CADImage/SCAN+FEATURE

for

WINDOWS 3.x, 95 & NT

Version 1.0

USER'S GUIDE

CONTEX FULL SCALE COLOR SCANNER
SCANNING, VIEWING, FEATURE EXTRACTION & CONVERTING
S/W

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PREFACE

CADImage/SCAN+FEATURE is a complete Scanning, Viewing, Feature extraction editing, Converting, and Print/Plot system for the Contex Full Scale Scanner:

- Full Scale Color Scanner (E-Size/A0)

This guide explains how to use all of CADImage/SCAN+FEATURE's features. It assumes a basic knowledge of your computer's operation, therefore it does not repeat material from the manufacturers documentation.

This User's guide applies to the edition of CADImage/SCAN+FEATURE for WINDOWS 3.1x, WINDOWS-95 and WINDOWS-NT. A common and consistent graphic user interface has been implemented across the operating systems.

SYSTEM REQUIREMENTS

- Supported computer and operating system, see Chapter 2: "Installation."
- Contex Full Scale Color Scanner with SCSI interface.

RELATED PUBLICATIONS

The "OPERATIONS GUIDE" which came with your computer.

The "OPERATORS GUIDE" which came with your Contex Multi-Platform Scanner.

See the README.TXT file on the CADImage/SCAN distribution diskette for latest information and news.

How To Use This Guide

This guide contains nine chapters and six appendices. Make sure you read chapter 2: Installation, and that the scanner is installed on the SCSI interface port, before attempting to install or use the CADImage software described in this guide.

Chapter 1. An introduction to the CADImage features. Gives a system overview of the multi-platform scanning system.

Chapter 2. Describes how to install CADImage onto your system, and set-up of configuration parameters in your computer.

Chapter 3. Describes the Main tool bar and the File menu.

Chapter 4. Describes scanning with the Full Scale Scanner and the Scan menu.

Chapter 5. Describes viewing and the Image menu.

Chapter 6. Describes feature extraction editing and the LUT menu.

Chapter 7. Describes the supported image file formats.

Appendix A. Describes configuration of plotter devices.

Appendix B. CADImage/SCAN License Agreement.

Appendix C. Contains a glossary.

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1. Introduction

CADImage/SCAN+FEATURE is a program designed to interface your Contex Full Scale Color Scanner with a wide range of popular software for CAD, GIS, Color copying, Desk Top Publishing, and Drawing Archival/Interchange (System configuration shown overleaf).The program enables:

- Control of all the Contex Full Scale Color Scanners advanced image enhancement features. With interactive graphic user interface for ease of use.
- Point-and-Click on-line control of scanning parameters e.g. color settings, threshold, scanwindow and alignment. On-line display during scanning provides for easy verification of quality
- Advanced color feature extraction ensuring optimal ease and cleanness of scanning, as well as reducing file sizes and storage requirements.
- View and Zoom 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, with Point-and-Click setable alignment points.
  Rotation of images, between 0 and 360 degrees.
  Electronic despeckling, removing speckles of user definable sizes.
  Reversing and mirroring of images.
  Measure angle and distance between any two points.
- Print/Plot to Laserprinters, and industry standard Ink-Jet and laser plotters, with setable printwindow for printing a selected part of the image. Setable scaling or autoscaling.
  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 Image Systems CADOverlay RLC format for AutoCAD.

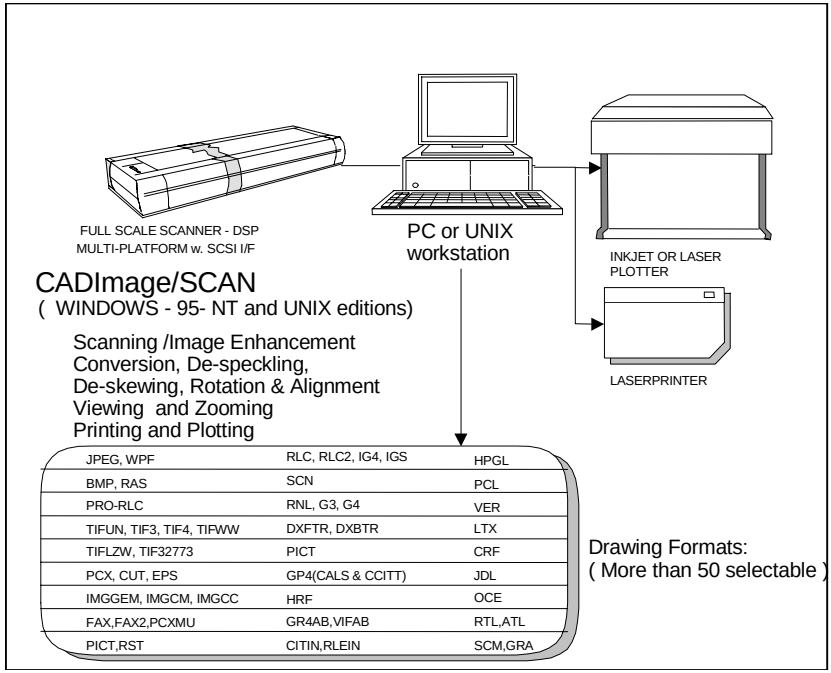


Fig. 1-1: CADImage/SCAN+FEATURE Overview

2. Installation

2.1 Introduction

The CADImage/SCAN+FEATURE program is not copy protected, but requires the Multi-Platform Scanner correctly installed and powered on, in order to function.
In the following sections, installation is described for CADImage/SCAN+FEATURE on:

- WINDOWS 3.1x, WINDOWS 95, and WINDOWS-NT

Always check the README.TXT file on the CADImage distribution diskettes or tape for updates describing installation procedures, or for installation on newly supported computers and operating systems.

Important note: Maximize your workstation memory, as CADImage/SCAN+FEATURE will use the available memory for buffers while scanning, thereby speeding up the scanning process.

2.1.1 Scanner installation

Turn off power to the computer and scanner.

Attach the scanner to the previously installed SCSI I/F board in the PC, using the SCSI cable provided with your interface kit.

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 OPERATORS GUIDE). Otherwise it should be switched off.

Set the SCSI device no. on the DIL switch (found besides the SCSI connectors on the scanner) to an unused SCSI device address, according to the table found in your OPERATORS GUIDE for the scanner. NOTE SCSI device no. 7 is occupied by the computer

Turn on power to computer and scanner.

2.2 WINDOWS 3.1x installation of CADImage/SCAN

The system requirements are:

- IBM PC, PS/2* or compatible (Pentium 100 Mhz or above is recommended.)
- 16 Mb. RAM min. (32 Mb. recommended), Hard Disk and Floppy drive.
- 24 bit RGB graphic display (1280 x 1024 recommended.)
- DOS 5.0 or later version, and Microsoft Windows 3.1 or later version.
- A mouse or other pointing device.

Before proceeding with the installation, make a backup copy of your CADImage distribution diskette(s) and store the original CADImage diskette(s) in a safe place.

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

1. Start Windows.
2. Insert the CADImage distribution disk in drive A (or B.)
3. In the Windows Program Manager, choose Run from the file menu.
4. Type a:setup (b:setup) in the Command Line Box.
5. Choose the OK button.
6. Follow the setup instructions on the screen.

After installing all the files, the Setup program creates a CADImage/SCAN for Windows program group and places the CADImage/SCAN icon in the group.

To start CADImage/SCAN for Windows:

1. In the Windows Program Manager, open the CADImage/SCAN program group.
2. Double-click the CADImage/SCAN icon.
3. CADImage/SCAN starts and displays the View screen.

***Note:** PS/2 requires a special ASPI compatible MCA SCSI interface board.

2.3 WINDOWS-95 installation of CADImage/SCAN

The system requirements are:

- IBM PC, PS/2* or compatible (Pentium 100 Mhz or above is recommended.)
- 16 Mb. RAM min. (32 Mb. recommended), Hard Disk and Floppy drive.
- 24 bit graphic display (1280 x 1024 recommended.)
- A mouse or other pointing device.

Before proceeding with the installation, make a backup copy of your CADImage distribution diskette(s) and store the original CADImage diskette(s) in a safe place.

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

1. Start Windows 95.
2. Insert the CADImage distribution disk in drive A (or B.)
3. Click the Start button on the Taskbar, choose Run from the menu.
4. Type a:setup (b:setup) in the Command Line Box.
5. Choose the OK button.
6. Follow the setup instructions on the screen.

After installing all the files, the Setup program creates a CADImage/SCAN for Windows program group and places the CADImage/SCAN icon on the desktop.

To start CADImage/SCAN for Windows:

1. In the Windows Program Manager, open the CADImage/SCAN program group.
2. Double-click the CADImage/SCAN icon.
3. CADImage/SCAN starts and displays the View screen.

***Note:** PS/2 requires a special ASPI compatible MCA SCSI interface board.

2.4 WINDOWS-NT installation of CADImage/SCAN

The system requirements are:

- IBM PC, PS/2 or compatible (Pentium 100 Mhz or above is recommended.)
- 24 Mb. RAM min. (32 Mb. recommended), Hard Disk and Floppy drive.
- 24 bit graphic display (1280 x 1024 recommended.)
- A mouse or other pointing device.

Before proceeding with the installation, make a backup copy of your CADImage distribution diskette(s) and store the original CADImage diskette(s) in a safe place.

Use the Setup program (SETUP.EXE) to set up CADImage/SCAN for Windows-NT on your computer:

1. Start Windows-NT.
2. Log in as member of the Administrator group.
3. Insert the CADImage distribution disk in drive A (or B.)
4. In the Windows program Manager, choose Run from the file menu.
5. Type a:setup (b:setup) in the Command Line Box.
6. Choose the OK button.
7. Follow the setup instructions on the screen.
8. Restart Windows-NT.

After installing all the files, the Setup program creates a CADImage/SCAN for Windows program group and places the CADImage/SCAN icon on the desktop.

To start CADImage/SCAN for Windows-NT:

1. In the Windows Program Manager, open the CADImage/SCAN program group.
2. Double-click the CADImage/SCAN icon.
3. CADImage/SCAN starts and displays the View screen.

***Note:** PS/2 requires a special ASPI compatible MCA SCSI interface board.

3. Main Tool Bar & File Menu

3.1 Introduction

The following sections describe the functions of the Main Tool Bar and File menu.

From the File menu you can control loading and saving of image files, general setup preferences etc., and in the Main Tool Bar you find tools for switching between scanning, viewing and feature extraction edit screens, as well as the zoom tools generally available.
The screen shown below is divided into 4 functional areas around the main display area:

Pull Down Menu Bar
Main Tool Bar
Functions Tool Bar
Screen Status Bar

The additional pull down menus, Functions Tool Bars and Screen Status Bar are described in later chapters, as their functionality changes with your present task (viewing, feature extraction etc.)

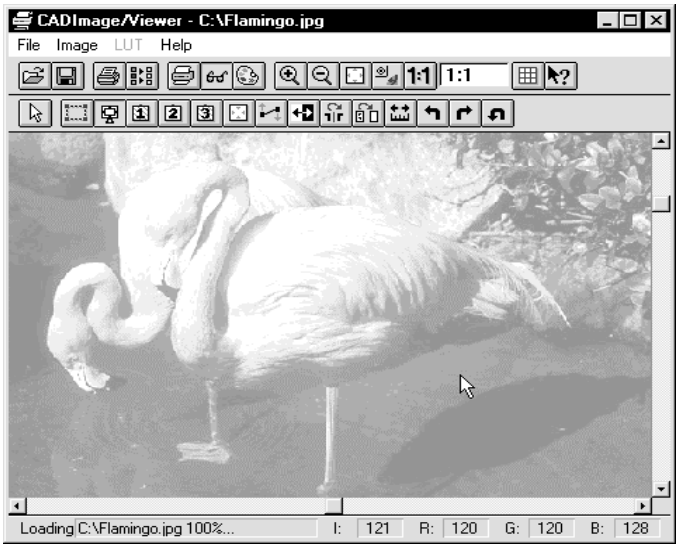


Fig. 3-1: CADImage Screen

The user interface focuses on the opened image and all functions apply to the active image. The image can either be opened from:

a File selector
or be the result of scanning.

The 2 ways of opening a document have the same functional effect.

3.2 Screens and Main Tool Bar

CADImage can show different screens. Each screen has a set of Tool Bar controls used for specific purposes.

The following screens are defined:

Viewer with viewing and image functions, and View Tool Bar (View Screen)
Feature extraction with LUT Tool Bar (Feature Screen)
Scanning (Scan Screen)

CADImage starts up in the View Screen, i.e. the startup window consists of the Menu Bar, Main Tool Bar, plus the View Tool Bar at the top and the status bar at the bottom. See the Viewer chapter.

If the active window is changed to the Feature screen the View/Edit Tool Bar changes to the LUT Tool Bar. See the Feature extraction chapter.

If the active window is changed to the Scan Screen, the screen is changed for scanning support. See the Scanning chapter.

3.2.1 Maneuvering between Screens

Going from one Screen to another is done by clicking on the Screen icons in the Main Tool Bar.

As a document can be specified/opened in different ways (in different windows), this has an impact on the way documents are handled when changing the active window.

There are the following possibilities:

- Going to the View Screen with image functions,
- Going to the Feature screen with LUT editing functions,
- Going to the Scan Screen.

Going to the View Screen:
When going to the View Screen, the opened or scanned image is viewed at startup (if available).

If an RGB file is open and switching to the View Screen is from the Feature Screen, the RGB file is displayed.

If no active image exists (no open or scanned file), the viewer will startup with an empty view area.

Going to the Feature Screen:
The Feature Screen tools are only active together with RGB images. In all other cases the tools are disabled/dimmed.

When going to the Feature Screen, the scanned or opened RGB image is viewed. Clicking at the RGB/LUT tool before any LUT file has been generated/loaded, will pop up the message: "Load/Create a LUT".

After both the RGB file has been opened and a LUT has been created/loaded, the LUT filtered output file can be displayed.

If no active document exists (no open or scanned RGB file), the Feature Screen will start up with an empty view area and the message: "No RGB file open".

Going to the Scan Screen:
When going to the Scan Screen with an opened image, this image file is used for saving the data from the scanning process. Thus when scanning, this image file will be overwritten with the new image. (The user is prompted if overwriting should take place).

Another scanning image file name can always be selected in the Scan Screen by clicking the File button.

3.2.2 Main Tool Bar

The Main Tool Bar is used both together with the View Screen and the Feature Screen.

Open:

Active in both the View Screen and the Feature Screen. (But not in the Feature sub screens, e.g. Color Wheel, Histogram and Add From Palette Screens).

Pops up a dialog for opening an existing file for viewing (see the File Menu...Open, description later in this chapter)

Save:

Active in both the View Screen and the Feature Screen. (But not in the Feature sub screens, e.g. Color Wheel, Histogram and Add From Palette Screens). When in the Feature Screen, only the underlying RGB input file is saved.

Saves the image to the open file (see File Menu... Save, description later in this chapter).

Print:

Active both with the View Screen and the Feature Screen. (But not in the Feature sub screens, e.g. Color Wheel, Histogram and Add From Palette Screens).

Pops up a dialog for printing the whole of an opened file or a part selected by the `Rectangle Select' (see the File Menu...Print, description later in this chapter)

Batch Convert:

Pops up a dialog for specifying files for batch converting to another format (see the File Menu...Batch Convert, description later in this chapter).

Change to the Scan Screen:

Changes to the Scan Screen

Change to the View Screen:

Changes to the View Screen

Change to the Feature Screen:

Changes to the Feature Screen

Zoom In:

Active in both the View Screen and the Feature Screen. (But not in the Feature sub screens, e.g. Color Wheel, Histogram and Add From Palette Screens).

Clicking "Zoom In" activates the cursor for dragging a frame while holding down the left mouse button. When the mouse button is released, zooming is done on the specified area. Further Zoom Ins can be performed immediately, since the Zoom In button stays on (it must actively be clicked off to leave the Zoom In mode).

Zooming can be performed until a zoom factor of 16:1 is obtained. With zoom factors greater than 1:1, the zoom factor is set to the nearest lower integer number.

Zoom Out:

Active in both the View Screen and the Feature Screen. (But not in the Feature sub screens, e.g. Color Wheel, Histogram and Add From Palette Screens).
Clicking "Zoom Out" zooms the view out 2:1, with the pivot point being in the middle of the screen (A previously selected tool is only intermittently interrupted, and afterwards reverted to).

Zoom All:

Active in both the View Screen and the Feature Screen. (But not in the Feature sub screens, e.g. Color Wheel, Histogram and Add From Palette Screens).
Clicking "Zoom All" zooms the view out to display the full image (A previously selected tool is only intermittently interrupted, and afterwards reverted to).

Zoom Birds Eye:

Active in both the View Screen and the Feature Screen. (But not in the Feature sub screens, e.g. Color Wheel, Histogram and Add From Palette Screens).
Clicking "Zoom Birds Eye" pops up a full view of the image, with a frame outlining the present zoom area. Moving the cursor close to the frame changes the cursor to the panning cursor. By clicking and holding the left mouse button the frame can be dragged to a new position in the image. When the mouse button is released, zooming in is done on the specified area.

A previously selected tool is only intermittently interrupted, and afterwards reverted to).

Zoom 1:1:

Active in both the View Screen and the Feature Screen. (But not in the Feature sub screens, e.g. Color Wheel, Histogram and Add From Palette Screens).

Clicking Zoom 1:1 sets the zoom factor to 1:1.

Zoom Factor:

Shows the present zoom factor in the View Screen and the Feature Screen (grayed out in the Feature sub screens). Changes with selection of Main View and Viewboards. The zoom factor is 1:1 when one pixel in the image corresponds to one pixel on the screen (e.g. a zoom factor of 16:1 means that one pixel in the image corresponds to sixteen pixels on the screen). Range of zoom factors are from 16:1 to 1:n, where n corresponds to the full-extent view of the image in the View Window).

Zoom Grid:

Active in both the View Screen and the Feature Screen. (But not in Feature sub screens, e.g. Color Wheel, Histogram and Add From Palette Screens).
Toggles On/Off. When ‘On’ superimposes a one pixel wide gray grid (grey value 127), for visual separation of pixels when the zoom factor is 8:1 or greater.

3.3 File Menu

Clicking the File pull down menu in the Main menu bar, displays the File Menu shown below.

Fig. 3-2: File Menu

3.3.1 Open...

Enabled together with View Screen and the Feature Screen, pops up a dialog for opening an image file.

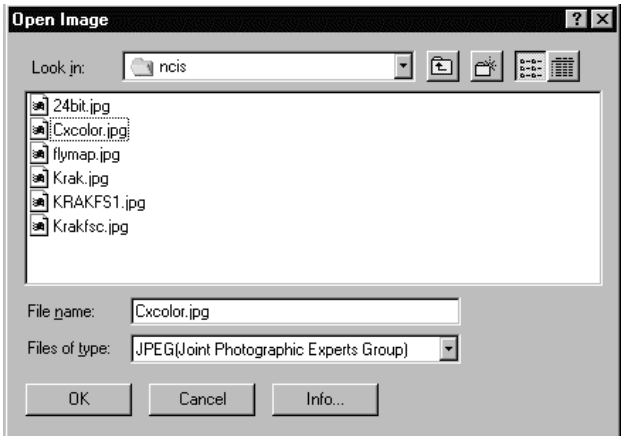


Fig. 3-3: Open Image Dialog

Clicking the List Files of Type dropdown list, displays a list of supported formats (see Appendix B: File formats).
Clicking "Info..." pops up a dialog with information on the selected file (see File Menu...Information, later this chapter for description).
Some formats have options that can be set. Clicking "Format Setup" pops up a dialog for setting such format options.

3.3.2 Close

Closes the open files. Changes are saved (see Save) and the view area is cleared.

3.3.3 Save

Enabled if one or more files are open. Saves the open image.

3.3.4 Save as...

Enabled if an image file is open, pops up a dialog for saving the image file.

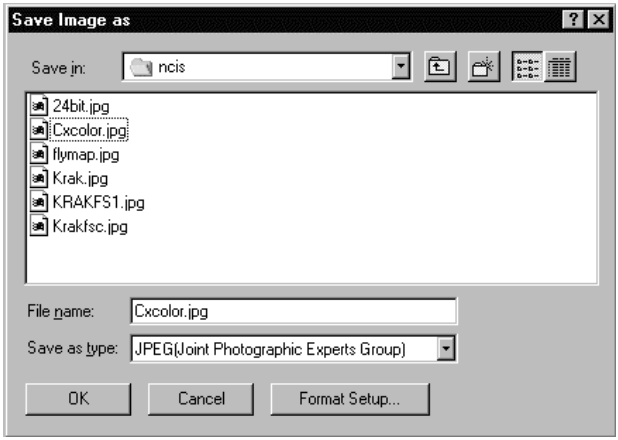


Fig. 3-4: Save Image as... Dialog

A raster file in one format can be saved into another format by choosing ‘Save as’ and selecting the desired format from the drop down list. (see Appendix B: File formats).

Some formats have options that can be set. Clicking "Format Setup" pops up a dialog for setting such format options.

3.3.5 Information...

Enabled if an image file is open.

Selecting Information pops up a dialog box, displaying information on the open image: Size, Resolution, Width, Height, Format and Type.

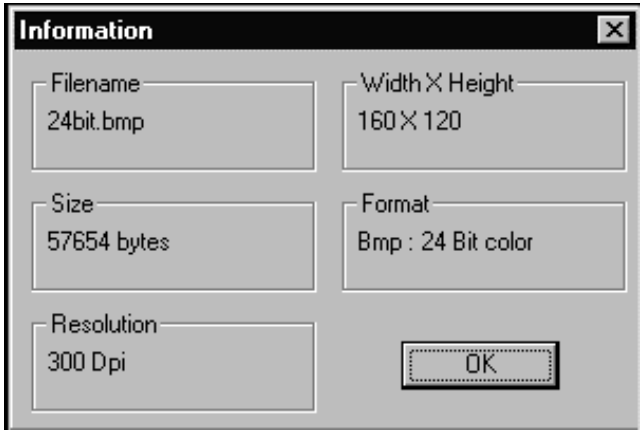


Fig. 3-5: File Information Dialog

3.3.6 Print...

Enabled if an image file is open.

Printing of the open image is done by selecting ‘Print’ in the File menu or clicking on the Print icon. When ‘Print’ is activated, a print dialog pops up similar to the one shown below.
This dialog informs the user of the settings for the currently selected printer and port:

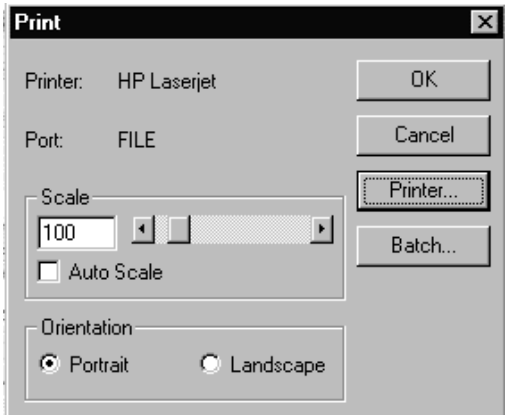


Fig. 3-6: Print Dialog Example

The part printed from an image is automatically selected as, either ‘All’, or the area within the rectangle selected by the "Rectangle Select" tool if active (See later chapter on the Viewer...View/Edit Toolbar for description).

The Scale can be set manually between 1 and 1000%. If auto scale is chosen, the print will be scaled to fit the printer/plotter size.

Portrait/landscape image orientation can be chosen.

Printer Setup:
Always enabled.

When the Printer.. button in the Print dialog is activated the list of supported printers pops up (see Appendix B: File formats) including a setup button for setting up the chosen printer:

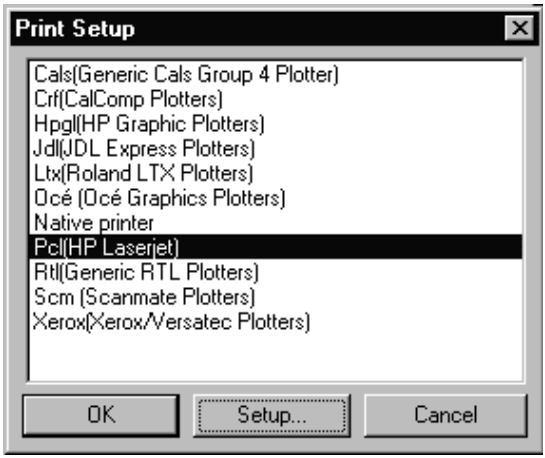


Fig. 3-7: Printer Selection and Setup Dialog

When the Setup button is pushed, a Setup dialog pops up for the selected printer.

Batch Printing:
Batch printing of several files (of the same format) can be done by clicking the Batch button in the Print dialog.

A file selector pops up for selecting the files. Use <<shft>> or <<ctrl>> key in combination with the mouse to select multiple files:

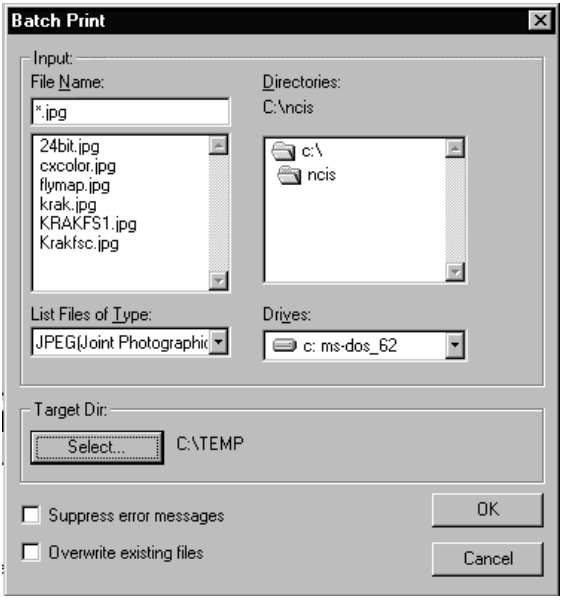


Fig. 3-8: Batch Print Dialog

The Target Dir section is enabled when printing to file: The output directory can be specified. The Suppress error messages check box can be checked to disable error messages. The Overwrite existing files check box can be checked to allow existing files to be overwritten without any warning message.

3.3.7 Batch Scan

Dimmed, not enabled. See the Scan Screen and Scan Menu chapter for selection of batch scanning.

3.3.8 Batch Convert…

Enabled in all screens.

Choosing ‘Batch Convert...’ will pop up a dialog for setting up for batch conversion:

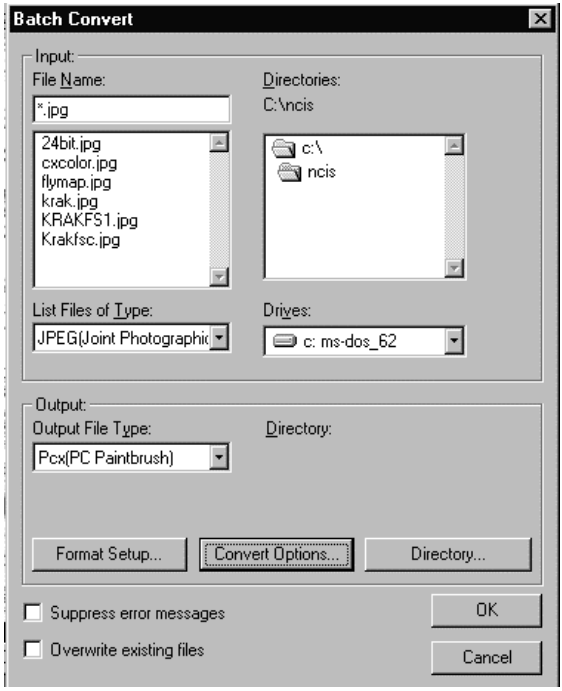


Fig. 3-9: Batch Convert Dialog

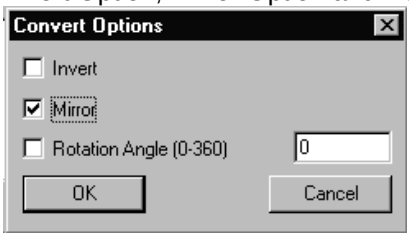
Input: Multiple input files of same format can be selected, using the <<shift>> or <<ctrl>> key in combination with the mouse.

Output: The output format and directory is specified in the Output part.

Clicking on ‘Format Setup’ pops up a dialog for setting file format options (see chapter on File Formats.)

Clicking on ‘Directory’ pops up a dialog for selecting the output directory. The output file name will be the same as the input file name.

Clicking on ‘Convert Options’ pops up a dialog for selecting and setting Invert Option, Mirror Option and Rotate Angle:



Batch Setup:
Check boxes can be set for suppressing error messages and overwriting existing files.

Start Conversion:
The conversion is started by clicking the OK Button. As each file is converting, the input and output file path fields are updated, the progress of the conversion is shown in the Status dialog box displayed during conversion.

Batch Conversion log dialog:
When the conversion starts a log dialog pops up, listing each conversion task as it is performed followed by ‘OK’ if conversion of the file was successful otherwise an error message is displayed. To stop batch conversion press the Abort button.

When the conversion process has ended a text scroll list pops up for checking through the log of conversion tasks. Pressing ‘Save Log’ pops up a file selector for saving the log to a file.

3.3.9 Calibrate Scanner

Since the light detectors of all color scanners are affected with use over time, the RGB output signals will vary. Age usually affects color balance and linearity, while the chromacity components are relatively stable.
To ensure long term stability and repeatability of scans, the scanner linearity, color balance and chromacity can be calibrated, using the ANSI IT8 standard reflective target shown below.

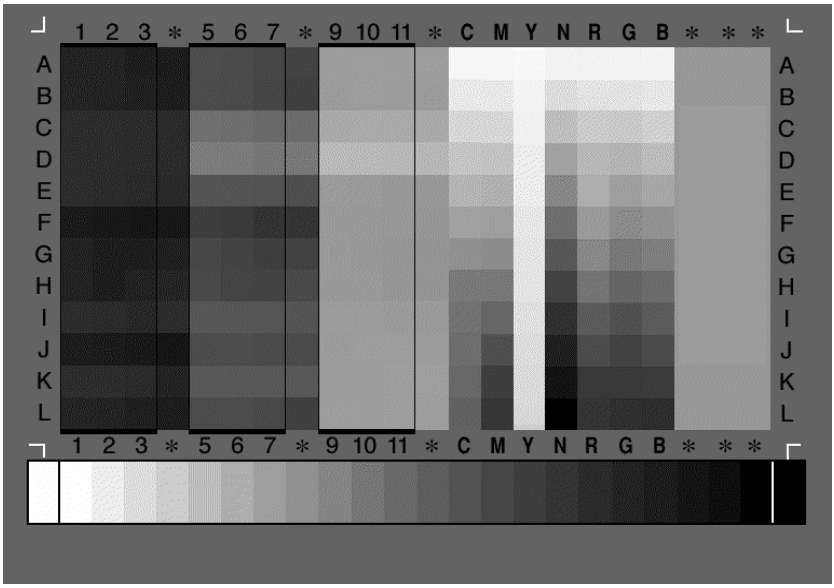


Fig. 3-10: ANSI IT8 Reflective Target

The dialog on the screen will guide you through inserting the target twice before each scanner camera, once for linearity calibration and once for color balance calibration, the rest is automatic.
CADImage 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.
CADImage automatically builds the color tone transfer tables and correction matrix and downloads them into the Full Scale Color Scanner.

3.3.10 Preferences

Clicking at Preferences pops up a sub menu:

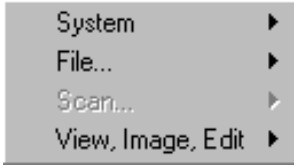


Fig. 3-11: Preferences Select Dialog

Here you can select and set up the globally active preferences you want in CADImage.

System Preferences:
Selecting System... will popup a sub menu:

- Status Bar... Color Info Field
  The View Screen and LUT Screen Status Bar will show RGB or HSV values depending on this setting.

File Preferences:
Selecting File... will popup a sub menu:

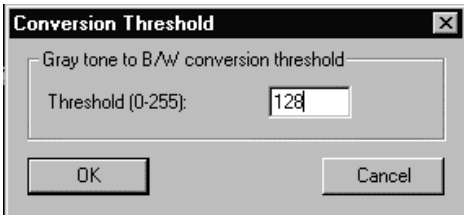


Fig. 3-12: Conversion Threshold Dialog

- File... 'Gray tone to B/W Conversion' Threshold...
  The setting will be used when converting Gray tone files to B/W (default setting 128)

Scan Preferences:
Dimmed, not enabled. See Chapter on scanning for setup.

View, Image, Edit Preferences:
Dimmed, not enabled. No settings.

3.3.11 Exit

Exits CADImage

4. Scan Screen & Scan Menu

4.1 Introduction

The following sections describe the functions of the Scan Screen and the Scan Menu.

From the Scan Screen you can control all aspects of scanning, while setup of the scanner and selection of preferences is done from the Scan drop down menu.

4.1.1 Scan Screen overview

The Scan Screen shown below is divided into four major areas:

- Filename, Scanwidth and Info
- Detail and Overview windows
- Scanning control panel
- Basic scanning options

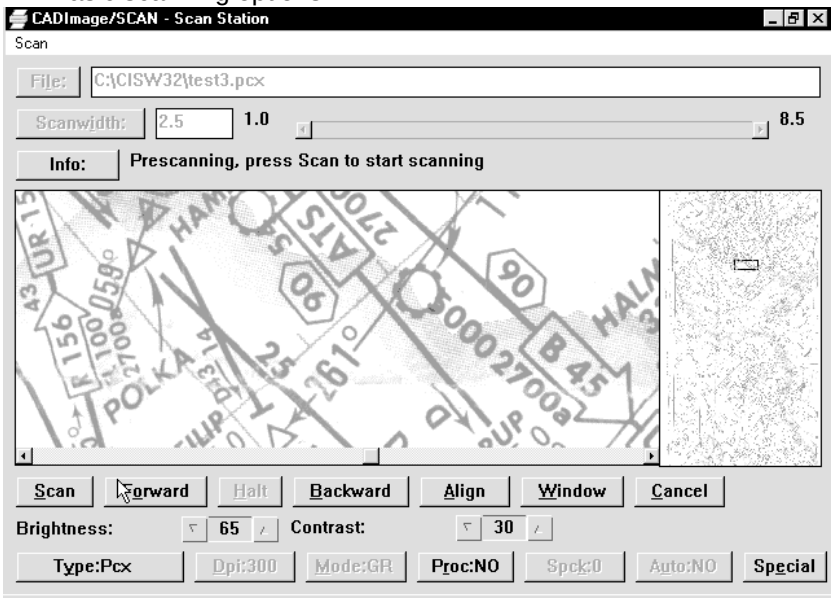


Fig. 4-1: The Scan Screen

Filename and Scanwidth:
At the top of the Scan Screen you find the input fields for the destination Filename and the Scanwidth.
The destination Filename may be typed into the input field, or by pressing the "File" button to pop up a "selection box" for easy selection of the directory and file name.
The Scanwidth may be typed into the input field, set with the Scanwidth slider (the units correspond to the scale displayed on the front of the Full Scale Scanner), or pressing the "Scanwidth" button pops up a dialog for optionally selecting standard paper sizes or manually setting the scanwidth, scanlength and off-set.

Info:
At the lower top of the Scan Screen you find the Info line displaying status or actions to be taken. Pressing the "Info" button pops up a window showing: "Drawing width and length in pixels, resolution and size" of the previously scanned file.

Detail and Overview windows:
In the middle of the Scan Screen you find the "detail window" on the left side and the smaller "overview window" on the right side. During scan and prescan, the overview window displays the whole drawing being scanned, and the detail window shows a zoom-in to the actual scanned pixel level of the part of the drawing pointed out in the overview window.
During prescan you can use the mouse to point and click on any area in the overview window to zoom in on that part in the detail window. During the actual scanning-to-file, clicking the mouse in the overview window moves the zoom-in view horizontally along the line of scanning.
The size of the overview window can conveniently be expanded by dragging the separating line between the overview and detail window, when not in the scanning or prescanning modes.

Scanning control panel:
Below the detail window you find the push-buttons for control of scanning and prescanning operations.

Basic Scanning options:
Setting up the basic scanning options for the scanner is done by clicking on the corresponding buttons in the bottom line of the Scan screen.

4.2 Scanning

Scanning of a drawing is activated using the push-buttons on the control panel. Prescanning operations can be performed prior to scanning-to-file, where the threshold setting can be fine tuned or a window can be set to scan a part of the drawing.
The "Scan" button will initiate a scan-to-file. The "Forward" button will start a prescan of the drawing.
Filename, Scanwidth, DPI, and Mode must be selected before initiating scan or prescan, since they cannot be changed during operation. All other settings may be changed during prescan.

4.2.1 Prescanning operations

After having inserted the drawing into the scanner, start prescan with the "Forward" button.

Using the Forward, Halt and Backward buttons you can alter the paper direction (Forward/Backward) and oscillate (Halt) about an area of you choice. You can make different setups (threshold, etc.) of the scanner, based on the detail view window, in order to find the solution that best fits this particular drawing.

Click positioning in the overview window:
An alternative to using the above buttons for positioning the detail view window, is clicking the mouse pointer in the overview window.

Contrast/Brightness and Blur filters:
When selecting either color scanning or graytone modes, the Contrast and Brightness controls (set-able from -100 to 100) are found in the lower left part of the control panel. Set these by using the mouse to click the up/down buttons. Contrast and Brightness may be changed during pre-scanning. It may take a while to display the change on the screen due to buffering of data in the scanner.
The Blur filter spin button have selections 1 for none, and 2,4 or 8 for color merging over an area of 2/400", 4/400" 8/400" correspondingly. The purpose of the blur filters are to diminish the effect of color dither patterns when scanning printed originals.
Threshold:
When selecting the B/W scanning mode, the Threshold control (setable from 0-255) is found in the lower left part of the control panel. Set by using the mouse to click the up/down buttons. Threshold may be changed at any time, even during scanning-to-file, but it may take a

while to show the change on the screen, due to internal buffering of data in the scanner. When 2-D Adaptive thresholding is selected in the "Auto" menu, the adaptive threshold setting controls are visible, see section on Auto threshold.

Scanwindow:

Press the "Window" push-button on the control panel to initiate setup of a scan window for selecting part of the drawing for scanning.
To input the first corner of the scan window, point and click in the overview window one or more times until the detail window view shows where you want the first corner; point and click on the exact position in the detail window to input this value.
Repeat for the diagonal corner of the scan window.
You can redo your scan window setup by pressing the "Window" button again.
Alternative to the above interactive method, you can also set up the scanwindow directly by pressing the "Scanwidth" button and entering the off-set, scanwidth and length values in the dialog.

Alignment:

A drawing not perfectly oriented horizontally at insertion into the scanner can be electronically deskewed during scanning. The realignment is performed by selecting an alignment line in the drawing.
Press the "Align" button on the control panel to initiate setup.
To input the first point of the alignment line, point and click in the overview window one or more times until the detail window view shows the area where you want the first point, click on an exact position in the detail window to input the value for the first point.
Repeat for the second point of the alignment line.
During scanning, the alignment line and the drawing will then be rotated to be horizontally aligned.

4.2.2 Scanning-to-file

Press the "Scan" button to begin scanning-to-file.

Scan:

Pressing the Scan button repositions the paper original in the scanner, and start of scanning follows immediately thereafter. During scanning, the scanned image is displayed in the view windows of the Scan Screen. The detail view can be moved horizontally along the line of scanning, by clicking in the overview window or by using the slider below the view window.

Contrast/Brightness:
When scanning graytone images, the Contrast and Brightness controls may be changed during scanning using the controls on the control panel (it may take a while to show the change on the screen, due to internal buffering of data in the scanner).

Threshold:
When scanning B/W images, the threshold can be changed during scanning using the controls on the control panel, e.g., to compensate for dark or light parts of the drawing.

AutoScan:
If one of the adaptive threshold options has been selected prior to the start of scanning of a B/W image (pressing "Scan"), an investigative scan may (when selecting GL-Global Histogram) be done automatically prior to scanning-to-file.

Cancel

:

Scanning is terminated either upon reaching the end of the drawing, by the operator pressing the "Cancel" button on the control panel, or by activating one of the buttons on the Full Scale Scanner operator panel. The scanned part of the original will be saved to disk under the file name specified, with a three-letter scanned file-format-type extension automatically added (for scanned file-format abbreviations, e.g. .rlc, .gp4, etc., see the chapter: "Supported File Formats").

4.2.3 Setting the scanning options

Setting up of the scanning options for the scanner is done by clicking the corresponding icons at the top and bottom of the screen and selecting an item from the pop up menu.

File

At the top of the Scan Screen you find the input field for the destination Filename.

The destination Filename may either be typed into the input field, or by pressing the "File" button to pop up a "selector box" for easy selection of the directory and file name:

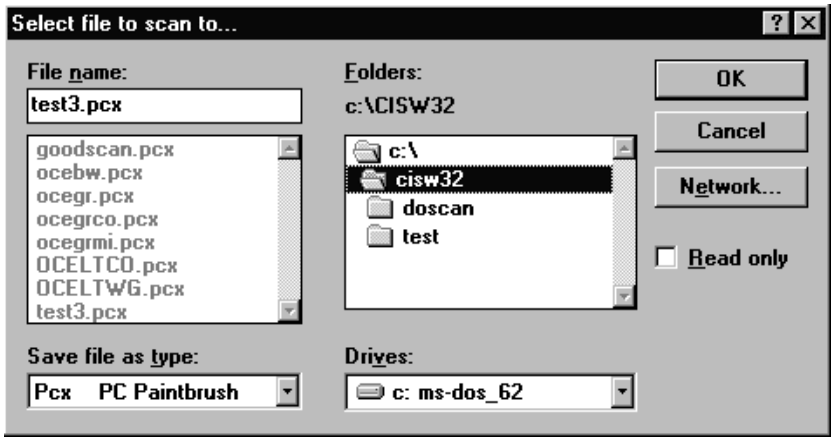


Fig. 4-2: File to Scan to... Dialog

When selecting the file type in this screen you cannot select options and sub file types, this is described later in this section for the "Type" button.

Scanwidth:

Pressing the "Scanwidth" button pops up the dialog shown below.

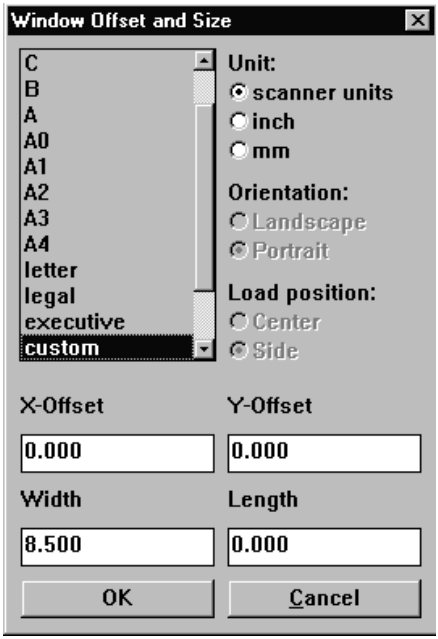


Fig. 4-3: Setting Scanwidth Dialog

In the dialog you can set:

- **Units:** The units displayed in the offset, width and length fields Scanner units (as displayed on the front of the scanner), Inches, or mm.
- **Orientation:** Landscape or Portrait
- Load position: Left side or Center aligned insertion of the paper original into the scanner. If Paper load position has been set to Center, the X-Offset is set to 'Max Scanwidth/2 - Scanwidth/2'. Note that 'Center' is not active if '**Custom**' is selected.
- **Paper Sizes:** Available standard sizes are shown in the selection box, and include common US, European and DIN drawing sizes. If selecting Custom the Paper size is defined in the "Width" and "Length" edit fields.

- **Auto Sizing (displayed if available):** Three selections for auto detection of the paper size are available in the paper size list: Auto size ISO, Auto size US and Auto width:
  Auto size ISO: The Width and X-Offset are auto 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 X-Offset are auto 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 X-Offset are auto detected.
- **X,Y Offset:** The offset edit fields defines the offset of the scanning field in relation to the paper origin.

Info:

Pressing the "Info" button pops up a window showing: "Drawing width and length in pixels, resolution and size" of the previously scanned file.

Fig. 4-4: Info Dialog

Type:

Here you can select the destination file-format type. A description of all supported file formats is found in the chapter: "Supported File Formats".

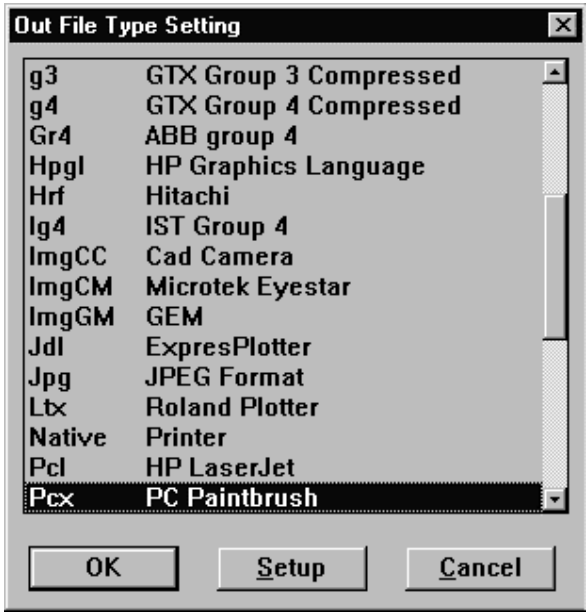


Fig. 4-5: File Type Dialog

For certain General Image, Graytone, and Print/Plot file formats, additional setup information may be input by pressing the Setup button for the selected file format. Detailed information on this is found in the chapter on: "Supported File Formats."
The color and graytone options of the file formats supporting color or graytone scanning (e.g. .Tif, .Pcx or .Igs), becomes selectable when "Mode" is selected to one of the color or graytone modes. (see Mode later this section).

DPI:

The dialog shown below pops up when pressing the "Dpi" button.
You can set the resolution to any of the resolutions supported by the scanner:

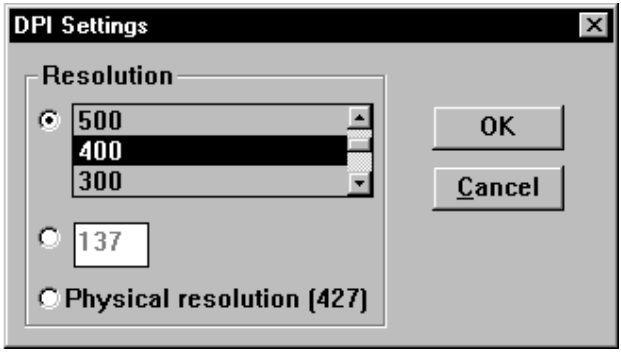


Fig. 4-6: Set Scanning Resolution (Dpi) Dialog

CADImage automatically detects the resolutions supported by the attached scanner and displays only those applicable. Selections are:

- **List box:** Using the slider you can select between the standard resolutions.
- **Custom Edit field (Displayed if one of the Color modes is selected):** The edit field allows you to set the scanning resolution in one dpi increments.
- **Physical resolution:** Selecting "Phys.Res." is of interest when scanning in graytone mode for later processing, the resolution is the actual unscaled physical resolution of the attached scanner.
- **Turbo Mode(Displayed if available):** 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.

Mode:

The dialog shown below pops up when pressing the "Mode" button:

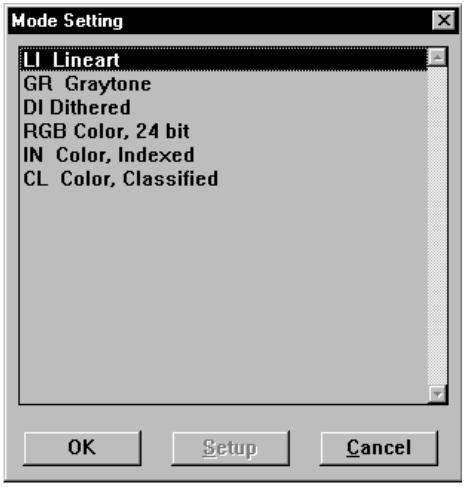


Fig. 4-7: Scan Mode Selection Dialog

You can set the scanning mode to those modes supported by the scanner:

- **Line** This mode uses thresholds to determine if a pixel is black or white. Use this mode for drawings and line art.
- **Graytones** In this mode 256 gray levels are recognized for each pixel (1 byte, 8 bits per pixel).
- **Dither** Scans Graytones as dithered black and white.
- **RGB** 24 bit true color mode.
- **Indexed** Indexed color mode.
- Clicking the Setup button pops up a dialog for selecting number of colors and method for computing the index color values based on a prescan analysis of the image:
  Linear: Index colors are linearly distributed (no prescan).
  Adaptive Photo: Index colors optimized for photos.
  Adaptive Map: Index colors optimized for maps.
- **Classified** A standard open file dialog pops up for selecting and loading the feature extraction LUT file (.lut).

Proc.:

The dialog shown below pops up when pressing the "Processing" button.

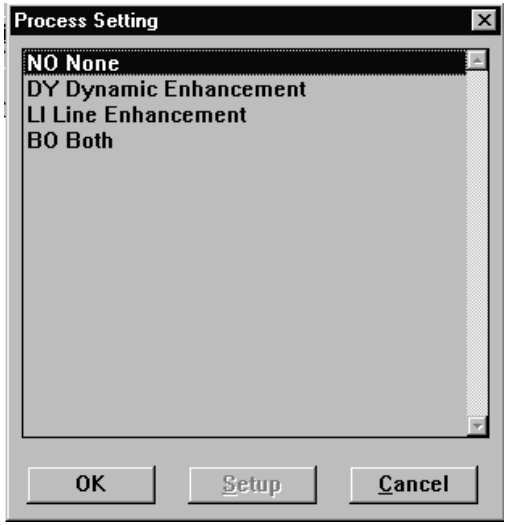


Fig. 4-8: Image Processing Options Dialog

You can set processing options* to:

- **Dynamic -** The scanner analyzes the information from the drawing and detects and emphasizes area edges, fine lines, and small details. This option is mostly used with maps and difficult drawings with weak details. For normal drawings, better results are obtained without it.
- **Enhanced** - If line enhancement is on, lines represented as thinner than one pixel will be increased to one pixel width. Lines represented as one or more pixels in width will also be increased by one pixel.
- **Dynamic+Enhanced –** Both of the above.
  Note: "Dynamic" and "Dynamic+Enhanced" cannot be selected together with an "auto" selection.

*Note: The processing options only take effect in B/W-Line mode.

Spck:

The dialog shown below pops up when pressing the "Speckle" button.

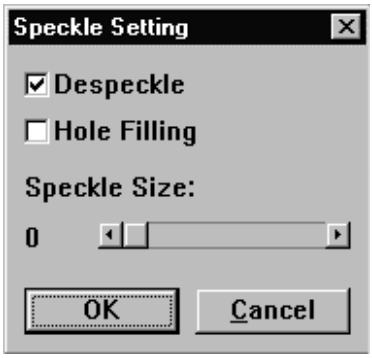


Fig. 4-9: Despeckle and Hole Filling Dialog

You can select Despeckling and/or Hole Filling filter(s), the Speckle Size slider in both cases sets the side size in pixels of a square box. Despeckling removes black speckles that fit within the box. Hole Filling removes white holes that fit within the box. Filtering occurs on-line during scanning.

Auto [AutoScan]:

The dialog shown below pops up when pressing the "Auto" button.

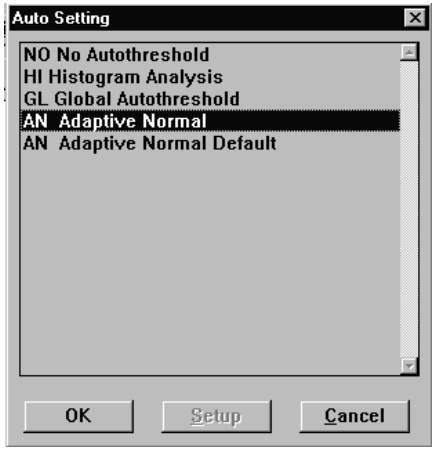


Fig. 4-10: Auto Scan selection Dialog

The following five selections are available in Line mode only:

- **None -** None of the below "Auto" selections is active, scanning takes place in the Fixed Threshold or graytone mode.
- **Histogram -** After pressing the "Scan" push-button, and prior to scanning-to-file, 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 histo¬gram of the distribution of graytones in the image is dis¬played 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. For more details on using histograms, see later section on "Histogram analysis."
- **GL-Global Autothreshold -** Histogram analysis is performed as described above, but scanning-to-file proceeds automatically using the computed global threshold value (without display of the histogram).
- **AN- Adaptive Normal* -** This selection is the normal adaptive mode used with low contrast and difficult to scan drawings. The

two controls: Adaptive Level and Background Suppression are set by the user for optimal result (see later section on "AutoScan" for details)

- **AN - Adaptive Normal Default* -** This selection functions as Adaptive Normal (AN) above, but Adaptive Level and Background Suppression is initially set to the default values appropriate for a normal drawing.

*Note: In the above adaptive modes, the built-in Digital Signal Processor (DSP) in the scanner supports on-the-fly two-dimensional 2D-Adaptive thresholding without the need for investigative pre-scanning.

Special:

The "Special" options button brings up the dialog shown below.

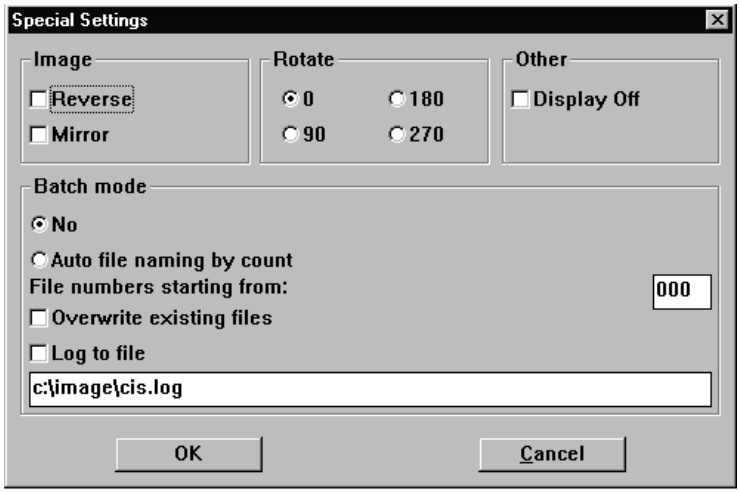


Fig. 4-11: Special Options Dialog

One or more of the following options can be selected independently (selections are only maintained while you stay in the Scan Station, leaving this resets options to "off"):

- **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 option will mirror the drawing during scanning to correct for this.
- **Reverse -** This option, when set, will reverse the image as a negative, with black parts becoming white and white parts becoming black. In Color the R,G & B channels invert separately.
- **Display Off -** Disables the graphic display during operations in order to increase speed.
- **Rotation -** During scanning it is possible rotate the image, rotations of: 0, 90, 180 or 270 degrees are selectable.
- **No Batch -** Drawings are scanned on demand by pressing the "scan" button.

- **Batch, Auto file naming by count -** As long as you have selected the Batch option, a three-digit number is added to your 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.).

  When you run batches of drawings, the loading into the Full Scale Scanner models can be speeded up by selecting: "AutoLoad" in the Scanner Setup selection found in the File menu (Technical Document Scanner models will always "Auto Feed" in batch mode until the drawing input tray is empty).

  In the check boxes you can specify if existing files should be overwritten by the new scan, and if a log file of the scanned drawings should be made.

- **Log file -** if " Log to File" is checked, logging is enabled even if batch is set to NO.

  The Log file is a comma separated delimited file, each line containing:
  "Filename, DPI, Threshold, Adaptive Level, Backgr.Suppr., Status".

  If either Threshold, Adaptive Level or Backgr.Suppr. is not used, the value is set to -999.

  Status can be:
  OK: Scanning to file was OK.
  Overwrote: When scanning to file an old file with the same name was overwritten.
  SkippedNoMatch: Scanning was skipped due to no matching autosize setup.
  SkippedDueToFilenameConflict: Scanning was skipped due to filename conflict with existing file and overwriting existing file was not allowed.

  When selecting Batch, 'Auto file naming by count' has been chosen and 'Overwrite existing file' has not been allowed, the program will automatically increase the counter until a non conflicting file name can be generated.

4.2.4 Histogram analysis

Histogram analysis is based on the fact that a normal drawing is not all black and white. It might be dark blue or brown lines on light blue or brown background. When the camera in the scanner looks at a drawing, it converts what it sees to graytone levels between 0 and 255. A very black background is represented by a high value and a very white background is represented by a low value. The light and dark gray, blue, brown, or any other tone are represented as in-between gray-tone values.

When the scanner performs a histogram analysis, it counts the number of pixels found at each of the 256 gray-tone levels. CADImage presents these counts in a graphical manner, as shown in the figure below. On the horizontal axis the graytone level and on the vertical axis you have the accumulated count of pixels at each individual gray-tone level.

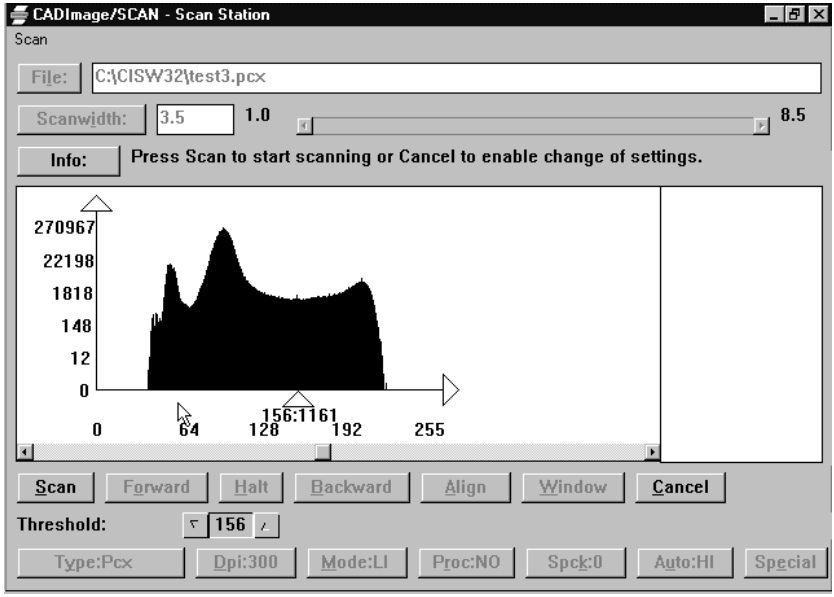


Fig. 4-12: The Histogram Screen

The vertical line in the histogram with the value-indicator attached shows at the line position:

Threshold value: number of pixels found at this value

The initial threshold value displayed on the screen is an automatically computed "good value" based on algorithmic analysis of peaks in the histogram. You can change the position of the vertical value-indicator line by dragging the threshold slider to a new threshold value with the mouse.

As you change the threshold value, the pixel count indicator gives you the exact number of pixels encountered at the gray-tone level of the indicator position, found within the investigated scanned area.

When you scan with a specific threshold, all gray tones lower than this threshold will be represented as white pixels, and all gray tones over this threshold will be represented as black pixels.

In most cases you will see a histogram with two peaks (see figure). If you have a third peak at a low gray-tone level, it is because the scanner cameras have seen some of the scanner's own white reference background (narrow the scanwidth setting to the width of the drawing to avoid this). Of the two other peaks you see, the first larger one represents the background information (the lightest gray tones) of the scanned original, and the second smaller one represents the line information (the darkest gray tones) in the drawing.

Normally the best threshold selection is in the deepest part of the valley between the two peaks and closest to the larger peak representing the background information in the drawing, as shown in the figure.

In many cases things will not be as simple as in the figure, but by using the histogram analysis intelligently, you will often be able to get good scanning results from poor original material.

4.2.5 AutoScan

The Scanner and the built-in Digital Signal Processor (DSP) supports two-dimensional 2D-Adaptive thresholding without the need for investigative pre-scanning. In addition the scanner supports Global Histogram threshold setting using an investigative pre-scan.

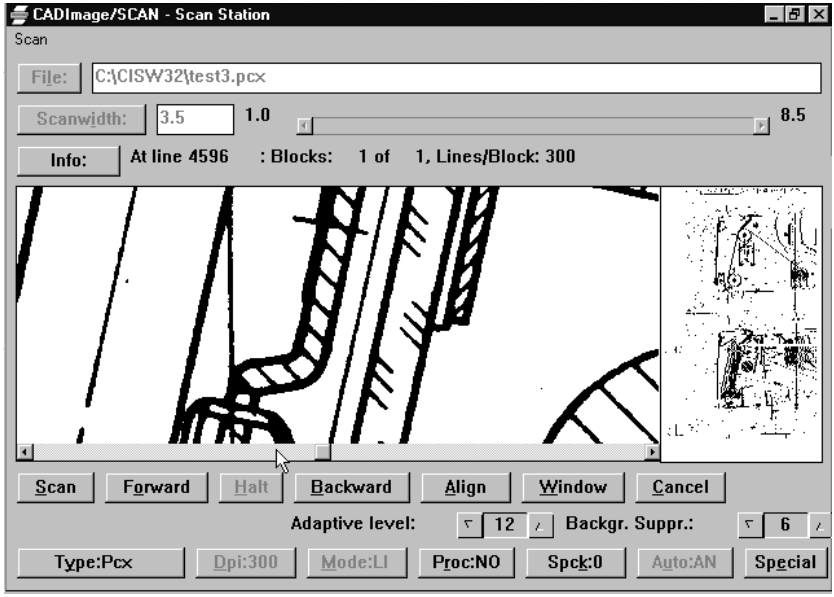


Fig. 4-15: 2-D Adaptive controls

2D-Adaptive thresholding - The 2D-Adaptive thresholding is based on the scanners built-in high speed Digital Signal Processor (DSP) performing two-dimensional analysis of the graytone information of each pixel. This is then compared with its neighboring pixels, in real-time while scanning the drawing.
Two 2D-Adaptive Threshold selections are available: **AN** for low contrast difficult to scan drawings, and **AN**-Default which works identically, but sets initial default values of the controls for normal easy to scan drawings. The controls for both are shown in the figure overleaf:

Adaptive Level (0-40): This works like a threshold, the lower the value, the more of the background is picked up. Normal range is: 3-15, with a setting of 10 working well for most drawings.
Background Suppression (0-18): Normally set to zero, but is raised to suppress the background influence in drawings with dark or patched multilevel background.

As the DSP works in real-time, the settings can be changed on-line, both during pre-scan and scanning to file. It may take a little while to

display the change on the screen due to internal buffering of data in the scanner.
To set the adaptive controls for a difficult drawing, start pre-scan by pressing "Forward". Select a difficult area in the overview window and click on this using the mouse pointer. Pressing the "Halt" button causes the scan to oscillate forwards and backwards, continuously displaying the selected area in the "detail window". Scan quality can be altered interactively whilst viewing the results on screen. Modifications appear on the down-strokes.

- Adjust the Adaptive Level for best result.
- If borders between lighter and darker areas (patches) in the background show, increase the Background Suppression until they just disappear.
- Re-adjust the Adaptive Level.

Global Autothresholding - The drawing is scanned investigatively and a global single threshold value is computed, based on the algorithmic analysis of the graytone histogram. After automatic return of the drawing to it's starting point, scanning progresses using the determined threshold value.

4.2.6 Direct copying to a Plotter/Printer device

Choosing one of the Print/Plot formats or Native Printer* in the file type dialog box sends the output from scanning to an output port or device, instead of to a file.
Having selected the Print/Plot device, the setup button can be used to alter the parameters.
This allows you to copy a B/W original (scanned in Line mode) directly from the scanner to a Plotter/Printer device, e.g. to make a cleaned up copy of an old faded or stained original, using the 2D-Adaptive or AutoThreshold features of the scanner.
Please refer to the chapter: "Supported File Formats" and the appendix: "Plotter Device Configuration" for information regarding set up for your plotter or printer.

*Note: Native Printer available in Windows.

4.3 Scan Menu

Clicking the Scan pull down menu in the Main Menu bar, displays the Scan Menu shown below.

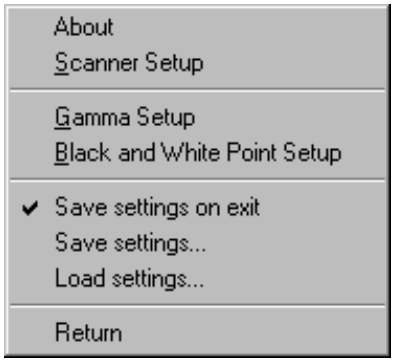
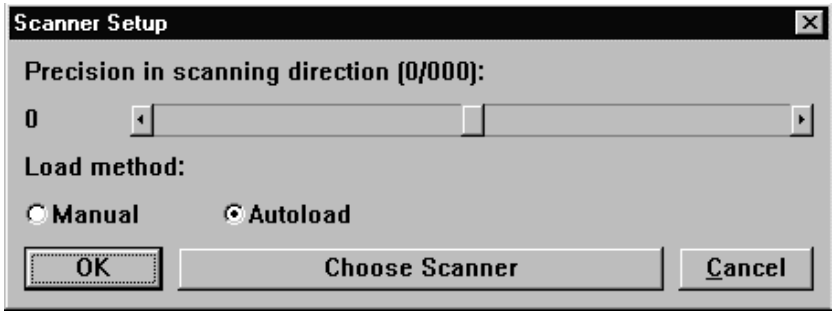


Fig. 4-16: Scan Menu

The Scan Menu allows you to set up scanner device options with the "Scanner Setup" selection, other options are also selectable. Ending scanning and returning to the View screen is done by selecting "Return".

4.3.1 Scanner Setup

The Scanner Setup choice pops up the dialog shown below for selecting active scanner, load method, and fine adjustment of the scanner's vertical precision setting.



Select Scanner:
Pressing the Choose Scanner button in the Scanner Setup menu allow you to choose the active scanner, if more than one is installed on the SCSI port (on different SCSI addresses).

Select Load Method:
For the Full Scale Scanner models, the Scanner Set-up dialog allows you to choose:
Manual - Press Start button on the scanner to load the inserted original into the scanner.
AutoLoad - The scanner automatically loads the original when inserted into the scanner.

Vertical Precision Setting
The Scanner Set-up dialog allows you to fine adjust the scanner's vertical precision setting. The factory setting is zero, with the mechanically adjusted vertical scan accuracy being extremely precise, and much better than required for most applications.
Should your application (e.g. maps) require very high accuracy, you can modify vertical precision in increments of 0.1 thousands of an inch between +10 and -10 thousands of an inch by using the slider.
With positive settings meaning that the distance between scan lines being incremented, and negative settings meaning that the distance between scan lines being decremented.
When you exit the Scanner Setup dialog, the modified value is stored in non-volatile memory in the scanner, and will only be changed by re-doing the set-up.
The procedure for vertical precision adjustment would be to scan a precision original. Import the scanned drawing into your CAD system or other application and measure the vertical distance between points in the image, and compare with the similar physical measurements between the points on the original.
Caution should be taken at all stages in the procedure with regard to stability and temperature sensitivity of original and measurement ruler used. Also, you should do the set-up at the scanning resolution you will later actually be using for scanning the originals.

4.3.2 Gamma Setup

The Gamma Setup choice pops up the dialog for setting the curves.

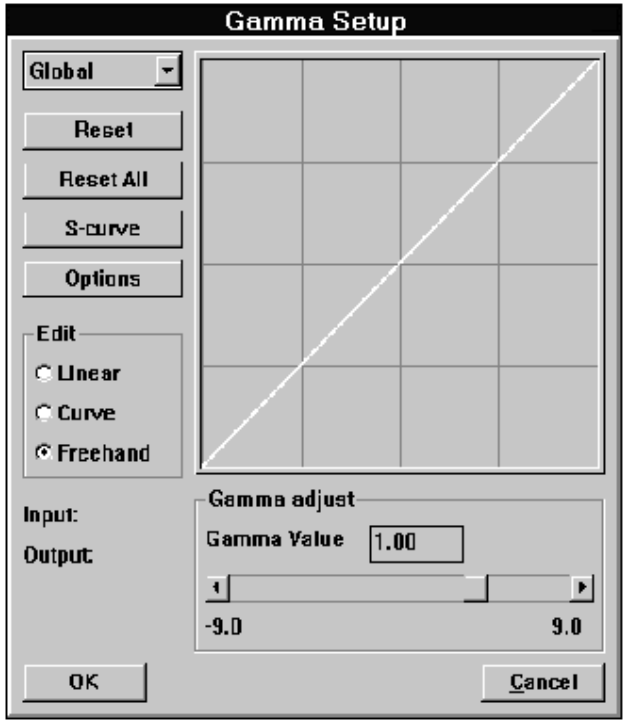


Fig. 4-17: Gamma Setup Dialog

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 (Global).
When changing the global curve, the changes will automatically be copied to the Red, Green and Blue curves. If brightness/contrast has been set in the Scan Screen the displayed curves will reflect this.

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 of the image.

Reset:
Clicking Reset will reset the currently selected color tone transfer curve to linear (1 to 1). Clicking Reset All will reset all transfer curves to linear.

S-curve:
Clicking S-curve will set the tone transfer curve to a Floyd-Steinberg curve also called an S-curve, the most commonly used tone enhancement of photos.

Options:
Clicking Options will enable setting of dot size, grid and number of curve handles.

Edit:
The Edit selection provides options for mouse dragging adjustment of the tone curves by handles:

- Linear between handles.
- Curve between handles
- Freehand, curves are drawn by clicking and dragging the mouse.

Gamma:
The Gamma adjust selection is used for adding a Gamma function to the existing curve. Settings are allowed in the range -9 to +9, where negative values mirror the gamma curve around the vertical center line.

When you leave the dialog by clicking OK, the modified curves are stored.

The color transfer curves are downloaded into the scanner when doing a prescan or scan, and the Contrast and Brightness values are set to zero.

4.3.3 Black and White Point Setup

The Scanner White Point and Black Point setup choice pops up the dialog for setting the points.

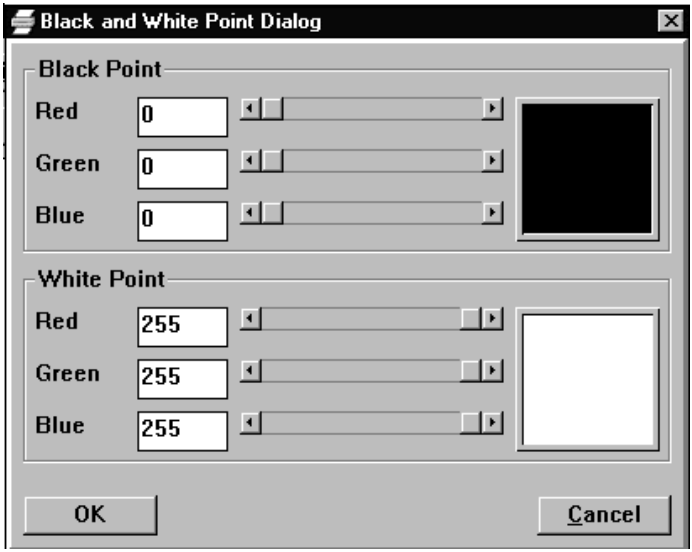


Fig. 4-18: Setting Black and White Point Dialog

Range for the Black Point settings are 0,0,0 to 15,15,15.
Range for the White Point settings are 128,128,128 to 255,255,255.

When you leave CADImage, the modified offsets are not stored. On startup, CADImage will revert to the calibrated settings stored in the non-volatile memory in the scanner (The calibrated scanner settings are Black Point: 0,0,0 and White Point: 255,255,255).

Adjusting the White Point will determine the amount of highlight detail in the scanned image. The White Point should be set so that the lightest part just have zero 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 just have zero detail.
Maintaining R=G=B for both the White Point and the Black Point will maintain the color balance in the scanned image.

4.3.4 Save settings on exit

When the "Save settings on exit" selection in the Scan menu is checked, the settings of all scanning options at the end of your session with CADImage is auto-saved to the file CIS.INI in the CADImage/SCAN directory. These will be auto-loaded as initial settings the next time CADImage is started.

4.3.5 Save settings

When the "Save settings" selection in the Scan Menu is selected, a file box pops up for enabling the present settings of all the scanning options in CADImage to be saved in a user specified filename (extension .INI).

4.3.6 Load settings

When the "Load settings" selection in the File menu is selected, a file box pops up for loading a previously saved file containing settings of the scanning options in CADImage.

4.3.7 Return

Retuns to the View Screen.

5. View Screen & Image Menu

5.1 Introduction

The View Screen displays the following image types:

- RGB Color
- Indexed Color
- Feature extracted Color (Classified Color)
- Graytones
- Raster (B/W lineart)

The Viewer supports a rich set of View, Zoom and Image Functions in a user friendly graphic interface:

- Screen functions in the View Toolbar:
  - Main view with zoom operations
  - 3 local Viewboards with zoom operations
- Image Functions in the View Toolbar:
  - Image Cropping
  - Align
  - Invert
  - Mirror
  - Despeckle
  - Measure
  - Rotate left 90°
  - Rotate right 90°
  - Rotate 180°
- Image functions in the Image pull down menu:
  - Brightness/Contrast
  - Histogram Stretch
  - Hue/Saturation/Value
  - Red/Green/Blue
  - Grayscale
  - Classify
  - Decrease Colors/Graytones
  - Count Colors

All Image functions (except for alignment and despeckle) are processed on screen data only, for fast interactive use. The whole image file is updated on `Save'.

5.2 View Screen, View Tool Bar and Status Bar

To start viewing and manipulating an image you open the image file and select "Viewer" from the Main Tool bar (clicking the spectacle icon), you see the View Screen shown overleaf.

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

The screen is divided into 4 functional areas around the main display area:

- **Pull Down Menu Bar**
- **Main Tool Bar**
- **View Tool Bar**
- **View Screen Status Bar**

The pull down menus and Main Tool bar have been described in previous chapters, except for the "Image" menu selection described later in this chapter.

5.2.1 Selection of views in the View Tool Bar

The View Tool Bar is divided into a view selection part on the left side followed by image manipulating tools on the right.

When one of the view selection buttons is turned on, the button stays turned on until another view is selected (radio button behavior). Changing between views does not change the function of other view tools:

- **Main View:** Displays the image in one of the color modes, greytone mode or raster mode.
- **Viewboards 1, 2 or 3:** Displays zoomed-in parts of the image in one of the color modes, greytone mode or raster mode.

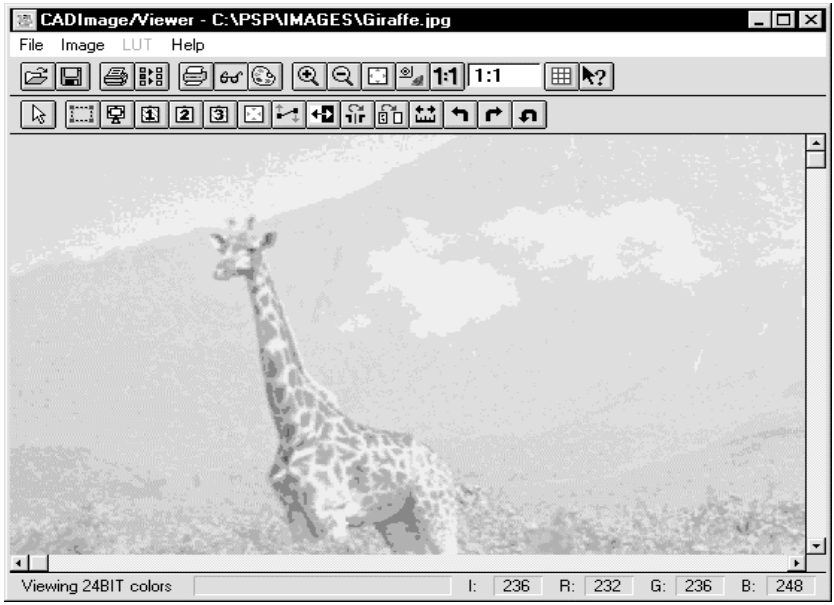


Fig. 5-1: The View Screen

Main View Screen:

The Image is displayed on the screen at the present zoom level, returning from a Viewboard will restore the zoom level to the value previous to that of leaving the Main View.

Viewboard 1,2,3:

Local Viewboards, clicking a Viewboard button for the first time after an image has been opened, displays the image as seen in the Main View. When in a Viewboard you can zoom and reposition the displayed part of the image, this partial view of the image is stored when leaving the Viewboard. Clicking the Viewboard again will restore the view as it was, when the Viewboard was previously left.

Standard Cursor:

Always Active.
Clicking on this tool will change the cursor to the standard cursor:

Rectangle Selector:

Clicking on this tool will turn the button “on” and change the cursor to:

Clicking and dragging the mouse allows a rectangle to be selected on the screen.

The cursor then changes to the standard cursor. The rectangle has handles and can be resized and moved with the standard cursor while using the zoom tools.

Clicking on any other tool except those listed below and the zoom tools, inclusive turning the rectangle selector tool off, will deselect the rectangle without any function performed.

Clicking on Crop, Save, Save As or Print will perform the function on the rectangle area and afterwards deselect the rectangle.

The selected rectangle can thus, by clicking one of the above tools immediately following the final setting of the rectangle, be:

- Printed (Print)
- Saved to file (Save, Save as)

The Save and Save as Rectangle will include all image changes. Only the selected part is saved.

5.2.2 Image Manipulation Tools:

The image manipulation functions found in the View Tool Bar are:

- Image Cropping
- Align
- Invert
- Mirror
- Despeckle
- Measure
- Rotate left 90°
- Rotate right 90°
- Rotate 180°

All Image manipulation functions are only processed on the displayed image data (except for alignment and despeckle). The whole image file is first updated on 'Save'.

Crop:

Only active when a Rectangle has been selected.
Clicking the Crop tool will remove all image data outside the selected rectangle.

Align:

Active if an image has been loaded.
Clicking the Align tool will turn "on" the button and change the cursor to:

Turning on the Align tool button allows an alignment line to be dragged for rotation of the image until the alignment line is horizontal. The cursor changes to the standard cursor and the alignment line has handles at its ends which can be dragged and resized while using the zoom tools and changing between Viewboards.
Alignment angle is displayed in the Info Field in the Status Bar.

Actual alignment is performed on the image when double clicking (or pressing the right mouse button on the image). Selecting any other tool, including turning the Align tool off, will deselect without aligning.

Alignment rotation is performed to a temporary file.

Invert:

Active if an image has been loaded.

Toggles On/Off and inverts the image when the tool is ON. For B/W images Black and White is inverted. For Graytones, Indexed Color and RGB the Invert function: (Output=255-Input) is performed on respectively the Graytones directly, or the Palette Colors or the RGB colors individually on each color channel.

Mirror:

Active if an image has been loaded.

Clicking Mirror will mirror the image horizontally.

'Despeckle:

Active if a B/W image has been loaded.

Pops up dialog for setting up a despeckling/hole filling size (0-255 pixels). The Image File will be despeckled/hole filled, depending on the two check box settings, when clicking OK, and the views are updated.

Measure:

Active if an image has been loaded.

Clicking on the Measure tool turns the button "on" and changes the cursor to:

Turning on the Measure tool allows for dragging a measure line. The cursor changes to the Standard Cursor and the measure line has handles at its ends and can be dragged and resized while using the zoom tools and changing between Viewboards. The Status Bar measurement information part is updated continuously with measured data: Distance (in pixels, mm, inch) and Angle.

Toggling off Measure tool or clicking any other tool causes the measure line and the status bar measurement information disappear.

Rotate Right:

Active if an image has been loaded.

Clicking Rotate Right will rotate the displayed image 90° right. The image file is rotated on `Save'.

Rotate Left:

Active if an image has been loaded.

Clicking Rotate Left will rotate the displayed image 90° left. The image file is rotated on `Save'.

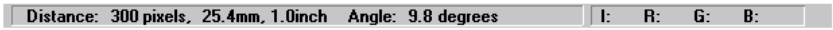
Rotate 180°:

Active if an image has been loaded.

Clicking Rotate 180° will rotate the displayed image 180°. The image file is rotated on 'Save'.

5.2.3 View Screen Status Bar

General information is shown in the left side information part of the status bar. The properties of the pixel that the cursor is presently positioned over in the display area, is shown in the right side part of the Status Bar:



If the image type is Feature extracted, Indexed or RGB, the Pixel Properties are shown as IHSV or IRGB, depending on the Preferences settings in the File Menu:

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

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

where:

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

If the image type is Graytone, the Pixel Properties are shown as I (intensity). If the image type is B/W, none is displayed.

When displaying the Main View or Viewboards, a vertical and horizontal slider appears unless the whole image can be presented within the physical screen size. (Standard Windows behavior).

This enables panning the images in both vertical and horizontal directions if needed.

5.3 Image Menu

Clicking the "Image" pull down menu in the Main Menu Bar, displays the Image Menu shown below, the menu contains selections for Image operations:

Fig. 5-2: Image Menu

The Image Menu is only enabled together with the View Screen.

The Availability of the different menu items varies with the loaded image type, see table (available=x):

	B/W	Graytone	Indexed	RGB
Brightness/Contrast		**x**	**x**	**x**
Histogram Stretch		**x**	**x**	**x**
Hue/Saturation/Value			**x**	**x**
Red/Green/Blue			**x**	**x**
Grayscale			**x**	**x**
Classify				**x**
Decrease Colors/Graytones		**x**	**x**	**x**
Count Colors		**x**	**x**	**x**

5.3.1 Brightness/Contrast

Selecting Brightness/Contrast in the menu pops up the dialog shown below:

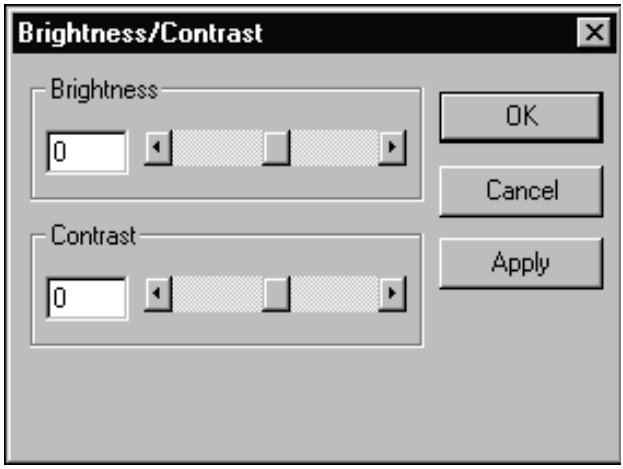


Fig. 5-3: Brightness/Contrast Dialog

Brightness (b) and Contrast (c) are both selectable with values from -100 to 100, and the function is applied to:

Graytone images:	pixel graytone values
Indexed Color:	palette colors, individually to R,G and B values
RGB:	pixel colors, individually to R,G and B values

If Apply is pressed, the image is updated with the changes without leaving the dialog.

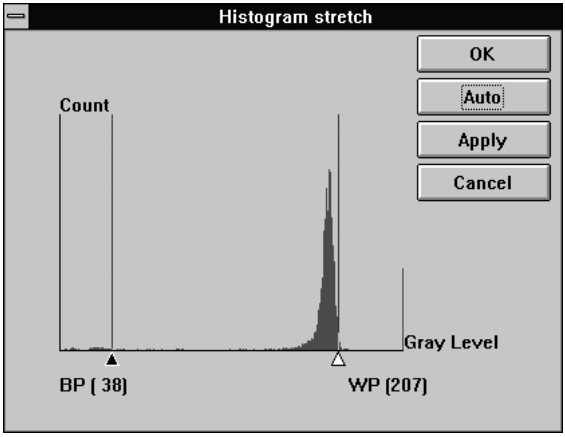
If OK is pressed, the image is updated with the changes.

If Cancel is pressed, the contrast/brightness values are reset to the values before the dialog was called up.

5.3.2 Histogram stretch

Selecting Histogram stretch will pop up a Sub Menu for selecting either Auto or Manual:

Auto: - Selecting Histogram Auto Stretch will initiate generation of the luminance histogram (max(R,G,B)) for the image. Two points in the histogram are now found automatically: The Black Point BP (graylevel (0-255) of the 5% darkest pixels) and the White Point WP (graylevel (0-255) of the 5% brightest pixels), and Brightness (b) and Contrast (c) settings are applied to the Graytone, Feature extracted color, Indexed color or RGB color image, This will stretch the image for the resulting histogram to occupy a graytone range from 0 to 255.
Manual: - Selecting Histogram Stretch Manual will function as for Histogram Auto, but the luminance histogram is displayed, you can manually set the Black Point (BP) and the White Point (WP) by dragging them to any position within the luminance range (0-255).
Clicking OK will perform the stretching of the image for the resulting Histogram to fit between the two points.
Clicking Auto will set WP and BP as described above for Auto.



Clicking Apply will make a preview stretching of the image without leaving the Histogram Stretch dialog.

5.3.3 Hue/Saturation/Value

Selecting Hue/saturation/value will pop up a dialog with selectable values in the range -100% to 100%:

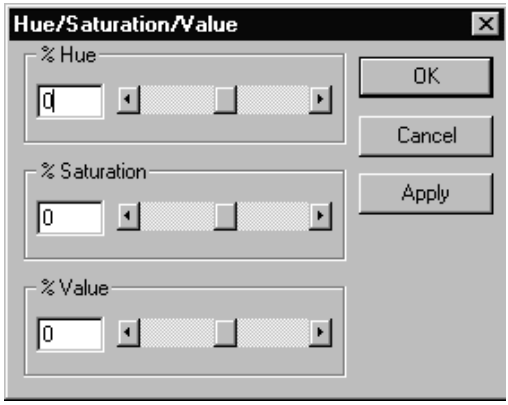


Fig. 5-4: HSV Dialog

Where the settings are:

Hue: Increases/decreases Hue, all colors are moved simultaneously up or down the spectrum (around the Color Wheel) (-100% to +100% corresponds to -90° to +90°.

Saturation: Increases/decreases Saturation, -100% converts the image to Graylevels (-100% to 100% corresponds to a multiplication factor 0 to 2, cutting values > 255 to 255).

Value: Increases/decreases Luminance, -100% produces pure black. (-100% to 100% corresponds to a multiplication factor 0 to 2, and cutting values > 255 to 255).

If Apply is pressed, the image is updated with the changes without leaving the dialog.

If OK is pressed, the image is updated with the changes.

If Cancel is pressed, the values are reset to the values before the dialog was called up.

5.3.4 Red/Green/Blue

Selecting Red/Green/Blue will pop up a dialog with selectable values in the range -100% to 100%:

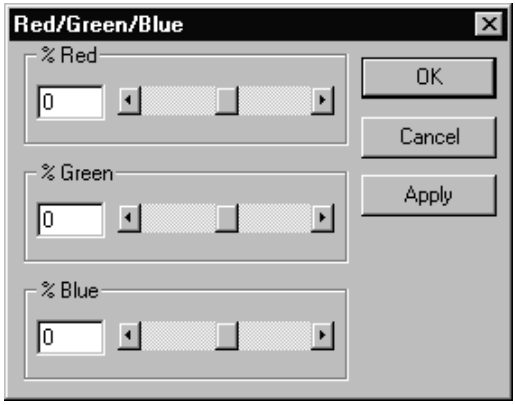


Fig. 5-5: RGB Dialog

Where the function of the settings are:

Red: Increases/decreases Red level (-100% to 100% corresponds to a multiplication factor 0 to 2, and cutting values > 255 to 255).

Green: Increases/decreases Green level (-100% to 100% corresponds to a multiplication factor 0 to 2, and cutting values > 255 to 255).

Blue: Increases/decreases Blue level (-100% to 100% corresponds to a multiplication factor 0 to 2, and cutting values > 255 to 255).

If Apply is pressed, the image is updated with the changes without leaving the dialog.

If OK is pressed, the image is updated with the changes.

If Cancel is pressed, the values are reset to the values before the dialog was called up.

5.3.5 Grayscale

Selecting Grayscale will convert the Feature extracted color, Indexed color or RGB color image to Grayscale by replacing each color with a gray of equal luminance (I=0.3R+0.59G+0.11B).

5.3.6 Classify (Feature extract)

Selecting Classify will pop up a dialog for selecting a .lut file.
Pressing OK will apply the LUT to the RGB image, performing off-line feature extraction (e.g. converting it to Classified color).

5.3.7 Decrease Colors/Graytones

Selecting Decrease Colors/Graytones dialog for type and method:

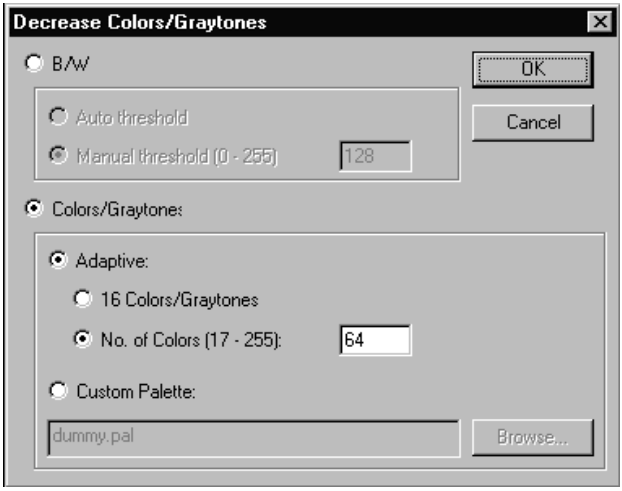


Fig. 5-6: Decrease Colors/Graytones Dialog

B/W: The luminance of the input Graytone/Indexed/RGB image is used as the base for thresholding, in either:

- **Auto threshold:** The threshold is automatically computed from the histogram.
- **Manual threshold:** The threshold is set by the user (0-255).

Color/Graytones: Output is Indexed Color for Indexed Color/RGB images and Graytone for graytone input images:

- **Adaptive:**The image is mapped based on nearest color for Feature extracted color, Indexed color and RGB color. For Graytone input, output graytones are selected based on equalizing the histogram:

  16 Colors/graytones: .Fixed selection of 16 Output Colors. (output image file type will be 4 bit indexed if possible, otherwise 8 bit).

  No of colors (17-255): As for 16 Colors above, but with variable no. of Output Colors. (output image file type will be 8 bit indexed).
- **Custom Palette:** A custom palette: .lut, .pal, .tif, .pcx etc. is loaded (see LUT Menu: Add from Palette for details).

The number of Output Colors and image file type is decided by the chosen custom palette file.

5.3.8 Count Colors

Selecting Count Colors in the menu will pop up a dialog displaying the number of colors or graytones used in:

- Image,
- Viewboards or
- Rectangle Selection.

Pressing OK will remove the message.

6. Feature Screen & LUT Menu

6.1 Color Feature Extraction Introduction

A scanned color image of a map or drawing has many more colors (up to 16.7 million) than features that can be conceived by the human eye. For example, the edge pixels of a red line on a white background will have graduations of red colors. A red and blue line crossing each other will have pixels whose colors are a mixture of red and blue etc. You need to filter all the colors in the input image so that only the perceived features are shown in the output image e.g. a single red color representing both the center and the edge pixels of the red line on a clean white background, or a red line crossing over a blue line.

The LUT filter (color Look Up Table) in the scanner can automatically reduce of all the scanned colors into a few significant colors (max. 255) representing the actual features. In addition you will obtain a significant compression of data, from 24 bit/pixel down to 8bit/pixel or even 4bit/pixel.

However, the scanner can not automatically generate the LUT filter content, so that the output colors correspond to the features 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 to automatically perform feature extraction (and data compression) on a whole class of similar maps or drawings.

To assist the user in preparing the LUT filter content for a class of similar map or drawings, the LUT editor provides tools to merge, explode or remove colors. This editing process will thus 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 (24-bit RGB) and the output image (8 or 4-bit feature extracted). Pixels that will be affected by the current edit operation are interactively highlighted. Any modifications will only be applied once the user is satisfied with the result.

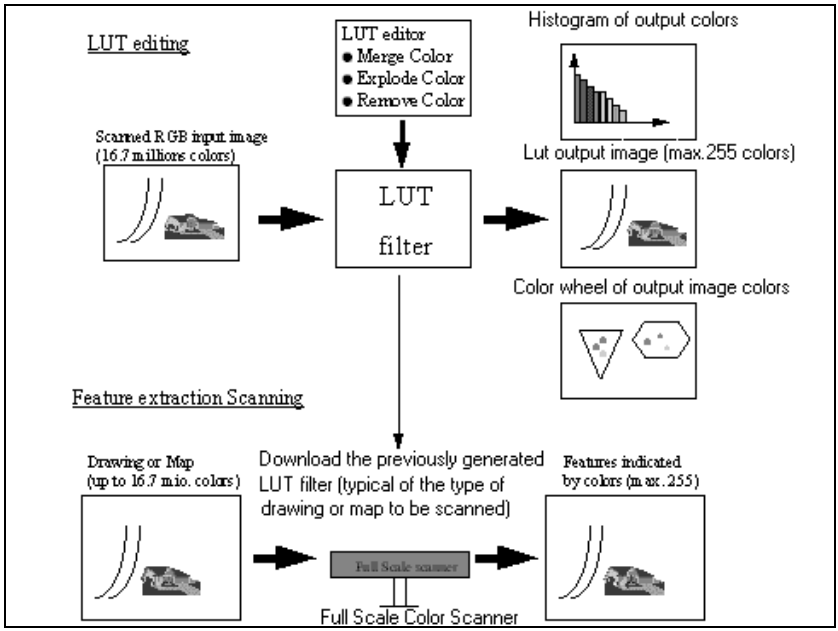


Fig. 6-1: Feature Extraction Overview

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

6.1.1 Creating and Editing a LUT filter

The procedure for creating and editing a LUT filter is:

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 modify the file in any way in the viewer. This is because modifications to the standard values will not be reproducible when you later scan other drawings using the created LUT filter.
It is only necessary to scan a small but representative part of the original - a small file will make the editing faster.

2. An initial automatic creation of the LUT filter is performed by opening the previously scanned true color image and entering the feature extraction LUT editor (by selecting one of the adaptive or linear methods in the LUT pull down menu). Two basic approaches to the setting of the initial number of automatically generated output colors exist, depending on the edit strategy:

A: Set the number of output colors to a higher count than you want to end up with (so you 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.

B: Set the number of output colors to a lower count than 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.

3. Use the LUT edit tools to enhance the automatically generated LUT filter until each of the output colors is representative of 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), but only that the colors represent, as accurately as possible, a one-to-one match with the features in the scanned map or drawing.

4. Save the LUT filter at this stage, for eventual later re-editing e.g. for checking and modifying the filter with another representative map or drawing from the class.

5. You can finally re-map the 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 a new color. This is an irreversible operation that will prohibit further editing, since the new colors will not normally be positioned in the immediate neighborhood of it's associated RGB colors.

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

6.2 Feature Screen, LUT Tool Bar and Status Bar

To start editing a color feature extraction LUT (Look Up Table), open a previously scanned true color image (24-bit RGB) and select "LUT Edit" from the Main Tool Bar (clicking the palette icon).
The Feature screen shown below then appears.

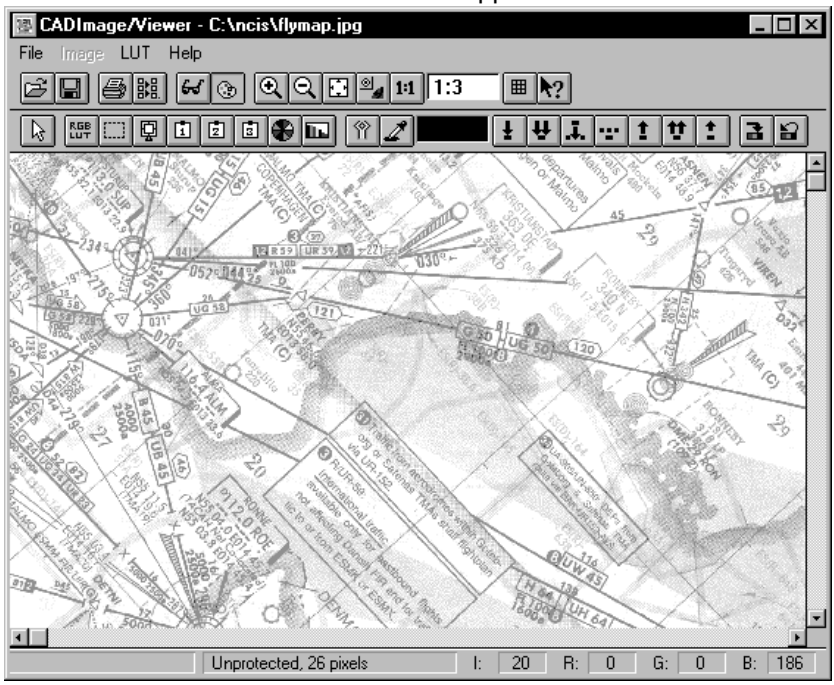


Fig. 6-2: Lut Edit Main Screen

By selecting "Create" in the LUT pull down menu, you can now automatically generate an initial feature extraction LUT. Thereafter all the screens and tools of the LUT editor, are accessible.

From the LUT Edit screen, all aspects of generating and editing a LUT can be directly controlled. The screen is divided into 4 functional areas around the main display area:

- **Pull Down Menu Bar**
- **Main Tool Bar**
- **LUT Tool Bar**
- **LUT Screen Status Bar**

Except for the LUT menu selection (described later in this chapter), the pull down menus and Main Tool Bar have been described in previous chapters,

6.2.1 Selection of views in the LUT Tool Bar

The LUT Tool Bar is divided into a view selection on the left and LUT edit tools at the right side of the display.

To assist in editing the LUT filter, several presentations are provided of the color data in the scanned true color original and the corresponding output after LUT filtering.

When one of the view selection buttons is turned on, the button stays turned on until another view is selected (radio button behavior). Changing between views does not change the function of other LUT edit tools:

- **Main View:** Displays either the true color input image, or the corresponding LUT filtered output image.
- **Viewboards 1, 2 or 3:** Displays zoomed-in parts of either the true color input image, or the corresponding LUT filtered output image.
- **Color Wheel:** Displays position in HSV color space of each of colors in the LUT filtered output image (HSV - Hue/Saturation/Value).
- **Histogram:** The by column size indicates the proportionate amount of true color pixels mapped to each of the LUT filtered output colors.

The RGB/LUT button is a toggle button that selects whether the Main View or any of the Viewboards should display the true color RGB input image or the corresponding LUT filtered output image.
In the Main LUT Edit Screen and the Viewboards, highlighted colors (colors affected by the presently selected edit tool) mean that a selected color blink on the screen. (LUT output color in the LUT mode, or the RGB input colors belonging to a LUT output color in the RGB mode).

Picking a LUT output color is done using the pipette tool and clicking the left mouse button on a pixel on the screen.

Mark/Unmarking LUT output colors are done by clicking the left mouse button on a pixel on the screen, when in one of the Edit functions supporting mark/unmark.

Protect/Unprotect LUT output colors is done by clicking the left mouse button on a pixel on the screen, when the Protect/Unprotect button is on.

Main LUT Edit Screen:

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 a RGB input image or as LUT Filtered output image depending on the RGB/LUT button.

Viewboard 1,2,3:
Clicking a Viewboard button for the first time after an image has been opened, displays the image as seen in the Main view. When in a Viewboard you can zoom and reposition the displayed part of the image, this partial view of the image is stored on leaving the Viewboard. Clicking the Viewboard again will restore the previous view.
The image will be displayed as either an RGB input image or as a LUT filtered output image depending on the RGB/LUT button position.

Toggle between RGB input, and LUT filtered output colors:

Clicking on this button will toggle between the RGB and LUT display mode. The RGB state will display the original true color RGB input image on the Main LUT Edit Screen and Viewboards. When the tool is toggled to LUT this will display the LUT filter output image on the Standard View and Viewboards. Clicking the right mouse button also toggles the RGB/LUT button.

The LUT selection is unavailable if a LUT has not been generated or loaded (see LUT menu).

Rectangle Selector:

Clicking on this tool will turn the button “on” and change the cursor to:

Clicking and dragging the mouse will allow a rectangle on the screen to be defined.

The cursor then changes to the standard cursor, the rectangle has handles and can be resized and moved with the standard cursor while using the zoom tools.

Clicking on any other tool except those below and the zoom tools, inclusive turning the rectangle tool 'off' will deselect the rectangle.
Clicking on Crop, Save, Save As or Print will perform the function on the rectangle area and afterwards deselect the rectangle.

Immediately following the final setting of the rectangle, the selected rectangle can by clicking on one of the above tools , be:

- Printed (Print)
- Saved to file (Save, Save as)

The Save and Save as Rectangle will include all image changes. Only the selected part will be saved.

Color Wheel Screen:

Displays the Color Wheel Screen. This screen is disabled if a LUT has not been previously generated or loaded (see LUT Menu).
The Color Wheel Screen, displays the LUT output colors in the HSV model (Hue/Saturation/Value).

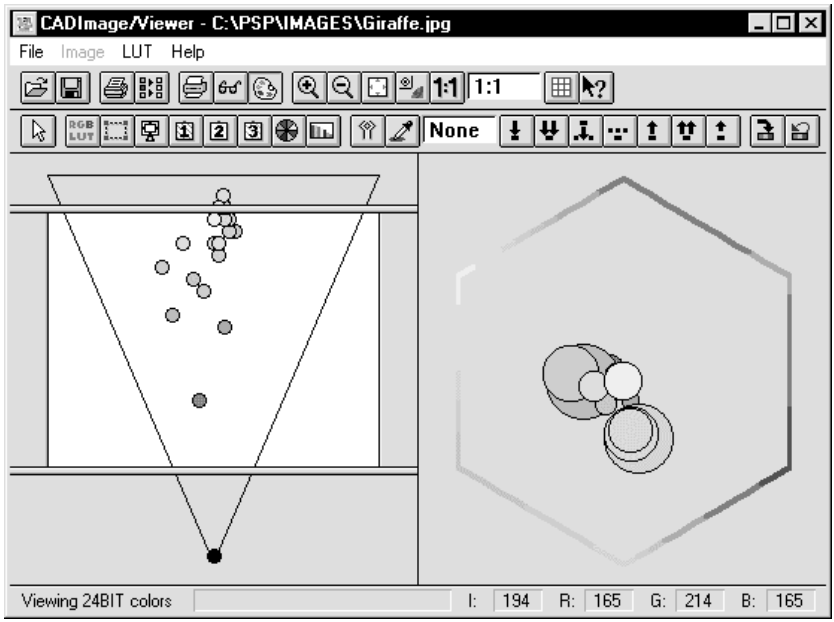


Fig. 6-3: Color Wheel Screen

The hexagonal part (Hue and Saturation) displays the slice of colors selected in the triangle (Brightness value) part. The hexagonal part is surrounded by a ring which displays colors of different hues on it's periphery for reference purposes.

At the top and bottom of the triangle, separate outside discs for white and black are displayed for easy reference.

The two lines bordering the slice selected in the triangle can be moved by clicking and dragging at the handles using the mouse pointer.

The size of the LUT output color discs are dependent upon the number of pixels belonging to them in the original RGB input image (discs with small pixel counts or none are displayed at equal minimum size.

In the Color Wheel Screen, the picked color is indicated by the pipette icon.

Mark/Unmarking of color(s) is done by clicking on the color disc (when in one of the supported edit functions) with the left mouse button (centered blue mark indicator on the color disc).

Protect/unprotect a color is done by clicking on the color disc (when the Protect/Unprotect button is on) with the left mouse button. (centered red protect indicator on the color).

LUT Histogram Screen:

Displays the Histogram of the LUT output colors that are used for classification (feature extraction) of the original RGB input image.
This screen is disabled, if a LUT has not previously been generated or loaded (see LUT Menu).

Associated with the histogram screen is a sorting selection (see LUT pull down menu). Switching between:

- Histogram sorted by pixel count
- Histogram sorted by LUT output color indexes
- Histogram sorted by HSV color values.

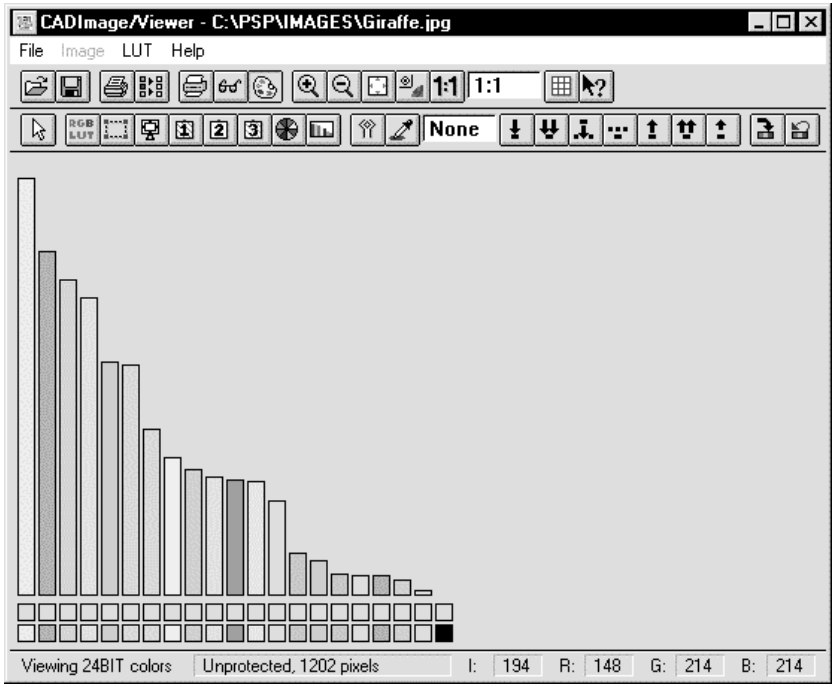


Fig. 6-4: LUT Histogram Screen

In the Histogram Screen the picked color is indicated by a rectangle surrounding the color histogram bar.

Mark/Unmarking a color is done by clicking on the color (when in one of the edit functions) with the left mouse button (blue mark indicator in the square below the color).

Protect/Unprotect a color is done by clicking on the color (when Protect/Unprotect button is on) with the left mouse button. (red protect indicator in the square below the color).

6.2.2 LUT Screen Status Bar:

The status bar includes fields for continuously updating and displaying information on the color pointed at by any of the LUT edit tools:

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

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

depending on the Color Preferences setting, where:

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

Furthermore the following status is also available:
Protect status and **Pixel counts**

RGB or **LUT** is indicated in the status bar, depending on the state of the RGB/LUT display mode tool button.

When displaying the Main View or Viewboards, vertical and horizontal sliders appear, unless the whole image can be presented within the physical screen size. (Standard Windows behavior).

This enables the images to be panned in both vertical and horizontal directions if required.

6.2.3 LUT edit Tools:

The right side of the LUT Toolbar contains the LUT edit funtions. Functionally they are divided into three groups:

- Assist functions
- Edit functions
- Commit/Decommit functions

Assist functions:
The two assisting tools support the Edit functions, but do not themselves make any edit changes to the LUT:

- Pick Color
- Protect Color(s)

The tool buttons are on/off buttons. When pressed, the button stays “on” until either the button is pressed again, or the function is turned “off” by pressing another of the Edit functions or Inquiry function buttons (radio button behavior).

Edit Functions:
The seven edit function tools set up edit changes to the LUT:

- 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 tool bar buttons is turned “on”, it stays turned “on” until either:
- The edit operation is performed by pressing the apply button.
- The edit operation is aborted by pressing Arrow tool button.
- The function is turned “off” by pressing another of the edit function or assist function buttons.

For the Rectangle selector, Pick Color (pipette) and Insert New Color functions, the cursor will change as specified below in the detailed function descriptions. For all other LUT functions, the cursor is an arrow.
In the Main View and Viewboards, highlighted colors are shown blinking on the screen. Highlighted colors are those affected by the presently selected edit function (affected LUT output color(s) when in LUT display mode, or the original RGB input image colors belonging to the affected LUT output color(s) when in RGB display mode).

Mark/Unmarking a LUT output color is done by clicking a belonging pixel on the screen with the left mouse button, when in an Edit function which supports mark/unmark. Any marked colors are automatically unmarked when aborting an edit function. Highlighted colors are also un-highlighted.

Use of the edit functions normally results in re-mapping of the original RGB input image colors into one or more LUT output colors. This re-mapping is based on the shortest distance (nearness) and depends on using RGB coordinates or HSV coordinates. The selection of method for the above Edit functions is done in the LUT Menu, Edit Setup entry (changes in Edit Setup take effect on Edit operations performed after the change).

Commit/De-commit functions:
The two Commit/Decommit tools actually apply or undo one of the above edit functions to the LUT:

- Apply Edit Operation
- Undo Edit Operation(s)

These tools are push buttons.

The Apply button when pressed will conclude and activate the specified Edit function changes to the LUT. It then turns the selected edit tool button 'off' when the operation is completed.

The Undo button, reverses the last edit function (including changes to the protect status of colors). Up to 10 levels of undo are available

Protect Color(s):

When the Protect Color(s) tool is selected, the button will be turned on. Pressing the Protect Color(s) tool 'off' will abort the function.

The pixels belonging to the protected LUT ouput colors are highlighted in the Main View and Viewboards.

The left mouse button is used to protect/unprotect colors.

Protection:
Protecting a LUT output color means that it cannot be removed e.g. colors in the original RGB image belonging to it cannot be moved to another LUT output color, and a protected LUT output color cannot be removed from the list of active LUT output colors. However other colors in the original RGB image can be mapped (added) to a protected LUT output color.

A protected LUT output color is identified in the Histogram Screen by a red square in the box below the color column. In the Color Wheel screen it is identified by a red center dot in the color disk.

When the Protect Color(s) tool button is on, all colors belonging to a protected LUT output color will be highlighted (blink) in the Standard View and Viewboards,

Trying to mark protected colors for merging/removal will result in a warning message on the screen.

Pick Color:

The Pick Color tool is selected by clicking on Pick Color icon. Pressing the Pick Color tool 'off' will abort the function. When the button is turned on the cursor changes to:

Clicking with the left mouse button on a pixel in the display selects the corresponding LUT output color.

The Pick Color tool works in all screens e.g. Main View, Viewboards, Color Wheel or Histogram screens. A sample of the selected output LUT color is displayed in the square field to the right of the Pick tool button:

It is only possible to select one Pick Color at a time. The last selected will be the Pick Color (*pipette* color).

When the Pick tool is selected all the pixels having the Pick Color as output LUT color will be highlighted in Main View and Viewboards.

In the Histogram screen the Pick Color is indicated by a full height rectangle surrounding the picked LUT output color column. In the Color Wheel screen the Pick Color is indicated by a pipette pointing at the picked LUT output color disc.

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

The Merge Marked Color tool is selected by clicking on the Merge Marked Color icon.
Pressing the Merge Marked Color tool button 'off' will abort the merge function.

Clicking the left mouse button on a pixel in, either the Main View, Viewboards, Color Wheel or Histogram screens, will mark the corresponding LUT output color (if unprotected) for re-mapping of it's belonging colors in the original RGB input color image to the Pick LUT output color (*Pipette* color).

If an attempt is made to mark a protected LUT output color for merging, a warning is displayed on the screen (e.g. *color is protected*).

The pixels belonging to the marked LUT output colors and the Pick LUT color will be highlighted in the Main View and Viewboard screens, and marked in the Histogram and Color Wheel screens.

Marked colors can be unmarked by clicking the left mouse button on a pixel corresponding to the marked LUT output color (Mark/Unmark functions as an on/off toggle).

Clicking on the Apply tool button remaps the indexes of the colors in the original RGB image belonging to the marked LUT output colors to the Pick LUT output color (*pipette* color).

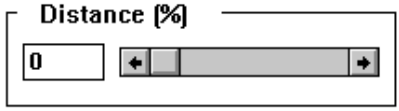
Merged LUT output colors are not removed from the list of active LUT output colors, and thus will still be shown in the Color Wheel and Histogram screens (zero pixels will be shown associated with these colors).

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

The Merge Similar Color tool is selected by clicking on the Merge Similar Color icon.
Pressing the Merge Similar Color tool button 'off' will abort the Merge Similar Color function.

The Merge Similar Color(s) merge all unprotected LUT output colors lying within a specified color distance from the Pick Color, into the Pick Color. Note the Pick Color (pipette color) can be protected.

When the Merge Similar Color button is toggled 'on' the slider shown below appears:



The slider defines the radius (in percentage of the full axis of colors), of a sphere surrounding the Pick Color. When changing the slider the pixels belonging to unprotected LUT output colors within the sphere, and the Pick Color are automatically highlighted.

Clicking the Apply tool button re-maps those colors in the original RGB input image belonging to unprotected LUT output colors within the specified sphere surrounding the Pick Color, to the Pick LUT output 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 (zero pixels will be shown associated with these colors).

Explode Color (Pick Color into n colors):

The Explode Pick Color tool is selected by clicking with the mouse on the Explode Pick Color icon.
Pressing the Explode Pick Color tool button 'off' will abort the explode function.

The Explode Pick Color function, distributes the colors in the original RGB input image belonging to the Pick LUT color (pipette color) into *n* LUT output colors (the Pick Color and n - 1 new LUT output colors).

Attempting to enter the Explode Pick Color function when the Pick Color is protected will display an error message.

When the Explode Pick Color button is toggled 'on', the slider shown below appears. The slider defines the number of colors n (1-63) into which the Pick Color will be exploded:

Clicking the Apply tool button will re-map the colors in the original RGB input image belonging to the Pick LUT color into *n* LUT colors (i.e. n-1 new LUT colors are created).

The new LUT colors are evenly distributed within the sphere of RGB colors previously belonging to the Pick LUT color.
The re-mapping is based on the nearness method (color distance) selected in the Edit Setup (see LUT menu).

If the total number of active LUT output colors becomes greater than 255 by using the explode function, the Apply operation will not be allowed.

Remove Marked Color(s):

The Remove Marked Color tool is selected by clicking with the mouse on the Remove Marked icon.
Pressing the Remove Marked Color tool button 'off' will abort the remove function.

Clicking the left mouse button on a pixel on the screen, whilst in either the Main View, Viewboards, Color Wheel or Histogram screens, will mark the corresponding LUT output color (if unprotected). A marked LUT output color will be removed by remapping each of it's belonging colors in the original RGB input image to the nearest unmarked LUT output color.

Multiple LUT output colors can be marked for removal.

A warning is displayed on the screen, if an attempt is made to mark a protected LUT color for removal.

The pixels corresponding to the marked LUT output colors will be highlighted (blink) in the Main View and Viewboards screens, and marked in the Histogram and Color Wheel screens.

Marked colors can be unmarked by clicking the left mouse button on a pixel corresponding to the marked LUT output color (Mark/Unmark functions as an on/off toggle).

Clicking the Apply tool button re-maps the colors in the original RGB input image belonging to the marked LUT output colors, into their nearest active LUT output colors.

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

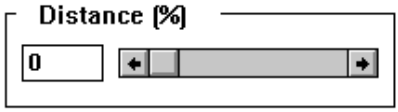
Remove Similar Color(s) (similar to Pick Color):

The Remove Similar Color(s) tool is selected by clicking with the mouse on the Remove Similar Color(s) icon.
Pressing the Remove Similar Color tool button 'off' will cancel the remove similar function.

The Remove Similar Color(s) removes all unprotected LUT output colors within a specified distance from the Pick LUT color (pipette color), the pipette can be clicked and dragged with the left mouse button .

The Pick Color is also removed if unprotected.

When the Remove Similar Color(s) button is toggled 'on' the slider shown below appears:



The slider defines the radius (in percentage of the full axis of colors) of a sphere surrounding the Pick Color (pipette color). When changing the slider (or dragging the pipette) the pixels belonging to unprotected LUT output colors within the sphere are automatically highlighted .

Clicking the Apply button re-maps the colors in the original RGB input image belonging to unprotected LUT output colors within the specified sphere surrounding the Pick LUT color, to the nearest active LUT output colors.

Removed LUT output colors will also be deleted from the list of active LUT output colors and thus from the Color Wheel and Histogram Screens.

Remove Minor Color(s):

The Remove Minor Color(s) tool is selected by clicking with the mouse on the Remove Minor Color(s) icon.
Pressing the Remove Minor Color tool button 'off' will abort the remove minor function.

When the Remove Minor Color button is toggled 'on' the slider shown below appears:

The slider defines a minimum (measured in percentage terms) number of pixels belonging to a LUT output color, compared to the total number of pixels in the image (range: .001-1%).

By moving the slider, the pixels belonging to unprotected LUT output colors having fewer pixels than the slider setting are automatically highlighted.

Clicking the Apply button re-maps the colors in the original RGB input image belonging to unprotected LUT output colors having a pixel count below the minimum percentage, to the nearest active LUT output colors.

Removed LUT output colors will also be deleted from the list of active LUT output colors, and thus from the Color Wheel and Histogram Screens.

Insert New Color (Pick):

The Insert New Color tool is selected by clicking with the mouse on the Insert New Color icon. Pressing the Insert New Color tool button 'off' will abort the insert function. The cursor is changed to:

A new LUT output color (which also becomes the new Pick Color) can be created in either in the Main View or Viewboards, when the LUT/RGB toggle button is in the RGB display mode. The new LUT output color is created by dragging a square (using the left mouse button) over a number of pixels on the screen. The new LUT output color will be the average of the original RGB input image colors within the square.
The nearest original RGB input image colors will also be re-mapped to the new LUT output color.
Double clicking instead of dragging a square selects a single original RGB input image color as the new LUT output color.

A warning will be displayed on the screen, if an attempt is made to insert an original RGB input image color belonging to a protected LUT output color.
A warning will be displayed (*color already exist in LUT)* on the screen, if a an original RGB input image color identical to an already existing LUT output color is selected.

The new LUT output color will be displayed in the Pick Color Patch in the Tool Bar for easy reference.
The pixels belonging to the new LUT output color will be highlighted in the Main View and Viewboards screens. No change occurs in the Histogram and Color Wheel screens until Apply is pressed.

Clicking the Apply button remaps the nearest colors in the original RGB input image (belonging to unprotected LUT output colors), into the new LUT output color. The Pick Color is also changed to the new LUT output color.
An Inserted LUT output color will also be added to the list of active LUT output colors and thus appear in the Color Wheel and Histogram screens.

Apply Edit Function Operations:

Clicking the Apply button applies the edit operations of the currently active Edit function to the LUT.

The edit tools work as state changers where (typically) multiple selections are allowed. Therefore the Apply button automatically appears (undims) in the Tool Bar when any edit tool button is turned 'on'.

Undo Edit Function Operations:

Clicking the Undo tool removes the most recent changes to the active LUT colors produced by an applied Edit function.

Up to 10 levels of undo are supported.

6.3 LUT Menu

Clicking the "LUT" pull down menu in the Main Menu Bar, displays the LUT Menu shown below.

The LUT Menu is only available from one of the LUT Edit screens.

Fig. 6-5: LUT Menu

6.3.1 Create LUT:

A dialog pops up for selecting the method of LUT generation (an RGB image must previously have been loaded). The choices are:

Photo, Artwork etc.: The median cut algorithm is used with the parameters specified in Setup.
Maps, CADPlots etc.: The modified median cut algorithm is used with the parameters specified in Setup.
Linear: Linear distribution of colors in RGB space as specified in Setup.
Load Predefined Colors: Predefined colors from a palette are used. The palette is specified in the File Selector and 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 paletized PCX file is used.
- **.PAL:** Palette file .PAL, generated by either Paint Shop Pro (JASC), PhotoStyler or Contex Standard Palette is used.

Pressing OK commences analysis of the RGB input image for generation of a representative LUT.

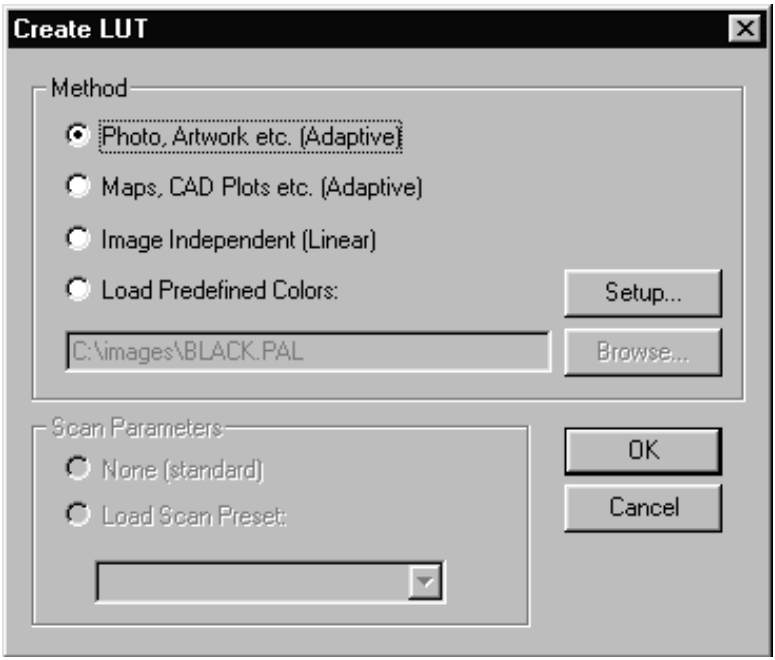


Fig. 6-6: Create LUT Dialog

Setup (Create LUT parameters):
Clicking the Setup button pops up the dialog shown overleaf.

For adaptive algorithms (Photo or Map method) either the RGB or HSV color space can be used for color distance calculations

The area investigated by the adaptive algorithm in order to create the LUT colors can be selected from the Main View or one or more of the areas covered by Viewboard 1,2 or 3.

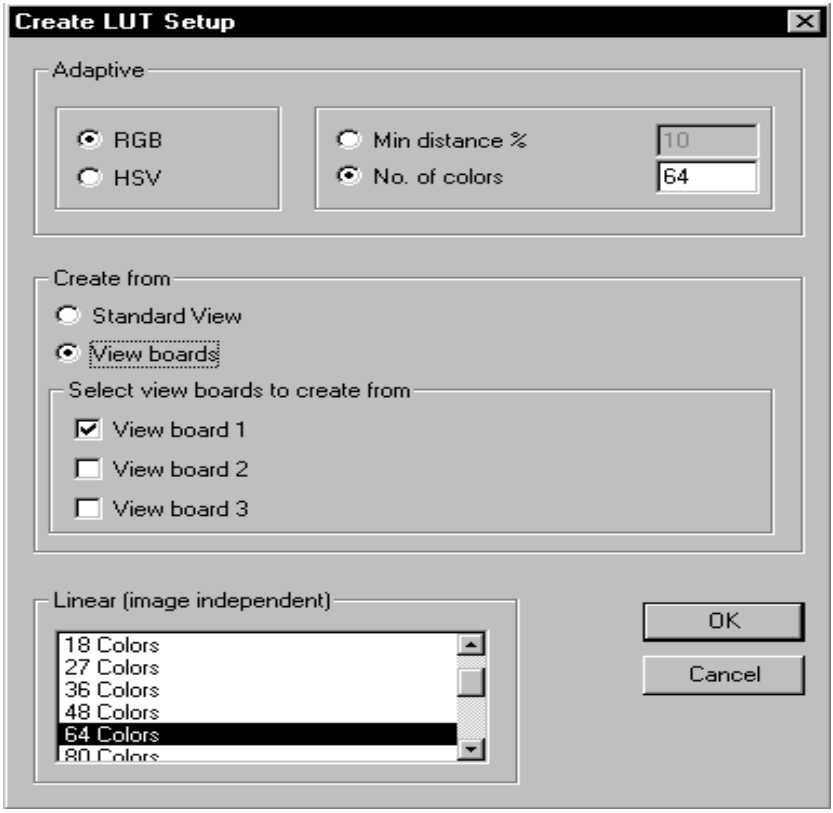


Fig. 6-7: Create LUT setup Dialog

Either Min. Distance between colors in percentage of full RGB or HSV (100%), or No. of Colors can be selected.

For Linear, 1, 2 or 3 bits can be assigned to each of the three color axes, corresponding to the following numbers of LUT output colors:

8,12,18,27,36,48,64,80,100,125,150,180,216, or 256

6.3.2 Load LUT

A file selector dialog pops up for loading a previously generated .LUT file.

6.3.3 Close LUT

Closes the opened LUT file. The LUT Screen view area is cleared.

6.3.4 Save LUT

A Save as dialog pops up for saving the generated/edited LUT.

6.3.5 Import Color(s)

Only available if a LUT has been previously loaded/generated

Pops up the Import Color(s) dialog for either specifying:

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

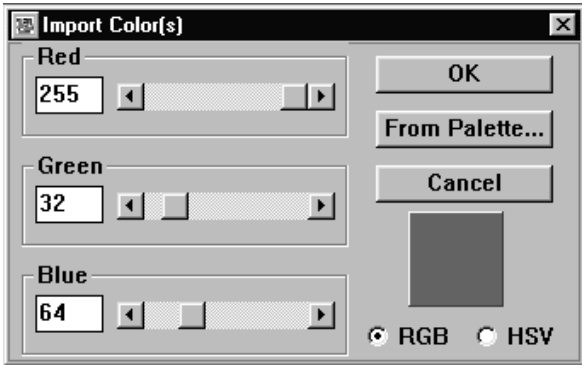


Fig. 6-8: Import Color(s) to LUT Dialog

Specifying a single new color can be done using the three sliders in the dialog (RGB color space or HSV color space selectable).

Pressing the "From palette" button pops up a file dialog for specifying and loading a file containing a palette, e.g. of the same types that can be selected in the Create LUT dialog previously described (.LUT, .TIF, .PCX or .PAL). A dialog pops up, displaying the palette colors as small squares. Palette colors can be sorted either by Palette Index Value or by HSV value depending on drop down list setting.

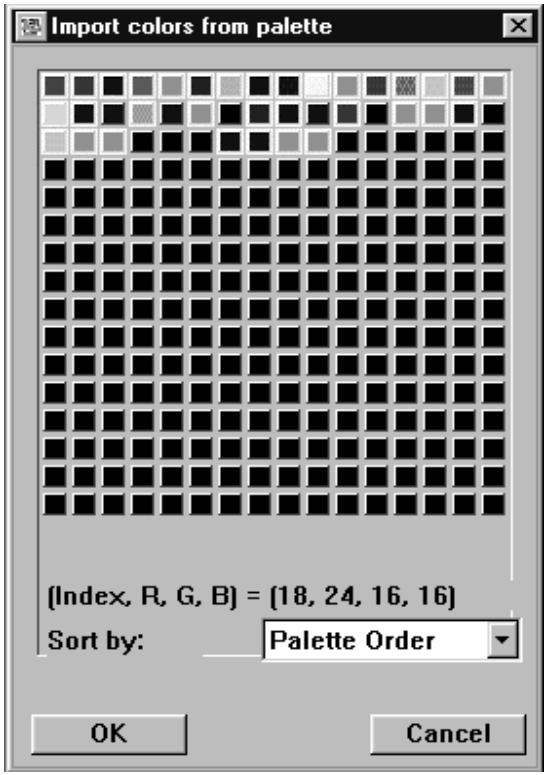


Fig. 6-9: Import from Palette Dialog

One or more colors can be selected for import by clicking and dragging the mouse pointer to define a rectangle. Every color inside this rectangle will be selected. Clicking on individual squares will select/deselect this color. The index value of the last selected (single color) is shown in the dialog.

Pressing the OK button will 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 belonging to them. This can later be done using the Merge, Explode or Remove edit tools as described in this chapter. The original number of colors in the LUT plus those added cannot exceed 255.

6.3.6 Histogram Sorting

Histogram Sorting is only active together with the Histogram Screen. Histogram Sorting pops up a sub menu for selection of:
Sort by Pixel count
Sort by Palette order
Sort by HSV

6.3.7 Edit Setup

An Edit Setup dialog pops up for setting the methods used with the LUT Edit functions (e.g. Merge, Explode and Remove). A change of settings only has effect on the result of LUT Edit operations performed after the change.

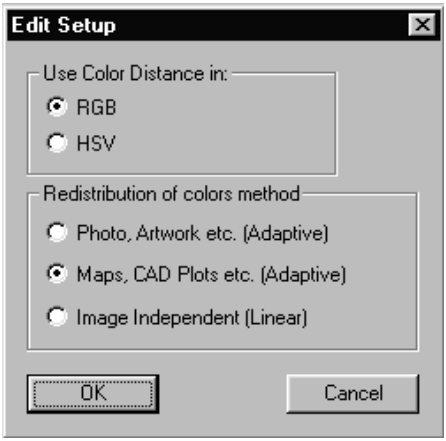


Fig. 6-10: LUT Edit Setup Dialog

7. Supported File Formats

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

The raster file formats supported are split into five groups:

- General image file formats.
- FAX file formats.
- Scanned DxfTR and DxbTR trace subset files.
- Graytone file formats.
- Color file formats
- Plot/print file formats.

For raster file formats, CADImage supports:

- Scanning to any of the following fifty-plus industry standard file formats.

- Converting from any file format (except the Plot/Print file formats) to any other file format (including the Plot/Print file formats).

- Viewing and zooming-in of any of the file formats (except the Plot/Print file formats).

- Plotting and printing from any file format (except color formats), to any of the supported Inkjet/laser/thermal plotters, laserprinters, and Plot/Print file formats.

7.1 General image file formats

Pcx. Black & white file format used by PC Paintbrush from Z-Soft Corporation. Pcx is a very useful format with a large number of applications.

ImgCM. File format used for the CADmate Raster To Vector conversion package, as well as for the general raster format (EYES¬TAR 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.

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 CADImage Rlc choice.

Ig4. Softdesk Group4 compressed format (similar to the Rlc2 fileformat, but with raster data segments containing strips of group 4 data).

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

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.

Bmp. Microsoft Windows bitmap file format. Most windows graphics and image applications support this format.

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

Hrf. Hitachi Inc. CADCore format.

Gp4.Type1 CALS untiled format, compatible with CCITT Group4 format.

Gp4.Type2 CALS tiled format, compatible with CCITT Group4 format.

CALS gives very compact image files. This format is standardized for CALS (Computer Acquisition and Logistics System, MIL-R-28002A) and ISO-ODA document exchange. Tiled Raster (Type2) is further described in NISTIR 4567: "Tiled Raster Graphics and MIL-R-28002A, A tutorial and Implementation Guide".
The Gp4 file format contains a CALS header, which can be edited by a text editor to include the required infor¬mation.
The orientation information in the header is entered by the operator through the "Setup" button in the Scan or Convert file format type selector.

Rst. Ind¬igo 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.

Tif. TIFF (Tag Information File Format, Aldus/Microsoft Spec.) is a standard file format used by many Raster and Desk Top Publis¬hing programs; it is also the standard image file format for many image processing/enhancement programs.
The Setup button in the file selection dialog allows you to select 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 file formats"). Both Intel and Motorola orientations are supported (TIFF vs.6.0 specification).
When a TIFF file is used as source in Convert, View or Print, CADImage autodetects which of the folowing compression methods, B/W or Graytone was selected when the TIFF file was generated.
Tif. Uncompressed B/W or Graytone version of TIFF, supported by many vendors, e.g. IBM-CAD.
Tif. Packbits byte oriented runlength compressed B/W or Graytone 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 many vendors, e.g. UNISYS.
Tif. LZW(Lempel-Ziw-Welch) compressed B/W or Graytone 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.

7.2 FAX file formats

When scanning or converting to a FAX file format, multiple output files are generated, each corresponding to a normal FAX size file (Letter or A4 size). The files are numbered with the extension .001, .002, ... .00n. All these files can then be sent to normal Group 3 FAX machines from the work station using a FAX board.

Fax. Format (Ver. 3.3c) for the Gamma FAX board.

Fax2. Enhanced format (Ver. 4.2) for newer Gamma FAX boards.

PcxMU. A generic FAX file format. The scanned file is stored in multiple files and each file is in the Pcx format.

7.3 Scanned DxfTR/DxbTR trace subset files

DxfTR. A trace subset of the general Drawing Exchange File Format (DXF), supported by many CAD Systems, including AutoCAD. As DXF is written as a simple ASCII file, it is easily exported to other computer systems.

DxbTR. A trace subset of AutoCAD's Drawing Exchange Binary File Format (DXB); it is stored as binary data in a much more compressed form than DXF (about ten times more compressed).

NOTE: CADImage only works with the trace entity subset of the DXF/DXB formats. Therefore, once a scanned DxfTR/DxbTR file has been modified in the CAD system, it cannot be further converted or printed by CADImage.

Operator Setup of transformation parameters is done by using the Setup button in the file selection dialog.

7.4 Graytone formats

Tif. Uncompressed 8-bit gray-level version of TIFF. The Setup button in the file selection dialog selects graytone option (see Tif file format in previous General Image file section for Setup).

Tif. Packbit compressed 8-bit gray-level version of TIFF. The Setup button in the file selection dialog selects graytone option (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.

Igs. 'Softdesk' uncompressed Graytone format.

Pcx. Graytone 8-bit format as defined by Z-Soft for PC-Paintbrush, widely used with many applications. The Setup button in the file selection dialog selects graytone option.
Ras. Sun graylevel 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 format Setup 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 above graytone formats to a line mode format, Print or View of Graytone files, is suppor¬ted by the user specifying a threshold value between 0 and 255, in the "Special" menu.
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.

7.5 Color formats

Tif. Uncompressed 24-bit color version of TIFF, the Setup button in the file selection dialog selects options (see Tif file format in previous General Image file section for Setup).

Tif. Packbit compressed 24-bit color version of TIFF, the Setup button in the file selection dialog selects options (see Tif file format in previous General Image file section for Setup).

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 supports 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 Setup button in the file selection dialog selects graytone option.

Ras. Sun 24-bit truecolor and 8-bit feature extracted and indexed color formats (is the native bitmap formats 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 format Setup dialog.

Rtl. Hewlett Packard Raster Transfer Language 8-color output file format (3 bitplanes) supported on the HP-DesignJet and the NovaJet plotters.

Pcl. Hewlett Packard 24-bit output file format.

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:

Graylevel = 0.29xR+0.59xG+0.11xB

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, in the "Special" menu.

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.

7.6 Plot/print file formats

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

Plt (HPGL). File format for electrostatic, thermal and ink-jet plotters having an HPGL controller. When connecting the work station to a HPGL plotter, you should make sure that hardware-flow control over the parallel or serial interface is implemented according to the manufacturer's specification. This will ensure that the computer does not output data faster than the plotter can process them. With some plotters, there are limitations to the number of HPGL vectors they can process simultaneously. This limits the size of drawings that can be plotted. (The method for HPGL output implemented by CADImage generates large sets of horizontal vectors).

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

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

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

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

Atl. Atlantek Inc. 24" thermal plotter raster output file format.

Con. Contex Hybrid thermal plotter raster output file format.

Scm. System Partner Gmbh. SCAN¬mate electrostatic large-format plotter raster output file format.

Rtl. Hewlett Packard Raster Transfer Language output file format supported on the HP7600, HP-DesignJet, Océ Graphics thermal plotter and the NovaJet plotters.

Gra. Graphtek thermal plotter raster output file format

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

7.7 Scan and Convert to DxfTR and DxbTR Setup

If you choose to scan or convert to the trace subset formats DxfTR or DxbTR, the Setup button in the file selection dialog will allow you to specify:

Error, Speckle, Layer, and Unit

These parameters control the Raster to CAD trace entity transformation that takes place on-the-fly during scanning or conversion.

Error: (range 0 to 15) Max. allowed error in generating the CAD trace entities. A small value, e.g. 0 or 1, gives the finest resolution and detail, but also the largest file sizes and scan/convert times. (Caution: value 0 results in approx. 3 times larger files than value 1.) A medium value of, for example, 4 gives a reasonable resolution for most purposes, while larger values tend to roughen the edges and make the text unreadable.

Speckle: (range 0 to 15) Sets the sides in pixels of a square filter for removing smudges during Scan/Convert. The value should normally be equal to, or less than the error value above. Note that large values can remove significant details from the drawing.

Layer: (range 0 to 99) Sets the layer number in the CAD system that the DxfTR or DxbTR file will import to.

Unit: (I or M) Sets the scale of the scanned/converted file to either Inches (I) or mm (M). This setting should correspond to the units used in your CAD system.

7.8 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:

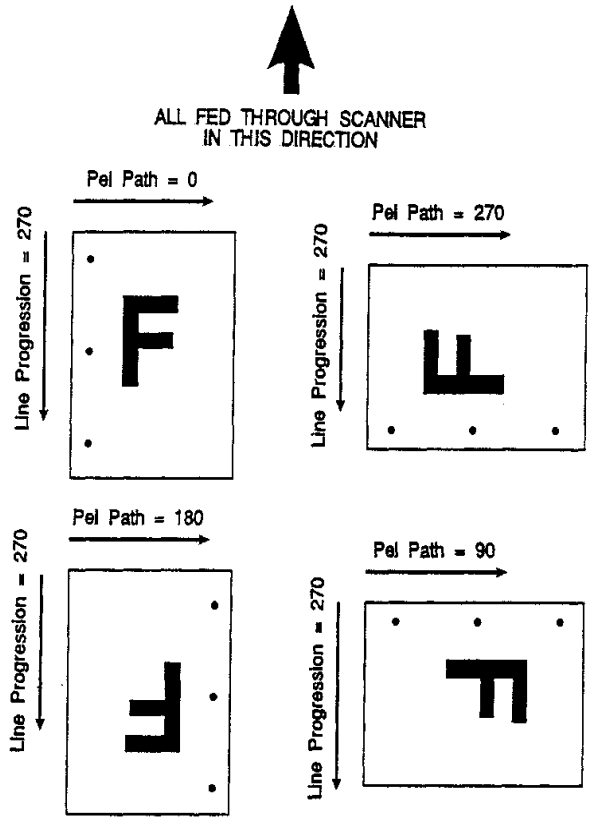
00/270 (default)
90/270
180/270
270/270

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 it's 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. The point is that the orientation parameters found in the file are purely descriptive, not rescriptive.

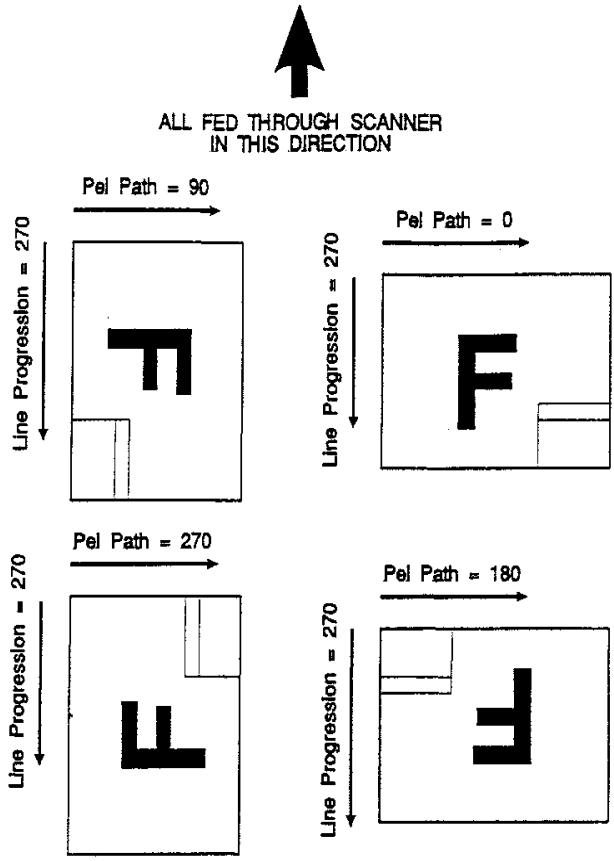
The pel-path direction may have any of four values and the line-progression direction can be at either of the two possible right angles to it. Therefore, this model can describe images that are not only retreated, but also mirrored either vertically and/or horizontally. This allows the orientation parameters 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.

7.9 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 suite. 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 have to 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 in the JPEG Setup:

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 10counts at a time until you are happy with the output image. Quality values above about 95 are not recommended for normal use. The compressed file size goes up dramatically for hardly any 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. Default is 0.

7.10 Files scanned at 1000 DPI and above

Some Full Scale Scanner models supports scanning at very high resolution. When scanning at the maximum width (8.5 on the front measurement ruler) at 1000 DPI the scanner produces approximately 36000 pixels/line.
This gives a problem with file formats that were designed to accept a maximum width of approximately 32000 pixels (signed 2 bytes).
The file formats with this limitation are: Pcx, Cut, Rlc, Vif, ImgCC, ImgCM and ImgGEM. In CADImage this problem is handled by writing the correct value to the width field in the file header. This means that CADImage 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 800DPI.
2. Limit the scan width to 7.5.
3. Have the third party software vendor change how they read the files.

8. Appendix A: Plotter Device Configuration

This appendix details the setup of device-specific options for interfacing printers/plotters with CADImage for direct output. Note that not all the listed printer/plotters are available on all computer and operating system platforms.
The parameters are set up via the Setup button in the Printer selection dialog in the Print Menu.
Also the output port or device driver to the printer/plotter is selected via the Setup button, see chapter: "Print Menu" for details.

8.1 Versatec plotter parameters

Input the "Bytes/line" and "Dots/inch" parameters from the list below, corresponding to your Versatec plotter model.
Input the "port no." (1, 2, 3, or 4), according to the setup of your Versatec device interface.
You can further select if the output should be "direct" or "spooled" on the disk; spooled output will run the plotter more smoothly and create less toner-smearing, but requires temporary space on your disk.

List of Versatec Models

Monochrome Plotters:

Model	Bytes/line	DPI
V80	264	200
1100,1110	128	100
1200	264	200
2000,2030	232	100
7222	528	200
7422	1056	400
7224	576	200
7424	1152	400
7225	588	200
7425	1176	400
7236	880	200
7436	1760	400
7244	1076	200
7444	2152	400
8222	528	200
8224	576	200

8236	880	200
8242	1024	200
8244	1076	200
8510/CADmate	1320	300
8624	576	200
8624HR	1152	400
8625	588	200
8625HR	1176	400
8636	880	200
8636HR	1760	400

Colorplotter in Monochrome Mode:

Model	Bytes/line	DPI
2562	284	200
2568	568	400
2726M	296	300
2766M	424	300
CE3224	588	200
CE3424	1176	400
CE3225	588	200
CE3425	1176	400
CE3236	880	200
CE3436	1760	400
CE3244	1076	200
CE3444	2152	400
8924-2x	588	200
8924-4x	1175	400
8925-2x	588	200
8925-4x	1176	400
8936-2x	880	200
8936-4x	1760	400
8944-2x	1076	200
8944-4x	2152	400

8.2 CalComp DrawingMaster

Set "Dot/inch" to 400 or 200 according to the DrawingMaster thermal plotter model.

8.3 SCANmate electrostatic plotter

Select "I/O address" (320, 330, 340, or 350) according to the setup of your device interface card for the System Partner Gmbh. electrostatic plotter.

8.4 Roland thermal plotters

Select "Model", either LTX420L, LTX420, LTX320L, or LTX320/321.

8.5 HPGL plotters

For electrostatic, thermal or inkjet plotters having a HPGL interface (Hewlett Packard Graphic Language) you can select "model", "paper size" and "port".

8.6 Atlantek thermal plotter

For the Atlantek 24" thermal plotter, input "Bytes/line" (default setting 587) and "Dots/inch" (200 or 300).
Select "I/O Address" (320, 330, 340, or 350) according to the setup of your device interface card.

8.7 Contex Hybrid Plotter

Select resolution 200 x 400 or 200 x 200, and cut of paper between plots.

8.8 HP, OCE, NovaJet RTL plotters

For the HP-DesignJet, Oce(thermal) and NovaJet inkjet plotters, and the HP7600 electrostatic plotters, input "scanlength" (default setting 10800), and select "Dpi (default 300)".

8.9 JDL Express plotters

For the JDL express thermal plotters, no parameter setup is necessary.

8.10 Graphtec Thermal plotter

For the Graphtec thermal plotters, select model: TM1010, TM1110, TM1210, or TM1310.

8.11 Laser Printers, PclA4 and PclA3

For HP LaserJet or compatible A4 (A-size) or A3 (B-size) Laserprinters select "Dpi (default 300)" and "Origin Offset".

8.12 Native Printers, Windows

Native Printer (Windows only), prints directly to the Windows default printer, with the selection and setup performed in the Windows print manager.

9. Appendix B: Program License Agreement

You should carefully read the following terms and conditions before opening the diskette package. Opening the diskette 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

10. Appendix C: Glossary

Adaptive thresholding

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.

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 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.

Calibration

Adjusting equipment so that it performs in accordance with an established standard e.g scanner calibration, minimizing color deviation between scanned ANSI IT8 reference color patches and the known color reference values.

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, the CCD is the image sensor in the scanner that converts light to voltages. These voltages are converted by the scanner into the image.

CCITT Group 3

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 Group 4

Two-dimensional compression format, giving very compact image files. Standardized by CALS (MIL 28002) and ISO-ODA for Drawing Archival and Interchange.

CIE

Centre Internationale dEclairage (CIE) is an international organization that establishes methods for measuring color. These color standards for colormetric 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.

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.

CMYK

The subtractive printing colors. Cyan, Magenta, Yellow, Black.

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.

Color bit depth

The simplest pixel has two options: black or white. (A pixel with two choices is known as a one-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 four-bit pixel would have 16 color options, and an eight-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

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

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.

Compressing

Reducing file sizes of images by encoding the data (see also Run Length Encoding and CCITT Group 3 and 4).

Contrast

The range between light and dark in an image. Proper contrast is important for an image to appear realistic.

Density

The light stopping ability of a film. Density is inversely proportional to the amount of light reflected or transmitted by an image.

Density units

Photographers and printers measures 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

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).

Display

Also called Graphic display or Monitor. The computer screen attached to your computer, or to the portion of a drawing image, menu, etc. shown on the screen

Dithering

A printing or display device may have only a small number of greyscale 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.

DPI

Dots Per Inch, equivalent to Pixels Per Inch. An expression of resolution of a scanned image.

DSP

Digital Signal Processor, does image enhancement in real-time while scanning

Dynamic Range

A measurement of scanner quality, the density difference between highlights and shadows.

Equalizing

Distributing all color or tone equally along a density range.

File

Image, text or program information stored on a computer disk, with a file name for retrieval (an extension to the name is often added to distinguish between different types of files).

Folder

An organizational aid on a hard disk. Like office folders it allows a user to group related files together.

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

The color range scanable, 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.

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.

GCR

Grey 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 grey value). The advantages are a reduction in overall ink usage and some increase in image detail.

Gigabyte

Computer storage equal to 1024 megabytes

Grayscale

A term for a black and white photographic image or a scanner setting. Refers to the range of 256 grey tones that make up the image.

Grey Balance Adjustment

A color correction adjustment to insure that grey elements within a scanned image appear as a neutral grey. It is generally considered proper technique to adjust the image so that neutral grey elements appear neutral gray. If this is done, it will usually be true that other elements within the image will also have true color reproduction.

Halftoning

The processes of offset printing and laser printing are intrinsically bilevel. However, these devices can reproduce a range of tonelevels 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.

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 variable 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 measurement of color as 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.

ICS

Integrated Component Scanner, integrates copying function into an existing plotting environment.

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 of TIFF, an indexed color image is accompanied by its colormap.

Ink-Jet Plotter/Printer

Inkjet Plotters/printers transfer color to a page by squirting cyan, magenta, yellow and black liquid ink onto the page. The ink dries on the paper through evaporation.

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 enhances 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.

Kilobyte

Computer storage equal to 1024 bytes of computer information.

Laser/LED Plotter/Printer

Laser/LED plotters/printers transfer toner to a page by discharging an electrostaticcally charged drum by the information modulated light from a laser or LED (Light Emitting Diodes) array. Toner then attaches to the remaining charged areas of the drum, and is subsequently transferred to the paper

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.

Megabyte
Computer storage equal to 1024 kilobytes.

Monochrome
An image composed of a single color.

Neutral
An area of no color; white, gray or black.

Noise
A term used to describe the occurrence of pixels within an image that contain random colors

Palette
The set of colors available for an image.

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 of 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.)

Plotter
A physical device that receive information of a digital image and reproduced it on paper (see also Inkjet and Laser/LED plotter).

Printable Color
A color that falls within the gamut of a particular output device.
A printable color will output as expected. Compared to a color that falls outside the gamut which will print as an unexpectedly different shade. See also Gamut.

Printer
A physical device that receive information of a digital image and reproduce it on paper (see also Inkjet and Laser/LED printer).

PROM

Programmable Read Only Memory

RAM

Random Access Memory. RAM is a computer resource, having more RAM in a computer makes it faster and more capable.

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 have large data files.

Resolution

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.

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.

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 produces grey.

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. a inkjet plotter.

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 exist of this scheme, with varying compression efficiency. Typically runlength compression formats yield a file 20-25% the size of an uncompressed file.

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.

Scanning

The process of running a hardcopy original through an optical scanner. The scanner produces a digital image (raster image) of the hardcopy drawing, which is then stored in RAM or on a disk.

SCSI

Small Computer System Interface specification of interface to computer equipment like disks, printers, scanners etc.

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.

Sharpness

An attribute of a scanned image and also an attribute of scanner quality.

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.

TIFF File Format

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

Any color or neutral that is denser than white.

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 unwanted changes to other parts of the image.

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.

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 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, relatively low memory requirement 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.

Viewing Conditions

Different light sources affect the colors that you see. For instance, a color viewed under fluorescent light will look radically different when viewed under incandescent light. Fluorescent light adds green to colors while incandescent light adds red. For this reason the printing industry developed a standard viewing condition known as the D50 (5000 Kelvin) light source in addition to a neutral gray background surround. This light source replicates daylight with equal parts of red, green, and blue.

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.

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

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 tri-stimulus values can describe any color.

Zoom

Changing the size of the viewing area, to examine a larger or smaller area in greater detail.