KOFAX

A DICOM GROUP COMPANY

VirtualReScan® 3.5

User's Manual

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Introduction

The *VRS User's Manual,* which gives instructions for using VirtualReScan (VRS), is intended for all potential scan operators. Whether you are an expert at image processing or have no special knowledge of scanning, this manual provides the information you need to make the best use of VRS features and functionality.

How this Guide is Organized

This manual consists of the following chapters and appendices:

Chapter 1 - **Overview** gives a general description of the VRS product and summarizes the standard features.

Chapter 2 - Operating VRS explains how to start, configure, and use VRS with your scan application. This chapter includes instructions on how to use the Kofax VRS scan interfaces, the VRS menu, the VRS Administration Utility, the VRS Interactive Properties dialog box, and the VRS Auto Resolve Manager dialog box. This chapter also describes how you can access optional features, such as endorsing support.

Appendix A - VRS Restore Default Values Utility describes the VRS Restore Default Values Utility, which is included in every VRS installation.

Appendix B - Long Paper Support explains how to configure VRS for long paper scanning with production class scanners.

Appendix C - VRS Non-Interactive Mode provides information on using the VRS Non-Interactive Mode, which is available only for Böwe Bell + Howell Spectrum series scanners.

Appendix D - Enhanced Bar Code Engine gives an overview of how to implement and use the Kofax Enhanced Bar Code engine.

How to Use This Guide

Appendix E - Patch Code Recognition covers VRS patch code support.

Appendix F - Advanced Color Processing explains how to use advanced color processing options that are available if your scanning application is set to color mode and you are using VRS with a Böwe Bell + Howell Spectrum II series scanner.

Related Documentation

The *VRS User's Manual* is just one piece in the VRS documentation set. Your VRS product package also includes related documentation, as outlined in this section.

VRS Installation Guide

The *VRS Installation Guide* includes instructions for installing and testing VRS. The manual is intended for system administrators who are responsible for installing the application and configuring VRS.

VRS Online Help

VRS online help provides online assistance with your application. You can access the online help by pressing F1 from any VRS dialog box.

VRS Quick Reference

The *VRS Quick Reference* contains screen shots, shortcuts, and basic user tips.

VRS Release Notes

Late-breaking product information is available from the release notes. You should read the release notes carefully, as they contain information that may not be available in the other VRS documentation.

Technical Support Information

For additional technical information about Kofax products, visit the Kofax Web site at www.kofax.com and select an appropriate option from the Support menu. The Kofax Support pages provide product-specific information, such as current revision levels, the latest drivers and software patches, online documentation and user manuals, updates to product release notes (if any), technical tips, and an extensive searchable knowledgebase. You can find VRS *FAQs* on the VRS Support pages.

The Kofax Web site also contains information that describes support options for Kofax products. Please review the site for details about the available support options. If you need to contact Kofax Technical Support, please have the following information available:

- VRS software version
- Scanning application
- Operating system
- Scanner make and model
- Scanner engine (board) type
- SCSI Scanner controller (if applicable)
- Special/custom configuration or integration information

Overview

Introduction

VirtualReScan (VRS) works with a wide range of scanning applications in a variety of settings—from single-user desktop systems to large-scale enterprise solutions. VRS is an extremely effective and versatile imaging tool that is easy to use for beginners and experts alike. VRS works hand-in-hand with your scan application. By giving you access to the VRS Interactive Interface and QC Modes, VRS gives you the ability to drive your image processing with true power. VRS keeps it simple, though. Basically, VRS can be used in three ways:

1 **Default Settings**—You can use VRS to scan documents and accurately capture data effortlessly using the default settings. These default settings have been carefully chosen to allow VRS to excel at a wide range of documents *without adjustments*.

2 **Automatic Image Enhancement**—VRS also monitors images, detecting poor image quality and performing automatic image enhancements that greatly reduce image quality and recognition errors with the assistance of user-created profiles. You determine the best settings for the documents you scan. VRS does the rest.

3 **Manual Image Enhancement**—For cases in which you want the ability to modify an image manually, VRS provides an interactive settings control that eliminates the guesswork with easy, real-time image correction.

Whether you choose to let VRS work completely on its own using its superior default settings, or make image adjustments yourself, you can be certain that every scanned image meets the highest standards.

Note VRS is equipped with context-sensitive help. Press F1 to view screen-specific information that helps you perform crucial tasks, without leaving the application.

Standard Features

VRS is designed to ensure that every scanned image meets your quality standards. While VRS products are designed to make high-volume scanning easier and more cost-effective, VRS provides the same advantages for low-volume scanners.

Key VRS features include the ability to scan batches that consist of multiple document sizes or varying degrees of quality, as well as the ability to automatically assign brightness settings that are optimal for your document type. It is not necessary to pre-sort mixed batches. During image optimization VRS suppresses any background or noise, which keeps image file sizes to a minimum. VRS detects paper jams and equipment conflicts. In addition to the time savings, post-processing accuracy is increased and storage requirements are reduced.

For batch scans in which Optical Character Recognition (OCR) precision is crucial, low-contrast documents traditionally pose significant problems. With VRS, you can enable "Auto-Brightness," and by selecting a high contrast value (greater than 50), process the batch with confidence, knowing that every low-contrast image will be adjusted automatically to the acceptable level of quality required for OCR.

Also critical for OCR is the VRS ability to perform an automatic deskew without character deformation. Traditional deskew software produces jagged edges, but with VRS, character edges remain smooth and precise even after deskew, as shown in Figure 1-1.
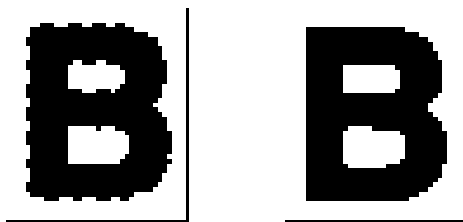
Figure 1-1. Traditional Deskew vs. VRS

In addition to contrast enhancement, brightness adjustment, and high quality deskew correction, VRS offers a range of other features to help you ensure the highest level of quality for every scanned image:

- Automatic image cropping or *Auto Crop* (available only on scanners that produce black borders)
- Despeckling
- Gamma correction

- Character smoothing
- Character dilation/erosion
- Accelerated scanning
- Advanced color processing (scanner dependent)

Certified Scan Applications

As part of the certification process, Kofax tests VRS compatibility with a wide range of scan applications. While the list of certified scan applications is updated on a regular basis, it is important to know that VRS is designed to work with *any application that is based on ImageControls, ISIS, or TWAIN.*

Certified vs. Non-Certified Scanners

When a scanner is certified for VRS, it goes through a rigorous testing process during which the best default settings are identified and selected. For this reason, we recommend that you use VRS only with certified scanners. You can use the product page on the Kofax Web site to view the list of VRS-certified scanners. In addition to listing the scanner name and manufacturer, the VRS product page includes the following information:

- Driver used for VRS 3.5 (TWAIN, ISIS, or Kofax SCSI)
- Black or white background (black borders are necessary for automatic cropping)
- Additional memory required for optimal performance (if applicable)
- Interface certified by VRS (SCSI, USB, or FireWire)

VRS is also capable of working with certain non-certified "compatible" scanners, provided that they have been configured with the Kofax Source Manager (KSM). It is important to be aware that you may experience less than optimal image quality when using a non-certified scanner with VRS.

Not every scanner can be used with VRS. To be configured as compatible with VRS, a non-certified scanner must meet the following requirements:

- Ability to output a 256-level grayscale image as a single image.
- Provide a TWAIN driver or an ISIS driver. While VRS works best with an ISIS driver, it also supports some scanners with TWAIN drivers.

Note For more information about using non-certified scanners with VRS, refer to "Configuring Non-Certified Scanners" in the *VRS Installation Guide.*

Operating VRS

Introduction

This chapter explains how to operate VRS using the default settings, how to set up custom profiles, and how to configure and use the manual image enhancement features.

Scanning with VRS Default Settings

With VRS, you can scan documents and accurately capture data in the shortest time possible using the default settings. These default settings have been carefully chosen to allow VRS to excel at a wide range of documents *without adjustments*. In order to take advantage of VRS, simply start VRS using the instructions below and scan.

Starting VRS

Once VRS is installed and you have opened your scan application, select VRS, as described in the following procedure.

▶ **To start VRS**

1 Power on your scanner and switch on your PC.

2 Start your scan application.

3 From the scan application, select a VRS scan source. The format for the dialog box used to select the VRS scan source and the name of the scan source will vary, according to your scan application (ImageControls-based, ISIS-based, or TWAIN-based). Generally, the name of the VRS scan source will follow one of these three formats:

- <*Your Scanner Model*> with VRS (ImageControls-based applications)
- Kofax VRS Scanner (ISIS-based applications)
- Kofax VRS – TWAIN (TWAIN-based applications)

Refer to Figure 2-1 through Figure 2-3 for examples.
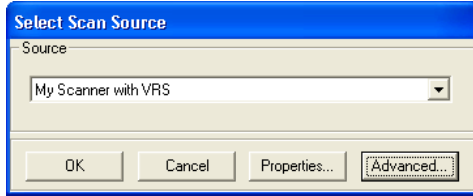
Figure 2-1. Select Scan Source Dialog Box (ImageControls-based application)
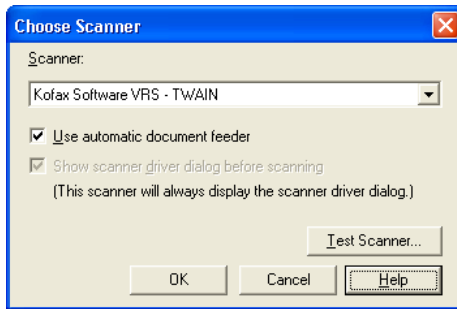
Figure 2-2. Select TWAIN Source Dialog Box (TWAIN-based application)
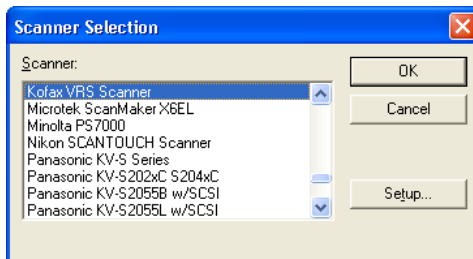
Figure 2-3. Scanner Selection Dialog Box (ISIS-based application)

4   Click the OK or Scan button, as applicable to your scan application.

5   For ImageControls-based applications, the VRS icon (Figure 2-4) will appear on your Windows taskbar. For ISIS and TWAIN applications that do not use the VRS ISIS or TWAIN interfaces, the VRS taskbar icon should appear after scanning starts. See *Kofax VRS Scan Interfaces* on page 8 for more information.

VRS Icon

Figure 2-4. VRS icon on Windows Taskbar

The scanner associated with the Kofax VRS ISIS or Kofax VRS TWAIN source is the default scanner. The default VRS scanner is set in three ways:

- When you select a scanner during the VRS installation process
- When you select a scanner as the default scanner from the Kofax Source Manager
- When you select a default scanner using the Restore Default Values (RDV) utility

Note For more information about the VRS installation process or the Kofax Source Manager, refer to the *VRS Installation Guide*. For information about the RDV utility, refer to *VRS Restore Default Values Utility* on page 75 of this manual.

6 Follow your scan application instructions and scan as usual.

Kofax VRS Scan Interfaces

Kofax VRS TWAIN Interface

The Kofax VRS TWAIN interface is designed to serve as a liaison between your TWAIN scan application and VRS. In most cases, the Kofax VRS TWAIN interface will automatically appear whenever you select the Kofax VRS TWAIN scanner source.

Figure 2-5. Kofax VRS TWAIN Interface

Some TWAIN applications may hide the Kofax VRS TWAIN interface and use their own interface instead. For several of these applications, the TWAIN interface includes a More button that typically gives you access to the VRS user interface.

You can use the Kofax VRS TWAIN interface to control scanner features made available via the TWAIN scanner driver. The Kofax VRS TWAIN interface is divided into two groups: the Profiles group and the General group.

You can use the Profiles group to create and manage configuration settings (scanner presets). You can use the list box to type in the name of a new profile which can then be saved, restored, or deleted using the Save, Restore, or Delete buttons. You can establish multiple profiles to accommodate different scanning situations. Although you can create an unlimited number of profiles, only seven profiles at a time will be visible in the Profiles window.

Note The profiles that you create from the Kofax VRS TWAIN interface are different from the profiles created from the Profile tab of the VRS Interactive Properties dialog box.

The General group consists of the following options:

- Source (Paper Source) – Select between the available input paper sources: Flatbed or ADF.
- Resolution (DPI) – Select an option for scan resolution or DPI (dots per inch).
- Color Mode – Select from the color modes supported by the scanner, which may include Black/White, Grayscale, or RGB (color).
- Paper Size – Select a paper size, such as Letter, A5, etc.
- Orientation – Select the paper orientation (portrait/landscape).
- Simplex/Duplex – Select single-sided or double-sided scanning.

A Preview check box, located in the lower left corner of the interface, allows you to not only view the image as it is being scanned, but also to make changes to the image in real time using the VRS Interactive Properties dialog box.

You can select the About button to view installation location and version information.

Figure 2-6. Kofax TWAIN Interface - About Dialog Box

▶ **To scan using the Kofax VRS TWAIN interface**

   1   Open your scan application.

   2   Select the Kofax VRS TWAIN scan source and click OK.
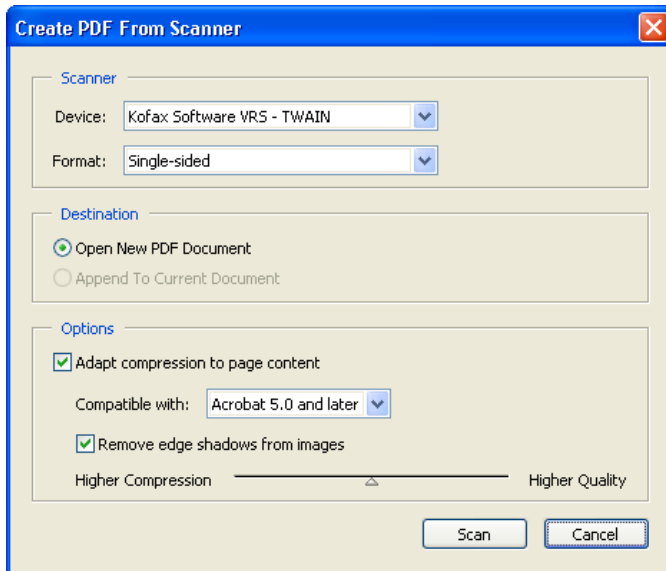
Figure 2-7. Kofax VRS TWAIN Interface – Select Source

3 The Kofax VRS TWAIN interface will launch. Make your selections from the General group, such as the Source, DPI, Color Mode, Paper Size, etc.

4 If desired, click Save to create a profile to save the settings for future use.

   a At the Save Profile dialog box, type a name for the profile.

   b Click OK. In the future, you can load a profile by selecting it and clicking the Restore button, or erase it by clicking the Delete button.
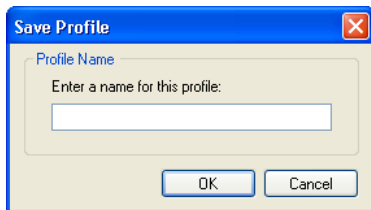
Figure 2-8. Kofax VRS TWAIN Interface - Save Profile Dialog Box

5 Click Scan to scan, or click Cancel to exit without making any changes.

Kofax VRS ISIS Interface

The Kofax VRS ISIS interface is designed to serve as a liaison between your ISIS scan application and VRS. In most cases, the Kofax VRS ISIS interface will automatically appear whenever you select the Kofax VRS scanner source.
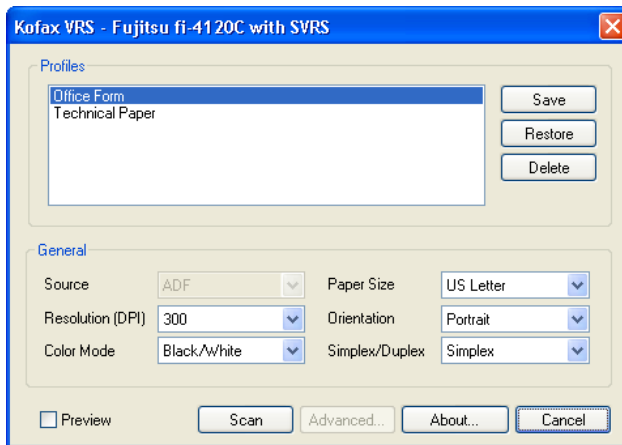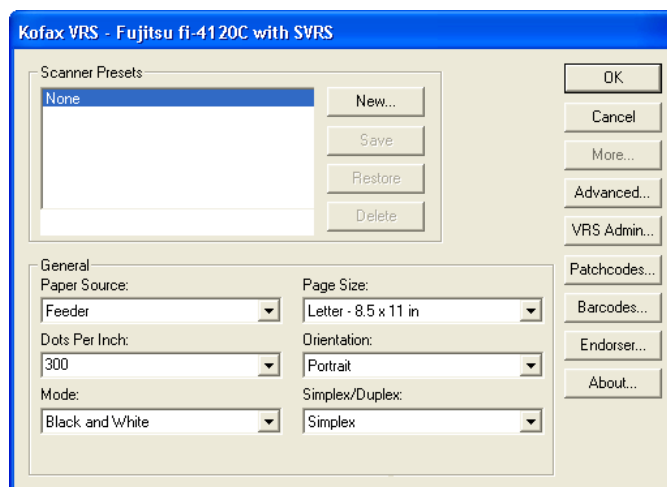

Figure 2-9. Kofax VRS ISIS Interface

Some ISIS applications hide the Kofax VRS ISIS interface and use their own interfaces instead.

You can use the Kofax VRS ISIS interface to control scanner features made available via the ISIS driver. The interface is divided into two groups: the Scanner Presets group and the General group.

You can use the Scanner Presets group to create and manage configuration settings (scanner presets). You type in the name of a new preset which can then be saved, restored, or deleted using the New, Save, Restore, or Delete buttons.

Note The Profiles (Scanner Presets) that you create on the Kofax VRS ISIS interface are different from the profiles created on the Profile tab of the VRS Interactive Properties dialog box.

The General group consists of the following options:

- Source (Paper Source) – Select between the available input paper sources: Flatbed or ADF.

- Resolution (DPI) – Select an option for scan resolution or DPI (dots per inch).
- Color Mode – Select from the color modes supported by the scanner, which may include Black/White, Grayscale, or RGB (color).
- Paper Size – Select a paper size, such as Letter, A5, etc.
- Orientation – Select the paper orientation (portrait/landscape).
- Simplex/Duplex – Select single-sided or double-sided scanning.

For situations in which you want to adjust image settings, you can access the VRS Interactive Properties dialog box by clicking on the Advanced button. An option to detect the page size being scanned is available by selecting Options | Special Features, and then selecting the Detect Page Length check box from the Advanced Settings dialog box.
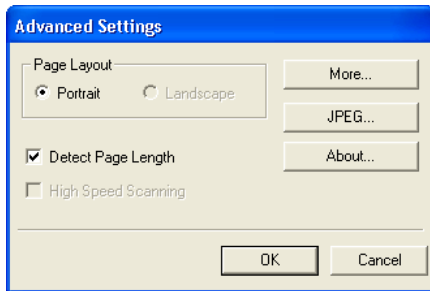
Figure 2-10. Kofax VRS ISIS Interface - Advanced Settings Dialog Box

And finally, you can select the About button to open the About dialog box where installation location and version information is listed.
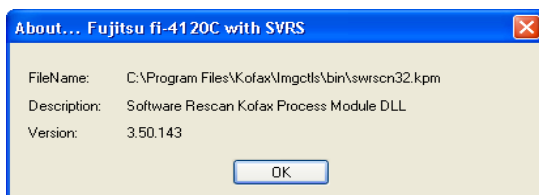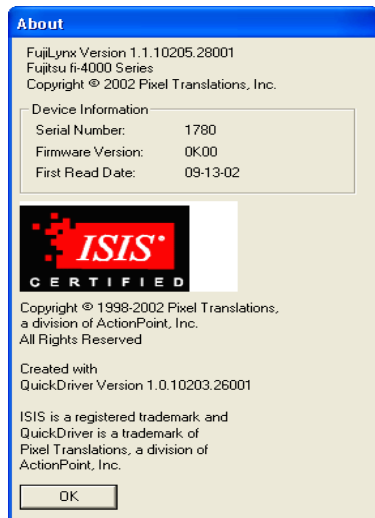
Figure 2-11. Kofax VRS ISIS Interface - About Dialog Box

▶ **To scan using the Kofax VRS ISIS interface**

    1   Open your scan application.

    2   Select the Kofax VRS Scanner source.
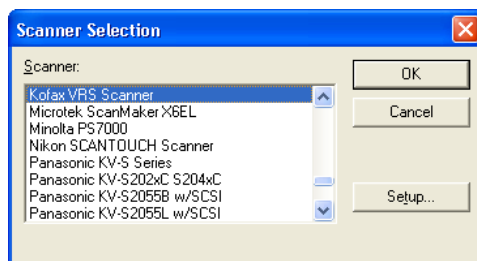
Figure 2-12. Kofax VRS ISIS Interface – Select Source Dialog Box

    3   The Kofax VRS ISIS interface will launch, as shown in Figure 2-9. Make your selections from within the General group, such as the Paper Source, DPI, Mode, Paper Size, etc.

    4   If desired, click New to create a profile to save the settings for future use.

        a   At the New Profile dialog box, type a name for the profile in the text box.

        b   Type the filename for the document into the text box.
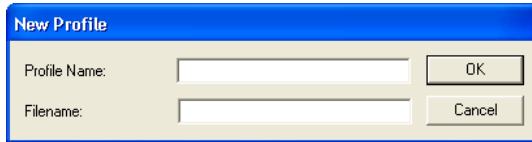
Figure 2-13. Kofax VRS ISIS Interface - New Profile Dialog Box

5   Click OK to close the Kofax VRS ISIS interface, or click Cancel to exit without making any changes. In the future, you can change a profile by changing the information in the General group, selecting it and clicking on the Save button. You may also load a profile by clicking on the Restore button, or erase it by clicking the Delete button.

Configuring VRS Before You Scan

VRS is designed so that, if desired, it can be customized to suit a particular kind of document or batch of documents. In addition, you can customize responses to scanner events (out of paper, cover open, etc.). You may want to adjust the VRS settings before you scan. This section gives an overview of the options that you can use to adjust VRS to suit your scanning preferences.

Using the VRS Taskbar Icon

The VRS taskbar icon, shown in Figure 2-14 is located in the Windows taskbar (the lower right corner of your Windows desktop). When you position your mouse cursor over the icon, the ToolTip text displays as "VirtualReScan."

Figure 2-14. VRS Taskbar Icon

Figure 2-15. VRS ToolTip

Right-click on the VRS taskbar icon to access a VRS menu where you can set your responses to potential errors and events (exception conditions) in the VRS Administration Utility, preview and update image properties, select or change a profile, or choose an operating (QC) mode.

When the VRS menu is enabled, it will appear as in Figure 2-16.
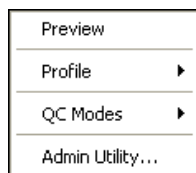
Figure 2-16. VRS Menu Enabled

The VRS menu is not available while scanning is in progress (even though the VRS taskbar icon is still visible). When the VRS menu is unavailable, it will appear as it does in Figure 2-17.

Preview	
Profile	▶
QC Modes	▶
Admin Utility…	
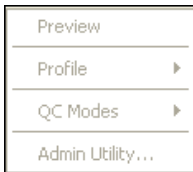
Figure 2-17. VRS Menu - Unavailable

▶ **To open the VRS menu**

    1   While scanning is not in progress, right-click on the VRS icon on the Windows taskbar.

    2   Select one of the four commands of the VRS menu:

- Preview
- Profile
- QC Modes
- Admin Utility

If you want to optimize VRS for a particular document type, begin by selecting the Preview command. For more information, refer to *Previewing Images* on page 30.

VRS Menu

This section explains each command that is available from the VRS menu.

Preview

Selecting Preview from the VRS menu opens the VRS Interactive Properties dialog box in Preview mode. Use this command to open a sample image that you can use to test image property settings.

Profile

Selecting Profile from the VRS menu displays a submenu that lists available profiles. A profile is a user-defined set of options for image processing. The Profile submenu indicates the currently loaded profile (also called the active profile) with a check mark. When you select a profile, the settings from the VRS Clarity tab, Noise tab, and

Skew tab are loaded from permanent storage into operational memory. The newly loaded profile becomes the active profile, which is indicated by a check mark on the tray menu. VRS remembers the active profile designation across sessions. For more information, refer to *Using the Profile Tab* on page 54.

Admin Utility

Selecting Admin Utility from the VRS menu opens the VRS Administration Utility dialog box, which is used to define exception condition parameters. For more information, refer to the *VRS Administration Utility* section on page 19.

QC Modes

Selecting QC Modes from the VRS menu displays a submenu of available QC Modes. The QC Modes control the conditions under which the VRS user interface opens for image inspection and interactive updates. The default QC Mode is On Errors. The default value of the Hardware Warnings setting is *on* (checked).

Once selected, a QC mode or the Hardware Warnings setting stays in effect until it is changed, even across scanning sessions. The currently selected QC Mode or Hardware Warnings setting is indicated by a check mark.

```
✔ On Errors
  First Page
  Every Page
  DISABLED

✔ Hardware Warnings
```
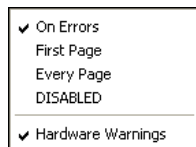
Figure 2-18. QC Modes Menu

By selecting the QC Modes command from the VRS menu, you can request that the VRS user interface display under the following conditions:

On Errors

VRS dialog boxes open only when exception conditions occur during the scanning process. This is the default setting after installation.

First Page

VRS dialog boxes open when you scan the first page of a batch and when exception conditions occur. This mode gives you the ability to set a VRS profile or enable a specific feature for all the documents in a batch. The first page in the batch is used as a sample image to adjust VRS settings.

Every Page

VRS dialog boxes open after each document scans, or with duplex scanning, after each document side scans. This mode can be used for extremely complex documents that require individual adjustments. This is an unusual condition because VRS has the ability to handle a wide range of document types without any adjustments.

Disabled

VRS dialog boxes remain out of view, even if exception conditions occur.

Hardware Warnings

You can use the Hardware Warnings option to specify how to respond to hardware conditions such as Paper Jam, Out of Paper, and Cover Open on a global scale. Selecting the Hardware Warnings option means that you are choosing to handle these errors exactly as defined by the Actions in the Administration Utility. When this option is not selected, it is the equivalent of choosing to Return Error (see the *Action Options* section on page 25 for a description) as your Action for all hardware error conditions in the Administration Utility.

Note If you have a Böwe Bell + Howell Spectrum series scanner and you selected VRS Non-Interactive mode during the installation process, your default QC Mode is *Disabled* and the default value of the Hardware Warnings setting is *off* (unchecked). VRS Non-Interactive mode only applies to Böwe Bell + Howell Spectrum series scanners. For more information, refer to *VRS Non-Interactive Mode* on page 81.

▶ **To change the QC mode**

    1 From the Windows taskbar, right-click on the VRS taskbar icon.

    2 From the VRS menu, select QC Modes.

    3 From the QC Modes submenu, select an operating mode.

VRS Administration Utility

The VRS Administration Utility dialog box consists of three tabs:

- **Warnings tab**: settings related to image quality conditions
- **Errors tab:** settings that affect the VRS response to errors that occur in connection with equipment conflicts and paper transport issues
- **Accelerated Scanning tab:** settings that you can use to maximize the speed of your scanner
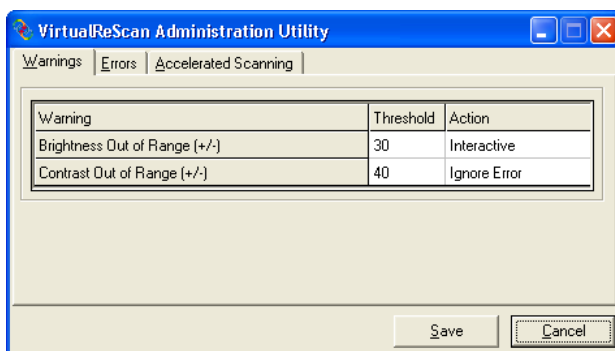
Figure 2-19. VRS Administration Utility Dialog Box

The default settings for VRS provide optimal scanning and accurate data capture for a wide range of documents. For most situations, it should not be necessary to adjust the default settings, which are listed in Table 2-1.

Table 2-1.   VRS Administration Utility Dialog Box Default Settings

Tab	Warning/Error Type	Threshold	Action	Setting
Warnings	Brightness Out of Range	30	Interactive	NA
			Ignore Error[1]	
Warnings	Contrast Out of Range	40	Ignore Error	NA
Errors	Paper Jam	NA	Auto Resolve	NA
Errors	Out of Paper	NA	Auto Resolve	NA
Errors	Cover Open	NA	Auto Resolve	NA

Table 2-1.   VRS Administration Utility Dialog Box Default Settings (continued)

Tab	Warning/Error Type	Threshold	Action	Setting
Errors	Multifeed[1]	NA	Auto Resolve	NA
Errors	Scanner Offline[1]	NA	Auto Resolve	NA
Errors	Feeder Timeout[1]	NA	Auto Resolve	NA
Errors	Scanner Stop Key[1]	NA	Auto Resolve	NA
Errors	Scanner Page Sensor Error[1]	NA	Auto Resolve	NA
Accelerated Scanning	NA	NA	NA	Image quality: Best Acceleration: None NA[1]

1   Böwe Bell + Howell Spectrum series scanners only

If desired, you can modify the VRS Administration Utility settings. Before scanning, set up parameters that define your requirements for image quality and exception handling. To set the parameters, open the VRS Administration Utility dialog box by selecting the Admin Utility command from the VRS menu.

From the Warnings and Errors tabs, you define settings that tell VRS exactly how to respond when it detects an exception image, an equipment conflict, or a paper transport issue. You can use the default settings on the Warnings and Errors tabs, or customize how VRS handles each exception type. Once you are satisfied with the settings, click Save. Changes that you have made on any of the tabs are saved permanently (until changed) and they take effect at the start of the next scan operation. When you use the Cancel button to dismiss this dialog, changes made on any of the tabs are automatically discarded.

For detailed information on how to modify settings on the VRS Administration Utility, refer to the next section, *Warnings Tab,* the *Errors Tab* section on page 23, or the *Accelerated Scanning Tab* section on page 26. A listing of the default VRS Administration Utility settings is also available from the online help system.

Warnings Tab

The Warnings tab lists exception conditions associated with image quality. For each condition, you may set a Threshold value. This threshold value defines the "margin of error" that VRS tolerates for brightness or contrast. VRS intercepts any image with values that fall outside the margin of error, and then handles the image according to the response selected from the Action column. For details on selecting an action type, see the *Action Options* section on page 25.

Note If your scanning application is set to color mode and you are using VRS with a Böwe Bell + Howell Spectrum II series scanner, an additional Color Confidence Out of Range warning will appear on the Warnings tab. For more information, refer to *Advanced Color Processing* on page 93.

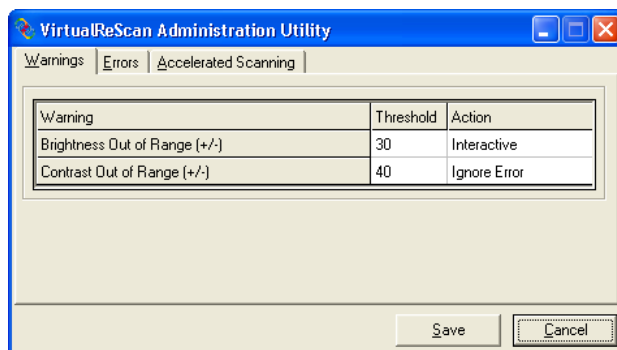**Figure 2-20. Warnings Tab**

Table 2-2 lists the types of warnings and their causes.

Table 2-2.   Warning Types

Warning	Cause
Brightness Out of Range	Brightness value for the image falls outside the acceptable range.
Contrast Out of Range	Contrast value for the image falls outside the acceptable range.

Brightness Out of Range

Use the Brightness Out of Range threshold to define the valid range for brightness values. When a document is scanned, VRS evaluates the resulting image to determine its brightness. Then, VRS compares it to the user-defined acceptable range determined by 50 plus or minus the value in the Brightness Out of Range threshold setting in the Warnings tab. Based on this real-time evaluation, VRS either accepts the image and allows it to be passed on to the scan application, or intercepts it and responds according to the user-defined action in the Warnings tab. The detected value for brightness is reported on the Analysis tab.

Note VRS uses the detected brightness value from the Analysis tab, rather than the brightness value on the Clarity tab, to determine if an image should be passed on to the scan application without generating an exception. When setting the threshold for Brightness Out of Range, you should use the information on the Analysis tab to determine the appropriate value.

For example, if the threshold is 10 on the Warnings tab, VRS accepts any image with a detected brightness value ranging from 40 to 60. The range starts at 40, which is 10 less than 50, and it ends at 60, which is 10 more than 50. Therefore, an image with a brightness value of 70 would fall outside the valid range. VRS would respond by taking the action listed on the Warnings tab for Brightness Out of Range.

Contrast Out of Range

Use the threshold to define the valid range for contrast values. When a document is scanned, VRS evaluates the resulting image to determine its contrast. Then, VRS compares it to the user-defined acceptable range determined by 50 plus or minus the value in the Contrast Out of Range threshold setting in the Warnings tab. Based on this real-time evaluation, VRS either accepts the image and allows it to be passed on to the scan application, or intercepts it and responds according to the user-defined action in the Warnings tab. The detected contrast value is listed on the Analysis tab.

Note VRS uses the detected contrast value from the Analysis tab, rather than the contrast value on the Clarity tab, to determine if an image should be passed on to the scan application without generating an exception. When setting the threshold for Contrast Out of Range, you should use the Analysis tab to set the appropriate value.

For example, if the threshold is 15 on the Warnings tab, VRS accepts any image with a contrast value ranging from 35 to 65. The range starts at 35, which is 15 less than 50, and it ends at 65, which is 15 more than 50. Therefore, an image with a contrast value of 25 would fall outside the valid range and generate a warning. VRS would respond by taking the action listed on the Warnings tab for Contrast Out of Range.

Errors Tab

The Errors tab lists exception conditions such as errors caused by equipment conflicts or paper transport issues, along with the VRS response to each condition.

Note The list of error types on the Errors tab may vary, according to the scanner that you are using with VRS.

In the Action column, select the desired VRS response for each error type. To change the setting, click in the Action box and select the new setting from the drop-down list. For details, see the *Action Options* section on page 25.
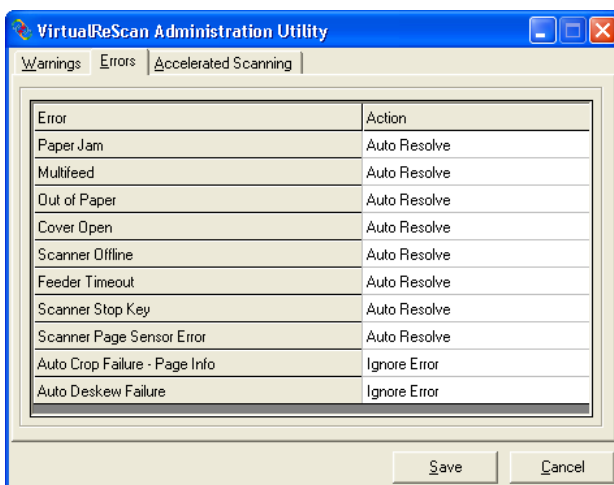
Figure 2-21. VRS Administration Utility - Errors Tab

Table 2-3. Error Types

Error	Description
Paper Jam	Paper jam occurs in the scanner paper path.
Multifeed[1]	Multiple pages were pulled into the transport.
Out of Paper	No paper is available to scan.
Cover Open	Scanner cover is not closed securely.
Scanner Offline[1]	The scanner is not ready to scan.

Table 2-3. Error Types (continued)

Error	Description
Feeder Timeout[1]	The document feeder tried but was unable to move the page for a period of time that exceeded the ADF timeout setting.
Scanner Stop Key[1]	The user pressed the OI STOP key, causing an immediate transport stop, and pages are left somewhere in the transport.
Scanner Page Sensor[1]	The sensor detects an unexpected page sensor transition during scanning, such as a hole in the document or a ragged page edge. The transport continues to run until clear and all pages are in the exit tray.
Auto Crop Failure - Page Info	Due to excessive skew or other condition, VRS is unable to detect the edges of the scanned document. **Note:** Auto Crop is only supported on black background scanners.
Auto Deskew Failure	The image does not contain sufficient horizontal or vertical lines to perform a correct deskew. Use the Skew tab to make a manual correction.

1   Böwe Bell + Howell Spectrum series scanners only

Action Options

Use the Action list to define how you want VRS to handle each exception condition on the Warnings tab and the Errors tab. To specify the VRS response, click in the Action column on the Warnings tab or the Errors tab, and select a response from the list. The action choices vary, according to the type of warning or error.
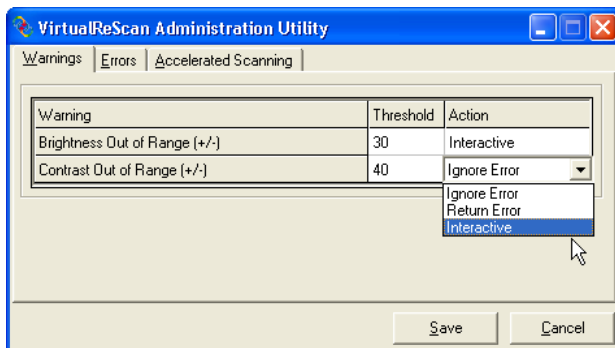
Figure 2-22. Action Drop-Down List

Table 2-4.   Action Types

Action Type	Description
Ignore Error	VRS does not notify the user of the error or take any action to correct it. VRS accepts the image "as is," passes it to the host application, and resumes the scanning session.
Return Error	VRS notifies the user of the error, but does not send the image to the host application. The scan session is then terminated.
Intervention	VRS launches the Auto Resolve Manager in manual mode so the user can select from a range of options to manually handle the error. Refer to *Using the Auto Resolve Manager* on page 29.
Auto Resolve	VRS opens the Auto Resolve Manager in automatic mode. As a result, the scanner automatically attempts to retry the scan until the user resolves an equipment or paper transport impediment, such as a paper jam or out of paper condition. Refer to *Using the Auto Resolve Manager* on page 29.
Interactive	The VRS Interactive Properties dialog box opens and displays the image in the VRS viewer, so that the user can apply new settings to the current image.

Accelerated Scanning Tab

While high-resolution settings have a positive impact on image quality, they can slow down the scanning process. With Accelerated Scanning in effect, VRS achieves the quality of a high-resolution image without compromising speed. To maintain speed, VRS scans the image at a rate that is lower than the DPI (dots per inch) rate defined in your scan application. Then, VRS performs an internal translation so that the image is output at the desired DPI setting.

Note The Accelerated Scanning setting has no effect on the Böwe Bell + Howell Spectrum series scanners.
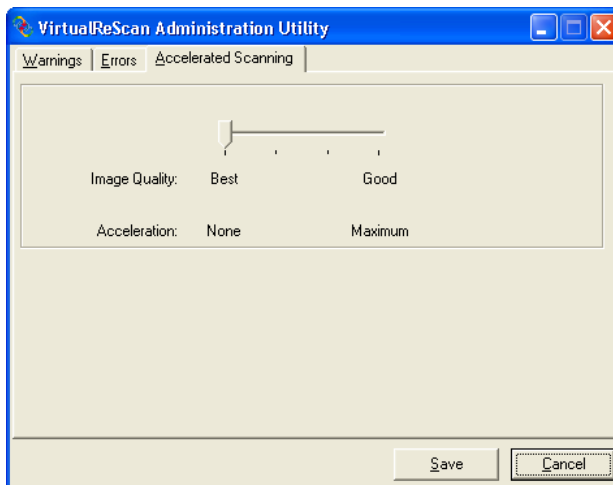
Figure 2-23. The Accelerated Scanning Tab

For example, suppose you select 300 DPI in your scan application and enable the first level of Accelerated Scanning in VRS. The image scans at 200 DPI to accelerate scan speed and VRS translates it to 300 DPI to achieve the desired resolution. Table 2-5 lists the DPI settings VRS uses for the Fujitsu M3091DC and M3092DC. Use this table as an example of how VRS treats DPI settings defined in a scan application.

Note When you select the first level of accelerated scanning, the image quality is virtually equivalent to non-accelerated scanning. However, higher levels of acceleration affect the image quality. Not all scanners increase in speed when you select accelerated scanning. If your scanner does not feature lower resolutions than the resolution selected in your scan application, accelerated scanning will have no effect.

Table 2-5. Accelerated Scanning DPI Settings for the Fujitsu M3091DC and M3092DC

DPI Setting as Defined in Scan Application	Actual Scan DPI Setting Level 1 Acceleration	Actual Scan DPI Setting Level 2 Acceleration	Actual Scan DPI Setting Level 3 Acceleration	Image Output DPI Setting
300	240	150	100	300
240	200	150	100	240
200	150	100	75	200
150	150	75	75	150
100	75	75	75	100
75	75	75	75	75

Updating the VRS Administration Utility Dialog Box

Use these instructions to update the settings on the VRS Administration Utility tabs.

▶ **To update the VRS Administration Utility settings**

  1 Right-click on the VRS taskbar icon to open the VRS menu.

  2 From the VRS menu, select Admin Utility.

  3 Select and adjust the settings for the following tabs:

  • Warnings tab—Threshold. Type directly into the Threshold text box, or click the arrows to select a new threshold setting. For more information, refer to *Warnings Tab* on page 21.
  • Warnings tab/Errors tab—Action. Define a VRS response to each exception type by clicking in the Action option and selecting from the list. For more information, refer to *Action Options* on page 25.
  • Accelerated Scanning tab. Click and drag the slider to make your selection. For details, refer to *Accelerated Scanning Tab* on page 26.

4 Once you are satisfied with the settings, click Save. Changes that you have made on any of the tabs are saved until changed and will take effect at the start of the next scan operation.

Using the Auto Resolve Manager

You can use the Auto Resolve Manager to handle VRS exception conditions such as errors caused by equipment conflicts or paper transport issues. VRS opens the Auto Resolve Manager dialog box for each occurrence of an exception condition specified as an Auto Resolve or Intervention action type on the Errors tab in the VRS Administration Utility. When Auto Resolve is the selected action, the Auto Resolve Manager opens in automatic mode. When Intervention is the selected action, the Auto Resolve Manager opens in manual mode.
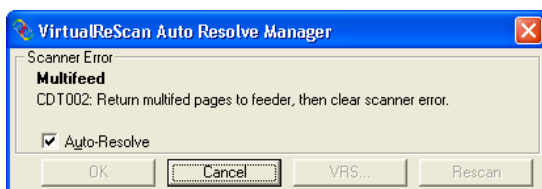
Figure 2-24. VRS Auto Resolve Manager - Automatic Mode

Figure 2-25. VRS Auto Resolve Manager - Manual Mode

The Auto Resolve Manager displays text indicating the exception condition and operator instructions for dealing with the condition. The Auto Resolve Manager dialog box may also display the image that triggered the exception, depending on the exception. The options on the Auto Resolve Manager will vary, according to the active mode (automatic or manual):

- **OK - Automatic Mode:** When the Auto Resolve Manager opens in automatic mode (when the Action selection is *Auto Resolve*), the OK button is disabled. VRS automatically will attempt to retry the scanning process, which will resume once you physically resolve the exception condition.
- **OK - Manual Mode:** When the Auto Resolve Manager opens in manual mode (when the Action selection is *Intervention*), you need to resolve the equipment or paper transport issue. Then select OK to accept the image "as is," send it to the scan application, and proceed with the scanning process.

- **Cancel:** Stop the batch or cancel the scanning process. When you select Cancel, any error information is passed to your scan application. The images that caused the errors are not sent to the scan application.
- **Rescan (Manual Mode only):** Rescan a sheet after you have reloaded a document into the scanner.

Previewing Images

The preview process gives you an opportunity to test image property settings with the aim of meeting quality standards. Use the Preview feature before you scan a batch of documents, or adjust the settings between batches.

When you select Preview, VRS opens the most recently scanned image in the VRS Viewer. For this reason, the Preview function is available only if a scanned image exists in the VRS cache. As you apply property changes from the VRS Interactive Properties dialog box, the Preview image is refreshed so you can evaluate the adjustments. Be aware that the changes to the preview image are not sent to your scan application; the image is intended only for preview purposes. Furthermore, for Personal and Professional VRS scanners, when you close your scan application or select another scanner source, the VRS image cache is cleared.

For information on the VRS Viewer window and using the Zoom, see the section *Using the VRS Viewer* on page 32. For information on updating image properties, see *Updating Images Using the VRS Interactive Properties Dialog Box* section on page 34.

▶ **To preview an image**

1   Scan a document similar to the type you plan to scan.

2   From the VRS menu, select Preview. VRS displays the last image scanned.

3   If desired, use the Zoom menu to adjust the magnification level.

4   Use the VRS Interactive Properties dialog box to change the image properties. If you expect to use these settings on a regular basis, save them as a profile, so they can be recalled as necessary. Refer to *Using the Profile Tab* on page 54.

5   When you are satisfied with the preview image, select the OK button on the VRS Interactive Properties dialog box. The property settings are saved and put into effect for the next batch of scanned documents.

Using VRS While You Scan

VRS is designed so that you may modify images manually during a scanning session. This is accomplished through the VRS Viewer and the VRS Interactive Properties dialog box, which provides an interactive settings control equipped with controls for real-time image correction. This section explains how to use VRS while you scan to create great images.

When Does VRS Come into Play?

While scanning, the VRS Interactive Properties dialog box and the VRS Viewer open under the following circumstances:

- When VRS intercepts an exception image for which the response is defined as Interactive. See the *VRS Administration Utility* section on page 19.
- As defined by the active operating mode. See *QC Modes* on page 17.

The VRS Viewer and the VRS Interactive Properties dialog boxes open together. You can use the VRS Interactive Properties dialog box to apply attribute changes to the image in the VRS Viewer. For more information, see the next section, *Using the VRS Viewer*, as well as the section, *Updating Image Properties Using the VRS Interactive Properties Dialog Box* on page 34.

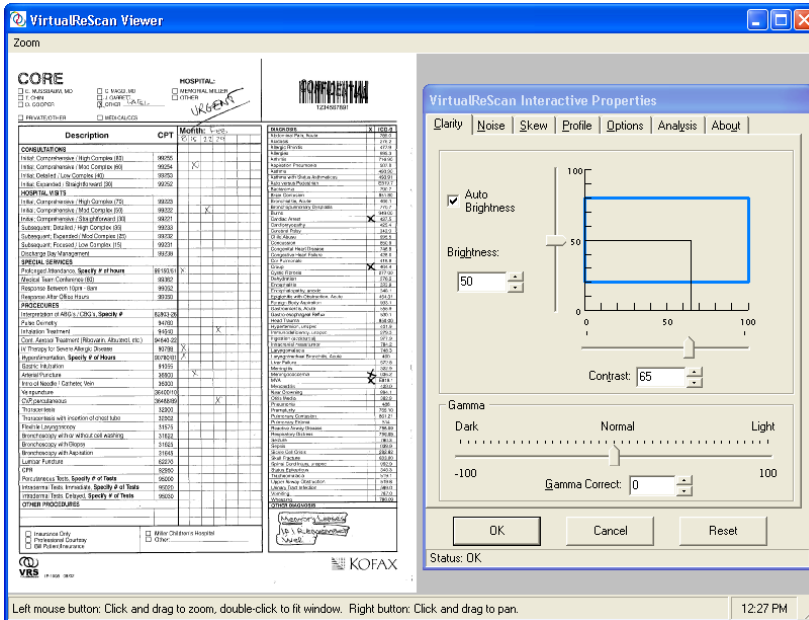**Figure 2-26. VRS Viewer with VRS Interactive Properties Dialog Box**

Using the VRS Viewer

The VRS Viewer displays scanned images for your inspection. The purpose of the viewer is to show you what an image looks like when it scans, and to refresh the image as you apply property changes.

The VRS Viewer includes a Zoom menu with a range of image magnification levels.
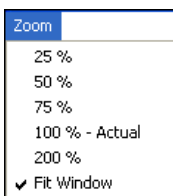
Figure 2-27. VRS Viewer Zoom Menu

Using the Zoom Menu to Adjust the View

From the Zoom menu, you can magnify or reduce the image in the VRS Viewer. Using the Fit Window setting, you can see the entire image in the viewer.

Using Mouse Buttons to Adjust the View

In the VRS Viewer, you can adjust the image view with the left and right buttons of your mouse.

- Using the left mouse button, you can do the following:
  - ✓ View part of the image by clicking and dragging the selection rectangle across the area you want to magnify.
  - ✓ Restore the image to the standard view by double-clicking the image.
- Using the right mouse button, once you have zoomed in on an image, you can click and drag (or pan) the image in the VRS Viewer.

Note The VRS Viewer treats Close the same as Minimize. To exit the viewer, you must click the OK or the Cancel button.

Updating Image Properties

The VRS Interactive Properties dialog box consists of seven tabs, including three with options for dynamically adjusting image properties as you scan.

Note If your scanning application is set to color mode and you are using VRS with a Böwe Bell + Howell Spectrum II series scanner, an additional tab called *Color* appears on this dialog box. For more information, refer to *Advanced Color Processing* on page 93.
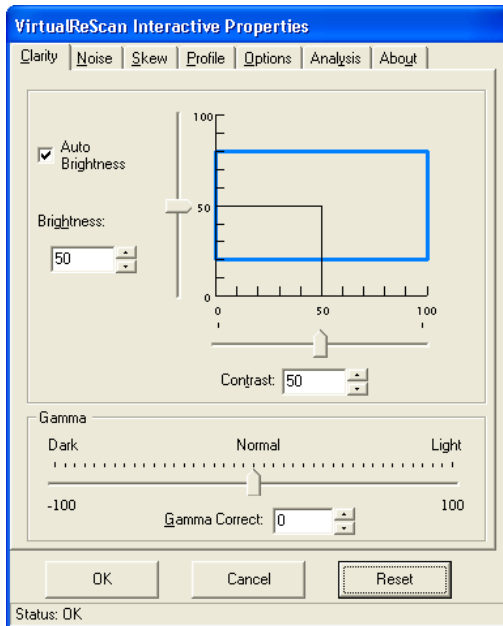

Figure 2-28. VRS Interactive Properties Dialog Box

When the dialog box opens for an exception condition, the status line lists the specific cause for the warning or error. Otherwise, you see Status OK on the status line.

VRS Interactive Properties Dialog Box Tabs

The standard VRS Interactive Properties dialog box consists of the seven tabs.

Clarity

The Clarity tab consists of settings for brightness, contrast, and gamma correction. Use this tab to enable or disable Automatic Brightness. For details, refer to "Using the Clarity Tab" on page 37.

Noise

The Noise tab consists of settings for applying character thinning/thickening (Line Filter) or to remove unwanted speckling from an image. For details, refer to *Using the Noise Tab* on page 49.

Note The Noise tab is only available when an application is set to scan images in black and white.

Skew

The Skew tab contains controls to straighten (deskew) an image. In addition, use this tab to enable or disable Automatic Deskew, enable an Image Crop option, or enable Edge Cleanup. Settings on the Skew tab apply only to the current image in the VRS Viewer window. For details, refer to "Using the Skew Tab" on page 51.

Note Image Crop and Edge Cleanup are only available for scanners that produce black borders around the images.

Profile

Use the Profile tab to create and manage image property profiles (user-defined settings from the Clarity, Noise, and Skew tabs). For details, refer to "Using the Profile Tab" on page 54.

Options

Use the Options tab to activate optional features specific to your scanner. For details, refer to "Using the Options Tab" on page 58.

Analysis

Use the Analysis tab to view a summary of the property settings for the most recently scanned image. For details, refer to "Using the Analysis Tab" on page 60.

About

Use the About tab to view information about your VRS version, as well as contact information for Kofax Image Products, Inc. For details, refer to "Using the About Tab" on page 61.

VRS Interactive Properties Dialog Box Buttons

These buttons are available from each of the VRS Interactive Properties dialog box tabs. When VRS restarts, the dialog box resets to the last selected profile's settings.

OK

Use the OK button to transmit the current settings to your scan application. If the VRS Interactive Properties dialog box opened because of an exception, the settings will only apply to the image in question. If the Interactive Properties dialog box appeared as the result of a First Page QC mode, or in connection with the Preview option, then the changes apply to subsequent scans or batches.

Cancel

Use the Cancel button in Preview to close the dialog without applying any changes. If an exception is detected when scanning, use this button to return an error (without the error image itself) to the scan application. In addition, the batch scan will be stopped.

Reset

The Reset button clears any changes and resets all settings to their original values.

Using the Clarity Tab

This section describes the Clarity tab of the VRS Interactive Properties dialog box. The Clarity tab provides options to adjust the contrast, brightness, and gamma values for an image. In general, a high Contrast value enhances faint text and lines in your documents. Since Brightness increases or decreases the overall density of your images, increasing the brightness level can clear up dark shaded documents. Finally, Gamma Correct allows you to adjust images created with incorrect gamma encoding.

Note With the Böwe Bell + Howell Spectrum series scanner, the Clarity tab features are available only when you scan in black and white or in grayscale mode. When you use this scanner in color mode, the Clarity tab will be disabled if the VRS Interactive Properties dialog box appears as the result of an exception or a QC mode setting. Also, the Clarity tab will be visible if you select Preview mode, but no image will be available to display in the viewer.
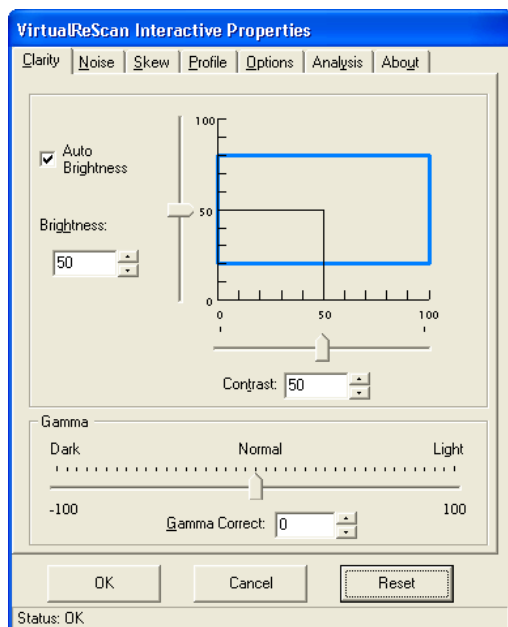

Figure 2-29. Clarity Tab

Automatic Image Enhancement

As stated previously, VRS has the ability to monitor images, detect poor image quality, and perform automatic image enhancements that greatly reduce image quality and recognition errors. For more information about manual image adjustment, refer to "Manual Image Adjustment" on page 46.

Brightness and Contrast

When the Auto Brightness check box is selected, VRS automatically assigns optimal values for brightness and displays those values in the manual Brightness slider and numeric text box. The Auto Brightness feature is not available when you scan images in color. It becomes available only when scanning in grayscale and black and white.

Note Moving the Brightness slider, entering a value in the Brightness numeric text box, or clicking in the Brightness-Contrast custom control turns off Auto Brightness.
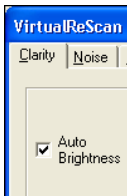
Figure 2-30. Auto Brightness Check Box

Gamma and Gamma Correct

When a scanner scans your document, it determines how to convert the light intensity of that document into pixels using a value called *gamma*. When scanners have an incorrect gamma value or no gamma encoding, image quality can be adversely affected. In most cases, VRS default settings will prevent this problem. The Gamma slider and the Gamma Correct box are available for extreme cases in which documents require manual gamma adjustments. Otherwise, you should keep the gamma default value.

Understanding Contrast, Brightness, and Gamma Settings in VRS

What are brightness, contrast, and gamma in VRS? When an image has high brightness, it seems to give off more light. It is like looking at a drawing under a 45-watt bulb, then looking at it using a 75-watt bulb. The drawing will seem "brighter" under the 75-watt bulb. In the same way, moving the Brightness slider up will increase the amount of light in the image. Moving it down will decrease the amount of light.

The VRS manual brightness setting ranges from 0 (very dark) to 100 (very bright). Adjusting the Manual Brightness setting by moving the Brightness slider, by entering a new value in the Brightness numeric text box, or by clicking within the Brightness-Contrast custom control causes Auto Brightness to be turned off.

Contrast is the amount of difference between the lightest and darkest areas on an image. For example, no matter what flash you use, the ratio of light to dark in a photograph stays the same. When you increase the contrast on a totally black and white image (binary image), the white parts become whiter and the black parts become blacker.

A Gamma value is a way to manually "sync up" the image you see on the screen with what you are supposed to see. In other words, sometimes output devices (monitors, televisions, etc.) do not produce the same image as the input devices (the scanner, for example) tell them to produce. In VRS, moving the gamma slider to the right will remove pixels from the entire image, which will create an overall appearance of brightening the image. Moving the slider to the left will do the opposite—adding pixels to make the overall image appear more dark, or dense.

VRS handles this gamma adjustment automatically for you, so even though the gamma correction slider is available, you will not need it to adjust images. Gamma should be considered as a scanner calibration and the default value should be maintained.

Now let us put these image components to use in creating exceptional images.

Divide and Conquer

Every scanned image has two basic parts: the part you want and the part you do not want. One of the major tasks of any image processing software is to separate these two entities so that the desired elements are preserved. VRS excels at this task, but you are probably wondering why. VRS takes advantage of two different technologies to achieve this—simple thresholding and edge detection.

In simple thresholding, a grayscale image (256 levels of gray) is converted to a binary image (two levels: black and white). This is done by first setting a threshold level, which acts like a dividing line. Everything (all the pixels) above that number (level of

gray) becomes white and everything below that number becomes black. Black pixels are assigned a value of 1, and white pixels are assigned a value of 0. Because the threshold level influences the brightness of the resulting image, we also refer to the threshold level as the brightness level. So in VRS, the Brightness slider on its own acts as a simple threshold level.

Simple Thresholding

Simple thresholding is fine for black text on white paper, but it is tricky when you have a combination of dark and light text and lines, and dark and light background surfaces on one page. Figure 2-31 shows a good example of this kind of document.
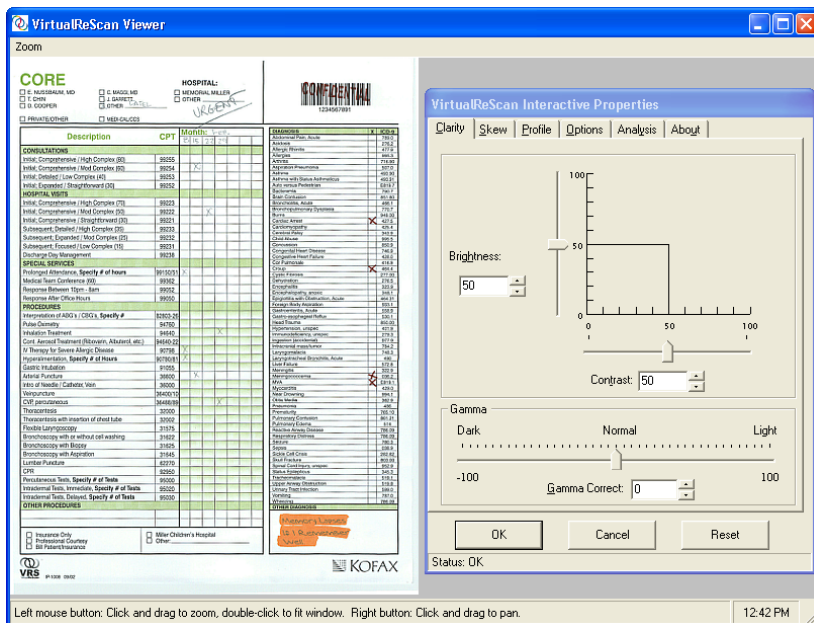

Figure 2-31. Color Scan of Original Document

A color or 24-bit image is an exact representation of how the original document looks, much like a photograph of the original. A 24-bit image can contain more than 16 million different colors and is capable of showing all the shades, as well as the darkest and faintest elements of a document.

It is important, however, to point out that while a 24-bit image can be converted to a grayscale or a black and white image, a grayscale or black and white image cannot be converted to a color image. Just as a photo taken on black and white film cannot be

converted to a color photograph, an image cannot be converted to color if that original color data was never captured.

Like the color image, an 8-bit grayscale or 256-level grayscale image also looks like a photographic representation of the original, but without the color. Because it can display up to 256 gray levels, it is suited for representing documents containing different shades of text. Black and white only document scanners capture the documents in 8-bit grayscale, but convert these images to single bit or pure black and white images before sending the images to your application.

In this example, we will scan a document and show the effects of VRS Contrast, Brightness, and Gamma settings on it. In the image shown in Figure 2-32, we have scanned a document we will refer to as the "CORE" document as a Black and White image at 200 DPI. If we first set the Contrast value to 0, then set the Brightness value to 20 (remember that setting the Contrast to 0 is basically like using VRS as a simple thresholding device), the faint text on the top of the page is visible, but the text behind the highlighter is unreadable.
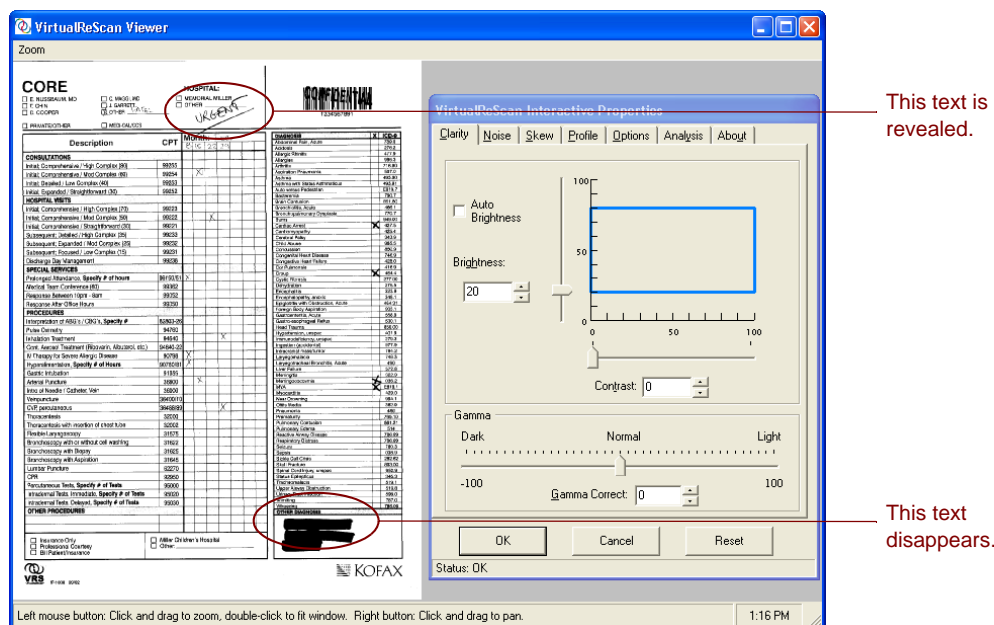

Figure 2-32. Brightness with a Low Setting

With a high Brightness setting, such as 45, the highlighted text appears, but the faint text becomes unreadable.
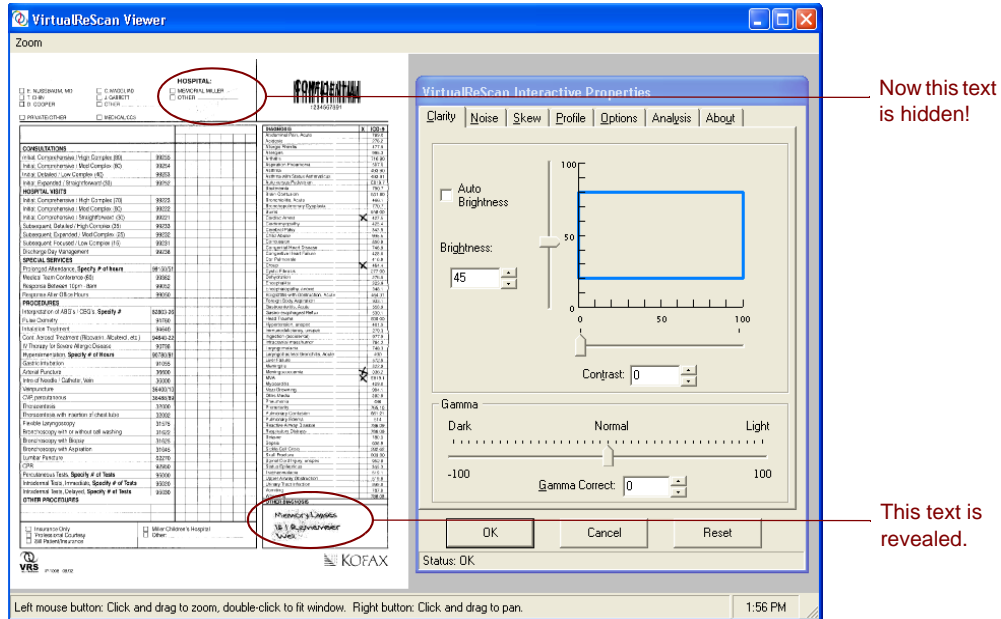
Figure 2-33. Brightness with a High Setting

It becomes apparent that these kinds of situations cannot be solved with simple thresholding. They need a technology that detects objects on a page—both faint and dark—and sets the brightness level dynamically for each of these objects. This technology is called *edge detection*.

Edge Detection

Edge detection in VRS is controlled with the Contrast slider. Edge detection, or edge finding as it is sometimes called, is a technology that can recognize transitions of one gray level to another level. The larger the difference between the levels of gray, the more "edgy" the object is. With a low contrast level, only very edgy objects become black (for instance black text on a white background); very faint text and lines would still not appear because the transition from a white background to light gray is relatively minor. Faint text and lines are therefore not "edgy." A background, because it does not have transitions from one level of gray to another, would not be edgy. A gradient, because there are no sudden transitions from one level of gray to another, would not be edgy.

Even something that is technically invisible to the eye, such as a piece of transparent tape placed on a document, could be detected when contrast is set high enough, since there is ultimately a transition from the tape to the paper surrounding it.

Let us look at the CORE sample document with the lowest Contrast level—zero. In addition, to truly see what Contrast does on its own, we will set the brightness value to zero. When it is necessary, as in the case of the CORE document, Brightness and Contrast take turns to output the best image. Contrast (Edge Detection) takes the primary role in dealing with anything edgy, while the Brightness function deals with everything else.

If you slide the Contrast slider to a level around 50, and set the Brightness to 29, you can see how the Brightness slider does not affect the edgy objects, leaving that completely to the edge detector. The only elements that are affected by the Brightness slider are the non-edgy objects, typically large surfaces of the same gray level (the inside of a highlighter, the background of a document, a shading on the document, the inside of very big text or logos, etc.)
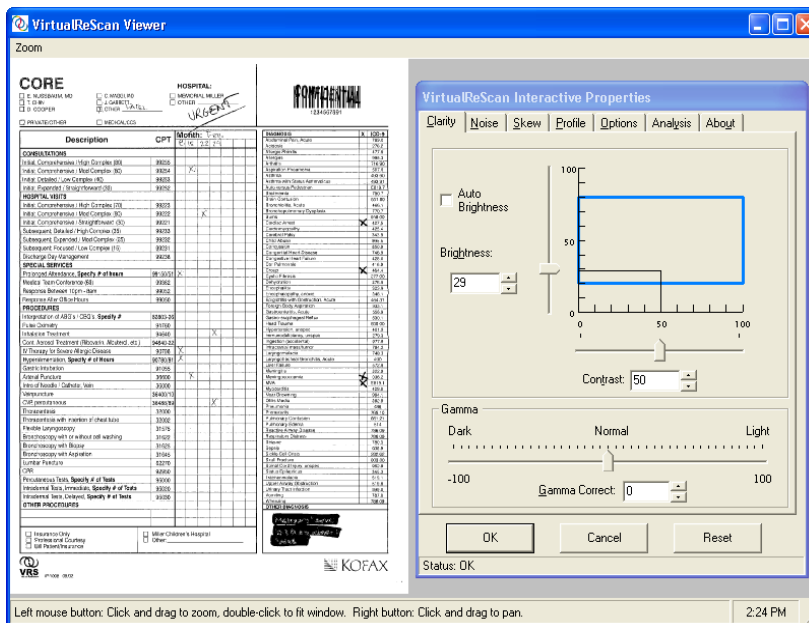

Figure 2-34. Contrast Set to 50, Brightness Set to 29

Then when the Contrast slider is on level 50, and you change the Brightness level, it does not affect the text any more; it only makes the large surfaces white or black. That's why there's a tendency to relate the contrast slider with the foreground or text and the brightness slider with the background because the higher the contrast, the clearer your text will be, and the higher the brightness the more the background will

be cleared up. The lower the contrast, the less readable your text will be; the lower the brightness the darker the background will turn.
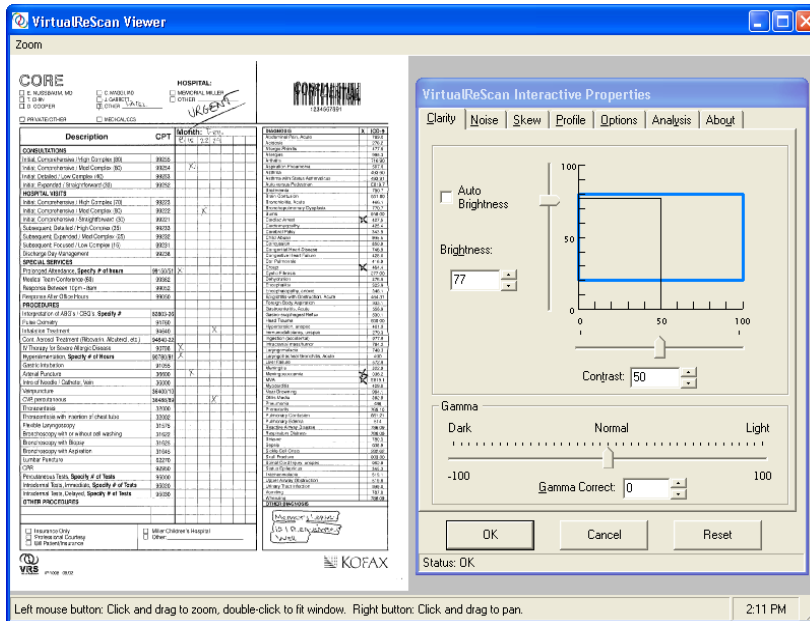

Figure 2-35. Contrast Set to 50, Brightness Set to 77

Your Optimal Scan

The default settings will provide optimal results for most scans. For a list of default settings, refer to Table 2-1. By simply scanning the CORE document without adjusting the settings, you will get optimal results.

Figure 2-36. Document Scanned With VRS Default Settings—Perfect!

Manual Image Adjustment

VRS provides the option to manually adjust the settings for an image or images. You can use the Clarity tab to make the adjustments.

Brightness-Contrast Custom Control

The Clarity tab includes custom controls (visual markers) to assist you in identifying the optimal range for Brightness and Contrast.
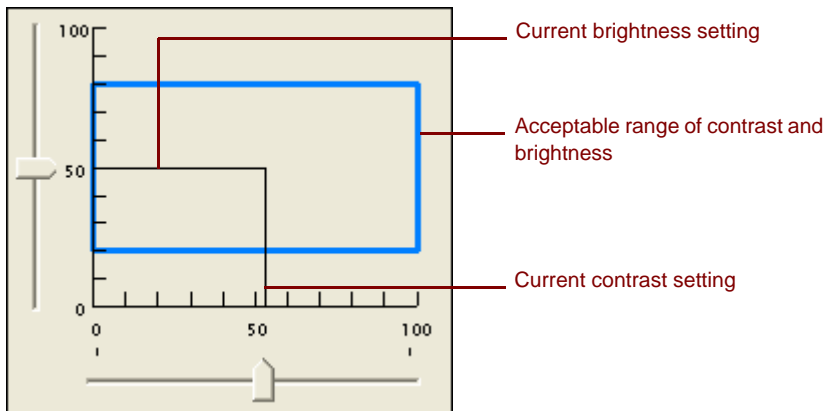

Figure 2-37. Brightness-Contrast Custom Control

The Brightness-Contrast custom control indicates the current value of the Brightness setting by means of a horizontal solid black line. The Brightness-Contrast custom control indicates the current value of the Contrast setting by means of a vertical solid black line. When Auto Brightness is enabled, the black lines (along with the slider) are automatically adjusted to reflect the automatic brightness adjustment.

The Brightness-Contrast custom control indicates the current acceptable range of detected brightness and detected contrast values by means of a rectangle with solid blue lines. This box shows you the region of acceptable Brightness and Contrast values. The box is centered on the 50-50 baseline settings for Brightness and Contrast, with the borders representing the Brightness and Contrast threshold values from the VRS Administration Utility dialog box. Valid VRS-detected values must fall within the blue box. VRS detected values that fall outside the blue box borders are invalid and they generate warnings.

Brightness Text Box

When the VRS Interactive Properties dialog is launched, the Brightness numeric text box on the Clarity tab indicates the current Brightness setting. If desired, the Brightness setting may be changed manually using the Brightness numeric text box. Brightness may be set from 0 (very dark) to 100 (very bright) for black and white, grayscale, or color images. Keep in mind, though, that the Manual brightness setting is not shared between black and white, grayscale, and color modes. Changing the value of the manual brightness setting in black and white mode does not affect the value of the manual brightness setting in grayscale or color mode, because VRS keeps these values separate.

Contrast Text Box

When the VRS Interactive Properties dialog is launched, the Contrast numeric text box indicates the current value of the Contrast setting. The Contrast value of an image may be set manually using the Contrast numeric text box. The Contrast value may be set from 0 (very low contrast) to 100 (very high contrast). Similar to the Brightness setting, the Contrast setting is not shared between black and white, grayscale, and color modes. You must enter a separate Contrast value for each mode.

Gamma Slider and Gamma Correct Text Box

The Gamma slider and Gamma numeric text box indicate the current value of the Gamma setting, which can range from -100 (very dark gamma) to +100 (very light gamma). Gamma may be set for black and white, grayscale, and color images, but is only shared between black and white and grayscale modes. This means that changing the value of the Gamma setting while in black and white mode also changes the Gamma setting for grayscale mode because VRS internally uses a single value to represent gamma for black and white and grayscale.

The Gamma setting is not shared between non-color and color modes, however. Changing the value of the Gamma setting in black and white mode does not affect the value of the Gamma setting in color as VRS uses a dedicated value to represent color gamma.

▶ **To update the Clarity tab settings**

   1   From the VRS Interactive Properties dialog box, select the Clarity tab.

   a   To adjust the contrast and brightness at the same time, click within the boundaries of the brightness/contrast grid, then insert the pointer so that the intersection of the crosshairs represents the desired values for brightness and contrast. For best results, stay within the blue rectangle.

   b   To adjust the contrast and brightness separately, skip to the next step.

2 In the Brightness text box, VRS displays the current brightness setting. To change the setting, do **one** of the following:

- Click the arrows on the Brightness text box to increase or decrease the brightness level.
- Click in the Brightness text box and type in a value.
- Move the Brightness slider control up or down to select a value.

Note As soon as you change the brightness value, the Auto Brightness option is automatically disabled. To enable it again, select Auto Brightness again and VRS will calculate and reapply the brightness level automatically.

3 In the Contrast text box, VRS displays the current contrast setting. To change the setting, do **one** of the following:

- Click the arrows on the Contrast text box to increase or decrease the contrast level.
- Click in the Contrast text box and type in a value.
- Move the Contrast slider control left or right to select a value.

4 In the Gamma text box, VRS displays the gamma correction setting. The correction values range from Dark to Light, with Normal at the midpoint. To change the setting, do **one** of the following:

- Click the arrows on the Gamma Correct text box to increase or decrease the gamma level.
- Click in the Gamma text box and type in a value.
- Move the Gamma slider control left or right to select a value.

Note Changes made to the Clarity tab are handled according to the way the Interactive Properties dialog box was launched. If the dialog box opened as the result of an exception, the changes apply to the image in question only. If the dialog box opened because you selected Preview or First Page mode, the changes also apply to subsequent scans. When VRS restarts, the tab is reset to the settings in the last selected profile. Böwe Bell + Howell Spectrum series scanner users should refer to the note on page 37.

Using the Noise Tab

Noise in an image consists of pixels accidentally and randomly added to the image during image processing. The level of shading for these pixels is also random and can vary quite a bit. Unfortunately, images attained through even the most sophisticated sensors can still be contaminated by a variety of noise sources and they have to be corrected.

The Noise tab gives you a set of filters that enhance image quality and remove excessive speckling. As you adjust the Noise settings, the effects are applied to the image in the VRS Viewer window. You can fine-tune the settings until the image appearance meets your quality standards.

Note The VRS Noise tab is only available when your scanner is set to do black and white scanning. In addition, the Enhancement Filter option is not yet available in this version of VRS; the drop-down box is reserved for future use.
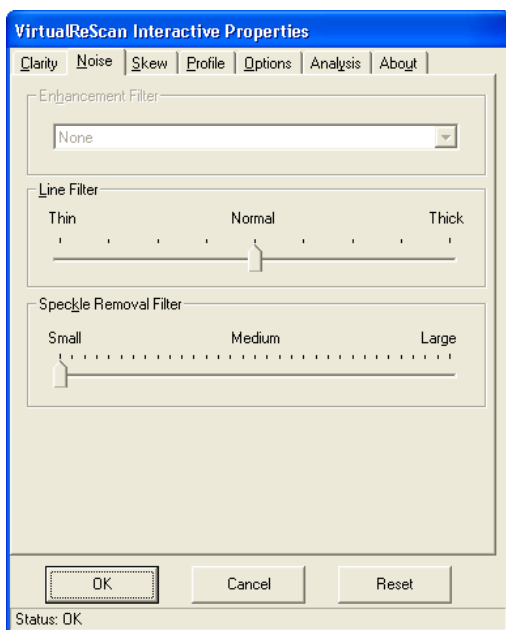

Figure 2-38. Noise Tab

Note Changes made to this tab are handled according to circumstances under which the VRS Interactive Properties dialog box launched. If the dialog box opened as the result of an exception, changes apply to the exception image only. If the dialog box opened because you selected Preview or First Page mode, changes apply to all subsequent scans. Upon restart, VRS is reset to the last selected profile's settings.

Removing Noise from a Document

Follow these general rules for removing noise from a document:

- If you have batches of mixed documents with varying quality, never use the Speckle Removal filter. You could risk losing information on documents.
- If the noise was produced by bleed-through of text from the backside or by background patterns such as on a boarding pass, decrease the contrast. If text starts to disappear as well, compensate by lowering the Brightness slider.
- If the noise is produced by shaded backgrounds, gradients, or dark-colored paper, increase the brightness.
- If you have only 1 or 2 kinds of documents with consistent quality, try to apply various levels of the speckle removal filters.
- If the filter removes part of the characters even at low levels of the speckle removal filter, apply the rules for mixed batches.

▶ **To update the Noise settings**

1 From the VRS Interactive Properties dialog box, select the Noise tab.

2 Use the Line Filter slider to select the amount of thinning/thickening to apply to image elements.

   a Move toward Thin for image elements ballooned or blended together.

   b Move toward the Thick setting for image elements too thin or too light.

3 Use the Speckle Removal Filter slider to remove unwanted black dots.

   a Move the slider toward Small if removal of small dots will achieve the desired image quality.

   b Move the slider toward Medium if removal of small and medium dots will achieve the desired image quality.

   c Move the slider toward Large if removal of small, medium, and large dots will achieve the desired image quality.

Note Moving the slider far to the right may interfere with text recognition.

Using the Skew Tab

The Skew tab allows you to control auto deskew, auto crop, edge cleanup settings and to perform manual skew adjustment on an image. Images can be rotated up to 360 degrees clockwise or counter-clockwise using the movable angle control arm, or they can be automatically deskewed by selecting the Deskew check box. If necessary, you can fine-tune the rotation with the Fine Angle Adjustment slider, or enter an amount in the Angle box. When the Angle box lists 0.00, the image is displayed as it was originally scanned.
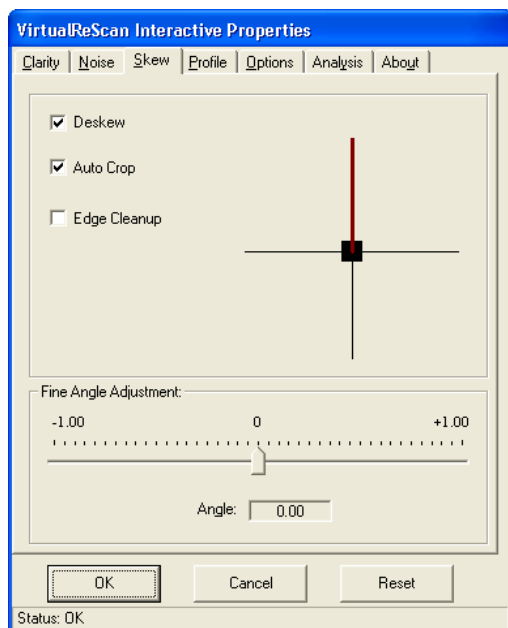

Figure 2-39. Skew Tab

Changes made to this tab are handled according to circumstances under which the VRS Interactive Properties dialog box launched. If the dialog box opened as the result of an exception, changes to Deskew, Auto Crop, or Edge Cleanup apply to the exception image only. If the dialog box opened because you selected Preview or First Page mode, Deskew, Auto Crop, and Edge Cleanup settings apply to the exception image as well as subsequent scans.

If the dialog box opened as the result of an exception, changes to Manual Skew Adjustment or Fine Angle Adjustment apply to the exception image only. Changes made when you select Preview are discarded when the OK or Cancel buttons are

selected. If you are in First Page Mode when an exception occurs, changes to the Manual Skew Adjustment or Fine Angle Adjustment apply to the exception image only.

Upon restart, VRS is always reset to the last selected profile's settings.

▶ **To change the Skew tab settings**

1 From the VRS Interactive Properties dialog box, select the Skew tab.

2 Adjust the movable angle control arm until the image is straight:

  a Click anywhere on the grid to position the angle control arm.

  - or -

  b Position the mouse over the vertical arm, click, and hold. The cursor will change to a hand.

  c Drag the arm counter-clockwise to rotate the image to the left, or clockwise to rotate it to the right. You can rotate the image up to 360 degrees.

3 Using the Fine Angle Adjustment slider, you can fine-tune the deskew angle in single degree, or partial degree, increments, as follows:

  a By moving the slider all the way to the left, you select a complete one-degree, counter-clockwise angle adjustment.

  b By moving the slider all the way to the right, you select a complete one-degree, clockwise angle adjustment.

  c By moving the slider to a position in between the leftmost or rightmost setting, you select an angle shift that is less than a full degree. Each line on the slider scale represents 5 percent of one degree.

When you use a scanner that produces white borders around the scanned images, the deskew correction is calculated based on horizontal and vertical text lines in the image. When you use a scanner that produces black borders around the images, VRS switches to using black borders and not the content of the document to determine the skew correction with faster and better results.

When you use a scanner that produces black borders, the Auto Crop option is enabled. Select this option to automatically crop every page to its original size. Auto Crop is important for a precise registration of each image in order to perform accurate optical character recognition (OCR).
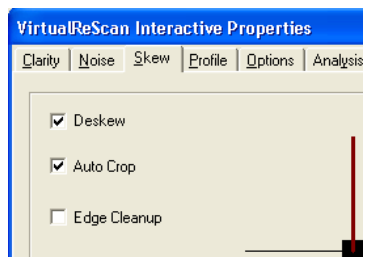
Figure 2-40. Skew Tab - Deskew, Crop, and Edge Cleanup Options

Edge Cleanup activates the VRS feature that automatically removes any black borders around the image. It is different from image cropping because it does not crop the image to its actual size. Instead, it replaces any black pixels in the border around the image with white pixels, preserving the width and length of the image size determined by the image crop.

| Black Background Scanner Image | Deskew Enabled | Auto Crop Enabled | Edge Cleanup Enabled |

Figure 2-41. Edge Cleanup Process

Note Because VRS requires black borders around the document to perform Image Crop and Edge Cleanup, these features are not available when your scanner produces white borders around the images, or in other words, has a white background. Refer to the *VRS Installation Guide* to determine if your scanner produces white or black borders around images (has a white or a black background).

Using the Profile Tab

As stated already, VRS allows you to scan documents and accurately capture data in the shortest time possible without any adjustments. However, invariably there are going to be documents that will evade even the best imaging software. You can use the VRS Interactive Properties dialog box to correct each image, but if you are going to be scanning large amounts of problematic documents, the best solution is to create custom profiles for them.
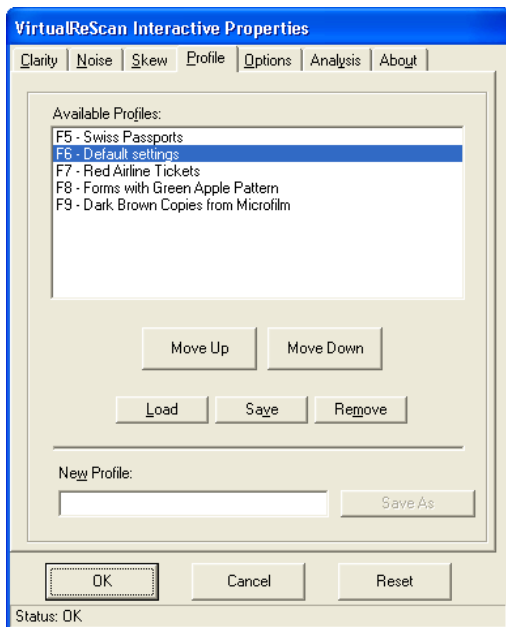

Figure 2-42. Profile Tab

A profile is a combination of settings from the Clarity, Noise, and Skew tabs. A profile works like a memorized strategy for image correction and enhancement. With the exception of the Default profile, which is pre-determined and created when you install VRS, profiles are created by the user. However, VRS uses the profile Default settings unless you define and select another profile.

The Profile tab helps you set up and manage VRS image property profiles. From the Profile tab, you can define, update, load, and remove profiles. You can establish multiple profiles to accommodate different scanning situations. You are not limited on the number of profiles you can create. However, only the first eight profiles will be

assigned a shortcut key, and only 10 profiles at a time will be visible in the Available Profiles window.

It is recommended that you do not update the Default settings as they can only be restored by reinstalling the software or by using the Restore Default Values Utility. In addition, reinstalling VRS will overwrite any profiles you have created and/or modified. For more information, refer to *VRS Restore Default Values Utility* on page 75.

Note Changes made to this tab are handled according to when the VRS Interactive Properties dialog box was launched. If the dialog box opened as the result of an exception, the changes will apply to the image in question only. If the dialog box opened because you selected Preview or First Page mode, the changes will apply to subsequent scans. When VRS restarts, the dialog box resets to the last selected profile.

Selecting, Creating, and Deleting Profiles

Use these instructions to select, create, and delete profiles.

▶ **To set up a profile**

1   Open the VRS Interactive Properties dialog box and make selections from the Clarity, Noise, and Skew tabs.

2   Select the Profile tab.

3   In the New Profile text box, assign a name to the new profile. Be sure to assign a profile name with alphanumeric characters; refer to Table 2-6.

Table 2-6. Invalid Characters for Profile Names

Character	Description	Character	Description
:	Colon	'	Single quotation
;	Semicolon	"	Double quotation
\	Backslash	>	Greater than
/	Slash	<	Less than
|	Pipe	^	Caret
&	Ampersand	.	Period
?	Question mark		

4 Select Save As. The new profile name appears in the Available Profiles list, and it becomes the active profile.

5 Notice how VRS automatically associates a function key to the first 8 profiles. You can change the sequence of any profile and its associated function key by moving a profile up or down with the Move Up and Move Down buttons.

6 The function keys are only active when the VRS Interactive Properties dialog box is active. Once you have created a profile, the Cancel button will not undo the changes to the Profile tab. You will need to change the active profile or remove it as described in the following topics.

▶ **To change the active profile**

1 At the VRS Interactive Properties dialog box, select the Profile tab.

2 From the Available Profiles list, select the profile you want to use.

3 Select the Load button. (This step is important; clicking the OK button before you click the Load button will not change the active profile.)

4 Click the OK button.

- or -

1 From the VRS Interactive Properties dialog box, select the Profile tab.

2 Do one of the following:
- From the Available Profiles list, double-click the name of the profile you want to use.
- Press the corresponding function key on the computer keyboard to load a profile. The function keys are only active when the VRS Interactive Properties dialog box is selected.

- or -

1 From the VRS menu, select the Profile command.

2 When the Profiles submenu opens, select the name of the profile you want to use. The profile selection stays in effect until you change it again.

Note If an image is open in the VRS Viewer when you change the active profile, the image is refreshed with the new settings.

▶ **To remove a profile from the Available Profiles list**

1   From the VRS Interactive Properties dialog box, select the Profile tab.

2   From the Available Profiles list, select the profile(s) you want to remove.

3   Click Remove. The profile name clears from the Available Profiles list.

4   If the deleted profile was the last profile in use, select another profile from the Available Profiles list and click the Load button to select it.

Using the Options Tab

Some scanner features are only available from the Options tab. If VRS supports your scanner's Advanced Settings or Advanced Properties dialog box, the Special Features button will be enabled. If your scanner driver does not support an Advanced Settings dialog box, this button will be unavailable.

Note The Options tab is hidden unless the VirtualReScan Interactive Properties dialog box is invoked in Preview mode. In addition, while the Advanced Settings dialog box is displayed, the VRS Interactive Properties dialog box is not available.
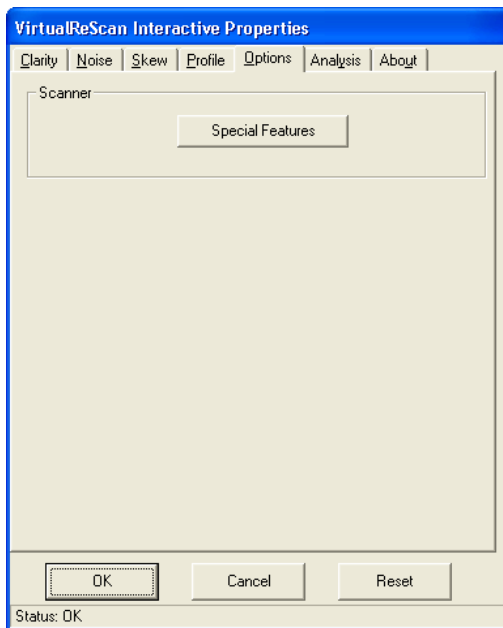
Figure 2-43. Options Tab

Clicking the Special Features button when it is enabled invokes the Advanced Settings dialog box for your scanner. Once you have made selections to the Advanced Settings dialog box and clicked OK, those changes will remain in effect until you change them again.

Some of the available features may include:

- Color Dropout (Böwe Bell + Howell Spectrum series, Fujitsu *fi*-4860C, Fujitsu *fi* 4990C, and Fujitsu M3091DC)

- Lamp Saver Mode
- Endorser (such as Panasonic models and OEMs, Canon DR-5080C, Fujitsu *fi* 4990C, Fujitsu *fi*-4860C, and Böwe Bell + Howell Spectrum series).
- Density
- Emphasis
- Document Form

Note Use the Special Features option with caution. Some features may interfere with the optimal performance of VRS.
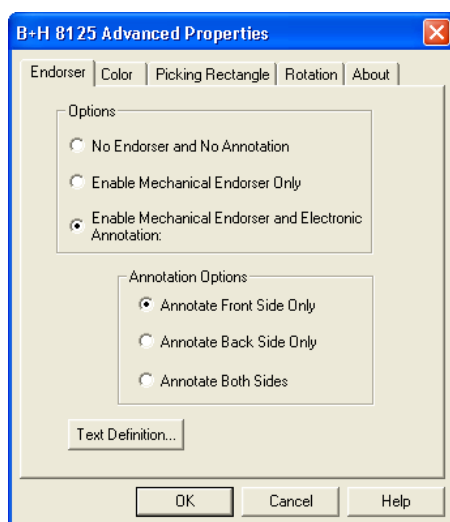
Figure 2-44. Böwe Bell + Howell Spectrum Series Advanced Settings Dialog Box

For more information regarding VRS support of advanced scanner properties, refer to *VRS Interactive Properties Dialog Box Tabs* on page 35.

Using the Analysis Tab

The Analysis tab summarizes the properties for the current image in the VRS Viewer at the time VRS scans the image. The information on the Analysis tab may help you identify threshold values for contrast and brightness on the VRS Administration Utility, as well as settings for contrast and brightness on the Clarity tab.

If you enable Auto Brightness on the Clarity tab, the brightness value on the Analysis tab is automatically adjusted. With the exception of the Speckle Count (the number of pixels that are removed from the image when using the Speckle Removal slider in the Noise tab), none of the Analysis tab information is updated as you apply image property changes. You cannot edit the information on the Analysis tab.

Note If you are using VRS with a scanner that supports Automatic Color Detection and Color Background Saturation, an additional group box called *Color Information* appears on this dialog box. For more information, refer to *Advanced Color Processing* on page 93.
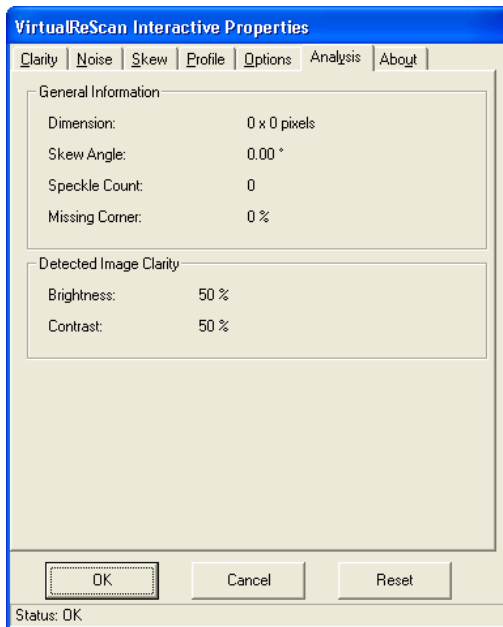
Figure 2-45. Analysis Tab

Using the About Tab

The About tab lists the VRS version information, along with the contact information for Kofax Image Products. For direct access to the Internet, you may either:

- Click the VRS Online button to access the VRS product Web site, from which you can download product updates.
- Select www.kofax.com to visit the Kofax Web site.

Figure 2-46. About Tab

VRS Advanced Properties Dialog Box Overview

Users of the Böwe Bell + Howell Spectrum series, the Fujitsu *fi*-4990C, and the Fujitsu *fi*-4860C have access to the VRS Advanced Properties dialog box via the Special Features button on the Options tab. The Advanced Properties dialog box is made up of the following tabs: Endorser, Color, Picking Rectangle, Rotation, and About. Each tab is described in this section.
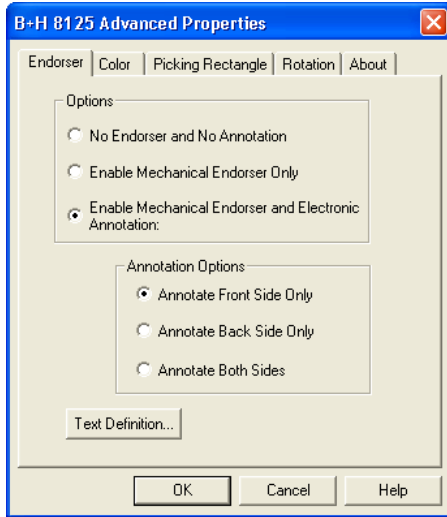
Figure 2-47. Advanced Properties Dialog Box

Some settings from the VRS Interactive Properties dialog box take precedence over settings on the Advanced Properties dialog box tabs. Image processing tasks will occur in this order:

1   VRS Interactive Properties Deskew (if enabled)

2   VRS Interactive Properties Auto Crop (if enabled)

3   Settings from the Advanced Properties Picking Rectangle tab

4   Settings from the Advanced Properties Rotation tab

Endorser Tab

VRS supports basic endorsing and annotation. For VRS Production-class scanners that are equipped with endorsers, you can set up endorsing properties using the Endorser tab of the Advanced Properties dialog box. Through the Endorser tab, you

will be able to build a text string from a text prefix and numeric counter value, and then use the string to endorse and/or annotate pages and images. Once added to the page or image, however, endorser and annotation strings are permanent.

The Endorser tab is divided into two groups, the Options group and the Annotation Options group. In the Options group, you can select from the following options:

- Endorsing Off, Annotation Off (default setting)
- Endorsing On, Annotation Off (mechanical endorsing only)
- Endorsing On, Annotation On (mechanical endorsing with electronic annotation)

When No Endorser and No Annotation are selected, no string is created on either the scanned page or on the resulting image. Selecting Enable Mechanical Endorser Only means that the endorsing string is physically printed on the scanned page, but is not placed on the image. By selecting Enable Mechanical Endorser and Electronic Annotation, you are choosing to have the endorsing string appear both on the document being scanned as well as on the resulting image.

When the Enable Mechanical Endorser and Electronic Annotation option is selected, the options in the Annotation Options group become available. Annotation can be performed on the document front, document back, and on both sides of a document, but the default setting is to annotate the front side only.

Also available on the Advanced Properties dialog box is a Text Definition option, which you can use to set and/or modify the contents of the endorser string. The Text Definition button is disabled unless endorsing and/or annotation is selected.

Text Definition Dialog Box

When the options for either Enable Mechanical Endorser Only or Enable Mechanical Endorser and Electronic Annotation are enabled, selecting the Text Definition button from the Advanced Properties dialog box launches the Text Definition dialog box. Use this dialog box to customize the endorser and/or annotation string. The Text Definition dialog box allows you to specify details about the endorsing string such as:

- Prefix (selection of text and date format)
- Location of the string relative to the Top and Left of the page
- Number of digits in the Page Counter
- Start number for the Page Counter
- Step Value (increment or decrement values) for the page counter.
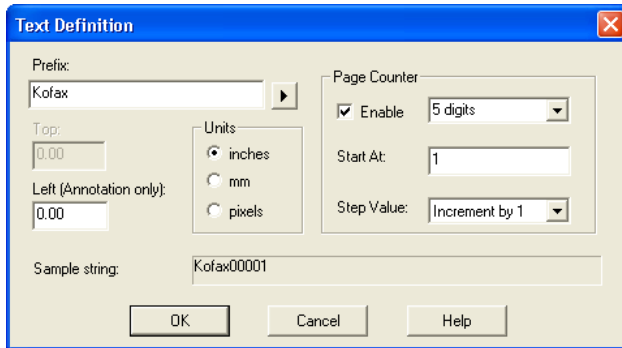
Figure 2-48. Text Definition Dialog Box

Prefix

The Prefix is an optional sequence of characters that you can set to precede the rest of your imprinting string. Typically, the prefix consists of a text string and a date. If no prefix is manually entered into the Prefix box, an empty string will be returned. When creating your text string, you will need to limit it to the characters in Table 2-7.

Table 2-7. Acceptable Prefix Text String Characters

space
0-9
% - _/\#.][()=+< > &
A-Z
a-z

You can manually enter the text string or date to be used during annotation, or you can select from the Prefix drop-down list to insert pre-formatted date information into the prefix string. These are the Prefix drop-down date format choices:

- YYYY-MM-DD
- DD-MMM-YY
- DD MMM YYYY
- MMM/DD/YYYY
- MMM/DD/YY
- MM/DD/YYYY
- MM/DD/YY
- MMM DD, YYYY
- MM.DD.YYYY
- MMM. DD, YY
- YYYY
- YY
- MMM
- MM
- DD
- YYDDD (Julian)

Once set, the contents of the prefix are identical for every endorsing and annotation occurrence for a batch. The counter, if enabled, will always be printed following the prefix (base) string. Prefixes are, however, restricted to the number of characters listed in Table 2-8. The number of allowable characters varies by scanner. Exceeding the maximum string length will result in the string being truncated to the maximum length and an audible alert.

Table 2-8. Maximum Number of Printable Characters in the Prefix

Page Counter	Fujitsu *fi*-4990C	Fujitsu *fi*-4860C	Böwe Bell + Howell Spectrum series
No counter	30 characters	40 characters	22 characters
Five (5) digit counter	25 characters (not incl. counter)	35 characters (not incl. counter)	NA
Eight (8) digit counter	25 characters (not incl. counter)	35 characters (not incl. counter)	NA
One to ten (1-10) digit counter	NA	NA	22 characters

Note Because the endorser/annotation string is made up of a text prefix and a counter, consider their combined length when setting the string length.

Directly below the Prefix box are the Top and Left text boxes, which you can use to specify the vertical and position of the annotation text string. A Units radio button group located near the edit boxes allows text positioning values to be specified in inches, millimeters, or pixels (DPI dependent). The default unit of measurement is inches.

In the Top text box, you may specify the distance of the endorsing and annotation string from the top of each page. The default and minimum value is zero, but the maximum value is dependent on the paper size. Whole numbers are required when entering pixels and millimeters, but when values are in inches, they can be entered in .01-inch increments.

In the Left box, the distance of an annotation string from the left edge of a page can be specified. The default and minimum value is zero, but the endorsing string is never printed less than 20 mm from the top of the page. The maximum is dependent on paper size. Whole numbers are required when entering pixels and millimeters. When

values are in inches, however, they can be entered in .01-inch increments. The Left edit box is disabled (grayed out) unless annotation is selected.

Note Not all scanners allow you to select a top and/or left position for your endorser string. Refer to your scanner documentation for more information.

On the right side of the Text Definition dialog box is the Page Counter group, which is used to enable the page counter, specify a starting number for your automatic endorser/annotation counter, set the number of digits to use, and determine the amount by which the counter will be incremented.

Enable

Select the Enable check box to activate the Page Counter feature. When the Enable check box is clear, all other elements in the Page Counter group are disabled.

Digits

The page counter length can be specified via a drop-down list. The available values depend on the scanner as well as on the installed endorsing hardware. Table 2-9 lists the maximum number of digits per scanner and the resulting counter value. The list contains only the available values for page counter length. Select None if you do not wish to increment the counter.

Note This drop-down list is only available when the Enable check box is selected.

Table 2-9.   Maximum Page Count per Scanner

Endorser and/or Page Counter	Fujitsu *fi*-4990C	Fujitsu *fi*-4860C	Böwe Bell + Howell Spectrum
16-bit endorser: 5 digits (drop-down list is disabled.)	65,535	65,535	NA
24-bit endorser: 5 or 8 digits	99,999 and 16,777,215 respectively	99,999 and 16,777,215 respectively	NA
1 to 10 digits; 5 digits is the default	NA	NA	The n-digit page counter will roll over at ($10^{**}n$) – 1.

Start At

The starting page counter value is set to 1 initially, but it may be reset using the Start At text box. When you start a new batch, the Page Counter Starting Value is the next number in the sequence based on the final page counter value from the previous batch. Again, you are free to enter a new value into the Start At text box instead.

Step Value

Select from the Step Value drop-down list to determine how the automatic endorser/ annotation counter is incremented on every page. Ideally, the counter should be set based on the documents being scanned, how the batches are organized, and specific user needs.

The following Step Values are available from the drop-down list.

- Increment by one (default)
- Increment by two
- Decrement by one
- Decrement by two

Note Decrementing is not available on the Böwe Bell + Howell Spectrum series.

Other Elements on This Dialog Box

The text displayed under Sample String shows how the current imprinting text will look with any optional date stamp or counter expanded. The current date is used.

Color Tab

VRS supports color features of the Böwe Bell + Howell Spectrum series, the Fujitsu *fi* 4860C, and the Fujitsu *fi*-4990C through the Color tab. You can use the Color tab to set up color-related features such as Color Dropout and JPEG Compression. The Color tab follows the Endorser tab on the Advanced Properties dialog box. The Color tab is made up of three groups: Front Side Dropout Color, Back Side Dropout Color, and JPEG Compression.
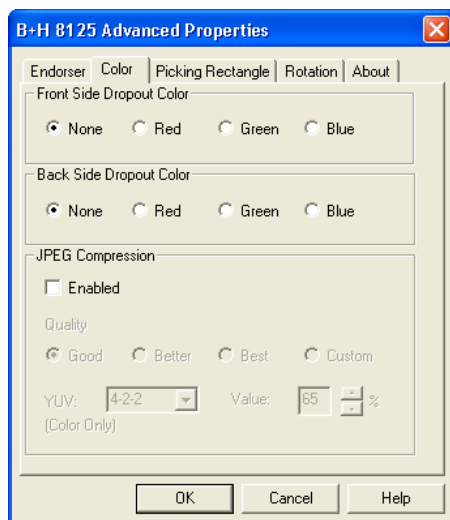
Figure 2-49. Advanced Properties Dialog Box – Color Tab

In some cases, you may want to remove all instances of one color, such as the background color, on a document in order to make the necessary data more accessible to OCR engines, etc. One method to effectively "erase" this unwanted color during scanning is to use color dropout. If you select a color to "drop out," your scanner will ignore that color, but capture everything else.

The Front Side Dropout Color and Back Side Dropout Color groups provide the following dropout color choices: None, Red, Green, or Blue. The default is None. If a scanner supports duplex, you can select different dropout colors for the front and for the back side.

Note The Böwe Bell + Howell Spectrum series scanners support color dropout. All scanners in the series support front and back side color dropout except for the Böwe Bell + Howell 8080 SB and Böwe Bell + Howell 8080 SC, which support single-sided scanning only. For these scanners, the back side options for color dropout are disabled.

JPEG (Joint Photographic Expert Group) is a standardized image format designed to compress color and grayscale images. In the JPEG Compression group of the Color tab, you can activate JPEG compression via the Enabled check box. When the Enabled check box is selected, you may then select an image quality level of Good (65), Better (80), Best (95), or Custom.

When the Custom image quality level option is selected, both a YUV value and a Custom JPEG Compression Value may be set. The Custom value has a range of 1 to 100, with a default of 65. As a very general example, setting the JPEG Compression Value at 100 would probably compress the image so lightly that it would be near its original size; a JPEG Compression Value of 10, however, could result in major data loss.

You may type a custom quality JPEG Compression Value into the text box provided, or use the up and down arrows to select a value. Because results from the Custom JPEG Compression Value cannot be predicted with certainty, use this setting with caution. The key is to achieve an agreeable balance between better performance (through optimum compression) and quality of the images. Avoid compression that speeds up scanning yet loses necessary data.

YUV, a color-encoding scheme involving luminance (frame and field brightness or "Y") and chrominance (color information or "UV"), may be selected if desired from the drop-down list. The choices for YUV may vary by scanner. The Fujitsu *fi*-4990C, Fujitsu *fi*-4860C, and the Böwe Bell + Howell Spectrum series choices are 4-4-4 or 4-2-2, with a default of 4-2-2. When the JPEG Compression Enabled check box is clear, the Quality, YUV, and quality Value choices are disabled.

Picking Rectangle Tab

The Picking Rectangle tab allows you to select only the portion of an image to be scanned or processed, effectively cropping off unwanted data. This feature is only available for the Böwe Bell + Howell Spectrum series, the Fujitsu *fi*-4990C, and the Fujitsu *fi* 4860C.

The Picking Rectangle tab is divided into two groups: Front Side and Back Side. If a scanner supports duplex scanning, you may select picking rectangle settings for the front or the back side, or both the front and the back side. For simplex scanners, only the Front Side setting will be available: the Back Side options will be disabled (as is the case with the Böwe Bell + Howell 8080 SB and Böwe Bell + Howell 8080 SC).
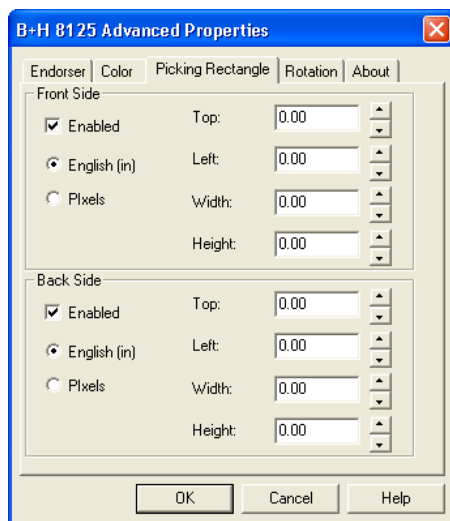
Figure 2-50. Advanced Properties Dialog Box – Picking Rectangle Tab

The Picking Rectangle tab allows you to enable and set the following:

- Unit of measurement to be used via the English or Pixels options
- Placement of the picking rectangle on the document--more specifically, the distance from the top and left (offset) of the document edge using the up and down arrows or by entering the distance into the Top and Left text boxes
- Width and Height of the picking rectangle using the up and down arrows or by entering the picking rectangle dimensions into the appropriate text boxes

Rotation Tab

For the Böwe Bell + Howell Spectrum series, the Fujitsu *fi*-4990C, and Fujitsu *fi*-4860C scanners, a Rotation tab will be available from the Advanced Properties dialog box. For other scanners, rotation options will be available from the scan application.
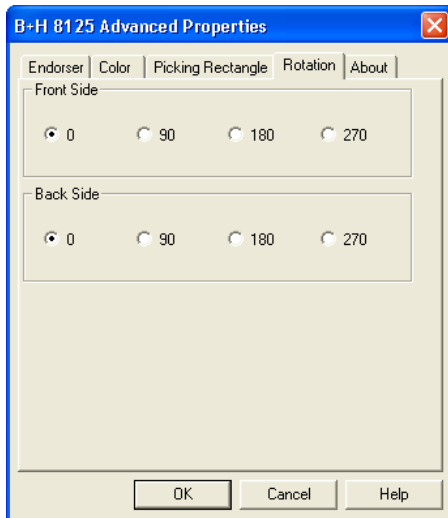
Figure 2-51. Advanced Properties Dialog Box – Rotation Tab

The Rotation tab contains a Front Side and a Back Side group. When a scanner supports duplex scanning, the front side and/or the back side of a scanned image can be rotated by 90, 180, or 270 degrees. Selecting 0 means no rotation. On simplex scanners, only Front Side rotation is enabled.

When there is an image displayed in the VRS Viewer, the image displays at the rotation angle plus the angle set on the VRS Interactive Properties Skew tab. Furthermore, any rotation in ImageControls-based applications is independent of (and performed after) the rotation set from the Rotation tab. Rotation tab settings apply after deskew, crop, and settings from the Picking Rectangle tab. In other words, image-processing tasks will occur in this order:

- First, VRS deskew (if enabled)
- Second, VRS crop (if enabled)
- Third, settings from Picking Rectangle tab
- Fourth, settings from Rotation tab

About Tab

Located at the rightmost tab position of the Advanced Properties dialog box is the About tab. The About tab provides valuable information particularly relevant to Technical Support issues. In addition to listing the scanner firmware version and the Enhanced Grayscale Adapter (EGSA) firmware version, the About tab also displays whether a scanner endorser is installed and whether the endorser is a 16-bit or 24-bit endorser (if applicable).
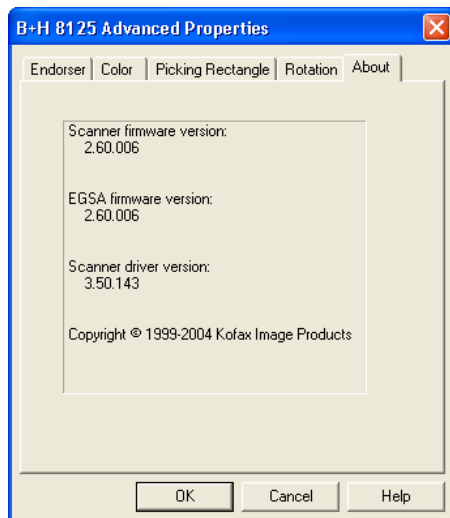
Figure 2-52. Advanced Properties Dialog Box – About Tab

VRS Restore Default Values Utility

Overview

The VRS default settings have been carefully chosen to allow VRS to excel at a wide range of documents without adjustments. In the day-to-day use of VRS, however, these default settings may inadvertently be altered. The VRS Restore Default Values (RDV) utility performs two valuable functions: it restores VRS settings to their original values and sets the default VRS scanner without requiring VRS to be reinstalled.

The Restore Default Values utility allows you to reset these values to their original state while carefully preserving any custom profiles that may have been created in the meantime. When you install VRS, the Restore Default Values utility is included as part of your installation.

Installation Instructions

This section describes how to install and use the RDV utility.

Note The imgctls folder location depends on the destination folder set during the installation process.

▶ **How to install the VRS Restore Default Values utility**

  1   Go to C:\Program Files\Kofax\imgctls\install\RDV and double-click on Setup.exe. The RDV installation will begin, as indicated by the RDV Setup Welcome screen.
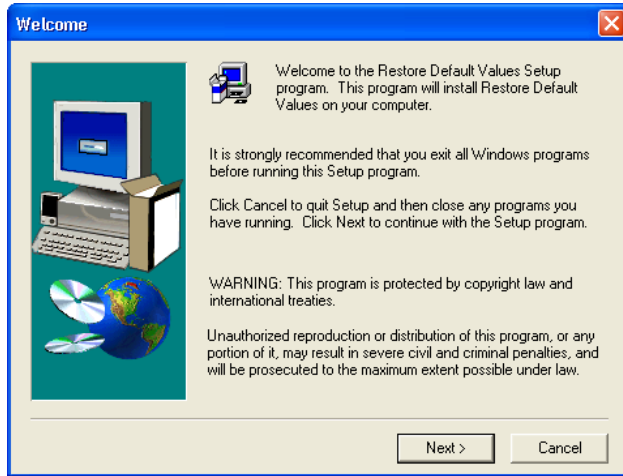
Figure A-1. RDV Setup Welcome Screen

2   Click Next. RDV setup will begin. When the progress indicator disappears, the RDV installation utility is complete.

3   A shortcut to the RDV program is added to the Kofax VRS program folder.

▶ **How to create a shortcut for the RDV utility on your desktop**

1   Go to C:\Program Files\Kofax\imgctls\RDV and right-click on RDV.exe.

2   Select Create Shortcut from the right-click menu.

3   Click, drag, and drop Shortcut to RDV.exe onto your desktop.

Restoring VRS Settings

This procedure gives a quick overview of how to use the RDV utility.

▶ **To restore VRS settings to the factory defaults**

  1 Double-click on the RDV desktop icon to launch the utility.

  2 Select the Restore factory default settings option, which will update your settings from the Restore Default Settings utility.

   -or-

   If you want the most current VRS settings and have Internet access, select the Download latest defaults from the Kofax Web site option. This will automatically launch your Web browser and begin the download of the factory default settings. Again, you must have Internet capability to use this feature.

  3 Click Apply.

  4 Select OK. The settings will be restored.

Note There is no need to restore VRS settings to the factory defaults when you choose to select another scanner as the default VRS scanner. Default settings are automatically updated when you change the VRS scanner using this utility.

Changing the Default VRS Scanner

If you have used VRS with one scanner, but have switched to another scanner (or scanners) at some point by reinstalling VRS, you may use the VRS Restore Default Values Utility to change the default VRS scanner without reinstalling VRS again.

▶ **To select another scanner as the default VRS scanner**

1   Click twice on the RDV desktop icon to launch the utility.

2   On the Select scanner drop-down list in the VRS Scanner group, select the scanner.

3   Click Apply. As a result, when Kofax VRS is listed as a source in your scan application, this scanner will be used.

4   Click OK to close the utility.

If you are switching to a Canon DR-2080C, a Canon DR-3060, a Canon DR-3080C, a Kodak i50, or a Kodak i60 scanner, you may receive an error message similar to the following when you attempt to use the default scanner: `"Missing or Corrupt ISIS.pxw scanner driver file."` This file is only installed by VRS when the scanner is selected during the setup process.

▶ **To install the ISIS.pxw (ISIS driver),** do **one** of the following:

•   Install the ISIS driver from the scanner manufacturer CD.
•   Reinstall VRS and select the scanner during VRS setup.

If you are switching to a Canon CanoScan N 650U/N 656U, a Canon CanoScan N 1220U, a Fujitsu *fi*-4110CU, an HP ScanJet 7400C series, or a Visioneer 9650 USB scanner, please see the special TWAIN and/or USB installation instructions in Chapter 2 of the *VRS Installation Guide*. Once you have installed the scanner using these instructions, you will be able to use the VRS RDV utility to switch between another scanner to this one and vice versa.

Long Paper Support

Overview

VRS supports long paper scanning for production-class scanners such as the Böwe Bell + Howell Spectrum series, the Fujitsu *fi*-4990C, and the Fujitsu *fi*-4860C.

Activating Long Paper Support

Using VRS, you can scan duplex paper up to 36" in Black and White mode at 300 DPI and below. With long paper support activated, images may not be rotated.

▶ **To scan long paper (up to 36") in VRS**

1 Start your scan application (VCDemo is used in this example) and select Source | Properties.

2 At the Scanner Properties dialog box, select Continuous Sheet.
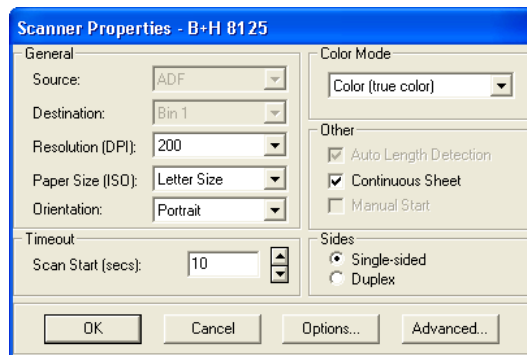
Figure B-1. Scanner Properties Dialog Box

3 Click OK. You may now scan documents up to 36" in length.

VRS Non-Interactive Mode

Using Non-Interactive Mode vs. Interactive Mode

Users of the Böwe Bell + Howell Spectrum series scanners have the choice of selecting VRS in a non-interactive mode at the time of installation. This mode is specifically designed for Böwe Bell + Howell users who do not wish to see any VRS dialog boxes while scanning, even though VRS is running conveniently in the background.

While this feature is automatically set during installation of a Böwe Bell + Howell Spectrum II series scanner, VRS non-interactive mode can be switched back to interactive mode.

▶ **To switch the Böwe Bell + Howell Spectrum series scanner from non-interactive mode to interactive mode**

1   Right-click on the VRS taskbar icon.

2   Select QC Modes | Hardware Warnings.

3   Select On Errors. Non-interactive mode will effectively be turned off.

4   In addition, you may go to the VRS Administration Utility and customize how you want VRS to respond to hardware problems. Refer to *Configuring VRS Before You Scan* on page 15 for more information.

Appendix C

Enhanced Bar Code Engine

Overview

Access to the Kofax Standard bar code recognition engine is provided through ImageControls-based applications and ISIS-based applications. In addition to the standard bar codes, you will have access to the Enhanced Bar Code feature if you are using an ImageControls-based application or an ISIS-based application and do **one** the following:

- Purchase the VRS for Professional Scanners with Adrenaline Image Processing Engine bundle with the Enhanced Bar Code hardware key (dongle).
- Use VRS in combination with a Kofax 650iMV, 650iHV, or an Adrenaline 650i as your SCSI scanner controller.

This section gives information on the bar code types supported, the differences between the Standard Bar Code engine and the Enhanced Bar Code engine, and instructions on how to switch between them. Refer to *Using the Bar Code Properties Dialog Box* on page 87 for more information.

Standard vs. Enhanced Bar Code

With the Adrenaline Image Processing Engine, the ability to capture and read bar codes has been expanded through the application of color technology. Because color images provide more information to assist in bar code interpretation, the enhanced bar code reader is able to achieve more accurate readings of all supported bar code types at low DPI levels and varying levels of quality. The enhanced bar code also has the ability to work with grayscale images in addition to having improved bitonal recognition capability. Another significant advancement is the support of two-dimensional (2D) bar codes.

If you are not familiar with this dialog box, refer to *Using the Bar Code Properties Dialog Box* on page 87.
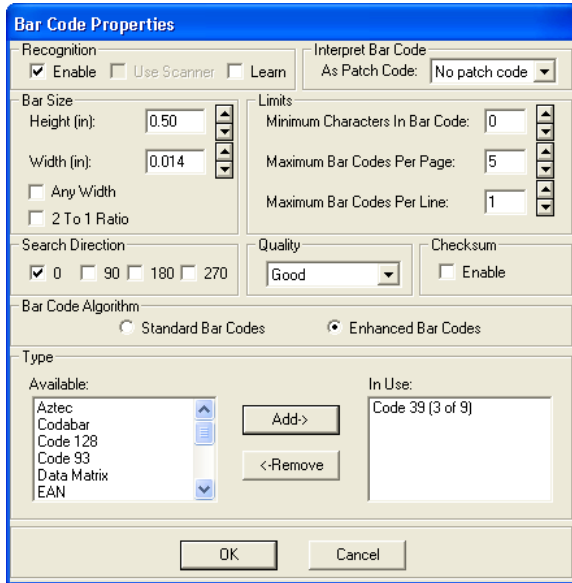
Figure D-1. Bar Code Properties Dialog Box

With the Enhanced Bar Code engine, you will be able to scan all the standard bar code types with improved recognition, in addition to the 2D bar codes. The Enhanced Bar Code engine supports the following bar codes:

- Aztec
- Codabar
- Code 128
- Code 39 (3 of 9)
- Code 93
- DataMatrix
- EAN
- Interleaved 2 of 5
- Maxi Code
- PDF 417
- Postnet
- QR
- UPC-A
- UPC-E

Standard bar codes include the following:

- Codabar
- Code 128
- Code 39 (3 of 9)
- Code 93
- EAN
- Interleaved 2 of 5
- Linear 2 of 5
- Postnet
- UPC-A
- UPC-E

How to Switch Between Bar Code Engines

While the Kofax Enhanced Bar Code recognition engine offers many advantages over the standard bar code recognition engines, in some cases the processing speed may vary. For those who wish to focus on processing speed rather than quality of recognition, the Standard Algorithm may be preferable. To make this transition easier, both algorithms are available for selection at any time without restarting the scan application.

▶ **To switch the active bar code engine**

1 At the Bar Code Properties dialog box, go to the Bar Code Algorithm group.

2 Select one of the following check boxes:
- Standard Bar Codes
- Enhanced Bar Codes

3 The corresponding bar code types will immediately become available.

4 Select the desired bar code type(s). Hold down the Control key to select multiple bar codes.

5 Click OK.

Note The 2D bar codes are not supported when you switch to the Standard Bar Code algorithm.

Accessing the Bar Code Properties Dialog Box

How you access the Bar Code Properties dialog box varies according to your scan application. From the Scan Demo application, as an example, you may select the Bar Code check box in the Recognition group of the Image Scanning Properties dialog box to enable your scan application to automatically recognize certain bar codes during scanning.
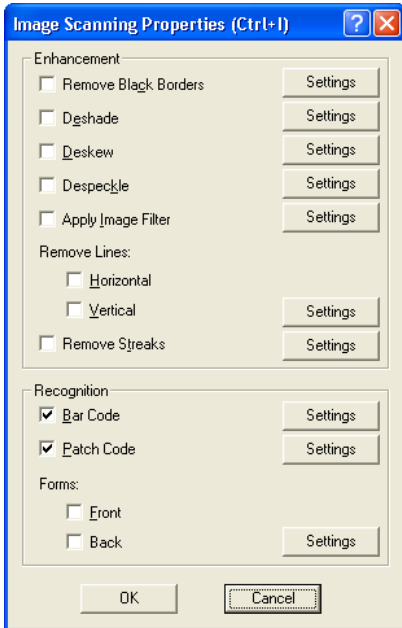
Figure D-2. Scan Demo Image Properties Dialog Box

Clicking the Settings button launches the Bar Code Properties dialog box, where you may customize how bar codes are handled. When a potential bar code is found, your application examines the bar code and determines if it meets the requirements you have selected. If so, it is decoded and bar code data is returned to your scan application. This bar code data can then be used, for example, in indexing and workflow operations, or for tracking inventory.

Using the Bar Code Properties Dialog Box

This section describes the options on the Bar Code Properties dialog box.

Recognition Group

The Recognition group of the Bar Code Properties dialog box gives you the ability to enable bar code recognition, to select scanner-specific bar code recognition (if available), and to implement the bar code learn feature.

Enable

Select the Enable check box to enable bar code recognition. Clear the check box to disable bar code recognition.

Use Scanner

The Use Scanner option is reserved for scanners that have bar code recognition ability.

Learn

The bar code Learn feature automatically ascertains the most appropriate values associated with bar codes on an image. It uses the selected bar code type(s) and search direction(s) to detect bar codes on the current image, and updates the following values:

- Height
- Width
- Ratio
- Quality

For best results, bar codes should be "learned" using the same scanner and scanner settings that will be used to process images. In addition, you must know the type of bar codes you are using for the Learn feature to work properly.

Note The Learn feature does not work with Postnet bar codes. In addition, the Learn mode operates on one bar code at a time. You cannot "learn" multiple bar codes or mixed bar code types with a single Learn operation.

Interpret Bar Code Group

Using the Interpret Bar Code option, you may translate bar codes as patch code. Choose a patch code from the list, or select No Patch Code to disable this feature.

- Patch I
- Patch II
- Patch III
- Patch IV
- Patch T
- Patch VI

Bar Size Group

Under Bar Size, you can type or select the Height and Width of the bar size.

Height

The height of a bar code is the distance between the top of the bars and the bottom of the bars. The minimum height is .015 inch and the maximum is 1.25 inches. You can type or select the bar code height from the drop down list.

Width

The bar width, the physical thickness of the narrowest element in a bar code, ranges from 0.010 to 0.050 inches. Type or select the width from the list.

Any Width

When the bar width is unknown, you can select this check box to allow the application to automatically determine the bar width as it searches for potential bar codes.

2 to 1 Ratio

Some bar code types support an optional ratio between the narrowest element and the larger elements in the code. In a 2 to 1 ratio, the width of the largest elements is two times larger than the narrowest element. For example, if the width of the narrowest element is .20 inches, the width of the largest elements will be .40 inches.

Note The ratio setting only has meaning for Codabar, Code 39, Code 93, Interleaved 2 of 5, and Linear 2 of 5.

Search Direction Group

The application searches for bar codes in a linear fashion, examining the search area for potential bar codes. For horizontal bar codes with an orientation of 0, for example, it works down the image starting on the left and searching toward the right edge; for vertical bar codes, it works across the image starting on the top edge and searches top to bottom. Bar codes can be oriented on an image in four general directions. You can select the 0, 90, 180, or 270 check box for the direction you would like to search.

Table D-1. Search Direction Options

Orientation	Direction on the Image
0	Horizontal, rotated 0 degrees, read left to right
90	Vertical, rotated 90 degrees, read top to bottom
180	Horizontal, rotated 180 degrees to the right, read right to left
270	Vertical, rotated 270 degrees to the right, read bottom to top

Quality Group

The bar code Quality refers to the condition of bar code elements on an image. For example, sometimes the bar code elements are well defined; the black bars are clearly delineated, and very little noise exists on the image. In some cases, the black bars are too light, or noise exists in the bar code's quiet zone. Because these factors can affect the application's ability to accurately read the bar code, you can specify the quality of the bar codes being read.

- **Good**—Well delineated, have smooth edges, and are noise free.
- **Normal**—Generally well delineated, but may have some noise and rough edges.
- **Poor**—Have jagged edges or other characteristics that might make them hard to read.

Checksum Group

Note Checksum verification only has meaning for Code 39, Interleaved 2 of 5, and Linear 2 of 5 bar code types. It is ignored for all other bar code types.

Usually the last character in the bar code, the checksum character helps to ensure that the bar code is valid. Selecting the Enable check box in the Checksum group allows the application to perform checksum verification.

Patch Code Recognition

Overview

A patch code is a pattern of horizontal black bars separated by spaces and typically placed near the leading edge of a document to be scanned. It can be used to separate documents or to stop the scanner. You may perform patch code recognition if you are using an ImageControls-based or ISIS-based application and **one** of the following is true:

- You purchased the VRS for Professional Scanners with the Adrenaline Image Processing Engine bundle.
- You are using VRS in combination with a Kofax 650iMV, 650iHV, or an Adrenaline 650i as your SCSI scanner controller.

The Patch Code Properties dialog box, shown in Figure E-1, can be used to enable, disable, or specify the location of a patch code. In VCDemo, the Patch Code dialog box is accessed via the Imaging menu. Other patch code options are set from the Units option on the File menu in VCDemo.
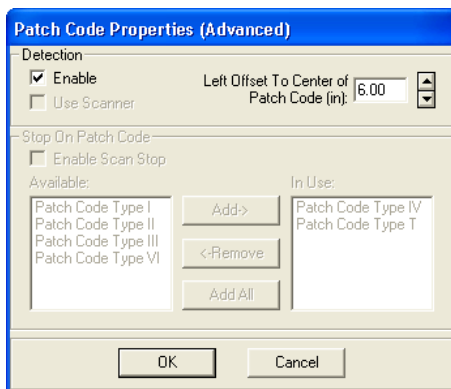
Figure E-1. Patch Code Properties Dialog Box

Using the Patch Code Properties Dialog Box

Use the following options to enable patch code detection.

Enable

Select the Enable check box to take advantage of the patch code detection feature.

Left Offset to Center of Patch Code

The Left Offset to Center of Patch Code is a value you select from the left edge of the page that defines a point near the center of the patch code. The offset value allows the patch code detection feature to quickly locate the patch code on the page. This offset can be any value in inches between 0 and the maximum page width. A value of 0 specifies searching anywhere in the horizontal direction for a patch code.

All patch codes are made up of narrow and wide bars as follows:

- The narrow bars must be 0.08 inch in height.
- The wide bars must be 0.20 inch in height.
- The entire patch code must be 0.80 inch in height.
- The entire patch code should be at least 2.0 inches in width.

To be detected, patch codes must be positioned correctly on the page:

- The patch code must be horizontal.
- It must be located at least 0.20 inches from the leading edge of the image.
- It must not extend beyond 3.75 inches from the leading edge of the image.

In compliance with the patch code specification for duplex scanning operations, patch codes are only detected on the front side of a page. Patch codes on the back side of a page are ignored.

Note As an alternative to using patch codes, you can specify that a bar code be interpreted as a patch code, as well as a bar code. This might be useful, for example, if there is always a bar code on the first page of each document. The Bar Code Properties dialog box is used to configure bar codes for use as patch codes. For more information, refer to *Using the Bar Code Properties Dialog Box* on page 87.

Advanced Color Processing

Overview

If your scanning application is set to color mode and you are using a Böwe Bell + Howell Spectrum II series scanner, your VRS installation will include advanced color image processing options. These options are accessible from the Color tab on the VRS Interactive Properties dialog box.

You can use the options on the Color tab to implement features such as Automatic Color Detection and Color Background Saturation. Additional options related to color processing will also be available from the VRS Administration Utility and the Analysis tab. For more information, refer to *Color Confidence Out of Range Warning* on page 99 and *Color Information on the Analysis Tab* on page 100.

Automatic Color Detection

Automatic Color Detection is the ability to detect and process a color image, or color content within an image. VRS can process a batch that contains both color and non-color images; the non-color documents are output as bitonal images. Automatic Color Detection includes a Color Object Size Detection setting that you can use to adjust sensitivity to documents that include small amounts of color.

With Automatic Color Detection, VRS is capable of outputting a document or batch of mixed image types as color or bitonal, based on automatic recognition of the image content. You can configure Automatic Color Detection to detect or ignore small amounts of color, or pages printed on color paper.

If you do not enable the Automatic Color Detection feature while scanning in color mode, VRS will process every document as a color image.

Note When Color Detection and Blank Page Thresholding are both enabled, be aware that a document detected as bitonal may not meet the criteria required to perform Blank Page Thresholding.

Color Content Aggressiveness

When Automatic Color Detection is enabled, you can specify how aggressive VRS should be in detecting the color content of documents. You can use the Color Content Aggressiveness controls to increase/decrease the likelihood that VRS will accurately detect color content. The range of aggressiveness spans from 0 to 255. To increase the likelihood that VRS will detect color content in a document, you would assign a high value. By assigning a low value to Color Content Aggressiveness, you decrease the likelihood that VRS will detect color content in a document.

Small Color Object Detection

If you want VRS to detect small amounts of color that appear on otherwise bitonal documents, you can enable Small Color Object Detection. With this feature enabled, you can use the Color Object Size Aggressiveness control to specify how aggressive VRS should be in detecting small amounts of color. The range of Color Object Size Aggressiveness spans from 0 to 255. To increase the likelihood that VRS will detect small amounts of color in a document, you would assign a high value. By assigning a low value to Color Object Size Aggressiveness, you decrease the likelihood that VRS will detect small amounts of color in a document.

Color Background Saturation

Color Background Saturation is the ability to apply special processing to the background of a color document. When Color Background Saturation is in effect, the background color can be changed to black or white. The background can also be smoothed and converted to a specific color (the smoothed color is an aggregate of the background colors detected). If Color Background Saturation is not enabled, no special processing is performed on the background in color documents.

Color Saturation Aggressiveness

When Color Background Saturation is in effect, you can use the Color Saturation Aggressiveness controls to specify the aggressiveness of the background processing. The range of aggressiveness spans from 0 to 255. To increase the likelihood that VRS will determine that a pixel is part of the image background, you would assign a high value. By assigning a low value to Color Saturation Aggressiveness, you decrease the likelihood that VRS will determine that a pixel is part of the image background.

Color Selection

You can use the Color Selection settings to override the results of Automatic Color Detection. Color Selection overrides apply only to the current image in a batch. You can select the following Color Selection options:

- Color: Image is processed in color, regardless of the results of the color detection process.
- Black & White: Image is processed in black and white, regardless of the results of the color detection process.
- Automatic: Image color is processed according to the results of the color detection process. This is the default selection.

Using the Color Tab

Use the procedure in this section to specify values for Automatic Color Detection, Color Background Saturation, and Color Selection.

▶ **To configure the Color tab settings**

    1 From the VRS Interactive Properties dialog box, select the Color tab.
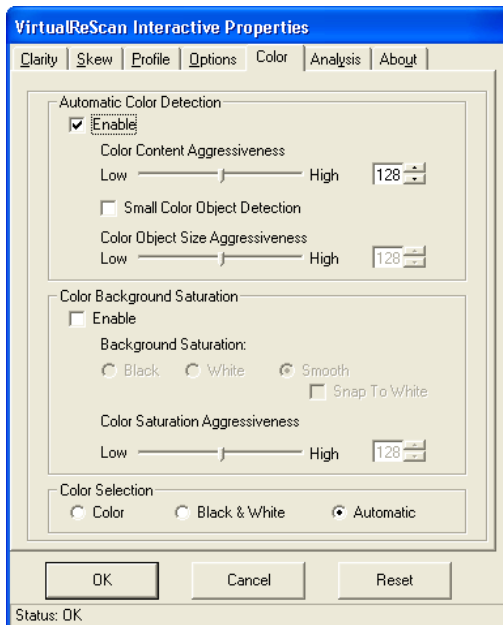
    Figure F-1. Color Tab

    2 Select the Enable check box if you want to enable Automatic Color Detection. If this check box is not selected, a color image is always returned when you scan in color mode, regardless of the color content of the document.

    3 Adjust the Color Content Aggressiveness setting by doing one of the following:

- Move the slider to the left to decrease the likelihood of detecting a color document.
- Move the slider to the right to increase the likelihood of detecting a color document.
- Click the arrows of the text box to increase or decrease the Color Content Aggressiveness value.

- Click in the Color Content Aggressiveness text box and type a value.

4   Select the Color Object Size Detection check box if you want to the function that is used to identify small amounts of color on otherwise bitonal documents. If this check box is not selected, the scanner may not detect small amounts of color.

5   Adjust the Color Object Size Aggressiveness setting by doing **one** of the following:

- Move the slider to the left to decrease the likelihood of detecting small amounts of color.
- Move the slider to the right to increase the likelihood of detecting small amounts of color.
- Click the arrows of the text box to increase or decrease the Object Size Aggressiveness value.
- Click in the Color Object Size Aggressiveness text box and type a value.

6   Select the Enable check box to turn on the Color Background Saturation features which you can use to modify the background of a color image. If this check box is not selected, the background region of a color image is not altered when it is processed.

7   You can select from the following Background Saturation options for processing images with color backgrounds:

- White: All background color is changed to white.
- Black: All background color is changed to black.
- Smooth: All background pixels are smoothed to the same value.

8   If you selected Smooth in the previous step, the outcome will be directly affected by the Snap To White setting, as follows:

- If Snap to White is selected and the image background is close to white, the resulting background color is white. The exact white color is determined by the selections in the scanner panel interface.
- If Snap to White is selected and the background is not close to white, the background color is set to a smoothed color value determined by the scanner.
- If Snap to White is not selected, the background color is set to a smoothed color value that is an aggregate of the detected background colors.

9   Adjust the Color Saturation Aggressiveness setting by doing **one** of the following:

- Move the slider to the left to decrease the level of background region processing in color documents. A low value decreases the likelihood that a pixel will be determined to be part of the image background.

- Move the slider to the right to increase the level of background region processing in color documents. A high value increases the likelihood that a pixel will be determined to be part of the image background.
- Click the arrows of the text box to increase or decrease the Color Saturation Aggressiveness value.
- Click in the Color Saturation Aggressiveness text box and type a value.

10 You can use the Color Selection settings to override the results of Automatic Color Detection, and they apply only to the current image in a batch. These settings are available only if Automatic Color Detection is enabled. You can select the following options:

- Color: Image is processed in color, regardless of the results of the color detection process.
- Black & White: Image is processed in black and white, regardless of the results of the color detection process.
- Automatic: Image color is processed according to the results of the color detection process. This is the default selection.

11 If you make adjustments that you do not want to save, click Reset to clear them and restore the default values.

12 When you are satisfied with the new Color tab settings, click OK. The settings are saved to the profile that is currently selected.

Color Confidence Out of Range Warning

When using the VRS advanced color processing features, you will notice that a Color Confidence Out of Range warning appears on the Warnings tab.
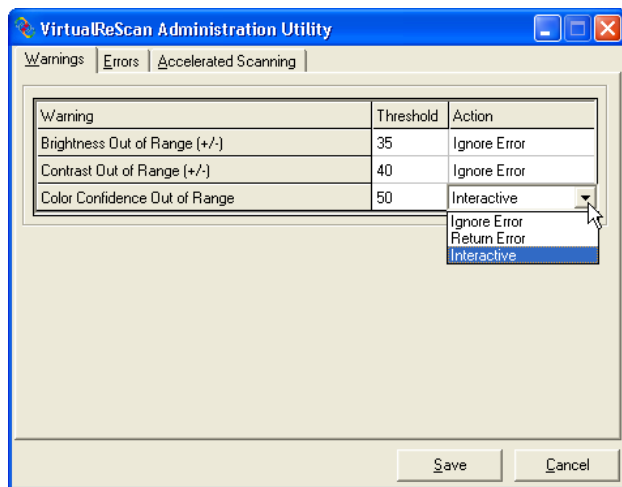
Figure F-2. Color Confidence Warning

Color Confidence Out of Range

Use this threshold to define the valid range for color confidence values. When a document is scanned, VRS evaluates the image to determine if it is color or bitonal. VRS also determines how confident it is that the correct assessment was made. The confidence level is expressed as a percentage.

VRS compares the percentage to the user-defined acceptable value, which is the Color Confidence Out of Range threshold setting on the Warnings tab. Based on this real-time evaluation, VRS either accepts the image and allows it to be passed on to the scan application, or intercepts it and responds according to the user-defined action in the Warnings tab.

For example, if the threshold is 50 on the Warnings tab, VRS accepts any image with a color confidence value of 50 or higher. Therefore, an image with a color confidence value less than 50 would fall below the valid range and generate a warning. VRS would respond by taking the action listed on the Warnings tab for Color Confidence Out of Range, as shown in Figure F-2.

Color Information on the Analysis Tab

When using the VRS advanced color processing features, you will notice that a group box called *Color Information* appears on the Analysis tab. The two Color Information values relate to the current image in the VRS Viewer:

- **Detected Color**: This value indicates whether or not the current image has been processed as a color image or a bitonal image. To make the determination, VRS takes into account the values on the Color tab in the VRS Interactive Properties dialog box. Based on those settings and the amount of color on the image, VRS determines whether or not the image is color or bitonal.
- **Color Confidence**: This value indicates how certain VRS is about reporting the content of an image as either color or bitonal. The Color Confidence value is directly affected by the Color tab settings, including the color detection aggressiveness settings.

You can review the values in the Color Information group box to help identify the proper threshold value for color confidence on the Warnings tab, as well as the proper settings on the Color tab. For more information, refer to *Color Confidence Out of Range Warning* on page 99 or *Using the Color Tab* on page 96.

VirtualReScan Interactive Properties

Clarity | Skew | Profile | Options | Color | Analysis | About

General Information

Dimension:	0 x 0 pixels
Skew Angle:	0.00 °
Speckle Count:	0
Missing Corner:	0 %

Detected Image Clarity

Brightness:	50 %
Contrast:	50 %

Color Information

Detected Color:	Color
Color Confidence:	100 %

OK   Cancel   Reset

Status: OK
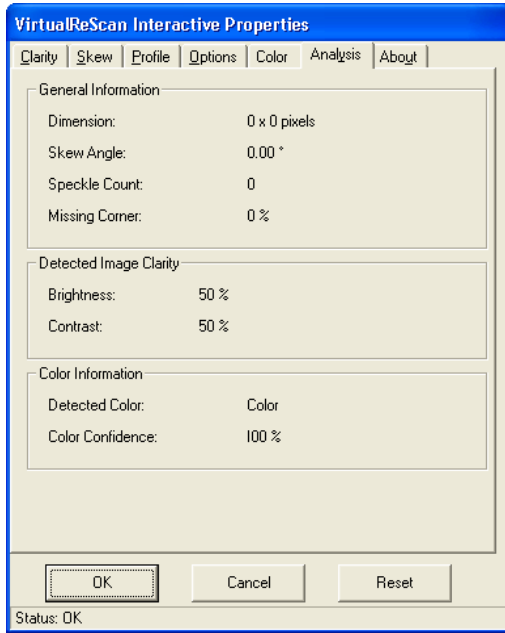
Figure F-3. Analysis Tab with Color Information

Appendix F

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