

WIDEimage

for

Windows 98, NT 4.0, 2000

USER'S GUIDE

CalComp B/W and COLOR SCANNER
SCANNING, VIEWING, CONVERTING, PRINTING,
&
IMAGE MANIPULATION
Software

WIDEimage

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PREFACE

WIDEimage is a fully integrated scanning, viewing, converting, image editing, and print system for large format B/W and Color Scanners.

General scanning features include among others:

- Easy-to-use Scan Panel for optimal control during scanning.
- On-line previewing in all scanning modes.
- Deskew alignment.
- Image Cropping, inverting, mirroring and rotating.
- On-the-fly image enhancement.
- On-line Topic and Task related help.

Special monochrome features include:

- Dual 2D-Adaptive enhancement – processing simultaneously on different drawing aspects.
- 2D-Adaptive thresholding.
- Fixed thresholding.
- ADL+ error diffusion halftoning for maintaining shades of gray.
- Despeckling and hole filling.
- Monochrome sharpen/soften/blur filters.

For color scanners, extended functionality includes:

- True color RGB, Indexed, and classified color scan.
- Color viewing.
- Color image processing.
- Color tone adjustment controls.
- Color sharpen/soften/slur filters.
- Feature extraction and LUT filter editing.

This User's Guide describes all of WIDEimage's features and explains how to use them for obtaining perfect results. It assumes a basic knowledge of your computer's operation, and therefore it does not repeat material from the manufacturer's documentation.

This User's Guide applies to the WIDEimage edition for Windows-98, Windows-NT and Windows 2000.

SYSTEM REQUIREMENTS

- Supported computer and operating system; see Chapter 2: "Installation."
- Scanner with compatible SCSI interface.

RELATED PUBLICATIONS

The "Operator's Guide" which was supplied with your scanner.

See the README.TXT file on the WIDEimage distribution CD-ROM for latest information and news.

How To Use This Guide

This guide contains 7 chapters and 4 appendices. Be sure to read Chapter 2: “Installation” before attempting to install or use the software described in this guide.

Chapter 1. An introduction to the WIDEimage features.

Chapter 2. Describes how to install WIDEimage on your system.

Chapter 3. Describes the Main Toolbar, the File Menu and how to move between the different screens.

Chapter 4. Describes scanning procedures, settings and tools.

Chapter 5. Describes post scanning options with image viewing and editing.

Chapter 6. Describes feature extraction and LUT filter editing.

Chapter 7. Describes the supported image file formats.

Appendix A. Tips on color scanning and copying.

Appendix B. WIDEimage License Agreement.

Appendix C. Contains a useful glossary over scanning/imaging terms.

Appendix D. Index.

Document Conventions

The following typographical conventions are used throughout this user guide:

- Menu, dialog and option labels are capitalized as they appear in the application and written in Italics for enhancement.

Examples:

Check the *Keep color balance* option, Select *Windows printer driver*, Click on *Batch Scan – Options* to reach the dialog.

- Names of WIDEimage tools, screen views, menus and buttons, appear in italics, conventional book title capitalization format (proceeding caps in each word).

Examples :

In the *Main View*, select the *Feature Menu*. Click on the *Invert Tool* button.

- Terms that are not tools but internal definitions related to WIDEimage features will appear without italics but in conventional book title capitalization format.

Examples:

The Pick Color, Indexed Mode, Adaptive Level.

1. Introduction

WIDEimage is an integrated software package designed to control all scanner functions and image processing features embedded in your scanner.

The program produces a multitude of industry-standard color, graytone and B/W output image file formats compatible with CAD, GIS, Raster-Editor, Raster-to-Vector, Digitize, Overlay, Color Reproduction, Color Copying, RIP and Archiving programs. After scanning, the files become usable for editing, storing, and conversion. Scanned drawings, maps, etc. can be printed, thus exploiting scanning enhancement features to create copies that look better than their originals. WIDEimage is ideal for use with CAD, GIS, DTP and Color Copying Systems.

The program enables:

- Controlling your scanner's advanced hardware embedded image enhancement processing features through a user friendly interactive user interface.
- Software emulation of advanced image enhancement processing features not supported in the hardware on the particular scanner model.
- Rapid and easy navigation between scanning, viewing and Feature Extraction tasks.
- Point-and-Click on-line control of scanning parameters such as color settings, threshold, scan-window and alignment. On-line display during scanning provides instant quality verification.
- Advanced color feature extraction ensuring uncomplicated and clean scans, as well as reduction of file sizes and storage requirements.
- Viewing and zooming to any level in scanned images with a rich set of color and image tools. Conversion between image file formats.
- Alignment, perfect electronic horizontal deskewing of originals to correct skew when scanning, by setting alignment points on screen through pointing and clicking with your mouse.
- Rotation of images between 0 and 360 degrees.
- Electronic despeckling, removing speckles of user-definable sizes.

- Reversing (image colors) and image mirroring during scanning.
- Measuring angles and distances between selected points.
- Printing to laser printers and industry standard ink-jet and laser printers, with a user-definable print window for printing a selected part of the image. Setable scaling or auto-scaling.
- Support of more than fifty important industry standard Image File Formats including TIFF formats, JPEG, CALS and CCITT Group 4 compressed formats, Intergraph RLE and CIT, and Systems CADOOverlay RLC format for AutoCAD.

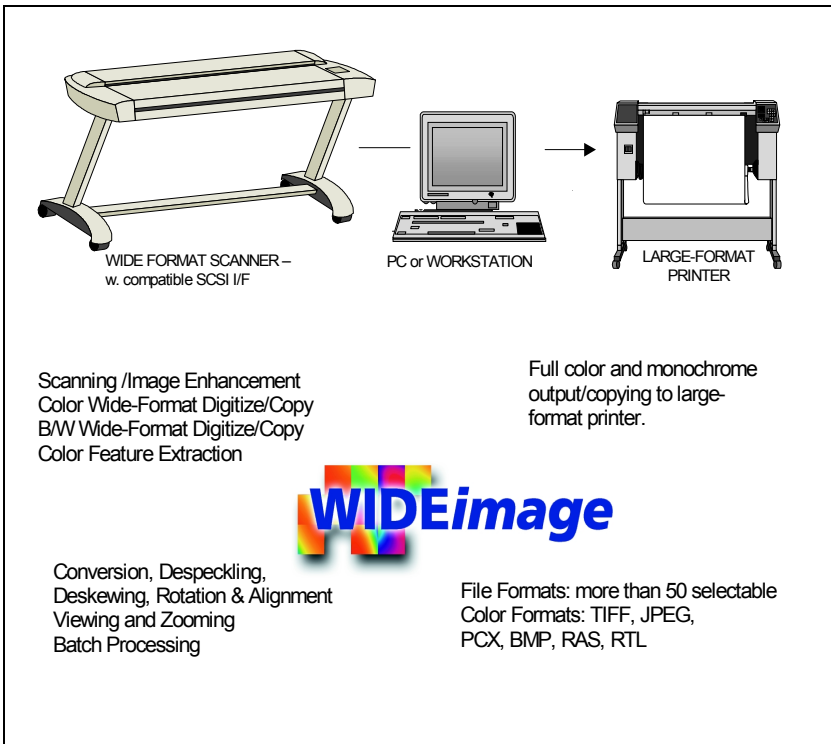


Fig. 1-1: WIDEimage System Overview

2. Installation

2.1 Introduction

In the following sections, installation is described for WIDEimage on:

- Windows 98
- Windows NT4.0
- Windows 2000

Always check the README.TXT file on the WIDEimage distribution CD for updates describing installation procedures, or for installation on newly-supported computers and operating systems.

Important note: WIDEimage will use available memory for buffers while scanning; therefore you should maximize your workstation memory in order to speed up scanning processes.

The WIDEimage program software is not copy protected, but requires a scanner correctly installed with the power ON, in order to be fully functional.

If no scanner is attached, the application will work only in demo mode.

2.1.1 Demo Mode

When the application is started without a scanner, a dialog is displayed providing the option of either running WIDEimage in Demo Mode or re-scanning the SCSI bus in case the scanner was turned on after your computer.

Demo mode allows you to use WIDEimage without a scanner. Demo mode can be useful for demonstrations, user instruction or when using the application as a viewer for pre-scanned images.

The following properties apply to Demo Mode :

- The scanner panel will function as if a color scanner is attached. You can use the Viewer and Feature tools with the image as if it were scanned in.
- Scanning is disabled.
- Saving to file in the viewer and from the file menu is disabled.
- Printing is disabled.

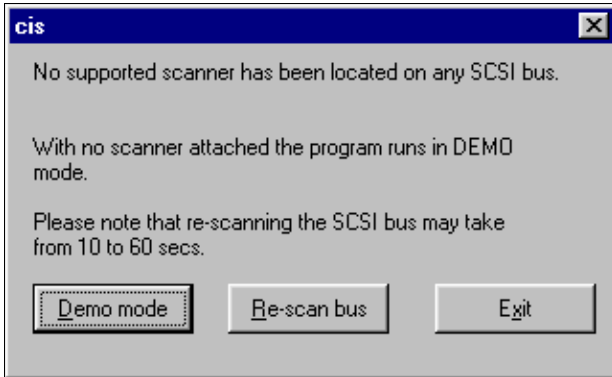


Fig. 2-1: Demo Mode Dialog

2.1.2 Scanner Installation

Turn off power to the computer and scanner.

On the PC, install the SCSI board as described in the SCSI board manual that came with your interface kit, then attach the scanner to the SCSI board using the SCSI cable.

If the scanner is the outermost physical device on the SCSI bus, remember to check that the built-in active SCSI terminator is switched on (see DIL-switch table in the scanner OPERATOR'S GUIDE).

If the scanner is not the outermost physical device on the SCSI bus, then the SCSI terminator should be switched off.

Set the SCSI device number on the DIL switch (found next to the SCSI connectors on the scanner) to an unused SCSI device number, according to the table found in your OPERATOR'S GUIDE for the scanner. NOTE: SCSI device number 7 is occupied by the SCSI controller.

Turn on power to the scanner and computer.

2.2 Windows Installation

The system requirements are:

- Windows 98 or Windows NT.40 or Windows 2000.
- IBM PC or compatible, 200 MHz or above is recommended.
- Windows 98 - 64 Mb. RAM min.
- Windows NT4.0 and 2000 - 128 MB. RAM min
- 24 bit graphics display.
- A mouse or other pointing device.

Use the Setup program (SETUP.EXE) to set up WIDEimage for Windows on your computer:

1. Start Windows.
2. Insert the WIDEimage distribution CD in your CD-ROM drive.
3. Click the Start button on the Taskbar, choose Run from the menu.
4. Type D:setup in the command line box. (Replace "D" with your CD-ROM's drive letter).
5. Choose the OK button.
6. Follow the setup instructions on the screen.

After installing all the files, the Setup program creates a program group and places the WIDEimage icon inside.

To start WIDEimage for Windows:

1. Click "Programs" in the "Start" menu.
2. Click the "WIDEimage" icon to start the program.

3. Getting Started – Basic Screens & Tools

3.1 General Screen Layout

The following sections give an overall view of the WIDEimage screen system and describe in detail the functions in the *Main Toolbar* and the *File Menu*.

The screen shown below contains 3 function areas above the main image display window listed here from top to bottom:

- *Menu Bar*
- *Main Toolbar*
- *Task Toolbar*

There are 2 function areas below the main image display window:

- *Screen-Select Tabs*
- *Status Bar*

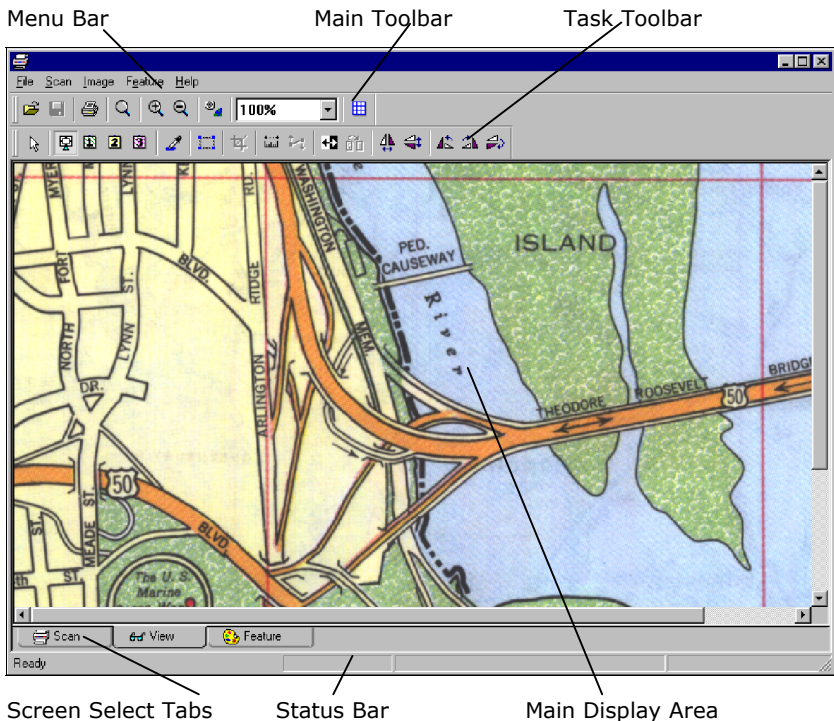


Fig. 3-1: WIDEimage Screen Overview

The *Menu Bar*, *Main Toolbar*, *Screen-Select Tabs* and *Status Bar* are all general function areas that are present on all screens, while the appearance and available tools in the *Task Toolbar* are task dependent.

From the *File Menu* you can control loading, saving and printing of image files, select program preferences, etc., while the *Main Toolbar* consists of central functions such as file open, save, print shortcuts, and a range of convenient zoom tools. Moving between the three different screens is controlled through the *Screen-Select Tabs*.

Additional pull-down menus, *Task Toolbars* and *Status Bars* are described in detail in later chapters because their functions and layouts change according to the task being carried out (e.g., scanning, viewing, feature extraction).

The WIDEimage user interface and all its functions apply to a current or active image. An image becomes active when it is either :

- Opened as a file
- The result of scanning

These two ways of activating an image have the same functional effect.

3.2 WIDEimage Screens

3.2.1 Introducing the 3 Task Screens

WIDEimage allows you to display and work with images in connection with different tasks. Each task has its own “Screen” and tools associated with the specific task in question. Moving from one screen to another is equivalent to changing between the different tasks you can perform on an active image.

The following screens are available:

- **Scan Screen** with scanning functions and the *Scan Toolbar*
- **View Screen** with viewing, image functions and *View Toolbar*
- **Feature Screen** with LUT creation functions and the *LUT Toolbar*

All screens have the common *Main Toolbar* at the top and a specific *Task Toolbar* just below it.

WIDEimage starts up in the *Scan Screen*. The *Scan Screen* consists of a *Menu Bar* and a *Main Toolbar* plus a *Scan Toolbar* as the specific ‘task’ toolbar, a *Status Bar* at the bottom, and a *Scan Panel* on the left

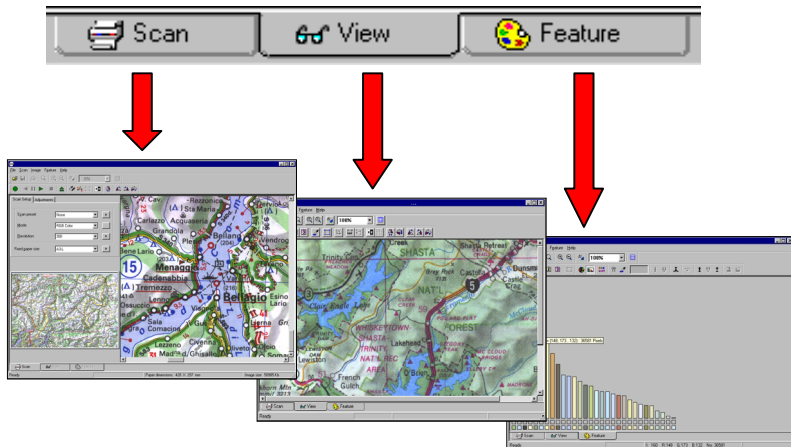
side of the screen. See Chapter 4 for details on the *Scan Screen*, *Scan Toolbar* and the *Scan Panel*.

In the *View Screen*, the Task Toolbar becomes the *View Toolbar*. See Chapter 5 for details on the *View Screen* with the *View Toolbar*.

In the *Feature Screen*, the Task Toolbar becomes the *LUT Toolbar*. See Chapter 6 for details on the *Feature Screen* with the *LUT Toolbar*.

3.2.2 Maneuvering Between Screens

Moving from one screen to another is easy – simply click on the appropriate tab among the *Screen-Select Tabs* at the bottom of the screen.



The screen choices are:



The *Scan Screen* with scanning functions and settings



The *View Screen* with image functions.



The *Feature Screen* with LUT editing functions.

Moving to the Scan Screen

WIDEimage starts in the *Scan Screen*. If you move to the *Scan Screen* from either the *View* or *Feature Screen* with an open image, you will be prompted to save the active image file if it has undergone changes since it last was saved.

An image file that is open when moving to the *Scan Screen* will act as the default file in the *Save As* dialog for subsequent scans.

Thus, when scanning, the active image file will be overwritten with the new image unless the user chooses to change the file name. A warning is displayed before files are overwritten. Default naming for scanning target files can be controlled through the *File Menu – Preferences* (section 3.4.9).

Moving to the View Screen

Upon moving to the *View Screen*, the active (opened or scanned) image is loaded in the main display area.

If you have moved to the *View Screen* from the *Feature Screen* with an open RGB (24-bit true color) file, then the RGB file will be displayed.

If no active image exists, the viewer will start up by displaying an empty view area.

Moving to the Feature Screen

The *Feature Screen* is only active with a color scanner and when an RGB image is open. Upon entering the *Feature Screen*, the active RGB image is immediately displayed. A LUT file must be loaded or created before LUT functions can be activated.

Only after an RGB file has been opened and an initial LUT generated or loaded, can LUT filtered output be displayed in the *Histogram*, *Color Wheel*, and *Main Views*.

See Chapter 6 for details on the *Feature Screen* and LUT generation.

3.3 The Main Toolbar

The *Main Toolbar* is displayed with all three WIDEimage screens. The availability of each tool varies from screen to screen.

3.3.1 Open



For opening an image file.

Displays a file-select dialog for browsing to and opening an existing file for viewing. This tool is identical with the *File Menu...*, *Open* option described later in this chapter.

3.3.2 Save



Saves the image to the open (active) file (see *File Menu...*, *Save* description later in this chapter). When saving from the *Feature Screen*, only the underlying RGB input file is saved.

3.3.3 Print



Displays a dialog for printing an entire open image or only a portion selected using the *Rectangle Selector Tool*. Clicking on the *Print Tool* displays the dialog described in section 3.4.6 – *File Menu – Print*. Printing of an image area defined by the *Rectangle Selector* is described in section 3.4.6 – under *Print Range* and in section 5.3.1. on the *View Screen* and its tools.

3.3.4 Zooming Tools


There are 5 zooming tools on the *Main Toolbar*:

Zoom, Zoom-In, Zoom-Out, Zoom-Birds-Eye and *Zoom Factor*.

Zoom



Zooming with image area selection

- Click the *Zoom Tool* to activate a special zoom cursor 
- With this cursor, drag a frame on an image area of your choice, while holding down the left mouse button.
- Release the mouse button to perform zooming on the specified framed area.
- Further zooming can be performed immediately with the active Zoom- cursor.
- Re-click the *Zoom Tool* in order to leave the Zoom mode.

Zooming can be performed up to a zoom factor of 1600%.

Zoom In



Clicking *Zoom In* enlarges the view by a factor of 2, with the pivot point in the middle of the current image view.

Zoom Out



Clicking *Zoom Out* decreases the view by a factor of 2, with the pivot point placed in the middle of the current image view.

Zoom Birds Eye



This tool allows you, so to speak, to “fly over different areas of the image equipped with binoculars”. You select an area for immediate zooming by moving a zoom area frame on an overview of the image.

Viewing with Zoom Birds Eye

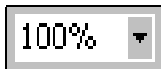
- Click on the *Zoom Birds Eye* button. This displays a full view of the image with a frame outlining the current zoom area.
- Drag the frame corners to enlarge or decrease the frame size
- Move the cursor close to the frame to change to the panning cursor.



Panning cursor

- Hold down the left mouse button and drag the frame to any position in the image.
- Release the mouse button to zoom in on the new framed area.

Zoom Factor



The current zoom factor is displayed in the zoom factor field on the *View Screen* and the *Feature Screen*.

The zoom factor is 100% when one pixel in the image corresponds to one pixel on the screen. The zoom factor can range from the whole image to 1600%. You can either select from among standard zoom factors or else enter your own zoom factor in the edit field.

Zoom Grid:



The *Zoom Grid* tool toggles On/Off. When ‘On’ it displays a gray grid over the image to help you view pixels separately at large zoom factors (500% or greater).

3.4 The File Menu

Clicking on *File* in the *Menu Bar* displays the *File Menu* shown below. The *File Menu* offers easy access to file management and global configuration settings for WIDEimage and for your printer output. The following section describes each of the *File Menu*'s options.

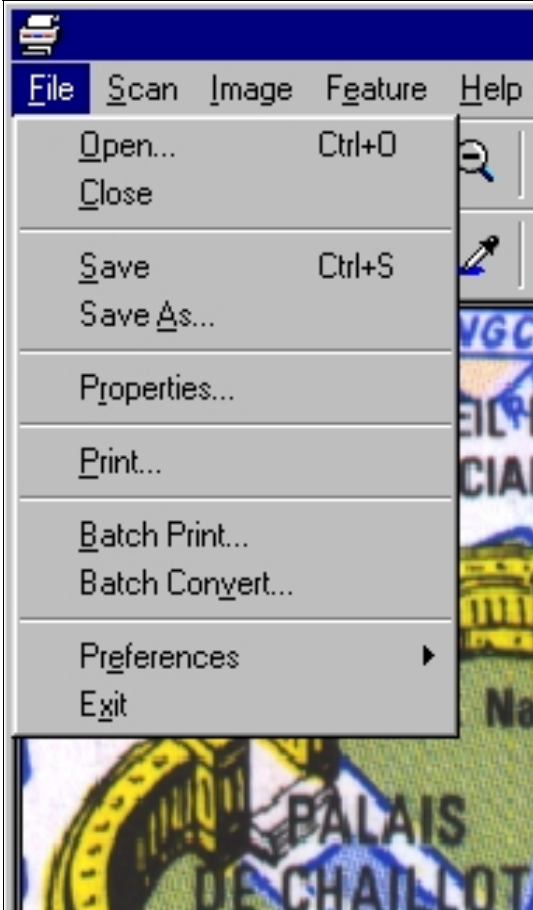


Fig. 3-2: The File Menu

3.4.1 Open...

For opening an image file.

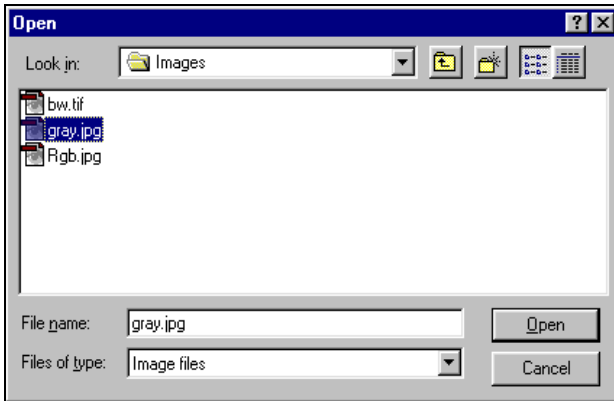


Fig. 3-3: Open Image Dialog

- Select *Open* to display a file-select dialog.
- Click on the down-arrow of the *Files of type* drop-down box to display a list of supported image file formats (see the appendix listing supported file formats). The dialog displays only files of the chosen format that reside in the *Look in* box specified folder.
- Select the folder and file and open it by double clicking or by clicking on the open button.
- You can open a file from any screen. WIDEimage will automatically move to the *View Screen* with the opened file displayed.

3.4.2 Close

The *Close* option closes the current open file.

If you after opening the current file made changes, a dialog will give you the option to save or disregard your changes.

3.4.3 Save

Saves the open image under the current file name.

3.4.4 Save As...

For saving to a new file name and for file conversion.

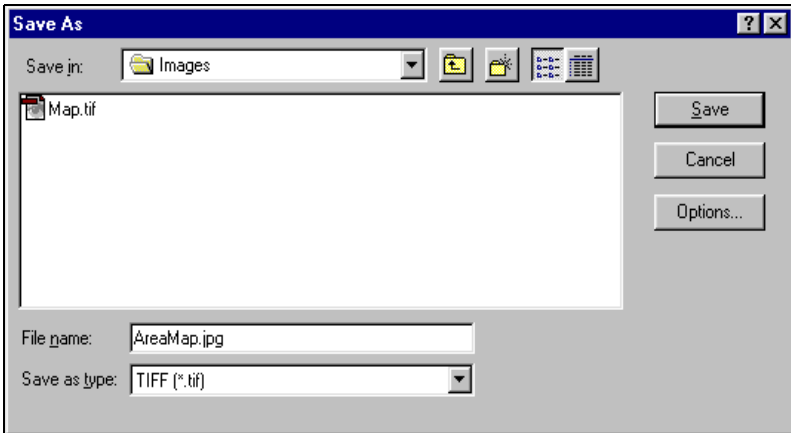


Fig. 3-4: Save As... Dialog

- With an active image, either scanned or loaded from a file ...
- Select *Save As...* from the *File Menu*.
- This displays a dialog for controlled saving of the image file under a name, location, folder and format of the user's choice.

File Format Conversion

An image file in one format can be converted into another format simply with the *Save As..* option.

- Select the desired format from the *Save as type* drop-down box. (See Appendix B: File Formats.)
- Some formats are supplied with options that can be adjusted prior to saving. Click on the *Options* button to set available format options.

3.4.5 Properties...

Selecting *File Menu - Properties* displays the active image file's main properties as shown below. Click *OK* to close the display box.

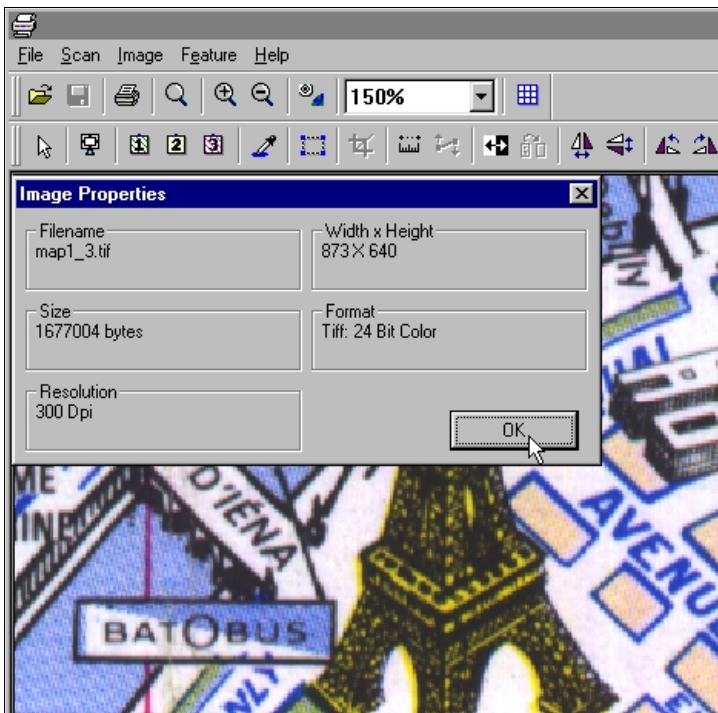


Fig. 3-5 Image Properties Dialog

3.4.6 Print...

For printing an open image and setting printer driver properties. Printing an open image is carried out either by selecting *Print* in the *File Menu* or by clicking on the *Print Tool* in the *Main Toolbar*. Both actions display a print dialog similar to the one shown below.

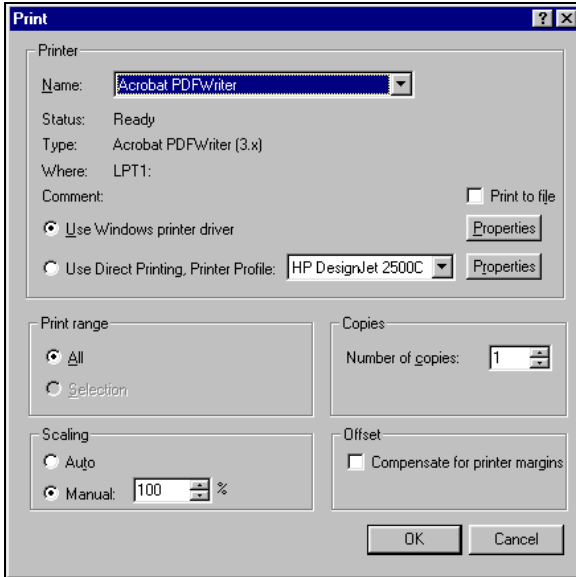


Fig. 3-6: Print Dialog Example

The *Print* dialog informs you of the current settings for the selected printer and port. Adjustments to printing settings are carried out here. The dialog offers a wide range of options, allowing optimal flexibility in relation to your different printing needs.

Making Settings in the Print Dialog

Printer Name

Printing is always done through a printer that is defined in your operating system i.e., Windows . Click the *Name* drop-down box to select one of the printers defined on your system.

Print To File

Check the *Print to file* option if you wish to redirect print output to a file. The file *Save As..* dialog appears when you click OK in the print dialog.

Select your Printer Driver

The printer driver selection area offers users optimal flexibility for obtaining perfect printer output at maximum speed. By clicking on *Properties* next to the selected driver type, existing printer settings can be amended or new printer profiles can be configured to fit specific requirements.

You can select either:

- Use Windows printer driver
- Use direct printing.

Use Windows printer driver

Select *Use Windows printer driver* to activate the current Windows printer driver when processing the print job. Click on *Properties* to display the Windows printer configuration dialog. See your Windows documentation for details on configuration of the Windows printer driver.

Use direct printing

With *Use direct printing* you can select one of the printer profiles available with WIDEimage from the list in the arrow box. There are printer profiles for many commonly used printers. The printer profiles and dialogs are designed to enable you to take full advantage of printer-specific options. The print job is processed as a raw print that goes directly to the printer queue, which speeds up printing considerably.

Use direct printing also allows you to use and create your own pre-defined printer profiles. User defined printer profiles can be added to the profile list by way of the *Properties* dialog's *Clone...* button shown below.

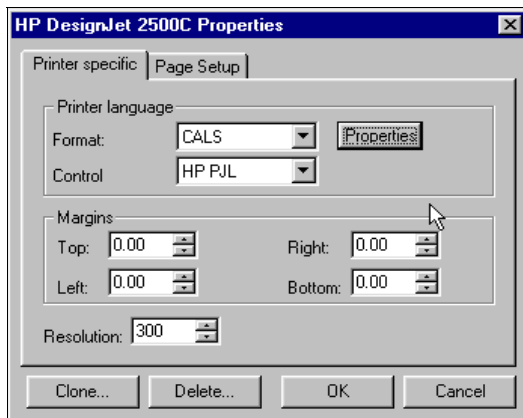


Fig. 3-7: Use Direct Printing - Properties Dialog

Use direct printing - Properties

Selecting *Properties* after choosing *Use direct printing* will start a dialog with 2 selection tabs: *Printer Specific and Page Setup* . From these tabs you can:

- Determine margins, printing resolution, and other printer specific settings. The *Properties...* button in the *Printer Specific* tab enables access to those printer settings that are specific to each printer.
- Determine *Paper size and Portrait or Landscape* orientation.

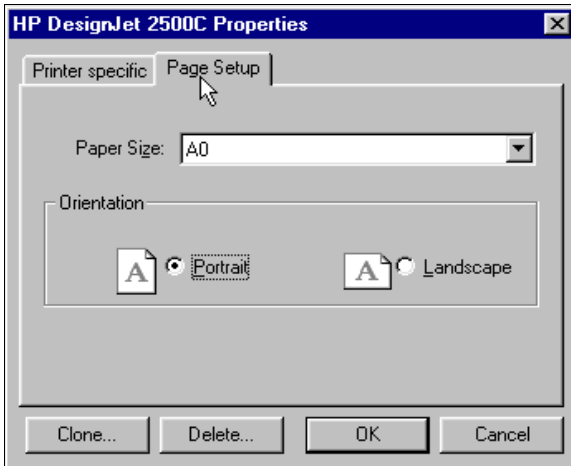


Fig. 3-8: Use Direct Printing - Properties - Page Setup Tab Dialog

Creating User-defined Printer Profiles

- User-defined profiles are configured and saved in the *Use Direct Printing - Properties* dialogs.
- You configure new Printer Profiles by cloning from the current profile. Click the *Clone...* button to enter a new profile name and save the current settings. Up to 10 user-defined profiles can be created and saved.
- To Delete the current user-defined profile, click on *Delete* in the *Printer Properties* dialog.

Print Range

The *Print range* option group, is where you define the portion of an image that will be printed. You can select ranges defined as *All* or *Selection*.

- Choose *All* to set the range to include the entire image.
- Choose *Selection* to limit the printing range to the area outlined by the *Rectangle Select Tool* when it is active (see Chapter 5 for details on the *Rectangle Select Tool*).
- The Print Range is set to *All* by default.

Copies

The number of copies can be set between 1 and 999. The default setting is 1.

Scaling

Scaling can be set to:

- **Auto** - which means the drawing is scaled to the printer page size as defined in the current printer profiles page settings in *Properties - Page Setup*.
- **Manual** - You choose scaling ratios between 1 and 1000%. Default is 100%.

Scaling is set to *Manual* by default.

Offset

Offset can be enabled, which means a part of the image will be cut off before printing in order to compensate for top and left printer margins. When using a Windows printer driver, the offset is read from the driver. With *Use direct printing*, offsets are specified and amended through the *Printer Properties* dialog.

3.4.7 Batch Print ...

Often you will have a list of files that are to be printed in the same way. Opening and starting *Print* for each file in turn would be a slow and annoying process. Multiple (batch) printing of several files can be carried out by selecting *Batch Print ...* in the *File Menu*. The files must have the same file format.

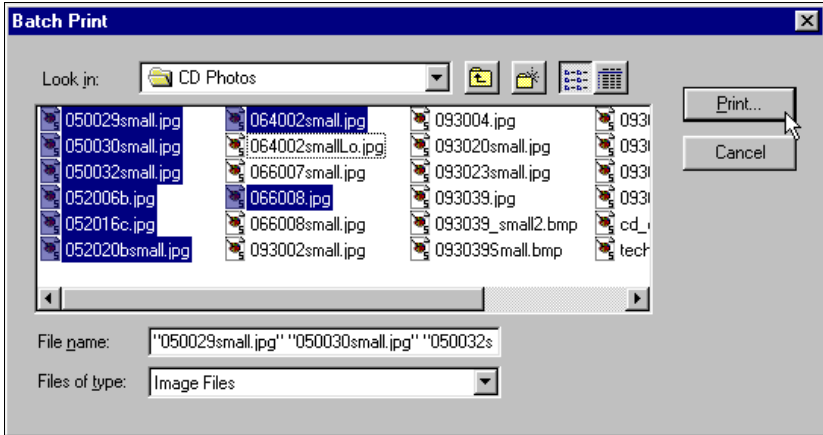


Fig. 3-9: Batch Print Dialog

Performing Batch Printing

- Select *Batch Print* from the *File Menu*.
- In the file selection dialog, select the files you wish included in the batch.
- Use the *Files of type* drop-down box to help ensure that you select files with identical formats.
- Use the <shift> or <ctrl> key in combination with the mouse to select multiple files.
- Click the dialog's *Print...* button to start printing. The normal *Print Dialog* described in the previous section (see 3.3.6 Print) will appear. From there, printing follows the same procedure as for printing a single image file.

3.4.8 Batch Convert

You may have a whole list of files in the same format that need to be converted in exactly the same way. WIDEimage offers a convenient interface for multiple file (batch) conversions.

Choose *File - Batch Convert...* to display the following dialog in which batch conversion settings can be configured. Your settings will apply to each file you include in the batch. The dialog is sub-divided into an input dialog area and an output dialog area.

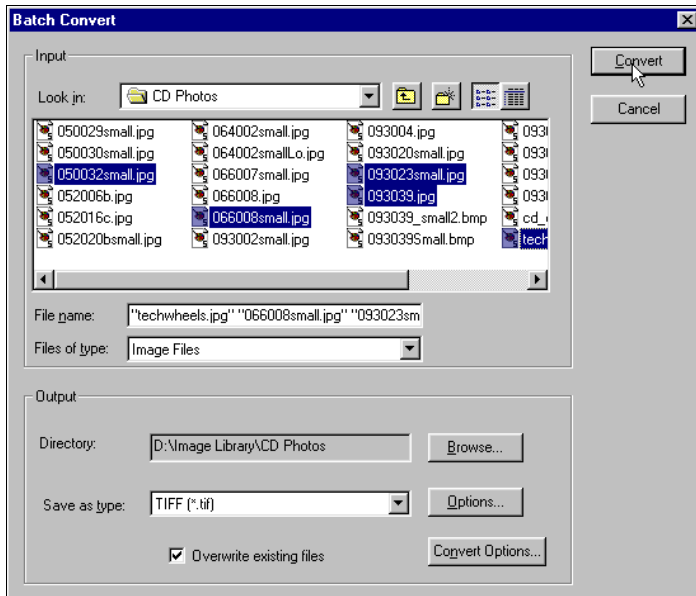


Fig. 3-10: Batch Convert Dialog

Batch Convert - Making Input Settings

- Select files for conversion from the File selection dialog.
- Make sure the input files are of identical file formats.
- Use the <shft> or <ctrl> key in combination with the mouse to make multiple selections.

Batch Convert - Making Output Settings

- Select the output format in the *Save as type* window. You can select a type from the arrow list.
- Select a target directory in the *Directory* window. Click on *Browse* if you need to search for an output directory.
- The resulting output files will inherit their names from the corresponding input files.
- Click on the *Options..* button for setting file format options. The dialog and its options are relevant to the file format specified as the batch output format. Different format types have different format option dialogs.
- Click on *Convert Options...* to make settings that will apply to all the output files in the batch. Rotation Angle, Invert option, Mirror option, Scale Factor, Despeckle and Hole Filling are available.
- Use the bottommost check box if you wish automatic overwriting of existing files with the same name.

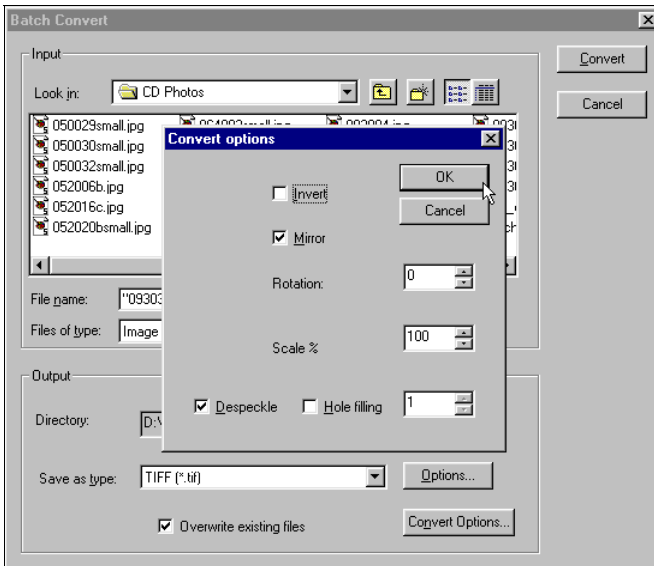


Fig. 3-11: Batch Convert - Convert Options Dialog

Starting Batch Conversion

Batch conversion is started by clicking the *Convert* button. You can follow its progress in the *Batch Convert Log* dialog box .

Viewing the Batch Conversion Log

The *Log* dialog appears just after the conversion process begins. The *Log* dialog's window displays the status of each conversion task as it is performed. An "OK" message follows each successful conversion of a file, while unsuccessful conversions are followed by an error message. An *Abort* option is available as long as the conversion process is running.

- Click the Abort button if you want to stop the batch conversion.

When the conversion process is completed, the *Log* dialog changes to a scroll window allowing you to view all the log entries and thereby verify the conversion's completeness.

- Click Close to leave the dialog
- Click Save... to start a file selection dialog for saving the log to a file.

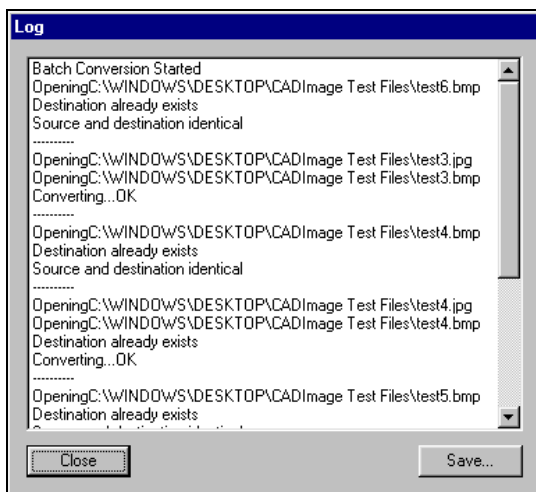


Fig. 3-12: Batch Conversion Log Dialog

3.4.9 Preferences

With the *Preferences* option you can customize central factors in WIDEimage.

Clicking on *Preferences* displays the following sub menu:

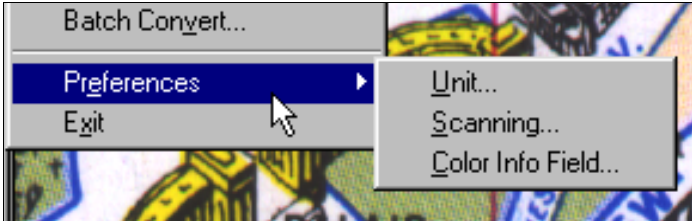


Fig. 3-13: Preferences Dialog

Setting Unit Preferences

- **Unit...**
Select *Unit* to set the unit to millimeters or inches. Your selection determines units for other measurement settings throughout the program.

Setting the Status Bars' Color Space Value Method

- **Color Info Field...**
A dialog will be displayed in which you can choose between RGB or HSV color space values. The *View Screen* and *Feature Screen Status Bar* will display either RGB or HSV values depending on this setting.

Setting Scan Preferences

- **Scanning...**
Select *Scanning...* to customize different categories of scanning aspects. Settings are grouped under 3 tabs : general settings, batch (log data) settings, and prescanning behavior.

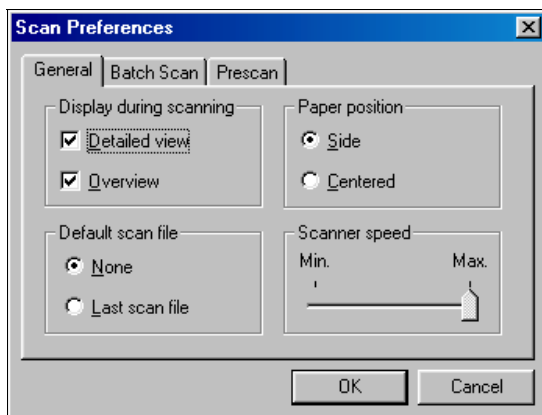


Fig. 3-14: General Scan Preferences Dialog

General Preferences (see figure above)

- **Display during scanning (no effect on prescan viewing)**
Check the *Detailed view* option if you want image details to be displayed during scanning. Un-checking this box can speed up scanning processes.
Check the *Overview* option if you want an overview displayed during scanning. Un-checking this box can speed up scanning processes.
- **Default scan file**
Check the *None* box if you prefer to enter the scan file name manually for each scan-to-file.
Checking the *Last scan file* box causes the *Save As...* dialog to always display the latest file name used. This is useful if you expect to make trial scans with each job.
- **Paper position**
Here you select paper loading from either the side of the scanner or from the center. This setting will be your default setting at startup. Paper position can also be set temporarily in the Scan Panel – Paper size method options.
- **Scanner Speed**
Sometimes, the performance of your workstation will cause the scanner to make repeated “back-ups” during scanning in order to ensure correct and continuous processing of scanned data. Back-ups can be avoided by reducing the scanning speed thus refitting the scanner’s performance to that of your workstation. Use the slider to adjust the speed of the scanner.

Batch Scan Preferences

- **Batch Scan**

Batch Scan preferences specify which information will be logged during batch scanning (see section 4.3.6 on *Batch Scanning*). Log information is presented on two levels:

- Information relative to the whole batch
- Information relative to each scan in the batch

The following dialog shows the log data options. By checking an item, you specify that information about its settings will be included in the log.

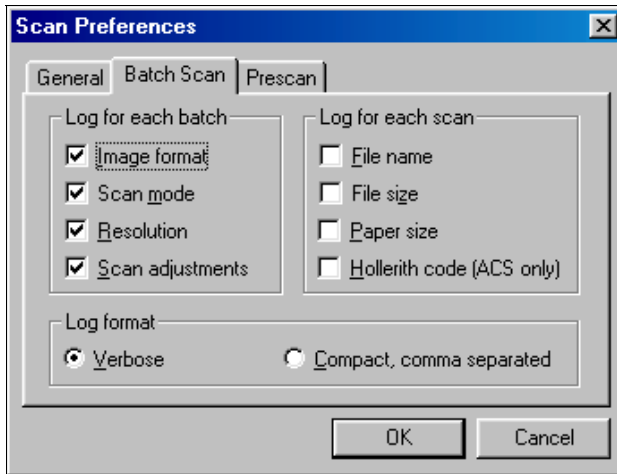


Fig. 3-15: Preferences – Scan - Batch Scan Dialog

Log Format

You can choose one of two formats for your batch log output. The *Verbose* format lists the batch data in a readable format and should be your choice for normal reference purposes.

The *Compact, comma separated* format is for importing the batch log data to another application such as a spreadsheet or database. Column headers are only written to a new or empty log file, otherwise data is appended without new headers. Fields irrelevant to the scan mode are left empty and each line will always contain a fixed number of comma separated fields.

Prescan Preferences

- **Prescan Mode – Single or Continuous pass**

Select *Single pass* if you prefer prescanning to automatically halt at the end of the document. Select *Continuous* if you prefer prescanning to move back and forth until you manually press the Halt button.

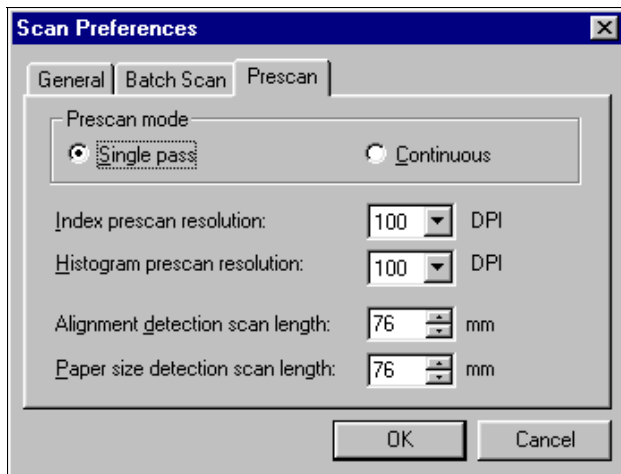


Fig. 3-16: Preferences - Scan - Prescan Settings

- **Prescan resolutions**

Here you determine resolutions for the following prescan activities:

- **Index prescan resolution**

Valid for COLOR scanners. In the *Index prescan resolution* box, you select from a drop-down list the resolution to be used during color index (*Index Mode*) prescanning.

- **Histogram prescan resolution...**

In the *Histogram prescan resolution* box, you select the resolution for use during histogram prescan.

- **Alignment detection**

Set the scan length for auto alignment detection i.e., how far the scanner will look until it finds a line usable for automatic alignment.

- **Paper Size Detection**

Here you set the scan length for automatic paper size detection i.e., how far the scanner will look for the signs that reveal the original's edges and paper size.

3.4.10 Exit

Exits WIDEimage.

4. Scanning - Scan Screen & Scan Menu

WIDEimage is a powerful tool for controlling your scanning activities and facilitating achievement of perfect results. The *Scan Screen* is your scanning cockpit from which all scanning options can be easily accessed and adjusted. This chapter focuses on Scanning procedures and settings made in the *Scan Screen* and the *Scan Menu*.

4.1 Functionality with Different Scanner Models

WIDEimage is an integrated software package for a large range of scanner models and types. Therefore, the availability of some scanning options and settings described in this chapter are dependent on the scanner model in question.

For instance, options regarding color scanning are of course disabled when running WIDEimage with B/W scanners and there are scanning *Modes* that run on certain scanner models but not on others. Differences of this kind will be pointed out in relevant sections.

A number of image enhancement features are processed in the hardware on some scanner models while the same features are software emulated through WIDEimage on others. WIDEimage's enhancement processing (software emulation) gives the same high quality results as hardware embedded processing but at lower speeds.

4.2 Scanning Interface - Scan Screen Overview

The *Scan Screen* shown overleaf is divided into general areas as described in section 3.1 : *Menu Bar*, *Main Toolbar*, and *Task Toolbar* , a *Main Display Area* in the middle, and the *Screen-Select Tabs* and *Status Bar* at the bottom.

The *Task Toolbar* position is now occupied by the *Scan Toolbar* which is composed of tools relevant to controlling scanning activities.

The main display area is subdivided into a:

- Scan Panel
- Detail Window
- Overview Window

4-2 Scanning - Scan Screen & Scan Menu

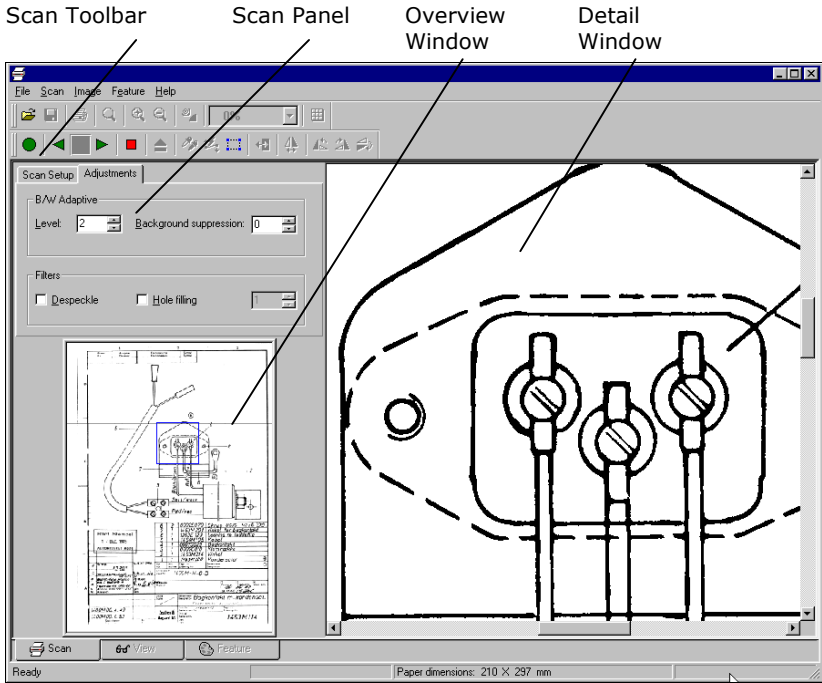


Fig. 4-1: The Scan Screen

4.2.1 The Scan Toolbar

The *Scan Toolbar* consists of tools that facilitate frequently-used scanning operations. Some of the tools are solely related to prescanning while others are used in connection with the final scan-to-file process. Each tool will be described in connection with its relevant function under the following sections about prescanning and scanning.

4.2.2 The Scan Panel

The *Scan Panel* is found at the upper left side of the *Scan Screen*, just under the *Scan Toolbar*. This is your main control station for setting options that apply to current prescanning and scanning activities. Settings such as scanning mode, resolution, paper size, threshold, brightness/contrast and many more can be adjusted through the *Scan Panel*.

4.2.3 Detail and Overview Viewing Windows

WIDEimage offers prescanning with on-screen viewing and adjusting before scan-to-file. To support this, the *Scan Screen* displays 2 views of scanning progress. Just under the *Scan Panel* you find the *Overview Window* and, on its right side, the larger *Detail Window* that dominates most of the *Scan Screen*. During scanning and prescanning, the *Overview Window* normally displays the whole drawing being scanned, while the *Detail Window* shows a zoom-in to the actual scanned pixel level of the part of the drawing pointed out by the square position indicator in the *Overview Window*.

During prescan you can use the mouse to point and click on any area in the *Overview Window* thus zooming in on that part in the *Detail Window* where viewing, pointing and marking can be performed with greater precision. A new prescan on the indicated area takes place immediately every time you change the *Detail Window* view by pointing and clicking with the mouse.

The square in the *Overview Window* always outlines the area you are currently viewing in the *Detail Window*. The square can be dragged around the *Overview Window* to a new position or moved horizontally by dragging the scrollbar under the *Detail Window*.

4.2.4 The Scan Status Bar

The *Status Bar* in the *Scan Screen* displays :

- The current paper dimensions in inches or mm depending on your unit setting in the *File Menu – Preferences – Unit*.
- Special scanning mode status - *Scan-to-Print* and *Batch Scan* modes.



Fig. 4-2: The Status Bar - Scan Screen

4-4 Scanning - Scan Screen & Scan Menu

4.3 An Overview of Scanning Procedures

Scanning of a drawing is activated by selecting the appropriate buttons on the *Scan Toolbar*. Scanning can be performed either directly or in a two-step process : prescanning and scanning-to-file.

4.3.1 Prescanning and Scan-To-File

Prescanning can be performed prior to scanning-to-file. Prescanning loads the image into memory only so you can view it on screen. Prescanning allows you to continuously adjust your scanning settings, viewing the effects as you go, before activating scan-to-file. During prescanning you can for example fine tune the threshold setting, make tonal adjustments or define a limited scanning area on a part of the drawing, The *Forward* button will start a prescan.

Scanning-to-file is performed when you are satisfied with your settings and their effects as displayed during prescanning. Scanning-to-file may also be carried out immediately if you choose to omit prescanning. The *Scan* button on the *Scan Toolbar* will initiate a scan-to-file.

***Note** : Prescanning cannot be performed with originals over 2mm thick.

4.3.2 Making Enhancement Adjustments

Enhancement adjustments can be made during prescanning through the *Scan Panel – Adjustments Tab*. When prescanning, each parameter adjustment in the *Adjustments Tab* automatically initiates a new prescan of the current area and the effects of the change are immediately displayed. You can also click on the *Halt button*, make your adjustments, and then watch as the effects are applied in the *Detail Window*. The enhancement adjustments can then remain active when you commit the scan to file or print.

The availability and relevance of these settings depend on the scanner model and the *Mode* selected in the *Scan Setup Tab*. Detailed instructions on using these features can be referenced in coming sections on the *Scan Panel*, *Scan Setup Tab* and the *Adjustments Tab* in this chapter. For starters, here are some of the adjustment features that can be used when prescanning:

Contrast/Brightness

There are different Contrast/Brightness options/dialogs depending on your chosen *Mode* setting and scanner model.

Threshold

The Threshold can be adjusted manually when selecting B/W Threshold scanning mode. The Threshold setting determines the degree of compensation for dark or light parts of a drawing. Threshold may be changed at any time during prescan.

2D-Adaptive Threshold

2D-Adaptive thresholding takes place in real time in the scanner hardware. Instead of using a singular threshold value, 2D-Adaptive thresholding automatically compensates for varying background, faded areas and stains and changes the threshold accordingly as it goes.

Dual 2D-Adaptive Enhancement

Dual 2D-Adaptive enhancement is where processing is performed simultaneously on individual aspects of the original. Dual 2D-Adaptive enhancement is performed in the copy modes and on some scanner models, also in the B/W Adaptive mode with 2D-Adaptive Thresholding as one of the processes. Different combinations of the following enhancement features are used: ADL+ error diffusion halftoning for maintaining grayshades in printouts, 2D-Adaptive foreground thresholding, 2D-Adaptive background suppression and 2D-Auto edge enhancement. The adaptive levels can be adjusted to achieve clear images from low contrast and difficult drawings. Background suppression is also adjustable on some scanner models. Dual 2D-Enhancement works only with the *Copy Modes* on scanners without hardware embedded support for the dual processing.

Black and White Point

When scanning in Color or Graytone Modes, you can determine the amount of highlight and shadow detail by setting the black and white points. By default, the black and white points are determined by the calibrated settings in the scanner. The *Black and White Point* tool allows you to change the defaults for the current drawing and offers 3 different setting methods : *Automatic*, *Manual*, and picking colors directly from the image.

4-6 Scanning - Scan Screen & Scan Menu

Despeckle/Hole Filling

Can be set in B/W Threshold and adaptive modes. You can choose removal of black speckles and filling white holes. You control the degree of despeckling and hole filling by setting the maximum size of the speckles and holes.

2D - Sharpen/ 2D - Soften Filter

This filter can be used to intensify or “mellow” edges in an image. The value you enter in the filter field determines the degree of sharpening/softening. Sharpening works well with the blur filter (see below).

2D - Blur Filter

The purpose of the Blur filters is to diminish the effect of color or graytone dither patterns when scanning printed originals. Using the blur filter together with sharpening gives very good results for many drawings. The combination of sharpen with blur allows you to enhance lines without creating noise in densely colored/graytones areas.

4.3.3 Making Your Scan

In most cases, scanning a document will only require initializing the scan job through the *Scan Setup Tab* (*Mode, Paper size, etc.*) and then just clicking on the *Scan* button. This of course requires that the current or default settings in the *Adjustment Tab* are considered adequate for your drawing.

In more advanced cases, scanning a document will be a combination of the following steps.

Scanning Steps

1. Initialize your scanning by setting the main parameters for the scanning job in the *Scan Panel - Scan Setup Tab*. These parameters must be set before initiating prescan or scan-to-file if they are to take effect. Press the *Halt Button* if you want to reset one of the Scan Setup Tab options.
2. Press Forward to start prescanning your drawing. You can view different details by pointing and clicking with the mouse, dragging the Area Indicator Square or with the Forward, Halt, Backward buttons.
3. Make the enhancement adjustments listed above as you interactively view the effects of your adjustments on-screen. Try out different settings for Adaptive level, brightness, sharpen, etc. until you find the perfect values.
4. When you are satisfied with your settings, press the *Scan Button* to perform a scan-to-file.

Use the User Guide Reference Overview below to find details on each scanning step.

Scanning Steps – User Guide Reference Overview

- **Initializing – Main Settings:** Section 4.4 - Instructions on making initial central settings with optional image correction settings.
- **Prescanning phase:** Section 4.5 - . Instructions on how to control prescanning and details on special options available during prescanning.
- **Scan Adjustments:** Section 4.6 – Instructions on fine tuning the Scan Mode through the *Adjustments Tab* before scan-to-file and during prescanning.
- **Scanning:** Section 4.7 – Instructions on scanning to a file and to a printer.

4-8 Scanning - Scan Screen & Scan Menu

4.4 Main Scan Settings - The Scan Setup Tab

Scanning starts in the *Scan Panel – Scan Setup Tab*. The Scan Setup Tab's 3 main parameters are central to the scanning operation and must be set prior to prescanning or scanning to a file since they cannot be amended later. These are:

- The scanning mode
- The resolution
- The original's paper size

Each of these settings involve options that are all accessed through the *Scan Setup Tab*. You can choose to set most of the options at one go by using either your own or WIDEimage's standard *Scan Presets* that combine *Scan Panel* options under a *Scan Preset* name. The *Scan Setup Tab* is shown below.

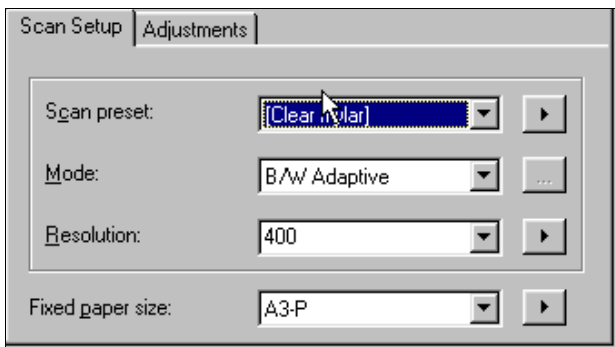


Fig. 4-3: Scan Panel - Scan Setup Tab

4.4.1 Scan Presets

A *Scan preset* is a combination of *Scan Setup Tab* and *Adjustments Tab* settings already defined and stored. *Scan presets* can be selected from the drop-down list, and then they can be amended, renamed, or deleted. A *Scan preset* is handy for storing, recalling and standardizing your favorite settings. Paper size settings cannot be saved in a *Scan preset*.

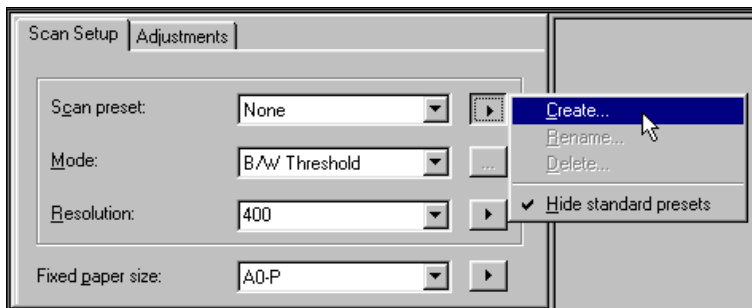


Fig. 4-4: Scan Setup - Scan Preset Dialog

To Create a Scan Preset

- Set the *Mode*, *Resolution* and the *Adjustment Tab* settings. You may have just made a successful scan and wish to save your settings for future jobs.
- Select the arrow next to *Scan preset* and select *Create*.
- You will be prompted for a name for your *Scan preset*. Choose a name related to the class of originals you are scanning (RoadMaps, Cartoon Picts ..etc.), so that the Scan Preset can easily be found and reused with similar originals.
- Click OK to save your settings and add the *Scan preset* to your list.

To Amend a Scan Preset

- Select the *Scan preset* that is to be amended in order to load its settings.
- Change the settings. The text for the current *Scan preset* will automatically change to *None* showing that the *Scan preset* is being redefined.
- Press the arrow button, - select *Create* and save the settings under the original *Scan preset* name.

Use Standard Scan Presets

A number of useful predefined standard *Scan presets* are available with your scanner. These presets combine scanning settings that are tested with different types of originals such as Light paper, Light/Dark Blueprint, Light/Dark Brown Sepia, Gray transparency, Pencil and more. Standard *Scan presets* cannot be deleted or amended, but they can be hidden from the drop-down selection list by checking the *Hide standard scan presets* option so only your own *Scan presets* are displayed.

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4.4.2 Scan Mode

The scan *Mode* is the most central scanning option and it determines the enhancement options available to you in the *Adjustments Tab*. Different scanning modes can be applied for different types of scanning assignments. There are true color and reduced color modes. Some of the monochrome *Modes* are especially effective for enhancing details on difficult and unclear drawings. Some of these are specially designed for printed output (copying) while others are more suited for file storage. An overview of the types of scan *Modes* follows below.

The availability of specific scanning modes and the adjustment options for each mode depend on your scanner model. Color modes are only available with a color scanner. WIDEimage adapts to the detected scanner and only displays those modes available to it.

Color Modes

The Full 24-bit true color mode creates 16.8 million colors.

Indexed color mode is an effective method for scanning documents that display a limited range of colors. True colors are automatically mapped to a selected color palette based on adaptive color optimizing. Indexed color transformation greatly reduces the data volume, increases scan speed and minimizes disk storage requirements by only requiring 8-bit per color pixel compared with 24-bit in true color mode.

Real-time color classification (*Classified Color*) mode sorts the observed color features in the document into a set of color categories by on-board mapping through a classified color LUT (Look Up Table). Color classification is described in chapter 6 - Feature Extraction.

Monochrome Modes

Monochrome scanning can be performed in 256 shade graytone, Copy modes or line modes.

Dual 2D-Adaptive Enhancement Processing (monochrome)

Processing works on the foreground and background separately. Processing is performed on-the-fly without the need for investigative pre-scanning. Enhancement processes are simultaneously performed on different drawing aspects. On some scanners, Dual 2D-Adaptive enhancement is performed only in the Copy Modes (see below) with processing carried out in the WIDEimage software.

The Copy Modes

The Copy modes incorporate Dual 2D-Adaptive enhancement processing with different combinations of ADL+ Error Diffusion Halftoning, 2D-Background suppression, 2D-Auto edge enhancement and 2D-Adaptive thresholding. The copy modes are ideal scanning wide format documents that are intended for re-printing. The ADL+ Error Diffusion Halftoning supports visibility of graytones in printed output by adding toned shades of gray in regions between black and white. On some scanners, all Dual 2D-Adaptive enhancement features and processing are embedded in the scanner hardware and controlled through WIDEimage. For other scanners, WIDEimage provides software emulation of any Dual 2D-Adaptive enhancement process not supported by the hardware.



Fig. 4-5: Dual 2D-Adaptive Enhancement - Before and After

Line Modes

In line modes, the scanner outputs each scanned pixel as a single bit, either black (1) or white (0), depending on whether its gray level is below or above the threshold.

Both adaptive and fixed level thresholding is supported.

Selecting the Scanning Mode

The scanning *Mode* is chosen from the drop-down box in the *Scan Setup Tab*. You can set the scanning *Mode* to one of the following if the *Mode* is supported by the attached scanner. Here are some guidelines:

- **B/W Threshold:** This mode uses a global threshold to determine whether a pixel is black or white. Use this mode for drawings and line art. You set the threshold value in the *Adjustments Tab*.
- **B/W Adaptive:** In this mode the threshold adapts to darker or lighter areas in the original as opposed to the B/W threshold mode that uses a singular global threshold. The BW Adaptive mode is


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suitable for scanning all kinds of line drawings including difficult blueprints, brown transparencies (sepias), etc. A stained or faded original can be renewed as good sections are retained and bad ones clarified. Normally, the sharpen/blur filters should not be adjusted with this mode. This mode provides minimum file sizes and is, thereby, well suited for scan-to-file. This mode supports adjustable adaptive level and background suppression. On some models, background suppression is applied automatically and only the level is adjustable.

The *B/W Copy Adaptive* mode (see below) is also good with this type of originals but is better suited for creating printed output .

- **B/W Copy Normal:** Dual 2D-Adaptive enhancement with ADL+ error diffusion halftoning and 2D-Auto edge enhancement and 2D-Adaptive background suppression. This mode is suitable for copying (scan and print) of normal drawings with a reasonably good quality. Halftones are distributed throughout the image for softer transitions between black and white.
- **B/W Copy Photo:** Dual 2D-Adaptive enhancement with ADL+ error diffusion halftoning. This mode is suitable for copying (scan and print) of continuous shades of gray like in photos. Halftones are distributed throughout the image for softer transitions between black and white.
- **B/W Copy Adaptive:** Dual 2D-Adaptive enhancement with ADL+ error diffusion halftoning, 2D-Adaptive thresholding and 2D-Adaptive background suppression. This mode is suitable for copying (scan and print) of Sepia, Blueprint and other originals with heavily distorted foregrounds and backgrounds where the shades that create unwanted “noise” are close to the shades that make up the image’s data and the two are hard to differentiate.
- **B/W Photo:** A halftone dithered mode suitable for photos and printouts. Scans gray-tones and converts them to dithered black and white in the end file. Scanning is performed in 8 bit graytone mode while the program generates halftone data in memory based on the Floyd Steinberg algorithm. You adjust *Contrast/Brightness* and *Lightness* in the *Adjustments Tab*.
- **Graytone:** In this mode 256 gray levels are recognized for each pixel (1 byte, 8 bits per pixel). Gives good reproduction of complicated B/W images like B/W photos. You adjust *Contrast/Brightness* and *Lightness* in the *Adjustments Tab*.

- **RGB Color:** 24 bit true color mode for capturing all of the image's colors. This mode produces large files. You adjust *Contrast/Brightness* in the *Adjustments Tab*.
- **Indexed Color :** Indexed Color mode allows you to compress file size by reducing the colors produced to a number between 2 and 256. In Indexed Color Mode, you can adjust *Contrast / Brightness* through the *Adjustments Tab*.


Clicking the setup button  in this mode displays a dialog for selecting the number of colors and a method for computing the index color values based on a prescan analysis of the image. The 3 methods are:

Linear: Index colors are linearly distributed without a prescan.

Adaptive Photo: Index colors optimized for photos with prescan and image adaptation.

Adaptive Map: Index colors optimized for maps with prescan and image adaptation.

- **Classified Color :** This mode is for scanning with a LUT filter created in the *Feature Screen*.

Click on the setup button  to invoke a standard open file dialog where you can select and load your feature extraction LUT file (.lut). See chapter 6 for details on feature extraction, LUT filter creation and the *Feature Screen*.

4.4.3 Resolution

Scanning resolution is the number of pixels per inch (dpi) in the end (scanned) image. An image with a high resolution will contain more and thereby smaller pixels than an image with equal dimensions with a lower resolution. High resolution images will therefore normally display more detail and wider color ranges than low resolutions. However, high resolutions produce larger files with the usual setbacks in relation to disk space, load time, etc.


Your selection of resolution will therefore depend mainly on how you intend to display the image. For offset printing, high resolutions work best while for screen and web display, lower resolutions will suffice. Normally, 300 dpi and above are considered high resolutions. High resolutions can also be necessary if small details (like in maps) must be displayed clearly. Often, your output device's documentation will contain recommendations about optimal scanning resolutions.

The image resolution should be determined before scanning i.e., before your original is digitized and the image transformed to pixel

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data. Using an Image editor to increase resolution of an image scanned at low resolutions will normally not improve the image's quality.

Resolution is selected from the *Resolution* drop-down box in the *Scan Setup Tab*. Depending on the scanner model, the drop-down box shows either predefined normal resolutions, predefined turbo-resolutions, or the physical resolution.

Click on the *Setup* button  to display a dialog for selecting between different resolution lists. WIDEimage automatically detects the resolutions supported by the attached scanner and displays only those applicable. Selections are:

- **Normal:** The edit field allows you to set the scanning resolution in one DPI increments.
- **Turbo:** Selecting *Turbo* sets the scanner in vertical interlaced mode and speeds up the scan process by up to two times. Turbo mode has no effect for resolutions below 300 DPI and is not available in Classified and Index modes.
- **Physical:** This list is of interest when scanning in graytone mode for later processing. The resolution is the actual unscaled physical resolution of the attached scanner.

4.4.4 Setting the Paper (original) Size

Setting paper size is a two step process:

- Select the setup arrow button to choose the method for paper size calculation.
- Select the actual size that relates to your chosen method.

Setting the Paper Size Method

The scanner must know the paper size of the original. This is not only important for capturing the whole image, but also effects measurements and calculations on technical drawings and maps. The application offers many different methods for determining the original's paper size. You select the method for defining your paper size through the *Paper Size Method* menu (*Fig 4-6* overleaf) that you activate by clicking the setup button.



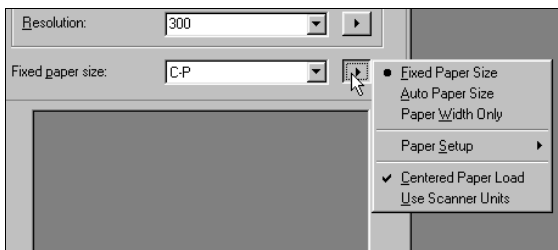


Fig. 4-6: Paper Size Method Menu

The chosen method will always be written in the *Scan Setup Tab* with the corresponding units setable in the edit field.

Depending on your scanner model, you can choose one of the following methods:

- **Fixed Paper Size** – Available standard sizes including common US, European and DIN drawing sizes and user defined custom sizes. You choose from a list of sizes that appears in the edit field. Amedning the list and sizes is described under *Setting Paper Size Method Parameters*.
- **Auto Paper Size** – Automatic detection of your paper size. You can make one of the following selections if available on your scanner model:
 - Auto size ISO*: The Width and left-Offset are automatically detected, snapping to nearest standard ISO paper size. Setting Orientation will also affect auto sizing. Length is set according to the detected standard size.
 - Auto size US*: The Width and left-Offset are automatically detected, snapping to nearest standard US paper size. Setting Orientation will also affect auto sizing. Length is set according to the detected standard size.
 - Auto width*: The Width and left-Offset are automatically detected without snapping. Use this setting if your original is not close to a standard size.
 - Auto image width*: Auto size detection on some color scanner models. The max paper width is detected and the whole length of paper is scanned.
 - Hollerith size info*: (Aperture Card scanners only) The paper size will depend on the Hollerith code on the card. Go to the *Paper Setup* option to set the card parameters. The steps involved are described under *Setting Paper Size Method Parameters*.

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- **Paper Width only** – With this method you set the paper width values directly in the *Paper Size Method* edit box. The values will be interpreted as inches or mm depending on the setting in the *File Menu-Preferences* dialog or as scanner units if you check the *Use Scanner Units* option (see below).
- **Centered Paper Load** – Checkmark this option if you are loading from the center. Unmark it if you are loading from the side. Make sure the setting corresponds with the physical positioning of the paper, or you will get a blank scan. This option defaults to the *Paper position* setting in the *File Menu – Preferences dialog*. Changing the setting here in the *Paper Size Method Dialog* temporarily overrides the *Preferences* setting for the current scanning session.
- **Use Scanner Units** – Scanner units are drawn on the scanner near the insertion slot. For example, with the *Paper Width Only* method, the original's paper size can be read off the scanner and then defined by these units if you check this option. This setting affects also the *Paper Size Setup* list so that all the standard sizes will be defined in scanner units.

Setting Paper Size Method Parameters

The **Paper Setup** option is for defining *Fixed Paper Size* values, the Y (vertical) offset with *Auto Width* and automatic detection properties for Aperture Card scanning. *Paper Setup* leads to one of the following option groups – *Paper Size*, *Y offset*, and *Oversize*, depending on the selected paper size method. Lets look at the method parameters in each option group.

Paper Size

With the *Fixed Paper Size* option selected, *Paper Setup* leads to the *Paper Size Setup dialog* for defining your paper sizes. The most popular standard sizes are already defined in the program. You can add, edit and delete your own size definitions in the list.

The *Paper Size Setup* dialog is shown overleaf.

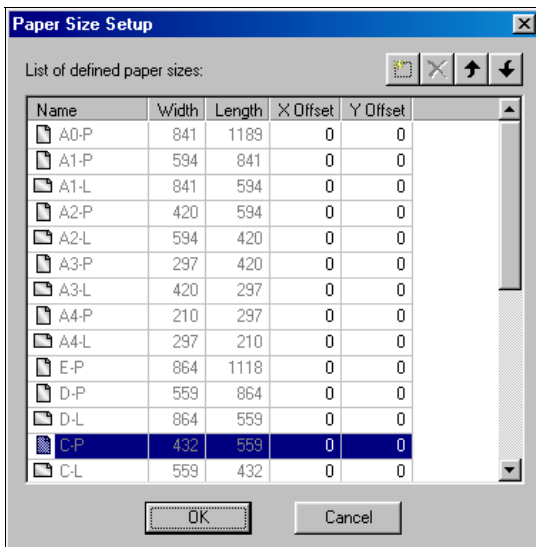



Fig. 4-7: Paper Size Setup dialog

Create New sizes  - Click the New Size tool at the top to add a new size.


Edit existing sizes - Edit directly in the list's fields to change values for existing sizes, and fixed offsets. You select paper orientation (portrait or landscape) by selecting the size defined by "P" or "L" like A4-P and A4-L. Only offsets can be edited in predefined standard sizes.

Delete a size  - Select a size with the arrow buttons or by clicking and then select the delete button. Predefined standard sizes cannot be deleted.

Auto Paper size detection with Aperture Cards (Aperture Card Scanners only) - You can use *Auto Paper Size* detection with an Aperture Card scanner. Your Hollerith cards hold punched hole information for the image paper size. The parameters you set tell the program where to look for this information and what to do. Here's how you setup automatic paper sizing with aperture card scanning:

- Click the *Auto Paper Size* option. With an Aperture Card scanner, the paper size window will display "Hollerith Size Info".
- Click again the arrow button to the right of the paper size window. In the sub menu, click the *Paper Setup - Paper Size...* option.

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- The *Paper Size Setup* dialog appears with additional fields related to Aperture Card scanning and the Hollerith codes on the cards.
- The list of defined paper sizes shows standard or customized sizes. You can create your own sizes if necessary with the button for new sizes. 
- Attach Hollerith paper size detection codes to the paper sizes by filling in the list's rightmost column. For example, your cards may have been constructed with the code "A4" in card column 67, indicating that the standard A4 portrait size is to be used for the image. In this case you would write "A4" in the *Size Code* field for the size named A4-P.
- Amend the *Reduction factor (Red. Factor)* field if necessary. The Reduction Factors have standard values and define the relation between the image on film and the original size

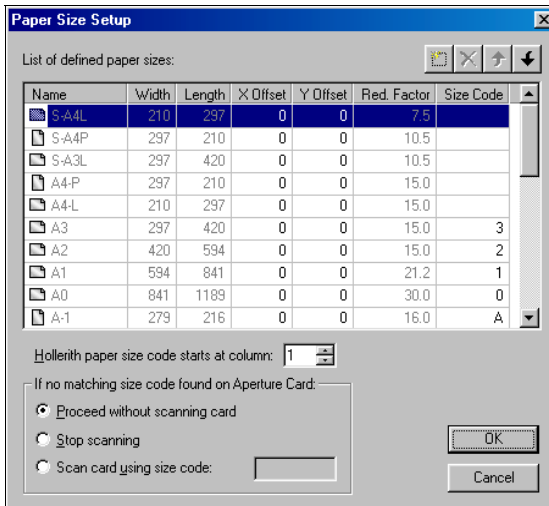



Fig. 4-8: Paper Size Setup with Aperture Cards

- In the "Hollerith paper size code starts at column" field, you enter the punched column where the paper size information is found such as "67" in the current example. Codes will be interpreted according to the paper sizes and their attached codes in the list of defined paper sizes that you prepare.
- The next three options determine what will happen should the scanner meet cards that do not contain a matching code. You can select one of the following actions:
 - *Proceed without scanning card* - skip the card and go on. This can be useful for selecting only certain cards for scanning.
 - *Stop Scanning* - You may expect all the cards to have valid codes and you want to manually check the process if a code cannot be read.
 - *Scan card using size code* - allows you to force an alternative size for those cards without valid codes.

Paper Y offset - With the *Auto Paper Size* option selected on normal Wide format scanners, *Paper Setup* leads to a dialog in which you enter an offset for the scanning (Y) direction. The default offset is zero.

Oversize – Select *Oversize* for expanding all paper sizes by a user-defined factor. This option is available with all paper size methods.

4.4.5 Optional Image Correction Settings

Apart from the central settings, the following operations can be performed while creating a scanned image. **These operations only take effect during scanning and cannot be previewed during prescanning.** For all these tools, you select the desired operation just before selecting the *Scan Button*  after optional prescanning if performed.

Invert (image colors)



Click on the *Invert* tool before scanning to file. This will reverse the image colors in your end file. The result is a negative image. When scanning in color modes, the R,G & B channels invert separately.

Mirror



It is sometimes necessary to scan a drawing on transparent film from the "back", due to the toner being on that side of a film. This would result in unintended reversal or "mirroring" of the image in relation to the original. Click on the *Mirror* tool before clicking on the *Scan Button* to "re-mirror" the drawing thus reversing the undesired effect.

Rotation

You can rotate the image in the end file.

Rotate Right (90°) :



Rotate Left (270°) :



Rotate 180° :



Press the desired *Rotation tool* before hitting the *Scan Button* and the image will be saved with the indicated adjustment. The *Rotation tools* are only available if *Fixed Paper Size* has been selected as the paper size method.

4.5 Using Prescanning

Prescanning allows fast on-screen viewing of scanning results with different settings and adjustments. Prescanning is optional and if you feel confident with the initial settings, you can skip prescanning and scan directly to a file. But for difficult drawings, or for your first experience with a certain type of original, prescanning offers advantages that are hard to overlook.

After having inserted the drawing into the scanner and chosen your central initial settings in the *Scan Setup Tab*, start prescanning by selecting *Forward* on the *Scan Toolbar*. Your image will gradually appear in the Overview and Detail windows as the original is horizontally scanned. You control prescanning of specific areas by activating one of the tools for area selection described below.

During prescanning, you can make different enhancement adjustments (Threshold, Brightness, etc.) through the *Adjustments Tab*, based on what you see in the *Detail View Window* in order to find the best solution for the particular drawing. You can make a complete assessment of the drawing by analyzing specific difficult areas.

TIP: Let the whole image be prescanned before making adjustments so you can afterwards click-select any area for detailed viewing.

NOTE: Media over 2mm thick cannot be accurately prescanned.

See also section 3.4.9 for details on selecting *Prescan Preferences*.

4.5.1 Forward, Halt and Backward Buttons



Using these toolbar buttons you can alter the prescan direction and *Halt* in an area of your choice. Prescanning is started by pressing the *Forward* button and will go into Halt Mode when you press *Halt*.

While in Halt Mode, every adjustment you make automatically starts a new prescan of the area currently viewed in the *Detail View Window* while immediately displaying the adjustment's effects on your screen. Applying adjustments while in Forward or Backward Modes will automatically put prescanning into Halt mode and thus initiate a new prescan over the current prescan area, as if you had pressed *Halt* manually.

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4.5.2 Fast Prescan Area Selection

An alternative to using the *Forward*, *Backward* and *Halt* buttons for repositioning the *Detail Window* view, is to click with the mouse in the *Overview Window* on the area you wish to work on. This initiates a fresh prescan and the specified area will appear in the *Detail Window* with the operation ending in *Halt Mode*. The new position of the square in the *Overview Window* indicates the area displayed in the *Detail Window*.

You can also drag the square to a new area in the *Overview Window*.

- Press and hold the left mouse key while pointing at the square to activate the panning cursor (hand).
- Drag the square while still holding down the key.
- Release the mouse key thus starting a new prescan and a detailed (zoomed in) view of the new area in the *Detail Window*.

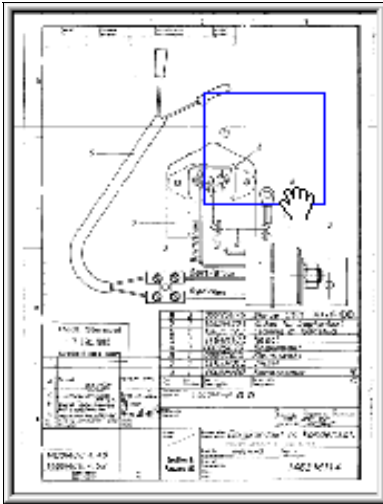


Fig. 4-9: Drag the area indicator square in the Overview Window

4.5.3 Reset Prescanning



Use the *Stop Button* to reinitialize a whole new prescan operation. Activating the *Stop Button* during prescanning will return the original to the start position and the *Scan Setup Tab* will be redisplayed, enabling you to reset/change the *Scan preset*, *Mode*, *Resolution* and *Paper size* settings.

4.6 Optional Settings During Prescanning


Prescanning allows you to see results before they are committed to a file. WIDEimage takes advantage of this with special tools that can be applied to the image on your screen during prescanning. The visible effects are then reapplied during scan-to-file. Unlike the enhancement options in the *Adjustment Tab*, these tools do not relate to the Scanning Mode.

4.6.1 Scan an Image portion - Scanwindow



With a Scanwindow you can scan a specific isolated area of a drawing. The *Rectangle Selector Tool* for defining a Scanwindow is found on the *Scan Toolbar*.

Defining a Scanwindow

- Select halt during prescanning and click on the *Rectangle Selector* button on the *Scan Toolbar*.
- The cursor will change to the rectangle draw pointer. 
- You define a Scanwindow by dragging a rectangle in the overview window.
- The rectangle can be resized and moved by dragging at its edge and corner handles.
- If great precision is required, you can either move the rectangle into the Scan Area Indicator square or move the Scan Area Indicator square onto the rectangle. Either action will zoom in on your Scanwindow in the *Detail Window* from which it can be adjusted in a zoomed in view.
- While the *Rectangle Selector* is active (button ON), click on the *Scan button* to initiate a scan-to-file with only the selected part as scanning input.
- The *Rectangle Selector* tool stands ready after you select Forward, and is turned off either by clicking on it again or by starting a scan-to-file.

4.6.2 Image Alignment



A drawing which is not perfectly oriented horizontally during insertion into the scanner can be electronically deskewed during scanning. Realignment is performed by placing an alignment line in the drawing. WIDEImage helps by automatically creating an alignment line based on features in the original image. For most purposes and originals, the automatically created line will be positioned with sufficient accuracy but, you have the option of amending it manually if necessary. The Align Tool is available when prescanning.

Setting an alignment line

- Click the Align tool to activate the Align Mode and click the Forward button.
- When in Align Mode, starting a prescan will automatically place a system-calculated alignment line on the image on-screen.
- If the calculation/angle of the automatic line does not meet your requirements, it can be repositioned, rotated, etc. Here's how:
- Use your mouse for making changes and adjustments to the alignment line. Moving the mouse over the line activates functions and relevant cursors as described below :
- Move the cursor over one of the alignment-line's end-points to reveal its adjustment and resizing handles. You can drag a line end while holding down the left mouse key to adjust its length or its alignment angle.
- Clicking on the right mouse-button, while pointing at one of the end-points, will make the cursor jump to the other end-point.
- Move the mouse over the line middle to reveal its movement handles indicated by the cursor on contact. With these handles you can move the alignment line to a different position on the screen while retaining its original angle.
- All the above mouse and drag functions can be deactivated by pressing the <ESC> key.
- The alignment angle is displayed in the Status Bar. You end the alignment process by re-clicking the Align tool button.
- Press the Scan button use your alignment in the resulting scanned file.
- Use the Stop button if you wish to deactivate the Align Mode and remove the line without using it.

4.6.3 Black and White Point



With the *Black and White Point Tool* you determine the amount of highlight and shadow detail during scanning in one of the Color or Graytone Modes. By adjusting the white point you determine the amount of highlight detail in the scanned image. The white point should be set so that the lightest part only just shows no detail. Adjusting the black point will determine the amount of shadow detail in the scanned image. The black point should be set so that the darkest part only just shows no detail.

Click on the *Black and White Point Tool* to access the adjustment dialog. This initiates a prescan and a luminance histogram is calculated and displayed.

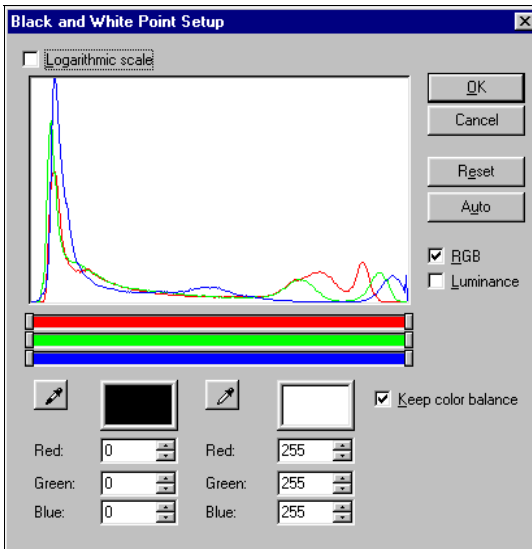


Fig. 4-10: Black and White Point Setup dialog

Black and White Point setting options

The Black and White Point dialog contains four option (check) boxes :

- *Logarithmic scale*
- *RGB*
- *Luminance*
- *Keep color balance*

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Logarithmic scale - Try this option if your histogram doesn't bring out enough detail. For example, an image that contains a large white background will show a very high peak and other colors that are represented by relatively small amounts of pixels will hardly be visible. Such large differences can be accounted for by checking the Logarithmic option. This will recalculate histogram point values by a logarithmic function rendering large pixel groups of single colors less dominating thus bringing out details that otherwise would not be visible in the histogram.

RGB - Check this option if you wish to view and set highlight and shadow through R, G, B Histograms, either with or without the Keep color balance option checked.

Luminance - Check this option if you wish to view and set highlight and shadow through a luminance histogram.

Keep color balance - Check this option if you wish to retain the current color balance and effect Red, Green and Blue channels simultaneously. If an image shows unbalanced color, for example if it seems too blue, you can uncheck this option and adjust blue separately without effecting Red and Green channels. This option is automatically checked when working with the Luminance histogram (see below).

Setting Black and White Point

The initial Histogram displays the current black and white points. Black and white point values can be modified by you through one of the following options :

Auto: Automatic calculation based on the image's darkest and lightest values according to the current histogram – based on either RGB values or Luminance.

- Click the *Auto* button to set the black and white points automatically.

Manual: Direct use of RGB values for setting black and white points.

- Set your Values manually either by moving the sliders or by writing in the edit field.
- Check *Keep color balance* to tie the sliders together, enforcing equal Red, Green, Blue values for both the White Point and the Black Point. This will maintain the current color balance in the scanned image.
- Click the *Reset* button if you wish to reset the sliders to the value currently set in the scanner.

Manual Picking : You can use a black pick tool or the white pick tool to select black and white directly from the prescanned drawing.

- Click on a *Pick button* to activate a black or white pipette.

- Drag the mouse pointer to select a whole area of pixels. When you release the button, an average of the pixels in the area defines the Black or White point.
- To select one pixel, just click and release without dragging.



Fig. 4-11: Black and White Point - Manual Selection Pipettes

Click OK to activate your new settings.

Click Cancel to reset the previous settings and end the dialog.

The values are offsets to those found during calibration. If you wish at any time to return to the calibration values, set the sliders to Black Point: 0,0,0 and White Point: 255,255,255.

Ranges for the Black Point settings are from 0,0,0 to 15,15,15 and for White Point settings 128,128,128 to 255,255,255 but these can vary with different scanner models.

When you leave WIDEimage, the modified offsets are not stored. At startup, WIDEimage will revert to the calibrated settings: Black Point: 0,0,0 and White Point: 255,255,255.

4.7 Tuning Your Scan - The Adjustments Tab

In previous sections we described how prescanning and scanning operations involve making initial settings followed by Scan Mode related adjustments. This section gives instructions on performing these adjustments for achieving optimal results.

The *Adjustments Tab* allows you access to quality enhancement features and on-the-fly adjustments during prescanning, such as threshold, brightness and contrast settings, i.e., Scan Mode related adjustments. After setting your options in the *Scan Setup Tab*, WIDEimage switches automatically to the *Adjustments Tab* when you initiate prescanning. If you wish to omit prescanning, just click on the *Adjustments Tab*, and make your adjustments before clicking on the *Scan Button*.

The adjustment Options are specific to each scanning mode

The *Adjustments Tab* allows you to make adjustments on options relevant to the scanning *Mode* which you selected through the Scan Panel's *Scan Setup Tab*. Because of this, the options displayed or enabled on the *Adjustments Tab* depend on the selected *Mode* (and on your scanner model). The *Adjustments Tab* for the *B/W Threshold Mode* is displayed below.

You can make *Adjustments Tab* settings continuously during prescanning or else immediately after making your initializing central settings and before scan-to-file.

Throughout the rest of this section, *Adjustment Tab* options are described under the Scan Modes that activate them.

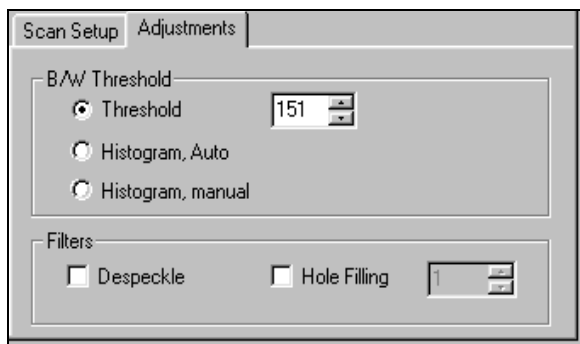


Fig. 4-12: Scan Panel - Adjustments Tab

4.7.1 Adjusting the B/W Threshold Mode

The *Adjustments Tab* with options for *B/W Threshold* mode is displayed in the previous figure. When a camera in the scanner looks at a drawing, it converts what it sees to graytone levels between 0 and 255 with dark tones represented by low values, light tones by high values and middle tones by middle values. When scanning at a specific threshold all gray tones below the selected threshold value will be represented as black pixels, and all gray tones above will be represented as white pixels. For example, if you have a very faded line drawing, you might want to increase clarity by setting a high threshold, thus forcing some of the grays back to their original black.

Setting the Threshold :

The threshold can be set in three different modes:

- **Threshold:** The threshold value is set by clicking on the up/down arrow buttons, or by editing in the field. This mode allows you to make threshold adjustment during prescanning activities (using the *forward*, *halt*, *backward* tools) while the effect is displayed on the screen.
- **Histogram, Auto:** Histogram analysis is performed as described above, but scanning-to-file proceeds automatically using the computed global threshold value without displaying the histogram. The drawing is prescanned and investigated. A global single threshold value is computed based on the analysis of the graytone histogram. The drawing is then automatically returned to its starting point, after which scanning progresses using the determined threshold value.
- **Histogram Manual:** After you click on the "Scan" button, the scanner automatically does an investigative scan of the original and returns it to the starting position. The image is analyzed by the scanner, and a histogram of the distribution of graytones in the image is displayed on the screen together with a proposed threshold setting computed algorithmically. You can accept the proposed value or change it with the threshold slider, thereby choosing an optimal threshold value. See section 4.6.2 for more details on using the histogram.

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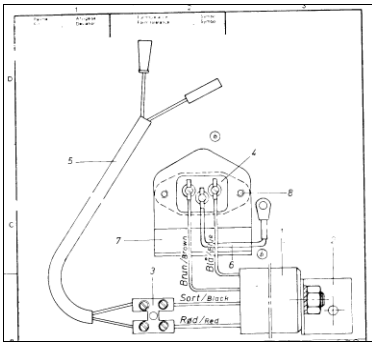


Fig. 4-13: Drawing Scanned at threshold setting of 45

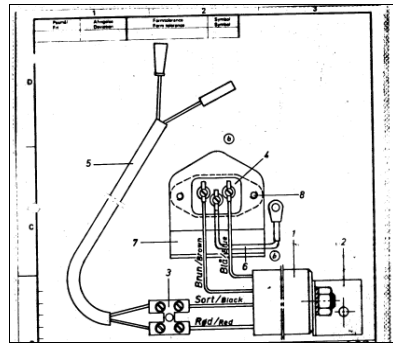


Fig. 4-14: Same Drawing at threshold value setting of 210

Setting Filters :

After selecting the threshold mode, you can take advantage of the following filters :

- **Despeckle and Hole Filling:** You can select/deselect Despeckling and/or Hole Filling filter(s). Using the up/down arrows, you can define the filter size as the number of pixels that make up one side of a square box. Despeckling removes black speckles that fit within the box. Hole Filling fills white holes that fit within the box. Filtering occurs on-line during scanning. Despeckle and Hole Filling adjustments can be done during prescanning as you view the effects on screen.
- **Blur Filter:** (not available on all scanner models) The *Blur* filter blends graytones and thus removes unwanted “noise” from the image. The value you set determines the degree of graytone blending. This filter can be combined with sharpening if available on your scanner (see below).
- **Sharpen/Soften Filter:** (not available on all scanner models) The Sharpen/Soften filters go over the scanned image, and intensify or “mellow” identified edges. The value given the filter with the slider determines the degree of sharpening/softening. Using this filter in combination with the *Blur Filter* can often enhance image quality as the scanner first blurs away unwanted noise and then sharpens the result.

*Sharpen/Soften and Blur filters are not available on all scanners in B/W Threshold mode.

4.7.2 Adjusting the B/W Adaptive Mode

Adaptive *Level* works like a threshold - the lower the value, the more of the background is picked up during scanning.

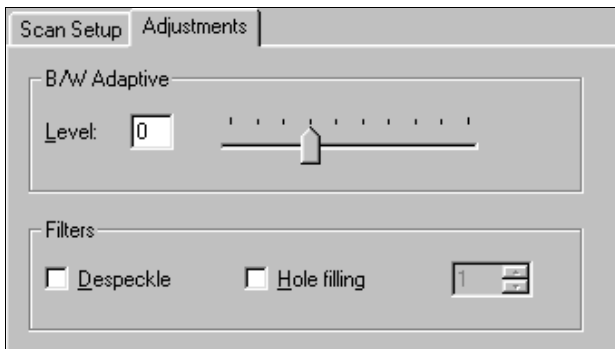


Fig. 4-15: Adjustments Tab - B/W Adaptive Adjustment

Some scanner models apply automatic background suppression in this mode while others let the user adjust background suppression automatically.

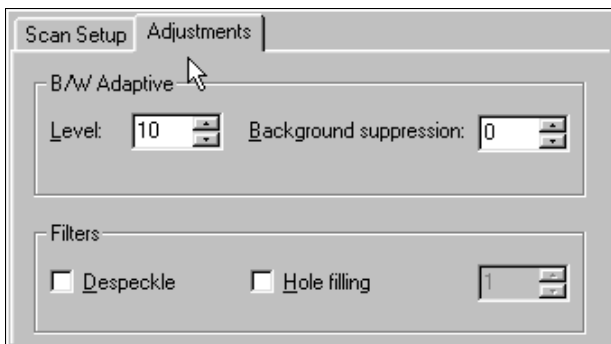


Fig. 4-16: Adjustments Tab - Adaptive Level with background suppression

Background suppression (if adjustable on your scanner model) is normally set to zero, but can be raised to suppress the background influence in drawings with dark or patched multilevel backgrounds.

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Using the adaptive controls:

- Start prescanning by clicking the *Forward* button.
- Find a critical area on your image in the *Overview Window* and click on it using your mouse.
- After prescanning the selected area, WIDEimage will go automatically to Halt Mode. Now, any adjustments you make in the *Adjustments Tab* will initiate a new prescan of the area currently viewed in the *Detail Window* while displaying the effects of your new settings immediately. In this way, the adaptive level and scan quality can be altered interactively while viewing the results on-screen.
- Adjust the adaptive *Level* for the best result.

Setting Filters:

- **Despeckle/Hole Filling:** You can select/deselect Despeckling and/or Hole Filling filter(s). Using the up/down arrows, you can define the filter size as the number of pixels that make up one side of a square box. Despeckling removes black speckles that fit within the box. Hole Filling fills white holes that fit within the box. Filtering occurs on-line during scanning.
- **Blur Filter:** (Not available on all scanner models). The *Blur* filter blends graytones and thus removes unwanted “noise” from the image. The value you set determines the degree of graytone blending. This filter can be combined with sharpening if available on your scanner (see below).
- **Sharpen/Soften Filter:** (Not available on all scanner models). The *Sharpen/Soften* filter goes over the scanned image, and intensifies or “mellows” identified edges. The value you enter in the filter field determines the degree of sharpening/softening. Positive values sharpen and negative values have a softening effect. Using this filter in combination with the *Blur Filter* can sometimes enhance image quality by first blurring away noise and then sharpening the result.

4.7.3 Adjusting the Copy Modes

B/W Copy Normal, B/W Copy Photo, B/W Copy Adaptive

Adaptive *Level* works like a threshold - the lower the value, the more of the background is picked up during scanning.

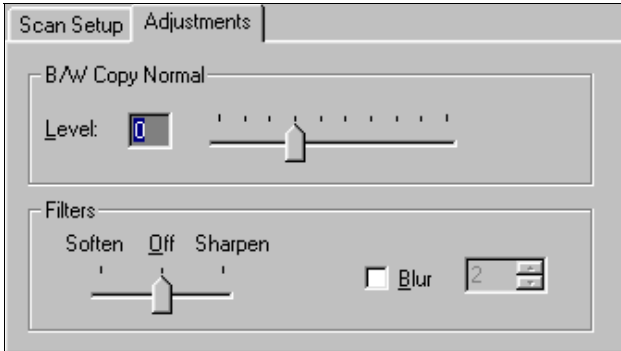


Fig. 4-17: Adjustments Tab - Copy Modes

Using the adaptive controls:

- Start prescanning by clicking the *Forward* button.
- Find a critical area on your image in the *Overview Window* and click on it using your mouse.
- After prescanning the selected area, WIDEimage will go automatically to Halt Mode. Now, any adjustments you make in the *Adjustments Tab* will initiate a new prescan of the area currently viewed in the *Detail Window* while displaying the effects of your new settings immediately. In this way, the adaptive level and scan quality can be altered interactively while viewing the results on-screen.
- Adjust the adaptive *Level* for the best result.
- Use the Sharpen and blur filter to enhance image edges in your printed output while reducing noise in dense graytone areas.

Setting Filters:

- **Blur Filter:** The *Blur* filter blends graytones and thus removes unwanted “noise” from the image. The value you set determines the degree of graytone blending. This filter can be combined with the sharpening filter (see below).

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- **Sharpen/Soften Filter:** The Sharpen/Soften filter goes over the scanned image, and intensifies or “mellows” identified edges. The value you enter in the filter field determines the degree of sharpening/softening. Positive values sharpen and negative values have a softening effect. Using this filter in combination with the *Blur Filter* can often enhance image quality as the scanner first blurs away noise and then sharpens the result.

4.7.4 Adjusting Dither, Graytone and Color Modes

B/W Photo, Graytone, RGB Color, Indexed Color, Classified Color

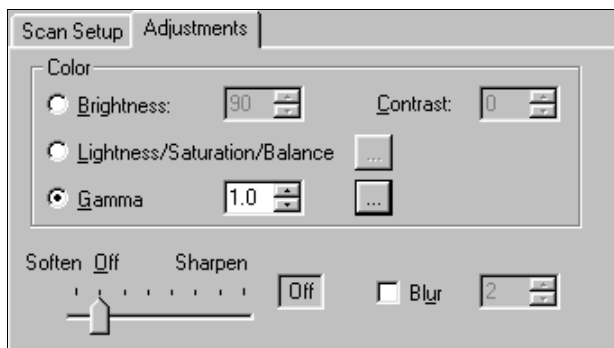


Fig. 4-18: Adjustments Tab - Dither, Graytone & Color Modes


In these modes you can make tonal adjustments and add blur, sharpen and soften filters. There are three possible methods for making tonal adjustments:

Setting Brightness/Contrast

- **Brightness**
Use brightness to compensate for a light or dark original being scanned. Numeric values for brightness are defined by clicking on the up/down arrow buttons or by editing directly in the fields. The normal position is zero with negative values for reducing brightness and positive values for intensifying brightness.
- **Contrast**
Contrast is the range between light and dark in an image. An image with little midtone detail, heavy shadows and bright highlights can have too much contrast and, conversely one mainly with midtone detail, dull shadows and highlights can have little contrast. Adjusting the contrast can make colors more vivid and realistic. Numeric values for contrast are defined by clicking on the

up/down arrow buttons or by editing directly in the fields. The normal position is zero with negative values for reducing contrast and positive values for adding contrast.

Setting L/S/B (Lightness, Saturation, Balance) Levels


Selecting this option and clicking on the setup button  starts a dialog where values can be entered for lightness and saturation, and balance values for red, green, and blue.

- Use the sliders to select the tonal values.
- Click *Apply* to activate the settings in a new prescan without closing the dialog.
- Click *Reset* to reset all the L/S/B values to 0.
- Click *Cancel* to apply the previous values and close the dialog.

Using a Gamma Curve

Select the *Gamma Curve* tonal adjustment option.

You can set a Gamma value in the edit field or...

select the setup button  to start a dialog for setting color tone transfer curves through the *Gamma Curve Editor* .

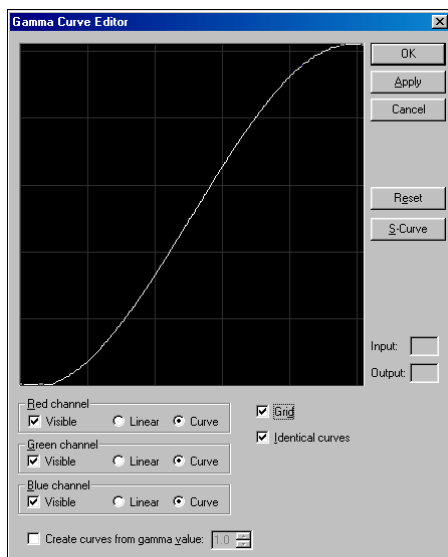


Fig. 4-19: Gamma Setup Dialog

Gamma adjustment can be used to make tone distribution lighter or darker in an image with emphasis on midtones rather than the extreme (black, white) ends. All three (Red, Green, Blue) color channels can be effected together with each change. Turn up the Gamma value to

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lighten the image tones and turn down the Gamma value to darken the tones. For example, if you are scanning a picture of a blue sea, a lower Gamma value will change the sea's color towards a darker marine blue, and turning up the Gamma value will change the normal sea color to a light sky-like blue.

The color tone transfer curves can be modified in the *Gamma Setup* dialog, either as separate curves for each color (Red, Green, Blue) or as a common curve. (Gray tone and B/W Photo modes use only the common curve).

The lower left end of a tone curve typically represents the dark portions of the scanned image and an upward bend will typically lighten the shadows. Similar capabilities exist when working with the middle and highlight parts of a curve. In this way it is possible to alter only certain tonal ranges of an image without making unwanted changes to other parts.

Editing the Gamma Curve:

Double click on the line to set and display editing points. Move the mouse over the point to display drag handles. You can use these to adjust the tone curves, either separately or as one curve.

The following editing options are available:

- Use the *Red channel*, *Green channel*, *Blue channel* option groups. Use the *Visible* option to render the channel editable. Marked channels will be part of the curve. For example, if all three *Visible* options are checked, then the curve represents all channels together in a common curve. If only Red's *Visible* option is checked, then you can amend the Red channel separately.
- Use the *Linear* option boxes to indicate if curve adjustments should use straight lines between the editing points.
- Use the *Curve* option boxes to indicate if curve adjustments should use curves between the editing points.
- *Identical curve* sets the active curves equally.
- The *Create curves from gamma value* option box enables you to edit the curves by setting gamma values.
- The *Grid* option sets a grid behind the curves to assist in editing.

Apply : Click the *Apply* button to activate the gamma setting and start a prescan without closing the dialog. This lets you preview the curve's effects as you make amendments.

Cancel: Click *Cancel* to restore the previous gamma values in the scanner.

Reset: Click on *Reset* to reset the currently selected color tone transfer curve to linear (1 to 1) and remove current handles.

S-curve: The default representation is linear. Clicking *S-curve* will set the tone transfer curve to a Floyd-Steinberg curve, also called an S-curve, which is a commonly used tone enhancement for photos. Default .

The modified curves are stored when you leave the dialog by clicking *Apply* or *OK*. The color transfer curves will be downloaded into the scanner when you initiate a prescan or scan-to-file operation.

Setting Filters:

- ***Blur Filter*** : The *Blur* filter blends colors or graytones and thus removes unwanted “noise” from the image. The value you set determines the degree of color or graytone blending. This filter can be combined with sharpening if available on your scanner (see below).
- ***Sharpen/Soften Filter***: (Not available with *Indexed* and *Classified* modes) The *Sharpen/Soften* filter goes over the scanned image, and intensifies or “mellows” identified edges. The value you enter in the filter field determines the degree of sharpening/softening. Positive values sharpen while negative values have a softening effect. Using this filter in combination with the *Blur Filter* can often enhance image quality by first blurring away noise and then sharpening the result.

4.7.5 Using a Histogram to Adjust the Threshold

A histogram analysis can be used with the B/W threshold mode for B/W drawings.

A *Histogram* is a graphic representation of the number of pixels at each graytone level in an image. The histogram can be displayed on screen and used to manually set a threshold value of your choice. This method is adequate for drawings that do not have isolated difficult areas and where a global threshold value would suit the whole drawing. Setting the threshold using a Histogram is available when scanning in the B/W threshold mode by checking *Histogram Manual*. For more difficult drawings, best results would be achieved by using the 2D-Adaptive scanning modes.

Histogram analysis is based on the fact that a normal drawing does not only contain black and white. A drawing might have a dark blue background, or perhaps brown lines on a light blue or brown background. When the camera in the scanner looks at a drawing, it

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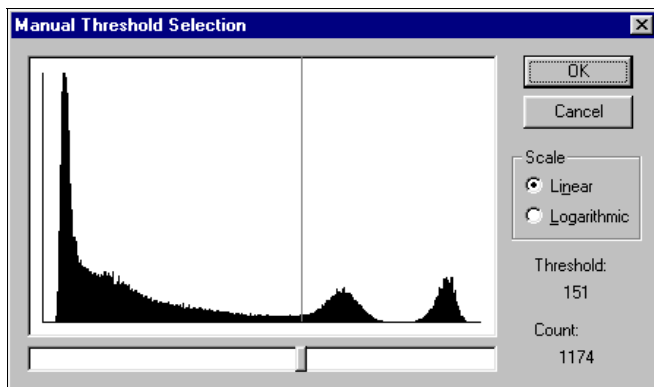


Fig. 4-20: The Histogram - Manual Threshold Adjustment

converts what it sees to graytone levels between 0 and 255. A very black background is represented by a low value and a very white background is represented by a high value. Light and dark gray, blue, brown, and all other tones are represented as in-between graytone values.

When the scanner performs a histogram analysis, it counts the number of pixels found at each of the 256 graytone levels. WIDEimage presents these counts in a graph. The graytone level is placed on the horizontal axis, while the vertical axis represents the accumulated pixel count at each individual graytone level. Pixels with black or the darkest graytones are will be represented on the left side of the horizontal axis while white or the lightest graytones will be on the right.

A vertical line in the histogram with a value indicator attached is displayed. The line's position and the value indicator represent the threshold value and the number of pixels found at the threshold value. The threshold value and the number of pixels found at the value are also displayed in the dialog. The initial threshold value is an automatically computed "good value" based on an algorithmic analysis of the peaks in the histogram. Using the mouse, you can alter the position of the vertical value-indicator line by dragging the threshold slider to a new threshold value.

When scanning at a specific threshold, all gray tones below the threshold will be represented as black pixels, and all gray tones above will be represented as white pixels.

In most cases you will see a histogram with two peaks. The larger peak represents the background information (the lightest gray tones)

of the scanned original, and the smaller one represents the line information (the darkest gray tones) in the drawing.

A third peak at a high graytone level occurs when the scanner's camera has seen some of the scanner's own white reference background. This can be avoided by narrowing the scanwidth setting to the width of the drawing.

Normally, in terms of the histogram, the best threshold selection lies in the deepest part of the valley, between the two peaks, and closest to the peak that represents background information in the drawing.

Normally, the Histogram will be based on **Linear** calculations as described above. Select the **Logarithmic** display option if your histogram doesn't bring out enough detail. For example, an image that contains a large white background will show a very high peak and other colors that are represented by relatively small amounts of pixels will hardly be visible. Such large differences can be accounted for by checking the Logarithmic option. This will recalculate histogram point values by a logarithmic function rendering large pixel groups of single colors less dominating thus bringing out details that otherwise would not be visible in the histogram.

4.8 An Overview of Scanning Modes and Options

Mode*	Usage	Adjustments
BW Threshold	Drawing and lineart	Threshold value Histogram. Despeckle, Holefilling Sharpen/Soften*** Blur***
BW Adaptive	Scan to file of Line drawings difficult blueprints, sepias, faded/stained drawings.	Adaptive Level Back. Suppression** Despeckle, Holefilling Sharpen/Soften*** Blur***
BW Copy Normal	Halftone copy to print of all normal originals with a relatively good quality image.	Adaptive Level Sharpen Soften Blur
BW Copy Photo	Halftone copy to print of continuous shades of gray such as in photos.	Adaptive Level Sharpen Soften Blur
B/W Copy Adaptive	Halftone copy to print of Sepia, Blueprint, and other originals with heavily distorted foregrounds and backgrounds in which the shades that create image noise are close to the shades that represent the image's data and the two are hard to differentiate.	Adaptive Level Sharpen Soften Blur

BW Photo	Halftone dithered mode for photos and printouts using Floyd Steinberg algorithm.	Contrast Brightness Lightness
Graytone	Monochrome image reproduction with all tones retained.	Contrast Brightness Lightness
RGB Color	True Color image reproduction	Brightness Contrast, Lightness, Saturation, Balance, Gamma
Indexed Color****	Color Scanning with file size compression through color reduction.	Brightness, Contrast, Lightness, Saturation, Balance, Gamma
Classified Color	Feature Extraction and scanning with LUT filter.	Brightness, Contrast, Lightness, Saturation, Balance, Gamma

* The availability of specific scanning modes will depend on your scanner model.

** Background suppression is not available (or necessary) on some scanner models

*** Sharpen, Soften and Blur filters are not available on all scanners in this mode.

**** Indexed Color scanning mode works through a preliminary prescan and can therefore not be used with thick media over 2mm (0.08") thick.

4.9 Scanning to a Target

You have made your central settings in the *Scan Setup Tab* and tuned the scan through prescanning and the *Adjustments Tab*. Now you are ready to commit your image to a file, a printer or another output target. The *Scan Button* triggers scanning. The target is determined by checking output options in the *Scan Menu*.

Scan Button



4.9.1 Scan to a file

- Make sure the *Scan To File* option (default setting) is selected in the *Scan Menu*.
- Select the *Scan button*. This halts any current prescanning operation, repositions the paper original in the scanner, and scanning-to-file follows immediately thereafter.
- In the file Save As... dialog select a file or create a new file name. The default filename will be set according to your choice in the *File Menu - Preference* dialog.
- Select the file format you wish used for your scanned file.
- During scanning, the scanned image is displayed in the two view windows of the *Scan Screen*. You can speed up scanning by turning off the *Detail View* through *File - Preferences - Scan*.

4.9.2 Scan to the Viewer

You can redirect scan output to the *View Screen*. Sometimes you know beforehand that you will need to make image adjustments and therefore, instead of first scanning to a file and then loading it into the *View Screen*, you scan straight to the *Viewer's* memory, make your adjustments and then save to a file.

- Select the *Scan To Viewer* option in the *Scan Menu*.
- Selecting the *Scan Button* will then start scanning when completed the image will be loaded and displayed in the *View Screen*.
- Select the *Save As* option when you are satisfied with your changes.

4.9.3 Scan to a Printer

You can redirect scan output to your printer.

- Check the *Scan To Print* option in the *Scan Menu*.
- Selecting the *Scan Button* will then start the normal print dialog in which you select a printer for the scanning output.
- Click OK in the print dialog to start scanning to your printer

4.9.4 Scan Whole Batches

Use batch scanning if you have a whole group of documents with equal characteristics and require equal settings. With batch scanning you can work from the scanner, inserting documents as each is automatically loaded and scanned.

- Check the *Batch Scan* option in the *Scan Menu*.
- The *Scan Button* will then start the *Batch Scanning* dialog in which you set up file naming, and logging options for the batch.
- Follow the instructions for applying batch scanning options described in the coming section.

4.9.5 Stop Scanning and Eject Original

Stop



Scanning will stop upon reaching the end of a drawing or when you click on the *Stop* button on the *Scan Toolbar*.

- Click on the Stop Button to terminate scanning at any point.
- The scanned part of the original will be saved to disk under the file name specified in the *Save as... dialog*.
- If you stop a scan-to-file midway, the file will be closed with the data already scanned.

Eject



Normally you would use the control buttons on the scanner to eject and reload originals. But you can also eject originals without leaving your workstation. Press the *Eject* button to eject the current original from the scanner insertion slot.

4.10 The Scan Menu

The *Scan Menu* contains global scanning modes and options. Select *Scan* in WIDEimage's *Menu Bar* to display the *Scan Menu* shown below.

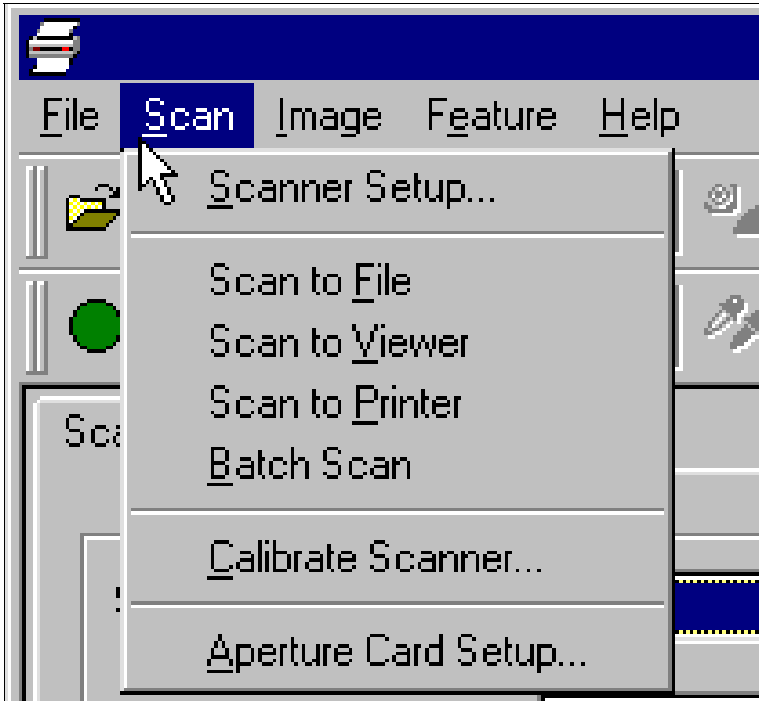


Fig. 4-21: The Scan Menu

The *Scan Menu* is where you, among other things, set up scanner device options, setup and initiate batch scanning, and redirect scanning output to your viewer or printer. In the following sections, we will describe each of the *Scan Menu's* options.

4.10.1 Scanner Setup

The *Scanner Setup* dialog contains options for scanner related settings. It is here you select the scanner, set *Paper Load* options, set your *Media Offsets*, and make adjustments for scanning thick originals through the *Extended Thickness* options.

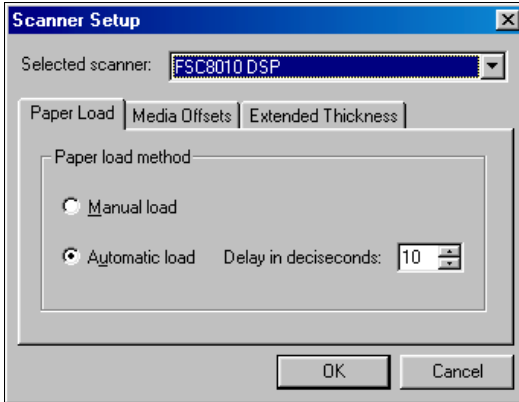


Fig. 4-22: Scanner Setup Dialog

Selected Scanner

WIDEimage detects which scanner models are accessible through your workstation. Selecting *Selected Scanner* displays a drop-down box containing a list of available scanners named by their model. Clicking on an item in the list makes it the active scanner.

Paper load

Select between *Manual load* or *Automatic load*. With manual loading, you position the original in the slot and then press the down button on the scanner. With automatic loading, the scanner detects and loads the original as soon as you insert it. A delay factor can be set for automatic paper loading giving you time to position the original correctly.

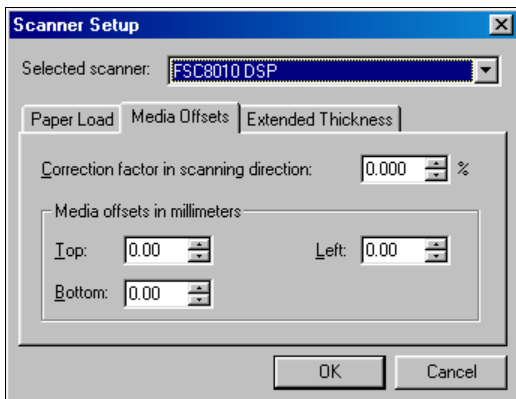


Fig. 4-23: Scanner Setup - Media Offsets

Media Offsets Settings

Correction Factor in scanning ... (Vertical Precision Setting)

This option allows you to tune the scanner's vertical precision setting. During scanning, an original image is digitized as it is propelled through the scanner. One at a time, thin strips of the image are processed as they pass the cameras. Vertical precision is directly affected by the speed in which this happens. Inaccurate vertical precision results in vertical lines in the scanned image that are longer or shorter than the same lines in the original. The vertical scan accuracy is adjusted mechanically during production of the scanner. This setting, is extremely precise and more than adequate for most applications.

Should you require very high accuracy, you can modify the vertical precision from zero to a value between -1% and 1% . Positive settings mean that the distance between scan lines will be increased, and negative settings mean that the distance between scan lines will be decreased. When you exit the *Scanner Setup* dialog, the modified value is stored in non-volatile memory in the scanner and can only be changed by re-doing the setup.

The procedure for vertical precision adjustment would be to scan a precision original. Import the scanned drawing into your CAD system or other image application, and measure the vertical distance between points in the image. Then compare those with similar physical measurements between the points on the original. Caution should be taken at all stages of the procedure with regard to the stability and temperature sensitivity of the original and the measurement ruler used.

Furthermore, you should perform the setup at the scanning resolution you will later actually be using for scanning the originals.

Media Offsets in...

The *Top*(start), *Bottom*(end), *Left* offset edit fields define the scanning field offsets. You can use this option to correct slight offset irregularities.

- Offset values are defined in inches or mm. depending on your *Preferences – System – Unit* settings.
- Offsets can be positive or negative.
- A positive offset value in the *Left* field means that the scanning field's left point is moved to the right and a negative value means it is moved to the left.
- A positive value in the *Top* or *Bottom* fields mean that the scanning field's top or bottom point is moved down while a negative value means that it is moved up.

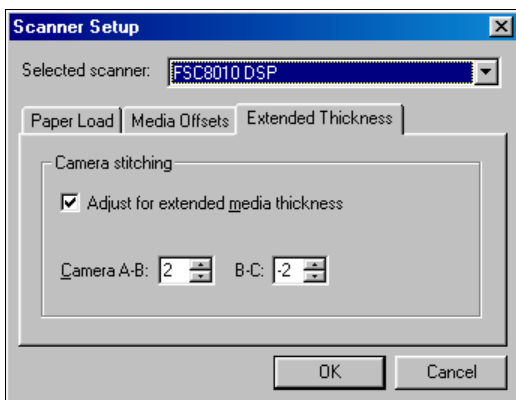


Fig. 4-24: Scanner Setup - Extended Thickness

Extended Thickness Settings

Camera Stitching

Scanning needs are not always limited to convenient paper thin media. You might need to scan thick originals such as maps or posters pasted on cardboard. While some scanner models are built to scan very thick originals, others require a special “Extension Kit for Thick Media”. Scanning thick media can require enlarging the scanner’s insertion area and this can affect the scanner’s automatic control of border lines between the cameras – the so called *Stitching*. Stiff and unbendable media will affect *Stitching* most. The *Camera stitching*

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option allows you to adjust stitching parameters when scanning with thick and stiff originals.

- Adjust the insertion slot to accommodate your thick media as described in the scanner's operations guide or Extension Kit guide.
- Load the thick original you wish to scan. Center loading is recommended with thick originals. The scanner's media transport rollers grip more evenly with center loading.
- Click *Scanner Setup* in the *Scan Menu*.
- Make a test scanning. Bulky thick media needs to be supported with both hands on its way in and out of the scanner.
- Stitching errors will be easiest to see on an image with one or more clear diagonal lines.
- Normally, only stiff media will affect stitching. A flexible media will usually be stitched correctly regardless of its thickness.
- If the lines seem uneven, check the box labeled *Adjust for extended media thickness*.
- Change the value for each of the scanner's cameras. Normally, only positive values should be used.
- Make test scans and readjust the values until you are satisfied that the lines are stitched correctly.
- Click OK to accept your settings.

Use extended thickness paper handling

Scanning thick originals can give distorted results at both the top and bottom edges where the edge meets the scanner's rollers. On some scanner models, you can omit edge distortion by letting the scanner skip the leading and trailing edges. This setting is only be available on scanners originally constructed with thick media scanning capabilities. Edge skipping is the default setting on these scanners when they are set (see your scanner's Operator's Guide) in one of the extended media positions. Use the checkbox *Use extending thickness paper handling* to enable and disable skipping of the two edges.

4.10.2 Aperture Card Setup

The Aperture Card Setup option is available if an Aperture Card scanner is the active scanner. The Dialog is shown below:

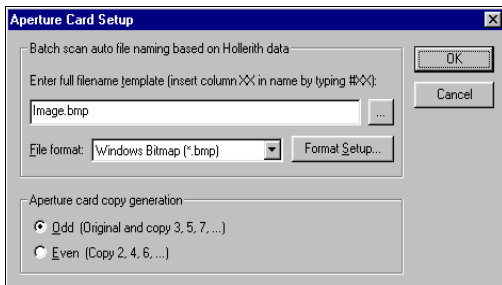



Fig. 4-25: Aperture Card Setup dialog

Hollerith card batch scan with automatic file naming

The first field allows users to define how file names will be generated using Hollerith data on the cards. You specify a template for using the Hollerith character index as a source for all or some of the characters in the automatically generated filename. For example, if you set your template to IM#23#2400E and a Hollerith card has an “a” punched at index 23 and a “g” at index 24, the image will be scanned to a file called Imag00E.

Hollerith characters that are invalid in file names will be replaced by an underscore character (“_”). Use the setup button  to pick file names from your computer or network.

File format selection

Select the desired file format for your output and click the *Format Setup* button to set the specific file format options.

Aperture Card insertion method (card copy generation)

The *Odd* and *Even* option boxes refer to how your cards are inserted into the scanner. The cards must always be placed so that the film faces towards the camera lens. Since optimal copying of aperture cards results in their being mirrored for each copy, odd generation copies must be inserted and treated differently than even generation copies. The original is an odd generation, the first copy an even generation, the third copy an odd generation and so on. For an original card and odd generation copies, select the *Odd* option and insert the cards with the cut corner facing down and forwards. For even copies select the *Even* option and insert the cards with the cut corner facing up and

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forwards. Odd and even generation cards cannot be mixed in one stack.

When scanning aperture cards, you can select automatic paper size setting where the size information is read off each card. See *section 4.4.1* for information on preparing automatic paper size setting with Hollerith card information.

4.10.3 Batch Scan

Batch Scanning is a powerful and time saving option for scanning a whole set of drawings that, due to their similarity in color and quality, require equal scanning settings. You can use all the scan options such as *Mode, Size, Resolution, and Despeckle/Hole Filling Filters*, when doing a batch scan. Selecting *Batch Scan* will set WIDEimage in Batch Scanning Mode.

(Scan to File, Scan to Viewer, Batch Scan and Scan to Printer work like radio buttons, meaning only one of them can be active at a time.)

To Perform Batch Scanning

- Set up your scanning parameters as with single-document scanning.
- Select *Batch Scan* in the *Scan Menu* to activate Batch Scanning Mode.
- Click on the *Scan Button*. A dialog for making batch scanning settings is displayed.
- Determine the batch scanning settings. The following settings are available:

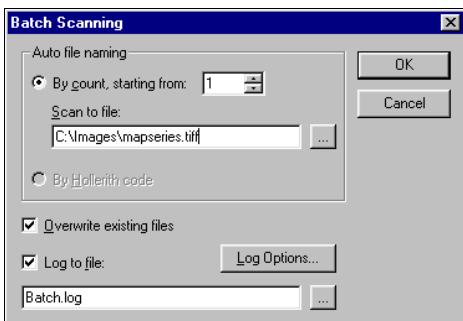


Fig. 4-26: Batch Scan Dialog

Auto file naming - "By count starting from"

If you select this option, a three-digit number will be added to your "Scan to file" filename (in addition to the three-letter file-format identifier), and is incremented automatically for each scan-to-file (e.g., name001.rlc, name002.rlc, etc.).

Scan to file

Here you enter a path and filename that will serve as the template for file naming in the batch as described above.

Overwrite existing files

In the check boxes you can specify if existing files should be overwritten by the new scan.

You can achieve automatic NEW file naming by selecting the Auto file naming by count option with the Overwrite existing files option disabled. This will set the program to automatically increase the file name counter until a non-conflicting name is found.

Log to file

Check this option and select a file name if a log file of the scanned drawings should be created. Log data is always **appended** to existing log files so you will either enter a new file name or else empty the default file in order to make a separate log file for a new batch. Log file output can be set up through the *Log options... Button* which leads to the same dialog found through *File Menu - Preferences – Scan - Batch Scan Tab* (see section 3.3.10).

- After making the batch scanning settings, click OK and continue working from the scanner. Load your originals in one by one and each will be scanned with your settings.
- When you run batches, the loading process can be speeded up by selecting *Autoload* in *File menu–Preferences–Scan–Paper Load*.

4.10.4 Scan To Print

Your scanner and printer can be used as an effective copy system. The *Scan to Print* option allows you to copy an original directly from the scanner to a Printer device and make a cleaned-up copy of old faded or stained originals, using the Adaptive and other enhancement features in WIDEimage and your scanner. Scan to File, Scan to Viewer, Batch Scan and Scan to Printer work like radio buttons, meaning only one of them can be active at a time.

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To redirect scanning output to a printer

- Click on the *Scan to print* option in the *File Menu* to set WIDEimage in "Scan-to-Print Mode". While in Scan-to-Print-Mode, all following scanned images will be sent directly to an attached printer device.
- Click on the *Scan button* when you have made your scan settings and are ready to scan.
- The normal *Print* dialog, will appear allowing you to set up your print job as described in section 3.3.6 before scanning starts.
- Click OK to start the scanning to your selected printer.

NOTE: This option was also described in previous section – “Scanning to a Target.”

4.10.5 Calibrate Scanner

Why Calibration?

Since the light detectors in all color scanners are affected with usage, RGB output signals can vary. Age usually affects color balance and linearity, while the chromacity components are relatively stable.

To ensure long term stability and reproduction of color scans, the scanner linearity, color balance and chromacity can be calibrated, using the IT8 Calibration Sheet (ANSI IT8 standard reflective target) shown in the next figure:

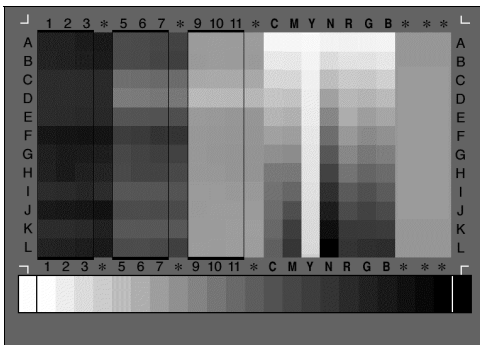


Fig. 4-27: IT8 Calibration Sheet

Some monochrome scanners support basic calibration. Basic calibration reduces noise in the dynamic area and ensures stable and clean scans. For example it reduces the unwanted effects caused by dust particles when scanning at high resolutions.

How to calibrate the scanner?

- It is recommended to **let the scanner warm up for 1 complete hour** before calibrating. Slight intensity changes can occur in the scanner's florescent lights just after turning the scanner on. The cameras can also shift slightly during the first minutes of start up. The 1 hour warm-up time will ensure stabilized light conditions and camera heights. The stabilization will ensure that the conditions during calibration match those during scanning.
- Select *Calibrate Scanner* from the *Scan Menu*.
- The Calibration Wizard will guide you through the calibration process. For color scanners, there are three main steps: Basic Calibration, Graytone Calibration and Color Calibration. For monochrome scanners that support calibration, only the first step - Basic Calibration will be necessary.
- Follow the wizard's instructions regarding insertion of the Basic Calibration Reference. See your scanner documentation for details on the Basic Calibration Reference supplied.
- Follow the wizard's instructions regarding insertion of the IT8 Calibration Sheet. You will be requested to make two insertions for each scanner camera: once for graytone calibration and once for color balance calibration.
- You start with graytone calibration of the first camera, move on to the next camera, and so forth. The last camera is graytone and color calibrated after which you move backwards, inserting the sheet for color calibration until you return to the first camera. The Wizard gives you the exact insertion points for each camera.

What Happens During Calibration?

WIDEimage scans the RGB color value of each patch, converts to CIE-Lab color space (where color distances correspond better with human vision). Comparing with the known reference CIE-Lab values of the IT8 target, the software calculates the scanner's color correction for each patch.

WIDEimage automatically builds the color tone transfer tables and correction matrix and downloads them into the scanner.

4.10.6 Scan to File and Scan to Viewer

Selection of these options determines the target for scanner output when activating the *Scan Button*.

Selecting *Scan to Viewer* is handy if you know or suspect beforehand that you will amend the image (crop, scale, tonal adjustment, etc.) in the *Viewer (View Screen)*. After making your amendments you save the image to a file using the *File Menu's Save As* option.

With *Scan to File* selected, the *Save As* dialog appears when you select the *Scan Button*, and output is sent to the file you selected. Scan with this option when you don't wish to make after-scanning changes to the image. *Scan to File* is the default selection.

Tip : *Scan to File, Scan to Viewer, Batch Scan* and *Scan to Printer* work like radio buttons, meaning only one of them can be active at a time. It's easiest to think of these 4 options as "Output Mode Selectors". For example selecting *Scan to File* puts the application in "Scan to File Output Mode" and it will stay in that output mode until another Output Mode Selector is chosen.

NOTE: These options were also described in the previous section - "Scanning to a Target".

5. Viewing Scans - View Screen & Image Menu

5.1 Introducing the Viewer

The *View Screen* and the *Image Menu* compose an independent work area, also called the *Viewer*, that allows you to inspect, refine, and manipulate either the image you just scanned or images previously scanned and saved on file. During scanning, you took full advantage of prescanning and optional scanning settings and modes. Here, in the *Viewer*, you can go one step further and perform those fine adjustments that make the difference between a very good result and a perfect one.

All the *Viewer's* image functions (except for alignment and despeckle) are processed on screen data only, for fast interactive use. To update the image file with amendments made in the *Viewer*, you must save it by clicking *Save* in the *Main Toolbar* or using *Save As* in the *File Menu*.

- **Viewing functions in the View Toolbar**
 - Main view with zoom and portion cutout operations
 - 3 local Viewboards with zoom operations

- **Image Functions in the View Toolbar**
 - Image Cropping
 - Align
 - Invert colors
 - Mirror image
 - Despeckle
 - Measure between two points
 - Flip Image and Rotate image 90° left, 90° right, 180°

- **Image functions in the Image Menu**
 - Brightness/Contrast adjustment
 - Histogram Stretch – Black and White point adjustment
 - Hue/Saturation/Value image adjustment
 - Red/Green/Blue image adjustment
 - Grayscale conversion
 - Classify – LUT filtering
 - Decrease Colors/Graytones
 - Count Colors in image
 - Scale image

5-2 Viewing - View Screen & Image Menu

5.2 View Screen layout

To start viewing and working with an image, you have to open the image file by clicking on the *Open Tool* in the *Main Toolbar*. If you have just performed a scan in the *Scan Screen* with *Scan* to *Viewer* selected in the *Scan* menu, the image just scanned will automatically be loaded and displayed in the *View Screen*.

From the *View Screen* you can directly control all aspects of viewing, zooming and manipulating an image.

Like the *Scan Screen*, the *View Screen* is divided into the general areas as described in section 3.1. The *Task Toolbar* position is occupied by the *View Toolbar*, and the whole main display area is available for viewing. The following general areas make up the *View Screen*.

- Menu Bar and Main Toolbar
- View Toolbar
- Main Display Area
- Screen-Select Tabs
- View Screen Status Bar

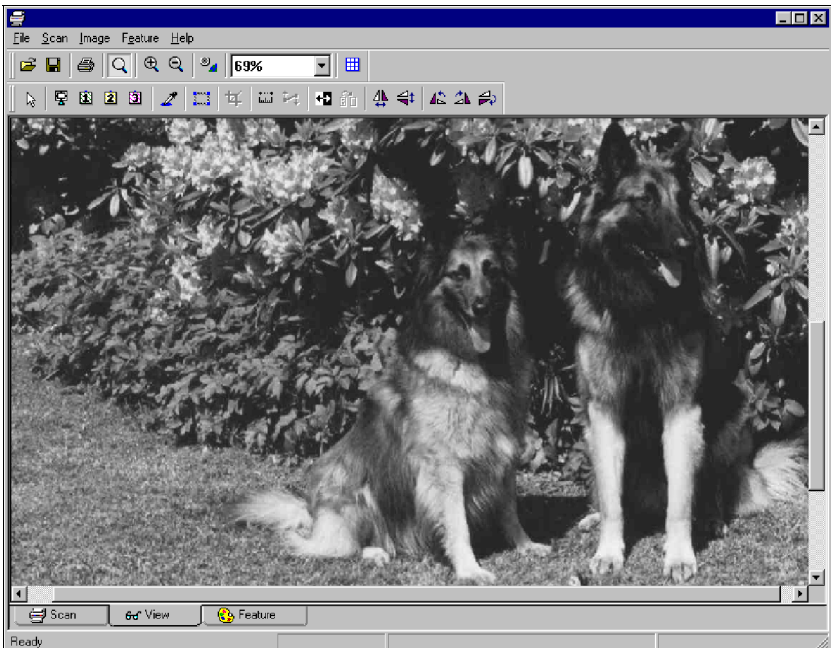


Fig. 5-1: The View Screen

5.3 Viewing an Image – Viewing Options

The Viewer combines view selection tools and image manipulation tools that together make after-scanning operations easy.

5.3.1 View Selection Tools

The *View Toolbar's* first 6 tools from the left are the view selection tools.

When one of the view selection buttons is turned ON, the button stays turned ON until another view is selected. Changing between views does not change the function of other view tools. The following view selection options are available:

Main View



The Image is displayed on screen at the current zoom level. If you return to the *Main View* from a *Viewboard*, the zoom level will be restored to the value set when you left the *Main View*.

Viewboard 1,2,3



Local *Viewboards* for retaining views of an image. When clicking a *Viewboard* button for the first time after an image has been opened, the image will be displayed as seen in the *Main View*. You can save a partial view of the image either by “cutting out” a section with the *Rectangle Selector* or else by zooming in on the image with the *Zoom Tools*. Usage of the *Rectangle Selector* tool is described on the next page.

The new (partial) view will be stored when leaving the *Viewboard*, and if you select it again later, the partial view will be redisplayed in the Viewer's main display area.

5-4 Viewing - View Screen & Image Menu

Rectangle Selector



For selecting image areas for use with *Viewboards*, *Crop*, *Save As*, *Print* and *Color Count*.

Defining a selection area

- Click on this tool to turn the button “on” and change the cursor to:



- Hold down the left mouse key with this cursor active and select an area by dragging a rectangle on the screen.

After you have created a preliminary rectangle, you can move and resize it using your mouse. Moving the mouse over the rectangle's components (sides and corners), activates different functions and relevant cursors as described below :

- Move the cursor over a rectangle's corner to reveal its resizing handle (a blue arrow will appear). You can drag any of the corners, while holding down the left mouse key to resize your rectangle.
- Clicking on the right mouse-button, while pointing at one of the corners, will make the cursor jump to the next corner (clockwise). <shift>right clicking will move the cursor counter clockwise.
- Move the mouse over one of the 4 rectangle lines to reveal its movement handles indicated by the cursor on contact. These handles can be used to move the rectangle to a different position on the screen.
- Point with the mouse anywhere inside or outside the rectangle to activate the “Zoom Cursor” shown below. Armed with this cursor you can click and zoom in on image details for making fine adjustments to rectangle corners. Zoom views can be saved on the *Viewboards*.



The Zoom Cursor

- All the above mouse and drag functions can be deactivated by pressing the <ESC> key.

If you regret your rectangle, it can be deactivated without any function being performed by re-clicking on the rectangle tool. You can deactivate the rectangle and the function by clicking on the standard cursor tool.

Creating “cutout” Views with the Rectangle Selector

You might be interested in viewing one or more specific areas in the image. You can save such a view in a Viewboards. Here's how:

- Mark out an area with the *Rectangle Selector* as described above.
- With the rectangle active, click on one of the Viewboards 1, 2 or 3 buttons.
- The marked area will be saved in the Viewboard you chose.
- Use the zoom tools to further enhance viewing of your cutout image portion if necessary.

Tools that can be used with the Rectangle Selector

Selecting *Crop*, *Save As...* or *Print* will perform the corresponding function on the area outlined by the rectangle. The rectangle will be deactivated immediately after performing the function.

You can also perform a Color Count of colors in the selected area. See section 5.3.8 *Image Menu – Color Count* for details.

The *Save* and *Save As...* functions will include all image changes within the rectangle. Only the selected area is saved.

5.3.2 Image Manipulation Tools

The image manipulation functions found in the *View Toolbar* are:

Standard Cursor



Clicking on this tool will change the cursor to the standard cursor. You can always use this tool to get back a normal “passive” cursor after activating any tool that creates active cursors such as resizing, panning, rectangle select and pipette cursors.




5-6 Viewing - View Screen & Image Menu

Pick Color



To view color information from the image

- Load the image in the *Viewer* and select the *Pick Color Tool*.
- The cursor will change to: 
- Move the cursor around and point at pixels in the *View Screen Window*.
- The corresponding color's Intensity ("I") and Red, Green, Blue values are displayed in the *View Screen's* status bar:



- Hold down the left mouse key and drag a rectangle on the screen. This will display the average RGB value of all the pixels within the rectangle.
- Release the mouse key to remove the rectangle.

Crop



For cutting out an image area.

This function works with a rectangle that has been placed with the *Rectangle Selector*. Clicking on the *Crop* button will remove all image data outside the rectangle, keeping only the image inside. See the previous section for instructions on placing the rectangle with the *Rectangle Selector*.

Measure



The *Measure* tool allows you to measure parts of your drawing directly on the screen. You set a measure line anywhere in the image and the line's length is displayed in the status bar. The *Measure* tool and the measure line are also used in combination with the *Align* tool when you need to align your image.

Setting a Measure Line

- Click on the *Measure* tool to turn the function ON. The cursor changes to the line marker :



- Using this cursor, drag a measure line directly on the image.
- Once you have created a preliminary line, your mouse can be used for making changes and adjustments. Moving the mouse over line components (end-points and line) activates new functions with a relevant cursors as described below:
- Moving the cursor over one of the measure line end-points will reveal its adjustment and resizing handles. You can drag the line end while holding down the left mouse key to adjust its length and end-point positions.
- Clicking on the right mouse-button, while pointing at one of the end-points, will make the cursor jump to the other end-point.
- Moving the mouse over the measure line itself, reveals its movement handles, indicated by the cursor on contact. These handles can be used to move the measure line to a different position on the screen while retaining its original angle.
- Pointing with the mouse anywhere away from the measure line activates the “Zoom Cursor”. With this cursor you can click and zoom in on image details for making fine adjustments to the line end-point position.



The Zoom Cursor

- All the above mouse and drag functions can be deactivated by pressing the <ESC> key.

Measurement information, given as the distance in pixels, mm, inch and angle, is immediately displayed in the *Status Bar* as shown below:



The angle information can be used with the *Alignment* tool as described below. The measure line disappears when you re-click on the *Measure* tool.

5-8 Viewing - View Screen & Image Menu

Align



The *Align Tool* works with the *Measure Tool*. If you have drawn a measure line, clicking on this tool will align the image based on the alignment angle displayed in the *Status Bar*. To align an image, set and adjust a measure line as described above. Find the desired angle using a line or border in the image that can guide you. Then just click on the *Align Tool*.

Invert



Click on the *Invert* tool to invert the image. You can deactivate the inversion effect by re-clicking on the button. Black becomes white and white becomes black for B/W images. For graytone images, the invert function is performed on the graytones directly. For Indexed color, inversion is performed on the Palette Colors and for RGB colors on individual color channels.

Despeckle



The *Despeckle* function is only relevant to B/W images. Selecting despeckle displays a dialog for determining the speckle and hole size. The Image File will be despeckled and Hole Filled on the basis of the settings that represent the size of a box. Speckles that fit into the box will be removed and holes that fit into the defined box will be filled. Clicking OK applies the changes and updates the view. As with all the *View Screen* functions, you still have to use *Save* to update the image file.

Mirror



Click on the *Mirror* tool to mirror the image in the *Viewer*.

Flip Image



Click on the *Flip Image* button to flip the image around vertically.

Rotate Left



Clicking *Rotate Left* will rotate the image 90° to the left (270°).

Rotate Right



Clicking *Rotate Right* will rotate the image 90° to the right (90°).

Rotate 180°



Clicking *Rotate 180°* will rotate the image right until it's upside down.

5-10 Viewing - View Screen & Image Menu

5.4 Editing features in the Image Menu

Clicking on *Image* in the *Menu Bar*, displays the *Image Menu* shown below. The menu contains selections for image operations that mainly apply for Graytone, Indexed and RGB images. The last item, *Scale*, can also be performed on BW images.

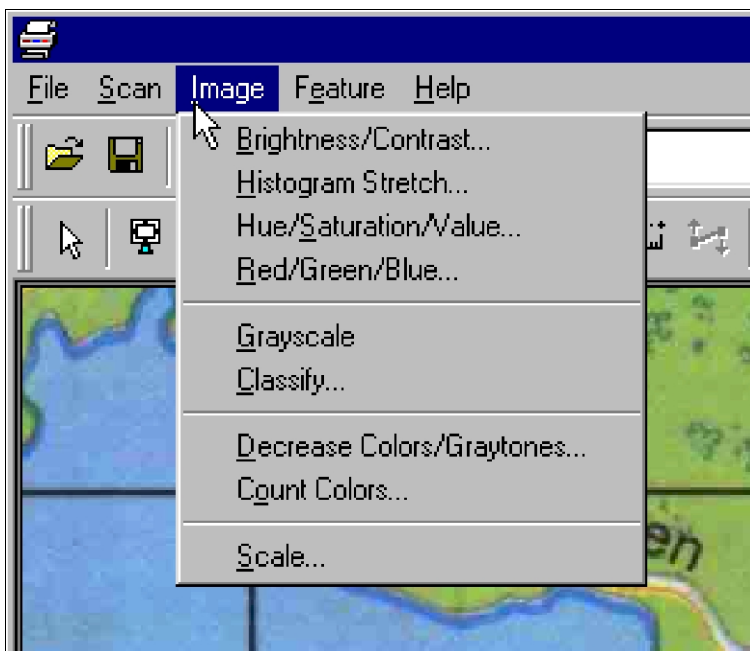


Fig. 5-2: The Image Menu

The availability of some of the menu items varies with the type of loaded image. For example, the *Classify* item only applies for RGB color images and the *Hue/Saturation/Value*, *Red/Green/Blue* and *Grayscale* items are not relevant with Graytone images. The *Scale* option can be applied on all types of images, including B/W.

As with the *View Toolbar* tools, these function apply to on-screen data only and the *Save* function must be applied to update the image file with your changes.

The *Image Menu* items are described in the following sections.

5.4.1 Brightness/Contrast

Changing Brightness/Contrast in an existing image

- Open the image in the *View Screen*.
- Select the *Brightness/Contrast* option in the Image menu.
- The adjustment dialog shown below appears.

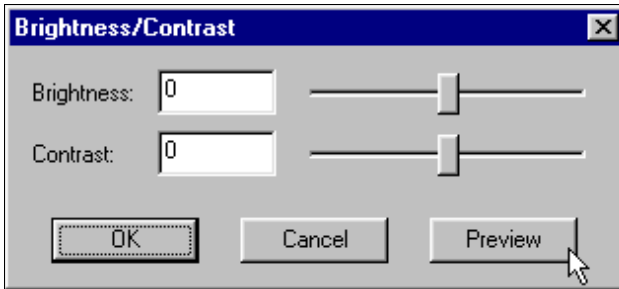


Fig. 5-3: *Brightness/Contrast Dialog*

- Brightness and Contrast can be selected independently. Values can be set either by dragging the sliders or by editing in the edit fields.
- Click *Preview* to update the image with your changes without leaving the dialog.
- Click *OK* to leave the dialog, and update the image with your settings.
- Click *Cancel* if you want to reset Contrast/Brightness to its former values i.e., the values that existed before you entered the dialog.

Tip : As an alternative to the *Preview* button, you can view setting effects interactively as you make adjustments. This is done by holding down the <ctrl> key as you move the sliders.

5.4.2 Histogram Stretch

For setting Black and White Point Values in an existing image. The histogram gives you a picture of your image's tonal range. You can use the histogram to set the Black Point and White Point values, for achieving optimal balance between highlight and shadows throughout your image.

- Open the image in the *View Screen*.
- Select *Histogram Stretch* from the *Image Menu*. A luminance histogram adjustment dialog is displayed.

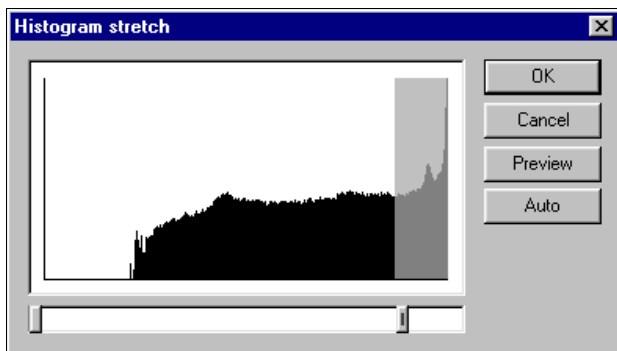


Fig. 5-4: Histogram Stretch Dialog

There are two ways to make Black and White Point adjustments:

- **Manual:** You can manually set the Black Point (BP) and the White Point (WP) by dragging the sliders to any position within the luminance range (0-255). Clicking OK will stretch the image so that the resulting histogram fits between the two manually defined points.
- **Auto:** Select the *Auto* button in the dialog to initiate generation of a luminance histogram for the image. Two points in the histogram will be automatically found: The Black Point (BP) which is calculated as the graytone level of the 5% darkest pixels, and the White Point (WP) which is the graytone level of the 5% brightest pixels. The image is stretched so that the resulting histogram occupies a graytone range from 0 to 255.
- Use the *Preview* button to display the effects of your settings.
- Click *OK* to apply the changes and close the dialog.

Tip : As an alternative to the *Preview* button, you can view setting effects interactively as you make adjustments. This is done by holding down the <ctrl> key as you move the sliders.

5.4.3 Hue/Saturation/Value

For tonal adjustment through adjusting Hue, Saturation, Value color balances within an existing image.

- Open the image in the View Screen
- Select *Hue/Saturation/Value* from the *Image Menu*. An HSV adjustment dialog will popup.
- Values can be set either by dragging the sliders or by editing in the respective edit fields.

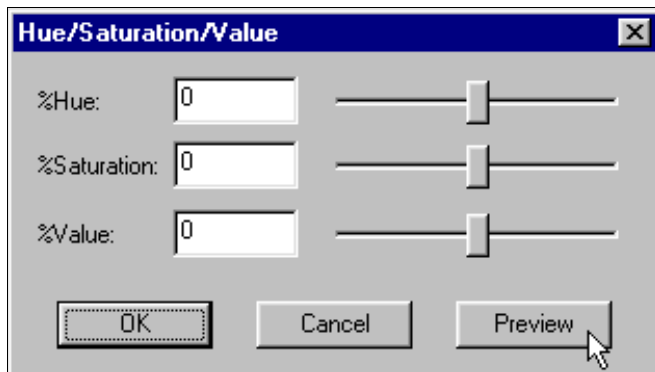


Fig. 5-5: Hue/Saturation/Value Dialog

The settings are applied in the following way:

- **Hue:** Increases or decreases Hue. All colors are moved simultaneously up or down the color spectrum.
- **Saturation:** Increases/decreases Saturation. 100% converts the image to Graylevels.
- **Value:** Increases/decreases Luminance. 100% produces pure black.
- Click the *Preview* button to see the effects of your settings.
- Click *OK* to leave the dialog and update the image with your settings.
- Click *Cancel* if you wish to reset the values to the prior settings.

Tip : As an alternative to the *Preview* button, you can view setting effects interactively as you make adjustments. This is done by holding down the <ctrl> key as you move the sliders.

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5.4.4 Red/Green/Blue

For tonal adjustment through adjusting Red, Green, and Blue (RGB) color balances within an existing image.

- Open the image in the *View Screen*.
- Select *Red/Green/Blue* from the *Image Menu*. An RGB adjustment dialog will pop up.

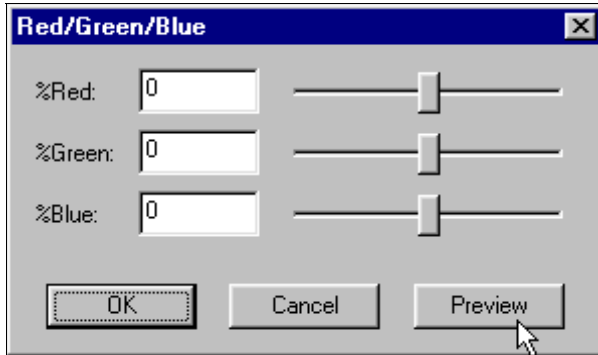


Fig. 5-6: Red/Green/Blue Dialog

- RGB balances are set as percentages by dragging the sliders or by editing in the respective edit fields.
- Click *Preview* to view your latest adjustments.
- Click *OK* to leave the dialog and update the image with your settings.
- Click *Cancel* if you wish to reset the values to the prior settings.

Tip : As an alternative to the *Preview* button, you can view setting effects interactively as you make adjustments. This is done by holding down the <ctrl> key as you move the sliders.

5.4.5 Grayscale

For converting an existing color image to grayscale colors.

- Open the image in the *View Screen*.
- Select the *Image Menu*
- Check (click on) the Grayscale option.

This action will convert an active Feature Extracted color, indexed color or RGB color image to a grayscaled image by replacing each color with a gray of equal luminance.

5.4.6 Classify (Feature extract)

For applying the effects of a LUT filter to an existing RGB true color image. This is "off-line" feature extraction i.e., feature extraction is applied to a single saved image. "On-line" feature extraction involves downloading a LUT filter into the scanner and applying the filter's effects directly during scanning as described in chapter 6.

To perform off-line classification

- Open the image in the View Screen.
- Select the Image Menu
- Select Classify. This will display a File-Selection dialog for selecting a LUT (Look Up Table .lut) file.

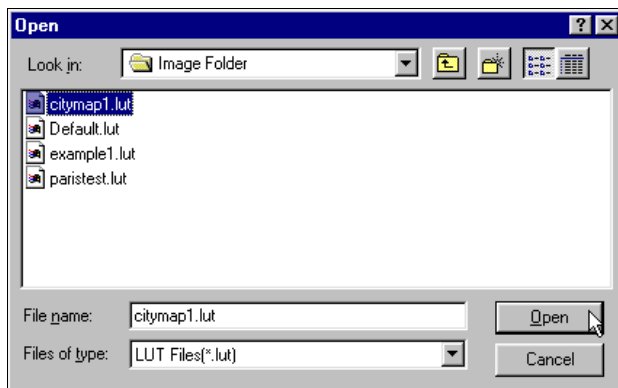


Fig. 5-7: Image Menu - Classify Dialog

- Click *Open* to apply LUT filtering to the RGB image, on the basis of the LUT file you selected in the dialog.
- Applying the LUT filter performs off-line feature extraction, converting the image to Classified color.

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5.4.7 Decrease Colors/Graytones

Use this option to decrease the number of colors or graytones in an image. This is typically used for adapting images to certain colors schemes (for example CAD programs) and for compressing file size through decreasing color/graytone detail.

- Open the image file in the *View Screen*
- Select the *Image Menu*
- Select *Decrease Colors/Graytones*. The submenu offers 2 options for decreasing colors and graytones with relevant adjustments.
- You can decrease by using only black and white in the image. You can decrease the number of colors or graytones in the image. The methods and adjustment options are described below:
- **B/W: (Decrease to B/W image)**
The luminance of the active Graytone, Indexed or RGB image is used as the base for thresholding. Use the sliders to set the threshold to the desired value. The *Preview* button can be used to view setting effects or else hold down the <ctrl> key as you move the sliders to view effects interactively.

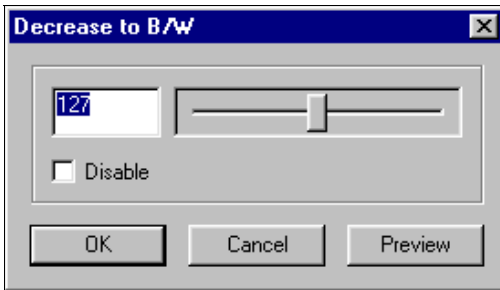


Fig. 5-8: Image Menu - Decrease B/W

- **Color/Graytones 2-255: (Decrease the number of graytones or colors)**
Output is will be created as Indexed Color for Color images and as Graytone for graytone input images.
If you wish to convert a color image to graytones, select Grayscale from the file menu and then, if required, come back here to reduce the number of graytones.

- **Adaptive, no. of colors** : The image is mapped based on the nearest color for Feature extracted color, Indexed color and RGB color. For Graytone input, graytones for output are selected based on equalizing the histogram. The number of output colors can be determined in the edit field.
Custom Palette: A custom palette: .lut, .pal, .tif, .pcx etc. can be loaded by selecting a file through the *Browse* button. Settings regarding the number of output colors and file type are determined by the selected custom palette file.
- Press the OK button to apply your settings on the image.

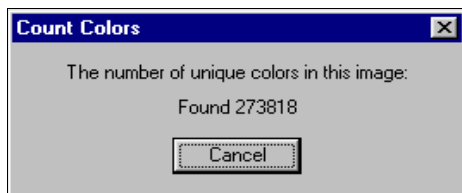


Fig. 5-9: Image Menu - Decrease Colors 256 colors

5.4.8 Count Colors

Select Count Colors to display the number of colors or graytones used in one of the following active views:

- Main View
- Viewboards
- Rectangle Selection. (See section 5.3.1 – Viewing Selection Tools for instructions on placing and resizing the rectangle in the image).



Click on *Cancel* to remove the message.

5-18 Viewing - View Screen & Image Menu

5.4.9 Scale

For resizing an image by a scale factor you set in the dialog.

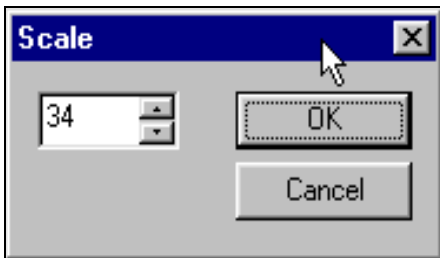


Fig. 5-10: Image Menu - Scale Dialog

- Open the file in the *Viewer*
- Select the *Image Menu* and click on the *Scale* option.
- In the *Scale dialog*, choose the scaling factor by dragging the slider with the mouse.
- The default scaling factor is 100%.
- Click OK to apply resizing in the *Viewer*.
- Select *Save* or *Save As...* to retain your changes.

6. Feature Extraction

6.1 What is Color Feature Extraction?

6.1.1 Introduction

A scanned color image of a map or drawing can be composed of up to 16.7 million colors. Most scanned images will contain many colors that cannot be perceived by the human eye, due to a relative low amount of pixels representing them or due to their nearness to another color that is represented on a larger scale. This means that a very large number of an image's colors are not required in order to bring out its features. For example, the edge pixels of a red line on a white background will have gradations of red colors, and a crossing red and blue line will have pixels with color mixtures of red and blue, etc. It would be beneficial to filter the many colors in the input image so that only those features that can be seen are actually represented in the output image. In the mentioned examples, this would mean outputting a single red color representing both the center and the edge pixels of the red line on a clean white background, and a red line crossing on top of the blue line.

The LUT filter (color Look Up Table) in the scanner can automatically perform a desired reduction of all the scanned colors into only a few significant colors (max. 255) representing the actual features. By filtering your images, you will obtain a significant reduction of data, save valuable space and render your image files easy to load and work with. This data compression can take place from 24 bits per pixel down to 8 bits per pixel or even down to 4 bits per pixel.

But the scanner cannot automatically generate the LUT filter content in such a way that the output colors correspond to an image's features as perceived by the human eye. Only the user can do this, by manipulating the LUT filter content on one or more representative sample maps or drawings until the colors in the output image satisfactorily represent the desired features. The prepared LUT filter content can then be downloaded into the scanner, allowing automatic feature extraction (and data compression) on a whole class of similar maps or drawings.

6.1.2 LUT editing in the Feature Screen

To assist the user in preparing the LUT filter content, the LUT editor provides tools to merge, explode or remove colors, and through this editing process the user can converge on a LUT filter that ideally outputs only one color for each feature in the scanned image. To facilitate the editing process, the user can switch between views of the true color input image and the feature extracted output image. Pixels that will be affected by the current edit operation are interactively highlighted. The user will only be required to commit the operation when satisfactory results are obtained.

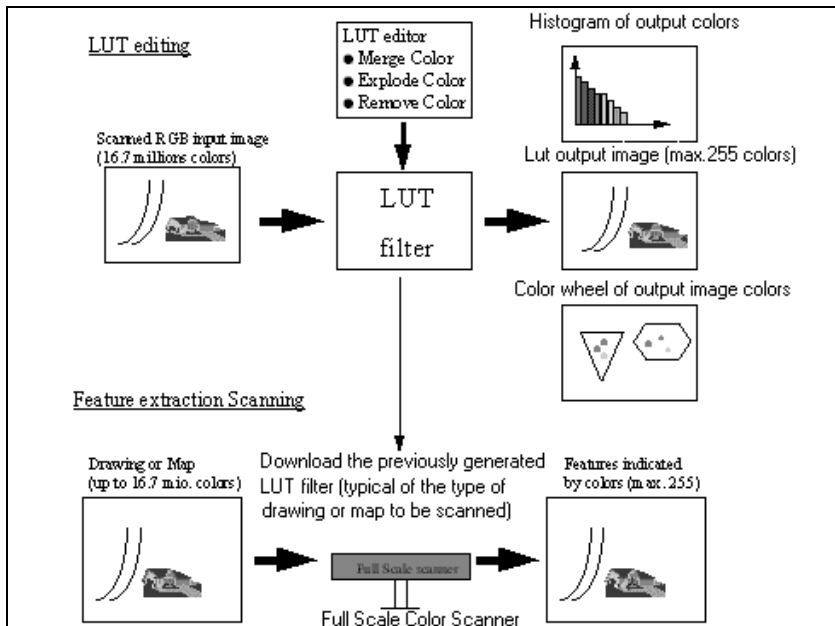


Fig. 6-1: Feature Extraction Overview

Two help screens, the *Color Wheel View* and the *Histogram View*, provide alternative ways of seeing color space position (Hue/Saturation/Value - HSV color space) and the input pixel count associated with each of the LUT filtered output colors.

6.1.3 Feature Extraction Procedures

Here are the typical steps involved when creating and editing a LUT filter for Feature Extraction:

1. Scan a representative sample of a class of maps or drawings in true color (24-bit RGB mode) and save it. You should scan with the default settings of white point/black point, contrast/brightness, etc., and not in any way modify the file in the *Viewer*. This is because your modifications will not be reproducible when you later scan other drawings from the same class that will share a created LUT filter. It is only necessary to scan a small but representative part of the original and a small file will make editing easier and faster.
2. An initial automatic creation of the LUT filter is performed by opening the previously scanned true color image in the *Viewer*. Then move to the *Feature Screen* by clicking on the *Feature Tab*. Select *Create* from the *Feature Menu* in the *Pull-down Menu Bar* in order to generate an initial LUT filter that you will later amend. From the *Create* dialog, you select a creation method and the initial number of automatically generated output colors. There are two basic approaches to selecting the initial number of colors.

Excessive Initial Colors : Set the number of output colors to a higher count than the number you want to end up with in order to have some additional colors to work with in the edit phase. Then use the *Merge Color* and *Remove Color* edit tools to reduce the resulting number of LUT output colors while controlling re-mapping to feature representative colors.

One or Few Colors : Set the number of output colors to a lower count than the number you want to end up with. Then use the *Insert Color* and *Explode Color* edit tools to increase the resulting number of LUT output colors. Some start with only one color (minimum), and then insert input colors picked right off the RGB image. The inserted colors can be selected as color averages from whole areas representing a specific feature. This method creates LUT filters that are stable throughout the class because they are based on broad color schemes that relate directly to the original RGB image colors. Re-mapping becomes predictable because the very pixels you wish to re-map are used to form the inserted target color.

3. Use the LUT edit tools to enhance the automatically generated LUT filter until each of the output colors represents a feature in the original

true color RGB image. Do not worry at this stage if the output colors do not look right - you can correct this later. Your only goal here is to ensure that the colors give an accurate one-to-one representative match of the features in the scanned map or drawing.

4. You should at this point save the LUT filter for eventual editing later on. You will probably want to check and modify the filter with other representative maps or drawings from the same class.

5. In the final stage you can re-map the logical output colors from the LUT filter to colors of your choice, e.g., change a muddy red output color to a clear, bright red, by using the *Import Color* function and replacing the existing output color with the new one. This is an irreversible operation that will prohibit further editing because the new colors will not normally be positioned in the immediate neighborhood of its associated RGB colors.

6. Save the generated LUT filter for future downloading into the scanner.

6.2 LUT Filter Editing - Getting Started

To start editing a color feature extraction LUT (Look Up Table) you must open a previously scanned true color image (24-bit RGB) in the *View Screen*, and then move to the *Feature Screen* by clicking on the *Feature Screen Tab*. As described in previous chapters, you open an RGB image in the *View Screen* by either:

- Selecting *Open* in the *Main Toolbar* or from the *File Menu*.
- Moving to the *View Screen* from the *Scan Screen* just after you have scanned-to-file in RGB mode.

The *Feature screen* (in its *Main View*) is shown below:

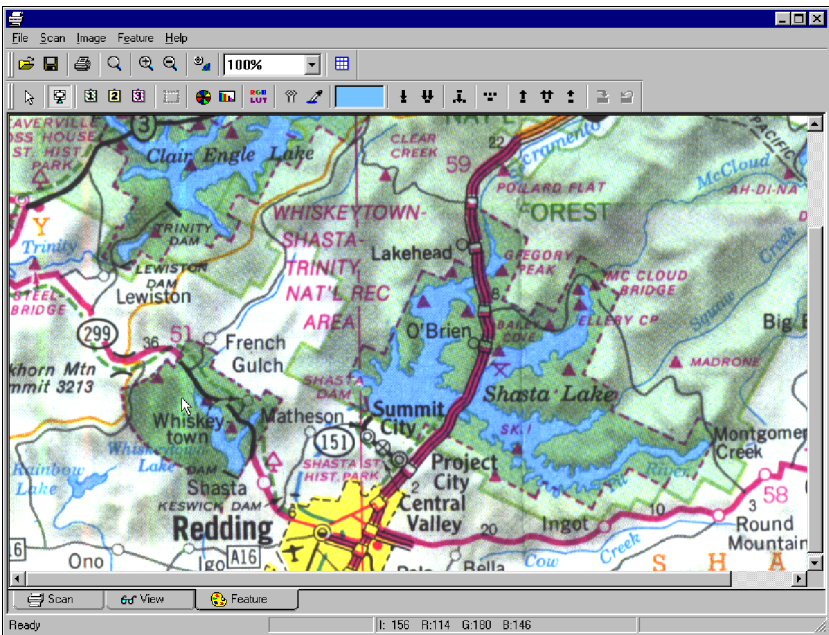


Fig. 6-2: The *Feature Screen* (In *Main View*)

Select *Create* in the *Feature Menu* to automatically generate an initial feature extraction LUT. The initial LUT will be used as the starting point from which you revise the LUT until you are satisfied with the result.

When you create the initial LUT, all the *Feature Screen* views and LUT editing tools become accessible. The *Feature Screen* is divided into the standard areas: *Menu Bar*, *Main Toolbar* and *Task Toolbar*, a *Main Display Area* in the middle and the *Screen Select Tabs* and *Status Bar* at the bottom. The *Task Toolbar* is now occupied by the *LUT Toolbar* which is composed of tools relevant to LUT filter editing.

6.3 Selecting LUT Editing Views

The *LUT Toolbar* consists of view selection tools and LUT edit tools.

To assist in editing the LUT filter, color data in the true color original and its corresponding output after LUT filtering can be displayed (viewed) in several ways. The following view options are available:

- **Main View:** This displays either the true color input image or the corresponding LUT filtered output image. This view is also known as the *Main LUT Edit Screen* – see Fig. 6-2.
- **Viewboards 1, 2 or 3:** Displays zoomed-in or cutout parts of either the true color input image or its corresponding LUT filtered output image.
- **Color Wheel:** Displays the position of each of the colors in the LUT filtered output image in HSV (Hue/Saturation/Value) color space.
- **Histogram:** A graphical representation of the output colors being used for classification. The size of a column indicates the proportional amount of true color pixels mapped to the LUT filtered output color i.e., the column's color.

You can select between these viewing options by clicking on the appropriate button on the *LUT Toolbar*. When one of the LUT filter view selection buttons is turned ON, the button stays turned ON until another view type is selected.

In the *Main* and *Viewboards* views, you can switch between displaying the true color RGB input image and the corresponding LUT filtered output image, by clicking on the RGB/LUT toggle button.

In the *Main* and *Viewboards* views, colors affected by the current edit tool will be highlighted by continuous blinking. In the LUT mode, (controlled by the RGB/LUT button) the highlighted color represents the LUT output color. In the RGB mode, the highlighted colors represent RGB input colors that belong to a LUT output color.

As we will see later, the *Main* and *Viewboards* views allow you, in connection with many edit functions, to use your mouse to select colors directly from the image. Selected colors will be highlighted as described above.

Editing selections and marking made in one view, will be saved and displayed when you move to another view. For example, if you mark a color with the pick tool in the *Color Wheel View*, the same color will be

marked with a blue rectangle in the *Histogram View* and will blink in the *Main View* and *Viewboards View*.

Lets look at the *Feature Screen's* viewing tools.

6.3.1 Viewing in the Main View



Clicking on the above tool activates the *Main View*. In the *Main View*, the image is displayed on the screen at the current zoom level. Returning to the *Main View* from a *Viewboard* will restore the current zoom level of the *Main View*.

The image will be displayed as either an RGB input image or as a LUT Filtered output image, depending on the state of the *RGB/LUT* button.

6.3.2 Making Partial Views - Viewboard 1,2,3



Viewboards can be used for retaining cutout and zoomed views of an image. When clicking a *Viewboard* button for the first time after an image has been opened, the image will be displayed as seen in the *Main View*. You can then create a partial view by either “cutting out” an area with the *Rectangle Selector* or by zooming and repositioning the image. The new (partial) view will be stored when leaving the *Viewboard*, and if you later select it again, the partial view will be redisplayed. The image will be displayed as either an RGB input image or as a LUT filtered output image depending on the state of the *RGB/LUT* button. See the following description of the *Rectangle Selector Tool*.

6.3.3 Using the Rectangle Selector



In the *Feature* screen, the *Rectangle Selector* tool can be used for two purposes:

- Selecting a “cutout” area for saving and viewing in a *Viewboard*
- Selecting an area that serves as the basis for creating an initial LUT filter.

In the following we will see how to select image areas with the tool and how to save the selection for viewing. Using the *Rectangle Selector* in connection with LUT creation is described in section 6.5.1 *Feature Menu – Create LUT*.

Marking out an area with the Rectangle Selector

- Click on the *Rectangle Selector tool* to turn the function “on” and change the cursor to:



- Hold down the left mouse key with this cursor active to select an area by dragging a rectangle on the screen.
- After you have created a preliminary rectangle, you can move and resize it using your mouse. Moving the mouse over the rectangle’s components (sides and corners), activates different functions and relevant cursors as described below :
- Move the cursor over a rectangle’s corner to reveal its resizing handle (a blue arrow will appear). You can drag any of the corners, while holding down the left mouse key to resize your rectangle.
- Click on the right mouse-button, while pointing at one of the corners, to make the cursor jump to the next corner (clockwise). <shift>right clicking will move the cursor counter clockwise.
- Move the mouse over one of the 4 rectangle lines to reveal its movement handles indicated by the cursor change on contact. These handles can be used to move the rectangle to a different position on the screen.
- Pointing with the mouse anywhere inside or outside the rectangle activates the “Zoom Cursor” shown below, allowing you to click and zoom in on image details for making fine adjustments to

rectangle corners. Zoom views can be saved on the *Viewboards*.



The Zoom Cursor

- All the rectangle mouse and drag functions can be deactivated by pressing the <ESC> key.

If you regret your rectangle, it can be deactivated without any function being performed by re-clicking on the rectangle tool. You can deactivate the rectangle and the function by clicking on the standard cursor tool.

Creating and saving “cutout” views with the Rectangle Selector

You might be interested in viewing one or more specific areas in the image. After marking out an area with the *Rectangle Selector*, you can save the specified area in a *Viewboard* from which it can be recalled.

- Mark out an area with the *Rectangle Selector* tool as described above.
- Click on one of the *Viewboard 1, 2 or 3* buttons.
- The marked area will be saved in the *Viewboard* you chose.
- Use the zoom tools to further enhance viewing of your selected image portion.

6.3.4 Viewing RGB input and LUT output colors



The RGB/LUT button is a valuable tool because it allows you to interactively evaluate your LUT filter and editing actions by comparing the original RGB input image with current LUT filtering results (output colors). Clicking on this button will toggle between the RGB and LUT display mode in the *Main* and *Viewboards* views. The RGB state (button OFF) will display the original true-color RGB input image. When the tool is toggled to LUT (button ON – highlighted), the image is displayed with the current LUT filter effects.

6.3.5 Viewing with the Color Wheel



Pressing this tool displays the *Color Wheel View*. The *Color Wheel view* displays the LUT output colors in the HSV model (Hue/Saturation/Value). An initial LUT file must be created or loaded before you can use this view.

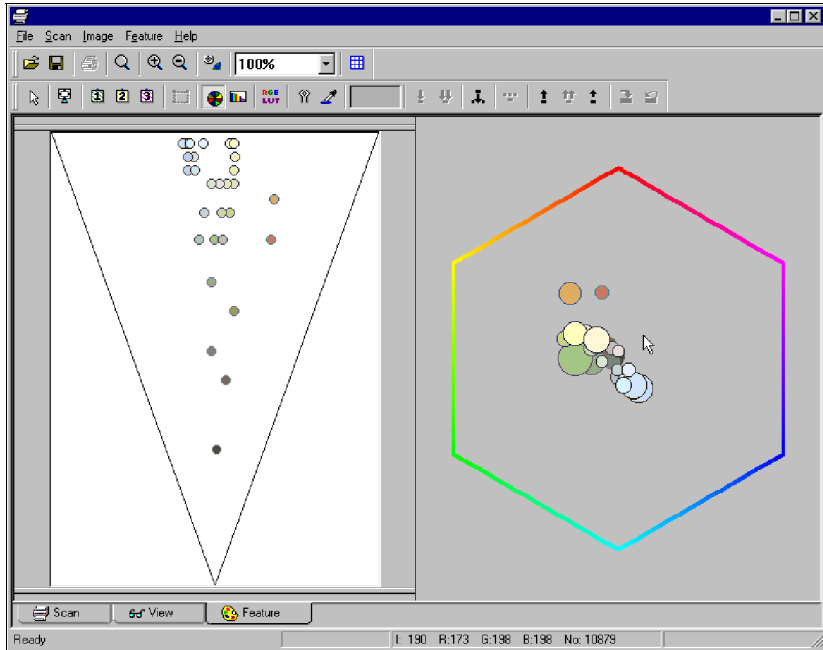


Fig. 6-3: The Color Wheel View

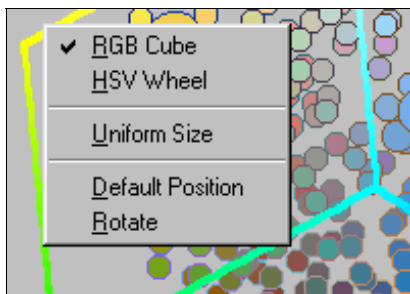
The view is divided into two parts, with Hue/Saturation represented on the right and the Brightness (value) represented on the left. On both sides, each color is represented by a color disc.

The hexagon on the right (Hue and Saturation) contains the slice of colors selected in the triangle on the left (Brightness value).

The hexagon is bordered by a color-hue-ring. The position of the color discs denotes their level of saturation. The closer to the hexagon's center, the less saturated the color.

On the left side (value), the topmost discs represent the lightest colors, and the lower discs represent the darkest colors.

The Hue and Saturation hexagon can be viewed in other ways. Clicking the right mouse button in the hexagon displays the following options:



- **RGB Cube**
Checking RGB Cube turns the hexagon into a 3 dimensional cube which represents RGB space. The cube can be rotated manually by dragging the left mouse pointer anywhere inside the right window. This allows you to view all the color discs and their relative positions to each other in color space. Colors “hiding” behind others will become visible.
- **HSV Wheel**
Checking this option reverts to the two dimensional view, with the hexagon ring as described above. *HSV Wheel* is the default setting.
- **Uniform Size**
When this option is not checked, the size of each LUT output color disc is relative to the number of pixels belonging to it in the original RGB input image. Therefore, the discs and their relative sizes clearly show the level of each color’s presence in the original input image. Sometimes the level of a color’s presence is unimportant in regard to the current editing function. Checking this option sets all color discs to equal sizes regardless of the pixel count.
- **Default Position**
Resets the RGB Cube to the default position.
- **Rotate**
Clicking on rotate displays a rotating RGB Cube and a controller that consists of an arrow and a compass as shown overleaf:



Rotate – Cube controller

Drag the mouse while holding down the left mouse button to move the arrow. The arrow in combination with the compass works like a joystick. You control the cube's rotation direction and speed by controlling the arrow's direction and distance from the compass.

You may want to concentrate your editing actions on certain colors and would therefore like to reduce the number of colors displayed. In the left view (Brightness Value), the two horizontal lines (top and bottom) that define the size of the slice selected in the triangle can be moved vertically by dragging the handles with the mouse. This “cutting out” of colors effects only the Color Wheel view and does not reduce colors in the output filter you are creating. You will have to use the Remove Marked and Remove Similar color tools for that (see section 6.4 LUT edit tools).

Editing in the Color Wheel View

Selecting colors in combination with editing tools is performed by moving the mouse pointer on the desired color disc in either one of the left (brightness) or right (Hue/Saturation) views. To help you, a blue ring will appear around the color that is being pointed at. The next click with the mouse will then select/mark that color with the current editing function.

Many edit functions work in connection with a Pick Color. Only one pick color may be active at a time. In the *Color Wheel View*, you choose the Pick Color with the *Pick Color* tool (the pipette icon). The current picked color will be indicated by a red ring around the selected disk, and the color will be displayed in the window next to the *Pick Color* tool.

Marking and unmarking of one or more colors is done by clicking on a color disc when in one of the supported edit functions. A marked color can be identified by a blue dot in the center of its color disc.

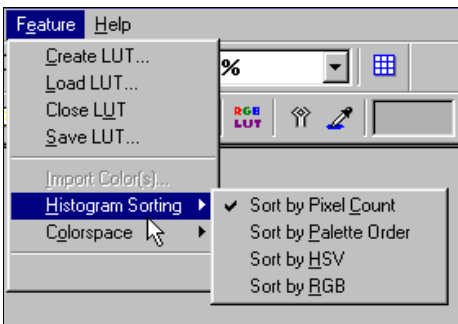
Marking a color as “Protected” or “Unprotected” is done by clicking on the color disc when the *Protect/Unprotect* tool button is on. A protected color can be identified by a red dot in the center of its color disc.

6.3.6 Viewing with the LUT Histogram



If a LUT file has been generated or loaded, selecting the above tool displays a histogram representing the LUT output colors that are used for classification (feature extraction) of the original RGB input image. The Histogram View gives a good clear picture of the quantity of output colors and their dominance in the original image.

You can select a histogram sorting method through the *Feature Menu* (see section 6.5.6 – *Histogram Sorting*). Your selection takes effect immediately in the *Histogram View* with values descending from left to right. The available sorting methods are shown below:



- Histogram sorted by each color's pixel count.
- Histogram sorted by palette order.
- Histogram sorted Hue/Saturation/Value(HSV) color values
- Histogram sorted by Red/Green/Blue (RGB) color values.

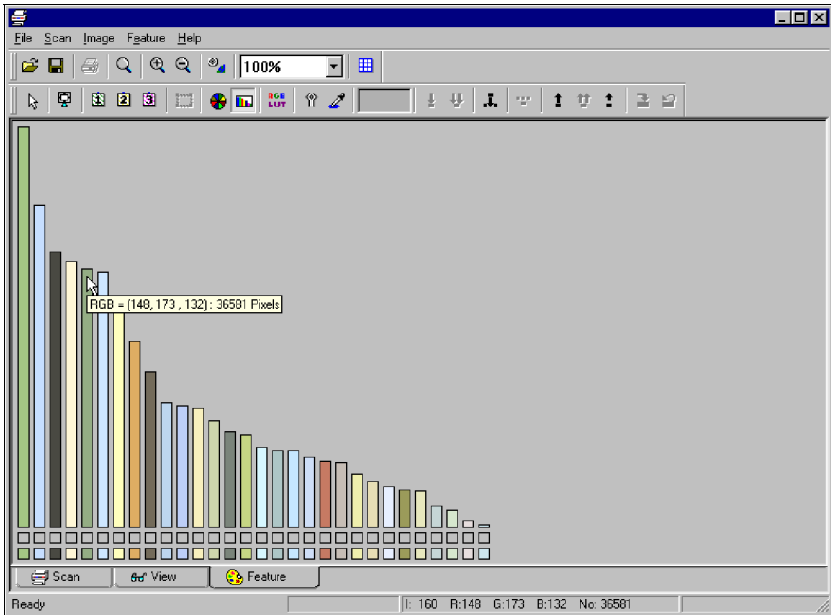


Fig. 6-4: The LUT Histogram View

Editing in the Histogram View

In the *Histogram View*, you can pick colors with the *Pick Color* tool (the pipette icon). The current picked color will be indicated by a blue rectangle with a red arrow around the color histogram bar, and the color will be displayed in the window next to the *Pick Color* tool.

Marking and unmarking of one or more colors is done by clicking on a color bar when in one of the supported edit functions. A marked color can be identified by a blue dot in the square below its color bar.

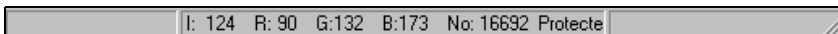
Marking a color as “Protected” and “Unprotected” is done by clicking on the color bar when the *Protect/Unprotect* tool button is on. A protected color can be identified by a red dot in the square below its color bar.

The *Pick Color*, *Mark/Unmark* and *Protect/Unprotect* tools will be described in section 6.4.

6.3.7 Viewing Pixel Information on the Status Bar

The *Screen Status Bar* in the *Feature Screen* displays information on any color pointed at by the cursor or by one of the LUT edit tools. Information is displayed immediately, simply by moving the cursor over the color in the *Histogram View* and the *Color Wheel View*. In the *Main View*, pixel status is displayed when using the *Pick Color* tool as described in section 5.3.2 (*View Screen- Image Manipulation Tools*).

The Status Bar is shown below:



The following information fields are displayed:

I:'#' H:'#' S:'#' V:'#'

or else

I:'#' R:'#' G:'#' B:'#'

depending on the *Color Info Field* setting in the *File Menu - Preferences - Color Info Field* (see section 3.4.9). The labels used to identify each field are :

I is the Intensity field
H,S,V are Hue, Saturation, Value fields
R,G,B are RGB fields

The *Status Bar* also displays a color's **Pixel count** and **Protection status**.

6.4 Using the LUT Filter Editing Tools

After automatic creation of an initial LUT filter, you will want to change the filter until it performs perfectly with the class of originals you wish to scan. The next sections are about the LUT editing tools and how to use them.

6.4.1 An Overview of LUT Editing Tools

On the right side of the *LUT Toolbar* you will find functions for controlling LUT editing. These tools can be sorted into three groups:

- Assistance function tools
- Edit function tools
- Commit and Regret function tools

Each of the tools in these three groups will be described in detail later in this section.

Assistance functions:

There are three selection tools that “assist” the Edit functions, but do not themselves make any alterations to the LUT. These are:

- Pick Color
- Protect Color(s)
- Standard Cursor (arrow)



Standard Cursor tool

The *Pick Color* and *Protect Color* buttons are ON/OFF buttons. When clicked, the button stays “ON” until the button is either clicked again or the function is turned “OFF” by selecting another button. The *Standard Cursor* tool is enabled in the *Main* and *Viewboards* views. Pressing the *Standard Cursor* button “turns off” any current editing function and pixel highlighting.

Edit functions:

Seven edit function tools for setting up edit changes to the LUT are available:

- Merge Marked Color(s)
- Merge Similar Color(s) (to Pick Color)
- Insert New Color (Pick)
- Explode Pick Color
- Remove Marked Color(s)
- Remove Similar Color(s) (similar to Pick Color)
- Remove Minor Color(s)

When one of the above Toolbar buttons is turned “ON”, it remains “ON” until one of the following occurs:

- The edit operation is executed by clicking the *Apply button*.
- The edit operation is aborted by clicking the *Standard Cursor* (arrow) tool button.
- The function is turned “OFF” by clicking another Edit or Assistance function button.

In the *Main View* and *Viewboards* highlighted colors are shown blinking on the screen. Highlighted colors are those affected by the currently selected edit function.

When using an edit tool, marking and unmarking a LUT output color is done by clicking on a pixel on the screen with the mouse.

Use of the edit functions normally results in re-mapping of the original RGB input image colors into one or more LUT output colors. Re-mapping is based on the shortest distance between input and output colors, and results depend on whether RGB or HSV coordinates are used. Selecting between the RGB or HSV methods takes place in the *Feature Menu - Color Space* (see section 6.3). Changes in *Color Space* will take effect on edit operations performed after the change.

Commit / Regret functions:

The Commit/Regret tools affect the LUT by either applying or undoing one of the above LUT edit functions. There are two tools:

- Apply Edit Operation
- Undo Edit Operation(s)

Clicking the *Apply* button will conclude and commit the specified Edit function changes to the LUT. The selected edit tool button is turned 'OFF' when the operation is completed.

The *Undo* button, reverses the latest edit function, including changes to a color's protection status. Up to 10 edit functions can be cancelled with the *Undo button*.

Lets take a closer look at each LUT editing tool.

6.4.2 Protect Color(s)



This tool is for protecting one or more colors from LUT editing operations. Protecting a color is like locking its current mapping settings. Colors are per default unprotected.

How do I protect a color?

- Go to the LUT edit view that best suites locating the color(s) for protection. Use the zoom tools to view individual pixels if necessary.
- Click on the *Protect Tool* to activate the function.
- Click on a color in any of the views to mark it as protected.
- If you regret a marking, re-click on a protected color to remove the protection mark.
- Re-Click the *Protect Tool* to turn the function OFF.

Why Protection? - Protection Properties

Protecting a LUT output color means that it cannot be removed by the editing operations. The following properties apply:

- Colors in the original RGB image belonging to a protected color cannot be moved to another LUT output color.
- A protected LUT output color cannot be removed from the list of active LUT output colors.
- Other colors in the original RGB image can be mapped (added) to a protected LUT output color.
- Attempts to mark protected colors for merging/removal will prompt a warning.

Identifying Protected Colors

In the *Histogram view*, a protected LUT output color is identified by a red square in the box below the color's column.

In the *Color Wheel view* a protected color is identified by a red dot in the center of the color disk.

In the *Main View* and *Viewboards*, with the *Protect Color(s) tool* turned ON, all colors belonging to a protected LUT output color will be highlighted (blinking).

6.4.3 Pick Color



For selecting LUT output colors for use in combination with other LUT editing functions.

How do I select a Pick Color

- Go to the LUT edit view that best suites locating the color you wish to select. Use the zoom tools (in *Main* and *Viewboards Views*) to view individual pixels if necessary.
- Click on the *Pick Color Tool*.
- When the button is turned ON the cursor changes to the Pick Color pointer cursor (pipette):



- Click with the pipette on a pixel in one of the views to select the corresponding LUT output color. In the *Histogram view*, you select an active Pick Color by clicking on the desired LUT output color column. In the *Color Wheel View* you select the Pick Color by clicking on one of the color discs.
- To help identify colors for selection, you can view (RGB or HSV) values of colors on the status bar as you point with the pipette.
- Only one color can be selected at a time with Pick Color. The last selected color will always become the active Pick Color.
- A sample of the active Pick Color will be displayed in the window to the right of the *Pick Color Tool* button.



Identifying the Pick Color in the Image

The *Pick Color Tool* works in all views, e.g., *Main View*, *Viewboards*, *Color Wheel* and *Histogram*.

In the *Main View* and *Viewboards*, with the *Pick Color tool* turned on, all pixels that have the active Pick Color as their output LUT color will be highlighted (blinking).

In the *Histogram view*, a full height rectangle around the column marks your selection and indicates that the color is the active Pick Color.

In the *Color Wheel View* the active Pick Color is indicated by a red ring around the selected LUT output color disc.

6.4.4 Merge Marked Color(s) (to Pick Color)



The *Merge Marked Color* tool enables you to merge one or more colors of your choice, through re-mapping.

How do I mark and merge output colors?

- Go to the LUT edit view that best suites locating the color(s) you wish to merge. Use the zoom tools to view individual pixels if necessary.
- Select a Pick Color with the *Pick Color Tool*.
- Select the *Merged Marked Color Tool*. The tool will stay ON until you re-click it. This means that you can mark many colors before applying the function.
- Click with your mouse on any color(s) to mark it for re-mapping.
- To un-mark a marked color, just re-click on it in any of the views.
- A warning will be displayed if you attempt to mark a Protected LUT output color for merging.
- Control your markings in different views i.e., *Histogram*, *Main*, *ColorWheel*.
- Click on the *Apply Tool* button to activate the merge process.
- View the effects in the Main View with the RGB/LUT button on LUT output.
- If you regret the merge effects, click on the *Regret Tool* to remove the action.

Merge Tool Effects

Colors in the original RGB input image, that belong to a Marked Color, will be merged (re-mapped) to the active Pick Color, i.e., the last color chosen with the *Pick Color Tool*.

Identifying Marked Colors

Pixels that belong to the Pick Color and the marked LUT output colors will be highlighted in the *Main* and *Viewboard* views, or marked by blue dots in the *Histogram* and *Color Wheel* screens.

6.4.5 Merge Similar Color(s) (similar to Pick Color)

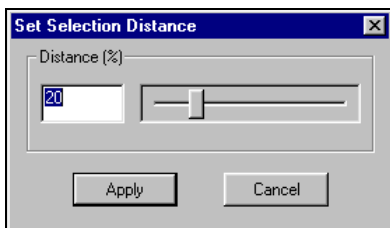


The *Merge Similar Color Tool* enables you to merge colors on the basis of their similarity, thus filtering out unessential color differences from the image.

The *Merge Similar Color(s) Tool* merges all unprotected LUT output colors that lie within a specified color distance from the Pick Color. The colors are re-mapped to the Pick Color.

How do I merge similar output colors?

- Go to the LUT edit view that best suites locating the color(s) for merging. The *Color Wheel View* gives a good picture of the output color's nearness in color space (similarity), or use the Histogram view sorted by HSV or RGB values.
- Select a Pick Color with the *Pick Color Tool*. You want to merge colors that are similar to this color and you want to merge the colors TO this color.
- Select the *Merged Similar Color(s) Tool*. The tool will stay ON until you re-click it. A *Set Distance dialog* box appears.
- Set the colors distance in the dialog box using the slider. See the definition of similarity below.



- The Pick Color and Pixels that belong to colors defined as similar to the Pick Color are highlighted/marked. You can interactively see which colors will be included because highlighting/marking takes immediate effect as you make changes to the color sphere radius by moving the sliders.
- Click the dialog's *Apply Button* to commit the function.
- Control your results in different views i.e., Histogram, Main, ColorWheel.
- View the effects in the *Main View* with the *RGB/LUT Button* on LUT output.
- If you regret the merge effects, click on the Regret Tool to remove the action.

Merge Similar Effects

Colors in the original RGB input image, that belong to LUT output colors within the sphere, are re-mapped to the Pick Color. Protected colors are excluded from the sphere regardless of their similarity to the Pick Color. Merged LUT output colors are not removed from the list of active LUT output colors, and thus will still be shown in the *Color Wheel* and *Histogram Screens* (values of 0 will be associated with these colors).

Definition of Similarity

Similarity is defined in the following way: The slider defines a distance which represents the radius of a sphere that surrounds the Pick Color. Colors close enough to the Pick Color, so that they are within the sphere, will be considered similar. **The smaller the distance, the less the number of colors that will be defined as similar.** The distance is represented as a percentage of the full color axis.

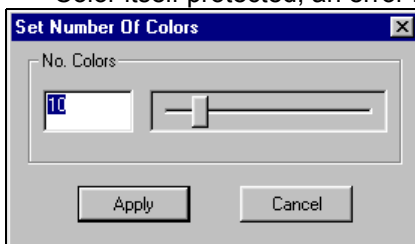
6.4.6 Explode Color (Pick Color into more colors)



For reproducing more LUT output colors based on a selected color and the original colors that belong to it. Colors in the original RGB input image that represent the Pick Color are evenly distributed into the Pick Color and a number of new LUT output colors.

How do I explode a LUT output color?

- Go to the LUT edit view that best suites locating the color you wish to explode.
- Select the color with the *Pick Color Tool*. You want to explode this color into more colors from the original that are near it.
- Select the *Explode Color Tool*. The tool will stay ON until you re-click it. A dialog box for setting the number of colors will appear.
- If you attempt to activate the *Explode Pick Color Tool* with the Pick Color itself protected, an error message will be displayed.



- Set the number of colors you wish the Pick Color exploded into in the dialog box using the slider. You can set up to 63 colors.
- Click the dialog's *Apply button* to commit the function. Colors in the original RGB input image, that belong to the Pick Color, are re-mapped into the specified quantity of LUT output colors. One of these colors is the Pick Color itself, while the rest are new colors.
- The Apply function will be disallowed if the total number of active LUT output colors exceeds 255 as a result of the explode function.
- Control the results in different views i.e., *Histogram*, *ColorWheel*.
- View the effects in the *Main View* with the *RGB/LUT button* on LUT output.

Explode Effects

Colors in the original RGB input image that represent the Pick Color are evenly distributed into the Pick Color and a number of new LUT output colors. Colors in the original RGB input image, that belong to the Pick Color, are re-mapped into the specified quantity of LUT output colors. One of these colors is the Pick Color itself, while the rest are new colors. The new LUT colors are evenly distributed within the sphere of RGB colors previously belonging to the Pick Color.

The new LUT colors are evenly distributed within the sphere of RGB colors previously belonging to the Pick Color.

Re-mapping is based on the color distance method selected in *Color Space* in the *Feature Menu* (see section 6.5.7).

6.4.7 Remove Marked Color(s)



For removing LUT output colors through manual selection.

How do I mark and Remove output colors?

- Go to the LUT edit view that best suites locating the color(s) you wish to remove. Use the zoom tools to view individual pixels if necessary.
- Select the *Remove Marked Color* tool. The tool will stay ON until you re-click it. This means that you can mark many colors before applying the function.
- Click with your mouse on any color(s) to mark it for removal.
- Marked colors can be unmarked by clicking on a pixel corresponding to the marked LUT output color.

- A warning will be displayed if you attempt to mark a Protected LUT output color for removal. Protected colors cannot be marked.
- Control your markings in different views i.e., *Histogram*, *Main*, *ColorWheel*.
- Click on the *Apply Tool* button to remove the marked colors from the output colors in the LUT.
- View the effects in the *Main View* with the *RGB/LUT button* on LUT output.
- If you regret the effects, click on the *Regret Tool* to cancel the action.

Remove Tool Effects

A marked LUT output color will be removed by re-mapping the colors it relates to in the original RGB input image. The colors are re-mapped to the nearest unmarked LUT output color.

Identifying Colors Marked for Removal

Pixels corresponding to the marked LUT output colors will be highlighted (blinking) in the *Main* and *Viewboards* views, and marked with blue dots in the *Histogram* and *Color Wheel* views.

Removed LUT output colors will be removed from the list of active LUT output colors, and thus from the *Color Wheel* and *Histogram* screens.

6.4.8 Remove Similar Color(s) (similar to Pick Color)



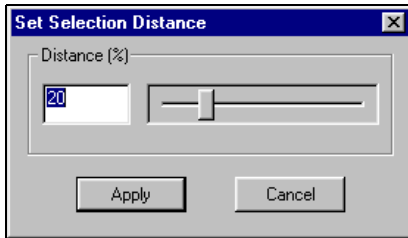
The *Remove Similar Color Tool* enables you to remove colors on the basis of their similarity.

The *Remove Similar Color(s) Tool* removes all unprotected LUT output colors that lie within a specified color distance from the Pick Color. The Pick Color itself will be removed if it is unprotected. After removal, an original input color that has lost its target, will be remapped to the nearest active output color in the LUT.

How do I Remove Similar output colors?

- Go to the LUT edit view that best suits locating the color(s) for removal. The *Color Wheel View* gives a good picture of the output color's nearness in color space (similarity), or use the *Histogram View* sorted by HSV or RGB values.
- Select a Pick Color with the *Pick Color Tool*. Your goal is to remove colors that are similar to this color.

- Use the *Protect Tool* on the Pick Color if you don't want it removed as well. Leave it unprotected if you want it removed with all the colors similar to it.
- Use the Protect Tool to protect other (similar) colors that you don't want removed.
- Select the *Remove Similar Color(s) Tool*. The tool will stay ON until you re-click it. The following dialog appears.



- Set the colors distance in the dialog box using the slider. See the definition of similarity below.
- The Pick Color and Pixels that belong to colors defined as similar to the Pick Color are highlighted/marked. You can interactively see which colors will be included because highlighting/marking takes immediate effect as you make changes to the color sphere radius by moving the sliders.
- Click the dialog's *Apply Button* to commit the function.
- Control your results in different views i.e., *Histogram*, *Main*, *Color Wheel*.
- View the effects in the *Main View* with the *RGB/LUT button* on LUT output.
- If you regret the remove effects, click on the *Regret Tool* to remove the action.

Remove Similar - Effects

Colors in the original RGB input image, that belong to LUT output colors within the sphere, are re-mapped to the nearest active LUT output colors. Protected colors are excluded from the sphere regardless of their similarity to the Pick Color. Removed LUT output colors are deleted from the list of active LUT output colors, and thus from the Color Wheel and Histogram Screens.

Definition of Similarity

Similarity is defined in the following way: The slider defines a distance which represents the radius of a sphere that surrounds the Pick Color. Colors close enough to the Pick Color, so that they are within the sphere, will be considered similar. **The smaller the distance, the less the number of colors that will be defined as similar.** The distance is represented as a percentage of the full color axis.

6.4.9 Remove Minor Color(s)

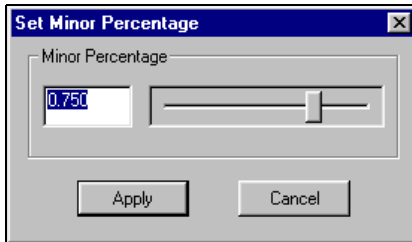


The *Remove Minor Color(s) Tool* enables you to remove colors on the basis of their relative dominance in the image.

The *Remove Minor Color(s)* function removes all unprotected LUT output colors that are identified as being minor in relation to all the active output colors. After removal, an original input color that has lost its target, will be remapped to the nearest active output color in the LUT.

How do I Remove Minor output colors?

- Go to the LUT edit view that best suites locating the color(s) for removal. The *Histogram View* and the level of each color column gives a good picture of an output color's dominance in the image.
- Use the *Protect Tool* on the colors you don't want it removed.
- Select the Remove Minor Color(s) Tool. The tool will stay ON until you re-click it. A dialog for setting the minority borderline appears.



- Set the minor percentage borderline value in the dialog box using the slider. A percentage value represents a color's number of pixels in relation to the total number of pixels in the original. The slider setting in the window determines the borderline between major and minor colors, meaning that image colors with lower percentage values will be removed when *Remove Minor Color(s)* is applied.
- The unprotected pixels that belong to colors defined as minor are highlighted/marked. You can interactively see which colors will be included because highlighting/marking takes immediate effect as you make changes to the minor borderline by moving the slider.
- Click the dialog's *Apply Button* to commit the function.
- Control your results in the different views i.e., Histogram, Main, Color Wheel.
- View the effects in the *Main View* with the *RGB/LUT Button* on LUT output.

- If you regret the remove effects, click on the *Regret Tool* to remove the action.

Remove Minor Color - Effects

Colors in the original RGB input image, that belong to LUT output colors with pixel counts lower than the borderline percentage, are re-mapped to the nearest active LUT output colors. Protected colors are excluded from the process regardless of their pixel count. Removed LUT output colors are deleted from the list of active LUT output colors, and thus from the Color Wheel and Histogram Screens.

6.4.10 Insert New Color (Pick)



The *Insert New Color Tool* enables you to insert new colors that are created on the basis of existing colors in the original RGB image. This is a powerful tool because it allows you to take out colors or color averages from the original RGB image and put them into the LUT filter as re-mapping targets. Basing your LUT on original input colors can help make it stable and well balanced in relation to a whole class of originals because you set up well-defined re-mapping relationships.

Inserting a New Color

- Move to the *Main view* or one of the Viewboards. This tools can only be used in one of these views with *the RGB/LUT Button* toggled on RGB viewing mode.
- Toggle the *RGB/LUT Button* so you are viewing in the RGB original color mode.
- Use the *Protect Tool* to mark colors you definitely don't want remapped to the new color.
- Select the *Insert Color Tool*. The cursor changes to the pipette cursor:



- Use the pipette cursor to select a pixel representing a color you want added to the LUT. Remember : Pixel selection is easiest after zooming-in so that pixels can be identified separately.
- You will be warned if you happen to select a pixel representing a color that is already present in the LUT. If you get this warning then try another color.
- Notice that the selected color becomes the new Pick Color and is ready for merge, removal, or explode actions.

- You can also insert a new color based on the average of many colors from a selected area. Hold down the left mouse key and drag a square with the new cursor over an image area.



- Release the key and see the color that appears as the Pick Color. The new LUT output color is an average of the original RGB input image colors (pixels) within the square.
- To add the color (single pixel or area), click on the *Apply Tool*.
- If you attempt to insert an RGB input color that belongs to a protected LUT output color, a warning will be displayed.
- Use the *RGB/LUT Button* to view the effects with the new color.
- View the color and its dominance in the Histogram View.

Insert New Color - Effects

The nearest original RGB input image colors will re-mapped to the new inserted LUT output color. By selecting area averages, you can ensure that whole groups of pixels will be re-mapped to one inserted color because the color will be based on and close to colors of those very pixels.

Colors that belong to protected LUT output colors will not be re-mapped.

An inserted LUT output color will be added to the list of active LUT output colors and thus appear in the Color Wheel and Histogram views.

Identifying the Effects After Color Inersion

Pixels that belong to the new LUT output color will be highlighted in the *Main* and *Viewboards* views with the *RGB/LUT Button* on RGB viewing mode. No change occurs in the *Histogram* and *Color Wheel* views until the *Apply button* is clicked.

6.4.11 Apply Edit Function Operations



Selecting the *Apply* button will conclude and commit any specified *Edit* function changes to the LUT file. The selected *Edit* tool button is turned 'OFF' when the operation is completed.

6.4.12 Undo Edit Function Operations



The *Undo* button reverses the latest edit function including changes to the colors' protection status. Up to 10 previous edit functions are "remembered" and can be cancelled with the *Undo* button.

6.5 LUT Edit Settings in the Feature Menu

The *Feature Menu* in the *Menu Bar* contains options from which you choose general LUT creation and LUT editing settings. Clicking on *Feature* displays the menu shown below.

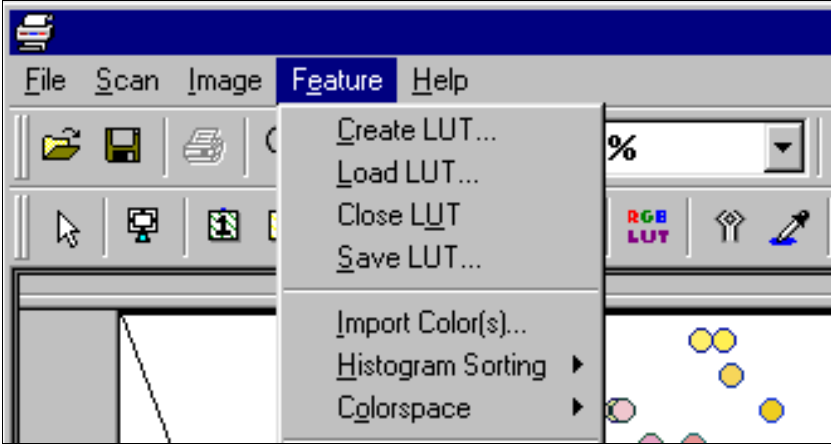



Fig. 6-5: The Feature Menu

6.5.1 Create LUT...

This is where you normally start the LUT process by generating a preliminary LUT that can then be refined through the *Edit* tools.

As described in section 6.1.1, you start by opening the RGB image file in the viewer and then select the *Feature Tab* to move the Feature Screen. In the Feature Screen, select *Create* from the *Feature Menu* to display the dialog (Fig. 6-6 shown overleaf) from which you select your LUT generation method and parameters. You also determine the number of initial colors, so it is here that you must choose starting with **Excessive Initial Colors** or **One/Few Initial Colors** (see section 6.1.3). The two setup buttons  lead to options that allow you to adjust each of the two adaptive generation methods.

LUT Generation Methods

The initial LUT generation method choices are:

Load Predefined Colors: Predefined colors from a palette are used. The palette is specified in the file window. You can select a palette by typing the file name in the edit field or by file selection through the *Browse* button. The available file types are:

- **.LUT:** The color palette part of a previously generated LUT is used.

- **.TIF:** The palette part of an indexed color TIFF file is used.
- **.PCX:**The palette part of a palettized PCX file is used.
- **.PAL:** Usage of a palette PAL file, generated by other software applications.

Image Independent (Linear): Linear distribution of colors in RGB space. The number of LUT output colors can be set in the pull-down box.

Photo, Artwork, etc.: Adaptive method. The median cut algorithm is used with the parameters specified through the setup button.

Maps, CAD Plots, etc.: Adaptive method. The modified median cut algorithm is used with the parameters specified through the setup button.

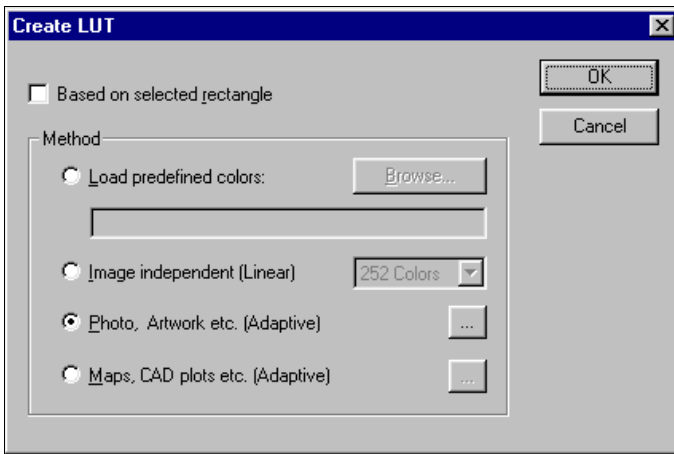


Fig. 6-6: Create LUT Dialog

As noted above, additional options are connected to the two adaptive algorithm methods – Photo, Artwork or Map, CAD plots.

Select the attached setup button  to reach the setup dialog for each of the adaptive methods. The dialog is shown overleaf:

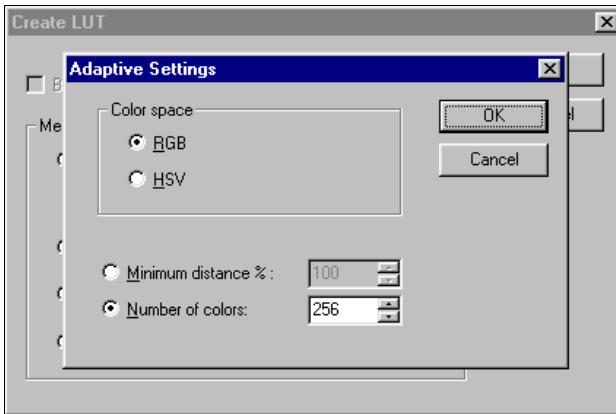




Fig. 6-7: Create LUT - Adaptive Method Settings

- Choose RGB or HSV color space for color distance calculations.
- Select the initial number of colors for your LUT output. The number of output colors can also be controlled by defining the smallest (minimum) distance between colors in color space.
- Commit your settings by clicking OK and thereby initiate the analysis of the RGB input image for generation of a representative LUT.

Tip: The initial LUT will normally be based on the whole image. With the adaptive methods, you can also create a LUT based on a selected portion of the image - a specific image area in which the colors best represent your purposes. Instructions follow below:

Creating an initial LUT on the basis of a specific image area

You may want to use a specific image area, with representative colors, as the only input for creating the initial LUT. Here's how :

- Move to the *Feature Screen - Main View* with an open image.
- Click on the *Rectangle Selector Tool* on the *View Toolbar*. 
- The cursor changes to : 
- Mark out the area by dragging the cursor. You can move and change the rectangle as described in section 6.2.3 on the *Rectangle Selector Tool*. You should now have an active rectangle.
- Select *Create LUT* from the *Feature Menu*.
- Select the *Selected rectangle* option in the *Create* dialog.
- Make the additional settings in the *LUT Create* dialog as described above and click OK.

- WIDEimage will proceed using only pixels within the square while calculating the initial LUT filter.

6.5.2 Load LUT...

Choose *Load LUT* if you want to work with a previously generated .LUT file. A file selector dialog allows you to choose your file.

6.5.3 Close LUT

This option closes the opened LUT file.

6.5.4 Save LUT...

A *Save As...* dialog is displayed for saving the generated/edited .LUT file wherever you specify.

6.5.5 Import Color(s)

Import Color(s) is used in connection with an active (open) .LUT file.

Selecting *Import Color(s)* displays the dialog below for specifying either :

- A number of self defined new colors to be added to the currently active LUT output colors, or
- A palette screen for selecting a number of new colors to be added to the active LUT output colors.

Importing Self-Defined Colors

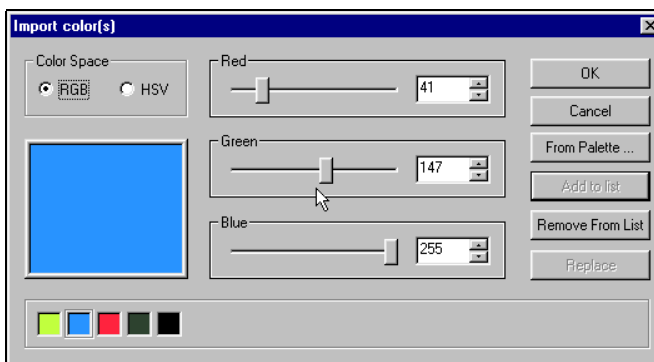


Fig. 6-8: *Import Color(s) to LUT Dialog*

- You specify self-defined new colors by mixing Red, Green and Blue using the three sliders or by setting values directly in the edit fields.
- Your result is viewed in the color window on the left. RGB color space or HSV color space can be selected.
- Click on *Add to list* for each self-defined new color. Your list of self defined new colors is displayed at the bottom of the dialog and will be updated with each new color.
- Use the *Remove From List* and *Replace* buttons to edit your list of self-defined colors.
- All the colors on the list will be imported to the LUT output colors when you click OK.

Importing Palette Colors

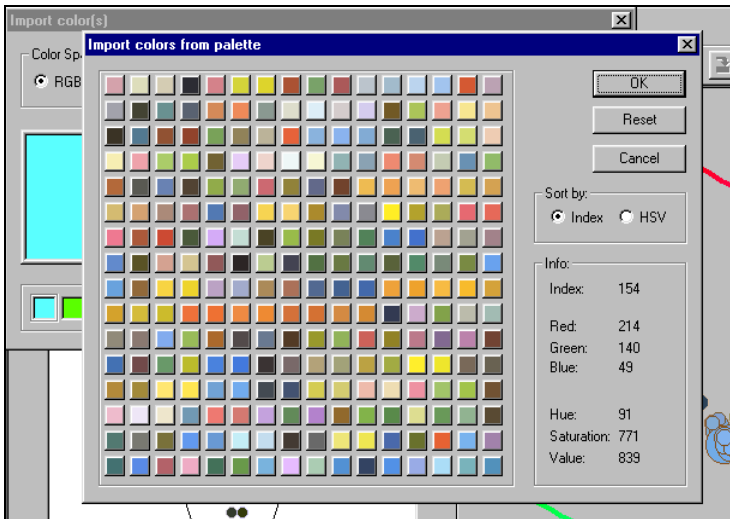


Fig. 6-9: Import from Palette Dialog

- Click on the *From Palette* button to display a file selector dialog for specifying and loading a file containing a palette.
- Loading the file displays the palette colors as small squares (see fig. above). Palette colors will be sorted either by their Palette Index Value or by their HSV value, depending on the dialog's *Sort By* box setting.
- One or more colors can be selected for importing. Click on a color square to select and deselect it. You can affect whole clusters by

dragging the mouse pointer over colors and thereby toggling their selection. The values of the last selected (single color) are displayed on the right side of the dialog.

- Click the OK button to import the marked colors from the palette and add them to the list of active LUT output colors. There will not be any RGB input colors relating to these imported colors. This can later be done using the *Merge*, *Explode* or *Remove* edit tools.
- The original number of colors in the LUT plus those added cannot exceed 255.

6.5.6 Histogram Sorting

Histogram Sorting interacts together with the *Histogram View*, allowing you to select the immediately active Histogram sorting method. The following methods are available:

- Sort by Pixel count
- Sort by Palette order
- Sort by HSV
- Sort by RGB

6.5.7 Color Space

The *Color Space* dialog allows you to determine if RGB or HSV color space is to be used in connection with the *Merge*, *Explode* and *Remove* LUT Edit functions (see section 6.2.3). *Color Space* changes will only effect LUT edit operations performed after the change.

7. Supported File Formats

WIDEimage supports more than 50 different industry standard file formats. This ensures compatibility with the maximum number of general and special applications within CAD, DTP, and Graphics.

The raster file formats supported are split into the following groups:

- General image file formats
- Graytone file formats
- Color file formats
- print file formats

For raster file formats, WIDEimage supports:

- Scanning to any of the following fifty-plus industry standard file formats.
- Converting from any file format (except the Print file formats) to any other file format (including the Print file formats).
- Viewing and zooming-in to any of the file formats (except the Print file formats).
- Printing from any file format (except color formats) to any of the supported printers, and print file formats.

7.1 General Image File Formats

Bmp. Microsoft Windows bitmap file format. Most Windows graphics and image applications support this format. Note that this format is defined “upside-down”, so that treatment after conversion or scanning may take a long time on the application.

Tif. TIFF (Tagged Image File Format, Aldus Spec.) is a standard file format used by most Raster and Desk Top Publishing programs; it is also the standard image file format for many image processing / enhancement programs.

Through the *Options* button in the *Save As...* dialogs you can select the best TIFF compression type (e.g., uncompressed, packbits, LZW, group3 or group4) and specify rows per strip or tile size. For the uncompressed, packbit and LZW types you can also select B/W or

graytones (see later section: "Graytone Formats"). Both Intel and Motorola orientations are supported.

When a TIFF file is used as source in Convert, View or Print, WIDEimage automatically detects which of the following B/W or Graytone compression methods was selected when the TIFF file was generated.

Tif. Uncompressed B/W, Graytone or Color version of TIFF, supported by most vendors.

Tif. Packbits byte oriented runlength compressed B/W, Graytone or Color version of TIFF, similar to Macintosh packbit format.

Tif. Group3 runlength compressed B/W version of TIFF, supported by many vendors.

Tif. Group4 compressed B/W version of TIFF, supported by some vendors.

Tif. LZW(Lempel-Ziw-Welch) compressed B/W, Graytone or Color version of TIFF, supported by many vendors.

A special case is the Wicks & Wilson aperture card file format, which is a separately selectable variant of TIFF:

Tif. Wicks & Wilson, Uncompressed B/W TIFF variant compatible with the Wicks & Wilson aperture card scanner. Since it is used with microfilm negatives, the image is reversed.

CALS – General for CALS - The CALS raster format is a standard developed by the Computer Aided Acquisition and Logistics Support. The CALS file is composed of the CALS header followed by some data. The CALS-headers subtype-parameter describes

and determines the format of the data that follows the header. WIDEimage supports the following CALS subtypes:

Cal – CALS1 CALS Type1 untiled format, compatible with CCITT Group4 format (CALS Computer Acquisition and Logistics System, MIL-R-28002A).

Cal – CALS2 CALS Type2 tiled format, compatible with CCITT Group4 format (CALS Computer Acquisition and Logistics System, MIL-R-28002A).

Cal – CALS4 CALS Type 4 tiled format, compatible with CCITT Group4 format (CALS Computer Acquisition and Logistics System, MIL-R-28002A).

It is a CALS-encapsulation of the JEDMICS (Joint Engineering Data Management Information and Control System) format (see below).

JEDMICS a black/white tiled raster data format as defined by the Joint Engineering Data Management Information and Control System. The image is divided into tiles of 512 * 512 pixels. Each tile is compressed with the 2-dimensional CCITT group 4 encoding algorithm.

Pcx. Black & white file format originally defined by PC Paintbrush from Z-Soft Corporation.

Rlc. Used by Softdesk CADoverlay and ViewBase. CADoverlay can be used to import raster images as an overlay into AutoCAD.

Rlc2. Softdesk CADOverlay-enhanced Rlc file format, containing additional information at the end of the file. Since Rlc and Rlc2 are compatible, except for this additional information, both formats are supported by the WIDEimage Rlc choice.

Ig4. Softdesk Group4 compressed format (similar to the Rlc2 fileformat, but with raster data segments containing strips of group4 data).

Rnl. Used by GTX corporation overlay CAD systems and Raster To Vector conversion systems (Simple runlength encoding).

Gtx-G3. Used by GTX corporation overlay CAD systems and Raster To Vector conversion systems (CCITT G3 encoding).

Gtx-G4. Used by GTX corporation overlay CAD systems and Raster To Vector conversion systems (CCITT G4 encoding).

Ras. Sun raster format (is the native bitmap format for the SUN UNIX platform).

Eps. Encapsulated Postscript format. Works with many Desk Top Publishing software packages.

Hrf. Hitachi Inc. CADCore format.

Rst. Indigo Graphics Systems Inc. raster format.

Gr4AB. ABB Engineering Automation Inc. format compatible with CCITT Group4 format.

VifAB. ABB Engineering Automation Inc. format compatible with runlength compressed format.

CitIN. INTERGRAPH Inc. format compatible with CCITT Group4 format (Intergraph Type 24).

RleIN. INTERGRAPH Inc. format compatible with runlength compressed format (Intergraph Type 9).

Pict. Macintosh PICT format is one of the best supported file formats on the MAC platform (packbit encoding).

Pro-RLc. Xerox Pro Scan RLC file format.

Wpf. Wicks & Wilson internal file format.

ImgCM. File format used for the CADmate Raster To Vector conversion package, as well as for the general raster format (EYESTAR format) supported by Microtek desktop scanners.

ImgCC. File format used for AutoDesk's CADcamera Raster To Vector conversion package (similar to Datacopy Inc. Img format).

ImgGEM. Used by Digital Research Inc. GEM applications, such as GEMpaint and GEMscan. Note that many GEM applications are rather limited in the size of image they are able to load.

Scn. Used by Eldak's Raster To Vector conversion package and by Eldak's raster editor (similar to Scan-Graphics Inc. Scn format).

Cut. For the Media Cybernetics Dr. HALO raster editor.

7.2 Graytone Formats

Tif. Uncompressed 8-bit gray-level version of TIFF. Graytone options can be selected through the *Options* button in the *Save As...* and *Batch Convert* dialogs. (See Tif file format in previous General Image file section for setup.)

Tif. Packbit compressed 8-bit gray-level version of TIFF. Graytone options can be selected through the *Options* button in the *Save As...* and *Batch Convert* dialogs. (See Tif file format in previous General Image file section for Setup.)

Tif. LZW (Lempel-Ziw-Welch) compressed gray-level version of TIFF, supported by many vendors.

Bmp. Microsoft Windows bitmap file format. Most Windows graphics and image applications support this format. Note that this format is defined “upside-down”, so that treatment after conversion or scanning may take a long time on the application.

Igs. 'Softdesk' uncompressed Graytone format.

Pcx. Graytone 8-bit format as defined by Z-Soft for PC-Paintbrush, widely used with many applications. Graytone options can be selected through the *Options* button in the *Save As...* and *Batch Convert* dialogs.

Ras. Sun gray-level format (is the native bitmap format for the SUN UNIX platform).

Jpeg. Joint Photographic Experts Group compression as specified in ISO 10918-1. Achieves outstanding compression ratios by "lossy" algorithm. The lossyness can be controlled by setting the quality factor in the *Save As... - Options* dialog.

NOTE: For scanning, the graytone file formats are selectable when *Mode* is set to "Graytone"

Conversion between the above graytone formats is supported with graytones maintained.

Conversion of the above graytone formats to a line mode format and Printing or Viewing of graytone files is supported by the user specifying a threshold value between 0 and 255.

Conversion of a line mode format to one of above graytone file formats is supported by mapping 0 and 1, to 0 and 255.

NOTE: Graytone formats produce very large files; e.g., an E-Size drawing scanned at 300 DPI results in a file size of 150 Mb.

7.3 Color Formats

Tif. Uncompressed 24-bit color version of TIFF. Adjustable settings can be made through the *Options* button in the *Save As...* and *Batch Convert* dialogs. (See Tif file format in previous General Image file section for options.)

Tif. Packbit compressed 24-bit color version of TIFF. Adjustable settings can be made through the *Options* button in the *Save As...* and

Batch Convert dialogs. (See Tif file format in previous General Image file section for options.)

Tif. LZW (Lempel-Ziw-Welch) compressed 24-bit color version of TIFF, supported by many vendors.

Tif. Feature extracted and indexed 8-bit and 4-bit color formats.

Bmp. Microsoft Windows bitmap file format. 24-bit true color and 8-bit and 4-bit feature extracted and indexed color formats. Most Windows graphics and image applications support this format.

Pcx. 24-bit true color and 8-bit and 4-bit feature extracted and indexed color formats as defined by Z-Soft for PC-Paintbrush. Widely used with many applications. The graytone option can be set through the *Options* button in the *Save As...* and *Batch Convert* dialogs.

Ras. Sun 24-bit truecolor and 8-bit feature extracted and indexed color formats (is the native bitmap format for the SUN UNIX platform).

Jpeg. Joint Photographic Experts Group compression as specified in ISO 10918-1. Achieves outstanding compression ratios by "lossy" algorithm. The lossyness can be controlled by setting the quality factor through *Options* in the *Save As...* and *Batch Convert* dialogs.

NOTE: For scanning, the color file formats are selectable when "Mode" is set to "Color"

Conversion between the above color formats is supported with colors maintained.

Conversion of above color formats to graytone formats is supported by using:

$$\text{Gray-level} = 0.29 \times R + 0.59 \times G + 0.11 \times B$$

Conversion of above color formats to a line mode format is supported by internal conversion to Graytone levels and the user specifying a threshold value between 0 and 255.

NOTE: 24-bit true color formats produce very large files; e.g., an E-Size drawing scanned at 300 DPI results in a file size of 450 Mb.

7.4 Print File Formats

Rtl. Hewlett Packard Raster Transfer Language output file format supported on the HP7600, HPDesignJet, Océ Graphics thermal printer and the NovaJet printers.

Pcl. File format for HP LaserJet-compatible laser-printers.

Tif. Group4 compressed B/W version of TIFF, supported by some vendors.

Generic Cals. Many printers today support output in the CALS type 1 format.

Ver. VersaTec Inc. CADMate electrostatic large-format printer raster output file format. The Versatec Data format is also available.

Crf. CalComp Inc. DrawingMaster thermal large-format printer raster output file format.

Jdl. Japan Digital Laboratory Inc. Express Printer output file format.

Atl. 24" thermal printer raster output file format.

Con. Hybrid thermal printer raster output file format.

Scm. Partner Gmbh. SCANmate electrostatic large-format printer raster output file format.

Gra. Graphtek thermal printer raster output file format

Ltx. Roland Inc. LTX420L, LTX420, LTX320L, and LTX320/321 thermal large format printer raster output file format.

7.5 Setting the CALS Gp4 Orientation

If you choose to scan or convert to CALS Gp4 format, the *Setup* button in the file selection dialog allows you to input the pel/path orientation and store it in the Gp4 CALS file header of the document to be scanned or converted.

The CALS Gp4 pel/path orientations selectable are:

00/270 (default)

90/270

180/270

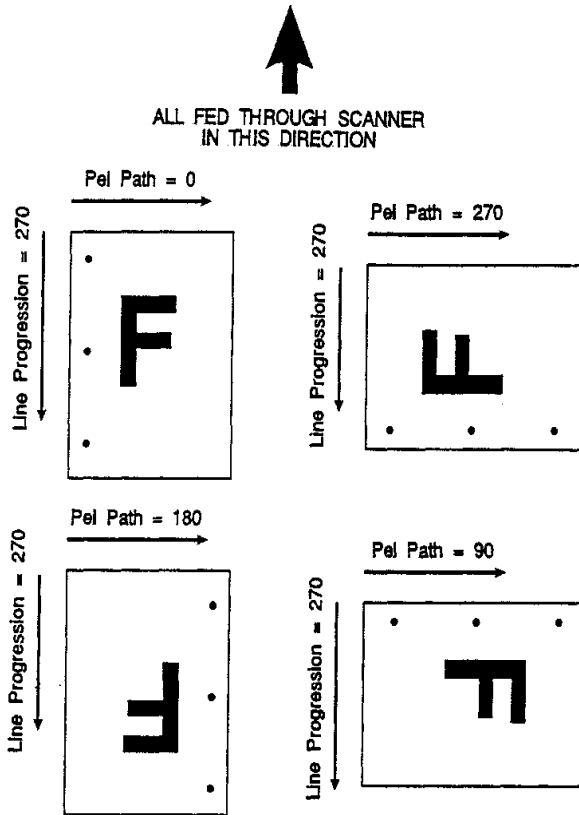
270/270

For CALS Gp4 documents, the manner in which the ODA raster architecture deals with orientation requires the use of two operations. The pel-path and line-progression directions specified for the document at interchange time will guide the user during the imaging process. To get proper viewing, a reader will take pels from a compressed or uncompressed data stream (file) and place them on the screen or paper in the directions indicated. The decoding program will lay down the first line of pels along the pel-path direction and the second line along a path parallel to the first, but displaced from it along the line-progression direction.

The decoding system knows its own requirements. If the target device is a display, the pels may be placed in memory in one organization. If the target device is a narrow printer, the pels may be placed in memory by the decoding program in a different way. This means that the orientation parameters found in the file are purely descriptive, not rescriptive.

The pel-path direction may have any of four values and the line-progression direction can be at either of the two possible right angles to it. Therefore, this model can describe images that are not only retreated, but also mirrored either vertically and/or horizontally. This allows the orientation parameters to describe how to image a file that might have resulted from scanning the reverse side of an aperture card or paper sepia. This procedure may have been done in order to improve image quality.

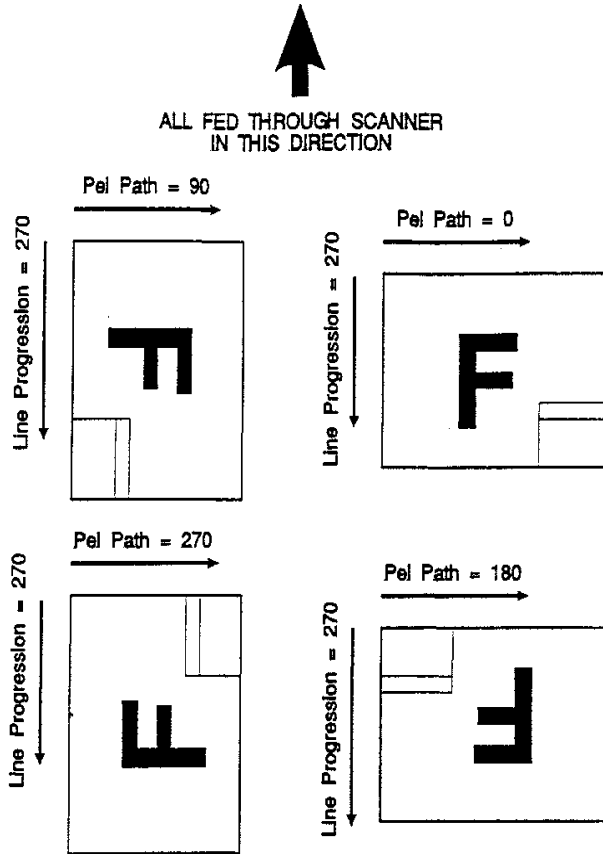
Refer to the figures overleaf for an illustration of the possible orientations.



Note 1: The pel path direction is measured in degrees counterclockwise from the positive horizontal axis (east).

Note 2: The line progression direction is measured in degrees counterclockwise from the pel path direction.

Fig. 7-1: CALS Positioning of Portrait Document



Note 1: The pel path direction is measured in degrees counterclockwise from the positive horizontal axis (east).

Note 2: The line progression direction is measured in degrees counterclockwise from the pel path direction.

Fig. 7-2: CALS Positioning of Landscape Document

If a mix of scans is done as a batch, and the file-writer assumes that all of the scans have a certain orientation, when in fact they do not, then a QA post-process will be necessary. The QA operator would view each scan, check its quality, perhaps perform a clipping operation, and then identify which direction would be "up" for proper viewing orientation. The orientation parameters would end up in the file, which until that point would have had incorrect orientation parameters. No other changes or actual rotation would be required.

It is worth noting that some organizations require that all files have the same orientation.

Rotation to Proper Viewing Orientation

MIL-R-28002A allows the contractor to optionally specify that all documents be rotated, where necessary, to achieve proper viewing orientation, with pel-path direction set to 0 and line-progression direction set to 270. If this option has been specified, the QA process described above would require an additional step of rotating any document that was improperly scanned. This contracting option would be specified in systems where the viewing subsystem is not powerful enough to perform at display time any rotation that may be required because of earlier random-orientation scanning.

7.6 JPEG Format:

JPEG is a compression method for full-color and gray-scale images.

JPEG is designed to handle "real-world" scenes, for example, scanned photographs. Line drawings images are not JPEG's strong suit. For that sort of material you may get poor image quality and/or little compression. Converting a B/W image to JPEG will result in a larger gray-scale image file of poor quality, and is therefore not recommended.

JPEG is 'lossy', meaning that the output image is not necessarily identical to the input image. Hence you should not use JPEG if you must have identical output bits. However, on typical real-world images, very good compression levels can be obtained with no visible change. Amazingly high compression is possible if you can tolerate a low-quality image. You can trade off image quality against file size by adjusting the "quality" settings through the *Options* button in the *Save As...* and *Batch Convert* dialogs:

Quality: The quality option lets you trade off compressed file size against quality of the reconstructed image: the higher the quality setting, the larger the JPEG file, and the closer the output image will be to the original input. Normally you want to use the lowest quality setting (smallest file) that decompresses into something visually indistinguishable from the original image. For this purpose the quality setting should be between 50 and 95; the default of 75 is often about right. If you see defects at quality 75, then go up 5 or 10 counts at-a-time until you are satisfied with the output image. Quality values above around 95 are not recommended for normal use. The compressed file size increases dramatically without significant gain in output image quality.

Smoothing: The smoothing option filters the input to eliminate fine-scale noise. A moderate smoothing factor of 10 to 50 may get rid of dithering patterns in the input file, resulting in a smaller JPEG file and a better-looking image. Too large a smoothing factor will visibly blur the image. The default value is 0.

7.7 File Format Limitations

Some scanner models support scanning at very high resolutions. Scanning at maximum width (8.5 on the front measurement ruler) at 1000 DPI produces approximately 36000 pixels/line.

This results in a problem with file formats that were designed to accept a maximum length of approximately 32000 pixels (signed 2 bytes), or 64000 pixels.

The file formats with the 32000 limitation are: Pcx, Cut, Rlc, Vif, ImgCC, ImgCM and ImgGEM. JPEG formats have the 64000 limitation. WIDEimage solves limitation problems by writing the correct value in the width field in the file header. This means that WIDEimage will work correctly with these formats.

Whether third party software will work with these files depends on the implementation. An example of a program that works correctly with the files is CADOverlay ESP version 3.5, although Rlc originally was designed to handle a maximum of 32000 pixels. If your software cannot handle the wide files correctly, you have the following possibilities:

1. Scan at max 800 DPI.
2. Limit the scan width so the scanner does not produce too many pixels.
3. Have the third party software vendor change the way they read the files.

8. Appendix A: About Color Scanning

Introduction

A wide format color scanner is designed to accommodate a large number of different scanning needs such as black and white scanning for CAD applications, classified scanning for GIS applications and true-color scanning for large format copying.

This document describes how to use your color scanner for color copying. At first, color copying may sound like a simple task. You just scan an original and get a file that - of course - is compatible with your printer. Since it is that simple with black and white, one would expect the same ease with color copying. Unfortunately the world of colors and color reproduction is not so simple, mainly because the scanner produces device dependent RGB colors, while printers need device dependent CMYK colors.

In an ideal world this would not be a problem. If printers were able to combine Cyan, Magenta and Yellow correctly it would be a simple mathematical problem to convert colors from RGB to CMYK. However, printers are far from being ideal. Printers such as inkjets are highly nonlinear and can only reproduce a fraction of the colors that can be produced by a scanner and viewed on a monitor.

During color copying we therefore need to undertake a number of additional steps besides scanning and printing in order to ensure high quality copy results. These are:

- Scanner Color Calibration.
- Raster Image Processing.
- Color Management.

Scanner Color Calibration

Included with your Color Scanner is an IT8.7 characterization target. The color values for each patch on this target is described in the IT8DATA.IT8 file placed in the application's installation directory. Running the wizard for scanner calibration adjusts the electronics in the scanner so RGB output from the scanner will match the color values from the IT8DATA.IT8 file as closely as possible.

The colors produced by the scanner after performing color calibration are not especially vivid and actually tend to be a bit dark. So why should we want to color calibrate the scanner? Scanner calibration is necessary to ensure stability, reproducibility and predictability of color output. RIP'ing and color matching mentioned later in this text can take care of producing the 'right' colors for us.

And why isn't scanner output stable? Over time, parts in the scanner, such as the light sources, will change thus this will affect the color balance and linearity. So if we do not color calibrate the scanner, the

output produced by the scanner half a year from now will differ from that produced today. By color calibrating the scanner at regular intervals, say once a month, you ensure that all files created are based on the same color scheme. Thus, the results you get from the RIP and your color management system are predictable, so you don't have to waste time and money experimenting in order to get the right result.

Raster Image Processors

When talking about RIP's, many tend to think of PostScript RIP's that are used to rasterize the fonts and vector graphics in a PostScript file. But in order to output, for example, a TIFF file containing RGB data on an inkjet printer you will also need a RIP. In this case, the job of the RIP is to convert from RGB to Cyan, Magenta, Yellow and blacK dots on the output media.

The RIP does this either by using halftone screening or stochastic screening. When using halftone screening, the shade of each color Cyan, Magenta, Yellow and blacK is represented by cells, e.g. 8 by 8 dot's where a certain percentage of the dots are on, corresponding to the intensity of the color. When using stochastic screening, the RIP uses randomly placed dots instead of the nicely aligned dots that are used in halftone screening. Often stochastic screening produces a better looking result on low resolution devices such as inkjet printers.

Apart from the screening, RIP's can act as color and ink control managers, handle enlargement, rotation, tiling and paneling, previewing and a number of other important tasks.

There are a lot of different color RIP's on the market today. The cheapest solution is just to use the Windows driver that comes with your printer. It will do the job, although the result will not be as good as that which can be obtained when using a dedicated RIP. To get better results, you may choose to use a low price RIP for a few hundred dollars (e.g. RenderPrint from Insight). For real professional results you will have to spend several thousands dollars on a high-end RIP such as PosterJET from DigiColor¹.

Color Management

Devices such as scanners, monitors and printers use different characteristics in the way they represent colors. Therefore, in order to ensure a close match between scanned input and monitor/printer output, some standard system is required to convert between the colors represented by each device.

Please note, that we are referring to predictable colors and not WYSIWYG colors, the latter being an unobtainable ideal result. This is one of the most important concepts in color management: a scanner might produce colors that can be seen on an RGB monitor, but cannot

be obtained with CMYK printing. So the objective is not to match the colors in the original - which is usually impossible - but to provide the best possible approximation of these colors, within the limitations of the monitor and the ink on paper, and to do so predictably.

A few years ago the International Color Consortium (ICC), published a detailed standard for device color profiles. Standard ICC device profiles use the CIE color model to represent the behavior of scanners, digital cameras, monitors and printers. The CIE model acts as a "universal translator" between, say the RGB color space of a scanner and the CMYK space of a printer. It works in conjunction with color transformation engines that actually perform such conversions.

The first implementation of the ICC profiles was ColorSync on the Macintosh. The next was the Image Color Matching (ICM) system included with Windows 95. Microsoft will support ICM in a future release of Windows NT and workstation vendors such as Sun will also include support for ICC in their operating systems.

A lot of add-on color management systems are been available for the Macintosh and these systems are now also becoming available for PC's running Windows 95 and NT. The first system for Windows 95 was FotoTune from AGFA and Kodak Precision CMS from Eastman Kodak and but soon the well known ColorBlind color management system will also be available both for Windows 95 and NT.

Image Color Matching under Windows 95

Under Windows 95, Color Management is supported by the ICM API in Win32. The operating system gathers information about the devices ICC profiles from the .ICM files placed in the <Windows95>\system\color directory. Applications written to support ICM can use the API calls to make the operating system map colors between devices such as monitors and printers. Unfortunately at the moment, very few applications support ICM under Windows 95 . A growing number of applications are expected to do this within the next few years.

AGFA FotoTune

Currently, a more practical approach to color management under Windows 95 is to use the FotoTune software package from AGFA. This color management system, available as a plug-in for Adobe PhotoShop for Windows 95 (FotoTune currently does not run under Windows NT), contains a dedicated color matching engine that acts as a translator between the RGB color space of the scanner, the RGB color space of the monitor and the CMYK color space of the printer.

In order to work properly, FotoTune must have an accurate color profile of the scanner, monitor and printer. FotoTune contains profiles for most common monitors and printers and a profile for the Color

Scanner is placed in the application's installation directory. To make the Color Scanner profile available to FotoTune, copy the file CTX_W4 from the application's installation directory to the \fotoflow\ctags directory.

When you have installed FotoTune, two filters are made available in PhotoShop: FotoTune/ColorMatcher and FotoTune/SoftProof.

You can use the SoftProof filter to preview what you get on paper through your monitor. You must select the scanner as the Source and then select appropriate profiles for your monitor and printer. You can then use this filter to get an impression of what your output will look like once it is printed.

Use the ColorMatch filter to process your image in order to get the best possible output on your printer. Don't be put off by the fact that the image might look completely wrong on your monitor, it will be all right on the paper.

Making Your Own AGFA FotoTune Profile

To obtain an even better match with your Color Scanner you can use FotoTune to make an individual profile for the scanner. To do this, you need to run the color calibration from the scanning application's File/Calibrate Scanner... menu. Having done this you should scan the IT8 test pattern (delivered with your Color Scanner) on camera 1 as an A4 page. Use the View Screen's crop function in the program to crop the image so only the color patches are left without removing any of the colors. You have to be very precise. Save the result as a TIFF file, for example IT8.TIF.

Copy the file IT8DATA.IT8 from the application's installation directory to the \fotoflow\crefs directory enable FotoTune to determine how the calibration original looked.

Start up FotoTune and click "new" below the scanner icon. Specify the name of the TIFF file you created (IT8.TIF) and push the Analyze... button. If you have been sufficiently accurate in your cropping, FotoTune will accept your file meaning you have a color profile for exactly your scanner. If the file is not accepted, you will have to go back to the program and improve the cropping step.

Color Profiles Installed Together with this Application

When installed under Windows 95 and Windows NT, the following two files are placed in the installation directory:

CTX_W4.ICM Windows 95 standard ICC color profile

CTX_W4 AGFA FotoTune color profile

Under Windows 95 the CTX_W4.ICM file is also installed in the <Windows 95>\system\color directory as a standard Windows 95 device profile.

Scanning

Once you have set up your Color Management and the RIP, there are a few things you should keep in mind when scanning.

First of all you should always scan to RGB color. The color management system will not work correctly with index colors.

Second, you must select a proper file format. The application supports scanning to a number of different color file formats: e.g. BMP, JPEG, PCX, Sun Raster and TIFF. The two most commonly used formats are JPEG and TIFF. JPEG provides excellent compression of about 50 times when running with the default setting. However JPEG uses a lossy compression scheme, i.e. it throws away information in order to achieve it's high compression and low file size. This is often unacceptable in connection with high quality copying. TIFF is the most widely used format for color scanning. When scanning in color, you can either scan uncompressed or use LZW compression. Do not use Group 3, Group 4 or Packed Bits, these compression methods only work for black and white and will corrupt your data! LZW is a lossless compression scheme, so no information is lost when using it. It will compress the files around 1.5 to 3 times. It doesn't sound like much, but when you are working with color files of 100Mbytes or so, it could make a big difference. The only disadvantage with using LZW is that some applications do not support it.

It is very important that you scan with gamma curve, contrast and brightness parameters set to exactly the same values that you used when you created your color profile. The default ICC and AGFA FotoTune profiles that came with the application were generated using default gamma, contrast and brightness values set to 0. When you create your own profile it would be best to do the same.

1.IT8.7/3, "Graphic technology—Input data for characterization of 4-color process printing", draft standard of Subcommittee 4 (Color) of ANSI Committee IT8 (Digital Data Exchange Standards), 14 December 1992, Paragraph 4.2.

Insight Development Corporation
2420 Camino Ramon, Suite 205
San Ramon, CA 94583
Phone: +510 244 2000
Fax: +510 244 2020
Internet: <http://www.insightdev.com>

DigiColor International Ltd.
Crown House, The Metro Centre
Toutley Road, Wokingham, Berkshire, RG41 1QN United Kingdom
Phone: +44 1189 78178
Fax: +44 1189 78179

Internet: <http://www.digicolorint.com>

Agfa Gevaert NV
GS/EPS FotoTune geb.58/04
Septestraat 27
2640 Mortsel
Belgium
Fax : +32 3 444 76 77
Internet: <http://www.agfahome.com>

EASTMAN KODAK COMPANY
Color Management Group
900 Chelmsford Street
Lowell, MA 01851
Phone: +1 716 726 7260
CompuServe: GO KODAK

9. Appendix B: Scanning With Thick Media

Scanning needs are not always limited to convenient paper thin media. Many industries, such as reprographics and GIS, will find the need to digitize or copy images printed or pasted on thicker media such as cardboard, foamboards, gatorboards etc.

Thick media scanning is not as straight forward as normal scanning. Certain procedures should be followed in order to compensate for the original's bulkiness and stiffness. Thick media scanning also sets some limitations on certain scanning modes and automatic adjustments. This chapter is about the procedures and limitations involved when scanning thick originals.

The following guidelines and comments apply to media from 2 mm (0.08") thick, hereafter termed "thick media" throughout this chapter. Original's from 0 mm to 2mm are considered "normal" scanning media. The guidelines and instructions apply for scanner model's originally constructed for thick media scanning.

9.1 Adjust the Insertion Slot

Normally, the insertion slot on your scanner will be set to take in normal scanning media. To carry out thick media scanning, you must enlarge the insertion slot space on your scanner and fit it to your thick original. See the **Operator's Guide** that came with your scanner for instructions on making insertion slot adjustments.

9.2 Scanner Adjustments

Your scanner needs to keep certain internal factors in line in order to function properly. The scanner frequently performs a completely automatic adjustment of its light profile and stitching factor but only when in the "Normal" thickness position. When you raise the insertion area to accommodate thick media, these automatic adjustments are turned off and you have to take certain measures to maintain them.

Light profiles – Adjustment of the light profiles must take place frequently because even slight movements of the cameras can affect optimal scanning conditions. As stated above, the light profiles are only adjusted at the "Normal" (0-2mm) position.

It is therefore important to let the scanner start up at the "Normal" position so that the light profiles will adjust themselves before your new scanning session.

If you are scanning thick media over many hours, then it is strongly recommended that you, from time to time, take down the insertion slot adjustment to the “Normal” position in order to trigger a new light profile adjustment. The scanning application will give a warning if a light profile adjustment hasn’t taken place within the last two hours.

Stitching – Stitching is the term used to describe the scanner’s ability to connect image points between cameras, despite overlapping or missing pixels.

Stitching settings are also automatically adjusted in the “Normal” position but, unlike light profiles, the stitching settings found at the “Normal” position may not be correct for your thick media. Therefore, whenever you scan thick media at other positions than “Normal”, you have to check the stitching factor and perhaps adjust it.

Normally, only stiff media will affect stitching while flexible media will likely be stitched properly regardless of its thickness. Stiff media will “perch” itself on top of the scanner rollers and thus rise a small distance over the glass plate which serves as the basis for “Normal” stitching settings.

Stitching adjustments are made in this program’s *Scan Menu - Scanner Setup dialog*. See the relevant section in this manual for more details. To modify the stitching factors, you insert your thick original in the scanner, and then scan while checking the results in the viewer. Look for overlapping or missing pixels in the camera transition areas and then adjust the values (for each camera) in the *Scanner Setup dialog*. The stitching parameters are modified by adding offsets to the automatic normal settings. Repeat the process until the effect is minimized.

The modified stitching parameters will automatically be selected when in one of the extended media positions and not in the “Normal position”, where the standard automatic stitching setting is always used.

9.3 Positioning the Scanner

Don't place the scanner pressed up close to a wall because a thick and stiff original will not bend and fall towards the floor as it passes out the other side of the scanner. Make sure you position your scanner so that the empty space behind it is at least as long as the original being scanned.

9.4 Thick Original - Insertion and Support

It is recommended to insert thick media using **Center Alignment** which gives a balanced grip from the rollers in the scanner. Remember to set the scanner to *Center Alignment* reading in the application's *File Menu – Scan Preferences*.

It is also recommended you help support the original with both hands during scanning so that it does not tilt and thus distort the image in the end result. This should be done both at front as the original enters the scanner and from behind as it exits.

9.5 Limitations

No Prescanning - Prescanning is like scanning, but the scan is carried out only in memory. Prescanning is used when a user wishes to evaluate a scan while making such adjustments as color tones, threshold etc. In some modes, the scanner performs its own prescans in order to make automatic assessments and calculations.

Prescanning is carried out by repeated scans of the original as it automatically slides back and forth in a direct path over the cameras. Unfortunately, the sheer bulkiness and stiffness of thick media makes it likely to swerve slightly in its path over the cameras. This means that the mechanical "sliding" cannot be performed with enough accuracy to enable reliable prescanning.

Below is a list of the scanning tools and modes that require prescanning and therefore **cannot be performed with thick media** :

- Index Color scanning mode
- Histogram Auto in B/W threshold mode
- Histogram Manual in B/W threshold mode
- *Apply buttons* in the mode adjustment dialogs
- Black and White point Setup
- Automatic Alignment
- Scanwindow – Scan an isolated image portion

Speed - In the thick media positions, scanning speed is automatically reduced in order to ensure smooth movement despite the media's low grade of flexibility. The "Normal" position gives the highest scanning speeds.

Edge Distortion - Scanning of thick originals can create distortions in the end result when the original's front edge meets the exit rollers or when the trailing edge leaves the entry rollers. To omit this problem, the leading and trailing edges are by default skipped when in one of the extended media thickness positions, i.e., insertion slot positions other than "Normal". Skipping of the leading/trailing edges can be turned OFF/ON through the scanning application's *Scanner Setup* dialog – *Extended Thickness* – *Use extending thickness paper handling*.

10. Appendix C: Program License Agreement

You should carefully read the following terms and conditions before opening the CD-ROM package. Opening the CD-ROM package indicates your acceptance of the terms and conditions. If you do not agree with them, you should promptly return the package unopened and your money will be refunded.

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CONTEX A/S

11. Appendix D: Glossary

Acquire:	A command in some programs that starts the HP PhotoSmart PhotoCapture software, to scan a picture directly into a program.
Activate:	To activate an open window, click anywhere on it or choose its name from the Window menu. To activate a window that is not open, open the window.
Active Window:	The window currently in use or currently selected. If a window is active, its title bar changes color to differentiate it from other windows. Only one window can be active at a time; the other windows are inactive.
AdaptiveThresholding	Advanced 2-D Adaptive Thresholding estimates the background gray level in a window area around each pixel. The difference between the actual pixel value and the background is then compared to the adaptive settings to determine if a pixel is thresholded as a black or a white pixel
Additive Colors:	The additive primary colors are red, green and blue. These additive primaries represent the three main components of white light. Used individually or together, these three colors of light can be mixed to create nearly all colors. When these three primary colors are mixed in equal parts they produce white. Additive color is used in scanners and computer displays.
ADL+ Error Diffusion Halftoning	Image Processing that supports visibility of graytones in printed output by adding toned shades of gray in regions between black and white. Carried out as a segment of Dual 2D-Adaptive enhancement processing in copy modes.
Automatic Exposure:	A feature of the HP PhotoSmart PhotoCapture software that automatically sets brightness and contrast levels to optimize the quality of the final scanned picture.
Bit:	The basic unit of digital information stored in a computer.
Bitmap:	A type of computer image made from a matrix of individual pixels. .bmp.
Bitmapped Image:	A bitmapped image is a computer file representing a line-art image that was scanned with a scanner. Refers to the pattern (map) of bits that are either black

or white.

- Black Level:** The *Black Level* is a setting in scan programs used to change dark graytone colors to true black. For example, if one is copying a brochure with a mixture of text and pictures, the text will often be digitized to a color that we may see as black but really is a dark graytone. When the printer digests this graytone data, it will print the original's text with a halftone pattern, meaning scattered dots instead of solid black. By increasing the *Black Level* value, one can get the text to be copied in real black and it will therefore appear clearer.
- Black Point Adjustment:** An adjustment made that will determine the amount of shadow detail in an image. It is considered proper to set the black point so that the darkest part of an image will only just have zero detail.
- Blueprint:** A process of photographic printing used mainly for copying architectural and mechanical drawings; produces blue lines on a white/bluish background.
- Blur:** The averaging of pixel elements.
- Brightness Adjustment:** An adjustment on a scanner that allows the user to compensate for a light or dark original.
- Byte:** A unit of digital information made up of a string of 8 bits.
- Calibration:** Adjusting a device so that it performs in accordance with an established standard.
- Scanner calibration is minimizing color deviation between scanned ANSI IT8 reference color patches and the known color reference values. Generally, Calibration is the process of setting a device to known color conditions – stabilizing the device to a known and quantifiable state.
- Calibration is commonly done with devices that change color frequently, such as monitors (phosphors lose brightness over time), scanners (light changes) and printers (proofers and other digital printing devices can change output when colorant or paper stock is changed).
- CALS:** Computer-aided Acquisition and Logistics Support (CALS) standard, a U.S. Defense Department and industry initiative that addresses the design, manufacture, and support issues of generation, access, management, and use of technical data in

digital form.

- CCD:** Charge Coupled Device, CCD is the image sensor in the scanner that converts light to voltages. These voltages are converted by the scanner into the image.
- CCITT Group3:** Standard runlength compression format used with FAX transmission. It utilizes modified Huffman coding to further compress the runlength numbers. Most scanner file formats are dialects of this format.
- CCITT Group4:** Two-dimensional compression format, giving very compact image files. Standardized by CALS (MIL 28002) and ISO-ODA for Drawing Archival and Interchange.
- Check Box:** Check boxes turn a feature on or off. The feature is on when the box contains an "X." or "(." Click the box to check or uncheck it as required.
- Choose:** Select an item from a menu. Click the main menu item and then click the item in the drop-down menu; or, click the menu item, drag to the drop-down menu item, and release the mouse button.
- CIE LAB:** A device-independent color space specified by CIE, used in modern color management software to facilitate conversion of data from a scanner to a display, or from a display to an output device.
- CIE:** Centre Internationale d'Eclairage (CIE) is an international organization that establishes methods for measuring color. These color standards for colorimetric measurements are internationally accepted specifications that define color values mathematically. The first color space model, the CIE xyz, was developed in 1931. CIE defines color as a combination of three axes: x, y, and z. The two color spaces released in 1978 are CIE Lab and CIE Luv. The goal was to provide an accurate and uniform reference of visual perception.
- Click:** Position the mouse cursor on top of an object and press and release the left mouse button once.
- Clipboard:** A temporary storage place used for copying and pasting pictures between programs.
- CMYK:** The subtractive printing colors. Cyan, Magenta, Yellow, Black.

- Color Balance:** The visual effect of an image when the amount of each color and the overall amount of color are balanced.
- Color bit depth:** The simplest pixel has two options: black or white. (A pixel with two choices is known as a 1-bit image, or two raised to the power of one). Adding more bit information increases the number of color options. The number of potential color options for a pixel is called color bit depth. For example a 4-bit pixel would have 16 color options, and an 8-bit pixel would have 256 color options, while a 24-bit pixel would have 16,777,216 color options.
- Color Cast:** An image is said to have a color cast if its colors are not true. A color cast will usually be described by stating the particular color predominant in the image, e.g., the grass appears to have a red color cast.
- Color Correction:** To improve the color rendition. Correcting for, and eliminating an unwanted color cast.
- Color Management System:** Color Management System (CMS) software increases the accuracy of color interchange between scanners, displays and printers based on profiles for each device. The CMS is a layer of software resident on the computer that negotiates color reproduction between the application and color devices. The CMS performs the color transformations necessary to exchange accurate color between diverse devices. The Color manager needs access to characterization data for the device. The format and content of such device profiles is standardized by the International Color Consortium (ICC.)
- Color Separation:** Process of separating colors, in an image, into primary color components for printing. Converting an RGB color image into CMYK color image. Color separation is a technical function during which critical settings such as GCR, black ink limit and total ink limit are applied to the image.
- Color Space:** A color space is a particular language used to describe color. Examples of color spaces are: RGB, CMYK, HSV, CIE LAB.
- Color:** Electromagnetic energy that exists in the form of wavelengths creates the perception of color. There is a huge difference between the visible spectrum we can see with our eyes and the colors which can be reproduced on a computer screen and then printed on a color printer. The total number of colors that a device can produce is called its color gamut. The visible spectrum is larger than the color gamut of a color monitor, which in turn is larger than that which

	can be reproduced by a color printer. No system can produce all the colors visible to the human eye.
Contrast:	The difference between the lightest and darkest significant areas in a picture. A picture with high contrast has nearly white areas and nearly black areas with sharp changes in brightness between them. The picture seems dominated by stark light and dark tones.
Copy:	To duplicate an image and place it on the clipboard.
Crop Box:	A box drawn in the picture when the Size tools are visible. It shows the area that will be scanned when saving or printing the picture.
Crop:	To select the part of the picture desired. Only the part of the picture inside the crop box is saved or printed.
Density units:	Photographers and printers measure transmission in base-10 logarithmic density units, where transmission of unity corresponds to a density of 0, transmission of 0.1 corresponds to a density of 1, transmission of 0.01 corresponds to a density of 2, and so on
Density:	The light stopping ability of a film. Density is inversely proportional to the amount of light reflected or transmitted by an image.
Destination:	The program or device where the scanned picture will be printed or used. This information lets the software produce the highest-quality picture based on the characteristics of the selected device.
Device Dependent Color Space:	For example RGB. A device dependent color space, e.g., the same scan file will appear different when viewed on different computer displays.
Device Independent Color Space:	For example CIE LAB. A device independent color space is one in which color values are absolute, e.g., defined by CIE standard. CIE LAB is the central color space in color management systems (CMS) and is used to translate between different device dependent color spaces such as scanner RGB and display RGB.
Device Profile:	A file used as part of a Color Management System (CMS). A device profile contains information about the characteristics of a scanner, computer display or printer. The format for device profiles (Win95, Colorsync. etc.) is standardized by ICC (International Color Consortium).

Dialog Box:	A window that appears to request or supply information. Many dialog boxes have options which must be selected before the program can carry out a command.
DIP	<u>D</u> igital <u>I</u> mage <u>P</u> rocessor. Hardware embedded function that does image enhancement in real-time while scanning.
Dither:	To use patterns of different colored pixels to create blended colors; or, to use dots of different sizes to simulate grayscale images. (see below)
Dithering:	A printing or display device may have only a small number of grayscale or color values for each device pixel. However, if the viewer is sufficiently distant from the printed page or display, the value of neighboring pixels can be set so that the viewer's eye integrates several pixels to achieve an apparent improvement in the number of levels or colors that can be reproduced.
Dots Per Inch (dpi):	A measure of dots in a square inch where the individual element is a round dot on the printed page.
Double-click:	Position the mouse cursor on top of an item and press and release the left mouse button twice, in quick succession. If the clicks occur within the time set in the MS Windows Control Panel, it interprets the two clicks as a single gesture.
DPI:	Dots Per Inch, equivalent to Pixels Per Inch. An expression of resolution of a scanned image.
Drag:	Press the left mouse button and move the mouse while keeping the button pressed. When the desired action is completed, release the mouse button. Drag refers to an action sequence (mouse down, mouse move, mouse up), such as "Drag the button in the scroll bar. . ."
DSP:	<u>D</u> igital <u>S</u> ignal <u>P</u> rocessor, does image enhancement in real-time while scanning.
Dual 2D-Adaptive Enhancement	Enhancement processing on the foreground and background separately. Processing is performed on-the-fly. The separate enhancement processes are simultaneously performed on different drawing aspects.
Dynamic Range:	A measurement of scanner quality; the density difference between highlights and shadows.

Edit:	Modify an entry using standard Windows text-editing techniques.
Emulsion:	The light sensitive silver, coated on the clear acetate film base, that forms the photograph when a picture is taken and the film is developed.
Equalizing:	Distributing all color or tone equally along a density range.
Export:	To send a copy of the picture to a file.
Exposure:	The overall lightness or darkness of a picture. Exposure is determined automatically when the film or photograph is pulled into the HP PhotoSmart photo scanner, but can be manually adjusted before saving the picture.
File Format:	The format in which a scanned picture is saved. Many programs can insert or import a picture from a file, if it is saved in a file format that the program supports. Common file formats include TIFF (Tagged Image File Format), BMP (Windows bitmap), JPEG (Joint Photograph Expert Group), and FPX (FlashPix format).
Flip Horizontal:	To flip the picture left/right.
Foreground:	Foreground when scanning raster data (black and white, or monochrome data) refers to the pixels that represent data of interest (background refers to everything else). Typically, lines and shapes are represented by black pixels (foreground) and empty space is represented by white pixels (background). When scanning grayscale data, background means the gray level of a region of pixels that surrounds some desired foreground data.
Gamma Adjustment:	An adjustment that makes the tone distribution lighter or darker in an image.
Gamut Transformation:	Color Management System function, where out-of-gamut colors are converted to colors within the gamut of the targeted device, e.g., a printer.
Gamut:	The color range scannable, printable or displayable by a device; e.g., if some of the displayable colors are outside of the gamut of the printer they cannot be printed.
GCR:	Gray component replacement. A color separation setting used on color photographs where cyan, magenta and yellow inks are replaced by black ink (in a balance that would yield a gray value). The advantages are a reduction in overall ink usage and

some increase in image detail.

- Grayscale:** A term for a black and white photographic image or a scanner setting. Refers to the range of 256 gray tones that make up the image.
- Halftoning:** The processes of offset printing and laser printing are intrinsically bilevel. However, these devices can reproduce a range of tone levels by halftoning; e.g., an array of widely spaced dots produces the perception of light gray, and an array of tightly spaced dots produces dark gray. Halftone dots are usually placed in a regular grid. In color printing it is conventional to use cyan, magenta, yellow and black grids that have exactly the same dot pitch but different carefully-chosen screen angles.
- Highlights:** The lightest part of a picture--reproduced as white on the screen or when printed.
- Histogram:** A bar graph representing the statistical distribution of Graytones or colors in an image. Each column represents the number of pixels at that gray level or color.
- HLS:** A color space with the three variables of Hue, Lightness, Saturation. See HSV.
- HSV:** A color space with the three variables of Hue, Saturation, Value. Hue means color (as in the color wheel.) Saturation is an indication relating to the richness or vibrancy of the color. Value is a term best related to the intensity of light illuminating the object.
- Hue:** A named color. In discussions of color that relate to photography, scanning, and printing, six hues are especially important: red, yellow, green, cyan, blue, and magenta. These hues make up every color we can see, and are the designated hues on color wheels.
- Hue:** A measurement of color that can be related by pointing towards a certain color on the color wheel. Hue indicates the relative redness, blueness, greenness, yellowness, etc., of a color.
- ICC:** The International Color Consortium (ICC) was formed to address the need for a common color framework. The ICC has developed a standard device profile that contains information about how various devices render color. This concept is supported by Apple (Colorsync), Microsoft for Windows 95, Sun for Solaris, and by Silicon Graphics for Irix.

Image Editor:	A program used to edit pictures to change colors, increase detail, scale or otherwise alter the picture.
Import:	A command in many computer programs, that brings a scanned picture which has been saved to a file, into a document.
Indexed color:	Indexed color (or pseudo-color) is the provision of a relatively small number, say 256, of discrete colors in a colormap or palette. For each pixel in the image, the index number of a color is then stored. When retrieving the image, a lookup table uses the index to retrieve red, green and blue components that are then sent to the display. In graphic file formats such as PCX or TIFF, an indexed color image is accompanied by its colormap.
Interpolation:	Using the interpolation method of resampling generates values for points in between the actual pixels by looking at the surrounding colors or intensities. In a scanner resolution is increased beyond the actual number of CCD cells. As each line of pixel data arrives from the cameras, new interpolated pixels are added between original pixels. The added pixels enhance line edge definition.
JPEG Compression:	Joint Photographic Experts Group Compression. A method to save storage space by compressing files. JPEG achieves a high degree of compression by discarding non-important picture detail.
JPEG:	A compressed file format for images. Named after the Joint Photographic Expert Group, JPEG images feature small file size and speed, but lower quality than other formats.
Landscape Photograph:	A photograph in which width is greater than height when properly oriented. A photo in which the height is greatest is called a portrait photograph.
Lossless Compression:	File compression and subsequent de-compression without any loss of data.
Lossy Compression:	File compression that will compress data to a high degree. When subsequently un-compressed, data will have been lost.
LZW:	Method of lossless compression used with many file formats; developed by Lempel, Zev and Welch.

Midtones:	The most important part of a picture between black (shadows) and white (highlights).
Negative:	A reversed photographic image used to produce a positive print or a scanned image.
Noise:	A term used to describe the occurrence of pixels that contain random colors within an image.
Original:	The paper, negative, slide, or film to be scanned.
Palette:	The set of colors available for an image.
Paste:	To insert a copy, to the clipboard, of whatever was last cut or copied.
PICT:	A file format for pictures used primarily on the Macintosh.
Pixels Per Inch (ppi):	A measurement of resolution for scanners, where the individual element is a square picture element (pixel).
Pixels:	The word pixel is a combination of the two words picture and element. It is the smallest building block within a scanned line-art or photographic image. A pixel is the small square picture element that is filled with a color, black or white. The value of a pixel depends on the luminance of the area, and is either a single bit for a black and white image, or multi-bit for a color or gray-tone image. Pixels come in various sizes and their size is expressed in terms of resolution. Resolution is measured in pixels per inch (ppi) or the equivalent dots per inch (DPI.)
Portrait Photograph:	A photograph in which height is greater than width when it is properly oriented. A photo in which the width is greatest is called a landscape photograph.
PostScript:	A computer language developed by Adobe (R) Systems, Inc. for printing text, graphics, and scanned images. PostScript (R) is a vector format that can include scanned bitmapped images.
Raster File:	Also called Raster Image or Bitmapped Image. A picture composed of individual dots (picture elements, pixels) the way a scanner perceives it. The rows in a high-resolution raster file typically contain 200 or 300 dots per horizontal inch of the original drawing, and there are typically 200 or 300 rows per vertical inch. As each of these dots is defined by location, and by whether it is on or off, raster images generally result in large data files.

- Resolution of a Scanner:** Expressed as DPI (dots per inch) or the equivalent ppi (pixels per inch). The higher the resolution of a scanner, the smoother the scanned images.
- Resolution:** A measure of how many pixels per inch are scanned. Generally, more pixels per inch means more detail in the picture and a larger file when saved. Defines the level of detail that can be captured or shown by a scanner, display, or output device. For scanners, the resolution is defined by the number of dots (pixels) per inch (DPI) that can be captured horizontally and vertically, e.g. 300 DPI equals 90,000 pixels per square inch. Screen Resolutions are normally 72 pixels per inch of screen. Additional detail is thrown away by the screen display driver, anyway. For Printer Resolution scans, you need 150 dots per inch and above for good results on the printed output. One must find the level of detail that is still visible in printed output on the printer in question, and not dramatically increase the size of a saved file without bettering the result.
- RGB:** Red, Green, Blue. These additive primary colors are the basic elements of white light. By mixing them on a computer monitor or in a scanned image file, other colors can be created. For instance, Red and Green produces Yellow, and equal amounts of all three produce gray.
- RIP:** Raster Image Processor. A RIP is a special software that converts scanned images into a color dithered (halftone) image that can be output directly. An image must be 'ripped' before it can be output on a CMYK device, e.g., an inkjet printer.
- Rotate:** To turn the picture left (clockwise) or right (counterclockwise) from the orientation in which it was scanned.
- Runlength Encoding:** A method of compressing raster or bitmap data by representing "runs" of white or black dots along a scanned line as the number of dots in each run. Many variations of this scheme exist, with varying compression efficiency. Typically, runlength compression formats yield a file 20-25% the size of an uncompressed file.
- Saturation:** The level of colorfulness of the picture. A picture with high saturation has vivid color. A black and white picture has zero saturation. The purity of a color or the degree to which it is diluted with white light. Red is a highly saturated color. Pink is a diluted red (has lower

saturation).

- Saturation:** Saturation is one attribute of color in the color space called HSV (Hue Saturation, Value). Saturation is a characteristic indicating the vibrancy or intensity of a hue. A color with high saturation will appear more intense than the same color with less.
- Scale:** To reduce or enlarge the size of a picture proportionally.
- Scanner Calibration:** A program that helps adjust the scanner to achieve stable colors or Black and white and work with a printer. Calibration gives better scanning results. The program should be run whenever changing printing equipment, toner, and inks, and whenever getting poor results when printing pictures.
- Screen Calibration:** A program that helps adjust the computer screen to get the best display of scanned pictures and documents. This program is run during installation and should be used again any time that the computer screen or the lighting around the computer is changed.
- Scroll:** Move through a list or window by dragging the scroll bar button to the desired position, clicking the scroll arrows, or using the up-arrow and down-arrow on the keyboard. Clicking the scroll bar itself moves the window or list faster than clicking the scroll arrows.
- SCSI (Small Computer System Interface):** An interface that allows hard disks and other high-performance peripherals to be attached to Macintosh and PC computer systems.
- SCSI Card:** The printed circuit card that came with the scanner. With its driver software, the card allows the computer to talk to the scanner. The card is ASPI compatible with a SCSI-II output connector.
- SCSI:** Small Computer System Interface. Specification of interface to computer equipment like disks, printers, scanners etc.
- Select Source:** The command in some programs that allows choice of where the Acquire command will get its picture.
- Shadow Detail:** The amount of detail contained in the dark parts of an image. It is desirable to maintain shadow detail, but there is a risk of decreasing overall contrast if one lightens the shadow too much in an attempt to expose additional detail. If an image is scanned without shadow detail, it will be impossible to regain detail using an image editing program.

- Shadow:** The darkest part of a picture; reproduced as black onscreen or when printed.
- Sharpness:** An attribute of a scanned image and also an attribute of scanner quality.
- Source:** When using either the Insert Object (OLE) or Acquire (TWAIN) commands to scan a picture into a program, such as a word processor, the source is the program where the picture is acquired or retrieved. The scanner software is the source that controls the HP PhotoSmart photo scanner.
- sRGB:** Hewlett-Packard and Microsoft proposed the addition of support for a standard color space, sRGB, within the Microsoft operating systems, HP products, the Internet, and all other interested vendors. The aim of this color space is to complement the current color management strategies by enabling a third method of handling color in the operating systems, device drivers and the Internet that utilizes a simple and robust device independent color definition. This is to provide good quality and backward compatibility with minimum transmission and system overhead. Based on a calibrated colorimetric RGB color space well suited to Cathode Ray Tube (CRT) monitors, television, scanners, digital cameras, and printing systems, such a space can be supported with minimum cost to software and hardware vendors.
- Stitching:** In large format multiple CCD camera scanners, electronic stitching adjusts for overlap in the field of view of adjacent cameras. Automatic stitching at start of scan ensures that each camera captures the correct number of pixels independently of mechanical and thermal changes.
- Subtractive Colors:** The subtractive primary colors: cyan, magenta, yellow. As ink applied to a piece of paper by a printer, these colors absorb light and alter the colors seen by looking at the printed paper. Cyan ink absorbs the red third of the spectrum, magenta ink absorbs the green third, and yellow ink absorbs the blue third. This should theoretically cause the viewer to see a black color, but due to unavoidable impurities in the inks, there is still light reflected and the viewer sees a muddy brown. The absence of CMY pigments results in white.
- Thumbnail:** A very small, low resolution version of a picture that shows just enough detail to tell which picture it represents. In the HP PhotoSmart PhotoCapture software, the thumbnails allow resetting of any changes made to the picture and, for negatives, allow

picking which negative will appear in the preview area.

TIFF:

Tagged Image File Format. One of the most common graphic file formats for line-art and photographic images.

Tonal Distribution:

Tonal Distribution describes the distribution of various bright or dark tones within an image. During the scanning or image editing stage, tones can be redistributed, lightening a dark image or darkening a light one.

Tone Compression:

A term used in scanning and image editing that refers to compressing the broad range of tones and colors in an image down to the narrower range available on a printer.

Tone Curves:

The shape of the tone transfer curves can be adjusted by the user to alter color or tone correction. The lower left end of the curve typically represents the dark portions of a picture and an upward bend will typically lighten the shadows. Similar capabilities exist by working with the middle or highlight parts of the curve. In this way it is possible to alter only certain tonal ranges of an image without making un-wanted changes to other parts of the image.

Tone:

Any color or neutral that is denser than white.

True color:

True color systems provide eight bits for each of the three components (red, green and blue). Therefore true color is often referred to as 24-bit color.

TWAIN:

A standard method of communications that programs can use to send instructions to hardware (such as scanners) and receive data back from them (such as pictures).

UCR:

Under Color Removal. A color separation setting used on color photographs where cyan, magenta and yellow inks are removed from dark, neutral areas and substituted by black ink. The advantages are a reduction in overall ink usage. See also GCR.

Vector Drawing:

Also called Vector File. Consists of mathematically defined elements, such as "Line from A to B", "Circle with center and radius", etc. CAD systems use vector drawings because of their accuracy, relatively low memory requirement and data-file sizes compared to raster images.

Vector File:	Also called Vector Drawing. Consists of mathematically defined elements such as: Line from A to B, Circle with center and radius etc. CAD systems use vector drawings because of their accuracy and relatively low memory and data file sizes compared to raster images.
Vectorization:	Also called raster-to-vector conversion (RTV). The process of automatically converting a raster (bit-mapped) image into a vector (CAD) drawing.
Video Card:	Expansion card installed inside the computer. Different types of video cards support varying monitor sizes and number of displayable colors.
White Level:	White Level is a setting in scan programs used if one has an original with a background that is not completely white. To get the background to appear as pure white one can set the White Level to a lower value.
White Point Adjustment:	An adjustment made that will determine the amount of highlight detail in an image. The white point should be set so that the lightest part of an image will only just have zero detail
WYSIWYG -	What You See Is What You Get. Pronounced "wizzywig." Screen output that exactly (or very closely) matches the appearance of printed output.
XYZ:	The CIE system is based on the description of color as a brightness (luminance) component Y (as described above), and two additional components X and Z. The spectral weighting curves of X and Z have been standardized by the CIE, based on statistics from experiments involving human observers. XYZ tristimulus values can describe any color.
Zoom:	The ability to enlarge or shrink the view of the picture in a window. Zoom does not alter the size of the final scanned picture; it only provides a better view while creating a selection border on the screen.

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