A Geno Technology, Inc. (USA) brand name

Gel Imaging Analyzer

Cat. No. BT3801

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Table of Contents

Important Safety information 4
Maintenance and care 4
Introduction 5
Features 5
Technical Specifications 6
Normal Operating Conditions 6
Basic Parameters 6
Minimum Computer Requirements 6
Software and Driver Installation 7
Structure 8
Operation Panel 8
Live Preview and Gel Image Capture 9
Save and Open Images 9
Image Optimization 10
Image Rotation 10
Annotations 11
Crop an Image 11
Automatic and Manual Lane Detection 11
Add Lane 12
Delete Lane 12
Restore Lane 12
Lane Correction 12
Lane Optical Density Curve 12
Comparing Lane Optical Density Curves 13
Band Labeling Options 13
Automatic and Manual Band Detection 14
Automatic Band Detection 14
Manual Band Adjustment 14
Molecular Weight Standard and Calibration 15
Select the Standard Lane 15
Enter Molecular Weight Marker Values 15
Generate the Molecular Weight Standard Curve 16

Result Analysis 17
Export Results to Excel 17
Report Analysis 18
Colony Counting 19
Configure Measurement Options 19
Spot and Dot Blot Analysis 21
Troubleshooting 22
Warranty 23
Returns and Service 23
Wiring Diagram 24

Thanks for choosing BT Lab Systems' Gel Imaging Analyzer. This operation manual describes the function and operation of the instrument. For proper use and to avoid any serious injuries, please read this manual carefully before operating the instrument.

IMPORTANT SAFETY INFORMATION



WARNING: Excessive exposure to ultraviolet (UV) radiation can injure the eyes and skin. Keep the chamber closed whenever UV illumination is active.

- Only trained personnel who have read and understood this manual should operate the instrument.
- Connect the instrument only to a properly grounded electrical outlet.
- Turn off the unit and remove the gel promptly after use.
- Do not open, disassemble, or repair the instrument without authorization. Unauthorized service may create a safety hazard and may void warranty coverage.
- In case of the following, immediately disconnect the power and contact BT Lab Systems.
    - The instrument encounters liquid.
    - The instrument gets soaked or burned.
    - The instrument emits an abnormal sound or smell.
    - The instrument is dropped or the outer shell damaged.
    - The instrument functions abnormally.
- Disconnect the power cord before replacing UV lamps or performing maintenance.
- Store and operate the instrument in a clean, dry, well-ventilated location away from corrosive substances

MAINTENANCE AND CARE

- Turn off UV lamps when not in use to prolong lamp life.
- UV lamps are consumable components that gradually lose intensity over time due to normal use and frequency switching. UV lamps are not covered under warranty.
- Keep the transparent viewing and transillumination surfaces clean and free of scratches. Do not apply excessive pressure.
- After each use, promptly remove the gel to prevent it from adhering to the glass surface. Clean the glass with a soft, lint-free cloth lightly moistened with absolute ethanol to remove residue and to maintain optimal light transmission.

INTRODUCTION

BT Lab Systems' Gel Imaging Analyzer is a high-performance laboratory instrument designed for the visualization, documentation, and analysis of electrophoretic gel bands. Featuring a Sony Exmor CMOS camera, the system captures clear, detailed images, including faint bands that may be difficult to detect with the naked eye. An advanced optical filter system effectively minimizes background interference and enhances image clarity, while the enclosed imaging chamber helps reduce exposure to ultraviolet (UV) radiation and potential contamination from ethidium bromide (EB). The integrated imaging and analysis software allows users to magnify, capture, save, annotate, edit, and analyze gel images, as well as generate and print experimental reports. Combining sensitive imaging technology with intuitive operation and comprehensive analysis capabilities, the Gel Imaging Analyzer streamlines laboratory workflows and provides a reliable solution for gel documentation and analysis.

Features

- Features a robust metal housing with a streamlined design, providing reliable performance, durability, and ease of operation.
- Equipped with a slide-out gel platform, dual-side access doors, and a concealed observation window for easy gel loading, removal, observation, and excision. An integrated gel-centering indicator light facilitates accurate sample positioning within the imaging chamber.
- Incorporates an overlapping, light-sealed chamber design that minimizes UV leakage and external light interference, improving imaging conditions while enhancing operator safety.
- Provides dual-intensity 302 nm transmitted UV illumination and 254 nm/365 nm reflected UV illumination. The transmitted UV illumination area measures 250 × 200 mm, supporting a variety of gel imaging applications.
- High-resolution, low-light digital imaging camera capable of capturing faint electrophoretic bands with excellent clarity. Real-time image preview and a 6X optical zoom lens with manual or automatic adjustment provide precise magnification and accurate image capture.
- Multi-layer coated optical filter system that effectively minimizes background interference and enhances image clarity.
- Zoom, focus, aperture, UV illumination, and white light illumination can be controlled through either the computer software or the instrument's control panel.
- Incorporates automatic UV shutoff when the chamber door is opened, delayed power-off, and UV leakage protection to minimize operator exposure and promote safe laboratory operation
- Equipped with an ultra-thin white light panel utilizing advanced phosphor-based UV-to-visible light conversion technology to provide uniform illumination for clear and accurate gel imaging.
- Specialized gel imaging software featuring automatic lane and band recognition, identification, adjustment, and numbering. The software supports the calculation and comparison of molecular weight, optical density, migration rate, pH, and percentage composition of nucleic acids and proteins. Additional capabilities include 1D and 2D gel analysis, Dot Blot analysis, and colony and clone counting. Users can capture, visualize, process, annotate, analyze, and save DNA, RNA, protein, and other electrophoretic gel images, as well as generate and export experimental reports in text or Excel formats.

TECHNICAL SPECIFICATIONS

Normal Operating Conditions

- Ambient temperature: 5 – 40 °C
- Relative Humidity: ≤80%
- Atmospheric pressure: 70.0 – 106.0 Pa

Basic Parameters

Model	**BT3801**
Camera	Sony Exmor CMOS
Lens	6X zoom; F1:1.2; 2/3-inch format
Shutter	Electronic
Camera Port	Standard C interface
Effective pixels	3072 x 2048
Bit depth	12-bit
Pixel size	2.4 x 2.4 μm
Resolution	6.3 MP
Housing material	Galvanized sheet metal
Detection sensitivity	Stained double-stranded DNA: less than 20 pg EB
Signal-to-noise ratio	≥56 dB
Optical filter	590 nm
UV lamp type	Quartz UV lamp
UV transillumination area	168 x 210 mm
Visible-light transillumination area	200 x 250 mm
White-light conversion plate area	210 x 260 mm
Transmitted UV wavelength	302 nm
Reflected UV wavelengths	254 nm, 365 nm
Transmitted UV lamp power	302 nm (8W)
Reflected UV lamp power	254 nm (11W); 365 nm (11W)
Power supply	AC 220V ±10%, 50Hz ±2% For operation in 110V environment, a compatible transformer will be provided.
Fuse	5A (ϕ5 x 20)
Dimensions (W × D × H)	470 x 450 x 755 mm
Net weight	33 kg

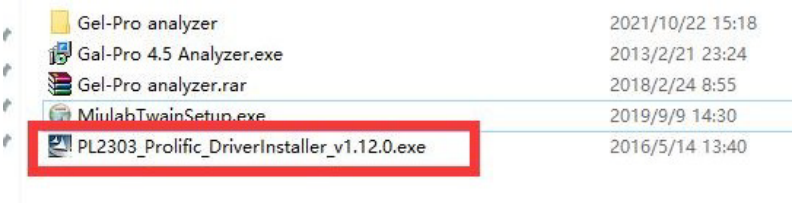
Minimum Computer Requirements

- USB-compatible computer motherboard and ports.
- A PC with a Pentium IV processor or higher is recommended to ensure optimal performance of the MVC USB digital camera.
- At least 1 GB RAM and 512 MB video memory.
- More than 20 MB available disk space for software and driver installation.
- Ensure that a compatible operating system, such as Windows 7 or Windows 10, is properly installed
- Ensure that the computer is free of viruses and malware. Check Windows Device Manager to verify that all device drivers are properly installed and that there are no conflicts with other video capture devices or their drivers.

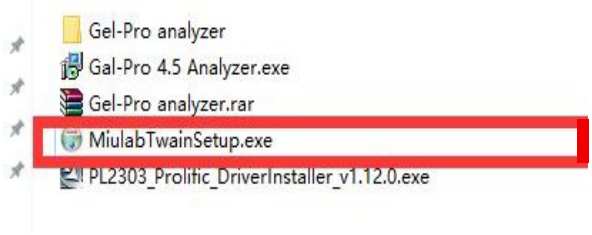
SOFTWARE AND DRIVER INSTALLATION

To ensure proper operation of the instrument, follow the instructions below to install the software from the USB flash drive provided with the instrument.

1. Select the appropriate software installation package (6.3 MP or 20 MP) based on the instrument model. For BT3801, users must select the 6.3 megapixels software package.
2. Install the serial-port driver by running PL2303_Prolific_DriverInstaller_v1.12.0.exe



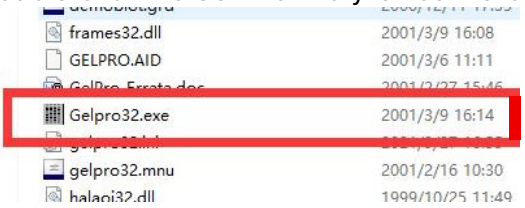
3. Next, install the camera driver by running MiulabTwainSetup.exe.



4. For the English-language application, open the Gel-Pro analyzer folder and launch the application icon.



5. Double-click the Gel-Pro Analyzer icon to launch the analysis software.



Note: The English version of Gel-Pro Analyzer is a portable application that does not require installation. It can be launched directly from its folder.

If antivirus software blocks the installation process, temporarily disable it only if the software has been verified as safe and your organization's IT policies permit it. Re-enable antivirus protection immediately after installation.

STRUCTURE

Familiarize yourself with the front power switch, operation panel, side access doors, observation window, rear communication ports, and drawer-style UV gel platform before operating the instrument.



Operation Panel

The front panel provides illumination controls and status indicators. The door interlock automatically switches off UV illumination when the chamber door is opened.



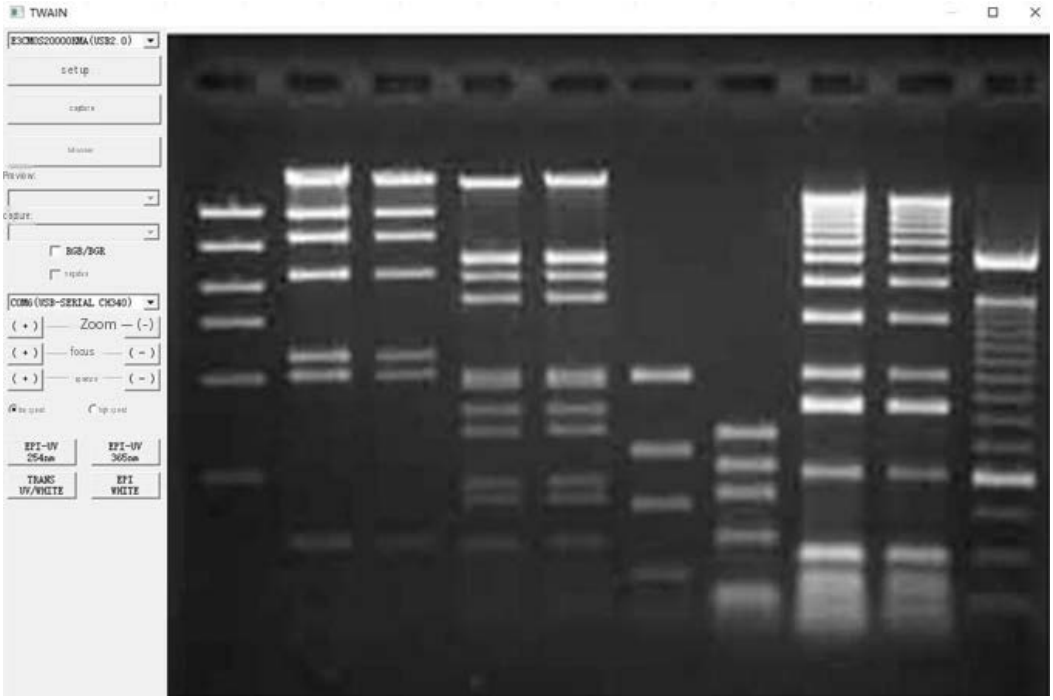
Power	Indicates instrument power status.
Door	Illuminates when the chamber door is open, automatically switching off the UV lamps and activating the white light. Closing the door reverses this process.
Iris ▲/▼	Adjust the camera aperture and image brightness.
Focus ▲/▼	Fine-adjust image sharpness.
Zoom +/–	Adjusts the apparent size of the gel image.
TRANS UV/WHITE	Selects transmitted UV or white-light illumination.
EPI-UV 254nm	Controls 254 nm reflected UV illumination.
EPI-UV 365nm	Controls 365 nm reflected UV illumination.
EPI WHITE	Controls reflected white-light illumination.

Software Operation Guide

This section describes the basic operating controls, and preparation required before startup. Before operating the instrument for the first time, become familiar with the controls described below.

LIVE PREVIEW AND GEL IMAGE CAPTURE

1. Place the stained electrophoresis gel onto the UV transilluminator glass surface.
2. For polyacrylamide gels, place the white light panel on the gel platform and activate the 302 nm UV light source.
3. Close the imaging chamber and launch the Gel-Pro Analyzer software.
4. Open the real-time imaging interface and click Preview to display the live image.



5. Adjust the Zoom, Focus, and Iris/Aperture using the camera controls or the software's Lens Control toolbar until the gel image is properly framed, focused, and illuminated.
6. Adjust exposure time and contrast to obtain clear bands without excessive saturation. An initial value of approximately 90 is recommended for the exposure time. Increase the value as needed if image flickering occurs.
7. Click Capture to acquire the gel image. The captured image appears in the analysis workspace.
8. Save the image and, when finished, switch off the illumination and instrument, remove the gel, and clean the transmission glass.

SAVE AND OPEN IMAGES

To save a captured image, select the Save command on the main toolbar and choose the destination folder and file name. To reopen an existing image, select Open and choose the saved file. The original software description indicates that an additional grayscale conversion is not required when opening an image for analysis.

IMAGE OPTIMIZATION

The software provides automatic and manual image optimization. Choose Automatic Optimization to apply the software's default corrections.

For manual adjustment, open the image adjustment controls and move the available sliders until the desired brightness and contrast are achieved.

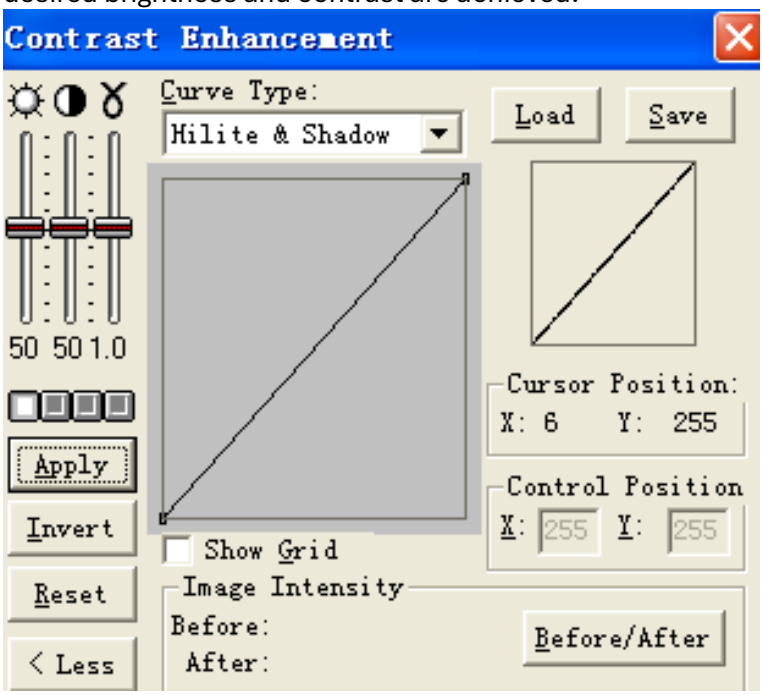
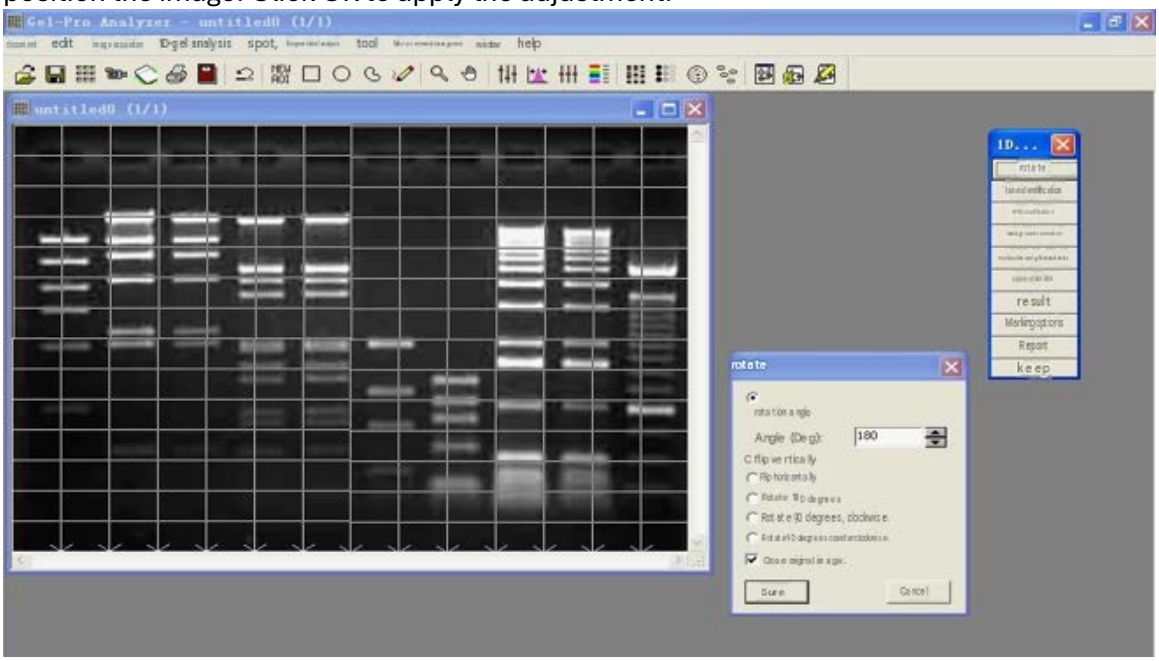


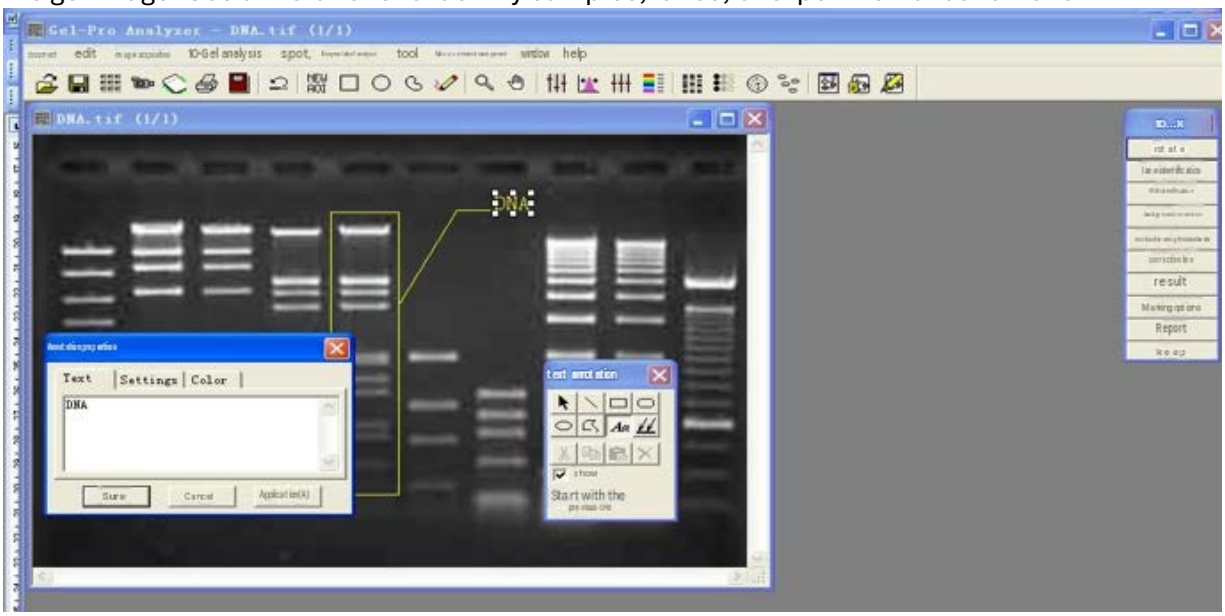
Image Rotation

Select Rotate from the toolbar. Enter the desired rotation angle or use the on-screen rotation grid to position the image. Click OK to apply the adjustment.



Annotations

Select Edit > Annotation to open the text annotation controls. Enter the desired label and position it on the gel image. Use annotations to identify samples, lanes, or experimental conditions.

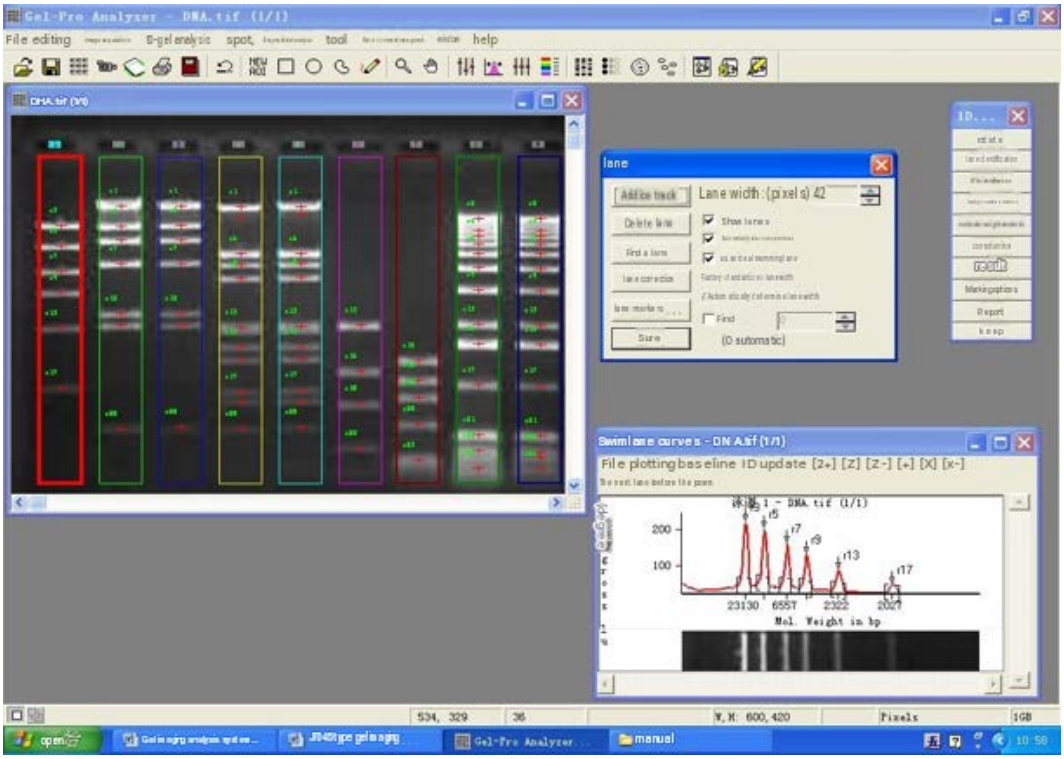


Crop an Image

Select the crop/selection tool and drag to define the region of interest. Use Edit > Copy/Crop to create an image of the selected region for further analysis

AUTOMATIC AND MANUAL LANE DETECTION

Select Lane Recognition in the analysis toolbar to automatically detect and number the lanes in the gel image. The lane recognition toolbar and corresponding optical density curves will appear. Review the boundaries and make manual corrections as needed.

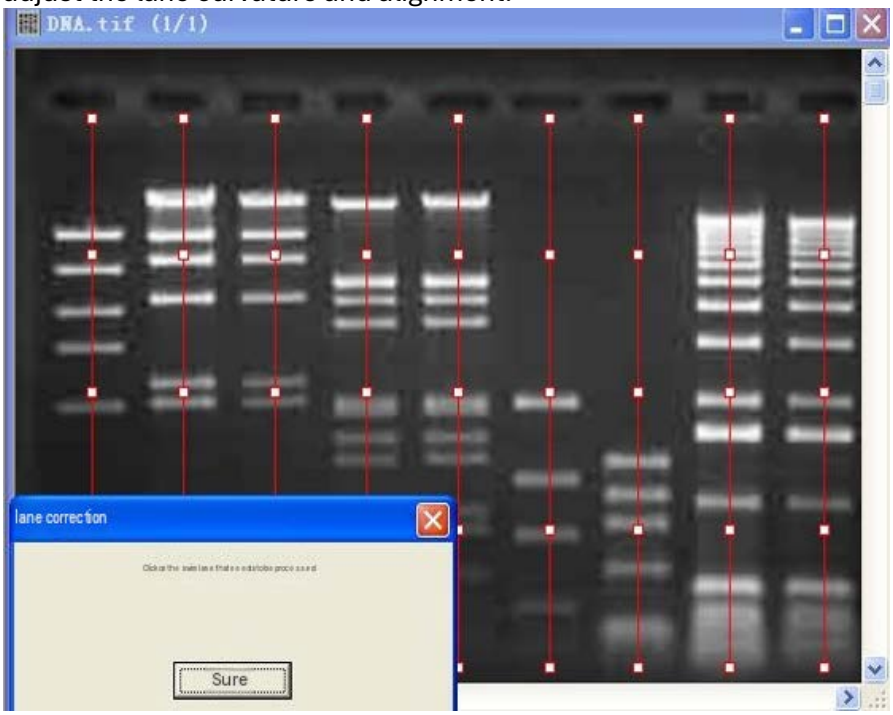


Add Lane
If a lane is not automatically detected, click “Add Lane” and select the unidentified lane in the gel image. The software will identify and number the selected lane. Click “OK” to confirm.

Delete Lane
Click “Delete Lane” and select the lane you wish to remove from the analysis. The selected lane will be excluded from detection. Click “OK” to confirm.

Restore Lane
Click “Find Lane” to restore the identification number of a previously deleted lane.

Lane Correction
Click “Lane Correction” to modify the detected lane boundaries. Drag the white control points to adjust the lane curvature and alignment.

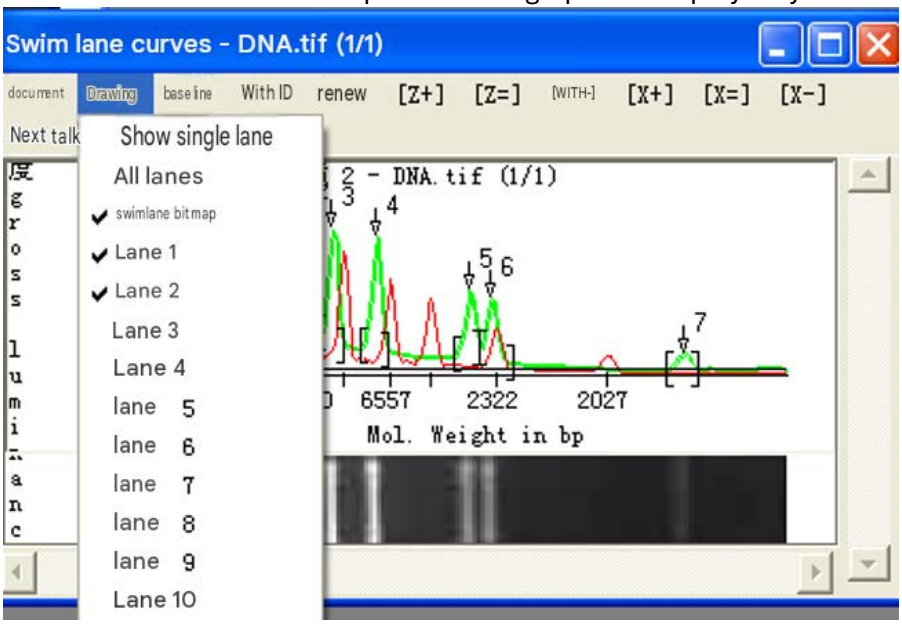


Lane Optical Density Curve
The software automatically generates an optical density curve for each detected lane. Click any band in the gel image to display its corresponding optical density profile.

Comparing Lane Optical Density Curves

Click “Draw” in the Curve toolbar, then select “All Curves” to display the optical density profiles of all detected lanes on a single graph.

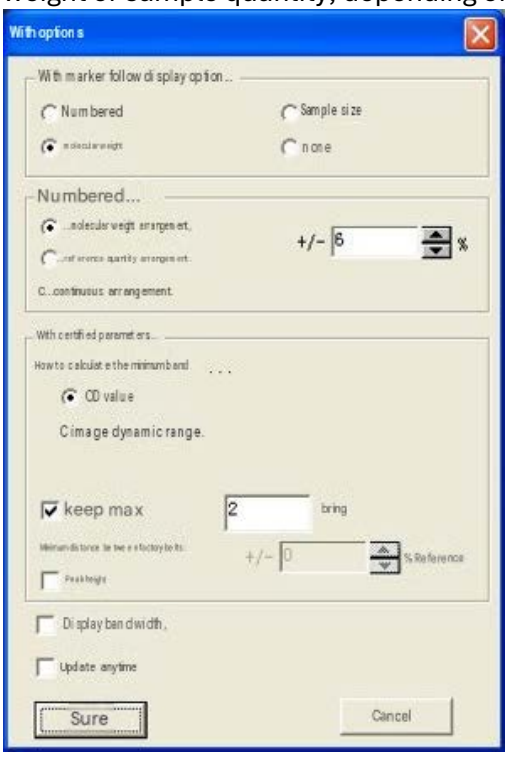
To compare specific lanes, uncheck (✓) next to the lanes you wish to exclude, leaving only the two or more lanes selected for comparison. The graph will display only the selected optical density curves.



Band Labeling Options

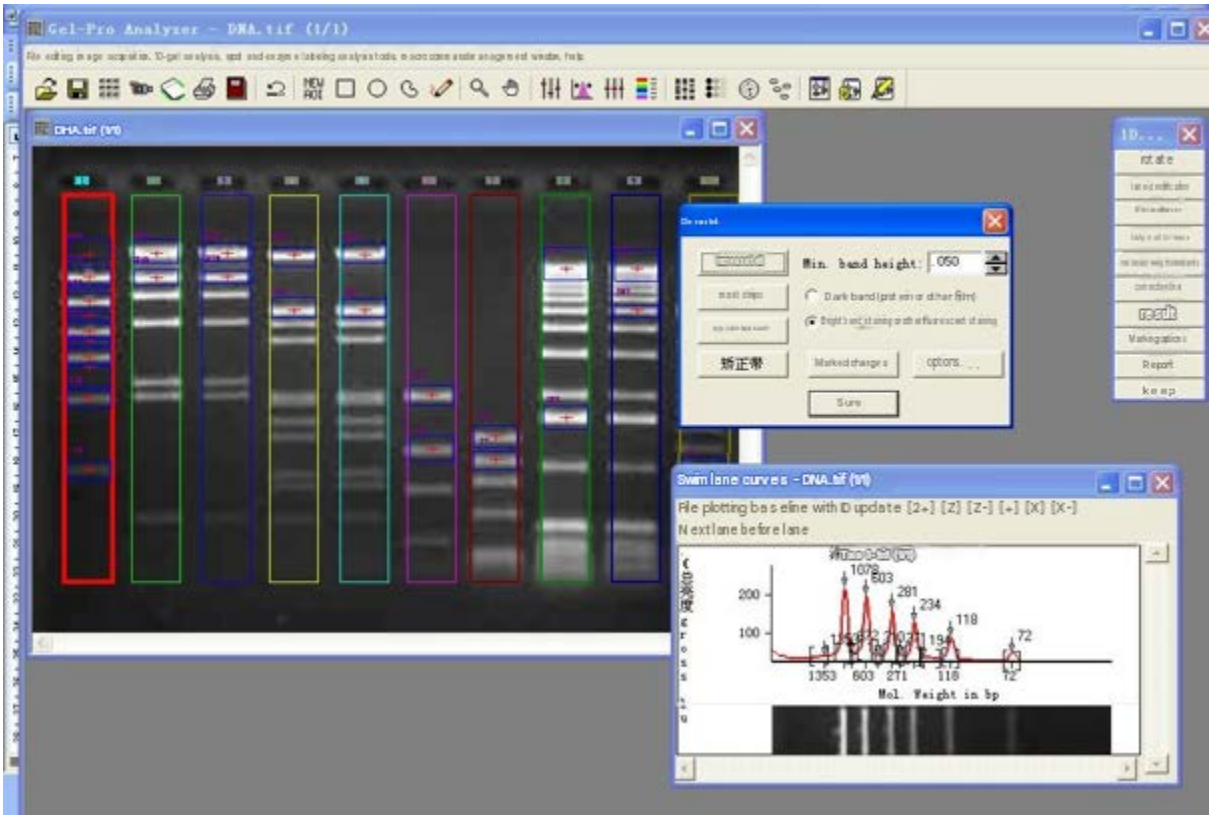
Click “With ID” in the Curve toolbar to open the “With Options” dialog box.

Select “Molecular Weight” or “Sample Size” to specify the information displayed on the gel image. Click “OK” to apply the settings. Each detected band will be labeled with its corresponding molecular weight or sample quantity, depending on the selected option.



AUTOMATIC AND MANUAL BAND DETECTION

Click “Strip Recognition” in the analysis toolbar to automatically detect and number the bands in the gel image. The band recognition toolbar and corresponding lane optical density curves will appear.



Automatic Band Detection

Enter the desired optical density threshold in the “Min. Band Height” field and click “OK.” The software will automatically identify and number all bands that meet the specified threshold.

Manual Band Adjustment

Bands that are not automatically detected can be added manually using the “Add Strip” function.

To remove incorrectly identified bands, use “Delete Strip.”

The procedures for adding and deleting bands are like those used for adding and deleting lanes.

MOLECULAR WEIGHT STANDARD AND CALIBRATION

Select the Standard Lane

1. Click “Molecular Weight Standard” in the analysis toolbar to open the “Molecular Weight Standard Curve” dialog box.
2. Use Select/Cancel to identify the lane containing the molecular weight marker.

   If the selected marker lane is not Lane 1, clear the default “Lane 1” selection and click “OK” to confirm.

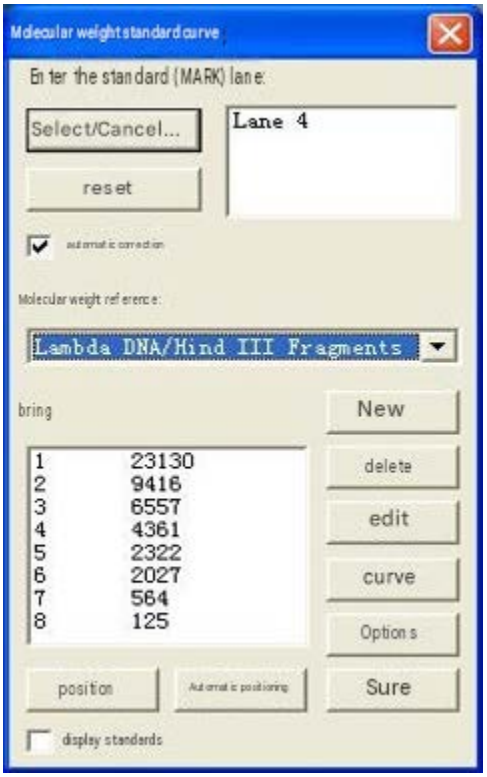
   If Lane 1 is the molecular weight standard, simply click “OK” to accept the default selection.

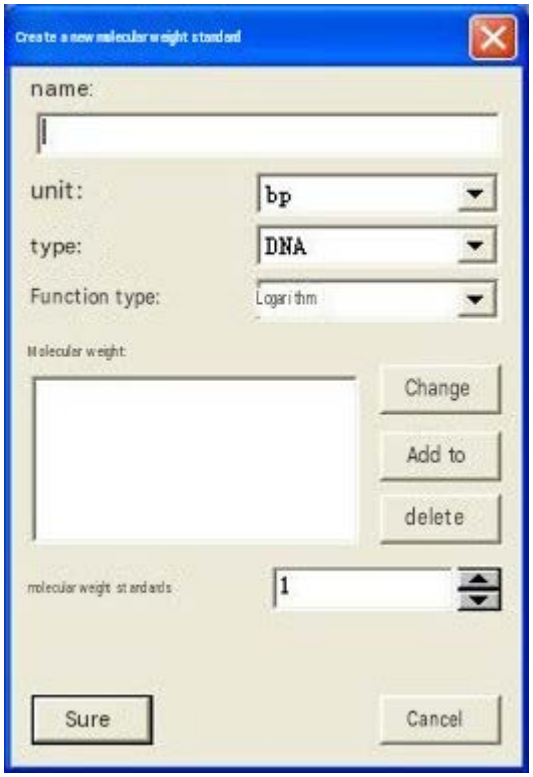
Enter Molecular Weight Marker Values

In the “Molecular Weight Standard Curve” dialog box, select the appropriate standard from the “Molecular Weight Reference” drop-down menu. The software will automatically populate the molecular weight values for each band in the selected marker lane.

To create or modify a molecular weight standard:

1. Click “Rebuild” to open the “New Molecular Weight Standard” dialog box.
2. Enter the standard Name and select the appropriate Unit, Type, and Function Type.
3. Click “Change” to modify the molecular weight reference values.
4. Enter the molecular weight value for the first band and click “Add.”
5. Repeat this process for each band in the standard lane, entering the values sequentially from the first band to the last.
6. Click “OK” to save the new standard. It will be added to the “Molecular Weight Reference” list for future selection.

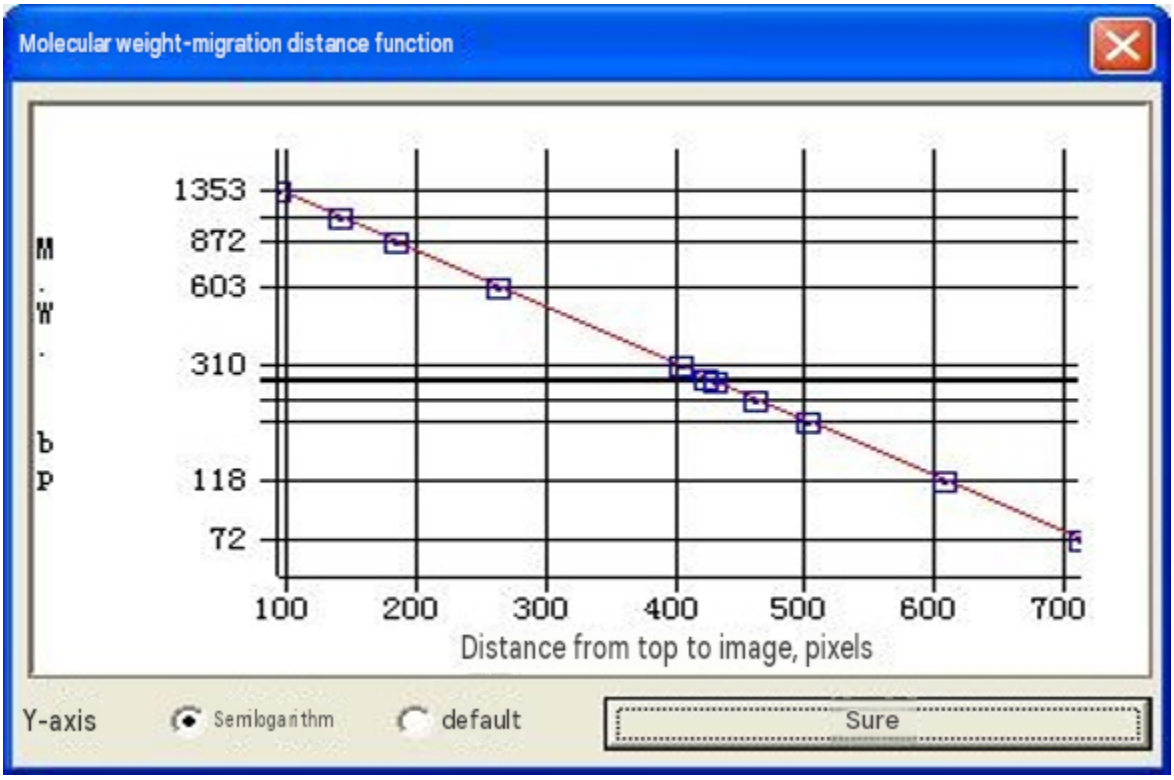




Generate the Molecular Weight Standard Curve

Once the molecular weight standard has been defined, click “Curve” in the “Molecular Weight Standard Curve” dialog box.

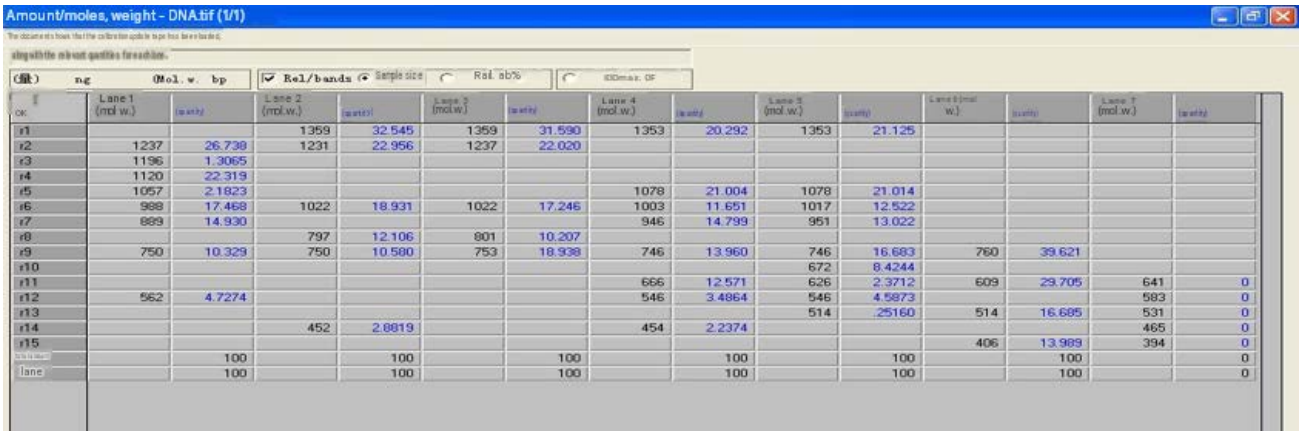
The software will automatically generate a Molecular Weight vs. Migration Distance calibration curve, as shown in the figure below. This curve is used to estimate the molecular weights of unknown sample bands based on their migration distances.



RESULT ANALYSIS

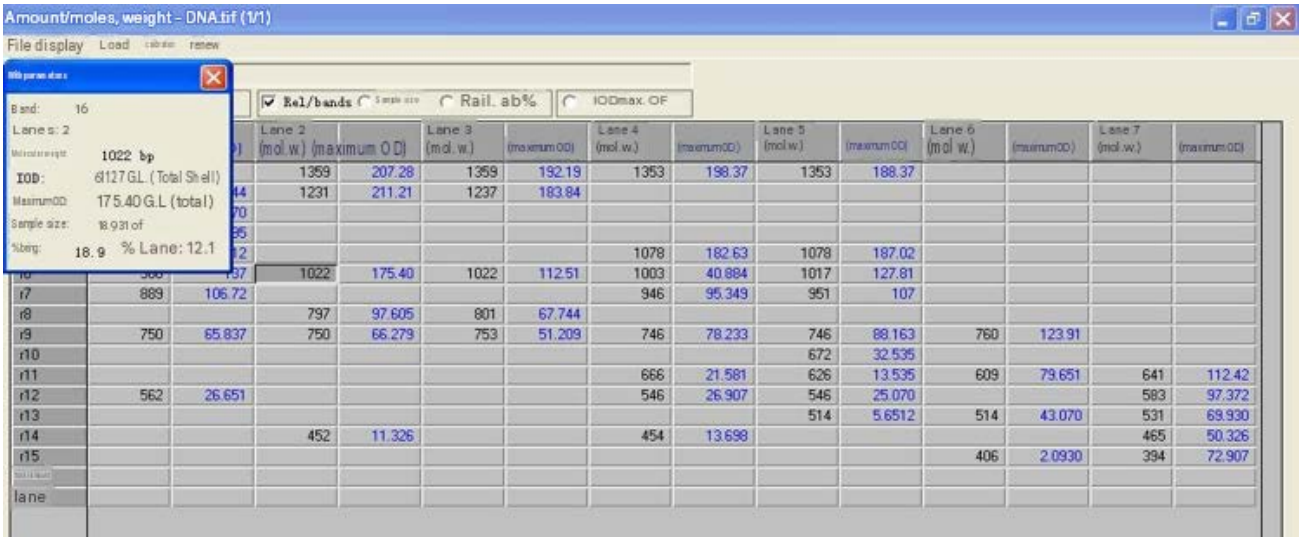
1. Select Results in the “Tools” menu to automatically calculate and display the analysis results for each selected lane and band.

   Available measurements in the source include sample amount, molecular weight, percentage content, integrated optical density (IOD), and maximum optical density.



2. Select the desired measurement to display its calculated values. Click any band value in the Results window to view the complete analysis data for that band.

   Note: Results displayed in scientific notation use the format xEx, where E represents a power of 10. For example, 2.5E3 represents 2.5 x 10^3 (2,500).

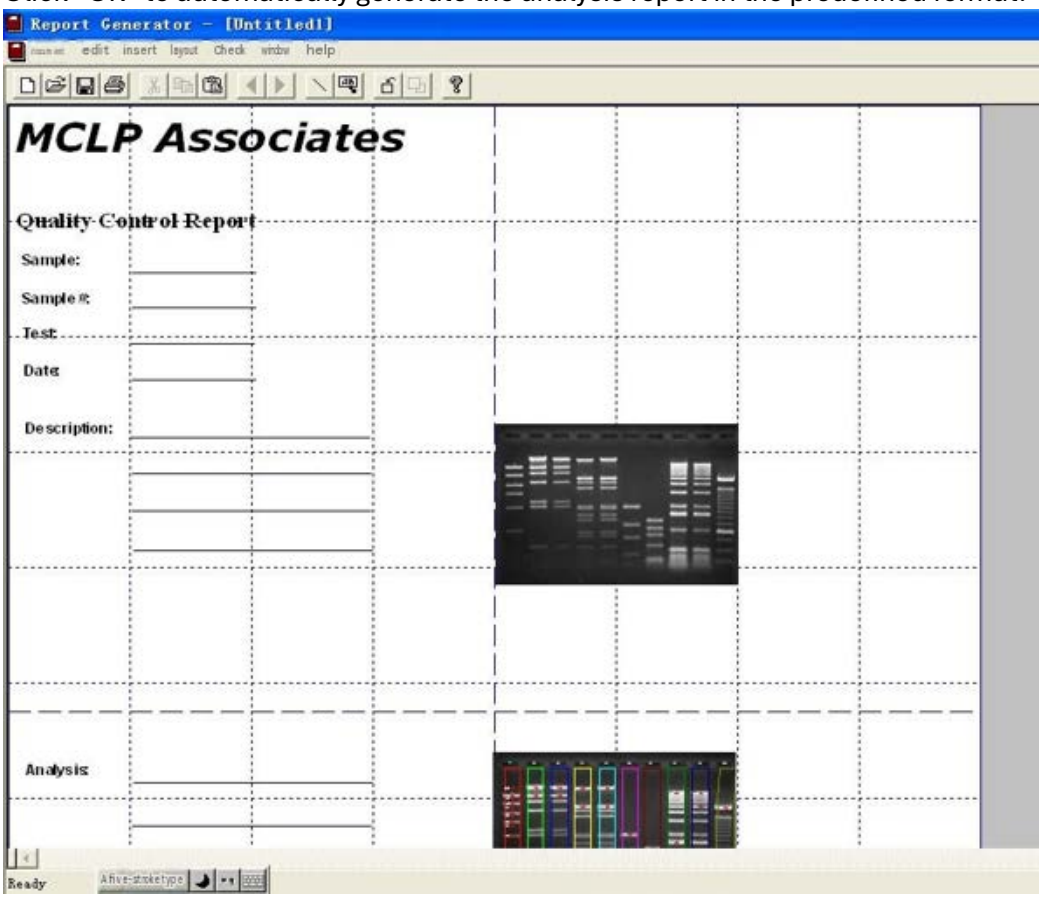


Export Results to Excel

To export data to Excel, select File > Data Copy to Excel from the Results window.

REPORT ANALYSIS

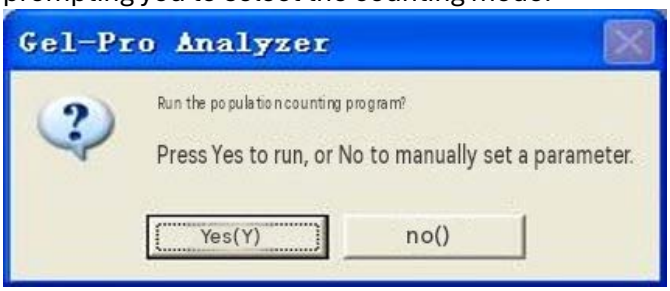
1. Select Report from the analysis toolbar.
2. Click on icon to generate a new report.
3. Click “OK” to automatically generate the analysis report in the predefined format.



4. Review the generated report and print it as needed.

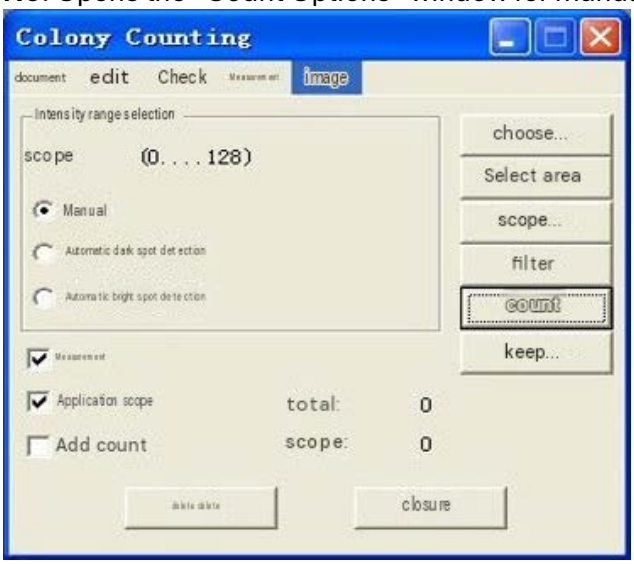
COLONY COUNTING

1. Open the colony image and click the  icon on the toolbar. A dialog box will appear, prompting you to select the counting mode.



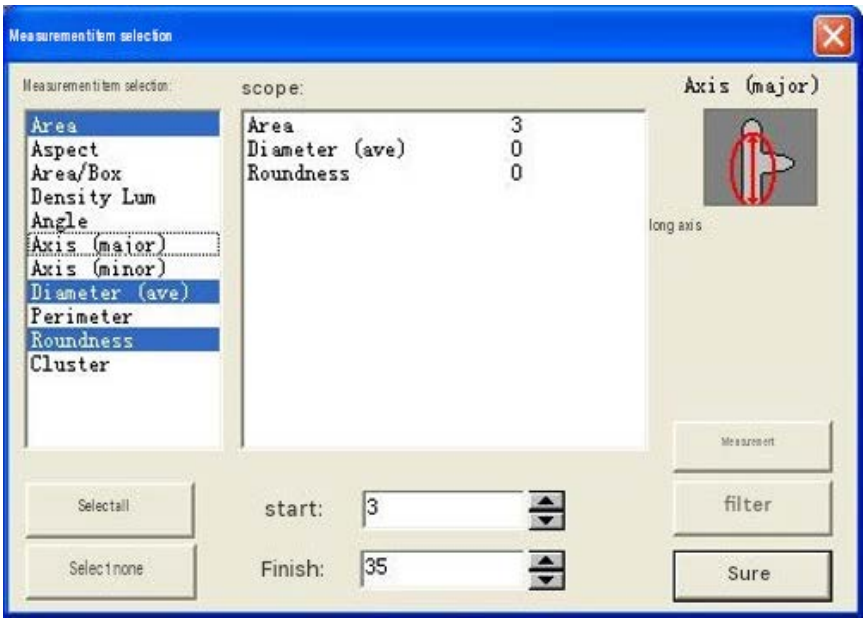
Yes: Automatically detects and counts colonies.

No: Opens the "Count Options" window for manual colony counting.

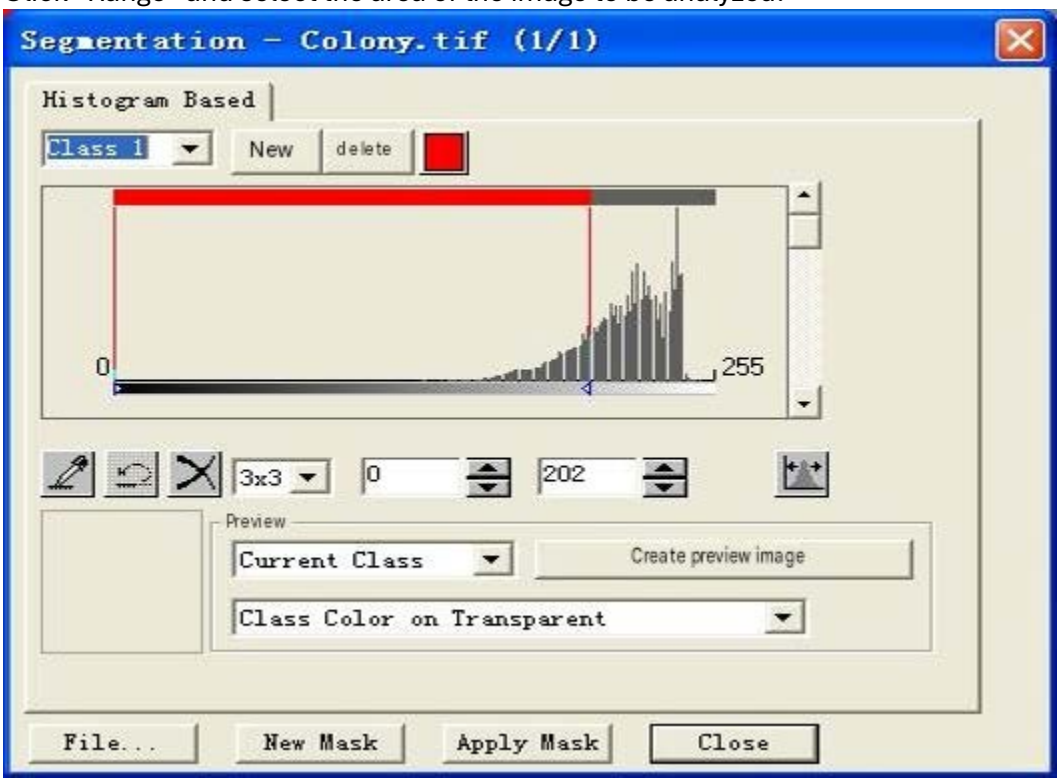


Configure Measurement Options

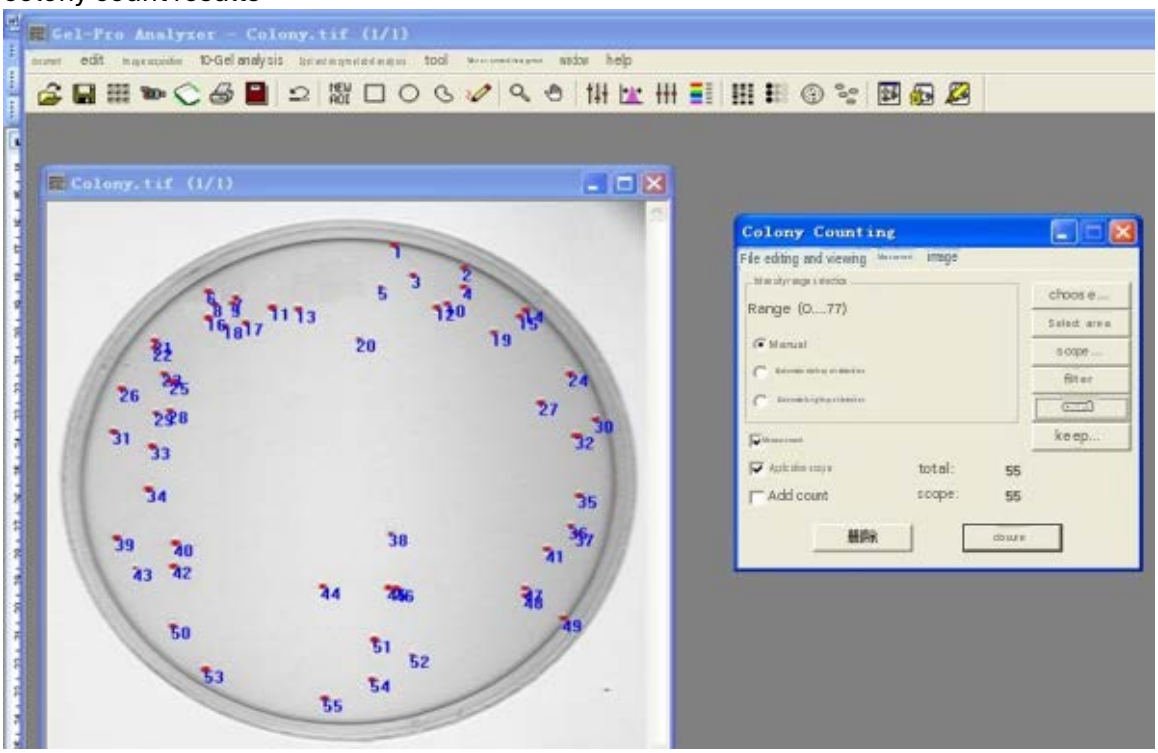
1. In the "Count Options" window, select the desired measurement parameters using the "Measurement" tool.



2. After selecting the measurement parameters, click “OK”.
3. Click “Range” and select the area of the image to be analyzed.

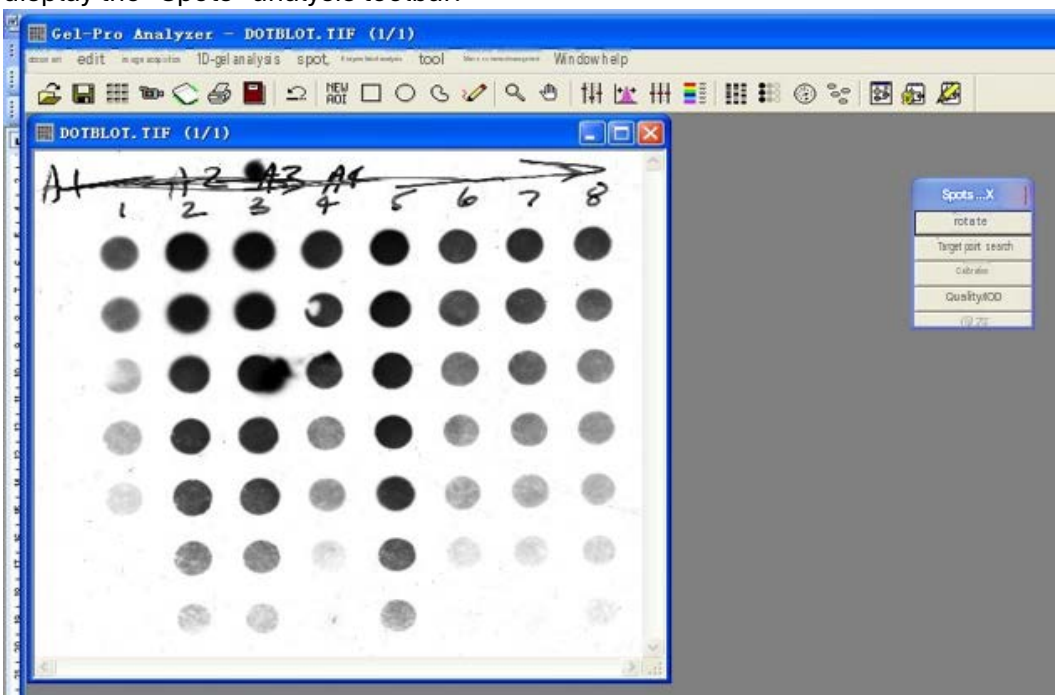


4. After defining the counting area, click “Close”.
5. Select “Count” in the “Colony Counting” dialog box. The software will calculate and display the colony count results



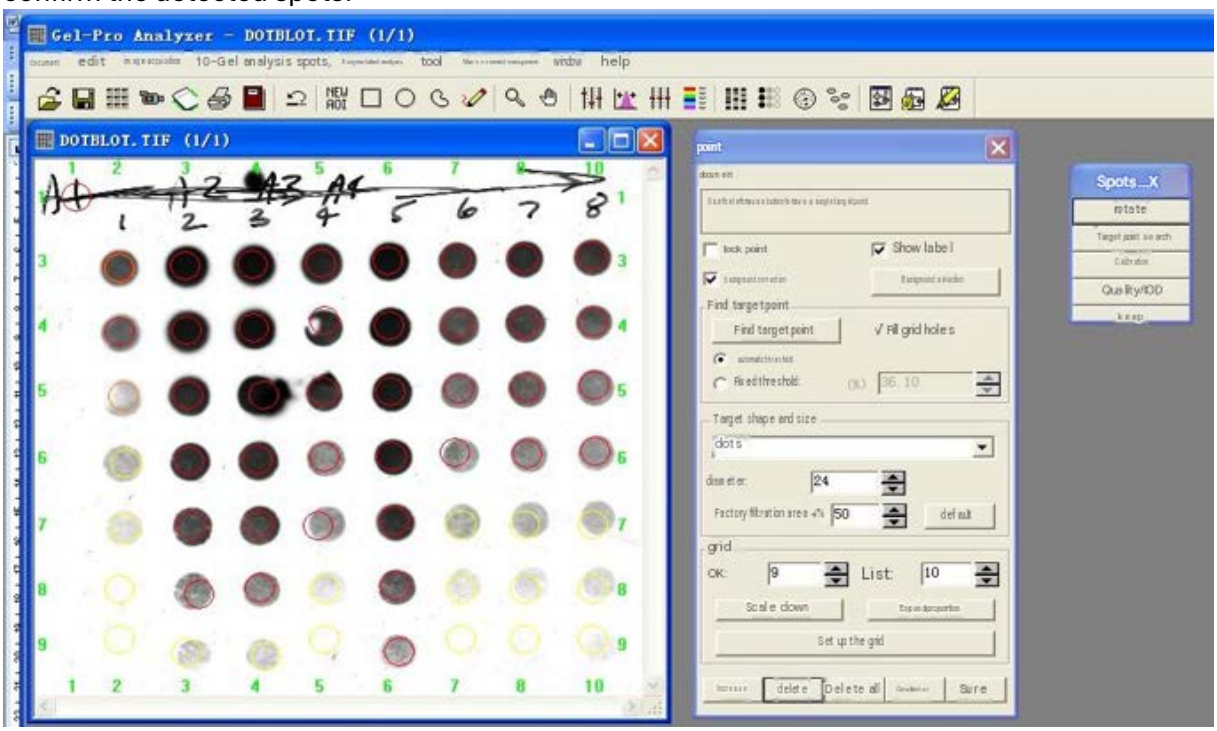
SPOT AND DOT BLOT ANALYSIS

1. Open the spot electrophoresis image and click “Spots, ELISA Analysis” on the toolbar to display the “Spots” analysis toolbar.

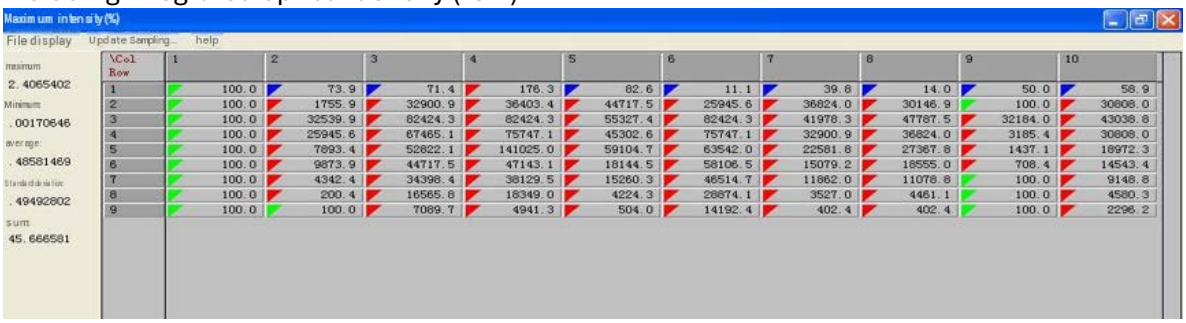


2. Select “Target Point Search” to open the “Point” toolbar.

3. Configure the desired detection parameters, click “Find Target Point”, and then click “OK” to confirm the detected spots.



4. Click “Quality/IOD” in the “Spot” toolbar to display the calculated spot analysis results, including integrated optical density (IOD).



TROUBLESHOOTING

The following table outlines common operating issues, their possible causes, and recommended corrective actions.

Fault / Problem	Possible Cause	Recommended Action
Power indicator does not illuminate	Power supply is disconnected.	Verify unit is securely connected to the power supply.
	Power switch is not activated or is defective.	Ensure the power switch is turned on. If the issue persists, contact BT Lab Systems
Door indicator does not illuminate when the drawer or door is opened	Door detection switch is defective.	Contact BT Lab Systems
Iris control does not respond	USB cable is improperly connected.	Check and securely reconnect the USB cable.
	Button failure or internal circuit malfunction.	Contact BT Lab Systems
Zoom (+/−) buttons do not respond.	USB cable is improperly connected.	Check and securely reconnect the USB cable.
	Button failure or internal circuit malfunction.	Contact BT Lab Systems
TRANS UV/WHITE button does not respond, or the drawer illumination does not activate.	Button failure or internal circuit malfunction.	Press the button gently. If the issue persists, contact BT Lab Systems
EPI-UV 254 nm button does not respond, or the 254 nm UV lamp does not illuminate.	Button failure or internal circuit malfunction.	Press the button gently. If the issue persists, contact BT Lab Systems
EPI-UV 365 nm button does not respond, or the 365 nm UV lamp does not illuminate.	Button failure or internal circuit malfunction.	Press the button gently. If the issue persists, contact BT Lab Systems
EPI WHITE button does not respond, or the white light does not illuminate.	Button failure or internal circuit malfunction.	Press the button gently. If the issue persists, contact BT Lab Systems

Safety Note: Disconnect power before inspection or maintenance. Electrical and UV-system repairs should be performed only by qualified personnel.

WARRANTY

Our company warrants this product against defects in materials and workmanship for a period of one year from the date of shipment. During the warranty period, we will repair or replace defective equipment at no charge, provided that the equipment has been operated under normal laboratory conditions and in accordance with the instructions provided in this manual.

The warranty does **not** cover damage or defects resulting from:

- Accident, misuse, or abuse.
- Natural disasters or other events beyond reasonable control.
- Unauthorized repair, modification, or alteration of the equipment.
- Corrosion or damage caused by using incompatible solvents, samples, or chemicals.
- Improper installation, operation, or maintenance.
- Use of fittings, replacement parts, or accessories supplied by other manufacturers.

Platinum wire, accessories, and consumable components are excluded from this warranty.

RETURNS AND SERVICE

A Return Authorization must be obtained from our company before returning any product for repair.

For technical support, warranty assistance, or repair service, please contact:

Email: info@BTLabSystems.com

WIRING DIAGRAM

The wiring diagram is for reference only. Product specifications and design are subject to change without prior notice.

