

BERTL

HIGHLY RECOMMENDED



RISO EZ390



Up to 130-ppm Monochrome

Print • Copy



100% INDEPENDENT ANALYSIS

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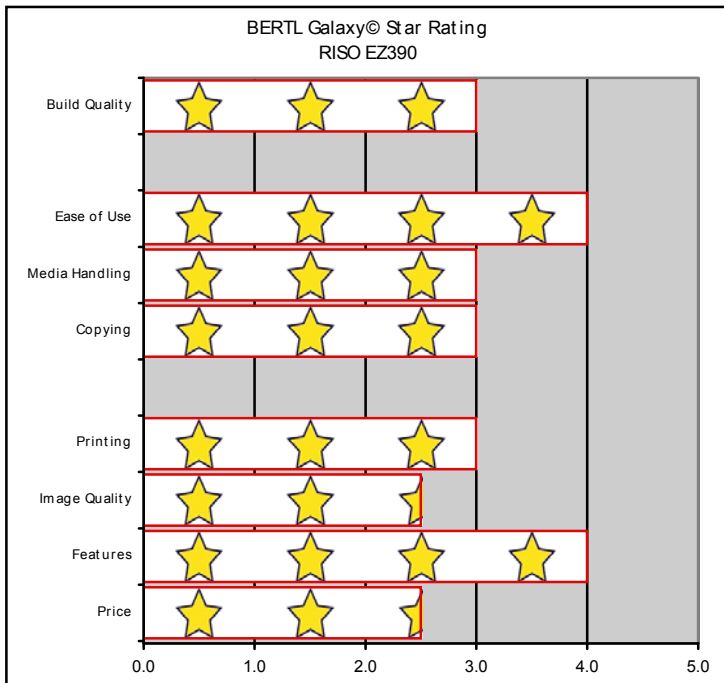
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OFFICE/LT. PRODUCTION



ABOUT BERTL'S GALAXY® STAR RATING

BERTL understands how difficult it is to choose one office-imaging device over another and exists to make this an easier choice for the consumer. That said, how does a consumer decide between two or more devices that carry the same BERTL 3-, 4- or 5-star rating?

Category-Criteria

Build Quality - An analysis of the construction quality of the major components that the user must interact with on a regular basis (e.g.: paper trays, access covers, supplies, etc.).

Network Administration - The quality of administrative and management utilities (both executable and Web-based) when compared to that of a sliding scale benchmark based on the network administration feature set of other vendors.

Finishing - The productivity penalty (punch, staple, booklets) based on tests and finishing specifications and effectiveness based on a sliding scale benchmark when compared to that of other finishing systems found on other devices.

Ease of Use - Ease of maintenance (adding paper, toner, misfeeds, cleaning) and ease of using the documentation, help, control panel, print drivers and client utilities when compared to a sliding scale benchmark based on of the ease of use of other devices.

Media Handling - Throughput specifications and evaluations based on a sliding scale benchmark when

compared with the handling of special media (e.g.: oversize, thick or coated stock) found on other devices.

Copying - Copy productivity based on tests and a feature-set analysis when compared to a sliding scale benchmark based on the feature set found on other devices.

Scanning - Simplex and duplex scan productivity and quality based on tests and a comparison of the overall scan and send feature set when compared to a sliding scale benchmark based on the feature set found on other devices.

Printing - Duplex and simplex print productivity based on tests and a printing feature set analysis when compared to a sliding scale benchmark based on the feature set found on other devices.

Image Quality - The quality of business color images (text, dot, line, halftone and solid quality) based on tests and a subjective rating on the quality of continuous tones (photos) when compared to a sliding scale benchmark based on the continuous tone quality produced by other devices.

Features - The feature set compared to a sliding scale benchmark based on the feature set found on other devices.

Price - MSRP of a system configured with network printing, copying, scanning, and one or two media trays/rolls (wide format) configuration.

Among the digital duplicators recently introduced by RISO, Inc. in April 2008, were the flagship EZ590, and the EZ390. Both systems are based on the same print engine, with print speeds up to 130 ppm, can be equipped with optional spot-color capability, and provide ledger-size printing. Both are also designed for traditional digital-duplicator markets including non-profit organizations, schools, religious organizations and in-plant printing systems with high-volume printing/copying applications and ledger-size printing applications.

The primary differences between the two are that the flagship EZ590 features a touch-screen user interface and standard GDI printer controller with USB 2.0 interface. It also features a USB flash drive for printing from flash memory devices and optional document storage for print-on-demand. In contrast, the EZ390 employs a LED panel (no touch screen), and the GDI controller is optional. This is reflected in the EZ390's lower acquisition price (list price is \$9,995 versus the EZ590's list price of \$13,995). BERTL tested both units; in this test report, we evaluate the EZ390.

Both systems may be equipped with an optional 10Base-T/100Base-TX interface for network connectivity, and both feature RISO's Quality System. The i Quality System provides two-way communication between the system and its supplies via Radio Frequency (RF) tags. These tags relay information to the system, so that it can adjust to provide optimum image quality.

Also standard are extensive account-management capabilities including RISO's User Management, Print Count Viewer, and ID Counter and Meter Reports. In a nod to eco-friendliness, the unit, which is Energy Star-compliant, uses more environmentally friendly soy inks and natural-fiber masters.

The EZ390, which can print on paper sizes up to 12.8" x 17" and has a maximum scanning area of 11.69" x 17", also features versatile paper handling. It can print on heavy card stock, recycled papers, newsprint, carbonless, pre-cut and odd-sized media.

Digital duplicators like the RISO EZ390 are generally designed for producing print jobs of at least 30 copies or more per original, and generally have a lower cost per page than toner-based digital copier/printers. RISO puts cost per page for the EZ390 at \$0.0209 at 25 copies per original and as low as \$0.0034 at 5,000 copies per original (includes costs of ink, masters and maintenance at 6-percent page coverage on 8.5"x11" paper). This makes the EZ390 especially attractive for enterprises that are very budget-conscious, such as non-profit organizations, schools, hospitals, churches, etc., or indeed, any

enterprise that requires the ability to produce high volumes at a low cost.

Ink Versus Toner?

Digital duplicators rely on a different imaging process than laser, LED-array or ink-jet printers and MFPs. Like other digital duplicators, the RISO EZ390 begin by digitally scanning the original, and then burns the image—using a thermal process—onto a special porous material (called the master), creating openings in the master. The master is then wrapped around a drum. The ink is drawn through the openings (perforations) in the master and onto the paper to create the printed image. This is usually a fast process—generally, digital duplicators operate as fast as 60 to 180 ppm.

Users of digital duplicators need to be aware of the two-step process when making copies—making the master and then printing—and the fact that for each page scanned in, a separate master must be made. Because the master is the most expensive consumable (about 20 cents per master), and ink is very inexpensive, the most cost-effective jobs are those that consist of over 30 copies of a single page.

Just How Much Can I Save?

The economics of digital duplicators makes them an attractive proposition in cost-conscious educational, religious and charitable establishments in that the imaging technology does not require expensive photo-sensitive components that need replacing. Because they don't utilize photo-sensitive components, they also tend to be more reliable. The most costly element in the print run is the master. This means that the longer the print run, the greater the cost advantage that the duplicator provides compared to a toner-based system. For most, the magic number is 30 copies. Cost per page can be as low as 1/3 of a cent.

Digital duplicators also have another important advantage over toner-based systems: they consume less power. Because there's no heating element, systems such as the RISO EZ390 consume as little 4 percent of the energy-cost of toner-based systems.

In this test report, BERTL takes an in-depth look at the EZ390 from the image quality it produces, to productivity, ease of use, and paper-handling.

Device-Features Summary – RISO EZ390	
Max. Engine Speed (Letter/A4)	130 ppm
Speed Intervals	60 – 130 ppm (5 steps)
Resolution	Scanning: 300 dpi x 600 dpi Printing: 600 dpi
Master Making Time	Approximately 20 secs. (for A4/landscape at 100% reproduction)
First Page Out Time	20 secs.
Maximum monthly volume	600,000 pages
Copy	Standard
Print	Optional
Scan	No



The RISO EZ390 as tested by BERTL.

PRICING

RISO EZ390	
List Price	\$9,995
Options	Color Print Cylinders, Automatic Document Feeder, Job Separator, Key Card Counter, Card Feed Kit, Envelope Kit, System Controller, RISO Network Card

SPECIFICATIONS

Print	
Operating Platforms	MS Win 2000, 2003, XP, Vista
Standard Print Drivers	EZ 3U Driver
Standard Interfaces	No

Copy	
Automatic Document Feeder	Optional
Max. Original Size (Platen)	11"x17" (280x432 mm)
Max. Original Size (ADF)	12.18"x17" (310x432 mm)
Maximum Scanning Area	11.69" x17" (297x432 mm)
Image Modes	Line, Photo (Standard, Portrait/Group), Duo (Line/Photo/Shadow Off), Pencil (Darker/Lighter)
Max/Min Zoom Ratio	50-200%/1%
Image Combine (N in 1)	Yes
Stamp Options	No
Security Mode (master removal)	Yes

Maintenance	
Master Capacity	215 sheets per roll (\$68.00)
Ink Container Yield	25 copies per original: 5,174 pages 5,000 copies per original: 37,049 pages (\$29.50)
Color Drum	Optional

Maintenance	
Available ink colors	Optional

Media Handling: Input	
Standard Paper Feed Capacity	1,000 sheets
Max. Paper Feed Capacity	1,000 sheets
Min. Paper Size	3.93"x5.84" (100x148 mm)
Max. Paper Size	12.18"x17" (310x432 mm)
Min. Paper Weight	13 lb. bond (46 gsm)
Max. Paper Weight	110 lb index (210 gsm)
Maximum Imaging Area	11.45"x16.73" (291 x 425 mm)

Media Handling: Output/Finishing	
Standard Output Capacity	1,000 sheets
Maximum Output Capacity	1,000 sheets
Job Separation System	Optional
Collation System	No
Variable Data Module	No
Instant Drying Module	No

FEATURES

Software Features	
Print Drivers	EZ 3U Driver
Client Software	Yes
Management Software	Yes
Other Software	No

Device-Management Software	
Web-based device monitoring	No
Job-tracking/ account management	Yes
Executable-based device monitoring	No
Group management of network devices	No
Monitor 3rd-party MIB-compliant network devices	No
HP Web JetAdmin compatible	No

PRODUCT HIGHLIGHTS



The EZ390 features a control panel that consists of hard keys and an LED panel.



The center of the control panel contains the LED panel, numerical keypad for entering number of copies, and a graphic of the device that lights up to indicate various device components.



The EZ390's paper-output tray features a unique mechanism that facilitates faster drying of prints. Inside the paper output tray are guides that help separate printed pages being deposited into the output bin. This helps facilitate quicker drying of printed pages. Depending on their needs, users can adjust the guides to provide more or less separation between pages.

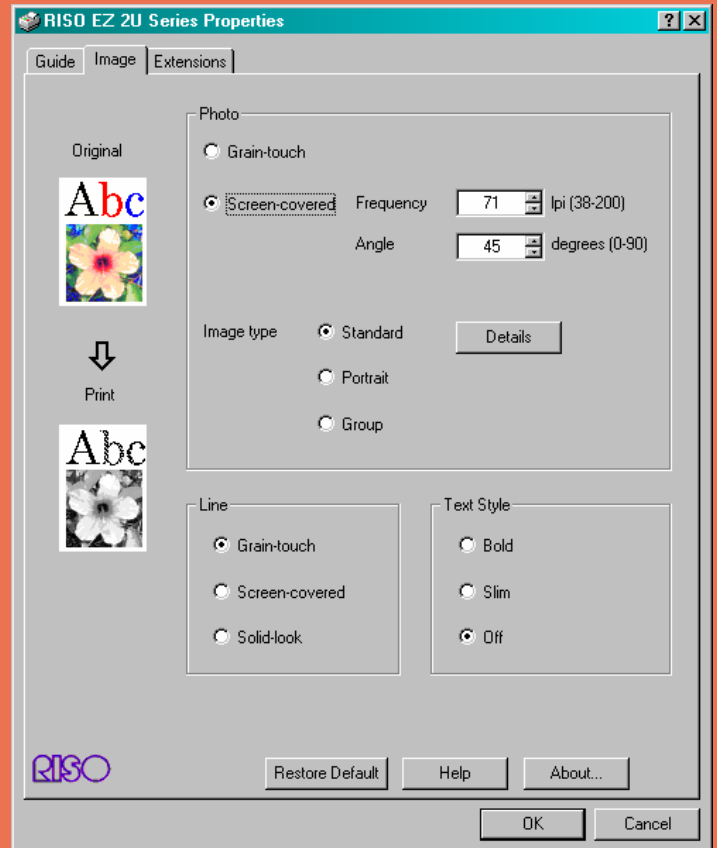


Image-quality adjustments from the control panel and within the print driver allow the user to fine-tune the image quality for the print application. This is used, for example, to improve the reproduction of photographic images.

BACKGROUND

A digital duplicator's productivity must be carefully assessed. Unlike a toner-based system that spends much of its time handling single-set (one copy) jobs where processing power must be taken into consideration, duplicators are exactly the opposite. Duplicators only become cost-effective when producing multi-set jobs (approximately 30 sheets per copy)—due to the cost of the master material—and as such tend to only be used for long-run, single-page jobs. In this setting, the processing time is insignificant over the entire print run.

Maximum speed is not always best in a duplicator, and operators often deliberately slow the device down in order to obtain the best image quality. It is important to look at the dynamic between image quality and speed, which can only be judged on a case-by-case basis. BERTL recommends that users take their typical jobs to their local dealer to see how factors like skip feed and speed settings affect the quality and productivity of the print job, and use this as a more accurate assessment of speed.

PRINT PRODUCTIVITY

Evaluating print productivity is not as simple as timing copy jobs. The printing process involves several steps and can be affected by a variety of factors along the way.

The document must first be spooled by the print driver into a PCL or PostScript file. The PCL or PostScript file is then sent to the printer where it is raster image processed (RIPped) into image data by the device processor. The image data is then sent to the marking engine and output as printed pages.

There are three obvious factors highlighted above (spool time, RIP time, and print engine speed), which can all make or break a device's overall productivity. Other factors include concurrency and contention; for instance, print speed may slow down when the device is being used for other functions, such as scanning.

However, it is possible to time and compare these factors through the use of careful preparation, conditioning and testing.

Printer First Page Out Time (seconds)

Job List	Media Size	EZ 3U Print Driver
1-page photo print	Letter	35.79
4-page passport form PDF	Letter	28.31
16-page magazine PDF	Letter	28.33
22-page Excel worksheet	Letter	24.22
32-page test-based PowerPoint	Letter	26.68
32-page graphic-intensive PowerPoint	Letter	34.05
38-page Word form	Letter	23.35
50-page text-based PDF	Letter	23.56

Copier First Page Out Time (seconds)

	Black-and-White Mode
Number of Originals	
1 Simplex Original	19.87
1 Duplex Original	18.93

Device Contention	
System can copy or scan while printing?	No
Print slowdown occurs when scanning copy job?	Yes*
Print slowdown occurs when scanning in scan job?	Yes*
Print slowdown occurs when scan-date transfer underway (after scanning is complete)?	Yes*

*Unit cannot simultaneously scan and print.

WHAT WE LIKED

- First Page Out Time (FPOT) as fast as 23.35 seconds in network-printer mode.
- FPOT as fast as 19.87 seconds in simplex copier mode.
- The device automatically senses the original and goes into master-making mode.

WHAT WE WOULD LIKE TO SEE

- Overall, BERTL was satisfied with the EZ390's productivity in both printer and copier mode.



The EZ390's optional document feeder lifted to expose the platen glass.

IMAGE QUALITY

BERTL evaluates the output of several “test targets” in order to determine image quality. Following are descriptions of key elements of image quality. Note the numbered examples on each of the test targets shown in the right column.

Office Color Image Quality

1. **Density of Solid Areas** - Better contrast; more vivid overall images
2. **Line Work** - Better production of lines and text
3. **Halftones** - Better production of photographic and screened images
4. **Negative/Positive** - Better production of fine detail

Photographic Color Image Quality

5. **Flesh tones** - Better production of portraits
6. **Banding** - Better solid and dithered fill
7. **Low Contrast** - Better production of dark images
8. **Saturation** - Better production of bright colors
9. **Caste** – Better color fidelity
10. **Fine Detail** – Better reproduction of fine details

Density of Solid Areas*	
	Print Density
Black	0.93

*Density is on a scale of 0 to 2.5, with 2.5 being the best possible.

Density of Solid Areas*	
	Copy Density
Black	1.23

*Density is on a scale of 0 to 2.5, with 2.5 being the best possible.

Print Resolution*		
	Vertical	Horizontal
Black	4	3

*Based on a scale of 1 to 5, with 1 being the best.

Print Halftones		
	Min. Gradation*	Max. Gradation**
Black	10	100

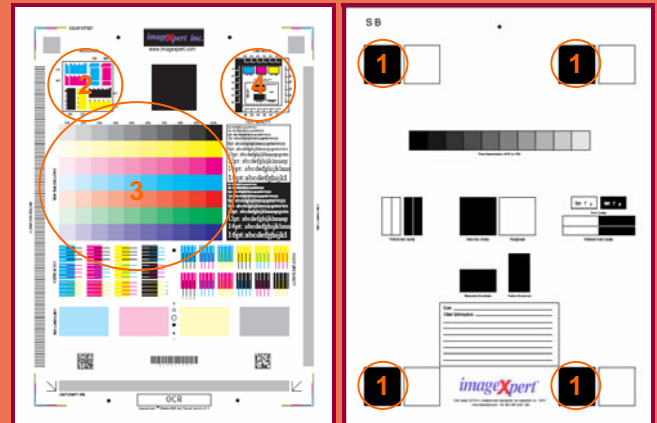
*Minimum gradation is on a scale of 10 – 100 percent in 10 percent increments. The best possible minimum gradation is 10 percent.

**Maximum gradation is on a scale of 10 – 100 percent in 10 percent increments. The best possible maximum gradation is 100 percent.

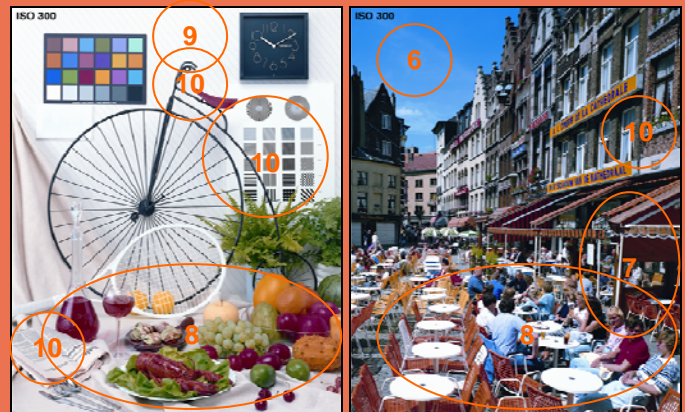
Copy Halftones		
	Min. Gradation*	Max. Gradation**
Black	10	100

*Minimum gradation is on a scale of 10 – 100 percent in 10 percent increments. The best possible minimum gradation is 10 percent.

**Maximum gradation is on a scale of 10 – 100 percent in 10 percent increments. The best possible maximum gradation is 100 percent.



BERTL uses ImageExpert printer test targets for the evaluation of printed image quality. BERTL technicians measure image density and evaluate the device's ability to produce a full range of halftones and various sizes of negative/positive text, dots and lines in each primary printing color (CYMK).



BERTL uses synthetic (photographic) test images obtained from ISO International Standard 12640--Graphic Technology--Prepress digital data exchange--CYMK Standard Color Image Data (CYMK/SCID) in order to evaluate the ability to print photographic images.

IMAGE QUALITY

Negative/Positive Lines*				
Line Width (points)	Negative		Positive	
	Vertical	Horizontal	Vertical	Horizontal
1	√	X	√	X
2	√	X	√	X
3	√	√	√	X
4	√	√	√	X
5	√	√	√	√
6	√	√	√	√

*Chart cells containing an "x" indicate that the printer was not able to print the line width correctly. Chart cells containing a "√" indicate that the printer was able to produce the line width correctly. Overall, the fewer "x's," the better the image quality.

Negative/Positive Dots*	
Line Width (points)	% of Dots Printed
1 pixel black negative	70
2x2 black negative	80
1 pixel black positive	70
2x2 black positive	80
Checkerboard appearance?	Yes

*On a scale of 0 – 100%. The higher the percentage, the better.

WHAT WE LIKED

- Overall, the RISO EZ390 produced good image quality that will be sufficient for use in traditional digital-duplicator markets (non-profit organizations, schools, religious organizations, etc.). It may also be acceptable for some applications in commercial-printing enterprises.
- The EZ390 correctly produced all halftones in both printer and copier modes.

WHAT WE WOULD LIKE TO SEE

- Less grainy appearance—in both copier and printer modes, output displayed a grainy appearance.
- Higher print density in both printer and copier modes.
- Higher print resolution
- Better line and dot control.

PROGRAMMING THE CONTROL PANEL

Among digital duplicators, some units provide a selection of hard keys and an LED panel (no touch screen). Others provide a selection of hard keys and a touch screen. Usually, touch screens are easier to use than LED panels.

Most touch screens utilize a menu-driven system, while others utilize an icon-based system. Some menu-driven touch screens can involve many complicated sub-menus that can be difficult to navigate.

In general, different control panels' ease of use—or lack of—can often have a significant affect on user productivity. The harder it is to select frequently used options such as duplexing, document finishing, etc., the more time the user has to spend programming the device and the less productive they are.



The EZ390 incorporates a control panel consisting of hard keys and an LED panel (no touch screen).



The left side of the control panel includes hard keys for scanning level, print density, image positioning, and imaging modes.



The center of the control panel contains the LED panel, numerical keypad for entering number of copies, and a graphic of the device that lights up to indicate various device components.

PRINT DRIVERS

As with control panels and touch screens, print-driver design can vary enormously from manufacturer-to-manufacturer. And, as with control panels and touch screens, how easy it is—or isn't—to make selections in the print driver and navigate through it can significantly affect user productivity.

Most vendors provide an emulation of PCL (printer control language) developed by the Hewlett-Packard Company. Some may also provide an emulation of PostScript, developed by Adobe Systems Incorporated, or they may license PostScript directly from Adobe. While the Adobe PostScript driver is not the most user-friendly of print drivers, one of its advantages is that many users are already familiar with it. Alternately, some manufacturers may use an emulation of PostScript and design their own print-driver user interface, or may license PostScript from Adobe and also design their own print-driver interface.

Print-Driver Checklist	
Do print drivers have identical user interfaces?	NA*
Are print drivers' interfaces identical to other vendor models?	Yes
Bidirectional communication within print drivers?	Yes
Auto device configuration from within print driver?	Yes
Does print-driver installation require rebooting of the workstation?	Yes
Are print-driver deployment processes included?	No
Are print-driver deployment guidelines and procedures included?	No

*Not Applicable

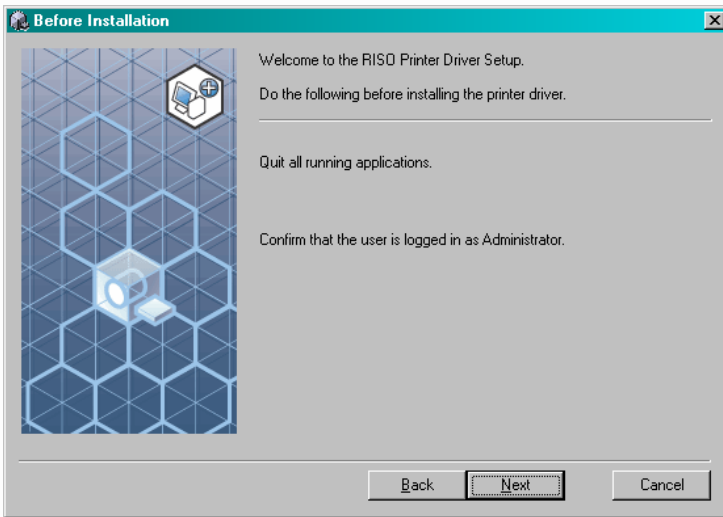
INSTALLING THE PRINT DRIVER



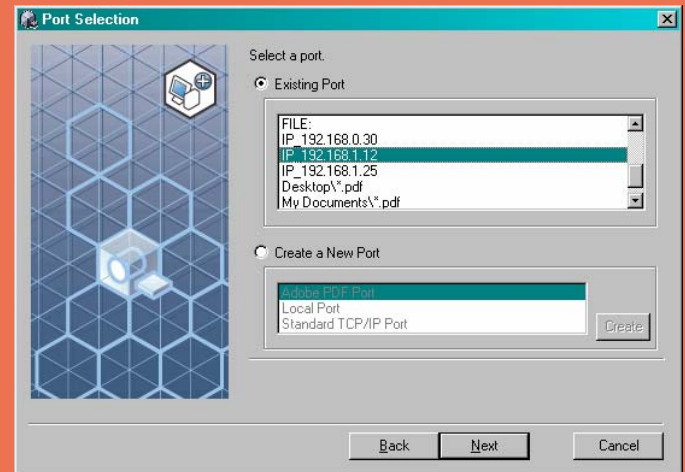
RISO provides an automated utility for installing the EZ 3U print driver. The first step is to select the desired language.



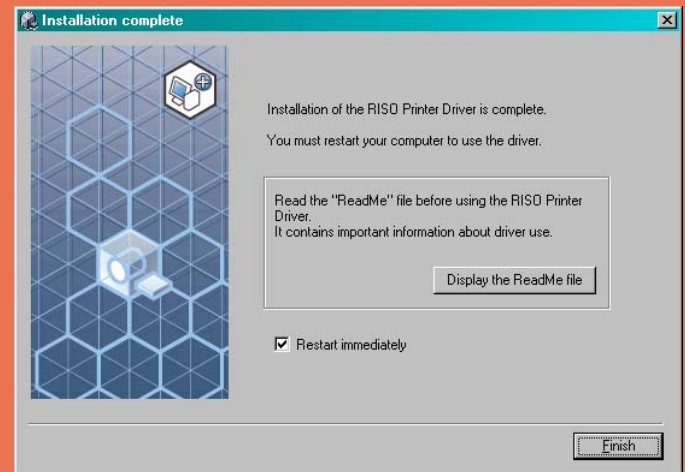
Next, the administrator installs the driver. Users can also download a User's Guide in Adobe PDF format.



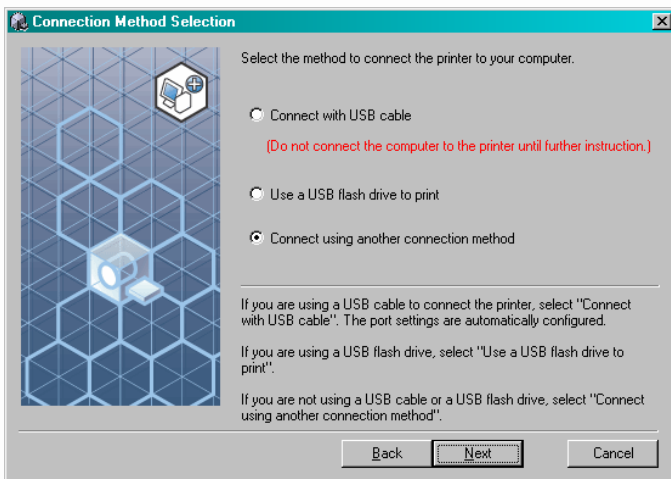
The administrator is prompted to quit all other applications before installing the driver.



The administrator selects the EZ390's Internet Protocol (IP) address (below).

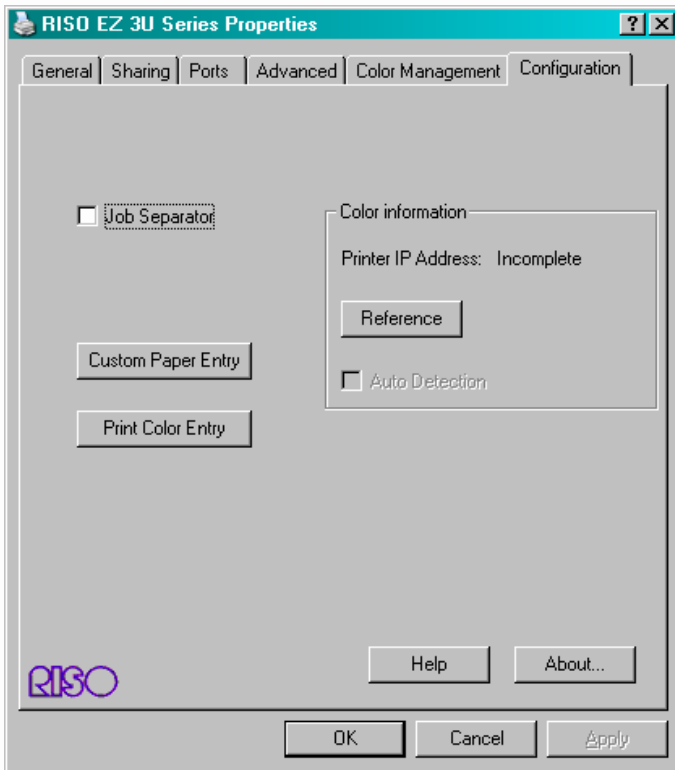


Installation of the print driver is complete.

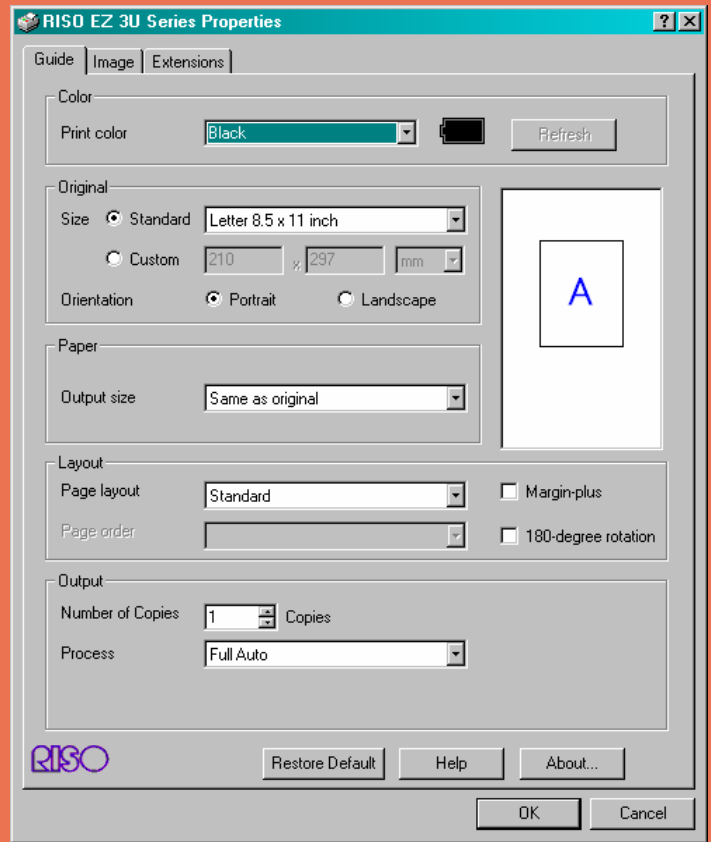


Next, the administrator is prompted to specify their connection. Note the option to print from a USB flash memory device via the USB flash memory port. This capability is only provided with the EZ590 however. The administrator then selects the EZ 3U print driver from a list.

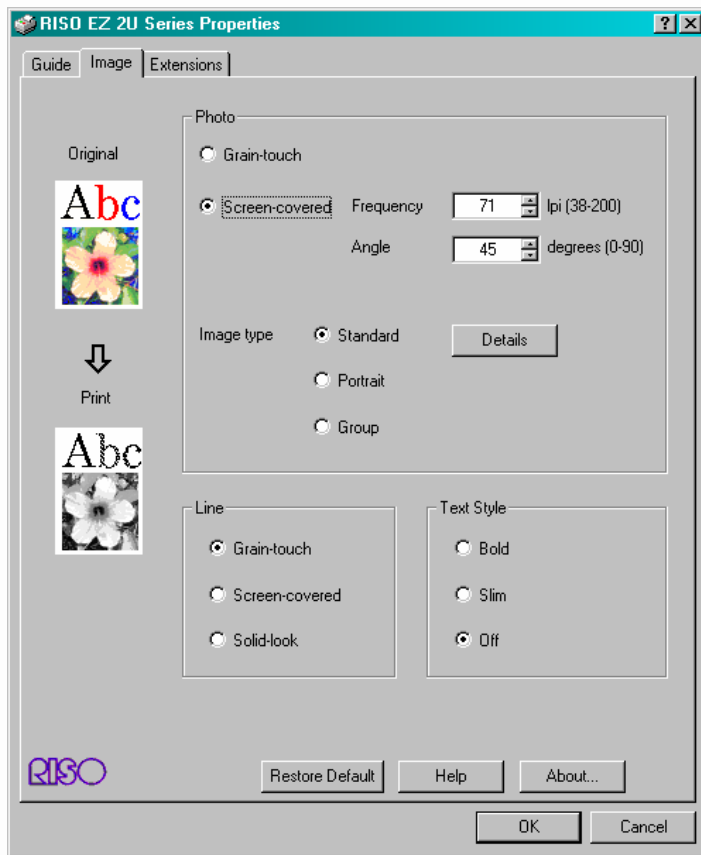
EZ 3U PRINT DRIVER



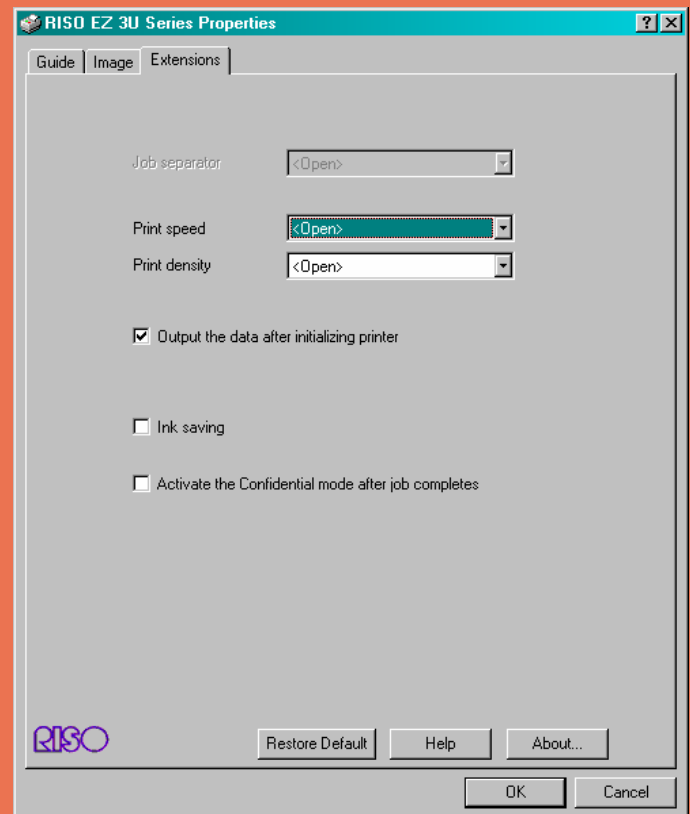
Administrators indicate installed options, as well as custom-size installed paper sizes and installed spot-color options, via the driver's Printer Properties. Printer Properties is accessed by selecting the Printers and Faxes folder from the Microsoft Windows' Start Menu, and then selecting the RISO EZ390's EZ 3U driver.



The driver's first tab, Guide, enables users to specify black or spot color, paper size, as well as specify a custom paper size. Users can also specify portrait or landscape orientation, output paper size, number of copies, and may also adjust margins and rotate images.



The second tab, Image, enables users to adjust image quality, enhance image quality for solid areas, and adjust halftone screening. Users can also adjust the appearance of text, making text bolder or slimmer. (Note that both the EZ 2U and 3U's print drivers are the same, as the EZ 2U driver is shown above.)



The third tab, Extensions, enables users to adjust print speed; there are five levels, enabling users to select from slowest to fastest print speed. There is also an ink-saving mode. With the ink-saving mode, less ink is consumed because less ink is printed on the page. Administrators can also limit and track usage by requiring users to enter an ID number before they can print.

Note that with Interval Printing, users can specify that the device skip a paper feeding during printing, providing inked pages with more time to dry, and preventing ink marks on the next sheets

By selecting "Activate the Confidential mode after job completes," users can prevent their documents from being duplicated by unauthorized users. When this check box is selected, the master is automatically replaced with a blank one after all specified print jobs are finished, so that other users cannot make prints with the first user's master.

ROUTINE MAINTENANCE

A digital duplicator's marking technology is significantly different compared to that of a typical toner-based laser printer or MFP. With a digital duplicator, the marking technology is ink-based and the device must produce a master for each page submitted in a print or copy job. Using a thermal process, the image is "burned" or etched into a master material that is then wrapped around an imaging drum. Next, the printing process begins as an internal ink roller presses the ink through the "burned" pores of the master for direct transfer to the media or via a transfer roller to the media produce the printed image. This relatively simple and efficient technology permits imaging onto a wide range of media types, high print speeds and offset-press like durability and cost per page without the downsides of a managing a traditional "print shop."

A duplicator has four components that can require end-user maintenance: imaging drums, ink, master rolls, and the master disposal unit.

The ink and imaging-drum replacement process usually means just simply sliding the units in and out.

Replacing the master roll in most duplicators is easy, but has the potential to be costly if performed incorrectly. The media is relatively thin and delicate and has to be handled with care.

Potentially, the messiest part of the routine maintenance of some duplicators is the emptying of the master ejection unit. The ejected masters—which are still covered in ink—are deposited into a container. That container must be emptied on a regular basis.

BERTL found removing the EZ390's used masters particularly easy and did not come into contact with the used masters. The user grasps and pulls out the used-master box, and removes it from the unit. Next, the user squeezes a clamp to release the masters into a disposal bin.

The following information describes the procedures that users must follow in order to maintain the tested device:



The EZ390's paper-output tray features a unique mechanism that facilitates drying and stacking of prints. Inside the paper output tray are retractable plastic guides that slow the descent of pages and separate them as they are output from the printer and settle into the exit tray. There are two sets of such guides built into the left and right media output guides.

On the photo on the left, one set of guides is retracted. In the photo on the right, the user adjusts the control that is used to extend and retract each set of guides.



The user adjusts each side guide in the exit tray independently by lifting this lock and sliding the guide into the appropriate position.

Maintenance Checklist

Load ink/toner while running?	Yes
Requires rear access for access to maintenance items?	No
Requires side access for access to maintenance items?	No
All-in-one imaging units?	No
User-disposable waste item(s)?	Yes

REPLACING PAPER/ADJUSTING OUTPUT TRAY



The user slides this guide into position in order for the paper-input tray to accommodate different paper sizes.



The user can also adjust the input-paper tray's position to the right or left to facilitate more accurate feeding of paper.

REPLACING THE IMAGING DRUM



To replace supplies, the user first opens the main front door.



In order to remove either the master roll or imaging drum, the user presses a button to release either of the units, pressing the button on the right to release the master unit, and pressing the button on the left to release the imaging unit. Once the light within the button is green, the units can safely be removed.



Most users should find it easy to replace the EZ390's imaging drum. After first opening the front door and pressing the imaging-drum button, the user can safely withdraw the imaging drum. It is a simple matter to then remove it and replace it with a new drum. The process is nearly the same for replacing the master roll.



After opening the front door, and pressing the master unit button as described previously, the user can withdraw and remove the master unit. It is an easy process to insert a new master unit, slide it back in, and shut the front door.



The process for removing and replacing the master unit is easy.

REPLACING THE MASTER DISPOSAL BOX



To remove the master disposal box, which contains used, inked masters, the user first opens a door, then grasps and withdraws the unit.



Above and below: Removing and replacing the master disposal box is an easy process. Removing and emptying the master disposal box is an easy process. The user squeezes a clamp to release the used masters into a disposal bin. The RISO EZ390's master disposal box is a clean process, so that users do not have to come in contact with inked masters.



REPLACING INK



Replacing ink is a very easy process. The user first opens the front door, and then twists the cap of the cylinder containing the ink to slide it out (next page).



Above and below: Ink is contained in a cylinder that is easy to remove and replace.



WHAT WE LIKED

- Print driver was very easy to use—it is logically laid out and easy to navigate.
- Removing and replacing the imaging drum, master unit and ink was an easy and clean process.
- Adding paper and adjusting the paper tray to accommodate different paper sizes was easy.
- BERTL liked the paper-output tray's mechanism that facilitates faster drying of printed pages.
- RISO's User Management eliminates the need for key-card counters. With it, administrators can set up to 100 accounts at the device's control panel. Administrators can limit usage to only specified users (who must enter a PIN), as well as limit the number of prints and masters specific users can produce.
- With ID Counter Report, administrators can generate reports indicating how many masters and copies have been made each month, as well as which groups or users are making them. When the system is equipped with network connectivity, administrators can e-mail these usage reports in .CSV format.
- Print Counter software utility enables administrators to view counter reports, including prints and masters made each month by user or group, at their computer workstation.
- With Meter Reports, administrators can set up monthly reminders to print out monthly meter readings. Meter readings can then be printed or e-mailed if network-connected.

WHAT WE WOULD LIKE TO SEE

- Overall, BERTL found the EZ390 easy to use and maintain.

MEDIA INPUT

Paper handling is a core requirement of every device. If a device cannot create documents on the paper users need, it does not matter how fast the print engine is, or how many pages it can produce in a month. Paper handling comes down to three key attributes: weight, capacity and size.

Weight

The majority of paper used in the general office is graded between 20 lb. bond/80 gsm and 28 lb. bond/105 gsm. Duplicators are generally designed to handle heavy paper stocks so that they can produce a wide range of documents. Most duplicators incorporate a heavy card stock switch that operators should select so that the media-picking mechanism knows to be more forceful in its feed process.

Capacity

Unlike printers and MFPs, duplicators do not come with cassettes stored under the main engine unit. To satisfy the high speeds and heavy media support, a large single paper input hopper on the side of the unit acts like a high-capacity bypass tray, feeding media at high speed via a very straight path through the engine.

The standard paper capacity for duplicators is 1,000 sheets. Some devices at the higher end of the duplicator market can be equipped with higher input capacities—up to 3,000 sheets—achieved with a single higher-capacity feed unit mounted to the side of the device.

Size

Letter/A4 size paper is used in the majority of day-to-day operations. Legal and financial documents often are printed on the longer legal size (8.5" x 14"), as are front and back booklet song-sheets for churches or event programs for schools. As a result, duplicator vendors offer entry-level models with an 8.5" wide imaging system at a low price.

However, some environments also rely heavily on the larger ledger/A3 size for printing pages from books, maps/floor plans, or spreadsheets. In production environments, printing letter/A4 documents two-up onto ledger/A3 paper, and guillotining offline is commonplace in order to reduce "click" charges by 50 percent, versus letter/A4 print runs. Many high-volume users are offered the same click charge for letter/A4 as they are for ledger A/3.

Media Handling Checklist

Maximum media weight from all media sources?	Yes
Maximum media weight in duplex mode?	NA*
Drop-in loading of a full ream of paper?	Yes
Corner separators in paper trays?	No
Spring-loaded ramps in paper trays?	No
Geared media size side guides?	Yes
Captured rear media guide?	Yes
Automatic paper size detection?	No

*Not Applicable

ADDING MEDIA/ADJUSTING OUTPUT TRAY

Reloading Paper Supplies

Being able to move paper swiftly through the system without jams occurring or paper-control issues is key to the success of any duplicator. The RISO EZ390's paper-input tray, located on the left of the unit, is easy to use. The tray can hold up to 1,000 sheets, and is equipped with a control for adjusting the device to print on lighter or heavier paper.



The EZ390's standard 1,000-sheet paper-input tray.



Using this control, the user can precisely adjust the input-paper tray's horizontal position to facilitate accurate feeding registration of print media.

MEDIA OUTPUT AND FINISHING

Since duplicators typically are used to create single-page documents instead of collated sets, there is usually no need for the finishing capabilities found on printers and MFPs.

Output stacking is generally limited to a 1,000-sheet output hopper which sits directly opposite the input hopper, thus maintaining a straight paper path. The sides of this hopper usually include plastic flaps that slow the rate of descent of each sheet, allowing for more time for the ink to dry before the sheet sits on the pile.

Job Separation

To allow for easy job separation in the stack, many duplicators provide a job-separation mechanism as standard or optional. Typically, this mechanism, known as a "tape unit", inserts a piece of colored tape between sets of prints. This tape protrudes in a fashion that is similar to that of tabs inserted into a large document.

The job-separation mechanism allows users to quickly determine the individual pages within a job so that they can be separated for offline collation (if creating multi-page documents) or distribution.

Other In-line Finishing Options

Entry-level duplicators are usually limited to a 1,000-sheet output tray only. Higher-end duplicators may provide additional in-line document-output equipments:

- Larger output stacking tray (capacity greater than 1,000 sheets).
- A large, multi-bin collation module that acts like a sorter bin on an analog copier, depositing a sheet into each bin in turn as it builds up collated sets.
- A variable-data module with a separate ink-jet print engine allows users to add variable data to the standard template printed by the duplicator. This can be useful for adding addresses to direct-mail pieces.
- To create multi-colored or spot-color output, duplicators must make multiple passes for each sheet so that each color can be applied individually. The ink needs to dry between each pass in order to avoid smudging or contamination inside the device. To minimize the time delays between passes, one manufacturer provides a drying module that allows printed output to be run back through the device immediately.

Other Off-line Finishing Options

Off-line collators much like those found on analog copiers are available from a variety of vendors. Users manually place un-collated pages into the appropriate sequential

page input bin, and the sorter feeds and produces stacks of collated sets to the output tray.



Above and below: The EZ390's standard paper-output tray that can hold up to 1,000 printed pages.



WHAT WE LIKED

- Both the input paper tray and output paper tray are easy to adjust to accommodate different paper sizes.
- The device can be adjusted for optimal feeding of standard, light or heavy-weight paper.
- Balanced paper-input and output trays—both the paper-input and output trays have the same capacities (1,000 sheets). This facilitates workflow for large print and copy jobs.
- The output tray incorporates a mechanism that can be adjusted to facilitate quicker drying of printed pages.

WHAT WE WOULD LIKE TO SEE

- Overall, BERTL was satisfied with the EZ390's paper-input and output capabilities.

As with RISO's EZ590, the EZ390 performed very well throughout testing. BERTL observed the following:

- First Page Out Time (FPOT) was as fast as 23.35 seconds in network-printer mode.
- FPOT was as fast as 19.87 in simplex copier mode.
- The image quality of the second print of each page was of acceptable quality (other similar devices must produce as many as four prints to reach acceptable image quality).
- When printing various originals on 20-lb. plain bond, drying time was not an issue in the tests.
- In testing, BERTL determined that the image quality produced by the EZ390 will be sufficient when used in the traditional digital-duplicator markets (non-profit organizations, schools, religious organizations, etc.) or used as a cost-effective adjunct/replacement for such existing offset/production-printer applications as printing spot-colors, forms and envelopes. That said, BERTL observed that when compared to that of most other printing technologies evaluated over the years, overall image quality displayed a somewhat grainy appearance. Keep in mind that although there is little doubt that while image quality could use density, resolution and line-and-dot production enhancements, the image quality as it stands is *more than serviceable for a wide variety of effective, economical AND profitable printing applications*.
- At first glance, it may appear a bit more intimidating for the user to maintain an ink-based digital duplicator versus a typical ink- or toner-based digital printer. However, BERTL found that it was easy to change the EZ390's ink, imaging drum and masters. Adding media and removing stacked prints is as easy as it gets. The control panel was also easy to use. On the PC side, there is minimal software required for efficient operation and the print driver was effective and easy to use. In fact, BERTL found that the overall user-maintenance requirements versus the print volume ratio was superior to that of any other digital imaging technology.

While the EZ390 lacks several of the EZ590's features—such as standard GDI printer controller, print-on-demand and document storage, and USB flash drive—the EZ390 has a lower acquisition price (\$9,995 versus the EZ590's list price of \$13,995), making it appropriate for customers with more limited budgets and who may require only copying.

As with all digital duplicators, keep in mind that while image quality produced by these devices will tend not to match that produced by toner- and ink-based devices, duplicators' real value lies in their fast print speeds and ability to handle large workloads (up to 600,000 pages per month for the EZ390). But perhaps their greatest advantage however is the real economy they offer—cost per page is generally about a one-third of a cent, while cost per page for toner- and ink-jet-based devices can be more than 10 times as much. The caveat of course is that with digital duplicators like the EZ390, because ink is the least expensive consumable and masters the most expensive, jobs should generally consist of approximately 30 copies or more of a single original in order to achieve low cost per page.

Considering its good performance in testing, excellent ease-of use, and exceptional economy, BERTL highly recommends the EZ390 for traditional digital-duplicator customers, such as non-profit organizations, as well as any organization with high monthly print volumes and where economy and low cost per page are a priority. With its low operating costs, quick setup time and ability to take on a variety of substrates and big workloads, the EZ390 should also be suitable for use as an adjunct to or replacement for commercial printing applications.

WHAT WE LIKED

- First Page Out Time (FPOT) as fast as 23.35 seconds in network-printer mode.
- FPOT as fast as 19.87 seconds in simplex copier mode.
- The device automatically senses the original and goes into master-making mode.
- Overall, the EZ390 produced good image quality that will be sufficient for use in traditional digital-duplicator markets (non-profit organizations, schools, religious organizations, etc.). It may also be acceptable for some applications in commercial-printing enterprises.
- The EZ390 correctly produced all halftones in both printer and copier modes.
- Print driver was very easy to use—it is logically laid out and easy to navigate.
- Removing and replacing the imaging drum, master unit and ink was an easy and clean process.
- Adding paper and adjusting the paper tray to accommodate different paper sizes was easy.
- BERTL liked the paper-output tray's mechanism that facilitates faster drying of printed pages.
- RISO's User Management eliminates the need for key-card counters. With it, administrators can set up to 100 accounts at the device's control panel. Administrators can limit usage to only specified users (who must enter a PIN), as well as limit the number of prints and masters specific users can produce.
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- The output tray incorporates a mechanism that can be adjusted to facilitate quicker drying of printed pages.

WHAT WE WOULD LIKE TO SEE

- Less grainy appearance—in both copier and printer modes, output displayed a grainy appearance.
- Higher print density in both printer and copier modes.
- Higher print resolution
- Better line and dot control.

About BERTL

The success of an organization depends on its ability to manage its information and assets. An effective workflow process requires the complex integration of information, devices, software and people.

IT managers, office managers, and other knowledge-management professionals need to know what digital imaging devices would best serve their specialized workflow processes.

BERTL's services are designed around this real-world framework, delivering business consumers the independent analysis and insight needed to make critical decisions about digital imaging's role in their organization.

Independent Analysis and Insight

BERTL's reports, comparative data, and strategic guides look at digital imaging through the eyes of the business user. The research examines not only the technical features, but also vertical market applications, and business benefits. The impact on worker productivity is a primary concern.

BERTL is 100 percent independent. It receives no funding from manufacturers and all product evaluations and reports are published at BERTL's own expense for its subscribers. Business users worldwide trust BERTL for objective, unbiased analysis of digital imaging systems.

BERTL Services

Reports and Star Ratings

BERTL analysts provide detailed reports on the technical and practical benefits of thousands of color and monochrome workgroup, office, graphic arts, and production devices.

Product Specifications

DataCheck Gen II provides the most current competitive data on printers, copiers, MFPs, fax devices, wide format printers, scanners, and more.

News, Interviews, and Analysis

The ITchat online magazine provides insight into the dynamics and trends of the digital imaging marketplace through interviews, feature articles, and software reviews.

BERTL Awards

BERTL analysts recognize the leading devices and software solutions in the annual BERTL's Best awards. BERTL also honors the performance of manufacturers in the annual Readers' Choice selections.

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