MultiView™
Software

MultiView™ MR Breast Software 4.1 User Guide

MAN-10410 Revision 001

HOLOGIC®

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Preface

CAUTION ⚠	Federal Law restricts this device to sale by or on the order of a physician. Consult the Intended Use, Limitations, and Precautions sections below.

□	Class II Device

Symbols and Safety Notices

The following symbols are used in this guide.

Symbol	Meaning
⚠️ **WARNING**	An orange WARNING symbol is used to identify conditions or actions for which a specific hazard is known to exist. These conditions or actions may cause severe personal injury or substantial property damage if the instructions are not followed.
⚠️ **CAUTION**	A yellow CAUTION symbol is used to identify conditions or actions for which a potential hazard may exist. These conditions or actions may cause minor personal injury or property damage if the instructions are not followed.

Symbol	Meaning
	Class II (double-insulated) electrical equipment.
	Manufacturer of the device.
CE 2797	This product complies with the essential requirements of the relevant European health, safety and environmental protection legislation.
EC REP	Authorized representative for Europe.

Intended Use

MultiView^{TM} is a software application that is intended for use in processing, manipulating, and displaying magnetic resonance imaging (MRI) images as well as other multi-modality DICOM medical images and data that it receives from various sources (e.g. CT, US, secondary capture devices, scanners, imaging sources, and imaging gateways).

MultiView provides various image processing and measurement tools to facilitate the interpretation of breast MRI images and enable diagnosis. These computer-aided and/or user-defined processing functions include artifact minimization, image subtractions, multi-planar reformats, and maximum intensity projections. It also includes the following automatic functions: physiological analysis tools, diffusion analysis, and segmenting of lesions. MultiView also provides tools for automated targeting for breast interventional procedures.

Lossy compressed mammographic images and digitized film screen images must not be reviewed for primary image interpretations. Mammographic images may only be interpreted using an FDA cleared monitor that meets technical specifications reviewed and accepted by the FDA.

MultiView is typically used by trained professionals, including radiologists, technologists and clinicians and may provide information to be used for screening, diagnostic and interventional procedures. Patient management decisions should not be made solely on the results of MultiView analysis.

Limitations

WARNING

Risk of Incorrect Diagnosis

- Effective use of the MultiView device requires adherence to MR imaging protocol requirements and the imaging manufacturer's instructions regarding maintenance and calibration of the MR imager.

- The measurement accuracy of MultiView is limited to the accuracy of the MR imaging system, site-specific imaging techniques, and patient motion effects.

CAUTION

Risk of Incorrect Diagnosis

- All medical professionals and personnel using the MultiView device must be trained in the use of the device.

- When used for biopsy guidance, MultiView must be used with a Hologic-approved grid and fiducial system to ensure accurate measurements.

- Although the MultiView device is designed to be compatible with a wide range of MR imaging systems, imager-specific variations may require assistance from Hologic prior to initiating use of the device.

- Lossy compressed mammographic images and digitized film screen images must not be reviewed for primary image interpretations.

- MultiView incorporates motion correction functionality; however, patients must be instructed to avoid movement and other immobilizing techniques should be used to minimize the amount of patient motion during the MRI exam to maximize accuracy of registration of images. Achieving satisfactory registration will contribute to optimizing the performance of the MultiView device.

- MultiView incorporates DICOM anonymization functionality; however, it is the user's responsibility to exercise care and act in accordance with HIPAA regulations when sharing patient-specific data and information.

Precautions

Dedicated Installation

It is recommended that the MultiView software be installed on a dedicated workstation that supports only the MultiView software application, its plug-ins, and its operational software. If other applications will be installed on the MultiView workstation, the workstation hardware must be sufficient to support these applications in addition to MultiView.

Installation and Service

MultiView shall be installed only by Hologic-authorized personnel. Only technically qualified personnel, trained by Hologic, shall perform troubleshooting and service procedures on the software and internal components.

Installation and Use of Unrelated Software

Unrelated software applications installed or used on the MultiView workstation may affect performance and may compromise or corrupt patient medical records. When installing antivirus software, ensure that files in c:\Program Files\ClearCanvas are excluded.

Data Backup Procedures

Hologic recommends using existing network procedures to back up data on a regular schedule. The MultiView system should not be used to archive or to back up data from an MR imager. Misuse of the MultiView database in this way may affect performance and compromise or corrupt patient medical records.

Introduction

MultiView MR Breast is a DICOM compliant software application that communicates with remote DICOM devices to send and receive imaging cases. Images may be sent to and received from both PACS and MRI scanner workstations. MultiView can be used in three modes: reading, targeting and manual targeting. The modes available to you depend on the license you have purchased.

- With the MultiView MR Breast Dx license, MultiView functions only in reading mode.

- With the MultiView MR Breast Bx license, MultiView functions in all three modes.

These modes are described separately below.

When working in the image-based modes (reading and targeting), images are seamlessly transferred from DICOM servers such as an MRI scanner or PACS to the MultiView device.

NOTE: If computer specifications do not meet the minimum video card hardware requirements, MultiView will be limited to 2D functions; 3D features such as targeting, MIPs, etc. will be disabled.

Reading Mode

When MultiView is launched, it opens in reading mode. The purpose of reading mode is to view and analyze radiological images of the breast. To support this analysis, the following functions are available:

- Image subtraction

- Maximum intensity projections (MIPs) and surface volumes

- Region of interest (ROI) analysis

- Distance measurements

- Visualization and display of magnetic resonance (MR) time enhancement kinetics

- Visualization and display of MR diffusion imaging

- Motion correction (requires the MultiView Breast Dx license)

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Biopsy Targeting

NOTE: Targeting functionality is only available with the MultiView MR Breast Bx license.

Use the MultiView biopsy targeting features to perform semi-automatic calculations of needle placement for MR-guided biopsies in conjunction with the Sentinelle Medical Vanguard system and supported calibration grids. MultiView automatically computes and displays the entry location and depth of puncture to guide the insertion of biopsy needles, localization needles, or other devices intended to reach a target as identified by the radiologist.

To do this, a trained medical professional must register the fenestrated grid spatial location using either manual fiducial registration or auto-fiducial recognition as described in the Biopsy Targeting chapter, beginning on page 191. This information, along with the identification of a target lesion by a medical practitioner, allows MultiView to calculate and display the appropriate entry

location and depth. Targeting functionality must be used with a Sentinelle Medical approved grid and fiducial system.

Manual Targeting

Manual targeting is equivalent to biopsy targeting, but without images being displayed in MultiView. You must identify the location of fiducials and grid surface displayed on the scanner and manually enter their DICOM coordinates in MultiView. You must also manually enter the coordinates of the target lesion.

Manual targeting is provided as a backup in case network resources are down and image transfer is not possible. This allows manual access to the MultiView advanced targeting algorithms to maximize targeting accuracy even in the worst case of network failure.

NOTE: Manual targeting functionality is only available with the MultiView MR Breast Bx license.

MultiView and Third-Party Applications

MultiView works with third-party applications such as Hologic® SecurView® to provide multi-modality image analysis functionality. The following features simplify your workflow:

- Logging into or out of MultiView automatically logs you into or out of the third-party application.

- When you open a study in MultiView, MultiView can be configured to open the corresponding study simultaneously in the third-party application (assuming a corresponding study exists in that application).

- When you close the study, the corresponding study closes simultaneously in the third-party application.

Licensing MultiView

MultiView is installed by Hologic professionals on systems that meet certain minimum requirements. However, if you purchase additional features for MultiView, you may need to update your license.

NOTE: Any changes to your MultiView Web installation must be made by a Hologic service technician.

To update your license:

1. Choose *Help > Change License*. The Register Your Software dialog appears.

Figure 1:   Register Your Software Dialog

2. Enter the new serial number provided by Hologic and click *Register*. The Activate Your Software dialog appears.

Figure 2:   Activate Your Software Dialog

NOTE: You can use MultiView for up to 10 days without activating the software. If the license is not activated within 10 days, MultiView will not start.

3. Click *Activate manually by entering a code*. The Activate Manually dialog appears showing the serial number and your machine code. Hologic uses these two numbers to generate a unique activation code for your system.
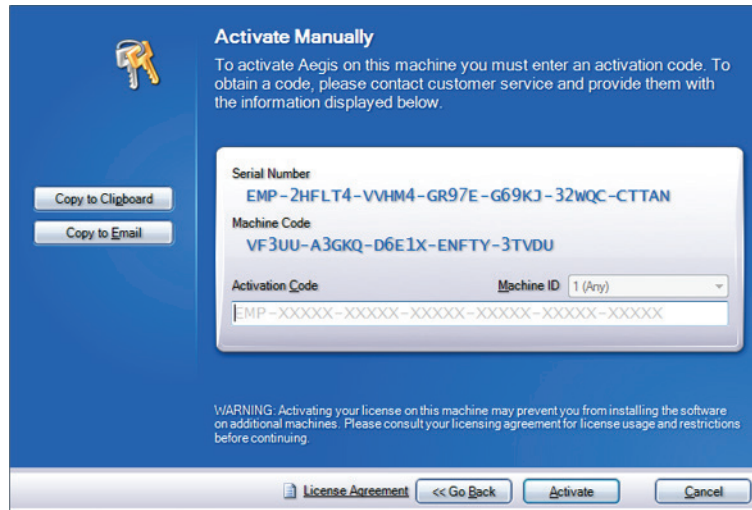
Figure 3:   Activate Manually Dialog

4. Click *Copy to Clipboard* to copy the serial number and machine code. A confirmation dialog appears indicating that the information has been copied.
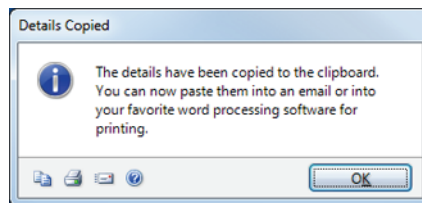
5. Click *OK*.

6. Open an email or a text file and paste the information copied from the dialog.

7. Send the information to Hologic at the following email address: torsupport@hologic.com.

8. When Hologic sends you the activation code, enter it in the *Activation Code* field in the Activate Manually dialog (see above) and click *Activate*.

If you have problems with your assigned license number, contact Hologic Technical Support. For contact information, see Contacting Hologic on page 20.

Viewing Your License Agreement(s)

To view your license agreement for a MultiView products license, select it from the *Help* menu. The license agreement opens in Adobe Reader.

Contacting Hologic

If you have comments or suggestions, or to obtain technical support you can contact Hologic in the following ways:

Phone: (North America) 1-866-243-2533

Email: MultiViewSupport@hologic.com

Service office hours are 8:00 a.m. - 6:00 p.m. Eastern Standard Time (EST) with emergency support available after these hours.

If you are contacting Hologic for technical support, you may be asked to provide your license/serial number.

- To find your license/serial number in the standalone MultiView client, open MultiView and click *Help > Change License*. The number is displayed in the Serial Number field.

- If you are using MultiView Web, the technical support person will instruct you how to find the license number if necessary.

Chapter 1   Getting Started

This chapter describes the first steps to using MultiView, including launching the application and logging in. It also provides an overview of the MultiView interface and instructions for how to update your license for new features.

Launching MultiView

- To launch MultiView from a standalone or laptop:
    - Click the MultiView icon on the workstation desktop, or
    - Choose *Start > Programs > Hologic > MultiView*

    By default, MultiView opens in a window that spans all available monitors. You can resize this window to your preferred dimensions.

- To launch MultiView from the web:
    1. Open a web browser.
    2. Type in the Citrix server IP address appended with */Citrix/StoreWeb* (e.g., *10.85.7.33/Citrix/StoreWeb*) in the URL search bar.
    3. At the Citrix login screen, type in your *domain\username* and password.

Logging Into the MultiView Application

You must log into MultiView when it first launches. MultiView can be configured to use one of two types of authentication: MultiView authentication or Active Directory authentication. Contact your MultiView system administrator to learn which type of authentication is implemented at your site.

In MultiView, you must select the type of authentication you are using to log in.
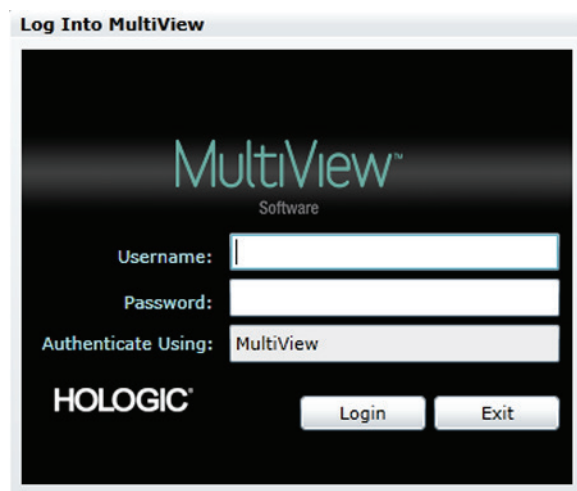
Figure 4:   Log Into MultiView Dialog

MultiView Authentication

To log into MultiView using MultiView authentication, enter your MultiView username and password, then click *Login*.

NOTE: To obtain your MultiView username or password, contact your MultiView system administrator.

NOTE: MultiView requires a minimum password length of five characters and must include at least one letter.

Active Directory Authentication

If MultiView has been configured to use Active Directory server authentication, enter your domain user name and password, then click *Login*. For more information about using Active Directory with MultiView, see the Login options on page 49.

Accessing Unique Device Identifier Information

Unique Device Identifier (UDI) is a unique numeric or alphanumeric code that identifies a medical device through distribution and use. UDI information is displayed in the About screen of the MultiView application.

To access UDI information, click *Help > About*.

Overview of the Interface

There are two parts to the MultiView interface:

- The Explorer / study manager where you will find studies, either in the local database or on other servers

- The workspace where you can view, analyze, and annotate the images in a study

Explorer / Study Manager

When you launch MultiView, it opens with the study manager displayed. Use the study manager to browse or search for studies, and view information about the study such as the study date, patient information, and whether the study has been opened or read by someone else.

To access the study manager when a study is open in the workspace, click the *Explorer* tab.

#	Description
1	Explorer tab. This tab contains three sub-tabs: DICOM, Enterprise and My Computer.
	▪ DICOM tab: Displays the local database (My Studies) and any servers MultiView has been configured to interact with in the Servers area.
	▪ Enterprise tab: Displays studies in the local database and applicable studies available on other clients connected to the Study List Manager such as SecurView.
	NOTE: The Enterprise *tab only appears when MultiView has been configured to communicate with* Study List Manager.
	▪ My Computer tab: Displays a Windows Explorer-type view of the contents of the workstation.
2	Search criteria. Use these fields to search for studies in the local database or on a server. For more information, see Searching for Studies on page 64.
3	Navigation pane. In the DICOM sub-tab, this pane displays a list of servers. In the My Computer sub-tab, this pane displays a tree view of the folders and drives on the workstation.
	This pane does not appear in the Enterprise sub-tab.
4	Studies list. This list displays information about the studies in the local database (My Studies) or the selected server or workstation folder. For more information, see the Working in the Study Manager chapter, beginning on page 79.

Figure 5:   Study Manager Interface

Workspace Overview

When you open a study, it opens in the workspace interface. The workspace consists of activity panes, a toolbar, and one or more viewports where you can view images and reports.
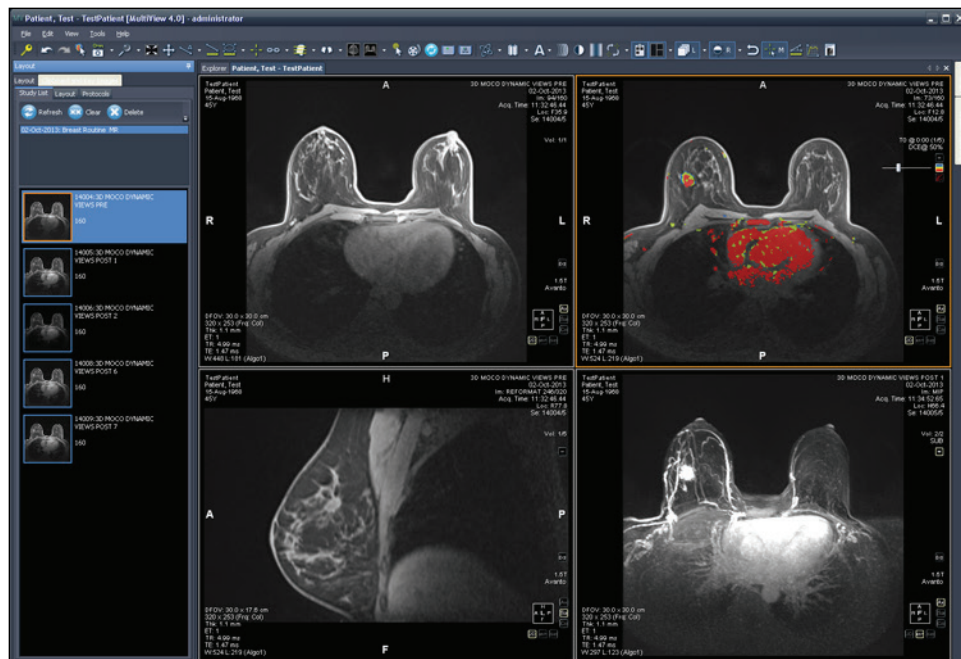
Figure 6:   MultiView Workspace Showing Four Viewports and the Layout Pane

For details about the features in the workspace, see About the MultiView Workspace on page 87.

Logging Out

To log out, or change users, click the Logout icon [icon] at the top left of the screen. In the confirmation dialog that appears, click *Yes*. The Log Into MultiView dialog is displayed allowing you or another user to log into the application.

NOTE: When application synchronization is configured, you are automatically logged out of SecurView when you log out of MultiView.

Automatic Logout

After a certain period of inactivity, MultiView automatically logs you out of the application. By default the inactive time is 30 minutes but your system may have been configured to allow a longer or shorter period of inactivity before you are automatically logged out.

To log back into MultiView, enter your password in the Log Into MultiView dialog and click *Login*.

Chapter 2   MultiView Configuration

This chapter describes how to configure MultiView to:

- Keep multiple MultiView installations in sync

- Manage DICOM servers

- Manage disk space

- Manage a local copy of the database

This chapter also describes the options that control the MultiView display and functionality such as workspace saving.

MultiView Web Server Requirements

The MultiView Web server's regional settings must be set to English (United States).

About Remote Agent

MultiView Remote Agent synchronizes user accounts across multiple MultiView workstations. It is the mechanism that stores the passwords and hanging protocols associated with each username as well as reports and study status which are not user-specific.

Remote Agent constantly monitors for any changes that occur on your local workstation and relays those changes to the server. The server propagates the changes on the other client workstations. As a result, any change done to one workstation is mirrored on all the other workstations.

You must configure the MultiView computer designated as the server and all client workstations to use Remote Agent.

NOTE: In a standalone configuration with only one MultiView computer Remote Agent configuration is not required.

To configure Remote Agent, choose *Tools > Options* and select *Remote Agent* in the tree on the left.
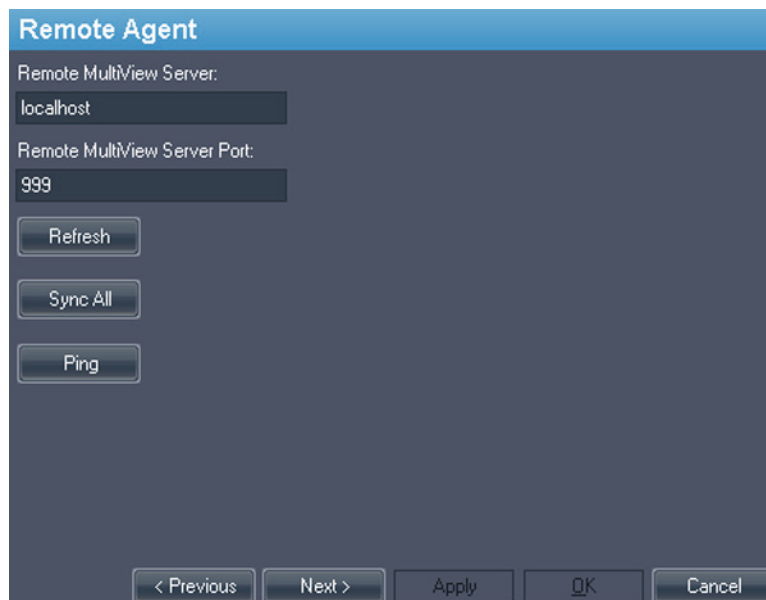
Figure 7:   Remote Agent Configuration Options

Remote Agent Server Configuration

On the computer designated as the MultiView Remote Agent server:

1. Select *Tools > Options > Remote Agent*.

2. In the Remote MultiView Server field, enter "localhost".

3. In the Remote MultiView Server Port field, enter an available port number.

4. Click *OK*.

5. Make a note of the IP address of this computer since you will need it to configure the client workstations.

Remote Agent Client Configuration

On **each** MultiView client computer:

1. Select *Tools > Options > Remote Agent*.

2. In the Remote MultiView Server field, enter the IP address of the MultiView server.

3. In the Remote MultiView Server Port field, enter the MultiView server port number.

4. Click *Apply*.

To synchronize the local workstation with the latest data (user names, passwords, hanging protocols, reports and study statuses) click *Sync All*.

Verifying Remote Agent Configuration

To check connectivity to the MultiView server, click the *Ping* button in the Remote Agent options dialog. If the local server is unresponsive, click the *Refresh* button to check for a response. If MultiView cannot contact the remote server, the following dialog appears.
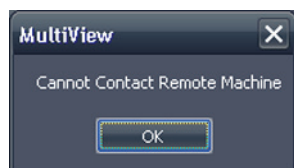
Figure 8: Communication Error Dialog

This error usually occurs because the Shred Host service is not running on the MultiView workstation (if MultiView is running in a standalone workstation configuration) or the Shred Host service is not running on the remote server workstation (in a multi-workstation configuration).

To start the Shred Host service:

1. Open Windows Control Panel.

2. Click on *System and Security > Administrative Tools > Services*.

3. Select the *ClearCanvas Workstation Shred Host Service* item and do one of the following:

   a) If the Status column displays "Started", choose *Action > Stop* to stop the service, then choose *Action > Start* to start it again. Note that you cannot restart the service by selecting the Restart option.

   b) If the Status column is blank, choose *Action > Start* to start the service. The Status column displays "Started" when the service is running.

Configuring MultiView to Communicate with Other DICOM Devices

You can configure MultiView to communicate with other DICOM devices such as MR scanners and picture archiving and communication systems (PACSs). This is necessary if you want to acquire studies **from** other DICOM devices or send reports and derived series **to** other DICOM devices.

There are two parts to this configuration process:

1. Configure the MultiView as a DICOM device so that it is able to communicate with other DICOM devices.

2. Specify the other DICOM devices you want the MultiView workstation to communicate with.

Configuring a Workstation as a DICOM Device

To configure a workstation as a DICOM device:

1. Choose *Tools > Options > DICOM Server*.

2. Specify the properties of the workstation.
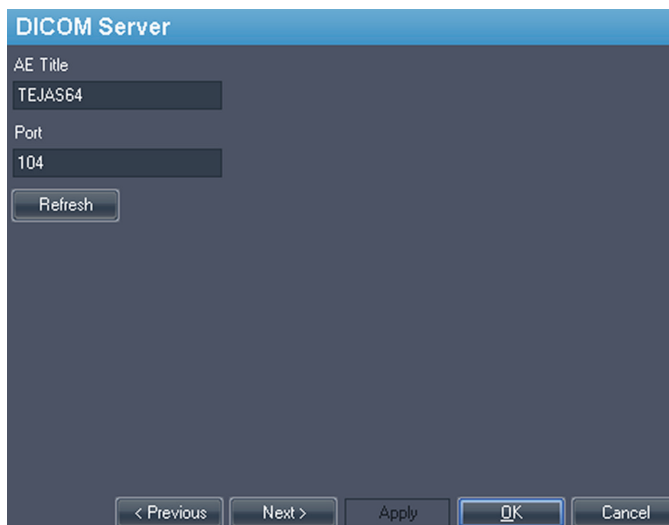
Figure 9:   DICOM Server Options

Option	Description
AE Title	(Application Entity Title) A tag that identifies the MultiView workstation as a DICOM device. Any title may be used. *NOTE: It is customary to enter the AE title in capital letters.*
Port	The network port through which workstations may communicate. The default is 104.

3. Click *OK*.

NOTE: Before the workstation can communicate with another DICOM device, that device must be configured with the workstation's AE Title and Port information. For more information, see the documentation provided with the DICOM device.

Adding a DICOM Server

When you have configured MultiView as a DICOM device, you must specify the remote DICOM device(s) you want the workstation to communicate with. Remote DICOM devices are referred to as "servers" in MultiView.

To add a DICOM server:

1. Right-click *My Servers* (or a server group folder) in the Servers pane on the DICOM sub-tab and choose *Add server* from the context menu.

2. Specify the properties in the Add New Server dialog.

Figure 10: Add New Server Dialog

Option	Description
Server Name	A name to identify this server.
Host	The server IP address. You may also use the server's DNS name if the network is DNS enabled; however, using the DNS name will be slower because the computer must resolve the name. It is recommended that you use the IP address, particularly in an environment where security is an issue.
Location	A description field to help identify the server.
AE Title	The AE Title of the server computer. *NOTE: It is customary to enter the AE title in capital letters.*
Port	The network port through which two (or more) workstations may communicate. The default is 104.
ClearCanvas Image Streaming Enabled	Select this option if you are using a ClearCanvas PACS and want to use the ClearCanvas image streaming functionality.
Header Service Port	If you are using a ClearCanvas PACS, enter the Header Service port number configured on the PACS.

Option	Description
Image Service Port	If you are using a ClearCanvas PACS, enter the Image Service port number configured on the PACS.

3. Click *OK*.

The new server appears in the Servers pane of the DICOM sub-tab.

NOTE: Hover over the server name to display a tool tip showing the server communication parameters.

Verifying DICOM Server Connection

To verify a server connection, right-click the server name and choose *Verify* from the context menu. This performs a DICOM C-ECHO, which confirms communication between the MultiView workstation and the remote DICOM server.
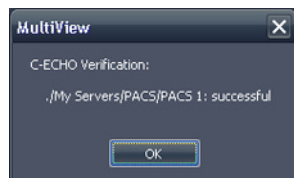
Figure 11: Successful Verification

NOTE: For a workstation to communicate with other remote DICOM servers, the other DICOM servers must be configured with the workstation's DICOM information.

IMPORTANT: If you change any information, such as the IP address, port, or AE Title on a workstation or the remote DICOM source, you must update the information about that source on every device that communicates with it. After making a change, re-verify the server communication between each device to ensure that the DICOM connections have been reestablished.

Organizing Servers

Use server groups to organize servers into meaningful categories. MultiView is installed with a default server group called My Servers. You can rename this server group or add more server groups to make the servers you access easier to find.
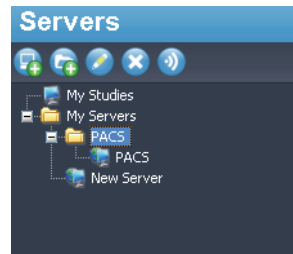
Figure 12: Servers Pane Showing a 'PACS' Server Group Under the My Servers Group

To add a new server group:

1. Right-click in the Servers pane on the DICOM sub-tab and choose *Add server group* from the context menu.

2. Enter a name for the server group in the dialog.

3. Click *OK*.

The server group appears in the Servers pane. At this point, you can either drag existing servers into the group to populate it, or add new servers as described in Adding a DICOM Server on page 32.

Server Toolbar Buttons

The toolbar at the top of the Servers pane contains icons for working with servers. You can also access the same functionality by right-clicking in the Servers pane and selecting an option from the context menu.

Table 1: Servers Pane Tools

Icon	Function
	Add a server.
	Add a server group.
	Edit the selected server or server group settings.
	Delete the selected server or server group.
	Verify the selected server's connection.

Managing Disk Space

Diskspace Manager automatically manages your hard drive space. When the *used space* reaches the *high watermark*, MultiView begins to delete the oldest studies (based on the date the study was imported into MultiView) until the used space reaches the *low watermark*.

NOTE: To keep MultiView operating at its optimal level, try to keep My Studies to a minimum.

To configure Diskspace Manager, choose *Tools > Options* and select *Diskspace Manager* in the tree on the left.

Figure 13: Diskspace Manager Options

Option	Action / Description
Drive	The hard drive capacity.
High Watermark	Sets the maximum percentage of hard disk space before files are automatically deleted.
Used Space	The amount of disk space that is currently being used.
Low Watermark	The point at which MultiView will stop deleting files. Sets the percentage of hard disk space on which files will be retained.
Check Interval	Sets how often MultiView checks the hard disk to determine whether it is necessary to delete files. The default value is ten minutes.

Option	Action / Description
Run For	Select this option if you want to limit the time when Diskspace Manager runs to a certain period of the day. Select the number of hours Diskspace Manager will run for and the time of day when it will start.
Limit to	Select this option if you want to set a maximum number of studies to store in the database. Once the number of studies in the database reaches this limit, MultiView will delete older studies as necessary to keep the total number of studies below the limit. The default value is 500 studies.

NOTE: Files are deleted based on the date they were imported into MultiView not by the study date.

Alternatively, you can manually delete studies stored locally (in My Studies) to free up hard drive space. For more information, see Deleting a Study from My Studies on page 80.

DICOM Database Rebuild

You can maintain a local copy of DICOM images for faster loading of images into MultiView.

When MultiView is launched it checks the local collection of DICOM images and updates the database. The *Reindex Local Data Store* option allows you to rebuild the database in case of a software update, or data corruption.

NOTE: You will not be able to interact with MultiView while re-indexing is in process.

To rebuild the local DICOM database, choose *Tools > Utilities > Reindex Local Data Store*.

NOTE: Rebuilding the database may take a while depending on the size of the DICOM database.

Chapter 3   MultiView Options

Use the Options settings to control MultiView behavior or to specify default values for certain features.

To access the Options dialog, choose *Tools > Options*, or press Ctrl + O. For information about the MultiView options, see:

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- Application Synchronization on page 40

- Breast Lesion Analysis on page 42

- Breast Targeting on page 42

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Annotation Tools

The Annotation Tools options control how MultiView behaves when you draw a region of interest (ROI).
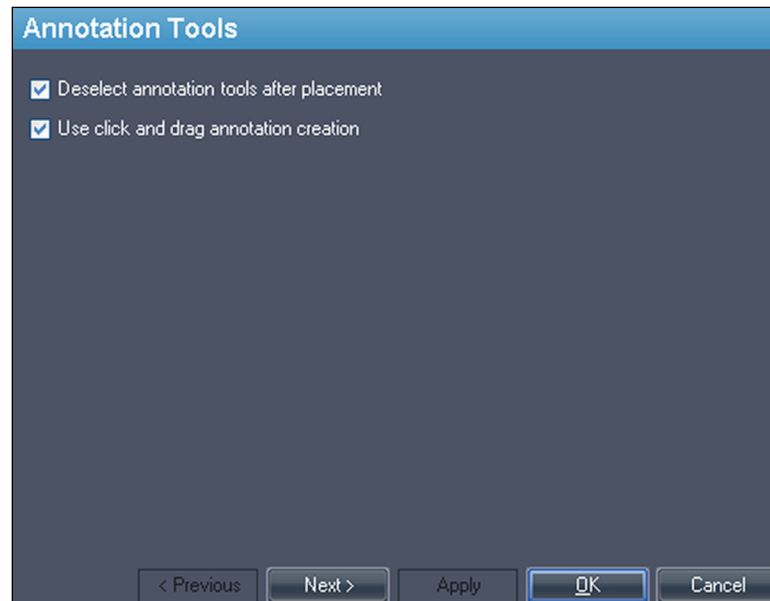
Figure 14: Annotation Tools Options

Option	Description
Deselect annotation tools after placement	Select this option to return the mouse button to the default tool (Stack for the left mouse button, Window Level for the right mouse button) after you have drawn a region of interest (ROI).
Use click and drag annotation creation	Select this option to create a region of interest (ROI) by clicking and dragging the mouse to the location where you want the ROI to end. The ROI is completed when you release the mouse button.
	When this option is not selected, you create ROIs by clicking, moving the mouse to the location where you want the ROI to end, then clicking again. The ROI is completed when you click a second time.
	For more information, see Creating Elliptical and Rectangular ROIs on page 127.

Application Synchronization

The Application Synchronization options determine how MultiView interacts with third-party applications such as SecurView through an application synchronization server.
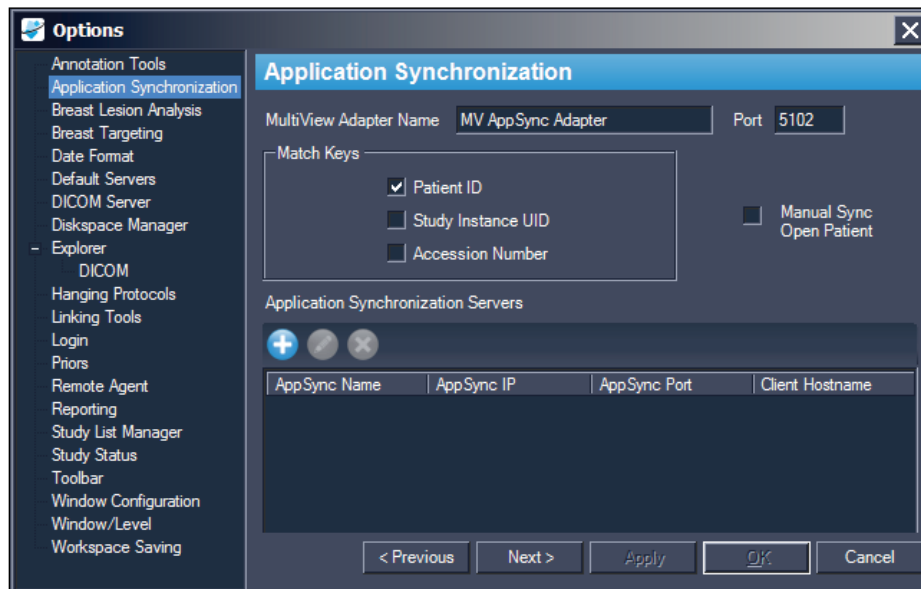
Figure 15: Application Synchronization Options

Option	Action/Description
MultiView Adapter Name	Enter the MultiView adapter name. The default name is MV AppSync Adapter. *NOTE: This value must exactly match the* Application Alias *for the MultiView application configured on the application synchronization server.*
Port	Enter the MultiView port number. The default port is 5102.
Match Keys	Select the DICOM tag(s) to use for synchronization. When a study is opened in the third-party application, MultiView will open any available studies that match the DICOM tags selected.
Manual Sync Open Patient	Select this option if you do not want a study to open automatically in the third-party application when it is opened in MultiView.
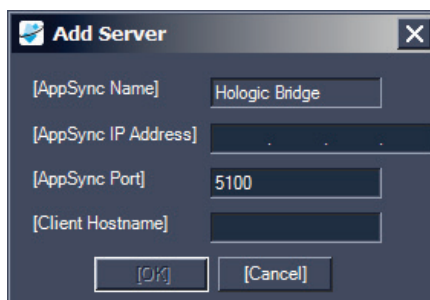
Option	Action/Description
Application Synchronization Servers	A list of application synchronization servers MultiView is configured to communicate with. ▪ To add a new server, click the *Add* icon. For more information about adding a server see Adding an Application Synchronization Server below. ▪ To edit the settings for a server, select the server and click the *Edit* icon. ▪ To delete a server, select the server and click the *Delete* icon.

NOTE: To configure MultiView to synchronize with a third-party application, you must have an application synchronization server correctly configured, and at least one MultiView user must be configured as a synchronization user in the third-party application. For more information, see the documentation provided for application synchronization and the third-party application.

Adding an Application Synchronization Server

To add an application synchronization server:

1. Click the *Add* icon .

2. In the Add Server dialog enter the following information about the application synchronization server (that is, Hologic Bridge):

   - AppSync IP Address – The IP Address of the application synchronization server.

   - AppSync Port – Port of the application synchronization server. The default port is 5100.

   - Client Hostname – The hostname of the client machine. For Standalone configurations, enter **LOCAL** for the Client Hostname. For web configurations, enter the hostname for each client accessing MultiView remotely from the web.

3. Click *OK*.

NOTE: If you are using the MultiView standalone application, you can only synchronize with one application synchronization server. In MultiView Web, you can add multiple application synchronization servers.

Breast Lesion Analysis

The Breast Lesion Analysis options control automatic behavior when MultiView analyzes a lesion.

NOTE: Lesion analysis is only available with the MultiView MR Breast Dx license.
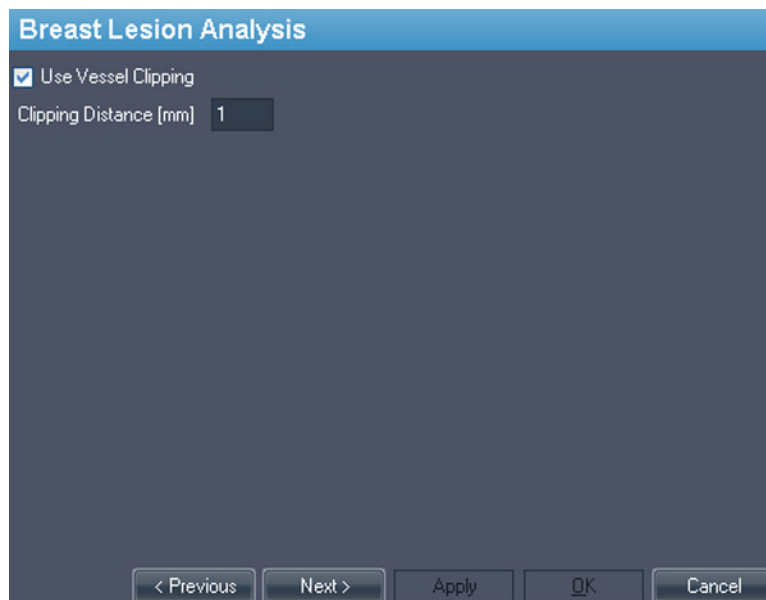
Figure 16: Breast Lesion Analysis Options

Option	Description
Use Vessel Clipping	Select this option to automatically apply vessel clipping after lesion analysis. For more information about MultiView vessel clipping, see Using the Vessel Clipping Control on page 145.
Clipping Distance [mm]	Set the clipping distance to control the amount of color filtered by the vessel clipping tool.

Breast Targeting

The Breast Targeting options allow you to automatically populate some of the fields in the Breast Targeting pane. You can also configure MultiView to automatically switch to interventional view when a lesion is successfully targeted.

NOTE: Breast Targeting is only available with the MultiView MR Breast Bx license.

Figure 17: Breast Targeting Options

Option	Action / Description
Default Grid	Select the grid used most often at your site. The Breast Targeting pane will open with this grid selected by default. The list of Hologic-approved grids for use with MultiView are: ▪ Sentinelle * ▪ Sentinelle Essenza ▪ Invivo 4ch ▪ Invivo 7ch ▪ Noras 4ch ▪ GE 8ch * Default value

Option	Action / Description
Default Needle	Select the needle used most often at your site. The Breast Targeting pane will open with this needle selected by default. The list of Hologic-approved needles for use with MultiView are: ▪ Bard Vacora 10-ga (118mm and 140mm plus short throw variant) and 14-ga (116mm and 138mm plus short throw variant) ▪ Ethicon Mammotome 11-ga (115mm and 145mm) and 8-ga (115mm and 145mm) ▪ SenoRx EnCor 10-ga (plus Half Sample variant) and 7-ga (plus Half Sample variant) ▪ SenoRx UltraCor 14-ga ▪ Suros ATEC * (and Petite) ▪ Wire Localization 14-ga and 18-ga * Default value
Default Manual Fixed Position	Specify the grid position where you usually place the fixed fiducial. The Breast Targeting pane will use this position by default. The default value is C4. *NOTE: Use this option for manual targeting only.*
Automatically switch to interventional view	Select this option to automatically switch to the interventional view, which orients the image in the viewport to correspond to the patient's position on the scanner bed.

Date Format

The Date Format options determine how MultiView displays dates. Choose either the system short or long date, or select a custom date from the drop-down list.
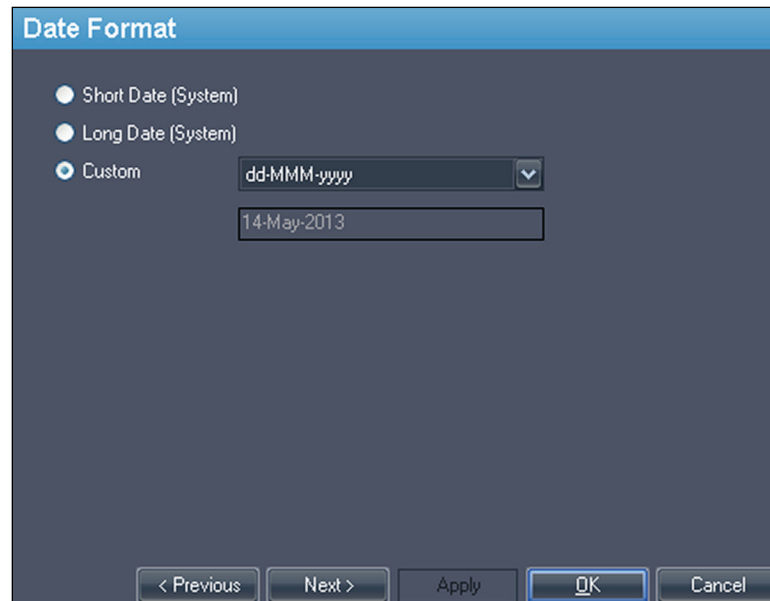
Figure 18: Date Format Options

Default Servers

The Default Servers option sets the default server(s) for automatically searching for related/prior studies and publishing key images. Select one or more servers to use the defaults.
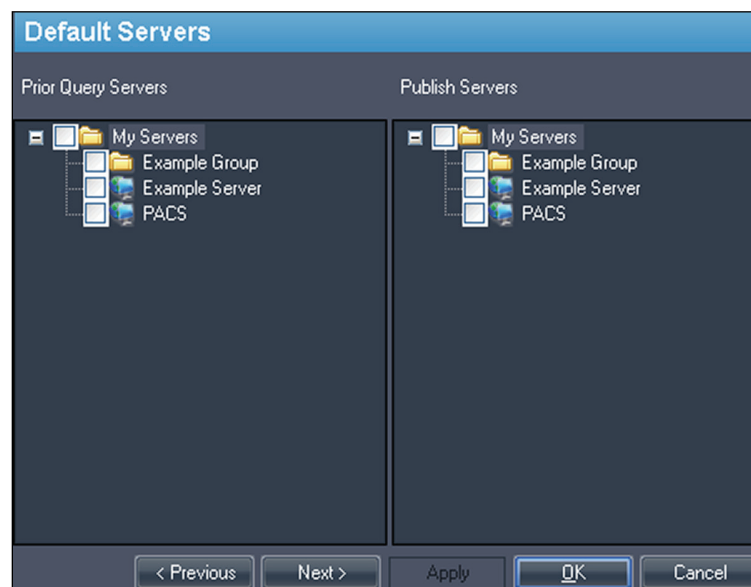
Figure 19: Default Servers Options

DICOM Server

These settings specify the MultiView DICOM device identity. For more information, see Configuring a Workstation as a DICOM Device on page 32.

Diskspace Manager

Diskspace Manager helps manage your disk space by automatically deleting old studies from My Studies when a specified amount of disk space has been reached. For more information about configuring Diskspace Manager, see Managing Disk Space on page 36.

Explorer/DICOM

Select the *Show number of images in study* option to show the number of images in a study in the Explorer window.

Select the *Show phonetic and ideographic names* option to show multibyte characters (such as Japanese characters) in MultiView when they are present in the DICOM data for a study.
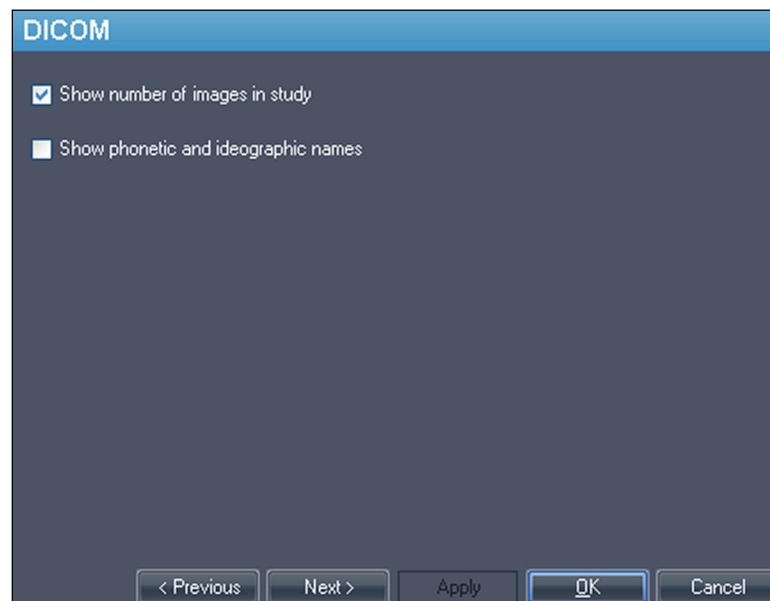
Figure 20: Explorer/DICOM Options

Hanging Protocols

The Hanging Protocols options control how hanging protocols are displayed in MultiView.
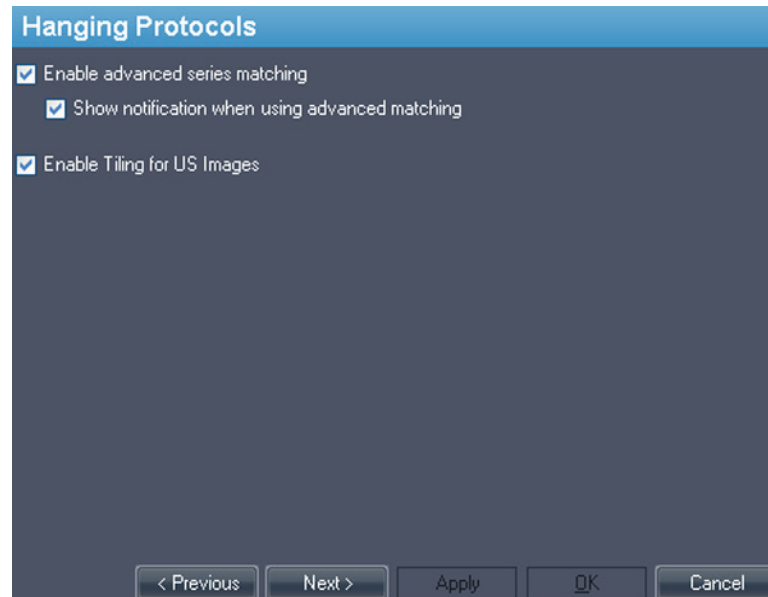
Figure 21: Hanging Protocols Options

Option	Description
Enable advanced series matching	Select this option if you want to utilize MultiView Smart MRI hanging function to automatically sort MRI series based on MR acquisition protocols rather than only rely on the series description.This option is disabled by default.
Show notification when using advanced matching	This option is not functional in MultiView.
Enable Tiling for US Images	Select this option to display ultrasound (US) images in "tiles" in the workspace viewport(s) when a hanging protocol for US studies is applied. For more information, see MultiView Default Hanging Protocols on page 104.

Linking Tools

This option sets the tolerance for images to be considered parallel for reference lines and when performing linked stacking. Enter the number of degrees in the angle to allow.
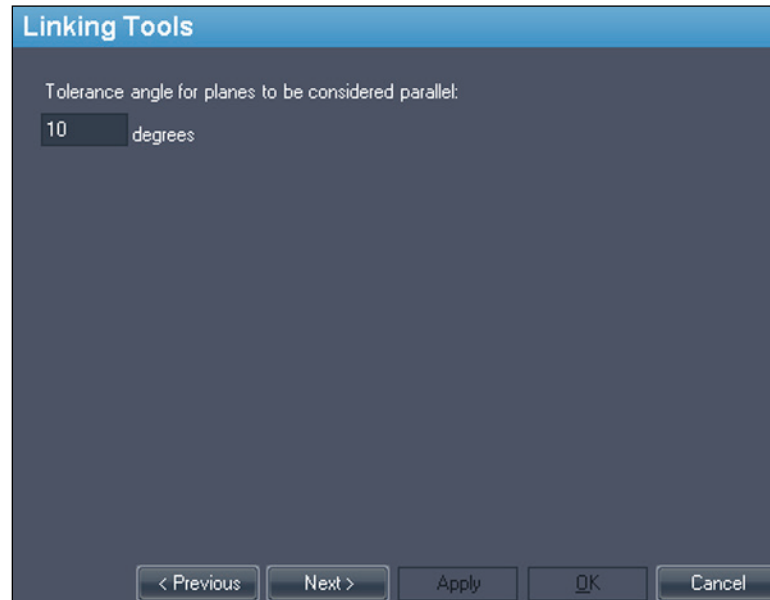
Figure 22: Linking Tools Option
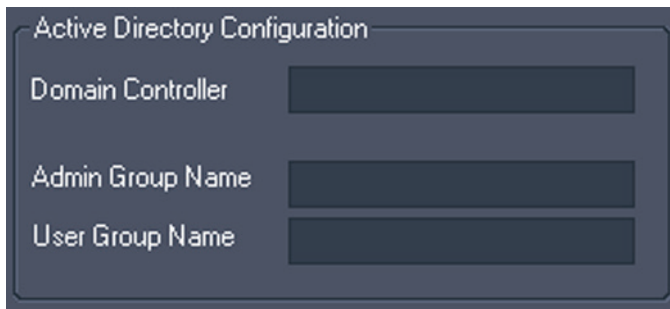
Login

The Login settings allow you to change your username, full name, site name, password, and site address. You can also specify here whether MultiView should use MultiView authentication or Active Directory authentication.

Figure 23: Login Options - Edit User Options

Option	Description
Edit User	Select this option and fill in the field on each tab to change your user information. Click *Submit* to save your information.
Change Password	Select this option and fill in the fields to change your password. Click *Submit* to save your new password. *NOTE: Your new password must be at least five characters in length and must include at least one letter.*

Option	Description
Add Users*	Select this option to add a new user to MultiView. Enter the following information for the user: ▪ Username: The username the user will use to log into MultiView. ▪ Full Name: The user's name. ▪ Site Name: A name to identify your site. ▪ Site Address: Your site's address. ▪ Password: The password the user will use to log into MultiView. Enter the password again in the Re-Enter Password field to confirm it. ▪ Status: Indicate whether this user is a regular user or an administrator. Click *Submit* to save the information.
Retrieve Password*	Select this option to retrieve a user's password if they have forgotten it. Enter the user's username and click *Submit*.
Remove Users*	Select this option to remove a user from MultiView. Enter the username of the user you want to remove and click *Submit*.
Use Active Directory	Select this option to use Active Directory user authentication. Users that exist in the Microsoft Active Directory 'Admin' group or 'User' group will be able to log into MultiView using their domain credentials. Active Directory Configuration Domain Controller Admin Group Name User Group Name Obtain the necessary Active Directory server information from your network administrator.

* Available to MultiView administrator users only.

Click the *Sync DB* button to synchronize the local database of usernames with the workstation acting as the MultiView server using Remote Agent. Note that this is a one-way synchronization. Any users that exist on the local workstation, but not on the MultiView server will be deleted.

Priors

MultiView can automatically display a patient's relevant previous studies when you open a study. Priors are found when another study with the same patient ID exists but has a different study date. Priors can also be filtered by keyword and/or by modality.

NOTE: To use automatic prior detection, you must have a default prior query server configured. For more information see the Default Servers options on page 45.

Figure 24: Priors Options

Option	Description
Enable automatic prior detection	Select this option to automatically detect and display a patient's prior studies.
Disable remote prior detection using default server(s)	Select this option if you want to see only prior studies already in the local database. Prior studies that exist on a default server but that are not in the local database will not appear in the Study List tab.
Notify if a more recent prior is available on a default server(s)	Select this option if you want MultiView to notify you when a more recent prior is available for a patient on a default server.
Use prior keywords	Select this option to filter prior studies for a patient by keywords. Enter the keywords that must appear in the study description.

Option	Description
Prior Modalities	Select the modalities you want to include in the list of prior studies for the patient.

Remote Agent

MultiView Remote Agent synchronizes user accounts across multiple MultiView workstations. For details about configuring Remote Agent, see About Remote Agent on page 29.

Reporting

The Reporting options control how the MultiView reporting features behave.

Report Options
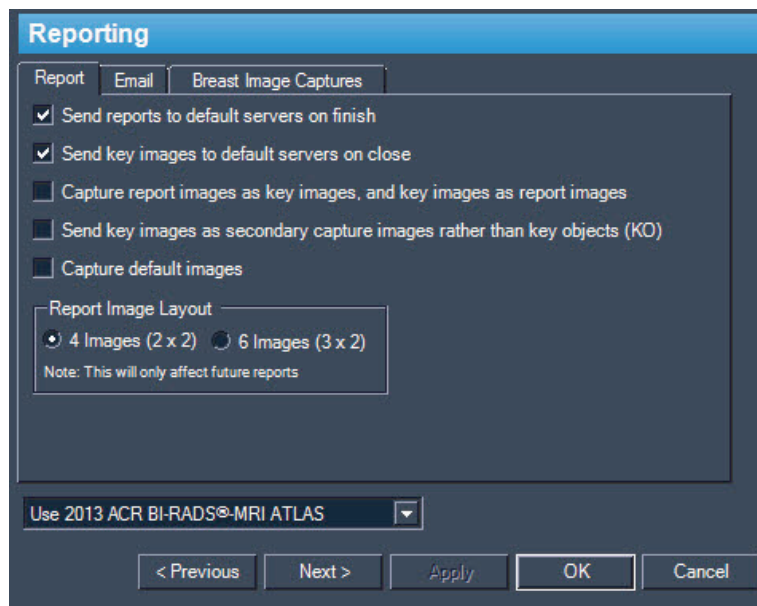
Figure 25: Basic Reporting Options

Option	Description
Send reports to default servers on finish	Select this option to send any reports you created for a study to your configured default servers when you click the Finish button in the Breast Reporting pane to complete a report.
Send key images to default servers on close	Select this option to send any key images you created for a study to your configured default servers when you close the study.

Option	Description
Capture report images as key images, and key images as report images	Select this option to automatically create a key image from images you add to a report and add all key images to a report. If you select this option, using the space bar shortcut key will create both a key image and add the image to a report.
Send key images as secondary capture images rather than key objects (KO)	Select this option if your PACS server does not support key objects.
Capture default images	Select this option to automatically add pre-defined image captures to a report when you analyze a lesion. For information about defining the images to capture, see the Breast Image Captures tab options described below.
Report Image Layout	Select whether you want to display four or six images per page in the reports.
Breast Report format type	• Use Legacy Breast Reporting • Use 2013 ACR BI-RADS®-MRI ATLAS

Email Options

If you want to send reports by email, enter information about the SMTP server to send email from on the Email tab.

NOTE: These options are only available to users with administrator status.

Figure 26: Email Options

Option	Description
SMTP Server	The SMTP server address for sending emails.
Port	The SMTP server port number for email traffic.
Domain	The domain name to send email from.
Username	The username to access the email account.
Password	The password to access the email account.
Email Address	The email address to send emails from.
Use SSL	Select this option if the SMTP server uses SSL encryption.
Test Email	You can send a test email to verify the settings you entered above. Enter an email address in the To field and click *Send*.

Breast Image Capture Options

You can configure MultiView to automatically capture a pre-defined set of images and add them to a report when you analyze a lesion. The image captures are centered on the analyzed lesion.

NOTE: To automatically add images to a report, you must have selected the "Capture default Images" option on the Report tab. If the "Capture report images as key images, and key images as report images" option is also selected, the image captures you define here will also be created as key images.

The Breast Image Captures tab defines the images that will be captured. Create as many image capture definitions as you need.
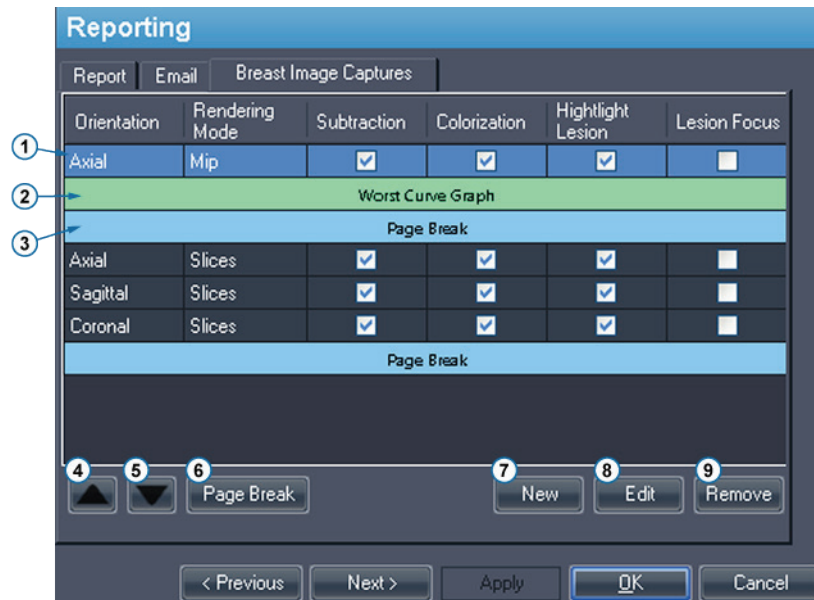
#	Description
1	Image capture definition (selected). The checkmarks indicate the options this image will be captured with.
2	Adds an image of the worst kinetic curve graph to the report.
3	Page break. This will create a new page of images in the report. You can add up to six images on a page. MultiView will automatically insert a page break in a report based on the Report Image Layout you specified on the Report tab (after either four or six images have been added to a page).
4	Move the selected image capture definition up in the list.
5	Move the selected image capture definition down in the list. You can also move an image capture definition by dragging it to a new position in the list.
6	Insert a page break.
7	Define a new image capture. For more information about defining image captures, see below.
8	Edit the selected image capture definition.
9	Remove the selected image capture definition or page break.

Figure 27: Breast Image Captures Tab

To create a new image capture definition:

1. Click the *New* button. The New Default Image Capture dialog opens.
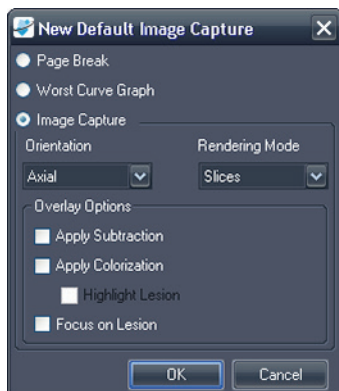
Figure 28: New Default Image Capture Dialog

2. Indicate the type of capture you want to add: *Page Break*, *Worst Curve Graph*, or *Image Capture*.

3. If you are adding an image capture:

    a. Select the *Orientation* and *Rendering Mode* for this image from the drop-down lists. If you select the *Slices* rendering mode, the image will be created at the slice where you placed the lesion marker.

    b. Select the *Overlay Options* to apply to the image.

4. Click *OK*.

Study List Manager

Study List Manager allows MultiView to see studies in other client databases and vice versa. To use Study List Manager, you must configure MultiView with information about the Study List Manager server.
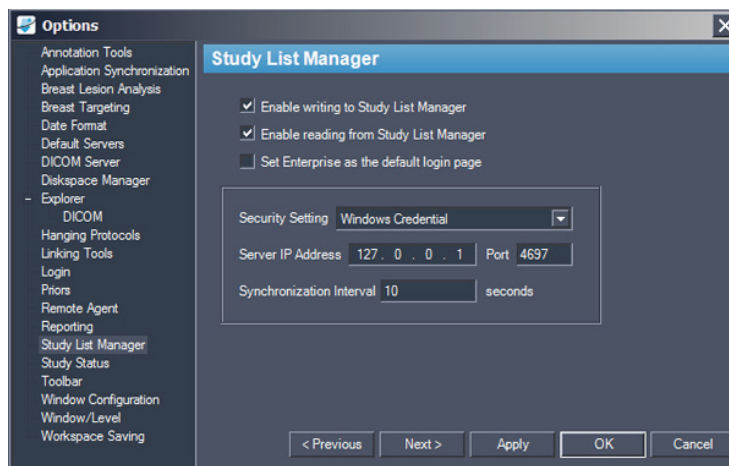
Figure 29: Study List Manager Options

Option	Description
Enable writing to Study List Manager	Select this option to enable MultiView to write to Study List Manager.
Enable reading from Study List Manager	Select this option to enable MultiView to read from Study List Manager.
Set Enterprise as the default login page	If you select this option, MultiView opens on the Enterprise tab when you log in.
Security Setting	The type of security used on the Study List Manager server.
Server IP Address	The IP address of the Study List Manager server.
Port	Use one of the following ports, based on the security setting you selected: ▪ Windows Credentials: 4697 ▪ HTTPS Anonymous Client: 4698 ▪ No Security: 4699
Synchronization Interval	The frequency, in seconds, MultiView should check for new studies in Study List Manager.
Set Enterprise as the default login page	Select this option if you want MultiView to open to the Enterprise tab when you log in.

NOTE: To see studies on a third-party application server such as SecurView, Study List Manager Server must be installed and correctly configured. The location where Study List Manager Server is installed will depend on the products you have licensed and the hardware architecture at your site. To open studies in the third-party application, Application Synchronization must be installed and configured. For more information, see Application Synchronization on page 40.

Study Status

Select the *Track the status of studies* option if you want to maintain a record of whether studies have been read.

NOTE: This option is selected by default. If you deselect this option, when you re-start MultiView, studies appear in the My Studies list without "Status" or "Processed" fields.
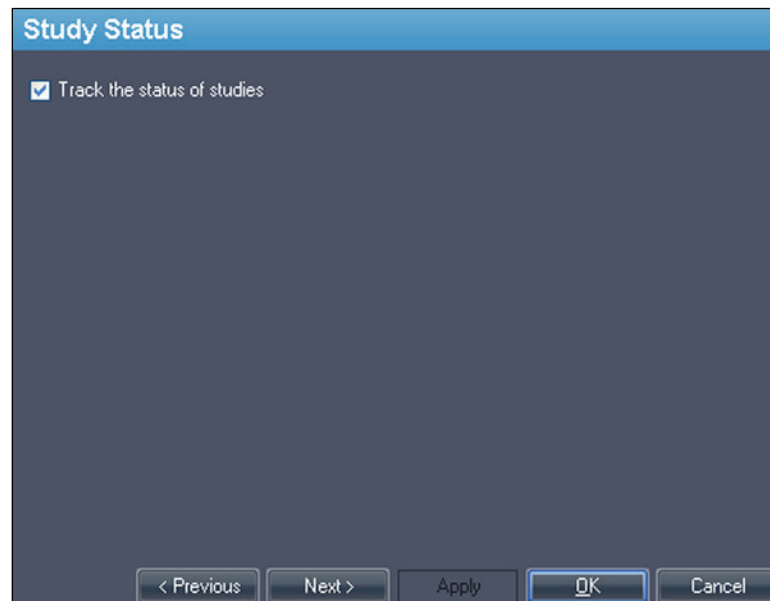
Figure 30: Study Status Tracking Option

Toolbar

The Toolbar options determine how MultiView displays the toolbar in the interface. The Toolbar Button Profile option also determines that amount of information displayed in the viewport DICOM overlay.
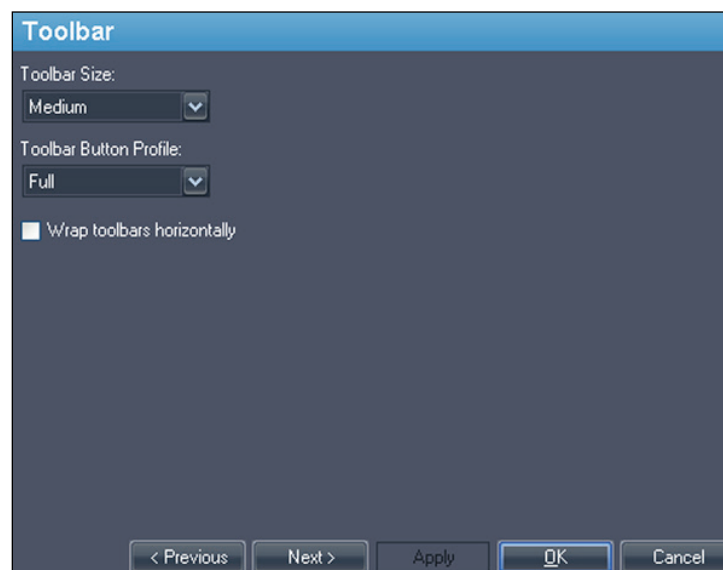
Figure 31: Toolbar Options

Option	Description
Toolbar Size	Sets the size of the toolbar buttons.
Toolbar Button Profile	Determines the number of toolbar buttons to display. Select the option that corresponds to the way you use MultiView: Simple, Advanced or Full.
Wrap toolbars horizontally	Select this option to wrap the toolbar if there are too many buttons to display in a single row.

Window Configuration

This option determines whether images open in the same window as the study manager, or in a different one. Opening images in a separate window is useful in a multi-monitor scenario where it is preferable to have the study manager open in a window on one monitor, and the image window span the remaining monitors.
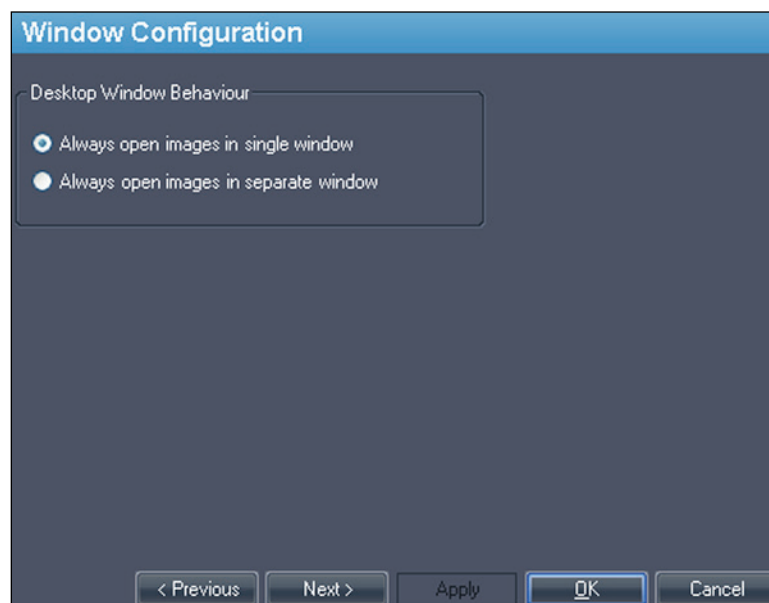
Figure 32: Window Configuration Options

Window/Level

You can add and delete window and level presets. For more information about how to use window and level presets, see Using Window/Level Presets on page 98.

To add a preset:

1. Ensure that the MR modality is selected (see the figure below).

2. Click the + icon or right-click and choose *Add*.

3. In the Add Preset dialog, choose an available keystroke to which to bind the preset.

4. Enter a name for the preset.

5. Set the *Window Width* and *Window Center* (level) values to your preferred values.

6. Click *OK*.
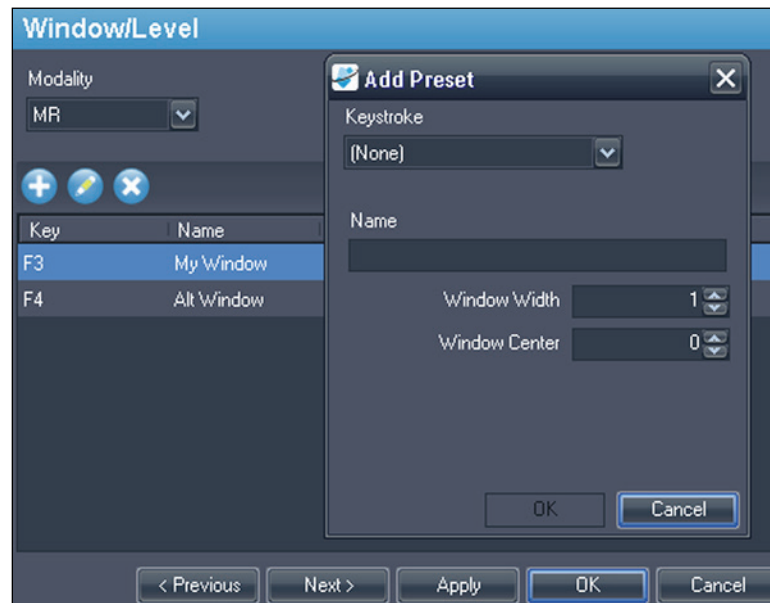
Figure 33: Window/Level Options

To edit a preset, select it in the list and click the *Edit* icon. Modify the preset values then click *OK*.

To delete a preset, select it in the list and click the *Delete* icon. Note that the preset is deleted without first displaying a confirmation dialog.

Workspace Saving

MultiView can save the workspace configuration you have set up for a study and automatically load it the next time you open the study.
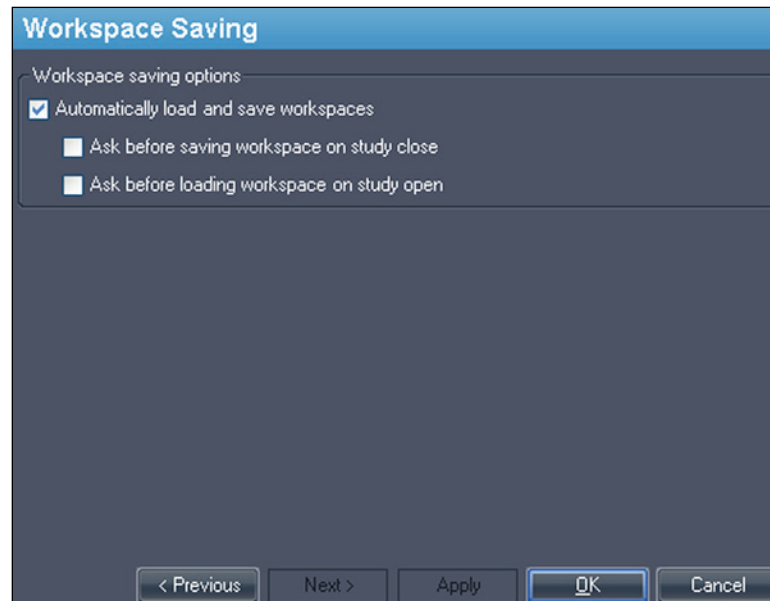
Figure 34: Workspace Saving Options

Option	Action / Description
Automatically load and save workspaces	Select this option to save the current workspace configuration when you close a study and load the saved workspace when you open a study. *NOTE: Even if this option is not selected, in the event that the software closes unexpectedly, MultiView automatically saves the workspace before closing.*
Ask before saving workspace on study close	If you select this option, a dialog appears when you close a study asking if you want to save the workspace. If this option is not selected MultiView always saves the workspace.
Ask before loading workspace on study open	If you select this option, a dialog appears when you open a study asking if you want to load the stored workspace. If this option is not selected, MultiView always loads the stored workspace.

NOTE: To preserve disk space, MultiView periodically deletes the workspace information for studies you have deleted.

Chapter 4   Sending and Receiving Studies

Before two workstations can exchange files, they must be configured to communicate with each other. For more information, see Configuring MultiView to Communicate with Other DICOM Devices on page 31.

NOTE: Create rules in the Windows firewall to send and receive images. You may also need to configure your antivirus software to allow access to the network. Check with your network administrator for help with this.For more information, contact Hologic Technical Support. For contact information, see Contacting Hologic on page 20.

Retrieving a Study from a Remote DICOM Server

To retrieve a study from a remote DICOM server:

1. Select the remote server in the Servers pane of the DICOM sub-tab.

2. Right-click the desired study in the studies list and select *Retrieve* from the context menu (or click the *Retrieve* button at the top of the right pane).

   The Send/Receive Activity Monitor slides out from the left showing the retrieval progress. For more information about the Send/Receive Activity Monitor, see Working in the Send/Receive Activity Monitor on page 65.

When the retrieval is complete, the study appears in the My Studies list. The best practice is to open the study from the My Studies list. For more information, see Opening an Image or a Study on page 80.

You can also retrieve studies, individual series and priors from the Study List tab on the Layout pane. For more information, see About the Study List on page 89.

Importing Studies on the Workstation

To import images on the workstation:

1. If the studies you want to import are on an external storage device such as a CD or USB flash drive, insert the device into the workstation.

2. Click the My Computer sub-tab on the Explorer tab and navigate to the target image or folder.

3. Right-click on the target image or folder and choose *Import* from the context menu.

Searching for Studies

Use the MultiView search functionality to find specific studies, either in the local database or on a DICOM server.

Figure 35: Search Pane

To search for a study, select the location to search in the Servers pane (either My Studies or one of the remote servers), then enter your search criteria and click *Search*.

About the Search Criteria

You can search for studies using the following search criteria:

- *Patient ID, Patient Name, Accession #, Study Description:* Enter the criteria to search for. You can enter partial values (for example only the first few letters of the patient's name) or use the asterisk (*) wildcard to match multiple characters (for example, enter '*breast' in the *Study Description* field to find all studies whose description ends in 'breast').

- *Study Date:* Enter the range of time to search in. Click the drop-down arrow to select the *From* and *To* dates from a calendar.

- *Modality:* Click the list control to select from a list of available modalities.

- *Workstation:* This option is only available on the Enterprise tab. Enter your MultiView workstation name to filter the results to show only local studies. Enter the name of another MultiView workstation to search for studies on that workstation.

When searching, you can leave some fields empty, but to reduce the time required to return results you should enter the most specific search criteria you can. If you start a search on a DICOM server without entering any search criteria, MultiView displays a warning message.
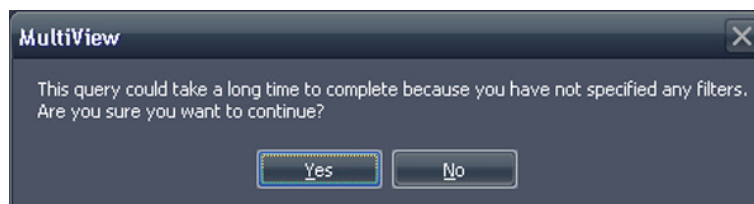
Figure 36: Remote Search Warning

Sending a Study to a Remote DICOM Server

To send a study to a remote DICOM server:

1. Right-click the desired study in the studies list of the DICOM sub-tab and choose *Send* from the context menu (or click the *Send* button at the top of the pane).

2. In the Send Study dialog that appears, select the server you want to send the study to.

3. Click *OK*.

The Send/Receive Activity Monitor displays the sending progress.

NOTE: When a study is being sent, you can still interact with MultiView and use it to perform any of its normal functions.

You can also send a series to a remote DICOM server from the Study List tab on the Layout pane. For more information, see About the Study List on page 89.

Working in the Send/Receive Activity Monitor

The Send/Receive Activity Monitor pane displays information about communications between the MultiView workstation and other servers. It opens automatically when you retrieve a study from a server or send a study to a server. To open the Send/Receive Activity Monitor pane at other times, choose *Tools > Utilities > Send/Receive Activity Monitor*.

Figure 37: Send/Receive Activity Monitor Pane

Table 2:   Send/Receive Activity Monitor Pane Icons

Icon	Name	Description
	Open Study	Studies you retrieve from a server appear in your My Studies list, but you can also open a study directly from the Send/Receive Activity Monitor pane.
	Clear Selected Item(s)	Removes the selected items from the Send/Receive Activity Monitor pane.
	Clear All Items	Removes all items from the Send or Receive sections of the Send/Receive Activity Monitor pane.
	Show Background Sends	Some features, such as reports and key images, create DICOM content that is automatically published to a remote server. Click this icon to show these send operations in the Send/Receive Activity Monitor list.

About SHREDs

A SHRED is a function, or series of functions, MultiView performs automatically based on a trigger. For example, you can configure MultiView to send studies received by a primary MultiView workstation to secondary workstations automatically using a SHRED. MultiView can also perform motion correction on the studies automatically as it receives the studies from the scanner console. All SHRED configuration is done on the primary MultiView workstation.

To access the SHRED configuration options, choose *Tools > SHRED Configuration.*
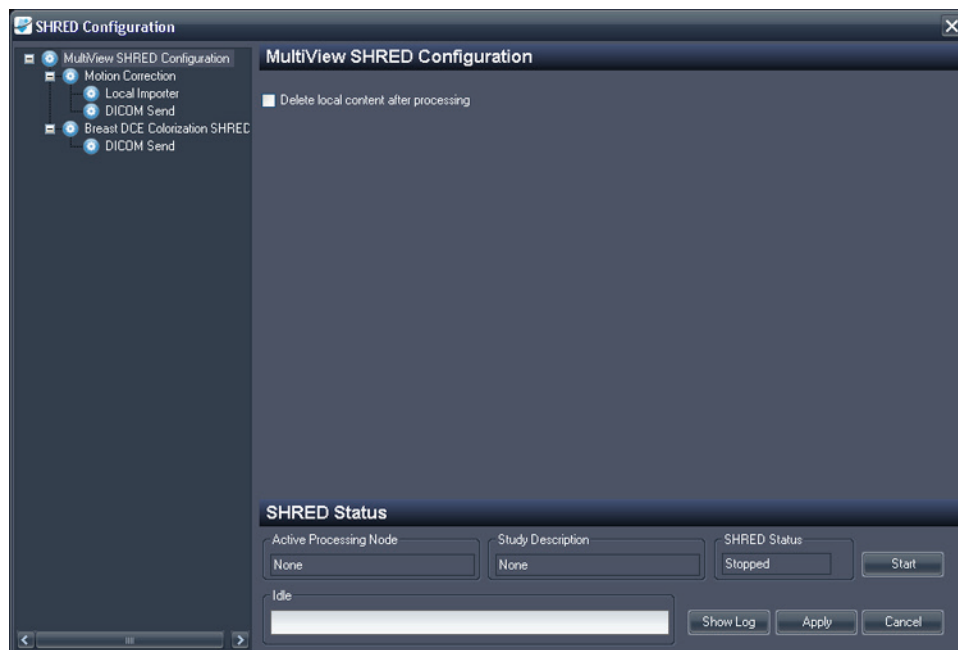
Figure 38: SHRED Configuration Dialog

The SHRED Configuration dialog displays the currently configured SHREDs in a tree view on the left. Details of the selected SHRED appear in the details pane on the right.

NOTE: To change the order of the SHRED processes, move the SHRED nodes by dragging them to a new location in the tree configuration.

Details about the selected SHRED's status appear at the bottom of the dialog.

SHRED Tasks

You can perform the following tasks on SHREDs.

Manually Starting or Stopping a SHRED

When a SHRED is stopped, a Start button appears in the SHRED Status section. Click *Start* if you need to manually start the SHRED. The Start button changes to a Stop button while the SHRED is running. If you need to stop the SHRED, click *Stop*. You must stop a SHRED before you can edit its details.

Editing a SHRED

To edit the details of an existing SHRED, select the SHRED in the tree view and click the *Stop* button if the SHRED is currently running. Edit the information in the details pane, and click *Apply* to save your changes.

Deleting a SHRED

To delete a SHRED, right-click the SHRED in the tree view and select *Delete*. The SHRED, and any SHREDs configured under it, are deleted.

NOTE: The SHRED is deleted without first displaying a confirmation dialog.

Delete Local Content After Processing

If you do not want to keep a local copy of the studies sent to MultiView, select the *Delete local content after processing* option to delete studies after they have processed by a SHRED and sent to a workstation or other DICOM device.

Copying SHRED Nodes and Trees

You can copy and paste existing SHREDs, or SHRED trees, to use as a starting point for new SHREDs.

- To copy a single SHRED, right-click on the SHRED node and select *Edit > Copy Node*.

- To copy a SHRED and all the SHREDs configured under it, right-click on the SHRED node and select *Edit > Copy Subtree*.

To paste the SHRED or SHRED tree, right-click on the node you want to add the SHRED(s) to and select *Edit > Paste*.

Sending Studies to the Local Database

If you want corrected studies to be available in the local database on the server, add a Local Importer SHRED under the Motion Correction, Uniformity Correction, or colorization SHRED node. There are no options to specify for Local Importer SHREDs.

Sending Studies to a Client Workstation or Another DICOM Server

You can configure the MultiView server workstation to send the studies to client workstations or other DICOM devices using a DICOM Send SHRED.

- To send studies to client workstations immediately after they are received from the scanner console, add the DICOM Send SHRED as a child of the main MultiView SHRED Configuration node.

To apply a correction or colorization to studies before they are sent to client workstations or other devices, first add the correction or colorization SHRED, then add the DICOM Send SHRED as a child of that SHRED.

To send studies to a client workstation:

1. Open the SHRED Configuration dialog (choose *Tools > SHRED Configuration*).

2. If the SHRED you want to add this SHRED under is running, click the *Stop* button under SHRED Status.

3. Right-click the node in the tree view where you want to add this SHRED and select *Add New DICOM Send*. The new SHRED is added as a child node under the node you selected. If you do not see the new SHRED, click the "+" icon to expand the node.

4. Click the *DICOM Send* node. The DICOM Send details appear.
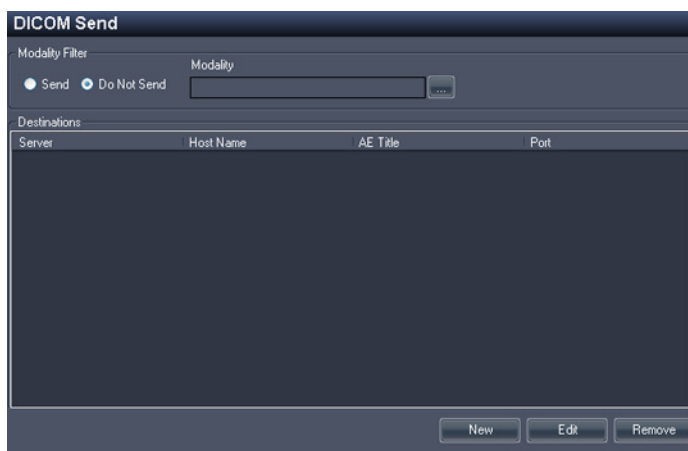
Figure 39: DICOM Send SHRED Details

5. Specify which modalities to send.

- If you select the Send option, only those modalities you specify will be sent.

- If you select the Do Not Send option, all modalities present in the study *except* the modalities you specify will be sent.

6. Click the *New* button. The New send target dialog appears.
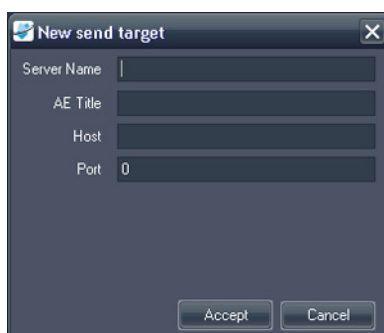
Figure 40: New send target Dialog

7. Enter the DICOM node details for the client workstation or DICOM device you want the server to send the studies to.

Table 3:   DICOM Send SHRED Options

Option	Description
Server Name	A name to identify the server.
AE Title	The AE Title of the workstation or DICOM device. *NOTE: It is common practice to enter the AE title in capital letters.*
Host	The IP address. You may also use the domain name service (DNS) address if the network is DNS enabled; however, using the DNS address will be slower because the computer must resolve the name. It is recommended that you use the IP address exclusively.
Port	The network port for communication with the workstation or DICOM device. The default is 104.

8. Click *Accept* to close the New send target dialog.

9. To add another target click *New* again, or click *Apply* to close the SHRED Configuration dialog.

Performing Automatic Motion Correction

Use a motion correction SHRED to perform motion correction on studies automatically when they are received from the scanner console. Performing motion correction removes motion artifacts from images and improves the accuracy of subsequent analysis such as DCE colorization.

NOTE: Duplicate series should not be sent to motion correction as this will lead to duplicate corrected series which will require longer processing time and cause hanging protocol problems.

To add a motion correction SHRED:

1. Open the SHRED Configuration dialog (choose *Tools > SHRED Configuration*).

2. If the SHRED you want to add this SHRED under is running, click the *Stop* button under SHRED Status.

3. In the tree view, right-click the node where you want to add this SHRED and select *Add New Motion Correction SHRED*. The new SHRED is added as a child node under the node you selected. If you do not see the new SHRED, click the "+" icon to expand the node.

4. Click the *Motion Correction SHRED* node. The Motion Correction SHRED details appear.

Figure 41: Motion Correction SHRED Details

5. Enter the motion correction information to use on studies sent from the scanner console.

Table 4: Motion Correction SHRED Options

Option	Description
Series Description Keywords	Enter the keywords used to identify scans in the series to be included in the motion correction. ▪ To add a keyword, click *Add*. ▪ To edit an existing keyword, select the keyword in the list and click *Edit*. ▪ To remove a keyword, select the keyword in the list and click *Remove*.
Keyword Matching	If you select this option, then **all** the keywords must be present in the series description to be considered a match.
Exact Matching	If you select this option, then the series description must exactly match the keywords.
For more information about using keywords, see Keyword Matching in SHRED Configuration on page 77.	
Correct to the following time index	The time index to base the motion correction on. PRE indicates the mask/pre-injection scan. POST 1, POST 2, etc. are the post injection scans.
Expected number of time points	The minimum number of time points that must arrive for this SHRED to start.

Option	Description
Use multiple CPUs	If your computer uses a multi-core processor, you can reduce the time required for the motion correction by selecting this option.
Reserve a CPU for applications	If you want to perform other operations while the motion correction is being processed, select this option.
Use 2D correction	Select this option to reduce the time required to perform the motion correction. This may result in a less accurate correction.

6. Click *Apply*.

Performing Automatic Non-Uniformity Correction

Some images may have areas of high signal intensity when imaged close to the coil and other areas with low signal intensity when imaged further away from the coil such as in prostate imaging. MultiView can reduce the dynamic range of the overall image to make it easier to work with.

To add a non-uniformity correction SHRED:

1. Open the SHRED Configuration dialog (choose *Tools > SHRED Configuration*).

2. If the SHRED you want to add this SHRED under is running, click the *Stop* button under SHRED Status.

3. In the tree view, right-click the node where you want to add this SHRED and select *Add New Non-Uniformity Correction*. The new SHRED is added as a child node under the node you selected. If you do not see the new SHRED, click the "+" icon to expand the node.

4. Click the *Non-Uniformity Correction SHRED* node. The Non-Uniformity Correction SHRED details appear.
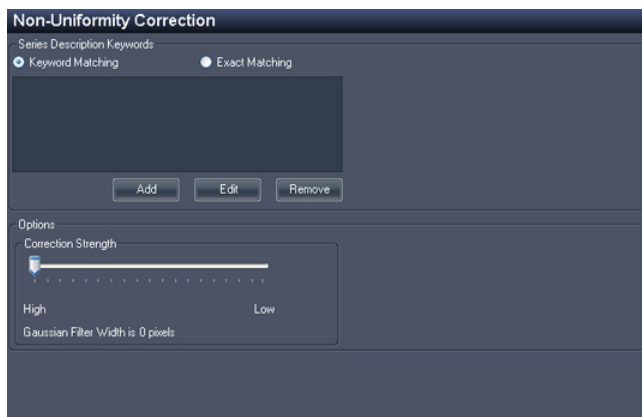
Figure 42: Non-Uniformity Correction SHRED Details

5. Enter the non-uniformity correction information to use on studies sent from the scanner console.

Table 5:   Non-Uniformity Correction SHRED Options

Option	Description
Series Description Keywords	Enter the keywords used to identify scans in the series to be included in the motion correction. ▪ To add a keyword, click *Add*. ▪ To edit an existing keyword, select the keyword in the list and click *Edit*. ▪ To remove a keyword, select the keyword in the list and click *Remove*.
Keyword Matching	If you select this option, then **all** the keywords must be present in the series description to be considered a match.
Exact Matching	If you select this option, then the series description must exactly match the keywords.
For more information about using keywords, see Keyword Matching in SHRED Configuration on page 77.	
Correction Strength	Drag the slider to control how much to reduce the dynamic range of the images.

6. Click *Apply*.

Performing Automatic Diffusion Colorization

You can add a SHRED to perform diffusion colorization automatically. For more information about diffusion colorization, see Diffusion Colorization on page 135.

To add a diffusion colorization SHRED:

1. Open the SHRED Configuration dialog (choose *Tools > SHRED Configuration*).

2. If the SHRED you want to add this SHRED under is running, click the *Stop* button under SHRED Status.

3. In the tree view, right-click the node where you want to add this SHRED and select *Add New Diffusion*. The new SHRED is added as a child node under the node you selected. If you do not see the new SHRED, click the "+" icon to expand the node.

4. Click the *Diffusion* node. The Diffusion SHRED details appear.
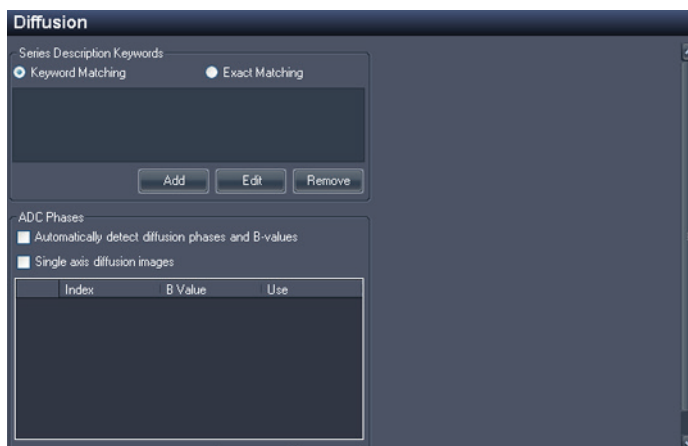
Figure 43: Diffusion SHRED Details

5. Enter the diffusion colorization information to use on studies sent from the scanner console.

Table 6:   Diffusion SHRED Options

Option	Description
Series Description Keywords	Enter the keywords used to identify scans in the series to be included in the colorization. ▪ To add a keyword, click *Add*. ▪ To edit an existing keyword, select the keyword in the list and click *Edit*. ▪ To remove a keyword, select the keyword in the list and click *Remove*.
Keyword Matching	If you select this option, then **all** the keywords must be present in the series description to be considered a match.
Exact Matching	If you select this option, then the series description must exactly match the keywords.
For more information about using keywords, see Keyword Matching in SHRED Configuration on page 77.	

Option	Description
Automatically detect diffusion phases and B-values	Select this option to allow MultiView to detect the diffusion phases and B values from the DICOM file header.
	If you do not select this option, you must specify the B value for each time index that will be present in the series. Scroll down in the dialog and click *Add*, then enter the B value for the first time index. Repeat this process to add the B values for remaining time indices that will be in the series.
Single axis diffusion images	Select this option if the images in the series will be created with a single axis.

6. Click *Apply*.

7. Add a Local Importer SHRED or DICOM Send SHRED under this SHRED to make the corrected studies available in MultiView, or to other DICOM devices including other MultiView workstations.

Performing Automatic DCE Colorization

You can add a SHRED to perform DCE colorization automatically.

To add a DCE colorization SHRED:

1. Open the SHRED Configuration dialog (choose *Tools > SHRED Configuration*).

2. If the SHRED you want to add this SHRED under is running, click the *Stop* button under SHRED Status.

3. In the tree view, right-click the node where you want to add this SHRED and select *Add New Breast DCE Colorization SHRED*. The new SHRED is added as a child node under the node you selected. If you do not see the new SHRED, click the "+" icon to expand the node.

4. Click the *Breast DCE Colorization SHRED* node. The Breast DCE Colorization SHRED details appear.

Figure 44: Breast DCE Colorization SHRED Details

5. Enter the DCE colorization information to use on studies sent from the scanner console.

Table 7: Breast DCE Colorization SHRED Options

Option	Description
Series Description Keywords	Enter the keywords used to identify scans in the series to be included in the colorization. ▪ To add a keyword, click *Add*. ▪ To edit an existing keyword, select the keyword in the list and click *Edit*. ▪ To remove a keyword, select the keyword in the list and click *Remove*.
Keyword Matching	If you select this option, then **all** the keywords must be present in the series description to be considered a match.
Exact Matching	If you select this option, then the series description must exactly match the keywords.
For more information about using keywords, see Keyword Matching in SHRED Configuration on page 77.	
Injection Delay	The injection, or scan delay time (in seconds). The injection delay is the time between the contrast injection and the first post contrast scan.

Option	Description
Time Point Duration	Time point duration is used to calculate pixel intensity vs. time curve. Select Auto-detect to allow MultiView to automatically detect the time point duration. *NOTE: There must be at least three phases present for MultiView to automatically detect the time point duration.*
Number of Time Points	The minimum number of time points this branch will be expecting to process.
Fat Sat Scan	Select this option if the scan was conducted using fat sat fat suppression. This is typically automatically detected by MultiView.
Peak Enhancement Time Range	Enter the time window MultiView should use to detect peak enhancement.
Minimum Enhancement Percentage	Enter the minimum threshold value. This determines the minimum threshold value on the color slider that appears in the viewport overlay when colorization has been applied.
Maximum Enhancement Percentage	Enter the maximum threshold value. This determines the maximum threshold value on the color slider that appears in the viewport overlay when colorization has been applied.

6. Click *Apply*.

7. Add a Local Importer SHRED or DICOM Send SHRED under this SHRED to make the corrected studies available in MultiView, or to other DICOM devices including other MultiView workstations.

Keyword Matching in SHRED Configuration

Your site probably uses standard descriptions for series. When you specify those descriptions as keywords, MultiView can recognize series with those keywords and perform automatic processing on them.

For example, consider the following series descriptions:
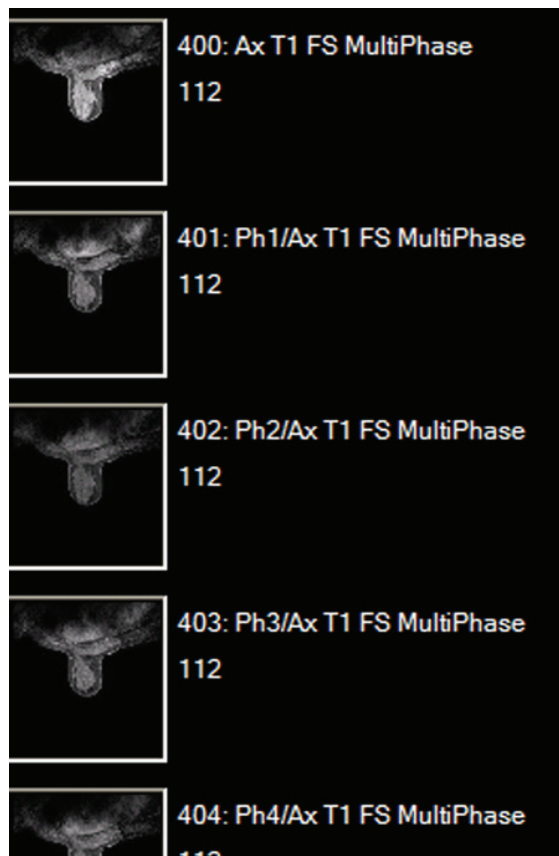
Figure 45: Example Series

To configure a SHRED to process a study containing those series descriptions, add the following series description keywords:
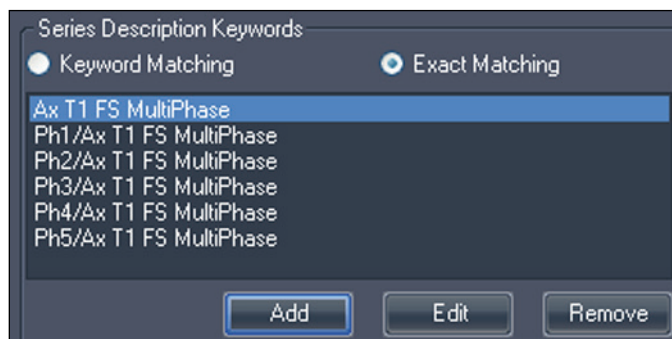
Figure 46: Keyword Example

Chapter 5   Working in the Study Manager

The studies list in the MultiView study manager/Explorer tab displays the studies available in the local database (My Studies), on a remote server, or the shared studies available on the Enterprise tab.

Figure 47: Studies List Showing Studies on a Remote Server

To sort the studies in the list, click the heading of the column you want to sort by. MultiView remembers the current sort order when it is closed and displays the same sort order the next time it is launched.

Studies Toolbar Buttons

The toolbar at the top of the studies list contains buttons for working with studies. Some buttons are only active for studies in the local database (My Studies), others are only active if they apply to the selected study.

Table 8:   Studies Pane Toolbar Buttons

Button	Name	Function
	Open Study	Opens the selected study in the workspace.
	Retrieve Study	Retrieves the selected study from the server. For more information, see Retrieving a Study from a Remote DICOM Server on page 63.
	Send Study	Sends the selected study to a remote DICOM server. For more information, see Sending a Study to a Remote DICOM Server on page 65.

Button	Name	Function
	Delete Study	Deletes the selected study. For more information, see Deleting a Study from My Studies on page 80.
	View Series Details	View information about the study. For more information, see Study Information on page 81.
	Anonymize Selected Study	Anonymize the selected study. For more information, see Anonymizing a Study on page 81.
	Generate Derived Series	Generate a derived series for the selected study. For more information, see Derived Series on page 149.
	View Breast Report	View a report that has been created for the selected study. For more information, see Viewing Study Reports on page 83.
	Mark as Read	Change the status of the selected study to "Read". For more information, see Study Status on page 83.
	Mark as Unread	Change the status of the selected study to "Unread". For more information, see Study Status on page 83.
	Send Study to SHRED	Process the selected study using a SHRED. For more information, see Processing a Study Using a SHRED on page 84.

Studies in the Local Database (My Studies)

To view the local database, click *My Studies* in the Servers pane.

Opening an Image or a Study

To open an image or study, double-click it (or select it and click the *Open* icon, or right-click and choose *Open*). The image or study opens in the workspace.

If MultiView has been configured to synchronize with a third-party application such as SecurView and to open studies automatically, the corresponding study opens in that application.

NOTE: To open multiple adjacent studies hold down the Shift key when selecting them and then right-click and choose Open*. To open multiple non-adjacent studies hold down the Ctrl key when selecting them and then right-click and choose* Open*.*

Deleting a Study from My Studies

To delete a study from My Studies, right-click the study in the right pane of the DICOM sub-tab and choose *Delete*, or select the study and click the *Delete* icon at the top of the pane. If you want to delete the oldest studies first, click the Study Date column heading in the My Studies list to sort the studies by date.

NOTE: Depending on the size of study (or studies) you selected, it may take several minutes to complete the deletion.

Study Information

To quickly view the details of a study, right-click the study and select *View Series Details* from the context menu. The Series Details dialog appears listing details about the patient, the study, and the series in the study.

Figure 48: Series Details

Anonymizing a Study

To anonymize a study:

1. Right-click the study in the right pane of the DICOM sub-tab and choose *Anonymize*, or click the *Anonymize* icon at the top of the pane.

The Anonymize Study dialog appears with default anonymization information which will be applied to the study unless you specify otherwise.
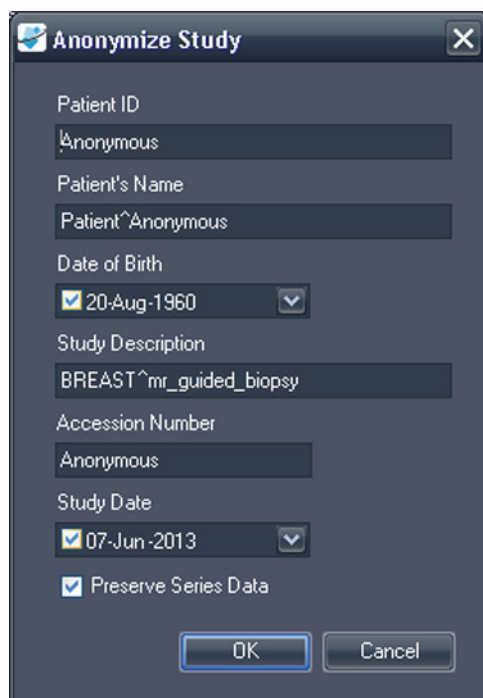
Figure 49: Anonymize Study Dialog

2. Enter the information you want to use for this study. Select the *Preserve Series Data* option if you want to preserve the series level data, as per DICOM 3.0 standard.

3. Click *OK*.

A progress window displays the anonymization progress. An anonymized **copy** of the study is generated when the process is complete. The original study is not modified.

NOTE: If the study is very large, the anonymizing process may take a few minutes during which you will not be able to interact with MultiView.

Generating Derived Series

A *derived series* is a series that includes enhancements such as MIPs, radials, subtractions, and colorizations added in MultiView in a format which allows non-MultiView users to view them. For more information, see Derived Series on page 149.

NOTE: Derived series are only available with the MultiView MR Breast Dx license.

To generate a derived series for a study in the studies list, select the study and click the *Generate Derived Series* icon in the studies list toolbar.

Viewing Study Reports

If a report has been created for a study, the View Breast Report icon is available when you select the study in the My Studies list. To view a study report, select the study and click the *View Breast Report* icon.

- If only one report exists for the study, it opens as a PDF file.

- If multiple reports exist, the Available Reports dialog opens with a list of the existing reports for the study.
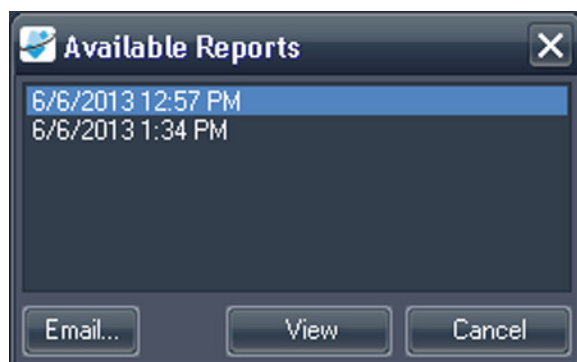
Figure 50: Available Reports Dialog

To view a report, select it in the list and click *View*. The report opens as a PDF file.

You can also email a report from the Available Reports dialog. To email a report, select it in the list and click *Email...*. For more information about emailing reports, see Emailing a Report on page 188.

Study Status

Studies may be in one of the following statuses:

- Unread – The study has been processed by MultiView, but has not yet been read by a radiologist.

- Opened – The study is currently open and being reviewed.

- Read – The study has been read by a radiologist.

When you close a study in the workspace, MultiView asks if you want to change the study status to "Read". You can also change the study status to Read or Unread by right-clicking the study and selecting *Mark as Read* or *Mark as Unread* from the context menu.

Processing a Study Using a SHRED

SHRED processing usually happens automatically, but you can manually process a study using a SHRED if necessary.

1. In the MultiView study manager/Explorer tab, right-click the study you want to process and select *Send Study to SHRED* from the context menu.

2. Click *OK* in the confirmation dialog that appears.

The study is processed by the appropriate SHRED based on the keywords present in the series descriptions. For more information about using SHREDs, see About SHREDs on page 66.

Studies on a Remote DICOM Server

Although you will usually work with studies in the local database, it is also possible to perform the following functions on studies on a remote DICOM server:

- Open the study in the MultiView workspace (for more information, see Opening an Image or a Study on page 80)

- Retrieve the study so that it is added to the local database (for more information, see Retrieving a Study from a Remote DICOM Server on page 63)

- View information about the study (for more information, see Study Information on page 81)

- Mark the study as "Read" (for more information, see Study Status on page 83)

NOTE: When opening a remote study, if the series and instance counts match that of a local copy of the study already in My Studies, MultiView will treat the remote study as if it were already local.

Studies on the Enterprise Tab

The Enterprise tab displays a combined list of studies available in the local database and studies from other clients connected to Study List Manager, such as SecurView.

Figure 51: Studies on the Enterprise Tab

To open a study, select it in the list and click the *Open Study* icon in the studies toolbar. If the study is in the local database, it opens in the MultiView workspace. If the study is from a third-party application, and application synchronization is correctly configured, the study opens in that application.

Studies on the Workstation

To work with images on the workstation, on the network, or on an external storage device connected to the workstation (such as a flash drive):

1. Use the left and / or right pane(s) in the My Computer sub-tab to navigate to the target image or folder.

2. Right-click on the target image or folder.

3. Choose an option from the context menu.

Table 9:   Context Menu Options

Option	Action
Import	Imports the file or folder into the local database.
Open	Opens an image preview of the file.
Open in Study Filters	Displays DICOM header information for an image or series of images in a study.

Option	Action
Dump Files	Performs a DICOM dump of the contents of the particular DICOM file. All DICOM tags are displayed in the DICOM Editor pane. Tags may be added or deleted and you can use the *Quick anonymize* button to remove all patient sensitive information.
	Save your changes to make them permanent.

Chapter 6   About the MultiView Workspace

About the MultiView Workspace

The workspace is composed of viewports and panes. If multiple studies are open, they are represented by tabs at the top of the viewport area. For more information, see Managing Workspace Tabs on page 88. The Explorer tab is also available at the top of the viewport area to allow you to return to the study manager.

By default, the workspace opens with the following panes open and minimized to the sides of the workspace:

- Layout

- Clipboard and Key Images

- Breast Reporting

- Graph
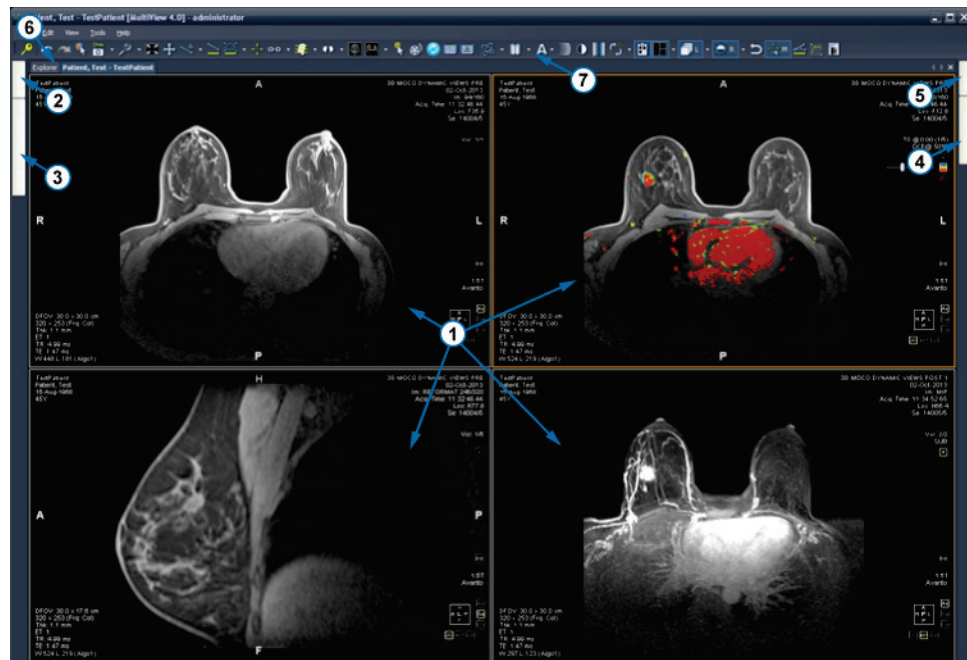
#	Description
1	Viewports
2	Layout tab
3	Clipboard and Key Images tab

4	Breast Reporting tab
5	Graph tab
6	Explorer tab
7	Toolbar

Figure 52: MultiView Workspace

Managing Workspace Tabs

MultiView supports multiple tabbed viewing. If you open a new study it will appear as another tab in the workspace. You can switch between studies by clicking on the different tabs. To organize tabs, right-click on a tab and select an option from the context menu.
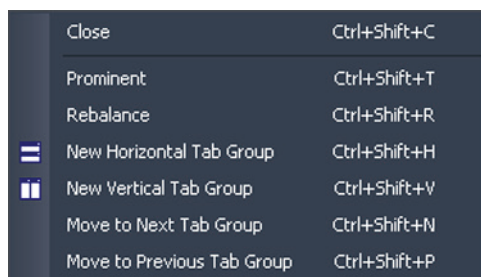
Figure 53: Tabs Context Menu

The tab context menu may have the following options:

- **Prominent:** Maximizes the tab to the full screen should the tab not be full screen already.

- **Rebalance:** Restores the maximized tab to its previous size.

- **New Horizontal Tab Group:** Moves the tab to its own new horizontal tab group

- **New Vertical Tab Group:** Moves the tab to its own new vertical tab group

- **Move to Next Tab Group:** Moves the tab to the next tab group if there is one present.

- **Move to Previous Tab Group:** Moves the tab to the previous tab group if there is one present.

Working with Panes

Many MultiView features appear in panes which appear when you are performing a particular task. Panes are visible when you are working with them, but "slide" out of the way when you click outside them and appear as tabs at the sides or the bottom of the workspace.

To view a pane, click its tab in the workspace.

To keep a pane visible when you aren't working it, click the pin icon in the top right corner of the pane. To hide a pane, click the pin icon again.

About the Study List

The Study List tab in the Layout pane displays the series in the open study.

If you have configured MultiView to automatically search for prior studies, any prior studies found are displayed in the Study List as well. Prior studies displayed with a bullet icon are located remotely on one of the default servers. If a prior study is displayed without a bullet icon it is already local.

To retrieve a study located remotely on a default server, double click the study name or select the study and click the Retrieve icon in the Study List toolbar (item 10 in the figure below). To retrieve a series in a study located remotely on a default server, click the Retrieve icon beside the series thumbnail (item 4 in the figure below).

For more information about configuring MultiView to search for prior studies, see Priors on page 51.

To view an image series in a viewport, double-click its thumbnail in the Layout pane or drag the thumbnail into the viewport.
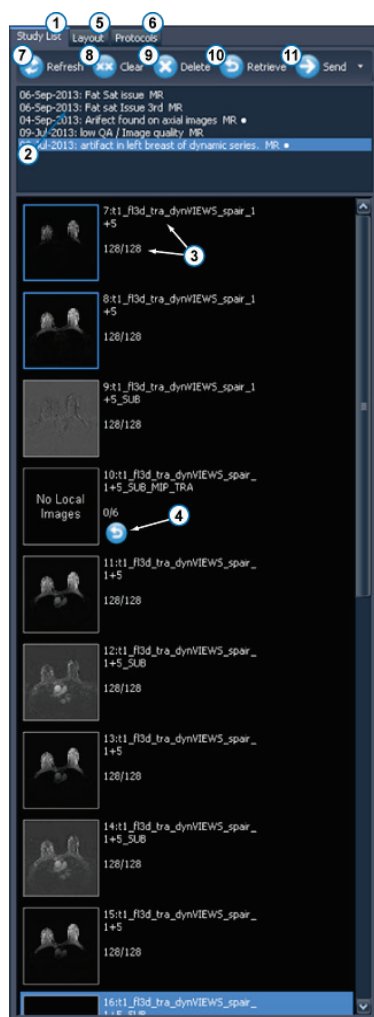
Figure 54:   Study List Tab

#	Description
1	Study List tab.
2	Current and prior studies (bullet icon indicates that the study has not been retrieved from the server).
3	Series number, series name and the number of slices in the series. The blue highlight around the thumbnail indicates that the series is open in a viewport.
4	Series Retrieve icon. Click to retrieve the selected series from the remote server.
5	Layout tab. Displays the layouts that may be applied to the workspace. For more information, see Viewport Layouts on page 92.
6	Protocols tab. Shows any saved layout schemes (known as "hanging protocols"). For more information, see Hanging Protocols on page 103.
7	Refresh icon. Click to refresh the selected thumbnails in the layout.
8	Clear icon. Click to empty the viewports in the workspace.
9	Delete icon. Click to delete the selected series. For more information, see Deleting Series on page 92.
10	Retrieve icon. Click to retrieve the selected study from the remote server.
11	Send icon. Sends the selected series to a remote DICOM server. Click the drop-down arrow to select the server to send the series to.

Loading a Dynamic Series Study

A dynamic series study contains a number of series of images taken at different time points (that is, a multiphase image series). It is possible to load all the series into MultiView simultaneously and then stack through both slices and time points.

To load a dynamic series study:

1. Open the study. (For more information, see Opening an Image or a Study on page 80.)

2. Click on the Layout tab on the left side of the workspace to open the Layout pane. If the Study List tab is not the active tab, click on it to open it.

3. SHIFT+click the first and last series in the group to select them all, or CTRL+click to select non-adjacent series, and then drag the group into a viewport.

Figure 55: Multiple Series Loading

MultiView displays the number of volumes (or series of time points) that have been loaded in the top right corner of the viewport. The currently visualized volume is displayed in this annotation.
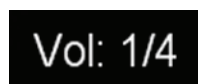
Figure 56: Volume Annotation

NOTE: Depending on the protocol, all the time points may appear in a single series. In this case, drag only that series into the viewport to load the multiple

volumes. MultiView will read and display all the volumes in the series automatically, based on the timestamp.

To move to the next volume (time point), with the Stack tool assigned to a mouse button click and drag left or right in the image.

Deleting Series

To delete a series, select it in the Study List and click the *Delete* icon. You will be prompted for confirmation before the series is actually deleted. Note that deleting a series will clear the current layout.

You cannot delete series located on remote servers – you can only delete series in the local database. Attempting to delete a series on a remote server will clear the layout, but will not delete the series from the remote server.

NOTE: Deleting a series may take several minutes during which time you will not be able to interact with MultiView.

Viewport Layouts

You can control the number and arrangement of viewports in the MultiView workspace from the Layout pane. To show the Layout pane press L on the keyboard or click the Layout tab on the left side of the workspace.

Figure 57: Layout Tab

The Layout tab in the Layout pane displays the viewport layouts that can be applied to the workspace. Click a layout thumbnail to apply that layout.

If MultiView detects that you are using multiple monitors, both monitors are displayed in the Layout tab. You can apply a separate layout to each monitor.

Using multiple viewports may be particularly helpful when viewing and comparing multiple series of images. To add a series to a viewport, drag the series into the viewport from the Study List tab.

NOTE: In multi-monitor configurations, MultiView will automatically shift viewports between monitors to maximize the area of each viewport given the size and location of the main MultiView window. For example, if MultiView fills the first monitor but only half of the second, MultiView may shift some viewports to the first monitor to better balance the layout. If MultiView fills both monitors, no viewports will be shifted.

In a multi-viewport layout, the "active" viewport is highlighted in orange. Click in a viewport to make it the "active" one.

You can view the active viewport in the full screen by double-clicking in the viewport or by choosing *Tools > Standard > Full Screen*. Double click in the viewport or *Tools > Standard > Full Screen* again to return to the multi-pane layout.
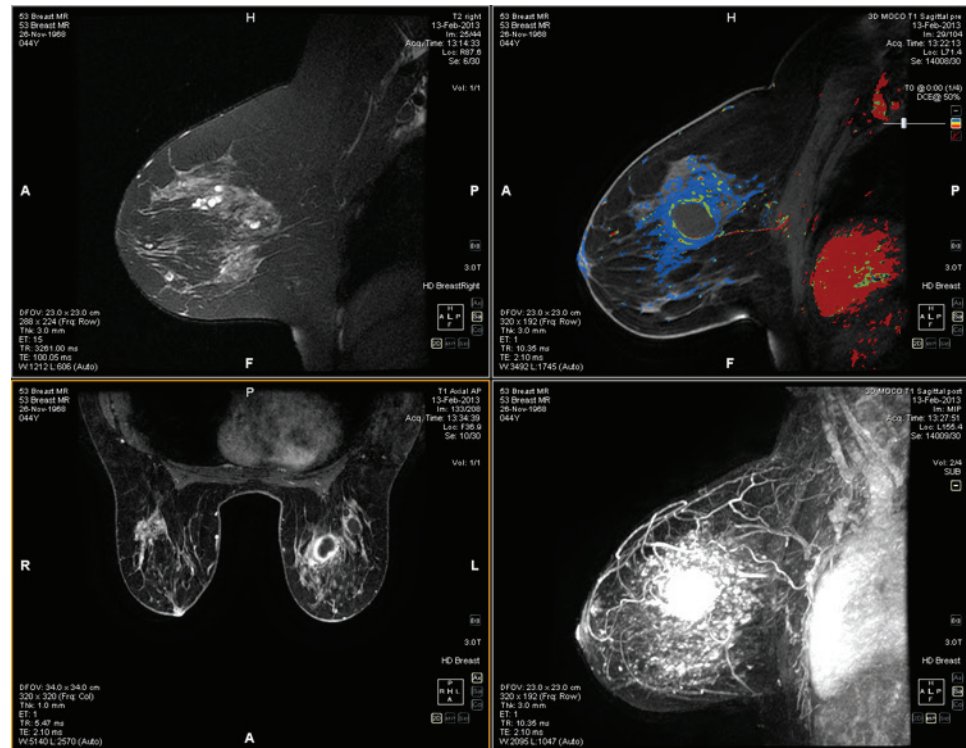
Figure 58: Multiple Series in Viewports

When you have a layout set up the way you like it, you can save it as a hanging protocol. For more information, see Hanging Protocols on page 103.

About the Viewport Overlays

The viewport overlay displays information about the patient and series, and provides controls for quickly shifting between views and rendering modes. To show or hide elements of the viewport overlay choose *Tools > Standard* then the element you want to show or hide: *Text Overlay*, *Graphics Overlay*, or *DICOM Overlay(s)*. Some features also add additional controls to the viewport overlay.
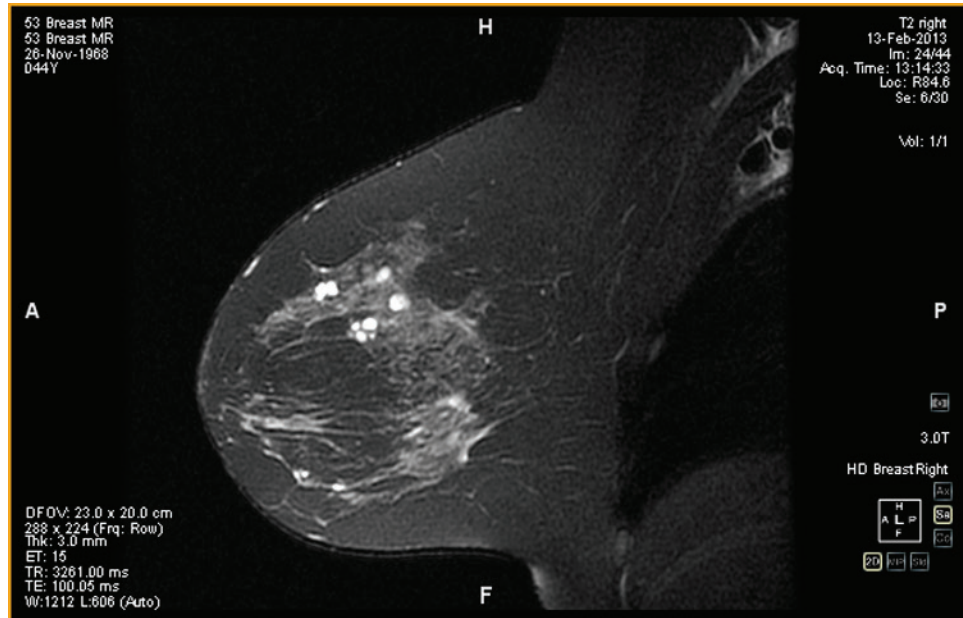
Figure 59: Viewport with Text Overlay Showing

Text Overlay

The viewport text overlay displays information about the patient and the procedure. The elements that appear in the overlay depend on the series modality and your toolbar profile (configured in *Tools > Options > Toolbar*). The tables below describe the text overlay elements for MR studies.

Table 10: Viewport Overlay Text in Viewport Quadrants - Full and Advanced Toolbar Profiles

	Left	Right
Top	▪ Patient ID ▪ Patient name ▪ Patient date of birth ▪ Patient age	▪ Series description ▪ Study date ▪ Slice number / series slice count ▪ Series acquisition time ▪ Slice DICOM coordinates ▪ Series number / series count ▪ Volume number / volume count
Bottom	▪ Defined field of view ▪ Image resolution ▪ Slice thickness ▪ Echo train length ▪ Scanner repetition time ▪ Scanner echo time ▪ Window/level settings	▪ Scanner magnetic field strength ▪ Scanner model ▪ Receive coil name The graphics overlay also appears in this quadrant (see below).

Table 11: Viewport Overlay Text in Viewport Quadrants - Simple Toolbar Profile

	Left	Right
Top	▪ Patient ID ▪ Patient name ▪ Patient date of birth ▪ Patient age	▪ Series description ▪ Study date ▪ Slice number / series slice count ▪ Series acquisition time ▪ Slice DICOM coordinates ▪ Volume number / volume count
Bottom	▪ Defined field of view ▪ Image resolution ▪ Slice thickness	▪ Scanner magnetic field strength ▪ Scanner model The graphics overlay also appears in this quadrant (see below).

Graphics Overlay

The graphics overlay in the bottom right corner of the viewport includes controls for quickly toggling between views and rendering modes. Click a control to change the view or rendering mode. The active control is highlighted in the overlay.

Figure 60: Highlighted Viewport Controls

Table 12: View Controls

Control	Description
Ax	Switches the viewport to axial view.
Sa	Switches the viewport to sagittal view.
Co	Switches the viewport to coronal view.
Pt	Switches the viewport to interventional view. (This control only appears when you are using a plug-in that supports lesion targeting.)

Table 13: Rendering Mode Controls

Control	Description
2D	Switches the viewport to the Slices rendering mode.
MIP	On first click, switches the viewport to full MIP mode. On second click Thin MIP mode is activated. A slider control appears allowing you to control the width of the MIP. The width (in mm) is shown in real time on the screen's upper-right quadrant. For more information on rendering modes, see Views and Rendering Modes on page 99.

Control	Description
Sld	On first click, switches the viewport to full Solid Volume rendering mode. On second click, Thin Solid Volume mode is activated. A slider control is displayed allowing you to control the width of the thin solid volume. The width (in mm) is shown in real time on the screen's upper-right quadrant. For more information on rendering modes, see Views and Rendering Modes on page 99.

Using the Orientation Cube

The orientation cube is part of the viewport graphics overlay. It rotates in three dimensions to show the orientation of the current slice, MIP or Surface Volume being displayed. The table below describes the nomenclature associated with the faces of the orientation cube.

Figure 61: Orientation Cube (showing oblique view orientation)

Table 14: Orientation Cube Nomenclature

Letter	Description
A	Anterior
P	Posterior
F	Foot
H	Head
L	Left
R	Right

NOTE: The A / P / F / H / L / R nomenclature is also used in the centers of the four sides of the viewport to indicate orientation.

DICOM Overlays

This option is not functional in MultiView 4.0.1.

Using Window/Level Presets

Window and level presets are pre-defined values for the viewport brightness and contrast assigned to keyboard keys. If you have created one or more window and level presets, press the assigned key to configure the viewport to those settings. For

more information about creating window and level presets, see the Window/Level options on page 59.

Your window and level presets are also available from the context menu. To apply a preset using the context menu, right-click in the viewport and choose *Window/Level Presets* then your desired preset.

Press F2 to return the window and level to their default values.

Views and Rendering Modes

MultiView Views

MultiView has three standard views for MR images: axial, sagittal, and coronal. To quickly switch between these views, click the view controls in the viewport overlay, or right-click in the viewport and choose an option from the *Orientation* sub-menu in the context menu.
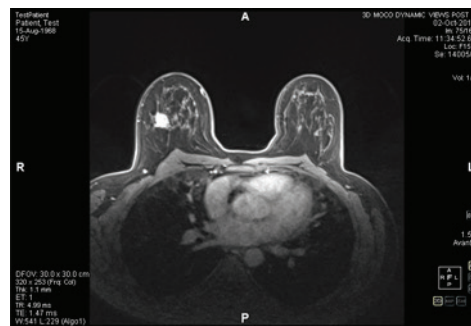
Figure 62:   Axial View
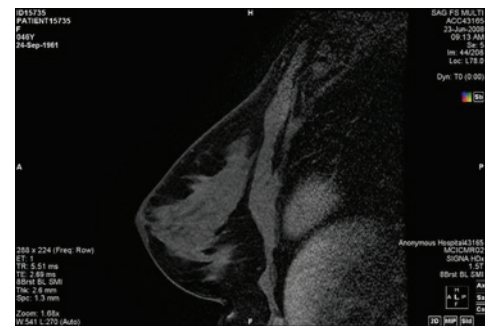
Figure 63:   Sagittal View
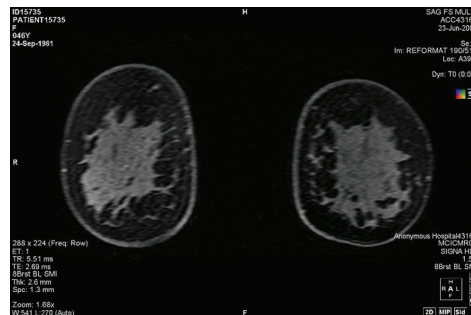
Figure 64:   Coronal View

MultiView Rendering Modes

MultiView can display (or render) images in five modes: 2D Slices, MIP, Thin MIP, Solid Volume, and Thin Solid Volume. By default, images open in the 2D Slices mode, which displays each image as a 2-dimensional slice in a stack. The other rendering modes are 3-dimensional depictions of the data.

To switch to a different mode, click the corresponding control in the viewport overlay, or right-click in the viewport and choose an option from the *Rendering Mode* sub-menu in the context menu.

Rotations may be applied in any of the 3D rendering modes. The orientation cube at the bottom right of the screen adjusts with each transformation to show the exact status of the rotation. To return to the viewport's initial view, click the [2D] viewport control or right-click in the viewport and choose *Rendering Mode > Slices* from the context menu.

MIP Mode

A MIP (Maximum Intensity Projection) displays the visualization plane where voxels that fall in the way of parallel rays traced from the viewpoint to the plane of projection are enhanced.

Figure 65: Image Rendered in MIP Mode

Thin MIP Mode

Thin MIP mode presents a small section of the MIP. This may be useful for viewing a specific area around a lesion. To adjust the thickness of the volume, drag the on-screen slider. An annotation in the top right-hand corner of the screen, displays the current thickness.
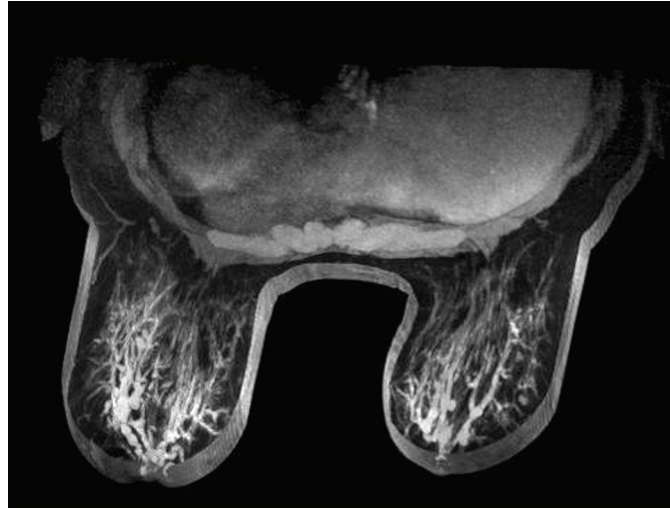
Figure 66: Image Rendered in Thin MIP Mode

Solid Volume Mode

Solid Volume mode is a 3D rendering mode resulting from the combination of all image slices within a series.
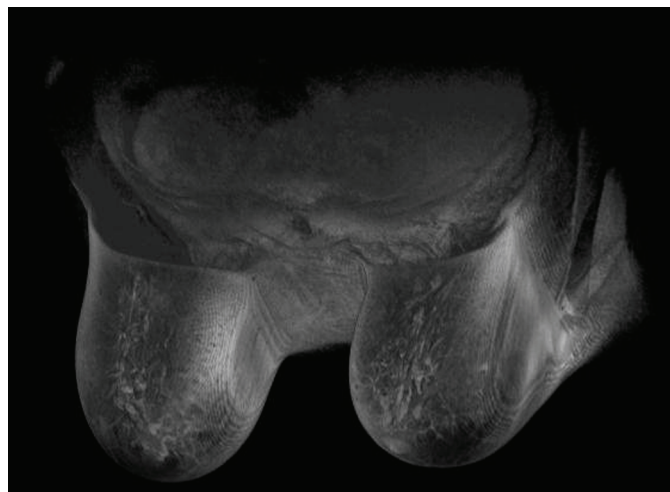
Figure 67: Image Rendered in Solid Volume Mode

Thin Solid Volume Mode

Thin Solid Volume mode displays a small section of the Solid Volume View. To adjust the thickness of the volume, drag the on-screen slider. An annotation in the top right-hand corner of the screen, displays the current thickness.
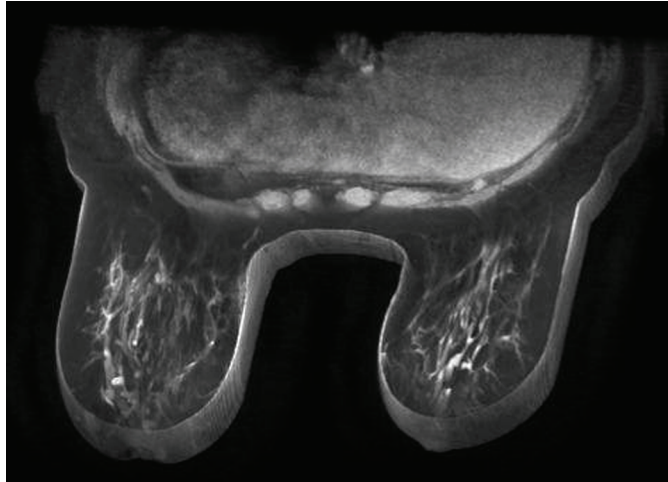
Figure 68: Image Rendered in Thin Solid Volume Mode

Subtraction

Subtraction applies to multiphase image series. It subtracts the volume at each time point from the initial mask or time point. For example, subtract a non-contrast series from a contrast series then use MIP mode to visualize the anatomy on the subtracted MIP image.

Figure 69: Visualization on a Subtracted MIP Image

To enable subtraction, right-click in the viewport and choose *Rendering Options >*

Enable Subtraction, or click the subtraction control [image] in the viewport overlay.

When subtraction is enabled, the word "SUB" appears under the volume annotation.
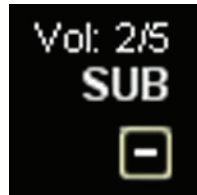
Figure 70: Subtraction Enabled Annotation

NOTE: If you are viewing the first volume when you enable subtraction, MultiView automatically switches to the second volume in the study as volume one subtracted from itself would be a blank screen.

Hanging Protocols

In MultiView, a *hanging protocol* is a saved profile of your preferred layout arrangement and settings. When you open a study, MultiView automatically applies a hanging profile based on the study parameters, if an appropriate hanging profile exists. You can manually apply a different hanging profile if you wish.

You can save the following information in a hanging protocol:

- Viewport layout configuration (number of rows and columns displayed) and the series opened in each viewport

- The rendering mode of each viewport (Slice, MIP, Thin MIP, Solid Volume, or Thin Solid Volume)

- Image manipulations such as image rotation, and image flipping

- The radial stack axis (for use with MIP rotations)

- Image orientation / transformation (for example, reformatting in Sagittal, Axial, or Coronal orientation)

- Colorization and subtraction

- Time index

- Window level

Hanging protocols appear on the Protocols tab in the Layout pane.
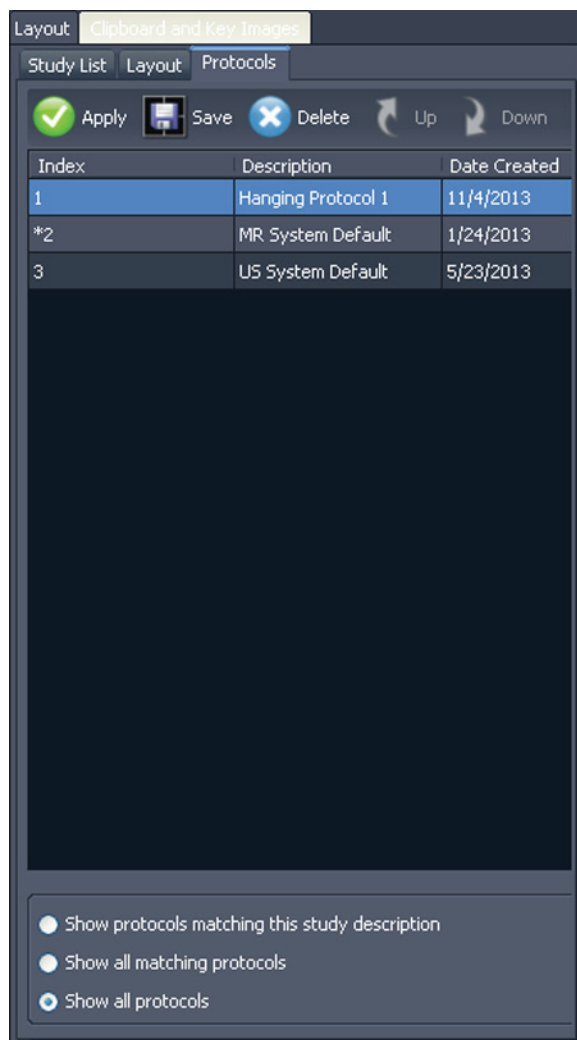
Figure 71: Protocols Tab in Layout Pane

MultiView Default Hanging Protocols

MultiView includes default hanging protocols for magnetic resonance (MR) studies and ultrasound (US) studies.

MR Default Hanging Protocols

The MR System Default hanging protocol is not initally applied automatically. To apply the MR System Default hanging protocol, select the protocol in the Protocols tab on the Layout pane and click **Apply**.

The MR System Default hanging protocol is consistent with common diagnostic MR imaging practice but will not be applicable to all studies. Create custom hanging protocols as necessary based on the study conventions used at your site.

Figure 72: MR System Default Hanging Protocol Applied to an MR Study

⚠ CAUTION

Risk of Incorrect Diagnosis

The Injection Delay parameter in the DCE colorization setting in the MR System Default hanging protocol is set to 20 seconds. Before you apply the MR System Default hanging protocol, verify that this matches the injection delay used at your site. An incorrect injection delay setting may cause incorrect colorization.

Note: The MR System Default hanging protocol displays images from GE scanners with the chest wall at the top of the viewport. To view images from GE scanners with the chest wall at the bottom of the viewport, rotate the image in the viewport and save the layout as a custom hanging protocol.

US Default Hanging Protocols

The three US system default hanging protocols are US 4-on-1, US 1-on-1, and US Current-Prior. The US 4-on-1 hanging protocol displays 2-by-2 mosaic tiling that contains images in sequential order from upper left, to upper right, to lower left and lower right. The US 1-on-1 hanging protocol displays the chosen study images in full screen format. The US Current-Prior hanging protocol presents two viewports displayed side-by-side with the current study on the left and its closest prior study on the right. If there is no prior study, the right hand viewport is empty with "NO MATCHES (1st PRIOR) EXPECTED SERIES:" displayed in the background. For studies with a prior available, the viewport contains a PRIOR label in yellow text in the upper right hand corner of the DICOM overlay.

Use the mouse wheel to move through the US images one at a time. For the US 4-on-1 hanging protocol, for example, if the four tiles contain images 1, 2, 3, and 4, when you scroll the next set of images displayed is 2, 3, 4, and 5. Use the **Page Up** and **Page Down** keys on the keyboard to move through US images four at a time, that is, if the four tiles contain images 1, 2, 3, and 4, when you press the **Page Up** key the next set of images displayed is 5, 6, 7, and 8.

The hanging protocol that is automatically applied when you launch a US study is a single viewport. If you have selected the **Enable Tiling for US Images** option on the **Tools > Options > Hanging Protocols** page, the viewport contains four image tiles. This hanging protocol is applied until you manually select one of the three US system default hanging protocols or you create and apply a custom hanging protocol for US studies.

Creating a Hanging Protocol

To create a hanging protocol:

1. Select the **Layout** pane.

2. Click the **Layout** tab and click on a layout thumbnail from the list of viewport layouts that can be applied to the workspace.

3. Click the **Study List** tab and select the desired series. Hold down the left mouse key and drag and drop the series into the viewport. Use the **Ctrl** key to select multiple series for one viewport.

4. Click the **Protocols** tab and click **Save**.

   The Store Hanging Protocol dialog appears.

Figure 73: Store Hanging Protocol Dialog

5. Specify the options you want to use with this hanging protocol and click **Save**.

Table 15: Store Hanging Protocol Options

Option	Description
Name	Enter a name for this hanging protocol.
Create new hanging protocol	If a hanging protocol is currently loaded, select this option to save your current layout as a new hanging protocol. If a hanging protocol is not currently loaded, this is the only available option.
Replace current hanging protocol	If a hanging protocol is currently loaded, select this option to replace it with your current layout.
Shared hanging protocol	Select this option if you want this hanging protocol to be available to other MultiView users.
Store window and level values	Select this option to store the current window and level values as part of the hanging protocol.
Store tool states	Select this option to store the tools you have assigned to the left and right mouse buttons as part of the hanging protocol.

The new hanging protocol appears in the Layout pane under the Protocols tab.

Applying a Hanging Protocol

When you open a study, the first hanging protocol listed under "Show protocols matching this study description" is automatically loaded. MultiView determines the hanging protocol to apply based on study parameters such as the study and series descriptions. This is meant to streamline the workflow so when you open similar studies with the same scanning protocols, your preferred view and rendering setup is automatically in place.

To apply a different hanging protocol, select the protocol in the Protocols tab on the Layout pane and click *Apply*. The currently applied hanging protocol is marked with an asterisk (*) in the list.

The Protocols tab pre-filters the list of available hanging protocols to show only hanging protocols that match the study description. Select *Show all matching protocols* to see all protocols that have at least one series with an exact matching series description to a series in the current study. Select *Show all protocols* to see every hanging protocol created, including ones that are not relevant to the open study.
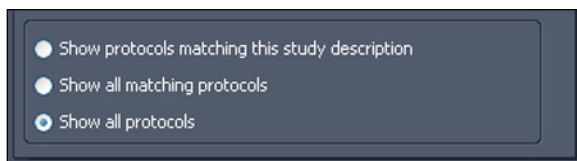
Figure 74: Protocol Filtering Options

You can also quickly apply another hanging protocol by using the + or - keys on the keyboard to apply the next (+) or previous (-) matching hanging protocol.

The previous and next hanging protocols are based on the index number assigned to the hanging protocol when you created it. You can change the index number of a hanging protocol by selecting it in the Protocols tab and clicking the Up or Down icons to move it up or down in the list.

If MultiView is unable to find a series in the current study with a description matching the saved value for the hanging protocol, the viewport displays "NO MATCHES EXPECTED SERIES:" and the description of the expected series.
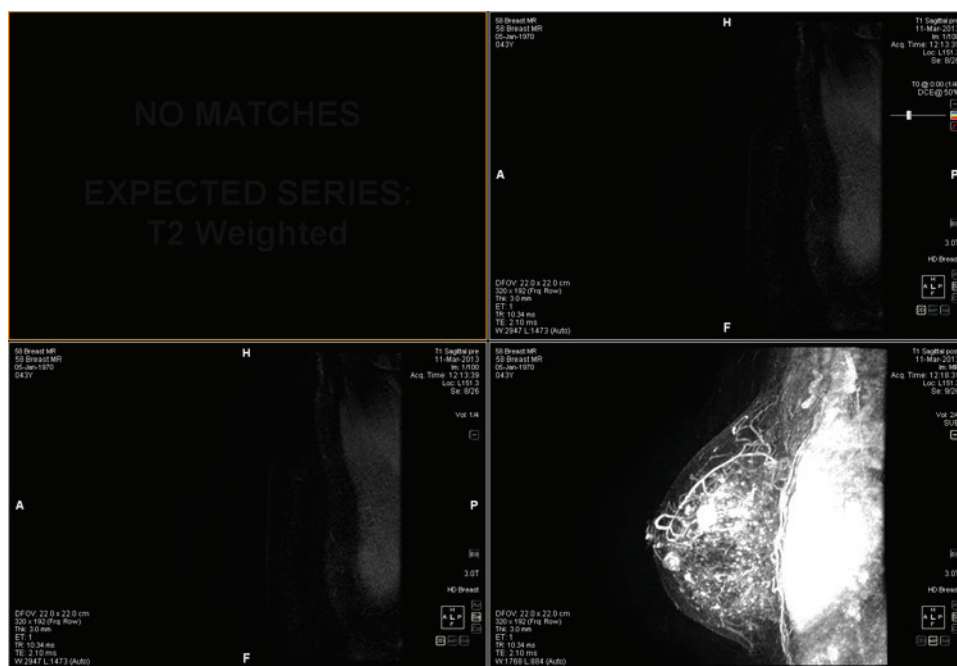
Figure 75: Missing Series in a Hanging Protocol

Similarly, if MultiView is unable to locate an expected series in a prior study, the viewport displays "NO MATCHES" and the description of the expected prior series.

NOTE: The Study List tab in the Layout pane lists the prior studies available for this patient ID. Prior studies displayed with a bullet icon are located remotely on one of the default servers. Double-click a study in the Study List tab to retrieve it.

Deleting a Hanging Protocol

To delete a hanging protocol, select it on the Protocols tab in the Layout pane and click *Delete*. If this hanging protocol is shared by other users, a confirmation dialog appears. Click *Yes* in the dialog to delete the hanging protocol.

If the hanging protocol you want to delete is not visible, select the *Show all protocols* option to show all saved hanging protocols.

Synchronizing with a Third-Party Application

When MultiView is configured to synchronize with a third-party application such as SecurView, you can quickly open a corresponding study for the patient you are viewing in the workspace by clicking the *Synchronize patient with external application* button in the toolbar .

NOTE: Use this option when MultiView has been configured to require manual synchronization. For more information, see the Application Synchronization options on page 40.

Exporting a Study as DICOM Files

You can export the study currently loaded in MultiView as a set of DICOM files.

To export a study as DICOM files:

1. Load the study in the viewport.

2. Choose *Tools > Utilities > Locate on Disk*. A Windows Explorer window appears displaying the DICOM files in the study.

3. Select the files and copy them to a folder on the workstation.

Closing an Image or Study

To close an image or study, click the *Close* button in the top right corner of the viewport. If MultiView has been configured to synchronize with a third-party application such as SecurView, the corresponding study also closes in that application.

When you close a study, a dialog appears asking whether you want to mark the study as Read. If you click *Yes*, the study's status is changed to Read. If you click *No*, the study's status remains Unread.
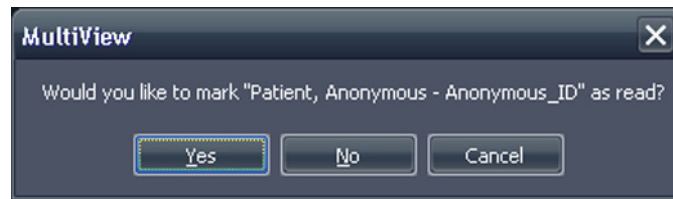
Figure 76: Change Study Status Dialog

You can also mark a study as Read in the My Studies list by selecting the study and clicking the *Mark as Read* button. To return a study to the Unread status, select the study in the My Studies list and click the *Mark as Unread* icon.

NOTE: Marking a study as Read in MultiView does not affect the study status in the third-party application.

Chapter 7   Standard Image Tools

Using MultiView Tools

All MultiView tools are available from the Tools menu. The tools that appear in the toolbar depend on the toolbar profile specified in the Toolbar options. You can also configure the tool icon size and whether MultiView wraps tools in the toolbar. For more information, see the Toolbar options on page 58.
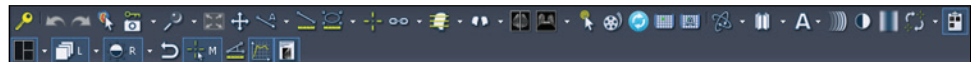
Figure 77: MultiView Toolbar Showing the Full Toolbar Button Profile

By default, the Stack tool and Window/Level tool are assigned to the left and right mouse buttons respectively, but many tools can be temporarily assigned to a mouse button. To assign a tool to a mouse button, select that tool from the Tools menu with that mouse button. Clicking in the image with that mouse button will now perform the functionality associated with the tool. The toolbar icon for the tool indicates which mouse button it has been assigned to.

Figure 78: Tools Assigned to the Left (L) and Right (R) Mouse Buttons

The measurement and annotation tools can be configured to automatically revert back to the default mouse button assignments after you complete the action associated with the tool (*Tools > Options > Annotation Tools*). For example, if you assign the Ruler tool to the left mouse button, the left mouse button reverts to the Stack tool when you complete the measurement. Other tools, such as the Pan tool, remain assigned to the mouse button until you deselect the tool in the Tools menu or assign another tool to that mouse button.

Some tools are organized into tool groups when they appear in the toolbar. A tool group has a dropdown arrow beside the tool icon. Click the arrow to access the tools in the tool group.
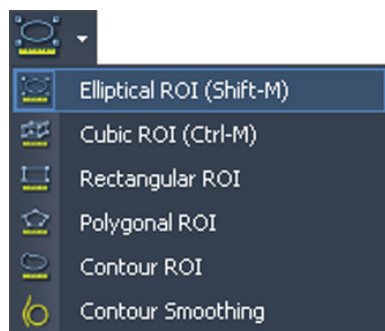
Figure 79:   Region of Interest (ROI) Tool Group
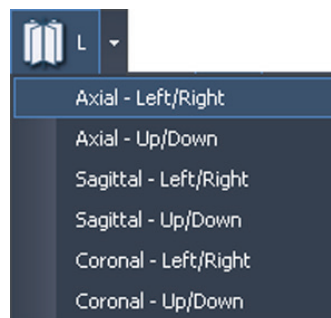
Figure 80:   Radial Stacking Tool Options

A dropdown arrow also appears beside tools that have options associated with them. Click the arrow to select an option to use with the tool.

You can also access many tools from the Tools sub-menu in the viewport context menu (right-click in the viewport and choose *Tools*). Note that the tools are assigned to a specific mouse button and clicking them in the sub-menu with a different mouse button will change the assignment.

Image Tools

To access the standard image tools choose *Tools > Standard* then the tool you want to access. Some of the standard image tools may also appear in the toolbar depending on your toolbar configuration settings.

Table 16: Image Tools

Icon	Name	Description
	Cine	Use the Cine tool to animate stacking through slices. For more information, see Using the Cine Tool on page 115.
	Stack	Use the Stack tool to view the next or previous slice in the stack. • Drag the mouse down to increase the slice index • Drag the mouse up to decrease the slice index • Drag the mouse left or right to stack through volumes The slice index is displayed in the top-right quadrant of the viewport. *NOTE: The stack function is also associated with the mouse scroll wheel.*

Icon	Name	Description
	Window/Level	The Window/Level tool adjusts the contrast and brightness of the images. The window and level of each view is controlled independently by moving the mouse in a pane with the associated mouse button held down. ▪ Drag the mouse left or right to adjust the window (contrast) value. ▪ Drag the mouse up or down to adjust the level (brightness) value. In the toolbar, click the drop-down arrow for this tool to select a window/level preset. For more information, see Using Window/Level Presets on page 98. The window and level values are displayed in the bottom left quadrant of the viewport pane.
	Pan	Use the Pan tool to move the image in any direction on the screen.
	Zoom	Use the Zoom tool to zoom in or out on the image. ▪ Drag the mouse down to zoom in. ▪ Drag the mouse up to zoom out.
	Radial Stacking	Use the Radial Stacking tool to stack around an axis. To define the stacking axis: 1. Select the Radial Stacking tool. 2. Click in the image to define the first point of the axis. 3. Click at the location of the second point of the axis. If you define an axis at an angle, MultiView adjusts the view so that axis becomes either a vertical or horizontal line, whichever is closest to the angle of the axis you defined. *NOTE: You can use the orientation cube in the lower-right corner of the viewport as a reference to the current position of the image.* When this tool appears in the toolbar, click the drop-down arrow beside this icon to select one of the pre-defined axes to stack around. Select the Stack tool and drag the mouse up or down (or scroll) to stack 360º around this axis.

Icon	Name	Description
	Rotate	Use the Rotate tool to rotate a MIP or Solid Volume in any direction.
		When this tool appears in the toolbar, click the arrow beside this icon and select *Discrete Rotation* to rotate the image in the up-down or left-right directions individually.
		▪ Hold down the left mouse button and drag up or down to rotate the image in increments of 10 degrees up or down.
		▪ Hold down the left mouse button and drag left or right to rotate the image in increments of 10 degrees left or right.
		NOTE: In the MIP or Solid rendering modes, scrolling with the mouse wheel rotates the image in the left-right direction, and dragging the mouse up or down while holding down the left mouse button rotates the image in the up-down direction. Note that this behavior does not apply to the Thin MIP or Thin Solid rendering modes.
	Invert	Use the Invert tool to invert the colors in the current image set.
	Show/Hide Text Overlay	Shows or hides the series and scanner information in the viewport.
		When this tool appears in the toolbar, click the arrow beside the icon to show or hide only parts of the overlay. For more information, see About the Viewport Overlays on page 95.
	Show/Hide Graphics Overlay	Shows or hides the orientation cube and related graphics in the viewport.
	Show/Hide DICOM Overlay	This tool is not used in MultiView.
	Add Text	Use the Add Text tool to add text to the image. For more information see Text Annotations on page 116.
	Add Text Callout	Use the Add Text Callout tool to add an arrow with text to the image. For more information see Text Annotations on page 116.
		When this tool appears in the toolbar, click the drop-down arrow to select the Add Text tool.

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Icon	Name	Description
	Flip Horizontal	Flips the image side to side. When this tool appears in the toolbar, click the drop-down arrow to access the following tools (described below): ▪ Flip Vertical ▪ Rotate Right ▪ Rotate Left
	Flip Vertical	Flips the image top to bottom.
	Rotate Right	Rotates the image 90º to the right (clockwise).
	Rotate Left	Rotates the image 90º to the left (counter-clockwise).
	Reset	Resets the image to its original settings and orientation. (Tip: You can also press the Backspace key on the keyboard to reset the image.)

Using the Cine Tool

When you click the Cine tool, a dialog appears with options to animate forward or in reverse and set the animation speed.
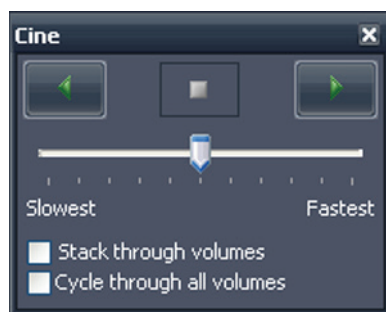
Figure 81: Cine Dialog

If you have more than one series open in the viewport, you can animate stacking through the slices in all open volumes.

Option	Description
Stack through volumes	Select this option to stack through the same slice in each volume; for example, volume 1 slice 5, volume 2 slice 5, etc.

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Option	Description
Cycle through all slices	This option becomes available when you select the Stack through volumes option. Select this option to stack through all slices in all volumes; for example, volume 1 slice 5, volume 2 slice 5, volume 1 slice 6, volume 2 slice 6, etc.
Cycle through all volumes	Select this option to stack through all the slices in the first volume, then all the slices in the second volume etc.

Text Annotations

Use the text annotation tools to add comments to an image.

Text Area

To add text to an image:

1. Choose *Tools > Standard > Add Text* and click in the viewport.

2. Type your text and press Enter.

3. If necessary, click and drag the text to an appropriate location on the image.

To change the text, right-click on it and choose *Edit*.

Text Callout

The Text Callout tool draws an arrow on the image with a text caption.

To create a text callout:

1. Choose *Tools > Standard > Add Text Callout*.

2. Click on the image where you want the arrow point to appear, then move the crosshairs to where you want the arrow to end and click again.

3. Type the text you want to associate with the arrow and press Enter.

To change the text caption, right-click on it and choose *Edit*.

Chapter 8   Tools and Methods for Linking Viewports

The MultiView linking tools link two or more viewports together. Use them to facilitate comparing, contrasting, and navigating MR images. Note that the default behavior of linked image stacking can be set to on or off for images that are in the same frame of reference.

About the Linking Tools

To access the tools for linking Viewports choose *Tools > Linking* then select the tool you want to use. Some of the linking tools may also appear in the toolbar depending on your toolbar configuration settings.

Table 17: Linking Tools

Icon	Name	Description
	Spatial Locator	Adds persistent crosshairs to all viewports to assist in cross-referencing images. For more information, see Linking Using the Spatial Locator Tool on page 121. You can also use the Spatial Locator tool to create and interact with markers in the image. For more information, see Working with Markers on page 120.
	Spatial Projection	Adds temporary crosshairs to all viewports to assist in cross-referencing images. For more information, see Linking Using the Spatial Projection Tool on page 122.
	Link Stacking	Links stacking in two or more viewports. When this tool appears on the toolbar, you can click the drop-down arrow to select whether to synchronize transforms (that is, zooming, panning, etc.) and/or volumes as well. For more information, see Using the Linked Stacking Tool on page 119.
	Unlink Studies	Unlinks viewports that contain series from different studies that have been synchronized for tandem stacking. For more information, see Using the Linked Stacking Tool on page 119.
	Link Studies	Links viewports that contain series from different studies for tandem stacking. For more information, see Using the Linked Stacking Tool on page 119.

Icon	Name	Description
	Reference Lines	Adds references lines to a non-active viewport (or viewports). Click the drop-down arrow to select whether to show or hide the first and last reference lines. For more information see Linking Using the Reference Lines Tool on page 118.

Linking Using the Reference Lines Tool

Use the Reference Lines tool to add yellow reference lines to the *non-active* viewports. Three reference lines are drawn on the non-active viewports, one for each of the first and last images in the active viewport, and one for the current image in the active viewport. The numbers below or beside the reference lines indicate the image number of active viewport. When you stack through the images in the active viewport, the line corresponding to the current image in the active viewport moves in tandem across the image in the other viewports showing the currently viewed pane as a reference.

NOTE: This functionality is available only when the images in the panes are in different orientations, for example sagittal and axial as shown below.

#	Description
1	Reference line corresponding to the first image in the series in the active viewport
2	Reference line corresponding to the image currently displayed in the active viewport
3	Reference line corresponding to the last image in the series in the active viewport
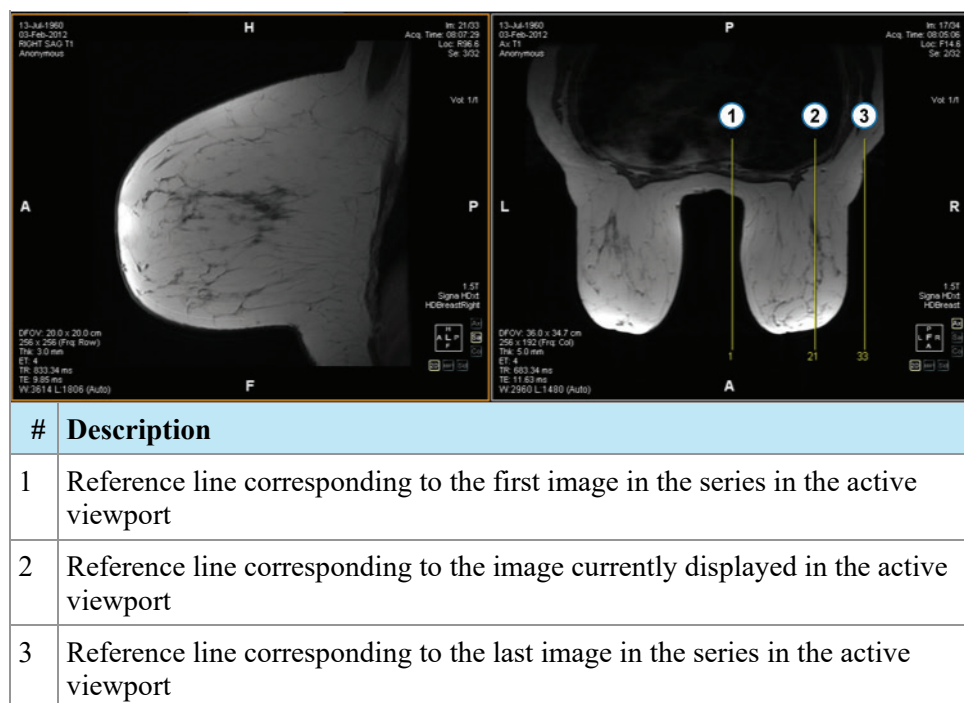
Figure 82: Reference Lines in Left Pane

To show or hide the reference lines for the first and last images in the active viewport, click the arrow beside the Reference Lines tool in the toolbar and click the *Show First and Last Reference Lines* option.

To hide all reference lines, deselect the Reference Lines tool.

Using the Linked Stacking Tool

Use the Linked Stacking tool to link multiple viewports together based on DICOM coordinates. Synchronized stacking is applied to all viewports that contain series in the same view (axial, sagittal or coronal). By default, linked viewports stack, pan, zoom, rotate and flip together.

To synchronize only stacking, click the drop-down arrow beside the Linked Stacking tool in the toolbar and deselect the *Link Transforms* option. When this option is not selected, viewports pan, zoom, rotate and flip independently of each other.

To synchronize stacking through multiple volumes, click the drop-down arrow beside the Linked Stacking tool in the toolbar and select the *Link Volume Index* option. Note that only viewports that contain the same number of volumes will be synchronized.

You can manually engage synchronized stacking on two different studies from different study dates (for example, a current scan and a prior image set having a different frame of reference) as long as both series are in the same orientation in their viewports. When you enable synchronized stacking in this case, MultiView synchronizes the studies based on DICOM coordinates.

The Unlink Studies tool applies to images in different studies where the anatomy has different start and end locations, such as priors. To manually synchronize a study and its prior, choose *Tools > Linking > Unlink Studies*, stack through one series until you reach the desired position, then choose *Tools > Linking > Link Studies* to re-link them.
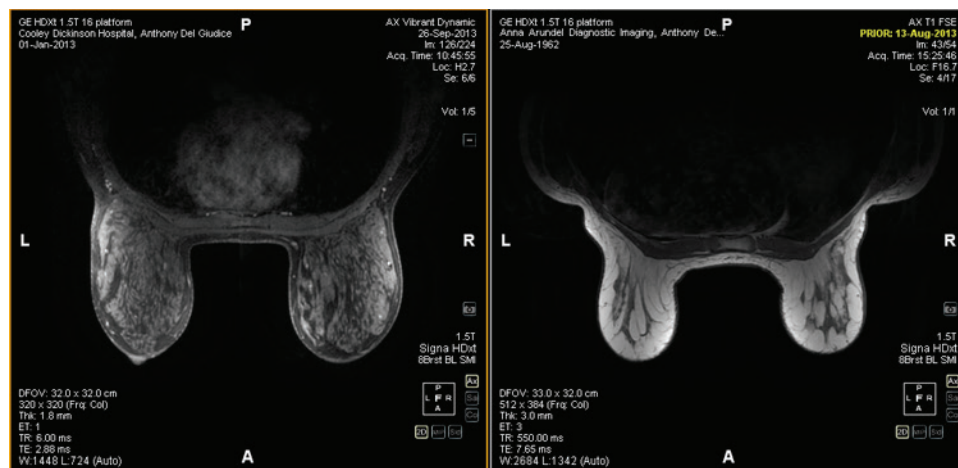
Figure 83: Two Images of the Same Orientation and a Different Frame of Reference are Synchronized

NOTE: The Spatial Locator tool does not apply across images taken in different frames of reference. So it will not apply, for example, to an image linked with its prior.

Working with Markers

MultiView represents points of interest on an image with markers. These include:

- Lesions

- The chest wall and nipples for chest wall clipping

- The grid surface and fiducials for lesion targeting (if you have the Breast Bx license)

Use the Spatial Locator tool to work with markers as described below.

Locating a Marker

In the 2D rendering mode, markers appear on the image slice they were created on. If you stack away from that slice, the marker annotation disappears.

To quickly locate a marker that is not visible:

1. Select the Spatial Locator tool from the toolbar.

2. Right click on the Spatial Locator crosshairs and select *Go to Marker > Go to* <marker name> (where <marker name> is the name of the marker you want to locate).

MultiView switches to the slice where the marker is located.

Moving a Marker

To move a marker:

1. Move the Spatial Locator crosshairs to the location where you want to move the marker.

2. Right-click the crosshairs and select *Move Marker Here > Move* <marker name> (where <marker name> is the name of the marker you want to move).

Measuring the Distance to a Marker

You can use the Spatial Locator tool to measure the distance between any point in an image and a marker.

To measure a distance to a marker:

1. Move the Spatial Locator crosshairs to the location you want to measure from.

2. Right-click the crosshairs and select *Distance to Target* then the name of the marker you want to measure to. The Distance to Target dialog appears.
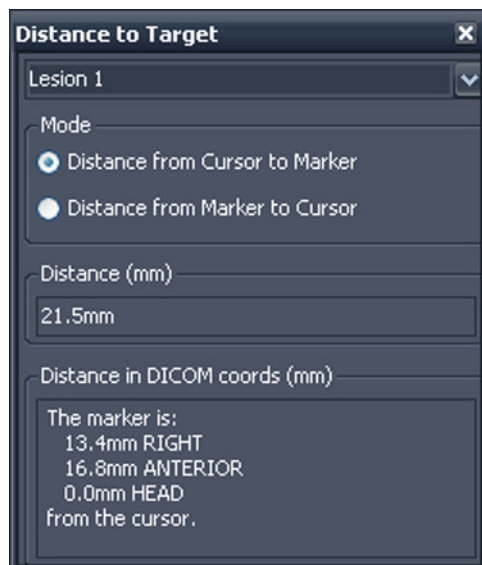
The Distance in DICOM coords (mm) section shows where the marker and cursor (that is, the Spatial Locator crosshairs) are relative to each other.

- Select the *Distance from Cursor to Marker* option to see where the marker is relative to the cursor.

- Select the *Distance from Marker to Cursor* option to see where the cursor is relative to the marker.

Linking Using the Spatial Locator Tool

Choose *Tools > Linking > Spatial Locator* to add a spatial locator crosshairs tool to all viewports with the same frame of reference as the active viewport.

Moving the crosshairs in one viewport will cause a change in the displayed slices in the other viewports so that the slice intersects the crosshairs coordinate. This allows the same point to be visualized in multiple image sets and from multiple orientations. Location and image information will also update in the top right corner of the viewports in real time.

#	Description
1	Spatial locator crosshairs.
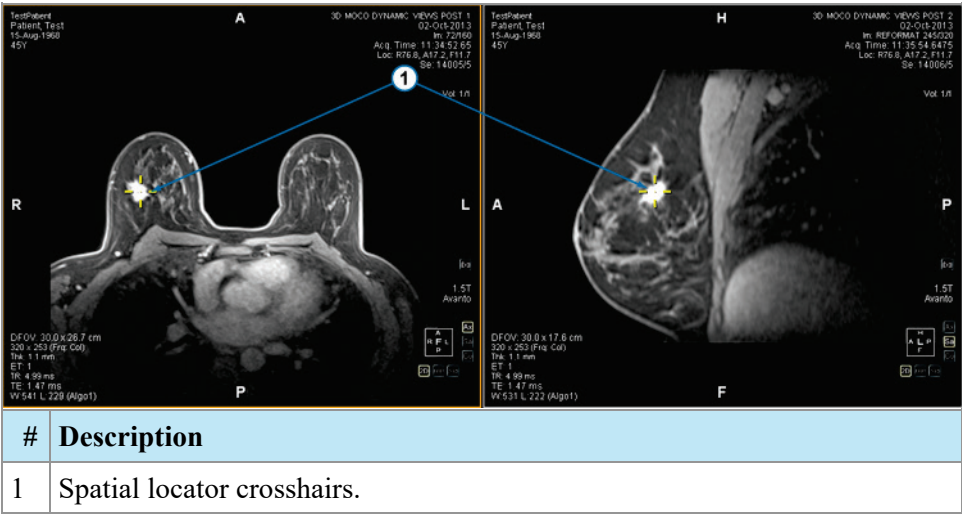
Figure 84: Viewports Showing Spatial Locator Crosshairs

You can also use the Spatial Locator tool and the Reference Lines tool together.
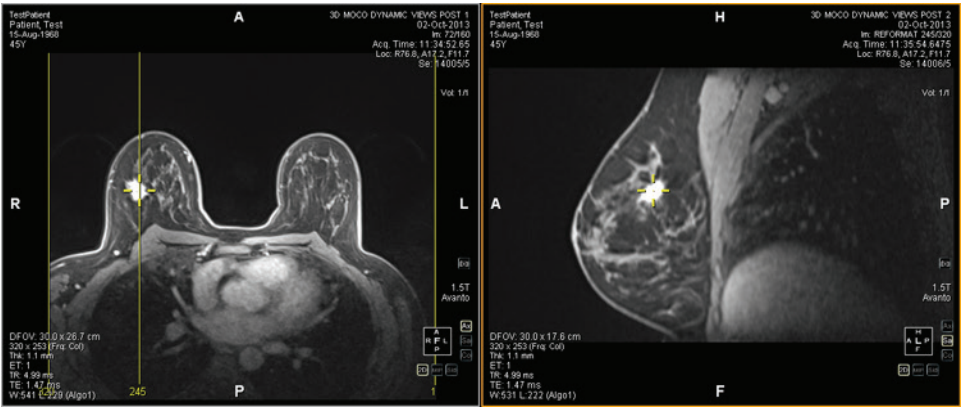
Figure 85: Spatial Locator and Reference Line Tools Used Together

Linking Using the Spatial Projection Tool

The Spatial Projection tool is similar to the Spatial Locator tool except that the crosshairs that appear are temporary. As soon as you release the mouse button, the crosshairs and coordinates disappear. This may be useful when you are viewing an image in MIP mode in one pane. As you follow along the vasculature (or other enhanced voxels) in the MIP rendering, MultiView uses the maximum intensity voxel you are viewing to synchronize any non-MIP images to the correct three-dimensional location.

By default, the Spatial Projection tool is assigned to the middle mouse button. Click in the viewport with this mouse button to see the Spatial Projection crosshairs.
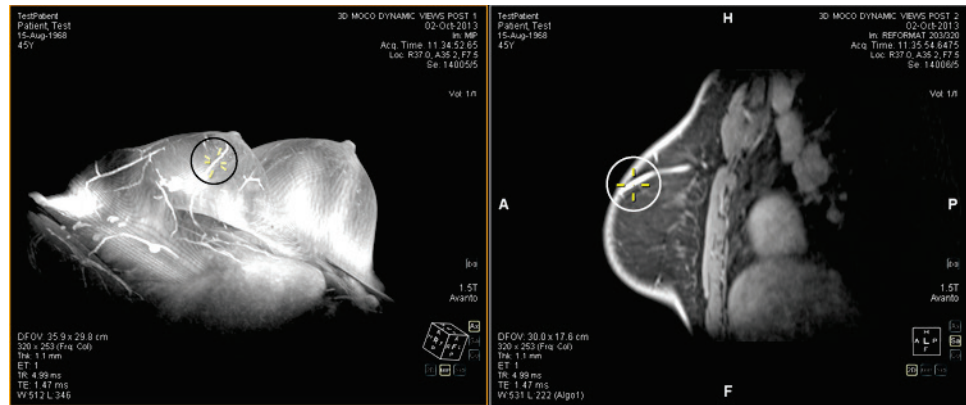
Figure 86: Position Interpolated in Right Pane from Left Pane Location

Chapter 9   Measurement Tools

Use the MultiView measurement tools to get more information about a region of interest or other feature in an image. To access the measurement tools, choose *Tools > Measurement* then the tool you want to access. The measurement tools may also be available as a tool group on the toolbar, depending on your toolbar configuration settings.

To use a measurement tool, assign the tool to a mouse button and click using that button. For more information about assigning tools to the mouse buttons, see Using MultiView Tools on page 111.

To stop creating measurement annotations, assign a different tool to the mouse button or deselect the tool in the Tools menu. You can also configure MultiView to automatically switch back to the default tools assigned to the mouse button by choosing *Tools > Options > Annotation Tools > Deselect annotation tools after placement*.

Table 18: Measurement Tools

Icon	Name	Description
	Ruler	Measures an area on the image. For more information, see Using the Ruler Tool on page 126.
	Protractor	Measures an angle on the image. For more information, see Using the Protractor Tool on page 126.
	Probe	Displays the characteristics of a specific voxel. For more information, see Using the Probe Tool on page 126.
	Graph	Displays the characteristics for a voxel, region of interest (ROI), or a lesion over time. For more information, see Viewing Changes in Pixel Intensity Over Time on page 131.
	Elliptical ROI	Draws an elliptical ROI on the image. For more information, see Creating Elliptical and Rectangular ROIs on page 127.
	Cubic ROI	Draws a three-dimensional ROI on the image. For more information, see Creating a Cubic ROI on page 128.
	Rectangular ROI	Draws a rectangular ROI on the image. For more information, see Creating Elliptical and Rectangular ROIs on page 127.
	Polygonal ROI	Draws a polygonal ROI on the image. For more information, see Creating a Polygonal ROI on page 128.

Icon	Name	Description
	Contour ROI	Draws a freehand contour ROI on the image. For more information, see Creating a Contour ROI on page 130.
	Contour Smoothing	Adjusts the shape of a contour ROI. For more information, see Contour Smoothing on page 130.

Measurement Tools

Using the Ruler Tool

The Ruler tool draws a line on the image and measures its length.

To measure a feature on an image, click on the image where you want to start the measurement, then move the crosshairs to where you want the measurement to end and click again. The length of the line appears in centimeters in the annotation.

NOTE: You can also measure distances using Spatial Locator tool. For more information, see Measuring the Distance to a Marker on page 120.

Using the Protractor Tool

The Protractor tool measures the angle between two line segments.

Click on the image where you want the first line segment to begin, then move the crosshairs to where you want the line to end and click again. Move the crosshairs to where you want the second line to end and click to complete the line. The inner angle of the two lines appears in the annotation.

Using the Probe Tool

Use the Probe tool to view the characteristics of a specific voxel. When you click on a voxel with the Probe tool, the following information is displayed:

- The x and y coordinate values of the voxel

- The PIX value (pixel intensity)

Double-click in the viewport with the Probe tool to create a probe annotation for a specific voxel.

About ROIs

You can define regions of interest (ROI) on an image using the ROI tools in MultiView. Use ROIs to determine the voxel intensity statistics for a specific region of the image.

When you create an ROI, MultiView displays the area and the voxel intensity statistics (mean and standard deviation) of the ROI beside it. You can move this text by clicking and dragging it to a new location if necessary. To hide this text,

right-click on the text and deselect the *Show Analysis* option. To show the text again, right-click on the ROI name and select the *Show Analysis* option.
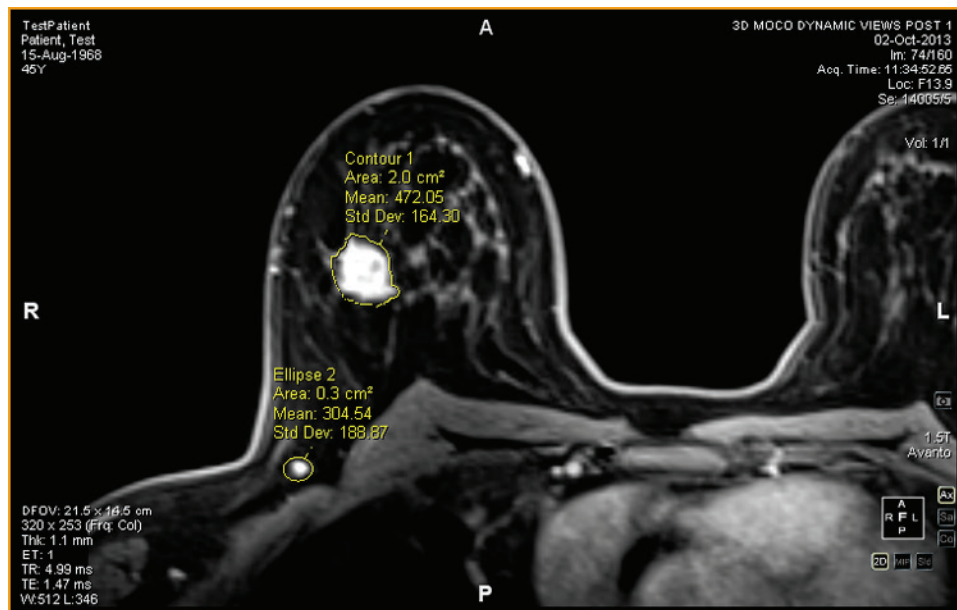
Figure 87: Two Regions of Interest

ROI Tools

To access the region of interest (ROI) tools choose *Tools > Measurement* then the tool you want to access. The ROI tools may also appear in the toolbar depending on the configured toolbar profile. If so, click the arrow on the ROI tools group in the toolbar to access all the MultiView ROI tools. The currently selected tool is displayed in the toolbar.

Creating Elliptical and Rectangular ROIs

MultiView provides two options for drawing elliptical and rectangular ROIs: a two-click method and a click and drag method. The two-click method is active by default. If you want to use the drag method, you must select the "Use click and drag annotation creation" option under *Tools > Options > Annotation Tools*.

To create an elliptical or rectangular ROI using the two-click method:

1. Assign the Elliptical ROI tool or the Rectangular ROI tool to a mouse button.

2. Click in the image where you want to start the ROI.

3. Move the mouse to where you want to complete the ROI.

4. Click again to complete the ROI.

To create an elliptical or rectangular ROI using the click and drag method:

1. Assign the Elliptical ROI tool or the Rectangular ROI tool to a mouse button.

2. Click and drag around the area in the image you want to include in the ROI.

3. Release the mouse button to complete the ROI.

Creating a Polygonal ROI

The Polygonal ROI tool creates a polygonal region of interest with any number of sides.

To draw a polygonal ROI, click on the image to start the first line, then move the crosshairs to where you want the line to end and click again. Repeat this process to create the sides of the polygon (each line starts where the last line ended). To complete the polygon, join the end of the last line to the start of the first line.

TIP: When the crosshairs are close to the start of the first line, a circle appears on the annotation and the end of the line you are drawing "snaps" to that point. Click to complete the polygon.

Creating a Cubic ROI

The Cubic ROI tool creates a three-dimensional ROI.
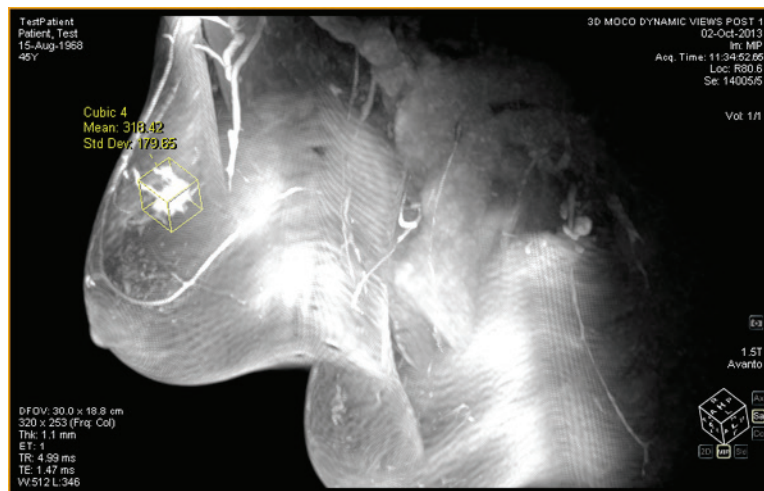
Figure 88: Cubic ROI on a MIP

To draw a cubic ROI:

1. Choose *Tools > Measurement > Cubic ROI*.

2. Draw a rectangle around the region of interest.
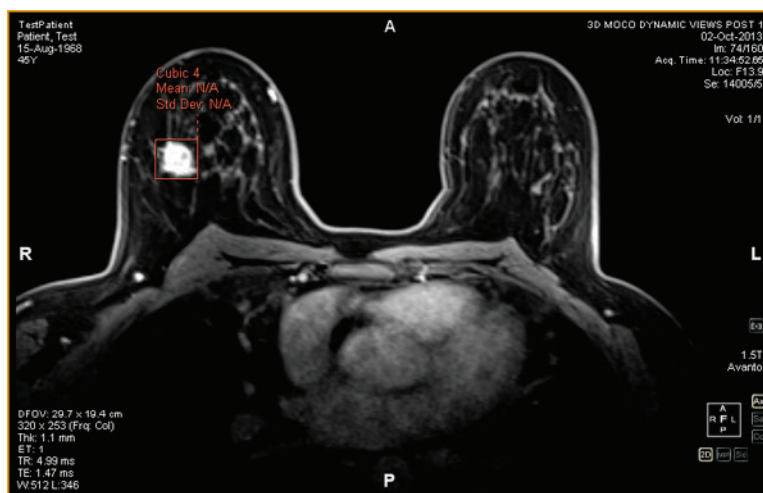
3. Switch to a different view. For example, if you drew the rectangle in the axial view, switch to the sagittal view. The ROI now appears as a line (see the figure below).
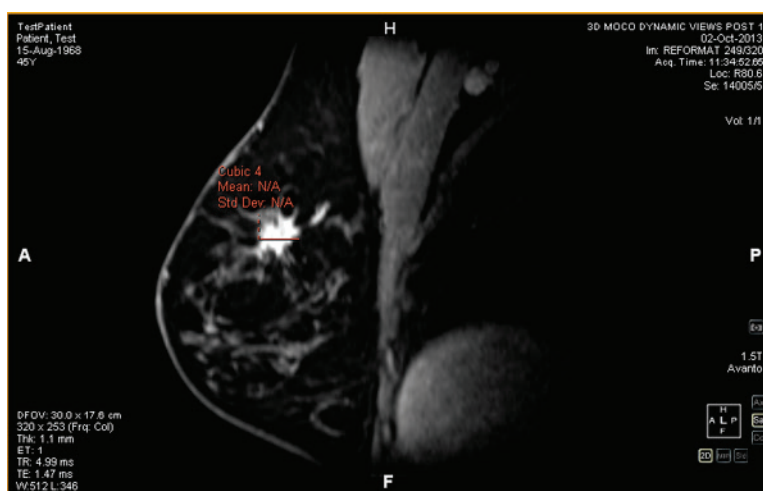
4. Select one of the ROI "handles" and drag it over the feature in the image.

5. If necessary, repeat the adjustment until the ROI completely contains the feature you are interested in.

Creating a Contour ROI

Use the Contour ROI tool to draw a freehand ROI on the image.

To draw the contour ROI, click on the image and drag around the area you want to include in the ROI. To complete the ROI, join the end of your contour to the point where you started.

TIP: When the crosshairs are close to the start of the ROI, a circle appears on the annotation and the end of the line you are drawing "snaps" to that point. Click to complete the ROI.

Contour Smoothing

Use the Contour Smoothing tool to refine the boundary of a contour ROI.

- To expand the boundary of a contour ROI, with the Contour Smoothing tool assigned to a mouse button click inside the ROI and use the circle to nudge the edge of the ROI outward. Note that this is only possible for large ROIs; when an ROI is small, clicking inside of it will select the ROI.

- To shrink the boundary of a contour ROI, with the Contour Smoothing tool assigned to a mouse button click outside the ROI and use the circle to nudge the edge of the ROI inward.

- To adjust the size of the Contour Smoothing tool, hold down the mouse button the tool is assigned to and scroll with the mouse wheel.

NOTE: The Contour Smoothing tool cannot be used in the MIP or Solid Volume rendering modes.

Working with ROIs and Annotations

Working with ROIs in MIP Mode

If you create a ROI or draw a ruler when in MIP mode, the annotation may move if you rotate away from the orientation you were in when you drew the ROI or ruler. To restore the original orientation, right-click the annotation label and select *Snap to Graphic Plane*.

Resizing ROIs and Lines

ROIs and lines are drawn with "handles" at their edges or endpoints. To resize a ROI or line, left-click a handle and drag it to a new location.

Moving Annotations

To move a ROI, line, or text annotation, click on the object you want to move and drag it to a new location.

Copying a Region of Interest

If you have multiple panes open in the viewport, you can copy a ROI from one pane to another.

To copy a ROI:

1. Right-click the ROI and select *Copy* from the context menu.

2. Right-click in the pane where you want to copy the ROI and select *Paste* from the context menu.

The ROI is copied to the new pane in the corresponding location.

NOTE: The volume in the new pane must be in the same orientation as the volume the ROI was copied from.

Deleting ROIs and Annotations

To delete a single ROI or annotation, right-click the object and select *Delete* from the context menu.

To delete all the ROIs and annotations, right-click in the viewport and select *Delete all Annotations* from the context menu.

Viewing Changes in Pixel Intensity Over Time

Use the Graph pane to view changes in pixel intensity over time for a lesion or region or interest. By default, the Graph pane is minimized to a tab on the right side of the workspace. Click the tab to open the Graph pane. Select the lesion or region of interest you want to view a graph of from the *Source* drop-down list.

Graph Pane Tools

The following tools appear in the Graph pane. For more information about the worst dynamic curve graph tools, see Viewing Uptake Information in Graphical Format on page 158.

Table 19: Graph Pane Tools

Icon	Name	Description
	Save Graph	Saves the graph as a PNG, GIF, JPEG, TIFF or BMP file.
	Add Graph to Report	Adds the current graph to a report.
	Reset Graph	Resets the graph to its original view and discards any zooming.
	Mean Graph Tool	Shows or hides the mean graph curve.
	Worst Dynamic Curve Tool	Shows or hides the worst curve graph.
	Dynamic Curve Line Fitting Tool	Toggles line fitting on and off.
	First Worst Dynamic Curve	Returns the graph view to the first worst graph curve.
	Previous Worst Dynamic Curve	After a series of "worst curves" have been established, click this icon to move the graph view to the previous curve.
	Next Worst Dynamic Curve	Moves the graph view to the next worst curve.
	Set Worst Curve in Report	Adds the data for the curve currently displayed in the graph to the Findings tab in a report.
	Source	Select the source of the data for the graph from this list. Possible sources include probes, ROIs, and analyzed lesions.
	Lock Axes	If you have more than one ROI defined, select this option to use the same axis scale for all sources.
	Show Values	When this option is selected, when you move the cursor over the line in a graph MultiView displays the data values for that point.

Mean Pixel Intensity Graph

Click the Mean icon to display the average absolute value voxel intensity within a lesion or ROI, or the intensity of a voxel selected using the Probe tool at each of the time points.

The graph shows this average voxel versus the volume (time point) index.
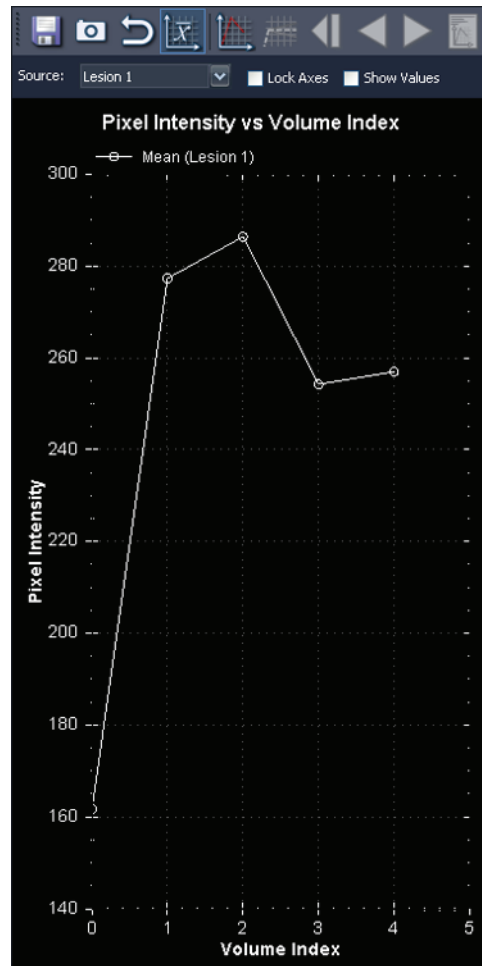
Figure 89: Mean Graphical Representation

Chapter 10   Colorization

Diffusion Colorization

Diffusion colorization uses colors to highlight areas with apparent diffusion coefficient (ADC) values of interest in diffusion series. Voxels with low ADC values are displayed in red, while intermediate and high ADC values appear yellow and blue respectively. You can configure which ADC values should be considered low, intermediate and high. In addition, a heat-map option is available that uses a continuous color scale from red to blue for low to high ADC values.

After performing diffusion colorization, you can probe the colorized diffusion weighted imaging (DWI) images to obtain the computed ADC value for each voxel. Also, regions of interest (ROI) you define contain information on the max/min and average ADC values within the ROI.

The *Diffusion* colorization option becomes available in the Image Loading Configuration dialog when you load a DWI series in the viewport.

Enabling Diffusion Colorization

To enable diffusion colorization:

1. Load a DWI series into a viewport.

2. In the viewport, right-click and choose *Image Analysis > Configure* from the context menu. The Image Loading Configuration dialog appears.

3. Select *Diffusion* in the list on the left.
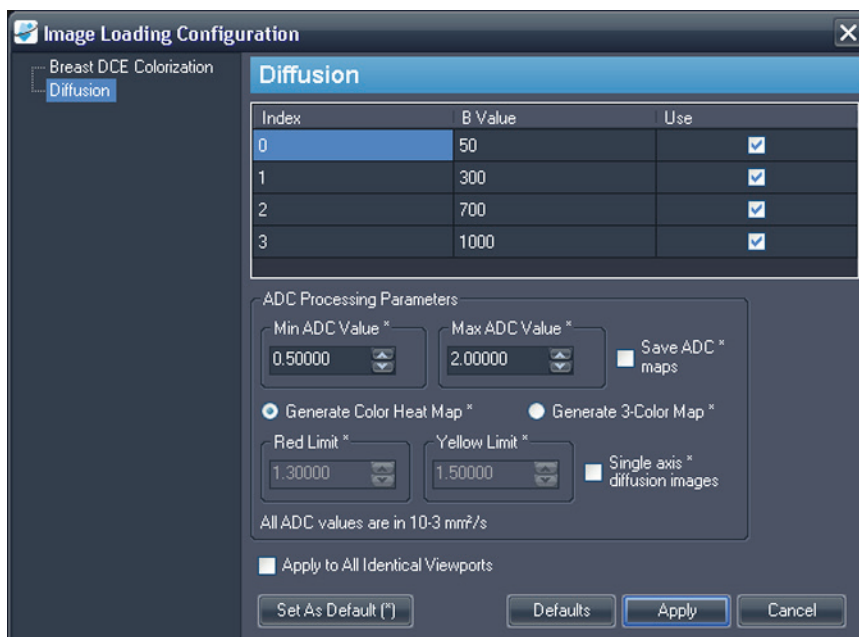
**Figure 90: Image Loading Configuration Dialog Showing Diffusion
Options**

4. Specify the diffusion options.

*NOTE: MultiView remembers the last colorization options you specified
during a session. Until you close and re-launch MultiView, the Image
Loading Configuration dialog is automatically populated with those
settings (even if you set them for another series or another study). If you do
not want to use the last configuration, click the Defaults button to load the
saved default settings.*

Table 20: Diffusion Colorization Options

Option	Description
B Value	The B value for the given time index. MultiView reads this information from the DICOM file header, but if this information was not present in the file, you must enter it manually. Verify that the B values match the acquired data.
Use	Select this option for each index value you want to use in the colorization.
Min and Max ADC Value *	Enter the minimum and maximum ADC values you want to include in the colorization. The default minimum value is 0.50000; the default maximum value is 2.00000.

Option	Description
Save ADC maps *	Select this option to create a new series from the ADC values. This is useful if you want to send this information to someone else.
Generate Color Heat Map *	Select this option to display ADC variations using the full color spectrum (see the example below).
Generate 3-Color Map *	Select this option to display ADC variations using only the colors red, yellow, and blue (see the example below). If you select this option, you can also specify the limits for the colorization.
Red Limit *	Voxels with ADC values lower than this value will be displayed in red.
Yellow Limit *	Voxels with ADC values between the Red Limit and this value will be displayed in yellow. Voxels with ADC values above this value will be displayed in blue.
Single axis diffusion images *	Select this option if the images in the series were created with a single axis.
Apply to All Identical Viewports	Select this option to apply the same colorization to any other viewports containing the same series with the same number of volumes.
Set As Default (*)	Click this button to save the apparent diffusion coefficient processing parameters marked with an asterisk (*) as default values. The next time you launch MultiView and open this dialog, these fields will already be populated with these values.
Defaults button	Click this button to load the saved default settings.

5. Click *Apply*. MultiView applies the colorization to the DWI series.
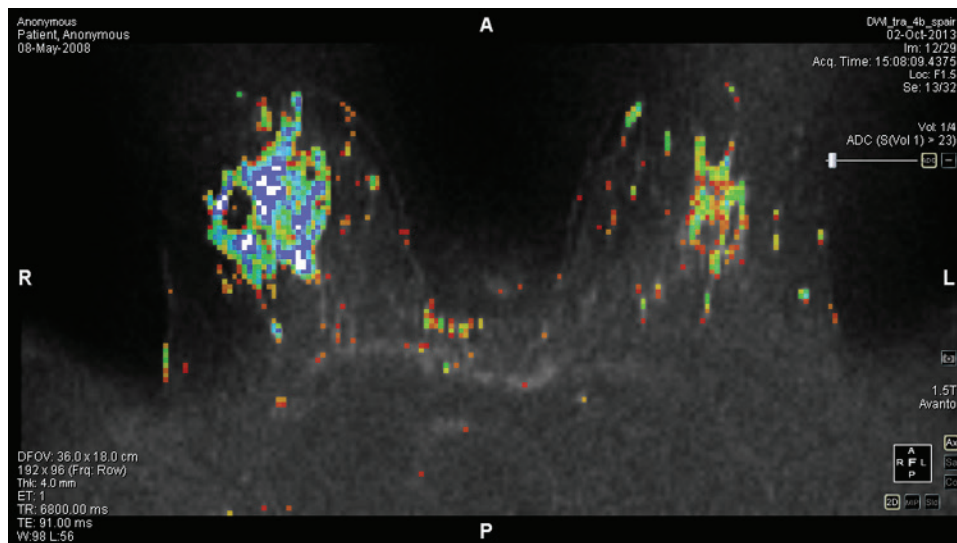
Figure 91: Diffusion Colorization Using the Color Heat Map Option
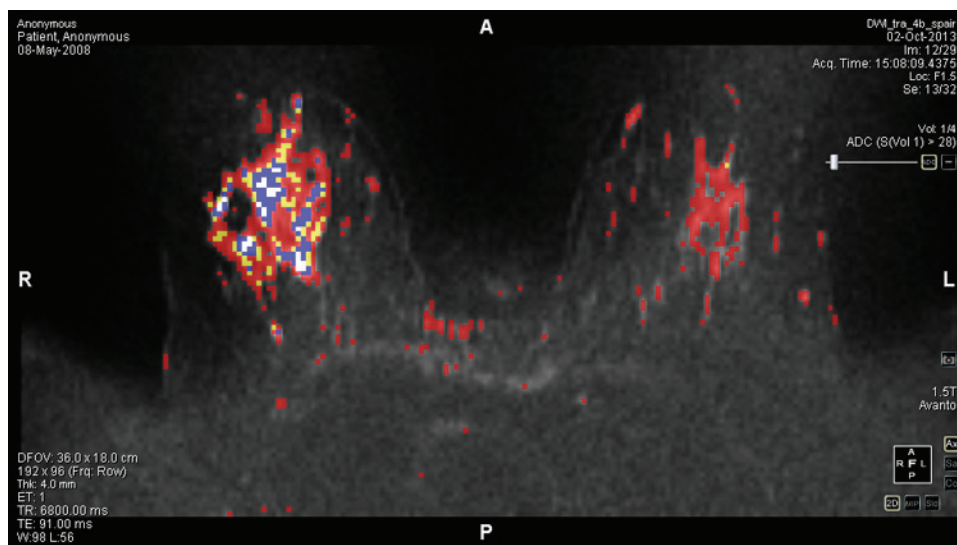
Figure 92: Diffusion Colorization Using the 3-Color Map Option

When diffusion colorization has been applied to the series, the ADC information is displayed in the top-right quadrant of the text overlay.
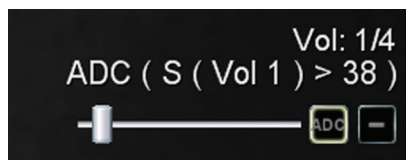
Figure 93: ADC Information

In this example, the slider has been set such that diffusion colorization will only be applied to pixels whose signal intensity on the first volume exceeds 38. The first volume contains the lowest B-value DWI images. This condition for diffusion colorization is reported as S (Vol 1) > 38.

The slider filters the diffusion colorization based on the signal intensity of the lowest B-value image. By dragging the slider to the right, only areas showing high signal intensity on the lowest B-value image will be colorized. In practice, dragging the slider to the right reduces excessive colorization; while dragging the slider to the left brings colorization to lower signal areas.

Click the ADC overlay control to toggle the colorization off and on.

Using the Region of Interest (ROI) Tool With Diffusion Colorization

When you create a region of interest in a colorized dynamic series image, the following information about the ROI is displayed along with a border defining the area:

- Average ADC value in the region

- Maximum and minimum ADC values in the region

- Area (in square Centimeters)

- Mean (voxel intensity across the region)

- Standard Deviation (of the voxels within that region from the first time point)
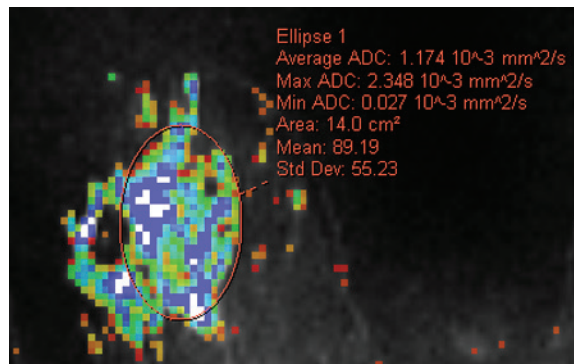
Figure 94: Defined for a Diffusion Colorization Series

For more information about working with the ROI tool, see the Measurement Tools chapter, beginning on page 125.

Using the Probe Tool with a DWI Series

To view the ADC characteristics for a specific voxel, assign the Probe tool to a mouse button and then click the voxel of interest in a colorized image in the viewport.

The following information is displayed for the voxel:

- Voxel co-ordinates (x and y)
- PIX value (pixel intensity)
- ADC value

Breast DCE Colorization

DCE colorization is a visual representation of the time enhancement characteristics of each voxel in dynamic contrast enhanced images using colors.

- Blue regions exhibit continued voxel-intensity increase, also known as persistent enhancement.
- Yellow areas represent regions showing an initial intensity increase and then a subsequent plateau.
- Red areas indicate a region with initial intensity increase followed by an intensity decrease (washout).
- Regions whose intensity does not increase by the specified threshold over the time series are not colorized.

Enabling Breast DCE Colorization

To enable breast DCE colorization:

1. Load a dynamic series study into a viewport.
2. Right-click in the viewport and choose *Image Analysis > Configure* from the context menu. The Image Loading Configuration dialog appears.

3. Select *Breast DCE Colorization* from the list of options on the left.
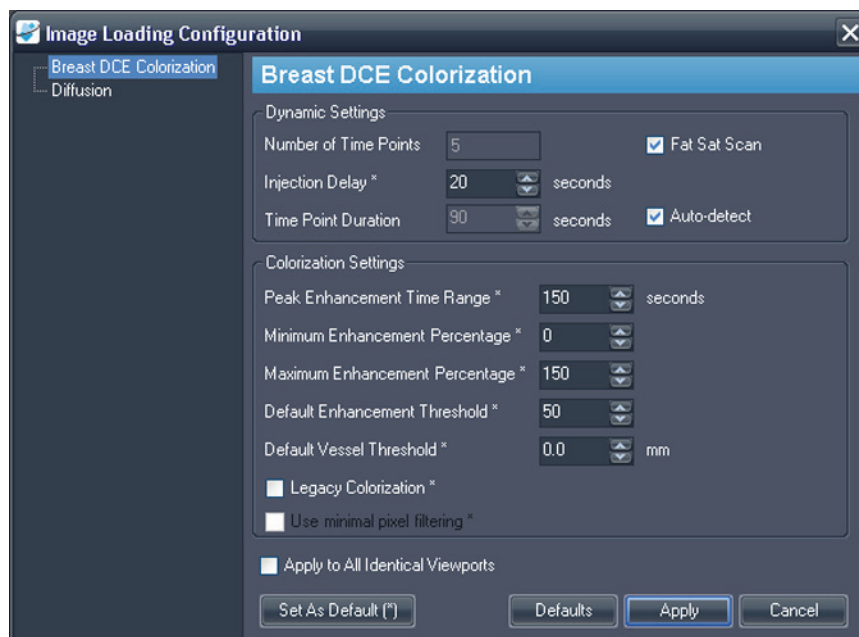
**Figure 95: Image Loading Configuration Dialog Showing Breast DCE
Colorization Options**

4. Specify the dynamic and colorization settings.

   *NOTE: MultiView remembers the last colorization options you specified
   during a session. Until you close and re-launch MultiView, the Image
   Loading Configuration dialog is automatically populated with those
   settings (even if you set them for another series or another study). If you do
   not want to use the last configuration, click the Defaults button to load the
   saved default settings.*

Table 21: Breast DCE Colorization Options

Option	Description
Number of Time Points	Displays the number of time points (determined from the DICOM data for the series).
Injection Delay *	Enter the injection, or scan delay time (in seconds) for this study. The injection delay is the time between the contrast injection and the first post contrast scan for the selected dynamic series. The default injection delay is 20 seconds.

Option	Description
Time Point Duration	Auto-detect will be selected if MultiView can read the timing interval between post scans from the DICOM header information. If MultiView cannot detect the time points, or if there are not enough time points, you must deselect the Auto-detect option and manually enter the value. Time point duration is used to calculate pixel intensity vs. time curve.
Fat Sat Scan	Select this option if the scan was conducted using fat sat fat suppression. This is typically automatically detected by MultiView. If this option is not set appropriately, fatty tissue may be colorized inappropriately.
Peak Enhancement Time Range *	The time window MultiView uses to detect peak enhancement (see Worst Curve Graph on page 158).
Minimum Enhancement Percentage *	This determines the minimum threshold value on the color slider that appears in the viewport overlay when colorization is applied.
Maximum Enhancement Percentage *	This determines the maximum threshold value on the color slider that appears in the viewport overlay when colorization has been applied.
Default Enhancement Threshold *	The color slider will be set at this value when colorization is applied.
Default Vessel Threshold *	The vessel clipping slider will be set at the closest available value to the value entered here when colorization is applied. (MultiView determines the number and size of the available slider increment values from the information recorded in the DICOM data for the study).
Legacy Colorization *	Select this option if you need to use the Aegis 3.0 colorization for compatibility reasons. *NOTE: Most users will not need to select this option. Current color filtering has been improved to better handle imaging artifacts and lower SNR, providing less spurious color.*
Use Minimal Pixel Filtering *	Select this option if you are using legacy colorization and need to use a less aggressive filtering technique.

Option	Description
Apply to All Identical Viewports	Select this option to apply the same colorization to any other viewports containing the same series with the same number of volumes.
Set As Default (*)	Click this button to save the colorization settings specified with an asterisk (*) as default values. The next time you launch MultiView and open this dialog, these fields will already be populated with these values.
Defaults button	Click this button to load the saved default settings.

5. Click *Apply*.

When colorization is complete, a colorization control ▣ and vessel clipping control ◪ appear in the top right quadrant. The colorization control is automatically active; click the vessel clipping control to use the vessel clipping feature. For more information, see Using the Vessel Clipping Control on page 145.

Figure 96: Breast DCE Colorization and Vessel Clipping Controls in Viewport Overlay
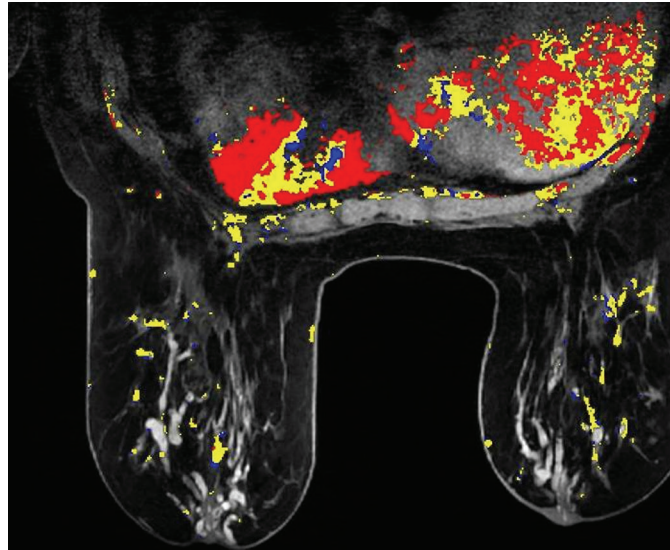
Figure 97: Colorized Image

You can stack through the colorized images in individual volumes using the Stack tool by clicking and dragging up and down, or look across time points by clicking and dragging horizontally.

NOTE: The color map is the same for all volumes.

You can view colorized images in any of the MultiView rendering modes. For example, the figure below shows a colorized solid view.
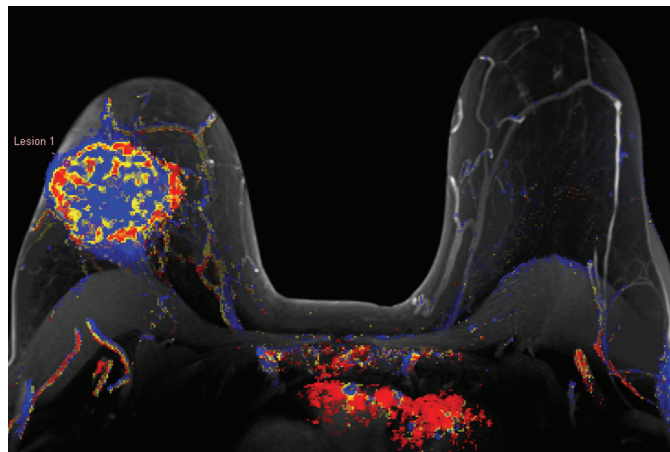
Figure 98: Colorized Solid View

NOTE: Motion correction may be required for best results if there was significant patient movement during scanning. For more information see Motion Correction on page 147 or Performing Automatic Motion Correction on page 70.

Using the Colorization Control

The Colorization slider sets the uptake threshold for the colorized display. Any voxels with uptake below this threshold are not colored. You can change the colorization threshold level by:

- Right-clicking the Colorization control to toggle through the default levels (50%, 100%)

- Dragging the slider to fine-tune the colorization in increments of 10%

- Left-clicking the Colorization control to turn the colorization off

⚠️ **CAUTION**

Risk of Incorrect Diagnosis

It is important to fine tune colorization given the variance in MR images and patients.

Using the Vessel Clipping Control

Use the vessel clipping control to remove the colorization from blood vessels connected to a lesion. The vessel clipping algorithm works by eliminating the color from voxels that are not connected to many other colorized voxels. Thin lines of color characteristic of blood vessels are caught by the algorithm, but the larger rounded shapes characteristic of lesions are not. This is useful if you intend to analyze the lesion using the MultiView Mass Lesion Analysis tool because it isolates the lesion by reducing the number of extraneous colorized voxels connected to it.

⚠️ **CAUTION**

Risk of Incorrect Diagnosis

The vessel clipping algorithm cannot distinguish between blood vessels and small lesions. You must always analyze the results of using the vessel clipping control carefully to ensure that color has not been removed inappropriately.
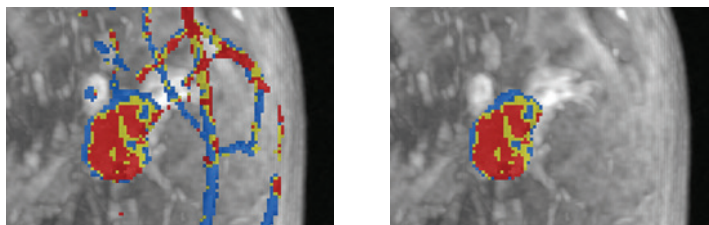
Figure 99: Lesion Before and After Vessel Clipping

The vessel clipping slider controls the size of the vessel that MultiView will clip. To change the amount of clipping:

- Right-click the vessel clipping control to toggle through the available increments (MultiView determines the number and size of the available slider

increment values from the information recorded in the DICOM data for the study)

- Drag the slider to adjust the clipped vessel size

- Left-click the vessel clipping control to turn vessel clipping off

Using the Region of Interest (ROI) Tool with Dynamic Colorization

When you create a region of interest in a colorized dynamic series image, the pixel intensity and kinetic curve data for the voxels within the ROI appears in the Graph pane. As you resize the ROI, the graph is updated with the new data real time (see Viewing Uptake Information in Graphical Format on page 158).

IMPORTANT NOTE: These ROI measurements apply to the image slice on which the ROI is defined.

NOTE: To hide the ROI information, right-click on the text and deselect the Show Analysis option.

For more information about working with the ROI tool, see the Measurement Tools chapter, beginning on page 125.

Using the Probe Tool with a DWI Series

To view the ADC characteristics for a specific voxel, assign the Probe tool to a mouse button and then click the voxel of interest in a colorized image in the viewport.

The following information is displayed for the voxel:

- Voxel co-ordinates (x and y)

- PIX value (pixel intensity)

- ADC value

Applying Colorization to Another Viewport

There are two ways to apply the same colorization configuration to multiple viewports.

To apply the colorization configuration in one viewport to another viewport:

1. Right-click in the viewport that has the colorization applied and select *Image Analysis > Copy Overlay Graphics*.

2. In the viewport you want to apply the colorization to, right-click and select *Image Analysis > Paste Overlay Graphics*.

NOTE: The viewport you are pasting the colorization into must contain the same series and the same number of volumes as the viewport you copied from.

To apply the same colorization configuration to all viewports that a series is open in:

1. In one of the viewports, right-click and select *Image Analysis > Configure....*

2. Select the type of colorization you want to apply from the list on the left and specify the colorization parameters.

3. Select the *Apply to All Identical Viewports* option.

4. Click *Apply*.

Motion Correction

Accurate analysis in MultiView requires images that accurately portray the patient's anatomy. Patient motion during scanning can result in image artifacts which the MultiView analysis algorithms cannot distinguish from breast tissue. Use the Motion Correction tool to create a corrected copy of a series with significant patient motion artifacts for analysis.

Using the Motion Correction Tool

The Motion Correction tool processes a series of images and attempts to synchronize them based on landmarks in the image at a given time index.

NOTE: You can have motion correction performed automatically using a SHRED. For more information, see Performing Automatic Motion Correction on page 70.

To use the Motion Correction tool:

1. Open the study that contains the series you want to correct.

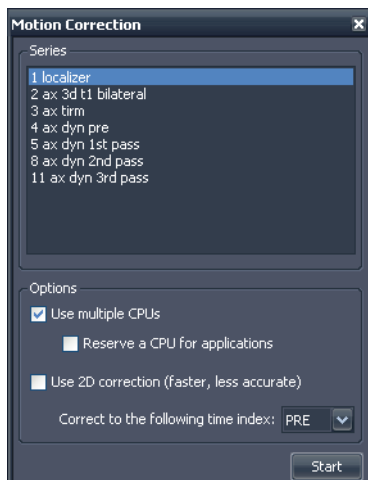2. Choose *Tools > Image Processing > Motion Correction*. The Motion Correction dialog appears.

Figure 100: **Motion Correction Dialog**

3. Select the series you want to perform the motion correction on.

4. Select the options to use for the motion correction.

Table 22: Motion Correction Options

Option	Description
Use multiple CPUs	If your computer uses a multi-core processor, select this option to reduce the time required for the motion correction.
Reserve a CPU for applications	If you want to perform other operations while the motion correction is being processed, select this option.
Use 2D correction	Select this option to reduce the time required for the motion correction, but note that this may result in a less accurate correction.
Correct to the following time index	Select the time index you want to base the motion correction on. If you select a time index greater than 1, MultiView will perform the motion correction on scans before and after the time index you indicate.

5. Click *Start*. The Motion Correction Activity pane opens displaying the motion correction progress.
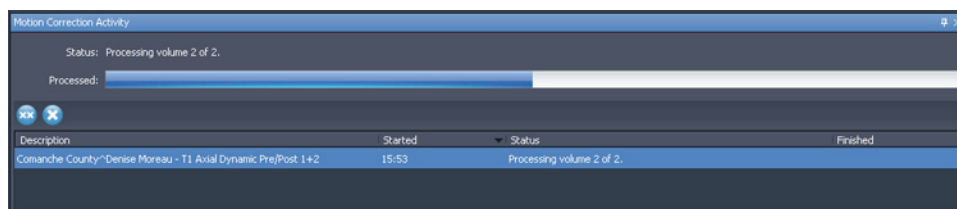
Figure 101:   Motion Correction Activity Pane

If you close the Motion Correction Activity pane, you can open it again by choosing *Tools > Utilities > Motion Correction Status*.

When motion correction is complete, a newly generated motion corrected series appears in the Layout pane. Review the time course of motion corrected image series and ensure that the images are aligned. The original uncorrected series are still available if you require them.

If Motion Correction Fails

If motion correction processing fails, check the log file (*Tools > SHRED Configuration > Show Log*). The motion correction algorithm generates the following error messages.

Table 23: Motion Correction Error Messages

Error Message	Notes
Frame of reference mismatch.	This is likely the result of re-landmarking the patient during the procedure.
Image orientation mismatch.	All images must have the same orientation for motion correction to function.
Image row or column size mismatch.	This could be the result of changing the acquisition matrix between consecutive scans.
Image headers are missing spatial information.	This could be the result of overly aggressive image de-identification.
Pixel format mismatch.	N/A
Image pixel spacing mismatch.	All images must have identical pixel spacing for motion correction to function.
Motion correction was unable to allocate adequate memory.	N/A
Motion correction was unable to make improvements to the data.	N/A
Not all volumes have the same number of slices.	N/A

Derived Series

MultiView provides many tools for viewing, manipulating, and enhancing MR images. However, MultiView keeps the information required to display these visualizations separate from the original image (that is, MultiView does not alter the original image received from the scanner). As a result, enhancements such as MIPs, radials, subtractions, and colorizations can only be viewed in MultiView. If you want to share enhanced images with others, you can generate a *derived series*, which is a new series with the enhancements "burned in" to the images. These images can be viewed on any PACS.

*NOTE: Derived series are only available with the MultiView MR Breast Dx license.*

There are two steps to creating derived series: setting up the image and generating the series.

Derived Series Setup

The first step to creating a derived series is to set up the image the way you would like the derived series to appear. You can apply rendering modes, subtraction,

radials and other rotations, colorization, and other visualizations to highlight the information you want see in the image.

When you have set up the image as you want it to appear in the derived series, right-click in the viewport and select *Add Derived Series*. The Add Derived Series dialog appears.
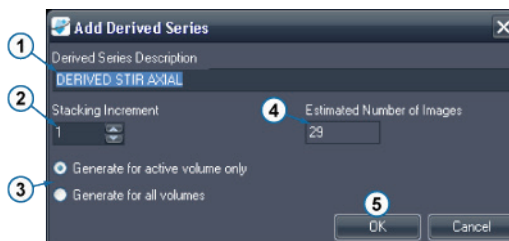
#	Description
1	MultiView automatically populates the *Derived Series Description* field with the word "DERIVED" followed by the series description and the modifications you made to it. You can change this description if you wish.
2	Enter the stacking increment to generate the slices in. Enter "1" to generate the series with all the slices in the original series; enter "2" to generate every second slice etc. For radial stacking, each stacking increment represents 2 degrees of rotation.
3	If you have more than one volume open, select whether to generate the derived series with all the open volumes or only the active volume.
4	This field indicates the number of images that will be created in the derived series based on the values you have specified.
5	Click *OK* to save the derived series configuration.

Figure 102:   Add Derived Series Dialog Fields

To view the derived series currently configured, choose *Tools > Derived Series Configuration*. The Derived Series Configuration dialog appears listing the currently configured derived series.
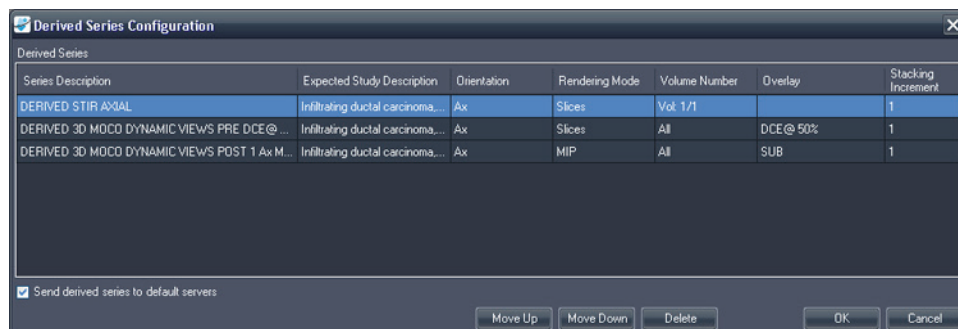

Figure 103:   Derived Series Configuration Dialog

By default, MultiView will send the generated derived series to your default servers, but you can deselect the *Send derived series to default servers* option if you do not want to send any derived series.

To change the order of the derived series in the list, select a series and click the *Move Up* or *Move Down* button. MultiView generates derived series in order from top to bottom.

To delete a derived series configuration, select it in the list and click the *Delete* button.

Generating Derived Series

When you have set up your derived series configurations, the next step is to generate the derived series themselves.

MultiView automatically generates the configured derived series when you retrieve a study from a server if the study contains a series with a description matching the description of the original series, but you can also manually generate a derived series.

NOTE: MultiView must be running to generate derived series. If you want derived series to be generated automatically when a study is sent to MultiView, MultiView must be running at the time when the series will be sent.

If you do not want to automatically generate a derived series for every study with a matching series description, follow the instructions below to manually generate the derived series, then delete the derived series from the Derived Series Configuration list. For more information, see Derived Series Setup on page 149.

To manually generate a derived series for a study, select the study in the My Studies list and click the *Generate Derived Series* icon in the My Studies toolbar. In the confirmation dialog that appears, click *Yes*.

The Derived Series Activity pane opens showing the progress of the generation. When the derived series have been generated, they appear at the bottom of the Study List in the Layout pane.

Chapter 11   Breast Analysis

MultiView provides several tools for analyzing breast tissue to help you reach an accurate diagnosis.

Risk of Incorrect Diagnosis

CAUTION

The definition of clinically suspicious lesions or tissue is outside the scope of this Guide. Clinicians should refer to latest literature and professional training to understand how lesion morphology, location, and patient history should be used to qualify suspect lesions. Dynamic lesion analysis is typically performed at the end of an image read to distinguish between certain types of lesions.

Chest Wall Clipping

The Chest Wall Clipping tool removes the chest wall area of the image.
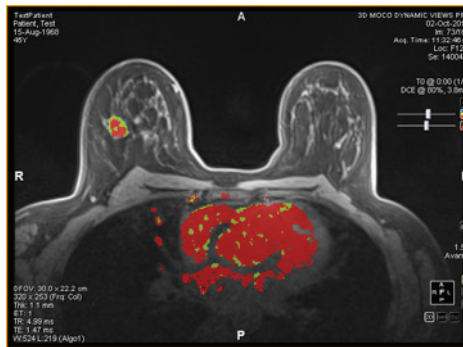
Figure 104: Before Chest Wall Clipping
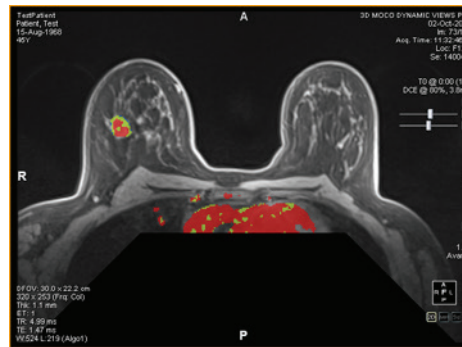
Figure 105: After Chest Wall Clipping

The amount of the image to remove and the location it is removed from is determined by the location of the nipples and chest wall. MultiView automatically detects the nipples and the chest wall based on the following information:

- The most anterior signal on the left and right sides of the image are considered to be nipples.

- The most anterior signal in the middle of the image is considered to be the chest wall.

Clipping is moved posteriorly by two inches (5 cm) and is angled by 45º from the intersection of the chest wall line and nipple line.
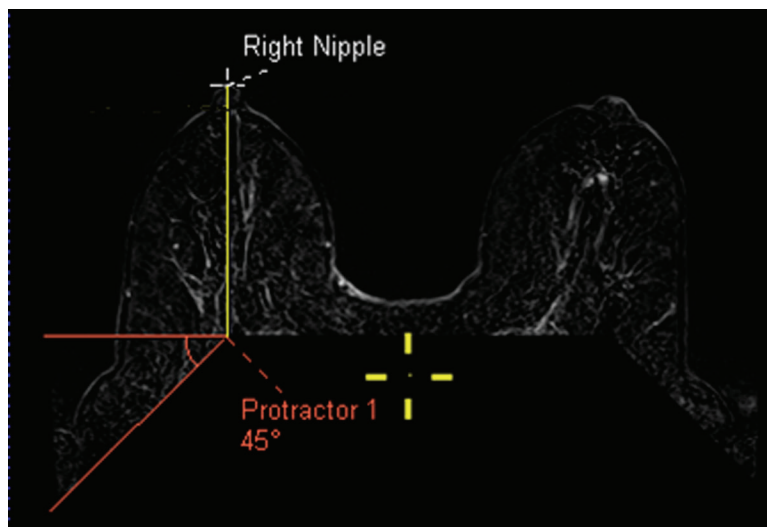

Figure 106:   Chest Wall Clipping Calculations

NOTE: If you do not see the nipple and chest wall markers, you can quickly locate them using the Spatial Locator tool. For more information, see Locating a Marker on page 120.

If the automatic chest wall clipping is not sufficient, you can place nipple and chest wall markers yourself.

To place the nipple and chest wall markers:

1. Stack through the images until the left nipple appears.

2. Move the Spatial Locator crosshairs to the location of the left nipple.

3. Right-click and select *Nipple Markers > Set Left Nipple Marker*.

4. Repeat steps 1 to 3 to set the right nipple marker and chest wall marker.

5. Click the Chest Wall Clipping tool in the toolbar to clip based on the markers you set.

You can also adjust the nipple and chest wall markers by moving them. For more information, see Moving a Marker on page 120.

To hide the nipple markers, click the drop-down arrow on the Chest Wall Clipping tool in the toolbar and deselect the *Show Nipple Markers* option.

NOTE: If scanning using the Sentinelle Breast Coil for Siemens scanners with a spectroscopy bottle present, the automatic chest wall detection may incorrectly place the chest wall marker. If this occurs, manually place the chest wall maker.

	Risk of Incorrect Diagnosis
⚠️ **WARNING**	Chest wall clipping is included as a visualization aid, but MultiView makes no attempt to assess the possible existence of any suspicious regions within the clipped area. This feature can be manually toggled on and off and it is imperative that you inspect the areas behind the chest wall clipping area.

When you use the Chest Wall Clipping tool to remove part of the chest wall, MultiView automatically populates the following details on the Findings tab in a report when you analyze a lesion:

- Breast (right or left)

- Breast Quadrant

- Distance to Nipple

- Distance to Chest Wall

The distance to chest wall is calculated as the shortest distance from the lesion to the chest wall. If the lesion falls within the area of the dashed lines, the distance to chest wall is calculated from the lesion to the corner of the chest wall as shown below. To see how MultiView measured the distances, select the *Show Distances* option in the Breast Reporting pane. For more information, see the description of the Findings tab on page 182.
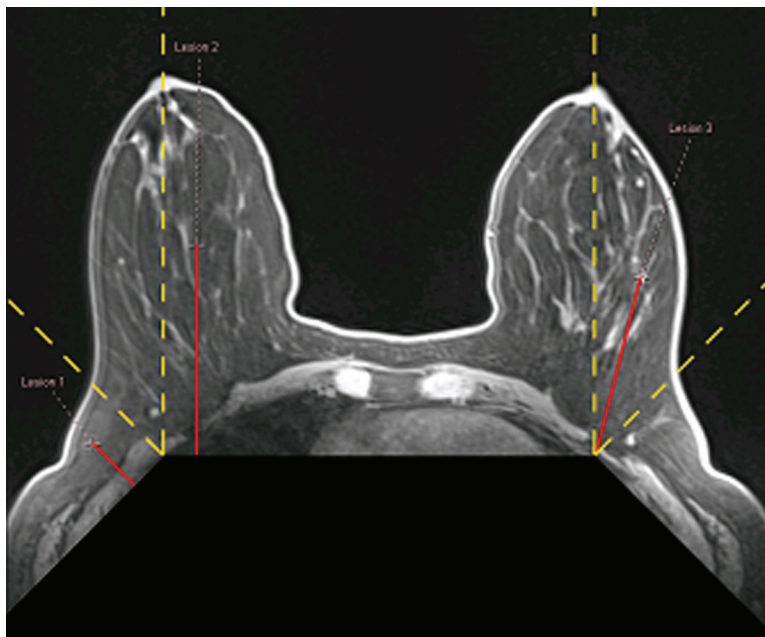

Figure 107:   Distance to Chest Wall Calculation

Marking a Lesion

There are two ways to mark a lesion in MultiView:

- Manually, using the Spatial Locator tool

- Automatically, using the Mass Lesion Analysis tool (for more information, see Lesion Analysis on page 156)

Manually Marking a Lesion

The most accurate way to mark a lesion is to use the Mass Lesion Analysis tool, but you may also need to manually mark a lesion in certain cases (for example when colorization is not possible for a series). Marking a lesion allows you to create a report for the lesion.

To manually mark a lesion:

1. Select the Spatial Locator tool ⊹ in the toolbar (or press N on the keyboard) and move the Spatial Locator crosshairs to the location of the suspected lesion in the image.

2. Right click on the crosshairs and select *Mark Breast Lesion*.

3. Enter a name for the lesion marker.

4. Click *OK*.

The lesion marker appears on the image.

⚠️ **CAUTION**

Risk of Incorrect Diagnosis

If you have the MultiView Breast Bx license, be sure to name your targets/lesions appropriately so they are easy to identify in the Breast Targeting pane before inserting a needle.

Lesion Analysis

Lesion analysis is the process of determining a suspected lesion's volume and dimensions. MultiView can do this automatically for images with DCE colorization applied.

NOTE: Lesion analysis is only available with the MultiView MR Breast Dx license.

When you analyze a lesion MultiView automatically analyzes some of the characteristics of the lesion and populates some of the fields in a report on the lesion. For more information about working with reports, see the Breast Reports.

There are two ways to analyze a lesion in MultiView:

- Using a ROI

- Using the Mass Lesion Analysis tool

Lesion Analysis Based on a ROI

To analyze based on a ROI that has been drawn around the suspected colorized lesion, right click on the ROI and select *Analyze Mass Lesion*. The lesion analysis algorithm uses the image voxels within the ROI to define a volume comprised of adjacent colorized voxels. Only voxels that are above the selected threshold and are visible on the image are used to define this functional volume and dimensions.

When a lesion has been analyzed, two controls appear in the viewport overlay:

Lesion Focus and Lesion Highlighting . Click these controls to toggle on/off lesion highlighting or lesion focus.
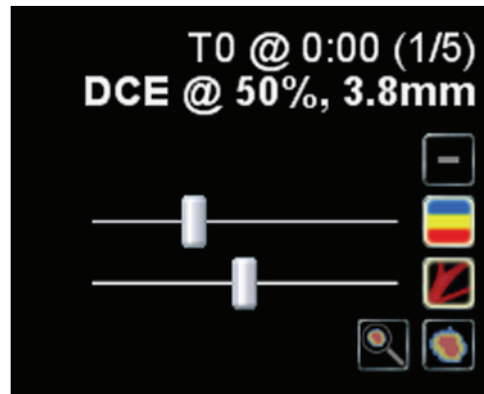

Figure 108:   Lesion Analysis Viewport Overlay Details

You can also enable or disable lesion focus and lesion highlighting by right-clicking in the viewport and selecting an option from the *Rendering Options* context sub-menu.
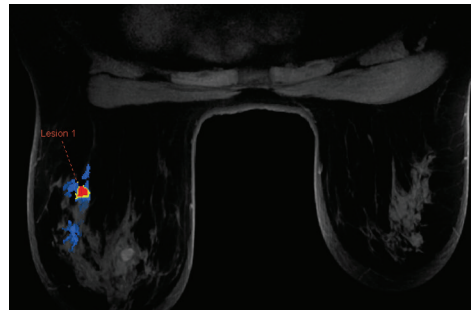

Figure 109: Lesion Highlighting Example

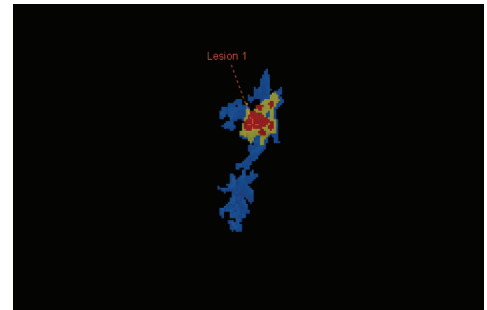**Figure 110: Lesion Highlighting and Focus Example**

NOTE: Lesion highlighting and focus only apply to the currently selected lesion.

Using the Mass Lesion Analysis Tool

You can also analyze a lesion in the 2D Slices or MIP rendering modes using the Mass Lesion Analysis tool. To use the Mass Lesion Analysis tool, choose *Tools > Breast > Mass Lesion Analysis*, then click a lesion in the image. MultiView selects

all the colorized voxels connected to the voxel you clicked and includes them as part of the lesion.

*NOTE: The Mass Lesion Analysis tool will select **all** colorized voxels anywhere in the series connected to the one you click. For this reason, use the Mass Lesion Analysis tool only for very well defined masses and ensure that the colorization parameters are set appropriately (see the Colorization chapter, beginning on page 135). You may also want to use the Vessel Clipping feature to help isolate the lesion (see Using the Vessel Clipping Control on page 145).*

When lesion analysis is complete, MultiView jumps to the image slice containing the voxel with the worst dynamic curve. The lesion annotation appears on the slice containing the most enhancing voxels.

NOTE: When using the Mass Lesion Analysis tool in the MIP rendering mode, it is best to enable subtraction in the viewport. Switch to 2D Slices mode for smaller regions of interest or when segmenting a lesion in MIP mode is not possible.

Viewing Uptake Information in Graphical Format

MultiView can plot the dynamic uptake and washout characteristics for an analyzed lesion or ROI in a graph for further quantification and reporting.

To view dynamic uptake and washout information in a graph, click the Graph tab on the right side of the workspace to open the Graph pane. Select the lesion or region of interest you want to view a graph of from the *Source* drop-down list. Alternatively, you can assign the Probe tool to a mouse button and click on a single voxel to view its uptake and washout information as a graph.

Worst Curve Graph

To view the curve for the "worst case" voxel region within a lesion or defined ROI, click the *Show Worst Dynamic Curve* icon in Graph pane. MultiView only considers voxels in a lesion or ROI as candidates for worst curve if the peak enhancement exceeds your configured threshold (see Enabling Breast DCE Colorization on page 140). The worst curve is defined as the curve with the steepest washout.
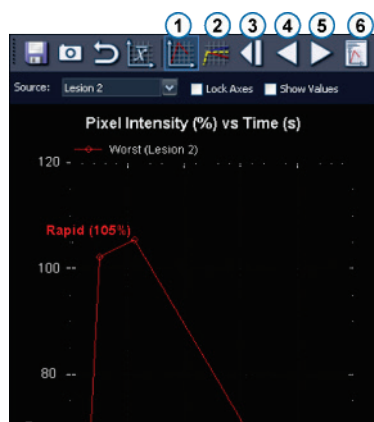
#	Description
1	Worst Dynamic Curve Tool
2	Dynamic Curve Line Fitting Tool
3	First Worst Dynamic Curve
4	Previous Worst Dynamic Curve
5	Next Worst Dynamic Curve
6	Set Worst Curve in Report

| 7 | Initial time point (0) |
| 8 | Final time point |

Figure 111:   Graph Pane Showing Worst Curve

The graph shows the percentage of voxel intensity relative to the intensity at time point 0 for every time point (in this case, five). The time points are indicated by dot markers. The first time point is 0 because relative to itself, it has 0 voxel intensity. Each of the following time points is compared to the first time point.

Click the *Next Worst Dynamic Curve* and *Previous Worst Dynamic Curve* icons in the Graph pane toolbar to navigate through the dynamic curves in the lesion or ROI. By default, the worst dynamic curve for a lesion is automatically added to a report on that lesion. If you would like to use a different curve in the report, navigate to the curve you want to use then click the *Set Worst Curve in Report* icon.

NOTE: The voxel corresponding to the curve currently displayed in the Graph pane is highlighted in the viewport.
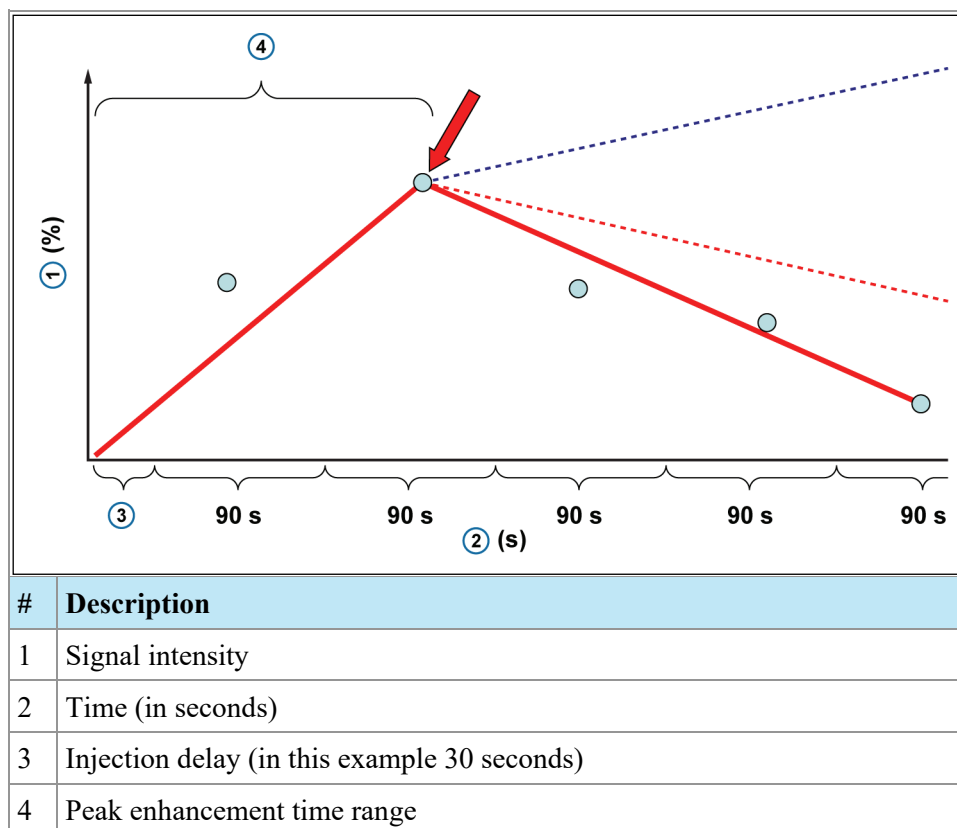
Worst Curve Calculation

The example below shows how a worst curve is calculated. This example uses the following data:

- Injection delay: 30 seconds

- Number of time points: 5

- Scan duration of each time point: 90 sec.

- Peak enhancement is the highest point in the peak enhancement time window (no interpolation or extrapolation between points).

Each voxel in the selected dynamic series is sampled for change in intensity over time. The uptake curve is determined by the line from time zero to the highest point within the peak enhancement time range.

NOTE: In the example below, the scan time was 90 seconds per phase and the peak enhancement time range was set to 150 seconds. Using a linear K-space fill, the center of K-space was filled at 45 seconds. The 30 second scan delay plus the 45 seconds of scan time = 75 seconds. If the first time point (at 75 seconds) was higher than the second time point (at 165 seconds = 30 + 90 + 45 seconds), then the first time point would have been taken as the peak enhancement.

Washout lines are calculated as best fit of points 240 seconds beyond the identified peak enhancement time point. This is calculated using all time points after the identified peak enhancement.

#	Description
1	Signal intensity
2	Time (in seconds)
3	Injection delay (in this example 30 seconds)
4	Peak enhancement time range

In the graph above:

- The pre-contrast phase, or mask phase, is assumed to be time point 0

- The time from Mask Timestamp to Post1 Timestamp is the scan delay plus half of the scan duration (in this example: 30 +90/2 s assuming a linear K-space filling)

- The time between subsequent Post timestamps is the Scan duration (90 s)

Line of Best Fit

With the worst curve graph displayed, click the Dynamic Curve Line Fitting tool to show an interpolated line of best fit indicating the uptake or washout characteristics of the worst case voxel in the selected lesion or ROI.

This graph also displays dotted lines indicating the thresholds for colorization (for more information about setting these thresholds, see Enabling Breast DCE Colorization on page 140). A voxel with a washout curve extending below the red limit line will be displayed as red. A voxel with a washout curve extending above the blue limit line will be displayed as blue. A voxel with a washout curve between these two limit lines will be displayed as green. Using this tool it is possible to understand exactly how the software selects the color for every voxel.
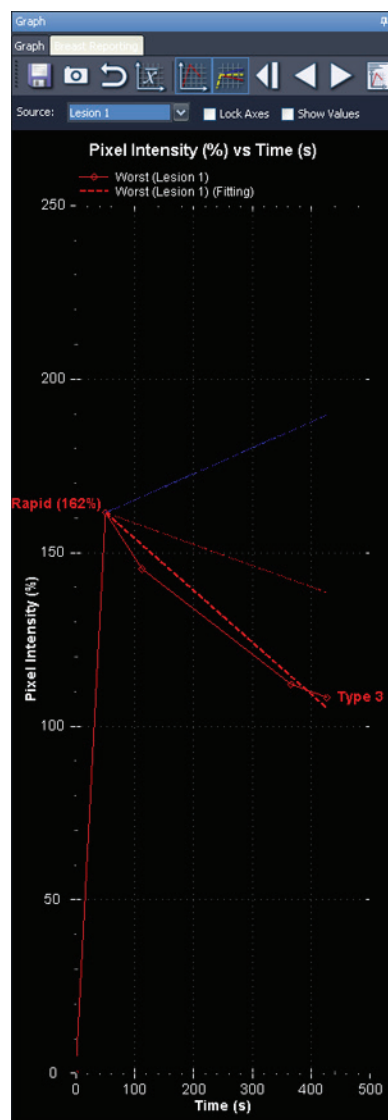
Figure 112:   Dotted Red Line Fitted to a Washout Curve

In summary, color is applied in the Line of Best Fit graph as follows:

- A dotted red line (below the configured red threshold) indicates a washout.

- A dotted yellow line (between the configured red and blue thresholds) indicates a plateau.

- A dotted blue line (above the configured blue threshold) indicates a continuous uptake.

Bilateral Comparison

Use the Bilateral Comparison tool to quickly shift from a bilateral axial view to sagittal views of each breast.

To use the Bilateral Comparison tool:

1. In the workspace, select a layout with at least two viewports.

2. Drag the series you want to view into the first (left) viewport and perform any image analysis such as colorization.
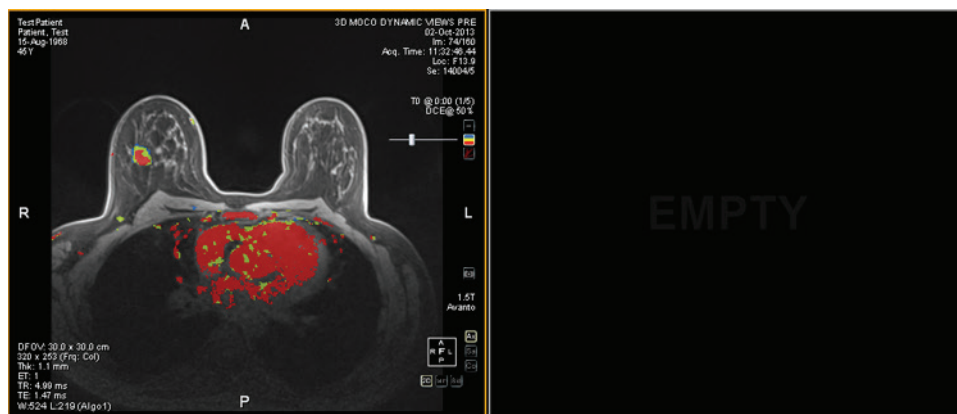

Figure 113: **Bilateral Axial View Before Bilateral Comparison**

3. Choose *Tools > Breast > Bilateral Comparison*.

The image in the first viewport is replaced with a sagittal view of the right breast, and a sagittal view of the left breast appears in the next available viewport.
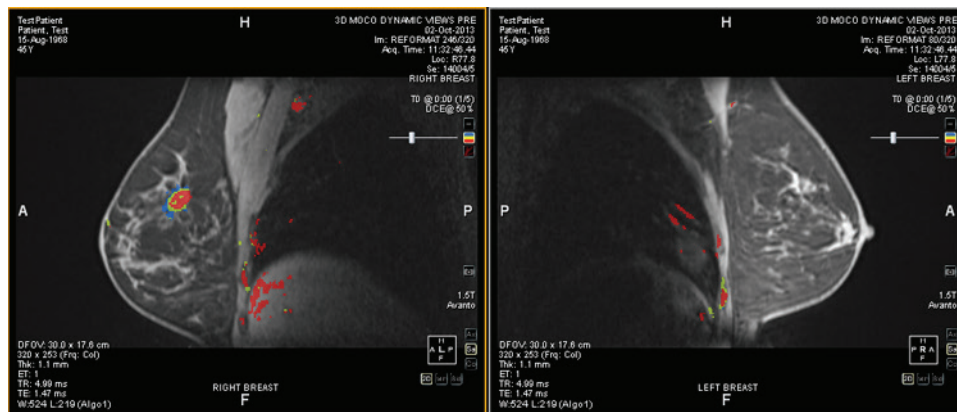

Figure 114: **Sagittal Views of Each Breast**

Any settings you specified in the original bilateral axial view, such as colorization, are applied to the sagittal views of each breast. The yellow spatial marker is the

"active" marker; the red marker is a reflection of the active marker in the opposite breast. When you click in a viewport, the spatial marker in the viewport becomes the active marker.

If colorization is applied, when you move the colorization or vessel clipping sliders in one viewport, the colorization threshold or vessel clipping diameter changes are applied to the other viewport as well. Colorization can be toggled on or off in each viewport independently however.

You can save your preferred bilateral comparison settings in a hanging protocol. For more information, see Hanging Protocols on page 103.

Chapter 12   Clipboard and Key Images

Key images are an effective way to capture the most relevant information from a study in one location for easy access later.

The clipboard is a convenient way to set aside images of interest. Once images are in the clipboard, you can export them to a different image format or create a video from them.

Key images and items on the clipboard appear in the Clipboard and Key Images pane. By default this pane is minimized as a tab on the left side of the workspace. Click on the *Clipboard and Key Images* tab to open this pane.

About Key Images

Once you have altered the presentation state of an image by changing the windowing, zooming, panning, adding annotations, etc., you may want to capture the state of the image and store it along with the study so it can be recalled later or reviewed by someone else. The key image functionality in MultiView allows you to capture and store images with a study.

NOTE: MultiView treats key images as flat, 2-dimensional images, unlike slices, which have "thickness" in MultiView.

When key images have been saved, they are added as a series to the study. When a key image is taken of a processed image, a generated reference image will be created and will appear in the list of series in the study. If configured, key images can also be sent automatically to a server when you close the study. For more information, see Reporting on page 52.

You can also export key images to another image format, such as JPEG, by adding the key image to the clipboard. For more information, see Copying Key Images to the Clipboard on page 171.

To work with key images, click the Clipboard and Key Images tab on the left side of the workspace to open the Clipboard and Key Images pane, then the Key Images tab.
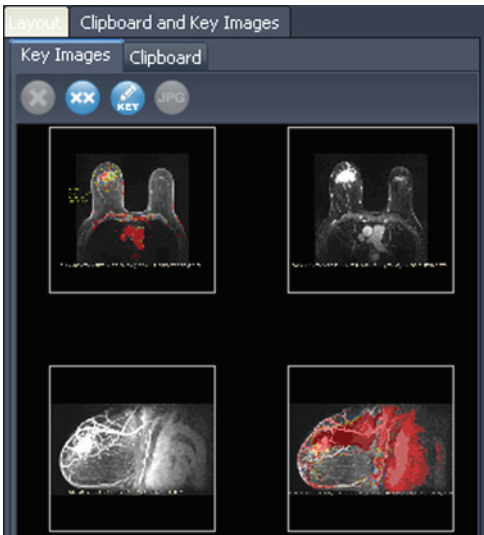

Figure 115:   Key Images Tab

Key Image Tools

The toolbar at the top of the Key Images tab contains icons for working with key images.

Table 24: Key Images Tab Tools

Icon	Name	Description
	Delete Selected	Deletes the selected key image from the Key Images tab.
	Delete All	Deletes all the key images in the Key Images tab.
	Edit Key Image Information	Click to edit the key image details. For more information, see Editing Key Image Details on page 167.
	Export to different image formats	Click to export the key image as an image file. For more information, see Exporting Key Images on page 168.

Creating a Key Image

To create a key image:

1. Set the presentation state exactly as you want it to look in the image. Pay particular attention to the zoom and pan; the visible region of the image is

stored as well, so you may want to focus in on something specific and make it as large as possible.

2. Do one of the following:

- Right-click in the viewport and select *Create Key Image* from the context menu.

- Press the space bar on the keyboard to capture the active viewport.

- Hold down the SHIFT key and press the space bar to create a key image of each open viewport.

The key image is created and appears in the Key Images pane. The next time you open this study, your key images will be displayed in the Study List.

Editing Key Image Details

You can edit some basic information about the key image. This information is stored in the header of the DICOM Key Object document.

To edit key image details:

1. Select the image in the Key Images tab.

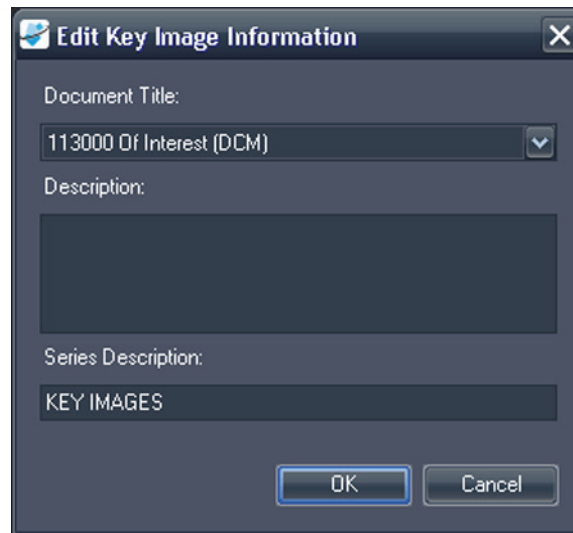2. Click the *Edit Key Image Information* icon. The Edit Key Image Information dialog appears.

Figure 116:   Edit Key Image Information Dialog

3. Enter the information for the image.

Option	Description
Document Title	Select a title from the list.
Description	Enter a description of the image.

Option	Description
Series Description	Enter a description for the series. This description will appear in the series list for the study.

4. Click *OK*.

Saving Key Images

Any images in the Key Images pane are saved automatically when you close the workspace. The next time you open this study, the key images are converted into a series and displayed in the Study List.

Exporting Key Images

You can export a key image as an image file in a format such as GIF or JPEG.

To export a key image as an image file:

1. Select the key image in the Key Images tab and click the *Export to different image formats* icon.

2. Specify how you want to export the image.
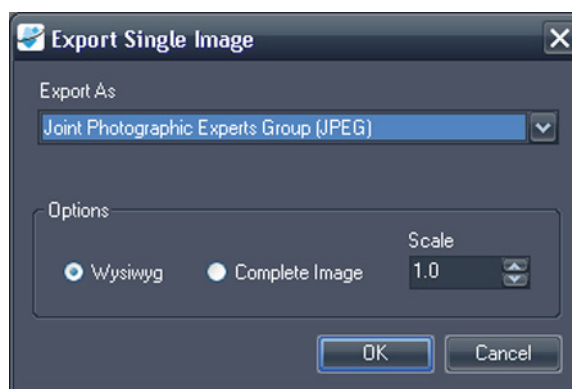
Figure 117:   Export Single Image Dialog

Option	Description
Export As	Select the file format you want to save the image as. Supported formats are: BMP, PNG, TIFF, GIF and JPEG.
Wysiwyg	Select this option to export the key image exactly as it appears in the viewport.
Complete Image	Select this option to export the entire key image, including areas that were not visible in the viewport when the key image was captured.

Option	Description
Scale	Enter the amount to scale the image. ▪ If you selected the Wysiwyg option, the image is scaled relative to the visible area in the viewport. ▪ If you selected the Complete Image option, the image is scaled relative to the actual width and height of the image.

3. Click *OK*.

4. Browse to the location where you want to save the image and enter a file name for the image.

5. Click *Save*.

About the Clipboard

You can copy images to the clipboard by volume or by display set.

To work with the clipboard, click the Clipboard and Key Images tab on the left side of the workspace to open the Clipboard and Key Images pane, then the Clipboard tab.
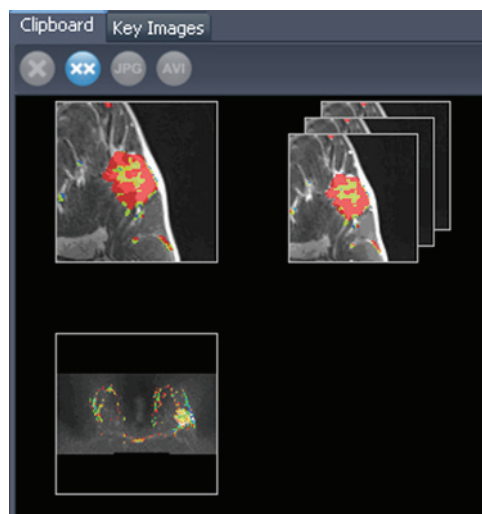
Figure 118:   The Clipboard Tab

Unless you delete them, items remain on the clipboard until you close MultiView. Note that if you log out but do not close MultiView, the next user who logs in will see the items on the clipboard.

Clipboard Tools

The toolbar at the top of the Clipboard tab contains icons for working with items on the clipboard.

Table 25: Clipboard Tab Tools

Icon	Name	Description
	Delete Selected	Deletes the selected key image from the Key Images tab.
	Delete All	Deletes all the key images in the Key Images tab.
	Export to different image formats	Click to export the selected item on the clipboard as an image file. For more information, see Exporting Items on the Clipboard as Images on page 172.
	Export To Video	Click to export the selected item on the clipboard to a video file. For more information, see Exporting Items on the Clipboard as a Video on page 174.

You can also access these tools by right-clicking on a clipboard image thumbnail and selecting them from the context menu.

Copying a Volume to the Clipboard

Copy a volume to the clipboard when you want to capture all the images in the volume currently active in the viewport. You can later export one or more of the images in the volume into another format, such as JPEG, or export a range of images from the volume as a movie file.

To copy a volume to the clipboard:

1. Right-click in the viewport containing the image you want to copy.

2. In the context menu, select *Clipboard > Copy Volume to Clipboard*.

The volume appears on the clipboard as a single image.

Note that the presentation state of the images in the volume (zoom, window/level, measurements, ROIs etc.) is also captured on the clipboard.

Copying a Display Set to the Clipboard

Copy a display set to the clipboard when you want to capture all the images in all the volumes open in the viewport to the clipboard. You can later export all or some of the images in the volumes in the display set to another format, such as JPEG, or export a range of images from the volumes in the display set as a movie file.

NOTE: The option to copy a display set to the clipboard only appears when you have more than one series open in the viewport.

To copy an entire display set to the clipboard:

1. Right-click on the display set you want to copy.

2. In the context menu, select *Clipboard > Copy Display Set to Clipboard*.

The display set appears on the clipboard as a set of images.

Copying Key Images to the Clipboard

You may want to copy key images to the clipboard so that you can export them to another image format. Or, if you open multiple key images in the viewport, you can add them to the clipboard together and export them as a movie file.

To copy one or more key images to the clipboard:

1. Open the key image(s) in the viewport.

2. Right-click in the viewport and select *Clipboard* from the context menu, then one of the following options.

Option	Description
Copy Image to Clipboard	Select this option to copy the current key image to clipboard.
Copy Display Set to Clipboard	Select this option to copy all the key images open in the viewport to the clipboard as a display set.
Copy Range of Images to Clipboard	Select this option to select which key images you want to copy to the clipboard.

3. If you chose to copy a range of images, enter the range in the Copy Images to Clipboard dialog, then click *Copy to Clipboard*.
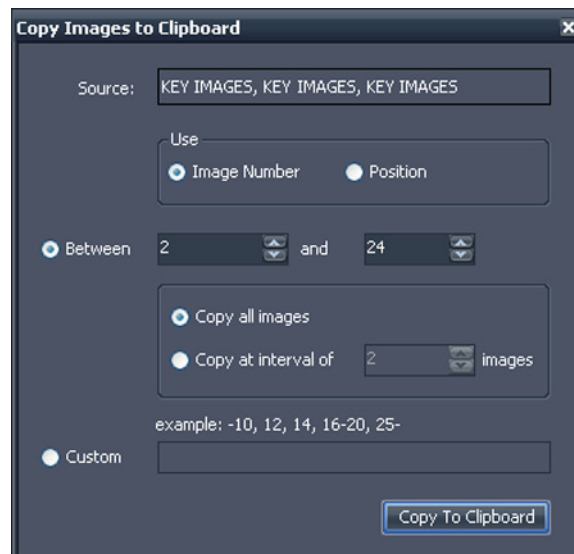
Figure 119:   Copy Images to Clipboard Dialog

The image(s) are added to the clipboard.

Exporting Items on the Clipboard as Images

The options available for exporting to an image depend on whether you are exporting a key image, a volume, or a display set.

- When exporting a key image, you can only select where to save the image and what scale to save it at.

- When exporting a volume, you have the option to export the image that was active when you copied the volume to the clipboard, or a range of the images in volume.

- When exporting a display set, all images, or the range of images you chose, will be exported for each volume in the set. For example, if your display set includes 3 volumes, and you choose to export images 10 – 12, images 10 – 12 from each volume will be exported and the result will be 9 images.

To export an item as an image:

1. Select the item in the Clipboard pane.

2. Click the *Export to different image formats* icon in the clipboard toolbar. The Export Images dialog appears.
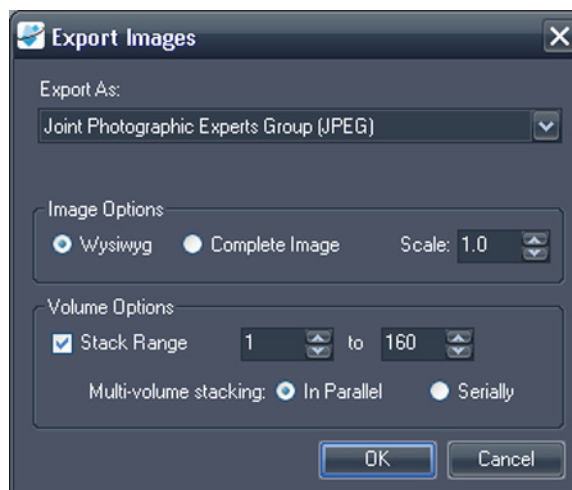
Figure 120: **Export Images Dialog Displaying All Possible Options**

3. Specify how you want to export the image.

Option	Description
Export As	Select the file format you want to export the image to from the list.
Wysiwyg	Select this option to export only the visible portion of the image at the time it was copied to the clipboard.

Option	Description
Complete Image	Select this option to export the entire image, including areas that were not visible in the viewport when the image was copied to the clipboard.
Scale	Enter the amount to scale the image. ▪ If you selected the Wysiwyg option, the image is scaled relative to the visible area in the viewport. ▪ If you selected the Complete Image option, the image is scaled relative to the actual width and height of the image.
Stack Range	This option is only available if you are exporting a volume or display set. If you are exporting a volume: ▪ Leave this option un-selected to export only the image that was active when you copied the volume to the clipboard ▪ Select this option if you want to export two or more images in the volume, then enter the range of images to export If you are exporting a display set: ▪ Leave this option un-selected to export all the images in all the volumes that were active in the viewport when you copied the display set to the clipboard ▪ Select this option if you want to export only a range of the images in the volumes, then enter the range of images to export
Multi-volume stacking	This option is only available if you are exporting a range of images from a display set. ▪ Select *In Parallel* to export the same image from each volume before moving to the next image in the range ▪ Select *Serially* to export all images in the range from the first volume before moving to the next volume

4. Click *OK*.

5. In the Save As dialog, navigate to the location to save the image. If you are exporting a single image from a volume, enter a file name for the image and click *Save*. If you are exporting multiple images, MultiView creates a new

folder in the location you specify and generates file names for the exported images automatically.

Exporting Items on the Clipboard as a Video

You can export a range of images, a volume, or a display set on the clipboard to a video file.

To export an item on the clipboard to video:

1. In the clipboard, select the item you want to export.

2. Click the *Export To Video* icon on the clipboard toolbar, or right-click on the item and select *Export To Video* from the context menu. The Export to Video dialog appears.
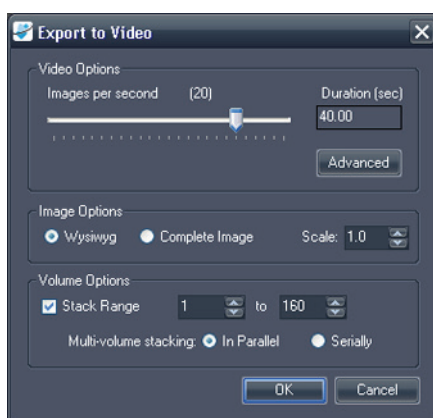
Figure 121: Export to Video Dialog   Figure 122: Video Advanced Options
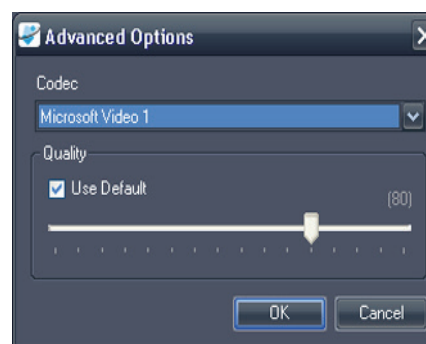
3. Enter the information about the video in the Export to Video dialog.

Option	Description
Images per second	The speed at which the video should play.
Advanced Options	Click the *Advanced* button to select the codec and quality level for the video.
Wysiwyg	Select this option to export only the visible portion of the images at the time it was copied to the clipboard.
Complete Image	Select this option to export the entire images, including areas that were not visible in the viewport when the image was copied to the clipboard.

Option	Description
Stack Range	This option is only available if you are exporting a volume or a display set. Select this option to export only a range of the images in the volume(s), then enter the range of images to export.
Multi-volume stacking	The option is only available if you are exporting a range of images from a display set. ▪ Select *In Parallel* to export the same image from each volume before moving to the next image in the range. ▪ Select *Serially* to export all images in the range from the first volume before moving to the next volume.

4. Click *OK*.

5. In the Save As dialog that appears, navigate to the location where you want to save the video, then enter a file name for the video and click *Save*.

Chapter 13   Breast Reports

Use the MultiView Breast Reporting feature to create a custom report with information and images from your analysis of a study. These reports can be saved as Adobe PDF files, sent directly to others as an email attachment, and/or exported to a PACS server as a DICOM image series.
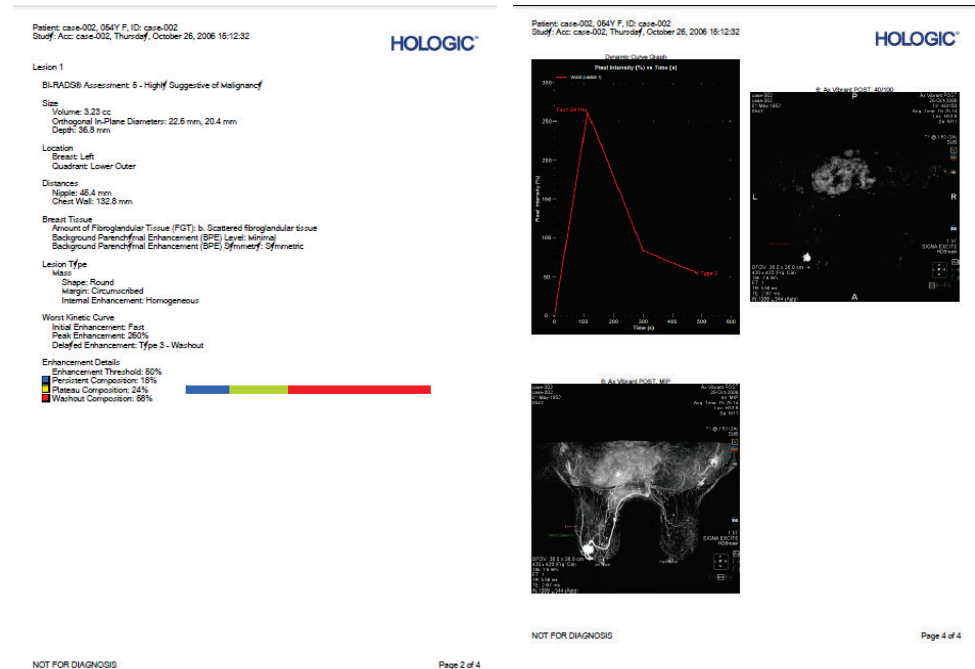
Figure 123:   Pages from a Sample Breast Report PDF File

Creating a Report

You can generate a report based on a lesion, or based on a set of images if no significant lesion is present.

To create a report, open the study you want to create the report for, and then open as many series as necessary to clearly show the lesion and/or area of interest. Click the Breast Reporting tab on the right side of the workspace to open the Breast Reporting pane.

Figure 124:   Breast Reporting Pane

The Breast Reporting pane is divided into four sections:

- Existing Reports, which contains a list of any reports already created for this study (see Working with Existing Reports on page 188).

- New Report, where you can select the lesion you want to report on and enter an assessment of the lesion (see Entering the BI-RADS® Assessment below).

- Image Captures (see Adding Images to a Report on page 179).

- Report details, where you can enter specific details about the patient, MRI protocol, and lesion (see Entering Report Details on page 182). Some fields may be automatically populated if you analyzed the lesion using the MultiView mass lesion analysis tools.

Entering the BI-RADS® Assessment

The Lesion field is automatically populated if an analyzed lesion was selected when you opened the Breast Reporting pane. If necessary, you can select a different lesion to report on from the Lesion list.
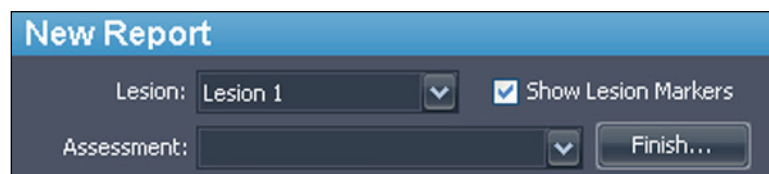
Figure 125:   Assessment Categories

The Assessment list contains the BI-RADS categories from the BI-RADS Atlas MRI lexicon. Select the category that best describes the lesion, if any.

Adding Images to a Report

To help describe relevant information about the study, you can add images from the viewport to a report. Viewport images may be in any mode including subtracted or colorized and reformatted to any orientation.

Use the camera icon in the viewport (circled in the figure below) to add images to a report.

- Click the camera icon to add the image in the viewport to the report.

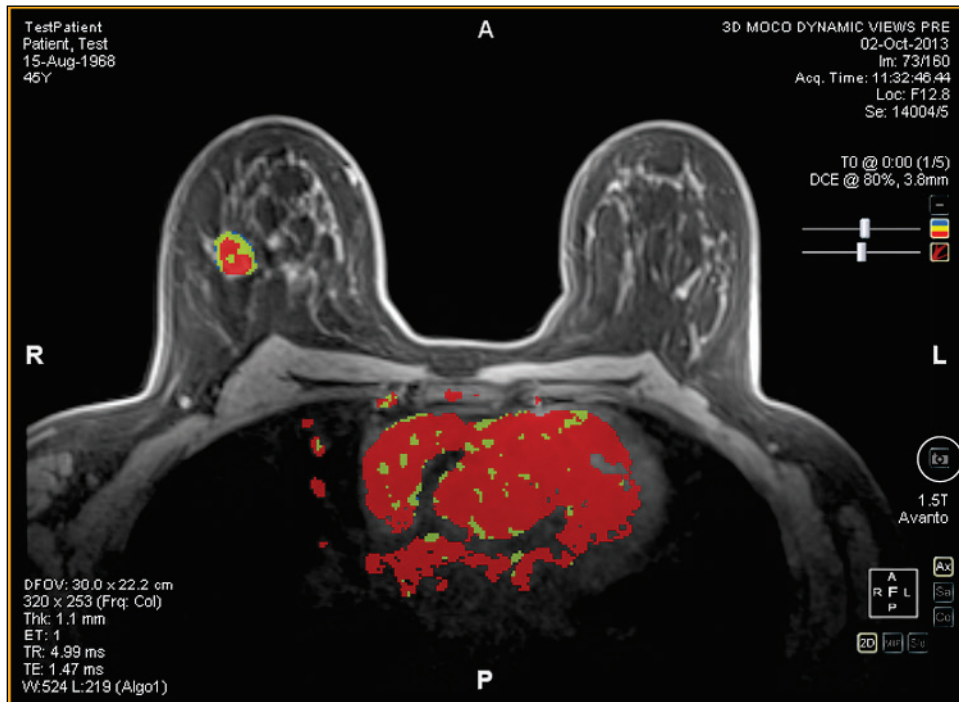- Right-click the camera icon to add the images in all viewports to the report.

Figure 126:   Camera Icon in the Viewport

NOTE: You can configure MultiView to capture report images as key images by selecting the "Capture report images as key images, and key images as report images" option under Tools > Options > Reporting.

Other ways to add images to a report include:

- Using the context menu. To add a single image, right-click the viewport image and select *Add Image to Report*, or to add all the images currently displayed, select *Add All Images to Report*.

- Using the space bar keyboard shortcut. This will create a key image for the selected viewport. If you have selected the "Capture report images as key images, and key images as report images" option in the Reporting options, the viewport will also be added as an image capture to the report. The space bar keyboard shortcut only captures the image in the active viewport.

- Configuring MultiView to automatically capture a pre-defined set of images when you open the Breast Reporting pane. For more information about configuring default image captures, see Breast Image Capture Options on page 54.

Captured images are automatically added to the first page of the report.
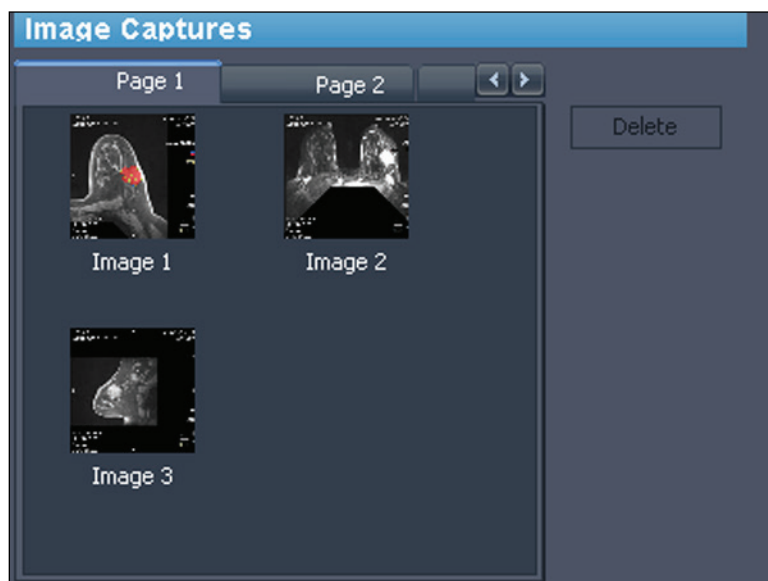
Figure 127:   Captured Images

It is possible to put a few images on a page and then skip to the next page. To skip to the next page, click the tab for the next page (additional pages are added automatically as needed).

You can quickly preview an image that has been added to a report by double-clicking the image thumbnail. The image opens in a new window. Click the Close button to close the window when you are finished viewing the image.
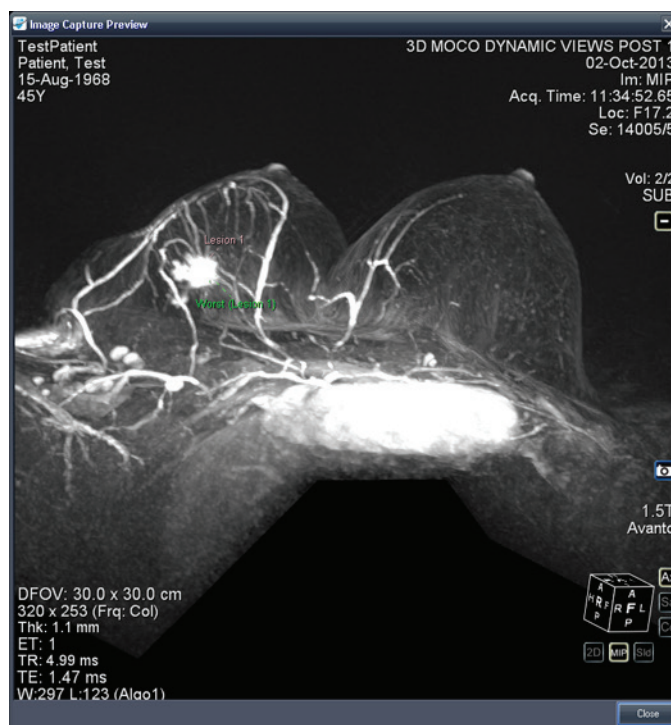

Figure 128: **Image Capture Preview Window**

Images from the Graph pane may also be added to a report by clicking the *Add Graph to Report* button in the Graph pane. For more information about working with graphs, see Graph Pane Buttons and Tools on page 132.

To delete an image, select the image and click the *Delete* button.

Entering Report Details

The report details section includes six tabs where you can enter information about the patient, study, and lesion or region of interest.
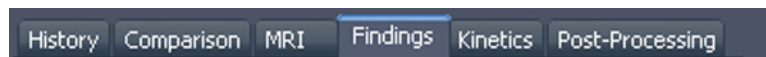
Figure 129: **Report Details Tabs**

Because the Findings tab is the most frequently used, it is displayed initially. Click any tab to enter the corresponding information.

Findings

Enter information about the lesion on the Findings tab. The fields on the Findings tab correspond to the BI-RADS® Atlas MRI lexicon for describing lesions. Under

certain circumstances, MultiView will automatically populate some fields on the Findings tab:

- When you analyze a lesion, MultiView automatically calculates the volume and in-plane diameters of the lesion and fills in those fields.

- If you use the Chest Wall Clipping tool, either before or after analyzing a lesion, MultiView automatically determines the breast, quadrant, and nipple and chest wall distances and fills in those fields. For more information about how the nipple and chest wall distances are calculated, see Chest Wall Clipping on page 153.

CAUTION

Risk of Incorrect Diagnosis

The accuracy of MultiView calculations depends on accurate colorization parameters and nipple and chest wall marker placement. Always review all values automatically calculated by MultiView and change them if necessary.

#	Description
1	Enter information about size and position.
1A	Enter the estimated volume of the lesion, or verify the volume calculated by MultiView.
1B	Enter the diameters of the lesion, or verify the diameters calculated by MultiView.
1C	If this information was not automatically determined by MultiView, indicate the location of the lesion. Specify which breast (or both) and the quadrant and region where the lesion appears.
2	Enter information about the breast tissue.
2A	Select the amount of Fibroglandular Tissue (FGT). The options are: • Almost entirely fat • Scattered fibroglandular tissue • Heterogeneous fibroglandular tissue • Extreme fibroglandular tissue
2B	Select the Background Parenchymal Enhancement (BPE). The options are: **Level** • Minimal • Mild • Moderate • Marked **Symmetry** • Symmetry • Asymmetric
3	Select the lesion type.
3A	Indicate the characteristics of the lesion. These options change based on the lesion type you select.
4	Select fat containing lesions.
5	Select non-enhancing findings.
6	Select associated features.
7	Select information about implants.

Figure 130:   Findings Tab

History

Use the History tab to record important details about the patient's clinical history.
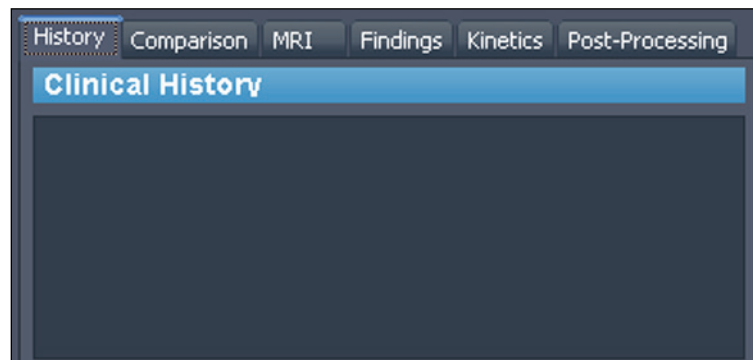

Figure 131:   History Tab

Comparison

Make any notes comparing the current assessment to previous assessments on the Comparison tab.
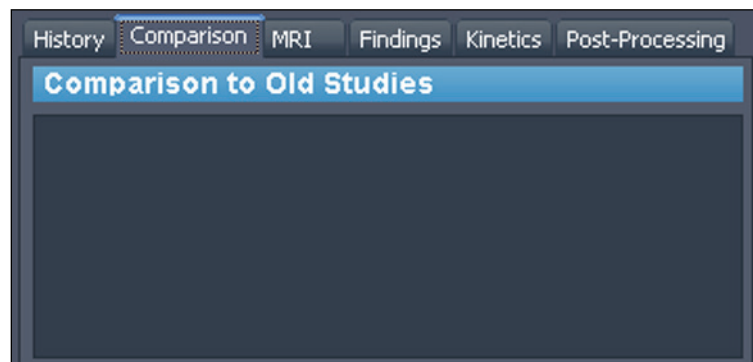

Figure 132:   Comparison Tab

MRI

On the MRI tab, enter the details of the MRI technique that was used to obtain the images for the study.
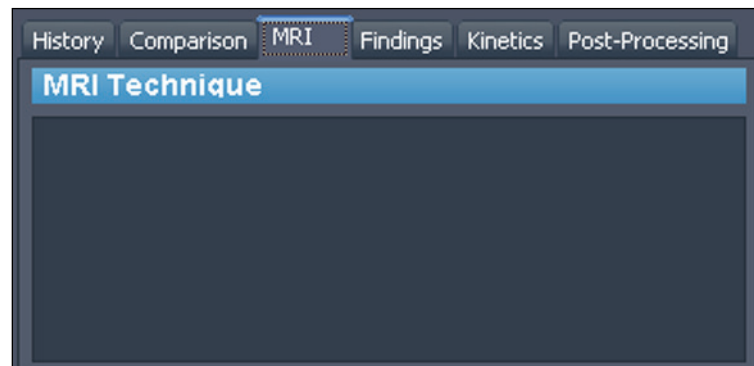

Figure 133:   MRI Tab

Kinetics

Describe the characteristics of the kinetic curves for this lesion on the Kinetics tab. If the lesion has been analyzed, the Enhancement Details section shows the enhancement threshold used during the volume analysis and indicates the percentage composition of each color within the volume.
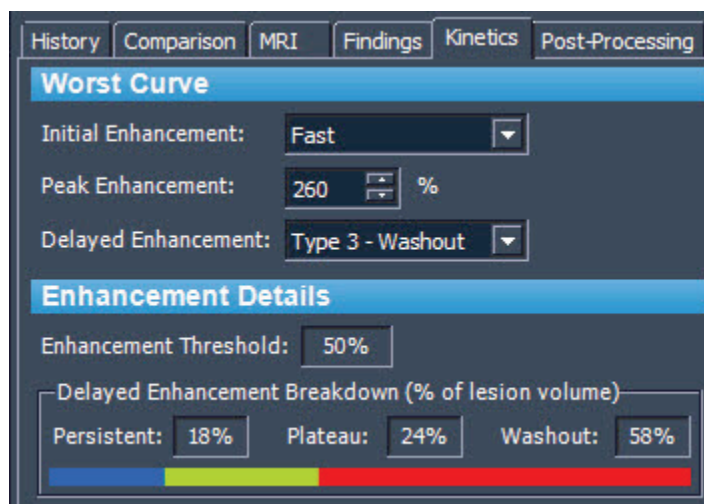

Figure 134:   Kinetics Tab

Post-Processing

On the Post-Processing tab, indicate any post-processing techniques you used on the image.

Figure 135:   Post-Processing Tab

Closing the Report

When you are finished capturing images and entering information about the lesion you are reporting on, click the *Finish* button to close the report. The following confirmation dialog appears.
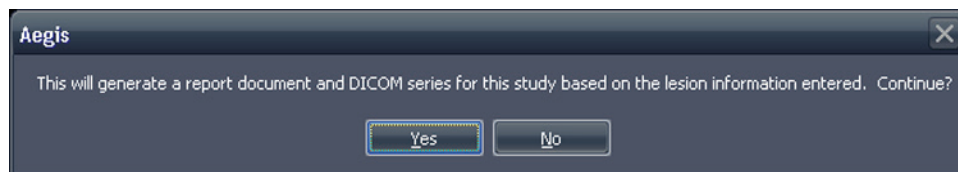

Figure 136:   Confirmation Notice on Closing a Report

Click *Yes* to generate the report. When MultiView has generated the report:

- It immediately appears in the Existing Reports list at the top of the Breast Reporting pane. For more information, see Working with Existing Reports on page 188.

- A DICOM series is added to the study. This series appears at the end of the study list the next time the study is opened in MultiView. Drag the series into the viewport to view the report in MultiView.

- Depending on how MultiView has been configured, the report and/or key images may be sent to the configured default DICOM servers. For more information, see the Reporting options on page 52.

NOTE: If you close MultiView with the Breast Reporting tool open, you will be prompted to save the report.

Working with Existing Reports

The Existing Reports section of the Reporting pane lists any reports that have been created for this study.

Figure 137:   Existing Reports List

To view a PDF of a report, select it in the list and click the *View* button. The report opens in Adobe Reader.

To view a report in MultiView, select the DICOM generated series for the report on the Study List tab in the Layout pane and drag it into a viewport.

Printing a Report

To print a report, select the report in the Existing Reports list and click the *View* button. The report opens as PDF file that you can print using standard Windows printing functions.

NOTE: You can also view reports for a study in the My Studies list. For more information, see Viewing Study Reports on page 83.

Emailing a Report

You can share reports with others by email. To email a report:

1. Click the *Email...* button in the Existing Reports section of the Breast Reporting pane. The Email Reports dialog opens.
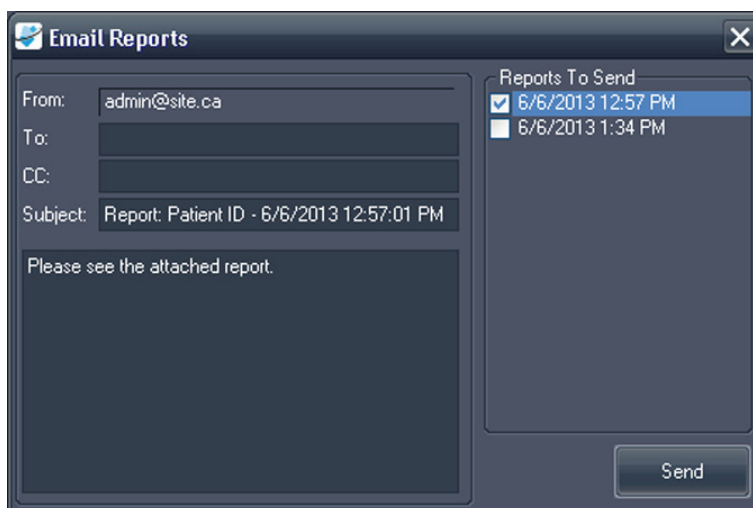

Figure 138:   Email Reports Dialog

2. Select the report or reports you want to email from the *Reports To Send* list on the right.

3. Enter the email address or addresses you want to send the report to in the *To* and *CC* (carbon copy) fields. The From field is automatically populated with the information configured in the MultiView Reporting options. For more information see the Reporting Email options on page 53.

4. The *Subject* field is automatically populated with the Patient ID and the date and time of the report. Overwrite this with your own subject if you prefer.

5. Type the text of the email, or leave the default "Please see the attached report" text.

6. Click *Send*.

The report is attached as a PDF file to an email and sent to the email addresses you specified.

NOTE: To send reports by email, MultiView must be configured with information about an email server. If MultiView is not configured to email reports, the From field in the Email Reports dialog is disabled and an error message is displayed when you click Send. For more information about email configuration, see the Email Options on page 53.

Sending a Report to a DICOM Server

To send a report to a DICOM server, select it in the Existing Reports list and click the *Send* button. In the dialog that appears, select the DICOM server you want to send the report to. The report is displayed as a DICOM secondary capture.

You can also configure MultiView to send reports to your default DICOM servers automatically when you close the workspace. Choose *Tools > Options > Reporting > Send reports to default servers on finish*.

Chapter 14   Biopsy Targeting

With accurate information about the location of a target or lesion in relation to a defined biopsy grid, MultiView can compute the needle positioning information required for accurate placement of biopsy or localization needles. If you performed the biopsy scan using a Sentinelle automatic grid registration fiducial plug, MultiView can automatically calculate targeting information for a lesion. In cases where automatic targeting is not possible, use the MultiView Breast Targeting features to manually register the locations of the grid surface and fiducials using scan images in the viewport.

In the rare event that images are not available (such as a network outage), you can still obtain targeting information by manually entering the grid, fiducial, and lesion coordinates in using the MultiView Manual Targeting feature.

Risk of Patient Injury, Risk of Incorrect Diagnosis

Always review the targeting information provided by MultiView. It is recommended that you perform a needle check scan to confirm targeting accuracy before taking a biopsy sample.

CAUTION

NOTE: Breast Targeting and Manual Targeting are only available with the MultiView MR Breast Bx license.

Before You Begin - Setting Up Distortion Correction

Due to the distortion inherent to all MRI scans, MultiView targeting may not be able to correctly calculate a target.

To ensure that the targeting accuracy in MultiView is within 5 mm, you must follow the distortion correction steps listed below for **all** series during a biopsy.

- Position the grid and region of interest as close to the center of the bore as possible to minimize spatial distortion. Spatial distortions increase at the extremities of the bore. This effect is stronger in larger diameter short axis bores.

- On sagittal and axial acquisitions, the slice thickness must be 2 mm **or less**.

- Use 3D distortion correction on the scanner during biopsy targeting. For instructions on how to enable 3D distortion correction on specific scanners, see the sections below.

Enabling 3D Distortion Correction on Siemens Scanners

Before scanning, disable 2D distortion correction on the Resolution > Filter page. Always use REF for biopsies; do **not** use ISO.

NOTE: If you have already scanned with 2D distortion correction, select the series in the Patient Browser and choose Evaluation > Undo 2D Distortion Correction.

3D distortion correction is a post-processing step in Siemens scanners. To perform 3D distortion correction, use the Browser to find and select the appropriate series, then select Evaluation > Distortion Correction 3D. This will take a minute or so to process (the software may not indicate the status of the process) and it will add a new series with "DIS3D" appended to the description. Send the corrected 3D image to MultiView.

NOTE: On VD 11 platforms or higher, you can automatically apply 3D distortion correction by enabling it in the adjustments tab.

Enabling 3D Distortion Correction on Toshiba Scanners

There are two ways to perform 3D distortion correction on Toshiba scanners: set up the distortion correction options before scanning, or run distortion correction as a post-processing step after the images have been acquired.

To enable 3D distortion correction before scanning:

1. Right-click in the blank area in the Sequence Editor window and select *Reconstruction*.

2. In the Reconstruction/Post-processing dialog, set the IDC (Intelligent Distortion Correction) option to VMC (Volume Measurement Correction).

To apply volume measurement correction to images that were acquired without it:

1. On the [Post Proc.] tab click *Reconstruction*.

2. In the Reconstruction dialog select the VMC option.

NOTE: The VMC option is not available in some countries. Contact your Toshiba sales representative to ensure that volume measurement correction is available on your scanner.

NOTE: An image that has undergone IDC cannot be used as a locator image in the scan plan. Use the Locator Image function to generate parent images for scan planning during acquisition. These images are registered as intermediate images. Set the IDC type to 2D when generating the locator images.

In volume measurement correction, correction is performed for the entire volume including the slice direction. When VMC is selected, however, the processing time is longer compared with 2D distortion correction and the image quality may be degraded. Images that have VMC applied display "VMC" in their image-related information.

Risk of Incorrect Diagnosis

CAUTION

VMC performs interpolation in three dimensions and image blurring is more likely to occur compared with 2D IDC. This phenomenon is more significant in cases where the slice interval is larger compared to the in-plan resolution. Blurring is more significant in the areas away from the magnetic field centre. Position the patient so that the target region is as close to the magnetic field centre as possible.

Enabling 3D Distortion Correction on GE scanners

GE scanners typically use 3D distortion correction by default. For GE Twin Speed, use "whole mode" only.

Breast Targeting

To determine targeting information for a breast biopsy:

1. Open a biopsy study and load the requisite image series into a viewport.

2. Choose *Tools > Breast > Breast Targeting*. The Breast Targeting tab appears on the right side of the workspace. Click the tab to open the Breast Targeting pane. You may want to pin the tab to the workspace so that it stays open while you are working in the viewports.

   MultiView attempts to automatically determine the breast, approach, and grid registration information based on the information in the study. Review this information to ensure that it is appropriate before continuing with step 3. If MultiView cannot automatically determine the breast, approach, and/or grid registration information, follow the steps in the sections below to manually specify the targeting parameters.

   NOTE: For MultiView to automatically register the grid, the viewport that is active when you open the Breast Targeting pane must contain a series with visible fiducials.

3. Use the MultiView tools to locate and mark a lesion. The Targeting tab in the Breast Targeting pane displays the needle placement information. For more information, see Using the Targeting Tab on page 202.

Figure 139:   Breast Targeting Pane

CAUTION

Risk of Patient Injury, Risk of Incorrect Diagnosis

Always review the targeting information provided by MultiView. If the grid registration is inadequate, deselect the *Use Auto Detect* option on the Registration tab and manually register the grid.

WARNING

Risk of Incorrect Diagnosis

When using the Sentinelle automatic grid registration fiducial plug you **must** put it in the C4 position in the Sentinelle grid. Putting the fiducial plug in any other grid position will cause MultiView to register the grid incorrectly and any subsequent targeting calculations will be incorrect.

NOTE: Automatic detection works best on axial image sets, and a slice thickness of 2 mm (axial or sagittal) or less is required. Check the Amiga Beekley markers in the fiducial plug for any air bubbles greater than 5 mm in diameter. If there are any, contact Hologic support.

CAUTION

Risk of Incorrect Diagnosis

Amiga Beekley markers are single-use devices and must be disposed of after use.

Biopsy Procedure Parameters

Select the breast location and the approach to use for the biopsy.
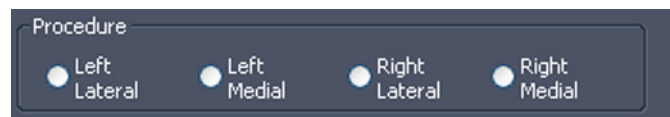
Figure 140:   Biopsy Procedure Parameters

If the *Automatically switch to interventional view* option is selected in the Breast Targeting options, when you select the breast and approach the MR series in the viewports switch to interventional view, meaning that they are displayed in the viewport in the same way that the patient is positioned relative to the approach (that is, Anterior down and Head/Foot to the right or left as appropriate).

CAUTION

Risk of Incorrect Diagnosis

Before proceeding with registration or performing a biopsy, verify that the patient position identified in MultiView accurately matches the patient's actual physical position.

NOTE: MultiView can store separate registrations for multiple breast and approach combinations. Simply complete the registration process for every combination of breast and approach that you want to use. See the next section for more information about the registration process.

Registration

The registration process specifies the location of the biopsy grid and fiducial markers relative to the target lesion. To complete the registration process

manually, follow the steps in the sections below to manually set the grid surface and mark the fiducial locations.
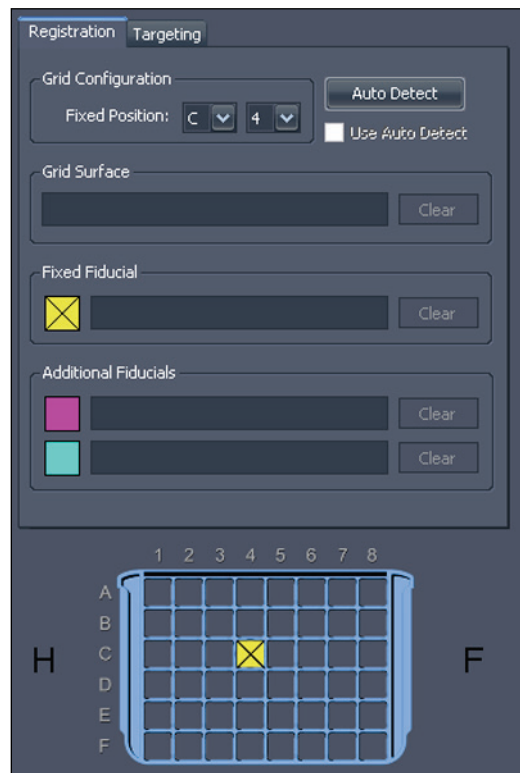
Figure 141:   Registration Tab in the Breast Targeting Pane

Automatic Grid Detection

If the Breast Targeting pane was open before you added the biopsy series to a viewport, and the biopsy series does not already contain valid registration data, MultiView does not immediately register the grid. You must use the Auto Detect feature to register the grid in this case.

NOTE: The biopsy scan must have been performed using a Sentinelle automatic grid registration fiducial plug in the C4 position in the Sentinelle grid.

To automatically register the grid:

1. Load an image series containing the Sentinelle fiducial plug in the viewport.

2. Click the *Auto Detect* button on the Registration tab. The registered grid position is displayed in the viewport.
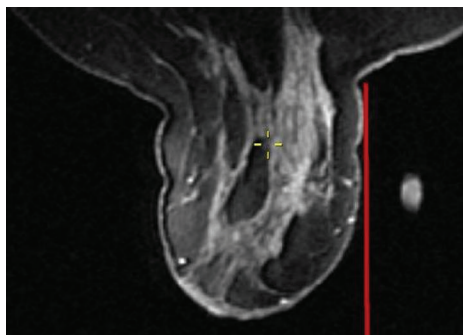
Figure 142:   Grid Displayed in the Viewport

⚠ **CAUTION**

Risk of Incorrect Diagnosis

You must verify that the grid placement is correct. If the automatic registration is not accurate, register the grid manually as described in the next section. Improper or inaccurate placement of the fiducial can affect the grid placement.

To cancel the registration, deselect the *Use Auto Detect* option on the Registration tab.

Locating the Fiducials Manually for Sentinelle Coils

If you used a Sentinelle automatic grid registration fiducial plug when scanning, but MultiView failed to automatically register the grid surface correctly, follow these steps to manually register the grid.

Specifying the Fixed Fiducial Position

The fixed fiducial is the one at the pre-determined grid location. For Sentinelle coils this must be in the C4 grid position.

To specify the fixed fiducial location:

1. Stack through the image series until the fiducials become visible.

2. Move the Spatial Locator crosshairs to the center of the fiducial you want to set as the fixed fiducial.
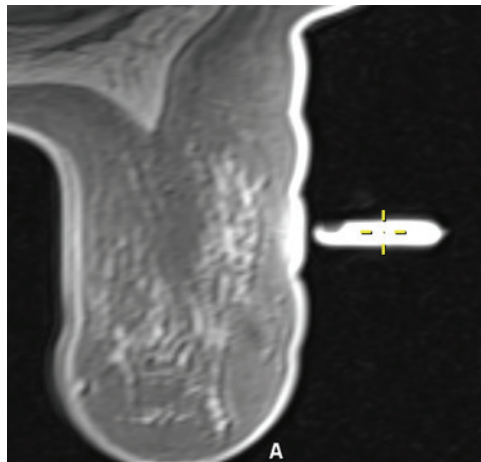
3. Right-click and select *Place Fixed Fiducial* from the context menu.

The coordinates of the fixed fiducial are automatically entered in the Registration tab and a yellow icon appears in the grid image. You can now specify the grid surface as described in Setting the Grid Surface on page 201.
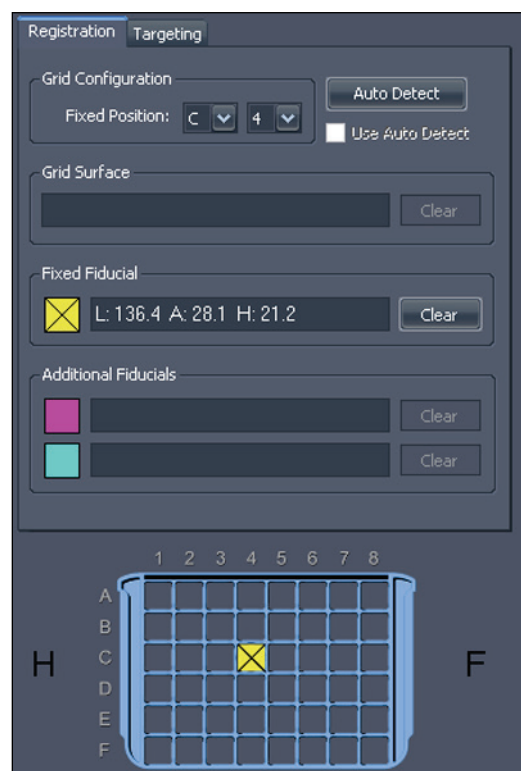
Figure 143:   Fixed Fiducial Information in the Registration Tab

Locating the Fiducials Manually for Other Coils

If you did not use a Sentinelle automatic grid registration fiducial plug, you must manually locate the fiducial markers in the image series. You can mark up to three fiducials on the approach side of each grid.

To locate the fiducials, stack through the image series until the fiducials become visible.

Figure 144:   Visible Fiducials

Specifying the Fixed Fiducial Position

The fixed fiducial is the one at the pre-determined grid location. By default this is grid location C4, but you can change it in the Breast Targeting options.

To specify the fixed fiducial position:

1. Move the Spatial Locator crosshairs to the center of the fiducial you want to set as the fixed fiducial.

    NOTE: You may need to zoom in on the image to accurately locate the center of the fiducial.

Figure 145:   Marking the Fixed Fiducial

2. Right-click the crosshairs and select *Place Fixed Fiducial* from the context menu.

NOTE: If the Place Fixed Fiducial *option is not available in the context menu, it is probably because you have not selected the breast and approach in the Breast Targeting pane.*

The coordinates of the fixed fiducial are automatically entered in the Registration tab and a yellow icon appears in the grid image. If you need to remove the fixed fiducial position, click the *Clear* button beside the fiducial information or right-click the fiducial marker in the viewport and select *Delete*. You can also move the fiducial marker as described in Moving a Marker on page 120.
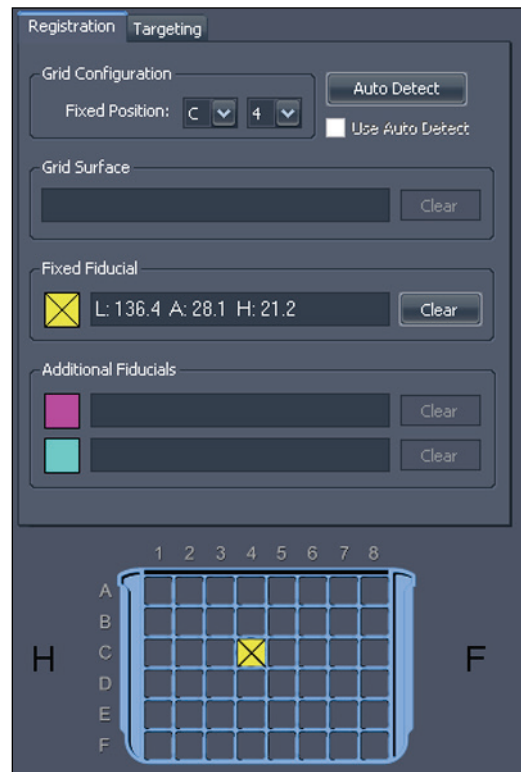
Figure 146:   Fixed Fiducial Information in the Registration Tab

You can now specify the grid surface as described in Setting the Grid Surface on page 201, or specify additional fiducials as described below.

Specifying Additional Fiducials

You may specify up to two fiducials in addition to the fixed fiducial. Proper placement of fiducials is important. For maximum accuracy, distribute the fiducial plugs so that they surround the expected target location and are about two to four window grid holes away from the entry hole. It is also best to avoid having multiple fiducials share the same grid row or grid column (other than the fixed fiducial location).

Risk of Incorrect Diagnosis

⚠ **CAUTION**

Only the fixed fiducial is required for registration. However, additional fiducials improve the accuracy of grid registration. If you set the grid surface after specifying only the fixed fiducial, and then later add additional fiducials, you will see the grid shift slightly as it adjusts for accuracy. Always review the position of fiducials and the grid annotation to confirm they are placed correctly.

To specify additional fiducials, follow the same procedure for specifying the fixed fiducial. The new fiducials will be given the identifiers "A" and "B".
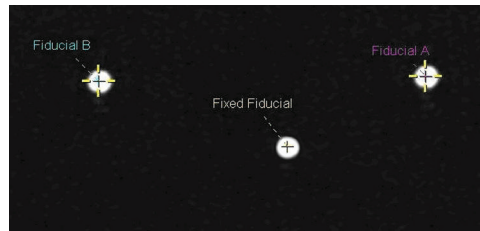
Figure 147: Two Additional Fiducials Identified

The additional fiducial coordinates are displayed in the Registration tab.
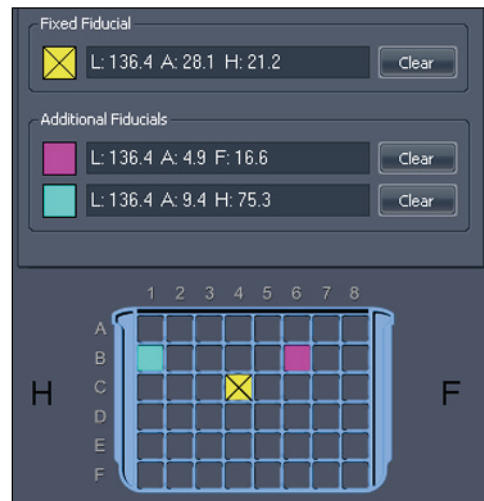
Figure 148: Additional Fiducial Information in the Registration Tab

Setting the Grid Surface

When you have marked the fixed fiducial, you can set the grid surface.

To set the grid surface:

1. Stack through a sagittal view of the image series until the "waffled" breast tissue becomes visible.

2. Continue stacking into the breast until you reach a slice where the waffling pattern is beginning to disappear. This image represents where the surface of the grid meets the breast tissue.

3. Right-click the Spatial Locator and select *Set Grid Surface* from the context menu.

The grid surface is displayed on the image.
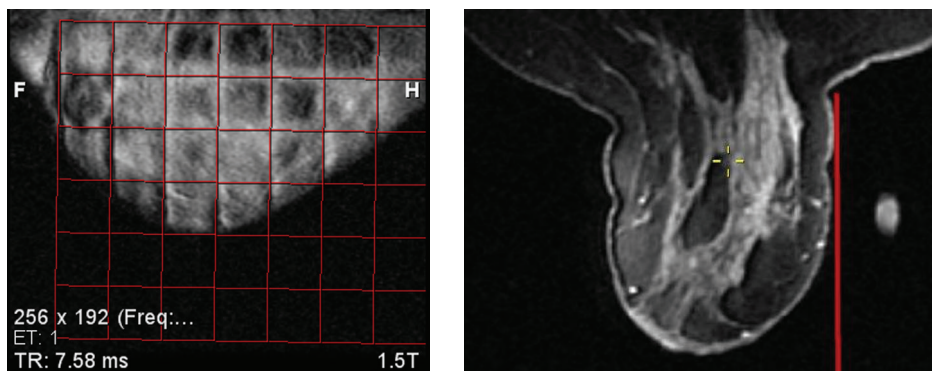
Figure 149:   Grid Surface Displayed in Sagittal and Axial Views

Risk of Patient Injury, Risk of Incorrect Diagnosis

Always verify that the grid registration in MultiView matches the actual grid position relative to the patient. The accuracy of MultiView targeting information depends on correct grid registration.

Using the Targeting Tab

Once a target/lesion has been marked, information relating to it is displayed on the Targeting tab in the Breast Targeting pane. The Targeting tab displays the suggested grid coordinates for the needle plug. Grid coordinates are specified by a letter followed by a number (e.g., C4) and plug coordinates are specified by a number followed by a letter (e.g., 3a).

#	Description
1	Information about the targeting appears here.
2	Select or change the lesion to target from this list.
3	Select the needle you are using from this list. MultiView supports all major vacuum assisted biopsy devices.
4	The clock icon indicates how the needle should be rotated to ensure the trough is correctly oriented to reach the target.
5	This field indicates where to place the needle plug in the grid. This information is also displayed as a green circle in the grid image.

6	This field indicates which hole in the needle plug to use. This information is also displayed as a green circle in the plug image.
7	This field indicates the needle depth required to reach the target point.
8	The placement information text provides an estimate of the positioning error relative to the selected target point. This error is due to the discreet nature of the grid and plug holes.
9	To print the targeting information, click *Print* and select a printer. MultiView supports printing to standard paper formats (e.g., letter, legal, etc.), as well as labels (e.g., 2.5" x 4"). Note that when printing to labels, the targeting information will typically be spread across two labels, and should be printed using a landscape orientation, not portrait.

Figure 150: Targeting Tab

Needle Annotation

When you mark a target/lesion on an image, a needle annotation appears representing the needle trajectory. The annotation is divided into 1 cm sections, alternating between light and dark colors, with a green section indicating the aperture.
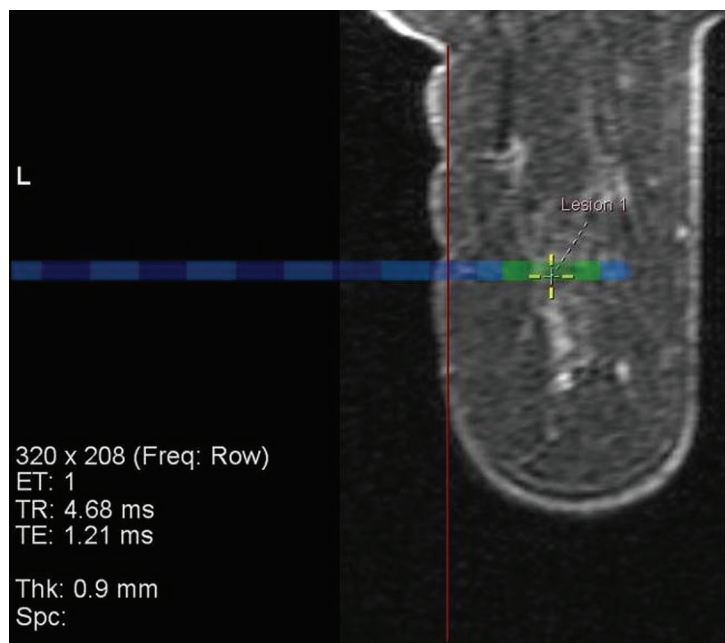
Figure 151: Lesion Marker with Needle Annotation

In interventional or sagittal views, the grid annotation displays a plug graphic indicating the type of plug to use, and the grid hole to place the plug in, to hit the target. When you stack through this image set, the target hole in the plug graphic changes from blue to green on image slices that cross the aperture of the needle.
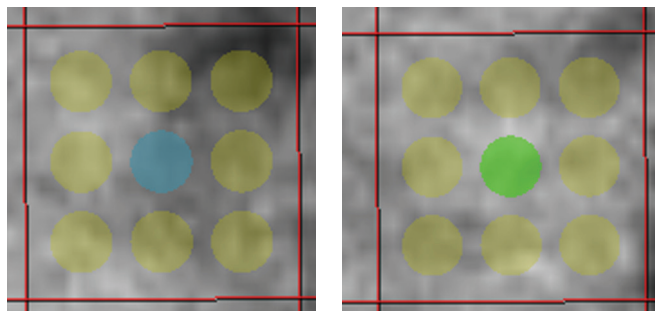
Figure 152:   Plug Graphics (Blue Annotations Indicate the Needle Annotation; Green Annotations Indicate an Intersection with the Image Slice Containing the Needle Aperture)

NOTE: The needle annotation and plug graphic also appear in MIP mode.

Interventional View

When a lesion has been successfully targeted, the interventional view mode becomes available. This view shows exactly how the grid and plug should look in relation to the patient. Click the "Pt" control in the overlay (circled in the figure below) to display the patient oriented interventional view.
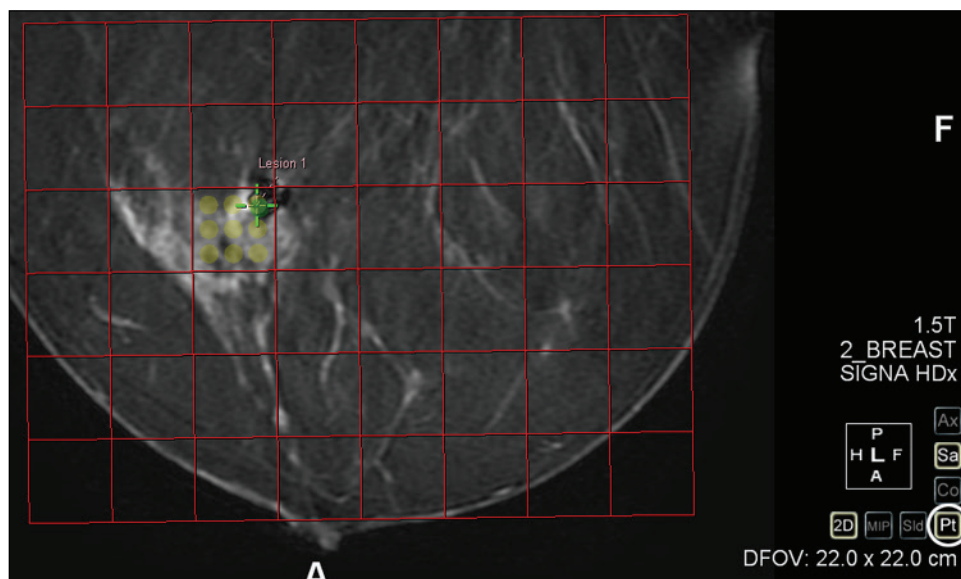
Figure 153:   Interventional View

Switching to Interventional View Automatically

You can configure MultiView to switch to interventional view automatically when you register the grid. Choose *Tools > Options > Breast Targeting*, then select the *Automatically switch to interventional view* option.

NOTE: You must register the grid surface in sagittal view for MultiView to automatically switch to interventional view.

Targeting for Angled Biopsies

The Verity Angled Biopsy device provides interventional access to targets that are inaccessible when using standard horizontal guidance methods. Select the *Angled Bx* option on the Targeting tab to display targeting information to use with the Verity.

In addition to the targeting information described in the previous section, the Targeting tab displays the angle to set using the Verity. You can manually adjust this angle if necessary.

NOTE: The status message will display a warning if you manually adjust the angle to a point where the target is no longer reachable, or if the needle will collide with the grid. A warning is also displayed if the needle is angled toward the chest wall.

You can also double click a row in the grid to select a different cell to insert the needle plug. The grid column cannot be changed. The Needle Placement information updates automatically to reflect the new needle plug location.
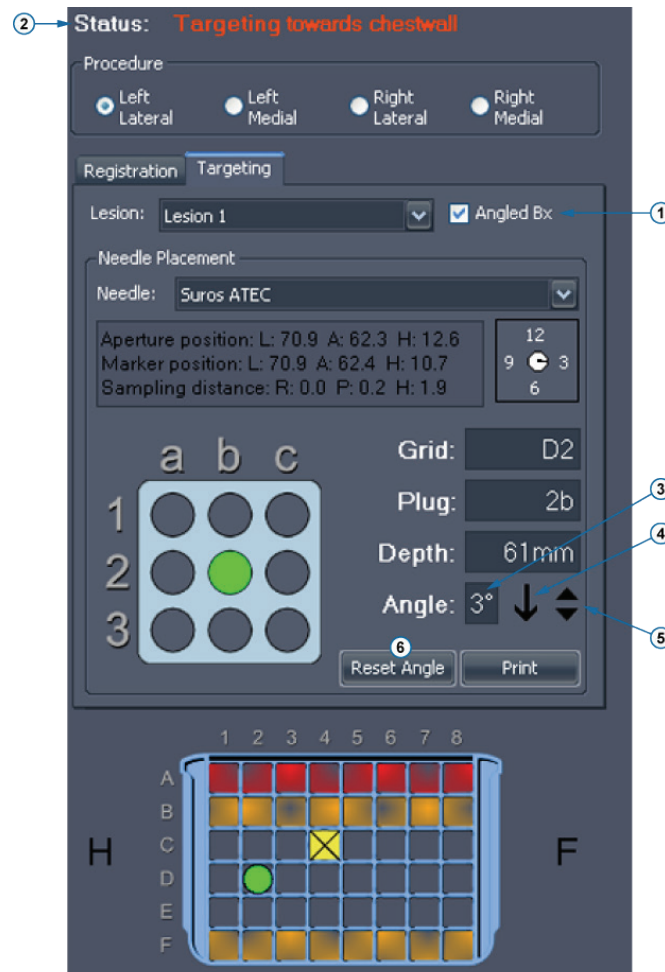
#	Description
1	Select this option to show angled targeting information.
2	Information about the targeting appears here.
3	This field displays the angle needed to reach the target.
4	The arrow indicates the angle direction: up is toward the nipple, down is toward the chest wall.
5	Click the triangles to manually adjust the angle by 1° increments, if necessary.
6	To discard any adjustment you made to the angle, click the *Reset Angle* button to revert back to the angle calculated by MultiView.

Figure 154:   Angled Biopsy Options on the Targeting Tab

Note: The interventional grid and needle guide, as depicted in the Breast Targeting Panel, is always displayed from the user's point of view. Both the grid and needle guide should appear as they would when approaching the patient.

Verifying the Angled Biopsy Plug Position

To verify that the plug will be positioned correctly before performing the biopsy:

1. Position the Verity in the grid as indicated in the Breast Targeting pane and insert the verification fiducial plug holder.

2. Perform an axial scan.

3. When the new series appears in MultiView, load it in the viewport.

4. Right-click in the viewport and select *Verify Angled Trajectory*.

A yellow line appears on the image indicating the trajectory of the needle based on the current plug position and a pop-up message "Angled Biopsy Configuration Verified" appears.
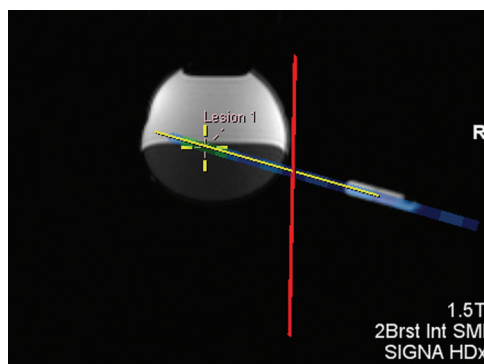
Figure 155:   Verifying the Trajectory for an Angled Biopsy

Understanding Targeting Information

Targeting information displays how to set up the equipment for accurate intervention. Depth is computed to correspond to the needle markings and the needle manufacturer's recommended settings. For vacuum biopsy needles inserted to the specified depth, the center of the needle's aperture will be at the target point (that is, where you have placed a target/lesion marker). For localization needles the tip of the needle will be at the target point.

The targeting error information indicates how close to the target the needle will be after insertion. Since there is a limited set of needle guidance holes, it is not always possible to reach a target exactly in the A/P and H/F directions. The targeting error information reports how far, and in what direction, the needle tip will be from the actual target after insertion. Note that this is based on the theoretical calculated tip position versus the target position. The targeting error does not take into account needle or target deflection, improper use of the biopsy needles, or any other factors that could affect accuracy.

⚠️ **CAUTION**

Risk of Incorrect Diagnosis

Depth is calibrated to the depth marks on the selected needle. For biopsy needles, this depth will place the center of the needle trough at the target. For localization needles this will be the tip of the needle.

Overlay Options in the Breast Targeting Pane

The Overlay Graphics section of the Breast Targeting pane lists the registration and targeting graphics that appear in the viewport overlay. Select or clear an option to show or hide that graphic in the viewport overlay.
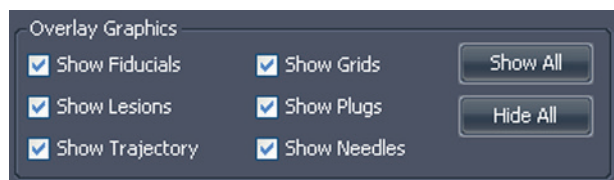
Figure 156:   Viewport Overlay Graphic Options for Targeting

NOTE: The Show Trajectory option only appears when the Angled Biopsy option is selected on the Targeting tab.

Manual Targeting

Manual Targeting does not require images to be transferred to MultiView from a remote DICOM source. Manual Targeting must be used in conjunction with another MR image viewer such as the MR console. Fiducial and lesion coordinates are entered manually, rather than using the visual approach used with Breast Targeting. In general, Manual Targeting is a backup mode in case network connectivity is lost or not working.

Also, if MultiView is installed on a workstation that does not meet the minimum requirements or there is some other conflict, then only Manual Targeting will be available (no image analysis tools will be available).

To access Manual Targeting, choose *Tools > Breast > Manual Targeting*.

Figure 157:   Manual Targeting Dialog

Patient Information
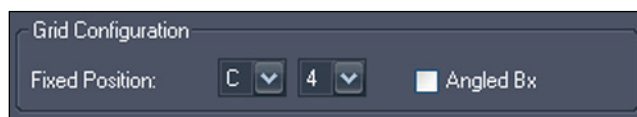
In the Patient Information area, enter the patient's name and patient ID. Select the breast and approach for this biopsy procedure from the Grid drop-down list.

Figure 158:   Patient Information

Grid Configuration

Indicate the position of the fixed fiducial in the biopsy grid. To see targeting information for angled biopsies, select the *Angled Bx* option.
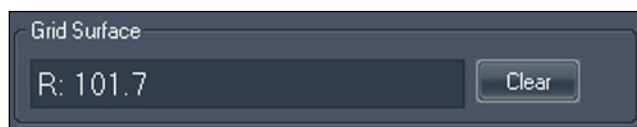
Figure 159:   **Grid Configuration Information**

Grid Surface

Enter the Left/Right coordinate that best represents the location where the grid meets the skin.
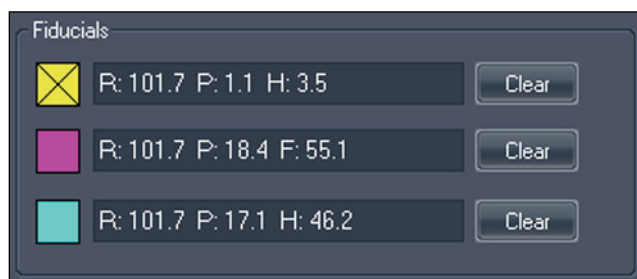
Figure 160:   **Grid Surface Information**

Fiducial Locations

On the MRI console, locate the fixed fiducial marker and center the MR cursor on it. Enter the coordinates of the fixed fiducial from the MR screen in the text box beside the yellow icon ⊠.

Figure 161:   **Fiducial Information**

Risk of Incorrect Diagnosis

If there are fiducials placed for both lateral and medial approaches, ensure that the fiducial coordinates for the proper approach side (that is, from the lateral plate if lateral approach was selected or from the medial plate for medial approaches) are used in the entry.

Find the remaining fiducial markers in the MR images (if any) and enter their coordinates in the spaces provided. You may add up to two additional fiducials. To remove or change the coordinates for a fiducial, click the *Clear* button.

A Note on Entering Coordinates

Coordinates are entered as three numbers representing the DICOM coordinate of a point. However, MultiView offers considerable flexibility in entering these coordinates. For example, the coordinate: Right 92.2, Anterior 36.4, Feet 18.0 may be entered in any of the following ways:

- R92.2   A36.4   F18

- R:92.2   A:36.4   F:18

- L:-92.2   A:36.4   H:-18

- A:36.4   R:92.2   F:18.0

- L-92.2   A:36.4   H:-18.0

Once entered, MultiView displays the value in a standard format, which, for the example above would be R:92.2   A:36.4   F:18.0.

Lesion Location

Locate the biopsy target on the MR console and enter its coordinates in the Lesion field. Click the *Set* button to establish this location and generate the appropriate needle position information.
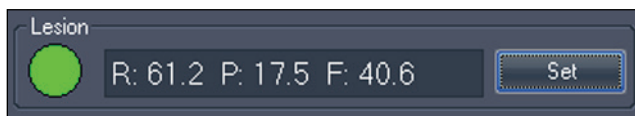
Figure 162:   **Biopsy Target Information**

Needle Selection

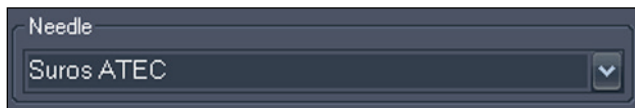Select the needle you will use to perform the biopsy from the list.

Figure 163:   **Needle Selection**

Needle Position Information

When a target has been set, the Status section of the Manual Targeting window displays the following information:

- Aperture position

- Target position

- Aperture to target position

Status: Successful targeting
Aperture position: R: 61.2 P: 19.5 F: 40.9
Marker position: R: 61.2 P: 17.5 F: 40.6
Sampling distance: R: 0.0 P: 2.0 F: 0.3

Figure 164: **Status Information When a Target is Set**

A picture of the needle plug is displayed in the Plug Position section. A green circle indicates where to place the needle.

A green circle is also displayed in the Grid Position illustration. This circle indicates where to place the plug in the biopsy grid.

The Needle Placement section summarizes the grid and needle plug position information and indicates how deep the needle should be inserted to reach the target.

⚠️ **CAUTION**

Risk of Incorrect Diagnosis

Needle depth is calibrated to the depth marks on the selected needle. For biopsy needles, this depth will place the center of the needle aperture at the target. For localization needles, this will be the tip of the needle. Depending on the needle, this is not necessarily a direct measurement of depth from grid/skin surface.

Figure 165: **Grid, Plug and Needle Placement Information**

If you selected the *Angled Bx* option when you specified the grid configuration, the targeting information to use with the Verity device is also displayed. You cannot manually adjust the angle information, but if you need to use a different approach, you can double click in the grid to select a different row (you cannot change the grid column). The needle placement information is updated to reflect the new grid row.

In the Needle Placement section, the Angle field indicates the angle necessary to reach the target using the Verity device. The arrow beside the Angle field indicates the angle direction: up is toward the nipple, down is toward the chest wall.
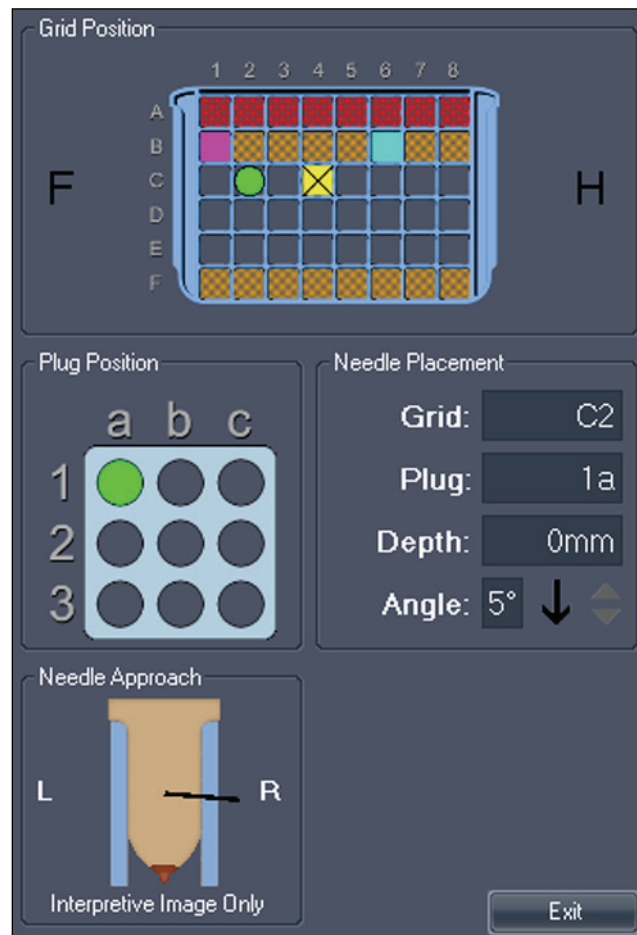
Figure 166:   Needle Placement Information for Angled Biopsies

Appendix A Shortcut Keys to Common Functions

Tools

	Layout	L
	Cine	**C**
	Speed up playback	UP Arrow
	Slow down playback	DOWN Arrow
	Move forward	RIGHT Arrow
	Move backward	LEFT Arrow
	Stop	0 or INSERT
	Stack	S
	Window/Level	W
	Pan	P (or CTRL + LEFT CLICK) (or CTRL + ARROW KEYS)
	Zoom	Z (or CTRL + MOUSEWHEEL)
	Radial Stacking	D (or ALT + MIDDLE CLICK)
	Rotate	R
	Flip Vertical	V
	Flip Horizontal	H
	Reset	BACKSPACE

	Show/Hide Text Overlay	O (or SHIFT + O)
	Text Callout	A (or ALT + MIDDLE CLICK)
	Spatial Locator	N
	Ruler	M (or ALT + LEFT CLICK)
	Elliptical ROI	SHIFT + M (or ALT + RIGHT CLICK)
	Rectangular ROI	CRTL + M
	Probe	B
	Graph	G
	Mass Lesion Analysis	SHIFT + S

Window/Level

Auto	F2
Custom	F3 - F12
Fast Window/Level	SHIFT + Window/Level
Window & Level Controls	Arrow Keys

Other Functions

Stack Images Forward	PAGE DOWN
Stack Images Backward	PAGE UP
Go to First Image	HOME
Go to Last Image	END
Stack Forward in Time	CTRL + PAGE DOWN
Stack Backward in Time	CTRL + PAGE UP
Fast Stack	SHIFT + STACK
Fast Stack Up/Down	SHIFT + MOUSEWHEEL
Go to First Volume	CTRL + HOME
Go to Last Volume	CTRL + END
Rotate Volume	CTRL + RIGHT CLICK
Capture Active Viewport as a Key Image	SPACE BAR
Capture All Viewports as Key Images	SHIFT + SPACE BAR
Options	CTRL + O

Appendix B Troubleshooting

The table below lists troubleshooting tips for problems that may occur when using MultiView. If you cannot resolve a problem using the suggestions listed here, contact Hologic Support (for contact information see Contacting Hologic on page 20).

Hanging Protocols

Problem	Possible Cause	Resolution
Hanging protocols were stored but are not available	Study description naming convention has changed (hanging protocol availability is based on study and series descriptions)	On the Protocols tab in the Layout pane select the *Show All Protocols* option
	(Toshiba scanners) No study comment entered when the patient was registered	Something must be entered in the Study Comment field when registered a patient on Toshiba scanners; this text appears as the study description in MultiView
Empty viewports when hanging protocol is applied (that is, an expected series is missing)	Series was not named following the expected naming convention	Name the series following the expected naming convention
	Series was never scanned	Run the scan for the series
	Series was not sent to MultiView	Verify the connection between the scanner or PACS and MultiView
	Expected series is a motion corrected series and motion correction was not completed	Run the Motion Correction tool to create a motion corrected study

Problem	Possible Cause	Resolution
MultiView is not applying a hanging protocol	Workspace saving is being applied	Choose *Tools > Options > Workspace Saving* and deselect the *Automatically load and save workspaces option*, or select the *Ask before loading workspace on open study* option

Lesion Analysis

Problem	Possible Cause	Resolution
Unable to analyze lesion	Image is in MIP, Thin MIP, or Solid mode	Switch to 2D mode
	DCE colorization has not been applied	Apply DCE colorization to the series containing the lesion you want to analyze
	Lesion highlighting has removed color from the lesion you want to analyze	Switch off lesion highlighting to restore color to the lesion
	Right-clicking on the ROI annotation	Right-click on the image inside the ROI (the context menu options are different when you right-click on the ROI annotation)

Breast Reports

Problem	Possible Cause	Resolution
After generating reports, and clicking Finish, Adobe gives an error stating: "Illegal operation 'q' inside a text object." Clicking OK leads to another dialog box stating: "Illegal operation 'ET' outside text object."	Version of Adobe Acrobat running on the workstation is not supported	Upgrade Adobe Acrobat
Breast report not arriving in PACS	PACS not selected as a default server	Choose *Tools > Options > Default Servers* and select the PACS
	Default server configured incorrectly	Check with the IT department for correct IP address, AE Title, and Port

Problem	Possible Cause	Resolution
	No value is present in the Institution Name field of the breast report	The PACS vendor maybe using the site name in the sorting process. Navigate to *Tools > Options > Login* and edit each user account to ensure something is configured in the site name
	MultiView is not configured correctly in PACS	The PACS server may not be set to "promiscuous receive." The facility may need to enter MultiView info into PACS, or grant permissions for MultiView to transmit to PACS.
	MultiView is not configured to automatically send reports when they are finished	Choose *Tools > Options > Reporting* and select the *Send Reports to Default Servers on Finish* option
Key images are not appearing in the breast report	MultiView is not configured to capture key images as report images	Choose *Tools > Options > Reporting* and select the *Capture report images as key images, and key images as report images* option
Breast Reporting pane has disappeared	Pane may be undocked and hidden behind viewports	Click on the *Explorer* tab then return to the study

Auto Image Capture

Problem	Possible Cause	Resolution
Image Capture was configured, but the images are not automatically captured	Configuration is incomplete	Choose *Tools > Options > Reporting > Report* and ensure the *Capture Default Images* option is selected
	3D lesion analysis not performed	Images are only captured on 3D analysis

Key Images

Problem	Possible Cause	Resolution
Key images are not arriving in PACS	MultiView is not configured correctly in PACS	PACS may need to be configured with the MultiView IP address, AE Title, and Port

Problem	Possible Cause	Resolution
	PACS does not support key objects	Choose *Tools > Options > Reporting > Report* and select the *Send key images as secondary capture images rather than key objects (KO)* option
	Key images are being captured using the camera icon (which adds images to a report)	Choose *Tools > Options > Reporting > Report* and select the *Capture key images as report images, and report images as key images* option

Derived Series

Problem	Possible Cause	Resolution
Derived series has been configured, but the series are not transmitting to PACS	Configuration is not complete	Choose *Tools > Derived Series Configuration* and ensure the *Send derived series to default servers* option is selected
Derived series has been configured, but the series is not being generated	Study description has changed (derived series are linked to study description; changes to the naming convention will cause a failure to generate images)	Do not change the study description
	MultiView is not running	MultiView must be running to generate images (though no user needs to be logged in). When MultiView is not running, the derived series are stored in a queue and will be generated the next time MultiView is launched
	Diskspace Manager is running	Wait for Diskspace Manager to complete deleting studies
	A study is being processed for motion correction	Wait for motion correction processing to finish

Priors

Problem	Possible Cause	Resolution
Priors do not appear on the Study List tab in the Layout pane	Prior detection is not enabled	Choose *Tools > Options > Priors* and select the *Enable automatic prior detection* option

Problem	Possible Cause	Resolution
	The correct PACS is not configured as a default prior query server in MultiView	Choose *Tools > Options > Default Servers* and select the appropriate prior query server
	Appropriate keywords are not configured	Choose *Tools > Options > Priors* and verify that the prior keywords are specified correctly
	Remote DICOM device specified as the default prior query server does not return Study Description and Modality fields when queried	Prior detection is not possible with this remote DICOM device
Local priors are detected but not priors stored on a PACS	MultiView is not configured to query remote servers for priors	Choose *Tools > Options > Priors* and deselect the *Disable remote prior detection using default servers* option

Subtractions

Problem	Possible Cause	Resolution
Failure to subtract or different frame of reference errors	Changes to scanning protocols involving spatial resolution (for example, changes to matrix, slick thickness, FOV, partial phase FOV, slice interpolation between the pre contrast and post contrast images)	With a pre contrast image in the viewport, navigate to *Tools > Utilities > Dicom Editor*. Note the protocol parameters. With a post contrast image in the viewport, open the Dicom Editor and compare protocol changes.
	Slice locations have shifted	▪ Do not move the slice volume ▪ Copy parameters ▪ Send the correct scans to MultiView
Negative pixels	Not a MultiView issue; possibly caused by scanning inconsistencies such as the signal intensity of the pre contrast scan being higher than the post contrast scan	Determine the scanning inconsistency. For example, ensure a prescan was performed between the pre and post contrast images

Problem	Possible Cause	Resolution
	Irregular Fat Sat	▪ Ensure the protocol is optimized and shim volumes are being used following the magnet vendor's recommendations ▪ Review proper prescan procedures for fat suppression following the magnet vendor's recommendations ▪ Adjust shim volume size and/or position
	Scanner malfunction	Contact the scanner vendor for troubleshooting and service
Poor image quality	Two pre contrast images sent to MultiView (MultiView assumes the first dynamic phase is the pre contrast and the second phase is the first post contrast phase)	Send only one pre contrast scan to MultiView
	Did the protocol change (for example, bandwidth, ETL, Lines per Shot, TE, TR, intensity correction filters, acceleration factors)	With a pre contrast image in the viewport, go to *Tools > Utilities > Dicom Editor*. Note the protocol parameters. With a post contrast image in the viewport, open the Dicom Editor again and compare protocol changes.

Graph Tool

Problem	Possible Cause	Resolution
No curve appears in the Graph pane	No source of graph data is selected	▪ Select a source of graph data from the Source drop-down list, or click on the image with the Probe tool ▪ Select a curve option in the Graph pane if none is selected

Glossary

2D

Two-dimensional

3D

Three-dimensional

A

Anterior

Acc

Accession

Acq

Acquisition

ADC

Apparent Diffusion Coefficient

Anterior

Closer to the front of the patient's body than to the back.

Ax

Axial

Axial

2D slices through the patient's body at a fixed superior/inferior position, i.e. slices aligned with the right/left axis and the anterior/posterior axis.

Cor

Coronal

Coronal

2D slices through the patient's body at a fixed anterior/posterior position, i.e. slices aligned with the right/left axis and the superior/inferior axis.

DFOV

Displayed Field of View

DWI

Diffusion Weighted Imaging

Ex

Exam

Fiducial

A target visible in the MR image that is used for registration of the image.

I

Inferior

Im

Image

Inferior

Closer to the patient's feet than head.

L

Left

Lateral Approach

From the side of the patient's body towards the middle.

Medial Approach

From the middle of the patient's body towards the side.

MIP

Maximum Intensity Projection.

MR

Magnetic Resonance

MRI

Magnetic Resonance Imaging

P

Posterior

Posterior

Closer to the back of the patient's body than the front.

R

Right

Registration

The process of defining the location and orientation of the MRI image plane to the location and orientation of the patient bed frame and biopsy grid.

ROI

Region of Interest

S

Superior

Sag

Sagittal

Sagittal

2D slices through the patient's body at a fixed right/left position, i.e. slices aligned with the anterior/posterior axis and the superior/inferior axis.

Se

Series

SNR

Signal-to-Noise Ratio

Superior

Closer to the patient's head than feet.

Uptake

Continued voxel-intensity increase.

US

Ultrasound

Voxel

Short for "volume pixel"; the three-dimensional equivalent of a pixel.

Washin

Continued voxel-intensity increase.

Washout

Continued voxel-intensity decrease.

Index

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