

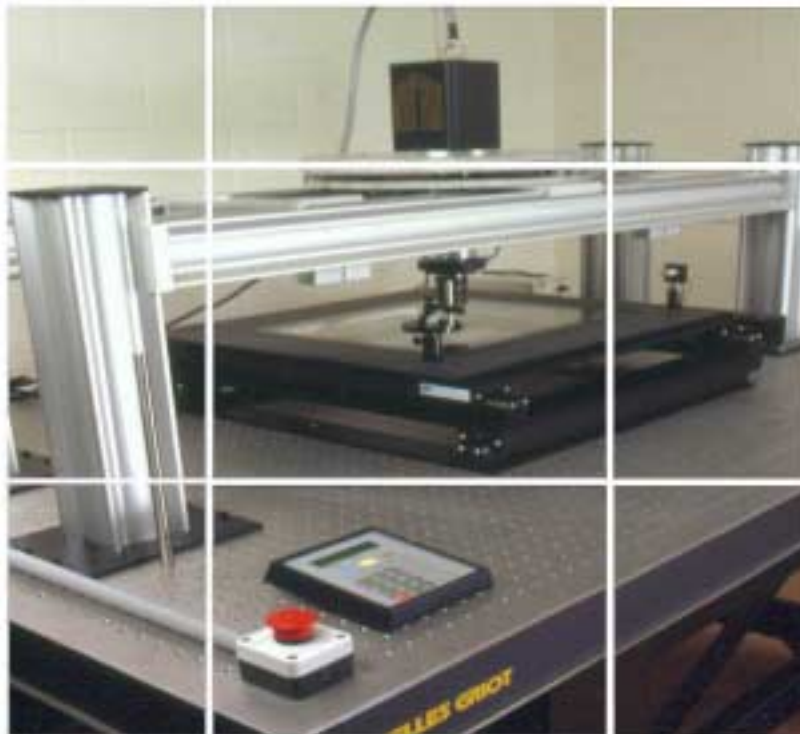
Retriever Technology

LF1417 Scientific Grade Densitometer



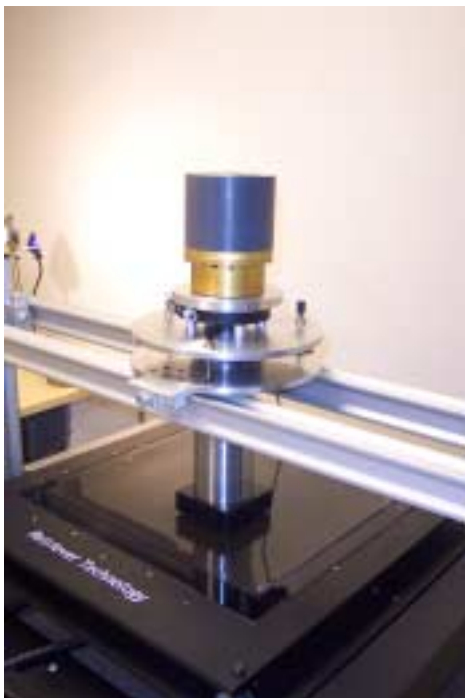
Retriever Technology has been designing and manufacturing sophisticated imaging products for the scientific community since 1998. We specialize in accurate, high resolution and high bit depth equipment, offering reliable and rapid digitization for many scientific applications.

Retriever Technology film densitometers allow for the rapid, accurate and calibrated digitization of precision scientific-grade film. More than just a piece of equipment, our densitometers are **scientific tools** that allow researchers to extract the maximum information from their valuable data.



Key Densitometer Features

- 6 micron sampling resolution
- OD > 5.0
- Film sizes up to 20" x 20"
- Precise stage motion with 1 micron linear encoders
- Area array CCD capture gives digitization rates of greater than 1 million pixels per second
- Powerful V++ software, combined with rapid acquisition, allows for large increases in dynamic range and SNR
- Stationary light and detector allows for precise and consistent flat-fielding
- Calibrated and precise illumination
- Powerful software allows for complete control over image acquisition
- Turnkey system includes workstation
- Factory installed, calibrated, and tested
- Training included



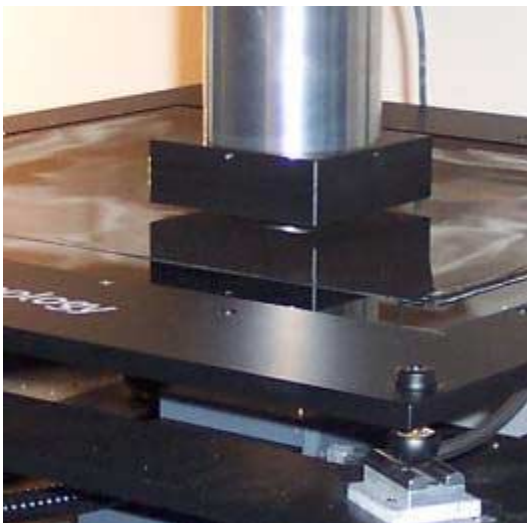
Choice of CCD Chips

Retriever Technology offers a wide selection of cooled scientific grade CCD chips that can be utilized in our densitometers. Our highest resolution system is offered with a cooled CCD that offers greater than 30,000:1 dynamic range in a single shot. With this system you can achieve true 16-bit digitization while digitizing at 6 micron resolution on your film. Even higher SNR can be obtained using powerful image acquisition options found in our V++ software.



Maintenance Free CCD Cameras

Retriever Technology densitometers come with integrated maintenance free scientific grade CCD cameras. Our cameras have all metal seals designed to hold vacuum for more than five years, eliminating the need for servicing the vacuum. This will result in years of worry free operations.

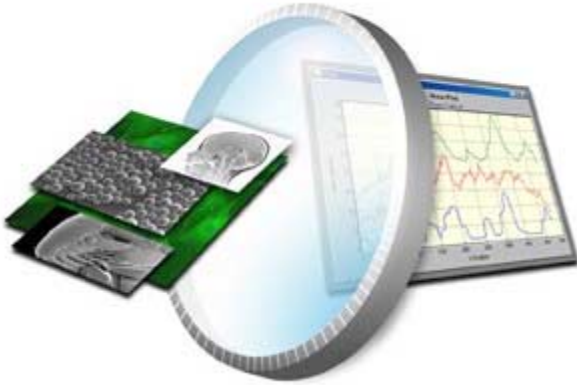


Complete System Including Workstation

Our densitometers are shipped and set up with state of the art workstations and preinstalled software, ready to tackle your most demanding applications.



Software



We offer the award winning Digital Optics[®] V++ image capture and analysis software as part of our total solution package

Retriever Technology systems come preinstalled with the award winning V++ software by Digital Optics.

Digital Optics specializes in producing high performance image processing software that is used worldwide in a myriad of scientific applications. V++ allows the users of our product to have access to a vast library powerful automation and imaging tools. Some of the features of V++ include:

- An extensive library of predefined functions
- Ability to handle the most advanced data types
- Designed to run other frame grabbers or video cameras
- Communicates with other laboratory devices and can automate the control of them
- Provides a tool for sophisticated users to write their own code

A demo version of this powerful software is available for further evaluation. For more information please contact Retriever Technology at 505-986-8196.

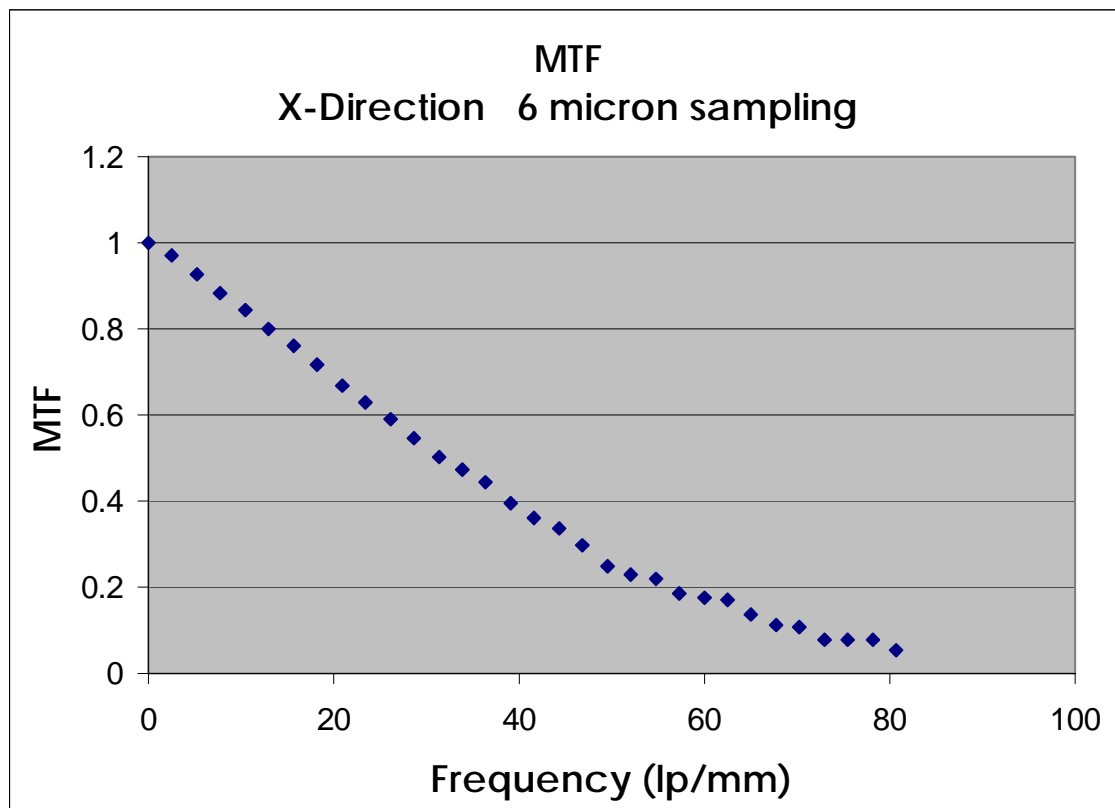
Technical

All of our densitometers come fully tested and with *guaranteed* specifications. Included in our acceptance testing are:

- Resolution as determined by Modulation Transfer Function
- Distortion
- Positional accuracy
- Dynamic range
- Illumination evenness

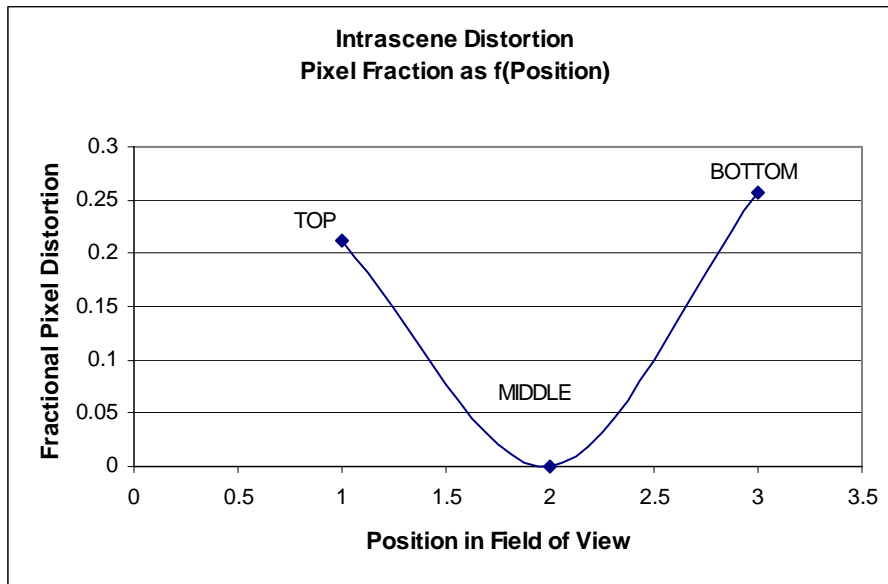
MTF

Most vendors don't like to talk about MTF because it will point to their equipment shortfalls but we are proud of our densitometers' performance and our ability to characterize it. We measure MTF using sharp chrome targets at multiple angles of attack. Typical values at Nyquist exceed 35%!



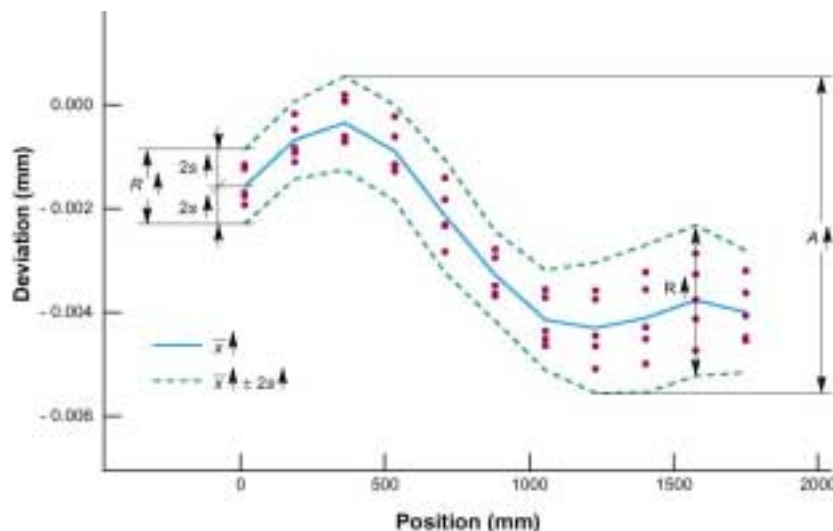
Distortion

Since we use the best optics available our images are nearly distortion free. For added accuracy we have optional distortion correction software that can correct each image. The graph below demonstrates an actual case with inter- and intra-scene distortion levels only a fraction of a pixel without correction. Point to point measurements across a entire 14" x 17" film can be made within one pixel accuracy.



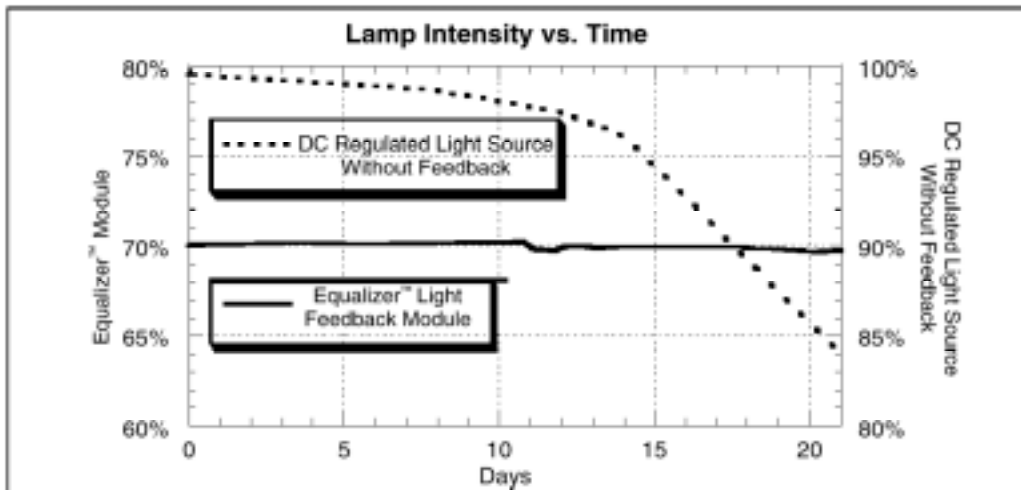
Accuracy

Only the most accurate stage can ensure perfect stitching for those films that need to be mosaicked. We use high precision stepper motor stages with 1-micron linear encoders to preserve the spatial accuracy of the digitized films, giving unprecedented measurement precision of your data.



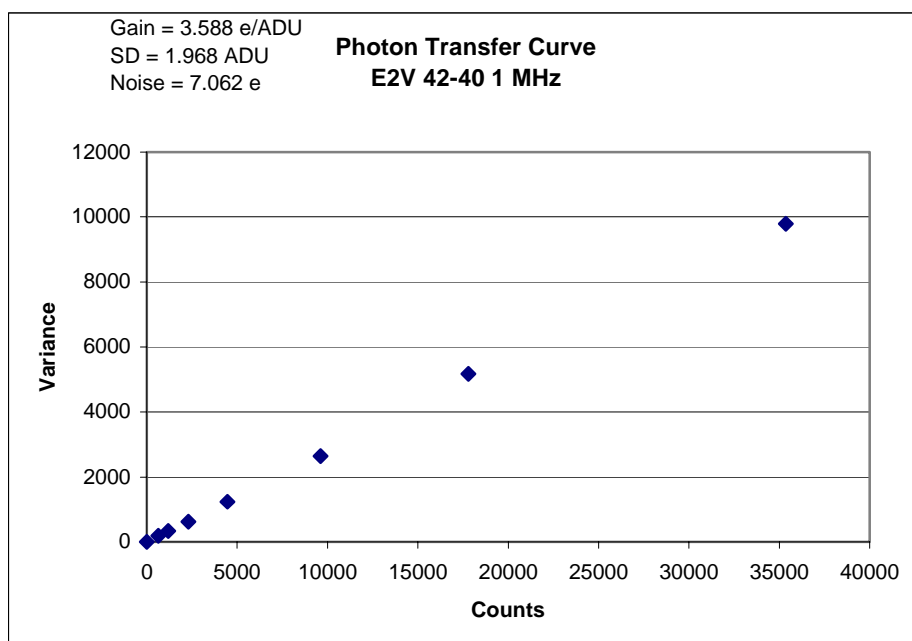
Illumination

We know that a good system needs to be built around a solid illumination source. So we use a system with an active DC feedback that maintains bulb intensity to +/- 2% over its lifetime. Actual results approach +/- 0.5%. Evenness within the field of view is +/- 3%, allowing easy and dead accurate flat fielding. And a remote fiber optically piped halogen source gives cold and clean illumination, preserving the film and the spatial accuracy of the data.



Photon Transfer Curves

PTCs are part of each system's acceptance testing, guaranteeing confidence in dynamic range, detector full well, system noise and linearity. Dynamic range of over 30,000:1 is easily obtained in a single image. Even larger improvements in SNR are obtained using our unique image acquisition features.



System Specifications

Feature	Benefit
Scientific grade 2D CCD sensor	Eliminates the need for constant calibration, provides high quality and fast throughput.
Choice of CCD size	Single image capture for many film sizes. The best chip can be specified for the application. Dynamic range of greater than 30,000:1 in a single shot.
Cooled CCD	Reduces readout noise and increases the dynamic range. Lifetime vacuum guarantee on the detector.
Fixed sensor - moving subject	Consistent alignment and illumination. Excellent flat fielding characterization.
Remote and regulated back illumination	No heat load on film. Even and consistent illumination. Extremely accurate flat fielding.
Open XY frame stage with 1 micron linear encoders	Calibrated and accurate movement allows for precise imaging and image stitching
Many film sizes accommodated	From 35 mm to 14" x 17"
High speed parallel digitizing	Digitize an 8" x 10" film in 10 minutes at full resolution
V++ Software	Powerful imaging software allows user to automate many imaging tasks. Large dynamic range increases through unique processing.
Precision mechanical assembly	Allows consistent calibration of the system to ensure complete and dependable performance.
Turnkey system	System is delivered with powerful workstation ready for operation.
Professional installation	The system will be installed at your site by Retriever Technology.

- A 2D CCD array digitizes in parallel, giving the end user wide leverage over imaging conditions. Multiple acquisitions for increased SNR and overlapping fields for tone balancing are just a few of the possibilities.
- The use of color effect wheels allows creative and dynamic effects to be achieved simply and cost effectively.
- There is virtually no heat at the point of light output thus allowing heat sensitive items to be lit and installations to be safely undertaken in areas where excess heat could otherwise cause problems.

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