



***GE Medical Systems
Kretz Ultrasound***

Technical Publication

**Direction 105832
Revision 2**

**GE Medical Systems - Kretztechnik
Voluson® 730Pro (BT'02)
Service Manual**

CE 0123

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Important Precautions

WARNING

- THIS SERVICE MANUAL IS AVAILABLE IN ENGLISH ONLY.
- IF A CUSTOMER'S SERVICE PROVIDER REQUIRES A LANGUAGE OTHER THAN ENGLISH, IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRANSLATION SERVICES.
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- CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.
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- FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENÖTIGT, IST ES AUFGABE DES KUNDEN FÜR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.
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AVISO

- ESTE MANUAL DE SERVICIO SÓLO EXISTE EN INGLÉS.
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- NO SE DEBERÁ DAR SERVICIO TÉCNICO AL EQUIPO, SIN HABER CONSULTADO Y COMPRENDIDO ESTE MANUAL DE SERVICIO.
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- ESTE MANUAL DE ASSISTÊNCIA TÉCNICA SÓ SE ENCONTRA DISPONÍVEL EM INGLÊS.
- SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEMS, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.
- NÃO TENHA TENTADO REPARAR O EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO ESTE MANUAL DE ASSISTÊNCIA TÉCNICA.
- O NÃO CUMPRIMENTO DESTA AVISO PODE POR EM PERIGO A SEGURANÇA DO TÉCNICO, OPERADOR OU PACIENTE DEVIDO A' CHOQUES ELÉTRICOS, MECÂNICOS OU OUTROS.

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- IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.
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- SI PROCEDA ALLA MANUTENZIONE DELL'APPARECCHIATURA SOLO DOPO AVER CONSULTATO IL PRESENTE MANUALE ED AVERNE COMPRESO IL CONTENUTO.
- NON TENERE CONTO DELLA PRESENTE AVVERTENZA POTREBBE FAR COMPIERE OPERAZIONI DA CUI DERIVINO LESIONI ALL'ADDETTO ALLA MANUTENZIONE, ALL'UTILIZZATORE ED AL PAZIENTE PER FOLGORAZIONE ELETTRICA, PER URTI MECCANICI OD ALTRI RISCHI.

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If there are any omissions, errors or suggestions for improving this documentation, please contact the GE Healthcare Global Documentation Group with specific information listing the system type, manual title, part number, revision number, page number and suggestion details.

Mail the information to: Service Documentation, 4855 W. Electric Ave (EA-53), Milwaukee, WI 53219.

GE Healthcare employees should use the iTrak System to report all documentation errors or omissions.

Revision History

Revision	Date	Reason for change
0	November 04, 2002	Initial Release
1	April 14, 2003	Software Upgrade to Version 2.1.0
2	July 30, 2004	Software Upgrade to Version 2.2.x

List of Effected Pages

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Chapter 1

Introduction

Section 1-1 Overview

1-1-1 Purpose of Chapter 1

This chapter describes important issues related to safely servicing the Voluson® 730Pro scanner. The service provider must read and understand all the information presented in this manual before installing or servicing a unit.

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1-1-2 Purpose of Service Manual

This Service Manual provides installation and service information for the Voluson® 730Pro Ultrasound Scanning System and contains the following chapters:

- 1.) **Chapter 1 - Introduction:** Contains a content summary and warnings.
- 2.) **Chapter 2 - Pre-Installation:** Contains pre-installation requirements for the Voluson® 730Pro.
- 3.) **Chapter 3 - Installation:** Contains installation procedures.
- 4.) **Chapter 4 - Functional Checks:** Contains functional checks that are recommended as part of the installation, or as required during servicing and periodic maintenance.
- 5.) **Chapter 5 - Components and Functions (Theory):** Contains block diagrams and functional explanations of the electronics.
- 6.) **Chapter 6 - Service Adjustments:** Contains instructions on how to make available adjustments to the Voluson® 730Pro.
- 7.) **Chapter 7 - Diagnostics/Troubleshooting:** Provides procedures for running diagnostic or related routines for the Voluson® 730Pro.
- 8.) **Chapter 8 - Replacement Procedures:** Provides disassembly procedures and reassembly procedures for all changeable Field Replaceable Units (FRU).
- 9.) **Chapter 9 - Renewal Parts:** Contains a complete list of field replaceable parts for the Voluson® 730Pro.
- 10.) **Chapter 10 - Care & Maintenance:** Provides periodic maintenance procedures for the Voluson® 730Pro.

- 1-1-3 **Typical Users of the Basic Service Manual**
- Service Personnel (installation, maintenance, etc.).
 - Hospital's Service Personnel
 - Contractors (Some parts of Chapter 2 - Pre-Installation)
- 1-1-4 **Voluson® 730Pro Models Covered by this Manual**

Table 1-2 Voluson® 730Pro Model Designations

GE Part Number	Kretz #	Description
H48601N	156800	Voluson® 730Pro Main Body

- 1-1-5 **Purpose of Operator Manual(s)**
- The Operator Manual(s) should be fully read and understood before operating the Voluson® 730Pro and also kept near the unit for quick reference.

Section 1-2 Important Conventions

1-2-1 Conventions Used in Book

Icons

Pictures, or icons, are used wherever they reinforce the printed message. The icons, labels and conventions used on the product and in the service information are described in this chapter.

Safety Precaution Messages

Various levels of safety precaution messages may be found on the equipment and in the service information. The different levels of concern are identified by a flag word that precedes the precautionary message. Known or potential hazards are labeled in one of following ways:



DANGER **DANGER IS USED TO INDICATE THE PRESENCE OF A HAZARD THAT WILL CAUSE SEVERE PERSONAL INJURY OR DEATH IF THE INSTRUCTIONS ARE IGNORED.**



WARNING **WARNING IS USED TO INDICATE THE PRESENCE OF A HAZARD THAT CAN CAUSE SEVERE PERSONAL INJURY AND PROPERTY DAMAGE IF INSTRUCTIONS ARE IGNORED.**



CAUTION Caution is used to indicate the presence of a hazard that will or can cause minor personal injury and property damage if instructions are ignored.



NOTICE **Equipment Damage Possible**

Notice is used when a hazard is present that can cause property damage but has absolutely no personal injury risk.

Example: Disk drive will crash.

NOTE: *Notes provide important information about an item or a procedure. Information contained in a NOTE can often save you time or effort.*

1-2-2 **Standard Hazard Icons**

Important information will always be preceded by the exclamation point contained within a triangle, as seen throughout this chapter. In addition to text, several different graphical icons (symbols) may be used to make you aware of specific types of hazards that could cause harm.



Table 1-3 Standard Hazard Icons

ELECTRICAL	MECHANICAL	RADIATION
LASER	HEAT	PINCH
 LASER LIGHT		

Other hazard icons make you aware of specific procedures that should be followed.

Table 1-4 Standard Icons Indicating a Special Procedure be Used

AVOID STATIC ELECTRICITY	TAG AND LOCK OUT	WEAR EYE PROTECTION
		 EYE PROTECTION

1-2-3 Product Icons

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

Table 1-5 Product Icons



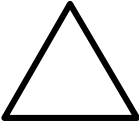









LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
Identification and Rating Plate	Manufacturer's name and address Model and serial numbers Electrical ratings	Rear side of the unit Monitor rear side On each probe
Device Listing/Certification Labels	Laboratory logo or labels denoting conformance with industry safety standards such as UL or IEC.	Rear side of the unit Rear side of the monitor
Type/Class Label	Used to indicate the degree of safety or protection.	
IP Code (IPX 1) IP Code (IPX 7)	Indicates the degree of protection provided by the enclosure per IEC 529. IPX 1 and IPX 7 indicates drip proof.	Footswitch Probes
	Equipment Type BF (man in the box symbol) IEC 878-02-03 indicates B Type equipment having even more electrical isolation than standard Type B equipment because it is intended for intimate patient contact.	Probe connectors Front side of the ECG-preamplifier (MAN) Rear of Power Supply
<p>"CAUTION" This unit weighs... Special care must be used to avoid..."</p> 	This precaution is intended to prevent injury that may result if one person attempt to move the unit considerable distances or on an incline due to the weight of the unit.	
	"CAUTION" The equilateral triangle is usually used in combination with other symbols to advise or warn the user.	Various
	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.	Rear side of Power Supply

Table 1-5 Product Icons (Continued)

LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
	"CAUTION - Dangerous voltage" (the lightning flash with arrowhead in equilateral triangle) is used to indicate electric shock hazards.	Rear side of Monitor
	"Mains OFF" Indicates the power off position of the mains power switch.	Rear of system at mains switch (F1)
	"OFF/Standby" Indicates the power off/ standby position of the power switch. CAUTION This Power Switch DOES NOT ISOLATE Mains Supply	Adjacent to On-Off/Standby switch left below the Control panel.
	"Mains ON" Indicates the power on position of the mains power switch.	Rear of system at mains switch (F1)
	ON switch of the isolation transformer for auxiliary devices.	Rear of system at the switch for auxiliary devices (F2)
	OFF switch of the isolation transformer for auxiliary devices.	Rear of system at the switch for auxiliary devices (F2)
	"Protective Earth" Indicates the protective earth (grounding) terminal.	Internal, Rear side of Power Supply
	"Equipotentiality" Indicates the terminal to be used for connecting equipotential conductors when interconnecting (grounding) with other equipment.	Rear side of Power Supply

Section 1-3 Safety Considerations

1-3-1 Introduction


The following safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual, violates safety standards of design, manufacture and intended use of the equipment.

1-3-2 Human Safety

Operating personnel must not remove the system covers.
Servicing should be performed by authorized personnel only.
Only personnel who have participated in a Voluson® 730Pro Training are authorized to service the equipment.


1-3-3 Mechanical Safety

 **WARNING** *WHEN THE UNIT IS RAISED FOR A REPAIR OR MOVED ALONG ANY INCLINE, USE EXTREME CAUTION SINCE IT MAY BECOME UNSTABLE AND TIP OVER.*

 **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.*

 **WARNING** *NEVER USE A PROBE THAT HAS FALLEN TO THE FLOOR. EVEN IF IT LOOKS OK, IT MAY BE DAMAGED.*

 **CAUTION** Always lower and center the Operator I/O Panel before moving the scanner.

 **CAUTION** The Voluson® 730Pro weighs 134 kg or more, depending on installed peripherals, (300 lbs., or more) when ready for use. Care must be used when moving it or replacing its parts. Failure to follow the precautions listed could result in injury, uncontrolled motion and costly damage.



ALWAYS:

Be sure the pathway is clear.

Use slow, careful motions.

Use two people when moving on inclines or lifting more than 16 kg (35 lbs).

1-3-3 Mechanical Safety (cont'd)

NOTE: Special care should be taken when transporting the unit in a vehicle:

- Secure the unit in an upright position.
- Lock the wheels (brake)
- DO NOT use the Control Panel as an anchor point.
- Place the probes in their carrying case.
- Eject any Magneto Optical disk or CD from their drive.



CAUTION Keep the heat venting holes on the monitor unobstructed to avoid overheating of the monitor.

1-3-4 Electrical Safety

To minimize shock hazard, the equipment chassis must be connected to an electrical ground. The system is equipped with a three-conductor AC power cable. This must be plugged into an approved electrical outlet with safety ground. If an extension cord is used with the system, make sure that the total current rating of the system does not exceed the extension cord rating.

The power outlet used for this equipment should not be shared with other types of equipment.

Both the system power cable and the power connector meet international electrical standards.

1-3-5 Labels Locations

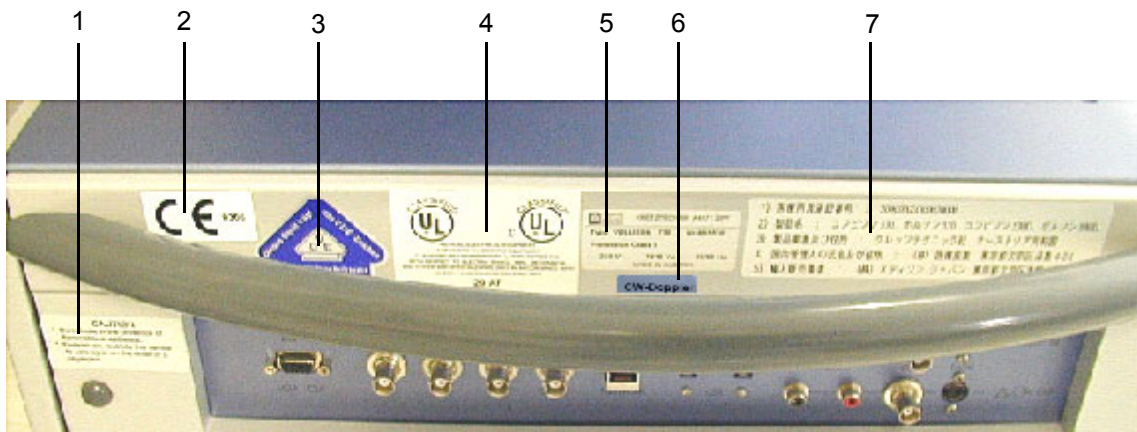


Figure 1-1 Labeling

- 1.) Caution Label
- 2.) CE-Label
- 3.) VDE-Label
- 4.) UL-Label
- 5.) Identification plate
- 6.) CW-Doppler (only if the CW-Doppler option is installed)
- 7.) Homologation label (for Japan only)

1-3-6 Dangerous Procedure Warnings

Warnings, such as the examples below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.



DANGER



DANGEROUS VOLTAGES, CAPABLE OF CAUSING DEATH, ARE PRESENT IN THIS EQUIPMENT. USE EXTREME CAUTION WHEN HANDLING, TESTING AND ADJUSTING.



WARNING

EXPLOSION WARNING

DO NOT OPERATE THE EQUIPMENT IN AN EXPLOSIVE ATMOSPHERE. OPERATION OF ANY ELECTRICAL EQUIPMENT IN SUCH AN ENVIRONMENT CONSTITUTES A DEFINITE SAFETY HAZARD.



WARNING

DO NOT SUBSTITUTE PARTS OR MODIFY EQUIPMENT

BECAUSE OF THE DANGER OF INTRODUCING ADDITIONAL HAZARDS, DO NOT INSTALL SUBSTITUTE PARTS OR PERFORM ANY UNAUTHORIZED MODIFICATION OF THE EQUIPMENT.

1-3-7 Lockout/Tagout Requirements (For USA Only)

Follow OSHA Lockout/Tagout requirements by ensuring you are in total control of the electrical Mains plug.

1-3-8 Returning/Shipping Probes and Repair Parts

Equipment being returned must be clean and free of blood and other infectious substances.

GEMS policy states that body fluids must be properly removed from any part or equipment prior to shipment. GEMS employees, as well as customers, are responsible for ensuring that parts/equipment have been properly decontaminated prior to shipment. Under no circumstance should a part or equipment with visible body fluids be taken or shipped from a clinic or site (for example, body coils or and ultrasound probe).

The purpose of the regulation is to protect employees in the transportation industry, as well as the people who will receive or open this package.

NOTE: *The US Department of Transportation (DOT) has ruled that "items what were saturated and/or dripping with human blood that are now caked with dried blood; or which were used or intended for use in patient care" are "regulated medical waste" for transportation purpose and must be transported as a hazardous material.*

Section 1-4 EMC, EMI, and ESD

1-4-1 Electromagnetic Compatibility (EMC)

Electromagnetic compatibility describes a level of performance of a device within its electromagnetic environment. This environment consists of the device itself and its surroundings including other equipment, power sources and persons with which the device must interface. Inadequate compatibility results when a susceptible device fails to perform as intended due to interference from its environment or when the device produces unacceptable levels of emission to its environment. This interference is often referred to as radio-frequency or electromagnetic interference (RFI/EMI) and can be radiated through space or conducted over interconnecting power or signal cables. In addition to electromagnetic energy, EMC also includes possible effects from electrical fields, magnetic fields, electrostatic discharge and disturbances in the electrical power supply.

For applicable standards refer to Chapter 2 in the Basic User Manual of the Voluson® 730Pro.

1-4-2 CE Compliance

The Voluson® 730Pro unit conforms to all applicable conducted and radiated emission limits and to immunity from electrostatic discharge, radiated and conducted RF fields, magnetic fields and power line transient requirements.

NOTE: *For CE Compliance, it is critical that all covers, screws, shielding, gaskets, mesh, clamps, are in good condition, installed tightly without skew or stress. Proper installation following all comments noted in this service manual is required in order to achieve full EMC performance.*

1-4-3 Electrostatic Discharge (ESD) Prevention



WARNING

DO NOT TOUCH ANY BOARDS WITH INTEGRATED CIRCUITS PRIOR TO TAKING THE NECESSARY ESD PRECAUTIONS:



1. ALWAYS CONNECT YOURSELF, VIA AN ARM-WRIST STRAP, TO THE EQUIPOTENTIALITY CONNECTION POINT LOCATED ON THE REAR OF THE SCANNER (TO THE RIGHT OF THE POWER CONNECTOR).

2. FOLLOW GENERAL GUIDELINES FOR HANDLING OF ELECTROSTATIC SENSITIVE EQUIPMENT.

Section 1-5 Customer Assistance

1-5-1 Contact Information

If this equipment does not work as indicated in this service manual or in the Basic User Manual, or if you require additional assistance, please contact the local distributor or appropriate support resource, as listed below.

NOTE: Prepare vital system information (see: [Section 7-2 on page 7-2](#)) before you call:

- System Type
- System Serial number (also visible on back of the system)
- Application Software version
- Backup version
- additional information about installed software

Table 1-6 Phone Numbers for Customer Assistance

Location	Phone Number
USA/ Canada GE Medical Systems Ultrasound Service Engineering 4855 W. Electric Avenue Milwaukee, WI 53219 Customer Answer Center	1-800-437-1171 1-800-682-5327 1-262-524-5698 Fax: +1-414-647-4125
Latin America GE Medical Systems Ultrasound Service Engineering 4855 W. Electric Avenue Milwaukee, WI 53219 Customer Answer Center	1-262-524-5300 1-262-524-5698 Fax: +1-414-647-4125
Europe GE Medical Systems Kretztechnik GmbH & Co OHG Service Department - Ultrasound Tiefenbach 15 A-4871 Zipf Austria Customer Answer Center	Tel: +43 (0)7682-3800-26 Fax: +43 (0)7682-3800-47 Tel: +33-13083-1300
Asia GE Ultrasound Asia Service Department - Ultrasound 298 Tiong Bahru Road #15-01/06 Central Plaza Singapore 169730	Tel: +65 6291-8528 +81 426-482950 Fax: +65 6272-7006

1-5-2

System Manufacturer

Table 1-7 System Manufacturer

Manufacturer	Telephone	FAX
GE Medical Systems Kretztechnik GmbH & Co OHG Tiefenbach 15 A-4871 Zipf Austria	+43 (0)7682-3800-0	+43 (0)7682-3800-47

Chapter 2

Pre-Installation

Section 2-1 Overview

2-1-1 Purpose of Chapter 2

This chapter provides the information required to plan and prepare for the installation of a Voluson® 730Pro. Included are descriptions of the facility and electrical needs to be met by the purchaser of the unit.

Table 2-1 Contents in Chapter 2

Section	Description	Page Number
2-1	Overview	2-1
2-2	General Console Requirements	2-2
2-3	Facility Needs	2-6

Section 2-2 General Console Requirements

2-2-1 Console Environmental Requirements

Table 2-2 Environmental Requirements

Operating Temperature	Operating Humidity	Heat Dissipation	Storage Temperature	Storage Humidity
10 to 40°C (50 to 104°F)	30 to 80% rH non-condensing	3446 BTU pr hour	-10 to 40 °C (14 to 104°F)	< 90% rH non- condensing

2-2-1-1 Cooling

The cooling requirement for the Voluson® 730Pro is 3446 BTU/hr. This figure does not include cooling needed for lights, people, or other equipment in the room. Each person in the room places an additional 300 BTU/hr. demand on the cooling system.

2-2-1-2 Lighting

Bright light is needed for system installation, updates and repairs. However, operator and patient comfort may be optimized if the room light is subdued and indirect. Therefore a combination lighting system (dim/bright) is recommended. Keep in mind that lighting controls and dimmers can be a source of EMI which could degrade image quality. These controls should be selected to minimize possible interference.

2-2-2 Electrical Requirements

NOTE: GE Medical Systems requires a dedicated power and ground for the proper operation of its Ultrasound equipment. This dedicated power shall originate at the last distribution panel before the system. The dedicated line shall consist of one phase, a neutral (not shared with any other circuit), and a full size ground wire from the distribution panel to the Ultrasound outlet. Please note that image artifacts can occur, if at any time within the facility, the ground from the main facility's incoming power source to the Ultrasound unit is only a conduit.

2-2-2-1 Voluson® 730Pro Power Requirements

Table 2-3 Electrical Specifications for Voluson® 730Pro

Voltage	Tolerances	Current	Frequency
100 VAC	±10%	10.10 A	50, 60 Hz (±2%)
115 VAC	±10%	8.80 A	50, 60 Hz (±2%)
130 VAC	±10%	7.80 A	50, 60 Hz (±2%)
230 VAC	±10%	4.40 A	50, 60 Hz (±2%)
240 VAC	±10%	4.20 A	50, 60 Hz (±2%)

2-2-2-2 Inrush Current

Inrush current is not a factor to consider due to the inrush current limiting properties of the power supplies.

2-2-2-3 Site Circuit Breaker

It is recommended that the branch circuit breaker for the machine be readily accessible.



CAUTION POWER OUTAGE MAY OCCUR.

The Voluson® 730Pro requires a dedicated single branch circuit. To avoid circuit overload and possible loss of critical care equipment, make sure you **DO NOT** have any other equipment operating on the same circuit.

2-2-2-4 Site Power Outlets

A dedicated AC power outlet must be within reach of the unit without extension cords. Other adequate outlets for the external peripherals, medical and test equipment needed to support this unit must also be present within 1 m (3.2 ft.) of the unit. Electrical installation must meet all current local, state, and national electrical codes.

2-2-2-5 Unit Power Plug

If the unit arrives without a power plug, or with the wrong plug, you must contact your GE dealer or the installation engineer must supply what is locally required.

2-2-3 EMI Limitations

Ultrasound machines are susceptible to Electromagnetic Interference (EMI) from radio frequencies, magnetic fields, and transients in the air or wiring. Ultrasound machines also generate EMI. The Voluson® 730Pro complies with limits as stated on the EMC label. However, there is no guarantee that interference will not occur in a particular installation.

Possible EMI sources should be identified before the unit is installed.

Electrical and electronic equipment may produce EMI unintentionally as the result of a defect. These sources include:

- medical lasers,
- scanners,
- cauterizing guns,
- computers,
- monitors,
- fans,
- gel warmers,
- microwave ovens,
- light dimmers
- portable phones.

The presence of a broadcast station or broadcast van may also cause interference.

see [Table 2-4](#) for EMI Prevention tips

Table 2-4 EMI Prevention/Abatement

EMI Rule	Details
Be aware of RF sources	Keep the unit at least 5 meters or 15 feet away from other EMI sources. Special shielding may be required to eliminate interference problems caused by high frequency, high powered radio or video broadcast signals.
Ground the unit	Poor grounding is the most likely reason a unit will have noisy images. Check grounding of the power cord and power outlet.
Replace all screws, RF gaskets, covers, cores	After you finish repairing or updating the system, replace all covers and tighten all screws. Any cable with an external connection requires a magnet wrap at each end. Install the shield over the front of card cage. Loose or missing covers or RF gaskets allow radio frequencies to interfere with the ultrasound signals.
Replace broken RF gaskets	If more than 20% or a pair of the fingers on an RF gasket are broken, replace the gasket. Do not turn on the unit until any loose metallic part is removed.
Do not place labels where RF gaskets touch metal	Never place a label where RF gaskets meet the unit. Otherwise, the gap created will permit RF leakage. Or, if a label has been found in such a position, move the label.
Use GE specified harnesses and peripherals	The interconnect cables are grounded and require ferrite beads and other shielding. Also, cable length, material, and routing are all important; do not change from what is specified.
Take care with cellular phones	Cellular phones may transmit a 5 V/m signal; that could cause image artifacts.
Properly dress peripheral cables	Do not allow cables to lie across the top of the card cage or hang out of the peripheral bays. Loop the excess length for peripheral cables inside the peripheral bays. Attach the monitor cables to the frame.

2-2-4 Scan Probe Environmental Requirements

Operation: Ambient temperature 18° to 30° C

Storage: -10° to 50° C

NOTE: *Temperature in degrees C. Conversion to degrees F = °C (9/5) + 32).*



NOTICE SYSTEMS AND ELECTRONIC PROBES ARE DESIGNED FOR STORAGE TEMPERATURES OF -10 TO + 50 degrees C. WHEN EXPOSED TO LARGE TEMPERATURE VARIATIONS, THE PRODUCT SHOULD BE KEPT IN ROOM TEMPERATURE FOR 10 HOURS BEFORE USE.

2-2-5 Time and Manpower Requirements

Site preparation takes time. Begin Pre-installation checks as soon as possible. If possible, allow six weeks before delivery, for enough time to make necessary changes.



CAUTION Have two people available to deliver and unpack the Voluson® 730Pro. Attempts to move the unit considerable distances or on an incline by one person could result in injury or damage or both.



Section 2-3 Facility Needs

2-3-1 Purchaser Responsibilities

The work and materials needed to prepare the site is the responsibility of the purchaser. Delay, confusion, and waste of manpower can be avoided by completing pre installation work before delivery. Use the Pre installation checklist to verify that all needed steps have been taken. Purchaser responsibility includes:

- Procuring the materials required.
- Completing the preparations before delivery of the ultrasound system.
- Paying the costs for any alterations and modifications not specifically provided in the sales contract.

NOTE: *All electrical installations that are preliminary to the positioning of the equipment at the site prepared for the equipment must be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations, and testing must also be performed by qualified personnel. The products involved (and the accompanying electrical installations) are highly sophisticated and special engineering competence is required. All electrical work on these products must comply with the requirements of applicable electrical codes. The purchaser of GE equipment must only utilize qualified personnel to perform electrical servicing on the equipment.*

The desire to use a non-listed or customer provided product or to place an approved product further from the system than the interface kit allows presents challenges to the installation team. To avoid delays during installation, such variances should be made known to the individuals or group performing the installation at the earliest possible date (preferably prior to the purchase).

The ultrasound suite must be clean prior to delivery of the machine. Carpet is not recommended because it collects dust and creates static. Potential sources of EMI (electromagnetic interference) should also be investigated before delivery. Dirt, static, and EMI can negatively impact system reliability.

2-3-2 Required Features

NOTE: *GE Medical Systems requires a dedicated power and ground for the proper operation of its Ultrasound equipment. This dedicated power shall originate at the last distribution panel before the system. The dedicated line shall consist of one phase, a neutral (not shared with any other circuit), and a full size ground wire from the distribution panel to the Ultrasound outlet. Please note that image artifacts can occur, if at any time within the facility, the ground from the main facility's incoming power source to the Ultrasound unit is only a conduit.*

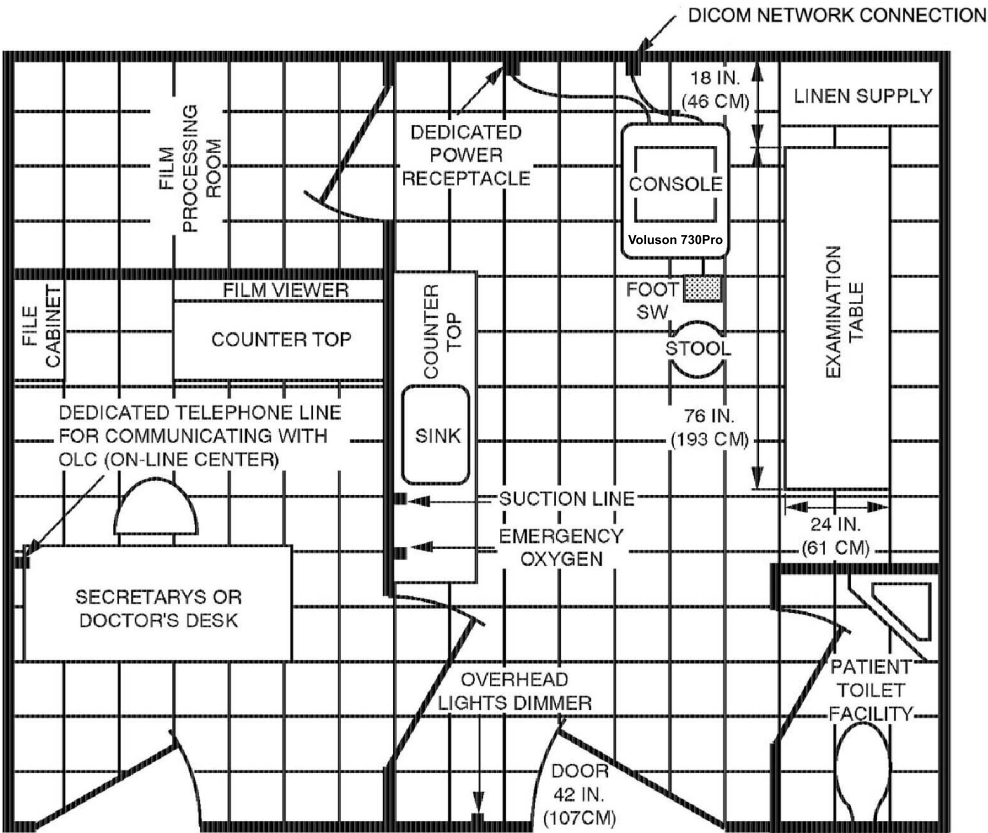
- Door opening is at least 76 cm (30 in) wide.
- Proposed location for unit is at least 0.3 m (1 ft.) from the wall for cooling
- Power outlet and place for any external peripheral are within 2 m (6.5 ft) of each other with peripheral within 1 m of the unit to connect cables.

NOTE: *The Voluson® 730Pro has four outlets inside the unit. One is for the monitor and three for on board peripherals.*

2-3-3 Desirable Features

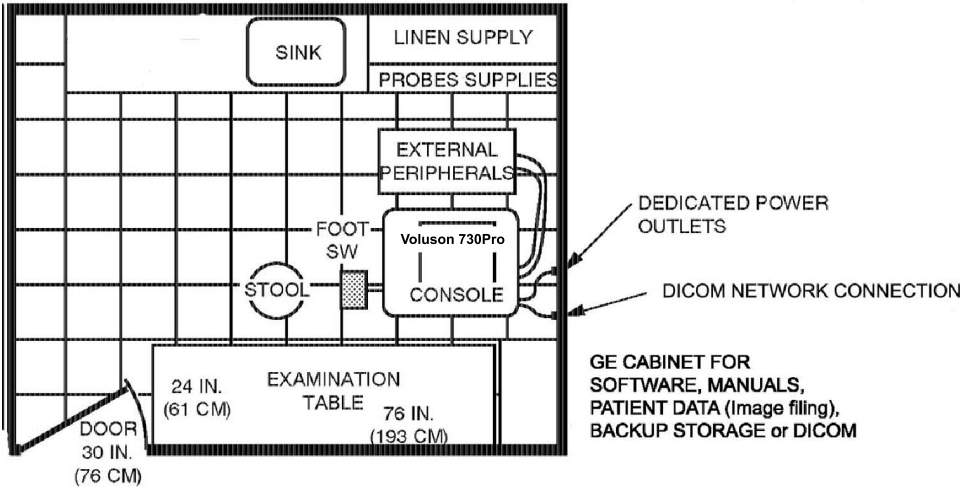
- Door is at least 90 cm (3 ft.) wide
- Circuit breaker for dedicated power outlet is easily accessible
- Sink with hot and cold water
- Receptacle for bio-hazardous waste, like used probe sheaths
- Emergency oxygen supply
- Storage for linens and equipment
- Nearby waiting room, lavatory, and dressing room
- Dual level lighting (bright and dim)
- Lockable cabinet ordered by GE for its software and proprietary manuals

2-3-4 Minimal Floor Plan Suggestion



A 14 by 17 foot Recommended Floor Plan

Scale: Each square equals one square foot



An 8 by 10 foot Minimal Floor Plan

Figure 2-1 Minimal Floor Plan

2-3-5 Networking Pre-installation Requirements

2-3-5-1 Purpose of the DICOM Network Function

DICOM (**D**igital **I**maging and **C**ommunications in **M**edicine) services provide the operator with clinically useful features for moving images and patient information over a hospital network.

Examples of DICOM services include the transfer of images to workstations for viewing or transferring images to remote printers. As an added benefit, transferring images in this manner frees up the on-board monitor and peripherals, enabling viewing to be done while scanning continues.

With DICOM, images can be archived, stored, and retrieved faster, easier, and at a lower cost.

2-3-5-2 DICOM Option Pre-installation Requirements

To configure the Voluson® 730Pro to work with other network connections, the site's network administrator must provide some necessary information.

Information must include:

- A Station name, AE Title, IP address and Net Mask for the Voluson® 730Pro.
- The IP addresses for the default gateway and other routers at the site for ROUTING INFORMATION. Only if necessary (e.g. for Internet access).

Installation see: [Section 3-10 "Network IP Address Configuration" on page 3-52.](#)

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Chapter 3

Installation

Section 3-1 Overview

3-1-1 The Purpose of Chapter 3

This chapter contains information needed to install the unit. Included are procedures to receive, unpack and configure the equipment.

Table 3-1 Contents in Chapter 3

Section	Description	Page Number
3-1	Overview	3-1
3-2	Installation Reminders	3-1
3-3	Receiving and Unpacking the Equipment	3-4
3-4	Preparing for Installation	3-6
3-5	Connection of Auxiliary Devices	3-7
3-6	Completing the Installation	3-20
3-7	Printer Installation	3-23
3-8	System Configuration	3-42
3-9	Connectivity Installation Worksheet	3-51
3-10	Network IP Address Configuration	3-52
3-11	Paperwork	3-54

Section 3-2 Installation Reminders

3-2-1 Average Installation Time

Table 3-2 Average Installation Time

Description	Average Installation Time	Comments
Unpacking the scanner	0.5 hours	
Scanner /options / printers	0.5 to 1.5 hours	Dependant on the required configuration
DICOM Option	0.5 - 1.5 hours	Dependant on the configuration amount

3-2-2 Installation Warnings

- 1.) Since the Voluson® 730Pro weighs approximately 134 kg (300 lb.) without options, preferably two people should unpack it. Two people are also preferable for installing any additional items in excess of 35 pounds (e.g., Monitor).
- 2.) There are no operator serviceable components. To prevent shock, do not remove any covers or panels. Should problems or malfunctions occur, unplug the power cord. Only qualified service personnel should carry out servicing and troubleshooting.
- 3.) After being transported, the unit may be very cold or hot. If this is the case, allow the unit to acclimate before you turn it on. It requires one hour for each 2.5°C increment it's temperature is below 10°C or above 40°C.


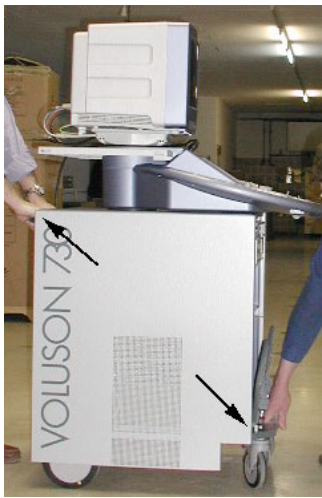
 **CAUTION** Equipment damage possibility. Turning the system on without acclimation after arriving at site may cause the system to be damaged.

Table 3-3 Acclimation Time

°C	60	55	50	45	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40
°F	140	131	122	113	104	96	86	77	68	59	50	41	32	23	14	5	-4	-13	-22	-31	-40
hrs	8	6	4	2	0	0	0	0	0	0	0	2	4	6	8	10	12	14	16	18	20



When pulling, moving or lifting the system, grasp it only at the rear handle of the trolley and the handle underneath the foot rest.



 **WARNING**
Do **NOT** pull or lift the system with the front handle of the user interface (operator panel).



Figure 3-1 pulling, moving or lifting the system

3-2-2-1 Brake Pedal Operation


 **WARNING** *REMEMBER: If the front wheels are engaged for transportation, pressing the release brake pedals (brakes on front wheels under the foot rest) once disengages the lock.*


3-2-2-2 Operator I/O Panel Position


If weight is placed on the Operator I/O Panel in it's extended position the console could tip over.


-  **WARNING** *The system should NOT be moved with the Operator I/O Panel extended. Move the Operator I/O Panel to it's centered and locked position.*
-  **WARNING** *Monitor mounting mechanism may break if not properly supported (e.g., with packing foam) during transportation even inside the hospital.*


3-2-3 Safety Reminders


-  **DANGER** **WHEN USING ANY TEST INSTRUMENT THAT IS CAPABLE OF OPENING THE AC GROUND LINE (I.E., METER'S GROUND SWITCH IS OPEN), DON'T TOUCH THE UNIT!**


-  **CAUTION** Two people should unpack the unit because of its weight. Two people are required whenever a part weighing 16kg (35 lb.) or more must be lifted.


-  **CAUTION** If the unit is very cold or hot, do not turn on its power until it has had a chance to acclimate to its operating environment.


-  **CAUTION** To prevent electrical shock, connect the unit to a properly grounded power outlet. Do not use a three to two prong adapter. This defeats safety grounding.

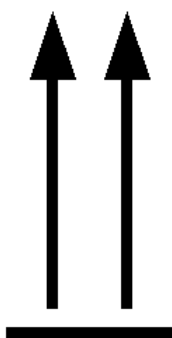
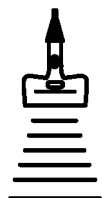
-  **CAUTION** Do NOT wear the ESD wrist strap when you work on live circuits and more than 30 V peak is present.

-  **CAUTION** Do not use a 20 Amp to 15 Amp adapter on the 120 Vac unit's power cord. This unit requires a dedicated 16 A circuit.

-  **CAUTION** Do not operate this unit unless all board covers and frame panels are securely in place. System performance and cooling require this.

-  **CAUTION** **OPERATOR MANUAL(S)**
The User Manual(s) should be fully read and understood before operating the Voluson® 730Pro and kept near the unit for quick reference.

-  **CAUTION** **ACOUSTIC OUTPUT HAZARD**
Although the ultrasound energy transmitted from the Voluson® 730Pro probe is within FDA limits, avoid unnecessary exposure. Ultrasound energy can produce heat and mechanical damage.




ENVIRONMENTAL STORAGE AND SHIPPING CONDITIONS -10°C to +40°C +14°F to +104°F max. 90% RH no condensation 700 to 1060 hPa

10 VERLAG J.A. KITZLER, 1011 Wien, Untergasse 4, Tel.: 01/713 53 34, Fax.: 01/715 57 84-85


12 VERLAG J.A. KITZLER, 1011 Wien, Untergasse 4, Tel.: 01/713 53 34, Fax.: 01/715 57 84-85

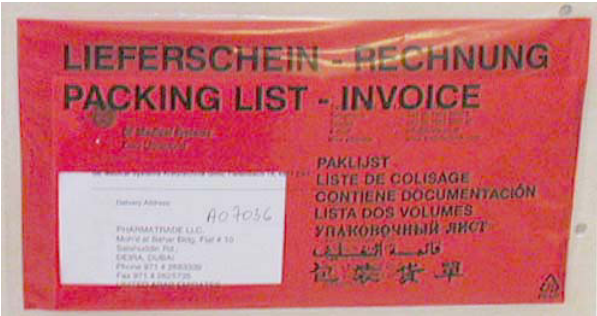
Figure 3-2 Environmental Labels

Section 3-3
Receiving and Unpacking the Equipment

**CAUTION**

Transport only with forklift or stracker truck.
During transport pay attention to the point of gravity (“tilt and drop” indicator)!

 Have two people available to unpack the Voluson® 730Pro.
Attempts to move the unit considerable distances or on an incline by one person could result in injury or damage or both.



The envelope with delivery address, packing list and invoice is located on the front panel of the crate.

Check whether delivery is complete (according to packing list) and check visual damage!

Figure 3-3 envelope at front panel of the crate

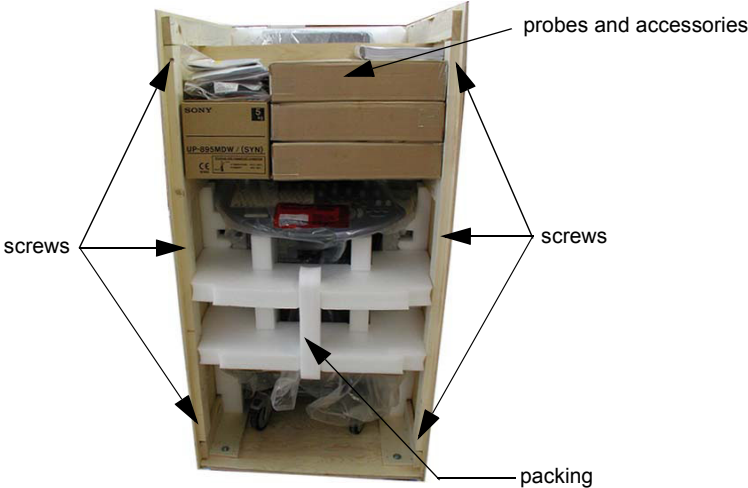
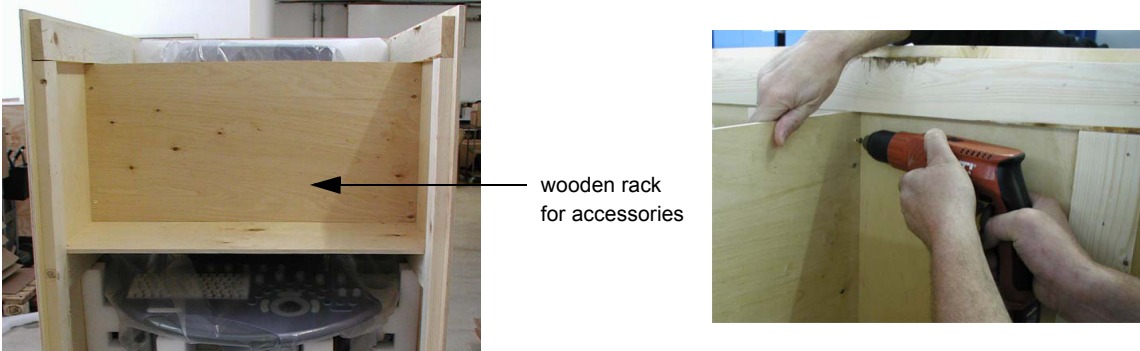
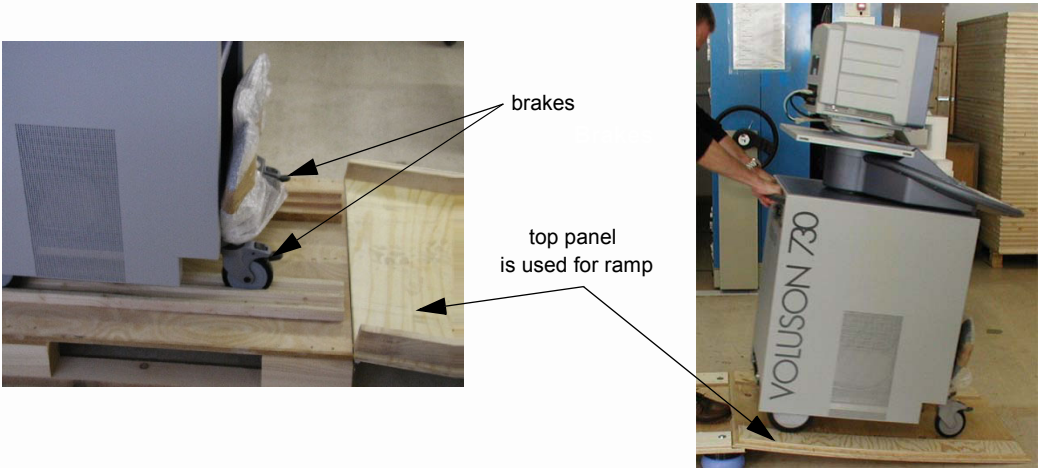
**NOTICE**

The device must only be transported in the original packaging!
Unpack the devices such a way that packaging can be reused.
A drill with size 20 torx bit and/or a Phillips 2 screwdriver will be needed to open the crate.

Table 3-4 Unpacking Procedure

Step	Task
1.	<div><p>Loosen the screws and remove top panel from crate; top panel is used for the ramp.</p><div></div></div>

Table 3-4 Unpacking Procedure

Step	Task
2.	<div>Open front panel by removing the screws from the side panels. Remove probes and accessories from the wooden box.</div> <div><p>Diagram illustrating the internal structure of the wooden box. Labels point to: probes and accessories (top), screws (side panels), and packing (bottom).</p></div>
3.	<div>Loosen all screws to remove the wooden rack for accessories as well as the left, right and back panel.</div> <div><p>Two photographs showing the removal of the wooden rack. The left photo shows the rack being loosened. The right photo shows a person using a power drill to remove a screw from the rack. Label: wooden rack for accessories.</p></div>
4.	Carefully remove foam packing material and plastic bag from the ultrasound unit and monitor.
Caution: Two people are needed in the next step due to the weight of the equipment.	
5.	<div>Disengage the brakes and slowly move unit down the ramp (top panel).</div> <div><p>Two photographs showing the unit being moved down a ramp. The left photo shows the unit on a ramp with labels for brakes and top panel. The right photo shows the unit being moved down the ramp. Label: top panel is used for ramp.</p></div>
Note: Packing crate and material should be stored for future use.	

Section 3-4

Preparing for Installation

3-4-1

Verify Customer Order

Compare items received by the customer to that which is listed on the delivery order. Report any items that are missing, back ordered or damaged.

3-4-2

Physical Inspection

3-4-2-1

System Voltage Settings

Verify that the scanner is set to the correct voltage. The Voltage settings for the Voluson® 730Pro Scanner is found on the identification plate, on the rear of the system.

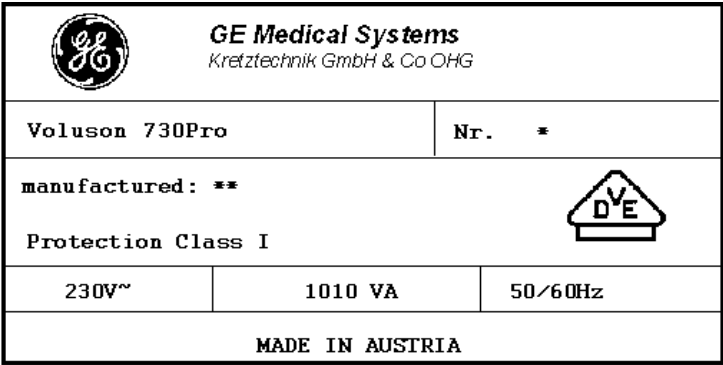


Figure 3-4 Identification Plate

 **WARNING**

CONNECTING A Voluson® 730Pro SCANNER TO THE WRONG VOLTAGE LEVEL WILL MOST LIKELY DESTROY THE SCANNER.

3-4-3

EMI Protection

This unit has been designed to minimize the effects of Electro-Magnetic Interference (EMI). Many of the covers, shields, and screws are provided primarily to protect the system from image artifacts caused by this interference. For this reason, it is imperative that all covers and hardware are installed and secured before the unit is put into operation.

Section 3-5 Connection of Auxiliary Devices

NOTE: Normally the auxiliary devices and peripherals come already installed with the system.

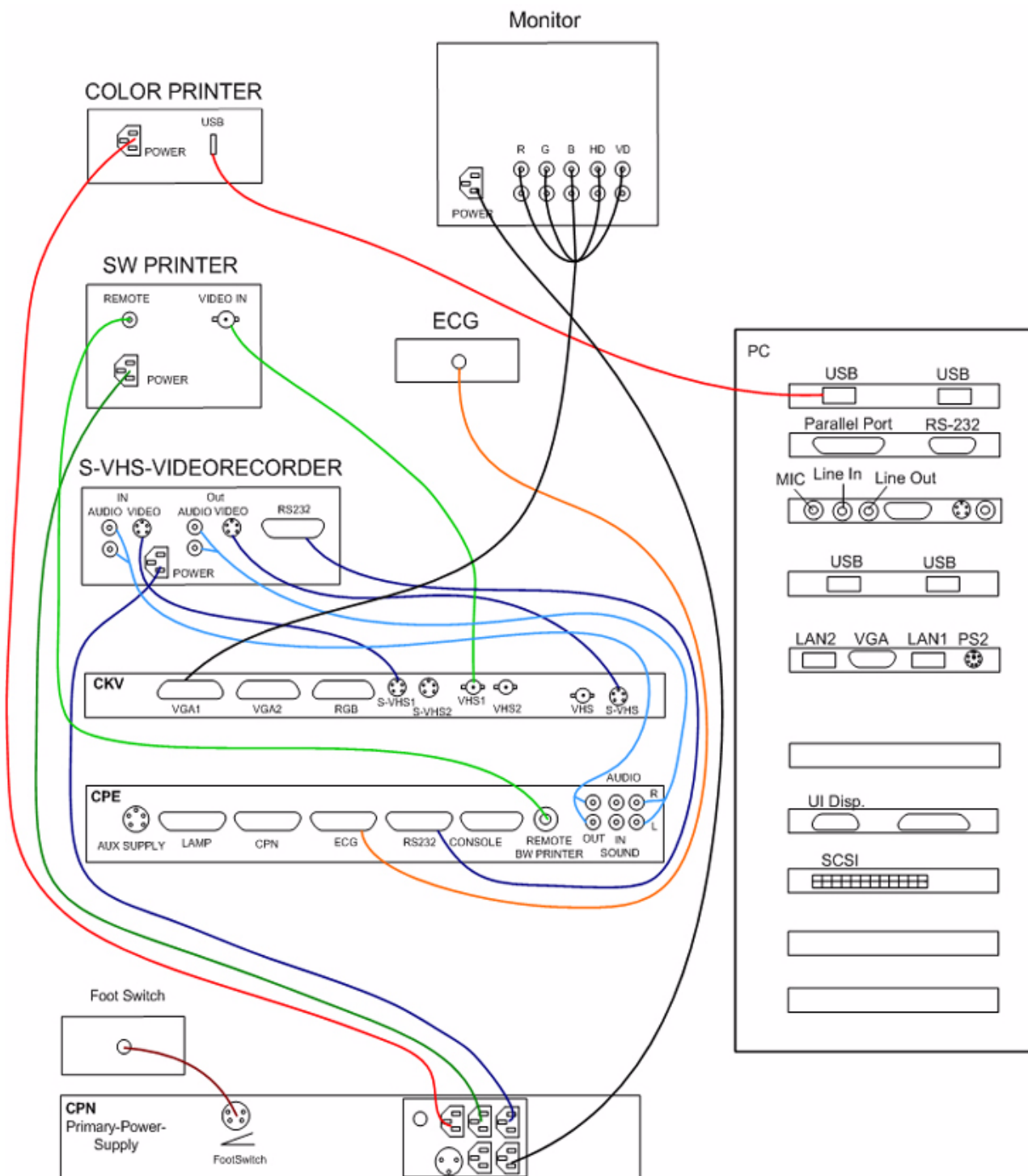


Figure 3-5 Connection of Peripherals

Section 3-5 Connection of Auxiliary Devices (cont'd)

- 1.) Remove rear cover plate; see [Figure 3-6](#).
- 2.) Carefully remove plastic caps using a knife and loosen screws and washers.
- 3.) When the cover is loose on top, pull the rear cover out and move upwards.

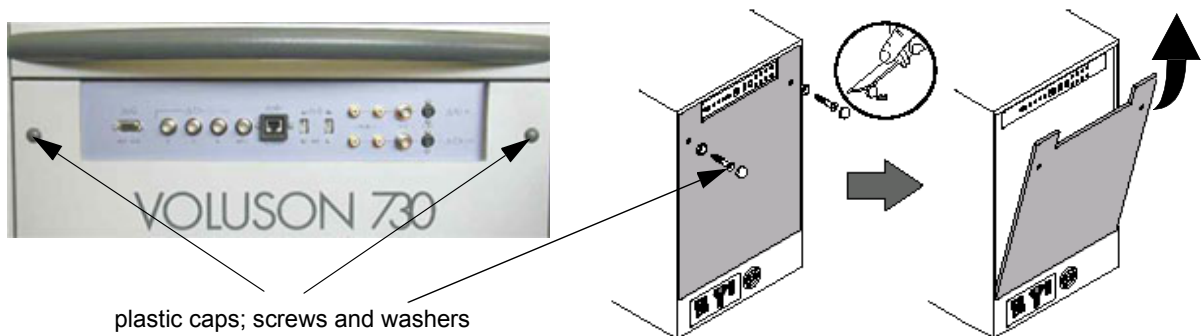


Figure 3-6 Remove rear cover plate

- 4.) Disconnect the GND ground-cable from the back of the rear cover plate.

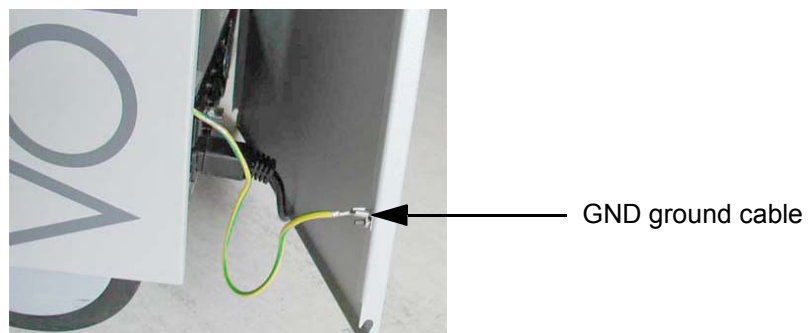


Figure 3-7 GND ground-cable

- 5.) Connect all Peripherals.
- 6.) Connect the GND ground-cable at the rear cover plate.
- 7.) Mount rear cover plate, reattach screw and washers and pug-in the caps.

3-5-1 SONY Monitor Connection

NOTE: The monitor comes already installed with the system. Please verify the correct connection.

- 1.) Connect all the Monitor cables a shown in Figure 3-8.
- 2.) Mount connector protection at the monitor cables.
- 3.) Activate the power switch on the rear side of the monitor.

NOTE: The switch of the monitor has to be in ON position before starting the system.
Leave monitor power switch always ON.

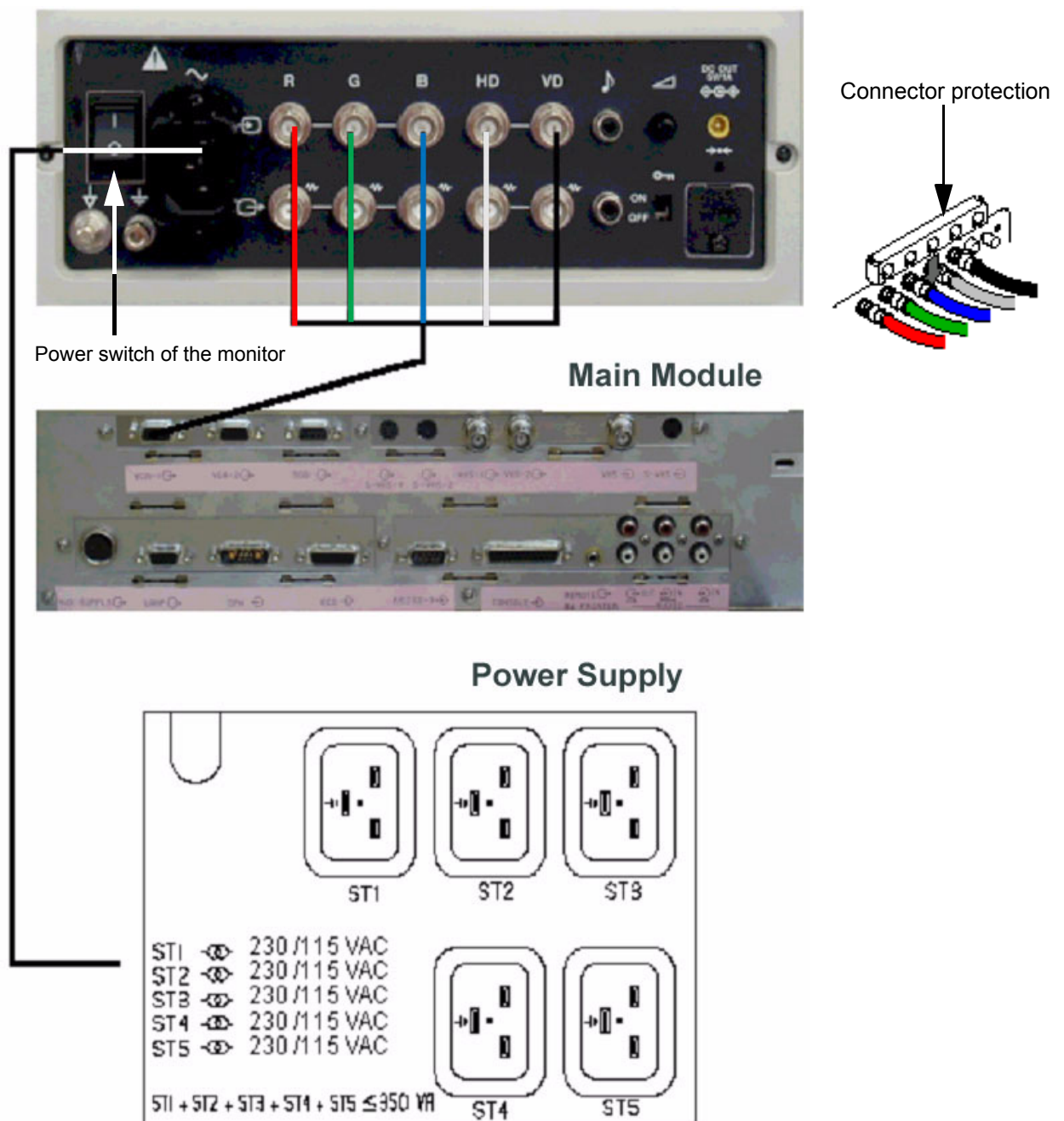


Figure 3-8 Monitor Connection Scheme

3-5-2 **Foot Switch Connection**

NOTE: To adjust the Foot Switch, refer to the Voluson® 730Pro Basic User Manual, Chapter 17.3.3, System Setup - Peripherals.



Figure 3-9 Foot Switch Connection Scheme

3-5-3 ECG-preamplifier Connection

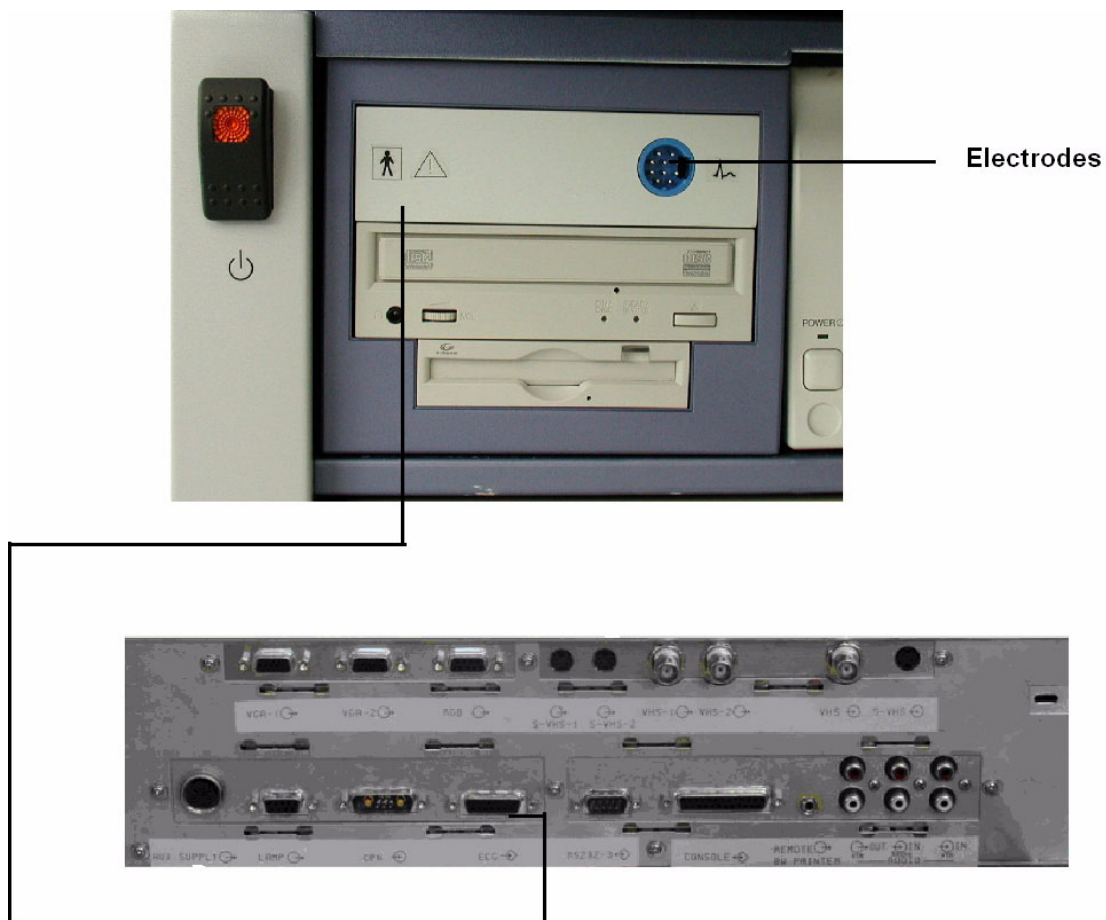


Figure 3-10 ECG Connection Scheme

3-5-4 S-VHS Video Recorder Connection

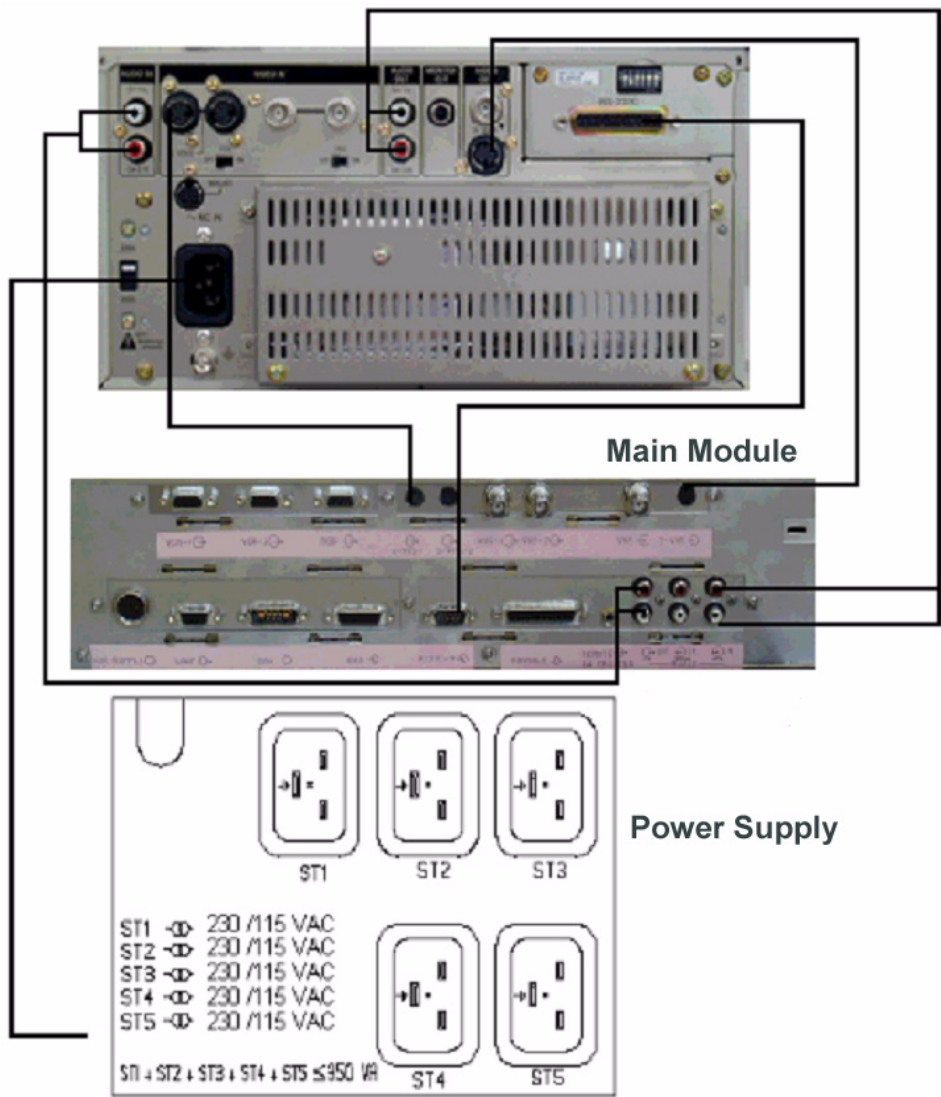


Figure 3-11 Video Recorder Connection Scheme

123456

On

Off

Set DIP Switches on back of the VCR as shown:

Switch 1:

OFF-Audio is muted during fast playback

Switch 2:

OFF-FF/REW mode is used during searches.

Switch 3:

ON-VCR counter is reset upon cassette ejection.

Switch 4:

OFF-The VCR can be controlled by the system.

Switch 5 + 6:

ON-The Baud rate is set to 19200 bit/sec (must be the same as Voluson® 730Pro)

Figure 3-12 DIP Switches

NOTICE

Please use the proper connection set and remote cable.
see: ["Section 9-12 Optional Peripherals and Accessories \(cont'd\)" on page 9-28.](#)

3-5-5 B/W Video Printer Connection

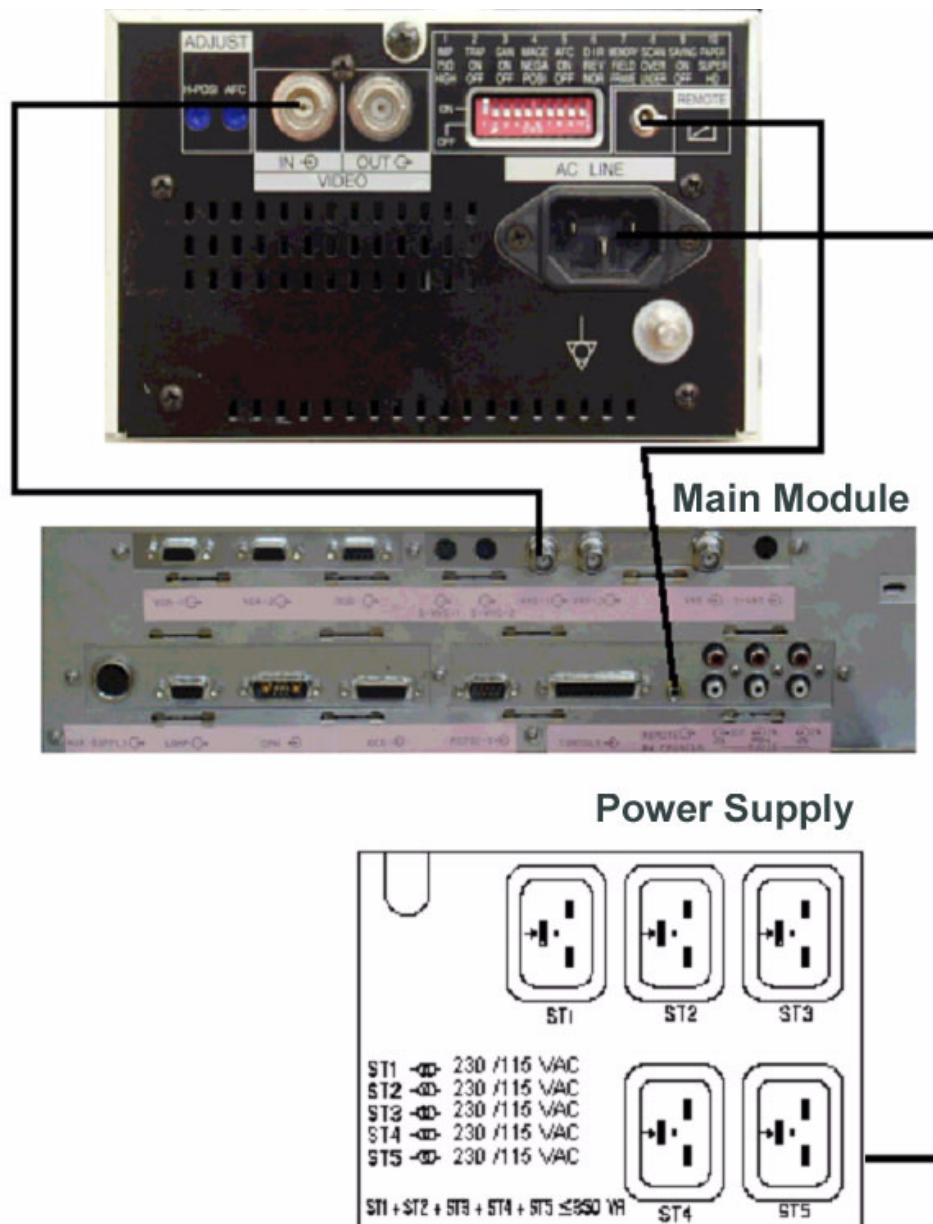


Figure 3-13 B/W Video Printer Connection Scheme



NOTICE Please use the proper connection set and remote cable.
 see: [Section 9-12 "Optional Peripherals and Accessories"](#) on page 9-27.

3-5-6 Line Printer Connection

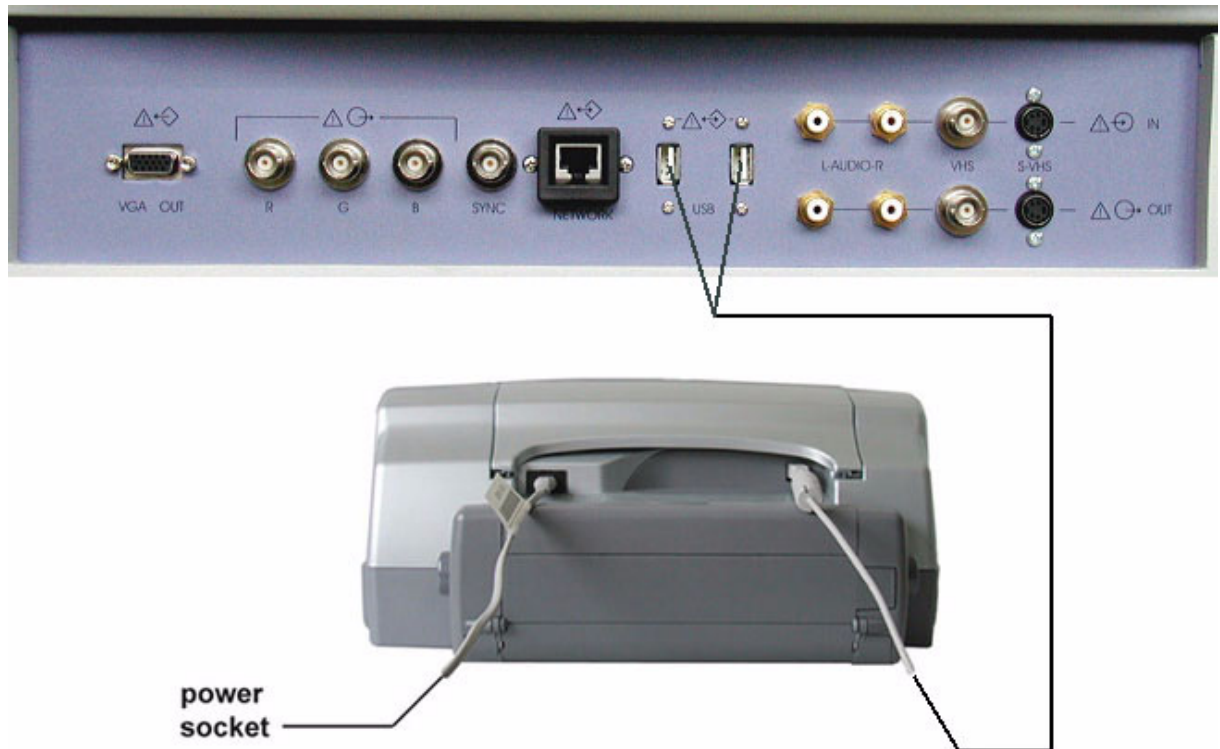


Figure 3-14 Line Printer Connection Scheme



CAUTION Please observe that the Line Printer (HP 990cxi or HP 995c) has to be located outside of the patient environment (acc. IEC 60601-1 / UL 2601-1).



NOTICE The switch of the printer has to be in ON position before starting the system. Leave printer switch always in the ON position.



NOTICE Please use the proper connection set.
see: [Section 9-12 "Optional Peripherals and Accessories" on page 9-27.](#)

NOTE: For further installation instructions see:
[Section 3-7-1 "Installing Line Printer HP 990cxi or HP 995c" on page 3-24.](#)

3-5-7 Digital Color Printer (Sony UP-D21MD or UP-D23MD) Connection

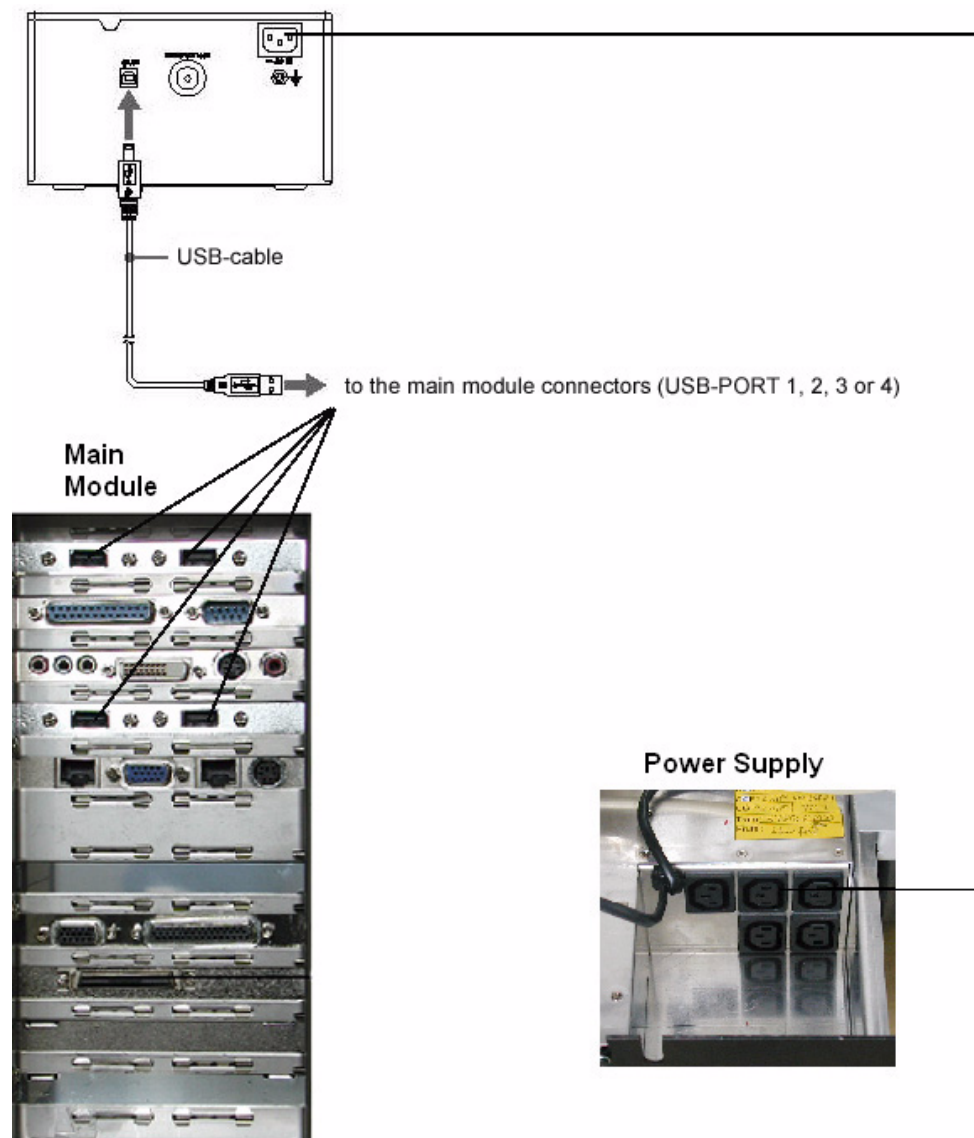


Figure 3-15 Digital Color Printer (Sony UP-D21MD or UP-D23MD) Connection Scheme



CAUTION Pay attention to lateral distances. See Instruction Manual of the printer !!!



CAUTION The Printer Supply Voltage must be the same as the Output Voltage of the Voluson® 730Pro Power Out Connectors (Power Supply) !



NOTICE The switch of the printer has to be in ON position before starting the system. Leave printer switch always in the ON position.



NOTICE Please use the proper connection set. see: [Section 9-12 "Optional Peripherals and Accessories" on page 9-27.](#)

NOTE: For further installation instructions see: [Section 3-7-2 "Installing Digital Color Printer Sony UP-D21MD or UP-D23MD" on page 3-26.](#)

3-5-8 Digital Color Printer (Mitsubishi CP770DW) Connection

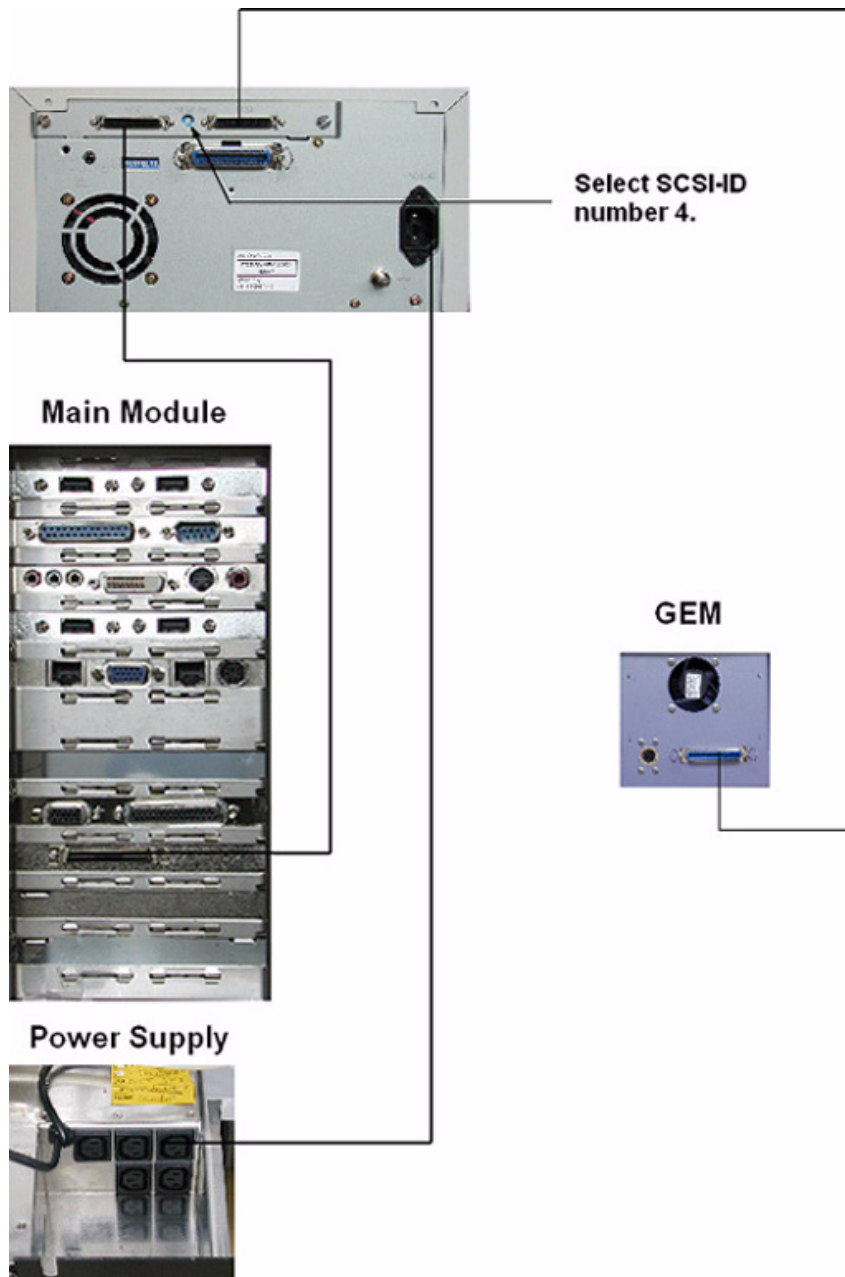


Figure 3-16 Digital Color Printer (Mitsubishi CP770DW) Connection Scheme

NOTICE The switch of the printer has to be in ON position before starting the system. Leave printer switch always in the ON position.

NOTICE Please use the proper connection set. see: [Section 9-12 "Optional Peripherals and Accessories" on page 9-27.](#)

NOTE: For further installation instructions see: [Section 3-7-3 "Installing Digital Color Printer Mitsubishi CP770DW\)" on page 3-28.](#)

3-5-9 Bluetooth Printer Connection



Figure 3-17 Bluetooth Printer Connection Scheme

- CAUTION** Please observe that the complete Bluetooth Printer Assembly has to be located outside of the patient environment (acc. IEC 60601-1 / UL 2601-1).
- CAUTION** The used printer (HP 5600 Series) may not be a medical device. The Bluetooth Printer Set and the Power Supply of the Bluetooth Printer Adapter is also not a medical device. The equipment meets the requirements of the EN60950 Standard.
- NOTICE** The switch of the printer has to be in ON position before starting the system. Leave printer switch always in the ON position.
- NOTICE** Please use the proper Bluetooth Printer Connection set. see: ["Section 9-12 Optional Peripherals and Accessories \(cont'd\)" on page 9-28.](#)

3-5-10 External USB-Devices

3-5-10-1 Connection

When an external USB-storage device (such as a USB-memory stick or an external hard disk) is connected to the Voluson® 730Pro system, Windows detects the device and automatically installs a driver.

During this process, several dialogs may pop up, starting with the „Found New Hardware“ dialog.

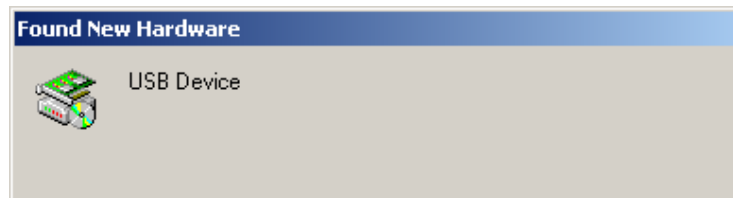


Figure 3-18 Found New Hardware - USB Device

The device is then accessible using the drive letter the system assigned to it.

3-5-10-2 Disconnection

Before an external USB-device (e.g., USB-memory stick) can be disconnected, the system has to be informed about the removal of the device! For this purpose the System Setup - BACKUP page (see: [Figure 4-21 on page 4-29](#)) has a STOP USB DEVICES button.

NOTE: *Unplugging or ejecting devices without first stopping them can often cause to crash and lose of valuable data.*

By clicking the STOP USB DEVICES button, the „Unplug or Eject Hardware“ dialog is started. Using this dialog, the USB-devices can be stopped before they are physically disconnected.

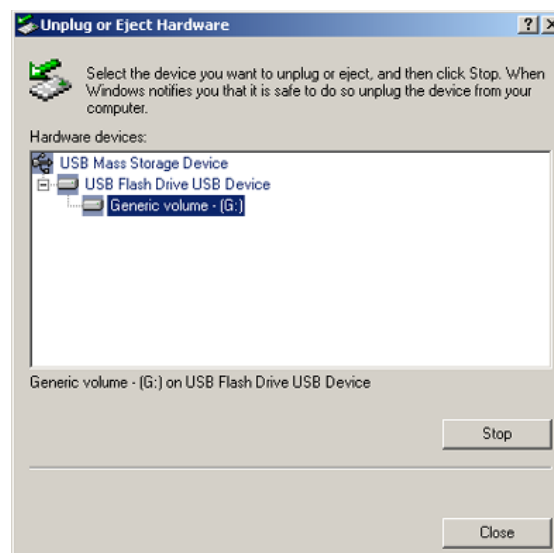


Figure 3-19 Unplug or Eject Hardware

The „Unplug or Eject Hardware“ dialog shows all USB-devices that are connected to the system.

3-5-10-2 Disconnection (cont'd)

To stop the external device, select it and click the STOP button.
A dialog shows which components will be stopped. To finish the process, click [OK].



Figure 3-20 Stop a Hardware device

Finally, a dialog shows that the device was stopped successfully.
The device can now be safely disconnected from the system.

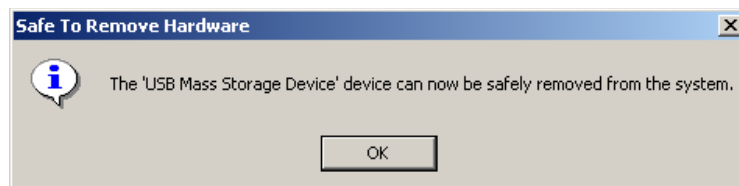


Figure 3-21 Safe to Remove Hardware

By clicking OK, the „Unplug or Eject Hardware“ dialog is active again.

Close this dialog by clicking CLOSE.

Afterwards select OK to reboot the system.



WARNING *Do not connect or disconnect any external USB-devices to or from the system while scanning a patient! The appearing dialogs could distract you from the scan!*

Section 3-6 Completing the Installation

3-6-1 Power On / Boot Up

3-6-1-1 Scanner Power On

- 1.) Connect the Power Cable to the back of the system.
- 2.) Connect the Main Power Cable to a hospital grade power receptacle with the proper rated voltage. Never use an adapter that would defeat the safety ground.
- 3.) Switch ON the Circuit Breaker and the Power Switch of peripherals at the rear of the system.



Figure 3-22 Circuit Breaker (F1) and Power Switch of Peripherals (F2)



NOTICE When AC power is applied to the scanner, the **ON/OFF** switch on the Control panel is illuminated, indicating that the System (including the Back-end Processor) is in standby mode.

3-6-1-2 Back-end Processor Boot Up

Press the **ON/OFF** Standby switch left below the Control Panel.

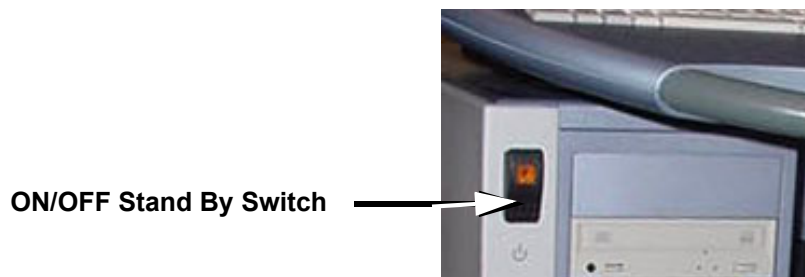


Figure 3-23 ON/OFF Standby Switch

When the **ON/OFF** Standby switch left below the Control Panel is pressed, the System (including the Back-end Processor) starts and the software code is distributed to initiate the scanner.

Depending on the BIOS-Version no status messages are displayed during this process. Boot up time is about 2 minutes.

NOTE: The mains outlet of the system for peripheral auxiliary equipment are commonly switched with the Standby switch. The switch of printers has to be in ON position before starting the system. So the auxiliary equipment need not to be switched ON/OFF separately if the **F2** power switch on the back of the system and the switches of the peripherals are always ON.

3-6-2 Power Off/ Shutdown

NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

3-6-2-1 Back-end Processor Power Down

- 1.) Press the **ON/OFF** Standby switch left below the Control Panel; [Figure 3-23](#).

3-6-2-2 Scanner Shutdown

- 1.) Press the **ON/OFF** Standby switch left below the Control Panel.
- 2.) Switch OFF the Circuit Breaker at the rear of the system.

NOTE: The mains outlet of the system for peripheral auxiliary equipment are commonly switched with the Standby switch. So the auxiliary equipment need not to be switched ON/OFF separately.

- 3.) Disconnection of the Mains Power Cable is necessary. *For example:* Repairing the scanner. Unscrew the 2 screws and remove the pull-out protection to disconnect the cable from the system, or unplug the cable from the wall socket.

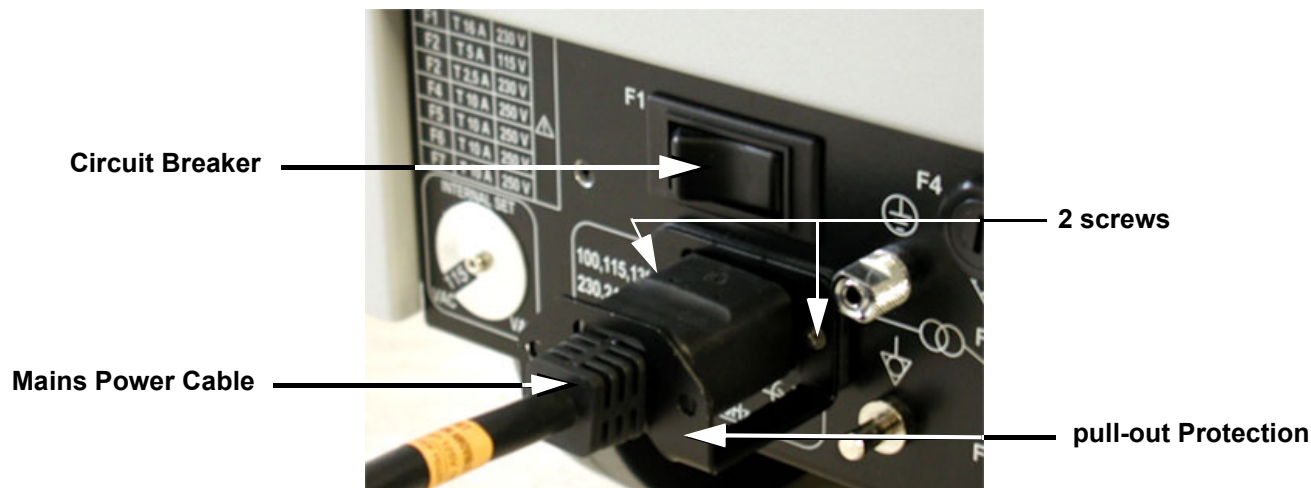


Figure 3-24 Circuit Breaker, Protection and Power Cable on back of Voluson® 730Pro

- 4.) Press once on the brakes to block the front wheels (brakes on front wheels under the foot rest).
- 5.) Prior to disconnect a probe freeze the image.
- 6.) Open the right-hand side door, remove the probe cable from the cable holder and close the door.
- 7.) Turn the probe locking handle counterclockwise. Pull the connector straight out of the probe port.



CAUTION If a probe is disconnected while running (Write-Mode) a software error may occur. In this case switch the unit OFF (perform a reset).

3-6-3 Transducer Connection

NOTE: *Prior to connecting or disconnecting a probe, freeze the image.
It is not necessary to turn OFF power to connect or disconnect a transducer.*

Connect a transducer to one of the three rightmost transducer receptacle as follows:

- 1.) Ensure that the transducer twist lock lever is at the horizontal position.
- 2.) Insert the transducer connector on the receptacle guide pin until it touches the receptacle mating surface.
- 3.) Twist the transducer twist lock lever to vertical position to lock it in place.
Twist the lever to the horizontal position to disconnect the transducer.
- 4.) Open the right-hand side door, lay the cable into the intended cable holder and close the door.

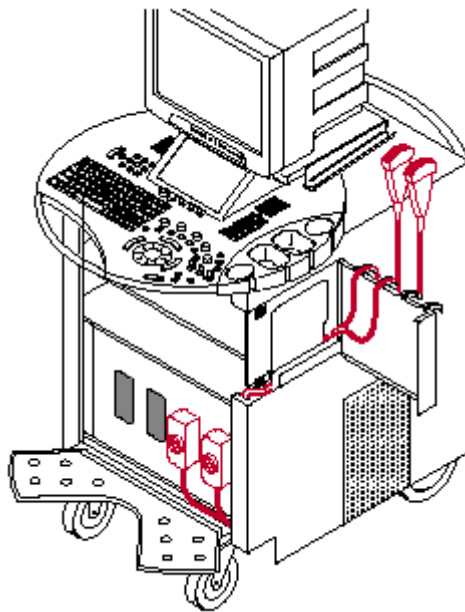


Figure 3-25 Transducer Connection

 **CAUTION** If the cable spout on the right-hand door is missing, don't pull the probe cable.
Please insert the spout in the designated place to avoid damage of the probe cable.

Section 3-7 Printer Installation

NOTE: For connection schemes refer to [Section 3-5 "Connection of Auxiliary Devices"](#).

For further installation instructions see:

- [Section 3-7-1 "Installing Line Printer HP 990cxi or HP 995c" on page 3-24.](#)
- [Section 3-7-2 "Installing Digital Color Printer Sony UP-D21MD or UP-D23MD" on page 3-26.](#)
- [Section 3-7-3 "Installing Digital Color Printer Mitsubishi CP770DW\)" on page 3-28.](#)
- [Section 3-7-5 "Adjustment of Printer Settings" on page 3-35.](#)



CAUTION The Bluetooth Printer Connection Set as well as the color printer HP 5600 Series **MUST NOT** be installed by the user!

For installation please contact your local distributor or GE service representative.

3-7-1 Installing Line Printer HP 990cxi or HP 995c

- 1.) Power off/Shutdown the system as described in: [Section 3-6-2 on page 3-21](#).
- 2.) Connect the printer as described on [page 3-8](#) and reinstall the rear cover plate.

NOTE: For connection scheme refer to [Section 3-5-6 on page 3-14](#) or see: [Figure 3-5 on page 3-7](#).



NOTICE Do not connect the USB-cable to the printer!

NOTE: "Mouse functions" can be performed by using the trackball for moving the cursor.
"Normal select" (Click) = left/right trackball key; "Opening a context menu" = upper trackball key

- 3.) Turn ON the printer, then switch ON the power of the system, and wait till the system has booted.

NOTE: The power switch of the printer has to be in ON position before starting the system!

3-7-1-1 Install the HP printer software/driver

Perform the following steps if this printer was never installed on the Voluson® 730Pro!

- 1.) Connect the USB cable to the printer and the system. The windows 'Searching for Drivers ...', 'Found new Hardware ...' and finally the following windows appear.

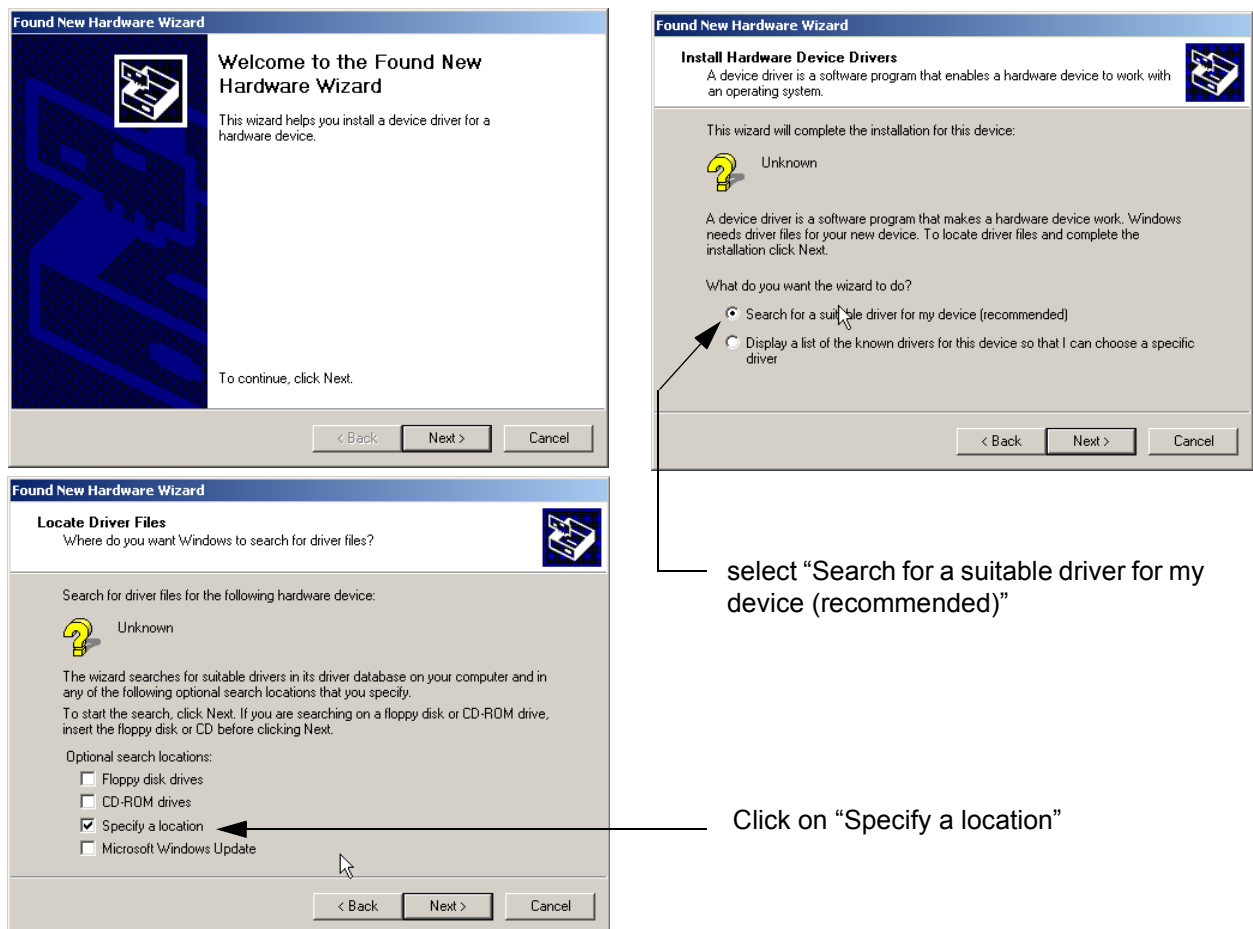


Figure 3-26 Found New Hardware Wizard

3-7-1-1 Install the HP printer software/driver (cont'd)

- 2.) Click the NEXT buttons to start the Hardware Wizard and to locate the driver files.
- 3.) Use the BROWSE button to search the following path on the hard disk (see: [Figure 3-27](#))
 - **C:\Utilities\PrinterDriver\HPDeskjet990c** for HP 990cxi
 - **C:\Utilities\PrinterDriver\HPDeskjet995c** for HP 995c, and then click OK.

NOTE: *If no drivers can be found on the hard disk (C:\...) for HP995c, use the HP-Installation disk and browse for the file **HPF995K.INF**. Path: **F:\DEU\DRIVERS\WIN2K_XP**.*



Figure 3-27 Search for Network path on hard disk

- 4.) Confirm the correct path and click NEXT to install the driver. All necessary files are copied.
- 5.) Confirm the installation by clicking FINISH to close the Hardware Wizard.

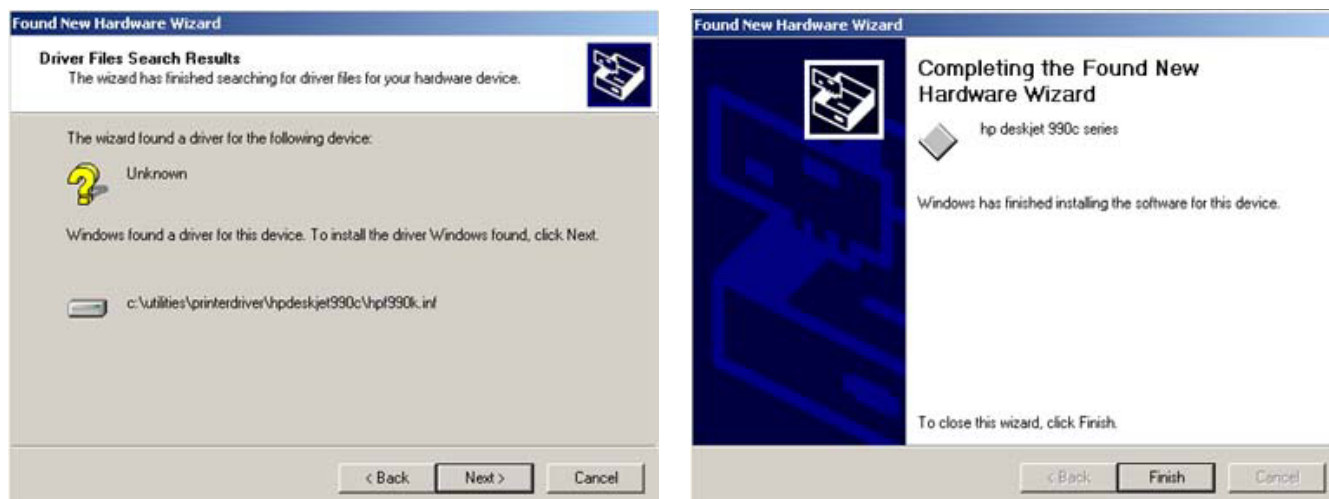


Figure 3-28 Confirm correct path and finish the Installation

- 6.) Close all open windows, close the "System Setup" with SAVE & EXIT and restart the system (turn off and on the system).



NOTICE After boot up of the system, verify the correct settings in the printer "Properties", see: [Section 3-7-5 "Adjustment of Printer Settings"](#) on page 3-35.

3-7-2 Installing Digital Color Printer Sony UP-D21MD or UP-D23MD

- 1.) Power off/Shutdown the system as described in: [Section 3-6-2 on page 3-21](#).
- 2.) Connect the printer as described in: [Section 3-5-7 on page 3-15](#) and reinstall the rear cover plate.

NOTE: For connection scheme refer to [Section 3-5-6 on page 3-14](#) or see: [Figure 3-5 on page 3-7](#).



NOTICE Do not connect the USB-cable to the printer!

NOTE: "Mouse functions" can be performed by using the trackball for moving the cursor.
"Normal select" (Click) = left/right trackball key; "Opening a context menu" = upper trackball key

- 3.) Turn ON the printer, then switch ON the power of the system and wait till the system has booted.

NOTE: The power switch of the printer has to be in ON position before starting the system!

3-7-2-1 Install the UP-D21MD / UP-D23MD printer software/driver

Perform the following steps if this printer was never installed on the Voluson® 730Pro!

- 1.) Connect the USB cable to the printer and the system. The windows 'Searching for Drivers ...', 'Found new Hardware ...' and finally the following windows appear.

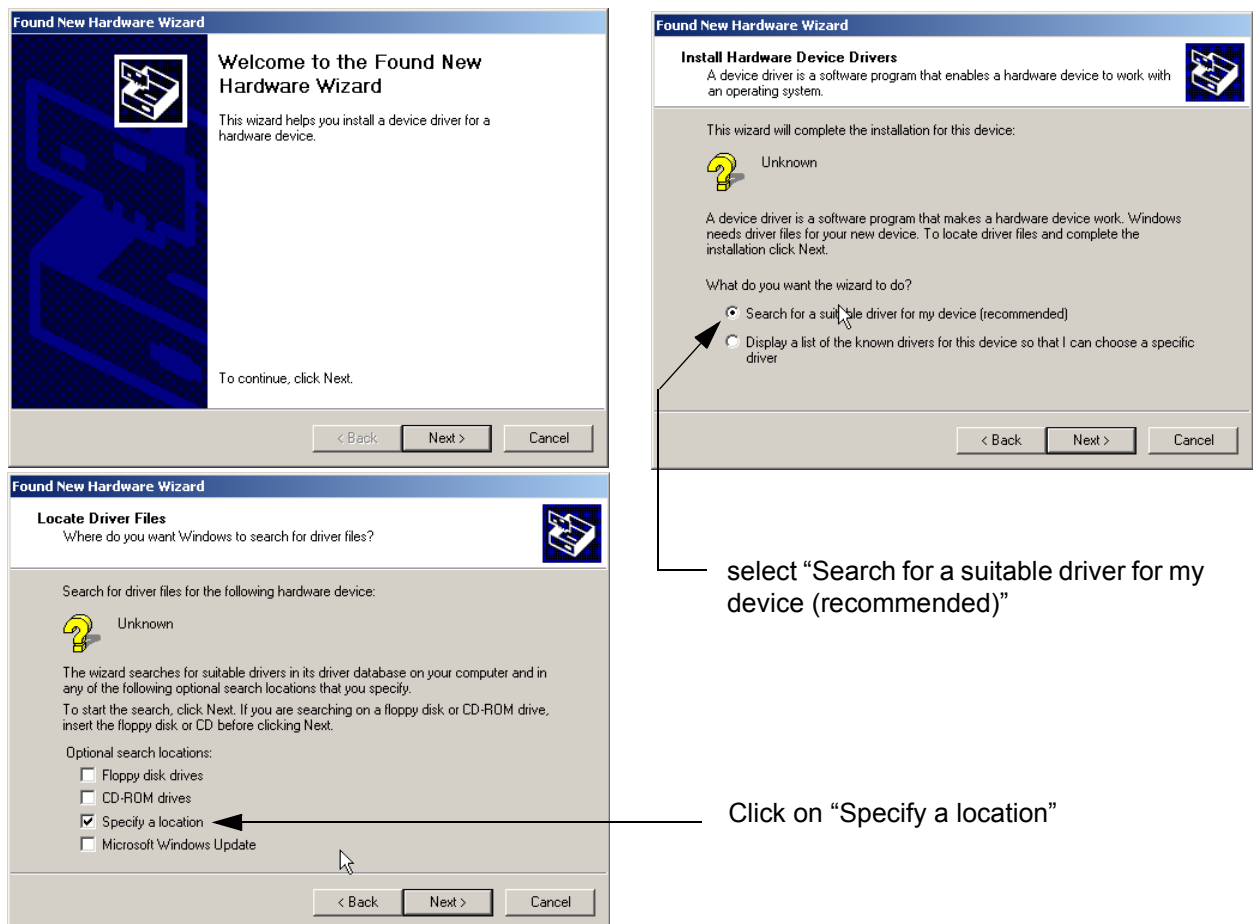


Figure 3-29 Found New Hardware Wizard

- 2.) Click the NEXT buttons to start the Hardware Wizard and to locate the driver files.

3-7-2-1 Install the UP-D21MD / UP-D23MD printer software/driver (cont'd)

- 3.) Use the BROWSE button to search the following path (see: [Figure 3-27](#)):
 - C:\Utilities\PrinterDriver\SonyUP-D21MD or
 - C:\Utilities\PrinterDriver\SonyUP-D23MD and then click OK.



Figure 3-30 Search for Network path

- 4.) Confirm the correct path and click NEXT to install the driver. All necessary files are copied.
- 5.) The Message: **Digital Signature Not Found** appears. Click YES.
- 6.) Confirm the installation by clicking FINISH to close the Hardware Wizard.

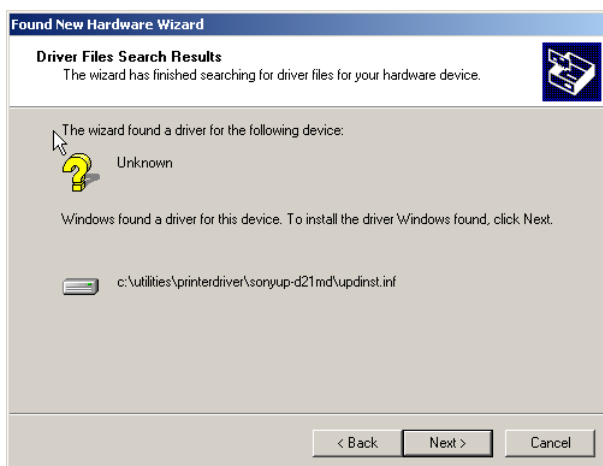


Figure 3-31 Confirm correct path and finish the Installation

- 7.) Close all open windows and restart the system (turn off and on the system).



NOTICE After boot up of the system, verify the correct settings in the printer "Properties", see: [Section 3-7-5 "Adjustment of Printer Settings"](#) on page 3-35.

3-7-3 Installing Digital Color Printer Mitsubishi CP770DW)

- 1.) Power off/Shutdown the system as described in: [Section 3-6-2 on page 3-21](#).
- 2.) Connect the printer as described on [page 3-8](#).

NOTE: For connection scheme refer to [Section 3-5-6 on page 3-14](#) or see: [Figure 3-5 on page 3-7](#).

- 3.) Remove SCSI-Adapter.



NOTICE If only one single SCSI-cable is connected between Main Module and GEM (Drive Module):

Disconnect the SCSI connector from the main module (PC-part) and connect it to the SCSI-printer. Connect the additional SCSI-cable (included in PZP50 connection set) from the main module to the SCSI-printer.

- 4.) Feed the SCSI-cables through the holes of the system housing to the front side where the printer will be placed and connect them to the printer.
- 5.) Feed the Power cable to the backside and connect it on the Voluson® 730Pro power supply.
- 6.) Reinstall the rear cover plate.



NOTICE Do not insert more SCSI-cables than required; the SCSI-cable length should be as short as possible!

NOTE: "Mouse functions" can be performed by using the trackball for moving the cursor.
"Normal select" (Click) = left/right trackball key; "Opening a context menu" = upper trackball key

- 7.) Turn ON the printer.
- 8.) Switch ON the power of the system and wait till the system has booted.

NOTE: The power switch of the printer has to be in ON position before starting the system!
Leave the power switch of the printer always in the ON position.

- 9.) Follow the printer installation steps as described in [Section 3-7-4 "Printer Installation manually" on page 3-29](#).

3-7-4 Printer Installation manually

- 1.) On the control panel, press the **UTILITIES** key.
- 2.) In the "Utilities" menu on the left side of the screen, select **SYSTEM** to invoke the setup desktop.
- 3.) Select the **SERVICE** page. The "password window" appears automatically.



Figure 3-32 System Setup Service page

- 4.) Enter the password **SHE** and click the **ACCEPT** button to display the Service Tools window.

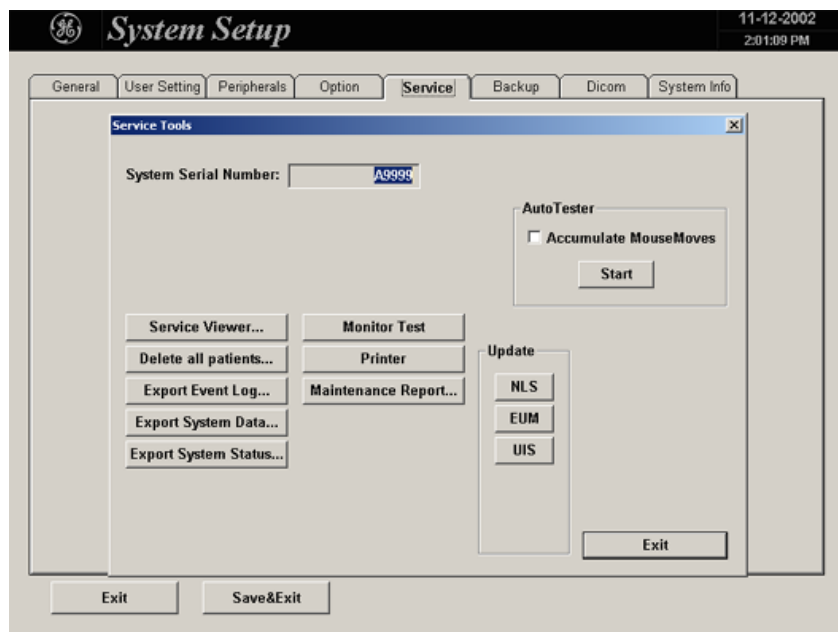


Figure 3-33 Service Tools window

- 5.) Click on the **PRINTER** button.

3-7-4 Printer Installation manually (cont'd)

6.) Click the ADD PRINTER button.

A warning message appears:

Please read this message carefully and click YES if you have skills to do this.

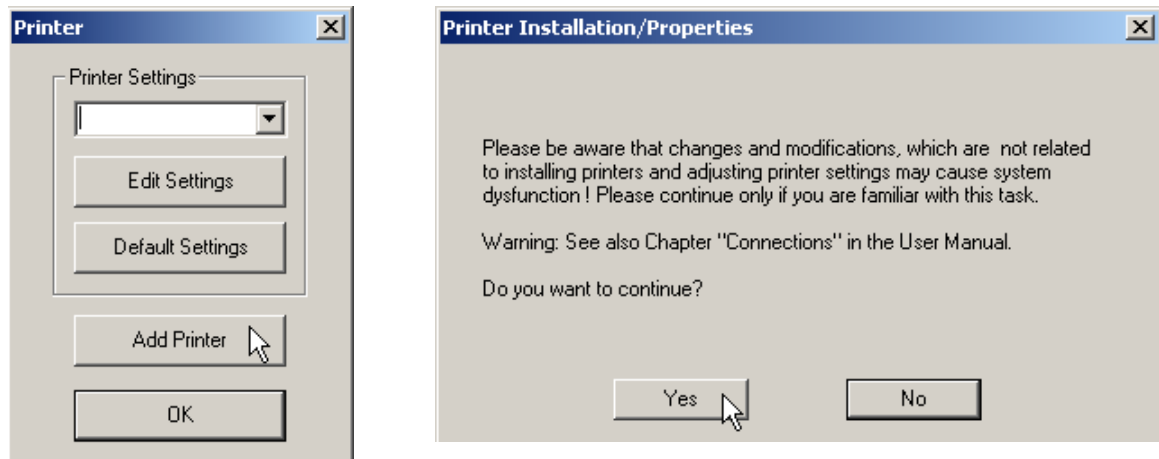


Figure 3-34 Add Printer and Printer Installation/Properties



NOTICE At older Software versions, first the warning message appears.
After confirming with the YES button, click the ADD PRINTER icon on the displayed screen.

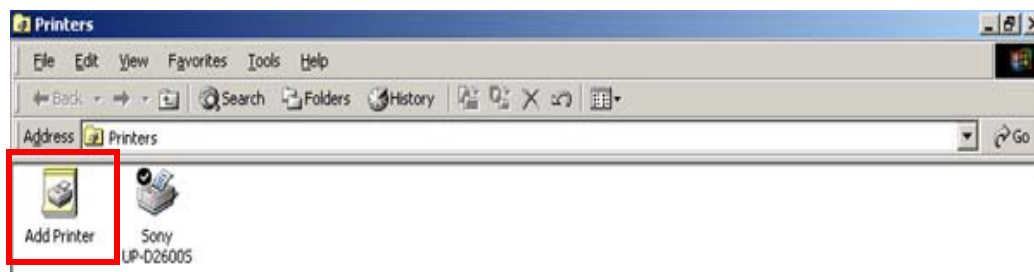


Figure 3-35 Add Printer (at older Software versions)

3-7-4 Printer Installation manually (cont'd)

- 7.) Click the NEXT button to start the Add Printer Wizard.
- 8.) Select the 'Local Printer', deselect "Automatically install Plug and Play printer" and then click NEXT.

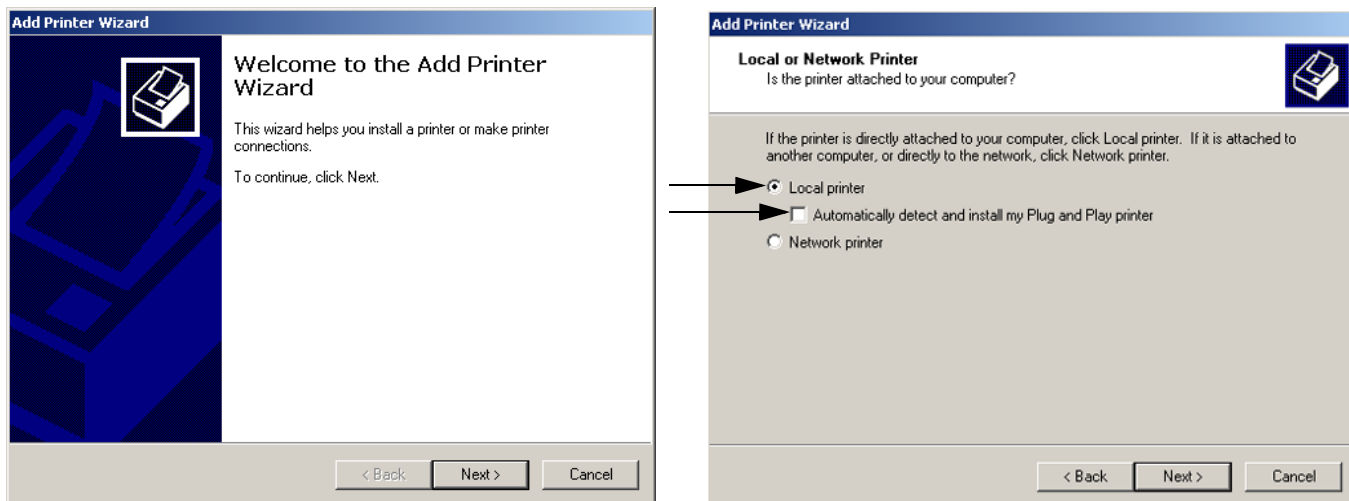


Figure 3-36 Add Printer Wizard

- 9.) Select the corresponding Printer Port (e.g., [Figure 3-37](#) Sony UP-D21MD = USB002) and click NEXT.



CAUTION If you have to install the SCSI-Printer UP-D2600S or the SCSI-Printer CP770DW for the first time, the correct port may not be listed.

In this case, select any port and finish the installation procedure. After restart of the system, adjust the port selection in the printer "Properties"; see: [Section 3-7-5 on page 3-35](#).

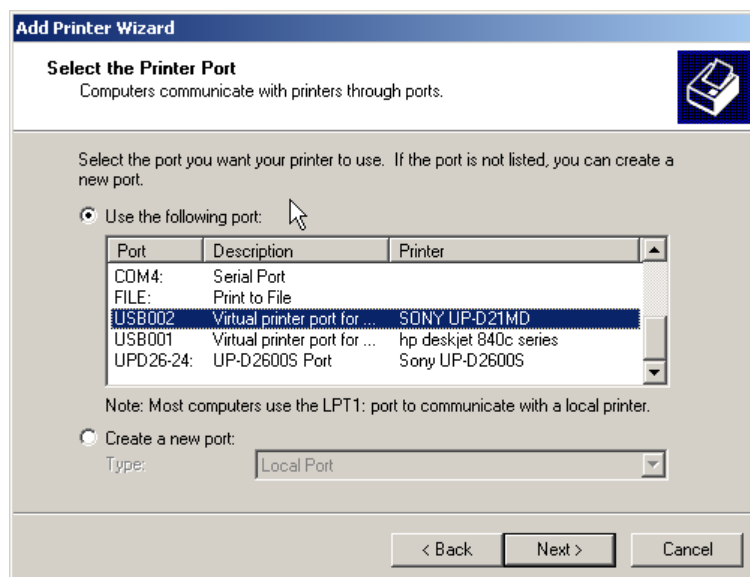


Figure 3-37 Select Printer Port

3-7-4 Printer Installation manually (cont'd)

10.) In the following window select the HAVE DISK button.

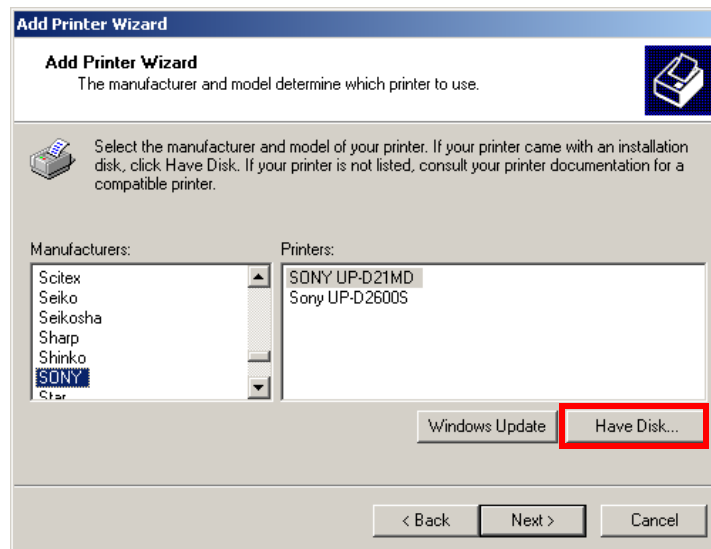


Figure 3-38 Have Disk...

11.) Use the BROWSE button to search the Printer Driver path.

- for Line Printer HP 990cxi **C:\Utilities\PrinterDriver\HPDeskjet990c**
- for Line Printer HP 995c **C:\Utilities\PrinterDriver\HPDeskjet995c**
- for Digital Color Printer UP-D21MD **C:\Utilities\PrinterDriver\SonyUP-D21MD**
- for Digital Color Printer UP-D23MD **C:\Utilities\PrinterDriver\SonyUP-D23MD**
- for Digital Color Printer UP-D2600S **C:\Utilities\PrinterDriver\SonyUP-D2600S**
- for Digital Color Printer CP770DW **C:\Utilities\PrinterDriver\MitsubishiCP770DW**

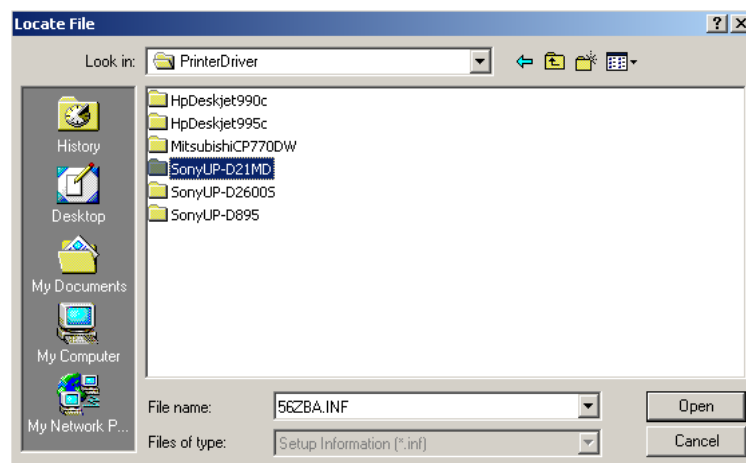


Figure 3-39 Select Printer Driver path (C:\Utilities\PrinterDriver\....)

NOTE: If no drivers can be found on the hard disk (C:\...), use the HP-Installation disk and browse for the path:
• **F:\DEU\DRIVERS\WIN2K_XP** (for a HP995c printer)

12.) Click OPEN.

3-7-4 Printer Installation manually (cont'd)

13.) Verify the selected Printer Driver path and confirm with OK.

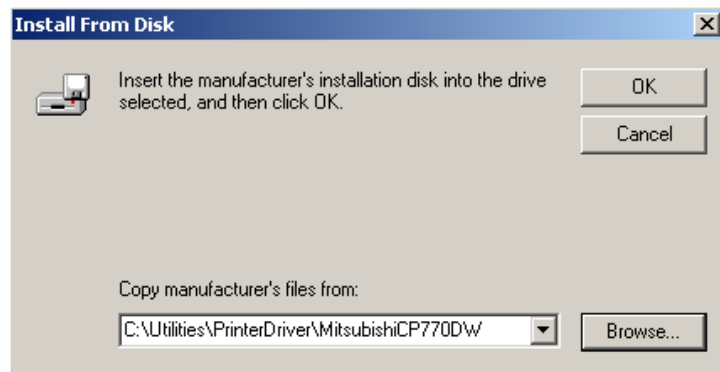


Figure 3-40 verify selected Printer Driver path

14.) Select the manufacturer and model of your printer and confirm with the NEXT button.

15.) Assign a name, decide if the printer should be used as default printer and confirm with NEXT. see: Figure 3-41.

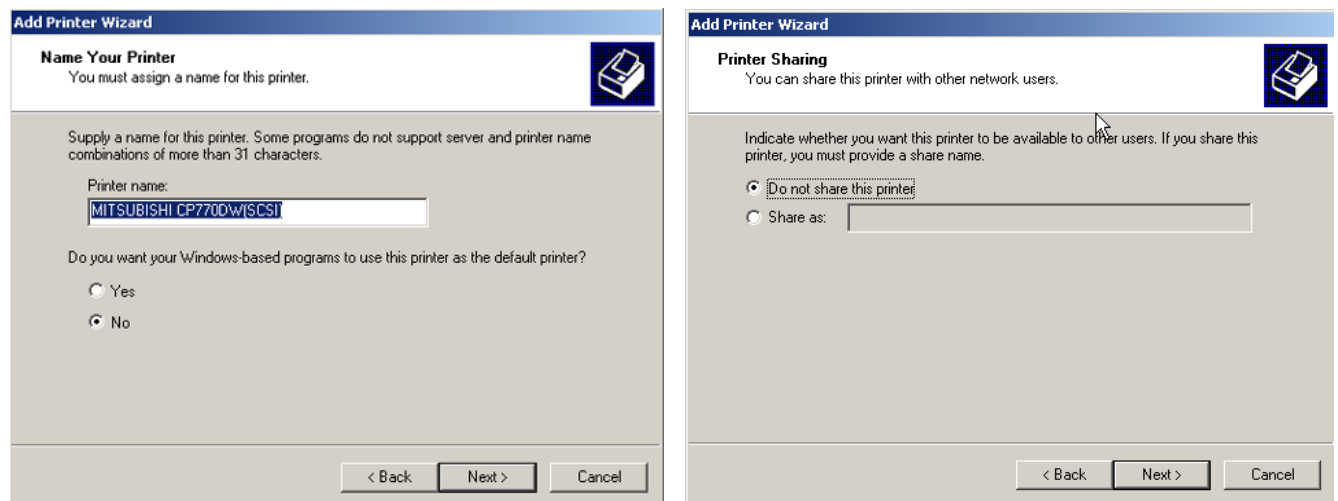


Figure 3-41 Assign name and select Printer Sharing - no

16.) Select 'Do not share this printer' and confirm the "Printer Sharing" window (Figure 3-41) by clicking NEXT.

3-7-4 Printer Installation manually (cont'd)

17.)The "Complete the Add Printer Wizard" window appears on the screen.

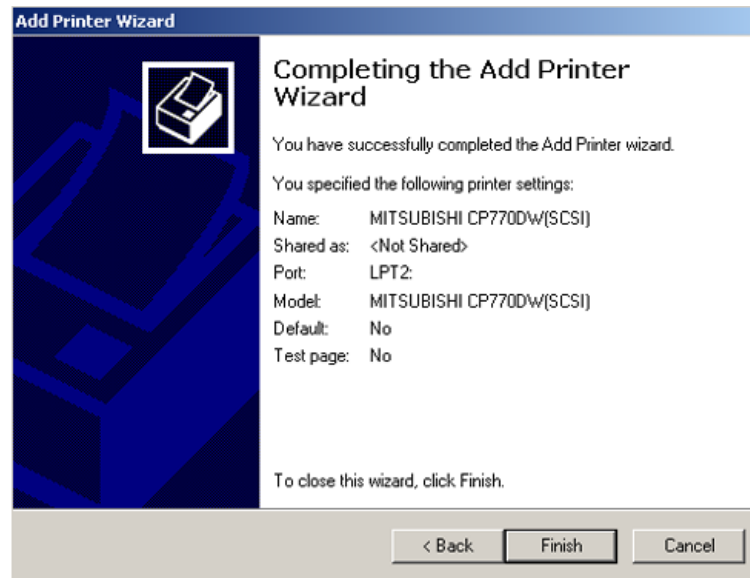


Figure 3-42 Complete manual Printer Installation

18.)Complete the manual Printer Installation with the FINISH button.

19.)Close all open windows, close the "System Setup" with SAVE & EXIT and restart the system (turn off and on the system).



NOTICE After boot up of the system, verify the correct settings in the printer "Properties", see: [Section 3-7-5 "Adjustment of Printer Settings" on page 3-35.](#)

3-7-5 Adjustment of Printer Settings

- 1.) After system restart, press the UTILITIES key and then select the SYSTEM item in the menu area.
- 2.) Select the SERVICE page, enter the password **SHE** and click the ACCEPT button.
- 3.) Click on the PRINTER button.
- 4.) Select the desired printer from the pull-down menu and click the EDIT SETTINGS button.
- 5.) Confirm the warning message with the YES button. The **"Printer Properties"** appear.

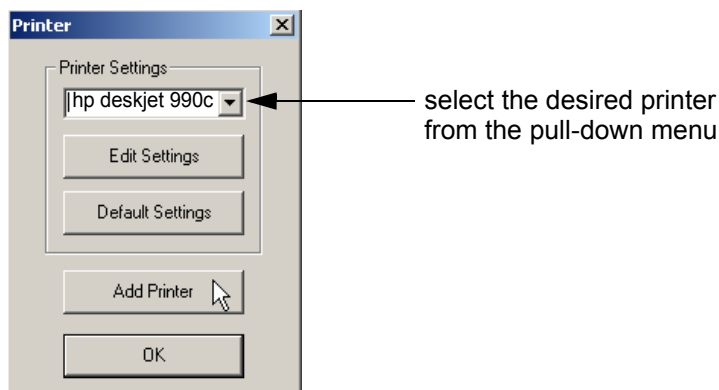


Figure 3-43 Select the desired printer



NOTICE At older Software versions, first the warning message appears. After confirming with the YES button, select the desired printer and press the upper trackball key to call up the **"Printer Properties"**.

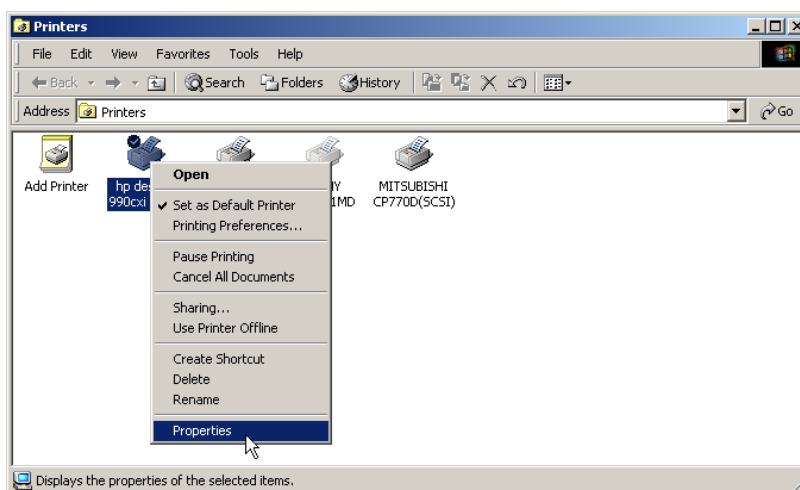


Figure 3-44 Printer Installation (at older Software versions)

To adjust the HP 990cxi / HP 995c printer see: [Section 3-7-5-1 "HP 990cxi / HP 995c- Printer Settings"](#) .

To adjust the UP-D21MD / UP-D23MD printer see: [Section 3-7-5-2 "UP-D21MD / UP-D23MD - Printer Settings"](#) .

To adjust the CP770DW Printer see: [Section 3-7-5-3 "CP770DW - Printer Settings"](#) .

To adjust the Bluetooth HP 5600 Series printer see: [Section 3-7-5-4 "HP 5600 Series - Printer Settings"](#)



WARNING *After each printer installation, the leakage currents have to be measured acc. IEC 60601-1 resp. UL2601-1.*

3-7-5-1 HP 990cxi / HP 995c- Printer Settings

- 1.) Call up the '**Printer Properties**'; operation see: [Section 3-7-5 "Adjustment of Printer Settings"](#) .
- 2.) Select the **GENERAL** page and click the **PRINTING PREFERENCES...** button.
- 3.) Select the **SETUP** page for adjusting print quality and paper size.
"Paper type" should be set to 'Automatic'. See left [Figure 3-45](#).
- 4.) Select the **FEATURES** page for adjusting 'Two-Side Printing' if desired.
"Orientation" must be set to 'Portrait'. See right [Figure 3-45](#).

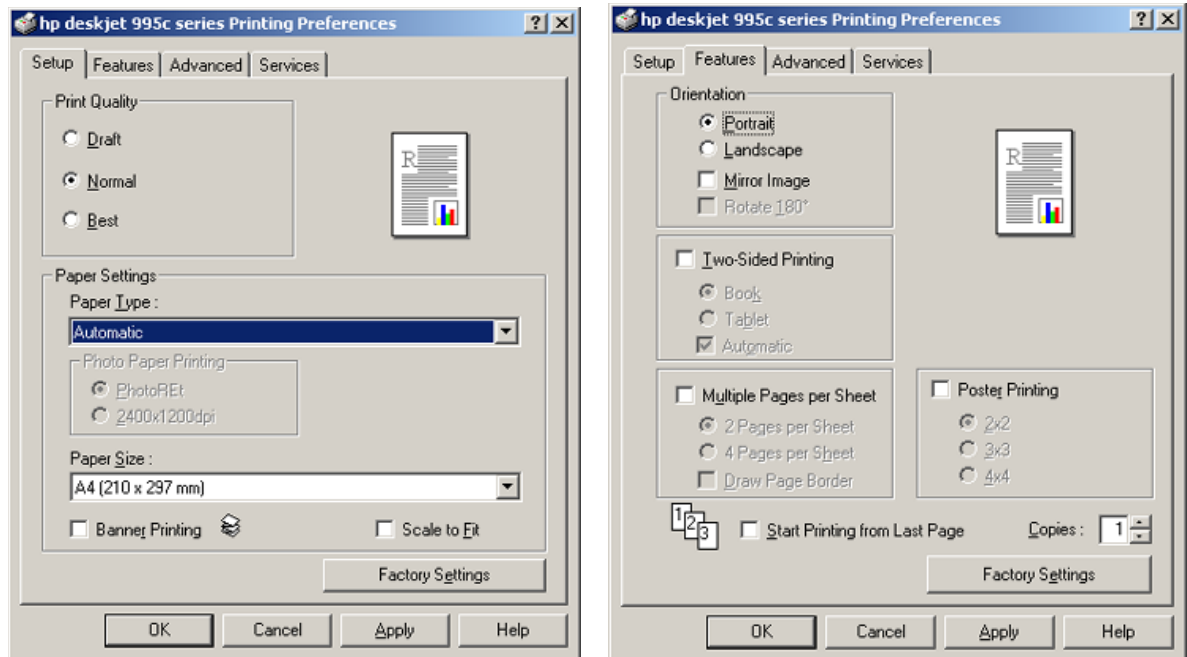


Figure 3-45 HP Printer - Settings

- 5.) For saving the adjusted printer settings click **APPLY** and then **OK**.
- 6.) Select the **PORTS** page and select/verify the correct USB printer port.
- 7.) For saving the adjusted printer settings click **APPLY** and then **OK**.
Finally close the 'Printers' -window with the close button and exit System Setup with **SAVE&EXIT**.
- 8.) Assign the HP 990cxi / HP 995c printer as Report Printer;
see: [Section 3-7-6 "Printer Remote Control Selection" on page 3-41](#).
- 9.) Print report page(s) containing measurements.
For operation see Basic User Manual of Voluson® 730Pro.
- 10.) **Turn off** the system!

3-7-5-2 UP-D21MD / UP-D23MD - Printer Settings

1.) Call up the '**Printer Properties**'; operation see: [Section 3-7-5 "Adjustment of Printer Settings"](#) .



NOTICE Settings for Paper Size MUST match with the used Paper (large/small) and also the right color ink cartridge has to be used. Otherwise you will get an error message at printing.

2.) Select the **PAPER** page and select:

- Paper Size: **UPC-21L** (large) / UPC-21S (small)
- Orientation: **Landscape** (recommended when using large paper size)
- **High Speed** (check mark on)

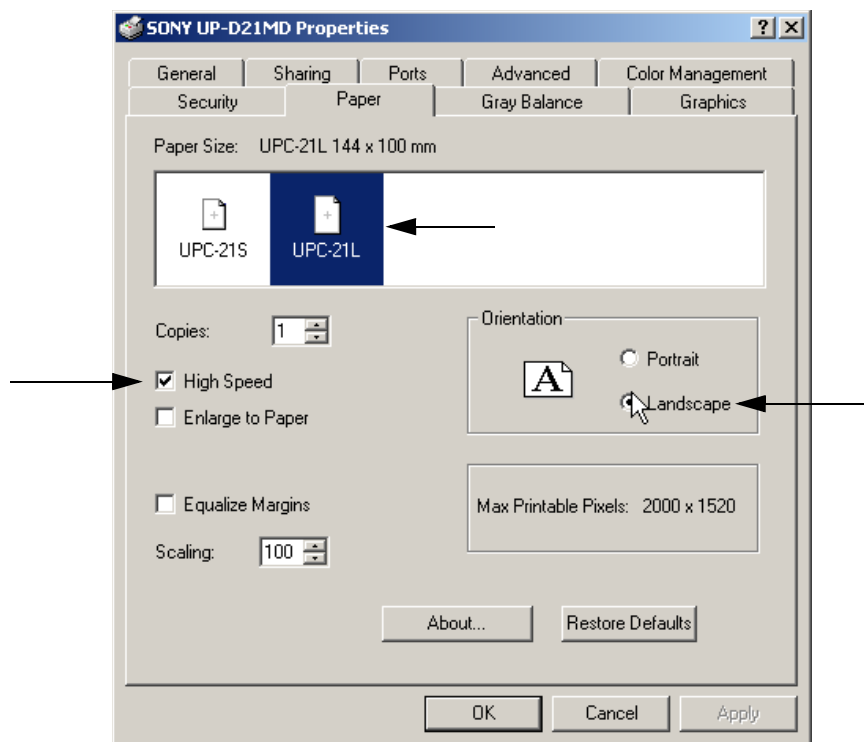


Figure 3-46 Paper page

3-7-5-2 UP-D21MD / UP-D23MD - Printer Settings (cont'd)

3.) Select the **GRAPHICS** page. From the "Color Adjust" pop-up menu select:

- a.) Color Balance: Cyan = **0**; Magenta = **0**; Yellow = **0**
- b.) Gamma Select: **Gamma 1**

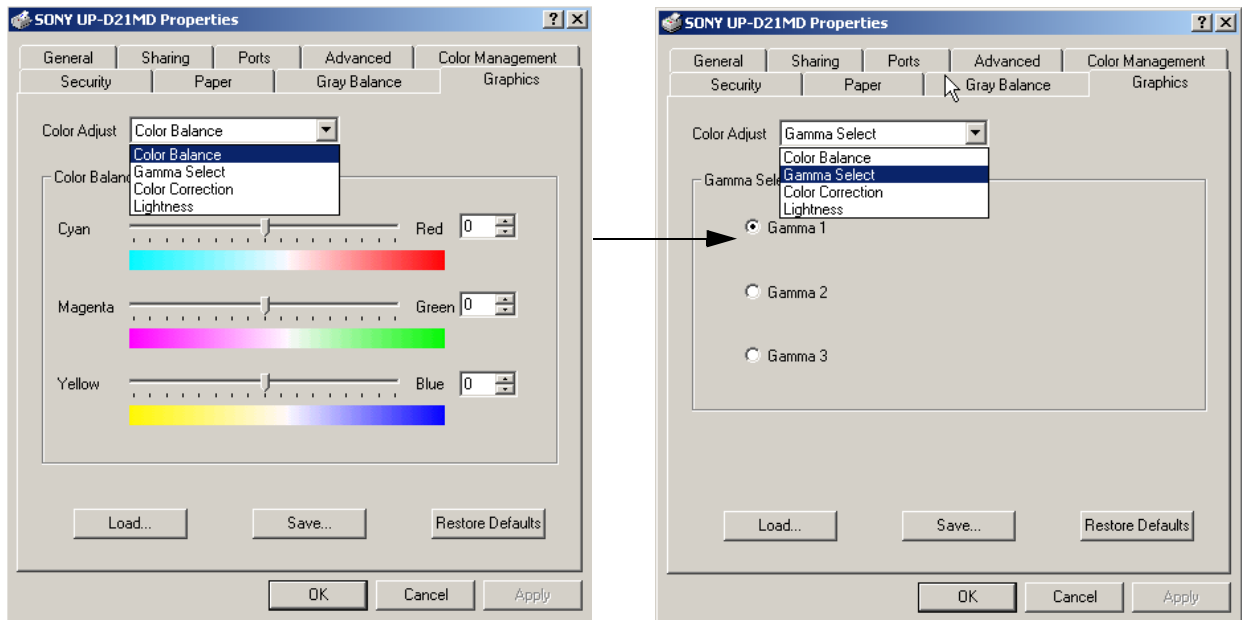


Figure 3-47 Graphics page (Color Balance + Gamma Select)

- c.) Color Correction: set **Printer Hardware Color Correction**
- d.) Lightness: Sharpness = **7** or **8**; Dark = **0**; Gamma = **-12**; Light = **8**

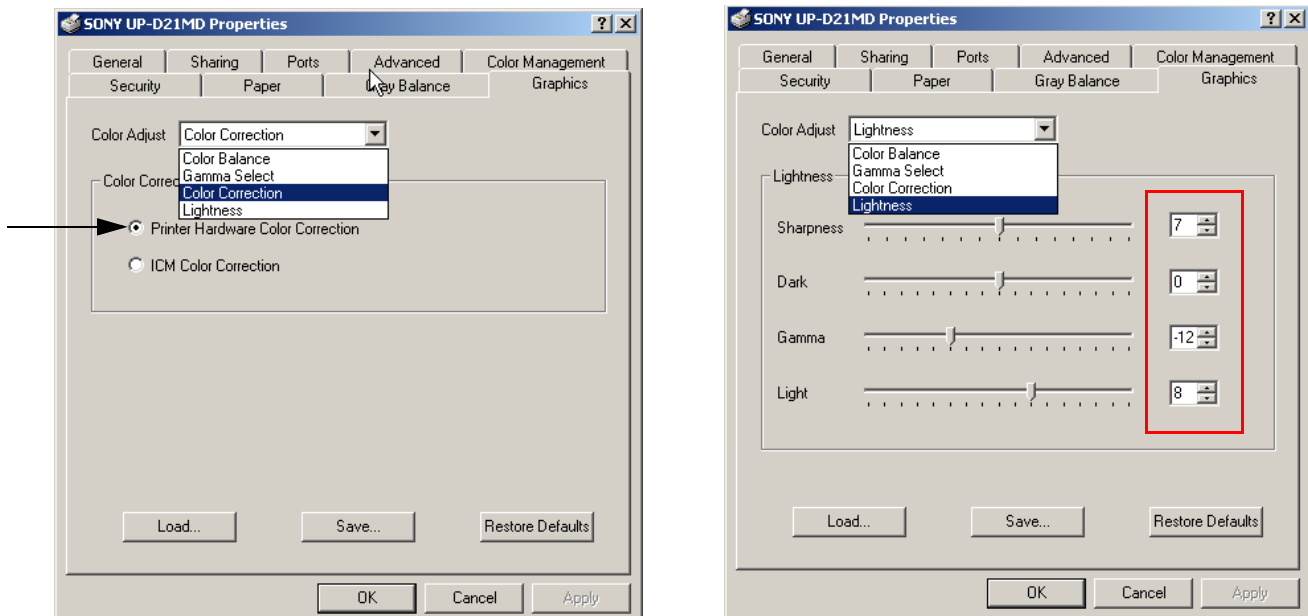


Figure 3-48 Graphics page (Color Correction + Lightness)

- 4.) For saving the adjusted printer settings click **APPLY** and then **OK**.
Finally close the 'Printers'-window with the close button and exit System Setup with **SAVE&EXIT**.

3-7-5-3 CP770DW - Printer Settings

- 1.) Call up the '**Printer Properties**'; operation see: [Section 3-7-5 "Adjustment of Printer Settings"](#) .
- 2.) Select the **PORTS** page and select/verify the correct printer port.
- 3.) Select the **GENERAL** page and click the **PRINTING PREFERENCES...** button.
- 4.) In the displayed **PAPER** page select: Paper Size = **S** and Orientation = **Portrait**.

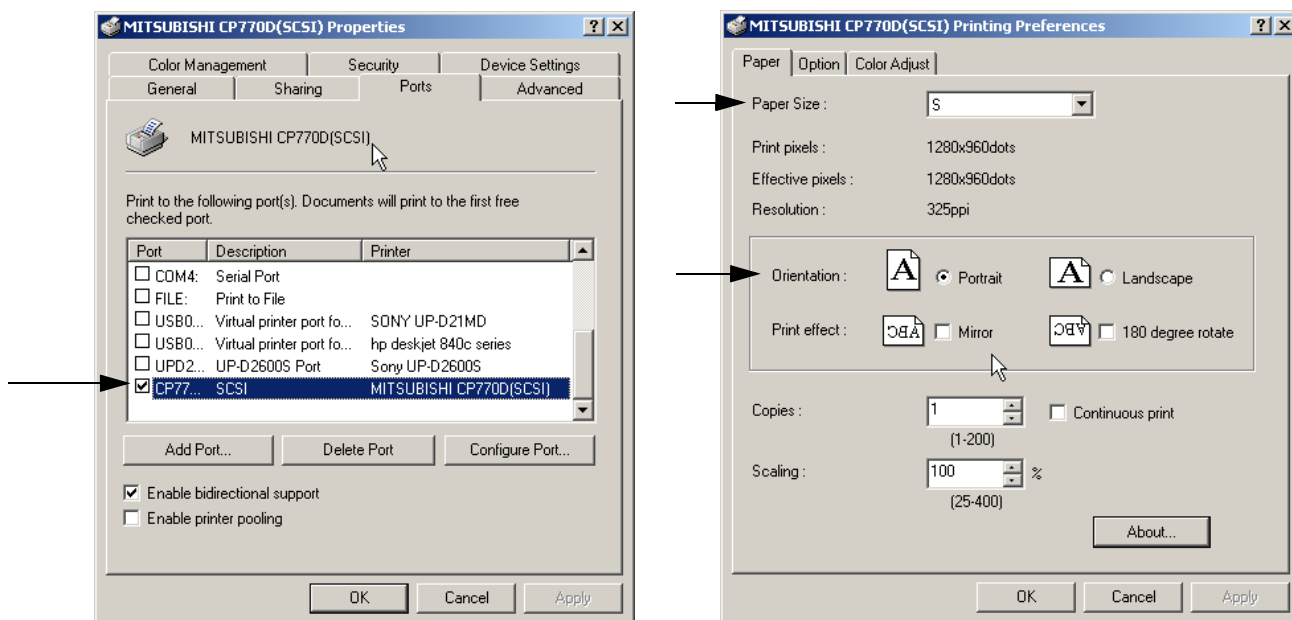


Figure 3-49 Ports page + Paper page

- 5.) Select the **COLOR ADJUST** page and click the **GAMMA ADJ...** button.

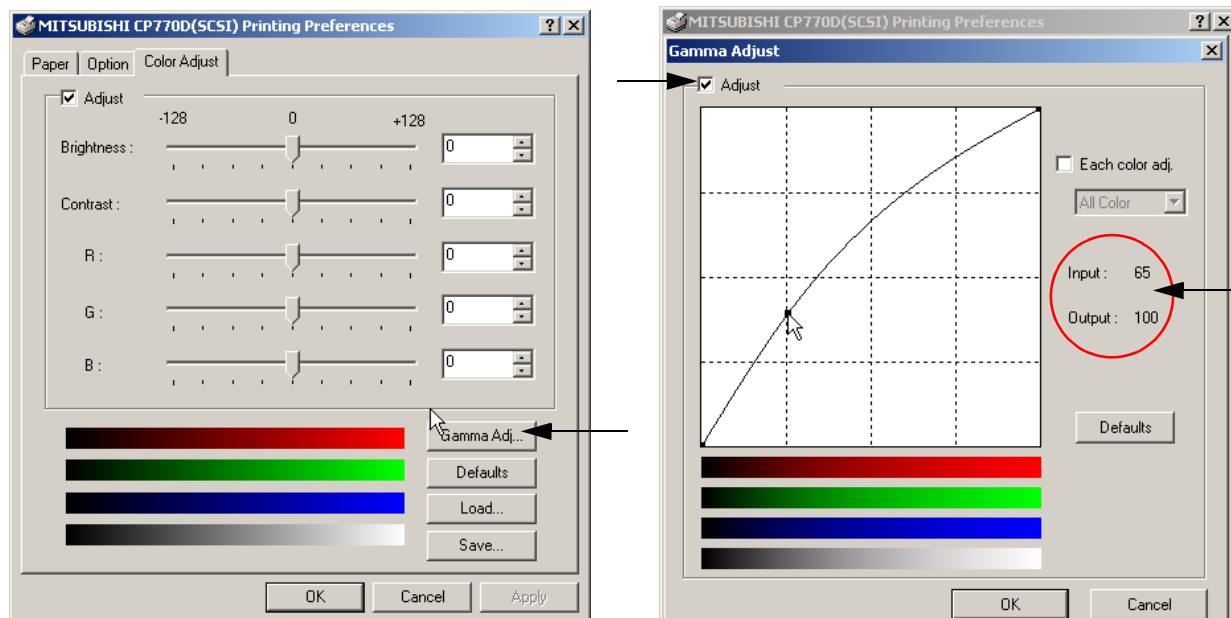


Figure 3-50 Color Adjust page + Gamma Adjust page

- 6.) Hook the "Adjust" field and move the line with the trackball till it shows: Input = 65; Output = 100.

3-7-5-3 CP770DW - Printer Settings (cont'd)

7.) For saving the adjusted printer settings click OK.

NOTE: When you call up the "Gamma Adjust" page again, the Input and Output parameters won't be shown until re-adjustment of the displayed Gamma curve.

8.) For saving the adjusted printer settings click APPLY and then OK.

9.) Finally close the 'Printers'-window with the close button and exit System Setup with SAVE&EXIT.

3-7-5-4 HP 5600 Series - Printer Settings



CAUTION The Bluetooth Connection Set as well as the color printer HP 5600 Series **MUST NOT** be installed by the user! For installation please contact your local distributor or GE service representative.

- 1.) Call up the '**Printer Properties**'; operation see: [Section 3-7-5 "Adjustment of Printer Settings"](#) .
- 2.) Select the GENERAL page and click the PRINTING PREFERENCES... button.
- 3.) Select the PAPER/QUALITY page and select the adequate paper size.

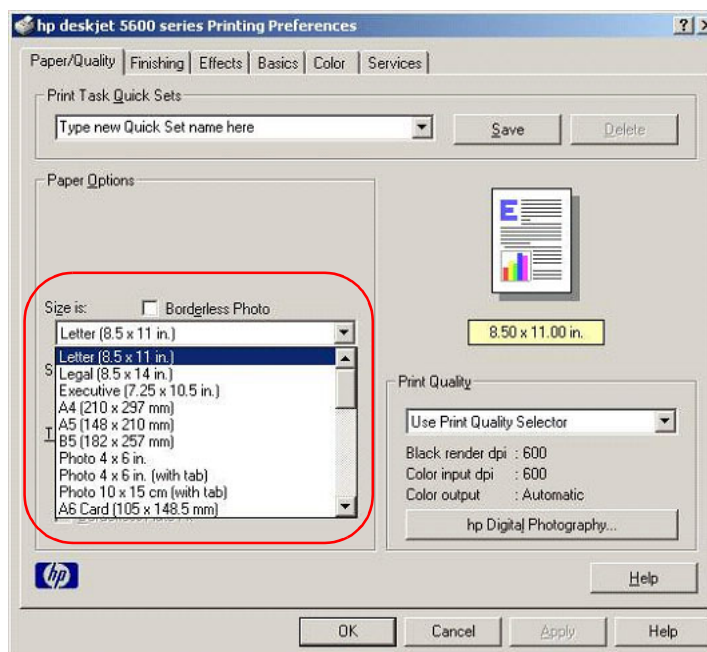


Figure 3-51 Paper/Quality page

- 4.) For saving the adjusted paper size settings click APPLY and then OK.
- 5.) In the next window, click OK again.
Finally close the 'Printers' -window with the close button and exit System Setup with SAVE&EXIT.
- 6.) Assign the HP 5600 Series printer as Report Printer;
see: [Section 3-7-6 "Printer Remote Control Selection" on page 3-41](#).
- 7.) Print report page(s) containing measurements.
For operation see Basic User Manual of Voluson® 730Pro.
- 8.) **Turn off** the system!

3-7-6 Printer Remote Control Selection

To assign the Remote **PRINT A** key, Remote **PRINT B** key and Report Printer to desired Printer:

- 1.) On the control panel, press the **UTILITIES** key.
- 2.) In the "Utilities" menu on the left side of the screen select **SYSTEM** to invoke the setup desktop.
- 3.) Select the **PERIPHERALS** page.

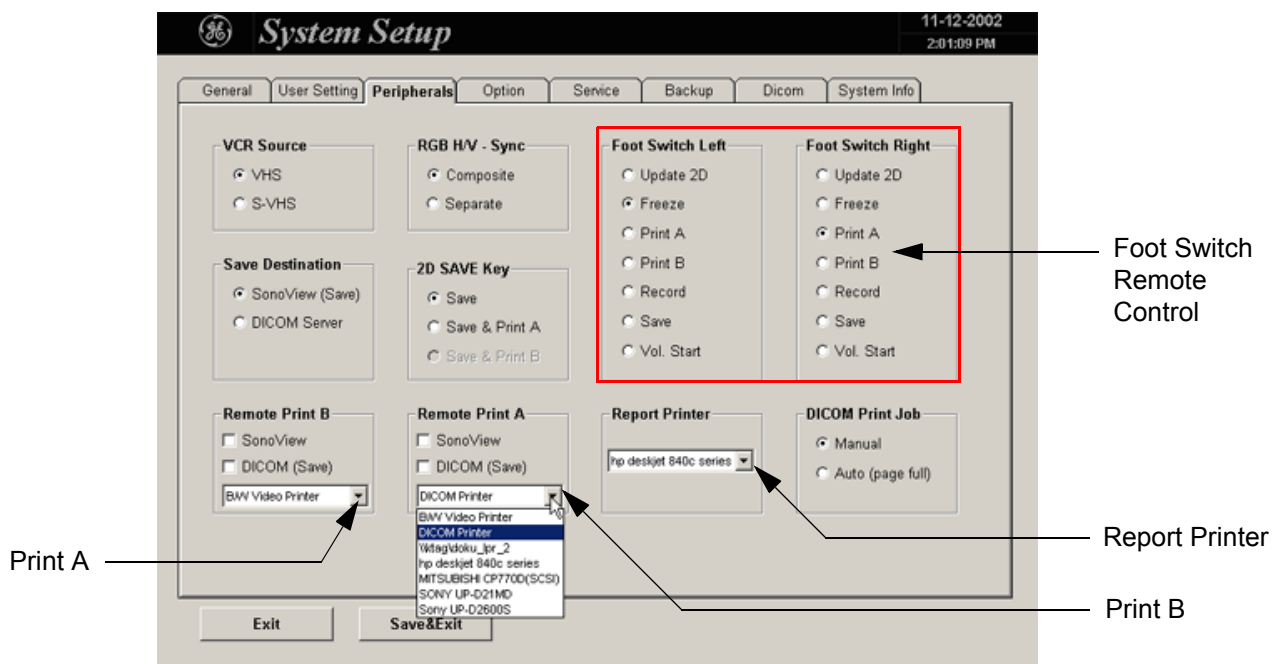


Figure 3-52 Peripherals page

- **Remote Print A:** Select the desired Printer for the remote control **PRINT A** key.
- **Remote Print B:** Select the desired Printer for the remote control **PRINT B** key.

NOTE: Optionally the Remote Control can be done by Foot switches.
Therefore select "Print A" or "Print B" in "Foot Switch Left" or "Foot Switch Right" - section.

- **Report Printer:** Select the desired Report Printer from the drop-down menu.



NOTICE The selected Report Printer (usually HP 990cxi or HP 995c) is used for printing reports and images from Sonoview.

Section 3-8 System Configuration

3-8-1 System Specifications

3-8-1-1 Physical Dimensions of Voluson® 730Pro

The physical dimensions of the Voluson® 730Pro unit are summarized in [Table 3-5](#).
[Table 3-6](#) lists the size of Voluson® 730Pro, with monitor and without on-board peripherals.

Table 3-5 Physical Dimensions of Voluson® 730Pro

Height	Width	Depth
145 cm / 57.1 inches	68 cm / 26.8 inches	100 cm / 39.4 inches

3-8-1-2 Weight without Monitor and Peripherals

Table 3-6 Weight of Voluson® 730Pro with Monitor and without other Peripherals

Model	Weight [kg]	Weight [lbs.]
Voluson® 730Pro	134	300

3-8-1-3 Acoustic Noise Output

max. 57dB(A)

3-8-2 Electrical Specifications

Table 3-7 Electrical Specifications for Voluson® 730Pro

Voltage	Tolerances	Current	Frequency
100 VAC	±10%	10.10 A	50, 60 Hz (±2%)
115 VAC	±10%	8.80 A	50, 60 Hz (±2%)
130 VAC	±10%	7.80 A	50, 60 Hz (±2%)
230 VAC	±10%	4.40 A	50, 60 Hz (±2%)
240 VAC	±10%	4.20 A	50, 60 Hz (±2%)

Power Consumption nominal 1010 VA including all options.

Mains outlets: Mains socket ST1, ST2, ST3, ST4, ST5 for accessories.

All mains outlets are co-switched by the unit's mains switch via built-in isolation transformer.

Output voltage for: ST1 - ST5: 115V or 230V.



CAUTION Modification of voltage setting only by an authorized service person!
The maximum power consumption of equipment (inclusive color video monitor) connected to these outlets must not exceed 350VA.

3-8-3 System Setup

Modifications of system parameters are supported by diverse dialog pages and windows on the system setup desktop:

- **General** - Date, Time, Clinic Name, Language, Screen saver, etc.
- **User Settings** - to save User programs, 3D/4D programs, Auto Text, Doppler 2D Refresh, etc.
- **Peripherals** - to adjust assignment of PRINT keys, Foot Switch, selection of Save Destination, etc.
- **Option** - shows which options are installed in the system
- **Service** - enter the password to get access to the Service Tools functions
- **Backup** - Save/Load User Settings Only, Save/Load/Delete Full Backup
- **DICOM** - to set up all DICOM target nodes (image servers) and Network configuration nodes
- **System Info** - shows which Software/Hardware version is installed in the system

To invoke the Setup procedure:



- 1.) Press the UTILITIES key on the Control Panel. The menu area changes to the Utilities menu.
- 2.) Select the SYSTEM item to activate the setup desktop screen.

In general operations are done with the trackball and the trackball keys (mouse emulation).



Trackball (mouse position):
positions the pointing device (arrow) on the desktop



left trackball key (left mouse button):
sets, fixates markers and activates pages/buttons etc. marked by the pointing device



upper trackball key (right mouse button):
no function in system desktop



right trackball key (left mouse button):
sets, fixates markers and activates pages/buttons etc. marked by the pointing device

3-8-3-1 How to enter Date and Time

Select the GENERAL page in the System Setup see: [Figure 3-53](#).

- 1.) Select the "Date Format" (only one can be active).
- 2.) Click the DATE/TIME button to activate a sub dialog window to enter date, time and time zone.
- 3.) Click the TIME FORMAT button to activate a sub dialog window to choose the preferred time format.
- 4.) Click SAVE&EXIT to save Settings and exit System Setup.

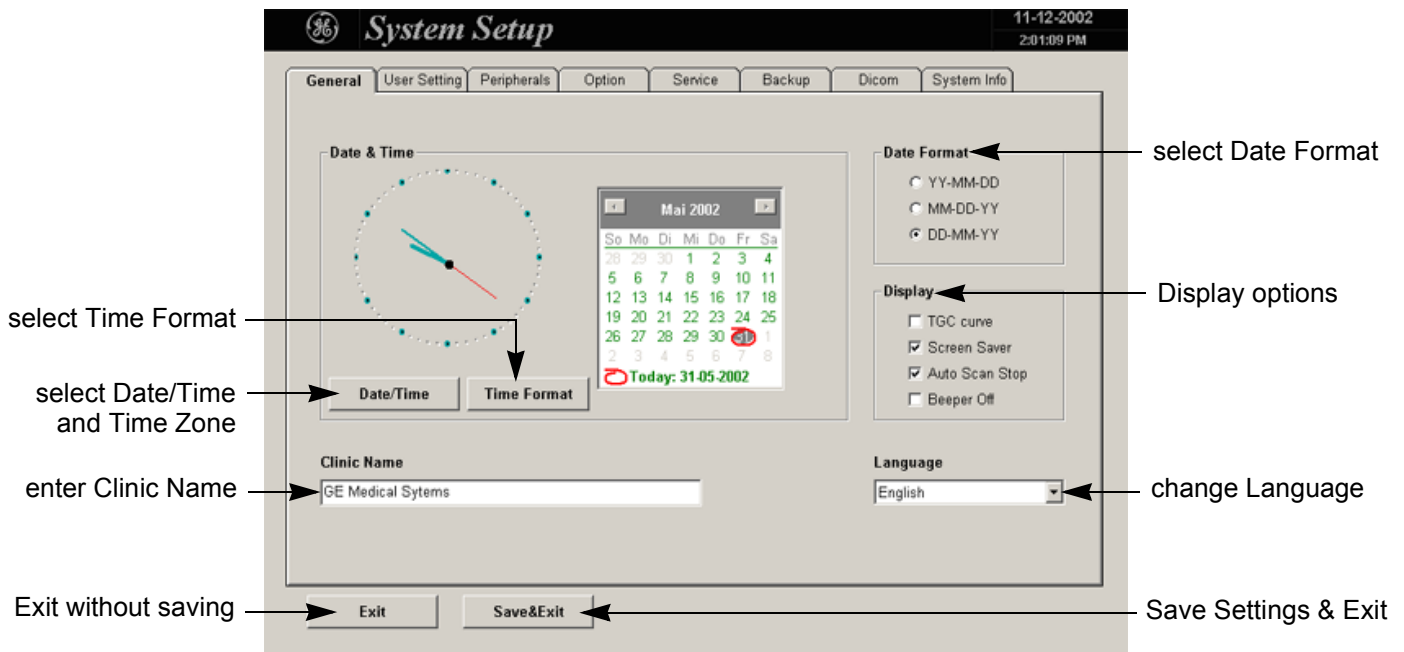


Figure 3-53 System Setup - General page

3-8-3-2 How to enter Hospital Name

Select the GENERAL page in the System Setup see: [Figure 3-53](#).

- 1.) Select the text box to enter a new "Clinic Name" with the keyboard.
 - 2.) Click SAVE&EXIT to save Settings and exit System Setup.
- The clinic name will be copied into the Hospital ID in the information header.

3-8-3-3 How to change Language

Select the GENERAL page in the System Setup see: [Figure 3-53](#).

- 1.) Select the desired language from the pop-up menu.
- 2.) Click SAVE&EXIT to save Settings and exit System Setup.

NOTE: After changing the language the system has to reboot.

3-8-4 On-Board Optional Peripherals

Mains outlets: Mains socket ST1, ST2, ST3, ST4, ST5 for accessories.

All mains outlets are co-switched by the unit's mains switch via built-in isolation transformer.

Output voltage for: ST1 - ST5: 115V or 230V.



CAUTION Modification of voltage setting only by an authorized service person!
The maximum power consumption of equipment (inclusive color video monitor) connected to these outlets must not exceed 350VA.

Table 3-8 Approved Peripherals

Device	Manufacturer	Model	Video Signal
B/W Video Printer	SONY	UP-895MD	NTSC/PAL
Digital Color Video Printer	SONY	UP-D21MD	USB-Port
Digital Color Video Printer	SONY	UP-D23MD	USB-Port
Digital Color Video Printer	Mitsubishi	CP770DW	SCSI-Port
Video Cassette Recorder	SONY	SVO-9500MD SVO-9500-MDP	NTSC PAL
Line Printer	Hewlett Packard	hp deskjet 990cxi	USB-Port
Line Printer	Hewlett Packard	hp deskjet 995c	USB-Port
Bluetooth Printer	Hewlett Packard	HP 5600 Series	USB-Port
ECG Preamplifier		MAN6	
Footswitch		MFT7	

3-8-5 External I/O Connection Panel (GES)

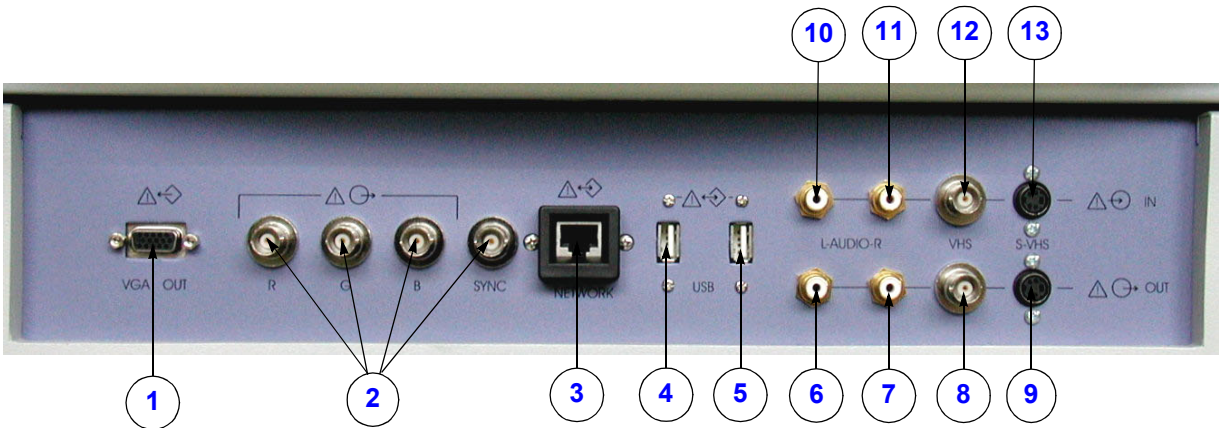


Figure 3-54 External I/O Panel Connectors

NOTICE If peripherals (e.g. VCR) are connected at the Internal I/O, some connectors on the External I/O may not be available. Please refer to [Section 5-6 "Internal I/O" on page 5-28](#).

Table 3-9 External I/O Connector Descriptions

Item	Connector Name	Table Number	Description		
1	VGA (OUTPUT)	Table 3-12	print out VGA signal with monitor/printer		
2	R, G, B, H/V SYNC	Table 3-15	outputs for color video printer/monitor		
3	NETWORK	Table 3-14	DICOM input/output twisted pair RJ-45 10/100 megabit/s		
4	USB-1	Table 3-13	USB port		
5	USB-2	Table 3-13	USB port		
6	AUDIO LEFT OUT				
7	AUDIO RIGHT OUT				
8	VHS OUT				
9	S-VHS OUT	Table 3-11			
10	AUDIO LEFT IN				
11	AUDIO RIGHT IN				
12	VHS IN				
13	S-VHS IN	Table 3-10			

3-8-5-1 External I/O Pin Outs

Table 3-10 S-VHS IN Video Connector, 4 Pin

Pin No	Output Signal	Description
1	SVIDEO IN YG	Y (Luma) GND
2	SVIDEO IN CG	C (Chroma) GND
3	SVIDEO IN Y	Y (Luma) SIGNAL
4	SVIDEO IN C	C (Chroma) SIGNAL

Table 3-11 S-VHS OUT Video Connector, 4 Pin

Pin No	Output Signal	Description
1	SVIDEO OUT YG	Y (Luma) GND
2	SVIDEO OUT CG	C (Chroma) GND
3	SVIDEO OUT Y	Y (Luma) SIGNAL
4	SVIDEO OUT C	C (Chroma) SIGNAL

Table 3-12 VGA (Output) Connector, Sub-D 15 Pin

Pin No	Output Signal	Description
1	VGA OUT1 R	Red
2	VGA OUT1 G	Green
3	VGA OUT1 B	Blue
4, 9,11,12,15	N/C	N/C
5, 6, 7, 8, 10	GND	GND
13	VGA OUT1 HS	H Sync
14	VGA OUT1 VS	V Sync

Table 3-13 USB 1, 2 Connectors

Pin No	Output Signal	Description
1	VCC	USB Power Supply
2	- Data	USB Data (-)
3	+ Data	USB Data (+)
4	GND	USB Power Ground

Table 3-14 Network Connector, RJ45 Modular 8 Pin

Pin No	Output Signal	Description
1	ETHER TD	Ethernet RD+
2	ETHER TD	Ethernet RD-
3	ETHER RD	Ethernet TD+
6	ETHER RD	Ethernet TD-
Others	NC	Non-connection

Table 3-15 R, G, B, SYNC, L-Audio-R (IN/OUT), VHS (IN/OUT) Connectors

Pin No	Signal	Description
1 (Center Pin)	Signal	
2 (Coax Pin)	Signal GND	

Table 3-16 Footswitch Connector (located at Power Supply Module CPN - rear side)

Pin No	Input Signal	Description
1	Signal GND	
2	right switch	normally open
3	left switch	normally open
4	not connected	not connected

3-8-6 Video Specification

Video specifications may be needed to be able to connect laser cameras or other devices to the Voluson® 730Pro.

Table 3-17 Video Specifications VGA Connector

S-Video Output set to: Timing Parameter	PAL 50Hz	NTSC 60Hz
Visible Resolution	800 x 600	800 x 600
Horizontal Rate [kHz]	47.20	57.10
H Total cycle time [μs]	21.20	17.50
H Sync width [μs]	1.50	1.48
H Back Porch [μs]	2.94	1.84
H Active Video Time [μs]	16.15	13.70
H Front Porch [μs]	0.616	0.512
Horizontal +/-	pos	pos
Vertical Rate [Hz]	75.00	90.00
Vertical Total cycle time [ms]	13.30	11.10
V Sync Width [ms]	0.170	0.140
V Back Porch [ms]	0.276	0.332
V Active Video Time [ms]	12.68	10.48
V Front Porch [ms]	0.174	0.144
Dot Clock [MHz]	49.54	58.39

Electrical Specifications on VGA Connector

- Signal Level: 700 mV at 75 Ohm
- H/V Sync: TTL Level

Table 3-18 Video Specifications for Composite, B/W, S-Video and RGB Connectors

S-Video Output set to: Timing Parameter	PAL 50Hz	NTSC 60Hz
Visible Resolution	800 x 600	800 x 600
Pixel Clock	17.734475 MHz = 4* ft	14.318 MHz = 4* ft
Horizontal Total Line	64μs / 1135 Pixel	63.56μs / 910 Pixel
Horizontal Active Display	50.50μs / 902 Pixel	52.50μs / 752 Pixel
Horizontal Front Porch	1.96μs / 35 Pixel	1.62μs / 23 Pixel
Horizontal Sync Width	4.62μs / 82 Pixel	4.68μs / 67 Pixel
Horizontal Back Porch	6.52μs / 116 Pixel	4.76μs / 68 Pixel
Vertical Total Lines	20ms / 312.50 Lines	16.68ms / 262.50 Lines
Vertical Active Lines	18.18ms / 284 Lines	15.22ms / 239.50 Lines

Table 3-18 Video Specifications for Composite, B/W, S-Video and RGB Connectors

S-Video Output set to: Timing Parameter	PAL 50Hz	NTSC 60Hz
Vertical Front Porch	256us / 4 Lines	381us / 6 Lines
Vertical Sync	160us / 2.50 Lines	190us / 3 Lines
Vertical Back Porch	1408us / 22 Lines	890us / 14 Lines
Serration Pulses	5	6
Interlaced	yes	yes
Aspect Ratio pixel size	14.75 (H) : 17.734475 (V)	14.75 (H) : 14.318 (V)
Video levels on 75 Ohm:		
white level	1020mV	1020mV
black level	370mV	370mV
blanking level	320mV	320mV
sync level*	20mV	20mV

* RGB OUT has no sync on signals - other values decrease by 300mV

3-8-7 Available Probes

See [Chapter 9 - Probes](#), for part numbers to be used when ordering new or replacement service probes.

3-8-8 Software/Option Configuration

Refer to the Voluson® 730Pro Basic User Manual, Chapter 17.3.1, System Setup - General, for information on configuring items like Clinic Name, Language, Display, Date/Time, Date Format and Time Format.

For information on configuring User Settings, refer to the Voluson® 730Pro Basic User Manual, Chapter 17.3.2, System Setup - User Settings.

For information on configuring assignment of **PRINT** keys, Save Destination, Video norm, etc., refer to the Voluson® 730Pro Basic User Manual, Chapter 17.3.3, System Setup - Peripherals.

For information on configuring Software Options, refer to the Voluson® 730Pro Basic User Manual, Chapter 17.3.4, System Setup - Options.

For information on configuring DICOM Connectivity, refer to the Voluson® 730Pro Basic User Manual, Chapter 17.3.8, System Setup - DICOM.

For information on configuring General Measurement Setup, refer to the Voluson® 730Pro Basic User Manual, Chapter 18.3.1.

For information on configuring Obstetric Measurement Setup, refer to the Voluson® 730Pro Basic User Manual, Chapter 18.3.2.

For information on configuring Cardiac Measurement Setup, refer to the Voluson® 730Pro Basic User Manual, Chapter 18.3.3.

Section 3-9 Connectivity Installation Worksheet

Site System Information

Site:	<input type="text"/>	Floor:	<input type="text"/>	Comments: <div style="border: 1px solid black; height: 80px; width: 100%;"></div>	
Dept:	<input type="text"/>	Room:	<input type="text"/>		
Serial #:	<input type="text"/>	Type:	<input type="text"/>		REV:

CONTACT INFORMATION

Name	Title	Phone	E-Mail Address
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

TCP/IP Settings

Name - AE Title:

IP Settings

IP Address:

Subnet Mask:

Default Gateway:

Remote Archive Setup

Remote Archive IP:

Remote Archive Name:

Services (Destination Devices)

	Device Type	Manufacturer	Name	IP Address	Port	AE Title
1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
6	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
7	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
8	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
9	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
10	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
11	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
12	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Section 3-10 Network IP Address Configuration

NOTE: Following Information must be provided by customer or hospital engineer before you can start:
A Station name, AE Title, IP address and Port Number for the Voluson® 730Pro.
The IP addresses for the default gateway and other routers at the site for ROUTING INFORMATION. Only if necessary (e.g. for Internet access).

- 1.) Press the UTILITIES key on the control panel once to display the Utilities menu.
- 2.) Select the SYSTEM item and then open the DICOM page on the System Setup desktop screen.
- 3.) Click the NETWORK CONFIG button, read the message and afterwards confirm with YES.

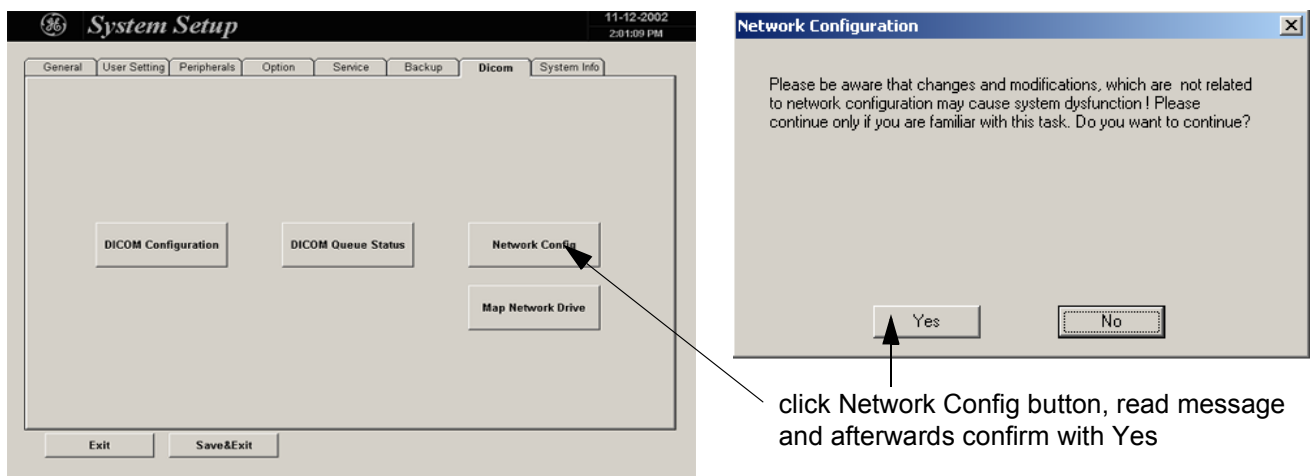


Figure 3-55 Network Configuration

- 4.) The "Internet Protocol (TCP/IP) Properties" dialog page appears.

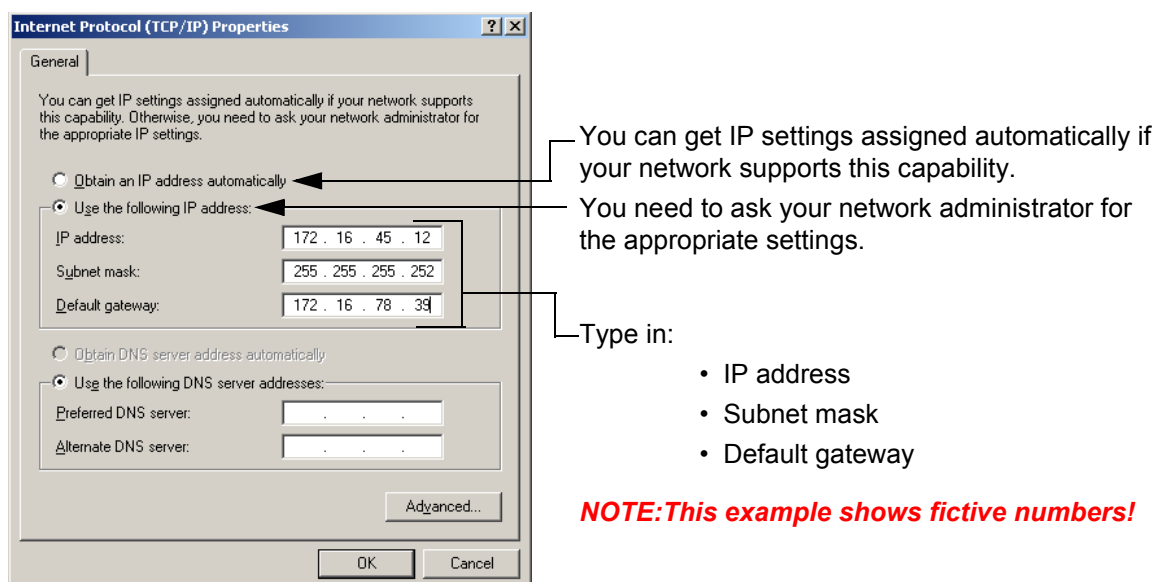


Figure 3-56 Internet Protocol (TCP/IP)

To specify a DICOM Address, follow the instructions of described in the Basic User Manual, Chapter 17.3.8 of the Voluson® 730Pro.

3-10-1 Map Network Drive

- 1.) Select the MAP NETWORK DRIVE button (in the System Setup - **DICOM** page, see: [Figure 3-55](#)) to open a dialog where the system can be connected to a shared network drive of another server.

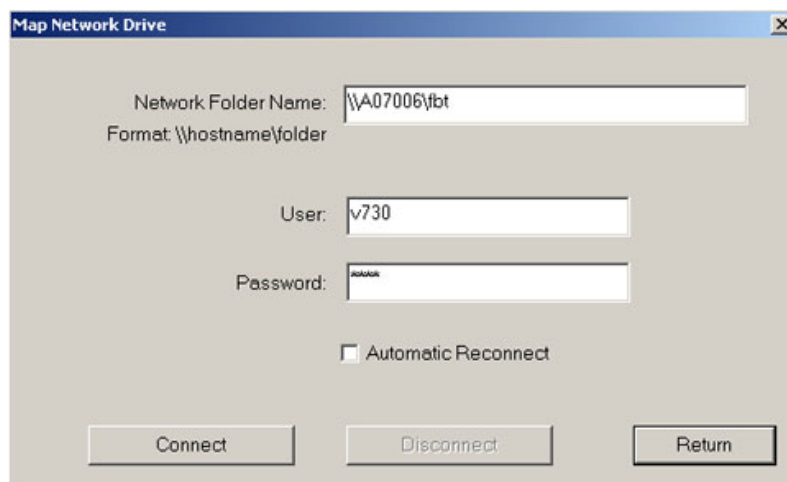


Figure 3-57 Map Network Drive window

- 2.) Enter the name of the shared network folder in the „Network Folder Name“ field.
- 3.) Supply a valid user name and a password for this folder.

NOTE: *If you check the „Automatic Reconnect“ box, the system tries to establish the connection again when starting up.
Otherwise, the connection must be re-established manually after a shutdown or reboot.*

- 4.) Select the CONNECT button to establish the connection to the remote machine.
If successful, the DISCONNECT button becomes active.



NOTICE If there is an error during the connection, a warning message appears inside the dialog. In this case, please verify the data in the dialog.



NOTICE If there already is a connection to the remote server, the CONNECT button is grayed. To change the existing connection, first click on DISCONNECT and then enter the new settings.




WARNING ***Please make sure that the server you are connecting to is trustworthy and reliable. For details, contact your local system administrator.
If you backup Sonoview data to this server, all the patients' demographic data will be copied to this server!***

Section 3-11
Paperwork

NOTE: During and after installation, the documentation (i.e. User Manual, Installation Manual,...) for the peripheral units must be kept as part of the original system documentation. This will ensure that all relevant safety and user information is available during the operation and service of the complete system.

3-11-1 Product Locator Installation

NOTE: The Product Locator Installation Card shown may not be same as the provided Product Locator card.



Mailing Address

GE Medical Systems
Product Locator File
P.O. Box 414
Milwaukee, WI 53201-0414

DESCRIPTION	FDA	MODEL	REV	SERIAL
-------------	-----	-------	-----	--------

PREPARE FOR ORDERS THAT DO NOT HAVE A LOCATOR INSTALLATION REPORT

SYSTEM ID NUMBER

INSTALLATION

OCF	BS	ORD	DATE (MO-DA-YR)
DIST.-COUNTRY	ROOM	EMPLOYEE NO.	
CUSTOMER NO.			
DESTINATION - NAME AND ADDRESS			
ZIP CODE			

Figure 3-1 Product Locator Installation Card

3-11-2 User Manual(s)

Check that the correct User Manual(s) for the system and software revision, is included with the installation. Specific language versions of the User Manual may also be available. Check with your GE Sales Representative for availability.

Chapter 4

Functional Checks

Section 4-1 Overview

4-1-1 Purpose of Chapter 4

This chapter provides procedures for quickly checking major functions of the Voluson® 730Pro scanner diagnostics by using the built-in service software, and power supply adjustments.

Table 4-1 Contents in Chapter 4

Section	Description	Page Number
4-1	Overview	4-1
4-2	Required Equipment	4-1
4-3	General Procedure	4-2
4-4	Functional Checks	4-7
4-6	Software Configuration Checks	4-40
4-7	Peripheral Checks	4-41
4-8	Mechanical Function Checks	4-42
4-9	Site Log	4-44



NOTICE Most of the information pertaining to this Functional Checks chapter is found in the Voluson® 730Pro Basic User Manual (Direction number 105831).

Section 4-2 Required Equipment

- An empty (blank) MO Disk or CD-RW.
- At least one transducer. [See "Probes" on page 9-30](#) for an overview.
(normally you should check all the transducers used on the system)

Section 4-3 General Procedure



CAUTION

SYSTEM REQUIRES ALL COVERS

Operate this unit only when all board covers and frame panels are securely in place.
The covers are required for safe operation, good system performance and cooling purposes.



NOTICE

Lockout/Tagout Requirements (For USA only)

Follow OSHA Lockout/Tagout requirements by ensuring you are in total control of the Power Cable on the system.



4-3-1 Power On / Boot Up

NOTE: After turning off a system, wait at least ten seconds before turning it on again.
The system may not be able to boot if power is recycled too quickly.

4-3-1-1 Scanner Power On

- 1.) Connect the Power Cable to the back of the system.
- 2.) Screw on the pull-out protection of the mains power cable with the 2 screws.
- 3.) Connect the Power Cable to an appropriate mains power outlet.
- 4.) Switch ON the Circuit Breaker at the rear of the system.

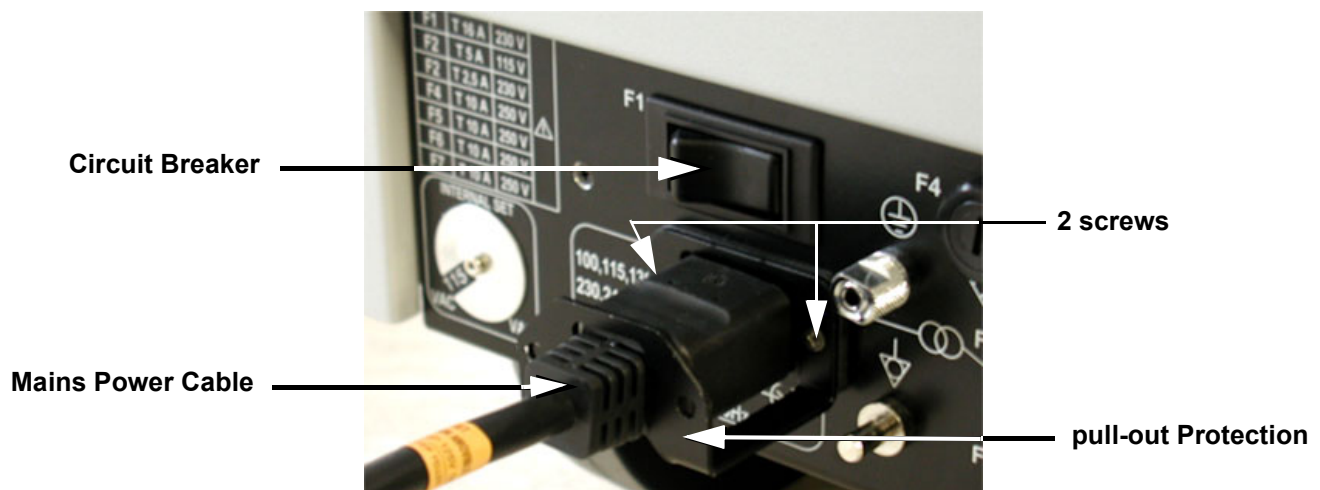


Figure 4-1 Circuit Breaker, Protection and Power Cable on back of Voluson® 730Pro



NOTICE When AC power is applied to the scanner, the **ON/OFF** switch on the Control panel illuminates amber, indicating the System (including the Back-end Processor) is in standby mode.

4-3-1-1 Scanner Power On (cont'd)

- 5.) Press the **ON/OFF** Standby switch left below the Control Panel.

ON/OFF Standby switch



Figure 4-2 ON/OFF Standby Switch

When the **ON/OFF** Stand-By switch left below the Control Panel is pressed once, the System (including the Back-end Processor) starts and the software code is distributed to initiate the scanner.

Depending on the BIOS-Version no status messages are displayed during this process.
Boot up time is about 2 minutes.

NOTE: The mains outlet of the system for peripheral auxiliary equipment are commonly switched with the Standby switch. So the auxiliary equipment need not to be switched ON/OFF separately.

4-3-2 Power Off / Shutdown

NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

4-3-2-1 Scanner Shutdown

- 1.) Press the **ON/OFF** Standby switch left below the Control Panel.
- 2.) Switch OFF the Circuit Breaker at the rear of the system.
- 3.) Disconnection of the Mains Power Cable is necessary. *For example:* Relocating the scanner.
Unscrew the 2 screws and remove the pull-out protection to disconnect the cable from the system, or unplug the cable from the wall socket.

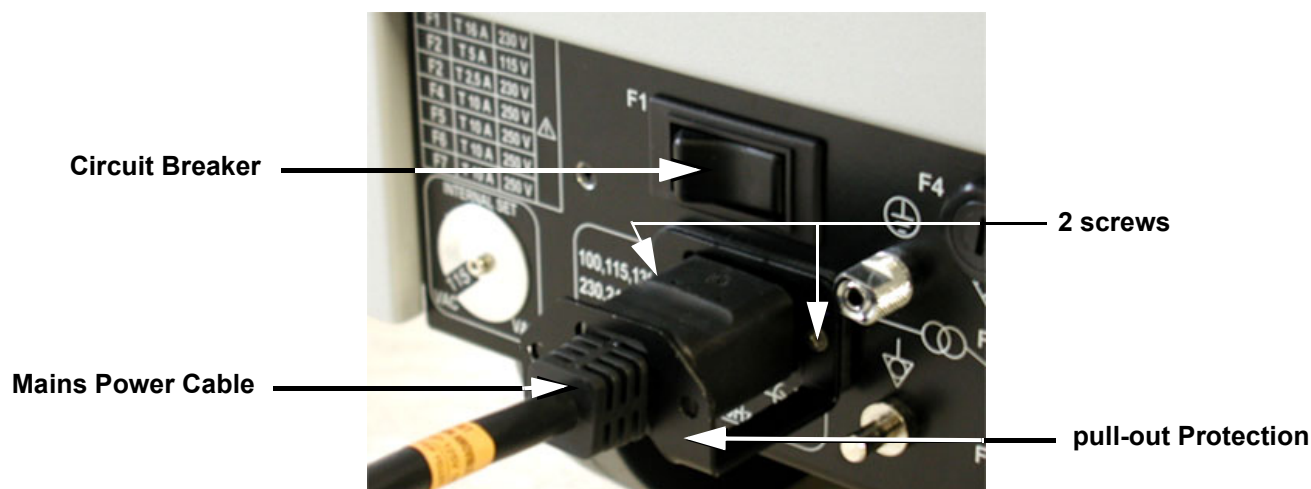


Figure 4-3 Circuit Breaker, Protection and Power Cable on back of Voluson® 730Pro

4-3-3 System Features

4-3-3-1 Control Panel

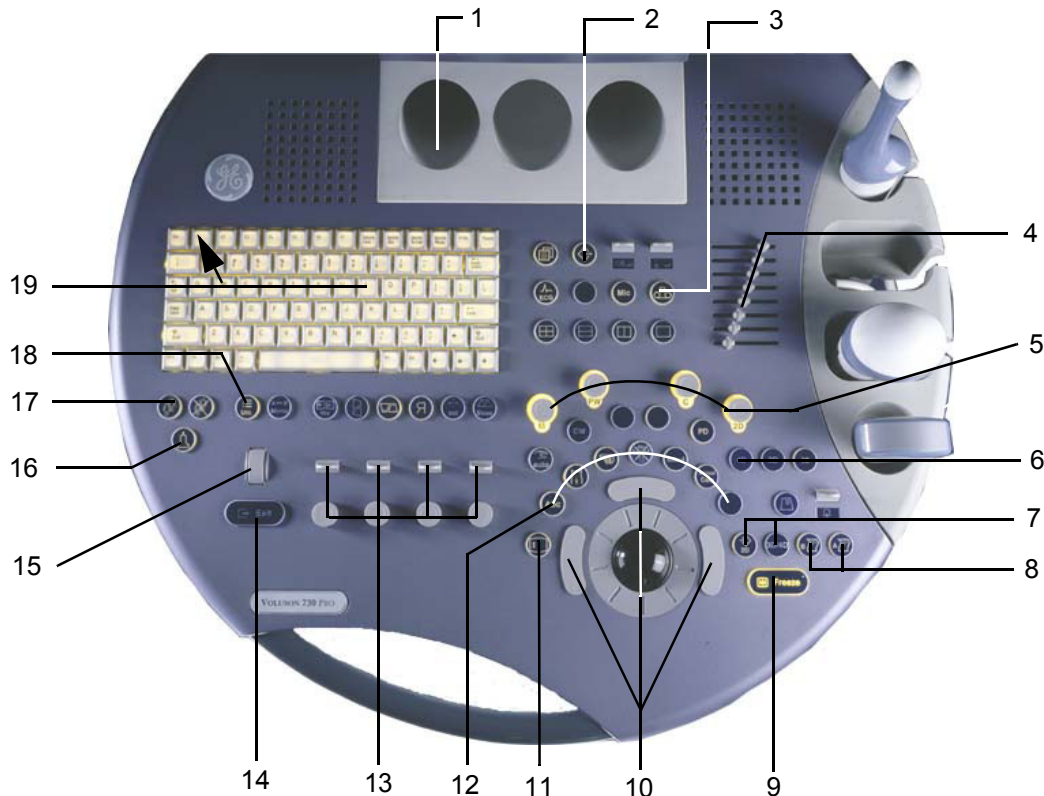


Figure 4-4 Control Panel Tour

- 1.) Ultrasound scanning gel holder
- 2.) Sonoview (Image Management) key
- 3.) VCR Remote Control key
- 4.) TGC - Slider Controls
- 5.) Mode/Gain keys
- 6.) 3D Volume Mode, 4D Volume Mode and Harmonic Imaging key
- 7.) Inter memory keys to save to Sonoview or send to DICOM server
- 8.) Print A-, Print B-Trigger key
- 9.) Freeze / Run key
- 10.) Trackball and Trackball keys
- 11.) Trackball Menu Navigation key
- 12.) Annotation and Measurement keys
- 13.) Menu Control digipots and toggle switch controls
- 14.) Exit key
- 15.) Navigation wheel (Menu control element)
- 16.) Probe key
- 17.) Patient Data Entry key
- 18.) Utilities key
- 19.) Keyboard with shortcut function keys and F1 key to invoke the Electronic User Manual (EUM)

4-3-3-2 Menu Control

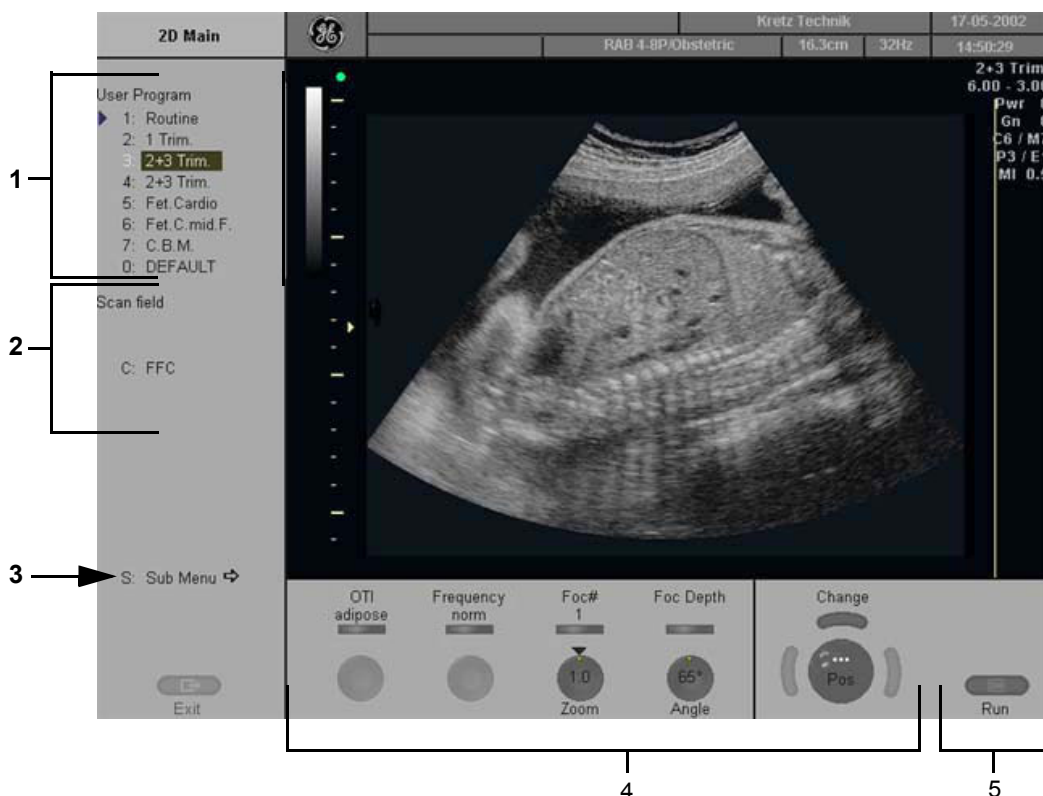


Figure 4-5 Menu Control Area- 2D Main Menu

- 1.) User Program: shows all setting for the active application. The active one is highlighted
- 2.) Additional functions which are supported by the selected Mode.
- 3.) Sub Menu: to adjust settings of the selected Scan mode.
- 4.) Status Area: shows the current functionality of the digipots, toggle switch controls and the trackball
- 5.) Status of the **FREEZE** key

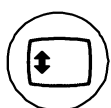
NOTE: Different menus are displayed depending on which Menu and which Mode is selected.

DIGIPOTS, TOGGLE SWITCH CONTROLS and TRACKBALL

Activated functions are easily controlled by these controls. By rotating resp. switching, they deliver digital pulses and can be selected by program call-up. They are displayed in the status area by their location, their function, and their actual value of setting.

NAVIGATION WHEEL and corresponding KEYBOARD-SHORTCUT FUNCTIONS

The available menus are shown in the menu area on the left side of the screen. The current menu selection is highlighted. Roll the navigation wheel and the blue arrow moves to another selection. Press the navigation wheel to select the desired item. The corresponding keyboard shortcuts (1, 2, 3, F2, F5, E, H, etc.) are shown to the right of the actual function.



If the **TRACKBALL MENU NAVIGATION** key is illuminated, the trackball is consequently assigned to select the menu items in the menu area on the left side of the screen. Pressing **SET** (the left or right trackball key) starts selected menu function.

4-3-3-3 Monitor Display

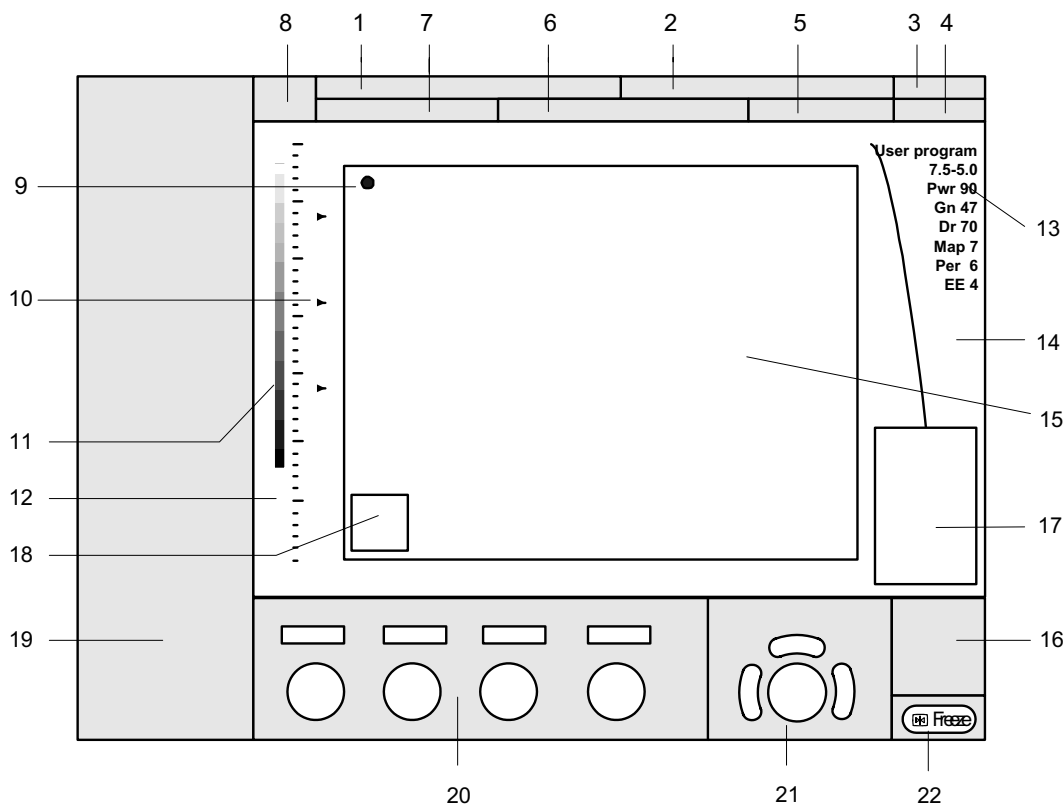


Figure 4-6 Monitor Display Tour

Table 4-2 Monitor Display Features

1. Patient Name	12. Depth scale markers
2. Hospital Identification	13. Image Info
3. Date	14. TGC curve
4. Time	15. Image area
5. Depth / Frame rate	16. Status (volume box, saved images, gray map)
6. Probe / Application	17. Measurement results
7. Patient Identification (ID-number)	18. Bodymarks
8. Logo	19. Menu (Softkey) area
9. Orientation marker	20. Status area of digipots and flip switch controls
10. Focal zone marker(s)	21. Status area of the trackball
11. Gray scale wedge	22. Status area of the Freeze key

Section 4-4 Functional Checks

For a basic functional check of the system's different modes, following pages will familiarize you with image optimization for:

- 2D Mode (B Mode)
- M Mode
- Spectral Doppler Modes
 - PW - Pulsed Wave Doppler
 - CW - Continuous Wave Doppler
- Color Doppler Modes
 - CFM - Color Flow Mode
 - PD - Power Doppler
 - TD - Tissue Doppler
- Volume Modes
 - 3D Static
 - 4D Real Time

*NOTE: Some software may be considered standard depending upon system configuration.
If any Modes or Options are not part of the system configuration, the check can be omitted.*

*NOTE: Different menus are displayed depending on which Menu and which Mode is selected.
Some function only appear in the menu area and the status area of the digipots and flip switch controls if they are available for the selected Probe.*

4-4-1 2D Mode Checks

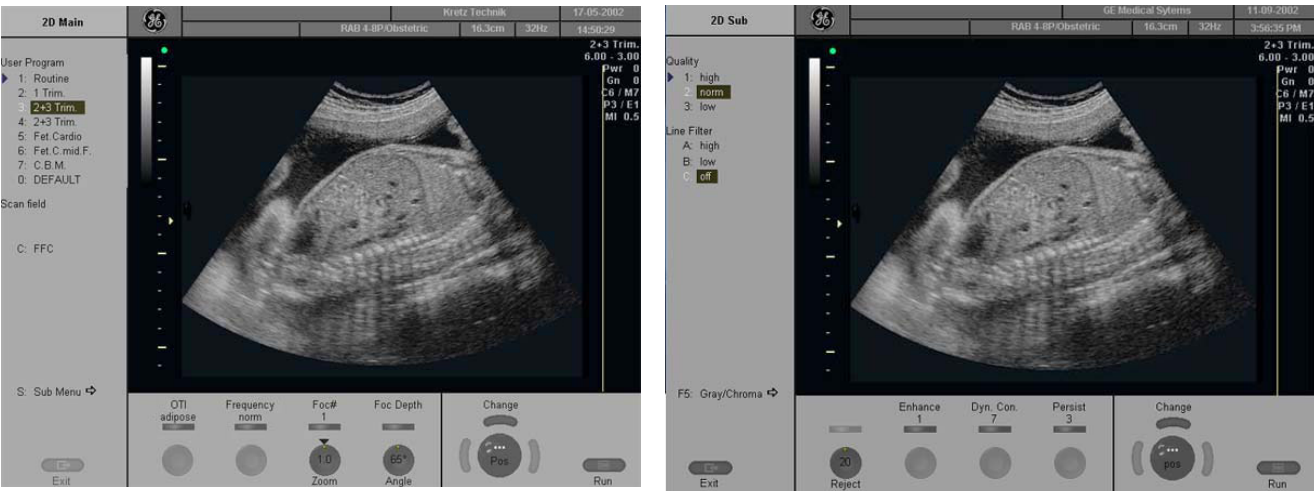


Figure 4-7 2D Main and 2D Sub

Table 4-3 2D Mode Functions



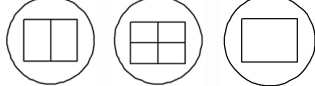
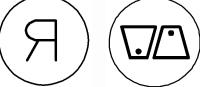




Step	Task	Expected Results
1	2D Mode Gain	Rotate the 2D MODE key to adjust the sensitivity (brightness) of the entire image.
2	Transmit Power 	Optimizes image quality and allows user to reduce beam intensity.
3	Depth 	Adjusts the depth range of the ultrasound image for the region of interest. The number of image lines and the frame rate are automatically optimized.
4	Screen Format (Dual, Quad, Single) 	Press this keys to change the display Mode from Single to DUAL or QUAD display mode. Press the SINGLE format key or the 2D MODE key to change from Dual or Quad to Single display.
5	Image Orientation 	Use the LEFT/RIGHT respectively the UP/DOWN keys on the control panel to alternate the image orientation. The orientation marker on the screen shows the actual orientation.
6	2D Automatic Optimization 	Pressing the AUTO key causes automatic optimization of the gray scale to enhance the contrast resolution. Pressing again : optimization will be updated and remain active. Press the AUTO key twice to switch off the Automatic Optimization in 2D.
7	FFC (Focus and Frequency Composite)	FFC combines a low frequency to increase the penetration and higher frequency to keep a high resolution. It reduces speckle and artifacts in the 2D image.

Table 4-3 2D Mode Functions

Step	Task	Expected Results
8	<u>LINEAR</u> / <u>TRAPEZOID</u>	Advantage of the Trapezoid Mode: The scan area is very increased in relation to the linear display by steering the ultrasound lines in the border of the probe.
9	High Resolution Zoom 	Press this key on write mode. The displayed zoom box can be placed over the entire 2D image <u>area</u> , also the size and position of the zoom box can be changed. Press the <u>HR-ZOOM</u> key again to activate the zoom and again to exit the High Resolution Zoom function.
10	Harmonic Imaging 	Press the <u>HI</u> key on the control panel to switch on/off the Harmonic Imaging function in 2D Mode provided the active probe allows this function.
11	<u>FREQUENCY</u> resp. <u>HARM.FREQU.</u> in case of Harm. Imaging	To adjust the range of the receive frequency. high resolution / lower penetration, mid resolution / mid penetration, or lower resolution / high penetration
12	<u>OTI</u> (Optimized Tissue Imaging)	OTI™ allows to "fine tune" the system for scanning different kinds of tissue.
13	<u>FOC #</u>	Increases the number of transmit focal zone, so that you can tighten up the beam for a specific area.
14	<u>FOC DEPTH</u>	To select the depth position of the actual focus zone(s). Arrows at the left edge of the 2D image mark the active focal zone(s) by their depth position.
15	<u>ANGLE</u>	Use this control to select a part of interest of the 2D image. The advantage of the decreased field-of-view is an increased 2D frame rate due to the smaller sector width.
16	<u>BETA VIEW</u>	This function allows the adjustment of the Volume O-Axis position of 3D probes in 2D Mode. The green line in the displayed symbol indicates the position of the acoustic block.
17	<u>ZOOM</u>	Image magnification (Pan Zoom) in read-/ and write mode.
18	<u>QUALITY</u>	Control to improve the resolution by reducing the frame rate. Respectively reducing the resolution by increasing the image frame rate.
19	<u>LINE FILTER</u>	The signals of the neighboring pulses are less weighted for the display of the actual pulse which considerably improves the detail lateral resolution and signal-to-noise ratio.
20	<u>ENHANCE</u>	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 only.
21	<u>DYN.CON.</u>	Dynamic Range controls how echo intensities are converted to shades of gray, thereby increasing the adjustable range of contrast.
22	<u>PERSIST.</u>	Persistence is a temporal filter that averages frames together. This has the effect of presenting a smoother, softer image.
23	<u>REJECT</u>	Selects a level below which echoes will not be amplified (an echo must have a certain minimum amplitude before it will be processed).
24	Exit  Exit	Press the <u>EXIT</u> key on the control panel to exit the 2D Sub menu.

For further details refer to the Voluson® 730Pro Basic User Manual, Chapter 5, 2D Mode.

4-4-2M Mode Checks

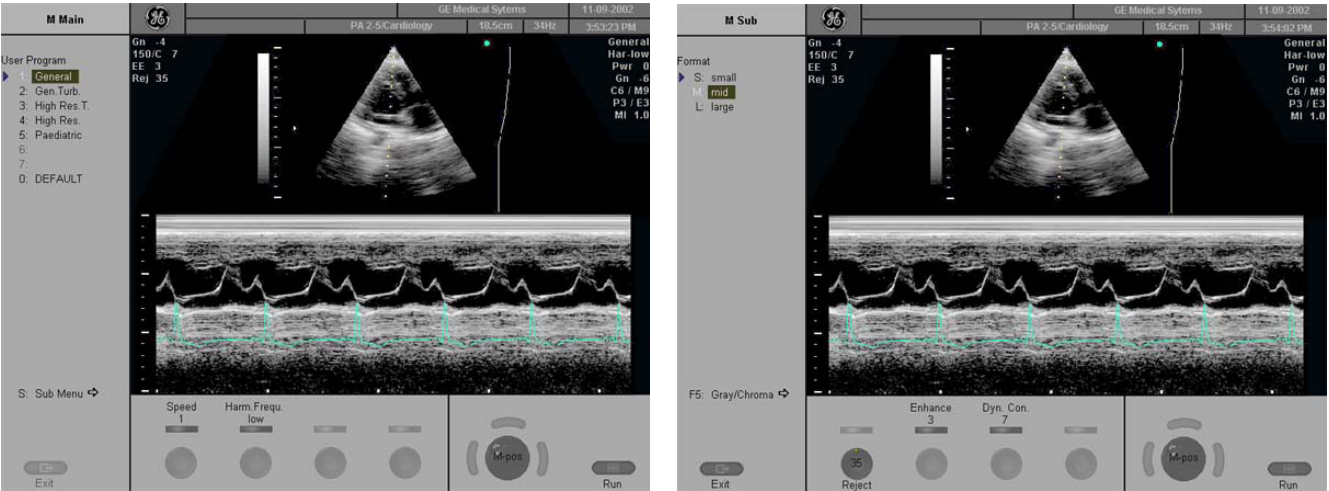


Figure 4-8 M Main and M Sub

Table 4-4 M Mode Functions

Step	Task	Expected Results
1	Cursor Position	Adjust the M Cursor position with the TRACKBALL in the 2D Single image.
2	Activation of M Mode	Press the right or left trackball key to activate both Modes (2D/M).
3	M Mode Gain	Rotate the M MODE key to adjust the sensitivity (brightness) of the entire M image.
4	M Mode Depth	Common with 2D Mode Depth .
5	<div><div></div>Invert</div>	This function inverts the M mode trace from up to down in the M mode display area. (The Invert function is only available with endovaginal probes.)
6	SPEED	By touching up or down, four different sweep speeds can be selected.
7	FREQUENCY	Common with 2D Mode Frequency resp. Harm.Frequ. in case of Harm. Imaging .
8	FORMAT	For selection of three different rations of display format.
9	DYN.CON.	Dynamic Range enhances a part of the grayscale to make it easier to display pathology.
10	ENHANCE	Due to this function a finer, sharper impression of the image is produced.
11	REJECT	It determines the amplitude-level below which echoes are suppressed (rejected).
12	<div><div></div>Exit</div>	Press the EXIT key on the control panel to exit the M Sub menu.

For further details refer to the Voluson® 730Pro Basic User Manual, Chapter 6, M Mode.

4-4-3 Spectral Doppler Mode Checks

NOTE: Different menus are displayed depending on which Spectral Doppler Mode (PW or CW) is selected.

NOTE: The Continuous Wave Doppler Mode is an Option. The **CW** key is only illuminated if the option is installed and the selected probe is capable for the Continuous Wave Doppler Mode.

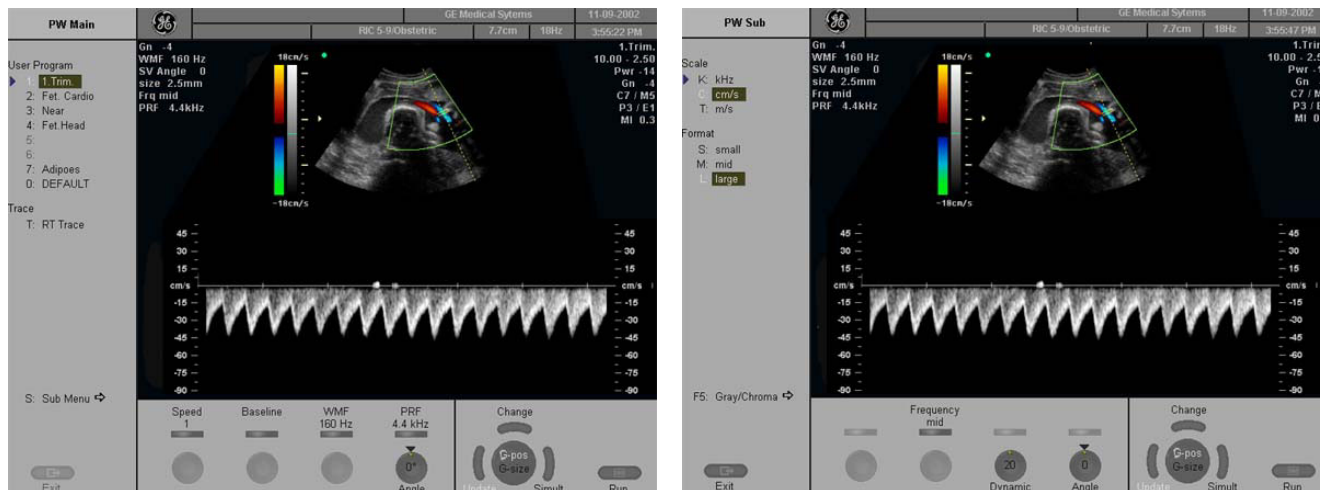


Figure 4-9 PW Main and PW Sub

Table 4-5 Spectral Doppler Mode (PW, CW) Functions




Step	Task	Expected Results
1	Gate Position and Gate Size	Adjust the Gate- position resp. size with the TRACKBALL in the 2D single image. The upper trackball key changes from Gate position to Gate size.
2	Activation of Doppler Mode	Press the right trackball key to activate the motion display. Press the left trackball key to activate both Modes (B/D).
3	Doppler Gain	Rotate the PW MODE key to adjust the amplification of the entire spectrum.
4	Steering 	The steering function is only possible with linear probes.
5	RT TRACE (Real Time Auto-Trace)	The envelope curve of the Doppler spectrum (maximum velocities) and the corresponding evaluations are automatically displayed on the monitor.
6	Invert 	This function inverts the Doppler spectrum display in relation to the direction of the flow. (The Invert function is possible in read and write mode.)
7	SPEED	By touching up or down, four different sweep speeds can be selected.
8	BASELINE	Adjusting the baseline is possible in read- and write Mode (up/down in 8 steps).
9	WMF (Wall Motion Filter)	Used to eliminate Doppler "noise" that is caused by vessel wall motion.
10	PRF	The Velocity Range display is governed by the pulse repetition frequency (PRF). Exceeding the maximum PRF, the HPRF-Mode is automatically switched on.

Table 4-5 Spectral Doppler Mode (PW, CW) Functions

Step	Task	Expected Results
11	<u>ANGLE</u>	The angle cursor can be turned in both directions without stop. By pressing the angle knob repeatedly the angle correction switches from +60° to 0° and to -60°.
12	<u>SCALE</u>	To select the displayed measuring unit (in relation to the zero-line).
13	<u>FORMAT</u>	For selection of either one of three formats.
14	<u>FREQUENCY</u>	Serves for selection of the required transmit frequency for actual gate position.
15	<u>DYNAMIC</u>	Dynamic Range adjusts the display cutoff of the Doppler analysis waveform.
16	Exit  Exit	Press the <u>EXIT</u> key on the control panel to exit the PW or CW Sub menu.

For further details see: Voluson® 730Pro Basic User Manual:

- Chapter 7.1, PW Mode (Pulsed Wave Doppler)
- Chapter 7.2, CW Mode (Continuous Wave Doppler)

4-4-4 Color Doppler Mode Checks

NOTE: Different menus are displayed depending on which Color Doppler Mode (CFM, PD or TD) is selected.

NOTE: The Tissue Doppler Mode is an Option. The **TD** key is only illuminated if the option is installed and the selected probe is capable for the Tissue Mode.

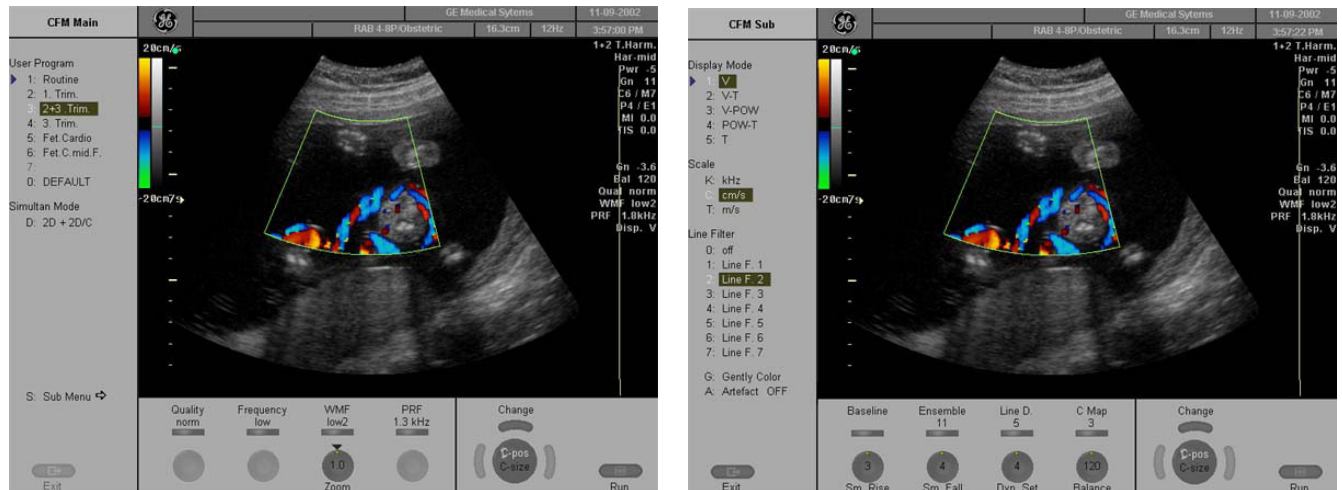


Figure 4-10 CFM Main and CFM Sub Menu

Table 4-6 Color Doppler Mode (CFM, PD, TD) Functions




Step	Task	Expected Results
1	Color Box Position and Color Box Size	Adjust the Box- Position resp. Size with the TRACKBALL in the 2DSingle image. The upper trackball key changes from Box position to Box size.
2	CFM Gain PD Gain TD Gain	Rotate the C MODE key to ensure that continuous flow is displayed, where appropriate. Rotate the PD MODE key to adjust the Power Doppler Gain. Rotate the C MODE key to adjust the Tissue Doppler Gain.
3	2D+2D/C (PD or TD)	Changes the Single image display to two simultaneous half images. The left frame shows only the 2D Mode image. The right frame shows the 2D Mode image with color information.
4	Steering 	Beam Steering is only possible with linear probes in CFM and PD Mode.
5	Invert 	The color of the color wedge inverts around the baseline. (impossible in PD Mode)
6	QUALITY	Improves the Color Resolution by reducing the image frame rate, respectively vice versa.
7	FREQUENCY	It serves for selection of the Transmit Frequency which also depends on the Color Box position.
8	WMF (Wall Motion Filter)	Used to eliminate Doppler "noise" that is caused by vessel wall or cardiac wall motion. (CFM,PD)
9	PRF	By touching toward up the PRF increases. By touching toward the PRF decreases.

Table 4-6 Color Doppler Mode (CFM, PD, TD) Functions

Step	Task	Expected Results
10	<u>ZOOM</u>	Image magnification (PAN-Zoom) in read- and write mode.
11	<u>DISPLAY MODE</u>	To select the CFM- Display Mode (V; V-T; V-Pow; Pow-T; or T).
12	<u>SCALE</u> (CFM, TD)	The maximum velocities are displayed above and under the color scale in kHz, cm/s or m/s.
13	<u>LINE FILTER</u>	With "Line Filter" the signals of the neighboring pulses are less weighted for the display of the actual pulse which considerably improves the detail lateral resolution and signal-to-noise ratio.
14	<u>GENTLY COLOR</u>	Gently means the transition between color and gray scale information. The embedding of the color into 2D Mode is performed smoothly with less colored splashes.
15	<u>ARTEFACT</u> (on/off)	Switch on/off the artifact suppression.
16	<u>BASELINE</u>	The baseline shift can be used to prevent aliasing in one flow direction similar to the Doppler baseline shift. There are 8 steps in each direction. (impossible in PD Mode)
17	<u>ENSEMBLE</u>	Controls the number of pulses to constitute one Color- or Power-Doppler line in the display.
18	<u>LINE D.</u>	Determines the line density within the Color-Box. The lower the line density, the larger the line distance and the size of the color pixels.
19	<u>C-MAP</u> (PD, TD)	Provides selectability of the color coding for an optimization of the display of blood flow (similar to the post-processing curves with grayscale 2D scans). After a selection has been made, the color bar displays the resultant map.
20	<u>SM. RAISE</u>	To select different filter periods for raising velocity. Filtering of the rise velocity leads to noise suppression.
21	<u>SM. FALL</u>	To select different filter periods for falling velocity. This filter leads for "prolongation" of the display flow.
22	<u>DYN. SET</u>	Dynamic range refers to the compression of grayscale information into a suitable range for the display. It allows you to enhance an interesting part of the grayscale.
23	<u>BALANCE</u>	The Balance controls the amount of Color display over bright echoes and helps to confine color within the vessels wall.
24	<u>THRESHOLD</u>	After <u>FREEZE</u> you can adjust the Color Threshold. It eliminates small color noise or motion artifact signals in the color image. (small number cuts off fewer signals than a higher setting)
25	Exit  Exit	Press the <u>EXIT</u> key on the control panel to exit the CFM, PD or TD Sub menu.

For further details refer to the Voluson® 730Pro Basic User Manual:

- Chapter 8, CFM Mode (Color Flow Mode)
- Chapter 9, PD Mode (Power Doppler Mode)
- Chapter 10, TD Mode (Tissue Doppler Mode)

4-4-5 Volume Mode Checks



NOTICE Real Time 4D is an Option.
If this option is not a part of the system configuration, the appendant checks can be omitted.

NOTE: Different menus are displayed depending on which Menu and which Volume Mode (Static 3D or Real Time 4D) is selected.

4-4-5-1 Pre-Volume Mode Functions

1. select the desired Volume Acquisition Mode:

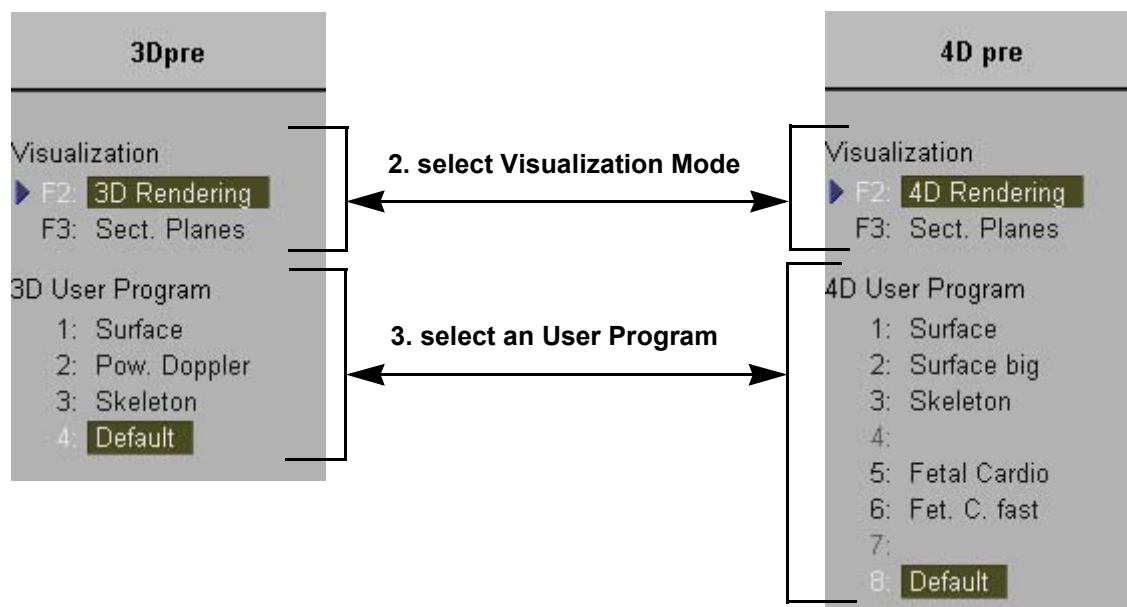
3D

Volume Acquisition: Static 3D

4D

Volume Acquisition: Real Time 4D

The Volume Mode function is switched on, the "3D Pre" respectively "4D Pre" menu appears on the screen (write mode) and the volume box appears on the Image area.



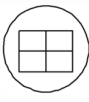


4. Start the Volume Acquisition with the Freeze key resp. the right trackball key.

Figure 4-11 Pre-Volume Mode menus

Table 4-7 Pre-Volume Mode Functions

Step	Task	Expected Results
1	<u>3D RENDERING</u>	3D Static volume acquisition + rendered 3D image (also in combination with PD or CFM Mode)
1	<u>SECT. PLANES</u>	3D Static volume acquisition resp. 4D volume acquisition without rendered 3D image
2	<u>4D RENDERING</u>	Real Time 4D - continuous volume acquisition and parallel calculation of 3D rendered images

Table 4-7 Pre-Volume Mode Functions

Step	Task	Expected Results
3		- Quarter size display of Sectional Planes without 3D image or - Quarter size display of Sectional Planes + rendered 3D image (<u>Note:</u> The display depends on selected Acquisition- and Visualization Mode!)
4		Dual size display of Sectional Planes + rendered 3D image. (<u>Note:</u> The display depends on selected Acquisition- and Visualization Mode! This format is not possible for Static 3D Acquisition)
5		- Full size display of a the reference image or - Full size display of the rendered 3D image. (<u>Note:</u> The display depends on selected Acquisition- and Visualization Mode!)
6	Volume Box Position and Volume Box Size	Adjust the Volume Box (ROI) Position resp. Size with the TRACKBALL in the 2D Single image. The upper trackball key to change the Trackball function from Box Position to Box Size.
7	QUALITY	Changes the line density against the acquisition speed (low, mid1, mid2, high1, high2).
8	VOL. ANGLE	To select the Volume Sweep Angle.
9	Start Acquisition	Press the FREEZE key resp. the right trackball key to start the Volume acquisition.

4-4-5-2 Functions after the 3D Acquisition

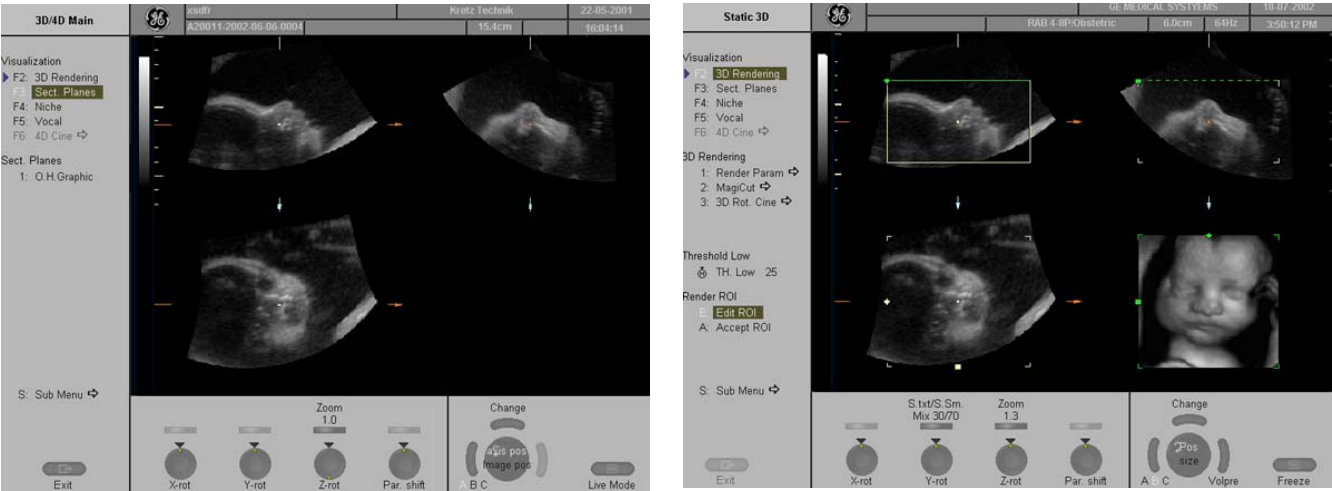


Figure 4-12 3D/4D Main - Sectional Planes and Image Rendering

Table 4-8 Functions after the 3D Acquisition




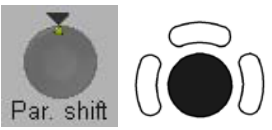
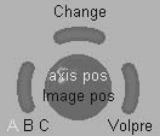

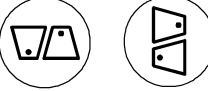
Step	Task	Expected Results
1	  	X-ROT: Rotation about X-axis of the reference image. Y-ROT: Rotation about the Y-axis of the reference image. Z-ROT: Rotation about the Z-axis of the reference image.

Table 4-8 Functions after the 3D Acquisition

Step	Task	Expected Results
2		PAR. SHIFT: Movement along Z-axis of the reference image. TRACKBALL: Movement along X- and Y-axis of the reference image.
3	<u>NICHE</u>	Parts of the orthogonal sections A, B and C are complied to a 3D section aspect. The aspect shows quasi a spatial cut into the reference image.
4	<u>O.H. GRAPHIC</u>	Display of orientation help image figure.
5	Choosing a reference image 	Press the left trackball key repeatedly to choose the Reference image among A, B or C. Choosing a reference image automatically determines the control functions of the rotary controls and the trackball for the liberal adjustment of a sectional plane.
6	Initial Condition 	Resets the rotations and translations of a volume section to the initial (start) position.
7	3D Image Orientation 	To change the image orientation of the rendered 3D image.
8	<u>ZOOM</u>	The 3D image as well as the sectional planes can be varied by their aspect ratio.
9	<u>S.TXT/S.SM. MIX</u>	To adjust the mix ratio between two calculated modes.
10	<u>TH. LOW</u> respectively <u>PD LOW</u> in case of 3D+PD	All echoes below the level will be disregarded for calculation of the surface. All color values below the level will be disregarded for calculation of the surface.
11	<u>MAGI CUT</u>	Ability to electronically manipulate the images and cut way "3D artifacts".
12	<u>RENDER PARAM.</u>	To select the Render Mode (Basic Mode and Render Algorithm)

4-4-5-3 Sub Menu

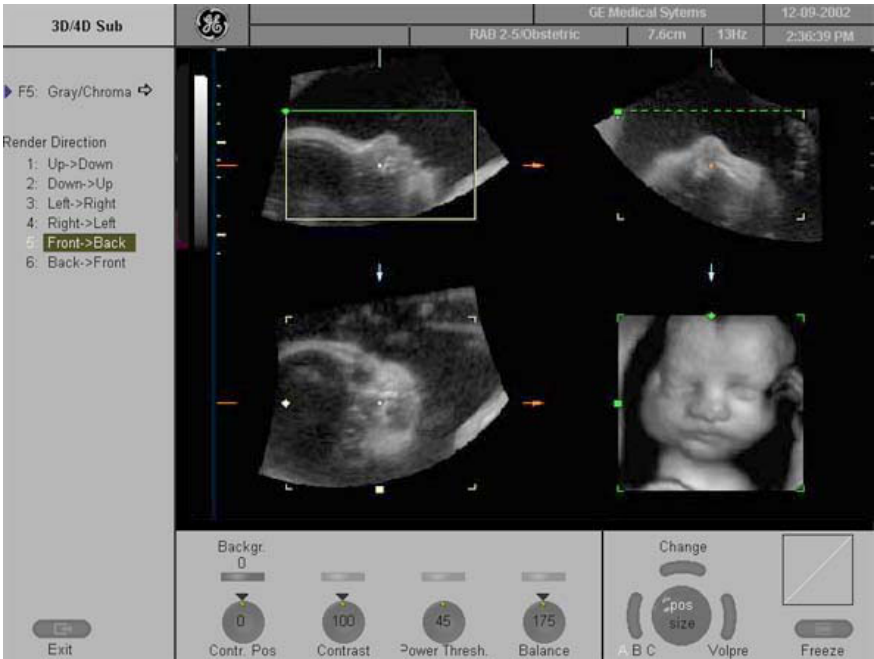


Figure 4-13 3D/4D Sub Menu

Table 4-9 Sub Menus

Step	Task	Expected Results
1	<u>RENDER VIEW DIRECTION</u>	To select the desired Render View Direction. The green line symbolizes the direction of the view. <u>Note:</u> The Render View Direction keys are not available in Static 3D Sectional Planes.
2	<u>GRAY/CHROMA</u>	Depending on individual requirements a “harder” or “softer” image can be obtained.
3	<u>BACKGR.</u>	Adjusts the contrast of the screen background from dark to bright. <u>Note:</u> This key is not available in Static 3D Sectional Planes mode.
4	<u>CONTR. POS</u>	To set the start point of the gamma curve bending. (Graphic display on screen) <u>Note:</u> This key is not available in Static 3D Sectional Planes mode.
5	<u>CONTRAST</u>	To set the contrast of the bending. (Graphic display on screen) <u>Note:</u> This key is not available in Static 3D Sectional Planes mode.
6	<u>POWER THRESH.</u>	Only available if a 3D+CFM or a 3D+PD image is acquired. <u>Note:</u> This key is only available if a 3D+CFM or a 3D+PD image is acquired.
7	<u>BALANCE</u>	Only available if a 3D+CFM or a 3D+PD image is acquired. <u>Note:</u> This key is only available if a 3D+CFM or a 3D+PD image is acquired.

For further details refer to the Voluson® 730Pro Basic User Manual:

- Chapter 11.2, Volume Acquisition: 3D Sectional Planes
- Chapter 11.4, Volume Acquisition: 3D Rendering
- Chapter 11.5, Real Time 4D Acquisition

4-4-6 Using Cine

4-4-6-1 Activating Cine

Press **FREEZE**, then roll the **TRACKBALL** to display the images of the stored sequence one by one.

4-4-6-2 Cine-Split Function (Multiple Format)

After **FREEZE** of a sequence in 2D Mode two or four different images of the sequence can be displayed simultaneously in Dual respectively Quad Display Mode.

Move the **TRACKBALL** to display the images of the stored sequence. Use the **FORMAT** keys to change to the next (part of) frozen 2D image sequence to play back the cine memory.

NOTE: *The Cine-Split function (multiple format) is also possible in 2D Auto Cine mode.*

4-4-6-3 Activating 2D Auto Cine

- 1.) After Freeze press the **LEFT TRACKBALL KEY**.
- 2.) Select the start image of the sequence by rotating the **START** digipot. The selected image is simultaneously displayed.
- 3.) Turn the **END** digipot to the end image of the sequence. The selected image is displayed.
- 4.) Select the review **SPEED** and the read **ZOOM** factor.
- 5.) Select the Cine Mode review direction.
- 6.) To start/stop the Cine Loop playback press the **RIGHT OR LEFT TRACKBALL KEY**.
After stopping the sequence, move the **TRACKBALL** to display the images one by one.

4-4-6-4 Spectral Doppler- or M Cine Loop

Press **FREEZE**, then roll the **TRACKBALL** to display the Cine / Loop one by one.

The **UPPER TRACKBALL KEY** changes from the 2D Cine to the D Loop (respectively M Loop).

NOTE: *The active Cine is displayed on the screen: **Cine xxx/Loop** or **Cine/Loop xxx**.*

4-4-6-5 Activating 3D Rotation Cine

- 1.) After 3D Volume acquisition select the **3D ROT. CINE** item from the menu area.
- 2.) Select the **ROTATION ANGLE** from the menu area or select it manually with the **START** and **END** digipot rotary controls.
- 3.) Select the **STEP ANGLE** and the **ROTATION AXIS**.
- 4.) Select **CALCULATE** or press the **RIGHT OR LEFT TRACKBALL KEY** to start the calculation.
- 5.) To start/stop the 3D Rotation Cine sequence press the **RIGHT OR LEFT TRACKBALL KEY**.

4-4-6-6 Activating 4D Cine

- 1.) After Real Time 4D acquisition press the Freeze key to display the "4D Cine" menu.
- 2.) Press the **LEFT TRACKBALL KEY** (Toggle function: Start/Stop).
- 3.) Select the Cine Mode direction and the review **SPEED**.
- 4.) To start/stop the Real Time 4D Cine sequence press the **LEFT TRACKBALL KEY**.

NOTE: *After stopping a 3D Rotation Cine sequence or a Real Time 4D Cine sequence, move the **TRACKBALL** to display the images one by one.*

4-4-7 Basic Measurements

NOTE: Different menus are displayed depending on which Mode is selected.



General remarks to perform Basic Measurements:

- By pressing the **CALIPER** key on the control panel the Basic Measurement function is switched on.
- Selection of the desired measurement marks is done with the **NAVIGATION WHEEL** or by pressing the corresponding keyboard shortcuts.
- If the **TRACKBALL MENU NAVIGATION** key is illuminated, the trackball is consequently assigned to select the menu items in the menu area on the left side of the screen.
- Positioning of measurement marks is done with the **TRACKBALL**.
- Entering and storage of measuring marks is done with **SET** (right or left trackball key).
- To change measuring marks before completion press **CHANGE** (upper trackball key).
- To erase measurement results, press the **CLEAR ALL** key on the control panel or the **DELETE MEAS.** key on the keyboard.
- To exit from Basic measurements, press the **CALIPER** key or the **EXIT** key on the control panel.

NOTE: The following instructions assume that you first scan the patient and then press **FREEZE**.

4-4-7-1 Distance and Tissue Depth Measurements (2D and M Mode)

- 1.) Press the **CALIPER** key once.
- 2.) Select the appropriate item from the menu area. An active cursor appears.
- 3.) To position the active cursor at the start point (distance) or the most anterior point (tissue depth), move the **TRACKBALL**.
- 4.) To fix the start point, press **SET** (the right or left trackball key). The system fixes the first cursor and displays a second active caliper.
- 5.) To position the second active caliper at the end point (distance) or the most posterior point (tissue depth), move the **TRACKBALL**.
- 6.) To complete the measurement, press **SET**. The system displays the distance or tissue depth value in the measurement results window.

Before you complete a measurement:

To toggle between active calipers, press **CHANGE** (upper trackball key).

To erase results, press the **CLEAR ALL** key on the control panel or the **DELETE MEAS.** key on the keyboard.

NOTE: The **CHANGE** key alternates the control from one cursor to the other.

NOTE: To exit Basic measurements, press the **CALIPER** key or the **EXIT** key on the control panel.

4-4-7 Basic Measurements (cont'd)

4-4-7-2 Circumference/Area (using Ellipse or Trace) Measurements

- 1.) Press the **CALIPER** key once.
- 2.) Select the corresponding item from the menu area. An active cursor displays.
- 3.) To position the active cursor, move the **TRACKBALL**.
- 4.) To fix the start point, press **SET** (the right or left trackball key). The system fixes the first cursor and displays a second active caliper.
- 5.) To position the second caliper, move the **TRACKBALL** and press **SET** (Rt. / Lt. trackball key).

NOTE: *If you have selected the **2D TRACE** item, the measurement is finished and the area and circumference results appear on the screen.*

- 6.) An ellipse appears the axis of which is defined by these two points.
To adjust the width of the ellipse, move the **TRACKBALL**.
- 7.) To toggle between calipers, press **CHANGE** (upper trackball key).
- 8.) To complete the measurement, press **SET** (right or left trackball key). The system displays the circumference and area in the measurement results area.

Before you complete a measurement:

- To erase the ellipse resp. trace and the current data measured, press the **CLEAR ALL** key on the control panel or the **DELETE MEAS.** key on the keyboard.
The original caliper is displayed to restart the measurement.
- To exit the measurement function, press the **CALIPER** key or **EXIT** key on the control panel.

4-4-7-3 Volume Measurements

- 1.) Press the **CALIPER** key once.
- 2.) Select the appropriate item among **3 DISTANCE**; **DIST.&ELLIPSE**; **1 DISTANCE**; **1 ELLIPSE**.
- 3.) Perform the measurement(s) using the **TRACKBALL** and **SET** (right or left trackball key).
For further details: [see 4-4-7-1](#) and [4-4-7-2](#).

4-4-7-3-1 3D MultiPlane Measurements

NOTE: *This volume measurement is only possible in 3D Mode.*

- 1.) Select the reference image in which the measurement is to be performed (A, B or C).
- 2.) Press the **CALIPER** key once and select the **MULTIPLANE** item.
- 3.) Select the first section through the body by rotating the **REF.SLICE** digipot (first section should be set at the edge of the object).
- 4.) Position the start dot of the area which should be surrounded and store it with **SET**.
- 5.) Surround the area with the trackball, then press **SET** (right or left trackball key). The area is calculated and displayed. It may even be "zero". Press the **SET** key twice.
- 6.) Select the next parallel section with the **REF. SLICE** digipot and measure the area.
- 7.) Repeat 5. and 6. until the edge of the measured object is reached.

NOTE: *The contour of the measured area is not erased if a new section is adjusted.
To call back the measured areas touch the **PREV / NEXT** flip switch control.*

NOTE: *To erase the results, select the **INIT** item at the menu area.*

4-4-7 Basic Measurements (cont'd)

4-4-7-4 Velocity Measurements (Spectral Doppler Mode)

NOTE: The Spectral Doppler image is displayed based on time (X-axis) and velocity (Y-axis).

4-4-7-4-1 Acceleration Velocity and Velocity Ratio

- 1.) Press the **CALIPER** key once.
- 2.) Select the appropriate item among **VELOCITY** or **A/B**.
- 3.) Perform the measurement(s) using the **TRACKBALL** and **SET** (right or left trackball key).

4-4-7-4-2 Average Velocity (Manual Trace)

- 1.) Press the **CALIPER** key once.
- 2.) Select the **MANUAL TRACE** item from the menu area. A cursor appears on the screen.
- 3.) Move the cursor with the **TRACKBALL** to the start point of the measurement and press **SET** (right or left trackball key) to fix the marker.
- 4.) Trace to the end of the period and press the **SET** key again to fix the mark.
The measurement results appear on the screen.

Before you complete the measurement:

To readjust the traced line, press **UNDO** (upper trackball key) repeatedly.

NOTE: Depending on the setting in the Measure Setup, the envelope curve will be performed with a continuous trace line or by setting points.

4-4-7-4-3 Average Velocity (Auto Trace)

- 1.) Press the **CALIPER** key once.
- 2.) Select **AUTO TRACE** item from the menu area on the left side of the screen.
It traces the Spectral Doppler image automatically and displays the results.
- 3.) Select the **SENSITIVITY** of the envelope curve (to eliminate artifacts).
- 4.) Select the **TRACE MODE** channel of the envelope curve (upper, both, lower).
- 5.) If necessary, select the Angle and the Baseline.
- 6.) Press the **RIGHT OR LEFT TRACKBALL KEY** to finish the measurement.

Before you complete the measurement:

- To readjust the start cycle (vertical yellow line), press **CHANGE** (upper trackball key).
Press **SET** (right or left trackball key) to fix the line.
- Press the **CHANGE** key again to readjust the end cycle (vertical green line).
Press **SET** to fix the line.

NOTE: The determination of the envelope curve requires a clear and low-noise record of the Doppler spectrum. Otherwise the reliability of the displayed measurement results may not be ensured!

4-4-8 Calculations

NOTE: Confirm that the patient information is correct and the probe and application are selected properly.



General remarks to perform Calculations:

- By pressing the **CALC** key on the control panel the Calculation function is switched on.
- Selection of the desired measurement is done with the **NAVIGATION WHEEL** or by pressing the corresponding keyboard shortcut.
- Positioning of measurement marks is done with the **TRACKBALL**.
- Entering and storage of measuring marks is done with **SET** (right or left trackball key).
- To change measuring marks before completion press **CHANGE** (upper trackball key).
- Depending on the setting in the Measurement Setup, also the **FREEZE** key can be used for confirming the last measuring mark of the currently performed measurement.
- To cancel the measurement of the currently selected item, select **CANCEL** or press the **BACKSPACE** key on the keyboard.
- To delete the results of the last measured item, select **UNDO LAST** or press the **BACKSPACE** key on the keyboard.
- To delete all measurement results of the selected group from the monitor as well as from the corresponding report, select **CLEAR GROUP** or press the **DELETE** key on the keyboard.
- All measurement results will be automatically included in the corresponding patient report. (Except Auto Trace measurements; therefore you have to press the right or left trackball key **STORE**.)
- To erase results, press the **DELETE MEAS.** key on the keyboard or press the **CLEAR ALL** key on the control panel.
- To exit from Calculations, press the **CALC** key again or press the **EXIT** key on the control panel.

4-4-8-1 OB Calculations

Most of items in the OB Calculations are the measurement of a distance. [see 4-4-7-1](#)

The items that calculate the circumference include HC, AC and FTA. [see 4-4-7-2](#)

In case of AFI you can measure the distances in several images.

The ways for fetal doppler measurements are the same as those of basic velocity measurements.

For details [see 4-4-7-4-2](#) and [4-4-7-4-3](#).

4-4-8-2 GYN Calculations

The ways of the measurement in the GYN Calculations are the same as those of distance [see 4-4-7-1](#) and Spectral Doppler measurements [see 4-4-7-4-2](#) and [4-4-7-4-3](#).

For details, refer to the Voluson® 730Pro Basic User Manual, Chapter 14.5, GYN Calculations.

4-4-8-3 Cardiac Calculations

This system allows measurements in 2D Mode, M Mode, Spectral Doppler Mode and Color Doppler Mode using different items of Cardiac Calculations.

For details, refer to the Voluson® 730Pro Basic User Manual, Chapter 14.7, Cardiac Calculations.

4-4-8-4 Vascular Calculations

The way of Vascular Calculations such as Lt. ICA, Rt. ICA, Lt. CCA, Rt. CCA, Lt. ECA, Rt. ECA and Peripherals are the same.

For details, refer to the Voluson® 730Pro Basic User Manual, Chapter 14.9, Vascular Calculations.

4-4-8-5 Report Pages



Press the **REPORT** key on the control panel to view a patient report that contains the results of Calculation Measurements. Any stored patient report can be edited, printed, transferred, saved to Sonoview or sent to DICOM server.

4-4-9 Probe/Connectors Usage

4-4-9-1 Connecting 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 cable.
- 3.) DO NOT allow the probe head to hang free. Impact to the probe head could result in irreparable damage.
- 4.) Turn the connector locking handle counterclockwise.
- 5.) Align the connector with the probe port and carefully push into place.
- 6.) Turn the connector locking handle clockwise to secure the probe connector.
- 7.) Open the right-hand side door, lay the cable into the intended cable holders and close the door. So it is free to move, but not resting on the floor.

4-4-9-2 Activating the probe

- 1.) Press the **PROBE** key to activate the "Probe Select" menu.
- 2.) Select the appropriate probe using the **TRACKBALL** and the **TRACKBALL KEYS**.
- 3.) Upon selection of an "Application", the programmed user presets appear.
- 4.) Clicking a "Setting" field causes loading of the preset.

The probe is initialized, the main menu (2D mode) and the ultrasound image appears on the monitor in write mode (real time display).


4-4-9-3 Deactivating the probe

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

- 1.) Press the **FREEZE** key.
- 2.) Gently wipe the excess gel from the face of the probe. (Refer to the Basic User Manual of Voluson® 730Pro for complete cleaning instructions.)
- 3.) Carefully slide the probe around the right side of the keyboard, toward the probe holder. Ensure that the probe is placed gently in the probe holder.

4-4-9-4 Disconnecting the probe

Prior to disconnect a probe freeze the image. It is unnecessary to switch the unit off.

 **CAUTION** If a probe is disconnected while running (write mode) a software error may occur. In this case switch the unit OFF (perform a reset).

- 1.) Open the right-hand side door, remove the cable from the cable holder and close the door.
- 2.) Turn the probe locking handle counterclockwise. 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. Ensure the cable is free.

4-4-10 Image Management (Sonoview)

For Sonoview - Image Management functionality refer to Chapter 15 in the Basic User Manual of the Voluson® 730Pro. It talks about several topics:

- Clipboard
- Sending Exams
- Printing Exams / Images
- Export Exams / Images
- Backup Exams
- Restore the Backup Exams
- DICOM Print / Send
- Verifying and Pinging a Device
- Sending Images via e-mail
- Browsing and Managing an Exam's stored Image
- Connectivity, and Dataflow Concept and Creation
- Configuring Connectivity
- Services (Destinations)
- Input of comments and voice annotations
- Measure Distance and Ellipse
- Buttons
- Views
- MO and CD-RW Formatting/Erasing
- Changing Backup Folder on mapped Network Drive
- etc.

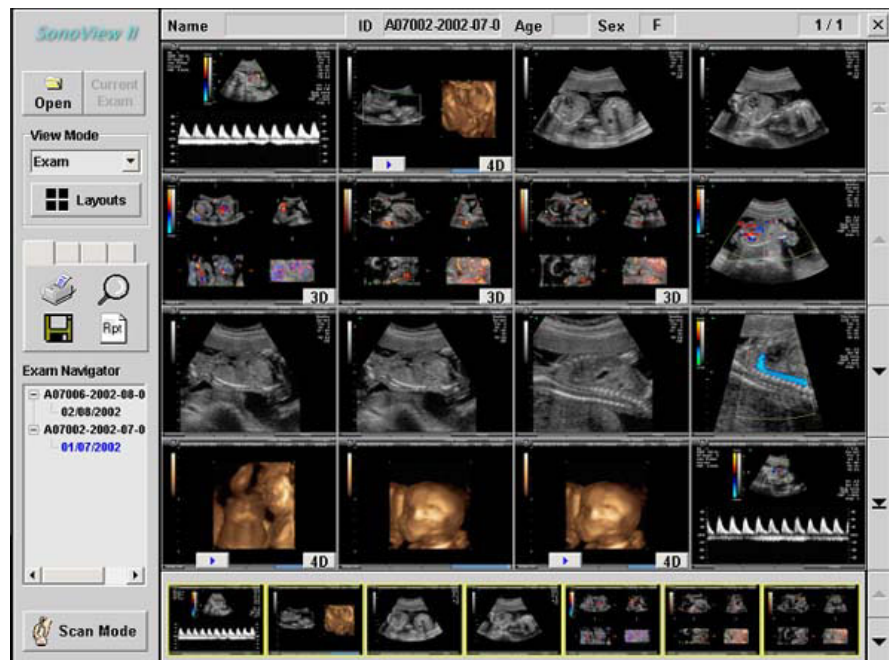
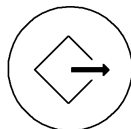


Figure 4-14 Sonoview

4-4-11 Using the MOD (Magneto-Optical Drive)

The 3.5 inch Magneto-Optical disk drive supports the following medias:

1.3GB; 640MB; 540MB; 230MB and 128MB



Figure 4-15 Magneto-Optical Drive

- 1.) Before installing an MO disk in the MOD, check the MO disk for loose hardware or damaged labels which could jam inside the MOD. Also, ensure that the slide switch in one corner of the disk is set so that the disk is write enabled (disk hole closed).
- 2.) Insert the disk into the MOD with the label facing up.



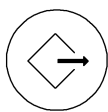
NOTICE Never move the unit with a disk in the MOD because the drive actuator will not be locked and the MOD could break.

- 3.) There are different methods to eject a disk from the MOD. Manual ejection methods are listed below in preferred order from best (1) to worst (3).
 - a.) Press the **EJECT** switch on the MOD while system is ON.
 - b.) Press and hold the **EJECT** switch while the system is booting.
 - c.) Mechanical ejection. Insert the end of a paper clip into the hole next to the **EJECT** switch while system power is OFF.



NOTICE Avoid mechanical ejection whenever possible. Mechanical ejection leaves the actuator unlocked and the MOD susceptible to damage if moved. If forced to use this method, reboot the system, then insert and eject a known good disk using one of the other manual ejection methods.

4-4-11-1 Formatting Media



To format the backup media, MOD or CD-RW, press the **SONOVIEW** key on the Control panel.

The Sonoview screen appears on the monitor; see: [Figure 4-14 on page 4-25](#).

a.) Select the “MO and CD-RW Formatting” tool on the left side of the Sonoview screen.

b.) Insert the medium and select the **CD** or the **MO** icon.

By selecting MO cartridge the unit displays the “MO Disk Formatter” window as shown in [Figure 4-16](#).

1.) Select a Format Type from the drop down menu. If desired, mark the Low Level Format icon.

2.) Click the **START** button to start the formatting process.

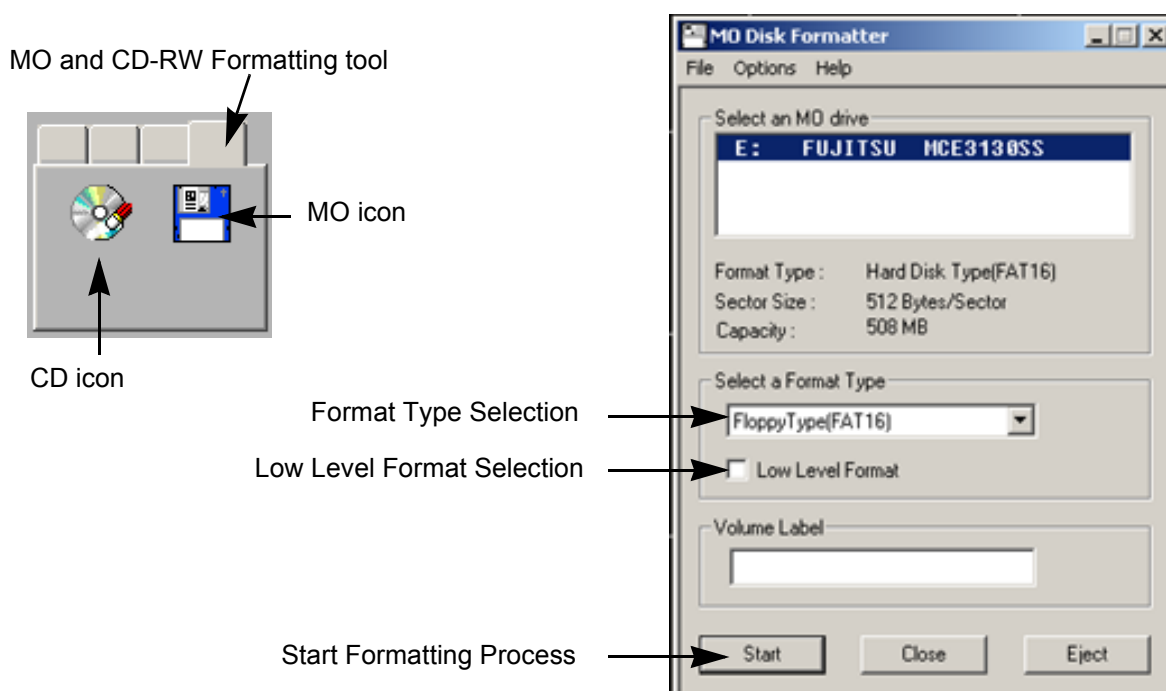


Figure 4-16 MO Disk Formatter Window

3.) A message box appears on the screen. Confirm with **OK**.

4.) When the formatting has been completed, click **OK** to continue.

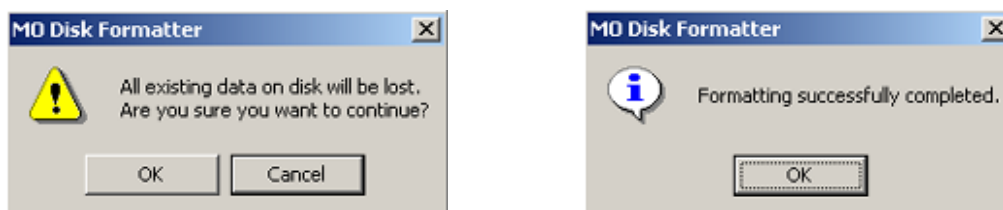



Figure 4-17 MO Disk Formatter messages

5.) Select the **CLOSE** button and press the **EXIT** key on the control panel to return to the Scan Mode.

4-4-11-1 **Formatting Media** (cont'd)

By selecting CD-RW the unit displays the “Erase CD-RW” window as shown in [Figure 4-18](#).

- 1.) Select the “Erase Mode” and click the [OK] button to start the format process.



NOTICE It is highly recommended to use the complete erase mode, to avoid problems with the CD-RW!

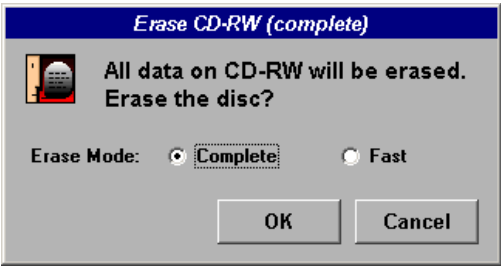


Figure 4-18 Erase CD-RW Window

- 2.) During erasing the Ultrasound system displays following message.

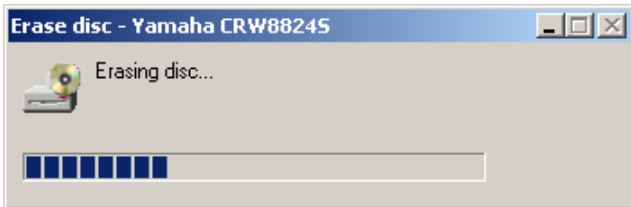


Figure 4-19 Erasing disk

- 3.) Press the EXIT key on the control panel to return to the Scan Mode.

*NOTE: It is possible to adjust the Write Speed of the CD-Writer.
At older software versions, also the Erase Mode can be preset in the “Settings” window.*

- 1.) Click the SETTINGS icon on the left side of the Sonoview screen.
2.) Select CD RECORDER from the tool bar.

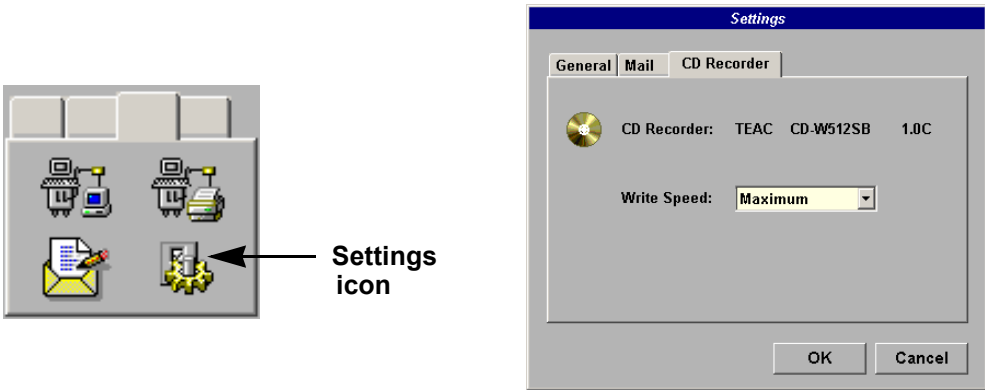


Figure 4-20 Settings of the CD-Recorder

- 3.) Choose the “Write Speed” (and the “Erase Mode” at systems with older software versions) from the corresponding pop-up menu.

Section 4-5 Backup and Restore Database, Preset Configurations and Images



NOTICE From Software Version 2.2.0 onwards, it is also possible to save/load/delete “Full Backup” data via the System Setup BACKUP page; see: [Figure 4-21](#).

- 1.) On the control panel, press the UTILITIES key.
- 2.) Select the SYSTEM item from the menu area that is displayed on the left side of the screen.
- 3.) In the System Setup, select the BACKUP page.

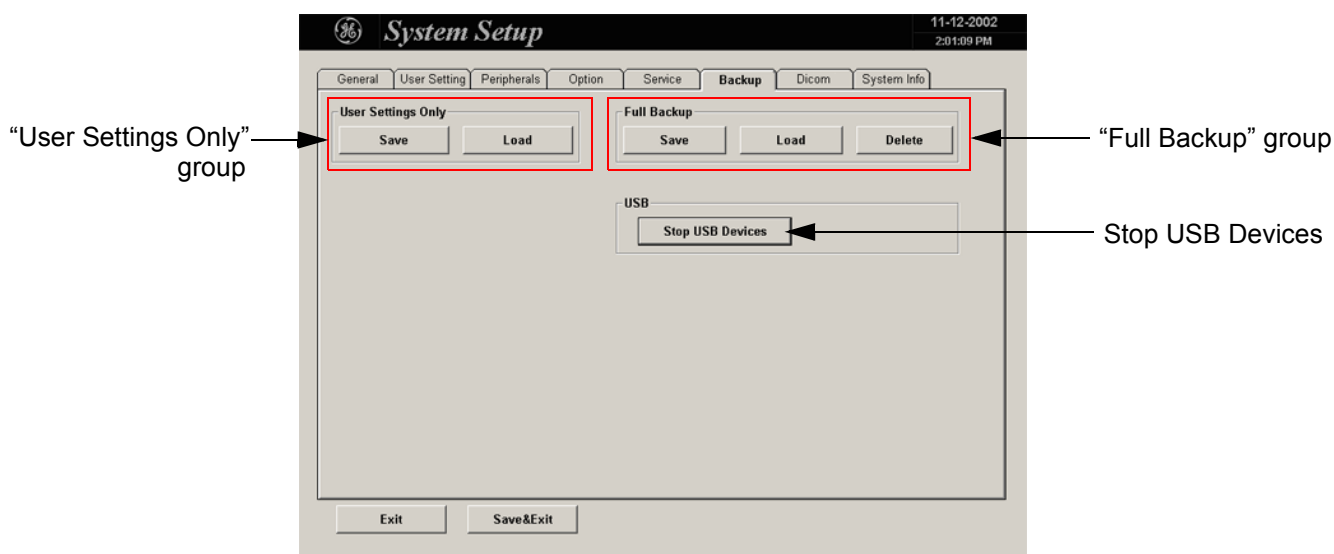


Figure 4-21 System Setup - Backup page

From Software Version 2.2.0 onwards, the “Backup” page is subdivided in two main groups:

A.) User Settings Only

- [Section 4-5-1 "Save User Settings Only \(Application Settings\)" on page 4-30](#)
- [Section 4-5-2 "Load User Settings Only \(Application Settings\)" on page 4-31](#)

B.) Full Backup

- [Section 4-5-3 "Save Full Backup \(Presets, Configurations & Application Settings\)" on page 4-33](#)
- [Section 4-5-4 "Load Full Backup \(Presets, Configurations & Application Settings\)" on page 4-35](#)
- [Section 4-5-5 "Delete Full Backup \(Presets, Configurations & Application Settings\)" on page 4-38](#)

The User Settings and/or Full Backup can be saved to the following destinations:

- D: partition of internal hard disk
- CD-RW
- MOD
- Mapped Network Drive **Z:**
see: [Section 3-10-1 "Map Network Drive" on page 3-53](#)
- Any other drive connected to the system (e.g.; an external USB-hard disk)
Note: This function is only available in the Full Backup utility.
For further details review: [Section 3-5-10 "External USB-Devices" on page 3-18](#).

4-5-1 Save User Settings Only (Application Settings)

The User Settings contains:

- User Programs
 - Auto Text
 - 3D/4D Programs
- 1.) Insert a CD-RW or MO (Magneto-Optical Disk) into the drive.
 - 2.) On the control panel, press the **UTILITIES** key.
 - 3.) Select the **SYSTEM** item from the menu area (on left side of the screen) to invoke the system setup.
 - 4.) Select the **BACKUP** page.
 - 5.) Click the **SAVE** button of the "User Settings Only" group.

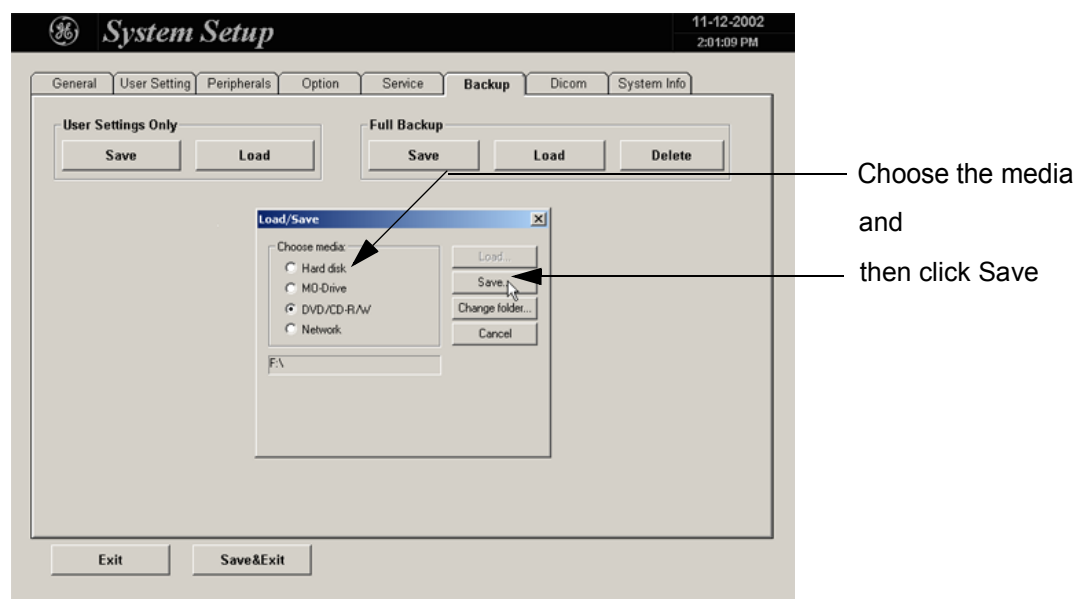


Figure 4-22 User Settings Only - Save window

- 6.) Choose the media (e.g., DVD/CD+RW) and click the **SAVE** button.
- 7.) Select the **NEW FILE...** key and enter a file name (without extension).
- 8.) Click the **OK** key to start the process. When the saving has been completed, click **OK**.

4-5-2 Load User Settings Only (Application Settings)

CAUTION The loading procedure overwrites the existing application settings on the local hard drive. Make sure to insert the correct CD or MO. Additionally you can load the backup from D:\UserSettings.

- 1.) Insert the CD-RW or MO (Magneto-Optical Disk) into the drive.
- 2.) On the control panel, press the **UTILITIES** key.
- 3.) Select the **SYSTEM** item from the menu area (on left side of the screen) to invoke the system setup.
- 4.) Select the **BACKUP** page and click the **LOAD** button of the "User Settings Only" group.

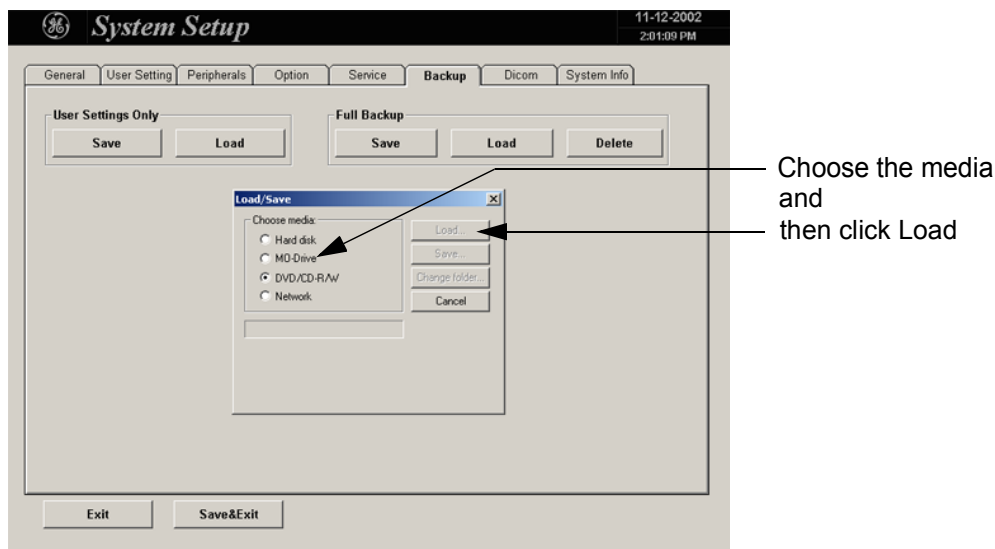


Figure 4-23 User Settings Only - Load window

- 5.) Choose the media (e.g., DVD/CD+RW) and click the **LOAD** key.
- 6.) Select the appropriate file and click **OK**. The "Load Backup Data" window appears.

NOTICE It is highly recommend to use Application settings which are adapted for the systems software version!

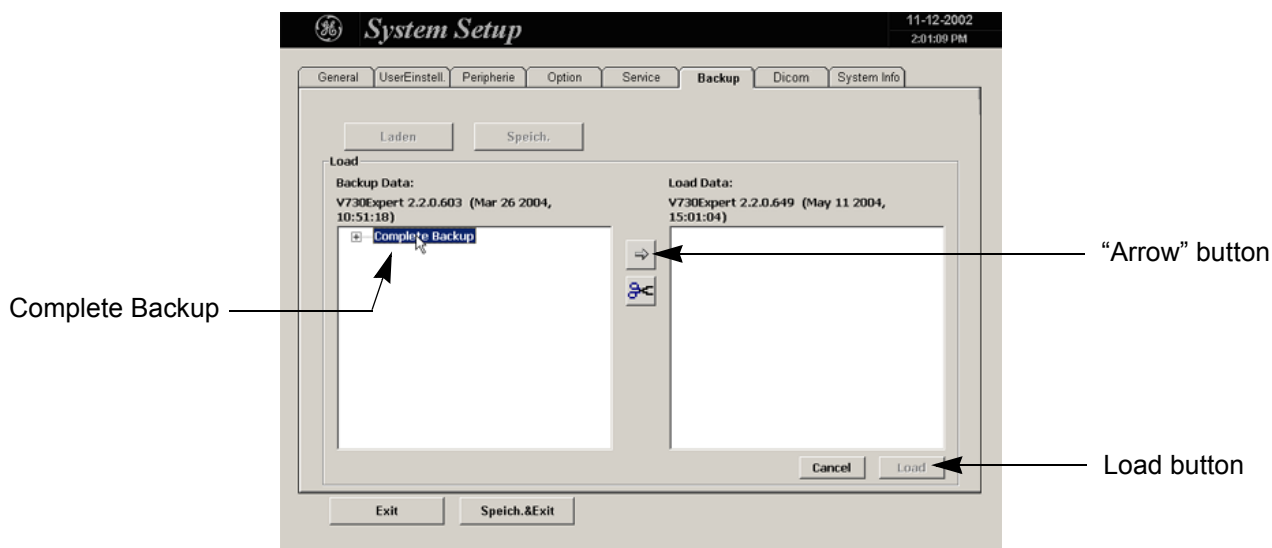


Figure 4-24 Load Backup Data

4-5-2 Load User Settings Only (Application Settings) (cont'd)

- 7.) Select the **Complete Backup** (marked blue; see: [Figure 4-24](#)) and click the ARROW button to copy the Complete Backup into the Load Data field.
- 8.) Click the LOAD button to start the loading procedure of the complete backup into the system.

NOTE: Also only parts of a User Settings Only "Backup" can be loaded into the database to overwrite, restore, copy, etc.... the database in the system.

- 1.) Click the ± sign to open the content tree.

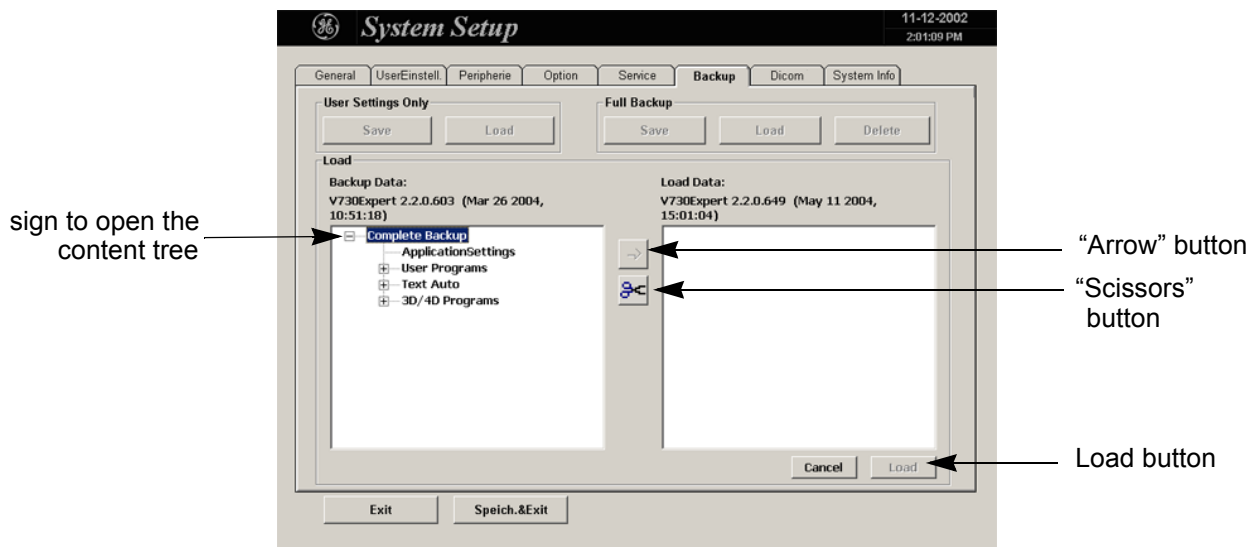


Figure 4-25 Load only parts of the Backup

- 2.) Click the ARROW button to copy the selected item into the Load Data field.
- 3.) To return selected items from the Load Data field to Backup Data field select the SCISSORS button.
- 4.) Click the LOAD button to start loading procedure of the selected Backup item into the system.

4-5-3 Save Full Backup (Presets, Configurations & Application Settings)

A full backup always contains the following data

- Patient demographic and exam data (database containing the patient data and measurements)
- SonoView image data (**NOT** available when saving to the internal hard disk, CD or MOD)
- User Settings (databases and files containing gray curves and the user settings.)
- Image transfer settings (DICOM settings e.g., DICOM servers, AE Title, Station Name, etc.)
- Measure Setup Settings (user specific measure settings)
- V730 settings (general settings such as language, time/date format and the enabled options)
- Windows Network Settings (network settings including the computer name)



CAUTION It is recommended to create a full backup of the settings once a week.

NOTE: Always “Full Backup” any presets, configurations and application settings to HDD and/or CD or MO-disk before upgrading the software and/or application settings. This ensures that if the presets need to be reloaded, will be the same ones the customer was using prior to service.

- 1.) On the control panel, press the UTILITIES key.
- 2.) Select the SYSTEM item from the menu area (on left side of the screen) to invoke the system setup.
- 3.) Select the BACKUP page and click the SAVE button of the “Full Backup” group.

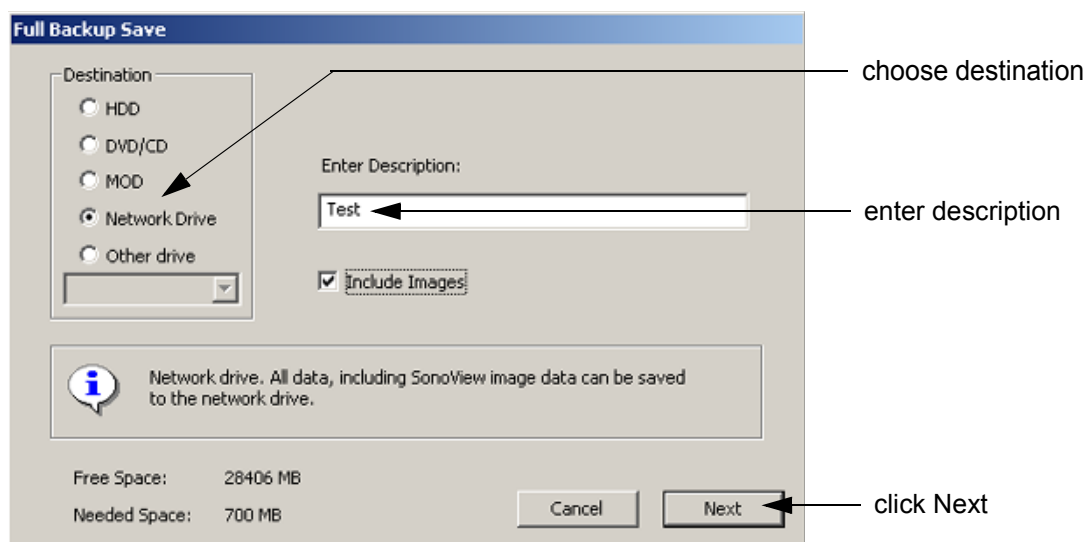


Figure 4-26 Full Backup Save

- 4.) Choose the Destination (e.g., Network Drive).
- 5.) Enter the description of the full backup.
- 6.) If desired and possible (Network Drive and Other drive **only**), activate “Include Images”.

NOTE: The “Include Images” option may result in a large amount of data: up to **70 Gigabytes!**

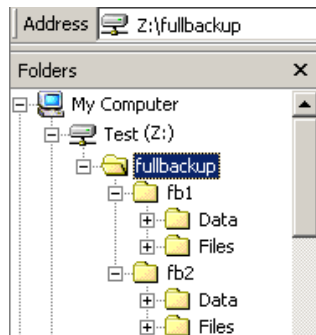
- 7.) Click the NEXT button and then confirm the message “Start Backup now?” with YES to start the backup process.
- 8.) After copying the data, confirm the message “Backup successfully completed....” with OK.
The Voluson® 730Pro reboots and the application starts again.

4-5-3 Save Full Backup (Presets, Configurations & Application Settings) (cont'd)

When the Full Backup is stored on a network drive (to map a network drive see: [Section 3-10-1 "Map Network Drive" on page 3-53](#)), it may be desirable to move the data (e.g., for backup or maintenance).

The backups reside in sub folders of the main "fullbackup" -folder found at the root of the drive. For Example: Backups on the mapped **Network Drive** are below path **Z:\fullbackup**.

The directory structure of the full backup data is as follows:

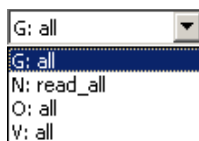


The sub folders have the names *fbX* where *X* is a number (e.g., Z:\fullbackup\fb1).

The data resides within a directory structure within these sub folders. It is possible to move the *fbX* sub folders, even leaving gaps in the numeration sequence.

However, **NO** change **MUST** be made to the contents of the *fbX* folders itself, otherwise the backup data cannot be restored!

Figure 4-27 directory structure of full backup data



If the destination „Other drive“ is selected, the available drives (e.g., external USB-memory stick) can be chosen from the drop down menu.

Figure 4-28 “Other drive” drop down menu



NOTICE When the backup is saved to an external USB-device, the system has to be informed about the removal of the hardware. For this purpose every last dialog of "Full Backup Save" and "Full Backup Delete" has a STOP USB DEVICES button (see: [Figure 4-29](#)).

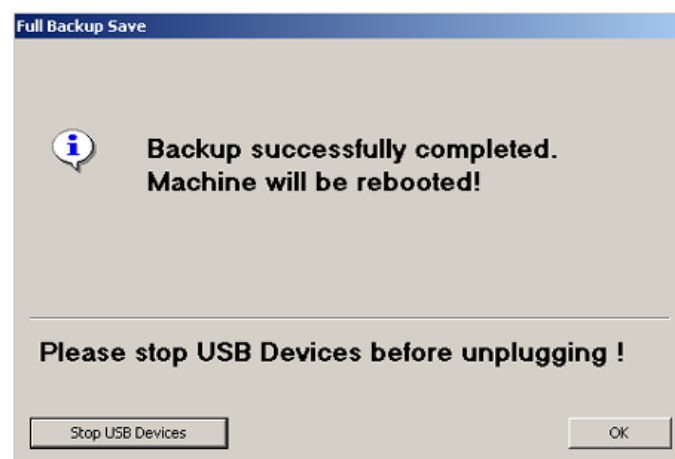


Figure 4-29 Please stop USB Devices before unplugging!

For further details review: [Section 3-5-10 "External USB-Devices" on page 3-18](#).

4-5-4 Load Full Backup (Presets, Configurations & Application Settings)



WARNING Always backup any data before an upgrade; see: [Section 4-5-3 on page 4-33](#).

*The "Full Backup" loading procedure replaces (overwrites) **ALL** the existing data on the local hard drive of the Voluson® 730Pro system!*



CAUTION There are circumstances where it is not possible to load (restore) all the data. The following rules specify these restrictions:

- 1.) Generally, **only** restoring data from an older to a newer software version is possible. Loading a backup into a system that has a lower software version than the system the backup was created on is prohibited.
- 2.) Options can **only** be restored on the same Voluson® 730Pro system within the same major software version.
- 3.) When loading a backup into a system with a software version that has a higher major number (2.x.x -> 3.x.x), the following items will not be restored:
 - A.) User Settings
 - B.) Options
- 4.) The **user** is **only** allowed to restore data to a different system if and only if the software version on this system is the same as in the backup.
- 5.) The **user** is **only** allowed to restore data onto the same system if and only if the software version on this system is equal or higher than the version in the backup.
- 6.) The **user** is **not** allowed to restore the following items to a different system:
 - A.) Windows Network Settings
 - B.) Options
 - C.) DICOM AE Title
 - D.) DICOM Station Name

4-5-4 Load Full Backup (Presets, Configurations & Application Settings) (cont'd)

- 1.) On the control panel, press the **UTILITIES** key.
- 2.) Select the **SYSTEM** item from the menu area (on left side of the screen) to invoke the system setup.
- 3.) Select the **BACKUP** page and click the **LOAD** button of the "Full Backup" group.

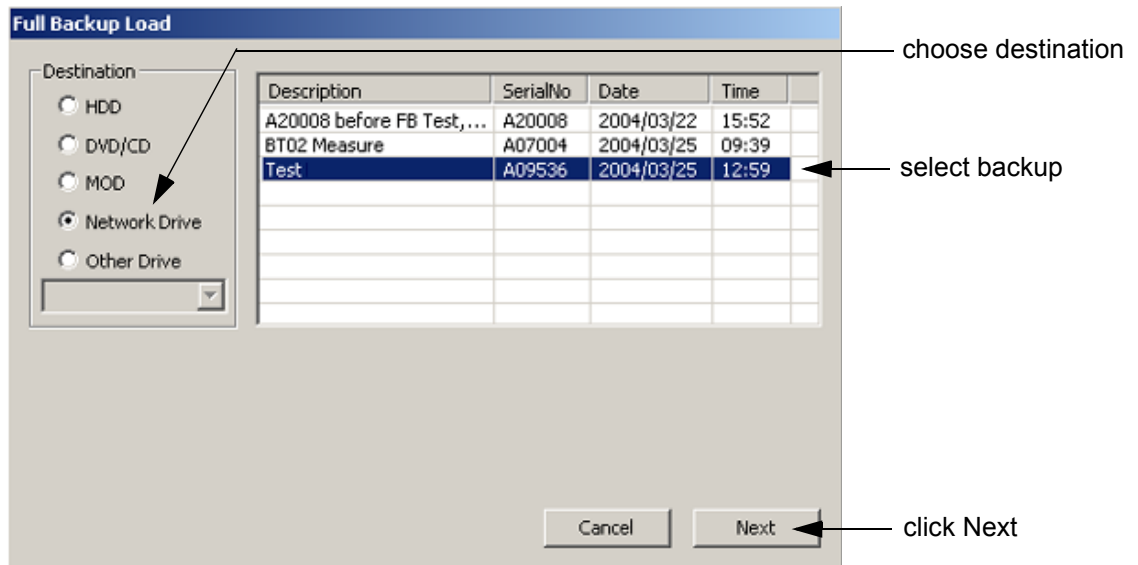


Figure 4-30 Full Backup Load

- 4.) Choose the Destination (e.g., Network Drive).
- 5.) Click on the backup to be restored (additional information is displayed in the table).
- 6.) Select the **NEXT** button. The following window will be displayed.

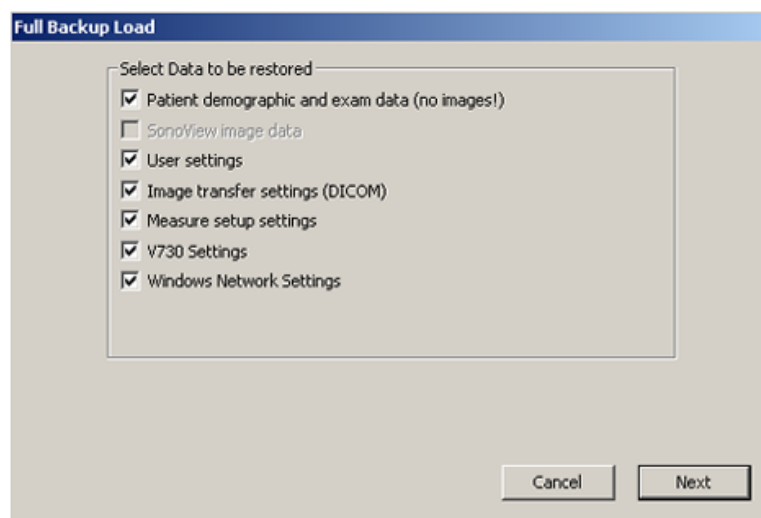


Figure 4-31 Select Data to be restored

- 7.) Select the data to be restored to the Voluson® 730Pro system.

NOTE: For description of the check box names review: [A full backup always contains the following data](#)

- 8.) Confirm the selection with **NEXT**.

4-5-4 Load Full Backup (Presets, Configurations & Application Settings) (cont'd)

9.) Click YES to start, or NO to cancel the restore procedure.



Figure 4-32 Start Restore Backup now?

The following warning messages appear.

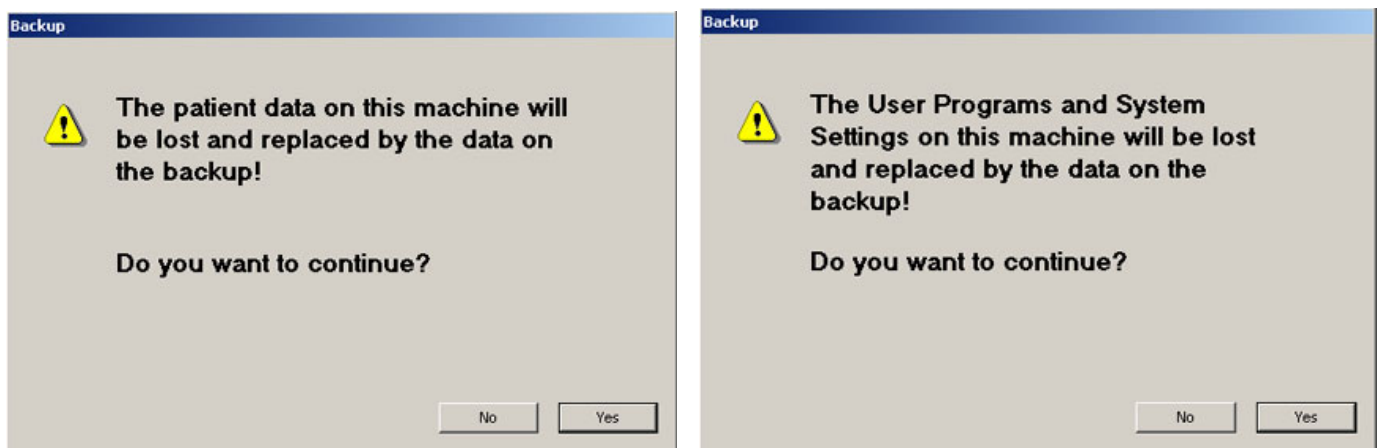


Figure 4-33 Warning messages



WARNING When clicking “YES”, the current data on the system will be permanently replaced by the data on the backup and can not be restored!

10.) If in doubt, verify that you have selected the correct “Full Backup” by clicking NO.
Otherwise confirm these warning messages with YES.

11.) Confirm the message “Restore successfully completed” with yes to reboot the system.
The Voluson® 730Pro reboots and the application starts again.

4-5-5 Delete Full Backup (Presets, Configurations & Application Settings)

- 1.) On the control panel, press the **UTILITIES** key.
- 2.) Select the **SYSTEM** item from the menu area (on left side of the screen) to invoke the system setup.
- 3.) Select the **BACKUP** page and click the **DELETE** button of the "Full Backup" group.

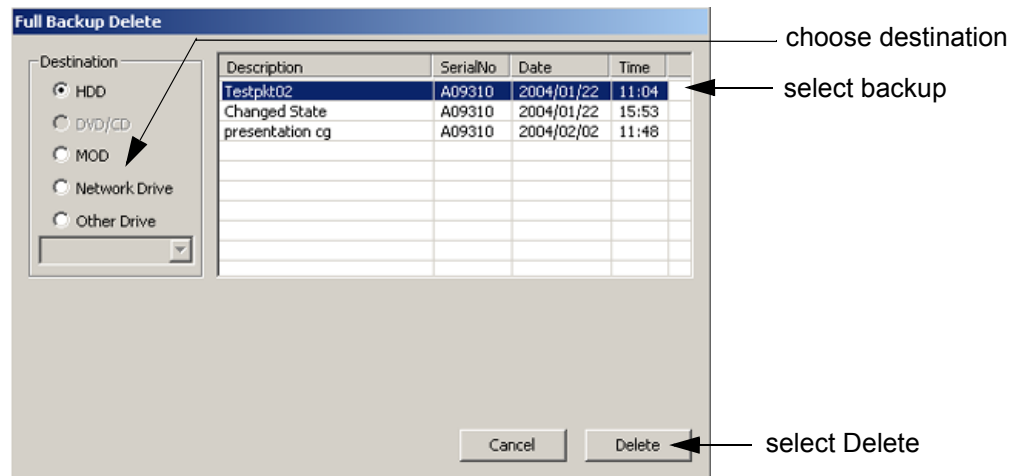


Figure 4-34 Full Backup Delete

- 4.) Choose the Destination (e.g., HDD = Hard disk).
- 5.) Click on the backup to be deleted (additional information is displayed in the table).
- 6.) Select the **DELETE** button.
- 7.) **Only if you are absolutely sure**, confirm the message "Do you really want to delete the selected backup?" with **YES**.



WARNING *There is no "UNDO" function for this action!*

- 8.) Confirm following message with **OK**.



Figure 4-35 Backup deleted

4-5-6 Archiving Images

- 1.) Press the **SONOVIEW** key on the control panel.
- 2.) Insert the CD-RW or MOD into drive.
If required, erase/format the media, see: [Section 4-4-11-1 "Formatting Media" on page 4-27](#).
- 3.) When you click the **OPEN** button on the upper left side of the screen, a list of all the exams is displayed see [Figure 4-36](#).

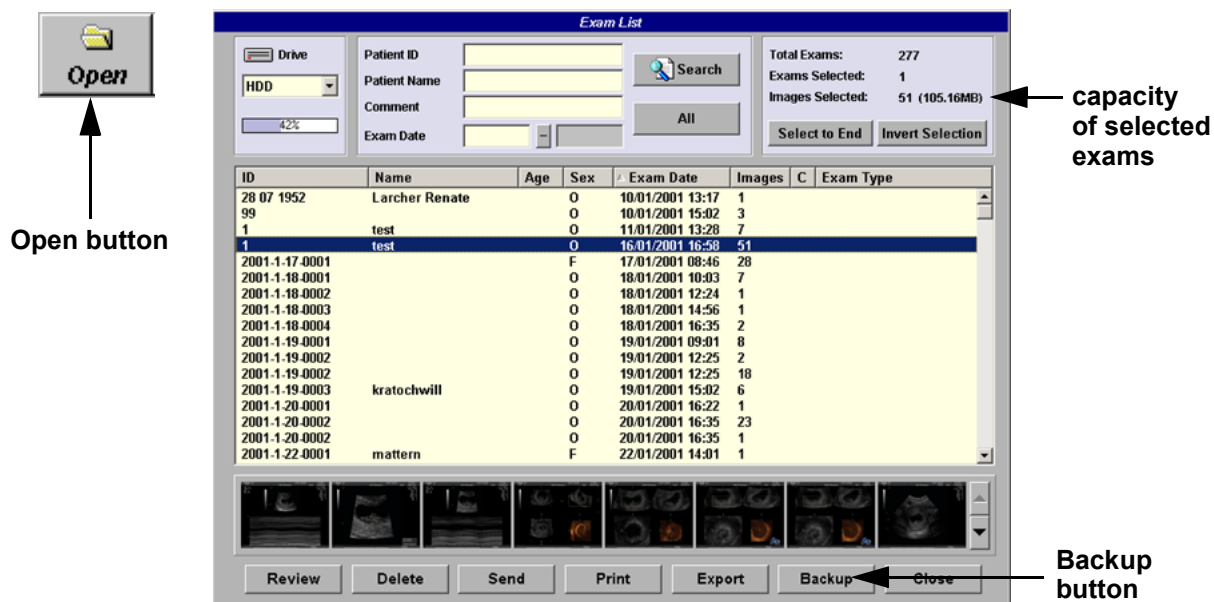


Figure 4-36 Sonoview Screen

- 4.) Select the exam(s) using the **TRACKBALL**, the **CTRL** or **SHIFT** key on the alphanumeric keyboard and the right trackball key **SET**.

The number of all exams, the number of currently selected exams, the number of images and the capacity of selected images are displayed automatically at the right and upper corner of the exams list.

- 5.) Click the **BACKUP** button.
- 6.) Select the destination for the backup.

NOTE: For destination NET perform [Section 3-10-1 "Map Network Drive" on page 3-53](#) first.

- 7.) After finishing the backup, select whether the selected exam(s) is to be deleted or not.

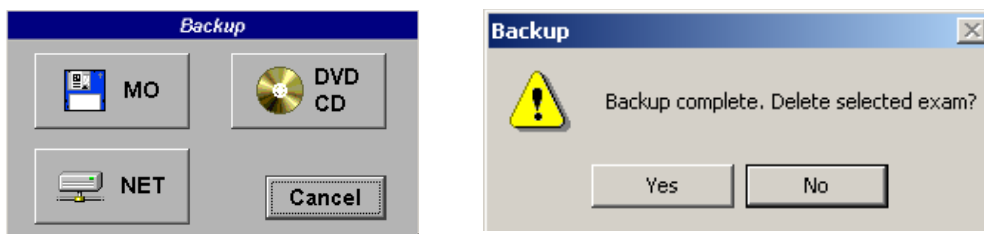


Figure 4-37 Backup windows



NOTICE If you select to delete the exam after finishing the backup, it will be absolutely deleted from the hard disk of the ultrasound scanner Voluson® 730Pro!

For further information refer to Chapter 15 in the Basic User Manual of Voluson® 730Pro.

Section 4-6 Software Configuration Checks

Press the **UTILITIES** key and select the **SYSTEM** item from the "Utilities" menu - which is shown in the menu area on the left side of the screen. The System Setup desktop offers different pages to check:

Table 4-10 System Setup Checks

Step	Task	Expected Result(s)
1	General: Check Date and Time setting	Date and Time are correct
2	General: Check that Location (Clinic Name) is correct	Location Name is correct
3	General: Check Language settings	desired Language is displayed
4	User Setting: Check all the User Settings	settings assigned as desired by the customer
5	Peripherals: Check assignment of Printer keys	Print A and Print B keys are assigned as desired by the customer
6	Peripherals: Check assignment of Foot switch	Foot Switch left and right are assigned as desired by the customer
7	Peripherals: Check Save Destination assignment	assigned as desired by the customer
8	Peripherals: Check 2D Save key assignment	assigned as desired by the customer
9	Peripherals: Check Remote Print A, Remote Print B, Report Printer and DICOM Print Job assignment	settings assigned as desired by the customer
10	Option: Check that all of the options are set up correct	all authorized functions are enabled
11	DICOM: Check DICOM and Network configurations	settings assigned as desired by the customer

Press the **UTILITIES** key and select the **MEASURE** item from the "Utilities" menu (shown in the menu area on the left side of the screen). The Measurement Setup desktop offers different pages to check:

Table 4-11 Measurement Setup Checks

Step	Task	Expected Result(s)
1	General: Check "2D Circumference and Area Method"	setting assigned as desired by the customer
2	General: Check "Show Caliper Information Text"	setting assigned as desired by the customer
3	General: Check "Caliper & Measure-Result Font Size"	setting assigned as desired by the customer
4	General: Check "Doppler Manual Trace Mode"	setting assigned as desired by the customer
5	General: Check "Store Measurements"	setting assigned as desired by the customer
6	General: Check "Doppler Trace Display Results"	settings assigned as desired by the customer
7	General: Check "Measure Results Display"	setting assigned as desired by the customer
8	OB: Check "Preset Selection"	setting assigned as desired by the customer
9	OB: Check "Pregnancy Weeks"	setting assigned as desired by the customer
10	OB: Check "Ratio Calculations"	settings assigned as desired by the customer
11	OB: Check "GS Measurement Method"	setting assigned as desired by the customer
12	OB: Check "Show Author's Name at Measure Menu"	setting assigned as desired by the customer

Table 4-11 Measurement Setup Checks

Step	Task	Expected Result(s)
13	Cardiac: Check "2D Circumference and Area Method"	setting assigned as desired by the customer
14	Cardiac: Check "LV Volume Calculation Method"	setting assigned as desired by the customer

Section 4-7 Peripheral Checks

Check that peripherals work as described below:

Table 4-12 Peripheral Checks

Step	Task to do	Expected Result(s)
1	Press the FREEZE key.	Stop image acquisition.
2	Press the PRINT A or PRINT B key on the Control Panel.	The image displayed on the screen is printed on printer, depending on the key assignment configuration
3	Press the VCR key on the Control Panel twice.	VCR starts recording (REC - will be displayed on the screen)
4	Press the VCR key twice again.	VCR stops recording
5	Press the VCR key on the Control Panel once.	The "VCR Remote Control" menu is displayed in the menu area as well as the status area on the screen.
6	Press the RECORD digipot or select the RECORD item from the menu area.	to start recording A red dot is displayed in the <i>VCR status area</i> on the <i>Title bar</i> to indicate that recording has begun.
7	Press the STOP digipot or select the STOP item from the menu area.	To Stop recording The video status icon is changed to (Pause)
8	Press the PLAY digipot or select the PLAY item from the menu area.	To start, Play back an examination
9	Press the EXIT key on the control panel.	to return to the scanning mode
10	Use the assignable keys on the control panel (their functions are shown in the status area) or select the corresponding item from the menu area on the left side of the screen.	to perform actions on the recorded session, such as stop, pause, rewind or fast forward. The video status icon is updated accordingly.

4-7-1 ECG Check Out

Connect the ECG preamplifier MAN and check:

Table 4-13 ECG preamplifier Check

Step	Task	Expected Result(s)
1	Connect the ECG at the Connector on the rear panel of the scanner. Press the ECG key on the control panel to display the "ECG" menu on in the screen.	It will display a curve along the bottom edge of the image sector

Section 4-8

Mechanical Function Checks

4-8-1

Rotation of the Control Console

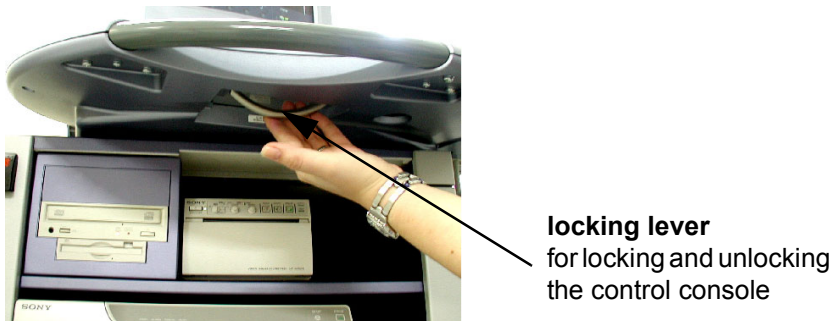



Figure 4-38 locking lever under Control Console

Table 4-14 Rotation of the Control Console

Step	Task	Expected Result(s)
1	Pull the locking lever under the Control Console forward, grasp it at the front grip and rotate the console.	It is possible to rotate the Control Console up to 30° to the right.

 **WARNING** *Do not put your hand between the control console and the main unit when moving the console to the 0 position: Danger of injuries!*

4-8-2

Brakes and Direction Locks

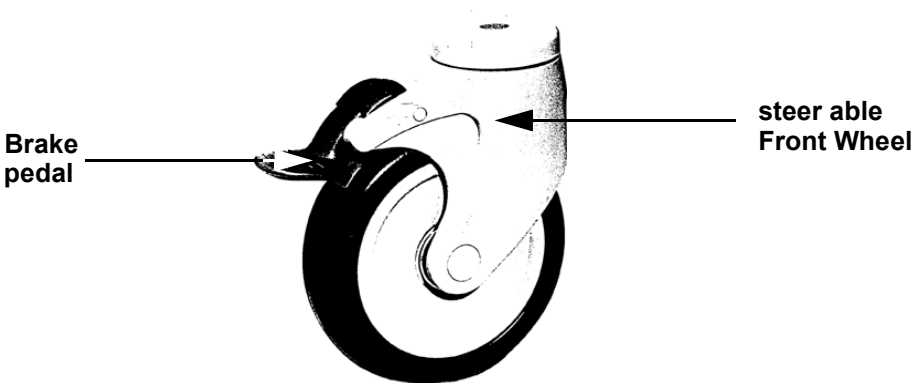


Figure 4-39 Front Wheel with Brake

Table 4-15 Brakes and Direction Lock

Step	Task	Expected Result(s)
1	Flap the foot rest up and press the release brake pedals on the front wheels.	The front wheels are engaged / disengaged for transportation.

4-8-3 Power Supply Adjustment

There are no adjustments on the power supplies. The DC Power is self-regulated. If a voltage is outside the specified range, it means that something is wrong, either with the power supply itself or with a component connected to that specific power outlet.

Section 4-9 Site Log

4-9-1 Site Log - System (Service Database)

- 1.) Press the UTILITIES key on the Control Panel. The menu area changes to the Utilities menu.
- 2.) Select the SYSTEM item from the menu area to activate the setup desktop screen.
- 3.) Select the SERVICE page. The "password window" appears automatically.
- 4.) Enter the password **SHE** and click the ACCEPT button to display the Service Tools window.

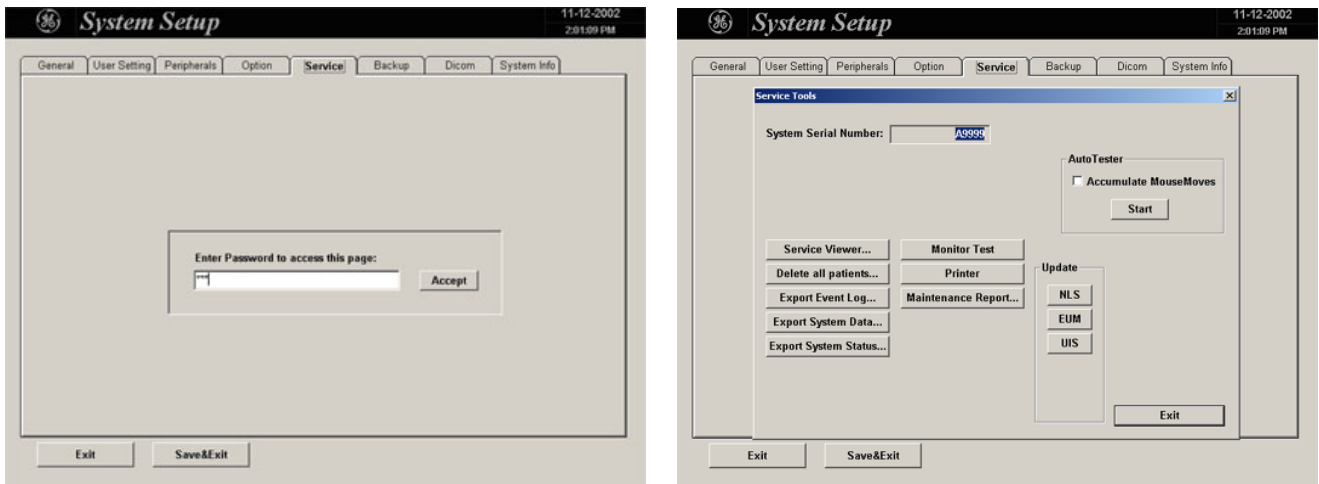


Figure 4-40 System Setup Service page and Service Tools window

- 5.) Click the MAINTENANCE REPORT button. The following message box will be displayed.

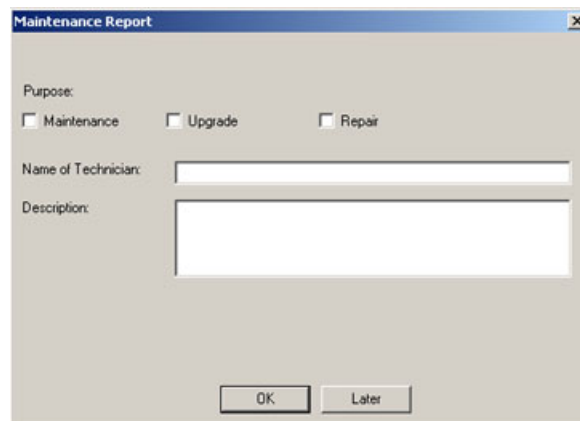


Figure 4-41 Maintenance Report

- 6.) Fill in the requested information and click OK.
- 7.) Click the EXIT button on the Service Tools window and the EXIT button on the System Setup Service page.

NOTE: After Hardware or Software modifications normally the "Maintenance Report" message box [Figure 4-41](#) appears automatically on the screen.

4-9-2 Site Log - Paper Documentation

Table 4-16 Site Log[illegible]

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Chapter 5

Components and Functions (Theory)

Section 5-1 Overview

5-1-1 Purpose of Chapter 5

This chapter explains Voluson® 730Pro's system concepts, component arrangement, and subsystem function. It also describes the Power Distribution System (PDS) and probes.

Table 5-1 Contents in Chapter 5

Section	Description	Page Number
5-1	Overview	5-1
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Section 5-2 General Information

Voluson® 730Pro is a digital beamforming curved-, linear- and phased array ultrasound imaging system. It has provisions for analog input sources like ECG and Phono. A CW-Doppler probe may also be connected and used.

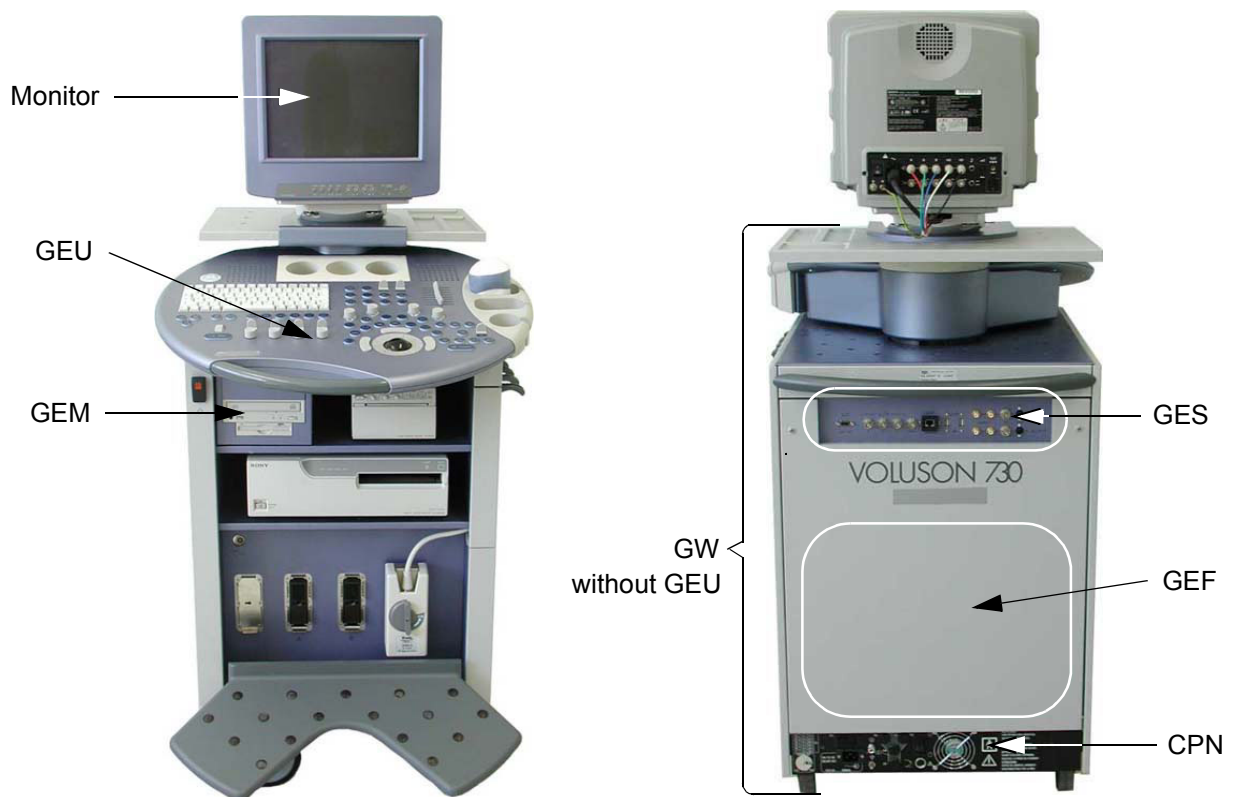
The system can be used for:

- 2D Gray Scale and 2D Color Doppler Imaging (CFM, PD and TD)
- M-Mode Gray Scale Imaging
- Doppler (PW, CW)
- 3D Mode and Real Time 4D Imaging
- Different combinations of the above modes



Figure 5-1 Voluson® 730Pro Major Components

Section 5-2 General Information (cont'd)



Major System Components:

- GEF: Main Board Chassis: [Section 5-3 on page 5-18](#)
 - Front-End processor [Section 5-4 on page 5-19](#)
 - Back-End processor [Section 5-5 on page 5-24](#)
- GEU: Top Console User interface (System I/O with hard keys)
[Section 5-7 on page 5-31](#)
- MONITOR: [Section 5-8 on page 5-32](#)
- GES: External I/O Connection Module [Section 5-8 on page 5-32](#)
- GEM: Removable Disk drive module (optional ECG-preamplifier MAN6) [Section 5-10 on page 5-34](#)
- CPN: Primary Power supply and Isolation transformer for the peripherals [Section 5-11 on page 5-35](#)
- GW: System mechanical chassis, stand alone trolley to keep all major components
[Section 5-12 on page 5-37](#)

Section 5-2 General Information (cont'd)

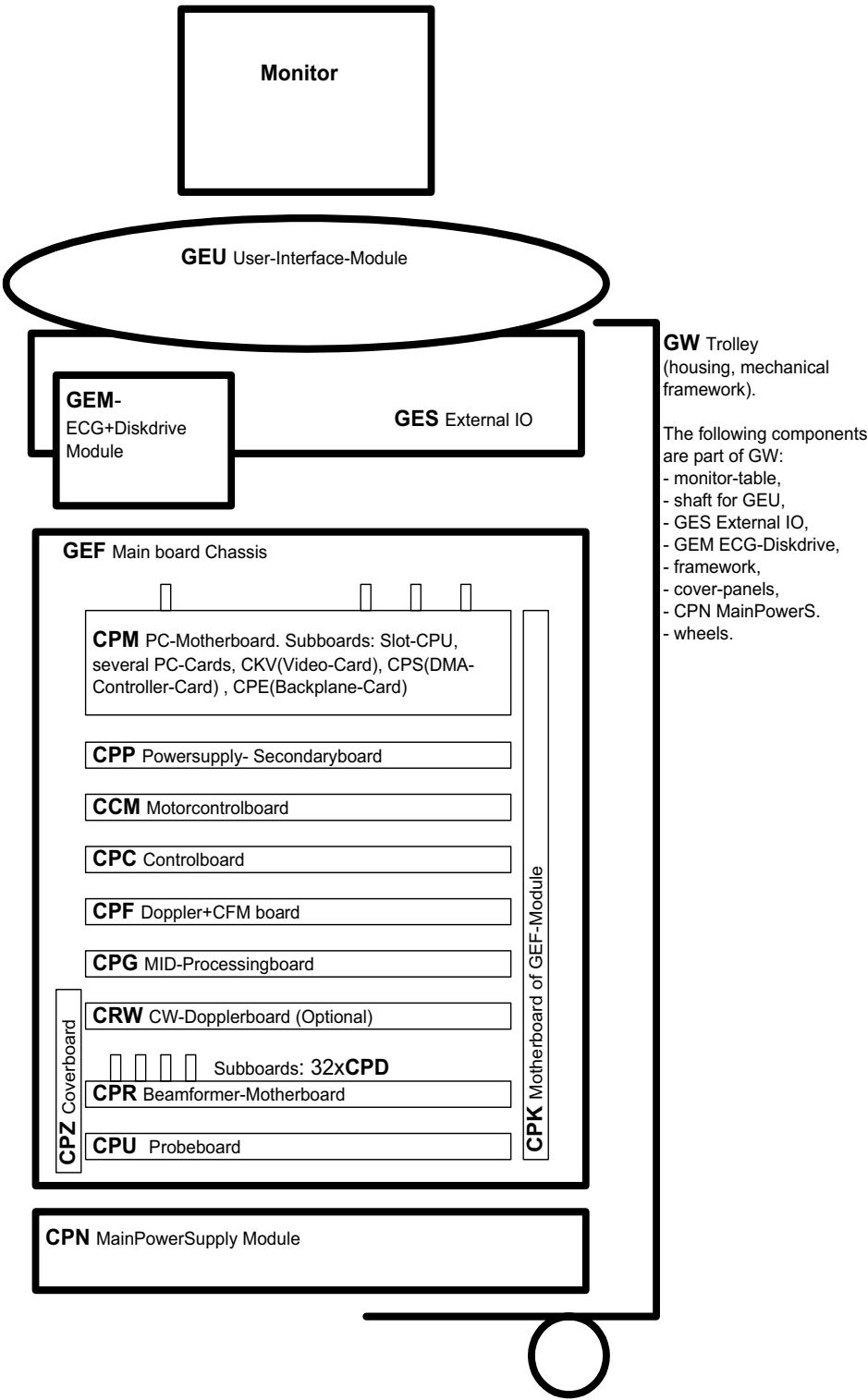


Figure 5-3 Basic Blockdiagram of Voluson® 730Pro

Section 5-2 General Information (cont'd)

The Voluson® 730Pro used digital beamforming technology which provides high resolution and high penetration performance. It is a general purpose, mobile, software controlled diagnostic ultrasound scanner. Its function is to acquire ultrasound data and to display the data of different modes. Voluson® 730Pro gives the operator the ability to measure anatomical structures and offers analysis packages that provide information that is used to make a diagnosis by competent health care professionals.

The Calculation and Report function supports 4 application packages:

- Obstetric Calculations
- Gynecology Calculations
- Cardiology Calculations
- Vascular Calculations

The Voluson® 730Pro supports a variety of linear-, curved-, phased array and pencil probes for various clinical applications. Any three probes may be connected at the same time (+ one pencil CW-probe).

Medical application fields include:

- Obstetrics
- Gynecology and Fertility
- Radiology
- Internal Medicine
- Neurology
- Cardiology
- Oncology
- Urology
- Orthopedics
- Pediatrics

The system is designed for follow-up expansion.

In addition to the initial operational settings for each transducer pre-programmed in the system, user-customized parameter settings for each transducer may be inserted by the operator and stored for recall as needed via the system control panel. System configuration is stored on the hard drive and all necessary software is loaded from the hard drive on power up.

Biopsy guidelines are provided on screen to assist in the collection of tissue samples, using biopsy guide adapters offered as an optional accessory.

The system provides the ability to perform remote viewing of images without compression, via DICOM 3.0 compatible output. Management of patient history is possible by "Sonoview" image-filing function. High-resolution images are provided by utilizing a technology called digital dynamic receive focusing.

Signal flow travels from the Probe Connector Panel to the Front End Electronics, to the Back-End Processor, and finally displayed on the monitor and peripherals.

For more detailed explanations of functions and controls refer to the Voluson® 730Pro Basic User Manual.

5-2-1 Description of Voluson® 730Pro Operating Modes

5-2-1-1 B-Mode or 2D-Mode

B-Mode or 2D-mode is a two-dimensional image of the amplitude of the echo signal. It is used for location and measurement of anatomical structures and for spatial orientation during operation of other modes. In 2D-mode, a two-dimensional cross-section of a three-dimensional soft tissue structure such as the heart is displayed in real time. Ultrasound echoes of different intensities are mapped to different gray scale or color values in the display. The outline of the 2D cross-section may be a rectangle, parallelogram, sector or 360-degree circle, depending on the particular transducer used. 2D-mode can be used in combination with any other mode.

5-2-1-2 M-Mode

In M-mode, soft tissue structure is presented as scrolling display, with depth on the Y-axis and time on the X-axis. It is used primarily for cardiac measurements such as valve timing on septal wall thickness when accurate timing information is required. M-mode is also known as T-M mode or time-motion mode. Ultrasound echoes of different intensities are mapped to different gray scale values in the display. M-mode displays time motion information of the ultrasound data derived from a stationary beam. Depth is arranged along the vertical axis with time along the horizontal axis. M-mode is normally used in conjunction with a 2D image for spatial reference. The 2D image has a graphical line (M-line) superimposed on the 2D image indicating where the M-mode beam is located.

5-2-1-3 Color Doppler Mode

Color Doppler is used to detect motion presented as a two-dimensional display. There are three applications of this technique:

- Color Flow Mode (C) - used to visualize blood flow velocity and direction
- Power Doppler (PD) - used to visualize the spatial distribution of blood
- Tissue Doppler (TD) - used to visualize tissue motion direction and velocity (optional [see 5-2-5-3](#))

5-2-1-3-1 Color Flow Mode

a real-time two-dimensional cross-section image of blood flow is displayed. The 2D cross-section may be presented as a rectangle, parallelogram, trapezoid, sector, or a full circle, depending on the particular transducer used. The 2D cross-section is presented as a full color display, with various colors being used to represent blood flow (velocity, variance, power and/or direction). Often, to provide spatial orientation, the full color blood flow cross-section is overlaid on top of the grayscale cross-section of soft tissue structure (2D echo). For each pixel in the overlay, the decision of whether to display color (Doppler), gray scale (echo) information or a blended combination is based on the relative strength of return echoes from the soft tissue structures and from the red blood cells. Blood velocity is the primary parameter used to determine the display colors, but power and variance may also be used. A high pass filter (wall filter) is used to remove the signals from stationary or slowly moving structures. Tissue motion is discriminated from blood flow by assuming that blood is moving faster than the surrounding tissue, although additional parameters may also be used to enhance the discrimination. Color flow can be used in combination with 2D and Spectral Doppler modes.

5-2-1-3-2 Power Doppler

a real-time two dimensional cross-section of blood flow is displayed. The 2D cross-section may be presented as a rectangle, parallelogram, trapezoid, sector, or a full circle, depending on the particular transducer used. The 2D cross-section is presented as a full color display, with various colors being used to represent the power in blood flow echoes. Often, to provide spatial orientation, the full color blood flow cross-section is overlaid on top of the gray scale cross-section of soft tissue structure (2D echo). For each pixel in the overlay, the decision of whether to display color (Doppler power), gray scale (echo) information or a blended combination is based on the relative strength of return echoes from the soft-tissue structures and from the red blood cells. A high pass filter (wall filter) is used to remove the signals from stationary or slowly moving structures.

Tissue motion is discriminated from blood flow by assuming that blood is moving faster than the surrounding tissue, although additional parameters may also be used to enhance the discrimination. The power in the remaining signal after wall filtering is then averaged over time (persistence) to present a steady state image of blood flow distribution. Power Doppler can be used in combination with 2D and Spectral Doppler modes as well as with 3D mode.

5-2-1-4 Pulsed (PW) Doppler

PW Doppler processing is one of two spectral Doppler modalities, the other being CW Doppler. In spectral Doppler, blood flow is presented as a scrolling display, with flow velocity on the Y-axis and time on the X-axis. The presence of spectral broadening indicates turbulent flow, while the absence of spectral broadening indicates laminar flow. PW Doppler provides real time spectral analysis of pulsed Doppler signals. This information describes the Doppler shifted signal from the moving reflectors in the sample volume. PW Doppler can be used alone but is normally used in conjunction with a 2D image with an M-line and sample volume marker superimposed on the 2-D image indicating the position of the Doppler sample volume. The sample volume size and location are specified by the operator. Sample volume can be overlaid by a flow direction cursor which is aligned, by the operator, with the direction of flow in the vessel, thus determining the Doppler angle. This allows the spectral display to be calibrated in flow velocity (m/sec.) as well as frequency (Hz). PW Doppler also provides the capability of performing spectral analysis at a selectable depth and sample volume size. PW Doppler can be used in combination with 2D and Color Flow modes.

5-2-2 3D Imaging

The Voluson® 730Pro Ultrasound System will be used to acquire multiple, sequential 2D images which can be combined to reconstruct a three dimensional image. These 3D images are useful in visualizing three-dimensional structures, and in understanding the spatial or temporal relationships between the images in the 2D sequence. The 3D image is presented using standard visualization techniques, such as surface or volume rendering.

5-2-2-1 3D Data Collection and Reconstruction

2D gray scale including Power Doppler images may be reconstructed. The acquisition of volume data sets is performed by sweeping 2D-scans with special transducers (called 3D-transducers) designed for the 2D-scans and the 3D-sweep.

Images are spatially registered, using internal probe position sensing and a position control to ensure geometric accuracy of the 3D data.

2D ultrasound imaging modes are used to view a two dimensional cross-sections of parts of the body. For example in 2D gray scale imaging, a 2 dimensional cross-section of a 3-dimensional soft-tissue structure such as the heart is displayed in real time. Typically, the user of an ultrasound machine manipulates the position and orientation of this 2D cross-section in real time during an ultrasound exam. By changing the position of the cross-section, a variety of views of the underlying structure are obtained, and these views can be used to understand a 3-dimensional structure in the body.

To complete survey a 3-dimensional structure in the body, it is necessary to collect 2D images which span a volume containing the structure. One way is to sweep the imaging cross-section by translating it in a direction perpendicular to the cross-section. Another example method is to rotate the cross section about a line contained in the cross section. The Voluson® 730Pro Ultrasound System uses the automated so called C-Scan for the motion perpendicular to automated B-scan.

Once a representative set of 2D cross-sections are obtained, standard reconstruction techniques can be used to construct other 2D cross-sections, or to view the collection of the cross-sections as a 3D images.

5-2-2-2 3D Image Presentation

The basic technique for 3D image presentation is to combine the 2D cross –sections into an image which represents how the volume of the data would appear from a particular viewing direction. The mathematics behind this feature is called 3D-rendering. Such combined images are called projections, because the data from the volume is projected onto a flat 2-dimensional surface(e.g. the ultrasound system display.) This technique can be applied to any 2D ultrasound mode.

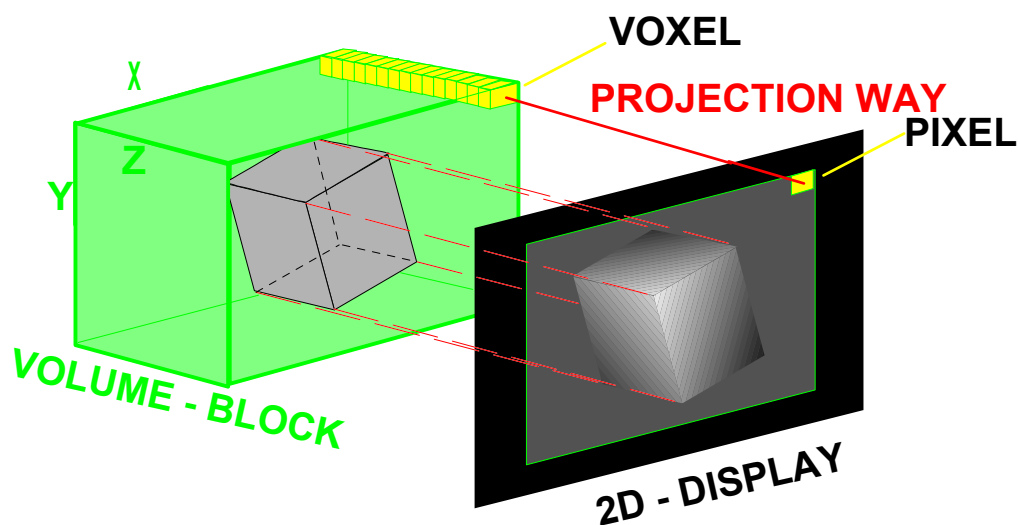
Several techniques can be used to aid the human observer in understanding the resulting 2D image as a representation of a three-dimensional object. One is to rotate the volume of data, and present the resulting sequence of 2D projections to the observer. The changing direction of observation helps the observer to separate the features in the volume according to their distance from the observer.

5-2-2-3 3D Rendering

The 3D (volume) rendering is a calculation process to visualize certain 3D-structures of a scanned volume by means of a 2D-image. The gray value for each pixel of the 2D-image is calculated from the voxels along the corresponding projection path (analyzing beam) through the volume. The render (calculation) algorithm, surface or transparent mode, determines how 3D-structures are visualized.

With the MagiCut function it is possible to cut off “3D artifacts” which hide regions that are of interest for the diagnostic purpose.

PRINCIPLE: VOLUME RENDERING



5-2-3 Blockdiagram Voluson® 730Pro

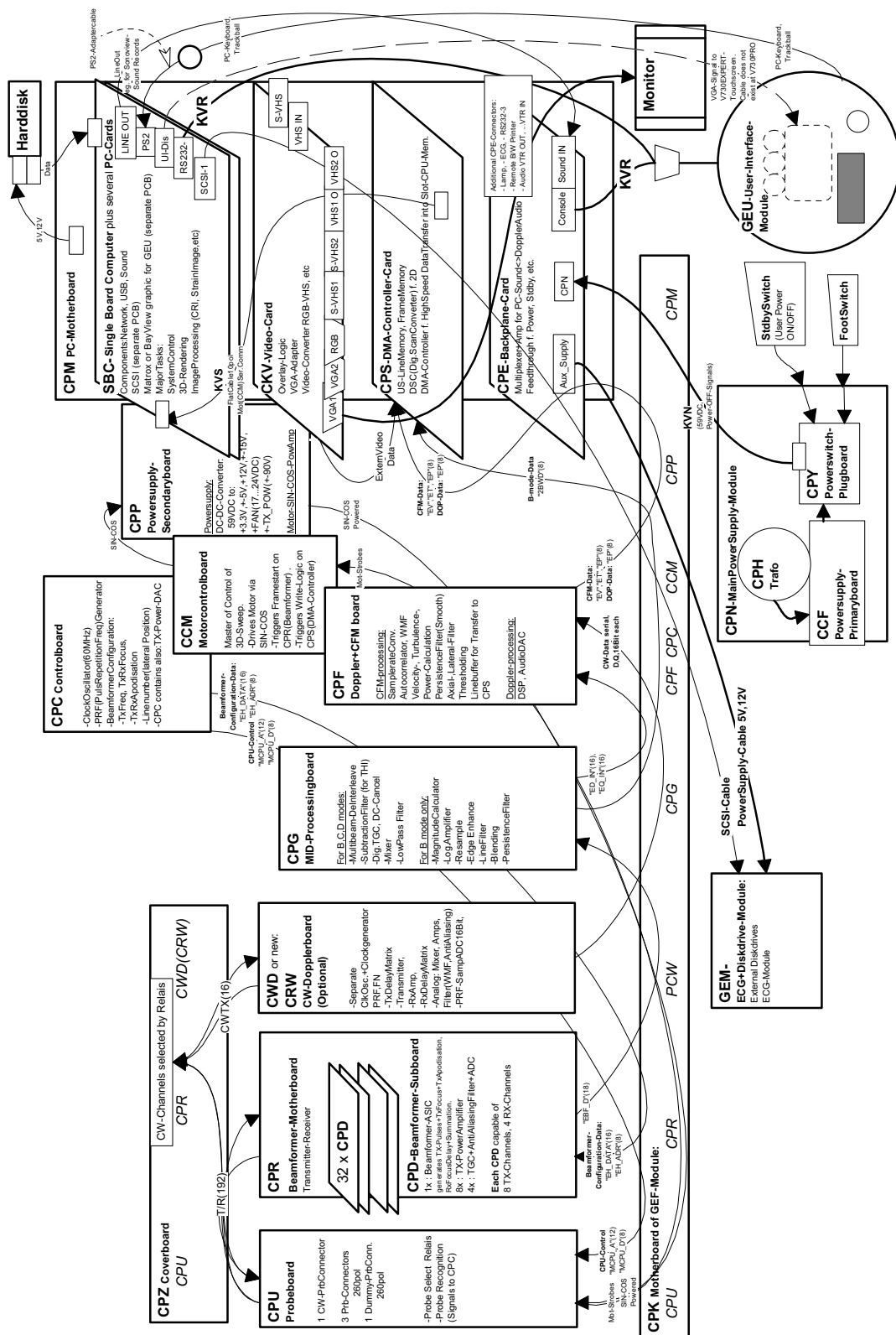


Figure 5-4 Voluson® 730Pro - Blockdiagram

5-2-4 Dataflow Control Description

This section describes the functions of the Voluson® 730Pro Boards vs different Operation Modes.

- CPC - System Control Board
- CPR - Beam former Board
- CPG - Mid-Processor Board
- CPF - Color Doppler Board
- CPS - Scan converter Board
(CPS-Block diagram) see [Figure 5-10 on page 5-25](#)
- CKV - PC-Video converter Board

5-2-4-1 B-Mode

1.) CPC

The CPC contains the Clock-Oszillator(60MHz) and PRF-Generator.

It generates(drives) BF(=Beamformer)-ASIC-Clock(60MHz) and Shot-Trigger for the CPR.

Configures CPU (Probeboard) and Beamformer (CPD-Subboards on CPR) with TX-Frequ, TX-Focus, RX-Focus, LineNo (lateral Position), TX- Apodisation, RX-Apodisation, Multibeam, etc. Furthermore CPC contains the TX-Power-DAC.

2.) CPR

Contains 32 CPD (Beamformer-Subboards).

The CPD consists of Beamformer-ASIC, TX-Amplifier, RX-TGC-Amplifier, Signal-ADC.

Each CPD can support 8 TX-Channels and 4 RX-Channels.

- TX-Channel: ASIC generates TX-Freq through dividing 60MHz by 2,3,4,5,... and TX-Focus.
- RX-Channel: ASIC generates Sample-Clocks for the ADC, manages RX-Focus (Delay and Chain-Adder) and Apodization.

3.) CPG

Contains Multibeam-DeInterleave, SubtractionFilter (for THI-Mode, see: [Section 5-2-4-1-1 "Special B Mode Techniques" on page 5-11](#), DigitalTGC, DC-Canceler, Mixer (Part of Demodulator), LowPassFilter, Decimation (Pixelrate Conversion), MagnitudeCalculator (Part of Demodulator), Logarithmic Amplifier, Re-Sample, Edge Enhance (Contrast Enhancement through differentiation), LineFilter, Blending (adapting Brightness in order to perfectly combine Nearfield-Frame with Farfield-Frame in FFC-Mode, see: [Section 5-2-4-1-1 "Special B Mode Techniques" on page 5-11](#), FrameFilter.

Multibeam-DeInterleave means: Incoming Pixelorder

shot1pix1-shot2pix1-shot3pix1-shot4pix1 -

shot1pix2-shot2pix2-shot3pix2-shot4pix2...

is converted to the new order:

shot1pix1-shot1pix2-shot1pix3..... - shot2pix1-shot2pix2-shot2pix3.....

After DC-cancelling the signal is mixed with RX-Frequency and brought to LF-Spectrum, where the LowPassFilter cuts HF. Mixer and Magnitude-Calculator arrange Complex Demodulation, and Logarithmic Amplifier arrange the conversion from High-Dynamic LinearSignal to the Low-Dynamik(e.g.8Bit) Log-Signal. Several Postprocessing steps (LineFilter, FrameFilter, ReSample, Edge Enhance) enable smooth image quality while keeping contrast high.

5-2-4-1-1 Special B Mode Techniques

a.) THI = \overline{HI} (Tissue Harmonic Imaging)

In one method of THI the RX-Frequency is doubled, so that the radial resolution is increased due to the higher RX-Frequency.

The second method of THI is pulse-inversion: 2 TX-Beams are shot to the same Tissue-location, one with positive, one with negative polarity. The subtraction of both shots (Subtraction Filter) brings to bear the nonlinear-echo-reflection-properties of the tissue (especially in usage of Contrast-medias), which is very useful with extremely difficult-to-image patients.

b.) FFC (Frequency and Focus Composite)

2 or more TX-Beams are shot to the same Tissue-location. The Beams have different TX-foci. By means of Blending (adaption of Brightnesses) they are composed to one whole RX-Line.

4.) CPF

Not used for B-Mode.

5.) CPS

B-mode-Data from CPG are written into LineMemory (CineMode-Mem). The DSC (Dig.ScanConverter) reads out the Lines and writes them scan converted (A-mode-polar to B mode-cartesian) into the FrameMemory. From there the non deflected Image can be read out and overlaid with the rest of the Monitor-Image, which is the PC-Graphics see: 6.) CKV
Cine Mode: Same, Cine Mode-Memory is the Line Memory. Same readout.

6.) CKV

Is the Voluson® 730Pro Monitor-Graphic Board. Performs the above mentioned B-image overlay-function. The background of the overlaid image is PC-Graphics. The PC reserves a "dedicated Color-Value" into the overlay-field, this color enables the CKV-Hardware to overlay the Hardware-generated (in this case B-Mode image).

5-2-4-2 M-Mode

- 1.) CPC
see: [5-2-4-1 B-Mode](#)
- 2.) CPR
see: [5-2-4-1 B-Mode](#)
- 3.) CPG
see: [5-2-4-1 B-Mode](#)
- 4.) CPF
see: [5-2-4-1 B-Mode](#)
- 5.) CPS
M-mode-Data from CPG are written into Line Memory (Cine Mode-Mem). The DSC (Dig.ScanConverter) reads out the Lines and writes them into the Frame Memory. (If high sweep speed is required, the DSC may interpolate Pixels between 2 real existing M-Lines.) From there the Lines can be read out and overlaid with the rest of the PC-Graphics. see: [6.\) CKV](#)
Cine Mode: Same, Cine Mode-Memory is the Line Memory.
Cine Mode with ECG: Cine Mode-Memory for the ECG-curve is inside PC-Memory. Software has to take care that M-Mode image and ECG-curve are placed exactly one upon the other, means: have the same Cine-Shift.
- 6.) CKV
see: [5-2-4-1 B-Mode](#)

5-2-4-3 D-Mode (Pulsed Wave- and Continuous Wave Doppler)

- 1.) CPC
see: [5-2-4-1 B-Mode](#)
- 2.) CPR
see: [5-2-4-1 B-Mode](#)
- 3.) CPG
After DC-cancelling the signal is mixed with RX-Frequency and brought to LF-Spectrum, where the LowPassFilter cuts HF. Mixer and Magnitude-Calculator arrange Complex Demodulation. Demodulated signal is output to CPF.
- 4.) CPF
Arranges the FFT. D-Mode Data use the same Bus to the CPS as CFM-Data.
- 5.) CPS
D-Mode Data from CPF are written... see: [5-2-4-2 M-Mode](#).
- 6.) CKV
see: [5-2-4-1 B-Mode](#)

**5-2-4-4 D-Mode Autotrace (draws PC-calculated envelope to D-Spectrum)
(ECG-Curve is similar to Autotrace-Curve)**

- 1.) CPC
see: [5-2-4-1 B-Mode](#)
- 2.) CPR
see: [5-2-4-1 B-Mode](#)
- 3.) CPG
After DC-cancelling the signal is mixed with RX-Frequency and brought to LF-Spectrum, where the LowPassFilter cuts HF. Mixer and Magnitude-Calculator arrange Complex Demodulation. Demodulated signal is output to CPF.
- 4.) CPF
Arranges the FFT. D-Mode Data use the same Bus to the CPS as CFM-Data.
- 5.) CPS
D-Mode Data from CPF are written... see [5-2-4-2 M-Mode](#) and Notes for D-Spectrum on page 15.
At the same time D-mode-Data from CPF are written to PC-Memory. PC calculates Autotrace-Curve and outputs it the CKV as part of PC-Graphics placed exactly onto the D-Spectrum, which itself is placed in the overlay-field.
Cine Mode with Autotrace/ECG: Cine Mode-Memory for the Autotrace/ECG-Curve is inside PC-Memory. Software has to take care that D-Spectrum and Autotrace/ECG-Curve are placed exactly one upon the other, means: have the same Cine-Shift.
- 6.) CKV
see: [5-2-4-1 B-Mode](#)

5-2-4-5 CFM-Mode (Color Flow Mode)

- 1.) CPC
see: [5-2-4-1 B-Mode](#)
- 2.) CPR
see: [5-2-4-1 B-Mode](#)
- 3.) CPG
After DC-cancelling the signal is mixed with RX-Frequency and brought to LF-Spectrum, where the LowPassFilter cuts HF. Mixer and Magnitude-Calculator arrange Complex Demodulation. Demodulated signal is output to CPF.
- 4.) CPF
Arranges the CFM-Processing.
WMF (Wall Motion Filter), Autocorrelator, Post-processing.
- 5.) CPS
Data from CPG and CPF are written... see: [5-2-4-1 B-Mode](#).
- 6.) CKV
see: [5-2-4-1 B-Mode](#)

5-2-4-6 3D-Mode (Freezes after 1 volume sweep)

- 1.) CPC
see: [5-2-4-1 B-Mode](#)
- 2.) CPR
see: [5-2-4-1 B-Mode](#)
- 3.) CPG
see: [5-2-4-1 B-Mode](#)
- 4.) CPF
Arranges the CFM-Processing. WMF (Wall Motion Filter), Autocorrelator, Post-processing.
(In case that 3D-Color is active, else CPF not used)
- 5.) CPS
Data from CPG and CPF go to Line Memory. In this Mode the Line Memory operates as Fifo-Buffer for DMA (see Notes for DMA [on page 5-15](#)). DMA transfers Data from Line Memory to PC-Memory. PC performs rendering and DSC for 2D-Frame. The rendered Image is written to CKV as Graphics. The 2D-Frame takes another way (see Notes for PC to Frame Memory [on page 5-15](#)). The second DMA-Controller puts 2D-Frame Data from PC-Memory to Frame Memory. From there 2D-Frame goes the same way as B-Mode Data through Gamma Ram and Color Encoder and finally as Overlay to the CKV.
- 6.) CKV
see: [5-2-4-1 B-Mode](#)

5-2-4-7 Real Time 4D-Mode (nonstop volume rendering)

- 1.) CPC
see: [5-2-4-1 B-Mode](#)
- 2.) CPR
see: [5-2-4-1 B-Mode](#)
- 3.) CPG
see: [5-2-4-1 B-Mode](#)
- 4.) CPF
Arranges the CFM-Processing. WMF (Wall Motion Filter), Autocorrelator, Post-processing.
(In case that 4D-Color is activated, else CPF not used)
- 5.) CPS
Data from CPG and CPF go to Line Memory. In this Mode the Line Memory operates as Fifo-Buffer for DMA (see Notes for DMA [on page 5-15](#)). DMA transfers Data from Line Memory to PC-Memory. All displayed Images are PC-generated and do not need CPS any more.
- 6.) CKV
see: [5-2-4-1 B-Mode](#)

5-2-4-8 Extern-Video-Mode (display Video from Video-Recorder)

- 1.) CPC
Not used for Signal-Processing
- 2.) CPR
Not used for Signal-Processing
- 3.) CPG
Not used for Signal-Processing
- 4.) CPF
Not used for Signal-Processing
- 5.) CPS
V-Rec-Data from the CKV-Video-Decoder are input to the CPS via the CFM-Data-Bus (CPF must disable Output-Driver). In the LM-FPGA the data are synchronized and output to the FM-FPGA. In the EXTERN-VIDEO-MODE the FM-FPGA is specially configured, that's why the right part of the CPS-Blockdiagram is not valid in this MODE. In this MODE the FM-FPGA re-scales the Video recorder-Image, that is to say that the Video is made for fitting exact into the Monitor-Frame.
- 6.) CKV
AD-Conversion of the grapped Video, etc.

5-2-4-9 Sonoview write mode (store Image to Sonoview)

- 1.) CPC
Not used
- 2.) CPR
Not used
- 3.) CPG
Not used
- 4.) CPF
Not used
- 5.) CPS
PC is able to access FrameMemory out e.g. B-Frames.
- 6.) CKV
AD-Conversion of the grapped Video, etc.

Notes for DMA:

The reason for "operating Line Memory as Buffer-Fifo for DMA" is, that DMA-Fifo itself is only 255 deep and has always been in danger to overflow and as conclusion to cut the volume. High effort on 3D-Software was necessary in order to prevent this.)

Notes for PC to Frame Memory:

The reason for using the "PC to Frame Memory-Color Encoder-OverlayCKV - way" is, that implementing those functions into software would exceed PC-capacity.

Notes for D-Spectrum:

The reason for "Overlaying the Hardware-generated D-Spectrum" instead of "output PC-memorized D-Spectrum as Graphics" is, that PC is not prepared for drawing the sweep exactly in a steady way, without interruptions. PC will always incline to sputter.

5-2-5 Description of Software Options

To activate the software options:

- 1.) Press the UTILITIES key on the control panel. The menu area changes to the Utilities menu.
- 2.) Select the SYSTEM item from the menu area to activate the setup desktop screen.
- 3.) Select the OPTION page.

For further details see: Basic User Manual Voluson® 730Pro, chapter 17.3.4

Table 5-2 Software Options

	SW-Options	Description
1	Real Time 4D	5-2-5-1 Real Time 4D
2	DICOM	5-2-5-2 DICOM
3	Tissue Doppler	5-2-5-3 Tissue Doppler Imaging
4	Harmonic Imaging	5-2-5-4 Tissue Harmonic Imaging (THI)
5	VOCAL	5-2-5-5 VOCAL - Virtual Organ Computer-aided Analysis

NOTE: Additional options are not yet implemented in the Voluson® 730Pro.

5-2-5-1 Real Time 4D

Real Time 4D mode is obtained through continuous volume acquisition and parallel calculation of 3D rendered images. In Real Time 4D mode the volume acquisition box is at the same time the render box. All information in the volume box is used for the render process. In Real Time 4D mode a "frame rate" of up to 16 volumes/second is possible. By freezing the acquired volumes, size can be adjusted, manipulated manually as known from the Voluson 3D Mode.

5-2-5-2 DICOM

Voluson® 730Pro software package providing following DICOM functionality:

- Storage Service Class
- Print Management Service Class
- Modality Worklist Management Service Class

Sending of reports - All OB/Gyn measurements can be sent to a PC. Receiving of these reports is supported by ViewPoint workstation "PIA" only. All other workstations can be adapted individually.

5-2-5-3 Tissue Doppler Imaging

The Tissue Color Doppler Imaging is used for color encoded evaluation of heart movements. The TD image provides information about tissue motion direction and velocity.

5-2-5-4 Tissue Harmonic Imaging (THI)

In Tissue Harmonic Imaging, acoustic aberrations due to tissue are minimized by receiving and processing the second harmonic signal that is generated within the insonified tissue. Voluson's high performance THI provides superb detail resolution and penetration, outstanding contrast resolution, excellent acoustic clutter rejection and an easy to operate user interface for switching into THI mode.

5-2-5-5 VOCAL - Virtual Organ Computer-aided Analysis

Diagnosis and therapy of cancer is one of the most important issues in medical care. The new VOCAL™ - Imaging program is an extension of the 3DView™ software, integrated in Kretztechnik's VolusonN® sonography systems and also available for PC. It allows completely new possibilities in cancer diagnosis, therapy planning and follow-up therapy control.

VOCAL™ offers different functions:

Volume Calculation - Manual tracing of contours in three dimensions

3D Color Histogram - Automatic calculation of the vascularization

Shell Imaging - construction of a virtual shell which covers the entire contour to separately calculate internal tumor vascularization and peripheral vascularization for tumor therapy planning and follow up control.

5-2-6 Description of Hardware Options

Table 5-3 Hardware Options

	HW-Options	Description
1	CW-Doppler	5-2-6-1 CW - Continuous Wave Doppler
2	ECG Digital Module	5-2-6-2 ECG Preamplifier
3	Scan freeze Footswitch	5-2-6-3 Scan/Freeze Foot switch

5-2-6-1 CW - Continuous Wave Doppler

CW Doppler mode provides real time spectral analysis of CW Doppler signals. This information describes the Doppler shifted signal from the moving reflectors in the CW Doppler beam. CW Doppler can be referenced through a small pencil probe or phased array scan head, but it can also be used in conjunction with a 2D image which has an M-line superimposed on the 2D image indicating the position of the Doppler sample volume. For through-the-beamformer CW, this beam is steerable by the operator, and is done by adjusting the location of the M-line. The CW Doppler beam, or M-mode line, can be steered allowing interrogation along an operator-selected line within the image. This option can be upgraded by implementing the CW-Dopplerboard (CRW).

5-2-6-2 ECG Preamplifier

MAN6 (internal, digital version)

5-2-6-3 Scan/Freeze Foot switch



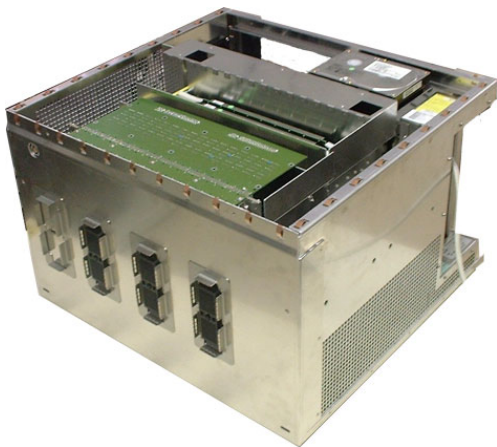
Foot switch connected to Power Supply-Box (below Main Electronic-Box)

Figure 5-5 Foot switch connector on CPN

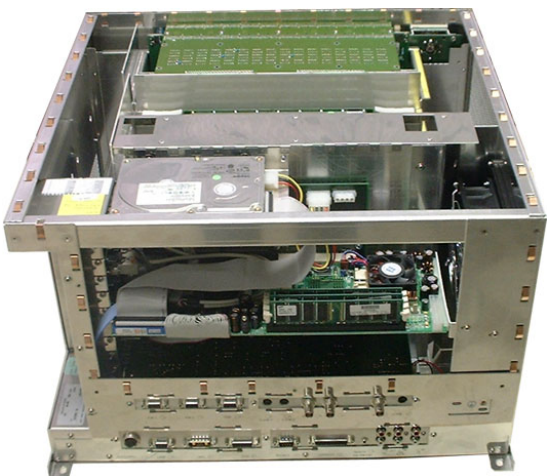
Section 5-3
Main board Chassis GEF Module

The GEF Module contains the Front End processor and the Back End processor and the Secondary Power supply for the full GEF Chassis.
Additionally GEF Module is the connection point of the internal I/O wiring.

Front



Rear with Internal I/O (Audio Video)



View from Right
with Internal I/O (PC-part)



Top View

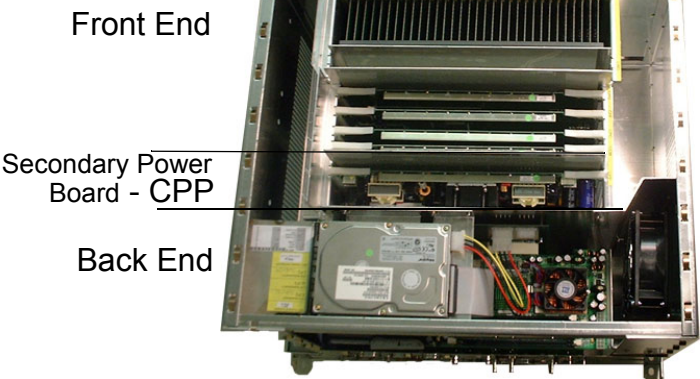


Figure 5-6 Mechanic of GEF Module

Section 5-4 FrontEnd Processor

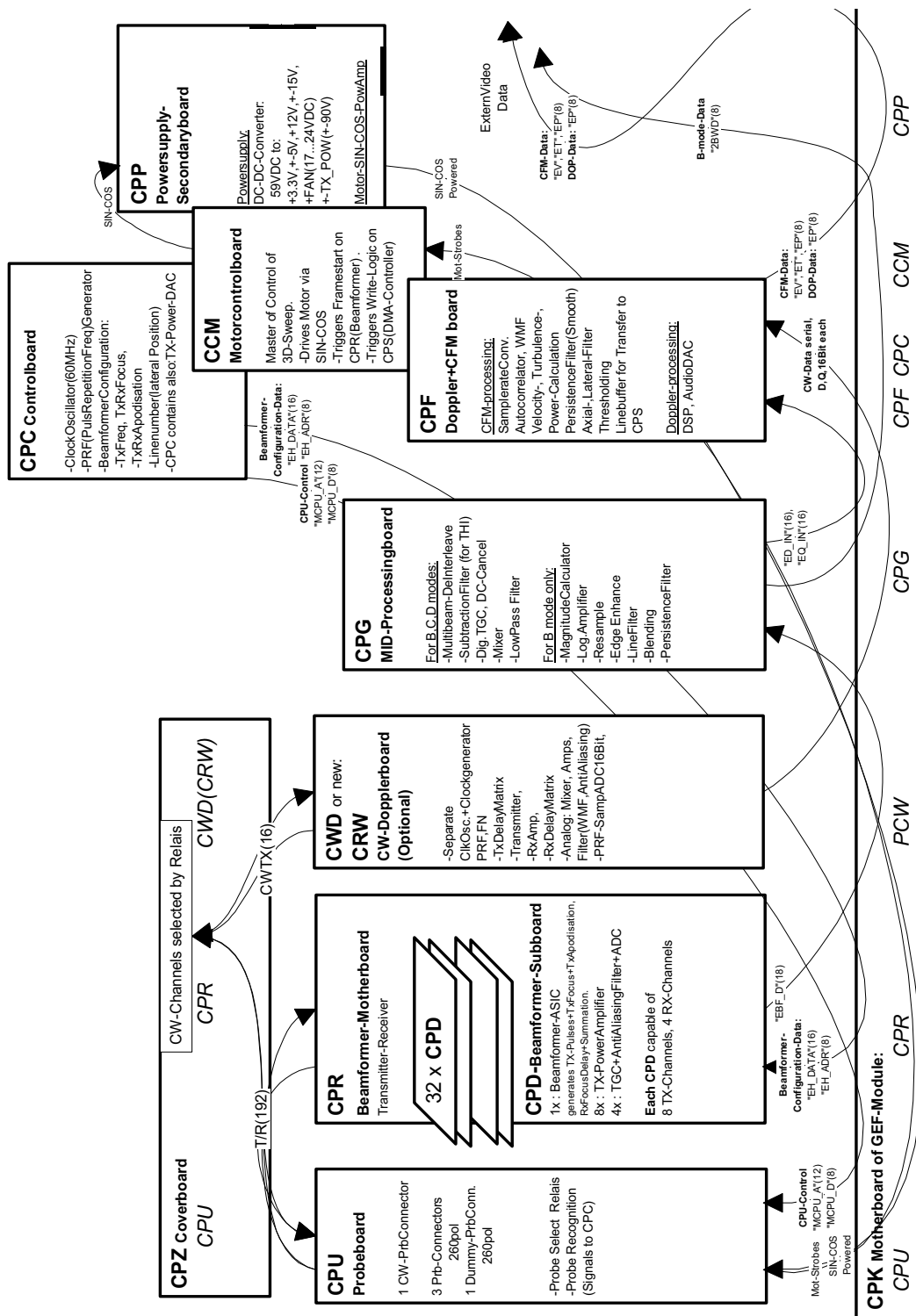


Figure 5-7 FrontEnd Processor - Blockdiagram

5-4-1 FrontEnd - Board Descriptions

5-4-1-1 CPU - Probe Connector Board

- 1 CW-Probe Connector
- 3 Probe-Connectors 260pin
- 1 Dummy-Probe Connector 260pin
- Probe Select Relays
- Probe Recognition

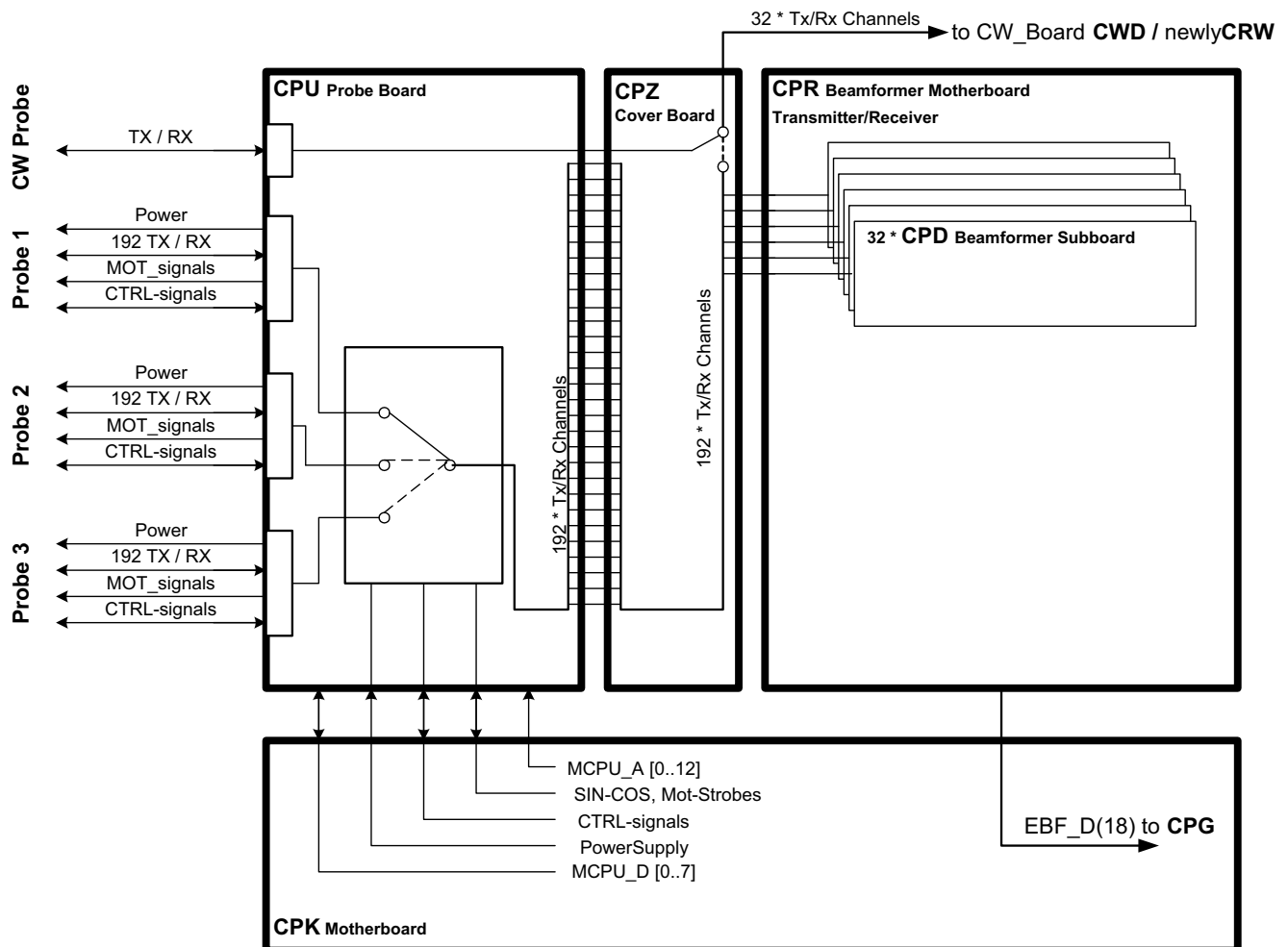


Figure 5-8 CPU + Beamformer

5-4-1-2 CPR - Beamformer-Motherboard

Transmitter-Receiver (192 transmitter channel used, 128 Receiver channels)

CPR contains 32 pieces of CPD (see: [Section 5-4-1-3 "CPD - Beamformer Sub-board" on page 5-21](#)).

5-4-1-3 CPD - Beamformer Sub-board

1x : Beamformer-ASIC
generates TX-Pulses + TX-Focus +TX-Apodization, Rx Focus Delay and Summation

8x : TX-Power Amplifier

4x : TGC + Anti Aliasing Filter + Analogue Digital Conversion (ADC)

Each CPD is capable of 8 TX-Channels and 4 RX-Channels

5-4-1-4 CRW - (old version: CWD) CW-Doppler Board (Optional)

- Separate Clock Oscillator + Clock generator PRF, FN
- TxDelayMatrix
- Transmitter,
- Receiver Amplifiers (RxAmp),
- Receiver Delay matrix (RxDelayMatrix)
- Analogue: Mixer, Amplifier, Filter (WMF, Anti Aliasing)
- PRF-SampADC16Bit,

5-4-1-5 CPZ - Cover Board

Transfers the analogue transmitting / receiving signals between the following boards:

- CPU (in old Version BYM)
- CPR
- CRW (in old Version CWD)

192 Transmitter-, 128 Receiver channels, 16 CW-Doppler channels - switched by relays at CPZ

5-4-1-6 CPG - MID-Processor Board

A.) For B, C, D modes:

- Multi Beam-DeInterleave
- Subtraction Filter (for THI)
- Digital TGC, DC-Cancelling
- Mixer with NCO
- FIR-Low Pass

B.) For B mode only:

- Magnitude Calculator
- Logarithmic Amplifier
- Resample
- Edge Enhance
- Line Filter
- Blending
- Frame Filter

5-4-1-7 CPC - Control Board

- Clock Oscillator (60MHz)
- PRF (Pulse Repetition Frequency) Generator
- Beamformer Configuration:
- Tx (transmitting Frequency, TxRx (transmitting/receiving) Focus timing
- TxRx (transmitting/receiving) Apodization
- Line number (lateral Position)
- contains TX-Power-DAC

5-4-1-8 CPF - Doppler+ CFM Board

A.) CFM-processing:

- Sample rate Conversion
- Auto-Correlator
- Wall motion filter (WMF)
- Velocity-, Turbulence-, Power-Calculation
- Persistence Filter (Smooth)
- Axial-, Lateral-Filter
- Thresholding
- Line buffer for Transfer to CPS

B.) Doppler-Processing:

- DSP, Audio DAC

C.) Beamformer- Configuration-Data:

- "EH_DATA"(16)
- "EH_ADR"(8)
- B-Mode-Data

5-4-1-9 CCM - Motor Control Board

- Master of Control of 3D-Sweep
- Drives Motor via SIN-COS
- Triggers Frame-start on CPR (Beamformer)
- Triggers Write-Logic on CPS (DMA-Controller)

5-4-1-10 CPP- Power Supply Secondary Board + Motor Power stage

used for Supply of both FrontEnd and BackEnd DC-DC-Converter:

59VDC to following output voltages:

+ 3.3V, +/-5V, +12V, +/-15V,

+ FAN (+24V DC)

- +TX_POW (+/-90V) fused by F7
- -TX_POW (+/-90V) fused by F1
- Motor Sinus2 Powerstage Amplifier fused by F3
- Motor Cosinus2 Powerstage Amplifier fused by F6

5-4-1-11 CPK - Motherboard of GEF-Module

Following boards are direct connected to the CPK:

- CPU (BYM) - Probe connector Board
- CPR - Beam former Board
- CRW (CWD) - CW-Doppler Board
- CPS - Scan converter Board
- CPC - System Control Board
- CCM - Motor Control Board
- CPP - Power Supply Board
- CPM - Motherboard (electrical Signal- and Supply connection between all PC-Plug-In Boards)

Section 5-5 BackEnd Processor

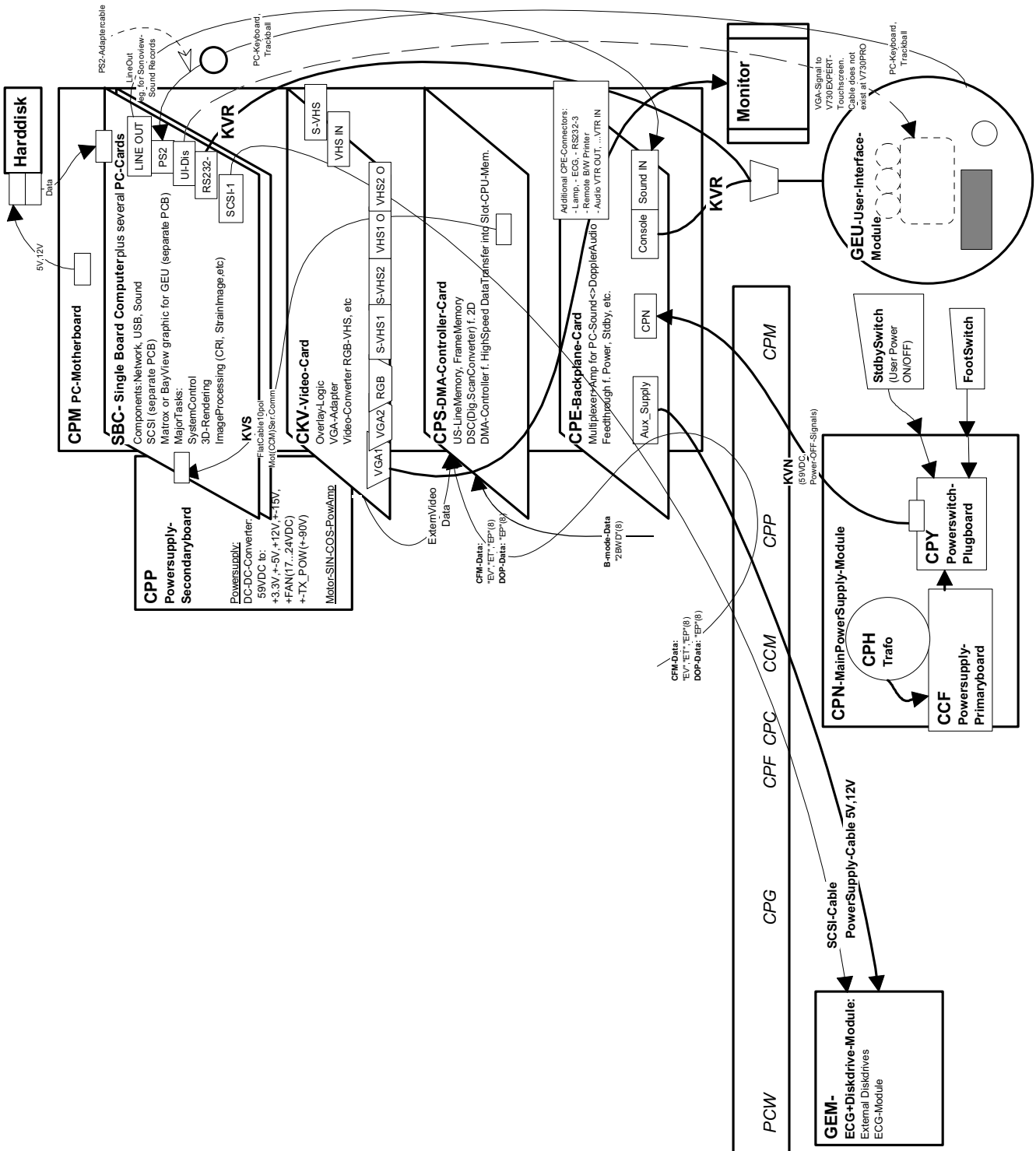


Figure 5-9 BackEnd Processor - Block Diagram

5-5-1 Blockdiagram CPS

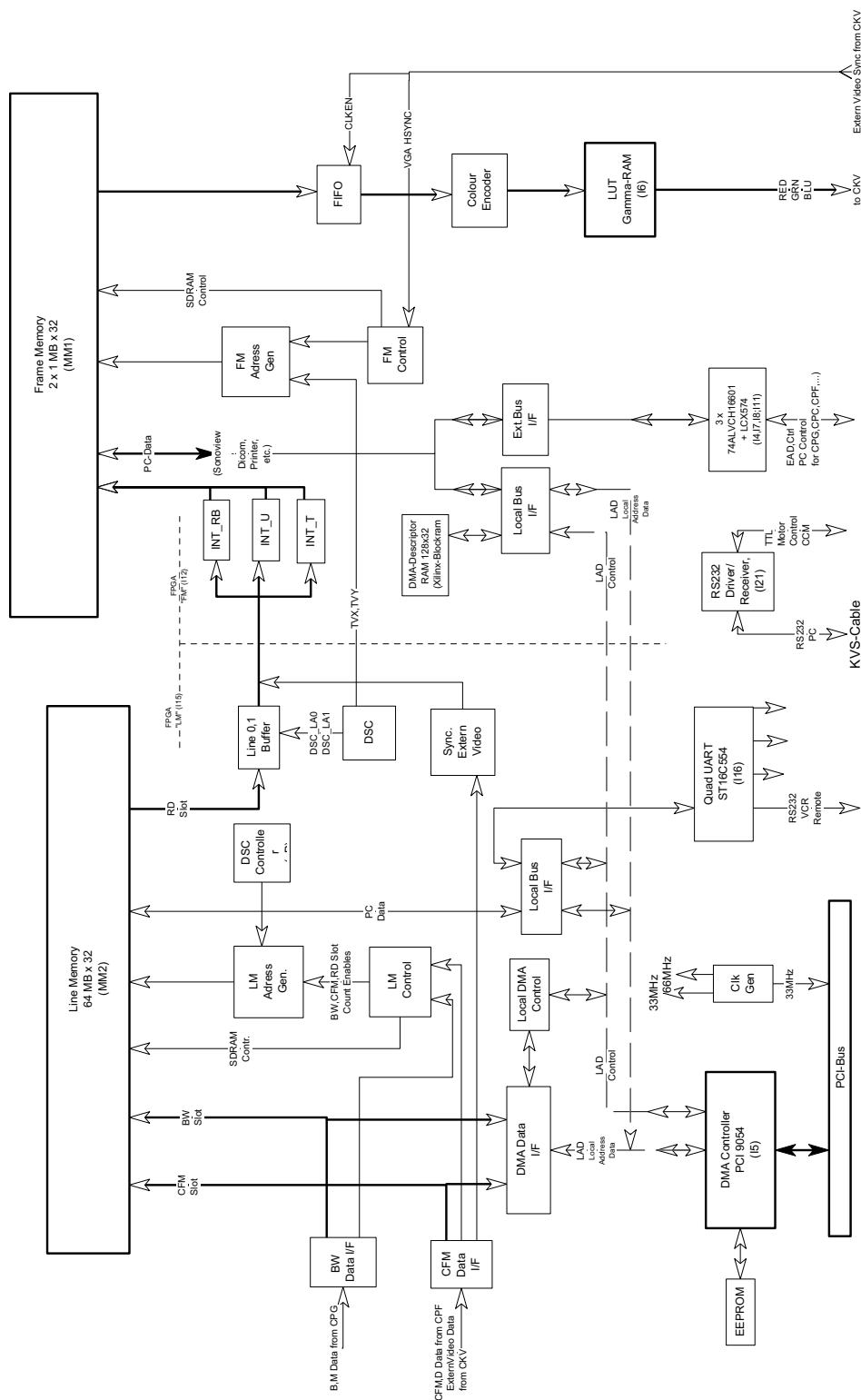


Figure 5-10 Blockdiagram CPS

5-5-2 BackEnd - Board Descriptions

5-5-2-1 SBC - Single Board Computer

Built in or external Components:

- Network, USB
- Sound (in old Version separate PCB)
- SCSI (in old Version separate PCB)

Major Tasks:

- System Control
- 3D-Rendering
- Image Processing (CRI, Strain Image, etc.)
- Mouse (COM-Interface)
- RS232 (User Interface)
- PS2 (User Interface PC-Keyboard, Mouse as Trackball)

5-5-2-2 CPS - DMA-Controller-Card

- US-Line Memory, Frame Memory
- DSC (Digital Scan Converter) for 2D
- DMA-Controller f. High Speed Data Transfer into Slot-CPU-Memory

see also: [Figure 5-10: Blockdiagram CPS on page 5-25](#)

5-5-2-3 CKV - Video-Card

- Overlay-Logic (Adding the Overlay graphics to the Ultrasound graphics)
- VGA- Output (2 Channels) for the System Main Monitor
- Video-Converter RGB-VHS, External Video Playback PAL/NTSC Video Generation etc.

5-5-2-4 Hard Disk Drive

Minimum 40GB; IDE

Stores the system programs and Image filing (patient data, Report files)

5-5-2-5 CPE - Back Panel I/O-Card

Multiplexer +Amplifier for PC-Sound<>Doppler Audio

Feed through for DC- Power and signals and for built in Peripherals (User Interface, Disk drive module, ECG, etc.)

5-5-2-6 CPM - PC-Motherboard card

Industrial Standard compatible (PCI) Motherboard

For interfacing between Front End and Back End Processor.

CPE is connected at CPM too.

5-5-2-7 CPP- Power Supply Secondary Board + Motor Power stage

used for Supply of both FrontEnd and BackEnd

DC-DC-Converter:

59VDC to following output voltages:

+ 3.3V, +/-5V, +12V, +/-15V,

+ FAN (+24V DC)

- +TX_POW (+/-90V) fused by F7
- -TX_POW (+/-90V) fused by F1
- Motor Sinus2 Powerstage Amplifier fused by F3
- Motor Cosinus2 Powerstage Amplifier fused by F6

Section 5-6
Internal I/O

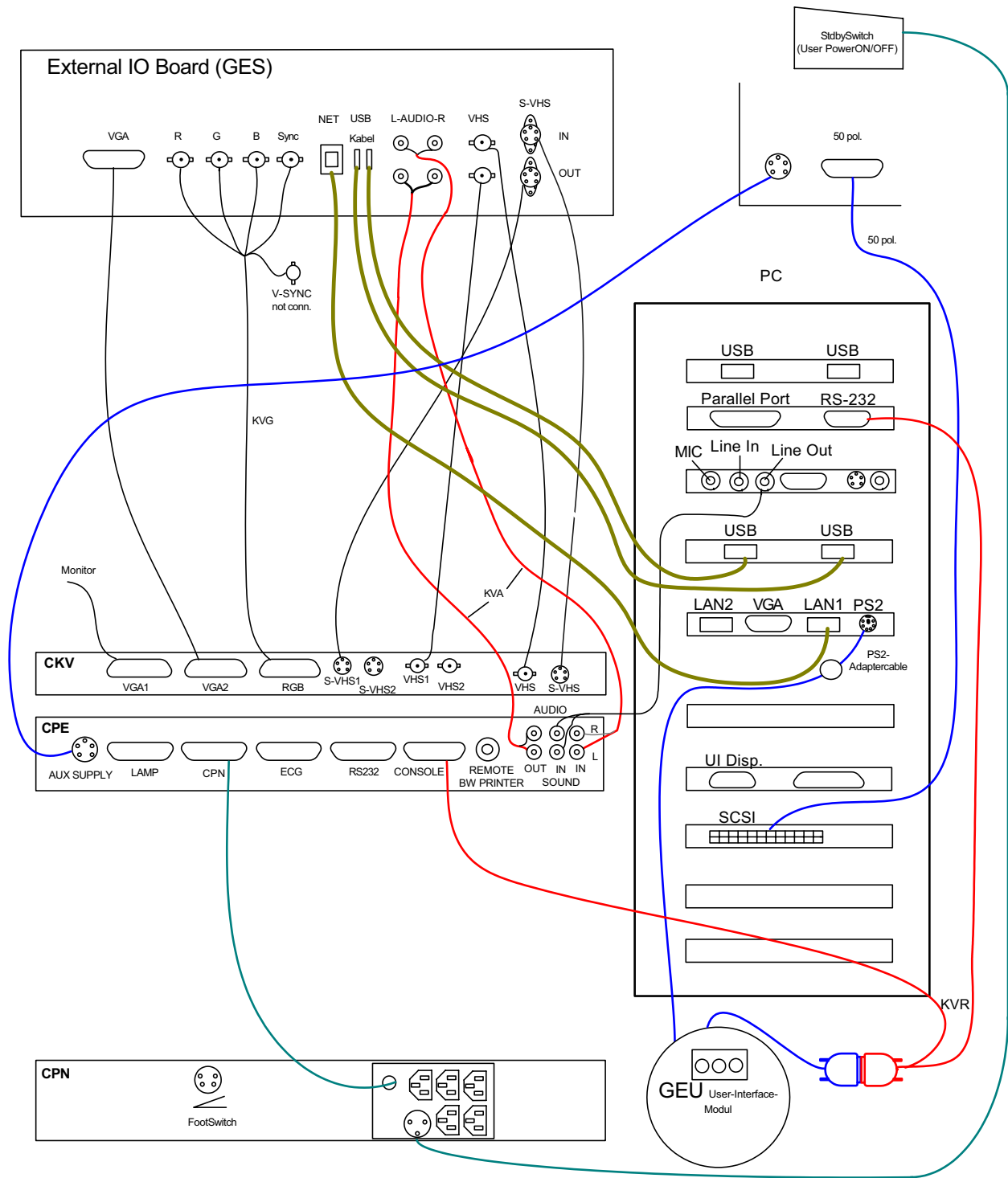


Figure 5-11 Internal I/O

Section 5-6 Internal I/O (cont'd)

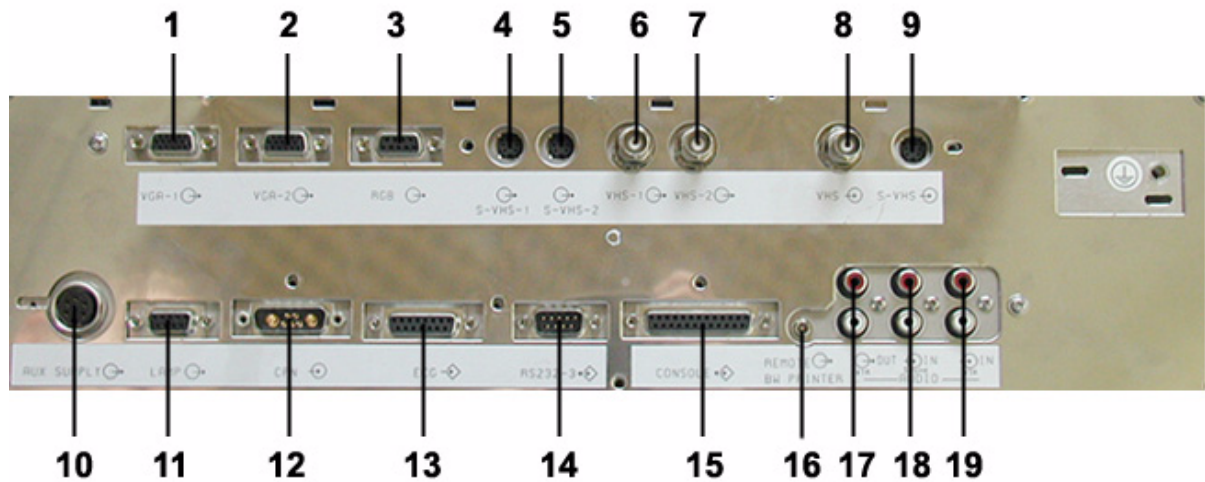


Figure 5-12 Connectors on the Main Module of the GEF

Item	Connector Name	Description
1	VGA1	Connector for the internal color video monitor
2	VGA2	Connector for an external color monitor
3	RGB	Output for color video printer
4	S-VHS 1	S-VHS 1 OUT
5	S-VHS 2	S-VHS 2 OUT
6	VHS 1	Video 1 OUT: 1Vss @ 75 Ohm, PAL ; 1Vss @ 75 Ohm, NTSC
7	VHS 2	Video 2 OUT: 1Vss @ 75 Ohm, CCIR ; 1Vss @ 75 Ohm, FCC
8	VHS	Video IN: 1Vss @ 75 Ohm, PAL / CCIR ; 1Vss @ 75 Ohm, NTSC / FCC
9	S-VHS	S-VHS IN
10	AUX Supply	Power Supply for Module GEM
11	Lamp	Connector for external lamp
12	CPN	Connector for Power Supply (CPN) input
13	ECG	Connector for MAN (ECG-preamplifier)
14	RS232-3	Remote control for Video Recorder
15	Console	Connector for Console
16	Remote BW Printer	Remote control for BW Printer
17	Audio OUT / VTR	Audio OUT / R/L Video Recorder
18	Audio IN Sound	Audio IN R/L Sound
19	Audio IN / VTR	Audio IN / R/L Video Recorder

Section 5-6 Internal I/O (cont'd)

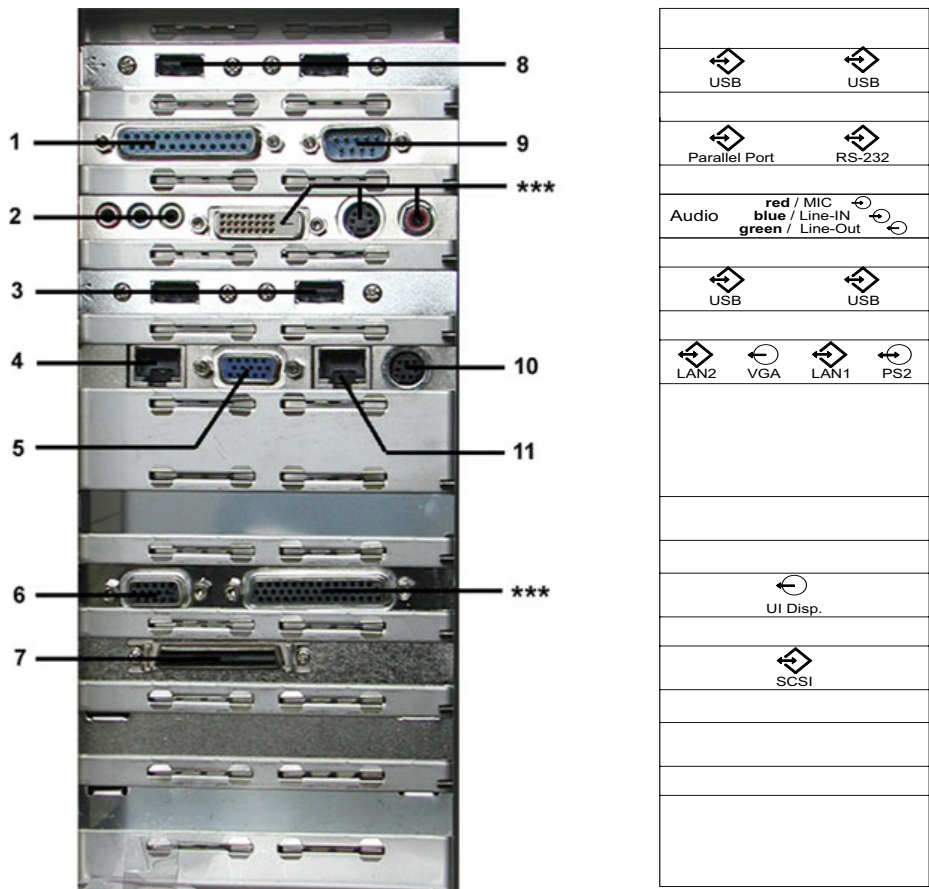


Figure 5-13 Connectors on PC-part of the GEF

Item	Description	Item	Description
1	Parallel port for PC-Line Printer	7	Auxiliary SCSI
2	MIC = Connector for Microphone; Line-OUT = Connector for Sound card	8	USB port connector
3	USB port connectors	9	RS-232 Connector for Operation Panel
4	LAN 2 (no function)	10	PS2 Connector for Mouse / Keyboard
5	VGA (no function)	11	LAN1 Connector for Network twisted pair RJ-45 10/100 megabit/s
6	UI Disp. Connector for User Interface Display (NOT used at Voluson® 730Pro)	***	no function

Section 5-7 Top Console

The Voluson® 730Pro Operator Control Panel (OCP) consists of the following electronic subassemblies and/or functional components:

- Console module:
 - C515 micro controller
 - Atmel micro controller
 - Slide pots TGC with zero raster position)
 - Rotary Encoders with integrated push buttons
 - PS/2 compatible Trackball (2") with standard PC interface
 - PS/2 compatible Qwerty Keyboard with standard PC interface
 - LED indicators with 3 intensity levels (off, 50%,100%)
 - 2 Speaker, used for Doppler and voice replay
- DC/DC Converter:
 - Converts 12V DC input voltage to 5V DC output voltage for supplying UI components

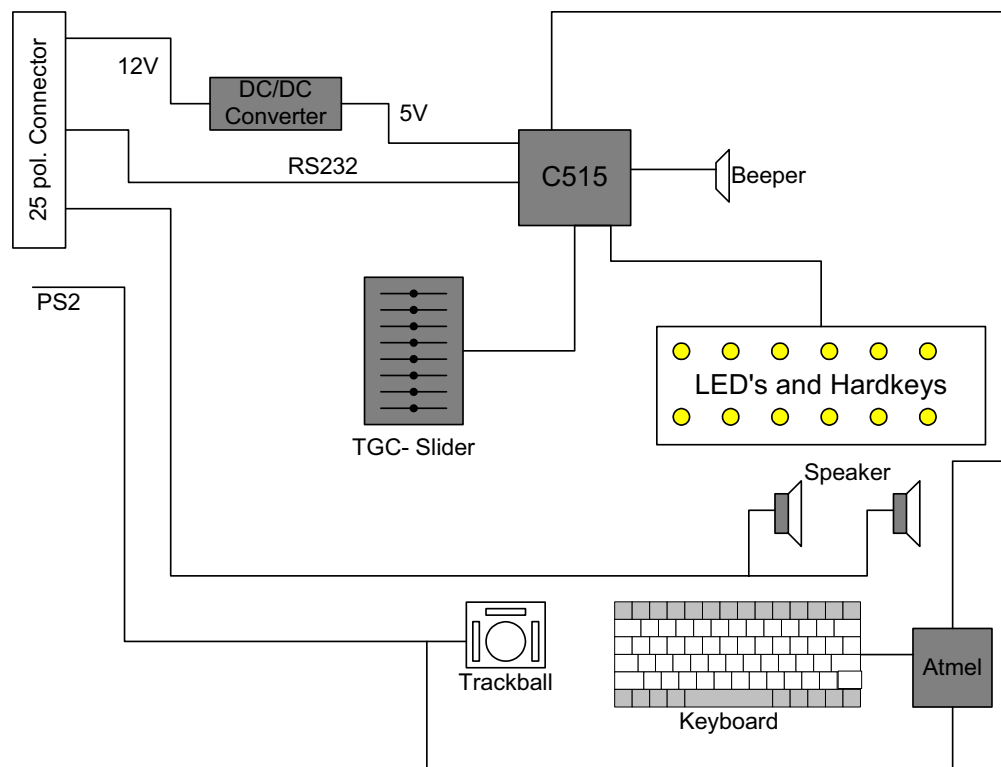


Figure 5-14 Top Console

Section 5-8
Monitor

5-8-1 SONY Monitor (KTZ211212)

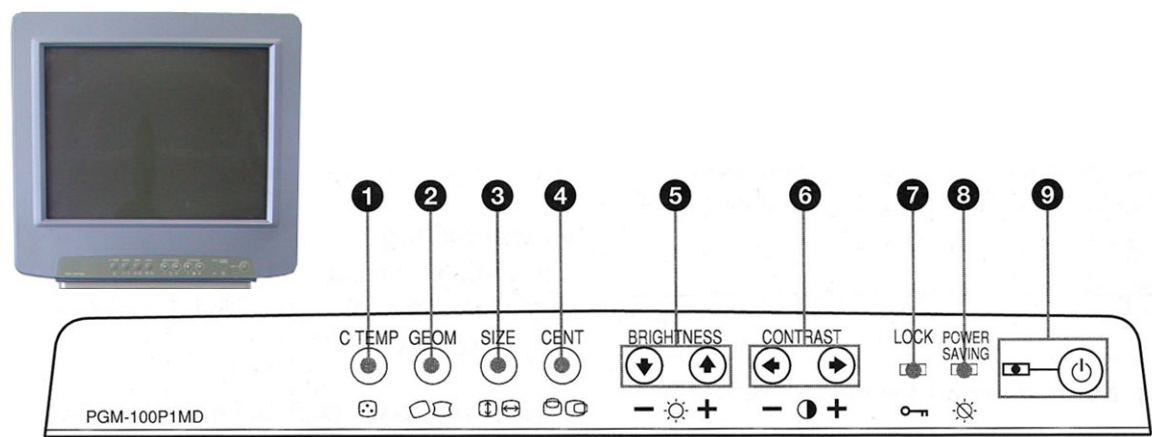


Figure 5-15 Monitor Adjustment buttons

For further details refer to: [Section 6-3-1 "Adjustment of the SONY Monitor \(KTZ211212\)" on page 6-2.](#)

5-8-2 ANY Monitor (KTZ212115)

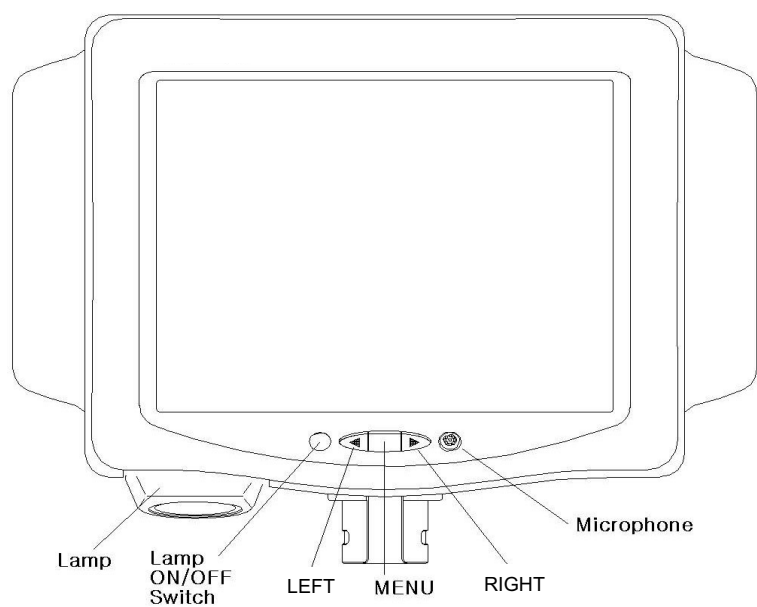


Figure 5-16 Monitor Adjustment buttons

For further details refer to: [Section 6-3-2 "Adjustment of the ANY Monitor \(KTZ212115\)" on page 6-4.](#)

Section 5-9
External I/O

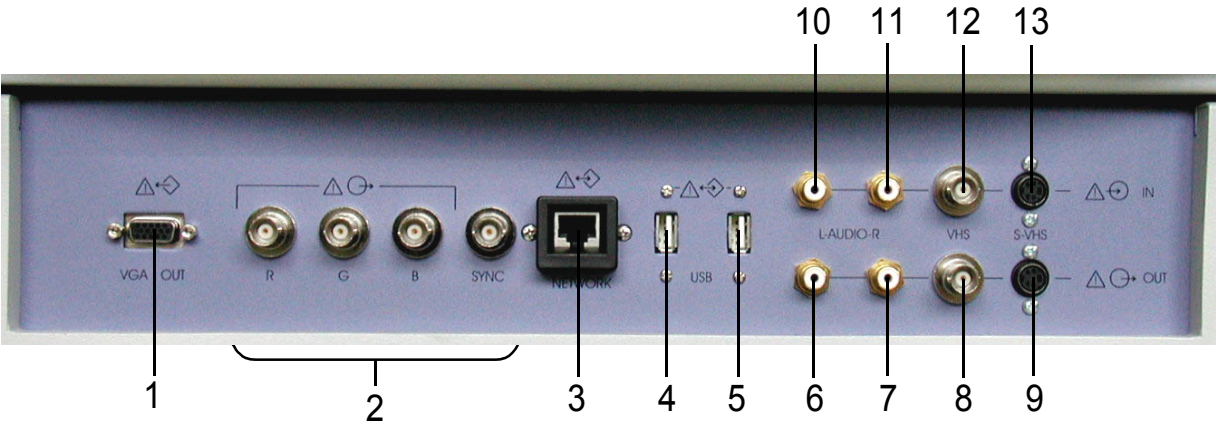


Figure 5-17 External I/O Panel Connectors


 **NOTICE** If peripherals (e.g. VCR) are connected at the Internal I/O, some connectors on the External I/O may not be available. Please refer to [Section 5-6 "Internal I/O" on page 5-28](#).

Table 5-4 External I/O Connector Description

Item	Connector Name	Description
1	VGA (OUTPUT)	print out VGA signal with monitor/printer
2	R, G, B, H/V SYNC	outputs for color video printer/monitor
3	NETWORK	DICOM input/output twisted pair RJ-45 10/100 megabit/s
4	USB-1	USB port
5	USB-2	USB port
6	AUDIO LEFT OUT	
7	AUDIO RIGHT OUT	
8	VHS OUT	
9	S-VHS OUT	
10	AUDIO LEFT IN	
11	AUDIO RIGHT IN	
12	VHS IN	
13	S-VHS IN	

Section 5-10 Peripherals

5-10-1 General Information

The GEM Module contains the Magneto Optical Drive and the CD-RW Drive. Additionally the ECG-preamplifier MAN6 can be installed as an Option.

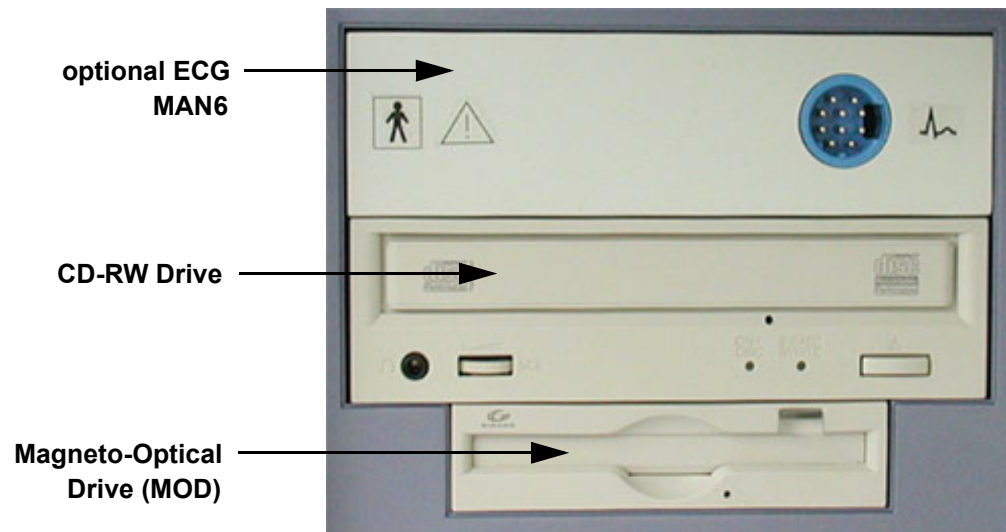


Figure 5-18 GEM incl. optional ECG

5-10-1-1 ECG-preamplifier (MAN6 - optional)

The ECG-preamplifier is used for acquiring an ECG-signal to be displayed with the ultrasound image. This optional peripheral serves for gaining an ECG-signal to mark the systolic and end diastolic moments in M-Mode and Doppler evaluations.

The ECG-preamplifier must not be used for ECG-diagnostics. It is not intended for use as a cardiac monitor and must not be used for an intraoperative application on the heart.

5-10-1-2 CD-RW Drive

Internal SCSI - 24x Read / 8x Write / 8x Re-Write CD-RW Drive
Access Speed: 140ms; Max Data Transfer (Read): 3600KB/sec.; Buffer size: 4MB

Recordable and Re-writable CD's are ideal for any storage purpose and offer complete security and reliability for important data.

5-10-1-3 Magneto-Optical Drive

Storage capacity by disk: 1.3GB, 640MB, 540MB, 230MB, 128MB

The MO-Drive allows to read and write any GIGAMO standard 1.3GB disk at twice the liner bit density. Additionally it retains full read/write compatibility with ISO/IEC 3.5 - inch disks ranging from original 128MB to current 640MB.

MO disks are nearly indestructible and immune from the problems that plague magnetic media. MO disks can be rewritten an unlimited number of times.

Section 5-11 Power Distribution

5-11-1 CPN-Module (Primary Power Module)

5-11-1-1 Mechanical Concept and Overview

The AC Power's main tasks are to supply the various internal subsystems with AC power and to galvanically isolate the scanner from the on site Mains Power System. To reduce inrush current, an inrush current limiter as well as an EMI filter. Voltage to peripherals can be configured to either 115 VAC or 230 VAC.

The mains cord has plugs in both ends. A female plug connects to the scanner and a male plug to the mains outlet on site.

The mains voltage is routed via an EMI filter to the Mains Switch, located on the rear of the system.

The Mains Switch is of the auto fuse type, if for some reason the current grows to high, the switch will automatically break the power.

From the Mains Switch, the AC power is routed via an Inrush Current Limiter to a internal outlet connector for the Mains Transformer.

5-11-1-2 Major Functions of CPN

- Inrush Current limiter
- Power factor correction transformer for Sinus load for the mains voltage
- Power down Circuitry + Standby-Switch
- The CPN module generates 57VDC (+/-2V) as an input voltage for the Secondary Power supply of the GEF module.
- The CPN module contains also the isolation transformer for the peripherals.
(Maximum load: 350VA) see: Basic User Manual Chapter 23 Technical Data/Information

NOTE: All DC-supply voltages for built in peripherals are generated in GEF-module not inside CPN.

NOTE: The system mains supply input voltage can be set to: 110V,130V,230V,240V.
The output voltages may be set to 115V or 230VAC (independent from the input voltages)

5-11-1-3 Fuses on Rear Panel

F1: The main Input voltage is fused by a magnetic Circuit breaker (Rated current 16A) built in the Main Power switch labelled F1

F2: The AC Output voltage (115/230V) is fused by F2 (magnetic Circuit breaker 2.5/5A)

F3, F4, F5, F6: are the fuses for the input voltage for the switching power supplies generating the DC-Supply voltage for the Secondary power supply inside GEF-Module

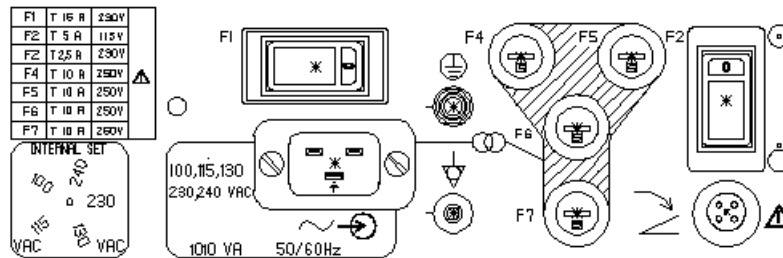


Figure 5-19 Fuses

5-11-1-4 Fuses inside CPN

F1 on CCF board: fuses the surge current limiter circuit.

NOTE: If this fuse is blown, the NTC (limiting the surge current will remain hot during system operation and if the system is switched off/on within a few seconds the surge current could be too high. Because of this reason Fuse F1 on CPN Rear Panel or the Hospital circuit fuse could be blown.

5-11-2 Disk Drive Module (GEM)

The check points for the drives voltages can be found at the AUX Supply connector (= GEM Power connector) on Backpanel of GEF-Box; see: [Section 7-3 "Check Points Voltages" on page 7-3](#).

- MO drive is supplied by +5V only
- CD drive is supplied by both +5V and +12 V
- Fan on the GEM module needs only 12 V power.

5-11-2-1 Fuses on CPE-Board for Disk Drive Module (GEM)

Description of fuses: 5A / 250V / slow-blow fuse / 5 x 20 mm

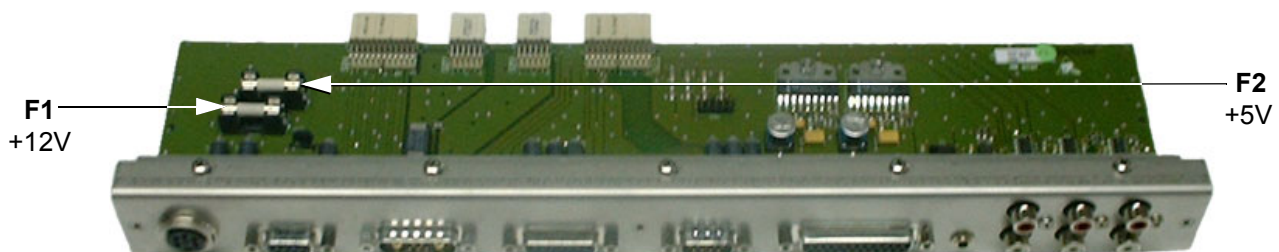


Figure 5-20 fuses for disk drives

Section 5-12 Mechanical Descriptions

5-12-1 Physical Dimensions

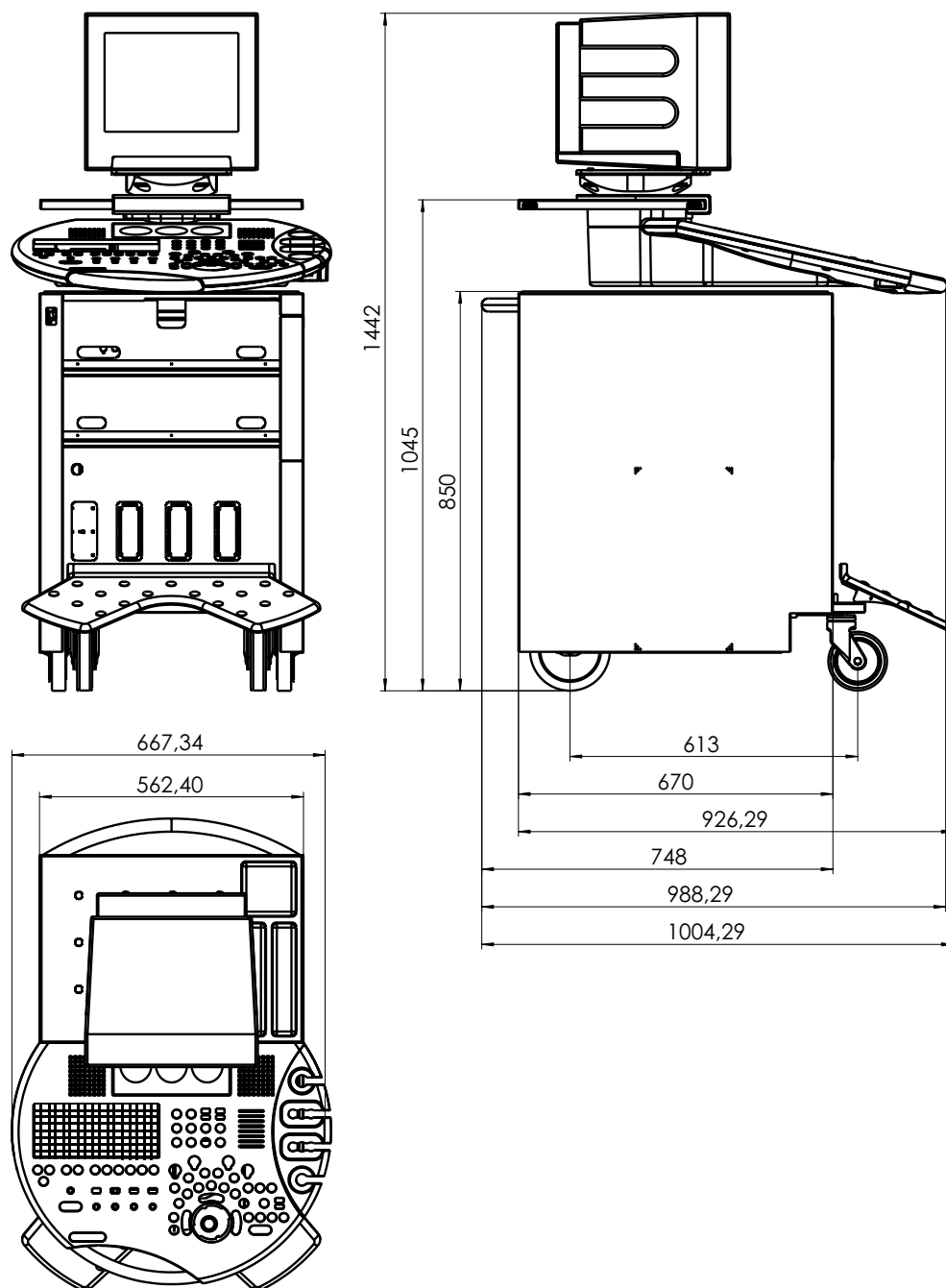


Figure 5-21 Physical Dimensions

5-12-2 Monitor

- Tilt: 10° forwards and backwards
- Swivel: +/-45° rotation.

5-12-3 Top Console Positioning

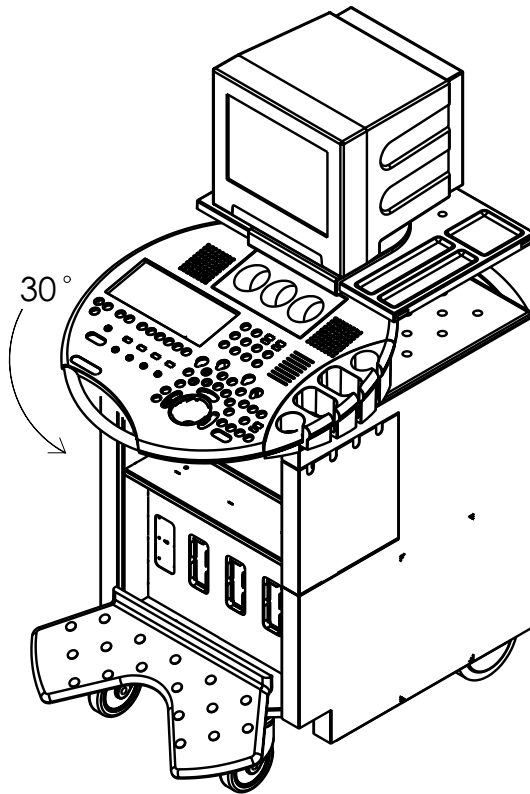


Figure 5-22 Top Console Positioning

5-12-4 Rotation of the Control Console



Locking Lever
for locking and unlocking
the control console

Figure 5-23 Locking lever under Control Console

- Horizontal Access: The control panel offers 30° of horizontal adjustment to the right.

5-12-5 Assembly Drawing GW & GEU & Monitor

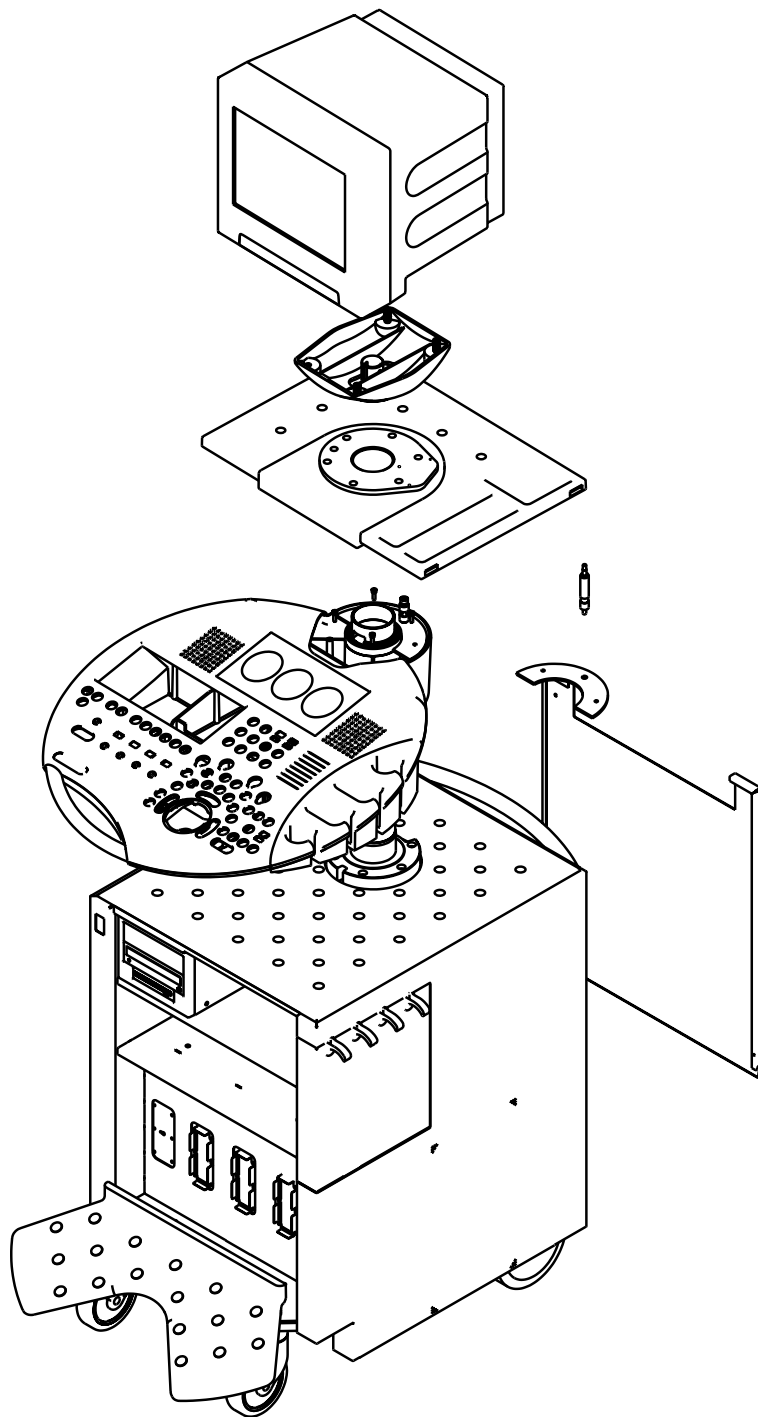


Figure 5-24 Assembly Drawing GW & GEU & Monitor

Section 5-13
Air Flow Control

5-13-1 Air Flow Distribution

The fans at the right side of the Main Board Chassis draw air into the scanner, through the filter grid, and pushes it through the card rack.

Air holes in the left and right side of the rack allow the air to move down through the card rack. Air exits the scanner through holes the Main Air Outlet at the left side panel.

5-13-1-1 Air Flow Distribution Overview:



Figure 5-25 Console Views

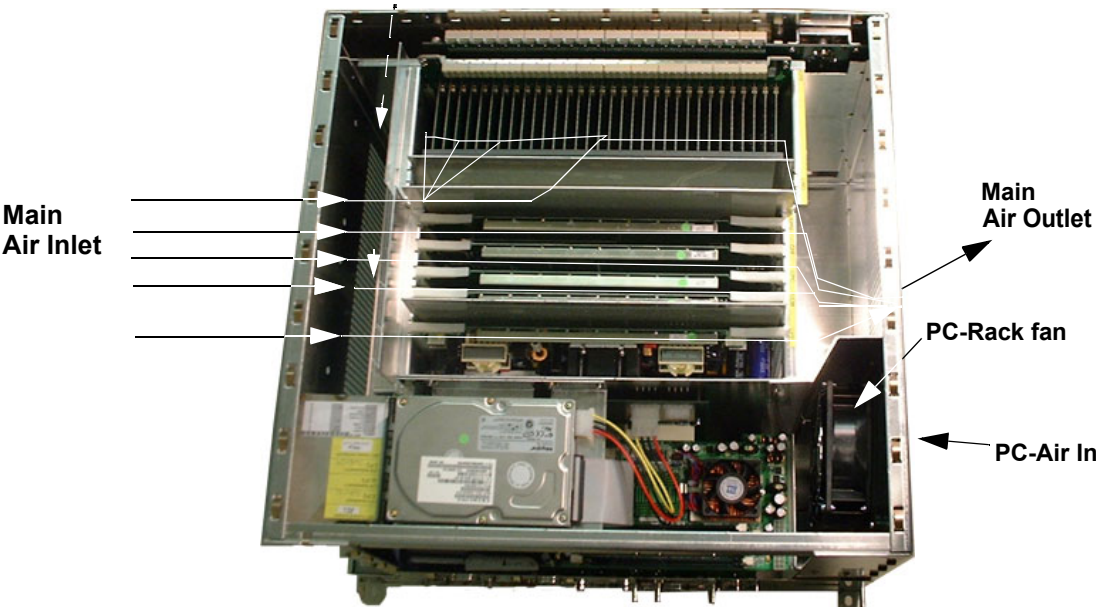


Figure 5-26 Air Flow Control

Section 5-14 Service Page

5-14-1 Introduction

The Service Page contains specific software/hardware test modules, system setup, troubleshooting, update, etc. that will increase service productivity and reduce training and service costs.

5-14-2 Access / Security

The service page has different access and security user levels.
Each user is only granted access to the tools that are authorized for their use.

5-14-3 Service Login

- 1.) Press the UTILITIES key on the Control Panel. The menu area changes to the Utilities menu.
- 2.) Select the SYSTEM item from the menu area to activate the setup desktop screen.
- 3.) Select the SERVICE page. The "password window" appears automatically.
- 4.) Enter the password **SHE** and click the ACCEPT button to display the Service Tools window.

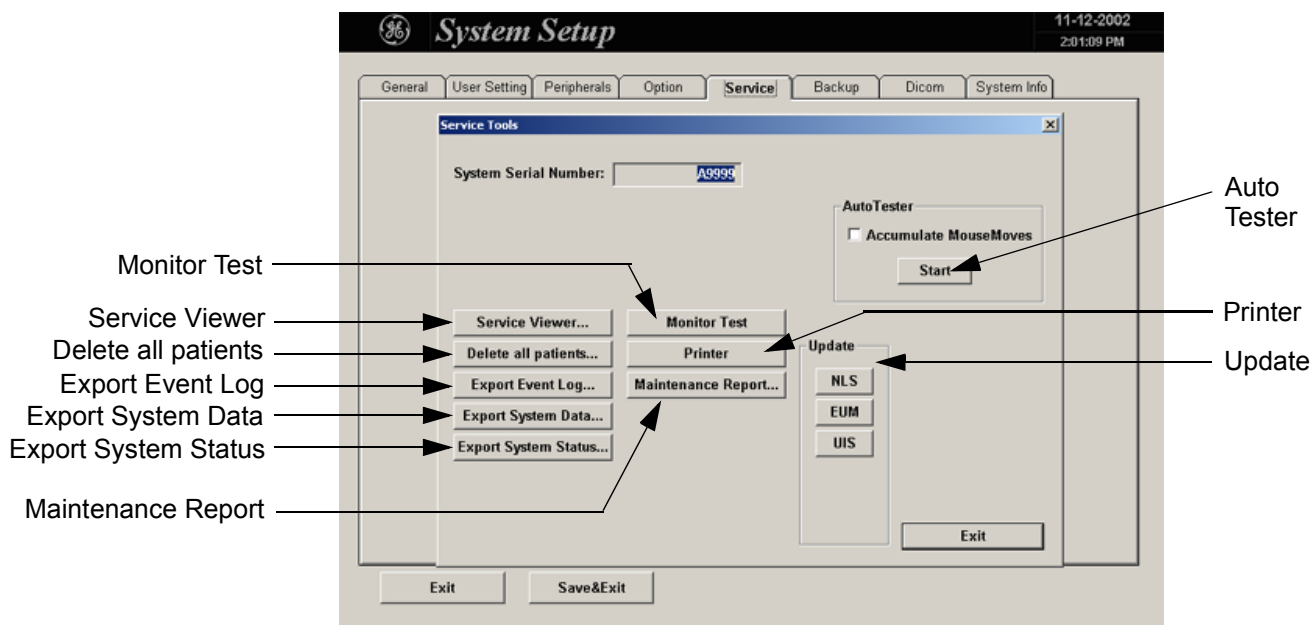


Figure 5-27 Service Tools window

After selecting the corresponding button, following Data's can be requested by the Service Engineers:

5-14-3-1 Auto Tester File

Autotest is a log function of customer activities. It records all user actions (scanning, entries, performing Calculations, review of Patient Reports, etc....). It is possible to save (record) as file on HDD. But also export to CD or MOD can be done to allow replay of the records on other units.



NOTICE For intermittent problems this file can be requested from the Service Engineer or customer. It is possible to burn this file on CD or to store it on MO-disk.

Operation see: [Section 7-5 "How to use the Auto Tester program" on page 7-6.](#)

5-14-3-2 Service Viewer

Provides common information about System Temperature, Probes, Working hours of system components and probes.

- 1.) Select the SERVICE VIEWER button to get access to the E-Service page.



Figure 5-28 Kretztechnik E-Service

5-14-3-3 Export System Status

Select the EXPORT SYSTEM STATUS... button on the "Service Tools" page to export informations about probes, boards, Software, Options and Service Actions to MO or CD Drive.

5-14-3-4 Export Event Log

Select the EXPORT EVENT LOG... button to export the Event Log File to MO or CD Drive.

5-14-3-5 Delete all Patients

- 1.) Click the DELETE ALL PATIENTS... button. Following WARNING message appears on the screen.

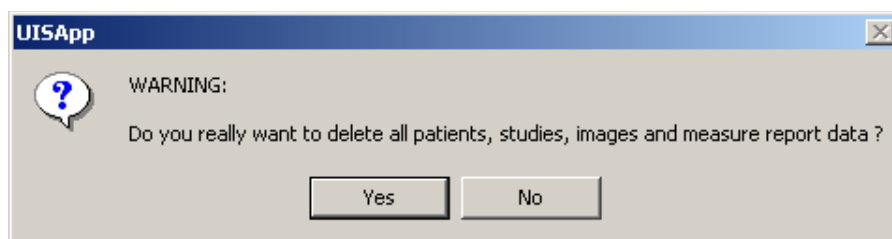


Figure 5-29 Warning message

⚠ WARNING *If you select the YES button, all patients data, studies, images and measure report data will be deleted permanently from the hard disk and cannot be recovered!*

5-14-3-6 Maintenance Report

Any modification upgrade and maintenance action should be entered in this report to get a history of all service actions.

- 1.) Click the MAINTENANCE REPORT button. The following message box will be displayed.

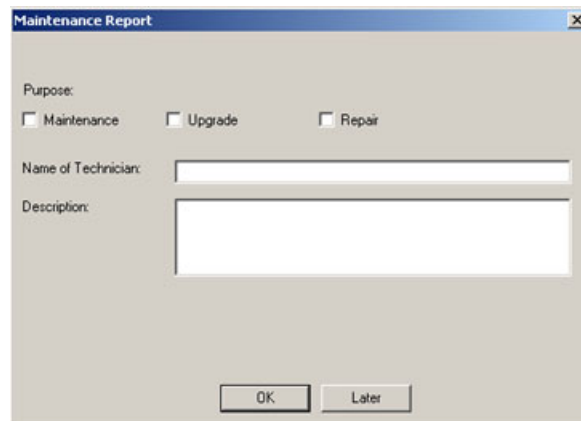
A screenshot of a 'Maintenance Report' dialog box. The dialog has a title bar with 'Maintenance Report' and a close button. Inside, there is a 'Purpose:' section with three checkboxes: 'Maintenance', 'Upgrade', and 'Repair'. Below this is a 'Name of Technician:' label followed by a text input field. Underneath is a 'Description:' label followed by a larger text area. At the bottom, there are two buttons: 'OK' and 'Later'.

Figure 5-30 Maintenance Report

- 2.) Fill in the requested information and click OK.
- 3.) Click the EXIT button on the Service Tools window and the EXIT button on the System Setup Service page.

NOTE: After Hardware or Software modifications normally the "Maintenance Report" message box [Figure 5-30](#) appears automatically on the screen.

5-14-3-7 Export System Data

Select the EXPORT SYSTEM DATA button on the "Service Tools" page to export dump-files, text files and Service Database informations about probes, boards, Software, Options, etc. to the MO or CD Drive. Operation see: [Section 7-4-2-3 "Export System Data" on page 7-5](#).

5-14-3-8 Monitor Test

- 1.) To perform the Monitor test, select the MONITOR TEST button.
The following message appears on the screen.

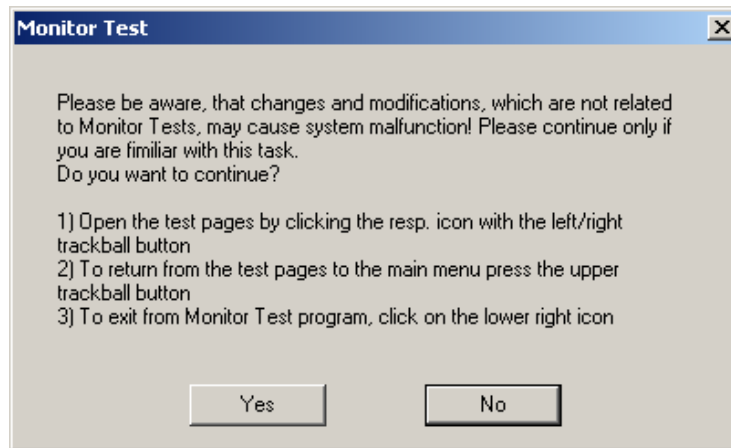


Figure 5-31 Monitor Test - Instructions

- 2.) Read the displayed instructions. Afterwards confirm with YES.
The Monitor Test main menu appears on the screen.

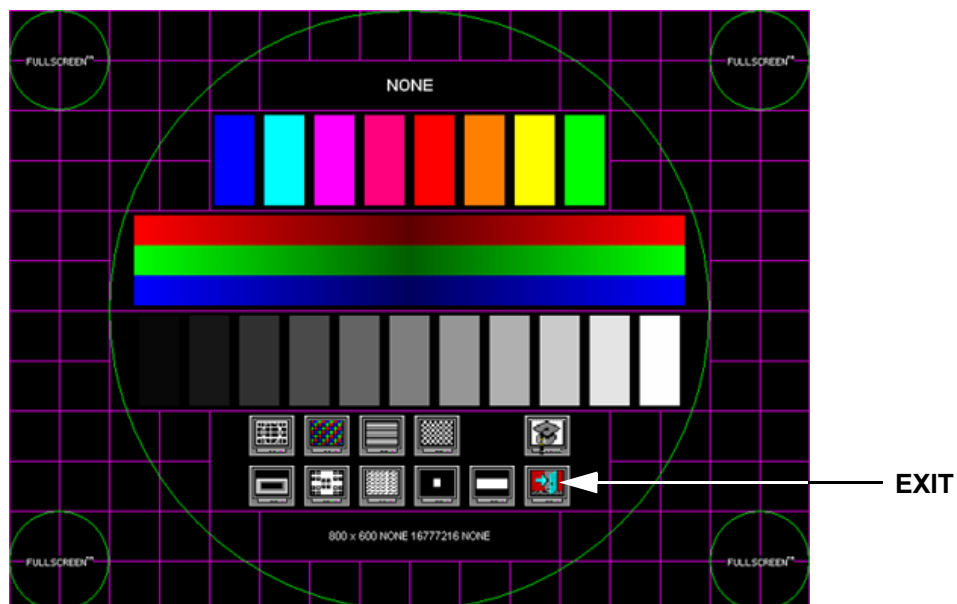


Figure 5-32 Monitor Test - Main menu

- 3.) Open the desired test page: select the respective icon and press the right/left trackball key.
- 4.) To return to the Main menu, press the upper trackball key.
- 5.) To exit the Monitor Test program, click the "Exit" icon.

5-14-3-9 Printer

Installation of the Line Printer is possible without entering the Windows Desktop.
Operation see: [3-7-4 "Printer Installation manually" on page 3-29.](#)



WARNING *Only accessories explicitly recognized and released by the system manufacturer GE Medical Systems - Kretztechnik may be used in connection with the system.*

5-14-3-10 Update

5-14-3-10-1 NLS

Not for use in the field!

5-14-3-10-2 EUM

is for updating the **E**lectronic **U**ser **M**anual

Operation see: [Section 8-5 "Electronic User Manual \(EUM\) Upgrade Procedure" on page 8-9.](#)

5-14-3-10-3 UIS

is for updating the Ultrasound Application Software

Operation see: [Section 8-2-5 "Software - Update \(via Service Page\)" on page 8-5.](#)

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Chapter 6

Service Adjustments

Section 6-1 Overview

6-1-1 Purpose of Chapter 6

This chapter describes how to test and adjust the mechanical capabilities of a scanner that may be out of specification. Although some tests may be optional they should only be performed by qualified personnel.

Table 6-1 Chapter 6 Contents

Section	Description	Page Number
6-1	Overview	6-1
6-2	Regulatory	6-1
6-3	Monitor Adjustment	6-2
6-4	Control Console, Transport Lock	6-5
6-5	Trackball Adjustment	6-6

Section 6-2 Regulatory

Verify, where applicable, that any regulatory information or tests required by national law are present and accounted for, and any regulatory tests required by national law are performed *and* documented.

Section 6-3 Monitor Adjustment

The Monitor can be tilted or rotated.

- Tilt angle: up/down 11°
- Rotation angle: right/left 90°

6-3-1 Adjustment of the SONY Monitor (KTZ211212)

Color temperature, Geometry, Size, Picture location, Brightness and Contrast are adjusted using the keys located on the front of the monitor just below the screen.

The screen is degaussed automatically when the power is turned on.

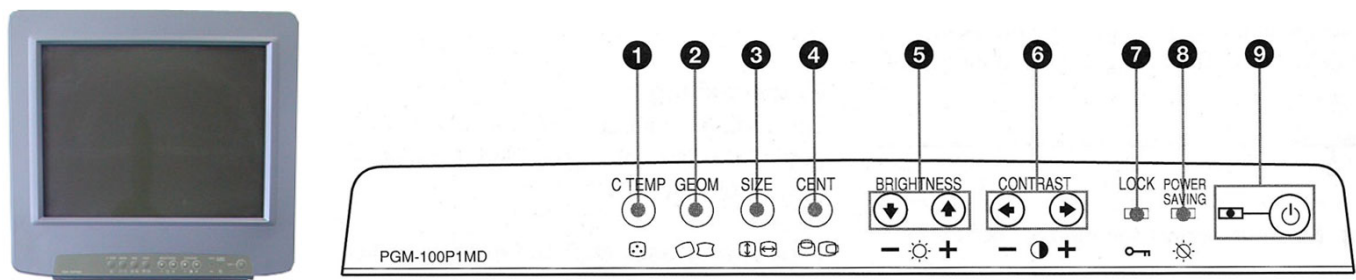


Figure 6-1 Monitor Adjustment buttons

1 ☺ (C TEMP: color temperature) button

Press to show the Color Temperature display on the screen for the color temperature adjustment.

2 ⬡ (GEOM: geometry) button

Press to show the Geometry display on the screen for the picture rotation and pincushion distortion adjustments.

3 ⬆ (SIZE: picture size) button

Press to show the Size display on the screen for the picture size adjustment.

4 ⬢ (CENT: picture location) button

Press to show the Center display on the screen for the picture location adjustment.

5 ☀ ⬇/⬆ (-/+) (BRIGHTNESS) buttons

- Press to show the Contrast/Brightness display on the screen for the picture brightness adjustment.
- Press to adjust the picture brightness, picture location, picture size, picture rotation, and color temperature.

6 ☀ ⬇/⬆ (-/+) (CONTRAST) buttons

- Press to show the Contrast/Brightness display on the screen for the picture contrast adjustment.
- Press to adjust the picture contrast, picture location, picture size, pincushion distortion, and color temperature.

7 🔒 (LOCK) indicator

Lights up when the 🔒 (lock) switch on the rear is set to the upper position (ON). No operation is possible.

8 ☀ (POWER SAVING) indicator

Lights up when the power saving function is used.

9 ⏻ (power) switch and indicator

Turns on or off the monitor.

This power switch is a functional on/off switch only. To isolate the monitor from the mains supply, turn off the mains supply switch on the rear panel.

The indicator lights green when the monitor is ready to operate, and lights orange when it is not ready (with the main supply switch turned on).

Figure 6-2 Description of Monitor Adjustment buttons

6-3-1 Adjustment of the SONY Monitor (KTZ211212) (cont'd)

Start Ultrasound application to adjust Monitor setting.

Table 6-2 Recommended Settings

Monitor buttons	Recommended Setting	Remark
C TEMP	select 9300K, 50 windows background should be white	select <u>UTILITIES</u> , <u>SYSTEM SETUP</u> and click the <u>DATE/TIME</u> button on the "General" page and look at background of calender
GEOM	no pincushion distortion no picture rotation	Monitor is pre-adjusted; minor distortion is normal and can be corrected with the GEOM function
SIZE	video display fills up full screen	
CENT	video centered left and right margin equal	

Table 6-3 Brightness / Contrast Settings

Room Condition	Monitor Adjustment	
	Brightness	Contrast
Dark Room for Obstetrics	55	55
Dim Room for Obstetrics	62	65
Bright Room for Obstetrics	72	75
Dim Room for Radiology	70	70

6-3-2 Adjustment of the ANY Monitor (KTZ212115)

The digital control panel is located at the front of the color monitor. If you are not satisfied with the factory settings, use these controls to program those you prefer in each resolution. Then, these adjusted settings are kept in memory even if you change the resolution or turn off the monitor.

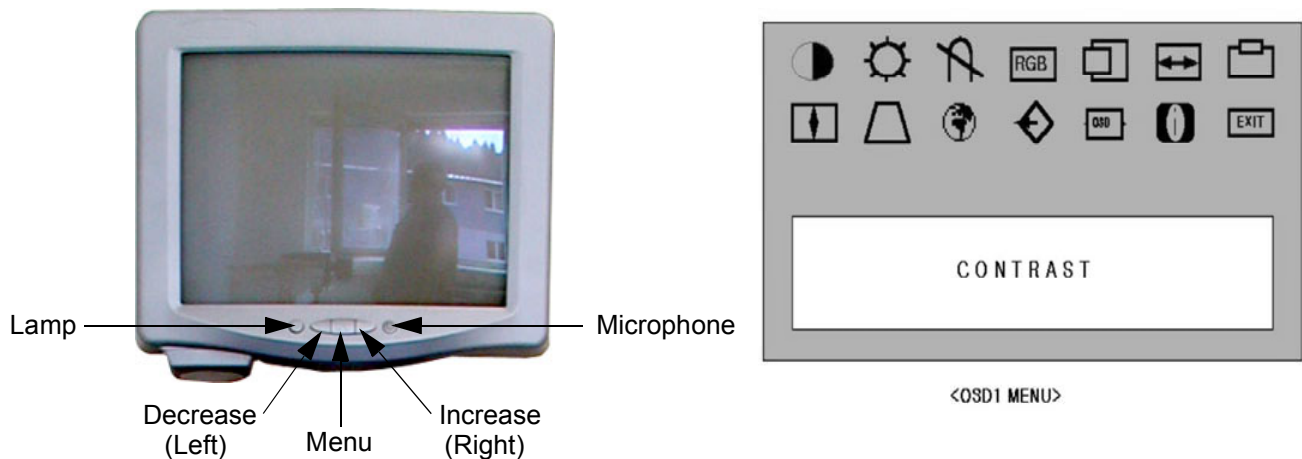


Figure 6-3 Monitor Adjustment buttons

- **Menu:**
Press this button for about 20 seconds to enable the expanded **On Screen Display** (OSD menu). This button is also used to select the function in the Main Menu or to save the settings in the Sub Menu. (Push for 3 sec.)

NOTE: *It is recommended that only the image size be adjusted as required and not anything else.*

- **Decrease (Left) = \leq button :**
Use this button to move down the OSD selection menu and adjust the attribute of the monitor while in OSD menu.
Pressing this button out of OSD menu allows to decrease the level of contrast of the display screen.
- **Increase (Right) = \geq button:**
Use this button to move down the OSD selection menu and adjust the attribute of the monitor while in OSD menu.
Pressing this button out of OSD menu allows to increase the level of contrast of the display screen.
- **Lamp ON/OFF**
Lamp on/off
- **Microphone:**
Allows to record voice.

NOTE: *There is no function of microphone.*

Section 6-4 Control Console, Transport Lock

6-4-1 Control Console

The control console can be rotated 30° to the right.

When rotating the control console grasp it only the front grip.



locking lever
for locking and unlocking
the control console

Figure 6-4 Locking Lever under Control Console

- 1.) Push the lever under the control console forward.
- 2.) Rotate the console to wanted position.

6-4-2 Transport Lock

There is a locking lever for locking and unlocking the control console, mounted at the front below the control console. When preparing the system for transport, the lock has to be engaged in order to secure the console against uncontrolled rotation. The lock catches in when the console is rotated to its center 0° position.



WARNING *Do not put your hand between the control console and the Main unit when moving the console to the 0 position: Danger of injuries!*

Section 6-5 Trackball Adjustment

Adjustment of the mechanical movement may be necessary to ensure smooth running of the trackball.

- 1.) Remove the outer fixing ring by turning it counterclockwise.

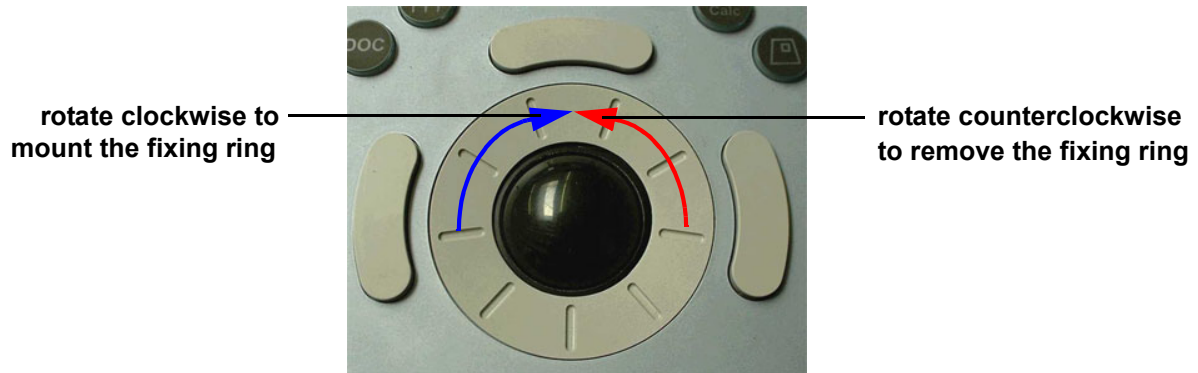


Figure 6-5 Trackball with fixing ring

- 2.) Adjust the trackball for smooth running by rotating the black securing ring.

- CCW: smooth run
- CW: tighten run

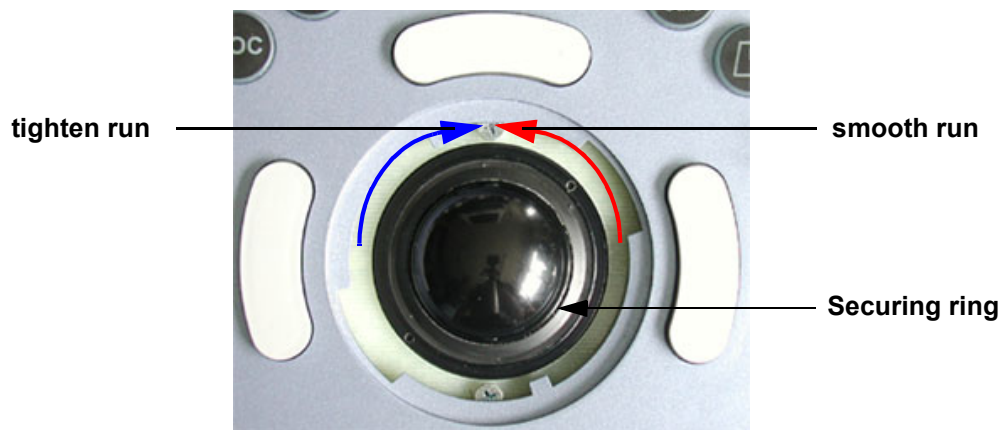


Figure 6-6 Trackball - Securing Ring



NOTICE Avoid tightening of thread caused by improper mounting of securing ring!

- 3.) Mount the outer fixing ring by turning it clockwise. see [Figure 6-5](#)

Chapter 7

Diagnostics/Troubleshooting

Section 7-1 Overview

7-1-1 Purpose of Chapter 7

This section describes how to setup and run the tools and software that help maintain image quality and system operation. Basic host, system, and board level diagnostics are run whenever power is applied. Some Service Tools may be run at the application level.

7-1-2 Overview

There may be a time when it would be advantageous to capture trouble images and system data (logs) for acquisition through remote diagnostics (InSite) or to be sent back to the manufacturer for analysis. There are different options to acquire this data that would give different results.

Table 7-1 Contents in Chapter 7

Section	Description	Page Number
7-1	Overview	7-1
7-2	Collect Vital System Information	7-2
7-3	Check Points Voltages	7-3
7-4	Screen Captures and Logs	7-4
7-5	How to use the Auto Tester program	7-6
7-6	Minimum Configuration to Boot/Scan	7-9
7-7	Troubleshooting Trees and Instructions	7-11
7-8	Error Messages	7-21

Section 7-2 Collect Vital System Information

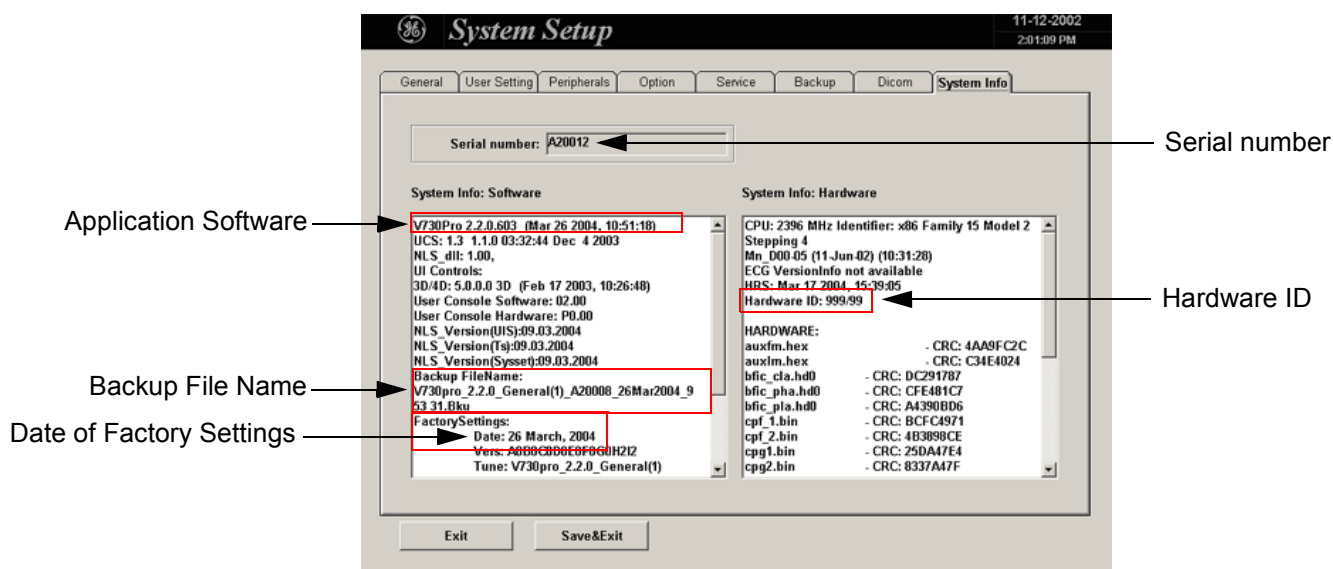
The following information is necessary in order to properly analyze data or images being reported as a malfunction or being returned to the manufacturer:



NOTICE Voluson® 730Pro can have two different serial numbers!

Press **UTILITIES**, select the **SYSTEM** item and then select the **SYSTEM INFO** page.

- **System Type**
- **System Serial number** (the serial number on the label of back of the system may be different!)
- **Application Software version**
- **Backup version** (File Name)
- **additional Information** (e.g., Hardware ID, MS-patches, etc.)



Move the scroll bar downwards to review additional information about installed software/hardware.

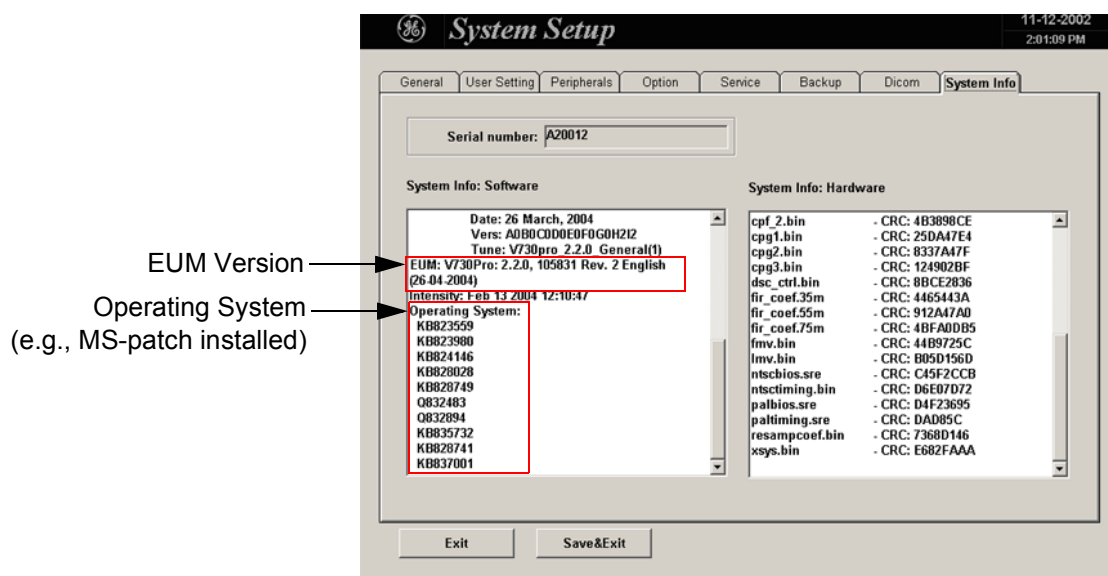


Figure 7-1 System Setup - System Info page

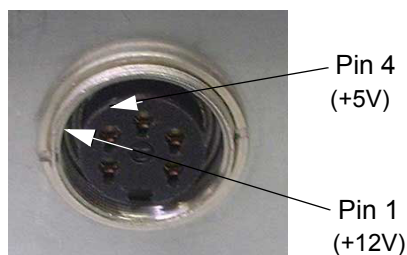
Section 7-3 Check Points Voltages

7-3-1 How to check power



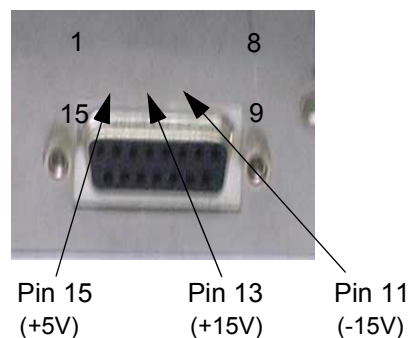
NOTICE In case of problems check the voltages (see: [Figure 7-2](#)) with a Digital Volt Meter (DVM) to Ground.

AUX Supply connector (= GEM Power connector)
on Backpanel of GEF-Box

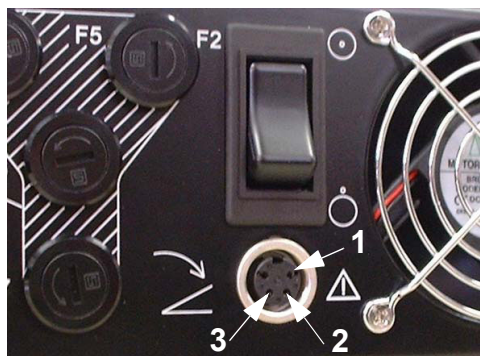


Location of fuses on CPE; see: [Section 5-11-2-1 on page 5-36](#)

ECG connector on Backpanel of GEF-Box



Footswitch connector on Power Supply Module (CPN)
(Pin 2 and 3 = +3.3V ; Pin 1 = GND)



Additionally check 58V/DC
(Power Connection-Cable from CPN to GEF)



Figure 7-2 Connectors and corresponding voltage check points

Section 7-4 Screen Captures and Logs

There may be times when the customer or field engineer will want to capture a presentation on the screen so it may be recovered by the OnLine Center through InSite.

This is accomplished by saving the image(s) to SonoView and export them (as jpg, bmp or tiff) to CD-ROM or MO-disk.

7-4-1 Capturing a screen

The following is the generic process to capture any screen from the scanner.



- 1.) Navigate to and display the image/screen to be captured.
- 2.) Press the **SAVE 2D** key on the control panel and save the image to Sonoview.
- 3.) Select the stored image(s) in Sonoview (Exam List) and **EXPORT** the image(s) to CD-Rom (jpg, bmp or tiff).

7-4-2 Export Log's and System Data's

- 1.) Press the **UTILITIES** key and select the **SYSTEM** item from the menu area.
- 2.) Select the **SERVICE** page on the screen. The "password window" appears automatically.
- 3.) Enter the password **SHE** and click the **ACCEPT** button to display the Service Tools window.

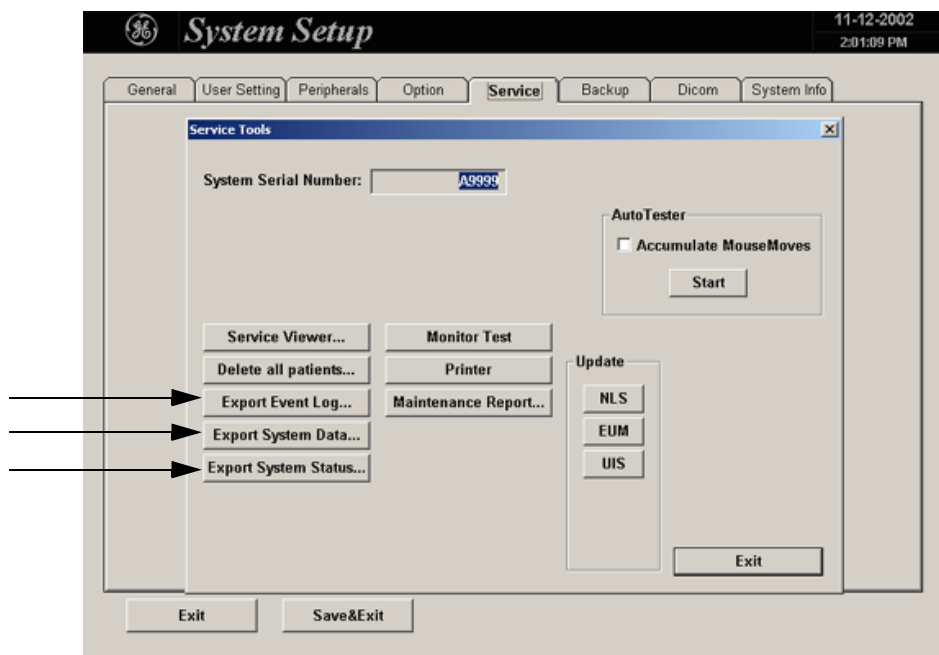


Figure 7-3 Service Tools window

7-4-2-1 Export Event Log

Exports Event Log File to MO or CD Drive.

7-4-2-2 Export System Status

This function exports information about probes, boards, SW, Options Service Actions to MO or CD Drive.

7-4-2-3 Export System Data

Every time an error message like [Figure 7-4](#) is produced, a dump-file and a text file containing the error dump and the error message are created in D:\export. Up to 20 dump files are stored there.

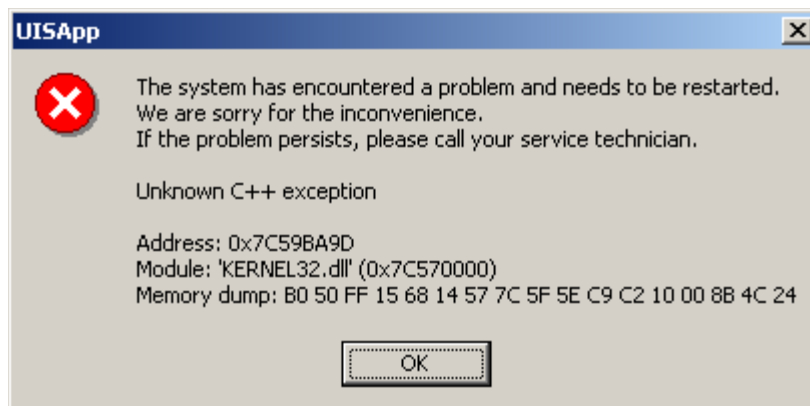


Figure 7-4 system has encountered a problem

Section 7-5

How to use the Auto Tester program

- 1.) Press the UTILITIES key and select the SYSTEM from the menu area on the left side of the screen.
- 2.) Select the SERVICE page on the screen. The "password window" appears automatically.
- 3.) Enter the password **SH**E and click the ACCEPT button to display the Service Tools window.

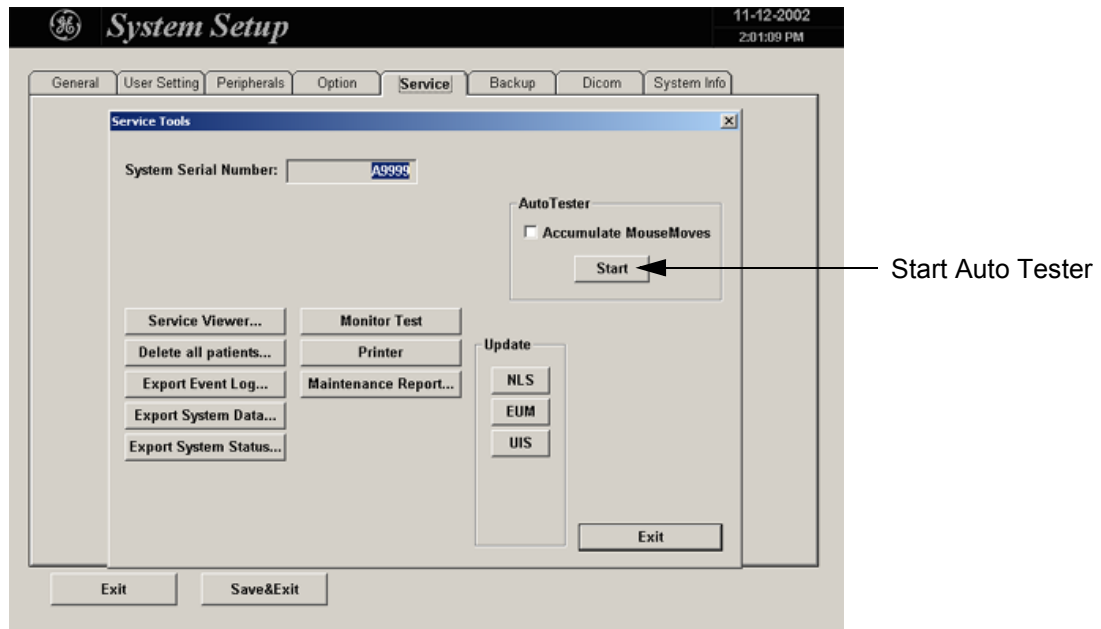


Figure 7-5 Service Tools window

- 4.) Activate the "Auto Tester" program by clicking START.

Section 7-5 How to use the Auto Tester program (cont'd)

The following message box appears.

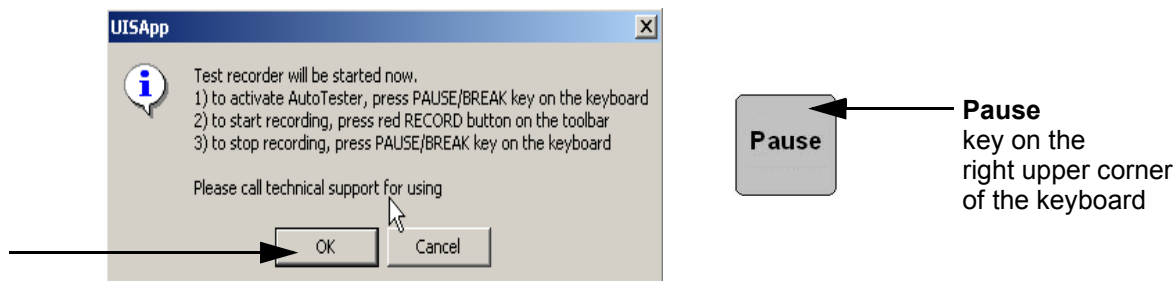


Figure 7-6 Message Box

- 5.) Click OK.
- 6.) Press the **PAUSE** key on the keyboard.
- 7.) Activate the "Auto Tester" program by clicking the "Record" icon on the displayed screen.

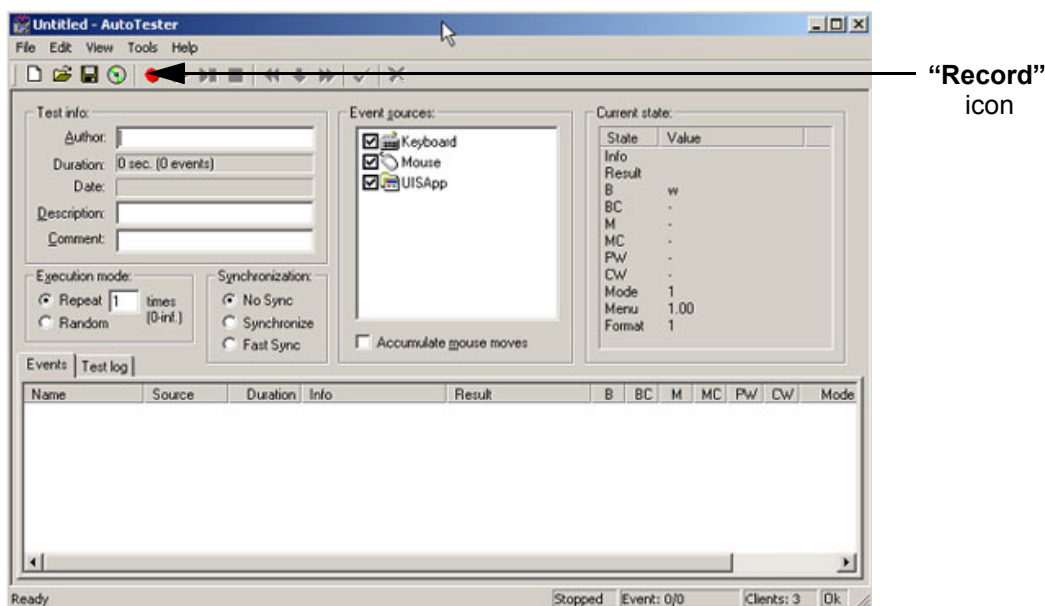


Figure 7-7 Start Auto Tester

- 8.) Start scanning.
You can scan normally and everything will be recorded to the program (up to several hours.)

NOTE: It is important that you are recording the processes where the errors normally occur.

- 9.) Stop the program by pressing the **PAUSE** key on the right upper corner of the keyboard.

Section 7-5 How to use the Auto Tester program (cont'd)

The following screen will appear.

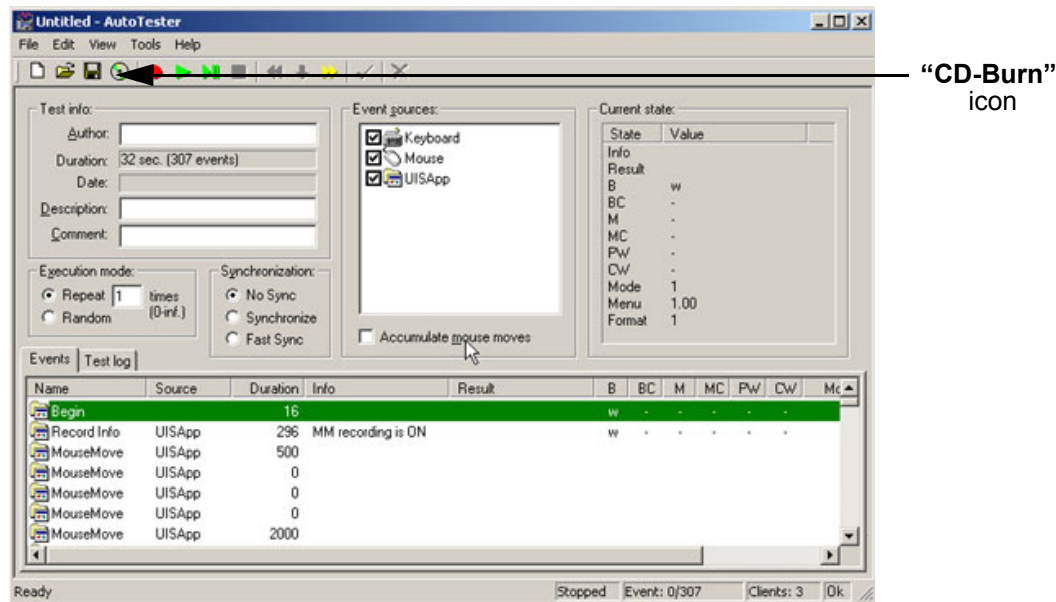


Figure 7-8 Auto Tester Finished

- 10.)Insert an empty CD-RW in the Drive and select the “CD-Burn” icon.
- 11.)Enter a Filename.



Figure 7-9 Enter a Filename

- 12.)After clicking OK, the following message boxes will appear.



Figure 7-10 CD-Burn Process

- 13.)After the CD write is finished click the OK button and close the “Auto Tester” program.

Section 7-6

Minimum Configuration to Boot/Scan

7-6-1 Minimum Configuration to Scan

Following Cables must be connected to scan; see: [Figure 7-11](#)

a.) RS232 (Connector for Operation Panel)

NOTE: *Don't mix up the RS232 connector (on PC-part of the GEF) with the RS232-3 connector (on the main module of the GEF).*

b.) PS2 (connector for Mouse/Keyboard)

c.) UI Disp. (connector for User Interface Display - **NOT USED** at Voluson® 730Pro)

d.) VGA (Monitor)

e.) CPN (Primary Power Supply)

f.) Console

g.) Standby switch

h.) Monitor (Power Supply)

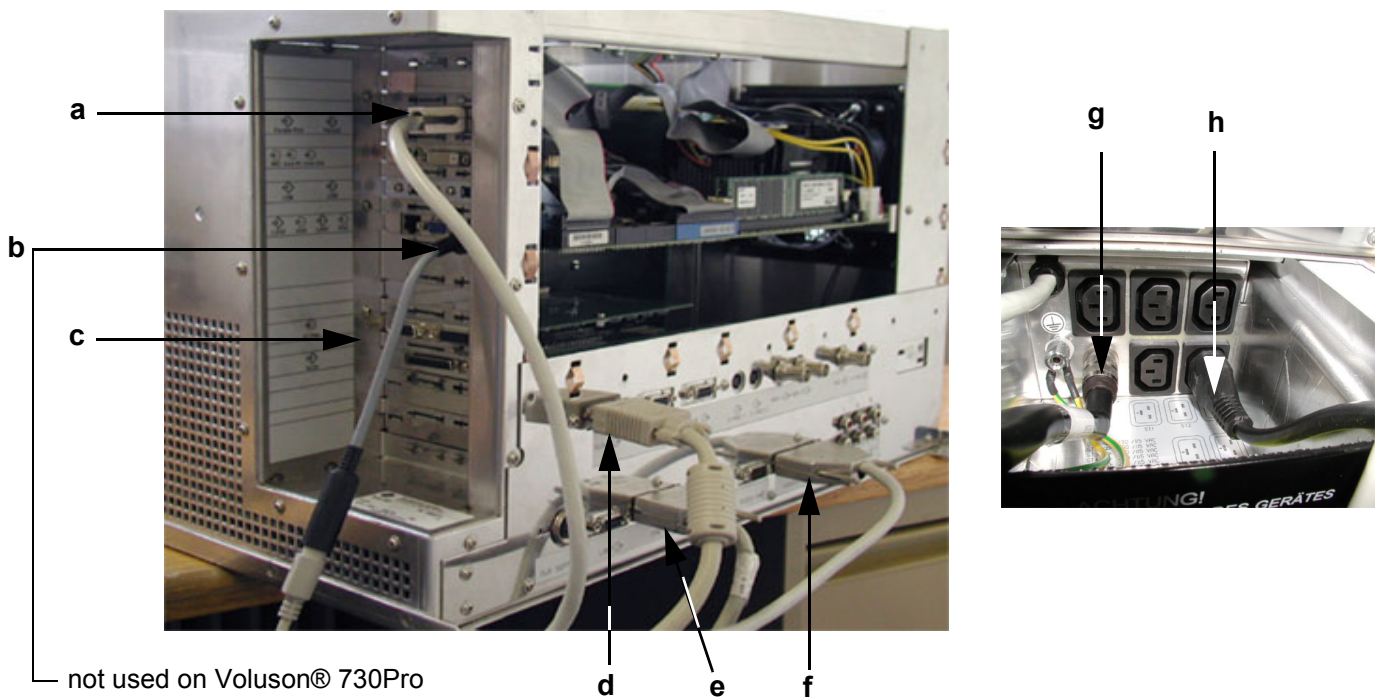


Figure 7-11 cable- minimum configuration

Connect mains power cable (**i**) to the system and to an appropriate mains power outlet.

Connect a probe, boot up the system and start an User program.

Section 7-7 Troubleshooting Trees and Instructions

7-7-1 System Does Not Power On / Boot Up

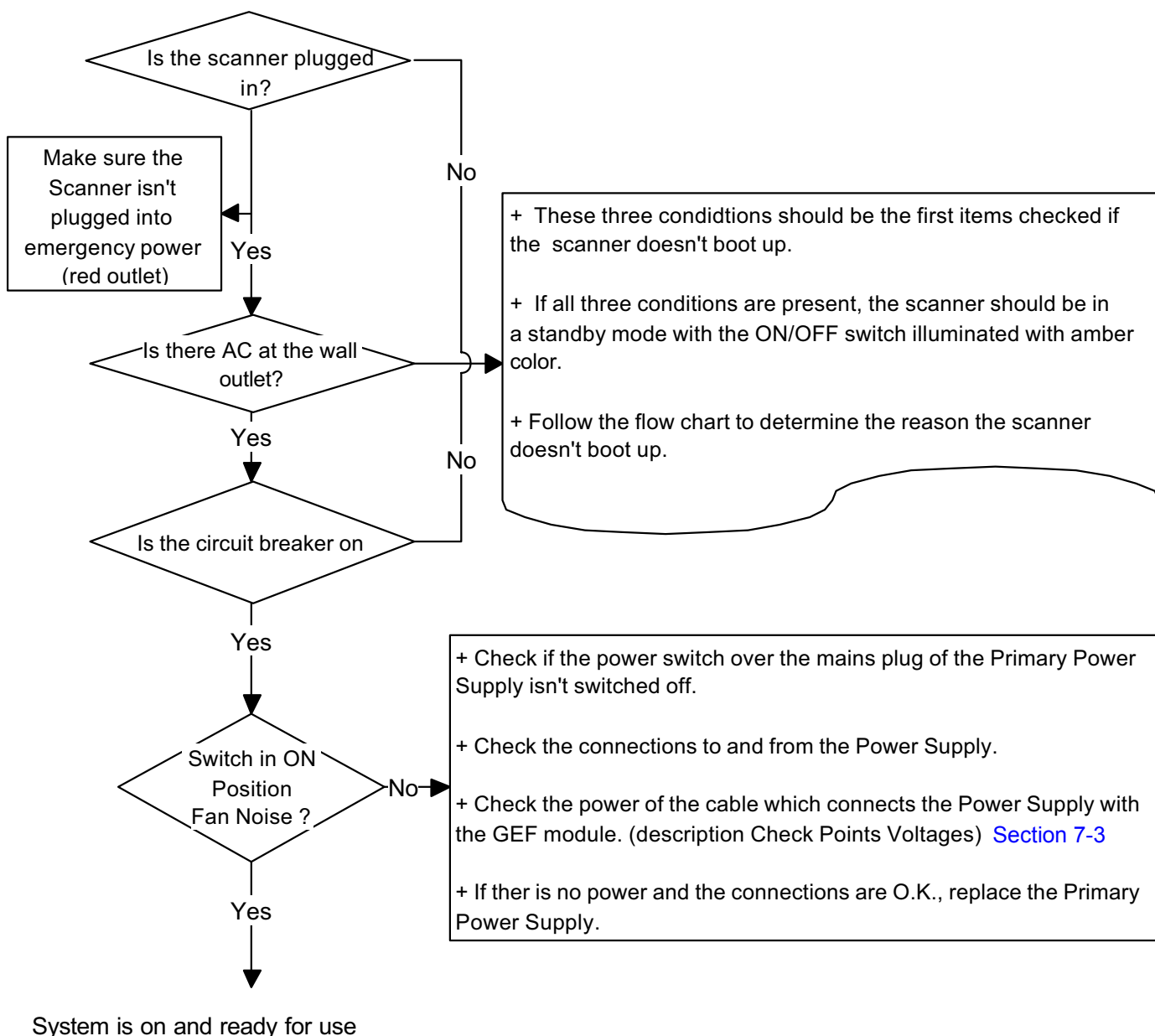


Figure 7-12 System does not boot up

7-7-2 Noise disturbs the Image

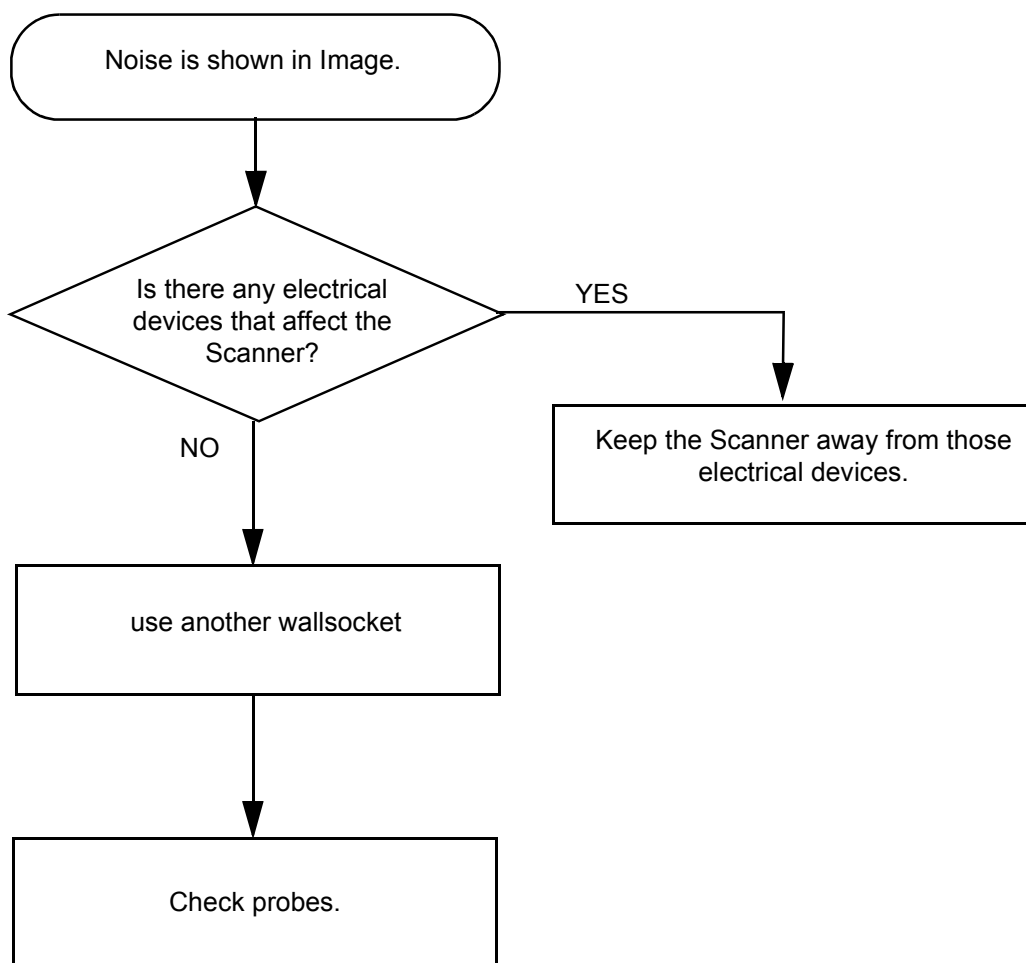


Figure 7-13 Noise disturbs the Image - Troubleshooting

7-7-3 Trackball

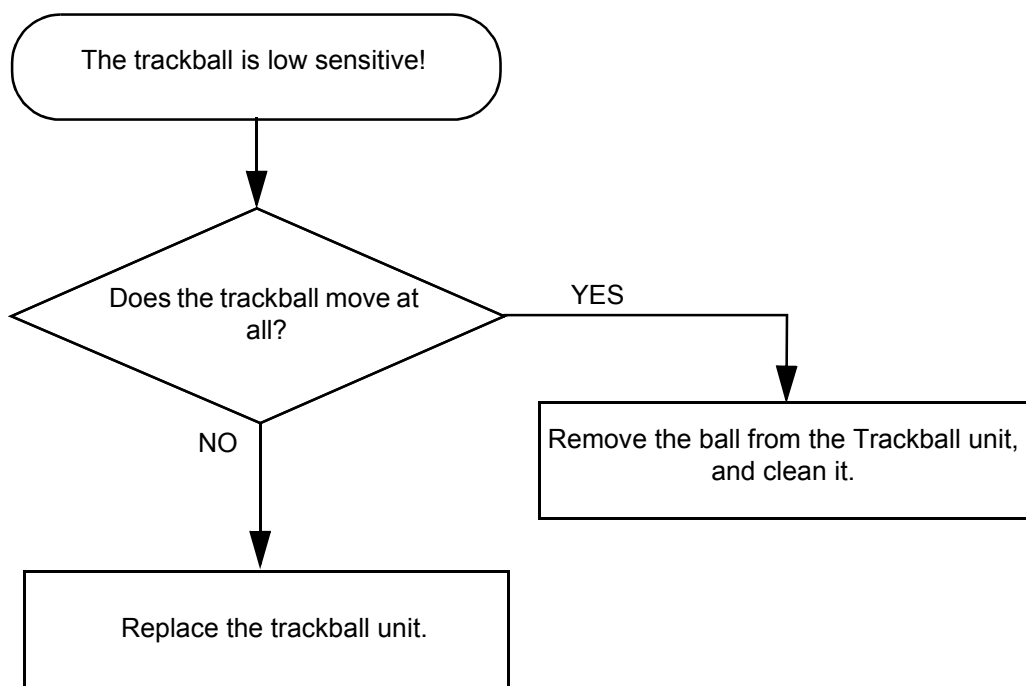


Figure 7-14 Trackball - Troubleshooting

7-7-4 System Does Not Power Off / Shutdown

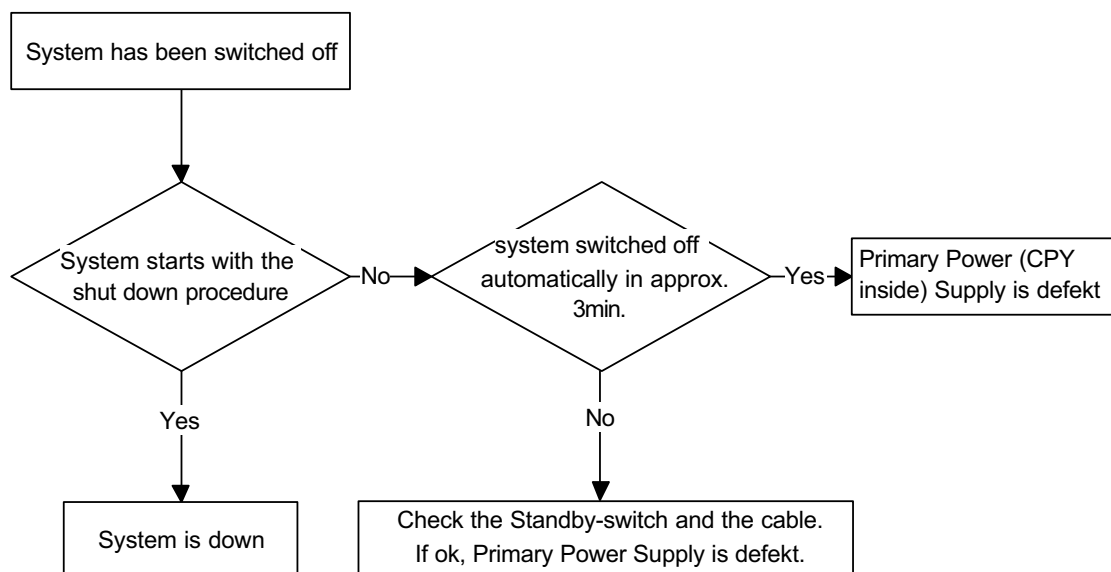


Figure 7-15 Power Off / Shutdown - Troubleshooting

7-7-5 Monitor Troubleshooting

Fault symptom	Check these items
No image	Check the power cord is properly connected.
	Check the Power Switch of Peripherals (F2) (see: Figure 3-22 on page 3-20) on back of system is set to the "ON" position.
	Check the video cable is properly connected.
	Check no pins of the video cable are bent.
	Check if video is present on backplane.
Color is not uniform	Turn ON the power to activate the Auto-Degauss function.
Colored streaks appear in image	Check for presence of magnetic sources near the monitor. Eliminate the sources and then degauss the monitor.
Screen image is not centered or sized properly	Adjust the picture location, picture size, picture rotation or pincushion distortion.
	Some video modes do not fill the screen to the edge of the monitor. There is no single answer to solve the problem. This phenomenon may occur on higher refresh rates (vertical frequency).
Picture is fuzzy	Adjust the picture contrast and picture brightness. Some SVGA cards having an excessive video output level will cause a fuzzy picture at the maximum contrast level.
	Turn ON the power to activate the Auto-Degauss function.
Video test patterns are not clear, bright, parallel or square	Replace the monitor.



NOTICE The monitor should automatically degauss itself each time power is applied if you wait at least 10 seconds before you turn power back ON.

7-7-6 Unable to Record to VCR

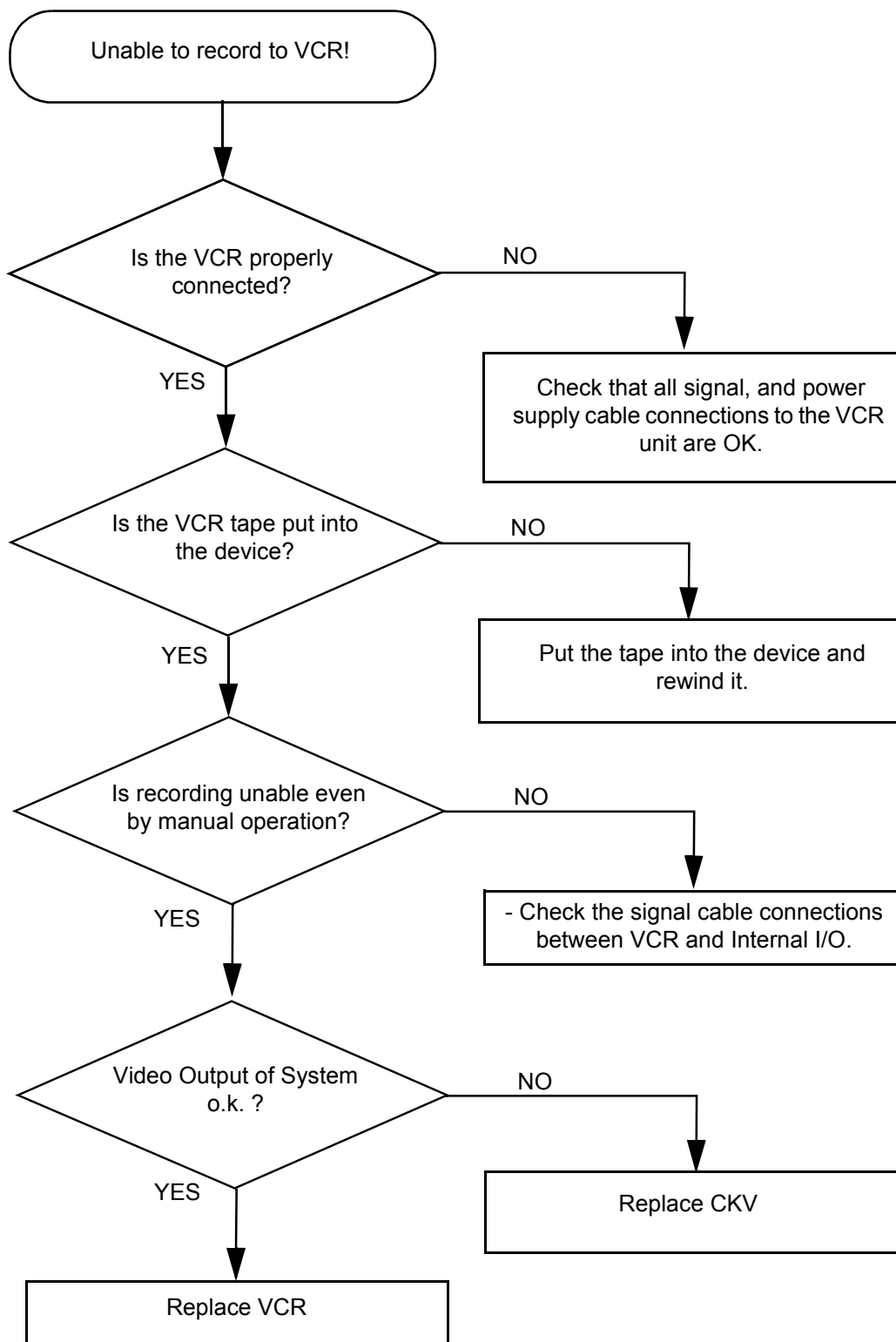


Figure 7-16 VCR - Troubleshooting

7-7-7 Printer Troubleshooting

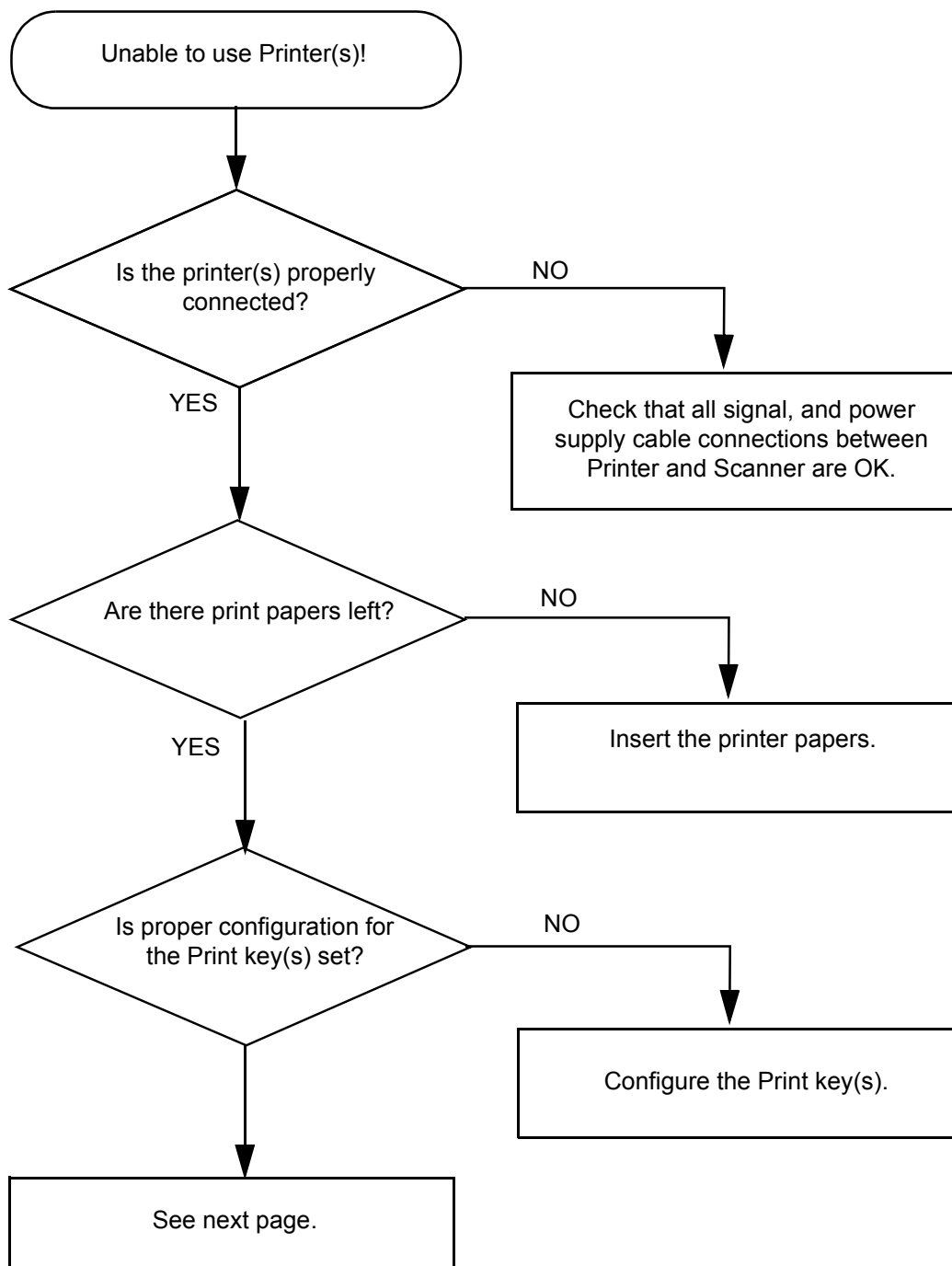


Figure 7-17 Printer - Troubleshooting

7-7-7 Printer Troubleshooting (cont'd)

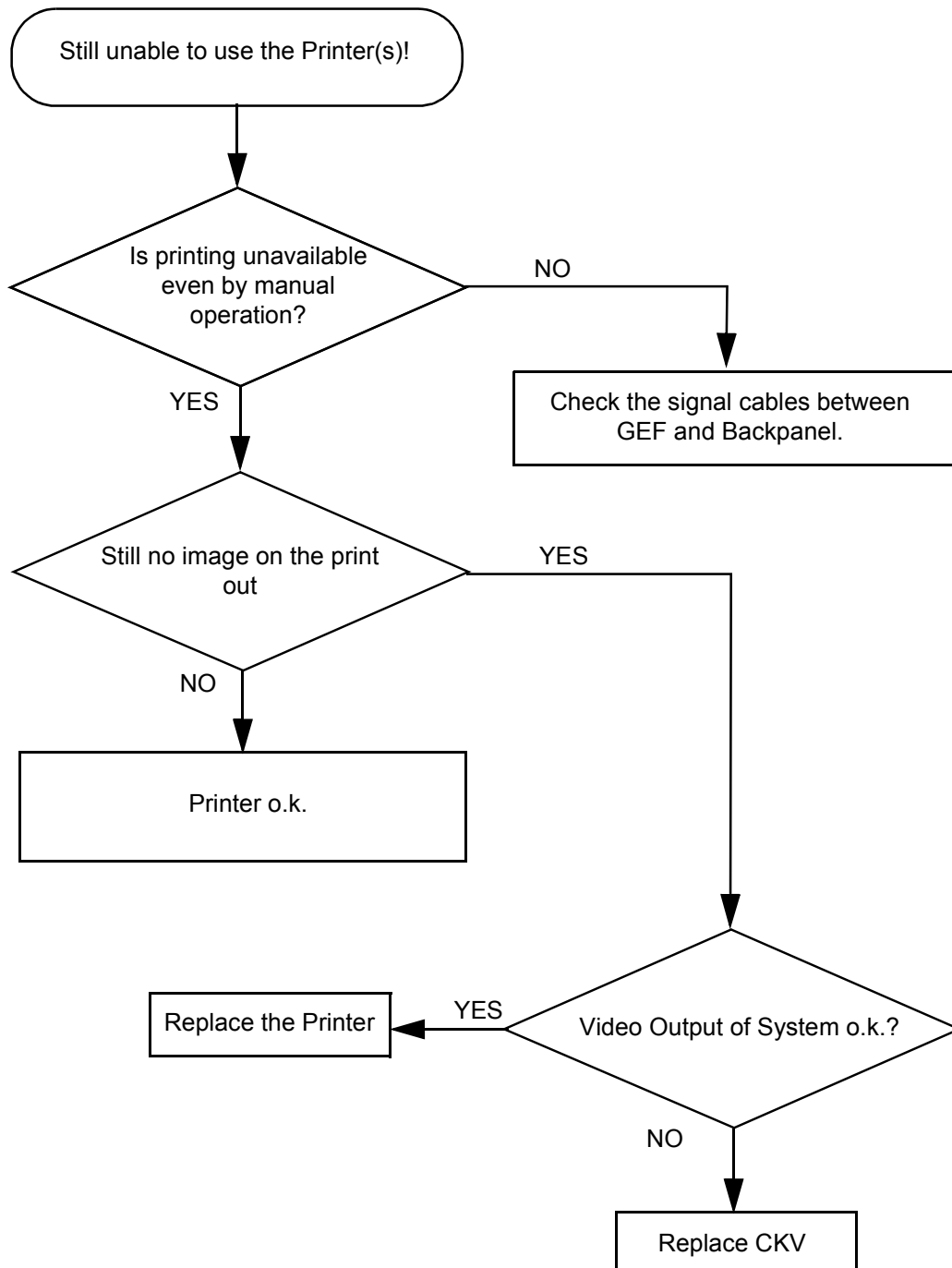


Figure 7-18 Printer Troubleshooting (cont'd)

7-7-7-1 CD-RW Troubleshooting (CD-Rom-Drive)

- 1.) Insert an empty CD-RW into the Drive.
- 2.) Enter "Sonoview" by pressing the **NETWORK** key on the control panel; see [Figure 7-19](#).
- 3.) Click the "Open" icon to display the list of exams.
- 4.) Select exam(s) and backup them to CD-ROM.
- 5.) Choose "CD-ROM" Drive.
- 6.) The images, which you have chosen during backup should be visible.

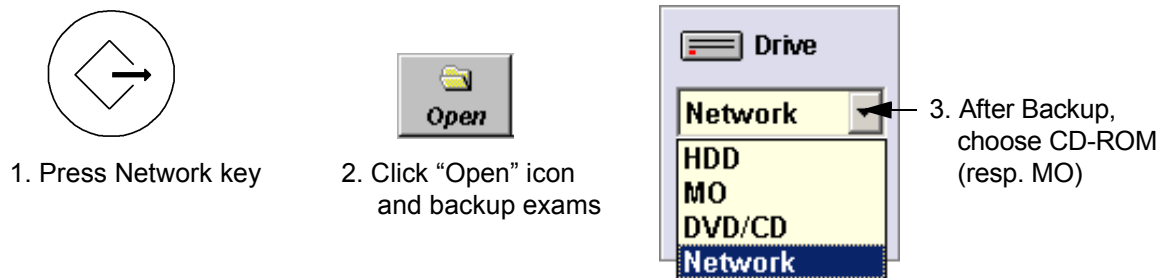


Figure 7-19 To backup exams to CD-ROM resp. MO-Disk



NOTICE In case of any problems, check voltages of the AUX Supply connector (= Disk Drive Module power connector) on the backpanel of the GEF-Box;
see: [Section 7-3 "Check Points Voltages" on page 7-3](#)

7-7-8 MOD Troubleshooting

- 1.) Insert an empty MO into the Drive.
- 2.) Enter "Sonoview" by pressing the **NETWORK** key on the control panel; see [Figure 7-19](#).
- 3.) Click the "Open" icon to display the list of exams.
- 4.) Select exam(s) and backup them to MO.
- 5.) Choose "MO" Drive.
- 6.) The images, which you have chosen during backup should be visible.



NOTICE In case of any problems, check voltages of the AUX Supply connector (= Disk Drive Module power connector) on the backpanel of the GEF-Box;
see: [Section 7-3 "Check Points Voltages" on page 7-3](#)

7-7-9 Network Troubleshooting

7-7-9-1 No Connection to the Network at All

- 1.) Check that the network cable between the scanner and the wall network is connected and well seated in both ends.
- 2.) Try a network cable that is known to be OK.
- 3.) Check the cable between the network-connector on the Back Panel to the LAN-connector on the GEF.
- 4.) Connect a network cable between your Scanner and your PC. Try to ping from the Scanner to the IP address on the PC. If OK, the hardware connection inside the Scanner is OK.

Section 7-8 Error Messages

Error Messages	Actions
3D B_RxLines exceeded!	restart the system
3D B-O_Frames exceeded!	restart the system
3D C_RxLines exceeded!	restart the system
3D C-O_Frames exceeded!	restart the system
530-Probe connected on.....	Disconnect and reconnect the probe. If error remains don't use such a probe.
Array bounds exceeded	restart the system
Attempt to read Probe-ID from an invalid probe connector.	reboot system.
AVI Save function fails	check the SCSI and the Power cable - restart the machine and try again
B_Enhance Out Of Range	press ok and save this user-setting once again
B_Gain Out Of Range	press ok and save this user-setting once again
B_Reject Out Of Range	press ok and save this user-setting once again
B_TxFocus - not calculated and B_SHOT_PART_ON	restart the system
Backup error while writing. (Error during writing of backup data.)	check storage destination for Full Backup (e.g., CD not empty, insufficient rights on target Network drive, write protection on MO or USB-drive)
Backup error while verifying. (Checksum mismatch)	repeat backup
BC lines_per_sequenz < 1	restart the system
BC lines_per_sequenz < 2	restart the system
BC_Dynamic Out Of Range	press ok and save this user-setting once again
BC_Gain Out Of Range	press ok and save this user-setting once again
BC_Lines: BC_LineDensity out of limit	restart the system
BCMC_Balance Out Of Range	press ok and save this user-setting once again
BC-TxPower Out Of Range	press ok and save this user-setting once again
BF: can't set BM RxApod	restart the system
BF: can't set C Rx Apod	restart the system
BF: can't set D RxApod	restart the system
BM_Resample: overrun SampleLengthOnLineMem	restart the system
Cannot read a valid Probe-ID (xxx) from.....	disconnect and reconnect the probe
CANNOT_IMPORT_VOLUME_DATA_TO_3D_DLL	load volume files from other storage medium

Error Messages	Actions
Can't import session	use a new CDR to write data to CD
can't open MotCtrl RS232 Serial connection	restart the system
Can't open:	restart the system
can't write XilinxFiles.ini	restart the system
CD write error	use a new CDR
Communication thread is dead!	restart the system
Compound: too many RxFrqResp.	restart the system
CW quant TxFreq out of range	restart the system
CW_BaseLinePos Out Of Range	press ok and save this user-setting once again
CW_Gain Out Of Range	press ok and save this user-setting once again
CW-hardware doesn't support	pencil probe + CW-Hardware not available->HW problem
CW-HW-PRF == 0	restart the system
CW-TxFrequency == 0	restart the system
CW-TxPower Out Of Range	press ok and save this user-setting once again
Datatype misalignment	restart the system
Delete error (Backup data could not be deleted.)	check storage destination of Full Backup (e.g., CD, insufficient rights on target Network drive, write protection on MO or USB-drive)
Density Out Of Range	press ok and save this user-setting once again
DFE::Block with openInput	restart the system
Disc full!	use a new CDR for writing data to CD
Display:Rect Region fails	restart the system
Division by zero	restart the system
done is low!	restart the system
Downgrade error (Backup data was made with a software version higher than the installed version.)	load appropriate backup for installed version
DSP - Gamma Corr - Load Data Timeout	restart the system
DSP - HilbertCoeff - Load Data Timeout	restart the system
DSP - Low Pass Coeff - Load Data Timeout	restart the system
DSP - SetFFT_Para - Load Data Timeout	restart the system
DSP - SetWMF_Koeff - Load Data Timeout	restart the system
DSP/MSE:Hanning-Window Load Data Timeout	restart the system
DynContrast Out Of Range	press ok and save this user-setting once again

Error Messages	Actions
Electronic user manual not installed. Please install.	install Electronic User Manual (EUM) and try it again
End Bandwidth too big	restart the system
End ET too big	restart the system
End frequency too big	restart the system
Enhance Out Of Range	press ok and save this user-setting once again
Ensemble Out Of Range	press ok and save this user-setting once again
Error in CreateCinImage	try to store again
Error not enough time for BC shot!	restart the system
Error on LoadBootMem Page:%2d, Addr:%5d	restart the system
Error programming Flashcomplete	restart the system
Error setting state	restart the system
ERROR_MSG_INIT_FAILED	check connection from US machine to VCR, VCR has power and is on
ERROR_MSG_NO_ACK	check VCR cables and try again
ERROR_MSG_NO_CASSETTE	put cassette into drive of VCR
ERROR_MSG_NO_RESPONSE	check VCR cables, cassette,... and try again
ERROR_MSG_WRITE_PROTECTED	remove cassette from VCR and put writeable cassette into drive of VCR
Execute privileged instruction	restart the system
FallSmooth Out Of Range	press ok and save this user-setting once again
File Could not CRC Check	load volume files from other storage medium
File CRC Error	load volume files from other storage medium
File CRC Missing	load volume files from other storage medium
File Data Missing	load volume files from other storage medium
File Datalength Not Consistent	load volume files from other storage medium
File Decompress Error	load volume files from other storage medium
File Decompress method Unknown	load volume files from other storage medium
File End Error	load volume files from other storage medium
File Execute Error	load volume files from other storage medium
File Memory Missing	load volume files from other storage medium
File Not Found	load volume files from other storage medium
File Pos	load volume files from other storage medium
File Read Error	load volume files from other storage medium

Error Messages	Actions
File Type Unknown	load volume files from other storage medium
File Volume size not consistent	load volume files from other storage medium
FLT: Denormal operand	restart the system
FLT: Divide by zero	restart the system
FLT: Invalid operation	restart the system
FLT: Stack overflow	restart the system
FLT: Underflow	restart the system
Hardware doesn't support CW-mode	pencil probe + CW-Hardware not available->HW problem
hardware error on....	restart the system
HardwareRelatedSoftware_Windows in write have different ProbeAcousticUnitIDs	disconnect all connected probes and connect them again; if not ok restart the system
HardwareRelatedSoftware_Windows in write have different ProbeScanFuncIDs	disconnect all connected probes and connect them again; if not ok restart the system
IBegrenzer.cpp Bshots TxMultiFocus problem	restart the system
IBegrenzer.cpp Mshots TxMultiFocus problem	restart the system
In the 3D Image Measure is not allowed	changed to another format than 3D Fullscreen mode
iSetVideoSource(eVideoIntern) function fails	reboot the system
iSetVideoSource(eVideoIntern) function fails	the system will restart itself by pressing OK
key not in list	restart the system
LP_KoefBlock: SamplePRF too big	restart the system
M_Gain Out Of Range	press ok and save this user-setting once again
M_Reject Out Of Range	press ok and save this user-setting once again
MC_BaseLinePos Out Of Range	press ok and save this user-setting once again
MC_Gain Out Of Range	press ok and save this user-setting once again
MC-TxPower Out Of Range	press ok and save this user-setting once again
Memory access violation	restart the system
memory allocation error	restart the system
Missing ProbeAcousticUnit, wrong ProbeAcousticUnitID.	restart the system
MotCtrl: No Referenzposition signal!	Confirm the message by pressing the OK button, disconnect and reconnect the active probe and use it again. If the message appears again, usually the probe itself has an defect, so you should contact the service
MotCtrlDrv::bCmdToRS232	restart the system
M-TxPower Out Of Range	press ok and save this user-setting once again

Error Messages	Actions
No CD Writer found	check the connection and the Power cable - plug the cable off and on and try again. (restart the system)
No disc in drive	insert disk, if fails again reboot and try again(with another disk)
Not enough space. (Not enough space on destination to hold the backup data.)	select another destination to save Full Backup
No Line Memory!	restart the system
Overflow	restart the system
Persistence Out Of Range	press ok and save this user-setting once again
Please plug off and on probe and try again	plug of and on the probe and try again, plug on a different probe connector
PRF_GeneratorBoundary: BBC Ensemble Limitation out of limit	restart the system
PRF_GeneratorBoundary: BBCPW Ensemble Limitation out of limit	restart the system
Probe Scan Function Not Supplied	restart the system
Probe with Probe-ID xxx not supported.....	disconnect and reconnect the probe
PW_BaseLinePos Out Of Range	press ok and save this user-setting once again
PW_BurstCalcBlock: UserProgApplication out of range	restart the system
PW_CW_FFT_FactBlock: DSC_ScrollX_Zoom darf nicht kleiner als eins sein!	restart the system
PW_Dynamic Out Of Range	press ok and save this user-setting once again
PW_Reject Out Of Range	press ok and save this user-setting once again
PWGain Out Of Range	press ok and save this user-setting once again
PW-TxPower Out Of Range	press ok and save this user-setting once again
RiseSmooth Out Of Range	press ok and save this user-setting once again
Start Bandwidth too small	restart the system
Start ET too small	restart the system
Start frequency too small	restart the system
System detected severe error, please call technical support.	restart the system, call technical support
System detected severe error.\nSome components like Touch Panel server may not be registered. Please register Touch Panel server and restart.	restart the system, call technical support
The Regesitery not closed	restart the system
Thickness mismatch xx - GIP xx	restart 3D (go to 2D); restart the system
UI_BBC_Wnd::vSet() has an wrong ImageType	restart the system

Error Messages	Actions
UI_BBC_Wnd::vSet() will change from eB_Wnd to wrong ImageType	restart the system
UI_BBC_Wnd::vSet() will change from eBBC_Wnd to wrong ImageType	restart the system
UI_Manager::vHRS_Execute multiple call	restart the system
Unable to save...	restart the system
undefined CW ADC_Clk-Teiler	restart the system
Unhandled Probe-EEPROM data type on.....	disconnect and reconnect the probe
unknown CPF_1 Xilinx-Version	restart the system
unknown CPF_2 Xilinx-Version	restart the system
unknown CPG1 Xilinx-Version	restart the system
unknown CPG2 Xilinx-Version	restart the system
unknown CPG3 Xilinx-Version	restart the system
Unknown Error	load volume files from other storage medium
unknown FMV Xilinx-Version	restart the system
unknown LMV Xilinx-Version	restart the system
unknown Xilinx-Version	restart the system
unknown XSYS Xilinx-Version	restart the system
unrecordable disc in drive	try again with another disk
Verify error (Error while checking backup data.)	Backup data are probably damaged. Try again or load another backup.
VolAcqu3D4D_Enum has changes and isn't implemented in this block!	restart the system
Volume_dB Out Of Range	press ok and save this user-setting once again
WMF_KoefBlock: SamplePRF too big	restart the system

Chapter 8

Replacement Procedures

Section 8-1 Overview

8-1-1 Purpose of Chapter 8

This chapter contains replacement procedures for different modules and their subsystems.



WARNING *No covers or panels should be removed from the system (high-voltage risk). Service and repairs must only be performed by authorized personal. Attempting do-it-yourself repairs invalidate warranty and are an infringement to regulations and are inadmissible acc. to IEC 60601-1.*

Table 8-1 Chapter 8 Contents

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8-1-2 Returning/Shipping Probes and Repair Parts

Equipment being returned must be clean and free of blood and other infectious substances.

GEMS policy states that body fluids must be properly removed from any part or equipment prior to shipment. GEMS employees, as well as customers, are responsible for ensuring that parts/equipment have been properly decontaminated prior to shipment. Under no circumstance should a part or equipment with visible body fluids be taken or shipped from a clinic or site (for example, body coils or and ultrasound probe).

The purpose of the regulation is to protect employees in the transportation industry, as well as the people who will receive or open this package.

NOTE: *The US Department of Transportation (DOT) has ruled that "items what were saturated and/or dripping with human blood that are now caked with dried blood; or which were used or intended for use in patient care" are "regulated medical waste" for transportation purpose and must be transported as a hazardous material.*

Section 8-2 Ultrasound Application Software (UIS) Update

8-2-1 Introduction



NOTICE From Software Version 2.2.0 onwards, it is possible to update the Ultrasound Application Software via the "Update" UIS button in the System Setup SERVICE page; see: [Section 8-2-5 on page 8-5](#).

8-2-2 Manpower

One Person, 20 min.

8-2-3 Tools

System CD or Upgrade-CD

8-2-4 Preparations

Before performing the Software Update/Upgrade:

- A.) make sure that all system functions are working correct
- B.) check the current Software Version and installed Options

8-2-4 Preparations (cont'd)

- 1.) Press the **UTILITIES** key on the control panel once to display the Utilities menu.
- 2.) Select the **SYSTEM** item from the Utilities menu - which is displayed on the left side of the screen.
- 3.) Select the **SYSTEM INFO** page on the System Setup desktop screen to see which Software/Hardware version is installed in the unit.

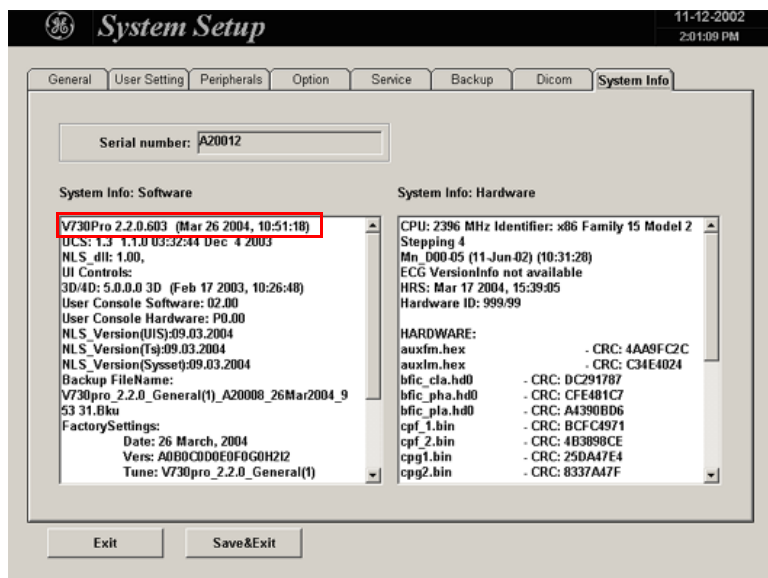


Figure 8-1 Version check

- 4.) Select the **OPTION** page on the System Setup desktop screen to see which Options are installed.

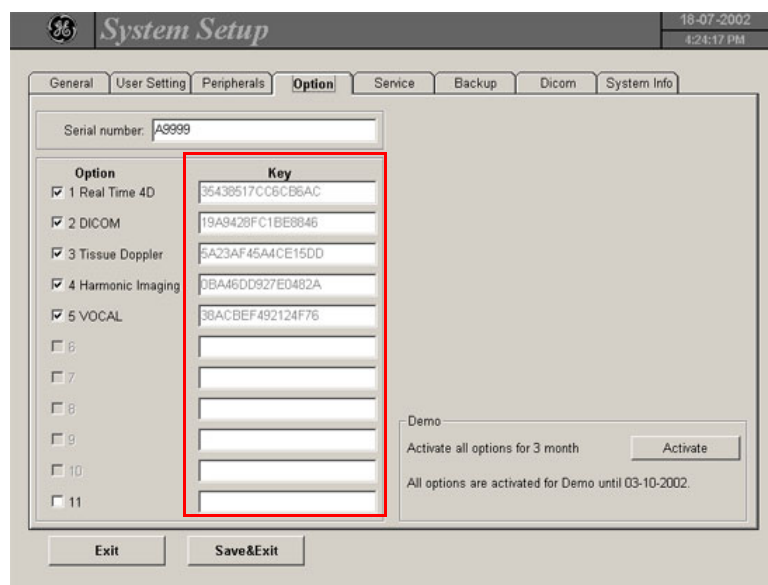


Figure 8-2 Option page



NOTICE Please print out the **OPTION** page or write down all the option codes which are shown in the "Key" fields!

8-2-4 Preparations (cont'd)

- 5.) Select the DICOM page on the System Setup desktop screen.
 - a.) Click on the DICOM CONFIGURATION button in the DICOM page.

Services	Alias	AE Title	IP Address	Port	Color / Size
<input type="checkbox"/> STORE	v730	v730	172.16.99.99	3104	Color / original
<input checked="" type="checkbox"/> PRINT	V730	V730	3.249.4.4	104	Grayscale
<input type="checkbox"/> WORKLIST	V730	V730	3.54.34.5	103	
<input checked="" type="checkbox"/> STORE 3D	pfrey	SONOVUE	3.249.6.229	104	Color / original

Figure 8-3 DICOM Configuration



NOTICE Please print out the “DICOM Configuration” dialog page or write down the DICOM designations (AE Title, Station name, Retry Count, Retry Interval).

- b.) Click on the NETWORK CONFIG button in the DICOM page.

NOTE: This example shows fictive numbers!

Figure 8-4 Internet Protocol (TCP/IP)



NOTICE Please print out the “Internet Protocol (TCP/IP) Properties” dialog page or write down the IP settings.

8-2-5 Software - Update (via Service Page)

- 1.) Insert the System CD or Upgrade-CD into the drive.
- 2.) Press the UTILITIES key and then select the SYSTEM item from the menu area.
- 3.) Select the SERVICE page.

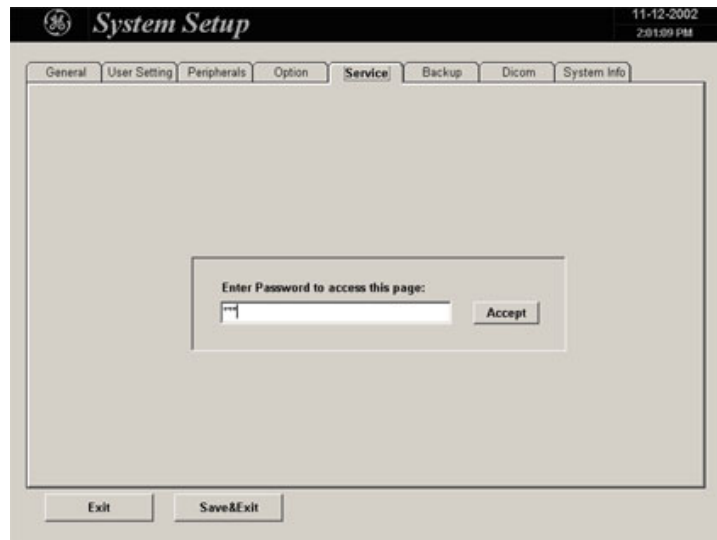


Figure 8-5 System Setup Service

- 4.) Type in the password **SHE** and click ACCEPT.

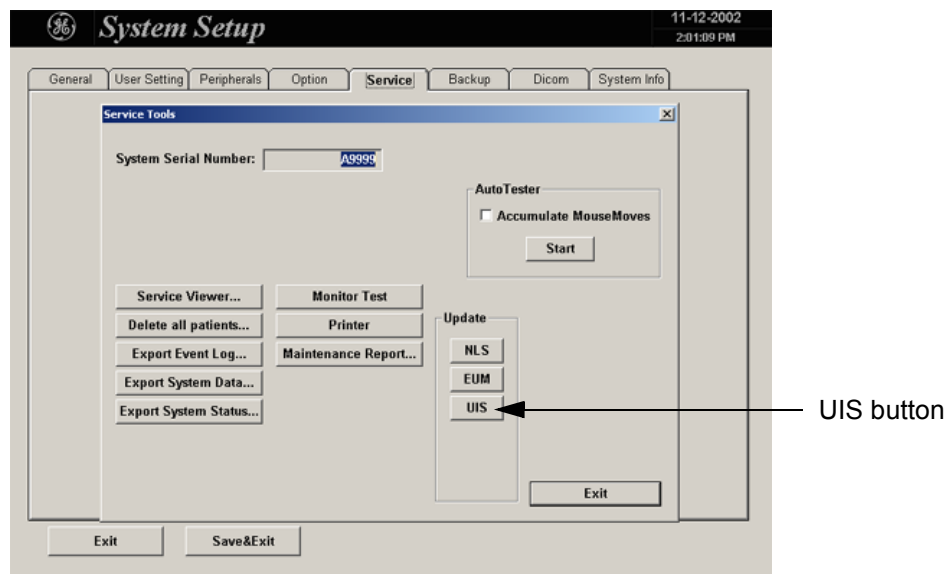


Figure 8-6 Service Tools

- 5.) Click on the UIS button for updating the Ultrasound Application Software.

8-2-5 Software - Update (via Service Page) (cont'd)

6.) Confirm the following message with YES.

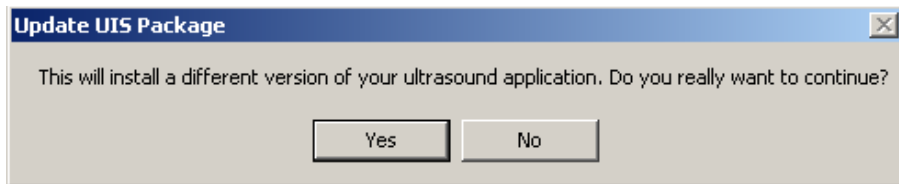


Figure 8-7 Update UIS message

7.) A new window pops up on the screen and the InstallShield starts extracting files.

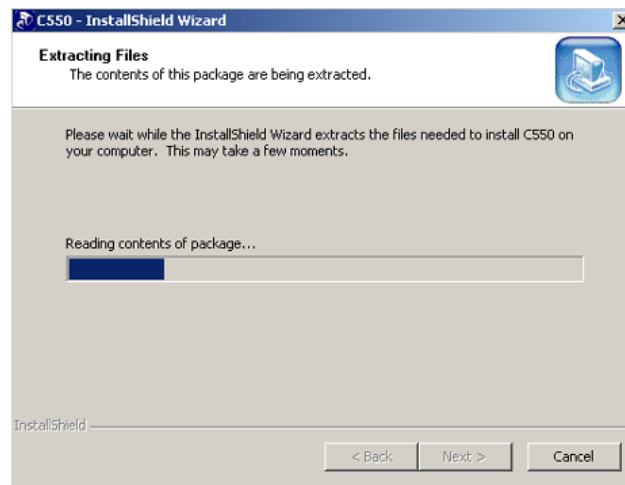


Figure 8-8 Install Shield Wizard - Extracting Files

8.) Click the NEXT button In the "Welcome to Kretz V730 Software Installation" window.

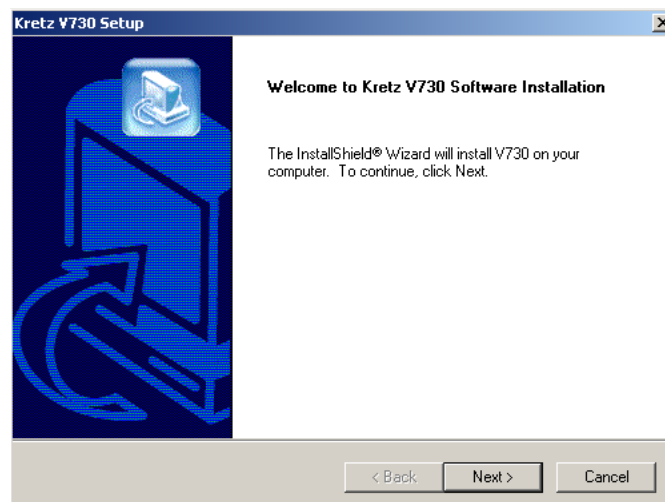


Figure 8-9 Welcome to ... Software Installation

The contents of the Software package are being extracted.

8-2-5 Software - Update (via Service Page) (cont'd)

NOTE: If a "Missing Security patches" window appears, skip it with CONTINUE.

9.) Complete the Software installation with the FINISH key.

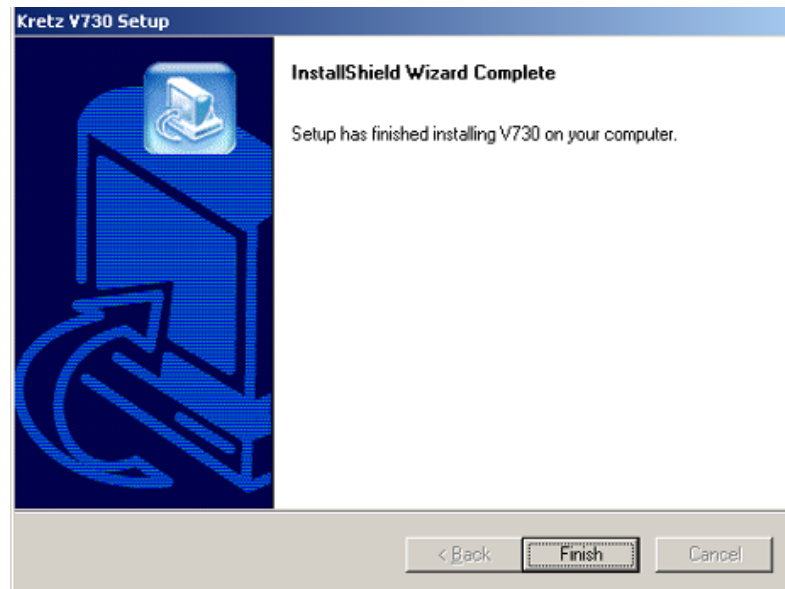


Figure 8-10 V730 Software Setup

The system restarts automatically.

- 10.) If desired, load the appropriate factory settings; see [Section 8-3 on page 8-8](#).
or the full backup; see: [Section 8-4 on page 8-8](#).
- 11.) Afterwards update the Electronic User Manual (EUM) as described in [Section 8-5 on page 8-9](#).
- 12.) Perform Software and Functional checks as described in [Section 8-6 on page 8-12](#).

Section 8-3 User Settings Only (Application Settings) Loading Procedure

8-3-1 Introduction

The User Settings contains:

- User Programs
- Auto Text
- 3D/4D Programs

8-3-2 Loading Procedure

see: [Section 4-5-2 "Load User Settings Only \(Application Settings\)" on page 4-31](#)

Section 8-4 Full Backup (Presets, Configurations & Appl. Settings) Loading Procedure

8-4-1 Introduction



NOTICE From Software Version 3.1.0 onwards, it is possible to load a **previously** saved "Full Backup" into the Voluson® 730Pro.

The Full Backup contains following data:

- Patient demographic and exam data (database containing the patient data and measurements)
- SonoView image data (**NOT** available when saving to the internal hard disk, DVD/CD or MOD)
- User Settings (databases and files containing gray curves and the user settings.)
- Image transfer settings (DICOM settings e.g., DICOM servers, AE Title, Station Name, etc.)
- Measure Setup Settings (user specific measure settings)
- V730 settings (general settings such as language, time/date format and the enabled options)
- Windows Network Settings (network settings including the computer name)

8-4-2 Loading Procedure

see: [Section 4-5-4 "Load Full Backup \(Presets, Configurations & Application Settings\)" on page 4-35](#)

Section 8-5 Electronic User Manual (EUM) Upgrade Procedure

8-5-1 Manpower

One Person, 15 min.

8-5-2 Tools

System CD, Upgrade CD or Upgrade MO-disk

8-5-3 Preparations

1.) Restart the system (turn off and on the system).



NOTICE The electronic user manual (EUM) **must never** be opened (by pressing the F1 key on the keyboard) after last restart! Even if closed again before installing the new EUM.

2.) Press the UTILITIES key on the control panel once to display the Utilities menu.

3.) Select the SYSTEM item from the menu area to invoke the setup desktop on the screen.

4.) Select the SERVICE page. The "Password window" appears automatically.

5.) Enter the password **SHE**, and click ACCEPT.

6.) The "Service Tools" menu appears on the screen.

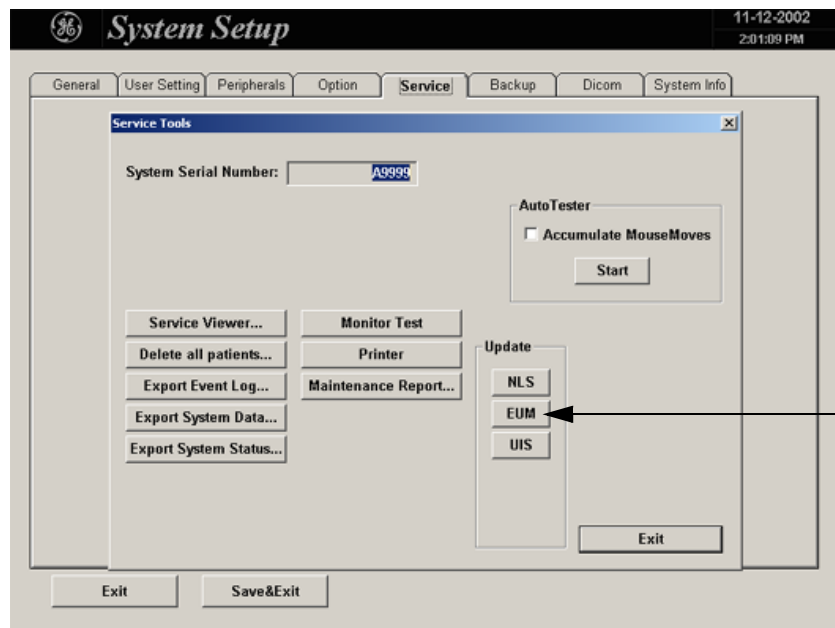


Figure 8-11 Service Tools

8-5-4 EUM - Upgrade Procedure

- 1.) Click the EUM button. The "Update Software" dialog appears.
- 2.) Select the MO DRIVE or the CD DRIVE button, depending on the storage medium you use.
- 3.) Browse for the **EUMSetup_en_V730Pro.exe** file and click OK.

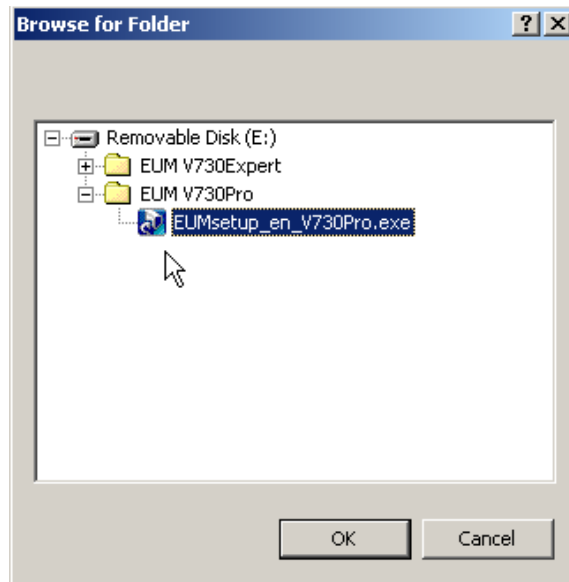


Figure 8-12 Browse for Folder

- 4.) Confirm the following message with YES to proceed the update.

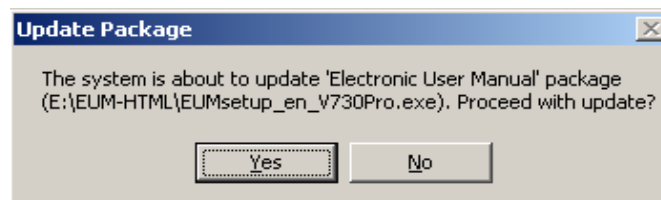


Figure 8-13 Update Package

The contents of this package are being extracted.

- 5.) Confirm the following warning message with OK to proceed the update.

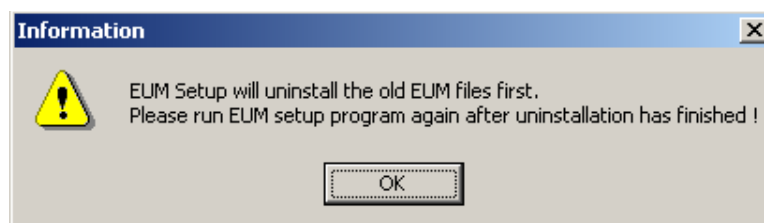


Figure 8-14 confirm warning message

- 6.) Confirm the "Maintenance Complete" message: «InstallShield Wizard has finished performing maintenance operations on V730 Pro User Manual» with the FINISH button.

8-5-4 EUM - Upgrade Procedure (cont'd)

- 7.) Click the EUM button again to install the new EUM.
- 8.) Select the MO DRIVE or the CD DRIVE button, depending on the storage medium you use.
- 9.) Browse for the **EUMSetup_en_V730Pro.exe** file again and click OK.
- 10.) Confirm the following message with YES to proceed the update.
The contents of this package are being extracted.
- 11.) Follow the instructions of the "InstallShield Wizard" (confirm the messages with the NEXT key).
- 12.) After successfully installation of the Electronic User Manual, click FINISH to exit the wizard.

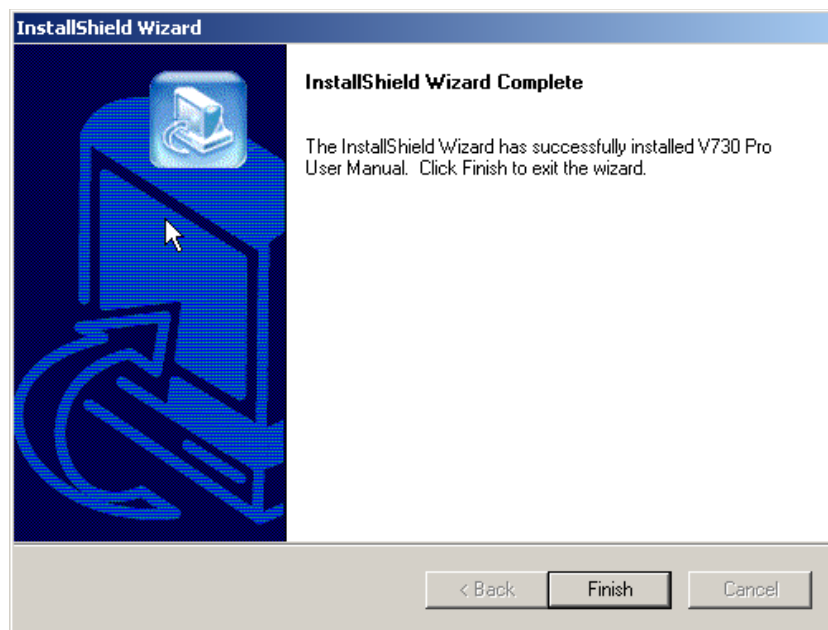
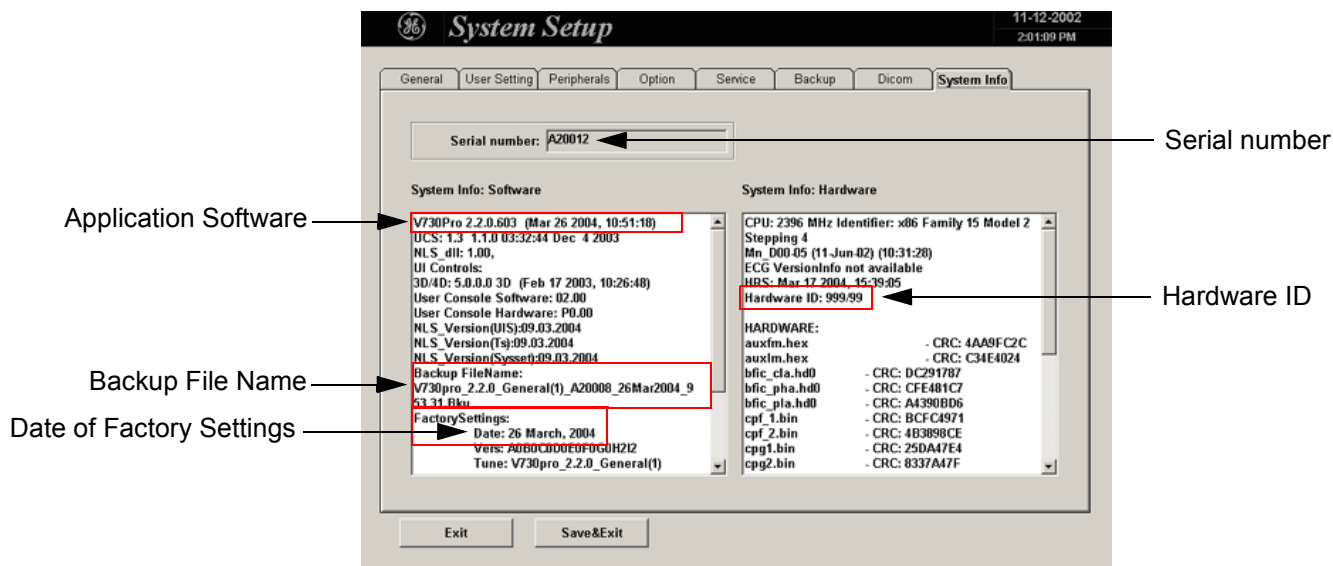


Figure 8-15 Complete Installation

- 13.) Close with EXIT and close the "System Setup" with SAVE & EXIT.
- 14.) Restart the system (turn off and on the system).
- 15.) After rebooting the system, fill in the requested information into the "System Status Messenger" box and click OK.
- 16.) Press the F1 key on the keyboard to invoke the electronic user manual.
- 17.) Press the EXIT key to exit the EUM.

Section 8-6 Software and Functional Checks after the Upgrade

- 1.) Press the **UTILITIES** key on the control panel once to display the Utilities menu.
- 2.) Select the **SYSTEM** item from the Utilities menu - which is displayed on the left side of the screen.
- 3.) Select the **SYSTEM INFO** page to see which Software/Hardware version is installed in the unit.



Move the scroll bar downwards to review additional information about installed software/hardware.

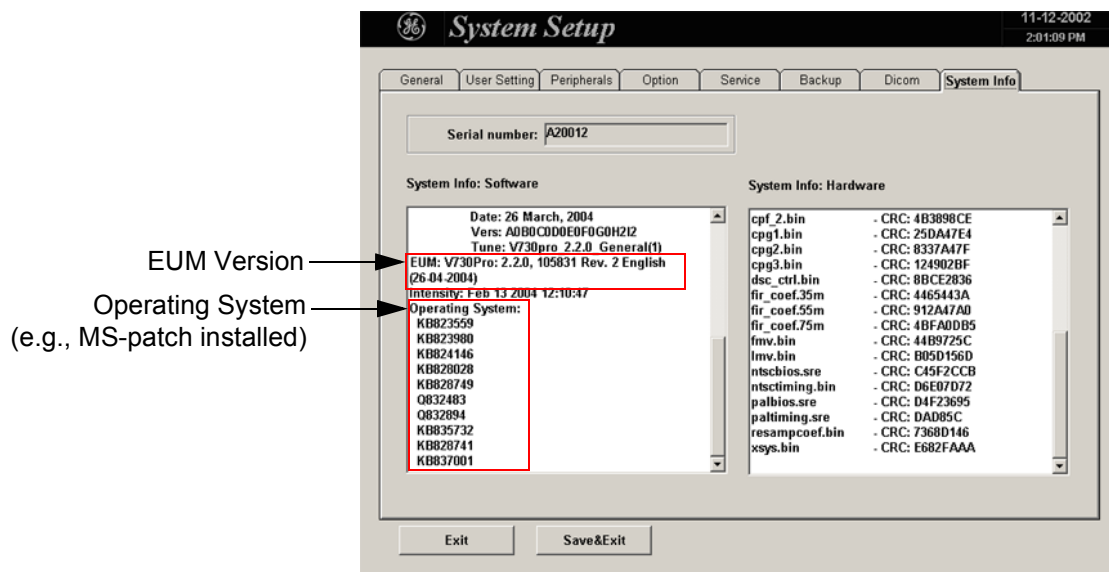


Figure 8-16 System Setup - System Info page

- 4.) Verify the correct settings of the **OPTION** page; see: [Figure 8-2 on page 8-3](#).
If necessary, customize the settings according to the printout.
- 5.) Check and (if necessary) match the **NETWORK** page settings according to the printout:
 - "DICOM Configuration" dialog page; see: [Figure 8-3 on page 8-4](#)
 - "Network Configuration" dialog page; see: [Figure 8-4 on page 8-4](#)
- 6.) Restart the system and perform basic functional checks to ensure that the system is functioning normally.

Section 8-7 Replacement or Activation of Options

Following Options are available:

- Real Time 4D
- DICOM
- Tissue Doppler
- Harmonic Imaging
- VOCAL

8-7-1 Operation for activating Options

- 1.) Press the UTILITIES key on the control panel once to display the Utilities menu.
- 2.) Select the SYSTEM item from the menu area to invoke the setup desktop on the screen.
- 3.) Select the OPTION page where you can see which options are installed in the system.

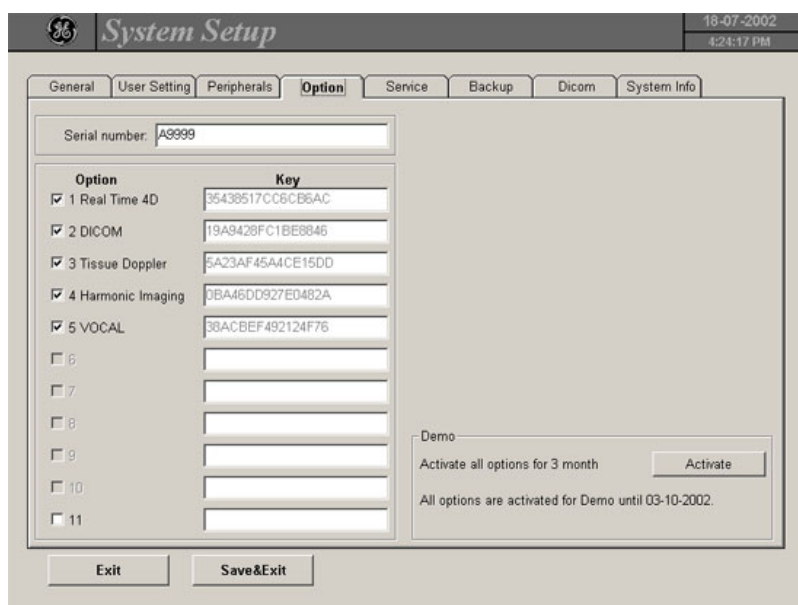


Figure 8-17 Option page in the System Setup

8-7-1-1 Operation for installing an Option:

- 1.) Position and select the option input field you want with the write cursor.
- 2.) Clear/Edit the current number, if existing.
- 3.) Enter the encrypted serial code or option code with the keyboard.
- 4.) Click the SAVE&EXIT button.
(The code will be checked and if ok the serial number/option is accepted.)

NOTE: To Exit from the System Setup without saving select the EXIT button.

NOTE: After installation of the DICOM option, restart (turn off and on) the Voluson® 730Pro system.

Section 8-8

Transfer of Patient Database and Images from System-to-System

8-8-1 Introduction



NOTICE From Software Version 2.2.0 onwards, it is possible:

- to backup Sonoview Image data to a Mapped Network Drive (Z:\)



WARNING *Please make sure that the server you are connecting to is trustworthy and reliable. For details, contact your local system administrator.*
If you backup Sonoview data to this server, all the patients' demographic data will be copied to this server!

8-8-2 Transfer of Patient Database and Images via Sonoview

8-8-2-1 Introduction

This section describes how to transfer the complete patient database and images from one system (= **"old" system**) to another system (= **"new" system**) via "Network" drive in Sonoview.

Thus in addition, the patient database and images can be shared between different systems within the same network.



NOTICE Both systems **MUST** be capable to BACKUP the Sonoview exams to the mapped network drive (Z:\). This means that both systems have to be:

- a BT'03, with at least Software Version 3.1.x installed and/or
- a BT'02, with at least Software Version 2.2.x installed

8-8-2-2 Manpower

One Person, time depends on amount of stored images

8-8-2-3 Tools

- Mapped Network Drive Z: (see: [Section 3-10-1 "Map Network Drive" on page 3-53](#))

8-8-2-4 Backup all Exams of the "old" system

- 1.) On the system (= **"old" system**) from which the data should be transferred, press the **SONOVIEW** key on the Control panel.
- 2.) Click on the **OPEN** icon on the upper left side of the screen and verify that "Drive **HDD**" is selected.
- 3.) Using the **TRACKBALL**, and the right trackball key **SET**, select the first exam of the list.
- 4.) To select all available exams, click on **SELECT TO END** and then on the **BACKUP** button.

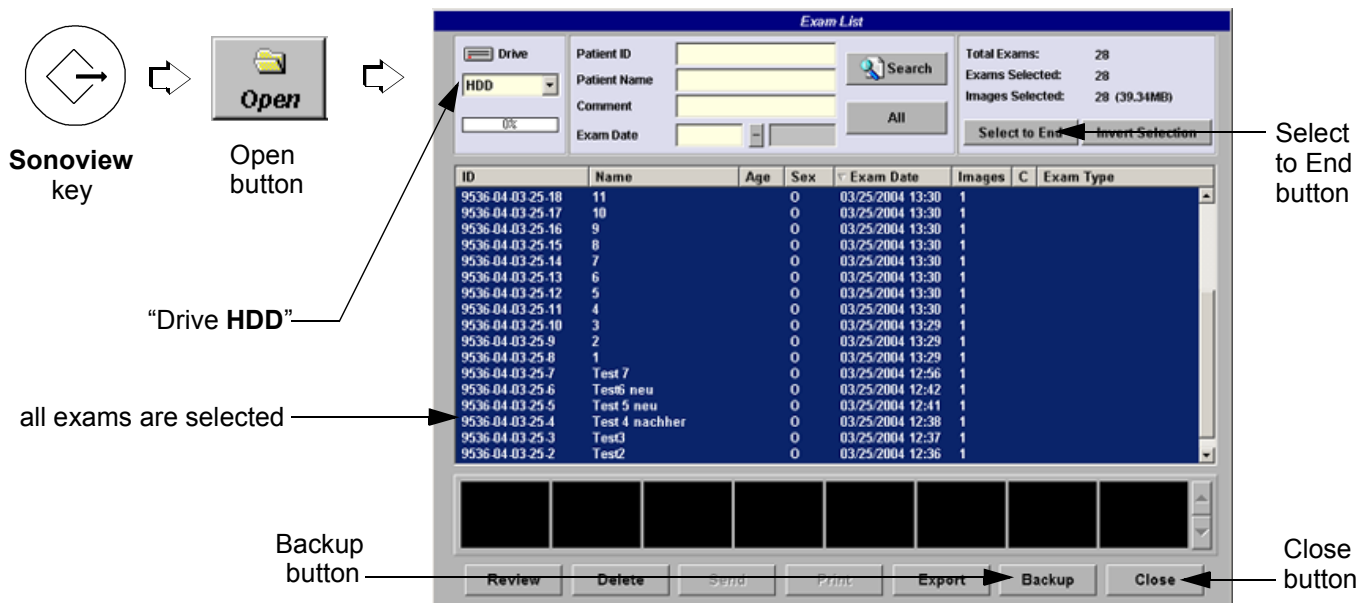


Figure 8-18 Step 1.) to 5.)

- 5.) In the "Backup" window select the destination NET.
- 6.) After finishing the backup, select whether the selected exam(s) is to be deleted or not.



NOTICE If you select to delete the exams after finishing the backup, they will be absolutely deleted from the hard disk of the ultrasound scanner Voluson® 730Pro!

8-8-2-4 Backup all Exams of the "old" system (cont'd)

- 7.) Click the CLOSE button (see: [Figure 8-18](#)) and then select the SETTINGS icon (see: [Figure 8-20](#)) on the left side of the screen.
- 8.) In the displayed window click on the CHANGE BACKUP FOLDER ON NETWORK DRIVE button. The first line in the dialog (see: [Figure 8-19](#)) displays the name (e.g., serial number A09008) of the "Backup Folder" used for storing data on, and reading data from the network drive.



Figure 8-19 Backup Folder on Network Drive

- 9.) Notice this name of the "old" system's Backup Folder (e.g., A09008) and then click CANCEL.

8-8-2-5 Restore all Exams (of the "old" system) to the "new" system

- 1.) On the system (= "new" system), that should receive data and images, press the SONOVIEW key on the Control panel.
- 2.) Select the SETTINGS icon on the left side of the screen.
- 3.) In the displayed window click on the CHANGE BACKUP FOLDER ON NETWORK DRIVE button.

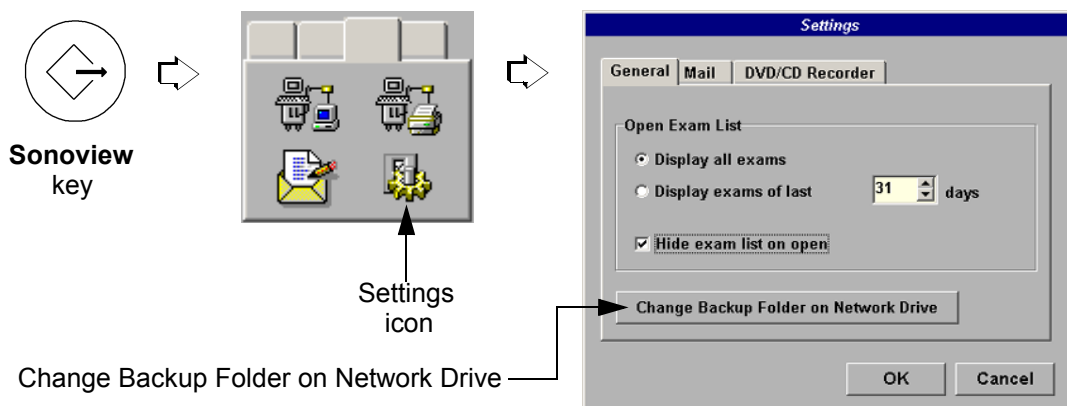


Figure 8-20 Step 1.) to 3.)

- 4.) Choose folder of the "old" system (e.g., A09008) from the drop-down list and click on RENAME.

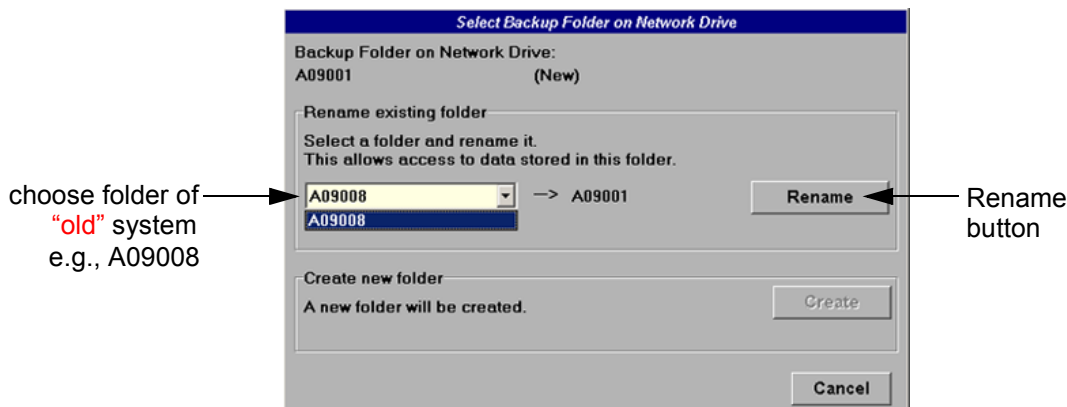


Figure 8-21 Select folder of "old" system and rename it

8-8-2-5 Restore all Exams (of the "old" system) to the "new" system (cont'd)



NOTICE The folder which is selected to be renamed (e.g., A09008, that contains the backup data from a different system - in this case the backup data of the "old" system), it is not copied, but simply renamed. Thus, the same data can be shared between two systems by renaming the respective backup folders to the serial number of the accessing system (in this case the "new" system).

- 5.) Close the "Settings" window with the OK button.
- 6.) Click on the OPEN icon on the upper left side of the screen and choose "Drive **Network**".
- 7.) Using the TRACKBALL, and the right trackball key SET, select the first exam of the list.
- 8.) To select all available exams, click on the SELECT TO END button.
- 9.) Click on the BACKUP / RESTORE button.

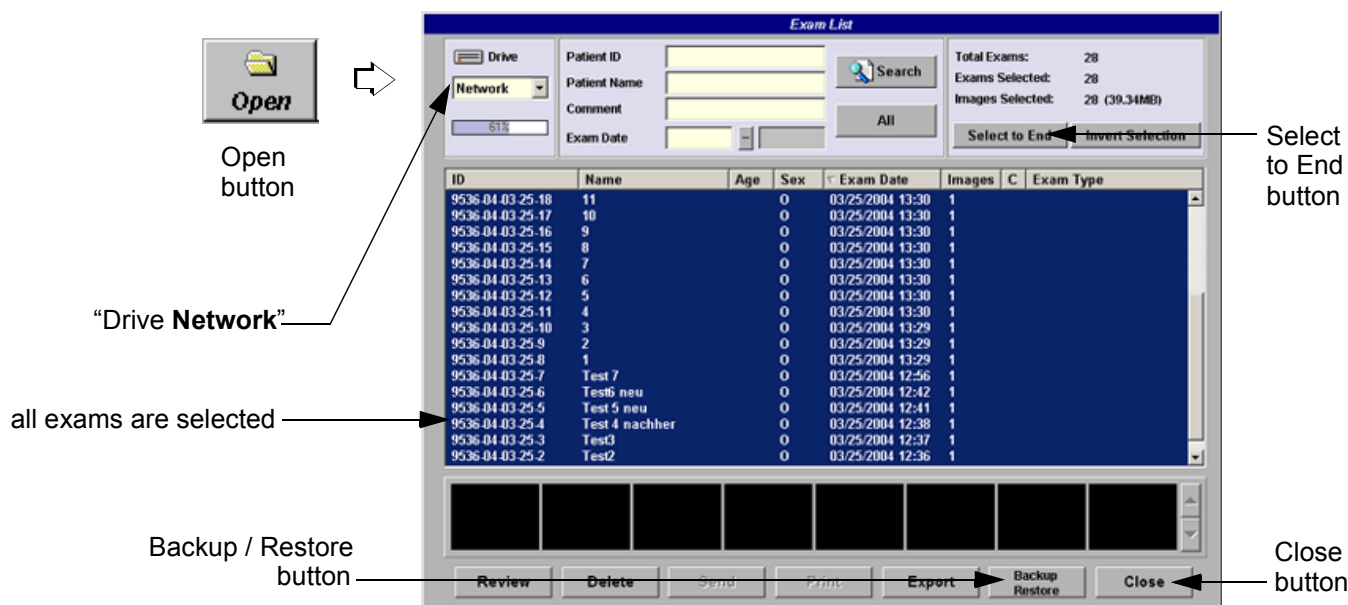


Figure 8-22 Step 5.) to 9.)

- 10.) In the "Backup / Restore" window click on the RESTORE button.



NOTICE If an exam is about to be restored that already exists on the hard disk of the "new" system, a dialog shows the Patient Name and Patient ID and asks for the action to be taken.

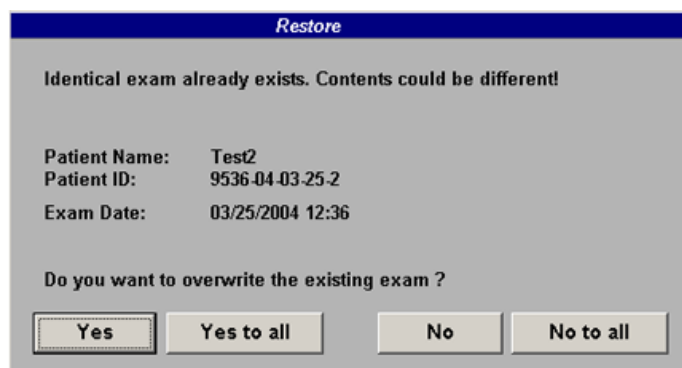


Figure 8-23 Identical exam already exists

8-8-2-5 Restore all Exams (of the “old” system) to the “new” system (cont’d)

11.)Select the desired action:

Yes The exam on the hard disk is replaced with the exam in the backup.
The system will ask again if another identical exam is found during the restore process.

Yes to all All identical exams are replaced without further notice.

No The exam on the hard disk is **not** replaced by the exam in the backup.
The system will ask again if another identical exam is found during the restore process.

No to all No identical exams are replaced with the exams in the backup.

After finishing the restore, select whether the selected exam(s) is to be deleted or not.



NOTICE If you select to delete the exams after finishing the restore, they will be absolutely deleted from the network drive!

Section 8-9 Replacement of the Monitor Task Lamp

NOTE: The Monitor Task Lamp ([Item No.: 257](#)) is **only** used at ANY Monitor (KTZ212115).

8-9-1 Manpower

One person, 15 min.

8-9-2 Tools

Philips screwdriver 1 and 2, stubby (length ~30mm)

8-9-3 Preparations

1.) Power Off/Shutdown the system; see: [Section 3-6-2 on page 3-21](#).

8-9-4 Task Lamp - Removal Procedure

1.) Use the stubby screwdriver and unscrew the 2 screws, which fixes the cover of the task lamp.



task lamp

Figure 8-24 remove cover of the task lamp

2.) Screw out the task lamp and remove it.

8-9-5 Task Lamp - Installation Procedure

1.) Screw in the new task lamp into the lamp socket.

2.) Mount the cover of the task lamp and fix it with the 2 screws.

Section 8-10

Replacement of the Trackball top fixation ring

8-10-1 Manpower

One person, 5 min.

8-10-2 Trackball top fixation ring - Replacement Procedure

1.) Remove the fixation ring by turning it counterclockwise.

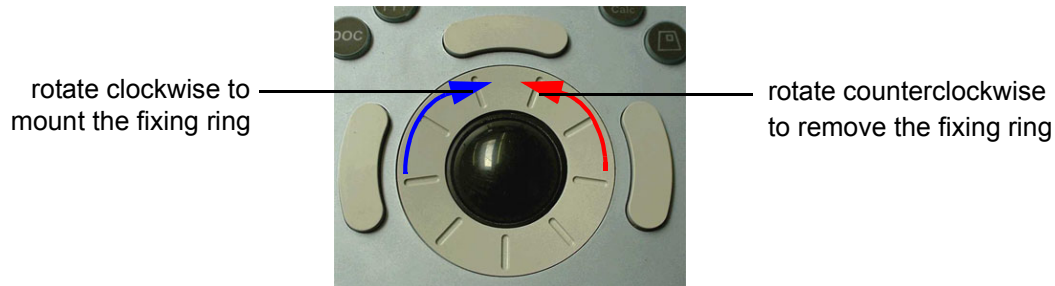


Figure 8-25 Trackball with top fixation ring

2.) Mount the fixation ring by turning it clockwise.

Section 8-11

Replacement of Digipots, Slider controls and Spring inside those Caps

8-11-1 Manpower

One person, 5 min.

8-11-2 Tools

small-sized slotted screwdriver or tweezers

8-11-3 Cap and/or Spring - Removal Procedure

- 1.) Remove the cap (for Rotation digipots or for Slider-potentiometer TGC).
- 2.) If necessary, pull-out the spring inside the cap using a small-sized slotted screwdriver or tweezers.

8-11-4 Cap and/or Spring - Installation Procedure

- 1.) If you have to replace the spring, press it into the cap.
- 2.) Mount the cap (for Rotation digipots or for Slider-potentiometer TGC).

Chapter 9

Renewal Parts

Section 9-1 Overview

9-1-1 Purpose of Chapter 9

This chapter gives you an overview of Spare Parts available for the Voluson® 730Pro.

Table 9-1 Contents in Chapter 9

Section	Description	Page Number
9-1	Overview	9-1
9-2	List of Abbreviations	9-2
9-3	Parts List Groups	9-3
9-4	Housing (GW) and additional Console Hardware	9-4
9-5	User Interface (GEU Top Console)	9-6
9-7	Disk Drives (GEM)	9-10
9-8	Main Power Module (CPN)	9-11
9-9	Main Board Module (GEF)	9-13
9-10	Options and Upgrades	9-20
9-11	Miscellaneous Cables	9-21
9-12	Optional Peripherals and Accessories	9-27
9-13	Probes	9-30

Section 9-2

List of Abbreviations

- CCM - Motor Control Board
- CKV - Video Converter Board
- CPC - System Control Board
- CPD - Sub-Board on Beamformer (CPR)
- CPE - Motherboard Extension (Backpanel I/O-Card)
- CPF - Color Doppler Board
- CPG - Mid-Processor Board
- CPK - Motherboard of GEF-Module
- CPM - PC-Motherboard
- CPN - Primary Power Supply Module
- CPP - Power Supply Secondary Board + Motor Power stage
- CPR - Beamformer Motherboard
- CPS - Scan Converter Board
- CPU - Probe Connector Board
- CPY - Power Switch Board
- CPZ - Cover Board
- CRW - CW-Doppler Board (optional)
- EUM - Electronic User Manual
- FRU 1 - Replacement part available in parts hub
- FRU 2 - Replacement part available from the manufacturer (lead time involved)
- GEF - Main Board Module (Ultrasound (FrontEnd) and PC-Boards (Backend Processor))
- GEM - Disk Drive module (with or without MO-Drive and MAN)
- GES - I/O-Interface (User accessible)
- GEU - User interface: Keyboard, TGC Unit
- GW - Console housing (except GEU and GEM)
- HDD - Hard Disk Drive
- MAN - ECG module
- MOD - Magneto Optical Disk
- SBC - Single Board Computer (PC-Board)
- UIS - Ultrasound Application Software

Section 9-3 Parts List Groups



Figure 9-1 Console Views

Table 9-2 Mechanical and user accessible parts

Item	Part Group Name	Table Number	Description
100-	Housing (GW) and additional Console Hardware	Table 9-3 on page 9-5	GW -Console housing including Monitor mounting plate (except GEU and GEM)
200-	User Interface (GEU Top Console)	Table 9-4 on page 9-7	GEU - User interface: Keyboard, TGC Unit
250-	Monitor + Monitor Replacement Parts	Table 9-5 on page 9-9	Monitor + Monitor replacement parts
300-	Disk Drives (GEM)	Table 9-6 on page 9-10	GEM - Disk Drive module (with or without MAN)
400-	Main Power Module (CPN)	Table 9-7 on page 9-12	CPN - Primary power module
500- 510- 520- 530- 570-	Main Board Module (GEF) • FrontEnd (US-Part) • FrontEnd (US-Part) cont'd • FrontEnd (US-Part) cont'd • Back Processor (PC-Part)	Table 9-8 on page 9-13 Table 9-9 on page 9-14 Table 9-10 on page 9-16 Table 9-11 on page 9-17 Table 9-12 on page 9-19	GEF - Main Board Module Ultrasound (FrontEnd) and PC-Boards (Backend Processor)
600-	Options and Upgrades	Table 9-13 on page 9-20	
700-	Miscellaneous Cables	Table 9-14 on page 9-21	
800-	Optional Peripherals and Accessories • Optional Peripherals and Access. cont'd	Table 9-15 on page 9-27 Table 9-16 on page 9-28	Printers, Video Recorder, ECG-Module (MAN)
	System Manuals	Table 9-17 on page 9-29	
900- 906- 920- 930-	Probes • 2D curved array Transducers • 2D linear- and phased array Transducers • Real-Time 4D Volume Probes • CW-Pencil Probes	Table 9-18 on page 9-30 Table 9-19 on page 9-31 Table 9-20 on page 9-32 Table 9-21 on page 9-33	

Section 9-4
Housing (GW) and additional Console Hardware



Figure 9-2 Housing (GW) and additional Console Hardware

Table 9-3 Housing (GW) and additional Console Hardware

Item	Part Name	Part Number	Description	Qty	FRU
101	Rear Handle for Trolley	KTZ220031	Rear Handle for Trolley	1	1
102	Blind Cap for rear screws	KTZ208109	covers housing screws to make them invisible	2	1
103	Rear Metal Cover Plate	KTZ208739	Rear metal cover plate complete	1	2
104	Side Panel left	KTZ208762	side panel left complete	1	2
105	Side Panel right	KTZ208763	side panel right complete	1	2
106	Door for Probe cables	KTZ208737	Through this door the side-panel-right can be opened to place the probe-cables within the housing.	1	1
107	Monitor Mounting Plate Voluson® 730Pro	KTZ134111	Monitor mounting plate	1	1
108	Rear Wheel (Ø175 mm x 32)	KTZ211081	Rear wheel non-steerable	2	1
109	Blind Cap for Wheel	KTZ14M871	Cover for the rear wheels	2	1
110	Steerable Wheel	KTZ211080	Front wheel steerable	2	1
111	Foot rest	KTZ207126	Foot rest	1	1
112	GW90 Trolley Voluson® 730Pro	KTZ154630	Housing with wheels, monitor mounting plate, backpanel with connectors and cables	1	2
113	GES3 I/O Connection Panel	KTZ195638	External Rear Panel with electrical Signal- and Supply-Connection-Cables to the V730-Main-Unit (internal) Rear-Panel.	1	1
114	Hinge for Foot rest	KTZ220018	Hinge for Foot rest	2	1
115	Top Cover of Trolley	KTZ208092	Top Cover of Trolley	1	1
116	Top Cover of Trolley	KTZ208119	Top Cover of Trolley (can replace KTZ208092)	1	1
117	Standby Switch	KTZ207125	Standby Switch left below the control panel	1	1
118	Probe Cable Guide	KTZ14M787	Probe Cable Guide	4	1
119	Pull-out Protection	KTZ14B667	Pull-out Protection for Mains Power cable	1	1

Section 9-5
User Interface (GEU Top Console)



Figure 9-3 User Interface (GEU)

Table 9-4 User Interface (GEU)

Item	Part Name	Part Number	Description	Qty	FRU
201	Front Handle User Interface	KTZ220039	Voluson® 730Pro Front Handle	1	1
202	Probe Holder Kit V730	KTZ207105	right hand Probe holder part	1	1
203	Trackball Kit V730	KTZ208264	generates X-Y-Coordinates of Trackball-Movements like moving a PC-Mouse	1	1
204	Spring for Cap (digipots, slider controls)	KTZ208187	spring for TGC slider controls and rotation digipots	16	1
205	Cap for Rotation Digipots	KTZ208318	Cap for Rotation control (digipot)	8	1
206	Cap for Slide-potentiometer (TGC)	KTZ208319	Cap for TGC slider controls	8	1
207	Trackball top fixation ring	KTZ208256	Trackball top fixation ring	1	1
208	Keytop Kit Voluson® 730Pro	KTZ207558	Keytop Kit Voluson® 730Pro	1	1
209	Alpha-numeric keyboard V730Pro	KTZ208217	Alpha-numeric keyboard for Voluson® 730Pro	1	1
210	Gel holder Voluson® 730Pro	KTZ134521	Gel holder Voluson® 730Pro	1	1
211	Loudspeaker for Top Console	KTZ208132	Loudspeaker on GEU User Interface	2	1
212	GEU60 User Interface Voluson® 730Pro	KTZ154641	keyboard, trackball, display, special knobs, switches (can be replaced by GEU60A - KTZ154688)	1	1
213	GEU60A User Interface Voluson® 730Pro	KTZ154688	keyboard, trackball, display, special knobs, switches (can replace GEU60 - KTZ154641)	1	1
214	Hard key Board GEU60(A) for V730Pro	KTZ208284	Hardkey Board(s) GEU8 for Voluson® 730Pro (large board - Part A ; small board - Part B)	1	1
215	Wheel control for V730Pro	KTZ208257	Wheel control for Voluson® 730Pro	1	1
216	Distance Rod for GEU60(A)	KTZ14B596	Distance Rod for GEU60(A)	1	1

Section 9-6
Monitor + Monitor Replacement Parts



Figure 9-4 Monitor + Monitor replacement parts

Table 9-5 Monitor + Monitor replacement parts

Item	Part Name	Part Number	Description	Qty	FRU
250	Color Monitor 15" painted (SONY brand)	KTZ211212	Sony PGM-100P1MD KR; lacquered	1	1
251	Color Monitor 15" painted (ANY brand)	KTZ212115	ANY AY-15CUI Color Image Monitor, lacquered; (can replace KTZ211212) Monitor Mounting Set KTZ154713 is required	1	1
252	PRM6 Monitor Mount Set	KTZ154676	Monitor Mount Set (fixing part for Monitor) only used with SONY Monitor (KTZ211212)	1	1
253	Monitor Mounting Set	KTZ154713	Monitor Mounting Set (fixing part for Monitor) only used with ANY Monitor (KTZ212115)	1	1
254	Set Monitor Front Housing	KTZ208445	Set Monitor Front Housing (incl. cover of task lamp); only used at ANY Monitor (KTZ212115)	1	1
255	Set Monitor Housing	KTZ208446	Set Monitor Housing (left-, right-, and top cover); only used at ANY Monitor (KTZ212115)	1	1
256	Monitor Switch Assembly	2300008	Common part with L5 and L3; only used with ANY Monitor (KTZ212115)	1	1
257	Task Lamp	2317347	Common part with L5 and L3; only used with ANY Monitor (KTZ212115)	1	1

Section 9-7
Disk Drives (GEM)



Figure 9-5 Disk Drives (GEM)

Table 9-6 Disk Drives (GEM)

Item	Part Name	Part Number	Description	Qty	FRU
301	CD/RW-Drive	KTZ207047	Standard CD-ROM-Burner internal (no own cabinet)	1	1
302	Fan axial 62 x 62 x 14 mm	KTZ207602	Fan for Air-Cooling of GEM (SCSI-Drive-Module)	1	1
303	MO-Drive SCSI 1.3 GB internal	KTZ207050	Standard Magneto-Optical-Drive SCSI 1.3GB internal (has no own cabinet)	1	1
304	GEM3-3a MO-Drive + CD/RW	KTZ154673	MO-Drive and CD/RW (replaces GEM6)	1	2

Section 9-8 Main Power Module (CPN)



Figure 9-6 Main Power Module (CPN)

Table 9-7 Main Power Module (CPN)

Item	Part Name	Part Number	Description	Qty	FRU
401	CPN5 Power Supply Module	KTZ195739	CPN5 Power Supply Module (can be replaced by CPN6 - KTZ195905 and CPN80 - KTZ207486)	1	1
402	CPN6 Power Supply Module	KTZ195905	CPN6 Power Supply Module (can be replaced by CPN80 - KTZ207486)	1	1
403	CPN80 Power Supply Module	KTZ207486	CPN80 Power Supply Module (can replace CPN5 - KTZ195739 and CPN6 - KTZ195905)	1	1
404	CPY3.P3 Power Switch	KTZ195471	Board to switch on and shut down Ultrasound System (only used with CPN5 and CPN6)	1	1
405	CPY80.P1 Power Switch	KTZ209338	Board to switch on and shut down Ultrasound System (only used with CPN80 - KTZ207486)	1	1
406	CCF100.P1 Power Primary Board	KTZ209339	Power Primary Board (only used with CPN80 - KTZ207486)	1	1
407	Mains Power switch (F1)	KTZ207733	Mains Power Switch (F1) therm. protected 16A 2 Pol. (only used at CPN5 and CPN6)	1	1
408	Mains Power Input connector	KTZ207574	Mains Power Input connector (only used at CPN5 and CPN6)	1	1
409	Mains Power switch and Input connector	KTZ209340	Mains Power Switch and Input Connector (only used at CPN80 - KTZ207486)	1	1
410	Fuse 10 Ampere 6.3 x 32	KTZ208239	Electric Current Overflow Protection GEF (only used at CPN5 and CPN6)	4	1
411	Fuses 16 Ampere 6.3 x 32 (10 pcs.)	KTZ209341	used at primary and secondary side (only used at CPN80 - KTZ207486)	3	1
412	Fuses 3.2 Ampere 6.3 x 32 (10 pcs.)	KTZ209342	fuse for auxiliary power output at 110V setting (only used at CPN80 - KTZ207486)	1	1
413	Fuses 1.6 Ampere 6.3 x 32 (10 pcs.)	KTZ209343	fuse for auxiliary power output at 230V setting (only used at CPN80 - KTZ207486)	1	1
414	KVN2 - Fan for Primary Power Supply	KTZ195440	KVN2 - Fan for Primary Power Supply (CPN)	1	1

Section 9-9
Main Board Module (GEF)

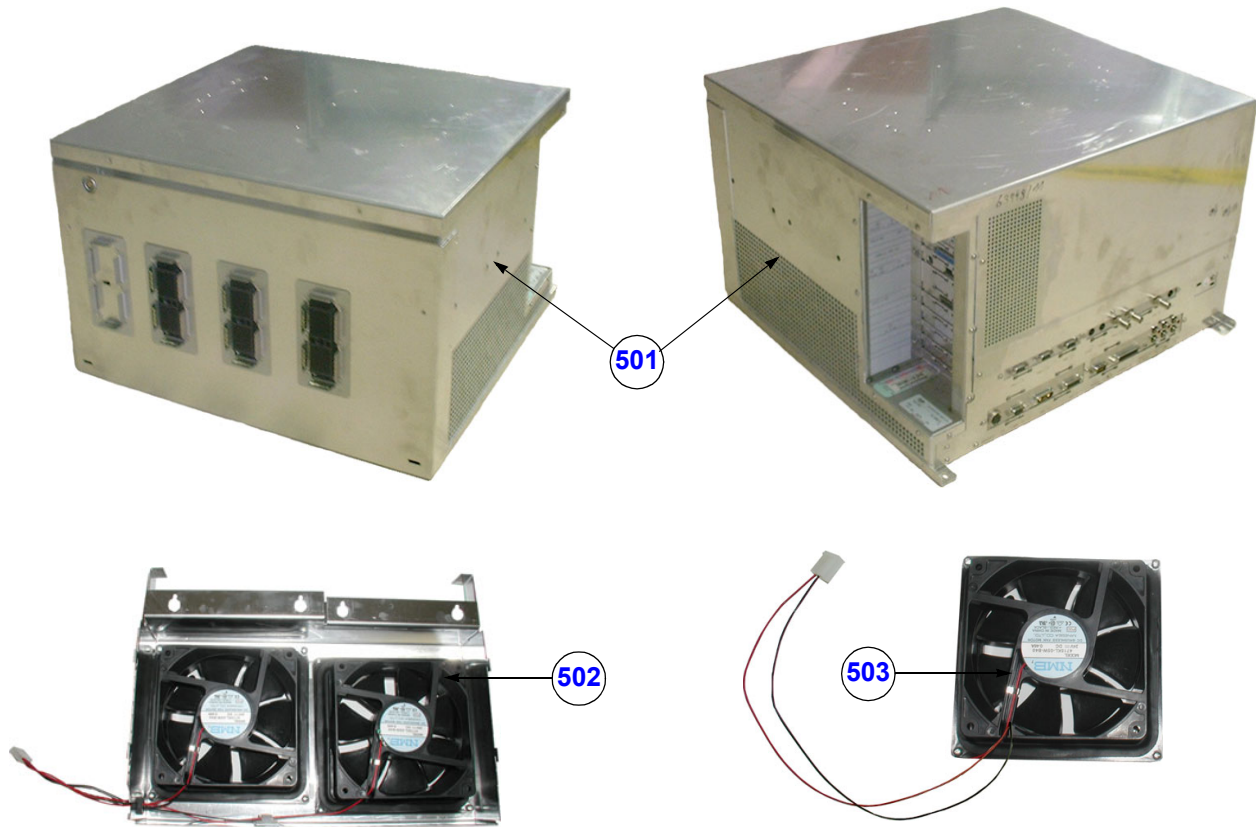


Figure 9-7 Main Board Module (GEF)

Table 9-8 Main Board Module (GEF)

Item	Part Name	Part Number	Description	Qty	FRU
501	GEF4 Main Board Chassis	KTZ195775	GEF4 Chassis mech.+ electr. (Main Board) NOT available as FRU	1	N
502	Fan for GEF-box (2 fan)	KTZ154678	Fan for GEF-box (2 fan)	1	1
503	Fan for GEF-box (single)	KTZ154679	Fan for GEF-box (single)	1	1

9-9-1 FrontEnd (US-Part)

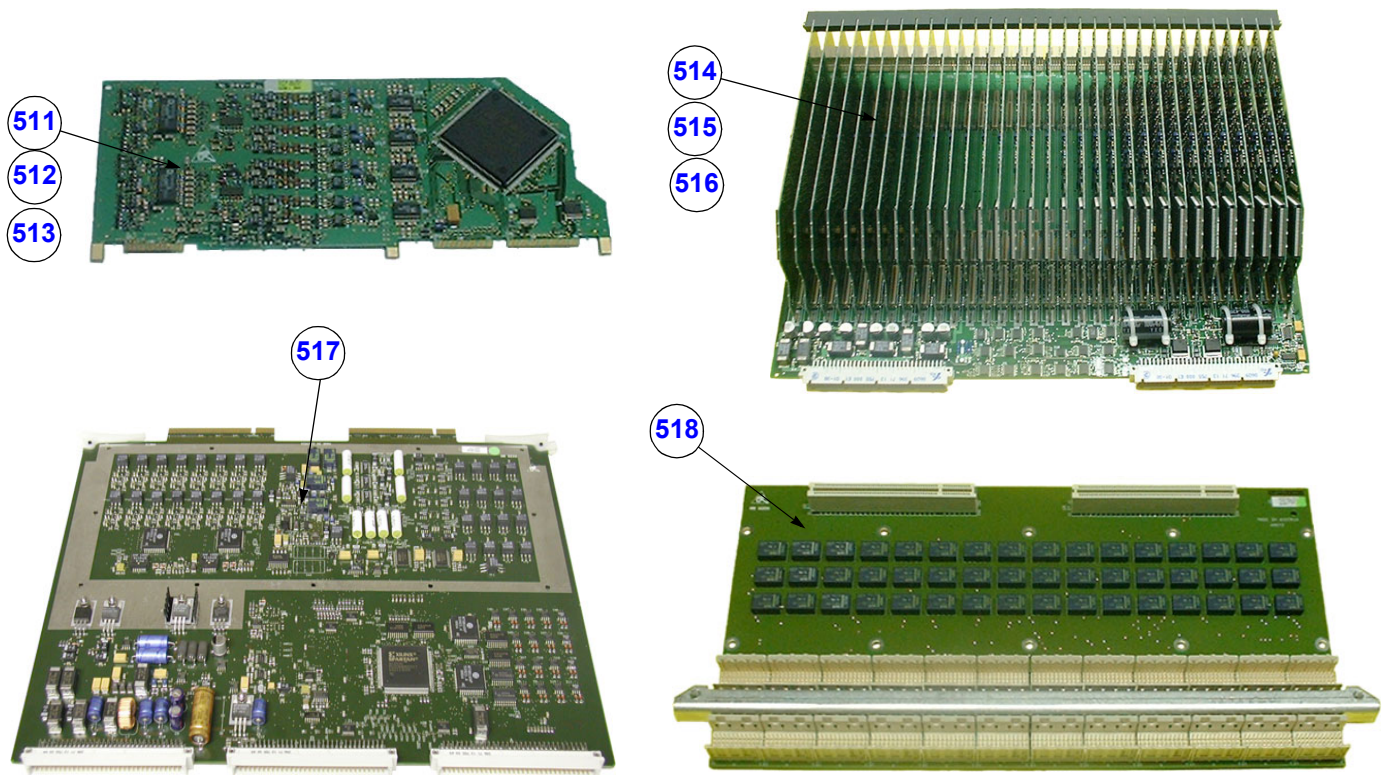


Figure 9-8 FrontEnd (US-Part)

Table 9-9 FrontEnd (US-Part)

Item	Part Name	Part Number	Description	Qty	FRU
511	CPD3-3a.P3 Beam former SUB-Board	KTZ195375	Sub-board on CPR56.P8 (can not be replaced by CPD33 or CPD35)	32	1
512	CPD33.P14 Beam former SUB-Board	KTZ195867	Sub-board on CPR57.P8 (can not be replaced by CPD3 or CPD35)	32	1
513	CPD35.P18 Beam former SUB-Board	KTZ195961	Sub-board on CPR60.P10 (can not be replaced by CPD3 or CPD33)	32	1
514	CPR56.P8 Beam former Board	KTZ195770	Beam former Board (can be replaced by CPR57; can be replaced by CPR60 if SW 2.1.3 is installed)	1	1
515	CPR57.P8 Beam former Board	KTZ195877	Beam former Board (can replace CPR56; (can be replaced by CPR60 if SW 2.1.3 is installed)	1	1
516	CPR60.P10 Beam former Board	KTZ195925	Beam former Board (can replace CPR56 or CPR57) SW 2.1.3 is required	1	1
517	CRW2a.P2 CW Doppler Board	KTZ195723	CW-Doppler Board	1	1
518	CPZ50-50a.P3 Cover board	KTZ195592	electrical signal connection between CPU,CPR and CW-Board; contains Relays for Signal to CW-Board.	1	1

9-9-1 FrontEnd (US-Part) (cont'd)

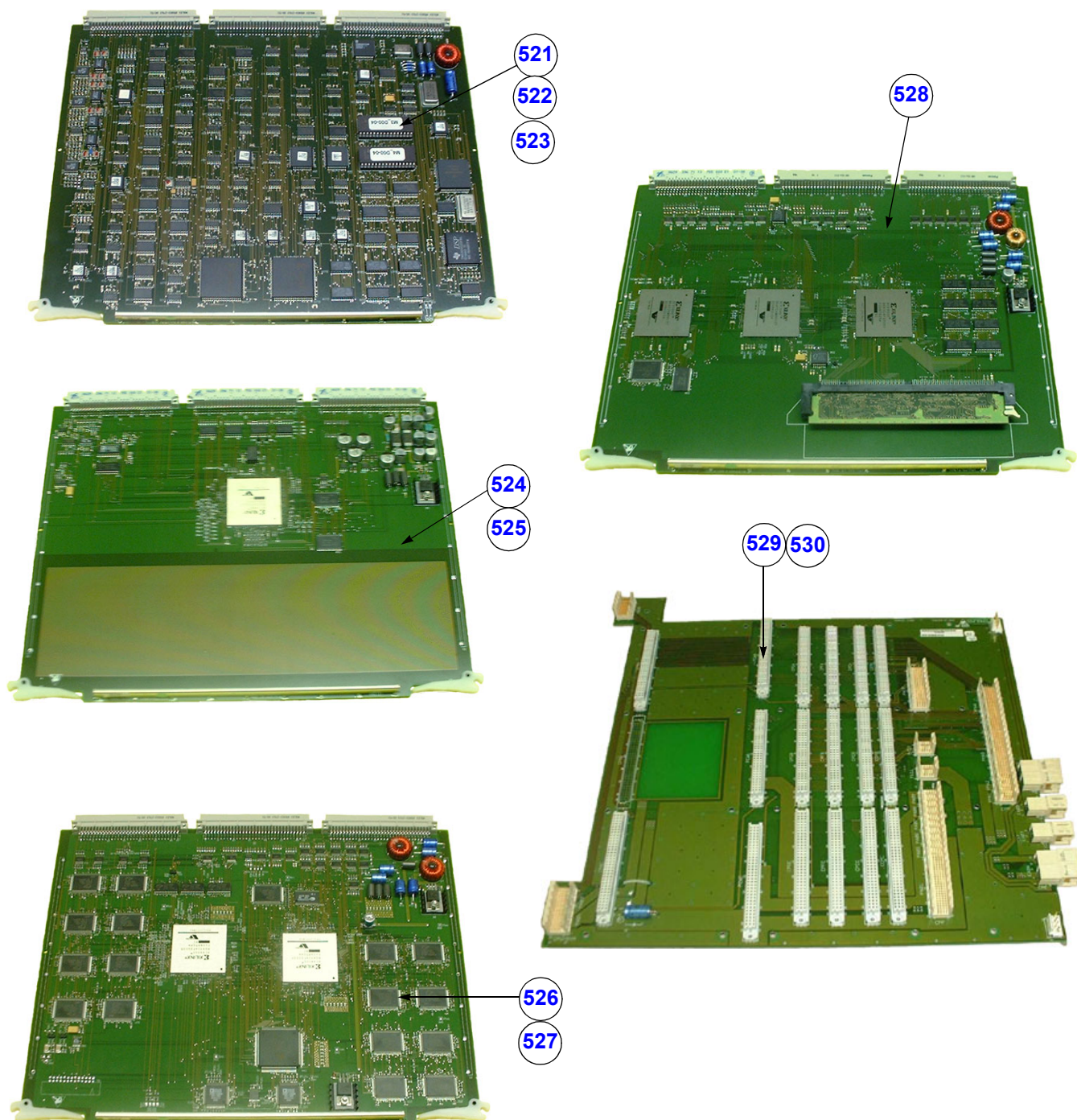


Figure 9-9 FrontEnd (US-Part) cont'd

Table 9-10 FrontEnd (US-Part) cont'd

Item	Part Name	Part Number	Description	Qty	FRU
521	CCM50.P7 Motor Control Board	KTZ195497	Motor Control Board	1	1
522	CCM55.P9 Motor Control Board	KTZ195788	Motor Control Board (can replace CCM50.P7)	1	1
523	CCM60.P9 Motor Control Board	KTZ196007	Motor Control Board (can replace CCM50.P7 and CCM55.P9)	1	1
524	CPC4.P4 System Control Board	KTZ195654	System Control Board	1	1
525	CPC5.P4 System Control Board	KTZ195821	System Control Board (can replace CPC4.P4)		
526	CPF10-10a.P4 Color Doppler Board	KTZ195597	Color Doppler Board	1	1
527	CPF11.P5 Color Doppler Board	KTZ195750	Color Doppler Board (can replace CPF10-10a.P4)	1	1
528	CPG4.P3 Mid-Processor Board	KTZ195594	Mid-Processor Board (Frame Filter, Mixer, HF-Filter, Log.Demodulator)	1	1
529	CPK3.P3 Motherboard V730	KTZ195466	Electrical Signal- and Supply-Connection for all boards including PC-Motherboard (CPM)	1	1
530	CPK4.P3 Motherboard V730	KTZ195822	Electrical Signal- and Supply-Connection for all boards including PC-Motherboard (CPM) (can replace CPK3.P3)	1	1

9-9-1 FrontEnd (US-Part) (cont'd)

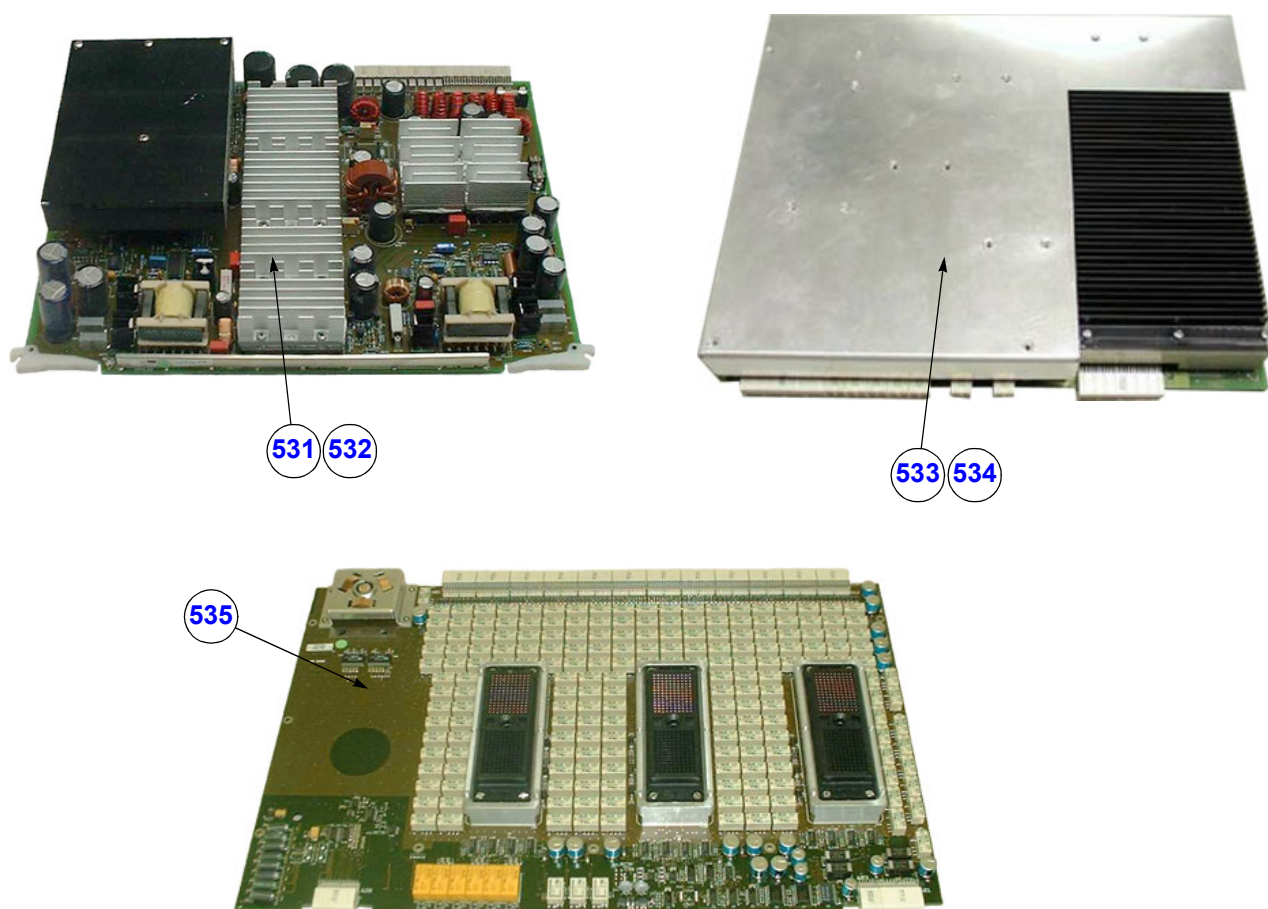


Figure 9-10 FrontEnd (US-Part) cont'd

Table 9-11 FrontEnd (US-Part) cont'd

Item	Part Name	Part Number	Description	Qty	FRU
531	CPP5.P3 Power Supply Board	KTZ195826	Power Supply Board Output Power: 900 W	1	1
532	CPP6.P3 Power Supply Board	KTZ195847	Power Supply Board Output Power: 900 W (can replace CPP5.P3)	1	1
533	CPP21a.P5 Power Supply Board	KTZ207195	Power Supply Board Output Power: 900 W (can be replaced by CPP22) NOT available as FRU	1	N
534	CPP22a.P6 Power Supply Board	KTZ207265	Power Supply Board Output Power: 900 W (can replace CPP5, CPP6 and CPP21)	1	1
535	CPU5.P5 Module Board (BYM)	KTZ195636	Probe Connector Board, Module Board	1	1

9-9-2 BackEnd Processor (PC-Part)

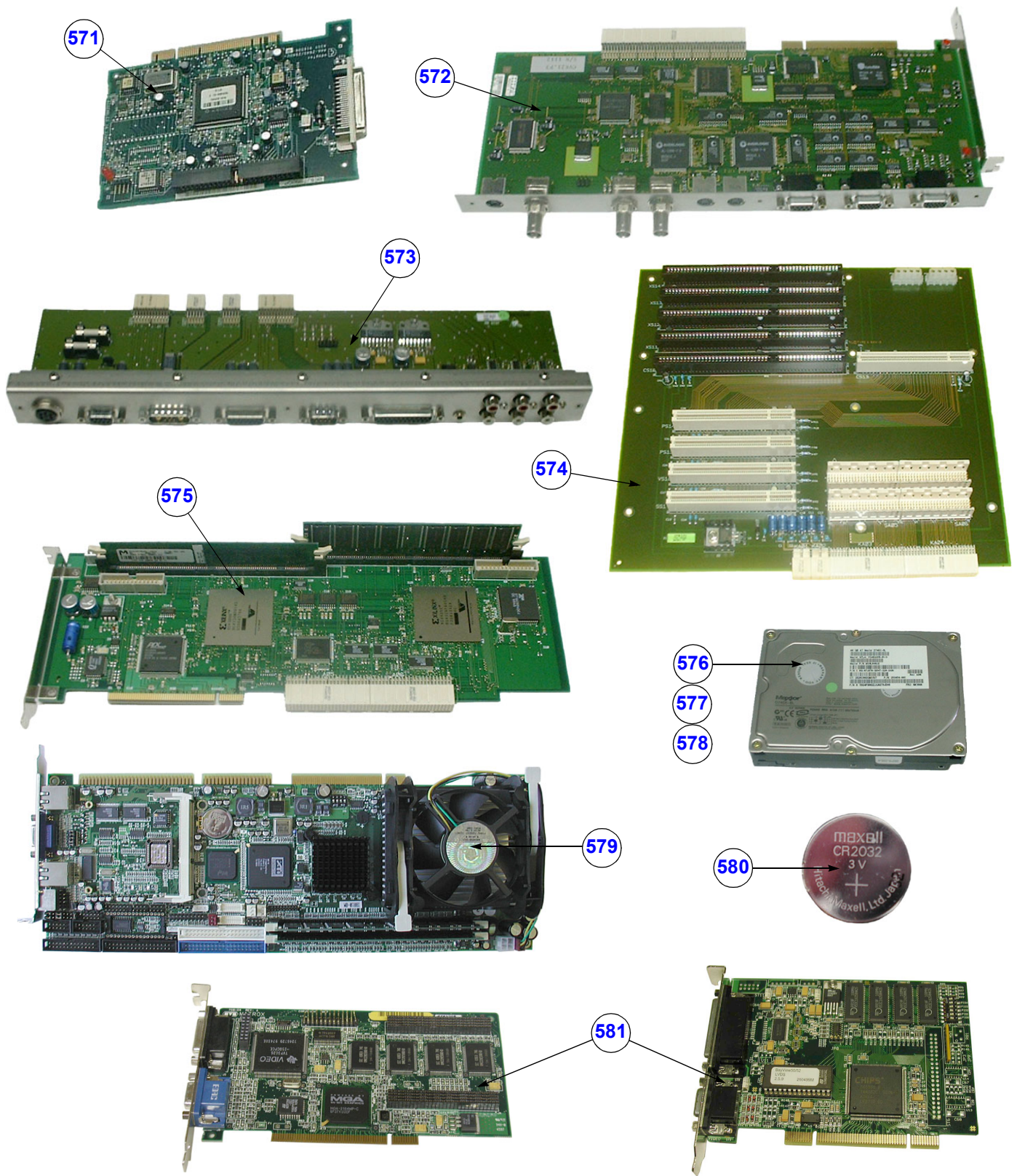


Figure 9-11 Back Processor (PC-Part)

Table 9-12 Back Processor (PC-Part)

Item	Part Name	Part Number	Description	Qty	FRU
571	AHA-2940U SCSI-II-Control Board	KTZ207402	SCSI-II Control Board	1	1
572	CKV22.P3 Video management Board	KTZ207593	PC-Video converter Board (can replace CKV20.P2-21.P3)	1	1
573	CPE4.-4a.P4 Motherboard - Extension	KTZ195542	Motherboard Extension	1	1
574	CPM3.P2 Motherboard	KTZ195699	electrical Signal- and Supply-Connection between all PC-Plug-In-Boards	1	1
575	CPS4.P3 Scan converter Board	KTZ195596	Scan converter Board	1	1
576	Harddisk V730Expert/Pro	KTZ195820	Harddisk	1	1
577	Harddisk V730Expert/Pro	KTZ195965	Harddisk (replaces KTZ195820)	1	1
578	Universal Hard disk for all Voluson 730 (V730, V730Expert and V730Pro) systems	KTZ196003	Universal Hard disk (can replace KTZ195820 and KTZ195965) System/Boot CD (see: Table 9-13) is required	1	1
579	SBC P4 2.4GHZ 768MB DDRAM	KTZ207404	Standard Single Board-PC, Pentium-IV, 2.4GHZ, 400MHz-FrontSideBus, PCI-Bus, 768MB Ram,	1	1
580	Lithium Battery CR2032 (3V)	KTZ208791	Lithium Battery CR2032 (3V) for SBC-Board	1	1
581	VGA graphic card for User Interface Display	KTZ207170	VGA Graphic card for UI Display (GEU) BayView; Matrox (second source)	1	1

Section 9-10 Options and Upgrades

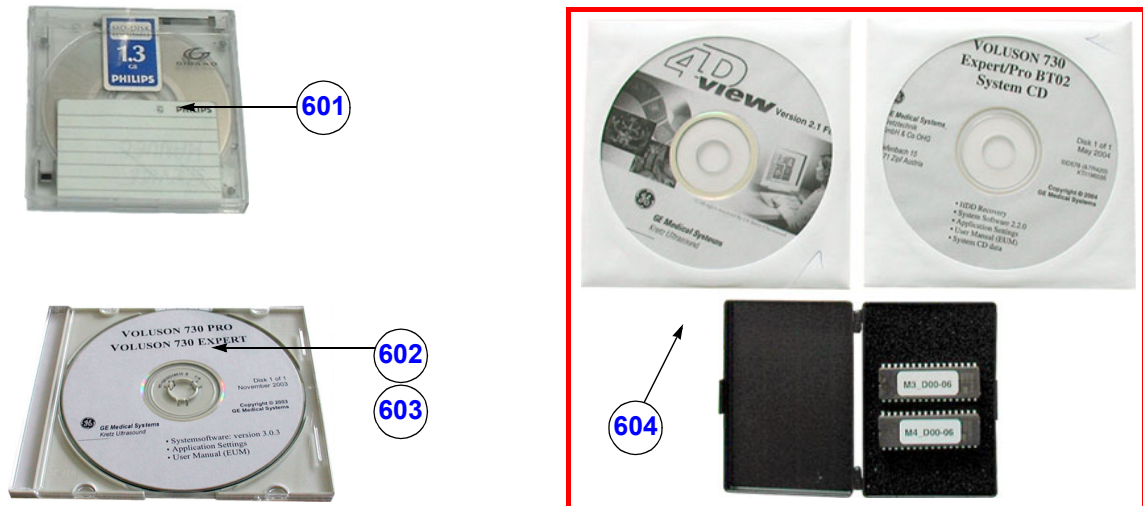


Figure 9-12 Options and Upgrades

Table 9-13 Options and Upgrades

Item	Part Name	Part Number	Description	Qty	FRU
601	MO Disk Media 1.3GB	KTZ207077	MO-Disk Media (Standard)	1	1
602	System/Boot CD-Set (SW2.1.4)	KTZ195996	System/Boot CD's for System HDD recovery (SW2.1.4) <u>Contents:</u> updated Linux rescue partition, System C: Image (Windows 2000, MSPatches: KB823980, KB824146 and KB828749), UISApp, Backup, EUM and Database Repair Tool	N	1
603	System/Boot CD-Set (SW2.2.0)	KTZ196011	System/Boot CD's for System HDD recovery (SW2.2.0) <u>Contents:</u> updated Linux rescue partition, System C: Image (Windows 2000, MSPatches: KB823980, KB824146, KB828749, KB828028, Q822483, Q832894, KB837001, KB828741 and KB835732), UP-D23MD Driver, UISApp, Backup, EUM and Database Repair Tool	N	1
604	RAB-Light Upgrade Kit	H46621AJ	RAB-Light Upgrade Kit inc. upgrade instructions	N	N/A

Section 9-11 Miscellaneous Cables

Table 9-14 Miscellaneous Cables


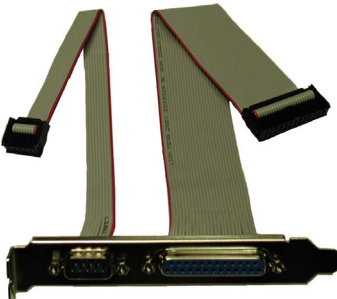
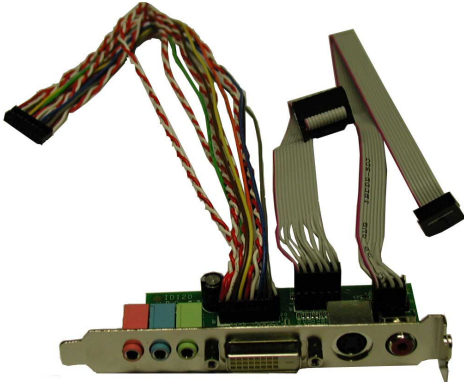

Item	Part Name	Part Number	Description	Qty	FRU
701	Adapter SCSI-Link	KTZ207121	Standard DB50/DB50 	1	1
702	Adapter slot parallel serial	KTZ208148	Adapter Parallel port / serial COM1 	1	1
703	Adapter Line in, MIC; GEU	KTZ208136	MIC in - Speaker out (the other ports are not used) 	1	1
704	Cable 50Pin SCSI-2 Data Cable 1.8m	KTZ212403	Data Transfer between PC and SCSI-Module 	1	1

Table 9-14 Miscellaneous Cables


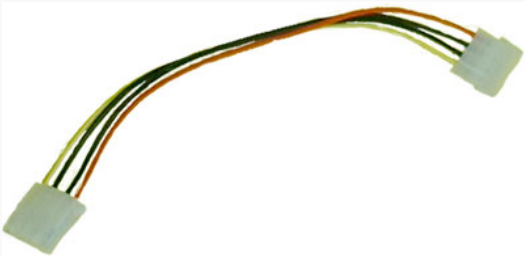


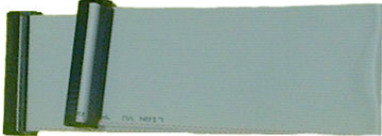

Item	Part Name	Part Number	Description	Qty	FRU
705	Cable HDD Y-Power	KTZ212426	12V/5V-Power Supply-Distributor-Cable (2x) for PC-Component (yellow-black, red-black) 	1	1
706	Power Cable for Harddisk	KTZ212401	Power cable for Harddisk 4pin 230mm 	1	1
707	Cable ATX 12Volt	KTZ212113	HDD power connector to Pentium4 power connector 	1	1
708	Cable Stereo Jack - Chinch	KTZ212074	Cable from PC-Sound-StereoJack to External Rear Panel 	1	1
709	Data Cable HDD ATA66/100	KTZ208147	Data cable for IDE-Hard disk 40pin 	1	1
710	GES3 I/O Connection Panel	KTZ195638	External Rear Panel with electrical Signal- and Supply-Connection-Cables to the Voluson® 730Pro Main-Unit (internal) Rear-Panel. 	1	1

Table 9-14 Miscellaneous Cables


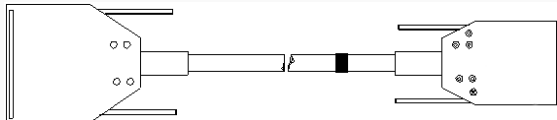

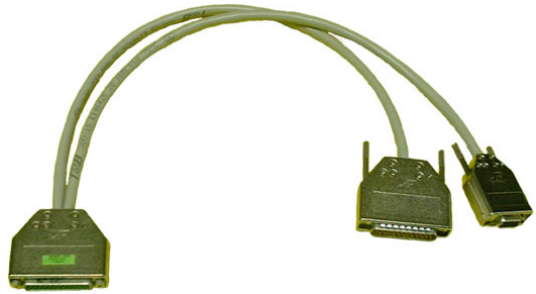

Item	Part Name	Part Number	Description	Qty	FRU
711	KGS10 Cable Power GEM-GEF	KTZ195464	Electrical Power-Supply for SCSI-Drives (5V/12V) 	1	1
712	KUG5 Remote Cable	KTZ195606	VCR -Remote Control Cable 	1	1
713	KUR10 Cable Data SCSI	KTZ195473	internal Data Cable between SCSI-Module-Connector and SCSI-Drives (CD-Rom, MO-Drive) 	1	1
714	KVR1 TERM-RS232PC / V730, Y-Cable	KTZ195416	electrical Signal- and Supply-Connection between Voluson® 730Pro and User Interface GEU 	1	1
715	KVR2 TERM-RS232PC / V730, Y-Cable	KTZ207353	electrical Signal- and Supply-Connection between Voluson® 730Pro and User Interface GEU (can replace KVR1 cable - KTZ195416) 	1	1

Table 9-14 Miscellaneous Cables

Item	Part Name	Part Number	Description	Qty	FRU
716	KVS2 Cable Serial Interface	KTZ195717	electrical-Signal-Connection between CPS and PIC_MG-Slot-CPU 	1	1
717	KVX1 Network Cable	KTZ212016	Cable from external rear Panel to the Voluson® 730Pro Main-Unit (internal) rear-Panel 1m 	1	1
718	Monitor Power Connection Cable	KTZ212116	Line cord for Supply from Main-Device to Sub-Devices (only used in combination with ANY Monitor KTZ212115) 	1	1
719	Monitor Power Connection Cable	KTZ212032	Line cord for Supply from Main-Device to Sub-Devices (only used in combination with SONY Monitor KITZ211212) 	1	1
720	Monitor Signal Cable RGB 75E	KTZ212010	Monitor cable RGB 75E; 2m VGA/SVGA (only used in combination with SONY Monitor KITZ211212) 	1	1

Table 9-14 Miscellaneous Cables








Item	Part Name	Part Number	Description	Qty	FRU
721	Adapter Cable PS2	KTZ208137	Adapter for GEU PS2-cable 	1	1
722	Power Cord Europe 230V	KTZ212317	Power Cord Europe 230V/240V 	1	1
723	Power Cord Japan (Hosp.grade)	KTZ212448	Power Cord Japan Hospital Grade 	1	1
724	Power Cord UK	KTZ212441	Power Cord United Kingdom 240V 	1	1

Table 9-14 Miscellaneous Cables

Item	Part Name	Part Number	Description	Qty	FRU
725	Power Cord USA Hosp.Grade	KTZ212402	<p>Power Cord USA Hospital Grade</p> 	1	1
726	USB to ICP CPU Board	KTZ207029	<p>USB for PC-Slot, Connector on Backpanel. Cables are connected to PC-Board. Leads the USB-signals to the PC-Backpanel</p> 	2	1
727	VGA - Monitor cable HD15-HD15	KTZ212275	<p>VGA - Monitor cable HD15-HD15 (only used in combination with ANY Monitor KTZ212115)</p> 	1	1

Section 9-12 Optional Peripherals and Accessories



Figure 9-13 Optional Peripherals and Accessories

Table 9-15 Optional Peripherals and Accessories

Item	Part Name	Part Number	Description	Qty	FRU
801	Sony B/W Video Printer UP-895MD (CE)	KTZ211332	NTSC/PAL	1	1
802	PPP55 Connection Set	KTZ195643	Connection Set UP-895MD	1	1
803	Sony Digital Color Printer UP-D21MD	KTZ211357	USB-Port (will be replaced by UP-D23MD)	1	1
804	Sony Digital Color Printer UP-D23MD	KTZ211373	USB-Port (will replace UP-D21MD)	1	1
805	PZP60 Connection Set	KTZ195776	Connection Set UP-D21MD and/or UP-D23MD	1	1
806	Mitsubishi Digital Color Printer CP770DW	KTZ211352	SCSI-Port	1	1
807	PZP50 Connection Set	KTZ195486	Connection Set CP770DW	1	1
808	HP Line Printer HPdeskjet 990cxi	KTZ211102	USB-Port	1	1
809	PZP55 Connection Set	KTZ195749	Connection Set HPdeskjet 990cxi	1	1
810	HP Line Printer HP deskjet 995c	KTZ211107	USB-Port	1	1
811	PZP56 Connection Set	KTZ195882	Connection Set HPdeskjet 990cxi / 995c (can replace PZP55 KTZ195749)	1	1

Section 9-12 Optional Peripherals and Accessories (cont'd)



Figure 9-14 Optional Peripherals and Accessories cont'd

Table 9-16 Optional Peripherals and Accessories cont'd

Item	Part Name	Part Number	Description	Qty	FRU
812	(Bluetooth) Printer HP 5600 Series	KTZ211503	USB-Port (Bluetooth Connection Set is required)	1	1
813	Bluetooth Connection Set	KTZ196002	Bluetooth Connection Set (HP 5600 Series only)	1	1
814	Sony VCR SVO-9500 MD	KTZ211317	NTSC	1	1
815	Sony VCR SVO-9500 MDP	KTZ211318	PAL	1	1
816	PRR50 Connection Set	KTZ195492	Connection Set for VCR without remote control	1	1
817	Foot switch (MFT7)	KTZ195446	Foot switch	1	1
818	ECG-preamplifier (MAN 6)	KTZ154644	consists of ECG-preamplifier and patient connection cable	1	1
819	USB-RS232 Connection kit PRY	KTZ195858	Converter from USB to RS-232 Serial Port	1	1
820	Touch-up Paint Set (gray-blue)	KTZ154680	contains blue, dark-gray, bright-gray and black 4x 2cl bottles incl. brush	1	1

Table 9-17 System Manuals

Item	Part Name	Part Number	Kretz #	Description	Qty	FRU
	Voluson® 730Pro Service Manual	KTZ105832	105832		1	N
System User Manuals						
	Basic User Manual, Voluson® 730Pro, English	H48611H			1	N
	Basic User Manual, Voluson® 730Pro, German	H46621A			1	N
	Instruction Manual, Voluson® 730Pro, English	H48611J			1	N
	Instruction Manual, Voluson® 730Pro, German	H48611K			1	N
	Instruction Manual, Voluson® 730Pro, Spanish	H48611L			1	N
	Instruction Manual, Voluson® 730Pro, Italian	H48611M			1	N
	Instruction Manual, Voluson® 730Pro, Portuguese	H48611N			1	N
	Instruction Manual, Voluson® 730Pro, French	H48611P			1	N
	Instruction Manual, Voluson® 730Pro, Chinese	H??????			1	N
	Instruction Manual, Voluson® 730Pro, Japanese	H??????			1	N
	Advanced Reference Manual Voluson® 730Pro, English	H48621A			1	N

Section 9-13
Probes

9-13-1 2D-Probes

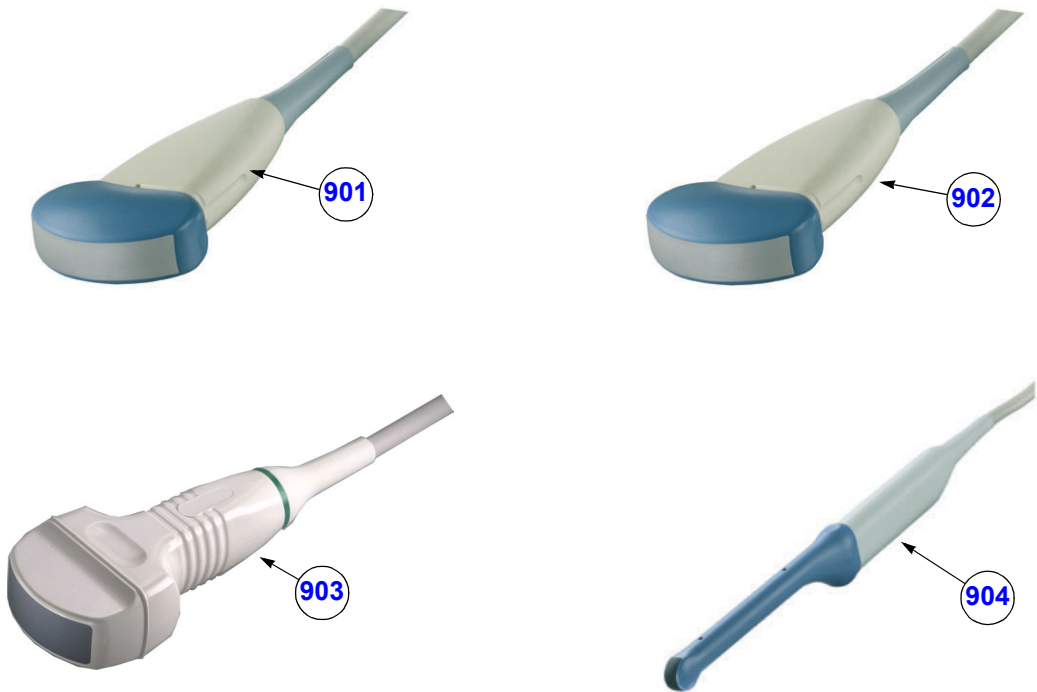


Figure 9-15 2D curved array Transducers

Table 9-18 2D curved array Transducers

Item	Part Name	Part Number	Description	Qty	FRU
901	AB2-5	KTZ195372 (H46701D)	electronic broadband curved array transducer, frequency range of 2-5 MHz Applications: Abdominal, Obstetrics, Gynecology		1
902	AB2-7	KTZ195757 (H46701T)	electronic broadband curved array transducer, frequency range of 2-7 MHz Applications: Abdominal, Obstetrics, Gynecology, Urology, Pediatrics		1
903	AC2-5	KTZ195784 (H46701U)	electronic broadband curved array transducer, frequency range of 2-5 MHz Applications: Abdominal, Obstetrics, Gynecology, Pediatrics		1
904	IC5-9	KTZ195386 (H46701F)	electronic endocavity broadband curved array transducer, frequency range of 5-9 MHz and a field-of-view of max. 150° Applications: Obstetrics, Gynecology, Urology		1

9-13-1 2D-Probes (cont'd)

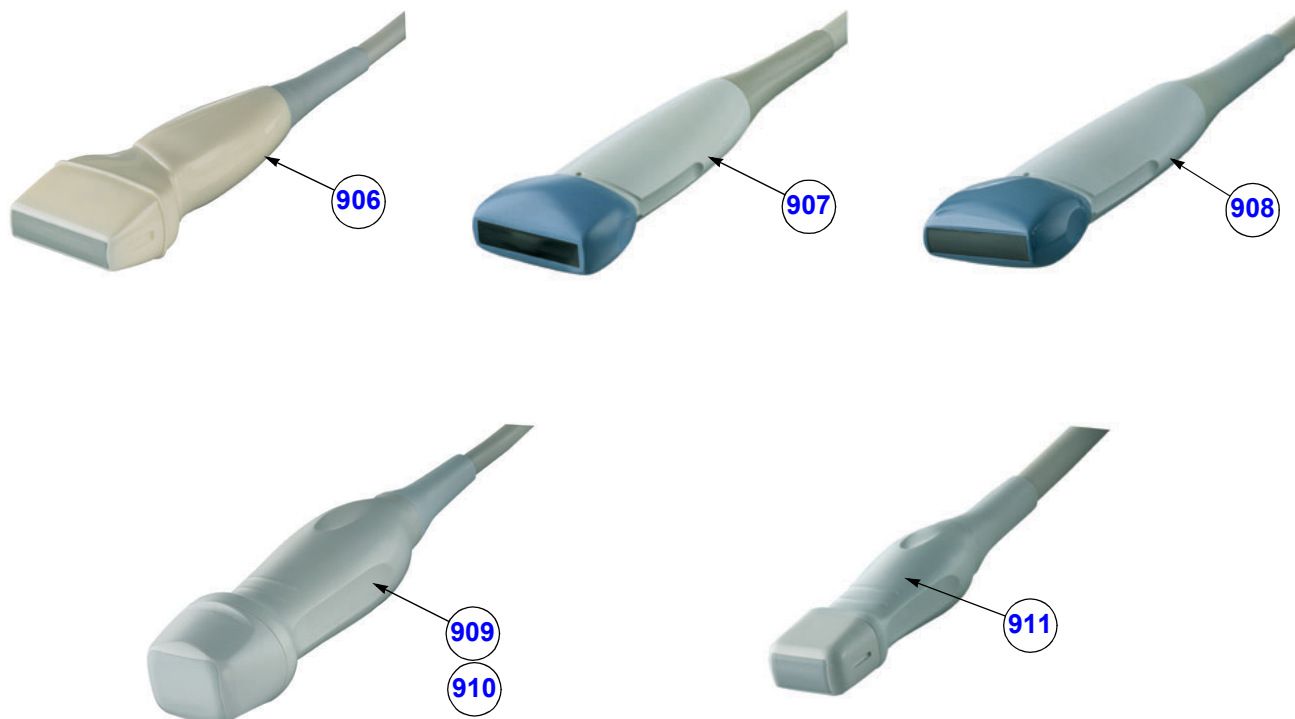


Figure 9-16 2D linear- and phased array Transducers

Table 9-19 2D linear- and phased array Transducers

Item	Part Name	Part Number	Description	Qty	FRU
906	SP4-10	KTZ195530 (H46701A)	electronic broadband linear array transducer, frequency range of 4-10 MHz, electronically steerable Applications: Small Parts, Peripheral Vascular, Pediatrics, Orthopedics		1
907	SP6-12	KTZ195362 (H46701B)	electronic broadband linear array transducer, frequency range of 6-12 MHz, electronically steerable Applications: Small Parts, Peripheral Vascular, Pediatrics, Orthopedics		1
908	SP10-16	KTZ195531 (H46701C)	electronic broadband linear array transducer, frequency range of 10-16 MHz, electronically steerable Applications: Small Parts, Orthopedics		1
909	PA2-5	KTZ195507 (H46701G)	electronic broadband phased array transducer, frequency range of 2-5 MHz Applications: Abdominal, Cardiology, Transcranial		1
910	PA2-5P	KTZ195773 (H46701V)	electronic broadband phased array transducer, frequency range of 2-5 MHz Applications: Abdominal, Cardiology, Transcranial		1
911	PA6-8	KTZ195532 (H46701J)	electronic broadband phased array transducer, frequency range of 6-8 MHz Applications: Cardiology, Pediatrics/Neonatology		1

9-13-2 Real-Time 4D Volume Probes

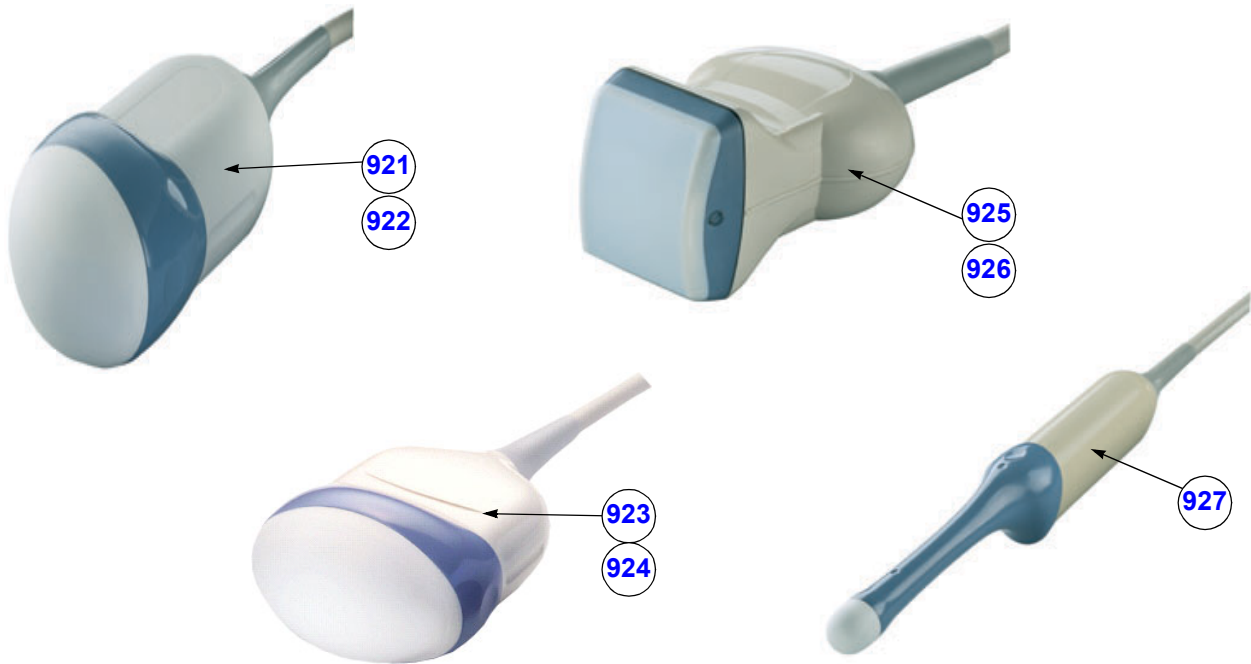


Figure 9-17 Real-Time 4D Volume Probes

Table 9-20 Real-Time 4D Volume Probes

Item	Part Name	Part Number	Description	Qty	FRU
921	RAB2-5	KTZ156736 (H46701M)	Real-time 4D broadband electronic curved-array transducer with a frequency range of 2-5MHz. Applications: Abdominal, Obstetrics, Gynecology, Interventional Radiology		1
922	RAB4-8P	KTZ156767 (H46701N)	Real-time 4D broadband electronic curved-array transducer with a frequency range of 4-8MHz. Applications: Abdominal, OB, Gyn, Pediatrics, Interventional Radiology		1
923	RAB2-5L *	KTZ156845 (H48621X)	Real-time 4D broadband electronic curved-array transducer with a frequency range of 2-5MHz. Applications: Abdominal, Obstetrics, Gynecology, Interventional Radiology		1
924	RAB4-8L *	KTZ156846 (H48621Z)	Real-time 4D broadband electronic curved-array transducer with a frequency range of 4-8MHz. Applications: Abdominal, OB, Gyn, Pediatrics, Interventional Radiology		1
925	RSP5-12	KTZ195763 (H46701W)	Real-time 4D broadband electronic linear array transducer with a frequency range of 5-12MHz and a scan width of 40 mm. Applications: Small Parts, Periph.Vascular, Pediatrics, Urology, Orthopedics		1
926	RSP6-12	KTZ195533 (H46701P)	Real-time 4D broadband electronic linear array transducer with a frequency range of 6-12MHz and a scan width of 40 mm. Applications: Small Parts, Periph.Vascular, Pediatrics, Urology, Orthopedics		1
927	RIC5-9	KTZ195242 (H46701R)	Real-time 4D endocavity broadband electronic curved array transducer with a frequency range of 5-9MHz. Applications: Gynecology/Fertility, Obstetrics, Urology		1

* RAB-Light Upgrade Kit (see: [Table 9-13](#)) is required to make the probe applicable on the Voluson® 730Pro.

9-13-3 CW-Pencil Probes



Figure 9-18 CW- Pencil Probes

Table 9-21 CW- Pencil Probes

Item	Part Name	Part Number	Description	Qty	FRU
931	SCW2.0	KTZ195538 (H46701K)	single element Continuous Wave (CW) Doppler pencil probe with a nominal operating frequency of 2.0 MHz (no B-image) Applications: Cardiology (suprasternal)		1

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Chapter 10

Care & Maintenance

Section 10-1 Overview

10-1-1 Periodic Maintenance Inspections

It has been determined by engineering that your Voluson® 730Pro system does not have any high wear components that fail with use, therefore no Periodic Maintenance Inspections are mandatory. Some Customers Quality Assurance Programs may require additional tasks and or inspections at a different frequency than listed in this manual.

10-1-2 Purpose of Chapter 10

This chapter describes **Care & Maintenance** on the scanner and its peripherals. These procedures are intended to **maintain the quality** of the ultrasound **systems performance**.
Read this chapter completely and familiarize yourself with the procedures before performing a task.

Table 10-1 Contents in Chapter 10

Section	Description	Page Number
10-1	Overview	10-1
10-2	Why do Maintenance	10-2
10-3	Maintenance Task Schedule	10-2
10-4	Tools Required	10-5
10-5	System Maintenance	10-6
10-6	Using a Phantom	10-11
10-7	Electrical Safety Tests	10-11
10-8	When There's Too Much Leakage Current...	10-24
	Ultrasound INSPECTION CERTIFICATE	10-25



CAUTION Practice good ESD prevention. Wear an anti-static strap when handling electronic parts and even when disconnecting/connecting cables.



DANGER THERE ARE SEVERAL PLACES ON THE BACKPLANE, THE AC DISTRIBUTION, AND DC DISTRIBUTION THAT ARE DANGEROUS. BE SURE TO DISCONNECT THE SYSTEM POWER PLUG AND SWITCH OFF THE MAIN CIRCUIT BREAKER (F1) BEFORE YOU REMOVE ANY PARTS. BE CAUTIOUS WHENEVER POWER IS STILL ON AND COVERS ARE REMOVED.



CAUTION Do not pull out or insert circuit boards while power is ON.



CAUTION Do not operate this unit unless all board covers and frame panels are securely in place. System performance and cooling require this.

Section 10-2 Why do Maintenance

10-2-1 Keeping Records

It is good business practice that ultrasound facilities maintain records of quality checks and corrective maintenance. The Ultrasound Inspection Certificate (see: [page 10-25](#)) provides the customer with documentation that the ultrasound scanner is maintained on a periodic basis.

A copy of the Ultrasound Periodic Maintenance Inspection Certificate should be kept in the same room or near the scanner.

10-2-2 Quality Assurance

In order to gain accreditation from organizations such as the American College of Radiology (USA), it is the customer's responsibility to have a quality assurance program in place for each scanner. The program must be directed by a medical physicist, the supervising radiologist/physician or appropriate designer.

Routine quality control testing must occur regularly. The same tests are performed during each period so that changes can be monitored over time and effective corrective action can be taken.

Testing results, corrective action and the effects of corrective action must be documented and maintained on the site.

Your GE service representative can help you with establishing, performing and maintaining records for a quality assurance program. Please contact us for coverage information and/or price for service.

Section 10-3 Maintenance Task Schedule

10-3-1 How often should care & maintenance tasks be performed?

The Care & Maintenance Task Schedule (see: [page 10-3](#)) specifies how often your Voluson® 730Pro should be serviced and outlines items requiring special attention.

NOTE: *It is the customer's responsibility to ensure the Voluson® 730Pro care & maintenance is performed as scheduled in order to retain its high level of safety, dependability and performance.*

Your GE Service Representative has an in-depth knowledge of your Voluson® 730Pro ultrasound scanning system and can best provide competent, efficient service. Please contact us for coverage information and/or price for service.

The service procedures and recommended intervals shown in the Care & Maintenance Task Schedule assumes that you use your Voluson® 730Pro for an average patient load (10-12 per day) and not use it as a primary mobile unit which is transported between diagnostic facilities.

NOTE: *If conditions exist which exceed typical usage and patient load, then it is recommended to increase the maintenance frequencies.*

Abbreviations used in the Customer Care Schedule [Table 10-2](#):

- D = Daily
- W = Weekly
- M = Monthly
- A = Annually

10-3-1 How often should care & maintenance tasks be performed? (cont'd)

Table 10-2 Customer Care Schedule

Item	Service at Indicated Time	D	W	M	A	Notes
Air Filter Grid	Clean the air filter grid with vacuum cleaner from outside (left side of the system front view).			•		more frequently depending on your environment
Air Filter Grid	Remove back panel and board chassis and clean the housing from inside. (vacuum cleaner and soft brush)				•	more frequently depending on your environment
AC Mains Cable	Inspect AC Mains Cable			•		Mobile Unit Check weekly
Cables and Connectors	Remove the Back Panel and check if all cables are well seated and if there is no mechanical damage visible; Check if they are fixed and well seated at the correct position.				•	also after corrective maintenance
User Interface	Clean alphanumerical keyboard, Functional keys, Digital potentiometers, TGC-Shift potentiometers. (vacuum cleaner, lukewarm soap water on a soft, damp cloth)		•			Be careful not to get the cloth too wet so that moisture does not enter the loudspeakers, TGC-Slider, or other keys!
Monitor	Clean Top surface, Monitor and Probe holder with a fluid detergent in warm water on a soft, damp cloth.		•			Be careful not to get the cloth too wet so that moisture does not enter the entire system.
Mechanical parts	Clean and inspect the mechanical function of wheels, casters, brakes and swivel locks as well as side door, foot rest, front and rear handle, and monitor holder. Remove Dust and Coupling gel.			•		Mobile Unit Check Daily
Control Panel movement	Check Turn mechanism				•	Mobile Unit Check Daily
Trackball Check	Check proper operation (Cursor movement X, Y direction)	•				If failure occurs go to trackball cleaning.
Trackball Cleaning	Remove top trackball cover; open the trackball housing and take out the trackball. Clean the X, Y axes of the trackball (soft tissue and screwdriver shaft.				•	Please record it in the systems setup maintenance report
Disk Drives (Sonoview Data Backup)	Test Image filing (Sonoview) Import and Export data capability (MO-, CD-RW Drive)		•	•*		* save the image filing data monthly or weekly on CD depending on the number of examinations
Safe Probe Operation	Clean probes and probe cables and check acoustic lens housing (cracks) and probe cables. In case of mechanical damage, don't use them! Danger: Safety risk for operator and patient.	•*				* or before each use
Probe Air bubbles	To detect air bubbles in filling liquid, shake the probe carefully and check abnormal noise.					
Probe connectors	Remove dust/dirt of all probe connectors. Clean with vacuum cleaner if dust is visible.			•		

Table 10-2 Customer Care Schedule

Item	Service at Indicated Time	D	W	M	A	Notes
Console Leakage Current Checks					•	Also after corrective maintenance or as required by your facilities QA program.
Peripheral Leakage Current Checks					•	Also after corrective maintenance or as required by your facilities QA program.
Surface Probe Leakage Current Checks					•	Also after corrective maintenance or as required by your facilities QA program.
Endocavity Probe Leakage Current Checks						Twice Annually
Measurement Accuracy Checks					•	Also after corrective maintenance or as required by your facilities QA program.
Probe/Phantom Checks	Check axial and lateral resolution (see Basic User Manual Technical specifications). Check Gain and TGC changes, vary the focus and check reaction on screen.				•	Also after corrective maintenance or as required by your facilities QA program.
Functional Checks of all probes Section 10-5-2 on page 10-7					•	Also after corrective maintenance or as required by your facilities QA program.

Section 10-4 Tools Required

10-4-1 Special Tools, Supplies and Equipment

10-4-1-1 Specific Requirements for Care & Maintenance

Table 10-3 Overview of Requirements for Care & Maintenance

Tool	Part Number	Comments
Digital Volt Meter (DVM)		minimum 5% accuracy, 3.5 digit and 200 Ohm range required
Anti Static Kit	46-194427P231 46-194427P279 46-194427P369 46-194427P373 46-194427P370	Kit includes anti-static mat, wrist strap and cables for 200 to 240 V system 3M #2204 Large adjustable wrist strap 3M #2214 Small adjustable wrist strap 3M #3051 conductive ground cord
Anti Static Vacuum Cleaner	46-194427P278 46-194427P279	120V 230V
Safety Analyzer	46-285652G1	DALE 600 KIT (or equivalent) for electrical tests
SVHS VCR Cassette	E7010GG E7010GF	60 minute 120 minute
SVHS VCR Head Cleaner		see VCR user manual for requirements
3.5" MOD MEDIA	E8381AA E8381AB KTZ207077	blank 128 M disk blank 230 M disk blank 1.3 GB MO-disk
3.5" MOD Media Cleaner	2117811	cleans the diskettes
3.5" MOD Head Cleaner Kit	2148392	cleans the drive heads
QIQ Phantom	E8370RB	RMI Grayscale Target Model 403GS
CD-RW Media		(minimum quad speed)
B/W Printer Cleaning Sheet		see printer user manual for requirements
Color Printer Cleaning Sheet		see printer user manual for requirements
Disposable Gloves		
Screwdriver PH0		
Screwdriver PH1		
Screwdriver PH2		

Section 10-5 System Maintenance

10-5-1 Preliminary Checks

The preliminary checks take about 15 minutes to perform. Refer to the system user documentation whenever necessary.

Table 10-4 System Checks

Step	Item	Description
1	Ask & Listen	Ask the customer if they have any problems or questions about the equipment.
2	Paperwork	Fill in the top of the Periodic Maintenance (PM) Inspection Certificate. Note all probes and system options.
3	Power up	Turn the system power on and verify that all fans and peripherals turn on. Watch the displays during power up to verify that no warning or error messages are displayed.
4	Probes	Verify that the system properly recognizes all probes.
5	Displays	Verify proper display on the monitor.
6	Presets	Backup all customer presets on an MO-disk.

10-5-2 Functional Checks (see also Chapter 4)

The functional checks take about 60 minutes to perform. Refer to the system user documentation whenever necessary.

10-5-2-1 System Checks

Table 10-5 System Functional Checks

Step	Item	Description
1	2D Mode	Verify basic B Mode (2D) operation. Check the basic system controls that affect this mode of operation.
2	M Mode	Verify basic M Mode operation. Check the basic system controls that affect this mode of operation.
3	CFM Mode	Verify basic CFM Mode (Color Flow Mode) operation. Check the basic system controls that affect this mode of operation.
4	PD Mode	Verify basic PD Mode (Power Doppler Mode) operation. Check the basic system controls that affect this mode of operation.
5	Doppler Modes	Verify basic Doppler Mode operation (PW and CW if available). Check the basic system controls that affect this mode of operation.
6	3D Mode	Verify basic 3D Mode operation. Check the basic system controls that affect this mode of operation.
7	*Applicable Software Options	Verify the basic operation of all optional modes such as Real Time 4D, VOCAL, Harmonic Imaging and TD (Tissue Doppler). Check the basic system controls that affect each options operation.
8	Keyboard Test	Perform the Keyboard Test Procedure to verify that all keyboard controls are OK.
9	Monitor	Verify basic Monitor display functions.
10	Measurements	Scan a gray scale phantom and use the measurement controls to verify distance and area calculation accuracy. Refer to the Basic User Manual, Chapter 13, for measurement accuracy specifications.

NOTE: * Some software may be considered standard depending upon system model configuration.

10-5-2-2 Peripheral/Option Checks

If any peripherals or options are not part of the system configuration, the check can be omitted. Refer to [Table 3-8, "Approved Peripherals,"](#) on [page 45](#) for a list of approved peripherals.

Table 10-6 Approved Peripheral/Hardware Option Functional Checks

Step	Item	Description
1	VCR	Verify record/playback capabilities of the VCR. Clean heads and covers if necessary.
2	B/W Printer	Verify hardcopy output of the B/W video page printer. Clean heads and covers if necessary.
3	Color Printer	Verify hardcopy output of the Color video page printer. Clean heads and covers if necessary.
4	Line Printer	Verify hardcopy output of the Line printer. Clean heads and covers if necessary.
5	DICOM	Verify that DICOM is functioning properly. Send an image to a DICOM device.
6	Footswitch	Verify that the footswitch is functioning as programed. Clean as necessary.
7	ECG	Verify basic operation with customer.

10-5-3 Input Power

10-5-3-1 Mains Cable Inspection

Table 10-7 Mains Cable Inspection

Step	Item	Description
1	Unplug Cord	Disconnect the mains cable from the wall and system.
2	Inspect	Inspect it and its connectors for damage of any kind.
3	Verify	Verify that the LINE, NEUTRAL and GROUND wires are properly attached to the terminals, and that no strands may cause a short circuit.
4	Verify	Inlet connector retainer is functional.

10-5-4 Cleaning

10-5-4-1 General Cleaning

Table 10-8 General Cleaning

Step	Item	Description
1	Console	Use a fluid detergent in warm water on a soft, damp cloth to carefully wipe the entire system. Be careful not to get the cloth too wet so that moisture does not enter the console.
2	Probe Holder	Clean probe holders (they may need to be soaked to remove excess gel).
3	Monitor	Clean Top surface and Monitor and with a fluid detergent in warm water on a soft, damp cloth.

10-5-5 Physical Inspection

Table 10-9 Physical Checks

Step	Item	Description
1	Labeling	Verify that all system labeling is present and in readable condition.
2	Scratches & Dents	Inspect the console for dents, scratches or cracks.
3	Control Panel	Inspect keyboard and control panel. Note any damaged or missing items.
4	Control Panel Movement	Verify ease of control panel (Operator I/O Panel) movement in acceptable direction. Ensure that it latches in position as required.
5	Wheels & Brakes	Check all wheels and casters for wear and verify operation of foot brake, to stop the unit from moving, and release mechanism. Check all wheel locks and wheel swivel locks for proper operation.
6	Cables & Connectors	Check all internal cable harnesses and connectors for wear and secure connector seating. Pay special attention to footswitch assembly and probe strain or bend reliefs.
7	Shielding & Covers	Check to ensure that all EMI shielding, internal covers, air flow panels and screws are in place. Missing covers and hardware could cause EMI/RFI problems while scanning.
8	External I/O	Check all connectors for damage and verify that the labeling is good.
9	Op Panel Lights	Check for proper operation of all operator panel key illuminations (flash once during system start-up).
10	Monitor Light	Check for proper operation of any monitor lights if available.
11	External Microphone	Check for proper operation of any external microphones by recording an audio test if available.



NOTICE There is no Microphone built in and released for Voluson® 730Pro.

10-5-6 Optional Diagnostic Checks

Optionally you can access the diagnostic software as described in Chapters 5 or 7.
View the error logs and run desired diagnostics.

10-5-7 Probe Maintenance

10-5-7-1 Probe Related Checks

Table 10-10 Probe Related Checks

Step	Item	Description
1	Probe Holder	Clean probe holders (they may need to be soaked to remove excess gel).
2	Probes	Thoroughly check the system probe connectors and remove dust from inside the connector sockets if necessary. Visually check for bent, damaged or missing pins.

10-5-7-2 Basic Probe Care

The Basic User Manual provides a complete description of probe care, maintenance, cleaning and disinfection. Ensure that you are completely familiar with the proper care of GE probes.

Ultrasound probes can be easily damaged by improper handling. Review the Basic User Manual of Voluson® 730Pro for more details. Failure to follow these precautions can result in serious injury and equipment damage. Failure to properly handle or maintain a probe may also void its warranty.

Any evidence of wear indicates the probe cannot be used.

Do a visual check of the probe pins and system sockets before plugging in a probe.

10-5-7-3 Basic Probe Cleaning

Refer to the Basic User Manual of Voluson® 730Pro for details on cleaning.

NOTE: *To help protect yourself from blood borne diseases, wear approved disposable gloves. These are made of nitrile derived from vegetable starch to prevent allergic latex reactions.*

NOTE: *Failure to follow the prescribed cleaning or disinfection procedures will void the probe's warranty. DO NOT soak or wipe the lens with any product not listed in the User Manual. Doing so could result in irreparable damage to the probe. Follow care instructions that came with the probe.*

NOTE: *Disinfect a defective probe before you return it. Be sure to tag the probe as being disinfected.*

Section 10-6 Using a Phantom

Refer to the User Manual of the Phantom for information on using a phantom and quality assurance tests. For measurement accuracy of the system review chapter 13.7 of the Basic User Manual of Voluson® 730Pro. To get comparable results, use Multi-purpose phantom, Model 539-05 from ATS Laboratories Inc.

Section 10-7 Electrical Safety Tests

10-7-1 Safety Test Overview

The electrical safety tests in this section are based on and conform to NFPA 99 (For USA) and IEC 60601-1 Medical Equipment Safety Standards. They are intended for the electrical safety evaluation of cord-connected, electrically operated, patient care equipment. If additional information is needed, refer to the NFPA 99 (For USA) and IEC 60601-1 documents.



WARNING *THE USER MUST ENSURE THAT THE SAFETY INSPECTIONS ARE PERFORMED AT LEAST EVERY 12 MONTHS ACCORDING TO THE REQUIREMENTS OF THE PATIENT SAFETY STANDARD IEC-EN 60601-1. ONLY TRAINED PERSONS ARE ALLOWED TO PERFORM THE SAFETY INSPECTIONS MENTIONED ABOVE.*



CAUTION To avoid electrical shock, the unit under test must not be connected to other electrical equipment. Remove all interconnecting cables and wires. The unit under test must not be contacted by users or patients while performing these tests.



CAUTION Possible risk of infection. Do not handle soiled or contaminated probes and other components that have been in patient contact. Follow appropriate cleaning and disinfecting procedures before handling the equipment.

Test the system, peripherals and probes for leakage current. Excessive leakage current can cause injury or death in sensitive patients. High leakage current can also indicate degradation of insulation and a potential for electrical failure. Do not use probes or equipment having excessive leakage current.

To minimize the risk that a probe may shock someone the customer should:

- Not use a probe that is cracked or damaged in any way
- Check probe leakage current:
 - * once a year on surface probes
 - * twice a year on endocavitary probes
 - * whenever probe damage is suspected

10-7-2 GEMS Leakage Current Limits

The following limits are summarized for NFPA 99 (For USA) and IEC 60601-1 Medical Equipment Safety Standards. These limits are GEMS standards and in some cases are lower than the above standards listed.

Table 10-11 Chassis Leakage Current Limits—Accessible Metal Surfaces

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral
USA	N/A	0.3 mA	0.3 mA	N/A
Other	0.1 mA	0.5 mA	0.5 mA	0.5 mA

Table 10-12 Type BF Applied Part Leakage Current Limits - Non-Conductive (Floating) Surface and Cavity Probes

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral	*Mains Applied
USA	0.05 mA	0.05 mA	0.05 mA	0.05 mA	N/A
Other	0.1 mA	0.5 mA	0.5 mA	0.5 mA	5.0 mA

Table 10-13 Type CF Applied Part Leakage Current Limits - Surgical Probes and ECG Connections

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral	*Mains Applied
USA	0.01 mA	0.05mA	0.05 mA	N/A	0.025 mA
Other	0.01 mA	0.05 mA	0.05 mA	0.05 mA	0.05 mA

NOTE: **Mains Applied refers to the sink leakage test where mains (supply) voltage is applied to the part to determine the amount of current that will pass (or sink) to ground if a patient contacted mains voltage.*

The following tests are performed at the factory and should be performed at the site. These tests are: grounding continuity, chassis leakage current, probe leakage current, and ECG leakage current. All measurements are made with an electrical safety analyzer.

10-7-3 Outlet Test - Wiring Arrangement - USA & Canada

Test all outlets in the area for proper grounding and wiring arrangement by plugging in the neon outlet tester and noting the combination of lights that are illuminated. Any problems found should be reported to the hospital immediately and the receptacle should not be used.

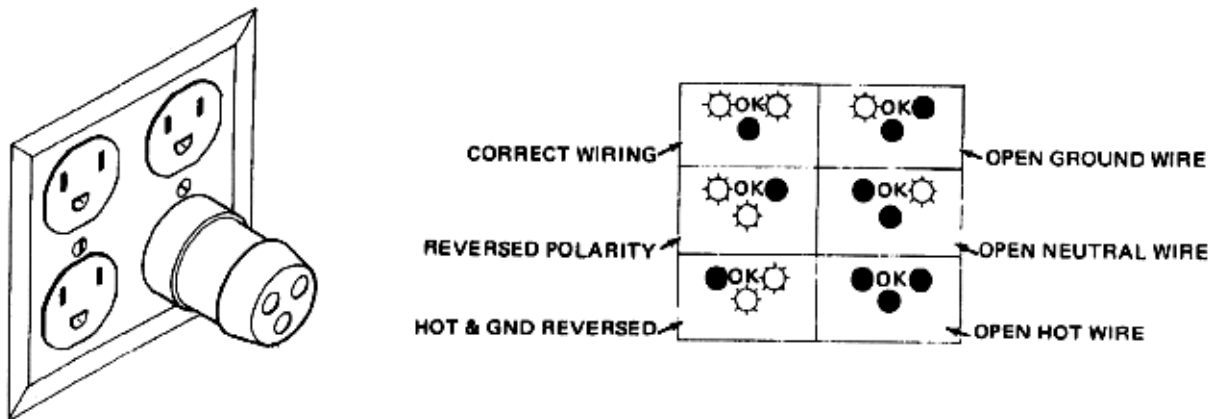


Figure 10-1 Typical Outlet Tester

NOTE: No outlet tester can detect the condition where the Neutral (grounded supply) conductor and the Grounding (protective earth) conductor are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.

10-7-4 Grounding Continuity



CAUTION Electric Shock Hazard. The patient must not be contacted to the equipment during this test

Measure the resistance from the third pin of the attachment plug to the exposed metal parts of the case. The ground wire resistance should be less than **0.2 ohms**. Reference the procedure in the IEC 601-1.1.

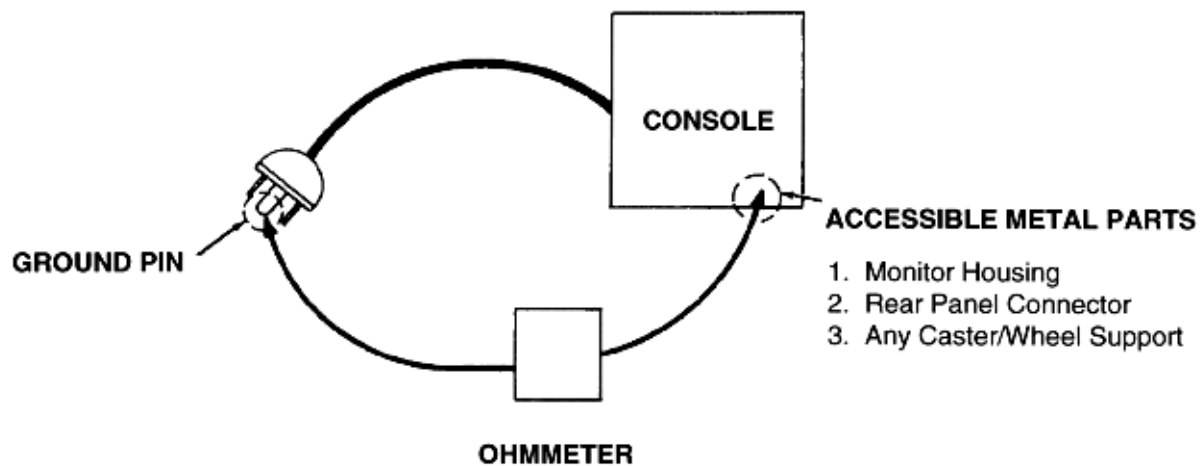


Figure 10-2 Ground Continuity Test

10-7-4-1 Meter Procedure

Follow these steps to test the ground wire resistance.

- 1.) Turn the Voluson® 730Pro unit OFF.
- 2.) Plug the unit into the meter, and the meter into the tested AC wall outlet.
- 3.) Plug the black chassis cable into the meter's "CHASSIS" connector and attach the black chassis cable clamp to an exposed metal part of the Voluson® 730Pro unit.
- 4.) Set the meter's "FUNCTION" switch to the RESISTANCE position.
- 5.) Set the meter's "POLARITY" switch to the OFF (center) position.
- 6.) Measure and record the ground wire resistance.

10-7-5 Chassis Leakage Current Test

10-7-5-1 Definition

This test measures the current that would flow in a grounded person who touched accessible metal parts of the bedside station if the ground wire should break. The test verifies the isolation of the power line from the chassis. The meter is connected from accessible metal parts of the case to ground. Measurements should be made with the unit On and Off, with the power line polarity Normal and Reversed. Record the highest reading.



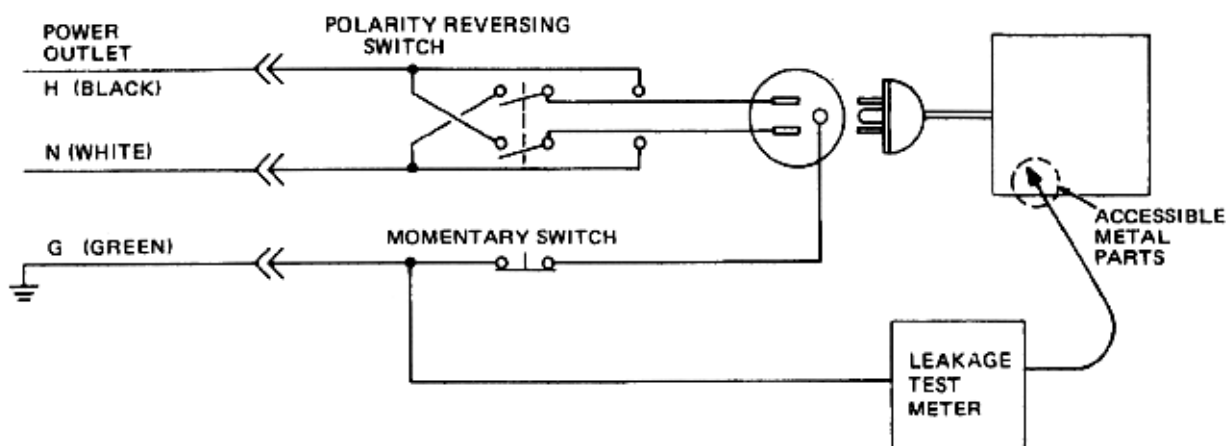
CAUTION Electric Shock Hazard. When the meter's ground switch is OPEN, don't touch the unit!



CAUTION Equipment damage possibility. Never switch the Polarity and the status of Neutral when the unit is powered ON. Be sure to turn the unit power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch. Otherwise, the unit may be damaged.

10-7-5-2 Generic Procedure

The test verifies the isolation of the power line from the chassis. The testing meter is connected from accessible metal parts of the case to ground. Measurements should be made with the unit ON and OFF, with the power line polarity Normal and Reversed. Record the highest reading of current.



**Figure 10-3 Set Up for Chassis Source Leakage Current,
IEC 601-1 Clause 19 - Continuous Leakage Currents and
Patient, Auxiliary Currents**

When using the Microguard or a similar test instrument, its power plug may be inserted into the wall outlet and the equipment under test is plugged into the receptacle on the panel of the meter. This places the meter in the grounding conductor and the current flowing from the case to ground will be indicated in any of the current ranges. The maximum allowable limit for chassis source leakage is shown in [Table 10-11](#).

7.) Follow the test conditions described for respective test points shown in [Table 10-14](#).

Table 10-14 Chassis Leakage Current Test Condition

TEST	CONDITION
1	Mounting screw for probe receptacle
2	Wheel support
3	Mounting screw for CRT housing
4	Mounting screw for peripheral plugged into unit
5	Mounting screw for other peripheral powered by unit

8.) Keep a record of the results with other hard copies of PM data kept on site.

10-7-5-3 Data Sheet for Chassis Source Leakage Current

The test passes when all readings measure less than the value shown in [Table 10-11](#).
Record all data on the Ultrasound Inspection Certificate.

Table 10-15 Typical Data Sheet for Chassis Source Leakage Current

Unit Power	Tester Polarity Switch	Tester Neutral or Ground Switch	Test 1 Probe Connector	Test 2 Wheel	Test 3 CRT	Optional Test 4	Optional Test 5
Enter Name of tested peripheral here:							
ON	NORM	OPEN					
ON	NORM	CLOSED					
ON	REV	OPEN					
ON	REV	CLOSED					
OFF	NORM	OPEN					
OFF	NORM	CLOSED					
OFF	REV	OPEN					
OFF	REV	CLOSED					

10-7-6 Isolated Patient Lead (Source) Leakage—Lead to Ground

10-7-6-1 Definition

This test measures the current which would flow to ground from any of the isolated ECG leads. The meter simulates a patient who is connected to the monitoring equipment and is grounded by touching some other grounded surface. Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the ultrasound console Off and On. For each combination the operating controls, such as the lead switch, should be operated to find the worst case condition.



CAUTION Equipment damage possibility. Never switch the Polarity when the unit is powered ON. Be sure to turn the unit power OFF before switching the polarity using the POLARITY switch. Otherwise, the unit may be damaged.

10-7-6-2 **Generic Procedure**

Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the unit Off and On. For each combination, the operating controls such as the lead switch should be operated to find the worst case condition.

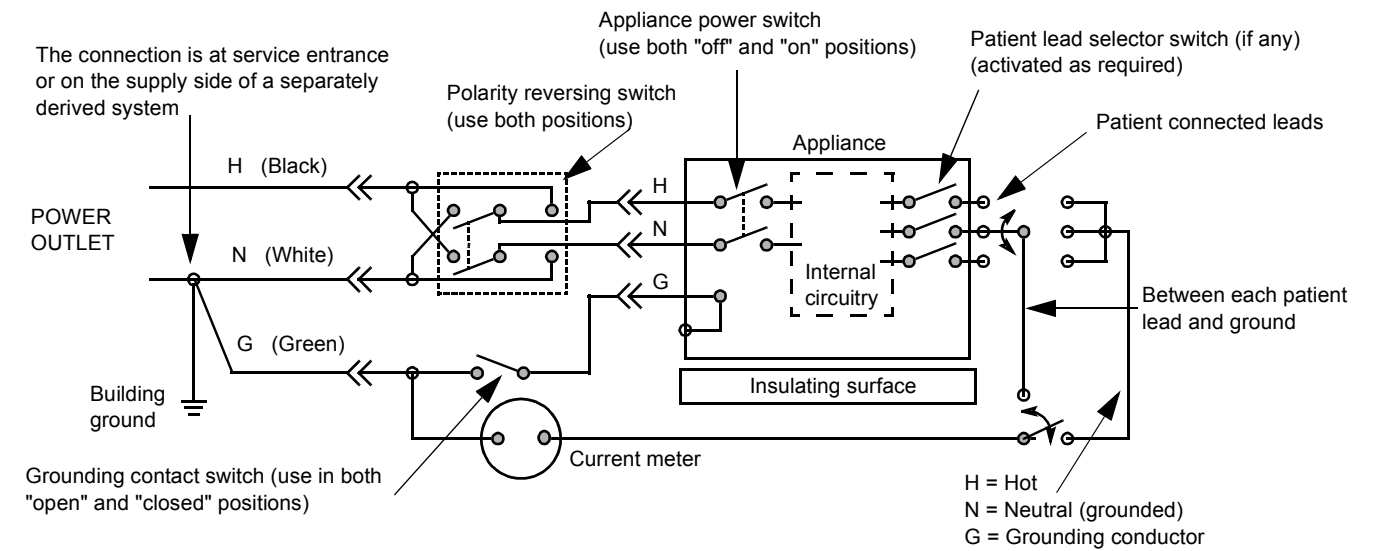


Figure 10-4 **Test Circuit for Measuring Non-Isolated Patient Leads**

Table 10-16 **Testing Power Conditions**

ECG Power	Meter's Polarity Switch	Meter's Neutral Switch
ON	NORM	CLOSED
ON	NORM	OPEN
ON	REVERSE	CLOSED
ON	REVERSE	OPEN
OFF	NORM	CLOSED
OFF	NORM	OPEN
OFF	REVERSE	CLOSED
OFF	REVERSE	OPEN

10-7-7 **Isolated Patient Lead (Source) Leakage–Lead to Lead**

Reference the procedure in the IEC 60601-1. When using the Dale 600, switch the meter's function selector to the LEAD-LEAD position. Select and test each of the five ECG lead positions (except ALL) on the LEAD selector, testing each to the power condition combinations found in the table. Record the highest leakage current measured.

10-7-8 Isolated Patient Lead (Sink) Leakage-Isolation Test

Reference the procedure in the IEC 60601-1. When using the Dale 600, switch the meter's function selector to the LEAD-ISO. Select the ALL position on the lead selector. Depress the rocker switch to ISO TEST to test lead isolation.



CAUTION Line voltage is applied to the ECG leads during this test. To avoid possible electric shock hazard, the system being tested must not be touched by patients, users or anyone while the ISO TEST switch is depressed.

NOTE: *It is not necessary to test each lead individually or power condition combinations as required in previous tests.*

10-7-8-1 Data Sheet for ECG Leakage Current

The test passes when all readings measure less than the value shown in the table below.
Record all data on the Ultrasound Inspection Certificate.

Table 10-17 Maximum Allowance Limit for ECG Leakage Current

	AC Power Source	Maximum Allowance Limit	
		GROUND OPEN	GROUND CLOSED
Patient Lead to Ground Leakage Current Test and Patient Lead to Lead Leakage Current Test	115V	10uA	10uA
	220/240V	500uA	10uA

Table 10-18 Maximum Allowance Limit for ECG Leakage Current

	AC Power Source	Maximum Allowance Limit
Patient Lead Isolation Current Test	115V	20uA
	220/240V	5mA

Table 10-19 Typical Data Sheet for ECG Leakage Current

ECG Power	Tester Polarity Switch	Tester Ground Switch	Tester Lead Selector				
			RL	RA	LA	LL	C
ON	NORM	CLOSED					
ON	REVERSE	CLOSED					
ON	NORM	OPEN					
ON	REVERSE	OPEN					
OFF	NORM	CLOSED					
OFF	REVERSE	CLOSED					
OFF	NORM	OPEN					
OFF	REVERSE	OPEN					

10-7-9 Probe Leakage Current Test

10-7-9-1 Definition

This test measures the current that would flow to ground from any of the probes through a patient who is being scanned and becomes grounded by touching some other grounded surface.

10-7-9-2 Generic Procedure

Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the unit Off and On. For each combination, the probe must be active to find the worst case condition.

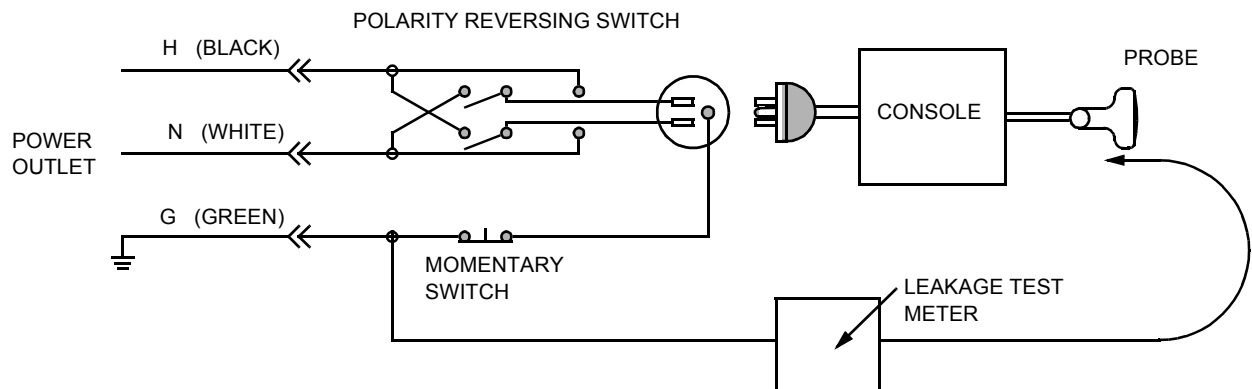


Figure 10-5 Set Up for Probe Leakage Current

NOTE: Each probe will have some amount of leakage current, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement.

10-7-9-3 No Meter Probe Adapter Procedure

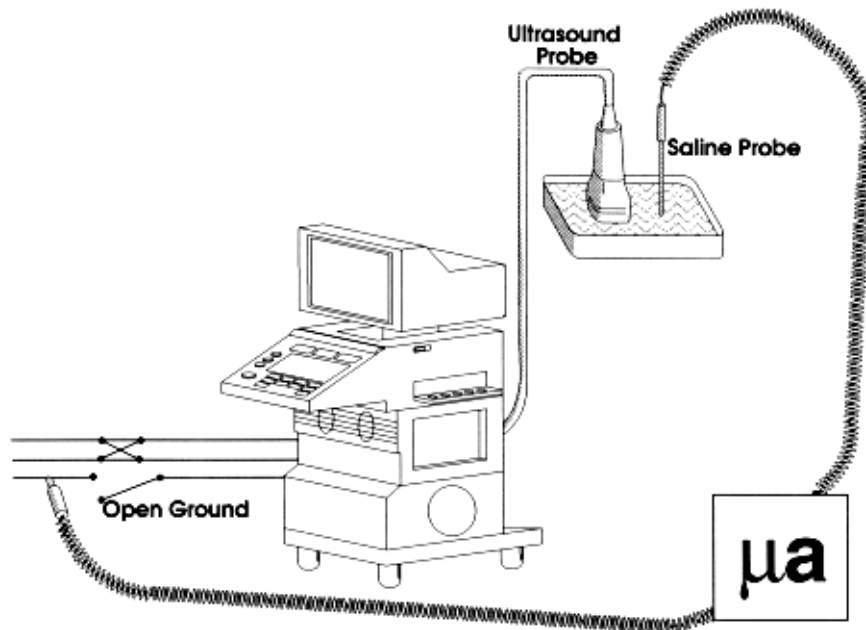


Figure 10-6 Check Without Probe Adapter

Follow these steps to test each transducer for leakage current.

- 1.) Turn the Voluson® 730Pro unit OFF.
- 2.) Plug the unit into the test meter, and the meter into the tested AC wall outlet.
- 3.) Plug the external probe into the meter's "EXTERNAL" connector.
- 4.) Set the meter's "FUNCTION" switch to EXTERNAL position.
- 5.) Connect the probe for test with the connector of the console.
- 6.) Add the saline probe and the imaging area of the probe into the saline bath.
- 7.) Have unit power ON for the first part; turn it OFF for the second half.
- 8.) Depress the ISO TEST rocker switch and record the highest current reading.
- 9.) Follow the test conditions described in [Table 10-20](#) for every transducer.
- 10.) Keep a record of the results with other hand copies of PM data.

10-7-9-4 Data Sheet for Transducer Source Leakage Current

The test passes when all readings measure less than values shown in [Table 10-12](#) and [Table 10-13](#).
Record all data on the Ultrasound Inspection Certificate.



CAUTION Equipment damage possibility. Never switch the Polarity and the status of Neutral when the unit is powered ON. Be sure to turn the unit power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch. Otherwise, the unit may be damaged

Table 10-20 Typical Data Sheet For Transducer Source Leakage Current

Transducer Tested:			
Unit Power	Tester Power Polarity Switch	Tester GROUND or NUETRAL Switch	Measurement
ON	NORM	OPEN	
ON	NORM	CLOSED	
ON	REV	OPEN	
ON	REV	CLOSED	
OFF	NORM	OPEN	
OFF	NORM	CLOSED	
OFF	REV	OPEN	
OFF	REV	CLOSED	

Section 10-8 When There's Too Much Leakage Current...

CHASSIS FAILS

Check the ground on the power cord and plug for continuity. Ensure the ground is not broken, frayed, or intermittent. Replace any defective part.

Tighten all grounds. Ensure star washers are under all ground studs.

Inspect wiring for bad crimps, poor connections, or damage.

Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.

NOTE: *No outlet tester can detect the condition where the white neutral wire and the green grounding wire are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.*

PROBE FAILS

Test the probe in another connector to isolate if the fault lies with the probe or the scanner.

NOTE: *Each probe will have some amount of leakage, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement. The maximum allowable leakage current for body surface contact probe differs from inter-cavity probe. Be sure to enter the correct probe type in the appropriate space on the check list.*

If excessive leakage current is slot dependent, inspect the system connector for bent pins, poor connections, and ground continuity.

If the problem remains with the probe, replace the probe.

PERIPHERAL FAILS

Tighten all grounds. Ensure star washers are under all ground studs.

Inspect wiring for bad crimps, poor connections, or damage.

STILL FAILS

If all else fails, begin isolation by removing the probes, external peripherals, then the on board ones, one at a time while monitoring the leakage current measurement.

NEW UNIT

If the leakage current measurement tests fail on a new unit and if situation can not be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.

ECG FAILS

Inspect cables for damage or poor connections.

ULTRASOUND INSPECTION CERTIFICATE

Customer Name:		System ID:		Dispatch Number / Date Performed:		Warranty/Contract/HBS	
System Type		Model Number:		Serial Number:		Manufacture Date:	
Probe 1:	Frequency:	Scan Format*:		Model Number:		Serial Number:	
Probe 2:	Frequency:	Scan Format*:		Model Number:		Serial Number:	
Probe 3:	Frequency:	Scan Format*:		Model Number:		Serial Number:	
Probe 4:	Frequency:	Scan Format*:		Model Number:		Serial Number:	
Probe 5:	Frequency:	Scan Format*:		Model Number:		Serial Number:	
Probe 6:	Frequency:	Scan Format*:		Model Number:		Serial Number:	
Probe 7:	Frequency:	Scan Format*:		Model Number:		Serial Number:	
Probe 8:	Frequency:	Scan Format*:		Model Number:		Serial Number:	
Probe 9:	Frequency:	Scan Format*:		Model Number:		Serial Number:	

* Scan Format: Phased Array, Linear Array, Curved Array, Mechanical Array or Other

FUNCTIONAL CHECKS

PHYSICAL INSPECTION AND CLEANING

Functional Check (if applicable)	OK? or N/A	Physical Inspection and Cleaning (if applicable)	Inspect	Clean
B-Mode Function		Console		
M-Mode Function		Monitor		
Doppler Modes Functions		Touch Panel		
Color Modes Functions		Air Filter		
3D-Mode Function		Probe Holders		
Applicable Software Options		External I/O		
Applicable Hardware Options		Wheels, Brakes & Swivel Locks		
Control Panel		Cables and Connectors		
Monitor		Approved Peripherals (VCR, CD-RW, MOD, Printers)		
Touch Panel				
Measurement Accuracy				

COMMENTS:

ELECTRICAL SAFETY

Electrical Test Performed	Max Value Allowed	Value Measured	OK?	Comments
Outlet (correct ground & wiring config.)				
System Ground Continuity				
Chassis Source Leakage Current - Probe				
Chassis Source Leakage Current - Wheel				
Chassis Source Leakage Current - CRT				
Patient Lead Source Leakage (Lead to Ground)				
Patient Lead Source Leakage (Lead to Lead)				
Patient Lead Source Leakage (Isolation)				
Peripheral 1 Leakage Current				
Peripheral 1 Ground Continuity				
Peripheral 2 Leakage Current				
Peripheral 2 Ground Continuity				
Peripheral 3 Leakage Current				
Peripheral 3 Ground Continuity				

PROBES

Probe Number (from previous page)	Max Value Allowed	Max Value Measured	OK?	Comments
Probe 1:				
Probe 2:				
Probe 3:				
Probe 4:				
Probe 5:				
Probe 6:				
Probe 7:				
Probe 8:				
Probe 9:				

Final Check. All system covers are in place. System scans with all probes as expected.

Accepted by: _____

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