GE Medical Systems

Technical Publications

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Revision 3

LOGIQ ™ 200 PRO Series

CE 0459

Basic Users Manual

Regulatory Requirement

This product complies with regulatory requirements of the following European Directive 93/42/EEC concerning medical devices

CE 0459

This manual is a reference for the LOGIQ™ 200 PRO Series. It applies to all version of the 3.1X software for the LOGIQ™ 200 PRO Series.

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Revision History

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1	January 15, 2000	Software Version 3.02 Release
2	June 15, 2000	Software Version 3.15 Release
3	November 21, 2000	Software Version 3.16 Release

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Please verify that you are using the latest revision of this document. Information pertaining to this document is maintained on GPC (GE Medical Systems Global Product Configuration). If you need to know the latest revision, contact your distributor, local GE Sales Representative or in the USA call the GE Ultrasound Clinical Answer Center at 1-800-682–5327 or 414-524-5698.

Regulatory Requirements

This product complies with the regulatory requirements of the following:

- Council Directive 93/42/EEC concerning medical devices:

  the CE 0459 label affixed to the product testifies compliance to the Directive.

  The location of the CE marking is shown on Safety chapter of this manual.

  European registered place of business:

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- Medical Device Good Manufacturing Practice Manual issued by the FDA (Food and Drug Administration, Department of Health, USA).
- Underwriters' Laboratories, Inc. (UL), an independent testing laboratory.
- Canadian Standards Association (CSA).
- International Electrotechnical Commission (IEC), international standards organizations, when applicable.

For USA Only

Caution: United States law restricts this device to sale or use by or on the order of a physician.

- *General Electric Medical Systems* is ISO 9001 and EN 46001 certified.
- The original document was written in English.

NOTE: This equipment generates, uses and can radiate radio frequency energy. The equipment may cause radio frequency interference to other medical and non-medical devices and radio communications. To provide reasonable protection against such interference, this product complies with emissions limits for a Group 1, Class A Medical Devices Directive as stated in EN 60601–1–2. However, there is no guarantee that interference will not occur in a particular installation.

NOTE: If this equipment is found to cause interference (which may be determined by turning the equipment on and off), the user (or qualified service personnel) should attempt to correct the problem by one or more of the following measure(s):

- reorient or relocate the affected device(s)
- increase the separation between the equipment and the affected device
- power the equipment from a source different from that of the affected device
- consult the point of purchase or service representative for further suggestions

NOTE: The manufacturer is not responsible for any interference caused by using other than recommended interconnect cables or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the users' authority to operate the equipment.

NOTE: To comply with the regulations on electromagnetic interference for a Class A FCC Device, all interconnect cables to peripheral devices must be shielded and properly grounded. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference in violation of the FCC regulations.

NOTE: Do not use devices which intentionally transmit RF Signals (cellular phones, transceivers, or radio controlled products) in the vicinity of the equipment as it may cause performance outside the published specifications. Keep the power to these type devices turned off when near this equipment.

The medical staff in charge of this equipment is required to instruct technicians, patients, and other people who may be around this equipment to fully comply with the above requirement.

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System Overview

Attention

This manual contains enough information to operate the system safely. Advanced equipment training will be provided by a factory trained Applications Specialist for the agreed upon time period.

Read and understand all instructions in this manual before attempting to use the LOGIQ™ 200 PRO Series system.

Keep this User's Manual with the equipment at all times. Periodically review the procedures for operation and safety precautions.

Prescription Device

For USA Only

Caution: United States law restricts this device to sale or use by or on the order of a physician.

System Components

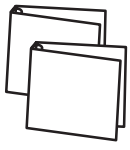
Refer to the Service Manual (2235374) for the LOGIQ™ 200 PRO Series system components.

Documentation

LOGIQ™ 200 PRO Series Documentation consists of three manuals:

- The Quick Start Guide (TRANSLATED) provides a step-by-step description of the basic features and operation of the LOGIQ™ 200 PRO Series. It is intended to be used in conjunction with the Basic User Manual in order to provide the information necessary to operate the system safely.

- The Basic User Manual (TRANSLATED) provides information needed by the user to operate the system safely. It describes basic functions of the system, safety features, operating modes, basic measurements/calculations, probes, user care and maintenance.



- The Advanced Reference Manual (ENGLISH ONLY) is intended for the trained, professional user. It contains all the information found in the Quick Start Guide and Basic User Manual, as well as information on options, advanced customization techniques and data tables.

The LOGIQ™ 200 PRO Series manuals are written for users who are familiar with basic ultrasound principals and techniques. They do not include sonography training or clinical procedures.

Introduction

The LOGIQ™ 200 PRO Series Ultrasound System is a high performance and compact size ultrasound imaging system, intended for general purpose applications.

The system provides image generation in B-Mode, M-Mode and B/M-Mode with all transducer types. Digital architecture allows maximum flexibility of all scanning modes and transducer types, throughout the full spectrum of operating frequencies.

All transducers are precise solid state array devices, allowing electronically controlled imaging with Convex, Micro-convex, Sector and Linear probes. Use of solid state designs allows a wide variety of scan parameters to be optimized including focusing, scan control, spatial resolution, temporal resolution and contrast resolution. The result is consistent generation of finely detailed anatomical resolution with excellent dynamic contrast tissue range and penetration.

The system display processor is highly versatile to produce the optimal set of imaging parameters and display formats without compromising important diagnostic information.

Versatile, yet easy to use, the LOGIQ™ 200 PRO Series system combines a wide variety of state-of-the-art operator features without complicating operation. The operator can customize all set-up parameters for a given mode, probe or clinical application. Operator controls have been placed in a logical clinical format. Two simultaneous probe connections allow rapid switching electronically between probes without delaying the examination.

The LOGIQ™ 200 PRO Series System provides a total imaging solution for today's diverse ultrasound department needs, with investment security through reliable upgrades, application enhancements, and complete product support from GE.

General Indications for Use

The LOGIQ™ 200 PRO Series diagnostic ultrasound system is intended for use in diagnostic ultrasound imaging using B, M, B/M combination modes in the following areas:

- Fetal
- Abdomen
- Intraoperative
- Pediatric
- Small organs including breast, neck, chest, male and female reproductive organs, limbs, and extremities
- Adult cephalic
- Neonatal cephalic
- Adult cardiac
- Pediatric cardiac
- Trans-vaginal
- Trans-rectal
- Urology

Contraindications

The System is **NOT** intended for use in the following areas: Ophthalmic use (or any use causing the acoustic beam to pass through the eye).

Who to Contact

Who To Contact

For additional information or assistance, please contact your local distributor or the appropriate support resource listed below:

USA

GE Medical Systems
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4855 W. Electric Avenue
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TEL: (1) 800–437–1171
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How This Book is Organized

The LOGIQ™ 200 PRO Series User Manual is organized to provide the information needed to start scanning right away. Detailed information is also provided for more time-intensive studies.

Manual Content

- **Getting started**. These sections give an overview of the system to help the operator start scanning as soon as possible.
  - *Introduction.* Information concerning indications/ contraindications for use, who to contact and how this documentation is organized.
  - *Safety*. Important information concerning the safe operation of the LOGIQ™ 200 PRO Series system.
  - *Preparing the System for Use.* How to prepare the system for use and a map of the control layout.
  - *Preparing for an Exam.* How to enter patient information, select an exam category.
- **Image optimization**. These sections detail how to improve image, trace, or spectral information.
  - *Modes*. How to adjust and optimize B-Mode and M-Mode imaging.
  - *Scanning and Display Functions.* Information concerning Zoom, Freeze, Cine and Annotation functions.

Manual Content (cont'd)

- **Measurements and Reports**. Shows how to do general and exam category specific measurements and calculations.
    - *General Measurements and Calculations*. Emphasis on basic measurements for each mode.
    - *Exam Categories.*
        - *Abdomen and Small Parts.*
        - *OB/GYN*.
        - *Cardiology.*
        - *Urology.*
- **Recording Images**. Explains the use of image archive and peripheral options.
- **Customizing your system**. Shows how to customize the system for your particular institution, clinic, or exam type.
- **Probes and Biopsy**. Provides intended uses, specifications, care and maintenance, and biopsy capability instructions for each probe.
- **User Maintenance.** Provides information concerning system specifications, warranties, error messages, user diagnostics, bioeffects, quality assurance, system care and assistance.
- **Data Tables.** Provides necessary data for reference.
        - *Acoustic Output.*

Manual Format

Information has been arranged and provided to help find information easily and quickly.

Finding information

Tables of Contents Locate topics in the main table of contents.

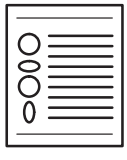
Tabs Chapter tabs are provided.

Headers/Footers The section name and page number appear on the outer corners of every page.

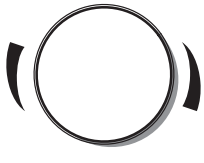
References See also page references that are noted.

Index Meant for frequent and easy reference. Extensive tool that presents ideas, topics, terms, titles, headings, and cross references. Also, use it to find all entries of a like topic throughout the manual.

2-Column Layout The right column contains text; the left column contains headers and graphics to highlight the text.



Graphics Graphics provide a visual guide to the text when possible.



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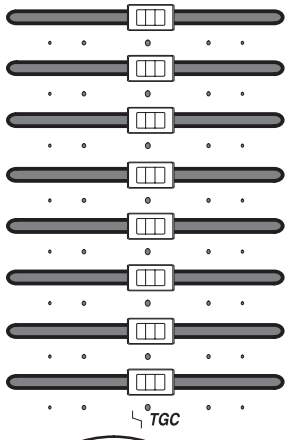
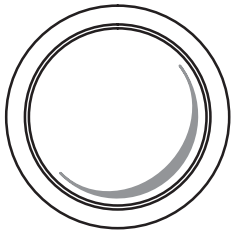


Move **TGC** slidepots to the left and right.



Move the **Trackbal**l around with the palm of a hand or fingertips.

Notes Notes are set in *italics*.

Icons Various icons highlight safety issues.

DANGER **WARNING** **CAUTION**

Indicates precautions or prudent use recommendations that should be used in the operation of the ultrasound system.

References References to other chapters appear in *italics*.

Hints Scanning hints help save time.

Safety

Safety Precautions 2–2
Icon Description 2–2
Hazard Symbols 2–3
Patient Safety 2–4
Equipment and Personnel Safety 2–6
Related Hazards 2–6
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Safety Precautions

Icon Description

Various levels of safety precautions may be found on the equipment and different levels of concern are identified by one of the following flag words which precede the precautionary statement.

DANGER 

Indicates that a specific hazard is known to exist which through inappropriate conditions or actions will cause:

- Severe or fatal personal injury
- Substantial property damage.

WARNING 

Indicates that a specific hazard is known to exist which through inappropriate conditions or actions may cause:

- Severe personal injury
- Substantial property damage.

CAUTION 

Indicates that a potential hazard may exist which through inappropriate conditions or actions will or can cause:

- Minor injury
- Property damage.

Hazard Symbols

Icon Description

Potential hazards are indicated by the following icons:

Icon	Potential Hazard	Usage	Source
 **Biological Hazard**	• Patient/user infection due to contaminated equipment.	• Cleaning and care instructions • Sheath and glove guidelines	ISO 7000 No. 0659
 **Electrical Hazard**	• Electrical micro-shock to patient, e.g., ventricular fibrillation initiated. • Electrical macro-shock to patient/user.	• Probes • ECG • Connections to back panel	
 **Moving Hazard**	• Console, accessories or optional storage devices fall on patient, user, or others. • Collision with persons or objects results in injury while maneuvering or during system transport. • Injury to user from moving the console.	• Moving • Using brakes • Transporting	
 **Acoustic Output Hazard**	• Patient injury or tissue damage from ultrasound radiation.	• ALARA, the use of acoustic output following the **a**s **l**ow **a**s **r**easonably **a**chievable principle	
 **Explosion Hazard**	• Risk of explosion if used in the presence of flammable anesthetics.	• Flammable anesthetic	
 **Smoke & Fire Hazard**	• Patient/user injury or adverse reaction from fire or smoke. • Patient/user injury from explosion and fire.	• Replacing fuses • Outlet guidelines	
 **Non–Ionizing Radiation**	• Console failure, erratic operation or output error due to RF interference.	• RF	IEC 878 No. 03-04

Table 2–1. Potential Hazards

Important Safety Considerations

The following sections (*Patient Safety*, and *Equipment and Personnel Safety*) are intended to make the equipment user aware of particular hazards associated with the use of this equipment and the extent to which injury can occur if precautions are not observed. Additional precautions may be provided throughout the manual. The equipment user is obligated to be familiar with these concerns and avoid conditions that could result in injury.

Patient Safety

Related Hazards

WARNING  The concerns listed can seriously affect the safety of patients undergoing a diagnostic ultrasound examination.

Patient identification

Always include proper identification with all patient data and verify the accuracy of the patient's name or ID numbers when entering such data. Make sure correct patient ID is provided on all recorded data and hard copy prints. Identification errors could result in an incorrect diagnosis.

Diagnostic information

Equipment malfunction or incorrect settings can result in measurement errors or failure to detect details within the image. The equipment user must become thoroughly familiar with the equipment operation in order to optimize its performance and recognize possible malfunctions. Applications training is available through the local GE representative. Added confidence in the equipment operation can be gained by establishing a quality assurance program.

Mechanical hazards

Damaged probes or improper use and manipulation of intracavitary probes can result in injury or increased risk of infection. Inspect probes often for sharp, pointed, or rough surface damage that could cause injury or tear protective barriers. Never use excessive force when manipulating intracavitary probes. Become familiar with all instructions and precautions provided with special purpose probes.

Related Hazards (cont'd)

Electrical Hazard

A damaged probe can also increase the risk of electric shock if conductive solutions come in contact with internal live parts. Inspect probes often for cracks or openings in the housing and holes in and around the acoustic lens or other damage that could allow liquid entry. Become familiar with the probe's use and care precautions outlined in *Probes*.

Acoustic Output Hazard

Ultrasound energy, even at diagnostic levels, is capable of damaging sensitive tissues if adequate precautions are not followed. The wrong combination of equipment settings, probe positioning, and tissue type can result in injury. Please become thoroughly familiar with equipment controls. Acoustic output concerns and their potential bioeffects are discussed in *User Maintenance*.

Follow the principle of **a**s **l**ow **a**s **r**easonably **a**chievable (ALARA) when scanning a patient. During each ultrasound examination, the clinical user is expected to weigh the medical benefit of the diagnostic information obtained against the risk of potential harmful effects. Once an optimal image is achieved the need for increasing acoustic output or prolonging the exposure cannot be justified.

Training

It is recommended that all users receive proper training in applications before performing them in a clinical setting. Please contact the local GE representative for training assistance. ALARA training is provided by GE Application Specialists.

Equipment and Personnel Safety

Related Hazards

WARNING

This equipment contains dangerous voltages that are capable of serious injury or death.

There are no user servicable components inside the console. Refer all servicing to qualified service personnel only.

DANGER

The concerns listed below can seriously affect the safety of equipment and personnel during a diagnostic ultrasound examination.

Explosion Hazard

Risk of explosion if used in the presence of flammable anesthetics.

Electrical Hazard

To avoid injury:

- Do not remove protective covers. No user serviceable parts are inside. Refer servicing to qualified service personnel.
- To assure adequate grounding, connect the attachment plug to a reliable (hospital grade) grounding outlet (having equalization conductor ⏚).
- Do not place liquids on or above the console. Spilled liquid may contact live parts and increase the risk of shock.

Smoke & Fire Hazard

The system must be supplied from an adequately rated electrical circuit. The capacity of the supply circuit must be as specified in Chapter 3 of the LOGIQ™ 200 PRO Series Service Manual.

Related Hazards (cont'd)

Biological Hazard

For patient and personnel safety, beware of biological hazards while performing invasive procedures. To avoid the risk of disease transmission:

- Use protective barriers (gloves and probe sheaths) whenever possible. Follow sterile procedures when appropriate.
- Thoroughly clean probes and reusable accessories after each patient examination and disinfect or sterilize as needed. Refer to *Probes* for probe use and care instructions.
- Follow all infection control policies established by your office, department or institution as they apply to personnel and equipment.

CAUTION

Devices containing latex may cause severe allergic reaction in latex sensitive individuals. USA customers should refer to the FDA's March 29, 1991 Medical Alert on latex products.

Device Labels

Label Icon Description

The following table describes the purpose and location of safety labels and other important information provided on the equipment.

Label/Icon	Purpose/Meaning	Location
Identification and Rating Plate	• Manufacturer's name and address • Date of manufacture • Model and serial numbers • Electrical ratings (Volts, Amps, phase, and frequency)	Rear of console near power inlet
Type/Class Label	Used to indicate the degree of safety or protection.	
IP Code (IPX1)	Indicates the degree of protection provided by the enclosure per IEC 529. IPX1 indicates drip proof.	Foot Switch
	Equipment Type BF (man in the box symbol) IEC 878-02-03 indicates B Type equipment having a floating applied part.	Probe connectors
	Equipment Type CF (heart in the box symbol) IEC 878-02-05 indicate equipment having a floating applied part having a degree of protection suitable for direct cardiac contact.	ECG connector and surgical probes
Device Listing/ Certification Labels	Laboratory logo or labels denoting conformance with industry safety standards such as UL or IEC.	Rear of console
"DANGER – Risk of explosion used in..."	The system is not designed for use with flammable anesthetic gases.	Rear of console
	"CAUTION" The equilateral triangle is usually used in combination with other symbols to advise or warn the user.	Various

Table 2–2. Label Icons

Label Icon Description (cont'd)

Label/Icon	Purpose/Meaning	Location
	"ATTENTION – Consult accompanying documents" is intended to alert the user to refer to the operator manual or other instructions when complete information cannot be provided on the label.	Various
	"CAUTION – Dangerous voltage" (the lightning flash with arrowhead in equilateral triangle) is used to indicate electric shock hazards.	Various
	"Mains OFF" Indicates the power off position of the mains power switch.	Front of system, Main power switch
	"Mains ON" Indicates the power on position of the mains power switch.	Front of system, Main power switch
	Indicates Main protective earth terminal	Various

Table 2–2. Label Icons (cont'd)

Classifications

Type of protection against electric shock
Class I Equipment (*1)

Degree of protection against electric shock
Type BF Equipment (*2) (Except ECG)
Type CF Equipment (*3) (ECG Only)
Ordinary Equipment
Continuous Operation

***1. Class I EQUIPMENT**

EQUIPMENT in which protection against electric shock does not rely on BASIC INSULATION only, but includes an earth ground. This additional safety precaution prevents exposed metal parts from becoming LIVE in the event of an insulation failure.

***2. Type BF EQUIPMENT**

TYPE B EQUIPMENT with an F-TYPE APPLIED PART
TYPE B EQUIPMENT: EQUIPMENT providing a specified degree of protection against electric shock, with particular regard to allowable LEAKAGE CURRENT.

	Normal Mode	Single fault condition
Patient leakage current	Less than 100 μA	Less than 500 μA

***3. Type CF EQUIPMENT**

EQUIPMENT providing a degree of protection higher than that for TYPE BF EQUIPMENT against electronic shock particularly regarding allowable LEAKAGE CURRENTS, and having an F–TYPE APPLIED PART.

	Normal Mode	Single fault condition
Patient leakage current	Less than 10 μA	Less than 50 μA

***4. EMC (Electromagnetic Compatibility)**

4.1 EMC Performance

All types of electronic equipment may characteristically cause electromagnetic interference with other equipment, either transmitted through air or connecting cables. The term EMC (Electromagnetic Compatibility) indicates the capability of equipment to curb electromagnetic influence from other equipment and at the same time not affect other equipment with similar electromagnetic radiation from itself.

This product is designed to fully comply with the EN60601–1–2 (IEC60601–1–2), Class A, which stipulates in medical electric equipment EMC regulations, that Devices must be designed and manufactured in such a way as to remove or minimize risks connected with reasonably foreseeable environmental conditions such as magnetic fields, external electronic influences electrostatic discharge, pressure, temperature, or variances in pressure and accerleration.

Class A equipments are allowed in domestic establishments when used under the jurisdiction of a health care profession.

Proper installation following the service manual is required in order to achieve the full EMC performance of the product.

The product must be installed as stipulated in 4.2, Notice upon Installation of Product.

In case of issues related to EMC, please call your service personnel.

CAUTION 

Do not use the following devices near this equipment. Use of these devices near this equipment could cause this equipment to malfunction.

DEVICES NOT TO BE USED NEAR THIS EQUIPMENT

Devices which intrinsically transmit radio waves such as: Cellular phone, radio transceiver, mobile radio transmitter, radio-controlled toys, etc.

Keep power to these devices turned off when near this equipment.

Medical staff in charge of this equipment is required to instruct technicians, patients and other people who may be around this equipment to fully comply with the above regulaion.

Classifications (cont'd)

4.2 Notice upon Installation of Product

1. Use either power supply cords provided by GE Medical Systems or ones designated by GE Medical Systems. Products equipped with a power source plug should be plugged into the fixed power socket which has the protective grounding conductor. Never use any adaptor or converter to connect with a power source plug (i.e. three-prong-to-two-prong converter).
2. Locate the equipment as far away as possible from other electronic equipment.
3. Be sure to use only the cables provided by or designated by GE Medical Systems. Connect these cables following the installation procedures (i.e. wire power cables separately from signal cables).
4. Lay out the main equipment and other peripherals following the installation procedures described in the Option Installation manuals.

4.3 General Notice

1. Designation of Peripheral Equipment Connectable to This Product.

   The equipment indicated in *Peripherals, List of Optional Peripherals*, can be hooked up to the product without compromising its EMC performance.

   Avoid using equipment not designated in the list. Failure to comply with this instruction may result in poor EMC performance of the product.

Classifications (cont'd)

2. Notice against User Modification

   Never modify this product. Unilateral user modification may cause degradation in EMC performance.

   Modification of the product includes:

   a. Changes in cables (length, material, wiring, etc.)
   b. Changes in system installation/layout
   c. Changes in system configuration/components
   d. Changes in securing system parts (cover open/close, cover screwing)

3. Operate the system with all covers closed. If a cover is opened for some reason, be sure to shut it before starting/resuming operation.

   Operating the system with any cover open may affect EMC performance.

5. Patient Environmental Devices

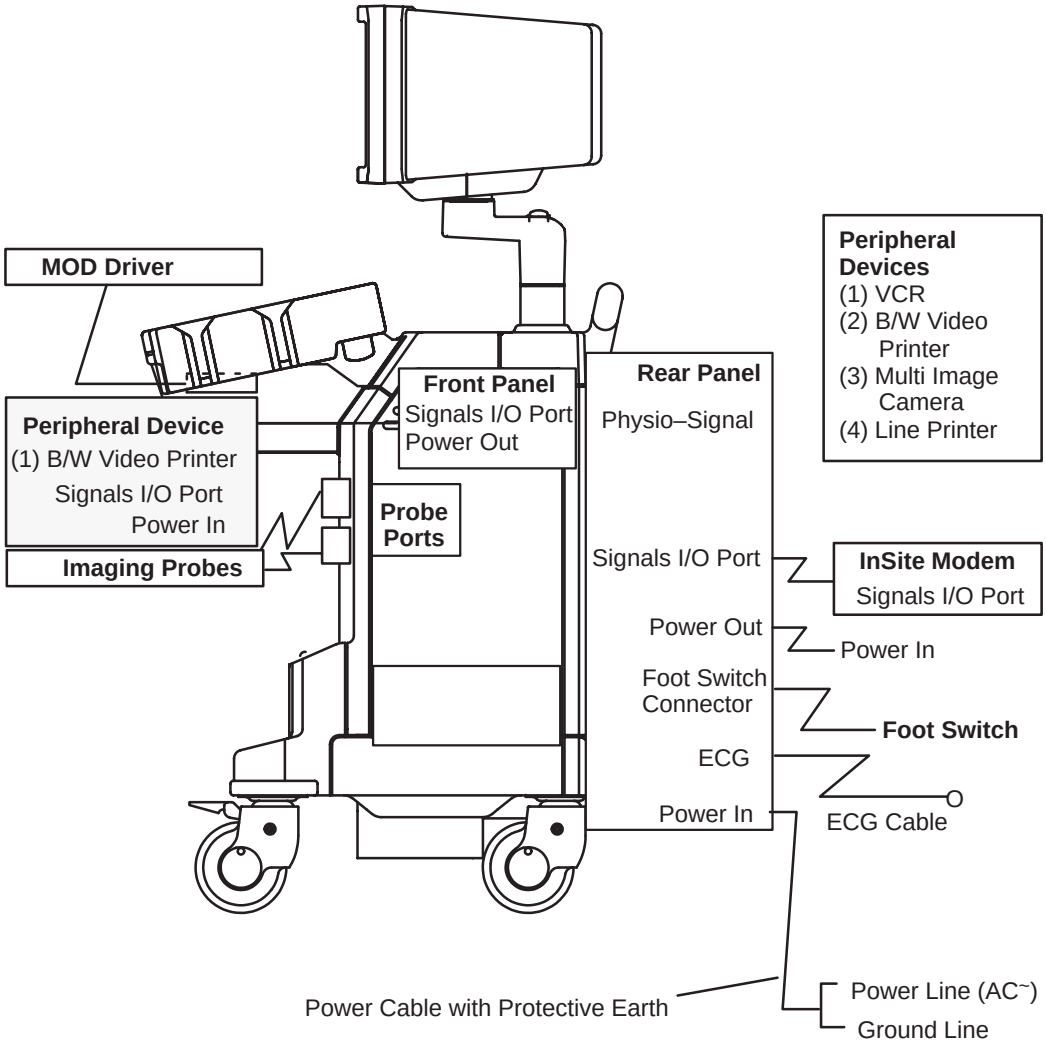


Figure 2–1. Patient Environmental Devices

Classifications (cont'd)

5.1 Acceptable Devices

The devices shown in Figure 2–1 are specified to be suitable for use within the PATIENT ENVIRONMENT.

CAUTION 

Do not connect any probes or accessories without approval by GE.

Those listed in the "Peripherals" and "Assistance" have been tested and verified to be compatible with the LOGIQ™ 200 PRO Series system.

5.2 Unapproved Devices

CAUTION 

The user takes All Responsibility for connecting unapproved devices.

If devices are connected without the approval of GE, the warranty will be **INVALID.**

Any device connected to the LOGIQ™ 200 PRO Series must conform to one or more of the requirements listed below:

1. IEC 50, IEC 65, IEC 335, IEC 348, IEC 414, IEC 820, IEC 950, IEC 1010–1, ISO 7767, ISO 8185, ISO 8359 or IEC 60601–1.
2. The devices shall be connected to PROTECTIVE EARTH (GROUND).

Acoustic Output

Controls Affecting Output

The potential for producing mechanical or thermal bioeffects is influenced by the controls listed below (refer to 17).

Direct. The **Acoustic Output** control has the most significant effect on Acoustic Output.

Indirect. Indirect effects may occur when adjusting the controls listed on 17.

Always observe the output display for possible effects.

Best practices while scanning

Hints

- Raise the Acoustic Output **only** after attempting image optimization with controls that have **no** affect on Acoustic Output, such as **Gain** and **TGC**.

NOTE: Refer to the Optimization section of the Mode chapters for a complete discussion of each control.

WARNING

Be sure to have read and understood control explanations for each Mode intended to be used before attempting to adjust the Acoustic Output control or any control that can affect Acoustic Output.

Acoustic Output Hazard

Use the minimum necessary output to get the best diagnostic image or measurement during an examination. Begin the exam with the probe that provides an optimum focal depth and penetration.

Controls

Mode	Control	Affect	Default Setting
All	Acoustic Output	Direct. Significant	The middle setting is a factory preset determined to be a reasonable setting for all exams. Use presets to set the output preferred by scan mode and exam combination.
B	Focus Comb	Indirect. Minor	Off.
B/M	Depth (FOV)	Indirect. Minor	Probe-dependent operator preset.
	Focal Zone Position and Number	Indirect. Minor	Probe-dependent system preset.
	Zoom	Indirect. Minor	Off.

Table 2–3. Controls Affecting Acoustic Output

Acoustic Output Default Levels

In order to assure that an exam does not start at a high output level, the LOGIQ™ 200 PRO Series initiates scanning at a reduced or default output level for each probe. The reduced level takes effect when the system is powered on, a new patient is entered or when changing probes.

Factory probe default settings are:

CBF	CAE	MTZ	CZB	LH
80%	80%	80%	80%	80%
LE	LI	LT	LB	LD
80%	80%	80%	80%	80%
CS	10L	SY	ERB	3Cb
80%	100%	80%	80%	80%

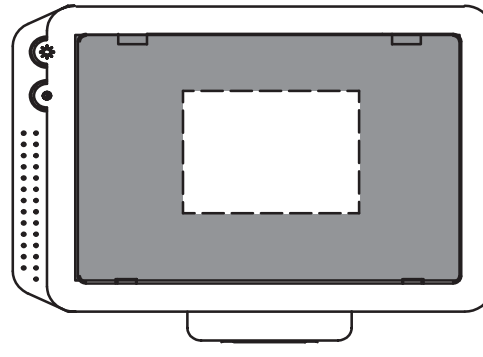
Warning Label Locations

Overview

LOGIQ™ 200 PRO Series warning labels are provided in eight different languages. Each message is provided in English, German, French, Italian, Portuguese, Spanish, Korean, and Japanese.

Monitor Labels

For service personnel, a temporary label is placed on the monitor face to warn not to move the monitor support arm without the monitor attached. Figure 2–2 shows the actual label.



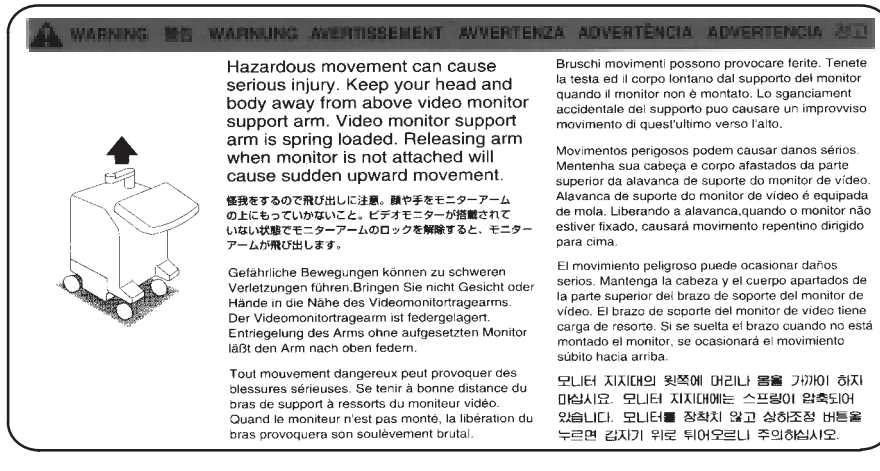
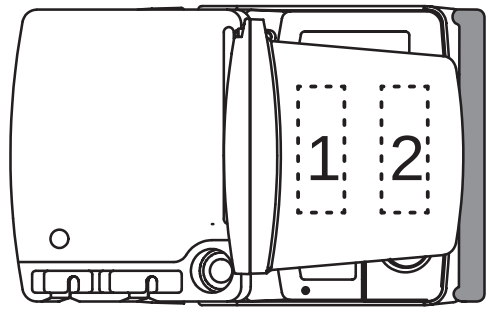
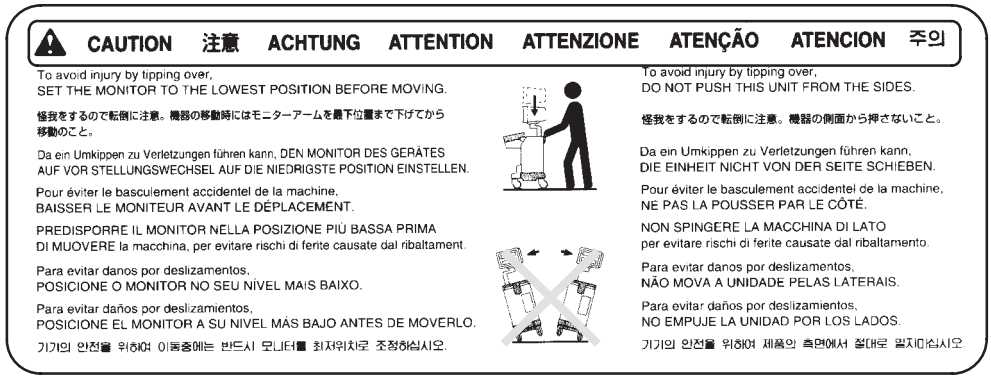


Figure 2–2. Temporary Label Location

Monitor Labels (cont'd)

Two caution labels are found on the top of the monitor. One warns to only move the console with the monitor in its lowest position, and not to push the console from the side; the second warns not to place objects on the top of the monitor. Figure 2–3 shows the actual labels.





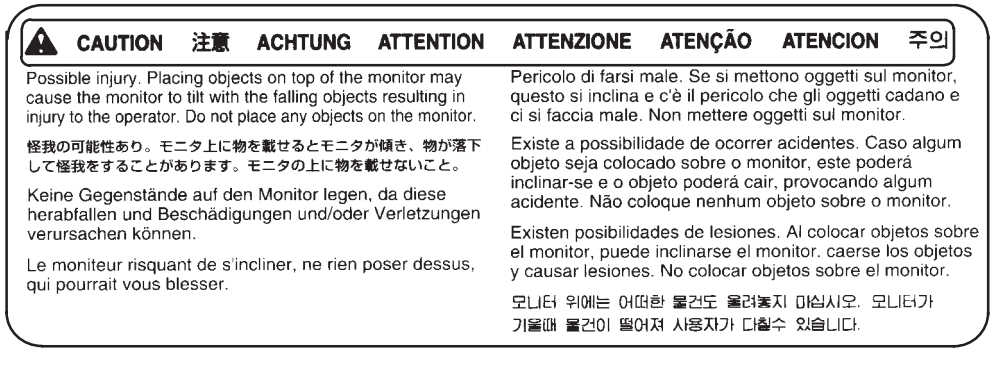


Figure 2–3. Caution Labels on Top of Monitor

Console Labels

Labels found on the back of the console will be translated to the eight languages or be specific to the region.

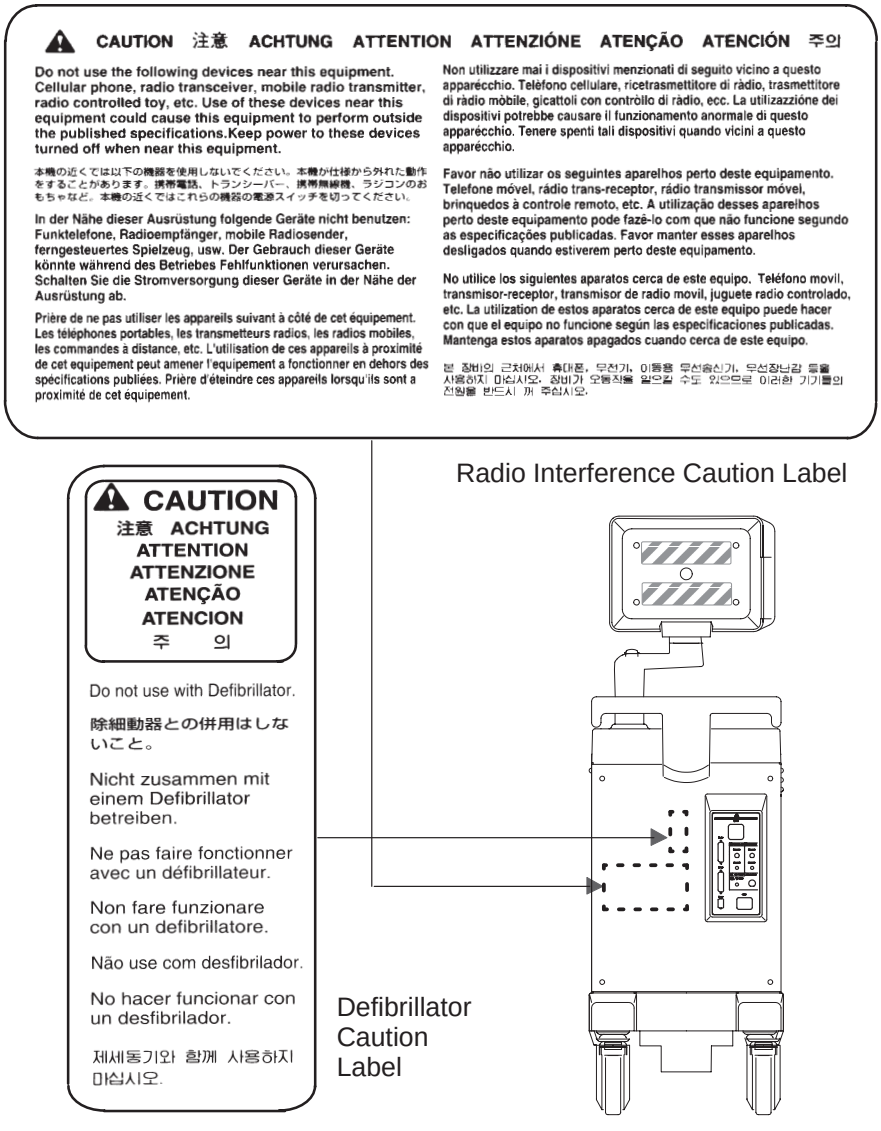


Figure 2–4. Console Label Location

CAUTION This is only for **"FUNCTIONAL GROUNDING", NOT "PROTECTIVE EARTH".**

Regulatory Labels (America, Mexico, Canada, Brazil)

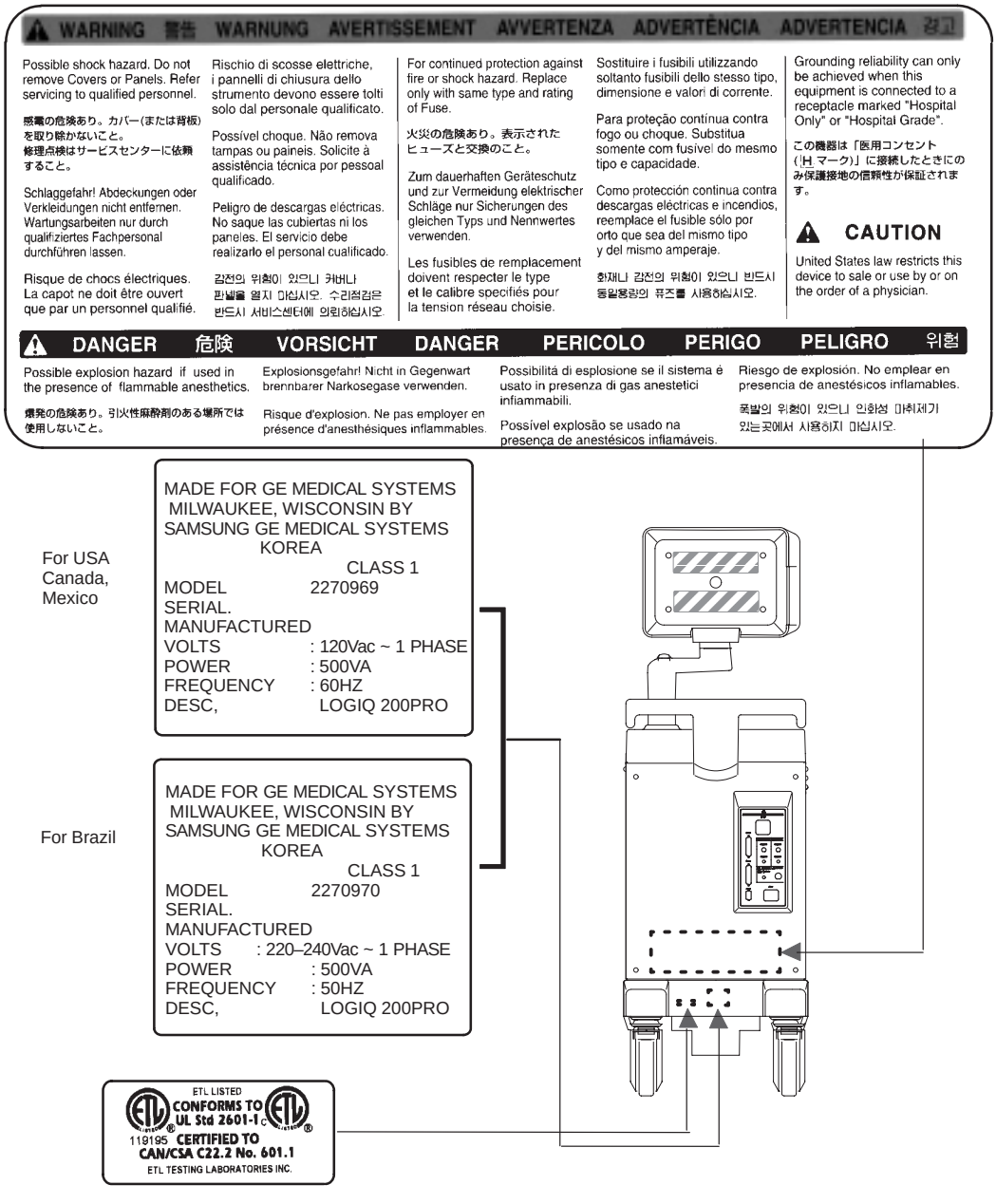


Figure 2–5. Regulatory Label Location (America, Canada, Mexico, Brazil)

Regulatory Labels (European Systems)

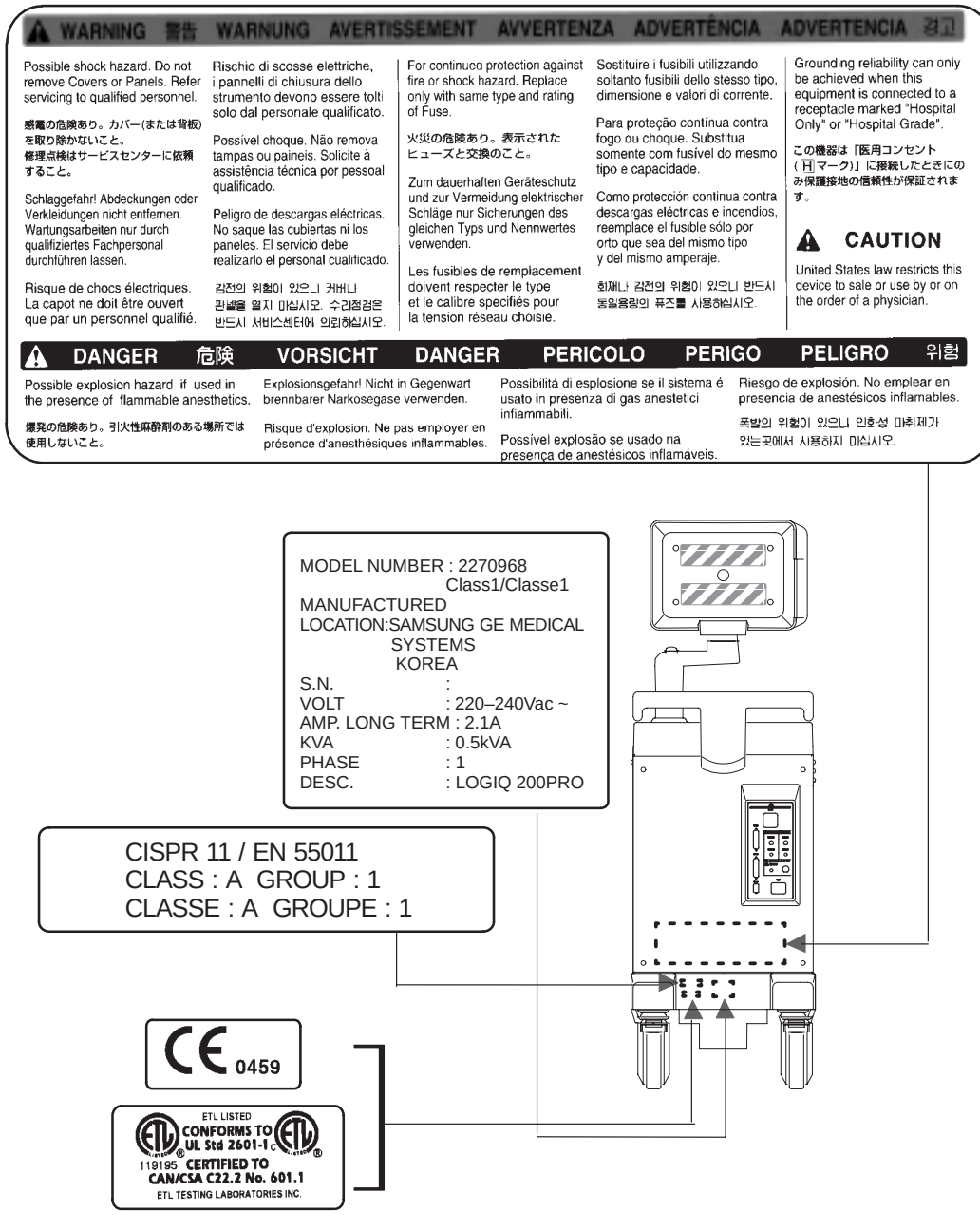


Figure 2–6. Regulatory Label Location (European)

Regulatory Labels (Sweden, Greece, Turkey, Russia, Denmark)

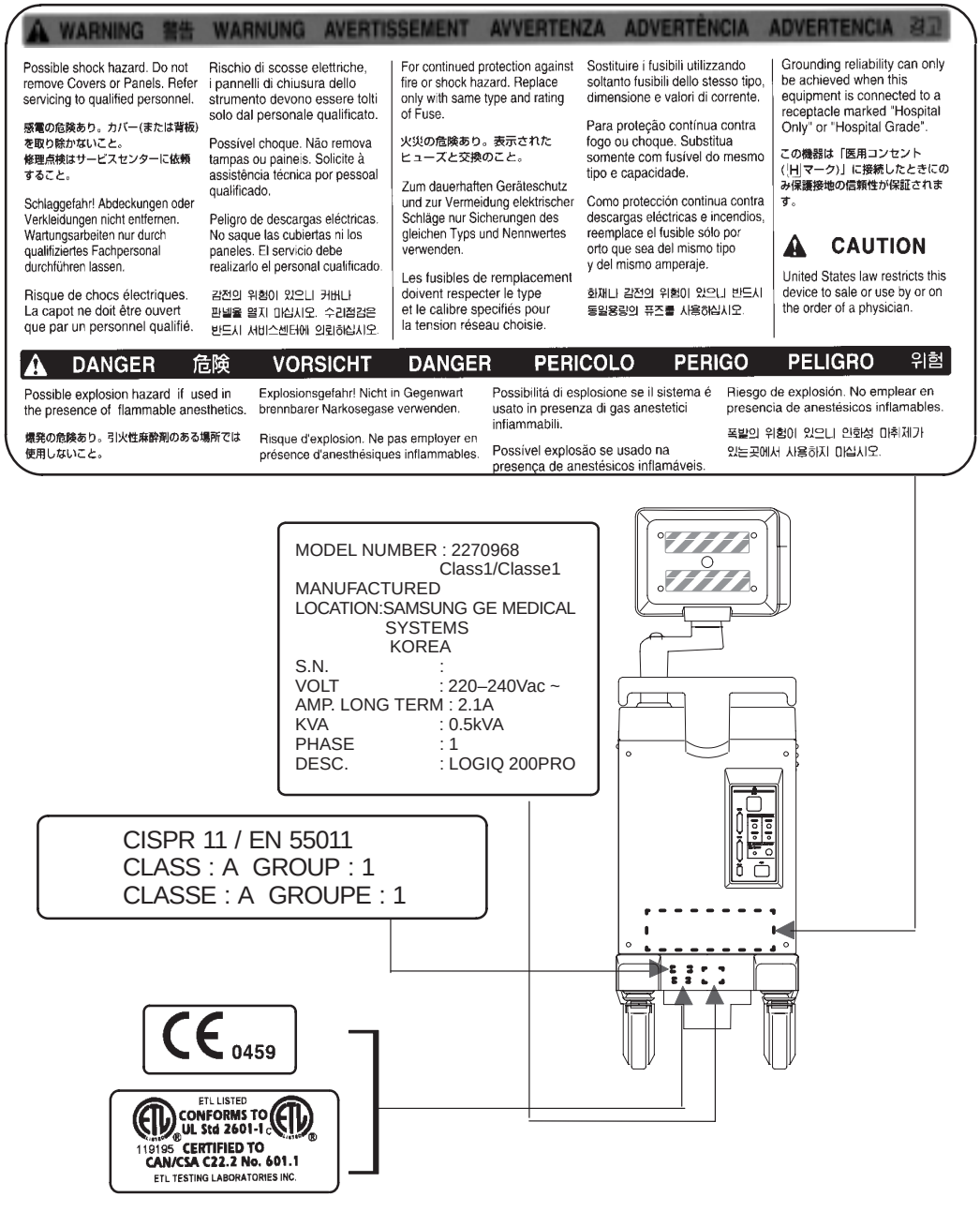


Figure 2–7. Regulatory Label Location (Sweden, Greece, Turkey, Russia, Denmark)

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Preparing the System for Use

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Before the system arrives 3–3
Environmental Requirements 3–4

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Site Requirements

Introduction

Only qualified physicians or sonographers should perform ultrasound scanning on human subjects for medical diagnostic reasons. Request training, if needed.

Do not attempt to install the system alone. General Electric, Affiliate, or Distributor Field Engineers and Application Specialists will install and setup the system.

Perform regular preventive maintenance. Refer to *User Maintenance* chapter for maintenance instructions.

Maintain a clean environment. Turn off the system before cleaning the unit. Refer to *User Maintenance* chapter for cleaning instructions.

Never set liquids on the unit to ensure that liquid does not drip into the control panel or unit.

Ensure that unauthorized personnel do not tamper with the unit.

Before the system arrives

NOTICE

This medical equipment is approved, in terms of the prevention of radio wave interference, to be used in hospitals, clinics and other institutions which are environmentally qualified. The use of this equipment in an inappropriate environment may cause some electronic interference to radios and televisions around the equipment. Proper handling of this equipment is required in order to avoid such trouble according to the operator and service manuals. This equipment can be used in residential areas only under the supervision of physicians or qualified technicians.

Ensure that the following is provided for the new system:

- A separate power outlet with a 15 amp circuit breaker for 120 VAC (USA) or 10 amp circuit breaker for 220–240 VAC (Europe, Latin America).
- Take precautions to ensure that the console is protected from electromagnetic interference.

  Precautions include:

  - Operate the console at least 15 feet away from motors, typewriters, elevators, and other sources of strong electromagnetic radiation.
  - Operation in an enclosed area (wood, plaster or concrete walls, floors and ceilings) help prevent electromagnetic interference.
  - Special shielding may be required if the console is to be operated in the vicinity of Radio broadcast equipment.

Environmental Requirements

The system should be operated, stored, or transported within the parameters outlined below. Refer to Table 3–1.

	Operational	Storage	Transport
Temperature	10°- 40° C 50°- 104° F	–10°- 60° C 14°- 140° F	–40°- 60° C –40°- 140° F
Humidity	5 ~ 90 % RH	5 ~ 90 % RH	5 ~ 90 % RH
Pressure	700-1060hPa	700-1060hPa	700-1060hPa

Table 3–1. System Environmental Requirements

Console Overview

Console graphics

The followings are illustrations of the console :

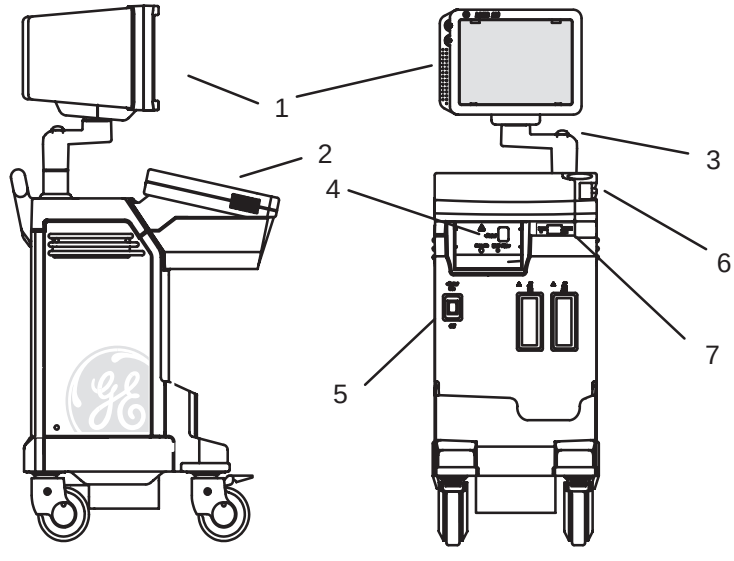


Figure 3–1. LOGIQ™ 200 PRO Series System

1. Black & White monitor
2. Keyboard
3. Release Button
4. B/W Page Printer (Option)
5. Power On switch
6. Probe Holder
7. MOD Driver (Option)

Console graphics (cont'd)

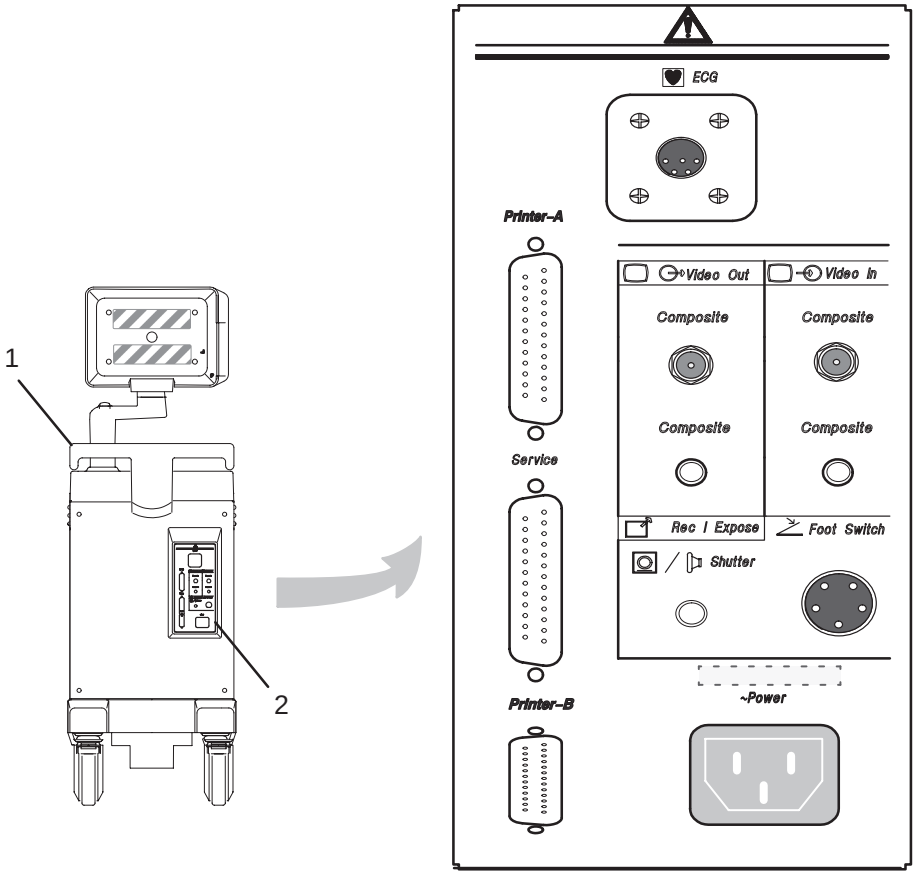


Figure 3–2. LOGIQ™ 200 PRO Series System

1. Rear Handle
2. Rear Panel

Storage areas

Several convenient storage areas are provided within the console as shown in Figure 3–3. Use them to store probe cables, accessories, etc.

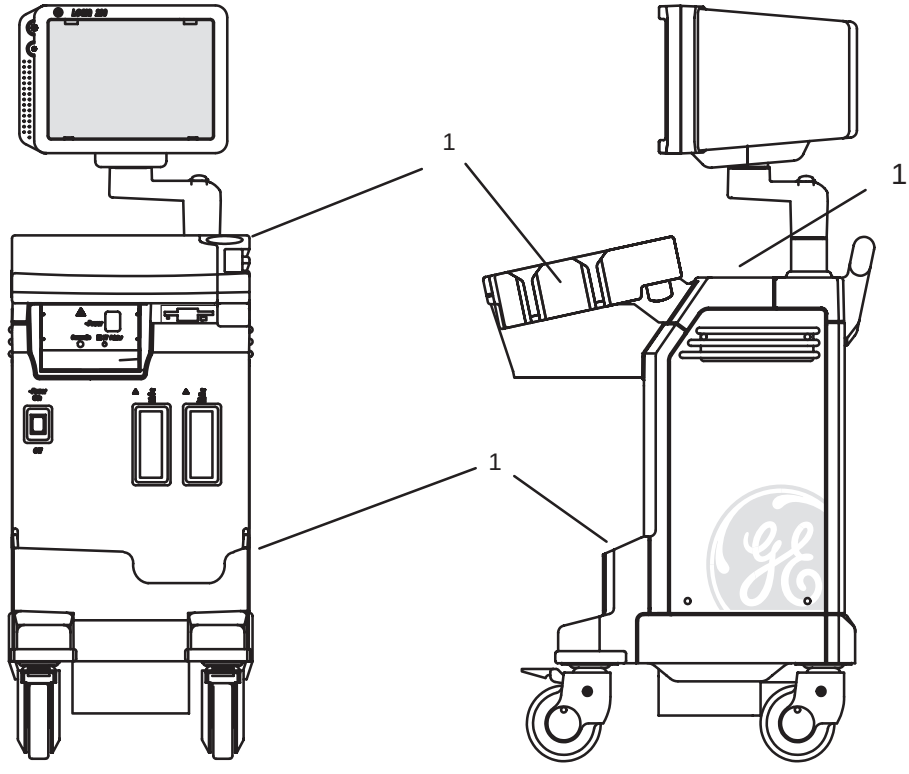


Figure 3–3. Storage Areas

1. Storage Area

Peripheral/Accessory Connector Panel

LOGIQ™ 200 PRO Series peripherals and accessories can be properly connected using the rear connector panel located behind the rear console. Only the B/W Page Printer (UP-890) can be connected to the front accessory panel.

Located on the connector panel are video input and output connections, recorder/camera expose connectors, foot switch connector, power connectors, SCSI bus control and service tools connections.

CAUTION

Each outer (case) ground line of peripheral/accessory connectors are **Earth Grounded**.

Signal ground lines are **Not Isolated**, except the Service Port.

All of the signal lines (including the signal ground) of the Service Port are **Isolated.**

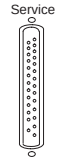


Figure 3–4. Service Port

CAUTION

Use only approved probes, peripherals or accessories.

Refer to the *Recording Images* chapter of this manual for more information.

Peripheral/Accessory Connector Panel (cont'd)

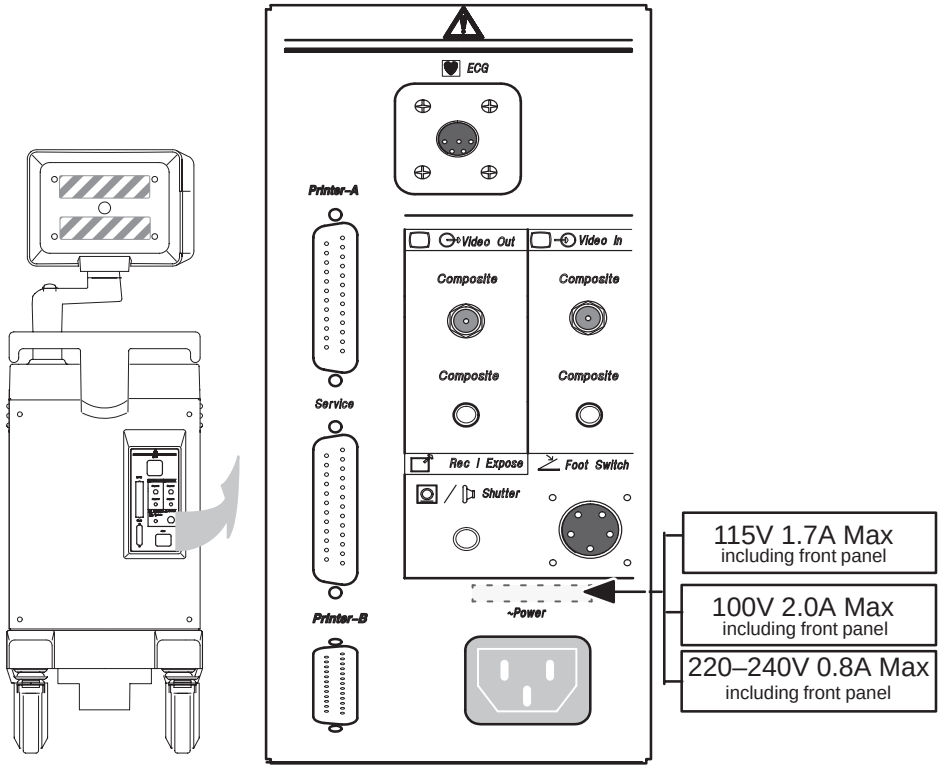
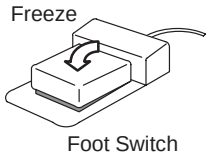


Figure 3–5. Peripheral/Accessory Connector Panel

Foot Switch (option)



An optional Foot Switch may be used as an alternative to the **Freeze** control to:

- Freeze a real-time image.

Only use the recommended foot switch.

The Foot Switch connection is located at the back of the console on the right-hand side of the back panel.

Store the Foot Switch in the storage compartment located at the front of the console, below the keyboard.

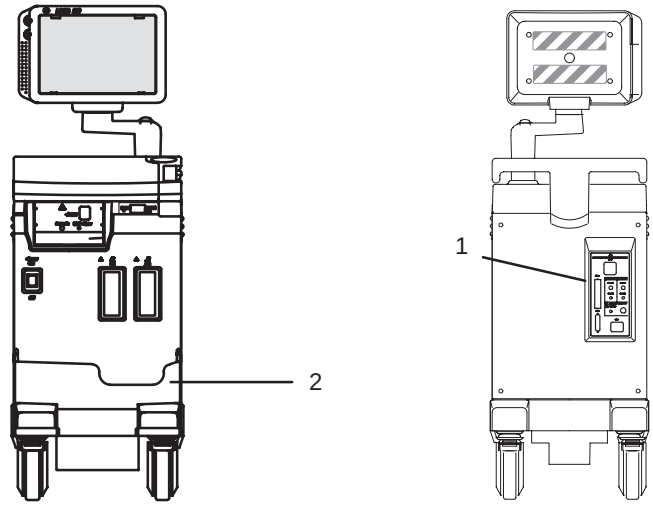


Figure 3–6. Foot Switch Storage and Connectors

1. Foot Switch Connector
2. Foot Switch Storage Area

System Positioning/Transporting

Moving the System

When moving or transporting the system, follow the precautions below to ensure the maximum safety for people, the system, and other equipment.

Before moving the system:

1. Turn the System power switch OFF.
2. Unplug the power cord.
3. All cables from off-board peripheral devices (IIE camera, external printer, VTR, etc.) must be disconnected from the console.
4. Ensure that no loose items are left on the console.
5. Loop the cord around the handle on the back of the system or wrap the cord in a bundle and store it in the front storage area. To prevent damage to the power cord, DO NOT pull excessively on the cord or make sharp bends while wrapping.
6. Connect all probes to be used while off site. Ensure that probe cables are out of the way from the wheels and not protruding beyond the console.
7. Store all other probes in their original cases or in soft cloth or foam to prevent damage.
8. Store sufficient gel and other essential accessories in the provided space.
9. Adjust the monitor to its lowest position possible. Ensure that the monitor arm is locked in place.
10. Unlock the front wheels.

Moving the System (cont'd)

When moving the system:

1. Take extra care when moving the system long distances and on inclines. Ask for help if necessary.

NOTE: Wheel chair ramps are usually less than five degrees.

Avoid ramps that are steeper than ten degrees to avoid tipping over the system.

Utilize additional care and personnel when moving on steep incline (>5°) or loading into a vehicle for transport.

2. Always use the rear handle to move the system.

NOTE: ***DO NOT*** *attempt to move the console using any cables or fixtures, such as the probe connectors.*

3. Use the brake, located on the bottom of the system in the front, when necessary.
4. Do not let the system strike walls or door frames.
5. Use extra care when crossing door or elevator thresholds.
6. Once the destination is reached, lock the wheels.

CAUTION

The system weighs approximately 76 kg (168 lbs). To avoid possible injury and equipment damage:

- Be sure the pathway is clear.
- Limit movement to a slow careful walk.

Transporting the System

Use extra care when transporting the system using vehicles. In addition to the instructions used when moving the system (refer to *11*), do the following:

1. Only use vehicles that are designed for transport of the LOGIQ™ 200 PRO Series system.
2. Load and unload the system to a vehicle parked on a level surface.
3. Ensure that the transporting vehicle can handle the weight of the system plus the passengers.
4. Ensure that the load capacity of the lift (a minimum of 76 kg (168 lbs) is recommended) is capable of handling the weight of the system.
5. Ensure that the lift is in good working order.
6. Secure the system while it is on the lift so that it cannot roll. Use either wood chocks, restraining straps, or other similar types of constraints. Do not attempt to hold it in place by hand.

NOTE: Strap the system below its handle so that the system does not break loose.

WARNING 

Never ride on the lift with the system. A person's weight coupled with the weight of the system may exceed the load capacity of the lift.

7. Employ two to three persons to load and unload safely from a vehicle.
8. Load the unit aboard the vehicle carefully and over its center of gravity. Keep the unit still and upright.

NOTE: Do not lay the unit down.

9. Ensure that the system is firmly secured while inside the vehicle. Any movement, coupled with the weight of the system, could cause it to break loose.
10. Secure system with straps or as directed otherwise to prevent motion during transport.
11. Prevent vibration damage by driving cautiously. Avoid unpaved roads, excessive speeds, and erratic stops or starts.

Wheels

Examine the wheels frequently for any obvious defects that could cause them to break or bind.

Front wheels — The front wheels swivel, pivot, and lock.

Back wheels — The back wheels swivel and pivot but do not lock (Back wheels are optional depending on configuration).

Setting the lock

To engage the wheel lock:

Press down on the lock pedal (located at the front of the wheels). The pedal remains depressed.

To release the lock:

Press down on the pedal again. The pedal returns to its normal position.

Powering On the System

Connecting and Using the System

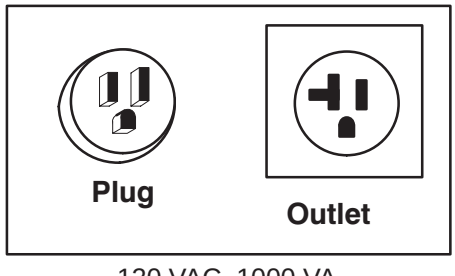
To connect the system to the electrical supply:

1. Ensure that the wall outlet is of the appropriate type.
2. Make sure that the power switch is turned off.
3. Unwrap the power cable. Make sure to allow sufficient slack in the cable so that the plug is not pulled out of the wall if the system is moved slightly.
4. Push the power plug securely into the wall outlet.

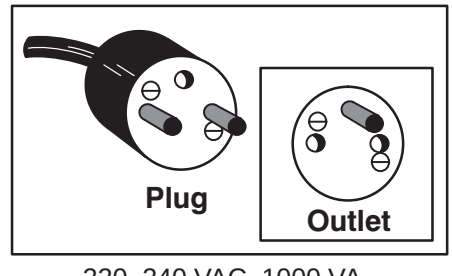
WARNING To avoid risk of fire, the system power must be supplied from a separate, properly rated outlet. See Local Site Requirements, Before the system arrives on 3 for rating information.

The system is supplied with an attachment plug. Under no circumstances should this plug be altered, changed, or adapted to a configuration rated less than specified. Never use an extension cord or adapter plug.

To help assure grounding reliability, connect to a “hospital grade” or “hospital only” grounded power outlet.



120 VAC, 1000 VA
Plug and Outlet Configuration
(USA)



220–240 VAC, 1000 VA
Plug and Outlet Configuration
(Europe)

Figure 3–7. Example Plug and Outlet Configurations

Acclimation Time

After being transported, the system requires one hour for each 2.5° increment its temperature is below 10° C or above 40° C.

° **C**	60	55	50	45	40	35	30	25	20	15	10
° **F**	140	131	122	113	104	95	86	77	68	59	50
hours	8	6	4	2	0	0	0	0	0	0	0

° **C**	5	0	–5	–10	–15	–20	–25	–30	–35	–40
° **F**	41	32	23	14	5	–4	–13	–22	–31	–40
hours	2	4	6	8	10	12	14	16	18	20

Table 3–2. System Acclimation Time Chart

Power On

CAUTION

The **Power** switch is located on the front of the console next to the Probe Connectors. Press the top portion of this switch to turn the power on.

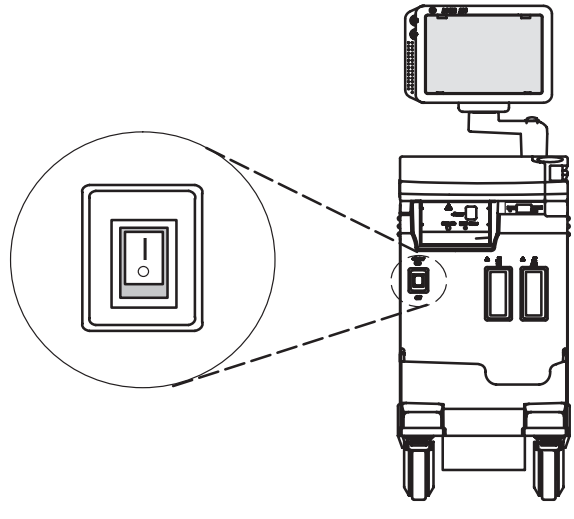


Illustration 1. Location of Power Switch

Power Up Sequence

- The monitor and console power indicator light up.
- The system is initialized. During this time:
  - One beep sounds during the sequence.
  - All LEDs on the keyboard light.

NOTE: If errors occur, an error message appears at the bottom of the screen. See User Maintenance, Troubleshooting for more information.

Hints

If problems occur, freeze the image and take a picture for reference. This will help if there is a need to call for service.

- Probes are initialized for immediate operation.

NOTE: If no probes are connected, the system goes into standby mode.

- Peripheral devices are activated on power up.

After initialization has been completed, the system is in B-Mode and ready for imaging. Refer to *Basic Scan* for scanning instructions.

Power Off

When switching off the system:

- Press the bottom portion (**O**) of the power switch.
- Disconnect the probes.

  Clean or sanitize all probes as necessary. Store them in their shipping cases to avoid damage.

Adjusting the Display Monitor

Rotate, tilt, raise and lower the monitor

The monitor position can be adjusted for easy viewing.

- The monitor can be rotated around it's central pivot point.
- The monitor can be tilted for the optimum viewing angle.
- The monitor arm can be raised or lowered for the best viewing height.

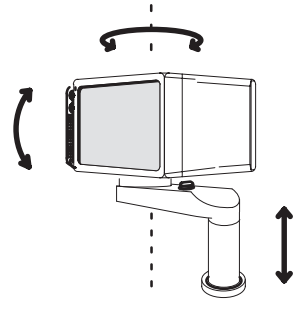
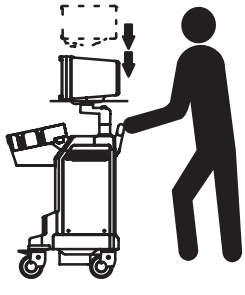


Figure 3–8. Monitor Movement

CAUTION

Monitor height adjustment requires the release of the locking mechanism. After an adjustment is made, ensure that the mechanism is locked to prevent unexpected motion.



When moving the LOGIQ™ 200 PRO Series system, lower the monitor to its lowest possible position to improve stability.

Brightness and Contrast

Adjusting the monitor's contrast and brightness is one of the most important factors for proper image quality. If these controls are set incorrectly, the Gain, TGC, Dynamic Range and even Acoustic Output may have to be changed more often than necessary to compensate.

The proper setup displays a complete gray scale. The lowest level of black should just disappear into the background and the highest white should be bright, but not saturated.

To adjust the Brightness and Contrast:

1. Turn on the LOGIQ™ 200 PRO Series and display a gray scale image with a variety of echo levels.
2. Access the Brightness**/**Contrast controls by rotating the knob on the left side of the display screen.
3. Rotate **Brightness** and **Contrast** knobs to minimum (counterclockwise).
4. Increase the **Brightness** until the background or monitor raster is just one shade above black.
5. Increase the **Contrast** to display the complete or desired range of gray shades.

Brightness and Contrast (cont'd)

Generally speaking, do not change the controls once they have been set. Once set, the display then becomes the reference for the hard copy device(s).

NOTE: After readjusting the monitor's Contrast and Brightness, readjust all preset and peripheral settings.

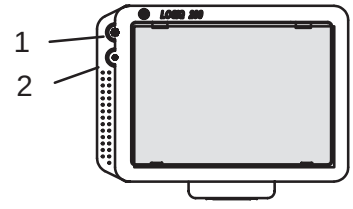


Figure 3–9. Brightness and Contrast

1. Brightness
2. Contrast

NOTE: Monitor degaussing (demagnetizing) is done automatically when the system is turned on.

Probes

Introduction

Only use approved probes.

All imaging probes can be plugged into any of the two standard probe ports.

For more information Refer to *Probes and Biopsy* chapter for more information.

Connecting the Probe

Probes can be connected at any time, regardless of whether the console is powered on or off.

To connect a probe:

1. Place the probe's carrying case on a stable surface and open the case.
2. Carefully remove the probe and unwrap the probe cord.

CAUTION

3. **DO NOT** allow the probe head to hang free. Impact to the probe head could result in irreparable damage.

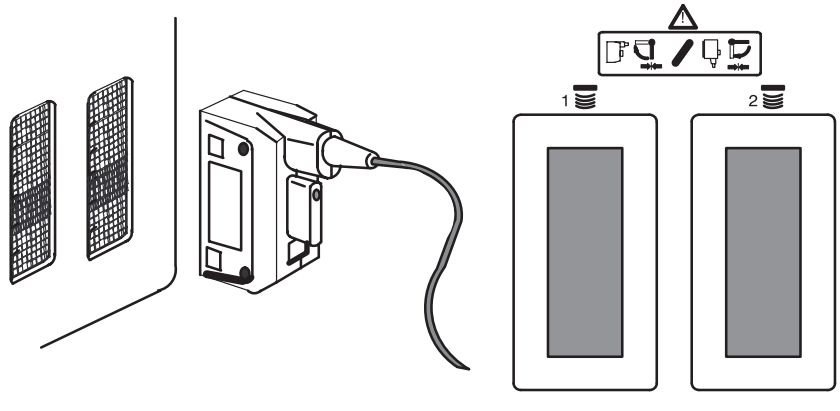


Figure 3–10. Connecting a Probe

Connecting the Probe (cont'd)

4. Align the connector with the probe port and carefully push into place.

5. Pressing the clamshell gently and completely, turn the connector locking handle clockwise or counter clockwise to secure the probe connector. Locking method is different depending on the type of a probe refer to Figure 3–11.

NOTE: Press clamshell to push the copper spring completely and lock the connector simultaneously.

6. Carefully position the probe cord so that it is free to move and is not resting on the floor.

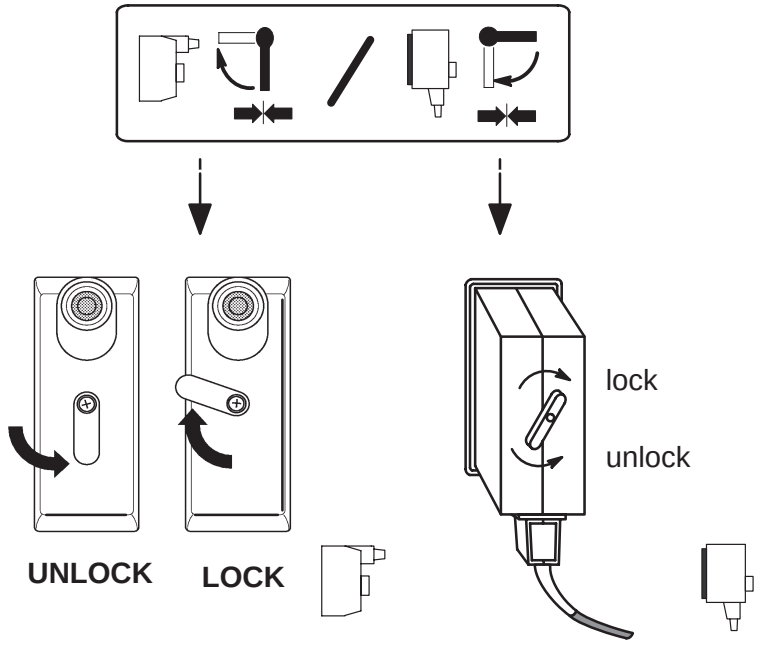


Figure 3–11. Locking a Probe Connector

Activating the Probe

To activate a probe:

Press the **Probe Select** key.

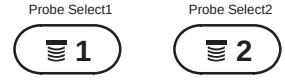


Figure 3–12. Probe Select Key

The probe activates in the currently selected operating mode. The probe's default settings for the mode and selected application are used automatically.

Storing the Probe

It is recommended that all probes be stored in the carrying case provided.

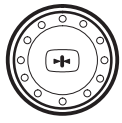
To store a probe:

1. First place the probe connector into the carrying case.
2. Carefully wind the cable into the carrying case.
3. Carefully place the probe head into the carrying case. **DO NOT** use excessive force or impact the probe head.

Deactivating the Probe

When deactivating the probe, the probe is automatically placed in standby mode.

To deactivate a probe:



1. Press the **Freeze** key.
2. Gently wipe the excess gel from the face of the probe.
3. Carefully slide the probe around the right side of the keyboard, toward the probe holder.
4. Ensure that the probe is placed gently in the probe holder.

Probes can be disconnected at any time, regardless of whether the console is powered on. However, the probe should not be selected as the active probe.

To disconnect a probe:

1. Move the probe locking handle counterclockwise.
2. Pull the probe and connector straight out of the probe port.
3. Carefully slide the probe and connector away from the probe port and around the right side of the keyboard.
4. Ensure the cable is free.
5. Be sure that the probe head is clean before placing the probe in its storage box.

Operator Controls

Control Panel Map

Controls are grouped together for ease of use. For in-depth information on using the controls, refer to the *Scan Modes* chapter.

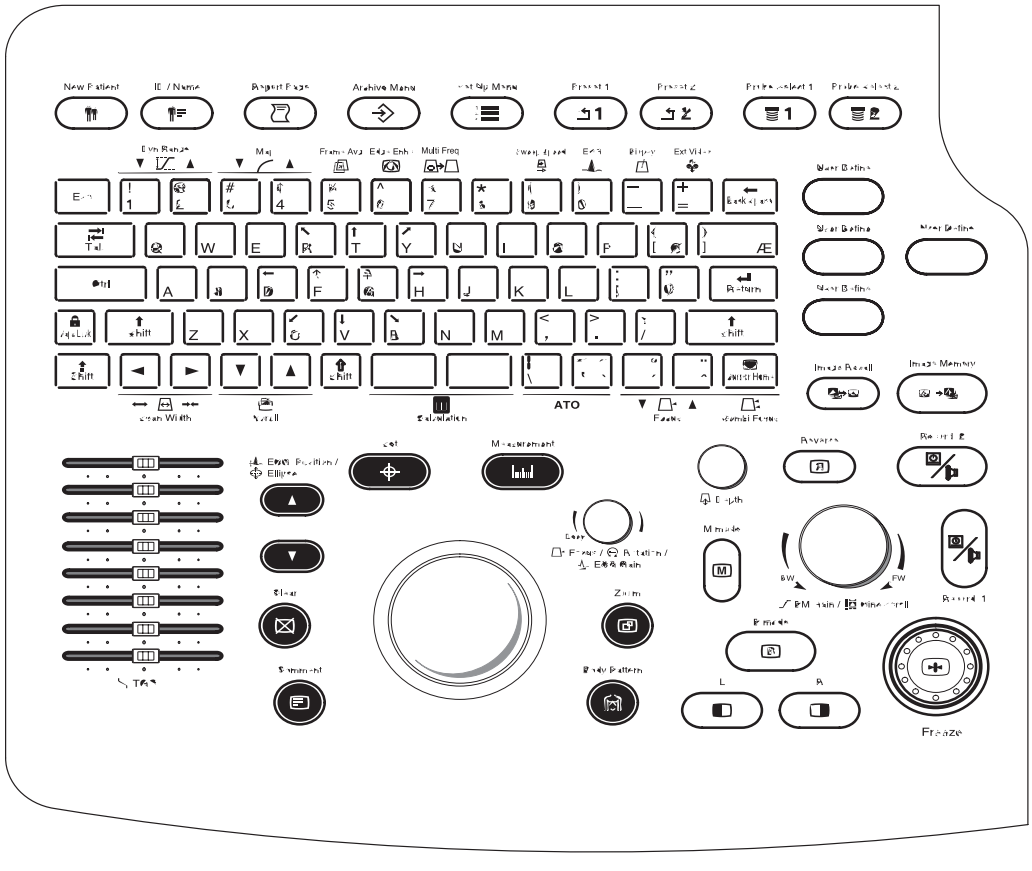


Figure 3–13. Keyboard Layout

Control Panel Map (cont'd)

- **Patient Information**. See 4–2.
- **Probe** See 23.
- **Preset**. These keys can be programmed through the Setup menu to establish a set of start up parameters.
- **TGC Controls**. These controls are used to adjust the Time Gain Compensation applied to the received signal.
- **Measurements and Annotations.** These controls are used to make specified measurements on the image or to annotate the image display.
- **Mode, Display and Record.** These controls are used to designate display modes, image orientation, gain, freeze, and record (print).
- **Keyboard**. The keyboard is used for patient data entry, image annotation and other special functions.

Preset Keys

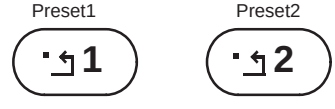


Figure 3–14. Preset Keys

The **Preset** keys are used to store user defined setup.

These controls compensate for echo attenuation as depth increases.

Measurement and Annotation

This group of controls performs various functions related to making measurements, annotating and adjusting the image information.

The **Comment** key enables the image text editor and displays the annotation library in the Setup menu. After the **Comment** key is pressed, text can be added through the Setup Menu comment library or by typing comments from the alphanumeric keyboard. Turning off the cursor can be done by pressing the **Set** key. Pressing the **Clear** key will erase all comments.

The **Body Pattern** key enables the pattern on the screen. For more details refer to 6–15.

The **Measurement** key is used in all types of basic measurements.

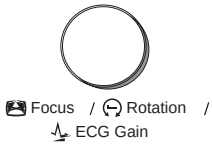
The **Ellipse Up** key is used to activate the ellipse measurement function after the first distance measurement has been set.

The **Set** key is used for various functions, but is generally used to fix or finish an operation (i.e. to fix a measurement cursor or position in zoom).

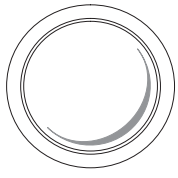
Measurement and Annotation

The **Clear** key is generally used to erase or exit functions such as annotations/comments, measurements and zoom.

Press the **Zoom** key to activate the zoom function. For more details refer to 6–2.



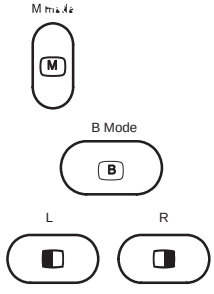
The **Focus/Rotation, ECG Gain** knob is used to rotate the probe position indicator in the body pattern function. Otherwise, the knob is used to change the focus position like the Focus keys on the keyboard. This knob is also used to adjust the receive gain of the ECG signal.



The **Trackball** is used with almost every key function in this group. Trackball control depends on the last key function pressed.

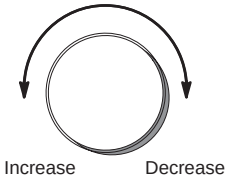
Mode, Display and Record

This group of controls provides various functions relating to the display mode, display orientation, freeze, gain and cine scroll.



The **Mode** Controls select the desired display mode or combinations of display modes.

During dual display modes the **L** and **R** keys activate the Left or Right displayed image.



The **Depth** knob controls the image display depth. Clockwise rotation decreases display depth. Counterclockwise rotation increases display depth.

The Image Recall key displays a menu of the images stored in memory. After pressing **Image Recall**, select the desired image from the Menu for display.

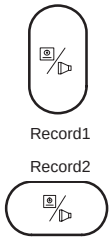
The Image Memory key stores the current frozen displayed image in system image memory.

Maximum number of images is 10.

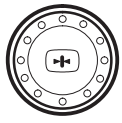
All images are erased when the New Patient key is pressed or there is a loss of system power.

The **Reverse** key toggles the left/right orientation of the scan image.

Mode, Display and Record (cont'd)

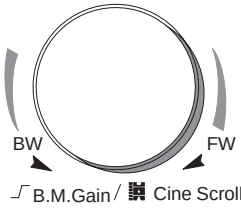


The **Record 1** and **Record 2** keys are used to activate/print the designated recording device (i.e. video page printer, multi-image camera, or image archive option).



The **Freeze** key is used to stop the acquisition of ultrasound data and freeze the image in system memory.

Pressing **Freeze** a second time continues live image acquisition.



The **B/M Gain/Cine Scroll** knob control performs a dual function. During B-Mode, it controls the gain of the displayed echoes. During M-Mode, it controls the gain of the displayed timeline echoes.

When the image is frozen it controls scrolling forwards and backwards through the Cine loop images in temporary storage.

Keyboard

The keyboard has standard alphanumeric keys available along with some special functions.

NOTE: The Cursor Home key is also used as a Focus Combination Key to activate the Focus Combination function.

The **Escape** key is used to exit or cancel B mode, M mode, B/M mode, Setup mode, Archive mode, Report Page, New Patient and Patient ID menu.

Control is used in conjunction with other keys to activate special keyboard functions.

Back Space is used to delete previous characters while annotating.

Return is used to move to the next line of annotation.

Tab is used to move forward or backwards through the text one word at a time or eight characters at a time, depending on the keyboard tab preset.

Shift (Green) is used to activate the special characters highlighted in green on the keys located on the right side of the keyboard. See 6–13 for details.

Shift (Blue) is used to activate the special characters highlighted in blue on the keys in the middle of the keyboard. See *6–13* for details.

Caps Lock locks all alpha characters in the upper case mode.

The keyboard has several function keys available along with alphanumeric functions.

Special Key Function

The keyboard has several function keys along with the alphanumeric functions.

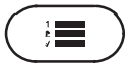
Report Page

The **Report Page** key is used to display the report format of each exam category.

Archive Menu

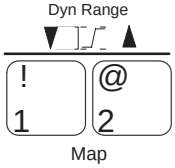
The **Archive Menu** key is used to display the Archive Menu.

Setup Menu



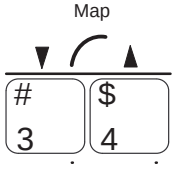
The **Setup Menu** key is used to display the Setup Menu.

Dyn Range



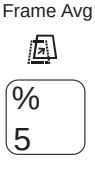
Dyn Range keys are used to control Dynamic Range.

Map



The **Map** keys are used to change Gray Scale Map.

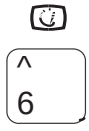
Frame Avg



The **Frame Avg** key is used to enhance the frame averaging function.

Special Key Function (cont'd)

Edge Enhc

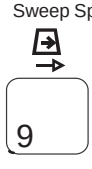


The **Edge Enhc** key is used to enhance the edge enhancement function.

Multi Freq

The **Multi Freq** key is used to enhance the penetration function.

Sweep Speed

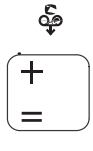


The **Sweep Speed** key is used to choose Sweep Speed.

Biopsy

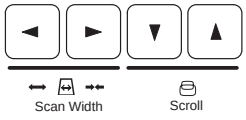
The **Biopsy** key is used to activate the biopsy function.

Ext.Video

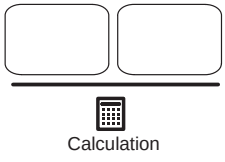


The **Ext Video** key is used to display the External Video on the LOGIQ™ 200 PRO Series screen.

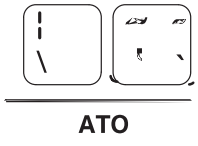
Special Key Function (cont'd)



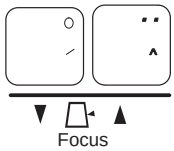
The four **Arrow** keys are used to move the cursor in the Calculation mode. The two right/left keys are **Scan Width** keys that are used to control Scan Width. The two up/down keys are **Scroll** keys that are used to scroll the display up or down in the image mode.



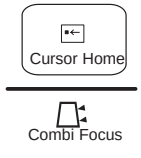
The **Calculation** keys are used to activate the calculation menus.



The **ATO** key is used to change the ATO.

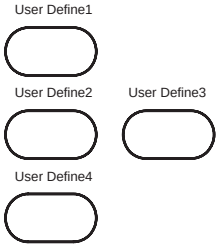


The **Focus** keys are used to change the focus position.



The **Cursor Home** key brings the alphanumeric cursor to the very upper left corner of the available field. This key is also used to activate combi focus.

User Defined Keys



Desired functions can be assigned to these keys (User Define 1 ~4) in the User Define Category and Key Setup menu (page 10 of 11). Refer to 13–47 for more information.

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Preparing for an Exam

Beginning an Exam 4–2
Introduction 4–2
Beginning a New Patient 4–2
OB/GYN Exam Category 4–6
ID/Name 4–6

Beginning an Exam

Introduction

Begin an exam by entering new patient information.

The operator should enter as much information as possible, such as:

- Exam category
- Patient name
- Patient ID
- Comments
- Other patient demographic information

The patient's name and ID number is retained with each patient's image and transferred with each image during archiving or hard copy printing.

Beginning a New Patient

The **New Patient** key should be pressed at the beginning of each patient study. Pressing this key automatically erases all patient data, annotations, measurements, calculations and summary report pages. A preset parameter, in the Patient Entry Setup menu, can be set to prompt the user if they wish to erase all data or not.

Beginning a New Patient (cont'd)

Enter patient data with the alphanumeric keyboard.

The Setup Menu automatically defaults to the last exam preset top menu when **New Patient** is pressed. A diagnostic region can be selected from the Preset sub-menus to provide a suitable starting point for system scan parameters.

NOTE: Oper ID and Ref MD will not be erased.

CAUTION

To avoid patient identification errors, always verify the information with the patient. Make sure the correct patient identification appears on all screens and hard copy prints.

The Patient Entry Menu appears on the display monitor.

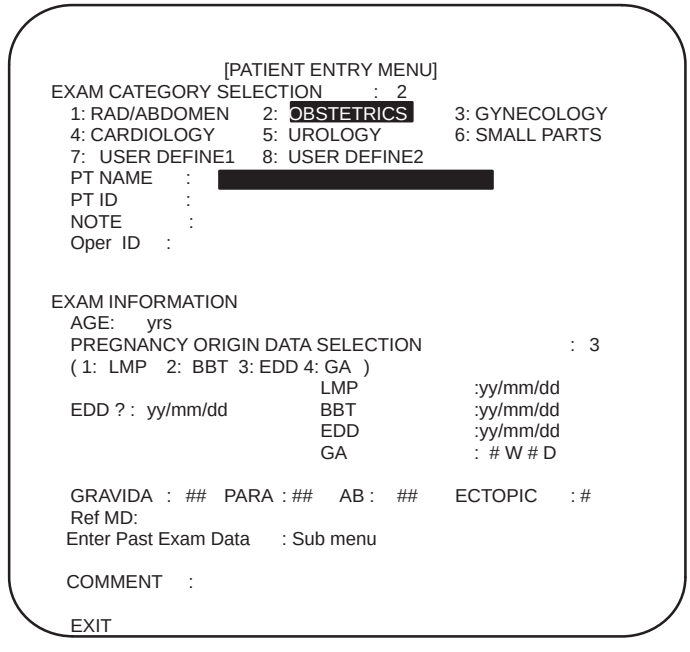


Figure 4–1. Patient Entry Menu

NOTE: The question "Do you really want to change patient?" can be enabled or disabled in Patient Entry Setup.

Beginning a New Patient (cont'd)

The first Data Entry field is presented in reversed display, with the selected cursor in position for the first character to be entered.

- Select from 8 examination categories : Radiology/Abdominal, Obstetrics, Gynecology, Cardiology, Urology, Small Parts, User Define1 and User Define2. The category should be selected before the start of the examination.
- The patient information input menu changes depending on the Category. Information pertinent to the selected exam category appears in an abbreviated menu.
- The USER DEFINE1 and 2 fields (#7, 8) can be input (15 characters maximum) in the User Define Category and Key Setup, Category name edit menu. Refer to 13–47.
- To navigate through the Patient Entry Menu, use the **Return** key or the **Trackball** to move the cursor.
- Input the patient name (29 characters maximum).
- Input ID number (14 characters maximum).
- Input any desired note (30 characters maximum).
- Input the desired Oper ID (four digits maximum).

NOTE: Patient Name, Patient ID, Notes, Oper ID, Ref MD, and Comments are common to all exam category menus.

Information in the Exam Category patient entry menus is considered necessary for that type of exam. Fill in all information possible.

Beginning a New Patient (cont'd)

- The display units of measure for items such as weight or height can be selected from the Setup Menu/New Patient Setup. Choose the unit of measure on this Setup Menu.
- Input Ref MD (16 characters maximum).
- Input comment field (2 lines of 60 characters each).
- When the previous Exam data is needed, place the cursor to the "Enter Past Exam Data" and Press **Set** to display.
- When all patient data entries have been completed, highlight **Exit** and press **Return, Set** or the **New Patient** key.

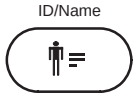
*NOTE: If patient information needs to be edited or the exam category changed, use the ID Name key. Pressing **ID Name** allows for modification of the Patient Entry Menus without erasing accumulated patient images, measurements, annotations, calculations and summary reports.*

NOTE: Patient age entry information (years, months, weeks, days) is selected in the Patient Entry Setup menu under "Unit Age". Patient height is "Unit Height" and Patient weight is "Unit Weight". Choose the unit values that are to appear on the patient entry menu.

OB/GYN Exam Category

BBT is a pregnancy origin data selection choice that appears in the Tokyo University, Osaka University and European OB formats only. LMP, EDD and GA are the only choices in the USA version.

ID/Name



Use the ID/Name key to enter or replace patient data without changing the current status of the system. One common reason might be to change the exam category.

Pressing **ID/Name** enables the Patient Entry Menu.

Use the **Trackball** or **Arrow** keys to move around the menu entry lines. **Return** moves the entry cursor to the next line.

No other function can be started until ID/Name is completed. To complete the ID/Name process, press **ID/Name** a second time or move the highlighted cursor to **Exit** and press **Set** or **Return**.

Helpful hints

Hints

If power is lost during the ID/Name function, data will not be saved.

The following rules apply when filling in the New Patient menu:

- Press **Caps Lock** to type uppercase letters. Press **Caps Lock** again to type lowercase letters.
- Press **Back Space** to erase characters and correct errors.
- To change information, press **Return** or **Tab** to move to the field, then type over the existing information with correct information.
- Press **Return** to move to the next field.
- Press **Tab** to move forward.
- Press **Shift** and **Tab** simultaneously to move backwards.
- Use the **Trackball** to move the reversed cursor to the desired item.
- When pressing **Return** at the last data entry field, the system returns to real-time scanning.
- To start over, press **New Patient.**

  Remember, user and factory-defined presets are dependent upon the exam category selected when filling in the New Patient menu.

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Modes

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Introduction 5–2
Optimizing the Image 5–6
M-Mode 5–17
Introduction 5–17
M-Mode Display 5–17
Optimizing the Timeline 5–18
Mixed Mode Display Formats 5–23

B–Mode

Introduction

The LOGIQ™ 200 PRO Series offers a wide variety of display formats. Each format shows the operator valuable information relating to patient data and system scan parameters.

The following illustrates the basic B-Mode display and the information that can be expected with this format. The remaining modes and combinations of modes will highlight information that is different for that particular display.

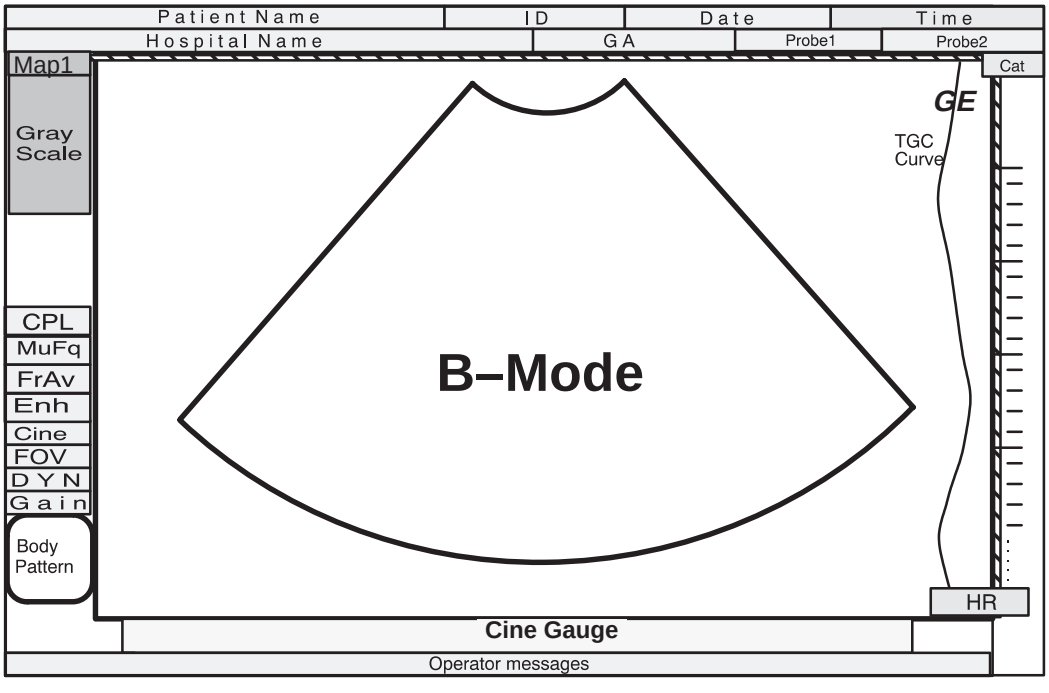
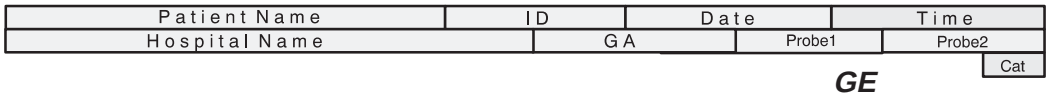


Figure 5–1. B-Mode Display Format

B-Mode Display (cont'd)



B-Mode Display	Description, Format, Values
Patient Name	A maximum of 29 alphanumeric characters. Input at Patient Entry Menu.
ID	Patient identification number. A maximum of 14 alphanumeric characters. Input at Patient Entry Menu.
Date	Today's date according to the system settings. Can be preset to display as MM/DD/YY, DD/MM/YY, or YY/MM/DD.
Time	Displays the current time during normal operation. Can be preset to a 12 or 24 hour clock.
Hospital Name	Shows the name of the hospital or institution. A maximum of 34 alphanumeric characters. Input at Patient Entry Menu.
GA	Gestational Age for OB patients. Calculated from LMP input from Patient Entry Menu. GA (LMP) = ##W#D
Probe1	Probe name or designation of the active probe in the probe port 1.
Probe2	Probe name or designation of the active probe in the probe port 2.
Probe Orientation GE	GE is the marker used for scan orientation. This should coincide with the probe orientation marking on the probe body.
Cat	Shows the name of the selected category. Maximum of 3 chracters.

Table 5–1. B-Mode Display Explanation

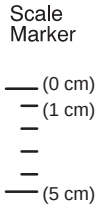
Cine Gauge	Shows the Cine Gauge.
Operator Messages	System generated messages are displayed on this line (i.e. error messages)
HR	Heart Rate is displayed here in beats per minute. ###BPM (Requires ECG input)

B-Mode Display (cont'd)

Graphic Display	Description, Format, Values
Map	Shows the B-Mode Gray Scale Map. Map# or ATO.
Gray Scale	Shows the B-Mode Gray Scale assignment.
MuFq	Shows the Frequency of current active probe.
FrAv	Shows the frame average. FA : # H :HIGH M :MID L :LOW
Enh	Shows the Edge Enhancement. EE : # H :HIGH M :MID L :LOW
Cine	In Cine Mode it shows the display playback frame number. CN## (Frozen)
FOV	Shows the display depth in cm. ##cm Dual Mode: ##cm##
DYN	Dynamic Range shows the range over which echo intensities are converted to gray scale. Displayed in dB. DR## Dual Mode: ##DR##
Gain	Displays the overall B-Mode or M-Mode Receive Gain. G## Dual Mode: ##G##
Body Pattern	Shows the body pattern selected for scan orientation.
CPL or WP	Shows the standoff status CPL: Couplant WP: Water Path

Table 5–2. B-Mode Display Explanation

B-Mode Display (cont'd)



Scale markers are presented along the right side of the display as large marks every 5cm and small marks every 1cm.

The TGC curve displays the relative position of the TGC slide pots compared to their depth.

10.0

The number displayed next to the probe orientation symbol is the zoom or scroll depth starting point for the image displayed.

NOTE: To disable the TGC curve display, go to the Image Display Setup. Select "TGC curve display" off.

Optimizing the Image

Control Layout

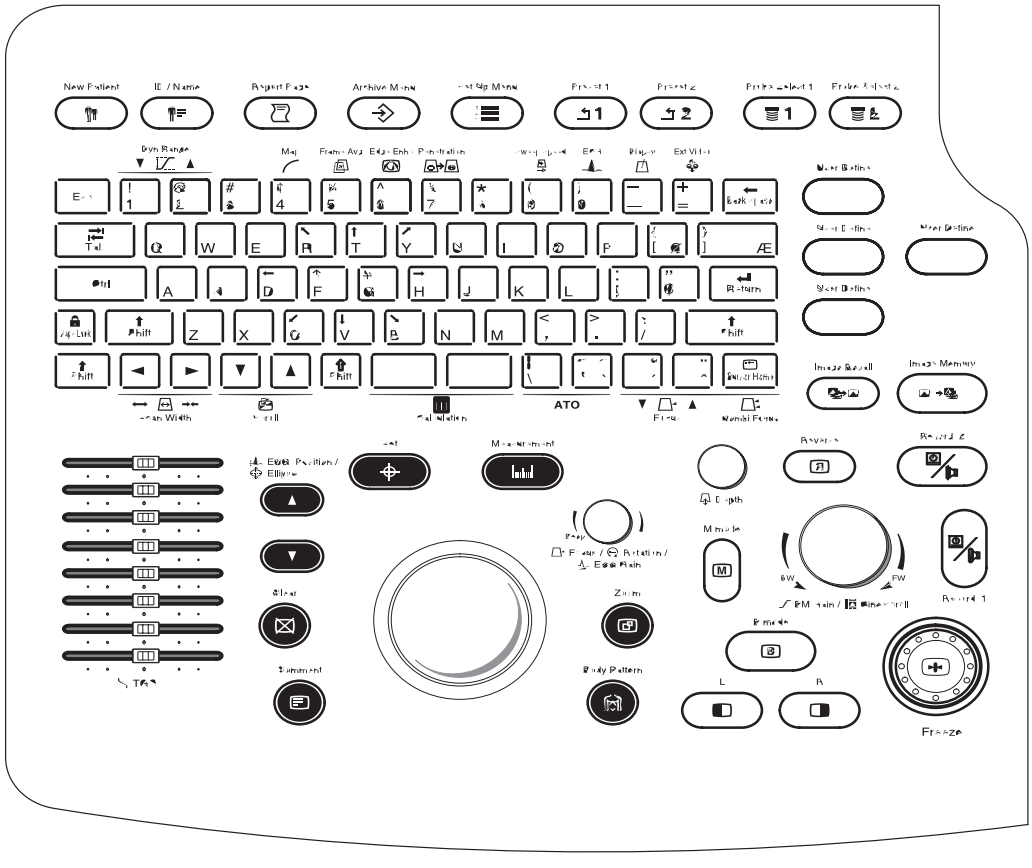


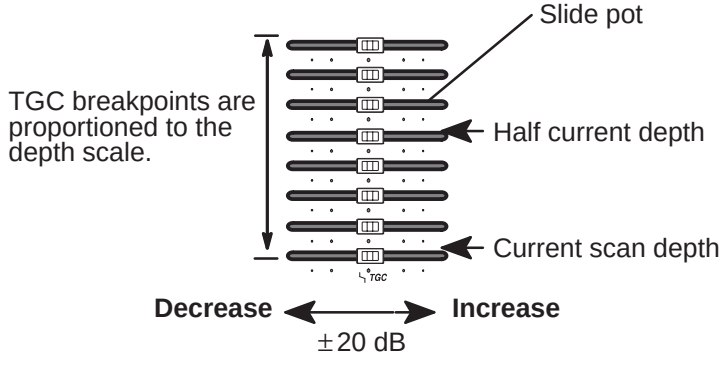
Figure 5–2. Controls Layout

LOGIQ™ 200 PRO Series controls are grouped together for optimum operator convenience.

Mode and Display controls are on the lower right side, while TGC is on the lower left side.

The following describes each control and selection available.

Controls

Controls	TGC
Description	The **TGC** controls are used to vary the gain of the received echoes at a specific depth.
Accessing/ Changing	
Benefits	These controls compensate for echo attenuation as depth increases.

Controls

Controls	Depth	Scan Area Size
Description	Depth controls the distance over which the B-Mode images anatomy. Display depth may be changed according to the anatomical size or to the region of interest. Minimum/ maximum values available depend on the probe. Select from 4 to 24 cm in 2 cm increments for the desired depth.	Widen or narrow the scan width to maximize the image's field of view.
Accessing/ Changing	Turn the rotary encoder to the next depth setting. Imaging and display parameters adjust automatically. To reduce depth (look at a shallower image), turn the **Depth** rotary encoder clockwise. To increase depth (look at a deeper image), turn the **Depth** rotary encoder counterclockwise.	To access Scan Area Size, activate the Probe Parameter 1 Setup in the Setup Menu. To widen the Scan Area Size by 100%, press the **Right Arrow** key. To narrow the Size by 55%, press **Left Arrow** key. To change the Scan Area Size, move the cursor to Scan Area Size and select the desired default size from five defaults.
Benefits	Depth adjusts the field of view. Increase the field of view to look at larger or deeper structures, decrease the field of view to look at structures near the skin line.	Increase the sector width to see a wide anatomical structure, decrease the sector width to have a faster frame rate.
Values	Depth increments vary by probe. Values may be preset for each probe. Depth displays on the monitor in centimeters.	100%, 88%, 75%, 63% and 55%. Scan Area Size is a pre-processing function.
Affects on Other Controls	After adjusting the depth, it may be necessary to adjust the TGC, focus, frame rate and edge enhance. Changing depth while scanning clears Cine memory.	
Bioeffects  **Acoustic Output Hazard**	Increasing the depth tends to decrease the MI and TI because the frame rate slows down.	As the sector width narrows, the TI tends to increase since the target is being hit more often and the MI may decrease since the peak power is reduced.
 **Hints**	Make sure enough space is left below the anatomy of interest to demonstrate shadowing or enhancement.	

NOTE: The default value of Depth can be set in the Probe Parameter 1 setup Menu.

Controls (cont'd)

Controls	Display Format (Dual)	Image Rotation
Description	Each scan mode or combinations of modes can be displayed in dual format (side by side images). The **Left Image** and **Right Image** keys allow for the dual format to be displayed.	Rotates the image in 90° increments.
Accessing/ Changing	To initiate the dual format display, press the **Left Image** key. The current display mode will be reduced to the left half of the image area. Press the **Right Image** key to activate the same image format on the right half of the image area.	To access Image Rotation, activate the Probe Parameter Setup in the Setup menu. To change the Image Rotation, locate the cursor in Image Rotation and select one of four directions.
Benefits	Allows for viewing two images side-by-side.	Orient image display for easy reference.
Values	System parameter displays are relocated for each format.	The image rotations are 0°, 90°, 180°, 270°. Image Rotation is a post-processing function.
Affects on Other Controls	Other controls only affect the active image.	
CAUTION		When reading a rotated image, be careful to observe the probe orientation to avoid possible confusion over scan direction or right/left image reversal.

Controls (cont'd)

Controls	Image Reverse	Multi Frequency
Description	Image reverse controls the horizontal orientation of the image on the screen. It toggles the left/right orientations of the image display.	Multi Frequency changes the receive filtering to allow more echoes to pass through.
Accessing/ Changing	Press the **Reverse** key to toggle image reverse on or off.	Press the **Multi Freq.** key to change the scan frequency.
Benefits	The **Reverse** key allows for changing the orientation of the image display without physically rotating the probe 180°.	Allows for an increase in echo intensity without changing gain, TGC or acoustic output.
Values	On or Off. The image direction mark at the top of the sector wedge corresponds to the orientation mark on the probe body. Pressing the **Reverse** key flips the image left/right and switches the image direction mark to correspond to the probe mark.	Resolution, Normal, Penetration or Further. This value is probe dependent.
Affects on Other Controls		Acoustic output, gain and TGC may be able to be reduced due to increased penetration.

NOTE: The default status of Image Reverse and Penetration can be set in the Probe Parameter 1 Setup Menu.

NOTE: It is not possible to activate Peneration on a frozen image.

Controls (cont'd)

Controls	Frame Avg (Average)	Focus Combi (Combination)
Description	When Frame Average is enabled, previous frames of image data will be averaged with the current frame of data. Frame averaging uses more data points to make up one image. This has the effect of presenting a smoother, softer image.	Focus combination changes the number of focal zones so that the beam can be tightened or expanded for a specific area. A graphic caret corresponding to the focal zone position(s) appears on the right edge of the image.
Accessing/ Changing	To Change the Frame Averaging Value, press the **Frame Avg** key repeatedly. From the default value, each press cycles between OFF→LOW→MID→HIGH. The selected value is displayed.	To Change the Focus Combination Value, press the **Combination** key repeatedly. From the default value, each press cycles between SINGLE→DUAL→TRIPLE→QUAD. The selected value is displayed.
Benefits	Helps to average out brief, sudden changes in echo intensity information. Could help to filter out low intensity noise.	Focus number optimizes the image by increasing the resolution for a specific area.
Values	Frame average values are off, low, mid and high. Frame average values are returned to the preset value when changing Probe, Exam category, New Patient or Preset. Frame Averaging value is a pre-processing selection.	Choose single, dual, triple or quad focal zones.
Affects on Other Controls	Selecting frame averaging slows the display frame rate.	Changing the focus number affects frame rate. The greater number of focal points, the slower the frame rate.
Bioeffects  **Acoustic Output Hazard**		Observe the output display for possible effects.

NOTE: Frame Average is not available on frozen image.

NOTE: The default status of Frame Average and Focus Combination can be set in the Probe Parameter 1 Setup Menu.

Controls (cont'd)

Controls	Focus Position	B/M Gain
Description	Focus Position changes the depth at which the focal zone is optimized. A graphic caret representing the focal point will move with a change in focal position.	Gain increases or decreases the amount of echo information displayed in an image. It has the effect of brightening or darkening all displayed echoes at any depth.
Accessing/ Changing	To preset the Focus Position, activate the Probe Parameter Setup in the Setup Menu, and move the cursor to the Single Focus position and select one from eight positions. To move the Focus Position up or down, press **Focus Up/Down** keys.	Turn the **B/M Gain** control to adjust gain. Gain values change depending on the probe; they are not associated with a particular position of the dial. To increase gain, turn the **B/M Gain** dial clockwise. To decrease gain, turn the **B/M Gain** dial counterclockwise.
Benefits	Focus position optimizes the image by centering the focal point to the depth of the area of interest.	Gain allows for the balance of echo contrast so that cystic structures appear echo-free and reflecting tissue fills in.
Values	Relative to depth of the display (FOV). Focal point indicators vary with change in position up (shallow) or down (deep). Focus Position is a pre-processing function.	Gain displays on the monitor in dB. B Gain increments are available every 2 dB within the range of 0 to 98 dB, depending on the selected probe.
Affects on Other Controls		After adjusting acoustic output, there may be a need to adjust the gain. Generally speaking, if acoustic output increases, the gain may need to decrease; a decrease in acoustic output may require an increase in gain. Gain and TGC interact by adding together. Gain changes overall echo amplification while TGC changes amplification at specific depths.
Bioeffects  **Acoustic Output Hazard**	Moving the focal zone may affect acoustic output requirements because of concentrating on a specific area of interest.	Gain has no affect on Acoustic Output. However, with increased Gain, the output level can usually be reduced to produce equivalent image quality.

NOTE: The default value of B Gain can be set in the Probe Parameter 2 Setup Menu.

NOTE: It is not possible to change the gain on a frozen image. Changing the gain while in another mode does not affect the B-Mode image gain.

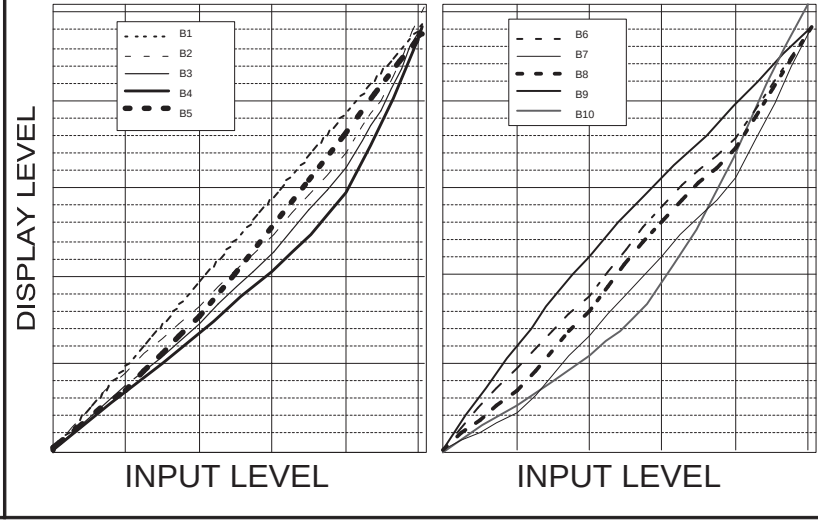
Controls (cont'd)

Controls	B Dynamic Range	B Edge Enhance
Description	Dynamic range controls how echo intensities are converted to shades of gray, thereby creating a range of gray scale that can be adjusted.	B edge enhance brings out subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures.
Accessing/ Changing	Press the **Dyn Range** key to change the dynamic range. To increase dynamic range, press the **Dyn Range** up arrow key. To decrease, press the **Dyn Range** down arrow key.	To Change the B Edge Enhance, press the **Edge Enhc** key repeatedly. From the default value, each press cycles between OFF→LOW→MID→HIGH. The selected value is displayed.
Benefits	Dynamic range is useful for optimizing tissue texture to differentiate between echo levels that are close together. Dynamic range should be adjusted so that the highest amplitude edges appear as white while the lowest levels (such as blood) are just visible.	Edge enhance modifies the B-Mode image by accentuating the interfaces between organs or vessels.
Values	The settings cycle in 6 dB steps from 30 dB to 72 dB. Dynamic range levels are returned to the preset value when changing the Application, Exam category or New Patient.	OFF, LOW, MID, or HIGH. Edge enhance status is returned to the preset value when changing the Application, Exam category or New Patient.
Affects on Other Controls	Dynamic range operates only in real-time, not in freeze, Cine, Timeline replay, or VCR playback.	Edge Enhance operates in real-time only, not in Freeze, Cine, or VCR playback.

NOTE: The default value of B Dynamic Range and B Edge Enhance can be set in the Probe Parameter 2 Setup Menu.

NOTE: It is not possible to change dynamic range on a frozen image.

Controls (cont'd)

Controls	B Gray Scale Map
Description	Gray scale mapping determines how the echo intensity levels received are presented as shades of gray.
Accessing/ Changing	Press the **Map** key to change the Gray Scale Map.
Benefits	Displays the received echo levels with different weights on specific levels of gray. For example, a certain gray map may enhance mid level echoes over a wider range of grays verses high or low level echoes. Allows for better differentiation between echo levels through gray levels displayed.
Values	There are 10 selections of Gray Scale Mapping. Gray Scale Mapping is a post-processing function. 

NOTE: The default value of Gray Scale Map can be set in the Probe Parameter 2 Setup Menu.

Controls (cont'd)

Controls	Biopsy Lines	B Rejection
Description	Biopsy Lines enable any electronic biopsy guidezone available for the active probe. Operation method depending on the Needle guide type.	Rejection allows for the elimination of low level echoes from the display. This is generally used to clear noise out of vessels or cysts.
Accessing/ Changing	Press the **Biopsy** key to choose the type of biopsy guide angle to be displayed for the attachment used. Each press cycles between OFF→MBX1→MBX2→MBX3 (multi) OFF→SGL (single)	To access B Rejection, activate the Probe Parameter Setup in the Setup Menu. To change the Rejection, move the cursor to the B Rejection and enter the desired value from 0 to 40 in 2 digit increments.
Benefits	Electronic biopsy guidelines show the expected needle path during insertion.	Allows for the elimination, from the display image, of low level echoes caused by noise.
Values	On or Off.	Off and 2 through 40 in increments of 2. Rejection is a post-processing function.
Affects on Other Controls		Rejection affects real-time imaging, frozen, or Cine.

NOTE: Biopsy Needle guide type can be preset in the Probe Parameter 1 Setup. It is possible in B–Mode or dual B–Mode.

*NOTE: Press the **Measurement** key once to display the integrated biopsy depth cursor while the guidelines are present. Use the **Trackball** to position the depth marker.*

Controls (cont'd)

Controls	Scroll	ATO Method
Description	The **Scroll** keys are used to scroll the image presentation up or down in order to display deeper parts of the body.	ATO, Automatic Tissue Optimization, optimizes the image based upon a specified Region Of Interest (ROI) or anatomy within the display.
Accessing/ Changing	Press the **Scroll** key to scroll the display up or down. To scroll the display up, press the up arrow key. To scroll the display down, press the down arrow key.	To size ATO up or down, press the **Ellipse Up/Down arrow** keys. Manual size adjustment can only be functional if the ATO method is set to 2:Manual in the Image Display and Application Setup Menu.
Benefits	The **Scroll** keys are useful for scrolling the image in order to display deeper parts of the body.	Improves contrast of the displayed image data.
Values	The **Ctrl** and **Scroll** keys are used to return to the top most scroll value location. A numerical value of a scrolled depth is displayed in the next probe mark of the image in Cm. The settings cycle in 5mm steps.	Auto or Manual.
Affects on Other Controls		**Gain** adjustment

M-Mode

Introduction

M-Mode is used to determine patterns of motion for objects within the ultrasound beam. The most common use is for viewing motion patterns of the heart.

Be sure to read and understand Acoustic Output considerations for each mode (refer to *the Safety* chapter) before adjusting the Acoustic Output control or any control affecting acoustic output.

M-Mode Display

The information displayed in the M-Mode format is the same as in B-Mode. The position of the parameters is slightly different as illustrated below.

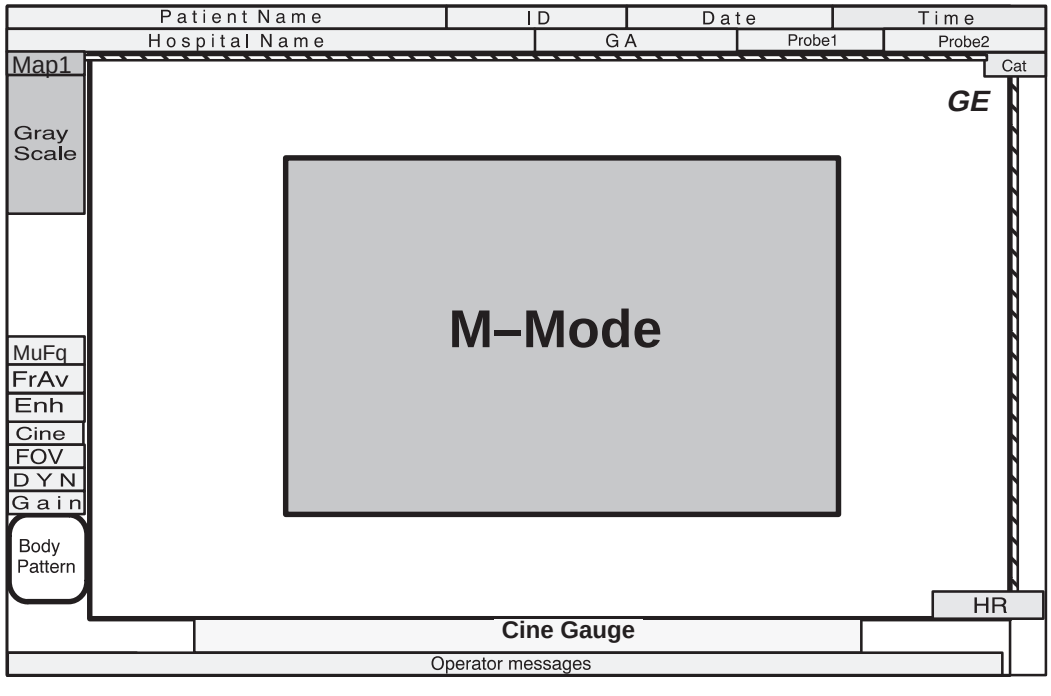


Figure 5–3. M-Mode Display Format

Optimizing the Timeline

Common Controls

Description

Since M-Mode is basically a single B-Mode scan vector displayed over time, basic controls that affect the B-Mode display also affect the M-Mode display.

TGC and depth affect both the M-Mode and B-Mode displays.

Scan area size, scan area position and reverse affect B-Mode only.

If the scan area size is reduced and the position changed, the M-Mode cursor will follow the position change to stay within the displayed scan area.

Accessing/Changing

See *B-Mode* for details on these controls.

Controls

Controls	B/M Gain
Description	Gain increases or decreases the amount of echo information displayed in an image. It has the effect of brightening or darkening all displayed echoes at any depth.
Accessing/ Changing	Turn the **B/M Gain** control to adjust gain. Gain values change depending on the probe; they are not associated with a particular position of the key. *Changing the gain while in M-Mode does not affect the B-Mode image gain.* To increase gain, turn the **B/M Gain** dial clockwise. To decrease gain, turn the **B/M Gain** dial counterclockwise.
Benefits	Gain allows for the balance of echo contrast so that cystic structures appear echo-free and reflecting tissue fills in.
Values	M Gain is displayed on the monitor in dB. M Gain increments are available every 2 dB. The range of M Gain is depending on the B Gain. The maximum is 98 – B Gain, and the minimum is – B Gain.
Affects on Other Controls	After adjusting the acoustic output, there may be a need to adjust gain. Generally speaking, if acoustic output increases, the gain may need to decrease; a decrease in acoustic output may require an increase in gain. Gain and TGC interact by adding together. Gain changes overall echo amplification while TGC changes amplification at specific depths.
Bioeffects  **Acoustic Output Hazard**	Gain has no affect on acoustic output. However, with increased gain, the output level can usually be reduced to produce equivalent image quality.

NOTE: Gain cannot be changed on a frozen image.

NOTE: The default value of M Gain and M Dynamic Range can be set in the Probe Parameter 2 Setup.

Controls

Controls	M Dynamic Range
Description	Dynamic range controls how echo intensities are converted to shades of gray, thereby creating a range of gray scale that can be adjusted. Adjustments to M-Mode's dynamic range affects the M-Mode timeline only.
Accessing/ Changing	Press the **Dyn Range** key to change the dynamic range. To increase, press the **Dyn Range** up arrow key. To decrease, press the **Dyn Range** down arrow key.
Benefits	Dynamic range is useful for optimizing tissue texture to differentiate between echo levels that are close together. Dynamic range should be adjusted so that the highest amplitude edges appear as white while the lowest levels (such as blood) are just visible.
Values	The settings cycle in 6 dB steps from 30 dB to 72 dB. Dynamic range levels are returned to the preset value when changing Probe, Exam category or New Patient.
Affects on Other Controls	M dynamic range operates only in real-time, not in freeze, Cine, Timeline replay, or VCR playback.
Bioeffects  **Acoustic Output Hazard**	

NOTE: It is not possible to change dynamic range on a frozen image.

Controls (cont'd)

Controls	M Edge Enhance	Gray Scale Map
Description	M Edge enhance brings out subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures. Adjustments to M-Mode's edge enhancement affects the M-Mode timeline only.	Gray scale mapping determines how the echo intensity levels received are presented as shades of gray.
Accessing/ Changing	To Change the M Edge Enhance, press the **Edge Enhc** key repeatedly. From the default value, each press cycles between OFF→LOW→MID→HIGH. The selected value is displayed.	Press the **Map** key to select Gray Scale Map.
Benefits	Edge enhance modifies the M-Mode image by accentuating the interfaces between organs or vessels.	Displays the received echo levels over different ranges of gray levels. For example, a certain gray map may enhance mid level echoes over a wider range of grays verses high or low level echoes. Allows for better differentiation between echo levels through gray levels displayed.
Values	OFF, LOW, MID, or HIGH. Edge enhance status is returned to the preset value when changeing Preset, Exam category, New Patient.	There are 10 selections of gray scale mapping. This is a post-processing function.
Affects on Other Controls	Edge enhance operates in real-time only, not in freeze, Cine, or VCR playback.	

NOTE: The default value of M Edge Enhance can be set in the Probe Parameter 2 Setup.

Controls (cont'd)

Controls	M Rejection	Sweep Speed
Description	Deletes low level echoes.	Sweep speed changes the speed at which the timeline updates across the display.
Accessing/ Changing	To access Rejection, activate the Probe Parameter Setup in the Setup Menu. To change the Rejection, locate the cursor in M Rejection and enter the desired value from 0 to 40 in 2 digit increments.	Press the **Sweep Speed** key to change sweep speed.
Benefits	Higher rejection values will remove weak, low level echoes in a displayed image.	Speed up or slow down the timeline in order to view more or fewer occurrences over a period of time. A fast speed shows less cycles but better transition definition. A slow speed shows more cycles but less definition during transitions.
Values	Off and 2 through 40 in increments of 2. Rejection is a post-processing function.	Low (16 ms/pixel), Mid (8 ms/pixel) and High (4 ms/pixel). Sweep speed is a pre-processing function.
Affects on Other Controls	Rejection functions in real-time, as well as in freeze, or Cine.	If more events are seen, the timeline appears smaller; if less events are seen, the timeline appears larger or more spread out.

NOTE: The default value of Sweep Speed can be set in the Probe Parameter 2 Setup.

NOTE: Time or distance measurements are not allowed across sweep speed changes.

Mixed Mode Display Formats

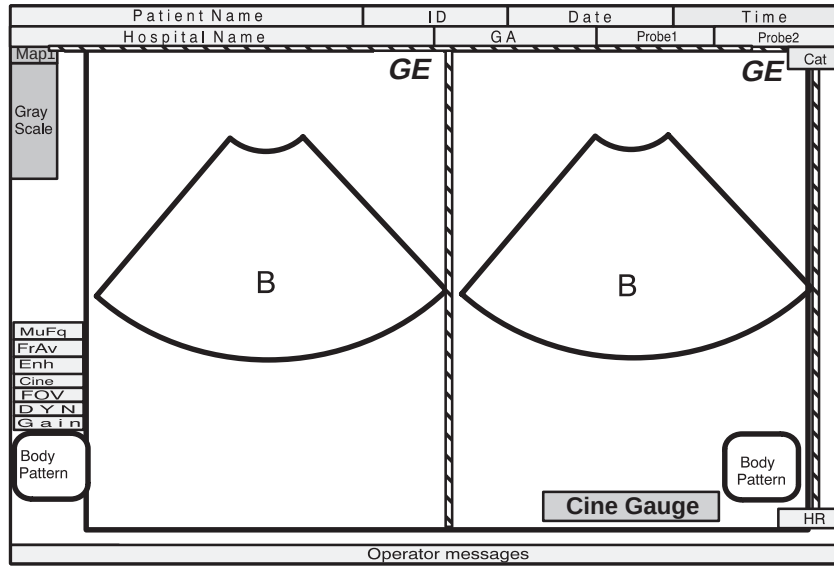


Figure 5–4. Dual B-Mode Display Format

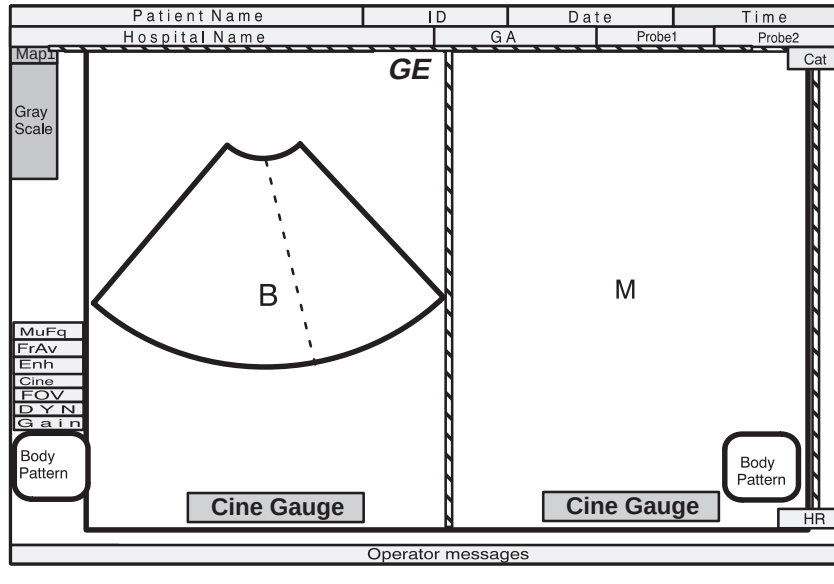


Figure 5–5. M Mode with B-Mode Display Format

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Scanning/ Display Functions

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Zooming an Image

Introduction

Zoom is used to magnify an image. The magnification factor for zoom is fixed at 2.0. The system adjusts all imaging parameters accordingly.

Zooming an Image

To magnify an image, press **Zoom** and move the **Trackball** to Region Of Interest (ROI). The zoomed image will appear unless the displayed format does not allow a zoomed image.

*NOTE: The zoomed image can be moved around the B-Mode image by moving the **Trackball**.*

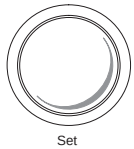
Measurements can be performed on zoomed images.

TGC pots within the zoom are active. Gain is decreased by sliding the pot to the left. Gain is increased by sliding the pot to the right.

Zoom Methods

Zoom is accomplished while scanning live (real-time).

While scanning, press the **Zoom** key to activate the zoom function. The zoom cursor (+) will appear on the image.



Use the **Trackball** to position the ROI. The zoomed image will appear.

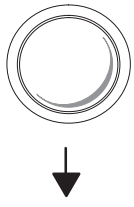
Press **Set** if the user wants to fix the image.

Press **Clear** or **Zoom** to cancel the zoom function.

NOTE: When using the Zoom function in a multiple image display format (dual B-Mode display), only live images can be zoomed.

Zooming an M-Mode Image

Press **Zoom** to display a magnified M-Mode image and a M-Mode zoom marker in the B-Mode image.



Use the up/down movement of the **Trackball** to move the Zoom Markers vertically along the M-Mode cursor.

Use the side to side movement of the **Trackball** to move the M cursor and Zoom cursor throughout the image.

Press **Set** if the user wants to fix the image.

Press **Clear** or **Zoom** to cancel the zoom function.

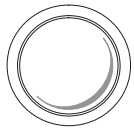
NOTE: In full M-Mode display, the zoom function does not work.

Reference Zoom

Reference Zoom is available when the Zoom Reference menu is set to 1:Yes in the Image Display and Application Setup menu.

Zoom is accomplished while scanning live (real-time) or when the image is frozen.

While scanning, press the **Zoom** key to activate the zoom function. The ROI window will appear on the image.



Use the **Trackball** to position the ROI window. The zoomed image will appear. The Reference zoom is displayed on the lower left or side of the screen.

Press **Clear** or **Zoom** to cancel the zoom function.

Zoom is automatically switched to the reference zoom if depth display is less than 8 cm.

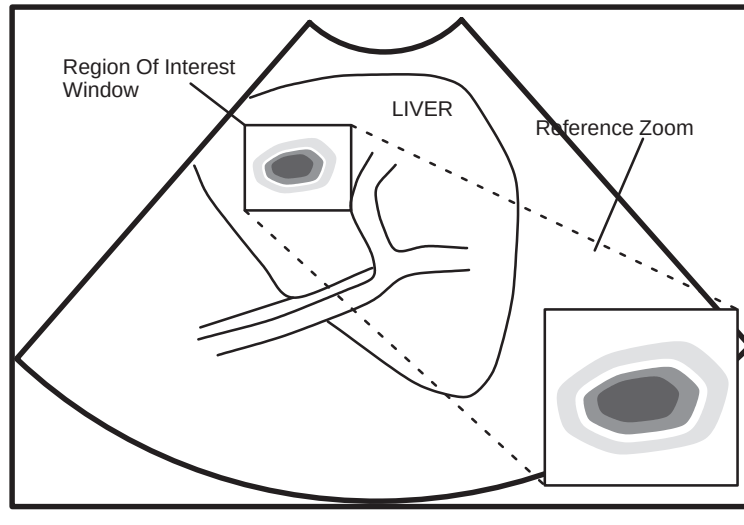


Figure 6–1. Reference Zoom display

Freezing an Image

Introduction

Freezing a real-time image stops all acquisition of information into system memory.

This allows for measurements, annotations, printing or storage into temporary image memory.

To freeze an image:

- Press **Freeze**.

NOTE: If both B- and M-Modes are active, the B-Mode and timeline trace stops immediately. Use the Cine Scroll Control to start CINE review.

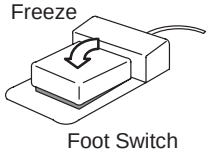
To reactivate the image:

- Press **Freeze** again. Deactivating Freeze restarts the B-Mode and timeline after a black and white bar indicating discontinuity is inserted in the timeline (M-Mode Display).

NOTE: Deactivating Freeze erases all measurements and calculations from the display (but not from the report page).

Selecting a new probe unfreezes the image.

Foot Switch option



Toggle Freeze on and off by pressing the foot switch.

Using Cine

Introduction

Cine is useful for focusing on images during a specific part of the heart cycle or to find an image before the patient moved or breathed.

Cine images are constantly being stored by the system. The standard 6 megabytes of memory stores the most recent data available for manual review via Cine.

Timeline data is continually stored at two times the display width of timeline data (and updates the corresponding B-Mode images).

View Cine images frame by frame via the Cine Scroll Control.

Data in Cine is available until new data is acquired. Cine is stored in the system's memory and can be transferred to image memory, video page printer or multi-image camera.

Cine memory

Cine memory is erased when changing the following:

- Probe
- Scan Mode
- Depth
- Zoom
- Timeline Sweep Speed (M-Modes).

Cine functionality

Post Processing functions can be performed while in Cine such as:

- Measurements and calculations
- Rejection
- Gray Scale Maps
- Edit annotations.

Accessing Cine

To access review Cine:

1. Press **Freeze**.
2. Rotate the **B/M Gain/Cine Scroll** knob to activate Cine.
3. Rotate the **Cine Scroll** dial left (backward) and right (forward) to move through the images in Cine memory.
4. The current frame on the Cine gauge moves and the Cine frame number is displayed on the left side of the screen.

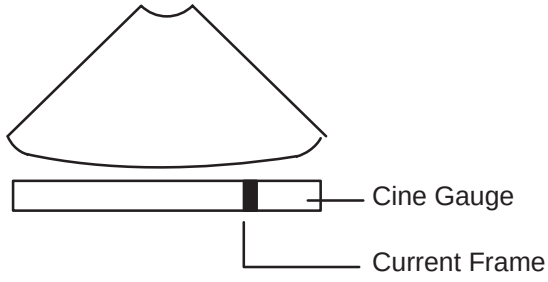


Figure 6–2. Cine Gauge Display

NOTE: Cine frame number 1 is the oldest image. The higher the Cine frame number, the latest the image.

Depth, dynamic range, and gain parameters are valid for Cine frame number one only.

Cine Gauge

Cine gauge graphic display can be set on or off in the Image display Setup.

Exiting Cine

To exit Cine, press **Freeze**.

Annotating an Image

Introduction

The annotation keyboard is active after the **Comment** key is pressed. Upon pressing **Cursor Home**, the underscore cursor appears in the mode's home position. Annotation can commence after using the Trackball to specify where the comment should start.

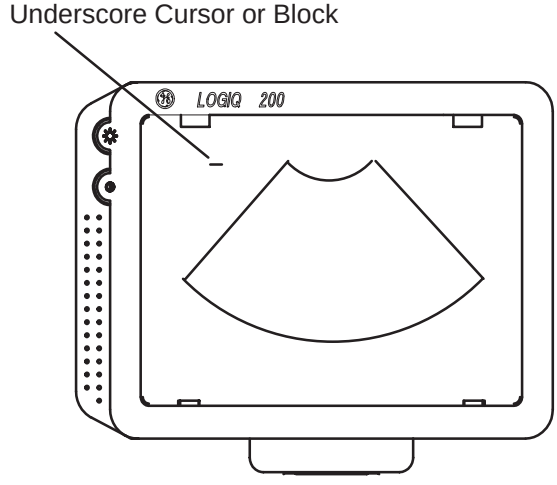


Figure 6–3. Annotation Cursor in Home Position

Annotations are input in type-over, not insert mode. Be careful not to write over text when editing.

All annotations are permanently retained with the image. However, annotations are erased at power down or when **Clear** or **New Patient** are pressed.

In addition, the display's home position can be changed (preferred annotation area) for each display so that all subsequent annotations begin in the same spot.

Introduction (cont'd)

To start the Comment/Annotation function, press the **Comment** key.

Cursor Home: Established in Comment Setup, the cursor returns to the home position.

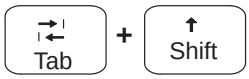
A cursor home position is established for each category by pressing **Ctrl** and **M**.

To delete comments, press **Clear**. Comments will be erased.

The **Trackball** and **Arrow** keys on the keyboard are used to move the cursor during the Comment function.

The **Set** key is used to end the Comment function.

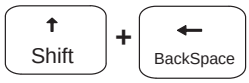
The **Tab** key moves the cursor to the right every eight characters or to the next word, depending on the preset parameter.



Shift and **Tab** moves the cursor in the same manner as **Tab** but to the left.

Return moves the cursor to the next line.

The **Back Space** key deletes the last character.



The **Shift** and **Back Space** keys delete the last word.

Annotation Library

To reduce the amount of time spent annotating an image, store often-used annotations in the Annotation (Comment) Library. These scripts can be up to 20 characters in length. As many as 20 scripts can be saved for each user application preset within each exam category.

Library scripts for each preset are entered in the Comment Setup. See *Customizing Your System* for details.

Entering/Editing the Library

Access the Annotation Library by activating the Comment Setup menu.

Use the **Trackball** or **Arrow** keys to move to the desired Annotation Library location number.

Type the Annotation Library name in the left side of dash (–). Maximum four characters available.

Press **Set** or **Return**. The reversed video will move to right side of dash.

Edit the desired script. The 20 character space for that library location will be in reverse video.

Press **Set** or **Return** to complete the entry.

Select the next library location.

Continue until all edits are complete.

Use the **Trackball** or **Arrow** keys to highlight EXIT and press **Set** or **Return.**

Adding Comments to an Image

To annotate an image:

- Type comments where the cursor is currently located (the display's home position) or use the **Trackball**/**Arrow** keys to place the annotation cursor in the desired location before typing.
- Press **Return** to move to the next line.

NOTE: Annotations wrap to the next line when they are within one character of the right margin.

The word wrap starts one line below the start of that annotation.

Annotations appear on all prints, photos, and VCR recordings.

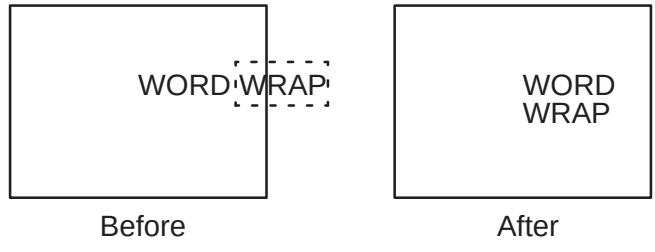


Figure 6–4. Next Line Word Wrap

If the cursor appears at the right edge of the lowest line, or a word cannot be completed in the lower right corner, word wrap cannot be executed.

To annotate an image using the Library:

- Type the four characters as they appear in the library of the Setup Menu.
- Press **Return.**
- The Library script will appear on the monitor.
- The same word wrap principles apply for library scripts as typed comments.

Special Annotation Keys

Some special annotation symbols can be used by activating the Blue Shift or Green Shift keys. Green Shift does not function while Blue Shift is active.

Activating Blue Shift will cause the arrow**,** female and male symbols to be printed on the screen during the comment function when the keys shown in Figure 6–5 are pressed.

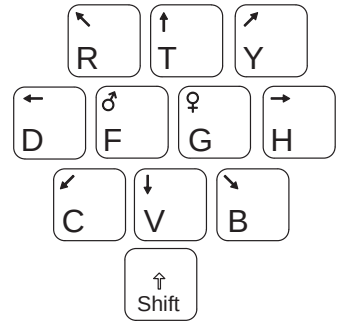


Figure 6–5. Blue Shift Keys

The Green Shift key enables the special symbols shown in green on the keyboard.

- The green symbols shown in the lower right portion of a key will print when the Green Shift is active.
- Green symbols for foreign languages can only be used with the proper designated letters.
- The Green Shift key and green symbols are shown in Figure 6–5.

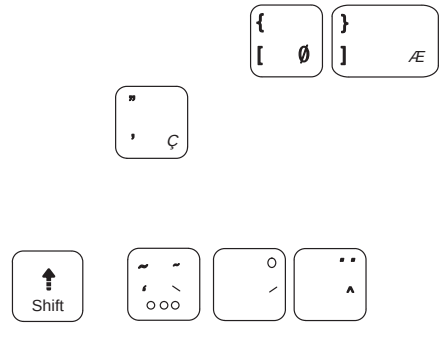


Figure 6–6. Green Shift Keys

Editing Annotations

On screen annotations can be revised. Revisions can be accomplished by adding or deleting text, or completely removing all annotations by pressing **Clear**.

Editing while annotating

Back space over any error(s) made. Blank spaces take the place of the letter(s) that was there. Continue typing the annotation after back spacing over all incorrect letters.

NOTE: Text does not adjust automatically.

To delete previous character(s):

- Press **Back space** as many times as necessary to make the deletion.
- Retype the annotation from the point where back spacing was stopped.
- Position the cursor and type over existing text.

To move through the text eight characters at a time:

- Press **Tab** to move to the right (Preset Keyboard Tab = Normal).
- Press **Shift** and **Tab** to move to the left.

To move through the text a word at a time:

- Press **Tab** to move to the right (Preset Keyboard Tab = Word)
- Press **Shift** and **Tab** to move to the left.

NOTE: The Tab selection is found on page one of the General System Setup.

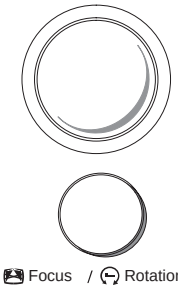
Body Patterns

An additional way to annotate the image display is with body patterns. Body patterns are a simple graphic of a portion of the anatomy that is frequently scanned.

Press the **Body Pattern** key to activate Body Patterns.

A body pattern, generally displayed in the lower left corner of the screen, appears.

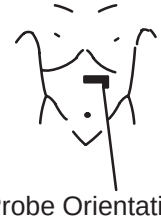
Cycle through the body patterns by pressing the **Body Pattern** key repeatedly.



Focus / Rotation / ECG Gain

A Probe Orientation Marker is used to illustrate the probe position.This marker can be placed with the **Trackball** and rotated with the **Rotation/Focus** control. Press **Set** to complete the body pattern selection.

The body pattern and probe marker can serve as a reference for patient and probe positioning when images are archived.



Probe Orientation Marker

Body Patterns (cont'd)

Body Pattern packages are displayed according to exam category and preset.

Use the arrow keys to select the desired pattern to be displayed. The Body Pattern Setup allows for the choice of displaying the pattern only during freeze or at all times.

Each Body Pattern Package can be customized for each preset in the Body Pattern Setup.

Each body pattern in a Body Pattern Package is assigned to ten alphanumeric keys on the keyboard. Figure 6–7 shows these ten alphanumeric keys.

Figure 6–7 shows the body patterns available to be preset and the order in which they appear in the selection cycle.

Figure 6–7.Alphanumeric Keys used in selecting body pattern

Body Patterns (cont'd)

Figure 6–8 shows the body patterns available to be preset and the order in which they appear in the selection cycle.

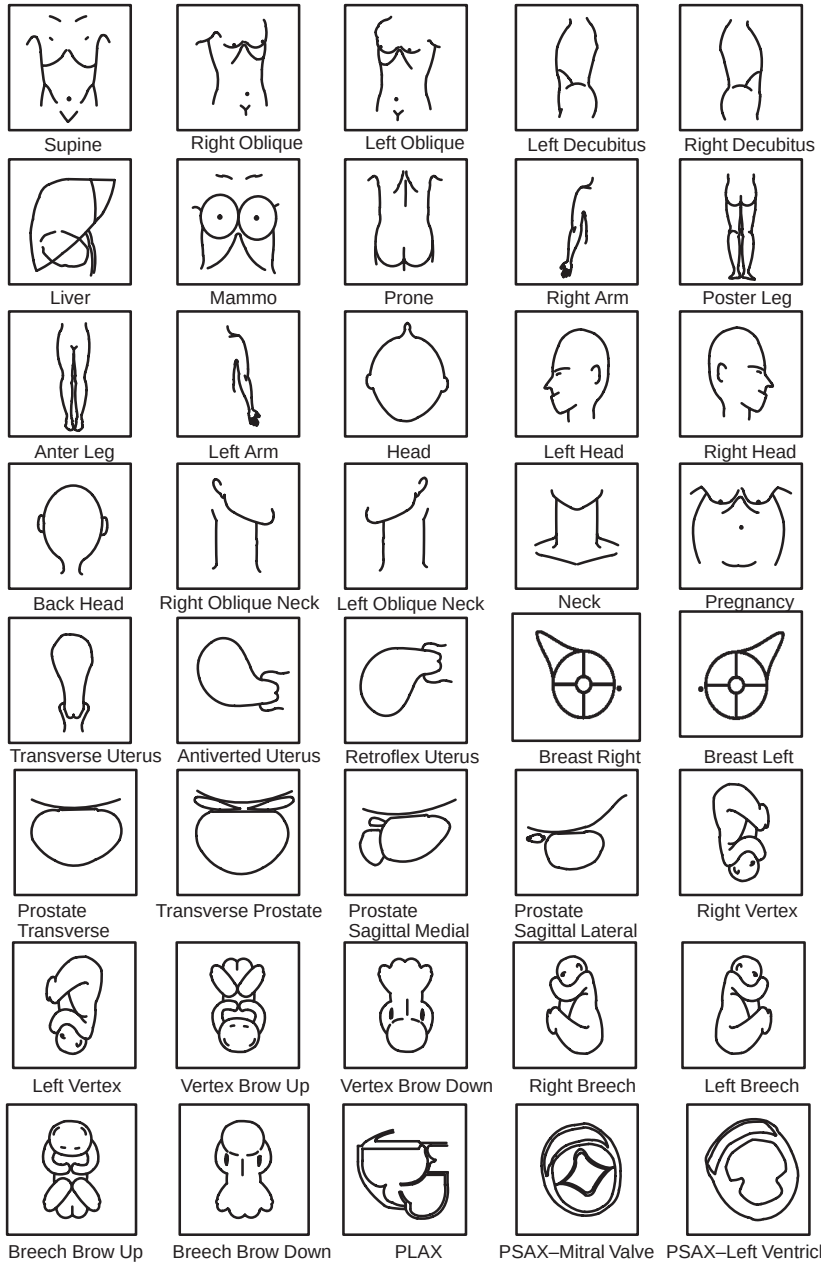


Figure 6–8. Body Patterns

Body Patterns (cont'd)

Figure 6–8. Body Patterns (cont'd)

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Introduction

Overview

Measurements and calculations derived from ultrasound images are intended to supplement other clinical procedures available to the attending physician. The accuracy of measurements is not only determined by system accuracy, but also by the use of proper medical protocols by the user. When appropriate, be sure to note any protocols associated with a particular measurement or calculation. Formulas and databases used within the system software that are associated with specific investigators are so noted. Be sure to refer to the original article describing the investigator's recommended clinical procedures.

General Instructions

Measurements can be made in all modes and image formats, including real-time, freeze and CINE.

Measurement values update on the display until the measurement has been completed. Twenty lines of measurements can be displayed on the screen at one time.

Erasing Measurements

The following actions erase measurements from the system's memory:

- Pressing **Clear** erases all measurements and calculations on the display. Measurements and calculations, however, remain on the report pages.
- Pressing **New Patient** erases all measurements and calculations on the display and clears the report pages.
- Unfreezing the image erases measurements from the display only, not from the report pages.
- Adding a new measurement that exceeds the maximum number of allowable measurements erases the oldest measurement.

Locating measurement controls

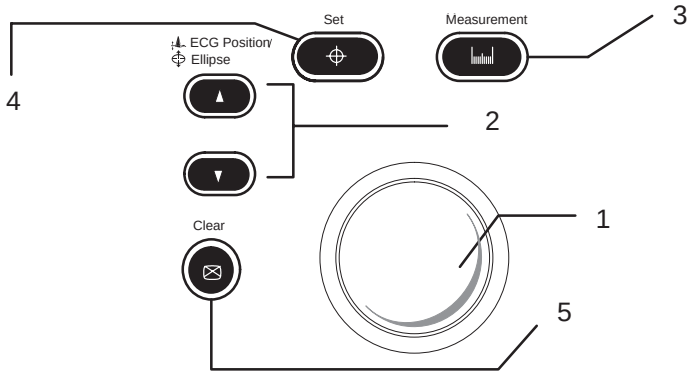


Figure 7–1. Locating Measurement Controls

1. is used to move the measurement cursors
2. Enables ellipse measurements
3. Enables specific measurements
4. Fixes the cursor for measurements or completes the measurement sequence
5. Erases measuring cursor and measurement data from the display. Clears all cursors and measurements from the display

Measurement Key

The following table indicates the types of generic measurements available when the **Measurement** key is pressed and no specific calculation is chosen. The type of measurement depends on the current scan mode and the number of times the **Measurement** key is pressed.

Key Pressed	B Mode	M (with B) Mode
Once	Distance Ellipse Tissue Depth	Tissue Depth (Distance) Depth Difference
Twice	Trace/Circle	Time Interval
Three Times	Gray Scale Echo Level	Time Slope

Table 1. General Measurements by Mode

Cursors

Once the measurement sequence is complete, the cursor symbol changes sequentially to one of the eight shown below.

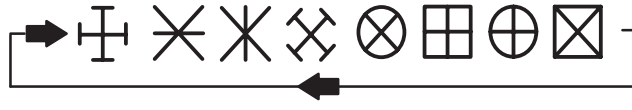
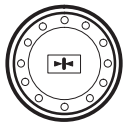


Figure 7–2. Measurement Completed Cursors

B-Mode Measurements

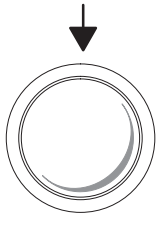
Distance Measurement

Distance Measurements are typically made in the B-Mode portion of the image. To make a distance measurement:

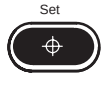


Press **Freeze** to stop image acquisition.

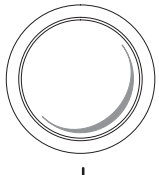
Press the **Measurement** key once to display a "×" cursor on the screen, and to display distance on the bottom part of the screen.



Use the **Trackball** to move the "×" cursor to the measurement start point.



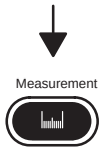
Press **Set** to fix the measurement start point cursor and to display a second cursor.



Use the **Trackball** to move the second "×" cursor to the measurement end point.

(continued)

Distance Measurement (cont'd)



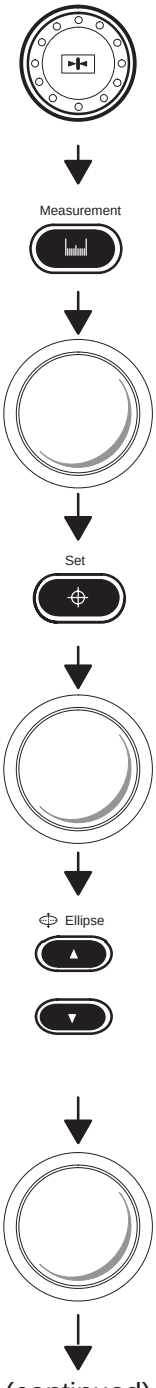
Press **Measurement** to toggle between activating the two cursors for fine adjustment.

*NOTE: Press **Clear** once to erase the second measuring marker and the current data measured and start the measurement again.*

Press **Set** to complete the measurement and fix the Distance value displayed on the bottom part of the screen.

Pressing **Clear** after the sequence is complete erases all data that has been measured to this point, but not data entered on the report pages.

Circumference/Area (Ellipse) Measurement



An ellipse can also be used to measure the circumference and area of an organ. To measure with an ellipse:

Press **Freeze** to stop image acquisition.

Press **Measurement** to set up the measurement mode. The "×" cursor appears on the display.

Use the **Trackball** to move the "×" cursor to either end of the major axis of the area to measure.

Press **Set** to fix the start point cursor.

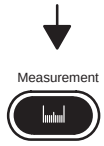
Use the **Trackball** to move the second cursor to the major axis measurement end point.

Press the **Ellipse** up arrow key. An ellipse having an initial circle shape appears.

Use the **Trackball** to position the ellipse, as necessary, and to size the measured axis.

(continued)

Circumference/Area (Ellipse) Measurement (cont'd)



Press the **Measurement** key to toggle the activation of the measurement cursors.

Press the **Ellipse** up arrow key to increase the size of the minor axis.

Press the **Ellipse** down arrow key to decrease the size of the minor axis.

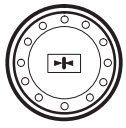
*NOTE: Press **Clear** once to erase the measuring marker and the current data measured.*

Press **Set** to complete the ellipse measurement and record the circumference and area.

Press **Clear** a second time or after the **Set** key has completed the measurement to erase all data that has been measured.

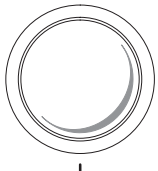
Circumference/Area (Trace) Measurement

To trace the circumference of a portion of the anatomy and calculate its area:



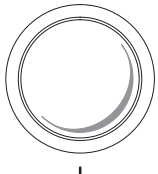
Press **Freeze** to stop image acquisition.

Press **Measurement** twice to display a dot "⊙" cursor on the screen. The display on the bottom of the screen shows the circumference in cm.



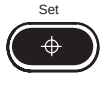
Use the **Trackball** to move the dot "⊙" cursor to the measurement start point.

Press **Set** to change the dot "⊙" cursor to a "×" cursor.



Use the **Trackball** to trace the measurement area. The circumference displayed on the bottom of the screen will change with the tracing.

*NOTE: Press **Clear** to erase the measuring marker and the current data measured and redo the measurement.*



Press **Set** to fix the Circumference value displayed on the bottom of the screen and calculate the area.

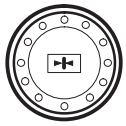
Circumference/Area (Trace) Measurement (cont'd)

Press **Clear** to erase all data that has been measured.

*NOTE: When using the trace method, the **Rotation/Focus** knob can be used to edit the trace line.*

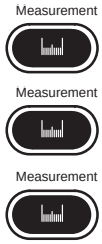
Turn it clockwise or counterclockwise to erase the line (bit by bit) back from its current point.

Echo Level Measurement

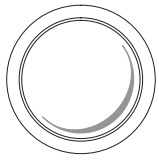


To make an echo level measurement:

Press **Freeze** to stop image acquisition.



Press **Measurement** three times to enable the echo level function. A box "□" cursor appears.



Use the **Trackball** to move the box "□" cursor over the measurement area.

*NOTE: Press **Clear** to erase the measuring marker and the current data measured.*

Press **Set** to fix the Echo value displayed.

Press **Clear** to erase all data that has been measured.

Hints

- The size of the box cursor can be changed by using the Measurement Setup.
- The box is actual size and will appear to get larger or smaller with changes in depth (scale).
- The echo level measurement is only available on a frozen image.

M-Mode Measurements

Overview

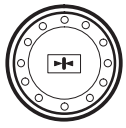
Basic measurements that can be taken in the M-Mode portion of the display are:

- Tissue Depth (Distance), Depth Difference
- Time
- Time Slope (Depth Difference/Time Interval)

Tissue depth

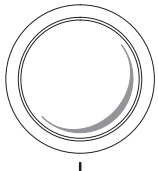
Tissue depth measurement in M-Mode functions the same as the distance measurement in B-Mode. It measures only vertical distance between points.

Scan the patient with a M-Mode timeline displayed.

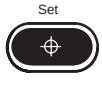


Press **Freeze** to stop image acquisition.

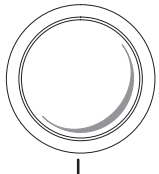
Press **Measurement** once. A "×" cursor with a vertical dotted line appears.



Use the **Trackball** to move the "×" cursor to the most anterior point to be measured.



Press **Set** to fix the start point.



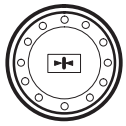
Use the **Trackball** to move the second point to the most posterior point to be measured.

Press **Set** to complete the measurement.

The vertical distance between the two points is displayed at the bottom of the screen.

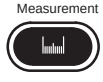
Time

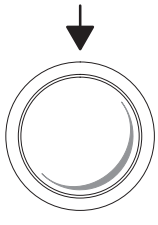
To measure a horizontal time interval:



Press **Freeze** to stop image acquisition.

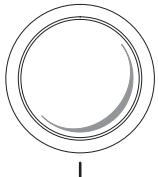
Press **Measurement** twice. A "×" cursor with a vertical dotted line appears when the cursor is in the M-Mode portion of the display.



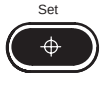


Use the **Trackball** to move the cursor to the measurement start point.

Press **Set** to fix the first cursor.



Use the **Trackball** to move the end cursor to the measurement end point.

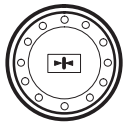


Press **Set** to complete the measurement.

The time interval between the two cursors is displayed at the bottom of the screen.

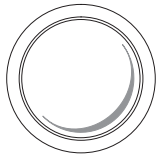
Slope

To measure depth difference:



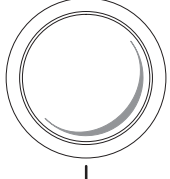
Press **Freeze** to stop image acquisition.

Press **Measurement** three times. With the cursor in the M-Mode timeline area, a "×" cursor with a vertical dotted line is displayed.



Use the **Trackball** to position the measurement start point.

Press **Set** to fix the start point.



Use the **Trackball** to position the measurement end point.

Press **Set** to complete the measurement.

The depth difference, time interval and slope between the two end points is displayed at the bottom of the screen.

Abdomen and Small Parts

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General Calculations

Overview

In each exam category, Calculations menus can be assigned to twenty alphanumeric keys through the Measurement Setup/A/N assignment menu.

Calculation Menu Page

Calculations menus are divided into four pages. Each page is displayed in one calculation menu. These four pages of calculation menus are shown in Figure 8–1.

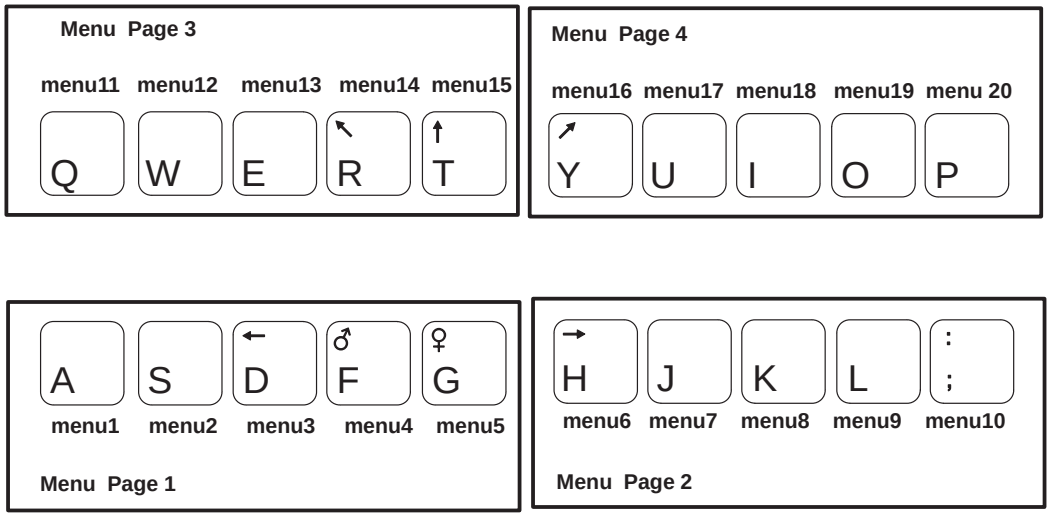


Figure 8–1. Calculations Menu Pages

Calculation Menu Page (cont'd)

The Calculation Menu is invoked by pressing the **Space** left/right keys. Each page is selected by the **Space** left/right keys or **Arrow** up/down keys as shown in Figure 8–2.

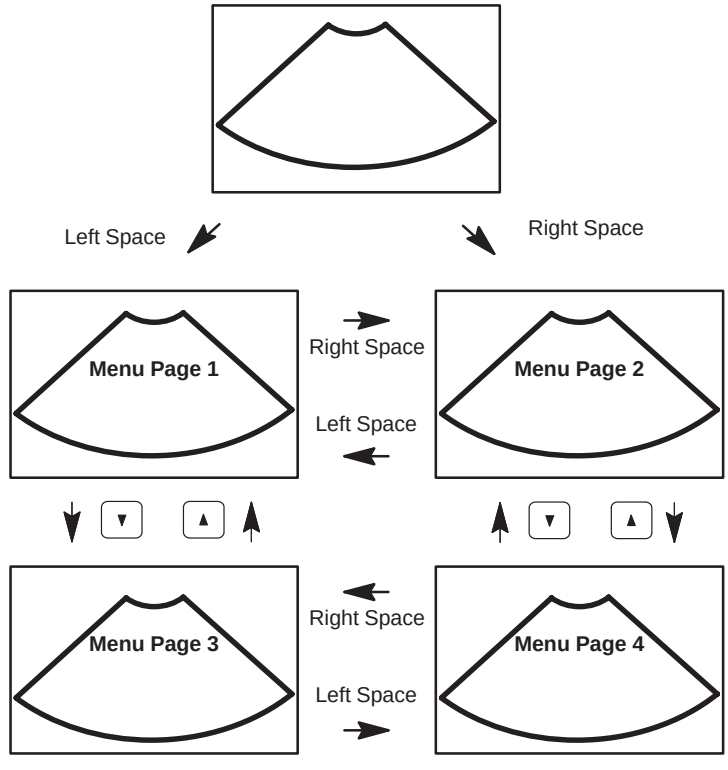


Figure 8–2. Calculations Menu Pages Selection Flow

Calculation Menu Selection

How to select the calculation menu:

1. Press the **Space** left/right keys to display a calculation menu on the monitor. Press the **Space** left/right keys again or press the **Arrow** up/down keys as necessary to display the desired menu page.

   An example of a Calculation menu page is shown in Figure 8–3.

2. Using the **Arrow** left/right keys or the **Trackball**, select the desired calculation menu as shown in Figure 8–3. The selected menu is inverted.

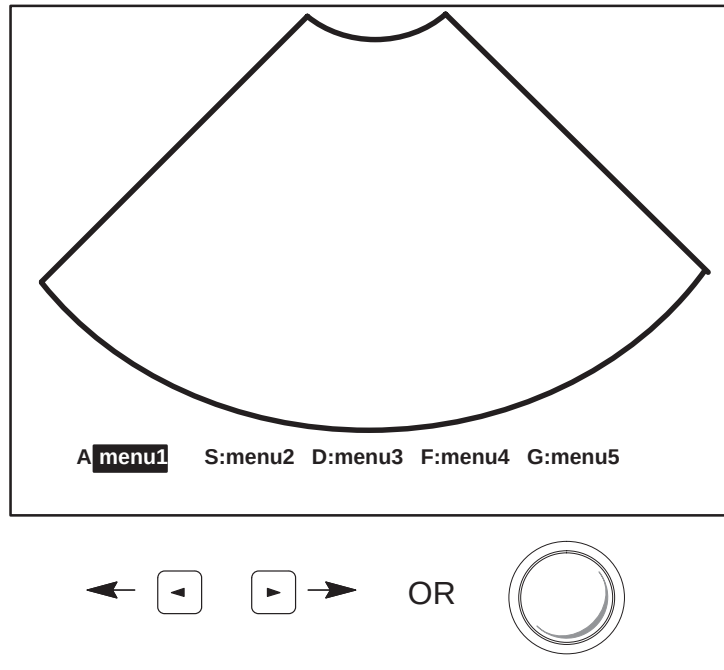


Figure 8–3. Calculation menu selection

3. Press **Set.**

NOTE: It is possible for the operator to directly press an alphanumeric key to access calculation function.

Measuring Volume

The volume calculation can be made from one, two or three distances, from one distance and an ellipse, from a single ellipse or from two ellipse measurements.

General Measurements and Calculations details how to make distance and ellipse measurements.

*IMPORTANT NOTE: When a volume calculation is desired, the necessary measurements or combination of measurements must be made BEFORE selecting **Vol** in the calculation menus.*

Examples

When a volume calculation is desired, do one of the following:

- Make one distance measurement.
- Make two distance measurements.
- Make one ellipse measurement.
- Make three distance measurements.

NOTE: One measurement is usually made in the sagittal plane and two measurements in the axial plane.

- Make one distance and one ellipse measurement.
- Make two ellipse measurements.

Measuring Volume (cont'd)

Formulas used in calculations are found in this section.

Hints

- Volumes are most accurate when measurements are taken in the sagittal and axial scan planes.
- Use the side by side dual format option to display sagittal and axial plane images simultaneously.
- See *General Measurements and Calculations* for details on the steps to take when doing basic distance and ellipse measurements.
- An overflow error message (OOR) will occur during a two ellipse, or one ellipse/one distance volume calculation if: the minor (small) axis of the large ellipse is equal to/less than the major (large) axis of the small ellipse (d1), or equal to/less than the single distance measurement (d2).

Figure 8–4. Volume Calculation Error Possibilities

Volume Calculation Formulas

Calc Name	Input Measurements	Formula
Volume (spherical)	one distance	Vol[ml]=(π/6)xd^3
Volume (prolate spheroidal)	two distances, d1>d2	Vol[ml]= (π/6)xd1xd2^2
Volume (prolate spheroidal)	one ellipse, d1 major axis, d2 minor axis	Vol[ml]= (π/6)xd1xd2^2
Volume (spheroidal)	three distances	Vol[ml]= (π/6)xd1xd2xd3
Volume (spheroidal)	one distance d1, one ellipse, d2 major axis, d3 minor axis	Vol[ml]= (π/6)xd1xd2xd3
Volume (spheroidal)	two ellipse, ellipse 1 with axes d1 and d2, ellipse 2 with axes d3 and d4, with |d2–d3| ≤ |d1–d4| and d2>d3	Vol[ml]= (π/6)xd1xd2xd4 (d3 is not used, assuming it is close to d2)

Table 2. Volume Calculation Formulas

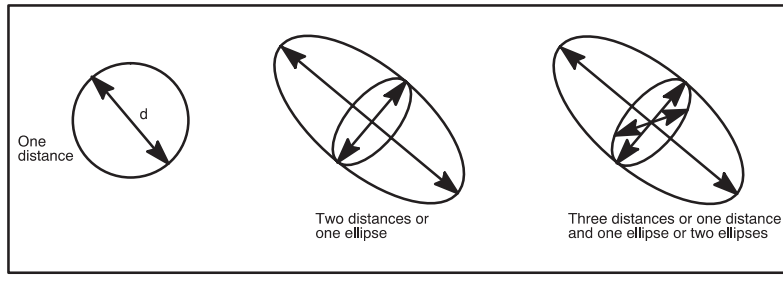


Figure 8–5. Volume Calculation Examples

Measuring Angle

This function is intended to measure the angle between two intersecting planes:

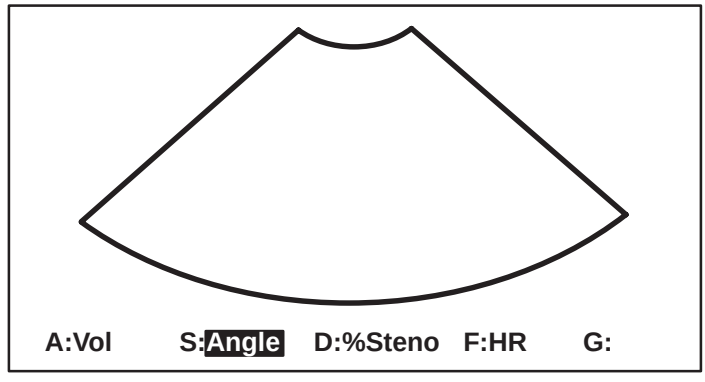
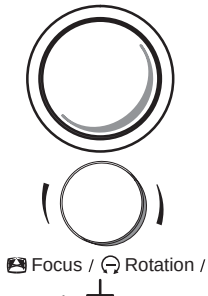
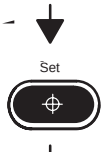


Figure 8–6. Calculations menu (Angle)

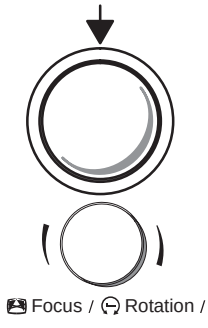
The Angle Calculation Mode is set and a "×" cursor with a vertical dashed line appears. The displayed angle is zero degrees.



Use the **Trackball** to position the line cursor and the **Rotation/Focus** control to adjust the angle of the line cursor.

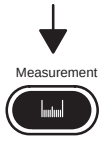


Press **Set** to fix the position of the first cursor.

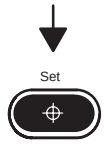


Use the **Trackball** to position the second line cursor and the **Rotation/Focus** control to adjust the angle of the second line cursor. The angle between the two cursors is constantly updated on the display.

Measuring Angle



If a fine adjustment of the two cursors is needed, press **Measurement** to toggle which line cursor is active. Adjust the active cursor with the **Trackball** and **Rotation/Focus** control.

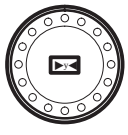


Press **Set** to complete the angle measurement.

Measuring Stenosis Area Ratio (% stenosis)

To calculate percent stenosis in a B-Mode image:

Scan the patient to display a B-Mode image of a blood vessel having a stenosis.



Press **Freeze** to stop image acquisition of a cross sectional view of the vessel.

Press **Measurement** to activate the measurement function.

The area of the blood vessel can be measured by the ellipse, circle or trace method. The Measurement Setup defines the default method.

CAUTION

When using a distance measurement to calculate area for % stenosis, the measurement should always be taken from a cross sectional view of the vessel.

Do NOT take a distance measurement from a longitudinal view for an area calculation. This may lead to an inaccurate assessment of % stenosis.

Ellipse method

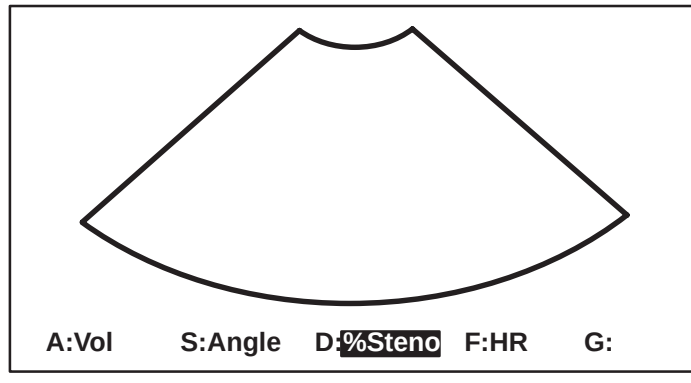
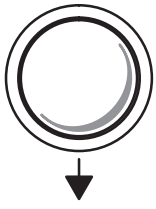


Figure 8–7. Calculations menu (% Steno)

Select **% Steno** in the Calculations menus. Press the **Arrow Up/Down** keys or **Space** left/right keys as necessary to display the menu. Highlight **% Steno** and press **Set**. The % stenosis measurement mode is set and a "×" cursor appears.

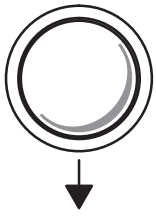
Ellipse method (cont'd)

- *Measurement of the residual area of the blood vessel is first.*



Use the **Trackball** to move the cursor to the start point of the stenosed region.

Press **Set**. The start-point cursor is set and an end-point cursor appears.



Use the **Trackball** to move the end-point cursor to the other end of the long axis of the residual area of the vessel being measured.

Press the **Ellipse** up/down arrow key. A circle is displayed.

Press the **Ellipse** up arrow key to increase the ellipse size.

Press the **Ellipse** down arrow key to decrease the ellipse size.

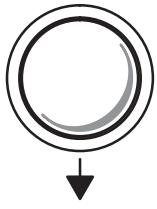
*NOTE: Use the **Measurement** key to toggle activation of the measurement cursors. Use the **Ellipse** arrow keys to adjust the size, if necessary.*

Press **Set**. The calculation of the residual area of the blood vessel (having no stenosis) is complete and the "×" cursor appears again.

(continued)

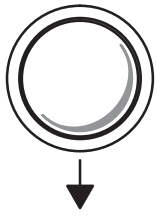
Ellipse method (cont'd)

- *Measurement of the lumen area of the blood vessel is second.*



Use the **Trackball** to move the cursor to the start point on the vessel wall.

Press **Set**. The start-point cursor is set and an end-point cursor appears.



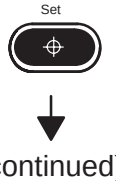
Use the **Trackball** to move the end-point cursor to the other end of the long axis of the vessel being measured.

Press the **Ellipse** up/down arrow key. A circle is displayed.

Press the **Ellipse** up arrow key to increase the ellipse size.

Press the **Ellipse** down arrow key to decrease the ellipse size.

*NOTE: Use the **Measurement** key to toggle activation of the measurement cursors. Use the **Ellipse** arrow keys to adjust the size, if necessary.*



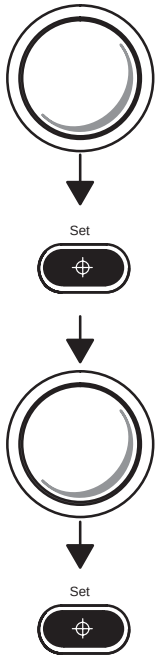
Press **Set** to complete the second ellipse and the % Area Stenosis measurement appears.

(continued)

Trace method

Select **% Steno** from the Calculations menu. Press the **Arrow** up/down keys or **Space** left/right keys as necessary to display the desired menu. Highlight **% Steno** and press **Set**. The % stenosis measurement mode is set and a "⊙" cursor appears.

- *Measurement of the residual area of the blood vessel having no stenosis is first.*



Use the **Trackball** to move the cursor to the start point of the stenosed region.

Press **Set**. The start-point cursor changes to a "×" cursor and is fixed. An end-point ("×") cursor appears.

Use the **Trackball** to trace the residual area.

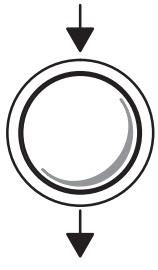
Press **Set**. The trace start-point and end point are connected to each other and the calculation of the residual area of the blood vessel (having no stenosis) is complete. At the same time, an "⊙" cursor appears.

Trace method (cont'd)

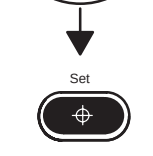
- *Measurement of the lumen area of the blood vessel is second.*

Use the **Trackball** to move the cursor to the start point on the vessel wall.

Press **Set**. The start-point cursor changes to a "×" cursor and is fixed. An end-point ("×") cursor appears.



Use the **Trackball** to trace the vessel wall.



Press **Set**. The trace start-point and end point are connected and the measurement of the lumen area of the vessel is complete.

The % Area Stenosis is displayed.

Echo Level Histogram

Fixed Area

To calculate Echo Level Histogram in a Fixed Area:

Make an Echo Level Measurement in B-Mode.

Select **Histogram** from the Calculation menu. Press the **Arrow** up/down keys or **Space** left/right keys as necessary to display the desired menu. Highlight **Histogram** and press **Set**.

The Echo Level Histogram will appear as shown in Figure 8–8.

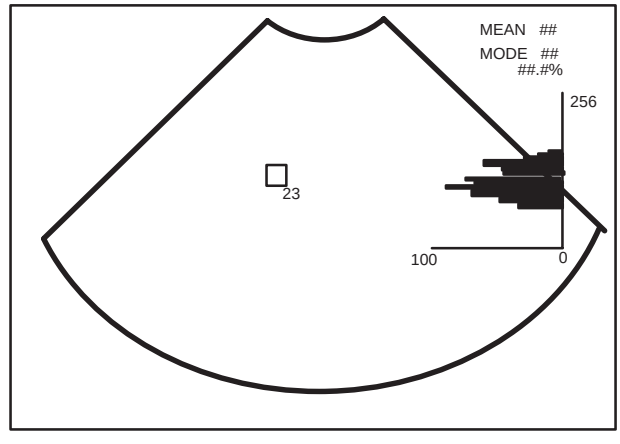


Figure 8–8. Echo Level Histogram

Arbitrary Area

To calculate Echo Level Histogram in a Arbitrary Area:

Make a Circumference/Area Measurement in B-Mode.

Select **Histogram** from the Calculation menu. Press the **Arrow** up/down keys or **Space** left/right keys as necessary to display the desired menu. Highlight **Histogram** and press **Set**.

The Echo Level Histogram will appear as shown in Figure 8–9.

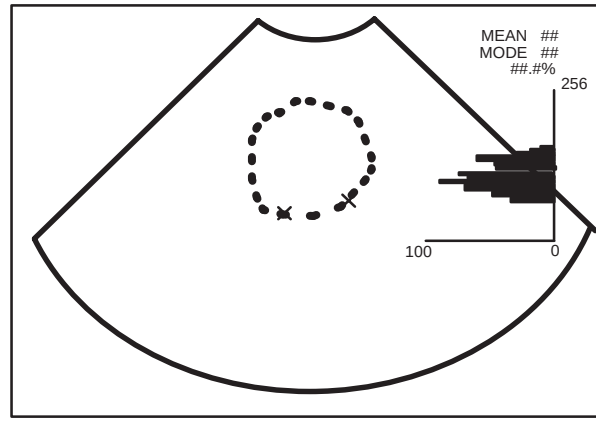
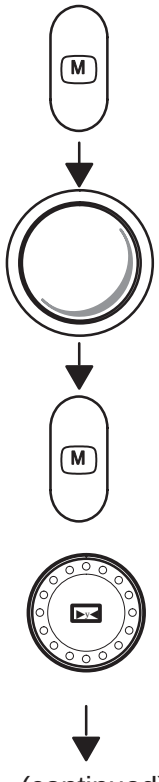


Figure 8–9. Echo Level Histogram

Measuring heart rate (HR)



The heart rate is taken in M-Mode.

To measure the heart rate:

Scan to display a B-Mode image of the heart.

Press **M-Mode**. The M-Mode cursor appears in the B-Image.

Use the **Trackball** to position the M-Mode cursor over the B-Mode image of the heart.

Press **M-Mode** a second time. The M-Mode timeline appears on the left side of the screen (or as designated by the Image Display Setup).

Press **Freeze** to stop image acquisition.

Select **HR** from the Calculation menu. Press the **Arrow** up/down keys or **Space** left/right keys as necessary to display the desired menu. Highlight **HR** and press **Set**. The HR measurement mode is set and a "×" cursor appears.

(continued)

Measuring heart rate (HR) (cont'd)

Use the **Trackball** to move the cursor to a point on the M-Mode waveform where it is desired to start the Heart Rate measurement.

Press **Set** to fix the start-point cursor. An end-point cursor appears.

Use the **Trackball** to move the end-point cursor to the same point on the M-Mode waveform two heartbeats from the measurement start point. See Figure 8–10.

Press **Set** to complete the measurement.

The heart rate appears on the display and is also recorded on the report page.

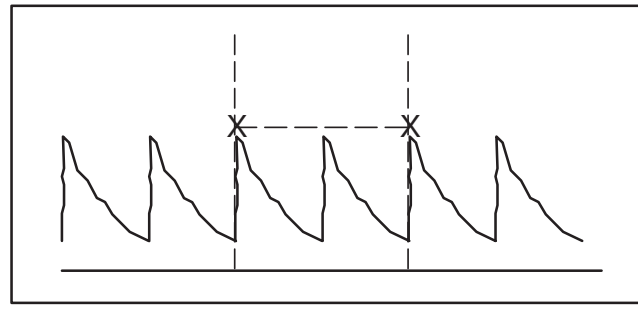


Figure 8–10. Two Heart Beat Reference

Helpful hints

Hints

The following hints can help when taking a measurement:

- If **Record** is pressed while making a measurement, the system completes the measurement and sends the data to the report page (unless the VCR is assigned to the **Record** key).
- Prior to making measurements, use the Cine function, if necessary, to display the best image.
- Measurements can continue to be made until all measurement/calculation cells are filled. The cells are displayed at the bottom center of the display.
- Once all measurement/calculation cells are filled on the display, any further measurements will cause the top (first) cell to be erased and the new measurement added last ("first in, first out").

General Calculation Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
% Stenosis	Area Stenosis Ratio	two areas (by ellipse, trace, circle, 2 distance or Diameter)	% Stenosis = $[1–(A_{residual}/A_{lumen})] \times 100$
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120[sec]/ 2beat time[sec]

Table 3. General Calculation Formulas

HIP Dysplasia (HIP)

The HIP calculation assists in assessing the development of the infant hip. In this calculation three straight lines are superimposed on the image and aligned with the anatomical features. The two angles are computed, displayed and can be used by the physician in making a diagnosis.

The three lines are (Source: R GRAF, journal of Pediatric Orthopedics, 4: 735–740 (1984)).

- The inclination line connects the osseous convexity to the labrum acetabulare.
- The Acetabulum roof line connects the lower edge of the osileum to the osseous convexity.
- The Baseline connects the osseous acetabulum convexity to the point where the joint capsule and the perichondrium unite with the iliac bone.

The Angle $\propto$ (Alpha) is the supplement of the angle between 1 and 3. It characterizes the osseous convexity. The angle β (Beta) is the angle between lines 1 and 2. It characterizes the bone supplementing additional roofing by the cartilaginous convexity.

NOTE: Choose the type of Hip Orientation method to be used for scanning the infant hip in the Measurement Setup.

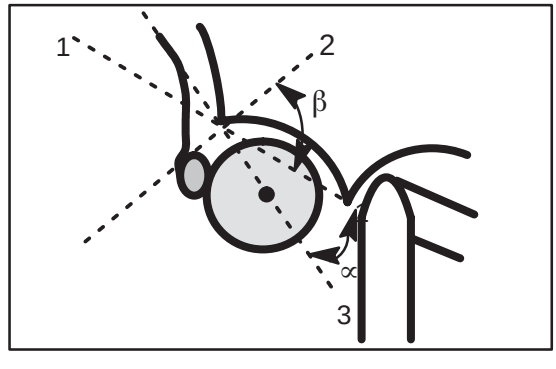
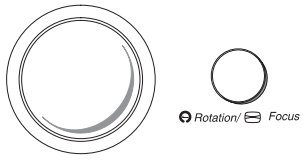


Figure 8–11. HIP Dysplasia

Hip Dysplasia (HIP) (cont'd)

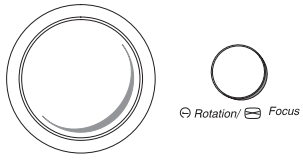
Press the assigned HIP key to start HIP measurement. The HIP key can be assigned in the A/N assignment menu. To assign HIP key, select the *undefined –General–HIP* in the A/N assignment menu.

Display line #1 appears on the screen.



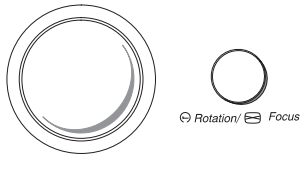
Use the **Trackball** and **Focus/Rotation** knob to position the line #1 as the baseline.

Press **Set**, display line #2 appears on the screen. The Greek letter beta (β) appears halfway between lines 1 & 2 and the angle is 55° by default.The angle change is displayed using Rotation/focus knob.

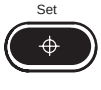


Use the **Trackball** and **Focus/Rotation** knob to position the line #2.

Press **Set**, display line #3 appears on the screen. The Greek letter alpha (α) appears halfway between lines 1 and 3 and the angle is 60° by default. In the Calculation Result Area, the results of angles ∝ and β appear.



Use the **Trackball** and **Focus/Rotation** knob to position line #3.



Press **Set** to fix line #3 if the results are satisfactory. Repeat the procedure if the results are not satisfactory.

Press **Measurement**, Display line #1 appears again.
Press **Clear** to repeat or finish. Press the HIP key to start HIP measurement.

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OB/GYN

(OB software)

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Exam Preparation

Overview

Prior to an ultrasound examination, the patient should be informed of the clinical indication, specific benefits, potential risks, and alternatives, if any. In addition, if the patient requests information about the exposure time and intensity, it should be provided. Patient access to educational materials regarding ultrasound is strongly encouraged to supplement the information communicated directly to the patient. Furthermore, these examinations should be conducted in a manner and take place in a setting which assures patient dignity and privacy.

- Prior material knowledge and approval of the presence of nonessential personnel with the number of such personnel kept to a minimum.
- An intent to share with the parents, either during the examination or shortly thereafter, the information derived.
- An offer of choice about viewing the fetus.
- An offer of choice about learning the sex of the fetus, if such information becomes available.

Ultrasound examinations performed solely to satisfy the family's desire to know the fetal sex, to view the fetus or to obtain a picture of the fetus should be discouraged.

OB Measurements and Formulas

Introduction

Measurements and calculations derived from ultrasound images are intended to supplement other clinical procedures available to the attending physician. When appropriate, be sure to note any protocols associated with a particular measurement or calculation. Formulas and databases used within the system software that are associated with specific investigators are so noted. Be sure to refer to the original article describing the investigator's recommended clinical procedures.

If obstetrics was selected as the exam category on the Patient Entry Menu, the OB calculation menu appears on the monitor when the **Space** left/right key is pressed or an alphanumeric factory default direct key is pressed directly. The factory default direct keys are shown in Figure 9–1 through Figure 9–4.

OB Format Selection

Four types of OB measurements and report pages can be edited from the Measurement Setup/Report Format menu.

The user may choose to measure and report items based on Tokyo University, Osaka University, USA or European methods.

OB Measurement Menus and Formulas

The factory default direct keys are shown in Figure 9–1 through Figure 9–4. The user should be familiar with how to do basic distance and circumference measurements, as described in the chapter7 of this manual.

Tokyo University Method

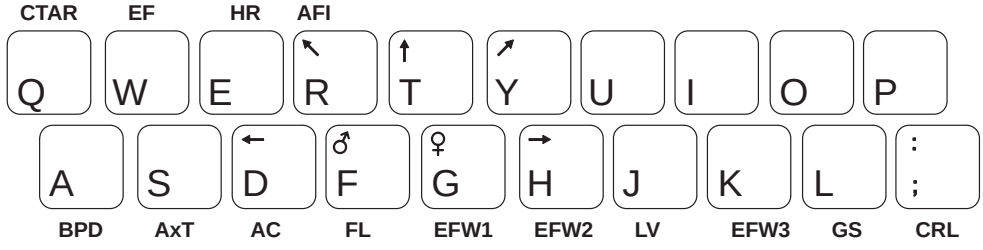


Figure 9–1. Tokyo University Calculation Direct Keys

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
HR	Heart Rate (beats/minute)	one 2 beat time (Measured manually or automatically)	HR[BPM]= 120[sec]/ 2beat time[sec]	n/a
GS	Gestational Sac	one distance	Curve data is available in Chapter 17	Tokyo University Method 1986, 6 by Univ. of Tokyo
CRL	Crown Rump Length	one distance		
FL	Femur Length	one distance		
BPD	Biparietal Diameter	one distance		
LV	Length of Vertebra	one distance		
APTD	Antero posterior Trunk Diameter	one distance	APTD = input	
TTD	Transverse Trunk Diameter	one distance	TTD = input	
EFBW	Estimated Fetal Body Weight	Average of BPD, Average of APTD, Average of TTD and Average of FL	EFBW = 1.07 x BPD^ 3 +3.42 x APTD x TTD x FL	
CTAR	Cardio–Thoracic Area Ratio	four distances or two areas	CTAR = (d1 x d2) / (d3 x d4) x 100 or a1 / a2 x 100	Y.Chiba Fetal Diagn Ther 1990 : 5 : 175 – 188
EF	Ejection Fraction	two distances on M-Mode (End–diastolic dimension and End–systolic dimension on M-Mode)	EF = (1 – Ds^3 / Dd^3)	n/a

Table 9–1. OB Calculation Formulas—Tokyo University

Tokyo University Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
BPD	Biperietal Diameter	one distance	mean(mm)=3.849xGx10^–1+ 1.062xG^2x10–3–0.37xG^3x 10^–5–18.30±SD(mm)= 0.796xGx10^–2+1.73 G=[day]	Tokyo Shinozuka Method 1996
APTD x TTD (AxT)	Antero posterior Trunk Diameter Transverse Trunk Diameter	two distance	mean(cm^2)=3.612xGx10^–1+ 3.022xG^2x10^–3–0.9234xG^ 4x10^–8+14.29±SD($cm^{2)}$=0.1 51xG^2x10^–3+0.58 G=[day]	
AC	Abdominal Circum–ference	circumference by trace, ellipse, circumference	mean(cm)=1.187xGx10^–1+ 0.245xG^2x10^–3–0.07xG^3x 10^–5–4.96±SD($cm^{)}$=0.068x Gx10^–1–0.19 G=[day]	
FL	Femur Length	one distance	mean(mm)=2.512 xGx10^–1+0.985xG^2x10^–3– 0.028xG^3x10^–4–16.42 ±SD($mm^{)}$=4.8 15xGx10^–3+2.1 G=[day]	
CRL	Crown Rump Length	one distance	mean(mm)=–0.4918xG+0.012 20xG^2+2.70 ±SD($mm^{)}$=0.01536xG–5.78 G=[day]	
EFW #1	Estimated Fetal Weight	Four distance	EFW1(gram)=1.07xBPD^3+3. 42xAPTDxTTDxFL G=(day); BPD=(cm) FL=(cm); APTDxTTD=(cm^2)	
EFW #2	Estimated Fetal Weight	2 distance and circumference	EFW2(gram)=1.07xBPD^3+0. 30xAC^2xFL G=(day); BPD=(cm) AC=(cm); FL=(cm)	
EFW #3	Estimated Fetal Weight	Four distance	EFW3(gram)=1.07xBPD^3+2. 91xAPTDxTTDxLV G=(day); BPD=(cm) LV=(cm); APTDxTTD=(cm^2)	
AFI	Amniotic Fluid Index	four distances	AFI=AFI1(distance)+AFI2(dis-tance)+AFI3(dis-tance)+AFI4(distance)	Dr. Rutherford/Dr. Phelan, OB/GYN Volume 70, No. 3, Part 1, p. 353–6, Sept. 1987.

Table 9–2 OB Calculation Formulas—Tokyo University (cont'd)

Osaka University Method

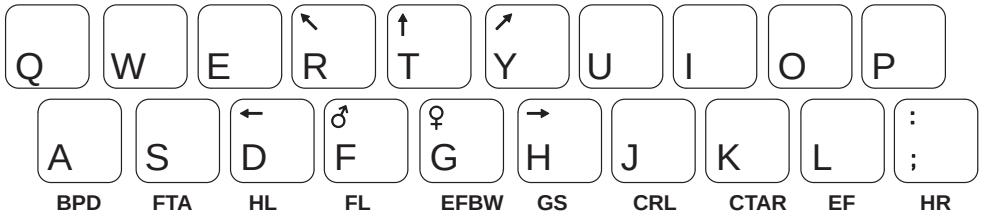


Figure 9–2. Osaka University Calculation Direct Keys

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
HR	Heart Rate (beats/minute)	one 2 beat time (Measured manually or automatically)	HR[BPM]=120[sec]/ 2beat time[sec]	n/a
CRL	Crown Rump Length	one distance	Curve data is available in Chapter 17	Osaka University Method 1989, 3 by Univ. of Osaka
FL	Femur Length	one distance		
BPD	Biparietal Diameter	one distance		
HL	Humerus Length	one distance		
FTA	Fetal Trunk Cross Sectional Area	one area	APTD = input	
EFBW	Estimated Fetal Body Weight	Average of BPD, Average of FTA and Average of FL	EFBW=1.25647x BPD^3+3.50655 x FTA x FL+6.3 (<5000g) IUGR=1.229 x BPD^3+3.063 x FTA x FL–24.6 Curve data is available in Chapter 17	
CTAR	Cardio–Thoracic Area Ratio	four distances or two areas	CTAR = (d1 x d2) / (d3 x d4) x 100 or a1 / a2 x 100	Y.Chiba Fetal Diagn Ther 1990 : 5 : 175 – 188
EF	Ejection Fraction	two distances on M-Mode (End-diastolic dimension and End-systolic dimension on M-Mode)	EF = (1 – Ds^3 / Dd^3)	n/a
AFI	Amniotic Fluid Index	four distances	AFI=AFI1(distance)+AFI2(distance)+AFI3(distance)+AFI4(distance)	Dr. Rutherford/Dr. Phelan, OB/GYN Volume 70, No. 3, Part 1, p. 353–6, Sept. 1987.

Table 9–3. OB Calculation Formulas—Osaka University

USA Method

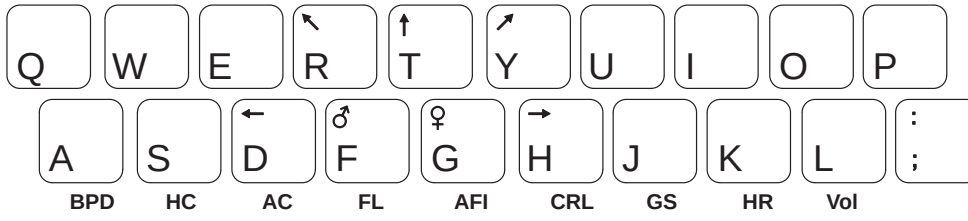


Figure 9–3. USA Calculation Direct Keys

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
HR	Heart Rate (beats/minute)	one 2 beat time (Measured manually or automatically)	HR[BPM]= 120[sec]/2 beat time[sec]	n/a
GS	Gestational Sac	three distances	GS=((d1+d2+d3)/3+2.543) /0.702	Hellman, A/OG, 103: 789,1969
CRL	Crown Rump Length	one distance	CRL=1.684969+ 0.315646xd1+ 0.049306xd1^2+ 0.004057xd1^3+ 0.000120456xd1^4	Hadlock, Radiology, 182:501, 1992
FL	Femur Length	one distance	FL=–3.91+0.427x (GA)–0.0034x(GA)^2	Hadlock, Radiology, 1984 152:497–501
AFI	Amniotic Fluid Index	four distances	AFI=AFI1(distance)+AFI2(distance)+AFI3(distance)+AFI4(distance)	Dr. Rutherford/ Dr. Phelan, OB/ GYN Volume 70, No. 3, Part 1, p. 353–6, Sept. 1987.

Table 9–4. OB Calculation Formulas Part 1—USA Version

USA Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
BPD	Biparietal Diameter	one distance	BPD=–3.08+0.41x (GA)–0.000061x (GA)^3	Hadlock, Radiology, 1984 152:497–501
AC	Abdominal Circumference	circumference by trace, ellipse, circle or two distances	AC=–13.3+1.61x(GA) –0.00998x(GA)^2	Hadlock, Radiology, 1984 152:497–501
HC	Head Circumference	circumference by trace, ellipse, circle or two distances	HC=–11.48+1.56x (GA)–0.0002548x (GA)^3	Hadlock, Radiology, 1984 152:497–501
EFW #1	Estimated Fetal Weight	Average of BPD and Average of AC	EFW[g]=10^(1.304+(0 .05281*AC[cm])+(0.1 938*FL[cm])) SD[g]=0.16*EFW[g]	Hadlock, Radiology, 1984 152:497–501
EFW #2	Estimated Fetal Weight	Average of FL and Average of AC	EFW=10^(1.304+ (0.05281xAC)+ (0.1938xFL)– (0.004xACxFL))	Hadlock-Radiology 150:535, 1984
EFW #3	Estimated Fetal Weight	Average of BPD, Average of AC and Average of FL	EFW=10^(1.335–(0.0 034xACxFL)+ (0.0316xBPD)+ (0.0457xAC)+ (0.1623xFL))	Hadlock, AJOG, 151:333, 1985
EFW #4	Estimated Fetal Weight	Average of FL, Average of AC and Average of HC	EFW=10^(1.326–(0.0 0326xACxFL)+ (0.0107xHC)+ (0.0438xAC)+ (0.158xFL))	Hadlock, AJOG, 151:333, 1985
EFW #5	Estimated Fetal Weight	Average of FL, Average of AC, Average of HC and Average of BPD	EFW=10^(1.3596–(0. 00386xACxFL)+(0.00 64xHC)+ 0.00061xBPDxAC)+ (0.0424xAC)+ (0.174xFL))	Hadlock, AJOG, 151:333, 1985

Table 9–5. OB Calculation Formulas Part 1—USA Version

USA Method (cont'd)

Calc Mnemonic	Calc Name	Formula	Author Reference
CUA	Composite Ultrasound Age	1. CUA=10.85+0.060(HC)(FL)+ 0.670(BPD)+0.1680(AC) 2. CUA=10.58+0.005(HC)^2+0.3635(AC)+ 0.02894(BPD)(AC) 3. CUA=10.33+0.031(HC)(FL)+ 0.361(HC)+0.0298(AC)(FL) 4. CUA=11.38+0.07(HC)(FL)+0.98(BPD) 5. CUA=10.61+0.175(BPD)(FL)+ 0.297(AC)+0.71(FL) 6. CUA=10.47+0.442(AC)+0.314(FL)^2– 0.0121(FL)^3 7. CUA=11.19+0.07(HC)(FL)+0.263(HC) 8. CUA=10.31+0.012(HC)^2+0.385(AC) 9. CUA=10.5+0.197(BPD)(FL)+0.95(FL)+ 0.73(BPD) 10. CUA=10.32+0.009(HC)^2+1.32(BPD)+ 0.00012(HC)^3 11. CUA=9.57+0.524(AC)+0.122(BPD)^2 12. CUA=10.4+2.256(FL)+0.195(FL)^2 13. CUA=6.8954+2.6345(BPD)+0.008771 (BPD)^3 14. CUA=7.61+0.7645(AC)+0.00393(AC)^2 15. CUA=8.8+0.55(HC)+0.00028(HC)^3	"Sonographic Estimation of Fetal Age and Weight", Hadlock, Radiology Clinics of North America, 1990.
FL/AC	FL/AC ratio	FL/AC	Hadlock, AJR 141:979, 1983
FL/HC	FL/HC ratio	FL/HC	Hadlock, JUM 3:439, 1984
FL/BPD	FL/BPD ratio	FL/BPD	Hadlock, AJOG 141:759, 1987
CI	Cephalic Index	BPD/OFD =short distance of HC/long distance of HC	Hadlock, AJR 137:83, 1981
HC/AC	HC/AC ratio	HC/AC	Campbell, BRJ.OG 84:165,1977

Table 9–6. OB Calculation Formulas Part 1—USA Version

European Method

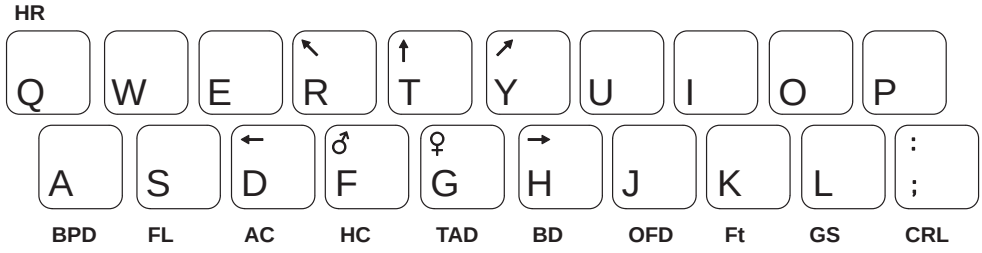


Figure 9–4. European Calculation Direct Keys

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
HR	Heart Rate (beats/minute)	one 2 beat time (Measured manually or automatically)	HR[BPM]= 120[sec]/ 2beat time[sec]	n/a
GS	Gestational Sac	one distance	Curve data is available in Chapter 17	Tokyo University Method 1986, 6 by Univ. of Tokyo
CRL	Crown Rump Length	one distance		JEANTY : Radiology, 143 : 513, 1982
BPD	Biparietal Diameter	one distance		
HC	Head Circum–ference	circumference by trace, ellipse, circle or two distances		
AC	Abdominal Circum–ference	circumference by trace, ellipse, circle or two distances		
FL	Femur Length	one distance		
BD	Binocular Distance	one distance		
BPD	Biparietal Diameter	one distance		CAMPBELL : King's College Hosp. London (Am.J. obst gynecol). Oct. 1, 1982
FL	Femur Length	one distance		
BD	Binocular Distance	one distance		
GS	Gestational Sac	one distance	Curve data is available in Chapter 17	HANSMANN: Ultraschallidiagnostik in Geburtschilfe und Gynakologie 1985
CRL	Crown Rump Length	one distance		

Table 9–7. OB Calculation Formulas—European Version

European Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
BPD	Biparietal Diameter	one distance	Curve data is available in Chapter 17	HANSMANN: Ultraschallidiagnostik in Geburtschilfe und Gynakologie 1985
HC	Head Circum–ference	circumference by trace, ellipse, circle or two distances		
AC	Abdominal Circum–ference	circumference by trace, ellipse, circle or two distances		
FL	Femur Length	one distance		
TAD	Transverse Abdominal Diameter	one distance		
OFD	Occipito Frontal Diameter	one distance		
CRL	Crown Rump Length	one distance	Curve data is available in Chapter 17	ROBINSON : Robinson and Al : BrJGynecol, 82 : 702, 1975
CRL	Crown Rump Length	one distance	Curve data is available in Chapter 17	Paris
BPD	Biparietal Diameter			
TAD	Transverse Abdominal Diameter	one distance	Curve data is available in Chapter 17	Paris
BD	Binocular Distance			
FL	Femur Length			
Ft	Foot Distance			
BPD	Biparietal Diameter	one distance		SOSTOA : Hospital de la Santa Cruz y San Pablo, servicio de obst. y gin.
HC	Head Circum–ference	circumference by trace, ellipse, circle or two distances	Curve data is available in Chapter 17	SOSTOA : Hospital de la Santa Cruz y San Pablo, servicio de obst. y gin.
AC	Abdominal Circum–ference	circumference by trace, ellipse, circle or two distances		

Table 9–8. OB Calculation Formulas—European Version

European Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
FL	Femur Length	one distance	Curve data is available in Chapter 17	SOSTOA : Hospital de la Santa Cruz y San Pablo, servicio de obst. y gin.
BD	Binocular Distance	one distance		
OFD	Occipito Frontal Diameter	one distance		
FL	Femur Length	one distance		Hadlock, AJR, 138 : 875, 1982
BPD	Biparietal Diameter	one distance	Curve data is available in Chapter 17	Hadlock, JUM, 1 : 97, 1982
AC	Abdominal Circum–ference	circumference by trace, ellipse, circle or two distances		Hadlock, AJR, 139 : 367, 1982
HC	Head Circum–ference	circumference by trace, ellipse, circle or two distances		Hadlock, AJR, 138 : 649, 1982
CRL	Crown Rump Length	one distance		NELSON
BPD	Biparietal Diameter	one distance		KURTZ
BD	Binocular Distance	one distance		BERKOWITZ
TAD	Transverse Abdominal Diameter	one distance		ERIKSEN
EFW	Estimated Fetal Weight	Average of BPD and Average of AC [cm]	EFW[g] = 10 ^ (1.7288 + 0.09184xBPD + (0.02581x AC) + (0.00011xBPDxAC))	Shepard/ Warsoff

Table 9–9 OB Calculation Formulas—European Version (cont'd)

European Method (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula	Author Reference
EFW	Estimated Fetal Weight	Average of BPD and Average of TAD [mm]	EFW[kg] = 0.515263 – (0.105775xBPD)) + (0.000930707x (BPD)^2) + (0.0649145xTAD) – (0.00020562x (TAD)^2)	German
		Average of BPD and Average of AC [cm]	EFW [g] = 10 ^ (3–1.7492 + 0.046xAC + 0.166xBPD – 0.002646xACxBPD)	Shepard : Richards/ Berkowitz
		Average of FL, Average of AC and Average of HC [cm]	EFW [g] = 10 ^ (1.5662 – (0.0108xHC) + (0.0468xAC) + (0.171xFL) + (0.00034x(HC)^2) – (0.003685xACxFL))	Hadlock, Radiology, 150 : 535, 1984
FL/AC	FL/AC ratio	Average of FL and Average of AC	FL/AC	Hadlock, AJR, 141 : 979, 1983
FL/HC	FL/HC ratio	Average of FL and Average of HC	FL/HC	Hadlock, JUM, 3 : 439, 1984
FL/BPD	FL/BPD ratio	Average of FL and Average of BPD	FL/BPD	Hadlock, AJOG, 141 : 759, 1987
CI	Cephalic Index	Average of BPD and Average of OFD	BPD/OFD Short distance of HC/Long distance of HC	Hadlock, AJR, 137 : 83, 1981
HC/AC	HC/AC ratio	Average of HC and Average of AC	HC/AC	Campbell, BRJ.OG, 84 : 165, 1977
FL/Ft	FL/Ft ratio	Average of FL and Average of Ft	FL/Ft	
BD/BPD	BD/BPD ratio	Average of BPD and Average of BD	BD/BPD	
GS	Gestational Sac	one distance	Curve data is available in Chapter 17	Rempen
CRL	Crown Rump Length			
BPD	Biperietal Diameter			

Table 9–10. OB Calculation Formulas—European Version

GS Measurement

GS Measurement for the Tokyo University and European methods require only one distance measurement.

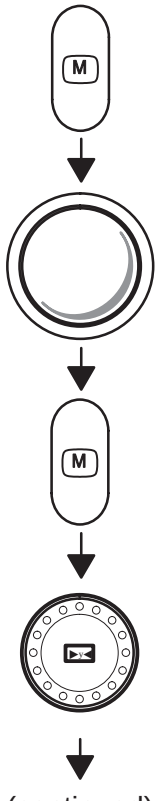
GS Measurement for the USA method requires three distance measurements obtained from longitudinal and transverse images. The three measurements are anterior–posterior, transverse and longitudinal. It is advantageous to use the dual-image (split screen) feature for this GS measurement.

Fetal Heart Rate Measurement

The fetal heart rate is taken in M-Mode.

To measure the fetal heart rate:

Scan to display a B-Mode image of the fetal heart.



Press **M-Mode**. The M-Mode cursor appears in the B-Image.

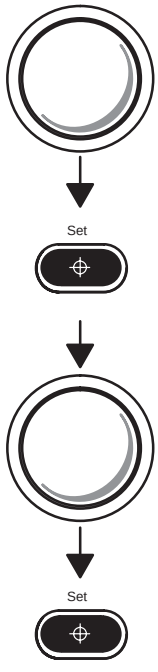
Use the **Trackball** to position the M-Mode cursor over the B-Mode image of the fetal heart.

Press **M-Mode** a second time. The M-Mode timeline appears on the left side of the screen (or as designated by the Image Display Setup).

Press **Freeze** to stop image acquisition.Select **HR** from the Calculation menu. Press the **Arrow** up/down keys or **Space** left/right keys as necessary to displaythe desired menu, and highlight **HR** and press **Set**. The HR measurement mode is set and a "×" cursor appears.

(continued)

Fetal heart rate measurement (cont'd)



Use the **Trackball** to move the cursor to a point on the M-Mode waveform where it is desired to start the Heart Rate measurement.

Press **Set** to fix the start-point cursor. An end-point cursor appears.

Use the **Trackball** to move the end-point cursor to the same point on the M-Mode waveform two heartbeats from the measurement start point. See Figure 9–5.

Press **Set** to complete the measurement.

The heart rate appears on the display and is also recorded on the report page.

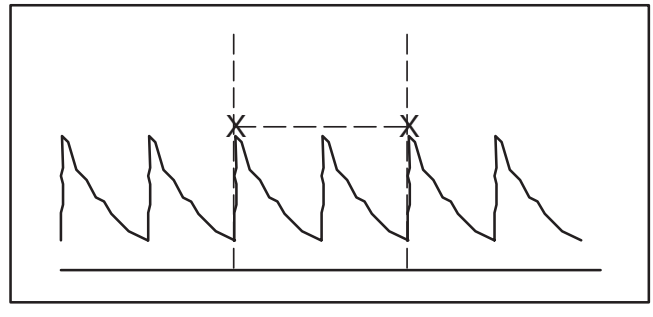


Figure 9–5. Two Heart Beat Reference

OB Summary Reports

Overview

OB Summary Reports consist of four pages of reports. The four report pages are OB Report Page, Measurement Averaging Page, Anatomical Survey Page and OB Trend Graph Page. The OB summary Report Page Sequence diagram is shown in Figure 9–6.

NOTE: Type of the initial display (OB Report page or OB Trend Graph Page) can be set in the General System 2 Setup menu. Refer to 13–13.

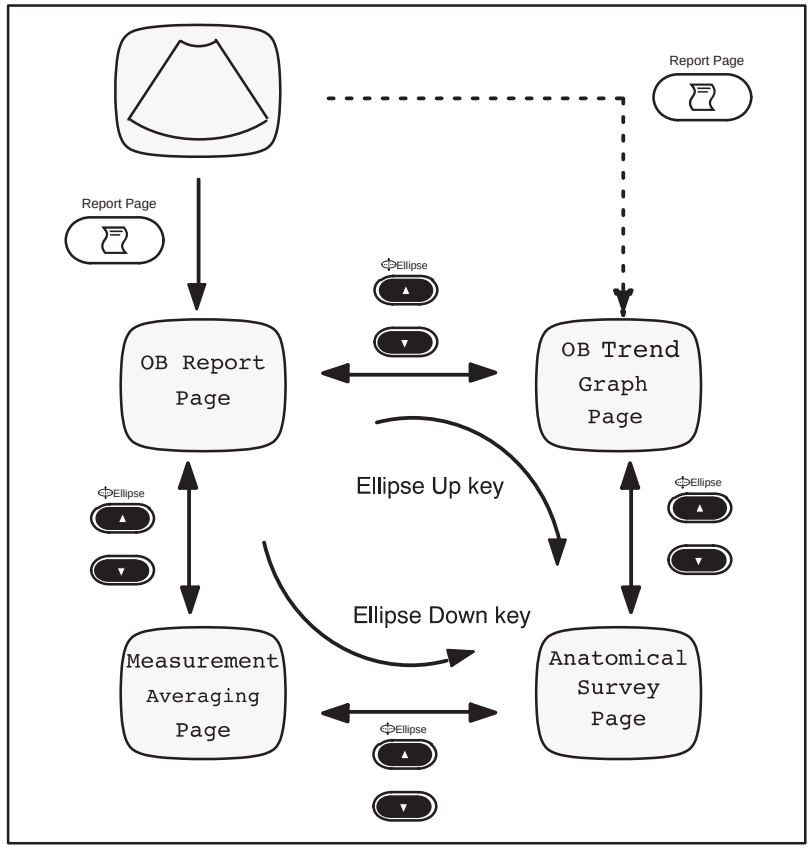


Figure 9–6. OB Report Page Sequence

Overview (cont'd)

To activate the OB Summary Reports:

Press the **Report Page** key on the keyboard. The OB Report Page is displayed on the monitor.

To change the OB Summary Report Page:

Press the **Ellipse** up/down arrow keys. The OB Summary Report Page will be changed as shown in Figure 9–6.

To exit the OB Summary Reports:

Move the cursor to EXIT on each display page. Press **Set** to exit the OB Summary Report and return to the previous exam mode.

OR

Press the **Report Page** key again.

Starting an Exam

Accurate and complete Summary Report presentation starts at the beginning of the patient exam. Always begin an exam by entering as much new patient information as possible.

NOTE: Refer to the Beginning an Exam section of Preparing for an Exam Chapter for instructions.

After selecting the OB exam type, fill in the following information after PT Name, PT ID, NOTE, and Oper ID:

1.	**AGE**.	Type the woman's age.
2.	**PREGNANCY ORIGIN DATA SELECTION**	Enter 1 for LMP, 2 for BBT (not in USA version), 3 for EDC and 4 for GA. Type in the required information for category selected.
3.	**GRAVIDA**.	Type the number of pregnancies.
4.	**PARA**.	Type the number of live births.
5.	**AB**.	Type the number of abortions, miscarriages, etc.
6.	**ECTOPIC**.	Type the number of pregnancies outside the uterus.
7.	**Ref MD**.	Type the name of the woman's physician.
8.	**COMMENT**	Type any pertinent medical history with regard to this pregnancy, e.g., diabetes, bleeding.
9.	**EXIT**	Press **Return** or **New Patient** after having completed filling in this information.

NOTE: If patient information needs to be edited, use the ID/Name key to display the patient entry menu for editing information.

Formulas

Data concerning the formulas, measurement type, tables and references used for measurements and calculations was presented earlier in this section.

Calculation fields in this middle and bottom portion of the report cannot be edited or deleted.

GA (LMP) is the estimated gestational age based on the last menstrual period date entered.

EDD/EDC (LMP) is the estimated delivery date based on the last menstrual period date entered.

CGA is the Composite Gestational Age based on the measurement.

EDD/EDC (CGA) is the estimated delivery date based on the measurements.

EFBW is the Estimated Fetal Body Weight.

For the US OB selection, EFBW is based on the five formulas found on 9. The system automatically selects the formula based on the measurements taken. If a BPD and AC are measured, EFBW formula #1 is used to calculate EFBW. If a HC, FL and AC are measured, EFBW formula #4 is used to calculate EFBW.

NOTE: Formulas can be selected by the user in the Setup menu.

For the European OB selection, EFBW is based on the formula selected in the Measurement Setup.

For the Tokyo University and Osaka University OB selection, EFBW is based on the single formula listed in the calculation formula tables.

The HR measurement/calculation report also cannot be edited.

Editing the OB Summary Report

Cursor Movement

Movement of the edit cursor on the report page can be accomplished by using the **Trackball** or the **Arrow** keys on the keyboard.

Edit Actions

When positioned on a measurement field the **Back Space** or **Clear** keys will delete the current value in that field.

NOTE: Any calculation relating to the deleted measurement field are recomputed.

Comments Edit

The comment field consists of two lines with a total of 120 characters. Use normal keyboard functions to type necessary comments.

Gestational Age Error Markers

Whenever three or more gestational age measurements are included in the CGA (the arithmetic mean of the included gestational age), an arrow marker may appear on the OB Report Page to mark the GA which is farthest from the CGA. This arrow is immediately to the right of the gestational age. This makes it easy to spot the outlying measurement.

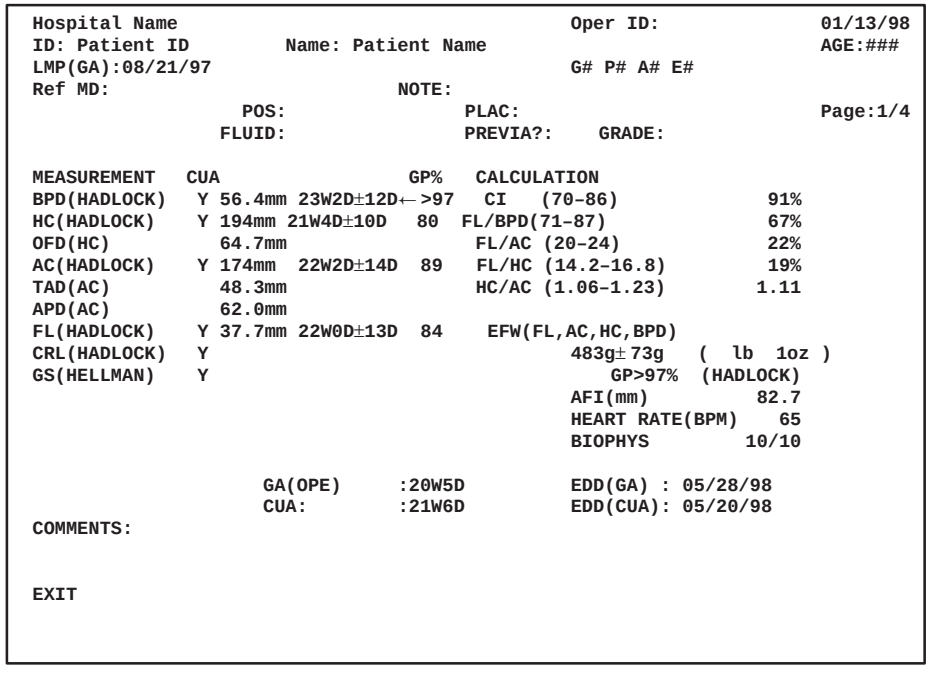


Figure 9–7. Error Markers (USA OB Report Page)

OB Report Layout

The OB Report Page provides a collection of Patient Data, Exam Measurements, Calculations and comments. Each OB method report page is illustrated.

```
Hospital Name                                        Oper ID:     mm/dd/yy
ID: Patient ID          Name: Patient Name                         AGE:###
LMP(GA):mm/dd/yy                                     G## P## A## E#
Ref MD:                              NOTE:
                    POS:[redacted]   PLAC:                        Page: 1/4
              FLUID:                 PREVIA?:        GRADE:

MEASUREMENT   CUA                    GP%   CALCULATION
BPD(HADLOCK)   Y ###.#mm  ##W#D±#D         CI    (70-86)       ###%
HC(HADLOCK)    Y ###.#mm  ##W#D±#D         FL/BPD (71-87)      ###%
OFD(HC)          ###.#mm  ##W#D±#D         FL/AC  (20-24)      ###%
AC(HADLOCK)    Y ###.#mm  ##W#D±#D         FC/HC (??.?-??.?)   ###%
TAD(AC)          ###.#mm  ##W#D±#D         HC/AC (???-???)     ####
APD(AC)          ###.#mm  ##W#D±#D
FL(HADLOCK)    Y ###.#mm  ##W#D±#D       EFW(FL,AC,HC,BPD)
CRL(HADLOCK)   Y ###.#mm  ##W#D±#D             ####g±###g   (   #lb   ##oz )
GS(HELLMAN)    Y ###.#mm  ##W#D±#D              GP>##%      (HADLOCK)
                                        AFI(mm)                ###
                                        HEART RATE(BPM)        ###
                                        BIOPHYS                 ##/##

                     GA(OPE)      :##W#D   EDD(GA) :mm/dd/yy
                     CUA:         :##W#D   EDD(CUA):mm/dd/yy
COMMENTS:

                                                    USA Report Page
EXIT
```

```
Hospital Name                        Oper ID:            mm/dd/yy
ID: Patient ID          Name: Patient Name               AGE:###
LMP(GA):yy/mm/dd  BBT(GA):yy/mm/dd  G## P## A## E#
Ref MD:                      NOTE:
                   POS:          PLAC:              Page: 1/4
                 FLUID:          PREVIA?:       GRADE:

MEASUREMENT   CGA                            CALCULATION
BPD(JEANTY)    Y ###.#mm ##W#D±##%             CI           ###%
FL(JEANTY)     Y ###.#mm ##W#D±##%             FL/BPD       ###%
AC(JEANTY)     Y ###.#mm ##W#D±##%             FL/AC        ###%
HC(JEANTY)     Y ###.#mm ##W#D±##%             HC/AC        ###%
TAD(ERIKSEN)   Y ###.#mm ##W#D±##%             FL/Ft        ###%
BD(JEANTY)     Y ###.#mm ##W#D±##%             BD/BPD       ###%
OFD(HANSMANN)  Y ###.#mm ##W#D±##%
Ft(PARIS)      Y ###.#mm ##W#D±##%           EFBW(Shep/Wars)   g
GS(TOKYO)      Y ###.#mm ##W#D±##D
CRL(JEANTY)    Y ###.#mm ##W#D±##%
                                               HEART RATE(BPM)    ###
                                               BIOPHYS           ##/##

                     GA(LMP)      :##W#D          EDD(LMP) : dd/mm/yy
                     CGA:         :##W#D          EDD(CGA) : dd/mm/yy
COMMENTS:

                                                 European Report Page
EXIT
```

Figure 9–8. OB Report Page Layout (USA, Europe)

OB Report Layout (cont'd)

```
Hospital Name                                    Oper ID:     mm/dd/yy
ID: Patient ID         Name: Patient Name                    AGE:###
                                                 G##P###A##E##
Ref MD:                          NOTE:
                 POS:            PLAC:                      Page: 1/4
               FLUID:            PREVIA?:    GRADE:

MEASUREMENT   CGA                                CALCULATION
BPD(TOKYO-S)   Y ###.#mm  ##W#D±##SD
AxT(TOKYO-S)   Y ###.#Cm2 ##W#D±##SD
AC(TOKYO-S)    Y ###.#mm  ##W#D±##SD             CTAR             ###%
FL(TOKYO-S)    Y ###.#mm  ##W#D±##SD             EF               ###%
LV(TOKYO)      Y ###.#mm  ##W#D±##D              FS               ###%
GS(TOKYO)      Y ###.#mm  ##W#D±##D
CRL(TOKYO-S)   Y ###.#mm  ##W#D±##SD
USER1          Y ###.#mm  ##W#D±##D
USER2          Y ###.#mm  ##W#D±##D
USER3          Y ###.#mm  ##W#D±##D              EFW1(TOKYO-S1) ###g
USER4          Y ###.#mm  ##W#D±##D              AFI(mm)          ###
                                                 HEART RATE(BPM)  ###
                                                 BIOPHYS         ##/##
             GA(EFW)
             GA(OPE): ##W#D                         EDC(LMP): dd/mm/yy
             CGA:                                   EDC(CGA):
COMMENTS:

EXIT                                  Tokyo University Report Page
```

```
Hospital Name                                    Oper ID:     mm/dd/yy
ID: Patient ID         Name: Patient Name                    AGE:###
                                                 G##P###A##E##
Ref MD:                          NOTE:
                 POS:                PLAC:                  Page: 1/4
               FLUID:                PREVIA?:    GRADE:

MEASUREMENT   CGA                                CALCULATION
BPD(OSAKA)     Y ###.#mm  ##W#D±##SD
FTA(OSAKA)     Y ###.#Cm2 ##W#D±##SD
HL(OSAKA)      Y ###.#mm  ##W#D±##SD             CTAR             ###%
FL(OSAKA)      Y ###.#mm  ##W#D±##SD             EF               ###%
GS(TOKYO)      Y ###.#mm  ##W#D±##D              FS               ###%
CRL(OSAKA)     Y ###.#mm  ##W#D±##SD

                                                 EFBW(OSAKA)      ###g
                                                 IU-EFBW(OSAKA)   ###g
                                                 AFI (mm)          ###
                                                 HEART RATE(BPM)   ###
             GA(EFBW)                            BIOPHYS           ###
             GA(IUGR)
             GA(LMP)                                  EDC(LMP):
             CGA:                                     EDC(CGA):
COMMENTS:

                                      Osaka University Report Page
EXIT
```

Figure 9–9. OB Report Page Layout (Tokyo University, Osaka University)

OB Report Layout (cont'd)

```
Hospital Name            Oper ID:                      yy/mm//dd
ID: Patient ID   Name: Patient Name                     AGE:###
LMP(GA):yy/mm/dd                  G  P  A  E
Ref MD:                NOTE:
             POS:               PLAC:                 Page #/4
           FLUID:               PREVIA?:        GRADE:
```

Figure 9–10. USA OB Report Page Top Portion

The top portion of the report is generally patient data entered at the beginning of the exam or provided automatically by the system.

These fields cannot be edited. The fields involved are:

Hospital Name	34 Characters
Operator ID	4 Digits
Date	Date Format
Patient ID	14 Characters
Patient Name	29 Characters
Age	3 Digits
Last Menstrual Period	Date Format
Basal Body Temperature	Date Format (for Tokyo University and Osaka University versions)
Gravida	2 Digits
Para	2 Digits
Abortions	2 Digits
Ectopic	1 Digit
Referring Physician	16 Characters
Note	30 Characters

OB Report Layout (cont'd)

The middle portion of the OB Report Page displays measurements taken (of each type), the estimate fetal age according to the measurement and the calculations made from the measurement. It also displays the heart rate.

CUA, AUA, CGA are calculated based upon each desired GA of the measurement lines which are selected to "Y".

NOTE: CUA, AUA, CGA selections (Y/N) are not revoked even after system power on/off or change of the Patient throgh the New patient Menu.

Only measurement results in this portion of the report can be edited (deleted). The estimated fetal age and other related calculation fields will be recomputed and the report displayed again.

Figure 9–11. OB Report Page Bottom Portion

The bottom portion of the OB Report Page displays Comments area, EXIT menu and Operator Message Area.

The two lines available for comments can be edited by the user.

The very bottom of the report is left for Operator Message.

Comment Library is available in this area.

Measurement Averaging Page Layout

The Measurement Averaging Page provides OB measurement results and their average. To reach the Measurement Averaging Page, use the **Ellipse** keys. Each Measurement Averaging Page is illustrated.

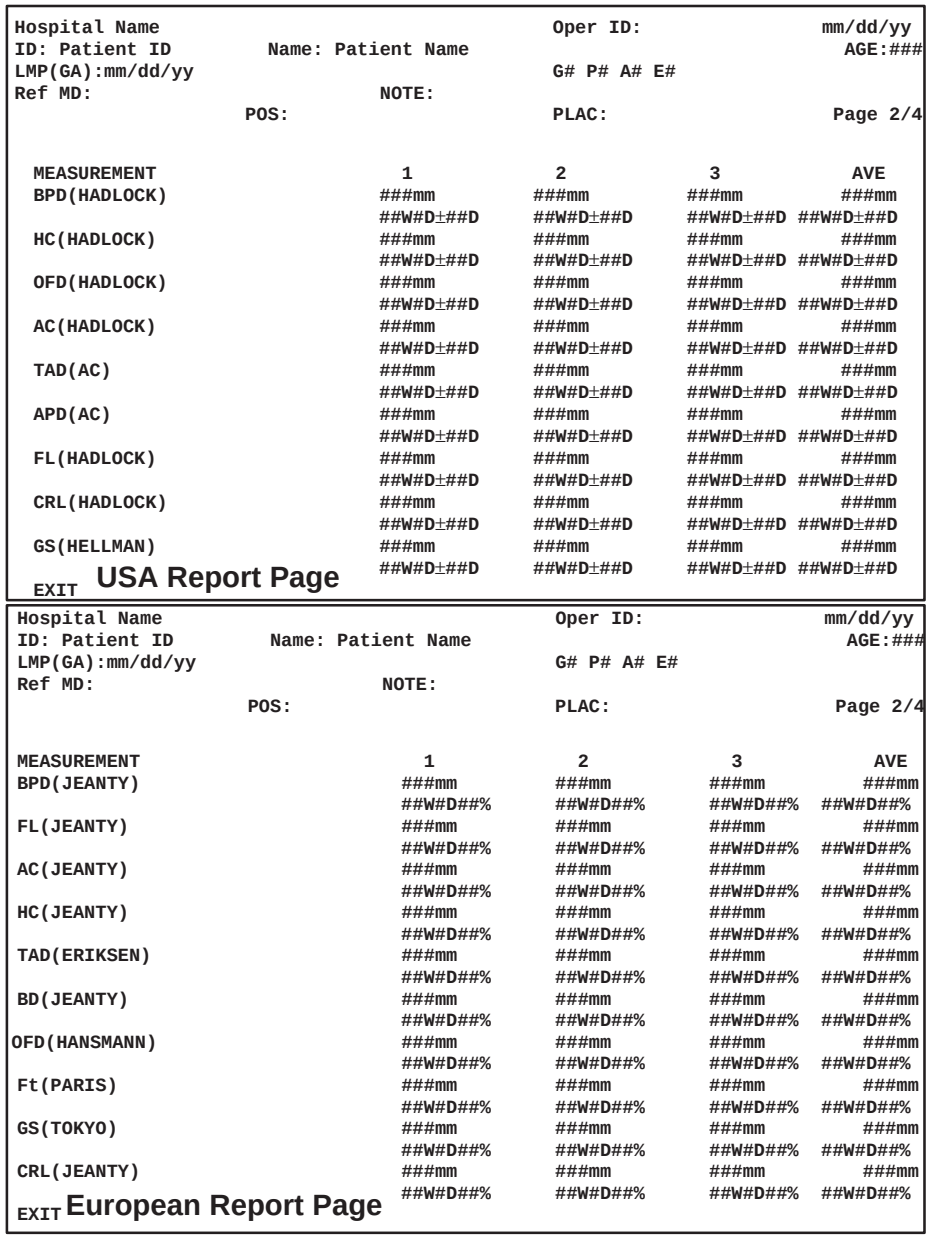


Figure 9–12. USA, European OB Averaging Report Page

Measurement Averaging Page Layout (cont'd)

```
Hospital Name                                  Oper ID:                  mm/dd/yy
ID: Patient ID        Name: Patient Name                                  AGE:###
LMP(GA):mm/dd/yy                               G# P# A# E#
Ref MD:                      NOTE:
                  POS:                         PLAC:                    Page 2/4

MEASUREMENT                 1              2              3              AVE
BPD(TOKYO-S)              ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD     ##W#D±##SD
AxT(TOKYO-S)              ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD     ##W#D±##SD
AC(TOKYO-S)               ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD     ##W#D±##SD
FL(TOKYO-S)               ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD     ##W#D±##SD
LV(TOKYO)                 ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD     ##W#D±##SD
GS(TOKYO)                 ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD     ##W#D±##
CRL(TOKYO-S)              ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD     ##W#D±##


EXIT                                                  Tokyo University Report Page
```

```
Hospital Name                                  Oper ID:                  mm/dd/yy
ID: Patient ID        Name: Patient Name                                  AGE:###
LMP(GA):mm/dd/yy                               G# P# A# E#
Ref MD:                      NOTE:
                  POS:                         PLAC:                    Page 2/4


MEASUREMENT                 1              2              3              AVE
BPD(OSAKA)                ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD##    W#D±##SD
FTA(OSAKA)                ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD##    W#D±##SD
HL(OSAKA)                 ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD##    W#D±##SD
FL(OSAKA)                 ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD##    W#D±##SD
GS(TOKYO)                 ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD##    W#D±##SD
CRL(OSAKA)                ###mm          ###mm          ###mm          ###mm
                        ##W#D±##SD     ##W#D±##SD     ##W#D±##SD##    W#D±##SD


EXIT                                                  Osaka University Report Page
```

Figure 9–13. Tokyo University, Osaka University OB Averaging Report Page

NOTE: If "REPORT AVERAGE ?" is set to "N", the AVE column displays the last measurement result, not the average.

OB Anatomical Survey Page Layout

The Anatomical Survey Page provides a check list that promotes routine thorough reporting of obsterical ultrasound exams. The Anatomical Survey Page also provides fetus's biophysical profile score. To reach the Anatomical Survey Page, use the **Ellipse** keys. The Anatomical Survey Page is shown in Figure 9–14.

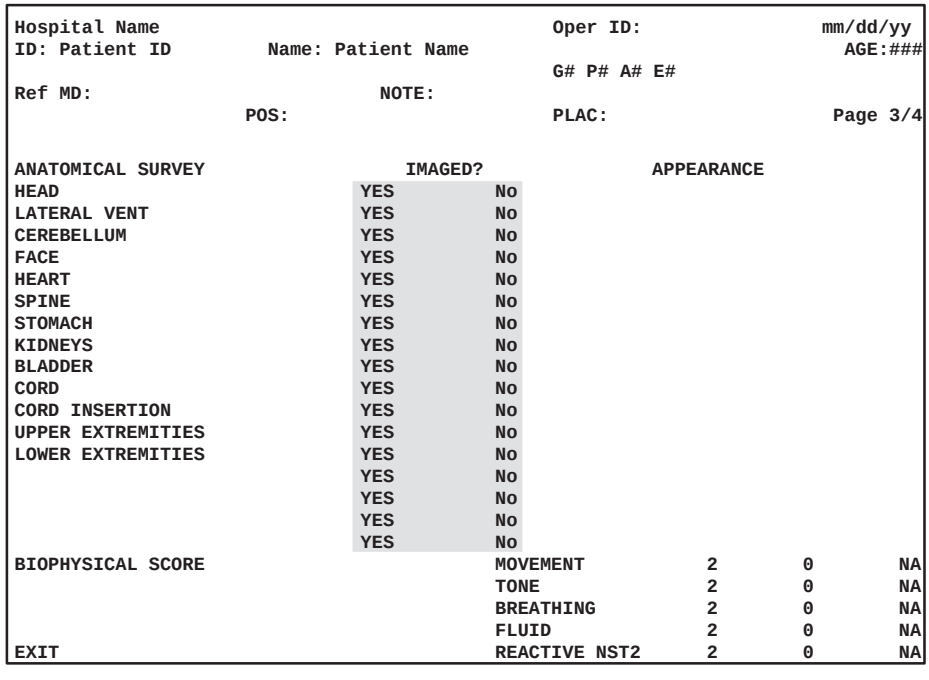


Figure 9–14. OB Anatomical Survey Page

OB Trend Graph Page Layout

Overview

The LOGIQ™ 200 PRO Series can display a fetal growth curve graph from data in each measurement table for fetal age.

An OB Trend Graph for the European Method is shown in Figure 9–15.

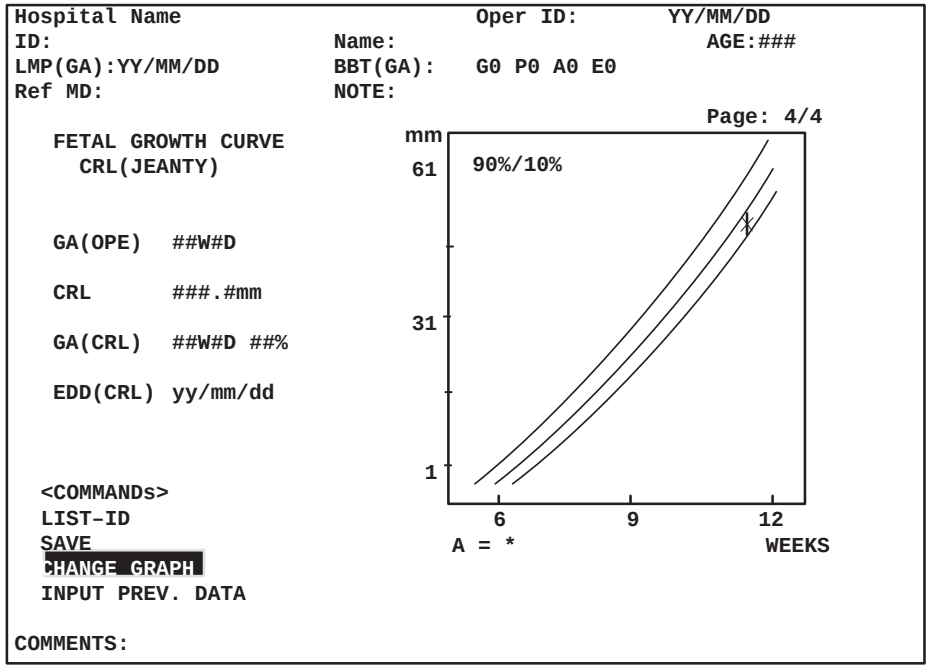


Figure 9–15. European OB Trend Graph

The graphic displays a horizontal scale for gestational weeks and a vertical scale for the measurement value.

The curve graphic shows the standard values with two additional curves representing the standard deviation.

OB Trend Graph Page Layout (cont'd)

If information was entered on the patient data entry menu that allows for the estimation of a gestational age, an asterisk (*) is displayed on the graph to show the current status of the fetus relative to the measurement table.

The OB Trend Graph Page also has patient data fields, measurement/calculation data fields and a comment field.

The system does not allow any field on the OB Trend Graph to be edited except the comment area.

To exit the OB Trend Graph display, move the cursor to **EXIT** in the OB Trend Graph Page and press **Set**.

NOTE: In many cases, the LMP is required in order to properly compute the OB Trend Graph. Ensure that the LMP is properly entered in the Patient Entry Menu.

OB Trend Graph Labeling

Table 9–11 is a summary of the labeling found in the OB Trend Graph for deviation.

OB Trend Graph Labeling (cont'd)

Author	Measurement table	Deviation	Deviation Label
Hadlock	BPD, HC, AC, FL	Vertical	+2SD/–2SD
	CRL	——	No Label
	EFW	Vertical	+2SD/–2SD
Hellman	GS	——	No Label
ASUM	BPD, AC	Horizontal	+2SD/–2SD(WEEK)
	CRL	——	No Label
Tokyo	GS, CRL, BPD, FL, LV	Horizontal	Deviation(WEEK)
Tokyo–S (Shinozuka)	CRL, BPD, FL, AC, AxT(APTDxTTD), EFW	Vertical	+1.64SD/–1.64SD
Osaka	CRL, BPD, FL, HL, FTA, EFBW	Vertical	+1.5SD/–1.5SD
Hansmann	BPD, CRL, OFD, HC, TThd, FL	Vertical	95%/5%
	GS, TAD	Vertical	90%/10%
	AC	——	No Label
Rempen	GS, CRL, BPD	Vertical	95%/5%
Campbell	BPD, CRL, FL	Vertical	90%/10%
	BD	——	No Label
Berkowitz	BD	——	No Label
Eriksen	TAD	——	No Label
Kurtz	BPD	Vertical	90%/10%
Nelson	CRL	Vertical	90%/10%
Robinson	CRL	Vertical	90%/10%
Jeanty	CRL, BPD, FL, AC, HC	Vertical	90%/10%
	BD	——	No Label
Paris	CRL, BPD, FL, Ft	Vertical	90%/10%
	TAD	——	No Label
Sostoa	BPD, FL, AC, HC	Vertical	90%/10%
	BD, OFD	——	No Label
User Table USA		Horizontal	Deviation(WEEK)
User Table TOKYO		Horizontal	Deviation(WEEK)
User Table OSAKA		Vertical	+1.5SD/–1.5SD
User Table Europe		Vertical	90%/10%

Table 9–11. OB Graph Deviation Labeling

Changing OB Trend Graph Selection

To change the graph:

With the OB Trend Graph displayed, CHANGE GRAPH will be in reverse video.

Press **Set**. The graphic is deleted and a measurement selection menu appears. The Measurement Selection Menu is shown in Figure 9–16.

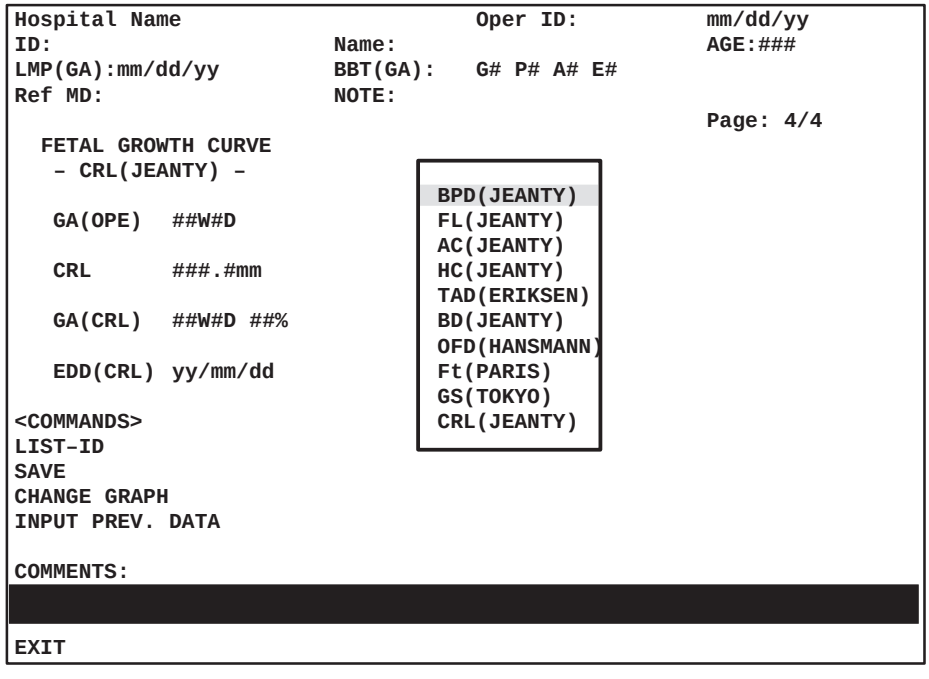
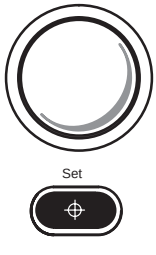


Figure 9–16. European OB Trend Graph Change Selection



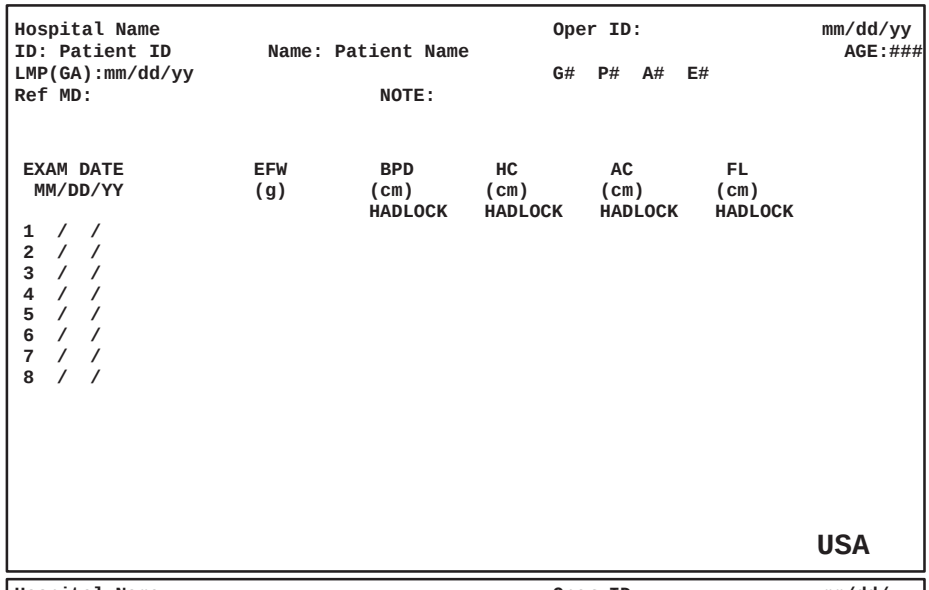
Use the **Trackball** to select the desired measurement value.

Press **Set**. The new measurements, calculations and graphic are displayed.

The summary report can be saved like any ultrasound image. Once it is displayed on the screen, it can be recorded on the VCR, printed on the B/W page printer, or photographed by the multi-image camera.

Input Previous Data Page Layout

The Input Previous Data Page allows the user to input previous OB measurement data. To access this page, move the cursor to INPUT PREV. DATA the OB Graph and press **Set**. Each method's Input Previous Data Page is illustrated.



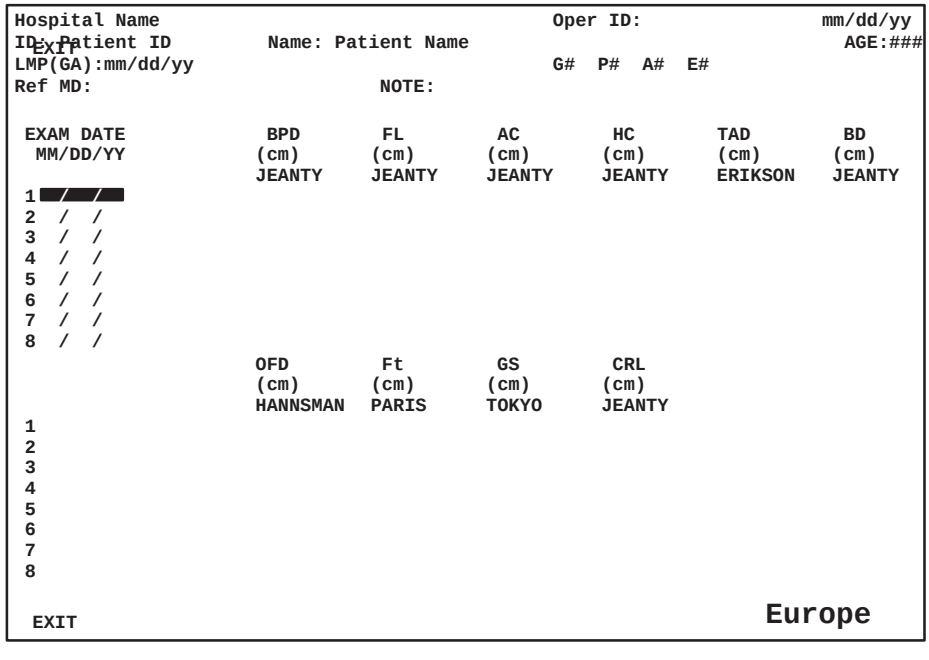


Figure 9–17. Input Previous Data Page (USA, Europe)

Input Previous Data Page Layout (cont'd)

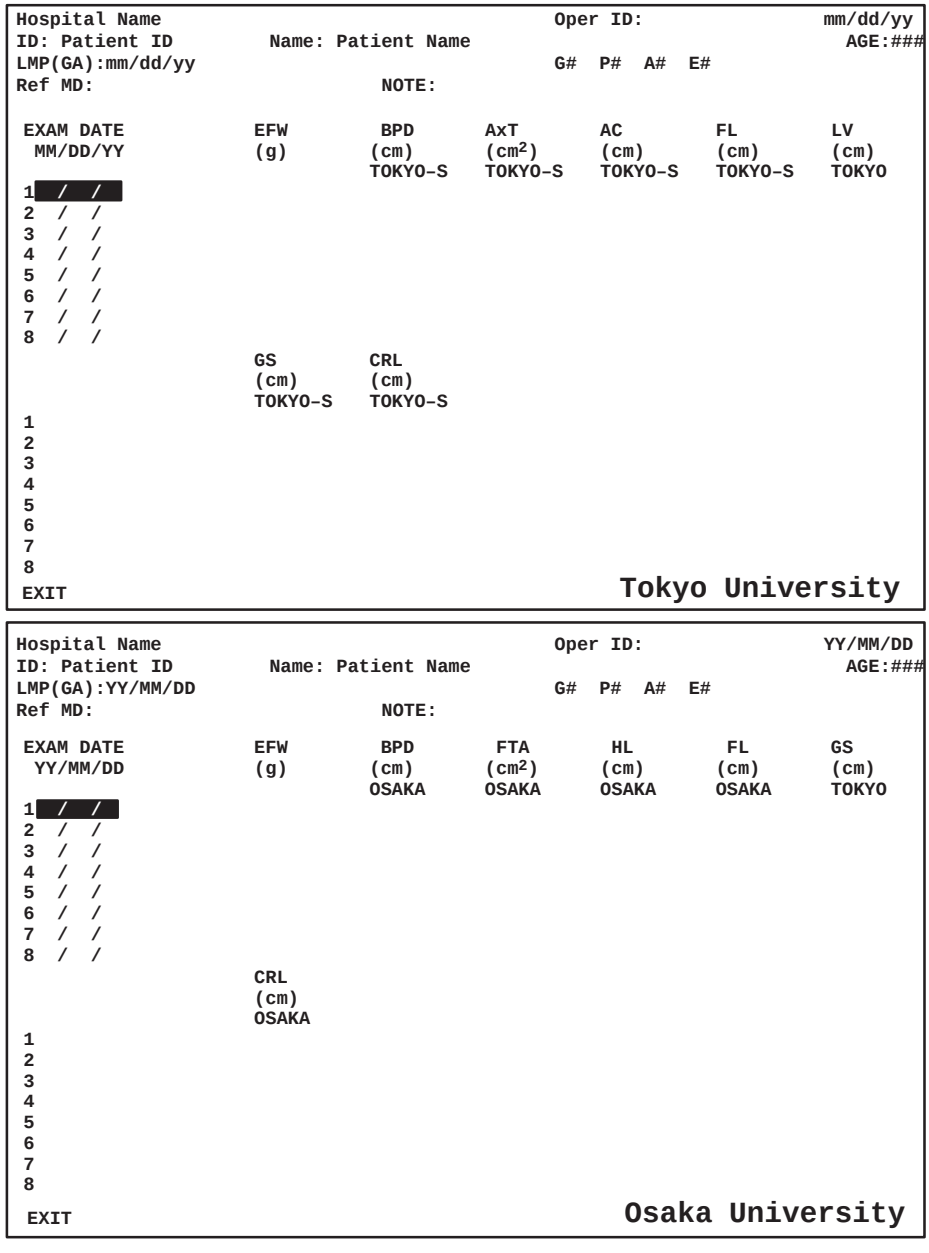


Figure 9–18. Input Previous Data Page (Tokyo University, Osaka University)

Fetal Trend Management

Overview

Fetal Trend Management is a function of the LOGIQ™ 200 PRO Series OB Calculation package that enhances the user's ability to monitor the development of the fetus.

If patient data, measurements and calculations are saved during the initial examination, this information can be compared to results of follow up examinations. The OB Graph function can be used to display the current data or combine the current data with past data to show a fetal growth trend.

Storing Patient Information

After an OB examination, the user can save the resultant patient data to the system memory.

Data Storage Estimations

Approximately 500 patient data can be saved.

When the system memory capacity is reached, the message “Data is full. Delete needless data” is displayed.

Saving Data

Before the diagnosis is complete, ensure that all patient information such as Name, ID, Ref MD and EDC has been entered. If it has not, use the ID/Name key to enter this necessary information. Select the OB Graph function from the OB Calculation menu.

Five additional commands are displayed on the OB Graph that relate to the Fetal Trend Management option as shown in Figure 9–19. These commands are:

LIST–ID	Displays a list by patient ID number.
SAVE	Saves Patient information on the system memory.
CHANGE GRAPH	Changes the measurement value graphed (performs the same function as in the basic OB calculation package).
INPUT PREV. DATA	Displays a past exam data for the specified patient.

Saving Data (cont'd)

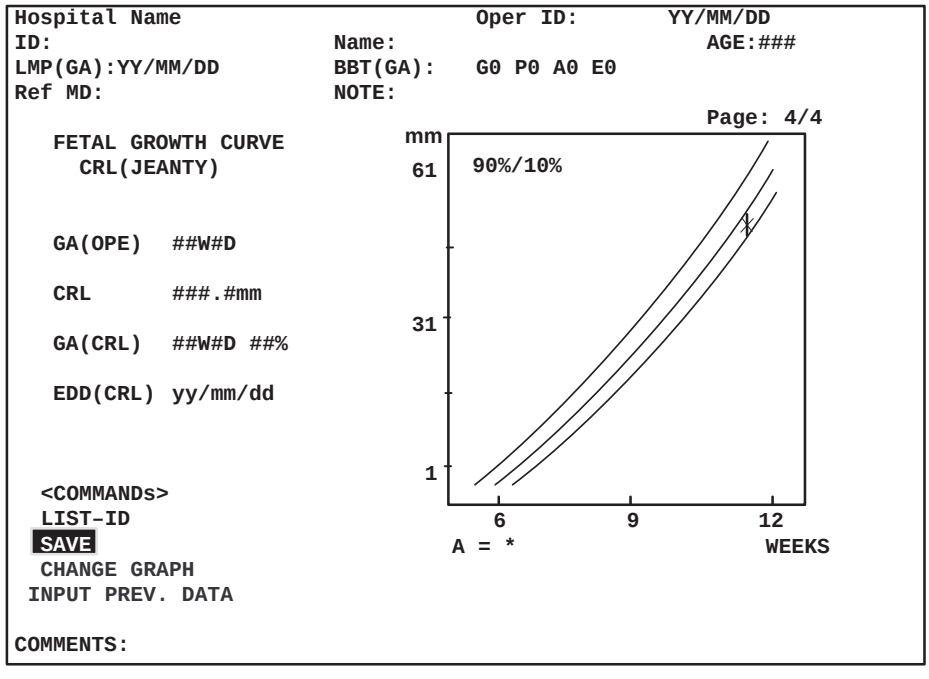


Figure 9–19. OB Graph Display

Type of Data Saved

The type of data that is recorded during the SAVE function is:

1. Date and Time
2. Patient Name and ID
3. Calculated EDC or EDD
4. Measurement Author's Name
5. Measured or Calculated Data

Save Command

NOTE: To avoid any trouble in searching later, it is better to have all patient information entered before saving.

Use the **Trackball** to highlight the SAVE command and press **Set**.

If patient information has been entered, the patient data, measurements and calculations will be saved to the system memory.

NOTE: If measurement averaging is turned on, only the average value is saved. If measurement averaging is turned off, only the last measured or calculated value is saved.

Save Function Messages

If patient information has not been entered, the message displayed is:

“Input patient’s information:”

NOTE: The ID number is necessary or the SAVE function CANNOT be accomplished.

If all of the data is the same as a file on the data list, the message displayed is:

“Overwrite existing data? ‘Set’ to Yes, ‘Clear’ to No. ”

where ‘Set’ replaces the archived file with the new file. ‘Clear’ causes the system to do nothing. This cancels the SAVE function request.

If the storage memory is full, especially in the case of the limited capacity of the fresh memory, the message displayed is:

“Data is full. Delete needless data.”

Eliminating needless spaces in the data entered will help to conserve storage space.

Growth Trending

Users can choose the type of OB Trend Graph display in the General System 2 Setup, Auto Patient Data Search menu.

1:Yes	Current and Stored OB data displayed.
2:No	Current data display only.

The default setting after the OB Graph is displayed is “2:No”. This will display an OB Graph for the current author/measurement selected.

When the user selects “1:Yes” from the General System 2 Setup, Auto Patient Data Search menu, the system automatically searches the storage media and gets the data and displays the OB Trend Graph as shown in Figure 9–20.

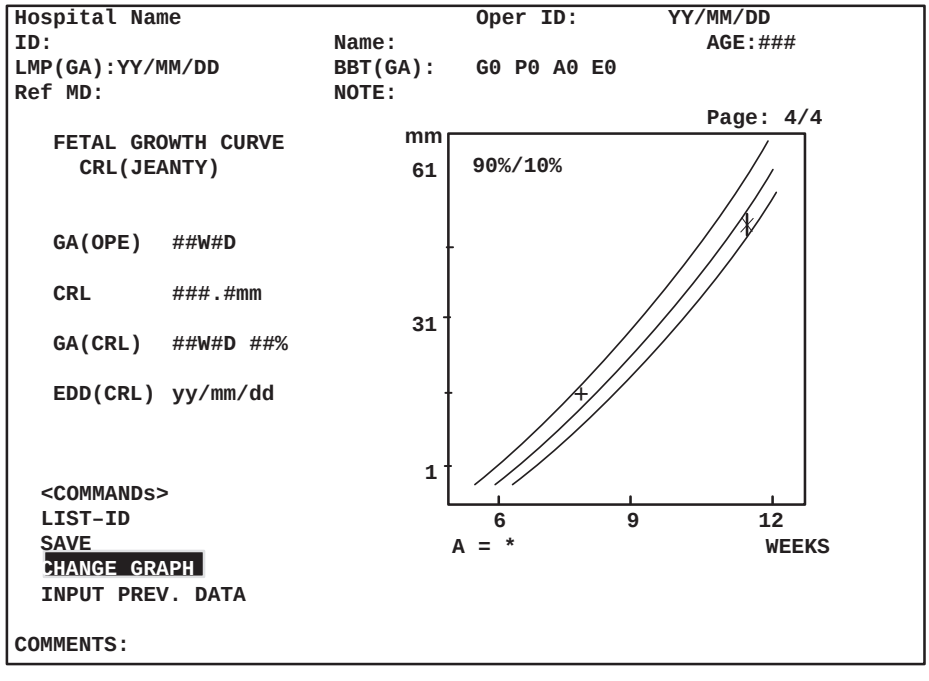


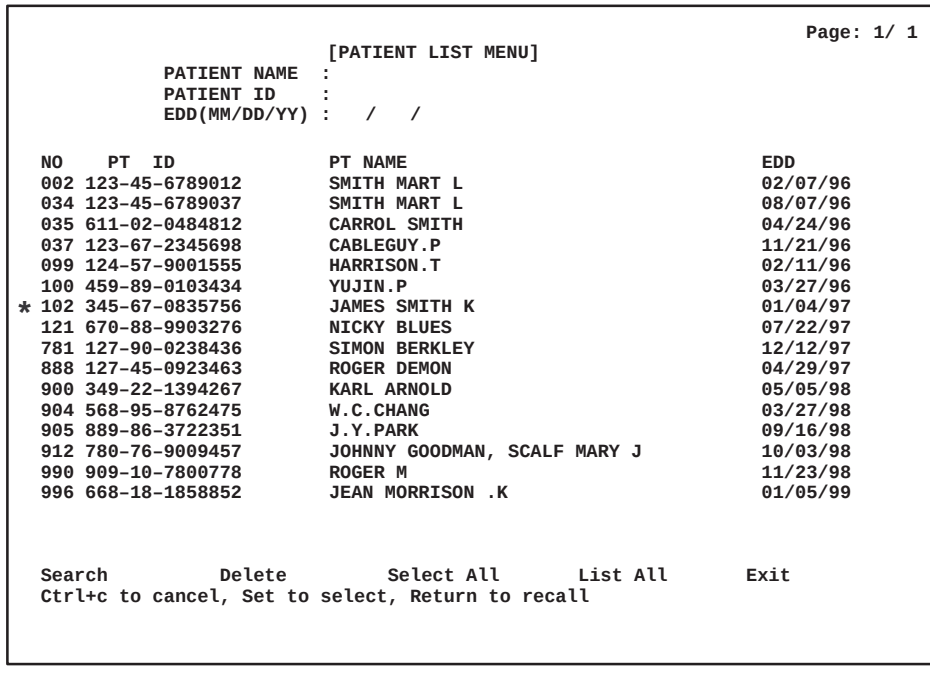
Figure 9–20. OB Trend Graph

The system will search for like data displayed on the OB Graph. If Hadlock BPD is the data displayed, then the current patient’s Hadlock BPD data is used with the past Hadlock BPD data to display the trend on the graph.

Patient List Management

The system allows the user to manage the data that was previously stored using the Patient ID List.

Choose LIST–ID from the OB Graph display. The system displays all data found on the storage media. The oldest data will have the first order number. The newest data is displayed on the last page as shown in Figure 9–21.



```
                                                                Page: 1/ 1
                          [PATIENT LIST MENU]
            PATIENT NAME  :
            PATIENT ID    :
            EDD(MM/DD/YY) :   /   /

  NO    PT  ID              PT NAME                                EDD
  002 123-45-6789012        SMITH MART L                           02/07/96
  034 123-45-6789037        SMITH MART L                           08/07/96
  035 611-02-0484812        CARROL SMITH                           04/24/96
  037 123-67-2345698        CABLEGUY.P                             11/21/96
  099 124-57-9001555        HARRISON.T                             02/11/96
  100 459-89-0103434        YUJIN.P                                03/27/96
* 102 345-67-0835756        JAMES SMITH K                          01/04/97
  121 670-88-9903276        NICKY BLUES                            07/22/97
  781 127-90-0238436        SIMON BERKLEY                          12/12/97
  888 127-45-0923463        ROGER DEMON                            04/29/97
  900 349-22-1394267        KARL ARNOLD                            05/05/98
  904 568-95-8762475        W.C.CHANG                              03/27/98
  905 889-86-3722351        J.Y.PARK                               09/16/98
  912 780-76-9009457        JOHNNY GOODMAN, SCALF MARY J           10/03/98
  990 909-10-7800778        ROGER M                                11/23/98
  996 668-18-1858852        JEAN MORRISON .K                       01/05/99


  Search          Delete         Select All       List All       Exit
  Ctrl+c to cancel, Set to select, Return to recall
```

Figure 9–21. Patient List Menu

Patient List Commands

The commands allow the user to perform the following functions:

Menu commands (Bottom of the Menu) :

Search	Searches the Patient List for the desired patient information
Delete	Deletes saved patient data
Select All	Selects all files
List all	Displays All patients data list
Exit	Exit from the Patient List Menu.

Key Commands :

Set Select a file. (Put asterisk mark in front of the desired file)

Return Displays the data of the selected file.

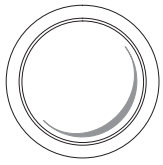
Clear Clears entered characters.

Ellipse Up Displays the previous page.

Ellipse Down Displays the next page.

Searching Patient List

The SEARCH function allows the user to quickly search the PATIENT LIST MENU data base for a specific patient file.



Use the **Trackball** to highlight PT (Patient) Name and type the necessary information with the alphanumeric keys.

Type the necessary information with the alphanumeric keys in the PT ID and EDD areas.

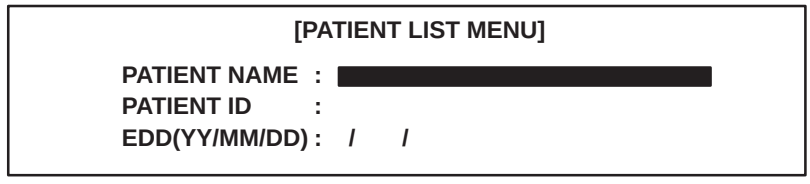
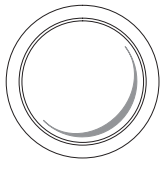


Figure 9–22. Search Data Entry



Use the **Trackball** to move the cursor to highlight SEARCH at the bottom of the menu.

Press **Set**.

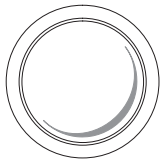
When the search has ended, the list is displayed on the screen.

If the search ends in failure, the system may beep or the cursor remains at the Search area and the following message is displayed:

“No data exists. Input other information.”

Loading Patient Data

The following process allows the user to display the data list for a selected patient file :



Use the **Trackball** to highlight the desired.

Press **Return**.

Previous data of the selected file is displayed.

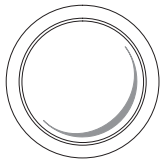
Refer to Figure 9–23.

```
Hospital Name                                  Oper ID:                mm/dd/yy
ID: Patient ID        Name: Patient Name                                AGE:###
LMP(GA):mm/dd/yy                               G#  P#  A#  E#
Ref MD:                        NOTE:


 EXAM DATE            EFW        BPD        HC         AC         FL
  MM/DD/YY            (g)        (cm)       (cm)       (cm)       (cm)
                                 HADLOCK    HADLOCK    HADLOCK    HADLOCK
 1 12/23/98           51.0       5.60       4.50       3.20       4.20
 2  1/24/99           58.0       5.70       5.20       4.20       5.60
 3  2/19/99           60.0       5.90       6.20       4.80       6.30
 4   /  /
 5   /  /
 6   /  /
 7   /  /
 8   /  /









  EXIT
```

Figure 9–23. Previous Data Page (USA)

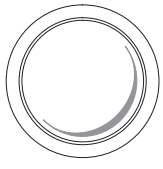
Deleting Patient Data

The following process allows the user to delete the specified files.



Use the **Trackball** to highlight the desired file number.

Press **Set** to mark (*) the highlighted.



Use the **Trackball** to move the cursor to highlight DELETE at the bottom of the menu.

Press **Set**.

Before deleting any data, the following message is displayed:

“Delete? Press ‘Clear’ to Cancel, ‘Set’ to confirm.”

‘Set’ : proceed with deleting the data.

‘Clear’ : canceling the job.

The data selected is then deleted from the data base.

MGOB–Multigestational

Overview

The LOGIQ™ 200 PRO Series offers an optional calculation package that allows the user to measure and report multiple fetus development. The system is capable of reporting a maximum of four fetuses.

Patient Entry Menu

If the Multigestational Option has been purchased, an extra entry appears on the Patient Entry Menu to the right of “RefMD:”. This entry is called “FETUS NUMBER:”. The factory default number is one.

Entering Fetus Number

It is generally during the first exam that the user recognizes a multiple gestation. If during the first exam more than one fetus is imaged, the user can use the ID/Name key to return to the Patient Entry Menu and enter the necessary number of fetuses.

For subsequent exams the user enters the correct number of fetuses when the New Patient key is used.

NOTE: Data Management Center transfer function will not work if the fetus number is greater than one. An error message will appear:
“Multigestation data transfer is not supported”

DMC data transfer will function normally if the fetus number is set to one.

Distinguishing Each Fetus

For measurements/calculations and report page displays, the fetuses are labeled A, B, C and D.

Each fetus is distinguished on the report pages by its letter and total number of fetuses. For example, a report page could be noted as FETUS:A/3. This is fetus A from a total of 3.

Following this fetal number designation, the user can use 10 characters to describe the position and 10 characters to describe placenta location of the fetus. This is displayed as:

POS: ########## PLAC: ##########

Measurements/Calculations

During measurements/calculations, all measurements are performed on fetus A first. The user then switches to fetus B and performs the same measurements, etc.

The user can switch between fetuses by pressing the **Ellipse Up** and **Down** keys**.**

NOTE: A fetus change can be accomplished at anytime during the exam. However, the Ellipse Up and Down function is NOT available while a measurement cursor is active.

After changing to the next fetus, any measurements made will be recorded and reported to the new designated fetus. Any active measurement or calculation not completed will be cancelled when the fetus number is changed.

Change the Number of Fetuses

In the ID/Name function the user can increase or decrease the fetus number or cancel the Multigestational function. This would need to be accomplished due to the demise of a fetus or error in the definition of the fetus number.

Number Increase

If the fetus number is increased, the message:

"Are you sure to change the number? (y/n)"

is displayed.

'y' will create the report pages for the new fetus.

'n' returns to the previous number.

If a fetus number increase is not available, the system Returns to the previous number automatically.

Number Decrease

If the fetus number is decreased because some measurement has already been completed or the fetus number was fixed in a previous exam, the message

"Are you sure to change the number? (y/n)"

is displayed.

'y' prompts the user to select which fetus to delete (A, B, C or D).

'n' returns to the previous number.

The data of deleted fetuses is deleted for the measurement result window and report pages. If the fetus number is reduced to one, the multigestation function is cancelled.

After a decrease in the fetus number, there is no need to adjust the IDs (A, B, C or D) of the remaining fetuses. The same ID for the remaining fetuses can be maintained and used.

Report Page Layout

The Multigestational Option adds additional pages to the Basic OB Report displays.

The additional pages of the Multigestational Option appear the same as the Basic OB Reporting package; except the fetus identifying information will be generated for each fetus. The fetal information displayed is:

"Fetus :◄ $/% ► POS:########## PLAC: ##########"

$ = Fetal ID (A, B, C or D)

% = Total number of fetuses

The user can switch between different fetus report pages by moving the highlight cursor to ◄ or ► and pressing **Set.** The user can switch within the same fetus report pages by pressing the **Ellipse Up** and **Down** Keys**.**

Report Page Layout (cont'd)

In the Multigestational Option, if the number of fetuses is more than 2, there are summary pages of the measurements and calculations based on each fetus measurement. However, all fetuses (maximum of 4) are displayed on this page. Since page one is different by region, page three is also different by region selected (i.e. USA, European, Tokyo University or Osaka University).

The last 3 pages, depending on the number of fetuses, are summaries that compare all fetuses. It contains the following:

Fetus Pos:	Fetus position. This 10 character string is common between pages 1, 2 and 3.
Fluid:	An estimate of the amount of aminotic fluid. Common between pages 1, 2 and 3.
Biophys:	Total biophysical profile score from page 3.
HR (BPM):	Heart rate in beats per minute from page 1.
AFI (USA Only):	Amniotic Fluid Index summary from page 1.
Placenta:	Shows location fetus, grade and previa (yes, no or partial)
Membrane:	Shows location between fetus to fetus.

OB Graph

With the Multigestational Option, the OB Graph selection includes pages to display graphs for individual fetuses as well as a graph to plot all fetuses simultaneously.

For individual fetus reports, the fetus is designated by fetus ID and total number of fetuses (i.e. Fetus: A/3 or Fetus: B/2)

Change the fetus pages by moving the highlight cursor to ◄ or ► and pressing **Set**.

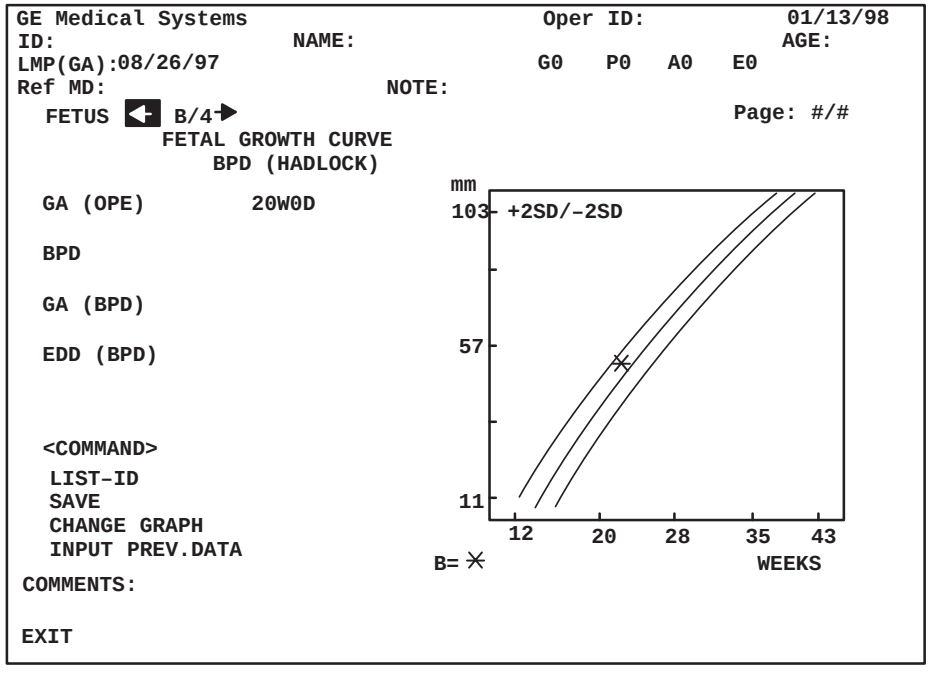


Figure 9–24. OB Graph Multigestational Option (USA Version)

If all fetuses are displayed simultaneously, different symbols are used to mark each fetus. The symbols are:

Fetus	Present
A	✳
B	✳
C	⊞
D	⊠

OB Graph (cont'd)

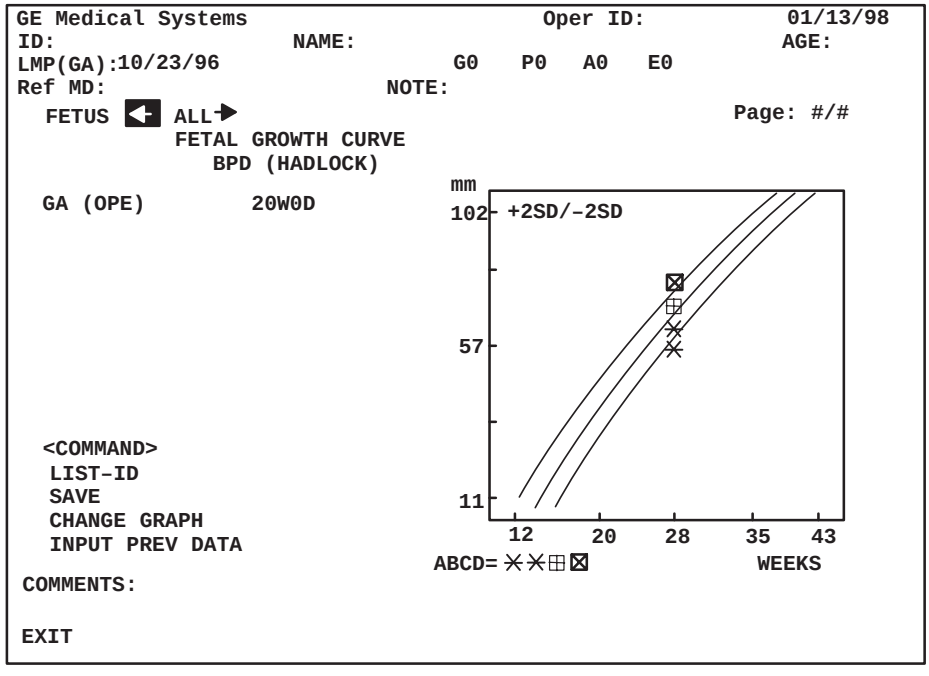


Figure 9–25. OB Graph Multigestational Option (USA Version)

Only gestational age, based on operator's input, is displayed for simultaneous plotting.

GYN Measurements

B-Mode

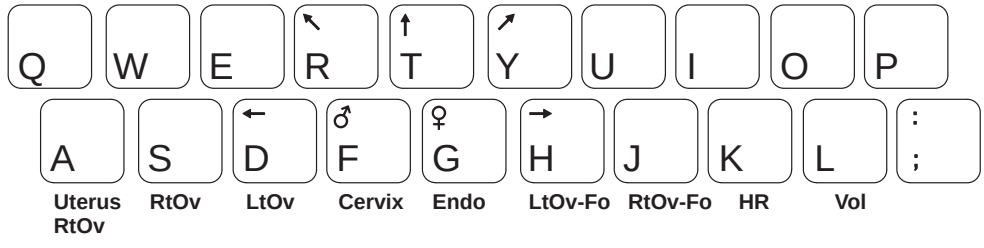


Figure 9–26. GYN Calculation Direct Keys

Ovarian Length, Height, and Width

The length, height and width of the left and right ovaries can be measured and recorded on the GYN summary report.

Each measurement is a typical distance measurement made on a B-Mode image in the appropriate scan plane.

Typically, the height and width are measured on the axial plane while the length is measured on the sagittal plane.

Ovarian Length, Height, and Width (cont'd)

To measure ovarian length:

Scan the patient's right or left ovary in the sagittal plane.

Press **Freeze** to stop image acquisition.

Press **Measurement** to activate the measurement function. An example of the factory default GYN calculation menu page is shown in Figure 9–27.

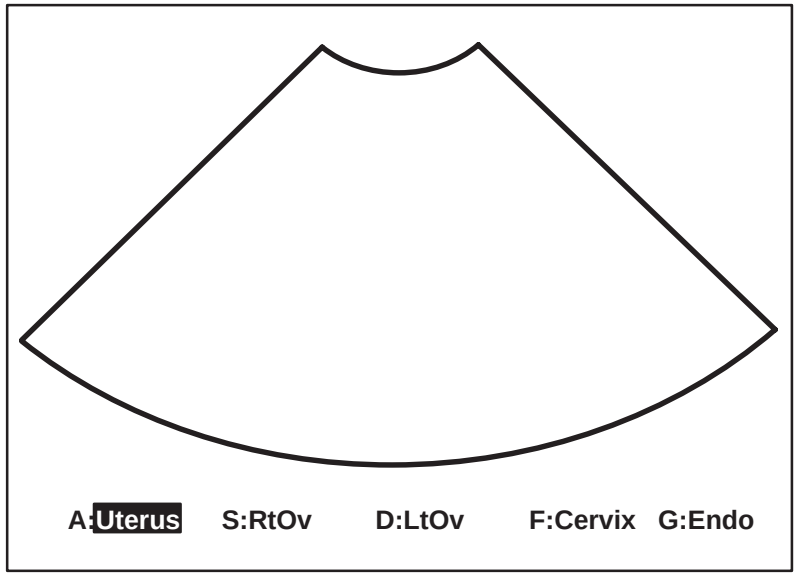
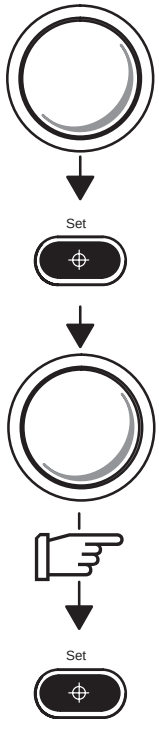


Figure 9–27. GYN Calculation Menu factory default

Select **Rt Ov-L** or **Lt Ov-L** from the GYN Calculation Menu. Press the **Space** left/right keys or the **Arrow** up/down keys as necessary to display the desired menu. Highlight the desired measurement and press **Set**. A "×" cursor appears.

Ovarian Length, Height, and Width (cont'd)



Use the **Trackball** to move the cursor to the measurement start point.

Press **Set** to fix the start-point cursor. An end-point cursor appears.

Use the **Trackball** to move the end-point cursor to the measurement end point.

*NOTE: If a fine adjustment of the two cursors is desired, press **Measurement** to toggle which cursor is active and adjust with the **Trackball**.*

Press **Set** to complete the measurement. The cursor and measured Rt Ov-L or Lt Ov-L value are fixed.

Ovarian Length, Height, and Width (cont'd)

To measure ovarian height and width:

Scan the patient's right or left ovary in the axial plane.

Press **Freeze** to stop image acquisition.

Press **Measurement** to activate the measurement function. Press the **Space** left/right keys to display the calculation menus.

Select **Rt Ov-H**, **Rt Ov-W**, **Lt Ov-H** or **Lt Ov-W** from the GYN Calculation Menu. Press the **Space** left/right keys, as necessary to display the desired menu. Highlight the desired measurement and press **Set**. A "×" cursor appears.

Follow the distance measurement steps outlined in the ovarian length measurement.

All right/left length, height or width measurements are recorded on the GYN Summary Report Page as selected from the GYN Calculation Sub Menu prior to measuring.

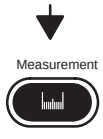
Uterine Length, Height, and Width

The GYN Calculation Menu allows for measurements to be recorded as uterine length (Ut-L), height (Ut-H) or width (Ut-W).

Once again, length is typically measured in the sagittal plane while height and width are measured in the axial plane.

Scan the patient in the appropriate scan plane.

Press **Freeze** to stop image acquisition.



Press **Measurement** to activate the measurement function.

Select the desired measurement from the GYN Calculation Menus. Press the **Arrow** keys as necessary to display the desired menus and highlight the desired measurement.

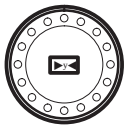
Follow the distance measurement steps as outlined in the ovarian measurements.

Measurements are recorded on the GYN Summary Report. The last three measurements of each type can be averaged by the Summary Report Page.

Endometrium Thickness

An endometrium thickness measurement is also available on the GYN Calculation Menu.

Scan the patient.



Press **Freeze** to stop image acquisition.

Press **Measurement** to activate the measurement function. Press the **Space** key to display calculation menus.

Select **Endo** from the GYN Calculation Menu. Press the **Arrow** keys, as necessary, to display page two and highlight **Endo**. A "×" cursor appears.

Use the **Trackball** to move the cursor to the measurement start point.

Press **Set** to fix the start-point cursor. An end-point cursor appears.

Use the **Trackball** to move the end-point cursor to the measurement end point.

Press **Set** to complete the measurement. The measured value is displayed on the screen and recorded on the GYN Report Page.

GYN Summary Report

Overview

GYN Summary Reports consist of three pages of reports. The three report pages are GYN Report Page, Measurement Averaging Page and IVF Report Page. The GYN summary Report Page Sequence diagram is shown in Figure 9–28.

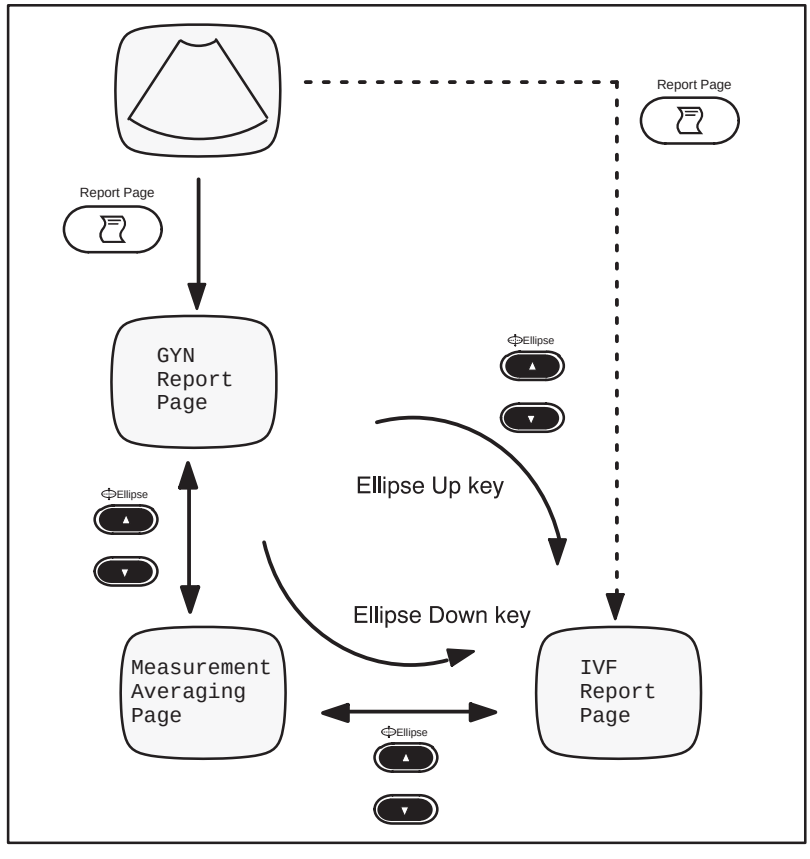


Figure 9–28. GYN Report Page Sequency

Overview (cont'd)

To activate the GYN Summary Reports:

Press the **Report Page** key on the keyboard. The GYN Report Page is displayed on the monitor.

To change the GYN Summary Report Page:

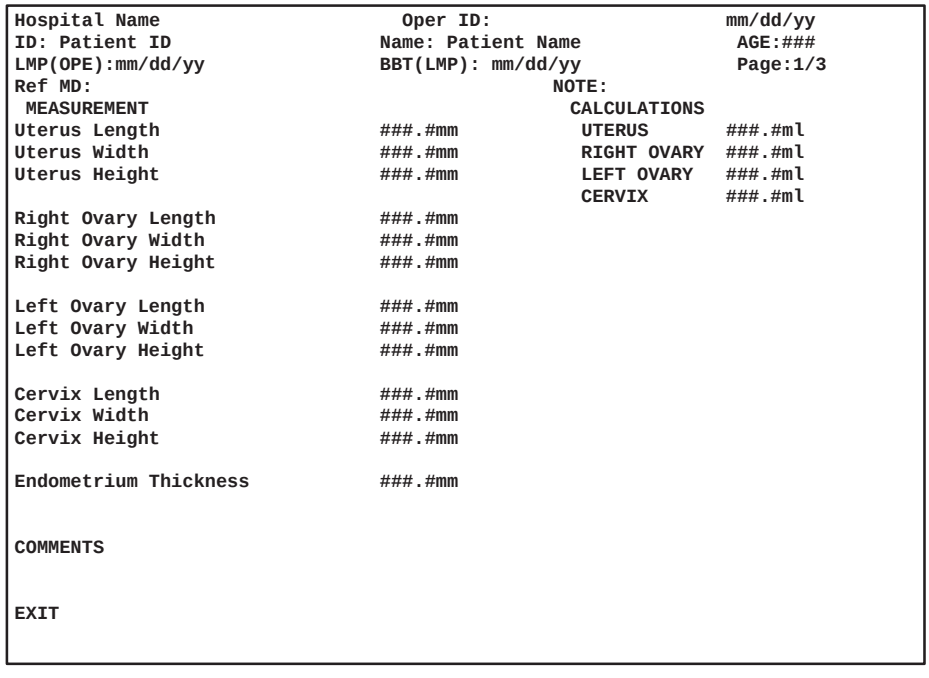
Press the **Ellipse** up/down arrow keys. The GYN Summary Report Page will be changed as shown in Figure 9–28.

To exit the GYN Summary Reports:

Move the cursor to EXIT on each display page. Press **Set** to exit the GYN Summary Report and return to the previous exam mode.

GYN Report Layout

The GYN Report Page provides a collection of Patient Data, Exam Measurements, Calculations and comments.



```
Hospital Name                    Oper ID:                    mm/dd/yy
ID: Patient ID                 Name: Patient Name             AGE:###
LMP(OPE):mm/dd/yy              BBT(LMP): mm/dd/yy             Page:1/3
Ref MD:                                    NOTE:
 MEASUREMENT                                 CALCULATIONS
Uterus Length                  ###.#mm       UTERUS        ###.#ml
Uterus Width                   ###.#mm       RIGHT OVARY   ###.#ml
Uterus Height                  ###.#mm       LEFT OVARY    ###.#ml
                                             CERVIX        ###.#ml
Right Ovary Length             ###.#mm
Right Ovary Width              ###.#mm
Right Ovary Height             ###.#mm

Left Ovary Length              ###.#mm
Left Ovary Width               ###.#mm
Left Ovary Height              ###.#mm

Cervix Length                  ###.#mm
Cervix Width                   ###.#mm
Cervix Height                  ###.#mm

Endometrium Thickness          ###.#mm


COMMENTS


EXIT
```

Figure 9–29. GYN Report Page

The top portion of the GYN Report Page contains patient information entered into the Patient Entry Menu.

GYN Report Layout (cont'd)

The middle portion of the GYN Report Page shows the measurement values made for each type and the calculations made from the measurement.

The bottom portion of the GYN Report Page displays Comments area, EXIT menu and Operator Message Area.

The two lines available for comments can be edited by the user.

The very bottom of the report is left for Operator Message.

GYN Calculation Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
UT-L	Uterine Length	one distance	Ut-L[cm or mm]=d1
UT-H	Uterine Height	one distance	Ut-H[cm or mm]=d1
UT-W	Uterine Width	one distance	Ut-W[cm or mm]=d1
Endo	Endometrium Thick-ness	one distance	Endo[cm or mm]=d1
Lt. Ov-L	Left Ovarian Length	one distance	Lt. Ov-L[cm or mm]=d1
Lt. Ov-H	Left Ovarian Height	one distance	Lt. Ov-H[cm or mm]=d1
Lt. Ov-W	Left Ovarian Width	one distance	Lt. Ov-W[cm or mm]=d1
Rt. Ov-L	Right Ovarian Length	one distance	Rt. Ov-L[cm or mm]=d1
Rt. Ov-H	Right Ovarian Height	one distance	Rt. Ov-H[cm or mm]=d1
Rt. Ov-W	Right Ovarian Width	one distance	Rt. Ov-W[cm or mm]=d1

Table 9–12. GYN Calculation Formulas

Measurement Averaging Page Layout

The Measurement Averaging Page provides GYN measurement results and their average.

```
Hospital Name                          Oper ID:                mm/dd/yy
ID: Patient ID                 Name: Patient Name               AGE:###
LMP(OPE):mm/dd/yy          BBT(LMP): mm/dd/yy                   Page:2/3
Ref MD:                            NOTE:
 MEASUREMENT                 1           2           3           AVE
Uterus Length              ###.#mm     ###.#mm     ###.#mm     ###.#mm
Uterus Width               ###.#mm     ###.#mm     ###.#mm     ###.#mm
Uterus Height              ###.#mm     ###.#mm     ###.#mm     ###.#mm

Right Ovary Length         ###.#mm     ###.#mm     ###.#mm     ###.#mm
Right Ovary Width          ###.#mm     ###.#mm     ###.#mm     ###.#mm
Right Ovary Height         ###.#mm     ###.#mm     ###.#mm     ###.#mm

Left Ovary Length          ###.#mm     ###.#mm     ###.#mm     ###.#mm
Left Ovary Width           ###.#mm     ###.#mm     ###.#mm     ###.#mm
Left Ovary Height          ###.#mm     ###.#mm     ###.#mm     ###.#mm

Cervix Length              ###.#mm     ###.#mm     ###.#mm     ###.#mm
Cervix Width               ###.#mm     ###.#mm     ###.#mm     ###.#mm
Cervix Height              ###.#mm     ###.#mm     ###.#mm     ###.#mm

Endometrium Thickness      ###.#mm     ###.#mm     ###.#mm     ###.#mm




EXIT
```

Figure 9–30. GYN Measurement Averaging Page

The top portion of the page contains patient information entered into the Patient Entry Menu.

The middle portion of the page shows the last three measurement values made for each type and the average of the last three measurements for each type.

IVF Report Page Layout

The IVF Report Page provides for the measuring and reporting of the development of ovarian follicles. Up to five follicles can be measured for each ovary. For each follicle one to three diameters can be measured. From three measurements, the mean diameter and volume are calculated.

```
Hospital Name                      Oper ID:                      mm/dd/yy
ID: Patient ID                     Name: Patient Name              AGE:###
LMP(OPE):yy/mm/dd                BBT(LMP) : yy/mm/dd             Page:3/3
Ref MD:                                        NOTE:
LEFT OVARY FOLLICLES
       D1          D2          D3                MEAN    VOLUME
  1  ###.#mm     ###.#mm     ###.#mm             ###.#mm  ###.#ml
  2  ###.#mm     ###.#mm     ###.#mm             ###.#mm  ###.#ml
  3  ###.#mm     ###.#mm     ###.#mm             ###.#mm  ###.#ml
  4  ###.#mm     ###.#mm     ###.#mm             ###.#mm  ###.#ml
  5  ###.#mm     ###.#mm     ###.#mm             ###.#mm  ###.#ml

RIGHT OVARY FOLLICLES
       D1          D2          D3                MEAN     VOLUME
  1  ###.#mm     ###.#mm     ###.#mm             ###.#mm  ###.#ml
  2  ###.#mm     ###.#mm     ###.#mm             ###.#mm  ###.#ml
  3  ###.#mm     ###.#mm     ###.#mm             ###.#mm  ###.#ml
  4  ###.#mm     ###.#mm     ###.#mm             ###.#mm  ###.#ml
  5  ###.#mm     ###.#mm     ###.#mm             ###.#mm  ###.#ml

FOLLICULAR OBSERVATIONS
 VOLUME CHANGES                  :
 BORDER APPEARANCE               :
 CONTENTS                        :
 OTHER                           :

COMMENTS


EXIT
```

Figure 9–31. IVF Report Page

This page left blank intentionally.

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Introduction

Overview

The cardiac calculation for the LOGIQ ™ 200 PRO Series offers limited cardiac measurement and calculation capabilities. Analysis of the left ventricle selections available are

- Cubed method
- Teichholz method
- Bullet method
- Modified Simpson's Rule method
- Single-plane ellipsoid method
- Biplane ellipsoid method
- Gibson method

M–Mode Analysis measurement selections available are

- Left/Right Ventricle (M–LV/RV)
- Mitral Valve (M–MV)
- Aortic Valve (M–AV)
- Pulmonic Valve (M–PV)
- Tricuspid Valve (M–TV)

Cardiology should be chosen in the exam category. In all measurements, press **Freeze** to stop acquisition of the desired image. Press **Measurement** to activate the measurement function.

Overview (cont'd)

To select the Cardiology calculation menu,

Press the **Space** left/right keys to display a calculation menu on the monitor. Press the **Space** left/right keys again or press the **Arrow** up/down keys as necessary to display the desired menu page. The selected menu is inverted.

An example of the calculation menu page is shown in Figure 10–1.

Using the **Arrow** left/right keys or the **Trackball**, select the desired calculation menu as shown in Figure 10–1. The selected menu is inverted. Press **Set**.

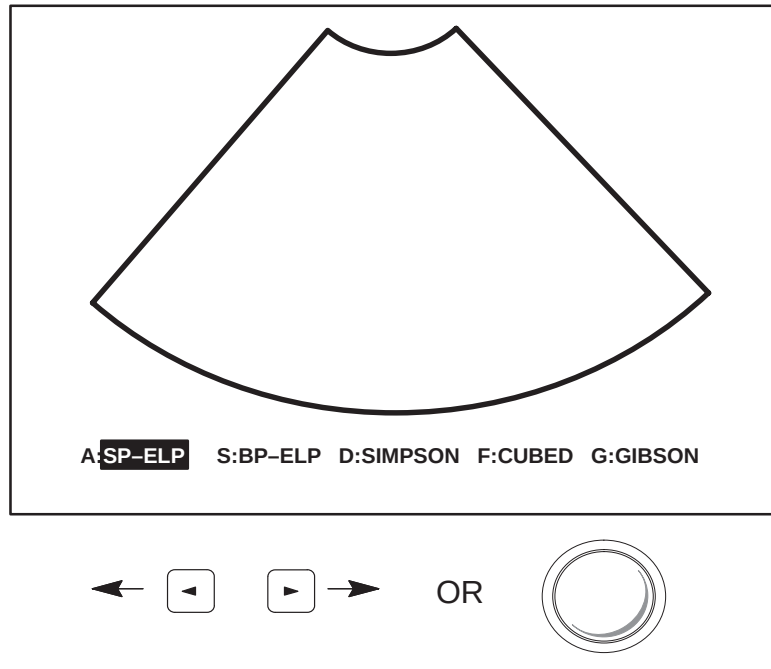


Figure 10–1. Cardiology Calculation Sub-Menu

Overview (cont'd)

NOTE: It is possible for the operator to directly press an alphanumeric key to access the calculation function.

Once one of the Cardiology menus is chosen, a Sub-Menu with the necessary measurement selections appears.

NOTE: Once an LV method has been chosen, the system will prompt the User through a sequence of LV measurements to perform before the User presses the Freeze key.

Cardiology Calculations Measurement Menus

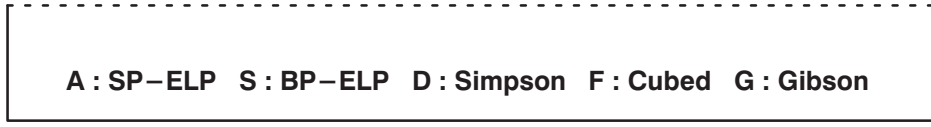
The illustrations that follow show the Cardiology Calculation measurement selections.

Each selection in the first layer of Sub-Menus will yield a second layer of Sub-Menus. This second layer contains measurements and calculations necessary to complete the category.

In Pages 1 and 3 of the first layer, LV Analysis method Sub Menus are available. In Page 2, there are five menu selections for M–Mode Analysis. In addition, Page 4 contains the three choices for additional cardiology calculations. Refer to Figure 10–2.

NOTE: It is possible for the operator to preset the alphanumeric key assignment.

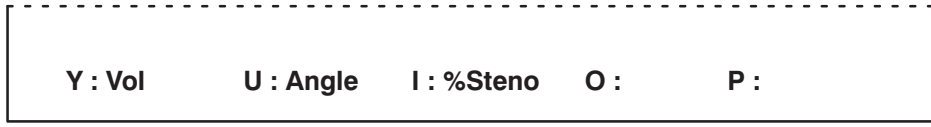
Cardiology Calculations Sub-Menus (First Layer)



Page One (LV Analysis Measurement)

Page Three (LV Analysis Measurement)

Page Two (M−Mode Analysis Measurement)



Page Four (Additional Measurement)

Figure 10–2. First Layer Sub-Menus

General Guidelines

Any measurement can be repeated by selecting that measurement again from the Sub-Menu.

The system retains as many as twenty lines of measurements.

The current report will be cleared and a method selection menu appears. Use the **Trackball** to select a new LV method and press **Set**.

After pressing **Set** the new LV method report is displayed.

Auto Sequence Measurement

Any cardiac measurements will be done through a sequential streamline automatically. Once the measurement begins, the system continues to calculate all the calculation items in the menu before the Clear key is pressed.

Press **Clear** only if it is desired to disable the system's cardiac auto-measurement sequence and calculate item by item.

BSA Calculation Methods

The LOGIQ™ 200 PRO Series can calculate BSA (Body Surface Area) by two different formulas, depending on the method selected in the Patient Entry Setup.

Oriental Formula

$$BSA\ [m^2] = (Height\ [cm])^{.03} \times (Weight\ [g])^{A} \times 3.207 \times 10^{-4}$$

$$A = 0.7285 - 0.0188 \times \log (Weight\ [g])$$

Occidental Formula

$$BSA\ [m^2] = (0.425 \times \log (Weight\ [g]) + 0.725 \times \log (Height\ [cm]) + 1.8654) \times 10^{-4}$$

NOTE: *1 inch = 2.54 cm*
1 lb = 453.59243 g
g = grams
cm = centimeters

LV Analysis Measurements

Cubed, Teichholz, Gibson Methods

The Cubed, Teichholz, and Gibson Methods consist of B-Mode or M-Mode measurements.

Measurements found on the Cubed, Teichholz, and Gibson Methods Sub-Menus are:

LVIDd	:	Left ventricular internal diameter, diastole
LVIDs	:	Left ventricular internal diameter, systole
IVSd	:	Interventricular septal thickness, diastole
IVSs	:	Interventricular septal thickness, systole
LVPWd	:	Left ventricle posterior wall thickness, diastole
LVPWs	:	Left ventricle posterior wall thickness, systole

Items calculated and found on the Cubed, Teichholz, and Gibson Methods are:

HR	:	Heart rate
EdV	:	End diastole volume
EsV	:	End systole volume
SV	:	Stroke volume
CO	:	Cardiac output
EF	:	Ejection fraction
FS	:	Fractional shortening

Calculation formulas can be found at the end of this section.

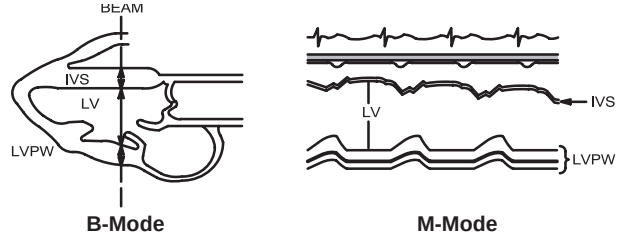


Figure 10–3. Cubed, Teichholz, and Gibson Methods Measurements

Cubed Method Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVIDd	Left Ventricular Internal Diameter, Diastole	one distance	LVIDd=d1[cm or mm]
LVIDs	Left Ventricular Internal Diameter, Systole	one distance	LVIDs=d1[cm or mm]
IVSd	Interventricular Septal Thickness, Diastole	one distance	IVSd=d1[cm or mm]
IVSs	Interventricular Septal Thickness, Systole	one distance	IVSs=d1[cm or mm]
LVPWd	Left Ventricle Posterior Wall Thickness, Diastole	one distance	LVPWd=d1[cm or mm]
LVPWs	Left Ventricle Posterior Wall Thickness, Systole	one distance	LVPWs=d1[cm or mm]
EdV	End Diastole Volume	one distance	EdV[ml]=LVIDd^3
EsV	End Systole Volume	one distance	EsV[ml]=LVIDs^3
SV	Stroke Volume	two distance	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and one 2 beat time interval	CO[1/min]= SVxHR/1000
EF	Ejection Fraction	two distances	EF=SV/EdVx100
FS	Fractional Shortening	two distances	FS=(1–LVIDs/ LVIDd)x100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=/120 [sec]/2 beat time [sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms orsec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]= 220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–1. Cubed Method Formulas

Teichholz Method Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVIDd	Left Ventricular Internal Diameter, Diastole	one distance	LVIDd=d1[cm or mm]
LVIDs	Left Ventricular Internal Diameter, Systole	one distance	LVIDs=d1[cm or mm]
IVSd	Interventricular Septal Thickness, Diastole	one distance	IVSd=d1[cm or mm]
IVSs	Interventricular Septal Thickness, Systole	one distance	IVSs=d1[cm or mm]
LVPWd	Left Ventricle Posterior Wall Thickness, Diastole	one distance	LVPWd=d1[cm or mm]
LVPWs	Left Ventricle Posterior Wall Thickness, Systole	one distance	LVPWs=d1[cm or mm]
EdV	End Diastole Volume	one distance	EdV[ml]=LVIDd^3x7/(2.4 +LVIDd)
EsV	End Systole Volume	one distance	EsV[ml]=LVIDs^3x7/(2.4 +LVIDs)
SV	Stroke Volume	two distances	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and one 2 beat time interval	CO[1/min]= SVxHR/1000
EF	Ejection Fraction	two distances	EF=SV/EdVx100
FS	Fractional Shortening	two distances	FS=(1–LVIDs/ LVIDd)x100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR=120[sec]/ 2 beat time[sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms or sec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]= 220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–2. Teichholz Method Formulas

Gibson Method Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVIDd	Left Ventricular Internal Diameter, Diastole	one distance	LVIDd=d1[cm or mm]
LVIDs	Left Ventricular Internal Diameter, Systole	one distance	LVIDs=d1[cm or mm]
IVSd	Interventricular Septal Thickness, Diastole	one distance	IVSd=d1[cm or mm]
IVSs	Interventricular Septal Thickness, Systole	one distance	IVSs=d1[cm or mm]
LVPWd	Left Ventricle Posterior Wall Thickness, Diastole	one distance	LVPWd=d1[cm or mm]
LVPWs	Left Ventricle Posterior Wall Thickness, Systole	one distance	LVPWs=d1[cm or mm]
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–3. Gibson Method Measurement Formulas

Bullet and Modified Simpson's Rule Methods

Bullet and Modified Simpson's Rule Methods consist of B-Mode measurements.

Measurements found on the Bullet Method Sub-Menu are:

LVLd : Left ventricular length, diastole
LVLs : Left ventricular length, systole
LVAMd : Left ventricular area mitral valve, diastole
LVAMs : Left ventricular area mitral valve, systole

Measurements found on the Modified Simpson's Rule Sub-Menu are:

LVLd : Left ventricular length, diastole
LVLs : Left ventricular length, systole
LVAMd : Left ventricular area mitral valve, diastole
LVAMs : Left ventricular area mitral valve, systole
LVAPd : Left ventricular area papillary muscles, diastole
LVAPs : Left ventricular area papillary muscles, systole

Items calculated and found on the Bullet and Modified Simpson's Rule Methods are:

HR : Heart rate
EdV : End diastole volume
EsV : End systole volume
SV : Stroke volume
CO : Cardiac output
EF : Ejection fraction

Calculation formulas can be found at the end of this section.

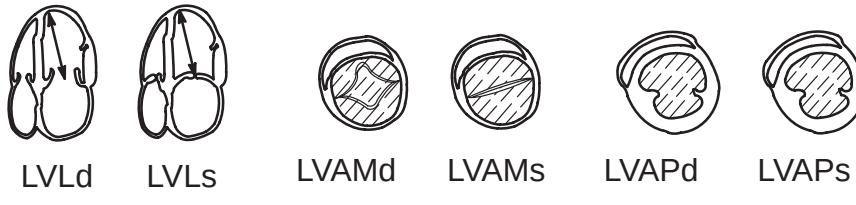


Figure 10–4. Bullet and Modified Simpson's Rule Methods Measurements

Bullet Method Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVLd	Left Ventricular Length, Diastole	one distance	LVLd=d1[cm or mm]
LVLs	Left Ventricular Length, Systole	one distance	LVLs=d1[cm or mm]
LVAMd	Left Ventricular Area, Mitral Valve, Diastole	one area (by ellipse, trace or circle)	LVAMd=a1[cm ^2]
LVAMs	Left Ventricular Area, Mitral Valve, Systole	one area (by ellipse, trace or circle)	LVAMs=a1[cm ^2]
EdV	End Diastole Volume	one distance and one area (by ellipse, trace or circle)	EdV[ml]=5xLVLd xLVAMd/6
EsV	End Systole Volume	one distance and one area (by ellipse, trace or circle)	EsV[ml]=5xLVLs xLVAMs/6
SV	Stroke Volume	two distances and two areas (by ellipse, trace or circle)	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and two areas (by ellipse, trace or circle) and one 2 beat time interval	CO[1/min]= SVxHR/1000
EF	Ejection Fraction	two distances and two areas (by ellipse, trace or circle)	EF=SV/EdVx100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms or sec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]= 220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–4. Bullet Method Formulas

Modified Simpson's Rule Method Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVLd	Left Ventricular Length, Diastole	one distance	LVLd=d1[cm or mm]
LVLs	Left Ventricular Length, Systole	one distance	LVLs=d1[cm or mm]
LVAMd	Left Ventricular Area, Mitral Valve, Diastole	one area (by ellipse, trace or circle)	LVAMd=a1[cm ^2]
LVAMs	Left Ventricular Area, Mitral Valve, Systole	one area (by ellipse, trace or circle)	LVAMs=a1[cm ^2]
LVAPd	Left Ventricular Area, Papillary Muscles, Diastole	one area (by ellipse, trace or circle)	LVAPd=a1[cm ^2]
LVAPs	Left Ventricular Area, Papillary Muscles, Systole	one area (by ellipse, trace or circle)	LVAPs=a1[cm ^2]
EdV	End Diastole Volume	one distance and two areas (by ellipse, trace or circle)	EdV[ml]=LVLd/3 x(LVAMd+(LVAMd+ LVAPd)/2+ LVAPd/3)
EsV	End Systole Volume	one distance and two areas (by ellipse, trace or circle)	EsV[ml]=LVLs/3 x(LVAMs+(LVAMs+ LVAPs)/2+ LVAPs/3)
SV	Stroke Volume	two distances and four areas (by ellipse, trace or circle)	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and four areas (by ellipse, trace or circle) and one 2 beat time interval	CO[1/min]= SVxHR/1000
EF	Ejection Fraction	two distances and four areas (by ellipse or trace or circle)	EF=SV/EdVx100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR=120[sec]/ 2 beat time[sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms or sec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]= 220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–5. Modified Simpson's Rule Method Formulas

Single Plane Ellipsoid Methods

Single and Bi Plane Ellipsoid Methods consist of B-Mode (2D) measurements.

Measurements found on the Single Plane Ellipsoid Method Sub-Menu are:

LVLd	:	Left ventricular length, diastole
LVLs	:	Left ventricular length, systole
LVAd	:	Left ventricular area, diastole
LVAs	:	Left ventricular area, systole

Bi Plane Ellipsoid Methods

Measurements found on the Bi Plane Ellipsoid Method Sub-Menu are:

LVMLd	:	Left ventricular medial-lateral dimension, diastole
LVMLs	:	Left ventricular medial-lateral dimension, systole
LVAMd	:	Left ventricular area mitral valve, diastole
LVAMs	:	Left ventricular area mitral valve, systole
LVAd	:	Left ventricular area, diastole
LVAs	:	Left ventricular area, systole

Items calculated and found on the Single and Bi Plane Ellipsoid Methods are:

HR	:	Heart Rate
EdV	:	End diastole volume
EsV	:	End systole volume
SV	:	Stroke volume
CO	:	Cardiac output
EF	:	Ejection fraction

Calculation formulas can be found at the end of this section.

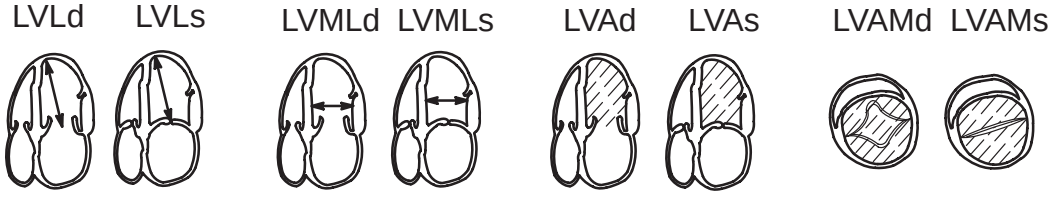


Figure 10–5. Single and Bi Plane Ellipsoid Methods Measurements

Single Plane Ellipsoid Method Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVLd	Left Ventricular Length, Diastole	one distance	LVLd=d1[cm or mm]
LVLs	Left Ventricular Length, Systole	one distance	LVLs=d1[cm or mm]
LVAd	Left Ventricular Area, Diastole	one area (by ellipse, trace or circle)	LVAd=a1[cm ^2]
LVAs	Left Ventricular Area, Systole	one area (by ellipse, trace or circle)	LVAs=a1[cm ^2]
EdV	End Diastole Volume	one distance and two areas (by ellipse, trace or circle)	EdV[ml]=8/(3 π) x(LVAd)^2/LVLd
EsV	End Systole Volume	one distance and two areas (by ellipse, trace or circle)	EsV[ml]=8/(3 π) x(LVAs)^2/LVLs
SV	Stroke Volume	two distances and four areas (by ellipse, trace or circle)	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and four areas (by ellipse, trace or circle) and one 2 beat time interval	CO[1/min]= SVxHR/1000
EF	Ejection Fraction	two distances and four areas (by ellipse, trace or circle)	EF=SV/EdVx100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms or sec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]= 220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–6. Single Plane Ellipsoid Method Formulas

Bi Plane Ellipsoid Method Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
LVMLd	Left Ventricle Medial-Lateral Dimension, Diastole	one distance	LVMLd=d1[cm or mm]
LVMLs	Left Ventricle Medial-Lateral Dimension, Systole	one distance	LVMLs=d1[cm or mm]
LVAMd	Left Ventricular Area, Mitral Valve, Diastole	one area (by ellipse, trace or circle)	LVAMd=a1[cm ^2]
LVAMs	Left Ventricular Area, Mitral Valve, Systole	one area (by ellipse, trace or circle)	LVAMs=a1[cm ^2]
LVAd	Left Ventricle Area, Diastole	one area (by ellipse, trace or circle)	LVAd=a1[cm ^2]
LVAs	Left Ventricle Area, Systole	one area (by ellipse, trace or circle)	LVAs=a1[cm ^2]
EdV	End Diastole Volume	one distance and two areas (by ellipse, trace or circle)	EdV[ml]=8/(3 π) x(LVAdxLVAMd)/ LVMLd
EsV	End Systole Volume	one distance and two areas (by ellipse, trace or circle)	EsV[ml]=8/(3 π) x(LVAsxLVAMs)/ LVMLs
SV	Stroke Volume	two distances and four areas (by ellipse, trace or circle)	SV[ml]=EdV–EsV
CO	Cardiac Output	two distances and four areas (by ellipse, trace or circle) and one 2 beat time interval	CO[1/min]= SVxHR/1000
EF	Ejection Fraction	two distances and four areas (by ellipse, trace or circle)	EF=SV/EdVx100
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]
PHT	Pressure Half Time	one time interval	PHT=t1[ms or sec]
MVA	Mitral Valve Area	one pressure half time interval	MVA[cm^2]= 220/PHT
ET	Ejection Time	one time interval	ET=t1[ms or sec]

Table 10–7. Bi Plane Ellipsoid Method Formulas

M–Mode Analysis Measurement

Overview

LOGIQ™ 200 PRO Series provides expanded measurement, calculation and report capabilities to the Left-Ventricular calculations found in the basic cardiac option package.

A page of measurements is also added to the cardiac calculation menu. This Measurement is available only in M–Mode. This includes Left/Right Ventricles, Mitral Valve, Aortic Valve, Pulmonic Valve and Tricuspid Valve measurement.

The number and type of measurements vary for each calculation. The formulas used are shown in the calculation specification tables in this chapter.

M-Mode Analysis – Left/Right Ventricle (M-LV/RV)

Measurements found on the M–LV/RV Sub-Menu are:

RVDd	:	Right Ventricular Dimension, diastole
IVSd	:	Interventricular Septal Thickness, diastole
LVIDd	:	Left Ventricular Interior Dimension, diastole
LVPWd	:	Left Ventricular Post Wall Thickness, diastole
IVSs	:	Inventricular Septal Thickness, systole
LVIDs	:	Left Ventricular Interior Dimension, systole
LVPWs	:	Left Ventricular Post Wall Thickness, systole

Items calculated and found on the M–LV/RV Sub Menus are:

HR	:	Heart rate
IVS/PW	:	Interventricular Septum/Left Ventricular Posterior Ratio at Diastole
FS	:	Left Ventricle Internal Dimension Fractional Shortening
%STIVS	:	Interventricular Shortening
LVM	:	Left Ventricle Cardiac Mass

Calculation formulas can be found at the end of this section.

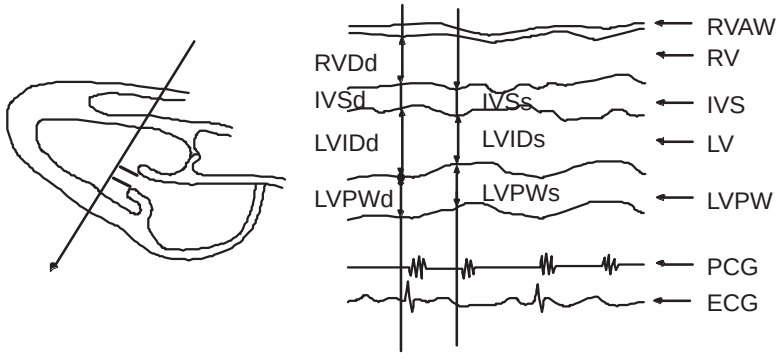


Figure 10–6. M-LV/RV Measurements

M-Mode Analysis – Left/Right Ventricle (M-LV/RV) Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
RVDd	Right Ventricular Dimension, Diastole	one distance	RVDd=d1[cm or mm]
IVSd	Interventricular Septal Thickness, Diastole	one distance	IVSd=d1[cm or mm]
LVIDd	Left Ventricular Interior Dimension, Diastole	one distance	LVIDd=d1[cm or mm]
LVPWd	Left Ventricular Posterior Wall Thickness at Diastole	one distance	LVPWd=d1[cm or mm]
IVSs	Interventricular Septal Thickness, Systole	one distance	IVSs=d1[cm or mm]
LVPWs	Left Ventricular Posterior Wall Thickness at Systole	one distance	LVPWs=d1[cm or mm]
LVIDs	Left Ventricular Interior Dimension at Systole	one distance	LVIDs=d1[cm or mm]
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]

Table 10–8. Left/Right Ventricle (M-LV/RV)

M-Mode Analysis – Left/Right Ventricle (M-LV/RV) (cont'd)

Calc Mnemonic	Calc Name	Input Measurements	Formula
IVS/PW	Interventricular Septum/Left Ventricle Posterior Ratio at Diastole	two distances (IVSd & LVPWd)	IVS/PW[%]= IVSd/LVPWd x 100
FS	Left Ventricle Internal Dimension Fractional Shortening	two distances (LVIDd & LVIDs)	FS[%]= [(LVIDd-LVIDs)/LVIDd] x 100
%STIVS	Interventricular Shortening	two distances (IVSd & IVSs)	%STIVS[%]= [(IVSs-IVSd)/IVSd] x 100
%STPW	Left Ventricle Posterior Wall Shortening	two distances (LVPWd & LVPWs)	%STPW[%]= [(LVPWs-LVPWd)/LVPWd] x 100
LVM	Left Ventricle Cardiac Mass	three distances (LVPWd, LVIDd & IVSd)	LVM[g]=1.04x[(IVSd+LVPWd+LVIDd)^3-LVIDd^3] –13.6

Table 10–8. Left/Right Ventricle (M-LV/RV) (cont'd)

M-Mode Analysis – Mitral Valve (M-MV)

Measurements found on the M–MV Sub-Menu are:

EPSS : E Point Septal Separation
D_CE : Mitral Valve C–E Separation
D_DE : Mitral Valve D–E Separation
T_AC : Mitral Valve A–C Separation
V_EF : Mitral Valve E–F Velocity
P–R : P–R Interval

Items calculated and found on the M–MV Sub–Menu are:

HR : Heart Rate (beats/minute)
A/E : Mitral Valve A/E Ratio
PR–AC : Mitral Valve PR–AC Interval

Calculation formulas can be found at the end of this section.

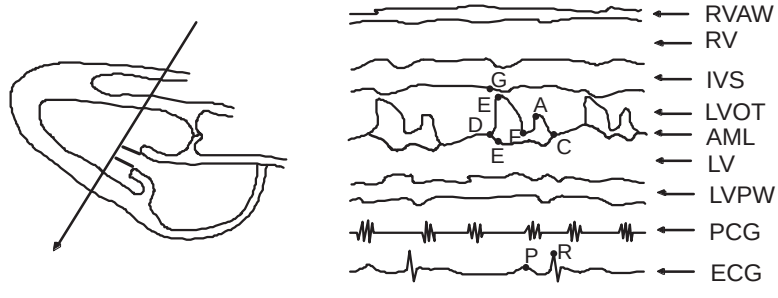


Figure 10–7. M-MV Measurements

M-Mode Analysis – Mitral Valve (M-MV) Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
EPSS	E point Septal Separation	one distance	EPSS=d1[cm or mm]
V_EF	Mitral Valve E-F Velocity	one slope	V_EF=s1[cm/s]
V_DE	Mitral Valve D-E Velocity	one slope	V_DE=s1[cm/s]
D_DE	Mitral Valve D-E Separation	one distance	V_DE=d1[cm or mm]
D_CE	Mitral Valve C-E Separation	one distance	D_CE=d1[cm or mm]
T_AC	Mitral Valve A-C Interval	one time interval	T_AC=t1[msec or sec]
P-R	P-R Interval	one time interval	P-R=t1[msec or sec]
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]
A/E	Mitral Valve A/E Ratio	two distances (A-C & D-E)	A/E[%]= (D_AC/ D_DE) x 100
PR-AC	Mitral Valve PR-AC Interval	two time intervals	PR-AC[msec or sec]=P-R - T_AC

Table 10–9. Mitral Valve (M-MV)

M-Mode Analysis – Aortic Valve (M-AV)

Measurements found on the M–AV Sub-Menu are:

RVOTs	:	Right Ventricular Outflow Tract Diameter at systole
AOd	:	Aortic Root Dimension
ALSs	:	Aortic Valve Leaflet Separation at systole
LADs	:	Left Atrium Dimension, systole
LVPEP	:	Left Ventricle Pre–Ejection Period
LVET	:	Left Ventricle Ejection Time

Measurements found on the M–AV Sub-Menu are:

HR	:	Heart Rate
LA/AO	:	LADs/AOd Ratio
PET/ET	:	Left Ventricle Systole Time Interval Ratio

Calculation formulas can be found at the end of this section.

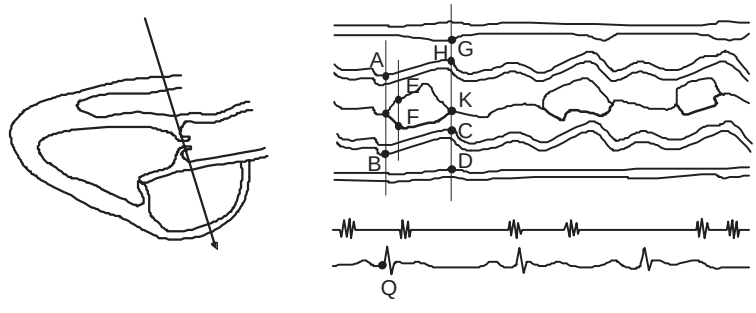


Figure 10–8. M-AV Measurements

M-Mode Analysis – Aortic Valve (M-AV) Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
AOd	Aortic Root Dimension, Diastole	one distance A-B	AOd=d1[cm or mm]
ALSs	Aortic Valve Leaflet Seperation, Systole	one distance E-F	ALSs=d1[cm or mm]
LADs	Left Atrium Dimension, Systole	one distance C-D	LADs=d1[cm or mm]
RVOTs	Right Ventricular Outflow Tract Diameter at Systole	one distance G-H	RVOTs=d1[cm or mm]
LVPEP	Left Ventricle Pre-Ejection Period	one time interval Q-I	LVPEP=t1[msec or sec]
LVET	Left Ventricle Ejection Time	one time interval I-K	LVET=t1[msec or sec]
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]
LA/AO	LADs/AOd Ratio	two distances (LADs & AOd)	LA/AO[%]=LADs/AOd x 100
PEP/ET	Left Ventricle Systole Time Interval Ratio	two distances (LVPEP & LVET)	PEP/ET[%]= (LVPEP/LVET) x 100

Table 10–10. Aortic Valve (M-AV)

M-Mode Analysis – Pulmonic Valve (M-PV)

Measurements found on M–PV Sub-Menu are:

PADs : Pulmonic Artery Diameter at Systole
aWAVE : Pulmonic Valve a–Wave Amplitude
RVPEP : Right Ventricle Pre–Ejection Period
RVET : Right Ventricle Ejection Time

Measurements found on the M–PV Sub-Menu are:

HR : Heart Rate
PAAs : Pulmonary Artery Area at systole
PEP/ET : Right Ventricle Systole Time Interval Ratio

Calculation formulas can be found at the end of this section.

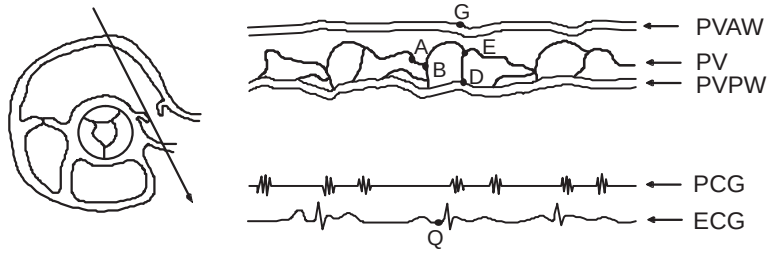


Figure 10–9. M–PV Measurements

M-Mode Analysis – Pulmonic Valve (M-PV) Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
PADs	Pulmonic Artery Diameter at Systole	one distance	PADs=d1[cm or mm]
RVPEP	Right Ventricle Pre-Ejection Period	one time interval	RVPEP=t1[msec or sec]
RVET	Right Ventricle Ejection Time	one time interval	RVET=t1[msec or sec]
aWAVE	Pulmonic Valve a-Wave Amplitude	one distance	aWAVE=d1[cm or mm]
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]
PAAs	Pulmonary Artery Area at Systole	one distance (PADs)	PAAs[cm^2]= (π/4)x(PADs) ^2
PEP/ET	Right Ventricle Systole Time Interval Ratio	two distances (RVPEP & RVET)	PEP/ET[%]= (RVPEP/RVET)x100

Table 10–11. Pulmonic Valve (M-PV)

M-Mode Analysis – Tricuspid Valve (M-TV)

Measurements found on the M–TV Sub-Menu are:

TV_EF : Tricuspid Valve E–F Velocity
TV_DE : Tricuspid Valve D–E Velocity
TV_CE : Tricuspid Valve C–E Velocity
TV_AC : Tricuspid Valve A–C Velocity
P–R : P–R Interval

Measurements found on the M–TV Sub-Menu are:

HR : Heart Rate
TV–A/E : Tricuspid A/E Ratio
TPR–AC : Tricuspid Valve PR–AC Interval

Calculation formulas can be found at the end of this section.

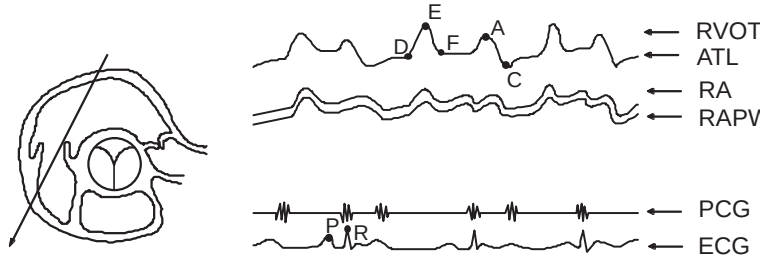


Figure 10–10. M-TV Measurements

M-Mode Analysis – Tricuspid Valve (M-TV) Formulas

Calc Mnemonic	Calc Name	Input Measurements	Formula
TV_EF	Tricuspid Valve E-F Velocity	one slope	TV_EF=v1[cm/s or m/s]
TV_DE	Tricuspid Valve D-E Amplitude	one distance	TV_DE=d1[cm or mm]
TV_CE	Tricuspid Valve C-E Amplitude	one distance	TV_CE=d1[cm or mm]
TV_AC	Tricuspid Valve A-C Interval	one time interval	TV_AC=t1[msec or sec]
P-R	P-R Interval	one time interval	P-R=t1[msec or sec]
HR	Heart Rate (beats/minute)	one 2 beat time interval	HR[BPM]=120 [sec]/ 2 beat time [sec]
TV-A/E	Tricuspid Valve A/E Ratio	one distance (TV<D-E>)	TV-A/E[%]= (D<TV_AC>/TV_DE) x 100
TPR-AC	Tricuspid Valve PR-AC Interval	two time intervals	TPR-AC[ms or sec]= P-R - TV_AC

Table 10–12. Tricuspid Valve (M-TV)

Additional Cardiology Calculations

In addition to the LV calculations found on page one of the Cardiology Calculations Sub-Menu, measurements are available on pages 2 and 4 of the Cardiology Calculations Sub-Menu. The three choices on page 4 are Volume, Angle and % Stenosis.

Additional Cardiology Calculations are basic measurements described in detail in the *Abdomen and Small parts* chapters.

Refer to 5 for volume measurement.

Refer to 8 for angle measurement.

Refer to 9 for % Stenosis measurement.

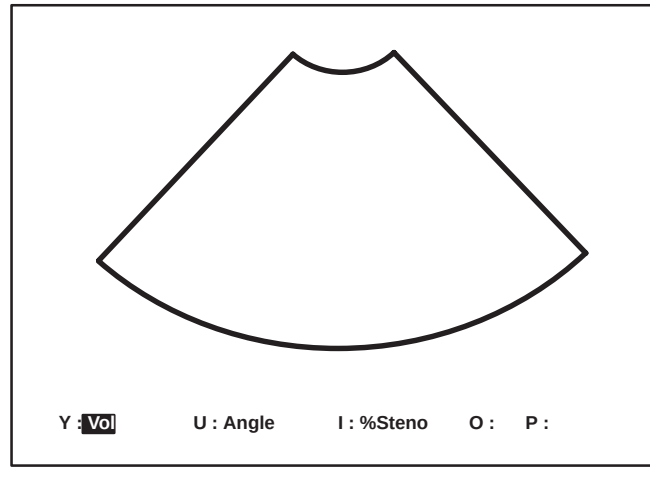


Figure 10–11. Cardiology Calculations menu (Volume)

Overview

A physiological input panel is available for the LOGIQ™ 200 PRO Series. This panel has inputs for ECG, physiological and auxiliary signals.

Approved accessory cables provide the proper signals to the Physiological Panel.

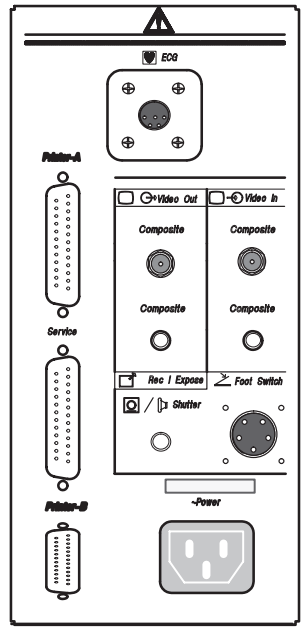


Figure 10–12. Optional Physiological Input Panel

WARNING Do not use with defibrillator.

ECG Lead Placement

The three patient ECG leads are color coded white, black and green.

White is connected to the patient's right arm, black to the left arm, and green (ground) to the right foot (often placed on the right side of the abdomen). The right arm connection may change if the patient is in the decubitus position. Refer to Figure 10–13.

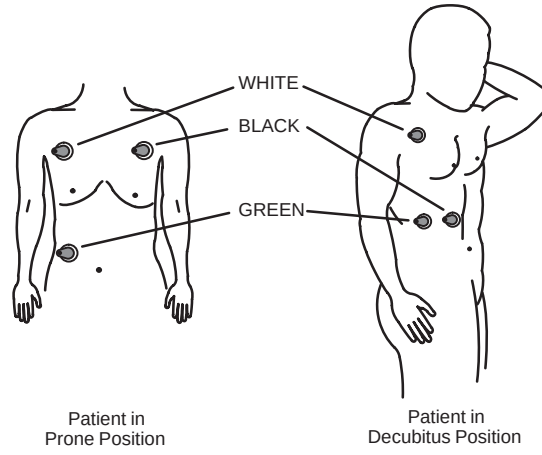


Figure 10–13. Common ECG Lead Placement

Once the leads are connected to the patient and the LOGIQ™ 200 PRO Series, the ECG waveform amplifier needs about 10 seconds to stabilize the waveform on the CRT before adjustments are made.

ECG Default Preset

Proper ECG Filter, B Cine Gauge with ECG, Gain and position defaults can be preset in the Image Display and Application Setup menu. Refer to 13–26.

Choose the default to have the desired frequency of ECG filtering (50Hz, 60Hz).

NOTE: Factory defaults already preset to minimize the noise. It differs depending on the input power supply.

ECG Controls

Controls	ECG On	ECG Gain
Description	ECG waveform is available when the ECG On Preset is set to “Yes”.This preset is available in the Image & Application Setup Sub–menu.	Allows for the amplitude control of the ECG waveform.
Accessing/ Changing	Press **ECG** to activate the ECG.	Choose the default value for ECG gain in the Image Display & Application Setup menu. Choose from –10 to +10 in 2 digit increments. The **Rotation/Focus** knob is used to increase or decrease the ECG Gain during an exam.
Benefits	Allows for displaying the ECG waveform On or Off.	Allows for amplitude adjustment to compensate for different levels of ECG output.
Values		EGC gain can be adjusted from –10 to +10 in 2-digit increments.

ECG Controls (cont'd)

Controls	ECG Position	B Cine Gauge with ECG
Description	Allows for the vertical positioning of the ECG waveform on the image display.	Allows for the relative positioning of the B Cine Gauge pointer with the ECG waveform on the image display.
Accessing/ Changing	Choose the default position (horizontal) for the ECG display. Choose from –50 to +50 in 2 digit increments in the Image Display & Appication Setup. The **Ellipse** keys are used to locate the vertical ECG Position during Exam. Press the **Ellipse Up** key to move the waveform position up. Press the **Ellipse Down** key to move the waveform position down.	Choose the relative default position for the B Cine Gauge pointer with ECG display. Choose from –99 to +99 in 1 digit increments in the Probe Parameter 1 Setup.

Urology

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Urology Calculations

Overview

Refer to the General Calculations section of this chapter for steps to perform these measurements and calculations.

Urology Summary Report Page

The Urology Summary Report Page is provided to improve productivity and facilitate consistency in Urology procedures.

```
Hospital Name                          Oper ID:          mm/dd//yy
ID: Patient ID    Name: Patient Name                     AGE:###
                                                         Page: 1/1
Ref MD:                                NOTE:
MEASUREMENT
    VOLUME #1           ml
    VOLUME #2           ml
    VOLUME #3           ml

LESION SITE:                                              BIOPSY
                1                                         YES  NO
                2                                         YES  NO
                3                                         YES  NO
                4                                         YES  NO

PAP:
PSA:            ng/ml
PPSA 1:                 BASED ON VOLUME #N (Coefficient 1 =0.40)
PPSA 2:                 BASED ON VOLUME #N (Coefficient 2 =0.15)
DRE:
   :

COMMENTS:


EXIT
```

Figure 11–1. Urology Report Page

The Urology Report page contains data, measurement results of three volumes, specific exam comments, lesion site comments and general comments.

The patient and ID cannot be edited on this report page. They were entered prior to the start of the exam by using the ID/Name Key in the Patient Menu.

Urology Summary Report Page (cont'd)

There are three fields in which measured volumes are reported. These volumes are obtained from the volume measurements. The first volume measurement taken is recorded as Volume #1. The second and third measurements are recorded as Volume #2 and Volume #3, respectively.

The system will store the three most recent volume measurements. If a four volume measurement is made, Volume #1 is erased. Volume #2 becomes #1. Volume #3 becomes #2 and the fourth measurement is Volume #3. The very first measurement is lost.

In the space to the right of each volume measurement, the user can type in comments pertinent to that particular volume measurement.

NOTE: If the STVOL measurements were taken in the STVOL (stepper volume) selection, the word STVOL will appear.

Urology Page Edit Fields

The following fields on the Urology Report page may be edited while it is displayed. Use the **Trackball**, **Arrow** or **Return** keys to move the desired field to be edited. See Figure 11–1 for the location of the edited fields (listed below) on the Urology Report Page.

PAP: Prostatic Acid Phosphatese concentration (12 characters)

PSA: Prostatic Specific Antigen concentration (6 digits including point, ####.#)

Urology Page Edit Fields (cont'd)

PPSA (PSAD): On the PPSA (PSAD) line is a non–edit field that corresponds to the calculation result. The edited field following the words "BASED ON VOLUME" is a single digit field (1, 2, or 3) to indicate which volume measurement (corresponding to the entire gland) is used to calculate the PPSA (PSAD).

NOTE: *PPSA, PSAD selection can be made in the Measurement Setup.*

PPSA1, 2: The volume chosen is multiplied by the value (0.15 default) used as the threshold level. (It is based on standard production of PSA per gram of volume of prostatic tissue).
The PPSA can be set in the Measurement Setup (0.01~0.99)
Example: volume of 17.6 X 0.15 = a 2.1 PPSA
Predicted PSA = Volume (grams) x 0.15ng/ml/g

PSAD1, 2: The PSA is divided by the volume chosen.
Example:150ng/ml÷17.6= a 8.52 PSAD
PSA Density = PSA (ng/ml) / Volume (grams)

Urology Page Edit Fields (cont'd)

DRE:	Digital Rectral Exam results (50 characters)
XXX:	Optional User Specific field (4 character name, 50 characters).
VOLUME 1~3:	Comment line, to the right of each measurement can be used to describe the volume measurement (36 characters maximum in each line).
LESION SITE:	Description of each four lesion sites (4 fields, 20 characters each).
BIOPSY:	Indicate whether the lesion site was biopsied. Enter Y for yes and N for no.
COMMENTS:	General comments and findings (120 characters in 2 lines).

PPSA Calculation

The PPSA is a number, in units of ng/ml/grams, which gives the normal level of PSA that would be expected for a prostate of a given volume.

Urology Page Non–edit Fields

The following independent data fields are not affected by the report page edit function:

Use the ID/NAME key in the Patient Entry Menu to enter the following data.

NAME: Patient name

ID: Patient ID

AGE: Patient age

Oper ID: Operator ID

Ref MD: Reference Medical Doctor

Note: Notes

PPSA: A calculation result using the selected volume and threshold factor entered in the measurement Setup (0.12 or 0.15 is commonly used).

VOLUME #1,2,3: Volume calculation results taken in the measurement. Any volume calculation beyond three causes the results to scroll up.

The PPSA is computed by multiplying the prostate volume by a constant threshold factor. Different physicians use different values for this factor : it is usually 0.12 or 0.15.

Constant Factor Setting

To set the PPSA Constant, choose from 0.01 to the 0.99 in 0.01 increments in the Measurement Setup Menu.

PPSA (PSAD) Volume Number

If more than 3 volume measurements are made and the results scroll up on the Urology Report Page, the PPSA (PSAD) volume number will change accordingly. Therefore, the same volume is used resulting in the same PPSA (PSAD).
If the volume measurement is scrolled off the top line of the 3 measurement, the PPSA (PSAD) and its volume number field will both be cleared.

Using the Transaxial Probe

Transaxial Probe Preparation

1. Remove the probe from the box and carefully examine it for any damage.
2. Clean and then disinfect/sterilize the Probe.
3. Inspect a sterile/sanitary sheath. Place a small amount of ultrasound gel inside the sheath tip (the gel is between the sheath inner surface and the probe aperture).
4. Place the sheath tip over the probe aperture and then pull the sheath end toward the probe handle.
5. Place a rubberband/twist lock over the sheath at the end of the probe shaft. Ensure the rubberband/twist lock is tight around the sheath. Rub your finger over the tip of the probe to ensure all air bubbles have been eliminated.
6. Place a small amount of ultrasound gel on the gel–filled sheath tip outer surface.

NOTE: Remember to rinse all probe sheaths of powder before placing on the probe. Powder can degrade the scan image displayed.

Use of Transaxial Probe with Volume Stepper Device

Transaxial Probe is designed to be used with the mechanical stepping device and needle placement guide. The needle placement guide matches the electronic needle placement grid displayed on the LOGIQ™ 200 PRO Series. When used with the stepper volume calculation option, a “stack–of–coins” method can be used to calculate the volume of the prostate gland.

A typical exam consists of:

- Placing the patient in the supine position.
- Carefully inserting a properly prepared probe and orienting it to scan the prostate at its most cephalic position.
- Position the mechanical stepping device and secure the probe to the stepper. If the needle placement guide is to be used in the exam, carefully align the probe to the needle placement guide registration line.
- Make as many stepper volume measurements as necessary to calculate the volume of the prostate.
- Retract the probe (utilizing the stepper device) the necessary step between each incremental slice of the gland.
- Once the complete gland has been evaluated detach the probe from the mechanical stepper and carefully remove it from the patient.

Use of Transaxial Probe with Volume Stepper Device (cont'd)

This calculated information can be used for future procedures, if necessary.

NOTE: Sterile/sanitary sheaths are to be used on the probe during its actual use with patients.

System Preparation

1. Connect the probe connector to the console in either probe position.
2. If needed, press **Biopsy** key.
3. Set the console for recommended optimum imaging.

Infection Control

Biological Hazard

Users of this product have an obligation and responsibility to provide the highest degree of infection control possible to patient, co–workers and themselves.

To avoid cross contamination, follow all infection control policies established for your office, department or hospital as they apply to personnel and equipment.

Patient Preparation for Transrectal Imaging

1. Prepare the patient. An enema is recommended one hour before the exam.
2. Transaxial imaging is best performed with the patient in the supine position.

Patient Scan

1. Scan the patient. The probe handle orientation mark indicates the image scan plane. Be sure that the Image Reverse function is OFF.
2. If necessary, rotate, retract, or advance the probe to see all pertinent anatomy.
3. When the probe is in position, attach it to the mechanical stepping device.

   Steps for attaching probe to stepper:

   a. Place the probe into clamp and tighten the clamp.

   b. Attach the needle placement guide.

   c. Align the probe to the needle placement guide.
4. If a needle placement is to be performed, display the needle placement grid on the image screen by:

   a. Ensuring that the Image Reverse function is OFF and the Image Rotation function is 180°.

   b. Select the desired scale factor and focus.
   To turn the needle placement grid display OFF, press the **Biopsy** key**.**

   c. Pressing the **Biopsy** key again will display the placement grid.

Patient Scan (cont'd)

CAUTION 

Ensure that the arrow at the bottom center of the Needle Placement Guide accurately aligns to the center line marked on the probe shaft.

5. When the examination is over:
   a. Carefully remove the probe.
   b. Remove the twist lock. Remove and discard the sheath.
   c. Throughly clean the probe and equipment. Refer to *Probes, Probe Overview Chapter* for Cleaning and sterilization instructions.
   d. Return the probe to its box.

CAUTION 

Before needle insertion, scan the patient to determine the correct puncture depth and site.

Only the sterile/sanitary sheath, rubberband or twist lock and finger cot with rubberband are on the RA probe during the pre–needle placement scanning.

Stepper Volume Calculation

Stepper Volume Formula

Stepper Volume (STVOL) is the method used to calculate the volume of an organ using the LOGIQ™ 200 PRO Series Urology software, Transaxial Probe and a mechanical stepping device that moves the probe in fixed increments. The calculation is based on the fact that each step or area measurement is taken at equal stepper increments. The area measured at each slice is then used to compute the total volume of the organ, according to the following model:

For **N** slices, there are N–1 volumes between the slices plus a small volume at each end.

It is assumed that the small volumes of the end caps are cones with a base equal to the measured area of the end slice and height equal to the slice spacing. The cones will have volumes $\mathbf{V=A_1\ d/3}$ and $\mathbf{A_N\ d/3}$ for slices **1** and **N** respectively, where **d** is the spacing between the slices.

The volumes between the slices are assumed to be segments of a paraboloid of revolution, where the volume between any slice n and n+1 is $\mathbf{(A_{n+}A_{n+1})d/2.}$

The sum of the volumes between slices is:

$$\mathbf{V=d\ [\ (A_{1+}A_2/2)+(A_{2+}A_3/2)+....+(A_{n-1+}A_n/2)]}$$

Therefore, the total volume of the organ is calculated as:

$$\mathbf{V=d\ [\ (5/6)A_{1+}A_2+A_{3+....+}(5/6)A_N]}$$

Description

The stepper volume measurement works only in B–Mode. Stepper volumes are not accumulated in either B/M– or M–Mode. Stepper Volume will only be functional with a Transaxial Probe attached. A stepper volume measurement begins when the first area is made while the system is in the Urology, **STVOL** (STepper VOLume) function.

Prerequisite

Before a Stepper Volume Measurement:

Make sure that Transaxial Probe is connected.

CAUTION  **Stepper Volume is only functional with a Transaxial Probe connected.**

Preset the proper Stepper Volume Increment in the Measurement Setup menu, Stepper Increment Setup.

CAUTION  **Ensure that the system selection matches the mechanical stepper increments to be used.**

Prerequisite (cont'd)

Position the patient as required for the study indicated.

Insert the probe to the first scan location and secure it to the mechanical stepper device.

Refer to the Transaxial Probe Operator Manual.

Press **Freeze** to have an Image of the organ to be measured. The probe should be inserted to its most cephalic position (i.e base of the prostate).

Preset the desired Area Measurement Method in the Measurement, Circ/Area Setup menu. The selections available for Stepper Volume Calculations are Circle, Ellipse and Trace method.

Press the **Space** left key to display a calculation menu on the monitor.

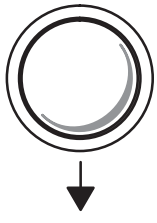
Select the **STVOL** calculation menu. The selected menu is inverted.

Area Measurement for Each Slice (Step Increment)

When the prerequsites listed above are satisfied, make the area measurement by one of three methods: circle, trace or ellipse.

Circle Method

Press **Set** to activate the measurement function.



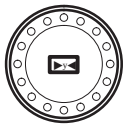
Use the **Trackball** to locate the cursor to the center point of the circle measurement.

Press **Set**. The center point of the circle and 8 dots around the cursor appear.

Press the **Ellipse** up arrow key to increase the circle size.

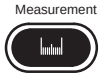
Press the **Ellipse** down arrow key to decrease the circle size.

Press **Set**. The first calculation of the Circle area of the Stepper Volume is complete and the cursor appears again.



Press **Freeze** to stop image acquisition.

Circle Method (cont'd)



Press **Measurement** to start the next step measurement. Move the mechanical stepper to the next increment. Repeat the Circle measurement steps for each necessary slice.

If the image or area measurement for the current slice are unacceptable, press **Clear**.

Press the **Return** key to finish the measurement. After more than one slice has been measured, the current and previous slice, areas, volumes, and accumulative volumes are calculated and displayed.

*NOTE: Use the **Measurement** key to toggle activation of the measurement cursors. Use the **Ellipse** arrow keys to adjust the size, if necessary.*

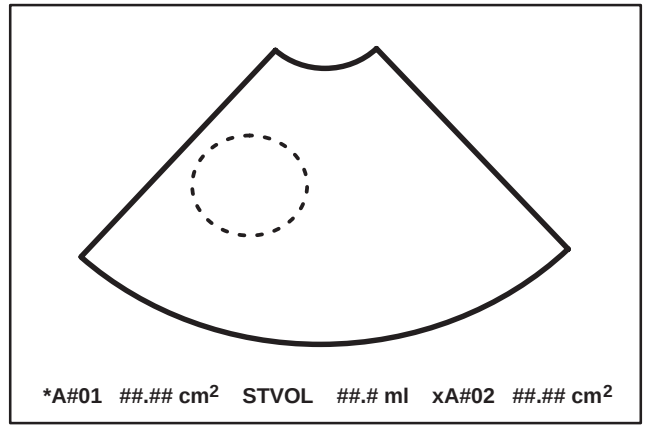
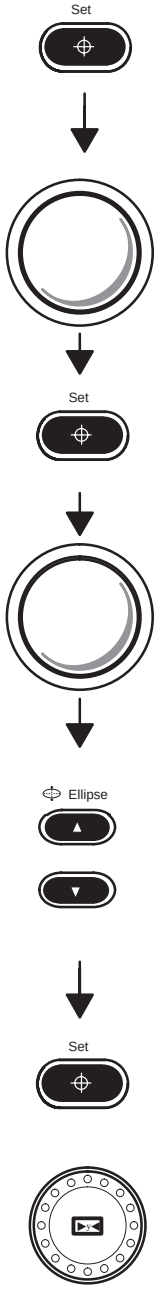


Figure 11–2. Area Measurement (Circle Method)

Ellipse method



Press **Set** to activate the measurement function.

Use the **Trackball** to move the cursor to the start point of the desired region.

Press **Set**. The start-point cursor is set and an end-point cursor appears.

Use the **Trackball** to move the end-point cursor to the other end of the long axis of the area being measured.

Press the **Ellipse** up/down arrow key. A circle is displayed.

Press the **Ellipse** up arrow key to increase the ellipse size.

Press the **Ellipse** down arrow key to decrease the ellipse size.

Press **Set**. The first calculation of the Ellipse area of the Stepper Volume is complete and the cursor appears again.

Press **Freeze** to stop image acquisition. Move the mechanical stepper to the next increment. Repeat the above Ellipse measurement steps for each necessary slice.

Ellipse method (cont'd)

Press **Measurement** to start the next step measurement. Move the mechanical stepper to the next increment. Repeat the above Circle measurement steps for each necessary slice.

If the image or area measurement for the current slice are unacceptable, press **Clear**.

Press **Return** to finish the measurement. After more than one slice has been measured, the current and previous slice, areas, volumes, and accumulative volumes are calculated and displayed.

*NOTE: Use the **Measurement** key to toggle activation of the measurement cursors. Use the **Ellipse** arrow keys to adjust the size, if necessary.*

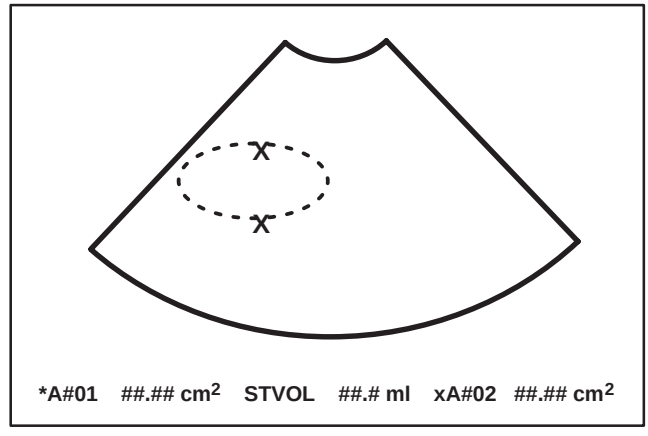
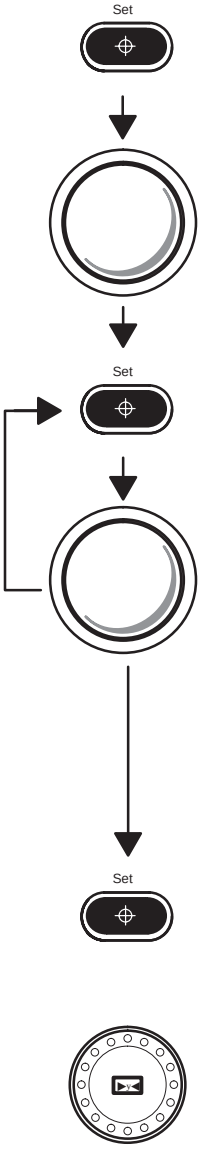


Figure 11–3. Area Measurement (Ellipse Method)

Trace method



Press **Set** to activate the measurement function.

Use the **Trackball** to move the cursor to the start point of the desired
region.

Press **Set**. The start-point cursor is set and an end-point cursor appears.

Use the **Trackball** to move the end-point cursor to the other end of the long axis of the area being measured.

Press **Set**. The start-point cursor changes to a "×" cursor and is fixed. An end-point ("×") cursor appears.

Use the **Trackball** to trace the area.

Press **Set**. The trace start-point and end point are connected to each other and the first calculation of the Trace area is complete. At the same time, a "⊙" cursor appears.

Press **Freeze** to stop image acquisition. Move the mechanical stepper to the next increment. Repeat the Trace measurement steps for each necessary slice.

Trace method (cont'd)

Press **Measurement** to start the next step measurement. Move the mechanical stepper to the next increment. Repeat the Circle measurement steps for each necessary slice.

If the image or area measurement for the current slice are unacceptable, press **Clear**.

Press **Return** to finish the measurement. After more than one slice has been measured, the current and previous slice, areas, volumes, and accumulative volumes are calculated and displayed.

*NOTE: Use the **Measurement** key to toggle activation of the measurement cursors. Use the **Ellipse** arrow keys to adjust the size, if necessary.*

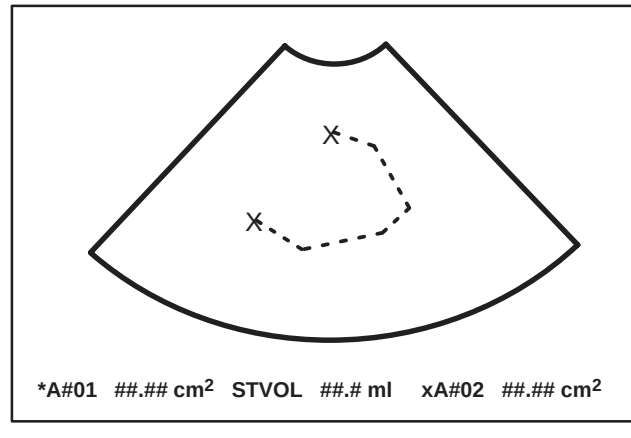


Figure 11–4. Area Measurement (Trace Method)

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Recording Images

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Archiving Images

Image Memory

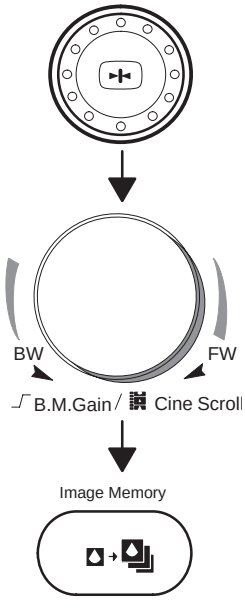
The LOGIQ™ 200 PRO Series has storage space for images in system memory.

Storage

10 images or proper combinations of formats can be saved in memory.

This storage is temporary. The images are erased when the **New Patient** key is pressed or power is turned off.

Image Memory (cont'd)



To save images in system memory:

Press **Freeze** to stop image acquisition.

Use the **Cine Scroll** control, if necessary, to display the best image.

Press the **Image Memory** key. The displayed image is saved to system memory and the number of images currently stored is displayed at the bottom of the screen.

The system gives a Memory Full warning display

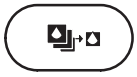
"Press the Key again to erase the oldest image"

with an optional beep each time an image is about to be stored when the memory is full. The beep sound can be set in the General System 1 Setup menu.

Pressing **Image Memory** after the warning deletes the oldest image in system memory and saves the current displayed image.

Recall

Image Recall



To recall images stored in system memory for review or archival:

- Press the **Image Recall** key. The Image Recall Menu with the assigned A/N keys is displayed.
- The last image to be placed into Image Memory is displayed.

Use the **Trackball** to select the desired image to recall.

After the recalled image is displayed, image post processing can not be performed. Only Comment, Measurement, Body Pattern, Clear and Ext Video are available.

Press **Freeze** to continue scanning or press **Image Recall** to return to the previous system status before Image Recall was initially pressed.

Measurements and Calculations can be performed on recalled image.

Helpful hints

Hints

- Images stored in system memory will be lost if the **New Patient** key is pressed or power is turned off.
- Images are stored in system memory on a “first in, first out” basis (maximum 10 images).

Peripheral Devices

Optional peripherals enhance the recording capabilities of the LOGIQ™ 200 PRO Series.

The LOGIQ™ 200 PRO Series can save scan images to a variety of optional devices.

Available archiving options are:

- Black/white video page printer
- Multi-Image (Multiformat) camera
- Video cassette recorder (VCR or VTR)
- Magneto Optical Disk Driver (MOD Driver)
- Black/white Polaroid Camera

How images are recorded depends on the desired destination.

Device	Manufacturer	Model	Catalog No.	Video Signal
Video Graphic Printer	SONY Mitsubishi	UP-890 P90	H4120SR	
Multi Image Camera	International Imaging Electronics	IIE460	H4550KF	
VCR	SONY	SVO-9500MD	H4220SR	NTSC
VCR	SONY	SVO-9500MDP	H4220PR	PAL
MOD Driver	Fujitsu	MDD3064AP	Local	

Table 12–1. Suggested Optional Recording Devices

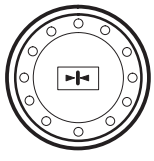
Black /White Video Page Printer Operations

Remote control of the B/W printer is limited to the print function only. Adjustments to print quality are done on the page printer. No status or error messages are available to be displayed on the LOGIQ™ 200 PRO Series.

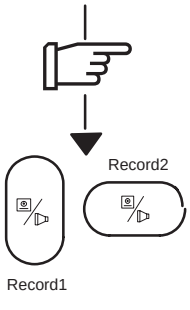
There is a six second delay built in to the Record key recognition. This eliminates improper operation if the Record key is pressed more than once in rapid succession.

NOTE: Set the minimum interval in seconds between B&W printer exposure capabilities from 1.0 to 10 in the General System 1 Setup.

To print an image:



Press **Freeze** to stop image acquisition.



NOTE: Remember that Cine Scroll may be used to look at previous image frames to obtain the best image.

Press **Record** to activate the print function on the standard B/W Video Page Printer.

For details on the page printer operation, consult the Sony Operator Manual provided with the printer.

Black/White Video Page Printer Operations (cont'd)

The Sony UP-890 Black and White Video Page Printer is mounted on the left side of the LOGIQ™ 200 PRO Series under the keyboard. The Sony connections are Video, AC power, and Remote Shutter (Expose).

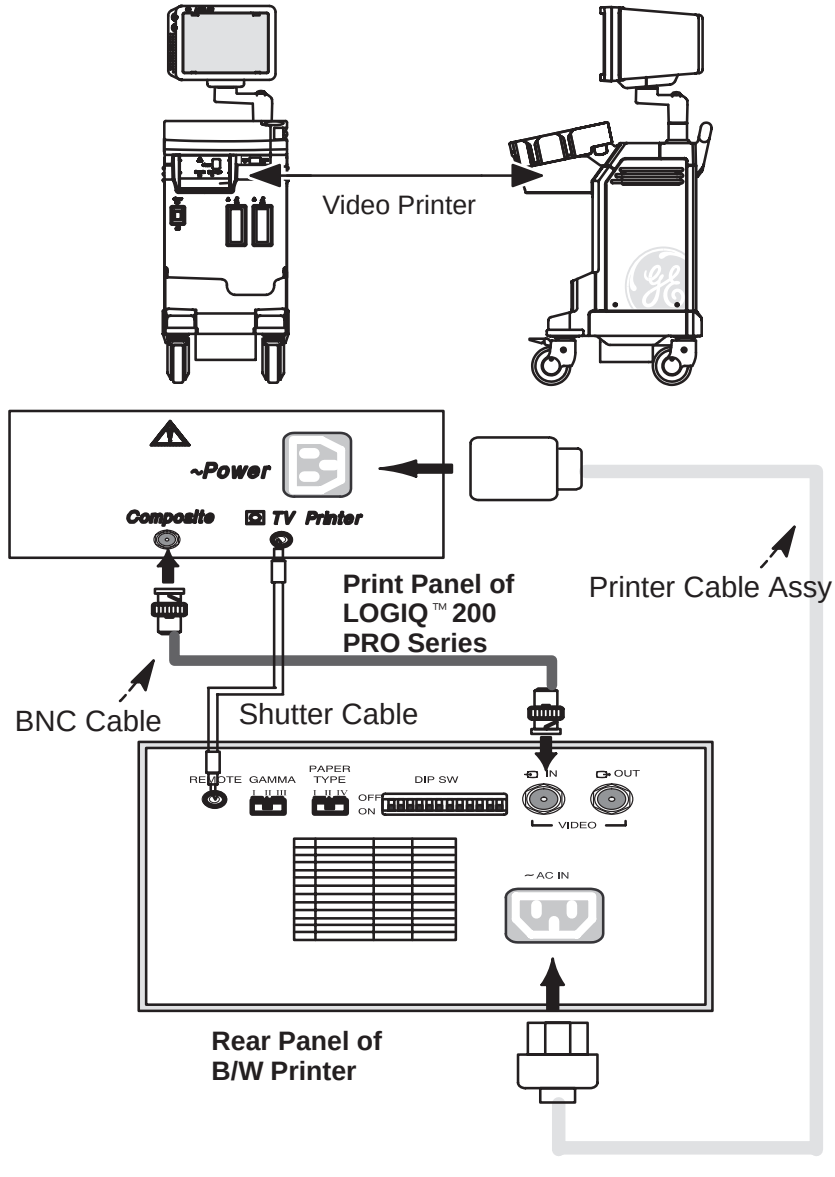


Figure 12–1. B/W Page Printer Location and Connection

Multi-Image Camera (MIC) (IIE Model 460)

The multi-image camera provides for the storage of still images on an 8½x11 sheet of x-ray film.

The Record keys can be programmed in the General System Setup to control the print (expose) function of the camera. All other camera functions are adjusted by the controls mounted on the camera.

For details on camera operation, consult the IIE Operator Manual provided with the camera.

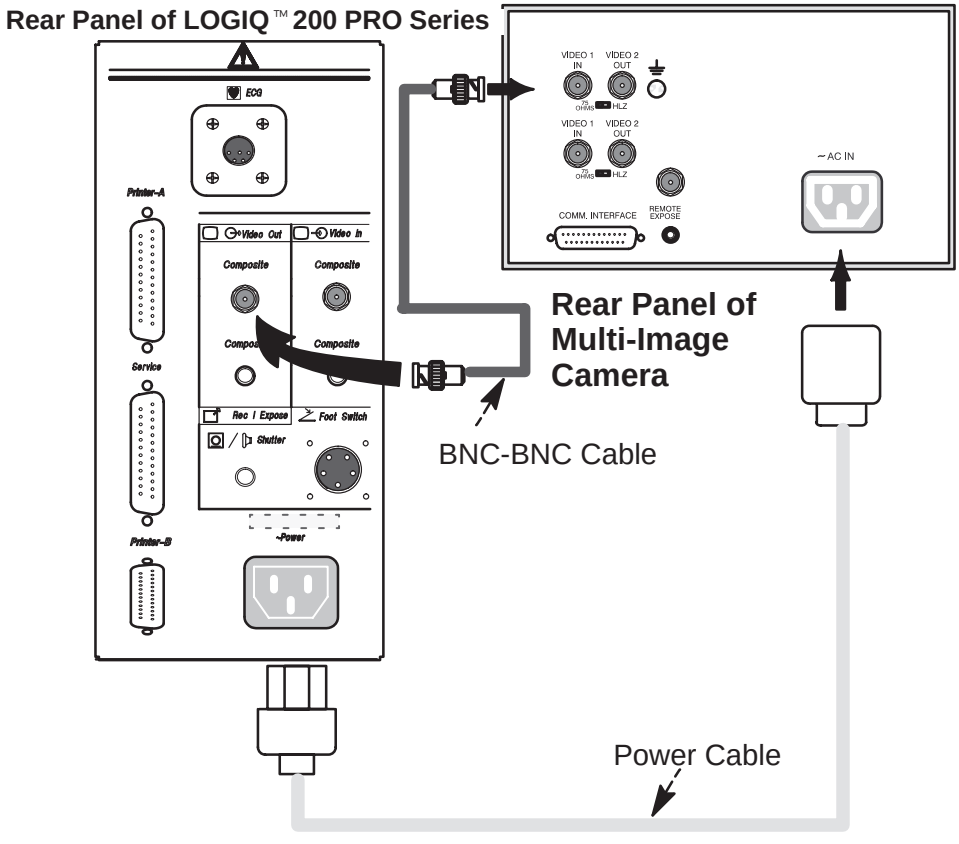


Figure 12–2. Multi-Image Camera Wiring Diagram

Video cassette recorder (VCR)

Consult the VCR instructions and the VCR operator manual provided with the VCR.

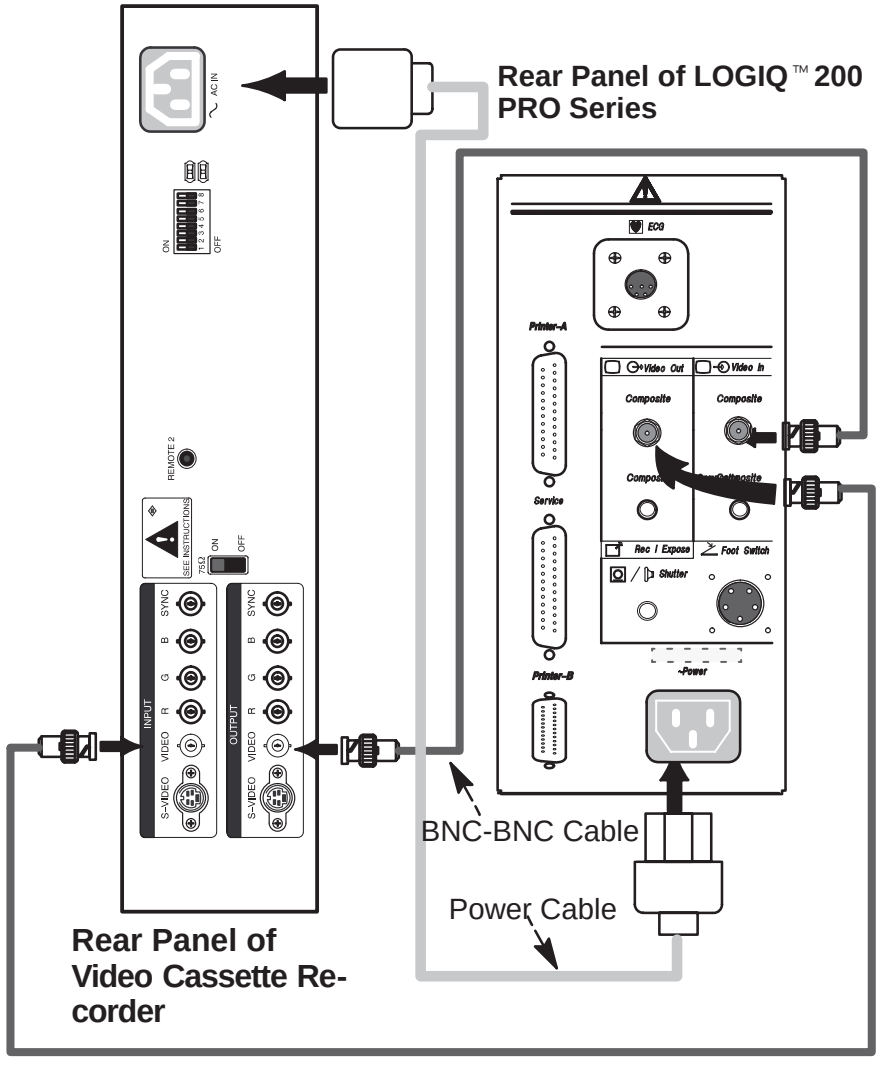


Figure 12–3. VCR Connections

MOD Image Archive (option)

Overview

Image Archive is an option to store and recall scan images using a 3.5 inch Magneto Optical Disk.

The Magneto Optical Disk (MOD) allows for much faster and greater storage capacity than a Floppy Disk Drive (FDD). A DEFF formatted MOD holds 128, 230, or 540 Megabytes of information (more than 320 images) compared to 1.4 Megabytes (3 images) that may be stored on a high density floppy disk.

Along with the increased speed and storage capacity, the user can perform measurements and calculations on images recalled from a MOD. Images recorded as hard copy (film) do not allow for additional measurements at a later date.

In addition to the image archive function, the MOD allows for a System Backup disk to be made in the unlikely event of loss of data in MSTE board replacement. System software updates may also be accomplished much faster.

Archive Functions

The Image Archive option allows the user to perform the following functions:

- Store Image to MOD
- Recall Image from MOD
- Patient File search of MOD
- Delete a file from MOD
- Format the MOD
- Eject the MOD from the drive

Media Format (DEFF)

Press the **Setup Menu** key to display page 11 of 11. Using the **Trackball** or **Arrow** keys, select **DEFF formatting** in the User Utility Menu. Refer to Figure 12–4.

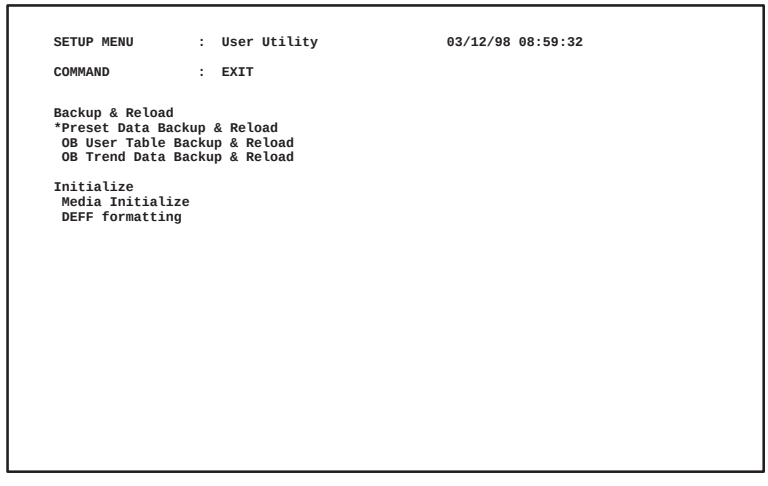


Figure 12–4. User Utility Menu

Press **Set**. The following messages are displayed during the disk initialization and formatting process:

‘Set’ to Formatting, ‘Clear’ to Cancel, ‘Esc’ to Exit

Insert the disk and press ‘Y’ to continue or ‘N’ to quit. If ‘Y’ is pressed :

“Initializing now”

appears. The disk format function is in progress.

Disk Verification

If the MOD is not inserted into the drive, the following message is displayed:

“MEDIA IS EITHER UNMOUNTED OR UNFORMATTED.”

Storing Images

The Record 1 & 2 keys can be programmed in the General System 2 Setup Menu, page 2.

By selecting Image Archive for the Record1 or Record2 selection, these keys automatically store the image to MOD when pressed.

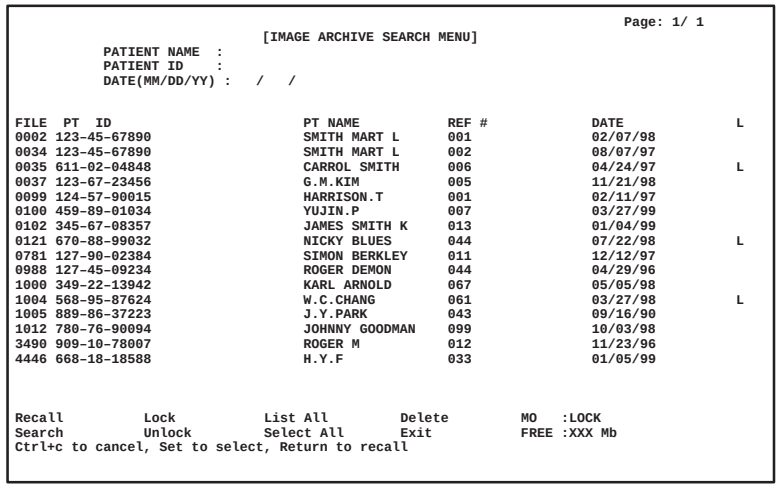
The following message is displayed during the storage process:

“In Progress. Please wait.”

Patient Search

Press the **Archive** key to display the Archive Search menu.

Refer to Figure 12–5.



```
                                                              Page: 1/ 1
                          [IMAGE ARCHIVE SEARCH MENU]
          PATIENT NAME  :
          PATIENT ID    :
          DATE(MM/DD/YY) :   /   /

FILE  PT  ID                      PT NAME          REF #          DATE            L
0002 123-45-67890                 SMITH MART L     001            02/07/98
0034 123-45-67890                 SMITH MART L     002            08/07/97
0035 611-02-04848                 CARROL SMITH     006            04/24/97        L
0037 123-67-23456                 G.M.KIM          005            11/21/98
0099 124-57-90015                 HARRISON.T       001            02/11/97
0100 459-89-01034                 YUJIN.P          007            03/27/99
0102 345-67-08357                 JAMES SMITH K    013            01/04/99
0121 670-88-99032                 NICKY BLUES      044            07/22/98        L
0781 127-90-02384                 SIMON BERKLEY    011            12/12/97
0988 127-45-09234                 ROGER DEMON      044            04/29/96
1000 349-22-13942                 KARL ARNOLD      067            05/05/98
1004 568-95-87624                 W.C.CHANG        061            03/27/98        L
1005 889-86-37223                 J.Y.PARK         043            09/16/90
1012 780-76-90094                 JOHNNY GOODMAN   099            10/03/98
3490 909-10-78007                 ROGER M          012            11/23/96
4446 668-18-18588                 H.Y.F            033            01/05/99


Recall          Lock          List All        Delete        MO   :LOCK
Search          Unlock        Select All      Exit          FREE :XXX Mb
Ctrl+c to cancel, Set to select, Return to recall
```

Figure 12–5. Image Archive Search Menu

Patient Search (cont'd)

Search Criteria

A specific MOD can be searched for patient files that meet certain criteria. Refer to the criteria listed below.

Patient Name	Maximum 29 characters
Patient ID	Maximum 14 characters
Date	Format specified in General System 1 Setup.

Criteria Input Region

Both the Patient Search Menu and Media Search Menu have a criteria input region as shown in Figure 12–5.

Type the desired name in the highlighted region. Press **Return** or **Trackball** to the PT ID region.

Input the Patient ID. Press **Return** or **Trackball** to the Date region.

Input the desired date. Press **Return** or **Trackball** to move the cursor out of the criteria input region.

Hints

Spaces can be used as a wild card in the date entry. For example:

MM/ /	lists everything for a specific month.
/ /YY	lists all in a specific year.
MM/ /YY	lists all within a specific month of a specific year.

If nothing is entered in one or more of the search criteria, a list of files is displayed that match the remaining criteria entered.

Wild card (*) can be used as a search criteria.

Patient Search (cont'd)

NOTE: Images which are not stored on the GE LOGIQ ™ series systems will not be listed by the patient search function.

Hints

In order to perform any other function, the user must wait until the search is complete or press **Ctrl**, **C** simultaneously to cancel the search function.

If no search criteria was entered by the user, a complete file listing of the entire MOD is executed. Only 16 files are displayed at one time on the monitor.

Menu Commands

The commands listed at the bottom of the Patient Search Menu can be used to manipulate the file information displayed.

Recall	Recalls multi images from the MOD for display on the monitor.
Search	Changes the current mode to the search criteria input mode
Lock	Locks an image file. A locked file has an "L" after it's file number and cannot be deleted while locked.
Unlock	Unlocks an image file.
Select All	Selects all images on the displayed page.
List All	Displays all images on the MOD in the Patient Search Menu.
Delete	Erases an unlocked image file from the list. A file must be unlocked before being erased.
Exit	Exits the Patient Search Menu.
Ellipse Key	Scrolls between the available pages to be displayed.

Image Selection for Recall

To select an image for recall from the Patient Search Menu:

- Use the **Arrow** keys or **Trackball** to place the cursor over one of the desired image file and press **Set**. The image file data will be marked (*****).
- Use the **Arrow** keys or **Trackball** to place the cursor over the next image file and press **Set**.
- Repeat the procedure until all of the desired image files are recalled.

*NOTE: If all the files are required for recall, place the cursor to SELECT ALL and press **Set**.*

Once all the desired image files are selected, place the cursor to RECALL and press **Set**.

The first image is displayed. The **Ellipse** keys are used to display the next or previous image.

*NOTE: If a single file is required for recall, place the cursor to the desired file and press **Return**.*

Image Recall Process

During the Image Recall process, from the Patient Search Menu, the message:

“In progress. Please wait.”

is displayed; changing modes and inputting scan parameters are not allowed.

To quit the recall process, press the **Freeze** key. The system returns to the previous menu displayed.

MO Eject

To eject a disk from the drive, Press the assigned **User Define** key. For an assignment of MO Eject function to User Define key, Refer to page 13–47 for details.

“Eject MO from the drive now.”

is displayed on the monitor. The inserted MOD is then ejected from the drive automatically.

Customizing Your System

Customizing Your System

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Basic Operation 13–5

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Introduction

Overview

The Setup function has one Top Menu. This Top Menu consists of ten Setup Menus and User Utility function.

The ten Setup Menus are General System 1 Setup, General System 2 Setup, Probe Parameter 1 Setup, Probe Parameter 2 Setup, Image Display & Application Setup, Body Pattern Setup, Comment Setup, Measurement Setup, Patient Entry Setup, User Define Category & Key Setup and User Utility.

The Top Menu is shown in Figure 13–1.

NOTE: When using Ext. Video, the Setup function does not work.

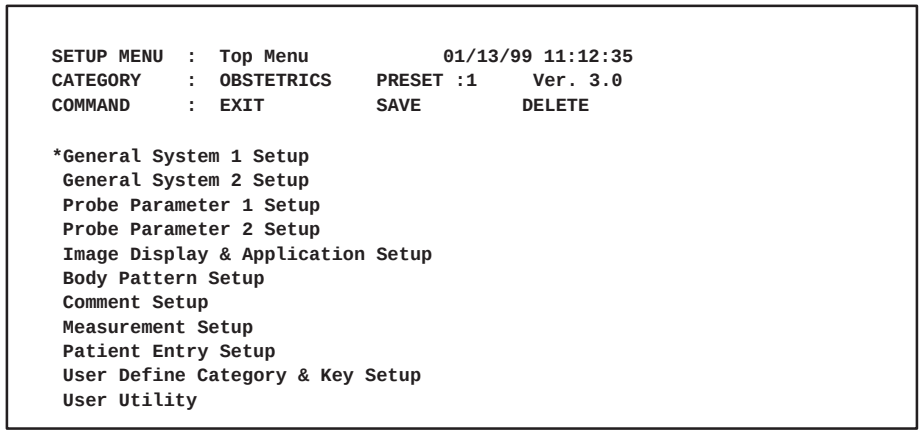


Figure 13–1. Setup Top Menu

Each Setup Menu has several items or Sub Menus in it.

Generally, these items are common to modes, probes, formats and applications.

Setup Menu

If it is necessary to go directly to the Setup/Top Menu, press **Setup Menu** key.

Setup Menu Command Lines

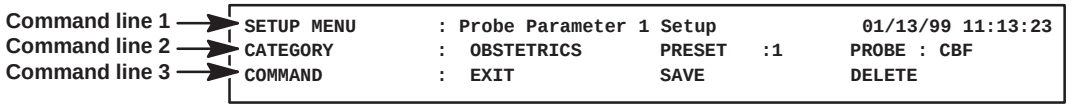


Figure 13–2. Setup Menu Command Lines

Command line 1

This line shows the name of the setup menu, date and current time.

Command line 2

This line shows the exam category and preset number.

In Setup Top Menu, this line shows the software version number.

In Probe Parameter 1 Setup, this line shows the probe type.

NOTE: Command line two is not in the General System Setup Menu.

Command line 3

This line shows three command menu choices.

Use the **Arrow** Keys or **Trackball** to place the cursor over one of the menu choices and press **Set**.

Setup Menu Command Lines (cont'd)

There are three menu choices that affect the parameters in the category displayed. They are:

EXIT	When in the Top menu, EXIT returns the system to the last scan mode. When in a Setup Menu, EXIT returns the system to the Setup Top Menu.
SAVE	The system displays an overwrite prompt when SAVE is selected. Pressing **Set** overwrites the old data with the values changed. Pressing **Clear** will return the system to previously saved values without saving.
DELETE	If parameters were changed in the setup menus, DELETE will return those parameters to factory default values.

Basic Operation

A Basic Operation Diagram of the Setup function is shown in Figure 13–3.

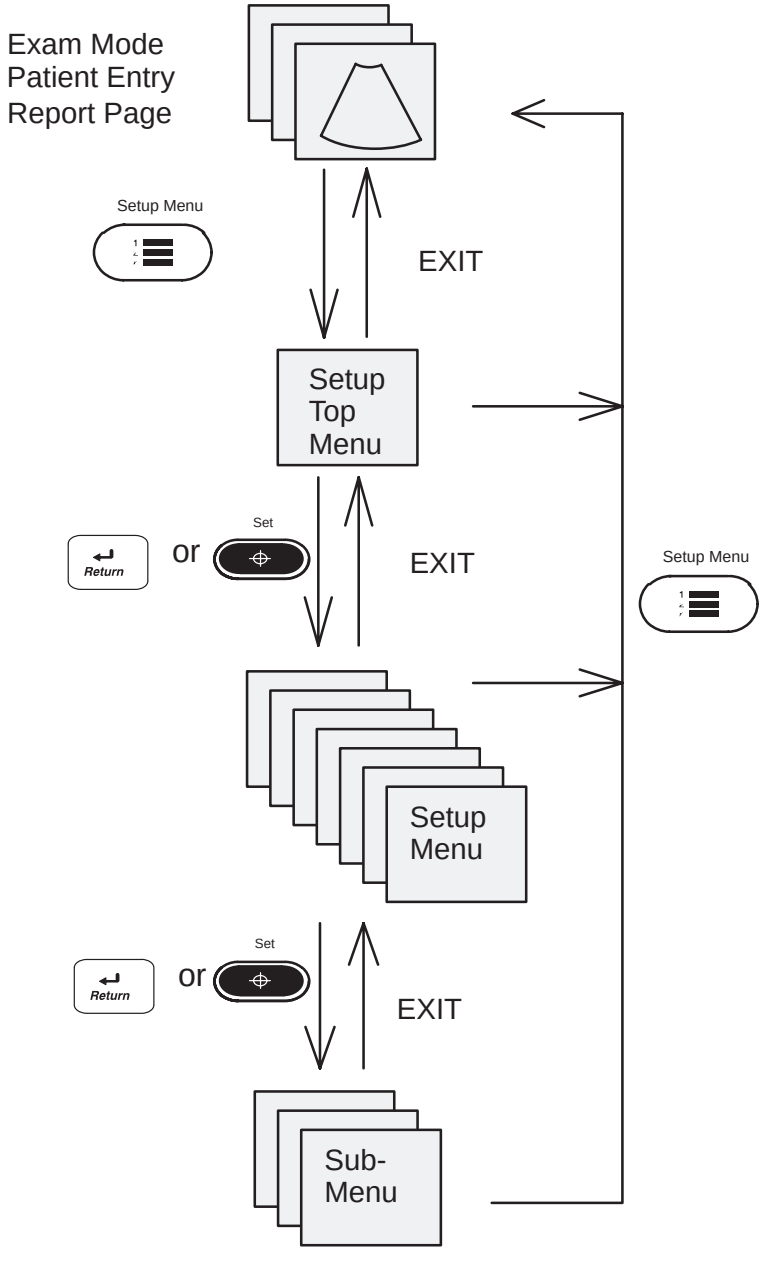
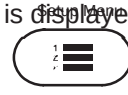


Figure 13–3. Basic Operation diagram

Activating Setup Menu

To activate the Setup Menu:

Press **Setup Menu** key, the Setup Top Menu is displayed on the monitor.

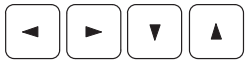


Select one of the setup menus by using the **Arrow** keys.

Press **Set** or **Return** to display the selected setup menu.

Changing a Parameter

To change a parameter value:



Press the **Arrow** keys to move the cursor to the desired Parameter.

Type a number to highlight the desired value, or type the necessary information or desired value.

Repeat the process until all of the necessary parameters have been changed.

Hints

- Parameters on all of the menu pages can be customized before selecting SAVE.
- Parameter changes will be lost if SAVE is not selected.
- Two user application presets can be saved.

Saving Setup to Preset

To save and exit the Setup function:

Select SAVE in the Top Menu and press **Return**.

The save setup flow diagram is in Figure 13–4.

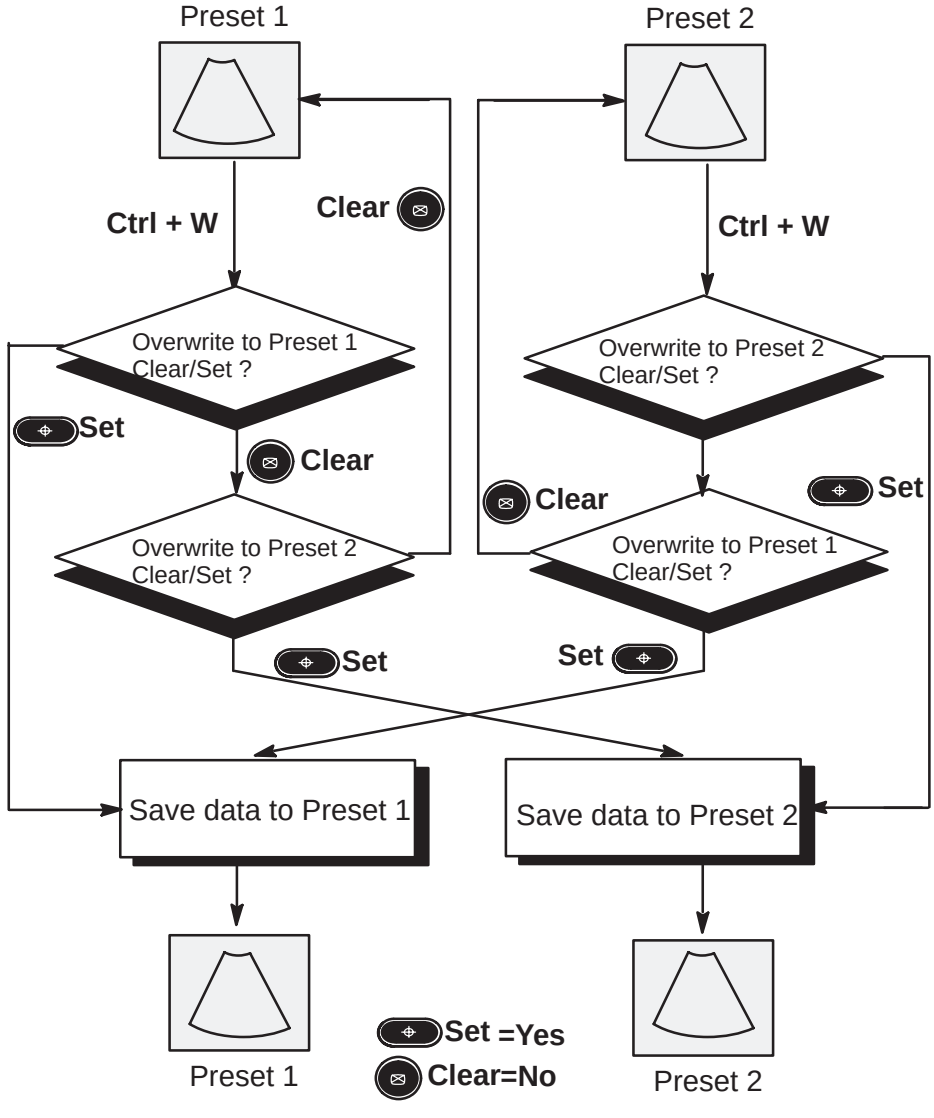


Figure 13–4. Save Flow Diagram

Menu Structure

General System 1 Setup (page 1 of 11)

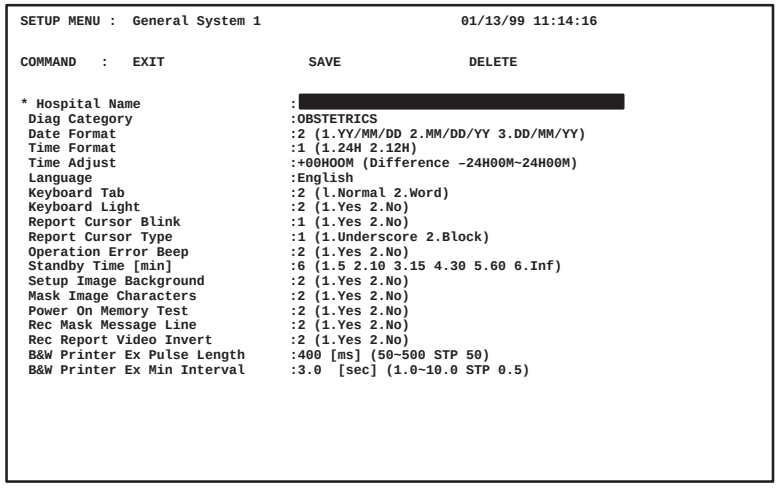
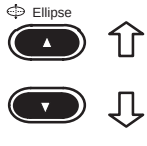
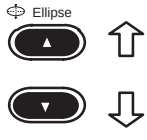


Figure 13–5. General System 1 Menu

Hospital Name	
	Enter the desired hospital or facility name. This appears at the top of all display screens and report pages. Maximum of 34 alphanumeric characters.
Diag Category	
	Using the **Ellipse Up/Down** keys, choose the desired default diagnostic category. To choose the next menu selection, press the **Ellipse Down** key. To choose the previous menu selection, press the **Ellipse Up** key. 1:Rad/Abdomen 2:Obstetrical 3:Gynecology 4:Cardiology 5:Urology 6:Small Parts 7:User Define 1 8:User Define 2 *NOTE: The default for the Diagnostic category does not change until the next power on.*

General System 1 Setup (page 1 of 11)

Date Format	
	Choose the desired presentation format for all dates displayed. 1:Year/Month/Day 2:Month/Day/Year 3:Day/Month/Year
Time Format	
	Choose the desired presentation format for all time graphics displayed. 1:24 H 24 hour clock 2:12 H 12 hour clock
Time Adjust	
	The system clock for the LOGIQ™ 200 PRO Series is set by service personnel to the local time during the installation process. If any other time adjustment is needed during the year, the clock can be changed in this menu. To adjust the time, type the current time. Time difference is –24H00M ~+24H00M
Language	
	Using the **Ellipse Up/Down** keys, choose the desired language for all displayed graphics. To choose the next menu selection, press the **Ellipse Down** key. To choose the previous menu selection, press the **Ellipse Up** key. 1:English 2:French 3:German 4:Italian 5:Spanish 6:Portuguese 7:Swedish 8:Danish 9:Russian 10:Greek 11:Turkish *NOTE: Language does not change until the next power on.*
Keyboard Tab	
	Choose the comment cursor movement desired when using the Tab key. 1:Normal Eight character spaces. 2:Word Next word (after a space).

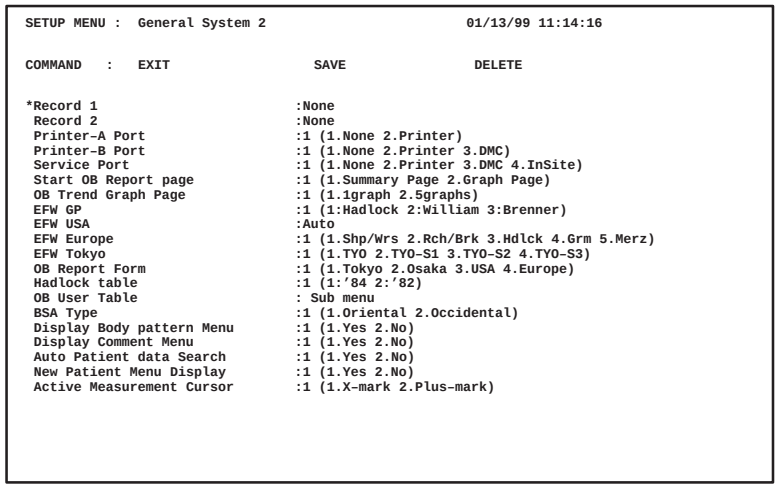
General System 1 Setup (page 1 of 11)

Keyboard Light	
	Choose to turn on or off the Keyboard backlight. 1:Yes Light on. 2:No Light off.
Report Cursor Blink	
	Choose to have the report cursor blinking or solid. 1:Yes Blinking 2:No Not Blinking
Report Cursor Type	
	Choose the desired default style of report cursor desired. 1:Underscore 2:Block
Operation Error Beep	
	Choose to enable or disable the audio error beep that is heard when a keystroke error is made. 1:Yes Beep on error. 2:No No error beep.
Standby Time [min]	
	The system can be set to go into stand-by mode if no keyboard activity is sensed for a specific period of time. 1:5 minutes 2:10 minutes 3:15 minutes 4:30 minutes 5:60 minutes 6:Inf (infinity=never)
Setup Image Background	
	Choose to display the image under the Setup menu. 1:Yes Image displayed. 1:No Image not displayed.

General System 1 Setup (page 1 of 11)

Mask Image Characters	
	Choose to mask (disable) the graphic characters on the image display. 1:Yes Graphics displayed. 2:No Graphics not displayed
Power On Memory Test	
	Choose to turn on or off the system memory test operation at power up. 1:Yes Run test. 2:No Do not run test.
Record Mask Message Line	
	Mask or hide the operator message area on the display during the record function. 1:Yes Message will be displayed during record. 2:No Message will not show during record.
Record Report Video Invert	
	Send calculation summary report video to the print device in inverse (reverse) video. 1:Yes Send inverse video to the printer. 2:No Do not send inverse video to the printer.
B&W Printer Exposure Pulse Length [msec]	
	Set the exposure pulse length needed to trigger the B&W printer print function. Choose from 50 to 500 ms in 50 ms intervals.
B&W Printer Exposure Min Interval [sec]	
	Set the minimum interval in seconds between B&W printer exposure capabilities. Choose from 1 to 10 in 0.5 sec intervals.

General System 2 Setup (page 2 of 11)

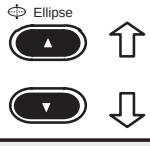


```
SETUP MENU :  General System 2                        01/13/99 11:14:16

COMMAND   :   EXIT                  SAVE                DELETE

*Record 1                          :None
 Record 2                          :None
 Printer–A Port                    :1 (1.None 2.Printer)
 Printer–B Port                    :1 (1.None 2.Printer 3.DMC)
 Service Port                      :1 (1.None 2.Printer 3.DMC 4.InSite)
 Start OB Report page              :1 (1.Summary Page 2.Graph Page)
 OB Trend Graph Page               :1 (1.1graph 2.5graphs)
 EFW GP                            :1 (1:Hadlock 2:William 3:Brenner)
 EFW USA                           :Auto
 EFW Europe                        :1 (1.Shp/Wrs 2.Rch/Brk 3.Hdlck 4.Grm 5.Merz)
 EFW Tokyo                         :1 (1.TYO 2.TYO–S1 3.TYO–S2 4.TYO–S3)
 OB Report Form                    :1 (1.Tokyo 2.Osaka 3.USA 4.Europe)
 Hadlock table                     :1 (1:'84 2:'82)
 OB User Table                     : Sub menu
 BSA Type                          :1 (1.Oriental 2.Occidental)
 Display Body pattern Menu         :1 (1.Yes 2.No)
 Display Comment Menu              :1 (1.Yes 2.No)
 Auto Patient data Search          :1 (1.Yes 2.No)
 New Patient Menu Display          :1 (1.Yes 2.No)
 Active Measurement Cursor         :1 (1.X–mark 2.Plus–mark)
```

Figure 13–6. General System 2 Menu

Record 1

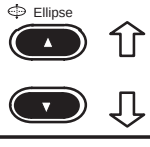
Using the **Ellipse Up/Down arrow** keys, choose the desired type of port or device to be controlled by Record 1 key.
To choose the next menu selection, press the **Ellipse Down arrow** key.
To choose the previous menu selection, press the **Ellipse Up arrow** key.



1:None	No selection.
2:B/W	Black and White Printer.
3:Archive	MOD
4:Service	Service Port.
5:Printer–A	Printer–A Port.
6:Printer–B	Printer–B Port.

Record 2

Using the **Ellipse Up/Down arrow** keys, choose the desired type of port or device to be controlled by Record 2 key.
To choose the next menu selection, press the **Ellipse Down arrow** key.
To choose the previous menu selection, press the **Ellipse Up arrow** key.



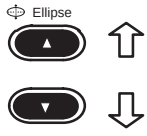
1:None	No selection.
2:B/W	Black and White Printer.
3:Archive	MOD
4:Service	Service Port.
5:Printer–A	Printer–A Port.
6:Printer–B	Printer–B Port.

General System 2 Setup (page 2 of 11)

Printer–A Port	
	Choose the type of device to be connected to the Printer–A port. 1:None No connection. 2:Printer Line Printer.
Printer–B Port	
	Choose the type of device to be connected to the Printer–B port. 1:None No connection. 2:Printer Line Printer. 3:DMC Data Management Center. 4:InSite Remote diagnostic capabilities.
Service Port	
	Choose the type of device to be connected to the Service port. 1:None No connection. 2:Printer Line Printer. 3:DMC Data Management Center. 4:InSite Remote diagnostic capabilities.
Start OB Report Page	
	Choose the type of initial OB Report Page display. 1:Summary Page. 2:Graph Page.
OB Trend Graph Page	
	Choose the number of graphs displayed on the OB Trend Graph Page. 1:1 Graph One graph is displayed on a page. 2:5 Graphs Five graphs are displayed on a page.
EFW GP	
	Choose the default author name for calculating the growth percentile of estimated fetal weight and EFW graph. 1:Hadlock. 2:William. 3:Brenner.

General System 2 Setup (page 2 of 11)

EFW USA



Using the **Ellipse Up/Down arrow** keys, choose the desired method for calculating the estimated fetal weight in the USA method.
To choose the next menu selection, press the **Ellipse Down arrow** key.
To choose the previous menu selection, press the **Ellipse Up arrow** key.

1:Auto	Automatcally selected.
2:BPD/AC	Biparietal Diameter/Abdominal Circumference.
3:FL/AC	Femur Length/Abdominal Circumference.
4:BPD/AC/FL	Biparietal Diameter/Abdominal Circumference/Femur Length.
5:FL/AC/HC	Femur Length/Abdominal Circumference/Head Circumference.
6:FL/AC/HC/BPD	Femur Length/Abdominal Circumference/Head Circumference/Biparietal Diameter.

EFBW Europe

Choose the method for calculating the estimated fetal birth weight for the European method.

1:Shp/Wrs	Shepherd/Warshoff Method.
2:Rch/Brk	Richards/Berkowitz Method.
3:Hdlck	Hadlock Method.
4:Grm	German Accepted Method.
5:Merz	Merz Method

EFBW Tokyo

Choose the method for calculating the estimated fetal birth weight for the Tokyo method.

1:TYO	Tokyo University Method.
2:TYO–S1	Tokyo Shinozuka Method.
3:TYO–S2	Tokyo Shinozuka Method.
4:TYO–S3	Tokyo Shinozuka Method.

OB Report Form

Choose default of the format for calculation and display of OB measurements.

1:Tokyo	Tokyo University Method.
2:Osaka	Osaka University Method.
3:USA	United States Method.
4:Europe	European Method.

Hadlock Table

Choose the default Hadlock Table.

1:'84	Hadlock '84 Table.
2:'82	Hadlock '82 Table.

General System 2 Setup (page 2 of 11)

OB User Table (Sub menu)

If the factory preset OB tables are not suitable, the user can input data for five OB tables.

To edit a user table

Select the General System Setup/OB User Table menu.

The User Table Programming menu appears as shown in Figure 13–7.

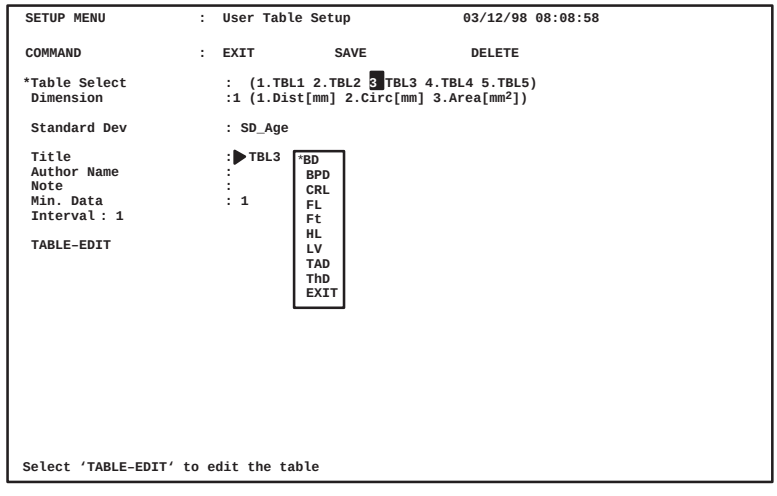


Figure 13–7. User Table Programming

Choose the desired table number TBL1 to TBL5.

Choose the the desired table dimension.

1:Dist [mm]	Distance in millimeters
2:Circ [mm]	Circumference in millimeters
3:Area[mm^2]	Area in square millimeters

General System 2 Setup (page 2 of 11)

To edit a user table (cont'd)

Choose the desired title by placing the cursor on the table title and Press **Set**. Select the desired title from the menu and Press **Set**. Refer to Figure 13–7.

NOTE: The table title can be typed in.

Type in the desired table title (maximum 5 characters). Press **Set** or the down **Arrow** key.

Type in the author's name (maximum 10 characters). Press **Set** or the down **Arrow** key.

*NOTE: The **Return** key can be used to cycle through the menu selections. To make a choice, press **Set**.*

Type in any desired notes (maximum 30 characters). Press **Set** or the down **Arrow** key.

Type in the minimum or beginning data value for the table (maximum 4 digits). Press **Set** or the down **Arrow** key.

Type in the interval value between each table data point (maximum 4 digits). Press **Set** or the down **Arrow** key.

The selection "Table-Edit" should now be highlighted. Press **Set** or **Return**.

*NOTE: The **Return** key can be used to cycle through the menu selections. To make a choice, press **Set**.*

*Use the **Arrow** keys or **Trackball** to place the cursor on the desired Menu choice.*

General System 2 Setup (page 2 of 11)

To enter table values

The User Table Edit Screen, shown in Figure 13–8, allows for adding data, editing data or clearing (deleting) a User Table.

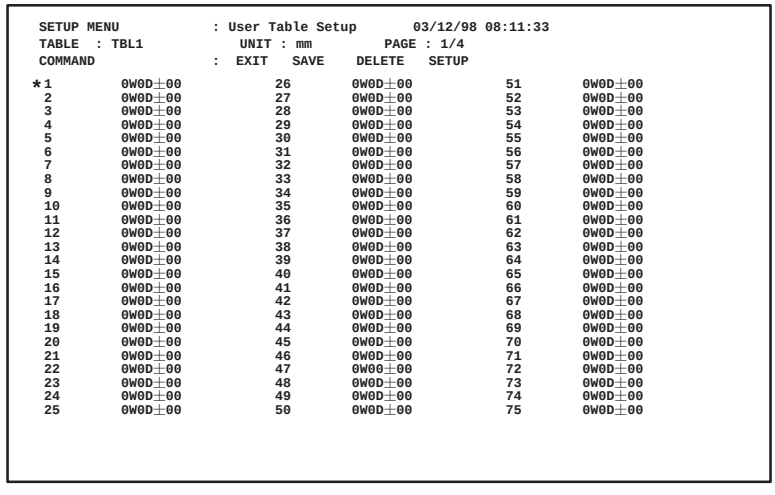


Figure 13–8. User Table Edit Screen

For each data point, the weeks (2 digits), days (1 digit) and deviation (2 digits) must be entered.

The menu choices at the third line allow:

EXIT	Exits the User Table Edit function.
SAVE	Saves the old data with the values changed.
DELETE	Clears or deletes the entire table.
SETUP	Returns to the General System Setup menu.

Use the **Arrow** keys or **Trackball** to place the cursor on one of the above choices. The table reverts to its previous state.

NOTE: If a new table was added, the measurement can be added to the summary report.

General System 2 Setup (page 2 of 11)

BSA Type	
	Choose the formula used to calculate Body Surface Area.
	1:Oriental USA formula. 2:Occidental Asian formula.
Display Body Pattern Menu	
	Choose to display all of the assigned body patterns when the body pattern key is pressed.
	1:Yes Display the body patterns. 2:No Do not display body patterns.
Display Comment Menu	
	Choose to display all of the assigned key cords when the comment key is pressed. The key cords can be assigned in the commnet setup menu.
	1:Yes Display the key cords. 2:No Do not display.
Auto Patient Data Search	
	Choose to display the previous stored OB data of the patient in a trend graph.
	1:Yes Current and Stored OB data displayed. 2:No Current data display only.
New Patient Menu Display	
	Choose to display New Patient Menu.
	1:Yes New Patient Menu displayed. 2:No Skip New Patient Menu.
Active Measurement Cursor	
	Choose the type of Cursor to be used.
	1:X–mark X–mark cursor. 2:Plus mark Plus mark cursor.

Probe Parameter 1 Setup (page 3 of 11)

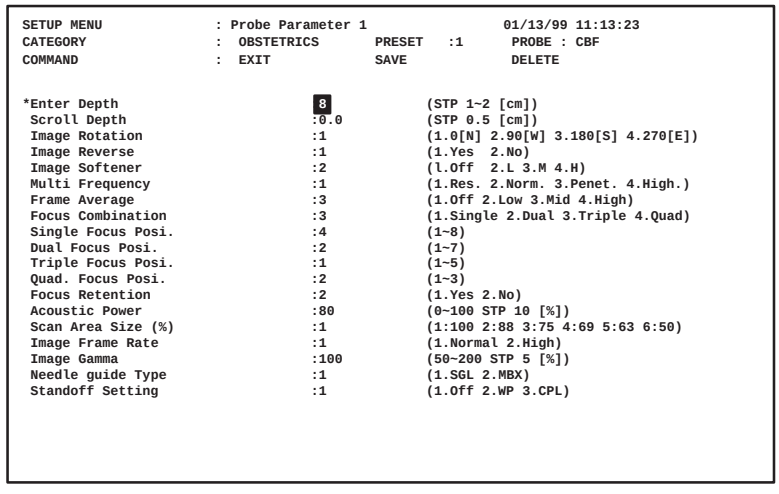


Figure 13–9. Probe Parameter 1 Setup Menu

Enter Depth EC, UP, P, R	
	Set the desired default display depth for the probe indicated. Choose from 3, 4, 5, 6, 7, 8, 10, 12, 14, 16, 18, 20, 22, 24cm in 1 or 2 cm increments.
Scroll Depth EC, UP, P, R	
	Choose the desired default scroll depth. Minimum value is 0.0. Maximum value is the maximum probe depth minus the current depth. Increments in 0.5 cm steps.
Image Rotation EC, UP, P	
	Choose the desired default image orientation. 1:0 (N) Normal top to bottom orientation. 2:90 (W) 90˚ left to right orientation. 3:180 (S) Inverted bottom to top orientation. 4:270 (E) 270˚ right to left orientation.
Image Reverse EC, UP, P, R	
	Choose the default to initially have image reverse on or off (left-right orientation). 1:Yes Image reverse on. 2:No Image reverse off.

Probe Parameter 1 Setup (page 3 of 11)

Image Softener EC, UP, P, R	
	Choose to have the image softener function default for B-Mode on or off. 1:Off No image softener as default. 2:L Low Image softener on as default. 3:M Mid Image softener on as default. 4.H High Image softener on as default.
Multi Frequency EC, UP, P, R	
	Choose to have the Multi Frequency function. 1:Res. Resolution. 2:Norm. Normal. 3:Penet. Penetration. 4:Fur Further.
Frame Average EC, UP, P, R	
	Choose to have the default for frame averaging enabled or disabled. 1:Off No Frame Average on as default. 2:Low Low Frame Average on as default. 3:Mid Middle Frame Average on as defailt. 4:High High Frame Average on as default.
Focus Combination EC, UP, P, R	
	Choose the default number for focus combination. 1:Single 1 focus combination as default. 2:Dual 2 focus combinations as default. 3:Triple 3 focus combinations as default. 4:Quad 4 focus combinations as default.
Single Focus Position EC, UP, P, R	
	Choose the desired single focus point from eight points. Choose from 1, 2, 3, 4, 5, 6, 7 or 8.
Dual Focus Position EC, UP, P, R	
	Choose the desired dual focus point from eight points. Choose from 1, 2, 3, 4, 5, 6 or 7.
Triple Focus Position EC, UP, P, R	
	Choose the desired triple focus point from eight points. Choose from 1, 2, 3, 4 or 5.
Quad Focus Position EC, UP, P, R	
	Choose the desired quadrant focus point from four points. Choose from 1, 2 or 3.

Probe Parameter 1 Setup (page 3 of 11)

Focus Retention EC, UP, P, R	
	Choose to have the focus retention function default on or off. 1:Yes Focus retention function is on. 2:No Focus retention function is off.
Acoustic Power [%] EC, UP, P	
	Acoustic output default levels can be set by exam category. Choose from 0–100% in 10 digit increments.
Scan Area Size EC, UP, P, R	
	Choose the desired default Scan Area Size. 1:100 100% Scan Area Size as default. 2:88 88% Scan Area Size as default. 3:75 75% Scan Area Size as default. 4:69 69% Scan Area Size as default. 5:63 63% Scan Area Size as default. 6:55 55% Scan Area Size as default.
Image Frame Rate EC, UP, P	
	Choose the default value for frame rate. Low Normal frame rate and resolution. Mid Middle frame rate and resolution. High Higher frame rate, less resolution.
Image Gamma [%] EC, UP, P	
	Choose the level of gamma correction applied to the image during photography. Choose from 50 to 200 in 5 digit increments.
Needle guide Type EC, UP, P	
	Choose the default biopsy needle guidezone. 1.SGL Single Biopsy guidezone. 2.MBX Multi Biopsy guidezone.
Standoff Setting EC, UP, P	
	Choose a setting for the type of probe standoff. 1.Off No standoff setting selected. 2.WP Water Path. 3.CPL Couplant.

Probe Parameter 2 Setup (page 4 of 11)

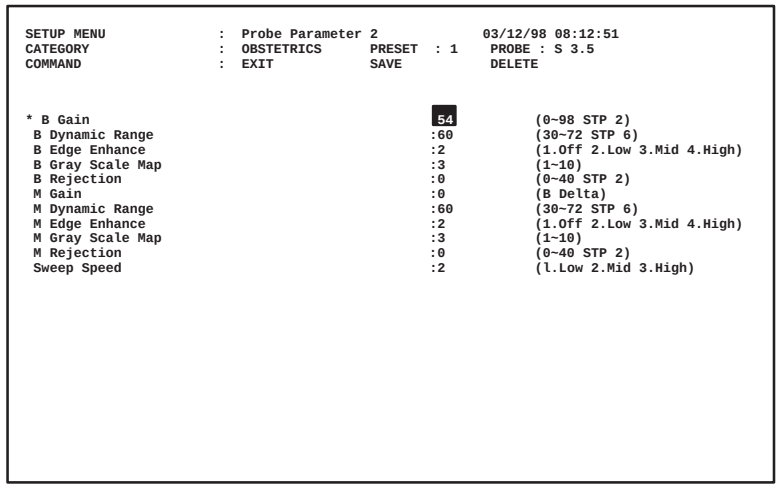


Figure 13–10. Probe Parameter 2 Setup Menu

B Gain EC, UP, P, R

Choose the default gain value for B-Mode.

Enter 0 to 98 in 2 digit increments.
The maximum value is probe dependent and may not reach 98.

B Dynamic Range EC, UP, P, R

Choose the default dynamic range value for B-Mode.

Enter a value from 30 to 72 in 6 digit increments.

B Edge Enhance EC, UP, P, R

Choose the default edge enhancement for B-Mode.

1.No	No B edge enhancement on as default.
2.Low	Low B edge enhancement on as default.
3:Mid	Middle B edge enhanvement on as default.
4:High	High B edge enhancement on as default.

B Gray Scale Map EC, UP, P, R

Choose the default gray scale map for B-Mode.

Enter from 1 to 10.

Probe Parameter 2 Setup (page 4 of 11)

B Rejection EC, UP, P, R	
	Choose the default level for rejection in B-Mode. Enter 0 to 40 in 2 digit increments.
M Gain (B Delta) EC, UP, P, R	
	Choose the default value for the M-Mode gain difference from B Gain. The initial value for M-Mode gain is determined by B-Gain. Minimum is – B Gain, Maximum is 98 – B Gain. 2 increments.
M Dynamic Range EC, UP, P, R	
	Choose the default dynamic range value for M-Mode. Enter from 30 to 72 in 6 digit increments.
M Edge Enhance EC, UP, P, R	
	Choose the default edge enhancement for M-Mode. 1:No No M edge enhancement on as default. 2:Low Low M edge enhancement on as default. 3:Mid Middle M edge enhanvement on as default. 4:High High M edge enhancement on as default.
M Gray Scale Map EC, UP, P, R	
	Choose a default gray scale map for M-Mode. Enter from 1 to 10.
M Rejection EC, UP, P, R	
	Choose the default rejection level for M-Mode. Enter 0 to 40 in 2 digit increments.
Sweep Speed EC, UP, P, R	
	Choose the default value for the timeline (M-Mode) sweep speed. 1:Low 16 milliseconds per pixel. 2:Mid 8 milliseconds per pixel. 3:High 4 milliseconds per pixel.

Image Display & Application Setup (page 5 of 11)

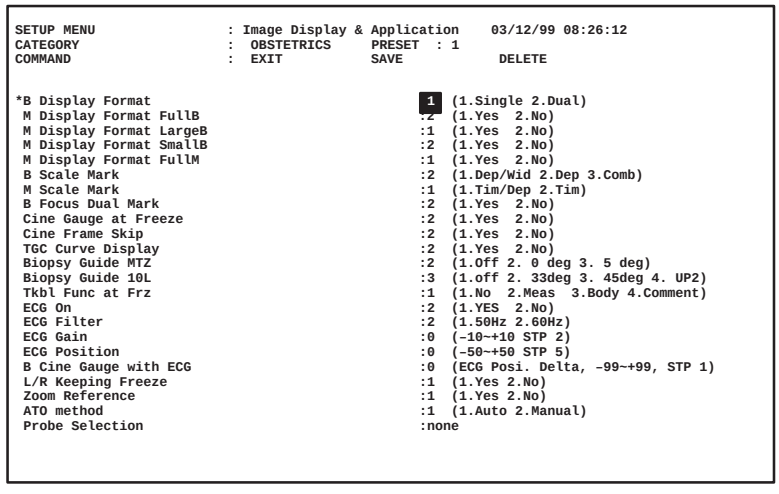


Figure 13–11. Image Display & Application Setup Menu

B Display Format EC, UP, R	
	Choose the default display format for the B-Mode display. 1:Single 2:Dual
M Display Format Full B EC, UP	
	Choose to enable the display format for screen B–Mode with M–Mode guidezone. 1:Yes Full screen B-Mode format with M-Mode guidezone as default. 2:No No Full screen B-Mode format with M-Mode guidezone as default.
M Display Format Large B EC, UP	
	Choose to enable the display format for M–Mode display with Large B–Mode. 1:Yes Side by Side format with Large B-Mode (left side) and M-Mode (right side). 2:No No Side by Side format with Large B-Mode (left side) and M-Mode (right side).

Image Display & Application Setup (page 5 of 11)

M Display Format Small B EC, UP

Choose to enable the display format for M–Mode display with Small B–Mode.

1:Yes	Side by Side format with Small B-Mode (left side) and M-Mode (right side).
2:No	No Side by Side format with small B-Mode (left side) and M-Mode (right side).

M Display Format Full M EC, UP, R

Choose to enable the display for full screen M–Mode.

1:Yes	Full screen M-Mode display format.
2:No	No full screen M-Mode display format.

B Scale Mark EC, UP

Choose as a default what scale marks will be displayed in B-Mode.

1:Dep/Wid	Depth and width marks.
2:Dep	Depth marks only.
3:Comb	Combination mode.

M Scale Mark EC, UP

Choose the method to display scale markers in M-Mode.

1:Tim/Dep	Time horizontal and depth vertical.
2:Tim	Time horizontal only.

B Focus Dual Mark EC, UP

Choose to display focus markers on both dual B-Mode images or just to the right side of the right image.

1:Yes	Focus markers will be displayed to the right of both the right and left images.
2:No	Only one focus marker is displayed.

Image Display & Application Setup (page 5 of 11)

Cine Gauge at Freeze EC, UP

Choose to have the Cine gauge initially displayed when Cine is activated.

1:Yes	Cine gauge displayed.
2:No	Cine gauge not displayed.

Cine Frame Skip EC, UP

Choose the method for storing images for Cine.

1:Yes	Store every other frame.
2:No	Store all frames.

TGC Curve Display EC, UP

Choose to display the TGC curve in B-Mode.

1:Yes	TGC Curve displayed.
2:No	TGC Curve not displayed.

NOTE: The TGC curve is displayed only during full B-Mode display.

Biopsy Guide MTZ EC, UP

Choose the default value for the MTZ Probe Biopsy Guideline in degrees.

1:Off	Disable Guideline
2:0 deg	0 degrees
3:5 deg	5 degrees

Biopsy Guide 10L EC, UP

Choose the default type for the 10L Probe Biopsy Guideline.

1:Off	Disable Guideline
2:33 deg	33 degrees
3:45 deg	45 degrees
4:UP2	UP2 type Guideline

Trackball Func at Freeze EC, UP

Choose the default function assigned to the Trackball when the image is frozen.

1: No	No function assigned.
2: Meas	Trackball assigned to the measurement function.
3: Body	Trackball assigned to the Body Pattern function.
4: Comment	Trackball assigned to the Comment function.

ECG On

Choose the default to have the ECG waveform displayed on the monitor.

1:Yes	ECG displayed.
2:No	ECG not displayed.

ECG Filter EC, UP

Choose the default to have the desired frequency of ECG filtering (50Hz, 60Hz).

1:50Hz	50Hz filtering.
2:60Hz	60Hz filtering.

Image Display & Application Setup (page 5 of 11)

ECG Gain EC, UP, R

Choose the default value for ECG gain.

Choose from –10 to +10 in 2 digit increments.

ECG Position EC, UP, R

Choose the default position (horizontal) for the ECG display.

Choose from –50 to +50 in 2 digit increments.

B Cine Gauge with ECG EC, UP

Choose the relative default position for the B Cine Gauge with ECG pointer which displays where on the ECG Cycle on the displayed image was taken.

Choose from –99 to +99 in 1 digit increments.

L/R Keeping Freeze EC, UP

Choose the default to have the inactive display keep freeze after active side change in the dual Mode.

1:Yes Inactive side keeps freeze.
2:No Inactive side melt.

Zoom Reference EC, UP

Choose to have the zoom reference image available or not available as the default.

1:Yes Reference image available in zoom.
2:No No reference image in zoom.

ATO Method EC, UP, R

Choose the default ATO (Auto Tissue Optimization) method.

1:Auto Automatic ATO size adjustment.
2:Manual Manual ATO size adjustment.

Probe Selection

Using the **Ellipse Up/Down arrow** keys, choose the default probe to be used in the preset category.
To choose the next menu selection, press the **Ellipse Down arrow** key.
To choose the previous menu selection, press the **Ellipse Up arrow** key.

1:None	2:CBF
3:CAE	4:CZB
5:MTZ	6:LH
7:LE	8:LB
9:LD	10:LI
11:LT	12:CS
13:ERBL	14:ERBC
15:S317	16:10L
17:3Cb	18:S611

Body Pattern Setup (page 6 of 11)

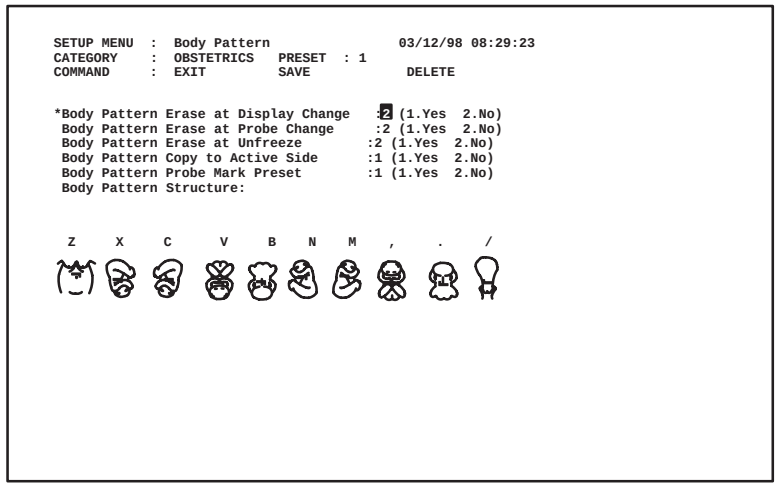


Figure 13–12. Body Pattern Setup Menu

Body Pattern Erase at Display Change EC, UP

Choose to erase the displayed body pattern when a display mode is changed or have the body pattern remain after the display mode changes.

1:Yes Body pattern is erased.
2:No Body pattern remains.

Body Pattern Erase at Probe Change EC, UP

Choose to erase the displayed body pattern when a probe is changed or have the body pattern remain after a probe change.

1:Yes Body pattern is erased.
2:No Body pattern remains.

Body Pattern Erase at Unfreeze EC, UP

Choose to erase the body pattern when the system exits the freeze function or have the body pattern remain after the image is active.

1:Yes Body pattern is erased.
2:No Body pattern remains.

Body Pattern Copy to Active Side EC, UP

Choose to have the selected body pattern copied to the active side during dual format displays.

1:Yes Copy to active side.
2:No Do not copy to active side.

Body Pattern Setup (page 6 of 11)

Body Pattern Probe Mark Active EC, UP	
	Choose to enable/disable the active position of the probe marker graphic with the body pattern. 1:Yes Use the active position. 2:No Do not use the active position.
Body Pattern Structure EC, UP	
	Choose the ten customized body patterns to be displayed in each exam category. Ten customized body patterns for each exam category are then available.

Body pattern package customization

Type the character above the body pattern to display a box around that pattern as shown in Figure 13–13.

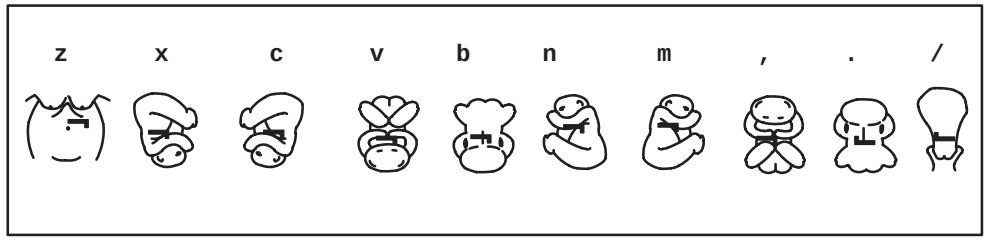
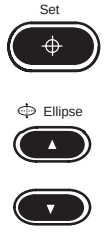


Figure 13–13. Changing Body Patterns

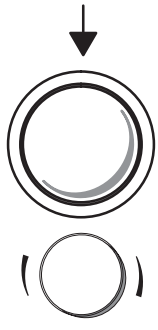
Body Pattern Setup (page 6 of 11)

Body pattern package customization (cont'd)

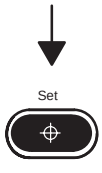


Place the cursor on the Body Pattern Structure and Press **Set**.

Use the **Ellipse** up or down arrow keys to cycle through the body pattern choices.



When the desired body pattern is displayed, use the **Trackball** to position the probe orientation marker to the desired default position on the body pattern. Use the **Rotation/Focus** knob to rotate the probe orientation marker to a desired angle.

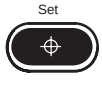


Press **Set** to complete the selection for that menu position.

Repeat the previous steps as necessary to customize the entire body pattern package.

Body Pattern Deletion

Use the **Ellipse** up or down arrow keys to cycle to the blank body pattern selection.



Press **Set** to record a blank space for that body pattern location.

Comment Setup (page 7 of 11)

```
SETUP MENU                  : Comment Setup          03/12/98  08:31:50
CATEGORY                    : OBSTETRICS   PRESET : 1
COMMAND                     : EXIT         SAVE       DELETE


*Comment Erase at Display Change  :2  (1.Yes  2.No)
 Comment Home Position Horizontal :4  (1~56)
 Comment Home Position Vertical   :4  (1~26)
 LIBRARY KEY      CODE - TEXT
 Lib 1:  A        3    - 3 VESSEL CORD
 Lib 2:  S        4    - 4 CHAMBER HEART
 Lib 3:  D        A    - AMNION
 Lib 4:  F        B    - BLADDER
 Lib 5:  G        C    - CEREBELLUM
 Lib 6:  H        CH   - CHORION
 Lib 7:  J        CI   - CORD INSERTION
 Lib 8:  K        D    - DIAPHRAGM
 Lib 9:  L        F    - FEMUR
 Lib10:  ;        FP   - FETAL POLE
 Libll:  Q        GS   - GESTATIONAL SAC
 Libl2:  W        H    - HUMERUS
 Libl3:  E        K    - KIDNEYS
 Libl4:  R        LV   - LAT VENTRICLE
 Libl5:  T        NF   - NUCHAL FOLD
 Libl6:  Y        RU   - RADIUS/ULNA
 Libl7:  U        S    - SPINE
 Libl8:  I        ST   - STOMACH
 Libl9:  O        TF   - TIB/FIB
 Lib20:  P        YS   - YOLK SAC
```

Figure 13–14 Comment Setup menu

Comment Erase at Display Change EC, UP

Choose to erase all comments when a change is made in scan mode.

1:Yes Erase at mode change.
2:No Do not erase at mode change.

Comment Home Position Horizontal EC, UP, R

Choose a point on the horizontal axis for the comment cursor home position.

Enter 1 to 56 in 1 digit increments.

Comment Home Position Vertical EC, UP, R

Choose a point on the vertical axis for the comment cursor home position.

Enter 1 to 26 in 1 digit increments.

Library 1–20 EC, UP

Use the **Trackball** or **Arrow** keys to move to the desired Annotation Library location number.

Type the Annotation Library name to the left side of the dash (–). Maximum four characters available.

NOTE: Duplication is not allowed.

Press **Set** or **Return**.
The reversed video will move to the right side of the dash.Edit the desired script.
The 20 character space for that library location will be in reverse video.
Press **Set** or **Return** to complete the entry. Select the next library location. Continue until all edits are complete.

Measurement Setup (page 8 of 11)

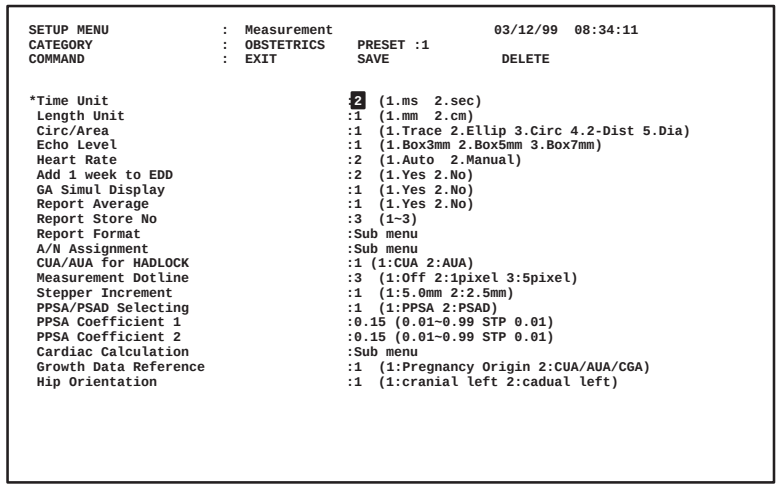


Figure 13–15. Measurement Setup Menu

Time Unit EC, UP

Choose the unit of display for all time measurements.

1:ms	milliseconds.
2:sec	seconds.

Length Unit EC, UP

Choose the unit of display for all length (distance) measurements.

1:mm	millimeters.
2:cm	centimeters.

Circ/Area EC, UP

Choose the default method to be used for circumference/area measurements.

1:Trace	Manually trace with the Trackball.
2:Ellip	Ellipse method.
3:Circ	Circle method.
4:2–Dist	Two diameter (distance) method.
5:Dia	Single distance method.

Echo Level EC, UP

Choose the size of the echo level measurement box cursor.

1:Box 3mm	3mm x 3mm box.
2:Box 5mm	5mm x 5mm box.
3:Box 7mm	7mm x 7mm box.

Measurement Setup (page 8 of 11)

Heart Rate EC, UP	
	Choose the default method for measuring heart rate. 1:Auto Automatic. 2:Manual Manual.
Add 1 week to EDD EC, UP, R	
	Choose to add 1 week to the calculation results of EDD. 1:Yes Add 1 week. 2:No Do not add 1 week.
GA Simul Display EC, UP	
	Choose the default method to display GA in an OB calculation. 1:Yes Simultaneously display. 2:No Do not Simultaneously display.
Report Average EC, UP	
	Choose to enable or disable the calculation summary report page measurement averaging function. 1:Yes Measurement averaging on. 2:No Measurement averaging off.
Report Store No EC, UP	
	Choose how many measurements will be used in the averaging function. Choose from 1, 2 or 3.
Report Format (Sub Menu) EC, UP	
	The LOGIQ™ 200 PRO Series allows for user control of each exam category summary report format. If the current exam category has an associated summary report page, select this menu option to change the report format. Factory default items can be deleted or user desired items added.

Measurement Setup (page 8 of 11)

Example report format change –Exam Category: OB

The Report Format menu appears as shown in Figure 13–16.

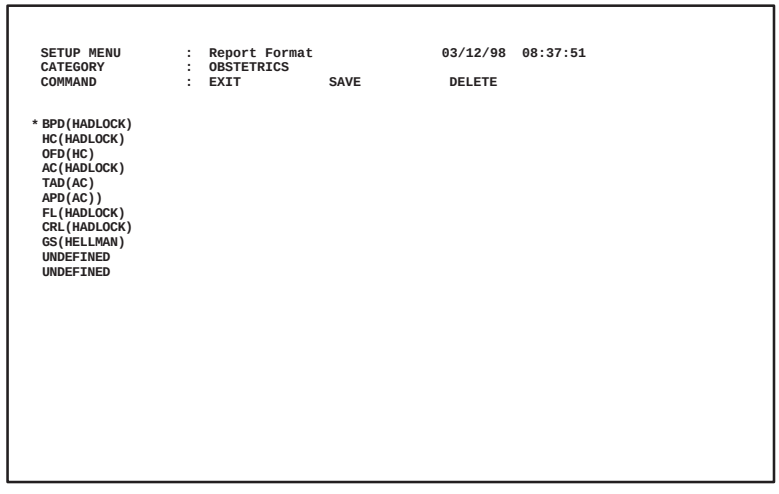


Figure 13–16. Report Format menu

The menu choices at the top allow:

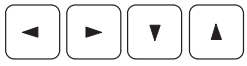
EXIT	Exits the Report Format function.
SAVE	Saves the old data with the values changed.
DELETE	Clears or deletes the entire report format.

*NOTE: The **Clear** key can be used to return the menu to the previous menu through the report format menu.*

It is impossible to select the same name on a different line.

Measurement Setup (page 8 of 11)

To Change Report Format:



Use the **Arrow** keys or the **Trackball** to move the cursor to the desired measurement name (to delete or change) or to an undefined area (to add).

Press **Set**. The author name menu will appear as shown in Figure 13–17.

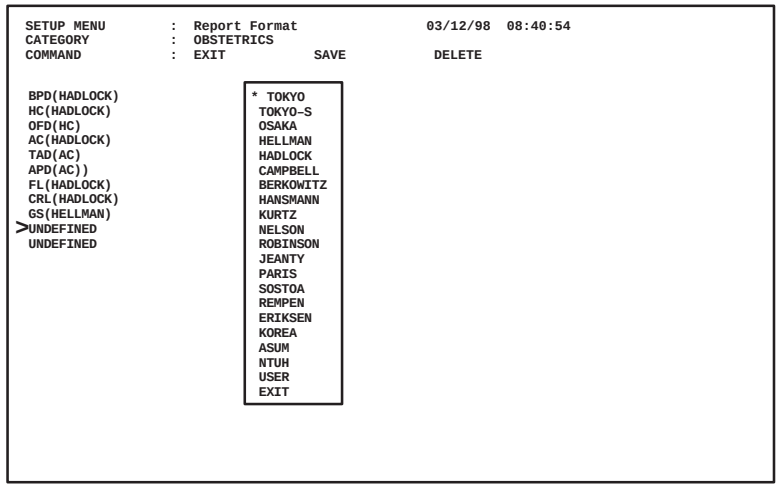


Figure 13–17. Author Name Menu

*NOTE: It is possible to return to the previous menu through the Report Format menu. Select EXIT at the bottom of each menu box and press **Set**.*

Measurement Setup (page 8 of 11)

To Change Report Format (cont'd):

Use the **Arrow** keys or the **Trackball** to move the cursor to the desired measurement method.

Press **Set**. The Measurement Type menu will appear as shown in Figure 13–18.

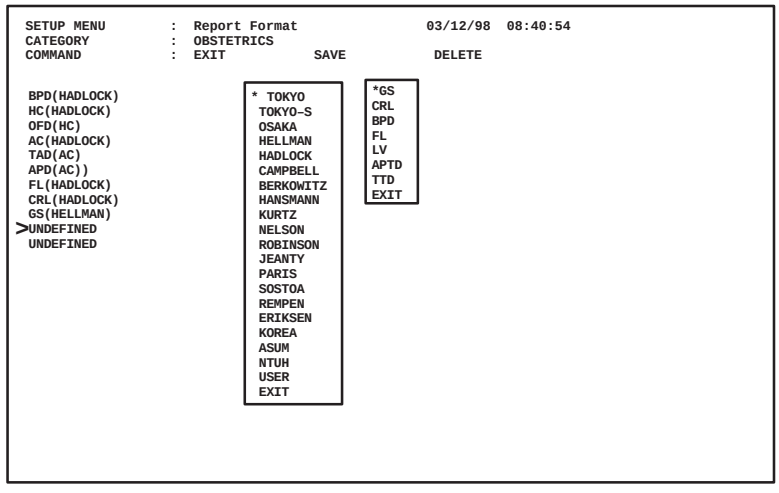
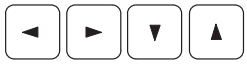


Figure 13–18. Measurement Type Menu



Use the **Arrow** keys or the **Trackball** to move the cursor to the desired measurement type.

Press **Set**.

Repeat the previous steps as necessary to program additional Measurement items.

Measurement Setup (page 8 of 11)

To EXIT Report Format:

Place the cursor on EXIT and press **Set** to return to the Measurement setup menu.

The user can assign calculation menus to alphanumeric keys.

NOTE:When changing the report format, the user should alter the A/N assignment of the report format.

To assign a calculation menu to an alphanumeric key:

Select the Measurement Setup/A/N Assignment menu.

The A/N Assignment menu appears as shown in Figure 13–19.

```
SETUP MENU          :  A/N Assignment Setup          03/12/98  08:54:53
CATEGORY            :  OBSTETRICS     PRESET : 1
COMMAND             :  EXIT           SAVE            DELETE

 Direct key NAME

 A :          BPD(HADLOCK)
 S :          HC(HADLOCK)
 D :          AC(HADLOCK)
 F :          FL(HADLOCK)
 G :          AFI
 H :          CRL(HADLOCK)
 J :          GS(HELLMAN)
 K :          HR
 L :          Vol
 ; :          UNDEFINED
*Q :          UNDEFINED
 W :          UNDEFINED
 E :          UNDEFINED
 R :          UNDEFINED
 T :          UNDEFINED
 Y ;          UNDEFINED
 U :          UNDEFINED
 I :          UNDEFINED
 0 :          UNDEFINED
 P :          UNDEFINED
```

Figure 13–19. A/N Assignment Menu

Measurement Setup (page 8 of 11)

A/N Assignment (Sub Menu) EC, UP

The menu choices at the top allow:

EXIT	Exits the A/N Assignment function.
SAVE	Saves the old data with the values changed.
DELETE	Clears or deletes the entire A/N assignment.

To Change Assignment of key:

*NOTE: The **Clear** key can be used to return the menu to the previous menu through the A/N assignment menu.*

Use the **Arrow** keys or the **Trackball** to move the cursor to the desired alphanumeric key.

Set

Press **Set**. The Category Menu will appear as shown in Figure 13–20.

To Change Assignment of key (cont'd):

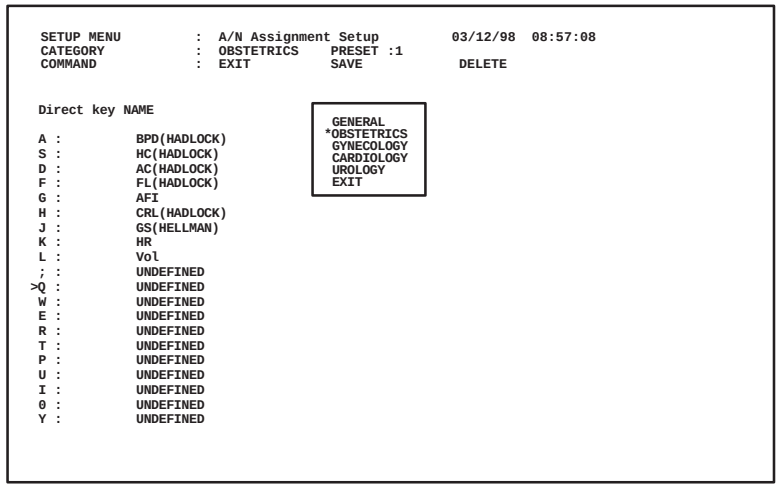


Figure 13–20. Category Menu

Measurement Setup (page 8 of 11)

To Change Assignment of key (cont'd):

Use the **Arrow** keys or the **Trackball** to move the cursor to the desired category.

Press **Set**. The author name menu will appear as shown in Figure 13–21.

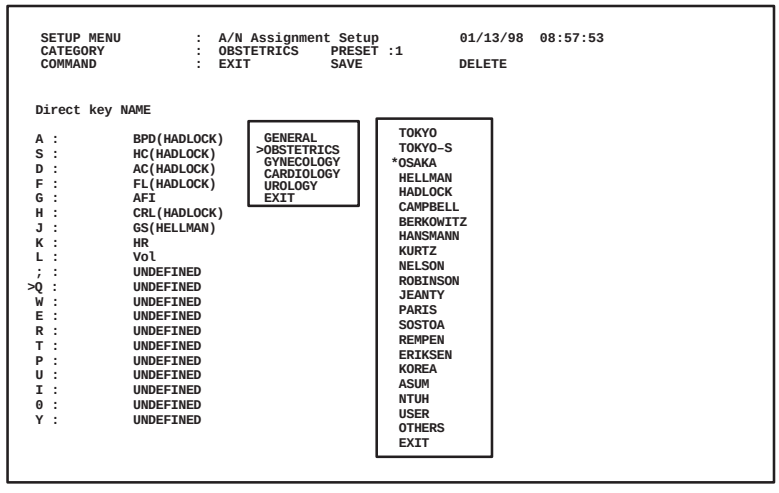
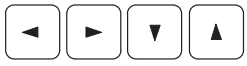


Figure 13–21. Author Name Menu

Measurement Setup (page 8 of 11)

To Change Assignment of key (cont'd):



Use the **Arrow** keys or the **Trackball** to move the cursor to the desired method.

Press **Set**. The measurement type menu will appear as shown in Figure 13–22.

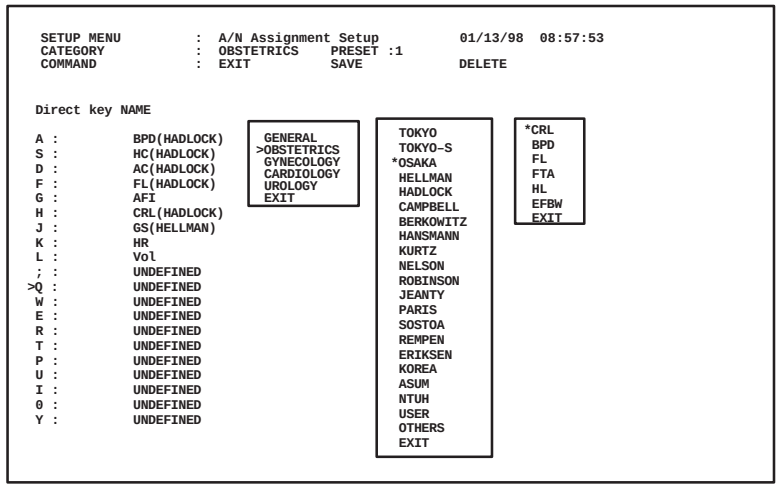


Figure 13–22. Measurement Type Select

Repeat the previous steps as necessary to program additional alphanumeric keys.

To EXIT Report Format:

Go to the initial A/N Assignment menu, as shown in Figure 13–19, place the cursor on EXIT and press **Return**. To return to the Measurement setup menu, press **Set**.

Measurement Setup (page 8 of 11)

CUA/AUA for Hadlock EC, UP	
	Choose the unit for measuring fetal age in the USA Hadlock method. 1:CUA Composite Ultrasound Age. 2:AUA Arithmetic Ultrasound Age.
Measurement Dotline EC, UP	
	Choose to have the line between the measurement cursors on or off. 1:Off No Line as default. 2:1pixel 1 pixel line as default. 3:5pixel 5 pixel line as default.
Stepper Increment EC, UP	
	Choose to have the default step increment for the stepper volume measurement. 1:5 mm spacing for area measurement. 2:2.5 mm spacing for area measurement.
PPSA/PSAD Selecting EC, UP	
	Set the desired default report item for calculating method on the Urology Report page. 1:PPSA PPSA method. 2:PSAD PSAD method.

Measurement Setup (page 8 of 11)

PPSA Coefficient 1 EC, UP	
	Set the desired default PPSA Coefficient 1 for the PPSA calculation on the Urology Report page. Enter from 0 to 99.
PPSA Coefficient 2 EC, UP	
	Set the desired default PPSA Coefficient 2 for the PPSA calculation on the Urology Report page. Enter from 0 to 99
Growth Data Reference	
	Choose which unit of fetal age will be used as a standard to get the Growth Data Reference. 1:Pregnancy Origin — GA used as a standard 2:CUA/AUA/CGA — CUA/AUA/CGA used as a standard
Hip Orientation	
	Choose the type of Hip Orientation method to be used for scanning the infant hip. 1:cranial left — cranial structures left /caudal structures right 2:caudal left — caudal structures left /cranial structures right

*NOTE: It is possible to return to the previous menu through the A/N Assignment menu. Select EXIT at the bottom of each menu box and press **Set**.*

Measurement Setup (page 8 of 11)

Cardiac Calculation (Sub Menu) EC, UP

The LOGIQ™ 200 PRO Series allows for setting the default Analysis method for Cardiac Calculation.

The Cardiac Calculation Setup menu appears as shown in Figure 13–23.

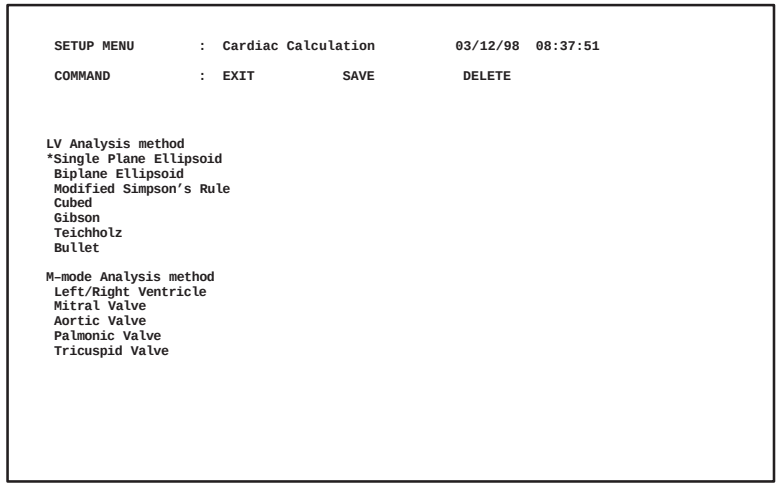


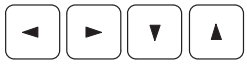
Figure 13–23. Cardiac Calculation Setup menu

The menu choices at the top allow:

EXIT	Exits the menu.
SAVE	Saves the old data with the values changed.
DELETE	Clears or deletes the entire preset data.

Measurement Setup (page 8 of 11)

To Change Analysis method:



Use the **Arrow** keys or the **Trackball** to move the cursor to the desired name of the Analysis method .

Press **Set**. The sub menu will appear as shown in Figure 13–24.

Move the cursor to the desired name of the calculation item.

Choose On or Off to calculate or not to calculate the item in the sub menu.

To save, place the cursor on SAVE and Press **Set**.

NOTE:If a measurement item is set to OFF, calculations using that measurement cannot be computed and displayed.

```
SETUP MENU        :  LV (CUBED)                    03/12/98  08:37:51

COMMAND           :  EXIT           SAVE           DELETE



*IVSd                  :1     (1.On  2.off)
 LVIDd                 :1     (1.On  2.Off)
 LVPWd                 :1     (1.On  2.Off)
 IVSs                  :1     (1.On  2.Off)
 LVIDs                 :1     (1.On  2.Off)
 LVPWs                 :1     (1.On  2.Off)
 EdV                   :1     (1.On  2.Off)
 EsV                   :1     (1.On  2.Off)
 FS                    :1     (1.On  2.Off)
 SV                    :1     (1.On  2.Off)
 EF                    :1     (1.On  2.Off)
 HR                    :1     (1.On  2.Off)
 CO                    :1     (1.On  2.Off)
 SI                    :1     (1.On  2.Off)
 CI                    :1     (1.On  2.Off)
 ET                    :1     (1.On  2.Off)
 MVCF                  :1     (1.On  2.Off)
 LVM                   :1     (1.On  2.Off)
```

Figure 13–24. Cubed Analysis Submenu

Patient Entry Setup (page 9 of 11)

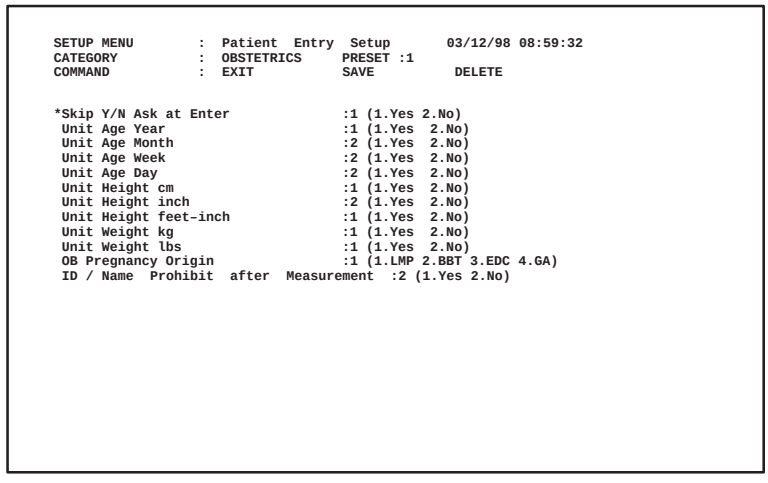


Figure 13–25. Patient Entry Setup

Skip Y/N Ask at Enter EC, UP	
	In the new patient entry menu, choose to ask to erase all current patient data or not. 1:Yes Do not ask, automatically erase all patient data. 2:No Ask to erase data Y/N.
Unit Age Year EC, UP	
	Choose the patient age to be displayed in years. 1:Yes Display age in years. 2:No Do not display age in years.
Unit Age Month EC, UP	
	Choose the patient age to be displayed in months. 1:Yes Display age in months. 2:No Do not display age in months.
Unit Age Week EC, UP	
	Choose the patient age to be displayed in weeks. 1:Yes Display age in weeks. 2:No Do not display age in weeks.

Patient Entry Setup (page 9 of 11)

Unit Age Day EC, UP	
	Choose the patient age to be displayed in days. 1:Yes Display age in days. 2:No Do not display age in days.
Unit Height cm EC, UP	
	Choose the patient's height to be displayed in centimeters. 1:Yes Display the patient's height in cm. 2:No Do not display the patient's height in cm.
Unit Height inch EC, UP	
	Choose the patient's height to be displayed in inches. 1:Yes Display the patient's height in inches. 2:No Do not display the patient's height in inches.
Unit Height feet–inch EC, UP	
	Choose the patient's height to be displayed in feet-inches. 1:Yes Display the patient's height in feet–inches. 2:No Do not display the patient's height in feet-inches.
Unit Weight Kg EC, UP	
	Choose the patient's weight to be displayed in kilograms. 1:Yes Display the patient's weight in Kg. 2:No Do not display the patient's weight in Kg.
Unit Weight lbs EC, UP	
	Choose the patient's weight to be displayed in pounds (lbs). 1:Yes Display the patient's weight in lbs. 2:No Do not display the patient's weight in lbs.
OB Pregnancy Origin EC, UP	
	Choose the method for calculating estimated fetal birth. 1:LMP Last Menstrual Period. 2:BBT Basic Body Temperature. 3:EDC Estimated Date of Confinement. 4:GA Gestational Age.
ID/Name Prohibit after Measurement EC, UP	
	Choose to enable or disable changes with the ID/Name key after measurement. 1:Yes **ID/Name** key enabled after measurement. 2:No **ID/Name** key disabled after measurement.

User Define Category and Key Setup (page 10 of 11)

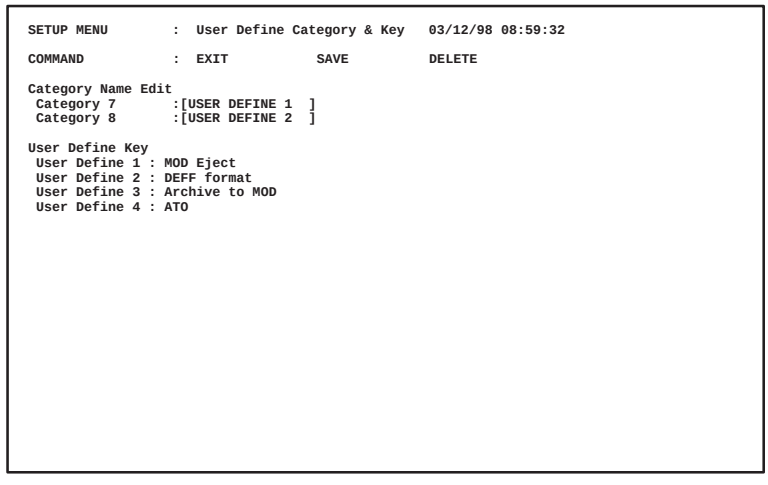


Figure 13–26. User Define Category and Key Setup

Category Name Edit – Category 7

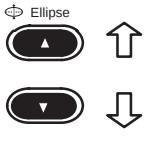
Type in the desired category name to be displayed in new patient Menu 7: USER DEFINE 1. Maximum 16 characters available.

Category Name Edit – Category 8

Type in the desired category name to be displayed in new patient Menu 8: USER DEFINE 2. Maximum 16 characters available.

User Define Key – User Define 1~4

Using the **Ellipse Up/Down arrow** keys, choose the type of function to be controlled by each of the User Define keys (1~4).
To choose the next menu selection, press the **Ellipse Down arrow** key.
To choose the previous menu selection, press the **Ellipse Up arrow** key.



1:None.
2:MOD Eject.
3:DEFF Format.
4:Print A
5:Print B
6:Archive to MOD
7:B/W Printer
8:Image Softener
9:Image Rotation
10:Frame Rate
11:ATO
12:ZOOM Reference
13:RAD/ABDOMEN
14:OBSTETRICS
15:GYNECOLOGY
16:CARDIOLOGY
17:UROLOGY
18:SMALL PARTS
19:USER DEFINE 1
20:USER DEFINE 2

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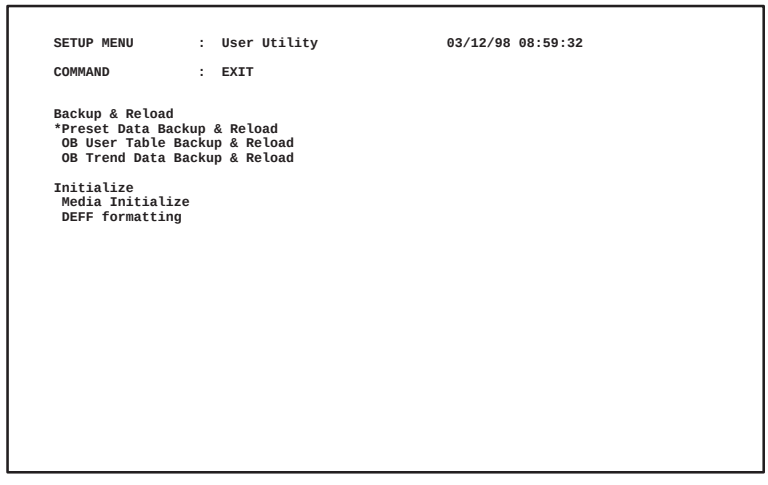
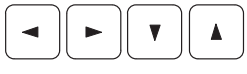


Figure 13–27. User Utility

Backup and Reload

Preset Data Backup & Reload



Using the **Arrow** keys or **Trackball** to place the cursor, press **Set** for Preset Data Backup and Reload.

'Set' to Save, 'Clear' to Reload, 'Esc' to Exit

is displayed.

Press **Set**. All of the preset data except OB data is saved in the optional MOD.

Press **Clear**. All of the preset data saved in the optional MOD is reloaded.

User Utility (page 11 of 11)

Backup and Reload (cont'd)

OB User Table Backup & Reload

Using the **Arrow** keys or **Trackball** to place the cursor, press **Set** for OB User Table Backup & Reload.

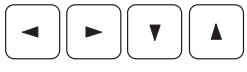
'Set' to Save, 'Clear' to Reload, 'Esc' to Exit

is displayed.

Press **Set**. All of the OB User Tables are saved in the optional MOD.

Press **Clear**. All of the OB User Tables saved in the optional MOD are reloaded.

OB Trend Data Backup & Reload



Using the **Arrow** keys or **Trackball** to place the cursor, press **Set** for OB Trend Data Backup & Reload.

'Set' to Save, 'Clear' to Reload 'Esc' to Exit

is displayed.

Press **Set**. All of the OB Trend Data are saved in the optional MOD.

Press **Clear**. All of the OB Trend Data saved in the optional MOD are reloaded.

User Utility (page 11 of 11)

Initialize

Media Initialize

Using the **Arrow** keys or **Trackball** to place the cursor, press **Set** for Media Initialize.

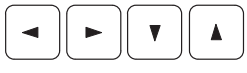
'Set' to Formatting, 'Clear' to Cancel, 'Esc' to Exit

is displayed.

Press **Set** to excute the DOS format of an optional MOD.

Press **Clear** to cancel.

DEFF formatting



Using the **Arrow** keys or **Trackball** to place the cursor, press **Set** for DEFF formatting.

'Set' to Formatting, 'Clear' to Cancel, 'Esc' to Exit

is displayed.

Press **Set** to excute DEFF formatting of an optional MOD.

Press **Clear** to cancel.

Refer to 11 for more information.

Probes and Biopsy

Probes and Biopsy

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Probe Overview

Ergonomics

Probes have been ergonomically designed to:

- Handle and manipulate with ease
- Connect to the system with one hand
- Be lightweight and balanced
- Have rounded edges and smooth surfaces.

Cables have been designed to:

- Connect to system with appropriate cable length
- Stand up to typical wear by cleaning and disinfectant agents, contact with approved gel, etc.

Cable handling

Take the following precautions with probe cables:

- Keep free from wheels
- Do not bend the cable acutely
- Avoid crossing cables between probes.

Probe orientation

Each probe is provided with an orientation marking (refer to Figure 14–1). This mark is used to identify the end of the probe corresponding to the side of the image having the GE orientation marking.

Figure 14–1. Orientation Marking on Probe

Labeling

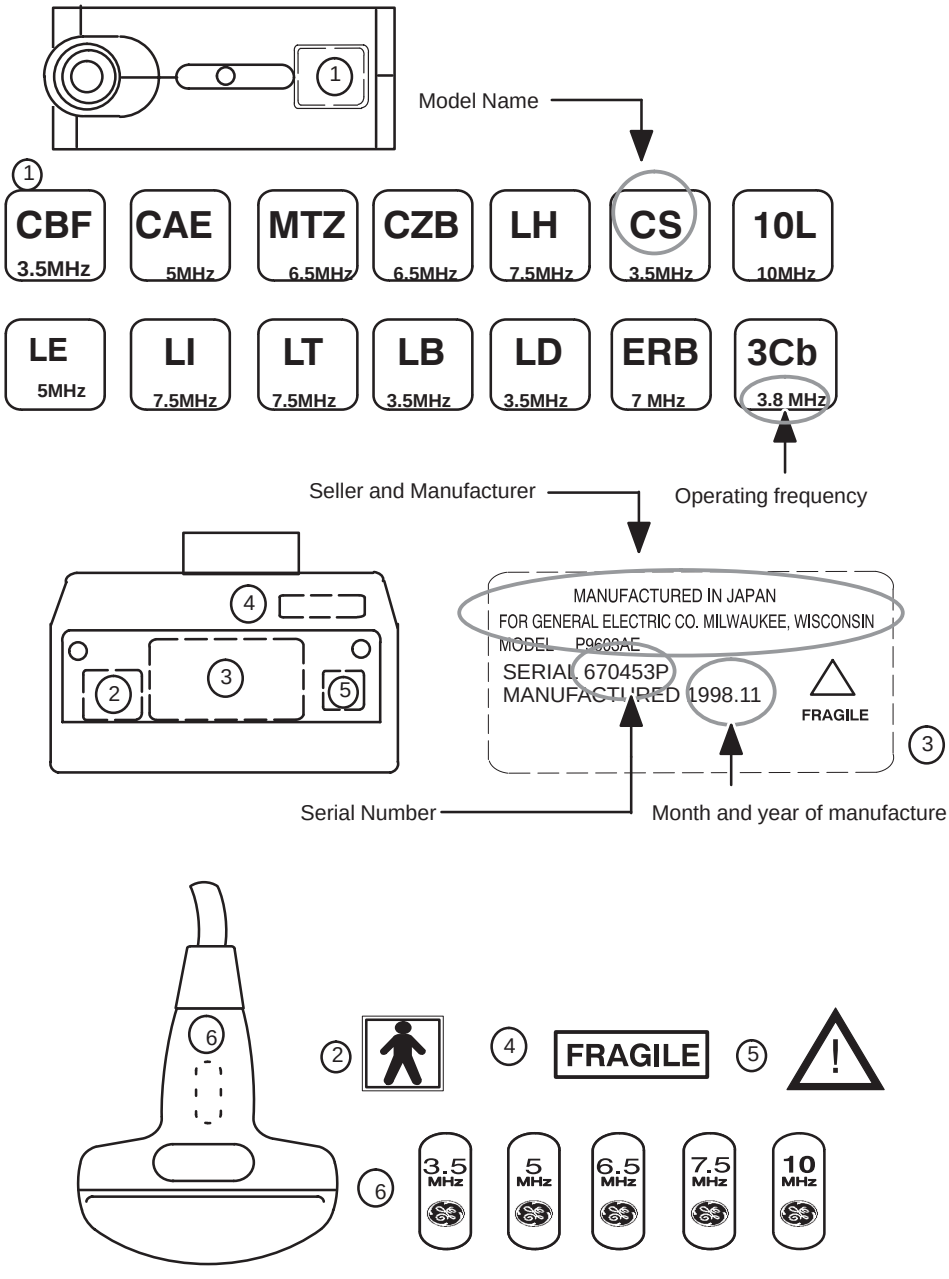


Figure 14–2. Probe Labels

Labeling (cont'd)

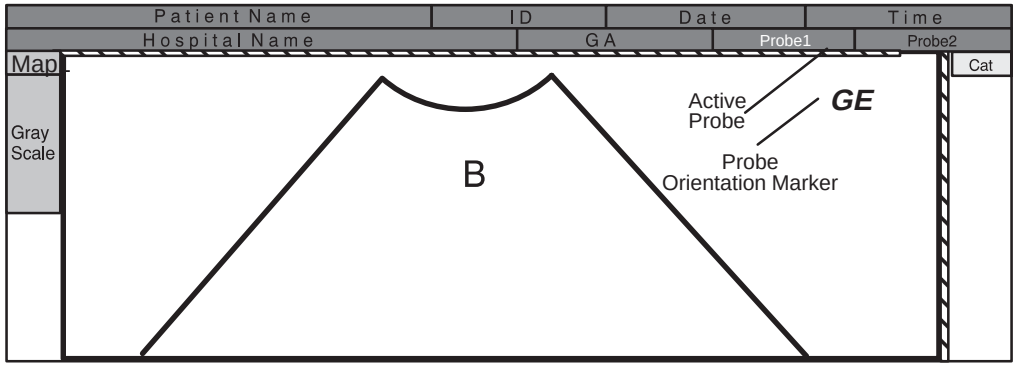


Figure 14–3. Displayed Probe Information

Applications

Below is a list of probes and their intended applications.

Probe Application	CBF	CAE	MTZ	CZB	LH	LE	LI	LT
Abdominal	●	●						
Small Parts					●			
Obstetrics	●	●	●			●		
Gynecology	○	●	●			●		
Pediatrics		○		○				
Neonatal				●				
Urology		○						
Surgery	○	○					○	○
Endocavity			●					
Intraoperative							●	●
Cardiology								
Biopsy	✓	✓	✓	✓	✓			

Probe Application	LB	LD	CS	10L	ERB	3Cb	S317
Abdominal			○			●	●
Small Parts				●			
Obstetrics	●		○			●	
Gynecology	●					●	
Pediatrics							○
Neonatal							
Urology					●		○
Surgery		○	○		○	○	
Endocavity							
Intraoperative		●					
Cardiology			●				●
Biopsy		✓	✓	✓	✓	✓	✓

● Main application
○ Alternative application
✓ Option kit available

Table 14–1. Probe Indications for Use

Specifications

Probe Name	Material of Headshell	Use	Type	Catalog No.	Mfg. by	Image Frequency (MHz)
CBF	PES	Abdom.	Convex	H46022CB	GEYMS	3.5
CAE	PES	Abdom.	Convex	H46022CA	GEYMS	5
MTZ	PES	Intercavity	Convex	H46022MT	GEYMS	6.5
CZB	NORYL	Neonatal	Convex	H45202CZ	GEYMS	6.5
CS	PES	Cardiology	Convex	H45222CS	GEYMS	3.5
ERB	PES	Urology	Convex	H45202ER	GEYMS	7
3Cb	PES	Abdom.	Convex	H45202WB	GEYMS	3.8
LH	PES	Superficial	Linear	H46022LH	GEYMS	7.5
LE	PES	OB/Gyn.	Linear	H46022LE	GEYMS	5
LI	PES	Intraoperative	Linear	H46022LI	GEYMS	7.5
LT	PES	Intraoperative	Linear	H46022LT	GEYMS	7.5
LB	PES	OB/Gyn.	Linear	H46022LB	GEYMS	3.5
LD	NORYL	Intraoperative	Linear	H45202LD	GEYMS	3.5
10L	PES	Abdom.	Linear	H45202LM	DIASONICS	10
S317	NORYL	Cardiology	Sector	H45202SD	GEYMS	3.3

Table 14–2. LOGIQ™ 200 PRO Series Probe List

Connecting and Disconnecting a Probe

When connecting or disconnecting a probe, the probe port should not be active. To ensure that the ports are not active, place the system in the image freeze condition. Ultrasound transmission is stopped until the system is unfrozen.

When activating a probe, system preset parameters such as **Depth**, **Focal Zone Number** and **Position**, and image **Rotation** are also activated. Refer to *Customizing Your System* for more information.

Selecting a probe

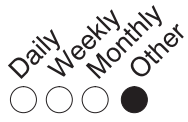
Hints

- Always start out with a probe that provides optimum focal depths and penetration for the patient size and application.
- Begin the scan session using the default Acoustic Output setting for the probe and application.

NOTE: Selecting a new probe unfreezes the image.

Care and Maintenance

Inspecting probes



After Each Use

Inspect the probe's lens, cable, and casing after each use. Look for any damage that would allow liquid to enter the probe. If any damage is found, do not use the probe until it has been inspected and repaired/replaced by a GE Service Representative.

Keep a log of all probe maintenance, along with a picture of any probe malfunction.

Storing probes

After scanning and cleaning of the probe is completed, put the probe in its carrying case to ensure safe storage.

Transporting probes

Secure the probe in its holder for moving short distances. When transporting a probe a long distance, store it in its carrying case.

Environmental Requirements

Probes should be operated, stored, or transported within the parameters outlined below.

	Operational	Storage	Transport
Temperature	10°- 40° C 50°- 104° F	–10°- 60° C 14°- 140° F	–40°- 60° C –40°- 140° F
Humidity	5 ~ 90 % RH	5 ~ 90 % RH	5 ~ 90 % RH
Pressure	700-1060hPa	700-1060hPa	700-1060hPa

Table 14–3. Probe Environmental Requirements

Probe Safety

Handling precautions

WARNING 

Ultrasound probes are highly sensitive medical instruments that can easily be damaged by improper handling. Use care when handling and protect from damage when not in use. **DO NOT** use a damaged or defective probe. Failure to follow these precautions can result in serious injury and equipment damage.

Electrical shock hazard

The probe is driven with electrical energy that can injure the patient or user if live internal parts are contacted by conductive solution:

- **DO NOT** immerse the probe into any liquid beyond the level indicated by the immersion level diagram. Refer to Figure 14–4 on *13*. Never immerse the probe connector or probe adaptors into any liquid.
- **DO NOT** drop the probes or subject them to other types of mechanical shock or impact. Degraded performance or damage such as cracks or chips in the housing may result.
- Inspect the probe before and after each use for damage or degradation to the housing, strain relief, lens, and seal. A thorough inspection should be conducted during the cleaning process.
- **DO NOT** kink, tightly coil, or apply excessive force on the probe cable. Insulation failure may result.
- Electrical leakage checks should be performed on a routine basis by GE Service or qualified hospital personnel. Refer to the service manual for leakage check procedures.

Mechanical hazards

CAUTION

A defective probe or excessive force can cause patient injury or probe damage:

- Observe depth markings and do not apply excessive force when inserting or manipulating intercavitary probes.
- Inspect probes for sharp edges or rough surfaces that could injure sensitive tissue.

Special handling instructions

Using protective sheaths

CAUTION

Biological Hazard

Protective barriers may be required to minimize disease transmission. Probe sheaths are available for use with all clinical situations where infection is a concern. Sterile sheaths should be used when sterile clinical procedures are indicated.

Instructions. Custom made sheaths are available for each probe. Each probe sheath kit consists of a flexible sheath used to cover the probe and cable and elastic bands used to secure the sheath.

Sterile probe sheaths are supplied as part of biopsy kits for those probes intended for use in biopsy procedures. In addition to the sheath and elastic bands, the kits include associated accessories for performing a biopsy procedure. Refer to the biopsy instructions for the specific probes in the *Probe Discussion* section of this chapter for further information.

Reordering. To reorder sheaths, refer to 15–27.

CAUTION

Devices containing latex may cause severe allergic reaction in latex sensitive individuals. Refer to FDA's March 29, 1991 Medical Alert on latex products.

Probe handling and infection control

This information is intended to increase user awareness of the risks of disease transmission associated with using this equipment and provide guidance in making decisions directly affecting the safety of the patient as well as the equipment user.

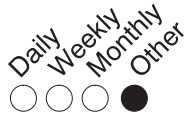
Diagnostic ultrasound systems utilize ultrasound energy that must be coupled to the patient by direct physical contact. Depending on the type of examination, this contact occurs with a variety of tissues ranging from intact skin in a routine exam to recirculating blood in a surgical procedure. The level of risk of infection varies greatly with the type of contact.

One of the most effective ways to prevent transmission between patients is with single use or disposable devices. However, ultrasound transducers are complex and expensive devices that must be reused between patients. It is very important, therefore, to minimize the risk of disease transmission by using barriers and through proper processing between patients.

CAUTION 

Adequate cleaning and disinfection are necessary to prevent disease transmission. It is the responsibility of the equipment user to verify and maintain the effectiveness of the infection control procedures in use. Always use sterile, legally marketed probe sheaths for intra-cavitary and intra-operative procedures. High level disinfection is strongly recommended for intra-cavitary and intra-operative probes even when probe sheathes are used.

Probe Cleaning Process



After Each Use

To clean the probe:

1. After each use, disconnect the probe from the ultrasound console and remove all coupling gel from the probe by wiping with a soft cloth and rinsing with flowing water.

Probe Cleaning Process (cont'd)

2. Wash the probe with mild soap in lukewarm water. Scrub the probe as needed using a soft sponge, gauze, or cloth to remove all visible residue from the probe surface. Prolonged soaking or scrubbing with a soft bristle brush (such as a toothbrush) may be necessary if material has dried onto the probe surface.
3. Rinse the probe with enough clean potable water to remove all visible soap residue.
4. Air dry or dry with a soft cloth.

Special Cleaning Instructions for the MTZ: When cleaning the MTZ probe, it is important to be sure that all surfaces are thoroughly cleaned. This probe has an adjustable two-part handle that must be disassembled to gain access to all surfaces. To disassemble the handle, completely remove the handle adjustment screw located mid-way between the cable entry and probe tip. The two handle halves and adjustment screw must be thoroughly cleaned along with the main probe shaft as described earlier in step 2. After rinsing and drying is completed, the probe handle can be loosely reassembled for the disinfection process.

Probe Cleaning Process (cont'd)

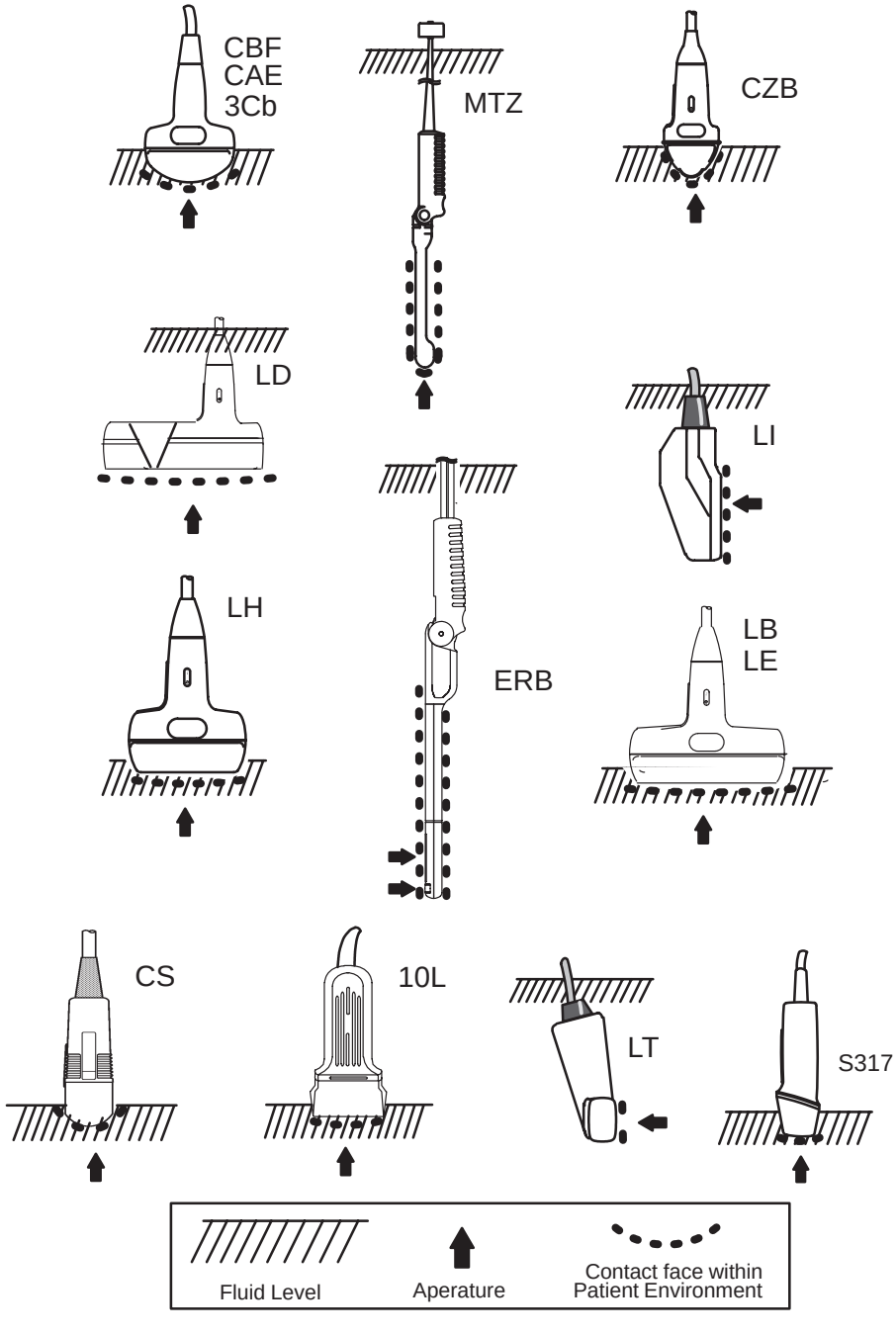


Figure 14–4. Probe Immersion Levels

Disinfecting probes

After Each Use

Ultrasound probes can be disinfected using liquid chemical germicides. The level of disinfection is directly related to the duration of contact with the germicide. Increased contact time produces a higher level of disinfection.
2% Glutaraldehyde-based solutions have been shown to be very effective for this purpose. Cidex is the only germicide that has been evaluated for compatible with the material used to construct the probes.

CAUTION

In order for liquid chemical germicides to be effective, all visible residue must be removed during the cleaning process. Thoroughly clean the probe, as described earlier before attempting disinfection.

1. Prepare the germicide solution according to the manufacturer's instructions. Be sure to follow all precautions for storage, use and disposal.
2. Place the cleaned and dried probe surface in contact with the germicide solution for the time specified by the germicide manufacturer. High-level disinfection (for surface and cavity probes) can be accomplished by soaking according to the contact time recommended by the germicide manufacturer.
3. After removing from the germicide, rinse the probe following the germicide manufacturer's rinsing instructions. Flush all visible germicide residue from the probe and allow to air dry.

Disinfecting probes (cont'd)

Special Disinfecting Instructions for the MTZ: To properly disinfect the MTZ probe, the probe handle can be reassembled loosely so that the entire probe with handle can be immersed in the germicide solution. The adjustment screw must be kept loose so that germicide can penetrate to all surfaces. After immersing, rotate and shake the probe while it is below the surface of the germicide to eliminate air pockets. Allow the germicide to remain in contact with the fully immersed probe, for high level disinfection, according to the germicide manufacturer's recommended time. To remove all germicide residue, final rinsing should be done following the germicide manufacturer's instructions. Remove excess water by shaking and allow to air dry.

CAUTION

Biological Hazard

CREUTZFIELD–JACOB DISEASE
Neurological use on patients with this disease must be avoided. If a probe becomes contaminated, there is no adequate disinfecting means.

WARNING

Ultrasound transducers can easily be damaged by improper handling and by contact with certain chemicals. Failure to follow these precautions can result in serious injury and equipment damage.

Disinfecting probes (cont'd)

- Do not immerse the probe into any liquid beyond the level specified for that probe. Never immerse the transducer connector or probe adapters into any liquid.
- Avoid mechanical shock or impact to the transducer and do not apply excessive bending or pulling force to the cable.
- Transducer damage can result from contact with inappropriate coupling or cleaning agents:
    - Do not soak or saturate transducers with solutions containing alcohol, bleach, ammonium chloride compounds or hydrogen peroxide
    - Avoid contact with solutions or coupling gels containing mineral oil or lanolin
    - Avoid temperatures above 60° C.
- Inspect the probe prior to use for damage or degeneration to the housing, strain relief, lens and seal. Do not use a damaged or defective probe.

Coupling gels

Applying

In order to assure optimal transmission of energy between the patient and probe, a conductive gel or couplant must be applied liberally to the patient where scanning will be performed.

Precautions

Coupling gels should not contain the following ingredients as they are known to cause probe damage:

- Methanol, ethanol, isopropanol, or any other alcohol-based product
- Mineral oil
- Iodine
- Lotions
- Lanolin
- Aloe Vera
- Olive Oil
- Dimethyl Silicone
- Methyl or Ethyl Parabens (para hydroxybenzoic acid)

Planned Maintenance

CAUTION 

The following maintenance schedule is suggested for the system and probes to ensure optimum operation and safety.

Do the Following	Daily	After Each Use	As Necessary
Inspect the Probes	**X**		
Clean the Probes		**X**	
Disinfect Probes		**X**	

Table 14–4. Planned Maintenance Program

Probe Discussion

Introduction

The LOGIQ™ 200 PRO Series supports three types of probes:

- **Curved Array (Convex)**. Curved Array (Convex) probes, including ‘micro’ convex, are usually designated by the prefix “C” or ”M”.
- **Linear Array**. Linear Array probes are designated by the prefix “L”.
- **Phased Array Sector**. Phased Array Sector probes are designated by the prefix/suffix “S”.

Curved Array (Convex) Probes

There are eight convex probes for the system: the CBF, CAE, MTZ, CZB, CS, ATR, ERB and C358 probes.

Biopsy Guidezone

The type of guide displayed for the convex probes is illustrated below.

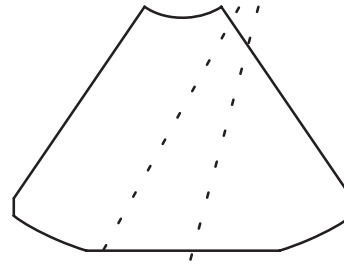
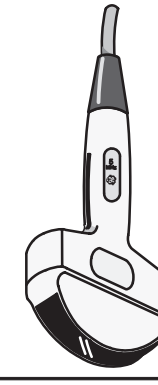


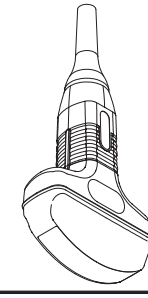
Figure 14–5. Typical Convex Probe Biopsy Guidelines

Probe	Description	Intended Uses	Capabilities and Features	Illustration
CBF	The CBF probe is a general purpose probe for obtaining B-Mode within the intended uses.	General Purpose Radiology OB/GYN	Wide field of view Penetration Small footprint Ergonomics for scanning and cleaning Biopsy capability	
CAE	The CAE probe is a general purpose probe for obtaining B-Mode within the intended uses.	General Purpose Radiology OB/GYN	Wide field of view Penetration Small footprint Ergonomics for scanning and cleaning	

Curved Array (Convex) Probes (cont'd)

Probe	Description	Intended Uses	Capabilities and Features	Illustration
MTZ	The MTZ probe is an endocavitary probe for obtaining B-Mode within the intended uses.	Transvaginal Transrectal	Wide field of view Small headshell and probe shaft Adjustable handle angle Good B-Mode Resolution Ergonomics for scanning and cleaning Biopsy capability	
CZB	The CZB probe is a convex probe for obtaining B-Mode within the intended uses.	Neonatal Pediatrics	Small Footprint Wide field of view Good B-Mode Resolution Ergonomics for scanning and cleaning Biopsy capability	
CS	The CS probe is a convex probe for obtaining B-Mode within the intended uses.	Cardiology General Abdominal	High Resolution Ergonomics for scanning and cleaning Biopsy capability	

Curved Array (Convex) Probes (cont'd)

Probe	Description	Intended Uses	Capabilities and Features	Illustration
ERB	The ERB probe is a convex probe intended for Urology.	Urology	Wideband for B-Mode resolution & homogenity Slant Scan Ergonomics for scanning and cleaning	
3Cb	The 3Cb probe is a general purpose probe for obtaining B-Mode.	General Purpose	Wide field of view Penetration Good image uniformity Good B-Mode Resolution Ergonomics for scanning and cleaning Biopsy capability	

Linear Array Probes

There are currently seven linear probes for the system: the LH, LE, LI, LT, LB, LD, MI and ERB probes.

NOTE: ERB probe is a multitype probe used both for convex and linear.

Biopsy Guideline

The type of guide displayed for the linear probe is illustrated below.

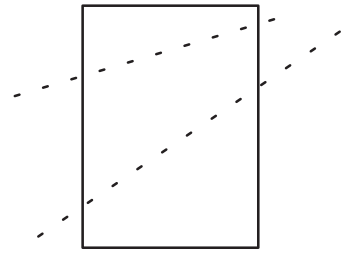
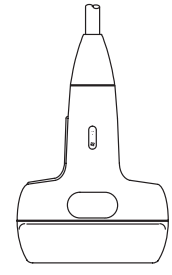
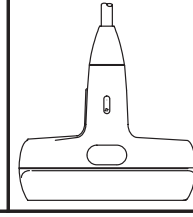
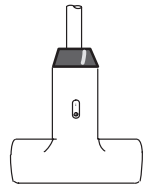
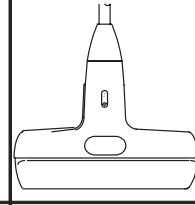
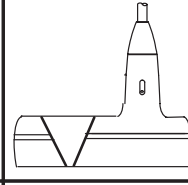
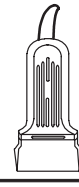


Figure 14–6. Typical Linear Probe Biopsy Guidelines

Probe	Description	Intended Uses	Capabilities and Features	Illustration
LH	The LH probe is a linear probe for obtaining B–Mode within the intended uses.	Small Parts Mammography	High Resolution Wideband for B-Mode resolution & homogenity Ergonomics for scanning and cleaning	
LE	The LE probe is a linear probe for obtaining B–Mode within the intended uses.	General Purpose Radiology OB/GYN	Wide field of view Biopsy capability	

Linear Array Probes (cont'd)

Probe	Description	Intended Uses	Capabilities and Features	Illustration
LI	The LI probe is a intra–operative probe for obtaining B-Mode within the intended uses.	Intraoperative	Intraoperation High Resolution Ergonomics for scanning and cleaning	
LT	The LT probe is a intra–operative probe for obtaining B-Mode within the intended uses.	Intraoperative	Intraoperation High Resolution Ergonomics for scanning and cleaning	
LB	The LB probe is a linear probe for obtaining B–Mode within the intended uses.	General Purpose Radiology OB/GYN	Wide field of view	
LD	The LD probe is a intraoperative linear probe for obtaining B-Mode within the intended uses.	Intra-operative imaging	Intraoperative Wideband for B-Mode resolution & homogenity Ergonomics for scanning and cleaning	
10L	The 9Lb probe is a general purpose linear probe for obtaining B-Mode.	Small parts High Resolution	High Resolution Wideband for B-Mode resolution & homogenity Ergonomics for scanning and cleaning	

Sector Array Probes

There is a currently one sector probe for the system: the S317 probe.

Biopsy Guideline

The type of guide displayed for the linear probe is illustrated below.

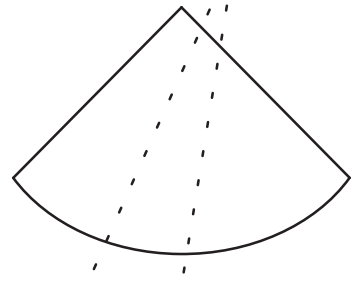


Figure 14–7. Typical Sector Probe Biopsy Guidelines

Probe	Description	Intended Uses	Capabilities and Features	Illustration
S317	The S317 probe is a general purpose sector probe for obtaining B-Mode.	Cardiology General Abdomen	Small footprint Wideband for B-Mode resolution & homogenity Ergonomically designed micro-case for scanning and cleaning Biopsy capability	

Biopsy Special Concerns

Precautions Concerning the Use of Biopsy Procedures

WARNING 

Do not freeze the image during a biopsy procedure. The image must be live to avoid a positioning error.

Biopsy guidezones are intended to assist the user in determining optimal probe placement and approximate the needle path. However, actual needle movement is likely to deviate from the guideline. Always monitor the relative positions of the biopsy needle and the subject mass during the procedure.

CAUTION 

The use of biopsy devices and accessories that have not been evaluated for use with this equipment may not be compatible and could result in injury. Refer to the list of recommended accessories and supplies in the section of chapter 15.

Precautions Concerning the Use of Biopsy Procedures (cont'd)

CAUTION

The invasive nature of biopsy procedures requires proper preparation and technique to control infection and disease transmission. Equipment must be cleaned as appropriate for the procedure prior to use.

- Follow the probe cleaning and disinfection procedures and precautions to properly prepare the probe.
- Follow the manufacturer's instructions for the cleaning of biopsy devices and accessories.
- Use protective barriers such as gloves and probe sheaths.
- After use, follow proper procedures for decontamination, cleaning, and waste disposal.

CAUTION

Improper cleaning methods and the use of certain cleaning and disinfecting agents can cause damage to the plastic components that will degrade imaging performance or increase the risk of electric shock. Refer to probe safety and handling precautions on 9.

Guidezones

Biopsy Procedure

A typical biopsy examination might proceed as follows:

1. Ensure that all supplies for the biopsy procedure are on hand before beginning the imaging session.
2. Prepare the patient for the biopsy procedure according to accepted practices at your facility.
3. Explain the biopsy procedure to the patient, along with any other instructions.
4. Prepare the probe, biopsy guide, and probe sheath.
5. Follow the basic B-Mode scan procedures outlined in *Basic Scan* and *B-Mode* to locate the anatomical site to be biopsied.

To display the Biopsy guidezones:

Press the **Biopsy** key on the keyboard to display the Guidezones.

The Biopsy guidezones adjust along with image adjustments, such as image inversion/rotations, zoom and depth changes.

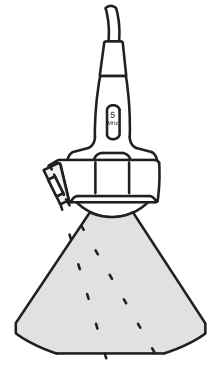


Figure 14–8. Biopsy guidezone Example

NOTE: The acceptable deviation is between 2 mm and 4 mm. If the deviation is greater than this, call Service.

Needle Guide Type Selection

Needle Guide Type selection is available for the probes in Table 14–5. Choose the type of biopsy guide angle to be displayed for the attachment used (desired target depth) with the probes listed in the chart below.

To change the type, press the **Biopsy** key.

	Depth in cm at Center Channel				
	Fixed–Angle (SGL)	Multi–Angle (MBX)			
Probe	**SGL**	**MBX1**	**MBX2**	**MBX3**	**MBX4**
CBF	8.0cm	4.0cm	6.0cm	8.0cm	n/a
CAE	7.0cm	4.0cm	5.5cm	7.0cm	n/a
CZB	3.0cm	2.0cm	3.0cm	4.5cm	n/a
LH	2.0cm	2.0cm	4.0cm	7.0cm	n/a
LD	n/a	3.0cm	6.0cm	6.0cm	10.1cm
CS	6.0cm	n/a	n/a	n/a	n/a
10L	3.0cm				
3Cb	n/a	4.0cm	6.0cm	8.0cm	n/a
S317	8.0cm	4.0cm	6.0cm	8.0cm	n/a

Probe	Selection	SGL	MBX1	MBX2	MBX3
10L	45 deg	n/a	2.7cm	3.0cm	3.3cm
	33 deg	n/a	4.6cm	5.0cm	5.4cm

Table 14–5. Biopsy Guide Attachment Selection

NOTE: In case of the ERB probe, a Grid Biopsy is provided.

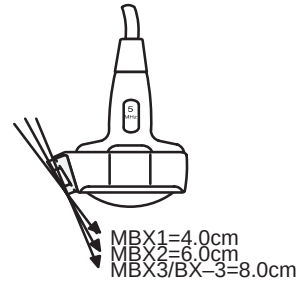


Figure 14–9. Biopsy Depth Selection

MTZ Type Selection

When the MTZ probe is attached and active, the needle guide type selection choices are in the Image Display & Application Setup Menu with the Biopsy Guide MTZ preset. The choices are:

- 0 deg Reusable metal guide with a 0 degree offset angle.
- 5 deg Civco disposable guide with a 5 degree offset angle.
- Off.

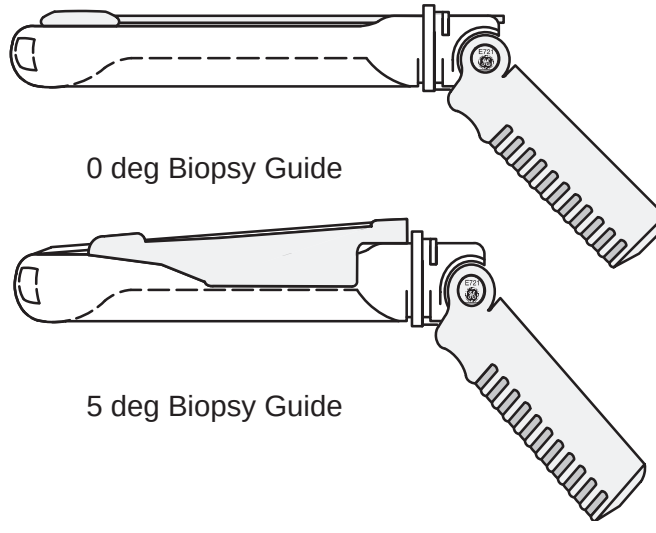


Figure 14–10. MTZ Biopsy Guide

	0 deg	5 deg
MTZ	10.0 cm	13.2 cm

Table 14–6. Biopsy Guide Attachment Selection (MTZ)

ERB Type Selection

When the ERB probe is attached and active, the needle guide:

- BX Guide attachment with 5 mm increments for vertical orientation (1~8 selections are available).
- GBX Needle Placement guide with 5 mm increments for seed implant template grid alignment.

Biopsy Guide Attachment

Convex, Linear, Micro Convex and Sector probes have optional biopsy guide attachments for each probe. The guide consists of a non-disposable bracket to attach to the probe, disposable needle clip to attach to the bracket and disposable needle barrels.

The disposable needle barrels are available for a variety of needle sizes.

Needle Guide Assembly

Identify the appropriate biopsy guide bracket by matching the label on the bracket with the probe to be used.

Orient the bracket so that the needle clip attachment will be on the same side as the probe orientation mark (ridge).

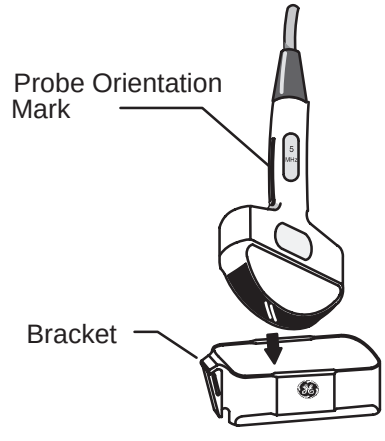


Figure 14–11. Probe/Bracket Alignment (i.e. CAE)

Attach the biopsy bracket to the probe by sliding the bracket over the end of the probe until it clicks or locks in place.

Place an adequate amount of coupling gel on the face of the probe.

Place the proper sanitary sheath over the probe and biopsy bracket. Use the rubber bands supplied to hold the sheath in place.

Needle Guide Assembly (cont'd)

Snap the needle clip onto the biopsy guide bracket.

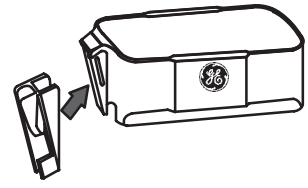


Figure 14–12. Needle Clip Attachment (i.e.CAE)

Choose the desired gauge (size) needle barrel. Twist it back and forth to remove it from the plastic tree.

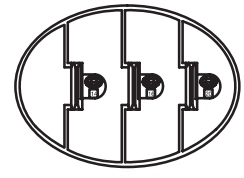


Figure 14–13. Needle Barrels

Place the needle barrel into the needle clip with the desired gauge facing the needle clip and snap into place.

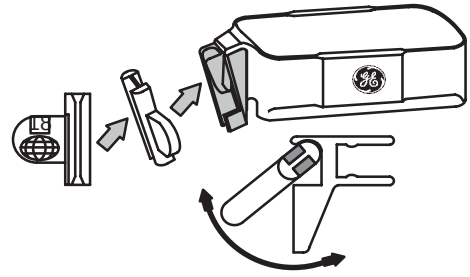


Figure 14–14. Needle Barrel Installation

CAUTION △ Ensure that all guide parts are seated properly prior to performing a biopsy.

The Procedure

Place coupling gel on the scanning surface of the probe/sheath/biopsy guide assembly.

Activate the biopsy guidezones on the system by pressing the **Biopsy** key on the keyboard.

Scan to locate the target. Center the target in the electronic guidezone path.

Place the needle in the guide between the needle barrel and needle clip.

Post Biopsy

When the biopsy is complete, remove the needle barrel, needle clip and probe sheath. Properly dispose of these items in accordance with current facility guidezones.

The biopsy bracket can be sterilized and reused.

MTZ Probe Biopsy Guide

Preparation

To prepare the MTZ for use:

1. Remove the probe from the box and carefully examine it for any damage.
2. If the biopsy guide is to be attached, use the filling removal tool to clean out the attachment area on the probe head.

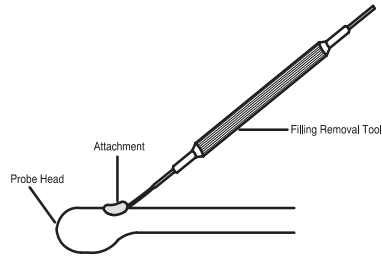


Figure 14–15. Attachment Filling Removal

3. Clean, then disinfect/sterilize the probe.

NOTE: Ensure that protective gloves are worn.

Install the sheath:

1. Remove the sheath from its package. Do not unroll the sheath.

NOTE: Remember to rinse all sanitary probe sheaths of powder before placing on the probe. Powder can degrade the displayed image.

2. Place a small amount of ultrasound gel inside the sheath tip (the gel is between the sheath inner surface and the probe aperture).

NOTE: Ensure that only acoustic coupling gel is used for this purpose.

3. Place the sheath tip over the probe aperture and then pull the sheath end toward the probe handle.
4. Inspect the sheath.

Preparation (cont'd)

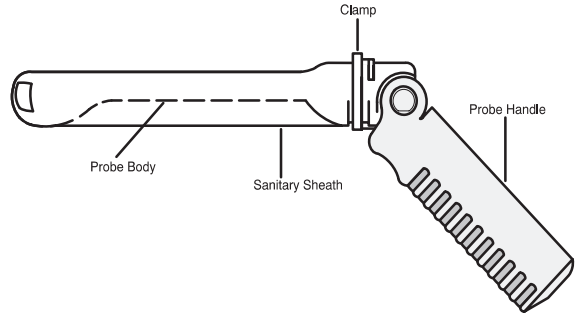


Figure 14–16. Probe with Sheath

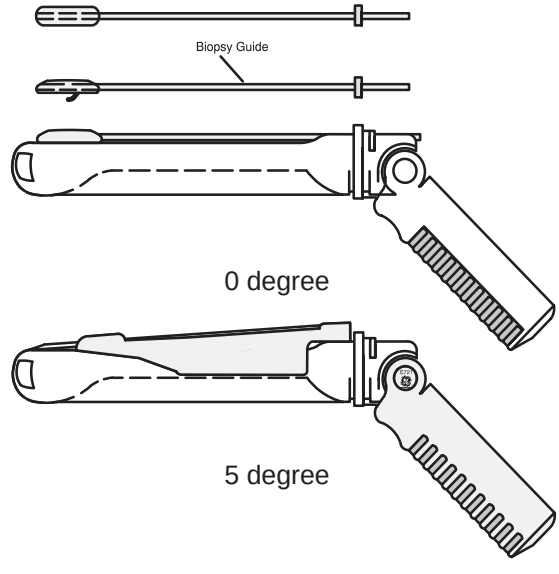


Figure 14–17. Biopsy Guide

5. Place a rubber band/twist lock or clamp over the sheath end of the probe shaft. Ensure the rubber band/twist lock or clamp is tight around the sheath. Rub a finger over the tip of the probe to ensure all air bubbles have been removed.
6. If a biopsy is to be performed, snap the metal biopsy guide on to the probe over the sheath.
7. Place a small amount of ultrasound gel on the gel-filled sheath tip **outer** surface.

Scanning

1. Scan the patient. The probe handle orientation mark indicates the image scan plane. Be sure that the **Image Reverse** function is **Off**.

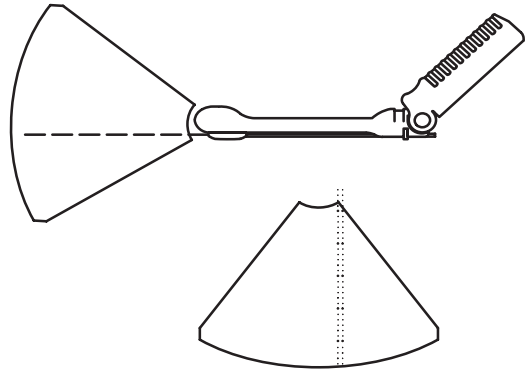


Figure 14–18. Probe and guidezone Alignment

2. Rotate, retract, or advance the probe, as necessary, to see all pertinent anatomy.
3. If a biopsy is being performed, activate the biopsy guidezones.

CAUTION 

Scan the patient to determine the correct puncture depth and site **before** inserting the needle.

Post Biopsy

If the exam is over:

1. Remove the biopsy guide and twist lock/clamp. Remove and properly dispose of the sheath.
2. Thoroughly clean the probe and equipment. Refer to your institution's infection control guidezones for disinfection/sterilization protocols.
3. After sterilization, return the probe to its carrying case.

Biopsy Probes

Probe	Application	Biopsy Guide	Needle Sizes	Procedure Repl. Kit
CBF 3.5 MHz	Abdominal, OB/GYN	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra-Pro E8385LC
CAE 5.0 MHz	Abdominal, OB/GYN	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra-Pro E8385LC
CZB 6.5 MHz	Neonatal, Small Parts	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra-Pro E8385LC
LH 7.5 MHz	Small Parts, Peripheral Vascular	Civco	14, 16, 18, 20, 22, 25 AWG	Civco Ultra-Pro E8385LC
MTZ 6.5 MHz	Endocavitary	YMS	Requires 25 cm needles	H46222AD
		Civco	18 AWG	H4550BG
LD 3.5 MHz	Intraoperative	YMS	15G	H45212AE
			18G	H45212AH
			19G	H45212AN
			21G	H45212BA
			23G	H45212BB
			Guide Stopper	H45212SS
CS 3.5 MHz	Abdominal, Intraoperative	YMS	Kit	E8385S
10L 10 MHz	Gynecology	Civco	14, 15, 16, 17, 18, 19, 20, 21, 22, 23 AWG	E8386JA
ERB 7.0 MHz	Urology	YMS	Bridge Type	H40202E
3Cb 3.8MHz	Abdominal, OB/GYN	Civco	14, 15, 16, 17, 18, 19, 20, 21, 22, 23 AWG	Civco Ultra-Pro II
S317 3.3MHz	Abdominal, Cardiology	Civco	14, 15, 16, 17, 18, 19, 20, 21, 22, 23 AWG	Civco Ultra-Pro II

Table 14–7. Probe Biopsy Chart

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System Data

Specifications

System Dimensions

- 49 inches High
- 16 inches Wide
- 26 inches Deep

Display Monitor

- Single 12” B/W Display
- non–Interlaced Monitor

Operating/Display

- B-Mode
- M-Mode
- Simultaneous B/M-Mode

Measurements

- Distance
- Circumference (Ellipse/Trace)
- Area (Ellipse/Trace)
- Volume (Ellipsoid)
- Angle Between Two Lines (B-Mode)
- Time & Slope (M-Mode)
- Stepper Volume (Ellipse/Trace)

Weight

- Approximately 76 kg (168 lbs) for fully configured console.

Image Processing

- 256 Displayed Gray Levels
- Dynamic Range
- Acoustic Zoom
- Image Invert & Rotate
- Independent Dual Image Displays

Linear Imaging

- 3.5 –7.5 MHz

Convex Imaging

- Variable Angle: 20°–120°
- No steerable Scan Angle
- 3.5 –7.5 MHz

Phased Array Sector Imaging

- Steerable Scan Angle
- 3.5 –7.5 MHz

Calculations

- Heart Rate (BPM, M-Mode)
- Fetal Age (GS, CRL, FL, BPD)
- Estimated Fetal Weight

Electrical Power

- 100-115/220-240 V_{AC}
- 50/60 Hz
- 500 VA Max Power Draw

Specifications (cont'd)

Transducer Types

- Convex Array
- Linear Array
- Micro-Convex Endocavitary (TV/TR) Array
- Phased Array Sector

Micro-Convex Imaging

- Steerable Scan Angle
- 6.5 MHz

Calculations

- 6 Mega Byte Frame Memory (std.)
- Optional 6 Mega Byte Frame Memory
- Measurement/Calculation & Annotations on CINE
- Variable Speed Display

Operator Interface

- Full alphanumeric keyboard
- Body Patterns

Digital Image Processing

- Micron imaging
- Adjustable dynamic range
- Auto Region Of Interest (ATO ROI)
- Multi frequency

Data Display

- Biopsy Guidelines with integrated distance measure
- New Patient Data Entry
- OB Summary Report
- GYN Summary Report
- Urology Summary Report
- User Programmable Annotation Libraries for each application

InSite™Remote Diagnostic Capability

- Live application support
- Remote execution of system diagnostics
- Image transfer

- Error log analysis
- Scan data analysis
- Keystroke analysis

Other Features

- Cine memory
- Temporal data storage on Memory
- ECG/Physio module (optional)
- Data storage on MOD (optional)

LOGIQ™ 200 PRO Series Clinical Measurement Accuracy

Basic Measurements

The following information is intended to provide guidance to the user in determining the amount of variation or measurement error that should be considered when performing clinical measurements with this equipment. Error can be contributed by equipment limitations and improper user technique. Be sure to follow all measurement instructions and develop uniform measurement techniques among all users to minimize the potential operator error. Also, in order to detect possible equipment malfunctions that could affect measurement accuracy, a quality assurance (QA) plan should be established for the equipment that includes routine accuracy checks with tissue mimicking phantoms.

Please be advised that all distance related measurements through tissue are dependent upon the propagation velocity of sound within the tissue. The propagation velocity usually varies with the type of tissue, but an average velocity for soft tissue is assumed. This equipment is designed for, and the accuracy statements listed below are based on, an assumed average velocity of 1540 m/s. The percent accuracy when stated applies to the measurement obtained (not the full scale range). Where the accuracy is stated as a percent with a fixed value, the expected inaccuracy is the greater of the two.

Basic Measurements (cont'd)

Measurement	Units	Useful Range	Accuracy	Limitations or Conditions
Depth	mm	Image Area Over Full Screen 40 to 240 mm	± 5 %	
Distance: Axial Lateral Lateral	 mm mm mm	Image Area Over Full Screen 0 to 240 mm	 ± 5 % or 1 mm ± 5 % or 2 mm ± 5 % or 4 mm	 Linear Probes Convex Probes
Circumference: Trace Ellipse	 mm mm	Image Area Over Full Screen (Depth 0 to 240 mm)	 ± 10 % or 1 mm ± 5 % or 1 mm	
Area: Trace Ellipse	 mm^2 mm^2	Image Area Over Full Screen (Depth 0 to 240 mm)	 ± 10 % or 2 mm^2 ± 10 % or 2 mm^2	
Time	s	Timeline Display (0 to 800 ms)	± 5 % or 10 ms	M-Mode Only
Slope	mm/s	Timeline Display (0 to ∞ mm/s)	± 5 % or 1 mm/s	

Table 15–1. System Measurements and Accuracies

Note: The above measurement accuracies apply to all transducers and to all modes.

LOGIQ™ 200 PRO Series Clinical Calculation Accuracy

The following information describes the method used to implement the stated clinical calculation and provides the user with an indication of error likely to be contributed by the equipment due to the system (computer) implementation of the stated formula or method. These accuracy statements assume that input values are correct. Estimate the overall inaccuracy of a combined measurement and calculation by including the stated inaccuracy from the basic measurement accuracy statements.

CAUTION 

Diagnostic errors may result from the inappropriate use of clinical calculations. Review the referenced source of the stated formula or method to become familiar with the intended uses and possible limitations of the calculation.

Calculation formulas and databases are provided as a tool to assist the user, but should not be considered an undisputed database, in making a clinical diagnosis. The user is encouraged to research the literature and judge the equipment capabilities on an ongoing basis in order to assess its utility as Edge of boarda clinical tool.

Warranties

Scope and Duration of Warranties

Product warranties

GE warrants that the ultrasound products are:

1. Free from defects in material, workmanship, and title.
2. Conform to our published product specifications in effect on the date of shipment of the products. The product specifications are available on request.

Patent and copyright warranty

GE warrants that when delivered, the products will not be subject to any valid patent or copyright infringement claim.

The warranty period for all warranties, except the warranty of title and the patent and copyright warranty, is limited in time as shown below:

Ultrasound Part	Time Limit
Ultrasound systems, components, modules, and upgrades	12 Months
Ultrasound probes and transducers	12 Months
Ultrasound water path attachment kit	3 Months

Table 15–2. Warranty Time Limits

NOTE: If a maintenance agreement is desired to extend coverage beyond the manufacturer's warranty, please contact the local service or sales representative.

Patent and copyright warranty (cont'd)

The warranty period begins on the date the products are delivered. But, if GE assembles the products, the warranty period begins on the earlier of:

1. Five (5) days after the date GE notifies you that we have completed assembly and the products are operating in accordance with our published product specifications

   OR

2. The date you first use the products for patient use.

If assembly is delayed for 30 days or more after the date of delivery for a reason beyond our reasonable control, the warranty period will begin on the thirtieth day after the date of delivery.

The warranty period for any product or part furnished to correct a warranty failure will be the unexpired term of the warranty applicable to the repaired or replaced products.

Warranty Exclusions

These warranties are exclusive and in lieu of all other warranties, whether written, oral, expressed, implied, or statutory.

No warranty of merchantability or fitness for a particular purpose applies.

The warranties **DO NOT** cover:

1. Any defect or deficiency (including failure to conform to product specifications) which results, in whole or in part, from:
   a. Any alteration, improper storage, handling, use or maintenance, or any extraordinary use of the products, by anyone other than GE.
   b. Failure to follow any of GE's written recommendations or instructions.
   c. Combining the products with products of others or with incompatible GE products.
   d. Any of your designs, specifications or instructions.

      OR

   e. Any cause external to the products as furnished by GE or beyond our reasonable control.
2. Ultrasound supplies and accessories identified by catalog numbers which start with the letter "E" (which are covered by a separate printed warranty).
3. Products which are not listed in our price pages at the time of sale. Non-listed products are provided with the manufacturer's warranties, if any, GE is permitted to pass on to you. Otherwise, non-listed products are provided AS IS.
4. The payment and reimbursement of any facility costs arising from repair or replacement of the products or parts.

Exclusive Warranty Remedies

Product warranties

If you promptly notify us of your warranty claim and make the product available for service, GE will at our option, repair, adjust, or replace (with new or exchange replacement parts) the non-conforming product or parts of the product. Warranty service will be performed without charge from 8:00 am to 5:00 pm, Monday through Friday, excluding our holidays, and outside those hours at our prevailing service rates and subject to the availability of personnel.

Patent and copyright warranty

GE will defend or settle any suit against you to the extent it is based on an infringement claim which would be a breach of the patent and copyright warranty. If the infringement claim is valid, GE will pay all damages and costs awarded against you due to the breach. In addition, GE will obtain a license for you to continue using the infringing product, provide a non-infringing replacement, alter the product so that it is non-infringing, or remove the infringing product and refund the price (less reasonable depreciation) and any return transportation costs paid by you.

The above describes your exclusive remedies and our sole liability for any warranty claims. You agree that GE and our representatives have no liability to you for:

1. Any penal, incidental, or consequential damages such as lost profit or revenue.
2. Any assistance not required under our quotation.
3. Anything occurring after the warranty period ends.

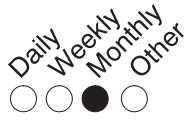
System Care and Maintenance

Overview

Refer to Section 7 of the LOGIQ™ 200 PRO Series Service Manual (2138853) for any additional maintenance guidance.

Contact the local Service Representative for parts or planned maintenance inspections. It is recommended that planned maintenance be performed on the system every six months.

Inspecting the System



Examine the following on a monthly basis:

- Connectors on cables for any mechanical defects.
- Entire length of electrical and power cables for cuts or abrasions.
- Equipment for loose or missing hardware.
- Control panel and keyboard for defects.
- Casters for proper locking operation.

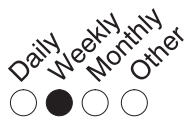
DANGER

To avoid electrical shock hazard, do not remove panels or covers from console. This servicing must be performed by qualified service personnel. Failure to do so could cause serious injury.

Electrical Hazard

If any defects are observed or malfunctions occur, do not operate the equipment but inform a qualified service person. Contact a Service Representative for information.

Weekly Maintenance



The LOGIQ™ 200 PRO Series system requires weekly care and maintenance to function safely and properly. Clean the following:

- System cabinet
- Monitor
- Operator control panel
- Foot switch
- Video Cassette Recorder (VCR)
- Multi Imaging Camera (MIC)
- Video Page Printer

Failure to perform required maintenance may result in unnecessary service calls.

Cleaning the system

Prior to cleaning any part of the system:

1. Turn off the system.

System cabinet

To clean the system cabinet:

1. Moisten a soft, non-abrasive folded cloth with a mild, general purpose, non-abrasive soap and water solution.
2. Wipe down the top, front, back, and both sides of the system cabinet.

NOTE : Do not spray any liquid directly into the unit.

Monitor

To clean the monitor:

1. Apply a glass cleaner to a soft, non-abrasive folded cloth.
2. Gently wipe the monitor face.

NOTE: When cleaning the monitor, make sure not to scratch the monitor.

CAUTION

Do not use a hydrocarbon base glass cleaner on a monitor with an anti-glare shield. Prolonged use of such cleaners damages the shield.

Cleaning the system (cont'd)

Operator Controls

To clean the operator control panel:

1. Moisten a soft, non-abrasive folded cloth with a mild, general purpose, non-abrasive soap and water solution.
2. Wipe down operator control panel.
3. Use a cotton swab to clean around keys or controls. Use a toothpick to remove solids from between keys and controls.

NOTE: When cleaning the operator control panel, make sure not to spill or spray any liquid on the controls, into the system cabinet, or in the probe connection receptacle.

Foot Switch

To clean the foot switch:

1. Moisten a soft, non-abrasive folded cloth with a mild, general purpose, non-abrasive soap and water solution.
2. Wipe the external surfaces of the unit then dry with a soft, clean, cloth.

VCR

To clean the VCR:

1. Turn off the VCR power. If possible, disconnect the power cord.
2. Wipe the external surfaces of the unit with a soft, clean, dry cloth.

NOTE: Do not use a wet cloth or any cleaning fluid because it may enter and damage the unit.

3. Clean the record and playback heads with a soft, non-abrasive cleaning system, according to the manufacturer's instructions.

For more information

See the VCR's Operator Manual.

Cleaning the system (cont'd)

Multi Image Camera

To clean the MIC:

1. Moisten a soft, non-abrasive folded cloth with a mild, general purpose, non-abrasive soap and water solution.
2. Wipe down the top, front, back, and both sides of the unit.

For more information

Review the Multi Image Camera's Operator Manual for details.

Video Page Printer

To clean the external surface of the video page printer:

1. Turn off the power. If possible, disconnect the power cord.
2. Wipe the external surfaces of the unit with a soft, clean, dry cloth.
3. Remove stubborn stains with a cloth lightly dampened with a mild detergent solution.

NOTE: Never use strong solvents, such as thinner or benzine, or abrasive cleansers because they will damage the cabinet.

No further maintenance, such as lubrication, is required.

To clean the surface of the print head:

1. Run the cleaning sheet (provided with the printer) through the printer.

For more information

Review the Video Page Printer's Operator Manual for details.

Planned Maintenance

The following maintenance schedule is suggested for the system and probes to ensure optimum operation and safety.

Do the Following	Weekly	Monthly
Inspect the Unit		X
Clean Foot switch	X	
Clean Monitor	X	
Clean Operator Control Panel	X	
Clean Page Printer	X	
Clean System Cabinet	X	
Clean VCR	X	

Table 15–3. Planned Maintenance Program

Troubleshooting

Introduction

Listed in this section are problem or system messages that may be encountered, possible causes for the problem or message, and the appropriate action to take to correct the situation. If additional information or assistance is needed contact a local Applications, Sales or Service Representative.

Loose cables

If peripheral cables are loose:

1. Check the connections on the back of the peripheral OR
2. Check the connection on the back panel.

Display Messages

The LOGIQ™ 200 PRO Series provides a variety of messages concerning the status of the system's operation.

- System Error Messages are displayed when a hardware problem is detected.
- Operation Error Messages are displayed when the user selects a control that is not appropriate to the current scan mode or function.
- Operation Guide Messages are displayed to inform the operator of a completed task or required action.

These messages are displayed in the single line message area at the bottom of the display. The message display time varies depending on the type of message. Some messages may be accompanied by an error beep.

The User can turn on/off the recording of the error message line in General System Setup (Record Mask Message Line).

The following tables outline the error messages, their possible cause and cure.

System Error Message Description

Category	Problem/ Message	Possible Cause	Possible Corrective Action
General	SYS ERROR: BUS ERROR OR BOARD NON EXISTENT	Bus error detected or hardware board is non existent.	*
	SYS ERROR: UNEXPECTED CPU ERROR.	Unexpected CPU exception is encountered.	*
	SYS ERROR: M-Mode DSP ERROR.	M-Mode DSP error encountered.	*
	Battery Low	Battery Voltage is Low.	*

Table 15–4. System Error Message Description

* If a System Error Message occurs, record the message and contact a Service Representative. Be aware that the system may be operating at reduced capabilities, some functions inoperative or not operating at all.

Operation Error Message Description

Category	Problem/ Message	Possible Cause	Possible Corrective Action
General	Improper Data Selected.	The data input is not correct.	Enter correct data.
Measurement & Calculation	Measurement(s) Required.	The system requires the operator to input measurement(s).	Input necessary measurements.
	Press 'FREEZE' to complete.	The system requires the operator to press **FREEZE** before completing measurements.	Freeze before all measurements.
	No correct data left.	The system no longer has correct data.	Enter new measurements.
	Invalid Area.	The Area is not valid.	Measure valid Area.
	Invalid Data.	The data input is not valid.	Enter valid data.
New Patient, ID/Name Function	Invalid, Input proper data.	Improper data has been input.	Input valid data.
	Data range over, Input proper data.	The input data is too large.	Numbers too large.
	Improper Data Selected.	Improper data has been input.	Input proper data.
Miscellaneous	No function(s) is defined.	No function is defined for the User Define key that was pressed.	Use setup menu to define.

Table 15–5. Operation Error Message Description

Operation Guide Message Description

Category	Problem/ Message	Possible Cause	Possible Corrective Action
Preset & Setup Function	Press 'Set' to overwrite preset 1, or press 'Clear'.	The system requires user to overwrite data to preset 1.	Press either Set for overwrite or Clear to not save
	Press 'Set' to overwrite preset 2, or press 'Clear'.	The system requires user input to overwrite data to preset 2.	Press either Set for overwrite or Clear to not save
	Data is saved in preset 1.	The system completed saving the data that was requested.	NA
	Data is saved in preset 2.	The system completed saving the data that was requested.	NA
	Data is reset in preset1.	Preset 1 Setup data has been reset.	NA
	Duplication is not allowed, Change code!.	The comment library code has been duplicated.	Change the code
Measurement & Calculation	Select <Table Edit> to edit table.		Select Table-Edit to edit table.
Miscellaneous	In progress. Please wait.	The system needs several seconds to do something.	NA

Table 15–6. Operation Guide Message Description

Assistance

Clinical Questions

For information, call your local Applications, Sales or Service Representative.

For USA Only

GE Clinical Answer Center at 1–800–682–5327 or 414–524–5698.

Service Questions

For service, call your local Service Representative.

For USA Only

GE CARES at 1–800–437–1171

Literature

To request the latest GE Accessories catalog or equipment brochures, call your local Applications, Sales or Service Representative.

For USA Only

Response Center at 1–800–643–6439

Accessories

To place an order, call your local Applications, Sales or Service Representative.

For USA Only

GE Access Center at 1–800–472–3666.

Refer to the *User Maintenance* chapter for additional information.

Supplies/Accessories

CAUTION

DO NOT connect any probes or accessories without approval by GE.

The following supplies/accessories have been verified to be compatible with the LOGIQ™ 200 PRO Series system:

CAUTION

The LOGIQ™ 200 PRO Series ultrasound system complies with regulatory requirements of CE 0459, except Gel, Disinfectant, Biopsy Kits, Biopsy Replacement Kits, Physio Accessories, Patient Electrodes, Optical Disks and Sheath Sets.

Peripherals

Accessory	Units	Catalog Number
Sony VCR Model SVO-9500MD	Each	H4120SR
Sony VCR Model SVO-9500MDP	Each	H4120PR
Sony B&W Printer Model UP890MD, UP890MDG, UP895MDW, UP895MD	Each	–
Mitsubishi B&W Printer Model P90E, P90W, P91E, P91W	Each	–
IIE Multi Image Camera Model IIE 460	Each	H4550KF
FUJITSU MOD Model Dynamo 640A1	Each	–
HP Line Printer Model Deskjet 460	Each	–

Table 15–7. Peripherals and Accessories

Console

Accessory	Units	Catalog Number
Foot Switch	Each	H43502LA
Printer Install Kit	Each	H43502LB
Cine Memory	Kit	H43502LJ
Advanced Reference Manual	Each	H43532MN
Basic Users Manual	Each	H43532BM
Service Manual	Each	H43532SM
User Quick Start Guide	Each	H43532SG

Table 15–8. Console Accessories

Probes

Accessory	Units	Catalog No.
CBF	Each	H46022CB
CAE	Each	H46022CA
MTZ	Each	H46022MT
CZB	Each	H45202CZ
LH	Each	H46022LH
LE	Each	H46022LE
LI	Each	H46022LI
LT	Each	H46022LT
LB	Each	H46022LB
LD	Each	H45202LP
CS	Each	H45222CS
ERB	Each	H45202ER
10L	Each	H45202LM
3Cb	Each	H45202WB
S317	Each	H45202SD
MTZ Probe Holder (Right)	Each	H43502LC
MTZ Probe Holder (Left)	Each	H43502LD

Table 15–9. Probes and Accessories

Gel

Accessory	Units	Catalog Numbers
Thermasonic Gel Warmer	Holds three plastic bottles (250 ml or 8 oz).	E8365BH
Aquasonic 100 Scan Gel	5 liter jug	E8365AF
	250 ml plastic bottles (12/case)	E8365BA
Scan Ultraound Gel	8 oz plastic bottles	E8365BC
	1 gallon plastic jug	E8365BD
	Four 1-gallon plastic jugs	E8365BK

Table 15–10. Gel

Disinfectant

Accessory	Units	Catalog Number
Cidex Activated Dialdehyde	16/1 qt. bottles	E8386EB
	4/1 gal. bottles	E8386EC
	2/2.5 gal bottles	E8386ED

Table 15–11. Disinfectant

Civco Biopsy Starter Kits (includes bracket)

Accessory	Units	Catalog Number
Biopsy Kit for CBF Probe	Kit	E8385MD
Biopsy Kit for CAE Probe	Kit	E8385MF
Biopsy Kit for CZB Probe	Kit	E8385MP
Biopsy Kit for LH Probe	Kit	E8385LA
Biopsy Kit for ERB Probe	Kit	H40202E
Biopsy Kit for MTZ Probe	YMS Kit	H46222AD
	Civco Kit	H4550BG
Biopsy Kit for CS Probe	Kit	E8385S
Biopsy Kit for LD Probe	15G Needle	H45212AE
	18G Needle	H45212AH
	19G Needle	H45212AN
	21G Needle	H45212BA
	23G Needle	H45212BB
	Guide Stopper	H45212SS
Multi Biopsy Kit for CBF Probe	14, 15, 16, 17, 18, 19, 20, 21, 22, 23 AWG	E8385PA
Multi Biopsy Kit for CAE Probe		E8385R
Multi Biopsy Kit for CZB Probe		E8385RB
Multi Biopsy Kit for LH Probe		E8385RA
Multi Biopsy Kit for 3Cb Probe		E8385RK
Multi Biopsy Kit for 10L Probe		E8386JA
Multi Biopsy Kit for S317 Probe	Each	E8385PD

Table 15–12. Probe Biopsy Brackets

Biopsy Replacement Kits

Accessory	Units	Catalog Number
Civco Replacement for CBF, CAE, LH and CZB Probes	Kit	E8385LC
Civio cleaning Brush for MTZ Biopsy Guide	Kit	E8323GE
Replacement Kit for 10L Biopsy Guide	Kit	E8385GA

Table 15–13. Biopsy Kits

Other Disposable Replacement Kits

Accessory	Units	Catalog Number
Disposable Replacement Kit for 10L Biopsy Guide	Kit	E8385LC

Table 15–14. Biopsy Kits

Ultrasound Probe and Cord Sheath Sets

Accessory	Units	Catalog Number
Sterile Ultrasound Probe Sheath Set	20 Per Set	E8385CA
Sterile Ultrasound Cord Sheath Set	20 Per Set	E8385CB
Sanitary Rectal/Vaginal Probe Cover	20 Per Set	E8385CC
Sterile Combination Probe and Cord Cover Set	12 Per Set	E8385CE

Table 15–15. Biopsy Sheath Kits

Physio Accessories

Accessory	Units	Catalog Number
ECG Cables	Set	H40562L
Physio Input Panel	Kit	H40552L

Table 15–16. Physio Accessories

Patient Eletrodes

Accessory	Units	Catalog Number
Adult	Box/300	E8811EE
Pediatric	Box/300	E8811EN
Adult/off center	Box/500	E8365DA
Pediatric/off center	Box/1000	E8365DB

Table 15–17. Patient Electrodes

Optical Disks

Accessory	Units	Catalog Number
Replacement Magneto Optical Disks (128Mb)	Each	E8381AA

Table 15–18 Optical Disk

Acoustic Output

Bioeffects 16–2
Concerns Surrounding the Use of Diagnostic Ultrasound 16–2
Operator Awareness and Actions to Minimize Bioeffect 16–5
Implementing ALARA Methods 16–8
Training and User Assistance 16–9
IEC Acoustic Output Tables 16–10
IEC Acoustic Output Tables 16–10

Bioeffects

Concerns Surrounding the Use of Diagnostic Ultrasound

During a diagnostic ultrasound examination, high frequency sound penetrates and interacts with tissue in and around the area of anatomy to be imaged. Only a small portion of this sound energy is reflected back to the probe for use in constructing the image while the remainder is dissipated within the tissue. The interaction of sound energy with tissue at sufficiently high levels can produce biological effects (aka bioeffects) of either a mechanical or thermal nature. Although the generation of bioeffect is intentional with therapeutic ultrasound, it is generally undesired in diagnostic applications and may be harmful in some conditions.

NOTE: The American Institute of Ultrasound in Medicine has published a document entitled "Medical Ultrasound Safety". This three part document covers Bioeffects and Biophysics, Prudent Use and Implementing ALARA.

Ultrasound users should order this document from the AIUM to become more familiar with Ultrasound safety.

In the USA, contact the AIUM by telephone at 1-800-638-5352. To write them concerning their publications, use the following address:

AIUM
14750 Sweitzer Lane
Suite 100
Laurel, MD, USA 20707–5906

Thermal Bioeffect

As with most forms of energy, ultrasound is attenuated as it passes through tissue and is converted to heat, which, if produced at sufficient rates, will increase tissue temperature to a point where tissue damage may result. Major factors contributing to thermal bioeffect can be categorized as tissue characteristics or control parameters:

- Physical tissue characteristics like acoustic impedance, attenuation, absorption, and perfusion determine the rates of heat production and heat transfer. The susceptibility of some tissues to injury from heat, such as developing fetal tissue, further complicate the concern for long-term effects.
- The time-average density of available ultrasound energy is mainly determined by acoustic parameters like output frequency, pulse amplitude, pulse duration, duty cycle, beam shape, and beam motion. These parameters are controlled by the operator through equipment selections such as probe type, operating mode, focal depth, sample volume location, and output control settings. The operator also has significant influence by controlling probe motion and dwell time. These “Control Parameters” form the means through which the operator can minimize thermal bioeffect.

Mechanical Bioeffect

In a similar manner, the interaction of ultrasound energy with tissue can produce a number of non-thermal or mechanical effects. The most significant is cavitation which results from the action of the oscillating ultrasound pressure on tiny gas bubbles within the tissues. Cavitation has caused mechanical damage on a cellular level such as microscopic tears and hemorrhage in laboratory tests with small animals. The major contributing factors can again be categorized as either tissue characteristics or control parameters:

- The physical characteristics of tissue such as the presence and size of microscopic gas bubbles and the sensitivity of the tissue to the effects of cavitation will influence the potential for and magnitude of cavitation.
- Acoustic field parameters like output frequency, peak pulse amplitudes, and perhaps pulse length are the primary parameters affecting the onset of cavitation. These are controllable by the operator through appropriate equipment selections.

Although it is generally accepted that no harmful biological effects have been demonstrated at the frequency, intensity, and exposure times used in diagnostic examinations, research into the potential for harmful effects continues. The operator is encouraged to survey the literature for future developments on bioeffects and to become familiar with the references at the end of this section.

Operator Awareness and Actions to Minimize Bioeffect

The operator must be aware of the particular conditions that exist during the examination to recognize the potential for bioeffect and then take appropriate action to reduce the risk. The recognition of potential harm comes from an understanding of tissue characteristics and a real-time knowledge of acoustic output. Taking appropriate action requires familiarity with equipment operation and examination skills like implementing alternative techniques for obtaining the same diagnostic information.

Tissue characteristics

Tissue characteristics vary considerably throughout the body. They influence the acoustic field and determine the heating/cooling rates and cavitation potential. Ultrasound energy dissipates as it passes through the tissue causing the deeper tissue to encounter much lower levels. Some tissues like bone readily convert ultrasound energy to heat, while others like blood and amniotic fluid pass the energy on to adjacent tissue relatively unattenuated.

A particular situation that represents a tissue combination requiring extra precaution is a third trimester transabdominal fetal examination where there is a very thin abdominal wall and a long fluid path. The relative lack of attenuating tissue along the acoustic path will significantly increase the available energy in the fetal tissue. Additionally, fetal tissues are more susceptible to long term injury due to nature of developing tissue. Focusing the ultrasound beam on or near fetal bone further increases the risk.

Other than fetal tissue, there is increased susceptibility for heating in any tissue that cannot easily conduct or distribute heat due to low blood perfusion. As the examination progresses, the operator must be aware of changing tissue conditions.

Operator intervention

When conditions indicate a potential for harmful bioeffect, the operator should take action promptly to reduce the risk by changing equipment settings or altering procedural techniques:

- Optimize gain and other image enhancement features before increasing the acoustic output control or other equipment controls that significantly affect the output level. Become thoroughly familiar with all controls that affect output and observe the output display for results. Controls affecting output are described throughout the user manual.
- Develop and practice skills to localize anatomy and optimize image quality rapidly, then freeze the image as soon as the necessary diagnostic information is obtained. It takes time for tissue temperatures to increase, so reducing exposure time can significantly reduce the potential for injury.
- Avoid susceptible tissues, if possible, by changing probe position, entrance angles or probe type. Higher frequency probes will not penetrate as deep while linear probes have lower near-field energy density. Avoid focusing on bone or poorly perfused tissue. Do not allow the acoustic beam to penetrate or focus on or near the eye.

Although choices like probe selection, mode of operation and other control adjustments have a significant affect on output levels, the ability to change these selections is often restricted by the type of examination or clinical objectives. Therefore, some examinations may require relatively high output levels to achieve success.

Operator intervention (continued)

The decision to raise acoustic output to potentially harmful levels must include an assessment of the risk/benefit potential. Such decisions are routine with imaging modalities incorporating ionizing radiation such as Nuclear Medicine, X-ray and CT. The principle of ALARA is widely used in these modalities for minimizing the exposure risk and is now a recommended practice with high-level diagnostic ultrasound.

CAUTION 

During each ultrasound examination, the clinical user is expected to weigh the medical benefit of the diagnostic information obtained against the risk of harmful effects. Once an optimal image is achieved the need for increasing acoustic output or prolonging the exposure can not be justified. It is important, therefore, for the user to be familiar with system controls that affect image quality as well as acoustic output. Complete descriptions of image optimization and acoustic output controls are provided in the user instructions.

Implementing ALARA Methods

The primary objective for any ultrasound examination is to obtain diagnostic information of sufficient quality to benefit the patient. Image quality can usually be improved by increasing the acoustic output or taking more time to refine the image. These same actions, however, will also increase the risk of harmful bioeffects when imaging sensitive tissues or when high output levels are used. The operator is therefore encouraged to use the lowest acoustic output setting necessary to produce clinically acceptable data.

The principle of ALARA, which stands for **A**s **L**ow **A**s **R**easonably **A**chievable, is to keep the radiation exposure at the minimum level necessary to obtain the diagnostic information. This principle is widely practiced in medical x-ray protection where exposure at any level is potentially harmful. Historically, ALARA was initiated as a cautious approach for dealing with uncertain hazards but has since become the principle method for reducing the risk of injury from hazards that do not have safe minimum threshold.

While no minimum thresholds for harmful bioeffects have been established with the use of diagnostic ultrasound, the principle of ALARA can be readily implemented on equipment incorporating an output display. As the operator adjusts the equipment to optimize the image quality, the display interactively updates to indicate the effect on output.

Controls that have no noticeable impact on image quality should be set to minimize the output while controls that improve the image quality and also increase acoustic output should be set no higher than needed to achieve a diagnostic quality image.

Training and User Assistance

Maintaining awareness of potentially harmful bioeffects and being able to recognize contributing conditions is essential to minimize the risk. Gaining experience with the system and becoming familiar with controls affecting output will improve the user's confidence to determine the presence of risk and how to reduce it. The user manual instructions and applications training are the best methods for learning these basic skills. Get fully acquainted with the user manual and review it frequently. Contact a representative at any time to request additional training or assistance.

As indicated by their titles, the following references are intended to provide additional detailed information concerning bioeffects.

1. Standard for Real-Time Display of Thermal and Mechanical Acoustic Output Indices on Diagnostic Ultrasound Equipment, AIUM/NEMA, 1992[1]
2. Implementation of the Principle of As Low As Reasonably Achievable (ALARA) for Medical and Dental Personnel, National Council on Radiation Protection and Measurements (NCRP), Report No.107, December 31, 1990.[2]
3. Biological Effects of Ultrasound: Mechanisms and Clinical Implications, NCRP Report No. 74, December 30, 1983.[18]
4. Exposure Criteria for Medical Diagnostic Ultrasound: I. Criteria Based on Thermal Mechanisms, NCRP Report No. 113, June 1, 1992.[19]
5. Bioeffects Considerations for the Safety of Diagnostic Ultrasound, Journal of Ultrasound in Medicine, AIUM, September 1988.[20]
6. Geneva Report on Safety and Standardization in Medical Ultrasound, WFUMB, May 1990.[21]
7. Medical Ultrasound Safety, AIUM, 1994.[22]

IEC Acoustic Output Tables

IEC Acoustic Output Tables

Acoustical parameters represent the maximum values for a probe/mode combination; other parameters refer to the operating conditions which yield these maximum acoustic parameters.

Key to Tables

Parameter	Unit	Description
$P_{\_}$	(MPa)	Peak-negative acoustic pressure in the plane perpendicular to the beam-alignment axis containing the maximum pulse-pressure-squared integral (or maximum mean square acoustic pressure for continuous wave systems) in the whole ultrasonic field.
I_{spta}	mW/cm^2	Spatial-peak temporal-average derived intensity in the whole ultrasonic field.
I_p	mm	Distance from the transducer output face to the point of maximum pulse-pressure-squared integral (or maximum mean square acoustic pressure for continuous wave systems).
w_{pb6} (||) (⊥)	mm	–6 dB pulse beam-width at the point of maximum pulse-pressure-squared integral (or maximum mean square acoustic pressure for continuous wave systems). These directions shall be parallel (||) and perpendicular (⊥) to the reference direction.
prr	KHz	Pulse repetition rate for non-scanning modes.
srr	Hz	Scan repetition rate (srr) for scanning modes.
Output Beam Dimensions	mm	Dimensions parallel and perpendicular to the reference direction.
f_{awf}	MHz	Arithmetic-mean acoustic-working frequency measured by a hydrophone placed at the point of maximum pulse-pressure-squared integral (or maximum mean square acoustic pressure for continuous wave systems).
APF	%	Acoustic power-up fraction.
AIF	%	Acoustic initialization fraction.

Table 16–1. Key to IEC Table Value

Key to Tables (cont'd)

Parameter	Unit	Description
Maximum Power	mW	Maximum temporal-average power output. For scanning modes, this shall be the total power output of all the acoustic pulses.
I_{ob}	mW/cm^2	Output beam intensity.
Power-up Mode		In systems in which the user defines the power-up mode, this shall be stated as either "user defined" or "not applicable" (n/a).
Initialization Mode		In systems in which the user defines the initialization mode, this shall be stated as either "user defined" or "not applicable" (n/a).
Acoustic Output Freeze		If the system has acoustic output freeze, then this shall be stated as "yes;" otherwise, it shall be stated as "no."
I_{tt}	mm	Transducer to transducer-output-face distance.
I_{ts}	mm	Typical value for the transducer stand-off distance. If the transducer assembly is normally used in contact with the patient, then this shall be specified "contact" system.

Table 16–2. Key to IEC Table Value (cont'd)

CBF, CAE, MTZ Probe

Probe	CBF		CAE		MTZ	
Parameter	**B Mode**	**B/M Mode**	**B Mode**	**B/M Mode**	**B Mode**	**B/M Mode**
$P_{\_}$ (MPa)	1.47	–	1.24	1.24	0.52	0.52
I_{spta} (mW/cm^2)	9.98	40.90	7.72	26.41	3.08	6.12
I_p (mm)	31.50	31.50	32.00	32.00	21.40	21.40
w_{pb6} (‖) (mm) (⊥)(mm)	1.67 5.37	1.67 5.37	2.14 4.14	2.14 4.14	2.40 4.20	2.40 4.20
prr (kHz)	4.83	4.83	4.88	4.88	6.80	6.80
srr (Hz)	38.96	35.31	39.34	35.68	54.86	51.11
Output Beam Dim. (‖) (mm) (⊥)(mm)	10.20 23.50	10.20 23.50	9.20 16.40	9.20 16.40	8.20 7.80	8.20 7.80
f_{awf} (MHz)	3.37	3.37	4.33	4.33	5.69	5.69
APF (%) (Acoustic Power up Fraction	n/a	n/a	n/a	n/a	n/a	n/a
AIF (%) (Acoustic Initialization Fraction)	n/a	n/a	n/a	n/a	n/a	n/a
Maximum Power (mW)	66.41	–	10.90	–	12.26	–
I_{ob} (mW/cm^2)	27.70	–	7.23	–	19.16	–
Power-up Mode	n/a	n/a	n/a	n/a	n/a	n/a
Initialization Mode	n/a	n/a	n/a	n/a	n/a	n/a
Acoustic Output Freeze	yes	yes	yes	yes	yes	yes
I_{tt} (mm)	0.00	0.00	0.00	0.00	0.00	0.00
I_{ts} (mm)	contact	contact	contact	contact	contact	contact

Table 16–3. CBF,CAE,MTZ IEC Acoustic Output Information

CZB, LH, LE Probe

Probe	CZB		LH		LE	
Parameter	**B Mode**	**B/M Mode**	**B Mode**	**B/M Mode**	**B Mode**	**B/M Mode**
$P_{\_}$ (MPa)	0.71	0.71	1.17	1.17	1.23	1.23
I_{spta} (mW/cm^2)	3.13	7.02	7.24	29.83	7.58	27.75
I_p (mm)	22.50	22.50	22.80	22.80	37.90	37.90
w_{pb6} (‖) (mm) (⊥)(mm)	1.94 5.21	1.94 5.21	0.65 1.19	0.65 1.19	1.21 4.72	1.21 4.72
prr (kHz)	6.80	6.80	7.96	7.96	6.49	6.49
srr (Hz)	54.86	51.11	64.23	60.43	52.37	48.63
Output Beam Dim. (‖) (mm) (⊥)(mm)	8.20 7.80	8.20 7.80	7.60 15.50	7.60 15.50	10.20 31.02	10.20 31.02
f_{awf} (MHz)	6.02	6.02	6.14	6.14	4.35	4.35
APF (%) (Acoustic Power up Fraction	n/a	n/a	n/a	n/a	n/a	n/a
AIF (%) (Acoustic Initialization Fraction)	n/a	n/a	n/a	n/a	n/a	n/a
Maximum Power (mW)	14.07	–	18.79	–	52.32	–
I_{ob} (mW/cm^2)	21.99	–	15.95	–	16.54	–
Power-up Mode	n/a	n/a	n/a	n/a	n/a	n/a
Initialization Mode	n/a	n/a	n/a	n/a	n/a	n/a
Acoustic Output Freeze	yes	yes	yes	yes	yes	yes
I_{tt} (mm)	0.00	0.00	0.00	0.00	0.00	0.00
I_{ts} (mm)	contact	contact	contact	contact	contact	contact

Table 16–4. CZB, LH, LE IEC Acoustic Output Information

LI, LT, LB Probe

Probe	LI		LT		LB	
Parameter	**B Mode**	**B/M Mode**	**B Mode**	**B/M Mode**	**B Mode**	**B/M Mode**
$P_{\_}$ (MPa)	1.11	1.11	1.10	1.10	0.91	0.91
I_{spta} (mW/cm^2)	4.33	12.56	4.33	12.56	8.21	25.08
I_p (mm)	24.20	24.20	24.50	24.50	37.90	37.90
w_{pb6} (||) (mm) (⊥)(mm)	0.64 1.21	0.64 1.21	0.64 1.21	0.64 1.21	3.10 4.57	3.10 4.57
prr (kHz)	7.09	7.09	7.09	7.09	4.85	4.85
srr (Hz)	101.31	94.64	101.31	94.64	39.15	35.49
Output Beam Dim. (||) (mm) (⊥)(mm)	7.60 15.50	7.60 15.50	7.60 23.50	7.60 23.50	12.50 32.25	12.20 35.25
f_{awf} (MHz)	6.00	6.00	6.00	6.00	3.06	3.06
APF (%) (Acoustic Power up Fraction	n/a	n/a	n/a	n/a	n/a	n/a
AIF (%) (Acoustic Initialization Fraction)	n/a	n/a	n/a	n/a	n/a	n/a
Maximum Power (mW)	8.27	–	9.13	–	90.61	–
I_{ob} (mW/cm^2)	7.02	–	5.11	–	21.07	–
Power-up Mode	n/a	n/a	n/a	n/a	n/a	n/a
Initialization Mode	n/a	n/a	n/a	n/a	n/a	n/a
Acoustic Output Freeze	yes	yes	yes	yes	yes	yes
I_{tt} (mm)	0.00	0.00	0.00	0.00	0.00	0.00
I_{ts} (mm)	contact	contact	contact	contact	contact	contact

Table 16–5. LI, LT, LB IEC Acoustic Output Information

LD, CS, S317 Probe

Probe	LD		CS		S317	
Parameter	**B Mode**	**B/M Mode**	**B Mode**	**B/M Mode**	**B Mode**	**B/M Mode**
$P_{\_}$ (MPa)	0.90	0.90	0.94	0.94	0.51	0.51
I_{spta} (mW/cm^2)	7.95	23.16	12.81	22.69	1.68	10.47
I_p (mm)	38.20	38.20	36.80	36.80	52.80	52.80
w_{pb6} (‖) (mm) (⊥)(mm)	3.15 4.67	3.15 4.67	2.87 3.00	2.87 3.00	2.40 2.81	2.40 2.81
prr (kHz)	4.85	4.85	7.66	7.66	6.89	6.89
srr (Hz)	39.15	35.49	123.60	116.03	66.26	61.78
Output Beam Dim. (‖) (mm) (⊥)(mm)	13.80 35.25	13.80 35.25	10.20 14.10	10.20 14.10	13.00 13.44	13.00 13.44
f_{awf} (MHz)	3.05	3.05	3.31	3.31	3.25	3.25
APF (%) (Acoustic Power up Fraction	n/a	n/a	n/a	n/a	n/a	n/a
AIF (%) (Acoustic Initialization Fraction)	n/a	n/a	n/a	n/a	n/a	n/a
Maximum Power (mW)	70.20	–	54.77	–	82.04	–
I_{ob} (mW/cm^2)	14.43	–	38.08	–	46.96	–
Power-up Mode	n/a	n/a	n/a	n/a	n/a	n/a
Initialization Mode	n/a	n/a	n/a	n/a	n/a	n/a
Acoustic Output Freeze	yes	yes	yes	yes	yes	yes
I_{tt} (mm)	0.00	0.00	0.00	0.00	0.00	0.00
I_{ts} (mm)	contact	contact	contact	contact	contact	contact

Table 16–6. LD, CS, S317 IEC Acoustic Output Information

10L, 3Cb Probe

Probe	10L		3Cb	
Parameter	**B Mode**	**B/M Mode**	**B Mode**	**B/M Mode**
$P_{\_}$ (MPa)	1.28	1.28	1.25	1.25
I_{spta} (mW/cm^2)	5.24	15.86	11.99	40.87
I_p (mm)	14.20	14.20	37.90	37.90
w_{pb6} (||) (mm) **(⊥)(mm)**	0.58 0.95	0.58 0.95	2.00 4.57	2.00 4.57
prr (kHz)	8.40	8.40	4.76	4.76
srr (Hz)	89.39	84.37	38.40	34.75
Output Beam Dim. (||) (mm) **(⊥)(mm)**	9.00 19.74	9.00 19.74	10.20 20.45	10.20 20.45
f_{awf} (MHz)	5.68	5.68	3.31	3.31
APF (%) (Acoustic Power up Fraction	n/a	n/a	n/a	n/a
AIF (%) (Acoustic Initialization Fraction)	n/a	n/a	n/a	n/a
Maximum Power (mW)	12.46	–	74.57	–
I_{ob} (mW/cm^2)	7.01	–	35.76	–
Power-up Mode	n/a	n/a	n/a	n/a
Initialization Mode	n/a	n/a	n/a	n/a
Acoustic Output Freeze	yes	yes	yes	yes
I_{tt} (mm)	0.00	0.00	0.00	0.00
I_{ts} (mm)	contact	contact	contact	contact

Table 16–7. 9Lb, 3Cb IEC Acoustic Output Information

ERB Probe (Convex, Linear)

Probe	ERB (Convex)		ERB (Linear)	
Parameter	**B Mode**	**B/M Mode**	**B Mode**	**B/M Mode**
$P_{\_}$ (MPa)	1.13	1.13	0.86	0.86
I_{spta} (mW/cm^2)	4.77	13.46	3.30	8.83
I_p (mm)	17.50	17.50	17.20	17.20
w_{pb6} (‖) (mm) (⊥)(mm)	1.10 1.75	1.10 1.75	1.10 1.60	1.10 1.60
prr (kHz)	6.66	6.66	6.66	6.66
srr (Hz)	53.68	49.93	53.68	49.93
Output Beam Dim. (‖) (mm) (⊥)(mm)	5.50 6.35	5.50 6.35	5.00 18.80	5.00 18.80
f_{awf} (MHz)	5.56	5.56	5.86	5.86
APF (%) (Acoustic Power up Fraction	n/a	n/a	n/a	n/a
AIF (%) (Acoustic Initialization Fraction)	n/a	n/a	n/a	n/a
Maximum Power (mW)	11.18	–	21.33	–
I_{ob} (mW/cm^2)	32.04	–	22.69	–
Power-up Mode	n/a	n/a	n/a	n/a
Initialization Mode	n/a	n/a	n/a	n/a
Acoustic Output Freeze	yes	yes	yes	yes
I_{tt} (mm)	0.00	0.00	0.00	0.00
I_{ts} (mm)	contact	contact	contact	contact

Table 16–8. ERB (Convex, Linear) IEC Acoustic Output Information

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