Pixel Perfect

Testing the Creo Eversmart Select & Eversmart Jazz+

Digital Dots

About Digital Dots

Digital Dots Limited is an independent provider of technology testing and evaluation services for the graphic arts, printing and publishing industries.

Best known for its series of Pixel Perfect© scanner testing reports, Digital Dots is a unique collective of like-minded graphic arts consultants, professional journalists and advisers to printers and publishers throughout Europe and Scandinavia. The organisation has no affiliations to any pre-press suppliers or associations, and operates entirely on behalf of the user community. This stance positions the company to provide objective and independent proprietary research, and make it available to anyone investing in graphic arts and publishing technologies.

Digital Dots was originally established to conduct objective technology testing for digital imaging devices, initally copydot scanners and more recently high end flatbed and drum scanners. The Pixel Perfect series has become the graphic arts industry's definite guide to scanner technology.

All research projects are overseen and managed by industry veterans, experienced editors in the graphic arts and digital imaging fields. These include contributors based in the United States, Continental Europe, Scandinavia and Great Britain. See also www.digitaldots.org.

Creo's Eversmart Select & Jazz +

The scanner market has gone rather quite of late. Even though there were some very interesting image capture technologies on show at DRUPA, few have actually made it to market. This suggests that either the technology was just too fragile, or that developers have had second thoughts. Given the crowded state of the scanner market, and the increased consolidation we are seeing throughout the industry, the latter is most likely.

There has only been one truly high end flatbed scanner released since the show, the CreoScitex Select. We recently tested this scanner along with the CreoScitex Jazz Plus as part of the continuing Pixel Perfect scanner testing programme. The results were interesting and confirm that developers are still pushing technology's limits and that with every new generation of CCDs, lenses, cpus and software, there are still improvements to be had.
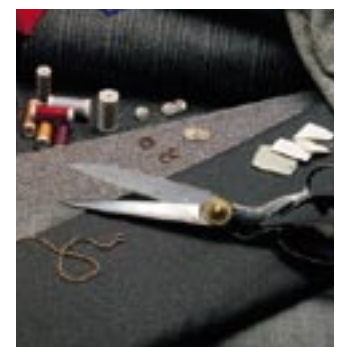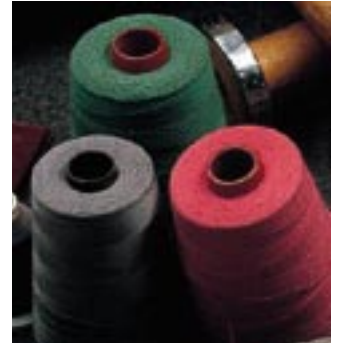
Evertsmart Select

The EverSmart Select is based on the same design as the EverSmart Supreme. It lacks two of the Supreme's technologies however: Max DR and CCD Cooling both of which make an important contribution to superior quality. At GBP22,000 the Select is however rather less expensive than the Supreme which is GBP30,000.

Like the Eversmart Supreme, which is CreoScitex' top of the line scanner, the Eversmart Select incorporates XY Stitch technology. In an XY scanner the optics move in both the X and Y directions capturing data swathes along the length of the scan bed at full resolution. The optics shift across the bed after each sweep so that target data is always focused directly onto the CCD, as the optics move across the bed. Because the light is reflected or transmitted in a straight rather than angled plane, there is no signal degradation. XY movement works in conjunction with special stitching algorithms which knit together the data swathes. Regardless of the original's size, full resolution data can be captured through multiple passes of the CCD array over the original. As the CCD array records the light transmissions, the stitching software puts together the captured data swathes. The objective is to achieve very high quality capture regardless of the stipulated output size or resolution, with uniform sharpness across the image. The number of passes the optical system makes over an original will depend on the size of the original relative to the optics. In the case of the Eversmart Select, the 4 x 5" transparency was mounted horizontally so that its longest dimension had the same orientation as the X movement of the optics, and only two passes across the image were required. The data strips were joined together and the data written straight to disc.

An added benefit of XY movement is that originals can be placed anywhere on the scan bed for maximum resolution capture, rather than just in the centre, as is the case with conventional devices. Stitching can work with single or multiple lens positions and is only used when needed, such as when capturing originals that are wider than the CCD array and it happens on the fly.

The alternative to stitching is XY Zoom technology which relies exclusively on lenses positioned to achieve the optimum capture for a given scaling. Zoom technology may also use interpolation when the required scaling is beyond the scope of the lens.

Like the Supreme, the Select has five lens positions which function in cooperation with the stitching algorithms. The software selects the best lens position in order to achieve the optimum results for a given set of scan parameters. Optical resolution for the Select is 5600 ppi and top interpolated resolution is 11,460 ppi. Enlargement ranges from 20 to 4660 percent, for any type of original that fits on the scan bed.

The Select's optical system is based on a trilinear 8,000 element antiblooming CCD array. A high-intensity 32 Watt fluorescent lamp light source tailored to the CCD array's spectral response provides illumination to capture a colour depth of 48 bits or 16 bits per colour. The scanning area is 305 x 432 mm and the Select will scan originals of all types including transparencies up to 5mm thick and with no thickness limit on reflectives. Density maximum is 4.1 with a density range of 3.9.

The Select in common with CreoScitex's other

premium scanners is sold with oXYgen scanner control and colour management software. We have covered this extensively in a recent issue, but a quick reminder might be useful.

OXYgen

OXYgen captures 16 bit image files and works either with or without a scanner. In concept this software is designed to separate capture and processing along with their associated tasks in order to get the maximum throughput. The emphasis is on quality, speed, workflow flexibility and productivity. The software consists of two modules, oXYgen Scan and oXYgen Open and drives the EverSmart Supreme, EverSmart Select and EverSmart Pro II scanners. OXYgen has been a workflow orientated scanner application for these devices since January of this year. OXYgen Scan is supplied with all supported models and is basically a traditional scanning application operating with 8 bit ICC compliant files. However it can also capture a 16 bit Digital Transparency file for use in the so-called SOOM workflow, as well as a traditional RGB/CMYK 8 bit file workflow. OXYgen Open is the module for 16 bit operation and processing, and will also operate independently ie without having a scanner to feed it. The EverSmart oXYgen Open module is used for retrieving the DT file for working with images from any workstation offline and without the need of a scanner. OXYgen Scan is bundled with premium models and OXYgen Open is purchased as a separate license.

A single high performance scanner can thus support several operators within a common workflow. The software captures 16 bit RGB files, what CreoScitex refer to as a Digital Transparency (DT). This is a raw RGB file to which can be added header information including an image profile. The DT concept is a key part of CreoScitex's plans for workflow system developments. The company is working on an oXYgen version of its copydot scanning tool. oXYgen Dot is due for release shortly for the premium scanners (Eversmart Pro II, Supreme and Select). CreoScitex SmartDot application will continue to be available for the Jazz and Jazz +.

Jazz Plus

Although the machines share a common design, the A3+ Jazz Plus is manufactured in Israel, whereas the Jazz is built for CreoScitex by Microtek in the Far East. Jazz and Jazz Plus differ in their technical specifications as well as in the lenses used and in their signal processing electronics. The Plus is more highly specified capturing 2540 ppi rather than 2000 ppi and has a greater enlargement range. Both are XY Stitching scanners capturing 14 bits per channel to a dMax of 3.7D, but we suspect that the optical system in the Jazz Plus is superior to that of the Jazz. The £11,000 Plus model is also rather more productive than the ordinary Jazz, which costs around £9,000.

The basic EverSmart scanning application software that drives the Jazz and Jazz+ shares a great deal of common functionality with oXYgen, but they differ in some important respects. The EverSmart scanner software version 3.1 supports 14 to 8 bit processing, rather than 16 bit and the Jazz does not support parallel workflows. The control software functions exclusively with a scanner and so cannot support the distributed processing model inherent to CreoScitex's Digital Transparency concept. In other respects the applications function similarly.

About the Tests

We have made little change to the Pixel Perfect test suite, apart from adding a new reflective as the previous test was no longer a challenge for most scanners. Indeed colour reflective scanning per se is rarely a challenge these days, at least not for the technology. Consequently we chose not to include an especially demanding or difficult reflective image. Such a test would effectively be a measure of operator skill rather than providing a basis for comparative evaluation. We chose a piece of print that incorporates a number of security features. Embossed text, subtle tonal gradation of metallic inks and monochrome text and lineart aren't particularly run of the mill for most scanning applications, but they highlight inadequacies as far as the technology goes.

The Test Suite

- a 4 x 5" test image to be scanned at 250% for a final resolution of 350 ppi (2 x 175 lpi)
- the same 4 x 5" image to be scanned at 850% to a final resolution of 350 ppi
- a crop of approximately 3 x 3cm in the centre part of this image at top optical resolution
- a chromium plated glass platen Variable Frequency Resolution Target rotated 10 degrees from the scan axis, at the highest optical resolution
- a chromium plated glass platen Variable Frequency Resolution Target rotated 10 degrees perpendicular to the scan axis, at the highest optical resolution
- a chromium plated glass platen Variable Frequency Resolution Target scanned at the highest interpolated resolution
- a chromium plated glass platen Variable Frequency Resolution Target scanned perpendicular to the scan axis at the highest interpolated resolution
- a productivity test of 20 6 x 7 cm images scanned at 400% for a final output of 350 ppi
- a scan of a UK tax exempt motor vehicle disc
- a crop of the vehicle disc at optical resolution

The Test Environment

The tests for both scanners were run at CreoScitex's corporate headquarters in Herzlia, Israel. We used a single Mac workstation with

network access disabled. We found that the 733MHz G4 is capable of writing data faster than the scanner can capture it. Whether it is in the processing or the capture (or output for that matter) the speed bar is always rising. A faster processing rate is particularly beneficial when capturing large single files which can benefit from the processing differential between computer and scanner's capture rates.

All images were mask mounted with the exception of the VFRT and the 20 image productivity test. CreoScitex prepared scan setup profiles in advance of running the tests. Both the Select and Jazz + scanners automatically recalibrate, and check focus and light intensity before each scan proceeds.

A Word on Evaluations

We present here the results of tests for productivity and optical resolution. We also offer a few opinions on how the 250% and 850% scans look to us on screen, relative to the appearance of these scans from CreoScitex's fellow developers. We have found that it is virtually impossible to establish coherent benchmarks for colour quality relevant for all applications and all tastes. Judgement has proved to be so very subjective, so extremely application and culturally driven that we have frankly given up trying to find a balanced and fair way of judging colour quality results. All we can do is to offer our opinions of how well we think these scanners have captured the 4x5" original based on their on screen appearance. We are sure you won't agree with our opinions -- particularly if you are a developer! Selections from the colour image scans will be printed in a future edition the Swedish edition of AGI, our long term partner in this project (www.agi.se) and in Printing World in the UK.

All colour image results are also available on CD. The CD contains guidelines for evaluating the scans, plus the full 250% scan and crops, selected crops from the reflective scan, and the 850% colour scans and crops. Also included are copies of the 250% scans judged to be the best and worst results in the last Pixel Perfect testing round. These scans were evaluated by an independent panel of judges and we include them purely as reference files for on screen comparison. We recommend that reference and test files are printed together for comparative purposes. The CD costs USD250.00. If you are interested in purchasing it please contact Laurel Brunner on 100330.706@ compuserve.com.

Optical Resolution

The Variable Frequency Resolution Target (VFRT) is a chromium plated glass platen used to measure optical resolution. The target is designed to measure the spatial frequency of black and white transitions, using line pairs, rising in frequency per millimetre. The lines in the target get finer and finer as their frequency rises so the modulation becomes more difficult for the optical system to resolve. Eventually the optical system can only record grey, so the point beyond which there are no visible transitions can serve as a measure of optical resolution.

We have based our evaluations on what is visible on screen. We looked for the highest number of lines per millimetre (lpmm) where light to dark transitions or modulations, are visible. The point at which line pairs appeared to us to be approaching grey, with no lines visible, we state that line pairs are no longer resolved. Moiré patterning, visible in many of these tests, is caused by interference between line pair frequency and the scanning resolution. As long as the transitions from light to dark are visible, it can be ignored. Optical resolution is calculated using the following formula: 2(lpmm)x25.4=n, where n is the number of resolvable points per inch.

These scans were done in greyscale mode with all unsharp masking switched off. CreoScitex's operator used a custom SmartSet scan set up and captured pure RGB data rather than converting it to CMYK as was the case with the quality tests. In general we see better results when the target slide is placed in the same orientation as the scanner's optics. Thus interpolation takes place only in one direction ie the pixel direction, because a scanner steps at the same rate for both orientations. In measuring true optical resolution there is some difference between the Select's stated resolution and what we can see on screen. However when using interpolation the results suggest a far higher resolution. In both optical and interpolated resolutions the Select is competitive with some of its substantially more expensive rivals including the Screen Cézanne Elite and the Fujifilm Lanovia Sprint.

The Jazz Plus comes close to its specification for optical capture. This scanner is amongst the least expensive we have tested and when it comes to value for money the Jazz offers a great deal. Its VFRT results are better than those of the Agfa T5000 + which is a substantially more expensive device. In fact the Jazz+ results are more in line with what they ought to be than many of this device's higher priced rivals including the Heidelberg Nexscan and Screen Cézanne Elite.

The Reflective

The image was selected not on the basis of its complexity, but because it contains a number of curious elements including metallic inks, graduated tints, holes and embossing, plus ordinary line art and text. As we found with our previous reflective test, there is no technological impediment for this type of capture. In fact the technology can easily be used as a microscope for reflectives. Clearly the differentiation lies with how image data is managed and on how well the scanner operator knows their job.
4x5" transparency

In both the Select and Jazz Plus tests the 4 x 5" transparency was oil mounted using CreoScitex's oil mounting station and then given a mask overlay on the scan bed. The oil was used to minimise the effect of scratches in the original and the mask to prevent stray light pollution. The image was placed upright on the scan bed. Both scanners captured it in two strips, stitching the two data sets together on the fly. The CreoScitex operator also created a series of Device Link profiles from which the best ones were used for the final scans. A series of different image profiles were applied to the previews and an optimum input profiles created from these data sets, in order to ensure maximum quality for both scanners. (Device Link Profiles override any other input and output profiles.) All corrections were made in the HSL colour space for both scanners, with OXYgen driving the Select, and the Eversmart scanning application driving the Jazz Plus.

We viewed these scans side by side with those ajudged the best and worst in the last Pixel Perfect round, purely on the basis of how the images compared relative to one another and relative to the original transparency. This can hardly be considered an absolute or fair valuation of the devices however, so we encourage interested parties to view the images in AGI, Printing World or on the latest Pixel Perfect CD.

In the 250% scan the Jazz + preserved highlight detail extremely well, with a comparable appearance to that of the same scan done with the Screen Cézanne Elite. However there is a loss of colour depth in the shadow areas where colour tended more towards black than a darker shade of a recognisable colour. Image sharpness is impressive, preserving fine details and maintaining the overall crispness of the original image. The Jazz + maintains clarity of detail and image vitality, without creating a brittle effect that so often characterises scans from lower cost devices, where sharpness is often used to compensate for inferior quality. The Select's colour quality appears to us on screen to be better than the Elite's, particularly in the greens. The highlight detail is particularly well preserved.

In our opinion the Select's 850% scan is also impressive. These scans were not part of the evaluation for the last testing round, but compared to the Select's 850% result, the Elite scan looked very soft, almost as if out of focus. The Jazz's 850% scan was also very good, sharp and with acceptable quality, apart from the tendancy to black in the darker shadow areas.

Productivity Test

In this test twenty 6 x 7cm transparencies must be captured as quickly as possible scaled to 400% for 350ppi final output. For the Select and the Jazz+ the images were mounted directly on the platen with single strips of sticky tape, so that the scanner could capture all 20 at once. Mounting all twenty images took about two and three quarter minutes for each scanner. With both the Select and the Jazz+ the preview took around 1:37 and the operator cropped 18 of the images to 53 x 67mm with the last two placed sideways (67 x 53mm). Each RGB image file was some 35MB, however when the scanners were asked to capture CMYK data the individual file sizes rose to over 45MB, the figure used to calculate the results. Why one might asked would one want to capture larger files? The answer is that the MB per minute rating is higher with larger files. Even though the overall time is slightly longer (the RGB scans completed a couple of minutes sooner that the CMYK scans), because of the data handling from scanner to disc, the final capture rate is faster.

The Jazz Plus does not support parallel working so all crops must be done prior to scan initiation. This imposes a fairly hefty penalty on the speed with which batches of images can be captured. This plus an average capture rate of 3,5 minutes are reasons why productivity tends to come at a price. The Select for example offers extremely fast productivity. Using an average of all productivity results, the only device to outpace the Select is the Fuji Lanovia Sprint. This scanner is however about 30% more expensive. The Select also outperformed the Supreme in our productivity tests, probably because they were run using a G4 rather than a G3 computer.

CreoScitex scanners recalibrate automatically after each image captured, but it is possible to have an automated single set up for all images and no individual image recalibration. We tried this on the Select to see whether switching off calibration would make a difference to productivity but there was little to be gained through switching off calibration. Automated single settings are also useful for groups of large images that must all look the same, especially for such things as large format aerial photos used in map making.

Conclusions

The market for scanners isn't dead yet, but it has definitely slowed particularly at the high end. CreoScitex Eversmart Select and Eversmart Jazz Plus are very different product offerings. The Select offers very good quality and high performance at a price that should more than rattle the cages of CreoScitex's competition. The Jazz Plus may not be the fastest scanner in the world, but in its price range it offers terrific colour quality.