KEYPOINT INTELLIGENCE Buyers Lab

Custom Test Report

KPI Comparative Lab Test Report

FEBRUARY 2018

Canon imagePROGRAF TX-3000

vs. HP DesignJet T930

Advantage ✔	Canon imagePROGRAF TX-3000	HP DesignJet T930
Colour Image Quality	✔	
Black Image Quality	✔	
Print Productivity	✔	
Banner Printing	✔	
Poster Printing	✔	
Direct Print Submission Functionality		✔
Ink Consumption	✔	
Device Feature Set	✔	
Print Driver Feature Set	✔	

TEST OBJECTIVE

Keypoint Intelligence – Buyers Lab was commissioned by Canon Europe to conduct confidential document imaging device performance testing on the Canon imagePROGRAF TX-3000 and the HP DesignJet T930, and produce a report comparing the relative strengths and weaknesses of the two products in the areas of image quality, productivity, banner and poster printing, direct print submission functionality, device feature set, driver functionality, and ink consumption. All testing was performed in Buyers Lab's European test facility in Wokingham, UK.

Executive Summary

The Canon imagePROGRAF TX-3000 outclassed the HP DesignJet T930 in many aspects of Buyers Lab's evaluation, with higher productivity across the board, superior colour and black image quality, lower ink consumption and richer device and driver feature sets. Notably, Buyers Lab technicians observed that the speed advantage of the Canon model became even more pronounced as the quality level was increased, which enables Canon users to achieve optimum image quality without sacrificing productivity. Another significant productivity-boosting feature is the Canon model's ability to handle ink outages without having an impact on user productivity or causing unnecessary waste. When the Canon model runs out of ink, it continues to operate while alerting the user to replace the cartridge, and thanks to its hot-swap ink tank design, inks can be replaced on the fly. In contrast, the HP T930 runs out of ink, printing must stop for a cartridge to be replaced, leading to operator downtime. Plus, the Canon TX-3000 can be configured with a Multifunction Roll System, which not only offers dual-roll capability, giving users added flexibility to switch between different media types or sizes without the need to reload the media each time, but has auto take-up with bi-directional rewind as well, which can help in high-volume production environments, as it allows large numbers of images or documents to be conveniently stored on a single roll.

As expected of models aimed at the Architectural, Engineering and Construction (AEC), Computer-Aided Design (CAD) and Geographic Information Systems (GIS) markets, the image quality produced by both devices was of a high standard and would easily satisfy customer needs. Yet, the Canon imagePROGRAF TX-3000 had the advantage in colour and black image quality. It delivered larger colour gamuts in all modes tested when printing on both plain and (especially) photo-quality paper, crisper pin-sharp text formation and line art with no bleed, better photographic quality, with brighter colours and more natural-looking skin tones, and excellent definition in dark and light contrast areas. The Canon TX-3000 also delivered the lower ink consumption in all three tests.

Not without its advantages, the HP T930 provides robust direct print submission support, not only from the PC desktop via HP Click but also via mobile print apps for iOS and Android mobile platforms, as well as files attached in emails to the printer's email address. The Canon TX-3000 offers good direct print support via a desktop utility which lets users print files stored on their network or in Google Cloud, but currently mobile print support is limited to Android users, with support for printing to the device from iOS devices to follow in 2018. In addition, Buyers Lab analysts were impressed with the design and build quality of the HP T930's rear-mounted stacker assembly which can hold up to 50 printed sheets in perfect alignment; however, the TX-3000 is capable of holding over 100 A0-size CAD prints in good alignment.

In terms of device and driver feature sets, the Canon imagePROGRAF TX-3000 has plenty of advantages over its rival HP model. It has higher cartridge capacities, higher memory and hard drive capacities to aid with job processing and job storage, smaller ink drop sizes, more media profiles, a unidirectional feature to avoid banding on image output even when printing in Fast mode, and a flexible layout nesting option to save on paper. While the HP model offers a similar nesting feature, it will position jobs automatically and doesn't support the same flexibility and control over image placement. Canon users can integrate the imagePROGRAF TX-3000 device with a smaller-format MFP to produce enlarged, poster-size copies via the free Color imageRUNNER Enlargement Copy Mode, a feature not offered by HP. The TX-3000 offers robust security features as well, which include hard drive encryption and overwrite as standard, while the HP T930 offers Secure Disk Erase as an option only.

In conclusion, the Canon imagePROGRAF TX-3000 is the stronger performer in Buyers Lab's large-format evaluation overall. Not only did it deliver faster productivity, lower ink consumption and top-class colour and black image quality, its driver and device feature sets are richer, providing many ways to boost productivity and enhance functionality.

Colour Image Quality

Advantage ✔	Canon imagePROGRAF TX-3000	HP DesignJet T930
Text	✔	
Fine Lines	✔	
Halftone Range	=	=
Halftone Fill	✔	
Solid Density	✔	
AEC Graphics	✔	
GIS Graphics	=	=
Business Graphics	✔	
Photographic Images	✔	
Colour Gamut (Plain Paper, Fast)	✔	
Colour Gamut (Plain Paper, Standard/Normal)	✔	
Colour Gamut (Plain Paper, High/Best Quality)	✔	
Colour Gamut (Gloss Photo, High/Best Quality)	✔	

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

O All image quality testing was conducted on CAD 90gsm inkjet plain paper.

\+ In terms of colour optical solid density, the Canon TX-3000 produced higher optical densities for the four colours in Fast mode, as well as higher cyan density in all modes, and higher yellow density in High/Best mode, whilst the HP T930 produced higher magenta optical density in High/Best mode and higher composite black density in Standard/Normal and High/Best modes. Both models had comparable densities for yellow in Standard/Normal and magenta in High/Best mode.

\+ In Buyers Lab's colour gamut assessment conducted on plain paper in Fast mode, the Canon TX-3000 delivered a fractionally (by 2%) larger colour gamut with a CIE volume of 140,164 versus a CIE volume of 137,431 for the HP model.

\+ The Canon model produced a 35.7% larger colour gamut when printing on plain paper using Standard/Normal settings—with a CIE volume of 208,945 versus a CIE volume of 153,924 for the HP device.

\+ When printing on plain paper in High/Best Quality settings, the Canon TX-3000 delivered a 30.3% larger colour gamut than the HP T930, with a CIE volume of 229,826 versus a CIE volume of 176,335 for the HP model.

\+ In High/Best quality settings using photo-quality paper, the Canon model delivered a 49.3% larger colour gamut, with a CIE volume of 675,750 compared with a CIE volume of 452,584 for the HP T930.

\+ The Canon TX-3000 delivered superior colour text reproduction overall; it produced dark, pin-sharp Arial sans serif text that was legible down to the smallest (3-pt.) type size, with no breakup or ink bleed, in all tested modes. Serif characters, again, displayed no bleed and were legible down to 3-pt. size in Fast mode and 5-pt. size in Standard and High modes. For the HP model in Fast mode, its serif and sans serif fonts were legible down to

the 3-pt. level, but displayed poor fills and some ink bleed; in Normal mode, serif fonts were legible down to the 4-pt. level and down to the 3-pt. level for sans serif fonts, with no bleed. However, in Best quality mode, text was legible down to 3-pt. size with some bleed evident.

+ Fine lines produced by both devices remained distinct down to the 0.1-pt. level across all modes, except for the HP model's Fast mode in which fine lines were distinct at the 0.25-pt. mark. In Standard/Normal mode, fine lines were rated very good for the Canon TX-3000 model as they were crisp and clean, but only rated good for the HP T930.

+ In Fast and Standard/Normal modes, the Canon model produced 0.1-pt. circles that were smooth and unbroken, and rated very good. In High/Best mode, the Canon model delivered 0.25-pt. circles that, again, were given a very good rating. Circles produced by the HP T930 model were fully formed at 0.1-pt. size but were blurred and indistinct in Fast and Normal modes, whilst in Best mode circles were rated only as good.

+ The Canon TX-3000 produced the 1x1 pixel grid in CMY with no quality issues, and coverage was consistently very good across all colours. In contrast, the HP T930 delivered good coverage in Best mode, but its 1x1 pixel grid output was rated only fair in Fast and Normal modes.

O Both devices delivered colour halftone output across the full range—from the 10% to 100% dot-fill levels—in all modes with distinct transitions between all levels.

+ The Canon TX-3000 delivered very good, smooth colour halftone fills in all modes; the HP model delivered smooth halftone coverage that was consistently rated good.

+ When evaluating Architectural, Engineering and Construction (AEC) graphics in Standard/Normal and High/Best modes, both the Canon and HP units' output exhibited an excellent level of detail, very distinct fine lines and clear text formation, although there was some evidence of ink bleed with the HP model's output when viewed under magnification.

O When evaluating Geographic Information Systems (GIS) graphics in High/Best mode on plain paper, both units delivered very good detail and exhibited an equally good depth of field—a critical factor in delivering a realistic three-dimensional rendering of topographical features.

+ Colour business graphics produced by the Canon TX-3000 unit exhibited sharper details than did those produced by the HP device.

+ When comparing photographic images in Standard/Normal and High/Best Quality modes, the Canon model delivered superior fine detailing in dark and light contrast areas as well as brighter colours than the HP device.

+ Skin tones produced by the Canon TX-3000 were natural-looking, while those produced by the HP model were slightly yellow in comparison.

+ Overall, the Canon TX-3000 was the stronger performer in Buyers Lab's assessment of colour image quality. The Canon printer delivered larger colour gamuts across the board, superb crisp text and fine lines, smoother circles, and brighter, more saturated colours and natural-looking skin tones. As befitting the needs of their target markets, both models produced distinct fine lines in AEC drawings and an excellent level of detail in GIS graphics with very good depth of field even on plain paper. However, the HP T930's text and line art suffered from some ink bleed when viewed under magnification, while the Canon's output did not, and there was no other aspect where HP's output truly stood out.

Black Image Quality

Advantage ✔	Canon imagePROGRAF TX-3000	HP DesignJet T930
Text	✔	
Fine Lines	✔	
Halftone Range	=	=
Halftone Fill	✔	
Solid density		✔
AEC Graphics	=	=
Business Graphics	✔	
Photographic Images	✔	

- When printing in monochrome, the HP model delivered darker solids than did the Canon unit, producing higher optical densities in Fast and High/Best modes, while black optical density was comparable in Standard/Normal mode.

+ Black serif text produced by the Canon TX-3000 unit displayed clear character definition and was legible down to the 5-pt. size with no breakup or ink bleed in Fast and Standard modes; in High quality mode, Times characters were crisp and legible down to the 3-pt. size. Sans serif characters were crisp, dark and legible down to the 3-pt. level for all modes. Although serif and sans serif fonts produced by the HP T930 were legible down to the 3-pt. level for all modes, character definition was far less distinct, suffering from some ink bleed or overspray in all modes tested.

+ In Buyers Lab's line art reproduction test, both models' fine lines remained distinct at the 0.1-pt. level in all modes. However, the Canon TX-3000 delivered better quality overall, with crisp and distinct fine lines in Standard/Normal mode, which were rated very good, but judged good for the HP model. In Fast mode, the Canon model's fine lines were rated good, and rated only fair for the HP T930, while both models' fine lines were rated as good in High/Best mode. White-on-black fine lines produced by both models remained distinct at the 0.25-pt. level in all quality modes and were rated very good for the Canon TX-3000 across the board, but only fair for the HP T930, except in Fast mode where its white-on-black lines were rated poor as white lines were barely visible.

+ Although circles produced by both models were fully formed at 0.1pt, those produced by the Canon TX-3000 were smoother than those produced by the HP unit, and were rated as very good in Fast and Standard modes and excellent in High quality mode, as opposed to a good rating for the HP T930.

O Both models delivered black halftone output across the full range—from the 10% to the 100% dot-fill levels—with distinct transitions between all levels.

+ Halftone fill results in all modes were rated good for the HP device. Although greyscale coverage was slightly grainy at the 80% to 100% fills in Fast mode with the Canon model, overall, coverage was judged very good across the board.

O When evaluating AEC graphics in Standard/Normal and High/Best quality modes in black, both models delivered detailed and distinct fine lines.

+ Monochrome business graphics were produced more accurately by the Canon model, whereas some fine lines and circles were indistinct on output from the HP unit, even without magnification.

+ Greyscale photographic images produced on plain paper by the Canon TX-3000 displayed very good depth and fine detailing in light and dark contrast areas, and no banding in all modes; however, dark areas on output produced in Fast and Standard modes were slightly grainy. In contrast, the HP T930 produced poor quality images in Fast mode which were grainy and lacked detail, and there was visible banding as well. Although banding was confined to dark areas on output produced in Normal mode, and eliminated in Best mode, fine detailing in light and dark areas was still quite flat.

+ Buyers Lab's technicians found that the Canon device delivers superior black image quality, producing smoother gradations in business graphics and pin-sharp text and crisp fine lines, with no breakup or ink bleed. The HP model produced higher optical black densities across the board, however it was unable to match the Canon in delivering smooth circles, and displayed some ink bleed or overspray in text and line art in all modes except Normal, when viewed under magnification. Both models delivered excellent AEC graphics.

Print Productivity

Advantage ✔	Canon imagePROGRAF TX-3000	HP DesignJet T930
First Page Out from Weekend Non-Use	✔	
First Page Out from Ready State	✔	
Throughput Speed (Fastest mode)	✔	
Throughput Speed (Default mode)	✔	
Throughput Speed (Highest-quality mode)	✔	
Job Stream	✔	

+ The Canon TX-3000 delivered 31.0% faster first-page-out time of 86.28 seconds after a weekend of non-use, compared with 125.08 seconds for the HP T930 device. Start-up time before printing commenced was slower for the Canon model at 62.25 seconds, compared with 54.22 seconds for the HP unit—but combined with the first-page-out from non-use result, it is clearly the faster model, overall.

+ The Canon device delivered a 47.4% faster first-page-out time of 45.53 seconds from its ready state, compared with 86.56 seconds for the HP T930. Start-up time before printing commenced was, again, slower for the Canon model—22.53 seconds for the Canon model versus 15.60 seconds for the HP model—however, the Canon unit is faster overall, when both times are combined.

+ When printing Buyers Lab's job stream, designed to simulate a typical mixed workflow for a large-format unit, the Canon TX-3000 was 12.4% faster than the HP model in Fast mode, 34.3% faster in Standard/Normal mode, and 53.4% faster in High/Best mode.

+ When printing Buyers Lab's 12-page DWF test file in colour, the Canon TX-3000 was faster than the HP unit in all modes tested; it was 8.5% faster in Fast mode; 35.4% faster in Standard/Normal mode; and 53.9% faster in High/Best mode.

+ Similarly, when printing Buyers Lab's 12-page DWF test file in monochrome, the Canon model was the faster model across the board; it was 8.4% faster in Fast mode; 35.1% faster in Standard/Normal mode and 53.6% faster in High/Best mode than the HP unit.

+ When printing Buyers Lab's single-page A0-size Cottage Architectural Plan test target in Standard/Normal mode, the Canon TX-3000 delivered a first-page-out time (114.10 seconds) that was 22.7% faster than that of the HP unit (147.62 seconds). The time to print five A0-size pages was 32.4% faster for the Canon TX-3000 than for the HP device (497.09 seconds versus 735.34 seconds).

+ The Canon model's unique sub ink tank system provides a further boost to productivity. When the HP T930 model runs out of ink, printing must stop for the cartridge to be replaced, which leads to operator downtime. In contrast, when ink needs replacing on the Canon model it will continue to print, drawing ink from its sub tank while the cartridge is being replaced, so there's no operator downtime. For added convenience, thq control panel alerts users to replace ink and also provides purchasing information.

O Both the Canon and HP models will pause and alert the operator when they run out of paper. After a new roll is installed, each device resumes printing at the beginning of the interrupted page, rather than printing the portion of the page that remained before running out of paper, so less ink and paper is wasted.

Banner Printing

	Canon imagePROGRAF TX-3000	HP DesignJet T930
Image Quality	=	=
Productivity	✔	

Both models successfully printed Buyers Lab's 36" x 105" banner (a 4,955-KB PDF file) in Fast mode, although the HP DesignJet T930 took longer to print it than did the Canon TX-3000. The HP unit took 7 minutes, 8.84 seconds from PC release to final paper cut and provided no preview. In contrast, the Canon model took 7.68 seconds to generate a preview at the desktop, and an additional 1 minute, 54.53 seconds from preview to final paper cut. With a total preview and print time of 2 minutes, 2.21 seconds, the Canon TX-3000 is clearly the much faster model.

Poster Printing

Advantage ✔	Canon imagePROGRAF TX-3000	HP DesignJet T930
Image Quality	✔	
Productivity (Fast mode)	✔	
Productivity (Standard/Normal mode)		✔
Productivity (High/Best Quality mode)	✔	

\+ When printing Buyers Lab's Poster test target in Fast mode at 300 dpi, the Canon TX-3000 took 33.33 seconds to complete the job, while the HP T930 took 38.23 seconds.

\+ In terms of image quality, some banding was evident in Fast mode on output produced by both models (across the whole image with the HP unit, but only in dark areas with the Canon model). Colours on the HP poster were slightly paler compared with the much brighter colours in the poster produced by the Canon model. When unidirectional printing was selected in the Canon print driver, banding was eliminated but the time to print the banner increased to 52.80 seconds.

\- The Canon model took 1 minute, 18.38 seconds to print the poster in Standard mode at 600 dpi, which is fractionally slower than the time (1 minute, 17.47 seconds) taken by the HP unit in Normal mode.

\+ In Standard/Normal mode, the Canon poster showed no banding and colours were vibrant with good detailing, whereas the HP unit's poster still exhibited some banding in both light and dark areas. Although colour vibrancy improved, it was still not as bright as the poster printed on the Canon model.

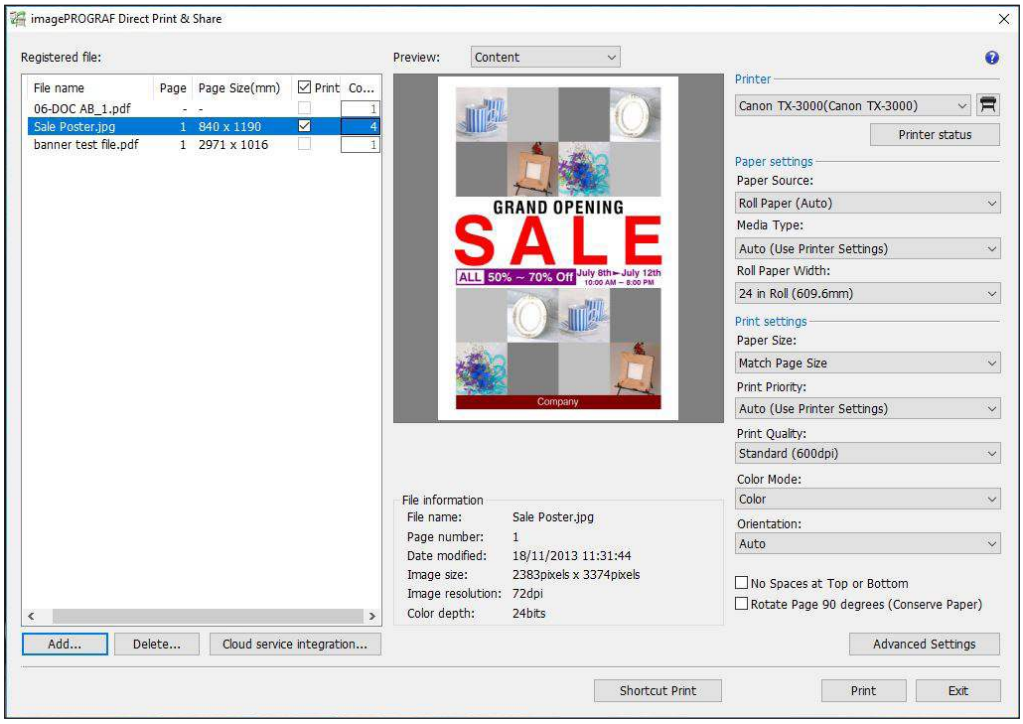
\+ When printing the poster in High quality (600 dpi) mode, the Canon model took 2 minutes, 6 seconds, which is 27.8% faster than the HP unit's 2 minutes, 54.44 seconds result when printing in Best mode.

\+ At the High/Best Quality settings, there was no observable banding and definition of fine details was equally good on output from both models, but the Canon model produced the more vibrant colours, overall.

Direct Print Submission Functionality

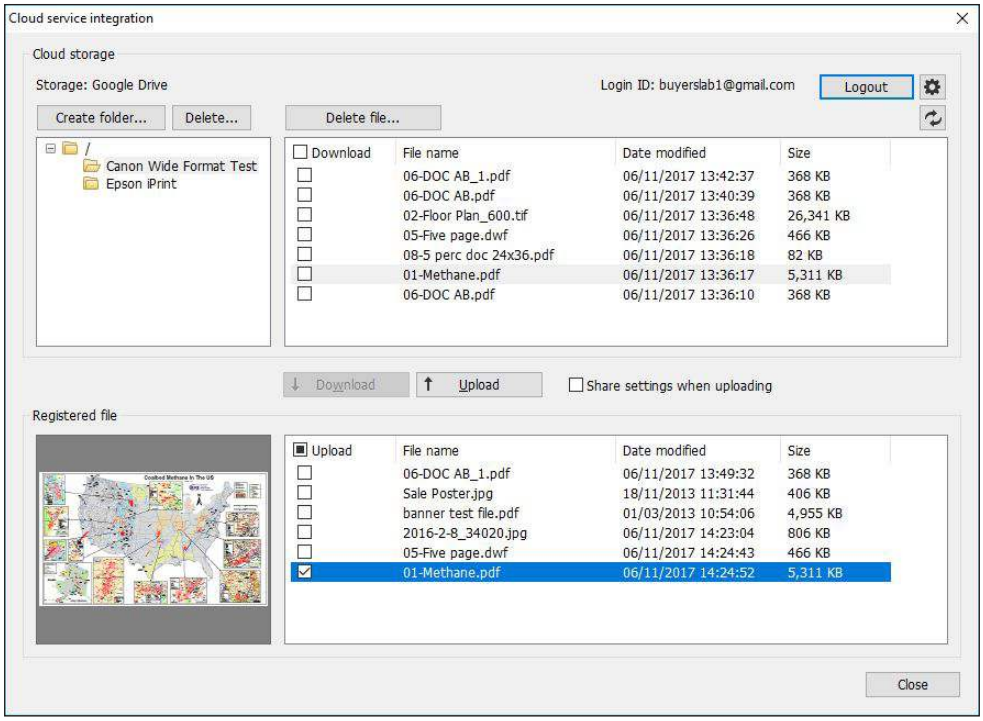
Advantage ✔	Canon imagePROGRAF TX-3000	HP DesignJet T930
Ease of Use	=	=
Direct Print Submission Functionality	=	=
Mobile App Integration		✔

O Available as a free download from Canon's website, the imagePROGRAF Direct Print & Share utility enables the direct printing of PDF, JPEG, TIFF and HPGL/2 files without the need for native applications or print drivers. Via the utility, users can preview print layouts and select print settings without the need to open up the driver properties. For added convenience, it also lets users print multiple files simultaneously.



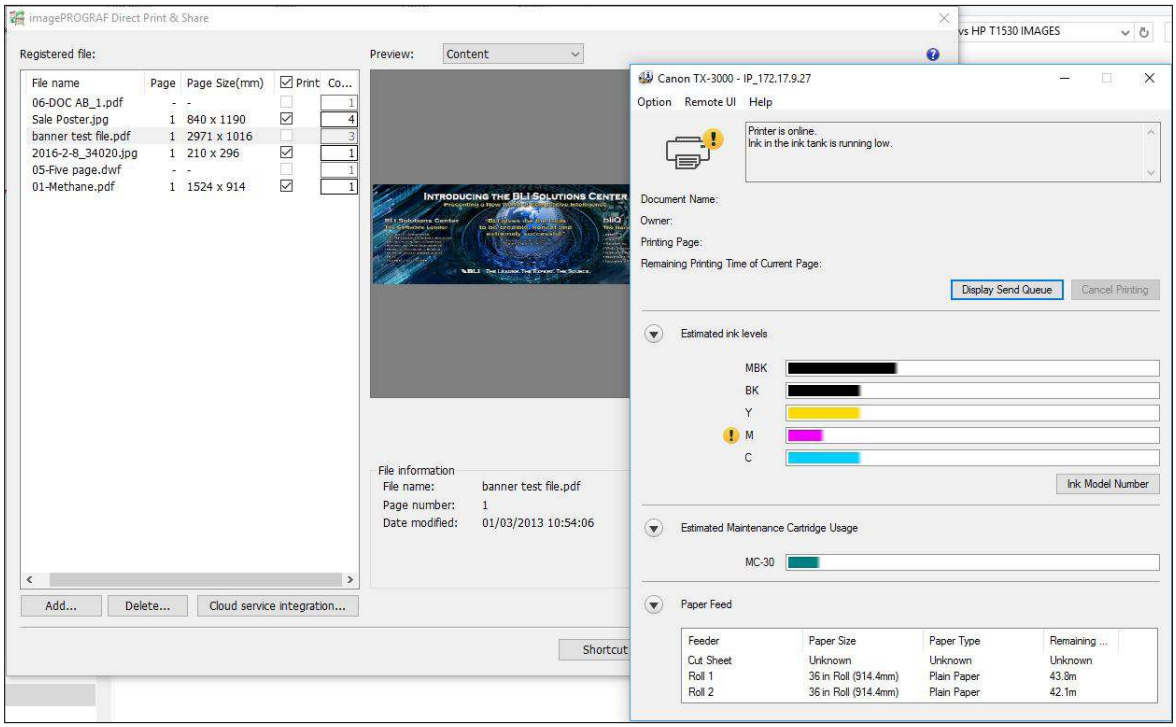
Canon's imagePROGRAF Direct Print & Share utility gives users an image preview.

O The imagePROGRAF Direct Print & Share utility supports "Shortcut Print" functionality, enabling users to create a desktop shortcut that includes commonly used print settings. Akin to a hot folder workflow, files are automatically printed with the predefined settings when users drag-and-drop the files to the desktop icon. Multiple desktop icons can be created for different print settings or combinations of print settings.



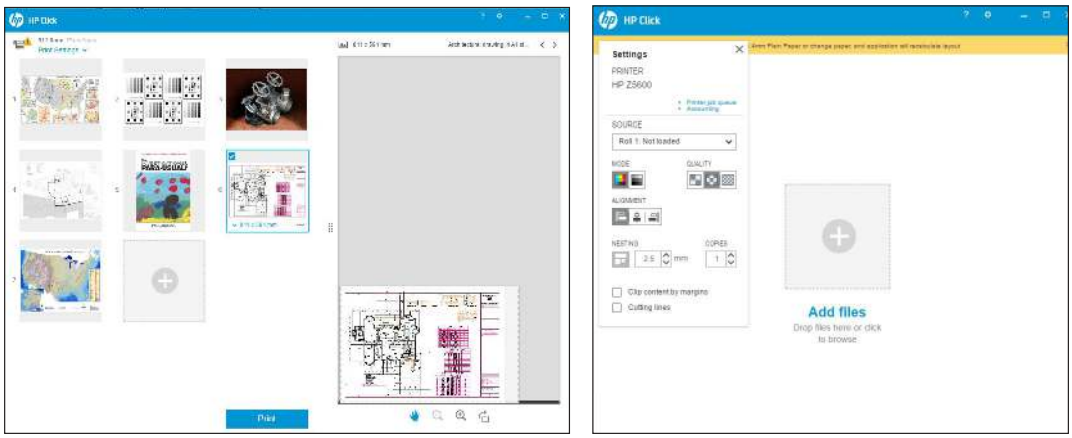
Retrieving files from Google Cloud using imagePROGRAF Direct Print & Share.

O Users can download stored files from Google Drive and AutoCAD 360 cloud storage services for printing via the imagePROGRAF Direct Print & Share utility, and can also upload files directly to cloud storage as well, which boosts collaboration. For added convenience, the utility also offers the option of sharing files simultaneously with one or more users (via Google Drive only), who will receive an email notification with a link to download the shared file without the need to log in.



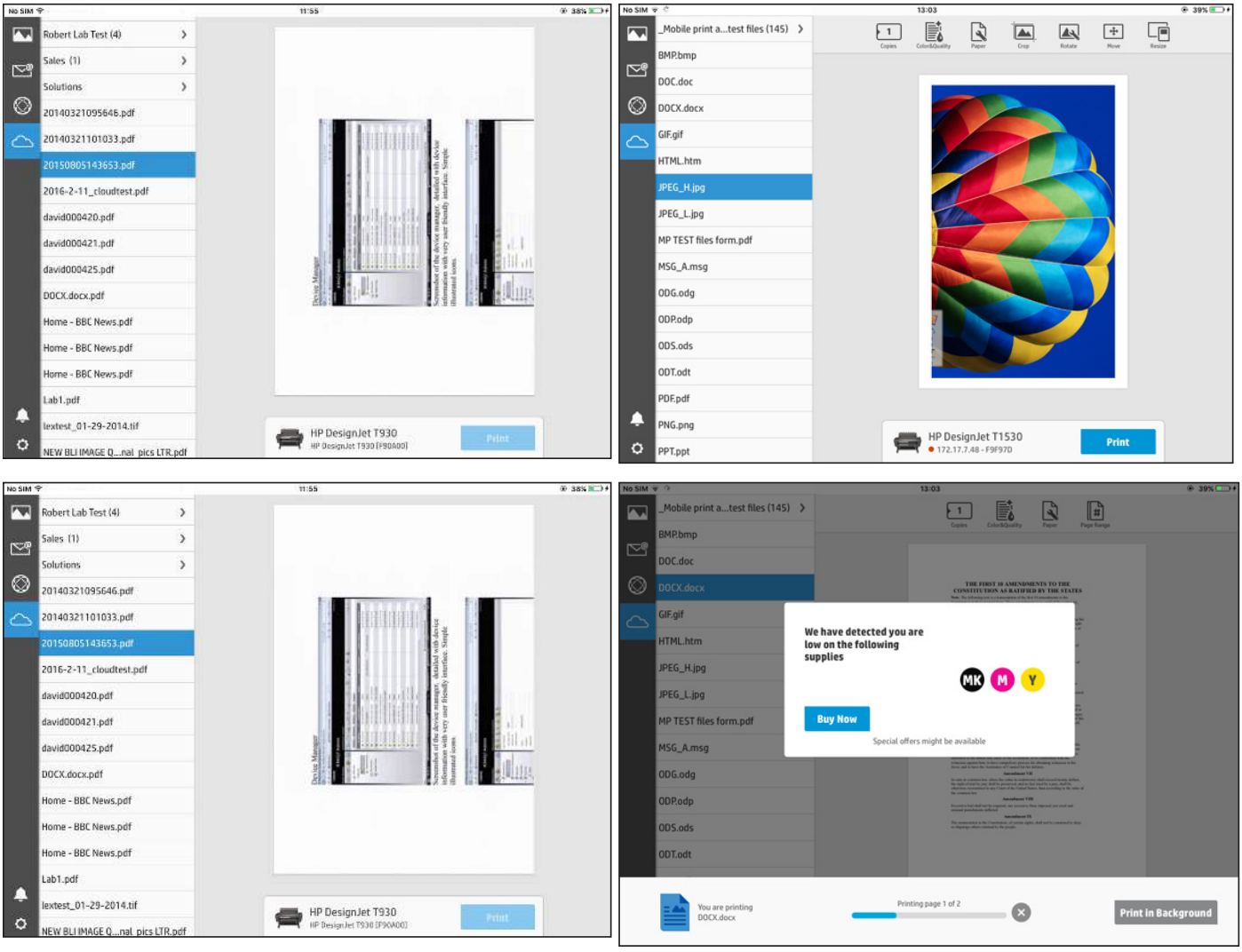
Users can view device status information via the utility.

O Available as a free download, HP Click printing software allows direct printing of PDF, JPEG, TIFF and HPGL/2 files from the PC desktop, without the need for native applications or print drivers. Via the utility, users can preview print layouts, resize and align images without the need to open up the driver properties. It also has an automatic nesting feature to reduce waste.



Via HP Click, users can select basic print settings, preview images, manipulate images as well as utilise the automatic nesting feature to reduce paper waste.

+ The HP Mobile Printing service allows users to print directly from an iOS or Android smart device to a compatible HP large-format device. Unlike the previous version (ePrint & Share), users do not need to create an account in order to access direct print functionality, instead, the mobile device quickly pairs with the printer via a wireless network connection or by Wi-FI Direct for direct job submission. Android users have the extra step, however, of downloading and enabling the free HP Print Service Plugin app, which is available from Google Play, before being able to access the HP Printing service. Users can print a wide selection of file formats such as Microsoft Office documents, as well as PDF, JPEG and TIFF files. Whether a file is stored locally on the device, in a cloud service account, or sent as an email attachment, the user just needs to open the file and select the Share option, which then allows them to send the job to their preferred HP printer.



The HP Mobile Printing service enables Android and iOS mobile devices to pair with the HP T930 and other compatible HP devices easily. Users can retrieve files from cloud storage, preview images and perform image adjustments.

O In addition, the HP T930 supports HP ePrint functionality, whereby users are able to send print jobs remotely by email either via a workstation PC or a mobile device; PDF, TIFF and JPEG files (up to 10 MB) are supported.

O The Canon TX large-format series supports Canon Print Service, a mobile print app for Android users (with support for Apple iPad devices to follow in 2018), which is a productivity boost in environments where workers are travelling between sites or working remotely.

Ink Consumption

Overall Weight of Ink Used (in Grams)

	Canon imagePROGRAF TX-3000	HP DesignJet T930
Cottage Architectural Plan	38.4	41.6
ISO Poster	82.6	100.2
GIS Map	74.5	103.8

Results are averaged across three sets of 50-page A0 printing in Standard/Normal mode.

+ When producing 50 prints of a Cottage Architectural Plan in Standard/Normal mode, the Canon unit used 7.6% less ink than the HP T930.
+ When printing an ISO Poster in Standard/Normal mode, the Canon unit used 17.6% less ink than the HP T930.
+ When printing a GIS Map in Standard/Normal mode, the Canon TX-3000 used 28.2% less ink than the HP device did.

Device Feature Set

+ The total capacity of the Canon TX-3000's starter ink cartridges is 970 ml, which is higher than the 269 ml total starter ink volume available with the HP model.
+ Canon's replacement ink cartridge capacities are 160 ml, 330 ml and 700 ml for all colours, whereas the HP model offers 130 ml for CMY, Photo Black and Grey and 300 ml for Matte Black, and as a consequence they will need replacing less frequently than with the HP device.
+ Canon's ink cartridges are replaceable during operation, which helps reduce downtime for users. HP's cartridges cannot be replaced during operation.
+ If the Canon device detects that printhead nozzles are becoming clogged, it automatically starts a cleaning routine when there are no nozzles available to compensate for the clogged ones. This task would have to be done manually with the HP unit, although Buyers Lab analysts did not encounter any nozzle clogging issues with either model during testing.

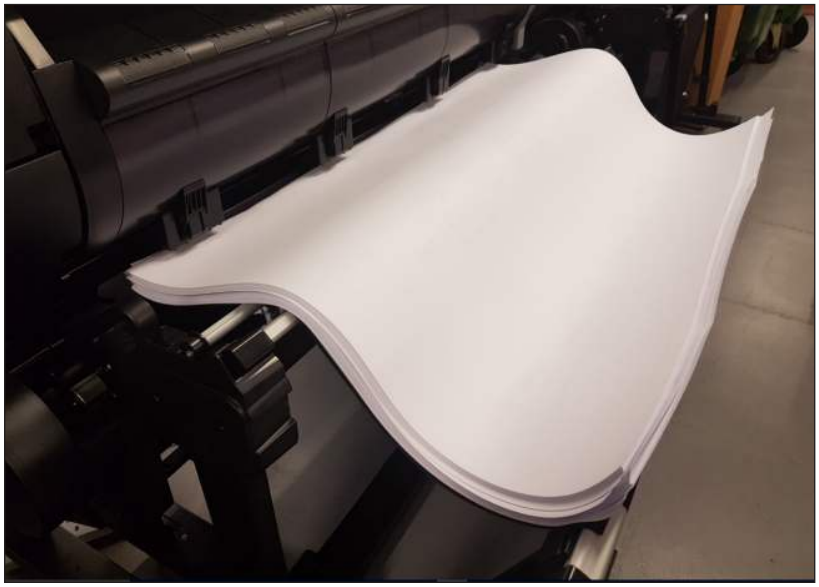
O Both units utilise a single user-replaceable printhead, taking less than five minutes to replace on both models.

+ The Canon unit supports a higher maximum cut-sheet media length of 1.6 m compared with 1.219 m for the HP unit.
+ The Canon TX-3000 supports an optional Multifunction Roll System, which gives users the added flexibility of switching between different media types or sizes without having to reload the media each time. It can also act as an auto Take-up-Roll unit with bi-directional rewind, which could be an extremely valuable feature in high-volume production environments, enabling large numbers of images or documents to be conveniently stored on a single roll. This option is not available for the HP device.

O Both models offer USB 2.0 and Gigabit Ethernet connectivity.

+ The Canon TX-3000's high-capacity stacker can accommodate up to 100 A0-sized CAD prints (depending on paper weight and thickness); the HP T930's integrated stacker has a lower reported maximum capacity of 50 sheets.

— While Canon's high-capacity stacker is better suited for stacking CAD drawings, the HP unit stacks any type of output (CAD or poster prints) in a consistent manner.



Although it took several attempts to install the stacker in the right configuration, Buyers Lab technicians noted the Canon TX-3000's stacker assembly at the front of the device held printed A0 and A1 sheets in good alignment.

O Buyers Lab technicians were impressed with the design and build quality of the HP T930's rear-mounted stacker assembly which can hold up to 50 printed sheets in perfect alignment.

+ The Canon model offers a standard, non-upgradable RAM capacity of 128 GB, while the HP unit has a standard non-upgradable RAM capacity of just 1.5 GB.

+ The Canon model has a 500-GB hard drive capacity as standard, while the HP model has a 320-GB standard hard drive.

+ The Canon TX-3000 supports borderless printing regardless of what roll media type is being used, whilst the HP T930 only supports this feature when photo paper is selected.

+ The Canon TX-3000 supports up to 0.8 mm media thickness for roll paper and 170 mm as the outside diameter of the roll, while the HP T930 supports up to 0.5 mm in thickness and 140 mm in diameter.

+ The Canon TX-3000 comes with robust security features, including newly added hard drive encryption, and protocol locking to prevent unauthorised access to the device; it also supports SNMP v3 (secure network protocol) and IPsec which provides further security by authenticating and encrypting data over the network. The HP T930 supports IPSec, 802.1x, SNMPv3, PIN printing as well as optional Secure Disk Erase, which lets users choose whether to erase particular files or the whole hard drive.

— The Canon model is heavier (105 kg versus 87 kg), and less compact than the HP unit.

O Both models offer a colour touchscreen user interface, both of which are similarly responsive and intuitive to navigate.

\+ The Canon TX-3000's power consumption while active is lower—105 watts versus 120 watts—than that of the HP model.

— However, in standby mode (where it may spend more of its time) the HP T930's power consumption is lower (1.3 watts versus the Canon model's 3.6 watts).

— Rated noise emissions are higher for the Canon model (51 dB) compared to the HP device (47 dB) while the devices are printing.

Driver Feature Set

\+ The Canon TX-3000 has five speed settings (Fast 300, Standard 600, Fast 600, High 600 and High 1200), which are matched by three settings on the HP device (Fast, Normal and Best), although not all speed settings are available with all media types on the Canon model.

O Both the Canon imagePROGRAF Printer Driver and the HP-GL/2 driver provide a useful overview of the settings for predefined profiles.

\+ Six predefined profiles are available with the Canon driver, while the HP driver offers a smaller range of four settings.

\+ The Canon driver supports multi-up (2 to 16) printing, while the HP driver does not support multi-up printing.

\+ The Canon driver offers a 2 by 2 poster mode, while the HP model does not offer support for poster printing.

— The Canon driver offers page stamping (Date, Time, Name and Page Number); the HP driver also enables custom stamps to be created in addition to these.

O The Canon imagePROGRAF Printer Driver offers a broad range of built-in adjustments for CMY balance, brightness and contrast, while the HP T930's HP-GL/2 driver also offers CMY balance and brightness adjustments. The Canon driver contains advanced colour-matching capabilities that include the ability to match ICC profiles and select the rendering intent based on different elements in the document. A wide range of colour management profiles are available when the HP driver and colour management tools (from the Printing Preferences menu) are downloaded from HP's website. Additionally, users can preview images before printing—features which were not included in the Startup driver disk supplied to Buyers Lab with the device.

\+ The Canon driver offers the option of unidirectional printing, even in Fast mode, which helps to avoid banding across output because the printhead travels in only one direction to create the desired image. The HP driver does not offer this feature.

\+ The Canon driver includes the Color imageRUNNER Enlargement Copy Mode utility, which is standard with the 32-bit version of the driver and available as a download for the 64-bit version of the driver via the Printer Driver Extra Kit. It enables users to integrate a Canon small-format MFP device with the TX-3000, whereby documents scanned at the MFP are automatically routed to a hot folder that is monitored by the TX-3000 driver. The image is then resized and printed, offering a fast, easy-to-use poster creation tool for office users.

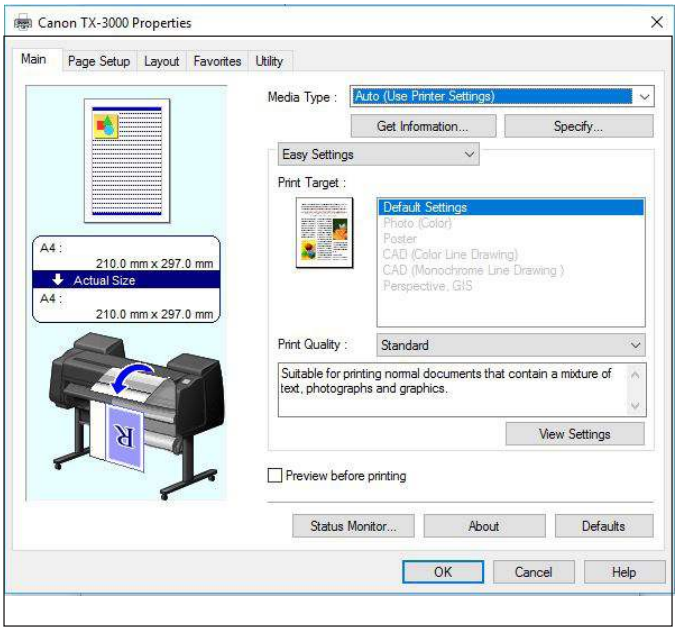
\+ The Canon driver includes the Free Layout nesting tool (also available as a download via the Printer Driver Extra Kit) that enables files—even those created with different applications—to be scaled, resized, or grouped together as a single job from the printer driver. Images can be dragged and dropped to the desired locations and printed together on a single page, helping to save on paper. The HP unit offers a similar nesting feature,

which can be activated directly on the control panel or from the print driver utility. However, unlike the Canon tool, it does not allow users to have precise control over the positioning of jobs, rather it will randomly position jobs to print across the width of a page, either in the order jobs were sent or in 'optimized' layout order.

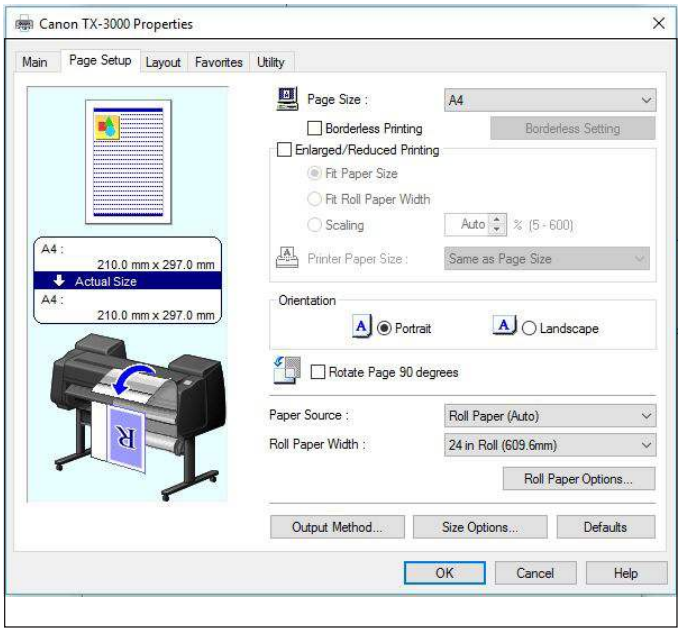
\+ The Canon model also offers a plug-in for printing from Microsoft Office applications, which includes useful tools for automatic media resizing, nesting and borderless printing. No such plug-in is available to HP users.

O 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 information 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. HP offers similar accounting management and tracking capabilities via the Accounting tab on its embedded web server page, or via the HP DesignJet Excel Accounting tool, which is available as a free download.

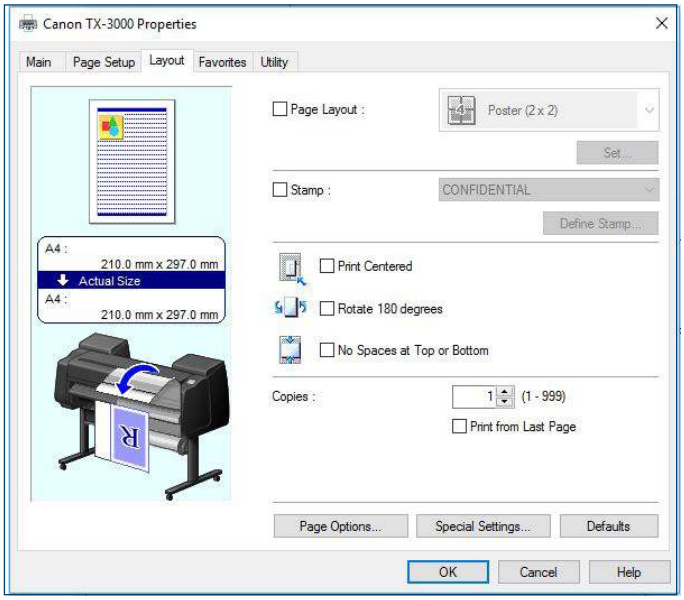
Test Models' Print Driver Screenshots



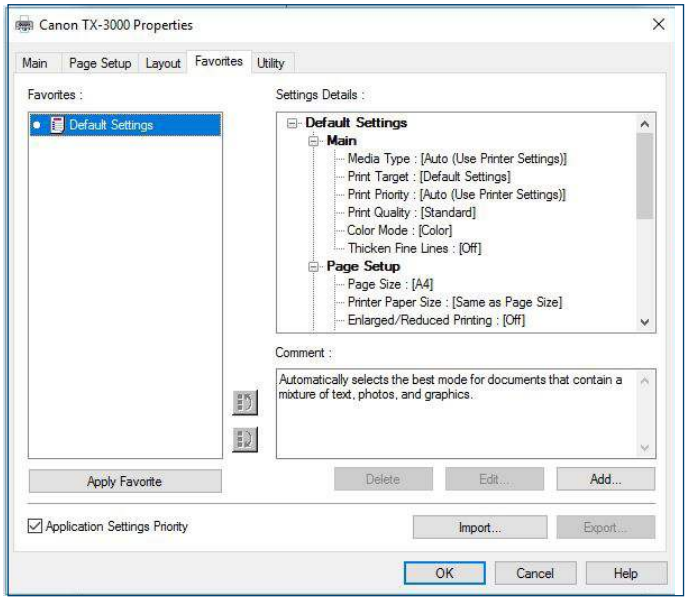
Canon imagePROGRAF TX-3000 Print Driver Main Tab



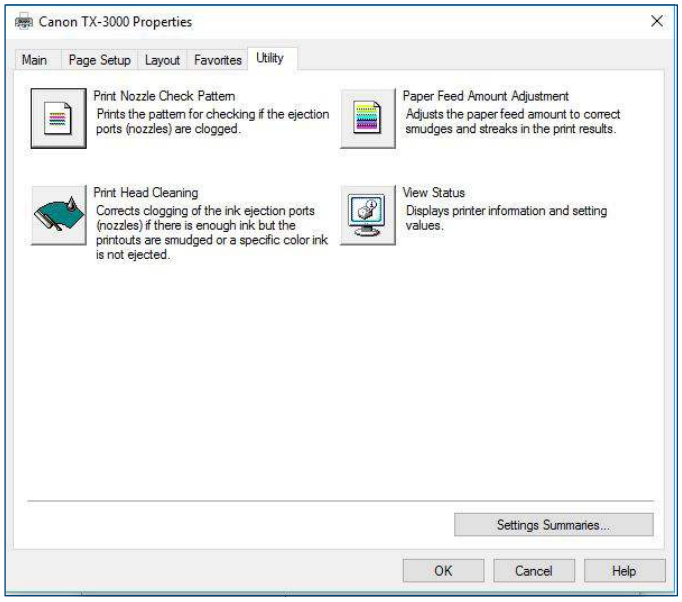
Canon imagePROGRAF TX-3000 Print Driver Page Setup Tab



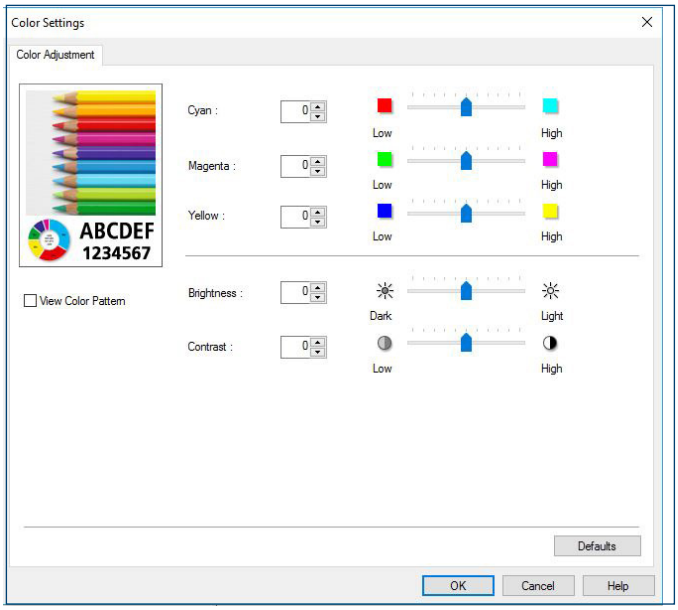
Canon imagePROGRAF TX-3000 Print Driver Layout Tab



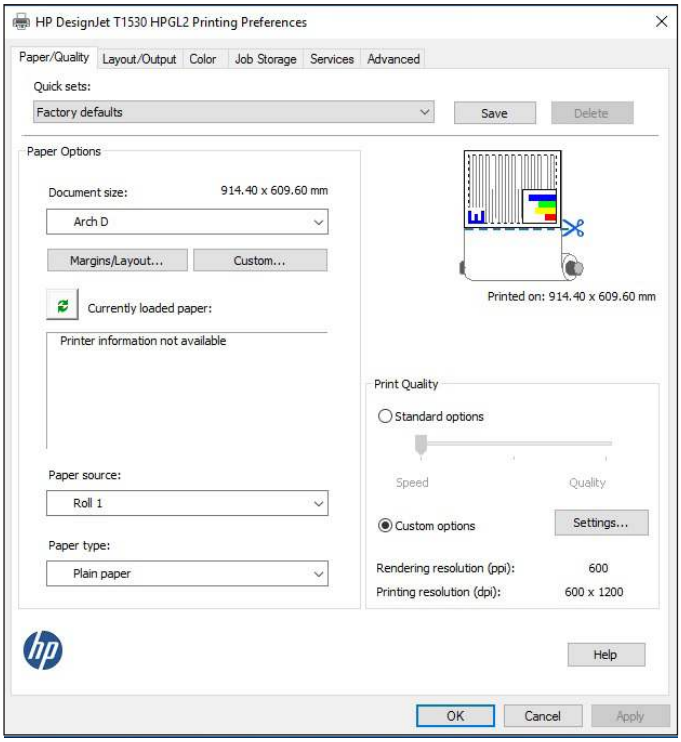
Canon imagePROGRAF TX-3000 Print Driver Favourites Tab



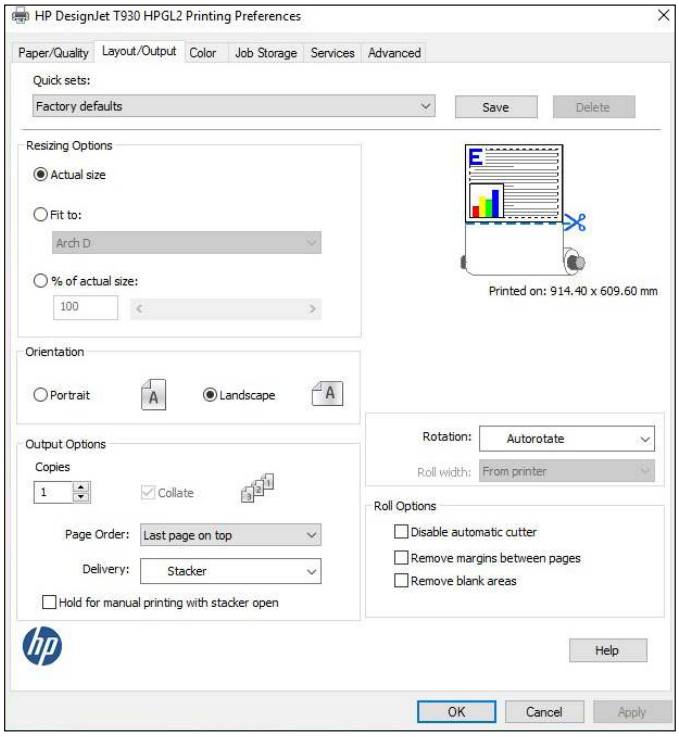
Canon imagePROGRAF TX-3000 Print Driver Utility Tab



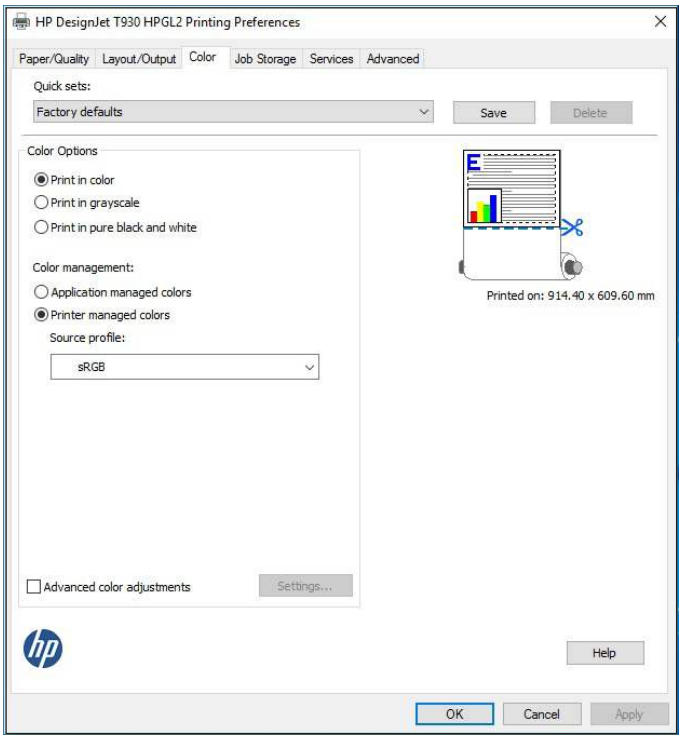
Canon imagePROGRAF TX-3000 Print Driver Colour Adjustment Tab



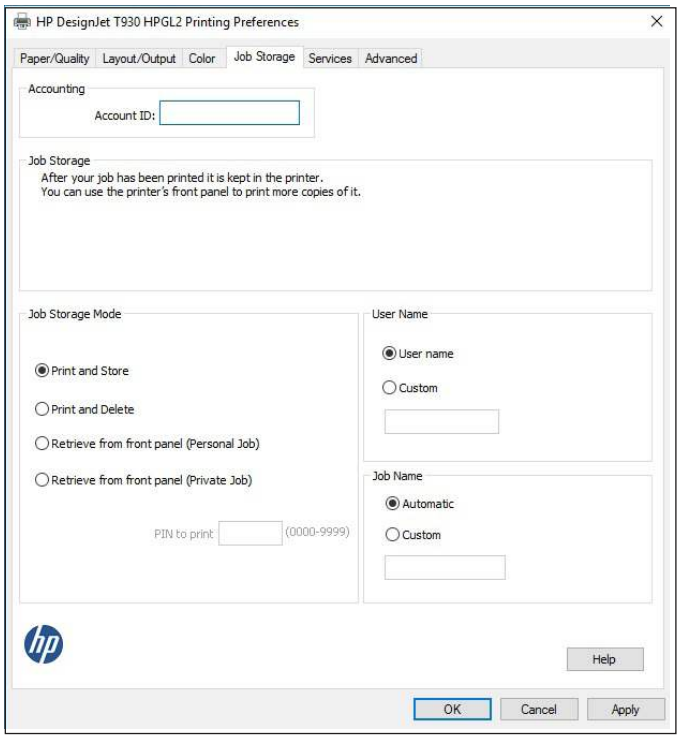
HP DesignJet T930 Print Driver Paper/Quality Tab



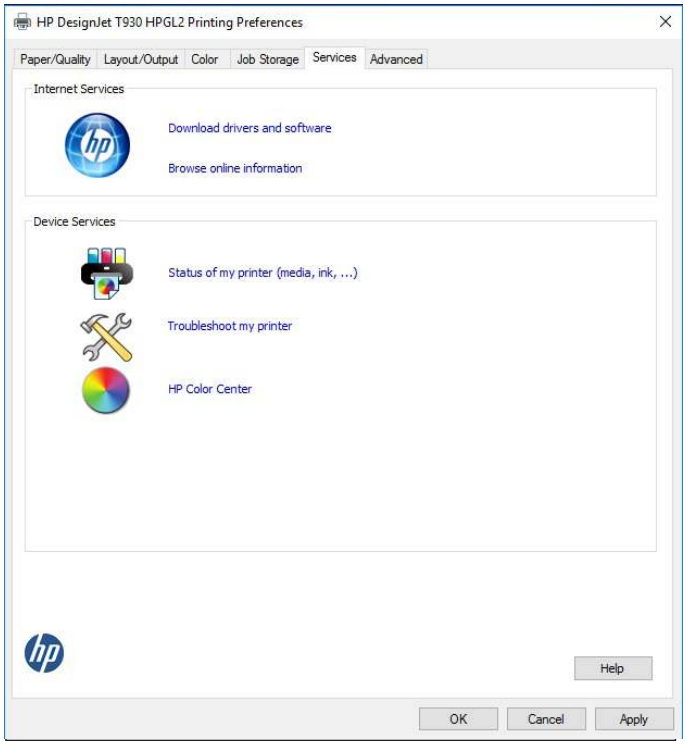
HP DesignJet T930 Print Driver Layout/Output Tab



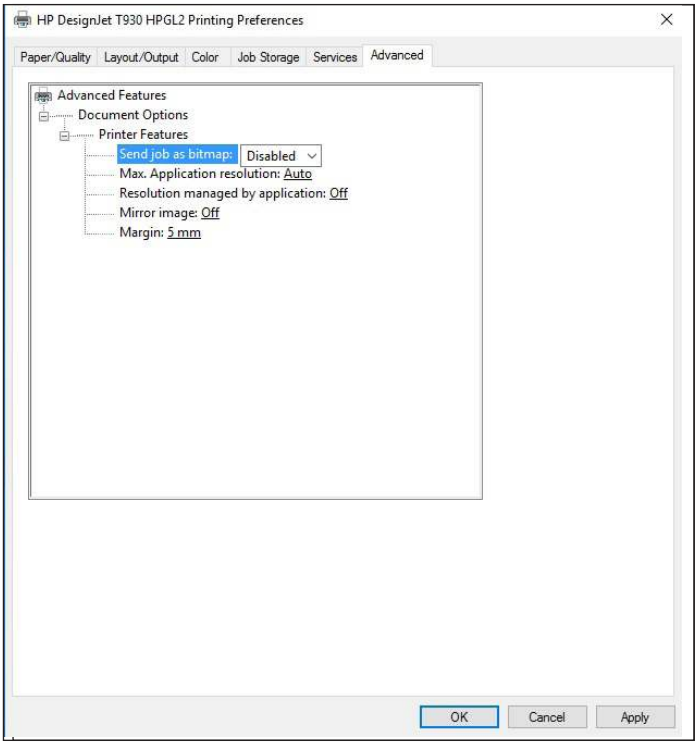
HP DesignJet T930 Print Driver Colour Tab



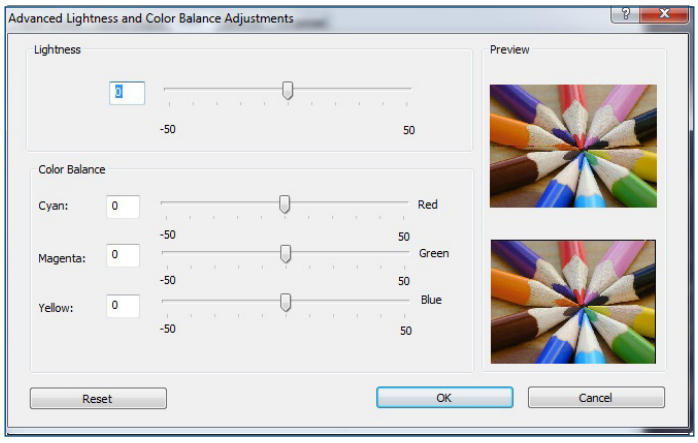
HP DesignJet T930 Print Driver Job Storage Tab



HP DesignJet T930 Print Driver Services Tab



HP DesignJet T930 Print Driver Advanced Tab



HP DesignJet T930 Print Driver Advanced Lightness and Colour Balance Adjustments

SUPPORTING TEST DATA

Print Productivity

Job Stream Productivity (in Seconds)

Mixed File Types, Same Size

Canon imagePROGRAF TX-3000		HP DesignJet T930	
Fast	616.09	Fast	703.67
Standard	1,054.74	Normal	1,605.55
High	1,897.28	Best	4,071.42

Buyers Lab's job stream consists of nine files, including PDF, TIFF and DWF files totalling 19 pages, all at Arch D-size, ensuring that the files are set to fit to page. 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 914-mm rolls, with each file set to auto-rotate to save media.

Colour Productivity (in Seconds)

Canon imagePROGRAF TX-3000		HP DesignJet T930	
Fast	373.70	Fast	408.59
Standard	690.28	Normal	1,068.32
High	1,231.69	Best	2,672.17

The 12-page DWF test file was printed using the device driver set to the plain paper/colour setting. Both devices were loaded with 914-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 (in Seconds)

Canon imagePROGRAF TX-3000		HP DesignJet T930	
Fast	373.01	Fast	407.38
Standard	687.69	Normal	1,060.40
High	1,227.85	Best	2,647.61

The 12-page DWF test file was printed with the Canon driver set to the plain paper/monochrome setting and the HP driver set to plain paper, black mode. Both devices were loaded with 914-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 (in Seconds)

	Canon imagePROGRAF TX-3000	HP DesignJet T930
Time Before Printing Commences	62.25	54.22
First Page Out	86.28	125.08

First-Page-Out Productivity from Ready State (in Seconds)

	Canon imagePROGRAF TX-3000	HP DesignJet T930
Time Before Printing Commences	22.53	15.60
First Page Out	45.53	86.56

First-page-out times are achieved by sending an Arch D-size PDF file to print, timed from release to page out with the Canon driver set to the plain paper/monochrome setting and the HP driver set to plain paper, black mode. Both devices were loaded with 914-mm rolls.

A0 First-Page-Out and Throughput Productivity (in Seconds)

	Canon imagePROGRAF TX-3000	HP DesignJet T930
First Page Out	114.10	147.62
Five Pages Out	497.09	735.34

The single-page A0-size Cottage Architectural Plan DWG TrueView Drawing test file was printed using the device driver with the plain paper/colour setting in Standard/Normal mode. The actual time indicated is the time it took to RIP, image and deliver five pages of the test document to the collection bin.

Colour Image Quality

Colour Optical Density Evaluation

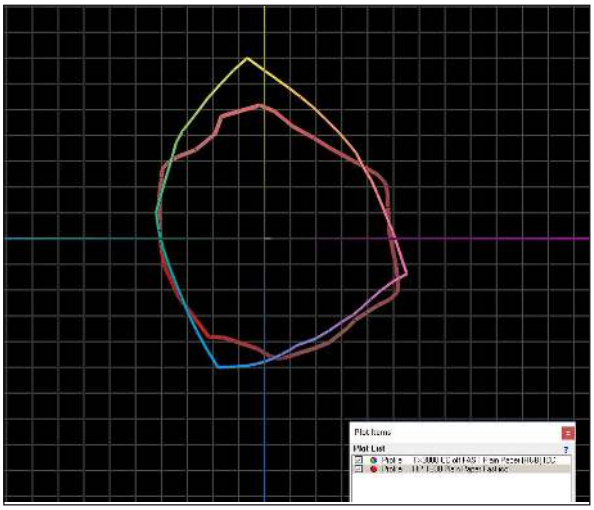
Canon imagePROGRAF TX-3000						
	Fast		Standard		High	
	50%	100%	50%	100%	50%	100%
Cyan	0.41	0.87	0.50	1.03	0.52	1.09
Magenta	0.35	0.72	0.42	0.86	0.43	0.95
Yellow	0.32	0.72	0.38	0.86	0.40	0.92
Black	0.44	1.42	0.54	1.35	0.55	1.36

HP DesignJet T930						
	Fast		Normal		Best	
	50%	100%	50%	100%	50%	100%
Cyan	0.46	0.58	0.40	0.65	0.41	0.69
Magenta	0.58	0.69	0.47	0.90	0.50	0.96
Yellow	0.48	0.59	0.51	0.84	0.50	0.84
Black	0.43	1.37	0.56	1.53	0.57	1.46

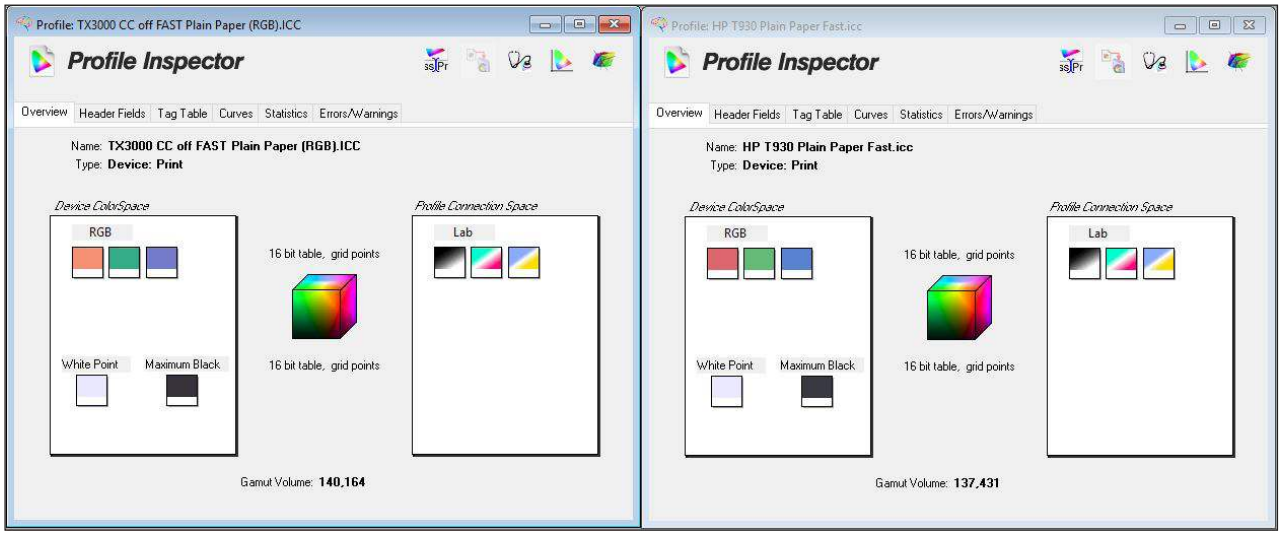
Note: Colour density readings were assessed by printing a Buyers Lab proprietary PDF test target file on Plain Paper in default colour settings at all quality settings available and measuring the density of 100% dot fill and 50% dot fill using an XRite 508 and XRite exact^{Xp} densitometer.

Colour Gamut Comparisons

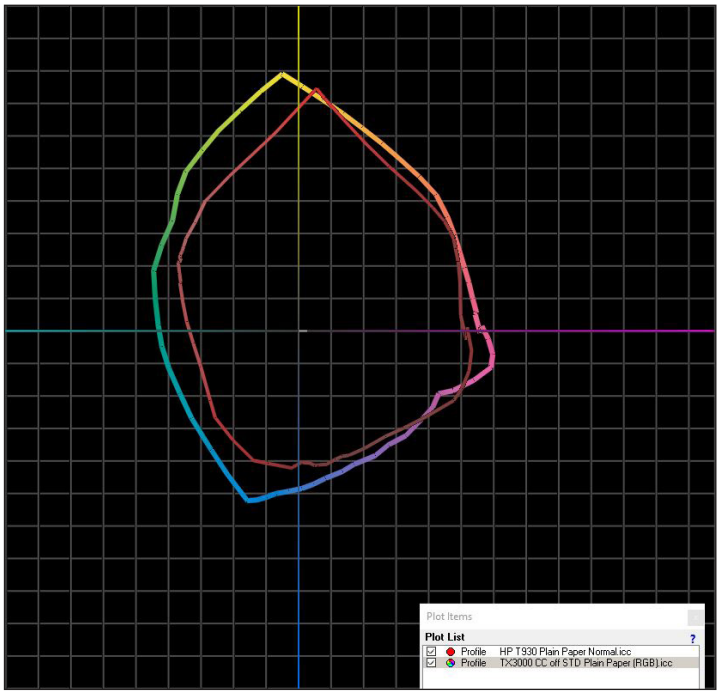
Media Type/Quality Settings	Canon imagePROGRAF TX-3000	HP DesignJet T930
Plain Paper Fast	140,164	137,431
Plain Paper Standard/Normal	208,945	153,924
Plain Paper High/Best	229,826	176,335
Gloss Photo High/Best	675,750	452,584



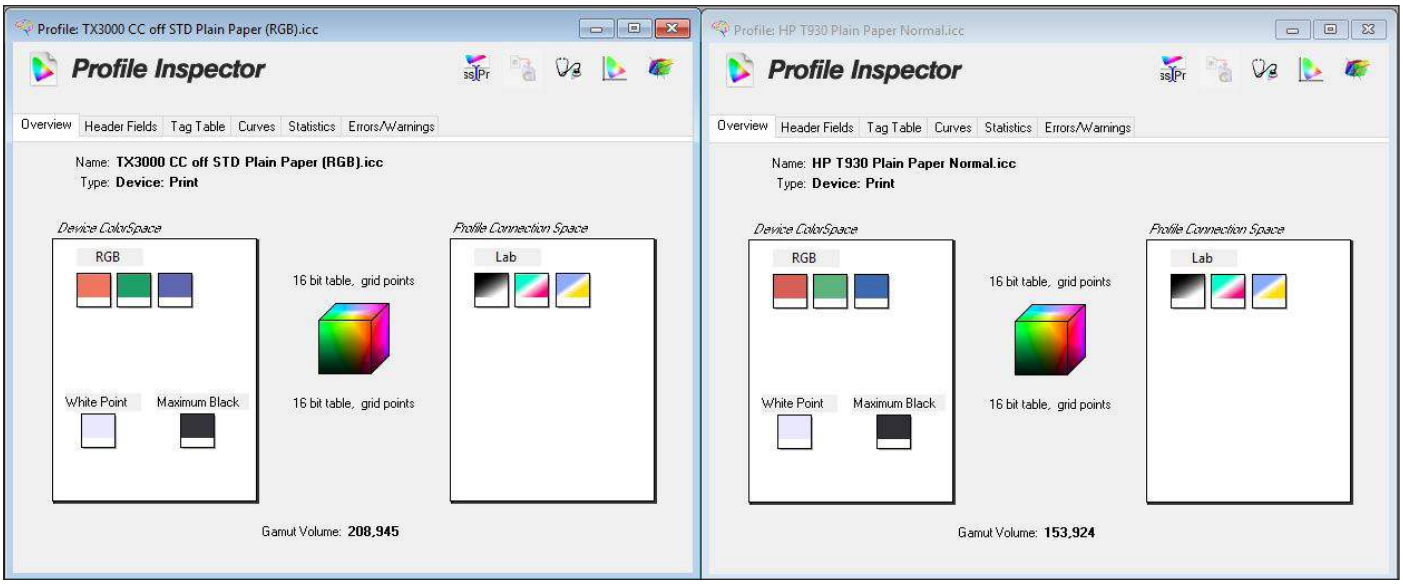
Canon imagePROGRAF TX-3000 colour gamut on plain paper in Fast settings (shown chromatically) versus HP DesignJet T930 colour gamut (shown in red) on plain paper in Fast settings.



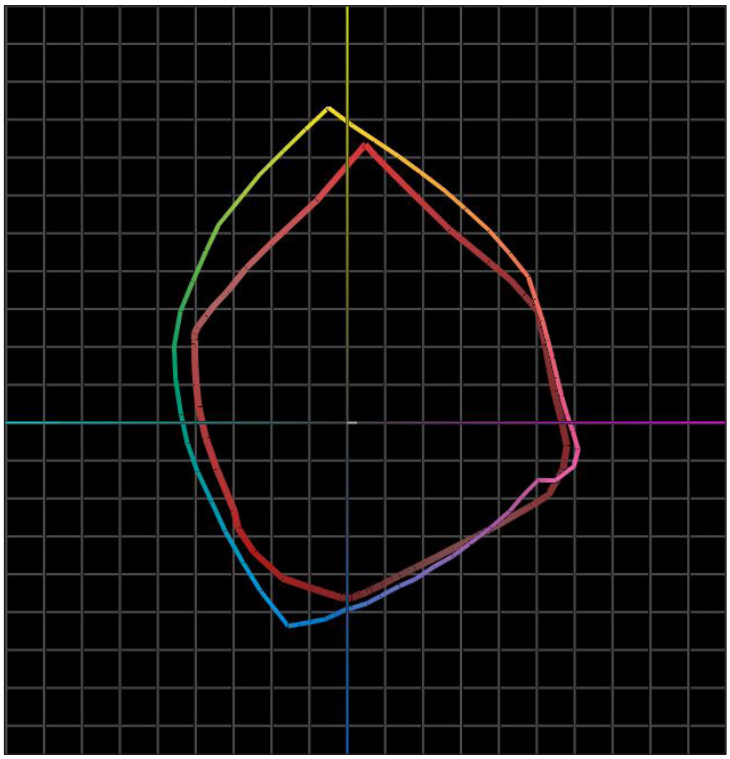
Colour gamut profile for Canon imagePROGRAF TX-3000 (left) and HP DesignJet T930 (right) on plain paper in Fast mode.



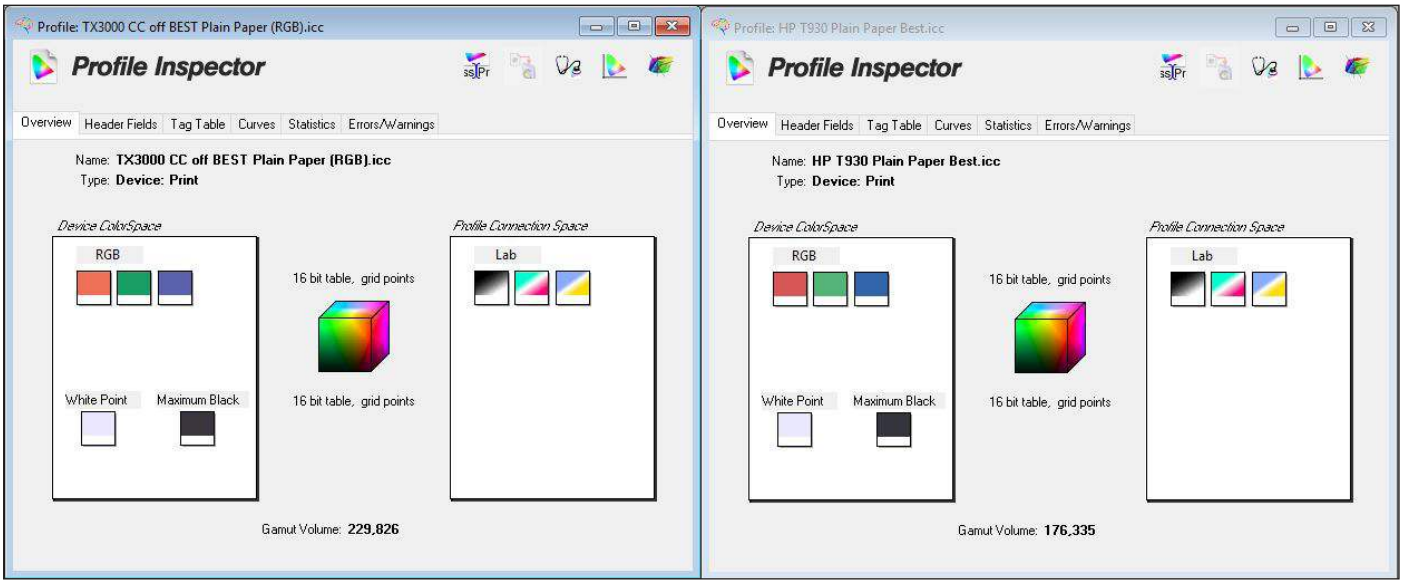
Canon imagePROGRAF TX-3000 colour gamut on plain paper in Standard settings (shown chromatically) versus HP DesignJet T930 colour gamut (shown in red) on plain paper in Normal settings.



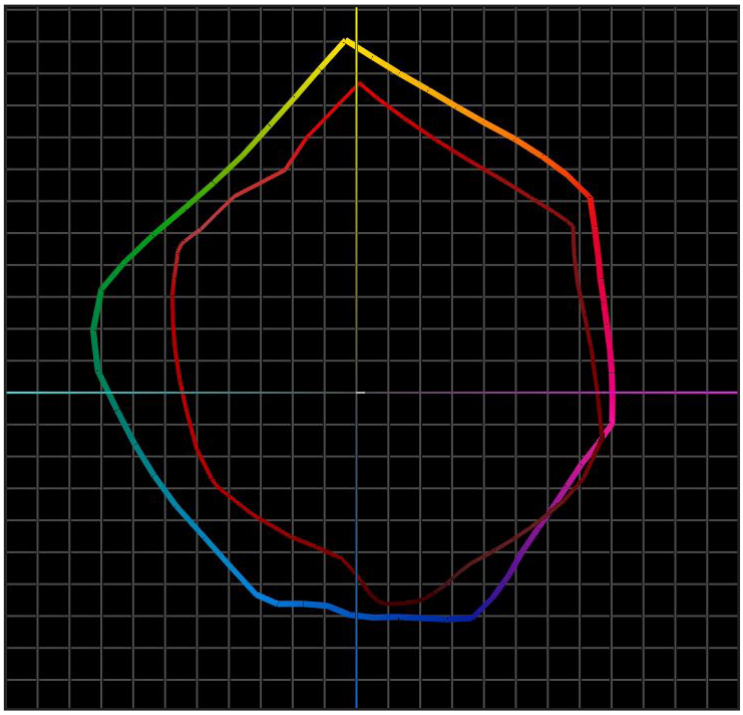
Colour gamut profile for Canon imagePROGRAF TX-3000 (left) and HP DesignJet T930 (right) on plain paper in Standard/Normal modes.



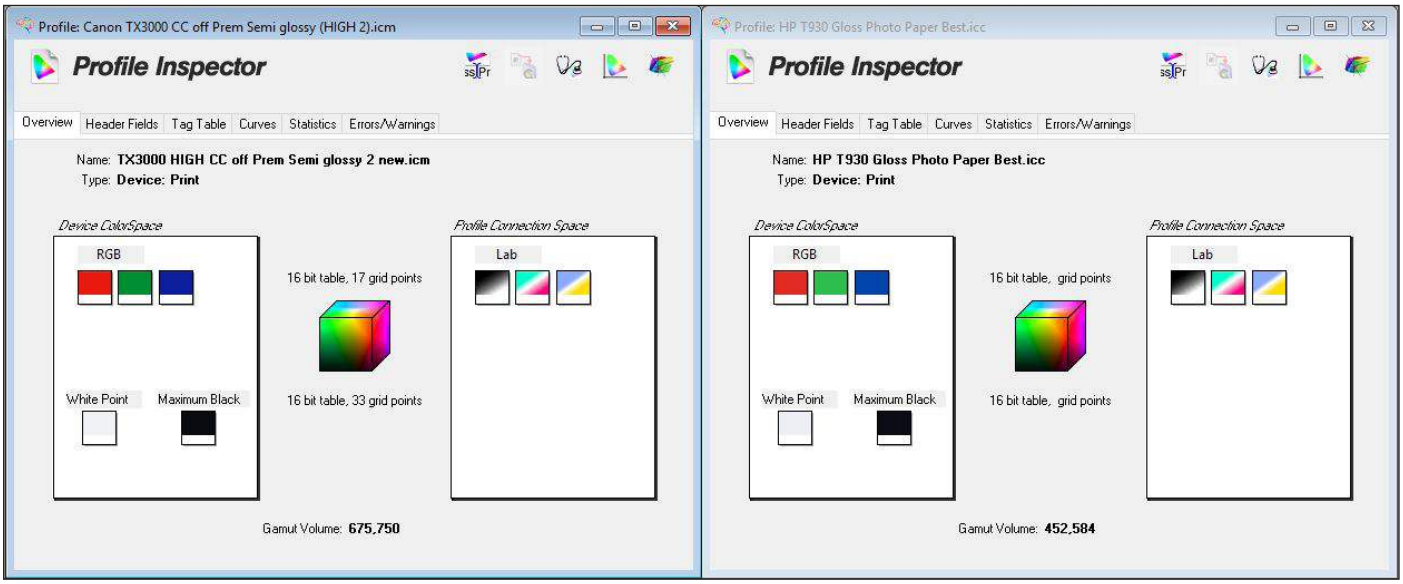
Canon imagePROGRAF TX-3000 colour gamut on plain paper in High settings (shown chromatically) versus HP DesignJet T930 colour gamut (shown in red) on plain paper in Best settings.



Colour gamut profile for Canon imagePROGRAF TX-3000 (left) and HP DesignJet T930 (right) on plain paper in High/ Best Quality modes.



Canon imagePROGRAF TX-3000 colour gamut on photo paper in High quality settings (shown chromatically) versus HP DesignJet T930 colour gamut (shown in red) on photo paper in Best settings.



Colour gamut profile for Canon imagePROGRAF TX-3000 (left) and HP DesignJet T930 (right) on photo paper in High/ Best Quality modes.

Black Print Quality

Black Optical Density Evaluation

	Canon imagePROGRAF TX-3000			HP DesignJet T930		
Density Block						
	Fast	Standard	High	Fast	Normal	Best
1	1.42	1.39	1.40	1.51	1.40	1.46
2	1.43	1.36	1.36	1.49	1.40	1.47
3	1.45	1.41	1.34	1.48	1.38	1.46
4	1.45	1.45	1.39	1.48	1.40	1.47

Note: Solid black density measurements are based on four readings taken from a Buyers Lab 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 HP driver set to plain paper, black mode. Density was measured using an XRite 508 densitometer and XRite exactXp densitometer.

Device Feature Set

	Canon imagePROGRAF TX-3000	Advantage		HP DesignJet T930
Max. image resolution	2400 x 1200 dpi			2400 x 1200 dpi
Number of inks	5		✔	6
Ink tanks replaceable during operation	Yes	✔		No
Ink-drop size	5 picoliter	✔		6 picoliter (CMY, G, PBk); 9 picoliter (MBk)
Ink capacity out of the box	970 ml (330 ml MBk; 160 ml CMYK)	✔		269 ml (5 x 40 ml, 1 x 69 ml)
Ink cartridge capacity	160/330/700 ml for all colours	✔		130/300 ml for all colours
Number of nozzles	MBk: 5,120 nozzles; other colours: 2,560 nozzles each; 15,360 in total	✔		8,256 in total (1,376 per colour)
Number of printheads	1 (User-replaceable)			1 (User-replaceable)
Line accuracy	+/-0.1%			+/-0.1%
Minimum line width	0.02 mm			0.02 mm
Minimum print margins	3 mm			3 mm
Borderless (0 mm) printing	Yes (Roll only)	✔		Yes (Photo paper only)
Maximum outside diameter of roll paper	170 mm	✔		140 mm
Maximum printable paper roll length	18 m (depending on OS and application)		✔	91.4 m
Maximum cut-sheet media length	1.6 m	✔		1.219 m
Maximum media thickness for roll paper	0.8 mm	✔		0.5 mm
Maximum media width	914 mm (36 inches)			914 mm (36 inches)

	Canon imagePROGRAF TX-3000	Advantage		HP DesignJet T930
Media loading	Top and Front Loading Slot for Sheet Paper			Front
Roll Paper	Optional Multifunction Roll System (with Auto Take Up)	✔		Not Supported
Optional media handling	Roll holder set			Roll media adapter
High-capacity stacker assembly	100 sheets	✔		50 sheets
Standard RAM	128 GB	✔		64 GB
Maximum RAM	128 GB	✔		64 GB
Hard drive capacity	500 GB (Standard)	✔		320 (Standard)
Interface	Hi-Speed USB; 10/100/1000Base-T/TX Ethernet; USB 2.0			1000Base-T Ethernet, USB 2.0
PDL	HP-GL/2, HP RTL			HP-GL/2, HP-RTL, TIFF, JPEG, CALS G4,HP-PCL3 GUI, URF
Net weight (unpacked)	105 kg		✔	87 kg
Power consumption when in standby	3.6 W		✔	1.3 W
Power consumption when active	105 W	✔		120 W
Acoustic pressure	Operation: 51 dB (A) or less; Standby: 35 dB (A) or less		✔	Operation: 47 dB (A); Standby: 39 dB (A)
Acoustic power	INA			Operation: 6.5 Bels; Ready: 5.8 B(A)

INA – Information not available

Driver Feature Set

	Canon imagePROGRAF TX-3000	Advantage		HP DesignJet T930
Speed settings	5 (Fast 300, Fast 600, Standard 600, High 600 and 1200)	✔		3 (Fast, Normal and Best)
Economy mode	Yes			Yes (in Fast mode)
Predefined profiles	6 (Default, Photo (colour), Poster, CAD (colour line drawing), CAD (mono line drawing) and Perspective GIS)	✓		4
Overview of profile settings provided	Yes			Yes
Media profiles	53 + 10 user customizable special options	✔		35
IQ optimized for print profiles	Yes			Yes
Watermark	Yes			Yes (Max. Detail setting)
Sharpen text	Yes			Yes (Max. Detail setting)

	Canon imagePROGRAF TX-3000	Advantage		HP DesignJet T930
Thicken fine lines	Yes	✔		No
Mirror image	Yes			Yes
Multi-up printing	Yes, 2 to 16	✔		No
Poster print mode	Yes (2 by 2)	✔		No
Page stamping	Yes (Date, Time, Name, Page Number)		✔	Yes (Date, Time, Name, Page Number; plus the ability to add custom stamps)
Image rotation	Yes, 90 degrees and auto 180 degrees	✔		Yes, auto 90 degrees
Option to preview before print	Yes	✔		No
CMYK balance adjustment	Yes (CMY only)			Yes (CMY only)
Brightness adjustment	Yes			Yes
Contrast adjustment	Yes			Yes
Saturation adjustment	No			No
Advanced colour management options	Yes			Yes
Enlargement Copy Mode	Yes	✔		No
Free Layout Capability	Yes (flexible placement)	✔		Yes (automatic placement)
MS Office Plug-in	Yes	✔		No
Accounting capability	Yes			Yes
Disable automatic cutter	Yes			Yes
Unidirectional printing selection option	Yes	✔		No
Integration with MFP	Yes	✔		No

The Canon imagePROGRAF TX-3000 comes bundled with PosterArtist Lite.

Ink Consumption

Table 1: Amount of Ink in each Canon imagePROGRAF TX-3000 Cartridge (in Grams)

	Matte Black	Black	Yellow	Magenta	Cyan
Weight of cartridge prior to installation	952.9	777.6	805.8	786.2	785.2
Weight of cartridge at end of life	217.4	217.4	217.4	217.4	217.4
Net weight of ink	735.5	560.2	588.4	568.8	567.8
Total ink weight across five cartridges					3,020.7

Table 2: Amount of Ink in each HP DesignJet T930 Cartridge (in Grams)

	Photo Black	Gray	Matte Black	Cyan	Magenta	Yellow
Weight of cartridge prior to installation	193.0	189.9	194.2	191.5	191.2	191.9
Weight of cartridge at end of life	57.3	57.3	57.3	57.3	57.3	57.3
Net weight of ink	135.7	132.6	136.9	134.2	133.9	134.6
Total ink weight across six cartridges						807.9

Table 3: Ink Used in Three 50-Page Runs of Cottage Architectural Plan Test Document (Standard Mode) on the Canon imagePROGRAF TX-3000 (in Grams)

	Matte Black	Black	Yellow	Magenta	Cyan
Test Run 1 Net weight of ink used	19.1	5.0	3.8	5.0	5.3
Test Run 2 Net weight of ink used	18.5	5.3	4.0	5.5	5.1
Test Run 3 Net weight of ink used	19.3	5.3	4.3	4.9	4.8
Average amount of ink used across three runs	19.0	5.2	4.0	5.1	5.1
Total ink weight across five cartridges					38.4

Table 4: Ink Used in Three 50-Page Runs of Cottage Architectural Plan Test Document (Normal Mode) on the HP DesignJet T930 (in Grams)

	Photo Black	Gray	Matte Black	Cyan	Magenta	Yellow
Test Run 1 Net weight of ink used	0.4	0.4	26.4	8.8	3.5	1.6
Test Run 2 Net weight of ink used	0.4	0.4	26.7	8.8	3.4	1.7
Test Run 3 Net weight of ink used	0.5	0.5	27.2	8.9	3.6	1.7
Average amount of ink used across three runs	0.4	0.4	20.3	8.8	3.5	1.7
Total ink weight across six cartridges for 50-page run (based on averages)						41.6

Table 5: Ink Used in Three 50-Page Runs of ISO Poster Test Document (Standard Mode) on the Canon imagePROGRAF TX-3000 (in Grams)

	Matte Black	Black	Yellow	Magenta	Cyan
Test Run 1 Net weight of ink used	21.2	7.0	5.6	22.1	26.0
Test Run 2 Net weight of ink used	21.6	7.6	5.9	22.8	25.1
Test Run 3 Net weight of ink used	20.1	7.9	6.0	22.7	26.4
Average amount of ink used across three runs	21.0	7.5	5.8	22.5	25.8
Total ink weight across five cartridges					82.6

Table 6: Ink Used in Three 50-Page Runs of ISO Poster Test Document (Normal Mode) on the HP DesignJet T930 (in Grams)

	Photo Black	Gray	Matte Black	Cyan	Magenta	Yellow
Test Run 1 Net weight of ink used	0.6	4.0	20.5	54.9	15.6	4.4
Test Run 2 Net weight of ink used	0.5	4.4	20.9	55.5	15.9	4.3
Test Run 3 Net weight of ink used	0.6	4.1	20.2	54.0	15.6	4.5
Average amount of ink used across three runs	0.6	4.2	20.5	54.8	15.7	4.4
Total ink weight across six cartridges for 50-page run (based on averages)						100.2

Table 7: Ink Used in Three 50-Page Runs of GIS Map Test Document (Standard Mode) on the Canon imagePROGRAF TX-3000 (in Grams)

	Matte Black	Black	Yellow	Magenta	Cyan
Test Run 1 Net weight of ink used	22.4	3.9	12.3	15.1	20.7
Test Run 2 Net weight of ink used	25.8	3.2	11.0	17.2	22.7
Test Run 3 Net weight of ink used	26.9	3.0	7.6	13.4	18.3
Average amount of ink used across three runs	25.0	3.4	10.3	15.2	20.6
Total ink weight across five cartridges					74.5

Table 8: Ink Used in Three 50-page Runs of GIS Map Test Document (Normal Mode) on the HP DesignJet T930 (in Grams)

	Photo Black	Gray	Matte Black	Cyan	Magenta	Yellow
Test Run 1 Net weight of ink used	0.6	35.4	11.1	27.9	10.3	17.5
Test Run 2 Net weight of ink used	0.4	35.9	11.1	28.2	10.4	17.7
Test Run 3 Net weight of ink used	0.5	36.2	11.5	28.4	10.3	18.1
Average amount of ink used across three runs	0.5	35.8	11.2	28.2	10.3	17.8
Total ink weight across six cartridges for 50-page run (based on averages)						103.8

Ink Consumption Test Methodology Overview

Buyers Lab's ink consumption analysis was conducted using three document types (Cottage Architectural Plan, ISO Office Poster and a GIS map). Each document was formatted as a PDF (except for the Cottage Architectural Plan, which was formatted as a DWG TrueView Drawing) and sized at ISO A0.

The Canon imagePROGRAF TX-3000 was installed in Buyers Lab's lab with the latest "01.10" level of firmware (as of October 2017) and connected to a Windows 10 workstation using a 1000BaseT TCP/IP connection. The Canon imagePROGRAF Printer Driver was used for all testing with media selection set to

plain paper and the image set to print at actual size. For the Cottage Architectural Plan, print priority settings were set to Line Drawing/Text with quality set to Standard (600 dpi). For the ISO Poster and the GIS map, print priority settings were set to Image with quality set to Standard (600 dpi).

The HP DesignJet T930 was installed in Buyers Lab's lab with the latest "MRY_04_01_00.2" level of firmware (as of February 2016) and connected to a Windows 10 workstation using a 1000BaseT TCP/IP connection. The HP GL/2 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. All three document types were printed with quality set to Normal mode.

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

For both models, one cartridge was then run to exhaustion and the weight of the empty cartridge was recorded.

Test Environment

Products were tested in Buyers Lab's environmentally controlled UK test lab, which replicates typical office conditions.

Test Equipment

Buyers Lab's dedicated test network, consisting of Windows 2008 and Microsoft Exchange servers, Windows 10 workstations, 10/100/1000BaseTX network switches and CAT6 cabling.

Test Procedures

The test methods and procedures employed by Buyers Lab in its lab testing include Buyers Lab's proprietary procedures and industry-standard test procedures. In addition to a number of proprietary test documents, Buyers Lab uses industry standard files including a Buyers Lab 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 XRite i1 profile software and an i1 Pro colour spectrophotometer, and analysed using Xrite i1i0 Advanced Scanning Table. Density of black and colour output was measured using XRite 508 and XRite exact^{Xp} densitometers.

About Keypoint Intelligence - Buyers Lab

Keypoint Intelligence is a one-stop shop for the digital imaging industry. With our unparalleled tools and unmatched depth of knowledge, we cut through the noise of data to offer clients the unbiased insights and responsive tools they need in those mission-critical moments that define their products and empower their sales.

For over 50 years, Buyers Lab has been the global document imaging industry's resource for unbiased and reliable information, test data, and competitive selling tools. What started out as a consumer-based publication about office equipment has become an all-encompassing industry resource. Buyers Lab evolves in tandem with the ever-changing landscape of document imaging solutions, constantly updating our methods, expanding our offerings, and tracking cutting-edge developments.

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