

# Light-Capture

ATTO COOLED CCD CAMERA SYSTEM  
Model AE-6981 LightCapture

Low Noise  
High Sensitivity

**Chemiluminescent Detection**  
**Fluorescent Detection**



for Chemiluminescence “Light-Capture” with CS Analyzer 3

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# CHEMILUMINESCENT IMAGING FLUORESCENT IMAGING

ATTO TYPE AE-6981 LIGHT CAPTURE

## Image taking for chemiluminescent samples

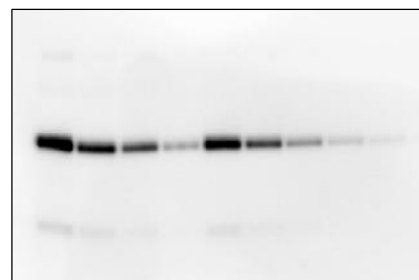
### ■ Luminescent detection of Western blotting

Western blotting is a specific detection method for proteins. First of all, proteins are separated through polyacrylamide gel electrophoresis, and they are blotted (transferred) to a PVDF membrane. This membrane is treated with blocking in order to reduce background noise at detection, and after reacting with an antibody (primary antibody) for detection of specificity and then reacting with the enzyme labeled secondary antibody, luminescence is detected.

As a reagent for detection of luminescence, "ECL (GE Healthcare Bio-Sciences KK)" or "SuperSignal (Pierce Biotechnology, Inc.)" using Luminol and hydrogen peroxide) is used.

LightCapture II can easily detect luminescence from western blotting in a laboratory. It has low running costs (printer paper) and does not emit any waste liquid from image development.

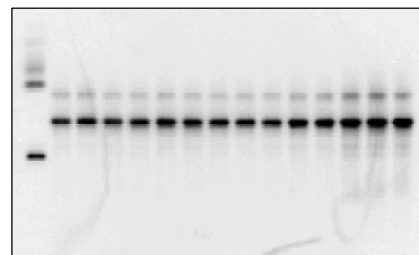
ATTO creates a series of experiment tips with regard to western blotting utilizing the experience with electrophoresis accumulated over a long time. We are distributing a leaflet "A method for success with Western Blotting".



### ■ Luminescence detection with southern blotting

Southern blotting is a specific detection method for DNA. DNA transferred and fixed on a membrane by dot blotting or by blotting after electrophoresis is detected in a base sequence-specific manner. As labeling enzyme for the probe (or antibody to a probe labeling substance), ALP (Alkaline phosphatase) is used and CSPD or CDP-star is used for luminescence reagent.

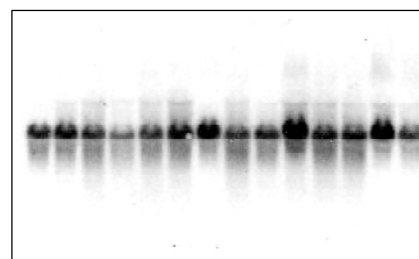
LightCapture II realizes sensitivity greater than X-ray film for this luminescence detection. We would strongly recommend that you attend a demonstration to witness its performance for yourself.



### ■ Luminescence detection with northern blotting

Northern blotting is a specific detection method for RNA. This method is frequently used as an index of gene expression. The method of experimentation is similar to that of southern blotting, however, the extraction of RNA is the key point to succeed with experiments employing this method.

LightCapture II realizes sensitivity greater than the X-ray film in the case of the last luminescence detection of northern blotting. We would strongly recommend that you attend a demonstration to witness its performance for yourself.

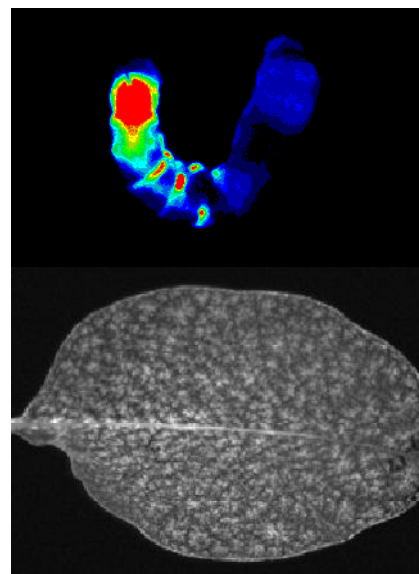


### ■ Luminescence detection for luciferase assay sample

Luciferase assay is a gene expression detection method using luminescent protein (luciferase) as a reporter. The promoter region of the gene to be measured and luciferase gene are connected and transferred to a cell. When the substrate, luciferin is added to a substance from which luciferase is expressed, light emission occurs.

LightCapture enables an image of luciferase transgene sample of plants, animals or microorganisms to be taken. (detection is not possible if the expression amount is small.)

When the gene expression amount is small, it's better to use a Luminometer for measurement of luciferase assay. Please request a Luminometer catalogue for details of the device.

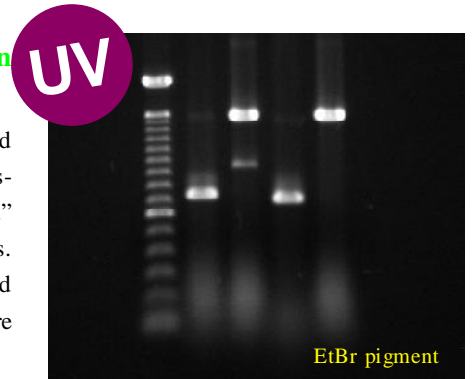


## Imaging of fluorescent sample

Fluorescent imaging requires a UV curing unit or LED light source “Visirays” as an excitation light source and a filter for fluorescent imaging.

### ■ Imaging of fluorescent detection sample ~ Fluorescent stained detection of electrophoresis gel ~

Electrophoresis gel of nucleic acid or protein is stained with fluorescent dye and band is detected fluorescently by excitation using a UV curing unit. LightCapture is able to detect typical fluorescent pigments of nucleic acids such as “Ethidium bromide”, “SYBR Green” and “SYBR Gold” (AE-6981FG model). It can also detect “SYPRO dye” series of fluorescent pigments for proteins. \*When performing fluorescent detection imaging with LightCapture, a UV curing unit (equipped as standard for AE-6981FC) and filter LCZII set (equipped as standard for AE-6981FC) are necessary.



### ■ Fluorescent detection by visible light excitation ~ AE-6935 Visirays ~

It is also possible to carry out fluorescent imaging using visible light as an excitation light source as well as a UV curing unit. When AE-6935 Visirays series is used, it becomes possible to take an image of the sample easily, which is difficult to detect with UV ray.

Images of “SYBR Safe”, “SYBR Green” and “SYBR Gold” for staining DNA and “SYPRO Ruby” and “Pro-Q Diamond (phosphoprotein detection)” for staining protein can be taken.



#### ■ AE-6935 Visirays Series

Visirays is a visible light source for fluorescent imaging using an LED. Either blue (470nm) or green (525nm) can be selected. In LightCapture, a powersource for Visirays is built in.

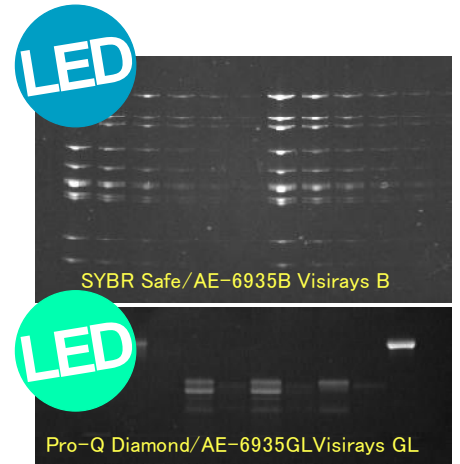
AE-6935B Visirays – B (470nm/blue)

AE-6935GL Visirays – GL (525nm/green)

Imaging filter for SCF515 Visirays B (50mm square)

Imaging filter for R-60 Visirays GL (50mm square)

\*Please request a separate catalogue for details of Visirays.



## Imaging of stained sample

**To image visible light, white light transmission source “Flat Viewer” and an LCZII filter set are required.**

### ■ Visible light imaging ~ stained sample ~

Band of electrophoresis gel is visualized by staining (CBB, etc.). LightCapture II is able to image the visualized band using white light transmission source (Flat Viewer: option). When background image under the same imaging conditions as those for gel image is taken and saved at imaging gel, irregularity of light source can be reduced using the function of “Image operation: Shading correction” of the attached analysis software “CS Analyzer 3”.

\*To image visible light, an LCZII filter set (equipped as a standard for AE-6981FC) is required. When imaging CBB stained gel, if a filter for fluorescent YA-3 is used in addition to a neutral density filter, imaging can be performed with higher contrast.



Flat viewer



# LIGHT-CAPTURE SYSTEM SPECIFICATION

ATTO TYPE AE-6981 LIGHT CAPTURE

## Features of hardware

### ① LightCapture control panel

Imaging control panel of LightCapture. 5 imaging modes; Single, Repeat, Sum, Auto Sum and Live are furnished and exposure time can be selected from the range of 1/30sec. ~ 90min. Taken images can be saved on compact flash in a 14 bit (16384 grayscale) original image format (CS file/ extension .cod). Operations of "Save", "Load", "Delete" and "Format" are available for compact flash.

\*LightCapture II can be controlled imaging from a Windows PC, too.



9in Monochrome Video Monitor: Display "Live images" and view captured images.

Monochrome video printer

Output of images displayed on the monitor takes only 3 seconds. High quality images can be printed out at extremely low cost. Equipped with negative/positive mode.

### ② Shielded cabinet for LightCapture

This is a shielded cabinet equipped with a cooled CCD camera designed exclusively for LightCapture. This is for both luminescence and fluorescent imaging. It is equipped with a high sensitivity cooled CCD camera and imaging control panel on the top. Under the control panel, a compact flash slot for saving images is equipped.

When the small door of the upper compartment is opened, there is a lens (zoom lens), imaging filter tray, cabinet light SW and SW for Light Viewer. An LCZII filter set (option) is required for fluorescent imaging. Filters are simply placed in the filter tray for use.

The lower compartment is where samples are set. It is designed to shield light. During fluorescent imaging, the door on the bottom is opened and the gel tray is set. A cabinet lamp, AC power terminal (9V) for Light Viewer, AC power terminals (12V) for Visirays/Flat Viewer are equipped.

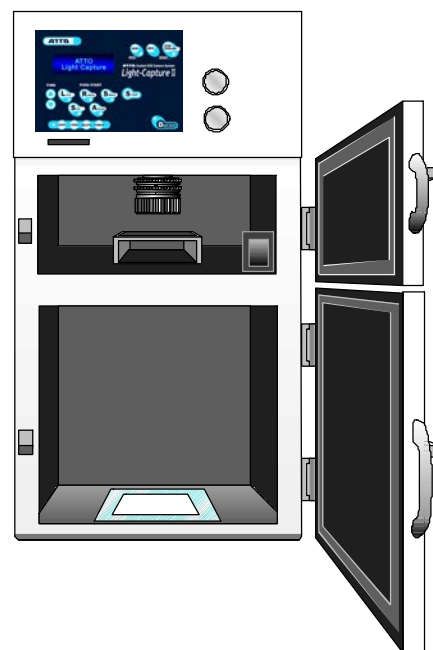
### ③ ATTO's cooled CCD camera

This is a high sensitivity cooled CCD camera specially developed for LightCapture. CCD is cooled down to -30 °C in order to reduce noise. It has resolution of 14bits: 16384 grayscale for A/D conversion and uses a CCD chip that is highly sensitive to luminescent wavelength of chemiluminescent samples.



UV transilluminator

For imaging fluorescent stained gel using EtBr, SYBR Green, and so on.



## ■ Feature 1. Easy-to-use, user-friendly control interface

The control panel is positioned at the top of the cabinet. The upper door is for lens operation and filter replacement. The lower door is for taking samples in and out. The control panel is set at the top of LightCapture. The imaging conditions can be set/executed on this panel. The panel is designed for user-friendly operation, thus anybody can handle it right away.



Taken image mode	Taken image times	Exposure time	Images sum	Main Unit Control	PC Control
Single	1	1/6 sec to 90 min	Nothing	○	○
Repeat	1 to STOP	1/6 sec to 90 min	Nothing	○	○
Sum	1 to STOP	1/6 sec to 90 min	Auto	○	○
AutoSum	1 to Saturation・AutoSTOP	1/6 sec to 90 min	Auto	○	○
Live	Live image	1/30sec	Nothing	○	○
AutoExpose	1 (taken shaking image once)	1/6 sec to 90 min	Nothing	×	○
SemiAuto	3	1/6 sec to 90 min	Nothing	×	○
DarkImage	Maintenance Mode	1/6 sec to 90 min	Nothing	○	×

\*Control by CS Analyzer with PC, AutoExpose and SemiAuto(3 times taken images) are enable.

## ■ Sensitivity is 3 times, imaging method using High mode (main unit control)

When luminescence detection samples are imaged with LightCapture, it is sometimes difficult to determine the correct exposure time. In such cases, if you carry out “trial imaging” in High mode at 3 times sensitivity, you can estimate the exposure time for imaging. Since exposure time can be determined quickly, you can ensure accurate imaging even for luminescence substrates with short luminescent time (e.g.: ECL). This high “Operability” is unique to LightCapture.

Trial Shot: One-minu exposure in High mode

**■ Weak Signal**  
Visible bands are detected but signals are weak.-> Exposure for imaging: 10 to 20 min. in Normal mode.

Trial Shot: One-minu exposure in High mode

**■ Adequate Signal**  
Clear bands are detected.  
-> Exposure for imaging: 3 to 5min. in Normal mode.

Trial Shot: One-minu exposure in High mode

**■ Strong Signal**  
Signal too strong to separate proximity bands.-> Exposure for imaging: 0.5 to 1min. in Normal mode.

## ■ Setting the appropriate exposure time automatically

### AutoExpose function (PC control)

When controlling LightCapture on a PC using CS Analyzer 3, if AutoExpose function is used, the exposure time is determined automatically and imaging is carried out through pre-imaging for a few seconds. (An appropriate exposure time may not be obtained if background noise is high or if there are spots emitting strong light nonspecifically.)

Shaking time of taken image

Auto Exposure Time

## ■ Feature 2. High sensitivity zoom lens ~ To image weak luminescence

### 6x zoom lens

(8-48 mm F1.0) 6981C/6981FC

Viewing angle of zoom lens (AE-6981) is 40 x 30mm to 220 x 170mm, and this freely-adjustable viewing angle allows for effective fluorescent imaging of agarose gels. Because it is a bright F1.0 zoom lens, it is well suited to high sensitivity imaging of chemiluminescent samples.

Features of zoom lens

\*Freely settable imaging size (most suitable for imaging of fluorescent gel)

\*Both luminescent imaging and fluorescent imaging can be carried out.



## ■ Feature 3. High sensitivity cooled CCD camera

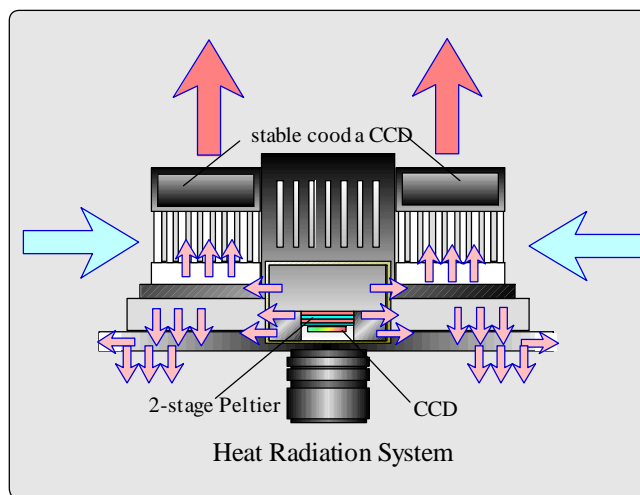
Stable cooling function for achieving high sensitivity

High sensitivity cooled CCD camera system

(forced air two-stage peltier cooling system)

LightCapture is equipped with a cooled CCD camera that can reduce noise for imaging over a long time. In principle, noise level can be reduced by lowering cooling temperature. Furthermore, it is important to maintain operating temperature at the same level during imaging over a long time. LightCapture II features a special radiation mechanism and it is designed to carry out stable cooling over a long time. (forced air two-stage peltier cooling system)

This stable cooling function effectively suppresses black spots (noise data) upon subtraction of the dark image during high-sensitivity imaging.



## ■ Feature 4. Optimal CCD for luminescence

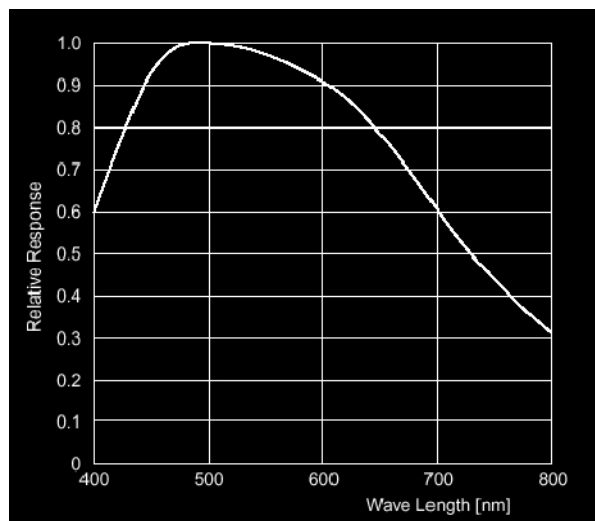
CCD features high sensitivity to wavelength of luminescent detection reagent (420nm~550nm)

Dedicated CCD chip for LightCapture

Available for use with all LightCapture models

The luminescent detection reagent produces the strongest illumination in the 420 to 550 nm range. This lies in the visible region but the wavelength is shorter than that of general fluorescent detection reagents. Typical CCDs used in gel imaging devices are not effective in this region, thus a CCD with high sensitivity of 500nm or below is required.

LightCapture is equipped with a CCD offering high sensitivity in this region to support luminescent imaging.



LightCapture CCD's wavelength

## ■ Feature 5. Image storage, 14bit (16384 grayscale), Storage on CF media

### Storage media: Compact flash

#### Available for all LightCapture models

#### Capable of direct capturing by connecting to a PC (CS Analyzer 3)

It is possible to store images on compact flash (CF) with LightCapture II. A single CF can hold up to 50 images. Image storage format of LightCapture is a CS file (14bit : 16384 grayscale), and capacity of storage file is approx. 600 KB. Image analysis software is included for quantitative analysis.

When a PC is connected, images can be stored in a CS file or Chain file (continuous file). It is also possible to store by converting to 16bit TIFF file or 8bit TIFF/BMP/JPEG files after capturing.

Saving format	Resolution	File format	Saved place
CS file	14bit (16384 grayscale)	.ccd	Main unit
CS file	14bit (16384 grayscale)	.ccd	PC
Chain file	14bit (16384 grayscale)	.cha	
TIFF file	16bit (65536 grayscale)	.tif	PC transfer
TIFF file	8bit (256 grayscale)	.tif	
BMP file	8bit (256 grayscale)	.bmp	
JPEG file	8bit (256 grayscale)	.jpg	

## ■ Feature 6. Connection with a PC

### The main unit uses USB interface for easy connection with a PC

#### CS Analyzer 3 software is equipped as standard.

#### Supporting AutoExposure (auto exposure mode)

Imaging and saving of images with the LightCapture II is performed by operating the control panel of the main unit, and it can also be controlled from a PC by connecting to Windows XP PC. CS Analyzer 3 is software for controlling LightCapture and analyzing images.

All images taken continuously in Repeat, Sum or AutoSum mode can be saved. Moreover, when AutoExposure mode is used, auto exposure imaging is available. SemiAuto mode is also furnished with which up to 3 kinds of arbitrary imaging durations can be set.



Image photo

## ■ Feature 7. Space saving shielded cabinet

### Compact body cabinet can be placed on the testing bench

#### Space saving cabinet

#### Included in all LightCapture models

\*Cabinet size: 32cmW x 34.5cmD x 62cmH, 21kg

AE-6981FC is 56cmW x 40cmD x 74.5cmH, 38kg.

\*Complete dark room is achieved for luminescent imaging.

\*Bottom lid can be opened, so transmission type UV curing unit can be used.

\*Lens part and sample chamber are separated.

\*A filter holder for fluorescent imaging is of the one-touch type.

\*In-cabinet lamp (with inverter) is equipped.

\*When Flat Viewer is used, pixel stained gel can be imaged. (Flat Viewer 78,000, LCZII Filter is required.)

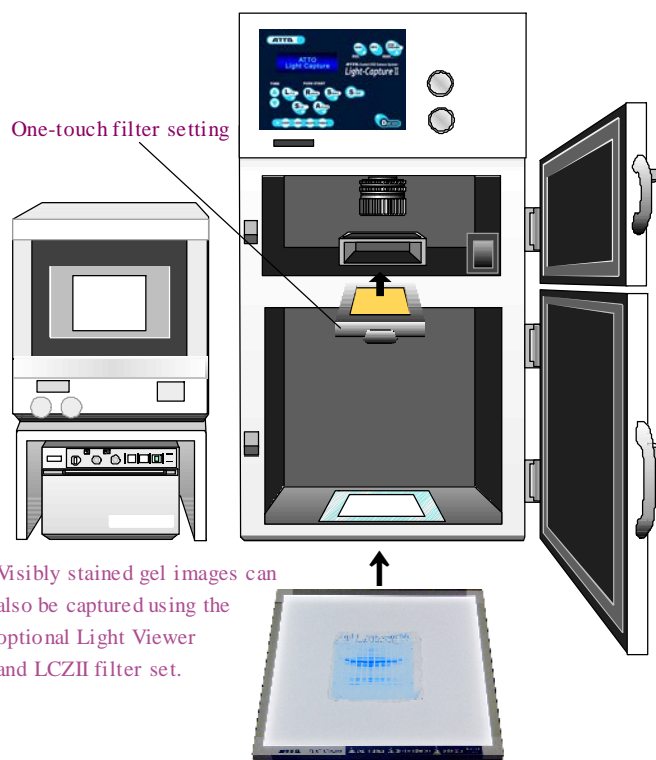
\*When Visirays is used, fluorescent imaging under visible light is possible.

(Visirays: 400,000, Fluorescent filter is required separately.)

\*Power consumption is small, so it contributes to energy saving.

Main unit of LightCapture 80VA

AE-6981FC system Max. 290VA



# CS Analyzer 3 for WindowsXP

ATTO TYPE AE-6981 LIGHT CAPTURE

## Image analyzing software CS Analyzer 3

### Image input function

#### \*LightCapture series

When LightCapture and a PC are connected, it is possible to control (image/capture) directly using CS Analyzer 3.

New! \*AutoExposure (auto exposure imaging)

->Appropriate exposure time is calculated automatically for imaging.

New! \*SemiAuto (arbitrary time imaging)

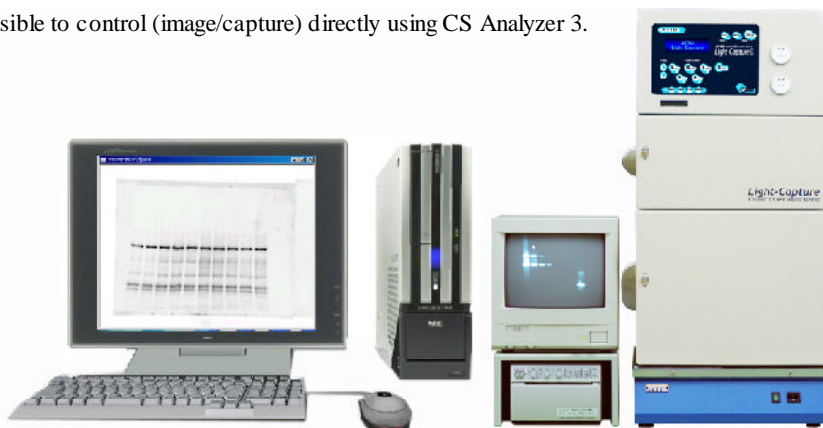
->Arbitrary exposure time is selected from 3 options and continuous imaging is carried out.

\*Single (single imaging), \*Repeat (repeated imaging),

\*Sum (summed imaging), \*AutoSum

(summed imaging with saturation detection function),

\*Read VRAM (video memory image copying function)



#### Processing after inputting an image

\*Shading correction/function (for white light source imaging)

-> Function used to correct irregularity of white transilluminator at imaging CBB stained gel, etc.

### Contrast adjustment function of displayed images

CS Analyzer is capable of handling images of 10 ~ 16bit with larger contrast grayscale than 8bit files (BMP, TIFF, JPEG, etc.). Bands of 10~16bit images are usually difficult to check on the monitor, but CS analyzer can make bands easier to see using display contrast adjustment function. When adjusting contrast, the brightness value of the image is not changed, so the same measurement result can be obtained regardless of the presence of adjustment.

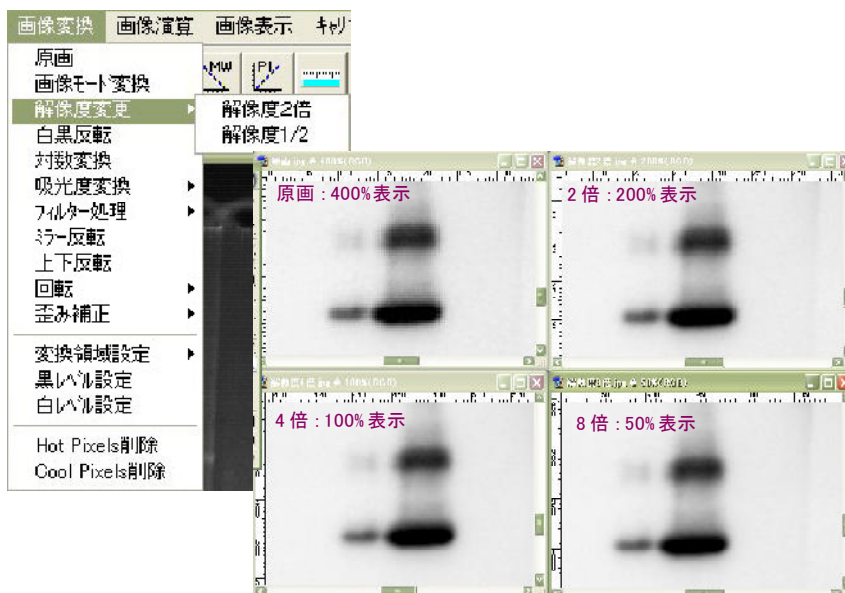
It is also possible to convert the contrast adjusted images to an 8bit file such as TIFF, BMP or JPEG and save it.



### Change of image resolution

CS Analyzer can double (or change to 1/2) the resolution of the image irreversibly. Changing resolution is effective when printing the image more smoothly.

When saving the changed images, the storage volume of the image with doubled resolution increases by 4 times.



## Image operation function

\*Example 1: Combination of luminescence pattern and colored marker image

In the case of chemiluminescence membrane imaging, luminescence patterns can usually be confirmed, but molecular weight markers that do not emit light are not detected. However, when CS Analyzer is used, (if prestained molecular weight marker is used) it is possible to combine (image subtraction) the image of membrane taken using white transilluminator and the image of luminescent pattern taken in a row. When this image is used, molecular weight of chemiluminescent pattern can be measured.



## Specification

Main specification of LightCapture

Model/Name – AE-6981FC LightCapture

Camera – Low noise type forced air cooling system, electronic cooled CCD camera (ATTO Cooled CCD Camera Fase III)

Effective pixels – 768x494pixels

Lens – 8 1/4 48mm F1.0 zoom lens

Noise removal – Forced air cooling 2-stage Peltier, -30 °C, Dark image auto operation function

Image size – 4 x 3cm – 21.5 x 16cm

Exposure time – 1/30sec. – 90min. (integration is possible)

Mode – Single, Repeat, Sum, AutoSum, Live (control panel), AutoEXposure, SemiAuto, ReadVRAM (CS Analyzer 3)

Data format/size – CCD file format (14bit; 16384 grayscale), Storage capacity: Approx. 600 KB

Storage media – LightCapture main unit: CompactFlash

Number of data per media : 50

Analysis/control software – CS Analyzer 3 is equipped as standard (Windows XP), LightCapture control function (PC is excluded), Image analysis function

Connection with PC – USB (with a cable)

Setting space (system) – 56W x 40D 74.5H cm

Power consumption (system) – 290 VA

In-cabinet lamp – High frequency turning ON

White transilluminator – Flat Viewer (option)

## Image analysis function

### ATTO CS Analyzer 3

Supported OS – Windows XP/Vista

#### Measurement function

Molecular weight estimation

- Calibration curve is created from the moving amount of molecular marker band and molecular weight

Densitometry

- Quantification from brightness value of band, peak position (at zone densitometry) detection, mobility, etc.

Quantitative determination function

- Determination of the quantity of molecular weight using molecular weight estimation, Determination of relative density from the quantified measurement value of the band

Measurement method

- Zone densitometry, Specified region densitometry, Spot measurement (Lane distortion correction, background correction, peak range correction)

Scale setting

- A scale can be set in the image as a line (it is used as a scale for full size printing)

#### Storage function

##### Image storage

- 8bit image storage (format: BMP/JPEG/TIFF) converted image, measured image, profile image, etc., 12~16bit image storage (format: CCD) special CS file format, 16bit image storage (format: TIFF) 16bit TIFF image storage, 12~16bit Chain file (format: cha) storage of the image taken into LightCapture

Text storage

- Measurement result and profile data can be stored as a text.

Data storage for reanalysis

- Image conversion, measurement region setting and measurement result can be stored as a batch when finishing the measurement. Data can be displayed again by opening reanalysis under the conditions set at finishing measurement

##### Image conversion

Pseudo coloring

- Brightness distribution of monochrome images can be displayed in pseudo color

Contrast display adjustment – Contrast for monitor display can be changed freely without changing brightness data