality)	✔	
Throughput Speed Portrait (Fast/Speed)	✔	
Throughput Speed Portrait (Standard/Quality)	✔	
Throughput Speed Retail Poster(Fast/Speed)	✔	
Throughput Speed Retail Poster (Standard/Quality)	✔	

+ When printing a high-resolution portrait, the Canon model delivered faster first-page-out times than the Epson model from the ready state in all modes, though times were quite close in High/Max Quality mode (299 seconds for the Canon iPF6450 versus 303 seconds for the Epson 7900).
+ When printing a medium-resolution Retail Poster, the Canon model again delivered faster first-page-out times than the Epson model from the ready state in all modes, though times were quite close in High/Max Quality mode (275 seconds for the Canon iPF6450 versus 289 seconds for the Epson 7900).
+ When printing five pages of a single-page A1-size high-resolution portrait test document in both Fast/Speed and Standard/Quality modes, the Canon model displayed a clear speed advantage over the Epson model, with times that were 34.3% faster in Fast/Speed mode and 51.6% faster in Standard/Quality mode.
+ When printing five pages of a single-page A1-size medium-resolution retail poster test document in both Fast/Speed and Standard/Quality modes, the Canon model again displayed a clear speed advantage over the Epson model, with times that were 18.7% faster in Fast/Speed mode and 36.0% faster in Standard/Quality mode.

Ink Consumption

BLI analysts observed that, owing to the vagaries of inkjet technology (for example, head flushing and calibration routines can occur at any time during testing), the same test can produce different results at different times. Although BLI makes every effort to ensure that devices are tested on a level playing field, the test results should be regarded as an indicator of likely performance and not as a prediction of actual ink consumption in a real-world environment.

Results averaged across three tests of 50-set A1 printing in Standard /Quality Mode

	Canon imagePROGRAF iPF6450	Epson Stylus Pro 7900
PACKAGING PROOF (Standard / Quality Mode)		
Overall weight of ink used (grams)	378.5	514.3
Percentage of total ink used averaged across all colours	23.2%	39.0%
RETAIL POSTER		
Overall weight of ink used (grams)	308.9	420.8
Percentage of total ink used averaged across all colours	18.9%	31.9%
STUDIO PORTRAIT		
Overall weight of ink used (grams)	378.5	626.4
Percentage of total ink used averaged across all colours	23.2%	47.5%

+ In all of the BLI Packaging Proof ink consumption print runs using Standard/ Quality mode on 255-gsm Semi-gloss Proofing media, the Canon imagePROGRAF iPF6450 used significantly less ink in terms of net weight than the Epson Stylus Pro 7900.
+ In all of the BLI Packaging Proof print runs using Standard/Quality mode on 255-gsm Semi-gloss Proofing media, the Canon model used a much lower percentage of available ink than the Epson model.

+ In all of the BLI Retail Poster print runs using Standard/ Quality mode on plain coated media, the Canon imagePROGRAF iPF6450 used significantly less ink in terms of net weight than the Epson Stylus Pro 7900.

+ In all of the BLI Retail Poster print runs using Standard/Quality mode on plain coated media, the Canon unit used a much lower percentage of ink available in the cartridges than the Epson device.

+ In all of the BLI Studio Portrait ink consumption print runs using Standard/ Quality mode on 250-gsm Semi-gloss Photo media, the Canon imagePROGRAF iPF6450 used significantly less ink in terms of net weight than the Epson Stylus Pro 7900.

+ In all of the BLI Studio Portrait print runs using Standard/Quality mode on 250 gsm Semi-gloss Photo media, the Canon iPF6450 used a much lower percentage of available ink than the Epson 7900.

Device Feature Set

+ The Epson Stylus Pro 7900 employs eleven inks, four of which are different shades of black, whilst the Canon imagePROGRAF iPF6450 employs twelve inks including two black and two grey inks. The fact that the Canon inks are replaceable during operation helps to reduce downtime.

+ The Canon model's two printheads contain more nozzles per colour than the Epson unit's single printhead.

— The Canon unit's ink delivery system dispenses a slightly larger drop size than the Epson ink delivery system.

— The Epson ink cartridge capacity is significantly larger than that of the Canon model.

○ Both models offer borderless printing.

+ The Canon model has a larger standard memory capacity (384 MB) than the Epson unit which has a 256-MB memory.

+ The Canon model has a 250-GB hard drive, which allows for the storage of commonly used documents and aids spooling workflow; the Epson device doesn't have a hard drive, even as an option.

— The Canon model has a higher advertised peak energy value (100W) than the Epson model (70W).

+ However, the Canon iPF6450's energy consumption in standby mode (where it will spend a large amount of time) is just 6 W compared with 16 W for the Epson device.

+ The Canon model includes a plug-in for Microsoft Office, which provides a wizard that walks users through the process of creating posters from Word, Excel or PowerPoint, avoiding the need for complex resizing. This feature is not offered on the Epson model.

+ The Canon model includes PosterArtist Lite, Canon's software for creating posters and signage in simple steps. The full version of Canon PosterArtist, available as an option, offers more advanced features such as auto design, variable data printing, in-application editing features, plus additional templates, photos and clip art. Epson does not supply an equivalent product.

+ The Canon device includes a media mismatch option, which places on hold jobs that can't be printed due to incorrect media being loaded, while jobs that can be completed are printed; the held jobs are printed once the required paper is loaded. The Epson device does not offer this capability, and continues printing on the mismatched media, which results in ink and media waste.

+ Canon offers a wide variety of software options designed to appeal to specific segments of the graphic arts market such as photography and fine art display, including a print plug-in for Photoshop which prints 16-bit files directly from Adobe RGB with a wide gamut and clear tonal gradation, and a plug-in for DPP (Digital Photo Professional) that includes a 'Digital Lens Optimizer' to improve photographic image quality and enhance depth of field.

+ Canon's Accounting Manager, accessed via the Status Monitor, offers comprehensive accounting management for all print jobs. Users enter the actual costs for individual inks and media types, and the cost per job is calculated automatically and displayed. For each job, the media type, area, ink used and total print time are listed, and more detailed cost and consumption can be obtained by double-clicking on an individual job name or by highlighting a range of different jobs. Job cost information can then be saved in .CSV format and opened in Excel.

○ Epson's LFP Accounting Tool, a free download from Epson's website for other large-format Epson devices, does not seem to be available for the SP7900.

Driver Feature Set

+ The Canon driver includes 55 media profiles versus 30 for the Epson driver.

+ The Canon driver includes a watermark capability; the Epson driver does not.

+ The Canon driver also includes a Thicken Fine Lines image enhancement option; the Epson driver offers only Sharpen Text.

○ Both the Canon and Epson drivers offer N-up (up to 16 and 4, respectively) and poster printing (2 x 2 and 4 x 4, respectively) capabilities.

— The page-stamping capabilities of both the Canon and Epson driver include date and time and user name. The Canon driver adds page number, while the Epson driver adds the time, printer name, comment, document name and print settings.

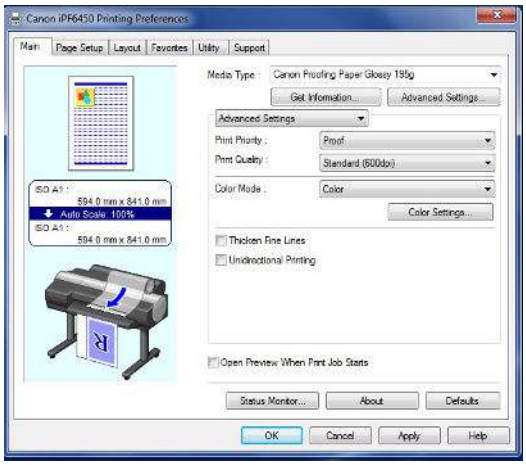
○ The Canon driver includes a utility, Colour imageRUNNER Enlargement Copy Mode, which allows users to integrate a Canon MFP device or other scanner with the imagePROGRAF iPF6450. Documents scanned by the Canon MFP are automatically routed to a hot folder, which is monitored by the imagePROGRAF iPF6450 driver. Users can also set up other scanners to route files directly to the hot folder. The image is then resized and printed, offering a fast, easy-to-use poster creation tool for office users. A similar feature is offered to Epson users in the form of its Epson CopyFactory Utility, but this has not been tested by BLI.

○ The Canon model's device status monitor can be accessed directly from the front tab of the driver, whereas users of the Epson model must access device status via an icon on the utility tab, which requires one more click.

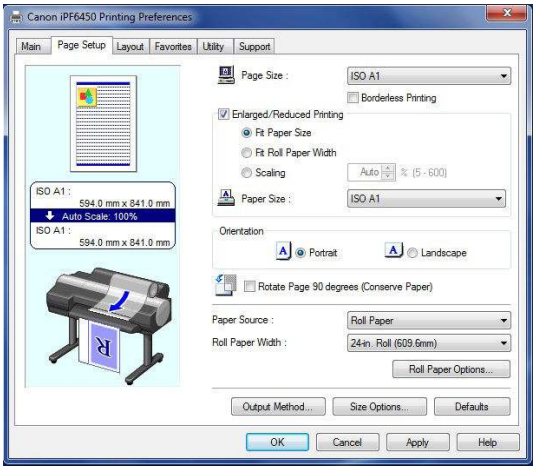
+ The Canon driver includes a wider selection of simple colour adjustment options, including brightness, contrast, saturation and CMYK sliding scale adjustments. The Epson driver is limited to only CMY with brightness, contrast and saturation control.

+ The Canon driver includes more advanced colour-matching capabilities, including the ability to match ICC profiles and select the rendering intent based on different elements in the document. The Epson driver offers more limited colour-matching options, with no rendering-intent options.

+ The Canon driver includes a unidirectional print selection, whereas the Epson driver does not.

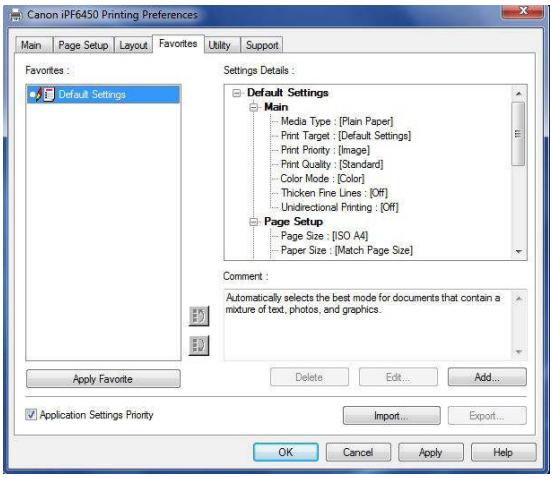


Canon Print Driver Main Tab

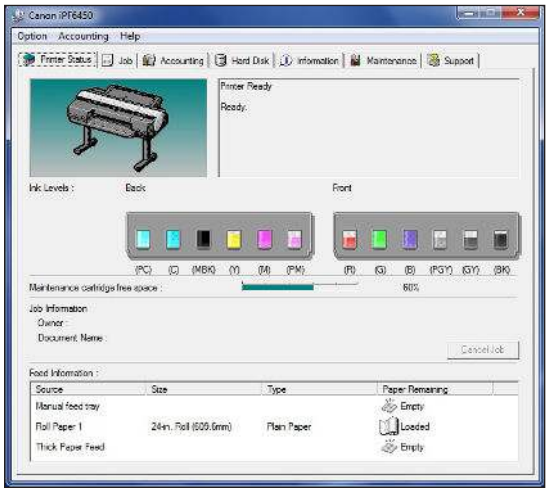


Canon Print Driver Page Setup Tab

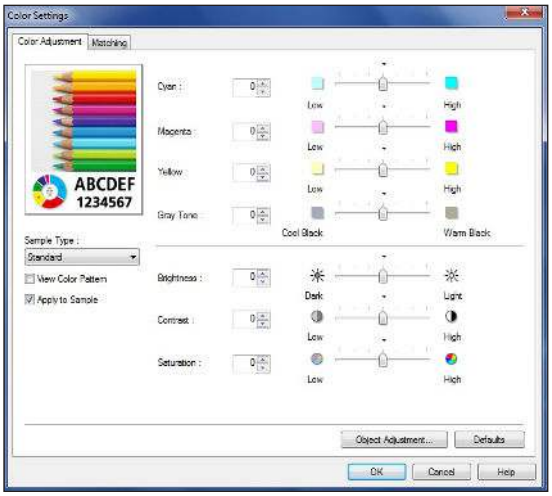
Canon Print Driver Layout Tab



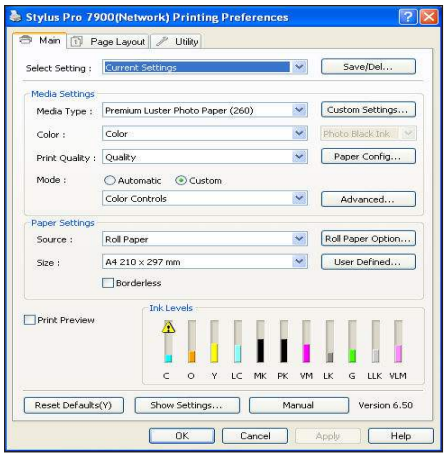
Canon Print Driver Favourites Tab



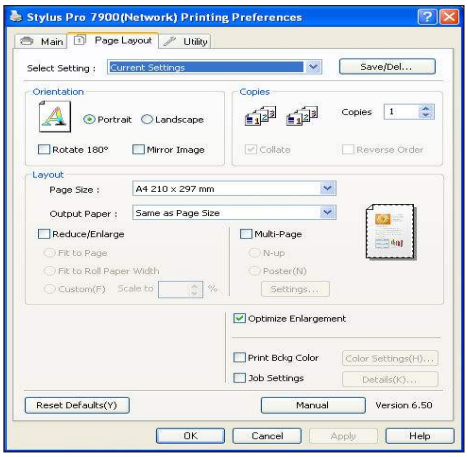
Canon Status Monitor Utility



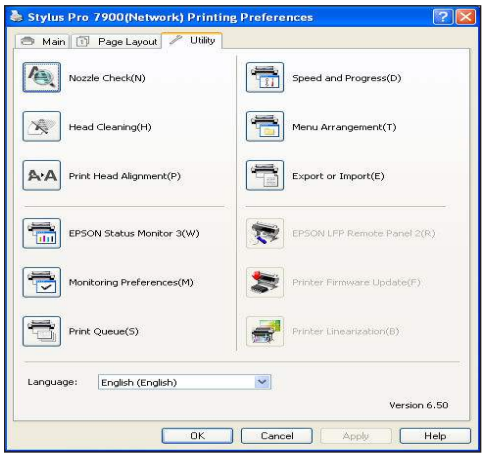
Canon Colour Adjustment Settings



Epson Print Driver Main Tab

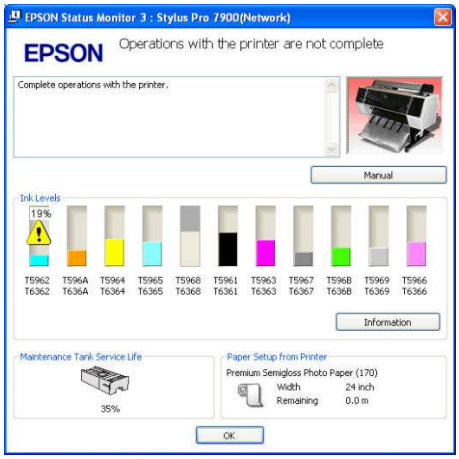


Epson Print Driver Page Layout Tab

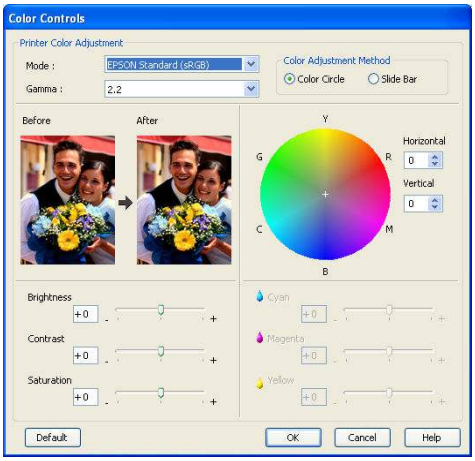


Epson Print Driver Utility Tab

Epson Print Driver Current Settings



Epson Status Monitor



Epson Print Driver Colour Adjustments Tab

Spectrophotometer Functionality

○ An outstanding feature offered with both models is the option of attaching an X-Rite Spectrophotometer (which Epson calls a SpectroProofer) to ensure colour consistency and automate workflows for colour calibration, target measurement and media profile generation when used in conjunction with software tools offered by both companies.

○ Epson offers Look Up Table (LUT) technology for spot colour optimization, increased gamut size and verification of colour difference from the test targets.

\+ The Canon iPF 6450 enables users to switch a UV filter on or off (via software) to ensure colour consistency where certain Proofing or Photo media have been artificially whitened. The Epson SP 7900 obliges users to choose at the point of purchase between the Spectroproofer either with or without a UV filter.

\+ The Canon model supports XRGA, X-Rite's Standard for Graphic Arts which ensures consistency in colour measurement and calibration between instruments from all the major vendors including X-Rite. The Epson SP7900 offers no support for the XRGA standard.

Colour Stability using calibration link

\+ The Canon iPF6450 has a built-in multi-sensor or densitometer positioned on the printhead to conduct a colour calibration which can be applied to all Canon media as well as third-party media used on the device. Canon recommends that calibration is performed after the printer is installed, after printheads are replaced, or if colour appears to vary over time. For third-party media, a calibration can be initiated either at the control panel or via the Colour Calibration Management Console utility. After initiation a colour calibration chart is automatically printed and scanned using a three-colour LED, and the colour calibration results are set automatically.

\+ Canon's calibration process is a one-off procedure which covers all resolutions, whereas the Epson model requires users to perform a separate calibration for each available resolution setting. The Canon model's calibration routine takes about 10 minutes to perform and uses just 25 cm of paper and an average of 10 grams of ink, whereas the Epson unit takes about 15 minutes for each calibration routine, and if all four resolution settings are required it can take up to an hour, using 90 cm of paper and an average of 4 grams of ink.

\+ Canon's innovative Media Configuration Tool and Colour Calibration Management Console utility offer an important advantage over the Epson software in that they can also be used to check for and maintain colour consistency across a whole range of compatible large-format devices, even ones in remote locations—a significant advantage for proofing in the Graphic Arts, Photography and Advertising industries where consistency of colour across devices is a paramount concern.

\+ In BLI's testing, the Canon iPF6450 with the SU-21 Spectrophotometer produced output with an astonishingly low Delta E variation of 0.6 from the same FOGRA39 colour patch printed by the iPF 8400. (This correlates closely with the equally impressive Delta E variation of 1.39 obtained with the same two devices with an IT8 colour patch during BLI's Lab Testing in the USA). Canon's free Colour Calibration Management Console utility also enables administrators to monitor the calibration status of each connected unit remotely when required. The utility displays a progress bar for each media type to indicate when a colour calibration should be conducted, and features a Delta E threshold setting whose default value is 2.0 on a scale of 0.4 to 5.0, ensuring that colour consistency is maintained over time.

Printhead Reliability / Cleaning Routines

○ Both models offer three choices of settings for nozzle checks at the control panel. The Canon iPF6450 has settings for Off, Per Print or Auto (the default setting), while the Epson 7900 has settings for Periodic (the default mode), On (Per Job) or Off.

+ When a clogged nozzle is detected on the Canon unit, it automatically runs a cleaning cycle in the background to maintain image quality and consistency, with no user intervention required. If a clogged nozzle is detected on the Epson device, the control panel alerts users that a cleaning cycle is required, and offers a choice between waiting until a print run is finished, or cancelling a print job and running a cleaning cycle immediately. The Epson unit's method requires more user intervention.

+ When the two devices were powered off completely over a weekend, the Canon model had no issues with nozzles clogging. If a nozzle check pattern was requested, it printed with perfect accuracy every time. In contrast, on every occasion that the Epson model was powered off over a weekend, the nozzles became clogged and a cleaning cycle was required. This would result in a good deal of downtime for Epson users, and waste a considerable amount of ink and paper.

+ As the Epson 7900 has both matte black and photo black inks which share the same printhead, users are required to choose to switch between them for a specific job at the control panel—a process which takes about three minutes and uses an additional 2.5 grams of ink.

○ The Canon model uses 0.5 grams of ink per cartridge on average during cleaning cycles, which take just under six minutes on average to complete.

+ The Epson model uses between 1.3 and 1.7 grams of ink per cartridge during cleaning cycles, taking between five and nine minutes.

SUPPORTING TEST DATA

Colour Throughput Time – High Resolution Portrait Printing

Canon imagePROGRAF iPF6450 (time in seconds)		Epson Stylus Pro 7900 (time in seconds)	
Fast	Standard	Speed	Quality
544.43	597.75	828.98	1,233.81

A single page high-resolution A1 portrait was printed as a 5-set job using the device driver set to the plain paper /colour setting. Both devices were loaded with 24" rolls, with each file set to auto-rotate to save media. The time indicated is the time from the cutting of the first page to the cutting of the final page to assess throughput speed of the final four.

Colour Throughput Time – Medium Resolution Retail Poster Printing

Canon imagePROGRAF iPF6450 (time in seconds)		Epson Stylus Pro 7900 (time in seconds)	
Fast	Standard	Speed	Quality
471.44	723.06	579.81	1,130.28

A single-page medium resolution A1 retail poster was printed as a 5-page job using the device driver set to the plain paper /colour setting. Both devices were loaded with 24" rolls with each file set to auto-rotate to save media. The time indicated is the time from the cutting of the first page to the cutting of the final page to assess the throughput speed of the final four pages.

First-Page-Out Time from Ready State – High-Resolution Portrait Printing

	Canon imagePROGRAF iPF6450 (time in seconds)			Epson Stylus Pro 7900 (time in seconds)		
	Fast	Standard	High	Speed	Quality	Max Quality
Time Before Printing Commences	17.53	17.60	21.01	23.65	23.69	23.85
First Print Out	95.28	164.41	298.84	105.44	224.24	303.24

First-page-out times are achieved by sending an A1 high resolution portrait PDF file to print, timed from release to page out with the Canon driver set to the plain paper setting and the Epson driver set to plain paper, black mode. Both devices were loaded with 24" rolls, with each file set to auto-rotate to save media.

First-Page-Out Time from Ready State – Medium-Resolution Retail Poster Printing

	Canon imagePROGRAF iPF6450 (time in seconds)			Epson Stylus Pro 7900 (time in seconds)		
	Fast	Standard	High	Speed	Quality	Max Quality
Time Before Printing Commences	16.41	15.12	18.45	23.16	23.31	23.42
First Print Out	92.45	144.67	275.48	98.44	212.42	289.08

First-page-out times are achieved by sending an A1 medium resolution retail poster PDF file to print, timed from release to page out with the Canon driver set to the plain paper setting and the Epson driver set to plain paper, black mode. Both devices were loaded with 24" rolls, with each file set to auto-rotate to save media.

Colour Print Quality

Colour Optical Density Evaluation

Canon imagePROGRAF iPF6450: Proofing Paper Semi-Glossy

High (600 dpi)						
	1	2	3	4	Max.	Min.
Cyan	0.63	0.64	0.63	0.64	0.64	0.63
Magenta	0.96	0.96	0.97	0.97	0.97	0.96
Yellow	0.88	0.89	0.89	0.90	0.90	0.88
Black	2.37	2.40	2.37	2.35	2.40	2.35

Epson Stylus Pro 7900: Standard Proofing Paper

Quality (720 x 1440 dpi)						
	1	2	3	4	Max.	Min.
Cyan	0.63	0.64	0.64	0.63	0.64	0.63
Magenta	0.95	0.94	0.95	0.94	0.95	0.94
Yellow	0.93	0.96	0.95	0.95	0.96	0.93
Black	2.38	2.36	2.38	2.38	2.38	2.36

Note: Colour density readings were assessed by printing a BLI test file on proofing paper in high-quality colour settings and measuring the density of 100% dot fill using an XRite 508 densitometer.

Skin Tone and Neutral Grey Consistency

Skin Tone 1 (C=6, M=15,Y=16,K=0)		
	Canon imagePROGRAF iPF6450	Epson Stylus Pro 7900
Colour block		
2	0.1	0.2
3	0.0	0.4
4	0.2	0.1
5	0.2	0.1
6	0.3	0.3
7	0.4	0.1
8	0.6	0.1
9	0.7	0.4
Max. Delta E Variance	0.7	0.3

Skin Tone 2 (C=30, M=63,Y=75,K=0)		
	Canon imagePROGRAF iPF6450	Epson Stylus Pro 7900
Colour block		
2	0.4	0.4
3	0.4	0.6
4	0.2	0.6
5	0.3	0.6
6	0.3	0.6
7	0.8	0.3
8	0.9	0.5
9	0.8	0.4
Max. Delta E Variance	0.7	0.3

Skin Tone 3 (C=19, M=33,Y=50,K=0)		
	Canon imagePROGRAF iPF6450	Epson Stylus Pro 7900
Colour block		
2	0.3	0.4
3	0.5	0.8
4	0.5	0.1
5	0.3	0.2
6	0.6	0.4
7	1.0	0.1
8	0.9	0.2
9	1.0	0.6
Max. Delta E Variance	0.7	0.7

Neutral Grey		
	Canon imagePROGRAF iPF6450	Epson Stylus Pro 7900
Colour block		
2	0.1	0.2
3	0.2	0.1
4	0.1	0.1
5	0.2	0.1
6	0.3	0.2
7	0.3	0.2
8	0.4	0.1
9	0.4	0.3
Max. Delta E Variance	0.3	0.2

Note: Skin tone and neutral grey consistency measurements are based on nine readings taken from a BLI proprietary PDF test target file comprising four A1-sized solid coverage documents of three skin tones and a neutral grey with the High/Quality print quality setting selected in the driver and the target printed on the manufacturer's own brand of proofing semi-gloss media. Colour differences across the A1 image were measured comparing eight locations to that of the colour measured at the top left of the page, using an EFI ES1000 colour spectrophotometer and Gretag MacBeth EyeOne Share colour comparison software.

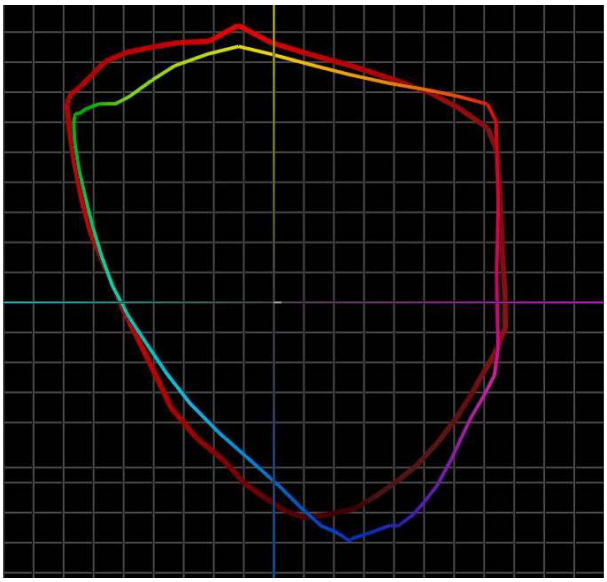
FOGRA 39 DRIFT TEST: comparison of FOGRA39 colour patches before and after ink consumption test.

	Canon imagePROGRAF iPF6450	Epson Stylus Pro 7900
Delta E Drift	1.3	6.5

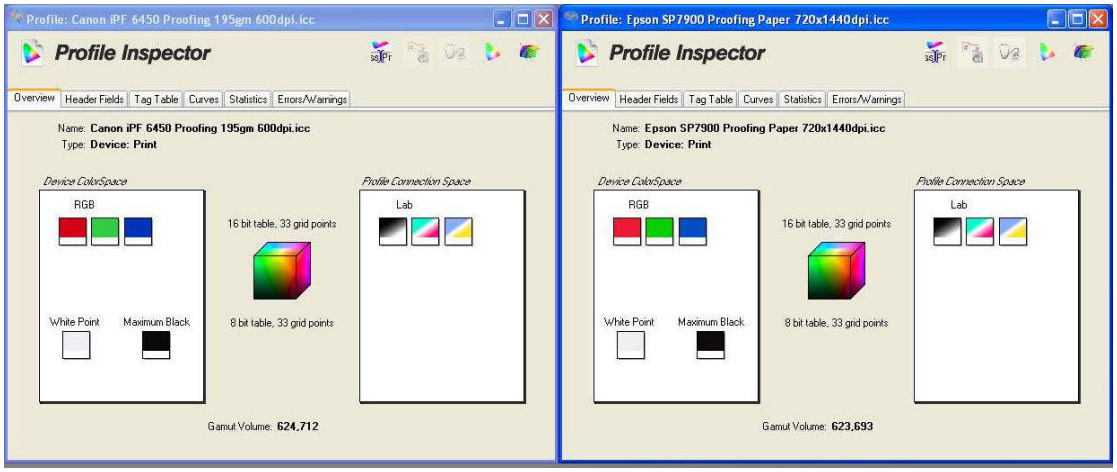
FOGRA 39 FIDELITY TEST: FOGRA39 colour patches taken before ink consumption test starts compared to FOGRA39 master.

	Canon imagePROGRAF iPF6450	Epson Stylus Pro 7900
Delta E Fidelity	5.5	9.9

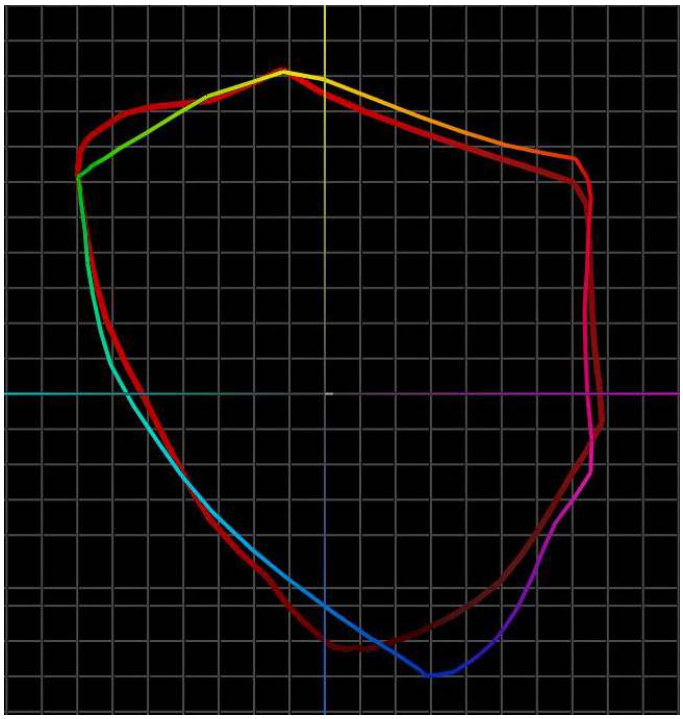
Colour Gamut Comparison



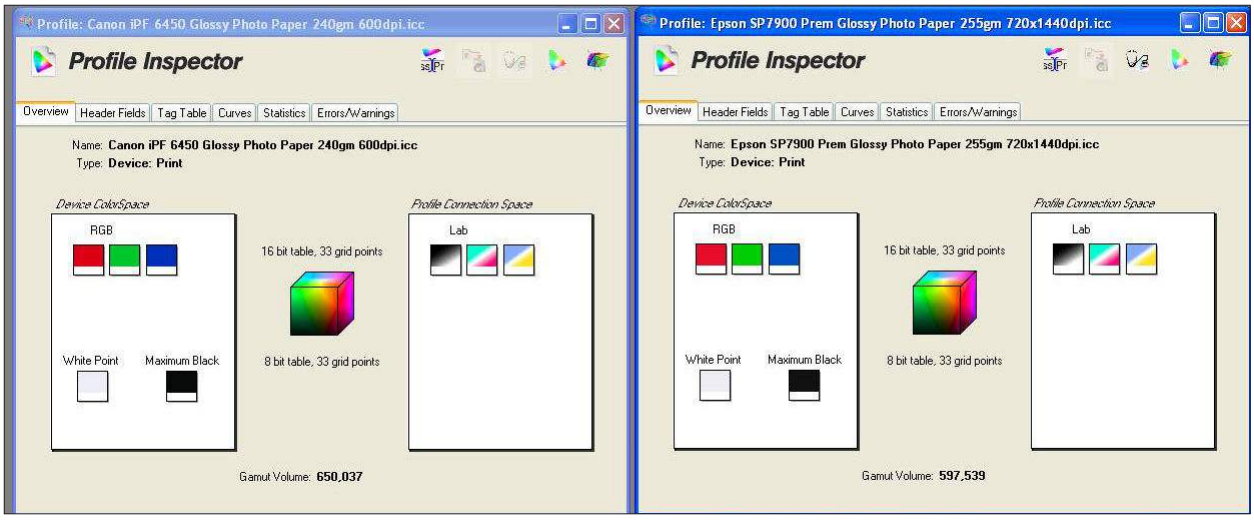
Epson Stylus Pro 7900 colour gamut on proofing paper in highest quality settings (red) versus Canon imagePROGRAF iPF6450 colour gamut (shown chromatically) on proofing paper in highest quality settings.



Canon iPF6450 Colour Gamut on Proofing Paper **Epson Stylus Pro 7900 Gamut on Proofing Paper**



Epson Stylus Pro 7900 colour gamut on photo paper in highest quality settings (red) versus Canon imagePROGRAF iPF6450 colour gamut (shown chromatically) on photo paper in highest quality settings.



Canon iPF6450 Colour Gamut on Photo Paper

Epson Stylus Pro 7900 Gamut on Photo Paper

Device Feature Set

	Canon imagePROGRAF iPF6450	Advantage	Epson Stylus Pro 7900
Max. print quality	2,400 x 1,200 dpi		✔ 2,880 x 1,440 dpi
Number of inks	12	✔	11
Ink tanks replaceable during operation	Yes	✔	No
Ink-drop size	4 picoliter		✔ Minimum 3.5 picoliter (variable)
Ink cartridge capacity	90 ml (Starter), 130 and 300 ml		✔ 350 ml, 700 ml
Number of nozzles	30,720 (2,560 per colour)	✔	3,600 (360 per colour)
Number of printheads	2		1
Line accuracy	+/-0.1% or less	✔	+/-0.2%
Minimum line width	INA		INA
Minimum print margins	Borderless		Borderless
Borderless (0 mm) printing	Yes		Yes
Maximum outside diameter of roll paper	150 mm		150 mm
Maximum printable paper roll length	18 m (varies according to the OS and application)		Limited by application, OS and driver/RIP used
Maximum cut-sheet media length	1.5 m	✔	INA
Maximum media thickness	1.5 mm from front		1.5 mm cardboard
Maximum media width	24 inches		24 inches
Media loading	Front/top		Front/top
Optional media handling	Roll holder set		Roll media adapter
Standard RAM	384 MB	✔	256 MB
Maximum RAM	384 MB	✔	256 MB
Hard drive	Standard 250-GB	✔	None
Interface	10/100/1000Base-T/TX Ethernet, USB 2.0 High Speed	✔	100Base-TX/10Base-T Ethernet, USB 2.0 High Speed
PDL	GARO (Graphic Arts with Raster Opeations)		Epson ESC/P3
Net weight (unpacked)	70 kg	✔	80 kg
Power consumption when in standby	6 W	✔	16 W
Power consumption when active	100 W		✔ 70 W
Acoustic pressure	Operation: 47 dB (A) or less; Standby: 35 dB (A) or less	✔	Operation: Less than 50 dB (A); Standby: INA
Acoustic power	Operation: 6.4 Bels or less		Information not available

Driver Feature Set

	Canon imagePROGRAF iPF6450	Advantage	Epson Stylus Pro 7900
Speed settings	5 (Fast 300, Standard 300, Standard 600, High 600, Highest 600) depending on media settings		Up to 5 depending on media settings
Economy mode	No		No
Predefined profiles	7 (Under Easy Settings)	✔	3
Overview of profile settings provided	Yes		Yes
Media profiles	55	✔	30
IQ optimized for options	Yes		Yes
Watermark	Yes	✔	No
Sharpen text	No	✔	Edge smoothing
Thicken fine lines	Yes	✔	No
Mirror image	No	✔	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)		No (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
Enlargement Copy Mode	Yes		Yes (CopyFactory Utility)
Free Layout Capability	Yes	✔	No
MS Office Plug-in	Yes	✔	No
Accounting Capability	Yes	✔	No
Disable automatic cutter	Yes		Yes
Unidirectional printing selection option	Yes	✔	No
Integration with MFP	Yes	✔	No

Ink Consumption

Table 1: Amount of Ink in Each Canon imagePROGRAF iPF6450 Cartridge (in grams)

	PC	C	MBK	Y	M	PM	R	G	B	PGY	GY	BK
Weight of cartridge prior to installation	173.7	173.0	174.1	171.9	172.4	170.4	172.3	174.5	172.0	171.5	171.4	172.0
Weight of cartridge at end of life	36.2	36.2	36.2	36.2	36.2	36.2	36.2	36.2	36.2	36.2	36.2	36.2
Net weight of ink	137.5	136.8	137.9	135.7	136.2	134.2	136.1	138.3	135.8	135.3	135.2	135.8
Total Ink Weight across 12 cartridges												1,634.8

Table 2: Amount of Ink in Each Epson Stylus Pro 7900 Cartridge (in grams)

	C	OR	Y	LC	MK	PK	VM	LK	G	LLK	VLM
Weight of cartridge prior to installation	317	318.3	317.1	319.7	320.3	318.9	319.1	317.6	320.7	316.4	321.3
Weight of cartridge at end of life	198.8	198.8	198.8	198.8	198.8	198.8	198.8	198.8	198.8	198.8	198.8
Net weight of ink	118.2	119.5	118.3	120.9	121.5	120.1	120.3	118.8	121.9	117.6	122.5
Total Ink Weight across 11 cartridges											1,319.6

Table 3: Ink Used in Three 50-Page Runs of Packaging Proof Test Document (Draft Mode) on the Canon iPF6450 (grams)

	PC	C	MBK	Y	M	PM	R	G	B	PGY	GY	BK
Test Run 1 Net weight of ink used	7.9	1.8	1.5	7.9	2.3	12.9	2.8	2.8	2.0	45.7	26.5	9.0
Test Run 2 Net weight of ink used	7.5	2.8	2.1	9.9	3.2	13.6	4.1	3.6	3.8	44.5	26.2	9.0
Test Run 3 Net weight of ink used	7.2	2.0	1.3	8.6	2.0	14.4	4.7	3.2	1.7	45.9	26.3	7.8
Average amount of ink used across three runs	7.5	2.2	1.6	8.8	2.5	13.6	3.9	3.2	2.5	45.4	26.3	8.6
Total average ink weight across 12 cartridges												126.1

Table 4: Ink Used in Three 50-Page Runs of Packaging Proof Test Document (Draft Mode) on the Epson Stylus Pro 7900 (grams)

	C	OR	Y	LC	MK	PK	VM	LK	G	LLK	VLM
Test Run 1 Net weight of ink used	5.9	14.5	7.6	28.2	0.2	30.8	7.5	15.7	14.5	35.1	13.8
Test Run 2 Net weight of ink used	5.3	14.9	6.7	27.3	0.1	30.7	8.7	15.7	13.7	35.7	11.0
Test Run 3 Net weight of ink used	5.5	14.6	6.8	27.1	0.0	30.5	8.4	15.6	13.6	35.6	13.0
Average amount of ink used across three runs	5.6	14.7	7.0	27.5	0.1	30.7	8.2	15.7	13.9	35.5	12.6
Total average ink weight across 11 cartridges											171.5

Table 5: Ink Used in Three 50-Page Runs of Retail Poster Test Document on the Canon iPF6450 (grams)

	PC	C	MBK	Y	M	PM	R	G	B	PGY	GY	BK
Test Run 1 Net weight of ink used	3.3	2.5	5.2	5.6	8.2	7.9	26.1	5.0	4.9	13.4	21.1	1.2
Test Run 2 Net weight of ink used	4.7	4.5	6.6	6.7	7.3	7.3	23.9	3.3	3.0	12.6	20.0	0.5
Test Run 3 Net weight of ink used	4.2	3.2	6.6	9.2	7.6	8.0	24.2	1.5	4.7	12.7	21.4	1.1
Average amount of ink used across three runs	4.1	3.4	6.1	7.2	7.7	7.7	24.7	3.3	4.2	12.9	20.8	0.9
Total average ink weight across 12 cartridges												103.0

Table 6: Ink Used in Three 50-Page Runs of Retail Poster Test Document on the Epson Stylus Pro 7900 (grams)

	C	OR	Y	LC	MK	PK	VM	LK	G	LLK	VLM
Test Run 1 Net weight of ink used	3.8	1.9	14.4	28.1	4.5	0.3	22.3	0.0	3.1	13.7	50.0
Test Run 2 Net weight of ink used	3.5	1.5	13.7	27.8	3.4	0.0	24.9	0.1	2.7	11.4	49.5
Test Run 3 Net weight of ink used	3.7	1.9	14.0	27.9	3.3	0.0	25.5	0.1	2.9	11.5	49.4
Average amount of ink used across three runs	3.7	1.8	14.0	27.9	3.7	0.1	24.2	0.1	2.9	12.2	49.6
Total average ink weight across 11 cartridges											140.2

Table 7: Ink Used in Three 50-Page Runs of Studio Portrait Test Document on the Canon iPF6450 (grams)

	PC	C	MBK	Y	M	PM	R	G	B	PGY	GY	BK
Test Run 1 Net weight of ink used	7.9	1.8	1.5	7.9	2.3	12.9	2.8	2.8	2.0	45.7	26.5	9.0
Test Run 2 Net weight of ink used	7.5	2.8	2.1	9.9	3.2	13.6	4.1	3.6	3.8	44.5	26.2	9.0
Test Run 3 Net weight of ink used	7.2	2.0	1.3	8.6	2.0	14.4	4.7	3.2	1.7	45.9	26.3	7.8
Average amount of ink used across three runs	7.5	2.2	1.6	8.8	2.5	13.6	3.9	3.2	2.5	45.4	26.3	8.6
Total average ink weight across 12 cartridges												126.1

Table 8: Ink Used in three 50-page Runs of Studio Portrait Test Document on the Epson Stylus Pro 7900 (grams)

	C	OR	Y	LC	MK	PK	VM	LK	G	LLK	VLM
Test Run 1 Net weight of ink used	2.7	0.3	5.9	17.7	0.7	10.3	3.8	28.3	10.2	107.5	29.5
Test Run 2 Net weight of ink used	2.2	0.4	3.5	17.2	0.0	6.0	3.4	26.3	9.6	107.1	28.9
Test Run 3 Net weight of ink used	2.3	0.1	5.6	17.1	0.0	5.8	2.0	26.2	9.7	107.1	29.0
Average amount of ink used across three runs	2.4	0.3	5.0	17.3	0.2	7.4	3.1	26.9	9.8	107.2	29.1
Total average ink weight across 11 cartridges											208.7

Ink Consumption Test Methodology Overview

Buyers Lab's ink consumption analysis was conducted using three document types (proof, retail poster and photo). The Packaging Proof document was formatted as a PDF, the Retail Poster as a JPG file and the Studio Portrait was formatted as a TIFF file and all three were sized at ISO A1.

The Canon imagePROGRAF iPF6450 was installed in BLI's lab with the latest level of firmware (as of March 2013) 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 unless otherwise specified. The Packaging Proof document was printed on 255 gsm Semi-gloss proofing media in Standard mode, The Retail Poster was printed on plain coated media in Standard mode, and the Studio Portrait phot was printed on 250 gsm Semi-gloss Photo media in Standard Mode

The Epson Stylus Pro 7900 was installed in BLI's lab with the latest level of firmware (as of March 2013) and connected to a Windows 7 workstation using a 100BaseT TCP/IP connection. The device was left in default configuration throughout testing. The Epson ESC/P driver was used for all testing and was left in default colour setting unless otherwise specified, with media selection set to plain paper and the image set to print at actual size. The Packaging Proof document was printed on 255 gsm Semi-gloss proofing media in Quality mode, The Retail Poster was printed on plain coated media in Quality mode, and the Studio Portrait phot was printed on 250 gsm Semi-gloss Photo media in Quality Mode.

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 iPF6450: one cartridge was then run to exhaustion and the weight of the empty cartridge was recorded.

Epson Stylus Pro 7900: 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 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 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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