

# **ACUSON Cypress™ System**

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## ***Operator's Manual***

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## WARNINGS



### ELECTRICAL SHOCK HAZARD

*Grounding reliability can only be achieved when equipment is connected to an equivalent receptacle marked "HOSPITAL GRADE." Do not remove system covers. There are no operator servicable parts inside. Refer servicing to qualified personnel.*



### DANGER

*Possible explosion hazard if used in the presence of flammable anesthetics.*



### WARNING

*Risk of fire. Replace fuse as marked.*

### WARNING

*The Cypress System is not intended for use as an ECG monitor or for diagnostic ECG.*



### CAUTION

*Total system chassis leakage current should not exceed 100 $\mu$ A.*



### ATTENTION

*Before using the system, carefully read the "Safety, Technical Description, and Accuracy" section.*

### IMPORTANT

*Read this manual carefully before you begin using the system.*

# *Contents*

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## **CHAPTER 1**

### *System Overview*

- Overview of the Cypress System **1-2**
- Turning the Cypress System On and Off **1-3**
  - Turning the Cypress System ON* **1-3**
  - Turning the Cypress System OFF* **1-4**
- Connecting and Using Transducers **1-5**
- Magneto Optical (MO) Disk Drive **1-6**
- External Devices and Connections **1-7**
- Transporting the System **1-8**
- Proper Viewing Angle **1-9**
- System Security **1-10**
- Location of Fan and Vents **1-11**

## **CHAPTER 2**

### *Keyboard & General Controls*

- Keyboard Overview **2-2**
- Keyboard Controls **2-3**
  - Mode Keys* **2-3**
  - Trackball and <ENTER> Key* **2-5**
  - Main Knob* **2-5**

- Time/Gain Compensation (TGC)* 2-5
- Main Knob Functions* 2-6
- How to Set the Playback Speed using the Play Function* 2-6
- Soft Window Knobs* 2-7
- Function Keys* 2-10
- Alphanumeric Keys* 2-12
- Special Marks* 2-13

## CHAPTER 3

### *Basic Setup*

- The Setup Menu 3-2
  - Navigating the Setup Menu* 3-3
  - How to Specify a Setup Option* 3-3
  - Explanation of Setup Menu Fields* 3-4
- The Presets Menu 3-10
  - Storing a User-Defined Preset* 3-11
  - Recalling a Saved Preset* 3-11
  - Recalling a Saved Preset on the New Patient Screen* 3-12
  - Renaming a User-Defined Preset* 3-12
  - Removing a User-Defined Preset* 3-12
  - Making Changes to the Current User-Defined Preset* 3-13
  - Reload Preset with New Patient* 3-13
- The System Menu 3-14
  - How to Specify a System Option* 3-14
  - Explanation of System Menu Fields* 3-14
- The Calculations Menu 3-16
- The DICOM Menu 3-18
- The Network Identification Menu 3-20

## CHAPTER 4

### *Patients*

- The Patient Menu 4-2
  - Icons used in the Patient Directory* 4-4
  - Explanation of Patient Menu Buttons* 4-6
  - Study Formats* 4-8
  - Expanding Patient Folders* 4-8
- Adding and Editing Patients and Studies 4-9
  - Adding a New Patient* 4-9
  - Registering a New Patient Using the Worklist* 4-12
  - Caching of Modality Worklist Results* 4-14

Starting a New Study	4-15
Editing Patient and Study Information	4-16
Completing a Study with No Patient Name	4-18
Using Existing Studies	4-18
Adding Data to an Existing Study	4-18
Viewing Existing Patient Studies	4-19
How to Change the Display Format	4-19
Removing a Study or Patient from the System	4-20
Batch Removal	4-21
Patient Reports	4-22
Adding a Text Comment to a Patient Report	4-23
Adding an Audio Comment to a Patient Report	4-23

## CHAPTER 5

### *Scanning*

Overview of the Scanning Process	5-2
General Information	5-2
Basic Steps to Complete a Scanning Session	5-2
Using Soft Windows	5-3
Using Tools	5-4
Saving Image Data	5-5
Viewing Saved Loops	5-6
Flagging Images	5-7
When to Use the Flag Function	5-8
Cypress System Data	5-9
Trigger Modes	5-13
Keeping Track of Saved Loops	5-14
Adding Text to an Image	5-15
Text	5-15
Hiding the Factory-Defined List	5-17
Quick Text	5-18
Adding an Arrow when Quick Text is Enabled	5-19
Adding an Arrow when Quick Text is Not Enabled	5-19
Removing an Arrow	5-19
Zoom	5-20
2D Scanning	5-21
Activate the 2D Display	5-22
Time/Gain Compensation (TGC) Controls	5-22
Main Knob Controls Compress and Gain	5-22
2D Soft Windows	5-23
2D Tools	5-27

- Color Flow Scanning **5-30**
  - Activate the Color Flow Display* **5-31**
  - Main Knob Controls 2D and Color Gain* **5-31**
  - Color Flow Soft Windows* **5-32**
  - Color Flow Tools* **5-35**
- Continuous Wave Doppler (CW) Scanning **5-38**
  - Activate the CW Display* **5-39**
  - Main Knob Controls Volume and CW Gain* **5-39**
  - CW Soft Windows* **5-40**
  - CW Tools* **5-41**
- Pulsed Wave Doppler (PW) Scanning **5-43**
  - Activate the PW Display* **5-44**
  - Main Knob Controls PW Gain and Volume* **5-44**
  - PW Soft Windows* **5-45**
  - PW Tools* **5-48**
- M-Mode Scanning **5-50**
  - Activate the M-Mode Display* **5-51**
  - Main Knob Controls Gain and Compress* **5-51**
  - M-Mode Soft Windows* **5-52**
  - M-Mode Tools* **5-53**

## CHAPTER 6

### *Cardiac Calculations*

- Overview of Cardiac Measurements **6-2**
  - Types of General Cardiac Measurements* **6-2**
  - Types of Specific Cardiac Calculations* **6-3**
- Cardiac Calculations Setup **6-4**
  - Setting Parameters* **6-4**
  - About Construction Methods* **6-4**
  - How to Add or Change an Estimated Value Using Setup* **6-4**
  - How to Edit the Estimated Value While Performing a Calculation* **6-5**
  - Selecting a Report Format* **6-5**
  - Selecting a Report Background Color* **6-5**
  - Using the Averaging Function* **6-5**
- Using the Cardiac Calculations Package **6-7**
  - Performing General Measurements* **6-7**
  - Performing Specific Cardiac Calculations* **6-9**
  - Saving Calculations to the Patient Report* **6-10**
  - Entering A Heart Rate* **6-11**
  - Saving Frames Containing Measurement Graphics* **6-12**
  - Deleting a General Measurement* **6-12**



Deleting a Specific Measurement	6-12
Making Corrections to the Trace and Area Measurements	6-13
Stopping a Measurement Before Completion	6-13
Setting the Trace Resolution	6-13
Viewing the Patient Report	6-13
Changing the Position of a CALC Menu	6-14
Setting a Default Position for the CALC Menu	6-14
Cardiac Formulas and References	6-15
2D Formulas	6-15
M-Mode Formulas	6-18
Doppler Formulas	6-20
Cardiac Calculation References	6-24

## CHAPTER 7

### *Vascular Calculations*

Overview of Vascular Measurements	7-2
Types of General Vascular Measurements	7-2
Types of Specific Vascular Calculations	7-3
Vascular Calculations Setup	7-4
Setting Parameters	7-4
About Construction Methods	7-4
Selecting a Report Format	7-5
Selecting a Report Background	7-5
About Default Sites for Vascular	7-5
Adding Default Sites for Vascular	7-5
Editing Default Vascular Sites	7-6
Removing Default Vascular Sites	7-6
Restoring Factory Defaults to Vascular Sites	7-6
Changing the Position and Order of the Vascular Sites	7-6
Using the Vascular Calculations Package	7-7
Performing General Vascular Measurements	7-7
Performing Specific Vascular Calculations	7-9
Saving Calculations to the Patient Report	7-10
Saving Frames Containing Measurement Graphics	7-10
Deleting a General Measurement	7-11
Deleting a Specific Measurement	7-11
Making Corrections to the Trace and Area Measurements	7-11
Stopping a Measurement Before Completion	7-12
Viewing the Patient Report	7-12
Changing the Position of a CALC Menu	7-12
Setting a Default Position for the CALC Menu	7-13
Vascular Formulas and References	7-14

*2D Formulas* 7-14  
*Doppler Formulas* 7-15  
*Vascular Calculation References* 7-16

## CHAPTER 8

### *Stress Echo*

Connecting and Using ECG 8-2  
    *Stress Echo ECG Cables and Connectors* 8-3  
    *ECG Signal Quality During Stress Echo Exam* 8-6  
    *Reducing ECG Artifacts* 8-6  
About the Stress Protocols 8-7  
Important Stress Controls 8-9  
    *Using the Protocol Soft Window Knob* 8-10  
    *Deleting Unlabeled Loops from a Study* 8-11  
    *Transferring Studies in a DICOM Format* 8-11  
    *Stress Echo TOOLS* 8-12  
Conducting a Stress Echo Protocol Exam 8-13  
    *Step-By-Step Stress Echo Exam* 8-13  
    *Quad-Screen Soft Windows* 8-19  
    *Viewing Additional Loops in a Quad* 8-19  
    *Removing a Label* 8-20  
    *Changing the ROI Position* 8-20  
    *Deleting Loops* 8-20  
    *Changing a View or Stage Label* 8-20  
Labeling Views 8-21  
    *Saving and Labeling Loops* 8-21  
    *Suspending the Protocol Labeling Function* 8-21  
    *Save the Loop and then Assign a Label* 8-22  
    *Viewing the Quad-Screen Display* 8-23  
    *Trimming Frames from a Loop* 8-25  
    *Save and Label Loops from Freeze Mode* 8-25  
    *Save and Label the Loop Simultaneously* 8-26

## CHAPTER 9

### *Transferring Studies*

Exporting Images from the Cypress System 9-2  
    *Overview* 9-2  
    *DICOM Format to MO Disk* 9-2  
    *Native Cypress System Format to MO Disk* 9-3  
    *Setting an IP Address* 9-3  
    *DICOM Format to a DICOM Server via a Network* 9-4

<i>Multimedia Format</i>	<b>9-5</b>
<i>Multimedia Format to a Computer Via a Network</i>	<b>9-5</b>
<i>Explanation of DICOM Menu Fields</i>	<b>9-6</b>
<i>Changing Server Information</i>	<b>9-8</b>
<i>DICOM Setup for Network Transfers</i>	<b>9-8</b>
<i>DICOM Storage Commitment</i>	<b>9-10</b>
<i>Setting the Network Speed</i>	<b>9-10</b>
<i>DICOM Setup For Modality Worklist</i>	<b>9-11</b>
<i>DICOM Setup For Storage Commitment</i>	<b>9-12</b>
Connecting the Cypress System to a Network	<b>9-13</b>
Transferring Studies	<b>9-14</b>
<i>Selecting Studies</i>	<b>9-14</b>
<i>Sending the Studies</i>	<b>9-17</b>
<i>Removing Patient Name and ID from Multimedia and DICOM Images</i>	<b>9-20</b>
<i>Troubleshooting a Network DICOM Transfer</i>	<b>9-21</b>
Transferring Studies Using the MO Drive	<b>9-22</b>
<i>MO Disk Drive Parts</i>	<b>9-22</b>
<i>Formatting Disks</i>	<b>9-23</b>
<i>Reading Native Cypress System Format Studies from the MO Disk</i>	<b>9-24</b>
<i>Copying Studies from an MO Disk to the Cypress System (Batch Restore)</i>	<b>9-25</b>
<i>Troubleshooting an MO Disk Transfer</i>	<b>9-26</b>

## CHAPTER 10

### *Safety, Technical Description, and Accuracy*

Important Warnings and Notices	<b>10-2</b>
<i>Electrical Shock Hazard</i>	<b>10-2</b>
<i>Explosion Hazard</i>	<b>10-2</b>
<i>Safety Information and Other Warnings</i>	<b>10-2</b>
<i>Display Monitor Radiation</i>	<b>10-2</b>
<i>Prescription Device Statement</i>	<b>10-2</b>
Intended Use	<b>10-3</b>
<i>Safety Overview of Intended Use</i>	<b>10-3</b>
<i>Intended Use of the Cypress System Ultrasound Imaging System</i>	<b>10-3</b>
<i>Cardiac Studies</i>	<b>10-4</b>
<i>Intraoperative Cardiac Studies</i>	<b>10-4</b>
<i>Pediatric Studies</i>	<b>10-5</b>
<i>Neonatal Cephalic Studies</i>	<b>10-5</b>
<i>Peripheral Vascular Studies</i>	<b>10-6</b>
<i>Fetal Studies</i>	<b>10-7</b>
<i>Abdominal Studies</i>	<b>10-8</b>
<i>ACUSON AcuNav Diagnostic Ultrasound Catheter</i>	<b>10-8</b>

- Patient Safety **10-9**
  - Exposure to Ultrasound Energy — Acoustic Output* **10-9**
  - Reducing Acoustic Exposure on the Cypress System — Implementing ALARA* **10-10**
  - Electrical Warnings* **10-11**
  - Infection Control* **10-11**
  - Sterilization* **10-12**
  - Infection Control Reference* **10-13**
  - Patient Contact Materials* **10-13**
  - U.S. Food and Drug Administration Medical Alert* **10-14**
  - Peripheral Device Connections* **10-15**
  - Ultrasound Contrast Agents* **10-16**
- Operator Safety Issues **10-17**
  - Electrical Safety* **10-17**
  - Explosion Hazards* **10-17**
  - Carpal Tunnel Syndrome* **10-17**
  - Glutaraldehyde Exposure* **10-18**
  - Infection Control* **10-18**
  - Transporting and Placing the System* **10-19**
- Technical Description and Accuracy **10-20**
  - Specifications* **10-20**
  - Electromagnetic Interference* **10-22**
  - Labeling Icons* **10-23**
- Measurement Accuracies **10-25**
  - Accuracy by Transducer Type* **10-25**
  - Potential Sources of Error During Scanning* **10-28**
  - Measurement Accuracy References* **10-30**

## CHAPTER 11

### *Maintenance, Care, and Service*

- Cleaning the System **11-2**
  - Cleaning the MO Disk Drive* **11-3**
- Maintenance **11-4**
  - Preventive Maintenance* **11-4**
  - Transducer Maintenance* **11-4**
  - MO Disk Drive Maintenance* **11-5**
  - Hard Drive Maintenance* **11-5**
  - Frequency of Maintenance* **11-6**
- Electrostatic Discharge Protection **11-6**
- Troubleshooting **11-7**
  - No Power* **11-7**

*LCD Screen* 11-7  
*Fuse Replacement* 11-8  
 Trackball Maintenance 11-9  
   *Cleaning the Cypress Trackball* 11-9

**APPENDIX A**

*Connecting External Devices*

Connecting a Video Printer **A-3**  
 Connecting a SVHS VCR **A-5**  
   *Connecting a VCR and Video Printer* **A-7**  
 Connecting an External Monitor **A-9**  
 Connecting an External Keyboard **A-10**

**APPENDIX B**

*Printing Reports*



Connecting an Ink-Jet Printer **B-2**  
 Printing Patient Reports **B-3**  
   *Printing the Active Study* **B-5**  
   *Printing Reports from Calculations* **B-6**

*Index*

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## Styles Used in this Manual

The following conventions are used in this manual:

<b>MODE KEYS</b>	Mode keys are in bold, capital letters.
<b>FUNCTION KEYS</b>	Function keys are in bold, capital letters.
SOFT WINDOW KNOBS	The names of the Soft Window knobs are in capital letters.
<i>Options</i>	Options on menus and screens are in bold italics.
<i>Tabs</i>	Tab names are in bold italics
[BUTTON]	Buttons that appear on the screen are in capital letter and enclosed in [ ] (square) brackets.
<KEY>	Keys are in capital letters and enclosed in < > (angle) brackets.
system output	System output (e.g., messages) are in courier font.
Click	In this manual, “click” means: <ul style="list-style-type: none"><li>■ Move the cursor to the desired location using the Trackball, </li><li>■ and then press the &lt;ENTER&gt; key located above the Trackball. </li></ul>
Double-click	Double-click means to quickly press the <ENTER> key twice. The rate is set on the Setup menu. For more information see Table 4, “Setup Menu Fields”.

# *System Overview*

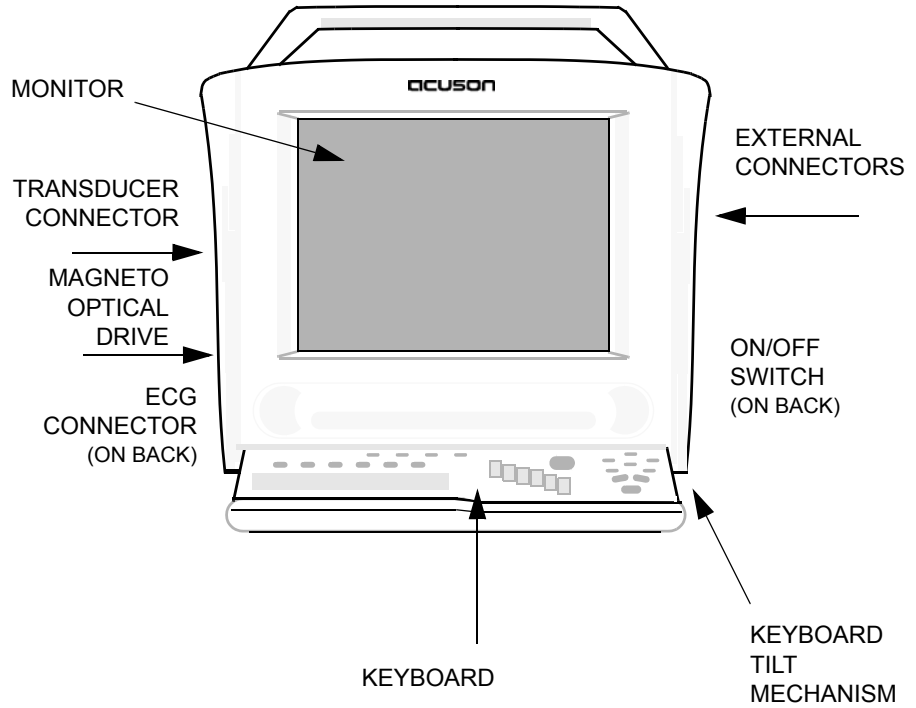
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This chapter presents an overview of the ACUSON Cypress™ ultrasound system. It includes the following information:

- Overview drawings of the system
- How to turn the power ON and OFF
- How to connect transducers
- Using removable media in the optical disk drive
- Connections to external devices
- How to transport the Cypress system
- System security

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## Overview of the Cypress System



**FIGURE 1. Overview of the Cypress System**

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## Turning the Cypress System On and Off

Before turning the Cypress system power ON, make sure that:

- The supplied power cord is securely inserted into the receptacle at the back of the unit.
- The power cord is securely plugged into a properly grounded wall outlet. See the WARNINGS on page 10-2.

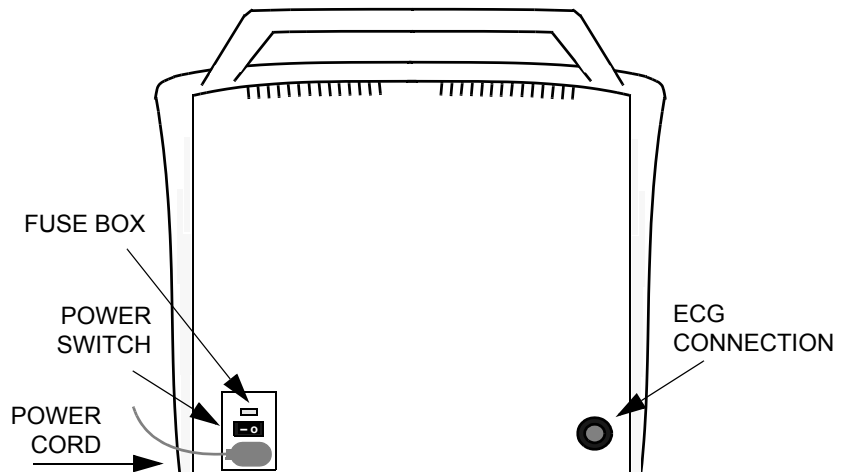
### Turning the Cypress System ON

To turn the system ON:

1. Press the switch located above the power cord receptacle. Press the “–” side of the rocker switch.

The system goes through its boot-up sequence. When the 2D screen appears the system is ready for use.

**WARNING** *Never turn the system OFF when it is in the process of booting-up, as this may cause a fatal error. Always wait until the 2D screen appears before turning the system OFF.*



**FIGURE 2. Cypress System Power Switch**

---

## Turning the Cypress System OFF

To turn the system OFF:

1. Press the **PATIENT** or **SETUP** function key.
2. Select the **Shutdown** tab.
3. Click the [SHUTDOWN] button. The system displays the Shutdown in Progress message: Please wait while the system writes unsaved data to the disk. Wait until the system displays this message: It is now safe to turn off your computer.

**NOTE:** *Using Shutdown insures that any open Patient Studies or images are properly saved. Failure to use the Shutdown command can result in boot-up delays the next time the system is turned on.*

4. Switch the power OFF. Press the “o” side of the rocker switch.

PRESS THE SETUP KEY AND CLICK THE SHUTDOWN TAB . . .

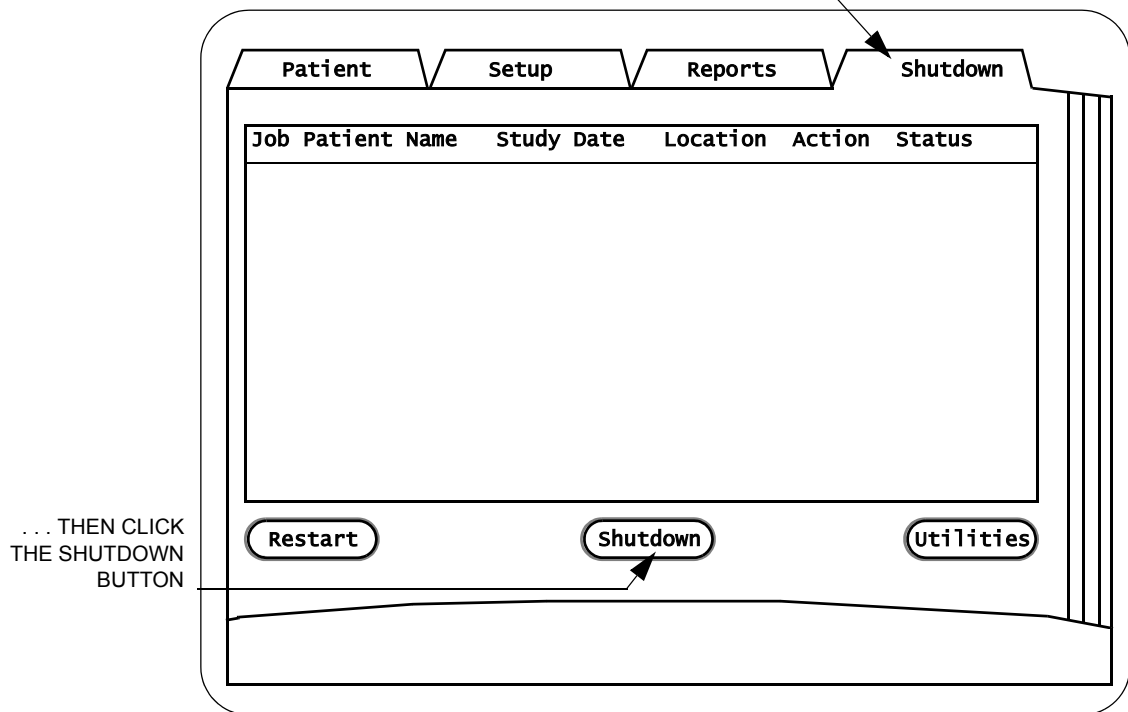
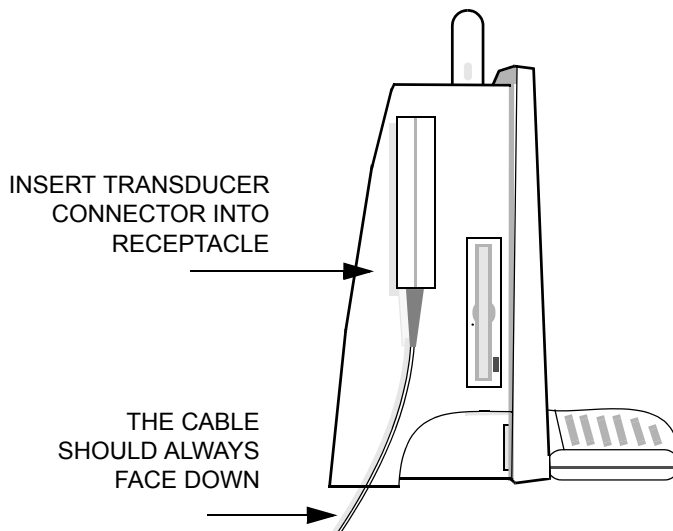


FIGURE 3. The Shutdown Menu Screen

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## Connecting and Using Transducers

Insert the transducer connector gently into the receptacle on the side of the unit. The transducer connector is keyed to allow proper insertion. The cable should always be facing in the down direction.



**FIGURE 4. Connecting the Transducer to the Cypress System**

---

Do not force the transducer connector into position. If you feel excessive resistance remove the connector and try again.

When attempting to scan, if a message that no transducer is connected appears on the screen, the transducer connector may not be securely attached. Remove the connector and try again. When the Cypress is powered up and a transducer is inserted, an audio signal indicates that the transducer has been inserted correctly.

When the transducer is not in use, store it in the holder on the side of the system. When transporting the system in a vehicle or over any long distance place transducers securely in a separate packing case.

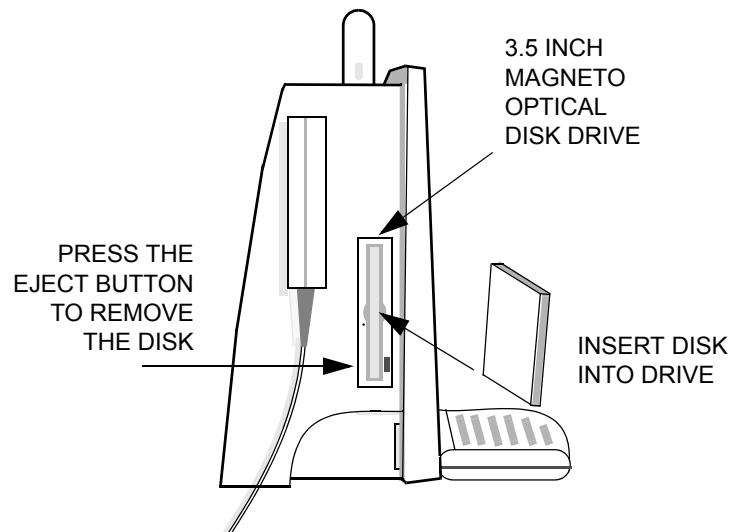
See “Safety, Technical Description, and Accuracy” on page 9-1 for important information on transducer cleaning and infection control.

---

## Magneto Optical (MO) Disk Drive

The Cypress system may be provided with an optical disk device for image and Patient Study storage. Details on the operation of the optical disk are provided in the section, “Transferring Studies” on page 9-14.

The Cypress system uses a 3.5 inch magneto optical disk for removable storage. Disks may need to be formatted prior to use. See “Transferring Studies Using the MO Drive” on page 9-22.



**FIGURE 5. Using the MO Disk Drive**

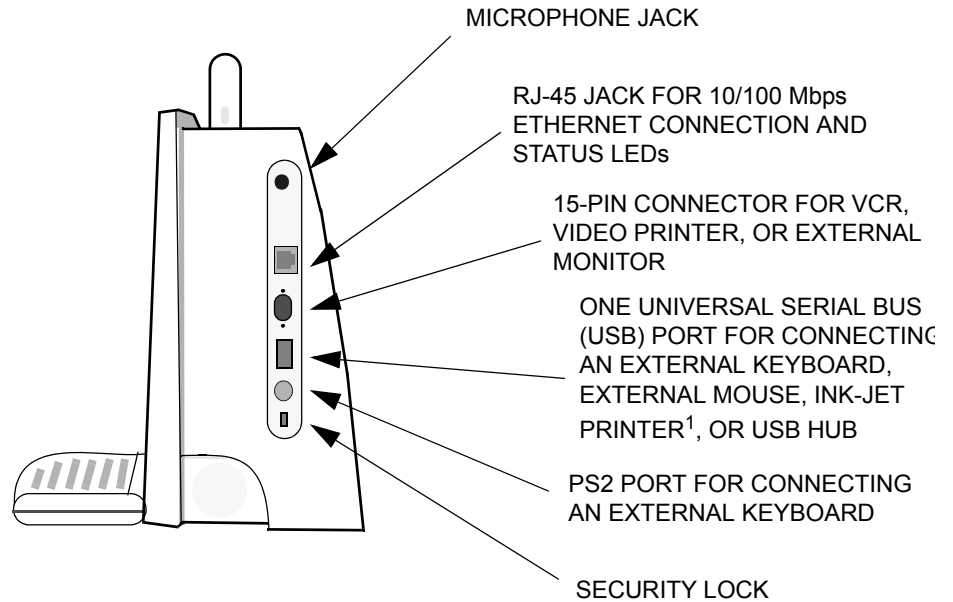
---

- To insert a disk into the system, load the disk as shown in Figure 5.
- To remove a disk, press the button located next to the disk bay.

**NOTE:** *The system must have power to eject the disk when using the eject button.*

## External Devices and Connections

The Cypress system has a number of external connections. For further details see the Appendix “Connecting External Devices” on page A-1.



**FIGURE 6. External Connections**

**WARNING** Do not use a peripheral device, such as a monitor, VCR or printer within 1.5 meters of a patient unless the device receives power from an isolation transformer that meets medical safety standards.

**WARNING** Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards (IEC 950 for data processing equipment and IEC 601-1 for medical equipment). Furthermore, all configurations shall comply with the system standard IEC 601-1-1. Any party who connects additional equipment to the signal input part or signal output part is considered to be configuring a medical system, and is therefore responsible for ensuring that the system complies with the requirements of the system standard IEC 601-1-1. If you have additional questions, contact your Siemens representative.

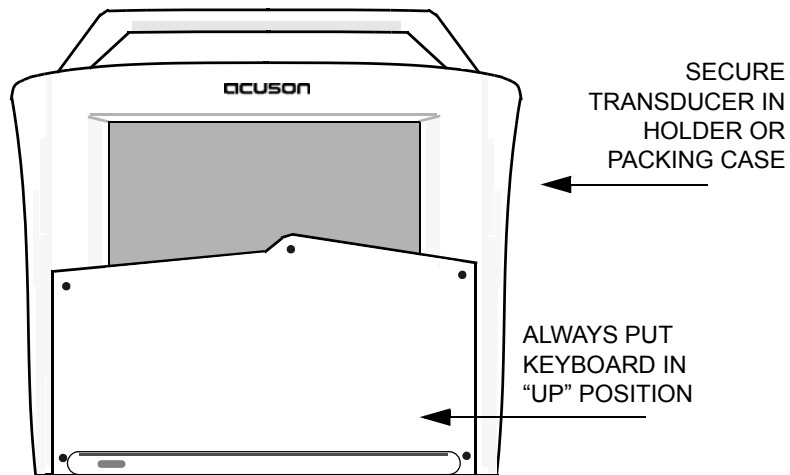
<sup>1</sup> See Appendix B for information about ink-jet printers.

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## Transporting the System

The Cypress system is a highly portable system, designed for use in a variety of settings. Certain precautions should be taken when moving the system to reduce the risk of injury and ensure reliable operation. See “Safety, Technical Description, and Accuracy” on page 10-1 for further details.

**NOTE:** *It is especially important to protect the display screen of the Cypress system when transporting the unit. Always put the hinged keyboard in the “up” position.*



**FIGURE 7. How to Move the Cypress System**

---

### ***Transporting the Cypress System in a Vehicle***

- Disconnect the transducers and store them in a separate packing case.
- Place the system itself securely in a packing case or carrying case.
- Secure the case within the vehicle to prevent it from moving or shifting.

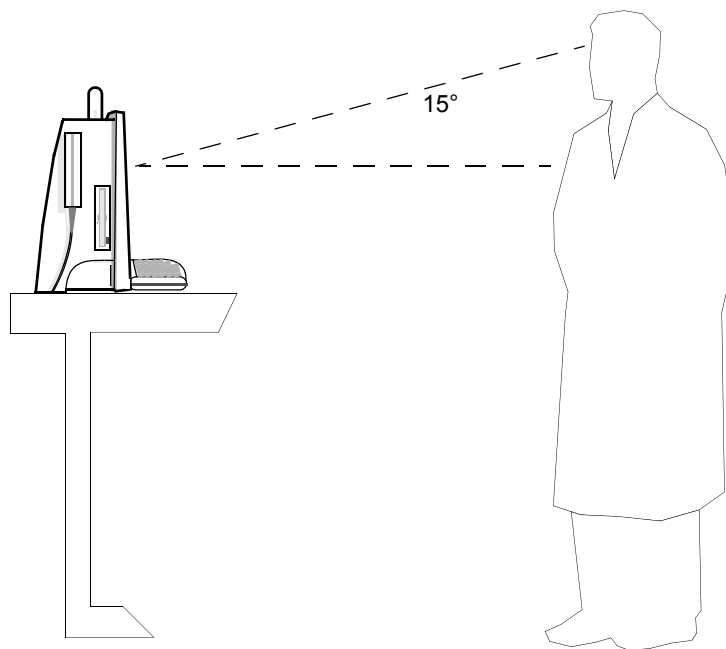
### ***Moving the Cypress System within a Building***

- Make sure that the transducer is securely placed in the transducer holder.
- Make sure that all cables are properly secured and that no cables are hanging loose.

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## Proper Viewing Angle

The images on the Cypress system appear most clearly when the user is looking down at the screen at a 15° angle.



**FIGURE 8. Proper Viewing Angle**

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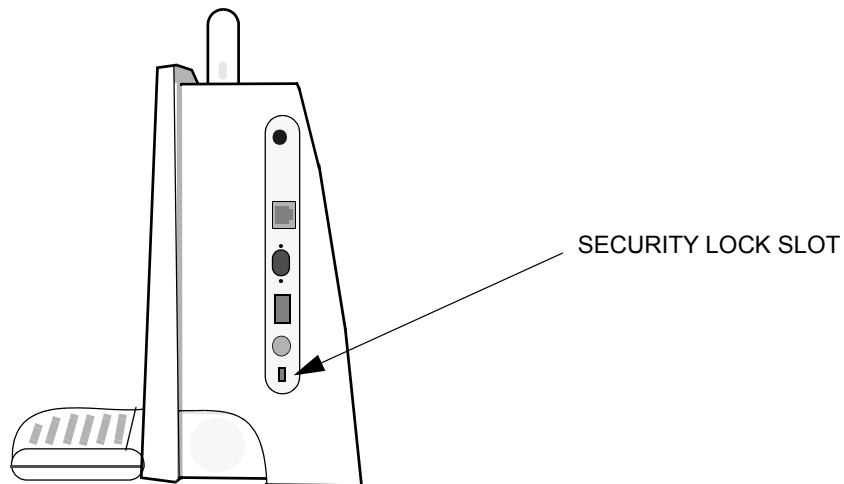
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## System Security

For added protection against theft, the Cypress system is equipped with a security feature. You can purchase a security cable from the vendor of your choice to use with the Cypress system security lock (Siemens does not sell this cable). These cables are most commonly used to secure laptop computers.

*To install the security cable, follow these steps:*

1. Insert the cable into the security slot provided.
2. Wrap and secure the cable around an adjacent fixture. To prevent theft, the fixture should be immovable or extremely difficult to move.



**FIGURE 9. Cypress System Security**

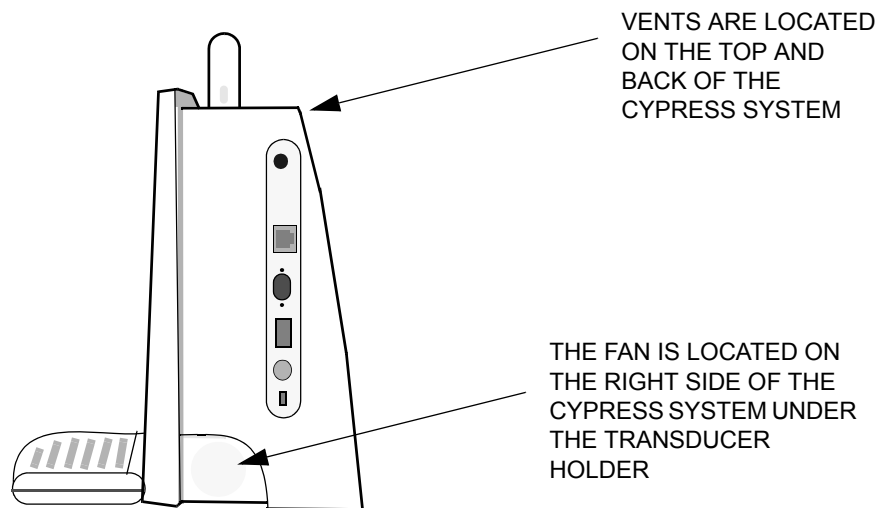
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## Location of Fan and Vents

Note the location of the Cypress system fan and vents in Figure 10. Make sure that the fan and vents are never covered. Air should always be able to flow freely around the Cypress system.



**FIGURE 10. Location of Fan and Vents**

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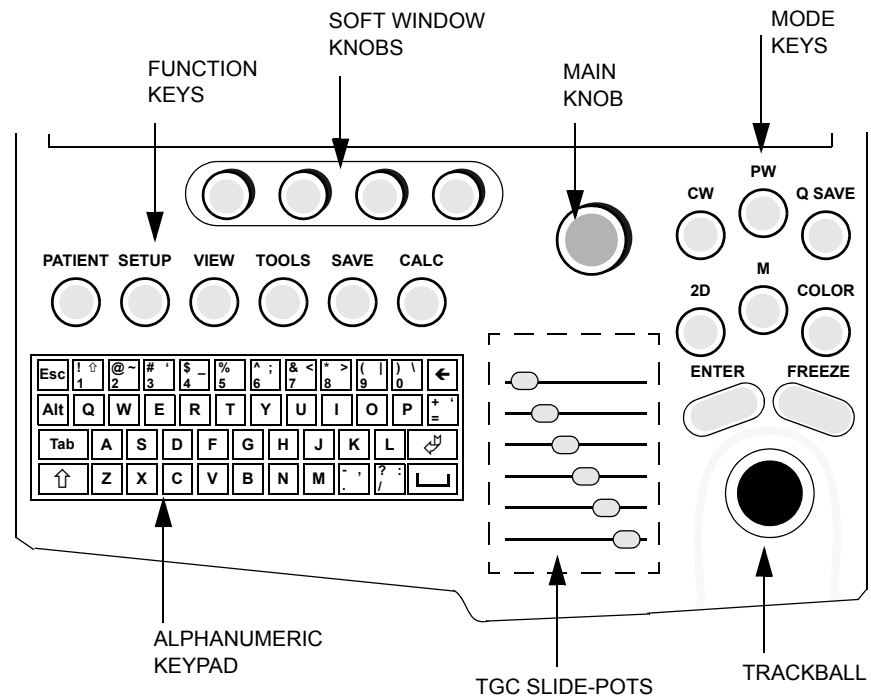
# *Keyboard & General Controls*

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This chapter describes the Cypress system keyboard and controls. It includes information on:

- Using the Mode keys to select the type of scanning
- Using the Trackball and <ENTER> key
- Using the time/gain compensation (TGC) slide-pots to adjust the depth-related gain of the 2D image
- How the function of the Main knob depends on the active mode of the system
- Using the Soft Window knobs to control the soft windows options located on the bottom of the screen
- Using the Function keys
- Using the Alphanumeric keys to enter text data

## Keyboard Overview



**FIGURE 11. The Cypress System Keyboard**

The Cypress system keyboard consists of:

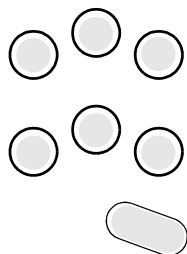
- Seven Mode keys
- An <ENTER> key and Trackball
- Time/gain compensation (TGC) slide-pots
- The Main knob
- Four Soft Window knobs
- Six Function keys
- An alphanumeric keypad

---

## Keyboard Controls

### Mode Keys

The Mode keys include **2D**, **M** (M-Mode), **COLOR** (Color Flow Mapping), **CW** (Continuous Wave Doppler), **PW** (Pulsed Wave Doppler), **FREEZE**, and **Q SAVE** (Quick Save). Each is described in Table 1.



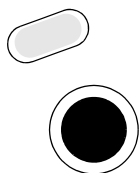
**TABLE 1. The Mode Keys**

<i>Mode Key</i>	<i>Description</i>
<b>2D</b>	The <b>2D</b> mode key activates B mode imaging. This is the default imaging mode. When other scanning modes are active, or when a menu is active, pressing the <b>2D</b> key returns the system to full-screen 2D imaging mode.
<b>M</b> (M-Mode)	M-Mode operates the time-motion scanning mode. Pressing <b>M</b> activates the M-Mode cursor, which is moved using the Trackball. Once the cursor has been placed on the desired portion of the 2D image, pressing <b>M</b> a second time activates the time-motion sweep. The <b>M</b> key then toggles from time-motion sweep to the real-time image. To exit M-Mode, press <b>2D</b> .
<b>COLOR</b> (Color Flow Mapping)	Pressing the <b>COLOR</b> key activates color flow mapping mode within the 2D image. The location of the color may be adjusted by moving the Trackball. The <b>COLOR</b> key toggles ON/OFF; to turn color flow OFF, press the <b>COLOR</b> key again.  Note that Color can only be turned ON/OFF when 2D is active in either <i>full-screen</i> or <i>split-screen</i> displays. Color flow mapping does not operate in M-Mode.
<b>CW</b> (Continuous Wave Doppler)	The <b>CW</b> key activates Continuous Wave Doppler mode. Pressing <b>CW</b> activates the CW cursor, which is moved using the Trackball. Once the cursor has been placed on the desired portion of the 2D image, pressing <b>CW</b> a second time activates the CW Doppler spectral display. The <b>CW</b> key then toggles from the CW display to the real-time 2D image. To exit the CW Doppler mode, press <b>2D</b> .

**TABLE 1. The Mode Keys**

<i>Mode Key</i>	<i>Description</i>
<b>PW</b> (Pulsed Wave Doppler)	The <b>PW</b> key activates Pulsed Wave Doppler mode. Pressing <b>PW</b> activates the PW cursor, which is moved using the Trackball. Once the cursor has been placed on the desired portion of the 2D image, pressing <b>PW</b> a second time activates the PW Doppler spectral display. The <b>PW</b> key then toggles from the PW display to the real-time 2D image. To exit the PW Doppler mode, press <b>2D</b> .
<b>Q SAVE</b> (Quick Save)	<p>During real-time 2D and Color Flow imaging, the <b>Q SAVE</b> key saves loops each time the key is pressed (the number of loops saved is defined in the system setup; see “Explanation of Setup Menu Fields” on page 3-4). A loop is defined as, either:</p> <ul style="list-style-type: none"> <li>■ If using ECG: a <i>single cardiac cycle</i></li> <li>■ If not using ECG: a <i>period of time</i></li> </ul> <p>In real-time CW Doppler, PW Doppler, or M-Mode, pressing <b>Q SAVE</b> saves a single sweep screen. In Freeze mode, <b>Q SAVE</b> saves the frozen image displayed on the screen. It also saves loops stored in temporary memory by pressing <b>Q SAVE</b> while the loop is playing. While images are being saved, an icon of a camera is displayed in the upper right-hand corner of the screen. For more information, see “Saving Image Data” on page 5-5.</p>
<b>FREEZE</b>	<p>The <b>FREEZE</b> key suspends active scanning and displays the last acquired image on the screen as a still frame. Use the Main knob to scroll backward and forward through the still images. To save any images as loops, first turn PLAY LOOP to display the desired loop or frame, and then press <b>Q SAVE</b> or <b>•SAVE</b>. This saves the image currently playing. For more information about saving, see “Saving Image Data” on page 5-5.</p> <p>Pressing <b>FREEZE</b> a second time unfreezes the image and returns to real-time scanning. Any unsaved loops are lost because loops are stored in temporary memory only.</p>

## Trackball and <ENTER> Key



Use the Trackball to place and point cursors within the image, to draw measurement traces, and to navigate through menus.

Use the <ENTER> key to enter data that has been typed into menus. It is also used to respond to menu prompts. In Calculations, <ENTER> is used to anchor the start points and end points that have been positioned by the Trackball.

**In this manual, “click” means:**

- move the cursor to the desired location using the Trackball and then
- press the <ENTER> key

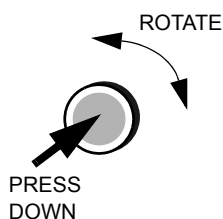
## Main Knob

The various functions of the larger “Main” knob above the TGC controls depends on the active mode of the system. To move through the range of available settings for a particular control, rotate the knob. For example, the Main knob can be used to move frame-by-frame through a loop.

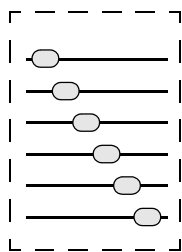
The Main knob also controls one or two separate parameters per mode. Press the knob down to activate the different parameters.

For example, in PW mode, the knob controls PW gain and volume. Buttons on the bottom right of the screen display the two choices with Gain highlighted as the active default control. Press the knob to select Volume; press the knob again to re-select Gain.

Use the Main Knob to scroll up and down when the Patient Report is displayed.



## Time/Gain Compensation (TGC)



The six time/gain compensation slide-pot controls adjust the depth-related gain of the 2D image.

- Slide-pot controls at the **top** affect the near-field to mid-field of the image.
- Slide-pot controls at the **bottom** affect the mid-field to far-field of the image.

In general, the near-field settings should be set relatively low (to the left) and the far-field settings should be set higher (to the right). See illustration at left.

## Main Knob Functions

The functions of the Main knob by mode are described in Table 2.

**TABLE 2. Functions of the Main Knob in Each Scan Mode**

<i>Scan Mode</i>	<i>Function in ACTIVE Mode</i>	<i>Function in FREEZE Mode</i>
2D	Compress, 2D Gain	Search, Play*
M-Mode (2D Active)	Compress, 2D Gain	Search, Play*
M-Mode (T/M Active)	Compress, Gain	Scroll
Color	2D Gain, Color Gain	Search, Play*
CW (2D Active)	Compress, 2D Gain	Search, Play*
CW (Spectral Active)	Volume, CW Gain	Scroll
PW (2D Active)	Compress, 2D Gain	Search, Play*
PW (Spectral Active)	Volume, PW Gain	Scroll
CW with 2D/Color (2D Active)	2D Gain, Color Gain	Search, Play*
CW with 2D/Color (Spectral Active)	Volume, CW Gain	Scroll
PW with 2D/Color (2D Active)	2D Gain, Color Gain	Search, Play*
PW with 2D/Color (Spectral Active)	Volume, PW Gain	Scroll
View	Search, Play*	Not available

\* Turn the Main knob to select from Normal, Slow, and Fast playback speeds.

## How to Set the Playback Speed using the Play Function

After the PLAY Soft Window is highlighted, the label changes to NORMAL. This indicates that the system will use the normal playback speed. To change the playback speed turn the Main knob counterclockwise to select SLOW and clockwise to select FAST.

This function is available in all full-screen View and Freeze modes when PLAY is displayed in the Soft Window controlled by the Main knob.



## Soft Window Knobs

The four knobs located at the top of the keyboard control the Soft Windows that appear along the bottom of the screen. These windows change with system modes, states, and exam types. To make a change to the active mode, use the corresponding Soft Windows knob.

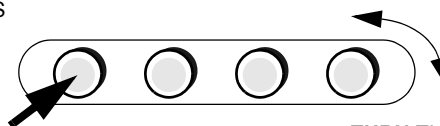
### Knobs with Multiple Functions

Some knobs are assigned multiple functions. This is designated by a triangle located in the top right corner of the Soft Window label. To cycle through the functions, press the corresponding knob. The label name changes as the knob is pressed.

For example, in PW active mode the fourth Soft Window knob controls both Filter and Scale. Press the corresponding soft window knob to switch between the two options. The label that is displayed on the screen determines which function is active.

See the list of the Cardiac and Vascular Soft Window controls on the following pages.

**PRESS DOWN** ON THE  
SOFT WINDOW KNOBS  
TO CYCLE THROUGH  
FUNCTIONS OR TO  
SWITCH BETWEEN  
THE OPTIONS



**TURN** THE SOFT WINDOW  
KNOBS TO ADJUST THE  
SETTINGS

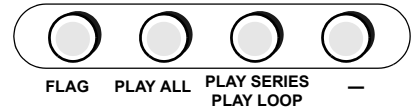
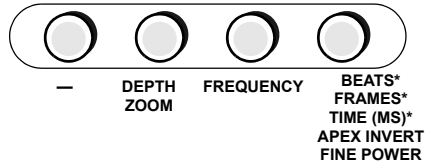
*NOTE: Cardiac and Vascular Soft Window controls may vary depending on the transducer being used and which protocol has been selected.*

The **Cardiac** Soft Window controls by mode, are as follows:

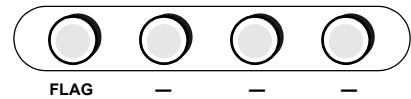
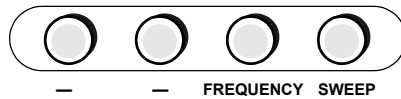
**ACTIVE MODE**

**FREEZE MODE**

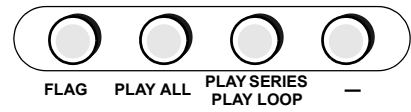
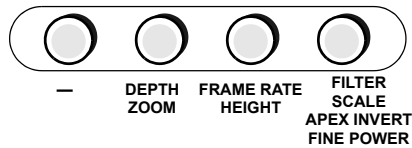
**2D:**



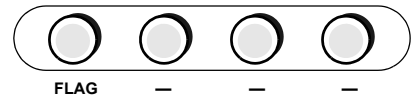
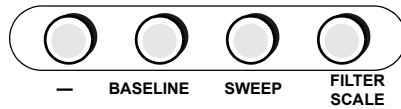
**M:**



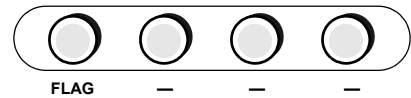
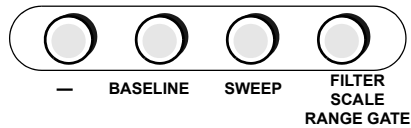
**Color Flow:**



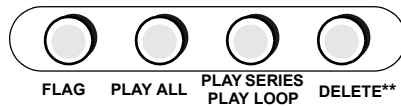
**CW:**



**PW:**



**View:**



*There is no View in FREEZE mode*

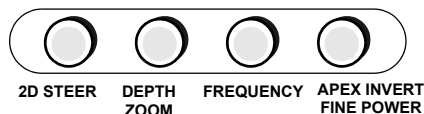
- \* These functions are available when the Advanced Triggering option is installed.
- \*\* The DELETE key is only available when the PLAY LOOP/PLAY SERIES function is activated; the area will be blank when PLAY ALL is activated.

The **Vascular** Soft Window controls by mode, are as follows:

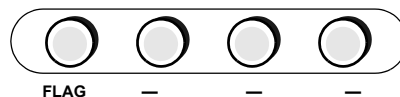
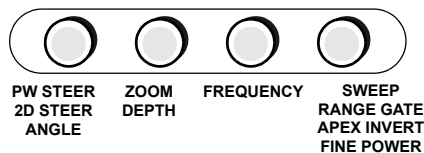
**ACTIVE MODE**

**FREEZE MODE**

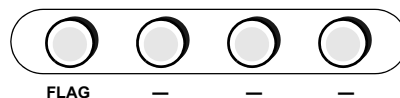
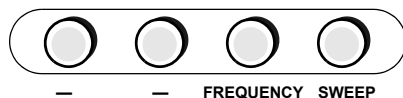
**2D:**



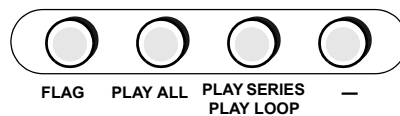
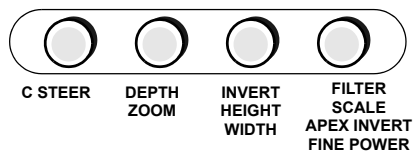
**2D with PW Setup:**



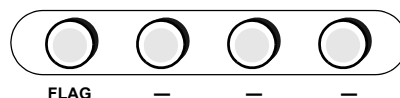
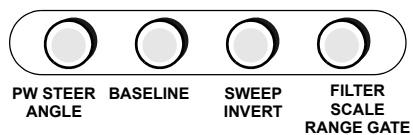
**M:**



**Color Flow:**



**PW:**



**View:**

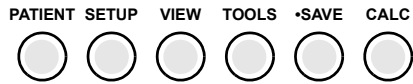


*There is no View in FREEZE mode*

\* The DELETE key is only available when the PLAY LOOP/PLAY SERIES function is activated; the area will be blank when PLAY ALL is activated.

## Function Keys

The six function keys are located above the alphanumeric keys. Press the key to enable each function.



**TABLE 3. The Function Keys**

<i>Function Key</i>	<i>Description</i>
<b>PATIENT</b>	<p>Activates the Patient ID entry screen. This screen stores the entries for patient name, ID number, and other data related to the patient and the study.</p> <p>Only one patient study can be active at a time. Activating a new patient study automatically closes the previously opened patient study. To exit the Patient screen, press the <b>PATIENT</b> key again, or press any scanning Mode key (except <b>COLOR</b>).</p>
<b>SETUP</b>	<p>Activates the Setup menu. To view the subheadings, double click a heading. Click a subheading and the available options are displayed in the section to the right of the subheading. To adjust the settings, use the Trackball, &lt;ENTER&gt; key, and alphanumeric keypad.</p> <p>To exit the Setup screen, press the <b>SETUP</b> key again, or press any scanning Mode key (except <b>COLOR</b>).</p>
<b>VIEW</b>	<p>Activates a review mode for the current study. All the loops and saved images from the active study are presented and played back. When <b>VIEW</b> is pressed, the most recently saved image is displayed first. The <b>VIEW</b> key toggles between the full-screen and quad-screen display.</p> <p>After activating a study from either the PATIENT LIST or STUDY LIST, press <b>VIEW</b> to display the stored images. Press <b>2D</b> to exit View mode.</p> <p>To return to the patient screen in order to select another patient or study, press the <b>PATIENT</b> key. To exit View, press any scanning Mode key (except <b>COLOR</b>).</p>

**TABLE 3. The Function Keys**

<i>Function Key</i>	<i>Description</i>
<b>TOOLS</b>	Used to access infrequently used image adjustment controls. Pressing <b>TOOLS</b> opens a list of controls on the right side of the screen. Use the Trackball and <ENTER> key to activate a specific choice. Once a choice has been activated, make adjustments in the settings using the Trackball and <ENTER> key. To leave Tools, press the <b>TOOLS</b> key again.
<b>•SAVE</b> (Save All)	Functions like a “record button” on a VCR except that images are stored digitally. <b>•SAVE</b> is an ON/OFF function. Images are saved until <b>•SAVE</b> is pressed a second time or until a predetermined time limit is reached. This limit is set in the Save Time Limit field on the System Setup menu or determined by the protocol.
<b>CALC</b> (Calculations)	<p>Activates the measurement and analysis function. If <b>CALC</b> is pressed during real-time scanning, the system will freeze the image first, then open the Calculations menu. Pressing <b>CALC</b> a second time removes the calculations menu from the screen.</p> <p>Which Calculations menu is activated is determined by the active scanning mode or what is being reviewed. For example, if 2D is active, the 2D-related measurements menu will be displayed.</p>

## Alphanumeric Keys

Use the alphanumeric keys to enter text data in Setup, Patient, and Report windows and when in Text mode. While in Quick Text mode, press any alphanumeric key to activate the text function.

- The <ALT> key is used in combination with several of the alphanumeric keys to activate the typographical function shown in the upper right section of some keys. For example, pressing <ALT> and the <4> key types an underscore.
- Use the <←> (Delete) key to delete characters to the left. Hold down the <⇧> (Shift) key and press <←> to delete characters to the right.
- Hold down the <⇧> key to type a capital letter or the character shown in the upper left section of the numeric keys.
- To enable Shift Lock (i.e., all capital letters), hold down the <ALT> key and press <1>. To disable Shift Lock, hold down the <ALT> key and press <1> again.

You can also use the keyboard to move the cursor on the Cypress system screen. Hold down the <ALT> key and press:

- <B> to move the cursor down.
- <F> to move the cursor to the left.
- <H> to move the cursor to the right.
- <G> to move the cursor up.

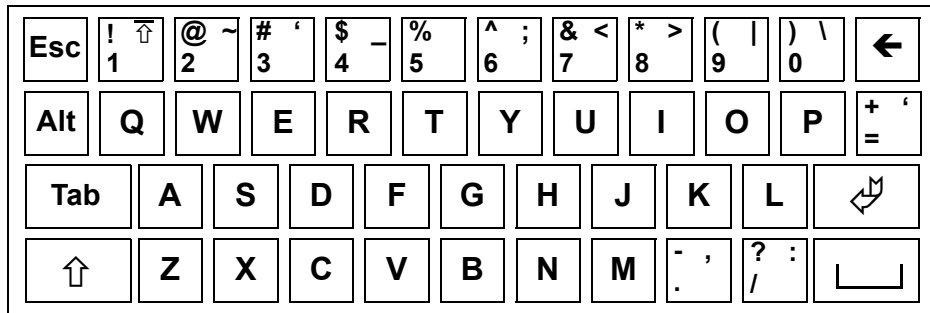


FIGURE 12. The Cypress System Keyboard

## Special Marks

To create lowercase characters with diacritical marks:

- Hold down the <ALT> key and press the corresponding key shown below.

Esc	⏏	~	`	-	¨	;	<	>		\	←
Alt	ä	å	é		þ	ü	ú	í	ó	ö	'
Tab	á	ß	ð	←	↑	→			ø	↩	
↑	æ		ç		↓	ñ		,	:	⏏	

To create uppercase characters with diacritical marks:

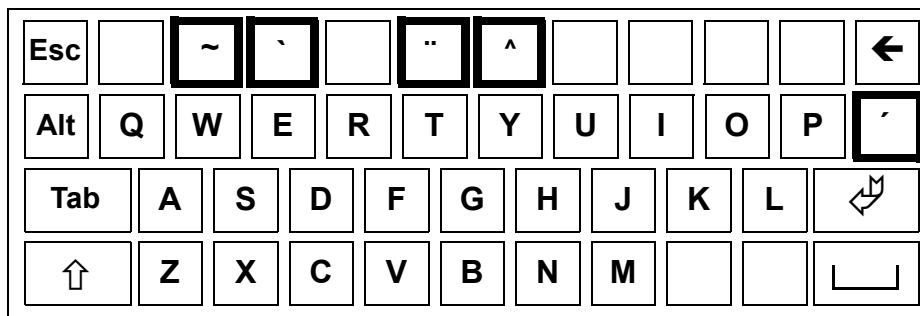
- Hold down the <ALT> key and the <⇧> key and press the corresponding key shown below.

Esc	¡	~	`	£	¨	^					←
Alt	Ä	Å	É		Þ	Ü	Ú	Í	Ó	Ö	'
Tab	Á	§	Ð						ø	↩	
⇧	Æ		Ç			Ñ			¿	⏏	

There are five diacritical marks that can be added to certain alphabetic characters. They are highlighted below.

To add a diacritical mark to certain alphabetic characters:

- Hold down the <ALT> key and the <⇧> key and press the key with the corresponding diacritical mark shown below.
- Type the alphabetic character key.





# *Basic Setup*

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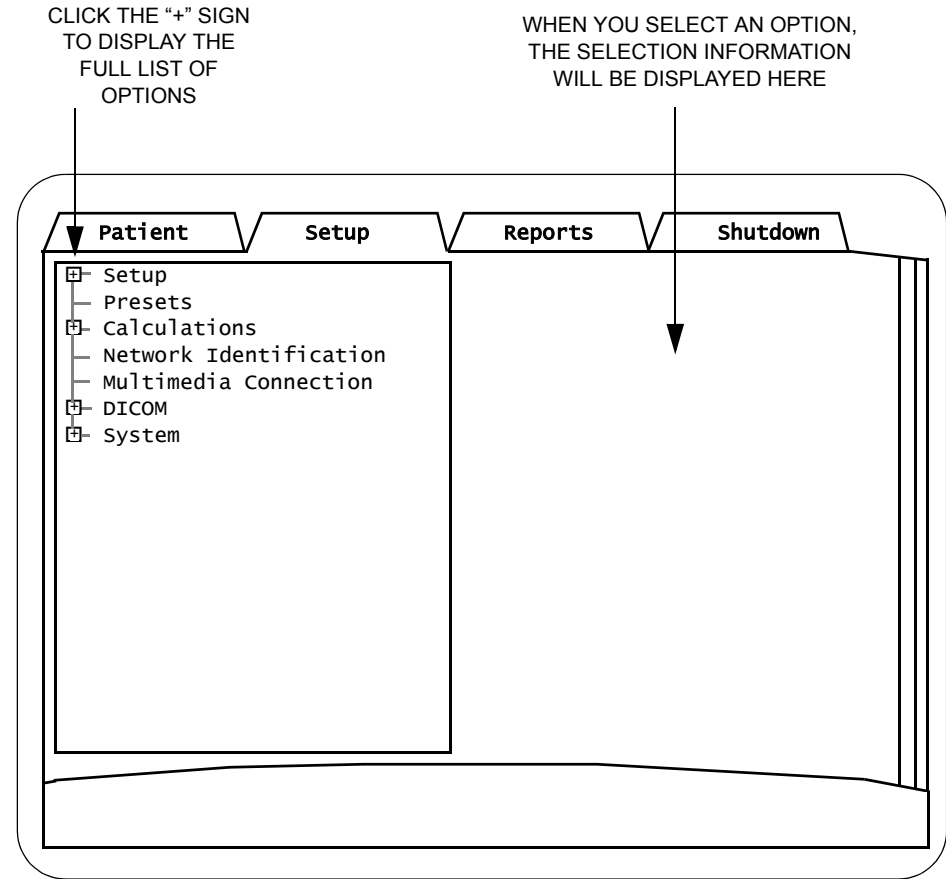
This chapter describes how to use the **SETUP** Function key to configure the Cypress system. It includes information on:

- Setting parameters for system operation
- The user-defined Preset settings

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## The Setup Menu

Press the **SETUP** function key to display the Setup menu. See Table 4 on page 3-4 for an explanation of the fields.



**FIGURE 13. The Setup Menu Screen**

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## Navigating the Setup Menu

- On the Setup menu, a "+" sign indicates there are subtitles. To display the list of subtitles either click the "+" sign or double-click the heading next to the plus sign.
- A minus (–) sign indicates all subtitles are displayed. To minimize the list of subtitles either click the minus sign or double-click the heading next to the plus sign.
- Turn the Main knob to scroll the list or use the scroll bar located to the right of the list.
- To switch to the **Patient**, **Report**, or **Shutdown** sections, click the corresponding tab.

## How to Specify a Setup Option

1. Press the **SETUP** key.
2. To display the list of subtitles click the "+" sign next to **Setup** or double-click the **Setup** heading.
3. Use the Trackball and <ENTER> key to highlight a subtitle. A selection menu will appear on the right side of the display.
4. Use the Trackball and <ENTER> key to specify a setting.

## Explanation of Setup Menu Fields

Table 4 describes each field on the **Setup** tab menu screen.

**NOTE** Cardiac Calculations are described in chapter 6; Vascular Calculations are described in chapter 7; the DICOM menu fields are explained in chapter 9.

**TABLE 4. Setup Menu Fields**

<i>Field</i>	<i>Description</i>
<b>ECG</b>	<i>Sets the ECG Display.</i> If using ECG, click the ECG Display box.
<b>View Mode Options</b>	<p><i>Sets parameters for viewing loops.</i></p> <ul style="list-style-type: none"> <li>■ <b>Play All</b> — specifies the number of times a loop will be repeated. This function is available in View or Freeze mode. Enter a number from 1 to 100. The default is 1. When 1 is selected the loop or series will play one time. <i>Using Loop Repeats:</i> While in <b>Play Loop</b> mode, turn the PLAY ALL knob and each loop will play <i>X</i> times before advancing to the next loop.</li> <li>■ <b>Quad Review</b> — specifies whether the system uses <b>Loop Align</b>. When this box is checked, the loops displayed in the quad format while in a stress protocol will start and end at the same time. For example, a loop consisting of 8 frames start and end at the same time as a loop consisting of 14 frames.</li> <li>■ <b>Date and Time</b> — specifies whether the system clock is displayed at the top, right of the screen (it shows the current time and date). To hide the system clock while in View mode, place a checkmark in the <b>Hide System Clock</b> box. To display the system clock while in View mode, remove the checkmark.</li> <li>■ <b>View Images After Study Activation</b> — When <b>Enabled</b>, it automatically starts the study review after activation (that is, it eliminates the need to press VIEW).</li> </ul>

TABLE 4. Setup Menu Fields

<i>Field</i>	<i>Description</i>
<b>Screen Brightness</b>	<i>Sets the screen brightness.</i> To the left is darker and to the right is brighter. To move the bar, position the Trackball so the arrow is over the bar, then press and hold down the <ENTER> key while using the Trackball to slide the bar.
<b>Trackball Speed</b>	<p><i>Adjusts the speed of the Trackball.</i> There are two options that can be set independently:</p> <ul style="list-style-type: none"> <li>■ <b>General</b> — For Trackball operation when not performing a measurement.</li> <li>■ <b>Measurement</b> — For Trackball operation when performing a measurement.</li> </ul> <p>To set the Trackball speed, use the Trackball and &lt;ENTER&gt; keys. Place the cursor on the speed marker and then press and hold the &lt;ENTER&gt; key while moving the Trackball to set the speed. Or, use the Trackball to position the cursor at a point within the range scale and then press the &lt;ENTER&gt; key, the speed marker will move towards the cursor. To slow down the Trackball, slide the bar to the left; for a faster Trackball, slide the bar to the right.</p>
<b>Double-Click Speed</b>	Sets the speed of the double-click used throughout the system (for example, when selecting a patient). To slow down the double-click (i.e., allow more time between clicks), slide the bar to the left. For faster double-click, slide the bar to the right.

TABLE 4. Setup Menu Fields

<i>Field</i>	<i>Description</i>
<b>TI Display</b>	<p><i>Sets the Thermal Index (TI) for the type of tissue being scanned.</i> The Thermal Index keeps us aware of conditions that may lead to a temperature rise whether at the surface, within the tissue, or at the point where the ultrasound is focusing on the bone. Each Thermal Index estimates temperature rise under certain assumptions. (Note that TI is a relative indicator of temperature increase.) For more information see the document published by the American Institute of Ultrasound in Medicine entitled <i>Medical Ultrasound Safety</i> that is included with this manual.</p> <p>Options: Soft Tissue (s), Bone (b), or Cephalic (c).</p> <p>There are three Thermal Indices:</p> <ul style="list-style-type: none"> <li>■ Soft Tissue TI (TIs) — for use in Cardiac, first trimester fetal, vascular, and abdominal</li> <li>■ Cranial Bone TI (TIc) — for use in Transcranial (Bone near surface)</li> <li>■ Bone TI (TIb) — Second and third trimester fetal (Bone near focus)</li> </ul>
<b>Institution Name</b>	<p><i>Sets the current Institution name.</i> Type a new name or select one from the drop-down list. A maximum of 10 names can be recalled from the drop-down list.</p>
<b>Sonographers</b>	<p>Add, edit, delete sonographers from your system. The sonographer names are stored here for use on the Patient screen.</p>
<b>Language</b>	<p><i>Sets the display language.</i> Select a language from the drop-down menu.</p> <p>Note that when the language is changed, the system must be restarted for the change to take effect.</p>

TABLE 4. Setup Menu Fields

<i>Field</i>	<i>Description</i>
<b>M-Mode / Doppler Display</b>	<p><b>Cursor Setup</b></p> <ul style="list-style-type: none"> <li>■ <b>Fullscreen.</b> When this option is selected and <b>M</b>, <b>PW</b>, or <b>CW</b> are pressed, the cursor appears on a full screen 2D image. Use the Trackball to position the cursor and then press the same mode key again to display the Time-Motion or Spectral display. Press the mode key to switch between the full screen display with the cursor and the Time-Motion or Spectral display. Press <b>2D</b> to exit.</li> <li>■ <b>Small Sector.</b> When this option is selected and <b>M</b>, <b>PW</b>, or <b>CW</b> are pressed, a split screen appears with a small image. Use the Trackball to position the cursor. Press the mode key again to display the Time-Motion or Spectral Display. Press the mode key to switch between the 2D image and the Time-Motion or Spectral display. Press <b>2D</b> to exit.</li> </ul> <p><b>Duplex 2D Update</b></p> <p>Use the radio buttons to select the rate of update for the 2D image while in duplex display. Select <b>Manual</b> (updates occur when the Mode button is pressed), <b>2 Sweeps</b>, <b>3 Sweeps</b>, or <b>4 Sweeps</b>.</p>
<b>Angle Correction</b>	Place a checkmark in the box to enable angle correction for all transducers. This enables angle correction on sector (cardiac) transducers.
<b>Date and Time</b>	<p><i>Sets the date and time.</i> Note that the time <i>must</i> be entered in military time using a 24-hour clock.</p> <ul style="list-style-type: none"> <li>■ To change the date and/or time: Place the cursor in the date and time boxes and type the new settings. Click the [SET] button.</li> <li>■ <b>24 Hour Clock.</b> Changes the display of time throughout the system. A check mark in the box tells the system to display military time. 2:00 PM is displayed as 14:00:00. To enable the 24-hour clock, click the checkbox. To disable the 24-hour clock, click the checkbox again to remove the check. AM and PM time are displayed when the box is not checked.</li> </ul>

TABLE 4. Setup Menu Fields

<i>Field</i>	<i>Description</i>
<b>Video Out Mode</b>	<i>Sets the video out mode.</i> Use VGA when connecting a monitor or overhead projector. Use NTSC when connecting a video printer or VCR. Use PAL for the European video standard. Use the RGB modes (RGB NTSC and RGB PAL) with a color video printer.
<b>Save</b>	<p>The Save options include:</p> <ul style="list-style-type: none"> <li>■ <b>Save Time Limit:</b> <i>Sets the number of seconds to be captured when the •SAVE key is pressed.</i> The •SAVE key can be set to capture 4, 8, 16, or 32 seconds of data. •SAVE will capture only one frame of the Time-Motion display in M-Mode and one frame of the spectral display in the Doppler modes.</li> <li>■ <b>QSAVE Cycle Limit:</b> <i>Sets the number of cardiac cycles to be captured when Q SAVE is pressed.</i> The Q SAVE key can be set to capture 1, 2, or 3 cardiac cycles when the patient's ECG is properly displayed on the screen. When an ECG is not displayed, the Q SAVE button will capture 2, 4, or 6 seconds of data. Note that Q SAVE captures only one frame of the Time-Motion display in M-Mode and one frame of the spectral display in the Doppler modes.</li> <li>■ <b>Lock Studies:</b> <i>Sets the status of a study once it is deactivated.</i> Options include: <ul style="list-style-type: none"> <li><b>Never</b> — Changes can be made to the studies at any time.</li> <li><b>After ## Hours</b> — Use the trackball to place the cursor in the box and type the number of hours after which the study will automatically lock.</li> <li><b>Once Deactivated</b> — Studies are locked as soon as they are deactivated.</li> </ul> </li> </ul>
<b>Stress Echo</b>	When <b>Enabled</b> , the captured loops will include the entire heart cycle (i.e., <b>Full Cycle Capture</b> ) instead of being limited to ~360 ms (systole). Click the checkbox to enable (the default setting is disabled).
<b>Printer</b>	<i>Designates the printer.</i> The Active window displays the current printer. To install a new printer, click [NEW PRINTER] and select a printer driver.



TABLE 4. Setup Menu Fields

<i>Field</i>	<i>Description</i>
<b>Eject MO on Shutdown</b>	<i>Sets the Cypress to eject an MO disk during Shutdown.</i> To automatically eject an MO disk during the Shutdown process, click <b>Enabled</b> . To turn automatic eject off, click <b>Disabled</b> .
<b>Quick Text</b>	Check the <b>Enabled</b> box to enable Quick Text. See “Quick Text” on page 5-17 for more information.
<b>Send Options</b>	<ul style="list-style-type: none"> <li>■ <b>Temporal Decimation (30 FPS)</b> — When checked, <i>Temporal Decimation</i> is enabled. Temporal Decimation normalizes the frame rate of DICOM and multimedia images from the acquisition frame rate to a frame rate of 30 FPS (frames per second). This operation is performed only on images that were acquired at frame rates above 30 FPS. The benefits of this are: reduced transfer time, smaller archived studies, and better operations with PACS systems that have limited amounts of display memory.</li> <li>■ <b>Extract Calc Frames</b> — When <b>Enabled</b>, if a loop contains one or more frames with measurements present, these frames will not have the measurement graphics present in the loop when exported in DICOM or multimedia format. The frames containing measurements will be transferred as single frame images with the measurement graphics visible. These images will follow the loop in which the measurements originally appeared. Using this feature, the frames containing measurements are easy to find.</li> </ul> <p style="text-align: right;"><b>NOTE</b> If <i>Temporal Decimation</i> is enabled, calc extraction is automatically enabled.</p>

---

## The Presets Menu

Presets are settings that are used to configure the system with your preferred settings as well as factory-defined settings. They are accessed from the **Setup** tab. The Preset feature allows a single user-defined “title” to store the presets for all transducers. When a different transducer is attached, the Cypress system automatically recalls and loads the presets assigned to that transducer. There are two types of presets:

- **Factory Presets** — These presets cannot be deleted and include: **Factory Defaults** (default presets for all transducers); **Last Power Down** (a preset that holds the settings in place at the last shutdown); and **Abdominal Factory Defaults** (stores abdominal presets for the 3V2c and 7V3c transducers).
- **User-defined Presets** — These presets can be defined, edited, and deleted by users.

**NOTE** The Cypress system saves the last-loaded preset which is loaded at the next power-up.

This is the list of functions that can be stored in a user-defined preset:

---

1. Depth	22. Sweep Speed
2. Frequency	23. PW Range Gate Size
3. Left/Right Invert	24. PW Gain
4. 2D Gain	25. PW Baseline
5. Apex Invert	26. PW Scale
6. Color Gain	27. Full Screen Review Speed
7. Priority	28. Post Processing Curve
8. CW Baseline	29. Color Scale
9. CW Scale	30. Color Filter
10. Color Frame Rate	31. Quad Screen Review Speed
11. Compress	32. PW Invert
12. CW Gain	33. Color Invert
13. Volume	34. Color Height
14. CW Filter	35. Color Width
15. Color Smoothing	36. 2D Beam Steering
16. 2D Persistence	37. Color Steering
17. 2D Angle	38. PW Steering
18. Spectral Compress	39. Color Box Location
19. Lateral Gain	40. Color Persistence
20. Colorize	41. Angle Correction
21. Colormap	42. PW Filter

---

## Storing a User-Defined Preset

To save a user-defined preset, follow these steps:

1. Set each Cypress system function to your preferred setting.
2. Press the **SETUP** key.
3. Highlight the **Presets** heading.
4. Click [ADD].
5. Use the Trackball to place the cursor in the Presets text field and type a unique label or name for the preset. For example, "Deep Venous," "John's Pediatric settings," "Contrast," etc.
6. Click [OK].
7. Click [UPDATE].

**NOTE** *A maximum of 16 user-defined presets can be stored.*

**NOTE** *Changes can be made to the Presets at any time by changing the system parameters and then clicking the [UPDATE] button in the Setup **Presets** menu.*

## Recalling a Saved Preset

To recall a saved Preset, follow these steps:

1. Press the **SETUP** key.
2. Highlight the **Presets** heading.
3. Use the pull-down menu to select a Preset option.
4. Click [LOAD]. The Preset is loaded when live imaging begins.

**NOTE** *If a Preset is removed (i.e., deleted) after [LOAD] is clicked and before the start of live imaging, the factory default Preset will be loaded.*

## Recalling a Saved Preset on the New Patient Screen

When a new patient is added to the system, you can assign a Preset to it by following these steps:

1. Press **PATIENT**.
2. Click [NEW PATIENT].
3. Add the patient data.
4. Click [PRESETS].
5. Highlight a Preset from the pull-down menu and press <ENTER> to select it.
6. Click [LOAD]. The Preset is loaded when live imaging begins.

**NOTE** *If a Preset is removed (i.e., deleted) after [LOAD] is clicked and before the start of live imaging, the factory default Preset will be loaded.*

## Renaming a User-Defined Preset

To change the name of an existing Preset, follow these steps:

1. Press the **SETUP** key.
2. Highlight the **Presets** heading.
3. Use the pull-down menu to select the Preset option to be renamed.
4. Click [RENAME].
5. Use the Trackball to place the cursor in the Presets text field and type a new name.
6. Click [OK].

## Removing a User-Defined Preset

To remove an existing Preset, follow these steps:

1. Press the **SETUP** key.
2. Highlight the **Presets** heading.
3. Use the pull-down menu to select the Preset option to be deleted.
4. Click [REMOVE].

**NOTE** *If a Preset is removed (i.e., deleted) after [LOAD] is clicked and before the start of live imaging, the factory default Preset will be loaded.*

## Making Changes to the Current User-Defined Preset

The [UPDATE] button lets you make changes to the currently loaded user-defined Preset. For example, to include *Sector Angle 2* in the user-defined preset, make the adjustment to the Cypress and then follow these steps:

1. Press the **SETUP** key.
2. Highlight the **Presets** heading.
3. Click [UPDATE]

## Reload Preset with New Patient

Presets can be reloaded each time new patient data is entered. To enable this feature, follow these steps:

1. Press **SETUP** and double-click the **Presets** heading.
2. Highlight the **Reload with New Patient** option.
3. Place a checkmark in the **Enabled** box. The Preset is loaded when live imaging begins.

**NOTE** *If a Preset is removed (i.e., deleted) after [LOAD] is clicked and before the start of live imaging, the factory default Preset will be loaded.*

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## The System Menu

The System option contains a menu of background system settings. You may need to adjust these settings occasionally. The System options are accessed from the **Setup** tab.

### How to Specify a System Option

1. Press the **SETUP** key.
2. To display the list of subtitles click the "+" sign next to **System** or double-click the **System** heading.
3. Use the Trackball and <ENTER> key to highlight a subtitle. A selection menu will appear on the right side of the display.
4. Use the Trackball and <ENTER> key to specify a setting or view the current setting. See Table 5 for an explanation of the System fields.

### Explanation of System Menu Fields

When **System** is highlighted the following information is displayed:

- **System Serial Number**
- **Software Version**
- **Boards** Displays part numbers and serial numbers for the boards in the system.

Table 5 describes the **System** options.

TABLE 5. System Menu Fields

<i>Field</i>	<i>Description</i>
<b>Transducers</b>	<p>Double-click <b>Transducers</b> to display a list of compatible transducers. Highlight each transducer and use the pull-down menu on the right side to select a default protocol.</p> <p><b>Setting a Default Protocol for Transducers</b>  A default protocol is assigned to each transducer by the manufacturer and can be redefined by the user. The default protocol should be the protocol that is used most often for each transducer. To select a different default protocol, follow these steps:</p> <ol style="list-style-type: none"> <li>1. Press <b>SETUP</b>, double-click <b>System</b>, and then double-click <b>Transducers</b>.</li> <li>2. Highlight a transducer (for example, AcuNav) and select a default protocol from the pull-down menu at the right of the screen.</li> <li>3. Continue until each transducer has been assigned a default protocol.</li> </ol>
<b>Options</b>	<p>Highlight <b>Options</b> to display the following information:</p> <ul style="list-style-type: none"> <li>■ <b>Enable Password Modification</b> Click the checkbox to enter a new password.</li> <li>■ <b>Password</b> Passwords are issued by Siemens. Passwords are unique to each Cypress system and cannot be transferred. Do not delete an existing password until a new password has been issued.</li> <li>■ <b>Enabled</b> The window shows the options that are enabled for this system.</li> <li>■ <b>Ethernet Address</b> Factory set and cannot be changed. This address is used to identify the Cypress system when new passwords are issued.</li> <li>■ <b>Service Information</b> <i>Stores service information.</i> Put the cursor in the field and then enter the name and phone number of your service representative.</li> </ul>

---

## The Calculations Menu

The Setup Calculations menu contains setup options for use with the calculations function. To access the menu, press **SETUP** and double-click the **Calculations** option.

**TABLE 6. Calculation Menu Fields**

<i>Field</i>	<i>Description</i>
<b>Measurements</b>	<ul style="list-style-type: none"> <li>■ <b>2D Distance:</b> A checkmark in the <b>Show Depth</b> checkbox lets you continuously view the depth of the first cursor when the Distance measurement is selected in 2D mode. The line indicating the depth of the first cursor will disappear when the first cursor is anchored into position by pressing &lt;ENTER&gt;.           <p><b>NOTE:</b> <i>Not available with the 7L3 transducer.</i></p> </li> <li>■ <b>2D Area</b> — Defines a portion of the 2D image. Specify the <b>Construction</b> and <b>Resolution</b>.</li> <li>■ <b>Doppler Trace:</b> Defines the flow patterns on the Doppler Spectral Display. Specify the <b>Construction</b> and <b>Resolution</b>.           <p><b>Construction</b> — The Construction option specifies whether the flow pattern is built in a continuous motion or using points that are then connected. To change the construction, use the <b>Construction</b> radio buttons to select either <b>Continuous</b> or <b>Point to Point</b>. See “About Construction Methods” on page 6-4 for more information.</p> <p><b>Resolution</b> — Specifies the spacing of the dots (pixels) used to form the trace outlines. A lower number specifies a more vivid resolution (i.e., more dots); a higher number specifies a less vivid resolution.</p> </li> </ul>
<b>Estimates</b>	<ul style="list-style-type: none"> <li>■ <b>RA Pressure</b> — Type the estimated pressure in the box. The estimate appears in the Report menu when the RA field is clicked.</li> </ul>



TABLE 6. Calculation Menu Fields

<i>Field</i>	<i>Description</i>
<b>Averaging</b>	When the Averaging function has been activated, measurements that are part of the Patient Report automatically display the averaged result when two or more of the same measurements are completed. Up to 20 results can be averaged. To activate Averaging, put a checkmark in the <b>Enabled</b> box.
<b>Report</b>	<ul style="list-style-type: none"> <li>■ <b>Color</b> — Specifies how the reports are printed; either dark text on a light background or light text on a dark background.</li> <li>■ <b>Cardiac Format</b> — Specifies a report format for Cardiac studies. When <b>Complete</b> is specified, the entire report is displayed, including sections without data. When <b>Configured</b> is specified, the report displays only the sections where data has been entered.</li> <li>■ <b>Vascular Format</b> — Specifies a report format for Vascular studies. Only the <b>Configured</b> format is available; the report displays only the sections where data has been entered.</li> </ul>
<b>Menu Position</b>	The default menu position for the Calcs menu is in the upper right corner. Using this option you can move it to one of the other corners of the screen by selecting the corresponding radio button.
<b>Cursor Type</b>	Select how you want the cursor to appear on the Cypress system screen. Click the radio button for the corresponding cursor type.
<b>Vascular Sites</b>	<b>Default Vascular Exam Type</b> — Specify the default exam type for vascular studies by selecting an exam type from the pull-down menu and clicking the <b>Default</b> radio button. See “Setting Up Default Sites for Vascular” for more information.

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## The DICOM Menu

The DICOM setup options are used when transferring images in the DICOM (Digital Imaging and Communications in Medicine) format.

**TABLE 7. DICOM Menu Fields**

<i>Field</i>	<i>Description</i>
<b>DICOM Server Information</b>	Stores the DICOM server information. See “Explanation of DICOM Menu Fields” on page 9-6 for more information.
<b>Cypress DICOM Information</b>	Stores the network information for the Cypress-Viewer system. See Table 41 on page 9-7 for more information.
<b>Storage Commitment Server</b>	If your facility uses DICOM Storage Commitment, the Storage Commitment Server information is entered here. Use this screen if the Storage Commitment server configuration information (IP Address, AE Title, Port Number) is different from that of the DICOM Server configuration. See “DICOM Storage Commitment” on page 9-10 for more information.
<b>Modality Worklist Server Information</b>	<p>If a DICOM Worklist Server (which is part of a hospital information system) is on the imaging network, it can be queried by the ultrasound system for a list of patients scheduled for exams.</p> <p>Patient and study demographics can then be automatically downloaded from the Worklist Server into the ultrasound system eliminating redundant data entry.</p> <p>The Cypress system queries the worklist, and then patient demographic and procedure data is transferred into the Cypress system once the procedure has been scheduled and data input is complete.</p>
<b>DICOM Stress Image Size</b>	The DICOM stress image size can take up the full screen or just a region of interest (ROI). To set the size, press <b>SETUP</b> , double-click <b>DICOM</b> , and highlight <b>DICOM Stress Image Size</b> . Click the radio button to select the size.

TABLE 7. DICOM Menu Fields

<i>Field</i>	<i>Description</i>
<b>DICOM Static Image Stress Labels</b>	<p>The DICOM elements used to label a particular Stage and View in a stress study can be suppressed for static images (single frame Doppler, M-Mode, and static B-Mode, and Color images). Selecting this option excludes the Stage, View, and Timer DICOM elements from the DICOM header for the static image.</p> <p>Using this feature will work toward preventing a DICOM review station from including these static images in the quad screen stress study display. Any text present on the image that identifies Stage and View will still be visible.</p>
<b>DICOM Calculation Report Color</b>	<p>This feature specifies the color of the calculation report when it is converted into DICOM. It does not affect the calculation report displayed on the Cypress system. To set the DICOM calculation report color, click the radio button to specify the color selection, either dark text on a light background or light text on a dark background.</p>
<b>Single Frame Images</b>	<p>Place a checkmark in the <b><i>Always Send Lossless</i></b> box to send single frame images in a lossless format regardless of the compression setting for loops.</p>
<b>Transfer Syntax</b>	<p>When sending JPEG or RLE compressed DICOM images, place a checkmark in the <b><i>Selected Transfer Syntax Only</i></b> box to ensure that the Cypress system will transfer the images only in the selected format. The secondary DICOM default transfer syntax of uncompressed will not be proposed in the DICOM association.</p>

---

## The Network Identification Menu

The Setup Network Identification menu contains setup options for use with the network functions. To access the menu, press **SETUP** and double-click the **Network Identification** option.

**TABLE 8. Network Identification Menu Fields**

<i>Field</i>	<i>Description</i>
<b>CypressLink</b>	This options enables the CypressLink software that automates communications between the Cypress systems and a PC running the CypressViewer software. Transferring images in Cypress format over a network using CypressLink requires the Networking option for the Cypress ultrasound system. CypressLink is enabled when the <b>Enabled</b> box is checked. Specify the <b>Port #</b> , <b>Multicast IP</b> address and <b>Multicast TTL</b> here. To <b>Allow Receiving Studies</b> , put a check mark in the box.
<b>Multimedia Connection Setup</b>	The Multimedia Connection options specify the setup for images in multimedia formats (AVI, RTF, and WAV). The options include: Name, Remote Share, User Name, Password, and Test Result. See “Multimedia Format to a Computer Via a Network” on page 9-5 for more information.

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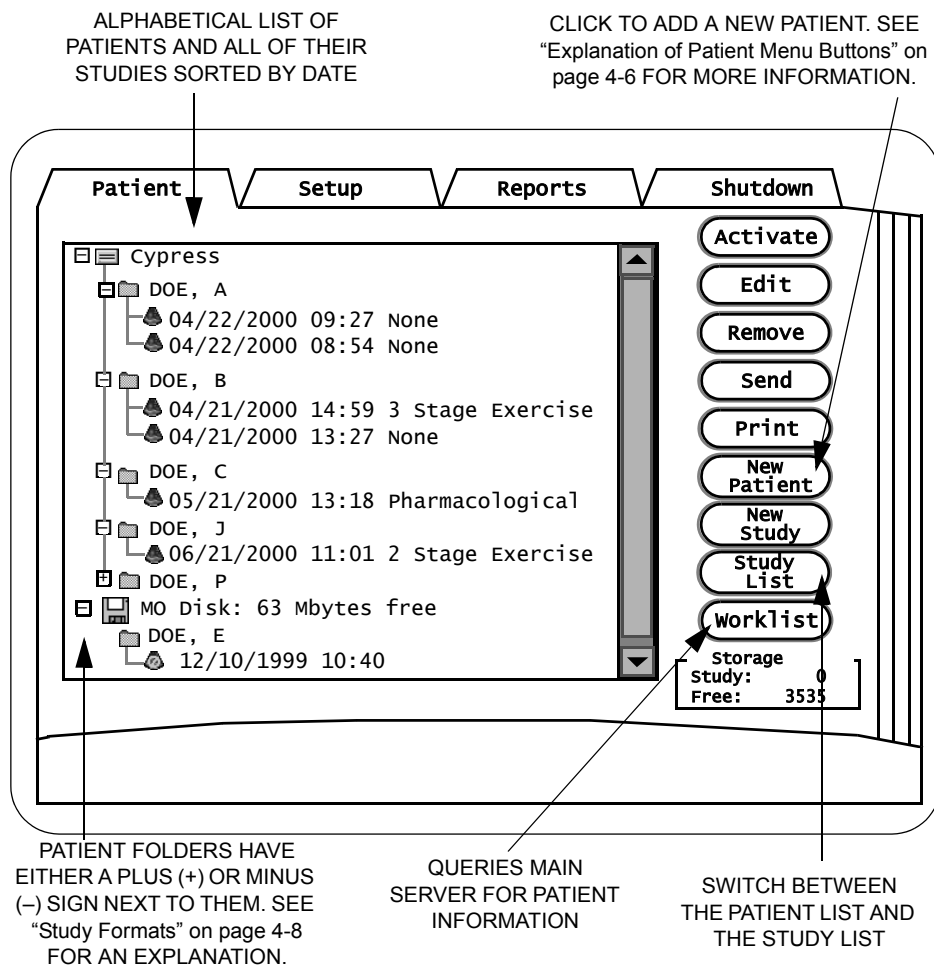
---

This chapter describes how to use the **PATIENT** Function key to create, view, and maintain a patient directory in the Cypress system. It includes information on:

- Setting up a patient directory
- Entering patient information
- Adding new patients to the directory
- Creating, editing, and viewing patient studies

## The Patient Menu

Use the Patient menu to add, edit, and delete patient information and studies. To display the Patient menu, press the **PATIENT** function key. Only one patient or one study can be opened at a time. Patient studies are read from the Cypress system hard drive. (If using the internal MO drive, the study must be transferred to the hard drive to be read.) Entering and selecting a new patient name automatically closes the active study.



**FIGURE 14. The Patient Menu — Organized by Patient Name**

The Patient menu can be displayed in two different formats: by patient name, or by individual patient studies. Click the [PATIENT LIST/STUDY LIST] button to toggle from one display format to the other.

THIS DISPLAY SHOWS EACH STUDY AS A SEPARATE ITEM WHERE THE LISTS CAN BE SORTED. TO SORT A COLUMN, CLICK THE LABEL AT THE TOP. FOR EXAMPLE, TO SORT BY PATIENT CLICK THE "PATIENT NAME" LABEL ONCE TO SORT FROM "A" TO "Z"; CLICK AGAIN TO SORT FROM "Z" TO "A".

TO RESIZE COLUMNS: PLACE THE CURSOR ON THE LINE BETWEEN THE COLUMN LABELS, HOLD DOWN THE <ENTER> KEY AND USE THE TRACKBALL TO MOVE THE LINE TO RESIZE THE COLUMN.

TO VIEW A STUDY:  
 1. CLICK ON THE STUDY TO HIGHLIGHT IT.  
 2. CLICK THE [ACTIVATE] BUTTON.  
 3. PRESS THE VIEW FUNCTION KEY OR DOUBLECLICK THE STUDY FOR IMMEDIATE REVIEW.

THE ARCHIVED HEADING SPECIFIES WHETHER A STUDY HAS BEEN ARCHIVED. A "Y" MEANS THE STUDY HAS BEEN ARCHIVED. AN "M" MEANS THE STUDY WAS ARCHIVED AND THEN MODIFIED.

The screenshot shows a software interface with a menu bar at the top containing 'Patient', 'Setup', 'Reports', and 'Shutdown'. Below the menu bar is a table with the following columns: Patient Name, Patient Id, Date, Arc., Protocol, and Si. The table contains 15 rows of data for various patients (DOE, AB through DOE, WR). To the right of the table is a vertical stack of buttons: Activate, Edit, Remove, Send, Print, New Patient, New Study, Patient List, and Worklist. At the bottom right, there is a 'Storage [MBytes]' box showing 'Study: 0' and 'Free: 3535'. Arrows from the surrounding text point to specific elements in the interface.

Patient Name	Patient Id	Date	Arc.	Protocol	Si
DOE, AB	36517	04/22/2000..		None	<1
DOE, C	36285	10/26/1999..		None	<1
DOE, C	36486	08/04/1999..		2 Stage E	<1
DOE, D	369387	09/02/1999..		None	<1
DOE, E	2345686	05/25/2000..	Y	None	<1
DOE, MM	36286	06/17/2000..		Pharmacolo	<1
DOE, P	36790	07/23/1999..		3 Stage E	<1
DOE, Q	36137	03/23/2000..		None	<1
DOE, R	36017	08/16/1999..	M	None	<1
DOE, S	369278	08/18/1999..		None	<1
DOE, S	36938	09/20/1999..		None	<1
DOE, TT	36987	09/20/1999..	Y	None	<1
DOE, V	36832	10/29/1999..	Y	None	<1
DOE, WE	36038	10/30/1999..		None	<1
DOE, WR	36517	04/04/2000..		None	<1





SWITCH BETWEEN THE PATIENT LIST AND THE STUDY LIST

FIGURE 15. The Patient Menu — Each Study as a Separate Item

## Icons used in the Patient Directory



Table 9 explains the icons used in the Patient directory. Figure 16 on page 4-5 shows the icons on the Patient directory screen.

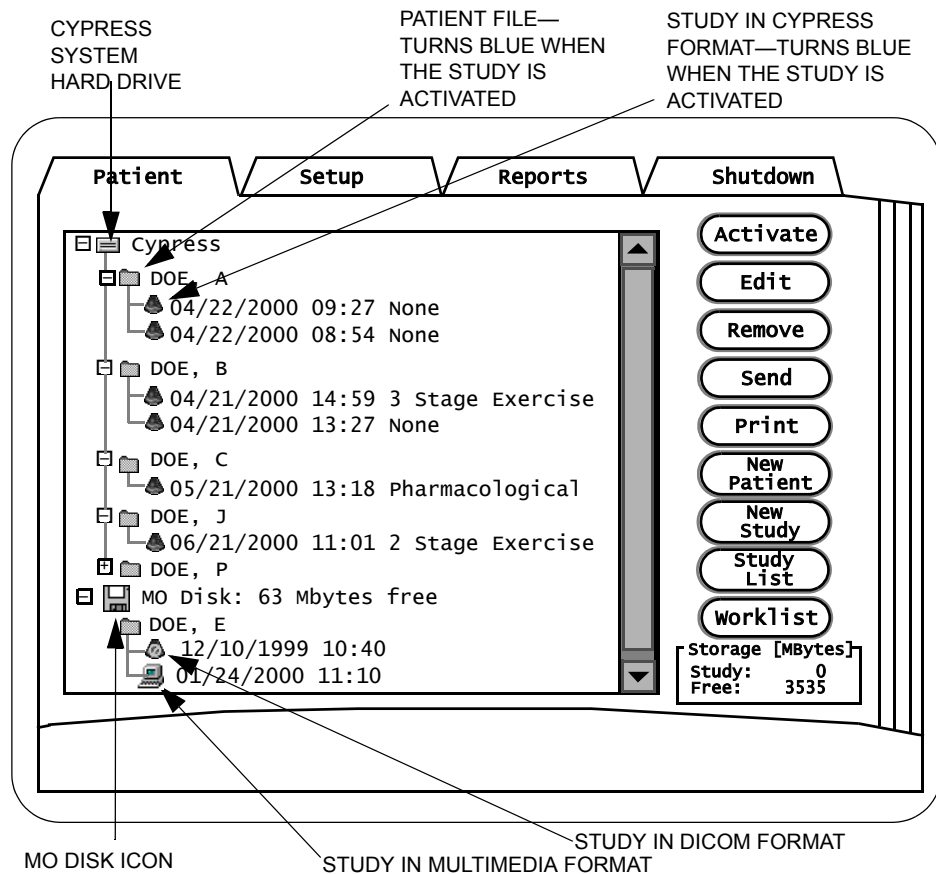
**TABLE 9. Patient Directory Icons**

<i>Icon</i>	<i>Name</i>	<i>Explanation</i>
	<b>Cypress Hard Drive</b>	All patient files and studies stored internally appear beneath the Cypress system hard drive icon.
	<b>Cypress Format</b>	<p>Appears in front of studies stored in <i>Cypress</i> format.</p> <p>All of the studies in the Cypress system sub-directory have this icon.</p> <ul style="list-style-type: none"> <li>■ Icon turns blue when the study is activated.</li> </ul>
	<b>DICOM Format</b>	<p>Appears in front of studies stored in <i>DICOM</i> format.</p> <p>This icon only appears in front of studies listed in the <i>MO Disk</i> sub-directory. Studies listed in the <i>MO Disk</i> sub-directory can have either the <i>Cypress</i> format icon or the <i>DICOM</i> format icon in front of them, depending on which format was used to save the study to the <i>MO Disk</i>.</p> <p>Note that studies saved to the <i>MO Disk</i> in <i>DICOM</i> format cannot be read on the Cypress system — you must load the study onto a DICOM-compatible viewer. Once a study is stored to an <i>MO Disk</i> in the <i>DICOM</i> format it cannot be changed back to the <i>Cypress</i> format. However, a study stored to an <i>MO disk</i> in the <i>Cypress</i> format can be reloaded onto the system and then saved in <i>DICOM</i> format.</p>
	<b>Multimedia Format</b>	Appears in the Patient/Study list when studies are transferred to the <i>MO disk</i> in Multimedia format.



**TABLE 9. Patient Directory Icons**

Icon	Name	Explanation
	<b>Patient</b>	Appears in front of patient names. <ul style="list-style-type: none"> <li>The icon turns blue when a study for the patient is activated.</li> </ul>
	<b>MO Disk</b>	All patient files and studies stored on the currently inserted MO Disk appear beneath the MO Disk icon. When a disk is inserted in the MO drive the amount of free disk space is listed in the directory.



**FIGURE 16. Patient Directory Icons**

## Explanation of Patient Menu Buttons

Table 10 describes each button on the **Patient** tab menu screen. Note that all the buttons are not active all the time. Only the buttons that are active are displayed.

**TABLE 10. Patient Menu Buttons**

<i>Button</i>	<i>Description</i>
[ACTIVATE/ DEACTIVATE/ RESTORE]	Activates or opens an existing patient or study that is highlighted (see “Adding Data to an Existing Study” on page 4-18). RESTORE copies studies from the MO disk to the Cypress system hard drive. Highlight the MO disk icon in the Patient List or highlight a group of studies in the Study List and then click [RESTORE] to copy the entire MO disk to the Cypress system hard drive.
[EDIT]	Opens the patient menu for the selected patient or study to edit existing data (see “Editing Patient and Study Information” on page 4-16).
[REMOVE]	Removes the highlighted patient or study from the list and the system (see “Removing a Study or Patient from the System” on page 4-20). There are three options: <ul style="list-style-type: none"> <li>■ <i>Remove all data</i>: removes all traces of the studies and all patient information and reports.</li> <li>■ <i>Remove all images</i>: removes images, but leaves patient information and reports.</li> <li>■ <i>Remove all unflagged images</i>: removes only the unflagged images; leaves flagged images, patient information, and reports.</li> </ul>
[SEND]	Allows you to send studies from the Cypress ultrasound system to an MO disk, CypressViewer, or another Cypress system.  See “Sending the Studies” on page 9-17 for more information.
[NEW PATIENT]	Opens the menu to add a new patient (see “Adding a New Patient” on page 4-9).
[NEW STUDY]	Starts a new study for the selected (highlighted) patient (see “Starting a New Study” on page 4-15).


**TABLE 10. Patient Menu Buttons**


<i>Button</i>	<i>Description</i>
[PATIENT LIST/ STUDY LIST]	<p>Switches between the two patient display formats:</p> <ul style="list-style-type: none"> <li>■ Each patient listed alphabetically with all their studies</li> <li>■ Each study listed separately; the list can be sorted by clicking on the labels at the top of the window. For example, to sort by date, click the Date label.</li> </ul>
[PRINT]	A [PRINT] button is displayed when a compatible ink-jet printer is connected to the Cypress system via the USB port.
[WORKLIST] <i>(Requires optional DICOM Network- ing Feature)</i>	<p>Use the Worklist feature to query the Hospital Information System for Patient Demographic Information. This information is automatically entered into the New Patient screen, eliminating the need to manually enter the data.</p> <p>Systems with the DICOM Networking feature and one or more Worklist servers configured have the [WORKLIST] button enabled on the Patient screen.</p>

## Study Formats


Studies can be saved in one of three formats. An icon to the left of the study shows which format the study has been saved in. The three formats are:

- **Cypress** The Cypress format that can be read on the Cypress system.


*Represented by this icon:* 

If a study that is in the Cypress format cannot be read on the Cypress system (because the study is not compatible with the system's current software and/or hardware), then this icon is displayed: 

- **DICOM** The universal format for ultrasound studies. A study can be saved to the DICOM format, but cannot be viewed on the Cypress system while in the DICOM format.

*Represented by this icon:* 

- **Multimedia** Study data can be sent to an MO disk or a computer in a Multimedia format. Images are converted to AVI files and the patient report is converted to RTF (Rich Text Format) files that are compatible with most major word processing programs. Audio comments are converted into WAV files.

*Represented by this icon:* 

## Expanding Patient Folders

Patient folders have either a plus (+) or minus (–) sign next to them:

- A *plus* sign means that there are studies under that patient name. Click the plus sign to display the studies. The plus sign will turn into a minus sign. To hide the studies, click the minus sign.
- A *minus* sign means all the studies for that patient are displayed (though you may have to scroll down to see them all). To hide the studies and display only the patient name, click the minus sign.

You can also expand or minimize the studies under a patient folder by double-clicking the patient name.

## Adding and Editing Patients and Studies

### Adding a New Patient

To add a new patient, follow these steps:

1. Press the **PATIENT** function key to display the Patient/Study list.
2. Click the [NEW PATIENT] button to display the patient screen.

The screenshot shows a patient entry screen with the following fields and controls:

- Navigation Tabs:** Patient (selected), Setup, Reports, Shutdown.
- Input Fields:**
  - Last Name: [Text Field]
  - First Name: [Text Field]
  - ID: [Text Field]
  - Birth Date: [dd] [mm] [yyyy] (dd-mm-yyyy)
  - Sex: [Dropdown Menu]
  - Height: [Text Field] cm
  - Weight: [Text Field] kg
  - Blood Pressure: [Text Field] / [Text Field] mmHg
  - Study Indication: [Text Field]
  - Accession #: [Text Field]
  - Protocol: [Dropdown Menu] (Current selection: Cardiac Routine)
  - Institution Name: [Dropdown Menu]
  - Sonographer: [Text Field]
  - Miscellaneous: [Text Field]
- Buttons and Checkboxes:**
  - OK
  - Cancel
  - Presets
  - Add Study
  - Averaging

3. Use the Trackball or <TAB> key to move the cursor to the **Last Name** field and type in the patient's last name.
4. Use the Trackball or <TAB> key to move the cursor to the **First Name** field and type in the patient's first name.
5. If desired, type an **ID** number (up to 64 characters). The ID number should be unique (e.g., the patient's date of birth or social security number). Note that the *combination* of the patient's last name, first name, and the ID number must be unique.

6. If desired, enter the patient's **Birth Date**, **Sex**, **Height**, **Weight**, **Blood Pressure**, **Study Indication**, and **Accession #**.
7. Select the **Institution** name from the drop-down menu.
8. Enter the name of the **Sonographer** who is performing the examination.
9. To select a protocol, click the arrow on the **Protocol** drop-down menu, highlight a protocol, and press <ENTER>. If **Vascular** is selected, a sub-menu opens where you select an **Exam Type**.

The screenshot shows a software interface with four tabs: Patient, Setup, Reports, and Shutdown. The Patient tab is active. The form contains the following fields and options:

- Last Name: Doe
- First Name: Edgar
- ID: QTR3942
- Birth Date: 19 01 1944 (dd-mm-yyyy)
- Sex: Male (dropdown)
- Height: [ ] cm
- Weight: [ ] kg
- Blood Pressure: [ ] / [ ] mmHg
- Study Indication: [ ]
- Accession #: [ ]
- Protocol: Routine Vascular (dropdown)
- Institution Name: Routine Cardiac (dropdown)
- Sonographer: [ ]
- Miscellaneous: [ ]

On the right side, there are buttons for OK, Cancel, and Presets. Below these are checkboxes for Add Study (checked) and Averaging (checked). A callout box for the Protocol dropdown shows a list of options: Routine Cardiac, 2 Stage Exercise, 3 Stage Exercise, Pharmacological, and Contrast. A sub-menu for Carotid is also shown with options: Carotid, Upper Extremity, Lower Extremity, and General. An arrow points to the Protocol dropdown with the text "PROTOCOL DROP-DOWN MENU".

10. If desired, enter a note in the **Miscellaneous** field.
11. Set the status of the **Add Study** box. When the box is checked, the current date and time of the study are added when the study starts. When the box is unchecked, the first time an image is *saved* for this study the date and time are automatically put in. The default is a checked box. If you are adding a group of patients before actually conducting the studies (for example, you may want to add all the patients that you will see on the following day), uncheck the box. When you save an image for these patients, the system will add the date and time of the actual study. **NOTE:** The study information such

as **Height**, **Weight**, **Blood Pressure**, **Study Indication**, **Accession #**, **Protocol**, and **Miscellaneous** can only be viewed when the **Add Study** box is checked.

12. Set the status of the **Averaging** box. A checked box indicates that the averaging function is active for the study. To deactivate averaging, click the box to remove the checkmark. Note that this checkbox overrides the system-wide selection in the Setup menu.
13. Select a Preset for this study. Click the [PRESETS] button to display a pull-down menu. Select a Preset and click [LOAD].
14. To save the new entry and stay in the patient study directory, click [OK]. To exit without saving, click [CANCEL]. To save the new entry and go to scanning mode, press the **2D** mode key (or any mode key except **COLOR**). The patient now appears in the directory of patients and studies.

## Registering a New Patient Using the Worklist

To register a new patient using the Worklist feature, follow these steps:

1. Press the **PATIENT** function key to display the Patient/Study list.
2. Click [WORKLIST] to display the Worklist Query screen.
3. Enter any required patient information for the Worklist search. (See Table 11 on page 4-13 for more information.)
4. Select the desired study date(s) for the search in the **Study Date** combination box.
5. Select the desired Modality to search in the **Modality** combination box.
6. Select the desired Worklist Server to use in the **Worklist Server** combination box.
7. Select the number of responses to display in the **Display** combination box.
8. To begin the search, click [QUERY]. To close the Worklist Query screen and return to the Patient screen, click the [CANCEL] button. To clear the entered search criteria, click [CLEAR].

**NOTE** When a Query is in progress, a dialog box is displayed with a [CANCEL] button; to cancel the search, click [CANCEL].

9. When the search is complete, the results are displayed in table form at the bottom of the Worklist Query screen. The displayed fields are: Patient, Sex, Birth Date, Patient Id, Accession Number, Study Date, and Modality. Each field can be sorted alphabetically by clicking on the column header.
10. Select the desired patient by double clicking on its row, or by selecting (highlighting) it and clicking the [CREATE] button.
11. The Modality Worklist Details screen will be displayed, listing all available information on this patient received from the Worklist Server. This information is used to verify that the selected patient is the patient that is about to be scanned.
12. To exit from the Modality Worklist Details screen and select another patient, click [CANCEL].
13. To create a new Patient and Study for the selected patient, click [OK] on the Modality Worklist Details screen. The Cypress system New Patient screen will be displayed with these fields filled in: Last Name, First Name, Birth Date, Sex, Accession Number. You will not be able to change any of the data for these fields.



14. To create the Patient and Study, click [OK] on the New Patient screen. If the Cypress system already has a patient in its database that matches the selected patient, you will be prompted to verify and create a new study under the existing patient.

### Worklist Search Fields

Table 11 describes the fields used in a Worklist search.

**TABLE 11. Worklist Search Fields**

<i>In this field . . .</i>	<i>Enter . . .</i>
Last Name	Patient's last name. Use an asterisk (*) to indicate partially known values. For example, to search for the last name "Miller", you can enter "Mil*" or "*ler".
First Name	Patient's first name. Use an asterisk (*) to indicate partially known values. For example, to search for the first name "Christopher," you can enter "Chris*" or "*pher".
Accession #	The Identification code indicating the sequence of the current study as related to other studies for this patient. Used for billing purposes. Typically generated by a HIS/RIS (worklist) server. Note that searching for the accession number requires an exact match.
Procedure ID	Requested Procedure ID. Note that searching for the requested procedure ID requires an exact match.
Station AE Title	Searches for patients assigned to a specific imaging unit. Note that searching for the Station AE Title requires an exact match.
Study Date	Select the range of dates for the search.
Modality	Select <b>Ultrasound</b> to search for patients scheduled on all ultrasound systems; select <b>All Modalities</b> to search for patients scheduled on any imaging modality.
Worklist Server	Select the Worklist Server to be queried.
Display	Select the number of query results that you want to display.

## Caching of Modality Worklist Results

The results of the Modality Worklist query are automatically saved on the system for later use, for instance, when the system is not connected to the network. The results are saved over power down cycles. Each subsequent query overwrites the cache.

*To use the cache, follow these steps:*

1. Press the **PATIENT** function key.
2. Click [WORKLIST] to display the Modality Worklist Query screen. The results of the most recent query are displayed in table form at the bottom of the Worklist Query screen.
3. Select the desired patient by double-clicking its row, or by selecting (highlighting) it and clicking [CREATE].
4. The Modality Worklist Details screen will be displayed, listing all available information on this patient received from the Worklist Server. Use this information to verify that the selected patient is the patient that is about to be scanned.
5. To create a new Patient and Study for the selected patient, click [OK] on the Modality Worklist Details screen. The Cypress system New Patient screen will be displayed.
6. To create the Patient and Study, click [OK]. If the Cypress system already has a patient in its database that matches the selected patient, you will be prompted to verify this and create a new study under the existing patient.

**NOTE** *Once the selected patient is used to create a study, its information is removed from the cache.*

## Starting a New Study

*If the patient being examined is already in the system Patient/Study list:*

1. Press the **PATIENT** function key to display the Patient/Study list.
2. Scroll through the list by positioning the cursor on the up or down arrow and pressing <ENTER> or by turning the Main knob.
3. When you have found the appropriate patient, use the Trackball and <ENTER> key to highlight the patient name.
4. Click the [NEW STUDY] button to start a separate and new study for this patient.
5. If desired, enter a new **Height, Weight, Blood Pressure, Study Indication,** or **Accession #** and select the **Protocol** by clicking on the arrow to display the drop-down menu and highlighting the protocol.
6. Click [OK].
7. To save the information and return to the 2D display, press **2D** or **SETUP**.

*If the patient being examined is **not** in the system:*

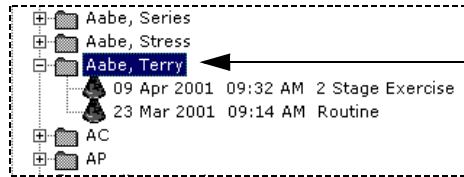
See “Adding and Editing Patients and Studies” on page 4-9.

## Editing Patient and Study Information

Patient and Study information that was manually entered into the New Patient screen can be edited. Patient information and Accession Numbers obtained from a Modality Worklist Query cannot be edited. Any fields that cannot be edited will be grayed-out. Patient information includes: Name, ID Number, Birth Date, and Sex. Study information includes: Height, Weight, Blood Pressure, Study Indication, Accession #, Protocol, and Miscellaneous.

To change patient information for an existing patient, follow these steps:

1. Press the **PATIENT** function key to display the Patient list or Study list.
2. Highlight the patient's name in the Patient list.



HIGHLIGHTING THE PATIENT'S NAME ON THE PATIENT LIST

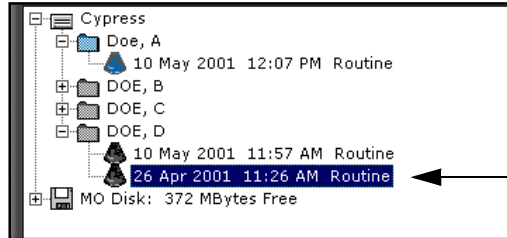
3. Click the [EDIT] button.
4. Use the Trackball or <TAB> key to move the cursor to the field you want to edit and type in the new information.
5. Click [OK] to save the changes.
6. To exit, press **2D** or any Mode key except **COLOR**.

TO DISPLAY THIS SCREEN TO EDIT THE PATIENT INFORMATION, HIGHLIGHT A PATIENT NAME AND CLICK THE [EDIT] BUTTON.

FIGURE 17. Editing Patient Information

To change the study information for an existing patient, follow these steps:

1. Press the **PATIENT** function key to display the Patient list or Study list.
2. Highlight the study date and time in the Patient list.



HIGHLIGHT THE STUDY DATE AND TIME

3. Click the [EDIT] button.
4. Use the Trackball or <TAB> key to move the cursor to the field you want to edit and type in the new information.
5. Click [OK] to save the changes.
6. To exit, press **2D** or any Mode key except **COLOR**.

THESE FIELDS CANNOT BE CHANGED

TO CHANGE THE INFORMATION IN THESE FIELDS USE THE TRACKBALL AND KEYPAD

	Setup	Reports	Shutdown
Last Name	<input type="text"/>		<input type="button" value="OK"/> <input type="button" value="Cancel"/> <input type="button" value="Presets"/> <input checked="" type="checkbox"/> Add Study <input checked="" type="checkbox"/> Averaging
First Name	<input type="text"/>		
ID	<input type="text"/>		
Birth Date	<input type="text"/> <input type="text"/> <input type="text"/> (dd-mm-yyyy)		
Sex	<input type="text"/> ▼		
Height	<input type="text"/> cm	<input checked="" type="checkbox"/> Metric	
weight	<input type="text"/> kg		
Blood Pressure	<input type="text"/> / <input type="text"/> mmHg		
Study Indication	<input type="text"/>		
Accession #	<input type="text"/>		
Protocol	Cardiac Routine ▼		
Institution Name	<input type="text"/> ▼		
Sonographer	<input type="text"/>		
Miscellaneous	<input type="text"/>		

FIGURE 18. Editing Study Information

## Completing a Study with No Patient Name

If you conduct a study without entering a patient's name, the patient is labeled "Unknown". The system can have any number of Unknown patients. They will each be listed separately with the date and time of the study.

*To update the Unknown entry with patient information, follow these steps:*

1. Press the **PATIENT** function key to display the Patient/Study list.
2. Highlight the correct Unknown patient. Be careful to check the date and time information to get the right study.
3. Click the [EDIT] button.
4. Use the Trackball or <TAB> key to move the cursor to the patient information fields and type the new information.
5. Click [OK] to save the changes.
6. To exit, press **2D**.

---

## Using Existing Studies

### Adding Data to an Existing Study

*To add additional loops to an existing study, follow these steps:*

1. Press the **PATIENT** function key to display the Patient/Study list.
2. Scroll through the directory by positioning the Trackball on the up or down arrow and pressing <ENTER> or by turning the Main knob.
3. Highlight an existing study under the patient's name and click [ACTIVATE].
4. Press **2D** to exit the Setup screen and return to the 2D display or press **SETUP** to return to the 2D display.
5. Save loops using **•SAVE** or **Q SAVE** (see "Saving Image Data" on page 5-5).
6. All loop saves are added to the selected study.

## Viewing Existing Patient Studies

The View function displays images from existing studies stored on either the internal hard disk or a removable optical disk. Only one patient study can be viewed at a time.

*To select a study, follow these steps:*

1. Press the **PATIENT** function key to display the Patient/Study list.
2. Scroll through the directory by positioning the cursor on the up or down arrow and pressing <ENTER> or by turning the Main knob.
3. Use the Trackball to highlight the desired study date and time and press <ENTER>.
4. Click the [ACTIVATE] button.
5. Press the **VIEW** function key to display the study.
6. To exit View and return to the patient directory, press **PATIENT**. To exit and continue scanning, press **2D**.

**NOTE** *An alternate method of activating a study is to double-click the study in the Patient List. If a patient folder contains more than one study, double-click the specific study date and time.*

## How to Change the Display Format

Studies may be reviewed in two ways:

- **Full screen**—For live imaging or reviewing saved loops.
- **Quad screen**—For reviewing saved loops only.

**NOTE** *Only the first 25 frames of the loop are displayed when viewing images in quad screen mode.*

*To change the display format, follow these steps:*

1. Press the **VIEW** key once to display full-screen mode.
2. Press **VIEW** again to display quad-screen mode.
3. To exit, press **2D**.

## Removing a Study or Patient from the System

**NOTE** *If you remove a patient name, all the studies for that patient are also deleted. Once a study or patient is deleted it cannot be retrieved.*

You can remove individual studies from a patient's directory (but leave the patient), or delete the patient entirely from the system.

*To remove a study or patient from the system, follow these steps:*

1. Press the **PATIENT** function key to display the Patient/Study list.
2. Scroll through the directory by positioning the cursor on the up or down arrow and pressing <ENTER> or by turning the Main knob.
3. When you have found the patient or study you want to remove, use the Trackball and <ENTER> key to highlight the patient name or the date of the study.
4. Click the [REMOVE] button to delete the patient or study from the system.
5. A system message prompts you to specify what data should be removed by clicking the corresponding radio button: **All Data** (deletes all information pertaining to the patient), **All Images** (deletes all loops and frames; the patient name and patient information remain in the Patient/Study List), or **Unflagged Images** (all image data not flagged will be deleted).
6. Click [YES] to remove the specified studies.
7. To exit, press **2D** or any Mode key except **COLOR**.

**NOTE** *The Cypress system is not meant to be used for long-term storage of patient studies. Completed studies should be moved to an MO disk or network server. See chapter 9, "Transferring Studies" for more information.*



## Batch Removal

To remove a group of patients or studies, follow these steps:

1. Press the **PATIENT** function key to display the Patient/Study list.
2. To highlight a group of studies in consecutive order, use the <SHIFT> key.

Patient Name	Pati...	Date	A.	Protocol	Size	Loc
Doe, A	987	10 May 2001 ...		Routine	<1	Cyp
DOE, B	234	09 May 2001 ...	Y	2 Stage Ex...	15	Cyp
DOE, B	234	26 Apr 2001 ...	M	Routine	117	Cyp
DOE, C	345	26 Apr 2001 ...	Y	Routine	<1	Cyp
DOE, C	345	02 May 2001 ...		2 Stage Ex...	3	Cyp
DOE, D	456	26 Apr 2001 ...		Routine	31	Cyp
DOE, D	456	10 May 2001 ...		Routine	<1	Cyp
DOE, E		15 May 2001 ...		Routine	1	Cyp

USE THE <SHIFT> KEY ON THE CYPRESS KEYPAD TO HIGHLIGHT MULTIPLE STUDIES. THE CYPRESS SYSTEM WILL REMOVE ALL THE HIGHLIGHTED STUDIES.

3. To highlight studies that are not in consecutive order, use the <CTRL> key.

Patient Name	Pati...	Date	A.	Protocol	Size	Loca
Doe, A	987	10 May 2001 ...		Routine	<1	Cypr
DOE, B	234	09 May 2001 ...	Y	2 Stage Ex...	15	Cypr
DOE, B	234	26 Apr 2001 ...	M	Routine	117	Cypr
DOE, C	345	26 Apr 2001 ...	Y	Routine	<1	Cypr
DOE, C	345	02 May 2001 ...		2 Stage Ex...	3	Cypr
DOE, D	456	26 Apr 2001 ...		Routine	31	Cypr
DOE, D	456	10 May 2001 ...		Routine	<1	Cypr
DOE, E		15 May 2001 ...		Routine	1	Cypr

USE THE <CTRL> (CONTROL) KEY ON AN EXTERNAL KEYBOARD TO HIGHLIGHT MULTIPLE STUDIES THAT ARE NOT IN CONSECUTIVE ORDER. THE CYPRESS WILL REMOVE ONLY THE HIGHLIGHTED STUDIES.

4. Click the [REMOVE] button to delete the studies from the system hard drive.
5. A system message prompts you to specify what data should be removed by clicking the corresponding radio button: All Data (deletes all information pertaining to the patient), All Images (deletes all loops and frames; the patient name and patient information remain in the Patient/Study List), or Unflagged Images (all image data not flagged will be deleted).
6. Click [YES TO ALL] to remove *all* of the highlighted studies or click [YES] to confirm deletion of each study, one-at-a-time.
7. To exit, press **2D** or any Mode key except **COLOR**.

## Patient Reports

Calculation information that has been saved can be viewed on the patient Report. For more information on saving measurements, see “Performing Specific Cardiac Calculations” on page 6-9 and “Performing Specific Vascular Calculations” on page 7-9.

To view the report information, follow these steps.

1. Press the **PATIENT** function key to display the patient directory.
2. Use the Trackball to highlight the desired study and press <ENTER>.
3. Click the [ACTIVATE] button.
4. Click the **Reports** tab to display the information.
5. Scroll through the report by positioning the cursor on the up or down arrow and pressing <ENTER> or by turning the Main knob.

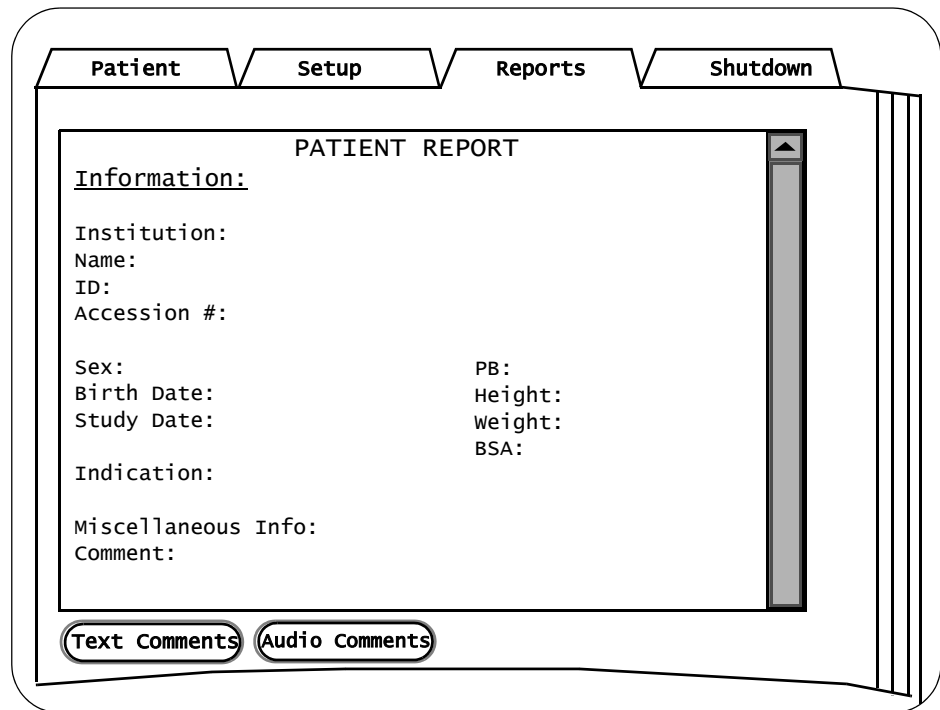


FIGURE 19. The Patient Report

## Adding a Text Comment to a Patient Report

*To add a text comment to the patient report, follow these steps:*

1. Press the **PATIENT** function key to display the patient directory.
2. Use the Trackball to highlight the desired study and press <ENTER>.
3. Click the [ACTIVATE] button.
4. Click the **Reports** tab to display the information.
5. Click the [TEXT COMMENTS] button to open a text box.
6. Use the Cypress system keypad or an external keyboard to type in the text box and then click [OK].

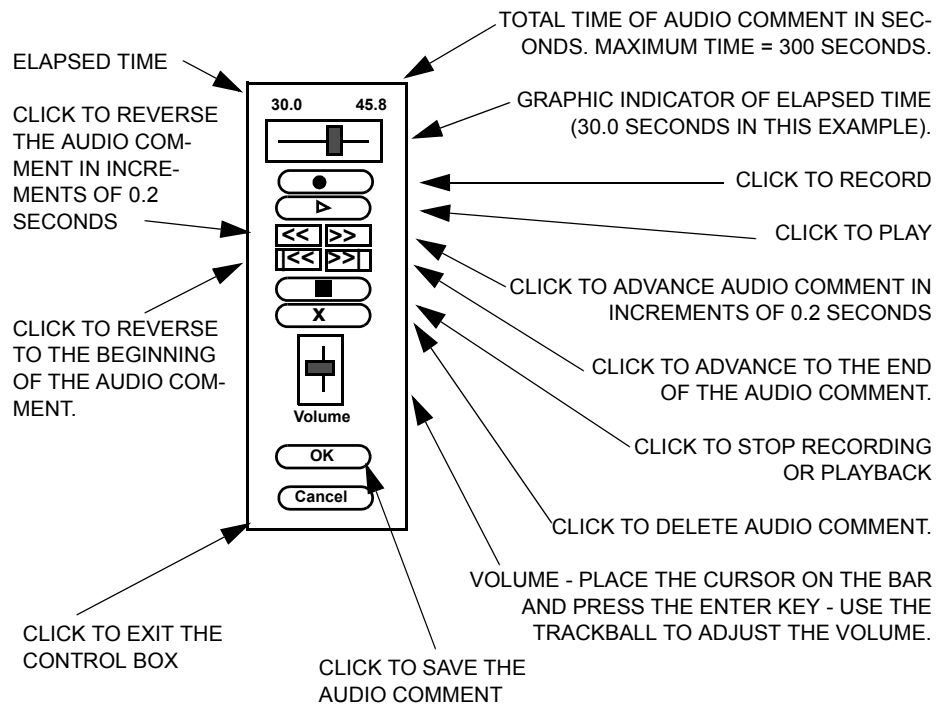
The text entered in the text box will appear in the **Comments** section of the Patient Report.

## Adding an Audio Comment to a Patient Report

*To add an audio comment to the study, follow these steps:*

1. Connect a microphone to the port located on the right side of the Cypress system.
2. Display the Audio menu using one of these methods:
  - Press the **PATIENT** key, click the **Reports** tab, and then click [AUDIO COMMENTS].
  - Press the **CALC** key, click [REPORT] in the selection menu, and then click [AUDIO COMMENTS].
  - Press the **TOOLS** key and click the [AUDIO] button.
3. Click the [AUDIO COMMENTS] button to display the audio control box (see Figure 20 on page 4-24).
4. Use the audio control box to *record*, *play*, and *edit* the audio comment.
5. To save the audio comment, click [OK].
6. To close the control box, click [CANCEL].

**NOTE** *The audio comment feature is available only at certain hardware revision levels. Contact your Siemens representative for additional information.*



**FIGURE 20. The Audio Control Box**

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This chapter describes how to scan, view, and save images. It describes specific controls for each of the following scanning states:

- 2D
- Color Flow
- Continuous Wave Doppler (CW)
- Pulsed Wave Doppler (PW)
- M-Mode

Controls used to complete scans and save images include:

- The time/gain compensation (TGC) controls
- The Main knob (changes for each scan mode)
- Soft windows (change for each scan mode)
- The Tools buttons (how they work for each scan mode)

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## Overview of the Scanning Process

### General Information

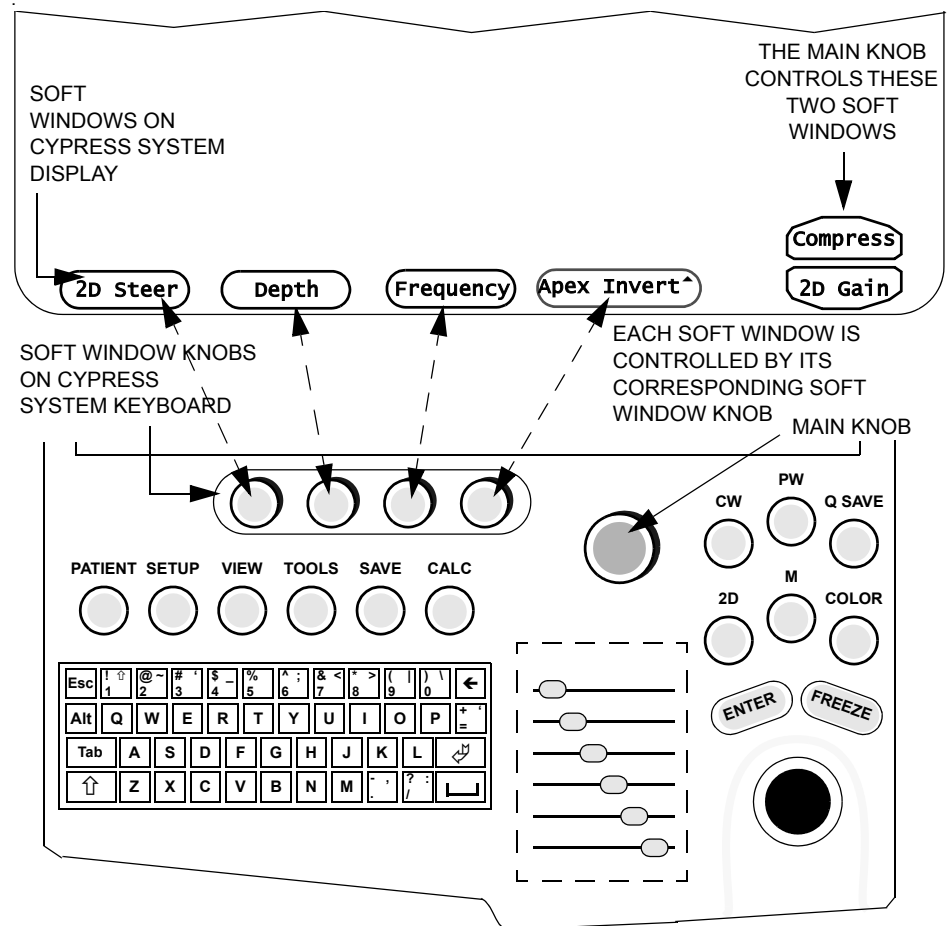
- Scanning is controlled using the Mode keys, Soft Window knobs, Tools, TGC slide pots, the Main knob, the **FREEZE** and <ENTER> keys. For a description of each of the controls, see “Keyboard Controls” on page 2-3.
- Use the Mode keys to switch between modes and between different formats of the same mode. See the sections in this chapter for specific information about each scanning mode.

### Basic Steps to Complete a Scanning Session

1. If you are not using the ACUSON Cypress basic cart or deluxe cart, place the Cypress system on a stable, level surface.
2. Connect the power cord.
3. Connect the transducer (and ECG cable for Cardiac studies).
4. Turn the Cypress system ON and allow it to complete the boot-up sequence. Never turn the Cypress system OFF until boot-up is complete.
5. Press the **PATIENT** function key to add a new patient, or select a patient with a previous study from the patient directory.
6. Scan the patient and use the system controls to optimize the image.
7. Use the Mode keys to activate the scanning modes.
8. Use the **FREEZE** key to freeze the image and activate the scrolling memory.
9. Press the **Q SAVE** or **•SAVE** key to save frames or loops.
10. To perform calculations, press the **CALC** key.
11. To view saved loops, press the **VIEW** key. To exit View, press a Mode key.
12. Press the **2D** key to exit any screen and return to the 2D screen.
13. Transfer the study to an MO disk or to a network server.
14. To scan another patient, press the **PATIENT** function key and select another patient from the directory, or add a new patient (see “Adding a New Patient” on page 4-9).
15. When finished scanning, press the **PATIENT** or **SETUP** function key and select the **Shutdown** tab.

## Using Soft Windows

The Soft Windows are functions displayed across the bottom of the screen. They vary depending on mode, state, and study type (Cardiac, Vascular, etc.). Soft Windows are controlled by the Main knob and by the four knobs located directly under the Soft Windows (see Figure 21). The Soft Window knobs are turned and/or pressed, depending on the assigned function. The functions are listed by mode on page 2-8 and page 2-9. Some Soft Windows are assigned two or more functions—these are indicated by a triangular icon in the upper right corner of the Soft Window. Press the corresponding Soft Window knob to display the additional function(s).



**FIGURE 21. Soft Windows are Controlled by the Soft Window Knobs**

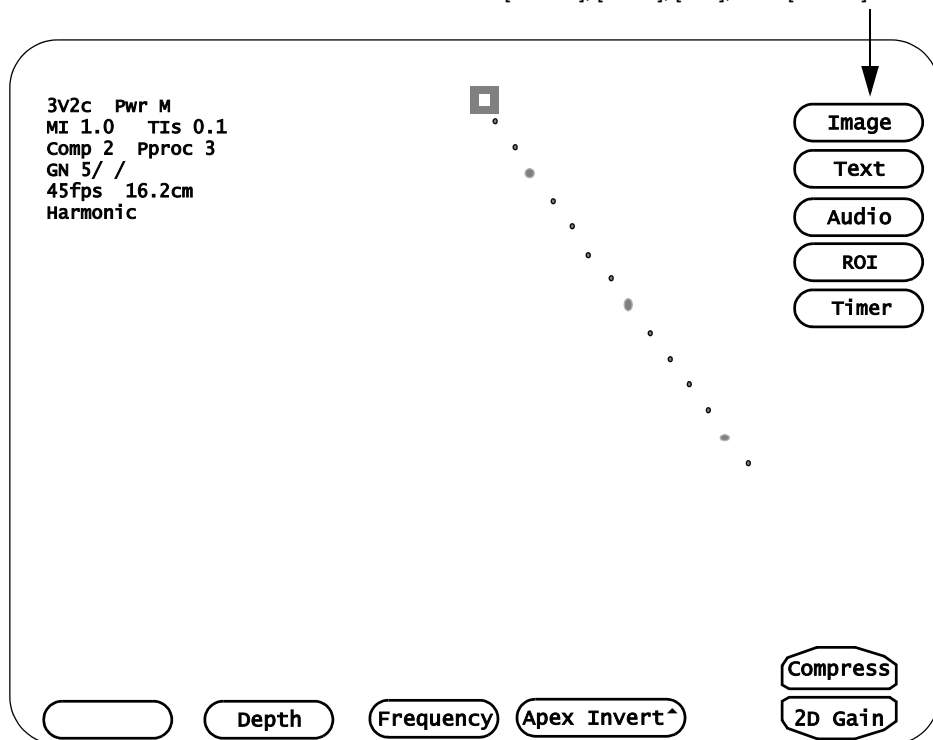
## Using Tools

Pressing the **TOOLS** function key opens a series of control buttons on the right side of the screen. These buttons control secondary image functions. The tools vary according to the active mode.

Use the Trackball and <ENTER> key to click (i.e., select) a control button. A menu opens. Select a function from the menu.

See the descriptions of each scanning mode on the following pages for information about specific tools.

THE TOOLS BUTTONS ARE LOCATED IN THE TOP RIGHT CORNER OF THE SCREEN. IN 2D MODE, THE TOOLS BUTTONS ARE [IMAGE], [TEXT], [ROI], AND [AUDIO].



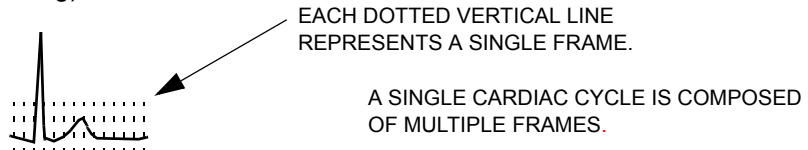
**FIGURE 22. The TOOLS Function Key Displays the Tools Buttons**



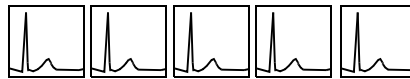
## Saving Image Data

The results of a scan are an image or a series of images. This section describes how images are saved.

- Frame:** The lowest level; a single image that can be viewed and printed. Press the **FREEZE** key to suspend active scanning and display the last acquired image on the screen as a still frame (press **FREEZE** again to resume scanning).

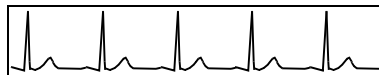


- Loop:** A series of frames. Press the **FREEZE** key and then turn the PLAY LOOP knob to display each loop one by one. Press **•SAVE** or **Q SAVE** to capture the loop while it is playing.



A SERIES OF LOOPS CAN BE VIEWED IN TWO FORMATS DEPENDING ON WHICH LABEL IS DISPLAYED IN THE SOFT WINDOW. THIS SHOWS THE PLAY LOOP FORMAT.

- Series:** A series of consecutive loops. Press the **FREEZE** key and then press the PLAY LOOP knob to display PLAY SERIES in the soft window. Turn the PLAY SERIES knob to view the series of consecutive loops in a seamless display. Press **•SAVE** or **Q SAVE** to capture the series of loops. Each loop in a series of loops can be viewed separately by pressing the PLAY SERIES knob to display PLAY LOOP in the soft window.



A SERIES OF LOOPS CAN BE VIEWED IN TWO FORMATS DEPENDING ON WHICH LABEL IS DISPLAYED IN THE SOFT WINDOW. THIS SHOWS THE PLAY SERIES FORMAT.

The **•SAVE** key can be programmed to save 4, 8, 16, or 32 seconds of data. The **Q SAVE** key can be programmed to save 1, 2, or 3 cardiac cycles when the patient's ECG is properly displayed on the screen. When the ECG is not connected, the **Q SAVE** key captures 2, 4, or 6 seconds of data.

**NOTE** *When an ECG is not connected to the patient, the Cypress system defaults to a time capture of 2 seconds per loop.*

## Viewing Saved Loops

Saved loops can be viewed at any time during an exam by pressing the **VIEW** function key. The system displays the most recently saved loop or frame. Press any Mode key to exit View.

**TABLE 12. Viewing Saved Loops Soft Windows**

<i>Window</i>	<i>Function/Description</i>
<b>Play All</b>	Plays each saved loop in a continuous rotation. When the PLAY ALL knob is pressed, the system plays the saved loops in the order they were saved. Press the <b>2D</b> key to exit Play All mode.
<b>Play Loop/ Play Series</b>	Press the knob to switch between the two functions. <ul style="list-style-type: none"> <li>■ To advance to the next loop/series, turn the knob clockwise.</li> <li>■ To return to the previous loop/series, turn the knob counter-clockwise.</li> </ul>
<b>Delete</b>	The Delete function is available in both the Play Loop and Play Series modes. When PLAY LOOP is displayed, pressing or turning the DELETE Soft Window knob deletes the currently displayed image data. When PLAY SERIES is displayed, pressing or turning the DELETE Soft Window knob deletes the currently displayed series.

**NOTE** Deleted loops cannot be retrieved.

**NOTE** A study must contain at least one loop. Therefore, the last loop or frame in a study cannot be deleted. For example, if a study contains three loops and you try to delete all three, the Cypress system will allow two loops to be deleted—but not the final loop. To delete the remaining loop, the entire study must be removed from the patient's file.

When viewing saved loops, the Main knob controls Search and Play (displayed on the bottom, right corner of the screen). Press the knob to switch between the two modes.



TO SWITCH  
BETWEEN  
SEARCH AND  
PLAY, PRESS  
THE MAIN KNOB

**TABLE 13. Main Knob Controls When Viewing Loops**

<i>Control</i>	<i>Function/Description</i>
<b>Search</b>	<p>In Search mode, turning the knob allows a frame-by-frame search.</p> <ul style="list-style-type: none"> <li>■ To search forward, turn the knob clockwise.</li> <li>■ To reverse the search, turn the knob counterclockwise.</li> </ul>
<b>Play</b>	<p>When PLAY is highlighted by pressing the Main knob, the PLAY label changes to NORMAL. NORMAL indicates the normal play-back speed. Turn the Main knob counterclockwise to select SLOW and clockwise to select FAST.</p> <p>This function is available in all full-screen View modes and Freeze modes when PLAY is displayed in the Soft Window controlled by the Main knob.</p>

## Flagging Images

Saved frames, loops, and series can be flagged. The Flag function is available when the system is in View or Freeze mode. When an image is flagged, a small flag icon is displayed in the top, right corner of the screen.



- To set the flag, turn the FLAG Soft Window knob clockwise.
- To remove the flag, turn the FLAG Soft Window knob counterclockwise.

When data is flagged, the amount of data flagged depends on the status of the PLAY LOOP/PLAY SERIES Soft Window. If PLAY LOOP is displayed in the Soft Window, the currently displayed single loop or frame is flagged. If PLAY SERIES is displayed, the entire series of loops is flagged.

**NOTE** *In Freeze mode, flagging does not save the data—you must also press either **•SAVE** or **Q SAVE** to save the data as part of the patient's study.*

## When to Use the Flag Function

### Removing Loops from a Study

*If a patient's study contains 50 loops and you want to trim the study to 20 loops, follow these steps:*

1. First flag the 20 loops you want to keep in the study.
2. Press **PATIENT** and highlight the Date and Time of the study.
3. Click [REMOVE].
4. An option box opens. Click the **Unflagged Images** radio box and then click [YES].

All frames, loops, and series not flagged are deleted. Note that deleted data cannot be retrieved.

### Removing Unflagged Loops

Since stress loops labeled with both a View and Stage are flagged automatically, you can easily remove all the unflagged loops from the study.

1. Press **PATIENT** and highlight the Date and Time of the study.
2. Click [REMOVE].
3. An option box opens. Click the **Unflagged Images** radio box and then click [YES].

ALL frames, loops, and series not flagged are deleted. Note that deleted data cannot be retrieved.

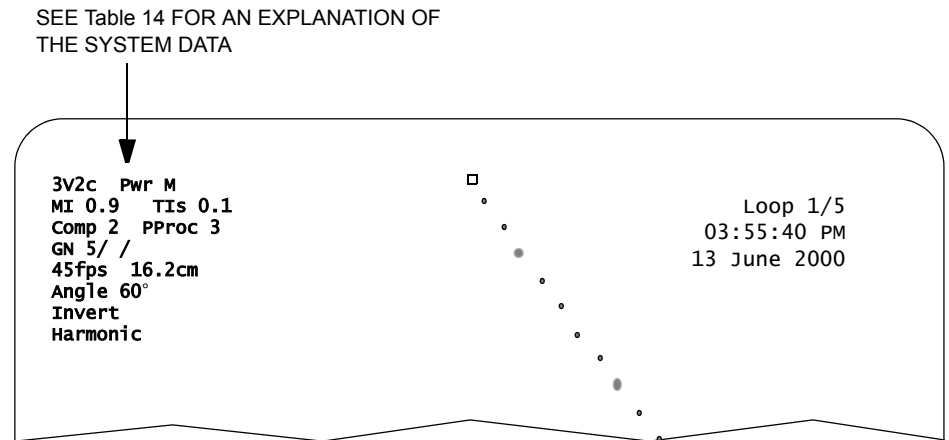
### Transferring a Study in Multimedia Format

*To transfer an entire patient study to a network server or an MO disk for permanent storage and also send the selected data to a computer in a multimedia format, follow these steps:*

1. Flag the selected images.
2. Press the **PATIENT** key and highlight the study Date and Time.
3. Click [SEND].
4. In the **Multimedia** section, check **Network** as the destination and click the **Only Flagged Loops** radio box.

## Cypress System Data

The upper left corner of the screen shows the System Data. The type of data displayed varies depending on the scanning mode, transducer type, and which options are set.



**FIGURE 23. The System Data**

Note that the system data changes as you change controls and work with the system. Always be aware of this information. It will let you know, for example, when you have reached the upper limits of ranges, etc.

Table 14 on page 5-10 describes each of the System Data fields. Not all fields appear all the time. When a field has a set range of values that range is noted. See the individual descriptions of scanning modes in this chapter for specific information on changing settings. Most of the fields are controlled by the Soft Windows and their options. When a field includes a variable number or letter, it is shown in the *Setting* column of the Table as the pound sign (#).

There is another set of information about the “trigger modes.” This information is displayed beneath the system data. See “Trigger Modes” on page 5-13 for details about the trigger modes.

TABLE 14. Explanation of the System Data Fields

<i>Setting</i>	<i>Function/Description</i>
#-# xx	<b>Transducer Type</b> Displays the name of the transducer currently connected to the Cypress. The frequency range depends on the type of transducer attached to the Cypress system.
Pwr x	<b>Transmit Power</b> Controls the maximum acoustic output of the transducer. Settings range from 5% to 100% of maximum. Use the <b>Transmit Power</b> option on the [IMAGE] button menu to select. <ul style="list-style-type: none"> <li>■ H (High), M (Medium), or L (Low)</li> </ul>
MI #.#	<b>Mechanical Index</b> MI is a relative indicator of the potential for mechanical effects and is used to estimate the potential for mechanical bioeffects.  The higher the index reading, the larger the potential. However, neither MI = 1.0, nor any other level, indicates that a bioeffect is actually occurring. Do not be alarmed by the reading, but use it to implement the ALARA (As Low As Reasonably Achievable) principle.
TIx #.#	<b>Thermal Index</b> TI is a relative indicator of temperature increase. The selections are Soft Tissue (s), Bone (b), or Cephalic (c).  TI monitors conditions that may lead to a temperature rise, whether at the surface, within the tissue, or at the point where the ultrasound is focusing on bone. Each Thermal Index estimates temperature rise under certain assumptions. <ul style="list-style-type: none"> <li>■ Soft Tissue (TIs): Cardiac, first trimester fetal, Vascular, and Abdominal</li> <li>■ Cranial Bone (TIC): Transcranial (bone near surface)</li> <li>■ Bone (TIb): Second and third trimester fetal (bone near focus)</li> </ul>
Compress #	<b>Compression or Dynamic Range</b> Use the Main knob to adjust the range. <ul style="list-style-type: none"> <li>■ The settings are: 1—9.</li> </ul>
PProc #	<b>Post Processing</b> Indicates the currently selected post-processing curve. There are 7 curves.

TABLE 14. Explanation of the System Data Fields

<i>Setting</i>	<i>Function/Description</i>
<b>GN</b> #/#/#	<p><b>Gain</b> Use the Main knob to adjust the gain. The setting is in this order: <i>2D/Color/Doppler</i>. For example a setting of: GN 5/ /13 shows a 2D gain of 5; no color gain; a Doppler gain of 13.</p> <ul style="list-style-type: none"> <li>■ For 2D Gain the range is: 1 through 28.</li> <li>■ For Color Gain the range is: 1 through 30.</li> <li>■ For Doppler Gain the range is: 1 through 25.</li> </ul>
<b>##fps</b>	<p><b>Frames Per Second</b> The speed at which the frames are displayed. Use the <b>Angle</b> option on the 2D image TOOLS menu to adjust the rate in 2D mode. Use the FRAME RATE Soft Window knob to adjust the rate in color mode.</p>
<b>##.#cm</b>	<p><b>2D Depth</b> (2D, Color, and M-Mode only) Use the DEPTH Soft Window knob to adjust the depth.</p> <ul style="list-style-type: none"> <li>■ The maximum scanning depth of the system is 24.4 cm.</li> </ul>
<b>HPF</b> ###HZ	<p><b>High Pass Filter</b> (Doppler Mode only) Use the FILTER Soft Window knob to adjust the filter.</p> <ul style="list-style-type: none"> <li>■ The range is from 200 Hz through 1400 Hz for CW and from 25 Hz through 1400 Hz for PW.</li> </ul>
<b>F#</b>	<p><b>Filter</b> (Color mode only) indicates the velocity filter applied to the Color Doppler.</p> <ul style="list-style-type: none"> <li>■ The range is F1 through F6.</li> </ul>
<b>Harmonic</b>	<p><b>Harmonic</b> If your transducer has harmonic mode, the word “Harmonic” will appear. Use the FREQUENCY Soft Window knob to turn harmonic on or off.</p> <ul style="list-style-type: none"> <li>■ The mode is ON when the word Harmonic is displayed.</li> </ul>
<b>Freq#</b>	<p><b>Frequency</b> The frequency of some transducers can be adjusted. If your transducer can be adjusted the word “Frequency” will be displayed. Use the FREQUENCY Soft Window knob to adjust the frequency.</p>
<b>Invert</b>	<p><b>Invert</b> Displayed when the spectral doppler flow display has been inverted. The spectrum is inverted using the corresponding Soft Window knob.</p>

**TABLE 14. Explanation of the System Data Fields**

<i>Setting</i>	<i>Function/Description</i>
$\angle$ <b>xx</b> <sup>°</sup>	<b>Angle</b> Displayed when the angle correction cursor is on the screen. The Angle is turned on and adjusted with the corresponding Soft Window knob.  The angle symbol appears in the System Data field when an angle equal to or greater than 1° is selected. The current angle correction setting appears to the right of the symbol.



## Trigger Modes

Triggered acquisition modes may be used if the advanced triggering option has been installed on the system. Triggered modes allow for ECG-gated scanning techniques. See Table 16 on page 5-23 for more information. The trigger mode information is displayed beneath the System Data. The trigger controls are assigned to the APEX INVERT Soft Window. Press the corresponding knob to display the triggering options and then turn the knob to adjust the settings. Note that the Advanced Triggering option must be installed for this Soft Window to have multiple functions.

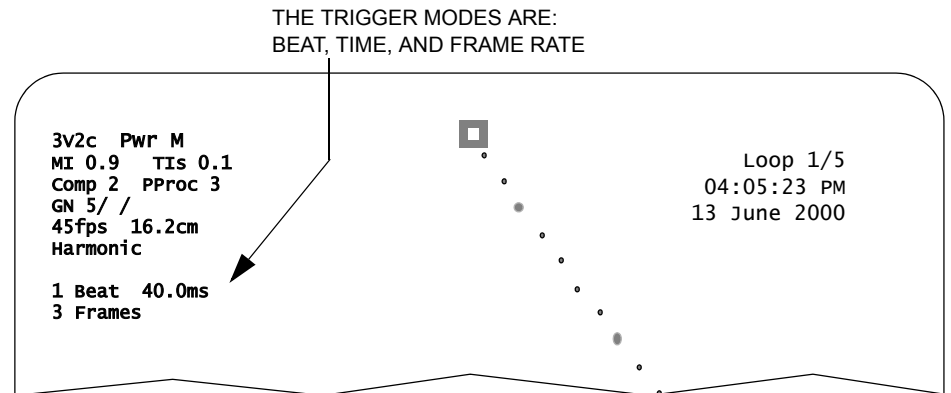


FIGURE 24. The Trigger Modes

Table 15 describes the trigger modes.

TABLE 15. Explanation of the Trigger Mode Fields

<i>Setting</i>	<i>Function/Description</i>
# <b>Beat(s)</b>	<b>Beat</b> Shows the number of beats selected for intermittent imaging mode. <ul style="list-style-type: none"> <li>■ The range is from 1 through 32.</li> </ul>
#.# <b>ms</b>	<b>Time</b> Increases the trigger time in milliseconds. <ul style="list-style-type: none"> <li>■ The range is from 8.0 ms through 1992.0 ms.</li> </ul>
# <b>Frames</b>	<b>Frames</b> Shows the number of frames that are produced in intermittent mode <ul style="list-style-type: none"> <li>■ The range is from 1 through 16 frames.</li> </ul>

## Keeping Track of Saved Loops

As loops are saved for a patient, the Cypress system keeps track of them. In Freeze, View, or Playback mode, the loop information is displayed in a counter at the top right corner of the screen. For example:

```

Loop 1/5
03:55:40 PM
13 June 2000
    
```

The lines display the following information:

- The first line displays the number assigned to the currently displayed loop (1 in the example). The second number displays the total number of loops in memory (5 in the example).
- The second line displays the time the current loop was captured.
- The third line displays the date the current loop was captured.

LOOP INFORMATION IS DISPLAYED:

1. IN **VIEW** MODE
2. WHEN THE **FREEZE** KEY IS PRESSED AND THERE ARE LOOPS TEMPORARILY STORED IN THE SCROLLING MEMORY

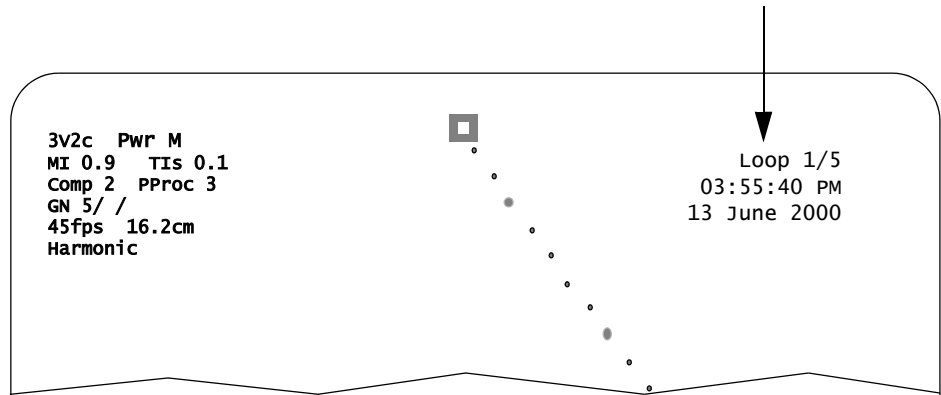


FIGURE 25. Loop Information

## Adding Text to an Image

There are two *methods* of adding text to an image:

- **Text:** uses the **TOOLS** function key to open the text window.
- **Quick Text:** once it has been turned on using the **Setup** menu, pressing any alphanumeric key on the Cypress system keypad opens the text window.

The following sections describe how each text method works.

### Text

Text labels can be added to images while in Freeze or Active mode (i.e., any-time except when doing calculations). There are two *types* of text that can be placed on images:

- Existing standard labels, for example, “Aorta” or “Left Ventricle.”
- New text or annotations that are added using the alphanumeric keypad, for example, “Check after 6 months.”

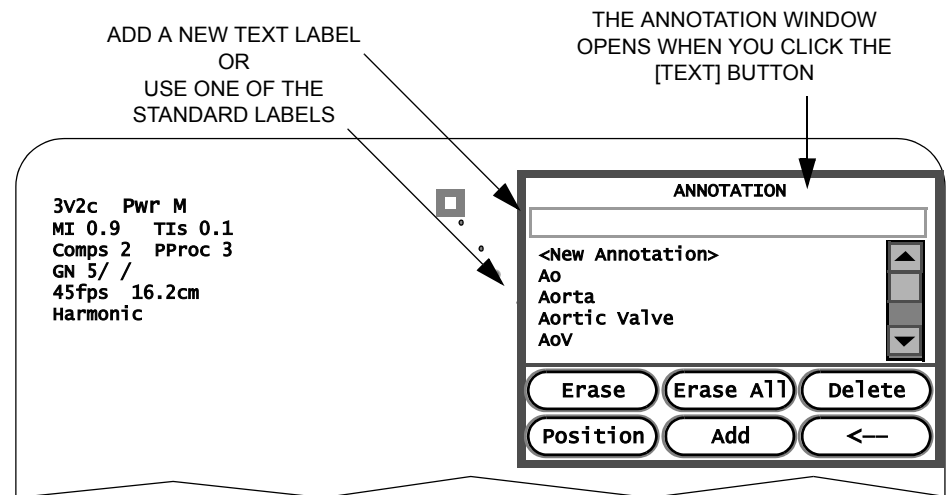


FIGURE 26. Adding Text Annotations

### Using the Text Function

*To add text labels to images, follow these steps:*

1. While scanning, press the **TOOLS** function key.
2. Click the [TEXT] button.
3. When the Annotation window opens, click either an existing label or **<New Annotation>**. If you select **<New Annotation>**, type text into the empty box.
4. Click the [POSITION] button in the Annotation window.
5. The text will be affixed to an arrow that can be moved around the screen using the Trackball. When the label is positioned where you want it, press <ENTER>.
6. When you are finished, click the [CLOSE] button.
7. The new annotation will be saved in the text menu until it is deleted from the menu.

### Removing Text Annotations from an Image

There are two methods of removing text annotations from an image.

*To remove one or more text annotations from an image using the TOOLS menu:*

1. While scanning, press the **TOOLS** function key.
2. Click the [TEXT] button.
3. Remove the text:
  - *To delete a single annotation:* In the annotation list, highlight the annotation to be erased from the screen and click [ERASE]. If the annotation being deleted appears on the screen more than once, the annotation placed last will be the first erased.
  - *To delete all the annotations:* Click [ERASE ALL].
4. When you are finished, click the [CLOSE] button.

*To remove one or more text annotations from an image using the Quick Text:*

1. Select the annotation that is to be deleted using the <TAB> key (pressing <TAB> cycles through the annotations on the screen).
2. When the desired annotation is highlighted, press <←> to delete it.

### Repositioning Text Annotations on an Image

1. Select the annotation to be repositioned using the <TAB> key (pressing <TAB> cycles through the annotations on the screen).
2. Once the desired annotation is highlighted (turns green), use the Trackball to move the position.
3. Press <ENTER> to lock the annotation in place or <ESC> to cancel the operation.

### Adding a User-Defined Annotation to the Text Menu

*To add a user-defined text annotation to the menu, follow these steps:*

1. While scanning, press the **TOOLS** function key.
2. Click the [TEXT] button.
3. When the Annotation window opens, click **<New Annotation>**.
4. Type text into the empty box.
5. Click the [ADD] button.

The annotation will be saved in the text menu until it is deleted from the menu.

### Deleting Text Annotations from the Text Menu

Text annotation that have been added to the menu using the <New Annotation> option can be deleted.

*To delete a text annotation from the menu, follow these steps:*

1. While scanning, press the **TOOLS** function key.
2. Click the [TEXT] button.
3. Highlight the user-defined annotation and click [DELETE]. Note that multiple contiguous annotations can be deleted by first clicking on an annotation and then holding down the <↑> key and clicking another annotation. For a non-contiguous set, use the <CTRL> key.
4. When you are finished, click the [CLOSE] button.

### Hiding the Factory-Defined List

The factory-defined list of annotations can be hidden from view by removing the checkmark from the **System Annotations** box. To access the System Annotations box, follow these steps:

1. Press the **TOOLS** function key and select [TEXT].
2. Click the checkmark in the **System Annotations** box to remove the check.

## Quick Text

The Quick Text method of adding text uses the Cypress System keypad to activate the Text function and to automatically find stored annotations (auto-find).

**NOTE** *The Quick Text function is not available while the Calculations package is open, or in a Patient or Setup menu or submenu.*

**NOTE** *Quick Text annotations cannot be added to a quad screen and Quick Text annotations are not displayed in the quad-screen format.*

### Activating/Deactivating the Quick Text Function

*To turn on the Quick Text function, follow these steps:*

1. Press the **SETUP** key and highlight **Quick Text**.
2. To activate the Quick Text function, click to place a checkmark in the box. To deactivate Quick Text, click to remove the checkmark.

### Adding a Quick Text Annotation to the Screen

*To add Quick Text labels to images while scanning, follow these steps:*

1. Make sure that Quick Text has been activated using the **Setup** menu.
2. To open the Quick Text function, press any alphanumeric key on the Cypress keypad (or external keyboard).
3. Type your text until the annotation is displayed and highlighted in the Text box. To backspace and erase a single letter, use the <←> key.
4. Press <ENTER> and use the Trackball to position the annotation.
5. To lock the position and exit Quick Text, press <ENTER>.

### Removing Quick Text Annotations

*To delete Quick Text annotations, follow these steps:*

1. Remove the Quick Text:
  - *To delete a single annotation:* On the screen, highlight the annotation that you want to remove by pressing the <TAB> key. If more than one annotation is on the screen, press the <TAB> key to cycle through the annotations. To remove the highlighted annotation, press the <←> key.
  - *To delete all the annotations:* Press and hold the <ALT> key and then press the <←> key.
2. To exit Quick Text, press <ESC>.

**Quick Text Notes:**

- Use the spacebar to end auto-find.
- Once the Quick Text function has been activated by pressing an alphanumeric key, pressing <ESC> deactivates Quick Text. Annotations not locked into position will be deleted.
- The Quick Text function is not available in the following cases: while the Calc package is open, when the Tools menu is displayed, and in a Patient or Setup menu or submenu.
- Annotations cannot be added to a Quad screen.
- Annotations are not displayed in the Quad screen format.
- Press the <ESC> key to exit any function.

**Adding an Arrow when Quick Text is Enabled**

1. Press the <↻> key on the alphanumeric keypad to display an arrow on the screen.
2. Use the Trackball to move and position the arrow.
3. Press <↻> to rotate the arrow in a clockwise direction in 45° increments.
4. When the arrow is correctly positioned, press the <ENTER> key (located above the Trackball) to anchor the arrow.

**Adding an Arrow when Quick Text is Not Enabled**

1. Press the **TOOLS** key and click [TEXT] to open the Annotations window.
2. Click the arrow button to display the on-screen arrow.
3. Use the Trackball to position the arrow on the screen.
4. Press the <↻> key to rotate the arrow in a clockwise direction in 45° increments.
5. When the arrow is correctly positioned, press the <ENTER> key (located above the Trackball) to anchor the arrow.

**Removing an Arrow**

1. Make sure that the text Annotation window is closed.
2. Press the <TAB> key until the arrow is highlighted (if there is more than one annotation on the screen the <TAB> key cycles through each).
3. Press the BACKSPACE key <←> to remove the arrow.

## Zoom

The zoom function lets you select and enlarge a portion of a scanned image. Follow these steps to use the zoom function:

1. Press the second Soft Window knob to toggle between DEPTH and ZOOM.
2. When ZOOM is displayed in the window, the 1.5X Zoom box will open. To select the 2.0X Zoom box, turn the Soft Window knob clockwise. To return to the 1.5X Zoom box, turn the knob counterclockwise.
3. Once the desired Zoom box is selected, use the Trackball to position the box and press <ENTER> to activate the zoom function.
4. To exit and return to a full screen display, press the ZOOM knob.

### Zoom Notes:

- The ZOOM function can be activated/deactivated only in the full-screen display.
- The Zoom box has a variable number of positions.



# 2D Scanning

2D sector scanning is the default mode for the Cypress system. To activate 2D from a menu or from another scanning mode, press the 2D mode key. Active system controls related to 2D operation are described on the following pages.

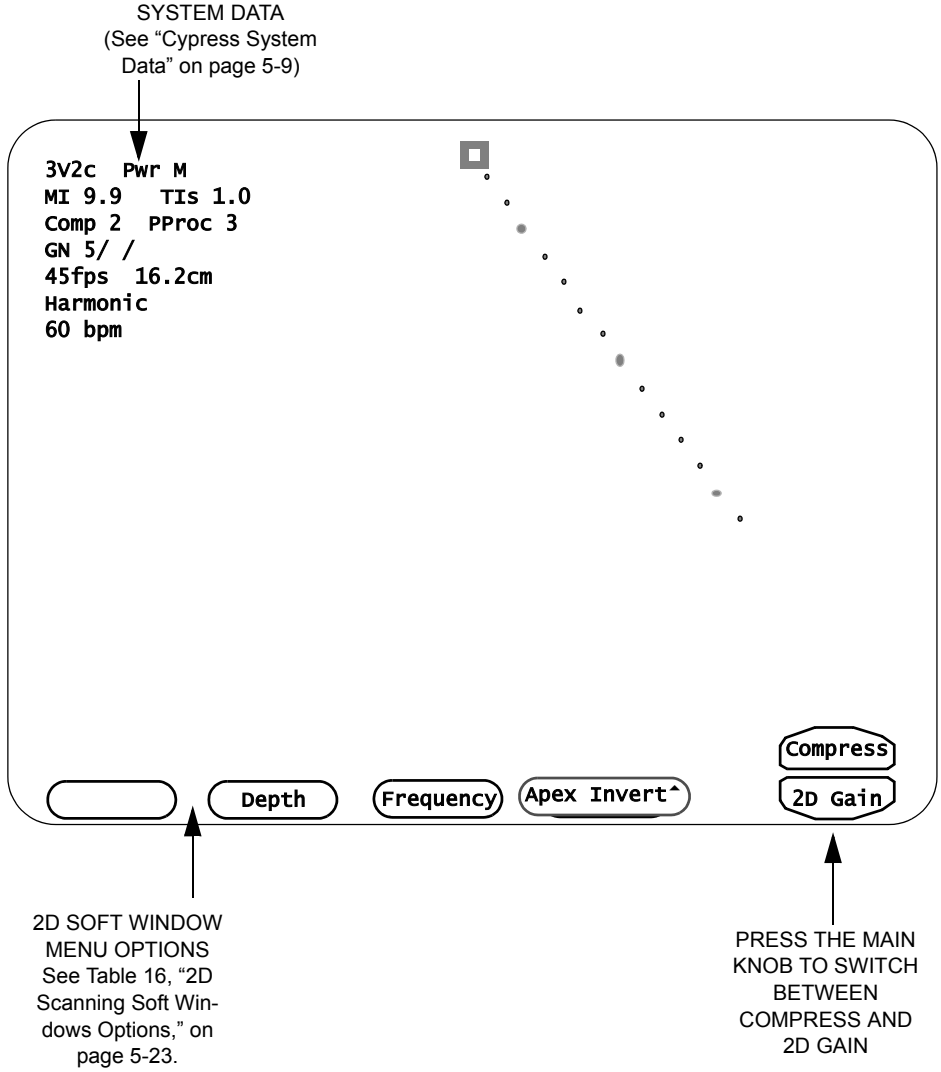


FIGURE 27. The 2D Scanning Screen

## Activate the 2D Display

To activate the 2D display:

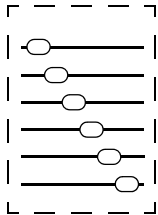


1. Press the **2D** mode key once.

**NOTE** *2D is the default scanning mode for the Cypress system.*

**NOTE** *The shallowest 10% of the scanning depth (nearest the transducer face) is not displayed. For example, if a scanning depth of 16.2 cm is selected, the shallowest 1.6 cm is not displayed. To view the extreme near field, reduce the scanning depth.*

## Time/Gain Compensation (TGC) Controls



The time/gain compensation (TGC) controls are six slide-pots that adjust the amplification of the 2D image data. Each slide-pot is associated with a scanning depth:

- Slide-pots at the top of the slide-pot console control near-field amplification.
- Slide-pots at the bottom of the slide-pot console control far-field amplification.

## Main Knob Controls Compress and Gain



TO SWITCH BETWEEN COMPRESS AND GAIN, PRESS THE MAIN KNOB.

When you press the **2D** mode key, two options appear—Compress and 2D Gain. They are controlled by the Main knob. Press the Main knob to toggle between the options. The current setting is shown in the upper left portion of the screen.

- **Compress** Adjusts the presentation of the 2D image by changing the three Dynamic Range settings.
- **2D Gain** (the system default) Turn the knob clockwise to increase the overall amplification of the 2D image data. Turn counterclockwise to decrease.

In Freeze mode, turn the Main knob to scroll through the frames or to select the playback speed.

## 2D Soft Windows

Table 16 describes how Soft Windows and their corresponding knobs on the keyboard operate in 2D scanning. The functions available to you depend on which options are installed on your Cypress system.

**TABLE 16. 2D Scanning Soft Windows Options**

<i>Window/Function</i>	<i>Description</i>
<p><b>2D Steer</b> (Linear) Changes the scanning angle of the 2D image</p>	<p>There are three positions: 0°, +20°, -20°. Press the corresponding Soft Window knob to select 2D STEER.</p> <ul style="list-style-type: none"> <li>■ To steer the beam to the right, turn the knob clockwise.</li> <li>■ To steer the beam to the left, turn the knob counterclockwise.</li> </ul>
<p><b>Protocol</b> (when in a stress protocol)</p>	<p>Displays the <b>Stage</b> and <b>View</b> labels. Continue turning the knob until either <b>Rest</b> (for 2-Stage and 3-Stage) or <b>Base</b> (for Pharmacological) is highlighted.</p>
<p><b>Depth</b> Adjusts the scanning field of view</p>	<p>Scanning depth is measured in centimeters and varies according to the transducer frequency. Press the corresponding Soft Window knob to select DEPTH.</p> <ul style="list-style-type: none"> <li>■ For a <i>shallower</i> depth, turn the knob counterclockwise.</li> <li>■ For a <i>deeper</i> depth, turn the knob clockwise.</li> </ul> <p>The current selection is displayed on the top left corner of the screen (see "Cypress System Data" on page 5-9).</p>
<p><b>Zoom</b> (Available only in active scanning) Allows you to select and enlarge a portion of the image.</p>	<p>Press the corresponding Soft Window knob to select ZOOM. This places the "zoom" box on the image. Use the Trackball to position the Zoom box</p> <ul style="list-style-type: none"> <li>■ To change the magnification factor, turn the knob clockwise.</li> <li>■ Press &lt;ENTER&gt; to enlarge the image.</li> <li>■ To reposition or resize the zoom box, turn the knob counterclockwise.</li> </ul> <p>Press the ZOOM Soft Window knob to exit.</p>

**TABLE 16. 2D Scanning Soft Windows Options**

<i>Window/Function</i>	<i>Description</i>
<p><b>Frequency</b> Turns second harmonic imaging ON and OFF or adjusts the transmit frequency (depending on the transducer type).</p>	<p>Some transducers are capable of employing second harmonic imaging. Second harmonic imaging uses a lower transmit frequency and a higher receive frequency. Harmonic imaging can improve image quality and edge definition in difficult studies.</p> <ul style="list-style-type: none"> <li>■ For the 3V2c transducer, turn or press the knob to turn Harmonic mode ON or OFF. The default state is ON.</li> <li>■ For the 7V3c transducer, turn the knob to switch between a “low” center frequency of 5 MHz and a “high” center frequency of 6 MHz.</li> <li>■ For the 7L3 transducer, turn the knob to switch between a “low” center frequency of 5 MHz and a “high” center frequency of 7 MHz.</li> </ul> <p>Harmonic is ON when “Harmonic” is displayed with the System Data in the top left corner of the screen; Frequency can be adjusted when “Frequency” is displayed with the System Data. See “Cypress System Data” on page 5-9 and Table 14 on page 5-10.</p>
<p><b>Apex Invert</b></p>	<p>Moves the orientation of the image so that the apex switches from the top to the bottom of the screen.</p> <p>Press the corresponding Soft Window knob to select APEX INVERT.</p> <ul style="list-style-type: none"> <li>■ To invert the image turn the knob. Turn again to return to normal.</li> </ul>
<p><b>Fine Power</b> Adjusts the Mechanical Index (MI) setting.</p>	<p>Press the corresponding Soft Window knob to select FINE POWER.</p> <ul style="list-style-type: none"> <li>■ To decrease the MI, turn the knob counterclockwise.</li> <li>■ To increase the MI, turn the knob clockwise.</li> </ul> <p>The MI setting is displayed in the data field located in the upper left portion of the screen (see Table 14 on page 5-10 for more information).</p>

TABLE 16. 2D Scanning Soft Windows Options

<i>Window/Function</i>	<i>Description</i>
<p><b>Beat, Time, and Frames</b> are only available when the advanced triggering option is installed.</p>	<p><b>Advanced Triggering</b> (<i>Cardiac only</i>)</p> <p>Triggered modes allow for ECG-gated scanning techniques.</p> <p>To use these modes:</p> <ol style="list-style-type: none"> <li>1. The patient must be connected to electrocardiographic leads or an external source of the ECG waveform, or R-wave trigger must be connected to the system.</li> <li>2. The study must be a stress protocol.</li> </ol> <p>Triggered acquisition modes may be restricted to specific protocols, such as stress echocardiography and contrast imaging.</p> <p>Press the corresponding Soft Window knob to display the triggering options: Beats, Frames or Time.</p> <ul style="list-style-type: none"> <li>■ Press the knob to display the triggering options and then turn the knob to adjust the setting.</li> </ul> <p><b>NOTE:</b> <i>As with any echocardiographic technique that uses ECG triggering, for this process to function properly a stable and reliable waveform or trigger must be detected by the system. Artifacts or other irregularities such as arrhythmias may cause problems in the detection of trigger points such as the R-wave.</i></p> <p><b>NOTE:</b> <i>To resume normal scanning when you are finished using the Advanced Triggering option, be sure to reset the Beat, Time, and Frames values to their lowest value.</i></p>
<p><b>Beat</b></p> <p>Selects the number of beats for intermittent imaging mode.</p>	<p>In intermittent imaging mode, the system scans only on the selected heartbeats. Press the corresponding Soft Window knob to select BEAT.</p> <ul style="list-style-type: none"> <li>■ Turn the knob to select a number.</li> </ul> <p>The current selection is displayed under the System Data (for example, "1 Beat").</p>

**TABLE 16. 2D Scanning Soft Windows Options**

<i>Window/Function</i>	<i>Description</i>
<b>Time</b> Increases the trigger time in milliseconds.	As the knob is turned, the delay is increased and the trigger moves. Press the corresponding Soft Window knob to select TIME. <ul style="list-style-type: none"> <li>■ To increase trigger times to the right of QRS, turn the knob clockwise.</li> </ul> The current selection is displayed under the System Data (for example, “40.0 ms”).
<b>Frames</b> Selects the number of frames that are produced in intermittent mode.	Press the corresponding Soft Window knob to select FRAMES. <ul style="list-style-type: none"> <li>■ Turn the knob to select a number. The range is from 1 to 16.</li> </ul> The current selection is displayed under the System Data (for example, “3 Frames”).

## 2D Tools

Pressing the **TOOLS** function key in 2D scanning mode opens a series of control buttons. These buttons provide controls for secondary image functions. See Table 17 on page 5-28 for a description of the 2D Tools functions.

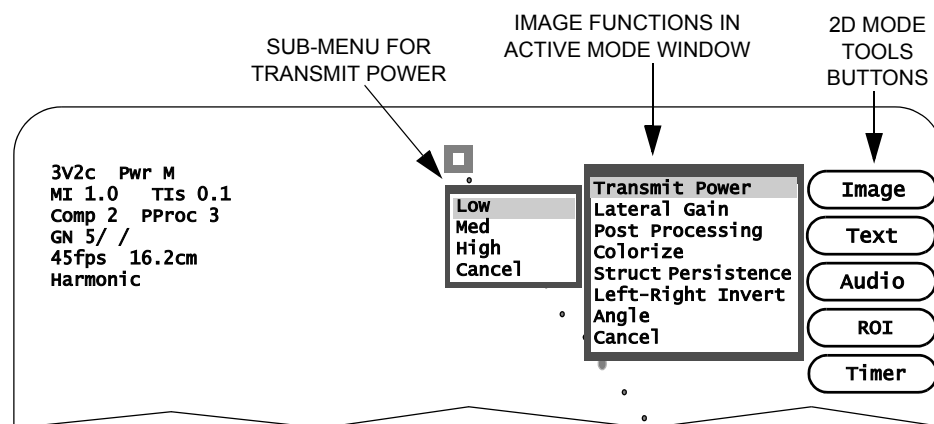


FIGURE 28. 2D Tools

To use the Tools functions, follow these steps:

1. Start a 2D scan by pressing the **2D** mode key.
2. Press the **TOOLS** Function key to display the menu of 2D tools.
3. Select one of the Tools buttons:
  - Click [IMAGE] to open a menu of adjustable controls. This menu differs depending on whether you are in Active mode or Freeze mode. Use the Trackball to highlight the desired option and press <ENTER>. If there is a sub-menu for the selected option, another window opens. Highlight the desired option and press <ENTER> to activate the change. Press **TOOLS** to exit the menu. To exit the menu without activating the change, highlight **Cancel** and press <ENTER>.
  - Click [TEXT] to add text to an image in either Freeze or Active mode.
  - Click [ROI] to capture a selected area of the image using the ROI (Region of Interest) box.
  - Click [AUDIO] to record an audio annotation.
  - Click [TIMER] to start the time counter.

### [IMAGE] BUTTON CONTROLS:

#### In Active Mode:

Transmit Power  
Lateral Gain  
Post Processing  
Colorize  
Structure Persistence  
Left-Right Invert  
Angle

#### In Freeze Mode:

Colorize

Table 17 describes the menu options for the **TOOLS** buttons in 2D scanning mode.

**TABLE 17. 2D Tools Controls**

<i>Button</i>	<i>Description</i>
<b>Image</b>	<p>Click [IMAGE] to open the menu with the following options:</p> <ul style="list-style-type: none"> <li>■ <b>Transmit Power</b> Controls the maximum acoustic output of the transducer. Settings range from 5% to 100% of maximum. Use the lowest setting consistent with diagnostic quality. The current mechanical index (MI) and thermal index (TI) of the acoustic output setting are displayed with the System Data. <ul style="list-style-type: none"> <li><b>NOTE:</b> Refer to the “Safety, Standards, and Accuracy” section of this manual, and the AIUM document provided with your system “Medical Ultrasound Safety” for important information about Acoustic Output.</li> </ul> </li> <li>■ <b>Lateral Gain</b> Select from three preset lateral gain curves. The lateral gain pre-sets increase the gain along the edges of the 2D sector. Curve 3 provides the most lateral gain.</li> <li>■ <b>Post Processing</b> Select from seven post processing or grayscale compression curves. The number 2 selection is a linear setting.</li> <li>■ <b>Colorize</b> Applies a variety of colorized maps overlaying the grayshade image. Colorize is useful in certain situations to optimize contrast resolution.</li> <li>■ <b>Structure Persistence</b> Turns image persistence to Low, Medium, or High. The default setting depends on the probe. The higher the setting, the smoother the image.</li> <li>■ <b>Left-Right Invert</b> Switches the orientation of the image from left to right. When Left-Right Invert is OFF, an index marker appears near the top of the sector on the right side.</li> <li>■ <b>Angle</b> Reduces or increases the sector scan angle. For the 77° sector angle, select either <i>Angle 1</i> for 45 fps (frames per second) or <i>Angle 2</i> for 33 fps; a 90° angle is automatically set to 33 fps (select <i>Angle 3</i>). <ul style="list-style-type: none"> <li><b>NOTE:</b> A higher frame rate requires more machine memory and creates larger studies. Thus, 45 fps uses more memory than 33 fps. Studies created with higher frame rates require more time to archive and allow for fewer studies to be archived on the removable disk.</li> </ul> </li> </ul>

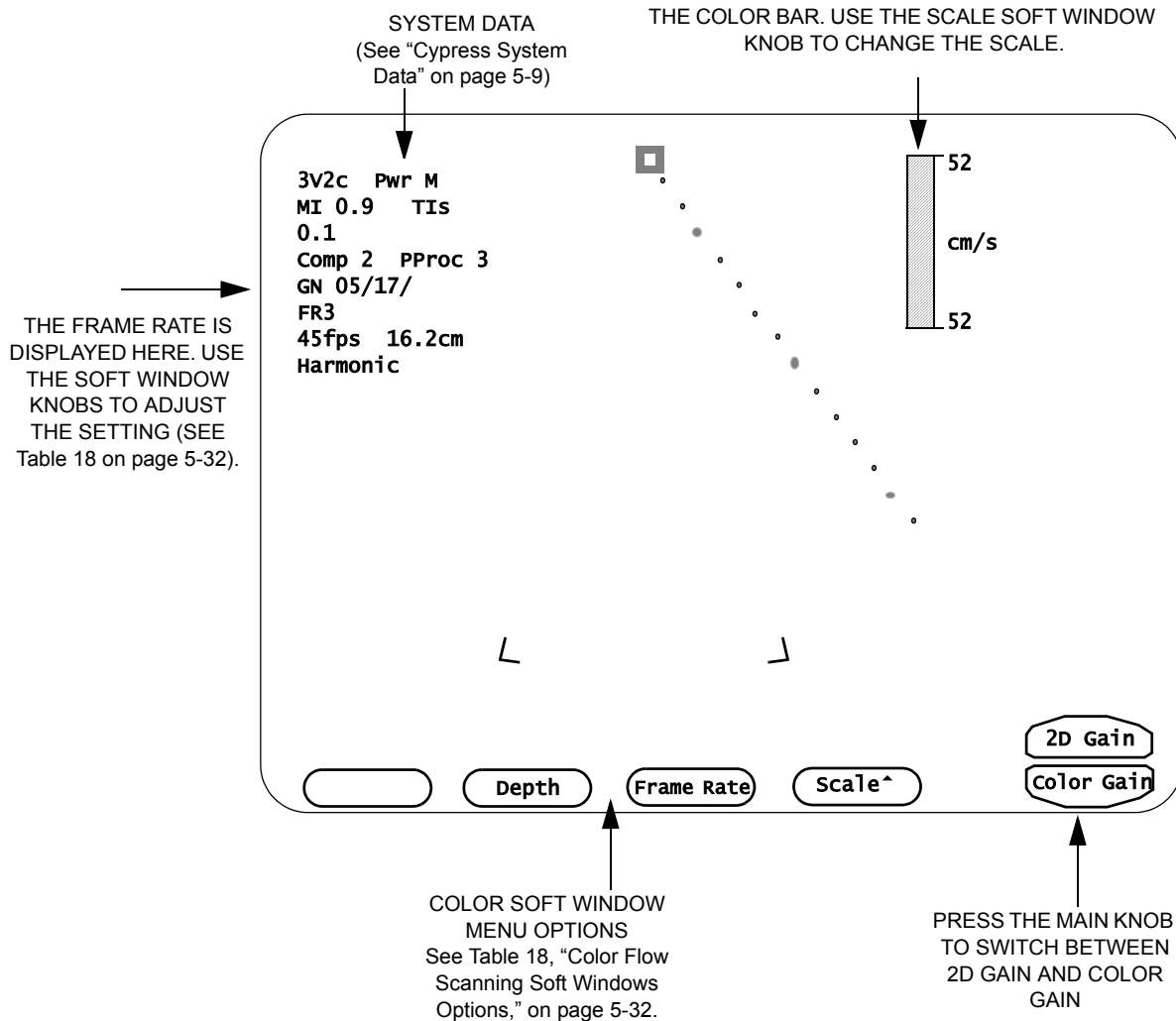


TABLE 17. 2D Tools Controls

<i>Button</i>	<i>Description</i>
<b>Text</b>	Adds text labels to an image. See “Adding Text to an Image” on page 5-15 for details.
<b>ROI</b>	(Region of Interest) Places a box in the 2D sector that allows the capture of selected areas of the image. Use the Trackball to move the box to the desired area.
<b>Audio</b>	Adds an audio annotation to the study.
<b>Timer</b>	<p><b>Procedure Timer</b> — A timer is available for all exams. To access the timer, follow these steps:</p> <ol style="list-style-type: none"> <li>1. Press <b>TOOLS</b> and click the [TIMER] button.</li> <li>2. Select [START] to display the timer. <ul style="list-style-type: none"> <li>■ <b>Start</b>: Starts the timer clock.</li> <li>■ <b>Restart</b>: Starts the timer clock once it has been stopped.</li> <li>■ <b>Stop</b>: Stops the timer clock.</li> <li>■ <b>Off</b>: Stops the timer clock and removes it from the screen.</li> <li>■ <b>Cancel</b>: Closes the menu without changing the timer clock.</li> </ul> </li> </ol>

## Color Flow Scanning

To turn color flow mapping ON or OFF, press the **COLOR** (Color Flow) mode key. Active system controls related to color flow mapping are described on the following pages.



**FIGURE 29. The Color Flow Scanning Screen**

## Activate the Color Flow Display

To activate the color flow display:



1. Press the **COLOR** mode key once. The trackball controls the position of the color sector.

**NOTE** *The 2D display must be active to use Color Flow mode.*

**NOTE** *Once color flow is acquired in active 2D, the color display can be turned OFF/ON in review mode and freeze mode.*

**NOTE** *The shallowest 10% of the scanning depth (nearest the transducer face) is not displayed. For example, if a scanning depth of 16.2 cm is selected, the shallowest 1.6 cm is not displayed.*

## Main Knob Controls 2D and Color Gain

When you press the **COLOR** mode key two options appear—2D Gain and Color Gain. They are controlled by the Main knob. Press the Main knob to toggle between the options.



TO SWITCH  
BETWEEN  
2D AND COLOR  
GAIN, PRESS  
THE MAIN KNOB

- **2D Gain** Turn the knob clockwise to increase the overall amplification of the 2D image data. Turn counterclockwise to decrease.
- **Color Gain** Turn the knob clockwise to increase the overall amplification of the color flow image data. Turn counterclockwise to decrease.

In Freeze mode, use the Main knob to search frame-by-frame or to set the playback speed.

## Color Flow Soft Windows

Table 18 describes how the Soft Windows and their corresponding knobs on the keyboard operate in Color Flow scanning.

**TABLE 18. Color Flow Scanning Soft Windows Options**

<i>Window/Function</i>	<i>Description</i>
<b>C Steer</b> <i>(Vascular only)</i> Color Steering for the 7L3 transducer.	Changes the angle of the color box within the 2D image. Press the corresponding Soft Window knob to select C STEER. <ul style="list-style-type: none"> <li>■ To steer to the right, turn the knob clockwise.</li> <li>■ To steer to the left, turn the knob counterclockwise.</li> </ul>
<b>Depth</b>	Scanning depth is measured in centimeters and is displayed on the top left corner of the screen (see "Cypress System Data" on page 5-9). Scanning depth varies with transducer frequency. The maximum scanning depth of the system is 24.4 cm. <ul style="list-style-type: none"> <li>■ For a <i>shallower</i> depth, turn the knob counterclockwise.</li> <li>■ For a <i>deeper</i> depth, turn the knob clockwise.</li> </ul>
<b>Zoom</b> <i>(Available only in active scanning)</i> Allows you to select and enlarge a portion of the image.	Press the corresponding Soft Window knob to select ZOOM. This places the "zoom" box on the image. Use the Trackball to position the Zoom box <ul style="list-style-type: none"> <li>■ To change the magnification factor, turn the knob clockwise.</li> <li>■ Press &lt;ENTER&gt; to enlarge the image.</li> <li>■ To reposition or resize the zoom box, turn the knob counterclockwise.</li> </ul> Press the ZOOM Soft Window knob to exit.

**TABLE 18. Color Flow Scanning Soft Windows Options**

<i>Window/Function</i>	<i>Description</i>
<b>Frame Rate</b> <i>(Cardiac only)</i> Increases or decreases the color flow frame rate.	<p>Increasing the frame rate decreases the packet size (ensemble length or the number of interrogations) of each color line, and decreases the number of color lines in the color sector. Higher frame rates may be useful in detecting jets of short duration, or when the patient has a high heart rate.</p> <p>Decreasing the frame rate increases the packet size and the number of lines per color sector. This improves definition or resolution of the color display.</p> <p>The range is from FR1 to FR5. The current selection is displayed under the System Data (see “Cypress System Data” on page 5-9).</p> <ul style="list-style-type: none"> <li>■ To increase the color flow frame rate, turn the knob clockwise.</li> <li>■ To decrease the color flow frame rate, turn the knob counterclockwise.</li> </ul>
<b>Width</b> Changes the width of the color box	<p>The width of the color box can be increased or decreased within the 2D image. Press the corresponding knob to select WIDTH.</p> <ul style="list-style-type: none"> <li>■ To increase the width, turn the knob clockwise.</li> <li>■ To decrease the width, turn the knob counterclockwise.</li> </ul>
<b>Height</b> Changes the height of the color box	<p>The height of the color box can be increased or decreased within the 2D image. Press the corresponding knob to select HEIGHT.</p> <ul style="list-style-type: none"> <li>■ To increase the height, turn the knob clockwise.</li> <li>■ To decrease the height, turn the knob counterclockwise.</li> </ul>
<b>Invert</b> Reverses the display of forward and reverse flow	<p>The Color Doppler display can be inverted, reversing the display of forward and reverse flow. Press the corresponding knob to select INVERT.</p> <ul style="list-style-type: none"> <li>■ Turn the knob to invert the display.</li> </ul> <p>Invert is shown to the right side of the image as an inverted color bar.</p>

**TABLE 18. Color Flow Scanning Soft Windows Options**

<i>Window/Function</i>	<i>Description</i>
<b>Scale</b> Changes the velocity limits	<p>Setting the Scale higher increases the velocity limits of the color flow signal and reduces aliasing.</p> <p>Setting the Scale lower decreases the velocity limits of the color flow signal. This may be useful in detecting low velocity blood flow.</p> <p>Press the corresponding knob to select SCALE.</p> <ul style="list-style-type: none"> <li>■ To increase the velocity setting, turn the knob clockwise.</li> <li>■ To decrease the velocity setting, turn the knob counterclockwise.</li> </ul>
<b>Filter</b> Applies a velocity filter to Color Doppler	<p>The settings are 1—6. A setting of 6 applies the maximum velocity filter.</p> <p>Press the corresponding knob to select FILTER.</p> <ul style="list-style-type: none"> <li>■ To increase the velocity filter, turn the knob clockwise.</li> <li>■ To decrease the velocity filter, turn the knob counterclockwise.</li> </ul>

## Color Flow Tools

Pressing the **TOOLS** function key in color flow scanning mode opens a series of control buttons. These buttons provide controls for secondary image functions. See Table 19 on page 5-36 for a description of the Color Flow Tools options.

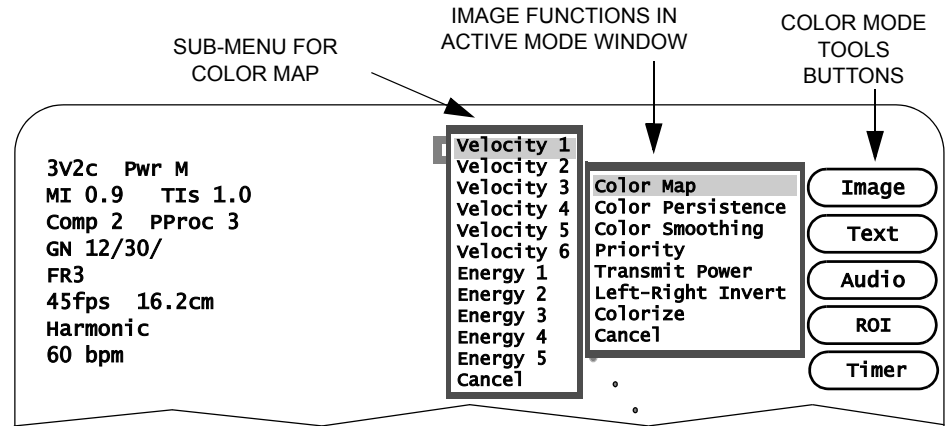


FIGURE 30. Color Flow Tools

To use the Tools functions, follow these steps:

1. Start a color scan by pressing the **COLOR** mode key.
2. Press the **TOOLS** Function key to display the menu of Color Flow tools.
3. Select one of the Tools buttons:
  - Click [IMAGE] to open a menu of adjustable controls. This menu differs depending on whether you are in Active mode or Freeze mode. Use the Trackball to highlight the desired option and press <ENTER>. If there is a sub-menu for the selected option, another window opens. Highlight the desired option and press <ENTER> to activate the change. Press **TOOLS** to exit the menu. To exit the menu without activating the change, highlight **Cancel** and press <ENTER>.
  - Click [TEXT] to add text to an image in either Freeze or Active mode.
  - Click [ROI] to capture a selected area of the image using the ROI (Region of Interest) box.
  - Click [AUDIO] to record an audio annotation.
  - Click [TIMER] to start the time counter.

### [IMAGE] BUTTON CONTROLS:

#### In Active Mode:

Color Map  
Color Persistence  
Color Smoothing  
Priority  
Transmit Power  
Left-Right Invert  
Colorize

#### In Freeze Mode:

Color Map

Table 19 describes the menu options for the **TOOLS** buttons in color flow scanning mode.

**TABLE 19. Color Flow Tools Functions**

<i>Button</i>	<i>Description</i>
<b>Image</b>	<p>Click [IMAGE] to open a menu with these options:</p> <ul style="list-style-type: none"> <li>■ <b>Color Map</b> Select one of 6 different Velocity maps or 5 different Energy maps. The color bar on the edge of the screen shows a depiction of the currently selected Color map. Energy maps use Color Doppler Energy mode, also called Power (Amplitude) mode.</li> <li>■ <b>Color Persistence</b> Turns color persistence ON and sets the level. The settings are 1—4 or OFF. A setting of ‘1’ displays the least amount of persistence; a setting of ‘4’ displays the greatest amount.</li> <li>■ <b>Color Smoothing</b> Applies averaging to adjacent color samples to present a more uniform flow display.</li> <li>■ <b>Priority</b> Controls the appearance of Color Flow data in conjunction with the 2D display. The settings are 1—6. A <i>Higher</i> setting allows the combined 2D and Color Flow data to be displayed with the emphasis placed on the color flow data; a <i>Lower</i> setting reduces the color flow data overlay of the 2D image data.</li> <li>■ <b>Transmit Power</b> Controls the maximum acoustic output of the transducer. Settings range from 5% to 100% of maximum. Use the lowest setting consistent with diagnostic quality. The current mechanical index (MI) and thermal index (TI) of the acoustic output setting are displayed with the System Data. <p><b>NOTE:</b> Refer to the “Safety, Standards, and Accuracy” section of this manual, and the AIUM document provided with your system “Medical Ultrasound Safety” for important information about Acoustic Output.</p> </li> <li>■ <b>Left-Right Invert</b> Switches the orientation of the image from left to right. When Left-Right Invert is OFF, an index marker appears near the top of the sector on the right side.</li> <li>■ <b>Colorize</b> Applies a variety of colorized maps overlaying the grayscale image. Colorize is useful in certain situations to optimize contrast resolution.</li> </ul>
<b>Text</b>	Adds text labels to an image. See “Adding Text to an Image” on page 5-15 for details.



**TABLE 19. Color Flow Tools Functions**

<i>Button</i>	<i>Description</i>
<b>ROI</b>	(Region of Interest) Places a box in the 2D sector that allows the capture of selected areas of the image for quad screen review.
<b>Audio</b>	Adds an audio annotation to the study.
<b>Timer</b>	<p><b>Procedure Timer</b> — A timer is available for all exams. To access the timer, follow these steps:</p> <ol style="list-style-type: none"> <li>1. Press <b>TOOLS</b> and click the [TIMER] button.</li> <li>2. Select [START] to display the timer. <ul style="list-style-type: none"> <li>■ <b>Start:</b> Starts the timer clock.</li> <li>■ <b>Restart:</b> Starts the timer clock once it has been stopped.</li> <li>■ <b>Stop:</b> Stops the timer clock.</li> <li>■ <b>Off:</b> Stops the timer clock and removes it from the screen.</li> <li>■ <b>Cancel:</b> Closes the menu without changing the timer clock.</li> </ul> </li> </ol>

## Continuous Wave Doppler (CW) Scanning

To activate Continuous Wave Doppler imaging mode, press the **CW** mode key. Active system controls related to CW operation are described on the following pages.

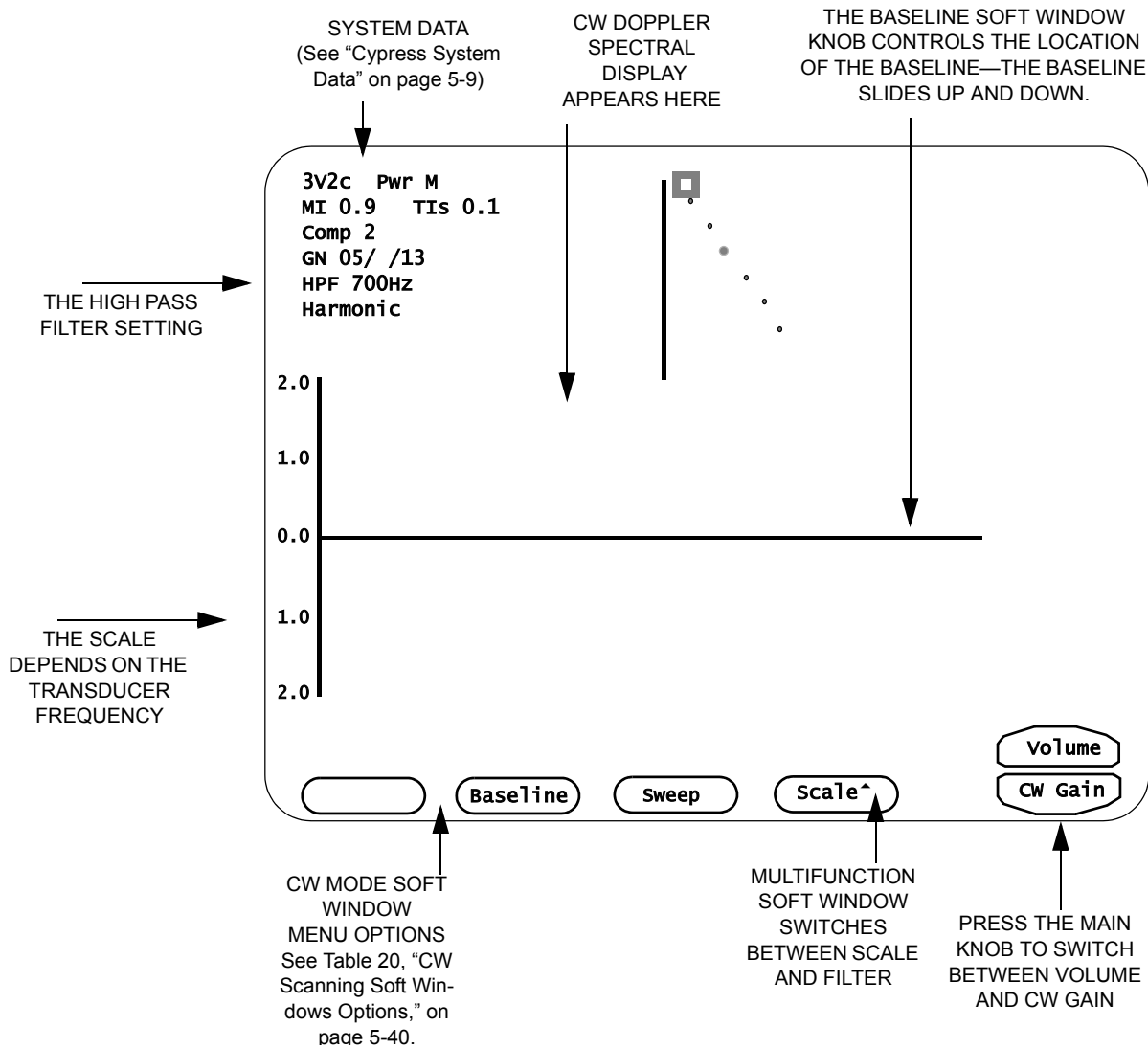


FIGURE 31. The CW Scanning Screen

## Activate the CW Display

To activate the CW spectral display, follow these steps:



1. Press the **CW** mode key once. The 2D sector is live and the Trackball is assigned to the CW cursor line.
2. Position the cursor to the desired portion of the image, and press **CW** a second time. This freezes the 2D image and activates the CW spectral display.
3. Pressing **CW** again toggles between the active spectrum and the real-time sector image. You can also reposition the CW sample while the 2D image is frozen. The cursor in the 2D image will move but the 2D image will remain frozen.

## Main Knob Controls Volume and CW Gain



TO SWITCH  
BETWEEN  
VOLUME AND  
GAIN, PRESS  
THE MAIN KNOB

When you press the **CW** mode key two options appear—Volume and CW Gain. They are controlled by the Main knob. Press the Main knob to toggle between the options.

- **Volume** Increases or decreases the amplification of the audio signal sent to the system speaker.
- **CW Gain** Turn the knob clockwise to increase the amplification of the Doppler signal. Turn counterclockwise to decrease.

In Freeze mode, turn the Main knob to scroll through the frames.

## CW Soft Windows

Table 20 describes how the Soft Windows and their corresponding knobs on the keyboard operate in CW scanning.

**TABLE 20. CW Scanning Soft Windows Options**

<i>Window</i>	<i>Function/Description</i>
<b>Baseline</b>	<p>Adjusts the position of the zero-velocity baseline marker. Turning the BASELINE knob clockwise raises the baseline; turning the knob counterclockwise lowers the baseline. There are five positions:</p> <ul style="list-style-type: none"> <li>■ Baseline at the top</li> <li>■ Baseline halfway between the top and middle positions</li> <li>■ Baseline in the middle</li> <li>■ Baseline halfway between the middle and bottom positions</li> <li>■ Baseline at the bottom</li> </ul>
<b>Sweep</b>	<p>Adjusts the sweep speed of the spectral display. Select a sweep number from 1 to 4 where the selection is the number of seconds. For example, <i>Sweep 1</i> is a 1-second sweep; <i>Sweep 2</i> is a 2-second sweep; etc.</p>
<b>Filter</b>	<p>Applies a high-pass filter to the Doppler spectrum. The filter setting is displayed in the upper left portion of the screen in Hertz (Hz) (see “Cypress System Data” on page 5-9). The range is from 200 Hz to 1400 Hz.</p> <p>Press the corresponding knob to select FILTER.</p> <ul style="list-style-type: none"> <li>■ To increase the filter setting, turn the knob clockwise.</li> <li>■ To decrease the filter setting, turn the knob counterclockwise.</li> </ul>
<b>Scale</b>	<p>Adjusts the velocity scale of the spectral display. The range depends on the transducer frequency.</p> <p>Setting the Scale higher increases the velocity limits of the color flow signal and reduces aliasing. Setting the Scale lower decreases the velocity limits of the color flow signal. This may be useful in detecting low velocity blood flow.</p> <p>Press the corresponding knob to select SCALE.</p> <ul style="list-style-type: none"> <li>■ To increase the velocity setting, turn the knob clockwise.</li> <li>■ To decrease the velocity setting, turn the knob counterclockwise.</li> </ul>

## CW Tools

Pressing the **TOOLS** function key in CW scanning mode opens a series of control buttons. These buttons provide controls for secondary image functions. See Table 21 on page 5-42 for a description of the CW mode Tools options.

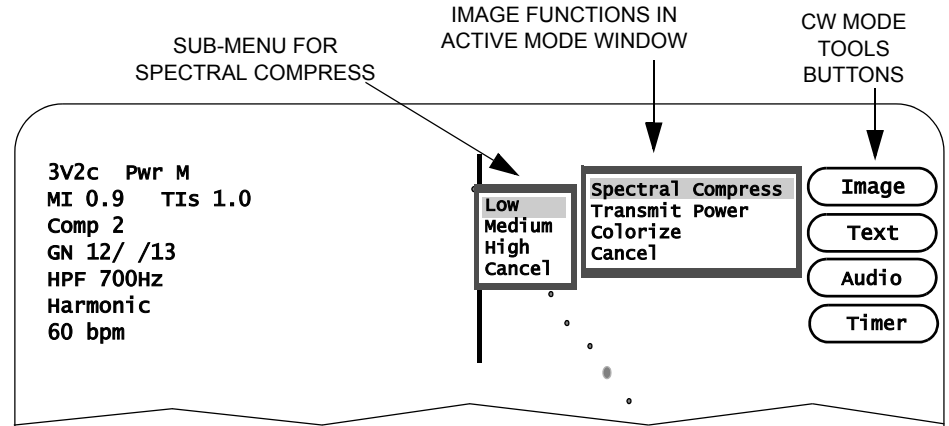


FIGURE 32. CW Tools

To use the Tools functions, follow these steps:

1. Start a CW scan by pressing the **CW** mode key.
2. Press the **TOOLS** Function key to display the menu of 2D tools.
3. Select one of the Tools buttons:
  - Click [IMAGE] to open a menu of adjustable controls. This menu differs depending on whether you are in Active mode or Freeze mode. Use the Trackball to highlight the desired option and press <ENTER>. If there is a sub-menu for the selected option, another window opens. Highlight the desired option and press <ENTER> to activate the change. Press **TOOLS** to exit the menu. To exit the menu without activating the change, highlight **Cancel** and press <ENTER>.
  - Click [TEXT] to add text to an image in either Freeze or Active mode.
  - Click [AUDIO] to record an audio annotation.
  - Click [TIMER] to start the time counter.

### [IMAGE] BUTTON CONTROLS:

**In Active Mode:**  
Spectral Compress  
Transmit Power  
Colorize

**In Freeze Mode:**  
None

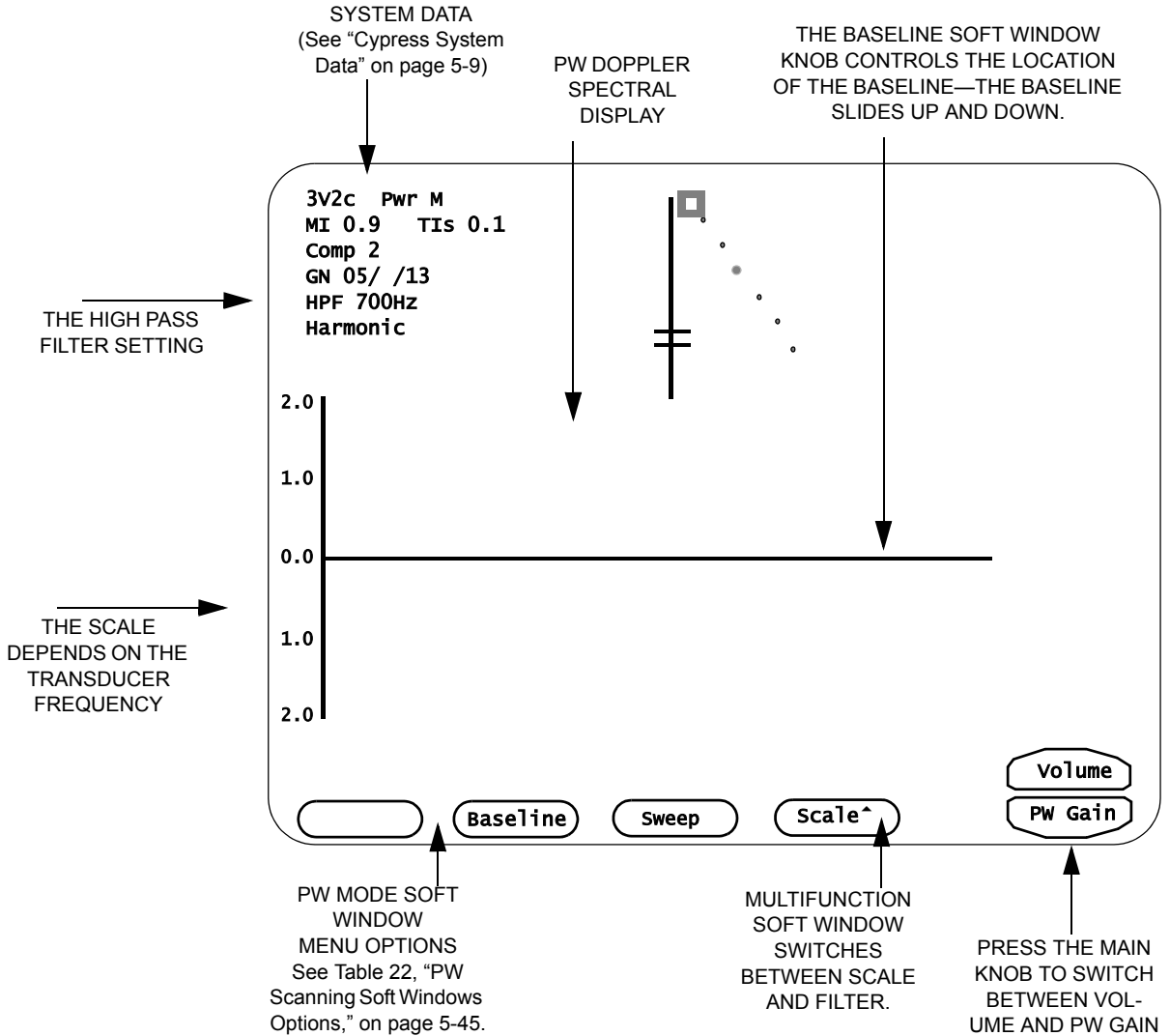
Table 21 describes the menu options for the **TOOLS** buttons in CW scanning mode.

**TABLE 21. CW Scanning Tools Functions**

<i>Button</i>	<i>Description</i>
<b>Image</b>	<p>Click [IMAGE] to open a menu with these options:</p> <ul style="list-style-type: none"> <li>■ <b>Spectral Compression</b> Selects <i>Low</i>, <i>Medium</i>, or <i>High</i>. <i>Low</i> increases the Dynamic Range and displays more shades of gray; <i>High</i> decreases the Dynamic Range and displays fewer shades of gray; <i>Medium</i> falls in between.</li> <li>■ <b>Transmit Power</b> Controls the maximum acoustic output of the transducer. Settings range from 5% to 100% of maximum. Use the lowest setting consistent with diagnostic quality. The current mechanical index (MI) and thermal index (TI) of the acoustic output setting are displayed with the System Data. <p><b>NOTE:</b> Refer to the “Safety, Standards, and Accuracy” section of this manual, and the AIUM document provided with your system “Medical Ultrasound Safety” for important information about Acoustic Output.</p> </li> <li>■ <b>Colorize</b> Applies a variety of colorized maps overlaying the CW grayshade image. This may be useful in certain situations to optimize contrast resolution.</li> </ul>
<b>Text</b>	Adds text labels to an image. See “Adding Text to an Image” on page 5-15 for details.
<b>Audio</b>	Adds an audio annotation to the study.
<b>Timer</b>	<p><b>Procedure Timer</b> — A timer is available for all exams. To access the timer, follow these steps:</p> <ol style="list-style-type: none"> <li>1. Press <b>TOOLS</b> and click the [TIMER] button.</li> <li>2. Select [START] to display the timer. <ul style="list-style-type: none"> <li>■ <b>Start:</b> Starts the timer clock.</li> <li>■ <b>Restart:</b> Starts the timer clock once it has been stopped.</li> <li>■ <b>Stop:</b> Stops the timer clock.</li> <li>■ <b>Off:</b> Stops the timer clock and removes it from the screen.</li> <li>■ <b>Cancel:</b> Closes the menu without changing the timer clock.</li> </ul> </li> </ol>

## Pulsed Wave Doppler (PW) Scanning

To activate Pulsed Wave Doppler imaging mode, press the **PW** mode key. Active system controls related to PW operation are described on the following pages.



**FIGURE 33. The PW Scanning Screen**

## Activate the PW Display

To activate the PW spectral display, follow these steps:



1. Press **PW** once. The 2D sector is live and the Trackball is assigned to the PW cursor line.
2. Position the cursor to the desired portion of the image, and press **PW** a second time. This freezes the 2D image and activates the PW spectral display.
3. Pressing **PW** again toggles between the active spectrum and the real-time sector image. You may also reposition the PW sample while the 2D image is frozen. The cursor line in the 2D image will move, but the 2D image remains frozen.

## Main Knob Controls PW Gain and Volume

When you press the **PW** mode key two options appear—Volume and PW Gain. They are controlled by the Main knob. Press the Main knob to toggle between the options.



TO SWITCH BETWEEN VOLUME AND GAIN, PRESS THE MAIN KNOB

- **Volume** Increases or decreases the amplification of the audio signal sent to the system speaker.
- **PW Gain** Turn the knob clockwise to increase the amplification of the Doppler signal. Turn counterclockwise to decrease.

In Freeze mode, turn the Main knob to scroll through the frames.



## PW Soft Windows

Table 22 describes how the Soft Windows and their corresponding knobs on the keyboard operate in PW scanning.

**TABLE 22. PW Scanning Soft Windows Options**

<i>Window</i>	<i>Function/Description</i>
<p><b>PW Steer</b> (<i>Linear transducer</i>) Changes the angle of the PW line within the 2D image</p>	<p>There are three positions: 0°, +20°, -20°. Press the corresponding Soft Window knob to select PW STEER.</p> <ul style="list-style-type: none"> <li>■ To angle to the right, turn the knob clockwise.</li> <li>■ To angle to the left, turn the knob counterclockwise.</li> </ul> <p><b>NOTE:</b> When using the 7L3 transducer and both Color and PW are activated, only “PW Steer” will be available in the multifunctional Soft Window. Steering PW will also steer the Color Box. When 2D and Color are both active, the multifunctional Soft Window will toggle between “2D Steer” and “C Steer”.</p>
<p><b>Angle</b> (<i>Angle Correction</i>) Adjusts the flow direction angle</p>	<p>Press the corresponding Soft Window knob to select and display the angle correction cursor.</p> <ul style="list-style-type: none"> <li>■ Turn the knob to adjust the incident angle to the direction of flow. The flow direction cursor rotates relative to the sample volume line and cursor. The Velocity scale is automatically adjusted for the angle displayed.</li> </ul> <p>The selected angle is displayed on the screen.</p> <p><b>NOTE:</b> Angle Correction may be activated for all transducers by selecting <b>Angle Correction</b> on the <b>Setup</b> menu and putting a checkmark in the <b>Enabled for all transducers</b> box.</p>

**TABLE 22. PW Scanning Soft Windows Options**

<i>Window</i>	<i>Function/Description</i>
<b>Baseline</b> Adjusts the position of the zero-velocity baseline marker	Turning the corresponding knob clockwise raises the baseline; turning the knob counterclockwise lowers the baseline. There are five positions: <ul style="list-style-type: none"> <li>■ Baseline at the top</li> <li>■ Baseline halfway between the top and middle positions</li> <li>■ Baseline in the middle</li> <li>■ Baseline halfway between the middle and bottom positions</li> <li>■ Baseline at the bottom</li> </ul>
<b>Invert</b> Reverses the flow in reference to the baseline	The Spectral Doppler display can be inverted, reversing the Display of forward and reverse flow in reference to the baseline. Press the corresponding knob to select. <ul style="list-style-type: none"> <li>■ Turn the knob to invert the display. Turn the knob again to return to the non-inverted display.</li> </ul> An on-screen indicator ("INVERT") is displayed in the System Data Field when the Doppler is inverted.
<b>Sweep</b> Adjusts the sweep speed of the spectral display	Press the corresponding knob to select Sweep. <ul style="list-style-type: none"> <li>■ Select a sweep number from 1 to 4 where the selection is the number of seconds. For example, Sweep 1 is a 1-second sweep; Sweep 2 is a 2-second sweep; etc.</li> </ul>
<b>Filter</b> Applies a high-pass filter to the Doppler spectrum	The range is from 25 Hz to 1400 Hz. Press the corresponding knob to select Filter. <ul style="list-style-type: none"> <li>■ To increase the filter setting, turn the knob clockwise.</li> <li>■ To decrease the filter setting, turn the knob counterclockwise.</li> </ul> The filter setting is displayed in the upper left portion of the screen in Hertz (Hz) (see "Cypress System Data" on page 5-9).

**TABLE 22. PW Scanning Soft Windows Options**

<i>Window</i>	<i>Function/Description</i>
<b>Scale</b> Adjusts the velocity scale of the spectral display	The range depends on the transducer frequency. Press the corresponding knob to select Scale. <ul style="list-style-type: none"> <li>■ To increase the velocity setting, turn the knob clockwise.</li> <li>■ To decrease the velocity setting, turn the knob counterclockwise.</li> </ul>
<b>Range Gate</b> Selects a size for the range gate	Select a size. Press the corresponding knob to select Range Gate. <ul style="list-style-type: none"> <li>■ For the <b>3V2c</b> transducer, the sizes are: 5.0 mm, 6.0 mm, 7.0 mm, 8.5 mm, 10.0 mm, 15.0 mm, 20.0 mm</li> <li>■ For the <b>7V3c</b> transducer, the sizes are: 2.0 mm, 2.4 mm, 3.9 mm, 4.9 mm, 5.9 mm, 8.0 mm, 10.0 mm</li> <li>■ For the <b>7L3</b> transducer, the sizes are: 1.0 mm, 2.0 mm, 3.0 mm, 4.0 mm, 6.0 mm, 8.0 mm, 10.0 mm</li> <li>■ For the <b>Acunav 10F</b> and <b>8F</b> transducers, the sizes are: 1.7 mm, 2.1 mm, 3.3 mm, 4.3 mm, 5.3 mm, 8.0 mm, 10.0 mm</li> <li>■ For the <b>4C1</b> transducer, the sizes are: 3.0 mm, 4.5 mm, 6.0 mm, 8.0 mm, 10.0 mm, 15.0 mm, 20.0 mm</li> <li>■ For the <b>V5M</b> transducer, the sizes are: 2.0 mm, 2.4 mm, 3.9 mm, 4.9 mm, 5.9 mm, 8.0 mm, 13.0 mm</li> </ul>

## PW Tools

Pressing the **TOOLS** function key in PW scanning mode opens a series of control buttons. These buttons provide controls for secondary image functions. See Table 23 for a description of the PW mode Tools options.

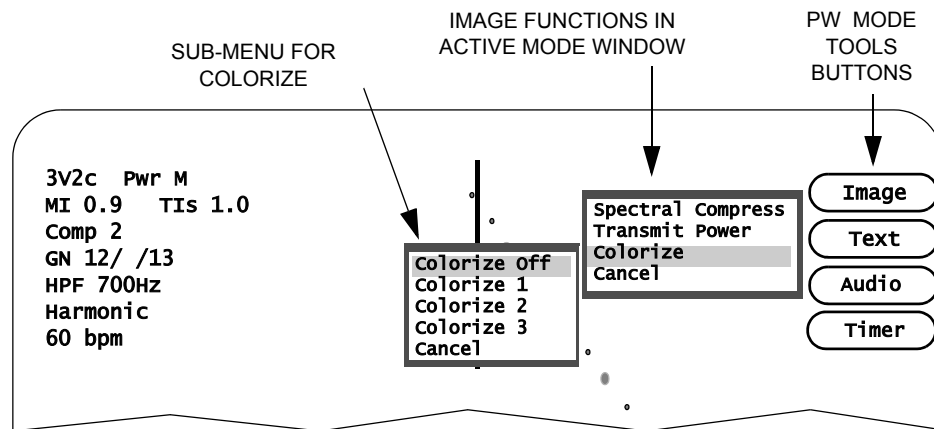


FIGURE 34. PW Tools

To use the Tools functions, follow these steps:

1. Start a PW scan by pressing the **PW** mode key.
2. Press the **TOOLS** Function key to display the menu of 2D tools.
3. Select one of the Tools buttons:
  - Click [IMAGE] to open a menu of adjustable controls. This menu differs depending on whether you are in Active mode or Freeze mode. Use the Trackball to highlight the desired option and press <ENTER>. If there is a sub-menu for the selected option, another window opens. Highlight the desired option and press <ENTER> to activate the change. Press **TOOLS** to exit the menu. To exit the menu without activating the change, highlight **Cancel** and press <ENTER>.
  - Click [TEXT] to add text to an image in either Freeze or Active mode.
  - Click [AUDIO] to record an audio annotation.
  - Click [TIMER] to start the time counter.

### [IMAGE] BUTTON CONTROLS:

#### In Active Mode:

Spectral Compress  
Transmit Power  
Colorize

#### In Freeze Mode:

None

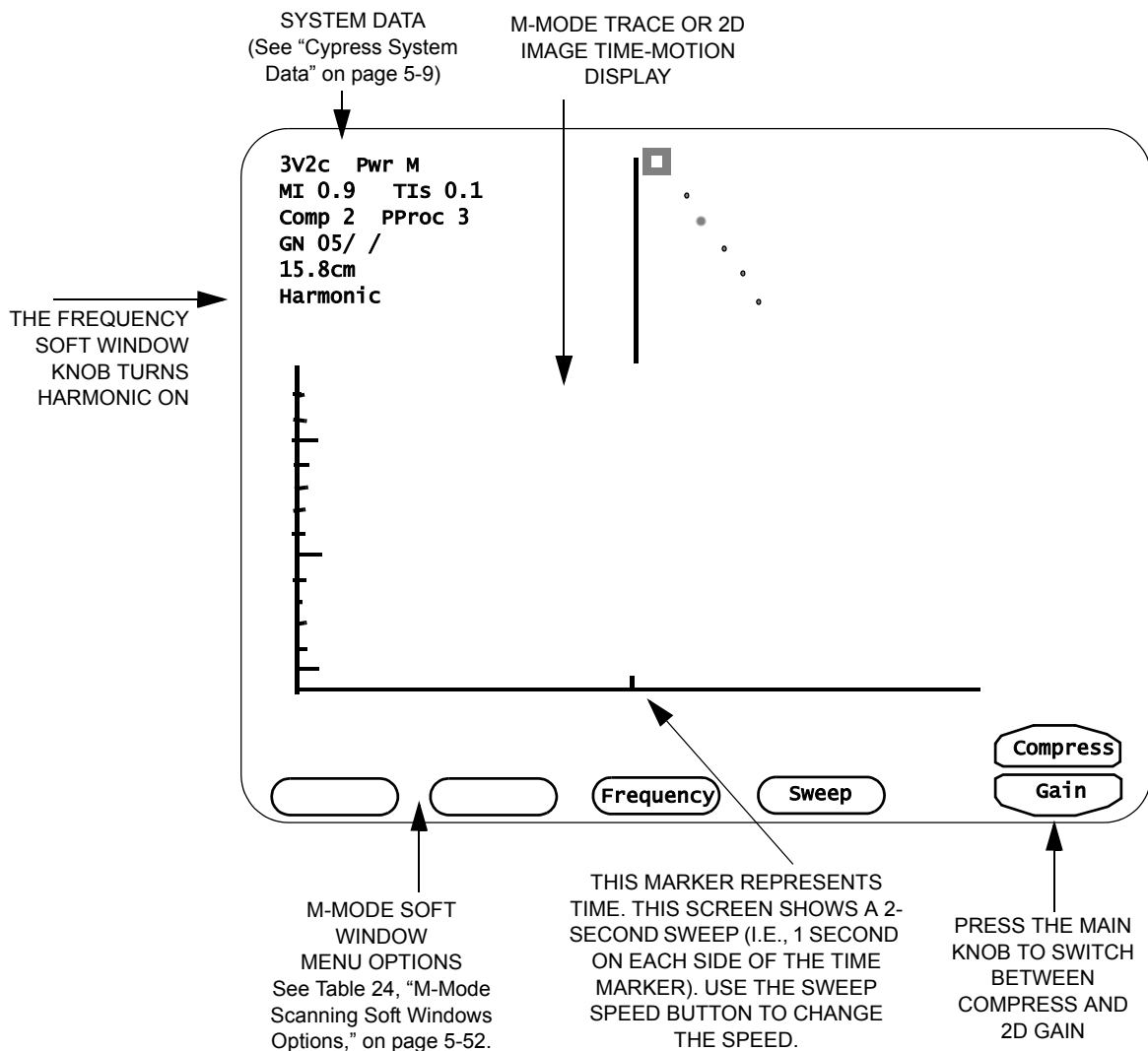
Table 23 describes the menu options for the **TOOLS** buttons in PW scanning mode.

**TABLE 23. PW Scanning Tools Functions**

<i>Button</i>	<i>Description</i>
<b>Image</b>	<p>Click [IMAGE] to open a menu with these options:</p> <ul style="list-style-type: none"> <li>■ <b>Spectral Compression</b> Selects <i>Low</i>, <i>Medium</i>, or <i>High</i>. <i>Low</i> increases the Dynamic Range and displays more shades of gray; <i>High</i> decreases the Dynamic Range and displays fewer shades of gray; <i>Medium</i> falls in between.</li> <li>■ <b>Transmit Power</b> Controls the maximum acoustic output of the transducer. Settings range from 5% to 100% of maximum. Use the lowest setting consistent with diagnostic quality. The current mechanical index (MI) and thermal index (TI) of the acoustic output setting are displayed with the System Data. <p><b>NOTE:</b> Refer to the “Safety, Standards, and Accuracy” section of this manual, and the AIUM document provided with your system “Medical Ultrasound Safety” for important information about Acoustic Output.</p> </li> <li>■ <b>Colorize</b> Applies a variety of colorized maps overlaying the PW grayshade image. This may be useful in certain situations to optimize contrast resolution.</li> </ul>
<b>Text</b>	Adds text labels to an image. See “Adding Text to an Image” on page 5-15 for details.
<b>Audio</b>	Adds an audio annotation to the study.
<b>Timer</b>	<p><b>Procedure Timer</b> — A timer is available for all exams. To access the timer, follow these steps:</p> <ol style="list-style-type: none"> <li>1. Press <b>TOOLS</b> and click the [TIMER] button.</li> <li>2. Select [START] to display the timer. <ul style="list-style-type: none"> <li>■ <b>Start:</b> Starts the timer clock.</li> <li>■ <b>Restart:</b> Starts the timer clock once it has been stopped.</li> <li>■ <b>Stop:</b> Stops the timer clock.</li> <li>■ <b>Off:</b> Stops the timer clock and removes it from the screen.</li> <li>■ <b>Cancel:</b> Closes the menu without changing the timer clock.</li> </ul> </li> </ol>

## M-Mode Scanning

To activate M-Mode imaging, press the **M** mode key. Active system controls related to M-Mode operation are described on the following pages.



**FIGURE 35. The M-Mode Scanning Screen**

## Activate the M-Mode Display

To activate the M-Mode time/motion display, follow these steps:



1. Press the **M** mode key once. The 2D sector is live and the Trackball is assigned to the M-Mode cursor line.
2. Position the cursor in the desired portion of the image, and press the **M** mode key a second time. This freezes the 2D image and activates the M-Mode time-motion display.
3. Pressing **M** again toggles between the active time-motion display and the real-time sector image. You can also re-position the M-Mode sample while the 2D image is frozen. The sample line in the 2D image moves but the 2D image remains frozen.

**NOTE** *The shallowest 10% of the scanning depth (nearest the transducer face) is not displayed. For example, if a scanning depth of 16.2 cm is selected, the shallowest 1.6 cm is not displayed.*



TO SWITCH  
BETWEEN  
COMPRESS AND  
GAIN, PRESS  
THE MAIN KNOB

## Main Knob Controls Gain and Compress

When you press the **M** mode key two options appear—Compress and 2D Gain. If you press **M** again the spectral display becomes active and the two options are Compress and Gain. Press **M** again to make 2D active again. The options are controlled by the Main knob. Press the Main knob to toggle between the two active options.

- **Compress** Adjusts the presentation of the 2D image by changing the three Dynamic Range settings. The current setting is shown in the upper left portion of the screen.
- **2D Gain** (the system default) Displayed when 2D is active. Turn the knob clockwise to increase the overall amplification of the 2D image data. Turn counterclockwise to decrease.
- **Gain** Displayed when the time-motion display is active. Turn the knob clockwise to increase the overall amplification of the M-Mode data. Turn counterclockwise to decrease.

In Freeze mode, turn the Main knob to scroll through the frames.

## M-Mode Soft Windows

Table 24 describes how the Soft Windows and their corresponding knobs on the keyboard operate in M-Mode scanning.

**TABLE 24. M-Mode Scanning Soft Windows Options**

<i>Window</i>	<i>Function/Description</i>
—	—
—	—
<b>Frequency</b>	<p>Some transducers are capable of employing second harmonic imaging. Second harmonic imaging uses a lower transmit frequency and a higher receive frequency. Harmonic imaging can improve image quality and edge definition for difficult studies.</p> <ul style="list-style-type: none"> <li>■ To turn Harmonic ON or OFF, press the FREQUENCY knob. The default state is ON.</li> <li>■ To adjust the Frequency, press the FREQUENCY knob. Harmonic is ON when “Harmonic” is displayed with the System Data in the top left corner of the screen; Frequency can be adjusted when “Frequency” is displayed with the System Data. See “Cypress System Data” on page 5-9 and Table 14 on page 5-10.</li> </ul>
<b>Sweep</b>	<p>Adjusts the sweep speed of the spectral display. Select a sweep number from 1 to 4 where the selection is the number of seconds. For example, Sweep 1 is a 1-second sweep; Sweep 2 is a 2-second sweep; etc.</p>



## M-Mode Tools

Pressing the **TOOLS** function key in M-Mode scanning opens a series of control buttons. These buttons provide controls for secondary image functions. See Table 25 on page 5-54 for a description of the M-Mode Tools options.

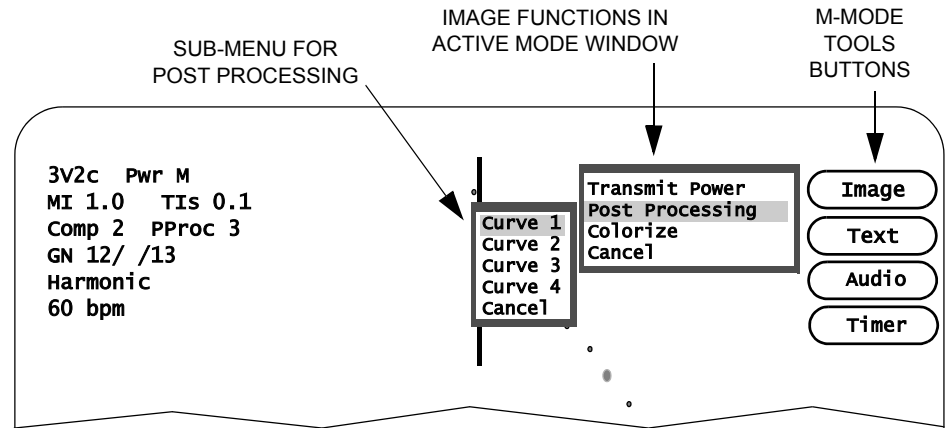


FIGURE 36. M-Mode Tools

To use the Tools functions, follow these steps:

1. Start an M-Mode scan by pressing the **M** mode key.
2. Press the **TOOLS** Function key to display the menu of 2D tools.
3. Select one of the Tools buttons:
  - Click [IMAGE] to open a menu of adjustable controls. This menu differs depending on whether you are in Active mode or Freeze mode. Use the Trackball to highlight the desired option and press <ENTER>. If there is a sub-menu for the selected option, another window opens. Highlight the desired option and press <ENTER> to activate the change. Press **TOOLS** to exit the menu. To exit the menu without activating the change, highlight **Cancel** and press <ENTER>.
  - Click [TEXT] to add text to an image in either Freeze or Active mode.
  - Click [AUDIO] to record an audio annotation.
  - Click [TIMER] to start the time counter.

### [IMAGE] BUTTON CONTROLS:

#### In Active Mode:

Transmit Power  
Post Processing  
Colorize

#### In Freeze Mode:

None

Table 25 describes the menu options for the **TOOLS** buttons in M-Mode scanning.

**TABLE 25. M-Mode Scanning Tools Functions**

<i>Button</i>	<i>Description</i>
<b>Image</b>	<p>Click [IMAGE] to open a menu with these options:</p> <ul style="list-style-type: none"> <li>■ <b>Transmit Power</b> Controls the maximum acoustic output of the transducer. Settings range from 5% to 100% of maximum. Use the lowest setting consistent with diagnostic quality. The current mechanical index (MI) and thermal index (TI) of the acoustic output setting are displayed with the System Data. <b>NOTE:</b> Refer to the “Safety, Standards, and Accuracy” section of this manual, and the AIUM document provided with your system “Medical Ultrasound Safety” for important information about Acoustic Output.</li> <li>■ <b>Post Processing</b> Selects from four post processing or gray-scale compression curves. The number 2 selection is a linear setting.</li> <li>■ <b>Colorize</b> Applies a variety of colorized maps overlaying M-Mode grayshade image. This may be useful in certain situations to optimize contrast resolution.</li> </ul>
<b>Text</b>	Adds text labels to an image. See “Adding Text to an Image” on page 5-15 for details.
<b>Audio</b>	Adds an audio annotation to the study.
<b>Timer</b>	<p><b>Procedure Timer</b> — A timer is available for all exams. To access the timer, follow these steps:</p> <ol style="list-style-type: none"> <li>1. Press <b>TOOLS</b> and click the [TIMER] button.</li> <li>2. Select [START] to display the timer. <ul style="list-style-type: none"> <li>■ <b>Start:</b> Starts the timer clock.</li> <li>■ <b>Restart:</b> Starts the timer clock once it has been stopped.</li> <li>■ <b>Stop:</b> Stops the timer clock.</li> <li>■ <b>Off:</b> Stops the timer clock and removes it from the screen.</li> <li>■ <b>Cancel:</b> Closes the menu without changing the timer clock.</li> </ul> </li> </ol>

# *Cardiac Calculations*

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The Cypress system can perform a number of cardiac and general measurements and calculations. This chapter includes information about:

- How to make cardiac measurements
- Formulas (2D, M-Mode, and Doppler)
- References for the calculations

**NOTE** *Review the information regarding measurement and calculations accuracy in Chapter 10, “Safety, Technical Description, and Accuracy” before starting any calculations.*

---

## Overview of Cardiac Measurements

The Cypress system provides a range of cardiac measurements and derived calculations for diagnostic ultrasound. There are two types of calculations:

- **General:** Simple general measurements, such as a distance or area, that are not associated with a particular calculation and are not saved to the Patient Report. Table 26 lists the general measurements by each mode type.
- **Specific:** Measurements that are a part of a formulaic calculation. These typically involve multiple measurements and the calculation of a clinical index such as Ejection Fraction. These calculations are saved in the Patient Report. Table 27 on page 6-3 lists the specific calculations by each mode type.

**NOTE** *General measurements are designed to be a quick way to perform calculations that you do not assign to a report.*

### Types of General Cardiac Measurements

Table 26 shows the general measurements for each mode.

**TABLE 26. General Cardiac Measurements by Mode**

<i>Mode</i>	<i>General Measurements</i>
<b>2D</b>	<ul style="list-style-type: none"> <li>■ Distance</li> <li>■ Area</li> </ul>
<b>M-Mode</b>	<ul style="list-style-type: none"> <li>■ Distance</li> <li>■ Time</li> <li>■ Slope—with Distance and Time</li> </ul>
<b>Spectral Doppler</b>	<ul style="list-style-type: none"> <li>■ Trace—Mean Velocity, Mean Pressure Gradient, TVI, and Time</li> <li>■ Peak Velocity and Peak Pressure Gradient</li> <li>■ Time</li> <li>■ Slope, Time, Peak Velocity, and Peak Gradient</li> <li>■ Pressure Half-Time and Area</li> </ul>

## Types of Specific Cardiac Calculations

Table 27 shows the specific calculations for the different modes. The formulas for each calculation are shown in Table 29, Table 30, and Table 31.

**TABLE 27. Specific Cardiac Calculations by Mode**

---

### **2D Mode** (See Table 29 on page 6-15)

- |                                |                                 |
|--------------------------------|---------------------------------|
| ■ LV Volume, Biplane, MOD      | ■ Cardiac Index                 |
| ■ LV Volume, Single Plane, MOD | ■ LV Mass                       |
| ■ Fractional Area Change       | ■ LV Mass Index                 |
| ■ Ejection Fraction            | ■ Percent Fractional Shortening |
| ■ Stroke Volume                | ■ Percent Fractional Thickening |
| ■ Cardiac Output               |                                 |
- 

### **M-Mode** (See Table 30 on page 6-18)

- |                                 |                                     |
|---------------------------------|-------------------------------------|
| ■ Percent Fractional Shortening | ■ Cardiac Output Cubed              |
| ■ Percent Fractional Thickening | ■ Cardiac Index Cubed               |
| ■ Ejection Fraction Cubed       | ■ Cardiac Output Teichholz          |
| ■ Ejection Fraction Teichholz   | ■ LV Mass                           |
| ■ Stroke Volume Cubed           | ■ LV Mass Index                     |
| ■ Stroke Volume Teichholz       | ■ EPSS—E Point to Septal Separation |
- 

### **Doppler** (See Table 31 on page 6-20)

- |   |  |
|---|--|
| ■ Peak Pressure Gradient                                  | ■ Cardiac Index  |
| ■ Mean Velocity   | ■ Pressure Half-Time   |
| ■ Mean Pressure Gradient                                  | ■ Valve Area by Pressure Half-Time   |
| ■ Time Velocity Integral                                  | ■ Aortic Valve Continuity Equation using $V_{max}$                               |
| ■ Stroke Volume   | ■ Aortic Valve Continuity Equation using TVI                                     |
| ■ Cardiac Output  | ■ Right Ventricular Systolic Pressure (RVSP) using VSD                           |
| ■ Mitral Valve Continuity Equation using LVOT             | ■ Right Ventricular Systolic Pressure (RVSP) using Tricuspid Valve Regurgitation |
| ■ Mitral Valve Continuity Equation using Pulmonary Artery | ■ Mitral Valve (MV) Slope  |
| ■ Shunt Ratio   | ■ Tricuspid Valve (TV) Slope   |
| ■ Time  |  |
-

---

## Cardiac Calculations Setup

### Setting Parameters

To set up the parameters for the calculations package, follow these steps:

1. Press the **SETUP** key and click the **Calculations** heading.
2. Click **Measurements** to display the list of options.
3. Use the Trackball to highlight a parameter and the <ENTER> key to select.
4. To exit, press **SETUP**.

**NOTE** See Table 6, “Calculation Menu Fields,” on page 3-16 for a complete description of the measurement options.

### About Construction Methods

There are two construction methods:

- When the **Continuous** method is selected, the Trackball is used to define the flow pattern or 2D image with a continuous motion.
- When the **Point to Point** method is selected, the Trackball is used to place points along the flow pattern or 2D image. Press <ENTER> after each point is positioned and the points will automatically connect. Double-click the last point to complete the outline.

**NOTE** *The direction of the trace cannot be reversed once started—when tracing from left to right, the trace can only be completed by continuing towards the right of the flow envelope.*

**NOTE** *When defining a portion of a 2D image, no part of the outline can intersect another segment of the outline.*

### How to Add or Change an Estimated Value Using Setup

1. Press the **SETUP** key and click the **Calculations** heading.
2. Click **Estimates**.
3. Type the desired estimate into the edit box. The estimate will appear in the Report menu when the field is clicked.

## How to Edit the Estimated Value While Performing a Calculation

To make a one-time change to an estimated value (the system will revert back to the setup default after this calculation), follow these steps while performing a calculation:

1. Click the field. For example, click [PRESSURE] to display the default estimated RA Pressure of 10 that was specified in the **Setup** menu.
2. Click [PRESSURE] a second time to open the edit box.
3. Type in a new estimate and click the [SET] button.

## Selecting a Report Format

1. Press the **SETUP** key and click the **Calculations** heading.
2. Click **Reports**. Select either the **Complete** format or the **Configured** format.
  - A report in the **Complete** format displays the entire report, including sections with open data fields.
  - The **Configured** format displays only the sections where data has been entered.

## Selecting a Report Background Color

1. Press the **SETUP** key and click the **Calculations** heading.
2. Click **Reports**.
3. Select a color.

## Using the Averaging Function

When averaging is turned ON, measurements that are part of the patient report will automatically display the averaged result when two or more of the same measurements are completed. To turn averaging ON, follow these steps:

1. Press the **SETUP** key and double-click the **Calculations** heading.
2. Highlight **Averaging**. A checkmark indicates if the averaging function is active. If it is not, click the checkbox to turn averaging ON. (To turn averaging OFF, click the checkbox to remove the checkmark.)

**NOTE** *Averaging can be activated or deactivated on a per-study basis using the patient information screen independent of the system wide selection in the Setup Menu.*

**NOTE** *Once an averaged result is displayed in a patient report, the averaging function cannot be deactivated.*

**NOTE** *If Angle Correction is different for averaged results, then the Angle Correction display will show three asterisks (\*\*\*). Note that there is no averaging of Angle Correction, only the measurements are averaged.*

To view and/or edit the individual components of an averaged result, follow these steps:

1. Press **CALC** to open the Selection Menu and then highlight the specific measurement and click <ENTER> to open the Report Menu.
2. Use the Trackball to place the cursor over the averaged result. The list of individual measurements will open. To edit the list, click <←> to open the Averaging Edit box. A checkmark next to a measurement indicates that the number is a part of the averaged result.
3. Use the Trackball and <ENTER> key to remove and add checkmarks. A checkmark in the **Select All** box, places a checkmark in each box. Remove the checkmark from the **Select All** box to remove the checkmark from each box.
4. To save changes made to the averaging edit box, close the box by clicking [CLOSE] and then click [OK] on the Report Menu.

**NOTE** *There is a maximum of 20 measurements per each averaged result.*

**NOTE** *Once an averaged result is displayed in a patient report, the averaging function cannot be deactivated.*



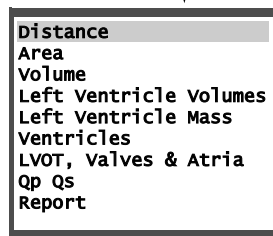
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## Using the Cardiac Calculations Package

To start a calculation, follow these steps:

1. Start a scan by pressing a Mode key.
2. Press the **CALC** function key while in any mode. Pressing the **CALC** key freezes the scanning mode and displays the Selection Menu. You can also access the calculations package by pressing **FREEZE** at any time during the examination, and then pressing **CALC** to display the Selection Menu. The Selection Menu displayed depends on which scanning mode is active. The menu provides a choice of general and specific measurements.

2D CALCULATIONS  
SELECTION MENU



### Performing General Measurements

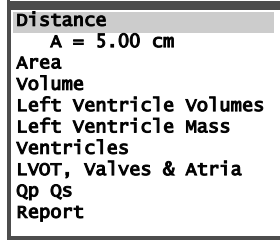
General measurements are not entered into the Patient Report. The measurement result is displayed on the Selection Menu and the screen, along with the image.

To perform a general measurement, follow these steps:

1. Press **2D** to activate the scanning mode.
2. Press the **CALC** key to freeze the image and open the Selection Menu.
3. Use the Trackball to highlight the desired type of measurement (for example, **Distance**) from the menu and press <ENTER>.
4. Use the Trackball to position the first cursor (startpoint) and then press <ENTER> to anchor the cursor at that position.

- The second cursor (endpoint) will appear. Use the Trackball to position the cursor and then press <ENTER> to complete the measurement.

MEASUREMENT INDEX IN  
SELECTION MENU



- Press **CALC** to exit the calculation package. Note that an index in green text is displayed in the upper right portion of the screen. This index is stored with the frame when the frame is saved for review at a later time.

**TABLE 28. Measurement Index Table**

<i>Measurement Index</i>	<i>Description</i>
<b>Single Upper Case Letter (A)</b>	A general measurement. Results are displayed in the Selection Menu.
<b>Single Lower Case Letter (a)</b>	A specific measurement. Results are displayed in the Selection Menu, Report Menu, and Patient Report.

## Performing Specific Cardiac Calculations

To complete a specific calculation, follow these steps:

1. Press **2D** to activate the scanning mode.
2. Press the **CALC** key to freeze the image and open the Selection Menu.
3. Select the desired type of calculation by highlighting an option in the Selection Menu (for example, *LV Volume*) and press **<ENTER>**. The *LV Volume* Report Menu will be displayed with the *AP4 Dias* area highlighted.

**NOTE** *The specific calculations are often performed together in a sequence. The Cypress assumes an order to this sequence and automatically steps you through the components of a calculation. The order is for ease of use and does not affect the results. To override this and go to a component out-of-sequence, move the Trackball to highlight the desired item in the Report Menu.*

**NOTE** *While the Report Menu is on the screen, turn the Main knob to search for the correct frame on which to perform the measurement and then press **<ENTER>**.*

4. Use the Trackball to position the cursor and press **<ENTER>**.
5. Use the Trackball to define the area and press **<ENTER>**.

**NOTE** *Use the **<←>** key to erase portions of the traced area.*

6. Use the Trackball to set the length and press **<ENTER>**. Or to manually draw the length, press **<←>**.
7. Complete the remaining views as described above. Images can be obtained by scanning the patient and then pressing **FREEZE** and using the Main knob to search for a frame, or pressing **VIEW** to display stored images. Results can be viewed in the Report Menu and Patient Report.

## Saving Calculations to the Patient Report

After each measurement or sequence of measurements is completed, the results of any calculation that uses the measurements as input are displayed. To save the results and close the menu, click [OK].

If you are not satisfied with a specific result, you can redo the measurement again. To keep the menu open, but clear all the results currently displayed, click [CLEAR]. To cancel the currently calculation and close the menu, click [CANCEL].

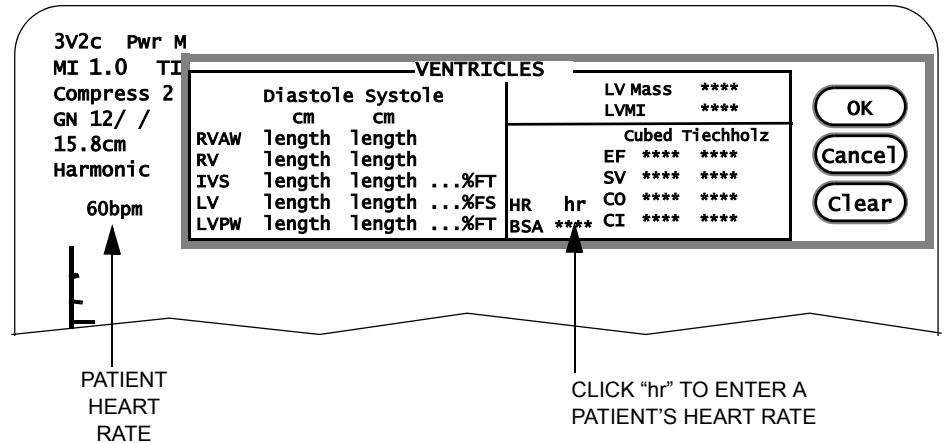
When you have completed all your calculations and are satisfied with the results, to save the measurements (and close the Report Menu) click [OK]. Results can be viewed at any time by activating the patient study and then clicking the **Report** tab.

## To Delete a Single Measurement from a Report Menu

1. Highlight the measurement with the cursor.
2. Press the <←> key to remove that measurement and any associated measurements.

## Entering A Heart Rate

Several Report Menus have a heart rate button that lets you enter the patient's heart rate for use in calculations.



Several calculation menus contain a field for the patient's heart rate, indicated by "hr". There are two methods to enter a heart rate on the Report Menu:

- To enter the heart rate displayed in the system data field (located in the upper left portion of the screen), click [HR].
- To enter a user-defined heart rate, click [HR] a second time and enter the desired heart rate into the edit box using the keypad. Click the [SET] button above the new heart rate to confirm the entry.

To clear the heart rate from a Report Menu, place the cursor over the [HR] button and press the <DEL> key, or click the [CLEAR] button to clear the heart rate as well as any measurements and calculations.

**NOTE** For more information regarding the method used to display the heart rate, read the "Heart Rate Information" section located in Table 56 on page 10-28.

## Saving Frames Containing Measurement Graphics

After each measurement or sequence of measurements is completed, the frame used to perform the measurement can be saved along with the graphics. While the frame and graphics are displayed, press **Q SAVE**. The camera icon will briefly appear in the upper right corner of the screen to indicate the frame has been saved as part of the study.

If the frame used to perform the measurement is part of a loop that has already been saved as part of the study, pressing **Q SAVE** will add the measurement graphics and index to the frame. The camera icon will briefly appear in the upper right corner of the screen to indicate the graphics have been added to the frame. The graphics can only be viewed by using the Main knob to search for the frame.

## Deleting a General Measurement

*To delete a general measurement, follow these steps:*

1. Display the frame containing the measurement graphic.
2. Press **CALC** to display the Selection Menu.
3. Use the Trackball to highlight the measurement you want to delete.
4. Press the <←> key.

## Deleting a Specific Measurement

*To delete a specific measurement, follow these steps:*

1. Display the frame containing the measurement graphic.
2. Press **CALC** to display the Selection Menu.
3. Use the Trackball to select the name of the Report Menu containing the specific measurement you want to delete and press <ENTER>.

**NOTE** *Specific measurements cannot be deleted from the Selection Menu.*

4. To delete a single measurement, use the Trackball to highlight the measurement you want to delete and press <←>. To delete all of the measurements, click [CLEAR].

**NOTE** *If the deleted measurement is part of a formula, all the formula results that use that measurement are also deleted.*

## Making Corrections to the Trace and Area Measurements

No matter which method you choose to use to perform the measurements, correcting the *Trace* or *Area* outline is the same. Press the <←> key to erase a small portion of the outline. Press and hold the <←> key to continuously erase the path of the cursor until the <←> key is released.

## Stopping a Measurement Before Completion

- To stop a measurement or sequence of measurements and return the cursor to the currently displayed Calculation menu, press the <ESC> key before completing the measurement.
- To stop a measurement or sequence of measurements and exit the Calculation package, press the **CALC** key before completing the measurement.

## Setting the Trace Resolution

The Resolution feature defines the spacing of the dots used to form the trace outlines. *To change the resolution, follow these steps:*

1. Press **SETUP**, double-click the **Calculations** heading, and highlight **Measurements**.
2. Specify resolution settings in the 2D Area and Doppler Trace boxes. Using the *Resolution* pull-down menu, select a number from 1 to 8. A lower number specifies a more vivid resolution (i.e., more dots); a higher number specifies a less vivid resolution.

## Viewing the Patient Report

There are two ways of viewing the Patient Report:

- While in the calculation package, select **Report** from the calculation Selection Menu.
- At any time, press the **PATIENT** function key and click the **Reports** tab.

## Changing the Position of a CALC Menu

*To change the position of a CALC menu, follow these steps:*

1. Place the cursor on a border of the CALC menu and press <ENTER>.
2. To move the menu ...
  - downwards, place the cursor on the bottom border.
  - upwards, place the cursor on the top border.
  - to the left, place the cursor on the left border.
  - to the right, place the cursor on the right border.
  - diagonally, place the cursor on the corners of the menu.

## Setting a Default Position for the CALC Menu

The factory default location for the CALC menu is the upper right corner of the Cypress system screen. You can change the default using this procedure. At any time you can also change the location of the menu to any corner using the method described in “Changing the Position of a CALC Menu” on page 6-14. If you change the position of a menu or menus during an exam, reset the menus to the user-defined default position by clicking the [RESET] button. The menus will also return to the user-defined default position when the Cypress system is powered down.

*To set the default position of the CALC menus, follow these steps:*

1. Press the **SETUP** key.
2. Double-click the **Calculations** entry on the Setup listing.
3. Highlight **Menu Position**. A menu opens on the right side of the screen. It shows arrows pointing in four directions—each with its own radio button. For example, if the radio button for the upper left option (↖) is selected, the CALC menu will be displayed in that screen position.
4. Click the radio button that corresponds to the corner of the screen where you want the CALC menus located.
5. Press the **SETUP** key to exit the menu.



## Cardiac Formulas and References

### 2D Formulas

TABLE 29. 2D Formulas (Cardiac)

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>LV Volume: Method of Disks, Biplane</b>	$V = \frac{\pi}{4} \sum_{i=1}^{20} a_{di} b_{di} \cdot \frac{L}{20}$ <p><math>a_{di}</math> is the <math>i^{\text{th}}</math> disk diameter of LV apical 2 chamber (cm).  <math>b_{di}</math> is the <math>i^{\text{th}}</math> disk diameter of LV apical 4 chamber (cm).  <math>L</math> is the chamber length from either A4C or A2C, whichever is longest (cm).  <math>20</math> is the number of disk segments into which the ventricle is divided.</p>	ml
<b>LV Volume: Method of Disks, Single Plane</b>	$V = \frac{\pi}{4} \sum_{i=1}^{20} a_{di}^2 \cdot \frac{L}{20}$ <p><math>a_{di}</math> is the <math>i^{\text{th}}</math> disk diameter of LV apical 2 or 4 chamber (cm).  <math>L</math> is the chamber length of the cavity (cm).</p>	ml
<b>Ejection Fraction</b>	$EF = \left( \frac{Vd - Vs}{Vd} \right) \cdot 100$ <p><math>V</math> is LV volume (ml).  <math>s</math> is systole.  <math>d</math> is diastole.</p>	%
<b>Stroke Volume</b>	$SV = Vd - Vs$ <p><math>V</math> is LV volume (ml).  <math>s</math> is systole.  <math>d</math> is diastole.</p>	ml
<b>Cardiac Output</b>	$CO = \frac{(SV \cdot HR)}{1000}$ <p><math>SV</math> is stroke volume (ml).  <math>HR</math> is heart rate (bpm).</p>	l/min
<b>Cardiac Index</b>	$CI = \frac{CO}{BSA}$ <p><math>CO</math> is cardiac output (l/min).  <math>BSA</math> is Body Surface Area (<math>m^2</math>).</p>	l/min/ $m^2$

**TABLE 29. 2D Formulas (Cardiac)**

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>LV Mass</b>	$LV\ Mass = 1.05 \left( \frac{5}{6} (A_1(L+t)) - \frac{5}{6} (A_2 \cdot L) \right)$	g
	$t = \left( \left( \sqrt{\frac{A_1}{\pi}} \right) - \left( \sqrt{\frac{A_2}{\pi}} \right) \right)$ <p>A<sub>1</sub> is SAX epicardial diastolic area (cm<sup>2</sup>).                      A<sub>2</sub> is SAX endocardial diastolic area (cm<sup>2</sup>).                      L is Apical length in diastole (cm).                      t is mean myocardial thickness.</p>	cm
<b>LV Mass Index (LVMI)</b>	$LVMI = \frac{LV\ Mass}{BSA}$	g/m <sup>2</sup>
	LV Mass (g). BSA is Body Surface Area (m <sup>2</sup> ).	
<b>Body Surface Area (BSA)</b>	$BSA = 0.007184 (W_{kg}^{0.425} H_{cm}^{0.725})$	m <sup>2</sup>
	W is weight (kg) (range: 0.5—160.0 kg). H is height (cm) (range: 15.0—204.0 cm).	
<b>Fractional Area Change (% FAC)</b>	$\% FAC = \left( \frac{LVd - LVs}{LVd} \right) \cdot 100$	%
	LVd is LV diastolic area (cm <sup>2</sup> ). LVs is LV systolic area (cm <sup>2</sup> ).	
<b>Flow Area</b>	$Flow\ Area = \pi \cdot \left( \frac{d^2}{4} \right)$	cm <sup>2</sup>
	d is diameter (cm).	
<b>Fractional Shortening (% FS)</b>	$\% FS = \left( \frac{LVd - LVs}{LVd} \right) \cdot 100$	%
	LVd is diastolic dimension (cm). LVs is systolic dimension (cm).	

TABLE 29. 2D Formulas (Cardiac)

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>Fractional Thickening–Interventricular Septum (% FT)</b>	$\% \text{ FT} = \left( \frac{IVSs - IVSd}{IVSd} \right) \cdot 100$ <p>IVSs is Interventricular Septum in systole. IVSd is Interventricular Septum in diastole.</p>	%
<b>Fractional Thickening–Left Ventricular Posterior Wall (% FT)</b>	$\% \text{ FT} = \left( \frac{LVPWs - LVPWd}{LVPWd} \right) \cdot 100$ <p>LVPWs is Left Ventricular Posterior Wall in systole. LVPWd is Left Ventricular Posterior Wall in diastole.</p>	%

## M-Mode Formulas

**TABLE 30. M-Mode Formulas (Cardiac)**

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>Fractional Shortening (% FS)</b>	$\% \text{ FS} = \left( \frac{LVd - LVs}{LVd} \right) \cdot 100$ <p>LVd is diastolic dimension (cm). LVs is systolic dimension (cm).</p>	%
<b>Fractional Thickening– Interventricular Septum (% FT)</b>	$\% \text{ FT} = \left( \frac{IVSs - IVSd}{IVSd} \right) \cdot 100$ <p>IVSs is Interventricular Septum in systole. IVSd is Interventricular Septum in diastole.</p>	%
<b>Fractional Thickening– Left Ventricular Posterior Wall (% FT)</b>	$\% \text{ FT} = \left( \frac{LVPWs - LVPWd}{LVPWd} \right) \cdot 100$ <p>LVPWs is Left Ventricular Posterior Wall in systole. LVPWd is Left Ventricular Posterior Wall in diastole.</p>	%
<b>Volume Cubed</b>	$V = LVID^3$ <p>LVID is left ventricular internal diameter (cm).</p>	ml
<b>Volume Teichholz</b>	$V = \left( \frac{7}{2.4 + LVID} (LVID^3) \right)$ <p>LVID is left ventricular internal diameter (cm).</p>	ml
<b>Ejection Fraction Cubed</b>	$EF = \left( \frac{Vd - Vs}{Vd} \right) \cdot 100$ <p>Vd is diastolic volume cubed (ml). Vs is systolic volume cubed (ml).</p>	%
<b>Ejection Fraction Teichholz</b>	$EF = \left( \frac{Vd - Vs}{Vd} \right) \cdot 100$ <p>Vd is diastolic volume Teichholz (ml). Vs is systolic volume Teichholz (ml).</p>	%
<b>Stroke Volume Cubed</b>	$SV = Vd - Vs$ <p>Vd is diastolic volume cubed (ml). Vs is systolic volume cubed (ml).</p>	ml
<b>Stroke Volume Teichholz</b>	$SV = Vd - Vs$ <p>Vd is diastolic volume Teichholz (ml). Vs is systolic volume Teichholz (ml).</p>	ml

TABLE 30. M-Mode Formulas (Cardiac)

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>Cardiac Output Cubed</b>	$CO = \frac{(SV \bullet HR)}{1000}$  SV is stroke volume cubed (ml). HR is heart rate (bpm).	l/min
<b>Cardiac Output Teichholz</b>	$CO = \frac{(SV \bullet HR)}{1000}$  SV is stroke volume Teichholz (ml). HR is heart rate (bpm).	l/min
<b>Cardiac Index Cubed</b>	$CI = \frac{CO}{BSA}$  CO is Cardiac Output cubed (l/min). BSA is Body Surface Area (m <sup>2</sup> ).	l/min/m <sup>2</sup>
<b>Cardiac Index Teichholz</b>	$CI = \frac{CO}{BSA}$  CO is Cardiac Output Teichholz (l/min). BSA is Body Surface Area (m <sup>2</sup> ).	l/min/m <sup>2</sup>
<b>LV Mass</b>	$LV\ Mass = 0.8(1.04)((IVSd + LVIDd + LVPWd)^3 - LVIDd^3) + 0.6$  IVSd is interventricular septum diastole (cm). LVIDd is left ventricular internal diameter diastole (cm). LVPWd is left ventricular posterior wall diastole (cm).	g
<b>LV Mass Index (LVMI)</b>	$LVMI = \frac{LV\ Mass}{BSA}$  LV Mass (g). BSA is Body Surface Area (m <sup>2</sup> ).	g/m <sup>2</sup>
<b>Body Surface Area (BSA)</b>	$BSA = 0.007184(W_{kg}^{0.425} H_{cm}^{0.725})$  W is weight (kg) (range: 0.5—160.0 kg). H is height (cm) (range: 15.0—204.0 cm).	m <sup>2</sup>

## Doppler Formulas

**TABLE 31. Doppler Formulas (Cardiac)**

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>Pressure Gradient</b>	Pressure Gradient = $4V^2$ V is velocity.	mmHg
<b>Mean Velocity</b>	$V_{mean} = \frac{\sum_{i=1}^{N-1} V_i \Delta_{ti}}{\sum_{i=1}^{N-1} \Delta_{ti}}$ <p>V is the average velocity between two successive velocity trace points (m/s). N is the number of velocity trace points. <math>\Delta_{ti}</math> is the time increment between two successive velocity trace points (seconds).</p>	m/s
<b>Mean Pressure Gradient</b>	$P_{mean} = \frac{\sum_{i=1}^{N-1} 4V_i^2 \Delta_{ti}}{\sum_{i=1}^{N-1} \Delta_{ti}}$ <p>V is the average velocity between two successive velocity trace points (m/s). N is the number of velocity trace points. <math>\Delta_{ti}</math> is the time increment between two successive velocity trace points (seconds).</p>	mmHg
<b>Time Velocity Integral</b>	$TVI = \text{area under curve}$	m

TABLE 31. Doppler Formulas (Cardiac)

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>Stroke Volume</b>	$SV = TVI \bullet Flow\ Area \bullet 100$ <p>TVI is the time velocity integral (m). Flow Area is derived from the flow diameter (cm<sup>2</sup>).</p> <p style="text-align: center;"><b>TVI      FLOW AREA</b></p> <p><i>Aortic:</i>    AoV TVI    LVOT Flow Area <i>Mitral:</i>    MV TVI    Mitral Flow Area <i>Pulmonic:</i> PV TVI    Pulmonic Flow Area <i>Tricuspid:</i> TV TVI    Tricuspid Flow Area</p>	ml
<b>Cardiac Output</b>	$CO = \frac{SV \bullet HR}{1000}$ <p>SV is Stroke Volume (ml). HR is Heart Rate (bpm).</p>	l/min
<b>Cardiac Index</b>	$CI = \frac{CO}{BSA}$ <p>CO is cardiac output (l/min). BSA is body surface area (m<sup>2</sup>).</p>	l/min/m <sup>2</sup>
<b>Pressure Half Time (PHT)</b>	$PHT = \left( \frac{V_{max} \bullet \left(1 - \frac{1}{\sqrt{2}}\right)}{Deceleration\ Slope} \right) \bullet 1000$ <p>V<sub>max</sub> is Maximum Velocity (m/s). Deceleration Slope (m/s<sup>2</sup>).</p>	ms
<b>Valve Area by PHT</b>	$Valve\ Area = \frac{220}{PHT}$ <p>PHT is Pressure Half Time (msec).</p>	cm <sup>2</sup>
<b>Aortic Valve Area by the Continuity Equation using V<sub>max</sub></b>	$AVA = CSA_{LVOT} \bullet \frac{V_{max_{LVOT}}}{V_{max_{AoV}}}$ <p>AVA is Aortic Valve Area (cm<sup>2</sup>). CSA<sub>LVOT</sub> is Cross-sectional Area of LVOT (cm<sup>2</sup>). V<sub>max<sub>LVOT</sub></sub> is the maximum velocity in the LVOT (m/s). V<sub>max<sub>AoV</sub></sub> is the maximum velocity across the aortic valve (m/s). LVOT is Left Ventricular Outflow Tract.</p>	cm <sup>2</sup>

**TABLE 31. Doppler Formulas (Cardiac)**

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>Aortic Valve Area by the Continuity Equation using TVI</b>	$AVA = CSA_{LVOT} \cdot \frac{TVI_{LVOT}}{TVI_{AoV}}$ <p>AVA is Aortic Valve Area (cm<sup>2</sup>).                      CSA<sub>LVOT</sub> is cross-sectional Area of LVOT (cm<sup>2</sup>).                      TVI<sub>LVOT</sub> is the Time Velocity Interval in the LVOT (m).                      TVI<sub>AoV</sub> is the Time Velocity Interval across the aortic valve (m).                      LVOT is Left Ventricular Outflow Tract.</p>	cm <sup>2</sup>
<b>Flow Area from Diameter</b>	$Flow\ Area = \pi \cdot \left(\frac{d^2}{4}\right)$ <p>d is diameter (cm).</p>	cm <sup>2</sup>
<b>Mitral Valve Area by the Continuity Equation using LVOT</b>	$MVA = CSA_{LVOT} \cdot \frac{TVI_{LVOT}}{TVI_{MV}}$ <p>MVA is Mitral Valve Area (cm<sup>2</sup>).                      CSA<sub>LVOT</sub> is cross-sectional Area of LVOT (cm<sup>2</sup>).                      TVI<sub>LVOT</sub> is the Time Velocity Integral of LVOT (m).                      TVI<sub>MV</sub> is the Time Velocity Integral of mitral valve (m).                      LVOT is Left Ventricle Outflow Tract.</p>	cm <sup>2</sup>
<b>Mitral Valve Area by the Continuity Equation using Pulmonary Artery</b>	$MVA = CSA_{PA} \cdot \frac{TVI_{PA}}{TVI_{MV}}$ <p>MVA is mitral valve Area (cm<sup>2</sup>).                      CSA<sub>PA</sub> is cross-sectional Area of pulmonary artery (cm<sup>2</sup>).                      TVI<sub>PA</sub> is the Time Velocity Integral of pulmonary artery (m).                      TVI<sub>MV</sub> is the Time Velocity Integral of mitral valve (m).</p>	cm <sup>2</sup>
<b>Right Ventricular Systolic Pressure from Tricuspid Regurgitation</b>	$RVSP = P_{RA} + 4V_{max}^2$ <p>P<sub>RA</sub> is estimated Right Atrial pressure (mmHg).                      V<sub>max</sub> is regurgitant Velocity of tricuspid valve (m/s).</p>	mmHg
<b>Right Ventricular Systolic Pressure from Ventricular Septal Defect</b>	$RVSP = BP_{sys} - 4V_{max}^2$ <p>BP<sub>sys</sub> is systolic Blood Pressure (mmHg).                      V<sub>max</sub> is maximum Velocity of ventricular septal defect (m/s).</p>	mmHg



TABLE 31. Doppler Formulas (Cardiac)

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>Shunt Ratio</b>	$\frac{Q_p}{Q_s} = \frac{CO_{Qp}}{CO_{Qs}}$ <p>CO<sub>Qp</sub> is pulmonic Cardiac Output (l/min). CO<sub>Qs</sub> is systemic Cardiac Output (l/min).</p>	—
<b>Shunt Difference</b>	$Q_p - Q_s = CO_{Qp} - CO_{Qs}$ <p>CO<sub>Qp</sub> is pulmonic Cardiac Output (l/min). CO<sub>Qs</sub> is systemic Cardiac Output (l/min).</p>	l/min

## Cardiac Calculation References

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# *Vascular Calculations*

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The Cypress system can perform vascular and general measurements and calculations. This chapter includes information about:

- How to make vascular measurements
- Formulas (2D and Doppler)
- References for the calculations

**NOTE** *Review the information regarding measurement and calculations accuracy in Chapter 10, “Safety, Technical Description, and Accuracy” before starting any calculations.*

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## Overview of Vascular Measurements

The Cypress system provides a range of vascular measurements and derived calculations for diagnostic ultrasound. There are two types of vascular calculations:

- **General:** Simple general measurements, such as a distance or area, that are not associated with a particular calculation and are not saved to the Patient Report. Table 32 lists the general measurements by each mode type.
- **Specific:** Measurements that are a part of a formulaic calculation. These typically involve multiple measurements and the calculation of a clinical index such as Pulsatility Index. These calculations are saved in the Patient Report. Table 33 on page 7-3 lists the specific calculations by each mode type.

**NOTE** *General measurements are designed to be a quick way to perform calculations that you do not need to assign to a site for a report. Specific measurements are assigned to a site and generate a Report.*

## Types of General Vascular Measurements

Table 32 shows the general vascular measurements for each mode.

**TABLE 32. General Vascular Measurements by Mode**

<i>Mode</i>	<i>General Measurements</i>
<b>2D</b>	<ul style="list-style-type: none"> <li>■ Distance</li> <li>■ Area</li> </ul>
<b>M-Mode</b>	<ul style="list-style-type: none"> <li>■ Distance</li> <li>■ Time</li> <li>■ Slope—with Distance and Time</li> </ul>
<b>Spectral Doppler</b>	<ul style="list-style-type: none"> <li>■ Velocity</li> <li>■ PI: PS (Peak Systolic), ED (End Diastolic), S/D (Systolic/Diastolic), PI (Pulsatility Index), RI (Resistance Index), TAVmax (Time-Averaged Maximum Velocity)</li> <li>■ RI: PS (Peak Systolic), ED (End Diastolic), S/D (Systolic/Diastolic), RI (Resistance Index)</li> <li>■ Acceleration: Vel (Velocity), Time</li> </ul>

## Types of Specific Vascular Calculations

Table 33 shows the specific calculations for the different modes. The formulas for each calculation are shown in Table 35 and Table 36.

**TABLE 33. Specific Vascular Calculations by Mode**

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**2D Mode** (See Table 35 on page 7-14)

- % Stenosis (Area and Diameter)
- Volume Flow
- HWL (volume)

---

**Doppler** (See Table 36 on page 7-15)

- Right Carotid: CCA, ICA, ECA, Bulb, Vert, Subclav, ICA/CCA, PSV/EDV
  - Left Carotid: CCA, ICA, ECA, Bulb, Vert, Subclav, ICA/CCA, PSV/EDV
  - Arterial: Vel, PI, RI, Accel
  - Venous: Time
  - Ratios: A/B
  - Volume Flow: TAVmax, Area
- 

**NOTE** *There are no specific vascular calculations for M-Mode.*

---

## Vascular Calculations Setup

### Setting Parameters

To set up the parameters for the vascular calculations package, follow these steps:

1. Press the **SETUP** key and click the **Calculations** heading.
2. Click **Measurements** to display the list of options.
3. Use the Trackball to highlight a parameter and the <ENTER> key to select.
4. To exit, press **SETUP**.

**NOTE** See Table 6, “Calculation Menu Fields,” on page 3-16 for a complete description of the measurement options.

### About Construction Methods

There are two construction methods:

- When the **Continuous** method is selected, the Trackball is used to define the flow pattern or 2D image with a continuous motion.
- When the **Point to Point** method is selected, the Trackball is used to place points along the flow pattern or 2D image. Press <ENTER> after each point is positioned and the points will automatically connect. Double-click the last point to complete the outline.

**NOTE** When tracing a Doppler flow envelope, the cursor has been programmed to remain either above or below the baseline.

**NOTE** The direction of the trace cannot be reversed once started—when tracing from left to right, the trace can only be completed by continuing towards the right of the flow envelope.

**NOTE** When defining a portion of a 2D image, no part of the outline can intersect another segment of the outline.

## Selecting a Report Format

1. Press the **SETUP** key and click the **Calculations** heading.
2. Click **Reports**.
3. Select the **Configured** format to display the sections of the report where data has been entered.

## Selecting a Report Background

1. Press the **SETUP** key and click the **Calculations** heading.
2. Click **Reports**.
3. Select either a light background or a dark background.

## About Default Sites for Vascular

Default vascular sites appear in the calculations menu and can be specified by the user. The following procedures describe how to add, edit, delete, and manage default sites.

## Adding Default Sites for Vascular

*To add vascular sites to specific exam types, follow these steps:*

1. Press **SETUP**, double-click **Calculations**, and highlight **Vascular Sites**.
2. Select the specific Exam Type (for example, *Carotid*), from the pull-down menu.
3. Select a calculation type (for example, *%Stenosis*). This opens a factory-defined list.
4. To add sites to the list, click [ADD].
5. Either scroll through the list or start typing (for example, *vertebral*) and the list will automatically find the word as you type.
6. Complete the site specifications (*artery* or *vein*, *right* or *left*, etc.) using the radio buttons.
7. Click [OK].
8. Continue adding sites for the selected calculation type by repeating steps 4—7.

**NOTE** *For Ratios, remember to complete the specifications for both sites.*

**NOTE** *The site labels are abbreviated in the menu. The abbreviations are displayed at the top of the Add window and in the Calculations menu.*

## Editing Default Vascular Sites

*To edit a specific site, follow these steps:*

1. Press **SETUP**, double-click **Calculations**, and highlight **Vascular Sites**.
2. Select an Exam Type from the pull-down menu (for example, *Carotid*).
3. Select a calculations type (for example, *%Stenosis*) and double-click to open a list of vascular sites.
4. To change a specific site, highlight the site (for example, **R ICA**), and click [EDIT].
5. Use the radio buttons to adjust the settings and click [OK] to save the changes and return to the Vascular Sites window.

## Removing Default Vascular Sites

*To remove a specific site, follow these steps:*

1. Press **SETUP**, double-click **Calculations**, and highlight **Vascular Sites**.
2. Select an Exam Type from the pull-down menu (for example, *Carotid*).
3. Select a calculations type (for example, *%Stenosis*) and double-click to open a list of vascular sites.
4. To change a specific site, highlight the site and click [REMOVE].

## Restoring Factory Defaults to Vascular Sites

*To restore the factory-defined site defaults to a calculation type, follow these steps:*

1. Press **SETUP**, double-click **Calculations**, and highlight **Vascular Sites**.
2. Select an Exam Type from the pull-down menu (for example, *Carotid*).
3. Highlight a calculations type (for example, *%Stenosis*) and click [RESET].

## Changing the Position and Order of the Vascular Sites

*To change the order in which the sites appear in the calculations site menu, follow these steps:*

1. Press **SETUP**, double-click **Calculations**, and highlight **Vascular Sites**.
2. Select an Exam Type from the pull-down menu (for example, *Carotid*).
3. Select a measurement type (for example, *%Stenosis*) and double-click to open a list of vascular sites.
4. To change the position of a specific site, highlight the site (for example, **R ICA**), and click the up ( $\wedge$ ) or down ( $\vee$ ) arrows to move the site up or down the list.



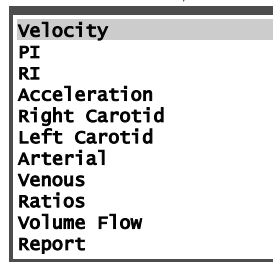
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## Using the Vascular Calculations Package

To start a calculation, follow these steps:

1. Start a scan by pressing a Mode key (**2D**, **PW**, or **M**).
2. Press the **CALC** function key while in any mode. Pressing the **CALC** key freezes the scanning mode and displays the Selection Menu. You can also access the calculations package by pressing **FREEZE** at any time during the examination, and then pressing **CALC** to display the Selection Menu. The Selection Menu displayed depends on which scanning mode is active. The menu provides a choice of general and specific measurements.

DOPPLER VASCULAR CALCULATIONS  
SELECTION MENU



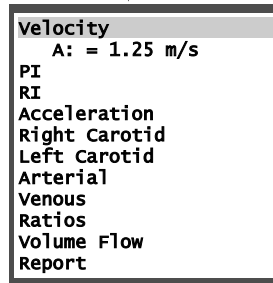
### Performing General Vascular Measurements

General measurements are not entered into the Patient Report. The measurement result is displayed on the Selection Menu and the screen, along with the image.

To perform a general measurement, follow these steps:

1. Press **PW** to activate the scanning mode.
2. Press the **CALC** key to freeze the image and open the Selection Menu.
3. Use the Trackball to highlight the desired type of measurement (for example, **Velocity**) from the menu and press <ENTER>.
4. Use the Trackball to position the cursor (startpoint) and then press <ENTER> to anchor the cursor at that position.

MEASUREMENT INDEX IN  
SELECTION MENU



5. Press **CALC** to exit the calculation package. Note that an index in green text is displayed in the upper right portion of the screen. This index is stored with the frame when the frame is saved for review at a later time.

**TABLE 34. Measurement Index Table**

<i>Measurement Index</i>	<i>Description</i>
<b>Single Upper Case Letter (A)</b>	A general measurement. Results are displayed in the Selection Menu.
<b>Single Lower Case Letter (a)</b>	A specific measurement. Results are displayed in the Selection Menu, Report Menu, and Patient Report.

## Performing Specific Vascular Calculations

*To complete a specific calculation, follow these steps:*

1. Press **PW** to activate the scanning mode.
2. Press the **CALC** key to freeze the image and open the Selection Menu.
3. Select the desired type of calculation by highlighting an option in the Selection Menu (for example, *Right Carotid*) and press <ENTER>. The *Right Carotid* Report Menu will be displayed with the CCA area highlighted.
4. Press <ENTER> to display the sub-Report Menu.
5. Select the desired measurement and press <ENTER>.

**NOTE** *The specific calculations are often performed together in a sequence. The Cypress assumes an order to this sequence and automatically steps you through the components of a calculation. The order is for ease of use and does not affect the results. To override this and go to a component out-of-sequence, move the Trackball to highlight the desired item in the Report Menu.*

**NOTE** *While the Report Menu is on the screen, turn the Main knob to search for the correct frame on which to perform the measurement and then press <ENTER>.*

6. Use the Trackball to position the cursor and press <ENTER>.
7. Complete all desired measurements by highlighting the measurement with the Trackball and pressing <ENTER> to select. Use the Trackball to position the cursor and <ENTER> to set. Images can be obtained by scanning the patient and then pressing **FREEZE** and using the Main knob to search for a frame, or pressing **VIEW** to display stored images. Results can be viewed in the Report Menu and Patient Report.

## Saving Calculations to the Patient Report

After each measurement or sequence of measurements is completed, the results of any calculation that uses the measurements as input are displayed. To save the results and close the menu, click [OK].

If you are not satisfied with a specific result, you can redo the measurement again. To keep the menu open, but clear all the results currently displayed, click [CLEAR]. To cancel the current calculation and close the menu, click [CANCEL].

When you have completed all your calculations and are satisfied with the results, to save the measurements (and close the Report Menu) click [OK]. Results can be viewed at any time by activating the patient study and then clicking the **Report** tab.

### To Delete a Single Measurement from a Report Menu

1. Highlight the measurement with the cursor.
2. Press the <←> key to remove that measurement and any associated measurements.

## Saving Frames Containing Measurement Graphics

After each measurement or sequence of measurements is completed, the frame used to perform the measurement can be saved along with the graphics. While the frame and graphics are displayed, press **Q SAVE**. The camera icon will briefly appear in the upper right corner of the screen to indicate the frame has been saved as part of the study.

If the frame used to perform the measurement is part of a loop that has already been saved as part of the study, pressing **Q SAVE** will add the measurement graphics and index to the frame. The camera icon will briefly appear in the upper right corner of the screen to indicate the graphics have been added to the frame. The graphics can only be viewed by using the Main knob to search for the frame.

## Deleting a General Measurement

To delete a general measurement, follow these steps:

1. Display the frame containing the measurement graphic.
2. Press **CALC** to display the Selection Menu.
3. Use the Trackball to highlight the measurement you want to delete.
4. Press the <←> key.

## Deleting a Specific Measurement

To delete a specific measurement, follow these steps:

1. Display the frame containing the measurement graphic.
2. Press **CALC** to display the Selection Menu.
3. Use the Trackball to select the name of the Report Menu containing the specific measurement you want to delete and press <ENTER>.

**NOTE** *Specific measurements cannot be deleted from the Selection Menu.*

4. To delete a single measurement, use the Trackball to highlight the measurement you want to delete and press <←>. To delete all of the measurements, click [CLEAR].

**NOTE** *If the deleted measurement is part of a formula, all the formula results that use that measurement are also deleted.*

## Making Corrections to the Trace and Area Measurements

No matter which method you choose to use to perform the measurements, correcting the *Trace* or *Area* outline is the same. Press the <←> key to erase a small portion of the outline. Press and hold the <←> key to continuously erase the path of the cursor until the <←> key is released.

## Stopping a Measurement Before Completion

- To stop a measurement or sequence of measurements and return the cursor to the currently displayed Calculation menu, press the <ESC> key before completing the measurement.
- To stop a measurement or sequence of measurements and exit the Calculation package, press the **CALC** key before completing the measurement.

## Viewing the Patient Report

There are two ways of viewing the Patient Report:

- While in the calculation package, select **Report** from the calculation Selection Menu.
- At any time, press the **PATIENT** function key and click the **Reports** tab.

## Changing the Position of a CALC Menu

*To change the position of a CALC menu, follow these steps:*

1. Place the cursor on a border of the CALC menu and press <ENTER>.
2. To move the menu ...
  - downwards, place the cursor on the bottom border.
  - upwards, place the cursor on the top border.
  - to the left, place the cursor on the left border.
  - to the right, place the cursor on the right border.
  - diagonally, place the cursor on the corners of the menu.

## Setting a Default Position for the CALC Menu

The factory default location for the CALC menu is the upper right corner of the Cypress system screen. You can change the default using this procedure. At any time you can also change the location of the menu to any corner using the method described in “Changing the Position of a CALC Menu” on page 7-12. If you change the position of a menu or menus during an exam, reset the menus to the user-defined default position by clicking the [RESET] button. The menus will also return to the user-defined default position when the Cypress system is powered down.

*To set the default position of the CALC menus, follow these steps:*

1. Press the **SETUP** key.
2. Double-click the **Calculations** entry on the Setup listing.
3. Highlight **Menu Position**. A menu opens on the right side of the screen. It shows arrows pointing in four directions—each with its own radio button. For example, if the radio button for the upper left option (↖) is selected, the CALC menus will be displayed in that screen position.
4. Click the radio button that corresponds to the corner of the screen where you want the CALC menus located.
5. Press the **SETUP** key to exit the menu.

## Vascular Formulas and References

### 2D Formulas

TABLE 35. 2D Formulas (Vascular)

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>Percent Stenosis Area</b>	$\frac{(A - a)}{A} \times 100$ <p>A is the greater of area 1 and area 2 (cm<sup>2</sup>). a is the lesser of area 1 and area 2 (cm<sup>2</sup>).</p>	%
<b>Percent Stenosis Diameter</b>	$\frac{(D - d)}{D} \times 100$ <p>D is the greater of diameter 1 and diameter 2 (cm). d is the lesser of diameter 1 and diameter 2 (cm).</p>	%
<b>Volume Flow</b>	$TAVMax \times CSA \times \frac{60}{10^4} \times 10^3$ <p>TAVMax is the time-averaged maximum velocity (m/s). CSA is Cross Sectional Area (cm<sup>2</sup>). Factor 60 converts to ml/min.</p>	l/min (liters/ minute)
<b>HWL (Volume)</b>	$\frac{4}{3} \times \pi \times \frac{L}{2} \times \frac{W}{2} \times \frac{H}{2}$ <p>L is the longitudinal axis. W is the transverse axis. H is the anteroposterior axis.</p>	ml



## Doppler Formulas

**TABLE 36. Doppler Formulas (Vascular)**

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>Resistance Index (RI)</b>	$\frac{(\text{Maximum Velocity} - \text{Minimum Velocity})}{\text{Maximum Velocity}}$ <p>Maximum Velocity is the peak Systolic velocity. Minimum Velocity is the end Diastolic velocity.</p>	—
<b>Pulsatility Index (PI)</b>	$\frac{(\text{Maximum Velocity} - \text{Minimum Velocity})}{\text{TAV Maximum}}$ <p>Maximum Velocity is the peak Systolic velocity. Minimum Velocity is the end Diastolic velocity. TAV Maximum is the time-averaged Maximum velocity. Time Averaged Velocity Maximum is the averaged (mean) value of the maximum Doppler shift frequency.</p>	—
<b>Volume Flow</b>	$\text{TAVMax} \times \text{CSA} \times \frac{60}{10^4} \times 10^3$ <p>TAVMax is the time-averaged maximum velocity (m/s). Time Averaged Velocity Maximum is the averaged (mean) value of the maximum Doppler shift frequency. CSA is Cross Sectional Area (cm<sup>2</sup>). Factor 60 converts to ml/min.</p>	l/min (liters/minute)
<b>Ratio</b>	$\frac{\text{Velocity A}}{\text{Velocity B}}$	—
<b>Systolic/Diastolic (S/D)</b>	$\frac{\text{Systolic Velocity}}{\text{Diastolic Velocity}}$	—
<b>Internal Carotid/Common Carotid Ratio (IC/CC)</b>	$\frac{\text{Highest ICA Velocity}}{\text{Mid CCA Velocity}}$ <p>ICA velocity is the highest Internal Carotid Artery Peak Systolic velocity. CCA velocity is the mid Common Carotid Artery Peak Systolic velocity.</p>	—

**TABLE 36. Doppler Formulas (Vascular)**

<i>Type</i>	<i>Formula</i>	<i>Units</i>
<b>Peak Systolic/ End Diastolic</b>	$\frac{PSV_{IC}}{EDV_{CC}}$ <p>PSV is the highest Peak Systolic Velocity of the Internal Carotid artery. EDV is the mid End Diastolic Velocity of the Common Carotid artery. The highest Peak Systolic Velocity of the Internal Carotid Artery/End Diastolic Velocity of the Mid Common Carotid Artery.</p>	—
<b>Acceleration</b>	$\frac{\Delta \text{ Velocity}}{\Delta \text{ Time}}$ <p><math>\Delta</math> Velocity is the change in velocity (m/s). <math>\Delta</math> Time is the change in time (s).</p>	m/sec <sup>2</sup>

### Vascular Calculation References

1. Bernstein, E., *Noninvasive Diagnostic Techniques in Vascular Disease*. The C.V. Mosby Company. 1990. St. Louis.
2. Bernstein, E., *Vascular Diagnosis* (Fourth Edition). Mosby-Year Book, Inc. 1993. St. Louis.
3. Hatle, L., Angelsen, B., *Doppler Ultrasound in Cardiology* (Second Edition). Lea & Febiger. 1985. Philadelphia.
4. Taylor, K., Strandess, D. E., *Duplex Doppler Ultrasound*. Churchill Livingstone Inc. 1990. New York.
5. Daigle, R., *Techniques in Noninvasive Vascular Diagnosis* (second edition). Summer Publishing. 2002. Littleton, CO.
6. Chervenak, F., Isaacson, G., Campbell, S., *Ultrasound in Obstetrics and Gynecology* (Volume 1; First Edition) Little, Brown 1993. Boston.

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Stress echo studies are based on the serial collection of image loops for specific cardiac views. The Cypress system provides several different stress echo protocols to choose from. Information in this chapter includes:

- Connecting the ECG signal
- How to achieve the best ECG signal quality during stress echo exams
- How to reduce ECG artifacts
- Using the stress setup controls
- The stress protocols
- Conducting the stress exam — including Rest Stage, Immediate Post and Peak, and Pharmacological Stress

## Connecting and Using ECG

Use ECG to display electrocardiogram waveforms. Siemens provides an ECG adapter that connects into the back of the Cypress system.

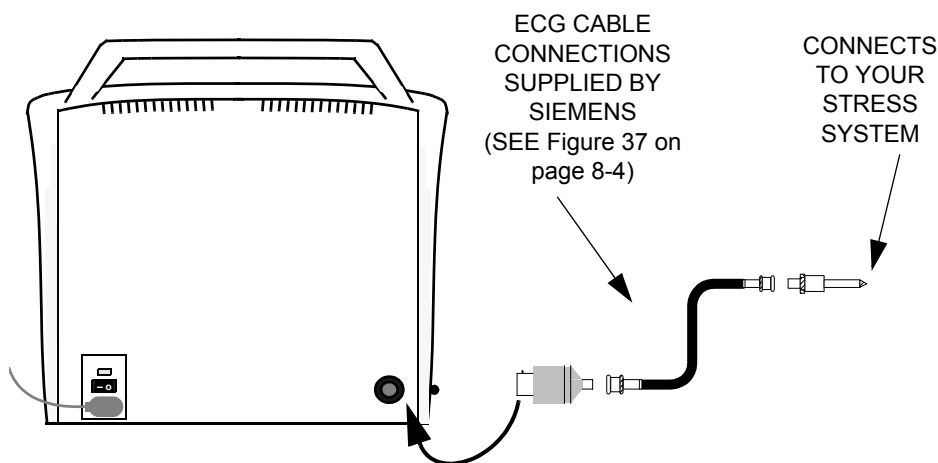
**WARNING** *The Cypress system is not intended for use as an ECG monitor or for diagnostic ECG. Signals displayed are for reference or triggering only.*



**WARNING** *Do not use ECG patient cables with detachable lead wires that have exposed male pins. Electrocution could result if these pins are plugged into AC power.*

To connect the Cypress system to a stress system, follow these steps:

1. Assemble the supplied ECG-to-BNC connector, cable, and BNC-to-Stress System plug as shown in Figure 37, "ECG-to-BNC Connector and BNC-to-Stress System Plugs," on page 8-4 and Figure 38, "Stress Echo ECG Cable," on page 8-5.
2. Insert the ECG-to-BNC connector into the port on the back of the Cypress system.
3. Insert the BNC-to-Stress System plug into your stress system.



4. Attach the electrodes and ECG leads to the patient.

5. If the ECG is not displayed at the bottom of the screen, press **SETUP** to display the Setup menu and then double-click the **Setup** tab. Highlight the ECG subtitle and click the box next to ECG to enter a check mark. If you want to remove the ECG display, click the box once again to remove the check mark.
6. When you press a Mode key (e.g., **2D**) in order to return to real-time scanning, the ECG waveform will be displayed. It is normal for the system to take a few moments to automatically adjust gain levels before displaying the ECG waveform. The triggers will automatically appear on the R-wave or each cardiac cycle. They can be turned off only by turning off the ECG.

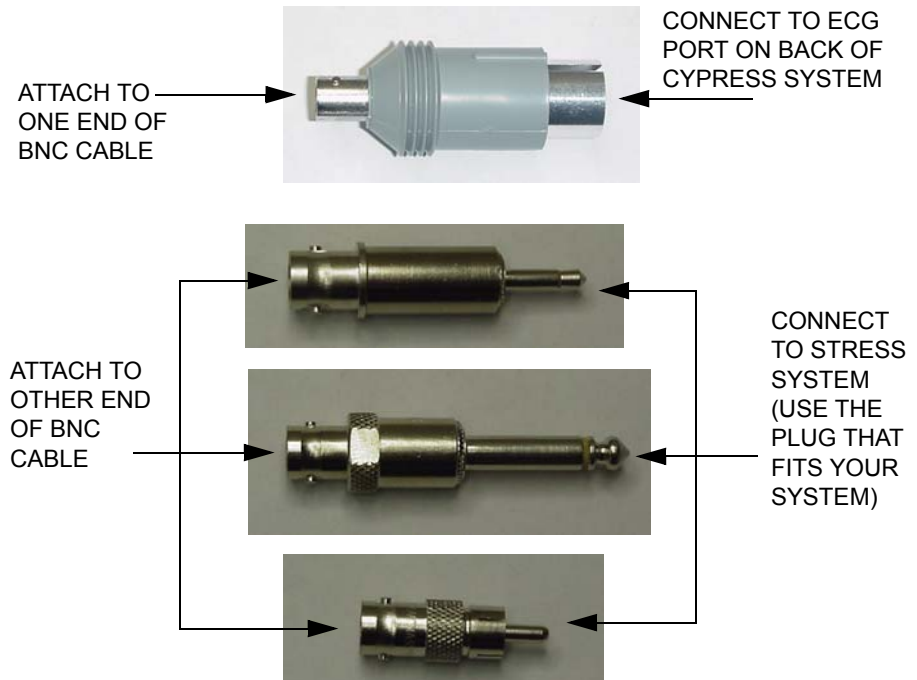
## Stress Echo ECG Cables and Connectors

All of the adapters described in this section are included in the Stress Echo option package.

### Stress Echo ECG Connectors

Siemens ships a variety of connectors with every Cypress Stress Echo option package. This ensures that the Cypress system can be properly connected to most stress systems.

Store the extra connectors in case you purchase another stress system that needs a different adapter.



**FIGURE 37. ECG-to-BNC Connector and BNC-to-Stress System Plugs**

### Stress Echo ECG Cable



← CABLE WITH BNC  
CONNECTOR AT  
EACH END

ATTACH CONNECTORS TO  
EACH END OF THE CABLE AS



**FIGURE 38. Stress Echo ECG Cable**

## ECG Signal Quality During Stress Echo Exam

A high-quality ECG signal is essential for a successful stress echo exam. Typically, stress echo exams rely on the ECG to trigger the acquisition of images. ECG artifacts can cause inaccurate timing of this trigger and interfere with image acquisition. So, it is important to minimize problems created by ECG artifacts during stress echo exams.

Artifacts may be more of a problem during stress studies than during routine rest studies because of increased muscle movements and respiratory rates. Both respiratory artifacts and muscle motion artifacts can cause problems during exercise stress studies. During pharmacological stress studies, there may be increased respiratory artifacts, though muscle motion artifacts typically are not an issue.

If artifacts are present and detected as a heart beat, the heart rate displayed by the system may become inaccurate.

## Reducing ECG Artifacts

Recommended techniques to reduce ECG artifacts during stress echo include:

- **Use a 12-lead electrocardiograph.** The Cypress system does not incorporate a 12-lead amplifier. However, your electrocardiograph unit may have an ECG output signal which can be input into the Cypress system ECG input. Using a 12-lead input provides the highest quality signal.
- **Use a square-wave pulse output.** Your electrocardiograph unit may also provide a square-wave pulse output signal which can be input into the Cypress system ECG input. This output signal can be used to provide a more robust R-wave trigger signal.



## About the Stress Protocols

The Cypress system has a series of stress protocols. The sequence of views that are collected and the names of the stages are shown in Table 37.

**TABLE 37. Views Collected for Stress Protocols**

<i>Protocol</i>	<i>Stage</i>	<i>Name of Stage</i>	<i>View Sequence</i>
<b>Exercise 2-Stage</b> (four views)	Stage 1	Rest	LAX, SAX, AP4, AP2
	Stage 2	Impost	AP4, AP2, LAX, SAX
<b>Exercise 2-Stage</b> (six views)	Stage 1	Rest	LAX, SAX, AP4, AP2, VIEW5, VIEW6
	Stage 2	Impost	AP4, AP2, LAX, SAX, VIEW5, VIEW6
<b>Exercise 3-Stage</b> (four views)	Stage 1	Rest	LAX, SAX, AP4, AP2
	Stage 2	Peak	AP4, AP2, LAX, SAX
	Stage 3	Post	LAX, SAX, AP4, AP2
<b>Exercise 3-Stage</b> (six views)	Stage 1	Rest	LAX, SAX, AP4, AP2, VIEW5, VIEW6
	Stage 2	Peak	AP4, AP2, LAX, SAX, VIEW5, VIEW6
	Stage 3	Post	LAX, SAX, AP4, AP2, VIEW5, VIEW6
<b>Pharmacological 4-Stage</b> (four views)	Stage 1	Base	LAX, SAX, AP4, AP2
	Stage 2	Low	LAX, SAX, AP4, AP2
	Stage 3	Peak	LAX, SAX, AP4, AP2
	Stage 4	Post	LAX, SAX, AP4, AP2
<b>Pharmacological 4-Stage</b> (six views)	Stage 1	Base	LAX, SAX, AP4, AP2, VIEW5, VIEW6
	Stage 2	Low	LAX, SAX, AP4, AP2, VIEW5, VIEW6
	Stage 3	Peak	LAX, SAX, AP4, AP2, VIEW5, VIEW6
	Stage 4	Post	LAX, SAX, AP4, AP2, VIEW5, VIEW6

**TABLE 37. Views Collected for Stress Protocols**

<i>Protocol</i>	<i>Stage</i>	<i>Name of Stage</i>	<i>View Sequence</i>
<b>Pharmacological 7-Stage (four views)</b>	Stage 1	Base	LAX, SAX, AP4, AP2
	Stage 2	Low	LAX, SAX, AP4, AP2
	Stage 3	Stage 3	LAX, SAX, AP4, AP2
	Stage 4	Stage 4	LAX, SAX, AP4, AP2
	Stage 5	Stage 5	LAX, SAX, AP4, AP2
	Stage 6	Peak	LAX, SAX, AP4, AP2
	Stage 7	Post	LAX, SAX, AP4, AP2
<b>Pharmacological 7-Stage (six views)</b>	Stage 1	Base	LAX, SAX, AP4, AP2, VIEW5, VIEW6
	Stage 2	Low	LAX, SAX, AP4, AP2, VIEW5, VIEW6
	Stage 3	Stage 3	LAX, SAX, AP4, AP2, VIEW5, VIEW6
	Stage 4	Stage 4	LAX, SAX, AP4, AP2, VIEW5, VIEW6
	Stage 5	Stage 5	LAX, SAX, AP4, AP2, VIEW5, VIEW6
	Stage 6	Peak	LAX, SAX, AP4, AP2, VIEW5, VIEW6
	Stage 7	Post	LAX, SAX, AP4, AP2, VIEW5, VIEW6

Abbreviations used in Table 37:

- LAX – Long Axis Parasternal
- SAX – Short Axis Parasternal
- AP4 – Apical 4 chamber
- AP2 – Apical 2 chamber
- Impost – Immediate Post

Because the apical views may provide increased information, many experts recommend obtaining these views first when the patient is closest to peak.

The system prompts you to capture images for the specific view at each stage in the sequence listed. By using the PROTOCOL Soft Window knob control you can change the sequence and still complete image acquisition. See “Using the Protocol Soft Window Knob” on page 8-10.

Pressing the **•SAVE** key during the Impost and Peak stages will capture loops for two consecutive minutes or until the **•SAVE** key is pressed a second time.

## Important Stress Controls

Important controls for the stress exam are described in Table 38.

**TABLE 38. Stress Controls**

<i>Control</i>	<i>Description</i>
<b>Protocol</b> (Soft Window Knob)	Provides a list of the active stress stages, such as Rest or Impost, and active views, such as LAX (long axis).
<b>FREEZE</b>	<p>Saves several loops in temporary scrolling memory. The number of loops saved depends on the patient's heart rate and the length of time since the last system parameter change. The loop counter in the upper right portion of the screen displays the number of loops in the temporary memory.</p> <p>Turn the PLAY LOOP knob to display individual loops. Label the loop and then press <b>•SAVE</b> or <b>Q SAVE</b> to save the loop to the hard drive.</p>
<b>Q SAVE</b> (Quick Save)	Saves a cardiac cycle and at the same time lets you label the loop. <b>Q SAVE</b> also automatically advances the view label to the next view in the sequence.
<b>•SAVE</b> (Save All)	<p>Turns image saving ON and OFF as in non-stress exams. During Impost, when <b>•SAVE</b> is activated:</p> <ul style="list-style-type: none"> <li>■ Make sure that the camera icon appears when <b>•SAVE</b> is pressed—the icon confirms that the study is being saved.</li> <li>■ The system captures images for 2 consecutive minutes or until the <b>•SAVE</b> key is pressed again.</li> </ul>
<b>ROI</b> (Region of Interest)	<p>Defines the portion of the sector image that will be played back in quad-screen format. The ROI control is located on the Tools menu.</p> <p>The region of interest box may be repositioned after a loop has been saved by playing the loop back in full-screen format and clicking the [ROI] button.</p>

**TABLE 38. Stress Controls**

<i>Control</i>	<i>Description</i>
<b>Timer</b>	<p>Provides a time counter, in seconds, of the elapsed time from the start of Immediate Post stages, and from the start of a Pharmacological Study's initial injection.</p> <p>In the Impost stage, the timer starts automatically when you press <b>•SAVE</b> or <b>Q SAVE</b>. In Pharmacological stages, you start the timer manually.</p> <ul style="list-style-type: none"> <li>■ To start the timer manually, press the <b>TOOLS</b> function key and click [TIMER], then select <b>Start</b>.</li> <li>■ To reset the timer to zero, press the <b>TOOLS</b> function key and click [TIMER], then select <b>Start</b>.</li> </ul> <p>See “Stress Echo TOOLS” on page 8-12 for more details.</p>
<b>Study Progress</b>	<p>For each stage, the system displays the appropriate views and details how many loops have been labeled for that view. The views are displayed as LAX, SAX, AP4, and AP2. The number of labeled loops follows each view (see Figure 40 on page 8-24).</p>

### Using the Protocol Soft Window Knob

The PROTOCOL Soft Window knob presents the various views, labels, or states associated with each study protocol. Select the desired Protocol using the Patient menu (see “Adding and Editing Patients and Studies” on page 4-9).

The active view, label, or state of the Protocol is displayed on the left side of the screen.

- To display the first stage, turn the PROTOCOL knob one click clockwise. Each clockwise click will then display a label with both *Stage* and *View*. Turn the PROTOCOL knob until the desired label is displayed.

## Deleting Unlabeled Loops from a Study

To delete unlabeled loops, follow these steps:

1. Press the **PATIENT** key.
2. Highlight the Date and Time of the study.
3. Click [REMOVE]
4. Select the **Unflagged Images** option by clicking the radio button.
5. Click [YES]
6. All unflagged images will be deleted.

*NOTE: Deleted images cannot be retrieved.*

## Transferring Studies in a DICOM Format

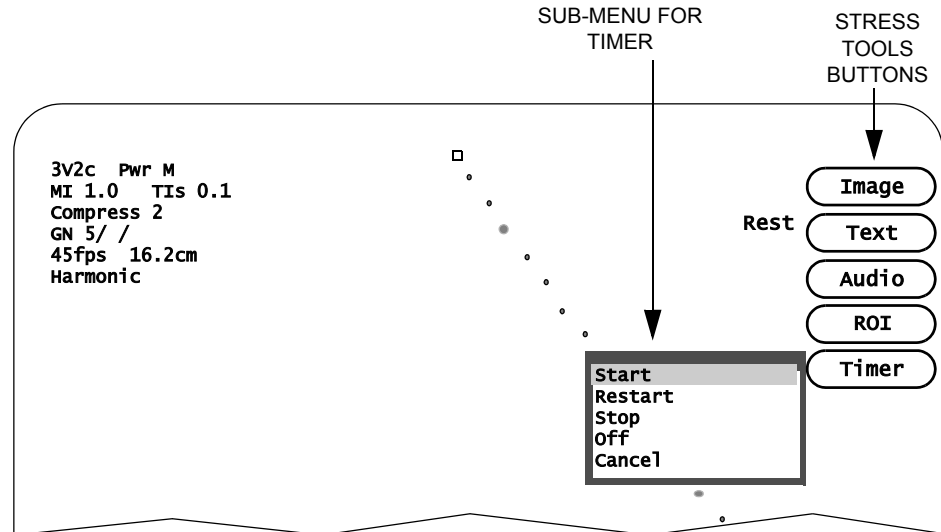
Stress studies can be transferred to a DICOM compatible viewer so that the images can be displayed in either a full-screen format or a region of interest (ROI) format. The full-screen format displays the entire image. The ROI format displays only the data within the ROI.

To setup the DICOM stress image size, follow these steps:

1. Press the **SETUP** key.
2. Double-click the **DICOM** tab.
3. Highlight the DICOM Stress Image Size subtitle and an option menu will appear on the right side of the screen.
4. Click the desired option.
5. Press the **SETUP** key to exit the menu.

## Stress Echo TOOLS

Pressing the **TOOLS** function key while in stress echo scanning mode displays the Tools buttons, including a [TIMER] button.



**FIGURE 39. Stress Tools**

The [IMAGE], [TEXT], [AUDIO], and [ROI] buttons function the same as they do in 2D mode (see Table 17 on page 5-28 for an explanation of these buttons).

The [TIMER] button has the following functions:

- **Start:** Starts the timer clock.
- **Restart:** Starts the timer clock once it has been stopped.
- **Stop:** Stops the timer clock.
- **Off:** Stops the timer clock and removes it from the screen.
- **Cancel:** Closes the menu without changing the timer clock.

## Conducting a Stress Echo Protocol Exam

### Step-By-Step Stress Echo Exam

This procedure details the steps for conducting the stress echo protocols: 2-Stage, 3-Stage, and Pharmacological. The basic steps for each protocol are the same and where there are differences for the individual protocols, they are noted.

To conduct a stress echo exam, follow these steps:

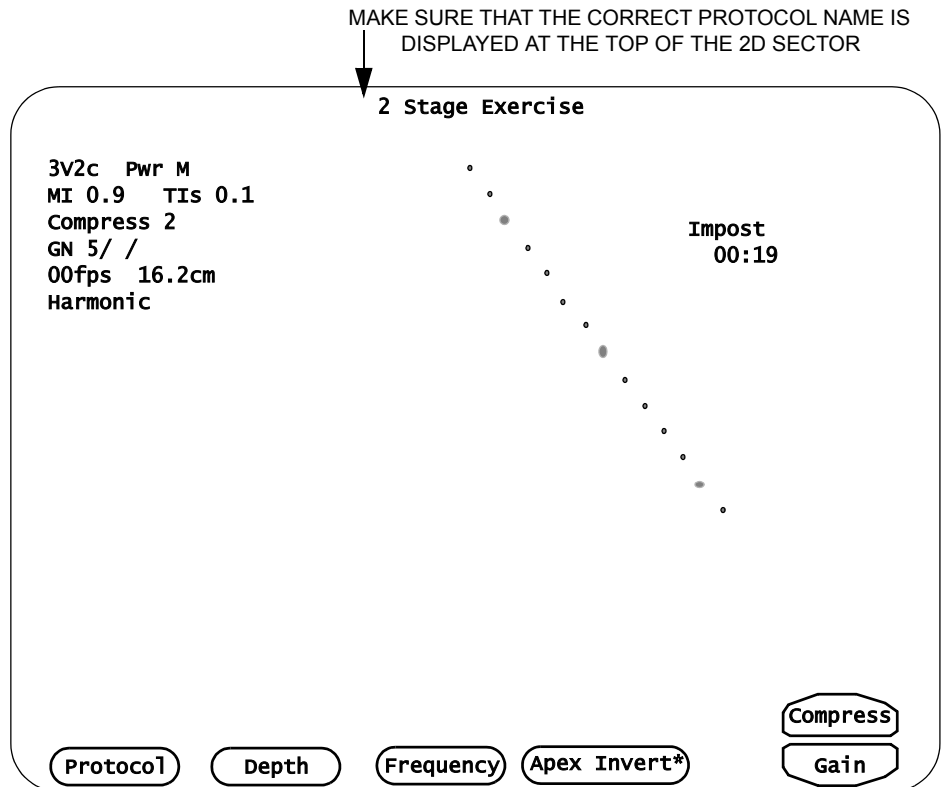
1. Press the **SETUP** function key and set the desired limits for the **Save Time Limit** and the **QSAVE Cycle Limit**. (See Table 4 on page 3-4 for more information.)
2. Press the **PATIENT** function key to open the patient directory and click the [NEW PATIENT] button to display the following screen:

The screenshot shows a patient setup screen with the following fields and options:

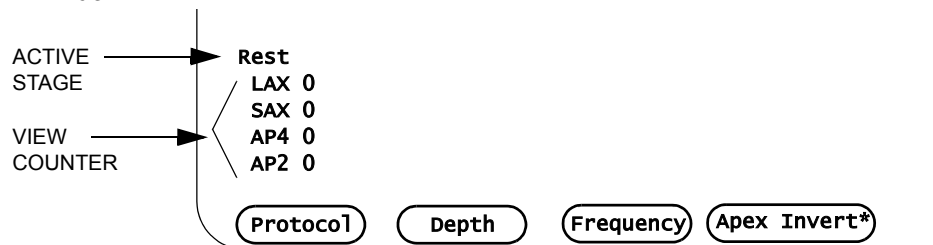
- Tabbed Headers:** Patient, Setup, Reports, Shutdown
- Patient Information:**
  - Last Name: Doe
  - First Name: Edgar
  - ID: QTR3942
  - Birth Date: 19 01 1944 (dd-mm-yyyy)
  - Sex: Male (dropdown)
  - Height: [ ] cm
  - Weight: [ ] kg
  - Blood Pressure: [ ] / [ ] mmHg
  - Study Indication: [ ]
  - Accession #: [ ]
  - Protocol: Routine Vascular (dropdown)
  - Institution Name: Routine Cardiac, 2 Stage Exercise, 3 Stage Exercise, Pharmacological, Contrast
  - Sonographer: [ ]
  - Miscellaneous: [ ]
- Study Options (Right Side):**
  - OK
  - Cancel
  - Presets
  - Add Study
  - Averaging
- Protocol Selection (Bottom Right):**
  - Carotid (dropdown)
  - Carotid
  - Upper Extremity
  - Lower Extremity
  - General

CLICK THE DOWN ARROW TO DISPLAY THE LIST OF PROTOCOLS.  
HIGHLIGHT THE PROTOCOL NAME.

- Complete the patient data and select an option from the **Protocol** drop-down menu. (Note that the *Contrast* protocol is available when the Advanced Triggering option is installed.) Then press the **2D** key to display the following screen.



- Turn the PROTOCOL Soft Window knob to display the **Stage** and **View** labels. Continue turning the knob until either **Rest** (for 2-Stage and 3-Stage) or **Base** (for Pharmacological) is highlighted. The following yellow text will appear in the lower left portion of the screen, just above the PROTOCOL soft window.





If the active stage is **Rest**, all loops captured are labeled “Rest.” If the active stage is **Base**, all loops captured are labeled “Base.” The view counter tracks the number of loops labeled for each of the four views.

5. Use the supplied ECG adapter to input the ECG signal from your treadmill into the Cypress system. Pay close attention to the ECG display at the bottom of the Cypress screen. Be sure the trigger is displayed on the R-wave of each QRS.
6. Press the **TOOLS** function key and click the [ROI] button that appears in the upper right corner of the screen to display the ROI box. Use the Trackball to position the ROI box. Turn the DEPTH Soft Window knob to make sure all four views are contained within the ROI box.
7. Rest loops and Base loops can be captured in three different ways—using **FREEZE**, **•SAVE**, or **Q SAVE**. See a description of each below.

#### **FREEZE**

- Begin scanning the patient starting with the LAX view. Once the image has been optimized, press **FREEZE**. Several loops are stored in temporary scrolling memory. The loop indicator located in the upper right portion of the screen displays the number of loops in temporary memory. The number varies depending on the patient’s heart rate and the amount of time between system parameter changes.
- Turn the PLAY LOOP Soft Window knob counterclockwise to display the loops. Stop when you see a loop that contains the greatest amount of diagnostic information. If you are not happy with any of the loops, press **2D** to continue scanning and then press **FREEZE** again.
- Once you have selected a loop—and the loop is playing—*turn* the PROTOCOL Soft Window knob to highlight **LAX**. The LAX0 counter turns white. To add this loop to the stress exam, press either **Q SAVE** or **•SAVE**. The LAX view counter displays a “1,” indicating one loop has been stored for the LAX view. Numerous loops can be stored for each view and are available for review in the quad display.
- If you are conducting a Pharmacological exam, go to Step 8 now. If you are conducting a 2-Stage or 3-Stage exam, go back to Step 6 until you have captured and labeled at least one loop for each view. When you are finished capturing all four views, go to Step 8.

#### **•SAVE**

- Begin scanning the patient starting with the LAX view. Once the image has been optimized, press **•SAVE**. If you set the **Save Time Limit** to four seconds, the Cypress system stores four seconds of data. To view the

captured loops press the **VIEW** function key and turn the PLAY LOOP Soft Window knob. Press **2D** to exit View mode. Continue scanning until loops for all four views have been saved.

- To assign a label to the loops, press the **VIEW** key and turn the PLAY LOOP knob to display each loop. Display the loop that you feel contains the greatest amount of diagnostic information. If you are not happy with any of the loops, press the **2D** key to continue scanning and saving loops.
- Once you have selected a loop—and the loop is playing—*turn* the PROTOCOL Soft Window knob to display the corresponding label. The view counter displays a "1" next to the selected view. Numerous loops can be stored for each view and are available for review in the quad display. Continue labeling the loops until all four views contain at least one loop.
- Go to Step 8.

#### Q SAVE

- Turn the PROTOCOL Soft Window knob to display the **RestLAX** label. The LAX View label turns white indicating it is the active view. Begin scanning the patient starting with the LAX view. Once the image has been optimized, press **Q SAVE**. If you set the **QSAVE Time Limit to 1 Cycle**, the Cypress system stores one loop that is automatically labeled LAX. The view counter registers a "1" next to LAX and then automatically advances to the SAX view label.
  - To view the captured loops, press the **VIEW** function key and turn the PLAY LOOP Soft Window knob. Press **2D** to exit View mode. Continue scanning until loops for all four views have been saved.
  - Once a loop has been captured for the AP2 view, the system automatically advances to the Impost stage.
  - Go to Step 9.
8. When all Rest loops and Base loops have been captured and labeled:
- **For 2-Stage:** Turn the PROTOCOL knob to display **Impost** (Immediate Post Stage). "Impost" is displayed in the lower left corner of the screen, and the view counters are reset to zero.
  - **For 3-Stage:** Press **2D** to exit View mode. Turn the PROTOCOL knob to display **Peak**. "Peak" is displayed in the lower left corner of the screen, and the view counters are reset to zero.
  - **For Pharmacological:** Press **2D** to exit View mode. Turn the PROTOCOL knob to display **Low**. "Low" is displayed in the lower left corner of the screen, and the view counters are reset to zero.

9. If the physician would like to review the loops prior to the start of the examination or exercise stage, press the **VIEW** function key for a full-screen display of each loop. Press **VIEW** a second time for the quad-screen display. (Press **VIEW** to toggle between full-screen and quad-screen.) To exit View mode, press **2D**. Use the Soft Window knobs to navigate through the pages and loops.
10. To complete the stress echo exam for each protocol, see the steps below.
  - **2-Stage:** see Steps A1–A4.
  - **3-Stage:** see Steps B1–B4.
  - **Pharmacological:** see Steps C1–C3.

**2-Stage:**

**A1.** Prepare the timer so that it will start as soon as the patient stops exercising. Press the **TOOLS** function key and click the [TIMER] button. Select **Start** but do not press <ENTER> until the exercise phase has ended. (If you forget to start the timer, the system automatically starts it as soon as you press **•SAVE**.)

**A2.** Press <ENTER> to start the timer. The timer is displayed in the upper right portion of the screen.

Press **•SAVE** to start capturing the Impost loops. (Loops are captured for two minutes.) The camera icon remains in the upper right corner of the screen to indicate that Impost loops are being captured. To start the Save function, press the **•SAVE** key. When all four views have been captured, press **•SAVE** again to stop the Save function.

Note: You can change the 2D GAIN and adjust the TGCs while the system is saving loops. Pressing a mode key or the **VIEW** key will stop the Save function and you will have to start it again manually.

To stop the timer, press the **TOOLS** key, click the [TIMER] button, and then select **Stop**; to clear the timer, select **Clear**.

**A3.** Loops captured during the Impost stage must be assigned a view label. Press the **VIEW** function key.

Turn the PLAY LOOP Soft Window knob clockwise until the first Impost view is displayed. Continue turning the knob until the best loop is playing. (AP4 is the first view for the Impost stage, but loops can be labeled in any order.) Turn the PROTOCOL knob to display AP4. A "1" appears next to the AP4 view counter. Continue turning the PLAY LOOP knob to select and label the remaining three views.

The ROI box can be repositioned while in full-screen display. Use the Trackball to move the ROI.

- A4. To view all loops, from the Rest and Impost stages in the quad-screen format, press the **VIEW** key.

**3-Stage:**

- B1. Prepare the timer so that it will start as soon as the patient begins exercising. Press the **TOOLS** function key and click the [TIMER] button. Select **Start** but do not press <ENTER> until the exercise phase has started.

- B2. Press <ENTER> to start the timer. The timer is displayed in the upper right corner of the screen.

Press **•SAVE** to start capturing the Peak loops. (Loops are captured for 2 minutes.) The camera icon remains in the upper right corner of the screen to indicate that Peak loops are being captured. To start the Save function, press the **•SAVE** key. When all four views have been captured, press **•SAVE** again to stop the Save function.

- B3. Loops captured during the Peak stage must be assigned a view label. Press the **VIEW** key.

Turn the PLAY LOOP Soft Window knob clockwise until the first Peak view is displayed. Continue turning the knob until the best loop is playing. (AP4 is the first view for the Peak stage, but loops can be labeled in any order.) Turn the PROTOCOL knob to display PeakAP4. A "1" appears next to the AP4 view counter. Continue turning the PLAY LOOP knob to select and label the remaining three views. Press **2D** to exit View mode.

- B4. Turn the PROTOCOL knob to display **Post**. Begin capturing Post exercise images for each view using a method described in Step 7. When all four views for the Post exercise stage have been captured and assigned a View label, press **VIEW** to display the quad-screen format.

**Pharmacological:**

- c1. When you are ready to start the timer, press the **TOOLS** function key and click the [TIMER] button. Select **Start** and then press <ENTER>. The timer is displayed in the upper right corner of the screen.

- c2. Capture loops in the Low, Peak, and Post stage as described in Step 7. Once all four views have been captured for each stage and assigned a View label, press **VIEW** to display the quad-screen format.

- c3. To stop the timer, press **TOOLS**, click [TIMER] and then select **Stop**.

## Quad-Screen Soft Windows

Table 39 describes how the Soft Windows operate in quad-screen mode.

**TABLE 39. Quad-Screen Soft Windows**

<i>Window/Function</i>	<i>Description</i>
<b>Next Loop</b>	Turn the NEXT LOOP knob to select the next loop in a series of loops for a highlighted quad.
<b>Sel Quad</b>	Turn the SEL QUAD knob to highlight (i.e., select) a quad.
<b>View/Stage</b>	<p>View and Stage share the same Soft Window. Press the corresponding Small Window knob to display and activate the function.</p> <ul style="list-style-type: none"> <li>■ When VIEW is selected, the quad screen displays the same view captured during the protocol. Use VIEW to shuffle the loops for a side-by-side comparison. If the stress protocol has more than four views, turn the knob to display additional pages.</li> <li>■ Use STAGE to display the images captured during each stage of the protocol (for example, to display the loops captured during the resting stage). If the stress protocol has more than four views, turn the knob to display additional pages.</li> </ul>
<b>End/Start</b>	This is a multi-functional soft window. Use the corresponding knob to trim frames from either the <i>end</i> or <i>start</i> of a loop. Use the SEL QUAD knob to highlight a loop and then use the END/START knob to trim the frames.

## Viewing Additional Loops in a Quad

*To view additional loops in a quad, follow these steps:*

1. Turn the SEL QUAD (select quad) knob to move the box to the desired quad.
2. Turn the NEXT LOOP knob to display the additional loops. The loop counter in the top left corner of each quad indicates the number of the loop currently playing.

## Removing a Label

*To remove a label from a loop, follow these steps:*

1. Display the loop in the full-screen format.
2. Turn the PROTOCOL knob until no labels are displayed.

## Changing the ROI Position

*To change the ROI position, follow these steps:*

1. Turn the SEL QUAD knob to move the ROI box to the desired quad.
2. To display the loop in full-screen, press the **VIEW** key.
3. If the ROI box is not displayed, press the **TOOLS** key and click [ROI].
4. Use the Trackball to change the position of the ROI box.
5. To display the quad-screen, press the **VIEW** key.

## Deleting Loops

**NOTE** *Deleted loops cannot be recovered.*

*To delete loops, follow these steps:*

1. Turn the SEL QUAD Soft Window knob to move the box to the desired quad.
2. To display the loop in full-screen, press the **VIEW** key.
3. Turn the DELETE Soft Window knob to display the confirmation window. Use the Trackball to highlight [NO] if you do not want to delete the loop. To delete the loop, press <ENTER>.
4. To return to the quad-screen display, press **VIEW**.

## Changing a View or Stage Label

*To change a view or stage label, follow these steps:*

1. Turn the SEL QUAD Soft Window knob to move the box to the desired quad.
2. To display the loop in full-screen, press the **VIEW** key.
3. Turn the PROTOCOL Soft Window knob to display the desired stage/view label.
4. To return to the quad-screen display, press **VIEW**.

---

## Labeling Views

### Saving and Labeling Loops

The Cypress system allows you to save and label loops in three general ways:

- Save the loop and then assign a label (see page 8-22).
- Save and label the loop from Freeze mode (see page 8-25).
- Save and label the loop simultaneously (see page 8-26).

These methods for saving loops can be used in combination during the stress echo exam to create a method best suited to the user.

During the 2-Stage Protocol immediate post exercise stage when images must be captured within a defined period of time, the "Save the Loop and then Assign a Label" method is the most commonly used. Using this method lets you quickly capture the loops and then choose the ROI and view label.

When performing a stress echo exam, all loops should be saved with the Stage label (Rest, Peak, etc.) assigned. A View label (LAX, SAX, AP4, AP2) can be assigned to the desired loop at a later time.

### Suspending the Protocol Labeling Function

To suspend the protocol labeling function, use the PROTOCOL Soft Window knob.

*To suspend labeling, follow these steps:*

1. Start a stress echo exam.
2. Turn the PROTOCOL knob until labels are no longer visible.

## Save the Loop and then Assign a Label

*To save a loop and then assign a label, follow these steps:*

1. Turn the **PROTOCOL** Soft Window knob to display the first stage. The stage label appears in yellow text in the lower left corner of the screen.
2. Scan the patient and, when the best images are displayed, press the **•SAVE** key. A camera icon appears in the upper right corner of the screen indicating loops are being saved. Continue until loops have been saved for the four views. To display the saved loops, press the **VIEW** function key at any time. To return to real-time scanning, press the **2D** mode key.
3. When loops have been captured for the four views, press the **TOOLS** function key, click [ROI]. A box appears that can be moved using the Trackball to select the region of interest.

To display the loops, press **VIEW**. To view each loop, turn the **PLAY LOOP** knob. While the best loop is playing, position the ROI box. Turn the **PROTOCOL** Soft Window knob to display the corresponding label. Continue until all four views have been assigned labels.

Numerous loops can be assigned to each view. If you are having difficulty deciding which loop displays the most useful diagnostic information, the same label can be assigned to additional loops for display in the quad-screen format. A View counter is displayed in the bottom left corner of the screen indicating the number of loops assigned to each view.

4. Continue Steps 1 through 3 until all stages are completed.
5. To start the timer, press the **TOOLS** key, then click the [TIMER] button.

Note: The timer will start automatically and continue for two minutes, when the **•SAVE** key is pressed during a 2-Stage Protocol immediate post exercise stage. The timer also may be started manually.

6. See “Viewing the Quad-Screen Display” on page 8-23.



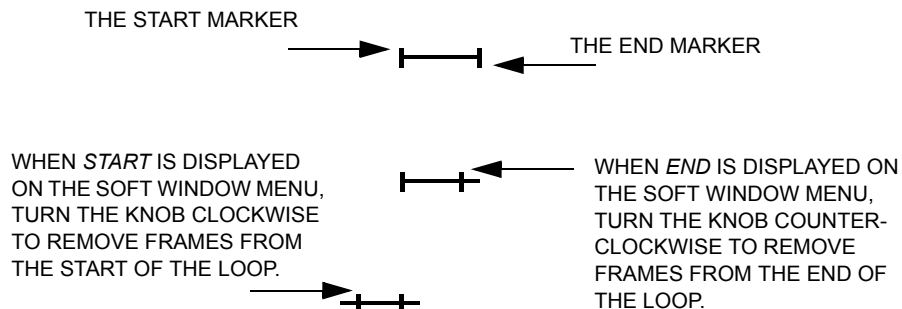
## Viewing the Quad-Screen Display

To view the quad-screen display, follow these steps:

1. Press the **VIEW** function key to see saved loops in a full-screen display. Press **VIEW** again to display the loops in a quad-screen format. The **VIEW** key toggles between the two display formats. Press **2D** to exit View mode.
2. To view additional quad pages, turn the VIEW/STAGE Soft Window knob.
3. To highlight a quad, turn the SEL QUAD Soft Window knob.
  - To display a full-screen loop with the ECG, press **VIEW**.
  - To view the other saved loops, turn the NEXT LOOP Soft Window knob. Each quad will display the number of loops saved and the currently displayed loop in the upper left corner of each quad. For example, “2/4” indicates that the second of four saved loops is currently displayed.
4. To change the playing speed of the loop, turn the Main knob to select from *Normal*, *Slow*, and *Slower*.

### The Loop Length Bar

The Loop Length bar (the yellow bar located in the upper right corner of each quad) represents the length (in frames) of the currently displayed loop. The bar has two vertical bars: a *Start* marker and an *End* marker.



See Figure 40 on page 8-24 for more details.

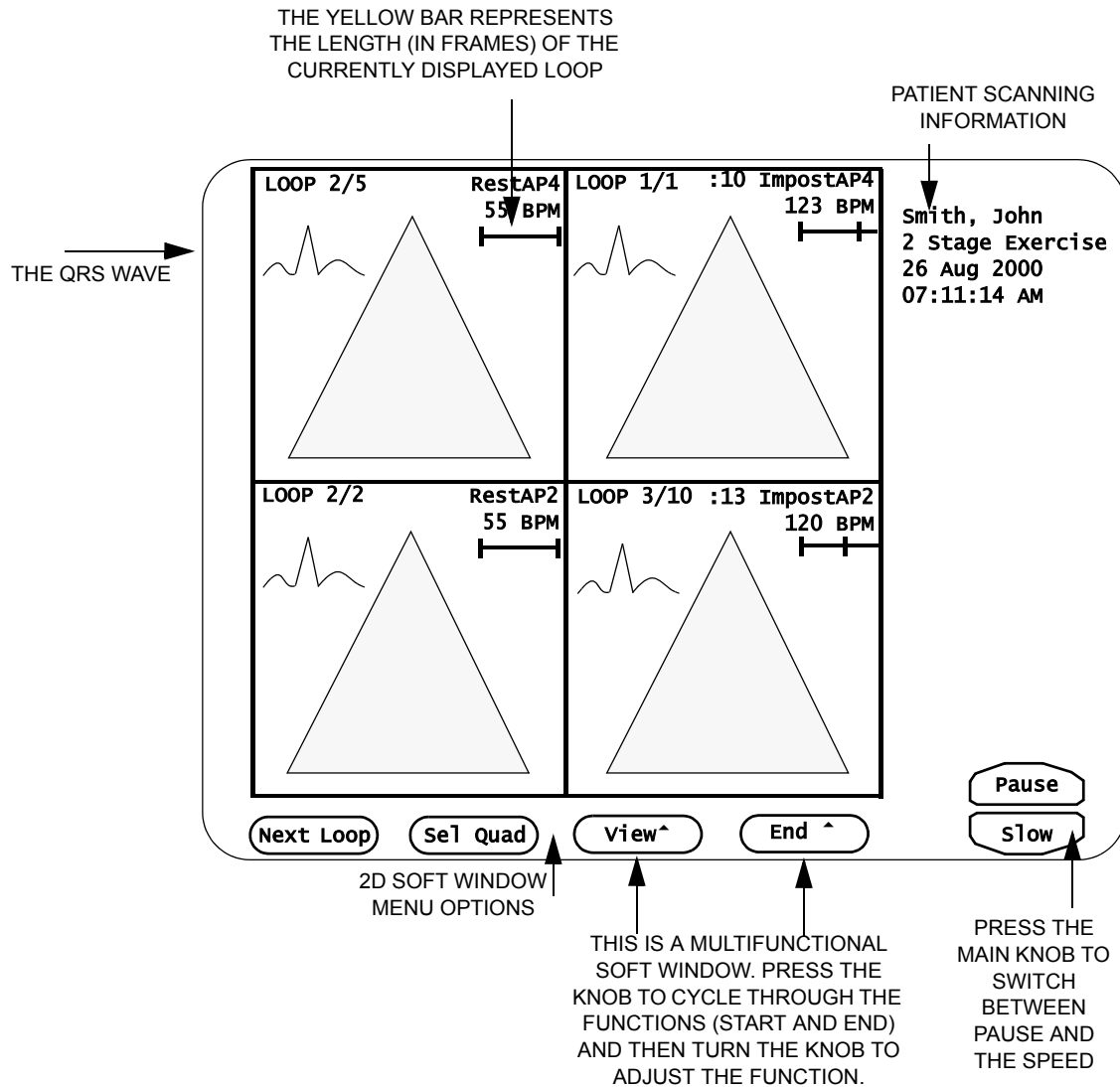


FIGURE 40. Quad-Screen Format for Stress Echo

## Trimming Frames from a Loop

The yellow bar located in the upper right corner of each quad represents the length (in frames) of the currently displayed loop. If the ECG is properly connected and displayed in the quad, the loop contains 14 frames.

*To trim frames from the start or end of a loop, follow these steps:*

1. Turn the SEL QUAD knob to highlight the quad.
2. Press the END/START knob to display *End* to trim frames from the end of the loop, or *Start* to trim frames from the start of the loop.
3. Turn the END/START knob until the desired frames of the loop are no longer visible.

*NOTE: Trimming frames does not delete the frames—turn the END/START knob in the opposite direction to display the frames.*

## Save and Label Loops from Freeze Mode

*To save and label loops from Freeze mode, follow these steps:*

1. Press the **PATIENT** function key.
2. Click [NEW PATIENT]. Select the stress protocol from the drop-down menu.
3. Press the **2D** mode key to save the patient information and exit the Setup screen.
4. Press the **TOOLS** function key and click [ROI] to display the region of interest.
5. Turn the PROTOCOL knob to display the Stage and View label of the first loop you want to capture. For example, to capture the LAX view first, turn the PROTOCOL knob to display **RestLAX**.
6. Scan the patient and when the best images are displayed, press **FREEZE**.

*NOTE: The Cypress system will temporarily store numerous loops—the number of loops depends on the patient's heart rate and the amount of time between the last mode change and when the FREEZE key is pressed.*

7. Turn the PLAY LOOP Soft Window knob until the best image is playing.
8. Position the ROI.
9. Press **Q SAVE** or **•SAVE** to capture the loop. A "1" will appear next to **LAX** in the view counter.

*NOTE: Numerous loops can be assigned to each view. If you are having difficulty deciding which loop displays the most useful diagnostic information, the same label can be assigned to additional loops for display in the quad-screen format. A view counter is displayed on the bottom left corner of the screen indicating the number of loops assigned to each view.*

10. Press the **2D** mode key to return to real-time scanning.
11. Turn the **PROTOCOL** knob to display the Stage and View label of the next loop you want to capture.
12. Repeat steps 5 through 10 until all views have been assigned a loop.
13. Press the **VIEW** function key at any time to display the saved loops in a full-screen format. Press **VIEW** a second time to display the loops in a Quad-screen format. Press **2D** to exit View mode.
14. To start the timer, press the **TOOLS** key, then click the [TIMER] button.
15. Press **•SAVE** to capture loops for two consecutive minutes during the *Impost* or *Peak* stages.

## Save and Label the Loop Simultaneously

*To save and label the loop at the same time, follow these steps:*

1. Press the **PATIENT** function key.
2. Click [NEW PATIENT].
  - Select the stress protocol from the drop-down menu.
3. Press the **2D** mode key to save the information and exit the Setup screen.
4. Press the **TOOLS** function key and click [ROI] to display the region of interest box.
5. Turn the **PROTOCOL** knob to display the View and Stage label of the first image you want to capture (*RestLAX*). The view label appears in yellow text in the lower left corner of the screen.
6. Scan the patient, and when the best image is displayed, position the ROI box and then press **Q SAVE**. One cardiac cycle is saved and labeled. The View label automatically advances. The View label can be manually changed at any time by turning the **PROTOCOL** knob and displaying the desired View label. Continue until all the views have been assigned to a loop.
7. To activate the timer, press **TOOLS** then click the [TIMER] button.
 

Note: The timer will start automatically and continue for two minutes, when the **•SAVE** or **Q SAVE** key is pressed during a 2-Stage Protocol immediate post exercise stage. The timer can also be started manually by clicking [TIMER] and selecting **Start**.

# *Transferring Studies*

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This chapter describes how studies are saved and transferred out of the Cypress system. It includes information about:

- Exporting images from the Cypress system
- Selecting a Compression Format
- Sending studies to the Network
- Connecting the Cypress system to a Network
- The DICOM Storage Commitment Option
- DICOM Setup For Modality Worklist
- Formatting an MO disk
- Transferring studies to and from an MO disk
- Reading studies on the Cypress system
- Reading studies on a DICOM compatible viewer
- Troubleshooting file transfers

**NOTE** *The Cypress system is not meant to be used for long-term storage of patient studies. Completed studies should be moved to an MO disk or network.*

---

## Exporting Images from the Cypress System

### Overview

Studies and their images can be exported from the Cypress system via the standard magneto-optical (MO) drive, or via the optional network feature in the following ways:

- DICOM format to MO disk.
- Native Cypress system format to MO disk.
- DICOM format to a DICOM server via a network (if network option is installed).
- Multimedia files to MO disk.
- Multimedia files to a computer via a network.

You have the option to export all data, or you can specify that only the *report*, *all images*, or *flagged images* are sent. Once the study is exported, the study can be deleted from the internal hard drive using the Patient menu. This frees up space on the internal hard drive.

### DICOM Format to MO Disk

Studies and their images can be exported in DICOM (Digital Imaging and Communications in Medicine) format to the MO drive. The images can be stored uncompressed, or compressed in Run Length Encoded (RLE), or JPEG compressed formats. To review the images stored on the MO disk, the images must be opened on a DICOM review station that accepts 3.5 inch MO disks of the same capacity.

#### Restrictions:

- Studies stored in DICOM format cannot be opened for review on the Cypress system or other ACUSON ultrasound acquisition platforms.
- An MO disk used in the Cypress system should contain only Cypress studies; it is recommended that studies from the Cypress system and studies from other image acquisition devices not be stored on a single MO disk at the same time.
- It is up to the user to determine compatibility between the Cypress system DICOM images and the DICOM review station. Refer to the *DICOM Conformance Statements* for the Cypress system and the review station for their respective capabilities.

- Some DICOM viewers may experience problems reading long loops. The Cypress system can save loops that range in size from a single frame to the maximum of 32 seconds. Select a loop size that is compatible to your DICOM viewer.
- The study cannot be converted from a DICOM format back to the Cypress format.

## Native Cypress System Format to MO Disk

Studies can be exported in native Cypress system format to the MO drive. This proprietary format stores images in a highly compressed, lossless format. Studies can be archived to the MO disk in this format to free up space on the internal hard drive.

### Restrictions:

- Images stored in this format can only be opened for review on a Cypress system. Once opened for review, the study can be exported to the MO disk in DICOM format or sent to a DICOM server over a network (if the network option is installed).

## Setting an IP Address

To set an IP address, follow these steps:

1. Press the SETUP key and click the **Network Identification** heading.
2. Click the [ADD], [EDIT], [REMOVE], or [RENAME] button.

**NOTE** *The Cypress system can store a maximum of four network identifications*

3. Complete the Cypress Network Identification settings described below:
  - **Network Name:** User-defined name of the network. The Cypress system can store a maximum of four network identifications.
  - **Computer Name:** Identifies the name of your Cypress system on the network.
  - **Workgroup Name:** Identifies the workgroup your Cypress system is part of.
  - **IP Address** (Internet Protocol Address): See your Network Administrator to determine your IP address. An IP address is made up of four sets of 1—3 digit numbers (from 0 to 255), separated by periods.
  - **Subnet Mask:** See your Network Administrator to determine your Subnet Mask. This number, combined with the IP address, identifies the network that your computer is part of.

- **Default Gateway:** See your Network Administrator to determine your Default Gateway. This address is required for systems on inter-networks. If this address is not provided, IP functionality will be limited to the local subnet.
  - **Use DHCP.** Click this checkbox if there is a Dynamic Host Configuration Protocol (DHCP) server on your network. If one is present, your network configuration settings are complete. If your network does not have a DHCP server, you must specify the IP Address, Subnet Mask, and Default Gateway of your Cypress system.
4. If you made changes in the Cypress Network Identification window you must restart the Cypress system by shutting it down and then starting it again. The network changes will take effect when the Cypress system is restarted.

### DICOM Format to a DICOM Server via a Network

If the network option is installed, images can be sent in DICOM format to a networked DICOM server. The images can be transferred uncompressed, or compressed in Run Length Encoded (RLE), or JPEG compressed formats. Studies saved on the server can be opened for review on a networked DICOM review station

#### Restrictions:

- It is up to the user to determine compatibility between the Cypress system's DICOM images and the DICOM server and review station. Refer to the *DICOM Conformance Statements* for the Cypress system, the server, and the review station for their respective capabilities. The DICOM Conformance Statement for the Cypress is located in the Operator's Manual Reference supplement and also on the ACUSON web site ([www.acuson.com](http://www.acuson.com)).
- It is recommended that the transfer to the server be confirmed at the server before the study is deleted from the Cypress system internal hard drive.
- Some DICOM viewers may experience problems reading long loops. The Cypress system can save loops that range in size from a single frame to the maximum of 32 seconds. Select a loop size that is compatible to your DICOM viewer.



## Multimedia Format

Images and reports can be converted into a multimedia format that is compatible with most personal computers. Images are converted into AVI files, reports are converted into RTF files, and audio comments are converted into WAV files. The files can be transferred to an MO disk or a computer via a network.

### Restrictions:

- You must determine the compatibility between the Cypress system and your computer.

## Multimedia Format to a Computer Via a Network

Multimedia images in an AVI, RTF, or WAV format can be sent to a computer via a network.

*To setup a multimedia connection via a network to your computer, follow these steps:*

1. Press the **SETUP** key.
2. Click the **Multimedia Connection** listing on the directory.
3. Click the [ADD] button
4. Complete the text fields on the right side of the screen:
  - **Name:** Enter a name for the connection (e.g., "Multimedia AVI RTF").
  - **Remote Share:** Enter a directory on your computer (e.g., \\JDOE\MyDocs).
  - **User Name:** Enter the user name for your computer.
  - **Password:** Enter the password used to access your computer (if applicable).
  - **Test Result:** When you click [VERIFY] in the following step, either *Success* or *Failure* will be displayed here.
5. Click [VERIFY] to confirm proper connection.

**NOTE** *Using the multimedia connection does not require installation of the Networking option. You can connect the Cypress system to your computer through a network Hub using a 10/100 Base T Ethernet cable or a with a direct connection using an Ethernet crossover cable.*

## Explanation of DICOM Menu Fields

Table 40 and Table 41 on page 9-7 describe the DICOM fields on the **Setup** menu.

**NOTE** *Server information and Cypress system information can only be entered or changed if the Network option has been installed.*

**TABLE 40. DICOM Server Information Fields**

<i>Field</i>	<i>Description</i>
<b>Server Name</b>	Identifies the individual server with a name you choose. By clicking on the arrow you can select from up to four different servers.
<b>Application Entity</b>	Identifies the server application that receives the images from the Cypress system. The alphanumeric string entered in this field must exactly match (including case) the application entity name assigned to the server application.
<b>Server IP Address</b>	The server IP address of the DICOM server where images will be sent.
<b>Port Number</b>	The remote port on the server that is to receive the connection request and the image data. The default setting is 104.
<b>Test Result</b>	Lets you know if the connection has been made successfully. After changing any of the three server parameters, click the [VERIFY] button. The system will test the connection and indicate its results in this field.
<b>Ignore Server Response</b>	When the box is checked, the Cypress system ignores all response statuses from the server.
<b>Accept Storage Commitment</b>	When the box is checked, the Cypress system will query the DICOM server to verify that all images in the study have been properly received and stored. Check the shut-down page for messages.

The **Cypress DICOM Information** fields set the network information for the Cypress system.

**TABLE 41. Cypress DICOM Information Fields**

<i>Field</i>	<i>Description</i>
<b>Application Entity</b>	The name the Cypress system presents to the server. For example, "Cypress_ER1" describes the machine and its location. This field can include only alphanumeric characters and the underscore. A maximum of 32 characters are allowed.
<b>Port Number</b>	Identifies the port on the Cypress that receives commands and data from the server. The number must match the port number of the server that sends commands and data. The default setting is 104.
<b>PDU Length (in bytes)</b>	The Protocol Data Unit Length can be set by changing this field. The minimum size setting is 4096. The default setting is also 4096.
<b>Network Time-out 1</b>	Defines the number of seconds allowed between successive data blocks when receiving a message. The value is only used after a part of a message has been received. The default time-out and minimum value is 5 seconds.
<b>Network Time-out 2</b>	Defines the number of seconds allowed before a time-out error is declared on an expected response. The default time-out and minimum value is 60 seconds.

## Changing Server Information

To add and edit server information, use the [ADD] and [EDIT] buttons on the DICOM menu. For an explanation of the fields in the Cypress Network Identification menu, see “Setting an IP Address” on page 9-3.

**Adding a Server:** Use the [ADD] button to add a new server. When you click the button a menu opens. Use the menu to define the new server and Cypress Network Identification information. Each server can have separate Cypress Network Identification information.

**Editing a Server:** Use the [EDIT] button to edit settings for an existing server name. When you click the button a menu opens and you can edit the server and Cypress Network Identification information.

**Removing a Server:** Display the server that you want to delete and then click the [REMOVE] button.

**Renaming a Server:** Display the server that you want to rename and then click the [RENAME] button. Type the new name in the Network Name field.

## DICOM Setup for Network Transfers

If the optional network package is installed, the DICOM Server and Cypress system information fields must be completely defined before sending images over a network. If the network package is not installed, the DICOM Server and Cypress system information fields will not be accessible.

*To specify your DICOM settings, follow these steps:*

1. Press the **SETUP** function key.
2. Double-click the **DICOM** directory listing.

Complete the Server information detailed in steps 3-10:

3. Click the **DICOM Server Information** subtitle.
4. Click the [ADD] button.
5. Identify the server by typing a user-defined name in the **Server Name** field.
6. Set the **Application Entity**. This defines the server application that receives images from the Cypress system.
7. Set the **Server IP Address**. This is the IP address of the DICOM server where images will be sent.
8. Set the **Port Number**. This is the remote port on the server that is to receive the connection request. The default setting is 104.

9. The **Test Result** field lets you know the test result of the connection to the DICOM server. After changing or setting up the DICOM server settings, test the connection by clicking the [PING] button. The system will test the connection and indicate its results in this field. Click [PING] to test the network connection to the server. If the ping is successful, test the DICOM connection by clicking the [VERIFY] button.
10. If the **Ignore Server Response** box is checked, the Cypress system ignores all response statuses returned by the DICOM server. The responses can indicate error or warning conditions that need to be addressed. If the **Ignore Server Response** box is not checked and the DICOM server returns an error or warning status, a dialog box will appear on the **Shutdown** page. You will be asked to either continue the transfer to the server or abort the transfer. These response codes are server-dependent. Consult the server documentation for an explanation of the codes.
11. Choose your Storage Commitment server using the **Storage Commitment** drop-down menu. If your network does not support Storage Commitment, select **None**. If your DICOM server supports Storage Commitment using the same IP Address, Application Entity Title, and Port Number that your images are sent to, select **DICOM Server**. If the Storage Commitment server requires a separate configuration, configure the server in the Storage Commitment Server setup page, then return to the DICOM Server setup page to select your Storage Commitment Server from the drop-down menu.
12. Click the **Cypress DICOM Information** subtitle in the **Setup** menu.
13. Set the **Application Entity**.
14. Set the **Port Number**.
15. Set the **PDU Length**.
16. Set the **Network Timeout 1** value.
17. Set the **Network Timeout 2** value. This defines the number of seconds allowed before a time-out error is declared on an expected response. The default time-out and minimum value is 60 seconds.
18. Press any mode key to return to live imaging.

## DICOM Storage Commitment

Storage Commitment is enabled by selecting any setting but “None” from the **Storage Commitment** drop-down menu. When enabled, the Cypress system will query the Storage Commitment server after a study transfer is complete to verify that all images in the study have been properly received and stored.

**NOTE** *If Storage Commitment is enabled, but the selected Storage Commitment server does not support this feature, the Cypress will automatically cancel the Storage Commitment operation.*

When Storage Commitment is **Enabled**, the Action column on the **Shutdown** page changes from DICOM to Storage Commitment. As each image is verified, the percentage in the Status column increases. When all the images have been verified, the Storage Commitment entry is removed from the screen.

**NOTE** *It may take several minutes for the Storage Commitment Server to respond to a Storage Commitment request. During that time, any other transfers that have been queued will continue. If the Storage Commitment Server has not validated all images in the study, the Storage Commitment entry for that study will remain on the transfer status display. If this happens, you can cancel the Storage Commitment function by highlighting the study, then clicking [CANCEL].*

## Setting the Network Speed

To set the network speed and duplex options, follow these steps:

1. Press **SETUP**.
2. Click the **Shutdown** tab, then click [UTILITIES].
3. Highlight **Network Adapter**.
4. Click [RUN SELECTED].
5. Set the **Speed** and **Duplex** options using the radio buttons.
6. Click [OK].

**NOTE** To return to imaging, click [CLOSE]; to restart and activate the changes, click [SHUTDOWN].

## DICOM Setup For Modality Worklist

If the optional networking package is installed, the DICOM Modality Worklist Server information fields must be completely defined before the ability to make Modality Worklist Queries is enabled.

*To specify your Modality Worklist settings, follow these steps:*

1. Press the **SETUP** function key.
2. Double-click the **DICOM** directory listing and complete the Server Information detailed in steps 3-9:
3. Click the **Modality Worklist Server** subtitle.
4. Click the [ADD] button.
5. Identify your server by typing a user-defined name in the **Server Name Field**.
6. Set the **Application Entity**. This defines the server application that receives Modality Worklist queries from the Cypress system.
7. Set the **IP Address**. This is the IP address of the Modality Worklist Server where the query will be made.
8. Set the **Port Number**. This is the remote port on the server that is to receive the connection request. The default setting is 104.
9. The **Test Result** field lets you know the test result of the connection to the Modality Worklist server. This field is used in conjunction with the [PING] and [VERIFY] buttons. Before using these buttons, verify with your IT department that your Modality Worklist server will respond to a ping and a DICOM Verify. Some systems will not respond to a ping due to network security issues. Some Modality Worklist servers may not respond to a DICOM Verify command — consult the server's DICOM Conformance Statement. After changing or setting up the DICOM server settings, test the connection by clicking the [PING] button. The system will test the connection and indicate its results in this field. If the ping is successful, test the DICOM connection by clicking the [VERIFY] button.

## DICOM Setup For Storage Commitment

If the optional networking package is installed, the DICOM Storage Commitment Server information fields must be completely defined before the ability to perform Storage Commitment is enabled.

*To specify your Storage Commitment settings, follow these steps:*

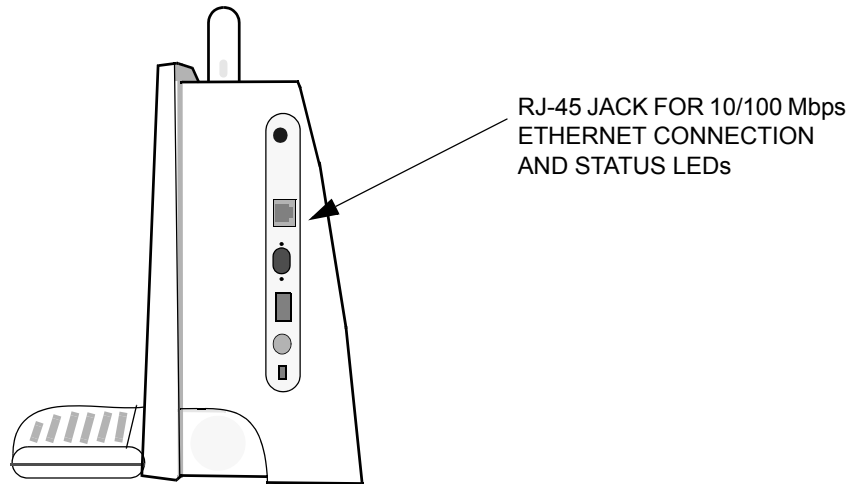
1. Press the **SETUP** function key.
2. Double-click the **DICOM** directory listing and complete the Server Information detailed in steps 3-9:
3. Click the **Storage Commitment** subtitle.
4. Click the [ADD] button.
5. Identify your server by typing a user-defined name in the **Server Name Field**.
6. Set the **Application Entity**. This defines the server application that receives Storage Commitment messages from the Cypress system.
7. Set the **IP Address**. This is the IP address of the Storage Commitment where the query will be made.
8. Set the **Port Number**. This is the remote port on the server that is to receive the connection request. The default setting is 104.
9. The **Test Result** field lets you know the test result of the connection to the Storage Commitment server. This field is used in conjunction with the [PING] and [VERIFY] buttons. Before using these buttons, verify with your IT department that your Storage Commitment server will respond to a ping and a DICOM Verify. Some systems will not respond to a ping due to network security issues. Some Storage Commitment servers may not respond to a DICOM Verify command — consult the server's DICOM Conformance Statement. After changing or setting up the DICOM server settings, test the connection by clicking the [PING] button. The system will test the connection and indicate its results in this field. If the ping is successful, test the DICOM connection by clicking the [VERIFY] button.



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## Connecting the Cypress System to a Network

The Cypress system can be connected to a network if the network option has been installed on the system. A standard RJ-45 network cable connects to the port on the right side of the system.



**FIGURE 41. Connecting Cypress System to a Network**

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Once the Cypress system is connected, complete the DICOM setup as described in “DICOM Setup for Network Transfers” on page 9-8.

Any time that you make changes, click [PING] and then [VERIFY] to confirm the connection to the network using the new settings. The Cypress system will respond with a status message in the **Test Result** field.

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## Transferring Studies

Studies can be transferred to a server or computer via a network or they can be transferred to an MO disk via the internal MO drive.

### Selecting Studies

Two lists are used to transfer studies:

- The Patient List displays each patient in alphabetical order—every patient has a sub-list of studies.
- The Study List displays each individual study—sort the list by clicking the column headings (Patient Name, Date, Size, Location...).

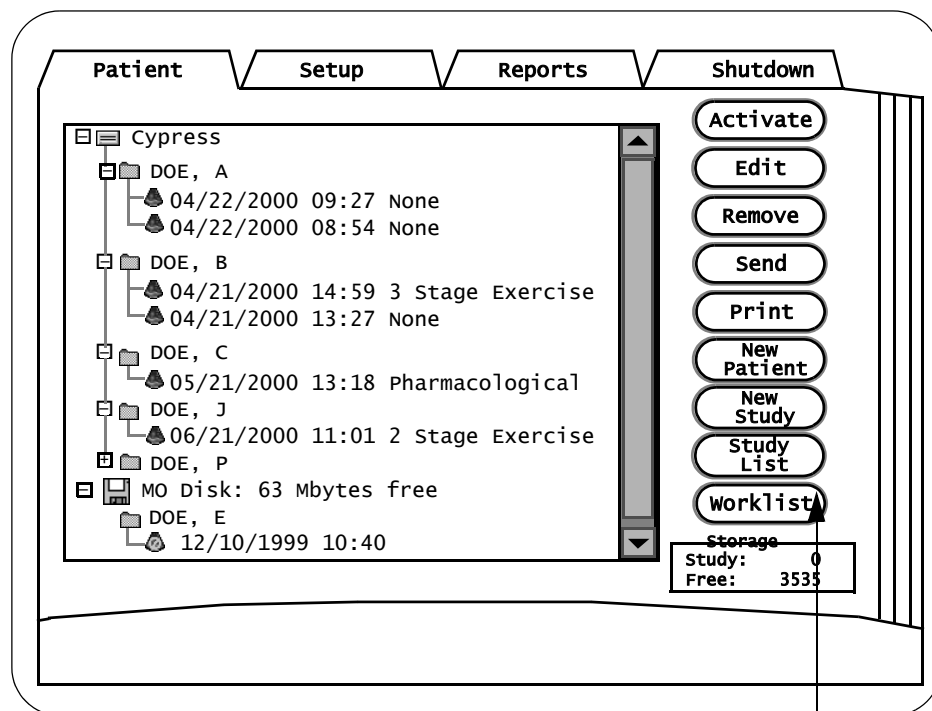
A button toggles between [PATIENT LIST] and [STUDY LIST]. When the Study List is displayed, the button is labeled [PATIENT LIST]. When the Patient List is displayed, the button is labeled [STUDY LIST].

The list last displayed before shutdown is the list displayed when the PATIENT key is pressed after the system is powered up.

**To select items from the Patient List:**

- To transfer all studies for a particular patient, highlight the patient name.
- To transfer only a single study, highlight a study date and time.

**NOTE** *Batch transfers of multiple patients must be performed using the Study List.*

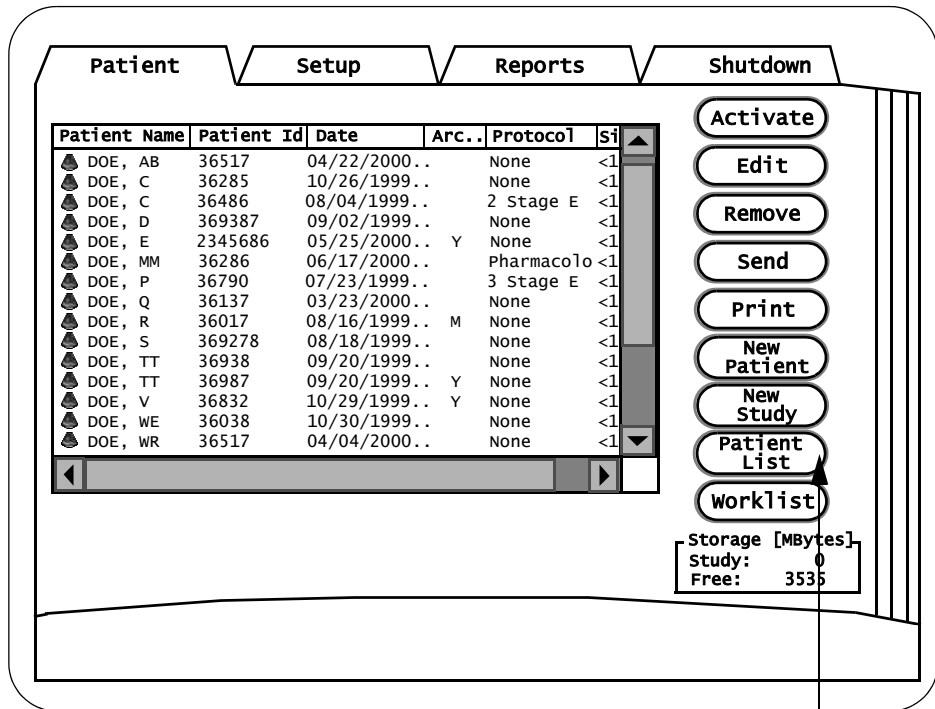


CLICK HERE TO SWITCH BACK AND FORTH BETWEEN THE PATIENT LIST AND THE STUDY LIST

**FIGURE 42. The Patient List**

**To select items from the Study List:**

- To transfer a single study, highlight only that study.
- To transfer multiple studies that are in consecutive order, use the <↑> key on the Cypress system keypad. Highlight the first study. While holding down <↑>, move the Trackball to highlight the last study. All studies between and including the first and last will be highlighted.
- To transfer multiple studies that are not in consecutive order, use the <CTRL> key on an external keyboard (first connect an external keyboard to either the PS2 port or the USB port). Highlight a study. Press and hold <CTRL> on the external keyboard. While pressing <CTRL>, use the Cypress Trackball and <ENTER> key to highlight any number of studies.



CLICK HERE TO SWITCH BACK AND FORTH BETWEEN THE PATIENT LIST AND THE STUDY LIST

**FIGURE 43. The Study List**

## Sending the Studies

To transfer studies, follow these steps:

1. Press the PATIENT key to display either the Patient List or Study List.
 

**NOTE** Click the toggle button located on the left side of the screen to display the desired list.
2. Select the study/studies to be transferred (see “Selecting Studies” on page 9-14 for details on how to select studies).
3. To display the set up screen, click the [SEND] button located to the right of the patient/study list. Use this screen to select the destination, data to be included in the transfer, DICOM compression, and to automatically delete the study from the Cypress system hard drive upon completion of the transfer. Multiple formats and destinations can be selected at the same time. The three type of formats are Cypress, DICOM, and Multimedia.

**NOTE** To remove the check marks from the destination area, click the All or Destinations radio button, and then click [CLEAR].

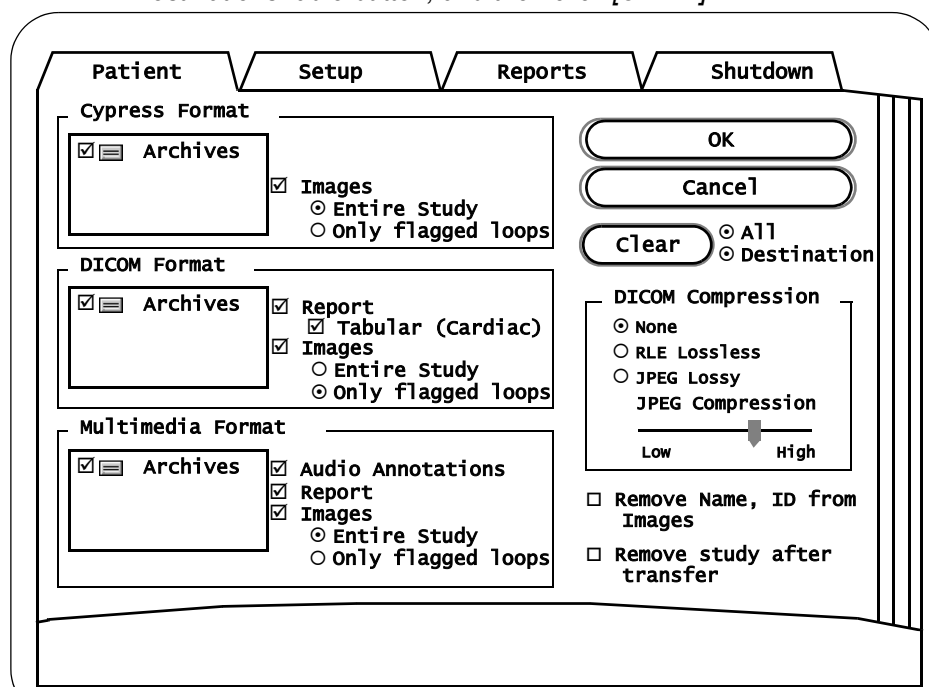


FIGURE 44. The Send Screen

4. For each type of format, select the destination. Multiple destinations (where available) can be selected.
5. Select the network where you want to send the images from the pull-down menu.
6. Select the data (**Report**, **Images** or **Audio Annotations**) to be transferred for each format. Click the corresponding radio button to specify sending the **Entire Study** or **Only Flagged loops**.

**NOTE** *When the Entire Study or Only Flagged Loops options are selected, the system automatically checks the Images box. If you don't want to transfer any images, remove the check mark from the Images box.*

**NOTE** *When sending images in a DICOM format, select a DICOM Compression setting (see Table 42 on page 9-19 for details). The DICOM format also lets you send cardiac reports in a tabular format. The tabular format may be useful when interfacing with workstations that use Optical Character Recognition (OCR) to accept reports. To send a report in this format, check the Tabular (Cardiac) box on the Send screen.*

7. To remove the name and ID from the images, click the **Remove Name, ID from Images** checkbox. If you want to keep the name and ID with the images, leave the box unchecked. To permanently delete the studies after they have been transferred, click the **Remove Study After Transfer** checkbox. If you want to keep them on your Cypress system, leave the box unchecked.
8. Click [OK].
  - A green light in the upper right corner of the screen indicates the transfer is in progress. An arrow will appear on each study indicating the study has been designated for transfer.
  - A red light in the upper right corner of the screen indicates an error has occurred during the transfer. Check the **Shutdown** tab for an error message. To cancel the transfer of a single study, highlight the study and click [CANCEL]. To cancel the entire transfer, click [SELECT ALL] to highlight all of the studies and then click [CANCEL] to stop the transfer.
  - A yellow light in the upper right corner of the screen indicates the transfer has been temporarily paused while the Cypress performs another function.

**NOTE** *If the Cypress system is in an imaging mode (active, frozen, or view) while data is being prepared for transfer, the system may pause during the transfer preparation process. Press PATIENT or SETUP to exit the imaging mode and to allow the transfer preparation process to continue.*

9. Go to the **Shutdown** tab to view the progress of the transfer or press the **2D** key to exit the menu.

**NOTE** You can operate the Cypress system while the transfer is in progress with the exception of the following restrictions:

- You cannot activate a study that has been designated for transfer.
- An active study automatically deactivates when designated for transfer.

**NOTE** Studies stored in the DICOM format cannot be copied back to the Cypress system for viewing.

**NOTE** Segments of the same study can be sent to different destinations in different formats. For example, an entire study can be sent to the Cypress internal MO disk drive in the Cypress format, selected (flagged) loops can be sent to a network server, and the report, audio annotation, and selected (flagged) loops can be sent to a computer.

**TABLE 42. Send Screen DICOM Compression Fields**

<i>Field</i>	<i>Description</i>
<b>DICOM Compression</b>	<p>Sets the DICOM compression settings. The selected compression is applied to studies saved in DICOM format that are saved to the MO disk or saved over a network to a DICOM server (if the Network option is installed).</p> <ul style="list-style-type: none"> <li>■ <b>None:</b> Use when a server or viewer does not support JPEG or RLE Lossless compression. The largest image files are produced with this selection.</li> <li>■ <b>RLE Lossless:</b> Select this format when a lossless data compression format is desired. This format preserves the quality of the image. The compression generally results in a data size reduction of approximately 3:1.</li> <li>■ <b>JPEG Lossy:</b> A lossy compression format may result in some degradation of the image, depending on the compression setting. However, JPEG compression results in significantly smaller file sizes than the RLE compression format.</li> <li>■ <b>JPEG Compression:</b> The JPEG Compression scale. <ul style="list-style-type: none"> <li>— a LOWER setting results in a higher image quality and larger file sizes.</li> <li>— a HIGHER setting results in lower image quality and smaller file sizes.</li> </ul> </li> </ul>

## Removing Patient Name and ID from Multimedia and DICOM Images

Studies transferred in DICOM or Multimedia format can have the patient name and ID removed from the images.

*To select this option, follow these steps:*

1. Click the **PATIENT** button and highlight a patient study.
2. Click the [SEND] button.
3. Put a checkmark in the **Remove name, ID from Images** box.

**NOTE** *When studies are displayed on DICOM readers such as KinetDx, the name and ID will be displayed in the study list. The Patient Name and Patient ID DICOM elements, (0010, 0010) and (0010, 0020) respectively, will still contain the valid patient identifying information for the image.*

**NOTE** *The name and ID cannot be removed from images archived in the Cypress format.*

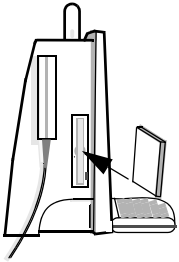


## Troubleshooting a Network DICOM Transfer

When transferring studies to a DICOM server, an error may be detected. Table 43 describes the possible errors and solutions.

**TABLE 43. Network Errors**

<i>Error</i>	<i>Solution</i>
Could not establish a connection to the server - Verify failed, Save canceled	The Cypress system did not receive a response to its Verification (C-Echo) command. Check the DICOM server settings on the DICOM Setup page and verify that the server is on-line and retry.
Could not establish an association with the server - Save canceled	The server rejected the Cypress system connection, most likely due to an image format incompatibility. Check DICOM compatibility by referring to the Cypress system and DICOM server's <i>DICOM Conformance Statements</i> .
DICOM Error: C-STORE response = xxxx, do you wish to continue?	The server sent back an error code on the save. Consult your server's error code information for more details. If you want to continue the save, click [YES]. To abort the save, click [NO]. The error will appear only if the <b>Ignore Server Response</b> checkbox is not checked (see Table 40 on page 9-6).
A network timeout error has occurred - Save canceled	The Cypress system received a time-out error. Verify that the server is on-line.
An internal DICOM error has occurred - Save canceled	Verify that the server is on-line. Test the connection by using the [VERIFY] button on the DICOM Server Information section located in the Setup menu.



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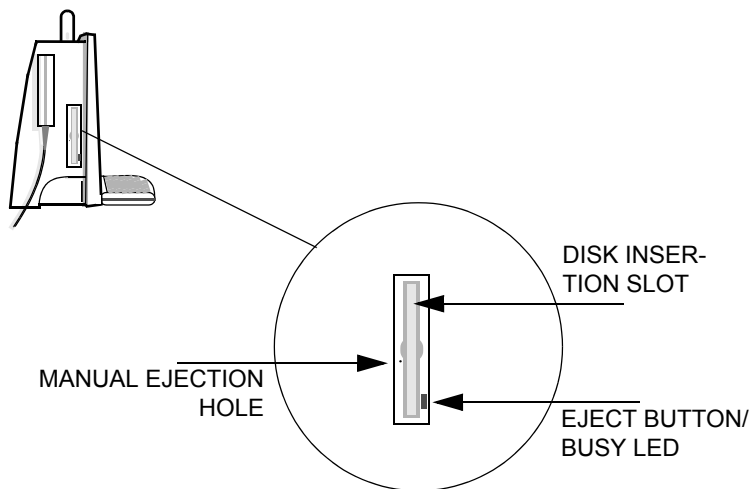
## Transferring Studies Using the MO Drive

The Magneto Optical (MO) drive is located on the left side of the Cypress system. The physical storage media is a 3.5 inch (90mm) Magneto Optical Disk in capacities from 128 MB to 640 MB.

### MO Disk Drive Parts

The optical disk drive contains the following parts and functions as pictured in Figure 45:

- **Disk Insertion Slot:** Use this slot to insert the MO disk cartridge.
- **Eject Button and Busy LED Display Lamp:** Press the push-button to eject the MO disk from the drive. The button is also the green LED display lamp that lights when the drive is “busy” — during seeking, erasing, writing, or reading of data. Note that the MO disk cannot be ejected while the LED is lit.
- **Manual Ejection Hole:** Use this hole to eject the MO disk manually by inserting the end of a paper clip. Note that manual ejection may not be possible during and just after shutdown.



**FIGURE 45. Magneto Optical Disk Drive**

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## Formatting Disks

There are two methods of formatting disks. Both methods require you to define settings in the Format Dialogue Box as described in Table 44.

**TABLE 44. Format Dialogue Box Settings**

<i>Field</i>	<i>Setting</i>
Capacity	Removable Media (Unknown Size)
File System	FAT
Allocation Unit Size	Default allocation size
Volume Label	(Blank)
Format Options	Quick Format (checked)

**NOTE** *All MO disks MUST be formatted on the Cypress system before transferring studies. This includes MO disks that may have been pre-formatted by the manufacturer.*



### Formatting a Disk While Transferring a Study

When a study is transferred to an unformatted MO disk, a red light appears in the upper right corner of the screen.

1. Click the **Shutdown** tab and follow the instruction at the bottom of the screen.
2. To format the MO disk, click [YES].
3. Click [START] on the dialogue box. A warning appears to let you know that all data will be erased from the disk if you want to continue.
4. To continue, click [YES] or to cancel the formatting, click [NO].
5. When formatting is complete, click [OK] and then click [CLOSE].

**NOTE** *If a transfer is attempted to an unformatted MO disk, the transfer is paused and the user given the opportunity to format the disk, erasing its contents, prior to completing the transfer process.*



### Formatting a Disk Using the System Utilities

To format a disk using the system utilities, follow these steps:

1. Press **SETUP** and then click the **Shutdown** tab.
2. Click [UTILITIES].
3. When the Utilities menu opens, click [MO DISK FORMAT].
4. Insert the MO disk and then click [RUN SELECTED].
5. The Format Dialogue box opens. Complete the settings (see Table 44).
6. Click [START]. A warning will appear to inform you that ALL data will be erased from the disk.
7. Click [OK]. A prompt will appear indicating the formatting procedure is complete.
8. Click [OK] and then click [CLOSE] on the Format Dialogue box.
9. Note that you cannot format another disk without first closing the Format Dialogue box. If you do not close the dialogue box, the format will fail. To format multiple disks at one time, repeat the steps as outlined above.
10. When finished formatting, click [CLOSE] on the Utilities menu and the system returns to the 2D screen.

### Reading Native Cypress System Format Studies from the MO Disk

To read a study from an MO disk, follow these steps:

1. Insert the MO disk into the MO drive. The Cypress system automatically reads the disk and lists the studies in the patient directory under the MO DISK heading. Studies saved in the CYPRESS format have a gray icon in front of the study; studies saved in the DICOM format have a blue circle and line overlaying a gray icon.
2. View a study. Studies saved in the MO CYPRESS format can be viewed on the Cypress system by highlighting the study and then clicking the [ACTIVATE] button.

**NOTE** *Studies stored in the DICOM format cannot be copied back to the Cypress system for viewing.*

## Copying Studies from an MO Disk to the Cypress System (Batch Restore)

Studies stored on a removable disk can be restored to the hard drive on the Cypress system in batches. Only studies stored in the Cypress format can be restored to the Cypress system hard drive (DICOM and Multimedia studies cannot be restored to the Cypress system).

*To return a group of studies from the MO disk to the Cypress system hard drive, follow these steps:*

1. Insert the MO disk into the MO drive.
2. Press **PATIENT**.
3. If you want to restore everything from the MO disk, click the [PATIENT LIST] and highlight the MO disk icon. To restore only selected studies, click the [STUDY LIST] and highlight the studies you want to restore.
4. Click [RESTORE]

## Troubleshooting an MO Disk Transfer

When transferring studies to an MO disk, an error message may be displayed on the **Shutdown** page. A red light appears in the upper right corner of the screen indicating an error has occurred. Table 45 describes the possible errors and solutions.

**TABLE 45. MO Disk Errors**

<i>Error</i>	<i>Solution</i>
No disk in the system	Insert a disk.
The disk is write-protected	Insert a disk that is not write-protected.
Insufficient space on the disk for the study	Insert a disk with more available space or delete studies from this disk.
A disk with an unknown format is detected	Format this disk or insert a properly formatted disk.
An unformatted disk is in the drive	Format this disk or insert a properly formatted disk.
An MO disk containing studies from a source other than a Cypress has been inserted. You will not be able to save studies to this disk.	If the studies on this disk are no longer needed, format the disk from the utilities menu and then save the study. Otherwise, insert a disk containing only Cypress studies or a new MO disk.

# *Safety, Technical Description, and Accuracy*

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This chapter includes information about:

- Important Warnings and Notices
- Intended Use of the Cypress system
- Information about specific types of studies including: Cardiac, Intraoperative, Pediatric, Neonatal Cephalic, Peripheral Vascular, Fetal, and Abdominal.
- Patient Safety
- Operator Safety Issues
- Standards Compliance and Other Safety Information

---

## Important Warnings and Notices



### Electrical Shock Hazard

**WARNING** *Grounding reliability can only be achieved when equipment is connected to an equivalent receptacle marked "HOSPITAL GRADE."*

**WARNING** *Do not remove the system covers. There are no operator serviceable parts inside. Refer servicing to qualified personnel.*

**WARNING** *Do not use electrocardiogram cables with exposed pins. Electrical shock could result.*

### Explosion Hazard



**WARNING** *Possible explosion hazard if used in the presence of flammable anesthetics.*

## Safety Information and Other Warnings

Before using this system carefully read this chapter.

### Display Monitor Radiation

The display monitor used in this product complies with the United States Food and Drug Administration regulations that were applicable as of the date of manufacture (21 CFR Subchapter J).

### Prescription Device Statement

For product usage in the United States of America, the following labeling statement applies:



**CAUTION** *Federal law restricts this device to use by or on the order of a physician.*

**NOTE** *The shallowest 10% of the scanning depth (nearest the transducer face) is not displayed. For example, if a scanning depth of 16.2 cm is*



*selected, the shallowest 1.6 cm is not displayed. To view the extreme near field, reduce the scanning depth.*

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## Intended Use

### Safety Overview of Intended Use

For well over 25 years diagnostic ultrasound has been accepted as a safe and very effective diagnostic technique. Diagnostic ultrasound images are obtained with a minimal risk to the patient, especially when compared to other imaging techniques. Diagnostic ultrasound does not use ionizing radiation. According to the published literature, there are no known, immediate or delayed or long-term risks from diagnostic ultrasound imaging using accepted acoustic output levels and conventional examination techniques.

### Intended Use of the Cypress System Ultrasound Imaging System

Diagnostic ultrasound is useful for diagnosing several different disease states. The Cypress ultrasound system is intended for cardiac, abdominal, peripheral vascular, fetal, neonatal cephalic, pediatric, and intraoperative cardiac applications, as defined in FDA guidance documents. The patients who may be imaged with the system include adults, children, and neonates. The system can be used with or without legally marketed ultrasound contrast agents.

All scanning modes may be applied for each application. The Cypress system contains three measurement and analysis applications:

- General
- Cardiac
- Vascular

**WARNING** *The Cypress system is not intended for use as an ECG monitor or for diagnostic ECG. Signals displayed are for reference or triggering only.*

## Cardiac Studies

Cardiac studies obtain images that can be used to:

- Detect abnormalities in heart anatomy and blood flow.
- Determine the blood flow patterns and velocities in the fetus, heart, and associated vessels.
- Image and measure anatomic and physiologic parameters of the heart and associated vessels.

**TABLE 46. Cardiac Studies Table**

<i>Target</i>	<i>Approach</i>	<i>Patients</i>
<b>Heart and Vessels</b>	Transthoracic	Adult, pediatric, neonatal

## Intraoperative Cardiac Studies

Intraoperative cardiac studies obtain images that can be used to:

- Detect abnormalities in heart anatomy and blood flow during cardiac surgery.
- Monitor cardiac function during cardiac surgery.

**TABLE 47. Intraoperative Cardiac Studies Table**

<i>Target</i>	<i>Approach</i>	<i>Patients</i>
<b>Heart and Vessels</b>	Transthoracic (Epicardial with sterile sheath)	Adult, pediatric, neonatal

## Pediatric Studies

Pediatric studies obtain images that can be used to:

- Detect abnormalities in heart anatomy and blood flow in pediatric patients.
- Detect abnormalities in organs, superficial, and bony structures in pediatric patients.

**TABLE 48. Pediatric Studies Table**

<i>Target</i>	<i>Approach</i>	<i>Patients</i>
<b>Heart and Vessels</b>	Transthoracic	Pediatric
<b>Organs and Structures</b>	Abdomen, Arms, Legs	Pediatric

## Neonatal Cephalic Studies

Neonatal cephalic studies obtain images of brain structures that can be used to:

- Detect abnormalities, such as abnormal ventricle size or a shift in the midline or flow abnormalities.

**TABLE 49. Neonatal Cephalic Studies Table**

<i>Target</i>	<i>Approach</i>	<i>Patients</i>
<b>Brain Structures</b>	Intact fontanelles	Infants

**NOTE** The 5 MHz external transducer is the only transducer intended for neonatal cephalic studies.

## Peripheral Vascular Studies

Peripheral Vascular studies obtain images that can be used to:

- Detect size, contour, and vessel patency.
- Characterize obstructions.
- Determine blood flow patterns and velocities.
- Image and measure anatomic and physiologic parameters of vessels.

**TABLE 50. Peripheral Vascular Studies Table**

<i>Target</i>	<i>Approach</i>	<i>Patients</i>
<b>Cerebrovascular arteries and veins</b>	Neck	Adult, pediatric, and neonatal
<b>Upper extremity arteries and veins</b>	Arms	Adult, pediatric, and neonatal
<b>Lower extremity arteries and veins</b>	Legs	Adult, pediatric, and neonatal

## Fetal Studies

Fetal studies are performed to obtain images of the fetus that can be used to:

- Detect structural abnormalities.
- Image and measure anatomic and physiologic parameters of the fetus.
- Determine blood flow patterns and velocities.

**TABLE 51. Fetal Studies Table**

<i>Target</i>	<i>Approach</i>	<i>Patients</i>
<b>Fetus</b>	Maternal Abdomen	Pregnant women and fetuses

## United States National Institutes of Health Consensus Statement on Using Ultrasound Imaging in Pregnancy



**CAUTION** It is important to read the following statement from “*Diagnostic Ultrasound Imaging in Pregnancy*,” National Institutes of Health Conference Consensus Statement, Volume 5, Number 1.

In a February 1984 Health Consensus Development Conference on the use of diagnostic ultrasound in pregnancy, the National Institutes of Health developed a consensus statement recommending:

“Ultrasound examination in pregnancy should be performed for a specific medical indication. The data on clinical efficacy and safety do not allow a recommendation for routine screening at this time.

Ultrasound examinations performed solely to satisfy the family’s desire to know the fetal sex, to view the fetus, or to obtain a picture of the fetus should be discouraged. In addition, visualization of the fetus solely for educational or commercial demonstrations without medical benefit should not be performed.”

## Abdominal Studies

Abdominal Studies obtain images that can be used to:

- Detect abdominal organ abnormalities.
- Determine size, contour, and patency of vessels.
- Characterize obstructions.
- Determine blood flow patterns and velocities.

**TABLE 52. Abdominal Studies Table**

<i>Target</i>	<i>Approach</i>	<i>Patients</i>
<b>Abdominal organs, arteries, and veins</b>	Abdominal	Adult, pediatric, and neonatal



**WARNING** *The Cypress system is not intended for ophthalmic studies, adult cephalic, or for intraoperative neurological studies.*

## ACUSON AcuNav Diagnostic Ultrasound Catheter

With the ACUSON AcuNav® diagnostic ultrasound catheter the Cypress system is specifically indicated for use in visualization of vascular anatomy, cardiac and great vessel anatomy and physiology, or other devices in the heart, as well as, measurement of blood flow. The AcuNav diagnostic ultrasound catheter is a disposable, single-use ultrasound-tipped catheter device that is used directly within the venous vasculature and/or right heart for intravascular or intracardiac ultrasound imaging.



**WARNING** *If you intend to use the Cypress system with the AcuNav diagnostic ultrasound catheter, you must carefully read the User Manual and Directions for Use that come with AcuNav catheter.*

**NOTE** *The AcuNav diagnostic ultrasound catheter is available only at certain hardware revision levels. Contact your Siemens representative for additional information.*

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## Patient Safety

There are identifiable hazards that can influence patient safety. These should be understood before using the system.

### Exposure to Ultrasound Energy — Acoustic Output

The ultrasound energy, frequency levels, and scanning times employed by the Cypress system have not been associated with harmful effects. Regardless, it is advisable to minimize the patient's exposure to ultrasound. The following steps provide a guide to reducing exposure:

- Conduct an ultrasound scan only when there is a clear and good medical reason for doing so.
- Use the lowest possible acoustic transmit setting consistent with obtaining diagnostically useful images.
- Reduce exposure time, even with lower acoustic transmit settings, using techniques that produce diagnostic data as rapidly as possible.
- Use the appropriate transducer for the type of exam being performed.

The maximum output levels provided by the Cypress system are described in "Reducing Acoustic Exposure on the Cypress System — Implementing ALARA" on page 10-10.

For a detailed examination of the acoustic output issue, please study the document published by the American Institute of Ultrasound in Medicine entitled *Medical Ultrasound Safety* that is included with this manual. This document explains the interaction of ultrasound and tissue, the possibilities and mechanisms of bioeffects, and it explains the output display indices employed by the Cypress system.

## Reducing Acoustic Exposure on the Cypress System — Implementing ALARA\*

In addition to the general guidelines above, several specific steps may be taken in scanning with the system to minimize acoustic exposure.

1. Use the lowest possible acoustic transmit setting consistent with obtaining diagnostic-quality images. The Transmit control is located in the Tools menu. Follow the principle of ALARA—using a setting as low as reasonably achievable. The Transmit level may be adjusted separately for each scanning mode.
2. Use Overall Gain to adjust for weaker images rather than increasing the Transmit level. The gain control applies to received signals and does not increase the acoustic output of the system. This applies to all scanning modes.
3. In 2D and M-Mode, use the Time Gain Compensation controls to adjust for weaker images rather than increasing the Transmit level.
4. The Compress control affects the dynamic range and grayscale curve settings applied to 2D and M-Mode image data but does not affect the acoustic output of the system. In some circumstances the controls may be adjusted to improve an image and minimize the need to increase the transmit level. Adjusting this control should be attempted first before increasing the Transmit setting.
5. The depth setting in all modes has an indirect effect upon the acoustic output. The system automatically places the transmit beam focus dependent on the overall depth setting. Deeper depths will cause the transmit focus to be placed deeper in the field of view, and this will reduce the output levels.
6. In general, as shown in the Acoustic Output Tables, CW Doppler will have the highest output level, followed in order by Color Flow Mapping, M-Mode and 2D. To the extent practicable and consistent with the diagnostic objectives of the exam, keep these mode-related levels in mind when scanning.
7. Select the appropriate system protocol when performing fetal neonatal cephalic studies. This will provide lower default values and provide access to TIC and TIB indices for neonatal cephalic studies.
8. Keep exams as brief as possible, consistent with diagnostic requirements.

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\* **As Low As Reasonably Achievable.**





## Electrical Warnings

Failure to comply with these warnings may pose a threat to patient and operator safety.

- WARNING** *Grounding reliability can only be achieved when equipment is connected to an equivalent receptacle marked "HOSPITAL GRADE."*
- WARNING** *Do not remove the system covers. There are no operator serviceable parts inside. Refer servicing to qualified personnel.*
- WARNING** *The equipment shall be connected to a center-tapped single-phase supply circuit when users in the United States connect the equipment to a 240 V supply system.*

## Infection Control

Infection control is an extremely important issue. The level of disinfection required for ultrasound transducers is determined by the manner in which a transducer is used.

- WARNING** *Operators must take steps to prevent the transfer of infections between persons.*
- WARNING** *Special infection-control precautions must be implemented when scanning patients with open wounds.*
- WARNING** *Only transducers properly enclosed in a sterile sheath are to be used for intraoperative cardiac studies.*
- WARNING** *To minimize risks of cross contamination and infectious diseases, high level disinfection of transducers is required after intraoperative cardiac studies or after scanning a patient with an open wound. High level disinfection should take place despite the fact that a sterile sheath was used during the procedure.*
- WARNING** *There have been reports of severe allergic reactions to medical devices containing latex. Operators are advised to identify latex-sensitive patients and to be prepared to treat allergic reactions promptly. For additional information (in the U.S.A.) refer to the FDA Alert which is reproduced on page 10-14.*

## Sterilization

### Noncritical Device Applications

Conventional applications for external transducers have a very low probability for spreading infection because they are used on intact skin. This requires general cleaning only, or low-level disinfection. Follow your institution's guidelines related to infection control and ultrasound imaging.

In instances where the risk of infection is very low use the following procedure:

- After completing an exam, wipe the gel off the transducer.
- Wipe the transducer and cable with a soft, dry or water-moistened cloth.
- To clean the transducer, wipe it with a cloth moistened with an isopropyl alcohol solution (rubbing alcohol) or a 2% glutaraldehyde-based disinfectant.
- Immediately wipe the transducer with a soft cloth moistened with quality tap water, to prevent the solution from air-drying on the transducer.

Do not sterilize a transducer using autoclaving, ultraviolet, gamma radiation, gas, or dry-heat methods.

### Semicritical Device Applications

If an external transducer is used in a situation where it may come into contact with a source of infection such as broken skin, lesions, or post-operative wounds, then use a sterile sheath.

Transducers used in a surgically invasive or intraoperative cardiac application for scanning a surgical site are to be used only with a sterile sheath legally marketed for such an indication. Transducers are not intended to be applied directly to a wound. If a transducer is used in such a situation it should be high-level disinfected after such use:

- After carefully disposing of the sterile sheath, wash the transducer with soap and water.
- Perform high-level disinfection with a generic 2% glutaraldehyde solution, following the manufacturer's instructions.
- Rinse the transducer with quality tap water, taking care to keep the cable and connector dry.
- Wipe the transducer handle with a cloth moistened with an isopropyl alcohol solution (rubbing alcohol).



**CAUTION** *In disinfecting external transducers, be careful to immerse only the top portion of the transducer, up to one inch (2.5 cm) from the transducer*

face in the disinfecting solution. Do not immerse the entire transducer or immerse the cable or connector.



**CAUTION** *Disinfectants other than isopropyl alcohol or 2% glutaraldehyde-based solutions may damage Cypress system transducers.*

**CAUTION** *When using a sterile sheath-covered transducer for intraoperative cardiac studies, be careful to extend the sheath over the transducer cable to prevent the cable from entering the sterile field unprotected.*

**NOTE** *The Cypress system is not intended for intraoperative cephalic applications.*

## Infection Control Reference

The following article provides an overview of infection control considerations.

Block, S.S., *Disinfection, Sterilization and Preservation*, Chemical Disinfection of Medical and Surgical Materials, Chapter 35, Lea & Febiger, Philadelphia, 1991.

## Patient Contact Materials

Materials used in ACUSON transducers have been tested for biocompatibility and have been widely used for many years in similar products and applications without reports of negative reactions.

Use only legally-marketed sterile sheaths indicated for the application when sterility is required.

**WARNING** *Commercially-available sheaths used to cover TEE transducers and external transducers in intraoperative cardiac applications to provide infection control may contain latex. On March 29, 1991, the U.S. Food and Drug Administration published a medical alert on latex products. Users should study this alert prior to using any latex products.*

## U.S. Food and Drug Administration Medical Alert

The text of this medical alert is reproduced below.

Text of March 29, 1991 US FDA Medical Alert: *Allergic Reactions to Latex-Containing Medical Devices*:

Because of reports of severe allergic reactions to medical devices containing latex (natural rubber), FDA is advising health professionals to identify their latex-sensitive patients and be prepared to treat allergic reactions promptly. Patient reactions to latex have ranged from contact urticaria to systemic anaphylaxis. Latex is a component of many medical devices, including surgical and examination gloves, catheters, intubation tubes, anesthesia masks, and dental dams.

Reports to FDA of allergic reactions to latex containing medical devices have increased lately. One brand of latex cuffed enema tips was recently recalled after several patients died as a result of anaphylactoid reactions during barium enema procedures. More reports of latex sensitivity have also been found in the medical literature. Repeated exposure to latex both in medical devices and in other consumer products may be part of the reason that the prevalence of latex sensitivity appears to be increasing. For example, it has been reported that 6% to 7% of surgical personnel and 18% to 40% of spina bifida patients are latex sensitive.

Proteins in the latex itself appear to be the primary source of allergic reactions. Although it is not now known how much protein is likely to cause severe reactions, FDA is working with manufacturers of latex containing medical devices to make protein levels in their products as low as possible.

FDA's recommendations to health professionals in regard to this problem are:

—When taking general histories of patients, include questions about latex sensitivity. For surgical and radiology patients, spina bifida patients, and healthcare workers, this recommendation is especially important. Questions about itching, rash or wheezing after wearing latex gloves or inflating a toy balloon may be useful. Patients with positive histories should have their charts flagged.

— If latex sensitivity is suspected, consider using devices made with alternative materials, such as plastic. For example, a health professional could wear a non-latex glove over the latex glove if the patient is sensitive. If both the health professional and the patient are sensitive,

a latex middle glove could be used. (Latex gloves labeled “hypoallergenic” may not always prevent adverse reactions.)

— Whenever latex-containing medical devices are used, especially when the latex come in contact with mucous membranes, be alert to the possibility of an allergic reaction.

— If an allergic reaction does occur and latex is suspected, advise the patient of a possible latex sensitivity and consider an immunologic evaluation.

Advise patients to tell health professionals and emergency personnel about any known latex sensitivity before undergoing medical procedures. Consider advising patients with severe latex sensitivity to wear a medical identification bracelet.

FDA is asking health professionals to report incidences of adverse reactions to latex or other materials used in medical devices. (See the October 1990 FDA Drug Bulletin). To report an incident, call the FDA Problem Reporting Program, operated through the U.S. Pharmacopeia tool-free number 800-638-6725. (In Maryland call collect 301-881-0256) For further information on the clinical aspects of latex sensitivity, call Claudia Gaffey MD, FDA Office of Health Affairs, Center for Devices and Radiological Health at 301-427-1060.

For a single copy of a reference list on latex sensitivity write to:  
LATEX, FDA HFZ-220, Rockville, MD 20857.

## Peripheral Device Connections

**WARNING** *Do not use a peripheral device, such as a monitor, VCR or printer within 1.5 meters of a patient unless the device receives power from an isolation transformer that meets medical safety standards.*

**WARNING** *Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards (IEC 950 for data processing equipment and IEC 601-1 for medical equipment). Furthermore, all configurations shall comply with the system standard IEC 601-1-1. Any party who connects additional equipment to the signal input part or signal output part is considered to be configuring a medical system, and is therefore responsible for ensuring that the system complies with the requirements of the system standard IEC 601-1-1. If you have additional questions, contact your Siemens representative.*

## Ultrasound Contrast Agents

The Cypress system may be used with legally marketed ultrasound contrast agents. Siemens makes no claims regarding the safety or efficacy of ultrasound contrast agents. It is important that you carefully follow the indications, instructions for use, warnings, and cautions that are provided by ultrasound contrast agent manufacturers as a part of the product labeling.

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## Operator Safety Issues



### Electrical Safety

**WARNING** Carefully read the warning notices regarding electrical safety that appear at the beginning of this section.



### Explosion Hazards

**WARNING** Possible explosion hazard if used in the presence of flammable anesthetics.

### Carpal Tunnel Syndrome

Repetitive ultrasound scanning has been associated with Carpal Tunnel Syndrome (CTS). Recent reports in the medical literature have examined and surveyed populations of sonographers using a variety of products from different ultrasound manufacturers. Several recommendations have been identified that can help prevent CTS:

- Do not grasp the transducer with excessive force.
- Interrupt scanning frequently, using these breaks to rest and give soft tissue a chance to recuperate from the strained positions and repetitive movements of examinations.
- Try to maintain a comfortable and balanced body position with minimal stress on your joints.

#### *References*

Vanderpool, et. al., Prevalence of carpal tunnel syndrome and other work related musculoskeletal problems in cardiac sonographers, *American College of Occupational and Environmental Medicine*, 35:6, June 1993.

Mercer, et. al., Occupational health hazards to the ultrasonographer and their possible prevention, *Journal of the American Society of Echocardiography*, 10:4, 363-366, May 1997.

Craig, M. Occupational health hazards of sonography: an update. *Journal of Diagnostic Medical Sonography*, 1: 47- 50, 1990.

## Glutaraldehyde Exposure

The United States Occupational Safety and Health Administration (OSHA) has issued a regulation dealing with levels of acceptable glutaraldehyde exposure in the working environment.

Glutaraldehyde can be used successfully without exceeding the exposure levels. Using one of the legally marketed TEE holding tubes can reduce the amount of glutaraldehyde fumes in the air. The use of a stopper at the top of the narrow holding tube can further reduce fumes.

Follow the glutaraldehyde manufacturer and your institution's procedures for handling glutaraldehyde in order to prevent skin irritation or allergic reactions. It is important to wear gloves when handling glutaraldehyde and standard latex gloves may not provide adequate protection. The occupational safety literature suggest that the type of glove used when working with glutaraldehyde should have scientific proof from the manufacturer that there is acceptable protection against glutaraldehyde (an OSHA requirement), be at least 11 inches long, be of medical grade to protect against blood-borne pathogens, and be made of butyl or nitrile rubber or polyethelene. Nitrile rubber gloves can protect against glutaraldehyde for approximately eight hours or more.

### *References*

Notarianni, G. Do your gloves really protect you from glutaraldehyd? *Association of Occupational Health Professionals*, 1:11-2, 1996.

Occupational Safety and Health Administration. OSHA safety and health standards, 29 CFR 1910.1030. Federal Register 58:64136, 1991.

Occupational Safety and Health Administration. OSHA safety and health standards, 29 CFR 1910.132-138. Federal Register 59:16360-4, 1994.

## Infection Control






In order to protect the operator and the patient from infection it is important that you carefully follow the infection-control procedures of your institution.

With the Cypress system, a chief infection control issue is the care of transducers that may have come into contact with infected patients. Carefully follow the infection control procedures described in this manual.

Blood on the system and transducer should be removed using soap and water followed by alcohol. Dry the equipment afterwards.



## Transporting and Placing the System

-  **CAUTION** *When placing the system for use, be certain that the unit is in a secure position where it will not be inadvertently knocked or displaced.*
-  **CAUTION** *During scanning operations use caution to prevent transducer, ECG, or power cables from being placed where they may obstruct movement or cause someone to trip over them.*
-  **CAUTION** *When moving the system within a building when the system is placed on its mounting stand, do not try to move the stand over uneven elevator thresholds.*
-  **CAUTION** *Fold the keyboard into the up position before moving the system. When folding the keyboard up take care to avoid pinching your fingers or cables.*
-  **CAUTION** *Take care when placing the system on a surface such as a table or cart that the system is securely placed and not subject to accidental bumping which might cause it to fall.*
- The Cypress system is a compact and highly portable ultrasound system. Take care when transporting and placing the unit to avoid potential injury to the operator or patient.
  - Use the built-in handle to carry or move the system short distances. When carrying the unit, take care not to bang it into a wall or other object. Take special care to protect the display.
  - When transporting the system over a considerable distance or in a vehicle, place it in the protective carrying or shipping case.
  - Remove all cables and connectors before moving the system. Do not move the system with dangling cables.
  - Remove transducers from the system when transporting it any distance, or in a vehicle. When transporting transducers, place them in a carrying or shipping case.
  - See “Technical Description and Accuracy” on page 10-20 for more information about transporting specifications.

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## Technical Description and Accuracy

### Specifications

#### Model

ACUSON Cypress™

#### Manufacturer

Siemens Medical Solutions USA, Inc.  
1230 Shorebird Way  
Mountain View, CA 94043  
650-969-9112

#### Electrical Power Requirements

Input Voltage: 100—120 V/220—240 V  
Frequency: 50/60 Hz  
Current: 1.2/0.6 A  
Fuse Rating: 2.5A SB-250 V  
Fuse Type: 3AG or 5 x 20 mm

#### Classifications

The Cypress is classified under IEC 60601-1, CSA 601.1, and UL2601-1 as:

1. Class I protection against electrical shock.
2. For continuous mode of operation.
3. Equipment not suitable for use in the presence of flammable anesthetic mixture with air or oxygen or nitrous oxide.
4. Ordinary equipment without protection against ingress of water.

The Cypress system has two applied parts:

1. The transducer is classified as a type BF applied part.
2. The ECG cable is classified as a defibrillation-proof type CF applied part.

#### Environmental Conditions

##### *Operating:*

Temperature: 10°C to 40°C (50°F to 104°F)  
Humidity (RH): 30% to 75%  
Pressure: 700hPa to 1060 hPa (20.7 inHg to 31.3 inHg)

##### *Transportation and Storage:*

Temperature: -20°C to 60°C (-40°F to 158°F)  
Humidity (RH): 10% to 90%, Non-condensing  
Pressure: 500hPa to 1060 hPa (14.8 inHg to 31.3 inHg)

## Physical Specifications

### *Dimensions (LxWxH):*

With keyboard in storage position: 216 mm x 406 mm x 356 mm

With keyboard extended: 368 mm x 406 mm x 356 mm

### *Weight:*

20 lbs.

**NOTICE** *Siemens will make available, upon request, circuit diagrams, component part lists, descriptions or other information to assist the user's appropriately qualified technical personnel to repair those parts of equipment which are designated by Siemens as repairable.*

**NOTICE** *See the "System Overview" section and the beginning of this section for information on the safe installation and operation of the Cypress system. The equipment shall be connected to a center-tapped single-phase supply circuit when users in the United States connect the equipment to a 240 V supply system.*

**NOTICE** *See the "Maintenance, Care, and Service" section for instructions on care, cleaning, maintenance, and fuses.*

## Electromagnetic Interference

- WARNING** *This equipment has been tested and found to comply with the limits for medical devices EN60601-1-2:2001 or the Electromagnetic Compatibility Directive 89/336/EEC. These limits are designed to provide reasonable protection against harmful interference in a typical medical installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to other devices in the vicinity. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to other devices, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*
- *Reorient or relocate the receiving device.*
  - *Increase the separation between the equipment.*
  - *Connect the equipment to an outlet on a circuit different from that to which the other device(s) are connected.*
  - *Consult the manufacturer or field service technician for help.*



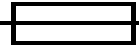







## Electrosurgical Units

Electrosurgical units (ESUs) and other devices are designed to introduce RF electromagnetic fields or currents into patients. The overlap of the frequencies used by these devices and diagnostic ultrasound systems creates a susceptibility to interference on the part of the ultrasound machine. During ESU operation, the ultrasound image should be expected to experience severe interference that may make the image unusable. This interference stops as soon as the ESU is turned off.






## Labeling Icons

A number of icons are used in the labeling of the Cypress system. These are explained in Table 53.

**TABLE 53. Labeling Icons**

<i>Icon</i>	<i>Meaning</i>	<i>Explanation</i>
	Attention	Alerts personnel to consult accompanying documentation.
	Electrical Shock Hazard	Alerts personnel to a possible shock hazard.
	Fuse	Location of fuse. <b>WARNING: Risk of fire. Replace fuse as marked.</b>
	Alternating Current (AC)	Specifies the type of input voltage.
	Type BF	Degree of protection from electrical shock (particularly regarding allowable leakage currents, having an F-Type isolated [Floating] applied part).
	Type CF	Degree of protection from electrical shock (particularly regarding allowable leakage currents, having an F-Type isolated [Floating] applied part).
	Defibrillation-Proof Type CF	Degree of protection from electrical shock with additional protection against the effects of a cardiac defibrillator.
	Microphone Input	Connector for attaching microphone.
	Video Output	Connector for attaching video display monitor or video recording device.
	External Keyboard	Connector for attaching external PC-compatible keyboard.

**TABLE 53. Labeling Icons**

<i>Icon</i>	<i>Meaning</i>	<i>Explanation</i>
	Network	Connector for attaching network cable.
	USB Port	Connector for attaching USB devices.
	System Power On	Turns the system on.
	System Power Off	Turns the system off.
	Security Lock	A security cable can be purchased for added protection against theft. Insert the cable into the opening.

---

## Measurement Accuracies

The Cypress system may be used to provide measurements and calculations derived from ultrasound images. The quantified image data may be used along with other clinical information to assist a physician in making a patient diagnosis.

The sole reliance on diagnostic ultrasound data to make a clinical diagnosis is not recommended. Numerous factors related to the accuracy of ultrasound image data must be taken into account. This section describes some of these factors. Measurement accuracies are also influenced by operator experience, scanning technique, interpreting physician experience, and the technical difficulty of the patient. Many of these variables are not associated with the Cypress system. This limits the ability to fully specify the clinical accuracy of the measurements and calculations provided by the Cypress system.

### Accuracy by Transducer Type

All transducers types have been verified for measurement accuracy in the modes appropriate to each measurement type.

Because of the moderate transducer frequency range of the system, measurement accuracies for the system are not expected to vary significantly based upon the transducer being used. Transducers range in scanning depth from 0.5 cm to 29.0 cm. The maximum spectral Doppler velocity range for 2.5 MHz frequency transducers is 16 meters per second, baseline fully shifted. The maximum spectral Doppler velocity range for 5.0 MHz frequency transducers is 8 meters per second, baseline fully shifted.

All reported accuracies are  $\pm$  one-half the least significant digit.

## Accuracy of Primary Measurements

**TABLE 54. Accuracy of Primary Measurements**

<i>Measurement</i>	<i>Description</i>
<b>Distance</b>	<p>The system assumes that the speed of sound is 1540 meters per second and that this speed is homogeneous in all tissues. The diagnostic ultrasound literature states that differences in the speed of sound in the body do exist because of the differing tissue types. In <i>Clinical Sonography – A Practical Guide</i>, (2nd Edition, Roger C. Sanders, ed., Little Brown and Company, 1991), the range is cited as from 1500 to 1600 meters per second. These differences would produce an inaccuracy of up to <math>\pm 4\%</math>.</p> <p>The distance measurements on the system are verified using an AIUM standard phantom with a fluid having an acoustic speed of approximately 1540 meters per second at room temperature. The accuracy of this measurement is <math>\pm 5\%</math>. The maximum range of this measurement is 24 cm.</p>
<b>Velocity</b>	<p>The velocity measurement is calibrated using a Doppler string phantom where multiple measured velocities are checked against actual velocities over the range of velocity values provided by the Cypress system. The accuracy of this measurement is <math>\pm 7\%</math>. The maximum range of this measurement is 16 meters per second.</p>
<b>Time</b>	<p>The time calibration is performed using a calibrated time-interval waveform generator. The accuracy of this measurement is <math>\pm 2.5\%</math>. The maximum range of this measurement is 4 seconds.</p>
<b>Heart Rate</b>	<p>The heart rate measurement calibration is performed using a calibrated electrocardiogram signal generator. The accuracy of this measurement is <math>\pm 2.5\%</math>. The maximum range of this measurement is 300 beats per minute.</p>



## Accuracy of Derived Calculations

### Standard Derived Calculations

The measurement accuracy and range over which that accuracy is valid is provided in the table below for standard derived calculations.

**TABLE 55. Accuracy of Standard Derived Calculations**

<i>Measurement Type</i>	<i>Maximum Range of Accuracy</i>	<i>Accuracy ± %</i>
Area	200 cm <sup>2</sup>	10
Slope	5000 mm/sec	10
Velocity	12 m/sec	7
Acceleration	100 m/sec	12
Pressure Half-Time	4 sec	12
Velocity Time Integral	900 cm	12
Mean Pressure Gradient	550 mm Hg	7

## Potential Sources of Error During Scanning

Table 56 shows the potential sources of error when conducting scans.

**TABLE 56. Potential Sources of Error**

<i>Source</i>	<i>Explanation of Error(s)</i>
<b>Patient Variability</b>	The technical difficulty of patients varies widely. Greater care must be taken with technically difficult patients to obtain the best images possible with the most optimum system control settings.
<b>Operator Variability</b>	The skill, care, and experience of the person conducting the scan is one of the most critical factors in obtaining accurate measurements. Operator training should be consistent with the recommendations of the relevant professional medical societies.
<b>Speed of Sound</b>	The image processing and measurement algorithms of diagnostic ultrasound assume that the speed of sound in body tissue is 1540 meters per second. Different types of body tissue have different sound speeds. In soft tissue there is approximately a 2% error; this may be as high as 5%, especially if fatty tissue is present in the area of the image being measured.
<b>Doppler Alignment</b>	When performing Doppler scans try to align the beam as close to parallel to flow as possible. Misalignment errors are typically approximately $\pm 5\%$ . Most cardiac clinical references assume that the angle is under $20^\circ$ .
<b>Clinical References</b>	Numerous clinical references and studies have been published which establish the accuracy of calculations formulas and algorithms. It is important to be familiar with these references and their descriptions of accuracy issues and limitations. These studies also describe any assumptions that may be made in the development of the clinical formula. The calculations formulas used in the Cypress system are derived solely from such published data, and references are provided in the calculations section of the manual.
<b>Screen Pixel Resolution</b>	The display screen provided in the Cypress system is comprised of a rectangular array of square picture elements (pixels). Measurement pixel resolution is assumed to be $\pm$ one pixel. The maximum potential error of this resolution accuracy is 0.4%.

**TABLE 56. Potential Sources of Error**

<i>Source</i>	<i>Explanation of Error(s)</i>
<b>Heart Rate Information</b>	<p>Several calculations in the Cypress system employ the heart rate. It is important that the heart rate number used in calculations be accurate and derived from an ECG source that is free of artifact.</p> <p>The Cypress system heart rate display is an average value that is extracted continuously from previous R-R intervals. The heart rate filtering function is a time-weighted average of R-R intervals with the highest weight assigned to the most recent interval. Successively older R-R intervals are assigned successively lower weights. For the purposes of characterizing this filter function, it can be considered an average of the last 5 heart cycles. For the 6th and older R-R intervals, a 20% variation in that interval will result in a 1% or less variation in the heart rate display, with each successively older interval contributing successively less to the average.</p>
<b>Manually Entered Patient Information</b>	<p>Some calculations in the system employ manually entered patient information. The Body Surface Area is obtained using height and weight information. It is assumed that the values entered for these indices are accurate.</p>

## Measurement Accuracy References

**NOTE** For additional references regarding measurements and calculations, see “Cardiac Calculation References” on page 6-24 and “Vascular Calculation References” on page 7-16.

Feigenbaum, H., *Echocardiography*, Fourth Edition, Lea and Febiger, Philadelphia, 1986.

Nanda, N.C., *Doppler Echocardiography*, Second Edition, Lea and Febiger, Philadelphia, 1993.

Sanders, R.C. ed, *Clinical Sonography – A Practical Guide*, Second Edition, Little Brown and Company, 1991.

Sahn, D., DeMaria, A. Kisslo, J., *The Committee on M-Mode Standardization of the American Society of Echocardiography*, “Recommendations regarding quantitation in M-Mode Echocardiography: Results of a survey on echocardiographic measurements,” *Circulation*, 58(6), 1072-1083, 1978.

Schiller, N.B., et. al., The American Society of Echocardiography Committee on Standards, Subcommittee on Quantification of Two-Dimensional Echocardiograms, “Recommendations for quantitation of the left ventricle by two-dimensional echocardiography,” *Journal of the American Society of Echocardiography*, 2(5) 358-367, Sept-Oct, 1989.

# *Maintenance, Care, and Service*

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The proper maintenance, care, and service of your Cypress system will help provide proper and safe operation. Carefully follow the steps described in this section.

This chapter includes information about:

- Cleaning the system
- Maintaining the system
- Electrostatic discharge protection
- Fuse replacement

---

## Cleaning the System



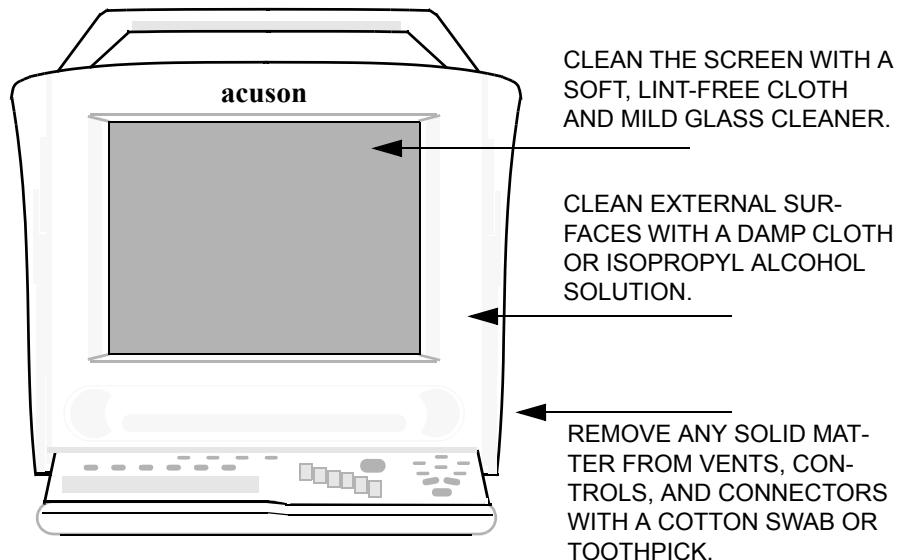
**WARNING** Before cleaning the Cypress system, make sure the power is OFF.



**CAUTION** Disinfectants other than isopropyl alcohol or 2% glutaraldehyde-based solutions may damage Cypress system transducers.

- Periodically clean the external surfaces of the system with a damp (not wet) cloth, or isopropyl alcohol solution. Do not spill or spray any water on the keyboard controls, into any connectors, or into any of the vents.
- Clean the display screen with a soft, lint-free cloth and a mild glass cleaner. Do not spray the glass cleaner or any fluid directly onto the screen.
- Carefully remove any solid matter around vents, controls, or connectors with a cotton swab or toothpick to prevent the matter from entering the inside of the system.

Refer to the “Safety, Technical Description, and Accuracy” section, for instructions on cleaning transducers and infection control.



**FIGURE 46. Cleaning the Cypress System**

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## Cleaning the MO Disk Drive

Dust and smoke can cause the lens actuator (located inside the drive) to become stained and decrease the performance of the MO disk drive. The cleaning period is usually once every six months (depending on environmental conditions).

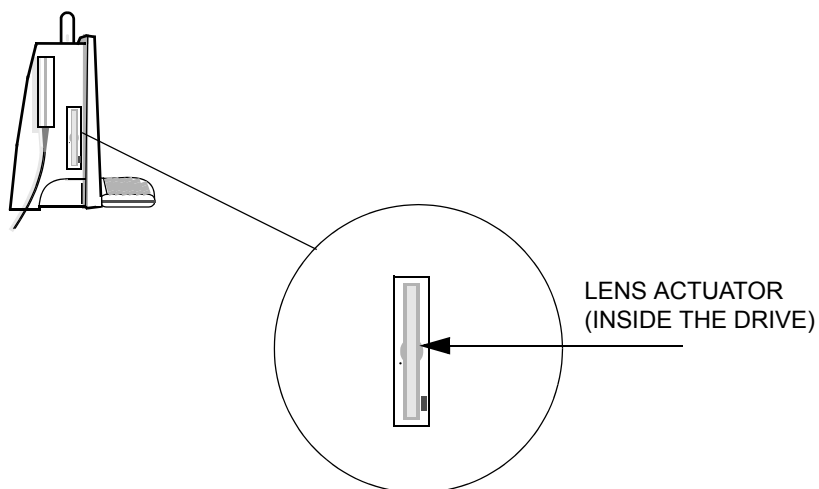
Use the *Fujitsu* MO disk drive head cleaner to clean the lens actuator:

Part Name: Head Cleaner

Part Number: 0240470

Order Number: CA90002-C980

Always check the condition of the cleaning brush by opening the shutter of the head cleaner. If the tip of the brush is open, use a new head cleaner.



**FIGURE 47. Cleaning the MO Disk Drive**

---

## Maintenance

### Preventive Maintenance

Basic and regular preventive maintenance can help prevent product failures. Follow these practices:

- Conduct periodic and thorough cleaning.
- Avoid spilling liquids or gel onto the control panel or display screen.
- Power down when not using the system.
- Follow the guidelines when transporting the system (see “Transporting the System” on page 1-8).
- Provide good air flow around the system to allow proper cooling.
- Insure that the fan is operating properly. Do not block the fan or vents.
- Allow space for the transducer and external connectors so there is not a forced bend on any of the cables.
- Check the ECG cable for cuts or breaks. Replace the cable if there are problems. New cables can be ordered from Siemens.

### Transducer Maintenance

Regularly check transducers for signs of wear or damage. Routinely inspect your transducers for the following problems:

- Cracks in case
- Cracks on transducer face
- Cuts or gouges on any part of the transducer, including transducer face, case, cable, and connector
- Buckling or bulging of the lens material on the transducer face
- Damage to the transducer connector



**WARNING** *Replace a transducer that shows any of the problems listed above.*



## MO Disk Drive Maintenance

To maintain the performance and reliability of the MO disk drive and MO disks, keep the following points in mind:

- Do not eject the MO disk when the drive is in the busy state (green light illuminated). The data may be destroyed or trouble may result in the drive.
- Do not use force to insert the MO disk into the drive.
- Do not use force to manually eject the MO disk.
- Do not use excessive pressure on the MO disk.
- Do not use the MO disk under the following conditions:
  - where exposure to direct sunlight is present
  - sharp temperature changes
  - high humidity
- Do not use the MO disk in a dusty or smoky environment.
- Do not open the shutter or touch the MO disk surface.

**NOTE:** *Always remove the MO disk from the MO drive when transporting the Cypress system.*

## Hard Drive Maintenance

The Cypress system's internal hard drive should not be used for long-term storage of studies and patient information. Remove data from the internal hard drive on a regular basis (daily or weekly).

Storage information is displayed on the Patient page in the bottom right corner. A "Low Storage" warning will appear when "Free" storage falls to 600 Mb. When you see this warning, transfer studies to a permanent storage media and then remove studies from the Cypress system's hard drive.

If "Free" storage reaches zero, new patient studies can no longer be added and old studies cannot be reviewed. You should immediately transfer studies to a permanent storage media and then remove studies from the Cypress system's hard drive.

When the "Free" storage reaches 1000 Mb, the Cypress system will automatically compact the study data.

## Frequency of Maintenance

Table 57 provides a guide to the frequency of maintenance procedures. If you use your system heavily it is advisable to increase the frequency. Safety-related inspections should be conducted frequently.

**TABLE 57. Frequency of Maintenance**

<i>Area</i>	<i>Frequency</i>	<i>Maintenance</i>
<b>Transducers</b>	6 months	Check for cracks or bent pins.
<b>TEE Transducers</b>	Each use	Check steering mechanism, look and feel for damage to tip and scope before each use.
	Each use	Follow cleaning procedure before each use.
<b>Fans</b>	4 months	Check for air flow and proper operation. The fan and vents are located: <ul style="list-style-type: none"> <li>■ On the right side of the Cypress system under the transducer holder.</li> <li>■ On the top of the Cypress system.</li> </ul>

## Electrostatic Discharge Protection

System covers should only be removed by qualified service personnel. Any service or maintenance operations must follow the necessary electrostatic discharge precautions. Failure to do so may cause damage or deterioration of sensitive electronic components. A full description of these safeguards is beyond the scope of this manual but the following basic steps include:

- Wear a properly grounded wrist grounding strap.
- Do not work in a carpeted area.
- When working on a sensitive area use a grounding mat.

---

## Troubleshooting

### No Power

If you turn the Cypress system ON and it does not boot up properly:

- If you hear the fan and the keyboard is lit, but the screen doesn't light up, call your Siemens representative.
- If the fan doesn't come on and the keyboard is not lit:
  1. Check to make sure the power cable is plugged in.
  2. Check the fuse. See "Fuse Replacement" on page 11-8.

### LCD Screen

**WARNING** It is possible for individual display pixels in the Cypress system flat-panel LCD (liquid crystal display) to become fixed in an ON or OFF state. This should not interfere with normal operation of the system, but could cause confusion if a "stuck" pixel occurs inside an alphanumeric display. For example, a pixel stuck in the ON state might be confused for a decimal point in a measurement, and a pixel stuck in the OFF state might obscure the display of a decimal point in a measurement. The system creates a space around the decimal point separating the whole number from the decimal — this will help guide you in reading a measurement even if there is a stuck pixel. If there is any suspicion of this problem, the multiple display of general measurement results in the Selection Menu and on the upper right of the imaging screen, and the multiple display of specific measurements in the Calc Menus and the Patient Report will allow you to verify the correct results.

## Fuse Replacement

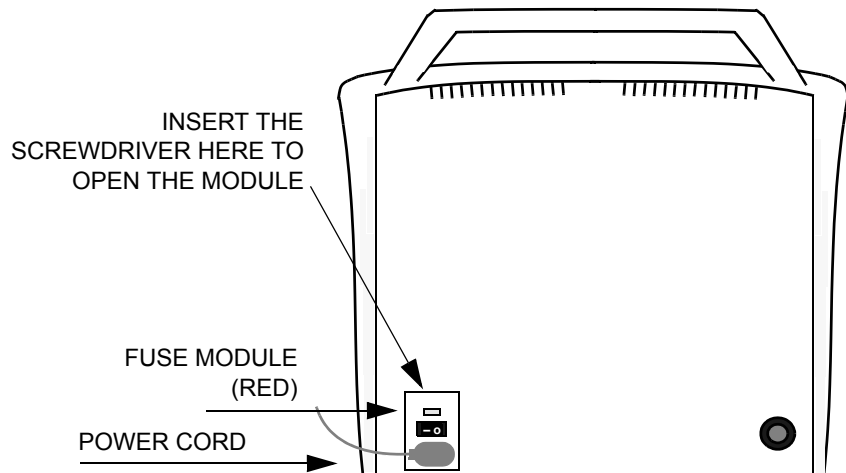
For 110 V and 220 V applications the Cypress system uses two fuses. The fuse rating is: 2.5A SB-250 V, 3AG or 5 x 20 mm.



**WARNING** Before starting this procedure, make sure the power is OFF.

**WARNING** Risk of fire. Replace fuse as marked.

1. Unplug the power cable from the back of the Cypress system (the door won't open if the power cord is connected).
2. Using a flat-nosed screwdriver, open the module door by inserting the screwdriver at the top of the module and pulling down.
3. Use a screwdriver to pull the red fuse module out.
4. Remove the old fuses from the sides of the module.
5. Insert the new fuses in the sides of the module.
6. Hold the fuses in place with your hand and push the module back in the Cypress system until it snaps into place.
7. Close the module door. If the door doesn't close properly, then the red fuse module is not seated properly.
8. Re-connect the power cable and turn the system ON to make sure the fuses are working.



**FIGURE 48. Replacing the Fuse**

---

## Trackball Maintenance

If the performance of the Trackball becomes sluggish, you may need to clean the Trackball and internal surface of the ball-cage.

**NOTE** Before cleaning, check the Trackball Speed settings in the **Setup** menu to make sure the current settings are set to your preferences.

### Cleaning the Cypress Trackball

*Required Materials:*

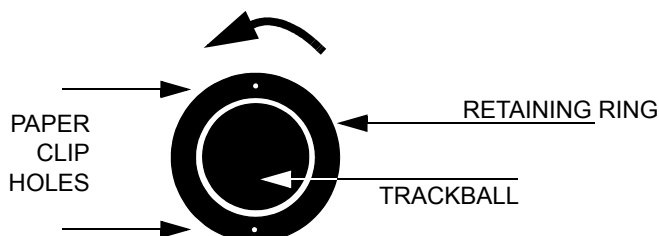
- Isopropyl alcohol
- Lint-free swabs such as "Radio Shack 44-1001 or 44-1094 anti-static, lint-less swabs" or equivalent
- Lint-free cloth, cotton or T-shirt type material
- Paper clip



**WARNING** Before cleaning the Trackball and internal ball-cage, make sure the Cypress system power is **OFF**.

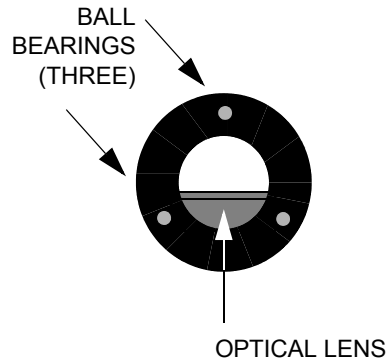
*To clean the Trackball and ball-cage, follow these steps:*

1. Shutdown the Cypress system and turn the power OFF.
2. Press and turn the black retaining ring surrounding the Trackball counterclockwise  $\frac{1}{4}$  turn.



**NOTE** If you have a problem completing step 2, insert the end of a paper clip into one of the two small holes located at the top and bottom of the retaining ring and turn counterclockwise.

3. Place your hand over the Trackball and lift the keyboard until the Trackball falls into your hand.
4. Clean the ball with the lint-free cloth by rubbing it carefully. Remove any oil or dust and set the ball aside until it is time to re-assemble the device. Do NOT use alcohol, soap, or any other cleaning material on the ball.



ONCE THE BALL IS REMOVED, CAREFULLY CLEAN THE FOLLOWING:

- THE INSIDE SURFACE
- BALL BEARINGS (3)
- LENS

5. Blow carefully into the ball-cage to dislodge dust and lint that may have accumulated on the surface or on the lens.
6. Dip the lint-free swab in alcohol. Use the alcohol sparingly; it should not saturate the swab. If necessary, reduce the amount of alcohol on the swab by applying it to the lint-free cloth or by squeezing the swab tip with tweezers. You may use any method for reducing the amount of alcohol on the swab as long as the swab and alcohol are not contaminated.
7. Once the proper amount of alcohol is on the swab, lightly rub the swab on the inside surface of the ball-cage to remove any contaminants. Look for a build-up of dirt on the ball bearings. Inspect the surface for cleanliness as you go. After cleaning, be sure that fluff from the swab is not left on the surface of the ball-cage or optical lens.
8. When all areas have dried completely, replace the previously cleaned ball.
9. Replace the retaining ring.

# *Connecting External Devices*

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This appendix describes how to connect external devices including:

- Video printer
- VCR

**NOTE:** *A Video Distribution cable is supplied with the system. When connecting to a VCR or Video printer, the Video Distribution cable must be connected to the 15-pin connector port on the Cypress system. The cable separates the composite video, S-video, and audio signals needed for VCR and printer operation to standard connector types used by these devices.*

**NOTE:** *When the screen is recorded on videotape and played back, portions of the screen—at the bottom and right side—are not displayed. There is nothing wrong with your display and ALL the imaging data is displayed.*

- Both a video printer and VCR
- Monitor
- Keyboard



**WARNING** *Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards (IEC 950 for data processing equipment and IEC 601-1 for medical equipment). Furthermore, all configurations shall comply with the system standard IEC 601-1-1. Any party who connects additional equipment to the signal input part or signal output part is considered to be configuring a medical system, and is therefore responsible for ensuring that the system complies with the requirements of the system standard IEC 601-1-1. If you have additional questions, contact your Siemens representative.*



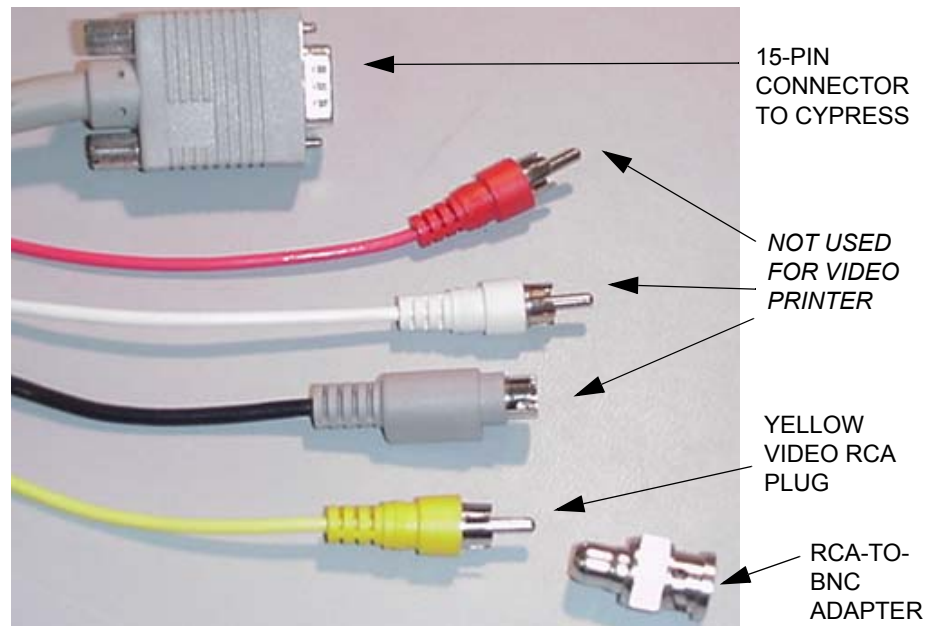
## Connecting a Video Printer



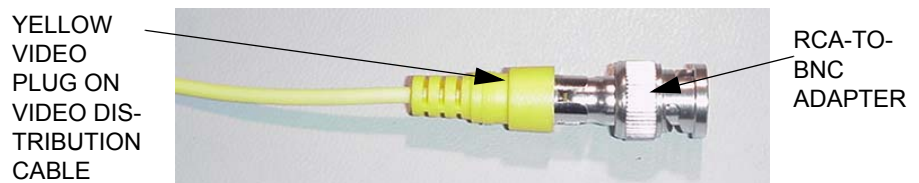
**WARNING** Do not use a peripheral device, such as a monitor, VCR or printer within 1.5 meters of a patient unless the device receives power from an isolation transformer that meets medical safety standards.

To connect a video printer to the Cypress system, follow these steps:

1. Make sure both the Cypress system and the printer are turned OFF.
2. Attach the RCA-to-BNC adapter to the yellow Video RCA plug on the Video Distribution cable (see Figure 49).



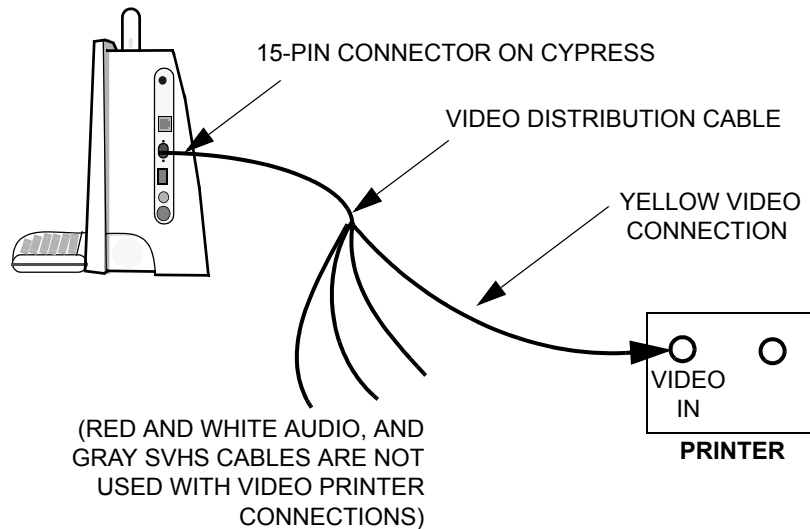
INSERT RCA-TO-BNC ADAPTER ON VIDEO OUT END OF CABLE



**FIGURE 49. Video Printer Connectors and Cables**

## Connecting External Devices

3. Connect the 15-pin end of the cable to the video port on the Cypress system (see Figure 50).
4. Connect the RCA-to-BNC adapter end of the cable to the Video In connector on the printer (see Figure 50).
5. Connect the power cord on the printer and plug it in.
6. Turn on the Cypress system, and then the printer.
7. On the Cypress system, press the **SETUP** function key to display the **Setup** tab.
8. Use the **Video Out Mode** drop-down menu to select NTSC.
9. Press **SETUP** to return to 2D mode or press **2D** to begin imaging.
10. Press the PRINT key on the printer to print images from the Cypress system.



**FIGURE 50. Connecting a Video Printer**

## Connecting a SVHS VCR

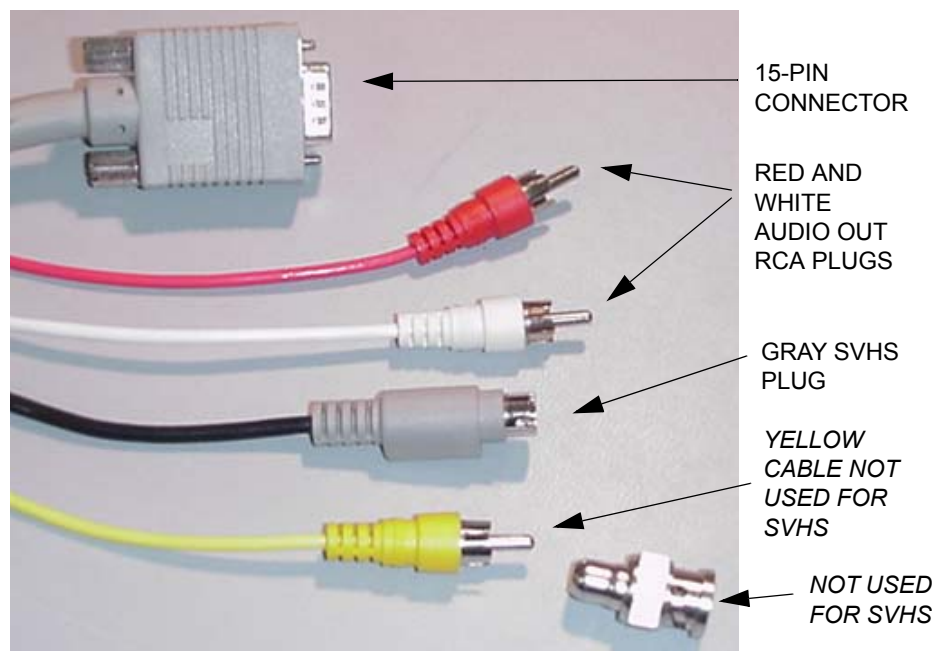


**WARNING** Do not use a peripheral device, such as a monitor, VCR or printer within 1.5 meters of a patient unless the device receives power from an isolation transformer that meets medical safety standards.

**NOTE:** To obtain the best video playback, use an SVHS recorder and SVHS videotapes.

To connect a SVHS VCR to the Cypress system, follow these steps:

1. Make sure both the Cypress system and the VCR are turned OFF.

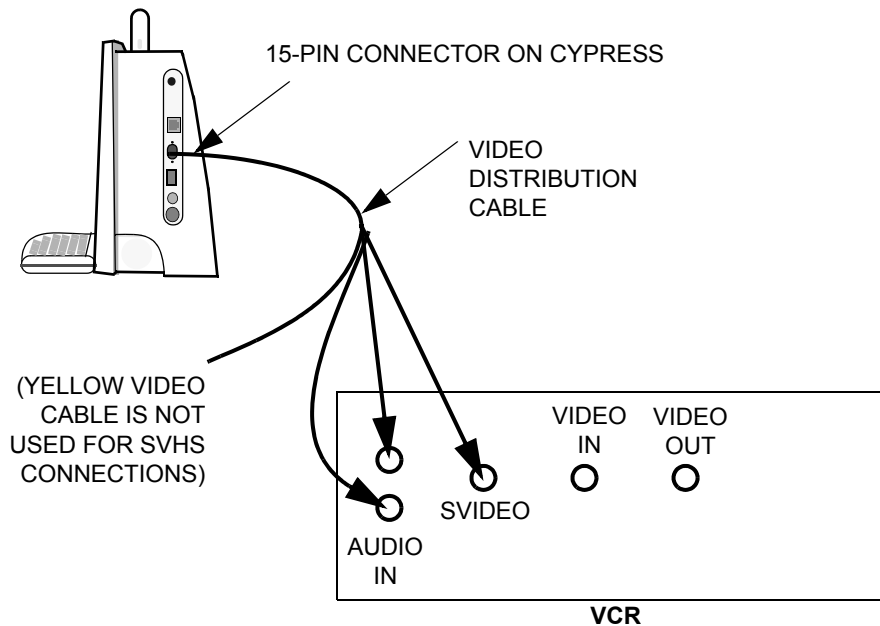


**FIGURE 51. Cypress System SVHS VCR Connectors and Cables**

2. Connect the gray SVHS cable to the SVIDEO INPUT connector on the back of the VCR (see Figure 52).
3. Connect the red and white cables to the two AUDIO IN connectors on the back of the VCR (see Figure 52).

4. Connect the 15-pin connector on the cable to the 15-pin connector on the Cypress system (see Figure 52).
5. Connect the power cord on the VCR and plug it in.
6. Turn on the Cypress system, then the VCR.
7. On the Cypress system, press the **SETUP** function key to display the **Setup** tab.
8. Use the **Video Out Mode** drop-down menu to select NTSC.
9. Press **SETUP** to return to 2D mode or press **2D** to begin imaging.
10. Insert a video tape and press the RECORD button on the VCR to record images.

**NOTE:** When images are recorded on videotape, the playback on the monitor will look slightly different than the display on the Cypress system—parts of the bottom and right sides of the screen will not be shown. Nothing is wrong with your playback. All the imaging data are displayed.



**FIGURE 52. Connecting a VCR**

## Connecting a VCR and Video Printer

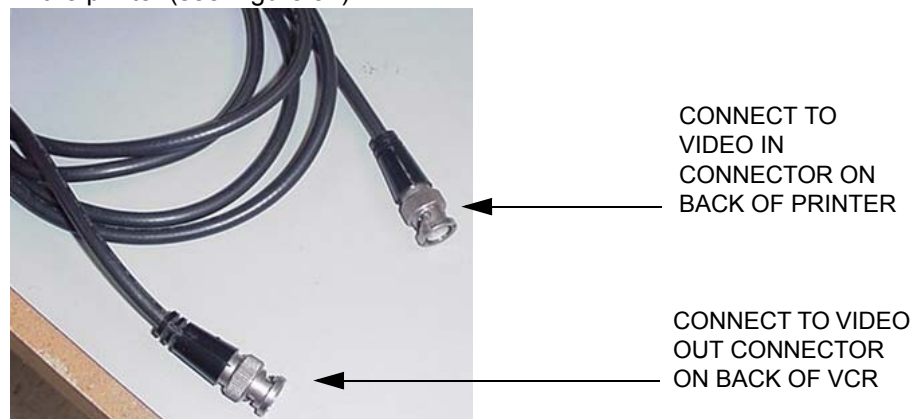


**WARNING** Do not use a peripheral device, such as a monitor, VCR or printer within 1.5 meters of a patient unless the device receives power from an isolation transformer that meets medical safety standards.

**NOTE:** To obtain the best video playback, use an SVHS recorder and SVHS videotapes.

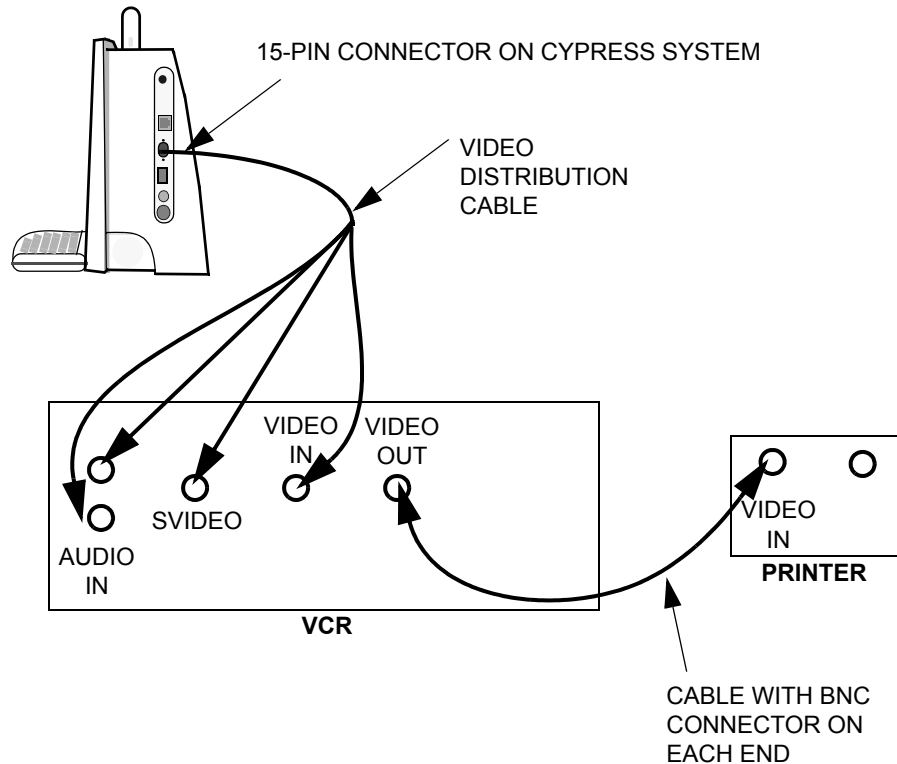
To connect a VCR and Video printer to the Cypress system, follow these steps:

1. Make sure the Cypress system, VCR, and printer are all turned OFF.
2. Attach the RCA-to-BNC adapter to the yellow Video RCA plug on the Video Distribution cable as shown in Figure 49 on page A-3.
3. Connect the RCA-to-BNC adapter end of the cable to the VIDEO IN connector on the back of the VCR (see Figure 54 on page A-8).
4. Connect the red and white cables to the two AUDIO IN connectors on the back of the VCR (see Figure 54).
5. Connect the gray SVHS cable to the SVIDEO input connector on the back of the VCR (see Figure 54).
6. Connect the cable to the 15-pin connector on the Cypress system (see Figure 54).
7. Connect the cable shown in Figure 53. One side connects to the VIDEO OUT connector on the VCR. The other side connects to the VIDEO IN connector on the printer (see Figure 54).



**FIGURE 53. Cable Connection from VCR to Printer**

8. Turn on the Cypress system, then the VCR, and then the printer.
9. On the Cypress system, press the **SETUP** function key to display the **Setup** tab.
10. Use the **Video Out Mode** drop-down menu to select NTSC.
11. Press **SETUP** to return to 2D mode or press **2D** to begin imaging.
12. Insert a video tape and press the RECORD button on the VCR to copy images.
13. Press the PRINT key on the printer to print images from the Cypress system.



**FIGURE 54. Connecting a VCR and Video Printer**

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## Connecting an External Monitor

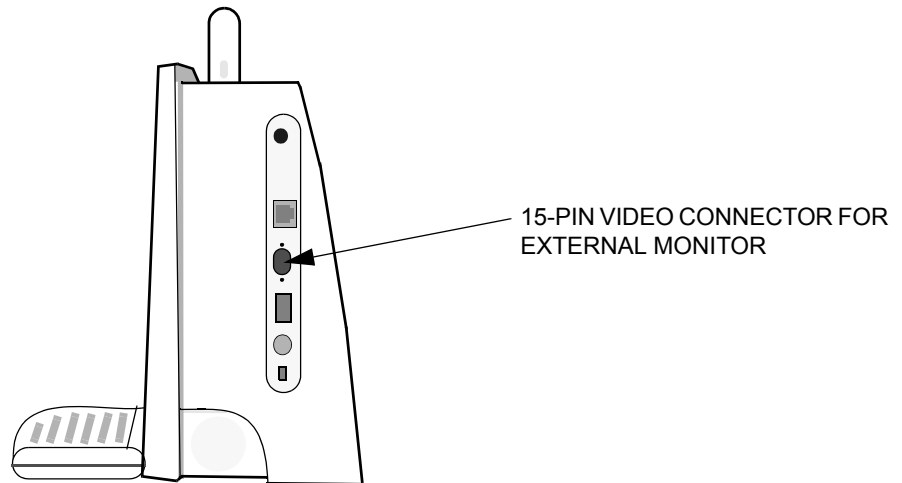


**WARNING** Do not use a peripheral device, such as a monitor, VCR or printer within 1.5 meters of a patient unless the device receives power from an isolation transformer that meets medical safety standards.

The Cypress system can be connected to a VGA-compatible monitor. The 15-pin high-density “D” type connector on the I/O panel connects directly to a VGA monitor through a standard VGA cable.

To connect an external monitor to the Cypress system, follow these steps:

1. Make sure Cypress system and monitor are turned OFF.
2. Connect the monitor cable to the 15-pin connector on the Cypress system (see Figure 55).
3. Connect the power cord on the monitor and plug it in.
4. Turn the Cypress system ON and then turn the monitor ON.
5. On the Cypress system, press the **SETUP** function key to display the Setup tab.
6. Use the **Video Out Mode** drop-down menu to select **VGA**.
7. Press **SETUP** to return to 2D mode or press **2D** to begin imaging.



**FIGURE 55. Connecting an External Monitor**

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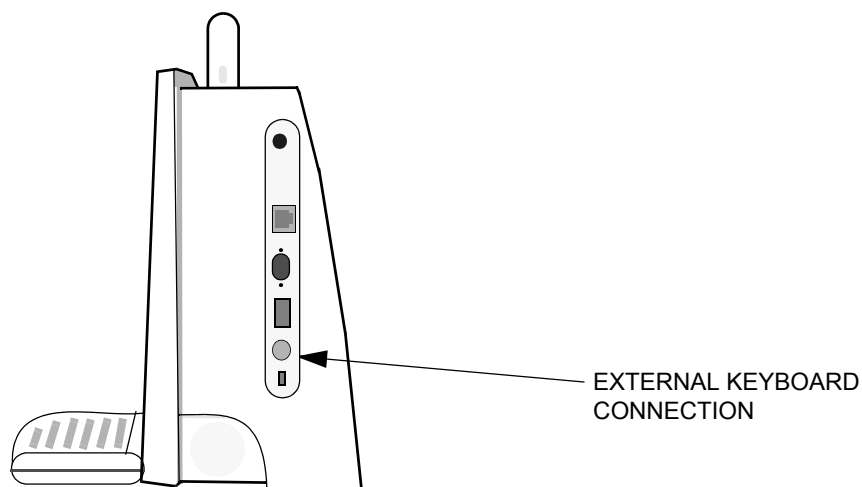
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## Connecting an External Keyboard

The Cypress system can be connected to a PS/2-compatible keyboard.

*To connect an external keyboard to the Cypress system, follow these steps:*

1. Make sure Cypress system is OFF.
2. Connect the keyboard cable to the external keyboard connection on the Cypress system (see Figure 56).
3. Turn the Cypress system ON.



**FIGURE 56. Connecting an External Keyboard**

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# *Printing Reports*

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This appendix describes printing Reports. It includes information about:

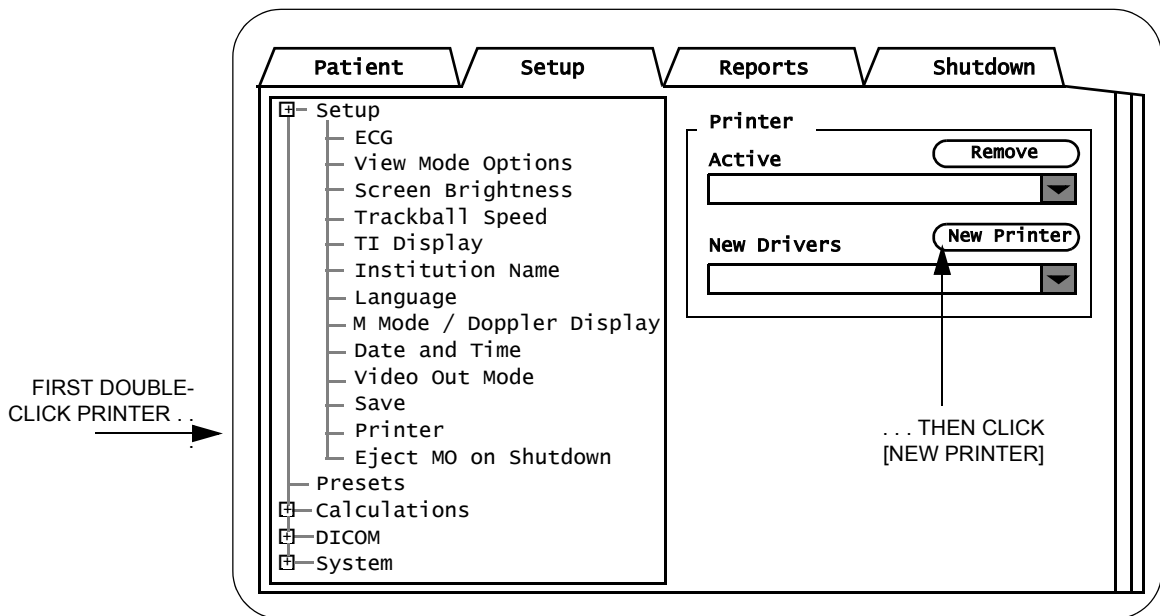
- Connecting an inkjet printer to the Cypress system.
- Selecting studies and printing reports.
- Printing the active study.
- Printing reports using the Calculations package.

## Connecting an Ink-Jet Printer

A list of compatible ink-jet printers is available at [www.acuson.com](http://www.acuson.com).

To connect a compatible ink-jet printer, follow these steps.

1. Locate the MO disk containing the printer drivers and insert it into the MO drive located on the left side of the Cypress system.
2. Press the **SETUP** key.
3. Double-click the **Setup** heading.
4. Click the **Printer** subtitle to display the printer activation screen.



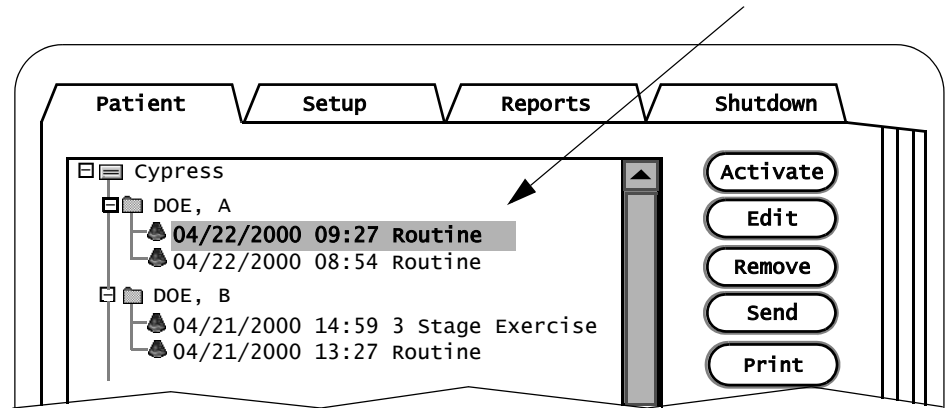
5. Click the [NEW PRINTER] button.
6. Click the **New Drivers** pull-down menu to display the list of compatible printers and select your printer.
7. Click the [INSTALL PRINTER] button.
8. To complete the printer installation, the system must be restarted. Click [OK] to restart the Cypress system.
9. Connect the printer to the Cypress system via the USB port located on the right side of the Cypress system.

## Printing Patient Reports

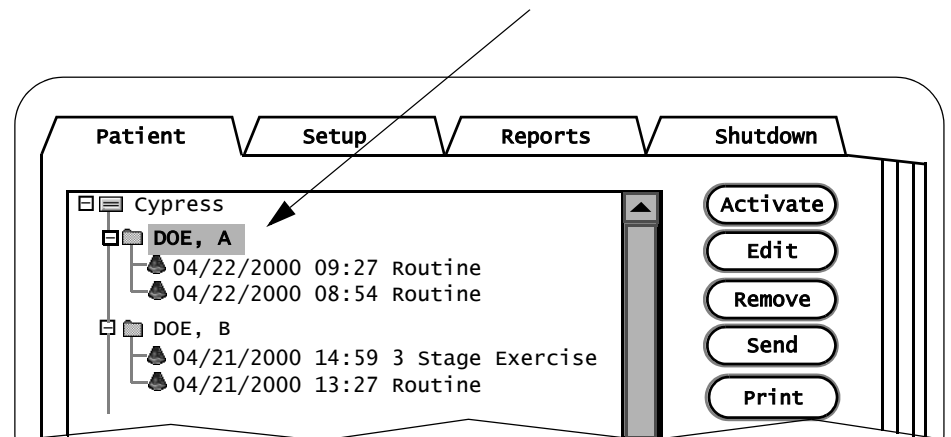
To print patient reports, follow these steps:

1. Press the **PATIENT** key.
2. Highlight the study or studies to be printed.

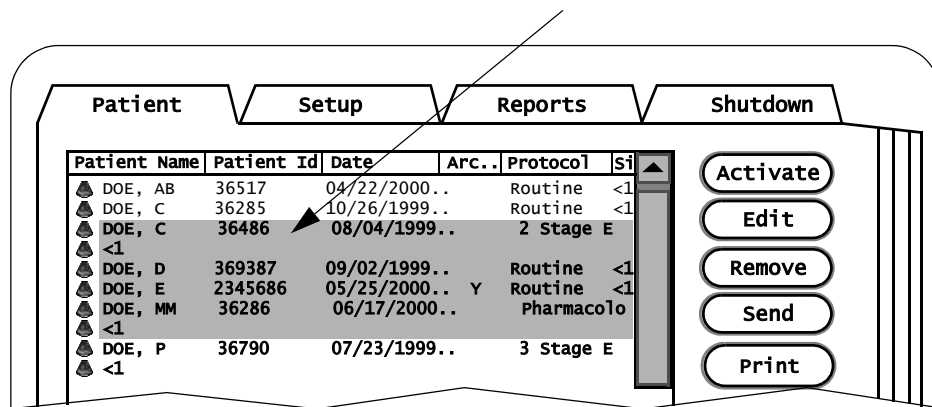
To print a single patient report, highlight the study's Date and Time.



To print the patient's demographic information, highlight a patient name on the **Patient List**.



To print a group of reports, use the <SHIFT> key to highlight a group of studies on the **Study List**.

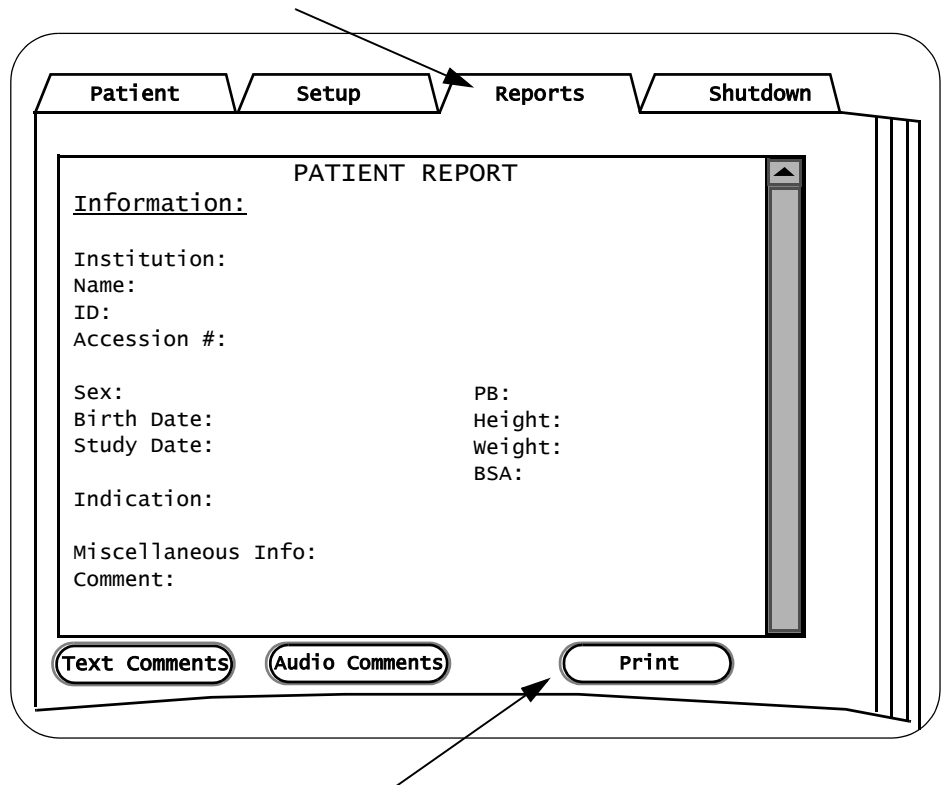


3. Click the [PRINT] button located on the right side of the screen.
4. To exit Reports, press **2D**.

## Printing the Active Study

To print the patient report of the active study, follow these steps:

1. Press either the **PATIENT** or **SETUP** key.
2. Click the **Reports** tab.

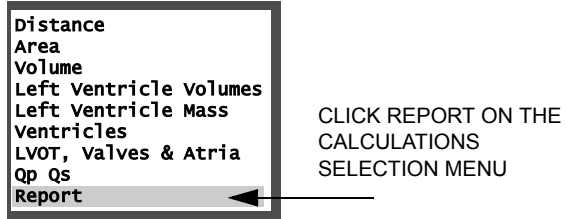


3. Click the [PRINT] button located at the bottom of the display screen.
4. To exit Reports, press **2D**.

## Printing Reports from Calculations

An alternate method of printing the patient report of the active study uses the Calculations function. Follow these steps:

1. Press the **CALC** key while in any of the imaging modes.
2. When the Calculations Selection menu opens, click **Report**.



3. Click the [PRINT] button located at the bottom of the display screen.
4. To exit the patient report, click [CLOSE] or press any mode key except Color.

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# Index

## Numerics

24 Hour Clock 3-7  
2D  
    Cardiac Formulas 6-15  
    Gain 5-22, 5-31  
    Left Ventricle 1 Calculation 6-9  
    Scanning 5-21  
    Tools 5-27  
    Vascular Formulas 7-14  
2D Mode  
    Key 2-3  
2D Sector Depth  
    Displayed with System Data 5-11  
2D Steer 2-9, 5-23

## A

Abdominal Studies 10-8  
Acceleration  
    Vascular Doppler Formula 7-16  
Accuracy 10-20  
    Derived Calculations 10-27  
    Primary Measurements 10-26  
Acoustic Exposure  
    Reducing 10-10  
Acoustic Output 10-9  
Acoustic Output, controlling  
    see Transmit Power  
Activate a Patient Study 4-6  
Active Mode  
    Main Knob Functions 2-6  
    Soft Window Functions 2-7  
Adding  
    Loops 4-18  
    New Patients 4-9  
    New Studies 4-6  
    Patients 4-6  
    Text to an Image 5-15  
Advanced Triggering 5-25  
ALARA 10-10  
Aliasing  
    Reducing, see Scale  
Allow Receiving Studies Checkbox 3-20  
Alphanumeric Keys 2-12  
ALT Key 2-12  
Always Send Lossless Checkbox 3-19

Angle 5-12  
    Increase Sector Angle 5-28  
    PW 5-45  
    Reduce Sector Angle 5-28  
Angle Correction 3-7, 5-12, 5-45  
Aortic Valve Area by the Continuity Equation  
    using TVI  
    Cardiac Doppler Formula 6-22  
Aortic Valve Area by the Continuity Equation  
    using Vmax  
    Cardiac Doppler Formula 6-21  
AP2 8-7  
AP4 8-7  
Apex Invert 5-24, 5-29  
Apical 2 Chamber (AP2) 8-8  
Apical 4 Chamber (AP4) 8-8  
Area  
    Correcting Cardiac Measurements 6-13  
    Correcting Vascular Measurements 7-11  
Artifacts  
    ECG 8-6  
    Reducing 8-6  
Audio Comments in Patient Reports 4-23  
Audio Control Box 4-24  
Averaging 3-17

## B

Baseline  
    CW 5-40  
    PW 5-46  
Batch Restore 9-25  
Beam Steering 5-23  
Beat 5-13, 5-25  
Body Surface Area  
    Cardiac 2D Formula 6-16  
    Cardiac M-Mode Formula 6-19  
Bone TI Setting 3-6  
Boot-up Sequence 1-3  
BSA  
    Cardiac 2D Formula 6-16  
    Cardiac M-Mode Formula 6-19

## C

C Steer 2-9, 5-32  
Calculation References 6-24, 7-16

- Calculations
  - Construction Methods 6-4
  - Deleting 6-12, 7-11
  - Estimated Value 6-4
  - Function Key 2-10
  - Report Format 6-5
  - Setup Menu 3-16
- Capacity Alert Threshold 3-14
- Cardiac Formulas 6-15
- Cardiac Index
  - 2D Formula 6-15
  - Cardiac Doppler Formula 6-21
- Cardiac Index Cubed
  - Cardiac M-Mode Formula 6-19
- Cardiac Index Teichholz
  - Cardiac M-Mode Formula 6-19
- Cardiac Measurements
  - by Mode 6-2
  - Deleting 6-13
  - General 6-2, 6-7
  - Patient Reports 6-2
  - Point-to-Point 6-13
  - References 6-24
  - Saving 6-13
  - Setup 6-4
  - Specific 6-2, 6-9
- Cardiac Output
  - Cardiac 2D Formula 6-15
  - Cardiac Doppler Formula 6-21
- Cardiac Output Cubed
  - Cardiac M-Mode Formula 6-19
- Cardiac Output Teichholz
  - Cardiac M-Mode Formula 6-19
- Cardiac Studies 10-4
- Carpal Tunnel Syndrome 10-17
- Change an Image's Orientation
  - see Apex Invert
  - see Left-Right Invert
- Changing the Display Format 4-19
- Classifications 10-20
- Cleaning 11-2
  - External Surfaces 11-2
  - MO Disk Drive 11-3
  - Screen 11-2
  - Vents 11-2
- Click 2-5
- Clinically-Referenced Calculations 10-28
- Color Bar 5-30
- Color Display
  - Improving Definition 5-33
- Color Flow
  - Combining 2D and Color Flow 5-36
  - Reducing, see Priority
  - Scanning 5-30
  - Tools 5-35
- Color Flow Mode
  - Key 2-3
- Color Gain 5-31
- Color Height Adjustment 5-33
- Color Invert Adjustment 5-33
- Color Maps 5-36
- Color Mode
  - Key 2-3
- Color Persistence 5-36
- Color Scale
  - Displayed with System Data 5-11
- Color Smoothing 5-36
- Color Steering 5-32
- Color Width Adjustment 5-33
- Colorize 5-36
  - 2D 5-28
  - CW 5-42
  - M-Mode 5-54
  - PW 5-49
- Compacting Studies
  - Compact Study Button 4-8
  - How to 4-8
- Compress
  - 2D Mode 5-22
  - M-Mode 5-51
- Compression 5-10, 9-19
  - JPEG 9-19
- Compression Curves, see Post Processing
- Connecting an Ink-Jet Printer B-2
- Construction Methods 3-16
  - Continuous 6-4
  - Point to point 6-4
- Continuous Measurement Method 6-4
- Continuous Wave (CW) Doppler Mode
  - Key 2-3
- Continuous Wave Scanning 5-38
- Contrast Resolution
  - see Colorize
- Cranial Bone TI Setting 3-6
- Cursor Setup 3-7
- Cursor Type 3-17
- CW
  - Scanning 5-38
  - Tools 5-41
- CW Mode
  - Key 2-3



- Cypress DICOM Information 3-18
- Cypress Format 9-3
- CypressLink 3-20
- D**
- Date
  - Setting 3-14
- Date and Time
  - Display Option 3-7
  - Setup 3-4
- Delete Key 2-12, 6-13, 7-11
- Deleting
  - Measurements 6-12, 7-11
  - Patients 4-20
  - Studies 4-20
- Depth
  - 2D Mode 5-23
  - Color Flow 5-31
  - Displayed with System Data 5-11
- DICOM
  - Calculation Report Color 3-19
  - Compression 9-19
  - Format 9-2, 9-3
  - Information Fields 9-7
  - Menu Fields 9-6
  - Modality Worklist 9-11, 9-12
  - Removing Patient Name and ID 9-20
  - Server Information 3-18
  - Setup Menu 3-18
  - Stress Image Size 3-18
  - Tabular Format 9-18
- DICOM Format 9-4
- Disks
  - Formatting 9-23
  - Inserting 1-6
  - MO 1-6, 9-23
  - Removing 1-6
- Display Format 4-19
- Display Language 3-6
- Display Monitor Radiation 10-2
- Doppler
  - Cardiac Formulas 6-20
  - Vascular Formulas 7-15
- Doppler Scanning 5-38, 5-43
- Doppler Steering 5-45
- Double-Click Speed 3-5
- Duplex 2D Update Display Option 3-7
- Dynamic Range 5-10
- Dynamic Range, see Spectral Compression

- E**
- ECG
  - Artifacts 8-6
  - Cable 8-2
  - Cables and Connectors 8-3
  - Connecting 8-2
  - Display 3-4
  - Signal Quality 8-6
- ECG Display 3-4
- ECG-gated scanning techniques 5-25
- Editing
  - Patient Information 4-15
  - Patient Studies 4-6
- Eject MO on Shutdown Option 3-9
- Ejection Fraction
  - Cardiac 2D Formula 6-15
- Ejection Fraction Cubed
  - Cardiac M-Mode Formula 6-18
- Ejection Fraction Teichholz
  - Cardiac M-Mode Formula 6-18
- Electrical Power Requirements 10-20
- Electrical Safety 10-17
- Electrical Warnings 10-11
- Electro Static Discharge 11-6
- Electromagnetic Interference
  - Compatibility 10-22
  - Controlling 10-22
  - Electrosurgical Units 10-22
- Enable Password Modification Checkbox 3-15
- End/Start Soft Window 8-19
- Enlarge a Scanned Image 5-20
- Enter Key 2-2, 2-5
- Environmental Conditions 10-20
- Errors During Scanning 10-28
- Estimates (Calculations) 3-16
- Ethernet Address 3-14, 3-15
- Exam Type 3-17
- Exercise 2-Stage
  - Impost 8-7
  - Protocol 8-7
  - Rest 8-7
- Exercise 3-Stage
  - Peak 8-7
  - Post 8-7
  - Protocol 8-7
  - Rest 8-7
- Explosion Hazards 10-17

- Exporting
  - Cypress Format to MO Disk 9-3
  - DICOM Format to DICOM Server 9-3, 9-4
  - DICOM Format to MO Disk 9-2
  - Images 9-2
  - Multimedia Format via Network 9-5
- External
  - Connections 1-7
  - Devices 1-7
- Extract Calc Frames Checkbox 3-9
- F**
  - Fans 1-11, 11-6
  - Far-Field Settings 2-5
  - Fetal Studies 10-7
  - Filter 5-11
    - CW 5-40
    - PW 5-46
  - Fine Power 5-24
  - Flagging Images 5-7
  - Flow Area
    - Cardiac 2D Formula 6-16
  - Flow Area from Diameter
    - Cardiac Doppler Formula 6-22
  - Format
    - Multimedia 9-5
  - Format of Studies
    - MO Cypress 4-8
    - MO DICOM 4-8
  - Formatting Disks 9-23
  - Formulas
    - 2D (Cardiac) 6-15
    - 2D (Vascular) 7-14
    - Cardiac 6-15
    - Doppler (Cardiac) 6-20
    - Doppler (Vascular) 7-15
    - M-Mode (Cardiac) 6-18
    - Vascular 7-14
  - Fractional Area Change
    - Cardiac 2D Formula 6-16
  - Fractional Shortening
    - Cardiac 2D Formula 6-16
    - Cardiac M-Mode Formula 6-18
  - Fractional Thickening, Interventricular Septum
    - Cardiac 2D Formula 6-17
    - Cardiac M-Mode Formula 6-18
  - Fractional Thickening, Left Ventricular Posterior Wall
    - Cardiac 2D Formula 6-17
    - Cardiac M-Mode Formula 6-18
  - Frame Rate 5-28
    - Color Flow 5-33
    - Displayed with System Data 5-11
  - Frames 5-13, 5-25
  - Frames Per Second 5-11
    - Displayed with System Data 5-11
  - Freeze
    - Key 2-2, 2-4
  - Freeze Key
    - Stress Exam 8-9
  - Freeze Mode
    - Main Knob Functions 2-6
    - Soft Window Functions 2-7
  - Frequency 5-11, 5-24
    - M-Mode 5-52
  - Full Screen 4-19
  - Fullscreen Display Option 3-7
  - Function Keys 2-2, 2-10
  - Fuse
    - Rating 11-8
    - Replacement 11-8
- G**
  - Gain 5-11
    - Color 5-31
    - CW 5-39
    - Displayed with System Data 5-11
    - Increasing, Lateral Gain 5-28
    - M-Mode 5-51
    - PW 5-44
  - General 7-2
  - General Cardiac Measurements
    - Overview 6-2
  - General Vascular Measurements
    - Overview 7-2
  - Glutaraldehyde Exposure 10-18
- H**
  - Hard Drive Maintenance 11-5
  - Harmonic 5-11
    - 2D Mode 5-23
    - Displayed with System Data 5-11
    - Imaging 5-24
  - Heart Rate, Entering 6-11
  - Hide System Clock 3-4
  - High Pass Filter 5-11
    - Displayed with System Data 5-11
  - HWL (Volume)
    - Vascular 2D Formula 7-14

## I

### Icons

- Cypress Hard Drive 4-4
- MO Cypress Format 4-4
- MO DICOM Format 4-4
- MO Disk 4-4
- Patient 4-4
- Immediate Post (Impost) 8-8
- Immunity 10-23
- Impost 8-7
- Infection Control 10-11, 10-18
- Infection Control References 10-13
- Institution
  - Name Setting 3-6
- Institution Name 3-4
- Intermittent Imaging Mode 5-25, 5-26
- Internal Carotid/ Common Carotid Ratio (IC/CC)
  - Vascular Doppler Formula 7-15
- Intraoperative Cardiac Studies 10-4
- Invert 5-11

## J

### JPEG

- Compression 9-19
- Lossless 9-19
- Lossy 9-19
- Quality 9-19

## K

### Keyboard

- (External) Connector 1-7
  - Connecting External A-10
  - Overview Drawing 2-2
- Keypad 2-2, 2-12

## L

- Labeling Icons on Cypress System 10-23

### Labels

- Changing 8-19, 8-20
- Loops 8-21
- Turning Off 8-21
- Viewing 8-20
- Language, displayed on screen 3-6
- Lateral Gain
  - 2D 5-28
- LAX 8-7
- Left-Right Invert
  - 2D Mode 5-28
  - Color Flow 5-36
- Lock Studies Option 3-8

- Long Axis Parasternal (LAX) 8-8

### Loops 5-14

- Adding to a Study 4-18
- Deleting 8-19, 8-20
- Labeling 8-21
- Length Bar 8-23
- Repeats 3-4
- Saving 8-21
- Viewing in Quad Display 8-19
- Viewing Saved Loops 5-6
- Low Storage Warning 11-5
- LV Mass
  - Cardiac 2D Formula 6-16
  - Cardiac M-Mode Formula 6-19
- LV Mass Index
  - Cardiac 2D Formula 6-16
  - Cardiac M-Mode Formula 6-19
- LV Volume, Biplane
  - Cardiac 2D Formula 6-15
- LV Volume, Single Plane
  - Cardiac 2D Formula 6-15

## M

- Magneto Optical (MO) Disk 1-6
- Magnifying an image 5-23
- Main Knob 2-2, 2-5
  - Functions in Each Scan Mode 2-6
  - Viewing Loops 5-6
- Maintenance 11-4
  - Fans 11-6
  - Frequency 11-6
  - Hard Drive 11-5
  - MO Disk Drive 11-5
  - Preventive 11-4
  - Probes 11-4
  - TEE Transducers 11-6
  - Trackball 11-9
  - Transducers 11-4, 11-6
- Mean Pressure Gradient
  - Cardiac Doppler Formula 6-20
- Mean Velocity
  - Cardiac Doppler Formula 6-20
- Measurement
  - Saving Frames 6-12, 7-10
- Measurement Accuracy 10-25
  - By Transducer Type 10-25
  - Derived Calculations 10-27
  - Primary Measurements 10-26
  - References 10-30
- Measurement Index Table 6-8, 7-8
- Mechanical Index 5-10, 5-24

- Menu Position 3-17
- Method of Disks
  - Biplane Formula 6-15
  - Single Plane Formula 6-15
- Microphone Jack Connector 1-7
- Mid-Field Settings 2-5
- Mitral Valve Area by the Continuity Equation using LVOT
  - Cardiac Doppler Formula 6-22
- Mitral Valve Area by the Continuity Equation using Pulmonary Artery
  - Cardiac Doppler Formula 6-22
- Mitral Valve Measurements 6-22
- M-Mode
  - Formulas 6-18
  - Key 2-3
  - Scanning 5-50
  - Tools 5-53
- M-Mode Display, Doppler Display 3-7
- MO Disk
  - Reading Studies 9-24
  - Troubleshooting 9-26
- MO Disk Drive 9-22
  - Cleaning 11-3
  - Maintenance 11-5
  - Write-Protect Tab 9-23
- Modality Worklist
  - Downloading Demographics 3-18
  - Server Information 3-18
  - Setup 9-11, 9-12
- Mode Keys 2-2, 2-3
- Monitor, Connecting External A-9
- Moving Cypress 1-8
- Multimedia Connection Setup 3-20
- Multimedia Format 9-5
  - Removing Patient Name and ID 9-20

## N

- Near-Field Settings 2-5
- Neonatal Cephalic Studies 10-5
- Network Connector 1-7
- Network DICOM
  - Troubleshooting 9-21
- Network Identification Setup Menu 3-20
- Network Speed 9-10
- New Study 4-15
- Next Loop Soft Window 8-19

## O

- Operator Safety 10-17
- Overview drawing 1-2

## P

- Passwords 3-14, 3-15
- Patient
  - Contact Materials 10-13
  - Folders 4-8
  - Function Key 2-10, 4-2
  - Menu 4-2
- Patient Directory
  - Formats 4-3
  - Icons 4-4
  - Resizing 4-3
  - Sorting 4-3
- Patient Menu
  - Buttons 4-6
- Patient Report 6-8, 7-8
  - Adding Audio Comments 4-23
  - Adding Text Comments 4-23
  - How to View 4-22
  - Printing B-3
  - Saving Cardiac Calculations 6-10
  - Saving Vascular Calculations 7-10
  - Viewing Cardiac 6-13
  - Viewing Vascular 7-12
- Patient Safety 10-9
- Patient Studies
  - Viewing 4-19
- Patients
  - Adding 4-6
  - Editing 4-6, 4-15
  - Removing from the System 4-20
- Peak Systolic/End Diastolic
  - Vascular Doppler Formula 7-16
- Pediatric Studies 10-5
- Percent Stenosis Area
  - Vascular 2D Formula 7-14
- Percent Stenosis Diameter
  - Vascular 2D Formula 7-14
- Peripheral Device Connections 10-15
- Peripheral Vascular Studies 10-6
- Pharmacological 4-Stage
  - Base 8-7, 8-8
  - Low 8-7, 8-8
  - Peak 8-7, 8-8
  - Post 8-7, 8-8
- Pharmacological 4-Stage Protocol 8-7
- Physical Specifications 10-21
- Play All 3-4
- Point-to-Point Measurement Method
  - Cardiac 6-4
  - Vascular 7-4

- Point-to-Point Trace
    - Cardiac 6-13
    - Vascular 7-12
  - Post Processing 5-10
    - 2D 5-28
    - M-Mode 5-54
  - Power
    - Cord 1-3
    - OFF 1-4
    - ON 1-3
    - Switch 1-3
  - Prescription Device Statement 10-2
  - Preset
    - Editing 3-13
    - New Patient Screen 3-12
    - Recalling a Saved 3-11
    - Reload with New Patient 3-13
    - Reloading with New Patient 3-13
    - Removing 3-12
    - Renaming 3-12
    - Storing 3-11
  - Presets Menu 3-10
  - Pressure Gradient
    - Cardiac Doppler Formula 6-20
  - Pressure Half Time (PHT)
    - Cardiac Doppler Formula 6-21
  - Preventive Maintenance 11-4
  - Printer, designating the current printer 3-8
  - Printing
    - Active Study B-5
    - Patient Reports B-3
    - Reports from Calculations B-6
  - Priority
    - Color Flow 5-36
  - Probes
    - Connecting 1-5
    - Maintenance 11-4
  - Process
    - 2D Mode 5-23
  - Protocol 5-23
    - Stress Exam 8-9
  - Protocol Data Unit 9-7
  - PS/2-Compatible Keyboard A-10
  - Pulsatility Index (PI)
    - Vascular Doppler Formula 7-15
  - Pulsed Wave
    - Doppler Mode
      - Key 2-4
    - Scanning 5-43
  - PW
    - Scanning 5-43
    - Tools 5-48
  - PW Mode Key 2-4
  - PW Steer 2-9, 5-45
- Q**
- Q Save
    - Key 2-4
    - Stress Exam 8-9
  - QSAVE Cycle Limit Option 3-8
  - Quad Review 3-4
  - Quad Screen 4-19
    - Display 8-23
    - Display by stage 8-19
    - Side-by-side comparison 8-19
    - View loops 8-19
  - Quick Save Key 2-4
  - Quick Text 3-9, 5-18
- R**
- RA Pressure 3-16
  - Range Gate 2-8, 2-9, 5-47
  - Ratio
    - Vascular Doppler Formula 7-15
  - Receive Frequency
    - see Harmonic
  - References
    - Cardiac Calculation 6-24
    - Infection Control 10-13
    - Measurement Accuracy 10-30
    - Vascular Calculation 7-16
  - Region of Interest (ROI) 5-29
  - Remove a Patient Study 4-6
  - Report 3-17
    - Background Color 6-5
    - Cardiac Format 3-17
    - Color 3-17
    - Patient 4-22
    - Printing B-3
    - Vascular Format 3-17
  - Report Format
    - Complete 6-5
    - Configured 6-5
    - Vascular 7-5
  - Report Menu 6-8, 7-8
    - Heart Rate 6-11
  - Resistance Index (RI)
    - Vascular Doppler Formula 7-15
  - Resolution 3-16
  - Right Ventricular Systolic Pressure from

- Tricuspid Regurgitation
  - Cardiac Doppler Formula 6-22
- Right Ventricular Systolic Pressure from
  - Ventricular Septal Defect
    - Cardiac Doppler Formula 6-22
- RLE Lossless 9-19
- ROI
  - 2D 5-29
  - Color Flow 5-36
  - Stress Exam 8-9
- S**
- Safety
  - Important Warnings and Notices 10-2
  - Overview 10-3
  - Patients 10-9
- Save
  - Stress Exam 8-9
- Save All Function Key 2-10
- Save Frames 6-12, 7-10
- Save Options 3-8
- Save Time Limit 3-4, 3-8
- Saved Loops 5-6, 5-14
- SAX 8-7
- Scale
  - Color Flow 5-33
  - CW 5-40, 5-47
- Scanning
  - Basic Steps 5-2
  - Depth 5-23
  - Overview 5-2
- Screen Brightness 3-4, 3-5
- Security
  - Lock Slot 1-10
  - System 1-10
- Select Quad Soft Window 8-19
- Selected Transfer Syntax Only Checkbox 3-19
- Selection Menu 6-7, 6-8, 7-7, 7-8
- Send Options 3-9
- Server Information 9-8
- Setup
  - Function Key 2-10, 3-2
  - Measurements 3-16
- Setup Menu 3-2
  - Fields 3-4
- Shades of gray,
  - see Spectral Compression
- Shift Lock Key 2-12
- Short Axis Parasternal (SAX) 8-8
- Show Depth Checkbox 3-16

- Shunt Difference
  - Cardiac Doppler Formula 6-23
- Shunt Ratio
  - Cardiac Doppler Formula 6-23
- Shutdown 1-4
- Single Frame Images 3-19
- Small Sector Display Option 3-7
- Smoothing an Image
  - see Structural Persistence
- Soft Tissue TI Setting 3-6
- Soft Windows
  - 2D Explanation 5-23
  - Color Flow Explanation 5-31
  - CW Explanation 5-40
  - How to Use 5-3
  - Knobs 2-2, 2-7
  - M-Mode Explanation 5-52
  - PW Explanation 5-45
  - Stress Exam 8-10
- Sonographers 3-6
- Specifications
  - Electrical 10-20
  - Environmental 10-20
  - Physical 10-21
- Spectral Compression
  - CW 5-42
  - PW 5-49
- Spectral Invert 5-46
- Square-Wave Pulse Output 8-6
- Stage Labels 5-23
- Starting a Study 4-15
- Steer
  - 2D 5-23
  - C 5-32
  - PW 5-45
- Sterilization
  - Noncritical Device Applications 10-12
  - Semicritical Device Applications 10-12
- Stress Echo
  - Connectors 8-3
- Stress Exam
  - Controls 8-9
  - Step-by-Step 8-13
- Stress Protocols 8-7
- Stroke Volume
  - Cardiac 2D Formula 6-15
  - Cardiac Doppler Formula 6-21
- Stroke Volume Cubed
  - Cardiac M-Mode Formula 6-18
- Stroke Volume Teichholz
  - Cardiac M-Mode Formula 6-18

- Structural Persistence
  - 2D 5-28
- Studies
  - Adding Data to an Existing Study 4-18
  - New 4-15
  - Removing from the System 4-20
  - Sending 9-17
  - With No Patient Name 4-18
- Study Progress
  - Stress Exam 8-10
- Suspend Labeling 8-21
- SVHS VCR, Connecting A-5
- Sweep
  - CW 5-40
  - M-Mode 5-52
- Sweep Speed
  - CW 5-42
  - M-Mode 5-54
  - PW 5-49
- Switch Display Button 4-3
- System Data
  - Explanation of Fields 5-9
  - Location on Display 5-9
- System Menu 3-14
  - Fields 3-14
- System Tab 3-14
- System Utilities 9-24
- Systolic/ Diastolic (S/D)
  - Vascular Doppler Formula 7-15
- T**
- Tabular Format (Cardiac) 9-18
- Technical Description 10-20
- Temperature Increase
  - Monitoring 5-10
- Temporal 3-9
- Temporal Decimation 3-9
- Text
  - Adding to an Image 5-15
  - Annotation 5-15
  - Hiding the Factory-Defined List 5-17
  - M-Mode 5-54
  - Quick Text 5-15
- TGC Slide-pots 2-2, 2-5
- Thermal Index (TI) 3-6, 5-10
  - Display 3-6
- Time 5-13, 5-25
  - Setting 3-14
- Time Velocity Integral
  - Cardiac Doppler Formula 6-20
  - Time/Gain Compensation 5-22
  - Slide-pots 2-5
- Time-Motion Spectral Display 5-42, 5-49
- Timer 5-29
  - Stress Exam 8-10
- Tools
  - Color Flow 5-35
- Tools Function Key 2-10, 5-4
- Trace
  - Correcting Cardiac Measurements 6-13
  - Correcting Vascular Measurements 7-11
  - Resolution 6-13
- Trackball 2-2, 2-5
  - Maintenance 11-9
  - Speed 3-5
- Transducer
  - Default Protocol 3-15
  - Display Compatible 3-15
  - Maintenance 11-4
  - Range Gate Sizes 5-47
  - Type 5-10
- Transfer Syntax 3-19
- Transferring Studies 9-14
  - DICOM format 8-11
- Transmit Frequency
  - see Harmonic
- Transmit Power 5-10
  - 2D 5-28
  - Color Flow 5-36
  - CW 5-42
  - M-Mode 5-54
  - PW 5-49
- Transporting Cypress 1-8, 10-19
- Tricuspid Valve Measurements 6-22
- Trigger
  - Modes 5-13
  - Time 5-26
- Triggered Modes 5-25
- Troubleshooting
  - LCD Screen 11-7
  - No Power 11-7
  - Transferring Studies 9-21, 9-26
- U**
- Ultrasound Contrast Agents 10-16
- V**
- Valve Area by PHT
  - Cardiac Doppler Formula 6-21
- Vascular Formulas 7-14

- Vascular Measurements 7-9
  - by Mode 7-2
  - Configured reports 7-5
  - Default Sites 7-5
  - Deleting 7-12
  - General 7-2, 7-7
  - Patient Reports 7-2
  - Point-to-Point 7-12
  - References 7-16
  - Saving 7-12
  - Specific 7-2
- Vascular Sites 3-17
- VCR Connector 1-7
- Velocity
  - Decreasing 5-33
  - Increasing 5-33
  - Limits 5-33
- Velocity Setting 5-40, 5-47
- VGA-Compatible Monitor A-9
- Video Out Mode 3-4, 3-8
- Video Printer
  - Connecting A-3
  - Connector 1-7
- View Function Key 2-10
- View Images After Study Activation
  - Checkbox 3-4
- View Key
  - Stress Exam 8-10
- View Labels 5-23
- View Mode Options 3-4
- View/Stage Soft Window 8-19
- Viewing
  - Full Screen Format 4-19
  - Quad Screen Format 4-19
- Viewing Angle 1-9
- Viewing Patient Studies 4-19
- Volume
  - CW 5-39
  - PW 5-44
- Volume Cubed
  - Cardiac M-Mode Formula 6-18
- Volume Flow
  - Vascular 2D Formula 7-14
  - Vascular Doppler Formula 7-15
- Volume Teichholz
  - Cardiac M-Mode Formula 6-18

## **W**

- Worklist 3-18
  - Caching of Results 4-14
  - Register a New Patient 4-12
  - Search Fields Description 4-13
- Write-Protect Tab 9-23

## **Z**

- Zero-Velocity Baseline Marker 5-40, 5-46
- Zoom 5-20, 5-23