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LABCHECK

Toshiba e-STUDIO 650

with EFI GA-1140 print controller

65ppm Digital Copier - Printer - Scanner

Also Sold As:
Sharp AR651

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End-User Oriented Testing : BERTL is widely regarded as the world's leading independent digital test lab with expertise spanning 12 years of hands-on testing of highly complex digital imaging devices and multifunction systems. BERTL is 100% independent and tests approximately 200 digital imaging systems each year, with all tests being "End-User" oriented. BERTL also publishes : DataCheck™ Side by Side Comparison service (compare 4 machines at a time), PageCheck ™ software, which measures page coverage and produces cost of ownership reports, Digital Times™ online magazine and a range of other specialist subscription-based services at www.BERTL.com.

OVERALL SUMMARY

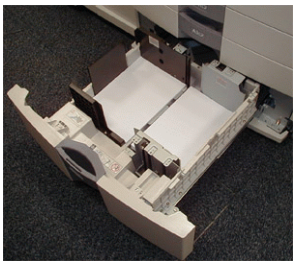
PROS	**Fastest copy and print speeds measured on current 65 to 70ppm devices.** Well designed icon based printer driver. Flexible document production capabilitiesallows users to incorporate up to 5 paper sources into a single document (6 with bypass). Good finishing options including booklet maker and post-process insertion. Finisher can also be used offline to produce up to 15-sheet documents (60 page booklet). Functional Scan to E-mail and Scan to FTP capability. Aggressive entry level pricing for copier base unit.
CONS	If fully configured, the GA-1140 is a relatively expensive print controller, compared to Toshiba's GL-1020. Scan to e-Mail is functional but not as advanced as competitors. Max 1,000 sheet ledger/A3 supply in drawers (this may only affect booklet maker users). 5 next job copy memories versus between 9-to-unlimited on some comparable devices. High bandwidth created on standard word processing documents, plus the driver was unable to recognise the collation commands within standard office applications. Some functions could be more advanced.

Toshiba e-STUDIO 650 with 4,000 sheet LCF, Post Process Insert and booklet making finisher

This report covers the Toshiba e-STUDIO 650 with EFI manufactured GA-1140 print controller; price, performance and functionality will differ on the same device configured with the Toshiba manufactured GL-1020 print controller.

The Toshiba e-STUDIO 650 is a 'ground up' newly designed system which has a 55, 65 and 81cpm version built around the same engine and components. The introduction of this new range is well timed for Toshiba because their previous 55-81cpm models were effectively conversions of the Toshiba analog copiers with consequent design limitations. For example, the previous Toshiba 55-81cpm devices had no job reservation / next job copy memories; this held it back in many environments because you could not place copy jobs into the print queue if a previous copy job was already in progress. Other limitations included the large capacity tray and internal deck built into the right side of the copier and difficult to load paper into (virtually impossible for disabled persons in wheelchairs). Finishing options were also limited on the older Toshiba range.

This has all changed with the new Toshiba e-STUDIO 650 and **BERTL felt that the product will be a hit amongst dealers and buyers**. The new improved Toshiba e-STUDIO 650 has more capabilities than previous Toshiba's while its **average print and copy speeds were measured as higher than competing units.**



Tandem paper drawer

Paper Supply: The Toshiba e-STUDIO 650 ships with 3,600 sheets on-line paper capacity which is adequate for most offices but not as high as some of its competitors. However, when full configured, the paper capacity increases to a total of 7,600 sheets, which is not the highest in its class but is higher than some units currently on offer. There is an optional 4,000 sheet Large Capacity Feeder which departs from the older Toshiba models by being side mounted and front loading. As a further improvement the new Toshiba e-STUDIO 650 will support 115lb / 209gsm from all paper sources with tab printing/copying and sheet insertion, 'Post Process', also possible. Post Process insertion is where you add pages to a document from a paper source the other side of the fuser unit. This allows you to add preprinted paper which could not be fed via the hot fuser unit without damaging it. An example would be to add a front cover which has been printed on a color laser printer. In addition to feeding paper for the documents produced on the Toshiba e-STUDIO 650, the post process inserter can be used as an off-line finisher (i.e.: feed ledger/A3 printed work through the finisher as documents or saddle stitched folded

magazine style booklets). The combination of heavier paper types and post process insertion makes the Toshiba e-STUDIO 650 one of the the 'best in class' for paper weight / substrate capabilities.

Full Paper Supply is 7,600 sheets (1,000 ledger / A3)

The standard unit has a bypass tray, two 500 sheet universal paper drawers and a 2,500 sheet, letter / A4 sheet tandem feed (1,250 sheets per side). The tandem tray is a single drawer with two internal sides that take paper. When the right hand supply has been depleted, the left hand stack of paper is pushed over to the right and printing continues. This gives a large paper supply in one drawer but is not as flexible as some other units. If the two paper holders were in separate drawers, like some alternatives, you could have a different paper stock in both drawers and / or could refill paper supplies more simply while the device was running.

Because Toshiba offers a fairly powerful booklet making finisher option, BERTL would have like there to be more on-line ledger/A3 paper supplies than the two 500 sheet universal drawers and 100 sheet bypass provide. For most purposes the combined 1,100 sheets ledger/A3 will suffice. Where it will seem lightweight will be in print shops or offices that want to make a lot of booklets (the maximum online booklets produced without a paper refill could be limited to 73 which is lower than some competing units).

Post Process Inserter

Document Feeder: There is a 600x600dpi, 100- sheet duplexing document feeder (RADF), that passes the original over a fixed scanner (similar to the e-Studio 35 and 45. Toshiba have stuck to a traditional 'one side at a time' scanning system rather than adopting a single pass scanner with two scan heads that pass over the top and bottom of originals at the same time. Toshiba's document feeder does not allow as wide a choice of original types as a single pass scanner but the duplex copy speeds were faster than other copiers which may put it on equal footing with a single pass dual head copy scanner.Toshiba advise that they have re-engineered the document feeder to dramatically improve the accuracy of the document feeder's deviation tolerances. The point here is that modern copier systems are increasingly used in scanning based document management systems where OCR based applications regularly scan and read forms and other standard documents which require respondents to fill in boxes. If the registration of the scanner is slightly out, the OCR may not correctly read and place the data into the appropriate slots on the computer system. Even if the scanner is only used for text OCR conversion, any minor skew in the original, during document feeding / scanning, can result in a document that is harder (or impossible) for the OCR software to convert.

A nice touch is the Toshiba e-STUDIO 650's document feeder outputs ledger/A3 and letter/A4 originals to separate trays.

Finishing Options: Chargeable extras include a multi position stapler finisher and folding, saddle stitch capability (automatic booklet maker) plus a hole punch (capable of 2-and-3 hole or 2-and-4 hole punching depending on which country you are in). There is also the new optional post process inserter which fits before the hole punch to act as an additional paper source for insert or cover sheets. Stapling of up to 50 sheets is currently possible; this is on par with many competing devices, but 100-sheet stapling is starting to emerge on products. Toshiba advise that a 100 sheet staple finisher with booklet maker will be available with a few months after launch.

Design: Like most copier based multifunctional systems, the Toshiba e-STUDIO 650 uses bulk toner (loaded by the operator) but is service engineer dependent for other maintenance. Toshiba support printing or copy volumes up to 460,000 impressions a month which is possible via a photoconductor / imaging system that Toshiba estimate lasts 460,000 pages between replacement / preventative maintenance. The 460,000 page photoconductor life estimate is one of the higher lives for a 65ppm device. BERTL felt that a monthly volume of up to 250,000 may be a more conservative target volume based upon analysis of the Toshiba e-STUDIO 650.

Toshiba use what they call 'IH fusing' technology to provide a fast warm up time, especially when recovering from energy save mode. They claim that it is 'typically 160 seconds to first copy/print from cold'. The IH system is similar to that used in the e-Studio 35/45 series and is said to be more energy efficient than other types of heat based fusing systems. For example, Toshiba quote that energy conversion in the Toshiba e-STUDIO 650's IH system is typically around 90% of a Halogen system, (which, at best, can manage 65-70%). **For the techies** - an improvement to earlier Toshiba copier designs is the introduction of a 3 part coil. This is meant to deliver better temperature control, in particular at the ends of roller, which have a tendency to retain heat outside the range of the paper passing through. The cleaning system of the fuser is further enhanced by using a web cleaner rather than traditional silicon and felt cleaner rollers. The result is a fusing system that is claimed to have improved reliability and energy efficiency, resulting in the extended preventative maintenance cycles, up to 500K. Toshiba have also incorporated a series of quality control sensors, in the print system, that continually measure the surface potential of the drum in terms of is photoconductive ability also drum temperature and humidity. The toner delivery systems and charging systems adjust during the running cycle to maintain the optimum output conditions.

Page Coverage / Pixel Counter: Newly featured in Toshiba's 55-81cpm devices is a pixel counter which Toshiba claim enables the machine to calculate and store the average toner page coverage for both print and copy documents. This figure is based on the average page size and figures related to the laser diode write times. BERTL's advice is to treat the pixel counter as a general guide only. It can provide users with a rough feel of the types of documents that are being printed but it was not accurate enough to be used in true cost calculation or for contracting purposes. Like most pixel counters the data that is being counted is based around the electronic image that is generated. Scientific opinion agrees that the electronic data sent to any printer or copier is likely to be lower than the final printed page coverage. Tests by BERTL have established that a 5.34% page coverage 'electronic pixel counted' document sent to a printer can have a true, final 'toner on paper' coverage of between 7.5% to 18% depending upon a number of variable factors.

So, what changes 5.34% electronic pixel coverage to 18% true toner on page coverage? For a start there is the toner. Different toner has varying electronic charge properties and particle sizes. Tests by BERTL have found that using third party toner can result in higher page coverage, on standard identical test patterns, which in turn can lead to lower life per toner cartridge. Then there is the photoconductor itself. As the photoconductor ages, its electrical charge properties change and this affects toner usage. Next you have atmospheric conditions. Some offices will have lower page coverage and higher toner yields simply because of their relative humidity and temperature. In contrast some offices may have lower coverage on the same device, even if using the identical consumables and parts, because of atmospheric conditions.

To test the Toshiba e-STUDIO 650's page coverage calculator, BERTL took a certified 11.3% coverage test original (containing mixed text and various graphic elements). The test original was copied multiple times on the Toshiba e-STUDIO 650 and the average page coverage measured on the device was obtained from its control panel. According to the Toshiba e-STUDIO 650 BERTL's page coverage was 9%. In reality, BERTL's original had 25% heavier page coverage than the estimate from the Toshiba e-STUDIO 650; this means that there could be a fairly wide margin of error between 'estimated page coverage' and 'actual toner on page coverage'.

Disabled Persons Usage / Section 508 Compliance (USA): The Toshiba e-STUDIO 650 did not appear to have major design features provided for wheelchair bound disabled persons. That said, it seems no harder to access the unit than other copiers; although the control panel and post process inserter (when used as a manual off line finisher) may prove a bit awkward from a wheelchair. The control panel layout and design is aimed at assisting disabled access because Toshiba have angled the control panel and placed large keys in logical groups all with a concave surface, some also have a back light. There is also Quick Tab with the most used features shown in reverse plus large font sizes to aid the visually impaired.

Network Connectivity / Controller Strategy: Toshiba offer the e-STUDIO 650 with a choice of two network connections / print controllers (1) EFI's GA-1140 or (2) Toshiba's GL-1020. This report covers the Toshiba e-STUDIO 650 linked with the GA-1140, therefore we do not expand on the GL-1020 details.

The GL-1020 is Toshiba developed, lower priced is based on a Linux Server platform unlike the earlier GL-1010 and SC-2 which were NT4 based. Toshiba's goals are to have high-speed print control and RIP functions with an easy to use graphical icon based driver. Unlike earlier Toshiba controllers, the GL-1020 offers Scanning at no extra cost. From BERTL's perspective, scanning is a critical application for many offices. EFI is moving their controllers over the Linux.

The GA-1140 is built for Toshiba by EFI (stands for Electronics For Imaging and is often pronounced as FE). EFI build controllers for many color and mono printing sytems therefore the use of the EFI controller by Toshiba can be a mixed bag. On the one hand EFI controllers are very stable and once you know one EFI controller / driver you can move to any other EFI system with ease. EFI also produce a good range of standard and optional capabilities which simply bolt onto the device. On the other hand, critics say that one EFI controller is pretty much like any other. The entry level price of the GA-1140 is lower than the Toshiba GL-1020 but the GA-1140 become more expensive as you add functionality.

The Toshiba e-STUDIO 650's GA-1140 controller ships with PCL only. If you want PostScript you need to buy it as an optional extra. Like most EFI controllers, you get a choice of adding good quality software/applications including DocBuilder Pro (document imposition software) and Fiery FreeForm (variable data printing facility).

Administration can be via Toshiba's Top Access web brower based utility or EFI's optional Command workstation (covered at end of report).

The base print controller is 500Mhz and ships with 128MB RAM but no hard drive. There is a 10GB hard drive option as well as RAM upgrades (to a maximum of 256MB). This is lower than a number of alternative systems which offer standard hard drives (ranging from 6GB to 40GB depending on manufacturer). BERTL also notes that while at least one competing product has lower standard and maximum RAM, one unit starts with 256MB RAM expandable to 384MB. The price of the PostScript upgrade is reasonable by copier-printer standards but this has to be balanced against the fact that many printers and some copier-printers provide PostScript as standard in the entry level printing price.

In most respects the EFI built GA-1140 is similar to the existing GL-1140 and GA-1110 controllers on earlier Toshiba products, although there are some additions to the driver including Tab Page printing.

Unlike Toshiba's earlier EFI made controllers, the new GL-1140 controller can be upgraded to include Network Scanning once the optional hard disk option has been fitted. This option supports both scan to file (to a Mailbox on the GL-1140's internal hard disk drive) plus scan to email and FTP options. People who have purchased Docbuilder Pro, will also be able to scan direct to Docbuilder Pro and use job build or composer functionality with the additional benefit of a full page layout / imposition functionality.

Finally, the GA-1140 supports new features from EFI including "Print Me" and their 'Sky Spooler' system (for more details on these - visit www.EFI.com). BERTL does not wish to cover these applications in this report but it is worth noting that most printers will require a separate device attached to the parallel port of their printer to access stored or "spooled" print jobs resident on a web server for Print Me.

If you have the GA-1140 it supports Print Me internally, which cuts out the need for the extra device. Cluster Printing (join multiple printers and use them as one combined printing system) and load balancing (split jobs between multiple printers to speed work up or balance volume throughput across devices) is available on the GA-1140 controller by buying/using EFI's 'Velocity' suite of applications. This differs on the Toshiba made GL-1020 controller which will not link to EFI's Velocity.

COPIER FUNCTIONALITY

A major advantage of the Toshiba e-STUDIO 650 was its speed of delivery. This is partially aided by its ability to output completed sets of documents face down (most copiers deliver face up output).

Copier Productivity: A series of office style copy jobs were run through the device. BERTL's procedures are based upon "most likely usage" of the copier functionality. By this we mean that BERTL does not de-feature automatic functions, nor does it pre-set paper sources in order to optimize the speeds. (i.e.: show the fastest speed achievable).

BERTL's productivity tests were run via the high capacity paper tray which is the most likely paper source used for plain paper in most offices. The following table shows how the Toshiba e-STUDIO 650 productivity speeds compared against several competing products.

Toshiba e-STUDIO 650 Copier Printer Productivity Table
All speeds expressed in copies per minute (cpm)

	Toshiba e-STUDIO 650	Copier Printer 1	Copier Printer 2	Copier Printer 3
Advertised Engine Speed	**65**	**65**	**70**	**65**
1 set of 5 single sided to single sided	28.24	32.79	28.41	20.51
5 sets of 5 single sided to single sided	48.34	54.55	43.62	42.47
1 set of 10 single sided to 5 double sided	29.31	26.86	34.34	29.59
1 set of 5 double sided to 10 single sided	35.50	29.23	35.82	16.54
1 set of 5 double sided to 5 double sided	25.70	22.64	28.57	14.46
5 sets of 5 double sided to 5 double sided	50.20	47.33	53.37	35.98
1 set of 20 double sided to 20 double sided	40.33	34.59	40.27	19.51
Average Copy Speed	**36.80**	**35.43**	**39.34**	**25.59**

The Toshiba e-STUDIO 650 performed well on duplex copying where it outperformed the rival devices. Simplex copy speeds were also measured as above average, albeit not the fastest tested.

Copy Concurrency: The Toshiba e-STUDIO 650 includes 5 copy memories. When a job is stored in the first memory slot the remaining four memories can be used to store copy jobs. Unlike at least one competing 65cpm device, the Toshiba e-STUDIO 650's five copy job memories are not also used for print jobs. On a competing product, each print job took up one of the five memories. BERTL analysts sent five print jobs and found they could no longer scan in a copy job until the first print job had finished processing. Meanwhile, further print jobs may be queuing up at the server / desktop of network users. These print jobs will continue to fill the five memories and block copying until the backlog has been cleared. **Because the Toshiba e-STUDIO 650 has a separate copy processor and print controller, it does not suffer from this limitation but delivered good concurrency.**

Control Panel: The Toshiba e-STUDIO 650 has a touch screen control panel which was reasonably well laid out, with simple to follow menus. Toshiba have arranged the copier control panel buttons / screens into different groups which they say assists with disabled access. Not so easy to find was scanning, which did not have its own button but was found when you press Printer/Network**.**

Job Build: The Toshiba e-STUDIO 650 allows documents larger than the capacity of the document feeder to be created using its job build feature. Jobs can be built up from both the ADF and the platen, allowing pages from books and / or originals which can not be placed through the document feeder to be incorporated in the document.

Print on Demand: The Toshiba e-STUDIO 650 ships with a standard document storage facility enabling print on demand of up to 24 documents of 400 pages. Also, when configured with the GL-1140 controller you get all of the EFI controller's storage and reprinting capabilities.

Tandem Copying: Some countries advise that this will be supported a few months after launch and is achieved via direct engine connection. If you need tandem, check if your country will be offering it, if available you will not have to buy the print controller to link to devices as a combined tandem copying system.

Finishing Productivity: The Toshiba e-STUDIO 650 finisher proved efficient but reduced output speed when stapling standard documents. The table below outlines the effect on productivity of a simple five set copy job when finishing features are added.

Toshiba e-STUDIO 650 Copy Finishing Effect on Productivity
5 sets of 5 simplex pages with 2 side staples

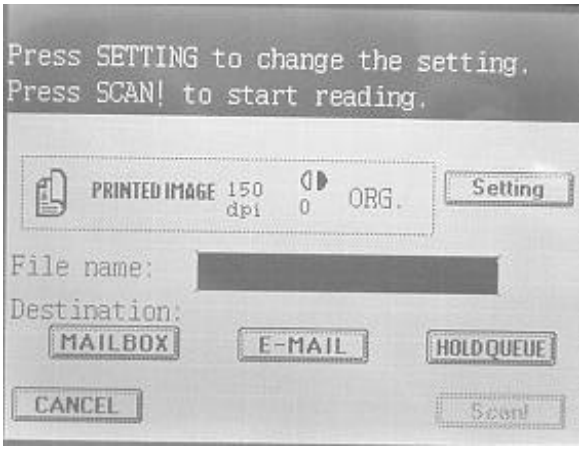
	Time for job (in seconds)	Finishing Time (in seconds)	Time added per set (in seconds)
Toshiba e-STUDIO 650	42.33	11.30	2.26
Competing 65cpm device	29.06	1.56	0.31

Copy Image Quality: Copy image quality was acceptable but not outstanding. Some work was lighter than desired. Toshiba advise that service technicians can set image quality to suit user requirements at time of set up, therefore the image quality measured by BERTL could be improved upon at client locations.

SCANNING FUNCTION

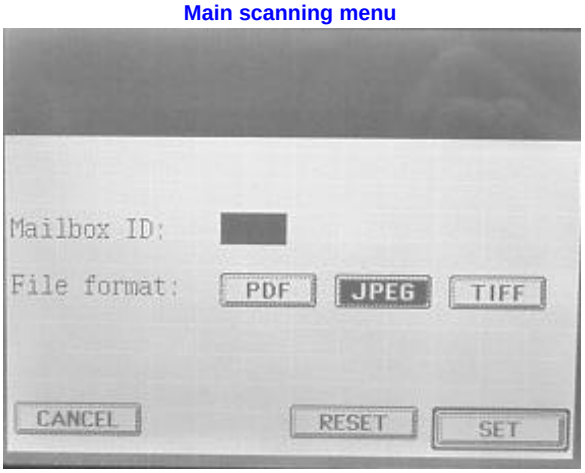
Scanning requires the addition of the optional EFI GL-1140 controller and hard drive. Once installed, you can have functional scanning which but not the most advanced available. EFI has recently increased the scanning functionality to include the ability to scan to e-mail addresses and scan to the Command WorkStation hold queue (Command WorkStation is an optional extra on the EFI GA-1140 controller).

Mono Scanning is set up via the copier control panel; you push a button marked scan to access it. BERTL were able to convert hard copy originals into PDF, JPEG or TIFF files with resolutions of 150dpi, 300dpi or 600dpi. Because of the duplex document feeder, double sided documents can be scanned and digitized. Most of this is good by modern standards but some IT departments may prefer to have lower than 150dpi for document management systems where smaller file sizes are important for archiving.



Main scanning menu

Scan to Mailbox Function: This feature uses the hard drive on the GA-1140 and allows users to scan originals straight to a virtual mailbox. The user chooses a mailbox number between 1-9999, selects scanning settings for the job and scans the job. To retrieve the job the desktop user browses to the IP address of the GA-1140, enters the mailbox number and can then access the file. The user can choose to download the file as a JPEG or PDF straight to their desktop PC. This is not as efficient as multifunctional scanning solutions that allow users to scan straight to a network location (one automatically shows a dynamic list of connected computers and lets you browse to and save on them).



Main scan to mailbox screen

Scan to Hold Queue: You can scan originals directly to the hold queue at the optional Fiery Command WorkStation. This feature allows users to then incorporate hard copy documents within other print files using the extensive document manipulation features on the Command WorkStation.

Scan to E-Mail: This is best described as 'functional' because it performs the basics but lacks subtleties. There is no QWERTY keypad, instead you get an A-Z layout but it has all required keys (including the " sign) on the main keypad. You can choose an e-mail address stored on the GA-1140 or type in an ad-hoc e-mail address using the keypad. Dynamic linking with central corporate email address books (such as LDAP - Lightweight Directory Acess Protocol) is missing. However, with a bit of training, you can send address lists to the GA-1140 via email and the scanning system will merge them into an address book on the hard drive; from which you pull up names as required. Compared to other systems, the level of personalization that could be applied to the e-mail is low. In these days where viruses are spread by e-mail, users are becoming more vigilant about the e-mails they open. E-mails with attachments are especially vulnerable to viruses. For this reason BERTL regards the need for as much personalization of scan to e-mail features as vital to the acceptance of a scan to e-mail solution. The GA-1140 scan to e-mail solution did not allow BERTL to identify: (1) who the e-mail had come from; or (2) add a subject line; or (3) type a message. In its favor it had the ability to give the file attachment a name of our choosing; but this was restricted to 8 characters.

Scan to e-mail main screen

As an alternative to sending an attachment, the GA-1140 can save files on its hard drive and just send a text URL hyperlink to connected users. Recipients click on the URL hyperlink which takes then straight to file on the GA-1140 hard drive; from here they can decide whether to download the file or not.

PRINTER FUNCTION

The Toshiba e-STUDIO 650 can be upgraded to a network printer via the purchase of the optional embedded GA-1140 print controller. As stated above, the entry level price of the GA-1140 looks attractive but if you need full functionality the price increases sharply.

The **GA-1140** is powered by a 500Mhz processor, ships with 128MB RAM which is expandable up to 256MB but does not include a standard hard drive, scanning or PostScript printing. You can purchase a 10GB hard drive upgrade, scanning and PostScript printing (PostScripts is a relatively expensive upgrade when you consider how many printers and copier-printers provide it free with the print option. Ethernet 10/100BaseT connectivity is included as standard within the price..

BERTL connected to the Toshiba e-STUDIO 650, via a direct 100BaseT TCP/IP connection in Windows XP. Some of the installation could be improved. When you place the Toshiba CD into your computer it automatically runs an installation which installed Agfa fonts and other programs onto BERTL's computer. At the end of the installation it forced the client computer to close and reboot; this was both time consuming and unwanted.

The Toshiba e-STUDIO 650 tested by BERTL was installed with the standard 128MB RAM and PCL software driver level 1.0.

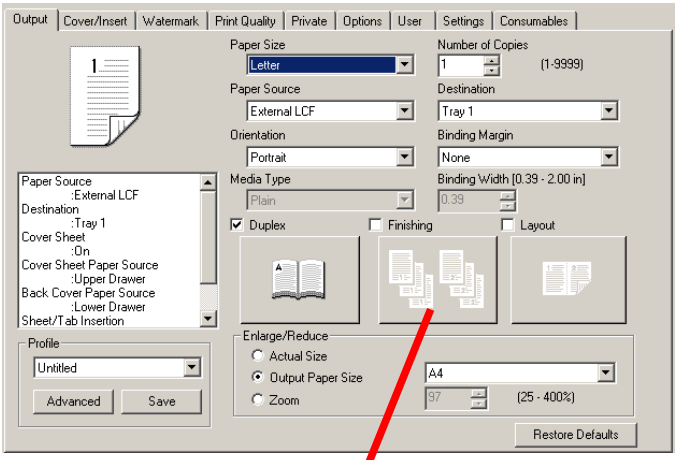
Toshiba e-STUDIO 650 Printer Productivity Table
All speeds expressed in pages per minute (ppm)

	Toshiba e-STUDIO 650	Copier Printer 1	Copier Printer 2	Copier Printer 3
Advertised Engine Speed	**65**	**65**	**70**	**65**
Word 35 page document (printed in simplex)	52.08	52.1	53.66	39.9
Word Perfect 5 sets of 6 page document (printed in duplex)	46.70	30.19	48.04	42.8
Netload Load Test (Multiple documents)	17.74	15.27	4.46	14.8
Average Print Speed	**38.81**	**32.86**	**35.38**	**32.5**

As the table above illustrates, the Toshiba e-STUDIO 650 performed well as a network printer and was fast at handling duplex printing.

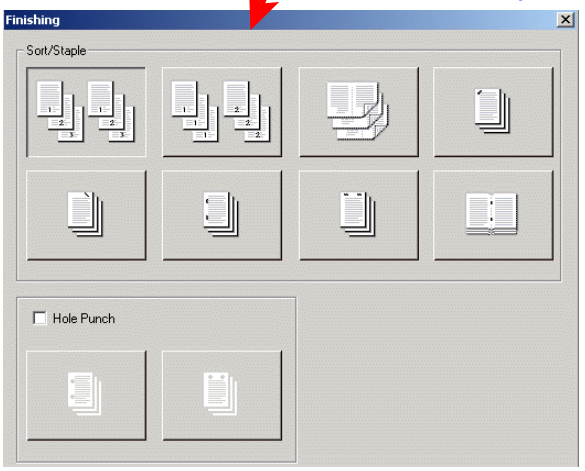
The Toshiba e-STUDIO 650 also delivered one of the highest recorded performances when BERTL switched to measuring network data streams of mixed work incorporating both text and graphics. During the network load test, a series of simplex and duplex print files, combining color and mono files from multiple applications are sent to print. The test looks at how well the processor is able to cope with the transitions between different print job types and, as can be seen above, most printers slow considerably. However, the Toshiba e-STUDIO 650 was much faster on this work pattern than all three competing benchmark devices.

The printer driver was well laid out and graphically orientated, which is a pleasant change from many previous EFI produced printer drivers / controllers. Overall BERTL found the printer driver relatively simple to use. Some of the more complex functions are accessed via graphical icons on the main tab (marked Output).



Main setup tab

One of the major weaknesses of many printer drivers on larger departmental copier printers is their lack of paper handling capability. Most of these high volume devices have the capability to store up to 5 or 6 different paper sources at any one time. However, many of the drivers for these devices give the network printer user no more document production capability than a user with a basic 2 paper tray desktop printer.

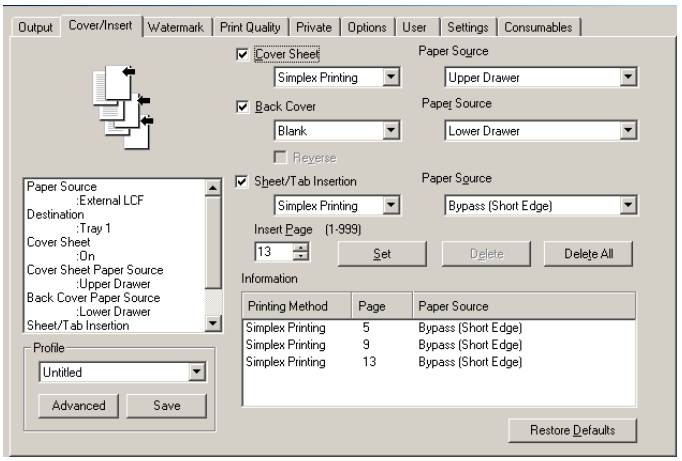


Icon based sub menus (ie: Finishing)

Toshiba e-STUDIO 650 users can select up to 4 different paper sources in each document. In our example (see 1st and 3rd images on right), BERTL set:

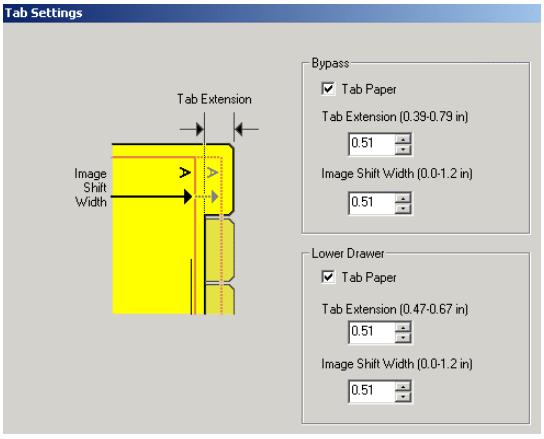
1. Front cover/letterheaded paper to feed from the top drawer (using Cover Sheet setting on the Cover/Insert tab);
2. Main paper to feed from large capacity side feeder;
3. Various numbered pages to feed from bypass tray (but it could have been via the Post Process Inserter for photos, etc) using the Sheet/Tab insertion setting;
4. Back page from lower drawer (using Cover Sheet setting on the Cover/Insert tab).

This worked reasonably well but was not as simple to use as an alternative 65ppm device. The point here is that the functionality is built into the Toshiba driver but you have to know how to use the settings, and sometimes ignore their names, to achieve the desired result.



Select multiple papers sources vie Cover/Insert tab

Tab Printing is supported on the Toshiba e-STUDIO 650. This was simple to set up using the graphical icon based settings.



Tab settings

As the image (left) shows, you can have two sets of tabs fed from either the bypass or lower paper drawer of the Toshiba e-STUDIO 650.

Creating saddle stitched booklets from the driver worked well and, in comparison to some of its competitors was simple to master.

A 20 page letter/A4 document was sent to print 'magazine style' with centre folding, saddle stitch finishing onto ledger / A3 paper.

Only two paper drawers (plus the bypass) on the Toshiba e-STUDIO 650 can handle ledger / A3 paper which means that up to 1,000 sheets (via auto drawer switching on empty) are available on line for continuous booklet production. This is similar to most 60-70ppm devices but at least one competitor can print up to 6,600 sheets of ledger paper, (up to 600% more ledger paper than competing units). When calculating the number of booklets that can be produced via the two paper drawers, bear in mind that a booklet requires 15 sheets of paper to produce a 60 page booklet)

On this test the Toshiba e-STUDIO 650 was faster than our two benchmark 65 to 70ppm devices while it virtually matched the throughput speed of the fastest 60ppm booklet maker tested by BERTL.

20 page Booklet Creation Productivity
[Comparison numbering is for ease of reference only - may not follow other tables]

	Toshiba e-STUDIO 650	Digital Copier-Printer 1	Digital Copier Printer 2	Digital Copier Printer 3
Engine Speed	65	65	70	60
Status When Ejected	Fully folded, center stapled and stacked for packing	Fully folded, center stapled and stacked for packing	Fully folded, center stapled and stacked for packing	Fully folded, center stapled and stacked for packing
Seconds per booklet (after first out)	20 secs	26 secs	25 secs	20 secs
No. of Booklets / Hour	180	138	144	180

BERTL could not perform the final speed test (production of manuals) on the Toshiba e-STUDIO 650 because it requires the ability to use 5 paper sources in one document (BERTL could print to 4 paper sources but was unable to find a method to print to 5). This test requires the automatic insertion and printing of front covers, back covers, tabs / chapters plus the ability to switch paper sources for the various sections and chapters. **BERTL's test job simulates 20 sets of a single sided (simplex) print job which required the fully automatic production of a manual comprising:**

- Front cover from 1st paper source
- 2nd page on letter head from 2nd paper source
- 4 pages plain paper from 3rd paper source
- Tab from 4th paper source
- 5 pages on plain paper from 3rd paper source
- Tab from 4th paper source
- 3 pages on plain paper from 3rd paper source
- Back cover from 5th paper source

While the Toshiba e-STUDIO 650 was unable to perform this final 5 source manual test, BERTL believes that the function is more likely to be required in a print-shop / CRD (central reprographics department). Toshiba stress that they are not targetting the Toshiba e-STUDIO 650 into this sector but envisage the device as an office system. If you need to produce manuals with 5 or more paper sources in one document, there is limited choice (only one 65ppm unit has been able to achieve this test to date) otherwise the Toshiba e-STUDIO 650's 4 paper source capability is considered adequate for most purposes.

Bandwidth: Like most EFI built controllers, the Toshiba e-STUDIO 650's GA-1140 produced low file sizes for Acrobat and graphical documents but delivered larger than average print file sizes / network traffic on standard office documents. For example, a 35 page Microsoft Word document was 1.5MB which is close to 5 times larger than some network printers.

This limitation was compounded by the Toshiba e-STUDIO 650 printer driver not interacting effectively with the collation function within the first / main printer driver in the application.

On 5 sets of the 6 page Word Perfect document Toshiba e-STUDIO 650's GA-1140 print driver created a 30 page document (instead of one five page set with a command to print 5 copies). This led to bandwidth use of almost five times larger than a single set. The driver RIP's the 30 page job, sending it as a single file across the network.

Note: Collation means to print sets as finished jobs in the order page 1, page 2, page 3 and then start the next set as page 1, page 2, page 3 until the required number are printed.

The alternative would be to print multiple copies of each page as groups (page 1,1,1...2,2,2...3,3,3) and manually sort the page order of the documents after printing.

This raises 3 issues:

1. The file created is larger than the single set job

2. The printer interprets the file as a single 30 page document. If finishing (e.g stapling) is applied to the document the whole 30 pages will be stapled rather than 5 stapled sets of 6 pages.

3. When duplex printing multiple sets of a 5 page document, Page 1 of the second copy of the document will be printed on the back of page 5 from the first copy. A consequential mismatching will occur throughout the entire run and make virtually all the copies unusable.

To understand this issue you must consider the fact that there are two print menus used to produce a printed page. In the application (ie: Word) there is a print menu which offers basic functionality. For many people this is as far as they go when printing a document. If the printer has been configured to the users preference they can choose all of the basic print commands from this menu.

Having chosen to print multiple sets (ie: 5 copies) of a document some applications automatically default to 'collate' mode within the print menu, while others offer you the choice of ticking a box for collation. By clicking on 'Properties' the user can go to a second print menu which contains similar options plus additional capabilities that are configured by the printer manufacturer. Within this second (and deeper) print menu there exists an additional collation or grouping command/option.

Some copier-printers and some network printers have not been programmed to properly interact with the first print menu (the main one presented to the user when printing a document). A common error is the failure to correctly interpret the collation command.

When this occurs, the user may:

1. choose (or accept the default) collation mode in main menu
2. Select multiple copies
3. Send to print.

When print driver programmers have not properly integrated the print driver with the first print menu (in the application) the print driver creates a gigantic single data file that contains as many copies of the document as sent to print. This means that instead of getting a 25 page document with a command to print 100 copies in duplex mode, the print driver may erroneously produce a single 2,500 page duplexed document which in turn creates the following problems:

- Massive use of bandwidth
- Documents that are too big for the stapler units to staple
- Multiple documents treated as one document and overloading any finishing.
- Page 1 of the second copy is printed on the back of page 25, this may render the documents unusable.

The Toshiba e-STUDIO 650 driver has this limitation and does not accurately recognize the collation command. This is common on some (but not all copier-printers). Like most manufacturers that have not programmed their printer drivers to

interact with the main print menu, Toshiba tells users that the application collation option must be disabled and that users should use the automatic collation capability built within their drivers. To use this facility users must remember to select the group printing mode rather than accepting the application / drivers default settings.

This may remove the problem 'if and when' people remember to circumvent the limitation in the printer driver. However, in the real world people work in general office environments with untrained staff, temporary workers and users who can not remember how to disable problems / bugs, or limitations, in the printer driver. The result is increased use of network bandwidth, paper, time and resources which can be a real problem.

Job Queue Management: Within the control panel of the Toshiba e-STUDIO 650, BERTL could view a list of printer and copy jobs queued to print. BERTL could move jobs up and down the queue and delete jobs. This function worked reasonably well.

Print image quality was good on the Toshiba e-STUDIO 650 with most images being reproduced to a good standard. Some images, including photograph, images were reproduced a bit darker than BERTL likes but not to a worrying degree and no jagginess was seen, (a common problem on some other units). Solid black and grayscale blocks were reproduced well with no visible banding or graininess, commonly seen on other devices. Because some images were a bit dark, the ability to clearly print colored text (screen colors reproduced in gray shades) on solid colors was impaired and sometimes hard to read.

Network Management System: Administration can be via Toshiba's Top Access web brower based utility or EFI's optional Command workstation (BERTL recommends save your money and try Toshiba's Top Access, because if it does not suit you the EFI Command workstation can be added later). The Toshiba e-STUDIO 650 includes a browser based printer management system. To access this, BERTL analysts entered the TCP/IP address for the device in the address box within the browser. This took us to the GA-1140's internal web page. From here we could view various details on the Toshiba e-STUDIO 650 including; device status, job queue details, device specification / configuration, etc.

Print to e-Mail: Provided you have the appropriate upgrade(s) you can print direct from the print driver to an email address. This is a nice touch.

PDF / Direct Printing: Provided you install the optional hard drive, the Toshiba e-STUDIO 650 with GA-1140 has the capability to print files directly from the PC without first being processed by either the PCL or PostScript driver. To do this you must use EFI's web based utility and, using a browser, go to the GA-1140's web page, select the appropriate mode, browse to the PDF file and then upload the file to the GA-1140 for processing and printing. This works reasonably well but some devices have the capability to print PDF, TIFF and other file formats directly to the print engine without the extra time / bandwidth that is required to process the jobs in this way.

Internet Printing / IPP: The Toshiba e-STUDIO 650 supports IPP printing. By this we mean that the device can be set up to receive jobs from remote locations across the internet. IPP printing needs to be enabled at the printer engine and an address set up for the device. Once this has been done, users can set up a IPP printer driver by typing in the URL of the device in the port location on the printer driver.

Mailboxes: There is no physical mailbin option, so sharing the Toshiba e-STUDIO 650 across a larger department may be awkward. Toshiba e-STUDIO 650's driver includes virtual mailboxes which they call 'Private Job' (under the Private Tab in the driver). While BERTL does not consider this as convenient as physical mailboxes it does let users send jobs to the printer and hold them in memory until the user arrives and enters a password. This keeps them separate from other work arriving at the printer and is an approach adopted by various manufacturers. The obvious limitation to all virtual mailbox systems is that when you get to the printer you have to wait in line for your print job to be processed once you have entered your passcode and submitted the job to the print engine (the Toshiba is at par with other systems in this respect). While the user has to wait at the printer for their job to get into the queue and print - the stored job is pre-RIPed and therefore processes reasonable fast.

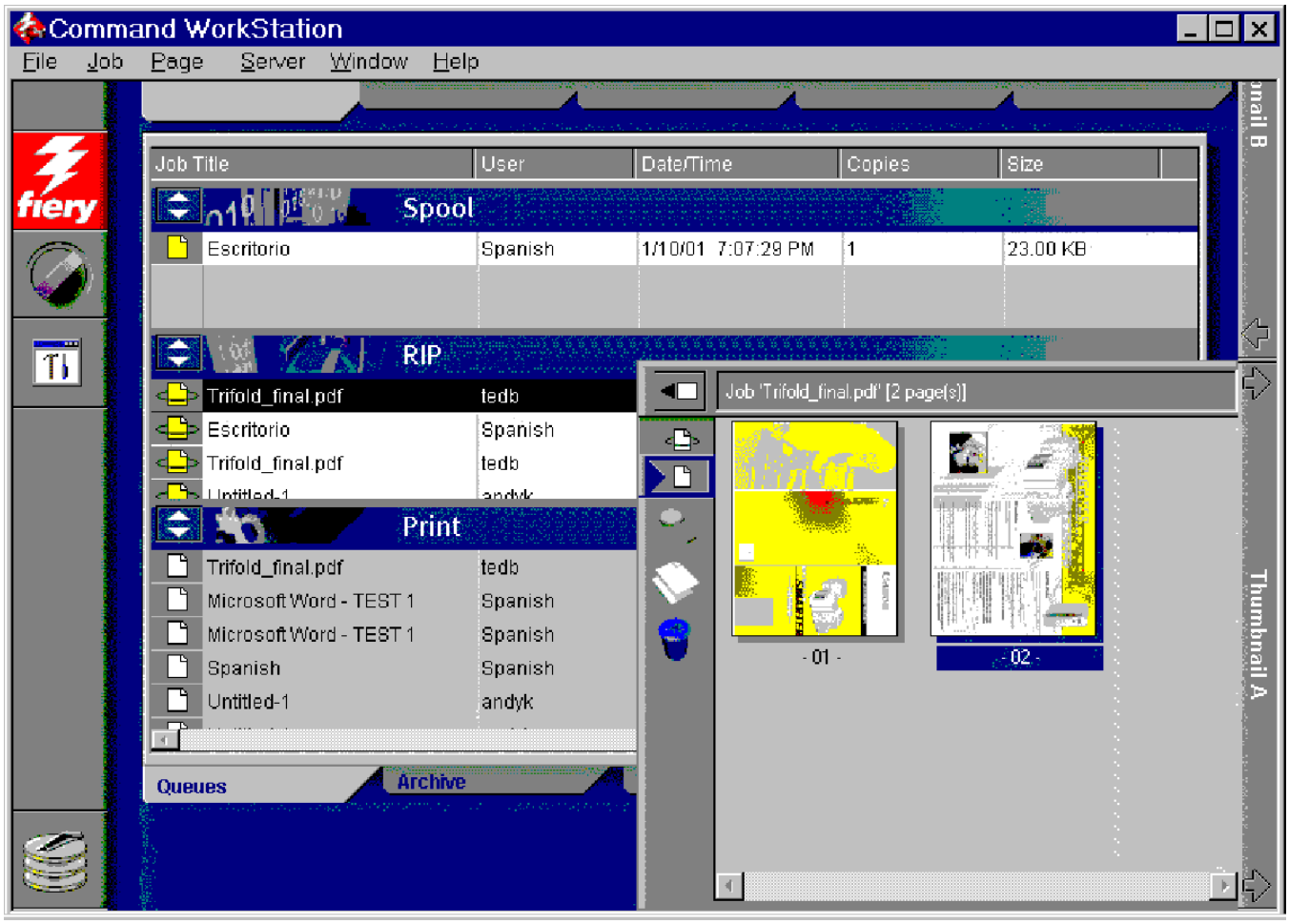
E-Mail Notifications: BERTL could find no internal interface in the base machine that can be configured to send e-mails for jams, toner out, paper out, service calls etc. Toshiba advise that they can provide pop up messages at client terminals and support third party network management tools that may already be running on the network and can provide similar capabilities.

FIERY COMMAND WORKSTATION

Because the GA-1140 is produced by EFI, users have access to various EFI options including Command WorkStation, which is designed to make centralized print job management easy. It automatically identifies Fiery servers on your network, and offers new customization options so you can choose how to display information about connected Fiery servers most efficiently. It sets the standard for conveniently managing and manipulating digital print jobs. Some features are useful to general users of the Toshiba e-STUDIO 650, other functions will only be useful if the user has other EFI controllers connected to their network(s).

Features

- Three levels of security for administration and printing
- Extensive job controls
- Thumbnail and full-screen job previews for remote job management
- Load balancing available to maximize printing resources (needs more than one print engine)
- Archiving of files for accessing and re-printing later (you save on the hard drive and then reprint via a browser).
- Job Log window for detailed information on every print job
- Customizable User Interface can be tailored to workflow requirements and operator skill level



EFI's Command WorkStation

FIERY DOCBUILDER

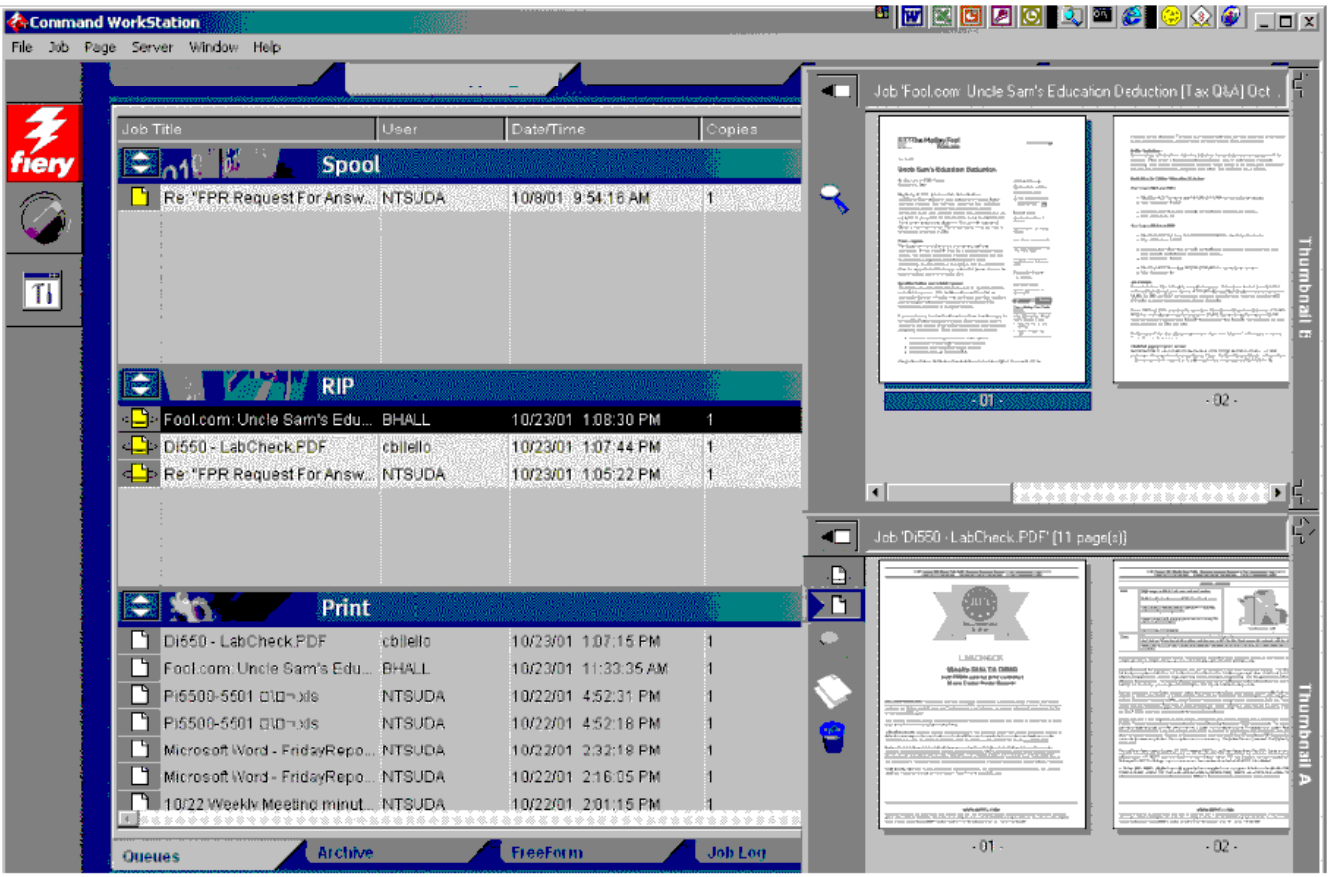
DocBuilder is a standard software tool provided with the GA-1140 controller (and most EFI controllers). It is accessible via Command WorkStation or the Fiery Web Spooler It provides users with a flexible print on demand solution with imposition software for the electronic ordering of pages ready for booklet production.

The user can retrieve print files stored on the GA-1140's hard drive and then carry out a variety of functions before sending the file to reprint.

Users can scroll through the post-Ripped documents viewing the individual pages on screen. Having displayed documents on screen the user can then carry out a variety of editing functions on the document including:

1. Merge two or more existing documents into one large document (image shows 2 documents in view ready to merge).

2. Insert and delete pages from the existing document and save the file under a new name. This function is especially useful when updating large files with new information, such as a training manual. Without this function the user would have to make the changes to the original electronic file, re-RIP the whole job then send it across the network which creates more bandwidth. With DocBuilder Pro the user can simply create the new pages, send them to the hard drive and replace the old pages with the updated pages to save time and network resources.



Productivity Tests			
.Output Origin	Job		
Copying A4/Letter	5 pages	28.24	CPM
Copying A4/Letter	5 sets of 5 pages	48.334	CPM
Copying 1:2	10 single to 5 double	29.31	CPM
Copying 2:1	5 double to 10 single	35.50	CPM
Copying 2:2	5 double to 5 double	25.70	CPM
Copying 2:2 Short documents	5 sets 5 double to 5 sets 5 double	50.20	CPM
Copying 2:2 Long Documents	20 double to 20 double	40.33	CPM
Printing Multiple Sets in Simplex	5 sets of 6 page WP 9	46.70	PPM
Printing Various Networked Jobs	Small Mixed Network Workload	17.74	PPM
Printing Simplex:	35 Page Word 2000	52.08	PPM

Production Efficiency & Network Usability / Capability	
Copier: Scan Once Print Many	Yes
Copier: Max Jobs Auto Scanned into memory	5
Print: 1st page from a different tray than rest of page	Yes
Print: Insert dividers for chapters from the driver	Yes
Print: Insert front and back cover from the driver	Yes
Print: Offset separate finished documents	Yes
Print: Send to physical mailbox for later collection	No
Print: Send to virtual mailbox & print with a password	Yes

Remote Control from Client Terminals / Network	
View Toner Levels before printing	No
Estimate max pages printed from toner	No
View paper levels in trays	Yes - in 25% increments
Specify problem (paper jam, door open)	Yes
Obtain departmental management figures	Yes - web based via Top Access
See \ View 3rd party products	No
Check page throughput \ copy totals	Yes
Estimate toner usage	Counts pixel data sent to print

Bandwidth \ File Sizes & Send Once Print Many		
Print Job	Lowest Recorded Network Printer	This Printer
Network Load Test	3.64 Mb	4.64 MB
5 copies of 6 pages WP-9 Collate set at Application	367 Kb	1.45 MB
5 copies of 6 pages WP-9 Collate set at Printer Driver	367 Kb	766 KB
35 Page Word 2000	811 Kb	1.50 MB

Reproduction Quality		
	Copying	Printing
Banding \ Screen Clash	None visible	None Visible
Small Text \ Lines	Average	Average
Color Definition (in grey)	Slightly light	Slightly dark rk
Photo Fine detail	Slightly light	Slightly dark
General impression	Good for most offices	Good