KEYPOINT INTELLIGENCE
Buyers Lab

Custom Test Report

Environmental Assessment on the

SEPTEMBER 2017

Toshiba e-STUDIO3508LP and e-STUDIO RD301

Toshiba e-BRIDGE3508LP (left) and e-BRIDGE RD301 (right) test models.

Test Objective

Buyers Laboratory (BLI) was commissioned by Toshiba TEC Corporation to conduct a confidential evaluation of the environmental features of the Toshiba e-STUDIO3508LP MFP model and e-STUDIO RD301. Specifically, the analysis focused on the ease of use, management functionality and energy consumption of the two devices. In addition, the effectiveness and productivity of the two e-STUDIO systems when erasing content, the sorting of paper into reusable and non-reusable, and the digitizing of content for archiving on the network prior to erasing capabilities of the e-STUDIO RD301, were also assessed. All testing was conducted at BLI's environmentally controlled lab facilities in Wokingham, UK.

Executive Summary

For any organization looking to boost or promote green work policies, then Toshiba's latest generation model, the e-STUDIO3508LP, is surely worth a look at. This 35ppm model occupies a special position in the MFP market—it is capable of rendering content printed with erasable blue toner transparent via an adapted fuser unit which 'erases' blue toner at a certain temperature. Erased paper can then be reused on the MFP, erased and reused and so on, up to five times, or possibly more (although, as BLI's results show, customers should bear in mind the number of erases is wholly dependent on the level of the original print coverage, condition of the paper and end purpose of the document). Users can achieve all of this with the single hybrid integrated system without the need for a separate erasing unit, which was not the case with MFP's predecessor model. This means they can save on hardware costs and a reduced office footprint. Another much welcomed feature is the MFP's ability to print in black; this greatly increases the overall value proposition of the device as it means higher value documents or documents with a longer shelf life can be printed in black on the e-STUDIO3508LP.

The e-STUDIO RD301 erasing station was also examined. It has powerful capabilities; it's far more productive in Erase mode than the MFP owing to the lack of need for its fuser temperature to adjust, unlike the MFP's fuser unit which must adapt to the type of function selected—print in black toner, erasable blue toner or erasing. Plus, the RD301 is able to monitor the condition of the paper and judge it suitable for reuse or not; it can keep track of how many times a paper is erased via the application of a mark, and reject paper when the optimum level of erase has been reached. Another notable strength is that the RD301 can capture and route digitized documents to a network folder or to a USB drive for archiving prior to erasing content, which adds a safety net to prevent the accidental erasure of valuable documents. For organizations in need of an extra erase station or for scan-intensive environments, then the RD301 would be a valuable supplemental partner to the e-STUDIO3508LP.

The two units performed strongly and provide plenty of potential for organizations that want to reduce paper consumption and encourage a greener workplace. Both are pretty straightforward to manage via TopAccess and both offer simple maintenance procedures for replacing consumables and strong ease of use. The MFP's touchscreen offers a large, bright and responsive interface and intuitive menus. The RD301's control panel has a small LCD display and a series of hard keys so entering data is more labour intensive – but its functions are primarily designed to be managed and setup via the TopAccess web utility and users can draw on a series of one-touch templates directly at the control panel to boost productivity.

Although BLI analysts were able to reuse paper up to five times, the number of times paper can be potentially reused largely depends on the amount of previously printed coverage and the intended end use of the document. BLI found high coverage documents in particular tended to leave a lot of latent impression on the page which affected the overall effectiveness of the erase cycle. Toshiba has improved the erasable blue toner so that it prints darker on the page, and increases legibility, but, in turn, this could be a contributing factor as to why high coverage documents are less capable of being reused effectively – with all high coverage documents rejected for reuse on the RD301 unit when operating in Erase Sort mode. Administrators can utilise the economy toner mode so that the MFP prints a lighter erasable blue colour but they need to weigh up whether that's to the detriment of print legibility.

Overall, the e-STUDIO3508LP is best suited for general office use; it's most effective when printing text-based documents using erasable blue toner in default standard mode, and higher value documents in black. It must also erase in bulk rather than in short bursts of ad hoc activity. For document intensive environments, users should consider purchasing the RD301 erasing station to supplement bulk erase and scan workflows.

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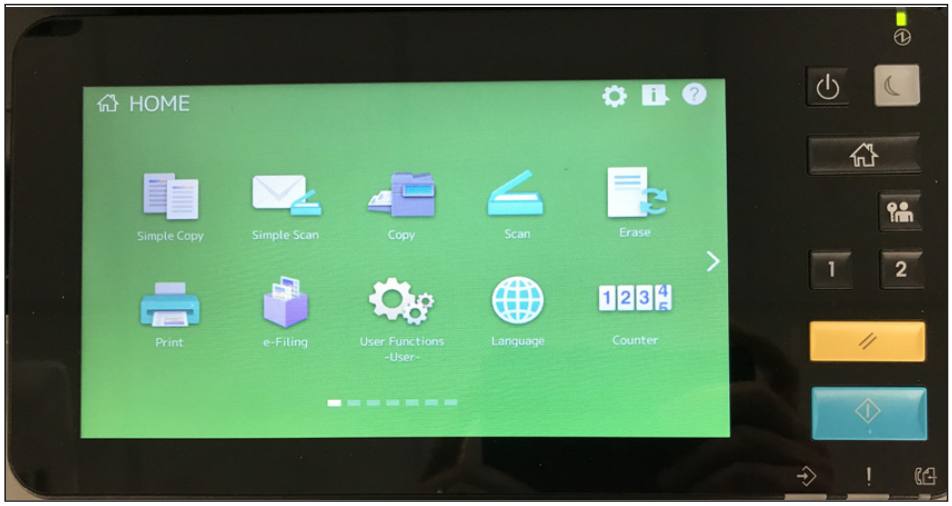
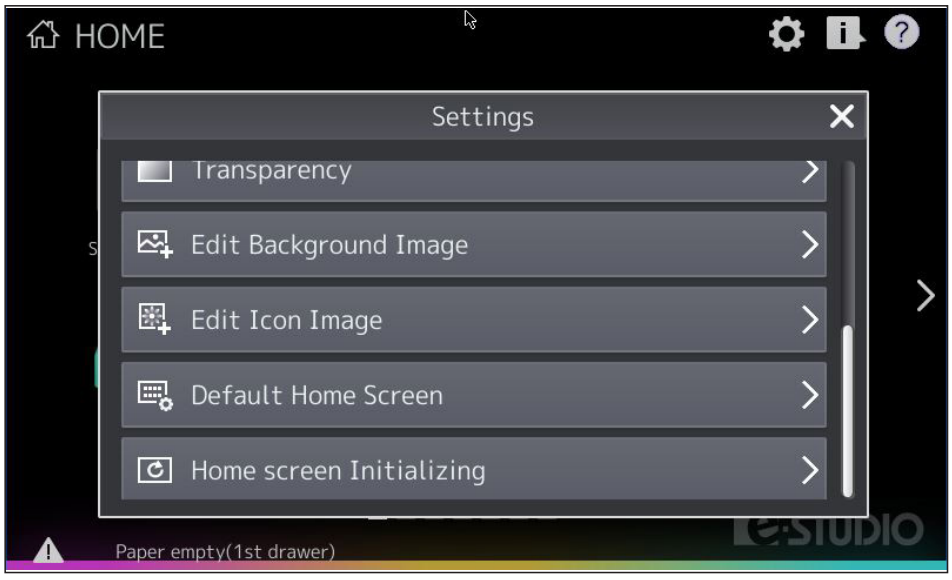
Ease of Use

- The e-STUDIO3508LP has an attractive piano black design, and this 'eco hybrid' model has green paper cassette indicators and a green-based touchscreen UI to accentuate its strong environmental credentials.



The 229mm tablet-style touchscreen control panel tilts up and down freely and is bright at its default settings. The touchscreen is highly responsive; the user interface (Home screen is shown above) is fresh and appealing, with clear icons and text options, and menus are logically organized and highly intuitive to navigate.



The MFP's touchscreen is highly customizable to suit end-users' preferences and needs; the background image, Home screen icons, layout and language can all be changed, and shortcuts and job profiles can be added.

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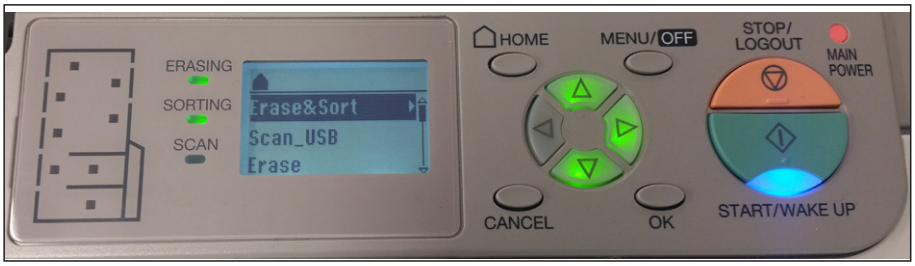
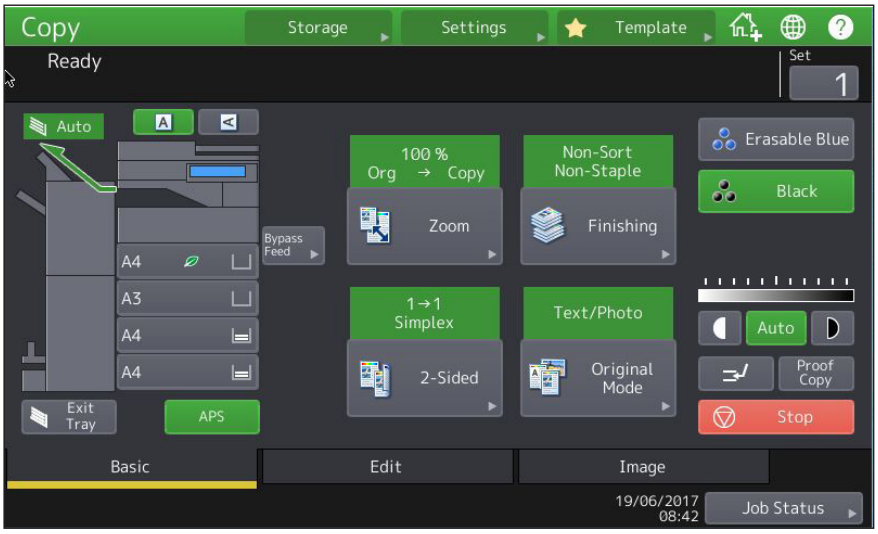
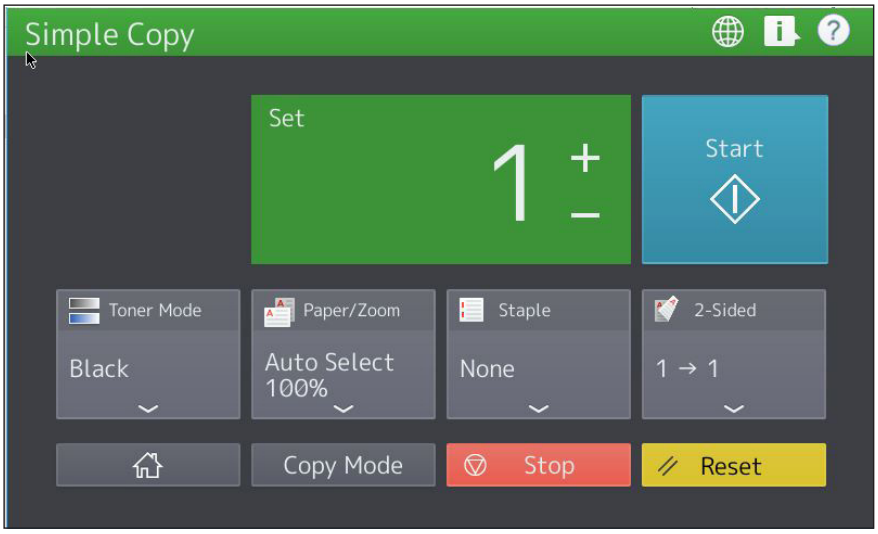


The RD301's control panel has a four-line LCD display, a device graphic with LED lights to indicate where misfeeds are located and various hard key buttons for users to use to navigate the menu options. At an administration level, the control panel is more limited than that of the MFP, plus entering information involves multiple key presses which is time-consuming; most functionality is easily managed in the web utility.

- The e-STUDIO3508LP offers very strong ease of use: in addition to the main Copy and Scan menus, which have all the typical settings a user is likely to need when programming a job, Simple Scan and Simple Copy menu screens are also available for more streamlined programming, and it's easy to switch to them.



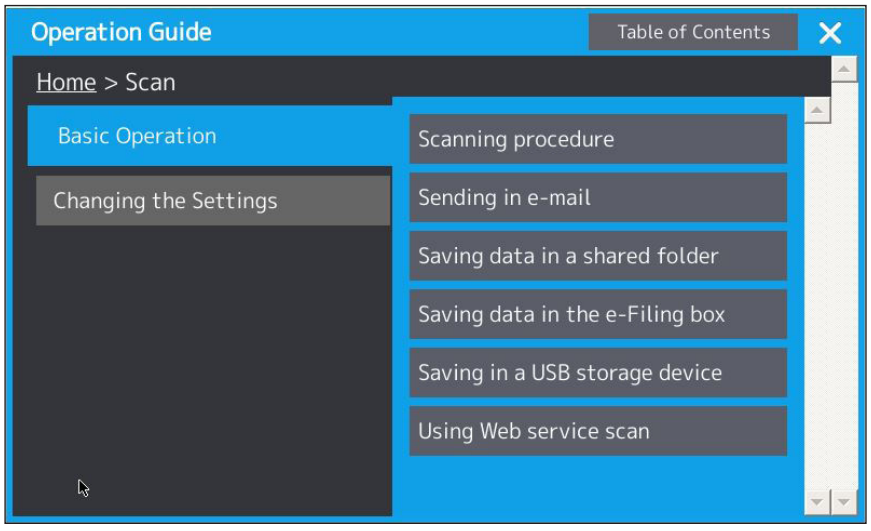
Most of the selections for a typical copy job are accessible, but not programmable, from the Basic tab on the main Copy screen. Paper source and exit tray can be conveniently selected directly from the graphic of the device.



An alternate Simple Copy screen can be easily switched to, based on user preference.

- Users can save and add up to 64 shortcut panel buttons to streamline the workflow of commonly run jobs. In addition, up to 12,060 templates can be stored to enable one-touch access to frequently used settings for not only copy but also scan and fax jobs. These templates can be saved in up to 201 groups on the device; groups can be personalised and password protected, or there's a public template group to share useful templates with other users. Touch keys for storage and templating are located at the top of every control panel screen for easy access.

- Users can access one-touch job program templates on the RD301. Several default templates are available, but users can create more personalised templates via the web utility, should they need to scan and save documents in a particular file format. Up to ten templates can be programmed for use on the RD301, and they are a useful feature for office environments where there may be a pool of users who need to either digitize paper documents or batch erase paper printed with erasable blue toner on a regular basis.



Help is provided on the MFP's control panel; users simply click the "?" icon that appears at the top right-hand corner of the screen to open the Operation Guide, which provides extensive guidance covering the device's features and functions. However, help is not context-sensitive nor do the instructions dynamically update.

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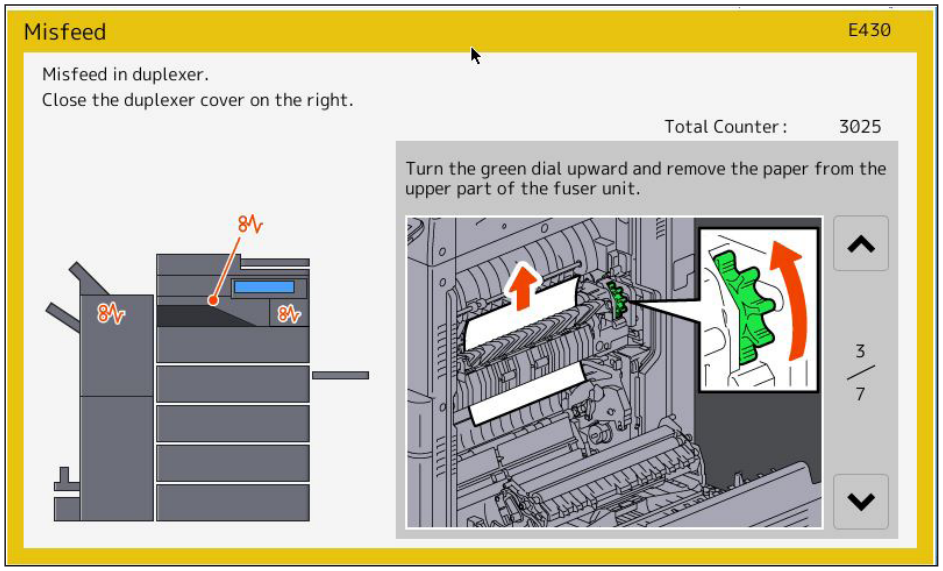
- Users should be mindful of the fact that paper will be erased in one go when the Erase function is initiated on the device, even if the paper drawer is at its full 400-sheet capacity.



Both the e-STUDIO3508LP and RD301 offer simple and intuitive maintenance processes for replacing consumables. There is ready access to covers and parts to clear any misfeeds; the RD301's operating panel features a schematic diagram of the device on which LED lights light up to pinpoint to location of a jam. The MFP's touchscreen provides clear, step-by-step text, graphical and animated instructions for clearing misfeeds (above).

Adjusting the MFP's paper drawers for different-sized media is very easy; users simply press the locking clips in and slide to the required size. In addition, paper limit indicators are easy to see which reduces the risk of users overloading the drawers.

Replacing black and erasable blue toner on the MFP is simple and clean, but toner cannot be replaced on the fly.

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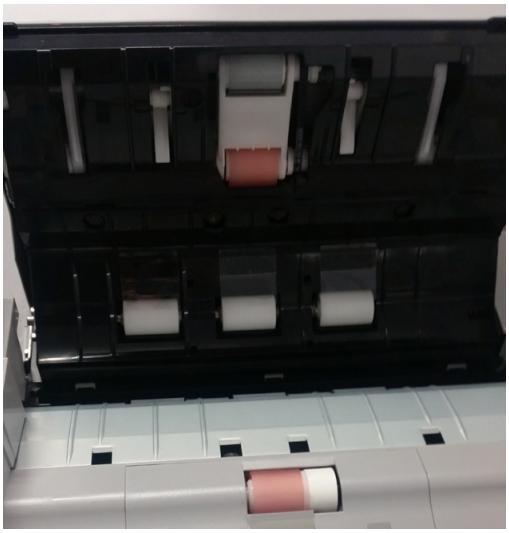
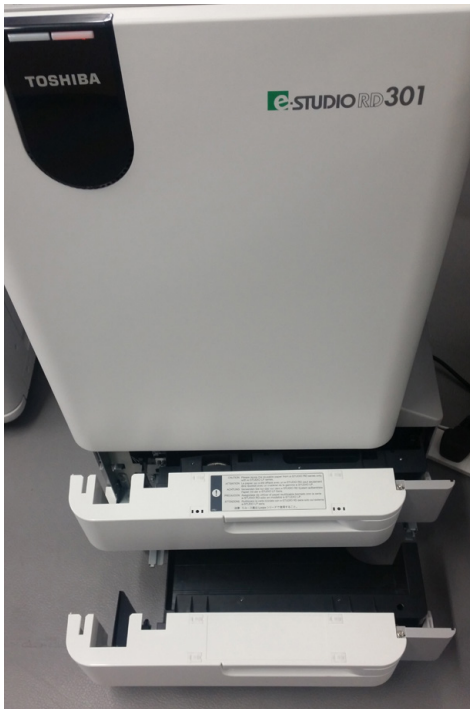


Originals are easily loaded into the document feeder on the RD301 unit; users are aided by clear paper size markers and a height limit marker to ensure paper is not overfilled. There are feeders (right) to ensure paper is fed into the system one sheet at a time.



Reusable and rejected paper is neatly sorted into separate paper drawers for easy identification; misfeed areas (right) are easy to access.

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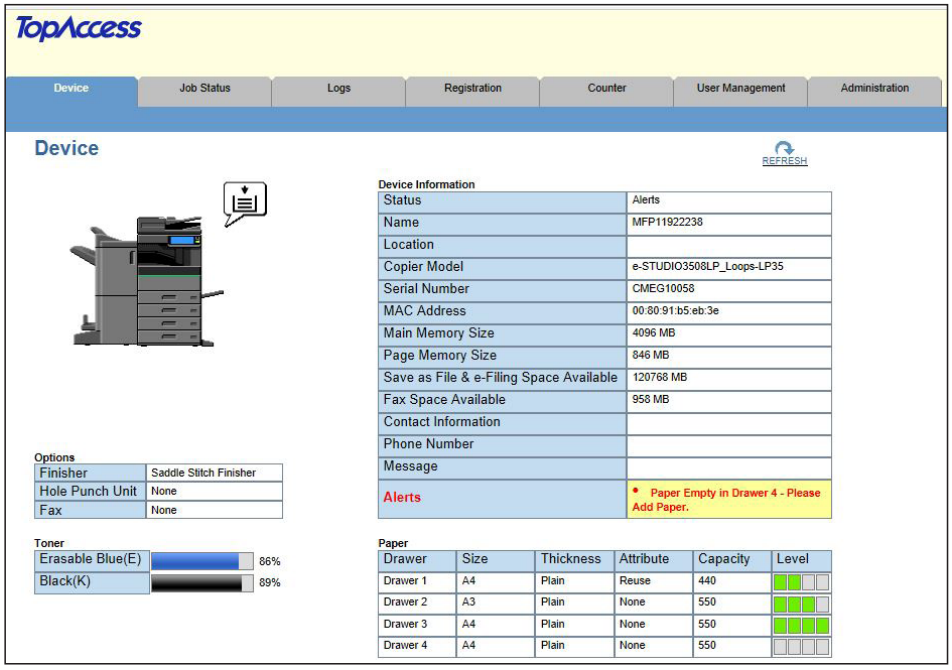
Management Functionality

- TopAccess, the embedded web server, has a pretty basic user interface, with a series of tabbed menus running across the top of the screen; functions are clearly labelled and selectable.
- Although some of the dropdown menus and icon buttons can be very small, such as those found in the MFP's e-Filing screen on the utility, and when printing or emailing files directly from within the utility, it's clean and simple to use and easy to navigate, overall.
- TopAccess provides some very convenient tools and features to help administrators to manage the e-STUDIO3508LP and RD301 more easily. Settings can be cloned from one device to another; users can export and save machine settings to a USB flash drive to expedite the setup of other Toshiba models; email alerts can be sent to the administrator when consumables are depleted and when errors occur, as well as when scan jobs are completed and faxes are received.
- TopAccess also provides status information on jobs that are currently running and pending, while job logs can be exported as a CSV file for both devices, which is useful for job tracking and device monitoring purposes.
- RD301 users can also export Counter information relating to user and departmental activity performed on the stand-alone erasing station, which is a welcome improvement on BLI's previous test on the RD30. The total Counter data includes multi-generational erasing statistics on number of pages successfully erased during the first, second and third cycle, and so on, along with the reason for erasing failures, which include paper size mismatch, high printed density, damaged paper and reached the reuse limit. This should help administrators to identify whether the RD301 is being used efficiently or not. For example, users may be attempting to erase paper that is too damaged, or putting through paper that cannot be erased (paper that's not been printed with erasable blue toner, or is marked with normal pen ink). This would have an adverse impact on the organization's overall energy and cost savings.



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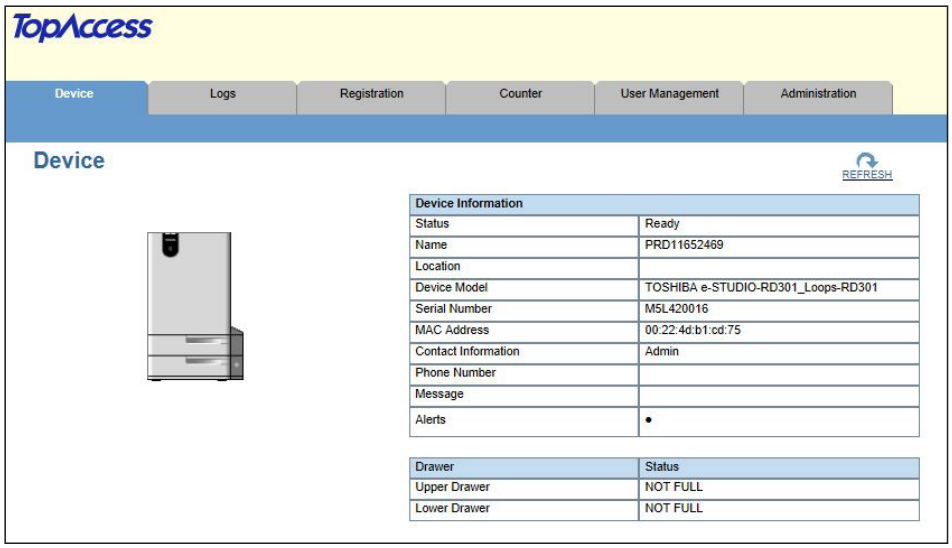
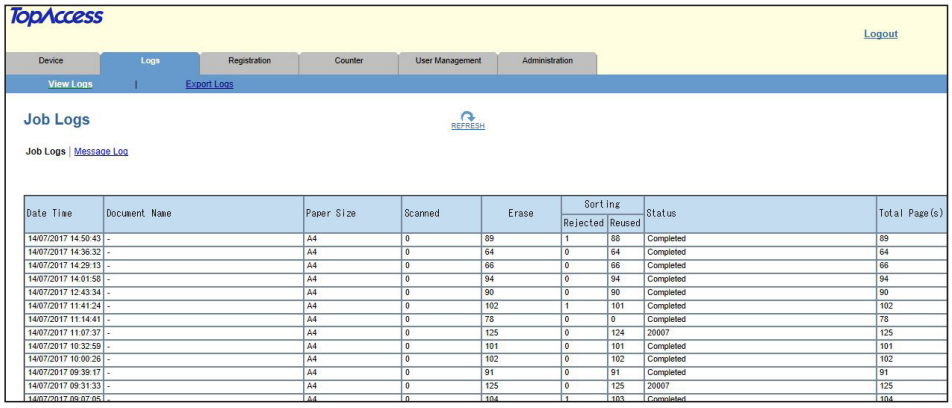


Consumable status is clearly signposted on the main screen of Top Access with an alert graphic shown near to the device image, and alerts are highlighted in red in the Alert section of the Device Information table. Toner levels on the MFP are displayed as colour bar gauges and reduce in 1% increments, while paper levels are represented by a gauge split into four blocks (top); drawers into which reusable and rejected paper are sorted into on the RD301 are marked as Not Full or Full (bottom).



Users can view and export to CSV format job logs for print, copy, scan and fax operations performed by the MFP (top); and, a job log listing paper erased and sorted as reusable and non-reusable on the RD301 unit (bottom).

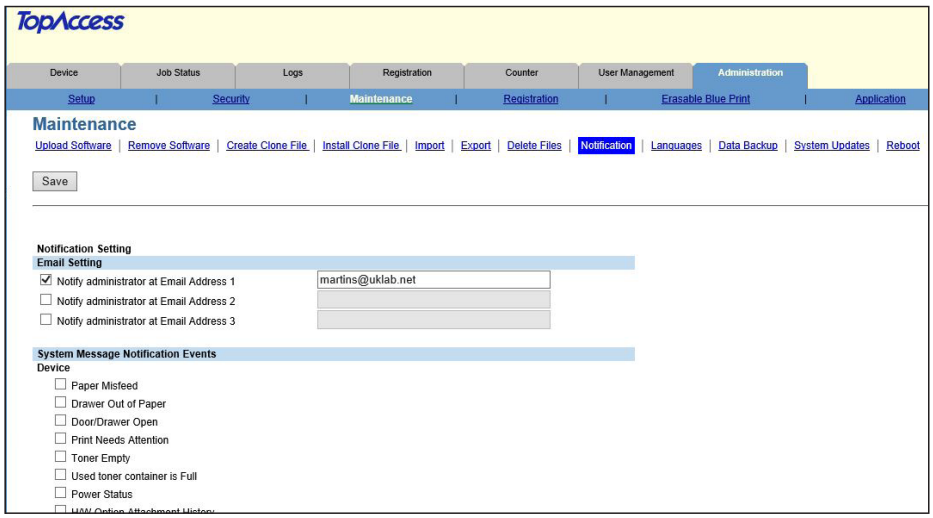
Total Counters										
Name	Device Model	Serial Number	MAC Address	Location	Contact Information	Phone Number	Message	Date	Time	
PRD11652469	TOSHIBA e-STUDIO-RD301_Loops-RD301	M5L420016	00:22:4d:b1:cd:75		Admin			42930	0.66501157	
Period	Sheets	Scan	Erase	Reuse(0)	Reuse(1)	Reuse(2)	Reuse(3)	Reuse(4)	Reuse(5)	Reuse(6)
Accumulated	7777	890	7777	5674	0	0	0	0	0	0
2017/06	1174	151	1174	393	0	0	0	0	0	0
2017/05	42	0	42	20	0	0	0	0	0	0
2014/12	0	0	0	0	0	0	0	0	0	0

In addition, users can export RD301 counter data by user, department or total as CSV files. When the reuse mark feature is enabled, the total counter information should include multi-generational erasing statistics.

- Administrators can add applications to the e-STUDIO3508LP's control panel by using the Applications tab in the web server. Available MFP connectors include Scan to Dropbox, OneDrive, Google Drive and Google Cloud Print. Once loaded, users can access these applications directly on the MFP (user credentials are required) enabling them to print from and scan to cloud services, a boon for productivity.

- TopAccess provides additional functionality to help administrators to manage this eco hybrid device, and ensure organizations will get the best use from its environmentally friendly features. This includes defining the default toner mode for different functions (so that, for example, job lists and faxes will print in erasable blue toner rather than in black); setting up rules via the more advanced Rules Based Printing feature, which will enforce certain green print policies on all users based on software application (so that, for example, Outlook emails and content from web browsers will always print in erasable blue toner and in duplex); and restricting and tracking print, scan and copy usage according to user roles. Administrators can also set up a series of one-touch job templates for users to select on the control panel, helping to simplify job programming for commonly used functions.

- TopAccess is comparable to other management applications, and BLI analysts had no problems using it. However, there are a few quibbles as to be expected with any system. For example, it doesn't offer users the ability to upload files from the PC desktop to print directly and setting up scan to network folders is not very intuitive, as it is a multi-step process involving different menu screens and form filling – there's no network browse feature so users will have to manually input all the required information. That said, via TopAccess, users can now specify a file archive time limit which means they no longer need to worry about deleting stored files and devoting ongoing dedicated house-keeping resources necessary for ensuring the folder is well maintained.



Email alerts can be sent to up to three recipients for a whole range of different conditions. They can be sent to the administrator when consumables are depleted and when errors occur, as well as when scan jobs are completed and faxes are received.

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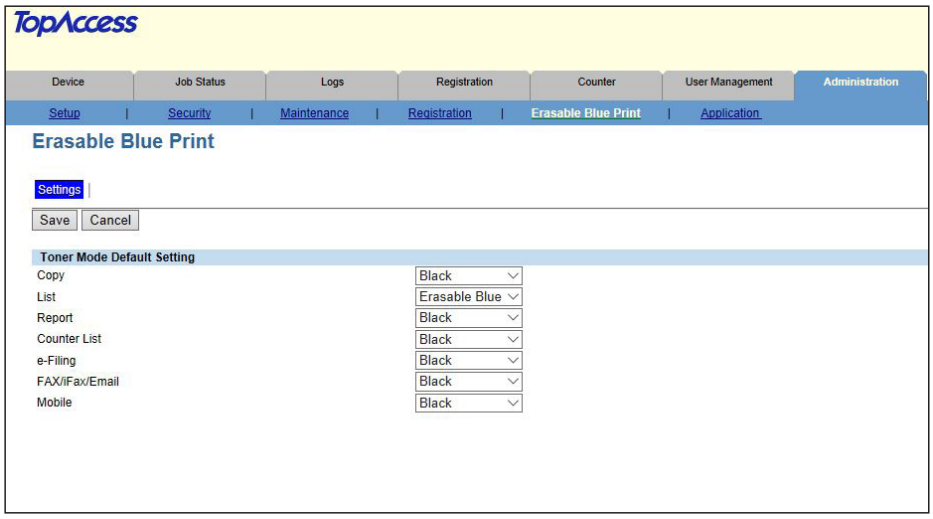
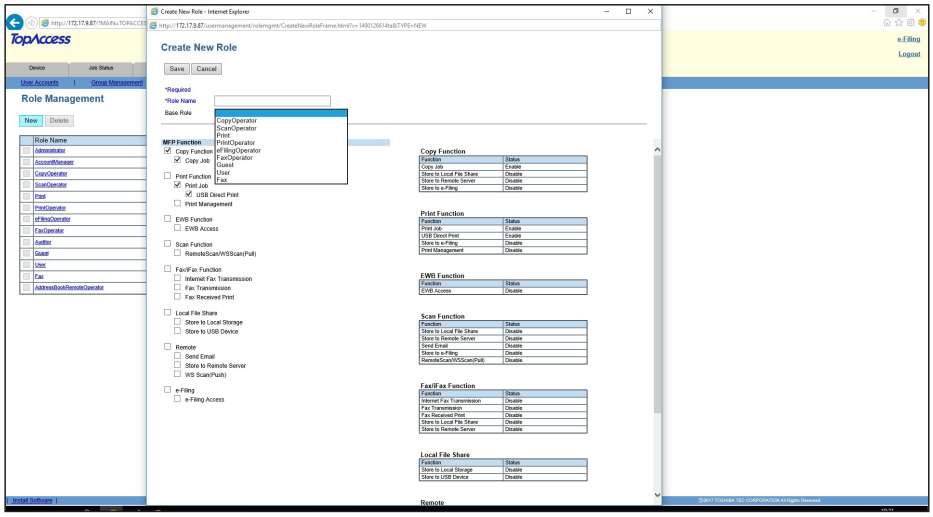


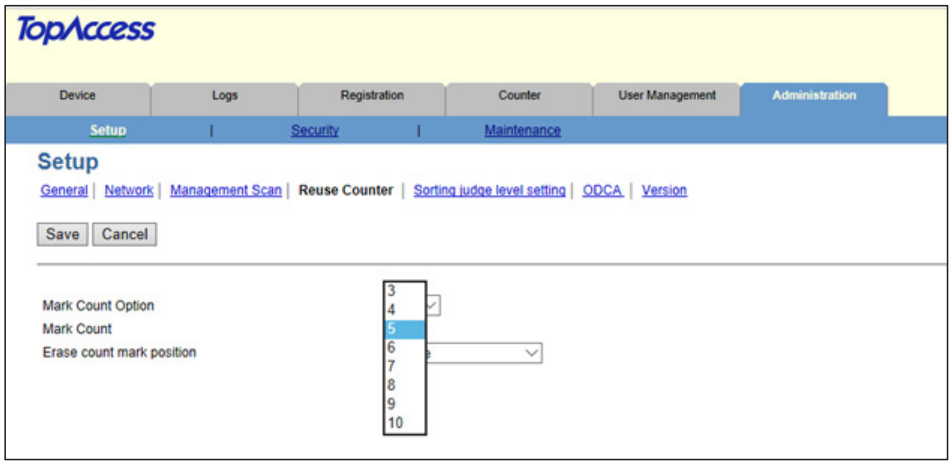
Administrators can define the default toner mode setting for specific operations. Job lists can be made to print in erasable blue toner by default, for example.

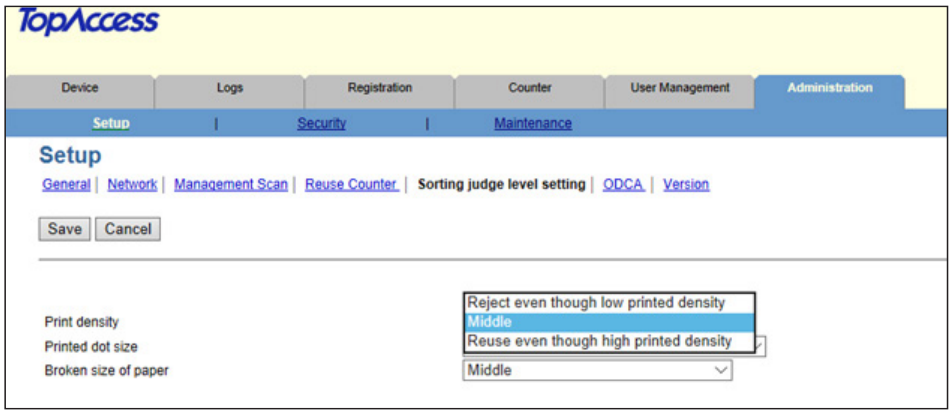


Administrators can set up role-based permissions to manage user access to functions.

- Unlike the MFP, the RD301 is capable of self-monitoring the quality of printed paper being put through the unit for erasing; the Erase Sort mode will reject paper as unusable based on the condition of the sheet, or if it detects 'un-erasable' pen marks or content. Administrators set the sensitivity levels of the monitoring filter via TopAccess. There are three types of monitoring settings: Print Density; Printed Dot Size; and Broken Size of Paper. Each setting offers three adjustment levels, for example, Print Density setting can be set to one of the following three options: Reject even though low printed density; Middle (default setting); and Reuse even though high printed density. Adjusting the sensitivity of the RD301's monitoring capabilities will have an impact on the number of erased pages judged fit for use by the unit. For example, paper with significant wear can still be passed for reuse if the 'Reuse even though a big dog ear' setting is selected, which will let businesses prolong the life of their office paper. Although not tested by BLI in this evaluation, the number of times paper is erased and reused can be tracked on the RD301 via the application of a red ink mark to a specified area on the page each time it is passed through the erasing unit. The system will track the marks during multi-generation erase and reuse cycles and then rejects paper once the maximum number of erases permitted is reached.

- With the Print Density level set to default, the RD301 rejected BLI's high-coverage document at each cycle stage (see Erase Efficiency and Functionality section below). Paper judged as acceptable for reuse or rejected will be sorted into separate paper drawers for easy identification.



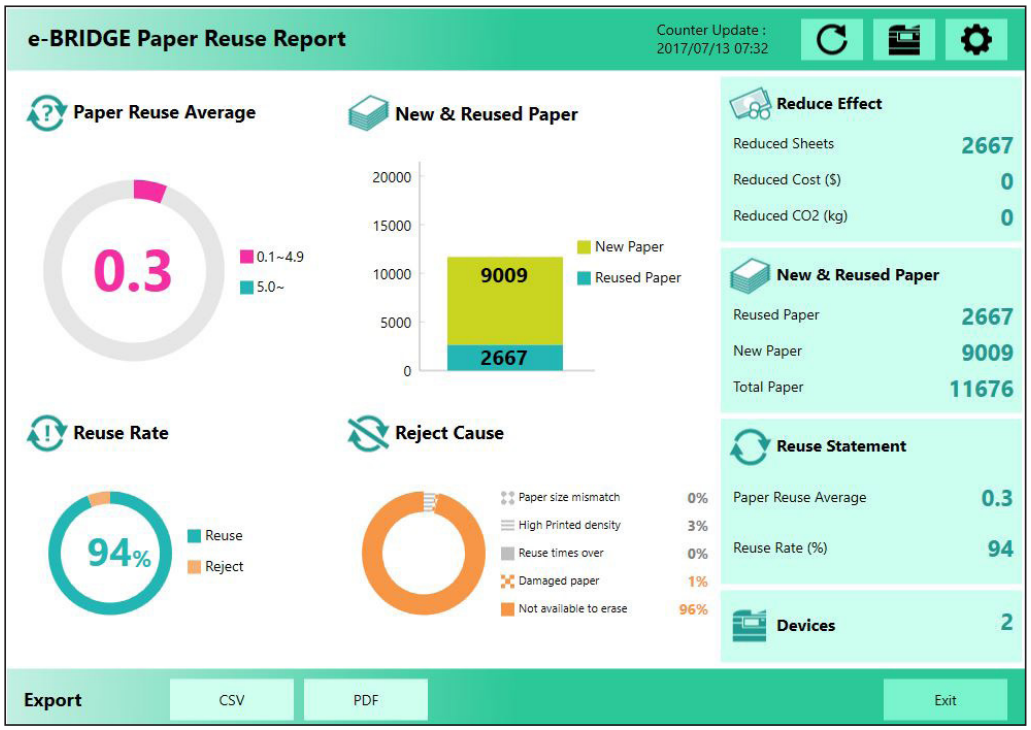


- A new supplementary tool for the MFP customer, Toshiba's e-BRIDGE Paper Reuse Report (ePRR) utility collects counters from the e-STUDIO3508LP for management reporting and tracking purposes. Available as a free separate Windows app, installation is an easy, wizard-driven process; the ePRR utility will auto search for devices on the network; users just need to select the devices they want to monitor and add them to the system. BLI analysts had no trouble whatsoever with getting the ePRR utility up and running.

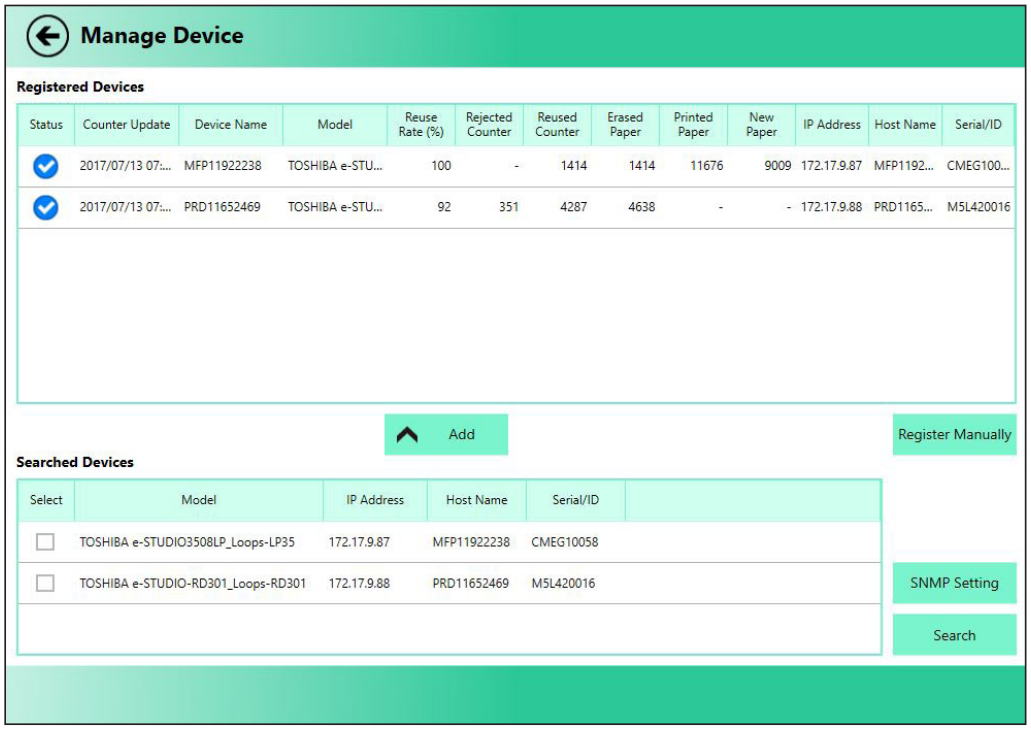
- The ePRR utility provides valuable information to better inform IT personnel and managers on how much reused and normal virgin paper is being used in the organization and the environmental contribution made as a consequence of using reused paper. (CO2 and cost reduction calculations can be tailored locally to regions.)

- Data is presented in a highly visual manner which makes it attractive and easy to understand at a glance, and it can be exported as a CSV file while a graphical summary can be saved in PDF format.

- One shortcoming is that data cannot be captured within a data range, as the utility is constantly running. However, if an administrator wants to review a month-by-month snapshot of reuse versus new paper usage activity, then one workaround is to take a screenshot at the start of the month, and export data as a CSV file and repeat at the end of the month, so that they will be able to compare the statistics for that particular month. This is a rather inefficient process, and it would be beneficial if this was an automated process.



e-BRIDGE Paper Reuse Report is a free utility that provides graphical data on the environmental contribution made by erasing and reusing paper using the eco hybrid MFP.



Adding devices to ePRR is easy as the utility automatically detects all networked Toshiba e-STUDIO5008LP series devices and e-STUDIO RD301 paper reusing systems.

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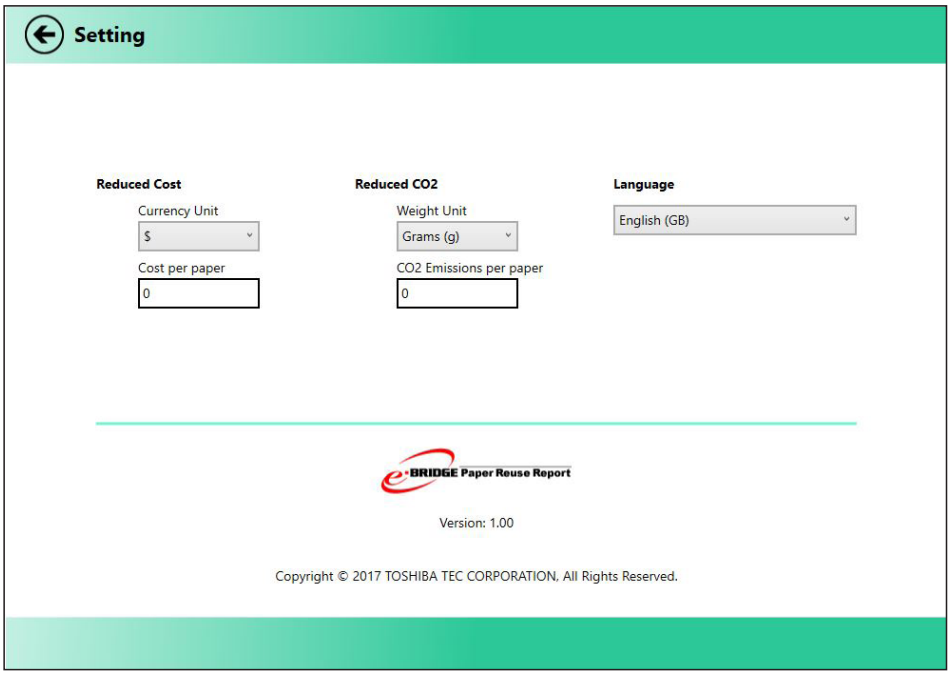
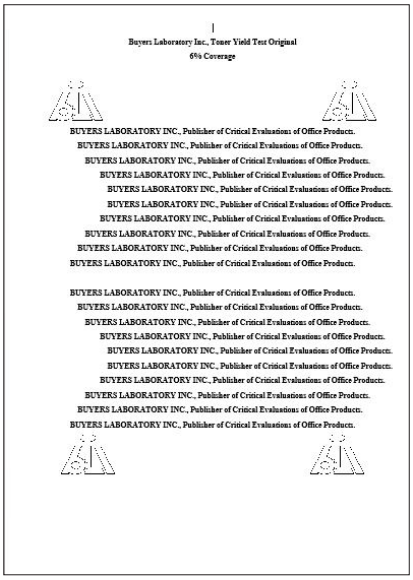


Values for CO_2 and paper costs can be localized to make the environmental cost/benefit analysis more tailored for customers.

Productivity Performance

Using a standard 6% coverage test document, BLI's productivity tests measured the time required to run 50 pages that are capable of being erased by both the e-STUDIO3508LP MFP and e-STUDIO RD301 when each device is operating in Erase mode. Ad.ditional testing was conducted on the stand-alone RD301 unit, which has an Erase Sort mode and a Scan Erase Sort mode, using two other condi-tions of paper: paper that can't be erased and an even mix of paper that can and can't be erased. Tests were timed from the start of the job until the last page to be erased has been output.


Buyers Laboratory Inc., Toner Yield Test Original
6% Coverage

BUYERS LABORATORY INC., Publisher of Critical Evaluations of Office Products.

BLI Test Target

Erase Productivity Performance when using A4 New Paper

	Mode	Production spec (ppm)	All 50 pages capable of being erased (in seconds)	All 50 pages capable of being erased (in ppm)	None of the 50 pages being capable of being erased (in seconds)	None of the 50 pages being capable of being erased (in ppm)	25 pages capable of being erased and 25 pages not capable of being erased (in seconds)	25 pages capable of being erased and 25 pages not capable of being erased (in ppm)
e-STUDIO 3508LP	Erase	17.5	193.44	15.51				
e-STUDIO RD301	Erase	30	135.59	22.46†				
	Erase Sort	15*	208.55	14.39	263.53	11.38	236.50	12.68
	Scan (to Network Folder) Erase Sort	15**	213.34	14.06	267.72	11.21	241.25	12.44
	Scan (to USB) Erase Sort	8***	388.56	7.72	443.62	6.76	416.73	7.20

†BLI noted a speed anomaly when running the RD301 in Erase mode—the device erased the first 16 A4-sized pages while running at 15.64 ppm (one minute and 1.39 seconds), but thereafter the process dramatically sped up. The device took two minutes and 15.59 seconds to erase 50 pages (a rate of 22.13 ppm), which means that when the device reached optimum erase speed at the 16-page mark, the next 34 pages were erased at a rate of 31.28 ppm (one minute and 5.2 seconds). Overall, the e-STUDIO RD301's average result is 22.46 ppm for processing 50 pages in Erase mode.

*In the case that all pages are capable of being erased.

**In the case that all pages are capable of being erased; scan destination is network folder and scan resolution is 200 dpi or lower.

***In the case that all pages are capable of being erased; scan destination is USB and scan resolution is 200 dpi or lower.

Productivity Performance in Erase Mode

- In BLI's evaluation, both devices performed effectively and handled the 50-pages that were capable of being erased without issue.
- When BLI ran 125 pages (the maximum document feeder capacity) on the e-STUDIO RD301 in Erase mode, its running speed was measured at 26.55 ppm. This mirrors the result obtained when BLI tested the RD301's predecessor model, the e-STUDIO RD30. After running 20 sheets to 50 sheets, the erasing speed reaches 30.7ppm which is on par with its rated speed of 30 ppm.
- When BLI loaded a slightly higher volume of paper in the document feeder (130 pages, five pages more than the feeder's maximum capacity), the device stopped after erasing 125 pages, and the control panel displayed a "Page Limit" message. However, batches of up to 125 sheets can be fed on a rolling basis, and the unit will continue to erase them (with the user having to press the Start button first) without prompting the user to unload the tray. When the tray reaches its capacity, the device does not resume operation automatically when the output tray has been emptied.
- With a clear productivity advantage over the MFP in Erase mode, BLI ran further tests on the e-STUDIO RD301 to see if it can handle having additional pages fed into its document feeder during operation, as this would allow for

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longer, uninterrupted erasing workflows. Unfortunately, the RD301 doesn't allow this—if extra paper is introduced when the device is in operation, the document feeder tends to jam pretty quickly. This inability to handle on-the-fly loading of paper is due to the way the feeder operates, as it part-feeds the next sheet in the stack.

- The e-STUDIO3508LP erases printed paper at a slower rate than the standalone RD301, so it's worth erasing pages in batches of 50 plus, instead of a few sheets at a time, as this will reduce the time and energy needed to get the fuser to the appropriate temperature for erasure.

Productivity Performance in Erase Sort and Scan Erase Sort modes

- The e-STUDIO RD301 achieved a 100% success rate in sorting reusable and non-reusable paper throughout the test run.
- Speed slows down when the e-STUDIO RD301 runs in Erase Sort mode and in Scan Erase Sort (SES) mode because the system must monitor the paper to detect if it has reached the maximum number of erases specified and/or if it contains content that can't be erased, such as pen marks or paper printed in black toner, both of which may have inadvertently been included in the batch of pages to be erased.
- There is a fractional drop in productivity when the e-STUDIO RD301 operates in Scan (to Network Folder) Erase Sort mode compared to Erase and Sort mode. The process of sending the scan file to the network folder adds a little bit of time to the process, depending on the file type.
- There is very little difference (about 30 seconds) between the results obtained on the e-STUDIO RD301 when handling the 50 non-reusable pages and the even mix of reusable and non-reusable pages, and operating in Erase Sort mode and in SES mode. This demonstrates that it is highly consistent in these modes whatever the condition of the paper.
- Overall, the results show that productivity fell short of the RD301 device's rated ppm for Erase Sort and SES modes, however the e-STUDIO RD301 is capable of running at 30 ppm in Erase mode, as demonstrated by BLI's 50-page reusability test.

Toner Switch Performance on the e-STUDIO3508LP

As the e-STUDIO3508LP is capable of printing with black toner as well as erasable blue toner, (unlike the predecessor e-STUDIO306LP model), BLI conducted a series of First-Page Out tests to see if there's an impact on productivity performance when switching between black and erasable blue toner.

- Results indicate that there is a two-second difference when switching from black toner to erasable blue toner; there is no time penalty when printing in erasable blue toner and then reverting to black toner (BLI would expect a longer print time for the 3rd Print Test if there was an impact on switching from erasable blue toner to black, but it is in fact consistent with the 1st Print Test).

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	1st Print Test	2nd Print Test	3rd Print Test	4th Print Test
	FPO Black Toner	FPO Erasable Blue Toner	FPO Black Toner	FPO Erasable Blue Toner
e-STUDIO3508LP	8.14	10.16	8.19	10.17

Testing is based on BLI's 6%-coverage test target document and with the input tray set to Inner Tray 1 (for the shortest paper path) as per BLI's standard lab test methodology for First-Print-Time tests.

BLI also conducted its standard job stream evaluation, which simulates printer use in real-world office environments where several users will send different types of jobs to the device simultaneously. The first job stream test was conducted using black toner, and the second test alternated between black and erasable blue jobs to see how productivity performance is impacted when the device switches between toners during longer-run jobs.

- The results indicate that it takes 8.36 seconds per toner change for the fuser unit to adjust to each switch in toner.

Job Stream

	Time (Seconds)	SPEED IN PPM
	Toshiba e-STUDIO3508LP	
Black Simplex	38.87	29.30
Erasable Blue and Black Simplex	103.73	11.00

BLI's jobstream test includes Word documents, Outlook email messages, Excel spreadsheets, PowerPoint, HTML and Acrobat PDF files, and totals 19 pages. This test simulates the type of traffic a typical device might experience in a real-world, multiuser environment. All files are sent to the device as a group, at which time the stopwatch begins; timing ends when the last page of the last file exits the device.

Erase Efficiency and Functionality

Erasing process efficiency and functionality of the e-STUDIO3508LP and the e-STUDIO RD301 was tested using a high-coverage test target and a low-coverage test target. The test target originals were printed on the e-STUDIO3508LP in erasable blue toner and then erased using the Erase mode, with the process repeated over multiple generations of erases (up to five sheet reuses). The Erase test was conducted on each unit separately.

Each erased sample was visually assessed for quality and erasing effectiveness. In addition, each sample was subjected to a high-resolution scan using a typical office scanner, which was set to 600-dpi greyscale mode with background erase and noise reduction disabled, and sensitivity/contrast raised to the highest setting so to maximise the potential for capturing any latent image data from the previous print. Further tests were conducted to assess the erase efficiency on handwritten notes made using Pilot FriXion ball pens. Standard office 80gsm A4 paper was used throughout the test.

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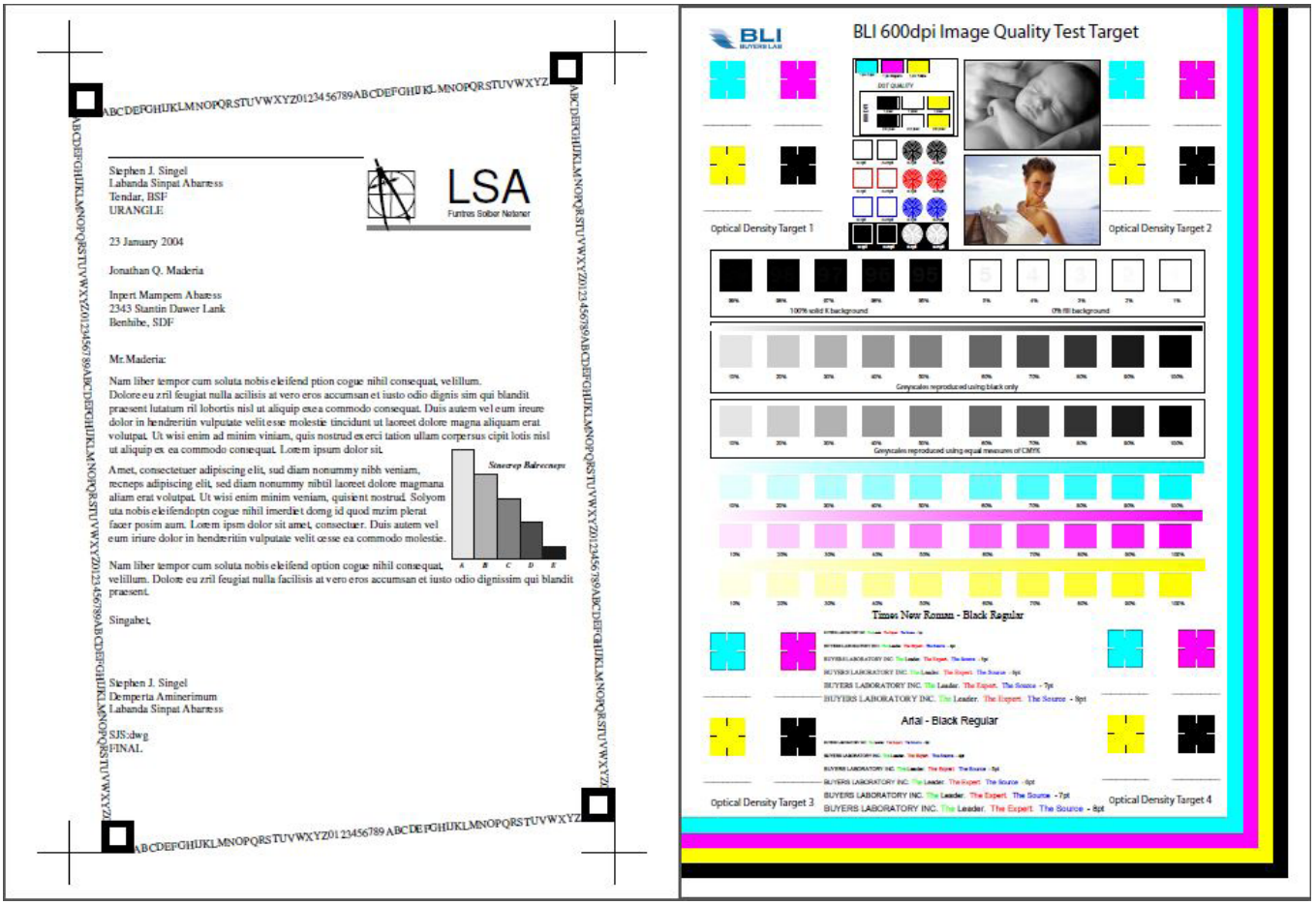

BLI used a low (6%) coverage ISO 19752 test target (left) to represent a typical office text-based document, and a high coverage BLI Standard 600 dpi test target (right), which contains a mix of text, solid areas, and halftone images in order to evaluate the effectiveness of the devices' erase function

According to Toshiba, there is technically no upper limit on how many times users can erase paper; it depends on the content of the document and how printed sheets are handled in an office, but up to five recycles is the standard marketing message. BLI assessed whether the introduction of a darker blue toner with Toshiba's latest generation eco hybrid model had any impact on the erasing efficiency of the MFP and RD301 standalone unit. A summary of the findings when using the low- and high-coverage test documents, along with examples, are provided below.

Summary of Analysis of Erasing Efficiency (Low Coverage Test File)

	Visual Analysis		Scan Result
1st Cycle			
	Print quality	**Erase efficiency**	**Scan check**
e-STUDIO3508LP	NA	Successfully erased	No data; blank page detected
e-STUDIO RD301	NA	Successfully erased	No data; blank page detected
2nd Cycle			
	Print quality	**Erase efficiency**	**Scan check**
e-STUDIO3508LP	Very Good	Successfully erased; minimal transparent impressions visible e.g., bar chart area when viewed under certain conditions, but generally okay	No data; blank page detected
e-STUDIO RD301	Very Good	Successfully erased using Erase Sort mode; slightly less transparent impression visible than that shown on the e-STUDIO3508LP's 2nd cycle sheet	No data; blank page detected
3rd Cycle			
	Print quality	**Erase efficiency**	**Scan check**
e-STUDIO3508LP	Very Good	Successfully erased; some transparent impression visible	No data; blank page detected
e-STUDIO RD301	Very Good	Successfully erased and judged reusable. Some impression of erased detail visible e.g., bar chart area but not as apparent as that from the e-STUDIO3508LP	No data; blank page detected
4th Cycle			
	Print quality	**Erase efficiency**	**Scan check**
e-STUDIO3508LP	Very Good	Successfully erased, however transparent impression increasingly visible. Would need to avoid reusing the paper if printing sensitive or personal information	No data; blank page detected
e-STUDIO RD301	Very Good	Successfully erased and judged reusable. Latent data is more visible and is legible. Would need to avoid reusing the paper if printing sensitive or personal information	No data; blank page detected
5th Cycle			
	Print quality	**Erase efficiency**	**Scan check**
e-STUDIO3508LP	Fair - previous printed content increasingly visible in blank areas on the sheet	Content is erased, but the latent impression is so apparent that BLI analysts deemed the sheet unusable for a sixth print run	Blank page detected, but when BLI rescanned the page in B/W mode and with blank-page removal disabled, some latent data was detected on the resulting scan file (see below)
e-STUDIO RD301	Fair - starting to look blurry as text is overlaid with the previous erased content	Content erased; judged reusable, but only fit for the most basic and general internal purposes	Blank page detected

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Summary of Analysis of Erasing Efficiency (High-Coverage Test File)

	Visual Analysis		Scan Result
1st Cycle			
	Original Print quality	Erase efficiency	Scan check
e-STUDIO3508LP	NA	Successfully erased but a latent impression is visible	No data; blank page detected
e-STUDIO RD301	NA	Successfully erased	No data; blank page detected
2nd Cycle			
	Print quality on 1st Cycle Sheet	Erase efficiency	Scan check
e-STUDIO3508LP	Very Good	Successfully erased but an impression of erased matter is visible	No data; blank page detected
e-STUDIO RD301	Very Good	Erased using Erase Sort mode and judged usable; latent impression is partly visible	No data; blank page detected
3rd Cycle			
	Print quality on 2nd Cycle Sheet	Erase efficiency	Scan check
e-STUDIO3508LP	Good	Successfully erased but latent impression visible	No data; blank page detected
e-STUDIO RD301	Fair	Erased using Erase Sort mode and judged unusable; impression of erased content is much stronger	No data; blank page detected
4th Cycle			
	Print quality on 3rd Cycle Sheet	Erase efficiency	Scan check
e-STUDIO3508LP	Fair	Successfully erased, but not fit for reuse due to the high visibility of previously erased content	No data; blank page detected
e-STUDIO RD301	Poor – BLI analysts deliberately changed the page orientation (sheet rotated 180 degrees) and the overall print quality was still deemed too poor to use	NA	NA
5th Cycle			
	Print quality on 4th Cycle Sheet	Erase efficiency	Scan check
e-STUDIO3508LP	Poor - output quality is fuzzy due to the visibility of previously printed content, which affected readability	Page erased, but sheet is too poor to reuse	Darker areas are picked up on the greyscale scan
e-STUDIO RD301	NA	NA	NA

- Both units demonstrated they could successfully erase the printed low-coverage document, with no erasable blue toner left on the pages. That said, the erase function could not entirely eliminate the impression of latent content from previous print cycles, particularly after the fourth erased cycle onwards.

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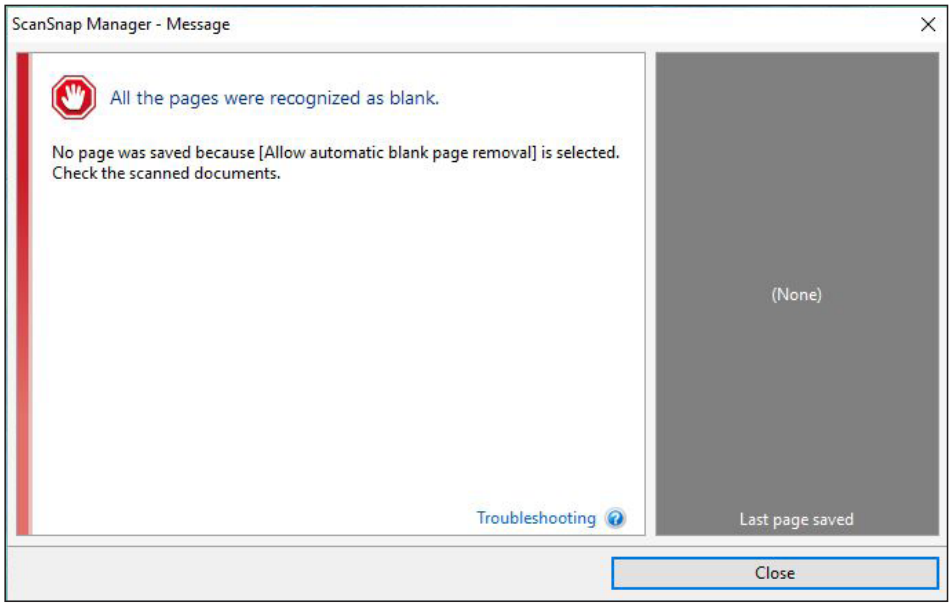
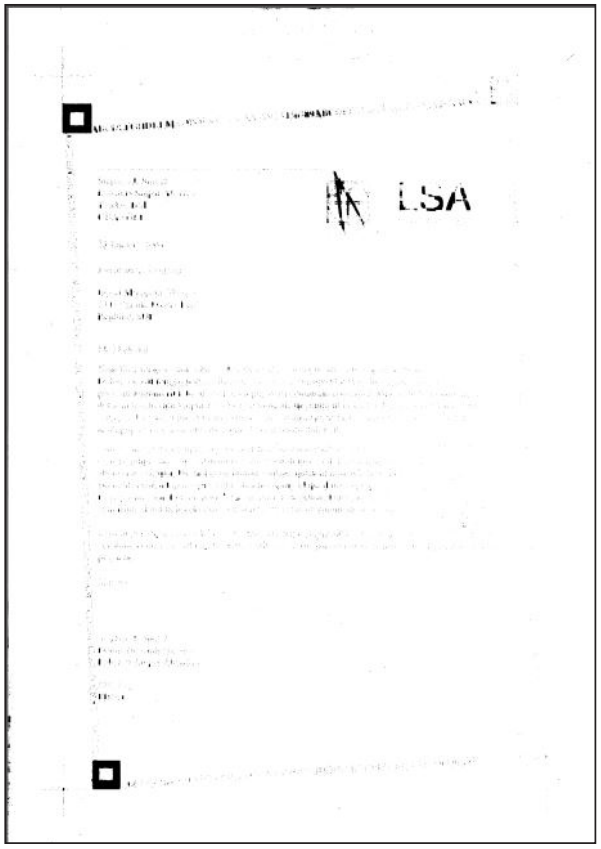
- The subsequent scan tests did not capture any image data on the erased low-coverage pages. However, when BLI rescanned a fifth-generation erased sheet in B/W mode some data was clearly visible on the scan image.



The subsequent scan tests on the low-coverage erased sheets did not capture any image data on the erased pages up to the fifth cycle.



The subsequent scan tests on the low-coverage erased sheets did not capture any image data on the erased pages up to the fifth cycle.

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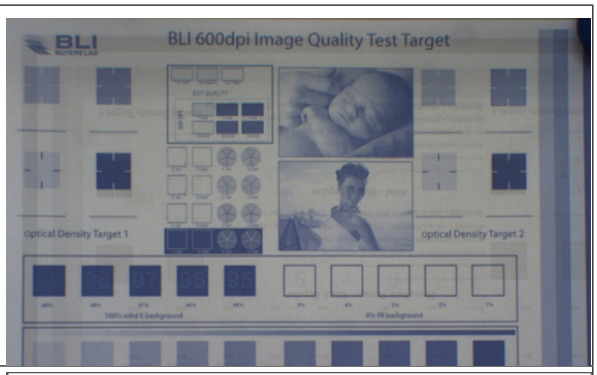
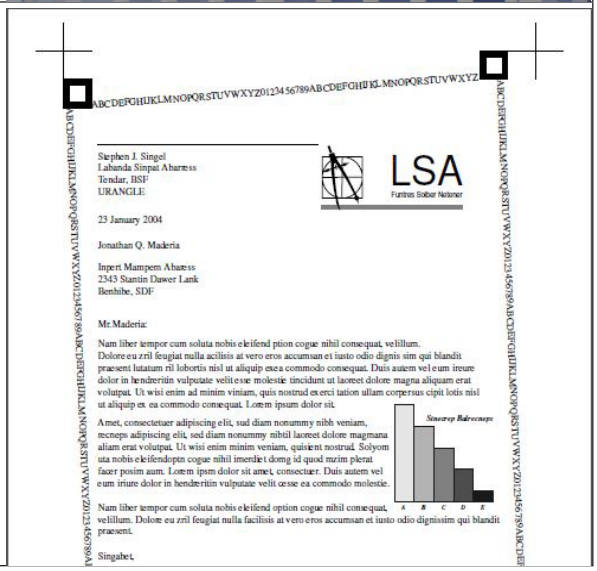
- The high-coverage document proved far trickier to handle than the low-coverage text-based document; toner that was rendered transparent in effect, had left clear impressions of content on the 'erased' page, as evidenced in the examples shown below. Furthermore, when operating in Erase Sort mode, the e-STUDIO RD301 rejected the paper as being reusable even at the first cycle stage. However, scan tests recognised the erased high-coverage sheets as blank pages for the majority of the generation erase cycles.

- BLI observed that when erased paper is loaded in the same orientation as the original printed document for printing on, the subsequent print quality is rated very good up to the fourth erase (low coverage document) and good up to the second erase (high coverage document), and is perfectly acceptable for general office use.

- Although high-coverage output was perfectly acceptable for use when printed for the third time on twice-erased paper, BLI would question the likelihood, in real-world environments, of the same type of content being printed on reused paper over and over again, and loaded in the same orientation each time. Most likely, walk up users would simply load erased paper in the e-STUDIO3508LP and e-STUDIO RD301 without considering this, or that the units may already be stacked with erased paper that had been previously printed with different content and from a variety of sources.

To check the impact of printing the same content but in a different orientation on reused paper, BLI rotated the high-coverage sheet 180 degrees when printing for the fourth time on 3rd-generation erased paper. The impression of previous erase and print cycles is clearly evident and it means this document is not fit for any type of office purpose.	
BLI rotated the fifth-erased low-coverage sheet for its sixth print; the quality is marred by the impression of previously erased content on the page.	

- Overall, BLI's test shows that latent content on a sheet becomes more apparent with each erase and print cycle it undergoes. For example, information such as the names and the address on the low coverage document became clearly visible to BLI analysts. This is clearly an important security concern for any organization. Businesses need to issue best practice guidelines over the use of erased paper and ensure staff understand the appropriate use of the device. Users will have to gauge the optimum number of erases that are appropriate for the type of printed content

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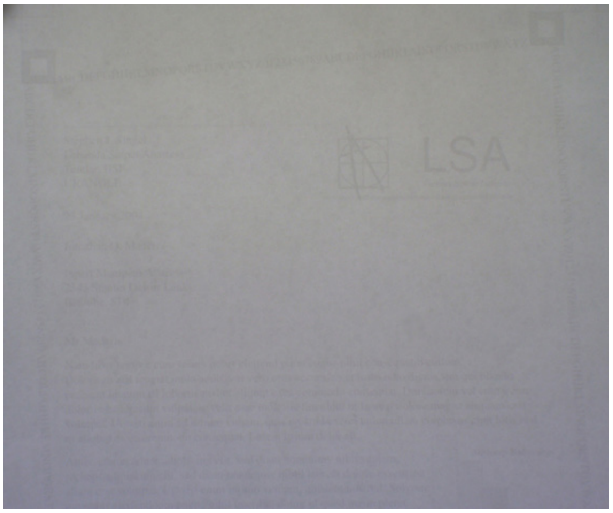
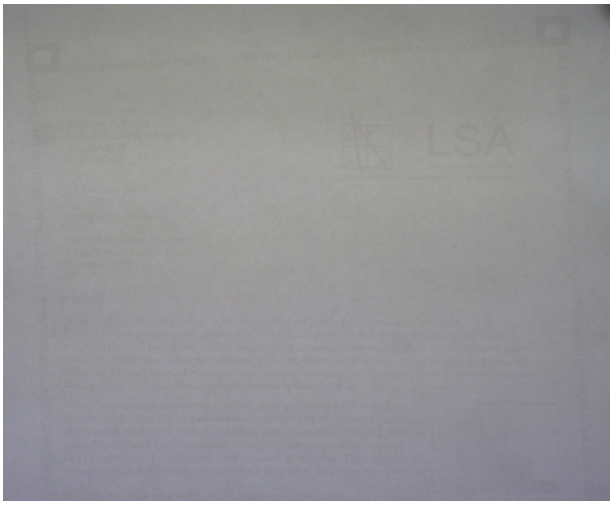
being erased on the units. Certainly, the RD301's handy reuse mark will aid the monitoring of erased sheets. In addition, users will need to use reused paper for appropriate types of communications, and ensure that documents with personal data or sensitive information on them are not reused. Toshiba stresses that erasable documents are only intended for use within an organization.

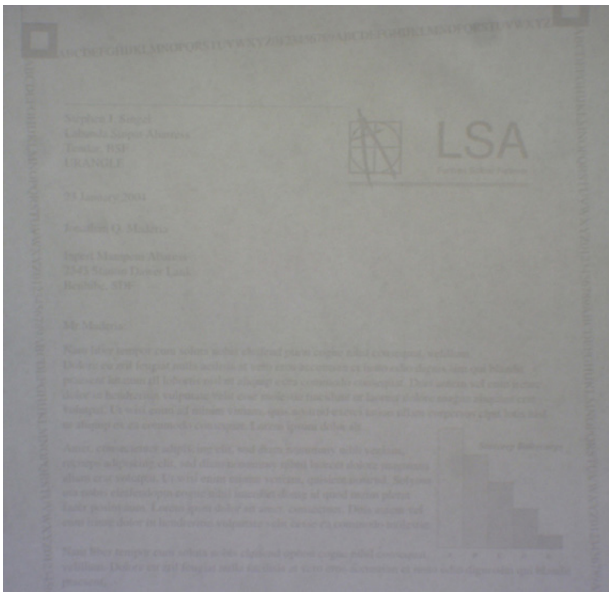
Low Coverage Erase on the e-STUDIO3508LP and e-STUDIO RD301



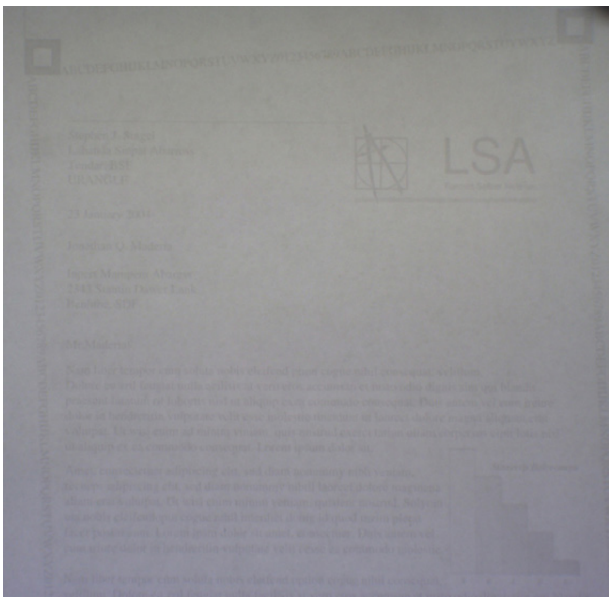
e-STUDIO3508LP: Low Coverage 1st Erase



e-STUDIO RD301: Low Coverage 1st Erase



e-STUDIO3508LP: Low Coverage 2nd Erase



e-STUDIO RD301: Low Coverage 2nd Erase

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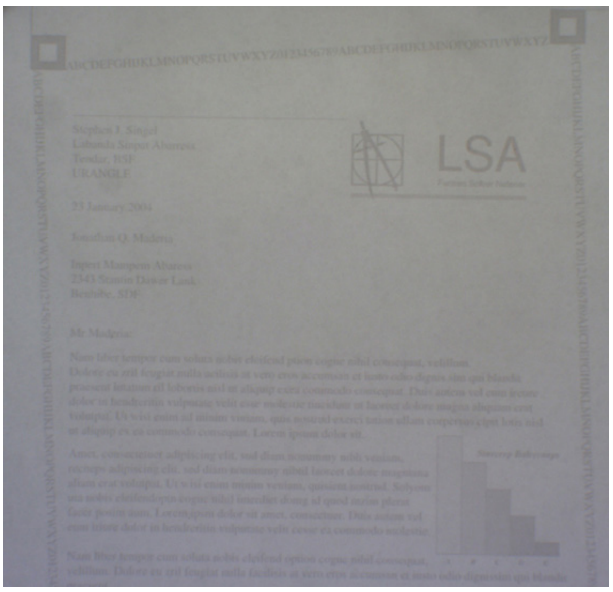
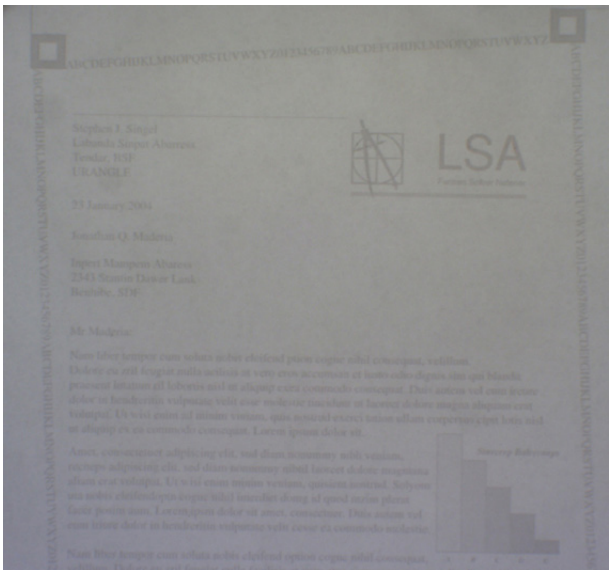
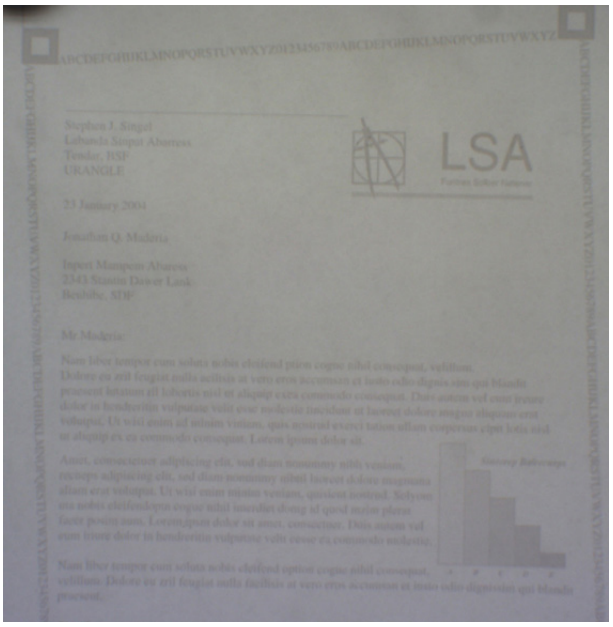


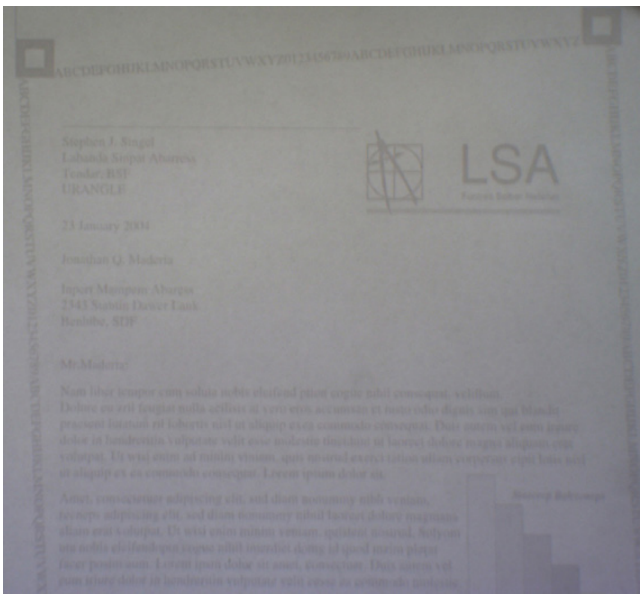
e-STUDIO3508LP: Low Coverage 3rd Erase



e-STUDIO RD301: Low Coverage 3rd Erase



e-STUDIO3508LP: Low Coverage 4th Erase



e-STUDIO RD301: Low Coverage 4th Erase

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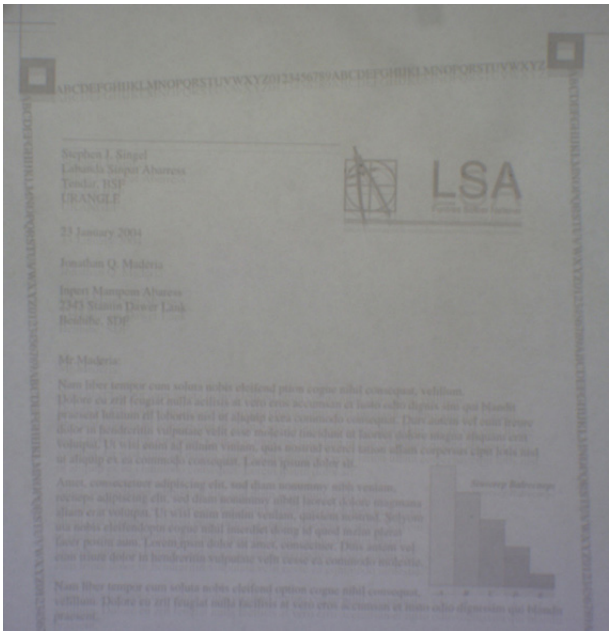
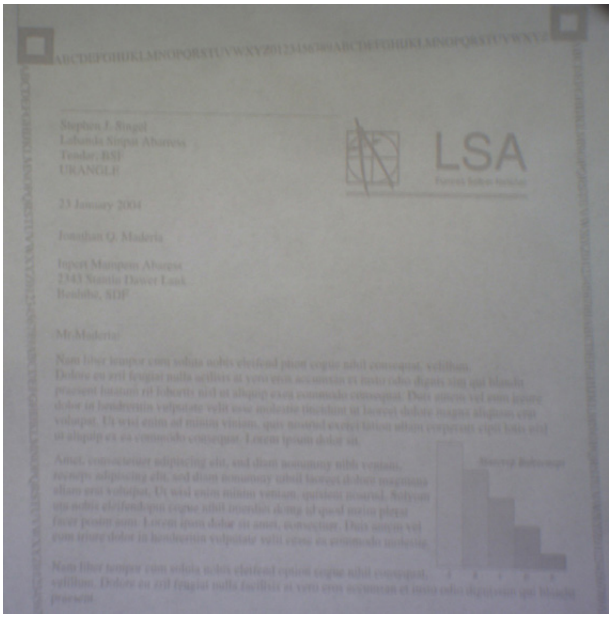
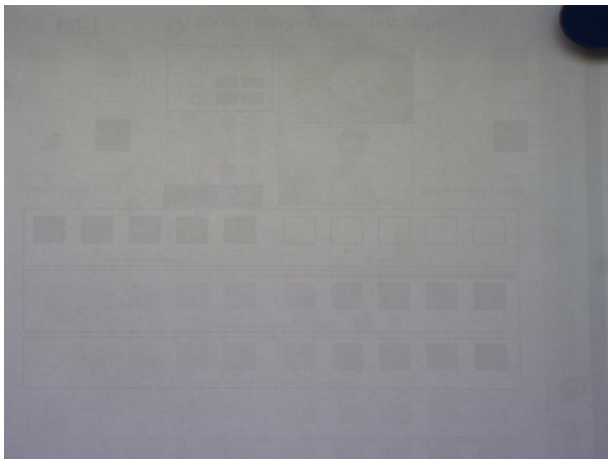


e-STUDIO3508LP: Low Coverage 5th Erase

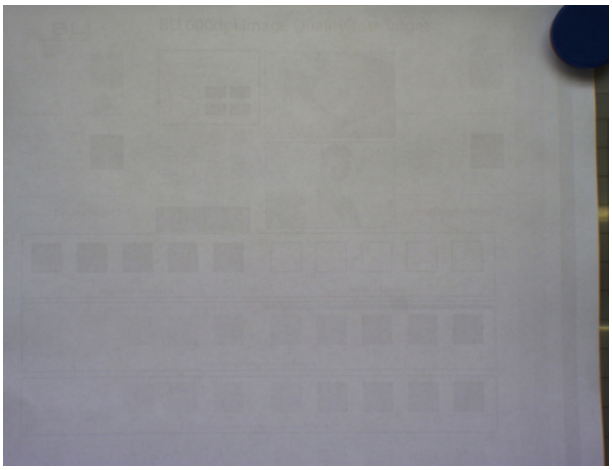


e-STUDIO RD301: Low Coverage 5th Erase

High Coverage Erase on the e-STUDIO3508LP and e-STUDIO RD301



e-STUDIO3508LP: High Coverage 1st Erase



e-STUDIO RD301: High Coverage 1st Erase

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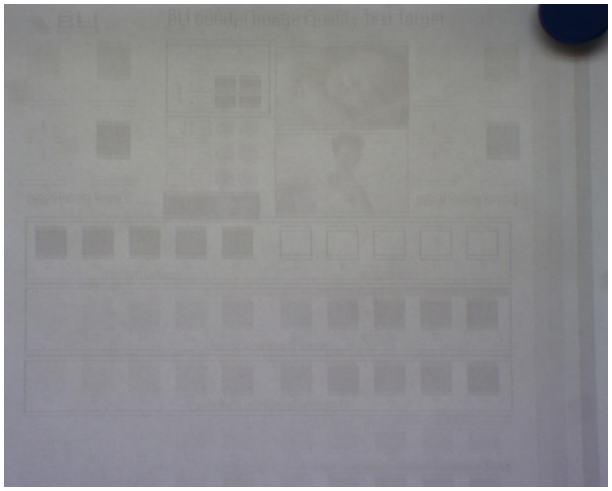
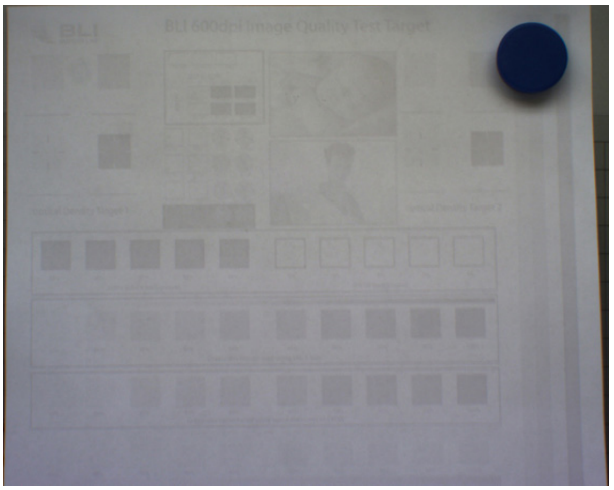
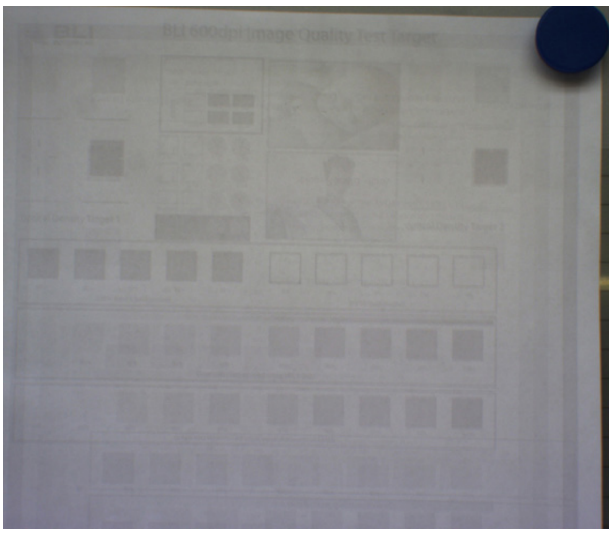


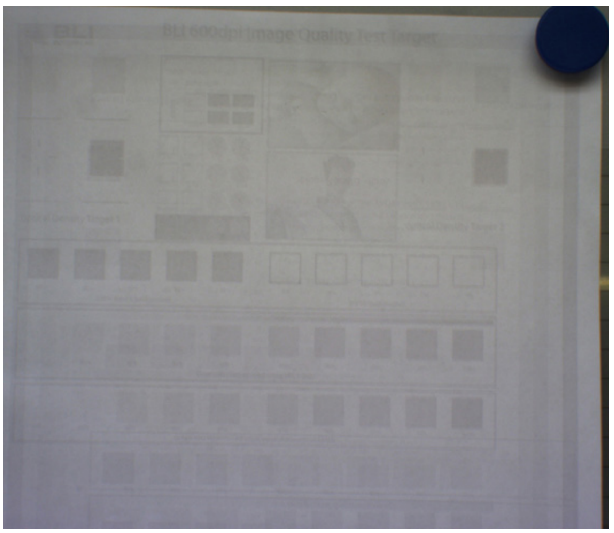
e-STUDIO3508LP: High Coverage 2nd Erase



e-STUDIO RD301: High Coverage 2nd Erase



e-STUDIO3508LP: High Coverage 3rd Erase



e-STUDIO RD301: High Coverage 3rd Erase

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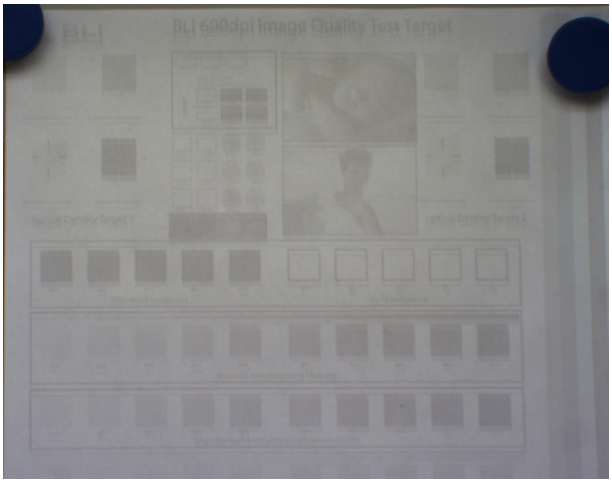
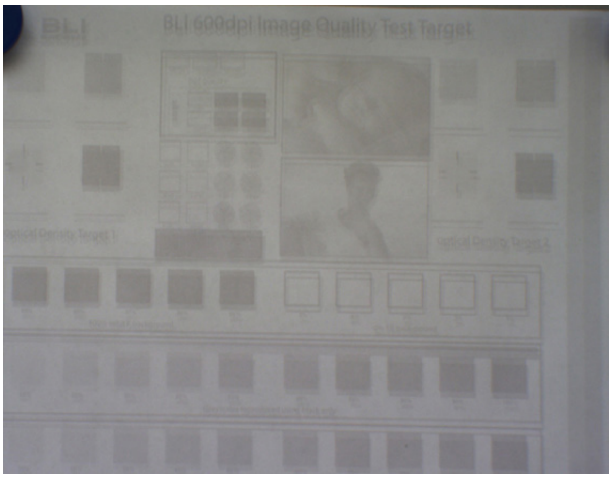


e-STUDIO3508LP: High Coverage 4th Erase



e-STUDIO3508LP: High Coverage 5th Erase

Note: BLI did not perform a 4th and 5th Erase on the e-STUDIO RD301, as paper was rejected due to the poor image quality attained on the 3rd recycled sheet (see Summary of Analysis of Erasing Efficiency (High-Coverage Test File) table above)

BLI conducted a further test using the low-coverage test target, in order to assess erase efficiency with the erasable blue toner set to Economy mode, which delivers a lighter print quality, to compare with the results obtained with the erasable blue toner set to Standard (default) mode. The results were excellent, with the economy erasable blue toner rendered transparent very effectively up to the fifth reuse. Image quality on multi-erased paper remained very consistent and of a high standard across the board as shown in the image examples shown below; the only downside is that the text is not as readable as that produced with default erasable blue toner.

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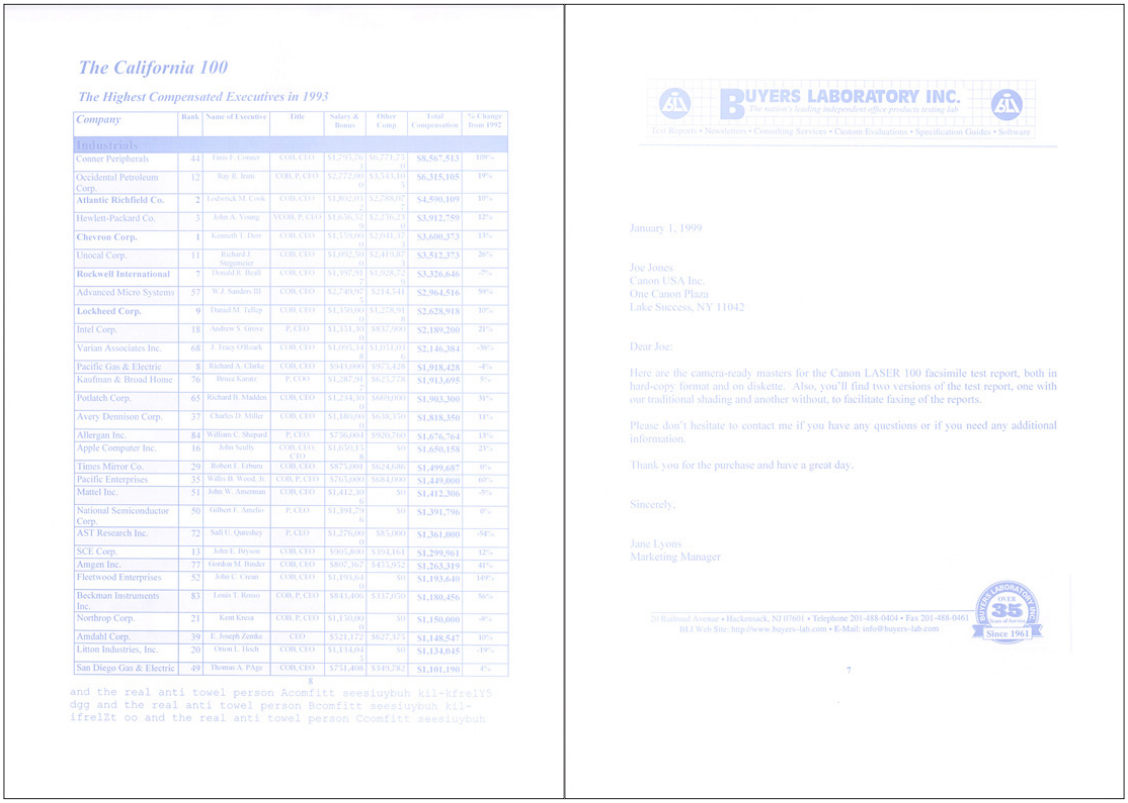
Example of print quality obtained using the first reusable paper, with Economy toner (low-coverage test target)

Example of print quality obtained on the fifth reusable paper with Economy toner (low-coverage test target). Quality is consistent with that shown on the first erased sheet.

A further behaviour was noted by BLI analysts: at sub-zero temperatures, the erased content becomes legible again. This scenario may be rare in a typical office setting, nonetheless, clearly it's an important security consideration in any organization. Toshiba acknowledge this behaviour is likely under such rare conditions and has documented the phenomenon in the device's user manual.



Text is legible again on erased paper when stored at sub-zero temperatures.

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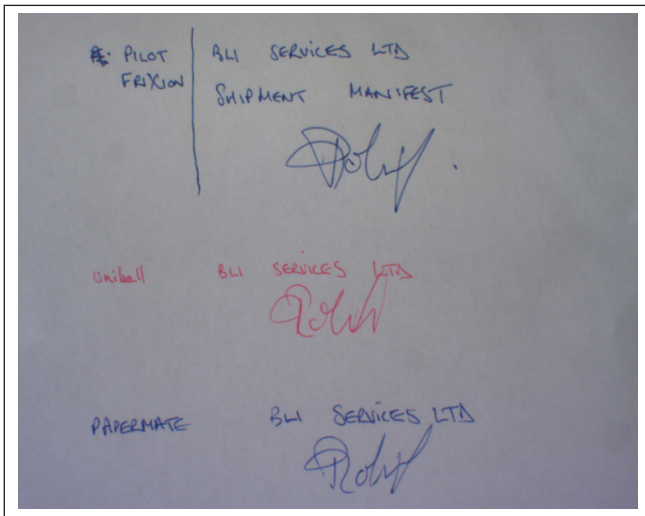
Erasing Efficiency of Erasable Pen Ink

BLI used three different brands of erasable pens to make handwritten notes on two sheets of standard 80gsm paper. The brands were Pilot FriXion (recommended by Toshiba for this test purpose), Uniball and PaperMate. The sheets were then erased on the e-STUDIO3508LP and e-STUDIO RD301, one sheet per device. The results were identical: the sheets were erased successfully, with all handwritten notes rendered transparent, regardless of the brand of pen used. This is a very good outcome as it shows the devices' Erase mode is capable of handling some of the popular brands of erasable pens available on the market very effectively, and not just the manufacturer's recommended stationery item.



Original sheet with handwritten notes

Result after being erased on the e-STUDIO RD301

Impact on Image Quality

To measure the impact on image quality after multi-generational erasing, BLI analysts printed its standard IQ test target on 'out of ream' UPM ImageTech 100gsm media in erasable blue toner and compared its image quality against multi-generational 'erased' sheets (of up to five reuses) printed with the same test target. (Note, a different test target was printed on the sheets prior to their erase cycle/s, so that any latent print impression left after the erasing process would show up more clearly).

Overall, there was not a huge difference in image quality when we focused in on the text, fine lines and solid reproduction between the sample printed on the first reused sheet and subsequent output printed on multiple-reusable sheets, as the analysis below highlights, which spells good news for users. They can expect cleanly-formed bold text and crisp fine lines, effortlessly. There was, however, less consistency shown in the halftone fill areas (in particular, the lower percentage fill levels), with printed output on the third, fourth and fifth reused sheets affected by some latent impression of former erased content, which impacted on the overall smoothness of the coverage.

Solid densities remained highly consistent over the duration of testing.

Looking at the printed document samples as a whole, some latent impression from previously erased content is clearly visible on sheets that have been reused at least three times, particularly on the fourth and fifth reused sheets. Although the legibility of text and distinctness of fine lines on all of BLI's image

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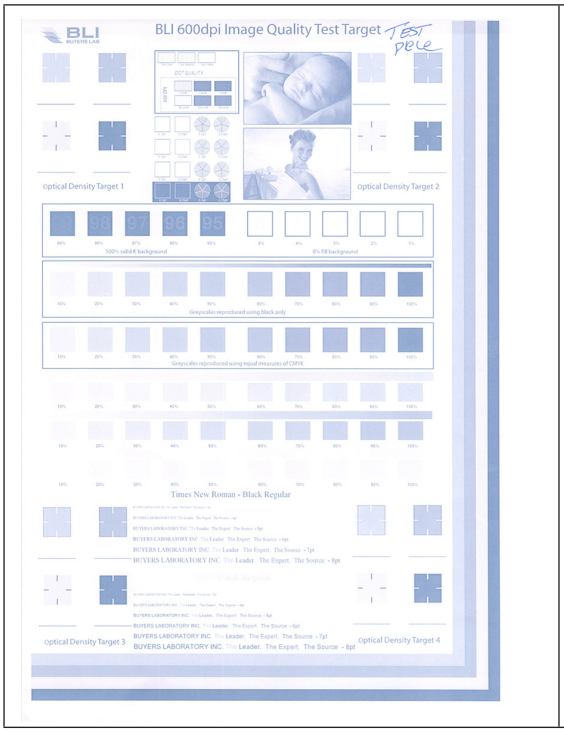
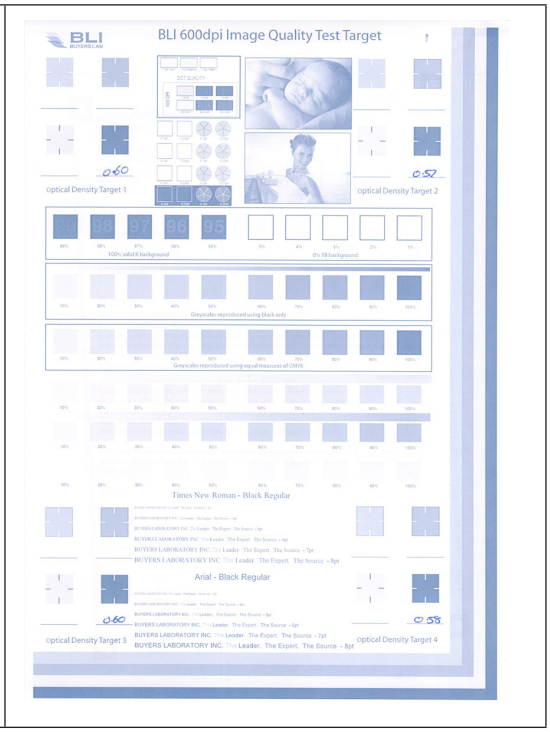
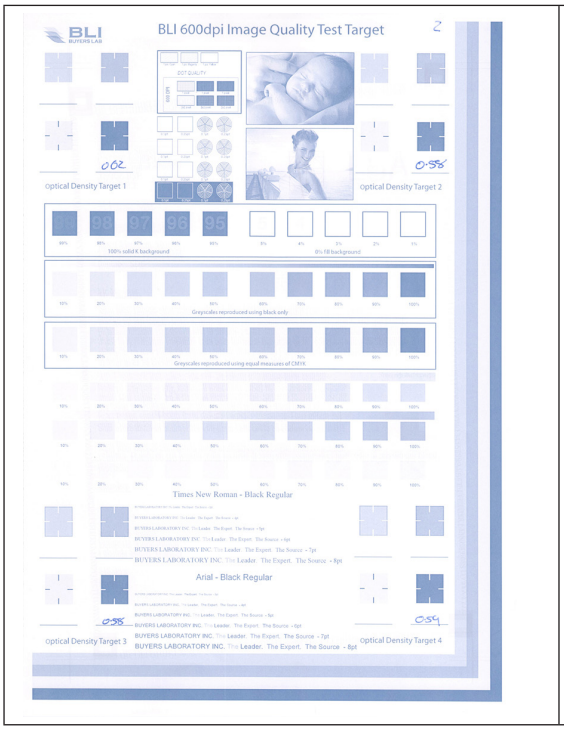
quality samples remained unaffected, the output would probably be unsuitable for more formal business communication purposes, due to the latent impression of former erased content. Toshiba acknowledge documents printed with erasable blue toner are best suited for internal office communications.



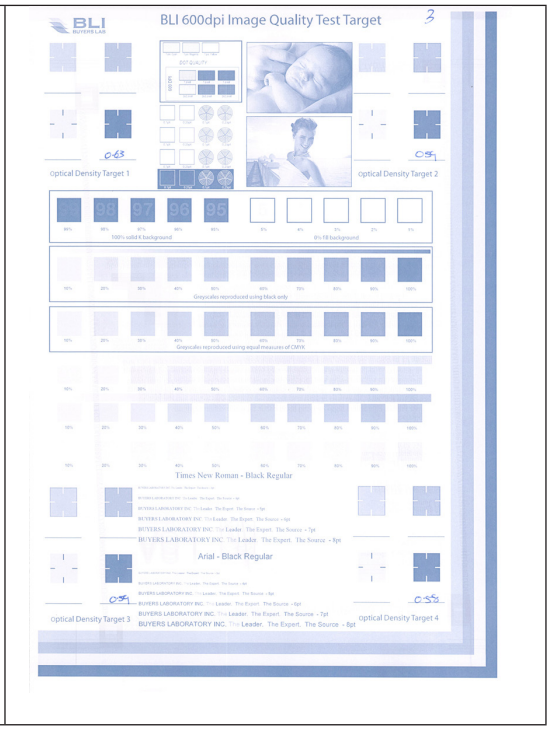
Original Print Sample



Printed Image on 1st Erased Sheet



Printed Image on 2nd Erased Sheet



Printed Image on 3rd Erased Sheet

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Printed Image on 4th Erased Sheet

Printed Image on 5th Erased Sheet

Text, Fine Lines and Halftone Reproduction

	Original Blue toner	1st Erase	2nd Erase	3rd Erase	4th Erase	5th Erase
Times New Roman serif text	4pt	4pt	5pt	5pt	5pt	5pt
Arial sans serif text	3pt	3pt	3pt	3pt	3pt	3pt
Fine Lines	0.1pt	0.1pt	0.1pt	0.1pt	0.1pt	0.1pt
Circles	0.1pt	0.1pt	0.1pt	0.1pt	0.1pt	0.1pt
White-on-Black	0.1pt	0.1pt	0.1pt	0.1pt	0.1pt	0.1pt
Pixel Grid	1x1 pixel	1x1 pixel	1x1 pixel	1x1 pixel	1x1 pixel	1x1 pixel

This chart shows the ratings and quality standards attained by the e-STUDIO3508LP on test when printing in default Standard mode on multi-generation reused sheets, as judged by BLI.

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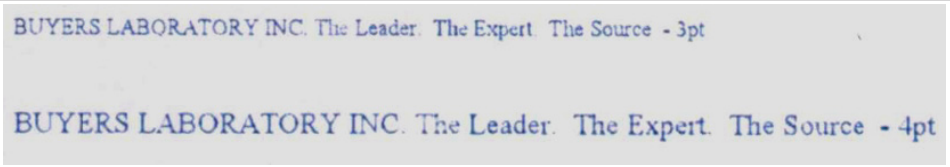
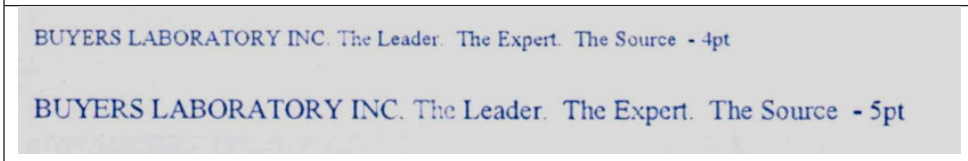
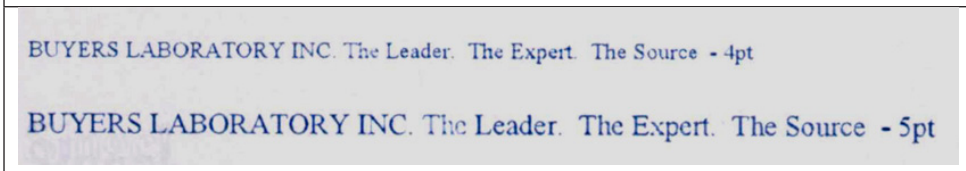
- Text reproduction quality remained fairly standard across the board. There was no difference detected in text quality between the original sample printed in erasable blue toner and that produced with the first reusable sheet—characters were fully formed and crisp. In fact, sans serif text remained legible and fully formed down to the smallest type size (3-pt.) across all output samples up to the fifth reusable sheet. Serif text suffered a slight dip in quality between the first and the subsequent reused sheets, with Times New Roman characters remaining legible only at the 5-pt. level rather than 4-pt. level as found with the original and first reused output.

- Fine lines remained clean, crisp and distinct down to the 0.1-pt. level in default settings on all print samples produced using the multi-generation reusable sheets. Circles were smooth and unbroken at the smallest (0.1-pt.) level. The quality of white-on-black fine lines and circles was very good as well, as they were clear and distinct at the 0.1-pt. level. 1x1 pixel grids were well produced and displayed a consistent dot formation pattern in default settings throughout the test.

- All printed samples showed the whole halftone range, with clear and distinct transitions between all levels and no mottling. Halftone coverage was rated very good on the first and second erased sheets; dot fill areas were smooth and consistent. From the third erased sheet onwards, the halftone ranges exhibited some latent impression of erased content at the lower percentage fill areas; however, coverage remained smooth at the higher-percentage levels.

Examples of Text Reproduction Produced on 1st, 3rd and 5th Erased Sheets (magnified to show detail):

	**1st Erase Serif Text** Text is judged fully formed and legible at the 4-pt. level.
	**3rd Erase Serif Text** Text is clean, dark and fully formed at the 5-pt. level.
	**5th Erase Serif Text** Text is dark, legible and fully formed at the 5-pt. level. There is some latent impression of erased content visible at the bottom of the 5-pt.-size text.

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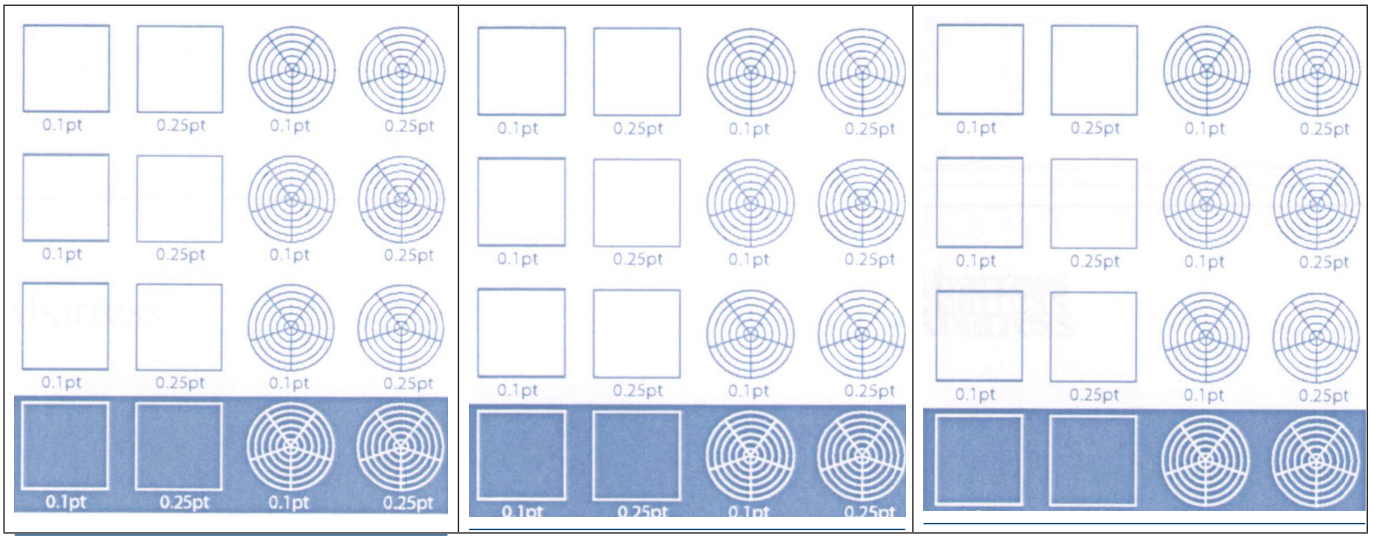
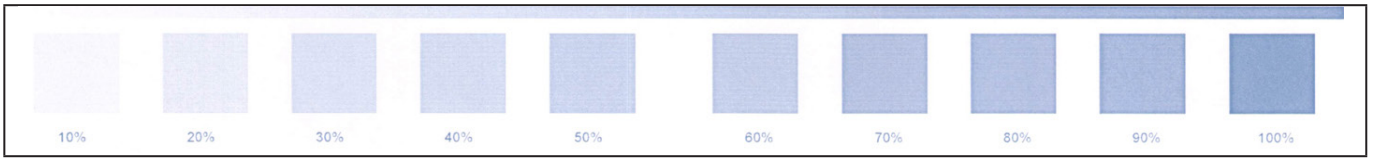
Examples of Line Art Reproduction Produced on 1st, 3rd and 5th Erased Sheets (magnified to show detail):

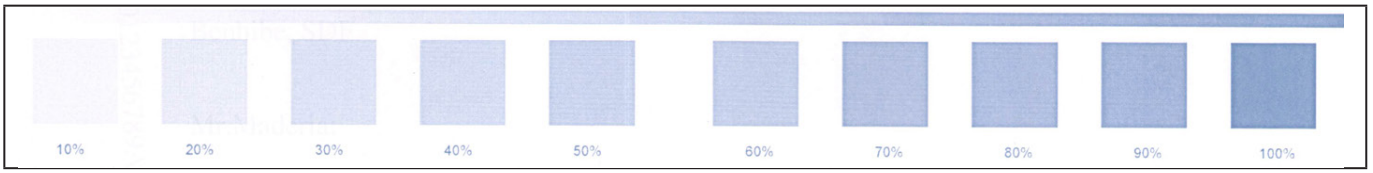


1st Erase Fine Lines and Circles | 3rd Erase Fine Lines and Circles | 5th Erase Fine Lines and Circles

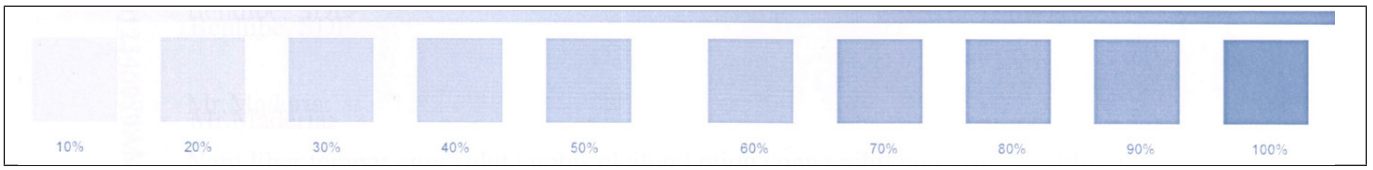
Examples of Halftone Reproduction Produced on Out of Ream and Multi-Generation Erased Sheets (magnified to show detail):



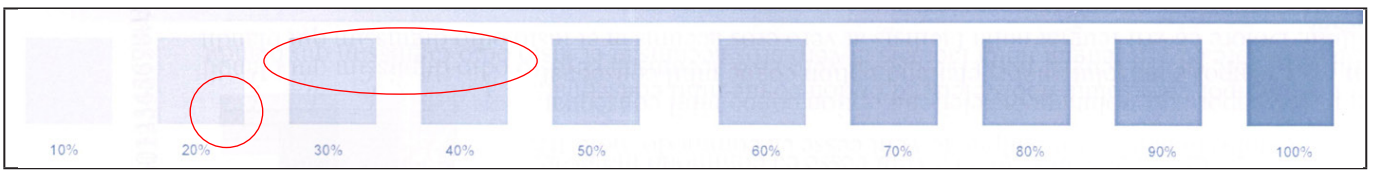
Halftones printed on out of ream paper.



1st Erase Halftones. Smooth and distinct halftone fills visible across the whole range.



2nd Erase Halftones. Very good halftone fills visible across the whole range.



3rd Erase Halftones. Halftone range is distinct at all levels, but there's some slight latent impression just starting to become visible in the lighter dot fills areas (circled)

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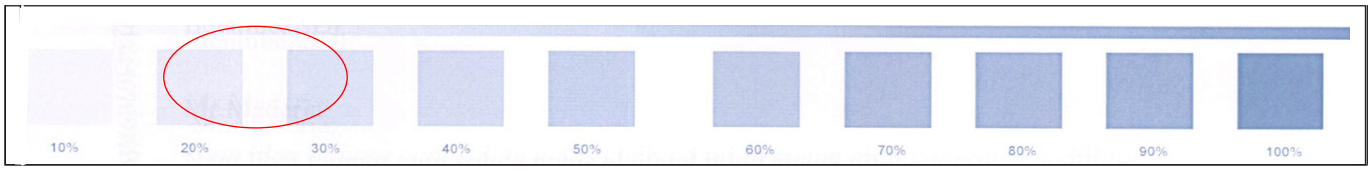
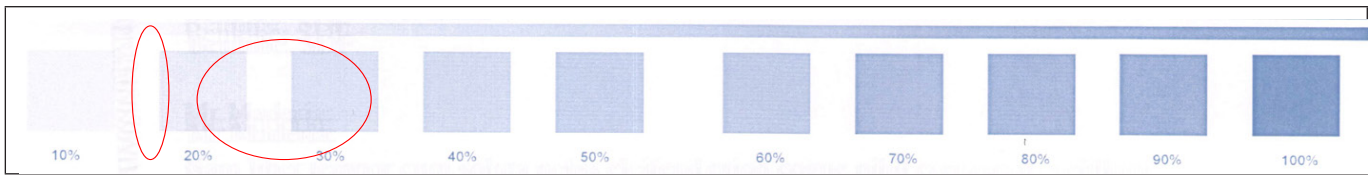


4th Erase Halftones. Visible halftone range, with some latent impression showing in the lightest dot fill areas.



5th Erase Halftones. Visible halftone range, with some latent impression showing in the lightest dot fill areas. The higher percentage dot-fill levels remain smooth, however.

Solid Density

Remarkably, solid optical density readings remained highly consistent across all printed output, regardless of how many times a sheet has been erased.

	1st Erase	2nd Erase	3rd Erase	4th Erase	5th Erase
1	0.60	0.62	0.63	0.63	0.60
2	0.57	0.58	0.59	0.57	0.59
3	0.60	0.58	0.59	0.58	0.57
4	0.58	0.59	0.58	0.57	0.58
Average	**0.59**	**0.59**	**0.60**	**0.59**	**0.59**

Measurements are based on four readings corresponding to four different solid locations on the output. The higher the density reading, the darker the image.

Impact on Image Quality with Multi-generation Copying

To assess the impact on image quality after multi-generational copying, BLI copied its standard IQ test target on multi-generation reusable paper which had been printed in using the same target and then erased. Copying was conducted in both Blue Original mode using erasable blue toner, and then in Blue Original mode using black toner.

- Overall, the quality of copied text and fine lines using erasable blue toner held up pretty well on reusable paper that had been erased up to five times. Text is well-formed, dark and legible at the larger font sizes (and you can argue that most text-based documents would not use type sizes less than 9 pt. to adhere to best practice for accessibility). Fine lines were becoming fuzzier and thicker on copied output using fifth-generation erased paper, but with no break up. However, it is the halftone range and pattern that suffer a sharp deterioration in quality when copying on reusable paper that has been erased two times or more. Coverage is grainy and uneven at up to the 40% fill level, and the 10% fill isn't visible on output, as shown in the examples below.

- All things considered, using reusable paper to copy text-based documents, or line-art graphics, in erasable blue toner delivers perfectly acceptable results and would be advantageous in environments such as schools and libraries where this type of activity is most prevalent.

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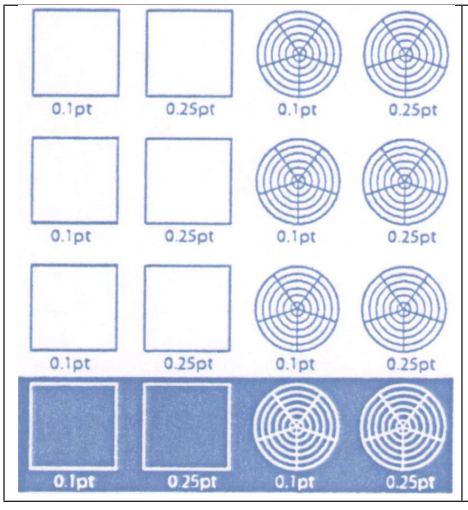
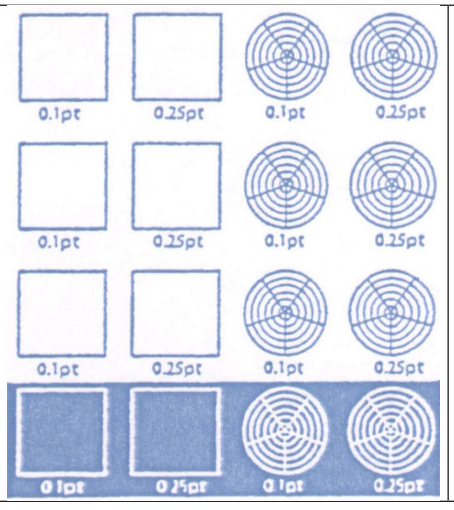
Examples of copy quality using erasable blue toner on multi-generation reusable paper

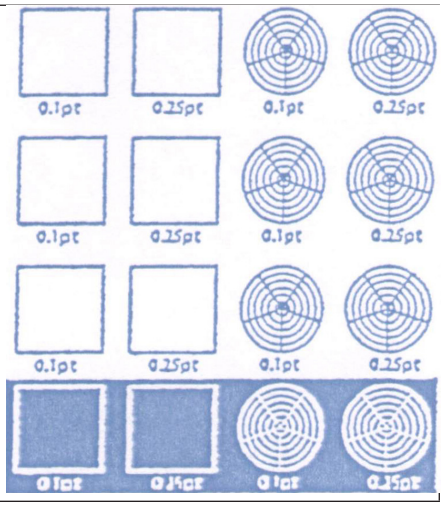
BUYERS LABORATORY INC. The Leader. The Expert. The Source - 3pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 4pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 5pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 6pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 7pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 8pt	Copied Text Reproduction Using Erasable Blue Toner on 1st Erase
BUYERS LABORATORY INC. The Leader. The Expert. The Source - 3pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 4pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 5pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 6pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 7pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 8pt	Copied Text Reproduction Using Erasable Blue Toner on 3rd Erase
BUYERS LABORATORY INC. The Leader. The Expert. The Source - 3pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 4pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 5pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 6pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 7pt BUYERS LABORATORY INC. The Leader. The Expert. The Source - 8pt	Copied Text Reproduction Using Erasable Blue Toner on 5th Erase



Copied Fine Lines Reproduction Using Erasable Blue Toner on 1st Erase



Copied Fine Lines Reproduction Using Erasable Blue Toner on 3rd Erase



Copied Fine Lines Reproduction Using Erasable Blue Toner on 5th Erase

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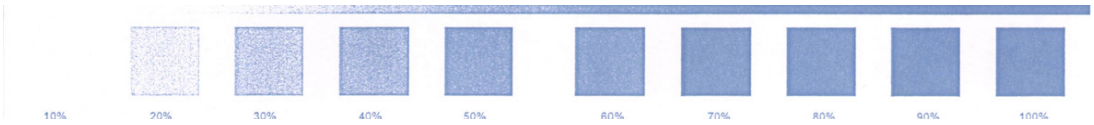
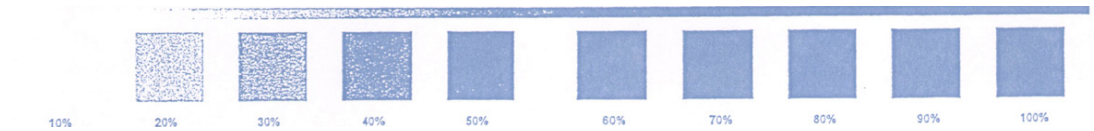
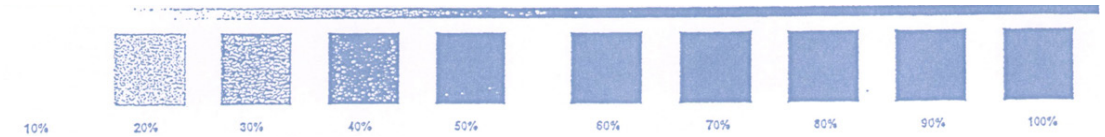
	Copied Half-tone Reproduction Using Erasable Blue Toner on 1st Erase
	Copied Half-tone Reproduction Using Erasable Blue Toner on 3rd Erase
	Copied Half-tone Reproduction Using Erasable Blue Toner on 5th Erase

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Energy Consumption

In BLI's environmental evaluation, energy consumption was measured when the devices were in three states (Energy Save, Idle and Erase modes), with five minutes consumption per mode measured and reported on. Additional testing included measuring time and energy consumption from Energy Save and Idle to first erased paper output, and overall energy consumption for batches of erasing to stimulate a planned routine bulk erasing process versus smaller batches of erasing, to mirror ad hoc activity likely to be performed by walk-up users. Tests were conducted with five minute intervals at the point of devices falling into sleep mode to allow the machines to cool down in between tests.

Five Minute Energy Tests

		5 min Energy Used in Deep Mode (wH)	5 min Energy Used in Save Mode (wH)	5 min Energy Used in Idle Mode (wH)	5 min Energy Used when Erasing Continuously (wH)
e-STUDIO3508LP		N/A	2.135	6.318	39.731
e-STUDIO RD301	Erase Mode	0.131	2.447	11.773	55.431
e-STUDIO RD301	Erase Sort Mode	0.131	2.447	11.773	41.264
e-STUDIO RD301	SES Mode* (100% erasable sheets SlimPDF Multi Colour)	0.131	2.447	11.773	40.164
e-STUDIO RD301	SES Mode (100% erasable sheets PDF Multi B&W (Blue) mode)	0.131	2.447	11.773	38.246
e-STUDIO RD301	SES Mode (alternate pages capable of erased/not capable of being erased SlimPDF Multi Colour)	0.131	2.447	11.773	40.241

This chart shows the amount of energy used by the devices during five minutes of erasing, and during five-minute periods spent in both Idle and Energy Save mode.

*SES Mode = Scan Erase Sort mode; test readings were measured from the time paper was inserted into the document feeder, which brings the RD301 immediately out of sleep mode, to when the digital file appeared in the network archive folder.

- The RD301 unit has two levels of sleep mode—Deep mode and Energy Save mode—whereas the e-STUDIO3508LP just has an Energy Save mode. The ultra-low energy used by the RD301 during five minutes spent in Deep Mode is 94.6% lower than that used in Energy Save mode.
- The RD301 wakes up instantly as soon as paper is loaded in the document feeder so there's no warm up time. The e-STUDIO3508LP has an auto-power-saving mode and is capable of entering sleep mode after 1, 3, 4, 5, 7, 10, 15, 20, 30, 45 and 60 minutes; the RD301'S auto-power-saving mode can be set to 1, 3, 5, 10, 20, 30, 45 and 60 minutes. Times can be adjusted in TopAccess by the administrator.
- When remaining in active ready (Idle) state, the state in which most devices are likely to spend their time in during office hours, the e-STUDIO3508LP consumes nearly half the amount of energy used by the RD301 unit (46.3% less energy).
- Again, the MFP unit is 28.3% more energy efficient (than the RD301 when erasing continuously for five minutes (although this advantage will be offset against its slower productivity compared with the RD301 unit, as the results for the batch erasing demonstrate below).

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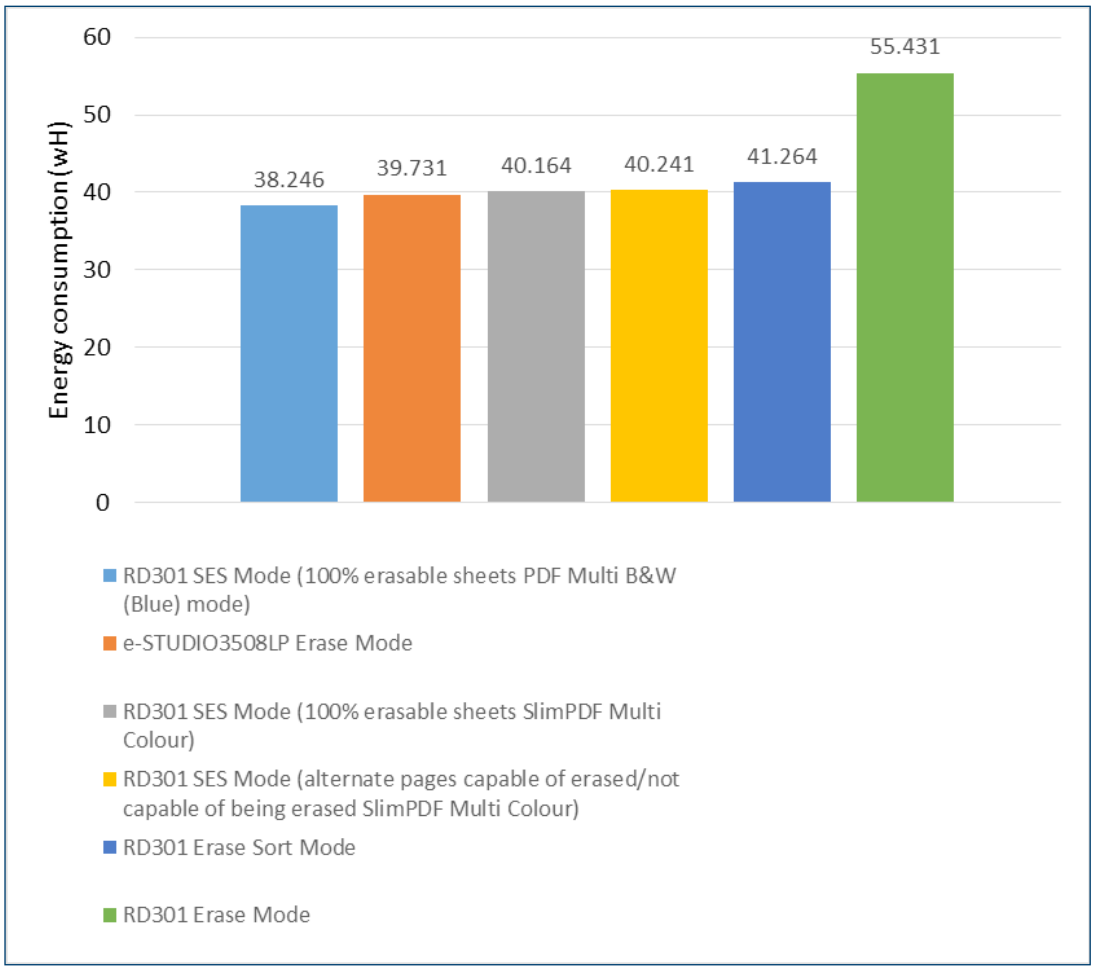
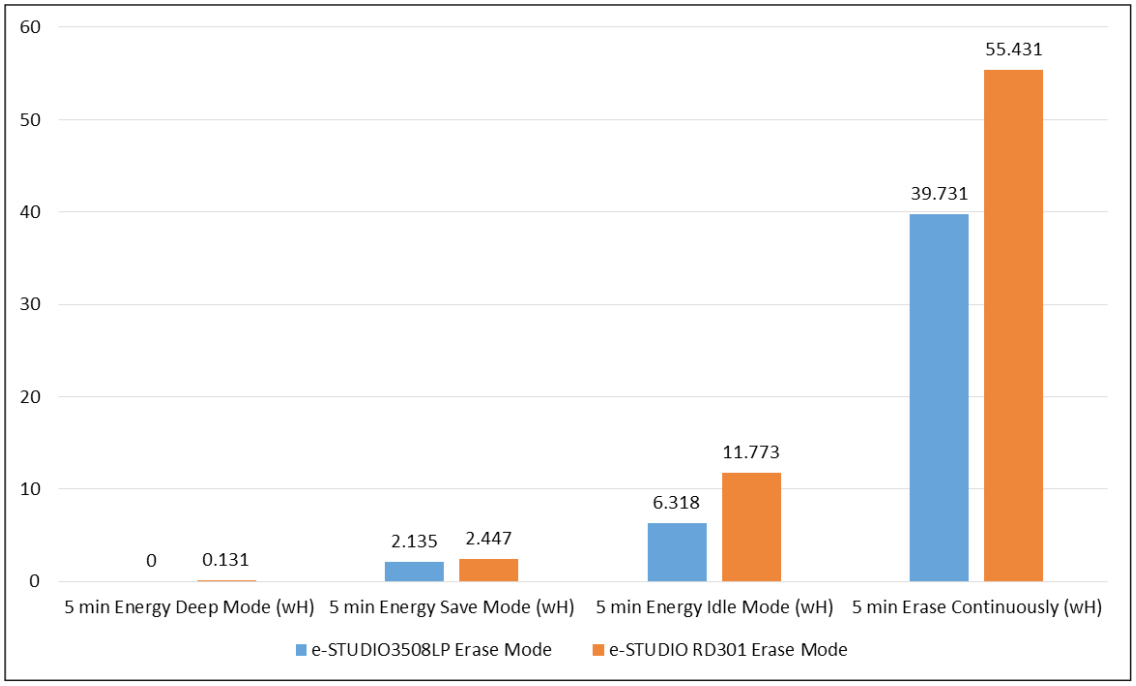
- Interestingly, the RD301 consumed 34.3% more energy during five minutes of continuous erasing activity in Erase mode, than the amount used when operating in Erase Sort mode; and, compared with the average amount of energy it used during five minutes spent in Scan Erase Sort mode, the figure is higher at 40.1%. It would be assumed that these additional workflows (of sorting and scanning and sorting) would have a negative impact on energy consumed versus Erase mode, and not the other way round.

Energy Consumption Used During Five Minutes of Continuous Erasing Activity



This chart shows the test models' energy consumption during a five-minute period spent in Erase mode, arranged from lowest to highest.

Energy Consumption Used During Five Minutes Spent in Sleep, Idle and Erase modes



This chart shows the test models' energy consumption during five-minute periods spent in Energy Save, Idle and Erase mode.

First-Erased-Page-Out Tests

		Energy from sleep to first erased page out (wH)	Time from sleep to first erased page out (seconds)	Energy from idle to first erased page out (wH)	Time from idle to first erased page out (seconds)
e-STUDIO3508LP	Erase Mode	*	*	5.12	35.00
e-STUDIO RD301	Erase Mode	1.24	11.00	1.37	10.00
e-STUDIO RD301	Erase Sort Mode	1.76	13.00	1.64	13.00
e-STUDIO RD301	Scan Erase Sort Mode (100% erasable sheets SlimPDF Multi Colour)	1.95	22.00	1.85	23.00
e-STUDIO RD301	SES Mode (100% erasable sheets PDF Multi B&W (Blue) mode)	2.41	18.00	1.83	16.00
e-STUDIO RD301	SES Mode (alternate pages capable of erased/not capable of being erased SlimPDF Multi Colour)	NA	NA	NA	NA

This chart shows the amount of energy used and time taken by the devices when erasing a single-page from sleep and idle modes.

*As the user must interact with the e-STUDIO3508LP in order to initiate the Erase feature, the machine will emerge from sleep immediately and so BLI cannot obtain a result.

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- In the first-erased-page-out from Idle mode test, the e-STUDIO3508LP used 273.7% more energy than the RD301 unit, and took 25 seconds longer to erase a single page from ready state.
- Overall, there's no significant difference in the amount of energy consumed and the time taken to erase a single page from sleep mode versus idle mode with the RD301.
- However, when the RD301is operating in SES mode, there is a sharp increase in the amount of time it requires to complete the test vs. Erase mode, particularly when scanning to PDF Multi B&W (Blue) mode—11 seconds longer from sleep mode, and 13 seconds longer from idle mode. Energy consumption figures obtained when operating in SES mode weren't significantly higher than the results attained in Erase and Erase Sort mode.

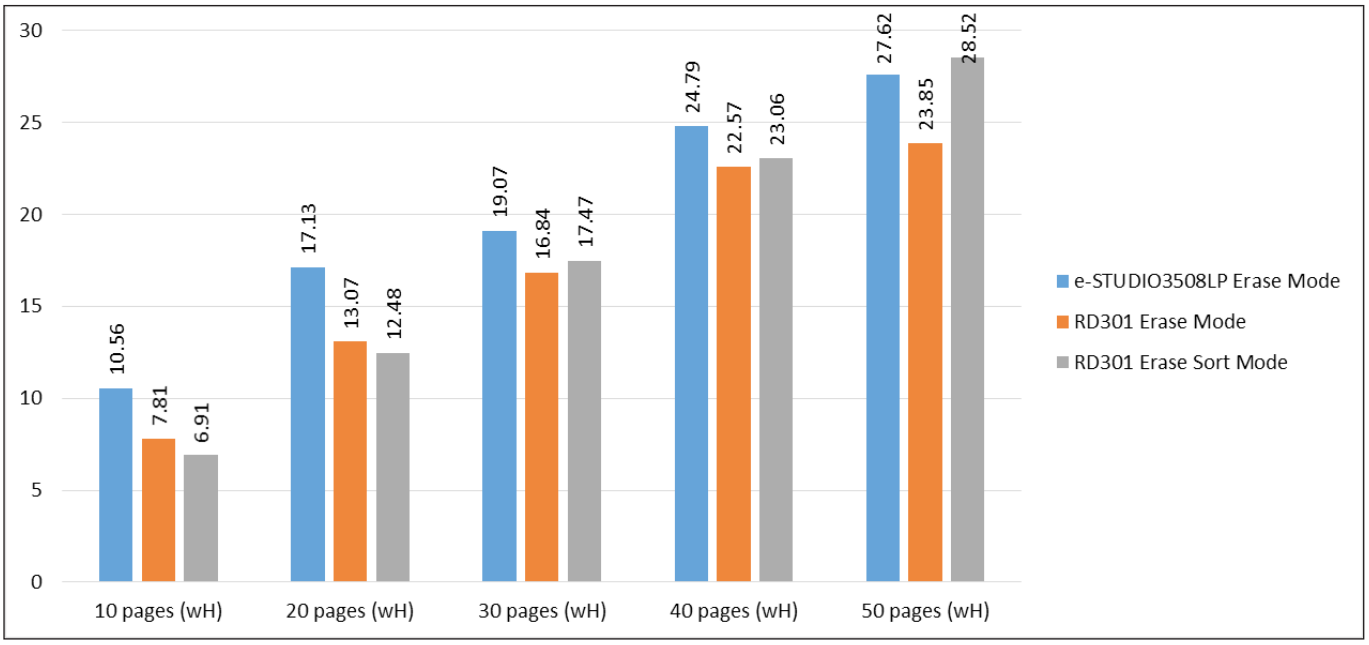
Ad hoc Erasing in Small Batches

		Energy from sleep to erase 10 pages (wH)	Energy from sleep to erase 20 pages (wH)	Energy from sleep to erase 30 pages (wH)	Energy from sleep to erase 40 pages (wH)	Energy from sleep to erase 50 pages (wH)
e-STUDIO3508LP	Erase Mode	10.56	17.13	19.07	24.79	27.62
e-STUDIO RD301	Erase Mode	7.81	13.07	16.84	22.57	23.85
e-STUDIO RD301	Erase Sort Mode	6.91	12.48	17.47	23.06	28.52
e-STUDIO RD301	Scan Erase Sort Mode (100% erasable sheets SlimPDF Multi Colour)	9.09	16.66	24.25	32.74	44.85
e-STUDIO RD301	SES Mode (100% erasable sheets PDF Multi B&W (Blue) mode)	7.00	12.50	17.51	22.59	28.50
e-STUDIO RD301	SES Mode (alternate pages capable of erased/not capable of being erased SlimPDF Multi Colour)	9.59	16.46	25.95	33.64	44.50

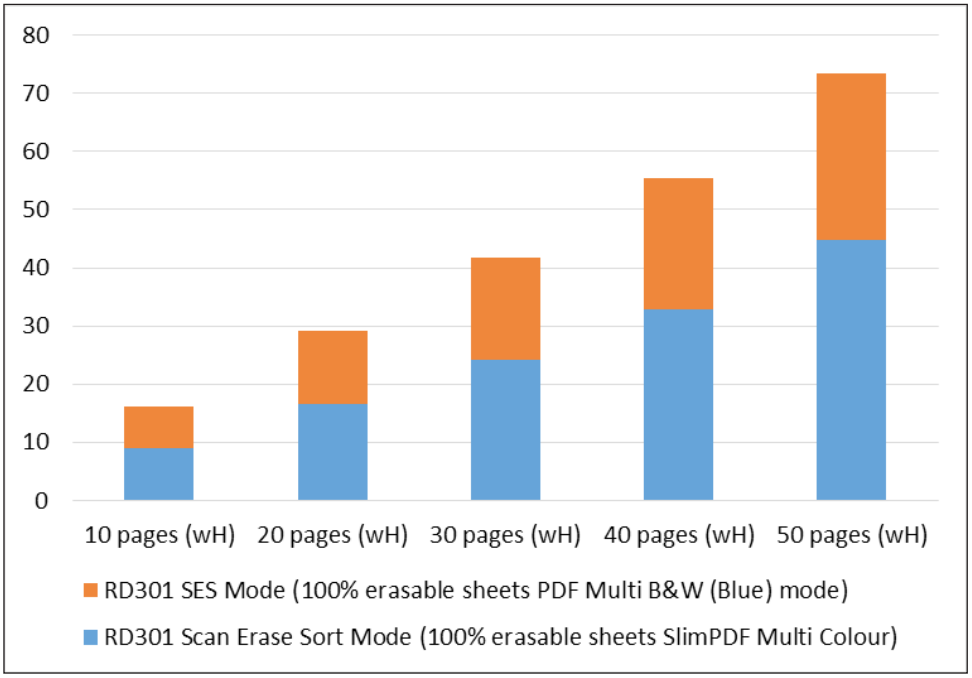
This chart shows the overall energy consumption used by each device when erasing in small batches.

- The RD301 is pretty energy efficient when compared with the e-STUDIO3508LP in all tests conducted in Erase mode, but that's not surprising given it is capable of erasing batches much faster than the e-STUDIO3508LP and it does not need any warm up time, unlike the MFP. Its rate of energy consumption when erasing different-sized batches increases on a much smaller scale than that experienced with the MFP. For example, the RD301 uses 5.7% more energy to erase 50 pages than it used for erasing 40 pages, while the e-STUDIO3508LP uses 11.4% more energy to erase 50 pages versus 40 pages.
- There's no significant difference between the RD301's energy consumption in Erase mode and Erase Sort mode when erasing in batches of 10 pages up to 40 pages; thereafter the unit consumes 19.6% more energy in Erase Sort mode versus Erase mode when erasing 50 pages.
- When the RD301 erases in small batches of 10 sheets in SES mode, its energy consumption figures are considerably higher than figures recorded in Erase mode, particularly when SlimPDF Multi Colour is selected. This is due to the unit remaining in full ready mode until the transfer of the scan file to the network is completed. Given that 99.9% less energy is consumed by the RD301 during five minutes of deep sleep (0.131 wH) compared with ready mode (11.773 wH), it would be a major plus if an auto sleep function could be triggered during the data transfer process to minimise energy use.

- BLI analysts observed that when the scan file format option of PDF Multi B&W (Blue) mode is selected, users can save anywhere between 23.0% and 36.5% on the energy consumed when using SlimPDF Multi Colour, which is due to the greatly diminished time for the scan data to be transferred to the network, allowing the device to enter sleep mode at a faster rate.



This chart shows the devices' energy consumption when erasing batches of 10 pages, up to 50 pages.



This chart shows the RD301's energy consumption in SES mode when set to different scan formats, with the PDF Multi B&W (Blue) mode clearly the more energy efficient option as the number of pages being erased increases.

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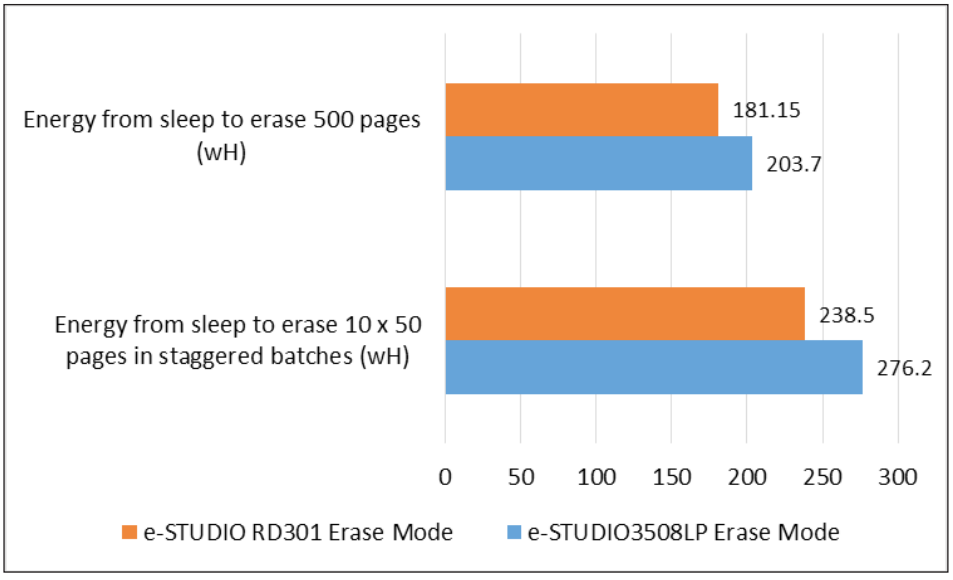
Planned Bulk Erasing Activity

BLI assessed the energy consumption and time required to erase 500 pages, to replicate a planned bulk erasing activity in an office setting. BLI erased 500 sheets of A4 paper on the e-STUDIO3508LP, which is capable of handling this stack all at once, and erased five batches of 100 sheets on the RD301 in a continuous rolling operation.

		Energy from sleep to erase 10 x 50 pages in separate staggered batches (wH)	Energy from sleep to erase 500 pages in one rolling session (wH)	Time to erase 500 pages (minutes)
e-STUDIO3508LP	Erase Mode	276.2	203.70	00:29:11
e-STUDIO RD301	Erase Mode	238.5	181.15	00:19:46

- Test findings confirm that both units become more energy efficient as the amount of paper to be erased increases, with planned bulk erasing being the best way to achieve optimum energy consumption. Plus, bulk erasing paper involves far less user intervention, particularly on the e-STUDIO3508LP which can handle 500 sheets in one go, so workers can concentrate on more important tasks while the units are running in Erase mode.
- The RD301 uses 11% less energy to erase 500 pages (and is 10 minutes faster) than the MFP, despite having to process 100 sheets over five rolling cycles, while the MFP can handle 500 pages in its erase drawer in one continuous operation.
- The MFP device uses over a quarter less energy to bulk erase 500 pages in one continuous operation than that required to erase 50 pages in 10 separate sessions; this is an immediate, clear and beneficial energy saving for businesses. And, an even greater saving when compared with 50 sessions of erasing 10 pages at a time, which would amount to 528 wH, over double the energy consumption required for the 500-sheet batch erasing process.



This chart shows the devices' energy consumption difference when erasing 500 pages in one continuous session versus erasing 50 pages over 10 ad hoc occasions.

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For any organization committed to maintaining a 'green' work policy, the ability to print, erase and reuse paper on the e-STUDIO3508LP has some clear environmental and cost benefits.

As BLI's evaluation demonstrates that technically, paper can be reused up to five times—depending on the type of content printed, how it's going to be used and the condition of the paper—this alone shows waste can be reduced as well as stationery spend. For example, it costs approximately £0.02* to erase a ream of paper on the MFP; offset this against the average purchase price of a ream of low-grade office paper at £4.00 and it is clear that significant savings to office budgets are achievable. One further consideration, is that the manufacture of one ream of standard virgin paper requires 26.90 kWh (source: Princeton University, www.princeton.edu/~clusters/printless/statistics.html); erasing one ream of paper for reuse on the e-STUDIO3508LP uses just 0.2037 kWh—99% less energy is involved.

Note, for the purposes of this evaluation, BLI has not conducted a true cost benefit analysis, which would take into account life-cycle costs, including the acquisition cost of the hardware and the cost-per-page of the consumables such as the erasable blue toner cartridges used by the e-STUDIO3508LP.

*Energy cost is based on GBP: £0.1033 per kWh, provided by EUROSTAT, the Statistical Office of the European Communities.

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 2008 servers, Windows 10 workstations, 10/100/1000BaseTX network switches and CAT5e/6 cabling.

About Buyers Laboratory

Buyers Laboratory (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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