Extended User Guide
Type 2202

Pro Focus
Ultrasound System

English
Pro Focus 2202 Extended User Guide(BB1279-Z)
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For Professional Users Only

LEGAL MANUFACTURER

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If you have comments about the user documentation, please write to us at the email address above. We would like to hear from you.

BK Medical Customer Satisfaction

Input from our customers helps us improve our products and services. As part of our customer satisfaction program, we contact a sample of our customers a few months after they receive their orders. If you receive an email message from us asking for your feedback, we hope you will be willing to answer some questions about your experience buying and using our products. Your opinions are important to us. You are of course always welcome to contact us via your BK Medical representative or by contacting us directly.

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Part 1: Basics

Chapter 1
General and Safety Information

This user guide is for all versions of the Pro Focus 2202 Ultrasound System from BK Medical, including the Pro Focus 2202 UltraView.

Intended use

The system is a 2D and 3D ultrasound echo and flow imaging system for diagnosis, data processing and transfer, and guidance of puncture and biopsy.

NOTE: *Some of the functionality and options described in this guide may not be available with your version of the system.*

User Documentation

Before using the system, please make yourself familiar with the information in the accompanying user information documents. Some documents are printed, and you will find the remaining documents on the accompanying *User Documentation CD (BB1984)*. Make sure that you also read the transducer user guide and specifications for each transducer that you use.

Document	Information
System User Guide	Introductory information, safety information, getting started.
Getting Started	User interface, basic operating instructions.
System Extended User Guide	Information about advanced functions, glossary.
Product Data for system	Specifications for the system, including disinfection methods that can be used. Indications for use for each transducer that can be used with the system.
Technical Data (BZ2100)	Acoustic output data, clinical measurements (ranges and accuracies), factory default power levels and data about EMC (electromagnetic compatibility) for all transducers. Pro Package calculation formulas.
Care, Cleaning and Safety	Cleaning, disinfection, sterilization, checking, storing and disposing of BK Medical equipment. Includes environmental limits.
Transducer User Guide	Specific instructions for the transducer and puncture attachments
Product Data for each transducer	Specifications for the transducer, including disinfection methods that can be used.

Table 1-1. User information documentation that accompanies the equipment.

Improper use

Failure to follow safety instructions or use for purposes other than those described in the user guides constitutes improper use.

About this User Guide

The chapters in this user guide are divided into Parts.

- *Part 1 – Basics* contains information you need to know before you start imaging.
- *Part 2 – Working with the Image* describes the user interface and how to work with it. It also contains general information about adjusting and working with the scanned image as well as how to make basic measurements.
- *Part 3 – Imaging Modes* contains chapters dealing with information specific to each of the imaging modes.
- *Part 4 – Setting Up and Maintaining Your System* tells you how to care for your system and how to set up and customize your system if you do not want to use the predefined setups.
- *Part 5 – Pro Packages* contains chapters for the various clinical application areas and 3D.
- *Part 6 – Appendixes* – The appendixes include a glossary of terms and a chapter containing technical information (including important information about electrical safety and about dismantling the system for transportation). Finally, there is an appendix that refers to the specifications for the system.

Safety Information

This user guide contains cautions, warnings and other information about what you must do to ensure the safe and proper performance of the ultrasound system. You must also follow local government rules and guidelines at all times.

Important safety information is indicated in the user guide by means of special formatting.

⚠ **WARNING** Warnings contain information that is important for avoiding personal injury.

⚠ **Caution:** Cautions contain information and instructions that must be followed to avoid damaging equipment, data or software.

NOTE: *Notes contain information that you should be aware of.*

Typographical Conventions

The following typographical conventions are used in this manual:

FREEZE – a function, something you can do by using the keyboard panel or the graphical user interface on the monitor

Freq. – text that can be selected or clicked on the monitor

[**Power**]– a key on the keyboard panel

Book Titles – names of books and scientific journals

[1] References. Literature references are found at the end of the chapter.

Terminology

Many of the terms and abbreviations used in this user guide are defined in the Glossary starting on page 311.

Instructions

You control the system by using the graphical user interface on the monitor, pressing keys on the control panel, or typing on the keyboard. Instructions in this user guide tell you what sort of action to take.

When the instructions say	It means
Click **Power**	Use the trackball to point at the word "Power" on the monitor, and then press [ ] (**Select**) on the control panel.
Press **[Power]**	Press the **Power** key on the control panel.
Press **[Sound]**	Press the **Sound** key on the control panel.
Type `Power`	Type the word "Power" on the keyboard.

Table 1-2. Click, Press and Type.

About the System

The system can be used for continuous operation, but imaging duration for individual patients must not exceed 60 minutes. We recommend, however, that you turn off the system at the end of each workday.

The Pro Focus 2202 Ultrasound System is easy to use. You can perform most system operations using just the trackball and the trackball keys to interact with controls on the monitor. Dedicated keys on the control panel make other operations quick and easy.

Imaging Modes

The Pro Focus lets you use various imaging modes:

- B-mode (brightness mode) for real-time imaging of soft tissues: includes harmonic imaging and IQPAC™ with Enhanced Tissue Definition (ETD) and Angular Compound Imaging (ACI)
- Color mode (CFM, color flow mapping, color Doppler mode) for information about flow direction and velocity
- Power mode (power Doppler mode) for higher sensitivity to flow information: includes directional Power Doppler
- Doppler mode (spectral Doppler mode) for information about the spectrum of flow velocities as a function of time
- CW Doppler mode (continuous wave Doppler) for information about high-velocity flow
- M-mode for information about tissue motion as a function of time

NOTE: *Not all imaging modes may be available with your version of the system.*

Pro Packages

Pro Packages contain default presets and calculation formulas that make it quick and convenient to use the system for specific applications.

Safety Symbols on the System

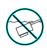
Important safety information is indicated in the user guide and on the system itself by means of special symbols and formatting.

Table 1-3 contains brief explanations of the symbols used to label the system. (Some labels in the table may appear on the transducer rather than the system itself.)

NOTE *especially the following:*

⚠ When you encounter this sign on the system, consult the user guide for important safety information.

BK Medical disclaims all responsibility for the operating safety, reliability and performance of the equipment if these symbols and warnings are disregarded in any way.

Symbol	Name	Description
	Caution or Warning	Consult accompanying user guide (BB1279) when you encounter this sign on the instrument, to avoid reducing its safety.
	Consult instructions for use	Consult user guide or other instructions.
	Manufacturer	Legal manufacturer.
CLASSIFIED c UL us 3D56	UL Classification for Canada and US	UL approval of medical equipment with respect to electrical shock, fire and mechanical hazards.
	Potential Equalization	Terminal connected to the chassis. Should be connected to corresponding terminals on other equipment to eliminate potential differences.
	Ground (earth)	Additional protective ground (earth).
	Type BF	BF: Isolated from ground. Maximum patient leakage current under • Normal condition ≤100 µA • Single-fault condition ≤500 µA
	Type BF	BF, defibrillator-proof
	Type B	B: Maximum patient leakage current under • Normal condition ≤100µA • Single-fault condition ≤500µA
IP	Sealing	Dust- and immersion-protected according to EN 60529 [1].
	Standby	Standby switch on front of system – used to turn system on and off.
	Non-ionizing radiation	Ultrasound system emits acoustic radiation.
STERILE	STERILE	Device is in a sterile condition.
	Not watertight	Plug may not be immersed (unless it is covered with a special watertight plug cover).
	ESD (electrostatic discharge)	Do not touch pins in connectors with this symbol unless you follow ESD precautionary procedures.
	WEEE waste	Within the EU, when you discard the equipment, you must send it to appropriate facilities for recovery and recycling.

Symbol	Name	Description
	China ROHS 25 Years Lifetime	Environmentally Friendly Use Period for ROHS is 25 years.
	Specified Radio Equipment	(On remote control UA1237.) This equipment conforms to Japanese Radio Law regulations concerning frequency and power.

Table 1-3. Symbols on the system.

CE Marks on Electrical Devices

The European Union has introduced directives requiring CE marks on devices.

Non-medical devices marked with CE comply with relevant directives, for example EEC Council Directive 89/336/EEC of 3 May 1989 concerning Electromagnetic Compatibility.

BK Medical devices marked with CE or CE 0543 comply with EEC Council Directive 93/42/EEC of 14 June 1993 concerning Medical Devices. CE applies to Class I medical devices. CE 0543 applies to Classes Im, IIa, IIb and III. BK Medical defines classes assuming imaging duration for individual patients does not exceed 60 minutes.

General Safety Precautions

The ultrasound system is designed and tested in accordance with EN/IEC 60601-1 [2] and EN 60601–2–37 [3]. It complies with requirements for Class 1 (protective earth) devices of EN/IEC 60601-1 [2]. It also complies with UL 60601-1 [4] and CSA C22.2 No. 601.1–M90 [5]. It fulfills the requirements for dust protection (IP20) for ordinary equipment specified in EN 60529 [1].

⚠ **Caution:** Federal law in North America restricts this device to sale to, or on the order of, a physician.

⚠ Equipment failure

WARNING If at any time the system malfunctions, or the image is severely distorted or degraded, or you suspect in any way that the system is not functioning correctly:

- Remove all transducers from contact with the patient.
- Turn off the system. Unplug the system from the wall and make sure it cannot be used until it has been checked.
- Do not try to repair the system yourself.
- Contact your BK Medical representative or hospital technician.

⚠ Isolating the system

WARNING The power supply cord connects the system to the line voltage. To isolate the system, you must unplug the power supply cord from the wall outlet. Do this before you try to make any repairs to the system.

Conden-
sation

Caution: Large variations in temperature or humidity may cause water to condense inside the system. If this happens, the system may fail to operate properly. Always let the system come to room temperature before you plug it in.

- Wait at least 2 hours after the system has been subjected to major changes in temperature or humidity.
- If there is visible evidence of condensation, wait at least 8 hours.

Before you use the system, make sure that all the safety requirements described in this chapter have been satisfied.

Explosion Hazards

Explosion hazards

WARNING The ultrasound system is not designed to be used in potentially explosive environments. It should not be operated in the presence of flammable liquids or gases, or in oxygen-enriched atmospheres.

There is a possible explosion hazard if the system is used in the presence of flammable anesthetic. The system should be placed at least 25 cm (10 inches) from the patient.

The ultrasound system contains a lithium battery. Never remove or replace this battery. The lithium battery must not be removed except by a BK Medical service representative.

Electrical Safety

Do not use a power strip

WARNING Do not plug the system into an ordinary power strip. If the ground connection fails, this is dangerous because

- the total leakage current for all the connected equipment can exceed the limits specified in EN/IEC 60601-1 [2].
- the impedance of the ground connection will probably also exceed the limits specified in EN/IEC 60601-1.

Leakage current

WARNING When the equipment is used with 230V (and you believe the leakage current would be within the UL limit if you were using 120V), power to the equipment must come from an installation or supply unit with a center-tapped, 240V single-phase circuit. This will make sure that chassis leakage current during single fault condition fulfills the requirements specified in UL 60601-1 [4] (limit of 300 µA). If power is not supplied in the way specified, the leakage current can be as high as 500 µA, the limit specified in EN/IEC 60601-1 [2].

Electrical shock

WARNING Never remove the cover to get access to the inside of the scanner. You risk electrical shock if you do so. Do not allow anyone but qualified service personnel to service the scanner.

ESD Training

The ESD Symbol

Anyone using the equipment must be able to recognize the ESD symbol and understand how to take the necessary precautionary procedures, as described in the caution below.

ESD

Caution: Do not touch pins in connectors that have the ESD symbol . Do not connect anything to them unless you follow these ESD (electrostatic discharge) precautionary procedures:

- Discharge your body to ground before you touch the pins with your hand or a tool. For example, touch an unpainted metal part of the system cover.
- You can use a wrist strap connected to the additional protective ground or potential equalization terminal on the scanner if that is more convenient.

Interference

The Pro Focus 2202 Ultrasound System is suitable for use in all establishments, other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.

Electrical Noise

Electrical noise

WARNING Electrical noise from nearby devices such as electrosurgical devices – or from devices that can transmit electrical noise to the AC line – may cause disturbances in ultrasound images. This could increase the risk during diagnostic or interventional procedures.

Electromagnetic Interference

Medical electrical equipment requires special precautions regarding EMC (electromagnetic compatibility) [6]. You must follow the instructions in this chapter when you install the system and put it into service.

If the image is distorted, it may be necessary to position the system further from sources of electromagnetic interference or to install magnetic shielding.

Other equipment nearby

WARNING Do not use this equipment adjacent to other equipment. If you must place it next to or stacked with other equipment, verify that it operates normally there and neither causes nor is affected by electromagnetic interference.

EMC noise can reduce the usable image depth. Therefore, in order to avoid having to repeat an ultrasound examination, you must make sure beforehand that the ultrasound system can be used for the examination. Repeating an examination can be regarded as a potential risk that should be avoided, especially if the examination involves transducers used intracorporeally or transducers used for puncture.

RF (Radio Frequency) Interference

Portable and mobile RF (radio frequency) communication equipment can affect the system, but the system will remain safe and meet essential performance requirements.

An ultrasound system intentionally receives RF electromagnetic energy for the purpose of its operation. The transducers are very sensitive to frequencies within their signal frequency range (0.3 MHz to 50 MHz). Therefore RF equipment operating in this frequency range can affect the ultrasound image. However, if disturbances occur, they will appear as white lines in the ultrasound picture and cannot be confused with physiological signals.

⚠ **Caution:** Other equipment may interfere with the system, even if that other equipment complies with CISPR (International Special Committee on Radio Interference) emission requirements.

⚠ **Caution:** If you use accessories, transducers or cables with the system, other than those specified, increased emission or decreased immunity of the system may result.

Installation

⚠ Installation safety requirements

WARNING To ensure safe performance, a qualified electrical engineer or hospital safety personnel must verify that the ultrasound system is correctly installed and that it complies with the safety requirements described below:

- Use only the original power supply cord. This must be fitted with a hospital-approved three-prong grounded power plug. See “Power Supply Cord” on page 342.
- Use only the original monitor power cord to connect the monitor to the system.
- The equipment must only be connected to a grounded AC power supply (or wall outlet) that meets EN/IEC/NEC requirements or applicable local regulations. The examination room’s grounding system should be checked regularly by a qualified electronics engineer or hospital safety personnel.
- Never use extension cords. The increased length of the cord will increase the resistance of the protective ground conductor beyond an acceptable level.
- Keep power cords, sockets and plugs clean and dry at all times.

Original power cords

If the original power cords are missing or damaged, you must order new ones from your local BK Medical representative.

⚠ Secure the power supply cord

WARNING Make sure that the power supply cord cannot be accidentally disconnected from the wall or the system.

Transducers

⚠ Electrical shock

WARNING The transducer sockets contain terminals with 5 V. Do not touch the patient while you are touching an uncovered socket.

Type B transducers

WARNING When using Type B (non-isolated) transducers, carefully check all electrical equipment within the patient area. Also, consider using additional protective grounding.

Electrical burns

WARNING Do not leave transducers in contact with the patient when using HF electrosurgical equipment.

BK Medical transducers fulfill EMC requirements when they are outside as well as inside the patient's body.

Surface temperature on array

WARNING Do not turn the transducer on and allow it to scan into mid-air without ultrasound gel applied to the surface of the array. Doing so may cause the surface temperature on the array to heat up to 27 °C above room temperature (measured according to EN60601–2–37 [3]). To avoid this, freeze the image when the transducer is not used for imaging.

Creutzfeldt-Jakob disease

WARNING C-J-1

Do not use a transducer for neurosurgical applications if the patient is suspected of having Creutzfeldt-Jakob disease. If a neurosurgical transducer has been used on a patient suspected of or diagnosed as being Creutzfeldt-Jakob positive, the transducer must be destroyed, following approved procedures for your hospital.

Care

Please refer to the *Care, Cleaning & Safety* manual for information about caring for transducers.

Remote Control

If you use a wireless remote control UA1237 with the system, be sure to read about how to use it in Chapter 4, "The User Interface".

The remote control uses short wave radio waves to communicate with the system.

Active at a distance

WARNING The remote control is active at a distance of at least 10 meters from the system, even if the system is in a different room.

Caution: The remote control can be disrupted by other equipment operating at the same frequency of 2.5 GHz.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1 This device may not cause harmful interference, and

2 This device must accept any interference received, including interference that may cause undesired operation.

Other Safety Considerations

Mechanical failure or unintended use of ultrasound equipment can result in physical injury to patients or operators.

⚠ Mechanical injury

WARNING Be careful to avoid the following potential sources of injury:

- Parts of the body can be pinched by moveable parts of the system, such as the keyboard panel and the monitor.
- Tilting the system can cause it to be unstable and injure someone.
- Do not lean or sit on the keyboard or any other part of the system. The keyboard panel or monitor can break if subjected to heavy weights or impact.

Measurements

⚠ Nuchal translucency

Caution: You must be adequately trained before you attempt to make nuchal translucency measurements.

Service and Repair

⚠ Authorized personnel

WARNING Service and repair of BK Medical electromedical equipment must be carried out only by the manufacturer or its authorized representatives. BK Medical reserves the right to disclaim all responsibility, including but not limited to responsibility for the operating safety, reliability and performance of equipment serviced or repaired by other parties. After service or repairs have been carried out, a qualified electrical engineer or hospital technician should verify the safety of all equipment.

Connecting Other Equipment

⚠

WARNING Consult this user guide before connecting other equipment to terminals marked with ⚠ .

To fulfill EMC requirements, do not attach cables to the system unless they are the same type as listed in Table C-2 on page 340 and do not exceed the maximum length given in the table. Do not attach transducers and other accessories unless the user guide for the transducer or accessory states that it can be used with this system. Attaching other equipment may cause an increase in electromagnetic emissions or may cause the system to be more sensitive to electromagnetic interference.

The system must not be galvanically connected to a computer network (DICOM) that has not been isolated. If the network is not isolated, the system must be connected via a network isolator DP0925 (see Accessories in Product Data sheet).

Medical equipment

WARNING Equipment that complies with the requirements of EN/IEC 60601–1 [2], UL 60601-1 [4] or CSA C22.2 No. 601.1–M90 [5] can be connected to the system, but the power for the equipment must come from the auxiliary power output on the system or from an independent wall power outlet. You can use the isolated auxiliary power outlets on the system to connect equipment such as a monitor or video printer requiring a total of 350VA or less. Otherwise, you can plug the system and other equipment into an external common isolation transformer in order to control the leakage current during a ground connection fault. Follow the guidelines in EN60601–1–1 [7]. If in doubt, contact your local BK Medical representative.

Non-medical equipment: location, standards and power supply

WARNING If you connect non-medical equipment (instruments that do not comply with safety requirements for medical equipment), this equipment must be placed outside the patient environment (1.5 m from the bed, for example). The equipment must fulfill the relevant EN standard or other applicable national or international standard.

The power for the equipment must come from the auxiliary power output on the system. You can use the isolated auxiliary power outlets on the system to connect equipment such as a monitor or video printer requiring a total of 350VA or less. Otherwise, you can plug the system and other equipment into an external common isolation transformer in order to control the leakage current during a ground connection fault. Follow the guidelines in EN60601–1–1 [7]. If in doubt, contact your local BK Medical representative.

Network Connection

BK Medical’s range of ultrasound systems comply with the DICOM standard for handling, storing, printing and transmitting information in medical imaging. DICOM includes a file format definition and a network communication protocol which facilitates the exchange of data between electronic medical systems.

For detailed information about:

- network requirements
- network configuration
- workflow between devices
- technical specifications
- safety specifications

see BK Medical’s DICOM conformance statement at http://www.bkmed.com/DICOM_en.htm

Network Security

It is the responsibility of the on-site personnel or technician to maintain the IT-network and identify, analyze, evaluate and control new risks caused by a change in the network configuration.

If the applicable network connection does not meet the required characteristics of the IT-network, the following hazardous situations may occur:

- Corrupt patient data due to network errors, see patient ID warning on page 47.
- System is unable to use the network due to faulty or overloaded network, see training requirements warning on page 32.
- System overloads the network causing other equipment to fail.

Network guidelines

NOTE: *If your system interacts with other equipment directly or indirectly you must ensure that your network is properly dimensioned and that critical equipment is placed on a separate network. Otherwise you could risk overloading the network and your equipment failing.*

Network Printing

For printing on network printers, BK Medical support protocols PCL 5, PCL 6 and PS (Post Script).

Computer Security

When the Pro Focus is connected to a hospital network, BK Medical does not take any responsibility for computer viruses from the network that may infect the Pro Focus. We recommend that the system is protected by a network firewall.

⚠ Check external media

Caution: You must perform a virus check on any external storage medium (USB device or CD) to make sure that it is virus-free before you connect it to the system.

Wireless Networks[1]

The system can be connected to a wireless network for printing and archiving data. This requires the optional wireless license for the system, and a Wi-Fi adapter that is supplied by BK Medical when you buy this option. The Wi-Fi adapter is inserted into one of the USB connectors located on the rear of the system (see Fig C-2 in Chapter , “Technical Guide” on page 337).

⚠ **Caution:** Do not use a USB extension cable to connect a Wi-Fi adapter to the system. If you do, the wireless network may become unstable due to electromagnetic interference.

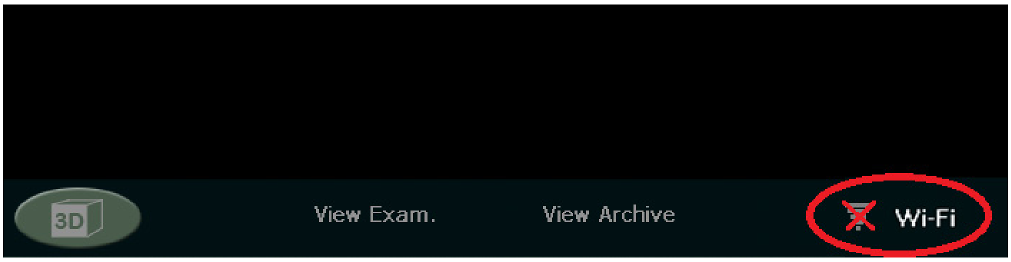
For information on how to install a license on the system, see the Setting Up and Customizing Your System chapter in the Pro Focus 2202 Advanced User Guide (BB1946).

Connecting to a Wireless Network

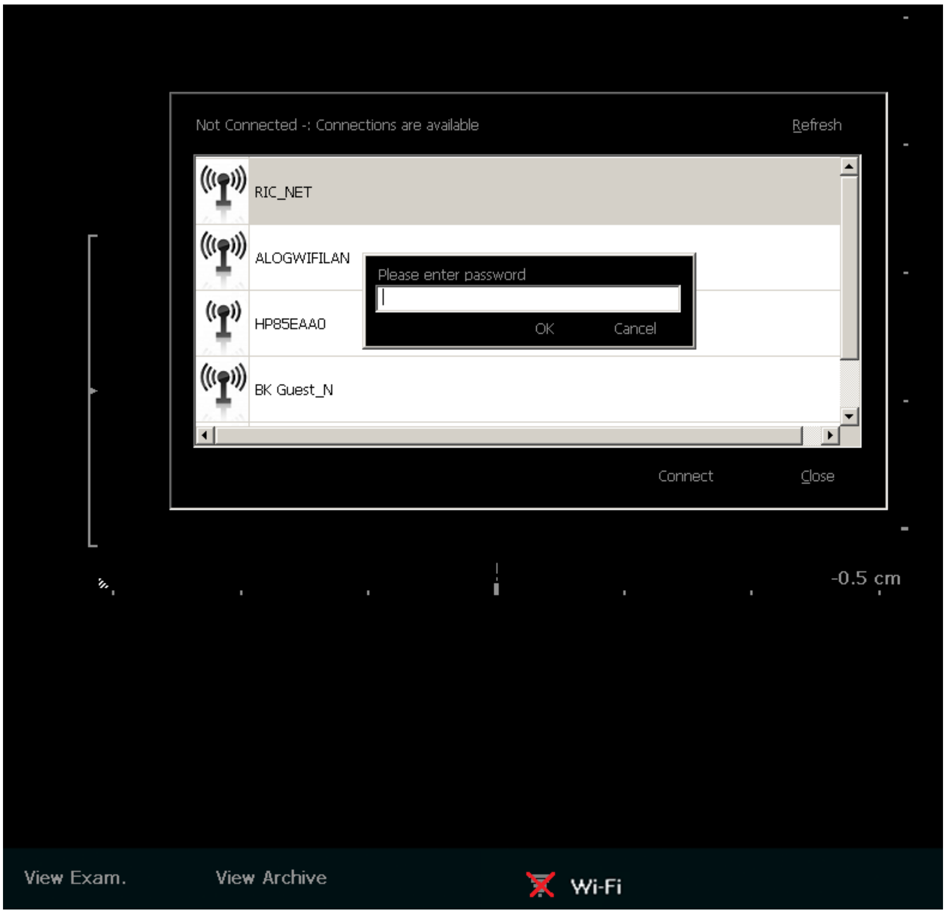
You must establish a secure wireless network at your hospital, clinic or institution, including a password for the network, before you can use the system’s Wi-Fi for printing and archiving.

1. Wi-Fi on Pro Focus 2202 UltraView systems has not been licensed by Health Canada.

To use Wi-Fi on the system you need to install a license. When you have installed the license, a Wi-Fi logo is visible in the lower middle part of the screen of the main screen.



To connect to a wireless network, click the Wi-Fi logo, choose the appropriate network, and type in the password.



You only have to type in a password the first time you connect to a specific network. When you turn on the system an attempt is made to reconnect to the network that the system was connected to before it was turned off.

Weak vs. strong signal

The bars in the Wi-Fi logo represents the signal strength. The more lit bars in the logo, the stronger the signal.

No wireless connection

When the system is not connected to a wireless network, the Wi-Fi logo has a red ‘x’ over it.

An advanced Wi-Fi setting option is available on the system using Windows configurations. Always follow the security procedures that have been established for your hospital, clinic or institution, as well as national guidelines. Contact your BK Medical service representative for more information.

Additional Characteristics	
Frequency band	2.412~2.4835 GHz
Data throughput	Max. 150 Mbps
Latency	Depends on network setup
Integrity	Full integrity of archiving operations
Security characteristics	Support for WEP, WPA and WPA2 encryption. Enterprise encryption (802.1x) requires assistance from an authorized BK Medical technician.
Spectrum management	None required

When you transmit data over a wireless network, some special considerations apply. In particular, the network connections must be set up correctly. See training requirements warning on page 32.

NOTE: *The system only supports one network at a time.*

If the system loses connection with the network while transmitting (for example, because it is moved out of range of the network during a transmission), the pending data is stored temporarily and re-transmitted when the connection is re-established.

For information on saving and printing using the DICOM protocol, see the Documentation chapter in Pro Focus 2202 Extended User Guide (BB1279).

⚠ **Caution:** The network must be set up correctly so that data is sent to the correct location. Otherwise data can be lost or accessed by unauthorized people.

⚠ **Caution:** A safe encrypted protocol for data transmission, approved by the hospital, must be used. This is to prevent unauthorized people from getting access to the data.

Acoustic Output

General

Medical research has yet to prove whether or not ultrasound causes biological effects. Therefore, prudent use considerations require you to follow certain guidelines [3].

Prudent Use

⚠ Exposure level

WARNING *Always keep the exposure level (the acoustic output level and the exposure time) as low as possible.*

- Image patients only when clinical reasons make it necessary.
- Keep exposure time as short as possible.
- Be careful to prepare the patient correctly so that you get the best possible image.
- Start imaging at a low acoustic output level (see "Thermal and Mechanical Indices" on page 33) and increase the level only as much as necessary to obtain a satisfactory image.
- If you switch from an application requiring high acoustic output levels (see "Functions Affecting Acoustic Output" on page 34), to one that requires lower levels (fetal imaging, for example), be sure to reset the levels before you image. (For example, start in B-mode.)
- Take into account all the types of tissue that may be affected. For example, when imaging a breast, it may be appropriate to monitor the TI in bone rather than in soft tissue because the ribs will be subjected to ultrasound.

⚠ Training require-ments

WARNING Before you attempt to use BK Medical equipment, you should be trained in ultrasonography or be under the supervision of someone who is trained in ultrasonography. You should also be thoroughly familiar with the safe operation of your ultrasound system: read all the user documentation that accompanies it. Always use the transducer best suited to the examination.

In addition, if your system interacts with other equipment directly or indirectly, you need to be trained in making sure the interactions are both safe and secure.

No further training is required, but BK Medical offers training in how to use the system. Consult your BK Medical representative for information.

Acoustic output data for transducers used with the system are given in Technical Data (BZ2100). The uncertainty level for each parameter is also listed. For definitions of the parameters, refer to the Food and Drug Administration (FDA) Guide [8] as well as EN 60601-2-37 [3] and AIUM/NEMA standards [9,10].

In North America, the FDA requires all ultrasound equipment to be cleared before it is marketed in the United States.

The routes (or tracks) available for clearance by the FDA are well-defined. Track 3 is for diagnostic ultrasound systems that follow the Output Display Standard. Under Track 3, acoustic output will not be evaluated on an application-specific basis, but the maximum derated Spatial Peak–Temporal Average Intensity (I_{SPTA}) must be $\leq 720\,mW/cm^2$, the maximum Mechanical Index (MI) must be ≤ 1.9, and the maximum Thermal Index (TI) must be ≤ 6. All BK Medical transducers for use with the Pro Focus 2202 Ultrasound System are Track 3.

Monitor Display

The Mechanical Index (MI) and Thermal Index (TI) can be viewed in all imaging modes.

Thermal and Mechanical Indices

The MI and TI indices are intended to allow users to implement the ALARA [11, 12] (As Low As Reasonably Achievable) principle using an indicator related to a potential bioeffect.

The full details of the indices are given in references [3] and [10], but the formulas are given below.

MI Formula

$$MI = \frac{P_{r0,3}(z_{sp})}{\sqrt{f_c}}$$

where the variables are defined in the table below.

Variable	Definition
$P_{r0.3}(z_{sp})$	Peak Rarefactional Pressure (MPa), derated by 0.3 dB/cm·MHz, measured at z_{sp}, the point on the beam axis where pulse intensity integral ($PII_{0.3}$) is maximum
f_c	measured center frequency (in MHz)

TI Formula

$$TI = \frac{W_0}{W_{deg}}$$

where the variables are defined in the table below.

Variable	Definition
W_0	time-averaged acoustic power of the source or other power parameter (W)
W_{deg}	estimated power necessary to raise the temperature of the target tissue one degree Celsius (W/°C)

Blood perfusion and TI

As a rule of thumb, the Thermal Index (TI) indicates the highest expected temperature increase in degrees Celsius. It is based on an average level of blood perfusion. The displayed TI may underestimate the temperature rise in poorly perfused tissues; you must take this into account when deciding on the maximum TI you will allow. Conversely, in areas with a rich perfusion of blood the temperature increase will be less than the displayed TI indicates.

Fever

A temperature increase of one degree Celsius increase in a patient with fever may cause complications in certain circumstances; it may be safer to delay the investigation.

Acoustic Output Measurement

All values are measured in water according to the EN and AIUM/NEMA display standards [3, 9, 10]. For the some of the acoustic parameters, an estimated in situ derated value is given. This is derived assuming a tissue attenuation of 0.3 dB/cm·MHz when the estimated in situ derated value (I) is described by the following equation:

I formula

$$I = I_w \exp(-0{,}069 fz)$$

where the variables are defined in the table below.

Variable	Definition
I_W	Intensity in water at the position where I is maximum
f	transducer frequency (in MHz)
z	distance (in cm) from the transducer face to the position where I is maximum

It should be stressed that the in situ values given are only applicable when there is attenuating tissue between the transducer face and the focal point.

Possibility of Adverse Effects

Although it is believed that diagnostic ultrasound causes no significant biological effects in mammalian tissue [3, 10], the user should be aware of the hypothetical possibilities of adverse effects [11, 13, 14].

Fetal imaging

Current scientific and clinical concern over possible adverse effects is particularly focused on fetal ultrasound imaging. It is due to the increased sensitivity of mammalian cells and organs at this phase of their development and the fact that such a risk could have profound implications on public health. If you use high acoustic output levels for some reason (see “Functions Affecting Acoustic Output”, below), be sure to return to B-mode alone and turn down the power level before you do any fetal imaging.

Functions Affecting Acoustic Output

The system has a control function that ensures that neither the I_{SPTA} nor MI nor TI value exceeds the maximum allowable value. When necessary, the system will reduce the output voltage and/or PRF (pulse repetition frequency) to the transducer in order to comply with requirements.

Some of the system functions can affect the acoustic output, as listed here. (Instructions for using these functions are given in the relevant sections of this user guide.)

- Sizing functions such as ROI (region of interest) – in general, smaller size results in higher acoustic intensity because the pulse repetition frequency (PRF) is higher or the ultrasound beam is more strongly focused.
- Focus – in general, strongly focusing the beam makes the acoustic intensity higher.
- Frame rate – higher frame rate results in higher acoustic intensity.
- Range – increasing the Doppler range increases the acoustic intensity by increasing the PRF.
- CFM Resolution – higher resolution increases the acoustic output.
- Color box size – narrowing the color box generally increases the acoustic output within it.

The user can set a Thermal Index limit. This will provide an upper limit for acoustic output.

Default Acoustic Output

After the system has been turned off, the transducers will start in the default setup when the system is turned on again. The default setup may be factory-defined or defined by the user.

The factory-defined default setup values of acoustic output for each transducer are listed in Technical Data (BZ2100).

These setups have been optimized to give the best compromise between low acoustic output and enough power to obtain the image features as quickly as possible. This is part of the ALARA principle. The factory default setup for all transducers is B-Mode to ensure the lowest acoustic output when you start imaging.

To change the default setup to another that satisfies the ALARA principle, see Chapter 14, “Setting Up and Customizing Your System”.

When you enter a new patient ID, the transducer setup will be reset to the default setup. You can prevent this from happening – see “Keeping Image Settings” on page 51.

Fetal imaging

When you use transducers intended for fetal imaging, it is important to make sure that the default settings are appropriate and to reset to the default setting before imaging a new patient.

Clinical Measurements: Ranges and Accuracies

This section states the accuracies for measurements made using the BK Medical range of ultrasound systems. A table containing accuracies for specific transducers can be found in Technical Data (BZ2100).

The measurement accuracies are based on the assumption of “ideal” tissue, that is, a tissue characterized by a sound velocity of 1540 m/s. When making clinical measurements with ultrasound, errors may arise which are not taken into account in this section. For example:

- the sound velocity may vary from approximately 1450 m/s in fatty tissue to 1585 m/s in muscle. This can, in simple cases, give rise to errors of up to 6% for linear measurements. This inaccuracy may be further increased by refraction occurring at tissue boundaries.
- the user can introduce errors when using approximate formulas, when positioning the system’s calipers with respect to the ultrasound image and when outlining structures in the image.
- the ellipsoid volume approximation, described in this user guide, is only applicable when the cross section of the structure being studied approximates an ellipse (the circle being a special ellipse), and when the structure is roughly symmetrical about the selected axis of rotation

NOTE: *The choice of the axis of rotation is important for the calculation of the volume. A vertical axis gives a different volume than a horizontal axis. See “Ellipse Measuring Tool” on page 99.*

The minimum requirement is that the cross section outlined by the user should be convex. If the user draws a non-convex outline, an inaccuracy is introduced which is not taken into account in this section. In this case, the system calculates and displays the convex hull of the figure, that is, the smallest convex figure containing the non-convex figure outlined by the user (see Fig 1-1). The system bases the calculation of the ellipsoid volume on the convex hull.

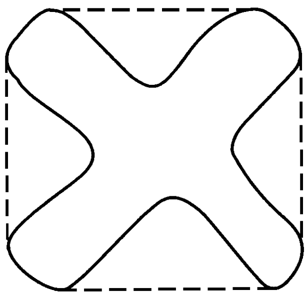


Figure 1-1. The dotted line indicates the convex hull of the non-convex figure.

Measuring volume using a stepping method produces an approximation caused by the finite number of steps in the measurement. The user must always try to assess how large an inaccuracy is introduced by the selected step size, that is, the distance between organ cross sections.

Geometric Measurements

2D Measurements

The geometric measurements performed by BK Medical ultrasound systems are distance, perimeter, area and ellipsoid volume. The accuracy of these measurements is influenced by the following factors:

- transducer geometry
- rounding of results
- resolution of digital image memory

3D Measurements

The 3D volume is found by summing the marked area in the individual slices and multiplying by a factor that includes the distance between the slices and their relative orientation.

To obtain the accuracies listed in the table in Technical Data (BZ2100), you must ensure that the calculation is based on contributions from at least 10 slices for very regular shapes and more for irregular shapes. It must also be possible to discriminate the boundary of the object from the surrounding tissue.

Volume accuracy

The volume accuracy in the table is given as a percentage of the captured 3D volume starting with the first slice and ending with the last slice that intersects the object of interest.

If the 2D ROI (region of interest) is set to be much larger than the object, the accuracy as a percentage of the object volume can be much worse (higher percent).

NOTE: *To ensure that the accuracy of your volume measurement is as high as possible, make sure that the object you are interested in fills the region of interest as much as possible.*

Distance and area accuracy

The accuracy of a distance measurement on a 3D image will never be better than 6%; the accuracy of an area measurement on a 3D image will never be better than 6%.

In the table in Technical Data (BZ2100), the overall measurement accuracy for a full range measurement is given in the right-hand column for each measurement. The footnote below the table states the digital image resolution.

Time Measurements

In M-mode and spectral Doppler mode, data is displayed along a time axis. It is possible to measure time differences. The accuracy for a time difference measurement is:

- rounded to the nearest: 0.01 s
- accuracy: 0.01 x *t*
  where *t* is the full time scale of the image field.

Doppler Measurements

In measuring blood flow velocity it is assumed that the measured power spectral distribution of the Doppler signal equals the blood cell velocity distribution.

The measurement accuracy of blood flow velocity is heavily dependent on the angle θ between the ultrasound beam and the velocity vector of the blood cells. The velocity accuracies given in Technical Data (BZ2100) are valid for $\theta = 55°$. To find the percentage accuracy for other angles, multiply the stated accuracy by

$$\left(\frac{\cos\theta - \cos(\theta + 1{,}8°)}{\cos\theta}\right) \times 100 + 0{,}5$$

If the blood velocity exceeds the selected velocity range, aliasing occurs, corresponding to an overload condition of the measurement system.

References

[1] EN 60529:1991+A1:2000. *Specification for degrees of protection provided by enclosures (IP code).*

[2] EN/IEC 60601-1:1990+A1:1993+A2:1995+A13:1996 *Medical electrical equipment. Part 1: General requirements for safety.*
EN/IEC 60601-1:2006 3rd Ed. *Medical electrical equipment. Part 1: General requirements for basic safety and essential performance*.

[3] EN 60601-2-37:2001+A1:2005+*A2:2005 Medical electrical equipment – Part 2-37: Particular requirements for the safety of ultrasonic medical diagnostic and monitoring equipment.*
EN 60601-2-37:2008 *Medical electrical equipment – Part 2-37: Particular requirements for the basic safety and essential performance of ultrasonic medical diagnostic and monitoring equipment.*

[4] UL 60601-1:2003 *Medical Electrical Equipment – Part 1. General Requirements for Safety.*

[5] CSA C22.2 No. 601.1–M90 *Medical Electrical Equipment – Part 1. General Requirements for safety.*

[6] EN 60601-1-2:2001 + A1:2006 *Medical electrical equipment - Part 1-2: General requirements for safety. Collateral standard: Electromagnetic Compatibility-Requirements and tests.*
EN 60601-1-2:2007 *Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance. Collateral standard: Electromagnetic Compatibility-Requirements and tests.*

[7] EN 60601–1–1:2001 *Medical electrical equipment –Part 1-1: General requirements for safety. Collateral standard: Safety requirements for medical electrical systems.*

[8] *Information for Manufacturers Seeking Marketing Clearance of Diagnostic Ultrasound Systems and Transducers.* FDA Center for Devices and Radiological Health. September 2008.

[9] *Acoustic Output Measurement Standard for Diagnostic Ultrasound Equipment.* AIUM/NEMA. 2004.

[10] *Standard for Real-Time Display of Thermal and Mechanical Acoustic Output Indices on Diagnostic Ultrasound Equipment.* AIUM/NEMA. 2004.

[11] *Medical Ultrasound Safety.* AIUM. 2009.

[12] *ALARA Training Program.* Ultrasound III Training. B-K Medical. 1993.

[13] Bioeffects considerations for the safety of diagnostic ultrasound. *Journal of Ultrasound in Medicine*, Vol. 7, No. 9 (supplement). September 1988.

[14] *The safety of diagnostic ultrasound.* The British Institute of Radiology. 1987.

AIUM: American Institute of Ultrasound in Medicine

CSA: Canadian Standards Association

EN: European Standards

FDA: Food and Drug Administration (USA)

IEC: International Electrotechnical Commission

NEC: National Electrical Code

NEMA: National Electrical Manufacturers Association

UL: Underwriters Laboratories Inc., USA

Part 2: Working with the Image

Chapter 2
Getting Started

General Information

The system and the monitor menus shown in this user guide may look different from yours.

Before you turn on the system, make sure that the installation has been approved by a qualified electrical engineer or hospital safety personnel. See “Installation” on page 25.

The controls you need to operate the system are located on the front.

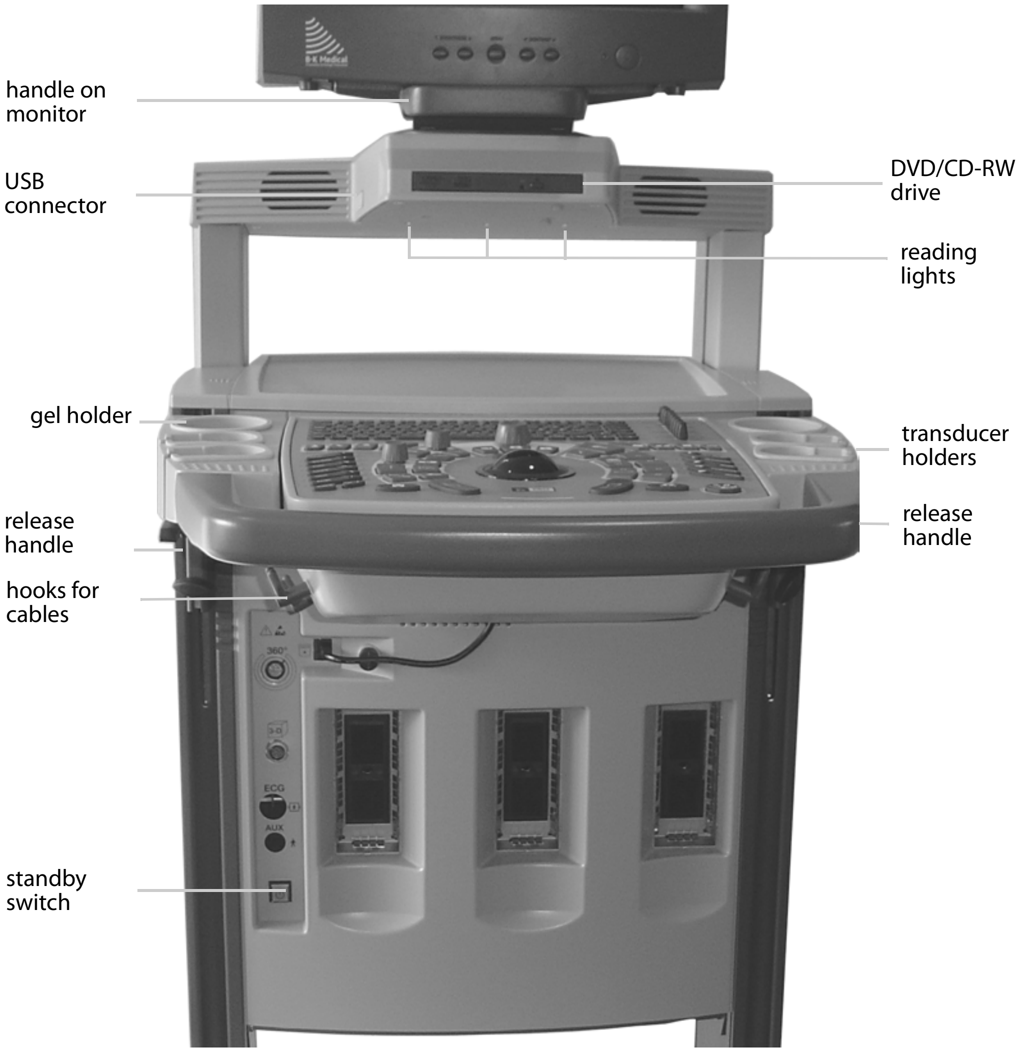


Figure 2-1. The front of the system.

Adjusting the Keyboard Panel and Monitor

You can easily adjust the position of the keyboard panel and monitor to make imaging comfortable for the operator. Instructions vary depending on the type of monitor and keyboard you have.

Up and down

To adjust the height of the keyboard panel and monitor:

1. Grab the panel on both sides and pull up on the two release handles (see Fig 2-1).Move the panel up or down.
2. Release the handles.

Angle

To change the viewing angle of the monitor:

- Use the handle on the front of the monitor to swivel it from side to side and tilt the monitor up or down.

Adjusting resistance of the flat screen

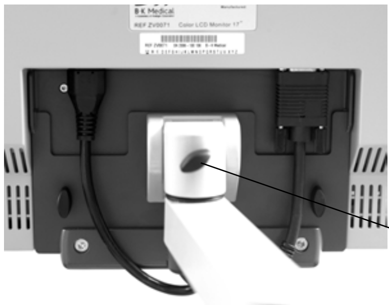


Figure 2-2. Thumb screw for adjusting resistance on the back of the LCD flat screen monitor.

To adjust the force required to change the viewing angle of the flat screen monitor:

- Use the thumb screw on the back of the LCD flat screen to increase or decrease the monitor's sensitivity to angle adjustments.

Hand Rest

The removable hand rest (UA0967) can be used to make working with the keyboard panel more comfortable. See *Care, Cleaning & Safety*.

Docking the Flat Screen on Arm

The flat screen monitor on the articulating arm can be docked. This prevents it from moving around, which is particularly important when the system is being moved to another location.

To dock the LCD flat screen:

1. Standing in front of the system, maneuver the flat screen on the arm so that the front of the monitor is over the front of the system body.
2. Holding the monitor handle, guide the monitor back.
3. Still holding the handle, press so that the monitor clicks into place.

Caution: Avoid using excessive force when docking the flat screen monitor.

Caution: We recommend that you dock the flat screen monitor before you wheel it around the hospital.

Caution: Do not put any weight on the arm nor use it as a lever. The arm is only designed to support the weight of the flat screen monitor.

Turning the System On and Off

To turn the system on and off, use the green standby switch on the front of the system.

To turn the system on:

- Press the standby switch ONCE. A startup screen with progress bar is displayed. Wait until the startup screen disappears and the display on the monitor is stable, indicating that the system is ready to use. Do not try to use the system until it is fully ready.

To turn the system off:

- Make sure the system is completely up and running. Then press the standby switch ONCE.

Wait after you press standby switch

Caution: Whenever you turn the system on or off, you must give the operating system of the system PC enough time to save and recover open files and unsaved data. Otherwise, a serious system failure may occur that requires technical support.

Wait to unplug

Never unplug the system from the wall without turning off the standby switch and waiting for its light to go out.

If you turn off the system without following the recommended procedure (for example, if you unplug it while it is running), the next time you turn the system on, it may take a longer time to start, and the system may be permanently damaged.

System Busy

When the system is busy, that is, performing an operation that takes some time, a spinning disk appears above the **Freeze** control on the monitor.

Caution: Wait until the spinning disk disappears before you press any keys on the system or buttons on the transducer.

Checking the Date

Check that the date and time displayed on the monitor are correct before you start imaging a new patient (or at least at the beginning of each day).

WARNING An incorrect date or time will make documentation of the image incorrect and may also cause some calculated values to be incorrect.

One cause of an incorrect date is battery failure. The battery fails very rarely. If it does fail, the system will usually not operate at all, so you will know to call a technician. However, under certain unusual circumstances the system will operate, but the date will be incorrectly set to a default date.

Settings on the Monitor

Instructions for the monitor vary depending on whether your system is fitted with an LCD flat screen monitor or an LCD flat screen monitor mounted on the articulating arm.

Brightness

Your system may be used with different levels of room lighting. Whenever the lighting changes significantly, you should adjust the monitor brightness.

NOTE: *Do not press the* **[+]** *button on the 19” LCD flat screen monitor or the* [◑/▶] *button on the 17” LCD flat screen monitor. These activate the contrast menu. The contrast settings should only be adjusted by the hospital technician or by your BK Medical service representative.*

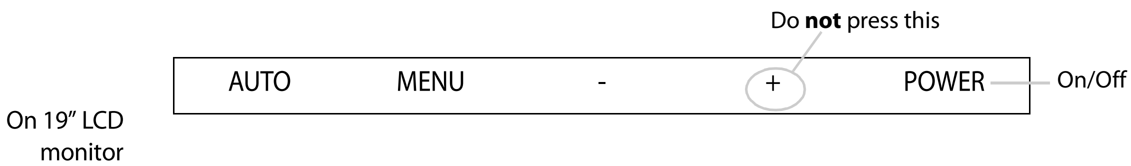


Figure 2-3. 19” flat screen monitor buttons.

To adjust the monitor brightness on the 19” LCD flat screen monitor:

1 Freeze the image.
2 Press **[Alt+Shift+G]** on the keyboard.
  A series of gray bars appears on a black background.
3 Press **[-]** once to enable brightness.
4 Then press **[+]** to increase or press **[-]** to decrease brightness.
  Subsequent presses either increase or decrease the brightness.

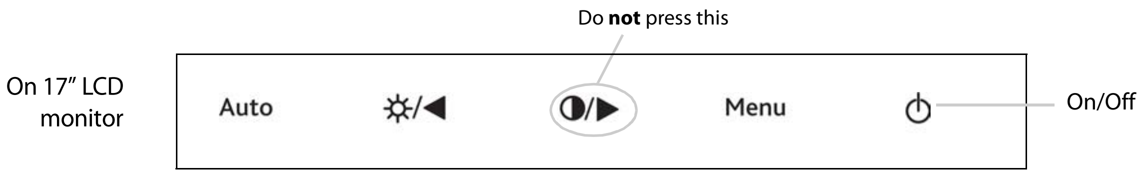


Figure 2-4. 17” flat screen monitor buttons.

To adjust the monitor brightness on the 17” LCD flat screen monitor:

1 Freeze the image.
2 Press **[Alt+Shift+G]** on the keyboard.
  A series of gray bars appears on a black background.
3 Press [☼/◀] once to enable brightness.

4 Then press [◑/▶] to increase or press [☼/◀] to decrease brightness. Subsequent presses either increase or decrease the brightness.

Factory Defaults

If the monitor image appears skew or too large, or the brightness and contrast settings appear incorrect, you can restore the factory default settings.

On LCD monitor

To restore the factory default settings on the LCD flat screen monitor:

1. Click **View Archive** at the bottom left of the monitor.
2. Point at **USB Eject** (do NOT click) so the frame around the monitor control becomes visible.
3. Press **[AUTO]** twice.

Menu Window on LCD Flat Screen

Advanced options

On the flat screen monitor, advanced options (which enable you to finely tune the appearance of images on the monitor) are available via the **Menu** window.

For most users, it is not necessary to adjust these settings because the default settings provide the optimal ultrasound image in most cases. Contact the hospital technician or a BK Medical service representative to adjust the gamma settings or the aspect-ratio controls.

Adjusting the Reading Lights

After you have turned on the system, you can adjust the brightness of the 3 reading lights under the DVD drive. (See Fig 2-1.)

To adjust the reading light brightness:

- Click **Light** under **Image** on the right side of the monitor and drag the slider ((or point at **Light** and press **[+/-]**).

Setting up a New Patient

Before you image a new patient, you must open the **Patient** window and enter some information about the patient, including the patient ID. The fields in the **Patient** window contain information about the patient and the examination.

Patient ID required

WARNING You must enter a new patient ID before you scan a new patient. Otherwise the documentation will not contain the correct patient identification, and you will not be able to capture images and clips. We recommend that you enter the complete name of the patient.

Verify patient ID

WARNING Verify that the patient name and ID are correct.

Opening the Patient Window

There are 3 ways to open the **Patient** window.

Opening the Patient window

To open the Patient window:

- Press [ID].

or

- Click **Enter Patient....** or the name of the previous patient in the identification area on the monitor.

or

- Click **New Examination** in the **Archive** window (see “The Archive window.” on page 117).

  The **Patient** window opens.

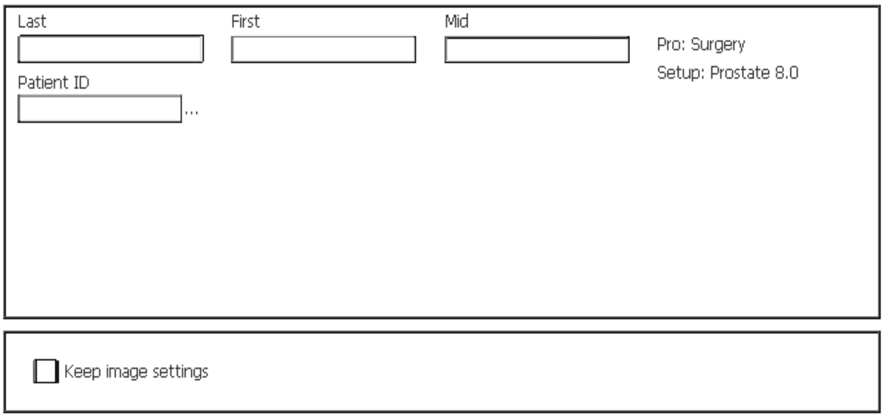


Figure 2-5. The Patient window.

Change the Pro Package first

Some fields in the **Patient** window are different, depending on which Pro Package is selected. Therefore, if you want to change the Pro Package, make sure you do it before you enter information about the patient. See the next section for how to do this.

If DICOM® is installed on your system, the **Patient** window may contain a worklist, as in Fig 2-6.

Auto-complete

When you start to type the patient’s name or ID, the system searches the patient database for patient names that match the entered data. A list of possible matches appears, and you can select the one you want and click it or use the arrow keys on the keyboard to select it and press [Enter].

To select the patient from the patient archiving system:

- Click **…** next to the **Patient ID** field.

  The **Archive** window opens.

See “The Archive window.” starting on page 117 for information about searching the patient archiving system and entering the information into a new **Patient** window.

Changing Pro Package or Preset in the Patient Window

When the **Patient** window opens, a default Pro Package and a default preset are displayed in the window.

To change Pro Package or preset in the Patient window:

1 Point at the name of the Pro Package or preset.
2 Press [**+/-**] to toggle through the available choices.

Click to save patient data and go to Pro Package menu window

If you click one of the default setups (instead of toggling through the choices), the data in the **Patient** window are saved and the **Pro Package** menu window appears. You can select a different Pro Package and preset from the menu. See “Selecting a Pro Package or Preset” on page 55. After you select something from the menu, the **Pro Package** menu window closes. If you have selected a new preset, imaging begins. If you have selected a new Pro Package, the image is frozen when the Patient window closes.

Using the Patient Window

TAB to move between fields

After you have entered information in a field, press [**Tab**] to move from field to field. (You can also move the cursor to a field by clicking the field.)

ENTER closes window

Do not press [**Enter**] (**Return**) unless you want to close the window. [**Enter**] on the keyboard is the same as **OK** in the window.)

Re-opening Patient window

If you decide to enter more patient data after you have started the examination (or if you have closed the **Patient** window by mistake before you have finished entering data), you can re-open the window. To re-open the **Patient** window, click the patient name at the top of the monitor. When the (blank) **Patient** window opens, click **Edit** to restore the previously entered patient data to the fields

NOTE: *Any information you enter after you re-open the* **Patient** *window will not be transferred to the patient archiving system.*

New Patient Information from a DICOM Worklist

DICOM® is not installed as a default on the system. See “DICOM Setup” on page 243 for information about installation and setup, which must be performed by qualified service personnel. If DICOM is installed, the system may be set up so that you can retrieve a worklist of patients and then select a patient from the worklist.

⚠ **Caution:** Changing the DICOM setup can cause your system not to work properly. For example, you may be unable to print to a DICOM printer. All changes to the DICOM setup should be made by qualified service personnel only. Do not try to change the DICOM setup yourself.

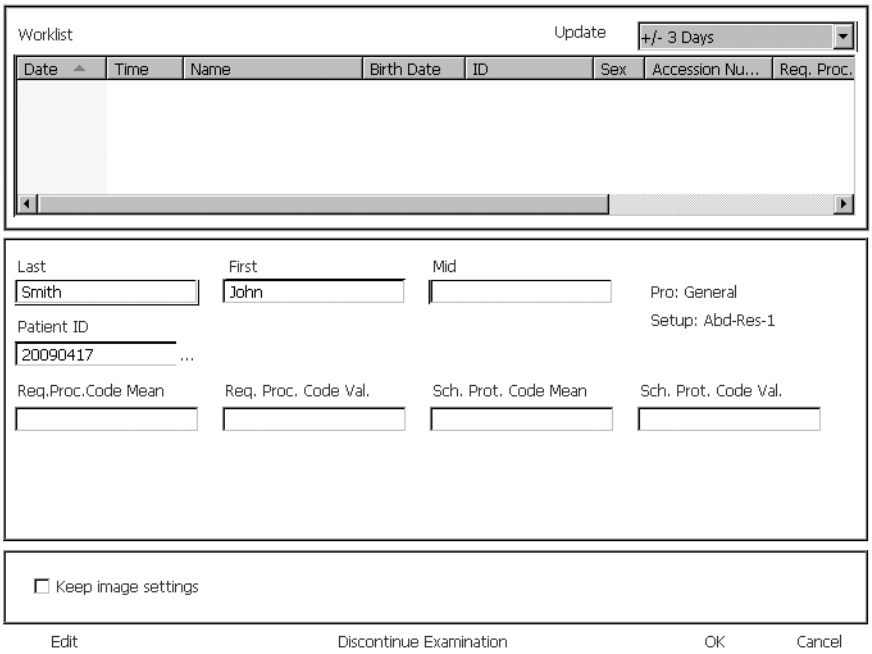


Figure 2-6. The Patient window with worklist.

Depending on how your DICOM system is set up, the worklist may appear as soon as you open the **Patient** window. If the worklist is blank, you can retrieve the information.

To retrieve a worklist:

1 Use the drop-down window in the upper right corner to select the dates or the patients you want the list to include.

If you choose the **Patient** option in the drop-down window, you can filter the information so that only certain patients are displayed by entering patient name, patient ID, accession number and procedure ID in the appropriate fields.

NOTE: *The Accession Number and Req. Procedure ID fields do not appear by default. You must activate the fields in the* **Patient Setup** *window (click* **Customize...** *under* **Image** *on the right side of the monitor. Then click the* **Patient** *tab), see* *"Patient Window Setup" on page 237.*

2 Click **Update**.

The worklist appears in the window. If there are more patients than can fit in the window, you can scroll down to see the rest of the list.

Sorting

To sort the worklist by name, or any other column in the worklist, click the column heading.

To select a patient from the worklist:

1 Click the row that contains the patient.

Now that patient is shown in the fields below the worklist.

2 If required, enter additional information in the fields in the window.

3 Press **OK** to start the examination.

Entering Dates

The **Patient** window contains one or more date fields. Dates in these fields can be displayed in various formats.

Format	Example
dd-MM-yyyy	18-11-1944
dd MMM yyyy	18 Nov 1944
MM/dd/yyyy	11/18/1944
MMM/dd/yyyy	Nov/18/1944

Table 2-1. Possible date formats.

The date format is set up in the **General Setup** window, but you probably will not need to change it. See "Date/Time" on page 205.

Use number keys

Use the number keys on the keyboard to enter dates.

NOTE: *You cannot type letters in a date field, even when the month is displayed in letters. In the example in Table 2-1, you must type 11 for the month, even if it is displayed as "Nov".*

To enter dates in date fields:

1. Put the cursor at the beginning of the date field.
2. Type the date (or number of the month, if your system is set to display month first).
3. Type a separator or press → to move to the next part of the date. You can use any of the following separators: period (.), comma (,), hyphen (-) and slash (/). (The separator you use when you enter a date does not affect the way the date is displayed in the field.)
4. Type the appropriate number.
5. Repeat steps 3 and 4.

Keeping Image Settings

When you enter a new patient ID, the transducer setup is reset to the default for the transducer. If for some reason you want to keep the current settings when you start imaging the new patient, you can prevent the settings from being changed back to the default ones. However, this does not work if you change transducer or Pro Package.

To keep transducer settings:

- Check **Keep image settings** in the **Patient** window.

  The system uses the image settings from the previous patient.

Keeping Patient-Related Data

When you enter a new patient ID, the patient-related data are reset to the default values. Patient-related data include the following:

- preset
- Bodymark
- Measurements
- Labels

You can start a new examination with the patient-related information from the current patient.

To keep patient-related data:

1. At the bottom of the **Patient** window, click **Edit**.
2. A new checkbox, **Keep patient-related data**, appears. Make sure that it contains a checkmark.

   The system uses the patient-related data from the previous patient. You can edit the information, including changing the patient name.

NOTE: *You must check both* **Keep image settings** *and* **Keep patient-related data** *if you want to return to the previous frozen image when you close the* **Patient** *window. If you do not check both boxes, the system starts imaging when you close the window, and measurements you have made are lost.*

Pausing and Later Continuing an Examination

It is possible to pause an exam (for example, while you examine a different patient) and then resume the exam with the first patient. Refer to the illustration of the **Archive** window in Fig 6-8 on page 117 when reading the following procedures.

To pause an examination:

1. Open the **Archive** window and click **Pause Examination.**

To resume a paused examination:

1. Open the **Archive** window.
2. From the **Examination List**, select an exam with the status **Pause**.
3. Click **Continue Examination.**

Discontinue Examination with MPPS Server Configured

If an MPPS server is configured, you can discontinue the current examination. Click **Discontinue Examination** to end the examination; the system will send a DISCONTINUE message back to the MPPS server. You will be prompted to confirm that the examination must be discontinued. Discontinuing the examination clears the current patient data and closes the **Patient** Window.

Discontinued examinations can be retrieved from the Patient List for later completion; see Table 6-5, “Ways to select the patients displayed in the Archive window.,” on page 119. Discontinued examinations can be retrieved from the Patient

List for later completion; see the Documentation chapter in the Extended User Guide for more details. The *2202 Service Manual* (BI2201) contains instructions for service personnel to use when configuring a MPPS server.

If you try to start or resume examinations on patients with discontinued examinations, you will be prompted to choose between these options:

- Continue the existing examination
- Delete existing examination and start a new
- Cancel

Ending an Examination

An examination is automatically ended if you start a new one.

To end an examination without starting a new one:

- Press (long) [**ID**].

Connecting and Selecting Transducers

Connecting a Transducer

On the front of the system body are 3 sockets for connecting array transducers. There can be a socket for connecting mechanical transducers.

Keep cables tidy

Under the keyboard panel are a number of hooks that can help keep transducer cables tidy and out of the way. (See Fig 2-1.)

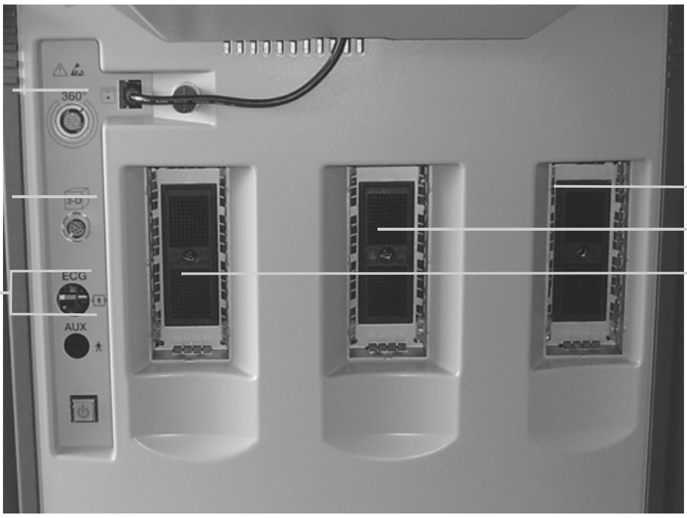


Figure 2-7. The transducer sockets.

To connect a transducer

1 Insert the transducer plug into the socket.
2 Turn the locking lever on the transducer plug clockwise.

To disconnect a transducer:

1 Turn the locking lever on the plug counterclockwise.

2 Remove the plug from the socket.

Transducer Holders

The 4 transducer holders beside the keyboard panel keep the transducers you need safe and ready for use. Transducer-holder inserts (DZ 9756) are available to hold the smaller transducers in the BK Medical range. See the 2202 Product Data sheet for a list of accessories that can be ordered to use with the system.

Gel Holders

The two gel holders behind the transducer holders hold gel containers ready for use.

Selecting a Transducer

You can choose to image with any of the transducers that are connected to the system. The type number of the transducer currently selected is displayed, together with the imaging frequency, in the Identification area at the top of the monitor. See page 89.

Type number displayed must match number on transducer

WARNING Before you start to image, make sure that the type number of the transducer you have selected matches the number displayed on the monitor. If they do not match, the puncture line on the monitor may not correspond to the true puncture path in the tissue. In case of any inconsistency, stop imaging, turn off the system, and contact your local BK Medical representative.

To select a different transducer that can be used with the same Pro Package:

- Point at the transducer type number on the monitor and press [+/-] to select the transducer you want.

or

- Press the button on the transducer itself (if it has a button).

To change Pro Package as well as transducer, or to see all connected transducers and the Pro Packages that support them, see “Selecting a Pro Package or Preset” on page 55.

Selecting the Imaging Plane

If you are using a transducer with more than one plane, you can select the imaging plane (sagittal, transverse or endfire). The current imaging plane (**T**, **S** or **E**) is displayed on the at the top of the monitor after the transducer type number.

To select the imaging plane:

- Press the appropriate button on the transducer. For details, see the user guide for the transducer.

or

- Click **T**, **S** or **E** (whichever is displayed) on the monitor and select the value you want, or point at **T**, **S** or **E** and press [+/-].

The imaging plane in the selected view is updated to the one you select.

Pro Packages and Presets

Each Pro Package contains all the measurement and calculation tools you need for a particular application area. It also contains appropriate presets for the various transducers that can be used with the Pro Package. Each transducer may have more than one preset, but one setup will be the default one.

The following Pro Packages are available on the system:

- Abdomen
- Brachy
- Cardiac
- Colorectal*
- MSK
- Neuro
- OB/Gyn
- Pediatric*
- Pelvic Floor
- Regional Anesthesia (UGRA Anes)*
- Small Parts
- Surgery
- Urology
- Vascular

* These Pro Packages are available on the Pro Focus 2202 UltraView 800 system only.

A preset contains information about the imaging modes that are being used and all the imaging information for those modes.

Selecting a Pro Package or Preset

The system starts imaging with the default preset for the transducer and Pro Package you are using.

The Pro Package and preset currently selected are displayed in the Identification area of the monitor. See page 89.

To select a Pro Package or preset:

1 Press [ ] or click the Pro Package or preset displayed in the identification area of the monitor.

The **Pro Package Menu** window appears. It contains a column for each connected transducer. The column lists the Pro Packages and presets that you can use with that transducer.

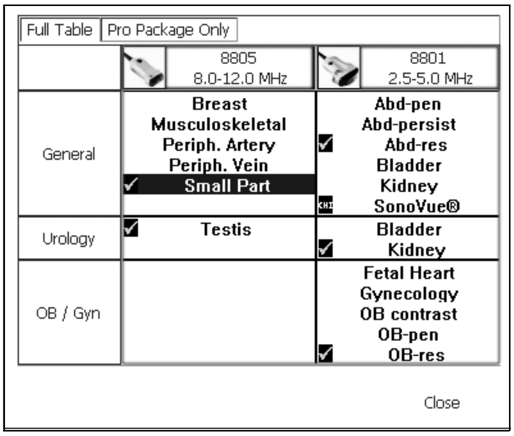


Figure 2-8. The Pro Package Menu window.

2 Select the Pro Package and preset you want.

3 Click **Close**.

Saving a Preset

When you have changed the setup, you can save it as a new preset.

To save a preset:

1 Click **Save** under **Image** on the right side of the monitor.

The **Save Preset** window appears.

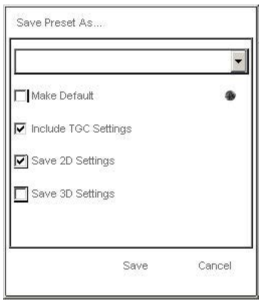


Figure 2-9. The Save Preset window.

2 Enter a name for the preset and select the options you want, for example, whether you want the setup to be the default for the transducer with the current Pro Package. (Puncture guide or brachy matrix settings will be saved as part of the setup.)

3 Click **Save**.

Selecting or Changing the Imaging Mode

The system is set up to start imaging in B-mode, unless something else is specified in the Pro Package you are using.

To add modes to B-mode, press the key for the mode you want to add.

Performing a Biopsy or Puncture Procedure (including Brachytherapy)

When you use a puncture guide to perform a biopsy or puncture procedure, a puncture line is superimposed on the image.

Brachy matrix or transperineal matrix

When you use a transducer for brachytherapy or prostate transperineal biopsy, a needle guide matrix is superimposed on the image.

Check puncture guide type number

WARNING Always check the type number of the puncture guide displayed on the monitor to make sure that it corresponds to the puncture guide that you are actually using. If the number is incorrect, the puncture line on the monitor may not correspond to the true puncture path in the tissue.

Watch the needle tip

WARNING The puncture line on the image is an indication of the expected needle path. The needle tip echo should be monitored at all times so any deviation from the desired path can be corrected.

NOTE: *If the image depth is set very low (in order to see tissue close to the transducer with high magnification), depending on your settings, the needle tip echo can be outside the displayed image area. In order to see the needle tip in this case, zoom out so the full needle path is visible or pan the image to the side (to keep the high magnification).*

Verify matrix type and coordinates

WARNING For brachytherapy and prostate transperineal biopsy, make sure that the matrix type and coordinates indicated on the monitor agree with the actual matrix template you are using.

Verify matrix alignment

WARNING Before you use the matrix for seed implantation or transperineal biopsy, check the matrix offset value to verify that it corresponds with the chosen matrix. Then check the matrix alignment. See *Care, Cleaning & Safety*.

Activate guide or matrix

To superimpose a puncture line or matrix on an ultrasound image:

- Press [ ].

  The default puncture guide or matrix appears.

Set default

To set a different puncture line or matrix to be the default:

- After you have selected the puncture line or matrix you want (and made any other setup changes you want), save your settings as a new preset (see page 56). Specify that you want the new setup to be your default.

To highlight the dot on a matrix where you expect to see the needle:

- Click one of the dots on the matrix.

  A blue square appears in its place.
- To highlight a different dot, click it. The previously highlighted dot returns to normal and the new one is highlighted.

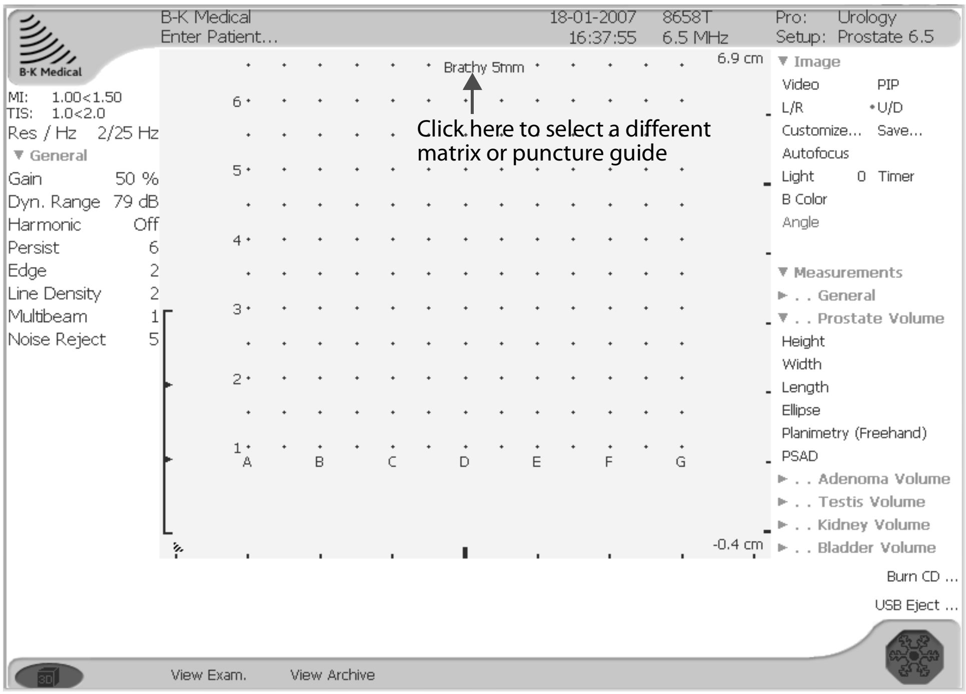


Figure 2-10. A matrix on the image area.

To select a different puncture guide or matrix:

1 Click the Type number or matrix name displayed at the top of the image area.

The **Puncture Guide** menu appears. It contains the puncture guides and matrices that are available for the selected transducer.

Figure 2-11. The Puncture Guide menu.

2 Click the puncture guide or matrix you want.

The menu disappears and the markings on the image area are updated.

To remove the puncture line or matrix from the monitor:

- Press [ ].

Programmable Puncture Guide

If you are using a programmable puncture guide, you can change the setup to move it to the left or right or in or out. See “Brachy Matrix, Brachy Ruler and Programmable Puncture Guide Setup” on page 231.

Brachy Ruler with Sagittal Plane Imaging

You can set up the system so that a brachy ruler is displayed when you image in the sagittal plane with the 8848 transducer in situations where a brachy matrix appears in the transverse imaging view.

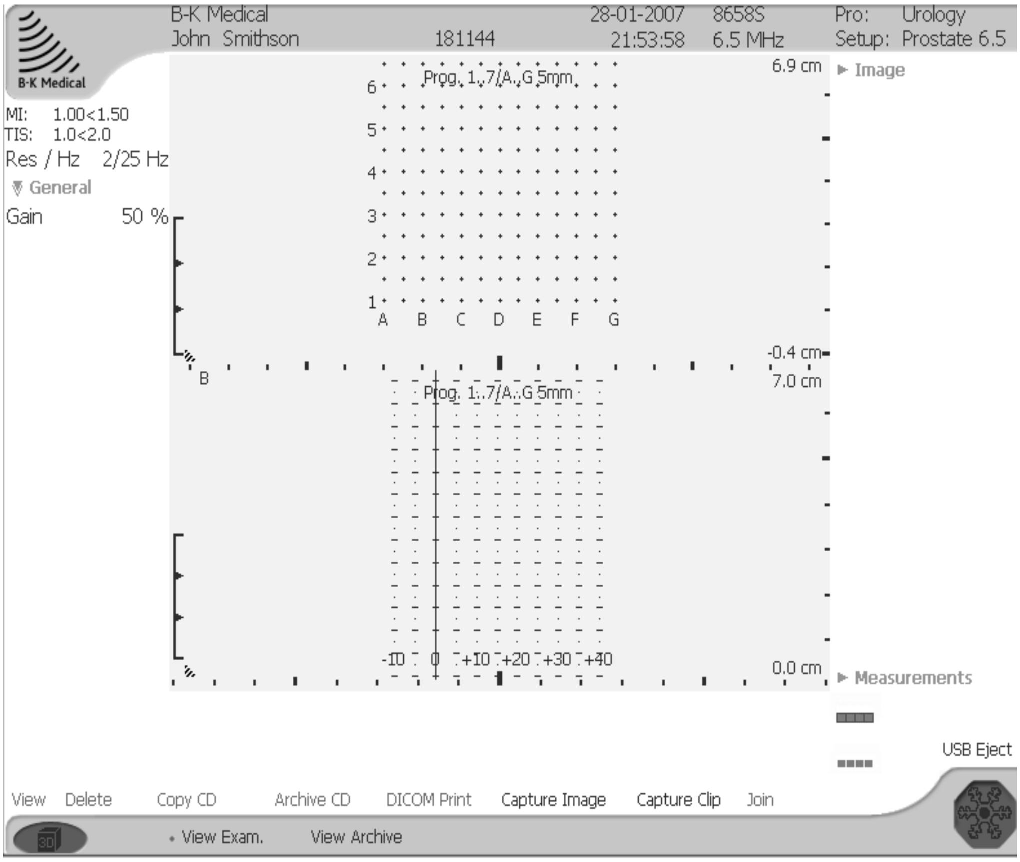


Figure 2-12. A split-screen view with transverse brachy matrix above and sagittal brachy ruler below. Ruler has vertical line to mark 0.

The sagittal brachy ruler is sometimes displayed with a 2-dimensional grid to make it easier for you to see the horizontal position of the needle no matter where it is in the vertical direction.

To move the ruler to the left or right:

1. Click the zero position on the horizontal (bottom) axis.
2. Drag the vertical line that replaces the ruler markers.
3. Click when the line is positioned where you want the new zero position of the ruler.

   The vertical line disappears and the ruler markers appear in their new positions.

NOTE: *You can set up the system so that a vertical 0 line is always visible, along with the markers (as shown in Fig 2-12).*

User-Definable Matrix and Ruler

You can also define your own matrix and ruler. See “Brachy Matrix, Brachy Ruler and Programmable Puncture Guide Setup” on page 231.

Remote Control

For a description of the controls on the wireless remote control UA1237 and how to pair it with the system, see Chapter 4, “The User Interface”.

The remote control uses short wave radio waves to communicate with the system. Before you use it, be sure to read the warning and other safety information in the section “Remote Control” on page 26.

Cleaning and Disinfection

For details of cleaning and disinfecting the remote control, see *Care, Cleaning & Safety*.

Chapter 3
Working with the Image

To adjust and work with the image (for example, to resize the image or to make a measurement), you can usually use the trackball keys to point and click and drag. In some cases (for example, to freeze the image), you can use special keys on the control panel. For more information about using the trackball and other keys, please see Chapter 4, “The User Interface”.

Image Adjustments

Image Size

The image size can be scaled to 5 different sizes, in steps from 75% to 100%. The size can only be changed when a single image is shown on the monitor.

To change Image Size:

- Click **Size** under **Image** on the right side of the monitor and select from the list that appears.

Image Orientation

You can change the horizontal or vertical orientation of a 2D image. The view must be imaging when you change orientation.

To change Left/Right or Up/Down orientation:

- Click **L/R** or **U/D** under **Image** on the right side of the monitor.

  The images of all modes in the selected view are inverted horizontally or vertically.

3D acquisition

NOTE: *In some cases, the system changes the orientation of a 2D image before starting to acquire a 3D data set. You are notified on the monitor if this occurs. For important information about image orientation and 3D acquisition, see “Imaging Direction” on page 288.*

TGC settings

NOTE: *When you change image orientation, you may need to adjust the TGC settings for the B-mode image. See “TGC” on page 137.*

Display Profiles

You can choose between two different display profiles, depending on whether you use the system in dark rooms or in light rooms.

To change the display profile:

- Click **Graphics** under **Image** on the right side of the monitor and select between a **Light** and **Dark** display profile.

Freezing the Image

To freeze the image, press [ ] or click **Freeze**. (You can also use the button on the transducer itself – see the transducer user guide for information about this.)

All images on the monitor are frozen.

If you press [ ] again, the image returns to its previous state.

NOTE: *When you freeze the image, the date and time displayed on the monitor are also frozen, so the time displayed on a printed image is the time the image was frozen, not the time it was printed.*

Update - Partial Freeze

Partial freeze is possible only when you are imaging in Doppler mode or CW-mode as well as one or more 2D modes (B-mode, color and power) – duplex or triplex imaging. In partial freeze *either* the Doppler image *or* the 2D-mode images are frozen.

To start partial freeze:

- Press [ ].

  The partial freeze state starts with all 2D-modes frozen and Doppler mode or CW-mode imaging.

When partial freeze is turned on, pressing [ ] toggles the display between the 2 states:

- Doppler mode or CW-mode frozen; 2D-modes imaging.
- 2D-modes frozen; Doppler mode or CW-mode imaging.

To end partial freeze:

- Press (long) [ ].

  Any frozen modes in the selected view start imaging.

Split Screen

You can split the screen horizontally or vertically to display 2 views side by side or one over the other.

If simultaneous imaging is turned on, both views can be imaging.

Adjust parameters in full-screen

NOTE: *If you adjust parameters in one view, the other view is not changed. Make image adjustments before you split the screen.*

To split the screen:

- Press [ ]. (You can change the default split orientation from horizontal to vertical in the **Screen Layout Setup** window. See page 201.)

or

- Click one of the icons next to **Split** on the right side of the monitor.

  Click for a horizontal split or for a vertical split.

The screen is split to display 2 images.

If you are using a single-plane transducer, the 2 views contain the same imaging view.

If you are using a biplane transducer, each view displays the image from one imaging plane.

To change the split orientation (vertical or horizontal):

- Click one of the icons next to **Split** on the right side of the monitor.

  Click for a horizontal split or for a vertical split.

To select one of the views:

- Click in the view you want to select.

or

- Press [ ] to select the view that is not currently selected.

To remove the split:

- Press (long) [ ].

or

- Click next to Split on the right side of the monitor.

  The currently selected view is resized to fill the monitor.

Simultaneous Imaging

The 2 views in a split screen can both be imaging simultaneously; in this case, freezing and unfreezing affect both images.

To turn simultaneous on and off:

- Click **Simultan** on the right side of the monitor.

Color or power in one view only

NOTE: *In simultaneous split-screen imaging, only one of the views can contain color or power mode. Thus if one view has B+Color or B+Power, the other view contains only a B-mode image.*

Saving setup

You can save a simultaneous split setup (which image is on which part of the monitor) as part of a preset. See “Saving a Preset” on page 56.

Labeling Parts of the Image

You can place text labels and arrows anywhere on an ultrasound image during an examination or on an archived image or on individual frames of archived clips from the same type of ultrasound system. You can select a label from a catalog or type a new one. Label catalogs can be customized in many ways. See “Label Setup” on page 229.

NOTE: *If you move the image or change its scale, an arrow or label with arrow will stay pointing at the same an anatomical structure. (That is, it will move with the image.) A label with no arrow will stay on the same part of the monitor and not move with the image.*

You can add more than one label to an image.

Placing Labels

Your system can be set up so that you can type labels directly on the image or select a label from the label catalog. See “Label Setup” on page 229.

To label the image:

- Type the label.

You can also use the **Label** window.

Using the Label Window

To open the Label window:

- Press [ABC] **or [F9].**

  The **Label** window appears, displaying the label catalog that you have used most recently (for the Pro Package you are using). The label that you used most recently is displayed in the **Edit** field.

  Use the drop-down menu at the top of the window to select other catalogs.

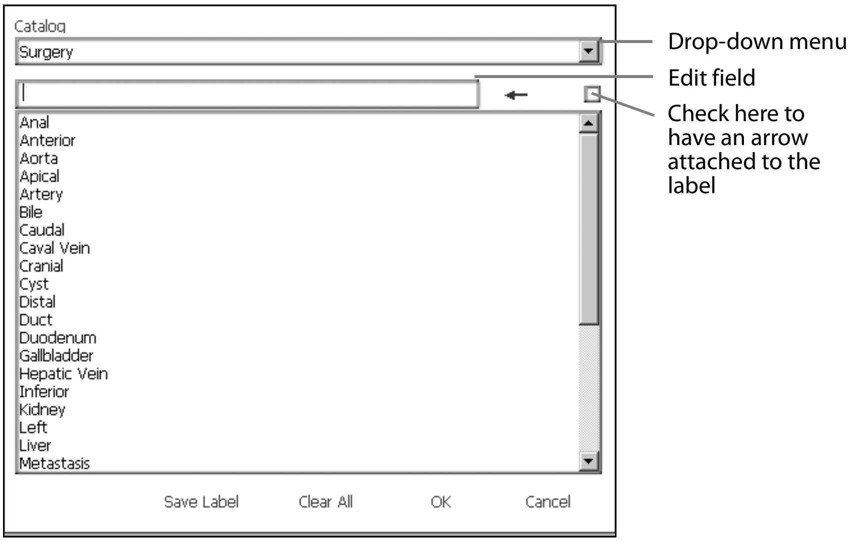


Figure 3-1. The Label window with the Surgery catalog displayed.

To use a label from the Label window:

1 To use the label in the **Edit** field, go to Step 2.

To use one of the other labels in the catalog, click the label text you want.

To edit the label in the **Edit** field or use a label that is not in the catalog, type in the field.

To attach an arrow to the label, check the box next to the arrow. (See Fig 3-1.)

2 When you have selected the label you want and decided whether it should have an arrow attached, press **[Enter]** or click OK.

The **Label** menu disappears and the label itself appears on the image in the default position. To change the default position, see page 65.

To change an orientation word in a label to its opposite (right/left, up/down, upper/lower, anterior/posterior):

1. Select the label.
2. Press +/- on the keyboard (either + or - will work).

   The orientation word will be replaced by its opposite.

Arrows

You can place arrows anywhere on the image to indicate a region of particular interest. You label the arrow.

To place an arrow on the image:

1. Press [F10].

   An arrow appears.
2. If you want to label the arrow, type the label.

   The label appears next to the tail of the arrow.
3. Drag the arrow to the required position and click.

To change the direction of an arrow or move it:

1. Click the arrow to select it.
2. Press [+/-] to change the orientation of the arrow.

   The tail of the arrow moves in a clockwise direction with each press. If the arrow is labeled, the label moves with the tail of the arrow.
3. Click.

Moving Labels and Arrows

To move a label or arrow that you have already positioned, click it and drag it to the new position. Click again when the label or arrow is where you want it.

Default Label Position

You can change the default label position that is used when you use the **Label** window to place a label on the image.

To set the default label position:

1. Type a label where you want the default position to be (or move an existing label to that position).
2. Select the label.
3. Press [ABC].
4. In the window that opens, click **Save position**.

   The label position you have saved is a now a default setting for the Pro Package. Whenever you add a label to an image while using the current Pro Package, it appears in this default position, though you can move it, of course. A second label will be added below the first, and so on.

Removing Labels and Arrows

To remove a label or arrow from the image:

- Click (long) the label or arrow you want to remove. (This means “Press (long) [ ] while pointing at the label.”)

To remove all labels from the image:

- Press (long) [ABC].

or

- Unfreeze the image.

or

1. Press [F9].
   The **Label** menu appears.
2. Click **Clear All**.

Creating and Editing Labels

You can create new labels and edit the text of existing ones.

Adding a label

To add a label to the catalog:

1. If the label menu is not already displayed, press [F9].
2. Type the new label text in the **Edit** field.
3. Click **Save Label**.

You can also use the **Label Setup** window to create or delete labels in a catalog. See “Label Setup” on page 229.

Editing a label on the image

To edit a label on the image:

1. Click the label on the image to select it.
2. Press [F9].
   The Label menu appears with the text of the selected label in the **Edit** field.
3. Edit the label text.
4. To save the edited label to the list, click **Save Label**.
5. To change the label on the image to the new, edited name, click **OK**.

You can also click the label and edit it directly on the image.

Using Bodymarks

Bodymarks are small bitmaps depicting parts of the body. You can place a bodymark anywhere on an ultrasound image during an examination or on an archived image or on individual frames of archived clips from the same type of ultrasound system.

You can set up a user-defined key to place a frequently-used bodymark. See “Assigning User-Defined Keys” on page 203.

An imaging plane indicator can be placed on the bodymark in order to show the imaging position.

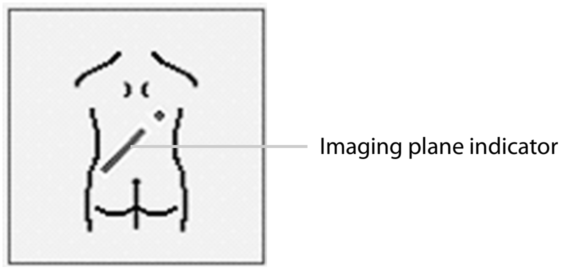


Figure 3-2. Bodymark with imaging plane indicator.

Imaging plane indicator

The imaging plane indicator consists of a long bar and small square. The orientation of the bar indicates the orientation of the probe on the body, and the square indicates the part of the probe that corresponds to the upper left of the image on the monitor.

Bodymarks are organized in catalogs. You select the one you want from one of the catalogs. Bodymark catalogs can be customized in many ways. See “Bodymark Setup” on page 227.

Placing Bodymarks

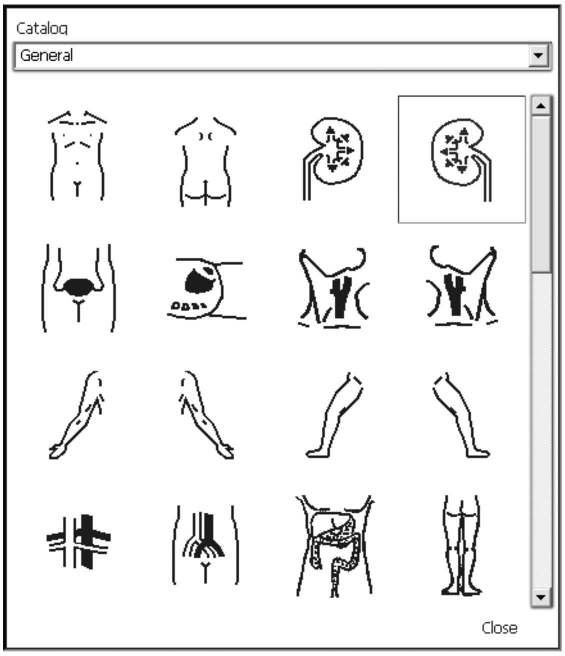


Figure 3-3. The Bodymark window with the General catalog displayed.

To place a bodymark on the image:

1 Press [ ].

The **Bodymark** window appears, displaying the most-recently-used bodymark catalog for the Pro Package you are using.

Use the drop-down menu at the top of the window to select other catalogs.

2 Click the bodymark you want.

The **Bodymark** window closes, and the bodymark appears on the monitor, with an imaging plane indicator. You can rotate or drag the imaging plane indicator to a different position.

Moving Bodymarks

To move a bodymark, click it, drag it to the position you want, and click again.

Adjusting the Imaging Plane Indicator

To adjust the imaging plane indicator, click it. You can then:

- drag it with the trackball
- rotate it with [+/-]

Click again when the imaging plane indicator is the way you want it.

Replacing a Bodymark

To replace an existing bodymark with a different one, click the bodymark on the monitor and select a new bodymark from the **Bodymark** window that appears.

Default Bodymark Position

For each Pro Package, you can set a default position for bodymarks. Whenever you place a bodymark, it appears in the default position on the image. (You can move it.) The position and angle of the imaging plane indicator are also saved as part of the default.

To set a default position for the bodymark:

1. On the image, move the bodymark to the position you want.
2. Adjust the position and angle of the imaging plane indicator on the bodymark.
3. Click the bodymark.

   The **Bodymark** window appears.
4. Click **Save Position**.

   The bodymark position and the imaging plane indicator position and angle are all saved as default for the Pro Package. Whenever you place a bodymark on an image while using the current Pro Package, it will appear in this default position. You can move it, of course.

Removing Bodymarks

To remove a bodymark from the monitor:

- Point at the bodymark and click (long).

or

- Press (long) [ ].

or

- Unfreeze the image.

Unless you delete it or replace it with a new one, a bodymark will remain on the monitor until you change Pro Packages or begin to image a new patient.

Adding New Bodymarks

You can import your own images to the bodymark catalog. See “Importing Bodymarks from a File to a Catalog” on page 228. The bodymarks are 100 x 100 pixel black and white bitmaps. Larger images will be scaled.

Cine

Cine (image review) lets you review a series of the most recently recorded B-mode, B+Color mode, B+M-mode or B+Doppler mode images. You can scroll backward or forward through the series.

Images are constantly being saved and stored for review. When the storage capacity is reached, the oldest images are discarded as new ones are stored. The number of images that can be stored for review varies, depending on such factors as image resolution and size.

Images viewed with the CINE function must be comparable. Therefore, changing certain parameters that affect the image will cause already-stored images to be discarded. If this happens, there will not be a full set of images to be reviewed until the storage has had time to fill again.

You can change some of the settings for the CINE function. For information about changing Cine functions see “Clip Storage and Cine Setup” on page 206.

To turn Cine on and off:

- Press [❄] to stop imaging.

  A vertical cursor line appears and **Cine** appears below **Image** on the right side of the monitor.

  The current image (**Frame**) number is displayed in the **Cine** menu.

Image (frame) numbers

NOTE: *Higher numbers are farther in the past. The image acquired most recently is number 1.*

To review the images:

- Click **Frame** under **Cine** and drag the slider to select the frame number.

or

- Select the cursor by clicking on it and press [**+/-**], or drag to scroll through the images.

NOTE: **+** *goes to the next image (lower image number) and* **-** *goes to the previous image (higher image number).*

Using Cine in M-Mode or Doppler Mode

When cine is activated while imaging in M-mode or Doppler mode, a vertical cine cursor is displayed overlaying the Doppler or M-mode image.

The B-mode image displayed is always the one that corresponds to the position of the Doppler or M-mode cursor. The image (frame) number in the **Cine** indicator corresponds to the B-mode image.

To make measurements on a cine image or record it:

1. When the desired image is displayed, press [ ] to release the trackball from controlling the image review.
2. Make measurements on the image or record it in the usual way.

NOTE: *When you move a cine image after you make a measurement, the measurement result remains, but the markers disappear (because the underlying image is different).*

Cine Play

You can also review the images as a movie using **Cine Play**.

To review the images using Cine Play:

- Click **Cine Play** under **Cine** on the right side of the monitor.

Cine Loop

During **Cine Play** the image with the highest frame number (oldest) is displayed first, followed by images with decreasing frame number (newer). After the newest image has been displayed, **Cine Play** will begin again with the highest frame number and repeat the sequence.

Start and Stop Markers

The **Start** and **Stop** marker positions are displayed under **Cine** (See Fig 3-4).

You can choose the range of images to be displayed in **Cine Play** by setting the Start and Stop markers in the **Cine** menu.

To Set a Start or Stop Marker:

1. Click **Frame**.
2. Drag the **Frame** slider to select the required frame number.
3. Click the marker you want to set.

NOTE: *The image chosen for the Start marker must be older (the Frame number must be higher) than the image chosen for the Stop marker.*

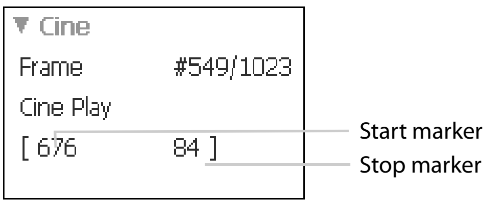


Figure 3-4. Cine Menu with Start and Stop markers.

Playback Speed

You can adjust the speed at which images are reviewed.

To adjust the playback speed:

- Click **Speed** and drag the slider to the required value.

The Video Window and Picture in Picture (PiP)

You can display a video image on the monitor. The video image can come directly from a camera (endoscope, for example), or it can be played back from a video recorder.

Picture in Picture (PiP), which can be purchased as an option for the Pro Focus, lets you view two types of images at the same time, on the same monitor: an ultrasound image and a video image.

To run the PiP software, you must have a license from BK Medical. For information about activating the PiP option, see “Licenses” on page 238. For more information about purchasing the PiP option, see the Product Data sheet.

Using the Video Window

When you display a video image on the monitor (and are not using PiP), the video image appears in a window that covers the ultrasound image and the on-screen controls to the left of the image. It also covers the patient ID and some other information at the top of the monitor. This large window is called the *video window*.

Video window

To activate the video window:

- Click **Video** under **Image** on the right side of the monitor.

To close the video window:

- Click **Video** under **Image** on the right side of the monitor.

The video window covers the ultrasound image. Therefore you cannot use any keys or on-screen controls that affect the ultrasound image when the video window is open.

NOTE: *You cannot move or resize the video window.*

You can use the COPY and FREEZE functions.

Unfreeze

If you unfreeze the ultrasound image, the video window closes if PiP is not turned on.

Changing audio volume

To change the audio volume of the video signal, press [**Sound**].

Changing the Video Setup

The video setup determines how the video image looks. You can change the video setup while a video image is displayed in the video or PiP window. You use the **Video Setup** window to specify the video source (the connector on the back of the system and the equipment that is attached to it). The video format (PAL or NTSC) that is set in the **General Setup** window also affects the video input. See “Video Format” on page 205.

To change the video setup:

- Click **Video Setup** under **Image** on the right side of the monitor. (**Video** or **PIP** must be selected.)

  The **Video Setup** window appears.

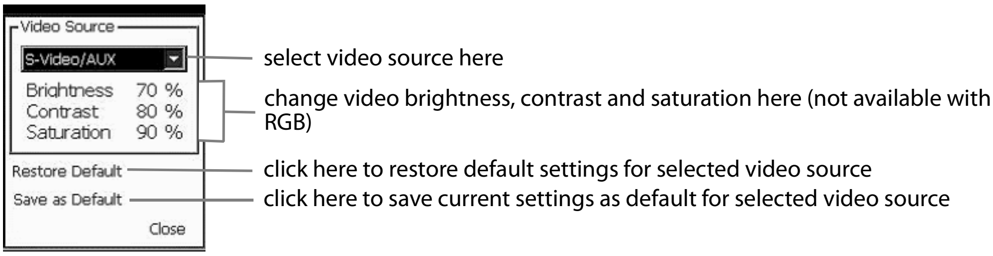


Figure 3-5. The Video Setup window.

Table 3-1 explains the video source options.

Video Source	Connector	Equipment Attached (Example)
S-Video/Camera		S-VHS video camera.
S-Video/VCR		S-VHS VCR
S-Video/AUX		A different S-VHS video camera.
Composite/Camera		Composite video camera.
Composite/VCR		Composite VCR
Composite/AUX		A different composite video camera.
RGB		RGBS video camera

Table 3-1. The video source options in the Video Setup window.

NOTE: *The equipment names (Camera, VCR, AUX) are just labels so that you can save setups for different equipment. If you plan to use three different composite video cameras, then you can use one of the first three options in the table for each camera.*

See page 339 for the location of the connectors on the back of the system.

Using PiP

PiP window

When you use PiP (Picture in Picture), there are two image windows on the monitor – one large and one small. The *PiP window* is the smaller window. If the main image on the monitor is an ultrasound image, the PiP window contains an external video image. If the main image is a video image, the PiP window contains an ultrasound image.

⚠ Do not cover patient ID or other important information

WARNING When you use Picture in Picture, do not cover critical information (such as TI or MI) on the monitor. Make sure that all important information will appear if you print or save the ultrasound image.

If the PiP window is outside the image documentation area (see page 90), it will not appear when you print the image. You must make sure that the PiP window is in a suitable position for your purposes.

NOTE: *If you archive images through DICOM you cannot change them afterwards. If the PiP window covers part of the ultrasound image, you may not be able to make accurate measurements on images archived through DICOM.*

To display the PiP window:

- Click **PIP** under **Image** on the right side of the monitor.

The contents of the PiP window when it opens depends on whether the video window is active (open) when you turn on PiP.

Video Window	PiP Window Contents
Not Active	Video from external video signal
Active	Ultrasound image

Table 3-2. Contents of the PiP window when it opens.

To turn off PiP:

- Click **PIP** under **Image** on the right side of the monitor.

Available controls

When the PiP window contains an ultrasound image, most ultrasound controls are disabled. You can only use GAIN, TGC, FREEZE and COPY functions.

Adjusting the PiP window

The PiP window can be placed anywhere on the monitor. It can have 3 possible sizes.

To reposition the PiP window:

1. Click inside the window.
2. Drag the frame to the position you want.
3. Click.

   The PiP window moves to the new frame position.

If you decide you do not want to move the window, press [**Esc**] or [↶]. The frame is not selected anymore.

To change the size of the PiP window:

- Move the cursor so that it is inside the window and press [**+/-**] to increase or decrease the window size.

or

- Click inside the PiP window and then press [**+/-**] to increase or decrease the window frame size. When you are finished, the PiP window changes size to fit the frame.

Chapter 4
The User Interface

The Pro Focus system has 4 types of controls, in addition to buttons on the transducers:

- keyboard panel controls (keys)
- controls on the monitor
- foot switch (optional)
- keys on the optional wireless remote control

This chapter gives an overview of the various controls and how they are used in general. Detailed information about using individual controls is contained in Chapter 3, “Working with the Image” and the chapters that deal with the various imaging modes *Pro Focus 2202 Extended User Guide* (BB1279). The monitor menus shown in this user guide may look different from the version on your system.

Keyboard Panel Controls

The Pro Focus keyboard panel contains:

- an alphanumeric keyboard
- a control panel with special system control keys.

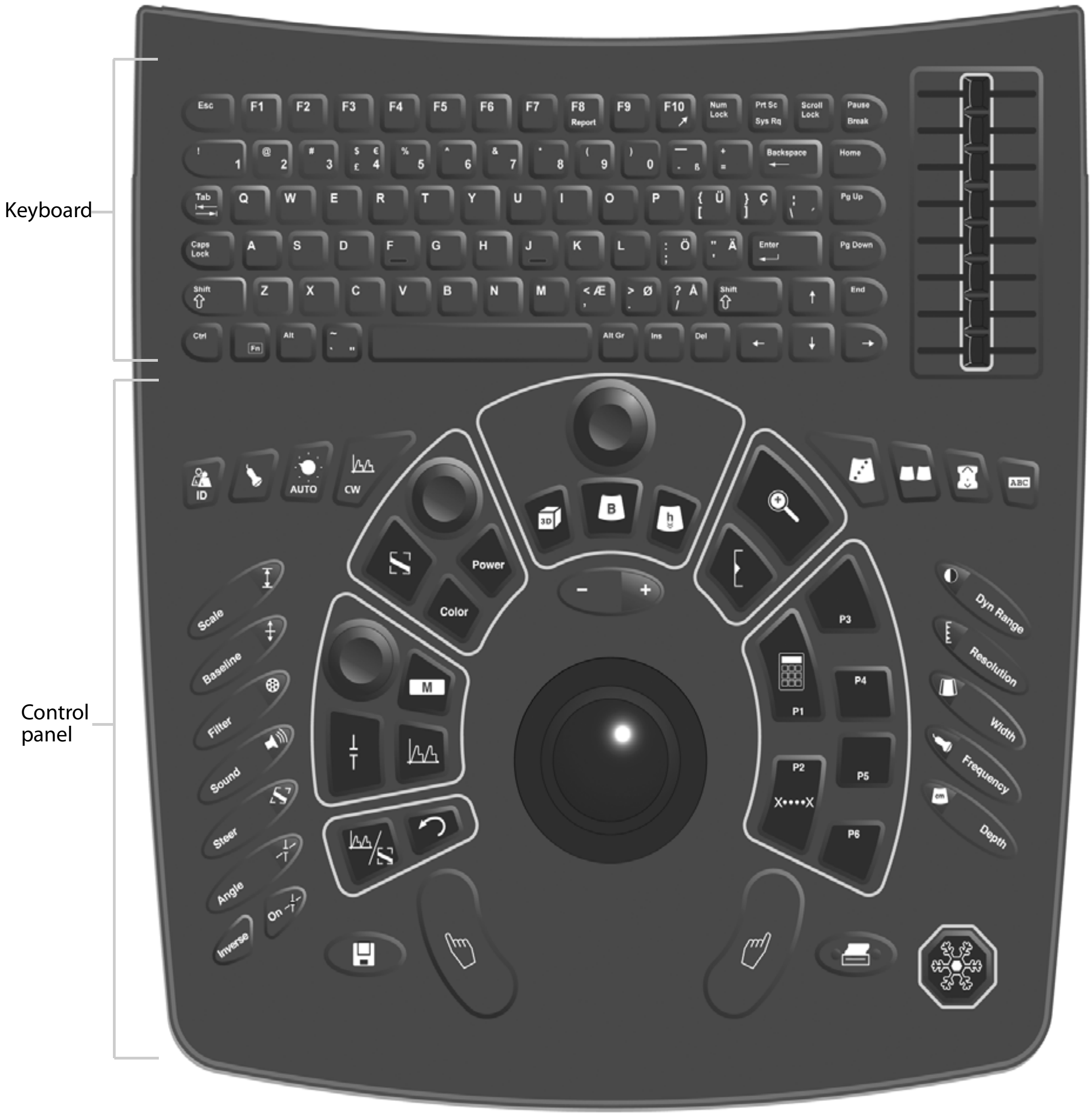


Figure 4-1. The keyboard panel.

The Control Panel

Each control key has a backlighted label that is visible when the functionality of the key is available. Keys turn green to indicate an active function.

There are several types of control keys, categorized according to how you use them.

Key types

Key Type	Example	Action
Trackball	**Trackball**	Rolling the trackball moves a cursor on the monitor.
+/-	**[+/-]**	Pressing the key adjusts a value or moves a cursor stepwise up or down (pressing the + side increases the value, pressing the - side decreases it). A long press repeats the action.
Press	**[Color]**	Pressing the key activates a function or turns something on or off. Sometimes a long press (at least one second) is required to turn it off.
Dial	**[Gain]**	Turning adjusts the gain. Turn clockwise to increase the gain, turn counterclockwise to decrease the gain.
Rocker	**[Scale]**	Same as for the **[+/-]** key (the + side being closest to the trackball, the - side furthest away from the trackball).
Slider	**TGC** controls	Moving the slider adjusts a value continuously.

Table 4-1. Control key types.

Press (long)

In some situations, pressing a key normally and pressing it for a longer time (at least one second) have different effects. The longer presses are indicated in this user guide by *press (long)*. A long press usually turns off a function.

The Trackball and Trackball Keys

The trackball, together with the [ ] (**Select**) keys and the **[+/-]** key, can be used to operate the on-screen controls.

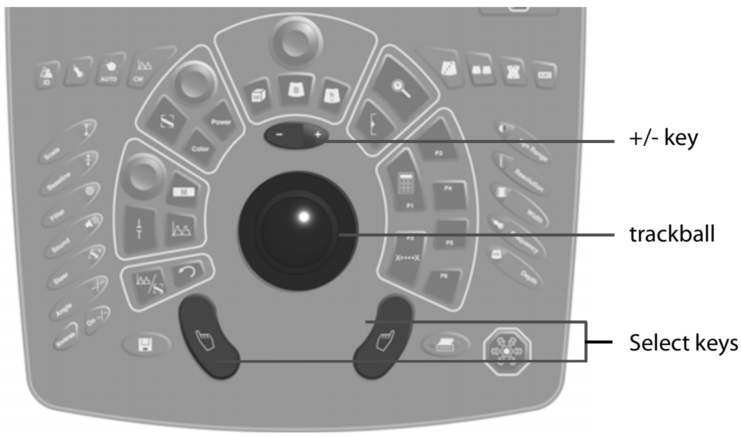


Figure 4-2. The trackball and trackball keys.

Trackball with Select Keys

Like a mouse

The trackball and [ ] (**Select**) keys are used together like a PC mouse.

- Rolling the trackball moves the cursor and other objects on the monitor.
- Pressing one of the [ ] keys is like clicking a left mouse button.

There is no difference between the [☝] keys – use the one that is most convenient for you.

Adjusting the Trackball The trackball should move smoothly. If it is too tight or too loose, use the trackball adjustment tool (QA0228) to adjust it.

Figure 4-3. Using the trackball adjustment tool.

The tool is stored in the keyboard base below the keyboard panel. To adjust the trackball movement, place both ends of the tool into the small holes in the black ring of the trackball housing. Turn clockwise to tighten and counterclockwise to loosen the trackball. The ball can be removed completely for cleaning.

Select Keys

Click

When this user guide tells you to “click” something on the monitor, point at it and press [☝].

- The [☝] key can be used to select items from lists or menus on the monitor.
- If the pointer points at a graphical control (such as the color box or one corner of it), clicking (pressing [☝]) selects the control so that the trackball can move it. Click [☝] again to deselect the control or selection. Usually this means that the trackball can move the pointer again.
- If the pointer points at an On/Off type on-screen control (such as **B Color**), pressing [☝] toggles the control off and on.

Click (long)

Some operations require you to point at something on the monitor and then press (long) [☝]. See “Press (long)” on page 77. This is indicated in this user guide as *click (long)*.

+/- Key

+/- key

When the pointer points at a control on the monitor, pressing [**+/-**] changes settings such as values or sizes. A single press increases or decreases values stepwise. A continuous press causes the value to keep changing. Pressing the right side of the key increases a value; pressing the left side decreases it. If the key is pressed for more than ½ second, the action starts repeating.

When the cursor points at	Pressing the +/- key
a softkey whose value can be changed	increases or decreases the value in the field.
a graphical control (such as the color box)	increases or decreases the size of the control.
an item on a list	moves the cursor up or down the list (so you can select a value) Note: this does not apply to the setup menu.

Table 4-2. Effects of pressing the +/- key.

For more details about using the on-screen controls, see "Controls on the Monitor" on page 89.

Basic Keys

The Basic keys are arranged around the [☝] keys for easy access. These keys work in different imaging modes. For detailed information about using them, see the chapters about the various imaging modes.

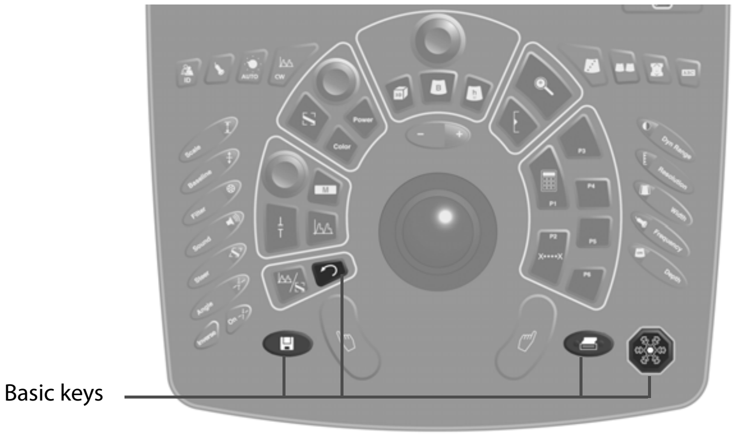


Figure 4-4. The Basic keys on the control panel.

Basic keys

Key	Name	Key Type	Action
[❄]	**Freeze**	Press	Freezes and unfreezes the image. See "Freezing the Image" on page 62.
[🖶]	**Print**	Press	Starts one of the user-defined documentation functions. For more information, see "User-Defined Keys" on page 201.
[💾]	**Save**	Press	Starts one of the user-defined documentation functions. For more information, see "User-Defined Keys" on page 201.
[↶]	**Cancel**	Press	Cancels the present procedure or action. Works in all imaging modes.

Please note that some of the documentation functions are only available after a patient ID has been entered.

Table 4-3. Function of the Basic keys on the control panel.

B-Mode Keys

The B-mode keys are centered above the trackball. For detailed information about using them, see Chapter 7, “B-Mode – 2D Imaging”.

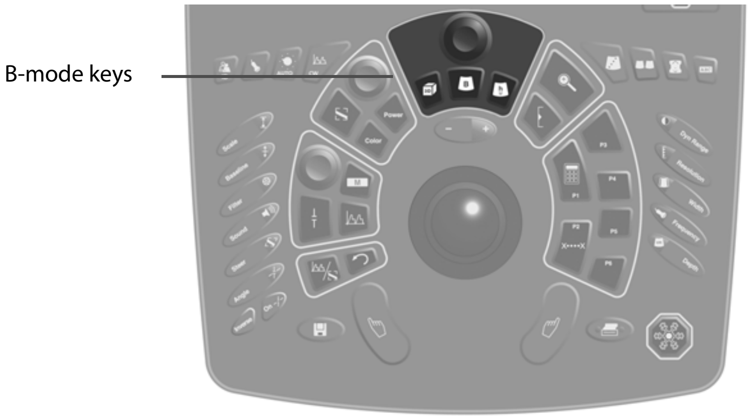


Figure 4-5. The B-mode keys on the control panel.

B-mode keys

Key	Name	Key Type	Action
[Gain]	**B Gain/Cine**	Dial	Adjusts the overall gain. If the image is frozen, turning activates the Cine scroll, but you can toggle it back to controlling the gain. For more information, see “Cine” on page 69 and “Post Gain – Gain of Frozen Images” on page 138.
[B]	**B-mode**	Press	If other modes than B are active, return to B-mode only. If only B-mode is active, return to last mode combination.
[3D]	**3D**	Press	Turns 3D imaging on (if the 3D Pro Package is installed). If 3D is already active, it steps through the different 3D states. A long press turns 3D imaging off.
[ ]	**Harmonic**	Press	Turns harmonic imaging on and off.

Table 4-4. Function of the B-mode keys on the control panel.

B-Mode Adjustment Keys

The B-Mode Adjustment keys are grouped on the right side of the control panel. For detailed information about using them, see Chapter 7, “B-Mode – 2D Imaging”*Pro Focus 2202 Extended User Guide* (BB1279).

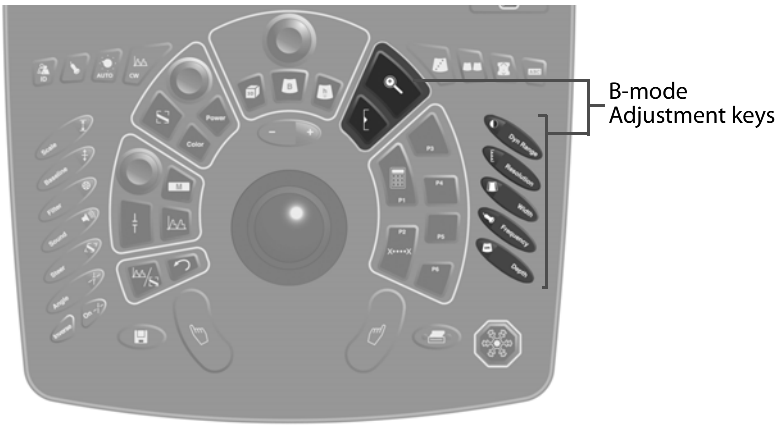


Figure 4-6. The B-mode Adjustment keys on the control panel.

B-mode Adjustment keys

Key	Name	Key Type	Action
[ ]	**Focus**	Press	Selects the **Focus** indicator on the monitor so you can use the trackball and [+/-] keys to adjust the focus. See “Focus” on page 138.
[ ]	**Zoom**	Press	Turns on the zoom box. Press again to zoom in. A third press resets the zoom area. A long press turns zoom off if it is on. See “Zoom” on page 140.
[Dyn Range]	**Dynamic Range**	Rocker	Adjusts the B-mode dynamic range of the image. See “Dynamic Range (Contrast)” on page 139.
[Resolution]	**Resolution**	Rocker	Increases the resolution (decreases the imaging frame rate) or vice versa when you are imaging in B-mode or Color mode.
[Width]	**Width**	Rocker	Adjusts the sector width. See “Width” on page 136. Decreasing the width increases the frame rate.
[Frequency]	**Frequency**	Rocker	Adjusts the main (B-mode) center frequency when you are imaging in B-mode only. If you are imaging in Color mode, adjusts the center frequency for those modes. See “B-Mode Frequency – MFI” on page 143.
[Depth]	**Depth**	Rocker	Changes the maximum depth (distance from the transducer) of tissue shown in the image. Pushing the + side *decreases* the depth (increases the magnification). See “Depth” on page 136.

Table 4-5. Function of the B-mode Adjustment keys on the control panel.

Power and Color Mode Keys

The Power and Color Mode keys are placed to the left above the trackball. For detailed information about using them, see the chapters about the various Doppler modes.

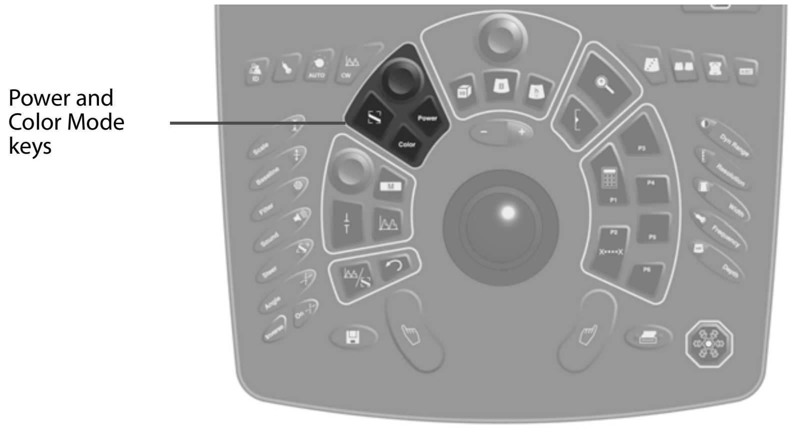


Figure 4-7. The Power and Color Mode keys on the control panel.

Power and Color mode keys

Key	Name	Key Type	Action
[Gain]	**Color/Power Gain**	Dial	Adjusts CFM (Color) gain if Color mode is active or Power gain if Power mode is active.
[Power]	**Power Mode**	Press	Turns Power mode (power Doppler) on and off. The trackball and [+/-] key are assigned to the color box when Power mode is turned on.
[Color]	**Color Mode**	Press	Turns Color mode (color Doppler, CFM) on and off. The trackball and [+/-] key are assigned to the color box when Color mode is turned on.
[S]	**Color Box**	Press	Selects the color box (the same as clicking inside the color box on the monitor). If the color box is already selected, pressing the [S] key cancels the selection. The trackball and [+/-] key are assigned to the color box when color box is selected.

Table 4-6. Function of the Power and Color mode keys on the control panel.

Doppler and M-Mode Keys

The Doppler and M-Mode keys are placed to the left of the trackball. For detailed information about using them, see the chapters about the various imaging modes.

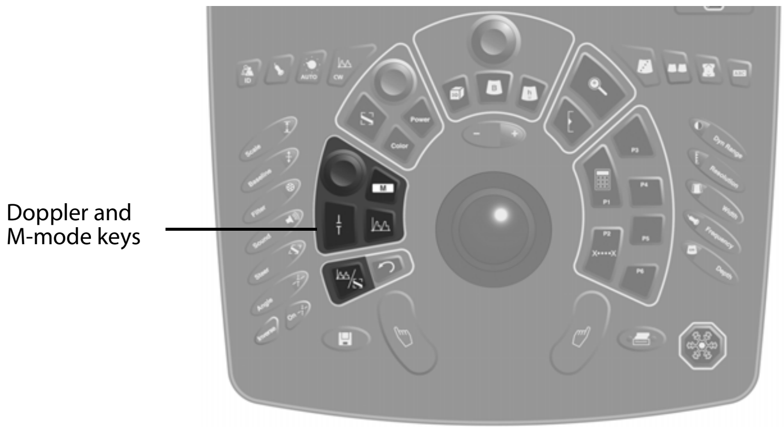


Figure 4-8. The Doppler and M-mode keys on the control panel.

Doppler and M-mode keys

Key	Name	Key Type	Action
[Gain]	**M/Doppler Gain**	Dial	Adjusts M gain if M-mode is active or Doppler gain if Doppler mode (spectral Doppler) is active.
	Doppler Mode	Press	Turns Doppler mode on and off. The trackball and [+/-] key are assigned to the Doppler gate when Doppler mode is turned on.
[M]	**M-Mode**	Press	Turns M-mode on and off. The trackball and [+/-] key are assigned to the M-line when M-mode is turned on.
	D/M Cursor	Press	In B-mode, turns on the Doppler gate so that you can position it before you activate Doppler mode. Press again to deselect the gate. A long press removes the gate. See “Doppler Indicator” on page 185.
	Update	Press	In combination modes, with one mode frozen, changes which mode is imaging and which is frozen. A long press unfreezes any frozen modes in the selected view. See “Update - Partial Freeze” on page 62.

Table 4-7. Function of the Doppler and M-mode keys on the control panel.

Doppler Adjustment Keys

The Doppler Adjustment keys are grouped on the left side of the control panel. For detailed information about using them, see the chapters about the various Doppler modes and M-mode.

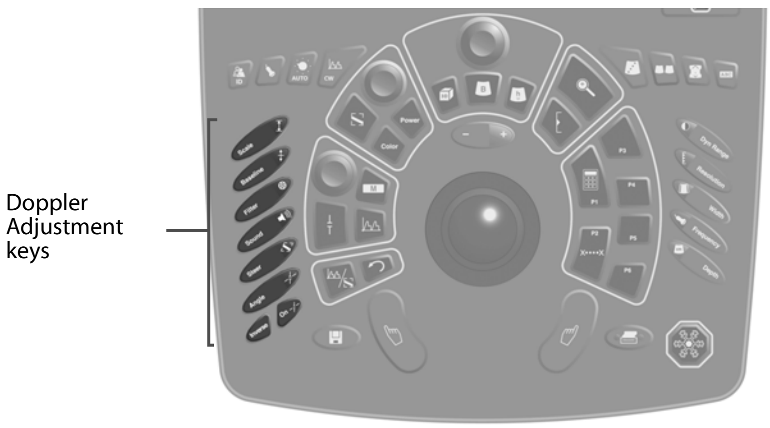


Figure 4-9. The Doppler Adjustment keys on the control panel.

Doppler Adjustment keys

Key	Name	Key Type	Action
[Scale]	**Scale**	Rocker	Changes the scale/range/PRF in PW Doppler, Color mode and/or Power mode. If PW is active *and* Color mode or Power mode is active, the [Scale] key adjusts the PW mode. In this case, use the on-screen controls to change the scale for Color mode/Power mode. For information about Doppler mode, see “Range” on page 188. For Color mode information see “Range” on page 164. For information about Power mode, see “Range” on page 179.
[Baseline]	**Baseline**	Rocker	Moves the baseline of Doppler mode and/or Color mode. If both modes are active, moves only the Doppler mode spectrum baseline. See “Baseline” on page 189.
[Filter]	**Wall Filter**	Rocker	Adjusts the wall filter. If both Doppler and Color modes are active, moves only the Doppler mode spectrum baseline. See “Wall Filter” on page 188.
[Sound]	**Sound**	Rocker	Adjusts the Doppler audio (speaker) volume and the video (speaker) volume during playback. See “Audio Volume” on page 184.
[Steer]	**Steer**	Rocker	Changes the beam angle in Color mode, Power mode and PW Doppler. See “Steering” on page 187.
[Angle]	**Angle**	Rocker	Changes the Doppler correction angle. See “Angle Correction” on page 187.
[On]	**Angle On**	Press	Turns the correction angle on or off.
[Inverse]	**Inverse**	Press	Inverts the spectrum (Doppler mode) or color scale (Color mode). If both Doppler mode and Color mode are active, inverts the spectrum only.

Table 4-8. Function of the Doppler Adjustment keys on the control panel.

User-Defined Keys

The user-defined keys are placed on the right side of the trackball. By default, the [P1] key is set up to open the **Calculations** menu, and the [P2] key is set up to open the **Measurements** menu.

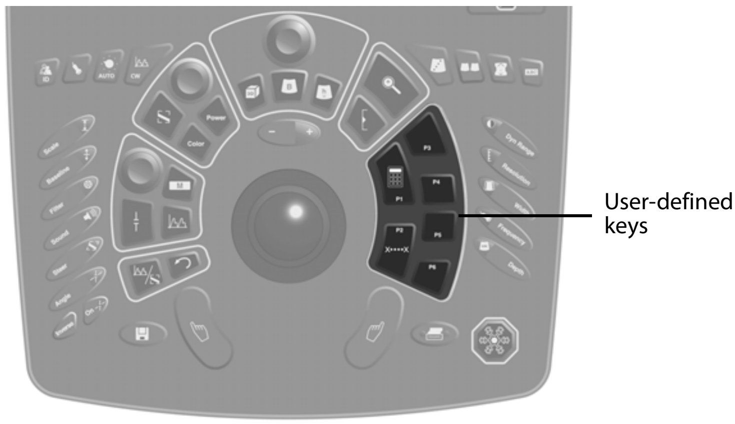


Figure 4-10. The user-defined keys on the control panel.

User-defined keys

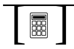
Key	Name	Key Type	Action
	**Calculation**	Press	Opens the **Calculations** menu on the monitor. See “Measurements and Calculations” on page 95 and “User-Defined Keys” on page 201.
[X••••X]	**Measure**	Press	Opens the **Measurement** menu on the monitor. If the menu is already open, starts the measurement at the top of the first open measurement group. See “Measurements and Calculations” on page 95 and “User-Defined Keys” on page 201.
[P3] [P4] [P5] [P6]	**User-defined**	Press	The function of each of the 4 user-defined keys is defined within each Pro Package. Their function depends on which Pro Package is being used. For information about assigning functions to these keys, see “User-Defined Keys” on page 201.

Table 4-9. Function of the user-defined keys on the control panel.

Image Annotation Keys

The Image Annotation keys are grouped on the top right side of the control panel. For detailed information about using them, see Chapter 2, “Getting Started” and Chapter 3, “Working with the Image”*Pro Focus 2202 Extended User Guide* (BB1279).

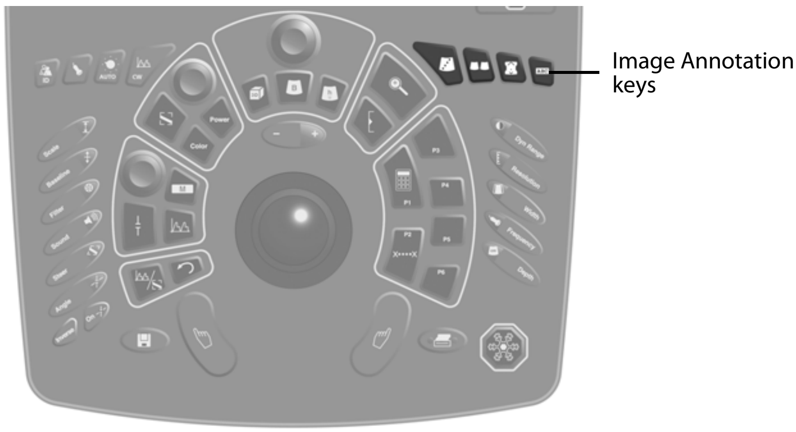


Figure 4-11. The Image Annotation keys on the control panel.

Image Annotation keys

Key	Name	Key Type	Action
	Puncture	Press	Turns a puncture or biopsy line on or off. See “Performing a Biopsy or Puncture Procedure (including Brachytherapy)” on page 57.
	Split Screen	Press	Splits the screen so two views are displayed. If the screen is already split, pressing shifts between which view is active. A long press turns split screen off if it is on. See “Split Screen” on page 62.
	Bodymark	Press	Opens the **Bodymark** window so you can place a bodymark on the image. Press to close the **Bodymark** window again. See “Using Bodymarks” on page 66. A long press removes bodymarks.
[ABC]	**Label**	Press	Opens the **Label** window so you can add text or arrows to the image. See “Placing Labels” on page 64. A long press removes all labels and arrows.

Table 4-10. Function of the Image Annotation keys on the control panel.

Miscellaneous Keys

The keys on the top left side of the control panel have varied functions.

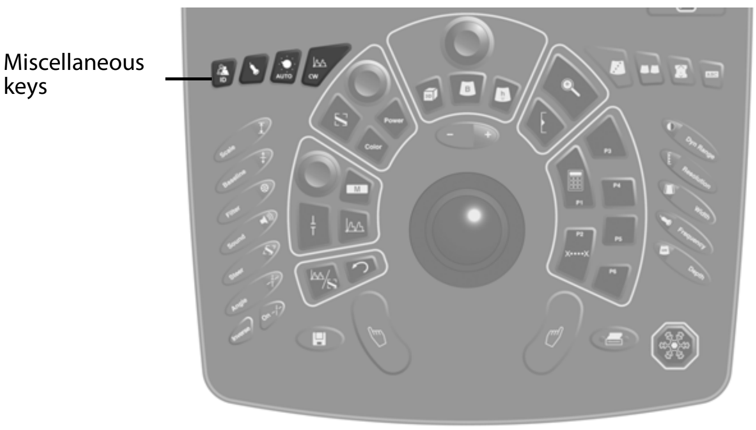


Figure 4-12. The Miscellaneous keys on the control panel.

Miscellaneous keys

Key	Name	Key Type	Action
[ ]	**ID**	Press	Opens the **Patient** window so you can enter data about a new patient. See “Setting up a New Patient” on page 47. A long press ends the current examination.
[ ]	**Transducer/ Pro Package**	Press	Opens the **Pro Package** menu on the monitor so you can choose a transducer, a Pro Package or preset. See “Selecting a Pro Package or Preset” on page 55.
[ ]	**Auto**	Press	Adjusts parameters or resets parameters to factory default. For more information, see “Auto” in the individual chapters in Part 3: “Imaging Modes”.
[CW]	**CW Doppler**	Press	Turns CW Doppler on and off. The trackball is assigned to the CW Doppler line when CW Doppler mode is turned on.

Table 4-11. Function of the Miscellaneous Control keys.

TGC Sliders

The 8 TGC sliders to the upper right of the keyboard are used to adjust the Time Gain Control at various depths in the image.

Figure 4-13. The TGC sliders on the keyboard panel.

Each slider controls 1/8th of the depth of the displayed imaged area. The top slider affects the top of the image and the bottom slider the bottom. (With 360° transducers, the top slider adjusts the part of the image that is most central – that is, closest to the transducer. The bottom slider adjusts the part of the image farthest from the transducer.)

Move the sliders to the right to increase gain. Move the sliders to the left to decrease gain.

Each slider is related to a part of the monitor rather than a part of the tissue being imaged. Therefore, if you move, resize or invert the image area, you may have to use the sliders to readjust the TGC in order to get the best image.

Keyboard

In addition to the control keys, the keyboard panel contains an alphanumeric keyboard for entering information into the system.

The [**F1**] to [**F10**] keys are user-definable keys. The [**F8**] and [**F10**] keys have default functions assigned:

F8 and F10

Key	Name	Default Function
[F8]	F8	Displays a report. A report is defined for each Pro Package. The content of the report will vary, depending on the Pro Package and the measurements you have made. For more information, see "Reports" on page 129.
[F10]	F10	Displays an arrow on the image and allows you to add text to the image. See "Placing Labels" on page 64.

Table 4-12. Default function of the F8 and F10 keys.

Controls on the Monitor

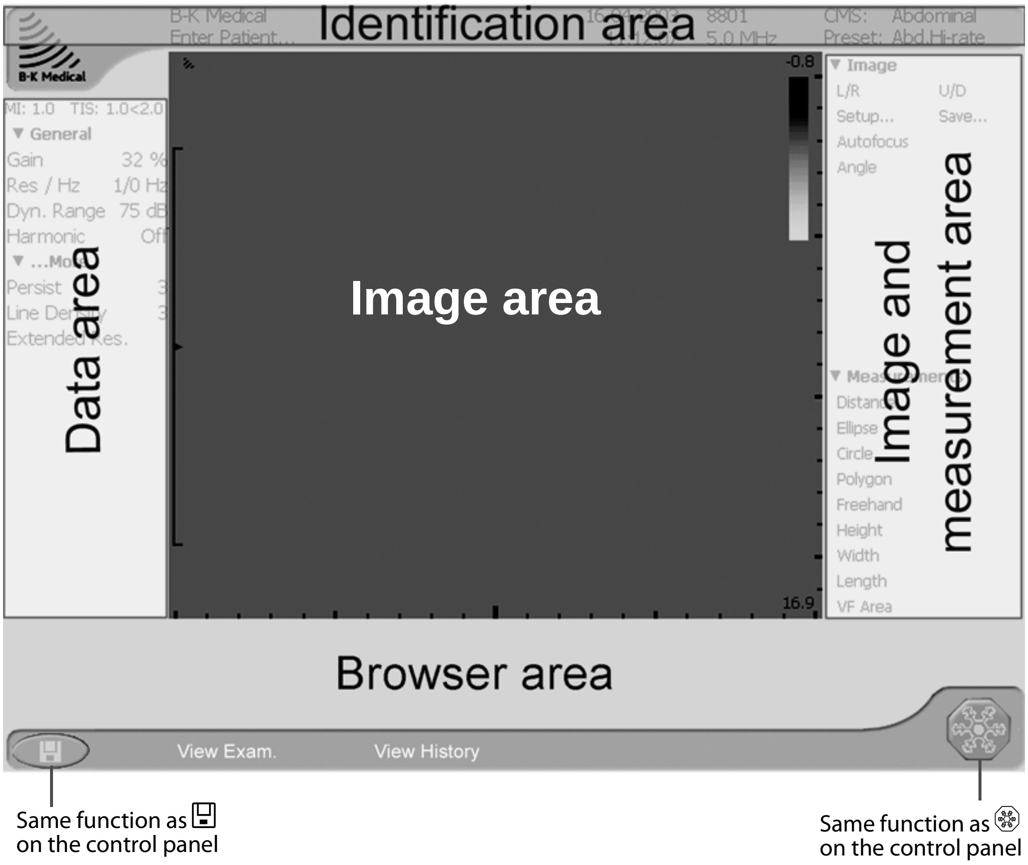


Figure 4-14. The parts of the display on the monitor. The layout shown here may be different from the one on your monitor.

Image area

- The Ultrasound Image area is in the center. This area displays the current imaging and/or frozen views. Graphical on-screen controls such as the zoom box, color box and focus indicator are located in this area.

Identification area

- The Identification area is at the top.

  This contains identifying information about the hospital and patient, the date and time, the transducer type and imaging frequency (and imaging plane, for a biplane transducer), and the name of the Pro Package and preset.

Data area

- The Data area is on the left side. It displays data that must be documented with the image. Information displayed in this area is automatically updated.

The Data area has a data section at the top that contains the relevant settings for image parameters. It has a measurement section at the bottom. The measurement section displays the results of current measurements you have made.

Image Documentation area

- The Image area, the Identification area and the Data area make up the Image Documentation area and will appear in documentation (except for the Pro Package and preset names).

Image and Measurement area

- The Image and Measurement area is to the right. You may need to click **Image** to see the image tools or click **Measurements** to see the measurement tools. This area will not appear in documentation.

Browser area

- The Browser area is at the bottom. Small pictures (thumbnails) of the clips and images stored in the system are displayed across the bottom of the monitor. This area will not appear in documentation.

Point and Click

Using the trackball and trackball keys to interact with the controls on the monitor is intuitive and easy. In this user guide, certain terms are used consistently to tell you what to do.

Terminology

Point at

Use the trackball to move the pointer to a control. When a control is *pointed at*, you can adjust it with the [+/-] key but you cannot move it. To move a graphical control, you must select it.

Click (select)

Point at an on-screen control and press [ ]. When a control is *selected*, moving the trackball resizes or moves it. (Pressing [ ] again cancels the selection, making it possible to use the trackball to move the pointer.)

Drag

Use the trackball to move a cursor or graphical control.

When an on-screen control has the color	It is	You can
White	Available	Point at it or select it.
Orange	Pointed at	Adjust it with [+/-]. Select it.
Blue	Selected	Move it with the trackball. Adjust it with the pointer or [+/-]
Gray	Unavailable	(No action possible).

Table 4-13. Color coding of controls on the monitor.

For some actions, you do not need to click. You can just point and press the [+/-] key (see the following section).

Moving

To move a graphical control on the monitor:

1. Click the control to select it.
2. Drag the selected control to the position you want.
3. Click to release the trackball for other uses.

Changing size

To resize a graphical control on the monitor:

- Select or point at the control and press [+/-].

or

1. Click a boundary of the control (such as a corner of a box or a boundary of the focus indicator) to select it.
2. Drag the selected control part until the control is the size you want.
3. Click to release the trackball for other uses.

Softkeys

The monitor contains many softkeys for functions whose value can be adjusted or changed. These softkeys appear as words or abbreviations on the monitor.

Softkeys with values

To select a value for a softkey:

1. Click the softkey.

   A list of possible values appears.
2. Click the value you want.

You can also use [+/-] to scroll up and down in the list and then press [ ].

NOTE: *Not all softkeys may be visible. Click the expand menu symbol to see all items in a menu. To change the setup for how menus appear, see “Customizing Menus” on page 203.*

Slider softkeys

Some softkeys have a slider that you move with the trackball.

On/Off softkeys

Some softkeys have only two values, On and Off.

To change the setting of an On/Off softkey:

- Click it.

or

- Point at it and press [+/-] to toggle the value.

Small green light

A small green light next to the key indicates that it is set to On.

Foot Switch

The optional foot switch has 2 or 3 pedals. You can assign a function to each pedal, and the same pedal can have different functions for different Pro Packages. For information about assigning functions to the pedals, see“User-Defined Keys” on page 201.

To use the foot switch:

- Press the appropriate pedal.

NOTE: *Releasing the pedal does not operate or reverse the function.*

Remote Control

The wireless remote control UA1237 is an option available for the Pro Focus UltraView. It uses short wave radio waves to communicate with the system and control many of its functions.

The Remote Control and Its Functions

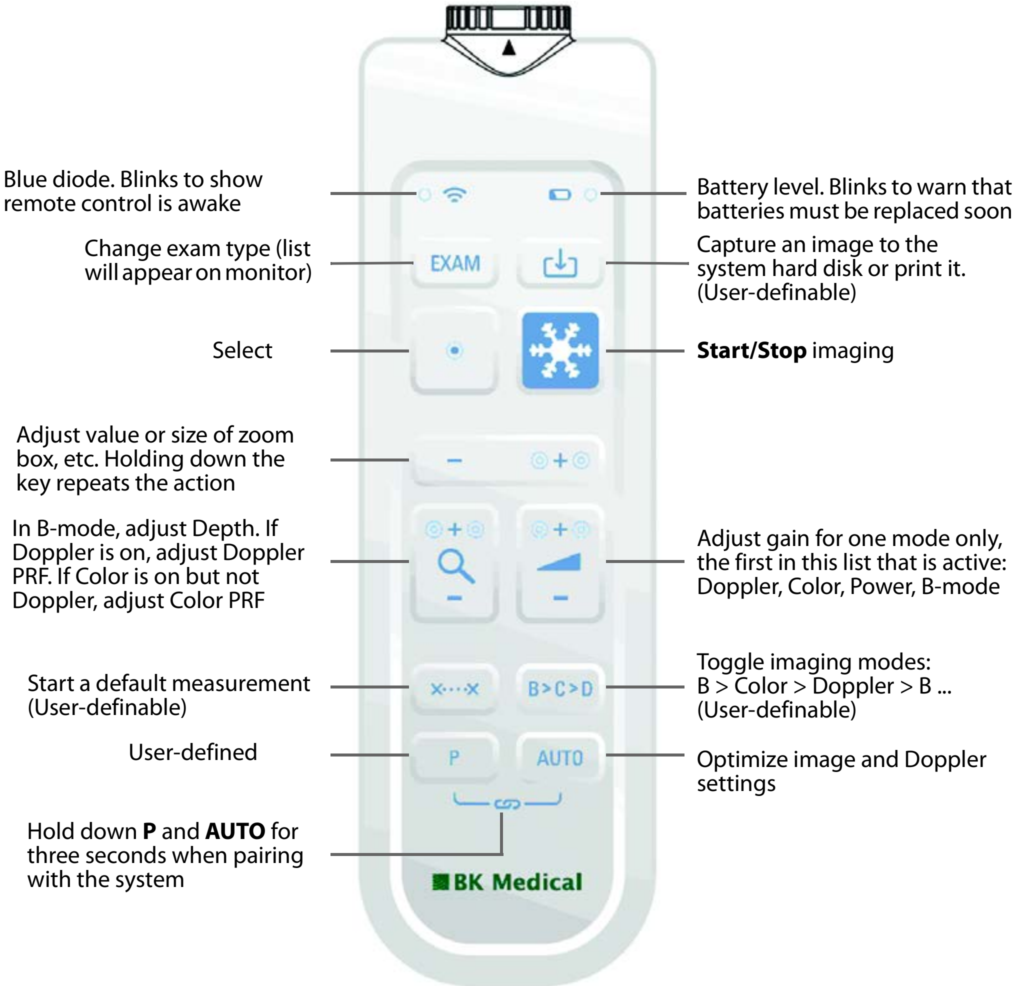


Figure 4-15. The remote control, with the location of its various controls.

The remote control uses short wave radio waves to communicate with the system.

Pairing the Remote Control with the System

1. Plug the Mini Bluetooth Adapter into a USB connector on the system. (Use the one that came with the remote control.)
2. Press any key on the remote control to wake it up.
3. Hold down the **P** and **AUTO** keys on the remote control for three seconds.

   The remote control emits two beeps.
4. Release the keys after the second beep.

   The blue diode starts blinking fast.

   A dialog box appears on the monitor. This may take up to two minutes.

5 Click **Accept** to pair the system with the remote control (indicated by its serial no.).

The pairing process takes up to one minute.

When pairing is done, the remote control emits a beep and the blue diode blinks to show the remote control is awake.

NOTE: *The pairing process may time out. Try again if this happens.*

NOTE: *If the cursor starts drifting on the monitor, place the remote control in its holder and leave it for 30 seconds to recalibrate.*

If you have more than one remote control, be sure you know which system each is paired with; the system and remote control remain paired even if the remote control is taken away to be disinfected. Pairing lasts until you pair the remote control with another system or pair another remote control with the system. Therefore, it is important to keep track of which remote control is paired with which system.

Before each use, verify that the remote control is working correctly.

Sleep

If the remote control is not used or moved for 5 minutes, it goes to sleep to save battery power. To wake it up, press any key.

Mouse Function

You can use the remote control as an air-tracking mouse to operate controls on the system monitor.

To move the cursor, tilt the remote control; that is, move the front end up, down, or side-to-side. The mouse will not respond if you keep it level.

NOTE: *You do not need to point it at the monitor. The cursor responds to changes in the position of the remote control, not to the position itself.*

To select an object on the monitor, move the remote control so that the cursor is on the object, then press **Select**.

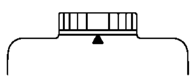
Replacing Batteries

To replace the batteries in the remote control:

1 Remove the battery cap.

2 Insert 2 batteries LR6 size AA 1.5 volt.

3 Screw the battery cap on tight until the arrow points to the area of the battery cap with a large gap between the ridges.



When the battery cap is screwed on tight, the remote control is watertight and can be immersed.

Cleaning and Disinfection

For details of cleaning and disinfecting the remote control, see *Care, Cleaning & Safety*.

Transducers

Control button — Some transducers have a control button that you can press to *Start* or *Stop* imaging (freeze frame).

Long press — You can set up your system so that a long press (more than one second) starts one of the user-defined documentation functions, such as capturing an image.

If the transducer has more than one control button, you can set up a user-defined long press function for each control button.

Each time the control button is pressed, a ‘beep’ is emitted.

Chapter 5
Making Measurements

Measurements and Calculations

You can use a variety of tools to measure aspects of the ultrasound image (and thus the underlying tissue). These measurements can be used for various calculations.

You can make measurements on archived images from the same type of ultrasound system. The images must be in DICOM format, not .bmp. For information about format of stored images, see “Formats of Exported Documents” on page 116. You cannot make measurements on video clips.

Accuracy

For information about the accuracy of different types of measurements, see “Clinical Measurements: Ranges and Accuracies” on page 35.

Each Pro Package contains the measuring tools that you will need for the calculations that the package contains. You can find descriptions of all the calculations in the Pro Package chapters.

You can also define customized measurements that you want to use. See “User-Defined Measurements” on page 217.

To view the list of measurements:

- Freeze the image.

  The names of all available measurements are displayed under **Measurements** to the right of the image.

  If the list is not visible, click **Measurements** to expand the list.

  To see more measurements, scroll with the trackball.

Making a Measurement – General Procedure

The sections following this one contain detailed descriptions for using the various measuring tools.

Image must be frozen

NOTE: *The image must be frozen.*

To make a measurement:

1. Click the name of the measurement.

   If you can use more than one measuring tool to make the measurement, a small triangle ▼ appears to the right of the measurement. Click the ▼ to expand the list. Click the measuring tool you want to use.

   A marker appears on the image.

2. Drag the marker to the position you want. Click.

   If the measurement requires 2 markers, another one appears.

3. Drag the second marker to the position you want. Click.

4 Repeat this until you have positioned all the markers for the measurement.

NOTE: *The look of the markers themselves and of any lines that connect them depend on what you are measuring.*

Measurement results displayed

Results The results of the measurement are displayed (continuously updated) at the bottom of the data area to the left of the image.

Depth While you are positioning the first marker for a distance measurement in a B-mode or Color mode image, the displayed measurement is the depth of the marker (distance from the marker to the transducer surface along the scan line). When a second marker is positioned, the depth is replaced by the appropriate measurement result.

Clearing a Measurement

There are 3 ways to clear a measurement and any current calculations that use the measurement.

To clear a measurement, do one of the following:

- Point at the marker and press (long) [☝].
- Point at the measurement result and press (long) [☝].
- Press [**Esc**] while the measurement is selected on the monitor.

Clearing All Measurements

You can clear all the measurements on the monitor at once.

To clear all measurements:

- Press (long) [x••••x].

B-Mode and Color Mode Measuring Tools

Distance Measuring Tool

Measuring a distance

Two markers can be positioned to measure a distance – the length or width of a structure, for example. When the first marker is positioned, a second one appears for you to position.

NOTE: *Pressing* [x••••x] *starts a distance measurement.*

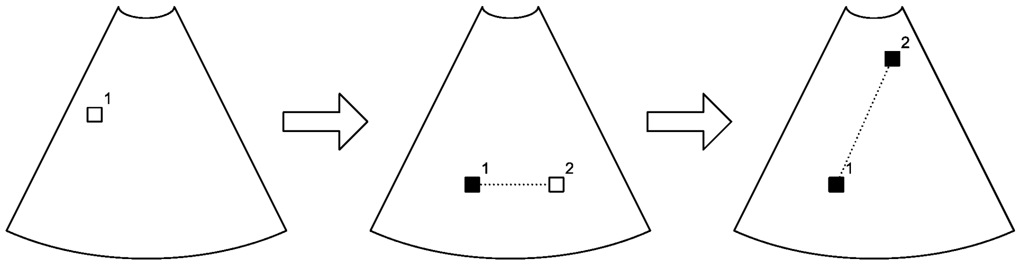


Figure 5-1. Positioning 2 markers on a B-mode or Color mode image.

NOTE: *The small numbers in the pictures (1,2) indicate the order in which the markers appear. The numbers do not appear like this on the monitor.*

Repositioning a distance marker

To move a marker after they have all been positioned:

1. Click the marker.
2. Drag it to the new position.
3. Click.

Perpendicular Distances

Measuring distances at right angles

Sometimes it is important for one distance to be measured perpendicular (at right angles) to another distance. In this case, a small square appears at the intersection point when the two measurement lines are perpendicular to each other.

Angle Measuring Tool

On a B-mode or Color mode image, you can measure 1 angle or 2 angles. The angle measuring tool works slightly differently from the other measuring tools. The numbers in the instructions below refer to the numbers on the markers in Fig 5-2.

To measure an angle:

1. Click Angle.

   A marker appears.
2. Position the marker and click.

   A second marker appears, with a line connecting the two markers.
3. Position marker #2 to change the angle of the line. Click.

   A third marker appears.
4. Position marker #3 and click.

   A fourth marker appears, with a line connecting it to marker #3.
5. Position marker #4 to change the angle of the line. Click.

   Angle **alpha** between the two lines is indicated on the image and the size of the angle appears as a measurement to the left of the image.

   If you have chosen to measure 2 angles, additional markers appear for you to measure another angle (**beta**) with the first line.

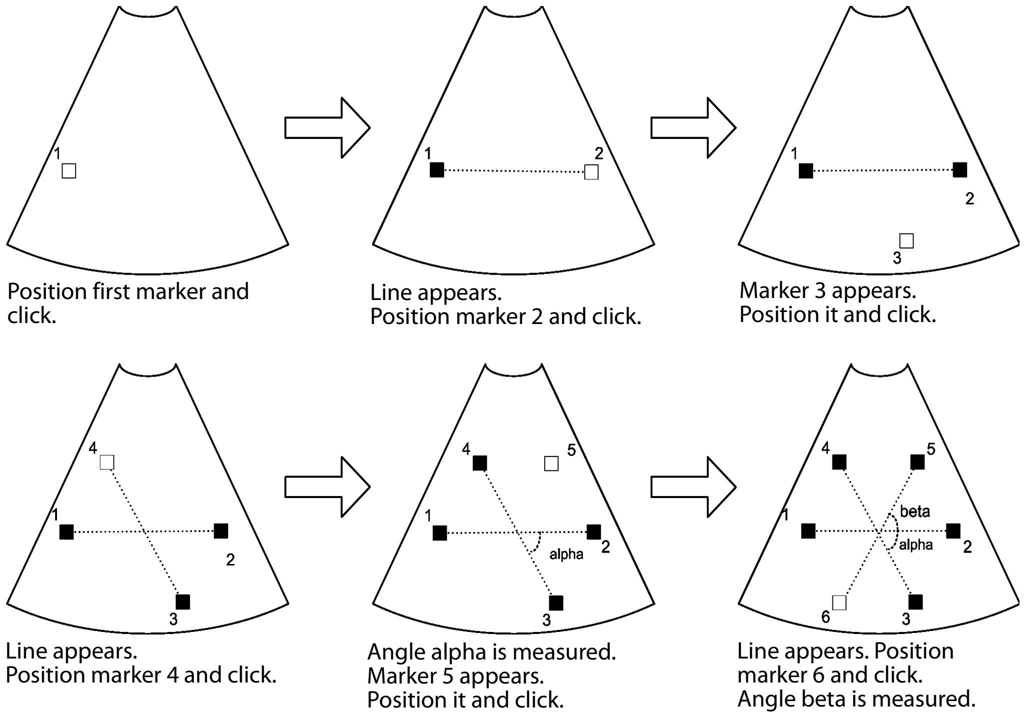


Figure 5-2. Using the angle measuring tool to measure two angles.

If you just click and do not move any markers, the default angles are 60º.

To change the angle measurement after all the lines are positioned:

- Click any marker and move it to change the length or orientation of one of the lines.

NOTE: *If you click somewhere on the measuring tool that is not on a particular marker, moving the trackball moves marker #1.*

Circle Measuring Tool

On a B-mode or Color mode image, you can position 2 markers to measure a circle. Position the markers in the usual way. As you move the second marker, the circle is continuously redrawn on the monitor.

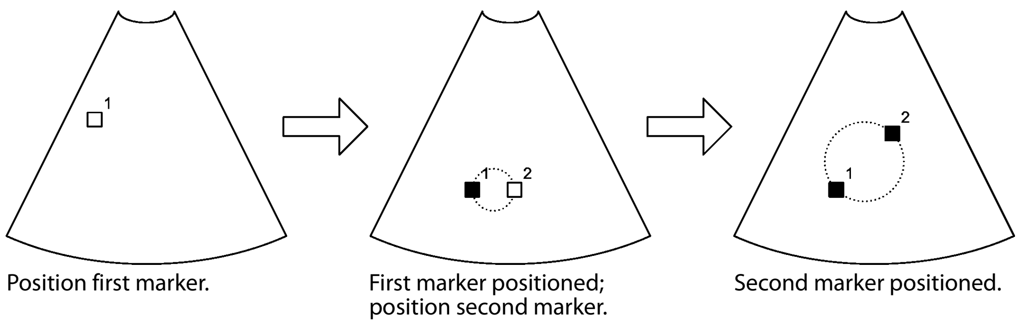


Figure 5-3. Using the circle measuring tool.

After the markers have been positioned, you can move any of them by clicking and dragging to a new location. Click again.

Repositioning a circle marker

To change the location or size of the circle:

1 Click one of the markers
2 Reposition the marker.
3 Repeat with the other marker, if necessary.

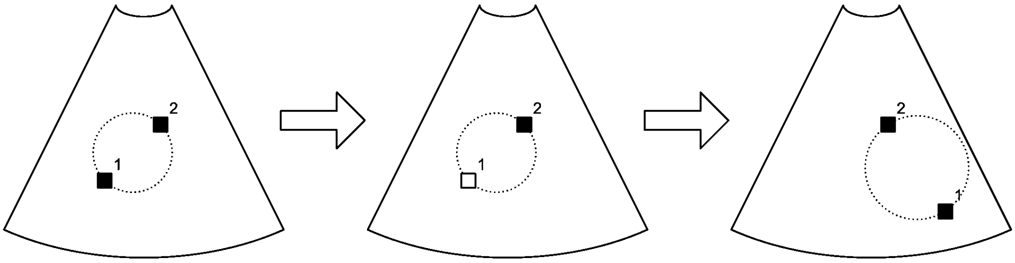


Figure 5-4. Repositioning one of the circle markers.

To move the entire circle without changing its size:

1 Click inside or on the circle.
2 Drag it.
3 Click again.

Moving a circle

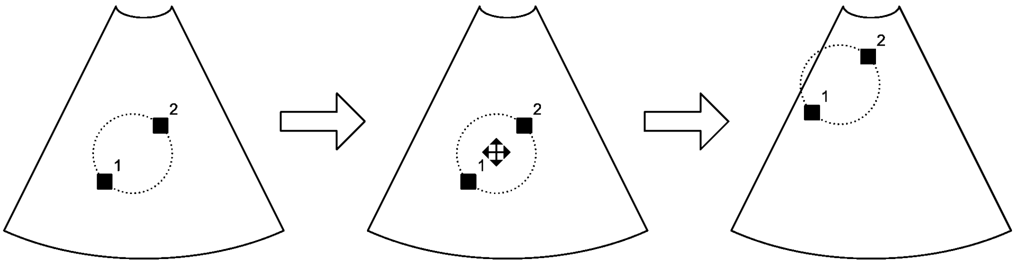


Figure 5-5. Moving a circle you have drawn.

Ellipse Measuring Tool

On a B-mode or Color mode image, you can use three markers to measure an ellipse. Position the markers in the usual way. The first 2 markers determine a line that is used as the axis of rotation if you use the ellipse to measure volume. (See important note below.) The third marker is always equidistant from the first 2. Moving it makes the ellipse broader or narrower. As you move the third marker, the ellipse is continuously redrawn on the monitor.

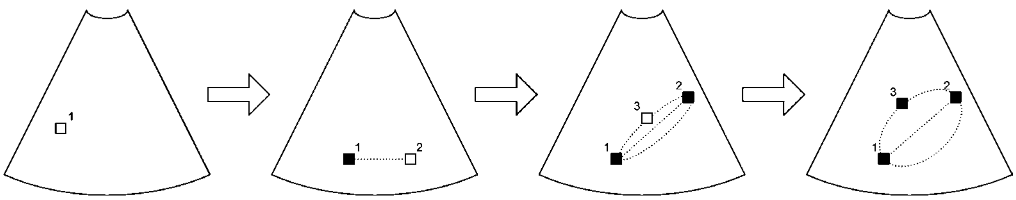


Figure 5-6. Drawing an ellipse.

Axis of rotation

NOTE: *The axis of rotation critically affects the calculated volume. Consider the basic shape of the structure of interest and make sure to place the first 2 markers so that they define the correct axis of rotation. See Fig 5-7.*

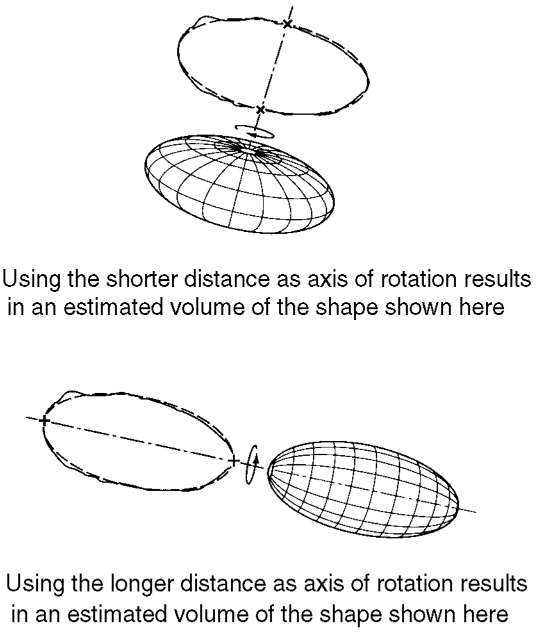


Figure 5-7. The effect of the rotation axis on volume determination.

Repositioning an ellipse marker

After the markers have been positioned, you can move any of them by clicking and dragging to a new location. Click again.

NOTE: *Moving marker 1 or 2 in an ellipse will automatically move marker 3.*

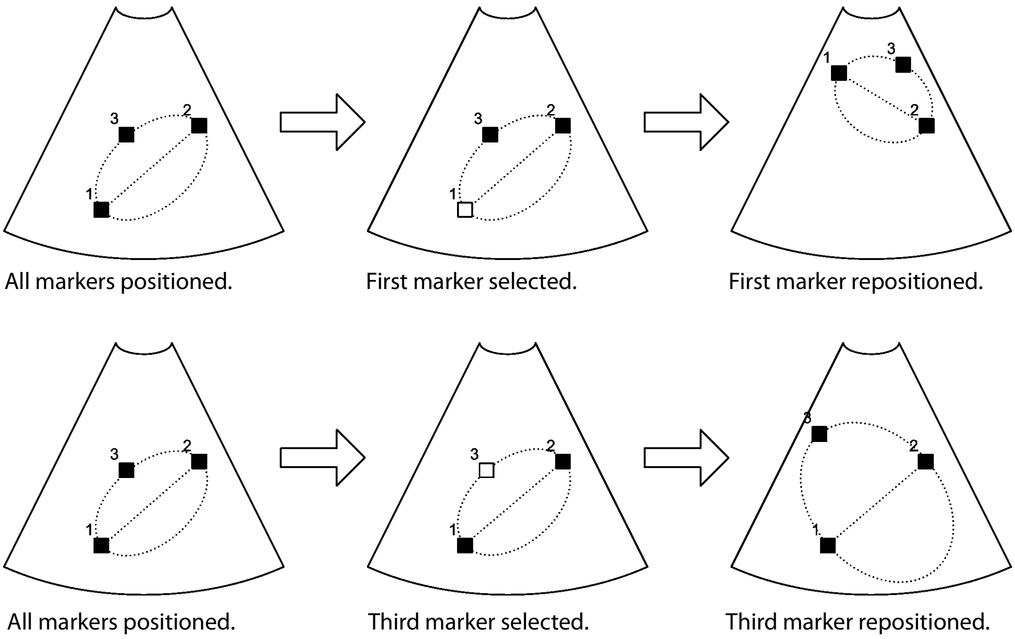


Figure 5-8. Repositioning markers in an ellipse you have drawn.

To move the entire ellipse without changing its size or orientation:

1 Click inside or on the ellipse.

2 Drag it.

3 Click again.

All of the ellipse does not have to lie within the ultrasound image.

Moving an ellipse

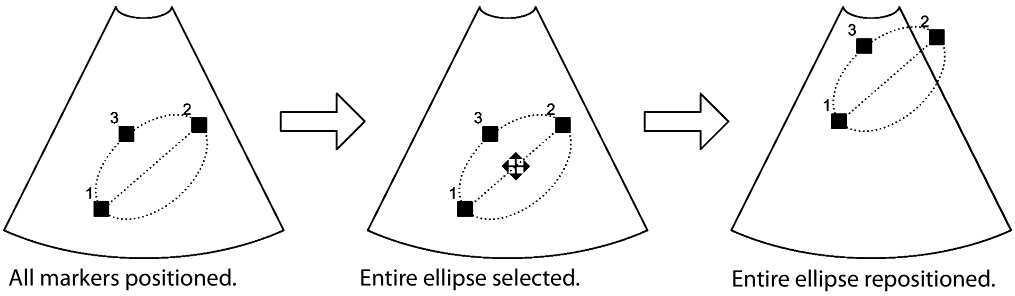


Figure 5-9. Moving an ellipse.

Polygon Measuring Tool

On a B-mode or Color mode image, you can position a number of markers to define the outline of a polygon. Position the markers in the usual way. After you position one and click it, a new marker appears. A dotted line connecting it to the previously positioned marker is continuously redrawn as you drag the new maker and click it to position it.

To delete the marker you have just positioned:

- Press **-** on the [+/-] key.

To undo the deletion:

- Press **+**.

Closing the polygon

When you have positioned the final marker you want to use, *double-click* it to indicate that it is the final marker in the polygon. A line is drawn from it to the first marker. No new marker appears after you double-click the final one.

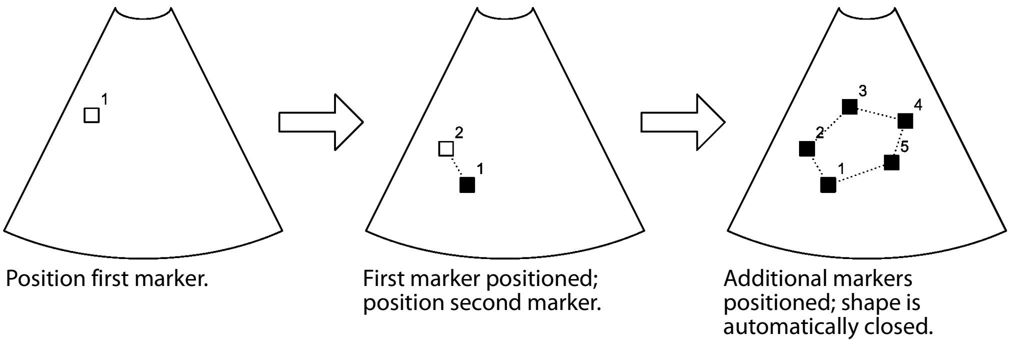


Figure 5-10. Drawing a polygon.

After the markers have been positioned, you can move any of them by clicking and dragging to a new location. Click again.

Repositioning a polygon marker

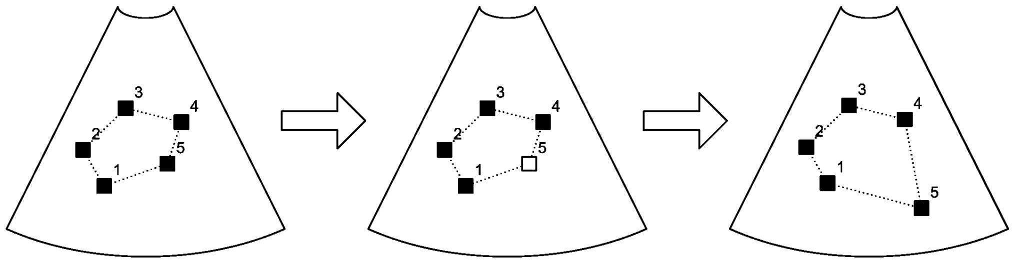


Figure 5-11. Repositioning one of the markers in a polygon.

To move the entire polygon without changing its size or orientation:

1 Click inside or on the polygon.
2 Drag it.
3 Click again.

You can move the shape to any location in the view.

Moving a polygon

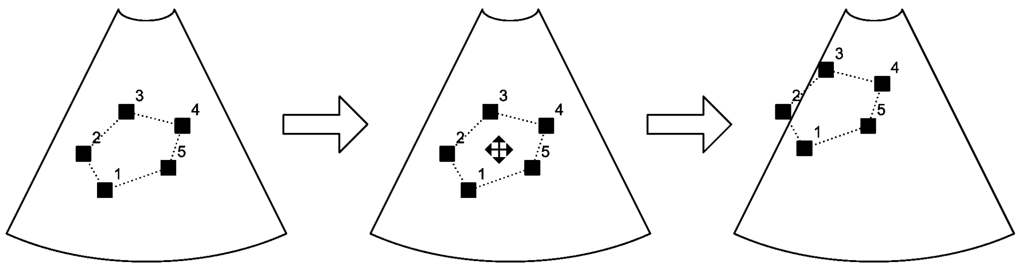


Figure 5-12. Moving a polygon you have drawn.

Polygon measuring tool

WARNING When you use the polygon measuring tool, if the sides of the polygon intersect (as in forming a curve like a figure eight, for example), the area calculation is incorrect. In this case, the calculated area of the polygon is the area of the bigger loop minus the area of the smaller loop.

Freehand Drawing on a B-Mode or Color Mode Image

On a B-mode or Color mode image, you can draw a closed shape freehand.

To draw freehand:

1 Click the measuring tool on the monitor:
   A drawing cursor appears.
2 Drag it to where you want to start drawing. Click.
   A second marker appears where you clicked.
3 Drag it to draw the shape you want.

Erasing what you have drawn

   To delete backward from the cursor, press - on the [+/-] key. The cursor is automatically moved back. To undo the deletion, press +.
4 When you have finished drawing, click the drawing cursor.

The shape is automatically closed by a straight line from the drawing marker to the first marker (starting point).

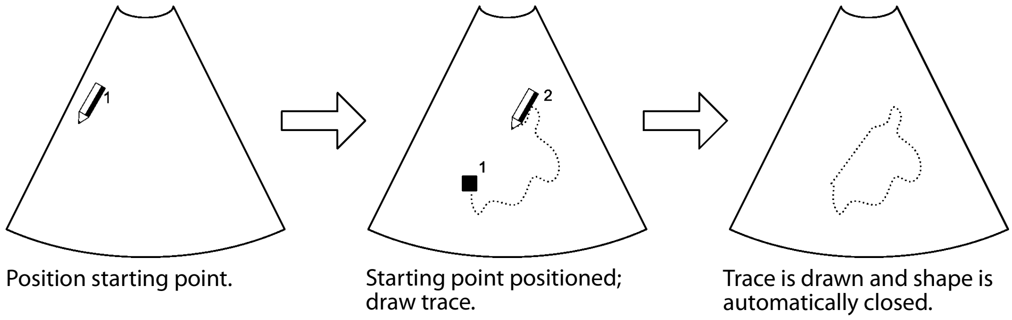


Figure 5-13. Drawing a freehand shape.

You can move the shape to any location in the view.

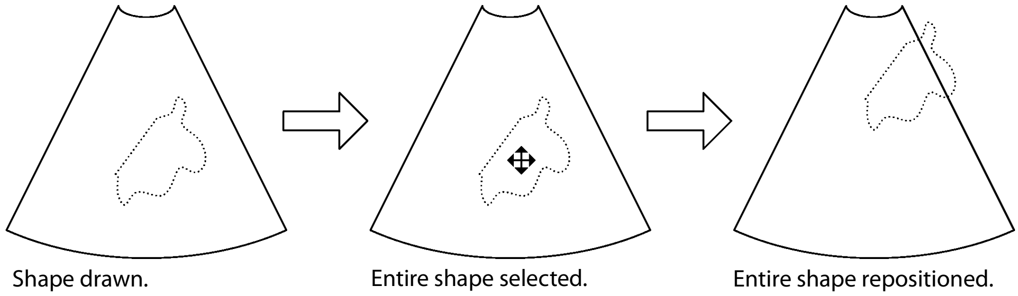


Figure 5-14. Moving a shape you have drawn freehand.

Doppler Mode Measuring Tools

Making measurements on a Doppler mode image is different (from measuring on a B-mode or Color mode image) because the Doppler mode image has time as a dimension. To avoid getting a negative result, successive markers must be positioned to the right, not the left, of any already-positioned markers.

Positioning 2 Point Markers on a Doppler Mode Image

While you are positioning a marker, 2 cursor lines are displayed. One is horizontal and one vertical, intersecting at the marker position.

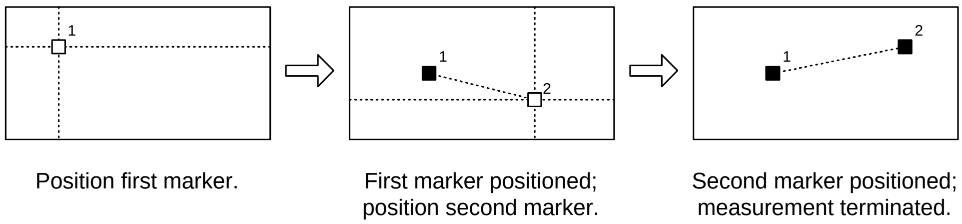
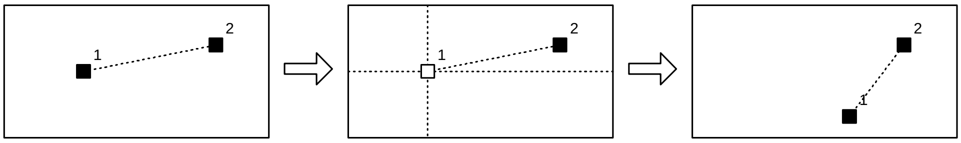


Figure 5-15. Positioning 2 point markers on a Doppler mode image.

After you position the markers, you can move one of them by clicking it and dragging it. Click again when you have positioned it where you want it.



All markers positioned. First marker selected. First marker re-positioned.

Figure 5-16. Moving a marker you have placed on a Doppler mode image.

You can position the markers anywhere in the Doppler mode image.

The appearance of the markers and whether they are connected by a dotted line depends on what you are measuring.

Positioning 1 Point Marker on a Doppler Mode Image

If you are measuring something that needs only one marker, position the marker in the same way as for 2 markers.

Positioning 2 Vertical Line Markers on a Doppler Mode Image

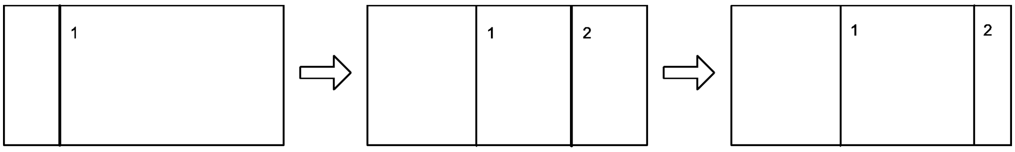
Two vertical line markers can be positioned on a Doppler mode image to measure intervals.

To position the vertical markers:

1 Click the measuring tool.
A marker appears on the image.

2 Drag this to the position you want. Click.
Another marker appears.

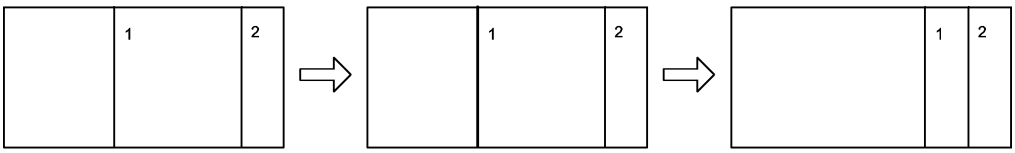
3 Drag it to the correct position. Click.



Position first line. First line positioned; position second line. Second line positioned; measurement terminated.

Figure 5-17. Positioning vertical markers on a Doppler mode image.

After you position the markers, you can move one of them by clicking it and dragging it. Click again when you have positioned it where you want it.



All lines positioned. First line selected. First line repositioned.

Figure 5-18. Moving a vertical line marker you have placed on a Doppler mode image.

Drawing an Outline Curve on a Doppler Mode Image

On a Doppler mode image, you can draw an outline curve freehand.

To draw freehand:

1 Click the measuring tool on the monitor:

A drawing cursor appears.

2 Drag it to where you want to start drawing. Click.

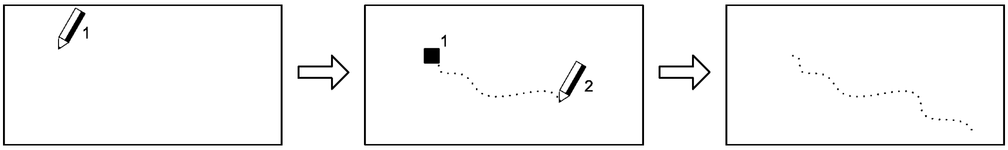
A starting point marker appears where you clicked.

3 Drag the drawing cursor to draw the shape you want. (You can only drag to the right; you cannot drag to the left.)

Erasing what you have drawn

To delete backward from the cursor, press **-** on the [+/-] key. The cursor is automatically moved back. To undo the deletion, press **+**.

4 When you have finished drawing, click the drawing cursor.



Position starting point. Starting point positioned; draw trace. Trace is drawn.

Figure 5-19. Drawing a freehand curve on a Doppler image.

Chapter 6
Documentation

What are documents?

This chapter describes ways to save, view and delete documents.

There are different types of documents:

- Images (2D and 3D)
- Clips (2D and video)
- 3D data sets
- Reports

In this chapter, the term “document” refers to all of these types of documents unless a particular type is specified.

HIPAA Compliance

HIPAA (the American Health Insurance Portability and Accountability Act of 1996) sets standards for handling patient data and medical records in a way that ensures the privacy and security of all health-care related data. Each hospital or office must set up procedures to make sure that all information that identifies an individual remains confidential and safe. Always follow the procedures that have been established for your workplace.

Information relating to HIPAA compliance can be found in the various parts of this chapter:

- "Deleting Documents or Patients from the System” on page 120.
- "HIPAA Compliance and Exporting Data” on page 122.
- "Password Protection of the Patient Archiving System” on page 130.

Local Patient Archiving System

The local patient archiving system contains information about patients and examinations, including comments about patients or documents.

When you capture an image or save a document during an examination, it is saved directly into the patient archiving system. If the document browser is open, it is automatically updated to show the saved documents from the current examination.

NOTE: *The patient archiving system can be password-protected. See "Password Protection of the Patient Archiving System” on page 130..*

The Document Browser

Documents on the system

You use the document browser at the bottom of the monitor to review and manage images and other documents stored in the patient archiving system. The document browser contains an image bar with a toolbar underneath it.

Externally stored documents

You can also use the document browser to review images and other documents stored or archived on external media, including network drives.

Not for PACS

You cannot use the document browser to review images and other documents stored on a PACS.

To open or close the document browser:

- Click **View Exam.** or **View Archive** in the toolbar at the bottom of the monitor.

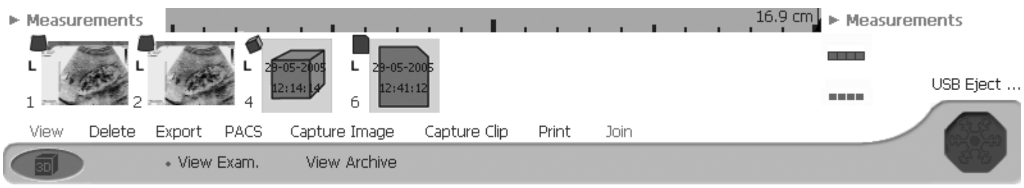


Figure 6-1. The document browser window.

The Image Bar

The image bar contains thumbnails of the available documents. Each thumbnail includes icons and numbers that give information about the document.

Icons and letters

A small icon in the upper left corner of each thumbnail identifies the document type. The letters L and A indicate whether it is archived locally or externally. A magnifying glass with a blue frame around it identifies the document that is displayed in the image area. An orange magnifying glass indicates a document that you are pointing at.

Icon	Information about Document
	Image
	3D data set
	Clip
	Report
L	Document is archived locally (on the system)
A	Document is archived externally
	Note: If document is archived both locally and externally, both L and A are shown.
	Blue magnifying glass icon indicates the document that is displayed in the image area. See "Using the Magnifying Glass Icon" on page 113..

Table 6-1. Document icons.

If the browser contains so many images that the thumbnails cannot fit on the monitor, you can use arrows at the left and right end of the image bar to scroll through the thumbnails.

Selecting Documents

You can select one or more documents so that you can view them or copy or archive them.

To select or deselect a document:

- Click the document thumbnail in the browser.

  (A magnifying glass icon appears when you point at a thumbnail. See Fig 6-3. Do NOT click inside the frame around the magnifying glass icon. See Fig 6-4.)

  A blue frame surrounds each document that is selected. (You can select more than one.)

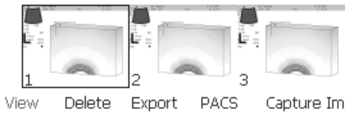


Figure 6-2. Document 1 is selected.

To select or deselect all documents in the browser:

- Click one of the icons to the right of the browser. See last row of Table 6-2.

The Document Browser Toolbar

The toolbar below the image bar contains the tools you can use in the document browser.

Click triangle for options

If there is a triangle to the right of the tool, click it to see options that you can select instead of using the default option.

Tool	Function
View	Displays the currently selected document (2D image, 2D video clip of images, 3D data set, Pro Package report). If more than one document is selected, clicking **View** has no effect.
Delete	Deletes the currently selected documents (see page 120).
Export	Exports the selected documents to an external storage device. If you click **Export** and do not select any option, the export option used is the same as the last time you exported. (The default is always the last option that was selected.) See description of **Export** options following this table.
PACS	Sends selected patients, examinations, 2D images or clips to the last-used PACS. If no PACS has been used since the system was turned on, information is sent to the default PACS. (Click the triangle to the right to select a different PACS, if more than one has been set up.) You cannot send 3D images or reports to a PACS.
DICOM Print	Sends all selected 2D images or all 2D images from selected patients or examinations to a queue to be sent to the last-used DICOM printer. If no DICOM printer has been used since the system was turned on, information is sent to the default DICOM printer. (Click the triangle to the right to select a different DICOM printer.) You cannot use this to print clips, 3D images or reports. See "Printing a Report" on page 130..
Capture Image	Saves the current image (frozen or not) to the local patient archiving system.
Capture Clip	Saves the clip (image sequence) from now and forward in time to the local patient archiving system. Click to start capturing and click again to stop before the standard clip time is finished. (Can be customized so that the captured clip is of the sequence just *before* you click **Capture Clip**.) You can capture a clip when the image is frozen or not frozen.
Join	Joins selected video clips into one large clip. The selected clips are deleted and replaced by the new large clip. The time label of the new clip is the latest time of the selected clips.
Print	Prints selected 2D images or all 2D images from selected patients or examinations on the default printer. You can select a different printer.
	Click top icon to select all thumbnails in the document browser. Click bottom icon to deselect all thumbnails in the document browser.

Table 6-2. Document browser tools.

Export Options	Functions
Copy to CD/DVD	Places documents in the staging area so that they can be burned on a copy CD or DVD in .bmp format.
Copy to CD/DVD (DICOM format)	Places documents in the staging area so that they can be burned on a copy CD or DVD in DICOM format.
Copy to CD/DVD (without patient ID)	Places images, clips and 3D datasets *with the patient ID removed* in the staging area so that they can be burned on a copy CD or DVD. Reports cannot be copied with the patient ID removed.
Copy to USB	Copies documents to a USB storage device in .bmp format.
Copy to USB (without patient ID)	Copies images, clips and 3D datasets *with the patient ID removed* to a USB storage device. Reports cannot be copied with the patient ID removed.
Copy to USB DICOM format)	Copies documents to a USB storage device in DICOM format.
Archive to CD/DVD	Places documents in the staging area so that they can be burned on an archive CD or DVD.
Archive to Network Drive	Archives documents on a network drive.

Table 6-3. Export options in the document browser.

Saving Documents – Capturing Images and Video Clips

You must have a patient ID entered in order to capture images and clips. Normally, you should enter this before you start imaging. If you have forgotten to enter a patient ID, and you have already made some measurements on an image, you can, however, enter the patient ID and not lose the measurement.

To enter patient information for the current image (and measurement):

1 Open the **Patient** window (see page 48).
2 Enter patient information to start the exam.
3 Click **Capture Image** to capture the current 2D frozen image, with any measurements. Click **Capture Clip** to capture a clip.

NOTE: *If you clicked* **Capture Image** *before entering the patient information, you do not have to click* **Capture Image** *again. If you clicked* **Capture Clip** *before entering the patient information, you must click* **Capture Clip** *again to end the clip (if forward capture is enabled).*

2D Images and Video Clips

To save a 2D image or video clip to the patient archiving system, click **Capture Image** or **Capture Clip** in the Document Browser toolbar.

You use the **Clip Storage and Cine Setup** window (see page 206) to specify (by setting **Forward Capture** to be **on** or **off**) how your system captures clips. You can also set the default clip length there.

Multiple clips

You can also set up user-defined keys to capture images and clips, or you can set up a key so that it captures images if the image is frozen and captures clips if the image is not frozen. See "User-Defined Keys" on page 201.. You can also set up a key to capture multiple clips. See page 209.

Video Clips – Capturing while Imaging

There are two ways to capture video clips when the image is not frozen.

Forward Capture ON

This is the default setting. You click once to start recording and again to stop recording.

To record a video clip:

1 Click **Capture Clip** to start recording.

2 Click **Capture Clip** again to stop recording.

Forward Capture OFF – Capturing What Has Just Happened

If Forward Capture is OFF, you can capture a video clip based on the cine loop of what has just happened.

To capture a clip of what has just happened:

1 Make sure that **Enable forward capture** is *not* checked. See Fig 14-6 on page 207.

2 Click **Capture Clip.**

The last 5 to 30 seconds of video data (from the cine loop) is captured and stored. (You specify the length of the clip in the **Clip Storage and Cine Setup** window; see page 207.)

Capture while Not Imaging

It is possible to continue to capture a clip when you freeze the image, or even to start to capture a clip when the image is frozen. This can be useful if you want to capture the process of making a measurement, for example. If the system is *not* set to capture while not imaging, freezing the image pauses a clip capture that is in progress. You set up this functionality in the **Clip Storage and Cine Setup** window on page 207.

3D Data Sets

3D data sets are automatically saved to the patient archiving system.

Reports

To save a report to the patient archiving system, click **Save** in the report.

Viewing Documents

Using the Document Browser

To view thumbnails of documents in the document browser:

Documents from current exam

- To see documents associated with the current examination, click **View Exam.** in the toolbar at the bottom of the monitor.

  Small pictures (thumbnails) of 2D images, video clips, 3D data sets or reports from the current examination are displayed in the document browser.

NOTE: *Clip Storage may have been disabled. See "Clip Storage and Cine Setup" on page 206..*

Other documents on the system

- To see other documents in the patient archiving system, click **View Archive**. The **Archive** window opens. See "The Archive Window" on page 117.

Using the Magnifying Glass Icon

To view a document:

1. Point at the document.

   A magnifying glass icon appears in the upper right corner of the thumbnail.

Figure 6-3. Magnifying glass icon.

2. Point at the magnifying glass icon.

   An orange frame appears around the magnifying glass icon.

Figure 6-4. Frame around magnifying glass icon.

3. Click inside the orange frame. It turns blue.

   The document is displayed in the image area.

Selection status not changed

NOTE: *Clicking the magnifying glass icon does not change the selection status of ANY documents.*

Frame Color When two magnifying glass icons are visible (as in Fig 6-5), one has an orange frame and one has a blue frame. The blue-framed icon indicates the document being viewed.

Orange and blue frames

Figure 6-5. Two magnifying glass icons. Document 2 is being viewed.

In Fig 6-5, Document 2 is being viewed. If you click where the pointer is, Document 3 replaces Document 2 in the image area, and the magnifying glass icons change as illustrated in Fig 6-6.

Figure 6-6. Orange frame has turned blue. Document 3 is being viewed. Magnifying glass icon has disappeared from Document 2.

To clear the viewed document from the imaging area:

- Click the magnifying glass icon in the blue frame.

  or

- Click **Close Review** on the right side of the monitor.

Other Ways to View a Document

To view a document:

- Select a document thumbnail and click **View**. (You cannot do this if more than one thumbnail is selected.)

  or

- Double-click the document thumbnail.

  The document is displayed in the image area, and *any other documents you have selected are deselected.*

Video Clips

Viewing and Editing a Video Clip on the System

When you view a video clip or cine image, there are special controls you can use to play, pause or go forward or back. You can also edit the clip.

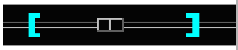
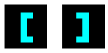
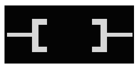
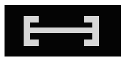
Video Clip Control	Function
	Slider indicates current position in clip. When the clip is paused, you can click the slider and move back and forth in the clip. See description of cursors below.
	Play, Pause. Only one of these is visible at a time.
	Click one of these to move the clip one frame backward or forward. Work when clip is paused.
	Left and right cursors. Click the icon to place the cursor next to the slider at the current position in the clip. When the cursors are present, as shown with the slider in the first row of this table, the clip will start from the position of the left cursor and stop at the right cursor.
	Cut. Click this to cut away (remove) the part of the clip that is between the cursors. Both cursors must be positioned before you cut.
	Crop. Click this to remove the part of the clip that is outside the cursor(s). At least one cursor must be positioned before you crop.
Close Review	Closes the review in the image area. Changes made with Cut and Crop are stored as a new clip that is added to the examination. After the review is closed, you can delete the original clip if you want to keep only the edited one.

Table 6-4. Viewing and editing controls for cine images and video clips.

Externally Stored Documents

Documents that have been archived or copied to external storage media can be viewed on the system or on a PC.

Viewing Exported Documents on the System

Documents that have been archived or copied to external storage media can be viewed on an ultrasound system.

From network drive

Documents that have been archived to a network drive can be accessed, just like documents stored on the system, by selecting an examination in the **Archive** window. (See page 117.)

From CD, DVD or USB

You can use the document browser to look through documents that you have copied or archived to a CD, DVD or USB storage device.

To view externally stored documents:

1 Insert a CD or DVD into the DVD drive or insert a USB storage device into the USB connector on the left side of the DVD drive.

2 Click **View Archive** in the toolbar at the bottom of the monitor. (If the patient archiving system is password-protected and you are not logged on, this option is not visible.)

3 In the window that appears, click the **CD/USB** tab.

The **External Documents** window appears, containing a list of the folders on the external storage device(s).

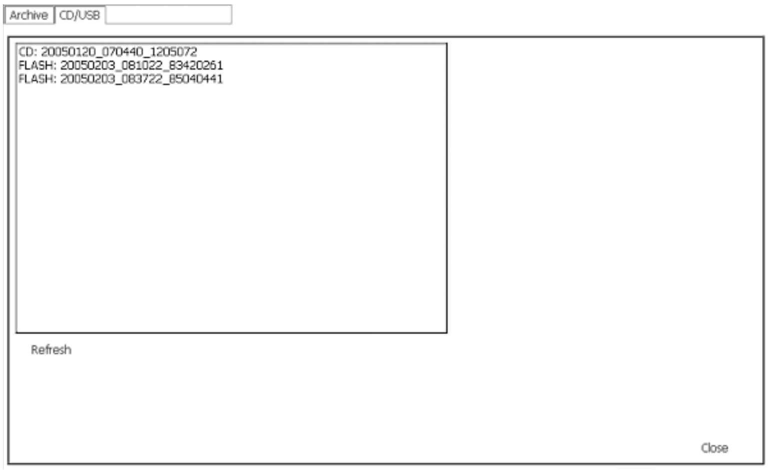


Figure 6-7. The External Documents window.

4 Click to select a folder.

The document browser is updated with the documents in the selected folder.

Viewing Exported Documents on an External Computer

Formats of Exported Documents

Copied Images Images copied to a CD or USB storage device are stored in DICOM or .bmp format. In .bmp format, they are labeled with a code that specifies the date and time the image was captured. For example, 2D_20131022_135426_FV12345.bmp would be the label on an 2D image of patient FV12345 that was captured on October 22, 2013 at 1:54:26 P.M. (13:54:26). The label on a DICOM file is the same except that the file extension is .dcm.

Copied Video Clips Video clips can be copied in .avi or DICOM format.

Archived Images and Video Clips Archived images and Video Clips (including ones archived on the system) are stored in DICOM format.

Viewing Images on a Computer

NOTE: *DICOM format requires a DICOM viewer on your computer.*

Copied documents

Copied images have been exported in DICOM or bmp. format. You select the file you want to view.

Archived documents

All *archived* images, whether on the system or on a CD, network drive or PACS system, are stored in a DICOM® format; you will not be able to read externally archived documents on a computer unless you have a DICOM viewer.

Viewing Video Clips on a Computer

DICOM format

If the video clip has been exported in DICOM format, you can view it with a DICOM viewer.

.avi format

If the video clip is not saved in DICOM format, you can still view it on a PC, but you must have a codec installed on the PC. You can set up the system to export the codec to an external storage medium. (See page 209.) The codec is exported to a folder called **Codec**.

To install the codec on your PC:

1. Use Windows® Explorer to view the contents of your external storage medium.
2. Open the folder called **Codec**.
3. Right-click the file called **lagarith.inf** and click **Install**.

   The codec is installed.

NOTE: *Lagarith version 1.3.27.0 is required.*

The Archive Window

You use the **Archive** window together with the document browser to manage all the documents in the patient archiving system. You can view documents, delete documents, copy documents, archive documents and send them to a PACS or DICOM printer.

To open the Archive window:

1. Click **View Archive** in the toolbar at the bottom of the monitor. (If the patient archiving system is password-protected and you are not logged on, this option is not visible.)
2. Click the **Archive** tab.

   The **Archive** window opens.

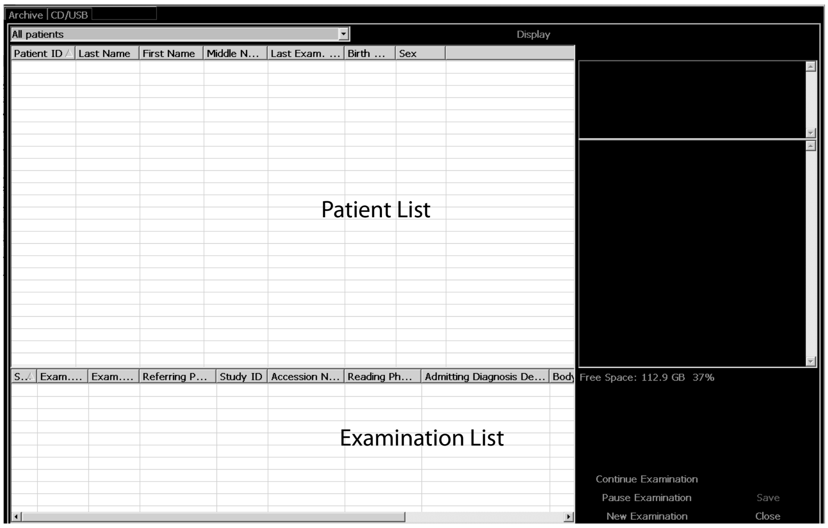


Figure 6-8. The Archive window.

The **Archive** window has 3 parts:

- a list of patients
- a list of examinations of selected patients
- a comment window containing patient or document comments

Patient List

The Patient List contains patient IDs, names, and other information about patients in the patient archive, including the date of the last examination. You can filter the information so that only certain patients are displayed. Table 6-5 explains the various ways you can filter the patient list.

Select this in the Display field	Type this in the Find field	Patients Displayed
Current patient's exams	*Not applicable*	The current patient (the one whose ID is displayed at the top of the monitor).
Patients examined today	*Not applicable*	All patients that have been examined today.
All patients	*Not applicable*	All patients.
Patients with exams before...	A date. (See "Entering Dates" on page 51..)	All patients who have any examination before the date you enter.
Patients with exams after...	A date. (See "Entering Dates" on page 51..)	All patients who have any examination after the date you enter.
Patients with data including...	Smith 1975	Patients named Smith, Smiths, Smithson, Whitesmith and those with other names containing "Smith". All patients born in 1975.
Patient with patient ID	the exact patient ID	The patient with a specific patient ID.
Patients with comment including...	"severe" (for example)	All patients with a patient comment that contains "severe".
Patients with document comment including...	"tumor" (for example)	All patients with a document comment that contains "tumor".
Patients with uncommitted documents	*Not applicable*	All patients with uncommitted documents.
Patients with committed documents	*Not applicable*	All patients with committed documents.
Discontinued examinations	*Not applicable*	All patients with discontinued examinations.
Not archived	*Not applicable*	All patients that have no archived examinations.
All archived	*Not applicable*	All patients with at least one archived examination.

Table 6-5. Ways to select the patients displayed in the Archive window.

Sorting columns

You can sort the listed patients according to the information in one of the columns by clicking the column heading. For example, if you click the **Last Name** column, the listed patients will be sorted alphabetically by last name.

Rearranging columns

You can move the columns to rearrange them. Click a column you want to move and drag it to a new position.

Examination List

To see the records (examinations) for particular patients, click the row in the Patient List that contains the patient. (To select more than one row, press **[Ctrl]** while you click.) The list in the Examination List is updated to display examinations from the selected patient(s).

To see documents from a particular examination, click the row containing the examination. (You can select more than one.) The document browser is updated with the thumbnails of documents of the selected examination(s).

Searching for Patients in the Examination List

In addition to filtering the patients, as described in Table 6-5, you can search for patients with specific information in various columns in the **Examination List**.

Hiding Part or All of the Examination List

You may not want all patients to be visible when the **Examination List** is displayed. You can control which patients appear by setting a filter to be active by default. See “Miscellaneous System Setup” on page 215.

Patient and Document Comments

The comment window to the right of the **Archive** window is a **Patient Comment** window if a patient or examination is selected. If a document in the document browser is selected, the window is a **Document Comment** window.

Existing comments are displayed in date order with the newest comments at the top.

To enter a comment:

1. Click in the comment window (see Fig 6-8).
2. Type the comment.
3. Click **Save** below the comment window.

   The comment appears (with the date and time above it) in the lower part of the comment window.

Deleting Documents or Patients from the System

NOTE: *In rare circumstances, you may want to clear (delete) the entire patient archive from the system. If you do, see "Miscellaneous System Setup” on page 215..*

Documents

You can delete documents from the system if they have not been archived externally. If they have been archived externally, you can delete the documents themselves from the system, but the patient and the reference to the externally archived documents remain.

NOTE: *You cannot delete a document that is in a queue to be sent to a DICOM device.*

Patients

You can delete a patient record from the system if the patient has no externally archived documents.

To delete one or more documents (archived or non-archived) from the system:

1. Click the images in the document browser to select them.
2. Click **Delete** in the toolbar below the document browser.
3. You are asked to confirm that you want to delete the documents.
4. Click **Yes**.

   The selected documents are deleted. If they were archived before they were deleted, the examination record, with a reference to where the documents are archived, remains on the system.

To delete all documents associated with an examination:

1. Click to select the examination. To select more than one row, press **[Ctrl]** while you click.
2. Click **Delete** in the toolbar below the document browser.
3. You are asked to confirm that you want to delete the documents.
4. Click **Yes**.

   The documents associated with the selected examination(s) are deleted.

NOTE: *The examination record itself is never deleted (unless you delete the patient).*

To delete a patient with no externally archived documents:

1. Click to select the row containing the patient. To select more than one row, press **[Ctrl]** while you click.
2. Click **Delete** in the toolbar below the document browser.

   You will be asked to confirm that you want to delete the patient.
3. Click **Yes**.

   All local documents for the patient are deleted. The patient is deleted in the patient archive if documents for the patient have not been externally archived (that is, if they only appeared locally in the patient archiving system).

Starting a New Examination from the Examination List

You can start a new examination from the **Archive** window. If a patient is selected in the window, the **Patient** window that opens contains patient data for that patient. If no patient is selected in the Archive window, the **Patient** window that opens is empty.

See "Using the Patient Window” on page 49..

To start a new examination:

- Click **New Examination** or press [ ].

Exporting Data

You can copy and archive documents so that they are stored outside the system.

Copying

Copying When you copy a document, only the document is copied.

You can copy documents to a CD, DVD or a USB storage device.

Patient database copied with archiving

Archiving When you archive a document, the patient database is copied along with the document. This ensures that you have a backup of the patient database as well as ultrasound images in case anything happens to the system hard disk.

You can archive documents to a CD, DVD or a network drive. You can also archive them to a Picture Archiving and Communications System (PACS). See "Archiving to a CD, DVD or Network Drive" on page 122. and "Archiving to a PACS" on page 123..

HIPAA Compliance and Exporting Data

To preserve patient confidentiality when you copy patient data, select the option to copy images and other documents to a CD, DVD or USB storage device *without the identifying patient information*: **Copy (without Patient ID).**

If you archive to a CD, DVD or network drive, the archive is password-protected, but you must still be aware that you are exporting confidential data from the system.

Copying to a CD, DVD or USB Storage Device

You can copy documents associated with a patient to a CD, DVD or USB storage device.

You can make more than one copy of a document.

See "Using CDs or DVDs" on page 123. and "Using USB Storage Devices" on page 125..

To copy individual documents or all the documents associated with a specific examination or patient:

1. Click to select the patient, the examination, or the individual documents you want to copy.
2. Click **Export**.

   The documents are exported using the option that was last used (which could be an archiving option).

   To select another option, click the triangle to the right to select the destination and whether you want to copy in DICOM format or not. Copying the document **without Patient ID** is recommended for patient security.

   The documents are copied to the staging area (see "Staging Area" on page 124.) or to the USB storage device.

Archiving to a CD, DVD or Network Drive

To keep a permanent record of documents, you can archive them to a CD, DVD or a network drive. See "Using CDs or DVDs" on page 123. and "Using a Network Drive" on page 126..

NOTE: *Archiving must be done to an empty CD or DVD. After you have archived documents to a CD or DVD, you cannot use the same disc again for archiving.*

You can archive a document to a CD, DVD or network drive only once. This means that you cannot archive the same document to both a CD, a DVD and a network drive. The system keeps a record of where the document has been archived so that you can always find an archived document.

To archive all documents for a patient or examination or individual documents:

1. Click to select the patient, the examination, or the individual documents you want to archive.
2. Click **Export, Archive to CD** or **Export, Archive to Network Drive**.

   If you archive to a CD or DVD, you are asked for a volume name.

Archiving to a PACS

If you have DICOM installed on your system, you can also archive images and clips to a PACS.

NOTE: *The system can be set up so that you can archive the same document to more than one PACS. Only qualified service personnel should make changes to the DICOM setup.*

To archive all documents for a patient or examination or individual documents:

1. Click to select the patient, the examination, or the individual documents you want to archive.
2. Click **PACS**.

   The documents will be archived to the default PACS. To select another PACS, click the triangle to the right of **PACS**.

Using CDs or DVDs

There are certain restrictions about copying and archiving to a CD or DVD:

- You cannot burn both archived and non-archived documents to the same CD or DVD.
- You cannot archive to a CD or DVD that is not blank.
- Problems can arise if one CD-burning program has been used to burn data to a disc and you try to add new data using a different burning program. The current system may use a different burning program from the one on older systems.

NOTE: *CD and DVD discs are vulnerable, and data may be corrupted when they are saved to a disc. After you save, check the disc to make sure that your data are saved properly.*

Remove the disc from the system before you turn it off because data can also be corrupted when the system shuts down.

Supported disc types

The following media are supported:

- CD-R
- DVD-R

Caution: Be careful when you use the DVD drive. Insert discs carefully. Do not use force. Do not push the drive to close it – use the button on the drive when you insert or eject a disc.

Staging Area

When you click **Copy CD** or **Archive CD**, the selected documents are not copied immediately to a CD/DVD. They are moved to a staging area. You can add more files to the staging area before you burn them to a CD or DVD.

You set the size of the staging area to match the size of the CD or the DVD. See “Setting the CD/DVD Size” on page 206.

Files in the staging area do not disappear when you turn off the system. When you turn on the system, you are reminded if there are files in the staging area.

If you try to copy or archive documents, and the total, including what is already in the staging area, is too big to fit on a disc, you are informed that you cannot copy the documents to the staging area.

Burning a CD or DVD

To burn archives or copies to a CD or DVD:

1. Insert a disc into the DVD/CD-RW drive.
2. Click **Burn CD ...** under **Image** on the right side of the monitor.

   The following window appears:

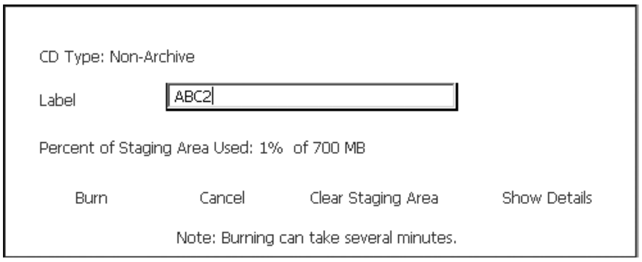


Figure 6-9. The Burn CD window.

3. If you are burning a copy, you must type a label name.
   If you are burning an archive disc, you cannot specify the label name here.
4. Click **Burn**.

   The progress bar tells you when the burning is finished. The keyboard panel and on-screen controls are disabled while the disc is being burned.

Reviewing and Deleting Documents in the Staging Area

You can also use the **Burn CD** window (Fig 6-9) to examine the contents of the staging area and to delete individual documents or clear all documents.

To review and edit the contents of the staging area:

- Click **Show Details**.

  The staging area browser appears in the **Burn CD** window.

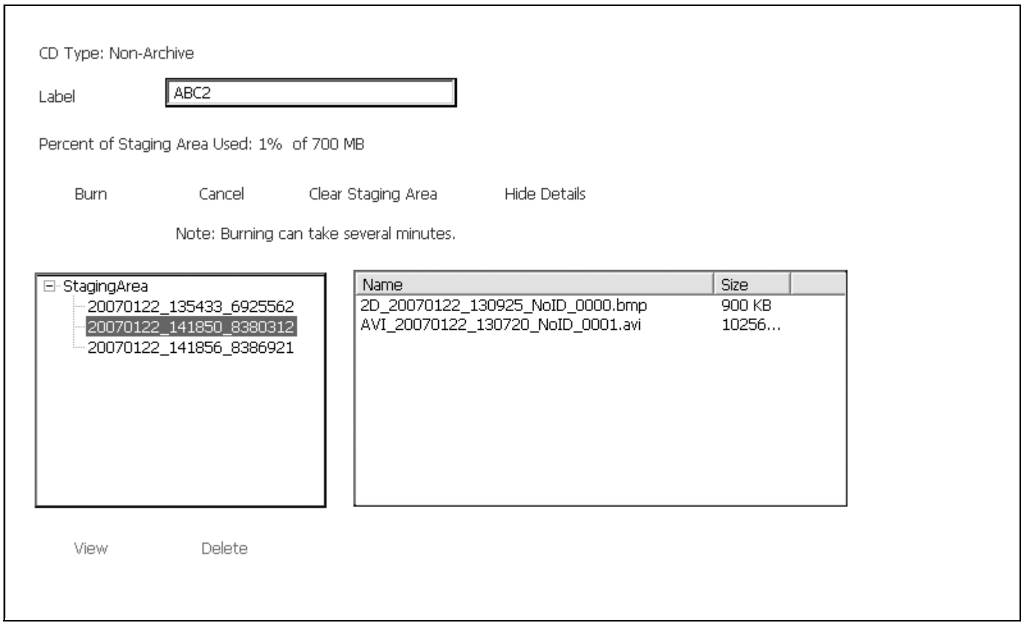


Figure 6-10. The staging area browser in the Burn CD window.

The list on the left side contains a list (labeled with the time) of selections you have put in the staging area.

If you click an item in the left-hand list, information about the individual documents it contains appears in the right-hand list.

To view a document in the staging area:

- Select it in the list on the right and click **View**.

To delete individual documents from the staging area:

- Select them (you can select more than one) and click **Delete**.

Caution: Be sure you have selected the correct documents to delete because they are deleted from the staging area as soon as you click Delete. You are not prompted to confirm that you want to delete them.

Clearing the staging area

To clear all documents from the staging area:

- Click **Clear Staging Area**.

Caution: When you clear the staging area, there is a risk of losing data if you have put something there (for example by clicking **Copy CD**) and then deleted it from the local patient archiving system. You are asked to confirm the deletion.

Caution: Do not delete documents from the local patient archiving system until you have verified that they have been externally archived successfully.

Using USB Storage Devices

Before you try to copy documents to a USB storage device, make sure that you have inserted the device into the USB connector.

When you click **Copy USB,** the copying starts immediately. (Unlike for CDs and DVDs, there is no staging area.) If more than one USB storage device is connected, choose which volume to copy to from the list that appears.

NOTE: *Some USB storage devices are configured as two partitions (for example, D: and E:).*

Caution: Before you remove the storage device, click **Eject USB** at the right side of the document browser. See Fig 6-1. You will be notified when it is safe to remove the storage device (no risk of losing data). If more than one storage device is connected, both will be ejected.

Using a Network Drive

A network drive can be set up for archiving; this must be done by a qualified service technician. The *2202 Service Manual* (BI2201) contains instructions for service personnel to use when configuring to a network drive.

Network Password

To access the network drive from the system, you need to log on to the network using your network username and password. There are 3 ways you can do this:

- You are prompted for the network username and password each time you try to access the network.
- If you use your network username and password as your system username and password, you can leave the password field blank (for greater security) when you set up network archiving. Then when you try to access the network drive (when you are logged on to the system), the system logs you on with your system username and password.
- If you enter the network username and password when you set up network archiving, the system remembers it for you and logs you in automatically. This is the least secure method.

Using the DICOM System

The information in this section only applies if DICOM is installed on your system.

Saving or Printing to a DICOM Network

When you archive or save to a PACS, the information is copied and put into a queue to be transferred to the PACS. When the PACS is available, the information is transmitted.

⚠ **Caution:** If you have an accidental power failure while information is being transferred to the PACS, transfer may fail. Documents and information may not be stored in the PACS even though they appear to have been transferred successfully from the system.

DICOM Status

A DICOM status indicator appears at the bottom right of the monitor. It has a little colored light next to it.

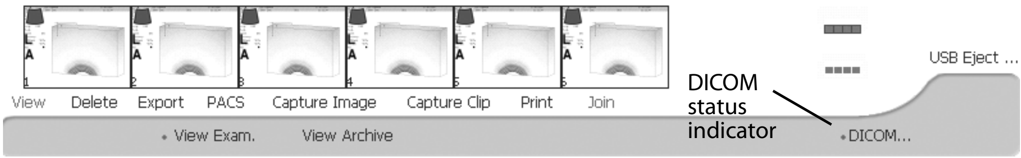


Figure 6-11. DICOM status indicator.

Status Indicator Color	Meaning
Green	No unsent documents. The LED disappears after 5 seconds.
Yellow	A document is being sent or waiting to be sent.
Red	A document was not sent successfully.

Table 6-6. DICOM status indicator.

If you click the DICOM status indicator, the DICOM status window appears.

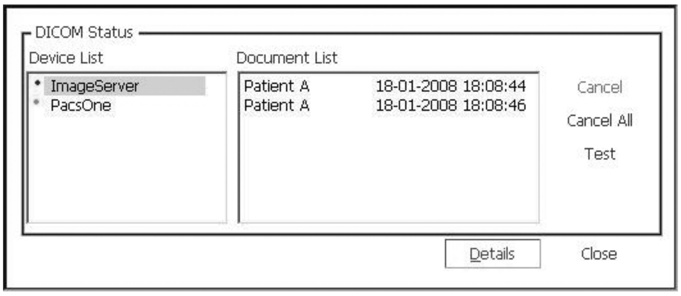


Figure 6-12. The DICOM status window.

Documents in queue

The colors of the status indicator next to a device in the Device List are the same as described in Table 6-6. If a device has a red or yellow indicator, you can click the device name to see a list of unsent documents displayed in the Document List. To check the DICOM storage commitment status for the sent documents, you can search for patients with committed documents in the **Archive** window (see page 117).

You have the following options:

- **Cancel** – cancels the selected document.
- **Cancel All** – cancels all pending documents or jobs for the selected device.
- **Test** – tests the connection to the selected device (PING + C-ECHO).
- **Details** – see log of DICOM transactions (see Fig 6-13).
- **Close** – closes the window and does nothing else.

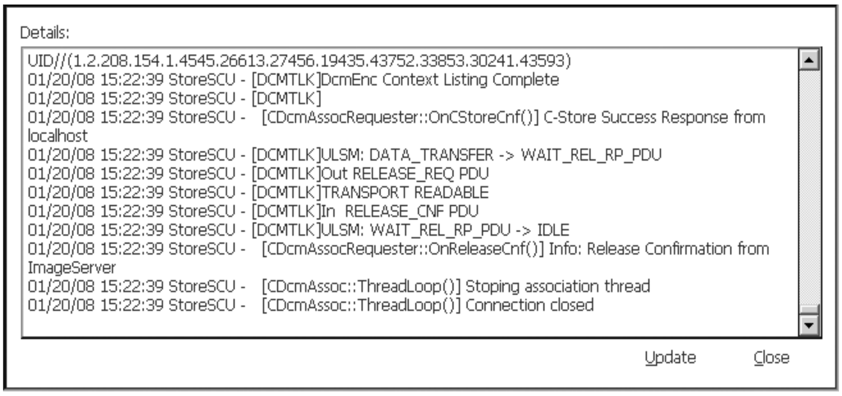


Figure 6-13. The DICOM transaction log.

To update the transaction log, click **Update**.

NOTE: *You can also open the DICOM status window from the* **DICOM Setup** *window. (Click* **Customize...** *under* **Image** *on the right side of the monitor. Then click the* **DICOM** *tab and click* **Status***.)*

Printing Documents or Images on the Monitor

You can print documents on a local printer or, if DICOM is installed on your system, send them to be printed on a DICOM printer. While a document is being sent to the printer, a small printer icon appears at the bottom right of the monitor.

Print quality

Caution: The quality of a printed ultrasound Image may vary, depending on the printer.

Printing Thumbnail Images

To print documents on a local printer:

1. In the document browser, click to select the documents you want to print.
2. Click **Print** to use the default printer.

   To use a different printer, click the triangle to the right of **Print** and click the printer you want.

To print documents on a DICOM printer:

1. In the document browser, click to select the documents you want to print.
2. Click **DICOM Print** to use the default DICOM printer.

   To use a different printer, click the triangle to the right of **DICOM Print** and click the printer you want.

Using a Transducer Button

You can set up a transducer button as a user-defined key (see "User-Defined Keys” on page 201.) for printing.

Printing Images Displayed on the Monitor on a Local Printer

To print the monitor using a local printer:

- Press [🖶] or the user-defined key assigned to printing.

Reports

Reports are defined for each Pro Package. A report contains information about the patient and the measurements you have made. You can add remarks to a report. You can save a report to the patient archiving system and view or save it in the same way as you view or save other documents. See page 111.

Creating a Report

To create a report:

- Press [**F8**] (**Report)** or a user-defined key.

  The report appears on the monitor.

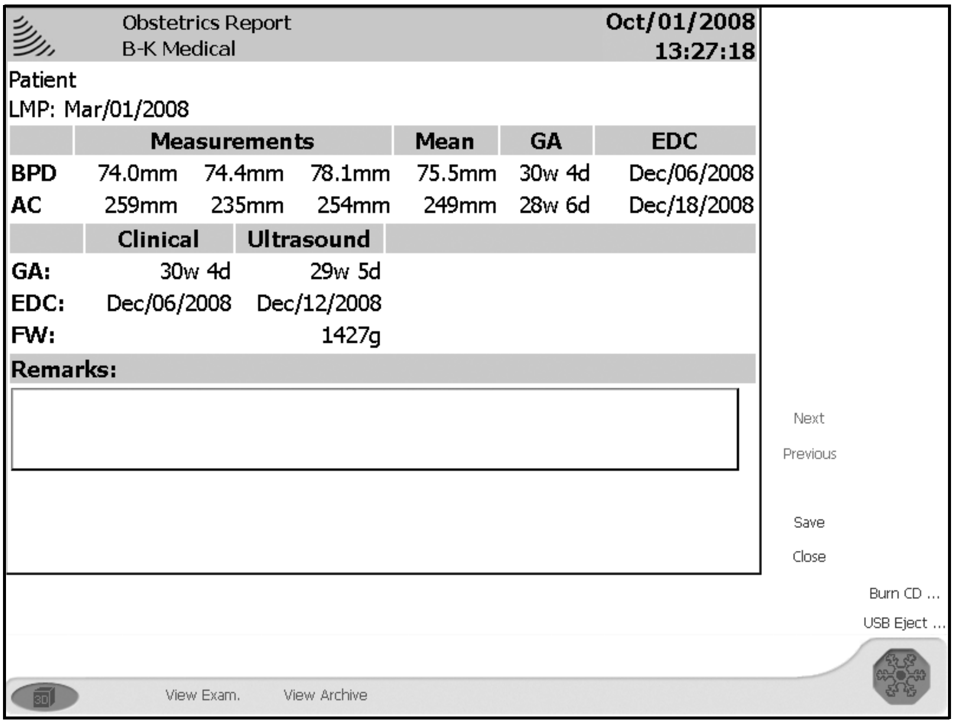


Figure 6-14. An OB report.

The contents of the report will vary, depending on the Pro Package and the measurements you have made.

If the report has more than one page, click **Previous** and **Next** to navigate through the pages.

Patient comments are included in a report. You can also add additional remarks.

Adding remarks

To add a remark to a report:

- Type in the **Remarks** area.

Editing a Report

You can edit a report before you save it or after it has been saved.

To edit a measurement in a report:

1. Click the measurement result in the **Measurements** column.

   A window appears with choices of how you can edit the value.

Figure 6-15. Window for editing report values.

2. Select what you want to do and click.

Printing a Report

To print a report:

- Press the key that is assigned to printing.

  The current page of the report is printed. If the report has more than one page, click **Next** or **Previous** to view other pages of the report and print them.

Saving a Report to the Patient Archiving System

To save the report to the patient archiving system:

- Click **Save** on the report.

Exporting a Report

It also possible to export DICOM Structured Reports.

To send a report to a PACS:

- Click **PACS**.

  For more information, see "Archiving to a PACS" on page 123.

You can also copy a report to an external storage device. See "Copying to a CD, DVD or USB Storage Device" on page 122.

You can archive a report to an external storage device or network location. See "Archiving to a CD, DVD or Network Drive" on page 122.

Password Protection of the Patient Archiving System

To help comply with HIPAA standards, the patient archive database on the system can be password-protected with a user-specific ID (username) and password.

NOTE: *If you archive documents to a CD or DVD, the database copy on the disc is protected with a different password. See "The Archive Window" on page 117..*

If the database on the system is password-protected, when you turn on the system, a login window appears:

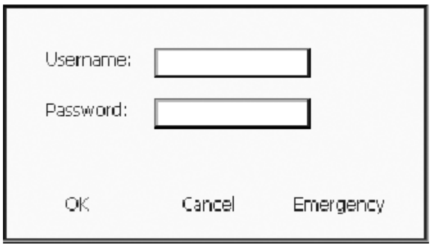


Figure 6-16. The login window.

Enter your system username and password and click **OK**. To change your password, see "Password Setup” on page 213..

Not Logged In

If you click **Cancel** in the window, you can use the system but you cannot use the patient archiving system or the 3D system. This means you cannot capture images or clips or 3D data sets. You also cannot see patient information or documents in the patient archiving system.

If you press [ ] to start the 3D system, the login window appears. If you log in, you are allowed to use the 3D system (if you have a license for it).

The login window also appears if you try to enter a patient ID when you are not logged in.

Emergency State

In an emergency, someone without a password may need to use the system and there may not be time to type in a name and patient ID. In this case, when the login window appears, click **Emergency**. This puts the system in the emergency state.

In the emergency state, a default patient ID (“EmergencyID”) is used. You can capture images and clips, but they will all have “EmergencyID” as the patient ID.

NOTE: *If you have clicked Emergency in the login window, do not send pictures to a PACS because they will be identified as EmergencyID and you will not be able to identify pictures from different patients.*

You can log in with your password at any time. When you do that, the emergency ID disappears and you must enter a patient ID.

Hard Disk Quota

The system hard disk does not have unlimited storage capacity.

The system checks the space on the hard disk each time you enter a new patient ID. If the hard disk is getting full, you will be notified:

- when there is less than 2 GB available space on the hard disk.
- when there is less than 1.5 GB available on the hard disk.
- when there is less than 1 GB available on the hard disk. At this point, you will not be allowed to save any more information to the hard disk.

To clear space on the hard disk, you must delete some documents. You can archive them to a CD, DVD or PACS (if you have DICOM installed) before you delete them from the hard disk.

NOTE: *If you have archived the documents to a CD or DVD, wait to delete them from the hard disk until you have successfully burned the archive disc. See "Using CDs or DVDs" on page 123.. If you have archived them to a PACS, make sure that they have been transferred successfully into the system before you delete them from the system hard disk.*

Capturing Multiple Clips

You can set up a user-defined key so that when you press it, a macro runs that captures multiple (sequential) clips and saves them in the patient archiving system. You can specify the number of clips in the sequence. To set up multiple clip capture, see "Clip Storage and Cine Setup" on page 206..

Interrupting multiple clip capture

To interrupt the multiple clip capture before the sequence is finished, press the user-defined key again.

Part 3: Imaging Modes

Chapter 7
B-Mode – 2D Imaging

Overview

B-mode ultrasound gives real-time 2D information about the anatomical structure of soft tissues.

Combination modes

B-mode can be used in combination with other imaging modes. See “Combination Modes” on page 146.

To return to imaging with B-mode alone after you have been using it in combination with other modes, press [B].

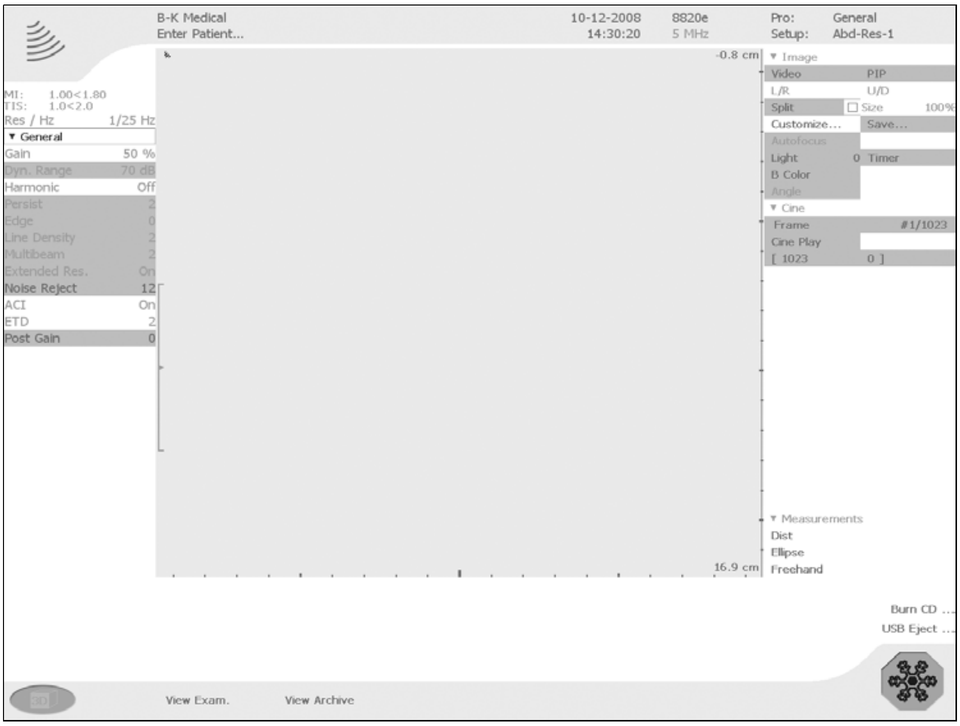


Figure 7-1. B-mode image.

Adjusting MI

You can adjust the maximum allowed MI (mechanical index).

To adjust the MI limit:

- Click **MI** above **Gain** on the left side of the monitor and drag the slider.

or

- Turn **[M/Doppler Gain]** (if the key is not assigned to adjusting gain for M-mode or Doppler gain).

Adjusting the Image Area

Depth

Full B-mode image

With a full B-mode image, you adjust the depth to cut out parts below the part you are interested in. The image always includes the transducer surface, so this key changes the magnification of the image, stretching or compressing it.

NOTE: *To adjust the depth of the image without changing the magnification, see “Panning” on page 140. When the image is panned, the top of the image does not necessarily still correspond to the transducer surface.*

Zoomed image

Adjusting the depth of a zoomed image (see “Zoom” on page 140), changes the magnification even though the transducer surface is not necessarily visible at the top of the image.

There are two ways to adjust image depth.

To adjust image depth:

- Make sure the cursor is located within the image and press [**+/-**].

or

- Press the [**Depth**] key to increase or decrease depth.

NOTE: *Pressing the* **+** *end of the key decreases the depth – increases the magnification.*

When the depth has been adjusted, **Zoom/Pan** is visible under **Image** on the right side of the monitor, together with a small indicator light.

To return to original depth:

- Click **Zoom/Pan.**

Width

You can adjust the width of the image area in a B-mode image. A narrow width allows for greater frame rate without a loss of image resolution.

To adjust the width of the image area:

- Press the [**Width**] key to increase or decrease width.

Red. Sector

If the image width is reduced, **Red. Sector** appears under **Image** on the right side of the monitor, together with a small indicator light.

For some transducers, you can increase the width of the image area beyond normal full width. This is called *Expanded Sector.* (With linear transducer arrays, this is sometimes referred to as *Trapezoidal View.*)

Exp. Sector

When the image area is wider than normal, **Exp. Sector** appears under **Image** on the right side of the monitor, together with a small indicator light.

To turn off reduced or expanded sector in one step:

- Click **Red. Sector** or **Exp. Sector** on the right side of the monitor.

  The image width returns to the normal full width for the transducer.

Gain

To adjust the gain (brightness) of the image, use a combination of the [**B Gain/Cine**] dial and the [**TGC**] (Time Gain Compensation) sliders on the control panel.

B-Mode Gain

The [**B Gain/Cine**] dial determines the overall amplification that is applied to ultrasound echoes from all depths.

To adjust the overall gain:

- Turn the [**B Gain/Cine**] dial.

or

- Click **Gain** under **General** on the left side of the monitor and drag the slider (or point at **Gain** and press [**+/-**]).

The current overall gain setting is displayed on the monitor next to **Gain**. As a default, the gain is displayed as a percentage, but you can choose to have it displayed in db. (See "Miscellaneous System Setup" on page 215.)

TGC

The TGC curve determines variable amplification applied to echoes from different depths in the tissue. The TGC function compensates for attenuation and scattering of the ultrasound beam in the tissue.

When you select a transducer, if all TGC sliders are in the center position, imaging starts using a default TGC curve optimized for the transducer. (The default is either the one set at the factory or one you have set up yourself.)

The [**TGC**] sliders adjust the relative gain of the image at different tissue depths. Each slider adjusts a specific part (1/8th) of the TGC curve; the topmost control adjusts the top 1/8th of the image.

NOTE: *The sliders operate relative to their center position; when they are all centered, the default TGC is used. However, resetting the gain to the default setting may change the relationship between the TGC sliders and the TGC curve. See "Auto" on page 141.*

To adjust the TGC curve:

- Move the [**TGC**] sliders to the right or left to adjust the TGC curve.

  The shape of the TGC curve is temporarily displayed to the right of the image as a curved vertical line. This indicates the modification that is applied to the default TGC curve.

NOTE: *The TGC curve operates on the monitor image, not on the ultrasound echo. Thus if you move or resize the image, you may have to readjust the TGC curve.*

360° transducers

NOTE: *With 360° transducers, the top slider adjusts the part of the image that is most central – that is, closest to the transducer.*

Post Gain – Gain of Frozen Images

You can adjust the B-mode gain of a frozen image when you are imaging in B-mode alone or in a combination mode.

To adjust the B-mode gain of a frozen image:

- Click **Post Gain** under **General** on the left side of the monitor and drag the slider.

  Negative values make the frozen image darker. Positive values make the frozen image lighter.

B-Gain/Cine

You can also turn [**B Gain/Cine**] to adjust the B-mode gain of a frozen image. When you freeze the image, [**B Gain/Cine**] is assigned to the CINE function. But you can press [B] to toggle the function of the dial between CINE and POST GAIN.

Focus

The ultrasound image is focused very sharply within a selected zone, while the rest of the image is not as well focused. The Pro Focus can use either a single focal zone or multiple (up to 8) focal zones (multiple focusing).

Multiple focus and resolution

When more than one focal zone is active, ultrasound beams are focused at different depths in the tissue. This improves the focus in several zones. However, using more focal zones gives a lower frame rate. Thus using multiple focal zones when there is much tissue movement causes the image to be blurred.

The **Focus** indicator to the left of the image shows the extent (range) of the focal region as well as the points of best focus.

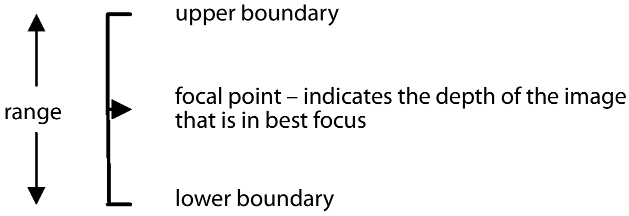


Figure 7-2. The Focus indicator.

The focal point triangle indicates the depth of the image that is in best focus – the focal point. If there is more than one focal point (composite focus), the number of triangles indicates the number of focal points (but not necessarily their position, because this is automatically optimized).

You can adjust both the position and range of the area in best focus. You can also select the number of focus zones.

To adjust focus position:

To move the focus up or down on the image, select the focus indicator and drag it vertically to the desired position on the image.

1. Select the **Focus** indicator by clicking on it or pressing [⁅].
2. Drag the **Focus** indicator to the desired position.
3. Click.

To adjust focal range:

- Point at the **Focus** indicator and press [+/-].

or

- Click one of the focus boundary indicators. Drag it and click, or press [+/-].

Any changes you make to focus settings can be saved in a preset.

Number of Focal Zones

When you choose to have more than one focal zone, the zones are automatically positioned within the focal range to give a uniform resolution throughout the range.

To select the number of focal zones:

- Press [**Resolution**] to increase or decrease the number of focal zones.

or

- Click **Res/Hz** on the left side of the monitor and select the value you want (or point at **Res/Hz** and press [+/-]).

The current number of focal zones and the frame rate are displayed on the monitor next to **Res/Hz** (as **x/y Hz**, where x is the number of focal zones and y is the frame rate).

You cannot select the number of focal zones if either ACI or AMA is turned on.

When AMA is on, the number of focal zones is limited to one or two, two being used only for the highest value of **Res/Hz**, and only if it improves the image.

Autofocus

Autofocus ensures that the center of the focal range is always centered in the displayed image.

To turn autofocus on or off:

- Click **Autofocus** on the right side of the monitor.

Dynamic Range (Contrast)

You can adjust the dynamic range (contrast) of the ultrasound image from 50 to 90 dB.

To adjust dynamic range:

- Press [**Dyn Range** ◐] to increase or decrease the level

or

- Click **Dyn. Range** under **General** on the left side of the monitor and drag the slider (or point at **Dyn. Range** and press [+/-]).

The current dynamic range setting is displayed on the monitor next to **Dyn. Range**.

Zoom

Zoom

To zoom in or out on the area you are interested in, adjust the Zoom box and then make the part of the image that is inside the box fill the monitor.

- To zoom in on a small part of the image, make the box smaller.

When you press [ ], the result depends on how many times you have already pressed it. A long press on [ ] turns off the Zoom box.

Pressing the key	Does this	You can
First press	Turns on the Zoom box and selects it. You can move (drag) it or resize it.	Move it (drag) or resize it ([+/-] key).
Second press	Makes the contents of the (selected) Zoom box fill the entire monitor.	Press [ ] to return to the previous image.
Third press	Returns image to the state it was in before the first press.	

To use the Zoom box (zoom on different parts of the image):

- Press [ ].
  A Zoom box appears superimposed on the image. It is selected (can be dragged) when it first appears. If the box is present but not selected, click inside the box to select it.

Moving the Zoom box

- To move the Zoom box to a different part of the image, drag the box with the trackball. Click to release the cursor when the box is where you want it.
- If the Zoom box is visible but not selected (you cannot drag it to move it), click inside the box to select it, then drag it.

Zooming in and out

- To resize the box (zoom in or out), press [+/-] when the box is selected.

  You can also resize the box by clicking one of the corners (selecting it) and then dragging the corner or using the [+/-] key.

When the image has been zoomed, **Zoom/Pan** is visible under **Image** on the right side of the monitor, together with a small indicator light.

To return to the original image:

- Press [ ].

Panning

Panning is moving the image so that different parts of the total image are displayed on the monitor.

You can pan in any direction, though only as far as the image area of the individual transducer permits.

To pan the image:

1. Double-click on the image.
2. Drag the image.

When the image has been panned, **Zoom/Pan** is visible under **Image** on the right side of the monitor, together with a small indicator light.

To return to the original image:

- Click **Zoom/Pan** under **Image** on the right side of the monitor.

Persistence

Persistence is the amount of time over which B-mode image frames are averaged on the monitor. High persistence increases the contrast in the image, but tissue movement will blur a high-persistence image.

You can select the persistence level of the ultrasound image.

To adjust B-mode persistence:

- Click **Persist** under **General** on the left side of the monitor and select the value you want (or point at **Persist** and press [**+/-**]).

  The available values range from 0 (no averaging) to 8 (maximum averaging).

  The current setting is displayed on the monitor next to **Persist**.

Edge Enhancement

Edge enhancement is a way of emphasizing contours so that edges stand out more clearly.

You can select the degree of edge enhancement of the ultrasound image. You cannot do this if ETD is turned on (see "Enhanced Tissue Definition – ETD" on page 143).

To adjust edge enhancement:

- Click **Edge** under **General** on the left side of the monitor and select the value you want (or point at **Edge** and press [**+/-**]).

  The available values range from 0 (no enhancement) to 7 (maximum enhancement).

  The current setting is displayed on the monitor next to **Edge**.

Auto

You can reset the B-mode overall gain and the TGC curve to the default setup for the preset.

NOTE: *This works only if you are not imaging in Doppler mode or CW Doppler mode. If Doppler or CW Doppler mode is active, the Auto function changes the Doppler display instead. See "Auto" on page 187 and on page 193.*

To reset the gain:

- Press [**Auto** ✹]

The overall gain is reset (50%) and the TGC curve is set to the default setup, indicated by a straight vertical line temporarily displayed to the right of the image.

NOTE: *The TGC sliders do not move when you do this. Thus the shape of the TGC curve on the monitor may not correspond to the relative position of the sliders on the control panel. gain. See "TGC" on page 137.*

Line Density

Line density is a measure of how closely spaced the image lines are in the ultrasound image. Increasing the line density decreases the frame rate so that you get finer resolution but a slower refresh rate.

You can select the line density of the ultrasound image for B-mode, tissue harmonic imaging (TEH - see page 146) and contrast imaging (CHI - see Chapter 8, "Contrast Imaging").

To adjust line density:

- Click **Line Density** under **General** on the left side of the monitor and select the value you want (or point at **Line Density** and press [**+/-**]).

  The current setting is displayed on the monitor next to **Line Density**.

NOTE: *You can adjust B-mode line density to have a different value when you use B-mode in combination with another mode (see "Combination Modes" on page 146). Changes you make in one case (imaging in B-mode alone or in combination) may not affect the other case (in combination or B-mode alone).*

Multibeam

Multibeam is a method for increasing the frame rate or the line density by receiving signals from several directions.

To select the multibeam level:

- Click **Multibeam** under **General** on the left side of the monitor and select the value you want (or point at **Multibeam** and press [**+/-**]).

  The current setting is displayed on the monitor next to **Multibeam**.

Resolution

You adjust resolution in the Pro Focus by adjusting the number of focal zones (see page 139) or line density (see page 142).

Extended Resolution

When B-mode only is imaging, you can use Extended Resolution to obtain better spatial resolution of the image at the cost of a lower frame rate.

To turn Extended Resolution on or off:

- Click **Extended Res.** under **General** on the left side of the monitor and select **On** or **Off**.

B-Mode Frequency – MFI

Harmonic imaging

If an MFI (Multi-Frequency Imaging) transducer is selected, you can select the imaging (transmitted) frequency. The current imaging frequency is displayed at the top of the monitor. (If harmonic imaging is turned on, the displayed frequency is the receiving frequency. See page 147.)

To select the imaging frequency:

- Press [**Frequency**] to step through the frequency options. (If you are using B-mode combined with other modes, the key works on Color or Power frequencies instead of the B-mode frequency.)

or

- Click the current imaging frequency (for example, **5.0 MHz**) in the Identification area of the monitor and select the value you want (or point at the frequency and press [**+/-**]).

The view must be imaging when you do this.

B-Mode Gray Scale

Several gray scales can be used to display a B-mode image. Different gray scales may make various aspects of the image clearer.

To select the gray scale in B-mode:

1. Point at the upper right of the image area.

   A gray scale bar appears.

2. Click the gray scale bar and select the gray scale you want.

   The gray scale bar is replaced by the one you select.

Enhanced Tissue Definition – ETD

With ETD, an automatic speckle suppression algorithm continuously analyses the ultrasound image for irregularities and adjusts the smoothness to be applied. This reduces speckle and optimizes the ultrasound image. ETD supports all array transducers (mechanical transducers are not supported).

ETD can be set at 5 different levels ranging from subtle speckle reduction (level 1) to strong reduction (level 5). The default level is 3, level 0 turns ETD off.

To set the ETD level:

- Click **ETD** under **General** on the left side of the monitor and select the desired level.

NOTE: *When imaging in B+M-mode, ETD is not applied to the M-mode image.*

Angular Compound Imaging – ACI

Angular Compound Imaging is a result of combining images made at up to 5 different angles into one compound image. This also reduces speckle and optimizes the ultrasound image.

NOTE: *In certain cases ACI can remove or suppress some image artifacts such as shadowing, (from e.g. kidney stones or cyst edges) which may be used to identify certain characteristics of the imaged anatomy.*

ACI can be turned on/off and is only supported for some transducers. When ACI is turned on, you cannot set the number of focal zones (see page 139).

To turn ACI on or off:

- Click **ACI** under **General** on the left side of the monitor.

You can also assign one of the user-defined keys on the control panel to turn ACI on/off (see “User-Defined Keys” on page 85).

AMA – Automatic Mode Adjustment

AMA is an image optimization function available on the Pro Focus Ultraview. In addition to automatic parameter adjustment, it includes motion compensation technology that helps minimize B-mode image blurring caused by motion of the transducer or of the tissue being imaged.

AMA is set to be on by default for presets where it is appropriate and works only with array transducers.

You can override the default setting to turn AMA on or off manually, but this is not recommended. AMA may not only adjust parameters that are not under user control; specific useful combinations of normal user parameters not accessible to the user can also be used in AMA mode because dependencies to other parameters are controlled.

Furthermore, typical changes to predefined setups such as depth changes, changes of color box size, or Doppler PRF can be handled automatically by AMA.

We believe that in most cases you will not be able to optimize the image as well as the system can.

When AMA is on, you set the compromise you want between frame rate and resolution (spatial resolution and contrast). The system then automatically adjusts a number of imaging parameters (including some that are not under user control) to give you the best image. AMA can be used in B-mode, Color mode and Doppler mode.

In B-mode, the normal user parameters that AMA adjusts are:

- Line density
- Extended resolution
- Number of focal zones
- Multibeam

NOTE: *If you want to adjust any of these parameters manually, you must turn AMA off. You must also turn ACI off if you want to change the number of focal zones (in B-mode) yourself.*

To turn AMA on or off:

- Click **AMA** on the upper right side of the monitor.

To set the target resolution and the frame rate for AMA:

- Click **Res ◄►Hz** on the left side of the monitor and select the value you want (or point at **Res ◄►Hz** and press **[+/-]**).

  The highest value gives the highest resolution.

  The lowest value gives the highest frame rate (lowest resolution).

You can also assign one of the user-defined keys on the control panel to turn AMA on/off (see “User-Defined Keys” on page 85).

Reducing Noise

You can adjust the gray scale to help reduce noise in the image and also make dark parts of the image (blood vessels, for example) appear darker.

To reduce noise:

- Click **Noise Reject** under **General** on the left side of the monitor and drag the slider.

B Color

Instead of a gray scale, you can choose to have the B-mode image tinted with a color that you select.

To select a color for B color:

1. Click **B Color** under **Image** on the right side of the monitor.
2. Click **B Color Setup...** under **B Color**.
3. In the window that appears, select the color you want.
4. Click **OK**.

   The color bar that appears when you point at the upper right of the image area is replaced by one that uses the color you selected.

To turn B Color on or off:

Click **B Color** under **Image** on the right side of the monitor.

Combination Modes

Duplex and triplex

B-mode can be used in combination with other modes. (The terms *duplex* and *triplex* imaging refer to combinations of 2 or 3 modes.)

The available combinations are:

- B+Color
- B + M
- B+Power
- B+Doppler
- B+Color+Doppler
- B+Power+Doppler

For details about the other modes, see the chapter for each mode.

To add another imaging mode:

- Press [**Color**], [**Power**], [M] or [] to add Color, Power, Motion or Doppler mode.

To remove an imaging mode from the combination:

- Press the key for the mode you want to remove.

To return from a combined mode to B-mode only:

- Press [B].

NOTE: *Pressing* [B] *several times lets you toggle back and forth between B-mode and any combined mode.*

Tissue Harmonic Imaging (True Echo Harmonics – TEH)

True Echo Harmonics (TEH) is BK Medical's trademarked name for tissue harmonic imaging. Using it can reduce noise and improve the clarity of the ultrasound image.

In normal B-mode imaging, the transducer uses essentially the same frequency range for both transmitting and receiving. In harmonic imaging, the image is created by receiving higher frequencies (harmonics) that are multiples of the transmitted frequency (f). Tissue harmonic imaging in the Pro Focus is based on the 2nd harmonic (2f) spectrum and pulse inversion.

Using TEH

TEH can be used only with transducers that support harmonic imaging.

Each preset that permits TEH has default settings for overall gain, TGC gain, contour level, and contrast level for tissue harmonic imaging.

Restrictions

- TEH is available for B-mode imaging only. If more than one imaging mode is active, TEH will be disabled.
- TEH is available only for certain transducers.

Advantages

- Better images with difficult-to-image patients
- Increased contrast resolution
- Reduced effect of grating lobes

Limitations

- Best in mid-range depth – the specific depth range for which harmonic imaging works best depends on the transducer as well as other factors.
- Reduced penetration
- Reduced lateral resolution
- Reduced frame rate

NOTE: *To use tissue harmonic imaging, you must have the appropriate license installed.*

To turn TEH on:

Make sure that you are imaging in B-mode (imaging is not frozen).

- Press [ ] or click **Harmonic** under **General** on the left side of the monitor.

  If it is not already selected, click **TEH** to the right of **Harmonic**.

Displayed Frequencies for Tissue Harmonic Imaging

When TEH is turned on, the letter **H** appears next to the frequency at the top of the monitor. The displayed frequency is the receiving frequency – double the transmitted frequency.

To turn TEH off:

Make sure that you are imaging in B-mode (imaging is not frozen).

- Press [ ].

or

- Click **Harmonic** under **General** on the left side of the monitor and then click **Off** to the right of **Harmonic**.

When you turn harmonic imaging off, B-mode imaging resumes with the frequency, gain, dynamic range and so on that you were using previously.

Chapter 8
Contrast Imaging

Overview

In contrast imaging, a contrast agent consisting of microbubbles is injected into the patient. When the ultrasound waves are reflected from the contrast agent, non-linear responses are generated. The non-linear signals are received and analyzed to create the contrast image.

To use contrast imaging, you must have the appropriate license installed. For information about activating the Contrast Imaging option, see "Licenses" on page 238.

NOTE: *In the USA, contrast-enhanced ultrasound has not been market cleared by the FDA, with the exception of only select cardiac imaging applications.*

Contrast Agents

Follow contrast agent guidelines

Contrast imaging is optimized for SonoVue® and DEFINITY® contrast agents. You must follow the manufacturer's guidelines for using contrast agents and pay attention to any warnings, recommended precautions and contraindications.

Each preset for contrast imaging is labeled with the word SonoVue® or DEFINITY® and has default settings for overall gain, TGC gain, edge enhancement, and dynamic range for contrast imaging.

Restrictions

Contrast imaging can be used only with:

- B-mode imaging. If another imaging mode is active, contrast imaging is disabled.
- certain transducers.
- presets labeled SonoVue or DEFINITY.

Simultaneous Split-Screen Imaging and Contrast Imaging

It can be an advantage to use simultaneous split-screen imaging (see page 63) with contrast so that you can see a contrast image that contains no tissue information along with a B-mode image.

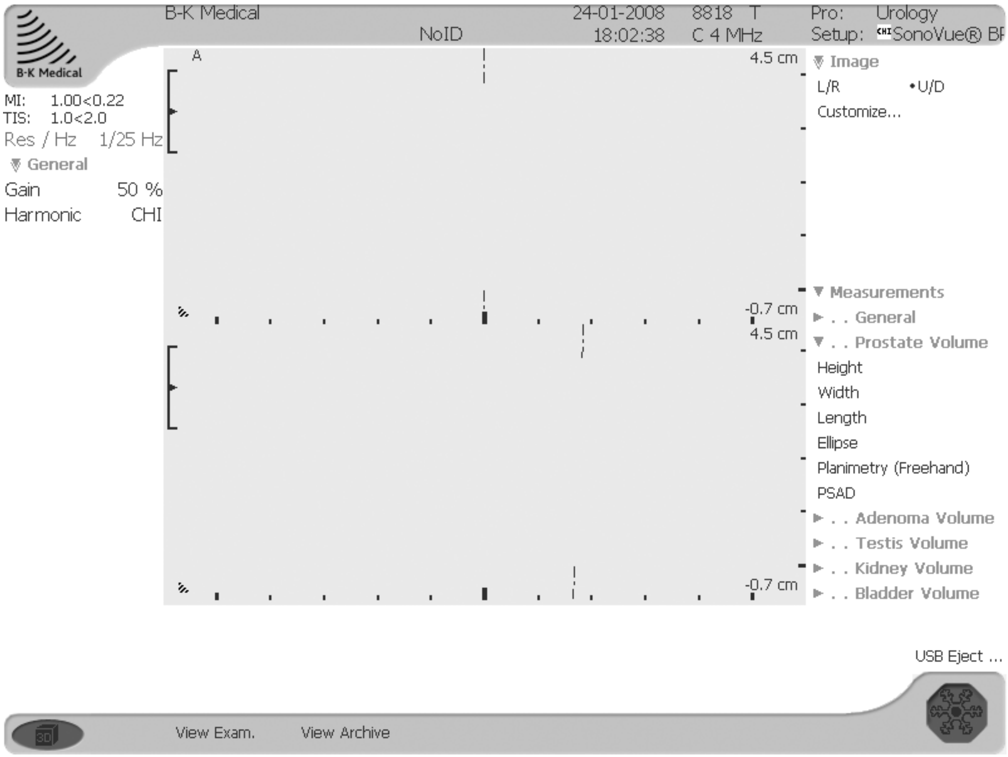


Figure 8-1. Contrast imaging with split screen.

To turn contrast imaging on:

Make sure that you are using a SonoVue or DEFINITY preset and that you are imaging in B-mode (imaging is not frozen).

- Press [ ].

or

- Click **Harmonic** under **General** on the left side of the monitor and then click **CHI** to the right of **Harmoni**c.

When contrast imaging is turned on, the letter **C** appears next to the frequency at the top of the monitor.

To turn contrast imaging off:

Make sure that you are imaging.

- Press [ ].

or

- Click **Harmonic** under **General** on the left side of the monitor and then click **Off** to the right of **Harmonic**.

When you turn harmonic imaging off, B-mode imaging resumes with the frequency, gain, dynamic range and so on that you were using previously.

MI after Contrast

NOTE: *When you turn contrast imaging off, the MI does not return to its previous value. It remains at the lower contrast imaging value until you adjust it yourself or until you choose another preset.*

CHI Accumulated

CHI accumulated increases the visibility of vessels that contain few contrast agent bubbles, such as microvessels or vessels with very slow flow.

With CHI Accumulated, the image from each imaging sweep is superimposed on the image. Because of this high persistence, you will not get good results if you use it on moving organs or if you move the transistor. At the end of the accumulation time, the image is cleared and a new image gradually builds up.

You can set up the system to perform a Bubble Burst (see page 152) at the end of each accumulation cycle. See “Miscellaneous System Setup” on page 215.

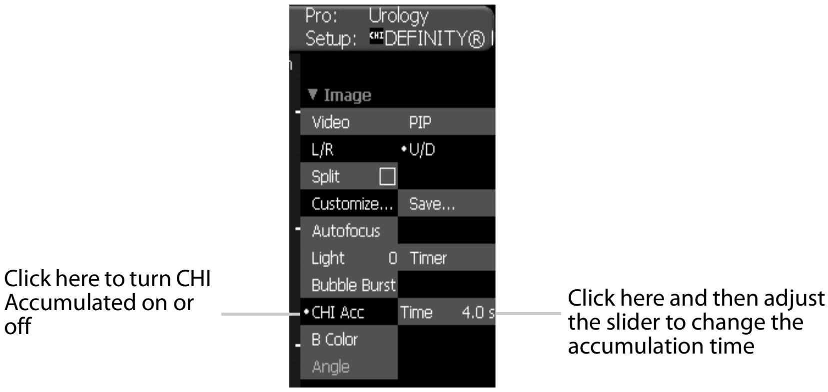


Figure 8-2. On-screen controls for CHI Accumulated. The controls are visible only when you are using contrast imaging.

To use contrast imaging:

1 Be sure that you have a license for contrast imaging. See “Licenses” on page 238.

2 Click **Setup** at the top of the monitor.

The **Pro Package Menu** window appears (see page 56.)

3 Click the SonoVue or DEFINITY preset that you want.

The MI limit will not change.

4 Use B-mode imaging to locate the lesion and prepare for contrast imaging.

5 Press [ ] or click **Harmonic** and then **CHI**.

The contrast frequency is displayed at the top of the monitor preceded by **C**.

6 Press [ ] to display both the B-mode image and the contrast image. See “Split Screen” on page 62.

7 Inject the contrast agent and start the timer. (See “Timer” below.)

8 Check the MI setting. When you turn on contrast imaging, the MI limit is reduced to avoid bursting the bubbles in the contrast agent. You can turn **[M/Doppler Gain]** or click **MI** to make small changes to the setting in order to make it suitable for the type of tissue and depth of the region of interest. (See “Adjusting MI” on page 135.)

9 For a full-screen contrast view, make sure that the contrast view is selected. Then press (long) [ ].

If you toggle between contrast and B-mode, the MI remains low in B-mode in order to preserve the bubbles.

Multiple clips

10 Click **Capture Clip** or **Capture Image** to save clips or images to the patient archiving system so you can review them later. The default frame rate for captured clips is 10 frames per second. You can also press a user-defined key to capture multiple clips. Pressing the same key again stops more clips from being captured.

11 If you want to inject more contrast agent, you can burst the remaining bubbles first. (See “Bubble Burst” below.)

Timer

You can start the timer to keep track of the elapsed time after you inject a contrast medium. The time will be displayed on a saved or printed image.

NOTE: *The timer is always available - not just with contrast imaging.*

To start the timer:

- Click **Timer** under **Image** on the right side of the monitor or press a user-defined key.

  The timer starts running and the elapsed time replaces the word “**Timer**”.

Position on image

  The elapsed time is also displayed in the image area of the monitor under the color bar. This time is saved when you save or print the image. You can move the time to a new location on the image by clicking and dragging it.

NOTE: *When you freeze the image, the time on the image is frozen, but the time next to the green light keeps running. When you unfreeze the image, the time on the image is updated to be correct.*

To stop the timer:

- Click the time under **Image** on the right side of the monitor.

  The time value in the image area disappears. The time under **Image** on the right side of the monitor is replaced by the word “**Timer”**.

Bubble Burst

When you use the BUBBLE BURST function, a stronger ultrasound pulse is emitted to burst the remaining bubbles so that you can inject additional contrast agent to repeat the examination.

To use Bubble Burst:

- Click **Bubble Burst** on the right side of the monitor or press a user-defined key.

  Bubble Burst remains on for 20 seconds or until you freeze the image, select a new preset or Pro Package, change imaging mode, change transducer, or split the screen.

⚠ High acoustic output during Bubble Burst

Caution: When you turn on Bubble Burst, the acoustic output limits are increased to 1.9 (MI). This change overrides any limits you have set. During Bubble Burst, the acoustic output will exceed normal contrast imaging values and may approach the higher (Bubble Burst) limits. (See "Thermal and Mechanical Indices" on page 33.)

Chapter 9
M-Mode

Overview

M-mode (motion mode) ultrasound is produced by slowly sweeping one line of a B-mode image across the monitor. The M-mode image illustrates a time series of images along this line.

Adjusting MI

You can adjust the maximum allowed MI (mechanical index).

To adjust the MI limit:

- Click **MI** above **Gain** on the left side of the monitor and drag the slider.

  or

- Turn **[M/Doppler Gain]** (if the key is not assigned to adjusting gain for M-mode or Doppler gain).

Turning M-Mode On or Off

M-mode can only be used in combination with B-mode.

To turn M-mode on or off:

- Press [M].

Selecting any other mode will also turn off M-mode.

You can also return to imaging with B-mode alone by pressing [B].

NOTE: *Ultrasound data are processed differently to produce B-mode and M-mode images. Therefore pixel values in the line used to create the M-mode image may differ from those in the corresponding line of the B-mode image.*

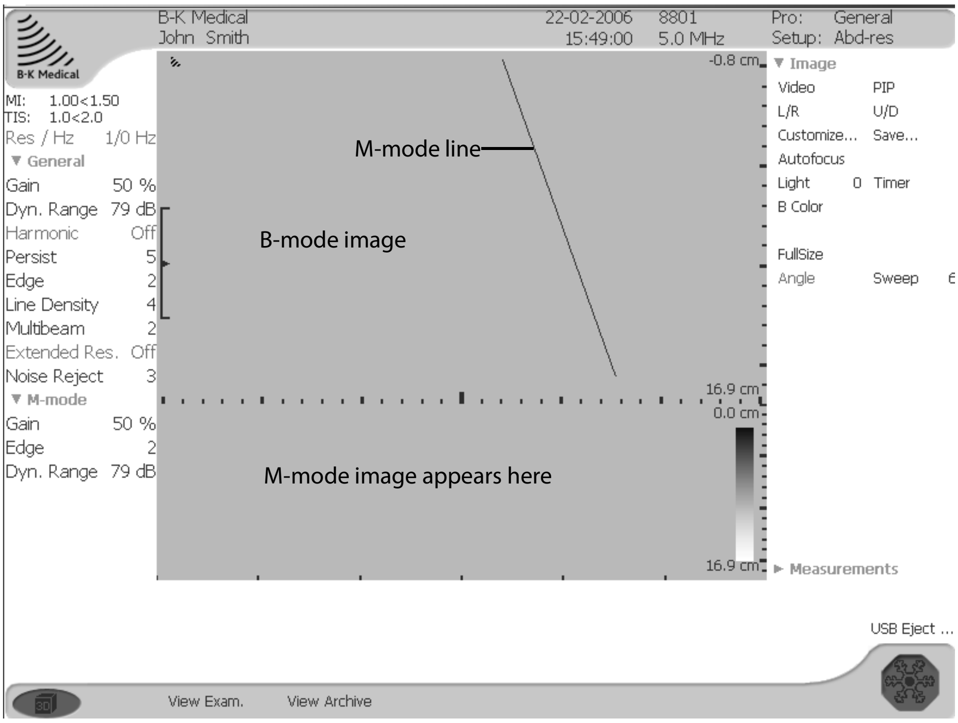


Figure 9-1. M-mode image.

The M-mode image

When M-mode is selected, the monitor will be divided into two windows (see Fig 9-1). You can adjust how the two windows are displayed (See "Doppler and M-Mode Screen Layout" on page 200).

Adjusting the Image Area

M-Mode Line

The M-mode line (see Fig 9-1) shows the path of the M-mode image in the B-mode window. You can adjust the path of the image by moving the M-mode line.

To adjust the M-mode line:

1. Select the M-mode line by clicking on it or press [↕].
2. Drag the line to the desired position.

M-Mode Image Ruler

The M-mode image ruler scales the ruler range of the B-mode image to the M-mode image. Any given value will represent the same position on both the M-mode and B-mode images.

It is not possible to change the ruler.

Sweep Speed

You can control the speed at which the M-mode image sweeps across the monitor.

To adjust the sweep speed:

1. Click **Sweep** in the right side of the monitor.
2. Drag to the desired value and click.

The available values range from 2 (slowest) to 8 (fastest).

Gain

To adjust the gain (brightness) of the image, use a combination of the [**M/Doppler Gain**] and the [**TGC**] (Time Gain Control) sliders on the control panel.

M-Mode Gain

The [**M/Doppler Gain**] determines the overall amplification that is applied to ultrasound echoes.

To adjust the overall gain:

- Turn the [**M/Doppler Gain**] dial.

or

- Click **Gain** under **M-mode** on the left side of the monitor and drag the slider (or point at **Gain** and press [**+/-**]).

The current overall gain setting (a percentage) is displayed on the monitor next to **Gain**.

TGC

M-mode uses the same TGC settings as the B-mode image.

To adjust TGC in the M-mode image, you must work in the B-mode image (see “TGC” on page 137). The changes that you make to the B-mode image will be reflected in the M-mode image.

Focus

M-mode uses the same Focus settings as the B-mode image.

To adjust the focus in the M-mode image, you must work in the B-mode image (see “Focus” on page 138). The changes that you make to the B-mode image will be reflected in the M-mode image.

NOTE: *Only a single focal zone is possible in M-mode.*

Autofocus

Autofocus ensures that the center of the focal range is always centered in the displayed image.

To turn autofocus on or off:

- Click **Autofocus** on the right side of the monitor.

  A small green light next to **Autofocus** indicates that the function is turned on.

Dynamic Range (Contrast)

You can adjust the dynamic range (contrast) of the ultrasound image from 50 to 90 dB.

To adjust dynamic range:

- Press [**Dyn Range ◐**] to increase or decrease the level

or

- Click **Dyn. Range** under **M-mode** on the left side of the monitor and drag the slider (or point at **Dyn. Range** and press [**+/-**]).

The current dynamic range setting is displayed on the monitor next to **Dyn. Range**.

Zoom

Zoom does not work directly in the M-mode image. To zoom in or out on the area of the M-mode image that you are interested in you must adjust the zoom box in the B-mode image (see “Zoom” on page 140).

Panning

Panning does not work directly in the M-mode image. To pan in the M-mode image you must work in the B-mode image (see “Panning” on page 140). Any changes made to the B-mode image will be applied to the M-mode image

Edge Enhancement

Edge enhancement is a way of emphasizing contours so that edges stand out more clearly.

You can select the degree of edge enhancement of the M-mode image.

To adjust edge enhancement:

- Click **Edge** under **M-mode** on the left side of the monitor and select the value you want (or point at **Edge** and press [**+/-**]).

  The available values range from 0 (no enhancement) to 7 (maximum enhancement).

  The current setting is displayed on the monitor next to **Edge**.

M-mode Frequency – MFI

If an MFI (Multi-Frequency Imaging) transducer is selected, you can select the imaging (transmitted) frequency. The current imaging frequency is displayed at the top of the monitor. M-mode uses the same MFI frequency as B-mode.

To select the imaging frequency:

- Press [**Frequency** ↘] to step through the frequency options.

or

- Click the current imaging frequency (for example, **5.0 MHz** in Fig 9-1) in the Identification area of the monitor and select the value you want (or point at the frequency and press [**+/-**]).

The view must be imaging when you do this.

M-Mode Gray Scale

Several gray scales can be used to display a M-mode image. Different gray scales may make various aspects of the image clearer.

To select the gray scale in M-mode:

- Click the gray scale bar to the right of the M-mode image and select the gray scale you want or point at the color bar and press [**+/-**].

  The gray scale bar to the right of the M-mode image is replaced by the one you select.

Chapter 10
Color Mode – Color Flow Mapping

Overview

Color mode (CFM, color flow mapping, color Doppler) ultrasound displays color-coded real-time information about direction and velocity of flow in the tissues.

Color Flow Mapping

In a Color mode image, the frequencies of the reflected ultrasound waves are measured to show the velocity and direction of the blood flow. The result is displayed in color on the monitor.

Flow Direction	Default Color
Toward the transducer	Red
Away from the transducer	Blue

Table 10-1. Default color coding in Color mode.

NOTE: *Flow direction is displayed differently for Vector Flow Imaging. See "Vector Flow Imaging (VFI)" on page 169.*[1]

It is possible to invert this color-coding or select a different one. (See "Invert" on page 167 or "Color Mapping" on page 168.)

Color mode can only be used in combination with B-mode. Whenever Color mode is active, a color box is superimposed on the B-mode image. The color box defines the area of the B-mode image for which flow information is available.

Submodes

Four submodes are available in Color mode imaging:

- Velocity
- Variance
- Velocity + Variance
- Vector Flow Imaging (VFI)

You can select the submode you want. The view must be imaging when you do this.

To select the submode:

- Click **Submode** on the right side of the monitor and select the submode you want.

  The current submode is displayed on the monitor next to **Submode**.

  The color bar is updated to match the submode.

1. VFI is not licensed by Health Canada.

Adjusting the Thermal Index (TI) Limit

Before you use Color mode, check that the TI settings are appropriate. The current TI tissue type and limit are displayed just under the BK Medical logo in the upper left corner of the monitor.

The absolute TI limit for each tissue type is set by the factory to conform to FDA standards (see “Acoustic Output” on page 32), but you may want to set a lower TI limit for some purposes. There are 2 types of settings you can vary:

- Tissue type (TIS – soft tissue, TIC – cranial, TIB – bone)
- TI limit (not exceeding the factory-set limits)

To select tissue type:

- Click the **TI** type displayed and select **TIB**, **TIC** or **TIS** (or point at **TI** and press [**+/-**]).

To adjust the TI limit:

- Click the limit displayed after the TI type and select the value you want.

  The current TI is displayed as **TIx:z.z<y.y**, where x is S, C, or B; y.y is the limit you select; and z.z is the actual TI.

Adjusting the Mechanical Index (MI) Limit

You can adjust the maximum allowed MI (note that the maximum must be ≤ 1.9; see page 33.

To adjust the MI limit:

- Click **MI** above **General** on the left side of the monitor and drag the slider.

or

- Turn [**M/Doppler Gain**] (if the key is not assigned to adjusting gain for M-mode or Doppler gain).

Turning Color Mode On or Off

When you turn on Color mode, B-mode must be imaging.

To turn on Color mode:

- Press [**Color**].

  The color box appears.

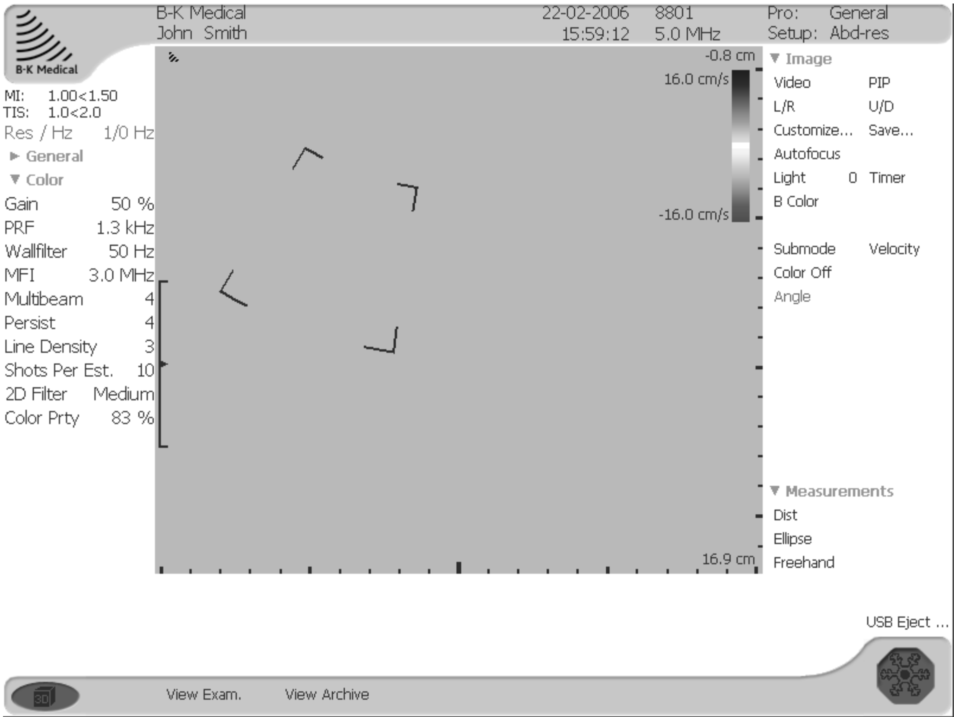


Figure 10-1. The Color mode color box superimposed on a B-mode image.

To turn off Color mode:

- Press [**Color**].

Adjusting the Color Mode Image

Color Box

When Color mode imaging is turned on, the color box is superimposed on the B-mode image. The color box outlines the area of the tissue in which flow information is available.

You can adjust the size and position of the color box to examine flow in various parts of the B-mode image. The view must be imaging when you do this.

To resize the color box:

1 Point at the box or select it by clicking inside it or pressing [⧅].

2 Press [**+/-**].

or

- Click a corner of the box and drag the corner.

To move the color box:

- Click inside the box and drag the box.

Gain

You can adjust the gain of the Color mode image. The view must be imaging when you do this.

To adjust Color mode gain:

- Turn the [**Color/Power Gain**] dial.

or

- Click **Gain** under **Color** on the left side of the monitor and drag the slider (or point at **Gain** and press [**+/-**]).

  The current Color gain setting (a percentage) is displayed on the monitor next to **Gain**.

Range

You can vary the PRF (pulse repetition frequency) to select the range of Doppler velocities (frequencies) that are color-coded and displayed. Restricting the range allows you to see velocity differences (within the range) in more detail.

To adjust the velocity range:

- Press [**Scale** ↕] to step through the available ranges.

or

- Click **PRF** under **Color** on the left side of the monitor and select the value you want (or point at **PRF** and press [**+/-**]).

  The color bar is updated to correspond to the new range of velocities.

  The current setting is displayed on the monitor next to **PRF**.

Wall Filter

A wall filter is used to eliminate low-frequency artifacts such as Doppler shifts arising from respiratory and cardiac motion or movement of blood vessel walls. The wall filter cuts off all frequencies below the cutoff frequency. You can adjust the cut-off frequency.

To set the cutoff frequency for the wall filter:

- Click **Wall Filter** under **Color** on the left side of the monitor and select the value you want (or point at **Wall Filter** and press [**+/-**]).

or

- Press [**Filter** ⚙] to step through the available values.

  The current setting is displayed on the monitor next to **Wall Filter**.

Color Mode Frequency

If an MFI (Multi-Frequency Imaging) transducer is selected, you can select the Doppler imaging frequency as well as the B-mode imaging frequency. The view must be imaging when you do this.

To select the Color mode frequency:

- Press [**Frequency**] to step through the frequency options.

or

- Click **MFI** under **Color** on the left side of the monitor and select the value you want (or point at **MFI** and press [**+/-**]).

  The current value is displayed on the monitor next to **MFI**.

NOTE: *The current imaging frequency displayed at the top of the monitor is always the B-mode frequency.*

NOTE: *If Vector Flow Imaging is selected, the system automatically selects the optimal frequency.*

Persistence

You can adjust the persistence level of the Color mode image. The view must be imaging when you do this. In the Pro Focus UltraView, if you use AMA, the system uses motion-compensated persistence instead of the usual persistence.

To adjust Color mode persistence:

- Click **Persist** under **Color** on the left side of the monitor and select the level you want (or point at **Persist** and press [**+/-**]).

  The available values range from 0 (no averaging) to 8 (maximum averaging).

  The current setting is displayed on the monitor next to **Persist**.

Line Density

You can adjust the line density of the Color mode image. Increasing the line density decreases the frame rate. You get finer color resolution but a slower refresh rate. The view must be imaging when you do this

To adjust Color mode line density:

- Click **Line Density** under **Color** on the left side of the monitor and select the value you want (or point at **Line Density** and press [**+/-**]).

  The current setting is displayed on the monitor next to **Line Density.**

NOTE: *The Color mode line density in B+Color mode can have a different value from when you use B+Color+Doppler. Changes you made in one case will not affect the other case.*

NOTE: *If Vector Flow Imaging is selected, the system automatically selects the optimal line density.*

Color Quality – Shots per Estimate

One way to improve the accuracy of the color-coded velocity information is to increase the number of pulses transmitted in each waveform packet (shots per estimate) at the expense of decreasing the frame rate. The view must be imaging when you do this.

To adjust the color quality (select shots per estimate):

- Click **Shots per Est.** under **Color** on the left side of the monitor and select the value you want (or point at **Shots per Est.** and press [**+/-**]).

  The available values range from 4 to 16.

  The current setting is displayed on the monitor next to **Shots per Est**.

NOTE: *The Color mode line shots per estimate in B+Color mode can have a different value from when you use B+Color+Doppler. Changes you made in one case will not affect the other case.*

NOTE: *If Vector Flow Imaging is selected, the system automatically selects the optimal number of shots per estimate.*

AMA – Automatic Mode Adjustment

AMA is an image optimization function available on the Pro Focus UltraView. In addition to automatic parameter adjustment, it includes motion compensation technology that helps minimize B-mode image blurring caused by motion of the transducer or of the tissue being imaged.

AMA is set to be on by default for presets where it is appropriate and works only with array transducers.

You can override the default setting to turn AMA on or off manually, but this is not recommended. AMA may not only adjust parameters that are not under user control; specific useful combinations of normal user parameters not accessible to the user can also be used in AMA mode because dependencies to other parameters are controlled.

Furthermore, typical changes to predefined setups such as depth changes, changes of color box size, or Doppler PRF can be handled automatically by AMA.

We believe that in most cases you will not be able to optimize the image as well as the system can.

When AMA is on, you set the compromise you want between frame rate and resolution (spatial resolution and contrast). The system then automatically adjusts a number of imaging parameters (including some that are not under user control) to give you the best image. AMA can be used in B-mode, Color mode and Doppler mode.

In Color mode, the normal user parameters that AMA adjusts are:

- B-mode and Color mode line density
- B-mode and Color mode multibeam
- Number of pulses transmitted in each waveform packet (shots per estimate)

In addition, if you shrink the color box, AMA automatically improves the color resolution.

NOTE: *If you want to adjust any of these parameters manually, you must turn AMA off.*

To turn AMA on or off:

- Click **AMA** on the upper right side of the monitor.

To set the target resolution and the frame rate for AMA:

- Click **Res ◄►Hz** on the left side of the monitor and select the value you want (or point at **Res ◄►Hz** and press **[+/-]**).

  The highest value gives the highest resolution.

  The lowest value gives the highest frame rate (lowest resolution).

You can also assign one of the user-defined keys on the control panel to turn AMA on/off (see “User-Defined Keys” on page 85).

2D Filter

Sometimes the color information in the image has an uneven appearance. A smoothing function can help even out the color information. You can set a 2D filter level to select the amount of color smoothing you want.

To set the 2D filter level:

- Click **2D Filter** under **Color** on the left side of the monitor and select the value you want (**Off**, **Low**, **Medium** or **High**)

  or

- point at **2D Filter** and press **[+/-]**).

  The current setting is displayed on the monitor next to **2D Filter**.

Color Priority

When color information is superimposed on a B-mode image, color can appear outside vessels, making it appear that the flow is not restricted to the vessel. To minimize this effect, you can adjust the color priority. Make the color priority lower to have less color outside the vessels.

To adjust the color priority:

- Click **Color Prty** under **Color** on the left side of the monitor and drag the slider.

  The current setting is displayed on the monitor next to **Color Prty**.

NOTE: *High color priority gives color in more areas; low color priority reduces the number of areas that are colored.*

Invert

You can invert the way color is assigned to flow information so that flow towards the transducer appears blue and flow away from the transducer appears red.

To invert the color coding or to return to the default:

- Press **[Inverse]** to toggle between the default and inverted color coding.

  The color coding in the Color mode image inverts.

  The color bar to the right of the image is inverted to show the new color coding

NOTE: *If Vector Flow Imaging is selected, inversion of the color coding is no longer needed.*

Color Mapping

Various color scales can be used to display a Color mode image.

To select the color scale in Color mode:

- Click the color bar to the right of the image and select the color scale you want (or point at the color bar and press [**+/-**]).

  The color bar to the right of the image is replaced by the one you select.

NOTE: *When you image in Color mode, you cannot use the color bar to change the B-mode gray scale because it is used to control the Color mode color mapping.*

Multibeam

Multibeam is a method for increasing the frame rate or the line density by receiving signals from several directions.

To select the multibeam level:

- Click **Multibeam** under **Color** on the left side of the monitor and select the value you want (or point at **Multibeam** and press [**+/-**]).

  The current setting is displayed on the monitor next to **Multibeam**.

NOTE: *If Vector Flow Imaging is selected, the system automatically selects the multibeam.*

Baseline

The baseline is the point on the scale that separates forward flow from reversed flow. You can reposition it (offset the Doppler color scale) to help with aliasing problems.

To adjust the baseline:

- Press [**Baseline** ‡] to move the baseline up or down.

  The color bar is updated.

  The frequency/velocity axis on the color bar is updated.

NOTE: *If Vector Flow Imaging is selected, adjustment of the baseline is no longer needed.*

Steering

You can steer the Doppler beam of a linear transducer to vary the beam angle. This can be useful for examining flow in blood vessels parallel to the transducer surface.

To adjust the beam angle:

- Press [**Steer**]. You can choose left steering, right steering or no steering.

  The shape of the color box is adjusted on the monitor to reflect the beam angle.

NOTE: *If Vector Flow Imaging is selected, manual steering is no longer needed.*

Vector Flow Imaging (VFI)[1]

Vector Flow Imaging is available as an option.

Normally, color imaging shows only axial flows. Vector Flow Imaging is a technology that uses ultrasound pulses in both axial and lateral directions. The measured signals are therefore sensitive to both axial and transverse motion.

VFI can be useful for the visualizing the following with high sensitivity:

- Flow when the transducer is perpendicular to the vessel – flow visualization that is independent of imaging angle
- Carotid and other vessels with high or complex flow

NOTE: *Vector Flow Imaging is only available with the 8670 linear array transducer and the 8822[2] vascular transducer, and certain Pro Packages and presets. It requires a Vector Flow Imaging license from BK Medical.*

Velocity range

It is recommended only to use Vector Flow Imaging up to a depth of 30 mm of the image. Vector Flow Imaging can be used in the velocity range of 10 cm/s to 350 cm/s with the corresponding PRF.

Angle-independent imaging

Using auto-correlation estimators, both the axial and transverse velocity components are determined and used to make an estimate of 2D blood velocity that does not depend on the image angle.

This method alleviates the problem of achieving a sufficient image angle and makes it possible to visualize complex flow patterns.

PRF affects velocity range

The maximum velocity that can be observed depends on the PRF. Higher velocities can be seen when the PRF is higher.

The direction and velocity of the flow are indicated on the image with color and also by arrows.

Color Flow Indicators for VFI – The Color Map

The **Color Map** is the default color flow indicator for interpreting the color. The **Color Map** outlines the maximum flow velocity by color. If you highlight the **Color Map** you can choose between 3 different VFI color options.

1. VFi has not been licensed by Health Canada

2. For use with VFI, the 8822 vascular transducer has not been marked cleared by the FDA or licensed by Health Canada.

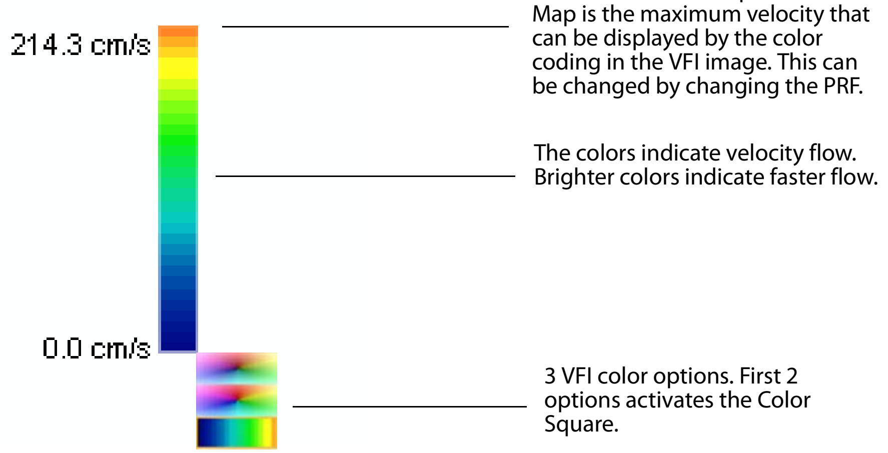


Figure 10-2. Explanation of the Color Map for Vector Flow Imaging.

Saturation/Brightness = Speed

Colors located nearer the top of the **Color Map** (less saturated colors) indicate faster flow.

Color Flow Indicators for VFI – The Color Square

The **Color Square** is an alternative to the **Color Map** for interpreting the color. If you choose this color indicator, flow direction and velocity are mapped by color. You can move the **Color Square** around on the monitor (like a bodymark) so that it does not interfere with what you are trying to observe.

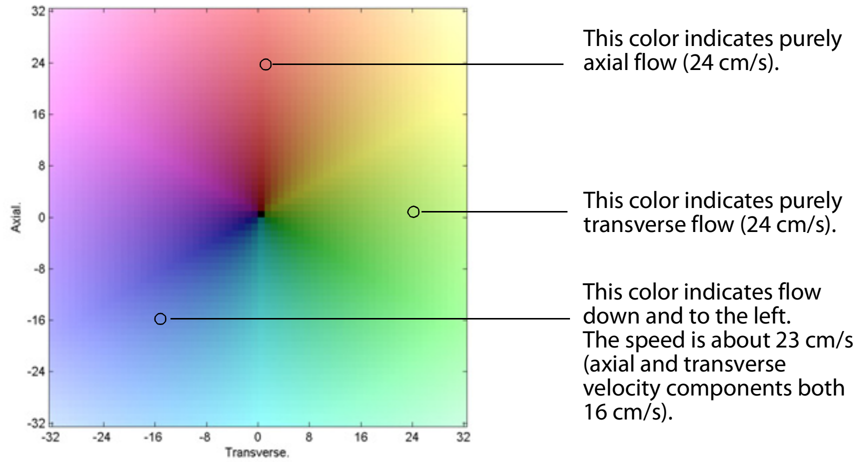


Figure 10-3. Explanation of the Color Square for Vector Flow Imaging. The values are only for illustrative purposes, because the color information is intended to be qualitative rather than quantitative.

Saturation/Brightness = Speed

The center of the square is black. Black indicates zero flow.

Colors located farther from the center (less saturated colors) indicate faster flow.

Hue = Direction

The color (hue) indicates the flow direction. For example, yellow indicates flow up and to the right.

Using VFI

VFI is activated if you select an appropriate VFI preset. VFI presets are only available with the 8670 linear array transducer and the 8822 vascular transducer. You can choose from the **Carotid VFI preset**, the **Vein VFI preset**, or the **Periph. Artery** VFI preset.

Alternatively, you can turn on VFI by:

1 Click **Submode** under **Image** on the right side of the monitor.

2 Click **VFI.**

Steering of the color box is not possible when you use VFI.

Arrow Flow Indicators for VFI

Direction and velocity are also indicated by small arrows superimposed on the flow part of the image. Longer arrows indicate higher velocity.

Artifacts

WARNING

Before you turn on VFI, check the B-mode image to make sure there are no artifacts visible in the blood vessel. If there are strong artifacts in the B-mode image, the arrows in VFI may be pulled to point in a more axial direction (toward or away from the transducer), especially in low flow situations with correspondingly low PRF. These artifacts will not affect the color mode (CFM) image, so it is important to check in B-mode.

Arrow Size (VFI)

Use this control to adjust the space between the arrows and the size of the arrows in VFI mode. You can choose 3 different arrow size settings (the default setting is Large):

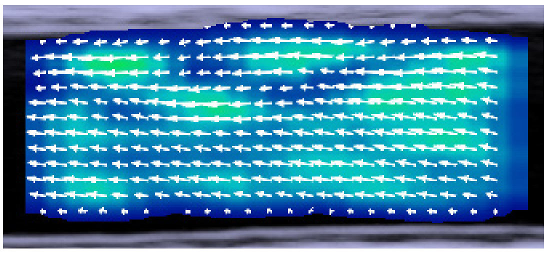


Figure 10-4. Small arrow size.

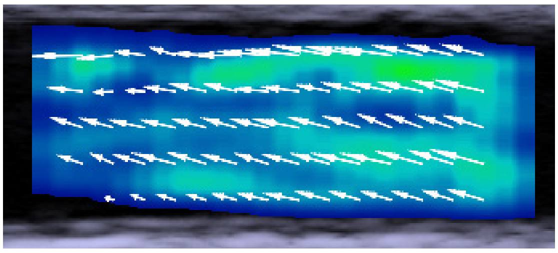


Figure 10-5. Medium arrow size.

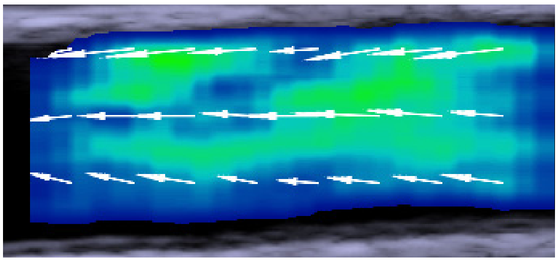


Figure 10-6. Large arrow size.

Streamlined VFI Workflow

VFI can be utilized to ease workload when determining peak systolic velocity or calculating volume flow rate.

In **B+VFI+D mode**, VFI can assist the user with:

- Doppler gate placement
- Angle correction
- Assisted Doppler steering
- Inverting the Doppler spectrum (when needed)
- Selecting the appropriate Scale/PRF (Pulse Repetition Frequency)
- Adaptively adjusting Doppler sample volume size (PW gate)
- Assisted Volume Flow Measurement

Assisted Doppler Gate Placement

Assisted Doppler gate placement is a method for selecting the optimal Doppler gate position when measuring the peak systolic velocity in arteries. The method uses VFI data to analyze where to place the Doppler gate at the highest velocity within the color box and the ROI (region of interest). The VFI data is also used to display and update flow direction, velocity, and Doppler in real-time.

To activate the assisted Doppler gate placement:

- Press the [**Doppler Mode**] key if you are in B+VFI mode.

  or

- Press the [**Doppler Gate**] key if you are in Triplex+VFI mode.

Arrow aliasing

WARNING

Check to make sure the VFI arrows are not aliasing before you activate the assisted Doppler gate placement. Otherwise, the Doppler gate will not be positioned correctly.

Angle Correction

The angle of the flow at the position of the Doppler gate (selected either manually by the user or by the VFI data) is estimated and displayed in real-time. The estimated direction of the flow is indicated visually by the line passing through the Doppler gate.

Assisted Doppler Steering

From the indication of the flow, the appropriate Doppler steering is selected using VFI data. Gate steering is updated dynamically. The steering angle corresponding to the angle of the flow is displayed in real-time making it easier to monitor when the desired Doppler angle of 60° is achieved.

Inverting the Doppler Spectrum

Automatic inversion of the Doppler spectrum is activated when the gate steering changes from right to left.

Selecting the Appropriate Scale/PRF

If the manually specified Scale/PRF if is too low or too high, it can be adjusted using VFI data.

To activate assisted Scale/PRF adjustment:

- Click **Auto Scale ON/OFF** under **Color** on the left side of the monitor.

When assisted Scale/PRF adjustment is activated, enabling Doppler mode or pressing [**Doppler Gate**] will change the Scale/PRF based on the VFI data. If the initial Scale/PRF is far from correct, it may be necessary to press [**Doppler Gate**] more than once.

Clicking [**Doppler Gate**] will also adjust the Doppler baseline.

If the [**Doppler Gate**] adjustment is not satisfactory, you can revert to adjusting Scale/PRF and the Doppler baseline using **Auto** This adjusts Scale/PRF (and Doppler baseline) using only the Doppler spectrum. However, this can cause the VFI signal to alias. Therefore adjusting Scale/PRF using **Auto** should only be used when the Doppler gate is at the maximum velocity position.

Assisted Volume Flow Rate Estimation

Volume flow rate is an indication of the amount of blood that passes through a vessel over a specific time span, typically [ml/min]. Assisted volume flow rate estimation uses VFI data and Pulsed Wave Doppler (PWD) to calculate the volume flow rate in a vessel. Assisted volume flow rate estimation uses VFI data to outline the vessel and extend the Doppler gate to cover the entire vessel. Visual diameter markers are inserted for the user to inspect. If preferable, you can manually adjust the visual diameter markers.

To activate assisted volume flow rate estimation:

- Click **VF (real-time)** under **Doppler** on the left side of the monitor.

The result of the assisted volume flow rate calculation is displayed in a real-time measurement value called VF.

⚠ Diameter markers

WARNING

Check to make sure that the diameter markers correspond to the inner vessel wall and that the connecting line between the markers is perpendicular to the direction of the vessel. Otherwise, the real-time volume flow measurement may not be precise.

⚠ Doppler gate large enough

WARNING

Check to make sure that the Doppler gate covers the entire vessel. Otherwise, the real-time volume flow measurement may not be precise.

⚠ Doppler gate over only one vessel

WARNING

Check to make sure that the Doppler gate only covers one vessel. Otherwise, the real-time volume flow measurement may not be precise.

⚠ Doppler spectrum aliasing

WARNING

Check to make sure that the Doppler spectrum does not alias. Otherwise, the real-time volume flow measurement may not be precise.

Asymmetric Doppler Gate Cross

The asymmetric Doppler gate cross places the POI (point of interest) at the highest velocity, and adjusts the Doppler gate to the size of the vessel. You can manually move the POI to another point in the vessel, and the asymmetric Doppler gate cross will still automatically adjust to the size of the vessel.

Outline of VFI Workflow

The screen capture below outlines the main features of the VFI workflow:

1 Asymmetric Doppler gate

2 POI

3 Volume flow rate estimation

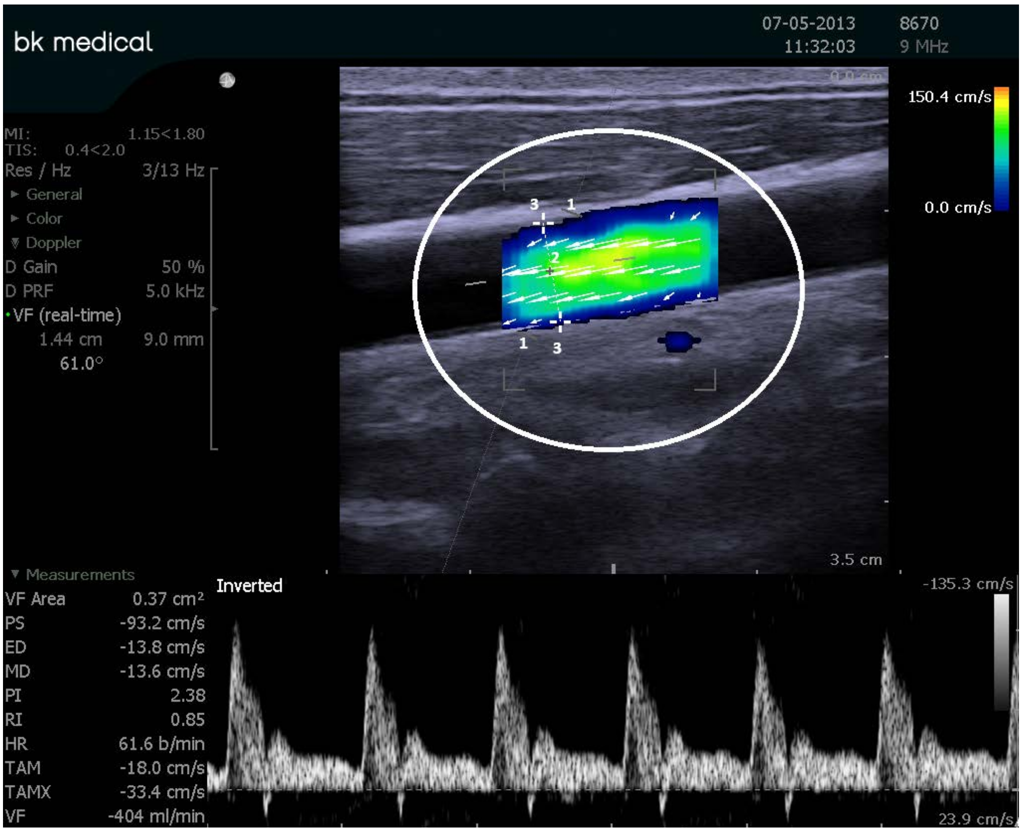


Figure 10-7. Outline of VFI workflow.

Chapter 11
Power Mode – Power Doppler

Overview

Power mode (power Doppler) ultrasound displays information about the number of particles moving, rather than their velocity. The signal strength (related to the square of the velocity) increases as the number of flowing particles increases. Thus the amplitude of the signal indicates the amount of blood present and flowing within a sample volume.

Power Doppler does not contain directional information, so you gain sensitivity at the expense of directional information.

Directional Power Doppler Directional power Doppler incorporates directional information into a power Doppler display – the directional information is retained. In effect, the power is calculated independently for the flow in each direction.

Power mode can only be used in combination with B-mode. Whenever Power mode is active, a color box is superimposed on the B-mode image. The color box defines the area of the B-mode image for which flow information is available.

Submodes

Two submodes are available in Power mode imaging:

- Power (power Doppler)
- Power + Direction (directional power Doppler)

You can select the submode you want. The view must be imaging when you do this.

To select the submode:

- Click **Submode** on the right side of the monitor and select the submode you want.

  The current submode is displayed on the monitor next to **Submode**.

  The color bar is updated to match the submode.

Adjusting the Thermal Index Limit

Before you use Power mode, check that the TI settings are appropriate. The current TI tissue type and limit are displayed just under the BK Medical logo in the upper left corner of the monitor.

For information about adjusting the TI, see “Adjusting the Thermal Index (TI) Limit” on page 162.

Adjusting MI

You can adjust the maximum allowed MI (mechanical index).

To adjust the MI limit:

- Click **MI** above **General** on the left side of the monitor and drag the slider.

or

- Turn **[M/Doppler Gain]** (if the key is not assigned to adjusting gain for M-mode or Doppler gain).

Turning Power Mode On or Off

When you turn on Power mode, B-mode must be imaging.

To turn on Power mode:

- Press **[Power]**.

  The color box appears.

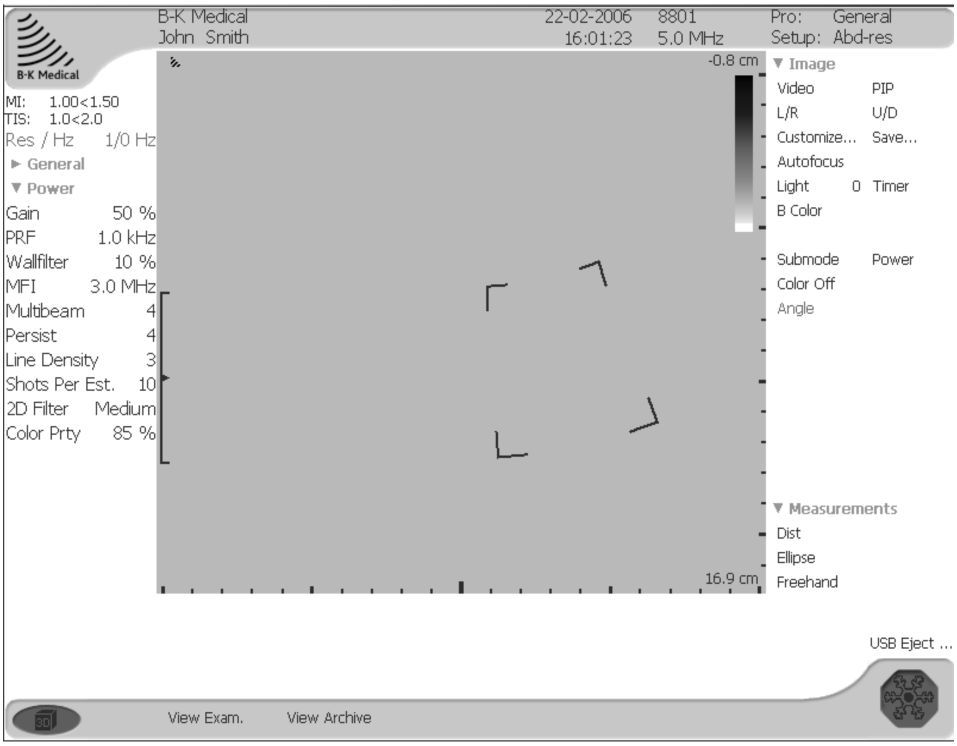


Figure 11-1. The Power mode color box superimposed on a B-mode image.

To turn off Power mode:

- Press **[Power]**.

Adjusting the Power Mode Image

Color Box

The color box outlines the area of the tissue in which flow information is available.

For information about adjusting the size and position of the color box, see “Color Box” on page 163. The view must be imaging when you adjust the color box.

To resize the color box:

1 Point at the box or select it by clicking inside it or pressing [⧅].
2 Press [+/-].

or

- Click a corner of the box and drag the corner.

To move the color box:

- Click inside the box and drag the box.

Gain

You can adjust the gain of the Power mode image. The view must be imaging when you do this.

To adjust Power mode gain:

- Turn the [**Color/Power Gain**] dial.

or

- Click **Gain** under **Power** on the left side of the monitor and drag the slider (or point at **Gain** and press [+/-]).

  The current Power gain setting (a percentage) is displayed on the monitor next to **Gain**.

Range

As in Color mode, you can vary the PRF (pulse repetition frequency) to select the range of velocities (frequencies) that are color-coded and displayed. The PRF must be carefully adjusted to filter out movement of the vessels and tissue.

To adjust the PRF:

- Press [**Scale** ⌶] to step through the available values.

or

- Click **PRF** under **Power** on the left side of the monitor and select the value you want (or point at **PRF** and press [+/-]).

  The current setting is displayed on the monitor next to **PRF**.

Wall Filter

As in Color mode, you can set the cutoff frequency for the wall filter.

To set the cutoff frequency for the wall filter:

- Click **Wall Filter** under **Power** on the left side of the monitor and select the value you want (or point at **Wall Filter** and press [+/-]).

or

- Press [**Filter** ⚙] to step through the available values.

  The current setting is displayed on the monitor next to **Wall Filter**.

Power Mode Frequency

As in Color mode, if an MFI (Multi-Frequency Imaging) transducer is selected, you can select the Doppler imaging frequency as well as the B-mode imaging frequency. The view must be imaging when you do this.

To select the Power mode frequency:

- Press [**Frequency**] to step through the frequency options.

or

- Click **MFI** under **Power** on the left side of the monitor and select the value you want (or point at **MFI** and press [**+/-**]).

  The current value is displayed on the monitor next to **MFI**.

NOTE: *The current imaging frequency displayed at the top of the monitor is always the B-mode frequency.*

Persistence

You can adjust the persistence level of the Power mode image. The view must be imaging when you do this.

To adjust Power mode persistence:

- Click **Persist** under **Power** on the left side of the monitor and select the level you want (or point at **Persist** and press [**+/-**]).

  The available values range from 1 (no averaging) to 8 (maximum averaging).

  The current setting is displayed on the monitor next to **Persist**.

Line Density

You can adjust the line density of the Power mode image. Increasing the line density decreases the frame rate. You get finer color resolution but a slower refresh rate. The view must be imaging when you do this.

To adjust Power mode line density:

- Click **Line Density** under **Power** on the left side of the monitor and select the value you want (or point at **Line Density** and press [**+/-**]).

  The current setting is displayed on the monitor next to **Line Density.**

NOTE: *The Power mode line density in B+Power mode can have a different value from when you use B+Power+Doppler. Changes you made in one case will not affect the other case.*

Color Quality – Shots per Estimate

As in Color mode, you can increase the number of pulses transmitted in each waveform packet (shots per estimate) at the expense of decreasing the frame rate. The view must be imaging when you do this.

To adjust the color quality (select shots per estimate):

- Click **Shots per Est.** under **Power** on the left side of the monitor and select the value you want (or point at **Shots per Est.** and press [**+/-**]).

  The available values range from 4 to 16.

  The current setting is displayed on the monitor next to **Shots per Est**.

NOTE: *The Power mode shots per estimate in B+Power mode can have a different value from when you use B+Power+Doppler. Changes you made in one case will not affect the other case.*

2D Filter

Sometimes the color information in the image has an uneven appearance. A smoothing function can help even out the color information. You can set a 2D filter level to select the amount of color smoothing you want.

To set the 2D filter level:

- Click **2D Filter** under **Power** on the left side of the monitor and select the value you want (**Off**, **Low**, **Medium** or **High**).

  The current setting is displayed on the monitor next to **2D Filter**.

Color Priority

When color information is superimposed on a B-mode image, color can appear outside vessels, making it appear that the flow is not restricted to the vessel. To minimize this effect, you can adjust the color priority. Make the color priority lower to have less color outside the vessels.

To adjust the color priority:

- Click **Color Prty** under **Power** on the left side of the monitor and drag the slider.

  The current setting is displayed on the monitor next to **Color Prty**.

NOTE: *High color priority gives color in more areas; low color priority reduces the number of areas that are colored.*

Invert

In the Power+Direction submode, as in Color mode, you can invert the way color is assigned to velocity flow information.

To invert the color coding or to return to the default:

- Press [**Inverse**] to toggle between the default and inverted color coding.

  The color coding of the velocity information inverts.

  The velocity color bar to the right of the image is inverted to show the new color coding.

Color Mapping

Various color scales can be used to display a Power mode image. The color bar is different in the 2 submodes. In Power + Direction, the bar is vertical but the intensity changes in the horizontal direction.

To select the color scale in Power mode:

- Click the color bar to the right of the image and select the color scale you want.

  The color bar to the right of the image is replaced by the one you select.

NOTE: *When you image in Power mode, you cannot use the color bar to change the B-mode gray scale because it is used to control the Power mode color mapping.*

Multibeam

Multibeam is a method for increasing the frame rate or the line density by receiving signals from several directions.

To select the multibeam level:

- Click **Multibeam** under **Power** on the left side of the monitor and select the value you want (or point at **Multibeam** and press [**+/-**]).

  The current setting is displayed on the monitor next to **Multibeam**.

Steering

As in Color mode, you can steer the Doppler beam of a linear transducer.

To adjust the beam angle:

- Press [**Steer**]. You can choose left, right or no steering.

  The shape of the color box is adjusted on the monitor to reflect the beam angle.

Chapter 12
Doppler Mode – Spectral Doppler

Overview

Doppler mode (spectral Doppler mode) imaging displays information about the spectrum of flow velocities as a function of time. It is sometimes called FFT (Fast Fourier Transform) because the information is presented as a frequency spectrum indicating velocity components.

Pulsed Wave Doppler (PW)

PW Doppler is the primary Doppler mode. In PW Doppler, short bursts (pulses) of ultrasound waves are transmitted at regular intervals and analyzed as they return. The received signals are detected and sent to amplifiers for audio output as well as displayed on the monitor for a visual presentation of the frequency components.

Adjusting the Thermal Index Limit

Before you use Doppler mode, check that the TI settings are appropriate. The current TI tissue type and limit are displayed just under the BK Medical logo in the upper left corner of the monitor.

For information about adjusting the TI, see “Adjusting the Thermal Index (TI) Limit” on page 162.

Adjusting MI

You can adjust the maximum allowed MI (mechanical index).

To adjust the MI limit:

- Click **MI** above **Gain** on the left side of the monitor and drag the slider.

NOTE: *If you are using partial freeze (see page 62) and you freeze the Doppler image, you can turn* [***M/Doppler Gain***] *to adjust the MI limit.*

Turning Doppler Mode On or Off

When you turn on Doppler mode, B-mode must be imaging.

To turn on Doppler mode:

- Press [ ].

  The Doppler indicator, including both the Doppler line and the Doppler gate, appears superimposed on the B-mode image and the Doppler spectrum appears.

To position the Doppler gate on a larger B-mode image, press [ ] and position the Doppler gate before you press [ ].

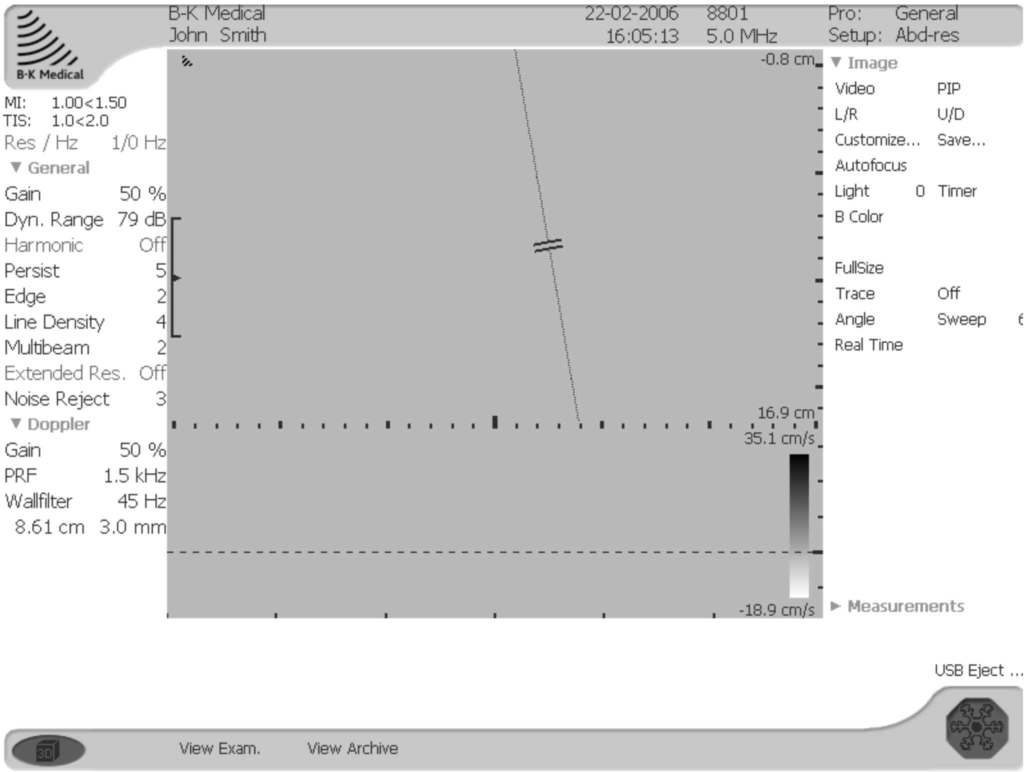


Figure 12-1. The Doppler indicator (line and gate) superimposed on a B-mode image.

Fig 12-2 shows information available in Doppler indicators.

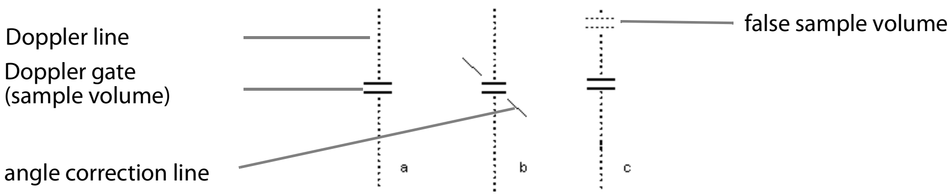


Figure 12-2. Doppler indicators (three examples).

Fig 12-2 (a) The dotted line represents the Doppler line. The lines at right angles to that show the Doppler gate.

Fig 12-2 (b) A diagonal line (relative to the Doppler line) indicates a sample volume with angle correction (see “Angle Correction” on page 187).

Fig 12-2 (c) The horizontal dotted lines show the false sample volume in HPRF (see page 188).

To turn off Doppler mode:

- Press [ ] or [ ].

Audio Volume

The Doppler signal can be played as an audio signal as well as appearing on the monitor.

To adjust the volume of the audio signal:

- Press [**Sound**].

Adjusting the Doppler Mode Image

Doppler Indicator

When Doppler mode imaging is turned on, the Doppler indicator is superimposed on the B-mode image.

You can adjust the position and size of the Doppler gate to get information from sample volumes in various parts of the B-mode image. The view must be imaging when you do this.

Sample volume position

To move the Doppler gate:

- Click **cm** on the left side of the monitor and drag to the desired value.

or

- Click the Doppler indicator or press [ ], and drag the gate.

  The sample volume line moves along with the gate.

Sample volume size

To resize the Doppler gate:

- Click **mm** on the left side of the monitor and drag to the desired value.
- Point at the Doppler indicator, (or click it, or press [ ]) and then press [**+/-**].

Independent D-Mode/C-Mode Steering

Independent steering

Independent steering of PW Doppler and CFM is possible using the **Sync Steer** screen key. To enable independent steering, click **Sync Steer** under **Doppler** in the **Image** group on the left side of the monitor and switch the setting to **Off**.

NOTE: *This feature is only available for certain transducers and pro packages, and is not available when using VFI.*

AMA – Automatic Mode Adjustment

AMA is an image optimization function available on the Pro Focus Ultraview. In addition to automatic parameter adjustment, it includes motion compensation technology that helps minimize B-mode image blurring caused by motion of the transducer or of the tissue being imaged.

AMA is set to be on by default for presets where it is appropriate and works only with array transducers.

You can override the default setting to turn AMA on or off manually, but this is not recommended. AMA may not only adjust parameters that are not under user control; specific useful combinations of normal user parameters not accessible to the user can also be used in AMA mode because dependencies to other parameters are controlled.

Furthermore, typical changes to predefined setups such as depth changes, changes of color box size, or Doppler PRF can be handled automatically by AMA.

We believe that in most cases you will not be able to optimize the image as well as the system can.

You should always use AMA if the Doppler PRF is low.

When AMA is on, you set the compromise you want between frame rate and resolution (spatial resolution and contrast). The system then automatically adjusts a number of imaging parameters (including some that are not under user control) to give you the best image. AMA can be used in B-mode, Color mode and Doppler mode.

In Doppler mode, the normal user parameters that AMA adjusts are:

- B-mode and Color mode line density
- B-mode and Color mode multibeam
- Number of pulses transmitted in each waveform packet (shots per estimate)

NOTE: *If you want to adjust any of these parameters manually, you must turn AMA off.*

To turn AMA on or off:

- Click **AMA** on the upper right side of the monitor.

To set the target resolution and the frame rate for AMA:

- Click **Res ◄►Hz** on the left side of the monitor and select the value you want (or point at **Res ◄►/Hz** and press **[+/-]**).

  The highest value gives the highest resolution.

  The lowest value gives the highest frame rate (lowest resolution).

You can also assign one of the user-defined keys on the control panel to turn AMA on/off (see “User-Defined Keys” on page 85).

Doppler Trace (Automatic Curve Tracing)

You can have the system automatically calculate and display a curve that traces the mean or peak values of the Doppler spectrum. See “Doppler Spectra” on page 248 for a description of the curves. You can also choose to have both the peak and mean curves displayed.

To change which curve is displayed or to turn off the display:

1. Click **Trace** under **Image** on the right side of the monitor.
2. Click **Off**, **Peak**, **Mean+Peak** or **Mean** to the right of **Trace**.

Noise Limit

You can reduce the noise (high frequency disturbances) in the data to improve the accuracy of automatically traced curves.

To reduce the noise:

- Click **Noise Limit** above **Angle** on the right of the monitor and drag the slider.

Low noise limits cut out less noise; high limits cut out more.

Noise Limit only appears on the monitor when automatic curve tracing is turned on.

Auto

The system can automatically adjust the Range (page 188) and Baseline (page 189) to prevent aliasing and optimize the display of the Doppler spectrum.

To optimize the baseline and range for the current Doppler spectrum:

- Press [**Auto**].

NOTE: *The control panel (except for* **Freeze** *[ ]) is disabled while the scale and baseline are being adjusted. This may take a few seconds.*

Steering

As in Color mode, you can steer the Doppler beam of a linear transducer.

To adjust the beam angle:

- Press [**Steer**]. You can choose left, right or no steering.

  The angle of the Doppler line and Doppler gate are adjusted on the monitor to reflect the beam angle.

Angle Correction

You can apply an angle to the volume used for Doppler measurement. This makes the Doppler spectrum be displayed in cm/sec instead of kHz.

To turn angle correction on or off:

- Click **Angle** on the right side of the monitor

or

- Press [**On**].

  The angle correction line is superimposed on the Doppler gate.

To adjust the angle correction:

- Select the angle correction line by clicking on it or by turning it on (see above), and rotate it to the position you want using the trackball.

or

- Click the angle correction value (degrees) under **Doppler** on the left side of the monitor and drag the slider (or point at the value and press [**+/-**]).

or

- Press and hold [**Angle**] until the desired value is reached.

NOTE: *The value will stop at +/- 60 degrees. Release* [**Angle**] *and press again to adjust the angle further.*

The current setting (in degrees) is displayed at the bottom of the list under **Doppler** on the left side of the monitor.

Gain

You can adjust the gain of the Doppler mode image. The view must be imaging when you do this.

To adjust Doppler mode gain:

- Turn the [**M/Doppler Gain**] dial.

or

- Click **Gain** under **Doppler** on the left side of the monitor and drag the slider (or point at **Gain** and press [**+/-**]).

  The current Doppler gain setting (a percentage) is displayed on the monitor next to **Gain**.

Range

In Doppler mode, as in Color mode, you can vary the PRF (pulse repetition frequency) to select the range of Doppler frequencies that are included in the spectral analysis.

To adjust the velocity range:

- Press [**Scale** Ī] to step through the available ranges.

or

- Click **PRF** under **Doppler** on the left side of the monitor and select the value you want (or point at **PRF** and press [**+/-**]).

  The vertical scale is updated to correspond to the new range of velocities.

  The current setting is displayed on the monitor next to **PRF**.

Note: The wall filter value will be changed automatically when you change the PRF value.

HPRF To measure higher flow speeds (high range setting) in a sample volume placed deep in the tissue, HPRF (high PRF) is automatically used. When HPRF is active, the Doppler line shows the actual sample volume, and false sample volumes (shown dotted). See Fig 12-2 on page 184.

The false sample volumes should always be placed outside a vessel.

Wall Filter

In Doppler mode, you can set the cutoff frequency for the wall filter.

To set the cutoff frequency for the wall filter:

- Click **Wall Filter** under **Doppler** on the left side of the monitor and select the value you want (or point at **Wall Filter** and press [**+/-**]).

or

- Press [**Filter** ⊛] to step through the available values.

  The current setting is displayed on the monitor next to **Wall Filter**.

Smooth

You can change how smooth the displayed spectrum looks.

To change the smoothness of the spectrum display:

- Click **Smooth** under **Doppler** on the left side of the monitor and select the degree of smoothness you want (**Off**, **Low**, **Medium** or **High**).

  or

- Point at **Smooth** and press [**+/-**].

D Freq

In Doppler mode, you can change the Doppler frequency.

To change the Doppler frequency:

- Click **D Freq** under **Doppler** on the left side of the monitor and select the Doppler frequency you want.

  or

- Point at **D Freq** and press [**+/-**].

Invert

In PW Doppler mode, you can invert the spectrum on the monitor.

To invert the spectrum or to return to the default:

- Press [**Inverse**] to toggle between the default and inverted color coding.

  The frequency axis is inverted to match the spectrum.

Baseline

In Doppler mode, you can reposition the baseline. The baseline separates forward flow from reversed flow, and moving the axis can help overcome aliasing problems.

To adjust the baseline:

- Press [**Baseline ↕**] to move the baseline up or down.

  or

- Point at the baseline and press [**+/-**].

  The frequency axis is updated to match the spectrum.

Sweep Speed

You can adjust the sweep speed to change the number of cycles of the spectrum displayed on the full time axis. The available values range from 2 (slowest) to 8 (fastest).

To select the sweep speed:

- Click **Sweep** on the right side of the monitor and select the required value (or point at **Sweep** and press [**+/-**]).

The current setting is displayed on the monitor next to **Sweep**.

The time axis is updated.

Doppler Color Mapping

Several color scales can be used to display a PW Doppler image. Different color scales may make the spectrum clearer.

To select the color scale in Doppler mode:

- Click the color bar to the right of the spectrum and select the color scale you want or point at the color bar and press [+/-].

  The color bar to the right of the spectrum is replaced by the one you select.

Chapter 13
Continuous Wave Doppler Mode

Overview

In Continuous Wave (CW) Doppler, ultrasound is transmitted along a line as a continuous wave and analyzed as it returns. CW Doppler provides greater velocity ranges when measuring high flow regions such as flow through the cardiac valves, especially with stenosis.

Adjusting the Thermal Index Limit

Before you use CW Doppler mode, check that the TI settings are appropriate. The current TI tissue type and limit are displayed just under the BK Medical logo in the upper left corner of the monitor.

For information about adjusting the TI, see "Adjusting the Thermal Index (TI) Limit" on page 162.

Adjusting MI

You can adjust the maximum allowed MI (mechanical index).

To adjust the MI limit:

- Click **MI** above **Gain** on the left side of the monitor and drag the slider.

NOTE: *If you are using partial freeze (see page 62) and you freeze the CW-mode image, you can turn* **[*M/Doppler Gain*]** *to adjust the MI limit.*

CW Doppler is a low voltage mode, so the MI will always be low.

Turning CW Doppler Mode On or Off

You must turn on CW Doppler and position the CW Doppler line before you turn on the CW spectrum.

To turn on CW Doppler mode:

Make sure that you are imaging in B-mode and the image is not frozen.

- Press [**CW**].

  The CW Doppler line appears superimposed on the B-mode image.

  Drag the line to the position you want.

To unfreeze the CW Doppler spectrum:

- Press [ ]

Note: The B-mode image is frozen while the live CW Doppler spectrum is displayed.

To switch between live B-mode and live CW Doppler mode:

- Press [ ].

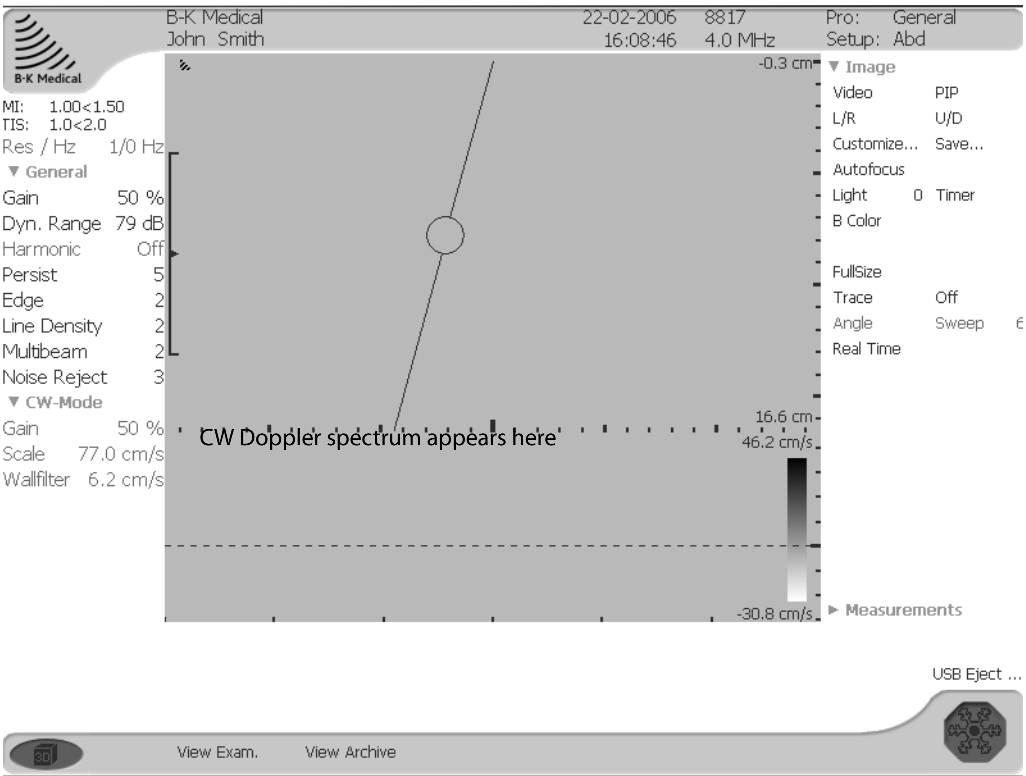


Figure 13-1. The CW Doppler line superimposed on a B-mode image.

To turn off CW Doppler mode:

- Press [**CW**] or [B].

CW Doppler Line

CW Doppler information is acquired along the full length of the CW Doppler line. When CW Doppler is turned on, the CW Doppler line is superimposed on the B-mode image.

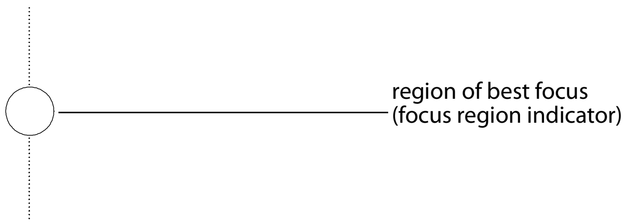


Figure 13-2. CW Doppler line.

The dotted line is the CW Doppler line. The circle indicates the region where the CW Doppler signal is best focussed.

When CW Doppler mode imaging is turned on, the CW Doppler line is superimposed on the B-mode image.

You can adjust the position of the line to get information from samples in various parts of the B-mode image. Place the focus region indicator on the region of interest. The system must be imaging when you do this.

To move the CW Doppler line and focus region indicator:

1. Select the CW Doppler line by clicking on it or by pressing [ ].
2. Drag to the desired position. (Moving the trackball to the left or right moves the line, and moving the trackball up and down moves the focus region along the line.)

Audio Volume

The CW Doppler signal can be played as an audio signal as well as appearing on the monitor.

To adjust the volume of the audio signal:

- Press [**Sound**].

Adjusting the Doppler Mode Image

Doppler Trace (Automatic Curve Tracing)

You can have the system automatically calculate and display a curve that traces the mean or peak values of the Doppler spectrum. See “Doppler Spectra” on page 248 for a description of the curves. You can also choose to have both the peak and mean curves displayed.

To change which curve is displayed or to turn off the display:

1. Click **Trace** under **Image** on the right side of the monitor.
2. Click **Off**, **Peak**, **Mean+Peak** or **Mean** to the right of **Trace**.

NOTE: *A CW Doppler signal is much weaker than a PW Doppler signal. Therefore automatic curve tracing does not always give good results, and measurements based on the curve will not be accurate. If the automatic curve is not a good fit to the signal, you must manually draw the curve to be used for measurements.*

Auto

The system can automatically adjust the Baseline (page 195) and Scale to prevent aliasing and optimize the display of the Doppler spectrum.

To optimize the baseline and scale for the current Doppler spectrum:

- Press [**Auto**].

NOTE: *The control panel (except for* **Freeze** *[ ]) is disabled while the scale and baseline are being adjusted. This may take a few seconds.*

Gain

You can adjust the gain of the CW Doppler mode image. The view must be imaging when you do this.

To adjust CW Doppler mode gain:

- Turn the [**M/Doppler Gain**] dial.

or

- Click **Gain** under **CW-Mode** on the left side of the monitor and drag the slider (or point at **Gain** and press [**+/-**]).

  The current Doppler gain setting (a percentage) is displayed on the monitor next to **Gain**.

Scale

In CW Doppler mode, you can vary the scale of the displayed spectrum.

To adjust the velocity scale:

- Click **Scale** under **CW-Mode** on the left side of the monitor and drag the slider (or point at **Scale** and press [**+/-**]).

  The vertical scale is updated to correspond to the new range of velocities.

  The current setting is displayed on the monitor next to **Scale**.

NOTE: *The wall filter value will be changed automatically when you change the scale.*

Smooth

In CW Doppler mode, you can change how smooth the displayed spectrum looks.

To change the smoothness of the spectrum display:

- Click **Smooth** under **CW-mode** on the left side of the monitor and select the degree of smoothness you want (or point at **Smooth** and press [+/-]).

Wall Filter

In CW Doppler mode, you can set the cutoff frequency for the wall filter.

To set the cutoff frequency for the wall filter:

- Click **Wall Filter** under **CW-Mode** on the left side of the monitor and select the value you want (or point at **Wall Filter** and press [**+/-**]).

or

- Press [**Filter** ⚙] to step through the available values.

  The current setting is displayed on the monitor next to **Wall Filter**.

Invert

In CW Doppler mode, you can invert the spectrum on the monitor.

To invert the spectrum or to return to the default:

- Press [**Inverse**] to toggle between the default and inverted spectrum coding.

  The frequency axis is inverted to match the spectrum.

Baseline

In CW Doppler mode, you can reposition the baseline. The baseline separates forward flow from reversed flow, and moving the axis can help overcome aliasing problems.

To adjust the baseline:

- Press [**Baseline** ‡] to move the baseline up or down.

  or
- Point at the baseline and press [**+/-**].

  The frequency axis is updated to match the spectrum.

Sweep Speed

You can adjust the sweep speed to change the number of cycles of the spectrum displayed on the full time axis.

To select the sweep speed:

- Click **Sweep** on the right side of the monitor and select the submode you want (or point at **Sweep** and press [**+/-**]).

  The current setting is displayed on the monitor next to **Sweep**.

  The time axis is updated.

Part 4: Setting up and Maintaining Your System

Chapter 14
Setting Up and Customizing Your System

The Pro Focus comes with many default setups that have been created to optimize the ultrasound images and make it easy for you to use the different transducers, Pro Packages and presets. You can customize the system so that it is easy to enter and select exactly the information you need, and so that the default setups are the way you want them.

To access the setup and customization windows:

- Click **Customize...** under **Image** on the right side of the monitor.

All descriptions in this chapter assume you already have the customization window displayed on the monitor.

Pro Packages and Presets

You can customize the Pro Packages and presets to suit your needs.

To open the setup window for Pro Packages and presets:

- Click the **Pro/Setup** tab.

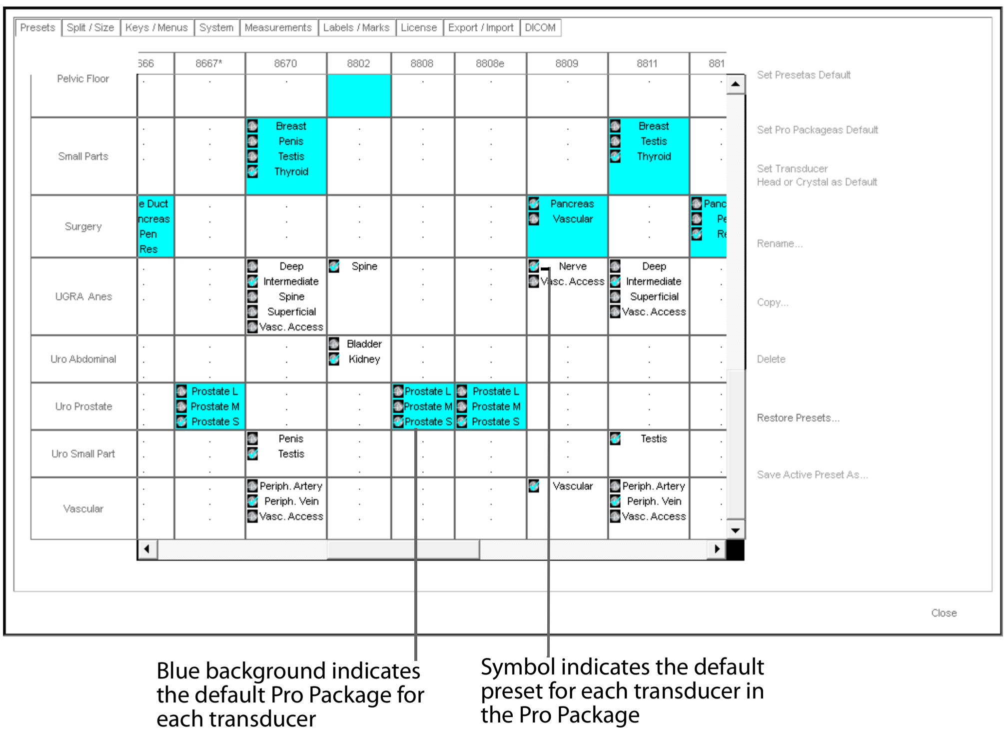


Figure 14-1. The Pro Package Setup window.

Each column in the window describes a transducer. The connected transducers are listed first. Each row describes a Pro Package. Each cell contains a list of the presets that are available for a particular transducer in a particular Pro Package. Use the scroll bars to see all the cells in the table.

In this window, you can:

- Specify which Pro Package is the default for each transducer. The default is highlighted in blue in the table.
- Specify which preset is the default for each transducer. This can be different for each Pro Package. The default is marked with a check mark.
- Set a transducer head as default (for transducers with more than one head).
- Rename or delete a preset.

NOTE: *You cannot rename a factory-defined preset.*

- Copy a preset.
- Restore factory default presets. If you click this, a table appears where you can select the setups to restore.
- Save the active preset with a name you choose.

To export or import presets, see “Importing or Exporting Presets” on page 241.

Doppler and M-Mode Screen Layout

When you image in Doppler or M-mode, a B-mode image is also present on the monitor.You use the **Screen Layout Setup** window to specify the screen layout:

- The split between the modes can be vertical or horizontal.
- The size of the Doppler or M-mode image can be small, medium or large.

NOTE: *If you have the VariSeed or Live Image Transfer licenses activated, the image size is locked by default for the Brachy Pro Package. See Fig 14-2.*

To open the Screen Layout Setup window:

- Click the **Split/Size** tab.

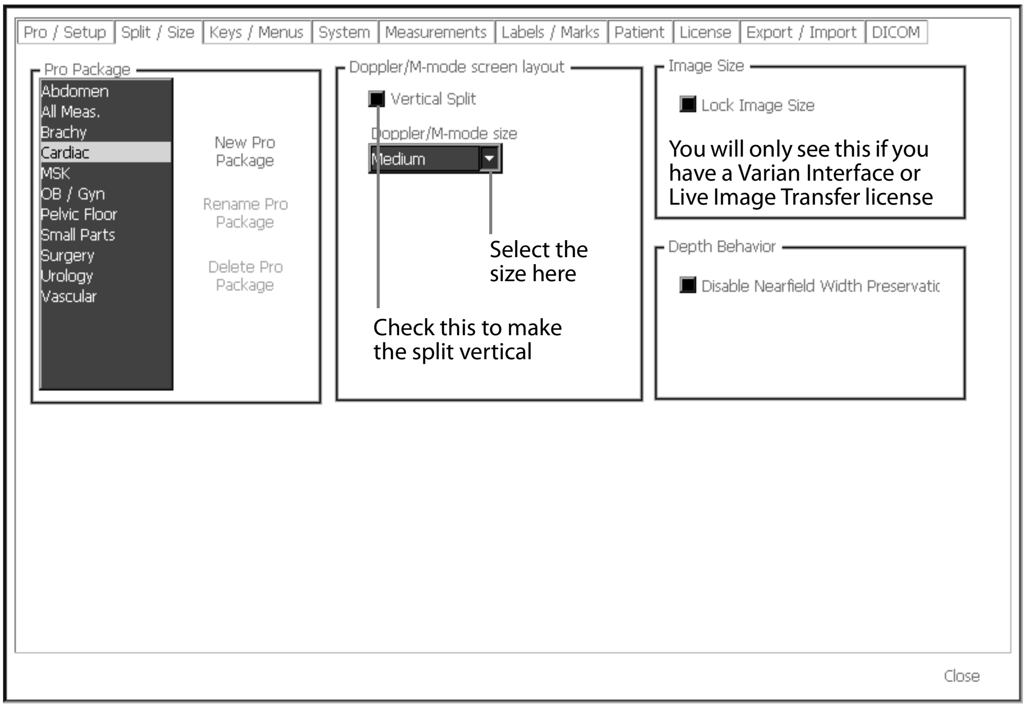


Figure 14-2. The Screen Layout Setup window.

Depth Behavior

The system is set to preserve nearfield width when you decrease the depth of the image. You can change this here. If you check this, the tissue at the side of the image will not be visible when the depth is decreased.

User-Defined Keys

You can assign functions you commonly use to one of the many user-definable keys on the system keyboard panel and optional remote control as well as the foot-switch pedals. You can also assign some functions to a long or short press on the buttons on the transducers themselves. You can also change the setup so that a short press on the transducer button 1 causes no action at all (like Freeze) to take place – select <Disabled>. (Pressing the button will still activate an inactive transducer, however.)

The same key can have different functions in different Pro Packages.

Here are the functions that you can assign to a user-definable key:

- 3D Activate
- ACI (Angular Compound Imaging)
- Activate Contrast Timer
- Angle Correction
- Auto Adjustment
- Autofocus
- Doppler/M-Mode Vertical/Horizontal Split
- Extended Resolution
- Freeze
- Harmonic
- Insert Arrow
- Insert Bodymark
- Print (PCL6)
- Print (PS)
- Print (USB B/W)
- Print (USB Color)
- Print Trigger 1
- Print Trigger 2

- AutoPlace doppler gate (VFI Only)
- BCD Toggle
- Biopsy
- B-Mode
- Bubble Burst
- Cancel
- Capture
- Capture Clip
- Capture Image
- Capture Multiple Clips
- Cine
- Clear and Start Clip Buffer
- Clear Clip Buffer
- Color
- Color Off
- CW-Mode
- Depth -
- Depth +
- Doppler
- Doppler/M-Mode Screen Size
- Invert
- Left/Right
- Line Density (B) -
- Line Density (B) +
- Line Density (C / P) -
- Line Density (C / P) +
- Measure/Timer
- Measurement [Various Organs]
- M-Mode
- Multibeam -
- Multibeam +
- Next crystal or head
- Persist (B) -
- Persist (B) +
- Persist (C / P) -
- Persist (C / P) +
- Post Gain
- Power
- Print (DICOM)
- Print (PCL5)
- Report
- Rotate -
- Rotate +
- Select Label
- Shots Per Est. -
- Shots Per Est. +
- Simultan
- Split
- Steering
- Store Image on PACS
- Toggle 3D View
- Toggle Scanning Plane
- Toggle Trace Curve
- Up/Down
- Update
- VFI/Velocity
- Wall Filter -
- Wall Filter +
- Zoom
- Zoom/Pan Reset

To open the Key Assignment Setup window:

- Click the **Keys/Menus** tab.

Figure 14-3. The Key Assignment Setup window.

Assigning User-Defined Keys

To assign functions to the user-defined keys and foot-switch pedals:

1. On the left side of the **Key Assignment Setup** window, click the Pro Package you want. (If you click **<All Pro Packages>**, the key assignment will be valid for all Pro Packages.)
2. On the right side, click the name of the key you want to define.
3. Click the ▼ that appears to the right to see a drop-down menu of the possible functions that you can assign to the key.
4. Click the one you want.
5. Repeat 2 through 4 until you have defined as many keys as you want.
6. Click **Save**.

Customizing Menus

In the **Key Assignment Setup** window, you can also specify whether you want to use personalized menus. This means you can specify how long unused menu options (buttons) remain on the monitor. (You can always see them again by clicking the arrow next to the menu heading.)

To reset the system so that most options are hidden or so that all are displayed, select **Default Hide All** or **Default Show All** in the field next to **Reset** and then click **Reset**.

- **Default Hide All** – hides all options that can be hidden. Options are displayed again when they have been used.
- **Default Show All** – displays all options that are currently hidden because they have not been used recently. Items are hidden again when not used for a period of time.

In this window you can also specify whether you want the system to remember which menu groups you have open.

Customizing Key Brightness, Mouse Controls and Depth Control

In this window, you can also

- Change the brightness of the key labels on the control panel.
- Set the mouse (cursor) speed.
- Set the mouse cursor to be hidden after a specified period of inactivity.
- Set the way the depth control works.

Depth Control

By default, the depth control is set so that if you turn the **Depth/Zoom** control dial clockwise or click **Depth** on the monitor and press **+**, the depth is increased. (This means that the magnification of the ultrasound image get smaller.) You can reverse this setting if you want to use the depth controls as magnification controls.

To use the Depth control as a magnification control:

- Check **Reverse Depth Control.**

To use the Depth control as a depth control:

- Make sure that **Reverse Depth Control** is unchecked.

System Setup

Under the **System** tab, you will find

- General Setup, page 205.
- Clip Storage Setup, page 206.
- 3D Setup, page 210.
- Printer Setup, page 210.
- Password Setup, page 213.
- Network Drive Setup, page 214.
- Version Information, page 214.
- Miscellaneous, page 215.

This section describes what you can configure and customize in each of these areas.

General Setup

You use the **General Setup** window to change location information, language, video output format, date and time, and to set the size of the staging area for burning CDs.

NOTE: *You can reset the system to the factory default setup in this window.*

To open the General Setup window**:**

- Click the **System** tab, and then, in the new window that appears, the **General** tab.

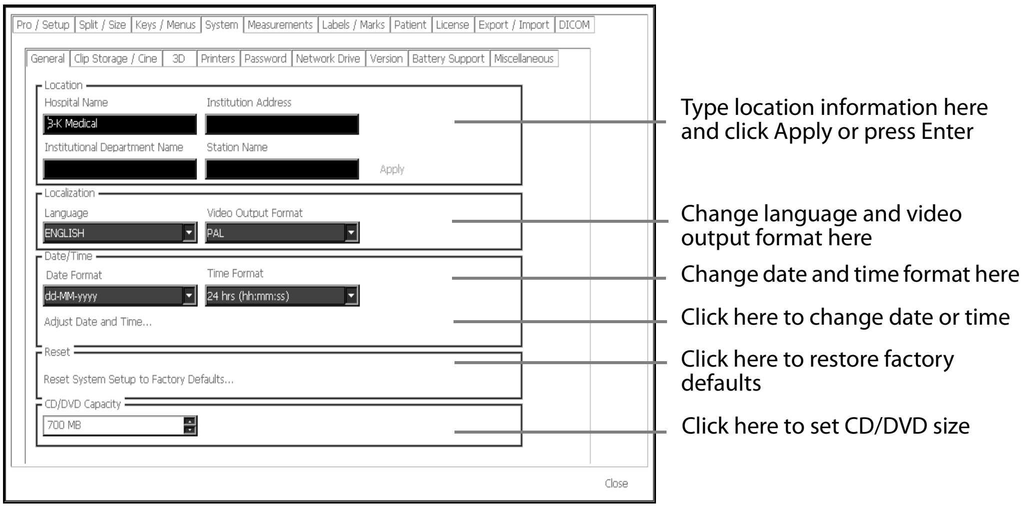


Figure 14-4. The General Setup window.

Location Information

Institution information is displayed above the patient name at the top of the monitor and included in documents archived to a DICOM system. It appears in all documentation of the image.

Language

Texts on the monitor can be displayed in different languages.

NOTE: *The change of language will not take effect until you restart the system.*

Video Format

You can select PAL or NTSC for video output. The selection also specifies the format of the video source for using the video window or PiP. See “The Video Window and Picture in Picture (PiP)” on page 71.

Date/Time

You can change the date and time in the usual Microsoft® Windows® **Date/Time Properties** setup window. You cannot change existing time stamps.

Change date or time

To change the date or time:

- Click **Date/Time**.

A message appears, stating that existing time stamps cannot be changed. When you accept the statement, the **Date/Time Properties** window appears.

Change date or time format

To change the date or time format:

- Select the date or time format in the **General Setup** window.

Restoring the Factory Setup

To restore all factory default settings on the system, click **Reset** in the **General Setup** window. See Fig 14-4.

NOTE: *If you restore the factory default settings, you will lose all customizations that have been made to the system.*

Setting the CD/DVD Size

You specify the size (storage capacity) of the disc that you will use for copying or archiving documents.

The options are:

CDs	DVDs	
185 MB	2.60 GB	5.20 GB
650 MB	3.97 GB	8.54 GB
700 MB	4.70 GB	9.40 GB

If the size of your disc is not listed, choose the largest value that is less than actual size of your disc. Do not select a size larger than your disc.

Caution: When you select a size here, you are specifying the size of the staging area for data to be burned to the disc. If you select a size that is too large, you will be able to put more data in the staging area than will fit on your disc, and you will be unable to burn the data to a disc.

Clip Storage and Cine Setup

You can use the **Clip Storage and Cine Setup** windows to change how **Clip Capture** and **Cine** work.

To open the Clip Storage and Cine Setup window:

1 Click the **System** tab and then the **Clip Storage/Cine** tab.

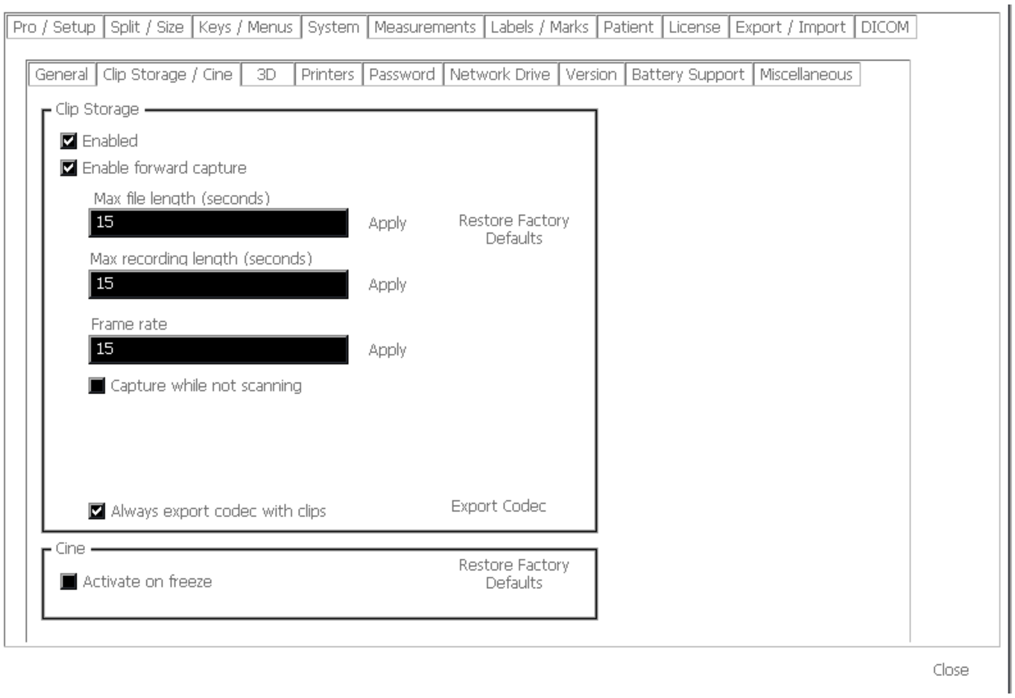


Figure 14-5. The Clip Storage and Cine Setup window when forward capture is enabled.

Figure 14-6. The Clip Storage and Cine Setup window when forward capture is not enabled.

The options in the **Clip Storage and Cine Setup** window are explained in Table 14-1.

NOTE: *The system will run slower if you enable clip capture and do not enable forward capture.*

Therefore, if you do not want to capture clips, you can speed up the system by leaving **Enabled** *unchecked.*

If you do want to capture clips and thus you check **Enable***, you can speed up the system by using forward capture (***Enable forward capture** *also checked).*

Clip Storage and Cine Options

Clip Storage	
Enabled	Enables clip storage on the system.
Enable forward capture	Enables clip capture to work like a recorder. Click to start and click to stop. When this is *not* checked, the captured clip is what has just happened before you clicked **Capture**.
Max file length (seconds)	You can record multiple clips, that is, split your recording into smaller files. This sets the length of an individual file.
Max recording length (seconds)	Sets a limit to the recording length. If forward capture is enabled and you do not click to stop the clip, the clip will stop when it reaches this length. Enter a length and click **Apply.** Example: *If you set **Max file length** to 15 seconds, and **Max recording length** to 45 seconds, and then click to record, the recording will stop after 45 seconds and you will have 3 clips of 15 seconds each.*
Frame rate/Clip frame rate	Sets the clip frame rate (from 5–15 Hz). Enter a frame rate and click **Apply**.
Clip length	(This option is available only when forward capture is not enabled.) Sets the length of clips that are stored (in seconds). The maximum possible length depends on the frame rate you set. Enter a clip length and click **Apply**.
Number of clips to capture	(This option is available only when forward capture is not enabled.) Sets the number of clips that are captured if you press a user-defined key to capture multiple clips. Click **Apply** after you type a number in the field. **NOTE:** *This option does not appear if your system is unable to capture multiple clips.*
Capture while not scanning	Check this if you want to be able to capture clips while the image is frozen. If this is not checked, clip storage stops when you freeze the image.
Clear buffer on freeze	(This option is available only when forward capture is not enabled.) Check this if you want the clip buffer to be cleared when you freeze the image.
Clear buffer on unfreeze	(This option is available only when forward capture is not enabled.) Check this if you want the clip buffer to be cleared when you start imaging again.
Clear buffer on start contrast timer	(This option is available only when forward capture is not enabled.) Check this if you want the clip buffer to be cleared when you start the timer.
Always export codec with clips	Check this if you want to export the codec every time you copy a clip to an external medium.
Restore Factory Defaults	Restores factory default clip storage or cine settings.
Export Codec	Exports the Clip Storage codec to a CD, DVD or USB device.

Clip Storage	
Cine	
Activate on Freeze	Check this if you want cine to start when you freeze the image.

Table 14-1. Settings in the Clip Storage and Cine Setup window.

3D Setup

You use the **3D Setup** window to

- Specify whether the 3D system prompts you before deleting or overwriting user views and presets.
- Have the 3D ROI be automatically selected when you start 3D or when acquisition of a 3D data set is complete.
- Choose to see the 3D volume as it is being acquired instead of seeing only the 2D view until the dataset acquisition is complete.

To open the 3D Setup window:

- Click the **System** tab, and then, in the new window that appears, the **3D** tab.

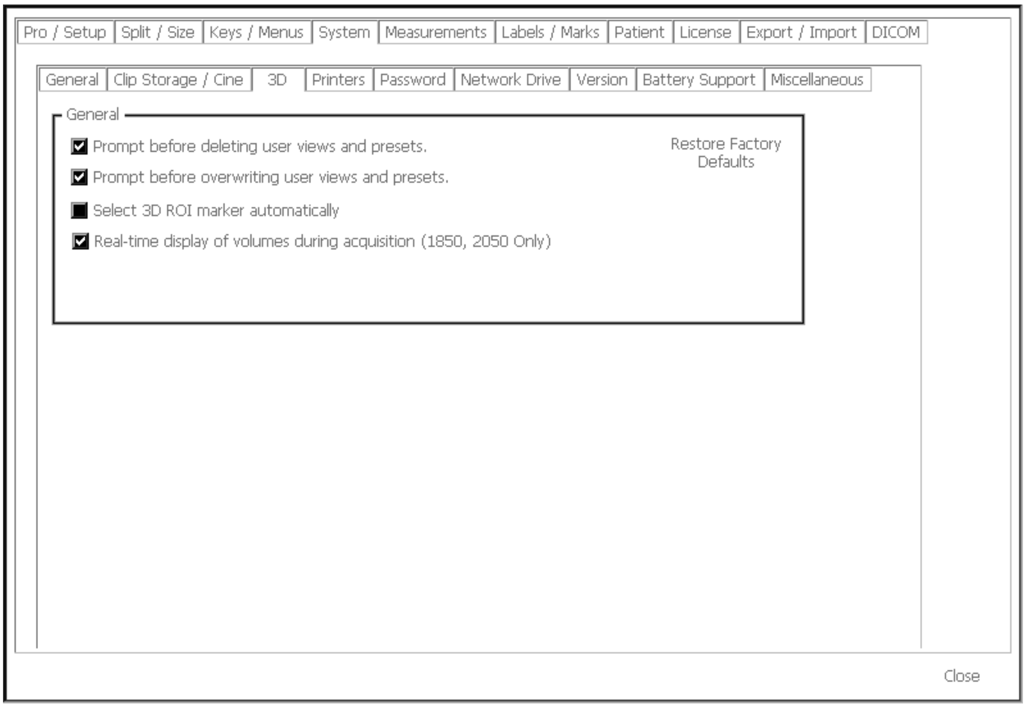


Figure 14-7. The 3D Setup window.

Printer Setup

You can set up the paper size for your printers in the **Printer Setup** window. You can also print a test page to check your settings. You can also set up an office printer on a network.

To open the Printer Setup window:

- Click the **System** tab, and then, in the new window that appears, the **Printers** tab.

Changing color, contrast or brightness

NOTE: *Click* **Setup** *in the* **Printer Setup** *window if you want to adjust the color, contrast or brightness of a printer. Do not use this new window to change anything else because your settings will be overruled by the settings in the* **Printer Setup** *window.*

In this window you can also specify whether images printed with a USB printer are archived automatically. (If the patient ID is missing, the printed image is not archived.)

Figure 14-8. The Printer Setup window.

Color Printer and **B/W Printer** are for thermal printers. An **Office Printer** means one that supports ordinary A4 or letter-size paper.

Setting Up an Office Printer

The Office Printer setup configures one of the pre-installed drivers (PCL5, PCL6 or PS) to work with the particular office printer you have configured.

NOTE: *You cannot connect an office printer directly to a USB connector on the system. You must connect it through a network. The only printers you can connect directly are the ones specified in the Product Data for the system.*

To set up an office printer:

1. Determine which of the printer languages (PCL5, PCL6 or PS) is correct for your printer. Consult the user guide for the printer if you are in doubt.
2. Select the correct printer driver from the drop-down box (see Fig 14-8).
3. Click **Config**.

The **Printer Configuratio**n window opens.

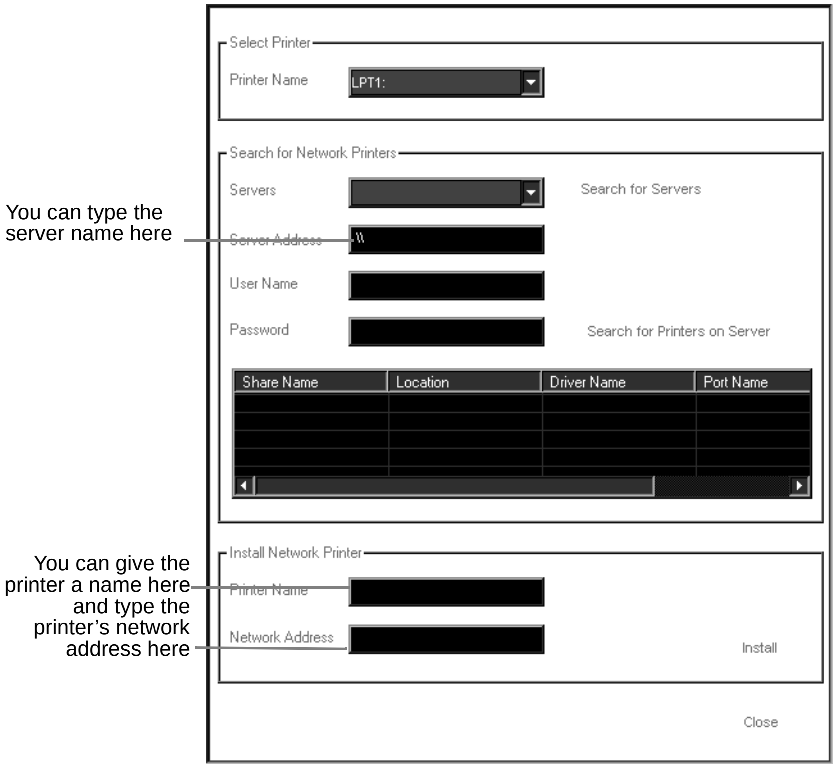


Figure 14-9. The Printer Configuration window.

4 Click **Search for Servers**.

5 Select a server from the **Printer Server** dropdown box.

6 Type the **User Name** for the printer server (you must know this in advance).

7 Type the **Password** for the printer server (you must know this in advance).

8 Click **Search for Printers on Server**.

9 Select the office printer you want from the list.

10 Click **Install**.

The name of the printer appears in the **Printer Nam**e field at the top of the window.

11 Click **Close**.

If you know the server name If you know the name of the server, you can type it in the box next to **Server Address**. See Fig 14-9.

If you do not know the user name and password for the printer server If you know the printer's IP address, you can use the **Install Network Printe**r part of the window, at the bottom.

To connect to a printer using the IP address:

1 Give the printer a name in the **Printer Name** field.

2 Type the printer's IP address in the **Network Address** field.

3 Click **Install**.

The name you have given to the printer appears in the **Printer Name** field at the top of the window.

4 Click **Close**.

Password Setup

If your system is set up to be password-protected, use the **Password Setup** window to change your password. If you are a superuser with administrative privileges, you can add or remove users, reset their passwords and enable or disable password protection.

The default superuser name and password are:

- Name: `administrator`
- Password: `superuser`

To open the Password Setup window:

- Click the **System** tab and then the **Password** tab.

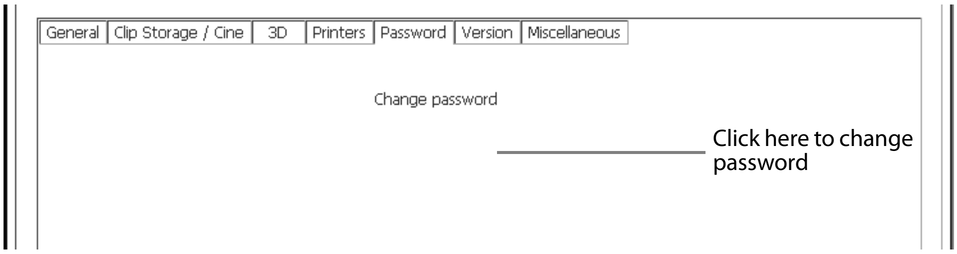


Figure 14-10. The Password Setup window for changing your password.

You can use the **Password Setup** window to change your password.

NOTE: *Your username and password must each be no longer than 16 characters. The username is not case-sensitive, but the password is case-sensitive. (Case-sensitive means that **B** is not the same as **b**.)*

If you are a superuser, you will have the options shown in Fig 14-11.

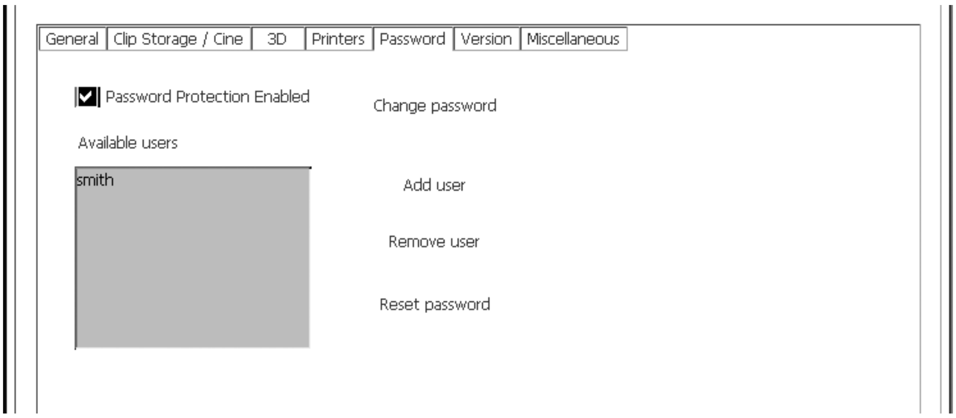


Figure 14-11. The Password Setup window for the superuser.

If password protection is disabled, then only the checkbox “Password Protection Enabled” (without a check) will be displayed. Only a superuser can enable or disable password protection.

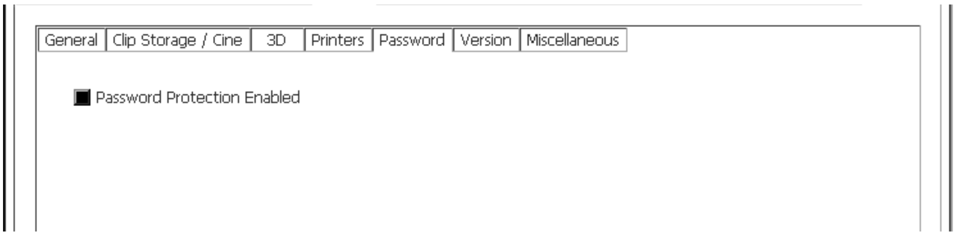


Figure 14-12. The Password Setup window when password protection is disabled.

Network Archiving

You use the **Network Drive Setup** window to set up a network drive for archiving; this must be done by a qualified service technician. The *2202 Service Manual* (BI2201) contains instructions for service personnel to use when configuring to a network drive.

Version Information

The **Version Information** window contains information about the software and hardware versions installed on your system.

You can also see how much free space is left on your hard disk.

Exporting log file

In this window, you can also export a log file that contains information about the system since the last software upgrade. You can email this to your BK service representative, for example, if you need support.

To open the Version Information window:

- Click the **System** tab, and then, in the new window that appears, the **Version** tab.

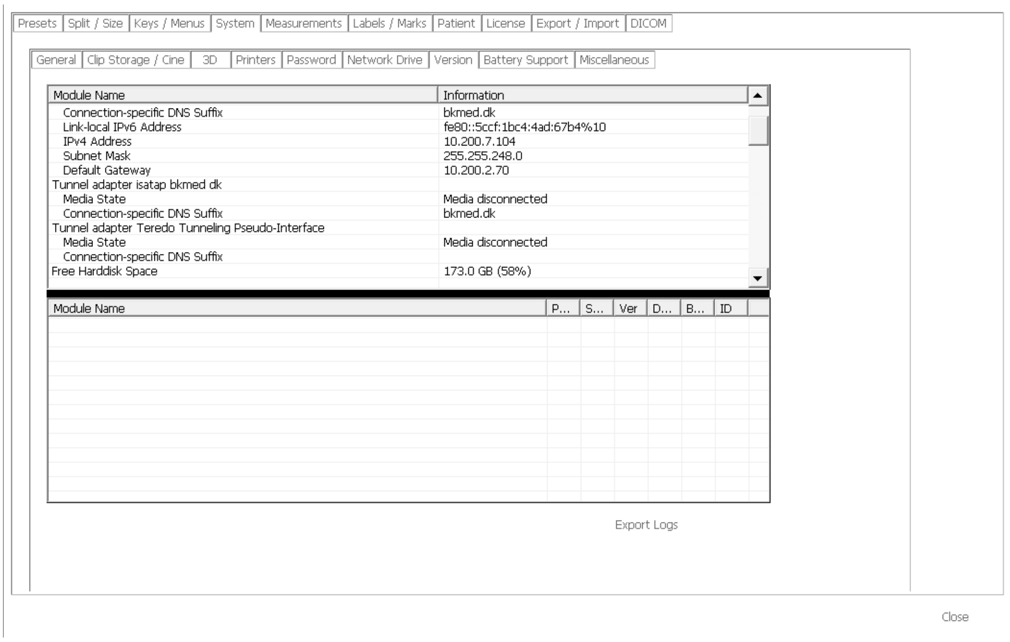


Figure 14-13. The Version Information window.

To export a log file:

1 Insert a USB device into the system.

2 On the **Version** tab, click **Export**.

3 Click **USB Device**.

4 In the window that opens, click **Full** and type a comment, including the time and details about what you were doing when an error occurred.

5 Click **Export**.

A log file is created and copied to your USB device.

6 To send it to the Service department at BK Medical, zip the file and send it to support@bkmed.dk.

Miscellaneous System Setup

In the **Miscellaneous System Setup** window you set up a number of functions.

To open the Miscellaneous System Setup window:

- Click the **System** tab, and then, in the new window that appears, the **Miscellaneous** tab.

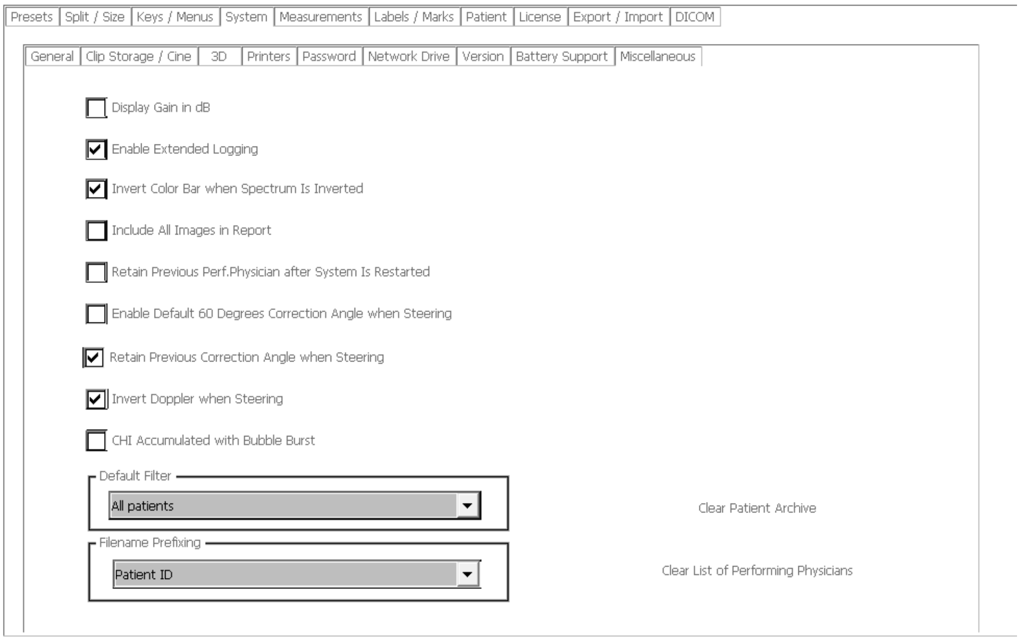


Figure 14-14. The Miscellaneous System Setup window.

Option	What it does
Display gain in dB	If checked, gain is displayed in dB. If unchecked, gain is displayed as a percentage.
Enable Extended Logging	Enables extended logging.
Invert Color Bar when Spectrum Is Inverted	Inverts the color bar to correspond to inverted spectrum.
Include All Images in Report	If checked, all images are saved to a report. If unchecked, only selected images are saved to the report.
Retain Previous Perf. Physician after System is Restarted	Keeps the setting for performing physician so you don't have to enter it the next time you start the system.
Enable Default 60 Degrees Correction Angle when Steering	Sets correction angle to 60 degrees when steering is enabled or changed. If unchecked, the correction angle is independent of steering.
Invert Doppler with Steering	Keeps the same state of the Doppler when steering changes.
CHI Accumulated with Bubble Burst	If checked, contrast bubbles are burst after each accumulation cycle when you use CHI accumulated (see "CHI Accumulated" on page 151).
Default Filter	Sets a default filter to filter the patients displayed in the Examination List on the monitor. You can use this to show only the current patient.
Filename Prefixing	You can select either patient ID, last name or comments as the prefix to the filename for all exported files and reports, to make identification and sorting easier.
Clear Patient Archive	Clears the entire patient archive. Doing this requires a password.
Clear List of Performing Physicians	Clears all the names of performing physicians.

Settings in the Miscellaneous System Setup window.

Measurements

You can customize the measurement setup so that each Pro Package contains exactly the measurements you want to use.

Defining measurements

You can import and export measurements and define new measurements that you can then use to measure features of ultrasound images. To define measurements, you use the **Measurement Definition Setup** window (page 218).

Organizing measurements

You can also arrange the measurements in groups and change the order in which they appear on the monitor. For this you use the **Measurement Group Setup** window (page 222).

Defining curves

In the **Curve Setup** window (page 223), you can define a new curve or edit an existing one.

In the **Miscellaneous Measurement Setup** window (page 226), you can set various measurement parameters and change the way in which measurements are displayed.

User-Defined Measurements

You can define several types of measurements. Table 14-2 contains information about each type. The term “D-mode” means “Doppler mode”.

Type of User-Defined Measurement	Measurement Based On This	About the Calculation	Results
B-Mode Measurement	1 or no B-mode measuring tool	Formula can use results of other measurements	1
D-Mode Measurement	1 or no Doppler mode measuring tool	Formula can use results of other measurements	1
Gestational Age	1 B-mode measuring tool	GA and EDC calculated from factory-default or user-defined curve.	<type> GA EDC
Fetal Weight	1 or more results of other measurements	User-defined formula	FW
M-Mode Measurement	1 or no M-mode measuring tool	Formula can use results of other measurements	1
Procedure	Any measurements	User-defined sequence of measurements to be performed in order, for example, first “Height”, then “Width”, then “Length”	A sequence of measurements

Table 14-2. Types of user-defined measurements and their properties.

To open the Measurement Definition Setup window:

- Click the **Measurements** tab and then the other **Measurements** tab.

  The **Measurement Definition Setup** window opens, displaying a list of all user-defined measurements.

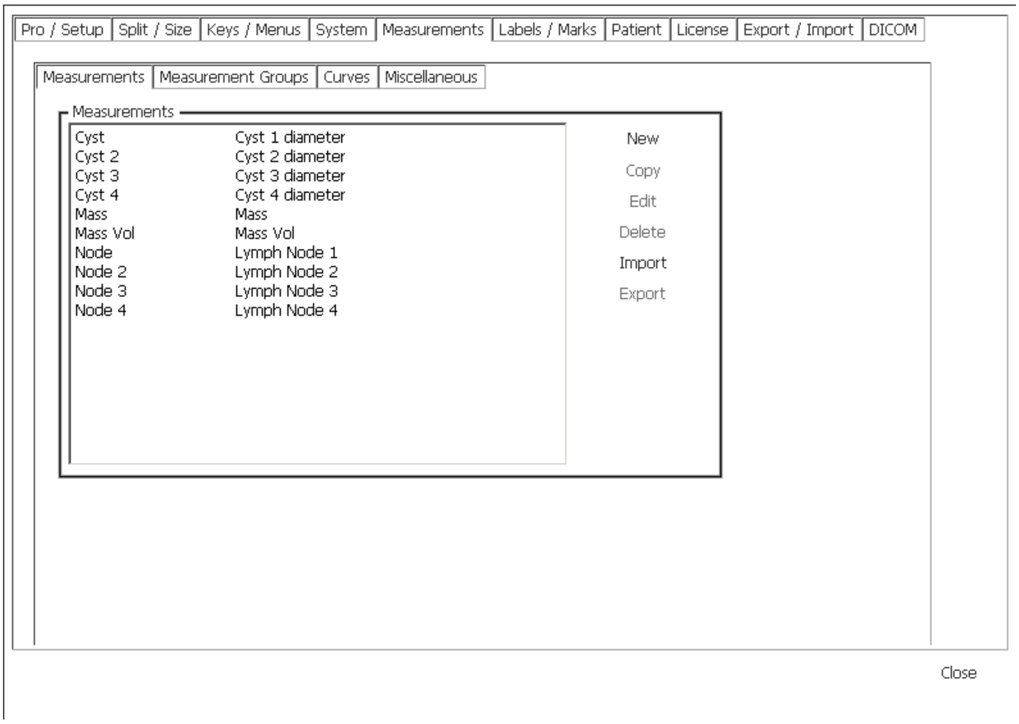


Figure 14-15. The Measurement Definition Setup window.

You have the following options in the **Measurement Definition Setup** window.

Option	What it does
New	Opens the Measurement Definition Wizard so you can define a new measurement.
Copy	Creates a new user-defined measurement as a copy of the currently selected measurement. You must enter a new name and description. You can then edit it to create a new user-defined measurement.
Edit	Opens the Measurement Definition Wizard so you can edit the selected user-defined measurement.
Delete	Deletes the selected user-defined measurement. You are asked to confirm the deletion.
Import	Imports a measurement from an external storage device. If the measurement depends on other measurements, you are prompted to import them, too.
Export	Exports a measurement to an external storage device. ***Note:*** *If the measurement depends on other measurements, they will not be exported automatically. You must do this manually by selecting user-defined ones for export. Factory-defined measurements do not need to be exported because they will exist on all systems.*

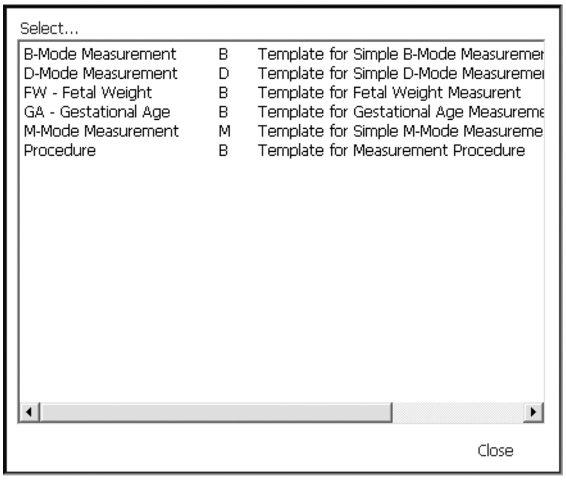
Table 14-3. Options in the Measurement Definition Setup window.

Using the Measurement Definition Wizard

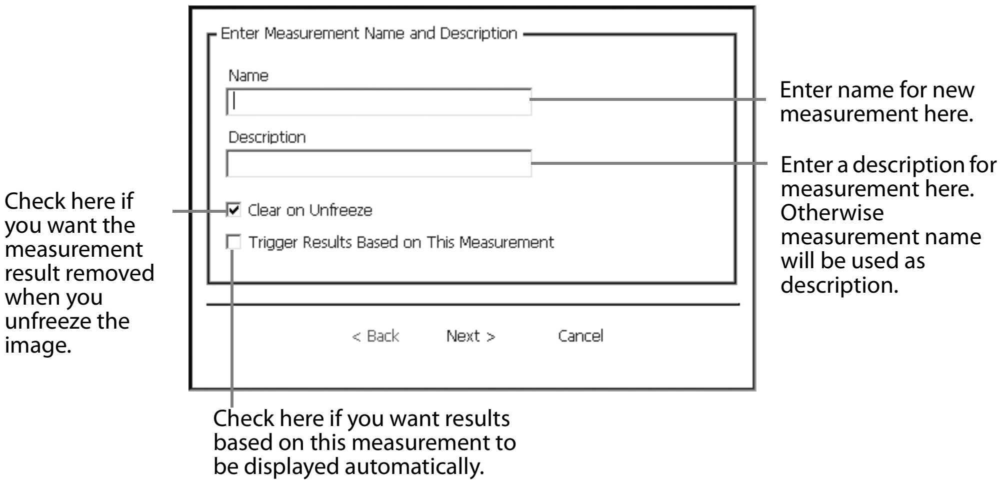
To define a new measurement or edit an existing one:

1 In the **Measurement Definition Setup** window, click **New** or select an existing measurement and click **Edit**.

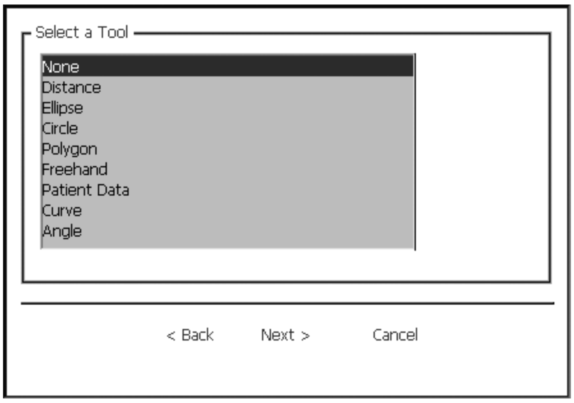
The following window appears.



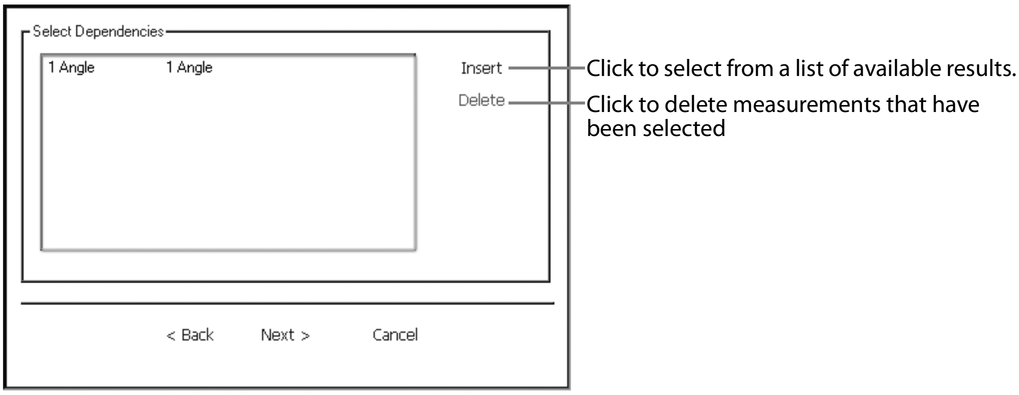
2 Select a template that the measurement will be based on. (This step does not appear if you are editing an existing measurement.)



3 Enter a name and description for the new measurement. Decide whether you want the measurement result to be removed when you unfreeze the image. If you use measurements made on images from different imaging planes, you probably do *not* want it removed. Click **Next**.

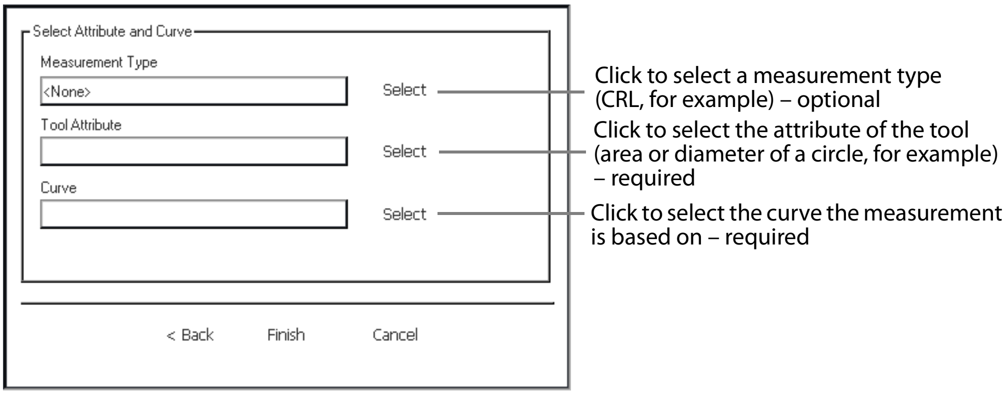


4 Select a measuring tool. (Fetal weight measurements and procedures skip this step and go straight to Step 5.) The tools that are available depend on the type of measurement you are defining. Click **Next**.

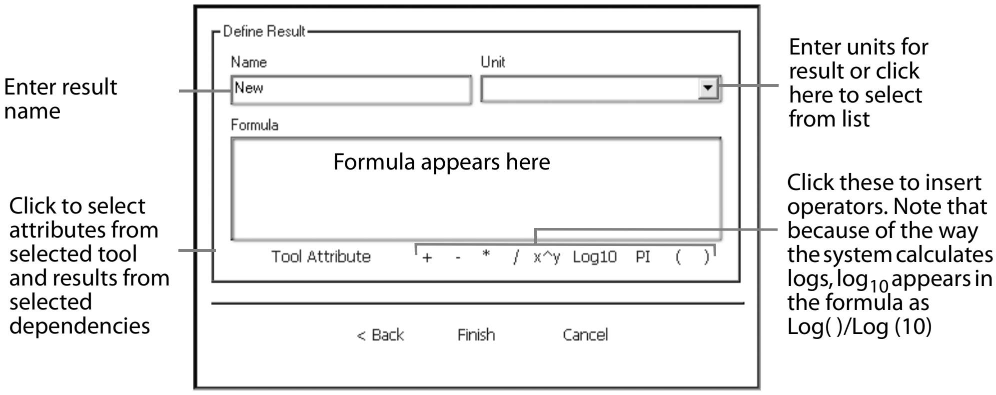


5 Select dependencies, one at a time. (Gestational age measurements skip this step and go to Step 6.) That is, click **Insert** and select the measurements whose results will be used by the new measurement. Click **Next** and jump to Step 7.

(If you are defining a procedure, select, in order, the measurements that will make up the procedure. Then click **Finish** and jump to Step 9.)



6 For gestational age measurements only, select a measurement type (optional), tool attribute (required) and curve (required). Go to Step 8.



7 Define the name and units of the result of the measurement. Then define the formula for the measurement. The formula must follow the syntax in Table 14-4. An example of a formula is

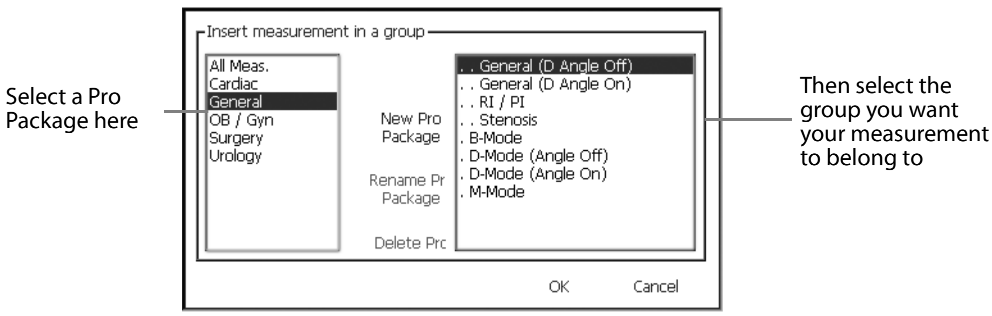
```
3.1419*([Distance.Distance_mm]/2)^2
```

(Gestational age measurements skip this step.)

Part of Formula	Syntax
Tool	[<tool name>.<attribute value>]
Dependency	[<dependency name>.<dependency result name>]
Argument list (ARG_LIST)	<tool name>.<attribute value> or <tool name>.<attribute value>,ARG_LIST or <tool name>.<dependency result name> or <tool name>.<dependency result name>,ARG_LIST

Table 14-4. Formula syntax for measurements.

8 Click **Finish**. (If the formula contains errors, you will not be able to continue until you correct them.)



9 If you are defining a new measurement, insert it into a measurement group for the selected Pro Package by selecting the Pro Package and then the measurement group.

You can also edit measurement groups in the **Measurement Group Setup** window. (See page 222.)

Measurement Group Setup

To open the Measurement Group Setup window:

- Click the **Measurements** tab and then the **Measurement Groups** tab.

  The **Measurement Group Setup** window opens with a list of Pro Packages on the left, a list of measurement groups in the middle, and a list of measurements on the right.

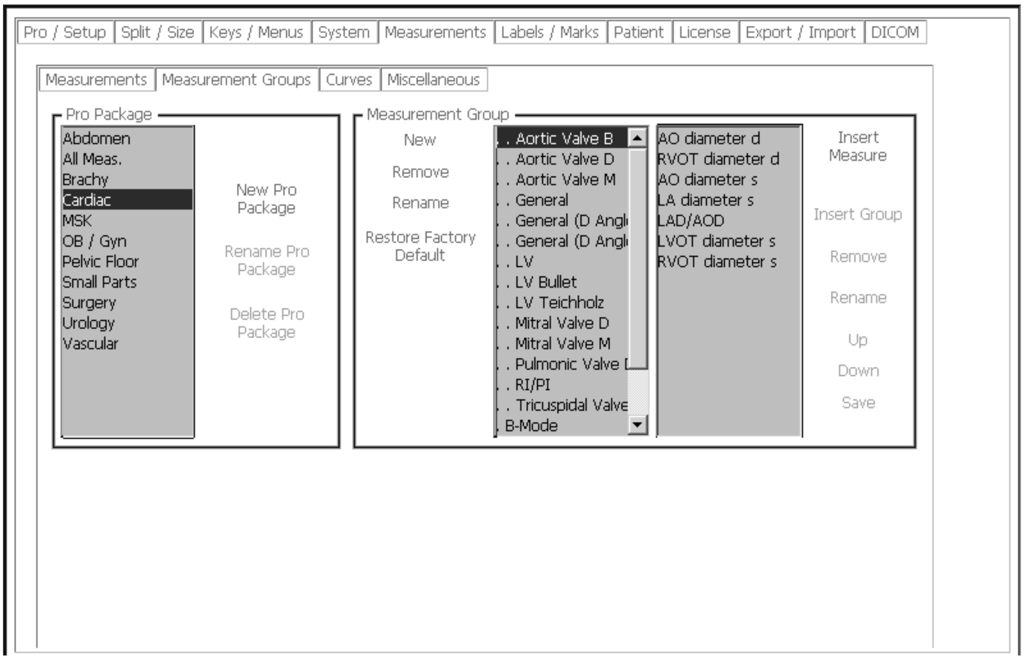


Figure 14-16. The Measurement Group Setup window.

When you click a Pro Package in the left-hand list, the measurement groups currently available in the Pro Package are displayed in the middle list. When you click one of the groups, the measurements currently in the group are displayed in the right-hand list. For each group, you can add new measurements, remove measurements, and move each one up and down in the list that will appear on the monitor next to the image. You can also add and name new measurement groups in this window.

Curves

You use the **Curve Setup** window to define a curve or to edit an existing user-defined one.

To open the Curve Setup window:

- Click the **Measurements** tab and then the **Curve** tab.

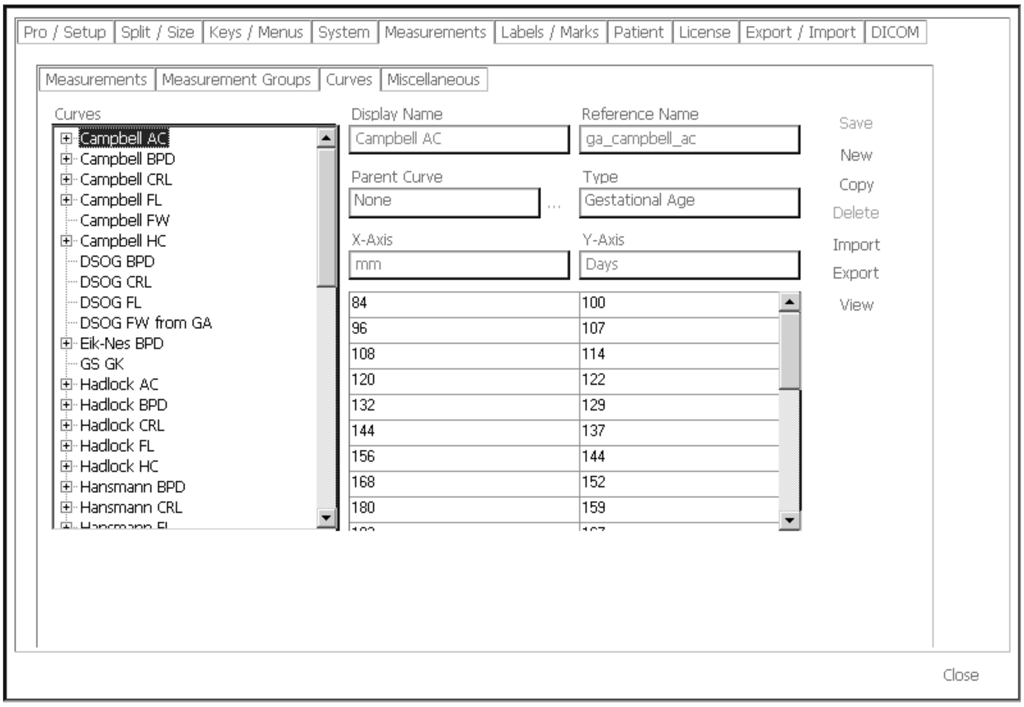


Figure 14-17. The Curve Setup window.

The **Curve Setup** window has a list of curves on the left, fields containing information about the curves in the middle, and a list of options on the right.

Curve list

The list contains all available curves, including all user-defined ones. The list is displayed in a the form of a "tree". If a curve appears with a + to the left of it, it has related (percentile) curves that will be displayed with it. Click on the + to expand the tree and see the related curves. The + becomes a - when the list is expanded. Click - to collapse the list again.

Child and parent curves

NOTE: *The percentile curves are called "child" curves. The curve that they are related to (and displayed with) is called the "parent" curve.*

Information fields

When the window opens, no curve is selected, and the information fields are blank.

When a curve in the list is selected, the information fields contain information about the selected curve. If the selected curve is user-defined, you can edit the information in the fields.

The actual values of the curve are listed below the other information fields.

Information Field	Contents
Display Name	The name you give the curve. It will appear with this name on the system. You are warned if you try to give a curve a name that is not unique, but you can do it anyway.
Reference Name	The reference name is used to reference curves from measurement formulas. The reference name must be unique. That will be checked when you click **Save**.
Parent Curve	The parent curve that will be displayed with the curve you are defining. Click to select a parent curve from a list.
Curve Type	The type of curve: • Gestational Age • Fetal Weight From Gestational Age • None (some other type or not a specific type) Measurements based on a GA-curve will be available in the reports. The default FW-curve will also be available in the reports.
X-Axis	A label for the x-axis of the curve.
Y-Axis	A label for the y-axis of the curve.
Curve Values	The curve values are entered in the spreadsheet-like control at the bottom of the dialog. The left column is the x-axis and the right column the y-axis. You do not have to enter the values in a sorted order. The database will sort the x-values ascending. If a cell in the left column is empty, the y-value next to it is not used. There is no limit to the number of values you can enter to define a curve.

Table 14-5. Information fields in the Curve Setup window.

You have the following options in the **Curve Setup** window.

Option	What it does
Save	Saves a curve that you have edited or defined.
New	Blanks all the curve values so you can insert new ones to create a new curve.
Copy	Creates a copy of the selected curve. Child curves are not included in the copy and must be copied separately. **Curve Type**, X-axis, Y-axis and points are copied. **Display Name**, **Reference Name** and **Parent Curve** are left blank so you can fill them in to create a new curve.
Delete	Deletes the selected curve. If the selected curve is a parent curve the children will be deleted as well. You are asked to confirm that you want to delete the curve.
Import	Imports a curve from an external storage device.
Export	Exports a curve to an external storage device. If the curve is a parent curve, the children will be exported as well.
View	Displays the currently selected curve. The curve dialog is opened and curve is displayed. This is very useful for verifying that curve points are positioned correctly.

Table 14-6. Options in the Curve Setup window.

Creating and Editing Curves

To create a new curve:

1 Open the **Curve Setup** window.

2 Click **New**.

3 Fill in the information fields and the values you want for the curve.

4 Click **Save**.

To edit an existing curve:

1 Open the **Curve Setup** window.

2 In the list on the left, click the curve you want to edit.

3 Edit the information fields (including the curve values) as you want to.

4 Click **Save**.

NOTE: *You can only edit curves that you have defined. Curves that come with the system cannot be edited.*

Miscellaneous Measurement Setup

To open the Miscellaneous Measurement Setup window:

- Click the **Measurements** tab and then the **Miscellaneous** tab.

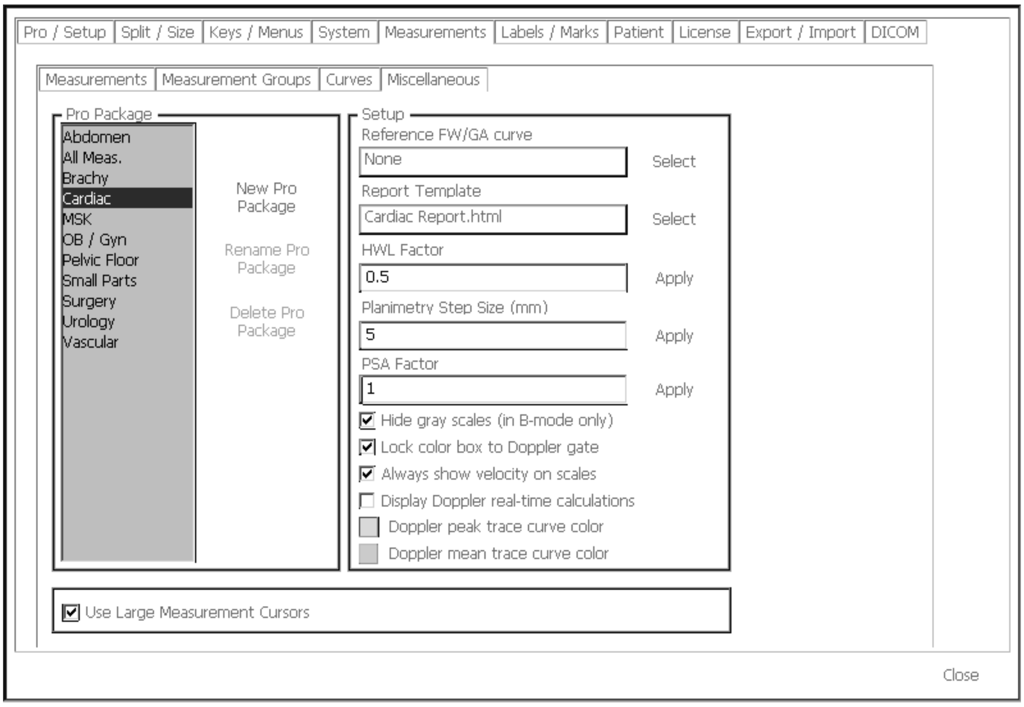


Figure 14-18. The Miscellaneous Measurement Setup window.

In this window you can specify:

- the FW/GA curve that is used as a reference curve when you create a report.
- the HWL factor.
- the planimetry step size.
- the PSA factor.
- whether gray scales are hidden in B-mode.
- whether the color box is locked to the Doppler gate – if you leave this box unchecked, the color box will not move when you drag the Doppler gate.
- whether Doppler and Color measurements are always shown in cm/s (velocity) or whether they are in kHz when the Doppler angle correction is turned off.
- whether Doppler real-time calculations are displayed all the time.
- the color for the Doppler peak or mean trace curve – to change the color, click the colored box and select the color you want.
- Whether you want displayed measurement cursors to be larger.

NOTE: *Make sure to select the appropriate Pro Package on the left side of the window before defining the settings.*

Marks (Bodymarks, Labels, Puncture Guides)

You can customize the bodymark and label setup so that it is easy to use exactly the labels you want. You can also change the offset of a programmable puncture guide or set up a brachy ruler.

For each Pro Package, you can:

- Import new bodymarks/labels into any bodymark/label catalog
- Copy bodymarks from one catalog to another
- Delete bodymarks/labels from a catalog
- Change the order in which bodymarks/labels in a catalog are displayed
- Set a default position for bodymarks (and imaging plane indicator) and labels

Bodymark Setup

To make changes to the bodymark setup, you use the **Bodymark Setup** window.

To open the Bodymark Setup window:

- Click the **Labels/Marks** tab and then, in the new window that appears, click the **Bodymark Catalogs** tab.

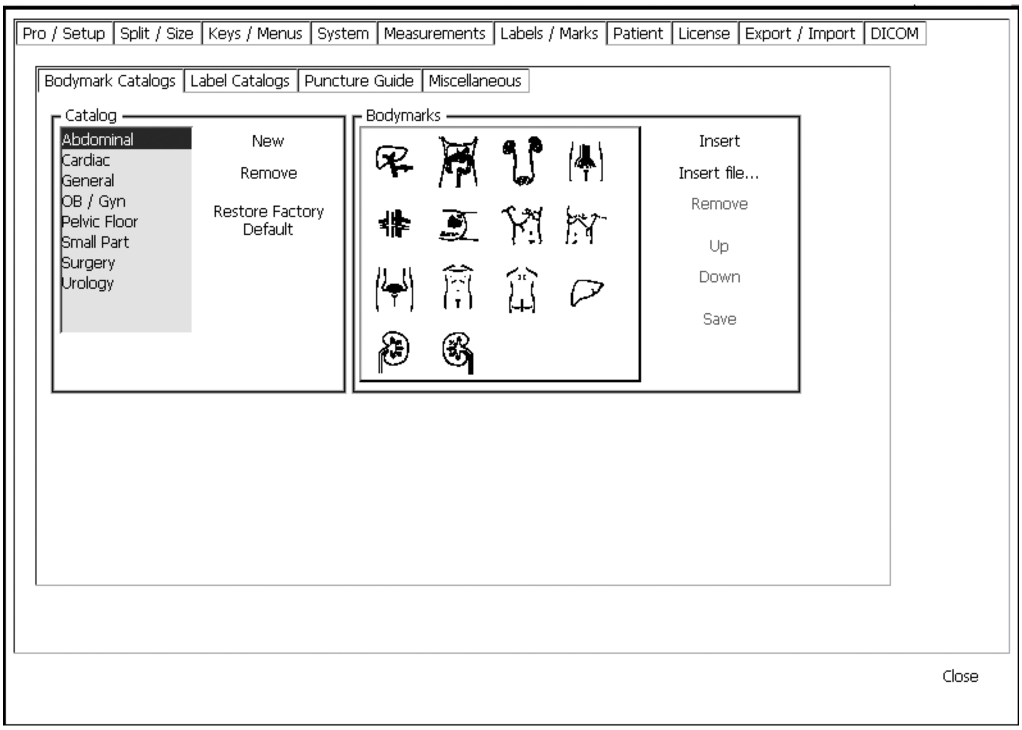


Figure 14-19. The Bodymark Setup window.

Adding or Removing a Bodymark Catalog

You can add a new catalog and then customize it to contain the bodymarks you want to use. You can remove any catalogs you do not want to use.

To add a bodymark catalog:

1 Click **New**.

2 Type a name for the new catalog in the box that appears.

The new catalog (empty of bodymarks) appears on the right side of the window.

To remove a bodymark catalog:

1 Click the name of the catalog you want to delete.

2 Click **Remove**.

You are asked to confirm that you want to delete the catalog. If you click **Yes**, the catalog is removed.

Factory default

To restore the factory default:

- Click **Restore Factory Default**.

  The catalog list and all bodymarks in each catalog are restored to the factory default settings.

Importing Bodymarks from a File to a Catalog

You can import bodymarks from a bitmap (.bmp) file to any of the bodymark catalogs. Images that you import must be:

- 100 x 100 pixels – larger images will be scaled
- black and white – color images will give unpredictable results

To import bodymarks to a catalog:

1 Open the **Bodymark Setup** window and select the catalog you want to import to.

2 Click **Insert file....**

A file list appears, showing all .bmp files on all external storage devices.

3 Select (click) the files you want to import.

The imported bodymarks appear at the beginning of the catalog.

Organizing Bodymarks in Catalogs

You can organize the bodymark catalogs as you like, adding and deleting bodymarks in a catalog, changing the order in which they appear in the catalog, deleting ones you don't need and so on.

Copying bodymarks from another catalog

To copy a bodymark from one catalog to another:

1 In the **Bodymark Setup** window, click **Insert**.

The **Bodymark** window appears.

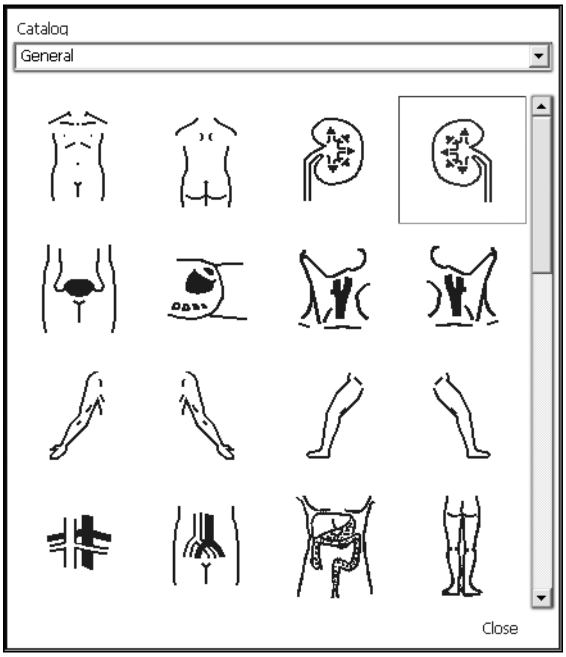


Figure 14-20. The Bodymark window with the General catalog displayed.

2 Click the catalog drop-down menu at the top of the window to select the catalog you want to copy a bodymark from.

That catalog is displayed in the **Bodymark** window.

3 Click the bodymark you want to copy.

The **Bodymark** window disappears, and the copied bodymark is inserted at the beginning of the catalog on the right side of the **Bodymark Setup** window.

Deleting a bodymark

To delete a bodymark from a catalog:

1 Click the bodymark (in the **Bodymark Setup** window).

2 Click **Remove**.

Changing the order

To move a bodymark up or down in the catalog:

1 Click the bodymark to select it.

2 Click **Up** or **Down**.

The bodymark moves up (or to the left) or down (or to the right) in the catalog.

Saving Changes

To save the changes you have made in the **Bodymark Setup** window, click **Save**.

Label Setup

To make changes to the label setup, you use the **Label Setup** window.

To open the Label Setup window:

1 Click the **Labels/Marks** tab, and then, in the window that appears, the **Label Catalogs** tab.

Figure 14-21. The Label Setup window.

Adding or Removing a Label Catalog

You can add a new catalog and then customize it to contain the labels you want to use. You can remove any catalogs you do not want to use.

To add a label catalog:

1 Click **New**.

2 Type a name for the new catalog in the box that appears.

The new catalog (empty of labels) appears on the right side of the window.

You can now add labels to the category. See “Importing Labels from a File to a Catalog” on page 230.

To remove a label catalog:

1 Click the name of the catalog you want to delete.

2 Click **Remove**.

You are asked to confirm that you want to delete the catalog. If you click **Yes**, the catalog is removed.

Factory default

To restore the factory default:

- Click **Restore Factory Default**.

The catalog list and all labels in each catalog are restored to the factory default settings.

Importing Labels from a File to a Catalog

You can import labels from a text (.txt) file to any of the label catalogs. One line in the file is treated as one label. Empty lines are ignored.

To import labels from a file to a catalog:

1. Open the **Label Catalog** window and select the catalog you want to import to.
2. Click **Insert file**....

   A file list appears, showing all .txt files on all external storage devices.
3. Select (click) the file you want to import.

   The imported labels appear at the end of the catalog.

Adding a Label to a Catalog or Removing One

You can organize the label catalogs as you like, adding and deleting labels, changing the order in which they appear in the catalog, deleting ones you don't need and so on.

To delete a label from a catalog:

1. In the **Label Setup** window, select the catalog.
2. Click the label in the list.
3. Click **Remove**.

Changing the order

To move a label up or down in the catalog:

1. Click the label to select it.
2. Click **Up** or **Down**.

   The label moves up or down in the catalog.

Saving Changes to a Catalog

To save the changes you have made to a label catalog in the **Label Setup** window, click **Save**.

Brachy Matrix, Brachy Ruler and Programmable Puncture Guide Setup

In the **Brachy Matrix Setup** window, you make setup changes to brachy matrices and puncture guides. You can:

- Move a programmable brachy matrix or puncture guide left or right or in or out.
- Specify that a brachy ruler is displayed on a sagittal view (8848 transducer).
- Define your own brachy matrix and ruler.

To open the Brachy Matrix Setup window:

- Click the **Labels/Marks** tab, and then, in the window that appears, the **Puncture Guide** tab.

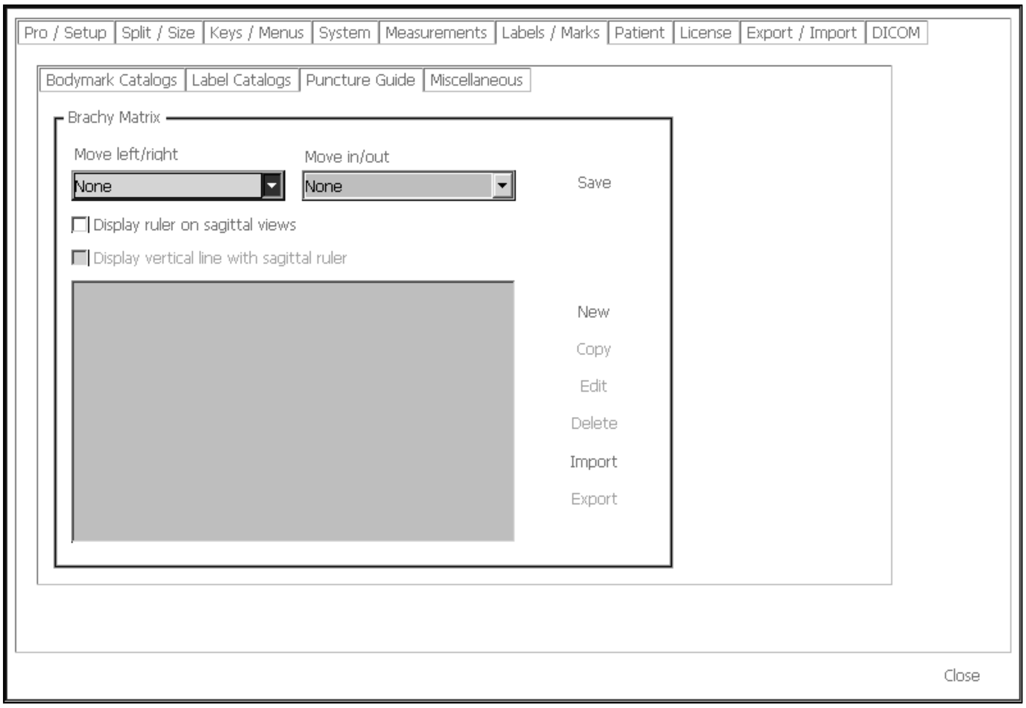


Figure 14-22. The Brachy Matrix Setup window.

To move the offset in either direction:

- Select the offset you want from the drop-down menu and click **Save**.

WARNING Changes you make to the offset of a programmable puncture guide or brachy matrix will affect ALL programmable puncture guides and brachy matrices. This could lead to incorrect puncture lines or matrix positions for a different guide than the one you wanted to change.

To have a brachy ruler displayed when you are imaging in the sagittal plane with the 8848 transducer:

- Check **Display ruler on sagittal views** and click **Save**.

  A brachy ruler will be displayed on sagittal views if a brachy matrix is displayed on transverse views.

  If the box is not checked, a brachy ruler will never be displayed with a sagittal view, but you will still be able to see and use the biopsy guides for sagittal views, where appropriate

To have a vertical line displayed at the 0 of the brachy ruler:

- Check the checkbox and click **Save**.

User-Defined Matrices (including Brachy and Transperineal)

Verify user-defined guide

WARNING If you create a user-defined matrix, it is your responsibility to verify that the matrix that appears on the monitor corresponds to the physical matrix you are using.

User-defined matrices are listed in the lower part of the **Brachy Matrix Setup** window (Fig 14-22).

You have the following options for user-defined matrices.

Option	What it does
New	Opens the User-Defined Matrix Wizard so you can define a new brachy matrix.
Copy	Creates a new user-defined brachy matrix as a copy of the currently selected matrix. The name of the new matrix is the name of the existing matrix plus an index number. You can then edit the copy to create a new user-defined matrix.
Edit	Opens the Measurement Definition Wizard so you can edit the selected user-defined brachy matrix.
Delete	Deletes the selected user-defined brachy matrix. You are asked to confirm the deletion.
Import	Imports a brachy matrix from an external storage device. If the system already has a matrix with the same name as the matrix you want to import, the imported matrix will be renamed to the matrix name plus an index number.
Export	Exports the selected matrices to an external storage device.

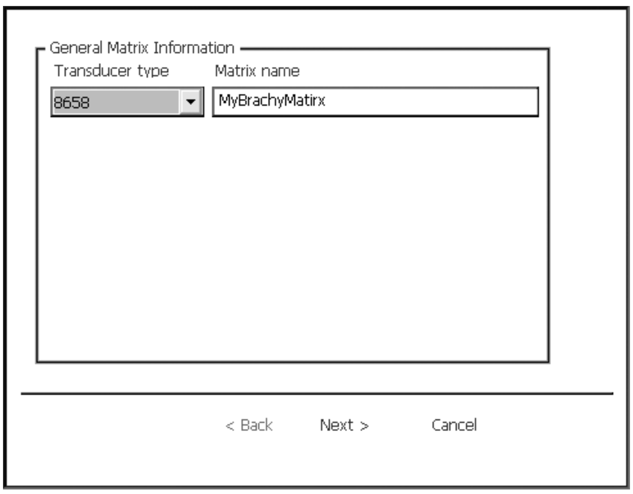
Table 14-7. Options in the Brachy Matrix Setup window.

Using the User-Defined Brachy Matrix Wizard

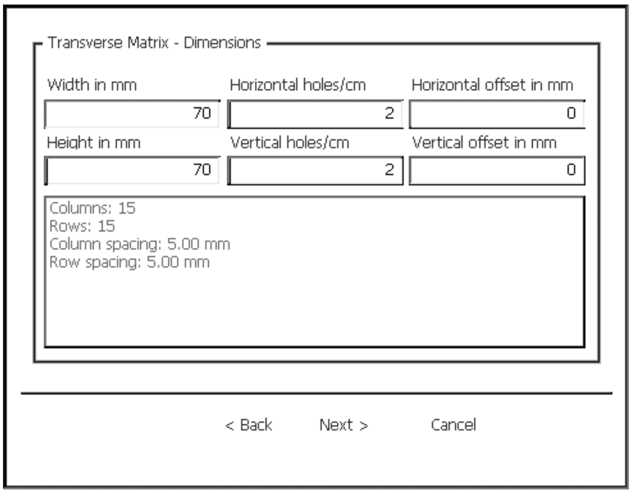
To define a new matrix or edit an existing user-defined matrix:

1. In the **Brachy Matrix Setup** window, click **New** or select an existing measurement and click **Edit**.

   The following window appears.

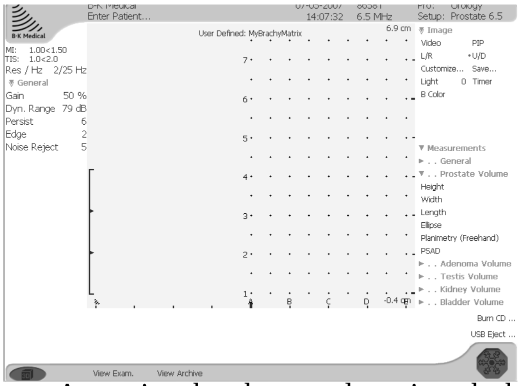


2. Select the transducer that the matrix will be used with, and name the matrix. Click **Next**.



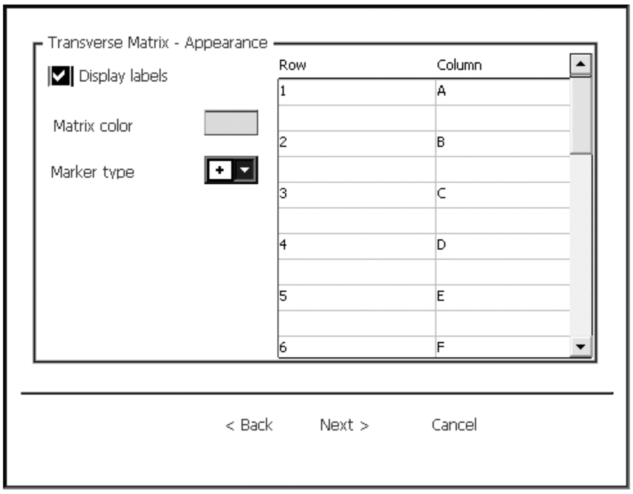
3 Enter the width and height of the matrix, the horizontal and vertical spacing between holes (holes per cm) and the horizontal and vertical offset of the matrix.

The system calculates the number of rows and columns and the hole spacing in each direction. When the both offsets are 0, the matrix looks like this:

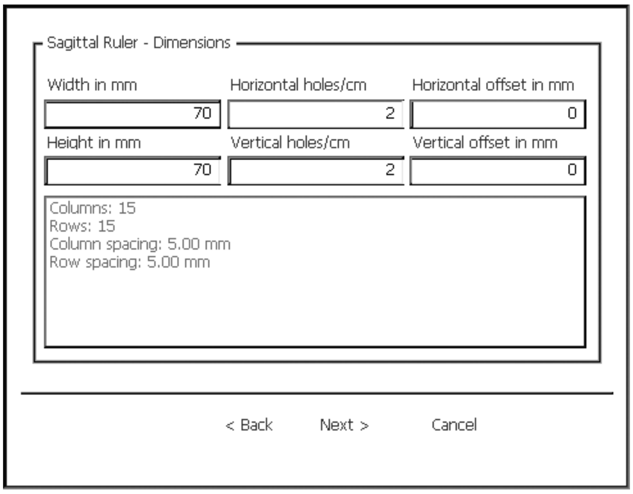


Assuming that the transducer is at the bottom of the image, positive offsets move the matrix to the right or up, negative offsets move it to the left or down.

4 Click **Next**.

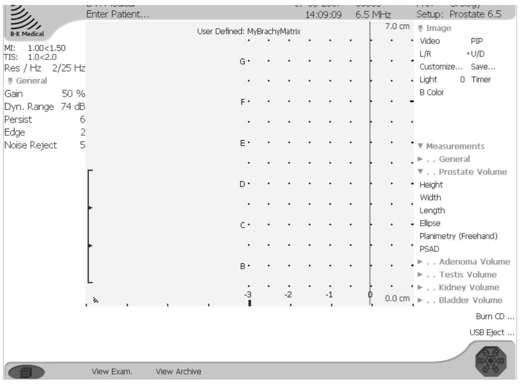


5 Select the symbols (**Marker type**) and color (click the box) that will be used for the matrix. If you check **Display labels**, you can enter names for the rows and columns. Click **Next**.



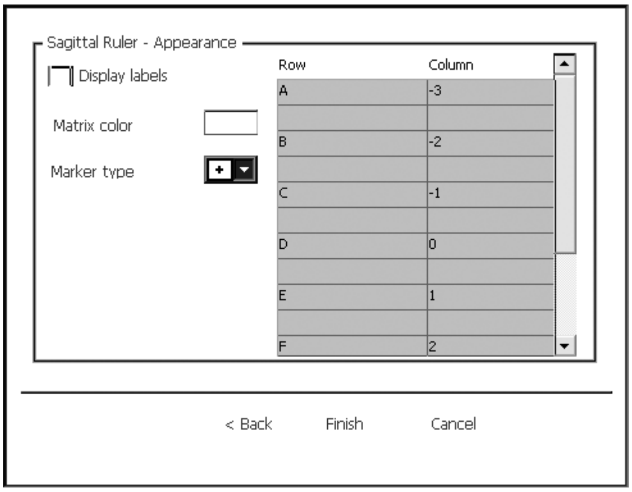
6 Enter the width and height of the ruler, the horizontal and vertical spacing between markers (holes/cm) and the horizontal and vertical offset of the ruler.

The system calculates the number of rows and columns and the hole spacing in each direction. When the both offsets are 0, the matrix looks like this:



Assuming that the transducer is at the bottom of the image, positive offsets move the matrix to the right or up, negative offsets move it to the left or down.

Click **Next**.



7 Select the symbols (**Marker type**) and color (click the box) that will be used for the ruler. If you check **Display labels**, you can enter names for the rows and columns.

NOTE: *If you want to be able to have a vertical line displayed at the 0 of the brachy ruler (see page 232), you must name one of the columns "0".*

8 Click **Finish**.

NOTE: *You must disconnect and reconnect the transducer (both plugs, if it has more than one) in order for the changes to take effect.*

Miscellaneous Marks Setup

You can customize some aspects of how bodymarks and labels work for each Pro Package.You do this in the **Miscellaneous Marks Setup** window.

To open the Miscellaneous Marks Setup window:

- Click the **Labels/Marks** tab, and then, in the window that appears, the **Miscellaneous** tab.

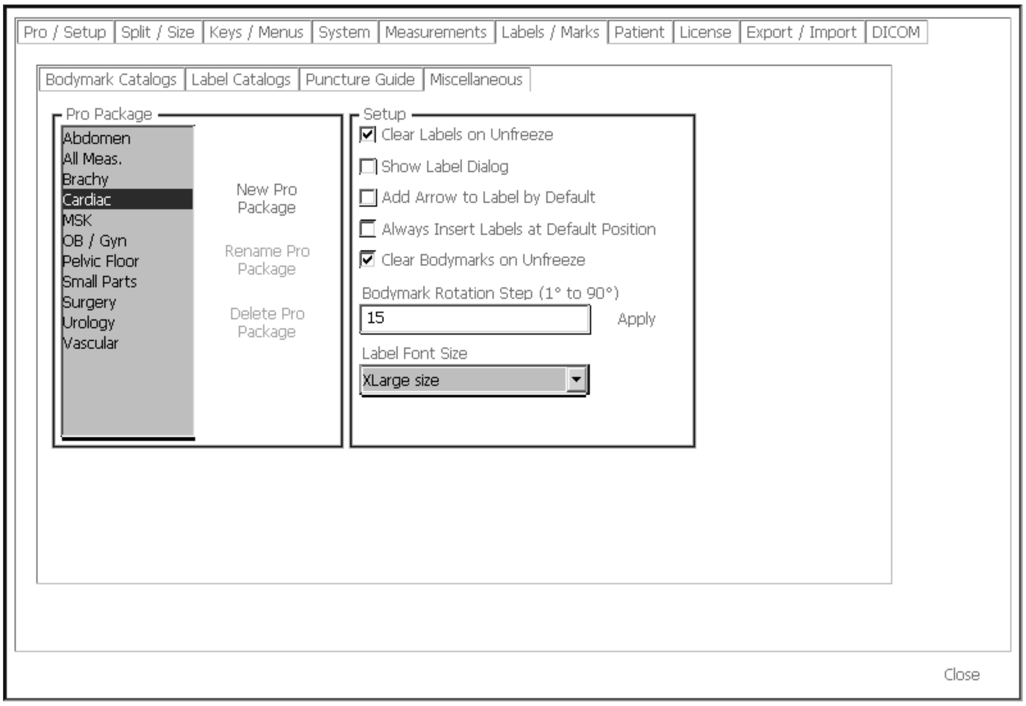


Figure 14-23. The Miscellaneous Marks Setup window.

Changes you can make to labels and bodymarks in a Pro Package:

- Set labels or bodymarks to be cleared when you begin imaging after the image has been frozen.
- Have the label dialog displayed.
- Set the system to attach an arrow to each label automatically.
- Set the system to always insert labels at the position you have defined as default. When this box is unchecked, labels are placed where the mouse cursor is. (However, if the cursor is outside the image or you are using the **Label** window to insert the label, the label is inserted at the default position.)
- Change the step size per click that is used when you rotate the imaging plane indicator. Step sizes can range from 1° to 90°. Type the number (but not the degree symbol) for the new step size and click **Apply** (or press **Enter**.)
- Set the font size for labels to make it easier to read their information.

Patient Window Setup

You can change some of the fields in the **Patient** window so that you record the information you need about each patient. The **Patient** window can contain different fields for each Pro Package.

To make changes to the **Patient** window, you use the **Patient Setup** window.

To open the Patient Setup window and make changes:

1. Click the **Patient** tab.

The **Patient Setup** window opens with a list of Pro Packages on the left and a list of the available fields on the right. Next to each field are 2 checkboxes where you can specify whether the field appears in the **Patient** window (**In Dialog**). If you check **In Dialog**, you can also check **On Screen** to have the field displayed on the lower left side of the monitor.

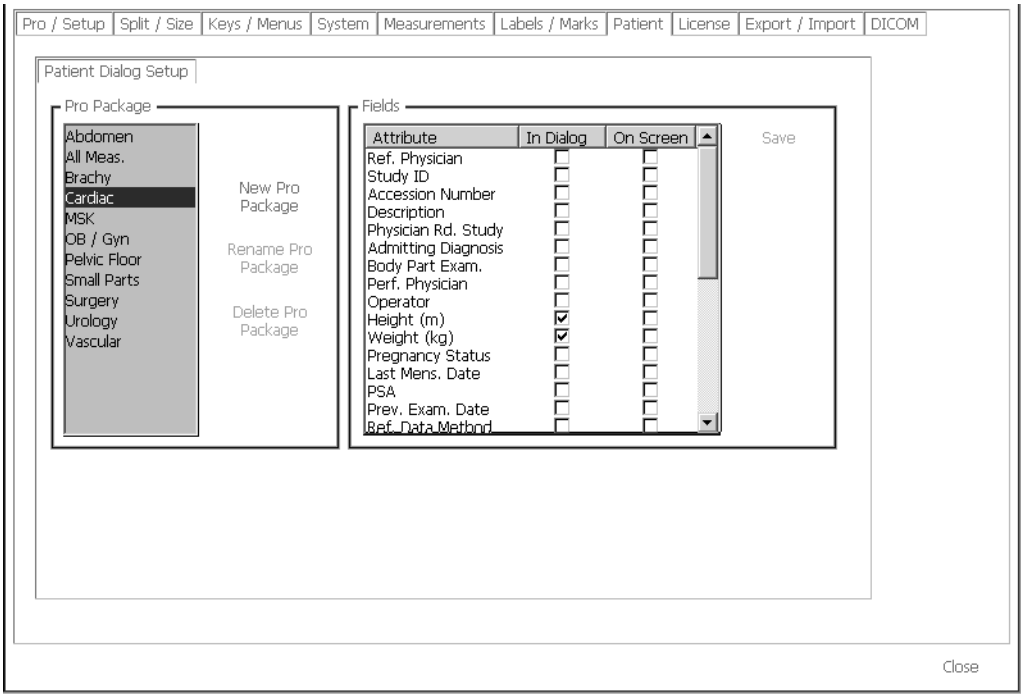


Figure 14-24. The Patient Setup window.

2 Select the fields to be displayed in each place (up to a maximum of 12), and then click **Save**.

NOTE: *If a field is displayed on the monitor, it must also be displayed in the* **Patient** *window.*

Licenses

Some functions of the Pro Focus are optional, and you must have a specific license in order to use them. The available options depend on the system version you have purchased.

When you purchase an option, you receive a 16-character license key. To activate the option, you must type the license key into the **License Manager** window.

To add a license:

1 Click the **License** tab.

The **License Manager** window opens.

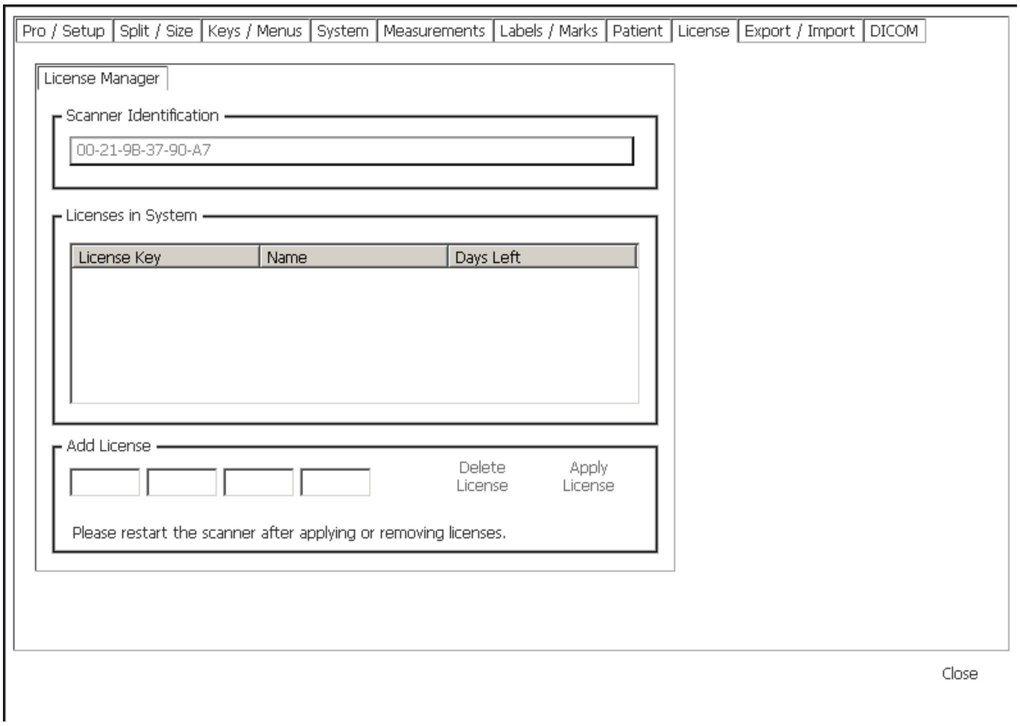


Figure 14-25. The License Manager window.

2 Type the license key in the fields in the **Add License** box.

3 Click **Apply License**.

The **Licenses in system** list is updated.

4 Close the **License Manager** window.

You must restart the system before you can use the option.

NOTE: *A license key is valid for only one system and one option. You must have a different key for each option and for each system.*

NOTE: *You cannot edit the **Scanner Identification** number. It is a unique number generated by the system.*

Importing or Exporting Pro Packages, System Settings and Presets

You can export or import a Pro Package to or from an external storage device. When you do this, the bodymarks, labels, user-defined key assignments, Doppler/M-Mode screen layout, measurement groups, and patient window setup that are associated with the Pro Package are exported or imported. A fetal weight curve may also be included if appropriate.

You can also import or export system settings that go with the Pro Package. These include 3D presets, DICOM settings, video settings and format, and general settings. (General settings are language and location information, date and time format, and video format.)

To open the Export/Import window:

- Click the **Export/Import** tab.

The **Pro Packages** tab in the **Export/Import** window opens with a list of Pro Packages. Use this tab to import or export Pro Packages. Click the **System Settings** tab to import or export system settings, including 3D presets.

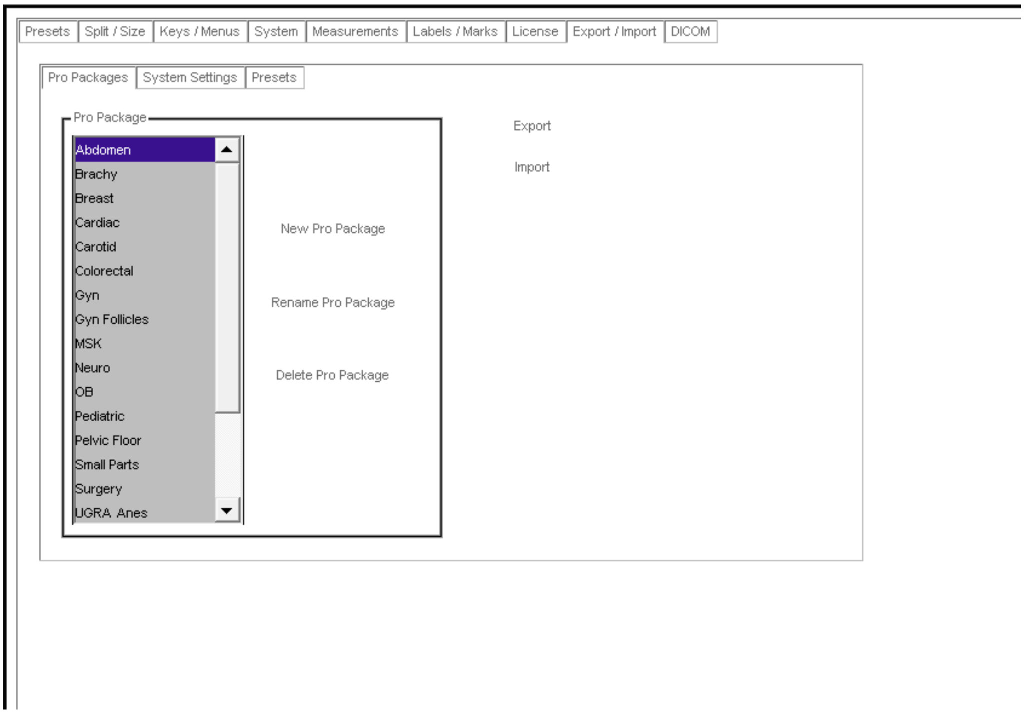


Figure 14-26. The Export/Import window.

To export a Pro Package or system setting:

1 From the list on the left, select the item you want to export.

2 Click **Export**.

When you point to **Export**, a triangle appears to the right of it. Click the triangle to choose whether you want to export to a CD, a DVD or a USB storage device.

NOTE: *If you export to a USB* storage *device, make sure that it is not set to be write-protected.*

Check staging area contents

Caution: When you export to a CD or DVD, the files are actually exported (copied) to the staging area and are not burned until you click **Burn CD ...** If other files have been *copied* to the staging area, they will be burned to the same disc unless you delete them. If the staging area contains files waiting to be *archived* to CD/DVD, you will not be allowed to export to a disc until you have burned the archive disc. See "Using CDs or DVDs" on page 123 for more information.

3 Type in a file name when you are prompted.

4 Press **Enter**.

NOTE: *See "Using CDs or DVDs" on page 123 and "Using USB Storage Devices" on page 125.*

To import a Pro Package or system setting:

1 Insert a CD/DVD or USB storage device containing the Pro Packages or system settings you want to import.

2 Click **Import**.

A list of files appears.

3 Click the ones you want to import.

In this window you can also create a new Pro Package (and then add labels and presets to it, for example). You can also rename or delete a Pro Package by selecting the one you want to rename or delete and then clicking **Rename Pro Package** or **Delete Pro Package**.

Importing or Exporting Presets

You can export presets to a USB storage device, CD or DVD and then import them to another Pro Focus system. You can also export customized setups before an upgrade as a backup.

After a software upgrade, you must import presets you have created or modified back into the system.

To export a preset:

1 In the **Export/Import** window (Fig 14-26), click the **presets** tab.

The **Preset Export/Import** window appears.

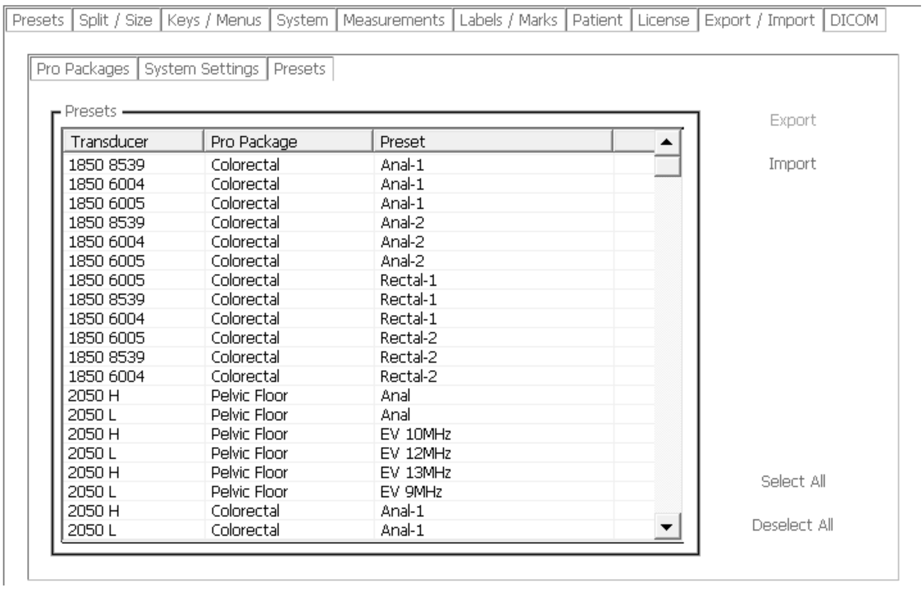


Figure 14-27. The Preset Export/Import window.

2 Select the presets that you want to export, and click **Export**.

When you point to **Export**, a triangle appears to the right of it. Click the triangle to choose whether you want to export to a CD, DVD or a USB storage device.

NOTE: *If you export to a USB storage device, make sure that it is not set to be write-protected.*

Check staging area contents

Caution: When you export to a CD or DVD, the files are actually exported (copied) to the staging area and are not burned until you click **Burn CD ...** If other files have been *copied* to the staging area, they will be burned to the same disc unless you delete them. If the staging area contains files waiting to be *archived* to disc, you will not be allowed to export to a CD or DVD until you have burned the archive disc. See "Using CDs or DVDs" on page 123 for more information.

You are prompted for a file name to which the presets will be saved.

The selected presets are saved, with their existing names, as part of the named file.

To import a preset:

1 In the **Preset Export/Import** window (Fig 14-27), click **Import**.

The **Files List** window appears.

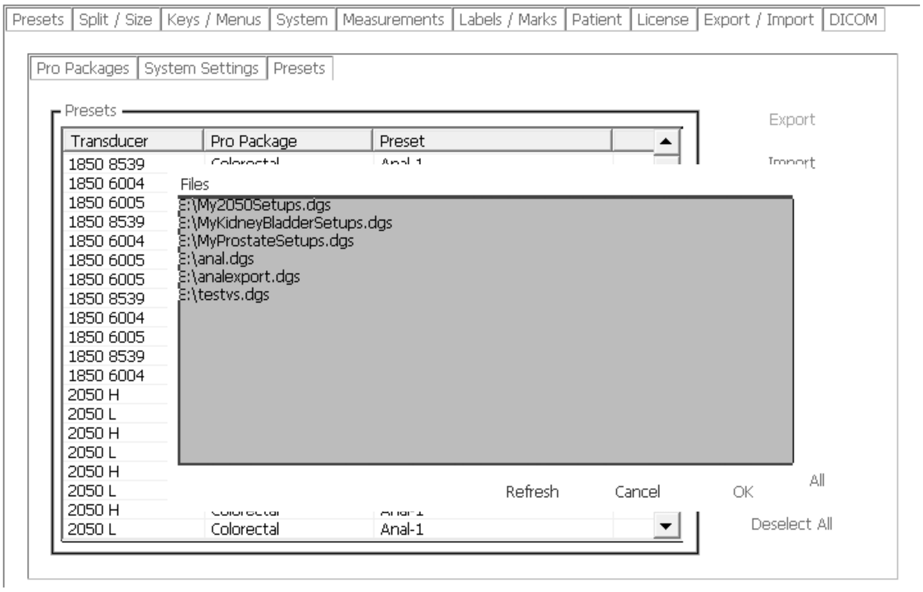


Figure 14-28. The Files List window.

The Files List lists all preset files (filename.dgs) or Pro Packages (filename.pac) that are on external devices connected to the system, for example, on a CD, DVD or USB storage device.

NOTE: *A .dgs file may contain more than one preset. A .pac file can contain only one Pro Package, but that Pro Package may contain many presets.*

2 Select the file you want to import from and click **OK**. You can select only one file at a time.

The **Import Presets** window appears.

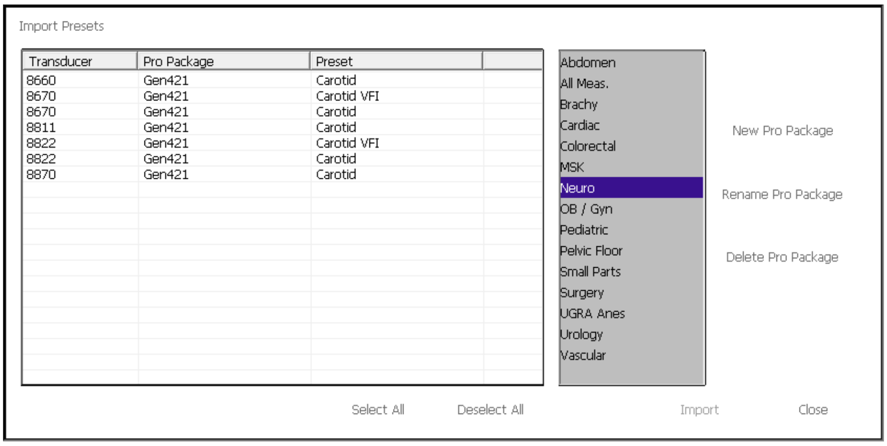


Figure 14-29. The Import Presets window.

This window lists all the presets in the selected file. For each preset, you can see the transducer and Pro Package it is associated with (if it was exported as part of a Pro Package).

3. In the left-hand list, select the presets you want to import.
4. In the right-hand list, select the Pro Package you want to import them to, or click **New Pro Package** to create a new one to contain the imported setups.
5. If you are creating a new Pro Package, type in a file name when you are prompted.
6. Click **Import**.

   If the listed Pro Package exists on the system, the preset is imported into it.

2 presets with same name

Caution: If the name of an imported preset is the same as one that already exists in the Pro Package, you will end up with 2 presets with identical names.

To prevent this from happening, create a special (temporary) Pro Package (called My Imports, for example) and import the setups to that. Then rename the imported setup before you copy it to the "correct" Pro Package.

DICOM Setup

Installing and setting up

DICOM is not installed on the Pro Focus as a default. You must purchase a DICOM license from BK Medical before a qualified service technician can install DICOM on your system. The *2202 Service Manual* (BI2201) contains instructions for service personnel to use when setting up your DICOM system.

Changing setup

If DICOM is enabled on your system, various DICOM setup windows can be accessed by clicking the **DICOM** tab after you click **Customize...** under **Image** on the right side of the monitor.

Caution: Changing the DICOM setup can cause your system not to work properly. For example, you may be unable to print to a DICOM printer. All changes to the DICOM setup should be made by qualified service personnel only.

Part 5: Pro Packages

Chapter 15
General Pro Package

Introduction

This Pro Package contains:

- presets
- labels and bodymarks
- a report
- measuring tools and calculations

used in basic ultrasound applications.

Before using this Pro Package, you should be familiar with the information in previous chapters, particularly Chapter 3, "Working with the Image".

Abbreviations used in measurements and calculations are defined in the Glossary, starting on page 311.

The information in this chapter may not correspond to the Pro Package on your system because Pro Packages can be customized. (See Chapter 14, "Setting Up and Customizing Your System".)

Patient Setup

This Pro Package uses the standard **Patient** window for entering patient information. (See "Setting up a New Patient" on page 47.)

Labels and Bodymarks

This Pro Package contains a catalog of labels and bodymarks designed for General applications. See "Labeling Parts of the Image" on page 63 for information about using labels and "Using Bodymarks" on page 66 for information about using bodymarks.

General Reports

For information about reports, see "Reports" on page 129.

Measurements

For detailed instructions for using the measuring tools, see "Measurements and Calculations" starting on page 95.

To make a measurement:

1. Click its name under **Measurements** to the right of the image. (Some of the measurements are contained in submenus.)

   If there is a triangle following the name of the measurement, click the triangle to see the various options for making that measurement. Click the option you want. A small green light appears to the left of the currently selected measurement in the list.

   The appropriate measuring marker or tool appears on the image.

2. Position the marker where you want it (or draw with the drawing tool).

   If another marker is needed, it appears after you position the previous one.

3. Continue to position all needed markers.

After you have positioned all the markers, the result appears on the left side of the monitor, at the bottom.

Doppler Spectra

Most vascular calculations involve making measurements on a Doppler (FFT) spectrum.

You can fit a curve to the spectrum either automatically (see "Doppler Trace (Automatic Curve Tracing)" on page 186 and page 193) or manually and then make measurements on the curve. Two curve types are generally used:

This type of curve	is a trace of...
Peak (Max)	maximum points of the spectrum (those farthest from the baseline)
Mean	mean points of the spectrum

Table 15-1. Two types of Doppler curves.

> ⚠ **WARNING** Drawings of Doppler curves, manual and automatic, are meant as tools for positioning cursors so that measurements based on the curves can be calculated automatically. The General Pro Package contains no facilities for checking whether the automatic measurements are reasonable. Curves drawn on very noisy spectra may lead to misplacement of measurement cursors. Make sure that measurement cursors are positioned so that the results are reasonable. If they are not, you must adjust the position of the cursors manually.

Fig 15-1 depicts a Doppler spectrum with two cycles. A cycle starts at the *start systole* (when the heart starts to contract) and ends at the *end diastole* (when the heart is resting and filled with blood). The correct placement of vascular calculation markers is indicated in the figure.

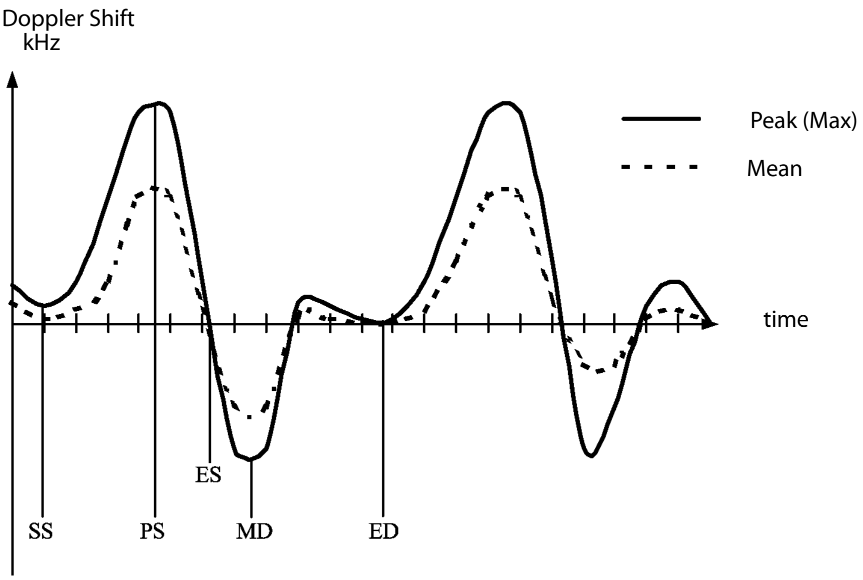


Figure 15-1. Doppler spectrum. Abbreviations explained below.

SS	Start systole	**MD**	Minimum diastole
PS	Peak systole	**ED**	End diastole
ES	End systole		

Frequency or velocity

The calculations and the way in which they are presented on the monitor depend on whether the Doppler angle is active or not.

Doppler Angle Active? (Yes/No)	Velocity or Frequency
No	Frequency measured at intersection of marker line and Doppler curve.
Yes	Velocity measured, and frequency parameters replaced by corresponding velocity parameters, (dF by dV, FACC by ACC, F1 and F2 by V1 and V2.)

When the Doppler angle is turned off or altered, the results are recalculated.

Stenosis

The stenosis measurement uses the area of the vessel before or after the stenosis and the area of the vessel at the stenosis (residual lumen) to calculate the degree (%) of stenosis. You can base the stenosis calculation on the distance across the vessel or the area of the vessel lumen.

Stenosis Based on Distance

1. Click **ST Dist 1**.

   Measure the total lumen of the vessel.

2. Click **ST Dist 2**.

Measure the residual lumen of the vessel.

The **ST Dist** value is updated continuously on the monitor if you move one of the markers you reposition the markers.

Stenosis Based on Ellipses or Freehand Drawings

When you use areas to calculate stenosis, make one area measurement to measure each of the following:

- total lumen of the vessel
- residual lumen of the vessel

The result on the monitor is continuously updated while you position the second ellipse or drawing.

VF (Volume Flow)

VF (volume flow) is calculated by multiplying the time average mean velocity (TAM) by a defined cross-section of a vascular structure. For detailed information about calculation formulas see Technical Data (BZ2100). The cross-section is measured on a B-mode image; the TAM is measured on a Doppler spectrum. These do not have to be measured on the same image.

You can calculate VF based on cross-section measures using a distance (VF Dist), an ellipse (VF Ell) or a circle (VF Circ).

Doppler angle on

VF can only be measured with the Doppler angle on.

TAM (Time Average Mean) and TAMX (Time Average Max)

TAM (time average mean) is the average value (over time) of mean frequencies in the Doppler spectrum.

TAMX (time average max) is the average value (over time) of the maximum frequencies in the Doppler spectrum.

You can measure TAM and TAMX in different ways:

- Automatic – you position markers on the spectrum (using the automatic curve tracing, if that is turned on), and the automatic Doppler curve is used to with the markers to calculate TAM or TAMX.
- Manual – you draw a number of cycles of the Doppler curve manually.

Doppler angle on

TAM and TAMX can only be measured with the Doppler angle on.

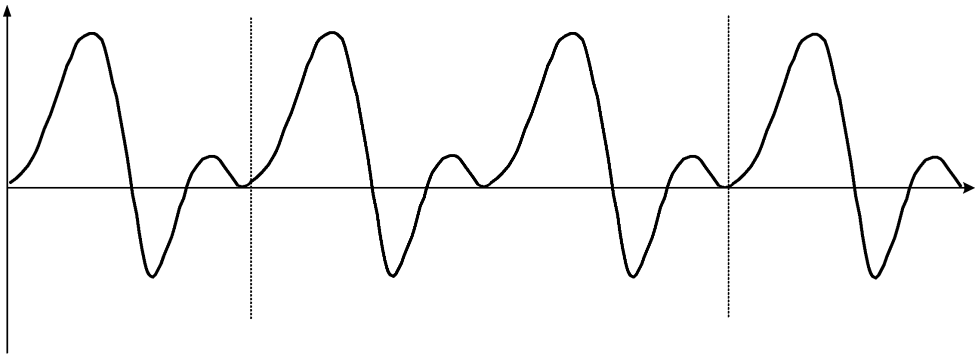


Figure 15-2. Measuring TAM on the Doppler spectrum.

To measure TAM or TAMX using the automatic Doppler curve:

1 Click the small arrow to the right of **Auto**, and make sure that **TAM** or **TAMX** is selected.

2 Position 2 line markers to specify the time interval (number of cycles) over which the frequency values are averaged. (See Fig 15-2.)

   The TAM or TAMX value is displayed to the left of the image.

NOTE: *Turn on the Doppler trace (see page 186) to make sure that the trace appears to be a good fit to the spectrum so that the basis for the automatic calculation is correct.*

You can also draw a Doppler curve manually on the spectrum and use it to measure TAM or TAMX.

To measure TAM manually:

1 Click **TAM**. (TAM must be inserted into the Pro Package.)

2 Draw a curve that follows the mean frequencies of the spectrum, starting and ending at the same part of the cycle.

   The TAM value is displayed to the left of the image.

Manual TAMX

NOTE: *If you follow the procedure above but draw the curve to outline the maximum frequencies, the value that is displayed as* **TAM** *is actually a TAMX value.*

RI and PI (Resistance Index and Pulsatility Index)

The resistance index (Pourcelot index) is based on the peak systolic velocity (V_{max}) and the end-diastolic minimum velocity ED (V_{ed}) in a supply vessel. RI indicates the level of impedance to blood flow and a high RI suggests increased peripheral vascular resistance.

The pulsatility index represents the hemodynamic conditions in a vessel. It is based on the peak systolic velocity (V_{max}), the maximum velocity at minimum diastole ($V_{min\text{-}diast}$), and the average (V_{mean}) of the peak (max) flow velocity curve. PI describes the elasticity of the vessel combined with the level of peripheral resistance.

The A/B ratio (Stuart index) is calculated as the ratio between PS (V_{ps}) and ED (V_{ed}).

The advantage of using indices rather than absolute velocities is that the indices are independent of the insonation angle.

Index	Formula
A/B ratio	PS/ED
Resistance index	(PS-ED)/PS
Pulsatility index	(PS-MD)/Mean

Table 15-2. Formulas for the main Doppler indices.

The correct placement of markers for measuring RI and PI is indicated in Fig 15-1. "Mean" in the Pulsatility index formula is the averaged max flow velocity.

RI (Resistance Index)

To calculate RI and the A/B and B/A ratios, you place one marker to measure Peak Systolic Frequency (PS) and one to measure End Diastolic Frequency (ED).

To measure RI:

1. Click **RI**.
2. Position the first marker to measure PS.

   The PS measurement is displayed to the left of the image.
3. Position the second marker to measure ED.

   The ED measurement is displayed to the left of the image.

   The calculated RI value is displayed to the left of the image.

PI (Pulsatility Index)

You can measure PI in different ways:

- Automatic – the Doppler curve is drawn automatically and you position markers on it.
- Manual – you draw the Doppler curve manually (freehand).
- Real-time – the system calculates and displays PI automatically in real time. (See "Real-Time Measurements" below.)

Automatic

To measure PI automatically:

1. Click **Auto**, then make sure that **PI** is selected.
2. Position one marker at the *start systolic* (SS) frequency.
3. Position the second marker at the *end diastolic* (ED) frequency.

   The PI measurement is displayed to the left of the image.

If more than one cycle is included between the time cursors, the calculated PI is an average over the cycles.

NOTE: *Make sure that the trace appears to be a good fit to the spectrum so that the basis for the automatic calculation is correct.*

Manual

To measure PI manually:

1. Click **PI**.
2. Position the marker on the *start systolic* (SS) frequency and click.

3 Draw a curve that traces a line along the whole maximum spectrum through the *peak systolic* (PS) frequency, the *minimum diastolic* (MD) and onto the *end diastolic* (ED) frequency.

4 Click.

The PI measurement is displayed to the left of the image.

If the traced curve covers more than one cycle, the PI is calculated as the average of each cycle.

Real-Time Measurements

The following measurements can be made and displayed in real time so that they are continually updated during imaging:

- PS
- ED
- MD
- PI
- RI
- HR
- TAM
- TAMX

Real Time appears in two places on the right side of the monitor. The upper one is used to turn real-time measurements on and off. The lower one is used to select the real-time measurements you want.

To turn real-time measurements on and off:

- Click **Real Time** on the right side of the monitor.

  The real-time measurements are displayed to the left of the image when the function is turned on.

When real-time measurements are turned on, automatic curve tracing can also be turned on. See "Doppler Trace (Automatic Curve Tracing)" on page 186 and page 193. Make sure that the trace appears to be a good fit to the spectrum *so that the basis for the real-time calculation is correct.*

On the **Miscellaneous** tab of the **Measurement Setup** window, you can set the system so that real-time measurements are always displayed. See page 226.

NOTE: *It is possible to collapse the section on the left that contains measurement results. If real-time measurements are not displayed, check to see whether the* **Measurement** *section is collapsed.*

To select which real-time measurements are displayed:

1 Freeze the image.

2 Click the small arrow to the right of **Real Time** under **Measurements**, and make sure that the ones you want are selected.

3 Unfreeze the image.

NOTE: *If you freeze the image when real-time measurements are selected, the real-time results are also frozen.*

Noise Limit

You can reduce the noise (high frequency disturbances) in the data to improve the accuracy of automatically traced curves.

To reduce the noise:

- Click **Noise Limit** above **Angle** on the right of the monitor and drag the slider.

Low noise limits cut out less noise; high limits cut out more.

Noise Limit only appears on the monitor when automatic curve tracing is turned on.

Carotid Velocities

LICA, RICA, LCCA, RCCA, LECA, RECA, V1 and V2 are carotid velocities that are used to calculate the extent of stenosis in the carotid vessels.

The displayed velocity ratios are constantly updated as you change the measurement of either of the velocities in the ratio.

Doppler measurements that can be used to accurately assess flow-limiting stenosis are:

- Peak systolic velocity – determined at the point of maximum stenosis. The peak velocity is measured at the peak systolic point of the cardiac cycle.
- End diastolic velocity – determined at the point of maximum stenosis. The end diastolic velocity is measured at the end point of the cardiac cycle.

Calculations

All formulas that the system uses to calculate various values are listed in Technical Data (BZ2100), together with detailed information about calculation accuracy and factors affecting accuracy.

Chapter 16
Urology Pro Package

Introduction

This Pro Package contains:

- presets
- labels and bodymarks
- a report
- measuring tools and calculations

used in urology ultrasound applications.

For a list of the calculation formulas that are used, see Technical Data (BZ2100).

Before using this Pro Package, you should be familiar with the information in previous chapters, particularly Chapter 3, “Working with the Image”. For more details about placing measurement markers for Doppler measurements, see “Doppler Spectra”, starting on page 248.

Abbreviations used in measurements and calculations are defined in the Glossary, starting on page 311.

The information in this chapter may not correspond to the Pro Package on your system because Pro Packages can be customized. (See Chapter 14, “Setting Up and Customizing Your System”.)

Patient Setup

The **Patient** window for this Pro Package contains some special fields. (See “Setting up a New Patient” on page 47 for information about using the **Patient** window.)

PSA Parameters

You can enter the following PSA parameters in the **Patient** window:

Parameter	Range allowed
PSA	0 – 9999
Gleason score	2 – 10

Table 16-1. PSA parameters.

Labels and Bodymarks

This Pro Package contains a catalog of labels and bodymarks designed for Urology applications. Labels and bodymarks from other catalogs are also available when using the Urology Pro Package. See “Labeling Parts of the Image” on page 63 for information about using labels and “Using Bodymarks” on page 66 for information about using bodymarks.

Reports

For information about Urology reports, see “Reports” on page 129.

Measurements

For detailed instructions for using the measuring tools, see “Measurements and Calculations” starting on page 95.

Some of the measurements are contained in the following submenus:

- Prostate Volume
- Kidney Volume
- Bladder Volume
- Adenoma Volume
- Testis Volume

The methods for calculating volume are slightly different, depending on the organ. For example, the empirical method can be used only with the bladder, and manual planimetry can be used only for the prostate and adenoma.

To make a measurement:

1. Click its name under **Measurements** to the right of the image. (Some of the measurements are contained in submenus.)

   If there is a triangle following the name of the measurement, click the triangle to see the various options for making that measurement. Click the option you want. A small green light appears to the left of the currently selected measurement in the list.

   The appropriate measuring marker or tool appears on the image.
2. Position the marker where you want it (or draw with the drawing tool).

   If another marker is needed, it appears after you position the previous one.
3. Continue to position all needed markers.

After you have positioned all the markers, the result appears on the left side of the monitor, at the bottom.

For more information about Doppler measurements, see Chapter 15, “General Pro Package”.

Calculating Volumes

Organ volumes can be calculated in several ways. For the formulas used for each of these calculations, and information about their accuracy, see Technical Data (BZ2100).

Choice of ellipse axis

NOTE: *A volume calculation based on a measured ellipse is critically dependent on the axis of rotation that you choose.* *See page 100.*

HWL

HWL is a method of calculating a volume using height, width and length measurements. To use this method to calculate the volume of a particular organ, use the Height, Width and Length measurements in the submenu for that organ volume.

To calculate an HWL volume:

1. Click **Height** and measure the height.

   The height appears under **Measurements** to the left of the image.
2. Click **Width** and measure the width.

   The width appears under **Measurements** to the left of the image.
3. Click **Length** and measure the length.

   The length appears under **Measurements** to the left of the image.

   The calculated volume appears under **Measurements** to the left of the image.

The height, width and length measurements must be made at right angles to each other. Therefore, you must use 2 images for HWL calculations.

To make a measurement in the other part of a split screen:

- Press [▢▢].

or

- Move the cursor to the other monitor and click.

Planimetry

For this method, you record a number of parallel B-mode images that cover the organ to be measured. On each image, you draw a curve that traces the outline of the structure. Thus you create a set of parallel section measurements of the structure.

These parallel sections (the outline measurements) are used to estimate the volume of the structure based on a number of equally spaced slices.

The accuracy of this method depends on starting the measurements in the correct place. Start at one end of the organ, where the image shows an area of as close to 0 as possible. After each step, trace the outline of the structure on the image. The system calculates the volume of the structure between the starting point and each new image (see Fig 16-1). This is continued until the whole organ has been covered and a total volume obtained.

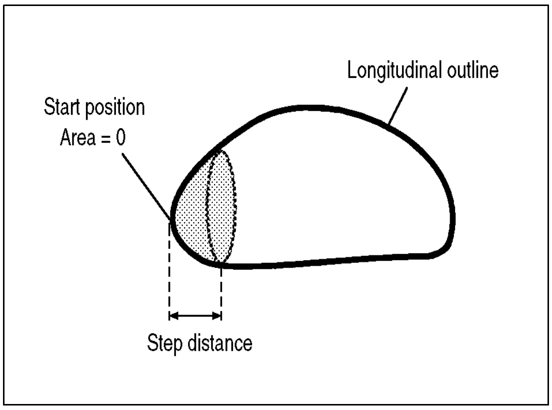


Figure 16-1. Longitudinal outline of organ showing the start position for planimetry.

Different stepping units to control the spacing between the sections are available for use with different transducers.

To use this method to calculate the volume of a particular organ, use the Planimetry (Ellipse) or Planimetry (Freehand) measurements in the submenu for that organ volume. The planimetry method is only available for the prostate and adenoma.

To make a planimetry calculation:

1 Record a B-mode image at the far end of the organ.
2 Move the transducer back one step.
3 Freeze the image.
4 Click **Planimetry (Ellipse)** or **Planimetry (Freehand)** and draw an ellipse or freehand drawing to outline the organ.
5 Repeat 2 through 4 until you have covered the entire organ.
The Volume is displayed (updated after each measurement is drawn) at the bottom of the data area to the left of the image.

Reset To reset the volume, press (long) [x••••x].

Empirical Method

The empirical method uses 2 orthogonal B-mode area outline measurements

- transverse (**T-area**)
- longitudinal (**L-area**)

to calculate volume. It is valid only for calculating bladder volume.

NOTE: *When you outline the bladder for the empirical method, the outlines must represent the maximum areas of the bladder in the transverse plane (AT) and longitudinal plane (AL).*

To make an empirical volume calculation:

1 Click **Empirical** and draw an ellipse to outline the organ.
2 From the same transducer position, record another image at right angles to the first.
3 Click in the other part of the split screen and draw an ellipse to outline the organ.

The Volume is displayed at the bottom of the data area to the left of the image.

Calculating PSAD

To calculate the PSAD (Prostate Specific Antigen Density), you calculate the volume of the prostate and type in a value for the PSA (Prostate Specific Antigen). The PSA is divided by the volume to give the PSAD.

To calculate PSAD:

1. Click **PSAD** in the **Prostate Volume** measurement submenu.

   If you have not entered the PSA value in the **Patient** window, you are prompted to enter it. Type in the correct value.

2. Calculate the prostate volume using HWL. Ellipse or planimetry.

   The PSAD appears under **Measurements** to the left of the image.

If volume already calculated

You can also click **PSAD** after you have calculated the prostate volume. You will be prompted for the PSA value if you have not already entered it.

Urology Calculation Formulas

The following methods for estimating volume are available:

- Height × Width × Length x factor
- Planimetry
- Empirical method (valid only for the bladder).

There is also a method for calculating PSAD.

All formulas that the system uses to calculate volumes and PSA density values are listed in Technical Data (BZ2100), together with detailed information about calculation accuracy and factors affecting accuracy.

Chapter 17
Brachy Pro Package

Introduction

This Pro Package contains:

- presets
- labels and bodymarks
- a report
- measuring tools and calculations

used with ultrasound-guided brachytherapy and cryotherapy for prostate cancer.

Before using this Pro Package, you should be familiar with the information in previous chapters, particularly Chapter 3, "Working with the Image". You will also need to refer to information in Chapter 16, "Urology Pro Package".

Abbreviations used in measurements and calculations are defined in the Glossary, starting on page 311.

The information in this chapter may not correspond to the Pro Package on your system because Pro Packages can be customized. (See Chapter 14, "Setting Up and Customizing Your System".)

NOTE: *If you have the VariSeed or Live Image Transfer licenses activated, the image size is locked by default for the Brachy Pro Package. See Fig 14-2 on page 201.*

Patient Setup

The **Patient** window for this Pro Package contains some special fields. (See "Setting up a New Patient" on page 47 for information about using the **Patient** window.)

PSA and Gleason Score

You can enter the following special parameters in the **Patient** window:

Parameter	Range allowed
PSA	0 – 1000
Gleason score	2 – 10

Table 17-1. Brachy parameters.

Labels and Bodymarks

This Pro Package contains a catalog of labels and bodymarks designed for Brachy applications. Labels and bodymarks from other catalogs are also available when using the Brachy Pro Package. See "Labeling Parts of the Image" on page 63 for information about using labels and "Using Bodymarks" on page 66 for information about using bodymarks.

Reports

For information about Brachy reports, see "Reports" on page 129.

Measurements

For detailed instructions for using the measuring tools, see "Measurements and Calculations" starting on page 95.

Some of the measurements are contained in the following submenus:

- Prostate Volume
- Adenoma Volume

The methods for calculating volume are slightly different, depending on the organ. Manual planimetry can be used only for the prostate and adenoma.

Calculating Volumes

Organ volumes can be calculated in several ways. For the formulas used for each of these calculations, and information about their accuracy, see *Technical Data (BZ2100)*.

Choice of ellipse axis

NOTE: *A volume calculation based on a measured ellipse is critically dependent on the axis of rotation that you choose. See page 100.*

HWL

For HWL measurements of prostate volume, see the "Urology Pro Package" chapter.

Planimetry (Contouring)

For this method, you record a number of parallel B-mode images that cover the organ to be measured. On each image, you draw a curve that traces the outline of the structure. Thus you create a set of parallel section measurements of the structure.

These parallel sections (the outline measurements) are used to estimate the volume of the structure based on a number of equally spaced slices.

The accuracy of this method depends on starting the measurements in the correct place. Start at one end of the organ, where the image shows an area of as close to 0 as possible. After each step, trace the outline of the structure on the image. The system calculates the volume of the structure between the starting point and each new image (see Fig 17-1). This is continued until the whole organ has been covered and a total volume obtained.

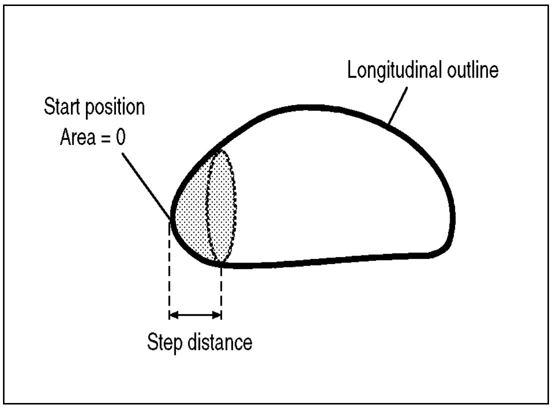


Figure 17-1. Longitudinal outline of organ showing the start position for planimetry

Different stepping units to control the spacing between the sections are available for use with different transducers.

To use this method to calculate the volume of a particular organ, use the Planimetry (Ellipse) or Planimetry (Freehand) measurements in the submenu for that organ volume. The planimetry method is only available for the prostate and adenoma.

To make a planimetry calculation:

1 Record a B-mode image at the far end of the organ.

2 Move the transducer back one step.

3 Freeze the image.

4 Click **Planimetry (Ellipse)** or **Planimetry (Freehand)** and draw an ellipse or freehand drawing to outline the prostate.

5 Draw an outline around any other structures of interest, such as the rectal wall or ureter.

6 Unfreeze the image.

7 Repeat steps 2 through 6 until you have covered the entire organ.

The prostate volume is displayed (updated after each measurement is drawn) at the bottom of the data area to the left of the image.

Reset To reset the volume, press (long) [x••••x].

Automatic Planimetry

Automatic planimetry uses orthogonal transverse and longitudinal B-mode area measurements form the basis for a simulated planimetry volume calculation.

You can make automatic planimetry measurements using Ellipse or Freehand drawing.

NOTE: *For automatic planimetry calculations, the transverse outlined area must represent the shape of the organ.*

Automatic Planimetry

This method estimates volume by automatically performing simulated planimetry. The estimation is based on the convex outlines of two orthogonal sections, transverse and longitudinal. It is assumed that the shape of the transverse area outline represents the shape of any transverse area in the organ (see Fig 17-1). The longitudinal outline must be the largest area that can be seen, and these measurements must be made at right angles to each other and to the transducer axis, and from the same transducer position.

To perform automatic planimetry:

1. Click **Ellipse** or **Freehand** and make an ellipse measurement on a transverse image.
2. Record a longitudinal image at a right angle to, and from the same transducer position as, the transverse image.
3. Click **Ellipse** or **Freehand** and measure the organ on the transverse image.

You can use **Ellipse** for measuring in one plane and **Freehand** in the other plane.

The system calculates the volume and results are displayed on the monitor and entered into the Urology report.

Requirements

The longitudinal outline must be:

- the largest area that can be seen

The two sections must be:

- at right angles to each other
- at right angles to the transducer axis
- taken from the same transducer position.

Calculating PSAD

See the “Urology Pro Package” chapter.

Performing a Biopsy or Puncture Procedure (including Brachytherapy)

Brachy matrix

When you use a transducer for brachytherapy, a brachytherapy needle guide matrix (brachy matrix) is superimposed on the image.

To superimpose a brachy matrix on an ultrasound image:

Activate guide or matrix

- Press the key.

  The default brachy matrix appears.

Set default

To set a different brachy matrix to be the default:

- After you have selected the brachy matrix you want (and made any other setup changes you want), save your settings as a new preset. Specify that you want the new setup to be your default.

To highlight the dot on a brachy matrix where you expect to see the needle:

- Click one of the dots on the brachy matrix.

A blue square appears in its place.

- To highlight a different dot, click it. The previously highlighted dot returns to normal and the new one is highlighted.

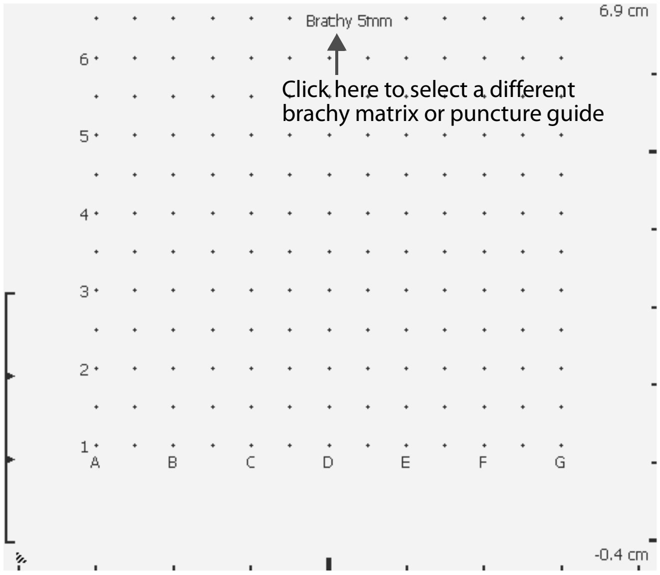


Figure 17-2. A brachy matrix on the image area.

To select a different puncture guide or brachy matrix:

1. Click the Type number or brachy matrix name displayed at the top of the image area.
2. Click the puncture guide or brachy matrix you want.

To remove the brachy matrix from the monitor:

- Press the [ ] key.

Programmable Puncture Guide

If you are using a programmable puncture guide, you can change the setup to move it to the left or right or in or out.

Brachy Ruler with Sagittal Plane Imaging

You can set up the system so that a brachy ruler is displayed when you image in the sagittal plane with the 8848 transducer in situations where a brachy matrix appears in the transverse imaging view.

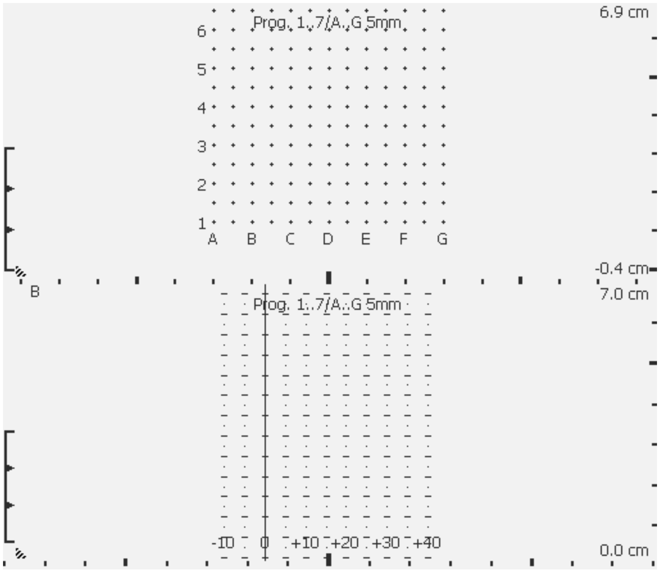


Figure 17-3. A split-screen view with transverse brachy matrix above and sagittal brachy ruler below. Ruler has vertical line to mark 0.

The sagittal brachy ruler is sometimes displayed with a 2-dimensional grid to make it easier for you to see the horizontal position of the needle no matter where it is in the vertical direction.

To move the ruler to the left or right:

1. Click the zero position on the horizontal (bottom) axis.
2. Drag the vertical line that replaces the ruler markers.
3. Click when the line is positioned where you want the new zero position of the ruler.

   The vertical line disappears and the ruler markers appear in their new positions.

NOTE: *You can set up the system so that a vertical 0 line is always visible, along with the markers.*

User-Definable Brachy Matrix and Ruler

You can also define your own brachy matrix and ruler. See page 231.

Chapter 18
Pelvic Floor Pro Package

Introduction

This Pro Package contains:

- presets
- labels and bodymarks
- a report
- measuring tools

used in pelvic floor ultrasound applications.

Before using this Pro Package, you should be familiar with the information in previous chapters, particularly Chapter 3, “Working with the Image”. You will also need to refer to information in Chapter 16, “Urology Pro Package”.

Abbreviations used in measurements and calculations are defined in the Glossary, starting on page 311.

The information in this chapter may not correspond to the Pro Package on your system because Pro Packages can be customized. (See Chapter 14, “Setting Up and Customizing Your System”.)

Patient Setup

This Pro Package uses the standard **Patient** window for entering patient information. (See “Setting up a New Patient” on page 47.)

Labels and Bodymarks

This Pro Package contains a catalog of labels and bodymarks designed for pelvic floor applications. Labels and bodymarks from other catalogs are also available when using the Pelvic Floor Pro Package. See “Labeling Parts of the Image” on page 63 for information about using labels and “Using Bodymarks” on page 66 for information about using bodymarks.

Reports

For information about pelvic floor reports, see “Reports” on page 129.

Measurements

For detailed instructions for using the measuring tools, see “Measurements and Calculations” starting on page 95.

To make a measurement:

1. Click its name under **Measurements** to the right of the image. (Some of the measurements are contained in submenus.)

   If there is a triangle following the name of the measurement, click the triangle to see the various options for making that measurement. Click the option you want. A small green light appears to the left of the currently selected measurement in the list.

   The appropriate measuring marker or tool appears on the image.

2. Position the marker where you want it (or draw with the drawing tool).

   If another marker is needed, it appears after you position the previous one.

3. Continue to position all needed markers.

After you have positioned all the markers, the result appears on the left side of the monitor, at the bottom.

Angle Measurements

The symphysis pubis is used as a fixed reference point for making an angle measurement. There are three angle measurements. For illustrations of the angle measurements on the anatomy during translabial ultrasound imaging, see Figs. 10–12 in the BK Medical Application Note *Ultrasonography of the pelvic floor region in women* [1].

Angle	Definition
Alpha	Urethral angle; the angle between a line drawn straight through the urethra against a sagittal projection.
Beta	Posterior urethrovesical angle.
Gamma	A line drawn through the axis of the symphysis pubis against a line through the urethra to the inferior internal urethral orifice.

Table 18-1. Angle definitions for translabial ultrasound imaging.

Follow steps 1–3 as described above to make an angle measurement.

Note that the result displayed depends on the order in which you position the four markers. There are two alternative types of angle calculations from the default method (see Table 18-2 and Fig 18-1). To add for example **Alpha2** or **Alpha3,** open the **Measurement Group Setup** window (see “Measurement Group Setup” on page 222).

Angle	Definition	Result displayed
Alpha1 Beta1 Gamma1	Angle	Actual angle (a) measured
Alpha2 Beta2 Gamma2	Supplementary angle	180° minus angle (a)
Alpha3 Beta3 Gamma3	Reflex angle	360° minus angle (a)

Table 18-2. Definition of the three methods of angle measurements.

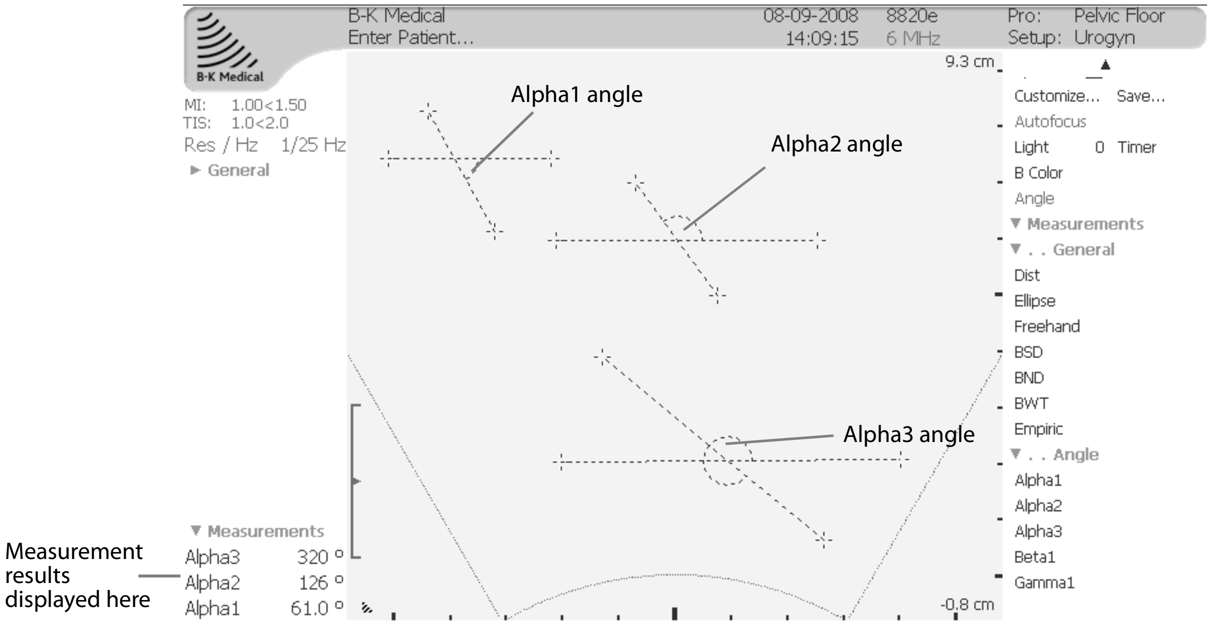


Figure 18-1. The three angle measurements and their results shown. Typically, you would only use one angle measurement.

Pelvic Floor Reports

For information about making reports in this Pro Package see “Reports” on page 129.

Labels and Bodymarks

This Pro Package contains a catalog of labels and bodymarks designed for Pelvic Floor applications. Labels and bodymarks from other catalogs are also available when using the Pelvic Floor Pro Package. See “Labeling Parts of the Image” on page 63 for information about using labels and “Using Bodymarks” on page 66 for information about using bodymarks.

References

[1] Fortling B, Wieczorek P. *Ultrasonography of the pelvic floor region in women*. BO0013-D BK Medical, 2006.

Chapter 19
Surgery Pro Package

Introduction

This Pro Package contains:

- presets
- labels and bodymarks
- a report
- measuring tools and calculations

used in surgical ultrasound applications.

Before using this Pro Package, you should be familiar with the information in previous chapters, particularly Chapter 3, “Working with the Image”.

Abbreviations used in measurements and calculations are defined in the Glossary, starting on page 311.

The information in this chapter may not correspond to the Pro Package on your system because Pro Packages can be customized. (See Chapter 14, “Setting Up and Customizing Your System”.)

Patient Setup

This Pro Package uses the standard **Patient** window for entering patient information. (See “Setting up a New Patient” on page 47.)

Labels and Bodymarks

This Pro Package contains a catalog of labels and bodymarks designed for Surgical applications. Labels and bodymarks from other catalogs are also available when using the Surgery Pro Package. See “Labeling Parts of the Image” on page 63 for information about using labels and “Using Bodymarks” on page 66 for information about using bodymarks.

Reports

For information about Surgical reports, see “Reports” on page 129.

Measurements

For detailed instructions for using the measuring tools, see “Measurements and Calculations” starting on page 95.

To make a measurement:

1 Click its name under **Measurements** to the right of the image. (Some of the measurements are contained in submenus.)

  If there is a triangle following the name of the measurement, click the triangle to see the various options for making that measurement. Click the option you want. A small green light appears to the left of the currently selected measurement in the list.

  The appropriate measuring marker or tool appears on the image.

2 Position the marker where you want it (or draw with the drawing tool).

  If another marker is needed, it appears after you position the previous one.

3 Continue to position all needed markers.

After you have positioned all the markers, the result appears on the left side of the monitor, at the bottom.

Surgery Reports

For information about making reports in this Pro Package see “Reports” on page 129.

Labels and Bodymarks

For more information about using labels and body marks in this Pro Package see “Working with the Image” on page 61.

Chapter 20
Neuro Pro Package

Introductio n

This Pro Package contains:

- presets
- labels and bodymarks
- a report
- measuring tools and calculations

used for basic brain imaging including:

- Craniotomy imaging (8862 craniotomy transducer)
- Burr hole imaging (8863 burr hole transducer)
- Neonatal[1] and infant brain imaging with the 8862 transducer

Before using this Pro Package, you should be familiar with the information inprevious chapters, particularly Chapter 3, “Working with the Image”.

Abbreviations used in measurements and calculations are defined in the Glossary,starting on page 309.

The information in this chapter may not correspond to the Pro Package on your system because Pro Packages can be customized. (See Chapter 14, “Setting Up and Customizing Your System”.)

Patient Setup

This Pro Package uses the standard **Patient** window for entering patient information. (See “Setting up a New Patient” on page 47.)

Presets

Special neuro presets are defined for each transducer.

Craniotomy transducer (8862):

- Neurosurgical

Burr hole transducer (8863):

- Neuro
- Ventricular

Neonatal cephalic transducer (8862)

- Neo Head
- Infant Head

1. Neonatal cephalic imaging on the Pro Focus 2202 UltraView has not been CE approved or licensed by Health Canada.

Labels and Bodymarks

This Pro Package contains a catalog of labels and bodymarks designed for Surgical applications. Labels and bodymarks from other catalogs are also available when using the Surgery Pro Package. See “Labeling Parts of the Image” on page 63 for information about using labels and “Using Bodymarks” on page 66 for information about using bodymarks.

Reports

For information about Surgical reports, see “Reports” on page 129.

Measurements

For detailed instructions for using the measuring tools, see “Measurements and Calculations” starting on page 95.

To make a measurement:

1. Click its name under **Measurements** to the right of the image. (Some of the measurements are contained in submenus.)

   If there is a triangle following the name of the measurement, click the triangle to see the various options for making that measurement. Click the option you want. A small green light appears to the left of the currently selected measurement in the list.

   The appropriate measuring marker or tool appears on the image.
2. Position the marker where you want it (or draw with the drawing tool).

   If another marker is needed, it appears after you position the previous one.
3. Continue to position all needed markers.

After you have positioned all the markers, the result appears on the left side of the monitor, at the bottom.

Surgery Reports

For information about making reports in this Pro Package see “Reports” on page 129.

Labels and Bodymarks

For more information about using labels and body marks in this Pro Package see “Working with the Image” on page 61.

Chapter 21
Cardiac Pro Package

Introduction

This Pro Package contains:

- presets
- labels and bodymarks
- a report
- measuring tools and calculations

used in cardiac ultrasound applications.

Before using this Pro Package, you should be familiar with the information in previous chapters, particularly Chapter 3, “Working with the Image”, Chapter 9, “M-Mode”and Chapter 12, “Doppler Mode – Spectral Doppler”.

Abbreviations used in measurements and calculations are defined in the Glossary, starting on page 311.

The information in this chapter may not correspond to the Pro Package on your system because Pro Packages can be customized. (See Chapter 14, “Setting Up and Customizing Your System”.)

Patient Setup

The **Patient** window for this Pro Package contains some special fields. (See “Setting up a New Patient” on page 47 for information about using the Patient window.)

Field	Enter this information
Height (m)	Height of patient measured in meters
Weight (kg)	Weight of patient measured in kilograms

Table 21-1. Special fields in the Patient window for Cardiac Pro Package.

Labels and Bodymarks

This Pro Package contains a catalog of labels and bodymarks designed for Cardiac applications. Labels and bodymarks from other catalogs are also available when using the Cardiac Pro Package. See “Labeling Parts of the Image” on page 63 for information about using labels and “Using Bodymarks” on page 66 for information about using bodymarks.

Reports

For information about Cardiac reports, see “Reports” on page 129.

Cine (Image Review)

Cine (image review) lets you review a series of the most recently recorded images in this Pro Package. For information about how to review, or make measurements from, a cine image see “Cine” on page 69.

Making Measurements

For detailed instructions for using the measuring tools, see “Measurements and Calculations” starting on page 95.

To make a measurement:

1 Click its name under **Measurements** to the right of the image. (Some of the measurements are contained in submenus.)

If there is a triangle following the name of the measurement, click the triangle to see the various options for making that measurement. Click the option you want. A small green light appears to the left of the currently selected measurement in the list.

The appropriate measuring marker or tool appears on the image.

2 Position the marker where you want it (or draw with the drawing tool).

If another marker is needed, it appears after you position the previous one.

3 Continue to position all required markers.

After you have positioned all the markers, the result appears on the left side of the monitor, at the bottom.

Doppler Mode Measurements

If the Doppler angle correction is turned on, the measurements are in cm/s; if it is turned off, the measurements are in kHz. For information about the Doppler correction angle and how to change it, see “Angle Correction” on page 187.

NOTE: *All Doppler measurements (except for real-time measurements) are made on a frozen Doppler recording.*

Mitral Valve Study

To perform a mitral valve study, you place 5 markers (A, B, C, D and E) on an M-mode image. Fig 21-1 uses an outline of an M-mode image to indicate where to place them.

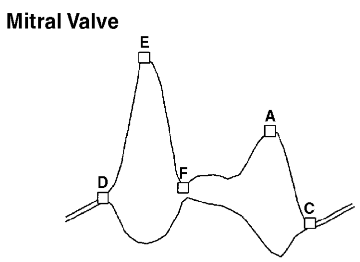


Figure 21-1. Placing markers on a M-mode image for a mitral valve study.

These marker positions are used to calculate amplitudes (CE, DE and CA), slopes (DE and EF), and the CA:CE ratio.

Calculations

All formulas that the system uses to calculate various values are listed in Technical Data (BZ2100), together with detailed information about calculation accuracy and factors affecting accuracy.

Chapter 22
OB/Gyn Pro Package

Introduction

This Pro Package contains:

- presets
- labels and bodymarks
- a report
- measuring tools and calculations

used in obstetrical and gynecological ultrasound applications.

For a list of the measurements you can make, see page 281. The tables and formulas that the system uses for calculations are listed in Technical Data (BZ2100).

Before using this Pro Package, you should be familiar with the information in previous chapters, particularly Chapter 3, “Working with the Image”.

Abbreviations used in measurements and calculations are defined in the Glossary, starting on page 311.

The information in this chapter may not correspond to the Pro Package on your system because Pro Packages can be customized. (See Chapter 14, “Setting Up and Customizing Your System”.)

Gestational Age and Expected Date of Confinement

You can calculate the gestational age (GA) and expected date of confinement (EDC) from measurements on the ultrasound image or from clinical parameters such as date of last menstrual period. You can also use the results of an earlier examination instead of the last menstrual period date to estimate the GA and EDC. Enter the information you want to use in the Patient window.

Patient Setup

The **Patient** window for this Pro Package contains some special fields. (See “Setting up a New Patient” on page 47 for information about using the **Patient** window.)

Field	Enter this information
Last Mens. Date	Date of last menstrual period (abbreviated LMP in reports)
Prev. Exam. Date	Date of exam with reference data.
Ref Data Method	Method to use for making clinical estimates of GA or EDC (CRL, BPD, FL, AC or HC).
Reference Data	Data to use for making clinical estimates of GA or EDC.
Menopause	Month/year of menopause
Length of Cycle	Number of days of menstrual cycle

Table 22-1.Special fields in Patient window for OB/Gyn Pro Package.

NOTE: *It is important to enter dates correctly. See “Entering Dates” on page 51.*

Labels and Bodymarks

This Pro Package contains a catalog of labels and bodymarks designed for OB/Gyn applications. Labels and bodymarks from other catalogs are also available when using the OB/Gyn Pro Package. See “Labeling Parts of the Image” on page 63 for information about using labels and “Using Bodymarks” on page 66 for information about using bodymarks.

Making Measurements

For detailed instructions for using the measuring tools, see “Measurements and Calculations” starting on page 95.

To make a measurement:

1. Click its name under **Measurements** to the right of the image. (Some of the measurements are contained in submenus.)

   If there is a triangle following the name of the measurement, click the triangle to see the various options for making that measurement. Click the option you want. A small green light appears to the left of the currently selected measurement in the list.

   If there are different results that can be shown, small green lights appear to the left of all the results that will be displayed. Click the name of the result to toggle results off or on.

   The appropriate measuring marker or tool appears on the image.

2. Position the marker where you want it (or draw with the drawing tool).

   If another marker is needed, it appears after you position the previous one.

3. Continue to position all needed markers.

After you have positioned all the markers, the result appears on the left side of the monitor, at the bottom.

Measurement out of range

If the result of a measurement is outside the allowed range of values, this is indicated on the monitor:

>>>> too high   <<<< too low

If this happens, you may have made a mistake in your measurement or you may be trying to use a measurement that is inappropriate (for example, for the GA).

NOTE: *It is not possible to base a CI measurement on an HC measurement that is made with any measuring tool other than an ellipse.*

Nuchal Translucency

⚠ Nuchal translucency

Caution: You must be adequately trained before you attempt to make nuchal translucency measurements.

Calculation Methods

General Information

This Pro Package contains measuring tools that can be used to calculate

- gestational age (GA)
- fetal weight (FW)
- expected date of confinement (EDC).

The calculations are based on measurements of the ultrasound image such as biparietal diameter (BPD) or abdominal circumference (AC).

Measurement units

Unless otherwise noted, in this chapter GA is expressed in days, FW in grams (g), and distances are in millimeters (mm).

NOTE: *Ovary and uterus volume measurements use the HWL factor specified on the* **Miscellaneous** *tab of the* **Measurements** *setup window.* *See page 226.*

Follicle Measurements

To measure the average of 3 follicle diameters[1]:

1. Click **FD (3 distances, 1, 2 ...)**.
2. Measure 2 follicle diameters.
3. Change imaging plane and freeze the image.
4. Click **FD (3 distances, ...3)**.
5. Measure the third follicle diameter.

   The average (**Avg. FD**) appears with the measurements.

1. This system is not market cleared by the FDA for IVF use in the USA.

Obstetrics Reports

For information about reports, see “Reports” on page 129.

Obstetrics reports can contain the results of clinical calculations of GA and EDC as well as calculations based on measurements of the ultrasound image.

Editing a Report

You can edit a report before you save it. A saved report cannot be edited.

Adding remarks

You can add a remark to a report by putting the cursor in the Remarks field and typing the comment.

Deleting measure-ments

In an obstetrics report, you can delete some measurements. If you delete a measurement in a report, an average that uses it is recalculated in the report.

To delete a measurement from a report:

1. Point at the measurement result in the **Measurements** column.

   If the measurement is one that can be deleted, the measurement value is highlighted in red and crossed out.

2. Click.

   The measurement is removed from the report.

Curves in Reports

If you enter information in the **Patient** window about a previous measurement (CRL, BPD, FL, AC or HC) or the date of the last menstrual period, the report includes reference curves for the current measurements.

The **Curve Setup** window (see Fig 14-17 on page 223) contains a list of all available curves (including any user-defined ones). Some curves also have associated percentile curves – these will be displayed along with the main curve.

Click Next to see curves

Each curve is on a separate page of the report. Click **Next** and **Previous** on the report to see the various pages. If you delete a measurement from a report, the curve associated with that measurement is also deleted.

Example of an OB Report with Curves

Here is an example of a report. A previous BPD measurement was entered in the **Patient** window, to be used as a basis for the curves.

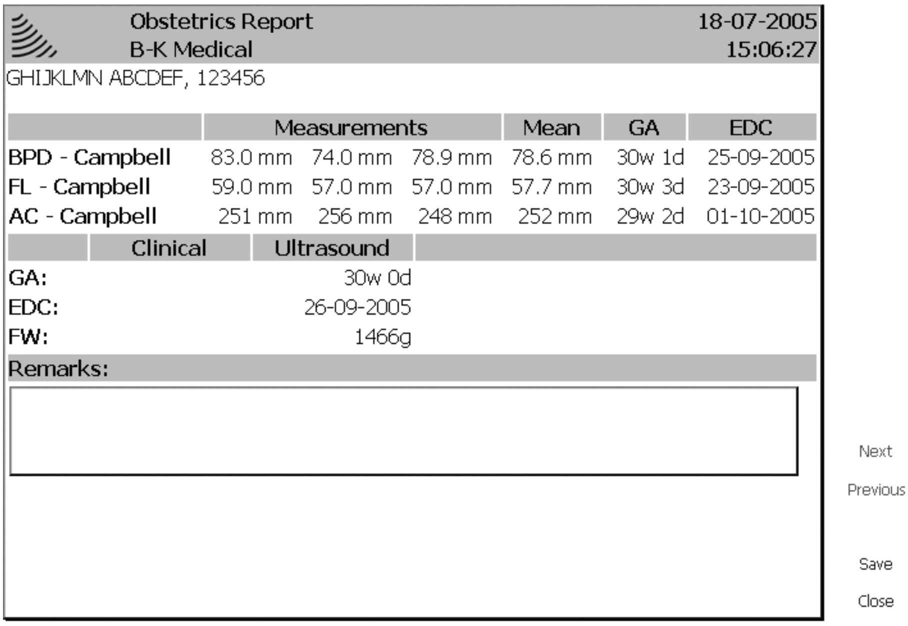


Figure 22-1. First page of OB report.

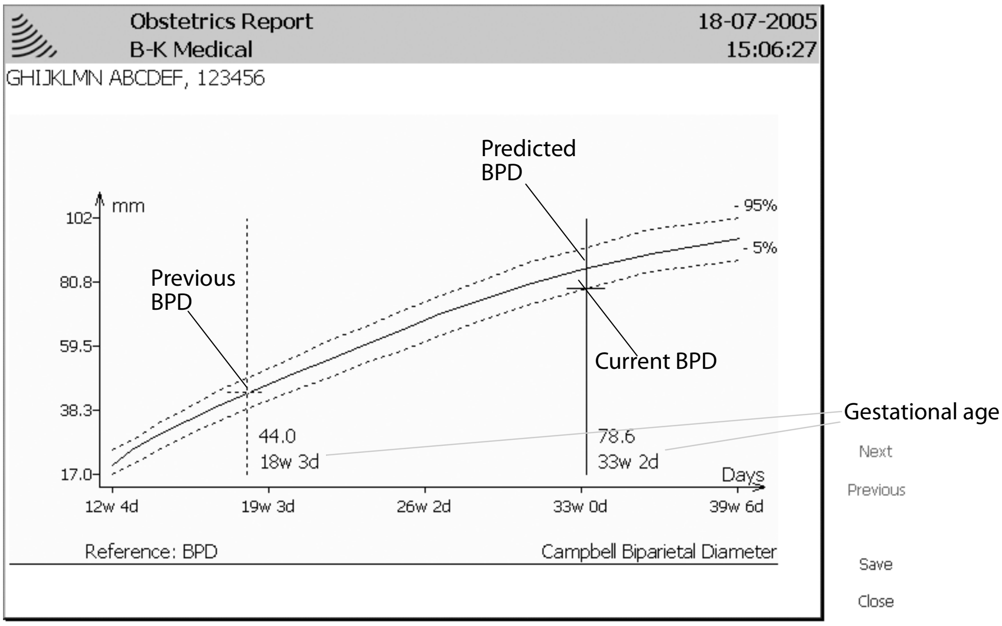


Figure 22-2. Campbell BPD curve in OB report.

Note that the gestational age assumed for the second (current) examination is based only on the gestational age estimated at the first examination plus the elapsed time. The current measurements do not affect it.

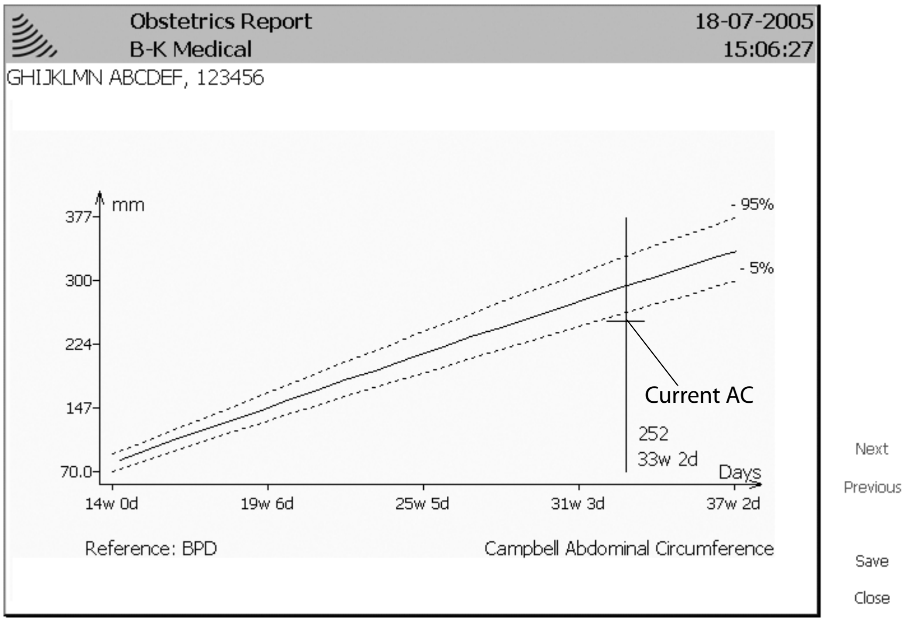


Figure 22-3. Campbell AC curve in OB report.

Fig 22-3 shows the position of the AC measured today compared to AC reference curves based on the BPD measured previously.

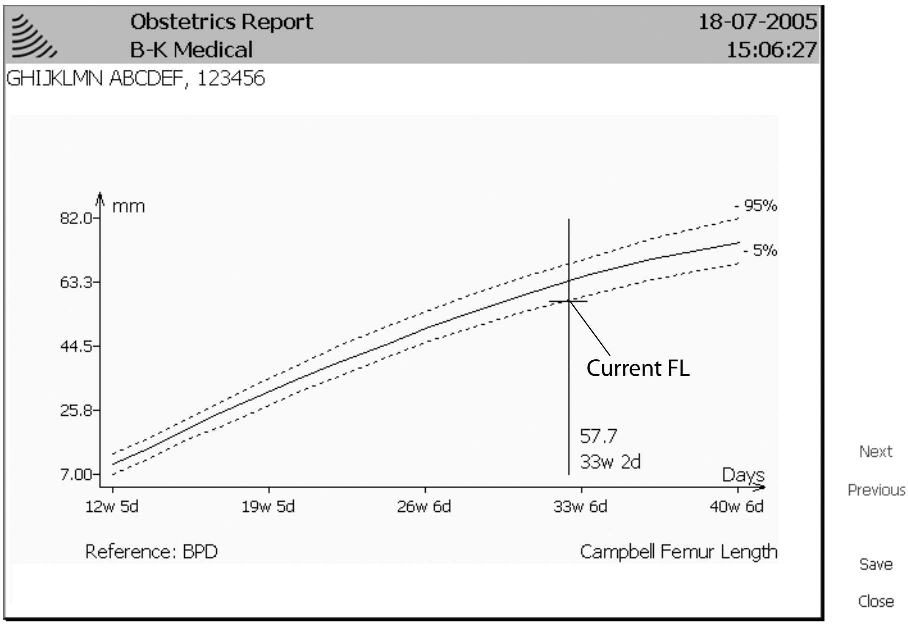


Figure 22-4. Campbell FL curve in OB report.

Fig 22-4 shows the position of the FL measured today compared to FL reference curves based on the BPD measured previously.

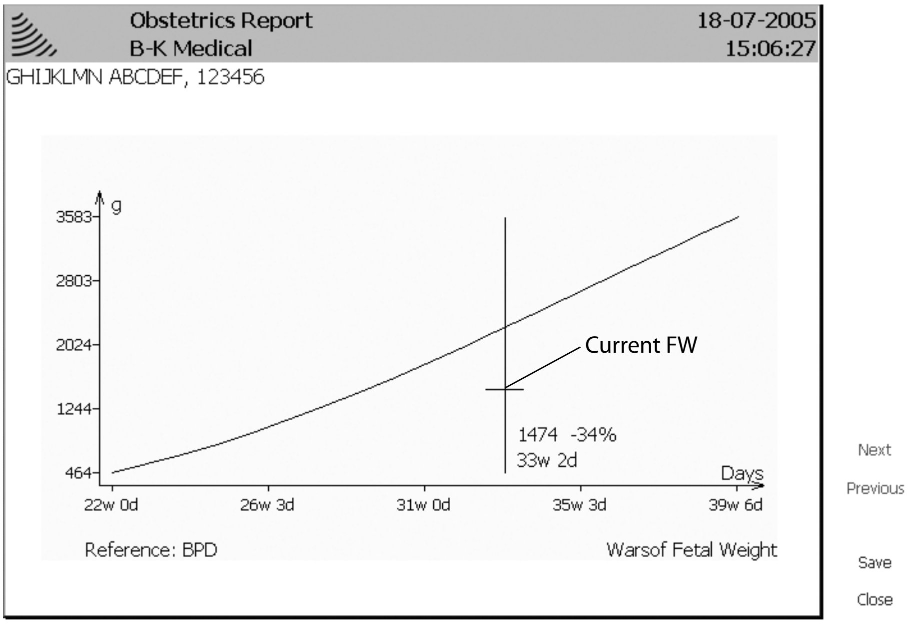


Figure 22-5. Warsof fetal weight curve in OB report.

The report page shown in Fig 22-5 shows how much the fetal weight measured today deviates from the fetal weight expected for today's gestational age. Today's gestational age is predicted from the previously measured BPD and the elapsed time.

Calculations

All formulas and tables that the system uses for obstetrical and gynecological calculations are listed in Technical Data (BZ2100), together with detailed information about calculation accuracies and factors affecting accuracy.

Chapter 23
3D Imaging

Introduction to 3D Ultrasound

The basic concept of 3D ultrasound is to collect a data set of 2D ultrasound images (black & white or color) while tracking and storing the location of each individual 2D image. The data set is then reconstructed into a single 3D volume that can be displayed on the monitor and manipulated. The reconstructed 3D volume can be rotated, sliced, rendered or displayed in multiplane cross-sections.

3D on the Pro Focus

The 3D function of the Pro Focus can be purchased as an option. For more information, see the Pro Focus 2202 Product Data sheet that accompanies this user guide.

To run the 3D software, you must have a license from BK Medical. For information about activating the 3D option, see “Licenses” on page 238.

Password Protection

If your patient archiving system is password protected (see “HIPAA Compliance” on page 107), you cannot use the 3D system unless you are logged in.

Emergency

In an emergency, you can put the system into an Emergency state and acquire 3D data sets, but you cannot save them with any patient ID other than **EmergencyID**. See “Emergency State” on page 131.

Imaging Modes

You can use 3D with B-mode, Color mode or Power mode imaging. You can also use it with split-screen imaging. However, you cannot use 3D with the following modes and functions:

- Doppler mode (spectral PW Doppler)
- CW Doppler
- M-mode
- Color mode using Velocity + Variance submode
- B Color

NOTE: *Turning on one of these modes or functions while you are using 3D will turn off 3D. If you are already using one of these modes, turning on 3D will turn the mode or function off, and turning off 3D will not turn it on again.*

Color maps

NOTE: *Acquiring a 3D volume with some color maps may result in faulty colors for some pixels. To avoid this, the system selects a default pure gray scale instead.*

Controlling Transducer Movement

The 2D images in the data set are imaged with the transducer in different positions. The transducer can be moved in the following ways:

- with a system-controlled positioning device (external or built into the transducer)
- untracked freehand (see second warning on page 289)

System-Controlled Positioning

If the transducer is moved with a system-controlled positioning device, you can make measurements on the reconstructed 3D volume. There are various system-controlled positioning devices you can use:

- the built-in 3D mover in the 2052 and 8838 transducers
- the magnetic wheel mover for the 8808, 8818 and 8848 transducers

Transducers 2052 and 8838

The 2052 transducer has a built-in mover for 3D acquisition. The 8838 transducer has a linear array that rotates up to 360º degrees to produce a 3D image. For information about setting up and attaching these transducers, see the relevant transducer user guide.

The Magnetic Wheel Mover

The magnetic wheel mover (UA 0513) is designed for use with the 8808, 8818 and 8848 transducers. The mover is a system-controlled positioner that uses different adapters either to rotate the transducer about its long axis (to produce a fanned data set) or to pull the transducer back (to produce a series of parallel images).

For information about setting it up, using it and caring for it, including important safety warnings, see the magnetic wheel mover user guide. For information about setting up the system to image with the mover, see "Setting Up the System for Use with Magnetic Wheel Mover UA0513" on page 294.

Untracked Freehand Acquisition

Untracked linear and fan acquisitions (freely moving the transducer while you acquire a 3D data set) are allowed with any transducer. However, certain combinations of motion and transducer – a fan acquisition with a 2052, for example – will not produce a sensible 3D volume.

Imaging Direction

Imaging direction icon

In the **3D Setup** window, you must select the imaging direction icon that corresponds to the direction you plan to move the transducer. See "Setting the Imaging Direction" on page 291. The icon you choose gives the system information about how to reconstruct the 3D volume. If there is a mismatch, the resulting volume can be mirrored.

After you acquire the image, you must check the reconstructed volume to make sure that it is a correct representation of the data.

Measurements Not Accurate

WARNING You cannot make accurate measurements on a 3D data set acquired using the untracked freehand method.

If you start to make a measurement on a 3D data set acquired using the untracked freehand method, the following warning appears in red on the monitor to remind you that the measurement will not be accurate.

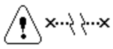


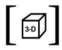
Figure 23-1. 3D untracked freehand measurement warning on the monitor.

3D Imaging Overview

Here is an overview of the steps involved in acquiring a 3D data set. The rest of this chapter contains detailed information about the procedures.

To make a 3D image:

1. Check all the connections.
2. Connect the relevant mover, if needed.
3. Choose the preset you want.
4. Optimize the 2D image.
5. Turn on 3D. If you have not entered a Patient ID, the **Patient** window opens.
6. Set the image capture settings that you want.
7. Adjust the 3D ROI markers to include the area of interest to be imaged.

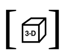
   Once you have defined the image capture settings, you can begin imaging.
8. Press  or click  or **Acquire**.

   The time taken to complete the image depends on the chosen frame rate, step size and image extent. To stop the acquisition at any time, click **Stop** next to the progress bar.
9. If you have not imaged the entire region of interest, reposition the transducer and reset the imaging parameters (if required). Press  or click  or **Acquire** to start imaging a new 3D image.

Turning 3D On and Off

NOTE: *You cannot turn on 3D if the image is frozen.*

To turn on 3D:

- Press .

or

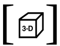
- Click  .

You can also use a user-defined key (or foot-pedal switch) to start 3D. See “User-Defined Keys” on page 201.

If you have not entered a valid patient ID, you will be prompted to do so.

NOTE: *You cannot acquire 3D data sets unless you have entered a patient ID. The default patient ID is “NoID”.*

To turn off 3D:

- Press (long) [] or the user-defined 3D key.

or

- Click (long)  .

Setting Up the Image Capture Settings

See also “Setting Up the System for Use with Magnetic Wheel Mover UA0513” on page 294.

When you turn 3D on, the **3D Setup** window appears:

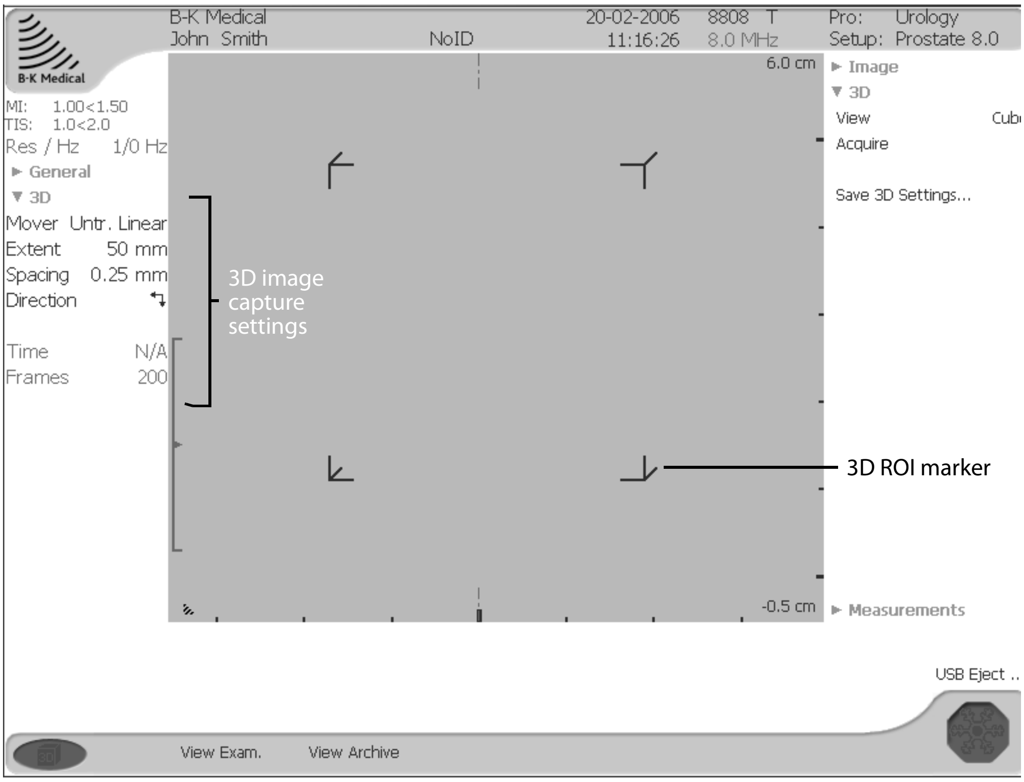


Figure 23-2. The 3D Setup window.

In the **3D Setup** window, 3D image capture settings are listed under **3D** on the left side of the monitor. On the right side of the monitor, under **3D**, are some other 3D settings (see page 292). The 3D ROI markers in the image area indicate the area that will be captured in the 3D data set.

3D Image Capture Settings	Description
Mover	Mover type (this includes untracked options)
Extent	Extent of the image.
Spacing	Spacing between frames of the 3D acquisition.
Direction	Imaging direction. See below.
Time	Time required for the acquisition. You cannot change this directly.
Frames	Number of frames in the acquisition. You cannot change this directly.

See also "Setting Up the System for Use with Magnetic Wheel Mover UA0513" on page 294.

Table 23-1.3D image capture settings.

Setting the Imaging Direction

Movers with fixed direction

With certain movers, the imaging direction is fixed, and you cannot change it.

Select direction for other movers

For other movers, you set the direction that the mover will move by selecting the appropriate imaging direction icon.

NOTE: *When you choose a mover, the system will change the 2D image orientation if a change is necessary to ensure that the 3D volume is reconstructed correctly. You are notified if this occurs.*

Untracked freehand

Before you acquire an untracked freehand data set, it is essential to select the appropriate imaging direction icon so that the 3D volume will be reconstructed correctly. Be especially careful if you have changed the orientation (either up/down or left/right) of the 2D image (changed its orientation). In this case the system will not make any automatic adjustments of orientation before 3D acquisition. The effect of a flipped 2D image on the resulting 3D volume can be confusing, so we recommend that you do *not* change the default orientation of the 2D image before acquiring a 3D data set.

Set direction carefully

You must select the imaging direction to match the direction that the transducer will move during acquisition.

NOTE: *If the patient is not lying on his or her back, be very careful when you choose the imaging direction, because the directions are defined relative to a patient lying face-up.*

Direction		Clockwise (fanned)
Direction		Counterclockwise (fanned)
Direction		Inferior to Superior or Right to Left* (linear or pullback)
Direction		Superior to Inferior or Left to Right* (linear or pullback)

*The directions are defined relative to a patient lying on his or her back.

Figure 23-3. 3D imaging directions.

ROI (3D Region of Interest)

The 3D region of interest (ROI) box defines the area that is captured with a 3D image.

NOTE: *You cannot press [ ] to activate the 3D ROI box. The [ ] key continues to work in the normal way for the 2D image.*

Moving the ROI box

To move the 3D ROI box to a different part of the image, click inside the box to select it and drag it with the trackball. Click to release the cursor when the box is where you want it.

Resizing the ROI box

To resize the box (increase or decrease the area covered by the 3D acquisition), press +/- when the box is selected.

You can also resize the box by clicking one of the corners (selecting it) and then dragging the corner.

Other 3D Settings

In the **3D Setup** window, under **3D** on the right side of the monitor, you can click:

- **Acquire** to start to acquire a 3D data set
- **View** to select a view that appears when acquisition is complete. (The one you last viewed is selected. When you point at it, a triangle appears to the right. Click to select a different view. Then click **View**.) See below.
- **Save 3D Settings...** to save your setup. See below.

Selecting a View

You can specify the view that will appear after you have acquired the 3D data set.

To the right of **View** under **3D** on the right side of the monitor, is the view that will appear. If you want a different view, click the triangle to the right to select from a list.

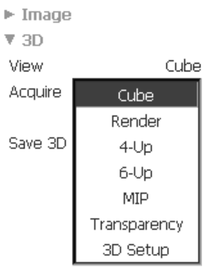


Figure 23-4. 3D data set views.

If you click **3D Setup**, no 3D view automatically appears after the data set is acquired.

Saving 3D Settings

When you finish setting up the 3D acquisition, you can save the 3D settings just as you save any other preset (see “Saving a Preset” on page 56. Click **Save 3D Settings...** under 3D on the right side of the monitor. The **Save Preset** window opens:

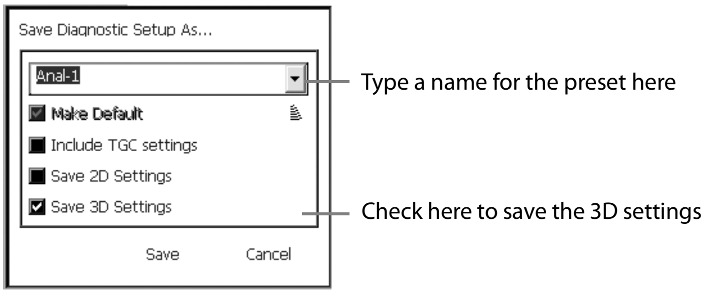


Figure 23-5. The Save Preset window.

A preset includes both 2D and 3D settings. In the **Save Preset** window, you specify whether you want to save 2D settings, 3D settings or both. You can overwrite the settings for the named preset, or you can save the settings you want with a new name.

Starting a 3D Acquisition

Starting 3D acquisition

To start the 3D acquisition:

- Press [ ].

or

- Click or **Acquire**.

or

- Press a user-defined key.

A progress bar appears.

NOTE: *During 3D acquisition, most keys and on-screen controls are disabled. You can use only the* FREEZE *function (monitor or control panel), and* [ ] or [ ] *on the control panel.*

NOTE: *When imaging with single-element transducers 2050, 2052 or 8551, you cannot start a 3D acquisition if the image is frozen.*

Aborting 3D acquisition

To abort a 3D acquisition (stop it before it is finished):

- Press [ ] or [ ] or [ ] or the user-defined 3D key.

or

- Click **Stop** next to the progress bar.

After you have acquired a 3D data set, it is displayed as a volume in the image area. You can select various ways of viewing the volume, and you can use various tools and settings to enhance the image.

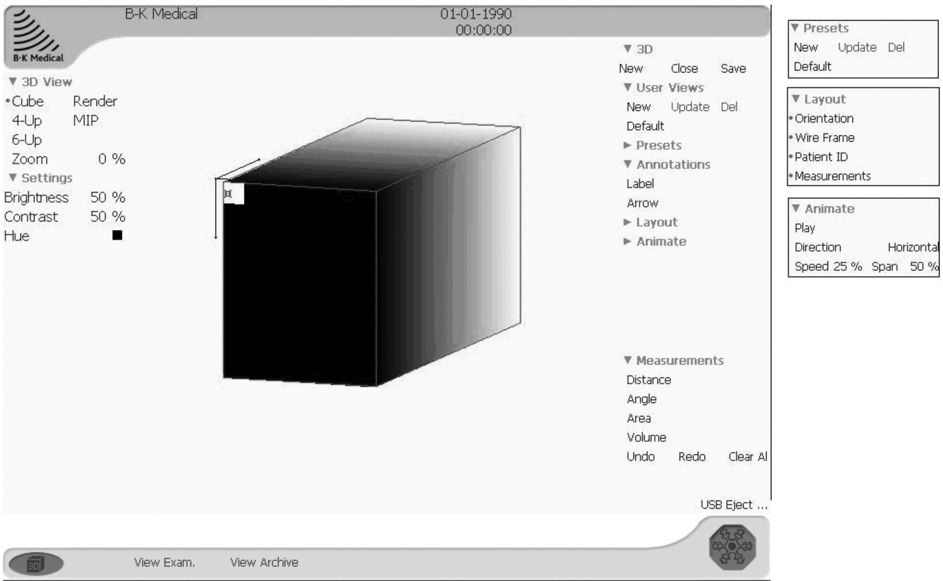


Figure 23-6. Viewing a 3D volume.

Setting Up the System for Use with Magnetic Wheel Mover UA0513

To acquire a 3D image using the rotational mover:

1. Select sagittal array (S) by clicking on the transducer type number at the top right on the monitor.
2. Press [ ] and click **3D** to open the 3D options on monitor.
3. Click **Mover** and select **Rotational mover**.
4. Click **Extent** to choose how many degrees you want to rotate the mover.
5. Click **Direction** to select imaging direction (see Fig 23-3 on page 291).
6. Click **Spacing** to set the desired spacing between frames of the 3D acquisition.
7. Press [ ] again. The mover will quickly turn to the starting position and start to rotate with a constant velocity covering the angle as planned in the setup.

Viewing a 3D Data Set

There are 6 different ways you can view the 3D data set. They are described later in this chapter.

- Cube (see page 299)
- Render (see page 301)
- MIP – Maximum Intensity Projection (see page 304)
- Transparency (see page 304)
- 4-Up (see page 305)
- 6-Up (see page 306)

Before you acquire the 3D data set, you can select the view that appears when acquisition is complete. See “Selecting a View” on page 292..

3D – New, Close, Save

When you view a 3D data set, there are 3 options at the upper right side of the monitor under **3D**.

- **New –** Returns to the 3D Acquisition window so you can acquire a new data set. (This option is only available when 3D is turned on – not if you are just viewing a 3D data set from the patient archiving system.)
- **Close –** Closes the 3D viewer.
- **Save –** Updates the 3D volume document in the patient archiving system to include saved User Views, measurements and the result of sculpting.

Changing the View

When a volume is displayed, a list of all the available 3D views appears on the upper left side of the monitor, under **3D View**. The current view is indicated by a little green light. To change the view, click the one you want.

NOTE: *Imaging is frozen when any view of the 3D volume is displayed.*

Enhancing a 3D View

When a 3D view is displayed, you can use various options under **Settings** on the left side of the monitor to enhance the appearance of the 3D volume and make it easier to see the structures you are interested in.

- **Brightness**
- **Contrast**
- **Hue –** Click this to open a window where you can select a hue (color) to color the gray scale part of the volume.
- **Zoom –** Initial zoom is 100%. (**Zoom** is located above Settings on the left side of the monitor.)

Presets

After you have set **Brightness**, **Contrast**, **Hue** and **Zoom**, and any Render settings, you can save your settings as a **Preset** on the right side of the monitor.

Preset Options	
New	Name the current settings to have them saved as a named preset. You are prompted for a name.
Update	Click this if you want to update the current preset to include new settings.
Del	Deletes the preset that is currently selected.
(Preset Name)	If you have defined any presets, their names appear under New, Update, Del.
Default	Returns to the default preset settings.

Table 23-2. Options under Presets.

3D Layout Options

When you view the acquired volume, you can change the layout of the monitor using the following options under **Layout** on the right side of the monitor.

- **Orientation –** Turns the orientation marker on and off. The orientation marker is positioned on the first frame in the image.
- **Wire Frame –** Shows or hides the wire frame on the volume.
- **Patient ID –** Shows or hides the patient name and ID at the top of the monitor.
- **Measure** (only in Cube view) – Shows or hides the measurement lines or boundaries on the volume, the **Measurement** menu (on the right side of the monitor), and **Measurement** results (on the left side of the monitor).

Manipulating the Volume

You can use the trackball and the key to manipulate the volume in various ways. The form of the cursor is different, depending on what you are doing.

Rotating

To rotate a volume in any direction:

1. Point outside the volume.

   The cursor looks like this:
2. Hold the key down while you drag the cursor and rotate the volume.

You can also rotate the intersecting planes view in the 4-Up and 6-Up views.

Moving a Plane In and Out of the Volume

You can move a selected plane in and out of the volume to “slice” the volume so that a plane inside the original volume is displayed as a face of the transformed volume. This new face is called a “cut plane”. The cut plane can be parallel to a one of the original faces of the volume or at an angle (tilted) relative to the axes of the volume.

To slice the volume:

1. Move the cursor onto one of the volume faces.

   The cursor looks like this:
2. Hold the key down while you drag the cursor to move the plane through the volume until the cut face you want is visible.
3. To restore parts of the volume that you have sliced away, drag the cut plane back through the volume.

Tilting a Plane

You can tilt a plane to see views that are not parallel to one of the original faces of the volume. (This often creates additional planes.)

To tilt a plane:

1. Click the edge of a plane to select it.

The cursor looks like this, and the wire frame around the plane becomes red.

2 Hold the key down while you drag the cursor to tilt the cut plane.

You can then move the tilted cut plane in and out (slice) as described before.

Moving the Volume

To move the volume:

1 Move the cursor so that it is inside the volume.

2 Hold down the **Shift** key (on the keyboard) and the key on the control panel.

The cursor looks like a hand.

3 Drag the volume to the position you want, while holding **Shift** and down.

4 Click when the volume is where you want it.

Animating the Volume

To make the volume rotate automatically forward and back:

- Click **Play** under **Animate**.

  The volume rotates continuously.

To stop the rotation, click **Animate** again.

Under **Animate** on the right side of the monitor, you can click to adjust the following animation parameters:

- **Direction – Horizontal** or **Vertical**
- **Speed**
- **Span –** the extent of the rotation

Aligning or Deleting a Face

You can turn the volume so that a particular plane is facing you. You can also delete a cut plane.

If you point at a plane of the volume and press the **+** side of the [**+/-**] key, a popup menu appears. If you click **Delete Face**, the plane disappears. If you click **Align Face**, the volume moves so that the plane is facing you.

Annotating a 3D View

As with 2D images, you can annotate a 3D view with a label or arrow. You cannot use a bodymark.

You can add as many labels or arrows to a 3D view as you want. When you have finished, you can save the annotated image as a view that you name.

Label **To add a label to a 3D view:**

1 Click **Label** under **Annotations** on the right side of the monitor or press [ABC].

A writing cursor appears.

2 Move the cursor to where you want the label.

3 Type the label.

4 Click. (You can drag the label to reposition it before you click, but after you click, you cannot edit the label, only delete it.)

You can add additional labels.

5 When you have added all the labels you want, click **Label** again.

6 A window appears for you to name the view with the annotation. You can update the current view to include the annotation, or you can give it a new name.

Arrow **To add an arrow to a 3D view:**

1 Click **Arrow** under **Annotations** on the right side of the monitor or press [F10].

The cursor appears on the 3D volume with an arrow.

2 Press [+/-] to change the orientation of the arrow.

The tail of the arrow moves in a clockwise direction with each press.

3 Drag the arrow to where you want it and click.

An arrow is placed on the image.

4 You can add another arrow.

5 When you have added all the arrows you want, click **Arrow** again.

6 A window appears for you to name the view with the annotation. You can update the current view to include the annotation, or you can give it a new name.

NOTE: *After you have positioned an annotation on the image and clicked, you cannot edit the annotation or move it. You can only delete it. To delete an annotation, click* **Undo**. *The most recent annotation is deleted. You can click* **Undo** *several times to remove more than one annotation.* **Redo** *restores the annotation that was just deleted. You can also click* **Clear All** *to remove them all. (***Redo** *will not restore annotations that were deleted with* **Clear All***.)*

User Views

After you enhance the 3D view and annotate it, you can save it as a User View. Settings for volume rotation and slicing, zoom level and annotations are saved in a User View. A User View is specific to a 3D volume.

User Views	
New	Name the current settings to have them saved as a named user view. You are prompted for a name.
Update	Click this if you want to update the current user view to include new settings or annotations.
Del	Deletes the user view that is currently selected.
(User View Name)	If you have defined any views, their names appear under New, Update, Del.
Default	Returns to the default user view.

Table 23-3. Options under User Views.

Cube View

This is a texture-mapped representation of the volume. It is the default view.

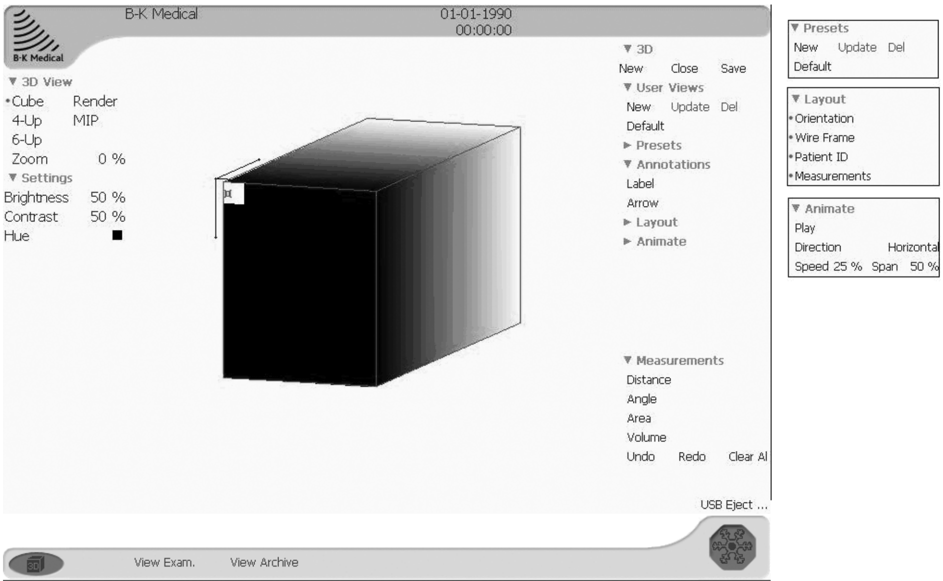


Figure 23-7. The 3D Cube View window.

Making Measurements in a Cube View

In a Cube view, you can measure the length, area and volume of a pathology, if you have used a system-controlled positioning device to acquire the data set. (You cannot make accurate measurements on data sets acquired using untracked freehand. See the warning on page 289.)

NOTE: *Making measurements on a 3D cube is not the same as making measurements on a 2D image, as described in Chapter 5, "Making Measurements". After you have clicked to position a point to make a 3D measurement, you cannot move the point. You can only complete the measurement (if it requires more points) and then delete the measurement and make a new one.*

To make a 3D measurement:

1. Click the type of measurement you want under **Measurements** on the right side of the monitor.
2. Click to position the points of the measurement. See Table 23-4.

   When you click (or double-click, in the case of a polygon) the final point for the measurement, a number appears next to the lines you have drawn. The number is used to label the measurement results.

   The results appear under **Measurements** on the left side of the monitor.

Measurement Type	What to Do	Result
Distance	Click to position 2 points. A line connects them.	Distance between the points.
Angle	Click to position 3 points. Two intersecting lines appear.	Angle between the lines.
Area	Click points on the perimeter of the area. A polygon appears. The number of sides in the polygon increases with each click. When you have come to the last point, *double-click* to indicate that it is the final point in the polygon. You must click the points in order so that the polygon does not intersect itself – see note below.	Area of the polygon.
Volume	See instructions on page 301.	Volume calculated from polygons drawn on slices of the volume.

Table 23-4. Measurements on a 3D data set.

Polygon measurements

NOTE: *You must click the points in order around the polygon perimeter. You cannot move a point once you have positioned it. If you backtrack, the polygon will intersect itself. If this happens, or if you have made another mistake in drawing the polygon, you must delete the entire measurement (click* **Undo** *on the right of the monitor under* **Measurements)** *and start over. If you are in the middle of a volume measurement, the entire volume measurement is deleted, not just the current polygon.*

Deleting Measurements

To delete a measurement:

- Click **Undo** under **Measurements** on the right side of the monitor.

  The most recent measurement is deleted.

You can click **Undo** several times to remove more than one measurement.

To restore the measurement that was just deleted:

- Click **Redo** under **Measurements** on the right side of the monitor.

To remove all measurements:

- Click **Clear All** under Measurements on the right side of the monitor.

  (**Redo** will not restore measurements that were deleted with **Clear All**.)

Measuring Volumes

You measure a volume by drawing polygons around the area of interest on slices taken throughout the Cube. The method for drawing polygons is not the same as for 2D images.

To make a volume measurement on a 3D Cube:

1. Click **Volume** under **Measurements** on the right side of the monitor.
2. Click **Step Size** and set the distance between slices of the Cube that will be used for the volume measurements. This does not have to be the same as the step size used for acquisition. (The default step size is 5mm.)
3. Draw a polygon around the area of interest by clicking points on the perimeter. When you have come to the last point, *double-click* to indicate that it is the final point in the polygon. See note above about clicking the points in order.
4. Click **Next** to move through the volume by the chosen step size.
5. Outline the area of interest in the new slice.
6. Repeat steps 3, 4, and 5 for each slice until the area of interest is no longer visible (the volume measurement is completed).

   The system updates the accumulated volume (in cm^3) as each polygon is completed.
7. Click **Volume** again.

NOTE: *For information about accuracy of measurements on acquired and reconstructed planes, see "3D Measurements" on page 37.*

⚠ **WARNING** Measurements obtained with the 3D system and used in diagnosis must be carefully and thoughtfully performed to ensure accurate quantitative assessment. Before you perform a calculation, make sure that all necessary calibrations and measurements are made.

If you suspect that the 3D system's calibration is inaccurate (that is, the measurements are not as expected), contact your local BK Medical service representative to check and confirm the system's proper operation.

Render View

Rendering dramatically improves 3D visualization. It is useful for looking in detail at soft tissues such as fistulas and abscess cavities. In this view, for gray scale volumes only, you can use sculpting tools to remove obstructing portions of the volume so you can better see the areas of interest. See page 302.

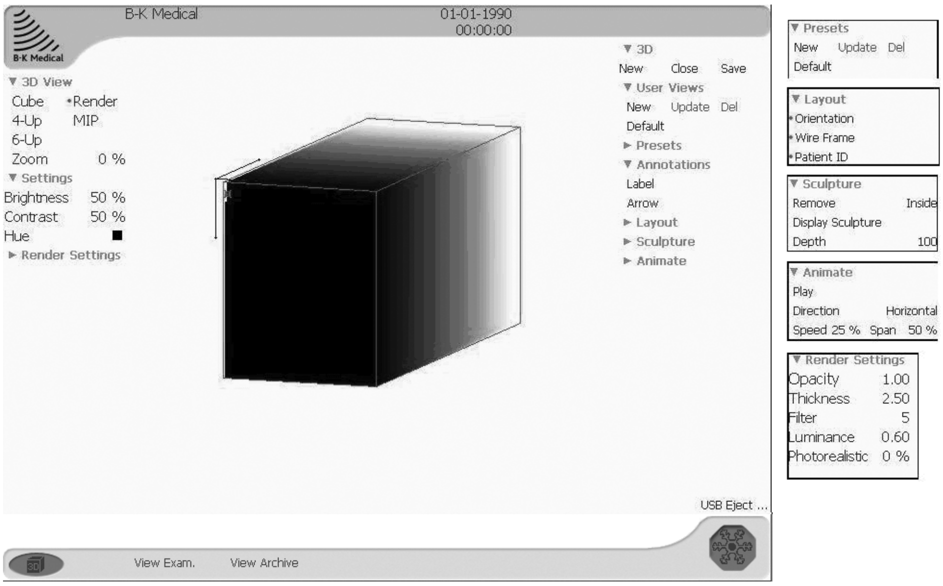


Figure 23-8. The 3D Render View.

Render Settings

You can change the way a Render view looks by adjusting the settings under **Render Settings** on the left side of the monitor (see Fig 23-8):

- **Opacity –** Specifies the transparency of a structure.
- **Thickness –** Determines how far you can look into the volume.
- **Filter –** Sets a threshold so that pixels that are not as bright as the threshold are not displayed.
- **Luminance –** Controls the brightness of structures within the volume. Moving the slider to the left increases brightness.
- **Photorealistic –** Adjusts the photorealistic parameter used in the rendering. This can only be used on gray scale volumes.

Sculpting Tools

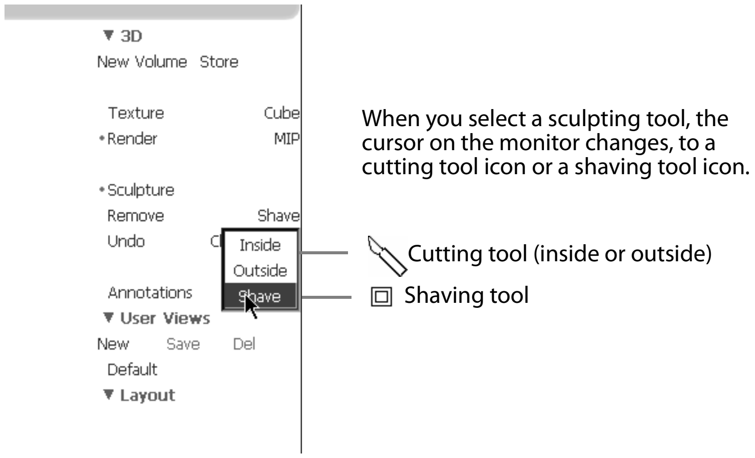
Sculpting tools let you remove unwanted data from a Render view. Sculpting tools can only be used on gray scale volumes – when there is no color in the volume.

There are two sculpting tools:

- the cutting tool (which you can use to cut away the outside of the volume or to cut a hole inside the volume)
- the shaving tool

To use the sculpting tools:

1. Click **Remove** under **Sculpture** on the right side of the monitor.
2. Click to select **Inside**, **Outside** or **Shave**.



3 If you select **Inside**, you can adjust how deep you want to cut. Click **Depth** under **Sculpture** and move the slider to adjust the percentage that is removed when you move the cutting tool.

4 Use the different tools as described below.

5 To turn off the sculpting tools, click **Remove** under **Sculpture**.

To use the cutting tool (inside):

1 Click on one plane of the volume.

2 Hold down [ ] while you drag the to draw a closed curve on the volume plane.

3 Release [ ] when you are finished.

If you have selected 100% **Depth**, a hole appears extending through the volume.

To use the cutting tool (outside):

1 Click on one plane of the volume.

2 Hold down [ ] while you drag the to draw a closed curve on the volume plane.

3 Release [ ] when you are finished.

The area outside the curve disappears.

To use the shaving tool:

1 Click on one plane of the volume.

2 Hold down [ ] while you move the cursor over the area to be shaved.

The longer you hold [ ] down, the more surface is removed.

3 Release [ ] when you are finished.

Displaying Sculpture Results

You can toggle between a view showing the result of sculpting and the unsculpted view. Click **Display Sculpture** under **Sculpture** on the right side of the monitor.

MIP View

Maximum Intensity Projection (MIP) emphasizes the pixels with the highest intensity in the volume. If the highest intensities are mapped to the highest blood flow velocities, this mode accentuates and reveals the peak velocity regions of a volume. It is useful for

- looking at maximum flow jets
- visualizing skeletal structures beneath tissue
- looking at vascularization

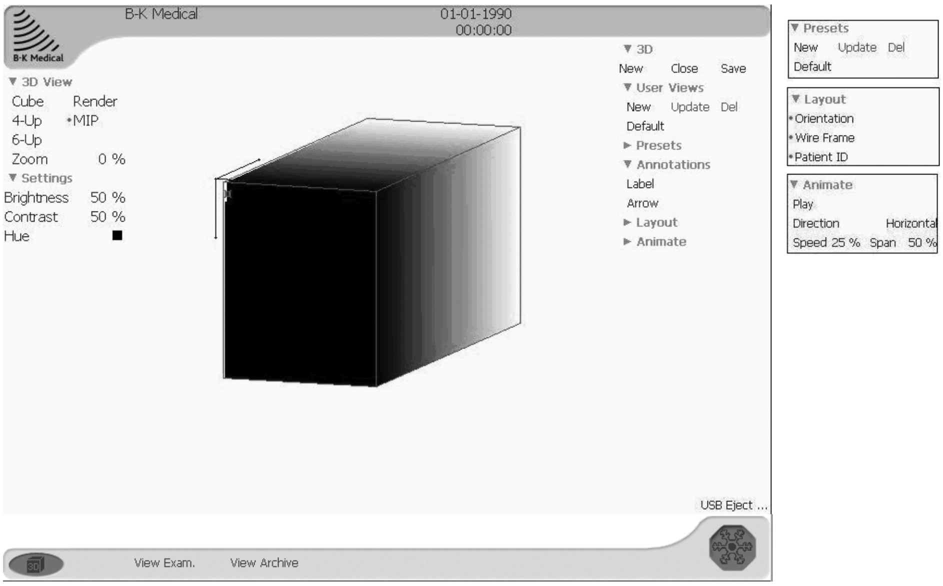


Figure 23-9. The MIP View window.

Transparency View

Transparency rendering (which is only possible when you have acquired the 3D image using Color or Power mode) lets you adjust the relative transparencies of the color and the gray scale parts of the volume. This can allow hidden features to become visible.

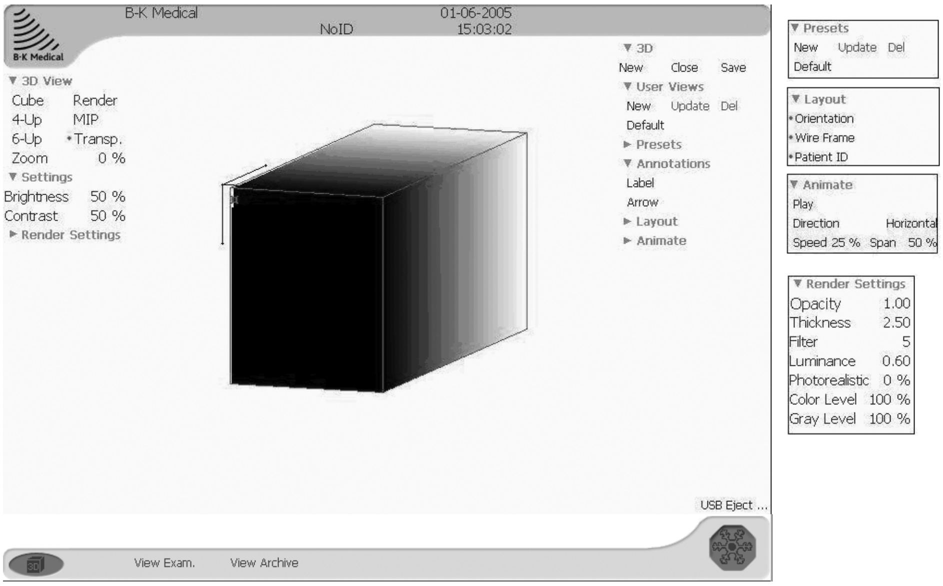


Figure 23-10. The 3D Transparency View window.

Render Settings

You can change the way a Transparency view looks by adjusting the settings under **Render Settings** on the left side of the monitor (see Fig 23-10). In addition to the Render Settings available for a Render view, there are 2 Render Settings that apply only to a Transparency view.

- **Opacity** – Specifies the transparency of a structure.
- **Thickness** – Determines how far you can look into the volume.
- **Filter** – Sets a threshold so that pixels that are not as bright as the threshold are not displayed.
- **Luminance** – Controls the brightness of structures within the volume. Moving the slider to the left increases brightness.
- **Photorealistic** – Adjusts the photorealistic parameter used in the rendering. This can only be used on gray scale volumes.
- **Color Level** – Moving the slider to the left makes the color information more transparent.
- **Gray Level** – Moving the slider to the left makes the gray scale information more transparent.

4-Up View

This view has three orthogonal plane views and a view showing the positions of these intersecting planes within the volume. The planes can be moved by adjusting them in the intersecting view.

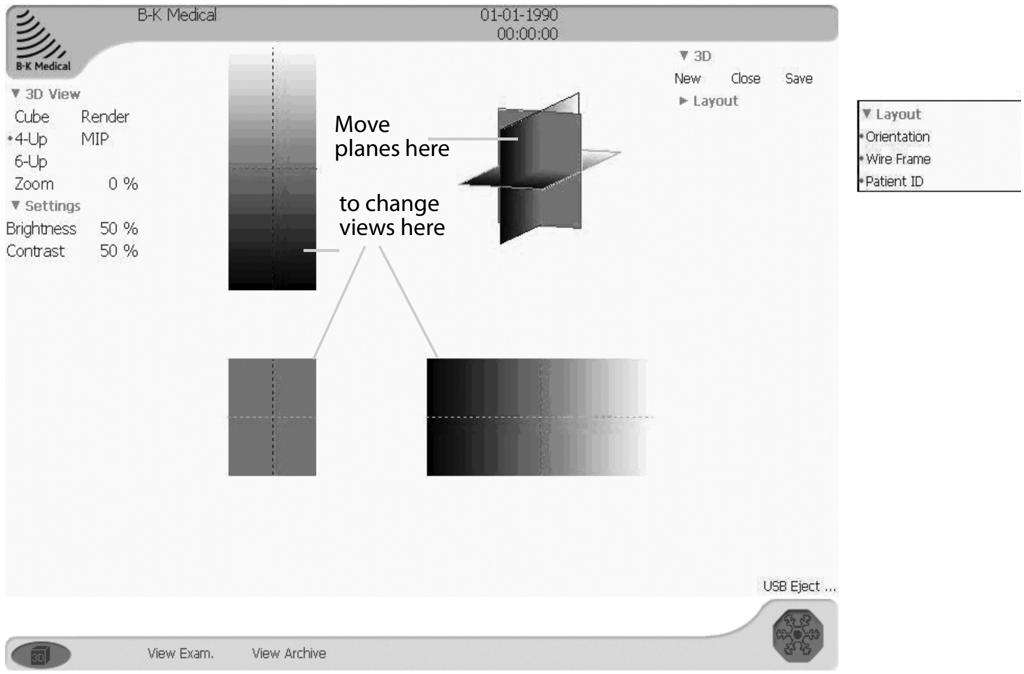


Figure 23-11. The 3D 4-Up View window.

6-Up View

In addition to the views in the 4-Up view, this view contains a Cube view and a sixth view, which is the view most recently displayed (MIP, Render, Transparency or Cube).

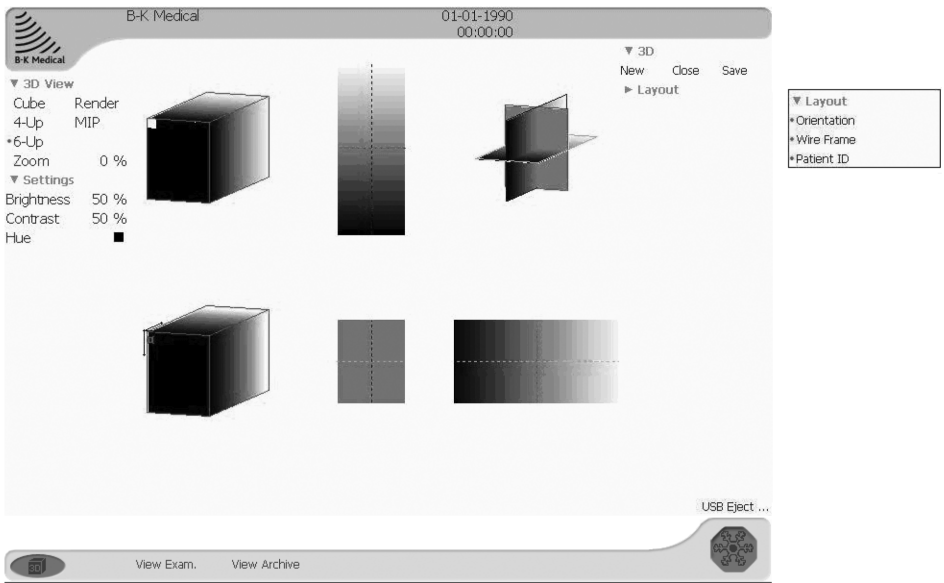


Figure 23-12. The 3D 6-Up View window.

Prostate HistoScanning

HistoScanning™ [1]is a proprietary tissue characterization technology developed to differentiate, characterize and visualize prostate tissue, based on the analysis of backscattered ultrasound. After 3D acquisition (see “3D Imaging Overview” on page 289) the data is transferred to the HistoScanning workstation for further processing.

NOTE: *HistoScanning has not been market cleared by the FDA for use in the USA.*

HistoScanning can be purchased as an option. For more information, see the 2202 Product Data sheet that accompanies this user guide.

For information about installation and use of the HistoScanning equipment, please refer to the accompanying user documentation from Advanced Medical Diagnostics (AMD). For important information about connecting other equipment safely, see “Connecting Other Equipment” on page 27.

To transfer 3D data to HistoScanning during acquisition:

1 Ensure that the HistoScanning workstation is properly connected to the Pro Focus.

  When the HistoScanning license is valid and 3D is active, a status indicator appears in the browser area at the bottom of the monitor, see Fig 23-13. The status indicator displays a different colored LED depending on HistoScanning status.

2 Follow steps 1–9 as described in “To make a 3D image:” on page 289.

Status Indicator Color	Meaning
Green	Ready for acquisition.
Yellow	Acquisition started and in process. Color changes to green a few seconds after the acquisition is ended.
Red	Not ready for acquisition. Check that all connections and settings are correct.

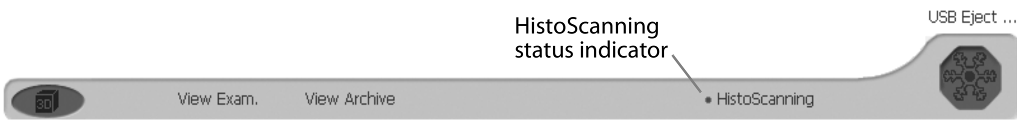


Figure 23-13. HistoScanning status indicator.

1. HistoScanning is not market cleared by the FDA for sale in the USA and not licensed by Health Canada.

Part 6: Appendixes

Appendix A
Glossary

This glossary contains explanations of terms and abbreviations that appear in the user guide or on the monitor. Measurements are listed in Appendix B, “Measurement Abbreviations”.

Term	Explanation
A/B	Stuart index. PS/ED. See page 251.
ACI	Angular Compound Imaging. See page 144.
AFD	Amniotic fluid distance.
AIUM	American Institute of Ultrasound in Medicine.
ALARA	As Low As Reasonably Achievable. Refers to the principle of keeping ultrasound exposure as low as possible (see page 33).
aliasing	Detection of a false flow in the opposite direction from the real flow. This can occur when the PRF used for the Doppler signal detection is not high enough compared to the flow speed. The problem only exists with pulsed wave Doppler detection.
array transducer	A transducer that consists of a set of transducer elements, each capable of transmitting and receiving ultrasound.
ATD	Abdominal transverse diameter.
Auto (Cardiac measurement)	PS, ED, RI, PS/ED
bodymark	A small drawing positioned on the scanned image to help identify it in documentation. See page 66.
catalog	A list of available items, as in a bodymark catalog or label catalog.
CFM	Color flow mapping. See Color mode.
CI	Cephalic index. BPD/OFD.
cine	A function that lets you review a series of previously scanned images.
Click (long)	Pointing at an on-screen control and pressing [ ] for at least 1 second. See page 78.
color box	A box drawn on the scanned image that specifies the region of the B-mode image for which color-coded flow information is available in Color mode.
color Doppler	See Color mode.

Term	Explanation
Color mode (CFM)	Color-Flow Mapping (CFM). Real-time signal that represents the speed of flowing material in each sample volume within the Color mode scan area. The Color mode signal is in principle independent of the amount of flowing material. The Color mode is normally superimposed on a B-mode image that shows the anatomical surroundings. Flow directions towards and away from the transducer are represented as different colors in Color mode (e.g. towards = red, away = blue). The Color mode signal (flow speed) is represented by different values in the color mapping (relative measure) for each sample volume in Color mode. No color means either: • No flow in the sample volume (very low flow speed) or • Amount of reflection from flowing material (which might have a high flow speed) is below threshold set by the Color mode gain. The Color mode signal (flow speed) is dependent on the angle of the ultrasound beam relative to the flow direction.
combination mode	Simultaneous imaging in more than one mode, for example, B+Color or B+Color+Doppler.
control panel	The part of the Pro Focus keyboard panel that contains the special system control keys. For a description, see "The Control Panel" on page 76.
Doppler mode	(Spectral) Doppler mode. This mode displays information about the spectrum of flow velocities as a function of time. It is sometimes called FFT (Fast Fourier Transform) because the information is presented as a frequency spectrum indicating velocity components.
duplex	Simultaneous imaging in 2 modes. See combination mode.
EDC	Expected date of confinement.
EMC	Electromagnetic compatibility.
EO	Ethylene oxide gas. See *Care, Cleaning & Safety*.
ES	End systole. See page 249.
ESD	Electrostatic discharge.
ETD	Enhanced Tissue Definition. See page 143.
F1, F2	Frequency at position of marker 1 or 2 (when you make a measurement).

Term	Explanation
FFT	Fast Fourier Transform. FFT is a method of calculating the Fourier Transform (frequency spectrum) of something that is moving as a function of time. It is used to calculate the spectrum displayed in Doppler mode imaging.
FOI	Field of interest. The area within the B-mode image where resolution and focus are maximal.
GAc	Gestational age (clinical).
GAu	Gestational age (by ultrasound).
graphical control	An on-screen control that is graphical, unlike a softkey. Graphical controls are located in the image area of the screen. Examples are the zoom box, color box, focus indicator, Doppler gate.
HIPAA	Health Insurance Portability and Accountability Act of 1996. American law that sets rules for how patient accounts, billing and medical records must be handled.
IEC	International Electrotechnical Commission.
image bar	Series of small images at the bottom of the monitor. Each image represents a document such as a 2D or 3D image, video clip or report.
image review	See cine.
IOP	Intraoperative – during a surgical operation.
keyboard panel	The part of the Pro Focus 2202 Ultrasound System that contains the keyboard and the control panel.
label	Text positioned on the scanned image to label it. See page 63.
LC	Length of cycle.
LMP	Last menstrual period. LMP is the abbreviation on reports. The field in the patient window for this information is Last Menst. Date.
long press, long click	See Press (long) or Click (long).
MD	Minimum diastole. See page 249.
MIP	Maximum Intensity Projection (3D imaging). See page 304.
MPPS	Modality Performed Procedure Steps. If an MPPS server is configured, you can discontinue the current examination.
NEMA	Association of Electrical and Medical Imaging Equipment Manufacturers (National Electrical Manufacturer's Association)
OB	Obstetrics.
PACS	Picture Archiving and Communications System (DICOM).
PE	Previous examination.

Term	Explanation
PED	Previous examination date.
perioperative	Around the time of a surgical operation.
phased array	A technique to control the scan area by using time delays on an array transducer.
PHT MV	Mitral Valve Pressure Half Time.
PI	Pulsatility index (see page 251).
planimetry	Measuring the surface area and perimeter of an object by tracing its boundaries.
Power Doppler	A real-time signal representing the size of reflection from material that is flowing. The Power mode is normally super-imposed on a B-mode image that shows the anatomical information. Power mode is in principle independent of the speed of the flowing material.
power supply cord	The cord that connects the base power unit to the wall outlet.
Press (long)	Pressing a key for at least 1 second. See page 77.
PRF	Pulse repetition frequency.
Pro Package	An application package containing presets, measuring tools and calculation formulas.
PS	Peak systole or peak systolic velocity. See page 249.
PSA	Prostate-specific antigen.
PSAD	PSA density: PSA divided by prostate volume.
pulse repetition frequency	The rate at which pulses of ultrasound waves are transmitted and received in PW (pulsed-wave) Doppler imaging. See “Pulsed Wave Doppler (PW)” on page 183.
PW Doppler	Pulsed wave Doppler. A type of (spectral) Doppler imaging. See “Pulsed Wave Doppler (PW)” on page 183.
ROI	Region of interest.
screen key	A control on the monitor that looks like a key or button.
spectral Doppler	See Doppler mode.
standby switch	The switch on the front of the system body used for turning the system on and off each day.
TAM	Time Average Mean (see page 250).
TAMX	Time Average Max (see page 250).
TEH	True echo harmonics. BK Medical’s trademarked term for its pulse inversion tissue harmonic imaging system.
TGC	Time gain control.

Term	Explanation
TI	Thermal index. The estimated rise in tissue temperature (in °C) caused by the power emitted by the transducer.
TIB	Thermal index in bone at focal point.
TIC	Thermal index, cranial – bone at surface.
TIS	Thermal index in soft tissue.
trackball keys	The 2 [ ] keys and the [+/-] key. See "The Trackball and Trackball Keys" on page 77.
triplex	Simultaneous imaging in 3 modes. See combination mode.
V1, V2	Velocity at position of marker 1 or 2 (when you make a measurement.)
voxel	A three-dimensional pixel. A **vo**lume pi**xel**.
wall filter	A wall filter is used to eliminate low-frequency artifacts in Color, Power and Doppler modes. It cuts off all frequencies below its cutoff frequency. See page 164.

Appendix B
Measurement Abbreviations

Measurement	Explanation
%ST Area	% Stenosis Area
%ST Dist	% Stenosis Distance
1 Angle	1 Angle
2 Angles	2 Angles
A/B	Stuart index. PS/ED. Systolic Velocity/Diastolic Velocity
AC	Abdominal Circumference
AC - ATD + APD	Abdominal Circumference - ATD + APD
AC - Campbell	Campbell Abdominal Circumference
AC Device	Abdominal Circumference Device
AC - Ellipse	Abdominal Circumference - Ellipse
AC - Freehand	Abdominal Circumference - Ellipse
AC - Hadlock	Hadlock Abdominal Circumference
AC - Jeanty	Jeanty Abdominal Circumference
Acc	Acceleration (velocity)
AccT	Flow Acceleration Time
AD	Abdominal Diameter
AD - Persson (AC)	Persson Abdominal Diameter - AC
AD - Persson (APD + ATD)	Persson Mean Abdominal Diameter
Ad	Adenoma (H, L, Vol or W)
AFI	Amniotic Fluid Index
All	Aortic Valve All (M-Mode)
Alpha1	Alpha1 Angle
Alpha2	Alpha2 Angle using 180°
Alpha3	Alpha3 Angle using 360°
ALSs	Aortic Valve Leaflet Separation, systole.
Angle	Angle

Measurement	Explanation
Anorectal	Anorectal Angle
AO diameter d	Aortic Root Dimension, diastole
AO diameter s	Aortic Root Dimension, systole
AOd	Aortic Root Dimension, diastole.
Aod Dia	Aorta Distal Vessel outside diameter
Aod PS	Aorta Distal Peak Systole
Aom Dia	Aorta Mid Vessel outside diameter
Aom PS	Aorta Mid Peak Systole
Aop Dia	Aorta Proximal Vessel outside diameter
Aop PS	Aorta Proximal Peak Systole
APD	Anteroposterior Diameter
AT	Acceleration Time
AT/ET	Acceleration Time/Ejection Time
ATD	Abdominal Transverse
Auto	Auto Doppler Calculations (PS, ED, RI, PS/ED)
Auto AV	Auto AV Cardiac Calculations
Auto MV	Auto MV Cardiac Calculations
Auto PV	Auto PV Cardiac Calculations
Auto TV	Auto TV Cardiac Calculations
AVA	Aortic Valve Area
Avg. ET	Average Endometrial Thickness
B/A	Diastolic Velocity/Systolic Velocity (ED/PS)
Beta1	Beta1 Angle
Beta2	Beta2 Angle using 180°
Beta3	Beta3 Angle using 360°
Bladder	Bladder Outline
Bl	Bladder (H, L, Vol or W)
BND	Bladder Neck Descent
BPD	Biparietal Diameter
BPD - Campbell	Campbell Biparietal Diameter

Measurement	Explanation
BPD - DSOG	DSOG Biparietal Diameter
BPD - DSOG (BPD,FL)	DSOG Biparietal Diameter (and Femur Length)
BPD - Eik-Nes	Eik-Nes Biparietal Diameter
BPD - Hadlock	Hadlock Biparietal Diameter
BPD - Hansmann	Hansmann Biparietal Diameter
BPD - Hobbins	Hobbins Biparietal Diameter
BPD - Jeanty	Jeanty Biparietal Diameter
BPD - Kurtz	Kurtz Biparietal Diameter
BPD - Persson	Persson Biparietal Diameter
BPD - Robinson	Robinson Biparietal Diameter
BPD - Tokyo	Tokyo Biparietal Diameter
BSA	Body Surface Area
BSA	Body Surface Area (m^2)
BSD	Bladder Neck Symphysis-Pubis Distance
BWT	Bladder Wall Thickness
CI	Cephalic Index
CI	Cardiac Index
CI (BPD + OFD)	Cephalic Index - BPD + OFD
CI (HC)	Cephalic Index - HC
Circle	General Circle
CO	Cardiac Output
CRL	Crown Rump Length
CRL - Campbell	Campbell Crown Rump Length
CRL - DSOG	DSOG Crown Rump Length
CRL - Hadlock	Hadlock Crown Rump Length
CRL - Hansmann	Hansmann Crown Rump Length
CRL - Hobbins	Hobbins Crown Rump Length
CRL - Jeanty	Jeanty Crown Rump Length
CRL - Persson	Persson Crown Rump Length
CRL - Robinson	Robinson Crown Rump Length

Measurement	Explanation
CRL - Tokyo	CRL - Tokyo
Cyst	Cyst diameter
DecT	Flow Deceleration Time
dF dV	Frequency Difference / Velocity Difference
Dist	Distance
DSOG (BPD,FL)	DSOG Biparietal Diameter and Femur Length
dT	Time Difference
dT	M Delta Time
ED	End Diastole
EDUA	End Diastole Uterine Artery
EdV	End-diastolic Volume
EF	Ejection Fraction
Ellipse	Ellipse (various organs)
Empiric	Empiric Volume
EsV	End-systolic Volume
ET	Endometrial Thickness.
ET AV	Ejection Time Aortic Valve.
ET MV	Ejection Time Mitral Valve.
ET PV	Ejection Time Pulmonic Valve.
ET TV	Ejection Time Tricuspid Valve.
FBL	Fibula Length
FD 1	Follicle Diameter (1 distance)
FD 2	Follicle Diameter (2 distances)
FD 3	Follicle Diameter (3 distances)
FD 3 (1,2)	Follicle Diameter (3 distances, distance 1 and 2)
FD 3 (3)	Follicle Diameter (3 distances, distance 3)
FL	Femur Length
FL/AC	Femur Length / Abdominal Circumference
FL/BPD	Femur Length / Biparietal Diameter
FL - Campbell	Campbell Femur Length

Measurement	Explanation
FL - DSOG	DSOG Femur Length
FL - DSOG (BPD,FL)	DSOG Femur Length (and Biparietal Diameter)
FL - Hadlock	Hadlock Femur Length
FL - Hansmann	Hansmann Femur Length
FL - Persson	Persson Femur Length
FL - Tokyo	Tokyo Femur Length
Freehand	General Freehand
FS	Fractional Shortening
FV1	Frequency/Velocity 1
FV1/FV2	Frequency Ratio/Velocity Ratio
FV2	Frequency/Velocity 2
FW	Fetal Weight
FW(GA)	Fetal Weight from Clinical Gestational Age
FW - Campbell (AC)	Campbell Fetal Weight
FW - DSOG (BPD,AD)	DSOG (BPD,AD) Fetal Weight
FW - DSOG (BPD,AD,FL)	DSOG (BPD,AD,FL) Fetal Weight
FW - Eik-Nes (BPD,ATD)	Eik-Nes Fetal Weight
FW - Hadlock (AC,FL)	Hadlock (AC,FL) Fetal Weight
FW - Hansmann (BPD,TT)	Hansmann Fetal Weight
FW - Persson (BPD,AD)	Persson (BPD,AD) Fetal Weight
FW - Persson (BPD,AD,FL)	Persson (BPD,AD,FL) Fetal Weight
FW - Shepard (AC,BPD)	Shepard Fetal Weight
FW - Warsof (AC,BPD)	Warsof Fetal Weight
GA	Gestational age.
Gamma1	Gamma1 Angle
Gamma2	Gamma2 Angle using 180°
Gamma3	Gamma3 Angle using 360°
Gleason Score	Gleason Score
GS	Gestational Sac
GS 1	Gestational Sac (1 distance)

Measurement	Explanation
GS 2	Gestational Sac (2 distances)
GS 3	Gestational Sac (3 distances)
GS 3 (1,2)	Gestational Sac (3 distances, distance 1 and 2)
GS 3 (3)	Gestational Sac (3 distances, distance 3)
GS Device	Gestational Device
GS - Hansmann	Hansmann Gestational Sac
GS - Hellman	Hellman Gestational Sac
GS - Tokyo	Tokyo Gestational Sac
H	Height
H*W*L	Volume H*W*L (various organs)
HC	Head Circumference
HC - BPD + OFD	Head Circumference - BPD + OFD
HC - Campbell	Campbell Head Circumference
HC - Circle	Head Circumference - Circle
HC Device	Head Circumference Device
HC - Ellipse	Head Circumference - Ellipse
HC - Freehand	Head Circumference - Freehand
HC - Hadlock	Hadlock Head Circumference
HC - Hansmann	Hansmann Head Circumference
HC - Polygon	Head Circumference - Polygon
HC/AC	Head Circumference / Abdominal Circumference Ratio
HR	Heart Rate
HR (1-10)	Heart rate where the number in parentheses is the number of cycles between the markers.
IVC Dia	Inferior Vena Cava Vessel outside diameter
IVC VCT	Inferior Vena Cava Valve Closure Time
IVSd	Interventricular Septal Thickness, diastole
IVSs	Interventricular Septal Thickness, systole
Kd	Kidney (H, L, Vol or W)
L	Length
L Ellipse	Empiric Longitudinal Ellipse

Measurement	Explanation
L Empiric	Empiric Longitudinal
L Freehand	Empiric Longitudinal Freehand
L Thy-H	Left Thyroid Height
L Thy-L	Left Thyroid Length
L Thyroid Vol	Left Thyroid Vol. (Proc)
L Thy-V	Left Thyroid Volume
L Thy-W	Left Thyroid Width
LA diameter systole	Left Atrium Medial-Lateral Diameter, systole
LA/AO	LADs/AOd Ratio
LA/AO Ratio	LA Diameter, systole / AO Diameter, systole
LADs	Left Atrium Dimension, systole
LATV Dia	Left Anterior Tibial Vein Vessel outside diameter
LATV VCT	Left Anterior Tibial Vein Valve Closure Time
LBGAd Dia	Left Anterior Tibial Vein Vessel outside diameter
LBGAd PS	Left Anterior Tibial Vein Valve Closure Time
LBGAp Dia	Left Bypass Graft Distal Anastomosis Vessel outside diameter
LBGAp PS	Left Bypass Graft Proximal Anastomosis Peak systole
LBGI Dia	Left Bypass Graft Inflow Vessel outside diameter
LBGI PS	Left Bypass Graft Inflow Peak Systole
LBGO Dia	Left Bypass Graft Outflow Vessel outside diameter
LBGO PS	Left Bypass Graft Outflow Peak Systole
Lbulb ED	Left Bulb End Diastole
Lbulb PS	Left Bulb Peak Systole
LCCA	Left Common Carotid Artery
LCCA/RCCA	Left Common Carotid Artery / Right Common Carotid Artery Ratio
LCCAd ED	Left Common Carotid Artery Distal End Diastole
LCCAd PS	Left Common Carotid Artery Distal Peak Systole
LCCAm ED	Left Common Carotid Artery Mid End Diastole
LCCAm PS	Left Common Carotid Artery Mid Peak Systole
LCCAp ED	Left Common Carotid Artery Proximal End Diastole

Measurement	Explanation
LCCAp PS	Left Common Carotid Artery Proximal Peak Systole
LCFA Dia	Left Common Femoral Artery Vessel outside diameter
LCFA PS	Left Common Femoral Artery Peak Systole
LCFV Dia	Left Common Femoral Vein Vessel outside diameter
LCFV VCT	Left Common Femoral Vein Valve Closure Time
LCIA Dia	Left Common Iliac Artery Vessel outside diameter
LCIA PS	Left Common Iliac Artery Peak Systole
LCIV Dia	Left Common Iliac Vein Vessel outside diameter
LCIV VCT	Left Common Iliac Vein Valve Closure Time
LDPA Dia	Left Dorsalis Pedis Artery Vessel outside diameter
LDPA PS	Left Dorsalis Pedis Artery Peak Systole
LECA	Left External Carotid Artery
LECA ED	Left External Carotid Artery End Diastole
LECA PS	Left External Carotid Artery Peak Systole
LECA/LCCA	Left External Carotid Artery / Left Common Carotid Artery Ratio
LECA/RECA	Left External Carotid Artery / Right External Carotid Artery Ratio
LEIA Dia	Left External Iliac Artery Vessel outside diameter
LEIA PS	Left External Iliac Artery Peak Systole
LEIV Dia	Left External Iliac Vein Vessel outside diameter
LEIV VCT	Left External Iliac Vein Valve Closure Time
LICA	Left Internal Carotid Artery
LICA/LCCA	Left Internal Carotid Artery / Left Common Carotid Artery Ratio
LICA/RICA	Left Internal Carotid Artery / Right Internal Carotid Artery Ratio
LICAd ED	Left Internal Carotid Artery Distal End Diastole
LICAd PS	Left Internal Carotid Artery Distal Peak Systole
LICAm ED	Left Internal Carotid Artery Mid End Diastole
LICAm PS	Left Internal Carotid Artery Mid Peak Systole
LICAp ED	Left Internal Carotid Artery Proximal End Diastole
LICAp PS	Left Internal Carotid Artery Proximal Peak Systole
LFAd Dia	Left Femoral Artery Distal Vessel outside diameter

Measurement	Explanation
LFAd PS	Left Femoral Artery Distal Peak Systole
LFAm Dia	Left Femoral Artery Mid Vessel outside diameter
LFAm PS	Left Femoral Artery Mid Peak Systole
LFAp Dia	Left Femoral Artery Proximal Vessel outside diameter
LFAp PS	Left Femoral Artery Proximal Peak Systole
LFVd Dia	Left Femoral Vein Distal Vessel outside diameter
LFVd VCT	Left Femoral Vein Distal Valve Closure Time
LFVm Dia	Left Femoral Vein Mid Vessel outside diameter
LFVm VCT	Left Femoral Vein Mid Valve Closure Time
LFVp Dia	Left Femoral Vein Proximal Vessel outside diameter
LFVp VCT	Left Femoral Vein Proximal Valve Closure Time
LGN Dia	Left Gastrocnemius Vein Vessel outside diameter
LGN VCT	Left Gastrocnemius Vein Valve Closure Time
LGSV Dia	Left Great Saphenous Vein Vessel outside diameter
LGSV VCT	Left Great Saphenous Vein Valve Closure Time
LGSV-C Dia	Left Great Saphenous Vein of Calf Vessel outside diameter
LGSV-C VCT	Left Great Saphenous Vein of Calf Valve Closure Time
LGSV-T Dia	Left Great Saphenous Vein of Thigh Vessel outside diameter
LGSV-T VCT	Left Great Saphenous Vein of Thigh Valve Closure Time
L-Kd	Left Kidney (H, L, Vol or W)
LLS Dia	Left Lesser Saphenous Vein Vessel outside diameter
LLS VCT	Left Lesser Saphenous Vein Valve Closure Time
LOH	Left Ovary Height
LOL	Left Ovary Length
LO-Vol	Left Ovary Volume
LOW	Left Ovary Width
LPerf-B Dia	Left Boyd's Perforating Vein Vessel outside diameter
LPerf-B VCT	Left Boyd's Perforating Vein Valve Closure Time
LPerf-C Dia	Left Cockett's Perforating Vein Vessel outside diameter
LPerf-C VCT	Left Cockett's Perforating Vein Valve Closure Time

Measurement	Explanation
LPerf-H Dia	Left Hunterian Perforating Vein Vessel outside diameter
LPerf-H VCT	Left Hunterian Perforating Vein Valve Closure Time
LPFAp Dia	Left Profunda Femoris Artery Vessel outside diameter
LPFAp PS	Left Profunda Femoris Artery Peak Systole
LPFVp Dia	Left Profunda Femoris Vein Vessel outside diameter
LPFVp VCT	Left Profunda Femoris Vein Valve Closure Time
LPopA Dia	Left Popliteal Artery Vessel outside diameter
LPopA PS	Left Popliteal Artery Peak Systole
LPopV Dia	Left Popliteal Vein Vessel outside diameter
LPopV VCT	Left Popliteal Vein Valve Closure Time
LPrnlVd Dia	Left Peroneal Vein Distal Vessel outside diameter
LPrnlVd VCT	Left Peroneal Vein Distal Valve Closure Time
LPrnlVm Dia	Left Peroneal Vein Mid Vessel outside diameter
LPrnlVm VCT	Left Peroneal Vein Mid Valve Closure Time
LPrnlVp Dia	Left Peroneal Vein Proximal Vessel outside diameter
LPrnlVp VCT	Left Peroneal Vein Proximal Valve Closure Time
LPTAd Dia	Left Posterior Tibial Artery Distal Vessel outside diameter
LPTAd PS	Left Posterior Tibial Artery Distal Peak Systole
LPTAm Dia	Left Posterior Tibial Artery Mid Vessel outside diameter
LPTAm PS	Left Posterior Tibial Artery Mid Peak Systole
LPTAp Dia	Left Posterior Tibial Artery Proximal Vessel outside diameter
LPTAp PS	Left Posterior Tibial Artery Proximal Peak Systole
LPTVd Dia	Left Posterior Tibial Vein Distal Vessel outside diameter
LPTVd VCT	Left Posterior Tibial Vein Distal Valve Closure Time
LPTVm Dia	Left Posterior Tibial Vein Mid Vessel outside diameter
LPTVm VCT	Left Posterior Tibial Vein Mid Valve Closure Time
LPTVp Dia	Left Posterior Tibial Vein Proximal Vessel outside diameter
LPTVp VCT	Left Posterior Tibial Vein Proximal Valve Closure Time
LSClav ED	Left Subclavian Artery End Diastole
LSClavA PS	Left Subclavian Artery Peak Systole

Measurement	Explanation
LSFJ Dia	Left Saphenofemoral Junction Vessel outside diameter
LSFJ VCT	Left Saphenofemoral Junction Valve Closure Time
LSL Dia	Left Soleal Vein Vessel outside diameter
LSL VCT	Left Soleal Vein Valve Closure Time
L-Ts	Left Testis (H, L, Vol or W)
LV All	Measurements of Left Ventricle in systole and diastole plus calculations
LVAd - Ellipse	Left Ventricular Area, diastole - Bullet
LVAd - Freehand	Left Ventricular Area, diastole - Bullet
LVAs - Ellipse	Left Ventricular Area, systole - Bullet
LVAs - Freehand	Left Ventricular Area, systole - Bullet
LV Dia	Left Ventricle Diastole
LV Dists	Left Ventricle Dists
LV Parent	Left Ventricle Parent
LV Sys	Left Ventricle, systole.
LVAd	Left Ventricular Area, diastole
LVAs	Left Ventricular Area, systole
LVDd	Left Ventricular Internal Diameter, diastole
LVDs	Left Ventricular Internal Diameter, systole
LVertA ED	Left Vertebral Artery End Diastole
LVertA PS	Left Vertebral Artery Peak Systole
LVET	Left Ventricle Ejection Time
LVLd	Left Ventricular Length, diastole
LVLs	Left Ventricular Length, systole
LVM	Left Ventricle Cardiac Mass
LVOT diameter s	Left Ventricular Outflow Tract Diameter, systole
LVOT PFV	Left Ventricle Outflow Tract Peak Flow Velocity
LVPEP	Left Ventricle Pre-ejection Period
LVPWd	Left Ventricle Posterior Wall Thickness, diastole
LVPWs	Left Ventricle Posterior Wall Thickness, systole
MAD	Mean Abdominal Diameter

Measurement	Explanation
Manual AV	Manual Aortic Valve Cardiac Calculations
Manual MV	Manual Mitral Valve Doppler Calculations
Manual PV	Manual Pulmonic Valve Cardiac Calculations
Manual TV	Manual Tricuspid Valve Cardiac Calculations
MAPSE	Mitral Annular Plane Systolic Excursion
Mass	Mass
Mass	Mass Vol
MSS	Mitral Septal Separation
MVA	Mitral Valve Area
MV A	Mitral Valve A
MV A-C	Mitral Valve A-C Interval
MV All	Mitral Valve All points
MV C	Mitral Valve C
MV C-A	Mitral Valve C-A Separation
MV C-E	Mitral Valve C-E Separation
MV D	Mitral Valve D
MV D-E	Mitral Valve D-E Separation
MV D-E slope	Mitral Valve D-E slope
MVE	Mitral Valve E
MV E-F slope	Mitral Valve E-F slope
MV F	Mitral Valve F
MVA	Mitral Valve Area
Node	Lymph Node
NT	Nuchal Translucency (NT)
OFD	Occipito-Frontal Distance
Osaka	Osaka Fetal Weight from Clinical Gestational Age
Peak A	Atrial Contraction
Peak E	Early Diastolic Flow
PEP/ET	LV Pre-ejection period/LV Ejection time Ratio
Persson	Persson Fetal Weight from Clinical Gestational Age

Measurement	Explanation
PFV AV	Peak Flow Velocity Aortic Valve
PFV AV (Point)	Peak Flow Velocity Aortic Valve (Point)
PFV AV (Trace)	Peak Flow Velocity Aortic Valve (Trace)
PFV LA	Peak Flow Velocity, Left Atrium.
PFV MV	Peak Flow Velocity, Mitral Valve.
PFV MV (Point)	Peak Flow Velocity Mitral Valve (Point)
PFV MV (Trace)	Peak Flow Velocity Mitral Valve (Trace)
PFV MV / PFV LA	PFV MV / PFV LA Ratio
PFV PV	Peak Flow Velocity, Pulmonic Valve
PFV PV (Point)	Peak Flow Velocity Pulmonic Valve (Point)
PFV PV (Trace)	Peak Flow Velocity Pulmonic Valve (Trace)
PFV TV	Peak Flow Velocity, Tricuspid Valve
PFV TV (Point)	Peak Flow Velocity Tricuspid Valve (Point)
PFV TV (Trace)	Peak Flow Velocity Tricuspid Valve (Trace)
PHT MV	Pressure Half Time Mitral Valve
PI	Pulsatility Index (manual)
PIUA	Pulsatility Index Uterine Artery (manual)
PL	Foot Length
Planimetry	Volume of various organs
Planimetry (Ellipse)	Volume of various organs
Planimetry (Freehand)	Volume of various organs
Polygon	General Polygon
Pr	Prostate (H, L, Vol or W)
Prostate	Prostate Outline
PS	Peak Systole
PS/ED	Peak Systolic End Diastolic Ratio
PSA	Prostate-Specific Antigen
PSAD	PSA density: PSA divided by prostate volume
PSUA	Peak Systole Uterine Artery
RATV Dia	Right Anterior Tibial Vein Vessel outside diameter

Measurement	Explanation
RATV VCT	Right Anterior Tibial Vein Valve Closure Time
RBGAd Dia	Right Bypass Graft Distal Anastomosis Vessel outside diameter
RBGAd PS	Right Bypass Graft Distal Anastomosis Peak systole
RBGAp Dia	Right Bypass Graft Proximal Anastomosis Vessel outside diameter
RBGAp PS	Right Bypass Graft Proximal Anastomosis Peak systole
RBGI Dia	Right Bypass Graft Inflow Vessel outside diameter
RBGI PS	Right Bypass Graft Inflow Peak Systole
RBGO Dia	Right Bypass Graft Outflow Vessel outside diameter
RBGO PS	Right Bypass Graft Outflow Peak Systole
Rbulb ED	Right Bulb End Diastole
Rbulb PS	Right Bulb Peak Systole
RCCA	Right Common Carotid Artery
RCCA/LCCA	Right Common Carotid Artery / Left Common Carotid Artery Ratio
RCCAd ED	Right Common Carotid Artery Distal End Diastole
RCCAd PS	Right Common Carotid Artery Distal Peak Systole
RCCAm ED	Right Common Carotid Artery Mid End Diastole
RCCAm PS	Right Common Carotid Artery Mid Peak Systole
RCCAp ED	Right Common Carotid Artery Proximal End Diastole
RCCAp PS	Right Common Carotid Artery Proximal Peak Systole
RCFA Dia	Right Common Femoral Artery Vessel outside diameter
RCFA PS	Right Common Femoral Artery Peak Systole
RCFV Dia	Right Common Femoral Vein Vessel outside diameter
RCFV VCT	Right Common Femoral Vein Valve Closure Time
RCIA Dia	Right Common Iliac Artery Vessel outside diameter
RCIA PS	Right Common Iliac Artery Peak Systole
RCIV Dia	Right Common Iliac Vein Vessel outside diameter
RCIV VCT	Right Common Iliac Vein Valve Closure Time
RDPA Dia	Right Dorsalis Pedis Artery Vessel outside diameter
RDPA PS	Right Dorsalis Pedis Artery Peak Systole
Real-Time	Real-Time

Measurement	Explanation
RECA	Right External Carotid Artery
RECA ED	Right External Carotid Artery End Diastole
RECA PS	Right External Carotid Artery Peak Systole
RECA/LECA	Right External Carotid Artery / Left External Carotid Artery Ratio
RECA/RCCA	Right External Carotid Artery / Right Common Carotid Artery Ratio
Rectum	Rectum Outline
REIA Dia	Right External Iliac Artery Vessel outside diameter
REIA PS	Right External Iliac Artery Peak Systole
REIV Dia	Right External Iliac Vein Vessel outside diameter
REIV VCT	Right External Iliac Vein Valve Closure Time
RFAd Dia	Right Femoral Artery Distal Vessel outside diameter
RFAd PS	Right Femoral Artery Distal Peak Systole
RFAm Dia	Right Femoral Artery Mid Vessel outside diameter
RFAm PS	Right Femoral Artery Mid Peak Systole
RFAp Dia	Right Femoral Artery Proximal Vessel outside diameter
RFAp PS	Right Femoral Artery Proximal Peak Systole
RFVd Dia	Right Femoral Vein Distal Vessel outside diameter
RFVd VCT	Right Femoral Vein Distal Valve Closure Time
RFVm Dia	Right Femoral Vein Mid Vessel outside diameter
RFVm VCT	Right Femoral Vein Mid Valve Closure Time
RFVp Dia	Right Femoral Vein Proximal Vessel outside diameter
RFVp VCT	Right Femoral Vein Proximal Valve Closure Time
RGN Dia	Right Gastrocnemius Vein Vessel outside diameter
RGN VCT	Right Gastrocnemius Vein Valve Closure Time
RGSV Dia	Right Great Saphenous Vein Vessel outside diameter
RGSV VCT	Right Great Saphenous Vein Valve Closure Time
RGSV-C Dia	Right Great Saphenous Vein of Calf Vessel outside diameter
RGSV-C VCT	Right Great Saphenous Vein of Calf Valve Closure Time
RGSV-T Dia	Right Great Saphenous Vein of Thigh Vessel outside diameter
RGSV-T VCT	Right Great Saphenous Vein of Thigh Valve Closure Time

Measurement	Explanation
RI	Resistance Index
RICA	Right Internal Carotid Artery
RICA/LICA	Right Internal Carotid Artery / Left Internal Carotid Artery Ratio
RICA/RCCA	Right Internal Carotid Artery / Right Common Carotid Artery Ratio
RICAd ED	Right Internal Carotid Artery Distal End Diastole
RICAd PS	Right Internal Carotid Artery Distal Peak Systole
RICAm ED	Right Internal Carotid Artery Mid End Diastole
RICAm PS	Right Internal Carotid Artery Mid Peak Systole
RICAp ED	Right Internal Carotid Artery Proximal End Diastole
RICAp PS	Right Internal Carotid Artery Proximal Peak Systole
RIUA	Resistive Index Uterine Artery
R-Kd	Right Kidney (H, L, Vol, W)
RLS Dia	Right Lesser Saphenous Vein Vessel outside diameter
RLS VCT	Right Lesser Saphenous Vein Valve Closure Time
ROH	Right Ovary Height
ROL	Right Ovary Length
RO-Vol	Right Ovary Volume
ROW	Right Ovary Width
RPerf-B Dia	Right Boyd's Perforating Vein Vessel outside diameter
RPerf-B VCT	Right Boyd's Perforating Vein Valve Closure Time
RPerf-C Dia	Right Cockett's Perforating Vein Vessel outside diameter
RPerf-C VCT	Right Cockett's Perforating Vein Valve Closure Time
RPerf-H Dia	Right Hunterian Perforating Vein Vessel outside diameter
RPerf-H VCT	Right Hunterian Perforating Vein Valve Closure Time
RPFAp Dia	Right Profunda Femoris Artery Vessel outside diameter
RPFAp PS	Right Profunda Femoris Artery Peak Systole
RPFVp Dia	Right Profunda Femoris Vein Vessel outside diameter
RPFVp VCT	Right Profunda Femoris Vein Valve Closure Time
RPopA Dia	Right Popliteal Artery Vessel outside diameter
RPopA PS	Right Popliteal Artery Peak Systole

Measurement	Explanation
RPopV Dia	Right Popliteal Vein Vessel outside diameter
RPopV VCT	Right Popliteal Vein Valve Closure Time
RPrnlVd Dia	Right Peroneal Vein Distal Vessel outside diameter
RPrnlVd VCT	Right Peroneal Vein Distal Valve Closure Time
RPrnlVm Dia	Right Peroneal Vein Mid Vessel outside diameter
RPrnlVm VCT	Right Peroneal Vein Mid Valve Closure Time
RPrnlVp Dia	Right Peroneal Vein Proximal Vessel outside diameter
RPrnlVp VCT	Right Peroneal Vein Proximal Valve Closure Time
RPTAd Dia	Right Posterior Tibial Artery Distal Vessel outside diameter
RPTAd PS	Right Posterior Tibial Artery Distal Peak Systole
RPTAm Dia	Right Posterior Tibial Artery Mid Vessel outside diameter
RPTAm PS	Right Posterior Tibial Artery Mid Peak Systole
RPTAp Dia	Right Posterior Tibial Artery Proximal Vessel outside diameter
RPTAp PS	Right Posterior Tibial Artery Proximal Peak Systole
RPTVd Dia	Right Posterior Tibial Vein Distal Vessel outside diameter
RPTVd VCT	Right Posterior Tibial Vein Distal Valve Closure Time
RPTVm Dia	Right Posterior Tibial Vein Mid Vessel outside diameter
RPTVm VCT	Right Posterior Tibial Vein Mid Valve Closure Time
RPTVp Dia	Right Posterior Tibial Vein Proximal Vessel outside diameter
RPTVp VCT	Right Posterior Tibial Vein Proximal Valve Closure Time
RSClavA ED	Right Subclavian Artery End Diastole
RSClavA PS	Right Subclavian Artery Peak Systole
RSFJ Dia	Right Saphenofemoral Junction Vessel outside diameter
RSFJ VCT	Right Saphenofemoral Junction Valve Closure Time
RSL Dia	Right Soleal Vein Vessel outside diameter
RSL VCT	Right Soleal Vein Valve Closure Time
R Thy-H	Right Thyroid Height
R Thy-L	Right Thyroid Length
R Thyroid Vol.	Right Thyroid Vol. (Proc)
R Thy-V	Right Thyroid Volume

Measurement	Explanation
R Thy-W	Right Thyroid Width
R-Ts	Right Testis (H, L, Vol or W)
RVDd	Right Ventricle Internal Diameter, diastole
RVDs	Right Ventricle Internal Diameter, systole
RVertA ED	Right Vertebral Artery End Diastole
RVertA PS	Right Vertebral Artery Peak Systole
RVOT diameter d	Right Ventricular Outflow Tract Diameter, diastole
RVOT diameter s	Right Ventricular Outflow Tract Diameter, systole
Seminal Vesicles	Seminal Vesicles Outline
SI	Stroke Volume Index
ST Area 1	Stenosis Area 1. Area of vessel lumen before the stenosis. Used to calculate % stenosis.
ST Area 2	Stenosis Area 2. Area of residual lumen of vessel used to calculate stenosis. When you measure this after measuring ST Area 1, % stenosis is calculated.
ST Dist 1	Stenosis Distance 1. Transverse diameter (distance) of the vessel lumen before the stenosis.
ST Dist 2	Stenosis Distance 2. Transverse diameter (distance) of the lumen at the stenotic part of the vessel.When you measure this after measuring ST Dist 1, % stenosis is calculated.
ST Ellipse 1	Stenosis Ellipse 1
ST Ellipse 2	Stenosis Ellipse 2
ST Free 1	Stenosis Freehand 1
ST Free 2	Stenosis Freehand 2
SV	Stroke Volume
SV (M-Mode)	Stroke Volume
T Ellipse	Empiric Transversal Ellipse
T Empiric	Empiric Transversal
T Freehand	Empiric Transversal Freehand
TAM	Time Average Mean Velocity by Manual Trace
TAPSE	Tricuspid Annular Plane Systolic Excursion
TBL	Tibia Length
THAP	Thorax Anteroposterior Distance

Measurement	Explanation
Ts	Testis (H, L, Vol or W)
TT	Thorax Transverse Distance
Urethra	Urethra Outline
Uterine	Uterus (H, L, Vol or W)
VF	Volume Flow
VF (auto)	Volume Flow Based on Auto TAM
VF Area	Volume Flow Area
VF Circle	Volume Flow Circle
VF Dist	Volume Flow Distance
VF Ellipse	Volume Flow Ellipse
VL	Vertebra Length
VTI AV	Velocity Time Integral Aortic Valve
VTI LVOT	Velocity Time Integral Left Ventricle Outflow Tract
VTI MV	Velocity Time Integral, Mitral Valve
VTI PV	Velocity Time Integral, Pulmonic Valve
W	Width
Williams	Williams Fetal Weight from Clinical Gestational Age

Appendix C
Technical Guide

This chapter contains information about the electrical requirements and operating conditions for the system as well as important information about attaching other equipment and so on. Before you turn on the system, make sure that the installation has been approved by a qualified service technician or by hospital safety personnel. See Safety Precautions in Chapter 1, “General and Safety Information”.

Operating Environment

The Pro Focus can be operated safely within the following operating condition limits:

Condition	Limits
Ambient operating temperature	10°C to 40°C (50°F to 104°F)
Humidity	max. 85% RH non-condensing
Atmospheric pressure	between 700 hPa and 1060 hPa

Table C-1. Operating condition limits.

⚠

WARNING Follow the guidelines in EN60601-1-1[1] when you connect the system to other equipment. See “General Safety Precautions” on page 22.

⚠
Explosion hazard

WARNING During use, the system must be at least 25 cm (10 in) from the patient to minimize the risk of igniting explosive gases.

The system is not intended for use in potentially explosive environments and should be kept well away from flammable gases and liquids. It should not be used in oxygen-enriched atmospheres. Avoid excessive heat, dust and direct sunlight.

The Rear of the System

The rear of the system body (see Fig C-1 and Fig C-2) contains a large number of connectors for connecting different equipment.

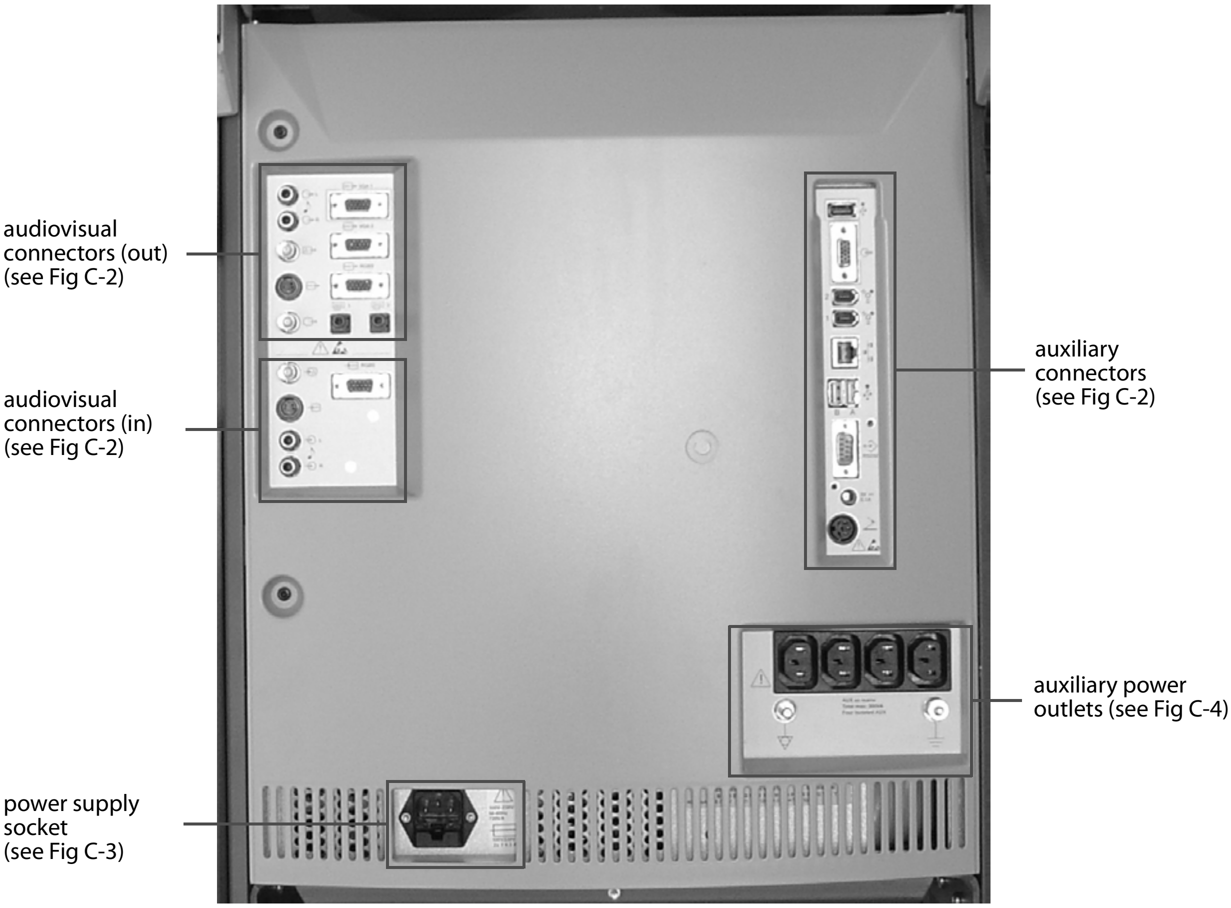


Figure C-1. The system's rear panel.

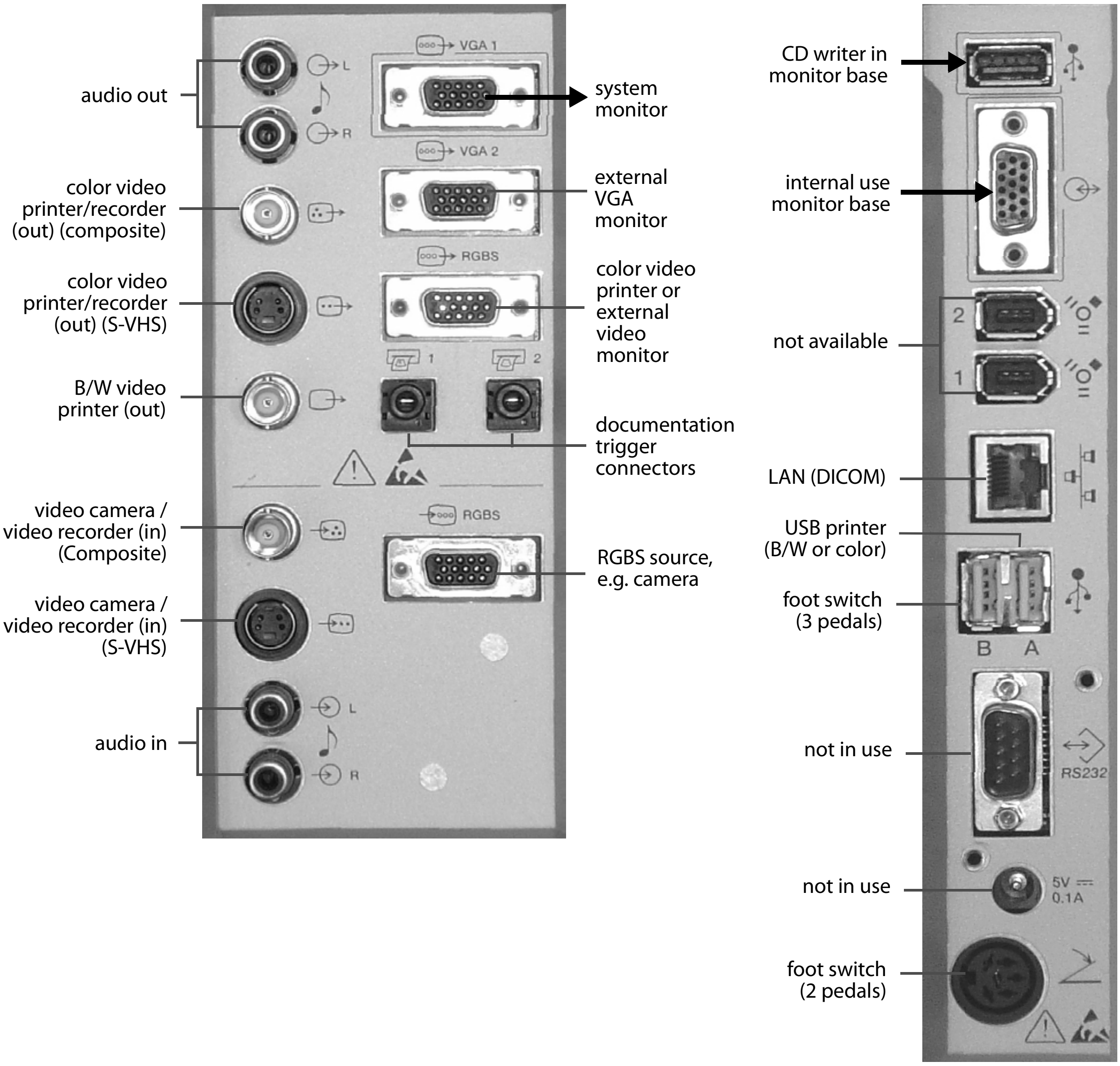


Figure C-2. The peripheral connectors on the rear of the system.

Bold arrows indicate connections installed at the factory. Do not change these connections.

Cables Types and Lengths

Table C-2 specifies the cables that were used to test the electromagnetic compatibility (EMC) of the system. EMC data for all transducers used with this system are in the Technical Data (BZ2100) section on the CD that accompanies this user guide. The CD also contains a list of accessories used in testing for EMC compliance.

To fulfill EMC requirements, do not attach cables to the system unless they are the same type as listed in the table and do not exceed the maximum length given in the table.

Symbol	Connector	Part number	Type and Maximum Length
	Color Composite Out	-	Shielded, 3 m
	Color Composite In	-	Shielded, 3 m
	B/W Composite Out	-	Shielded, 3 m
	S-VHS In	-	Shielded, 2 m
	S-VHS Out	-	Shielded, 2 m
	Audio In	-	Shielded, 2 m
	Audio Out	-	Shielded, 2 m
	VGA 2 Out	AO1382	Shielded, 2 m
	RGBS Out	AO1382	Shielded, 2m
	RGBS In	AO1382	Shielded, 2m
	Documentation Trigger 1	EL4020	Shielded, 1 m
	Documentation Trigger 2	EL4020	Shielded, 1 m
	DICOM	Included in DP0925	Shielded, 3 m
	USB A	-	Shielded, 3 m
	USB B	-	Shielded, 3 m
	RS232	-	Shielded, 3 m
	ECG wire (on front panel)	AO0366	Shielded, 3.5 m

Table C-2. List of cables used in testing for EMC compliance.

Monitors

The system monitor is connected to the **VGA1** connector. The power to the monitor comes from one of the auxiliary power outlets. See page 344. You can use the **VGA2** connector for an external VGA monitor.

Audio Input and Output

An audio Doppler signal is available from the (**L** and **R**) connectors.

Speakers

The speakers are connected to an internal amplifier (built into the monitor base) and connected to the connector at the top right of the rear panel via a multi cable.

Recording

To record an audio signal, connect the connectors to a video recorder. To play a recorded signal back through the system speakers, connect the video recorder output to the connectors.

Documentation Accessories

The optional digital B/W printer (EQ4100) which should be connected to the port **A**.

If you install other documentation accessories, always follow the installation and verification instructions in the user guide that accompanies them. See “Connecting Other Equipment” on page 27.

Always use the cables specified in the 2202 Product Data sheet.

PAL/NTSC

The format for the video output that is sent to a video printer or video recorder can be either PAL or NTSC.

To set the format for video output from the system:

1. Make sure that the PAL/NTSC switch on the rear of the printer is set to the appropriate format.
2. Open the **General Setup** window (see page 205).
3. Select the video output setting you want, and close the window.

Video Documentation Equipment

Table C-3 gives an overview of video documentation connections. See also Table C-2.

Equipment	Signal type	Connector	Comments
Video printer, B/W	Composite Out		
Video printer, Color	RGBS Out	RGBS	The R, G, and B signal levels are 0.7Vpp/75Ω. The S (Sync.) signal level is TTL.
Video printer, Color	Composite Out		
Video recorder	Composite Out		
Video recorder	Composite In		For playback
Video recorder	S-VHS Out		
Video recorder	S-VHS In		For playback
Video monitor, B/W	Composite Out		
Video monitor, Color	RGBS Out	RGBS	Only one piece of external equipment can be connected to the RGBS connector.
Video camera	RGBS In	RGBS	
Video camera	Composite In		
Video camera	S-VHS In		

Table C-3. Overview of video documentation connections.

Documentation Trigger Connectors

In order to use the foot switch or [ ] key to print the image on the monitor, connect **1** or **2** to the trigger input of a video printer. For information about assigning a key or foot-switch pedal to **1** or **2,** see “User-Defined Keys” on page 201.

USB Devices

USB connector under monitor

Images can be saved to a USB storage device through the USB connector on the left side of the DVD drive.

External hard drive

The power available from the USB connector on the left side of the DVD drive is limited. If you are using an external hard drive, attach only a data transfer cable to this connector. Do not use it for supplying power to the hard drive.

Caution: Do not attach 2 USB storage devices (for example a memory stick and an external hard drive) to the system at the same time.

Consult your BK Medical service representative if you have questions about connecting an external hard drive.

The DVD writer built into the monitor base is connected to the connector at the top right of the rear panel.

connector **A** on the back of the system is reserved for use with USB printers (black and white or color). connector **B** on the back of the system is reserved for use with the optional 3-pedal foot switch.

NOTE: *The USB ports on the system are USB 2.0 ports. However, in order to get high-speed performance, the equipment you connect to them must be labeled “certified Hi-Speed USB”.*

For information about saving images, see Chapter 6, “Documentation”.

Foot-Switch Connector

There are two connectors for the optional foot switches (see page 91), one for a 2-pedal and one for a 3-pedal foot switch (see Fig C-2 on page 339).

Electrical Connections

Power Supply Cord

The system comes with a power supply cord that is specific to your region**.** The connector (see Fig C-3) is on the lower left side of the rear panel.

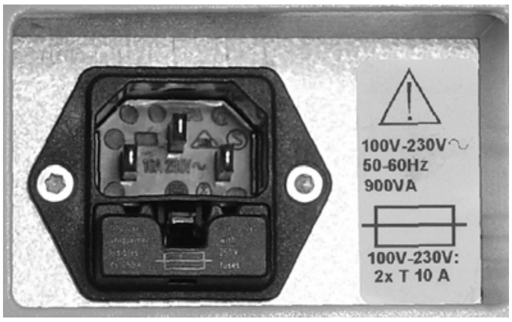


Figure C-3. The connector for the power supply cord.

Use only original power supply cord

WARNING Use only the power supply cord that comes with the system. Never use extension cords. The increased length of the cord will increase the resistance of the protective ground conductor and may increase the equipment's leakage current beyond an acceptable level.

The power supply cord for the USA has a hospital-grade 3-prong grounded power plug. Contact your local BK Medical representative if you need a different plug or if the cord is missing or damaged.

Don't change power plug

WARNING Never try to remove or change the plug on the power supply cord.

Cord Retaining Kit UA2204

The optional cord retaining kit UA2204 is attached to the power supply socket to ensure that the power supply cord cannot be accidentally disconnected from the system. The kit consists of two mounting screws and two brackets, each fitting a different type of power plug.

To use the cord retainer, lift the bracket up when you plug in the power supply cord. Then push it down over the plug so it holds the cord.

Connecting Other Equipment

For important information about connecting other equipment safely, see "Connecting Other Equipment" on page 27.

Lithotriptor

Special considerations apply if you are using a lithotriptor with the system. See "Using the System with a Lithotriptor" on page 348.

Equipment that uses line voltage

WARNING When you connect other equipment that uses the line voltage (such as a video printer, video recorder, endoscopic camera control unit or other documentation device) to the system, the connections must follow the guidelines given in EN 60601–1–1 [1]. If in doubt, contact your local BK Medical representative.

Using the RS 232 and LAN Connectors

You can connect other equipment to the RS 232 and LAN connectors on the back of the system (see Fig C-2). You can connect a HistoScanning[1] workstation to the LAN connector.

Power isolation requirements

WARNING Electrical equipment that is connected to the RS 232 and LAN connectors must get its power from the system's isolated auxiliary power outlets (see below) if it does not comply with EN/IEC 60601-1 [2]. In particular, if you connect an IEC 60950 apparatus, such as a PC, it must be outside the patient area and get its power from the system.

Auxiliary Power Outlets

To minimize leakage currents, plug all other equipment into the isolated auxiliary power outlets on the bottom right of the rear panel. There are 4 auxiliary outlets, as shown in Fig C-4.

Standby switch does not turn off outlets

Caution: The 4 auxiliary power outlets are still "live" even when the standby switch on the front is turned off. In order to remove voltage from these outlets, you must unplug the power supply cord from the wall outlet.

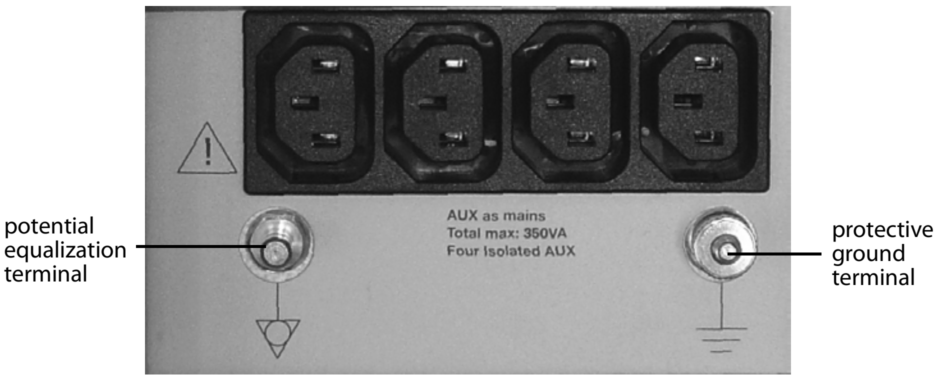


Figure C-4. Auxiliary power outlets.

The voltage and frequency of these outlets is the same as from the power supply cord. The thermal fuses limit the power that can be drawn from the outlets to a safe level, but the available total output from the auxiliary outlets must not exceed 80 VA if the black and white printer EQ 4071 is attached to the system. (Actually, the total output is limited to 350 VA, but the system monitor, using 150 VA, is permanently plugged into one of the outlets, and the USB black and white printer uses 120 VA. This leaves 80 VA for other accessories.)

Additional Protective Ground

⏚ An additional protective ground can be connected to the ⏚ terminal below the auxiliary power outlets (see Fig C-4).

1. HistoScanning is not market cleared by the FDA for sale in the USA and not licensed by Health Canada.

Potential Equalization

The potential equalization terminal ⏚ below the auxiliary power outlets (see Fig C-4) is connected to the system chassis. It can be connected to corresponding terminals on other equipment to eliminate potential differences.

Dismantling the System for Transportation

The keyboard panel, keyboard base, monitor and monitor base can be removed to make it easier to transport the system.

Figure C-5. Removing the keyboard base.

Keyboard Base and Panel

To remove the keyboard base and panel:

1. Move the keyboard base to the top position.
2. Unplug the keyboard panel from the front of the system.
3. Lift and remove the keyboard panel (see Fig C-5).
4. Remove the 2 sliding covers from the system.
5. Loosen the black screws under each side of the keyboard base.
6. Press the black release handles and lift the keyboard base out of the groove.
7. Replace the sliding covers.

To replace the keyboard base and panel:

1. Remove the 2 sliding covers from the system.
2. Slide the keyboard base back into the grooves.
3. Tighten the black screws.
4. Reconnect the keyboard panel to the front of the system.
5. Replace the keyboard panel.

Monitor

Removing and Replacing an LCD Flat Screen Monitor

To remove the LCD flat screen monitor from the base:

1. Make sure that the system wheels are locked.
2. Unplug the power cord and VGA connector from the back of the monitor.
3. Loosen the 2 thumb screws on the bracket to expose approximately 5 mm of thread. If metal screws have replaced the thumb screws (in order to secure the flat screen monitor from theft), use an Allan key to loosen these screws.

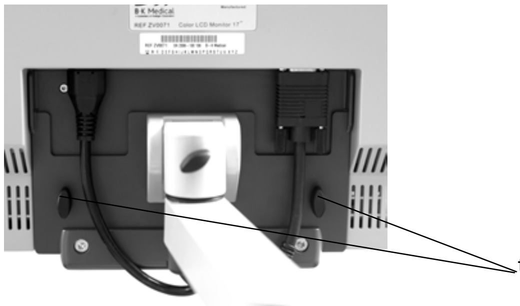


Figure C-6. Loosen the thumb screws to remove the monitor from the base.

4. Slide the monitor off the base.

To replace the LCD flat screen monitor:

1. Make sure that the system wheels are locked and that the sliding covers are removed.
2. Make sure that the two thumb screws on the bracket are loosened exposing approximately 5 mm of thread.
3. Slide the monitor onto the base, making sure that it is securely and completely on the base and is not crooked.
4. Tighten the thumb screws until the flat screen is secured, or tighten the metal screws using an Allan key.

⚠ Monitor can fall

WARNING If the thumb screws are not tightened correctly so that they secure the monitor, the monitor can fall off and injure you or others when you move the system.

5. Plug the power cord and VGA connector into the back of the monitor.

Monitor Base

Removing and Replacing the Monitor Base

To remove the monitor base:

1. Make sure that the system wheels are locked.
2. Move the monitor base to the top position.

3 Disconnect 2 monitor connections on the rear panel of the system: the **VGA1** connector and the power cord (see Fig C-2).

4 Disconnect 2 monitor base connections (internal connection and USB for DVD writer) at the top right of the rear panel (see Fig C-2).

5 Remove the 2 sliding covers from the system (see Fig C-5).

6 Use a TORX 30 screwdriver or an NV4 Allen key to remove the 2 screws on the hook bars (see Fig C-7) that are attached to the back of the monitor base.

7 Loosen the 2 black screws on the hook bars. (Do not remove them.)

8 Hold the monitor base under the DVD drive, and lift the hook bars carefully out of the grooves.

To replace the monitor base:

1 Make sure that the system wheels are locked and that the sliding covers are removed.

2 Slide the hook bars of the monitor base into the grooves (see Fig C-7). Make sure that the hooks are in place at the top of each groove so that the monitor base is supported correctly.

3 Use a TORX 30 screwdriver or an NV4 Allen key to screw the 2 screws into the hook bars.

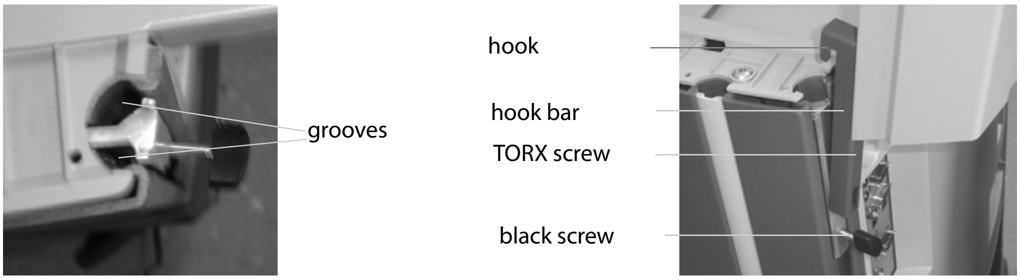


Figure C-7. Hooks and grooves for holding monitor base.

4 Tighten the black screws on the hook bars.

5 Replace the sliding covers.

6 On the rear of the system, reconnect the 2 connections to the monitor (**VGA1** and auxiliary power outlet) and the 2 connections to the monitor base (internal connector and top USB connector). (See Fig C-2.)

HistoScanning[1]

The scanner units to be used with HistoScanning™ systems from AMD have an extra connector on the back of the system, on the lower left side. It is used to take raw data, before it has been converted to an image on the monitor, out of the system.

To use the Pro Focus for HistoScanning, you must have a HistoScanning license installed.

1. HistoScanning is not market cleared by the FDA for sale in the USA and not licensed by Health Canada.

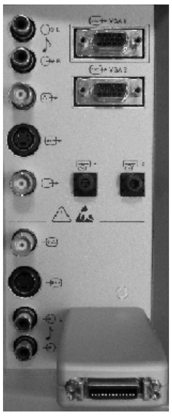


Figure C-8. Connector for HistoScanning.

Using the System with a Lithotriptor

You must have a license installed in order to use a lithotriptor with the system. See “Licenses” on page 238.

You must always follow instructions in the manufacturer’s user guide for the lithotriptor.

Power Connections

If you are using the system with a lithotriptor, make sure that the lithotriptor complies with the guidelines in EN/IEC 60601-1 [2]. Connect both the system and the lithotriptor directly to independent wall outlets.

Connecting the System to the Lithotriptor

You can use the RS 232 connector on the back of the system (see Fig C-2) to connect a lithotriptor.

You must follow the connection instructions in the manufacturer’s user guide for the lithotriptor system. The connections must follow the guidelines given in EN 60601–1–1 [1].

References

[1] EN 60601–1–1:2001 *Medical electrical equipment – Part 1-1: General requirements for safety. Collateral standard: Safety requirements for medical electrical systems.*

[2] EN/IEC 60601–1:1990+A1:1993+A2:1995+A13:1996 *Medical electrical equipment. Part 1: General requirements for safety.*
EN/IEC 60601-1:2006 3rd Ed. *Medical electrical equipment. Part 1: General requirements for basic safety and essential performance*.

Appendix D
Specifications and Indications for Use

Specifications for the system are included in the Product Data sheet for the system, which forms part of this user guide.

Indications for Use

The system is intended for use by qualified physicians for ultrasound evaluation. Specific clinical applications and exam types include the following types of imaging:

- Abdominal
- Adult cephalic
- Cardiac (not for direct use on the heart)
- Fetal
- Intraoperative
- Intraoperative neurological
- Musculoskeletal conventional
- Musculoskeletal superficial
- Neonatal Cephalic[1]
- Obstetrics
- Pediatric
- Peripheral vascular
- Small organ
- Transrectal
- Transurethral
- Transvaginal

Indicated uses are different for different transducers. The Product Data sheet for the system contains a table listing the indicated uses for each transducer that can be used with the system.

Contraindications

The Pro Focus 2202 ultrasound system is not intended for ophthalmic use or any use causing the acoustic beam to pass through the eye.

1. Neonatal cephalic imaging on the Pro Focus 2202 UltraView has not been CE approved or licensed by Health Canada.

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