

TABLE OF CONTENTS

CHAPTER 1

Configurations & Conventions . . .5

VX4000 Series Scanner7

System Configuration8

VX4000 Conventions9

I Using the Mouse9

II Input Fields10

III Message Windows10

IV Pull-Down Menus11

V Selection Window11

Filter12

Directories12

Files12

Selection13

VI Hot Keys13

VII Starting the Scanner13

Power up and Boot13

Login14

Starting vxscan from your
NT desktop14

Scanner initialization process . . .14

CHAPTER 2

Step by Step15

Introduction17

Scanning from Scratch17

I Mounting the Image17

II Create the Rectangle18

III Resolution and Radiometric
Controls20

IV Completing Current ROI
Settings22

Scanning Multiple ROIs from One or
More .ph Files23

I Multiple Regions of Interest . . .23

II Multiple Photo Files25

CHAPTER 3

Details & Definitions27

Introduction29

Accurate29

Acquire Centers29

Acquire Points31

Active ROI33

AFD34

.ah File34

Approximate34

Auto Calculate Dimension35

Automated Film Drive (AFD)36

Axis36

Backplane36

Backplane Representation36

Backlight37

Brightness	37	Intensity	59
Adjusting brightness	38	Transmittance	59
Calculate	41	Opacity	59
Calibrate	42	Density	60
Camera	42	Interior Orientation	61
Moving the camera	42	How IOT Works	62
Color	43	Using Interior Orientation	62
To set up color scans	43	Local	66
Constraint Point	45	Look Up Tables	66
Contrast	46	LUTs	69
Adjusting Contrast	46	Metric	69
Controller	48	Main Window	69
Default Photo File	48	Manually Changing ROI	
Density	49	Dimensions	70
English	50	MM	71
Fiducial	50	Mounting an Image	71
Fixed ROI	51	Opening the backplane	71
Formats	51	Emulsion testing	71
Frame Relative ROI	53	Closing the backplane	71
Template Photo Files	53	Proper scanning attire	72
Generating template Photo Files	53	Non Template	72
Repositioning ROIs	54	Photo	72
Frame Setup Window	55	Photo File (.ph file)	73
Gray Level	55	Pivot	74
Height	56	Pixels	74
Histogram	56	Quick Point Model	75
Host	57	Activating Quick Point	75
Unix	57	Using quick point	75
Windows95 & NT	58	Radiometry	76
IDAS	58	Region of Interest	76
Image Monitor	58	List of Regions	78
Inactive ROI	58	File Naming Conventions	78
Inches	59	Manipulating ROI Dimensions	79
		Relative	79

Remote Storage	80	Save	93
Reposition	80	Save As	94
Reseau	80	Exit	94
Reset	80	Edit Menu	95
Resolution	811	New ROI	95
Changing Resolution using the		Delete ROI	96
Resolution Window	81	Release Point	96
Changing Resolution Manually	81	Delete Rectangle	97
Rubberbanding	82	Quick Point	98
Shutter	83	Acquire Points	98
Size in mm/inches	83	Acquire Centers	98
Size in pixels	83	View Menu	99
Slope	84	Clean	99
Template	84	Histogram	100
Units	84	Options Menu	100
Vexcel Imaging	85	Set Preferences	101
VX3000	85	Open/Close Backplane	101
VX4000	85	Backlight On	102
vxformat	85	Backlight Off	102
vxscan	86	The Frame Setup Window	102
.vxscanrc	86	Help	104
Width	86	Current Scanner Settings	104
CHAPTER 4		Backplane Representation	105
User Interface		Camera Field of View	105
87		Rectangles	106
The vxscan Main Window	89	Scroll Bars	106
Menu Bar	90	Color Type	
File Menu	90	(Monochrome/Color)	106
New	91	Image Type	
Open	91	(Positive/Negative)	107
Close	92		

Intensity/Density	107	Appendix I .....123
Lookup Tables (LUTs)	108	
Default LUT	108	RTINFO.ini File Quick Reference
Custom LUT	108	Guide
Resolution	109	Appendix II .....127
Filters	109	
Brightness	110	VX4000.ini File
Contrast	111	Appendix III .....133
Apply to ROI	111	
Accurate/Approximate	112	Index .....135
Histogram	112	
Current Region of Interest		
Description	113	
Apply to Scanner	114	.ah File
Photo:	114	
ROI:	116	
List of Regions	117	
Format	117	
Host	119	
Normal/Mirrored	119	
Normal	119	
Mirrored	120	
Absolute/Relative	120	
Region of Interest Size	120	
Resolution	121	
Physical Size	121	
Pixels:	121	
Resolution and Radiometric		
Controls	121	
Scan	122	
Scan All	122	

CHAPTER ONE



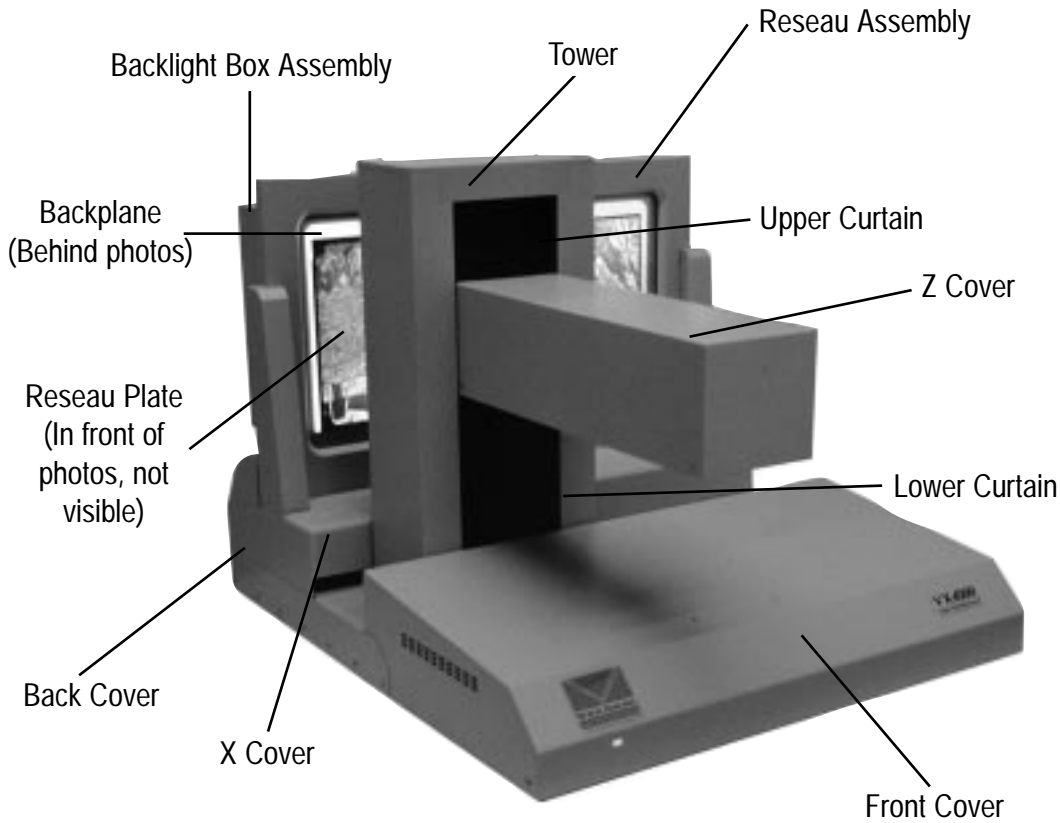
Black and white image scanned on a VX4000HT scanner

CONFIGURATIONS & CONVENTIONS

User's Notes

VX4000 Series Scanner

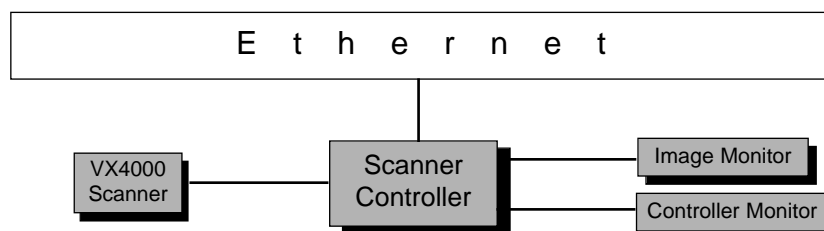
This chapter will introduce you to the VX4000 scanning system and how to interact with it. We recommend that first-time-users and those needing a quick refresher course on the scanning system read this chapter thoroughly; the information will make your scanning experience more enjoyable. The parts of the scanner, the system configuration and command conventions are all covered here.



(Figure 1)
VX4000 Scanner

System Configuration

The VX4000 Scanning System, shown below, is configured with a scanner pc controller, image monitor, controller monitor, and scanner. The VX4000 application (vxscan) from the scanner pc controller.



Scanner Controller	The component that houses the computer hardware and software for the VX4000 scanner and the NT based formatter.
Image Monitor	The monitor on which a preview of the image is displayed.
Controller Monitor	The monitor which is used to view the vxscan user interface.
Ethernet	A standard Ethernet network that connects the Scanner Controller to remote network devices (ie. pc, workstation, server).

VX4000 Conventions

I Using the Mouse

Within the VX4000 user interface, the mouse is used to move the camera, select options and set scanning parameters.

Note: The only time you press the right-mouse button is to move the camera. Otherwise, always use the left mouse button.

Mouse Pointer Shapes

The mouse pointer changes shape when it is in different locations within the user interface. These different shapes provide visual cues to the current activity.

- ↗ The pointer usually appears as an arrow cursor.
 - +
 - ⌞
 - ⛶
- In the backplane representation, the pointer appears as a cross for adjusting the size and shape of a scan area. A cross also appears on the image monitor for selecting points of interest.
- When an inverted "L" bracket appears, the user can create a new rectangle for defining a region of interest.
- Holding down the right mouse button will turn the pointer into a cross with arrows which allows the user to adjust the camera position on the backplane.

Clicking, Double-Clicking, and Dragging

“Click” means to press and release a button without moving the mouse. “Double-click” means to click a button twice in rapid succession. “Drag” means to press and hold a button while moving the mouse pointer.

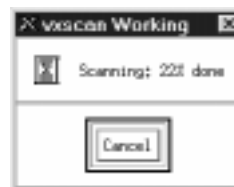
II Input Fields

Input fields are used to enter text or numerical values. For example, names and directory paths of photo files or resolution values. To select an input field, point to it and click the left mouse button. The text insertion point is then marked by a blinking I shaped cursor in the input field. Type information into an input field. The <Backspace> and <Delete> keys can be used to delete unwanted characters. The arrow keys move the cursor left and right. When you are done entering text into an input field, either click on another input field or option menu or hit the <Enter> key. This will cause vxscan to accept your input. Pressing <Enter> in a multiple-line text field causes the cursor to advance to the next line.

Tip: Double clicking on the text will select all the text to be overwritten. Also, you may select sections of text to delete or overwrite by clicking and dragging over the desired text.

III Message Windows

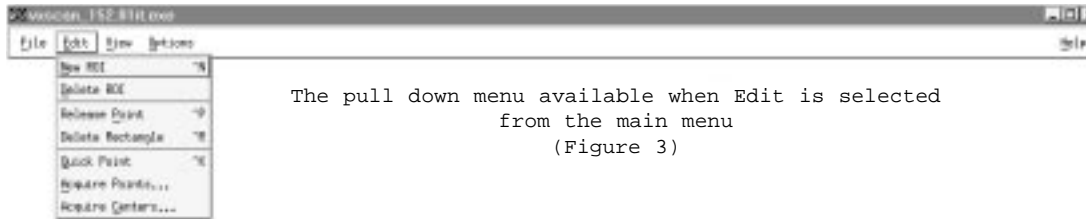
Message windows provide helpful information about system operations. A message window appears automatically and will often prompt you to click **OK** to continue. Sometimes a message window does not require any action. For example, when you click **Scan**, the vxscan Working Window (Figure 2) displays the progress of the scan.



vxscan Working Window
(Figure 2)

IV Pull-Down Menus

Pull-down menus give you access to more options. There are two ways to choose a function from a pull-down menu using the mouse:



The pull down menu available when Edit is selected from the main menu
(Figure 3)

- **Drag method:** Point to the menu you want to display, press and hold the mouse button, drag the pointer and highlight the desired function, and then release the button.
- **Click method:** Point to the menu you want to display, click the mouse button once to display the menu. Point to the desired function and then click again.

V Selection Window

When you select "open" or "save as" a selection window (Figure 4) appears with the following fields:



Open Photo Selection Window
(Figure 4)

Filter

This filter determines what files will be displayed in the “Files” text field and from which directory. For example, in Figure 4, all files that end with “.ph” in the “C:\USERS\scans” directory will be displayed in the “Files” text field. Filter uses regular NT naming conventions.

To start the search using the filter,

1. Click in the “Filter” input field and type the directory where you think the file is located, an asterisk, and the extension if one exists. Use the <Backspace> and <Delete> keys if necessary. The asterisk is used as a wild card so that any file with that extension within that directory will be displayed.
2. To make the filter take effect, click **Filter** at the bottom of the window. You may also press <Enter>.

Directories

The “Directories” text field lists all the directories which reside below the specified directory in the “Filter” input field. To scroll through the list of directories, click either the up or down arrow. To see the entire path, click the left or right arrow.

To select a directory, use one of the following:

1. Double click on one of the directories listed in the “Directories” text field to highlight it. The “Files” text field then lists those files for the directory you selected.
2. Click on the directory you need, then click **Filter**.

To go one directory up the directory tree, double click the directory name which is followed by two dots (ie. C:\Users\..\ in Figure 4).

Files

The “Files” text field lists the files in the specified directory that match the filter.

Click on the desired file in the Files text field. That file name appears in the “Selection” input field.

Selection

The “Selection” input field displays the current file you have selected. Use the “Filter” input field and “Directories” and “Files” text fields to search for and select a file. If you already know the name, you can type it directly into the “Selection” input field.

VI Hot Keys

The following key combinations will perform the corresponding task. Further explanation of the functions can be found on the pages listed.

Ctrl-K	Quick Point Model . . . . .	.75
Ctrl-N	New ROI . . . . .	.95
Ctrl-P	Release Point . . . . .	.96
Ctrl-R	Delete Rectangle . . . . .	.96
Ctrl-H	Open Histogram Window . . . . .	.100
Ctrl-S	Open Preferences Window . . . . .	.101

IV Starting the Scanner

1 Power up and Boot

If the system is not yet powered on, do so now. The power button for the controller (the Windows NT PC) should be located on front of the PC. Press it, wait through the memory checks, and press <Enter> when prompted to boot into Windows NT 4.0. While this is booting, power on the scanner and confirm that the green LED on the front left of the scanner is lit. The power switch for the scanner is located on the rear of the scanner, on the left side and above the power cable.

2 Login

By now, you should see a message on the controller monitor telling you to press <Ctrl> <Alt> <Delete> to login. Press these three buttons simultaneously and you will be presented with a login window. The user account that you would normally use to run the vxscan application is user “vexcel”. The password for “vexcel” is normally “scanb1”.

Once you are logged in, you should be able to look on the Windows desktop and see the icon to begin vxscan.

3 Starting vxscan from your NT desktop

To start vxscan from your NT desktop, double click with the left mouse button on the Vexcel icon, and vxscan will begin. You can also start vxscan from a Command Window (MS-DOS prompt) by going to the project directory and typing “vxscan”. First, a Command Prompt Window will appear which provides information about your scanner’s performance as the scanning process executes. This window is not vital to normal scanning procedure, and is typically covered up by the next window to appear, the vxscan Main Window.

4 Scanner initialization process

When vxscan first begins, it sends a homing process to the scanner. You will notice that the backlight will flash and the tower (the part of the scanner which is mobile, and contains the camera) will move to the left, the camera will move down, and you will hear the sounds of other internal components being moved as well to their initial starting position.

Note: It is vital that no objects be placed on or close to the scanner, as they may interfere with the homing motion and other motions throughout the scanning process. The VX4000 scanner, while more forgiving than other high resolution/high accuracy scanners on the market, still requires precise calibration to achieve its results. Jamming of motion by foreign object, or even such actions as resting one’s arm against the camera, can result in changes in the scanner’s geometry which will affect its performance. Warn all people who will come in contact with this system to exercise care in its use.

VX4000 SERIES

USER'S MANUAL

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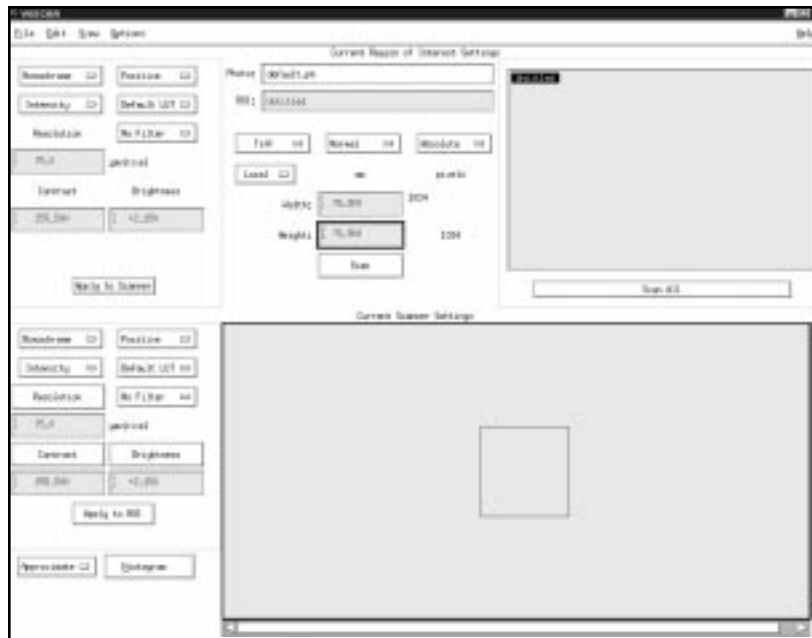
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Manual Conventions



- 1 Action button text:** This is text on a button that, when clicked on, will generally cause the software to perform a task, open a different window, or allow the user to choose a parameter (such as “positive” or “negative”, or a scanning format such as “TIFF” or “BIP”). All such text will appear highlighted, such as “To open the Histogram Window, click on **Brightness**, **Contrast**, or **Histogram** in the “Current Scanner Settings” area.
- 2 “User interface descriptive text”:** This is text that labels a part of the user interface, such as “Current Scanner Settings” or “Height” or “Resolution” in the “Current Region of Interest Settings” area. Clicking on this text will have no effect on anything.
- 3 ‘Menu item text’:** Single quotes around text signifies text that appears either on the menu bar itself, or as an option when an item on the menu bar is clicked. The quotes signal to the reader that this is the text that should be chosen to achieve the desired effect, such as opening a window or deleting a rectangle. For example, “From the Edit menu, select ‘Acquire Points’ to open the Acquire Points Window”.

C H A P T E R T W O



Scanned on a VX4000HT from a color negative compliments of PASCO corporation

STEP BY STEP

S T E P B Y S T E P

User's Notes

Introduction

This chapter will take you, step by step, through two types of typical scanning sessions: Scanning from Scratch, and Scanning Multiple ROIs from One or More .ph Files. Short explanations will be provided as you go. If this is your first time scanning, each section will point you to different sections of the manual which will give detailed explanations. If you have simply forgotten a step or need a little refresher on what comes next in the scanning process, you've come to the right place. You may wish to have available a well detailed, monochrome diapositive to practice with.

Scanning from Scratch

This section will guide you through the procedures necessary to perform a single scan on an image that has not been previously scanned.

I Mounting the Image

- 1 Open the backlight box assembly by grabbing the top of the backlight box assembly and gently pushing it away from the reseau plate.**

See also:

Opening the backlight box assembly71

Proper scanning attire72

- 2 Place the image, emulsion side towards the reseau (the etched grid on the front glass plate), in the backplane viewing area. If you have more than one image, place the images side by side in the backplane.**

See also:

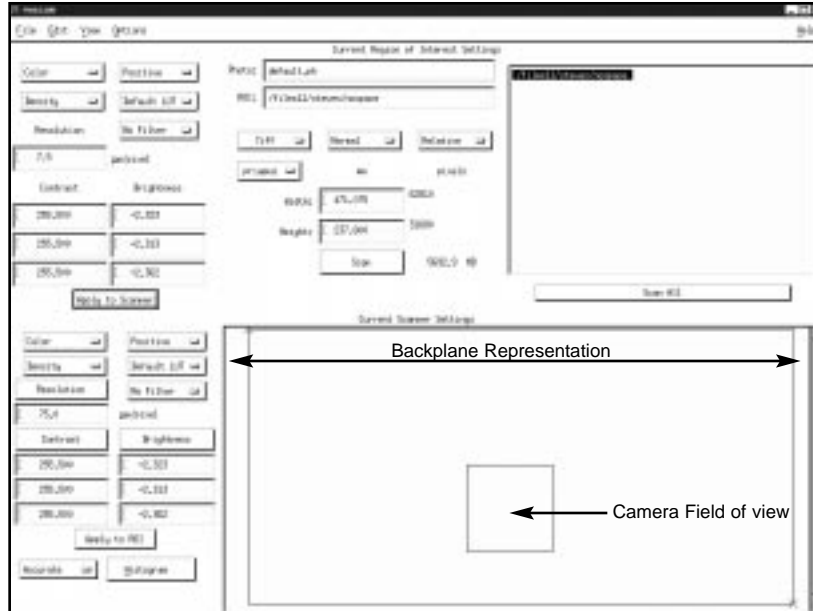
Emulsion testing71

- 3 Close the backlight box assembly snugly. The image is now mounted.**

See also:

Closing the backplane71

II Create the Rectangle



vxscan Main Window
(Figure 5)

When you first start vxscan, the vxscan Main Window (Figure 5) will appear with one box in the backplane representation (the large beige section in the lower right part of the vxscan Main Window). The dark blue box represents the camera's field of view. If you move the mouse pointer inside the backplane representation, the cursor will become an inverted "L". Left clicking on the mouse will "drop" a red rectangle with the dimensions appearing in the "Current Region of Interest Settings" area. This rectangle represents the boundaries of the region of interest (ROI) on the backplane.

- 1 Set the resolution in the “Current Scanner Settings” area to 100 microns. This increases the area of the camera field of view, allowing you to see more of the image.**

See also:

Resolution	81
Camera Field of View	42

- 2 Move the camera so that the point where you want the upper left-hand corner of the rectangle to be is visible on the image monitor.**

See also:

Camera	42
--------------	----

- 3 In the vxscan Main Window’s backplane representation, move the cursor inside the camera field of view; a “+” should now appear on the image monitor.**

- 4 Place the “+” where you want the upper left-hand corner of the rectangle to be and left click the mouse. A red rectangle will appear.**

- 5 Move the camera so that you can see on the image monitor where you will want the bottom right-hand corner of the rectangle to be.**

See also:

Camera	42
--------------	----

- 6 In the vxscan Main Window, left click the bottom right-hand corner of the rectangle and stretch it so that it appears on the image monitor. Use the image monitor to guide you, stretch the bottom right-hand corner of the rectangle to the proper location.**

See also:

Rubberbanding	82
---------------------	----

- 7 Roaming with the camera, verify that all the corners are properly placed to cover the target area.**

See also:

Camera	42
--------------	----

III Resolution and Radiometric Controls

vxscan's "Current Scanner Settings" (Figure 5) area contains several resolution and radiometric settings that affect your preview of the image. The image monitor will reflect the changes made to these settings, but when the image is scanned, only those settings in the "Current Region of Interest Settings" area will be used. Select the **Apply to ROI** button to apply any changes made in the "Current Scanner Settings" area to the "Current Region of Interest" area before scanning.

- 1 Change resolution in the "Current Scanner Settings" area to the desired scanning resolution.**

See also:

Resolution 81

- 2 Select Intensity or Density Mode.**

See also:

Intensity 59

Density 49, 60

- 3 Roam ROI for brightest area. With that area visible on the image monitor, adjust brightness so that the histogram shows just a few pixels at 255.**

See also:

Histogram 56

Brightness 37

- 4 Roam ROI for the darkest area. With that area visible on the image monitor, adjust contrast so that the histogram shows just a few pixels at 0.**

See also:

Histogram 56

Brightness 37

5 Roam ROI and use the histogram to verify that radiometric settings are properly set throughout the ROI.

See also:

Camera 42

Histogram 56

6 If having difficulty setting up a good histogram, apply a Custom LUT

See also:

Look Up Tables 66, 92, 108

7 Apply values in “Current Scanner Settings” area to “Current Region of Interest Settings” area.

See also:

Apply to ROI 111

Apply to Scanner 114

IV Completing Current ROI Settings

The ROI you are creating will be saved upon scanning. The settings for that ROI may be saved in a .ph file.

1 Name the ROI, making sure to have the correct path and corresponding host.

See also:

File Naming Conventions 78

Hosts 57

2 Set format type.

See also:

Formats 51

3 Set Local or Remote Host.

See also:

Local 119

Remote 78

4 Set Absolute or Relative Mode.

See also:

Absolute/Relative 120

Relative 79

5 Set Normal or Mirrored Mode.

See also:

Normal/Mirrored 119

6 Save the photo file (.ph file).

See also:

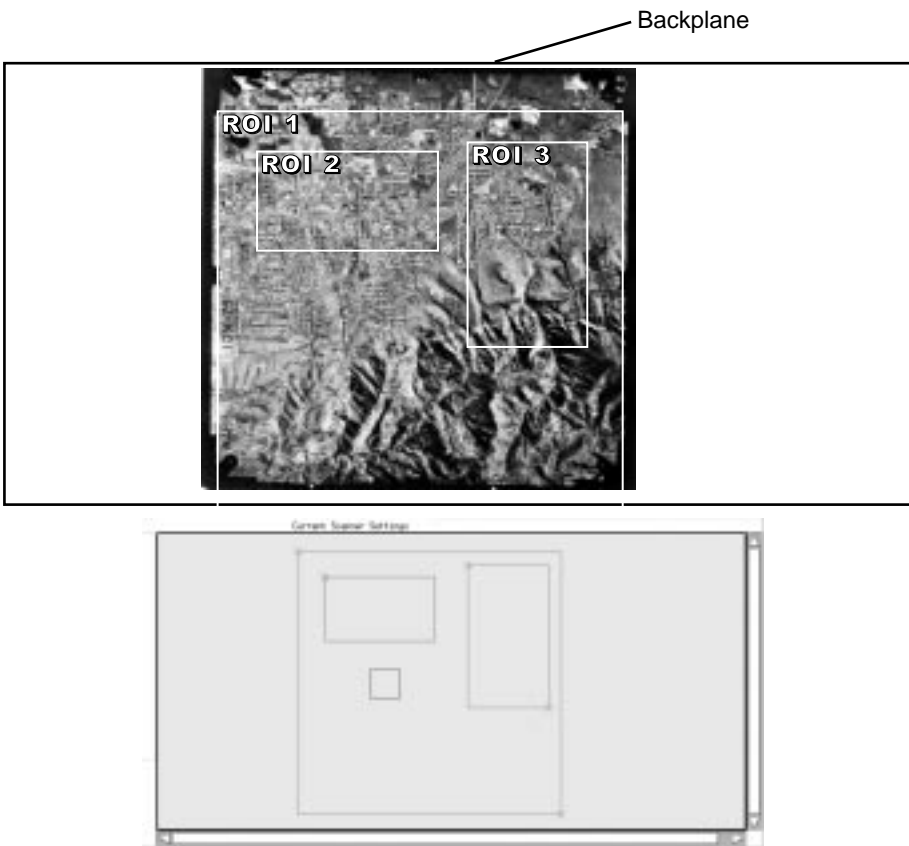
Photo: 72

7 Start the scan by clicking **Scan**. When scanning more than one ROI, click **Scan All**.

Scanning Multiple Regions of Interest (ROIs) from One or More .ph Files

I Multiple Regions of Interest

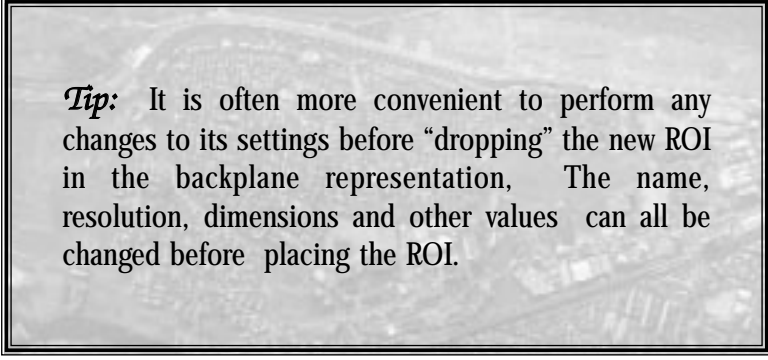
When setting up a scan, it is often convenient to use multiple regions of interest. For instance, if you have more than one image in the backplane, a region of interest may be placed around each. Also, you may wish to scan an entire image at a low resolution, and then scan certain locations in that image at higher resolutions (ex. Figure 6).



Representation of backplane, aerial photo and multiple ROIs (top) and how this would look in the backplane Representation on the vxscan Main Window (bottom)

(Figure 6)

Functions for manipulating ROIs are available under Edit on the menu bar. To create additional ROIs, select 'Edit' → 'New ROI'. The mouse pointer will be represented by an inverted "L" cursor in the backplane representation. Move to the top left of the region you wish to scan, then click the left mouse button to drop the new ROI. It will have the same dimensions and settings of the ROI that already exists within the photo file (.ph file) which is open. At this point, change the dimensions, resolution, and radiometric settings as desired for your new ROI. Before scanning, remember to also change the ROI name, since it comes up by default with the same name as the ROI present in the (.ph file).



Tip: It is often more convenient to perform any changes to its settings before “dropping” the new ROI in the backplane representation. The name, resolution, dimensions and other values can all be changed before placing the ROI.

Tip: If the quantity and location of images mounted is consistent each time you scan, you may wish to save multiple ROIs to your default photo file (default.ph). To do so, create your regions of interest, setting them up with appropriate default names and settings (resolution, contrast, brightness, etc.). Then, select from the menu bar 'File'→'Save'→'Photo' (if default.ph is the photo file open) or 'File'→'Save As' and specify default.ph as the file to be saved.

II Multiple Photo Files

More than one photo file (.ph file) may be opened to allow scanning of regions without having to create multiple ROIs. For example, if you wished to scan two images with the same dimensions and a photo file already exists with one ROI and the settings you wish to use for scanning, you may open that photo file twice, once for each image. Both ROIs which are present will have the same name, so remember to assign them different names before scanning.

Photo files are opened by selecting 'File'→'Open'→'Photo'. After selecting 'Photo', the Open Photo Window (Figure 7) will appear. To open multiple .ph files, repeat this process after opening the target file.



Open Photo Window
(Figure 7)

See also:

File, open 91
Selection Window 11

Note: When multiple photo files are open, only the .ph file associated with the current ROI (highlighted in the List of Regions) will be displayed in the text field next to “Photo:”. The .ph file name will change as you click on ROIs from different .ph files in the List of Regions.

Note: The vxscan Main Window will not indicate that more than one photo file is open, so you must take care if you choose to save changes so that they will be applied to the appropriate file. You may find that using multiple ROIs is a simpler option for scanning more than one region.

CHAPTER THREE

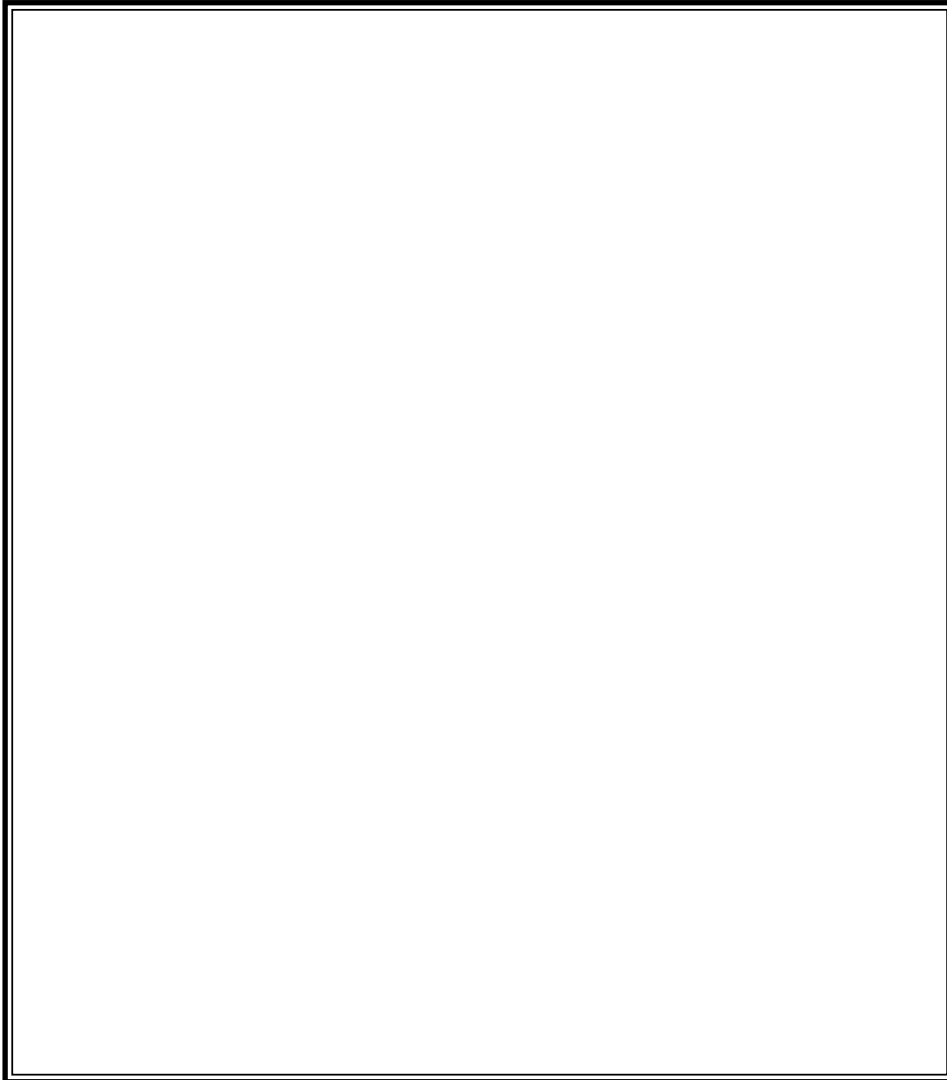


Infrared imagery compliments of Surdex Corporation, scanned on a VX4000HT

**DETAILS &
DEFINITIONS**

DETAILS & DEFINITIONS

User's Notes

A large, empty rectangular box with a double black border, intended for the user to write their notes.

Introduction

In this chapter, more time will be spent describing the actual terms and functions and how you will apply them. This chapter is ordered alphabetically, and contains descriptions and usage of the functions presented on the User Interface, plus scanning terminology and tips which have been acquired through the experiences of our customers over the years.

Accurate

Selecting this feature will result in a reseau grab being performed for accuracy before the image grab is performed. This allows the view on the image monitor to be located accurately relative to the actual geometric position of the camera. When performing functions such as Acquire Points, or even when needing to place an ROI accurately, selecting this feature will produce more accurate results.

See also:

Approximate	34
Accurate/Approximate	112

Acquire Centers

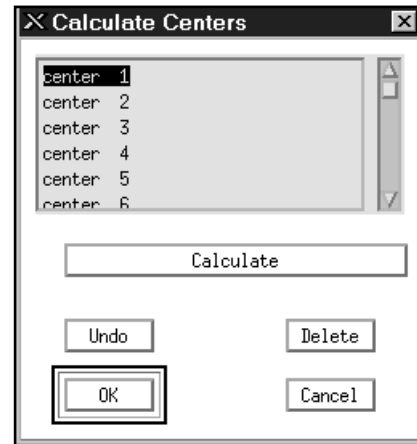
The Acquire Centers computation requires that the points be centrally symmetric and light-colored against a darker background. The pug holes (circular holes drilled in the film emulsion) used by many photogrammetrists meet these requirements. Poor contrast or non-symmetrical points could cause vxscan to miscalculate the point, or to select an area too big around the point.

To acquire centers:

- 1** From the Edit menu, select 'Acquire Centers'. The Calculate Centers Window (Figure 8) appears.
- 2** Highlight a point of interest in the list, for example, "center 1".

3 Move the camera over the point you want to digitize and zoom to the resolution required for your application. You will see a green box on the image monitor which you can resize over the point by moving the upper left and lower right corners. This box is used to constrain the area that vxscan uses for calculating a center. The box narrows the search region, isolating the point from other radiometric highs.

4 Click **Calculate** to find the point value. A plus sign (+) is displayed on the image monitor confirming the point and an asterisk appears next to the point name listed in the Calculate Centers Window.



Calculate Centers Window
(Figure 8)

5 Continue using the above steps to acquire additional centers.

6 The following three buttons assist the user during this function:

Undo - undoes your last action, a delete or an undo.

Delete - deletes the current (highlighted) digitized point.

Cancel - exits the Calculate Centers Window without preserving any digitized points.

7 When you are done acquiring centers, select OK.

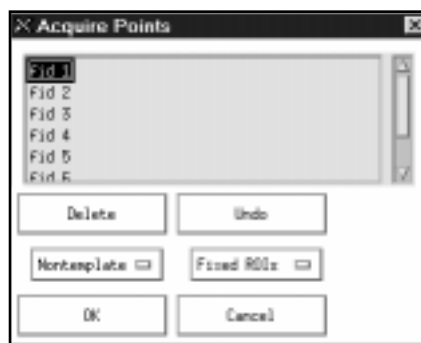
Note: Always use the highest resolution possible when acquiring centers and make sure that the Current Scanner Settings are such that the points you will be capturing with Acquire Centers have high contrast.

Note: Acquired centers are stored in the .ph file and are only saved if you save the .ph file prior to exiting vxscan.

Acquire Points

To acquire points:

- 1** From the Edit menu, select 'Acquire Points'. This brings up the Acquire Points Window (Figure 9).
- 2** Highlight a point of interest in the list, for example, "fid 1" (fiducial 1).
- 3** Move the camera over the point you want to digitize and zoom to the resolution required for your application. Place the mouse pointer over the point you want to digitize.



Acquire Points Window
(Figure 9)

- 4** Digitize the point using the left mouse button. An asterisk appears next to the point name listed in the Acquire Points Window, and a cross should appear over the point itself. Confirm its accuracy.
- 5** Continue using the above steps to digitize additional points.
- 6** When you are done digitizing, click **OK**.
- 7** The following three buttons assist the user during this function:
 - Undo** - undoes your last action, a delete or an undo.
 - Delete** - deletes the current (highlighted) digitized point.
 - Cancel** - exits the Acquire Points Window without preserving any digitized points.

See also:

Acquire Centers	29
Frame Relative ROI	53

Tip: When using Acquire Points, be sure you are in Accurate Mode. Otherwise, your point locations will often appear shifted when the image monitor view is refreshed.

Note: Like acquired centers, acquired points are stored in, and can be retrieved from, a Photo File.

Note: Digitized points are stored in the .ph file and are only saved if you save the .ph file prior to exiting vxscan. The point names and corresponding X and Y coordinates are stored in the .ph file and can be used in post processing. Points are stored in scanner coordinates (microns from the upper left hand corner of the scanner). You can also write your own software to read data from the .ph files. Contact the Customer Support Department at Vexcel Imaging for more information on these features.

Active ROI (Region of Interest)

An active ROI is the ROI represented by a red box in the backplane representation. This ROI will have its settings displayed in the “Current Region of Interest Settings” area, and any changes you make in these fields will apply only to the active ROI.

See also:

Backplane representation	36
Inactive ROI	58
List of Regions	78
Region of Interest	76

AFD

See also:

Automatic Film Drive 36

.ah File

The .ah file is produced when IOT is enabled. This file will be written to the same directory as the resulting images. The following information is included in the .ah file:

- 1 The fiducial locations in image space (pixel based)
- 2 The calculated image to camera system transform parameters based on the following formulas: $X' = A + Bx + Cy$, $Y' = D + Ex + Fy$, where:
 - x and y are pixel based fiducial locations within the scanned image space.
 - X' and Y' are millimeter based fiducial location within camera space.
 - A and D are transform coefficients in units of millimeters.
 The parameters will be written in the following order: **ABCDEF**.
 The following statistical information will be written:
 - The x, y and composite x/y residuals (in millimeters) for all fiducials.
 - The x, y and composite x/y RMS values for the residual data described above.
- 3 The calculated camera system to image transform parameters based on the following formulas: $x = G + HX' + IY'$, $y = J + KX' + LY'$, where
 - G and J are transform coefficients in units of pixels.
 - B, C, E, and F are transform coefficients in units of millimeters/pixel.
 - H, I, K and L are transform coefficients in units of pixels/millimeter.
 The parameters will be written in the following order: **GHIJKL**.

A complete .ah file can be found in Appendix III

Approximate

This function will result in image grabs being performed rapidly when you stop moving the camera across the backplane representation. This allows for the quicker setup of an ROI, but will result in “sloppier” ROI placement. For more accurate placement of ROIs, and for using such functions as Acquire Points, you may prefer to use Accurate Mode.

See also:

Accurate	29
Accurate/Approximate	112

Auto Calculate Dimension

vxscan uses three variables to define the dimensions of an ROI: resolution, size in pixels, and size in either millimeters or inches. One of these dimensions is calculated while the other two are defined by the user. The “Auto Calculate Dimension” option is used to specify which dimension you want automatically calculated. The two dimensions you do not select for automatic calculation then become variables for which you can enter the information. For example, if you select “Resolution” for Auto Calculation Dimension, the vxscan Main Window provides input fields for size in mm/inches and size in pixels in the “Current Region of Interest Settings” area to allow you to type in the information.



Preferences Window
(Figure 10)

Remember that the choice you make for automatic calculation affects your control of those dimensions. For example, if you have selected "Size in mm/inches" for automatic calculation, you will not be able to dynamically resize ("rubberband") an ROI rectangle in the backplane representation because the system will compute the dimensions for you. Likewise, if you have selected to have the resolution automatically calculated, you will not be able to adjust the resolution, only the size in pixels and the size in mm/inches.

See also:

Resolution	81
Region of Interest	76
Rubberbanding	82
Size in mm/inches	83
Size in pixels	83

Automated Film Drive (AFD)

AFD is a peripheral device which may be integrated with the VX4000 to allow for continuous roll scanning. vxphotolist, the software used to control the AFD, allows the user to specify the number of frames on a roll and the radiometric settings to be used. The AFD will scan all frames specified without the need of user attendance. This device will function with many roll sizes, and you may specify full frame or even specific area scanning. AFD may also be combined with IDAS for a simple to use, and fast, bundle adjustment population tool.

See also:

IDAS 58

Axis

Five planes of motion are present in the VX4000 and are referred to as axes. The camera is moved across the backplane in the x and y axes, then may move in and out on the z axis. In front of the camera is a lens which moves in and out and is the fourth axis. A filter wheel with color and density filters constitutes the fifth axis. VX4000 systems with the AFD will also have an automatically opening backplane, but it is not referred to as an axis.

Backplane

This is the physical scanning area of the VX4000. With approximate dimensions of 10"x20" (25.4cm. x 50.8cm.), the backplane is where imagery will be placed for scanning.

See also:

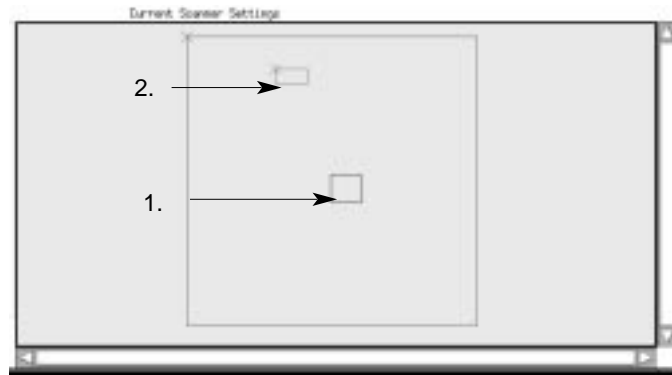
Backplane Representation 36

Mounting an Image 71

Backplane Representation

This is the vxscan Main Window representation of the actual physical scanning area of the VX4000 (backplane). Located in the lower right section of the Main Window, it is here that you will use the mouse to perform such actions as moving the camera and manipulating regions of interest. Two types of boxes should appear within the backplane representation (Figure 11):

1. Regions of Interest represented by either red boxes (active) or magenta boxes (inactive).
2. The camera field of view represented by a blue box.



See also:

Active ROI

33

Backplane 36

Camera Field of View 105

Inactive ROI 58

Backplane representation
(Figure 11)

Backlight

The backlight is the fluorescent tube which illuminates the backplane and, consequently, any translucent imagery therein. It can be adjusted in the Histogram Window (Figure 12) by moving the “Backlight” bar between 0 and 4, where 4 is the brightest setting and 0 is the dimmest.

See also:

Brightness 37

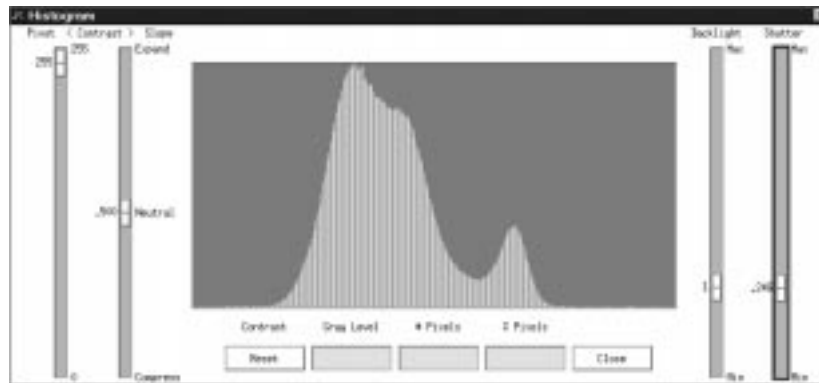
Histogram 56

Shutter 83

Brightness

The brightness control is used to increase or decrease the amount of light transmitted from the backlight to the camera, thus affecting the overall brightness of the resultant image.

Adjusting the brightness causes the entire histogram to shift either to the right (brighter) or to the left (dimmer), without having much effect on the range of the gray levels used.



Bad Histogram
(Figure 12)

This histogram shows a less than ideal match between the image intensities and the gray levels representing the image pixels. Note that no pixels have a gray value of 0 or 255, thus reducing the radiometric range. To correct this, increase both the brightness and contrast.

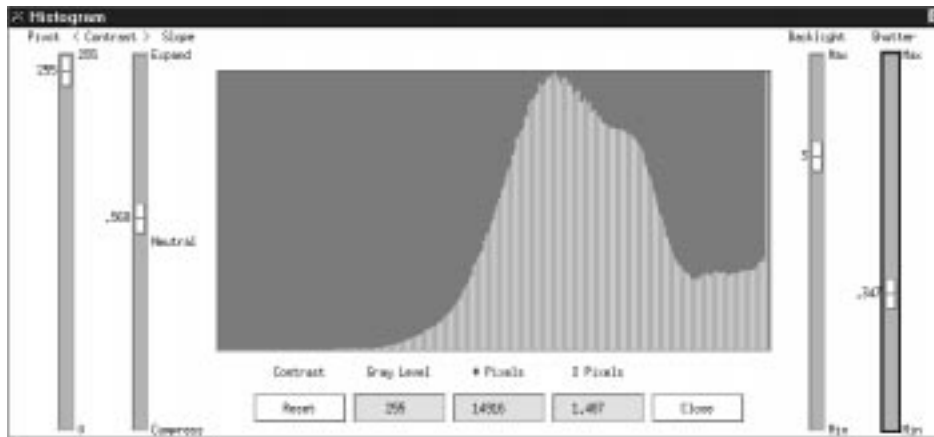
Adjusting brightness

To properly set the brightness, first make sure that 'Resolution' in the "Current Scanner Settings" area is set to the resolution at which you will be scanning. Move the camera field of view to the brightest parts of the ROI and look at the histogram. Adjust the histogram so that there are just a few pixels with a gray value of 255. If you see a spike at 255, decrease the brightness. If the brightest pixel has a value less than 255, increase the brightness. It is a good idea to check several bright areas on the ROI, and set according to the brightest one. Be careful to look only at the film and not include any of the empty backlight in the camera field of view. It is also best to set your histogram using only detail within the ROI. Detail outside of an ROI will not be scanned, and consequently you would not want to rely on it for your adjustments.

The Backlight Bar and the Shutter Bar (Figure 12) adjust the brightness registered by the camera. The backlight bar changes the intensity of the backlight and has settings from 0 to 4, with 0 being the dimmest and 4 the brightest. Brightness can then be fine-tuned by changing the shutter duration, which affects the amount of time that the camera is exposed

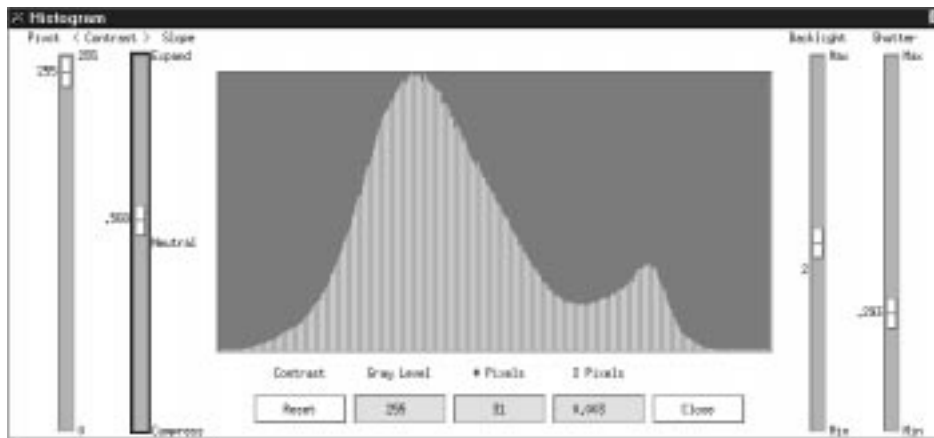
to the image. Values may vary between .000 to .999, with .000 being the least exposure time and .999 being the most exposure time.

This system does create a certain overlap between different backlight/shutter combinations. For example, theoretically, on certain film, Backlight 3, Shutter .750 (3.750) will produce approximately the same results as Backlight 4, Shutter .250 (4.250). However, this is not a simple redundancy. If the film itself is very dark, a brighter backlight will result in a more effective grab by the camera. If the film is very light, better result may be obtained by limiting the backlight and increasing the shutter for a longer exposure time.



Saturated histogram
(Figure 13)

This histogram represents an image that is too bright. Note the big spike at 255 (the highest gray value). This is known as “saturating white”, which will result in clipping, whereby bright areas of the image with different brightness levels will all be represented by 255, thus destroying the detail in those areas. To correct this, decrease the brightness. The contrast control may also have to be adjusted, either up or down.



Good histogram
(Figure 14)

Figure 14 shows the effect of decreasing the brightness. Note that as the right hand side of the histogram is moved towards the left, or away from 255, the left hand side has moved to the left as well. This is the proper setting for the brightness.

See also:

Backlight	37
Contrast	46
Histogram	56
Shutter	83

Tip: When performing high resolution scans, it is often easiest to locate the brightest and darkest areas of an image at a low resolution, centering this area in the camera field of view (as seen on the image monitor) then changing to your scanning resolution. Also, in order to save time when performing color scans, try locating these regions first in monochrome and then select color.

Tip: Longer shutter duration may cause a slight increase in the amount of time it takes to perform a scan. For speed purposes, a brighter backlight setting and lower shutter setting may be preferred. Therefore, although *theoretically* settings of 3.5 and 2.8 would produce the same histogram, 3.5, with a shorter shutter duration and brighter light, would be preferable.

Tip: For best results, film should be handled only with cotton gloves and kept in protective sleeves or film canisters. Scratches and dirt on the film may cause misleading spikes in the histogram which could affect how you set your radiometry.

Calculate

The selection of this button in the Acquire Centers Window will result in the center of a centrally symmetric point being located and digitized.

See also:

Acquire Centers 29

Calibrate

The VX4000 relies on software calibrations to maintain its high level of geometric and radiometric accuracy. The hardware component of the VX4000 is extremely durable, yet in the event of damage, or even just over time, it may be necessary to perform calibrations. If scanner errors or degraded scans are experienced, contact Vexcel Imaging for calibration advice or refer to the VX4000 Installation and Maintenance Manual.

Camera

Moving the camera

- 1 Position the mouse pointer within the backplane representation (it is usually best to position the pointer in the dark blue box, which represents the camera's field of view) and hold down the right mouse button while moving the mouse. This grabs the camera and moves it to a new location within the backplane. As you hold down the button and roam, the camera field of view is displayed on the image monitor in "live" mode.

Tip: If things are too dark on the image monitor during "live" roaming, increase the backlight in Monochrome Mode. (ie. If the Monochrome Mode Backlight Bar in the Histogram Window is at "1", increase it to "2" or "3").

- 2 Release the right mouse button when you are satisfied with the new camera position. As soon as you release the mouse button, the camera grabs and displays the image on the image monitor using the Current Scanner Settings.

Tip: For more precise movement, hold down the <Shift> key while moving the camera. Release the right mouse button before releasing the <Shift> key.

Moving the mouse cursor inside the camera field of view will cause the cursor to appear on the image monitor. The cursor will appear to slow down in the backplane representation, but will move at normal speed on the image monitor. Especially at high resolutions, the cursor may appear to be trapped in the camera field of view, and the mouse will need to be moved a comparatively great distance to exit the camera field of view.

See also:

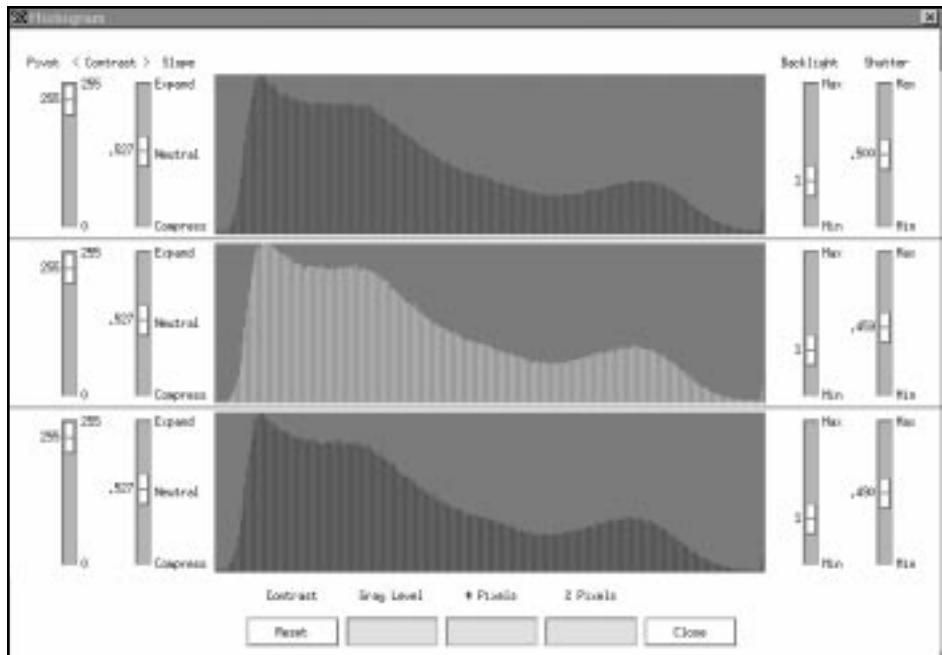
Backplane Representation36

Color

This function, located in both the “Current Region of Interest Settings” area and the “Current Scanner Settings” area, allows the operator to toggle from **Monochrome** to **Color** for scanning color imagery. Color scanning on the VX4000 is made possible by the use of red, green, and blue filters which are placed in the optical path. An 8-bit monochrome grab is performed through each filter, resulting in a 24-bit color image.

To set up color scans

When **Color** has been selected in either or both of the “Current Region of Interest Settings”, or “Current Scanner Settings”, the User Interface will contain three Contrast and Brightness input fields. These settings can be adjusted manually by placing the desired values in the fields, or by using the histogram.



Color histogram
(Figure 15)

When adjusting the radiometry for color images, a histogram for each band is displayed (Figure 15) to facilitate the setup process.

Setting the “Brightness” and “Contrast” controls becomes a little more complex when working with color images. As in monochrome imagery, you would wish to set your histogram to use the maximum number of gray values. With color however, you must also concern yourself with achieving a proper balance between the colors. This may be done by locating the whitest area on your image and moving the camera to that location. Since pure white consists of an even balance between red, green, and blue, the goal is to align the highest (brightest) peak of each band. To achieve this, you will often have to set your histogram such that one band has pixels at 255 (as in monochrome setup), while the other bands may not. It is common for the three brightness settings to be different.

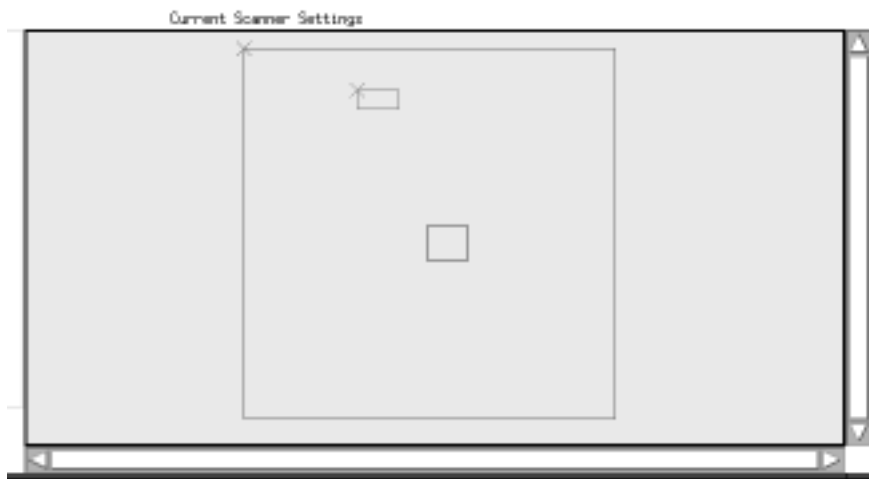
To set the contrast, go to the darkest area and proceed as with a monochrome image, stretching the histogram curve to the left for each color band. It is, however, important in

color imagery that you do not stretch one band significantly more than the others, as this may unbalance the colors and “exaggerate” detail which is not apparent in the image.

See also:

Brightness	37
Contrast	46
Histogram	56
Color Type (Monochrome/Color)	106

Constraint Point



Examples of constraint points
(Figure 16)

Constraint points “lock” a dimension on an ROI. They are represented by an “x” in an ROI corner. Like ROIs themselves, active constraint points are red, while inactive constraint points are magenta. An ROI will appear initially with the top left corner constrained. If another constraint point is placed adjacent to the existing one and “Size in pixels” has been specified under ‘Set Preferences’ in ‘Options’ on the menu bar, then the ROI will not be able to be moved in certain dimensions. To remove a constraint point, make it the active constraint point (by clicking on it with the left mouse button) then select ‘Release Point’ under ‘Edit’ on the menu bar. In circumstances where you wish to delete multiple constraint points, you may select ‘Delete Rectangle’ under ‘Edit’ on the menu bar. This has the effect of removing the ROI from the Backplane Representation while keeping its name and

settings. The ROI may be placed again by clicking the left mouse button within the backplane representation, and you will notice that only one constraint point will remain.

See also:

Delete Rectangle	97
Edit Menu	95
Release Point	96
Rubberbanding	82

Contrast

Selecting this option in the vxscan Main Window will open the Histogram Window. Contrast is a radiometric adjustment which must be performed prior to scanning. The contrast control may be thought of as the "stretch" factor. Contrast is always set after the brightness has been properly adjusted. To set the contrast for an image, use the resolution you will use at scanning time. Move the camera field of view to the darkest parts of the image and look at the histogram.

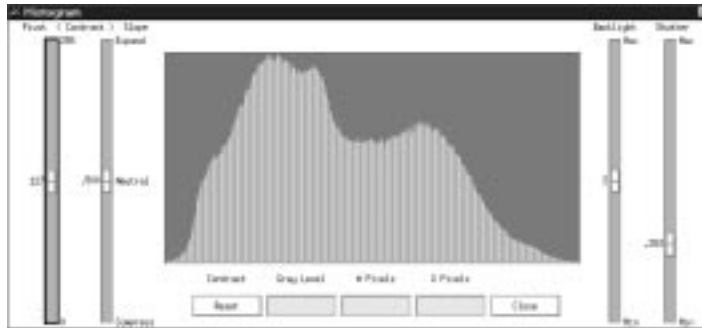
Adjusting Contrast

Contrast may be adjusted using the Pivot and Slope Bars on the left side of the Histogram Window. The Pivot Bar determines from what point on the gray scale the histogram will be stretched. For example, if the Pivot Bar is at 153, then the histogram will stretch from 153 to 0 and 153 to 255. If the Pivot Bar is set at 255, then the histogram will stretch from 255 to 0.

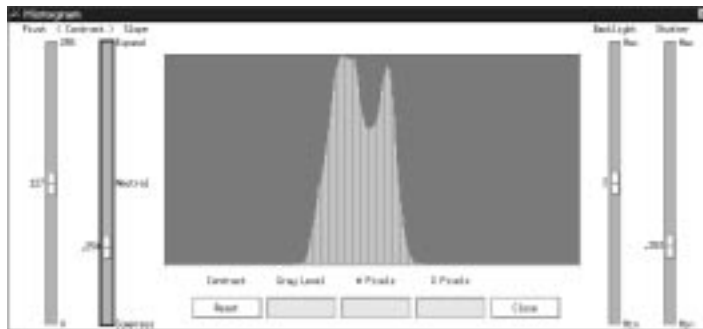
It is recommended that the histogram first be properly adjusted using the brightness settings such that the histogram shifts up to allow a few pixels with a gray value of 255. Then, use contrast to stretch the histogram towards 0.

Slope determines the amount that the histogram will be stretched from the pivot point. At .500 there will be no stretch. .000 to .499 will compress the histogram, with .000 compressing it the most, and .499 the least. .501 to .999 will expand the histogram, with .501 expanding it the least and .999 the most.

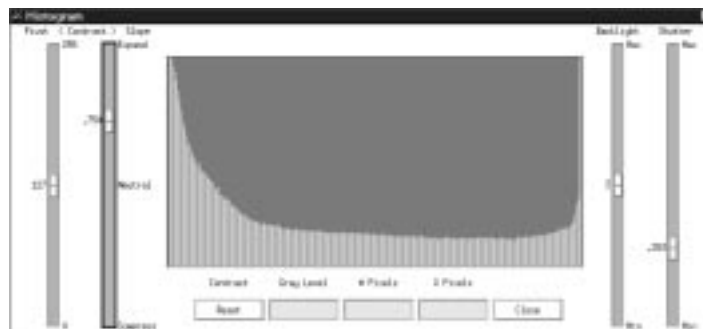
Figures 17-19 show the effect of stretching and contracting the histogram from the midpoint of 127.



Good histogram
(Figure 17)



Over-contracted histogram
(Figure 18)



Over-stretched histogram
(Figure 19)

Setting the Slope Bar to a value less than .5 will compress the histogram so that areas that had a gray value will lose some or all of their value. Thus, setting the Slope Bar to a number less than .5 actually shrinks the output gray value range and would rarely be desired.

Tip: It is often simplest to set the Pivot Bar to 255. This causes stretching to occur only in one direction (from 255 to 0). If your brightness has been adjusted properly, then you should already have an appropriate amount of pixels at 255, and stretching in that direction would cause loss of detail.

See also:

Brightness	37
Histogram	56
Pivot	74
Slope	84

Controller

The Windows NT PC which runs the VX4000. It is on this system that vxscan will be run.

Default Photo File

When the vxscan application is first started, parameters saved in a default Photo File (default.ph) will be loaded. This default file may be used to store scanning parameters that are used often. For example, if you typically scan images that use the same "Resolution", "Contrast", and "Brightness" settings, these settings may be stored in the default.ph file. This will save time when you start the set up of each image. Because default.ph is an actual .ph file, it must be saved just as you would save any other photo file. The default.ph file must be located in the current working directory from which you run vxscan to be used as a default file, otherwise, vxscan uses the system defaults which are stored in the code.

Note: The default photo file saves the settings in the “Current Region of Interest Settings” area at the top of the Main Window, as opposed to .vxscanrc, which saves the settings in the “Current Scanner Settings” area.

Note: Loading a .ph file changes the current ROI to be the first ROI in the .ph file, and changes the ROI settings appropriately, but does not affect the Current Scanner Settings. The .vxscanrc file specifies the Current Scanner Settings when the vxscan Main Window first comes up.

See also:

Photo File	73
Save	93
.vxscanrc	86

Density

Selecting this option, which is located in both the “Current Region of Interest Settings” area and the “Current Scanner Settings” area, will result in scans being performed in density space as opposed to intensity space. For a more detailed description of the difference between density and intensity, see Intensity. As a general rule of thumb, if you have very dark or detailed imagery, or wish to bring out more dark detail, scanning would be best performed in density mode.

See also:
Intensity 59

English

Option for “Units:” in the Preferences Window under ‘Options’ on the menu bar. Resolution will be displayed in dots per inch (DPI) and ROI dimensions will be displayed in inches.

See also:
Units 82

Fiducial

Fiducials (Figure 20) are reference marks present on much imagery. They are, in most cases, located on a mask in the optical path of a camera. When a photograph is taken, the fiducials will appear on the film along with the image. Since the relative locations of the fiducials are known through camera calibration, they may be used along with values pertaining to the geometry of the airplane (in the case of aerial photography) to produce accurate information regarding the physical surface photographed.



Various fiducials
(Figure 20)

On the VX4000, fiducial coordinates may be recorded and stored in a Photo File for future extraction and use. Their locations will be stored in scanner coordinates, so a conversion must be undertaken to put them into a usable coordinate system. They may be saved by using Acquire Points.

See also:
Acquire Points31
Interior Orientation61

Fixed ROI

A Fixed ROI is an ROI which is not moveable through automatic means, and would be designated as such within the Acquire Points window. A fixed ROI will not reposition and can not be used for Frame Relative ROIs.

See also:

Acquire Points	31
Frame Relative ROI	53

Formats

The following formats are supported on the VX4000:

1 No Format

This option stores the raw data tiles but does not format them together. The Vexcel Imaging vxformat program will have to be executed manually if you wish to produce a final, formatted image. These raw data tiles usually have a name like: *.w for monochrome images or *.rgb for colored images.

2 BIF

BIF stands for binary information file. It contains a raw binary image file and an ASCII header file which describes the file name, width and height of the image and so on. This image format is row major, band interleaved by pixel and one byte per pixel in RGB order. The output raster image files have a suffix .bif.w for monochrome images or .bif.rgb for colored images. The ASCII header files have a suffix .bif.

3 BSF

BSF is a band sequential file, one byte per pixel image format. There is no ASCII header file for this image. The output image file is just one or three raster image data files with a suffix .bsf.w for monochrome images or .bsf.rgb for colored images.

4 BIP

BIP stands for band interleaved by pixel. It is a row major image format, one byte per pixel

in RGB order. There is a ASCII header file that contains ancillary data about the image, such as the number of rows and columns in the image, etc. This header file has a suffix .hdr. The output raster image files have the suffix .bip for both monochrome and colored images.

5. COT Row

COT stands for continuous tone image format. We support only COT type 1 formats with minimum header size (row major). These formats are proprietary image formats of Intergraph Corporation. There is a fixed-size header followed by ordinary raster data. The output image files have a suffix .cot for monochrome images and _[rgb].cot for color images. There is no separate ASCII header file required for this image format.

6. Imagine

The Imagine format supported by the VX4000 is the proprietary format of ERDAS Imagine. The files have the extension .img. No ASCII header file is required for this format.

7. SunRaster

SunRaster files are used by Sun Microsystem workstations. They are also now supported on non-Sun workstations. Its raster image file has a suffix .ras with a binary header for both color and monochrome images. Each line of the image is rounded up to a multiple of 16 pixels. There is no separate ASCII header file required for this image format.

8. TIFF

Tagged Interchange File Format (TIFF) is designed to be a universal raster image format. Its image file contains a header and image data. Image data is stored through a simple scanline-based interface that works with images organized as strips (row major). The output image files are named with .tif for both color and monochrome images.

9. Tiled TIFF

Tiled TIFF format allows the user to select/specify a tile size for viewing on 3rd party platforms which support tiled TIFF. Three tile size options are given, or you may contact the Customer Support Department at Vexcel Imaging for information on specifying your own tile size. There are several settings in the VX4000.ini file which related to this format:

RamCacheMemory TileGroupMemory OutputTileSize=

Additional information can be found on these settings in the Installation and Maintenance manual.

For all image formats mentioned above, there will be an output region header file supplied with a name suffix .rh. All output files, such as image data files, .rh files, and ASCII header files (if applicable to that image format), will be placed in the ROI subdirectory specified in the ROI input field in the Main Window.

See also:

vxformat 85
Format 117

Frame Relative ROI

vxscan supports repositioning of ROIs with respect to reference points on the film. This means that ROIs established when the film was previously in the scanner may be easily moved to the proper position when that film or similar film is placed in the scanner again at a different location.

Template Photo Files

A Template Photo File must contain reference so that the ROI, or ROIs, can be correctly repositioned on the next image.

Generating Template Photo Files

- 1** From the menu bar, select 'Edit' → 'Acquire Points'.
- 2** Click **Template**
- 3** Use the left mouse button and click on the point to be digitized, at least one point (the top left fiducial is recommended). Then click **OK**.



Acquire Points Window
(Figure 21)

- 4** There can be many ROIs saved in this template file but all ROIs to be repositioned must be saved in Relative Mode. The **Absolute/Relative** button is in the “Current ROI Settings” area of the vxscan Window.
- 5** From the menu bar, select ‘File’ → ‘Save As’ to save your template.ph file.

Repositioning ROIs

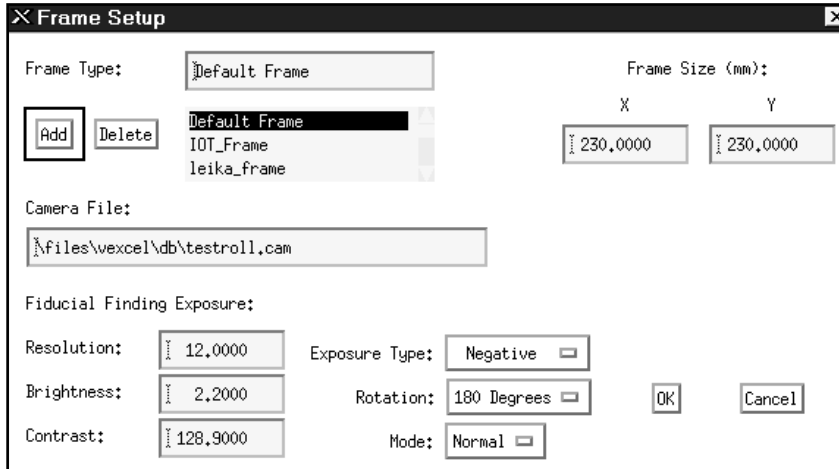
- 1** From the menu bar select ‘File’ → ‘Open’ → ‘Photo’ and open your template.ph file. All ROIs saved in the template file will open on the same location on the backplane that they were originally saved.
- 2** Move the camera over the new point (for example the top left fiducial) you want to use as the reference for the new image location.
- 3** From the menu bar, select ‘Edit’ → ‘Acquire Points’ and verify that **Reposition** has been selected. If the ROIs were not saved in Relative Mode, than **Reposition** may be greyed out and only **Fixed ROI** will be available. In this case, go back to step one under Generating Template Photo Files and be sure to save all ROIs in Relative Mode
- 4** Move the cursor into the camera field of view in the backplane representation, watch for the cross hairs (+) in the image monitor, place the cross hair on the desired point and click the left mouse button. Note in the image monitor that a green cross hair is placed at that location.
- 5** Click **OK** in the Acquire Points Window and your ROIs should be repositioned. Update the image monitor to verify the repositioning by clicking on the right mouse button while in the backplane representation.

See also:

Acquire Points 31

Frame Setup Window

The Frame Setup Window is opened when the operator desires to use the Interior Orientation Transform. In this window a “Frame Type” will be designated and the path to the camera database file will be verified. The bottom portion of the window allows the operator to adjust the radiometric setting which will be used when looking for fiducials. The rotation, exposure type and mode (density/intensity) may also be designated at this time.



The Frame Setup Window
(Figure 22)

See also:

Frame Setup Window102
Interior Orientation61

Gray Level

For the VX4000, the gray level is an 8-bit number representing the shade of a pixel. This means that gray levels may fall between 0, which is 100% black, and 255, which is 100% white. In color scanning, three 8-bit monochrome pixels are accumulated by the camera for each pixel location, then formatted into an image giving 24-bit color.

Height

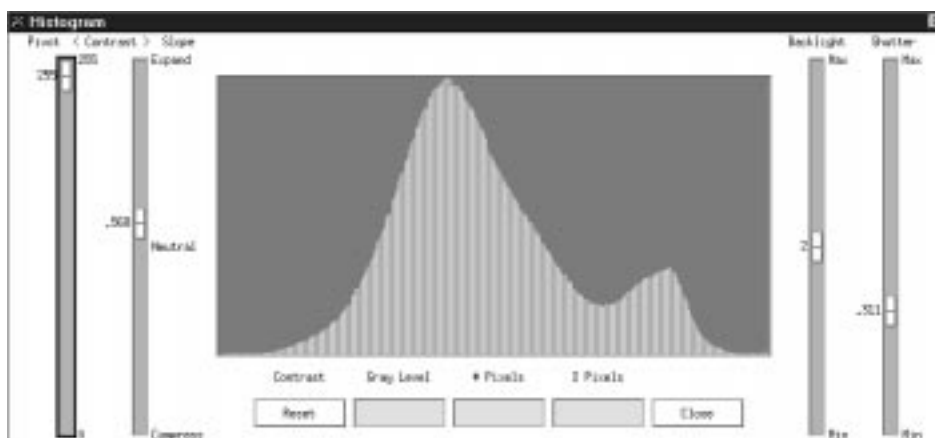
The height parameter is located in the “Current Region of Interest Settings” area and indicates the height of the active ROI in both mm/inches and pixels. Depending upon your settings in the Preferences Window, at least one of the input fields will allow manual changes to its values.

See also:

Auto Calculate Dimension	35
Units	84

Histogram

This option in the “Current Scanner Settings” area will bring up the Histogram Window (Figure 23) which will display a histogram for the region currently within the camera field of view. This window may also be brought up by selecting ‘View’ → ‘Histogram’ on the menu bar, by clicking **Contrast**, or by clicking **Brightness**.



Histogram Window
(Figure 23)

With the Histogram Window open, you will see two slider bars on the left which affect contrast, two slider bars on the right which affect brightness, three beige input fields along the bottom which will display information about particular gray levels, and a large field in

the middle which displays the histogram curve. Within this large middle field, the available 256 gray levels are represented along the x-axis, and the number of pixels is represented along the y-axis. By clicking with the left mouse button within this field, data pertaining to that gray level is displayed in the input fields along the bottom of the Histogram Window. You will see the specific gray level you selected, the number of pixels at that level, and the percent of overall pixels represented by that number of pixels. Clicking and dragging will enable you to move the pointer along the histogram so that the information can be checked at any location.

See also:

Brightness	37
Contrast	46

Host

Formatted images may be written to remote hosts. There are two categories of remote hosts that may receive formatted images.

Unix

Hosts using unix filesystems must be running the vexcel remote-I/O server. To send a formatted image to a unix-based host, add the name of that host to the TargetHosts line of the [Formatting] section of vx4000.ini. This host name must also be visible to the instance of NT running on the controller. The simplest way to accomplish this is to add the host (along with its IP address) to the file \winnt\system32\drivers\etc\hosts.

Once the host name has been added to vx4000.ini, it will appear on the **Hosts** push-button menu on the vxscan Main Window the next time vxscan starts. To send an image to a remote host, select the host on the push-button menu and enter the full path to the target directory in the ROI input field. ROI paths specified for Unix remote targets are not checked before scanning commences.

For more detail on setting up an RIO server, or if you are running 3rd party PCNFS software, please contact a Vexcel Imaging Customer Support Engineer.

Windows95 & NT

Sending images to other NT or Windows 95 hosts does not require that a remote-I/O server be running on the target machine. All that is required is that the target drive be mapped to a drive letter on the scanner controller. In the “Current Region of Interest Settings” area, select **Local** on the host push-button menu, and enter the full path to the target directory in the ROI input field, beginning with the drive letter. ROI paths specified for NT and 95 are checked before scanning commences.

IDAS

Integrated Digital Aerotriangulation System, IDAS, is a Vexcel Imaging software package which works directly with the VX4000 and Automated Film Drive to increase productivity by decreasing the time required to perform aerotriangulation. For more information regarding IDAS, please contact Vexcel Imaging.

See also:

Automatic Film Drive 36

Image Monitor

The monitor attached to the controller which displays the camera field of view as you roam in “live mode”.

Inactive ROI

Represented as a magenta box on the backplane representation, inactive ROIs are listed in the List of Regions but do not have their values immediately visible in the “Current Region of Interest Settings” area.

See also:

Active ROI 33

Backplane Representation 36

List of Regions 78, 117

Inches

Unit of measurement used when “English” is selected under “Units:” in the Preferences Window. “Resolution” will be displayed in dots per inch (DPI).

See also:

Units 84

Intensity

Selecting this option, which is located in both the “Current Region of Interest Settings” area and the “Current Scanner Settings” area, will result in the scan being performed in Intensity space as opposed to density space. Generally, if you have very light imagery, or low detail (flat) imagery, intensity mode may work best.

To understand the difference between the intensity and density settings, some common terms need to be reviewed. When film is processed, areas of the image receive different amounts of illumination and thus have varying degrees of blackness. The blackness of a negative, or its light-stopping power, can be expressed numerically in the following different ways:

Transmittance


Transmittance is the ability of a material to allow light to pass through it and is usually expressed as a fraction or a percentage: what comes out divided by what went in. For example, if 100 units of light are directed at a material and 90 units actually pass through, the transmittance of the material is 9/10, or 90%.

Opacity

Opacity is just the opposite of transmittance. Opacity refers to a material's ability to block or absorb light. It can be found by dividing 1 by the material's transmittance and its value can never be less than 1. Using the example above, the opacity of the material would be 1.11.

Density

Density is the common log of opacity. For example, if a material transmits 25% of the light that strikes it, 25% is equivalent to the fraction of 1/4, the reciprocal of which is 4. The opacity of the material is therefore 4, and the density is the log of 4, or 0.604. Here are some examples to help clarify this relationship.

CLEAR	%Transmittance	Opacity	Density
	100 .....	.1 .....	.0
	75 .....	.133 .....	.0124
	50 .....	.2 .....	.0.3
	33.3 .....	.3 .....	.0.48
	20 .....	.5 .....	.0.7
	10 .....	.10 .....	.1
	5 .....	.20 .....	.1.3
	2 .....	.50 .....	.1.7
	1 .....	.100 .....	.2.0
DARK			

Density is the unit used most often in sensitometry. Like opacity, it increases with increasing blackness, but has the following advantages:

- 1) The numerical value of density bears an approximately linear relationship to the amount of silver or image dye present. For example, if the amount present in an image of density 1.0 is doubled, the density is increased to 2.0. The opacity, however, increases from 10 to 100, or tenfold. Thus, calculations between several optical components that are multiplicative because they use transparency or opacity, become additive when using optical density.
- 2) The final aim is to relate the tones of the print to those of the subject. Blackness in the print depends on the way the eye assesses it, and is therefore essentially physiological. The law governing the effect produced in the eye when stimulated is not a simple one, but over a wide range of viewing conditions the response of the eye is approximately logarithmic. Thus, if we examine a number of patches of a print in which the density increases by equal steps, the eye accepts the steps as of equal blackness increase. From this point of view, a logarithmic unit is the most satisfactory measure of blackening.

The vxscan intensity setting is essentially transmittance and the vxscan density setting is the density value, or log transform of opacity. So, which setting is appropriate? Use density to accentuate structures within the darkest areas. Use intensity to accentuate structures in the brightest areas. Your choice also depends on the final film writing process; use density if your printing setup assumes density data.

See also:

Density 49

Interior Orientation Transform (IOT)

Interior Orientation is the process of relating the fiducial markings from scanned images to those calibrated on the aerial camera. The fiducial markings from the scanned images are transformed mathematically and compared to the calibrated ones. The results of the transformation, which are written to the .ah file, can be evaluated by a third party software package. This saves time in post processing since the Interior Orientation transformation has already been calculated.

In order for vxscan to perform Interior Orientation the user must specify a Camera Database file. A Camera Database file contains the name of the camera, number of fiducials, calibrated X and Y coordinates, and the fiducial mask file name. A fiducial mask must be created for each type of fiducial on the camera. A library of fiducial masks for the most common aerial cameras is located in Files\Vexcel\db\fid_masks.

How IOT Works

The Interior Orientation Transform will transform points between image space (which is pixel based) and camera space (which is millimeter based). For every ROI that is scanned, the location of the fiducials will be written to the .ah file.

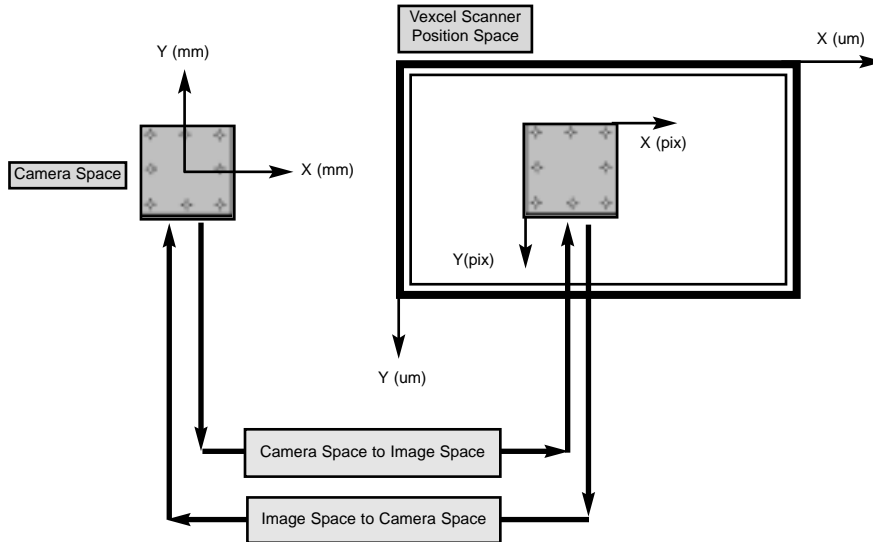


Diagram showing the relationship between image and camera space
(Figure 24)

Using IOT

There are 4 basic steps involved in using IOT:

1. Enable IOT
2. Complete the Frame Setup Window
3. Complete the Scan(s)
4. Check .ah file

Step 1 - Enable IOT

1 Check to see if IOT has been enabled.

- From the Menu Bar click on 'Options' A sixth choice has been added: Frame Setup. If this option is grayed out then IOT has not been enabled.

2 Enable IOT.

- From the Menu Bar select 'Set Preferences' to bring up the Preferences Window (Figure 25). Click in the box next to "Enable Interior Orientation". It is not necessary to select **OK** as the 'Set Preferences' Window will accept the change and close automatically.



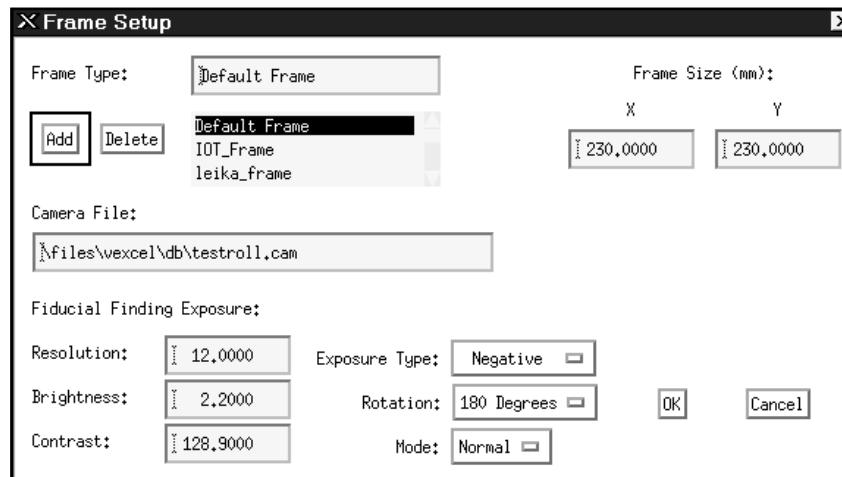
The Set Preferences Window
(Figure 25)

Note: To skip this step in the future, save .vxscanrc and the current settings will become the default. The next time vxscan is started Interior Orientation will already be enabled.

Step 2 - Complete Frame Setup Window

1 Bring up the Frame Setup Window

- Select 'Options' from the Menu Bar. After Interior Orientation has been enabled Frame Setup will be available. The Frame Setup window automatically appears when Frame Setup is selected.



The Frame Setup Window
(Figure 26)

2 Designate the Frame Type and any other information relevant to the current project.

- The Frame Setup Window is similar to the Frame Parameters and Frame Mounting Windows used in vxphotolist.. Through this window the "Frame Type" will be designated and the path to the camera database file will be verified. The bottom portion of the window allows the operator to adjust the radiometric settings which will be used when looking for fiducials. .

See Also

Frame Setup Window 55, 102

3 Save the settings

- Once the frame type has been selected, and any other changes have been made to the Frame Setup Window complete, click on **OK** to save the settings.

Step 3 - Complete the Scan

1 Open the desired .ph file

2 Digitize a point (the upper left fiducial is recommended) and reposition the ROI. Using the Quick Point Model is the recommended method.

3 Complete the setup for the scan by designating resolution, brightness, contrast and any other settings that are pertinent to the current project.

4 Scan the Images(s).

Note: Once the Interior Orientation Transform has been enabled, IOT will be performed on all subsequent scans until vxscan is closed.

See also:

.vxscanrc	.....	.86
.ph file	.....	.73
Acquire points	.....	.31

Step 4 - Check .ah File

The .ah file is written to the same directory as the resulting images. View the contents of the file to examine the validity of the results.

See also:

.ah file34
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Local

Selecting this option in the “Current Region of Interest Settings” area, along with specifying an ROI path which is local to the controller, will result in the scans being stored on the local hard drive or a remote machine with a mapped drive as opposed to remote storage.

See also:

Remote Storage	80
Region of Interest	76

Look Up Tables

A Look Up Table (LUT) is an ASCII (text) file that specifies how original or input gray values (0-255) are mapped to output gray values (0-255). The file contains 256 lines of paired integers separated by blanks or tabs. This file can contain optional comments, preceded by a '#' sign as the first character on a line. It is recommended that the name of a custom LUT end in '.lut' to aid in managing the files. The following is an example of a LUT file:

```
# log LUT
#
0      0
1      31
2      50
3      63
254    255
255    255
```

In the example, the first two lines are comments. The next 256 lines specify a mapping between input gray values such as 3, and the corresponding output gray value such as 63.

Because LUTs are tedious to create using a text editor, it is recommended that they be generated by spreadsheets or other software. vxscan does not include tools to produce custom LUTs.

vxscan allows a custom LUT to be associated with each band (monochrome, red, green, and blue). If the Current Scanner Settings in the vxscan Main Window are set to **Monochrome** and **Custom LUT** is selected, then a file selection window is displayed. This allows you to specify the name of the custom monochrome LUT. If the Current Scanner Settings are set to **Color**, you are prompted to enter Custom LUTs for red, green, and blue. These LUTs may be the same or different for each color (Figure 27).

After selecting the name (or names) of the LUTs, the display on the image monitor and histogram will reflect the application of the LUT(s) to the image. Use of the LUT(s) may be disabled/enabled by toggling between **Default LUT** and **Custom LUT**. The LUT(s) may be applied to the ROI by clicking **Apply to ROI**.

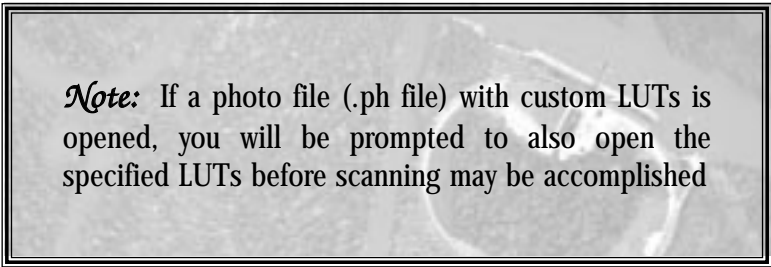


Custom Green LUT Window
(Figure 27)

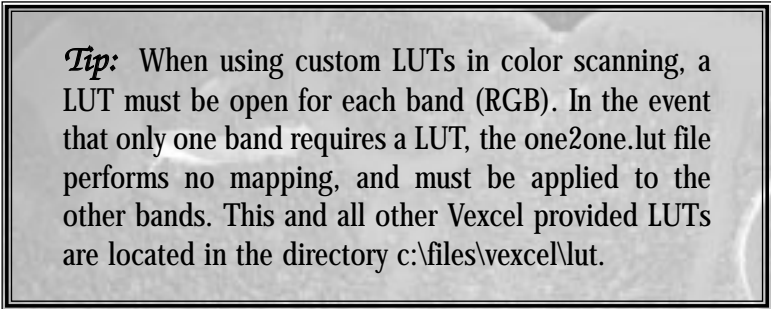
Because custom LUTs are files, they can also be managed under 'File' on the menu bar. By selecting on the menu bar 'File' → 'Open' → 'LUT' → 'Monochrome,Red,Green,Blue', you can load a LUT for each color channel. If a LUT has already been loaded for a given channel, it can be closed and replaced. Selecting 'File' → 'Close' → 'LUT' → 'Monochrome, Red, Green, Blue' on the menu bar removes the association between a LUT and a color channel.

See also:

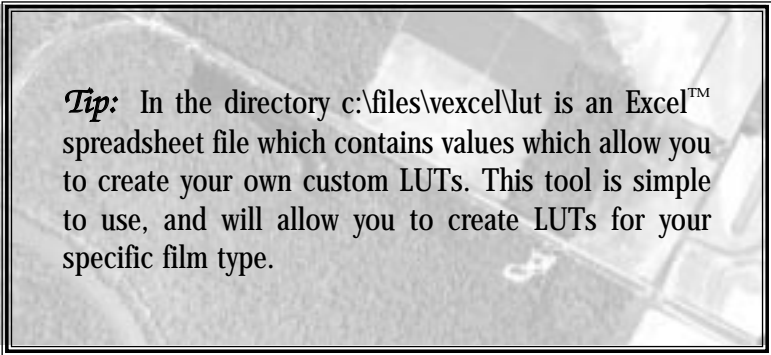
Open, Custom LUT	91
Look Up Tables	108



Note: If a photo file (.ph file) with custom LUTs is opened, you will be prompted to also open the specified LUTs before scanning may be accomplished



Tip: When using custom LUTs in color scanning, a LUT must be open for each band (RGB). In the event that only one band requires a LUT, the one2one.lut file performs no mapping, and must be applied to the other bands. This and all other Vexcel provided LUTs are located in the directory c:\files\vexcel\lut.



Tip: In the directory c:\files\vexcel\lut is an Excel™ spreadsheet file which contains values which allow you to create your own custom LUTs. This tool is simple to use, and will allow you to create LUTs for your specific film type.

LUTs

See also:

Look Up Tables66, 108

Metric

Option for unit of measurement under “Units:” in the Preferences Window under ‘Options’ on the menu bar. Resolution will be displayed in um/pixel and ROI dimensions will be displayed in millimeters (mm).

See also:

Units84

Main Window

The vxscan graphical user interface (GUI) will come up when vxscan is started. The interface, which will be used for setting up and performing scans, consists of three main sections:

Menu Bar - Contains commands for file manipulation, preference setting, ROI manipulation, and system cleaning,

Current Region of Interest Settings - Displays information regarding ROIs

Current Scanner Settings - Displays information about the image as seen on the image monitor, as well as the placement of the ROIs.

See also:

Current Region of
Interest Settings 113
Current Scanner Settings 104
Menu Bar90

Manually Changing ROI Dimensions

In the center of the Main Window you will see two beige input fields, labeled “Width:” and “Height:”. Change the value in each field to your desired dimensions and press <Enter>. It may now become necessary to reposition the rectangle.

To place the ROI exactly where you want it, first, repeat the steps listed above. Then, use the left mouse button to select from the menu bar ‘Edit’ → ‘Delete Rectangle’ (**NOT** ‘Delete ROI’). This will make the red box in the backplane representation disappear, and your mouse pointer will now appear as an inverted “L” when it is within the backplane representation (but will still appear as a cross in the camera field of view). On the menu bar, select ‘Options’ → ‘Set Preferences’. Within the Preferences Window (Figure 28), in the section “Auto Calculate Dimension:” select “Size in Pixels” (it may already be selected by default).



Preferences Window
(Figure 28)

Click **OK** to close this window. Now move the pointer into the camera field of view, move the cross that you see on the image monitor to the upper left of the region which you wish to scan, then press the left mouse button to “drop” your region of interest rectangle. The dimensions (relative to the backplane) of the red rectangle will be those you specified.

See also:

Auto Calculate Dimension35

MM

Millimeters. Unit of measurement used when “Metric” is selected under “Units:” in the Preferences Window under ‘Options’ on the menu bar. Resolution will be displayed in um/pixel.

See also:

Units 84

Mounting an Image

Opening the backlight box assembly

To do this, lightly grasp the top edge of the backplane, which is directly attached to the backlight box assembly, and push it away from you (VX4000 systems with the AFD also have software switches to allow automatic opening and closing. Use of these are described in the manual supplied with the AFD). Set the image between the backplane and the front plate of glass, what we refer to as the reseau plate. Be sure to place the emulsion side of the image towards the reseau plate (and therefore, towards the camera), as even the ~115um thickness of the film could affect focus and geometry if the film is placed incorrectly.

Emulsion testing

The emulsion side of film is often apparent as the “dull” side of the image, as opposed to the “shiny” side. If you are unable to see a dull side, you may perform a scratch test in an inconspicuous corner of the undeveloped portion of the image. The emulsion should be easily scratched by a pocketknife or other sharp object.

Closing the backplane

Once the imagery has been properly placed, close the backplane slowly so as to not “slam” the glass plates together. The backplane is supported internally with springs, so it should clamp the image snugly between the glass plates. (It is recommended, however, that you confirm tight closure by grasping either side of the backplane and lightly pulling it forward if properly closed, forward motion should be so slight as to be imperceptible).

Note: Do not confirm closure by grasping unevenly on the top edge as this could result in the lower portion of the backplane pulling away from the reseau plate. This can lead to the possibility of bad focus and projection errors.

Proper scanning attire

It is recommended that you use cotton gloves when handling imagery, not only to keep finger prints off of your film, but to also keep them off the scanner's glass surfaces. Also, it is extremely important that you remove jewelry with diamonds (rings, watches, bracelets) any time you may come in contact with the scanner's glass surfaces, whether you are just mounting images or cleaning the scanner. Scratches resulting from such contact could be detrimental to the quality of your scans, and could also result in intermittent scanner failure.

See also:

Clean 100

Non Template

This option on the Acquire Points Window specifies that the .ph file to which you save the points you digitize will not be a template .ph file for use with Frame Relative ROIs.

See also:

Acquire Points 31

Frame Relative ROI 53

Photo

'Photo' will be presented as an option when either 'Open', 'Close', or 'Save' is selected under 'File' on the menu bar. If selected under 'Open', 'Photo' will present you with a File Selection Window from which you will choose a Photo File to open. If selected under either 'Close' or 'Save', the currently opened and active photo file will be affected appropriately.

Photo is also the text field which displays the name of the currently open and active .ph file. This field is found in the “Current Region of Interest Settings” area of the Main Window.

See also:

Close, Photo	92
Selection Window	11
Open, Photo	91
Save	93

Photo File (.ph file)

A Photo File is a text file in which the settings for a scan may be saved for future use. Photo files will contain all information regarding placement of ROIs, the radiometry of the ROIs, the scan resolution, and the locations of any point digitized with Acquire Points. The ability to save photo files allows the user to save commonly used settings, which will allow future scans to be set up faster. To illustrate, if a user commonly scans two 9”x9” (230mm.x230mm.) color negatives, a photo file may be saved with the two ROIs already set as negatives and with approximate radiometric values. Therefore, when two color negatives are next scanned again, the photo file previously saved may be opened for the new scan.

See also:

Close, Photo	92
Default Photo File	48
New	91
Save	93
Save As	94

Tip: Save the most commonly used scanning parameters in the default.ph file. This file is loaded when the scanner first opens.

Note: When multiple .ph files are open, only the .ph file associated with the current ROI (highlighted in the List of Regions) will be displayed

Pivot

This component of “Contrast” allows the user to select from which gray level the contrast will stretch. The actual amount of stretch is specified by the Slope Bar in the Histogram Window.

See also:

Contrast	46
Histogram	56
Slope	84

Pixels

“Pixels” is the dimension label for two input fields in the “Current Region of Interest Settings” area, indicating the width and height of an ROI in number of pixels. Depending upon your Auto Calculate Dimension, these dimensions may be manually alterable.

Pixels are also the smallest component of the scanned image. It is a square of uniform gray level represented by an 8-bit number.

See also:

Auto Calculate Dimension ... 35

Quick Point Model

The Quick Point Model provides a simpler method of repositioning points when a template photo file is loaded. To use this feature, the following conditions must be met:

- The current photo file must be a template.
- The current photo must have at least one relative ROI.
- The current photo must have at least one previously digitized point which has not been digitized during the current session.

Activating Quick Point

There are two ways to access the Quick Point Model. From the menu bar, select 'Edit' → 'Quick Point'. A Hot Key has also been created for this function. Pressing **ctrl k** on the right side of the keyboard will also activate Quick Point.

Once Quick Point has been activated (by either method) the Quick Point Pop-up window appears.



Quick Point popup Window
(Figure 29)

This window informs the user that the Quick Point Model has been activated.

Using Quick Point

Quick Point works in a similar manner as Repositioning the ROI described in the Frame Relative ROI Section (pg 53- 54), however it requires fewer steps.

- 1** Activate Quick Point
- 2** Open a .ph file which contains a relative ROI template.
- 3** Digitize the upper left fiducial. The ROI will automatically be repositioned. It is not necessary to open the Acquire Points Window or to click on **OK**.
- 4** Additional points can be digitized if desired, however digitizing the upper left fiducial is generally considered sufficient.
- 5** Right click on the image in Liveview to verify that the ROI is positioned accurately.
- 6** Click on Cancel or press escape when there are no more points that need to be repositioned.

See also:

Relative ROI , , , , , , , , , 53

Acquire Points , , , , , , , , , 31

Radiometry

For VX4000 purposes, radiometry refers to the “Brightness” and “Contrast” settings, which would be manipulated to produce an ideal reproduction of an image.

See also:

Brightness 37

Contrast 46

Region of Interest (ROI)

Before a scan may be started, at least one region of interest must be specified. These regions indicate the area you wish to have scanned. Only the area you specify will be scanned, everything else in the Backplane will be excluded. Once scanned, these regions are stored in sub-directories that are created using the file name specified in the ROI input field. This subdirectory is where tiles, information files, and formatted images are stored. For example, if you specify c:\images\atlanta in the ROI text field, an image subdirectory called atlanta is created under the directory c:\images. c:\images must already exist and have write permissions. The scanned regions are given file extensions to specify the type of image file. In the above example, if **Tiff** was specified as the format type, the final image file atlanta.tif

will be present in the subdirectory c:\images\atlanta. vxscan uses the default ROI directory name, Untitled, until you supply one. If you decide not to supply an ROI file name and use the default name of Untitled, a directory called Untitled is created in your current working directory when you scan.

See also

ROI 116



The prompt_popup Window
(Figure 30)

Note: Images can become very large, and scanning in color requires three times the amount of disk space as a monochrome image, so select directories accordingly.

**DETAILS &
DEFINITIONS**

To name the current region of interest,

1. Click on the ROI input field to open the window where you will change the ROI name. Use the <Backspace> or <Delete> keys to delete any existing name such as "Untitled" that may already be in the input field.
2. Type an absolute path name (if different than the directory in which you are working) followed by the new directory name for the region of interest. The name appears in the List of Regions on the right when you click outside the input field or press <Enter>. vxscan checks to see if you have write permission for the given directory.

List of Regions

Within the “Current Region of Interest Settings” area, the list of regions displayed on the right are either ROIs that you have created or ROIs contained in an open photo file. If you have more than one photo file opened, all of the regions from all of the photo files are listed.

File Naming Conventions

Although you provide the photo file and ROI names, vxscan appends certain file extensions when storing the scanned images. Every scanned ROI is assigned a region header file using the extension .rh. Every raw tile is a file which has its tile number appended. For example, atlanta.nnmm.w, where

nn = tile number in x (across)
mm = tile number in y (down)
w = the color channel (monochrome in this example)

In the example above, a monochrome image has the extension .w appended. When you select color scanning, the three color bands - red, green, and blue - are stored in separate files as tiles. Color image tiles have the extensions .r, .g, and .b appended. When formatting is complete, these individual tiles will no longer be present, and only the final image file and its region header (.rh) file will be present in the ROI subdirectory.

For example, a monochrome scan in a BSF (band sequential file) format would have the following files:

atlanta.rh
atlanta.bsf.w

The following example is a color (RGB) scan in BSF format:

atlanta.rh
atlanta.bsf.r
atlanta.bsf.g
atlanta.bsf.b

If scanned in tiff format, the above example would produce the following files:

atlanta.rh
atlanta.tif

Manipulating ROI Dimensions

The dimensions of a ROI may be changed many different ways. First, you may enter an exact dimension within the width and height input fields. At least one field should be alterable, depending upon how you set up your Auto Calculate Dimension. When an ROI has only one constraint point in its upper left corner, its location in the backplane may be changed by “grabbing” the upper left ROI corner with the left mouse button, then relocating the ROI. Also depending upon the Auto Calculate Dimension, the ROI may be relocated despite the number of constraint points, or the dimensions of the ROI may be changed dynamically using “Rubberbanding”.

Typically, the simplest way to properly place an ROI is to place the upper left corner of the ROI where you would like the upper left corner of your scan to be, then use rubberbanding to drag the lower right corner of the ROI to the lower right corner of your desired scan area. This may be easier to accomplish at lower resolutions. Once the ROI has been placed you would need to switch back to your scanning resolution before adjusting the radiometry.

See also:

Auto Calculate Dimension ... 35
Backplane Representation .. 36
Rubberbanding82

Relative

This option would need to be selected when placing a Relative ROI for use with the Frame Relative ROI method. Relative ROIs may have their positions dynamically updated, as opposed to Absolute ROIs, which are static.

See also:

Frame Relative ROI 53

Remote Storage

Images may be stored on remote filesystems once formatting is complete. Click on the **Hosts** button in the “Current Region of Interest Settings” area and select the name of the remote filesystem host. Specify the path to that filesystem within the ROI input field.

See also:

Local	66
Region of Interest	76

Reposition

This option in the Acquire Points Window will allow for the dynamic repositioning of a Frame Relative ROI.

See also:

Frame Relative ROI	53
--------------------------	----

Reseau

The reseau is an extremely fine grid which is etched into the back side (away from the camera) of the forward piece of glass. It is etched at a depth of 0.75um, and is visible only when illuminated from the side by the reseau lamp, which is embedded in the Backplane assembly. The reseau is what allows the VX4000 to consistently maintain accuracies greater than 1/5 pixel. It is established as the focal plane (which is why it is important that the emulsion of an image be against the reseau), and is used as a reference during calibration.

See also:

Clean	99
Mounting an Image	71

Reset

Found on the bottom of the Histogram Window, clicking **Reset** returns the contrast values to 255 for the pivot point and .5 for the slope value.

Resolution

In its standard configuration, the VX4000 series of scanners support resolutions from 7.5um/pixel to 120um/pixel. The desired resolution may be specified manually by typing it in the “Resolution” input field (unless resolution is specified as your Auto Calculate Dimension), or a resolution slider bar may be opened by clicking **Resolution**.

See also:

Auto Calculate Dimension ..35

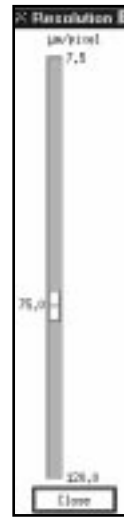
Changing Resolution using the Resolution Window

Using the left mouse button, click **Resolution** in the “Current Scanner Settings” area in the Main Window. The Resolution Window (Figure 31) with a slider bar will appear which allows you to use the mouse to change resolutions. When you change the resolution, you will hear the scanner adjust to the new settings. Once it has changed to the new resolution, you will notice that the dark blue box in the backplane representation has changed size. Also, if the image which you mounted is within the camera field of view, you should see a larger or smaller portion of that image, depending on whether you increased or decreased the resolution.

See also:

Moving the camera42

Camera Field of View105



Resolution
Window
(Figure 31)

DETAILS &
DEFINITIONS

Changing Resolution Manually

This is often the easier way to change to specific resolutions. Using the left mouse button, double click in the beige input field under “Resolution” in the “Current Scanner Settings” area. Once you have succeeded in highlighting the value in this field, type in the desired value (ie. “25”) and press <Enter>. You should hear the scanner as it changes resolution, and see the dark blue box in the backplane representation change sizes.

See also:

Camera Field of View	105
Resolution	81
Auto Calculate Dimension ...	35

Rubberbanding

This term is used to describe the action of dynamically resizing a region of interest when “Size in pixels” is selected as the Auto Calculate Dimension. When an ROI first appears, the top left corner should be the only one constrained. At that time, grabbing on or near that corner with the left mouse button will allow the position of the entire ROI to be changed. If any other corner is grabbed, the ROI may be resized as opposed to moved. When a corner is grabbed, a constraint point will be placed in that corner. Adjacent constraint points will restrict resizing in a dimension, whereas if constraint points are placed diagonally to each other, resizing is possible in both dimensions. This action of resizing by using the left mouse button is referred to as rubberbanding.

See also:

Release Point	96
Auto Calculate Dimension ...	35
Constraint Point	45
Manipulating ROI	
Dimensions	79

Note: If in Rubberband Mode, all points on the rectangle except for the upper left must be released before the rectangle can be removed without changing its size.

Shutter

This component of “Brightness” controls the amount of time which the CCD camera is exposed to the image. The range 0.000 to 0.999 represents time through the following equation:

$$t = s_{\min} + B^{\text{Exponent}} \times (s_{\max} - s_{\min})$$

where

s_{\min} = minimum shutter time VX4000.ini

s_{\max} = maximum shutter time VX4000.ini

Exponent = 4 Transmit.Cal

B = (0.000 - 0.999)

t = microseconds

See also:

Backlight 37

Brightness 37

Histogram 56

Size in mm/inches

Option for the Auto Calculate Dimension which will result in the “Pixels” input fields and the “Resolution” input field being manually alterable and the “mm/inches” input fields being automatically calculated. The most noticeable effect of this selection is that an ROI may have its location changed on the backplane representation, but it may not be dynamically resized using rubberbanding.

See also:

Auto Calculate Dimension ... 35

Rubberbanding 82

Size in pixels

Option for the Auto Calculate Dimension which will result in the “mm/inches” input fields and the “Resolution” input field being manually alterable, and the “Pixels” input fields being

automatically calculated. The most noticeable effect of this selection is that you may perform dynamic resizing using rubberbanding.

See also:

Auto Calculate Dimension ... 35
Rubberbanding 82

Slope

Component of “Contrast” which determines the amount of stretch from the Pivot to be performed.

See also:

Contrast 46
Histogram 56
Pivot 74

Template

A template is a .ph file which has been saved with a Relative ROI for use with the Frame Relative ROI method.

See also:

Frame Relative ROI 53
Save 93
Save As 94

Units

The “Units:” setting determines which units of measurement will be used, either English (size in inches, resolution in dots per inch) or metric (size in millimeters, resolution in $\mu\text{m}/\text{pixel}$). To select a type of unit, click on the toggle button next to the units you want.

See also:

English 50

Metric 69

Vexcel Imaging

Vexcel Imaging Corporation of Boulder, Colorado, produces of the following systems:

- VX3000:** High resolution, high accuracy image scanner.
- VX4000:** High resolution, high accuracy image scanner.
- AFD:** Allows unattended scanning with the above systems.
- IDAS:** Software package performing digital aerotriangulation.

Vexcel Imaging may be reached by phone at (303)440-9790, fax (303)440-9947.

See also:

- Automatic Film Drive 36
- IDAS 58
- VX3000 85
- VX4000 85

VX3000

Original Vexcel Imaging scanning platform. Supports scanning resolutions of 8.5um/pixel to 160um/pixel, and is controlled by a SCO UNIX PC controller networked for remote storage.

VX4000

Newest Vexcel Imaging scanning platform. Supports scanning resolutions of 7.5um/pixel to 120um/pixel, and is controlled by a Windows NT PC controller operating either stand-alone or networked.

vxformat

Software component of vxscan which formats images concurrently in the background as a scan is being performed. May be run manually from the command line as follows:

(Run from the destination directory, not ROI directory)

vxformat <ROI name> -fmt <format> -clean

See also:

Formats 51

vxscan

The actual scanning program, the execution of which will start the scanner and the Main Window.

.vxscanrc

This file, which is user alterable, contains the information used by vxscan to establish the initial state of the scanner. All values within the “Current Scanner Settings” area may be saved in a configuration which affords convenience for when the scanner is restarted.

See also:

Save 93

Width

The Width parameter is located in the “Current Region of Interest Settings” area and indicates the width of the active ROI in both mm/inches and pixels. Depending upon your settings in the Preferences Window, at least one of the input fields will allow manual changes to its values.

See also:

Auto Calculate Dimension ... 35

Units 84

CHAPTER FOUR

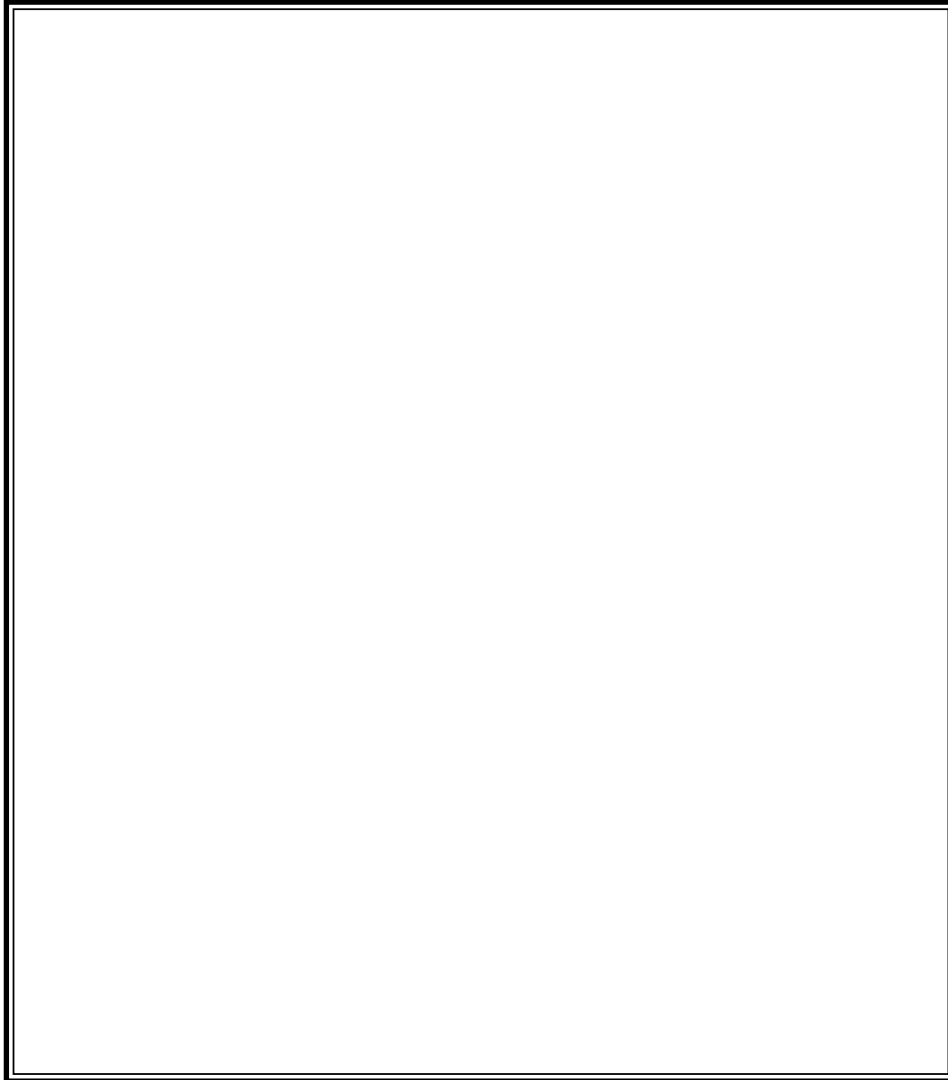


Black and white imagery compliments of Aerial Services, Incorporated, scanned on a VX3000Plus

USER INTERFACE

USER INTERFACE

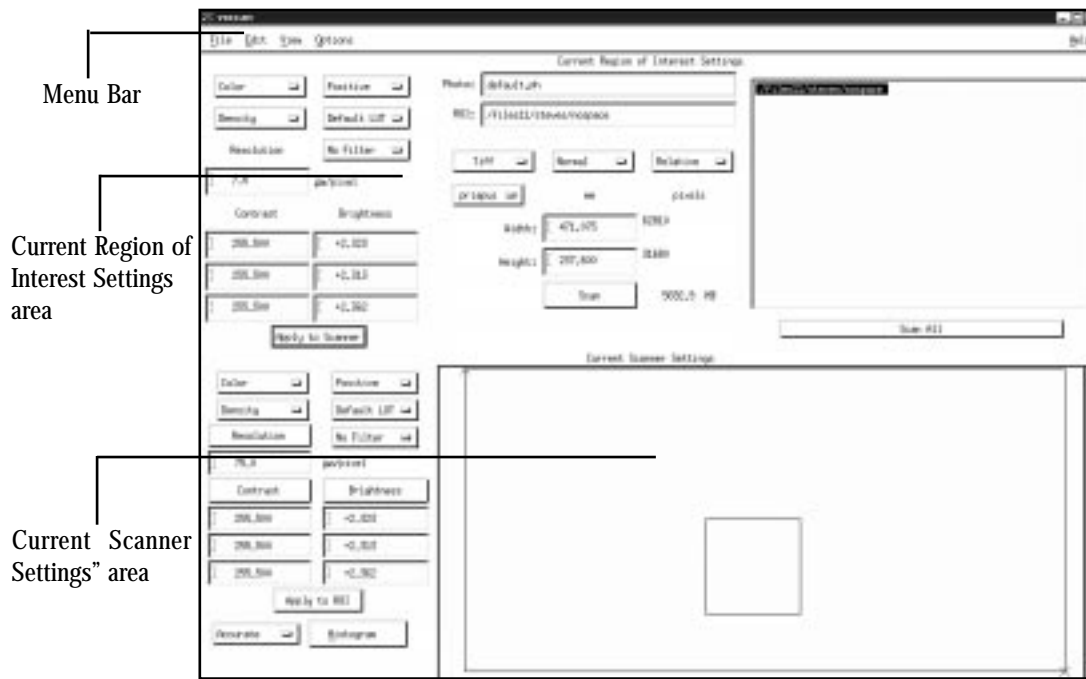
User's Notes

A large, empty rectangular box with a thin black border, intended for the user to write their notes.

The vxscan Main Window

When you start vxscan, the vxscan Main Window (Figure 32) appears as shown below.

The vxscan window has three major areas:



vxscan Main Window
(Figure 32)

Menu Bar

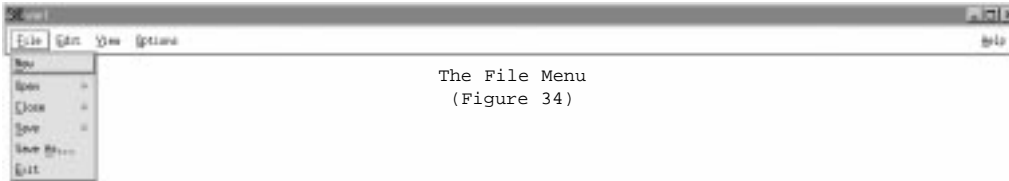
The menu bar (Figure 33) consists of the very top row of the Main Window. It has the following options; File, Edit, View, Options and Help.



The menu bar
(Figure 33)

- | | |
|---------|---|
| File | Open, close, save and create new photo files and exit vxscan. |
| Edit | Create and delete regions of interest (ROI's), control ROI rectangle constraints, specify photo information, access Quick Point, and digitize points of interest. |
| View | Display histogram and turn on the reseau light for cleaning the glass. |
| Options | Set preferences for units of measurement and determine which dimension will be automatically calculated. If equipped with Automated Film Drive, open the AFD Main Window, and open and close backplane. |

File Menu



The File Menu
(Figure 34)

The 'File' menu (Figure 34), located on the menu bar, contains the following options:

- New
- Open
- Close
- Save
- Save As
- Exit

These options allow you to create or alter .ph files, custom LUTs, and the initialization file, .vxscanrc. The 'File' menu also has the option of exiting from vxscan.

New

Selecting this option under 'File' on the menu bar will result in the opening of the default photo file with one ROI. The new photo file will be labeled "default" and will have one ROI. This ROI will be given the name and settings of the most recently created ROI.

Open

When you select 'Open' you have two choices:

Photo

Custom LUT

Photo

Selecting 'Photo' brings up the Open Photo Window (Figure 35) from which you can open a previously saved .ph file. When you select a .ph file, the scanning parameters for the first ROI stored in that file appear in the "Current Region of Interest Settings" area, and the name appears with additional ROIs from that .ph file in the regions list.

See also

Selection Window 11



Open Photo Window
(Figure 35)

Custom LUT

Selecting 'Custom LUT' allows you to choose a previously created custom look-up table (LUT) that will map the scanned image values to alternate values.

By selecting 'File' → 'Open' → 'Custom LUT' → 'Monochrome/Red/Green/Blue' from the menu bar, you can load a LUT for each color channel. If a LUT has already been loaded for a given channel, it will be closed and replaced. 'File' → 'Close' → 'Custom LUT' → 'Monochrome/Red/Green/Blue' removes the association between a LUT and a color channel.

See also
Look Up Tables 64

Close

When you select 'Close' you have two choices:

Photo
Custom LUT

Photo

If closing a .ph file, first save any changes you may wish to keep. If the last photo file on the interface is closed, the photo file Default.ph will automatically open.

If you choose 'Close' → 'Photo' and have made changes without saving, the following window will pop up (Figure 37):



vxscan Question Window
(Figure 37)



Custom Monochrome Window
(Figure 36)

- OK** Saves the file without the changes
- Cancel** Does not save the file and returns to the Main Window. From this point the user can choose 'Save' or 'Save As...' from 'File' on the Menu Bar.

Custom LUT

If closing a Custom LUT file, you will have to select which band to close. Options are monochrome, red, green, and blue.

See also

Photo File	73
Look Up Tables	66

Save

This option under 'File' on the menu bar presents two options:

- Photo**
- .vxscanrc.**

Photo

Selecting 'Photo' will result in the currently open and active Photo File being saved. You will be prompted to overwrite the existing photo file. (Figure 38).



vxscan Question Window
(Figure 38)

.vxscanrc

Selecting '.vxscanrc' will result in the scanner's initial start-up state being saved with the settings in the "Current Scanner Settings". The settings will be saved in the .vxscanrc file in your home directory and will be used as the initial setup settings next time vxscan is started.

See also:

File Menu	90
Photo	93
.vxscanrc	86, 93

Save As

This option under 'File' on the menu bar will allow a photo file to be saved under a name you specify. A File Selection Window (Figure 39) will appear, from which you may select an existing file to overwrite, or type in a new name.

See also:

File Menu	90
Selection Window	11

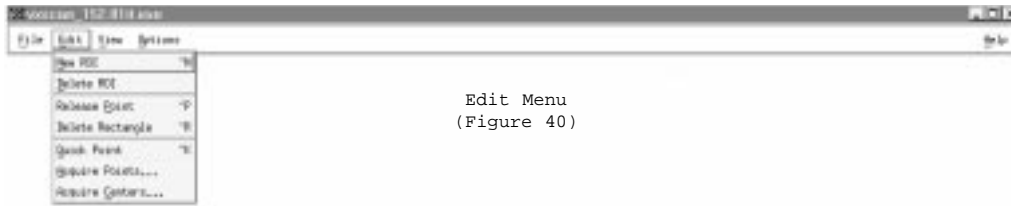


Save Photo As Window
(Figure 39)

Exit

'Exit' exits vxscan and its associated command window. A window may appear prompting you to save any changes you may have made to the .ph file. This option also shuts down the scanner. It is recommended that you always exit vxscan in this way. Exiting either via the X Window's window manager menu or other termination methods will prevent the scanner from properly moving its Axis to a "resting" state, and may cause failures in other applications running in the background.

Edit Menu



Edit Menu
(Figure 40)

This selection on the menu bar is used for manipulating ROIs and digitizing points of interest and contains the following options:

- New ROI
- Delete ROI
- Release Point
- Delete Rectangle
- Quick Point
- Acquire Points
- Acquire Centers

New ROI

Selecting this option under 'Edit' on the menu bar will result in the creation of a new ROI, which will have the same values as the most recently created ROI. The new ROI will be represented by an inverted "L" when the mouse pointer is in the backplane representation. To place your new ROI, move this pointer to the location where you desire the top left corner of the ROI to be, then press the left mouse button. The ROI rectangle will then appear. You must remember to change the name of the new ROI, even if you do not change any of its other settings. Failure to do so will result in the new ROI over writing the previous one in the event that both ROIs are scanned.

See also:

Region of Interest 76

Delete ROI

'Delete ROI' deletes the current ROI, including the name, any parameters you have set, and the ROI rectangle.

- 1 First make the ROI you wish to delete the current ROI by either highlighting the ROI name in the List of Regions or clicking on the rectangle in the backplane representation.
- 2 From the 'Edit' menu, select 'Delete ROI'.

Note: You cannot delete the last ROI in a photo, as each photo file must contain at least one ROI. If you attempt to do so, a new ROI will be created with the default parameter settings.

Release Point

This option releases the currently active point on the current ROI rectangle.

- 1 First make sure that the point you want to release is currently active. If not, click on the point to make it active. The current point is drawn in red, others are drawn in magenta.
- 2 From the 'Edit' menu, select 'Release Point'. The active point will then disappear, and the ROI will be constrained by only the remaining points.

Note: Releasing all points will result in effectively deleting the rectangle. Similar to Delete Rectangle, deleting the rectangle by releasing all points does not effect the ROI. The ROI may be replaced within the backplane representation just by placing the mouse pointer to the location you wish to “drop” the ROI, then clicking the left mouse button. The resulting ROI rectangle will retain all previous settings, and will appear with only one constraint point, on its top left corner.

Delete Rectangle

This option under ‘Edit’ on the menu bar will result in the removal of the active ROI from the backplane representation. The ROI’s parameters, however, will remain in the “Current Region of Interest Settings” area. The ROI may be replaced within the backplane representation just by placing the mouse pointer to the location you wish to “drop” the ROI, then clicking the left mouse button. The resulting ROI rectangle will retain all previous settings, and will appear with only one constraint point, on its top left corner.

- 1** Make sure the rectangle you want to delete is current. The current ROI rectangle is drawn in red, other rectangles are drawn in magenta.
- 2** From the ‘Edit’ menu, select ‘Delete Rectangle’.

See also:

Constraint Point	45
Edit Menu	95

Quick Point

'Quick Point' will bring up the Quick Point Pop-up Window (Figure 41) which will inform the user that this feature has been activated. When you desire to exit Quick Point, click on the cancel button displayed in the Pop-up Window.



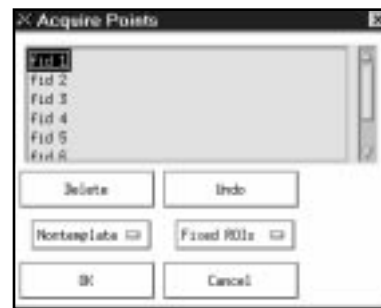
Quick Point Pop-up Window
(Figure 41)

Acquire Points

'Acquire Points' will bring up the Acquire Points Window (Figure 42) which is used to digitize points of interest (such as fiducials) on an image and save them along with the scanned image for post processing.

See also:

Acquire Points	31
Frame Relative ROI	53



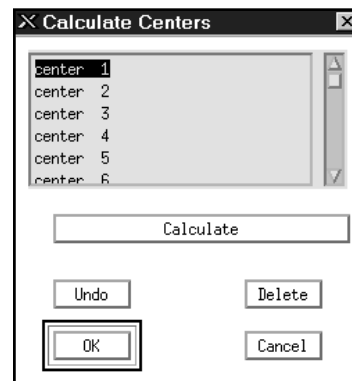
Acquire Point Window
(Figure 42)

Acquire Centers

This option is similar to Acquire Points but gives you much greater accuracy than hand digitized points. Acquire Centers calculates the center of each point to an accuracy of one-tenth of a pixel. Acquire Centers is used as part of the geometric accuracy test for the scanner and gives you confirmation that the scanner is working properly.

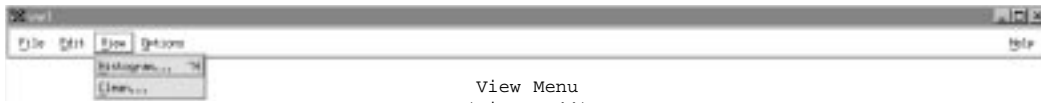
See also:

Acquire Points	31
Edit Menu	95



Calculate Centers Window
(Figure 43)

View Menu



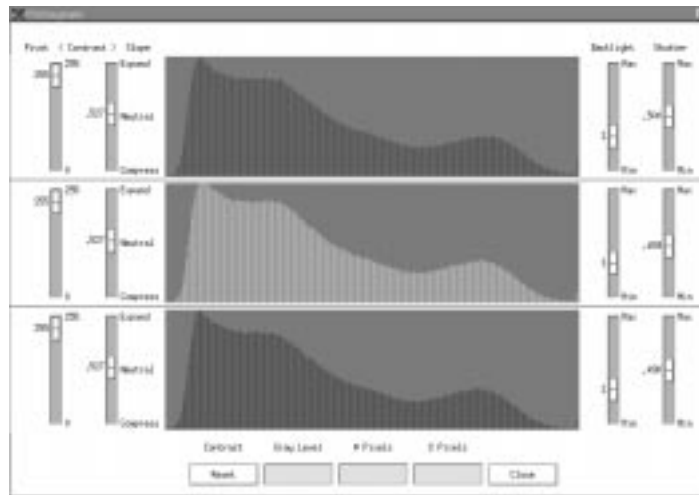
View Menu
(Figure 44)

The 'View' menu (Figure 44) contains the following options:

Histogram
Clean

Histogram

This option displays a single histogram for monochrome images and three histograms for color images, one each for red, green, and blue. The histogram can also be displayed by clicking on **Brightness**, **Contrast**, or **Histogram** in the "Current Scanning Settings" area.



Color Histogram Window
(Figure 45)

See also:

Brightness 37
Contrast 46

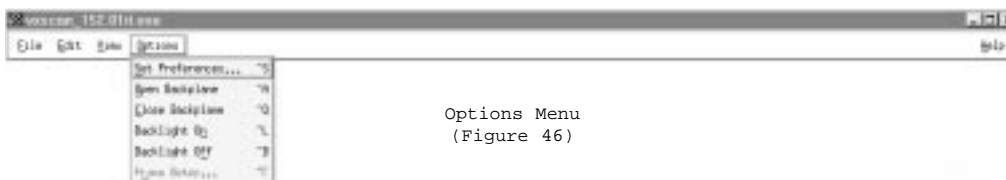
Clean

This function, located under the 'View' option on the menu bar, turns off the scanner backlight and turns on the reseau light for a fixed period of time to illuminate the glass for ease of cleaning. A message window will appear, prompting you to click **OK** when cleaning is complete.

Dirty glass, or obscured reseaus, can lead to scanning errors. The reseaus are etched into the back side of the glass at a width of 112u and depth of 0.75u. Therefore, it is very easy for fingerprints or other substances to prevent the reseau grid from being properly recognized.

For best results, use 70% isopropyl alcohol (not ethyl) applied to the glass surfaces with clean, non-abrasive and dust free wipes. clean first the reseau plane (back side of front glass), using first horizontal then vertical strokes, end to end. Then clean the front glass, and finally the backplane glass. After cleaning with the alcohol, clean with distilled water using technique outlined above.

Options Menu



Options Menu
(Figure 46)

The 'Options' menu (Figure 46) is used for setting system preferences that affect the way you set your scanning parameters and define your regions of interest. This menu offers options for the Interior Orientation Transform in addition to options for the Automated Film Drive (AFD) on VX4000 systems with AFD.

Set Preferences

Units

This option allows the user to select the preferred units of measurement, which are either Metric or English.

See Units 84

Auto Calculate Dimension

This option allows the user to select which variables will be used to define the dimensions of the ROI

See Auto Calculate Dimension . . 35



Preferences Window
(Figure 47)

Use Film Drive

This option must be selected in order to utilize an Automated Film Drive.

Enable Interior Orientation

This option must be selected in order to enable the Interior Orientation Transform. Once IOT has been enabled, Frame Setup will be a valid option under the “Options” menu. Please note that both “Use Film Drive” and ‘Enable Interior Orientation’ cannot be selected simultaneously.

See also

Interior Orientation61

Open Backplane/Close Backplane

This option allows the user to open/close the backlight assembly without having to do it manually.

Backlight on

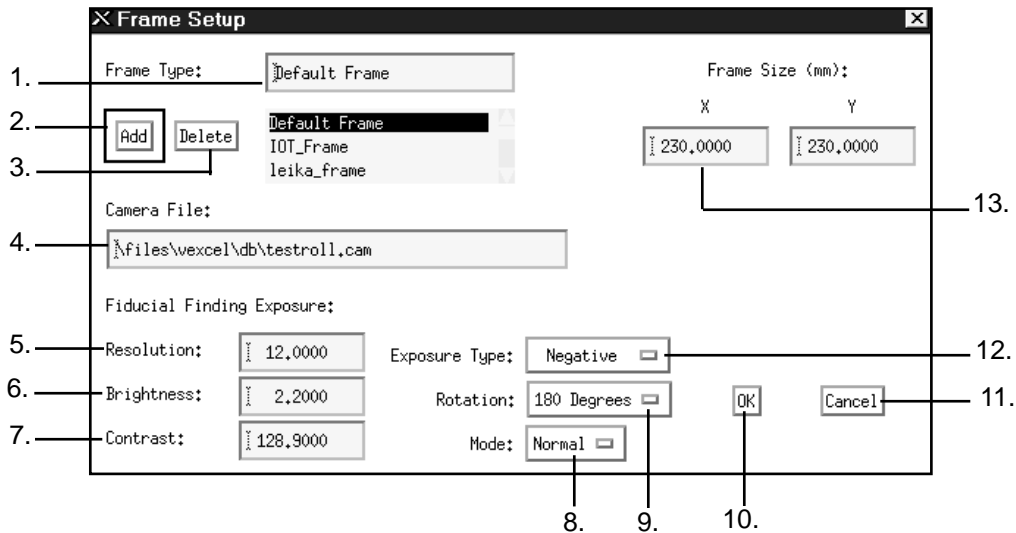
This option allows the user to keep the backlight on during procedures which would normally be performed with the light off.

Backlight off

This option allows the user to keep the backlight off during procedures which would normally be performed with the light on. It is also used to turn the light off if it was turned on using the previous option

The Frame Setup Window

Interior Orientation required the addition of the Frame Setup window.



The Frame Setup Window
(Figure 48)

1 Frame Type

The name of the frame type can be entered manually in this field or selected from the "Frame Type" text list directly below it.

2 Add

This button is used when creating a new frame type. A new frame type is created by typing a name in the “Frame Type” input field and clicking on **Add**. This will save all the settings in the Frame Parameters Window under that name.

3 Delete

This button deletes the frame type in the “Frame Type” input field and all of its settings.

4 Camera Database Input Field

The name of this file is entered manually by the user when fiducial accuracy is desired.

5 Resolution

Enter the resolution which the program should use when looking for fiducials

6 Brightness

Enter the brightness which the program should use when looking for fiducials

7 Contrast

Enter the contrast which the program should use when looking for fiducials

8 Mode

Enter the scanning mode - normal or mirrored

9 Rotation

Clicking on **Rotation** causes it to expand, giving you four choices: 0°, 90°, 180° and 270°. These values specify how the film will be mounted relative to the Camera Database File.

10 OK Button

Clicking on **OK** saves all current settings.

11 Cancel Button

Clicking on **Cancel** closes the Frame Setup Window without saving any changes.

12 Exposure Type

Clicking on this box expands the box giving you two choices. If the undeveloped film on a

roll is clear or light, then **Negative** is the appropriate setting. If the undeveloped film is solid, or dark, **Diapositive** should be chosen. This setting tells vxphotolist what type of edge to look for when scanning for edge positions in Edge of Film mode.

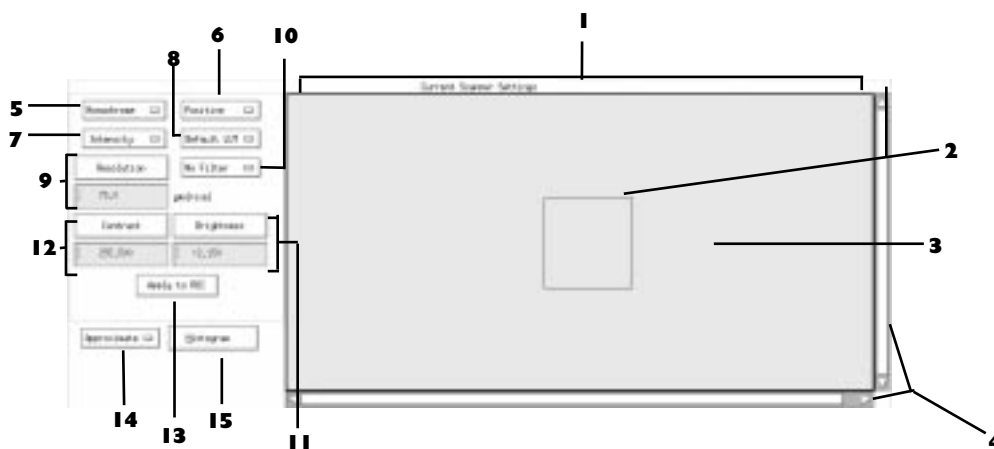
13 Frame Size (mm)

The X and Y measurements of the frame in millimeters.

Help

Selecting this option on the menu bar displays information regarding the vxscan release you are using.

Current Scanner Settings



"Current Scanner Settings" Area
(Figure 49)

This section constitutes the lower half of the Main Window and contains information regarding how the camera "sees" an image and, therefore, how you see it on the image monitor. The majority of this region is taken up by the backplane representation, which displays current camera and ROI locations. To the left of the backplane representation is a section which contains information pertaining to an image's setup, both radiometrically and geometrically. Any changes made here will have an immediate effect upon the displayed image.

It is within this region that you will make the changes necessary to bring out the best detail possible in your imagery. Once you are satisfied with the appearance of the image, these changes must be applied to the “Current Region of Interest Settings” area before they can be used for performing the scan.

See also:

Apply to ROI	111
Current Region of Interest Settings	113
Main Window	89

1 Backplane Representation

Within the “Current Scanner Settings” area, a backplane representation of the 20" by 10" backlit scanner surface is displayed in the lower right portion of the Main Window. This area is a visual representation of the scanner backplane, containing the camera field of view and rectangles defining ROIs. The image within the current camera field of view is visible on the image monitor. This backplane representation is where you move the camera to roam in X and Y, define the position of your region of interest, and digitize points of interest.

The backplane representation has three types of boxes, each with a different color:

- The camera field of view shown in dark blue
- The current Region of Interest shown in red
- All non-current ROIs shown in magenta

2 Camera Field of View

The dark blue box in the backplane representation represents the camera field of view. The camera field of view is that portion of the backplane currently visible to the camera and displayed on the image monitor. You may roam about the backplane by moving the cursor into the backplane representation and pressing and holding down the right mouse button as you move in the X and Y directions, dragging the camera field of view. Releasing the right mouse button will cause the image to be grabbed. By adjusting the resolution (which operates on the Z axis), you may also zoom in on a specific area. As the resolution setting is changed, the camera field of view will become respectively larger or smaller.

See also

Camera, Moving the camera 42

3 Rectangles

Rectangles represent the area of an ROI on the backplane. When red, they represent an active ROI, when magenta, they represent an inactive ROI. Typically, one of the first steps in defining your region of interest is to draw a rectangle around the area to be scanned.

See also:

ROI 76
Active ROI 33
Inactive ROI 58

4 Scroll Bars

Use the scroll bars on the right and lower edges to adjust the currently visible part of the backplane representation. To move vertically, click the up or down arrows on the right side. To move horizontally, click the left or right arrows at the bottom. You can also click and drag either bar.

The purpose of the scroll bars is to compensate for the difference in aspect ratios between the backplane representation and the scanner. If the aspect ratios were the same, the scroll bars would be full width and height and would not scroll. For ease of use, use the maximize option of X Windows to enlarge the window as much as possible rather than using the smaller default size.

5 Color Type (Monochrome/Color)

The **Color** setting specifies the type of image as either color (RGB) or monochrome. To scan a color image in monochrome, select **Monochrome** instead of **Color**. If you select **Monochrome**, one “Contrast” and one “Brightness” input field appear. If you select **Color**, three “Contrast” and “Brightness” input fields appear, one for each color band (RGB).

See also:

Color 43

6 Image Type (Positive/Negative)

Positive

This setting is to be used for scanning positive imagery.

Negative

Selecting this option will allow scanning of negative imagery. The view on the image monitor will be that of a positive, and the only discernible difference is that the histogram displayed for a negative will have its gray levels reversed, that is instead of the x-axis on the window representing gray levels from 0-255 left to right, they are instead represented from right to left. This should not affect how you set the histogram.

The other option presented by the **Negative** button is **Positive**.

See also:

Brightness 37
Contrast 46
Histogram 56
Positive 103

7 Intensity/Density

This button allows you to choose between scanning in Intensity or Density Mode. As a general rule of thumb, if you have very dark or detailed imagery, or wish to bring out more dark detail, scanning would be best performed in density mode.

See also:

Density 49
Intensity 59

8 Lookup Tables (LUTs)

This button allows you to choose between **Default LUT** and **Custom LUT**. A Lookup Table (LUT) is an ASCII (text) file that specifies how original or input gray values (0-255) are mapped to output gray values (0-255).

Default LUT

This option tells the system to not use any LUTs while performing the scan. If you wish to use LUTs, you must select **Custom LUT** and specify which LUT(s) you wish to apply.

Custom LUT

If selected, **Custom LUT** will result in your being prompted to load a LUT file for each color band present. For monochrome scanning, you will be prompted for one LUT, while color scanning will require that you open three LUTs. Vexcel Imaging provides several custom LUTs for use in the directory c:\files\vexcel\lut.



Custom Monochrome LUT Window
(Figure 50)

See also:

Look Up Tables66

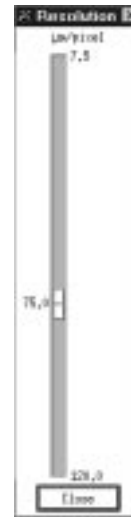
Tip: When using custom LUTs in color scanning, a LUT must be open for each band (RGB). In the event that only one band requires a LUT, the one2one.lut file performs no mapping, and must be applied to the other bands. This and all other Vexcel provided LUTs are located in the directory c:\files\vexcel\lut.

Tip: Also in the c:\files\vxcel\lut directory is an Excel spreadsheet file which contains values which allow you to create your own custom LUTs. This tool is simple to use, and will allow you to create LUTs for your specific film type.

9 Resolution

There are three ways to change the resolution:

- Click **Resolution** in the “Current Scanner Setting” area to display the Resolution Window (Figure 51). Drag the slider to adjust the resolution.
- Type the resolution value into the input field below the **Resolution** button in the “Current Scanner Settings” area.
- Type the resolution value into the input field below “Resolution” in the “Current Region of Interest Settings” area. If you wish this change to affect the Current Scanner Settings, then you must click **Apply to Scanner**.



Resolution Window
(Figure 51)

10 Filters

The VX4000 comes with 4 filter options, **No Filter**, **Low**, **Medium**, and **High**. These filters are 3x3 high pass convolution filters of varying strength. If you select a filter in the “Current Region of Interest Settings” area, you must click **Apply to Scanner** for the change to have an effect on the Current Scanner Settings.

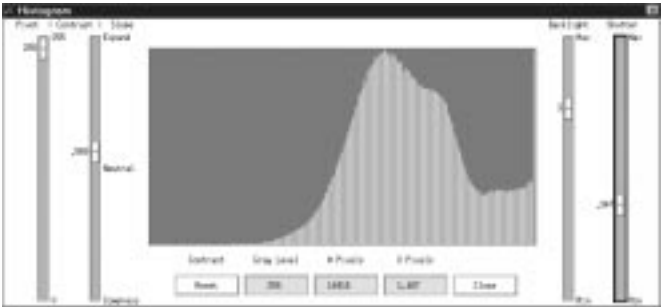
Tip: When using a filter, select the filter before adjusting the brightness and contrast, as filters will affect the radiometry of your scan.

11 Brightness

Clicking **Brightness** will bring up the Histogram Window (Figure 52) in which brightness and contrast for the ROI can be adjusted. The brightness adjustment effectively shifts the entire histogram either to the right (brighter) or to the left (dimmer), without having much effect on the range of the gray levels used. To adjust brightness, move the camera field of view to the brightest parts of the image and look at the histogram. Using the slide bars on the right side of the Histogram Window, adjust the histogram until there are just a few pixels at 255.

The value for brightness can also be entered manually in the input field just below the **Brightness** button. As the number in this input field is increased, the intensity of the light from the scanner increases.

When setting Brightness for an image, be sure to use the resolution you will use at scanning time.



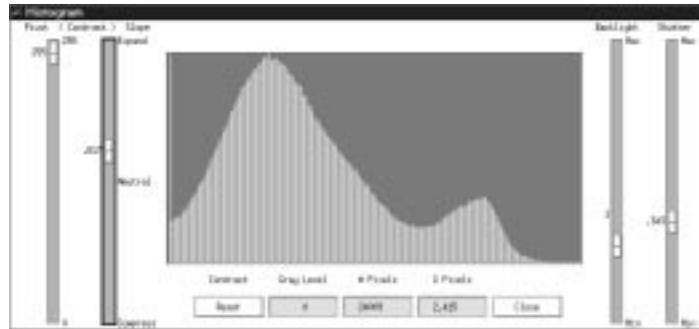
Histogram Window
(Figure 52)

See also:
Brightness 37

12 Contrast

Clicking **Contrast** will bring up the Histogram Window (Figure 53). The “Contrast” control can be thought of as the “stretch” factor. Contrast is always set after the brightness has been properly adjusted. To adjust contrast, move the camera field of view to the darkest parts of the image and look at the histogram. Using the slide bars on the left side of the Histogram Window, adjust the histogram until there are just a few pixels at 0.

The value for contrast can also be entered manually in the input field just below the Contrast button. The numbers to the right of the decimal determine the amount of stretch (.999 for the most, .501 for the least) or contraction (.001 for the most, .499 for the least) that will be applied to the histogram. The numbers to



Histogram Window
(Figure 53)

the left of the decimal determine where on the histogram the pivot point will be located. It is from the pivot point that the histogram will be stretched or contracted.

When setting Contrast for an image, be sure to use the resolution you will use at scanning time.

See also:

Contrast	46
Pivot	74

13 Apply to ROI

Selecting this function will result in the settings within the “Current Scanner Settings” area being applied to the “Current Region of Interest Settings” area. Once you have set up an image in the “Current Scanner Settings” area, you would need to apply these settings to the

“Current Region of Interest Settings” area if you wish your scan to be performed with those settings.

See also:

Apply to Scanner	114
Current Scanner Settings	104

14 Accurate/Approximate

vxscan operates in two modes, Accurate and Approximate. Accurate Mode uses the reseau grid to determine the camera position, while Approximate Mode does not. For this reason, use Approximate Mode while roaming and zooming for faster movement as you preview an image, and use Accurate Mode to precisely position your ROI rectangles relative to the film.

See also:

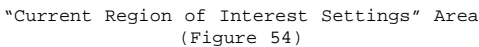
Accurate	29
Approximate	34

15 Histogram

Clicking on the **Histogram** button opens the Histogram Window. This window may also be opened from the **Contrast** and **Brightness** buttons or by selecting ‘View’ → ‘Histogram’ on the menu bar.

See also:

Brightness	37
Contrast	46
Histogram	56



USER INTERFACE

Apply to Scanner	114
Current Scanner Settings	104
Main Window	69

1 Apply to Scanner

This button applies all of the settings in functions numbers 9 & 12 within the “Current Region of Interest Settings” area to the corresponding Current Scanner Settings areas. Changes you make to the Current Region of Interest Settings are not automatically used by the Current Scanner Settings when you preview the image. You must click Apply to Scanner to apply those settings to the Current Scanner Settings in order to preview the changes on the image monitor.

See also:

Apply to ROI 111
Current Region of Interest Settings 113

2 Photo

A photo file name may be assigned to each photo that is mounted for scanning. Within each Photo file, one or many regions of interest (ROIs) may be defined, each with a specific ROI file name. In addition, multiple photo files may be viewed and used at one time. Each photo file has a name with a .ph extension. New .ph files may be named anything you want, as long as they follow NT naming conventions and have a .ph extension. Photo files do not need to be saved in order to scan an image, but you must save photo files if you wish to preserve the scanning parameters and any digitized points.

When you open an existing photo file, all of the regions of interest for that photo file are displayed in the list of regions on the right-hand side of the Current Region of Interest area. The name of the current photo file is displayed in the photo description field and the name of the currently selected region of interest is displayed in the ROI field. You may open as many photo files as you want, each with varying numbers of ROIs.

See also:

Photo File 73

Tip: When naming photo files, it is often convenient to assign a name which pertains to the job you are performing. This would include, for example, customer names, location names, or if you wish to be more specific, flight line or frame numbers (if applicable). Remember to always designate your photo file with a .ph extension.

Note: Images can become very large, and scanning in color requires three times the amount of disk space as a monochrome image, so select directories accordingly.

3 ROI:

Scanned regions are stored in sub-directories that are created using the file name specified in the ROI text field. This sub-directory is where tiles, information files, and formatted images are stored. For example, if you specify `c:\images\atlanta` in the ROI text field, an image sub-directory called *atlanta* is created under the directory `c:\images`. `c:\images` must already exist and have write permissions. The scanned regions are given file extensions to specify the type of image file. In the above example, if **Tiff** was selected as the format type, the final image file *atlanta.tif* will be present in the sub-directory `c:\images\atlanta`. See File Naming Conventions for the extensions that vxscan assigns. vxscan uses the default ROI directory name, *Untitled*, until you supply one. If you decide not to supply an ROI file name and use the default name of *Untitled*, a directory called *Untitled* is created in your current working directory when you scan.

To name the current Region of Interest:

1. Click on the ROI input field to open the Prompt_popup Window (Figure 55) where you will change the ROI name. Use the <Backspace> or <Delete> keys to delete any existing name such as "Untitled" that may already be in the window.
2. Type an absolute path name (if different than the directory in which you are working) followed by the new directory name for the region of interest. The name appears in the list of regions on the right when you click outside the text field or press <Enter>. vxscan checks to see if you have write permission for the given directory.



Prompt_popup Window
(Figure 55)

See also:

Region of Interest.....	76
Region of Interest,	
File Naming Conventions.....	78

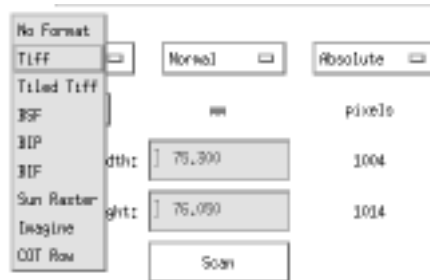
4 List of Regions

Located in the upper right side of the “Current Region of Interest Settings” area, this text field lists the names of all ROIs which are currently accessible. The active ROI will be highlighted.

5 Format

vxscan uses several settings in the “Current Region of Interest Settings” area to determine how the image will be processed and stored. Options are given for format type, whether the image is Mirrored or Normal, and whether the ROI is Relative or Absolute.

vxscan supports the following image formats: Native, BSF, BIP, BIF, TIFF, SunRaster, IIS, COT, tiled TIFF, and IMG. Here are brief explanations of each of the image formats.



Format Options Button
(Figure 56)

No Format

Option to keep the raw data tiles of a scan without formatting them together.

See also:

Formats, No Format..... 51

BIF

Binary Information File format.

See also:

Formats, BIF51

BIP

Band Interleaved by Pixel format.

See also:

Formats, BIP 51

BSF

Band Sequential File format.

See also:

Formats, BSF 51

COT Row

Intergraph proprietary format.

See also:

Formats, COT Row 52

Imagine

Erdas Imagine proprietary format (.img).

See also:

Formats, Imagine 53

SunRaster

Format files used primarily on Sun workstations.

See also:

Formats, SunRaster 52

TIFF

Tagged Interchange File Format.

See also:

Formats, TIFF 52

Tiled TIFF

Tiff files which are formatted in tiles of a size which may be user specified.

See also:

Formats, Tiled TIFF 52

6 Host

The host is the location on the network where the scanned image will be stored. The host can be on Unix, Windows95, or WindowsNT.

This button will give you a choice of Unix machines that have been mounted on the controller or **Local**. **Local** is chosen if you want the host to be a directory on a Windows95 or WindowsNT machine. To use local, the directory must first be mounted in the Control Panel on the controller.

See also:

System Configuration 8

7 Normal/Mirrored

Normal

This option will result in the final scan having the same orientation as the source image.

Mirrored

This option, which appears in the “Current Region of Interest Settings” area, will result in the final scan being a mirror image of the source photograph, as opposed to **Normal**, which will scan the image just as it appears in the backplane. You would select **Mirrored** if you had to mount an image backwards in order that the emulsion faces the reseau. If the writing on the image in the backplane is backwards, then chances are you should choose mirrored. This is often the case when scanning negative imagery.

8 Absolute/Relative

This feature has the effect of specifying the ROI which you have active as an absolute ROI. This means that the location of the region of interest is fixed and will not shift through automatic means by the use of Frame Relative ROI. The dimensions and location of the ROI may still be altered manually.

See also:

Frame Relative ROI	53
Relative	79

9 - 10 Region of Interest Size

The current region of interest's size is determined by three variables:

- Resolution (in micrometers per pixel or dots per inch)
- Physical size (height and width)
- Pixels

Changing any of these variables will affect the others. For example, if you change any one of the variables either by typing in values or by rubberbanding the ROI rectangle, the other values will change accordingly.

One of these three variables is calculated from the other two, and may not be specified dynamically. You can select which one of these variables vxscan will automatically calculate for you by setting the Auto Calculate Dimension in the vxscan Preferences Window. For

example, if you select “Resolution” for automatic calculation, you can alter the size of the region of interest in inches, millimeters or pixels. vxscan will then automatically calculate the resolution.

Resolution

In its standard configuration, the VX4000 supports resolutions from 7.5um/pixel to 120um/pixel. The desired resolution may be specified manually by typing it in the input field labeled “Resolution” (unless resolution is specified as your Auto Calculate Dimension), or a resolution slider bar may be opened by clicking **Resolution** in the “Current Scanning Settings” area.

Physical Size

The width and height of the scanned area are measured either in metric with millimeters or in English with inches, according to the units you select in the vxscan Preferences Window.

Pixels:

Pixels specifies the dimensions of the scan area in pixels.

See also:

Set Preferences 101

11 Image Size

After all settings have been made, vxscan shows the user the estimated size of the file from the resulting scan.

12 Resolution and Radiometric Controls

The resolution and radiometric controls are the same in the “Current Region of Interest Settings” area as they are in the “Current Scanner Settings” area with the following exceptions:

- There is no slider control window for adjusting resolution. Instead, you have only the option of entering a specific resolution value in the input field.
- Similarly, the Contrast and Brightness can only be adjusted by entering specific values in the input fields.

13 Scan

Once the radiometry, position, and other values of an ROI have been established, the actual scan may be performed by clicking **Scan**. Only the active ROI will be scanned, any other ROIs in the List of Regions will not be scanned. To scan every ROI, you must click **Scan All**.

14 Scan All

Clicking **Scan All** will result in all of the ROIs in the List of Regions being scanned. If you wished to scan one individual ROI, make that ROI active (by selecting it in the List of Regions) then click **Scan** as opposed to **Scan All**.

Summary of Default Settings for rtinfo.ini Flags

Flag:	Default Setting:	Effect of Non-Default Setting:
ReseauProcessing		
LongReseauDisplay:	F	All reseau grabs displayed on image monitor
ReportReseauBrightness:	F	Reseau point information reported to console
ViewReseauAccums:	F	Enables viewing of reseau grab process
ViewReseauGrabs:	F	Enables viewing of reseau grab process
ViewReseauPoints:	F	Points collected by reseau finder are viewed
ViewEnhancedReseaus:	F	Enables viewing of enhancement process
ViewReseauEnhanceKernels:	F	Reseau kernels printed to console window
SaveReseauGrabs:	F	Reseau grab images saved to disk as .tif file
SaveReseauPoints:	F	Reseau point images saved to disk as .raw file
SaveEnhancedReseaus:	F	Two enhanced reseaus saved to disk as .raw files
ApplySubPixelInterp:	F	No reason to change from default setting
ApplyWeighting:	F	No reason to change from default setting
ApplySubPixelCulling:	F	Collected points are culled
ApplyPointCulling:	F	Collected points culled if far from reseau
ApplyGammaLut:	F	Reseau image is mapped through an additional lut
LogReseauFailures:	F	All reseau points printed to a log file if RMS >1.0
CalcPixRMS:	F	Brute-force calculation of the RMS is performed
LoadReseauCal:	F	Reseau plate calibration file is loaded
CreateReseauCal:	F	A statistical summary of the RMS is created
UseReseauCal:	F	Reseau errors are calibrated with aide of statistics
ReportReseauCal:	F	No reason to change from default setting
CreateDistField:	F	A distortion field is created for the camera
ReportDistField:	F	An image will be written out of the distortion field
PerformSecondPass:	F	All reseau points culled based on found transform
TileReseaus:	F	Currently for use by Vexcel Imaging only
DontApplyResLut:	F	Reseau grabs are not run through reseau lut
ViewResLut:	F	Reseau LUT is printed to console window

LoadResLutEveryGrab:	F	Reseau LUT is loaded to software during scanning
DoOverwriteRad:	T	Currently for use by Vexcel Imaging only
UseOldReseauFinder:	T	The "old" reseau finder is utilized
LogReseauShutterVal: "ResRezShutter.log"	F	resolution and reseau shutter to
RadiometryProcessing		
DisplayRadGrab:	F	Radiometry grab is displayed during scanning
DontApplyBackModel:	F	Backmodel corrections not applied during scanning
LeaveBacklightOn	T	Leaves backlight on between photolist scans
LeaveCameraTriggering	F	Allows camera warm up by continuously triggering
DontApplyFalloff:	F	Falloff corrections not applied during scanning
DontApplyFlatField:	T	This flag is currently obsolete - always set to T
SaveBackModel:	F	Backmodel correction saved to disk as .raw file
SaveFalloff:	F	Falloff correction saved to disk as .raw file
SaveGrabbed:	F	Radiometry grab is saved to disk as 16 bit .raw file
SaveCorrected:	F	Radiometry grab is saved to disk as 8 bit .raw image
SaveBlurred:	F	Radiometry grab is saved to disk as 8 bit .raw image
SaveResampled:	F	Radiometry grab is saved to disk as 8 bit .raw image
SaveSharpened:	F	Radiometry grab is saved to disk as 8 bit .raw image
SaveFlatFieldDebug:	F	This flag is currently obsolete - always set to F
LogSingleFlatFieldLut:	F	This flag is currently obsolete - always set to F
LogMultiFlatFieldLut:	F	This flag is currently obsolete - always set to F
DontProcess:	F	Files are not radiometrically processed
BruteForceResample:	F	An exact resampling of the tile is performed
SingleSnapRawHisto:	F	A raw radiometric grab is displayed on the monitor

DCXInfo

ViewWrite:	F	Commands sent to DCX board are printed to console
ViewRead:	F	Responses from DCX board are printed to console

FormatterInfo

Tilting:	T	Tilting will not occur during formatting
Blending:	T	Blending will not occur during formatting
Cleaning:	T	Tile files and .rh file are not deleted
Output:	T	This flag is currently not in use - always set to T
Borders:	F	This flag is currently not in use - always set to F
RadStats:	F	Radiometric statistics are printed during formatting
GeoStats:	F	Projection error at each tile border is calculated
RemoteIODebugging:	F	Remote file I/O server prints debug info to console

AFDInfo

ViewWrite:	F	Commands sent to AFD controller printed to console
ViewRead:	F	Responses from AFD controller printed to console
LogEdgeFindingFailures:	T	Tile is saved and edge image is written to disk
UseSimpleWideFind	T	Takes a single grab during widefind

HardwareChecks

QuickHardwareChecks:	F	Quick hardware checks performed while scanning
CompleteHardwareChecks:	F	Complete hardware checks performed while scanning

VX4000.ini File

```
*****
* VX4000 Initialization File *
*****
```

Insert comments wherever you like...

; A leading semicolon ensures that nothing on the line gets processed,
but as long as your comments do not include a valid parameter name followed
directly by an equals sign, i.e.

ValidParameterName= random commentary text

they will not affect the interpretation of this file.

Extra lines are ok too...

Note, however, that valid parameter names must be followed directly by an
equals sign. Both of the following are valid:

ValidParameterName=parameter string
ValidParameterName= parameter string

; ----- Begin initialization data -----

```
;-----
[Common]
;-----
```

```
ScannerName=    vicxx_vxtyy
ScannerID=      0
ScannerType=    thor
AspectRatio=    1.000
FrameDepth=     8
CameraType=     PulnixTM1001
BoardType=      KCS
FrameGrabberType= ITI_CLU
```

```
;-----
[FrameDefinition]
;-----
```

```
; overlap for both x and y, acquisition and formatting
TileOverlap=    8
```

```
; minimum frame border around tile
SlopInMicrons=  200
SlopInPixels=   20
PositioningTolerance= 500
```

```

;-----
[ReseauManager]
;-----

TakesLutFile=\files\vxcel\cal\restake.lut
PointsLutFile=\files\vxcel\cal\respoint.lut
BadReseauLimit= 1

;-----
[ReseauKernel]
;-----

; maximum reseau kernel length is 128
LoPassLength= 16 16

LoPassValue= 1 1
LoPassDivisor= 4 4
HiPassDivisor= 5 5
KernLengthOffset= 6 6

; The double-line separation depends upon the master backplate.
; For 1701.80, use 109.6
; for 3505.20, use 92

; Double line sep for T1 plate
; DoubleLineSep= 94.4
DoubleLineSep= 109.6

Exponent= 6 6
Multiplier= 2 2
Scalar= 4000 4000
FullLength= 508000 254000
HalfLength= 221000 221000 221000 221000
Io= 100 100 100 100
Bias= 0 0
GammaLutFile=\files\vxcel\cal\resgamma.lut

PosSpaceScalar_White= 1.0 1.0
PosSpaceScalar_Red= 1.0 1.0
PosSpaceScalar_Green= 1.0 1.0
PosSpaceScalar_Blue= 1.0 1.0

;-----
[ReseauFinder]
;-----

ResOffset= 0.00 0.00
ResCellSize= 1701.8
Res2HorizonDeg= -2.5
Res2FrameTanHorz= 0.027
Res2FrameTanVert= 0.027

```

```

VR_MotorSpaceToReseau_Ang=      -2.5
RejectThreshold=      10
R2ICoeffs=      1 0 0 1

; 1 means do shift and add, 0 means do shift and multiply
DoShiftAndAdd=      0

; If "ResLutSource= formula", then the res lut formula paramaters below
; will be applied, otherwise, we assume that ResLutSource points to a text
; file which contains sequential entires for an 8 bit lut which will be
; applied to the non-clipped region (0-255) of the reseau grabs

;ResLutSource=      \files\vxcel\lut\8-bit-lin.txt
ResLutSource=      formula
; Settings for try 4
ResLutLinearStartX=      0
ResLutLinearEndXY=      5 5
ResLutExponent=      .25

; Settings with best results
;ResLutLinearStartX=      0
;ResLutLinearEndXY=      10 8
;ResLutExponent=      .20

;-----
[Radiometry]
;-----

BacklightCalFile=      \files\vxcel\cal\backlight
FalloffCalFile=      \files\vxcel\cal\falloff.cal
FlatfieldCalFile=      \files\vxcel\cal\flatfield.raw
DenseMapCalFile=      \files\vxcel\cal\densemap.cal

BacklightImageSizeX=      608
BacklightImageSizeY=      354
BacklightPositionOffsetX=      51250
BacklightPositionOffsetY=      51250
BacklightImagePixelSize=      1000.0
BacklightImagePixelAspectRatio=      1.00

MaxFlatFieldValue=      85
CameraGamma=      0.45

FalloffClippingFraction= .0001

;-----
[DeviceParams]
;-----

XYSettleTime=      50
;It only takes 9H = 575 us to set the shutter.
ShutterSetSettleTime=      1

```

```

; The length of time to settle the trigger is determined by the length of the
; shutter. If the shutter isn't done, when the ITI card snaps, then the ITI card
; will go ahead and wait the correct amount of time...
ShutterTriggerSettleTime=      10

ResLiteOnSettleTime=          10
ResLiteOffSettleTime=         10
BackLiteOnSettleTime=         50
BackLiteOffSettleTime=        50
BackLiteIntensitySettleTime=   10
FilterMoveSettleTime=         300

;The minimum shutter in 2H = 65*2 us. The smallest practical shutter is probably 500us
CamShutterLimits=             500      300000

BackLiteLimits=               0.5      1.0

WheelLimits=                   0      5000
ReseauShutter=                 105000
DefaultLiveViewShutter=        50000

;-----
[CalibrationFiles]
;-----

FilterWheel=                   \files\vxcel\cal\wheel.cal
Transmittance=                 \files\vxcel\cal\transmit.cal
VxAfdCal=                      \files\vxcel\cal\vx_afd.cal
ResRezName=                    \files\vxcel\cal\ResRez.ini

;-----
[LightBoardInitStrings]
;-----

NumEntries=                    16

r0=  ch1,ch2,ch3,ch4,ch5,ch6,ch7,ch8,cl9,clA,clB,clE,clF,cl10
r1=  ct1,ct2,ct3,ct4,ct5,ct6,ct7,ct8,ctB,ctE,ctF,ct10
r2=  cn10,cf10
r3=  cnE,cfE
r4=  cn5
r5=  ctA
r6=  cnA,cfA
r7=  ct9
r8=  cf1,cn2,cn3,cf4,cn5,cf6,cf7,cn8
r9=  cnF,cfF
r10= cn9,cf9
r11= cn9,cf9
r12= cn9,cf9
r13= cn9,cf9

```

```
r14= cn9,cf9
r15= cn9,cf9
;r16= cf1
;r17= cnB,cfB
```

```
;-----
[FilterWheel]
;-----
```

```
MotorParams=      wa200,5si28,5svFD,5saFE,wa200
HomingString=     wa200,5siD0,5mn,5fe,5si28,5fe,5dh0,wa200
```

```
;-----
[DcxBoard]
;-----
```

```
InitString=       hm
Checksum=         E121
ComPort=          COM2
```

```
;-----
[Formatting]
;-----
```

```
ImagineAuxDir=    \files\vexcel\auxiliary\imagine
TempCacheDir=     \temp
RamCacheMemory=   0
TileGroupMemory=  16
OutputTileSize=   512
TargetHosts=      kali priapus idas veximg VirtuoZo
```

```
LastUsedPort=     6187
FormatterName=     /usr/bin/rio_server
PortRange=         6000 6500
```

```
; number of different ports each rio server request should try
SocketSpawnAttempts= 3
```

```
; Number of times each client should request a connection
; with the server before failing
SocketConnectAttempts= 15
```

```
; Number of milliseconds the client should wait between connection attempts.
SocketSleepLength=  10
```

```
;-----
[AFD]
;-----
```

```
Enabled= F
ComPort= COM1
TempPhotoDir= \temp
```


.ah File

```

num_tags      int    1    52
roi_path      str    1    wu103L

roi_base      str    1    wu103L

format int     1     0
device int     1     0
offul_x int    1     0
offul_y int    1     0
ul_x  dbf     1  115754.937487
ul_y  dbf     1  15493.936169
ur_x  dbf     1  348579.937487
ur_y  dbf     1  15493.936169
ll_x  dbf     1  115754.937487
ll_y  dbf     1  243868.936169
lr_x  dbf     1  348579.937487
lr_y  dbf     1  243868.936169
sizpix_x      int    1    9313
sizpix_y      int    1    9135
resmp  dbf     1  25.000000
depth_w bool   1     0
depth_r bool   1     1
sat_r  dbf     1  2.451000
contrast_r dbf   1    255.558000
depth_g bool   1     1
sat_g  dbf     1  2.421000
contrast_g dbf   1    255.558000
depth_b bool   1     1
sat_b  dbf     1  2.519000
contrast_b dbf   1    255.567000
overlap int    1    20
filter int     1     0
point_num      int    1     8
ps_point_x     dbf     8  127839.231700  337554.771458  125831.878992  339557.418700  120850.210286  344533.073101  231644.493178
233752.968419
ps_point_y     dbf     8  236174.304348  22435.862695  24405.318663  234187.787080  130348.975518  128255.521074  17441.012504
241167.206059
cal_point_x    dbf     8  -105987.000000  106003.000000  -105994.000000  106012.000000  -111981.000000  111999.000000  4.000000
10.000000
cal_point_y    dbf     8  -106007.000000  105987.000000  105988.000000  -106007.000000  -10.000000  -10.000000  111980.000000 -
112002.000000
pix_point_x    dbf     8  483.371769  8871.993359  403.077660  8952.099249  203.810912  9151.125425  4635.582228
4719.921237
pix_point_y    dbf     8  8827.214727  277.677061  356.455300  8747.754036  4594.201574  4510.463396  77.883053
9026.930796
point_coef     dbf     8  0.873090  0.913180  0.923814  0.928650  0.834419  0.918450  0.828816  0.918471
point_name     str     8  fiducial1
fiducial2
fiducial3
fiducial4
fiducial5
fiducial6
fiducial7
fiducial8
fid_point_num  int     1     8

```

Appendix III

fid_point_list	int	8	1	2	3	4	5	6	7	8
dig_point_num	int	1	0							
acq_point_num	int	1	0							
edge_point_num	int	1	0							
ref_point_num	int	1	0							
cam_img_iot	dbl	6	4677.289353	39.947392	-0.376328	4551.921027	-0.373504	-39.955307		
img_cam_iot	dbl	6	-116.002766	0.025031	-0.000236	115.009717	-0.000234	-0.025026		
img_cam_iot_res_x	dbl	8	-0.002297	-0.001140	0.003479	-0.000366	0.003349	0.005894	-0.006827	-
0.002091										
img_cam_iot_res_y	dbl	8	0.004150	0.002305	-0.006837	-0.002832	0.001361	-0.000684	0.004037	-
0.001501										
img_cam_iot_res_xy	dbl	8	0.004743	0.002571	0.007671	0.002855	0.003615	0.005933	0.007932	
0.002574										
img_cam_iot_rms_x	dbl	1	0.003804							
img_cam_iot_rms_y	dbl	1	0.003503							
img_cam_iot_rms_xy	dbl	1	0.005171							