



***GE Medical Systems***

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# **Technical Publication**

**Direction 2317229**

**Revision 3**

**GE Medical Systems**

**LOGIQ™ 180 Basic Service Manual**

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# Important Precautions

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- 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.

## WARNING

- DO NOT ATTEMPT TO SERVICE THE EQUIPMENT UNLESS THIS SERVICE MANUAL HAS BEEN CONSULTED AND IS UNDERSTOOD.
- FAILURE TO HEED THIS WARNING MAY RESULT IN INJURY TO THE SERVICE PROVIDER, OPERATOR OR PATIENT FROM ELECTRIC SHOCK, MECHANICAL OR OTHER HAZARDS.

- CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.
- SI LE TECHNICIEN DU CLIENT A BESOIN DE CE MANUEL DANS UNE AUTRE LANGUE QUE L'ANGLAIS, C'EST AU CLIENT QU'IL INCOMBE DE LE FAIRE TRADUIRE.

## AVERTISSEMENT

- NE PAS TENTER D'INTERVENTION SUR LES ÉQUIPEMENTS TANT QUE LE MANUEL SERVICE N'A PAS ÉTÉ CONSULTÉ ET COMPRIS.
- LE NON-RESPECT DE CET AVERTISSEMENT PEUT ENTRAÎNER CHEZ LE TECHNICIEN, L'OPÉRATEUR OU LE PATIENT DES BLESSURES DUES À DES DANGERS ÉLECTRIQUES, MÉCANIQUES OU AUTRES.

- DIESES KUNDENDIENST-HANDBUCH EXISTIERT NUR IN ENGLISCHER SPRACHE.
- FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENÖTIGT, IST ES AUFGABE DES KUNDEN FÜR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.

## WARNUNG

- VERSUCHEN SIE NICHT, DAS GERÄT ZU REPARIEREN, BEVOR DIESES KUNDENDIENST-HANDBUCH NICHT ZU RATE GEZOGEN UND VERSTANDEN WURDE.
- WIRD DIESE WARNUNG NICHT BEACHTET, SO KANN ES ZU VERLETZUNGEN DES KUNDENDIENSTTECHNIKERS, DES BEDIENERS ODER DES PATIENTEN DURCH ELEKTRISCHE SCHLÄGE, MECHANISCHE ODER SONSTIGE GEFAHREN KOMMEN.

**AVISO**

- ESTE MANUAL DE SERVICIO SÓ LO EXISTE EN INGLÉS.
- SI ALGÚN PROVEEDOR DE SERVICIOS AJENO A GEMS SOLICITA UN IDIOMA QUE NO SEA EL INGLÉS, ES RESPONSABILIDAD DEL CLIENTE OFRECER UN SERVICIO DE TRADUCCIÓN.
- NO SE DEBERÁ DAR SERVICIO TÉCNICO AL EQUIPO, SIN HABER CONSULTADO Y COMPRENDIDO ESTE MANUAL DE SERVICIO.
- LA NO OBSERVANCIA DEL PRESENTE AVISO PUEDE DAR LUGAR A QUE EL PROVEEDOR DE SERVICIOS, EL OPERADOR O EL PACIENTE SUFRAN LESIONES PROVOCADAS POR CAUSAS ELÉCTRICAS, MECÁNICAS O DE OTRA NATURALEZA.

**ATENÇÃO**

- 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 TENTAR 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.

**AVVERTENZA**

- IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.
- SE UN ADDETTO ALLA MANUTENZIONE ESTERNO ALLA GEMS RICHIEDE IL MANUALE IN UNA LINGUA DIVERSA, IL CLIENTE È TENUTO A PROVVEDERE DIRETTAMENTE ALLA TRADUZIONE.
- 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.

このサービスマニュアルには英語版しかありません。

GEMS以外でサービスを担当される業者が英語以外の言語を要求される場合、翻訳作業はその業者の責任で行うものとさせていただきます。

**警告**

このサービスマニュアルを熟読し理解せずに、装置のサービスを行わないで下さい。

この警告に従わない場合、サービスを担当される方、操作員あるいは患者さんが、感電や機械的又はその他の危険により負傷する可能性があります。

**本维修手册仅存有英文本。**

**非 GEMS 公司的维修员要求非英文本的维修手册时，客户需自行负责翻译。**

**注意：**

**未详细阅读和完全了解本手册之前，不得进行维修。忽略本注意事项会对维修员，操作员或病人造成触电，机械伤害或其他伤害。**

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## DAMAGE IN TRANSPORTATION - FOR USA ONLY

All packages should be closely examined at time of delivery. If damage is apparent write "Damage In Shipment" on ALL copies of the freight or express bill BEFORE delivery is accepted or "signed for" by a GE representative or hospital receiving agent. Whether noted or concealed, damage MUST be reported to the carrier immediately upon discovery, or in any event, within 14 days after receipt, and the contents and containers held for inspection by the carrier. A transportation company will not pay a claim for damage if an inspection is not requested within this 14 day period.

### For USA Only

Call Traffic and Transportation, Milwaukee, WI (262) 827-3468 or 8\*285-3468 immediately after damage is found. At this time be ready to supply name of carrier, delivery date, consignee name, freight or express bill number, item damaged and extent of damage.

### For USA Only

Complete instructions regarding claim procedure are found in Section "S" of the Policy And Procedures Bulletins.

## CERTIFIED ELECTRICAL CONTRACTOR STATEMENT - FOR USA ONLY

All electrical Installations that are preliminary to positioning of the equipment at the site prepared for the equipment shall be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations and testing shall be performed by qualified GE Medical Systems personnel. In performing all electrical work on these products, GE will use its own specially trained field engineers. All of GE's electrical work on these products will comply with the requirements of the applicable electrical codes.

The purchaser of GE equipment shall only utilize qualified personnel (i.e., GE's field engineers, personnel of third-party service companies with equivalent training, or licensed electricians) to perform electrical servicing on the equipment.

## OMISSIONS & ERRORS

If there are any omissions, errors or suggestions for improving this documentation, please contact the GE Medical Systems Global Documentation Group with specific information listing the system type, manual title, part number, revision number, page number and suggestion details. E-mail the information to : [UltrasoundDocError@med.ge.com](mailto:UltrasoundDocError@med.ge.com)

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

# Revision History

Revision	Date	Reason for change
0	Oct 29, 2002	Initial Release
1	Mar 19, 2003	Address Change
2	Apr 29, 2003	add console for Korea
3	May 27, 2004	Change rating plate label

# List of Effected Pages

Pages	Revision	Pages	Revision	Pages	Revision
Title Page	3	Chapter 2 - Pre-Installation pages 2-1 to 2-6	3	Chapter 7 - Diagnostics/ Troubleshooting pages 7-1 to 7-14	3
Important Precautions pages i to iv	3	Chapter 3 - Installation pages 3-1 to 3-26	3	Chapter 8 - Replacement Procedures pages 8-1 to 8-2	3
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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 this ultrasound machine. The service provider must read and understand all the information presented here before installing or servicing a unit.

### CONTENTS IN CHAPTER 1

Table 1-1 Contents in Chapter 1

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1-2	Important Conventions	1-3
1-3	Safety Considerations	1-7
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1-5	Customer Assistance	1-17

#### 1-1-2 Purpose of Service Manual

This Service Manual provides installation and service information for the LOGIQ™ 180 Ultrasound Scanning System and contains the following chapters:

- 1.) **Chapter 1, Introduction:** Contains a content summary and warnings.
- 2.) **Chapter 2, Pre-Installation:** Contains any pre-installation requirements for the LOGIQ™ 180.
- 3.) **Chapter 3, Installation:** Contains installation procedure with installation checklist.
- 4.) **Chapter 4, Functional Checks:** Contains functional checks that must be performed as part of the installation, or as required during servicing and periodic maintenance.
- 5.) **Chapter 5, Theory:** Contains block diagrams and functional explanations of the electronics.
- 6.) **Chapter 6, Service Adjustments:** Contains instructions on how to make any available adjustments to the LOGIQ™ 180.
- 7.) **Chapter 7, Diagnostics:** Provides procedures for running and diagnostic or related routines for the LOGIQ™ 180.
- 8.) **Chapter 8, Replacement Procedures:** Provides disassembly procedures and reassembly procedures for all changeable FRU.
- 9.) **Chapter 9, Renewal Parts:** Contains a complete list of replacement parts for the LOGIQ™ 180.
- 10.) **Chapter 10, Quality Assurance:** Provides periodic maintenance procedures for the LOGIQ™ 180.

### 1-1-3 Typical Users of the Basic Service Manual

- Service Personnel (installation, maintenance, etc.).
- Hospital's Service Personnel
- Architects (Some parts of the Pre Installation Chapter)

### 1-1-4 LOGIQ™ 180 Models Covered by this Manual

Table 1-2 LOGIQ™ 180 Models Covered in this Manual

Part Number	Description	Comments
H41542LA	LOGIQ™ 180, 220V - 240V	LOGIQ™ 180 for China
H41542LB	LOGIQ™ 180, 220V - 240V	LOGIQ™ 180 for Europe
H41542LC	LOGIQ™ 180, 220V - 240V	LOGIQ™ 180 for India
H41542LD	LOGIQ™ 180, 220V - 240V	LOGIQ™ 180 for Korea

### 1-1-5 Purpose of Operator Manual(s)

The Operator Manual(s) should be fully read and understood before operating the LOGIQ™ 180 and also kept near the unit for quick reference.

## Section 1-2 Important Conventions

### 1-2-1 Conventions Used in Book

#### Model Designations.

This manual covers the LOGIQ™ 180 scanners.

#### Icons.

Pictures, or icons, are used wherever they will 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 three 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 or 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.

**NOTE:** *Notes provide important information about an item or a procedure.  
Be sure to read the note; the 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
		

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

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

AVOID STATIC ELECTRICITY	TAG AND LOCK OUT	WEAR EYE PROTECTION
		

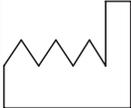
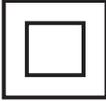
### 1-2-3 Product Icons

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 Date of manufacture Model and serial numbers Electrical ratings	Rear of console near power inlet
Type/Class Label	Used to indicate the degree of safety or protection.	
IP Code (IPX1)	Indicates the degree of protection provided by the enclosure per IEC 529. IPX1 indicates drip proof.	Footswitch
	Equipment Type BF (man in the box symbol) IEC 878-02-03 indicates B Type equipment having a floating applied part.	Probe connectors and PCG connector
Device Listing/Certification Labels	Laboratory logo or labels denoting conformance with industry safety standards such as UL or IEC.	Rear of console
CAUTION - This unit weighs...Special care must be used to avoid..."	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.	On the console where easily seen during transport
"DANGER - Risk of explosion used in..."	The system is not designed for use with flammable anesthetic gases.	Rear of console
	"CAUTION" The equilateral triangle is usually used in combination with other symbols to advise or warn the user.	Various
	ATTENTION - Consult accompanying documents " is intended to alert the user to refer to the operator manual or other instructions when complete information cannot be provided on the label.	Various
	"CAUTION - Dangerous voltage" (the lightning flash with arrowhead in equilateral triangle) is used to indicate electric shock hazards.	Various

Table 1-5 Product Icons

LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
	"Mains OFF" Indicates the power off position of the mains power switch.	Rear of system adjacent to mains switch
	"Mains ON" Indicates the power on position of the mains power switch. "ON" Indicates the power on position of the power switch. <b>CAUTION</b> <b>This Power Switch DOES NOT ISOLATE Mains Supply</b>	
	"Protective Earth" Indicates the protective earth (grounding) terminal.	
	"Non-ionizing Radiation" indicates that the system applies RF energy.	Rear of console near power inlet
	Date of manufacture. The date could be a year, year and month, or year, month and day, as appropriate. See ISO 8601 for date formats.	Rating Plate
	Catalog or model number.	Rating Plate
	Serial number	Rating Plate
	Equipment Class II. For products not relying protective earth such as products having double or reinforced insulation.	Rating Plate
	Direct Current. For products to be powered from a DC supply.	Rating Plate

## 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.

#### **CARE FULLY READ ALL THE WARNINGS LISTED BELOW.**

- 1.) Read the LOGIQ™ 180 Operator Manual thoroughly before operating the system and keep at hand for ready reference.
- 2.) Although the ultrasound energy transmitted from the LOGIQ™ 180 transducer is within AIUM/ NEMA standards, unnecessary exposure should be avoided. Only trained personnel should operate/service the LOGIQ™ 180.
- 3.) To avoid electrical shock, use only the supplied power cords and connect them to properly grounded power Sock et. Do not use a three pin to two pin adapter. This defeats the purpose of safety grounding. System should be operated within the voltage limits.
- 4.) Probes are fragile, please handle with care. A damaged probe may cause an electrically hazardous condition when coupled to the human body. A damaged probe will not produce a desirable image. A damaged probe has to be discarded. It cannot be repaired or reused. Do not allow the lens to come into contact with a sharp object or to be knocked against an object.
- 5.) Do not place liquids on or above the console. If the liquid spills, it may come in to contact with live parts and can cause an electric shok. This system contains no operator serviceable components. To prevent shock, do not re move any covers or panels. Should problems or malfunctions occur, unplug the power cord. Only qualified Service personnel should service the system. Accidentally coming in contact with the electrical circuits inside the housing could cause serious injury.
- 6.) Do not use Defibrillators when the LOGIQ™ 180 is operated.
- 7.) Concerning outside markings, refer to ILLUSTRATION 1-1.

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

### 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 LOGIQ™ 180 Training Seminar 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** *The LOGIQ™ 180 weights 70kg or more, depending on installed peripherals, when ready for use. Care must be used when moving it or replacing its parts. Failure to follow the precautions listed below could result in injury, uncontrolled motion and costly damage.*

**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.*

### 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

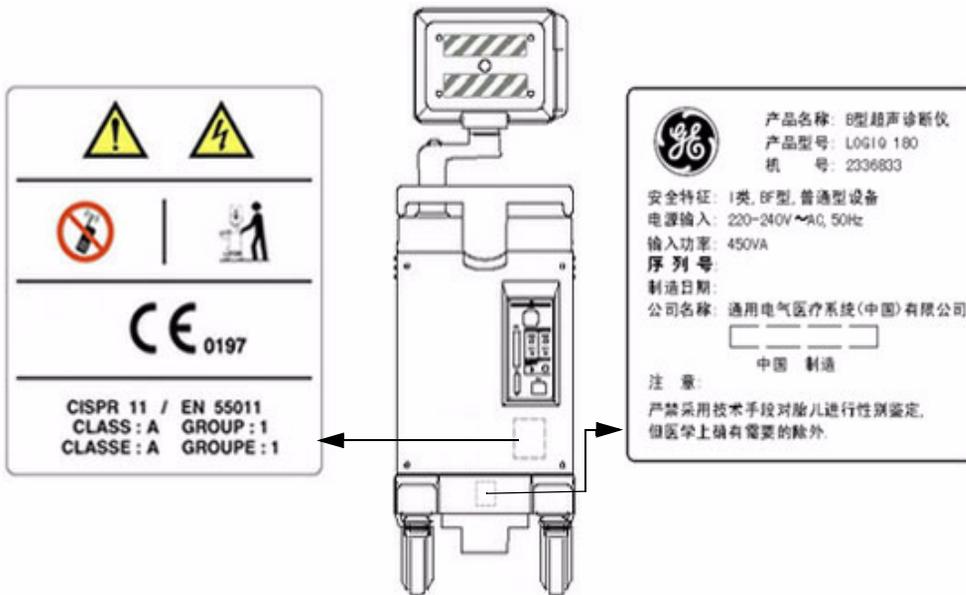


Figure 1-1 Console Labels Location (for China)

Labels Locations (cont'd)

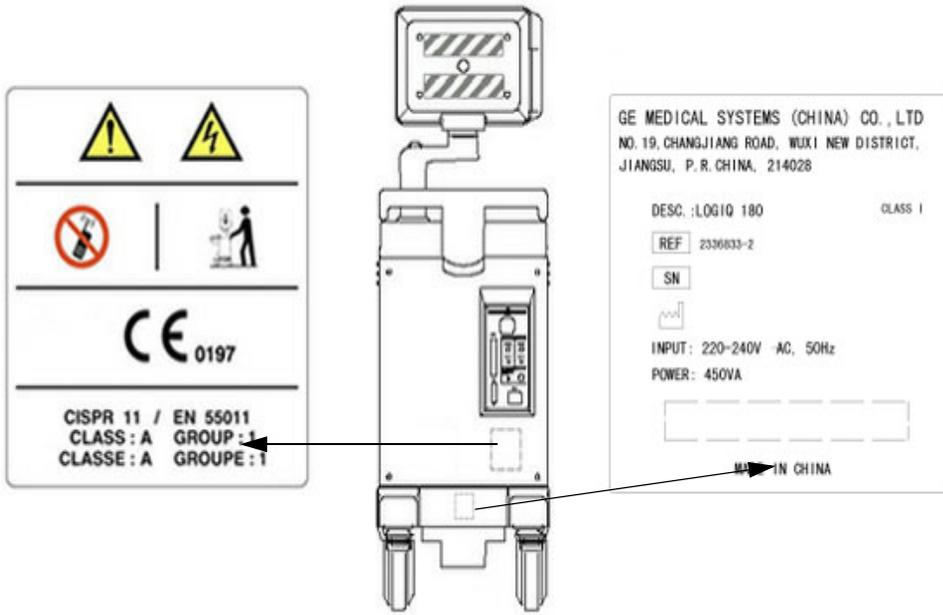


Figure 1-2 Console Labels Location (Europe)

### Labels Locations (cont'd)

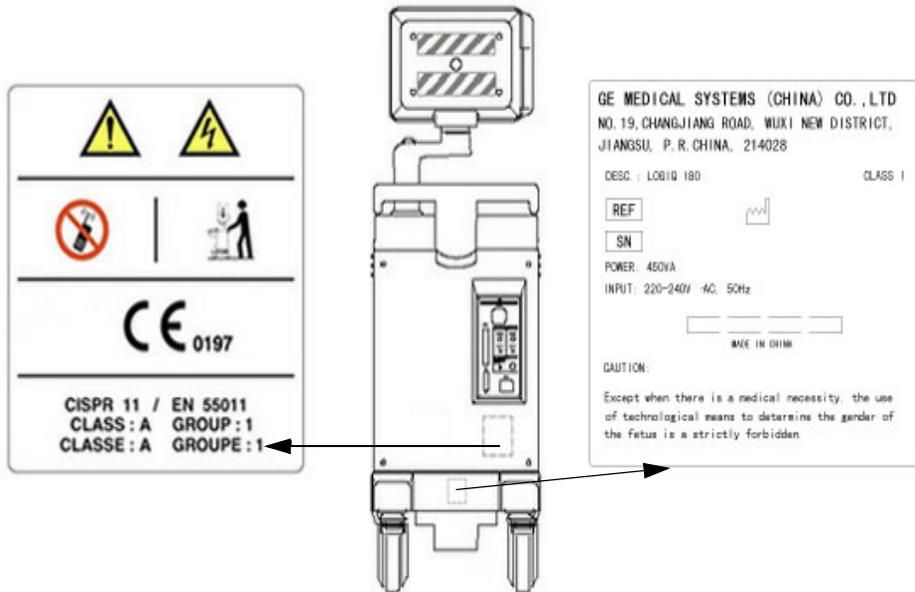


Figure 1-3 Console Labels Location (India)

Labels Locations (cont'd)

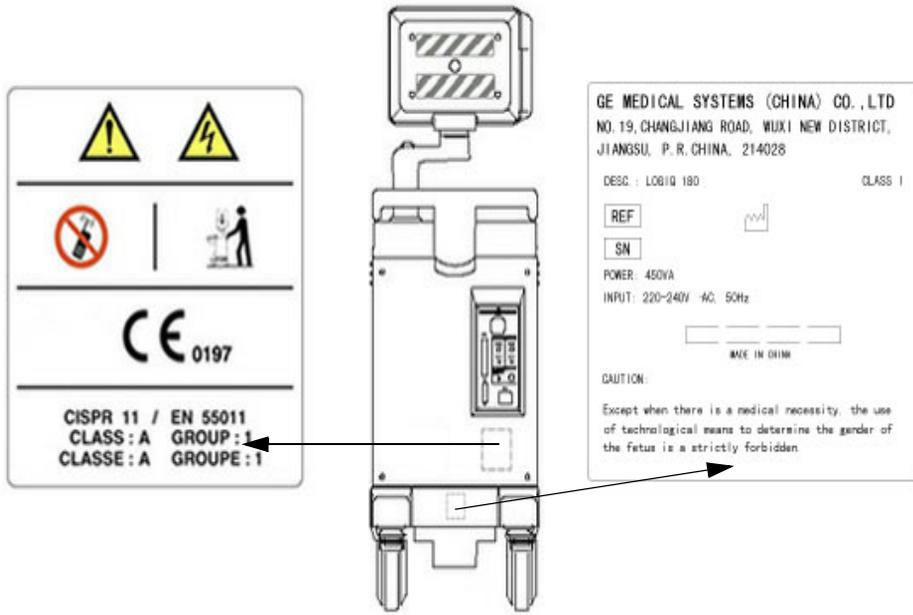


Figure 1-4 Console Labels Location (Korea)

Labels Locations (cont'd)

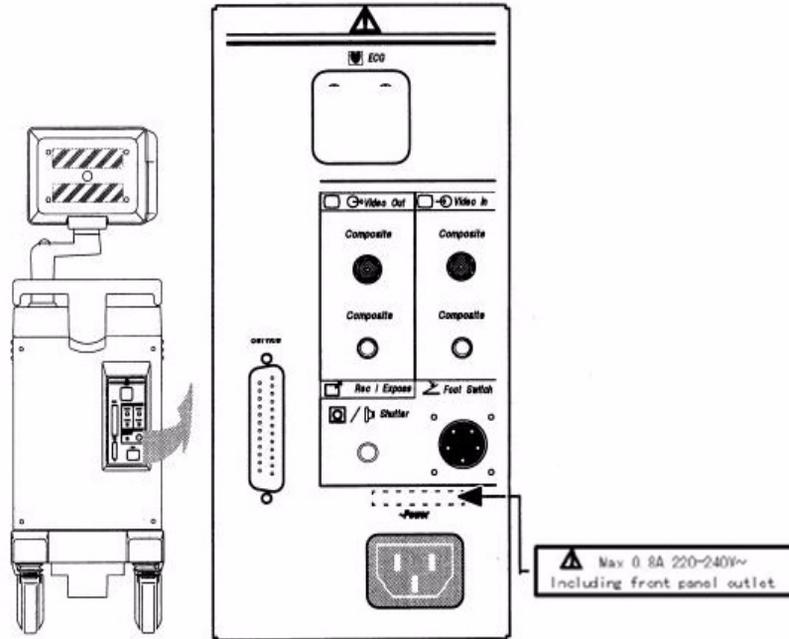


Figure 1-5 Console Labels

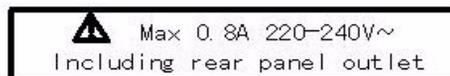


Figure 1-6 Printer Panel label

### 1-3-6 Dangerous Procedure Warnings

Warnings, such as the example below, precede potentially dangerous procedures through our 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 interdicting additional hazards, do not install substitute parts or perform any unauthorized modification of the equipment.***

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

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

### 1-3-8 Classification

Type of protection against electric shock: Class I EQUIPMENT \*1

Degree of protection against electric shock: Type BF EQUIPMENT\*\*2

#### 1.) \*Class I EQUIPMENT

EQUIPMENT in which protection against electric shock does not rely on BASIC INSULATION only, but which includes an additional safety precaution in that means are provided for the connection of the EQUIPMENT to the protective earth conductor in the fixed wiring of the installation in such a way that ACCESSIBLE METAL PARTS cannot become LIVE in the event of a failure of the BASIC INSULATION.

#### 2.) \*\*Type BF EQUIPMENT\*

Type B EQUIPMENT with a F-TYPE isolated applied part providing a degree of protection against electric shock to such a degree that the allowable PATIENT LEAKAGE CURRENT under SINGLE FAULT CONDITIONS is not exceeded when 1.1 times the highest rated MAINS VOLTAGE is applied between the APPLIED PART and earth.

## 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 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.

### 1-4-2 CE Compliance

The LOGIQ™ 180 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.

Applicable standards are: 47CFR Part 18, IEC 601–1–2, and 806–13.

**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 EMC Performance

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

This product is designed to fully comply with the EN60601-1-2 (IEC601-1-2), in Medical electrical equipment EMC regulations.

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

The product must be installed as stipulated in 1-4-4, Notice upon Installation of Product.

In case of issues related to EMC, please follow procedures stated in 1-4-6, Countermeasures against EMC-related Issues.

### 1-4-4 Notice Upon Installation of Product

- 1.) Use either power supply cords provided by GEMS or ones approved by GEMS. Products equipped with power source plug should be plugged into the fixed power socket which has the protective grounding conductor
- 2.) Connect a three-pin plug to a three-pin socket without using a three-pin-to-two-pin converter.
- 3.) Keep the equipment as far as possible from other electronic equipment.
- 4.) Be sure to use the only cables provided by GEMS or ones approved by GE Wuxi. Install the unit/peripherals as per the installation procedure provided in Chapter 3 - INSTALLATION. The layout of the LOGIQ™ 180 & other peripherals should be as per installation procedures described in Chapter 3 - INSTALLATION.

### 1-4-5 General Notice

- 1.) Designation of Peripheral Equipment Connectable to this Product. The peripheral which conforms to EN60601-1-2 (IEC601-1-2), can be connected up to the LOGIQ™ 180 without compromising its EMC performance. Failure to comply with the above instruction may result in poor EMC performance of the product.
- 2.) **Notice against User Modification:** Do not modify this product. Unilateral user modification may cause degradation in EMC performance. Modification of the product includes:
  - a.) Changes in cables (length, material, wiring etc.)
  - b.) Changes in system installation/layout
  - c.) Changes in system configuration/components
  - d.) Changes in means of fixing system/parts (cover open/close, cover screwing)
- 3.) Operate the system with all covers closed. If you open any cover for some reason, be sure to shut it before starting/ resuming operation. Operating the system with any cover open may affect EMC performance.

### 1-4-6 Countermeasures against EMC related Issues

Generally it is very difficult to handle with issues related to EMC. It is time consuming and expensive. General counter measures for Electromagnetic interference with other equipment

- 1.) Electromagnetic interference may be reduced by positioning other equipment far away from the system.
- 2.) Electromagnetic interference may be reduced by changing the relative location (installation angle) of the system and other equipment.
- 3.) Electromagnetic interference may be reduced by changing wiring locations of power/signal cables of other equipment.
- 4.) Electromagnetic influence may be reduced by altering the path of power supply for other equipment.

### 1-4-7 Notice on Service

Ensure all screws are tight after servicing. Loose screws may cause degradation in EMC performance.

 **CAUTION** Do not use the following devices near the LOGIQ™ 180 system. Devices which intrinsically transmit radio waves such as cellular phone, radio transceiver, mobile radio transmitter radio-controlled toy, etc. Use of these devices could cause the LOGIQ™ 180 system to perform outside the published specifications. Keep power to these devices turned OFF when near the system.

Medical staff in charge of the LOGIQ™ 180 system is required to instruct technicians, patients and other people who may be around the system to fully comply with the above regulation

### 1-4-8 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 advised esd connection point located on the rear of the scanner (to the right of the power connector).
- 2.) Follow general guide lined 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 User Manual, or if you require additional assistance, please contact the local distributor or appropriate support resource, as listed below.

Prepare the following information before you call:

- System ID serial number.
- Software version.

**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 Ultraschall Deutschland GmbH & Co. KG BeethovenstraBe 239 Postfach 11 05 60, D-42665 Solingen Germany	Tel: +49 212 2802 208 +49 212 2802 207    Fax: +49 212 2802 431
Asia (Singapore/ Japan) GE Ultrasound Asia Service Department - Ultrasound 298 Tiong Bahru Road #15-01/06 Central Plaza Singapore 169730	Tel: +65 291-8528 +81 426-482950    Fax: +65 272-3997 +81 426-482902

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**1-5-2 System Manufacturer**

**Table 1-7 System Manufacturer**

Manufacturer	FAX Number
GE Medical Systems (China) Co., Ltd. No. 19 Changjiang Road, Wuxi National Hi-Tech Development Zone, Jiangsu, P.R. China 214028	TEL: +86 510-5225888 FAX: +86 510-5226688

# 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 LOGIQ™ 180. Included are descriptions of the facility and electrical needs to be met by the purchaser of the unit. A checklist is also provided at the end of this section to help determine whether the proper planning and preparation is accomplished before the actual equipment installation is scheduled.

### CONTENTS IN CHAPTER 2

Table 2-8 Contents in Chapter 2

Section	Description	Page Number
2-1	Overview	2-1
2-2	General Console Requirements	2-1
2-3	Facility Needs	2-5

### Section 2-2 General Console Requirements

#### 2-2-1 Console Environmental Requirements

Table 2-9 Environmental Specifications for LOGIQ™ 180 Scanners

Operating temperature:	-10 to 40 °C (14 to 104 °F)
Storage temperature:	-10 to 60 °C (14 to 140 °F)
Humidity:	30% to 75% rH non-condensing (Operating) 30% to 80% rH non-condensing (Storage)

**2-2-1-1 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**

**2-2-2-1 LOGIQ™ 180 Power Requirements**

Electrical Specifications for LOGIQ™ 180.

**Table 2-10 Electrical Specifications for LOGIQ™ 180**

GEMS P/N	Voltage	Tolerances	Current	Frequency
H41542LA	220-240VAC	±10%	1.9-2.0 A Max.	50 Hz
H41542LB	220-240VAC	±10%	1.9-2.0 A Max.	50 Hz
H41542LC	220-240VAC	±10%	1.9-2.0 A Max.	50 Hz
H41542LD	220-240VAC	±10%	1.9-2.0 A Max.	60 Hz

**2-2-2-2 Site Circuit Breaker**

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

 **CAUTION POWER OUTAGE MAY OCCUR. The LOGIQ™ 180 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.**

**2-2-2-3 Site Power Outlets**

A dedicated AC power outlet must be within reach of the unit without extension cords. Other outlets adequate 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.

**2-2-2-4 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.

**2-2-2-5 Power Stability Requirements**

**Voltage drop-out**

Max 10 ms.

**Power Transients**

(All applications)

Less than 25% of nominal peak voltage for less than 1 millisecond for any type of transient, including line frequency, synchronous, asynchronous, or aperiodic transients.

### 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. They also generate EMI. The LOGIQ™ 180 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 2-11](#) for EMI Prevention tips.

**2-2-3EMI Limitations (cont'd).**

**Table 2-11 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 Probes Environmental Requirements**

**Table 2-12 Operation and Storage Temperatures for Probes.**

	Electronic	PAMPTE
Operation:	-10 to 40 °C	-10 to 40°C
Storage:	-10 to 60 °C	-10 to 60 °C
Temperatures in degrees C, conversion to degrees F = °C*(9/5) + 32)		

 **NOTICE** SYSTEMS AND ELECTRONIC PROBES ARE DESIGNED FOR STORAGE TEMPERATURES OF -10 TO + 60 deg 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, six weeks before delivery, to allow enough time to make any changes.

 **CAUTION** Have two people available to deliver and unpack the LOGIQ™ 180. 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 Responsibility

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 (preferable prior to the purchase).

The ultrasound suite must be clean prior to delivery of the machine. Carpet is not recommended should also be investigated before delivery. Dirt, static, and EMI can negatively impact system reliability

### 2-3-2 Required Features

- Dedicated single branch power outlet of adequate amperage (see [Table 2-10](#)) meeting all local and national codes which is located less than 2.5 m (8 ft.) from the unit's proposed location.
- 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.
- Power outlets for other medical equipment and gel warmer.
- Clean and protected space to store transducers (in their cases or on a rack).
- Material to safely clean probes (done with a plastic container, never metal).

### 2-3-3 Desirable Features

- Door is at least 92 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 lines 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 Checklist for Installation

#### 2-3-4-1 Checklist for Installation

Table 2-13 Checklist for Installation

Procedures	Paragraph	Initials
Unpack LOGIQ™ 180	Section 3-2	
Assemble LOGIQ™ 180	Section 3-4	
Perform Functional Checks	Chapter 4-3	
Perform Electrical Safety Tests	Chapter 10-7	

# Chapter 3

## Installation

### Section 3-1 Overview

#### 3-1-1 Purpose of Chapter 3

This chapter contains information needed to install the unit. Included are references to a procedure that describes how to receive and unpack the equipment and how to file a damage or loss claim.

How to prepare the facility and unit of the actual installation, and how to check and test the unit, probes, and external peripherals for electrical safety are included in this procedure. Also included in this section are guidelines for transporting the unit to a new site.

#### 3-1-2 Contents IN chapter 3

**Table 3-14 Contents in Chapter 3**

Section	Description	Page Number
3-1	Overview	3-1
3-2	Receiving and Unpacking the Equipment	3-4
3-3	Preparing for Installation	3-9
3-4	Assembling LOGIQ™ 180	3-9
3-5	Completing the Installation	3-10
3-6	System Configuration	3-18
3-7	Paperwork	3-27

#### 3-1-3 Average Installation Time

**Table 3-15 Average Installation Time**

Description	Average Installation Time	Comments
Unpacking the scanner	20 Minutes	
Scanner wo/options	40 Minutes	Dependant on the configuration that is required

### 3-1-4 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!**

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 Deg.C increment it's temperature is below 10 Deg.C or above 40 Deg.C.

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

°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	2	4	6	8	10	12	14	16	18	20	

Figure 3-7 Acclimation Time

 **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 Electric shock hazard. The user is responsible to assure that, when peripherals or accessories are interconnected with the LOGIQ™ 180 , the combination must conform to the requirements of IEC/EN 60601-1-1 standard for safety of electrical medical systems. Leakage current safe limits may be exceeded and serious injury may result if the following precautions are not followed:**

- 1.) All peripheral or accessory devices must be in conformance with their applicable standard for safety. Computer devices must conform to IEC-EN 60950.
- 2.) The system of interconnected devices must conform to the leakage current requirements for electrical medical equipment if any portion of the system is located within the patient vicinity (within two meters of the patient).
- 3.) To achieve safe leakage current levels for equipment located within the patient vicinity, it may be necessary to install data or mains isolation or additional protective earth conductors. Devices having individual mains cords should always be connected to separate mains outlets. Multiple-outlet extension boxes should not be used to power the LOGIQ™ 180 and the computer device from a single mains plug.
- 4.) If safe leakage current levels are not achieved, the all parts of the system must be removed from the patient vicinity before being interconnected. For example, the transfer of the images from the LOGIQ™ 180 to a personal computer which exceeds safe current limits for medical electrical equipment must be done only if both pieces of equipment are not located in the patient vicinity.

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

### Safety Reminders (cont'd)



**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 LOGIQ™ 180 and kept near the unit for quick reference.



**CAUTION**

**ACOUSTIC OUTPUT HAZARD**

Although the ultrasound energy transmitted from the LOGIQ™ 180 probe is within AIUM/NEMA standards, avoid unnecessary exposure. Ultrasound energy can produce heat and mechanical damage.



## Section 3-2 Receiving and Unpacking the Equipment

### 3-2-1 Unpacking procedure

Please read that procedure before packing/unpacking the LOGIQ™ 180 .

**NOTE:** We strongly advice you to store the LOGIQ™ 180 packing material in undamaged condition in case of future transportation.

- 1.) Cut the two bands and two plumbum rope.
- 2.) Remove the clip by clip opening tool.
- 3.) Then open the wood box (include top cover and side cover).



Figure 3-8 Unpacking procedure (1)

- 4.) Remove the plastic covers and all vinyl covers.
- 5.) Remove the option box, accessories box and Manuals.
- 6.) Lift the console down, then lock the casters.



Figure 3-9 Unpacking procedure (2)

## Unpacking Procedure (cont'd)

**NOTE:** Check the shipping container for special instructions. Verify that the container is intact. If not tally with the shipping list, ask the carrier for unpacking instructions.

**NOTE:** The Service Manual, Operator Manual, and Gel Bottle are wrapped in bubble sheet and are kept along the sides of the corrugated carton box. Refer Illustration below for details

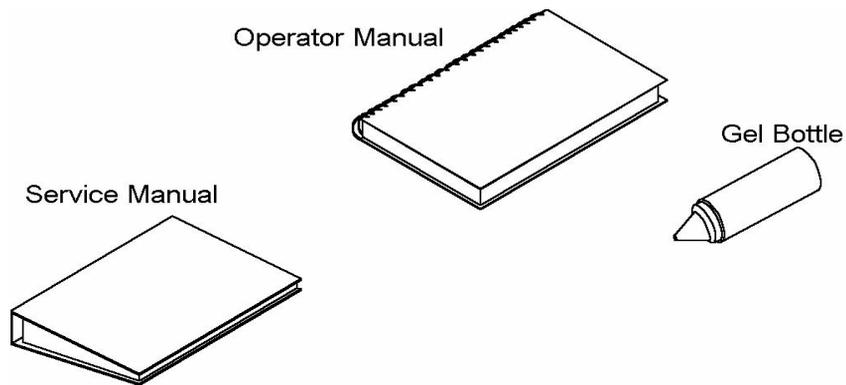


Figure 3-10 Unpacking procedure (3)

### 3-2-2 Packing Procedure

- 1.) Clean the system, then make the preparation as below:
  - a.) Put the top cover sheet on the system top cover.
  - b.) Cover the ten caps on the side cover.

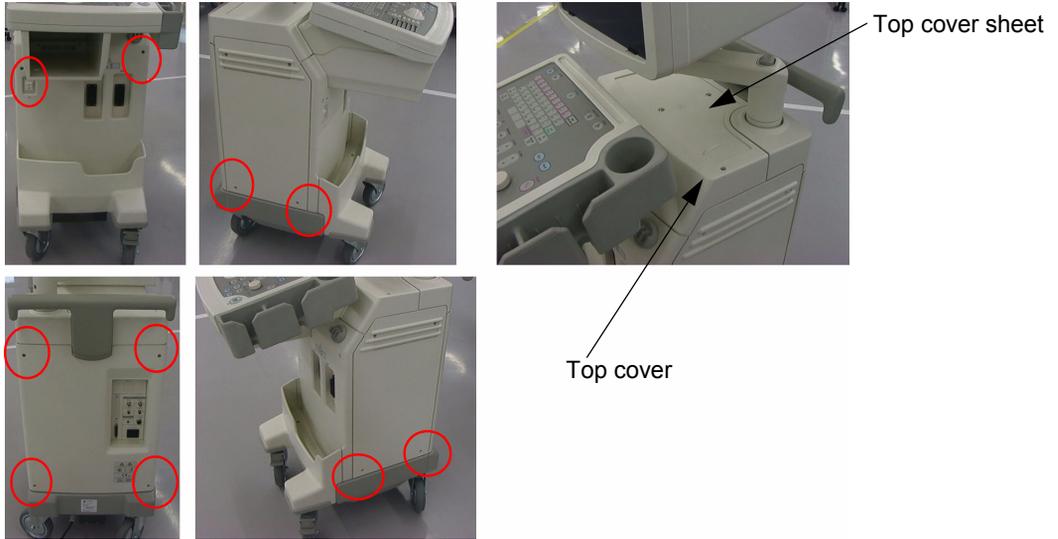


Figure 3-11 Packing procedure (1)

- c.) Clean the caster, power cord.
- d.) Check the accessories based on checklist.

### Packing Procedure (cont'd)

- 2.) Lift the system on the bottom of the wood package, lock the casters. Insert the Manual between the console and the bottom cover.
- 3.) Put the middle support under the monitor, cover the plastic sheet around the keyboard and monitor.
- 4.) Put the right side cushion and left side cushion around the console, cover them with plastic sheet
- 5.) Put the probe box and accessories box in front of the console, detail in picture, cover them with plastic sheet again.
- 6.) Put the middle frame and top cap around the keyboard and monitor, detail in picture.

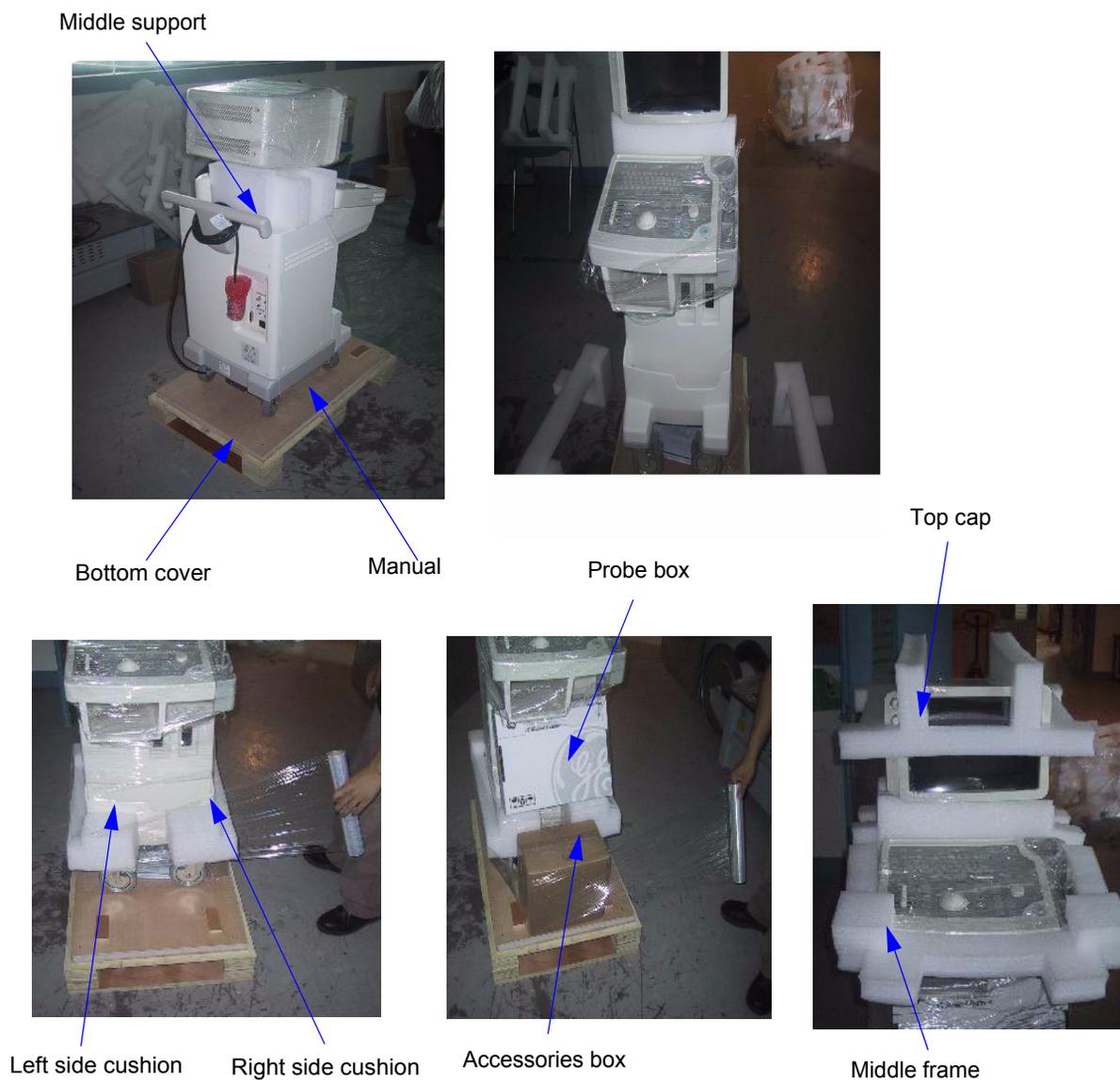


Figure 3-12 Packing procedure (2)

### Packing Procedure (cont'd)

- 7.) Cover the whole console with the plastic bag.
- 8.) Fix the side cover and top cover with the clip.
- 9.) Attach the shipment card, package label and on the position which show on the picture.
- 10.) Fix the steel band around the package then attach the clip opening tool on the position which showed on the picture.



Figure 3-13 Packing procedure (2)

## Section 3-3 Preparing for Installation

### 3-3-1 Physical Inspection

#### 3-3-1-1 Systems Voltage Settings

- Verify that the scanner is set to the correct voltage.  
The Voltage settings for the LOGIQ™ 180 Scanner is found on a label on the rear of the system.

**CONNECTING A LOGIQ™ 180 SCANNER TO THE WRONG VOLTAGE LEVEL WILL MOST LIKELY DESTROY THE SCANNER.**

#### 3-3-1-2 Video Formats

Check that the video format is set to the locally used video standard, NTSC or PAL.

### 3-3-2 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 3-4 Assembling LOGIQ™ 180



**CAUTION** It is strongly recommended that the equipment should be installed on an even and hard surface to provide proper cooling, as the vents for air circulation are on the bottom cover.

### 3-4-1 Installation of the System

- 1.) Locate, remove and unpack the probes located in the separate container.
- 2.) Make sure that system power is OFF before connecting or disconnecting the probe.
- 3.) Secure the probe to the receptacle as follows:
  - a.) Ensure probe 'twist lock' lever points towards the 12 o'clock position
  - a.) Install probe connector on the receptacle guide pin until it touches the receptacle mating surface.
  - a.) Twist the probe connector 'twist lock' lever to the 3 o'clock position to lock it in place (Twist the lever to the 12 o'clock position to disconnect the probe).
- 4.) Connect the LOGIQ™ 180 Power cable's female part to the power connector located on the rear panel and the male part to a hospital grade power socket of a proper voltage. Never use a three-to-two pin adapter; this defeats the purpose of safety ground.

## Section 3-5 Completing the Installation

### 3-5-1 Transducer Connection

- 1.) Connect a transducer to transducer receptacle as follows:
  - A.) Ensure that the transducer twist lock lever points towards the 3 o'clock position.
  - B.) Insert the transducer connector on the receptacle guide pin until it touches the receptacle mating surface.
  - C.) Twist the transducer twist lock lever to the 12 o'clock position to lock it in place. Twist the lever to the 3 o'clock position to disconnect the transducer.

**NOTE:** *It is not necessary to turn OFF power to connect or disconnect a transducer.*

- 2.) Connect the main power cable to a hospital grade power receptacle with the proper rated voltage. Never use a three-to-two prong adapter; this defeats the safety ground.

### 3-5-2 Installation of LOGIQ™ 180 to PC Image Transfer Software

The image transfer software can be used to download images from the LOGIQ™ 180 Service Port (parallel port) to the PC. It can also be used to retrieve & view images already stored in the PC.

**NOTE:** *For more details on the application of the Image Transfer Software, please refer to the Operator manual.*

#### 3-5-2-1 Pre-requisites

Hardware & Software requirements

 **WARNING** Image Transfer should not be done while live scanning patients. Also, the image transfer cable also should not be attached to the LOGIQ™ 180 during the scan.

*For Europe Only: All devices connected to the LOGIQ™ 180 must be CE Marked*

#### A.) Hardware:

- 1.) The recommended PC for Image Transfer should be Compatible with **IEC 950 Standards** with a Minimum Configuration required for the PC is as below.
  - a.) Display resolution: 800X600
  - b.) Color: 16 bit
  - c.) Ram: 4MB
  - d.) Processor: 486
  - e.) Hard Disk Space Required: 20 MB of free space
  - f.) Parallel port Mode: ECP, EPP & Std. Bi-directional
- 2.) LOGIQ™ 180 Version V7.0HC.
- 3.) Any standard 25 Pin DSub Male to Male Cable for **LOGIQ™ 180** (To interface PC to LOGIQ™ 180)

#### B.) Software:

**For V7.0HC (LOGIQ™ 180)**

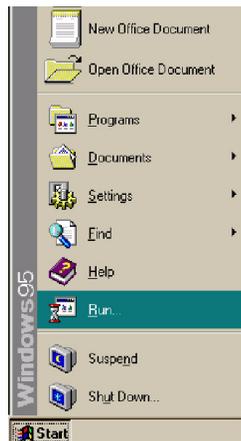
- 1.) Operating System: Windows 95 / 98 / ME / NT / 2000
- 2.) Image Transfer Software (2347331) Supplied by GE Medical Systems

**C.) PC Settings:**

The Service Port (parallel port) of the PC should be configured in the EPP/ECP/Bi directional mode. This can be done by entering into the CMOS setting of the PC. If required, for more details contact your local PC supplier.

**D.) Software Installation**

- 1.) Before starting to install the *Image Transfer* software, close all applications.
- 2.) For LOGIQ™ 180 Systems Insert CD (2347331) in the CD Drive, and click *Start* and then click *Run* as shown below.



**Figure 3-14**

3.) Now type the Respective Drive Letter E.g. F:in95,98, Setup.exe as shown below and click OK.

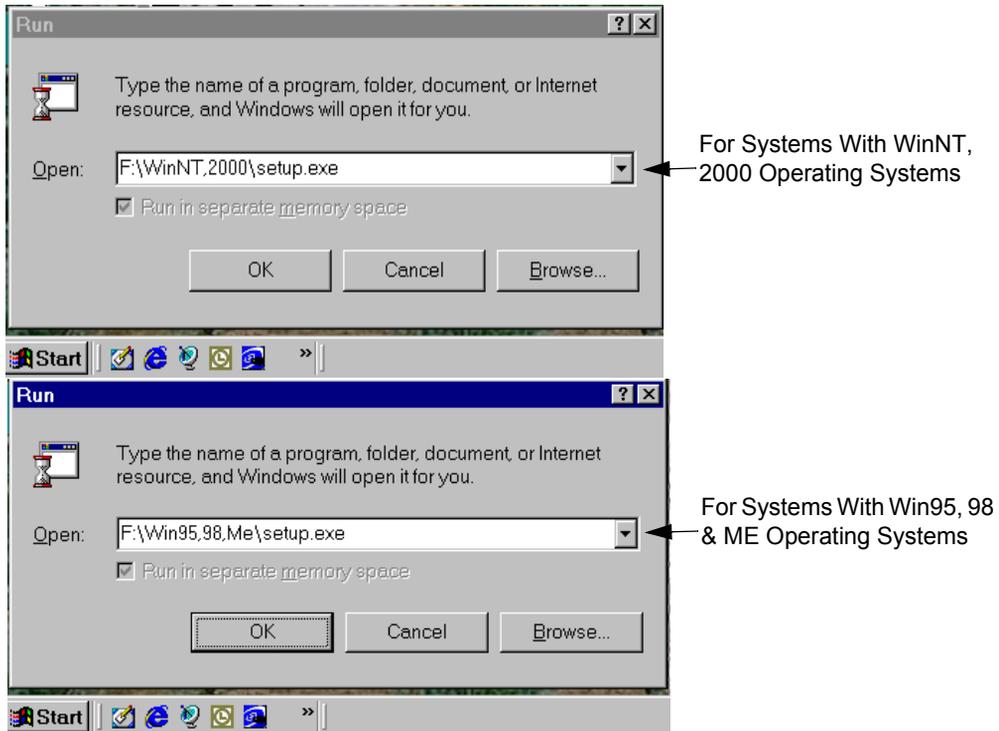


Figure 3-15

- 4.) A warning screen will appear asking to close all other applications.



Figure 3-16

- 5.) Click *OK* if other applications are closed else click *Exit Set-up*, close all programs and go through steps 2 to 4 again.

- 6.) Begin Installation screen appears. To change the directory click on change directory and select the desired directory. Click on the installation button to continue with Installation.



Figure 3-17

- 7.) Next you will get the following screen indicating the completion of the installation. Click OK to come out of the installation set-up.

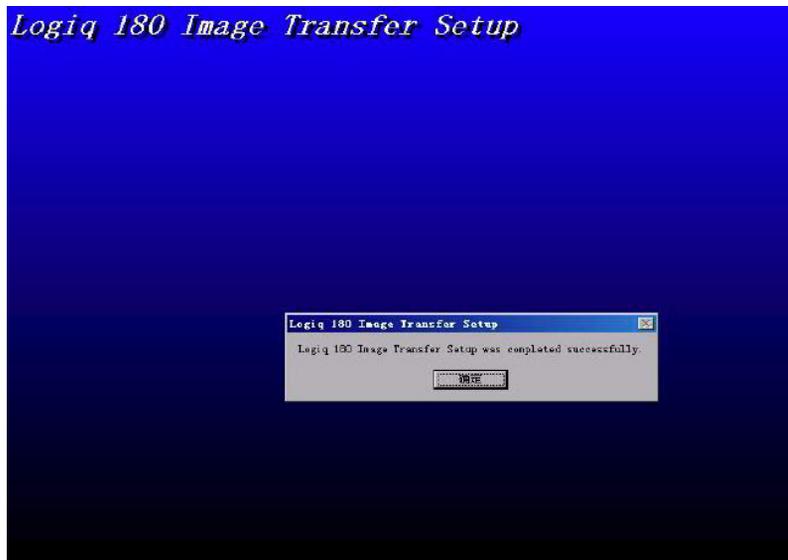


Figure 3-18

8.) The software is fully installed and ready to use when you get the following screen

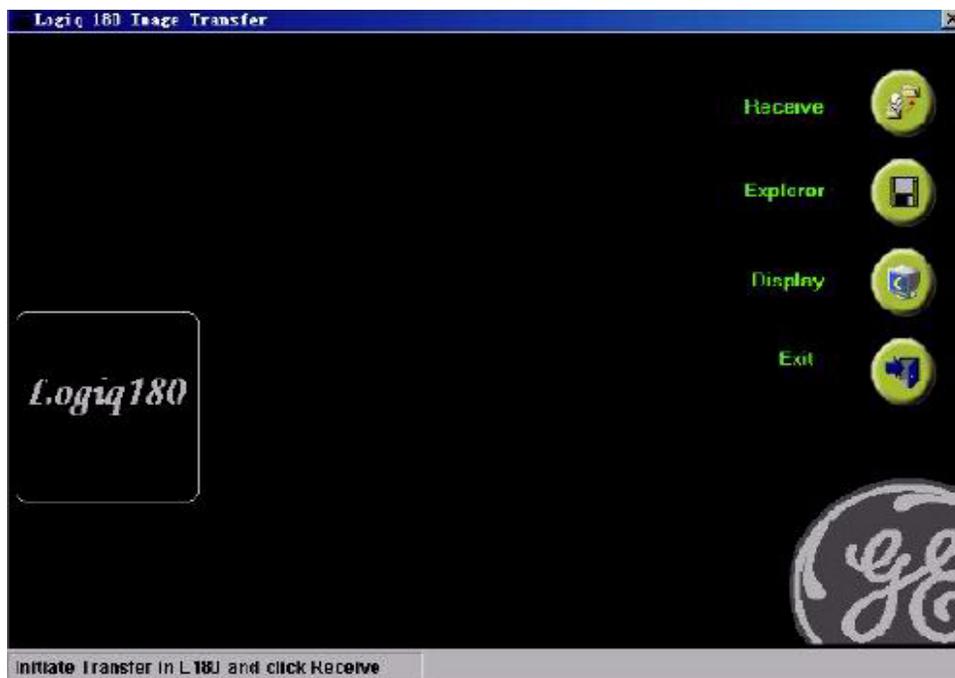


Figure 3-19

### E.) Hardware Installation

Connect the LOGIQ™ 180 MP to the PC through the Image Transfer Cable -2344566.

This completes the total installation of the *Image Transfer* software.

**NOTE:** To transfer images, please refer to the Operator manual.

### 3-5-3 Installation of Optional Accessories

- 1.) Unpack the foot switch and connect it to the connector on the rear panel. (Refer Figure 3-20)
- 2.) Connect the VCR to a suitable power outlet. Using the BNC to BNC cable connect the Video Out on the rear panel of LOGIQ™ 180 to the Video IN of the VCR.
- 3.) Connect the Video Graphic Printer (VGP) to a suitable power outlet. Using the BNC to BNC cable connect the Video Out on the rear panel of LOGIQ™ 180 to the Video IN of the VGP.

**NOTE:**

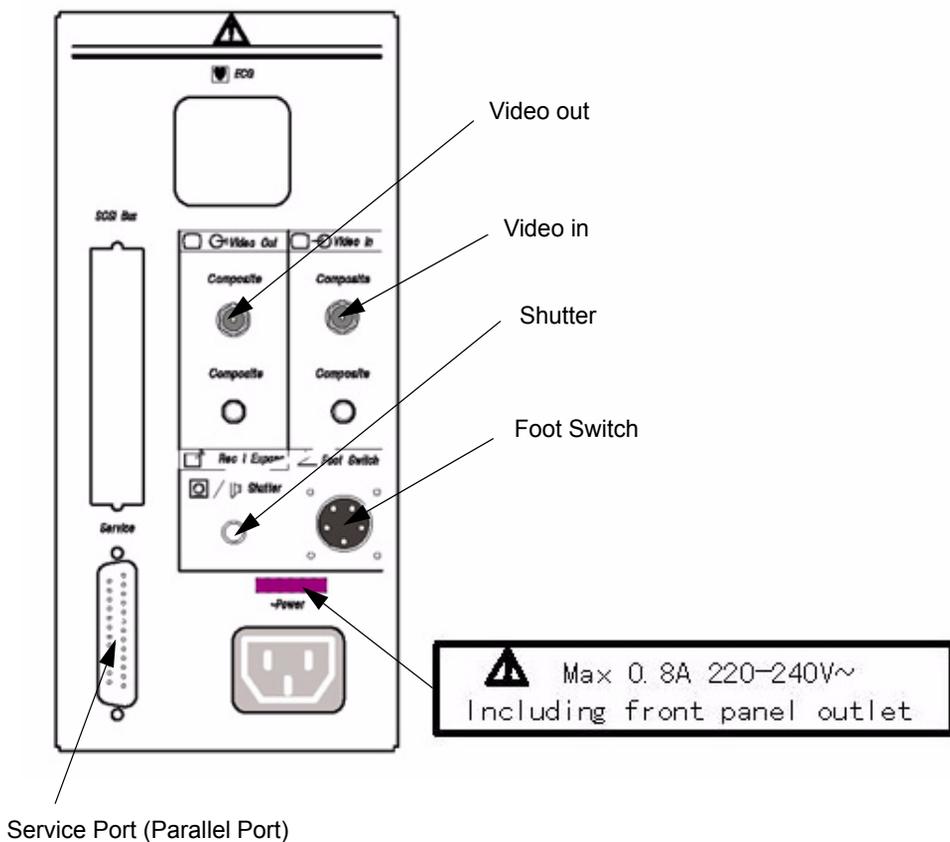


Figure 3-20 Installation of Accessories

### **3-5-4 Adjustment of Monitor Brightness & Contrast**

Turn ON the Machine and then adjust the monitor contrast and brightness. Monitor contrast and brightness should be adjusted according to the lighting in the room.

### **3-5-5 Adjustment of System Clock/Date, Hospital Name & OB Version**

Press CTRL-S-1 ENTER, an 'Installation Setup window appears'. Set the system Clock/Date, Hospital Name and OB Version. These settings can be modified by using the CONTROL-S-1 key if required. Refer Section Control Keys of the User Manual for more details.



**CAUTION** Functional checks in Chapter 4, to be carried out before handing over the system to the customer.

## Section 3-6 System Configuration

### 3-6-1 System Specifications

#### 3-6-1-1 Physical Dimensions

The physical dimensions of the LOGIQ™ 180 unit are summarized in [Table 3-1](#).

**Table 3-1 Physical Dimensions of LOGIQ™ 180**

Height	Width	Depth	Unit
145	40	66.3	cm

3-6-1-2 Front View

WEIGHT: 72.2 kg

**NOTE**

LENGTH : mm (inches)  
ABERRATION : ±5%

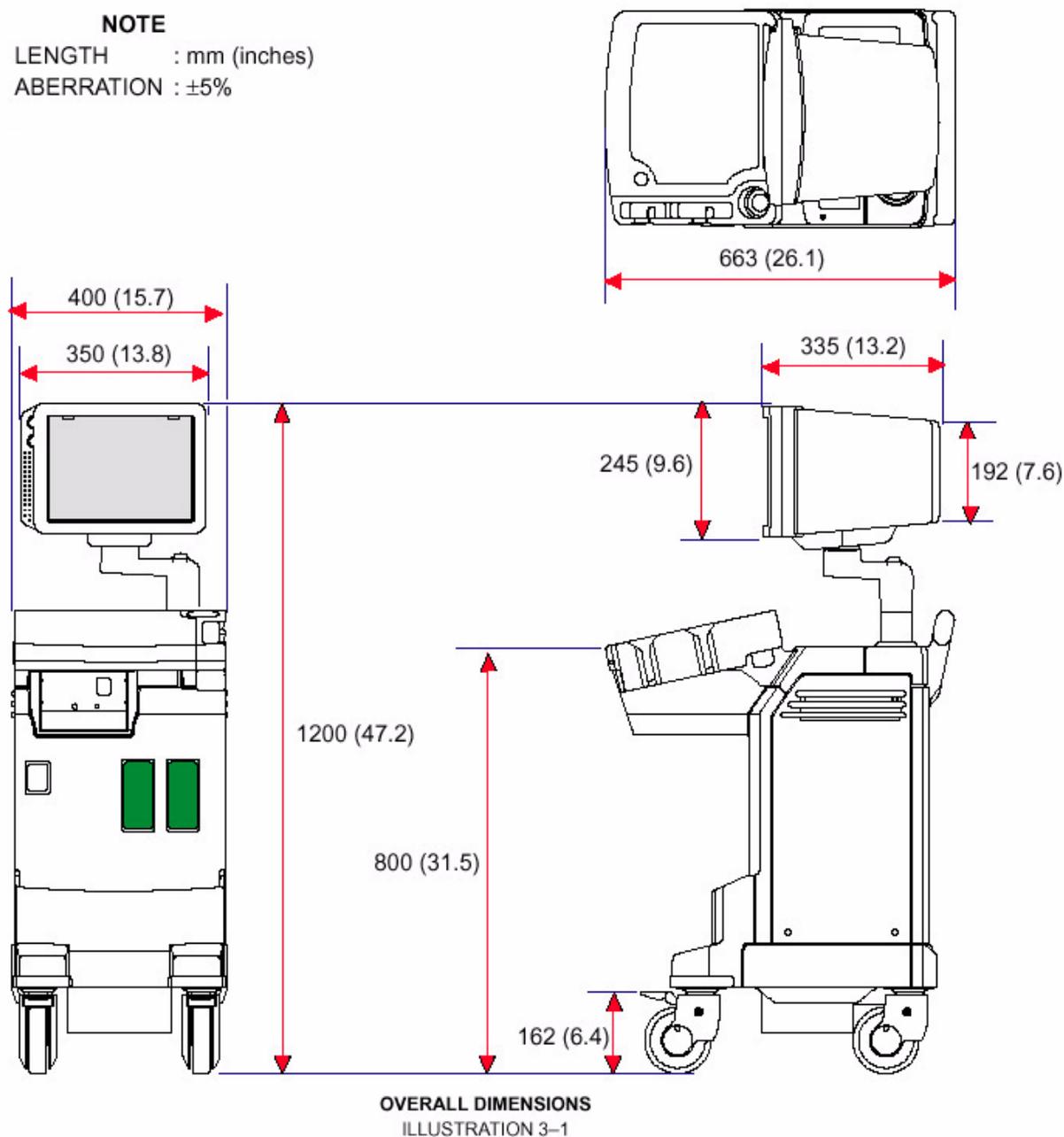


Figure 3-21 Overall Dimensions

**3-6-1-3 Weight without Peripherals**

The Weight of LOGIQ™ 180 without peripherals

**Table 3-2 Weight of LOGIQ™ 180**

Model	Weight [kg]	Weight [lbs]
LOGIQ™ 180	72.2	163.17

**3-6-2 Electrical Specifications**

Electrical Specifications for LOGIQ™ 180 .

**Table 3-3 Electrical Specifications for LOGIQ™ 180**

GEMS P/N	Voltage	Tolerances	Current	Frequency
H41542LA	220-240 VAC	±10%	1.9-2.0 A Max.	50 Hz
H41542LB	220-240 VAC	±10%	1.9-2.0 A Max.	50 Hz
H41542LC	220-240 VAC	±10%	1.9-2.0 A Max.	50 Hz
H41542LD	220-240 VAC	±10%	1.9-2.0 A Max.	60 Hz

**3-6-2-1 Power Supply**

The Following Power Line requirement should be monitored one week before Installation. We recommend that a Drantez model 605-3 Power line Monitor with options 101 to be used.

Parameter	Limits	
Voltage Range	China, Europe, India, Korea	200-240VAC ± 10%
Power	China, Europe, India, Korea	MAX 450VA
Line Frequency	All Applications	50/60Hz ± 2Hz
Power Transients	Less than 25% of nominal peak voltage for less than 1 millisecond for any type of transient, including line frequency, synchronous, asynchronous or periodic transients	
Decaying Oscillation	Less than 15% of Peak Voltage for less than 1 millisecond	

**Table 3-4 Power supply**

**3-6-2-2 Facility Power Socket**

A separate power outlet with a 5 amp circuit breaker for 220-240 VAC is recommended. The specific power receptacle used depends on the country's power line standards.

This receptacle should have International Electro technical Commission (IEC) approval, or equivalent

### 3-6-2-3 Storage & Operation Requirements

The LOGIQ™ 180 is shipped in a single container excluding probes. Shipping weight is approximately 12 kgs. Table 3-5 provides a summary of temperature, atmospheric pressure, and humidity tolerances for shipping, installation and operation:

Parameter	Storage	Operation
Temperature (Deg.C) (Deg. F)	-10 to 60 14 to 140	10-40 50 to 104
Atmospheric Pressure (hPa)	700 to 1060	700 to 1060
Humidity (%) Non- Condensing	30 to 80	35 to 75

Table 3-5 Storage & Operation Requirements

### 3-6-3 Optional Peripherals

LOGIQ™ 180 peripherals and accessories can be properly connected using the connectors on the rear panel of the LOGIQ™ 180 system.

#### External Optional Peripherals

- VCR (Sony SVO-9500MD)
- VGP (Sony UP-895MDW/MD/SYN)

 **WARNING** *Parallel Printing should not be done while live scanning patients. Also, the Printer cable should not be attached to the LOGIQ™ 180 during the scan.*

*For Europe Only:* All devices connected to the LOGIQ™ 180 must be CE Marked.

Located on the panel are video input & output connectors, footswitch connector, shutter connector, power connector & control connections for Video Graphic Printer and Service Port (Parallel Port).

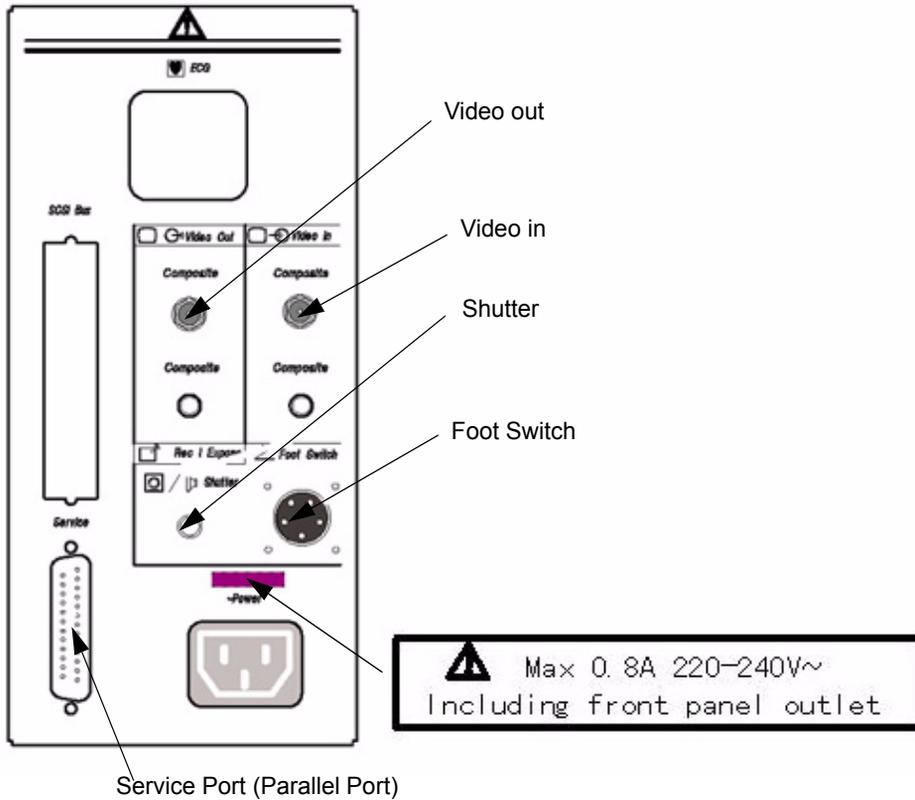


Figure 3-22 Optional Peripherals

### 3-6-4 Peripherals Connections

3-6-4-1 This section indicates pin assignment for each connector

A.) Pin Assignment for Parallel Port ( for V7.0HC systems)

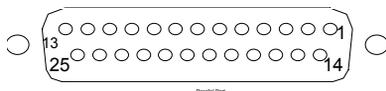


Figure 3-23 Connector: Female D type, 25 Pin on the Rear Panel

Table 3-6 Parallel Port (25 Pin Connector) Details

Pin Number	Signal
Pin 1	$\overline{\text{STROBEWRITE}}$
Pin 2	DATA 1
Pin 3	DATA 2
Pin 4	DATA 3
Pin 5	DATA 4
Pin 6	DATA 5
Pin 7	DATA 6
Pin 8	DATA 7
Pin 9	DATA 8
Pin 10	$\overline{\text{ACKNLG}}$
Pin 11	Busy
Pin 12	PE
Pin 13	SLCT
Pin 14	$\overline{\text{Not Connected}}$
Pin 15	$\overline{\text{ERROR}}$
Pin 16	INIT
Pin 17	SELECT-IN
Pin 18	GND
Pin 19	GND
Pin 20	GND
Pin 21	GND
Pin 22	GND
Pin 23	GND
Pin 24	GND
Pin 25	GND

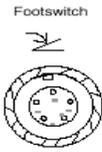
B.) Footswitch Connection

The footswitch which is the remote **FREEZE** device is connected to the rear panel of the system. this extra **FREEZE** switch is provided to enhance flexibility to freeze images when the system is not within reach of the user.

**Pin Assignment of Foot Switch Connector**

**Figure 3-24 Foot Switch Connector (Round 5-pin connector)**

Pin No.	Signal
1	Foot Switch
2	GND
3	GND
4	GND
5	GND



C.) Video Graphic Printer (VGP)

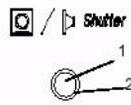
Connect the Video Graphic printer (with BNC to BNC cable) Video IN to the Video OUT located on the rear panel of the system, also establish shutter (with Mini Jack cable) if required.

Model: (Sony UP-890MD/CE/MDG or UP-895MDW/MD/SYN) / (Mitsubishi P91E)

D.) Pin Assignment of Mini Jack controlling VGP

**Figure 3-25 Foot Switch Connector**

Pin No.	Signal
1	Shutter
2	Signal GND



E.) Video Cassette Recorder

Connect the VCR Sony SVO-9500MD (H4120SR) for NTSC and Sony SVO 9500MDP(E11801AA) for PAL System to the Video IN socket in the rear panel. Press the “EXT. VIDEO” button on the keyboard to enable an external video signal on the system monitor.

### 3-6-5 Available Probes for LOGIQ™ 180

See in Specifications in the LOGIQ™ 180 User Manual for Probes and intended use.

**Table 3-7 Available Probes**

Probe Type	Part No.	Catalog No.	Freq in MHz	Radius of Curvature	FOV
C36	2107922	H45252CF	3.5	50mm	68°
C55	2107925	H45252CE	5.0	40mm	68°
E72	2107928	H45252MT	6.5	10mm	114°
L76	2107910	H45252HP	7.5	60mm	-
C31	2175994	H45252CS	3.5	13mm	85°



**CAUTION Use only approved probes, peripherals or accessories.**

### 3-6-6 Video Specification

Video specifications may be needed to be able to connect laser cameras to the LOGIQ™ 180 .

General			
SL	Parameter	NTSC	PAL
1	Total Number of Horizontal Lines	525[Frame]	625[Frame]
2	Vertical Field Frequency	60[Hz]	50[Hz]
3	Horizontal Scanning Frequency	15.734[kHz]	15.625[KHz]
4	Vertical Scanning Method	Interlaced	Interlaced
5	Sync Input	Composite	Composite
6	Pixel Clock	12.272715[MHz]	12.25[MHz]
7	Display width and Height [pixel * line]	608 X 464	608 X 472
Horizontal Timing & Video Amplitude			
SL	Parameter	NTSC	PAL
1	Total H-Line Time	63.556[micro sec.]	64.00[micro sec.]
2	H-Sync Pulse Width	4.725[micro sec.]	4.68[micro sec.]
3	Back Porch	4.725[micro sec.]	4.68[micro sec.]
4	Total Active H-line time	52.64[micro sec.]	52.07[micro sec.]
5	Front Porch	1.46[micro sec.]	1.49[micro sec.]
6	Video Amplitude (back porch to peak)	0.7Vpp	0.7Vpp
7	Sync Amplitude (back porch to peak)	0.3Vpp	0.3Vpp
Vertical Timing			
SL	Parameter	NTSC	PAL
1	Total V-Line Time	262.5[H]	312.5[H]
2	V-Sync Pulse Width	1st Field 3[lines]	1st Field 2.5[lines]
		2nd Field 3[lines]	2nd Field 2.5[lines]
3	V-front porch	1st Field 7.5[lines]	1st Field 6.25[lines]
		2nd Field 7.5[lines]	2nd Field 6.25[lines]
4	V-Blanking	1st Filed 30.5[lines]	1st Filed 32[lines]
		2nd Field 30.5[lines]	2nd Field 32[lines]

## Section 3-7 Paperwork

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

### 3-7-1 User Manual(s)

Check that the correct User Manual(s), per software (sw) revision, for the system is included.

### 3-7-2 Product Locator Card

Fill out proper customer information on the Product Locator Installation Card. Refer to Illustration below. Mail this Installation Card "Product Locator" to the address corresponding to your pole.

**NOTE:** The Product Locator Installation Card shown in Figure 3-26 may not be same as the Product Locator card actually provided.

		GE Medical Systems Product Locator File P.O. Box 414 Milwaukee, WI 53201-0414		General Electric CGR Product Locator Adm. - DSE/SM 283 Route de la Miniere 78530 Buc, FRANCE		Yokogawa Medical Systems Ltd. GEMSA Service Administration 4-7-127 Asahigaoka Hino-shi Tokyo 191, JAPAN	
DESCRIPTION		FDA	MODEL		REV	SERIAL	
SYSTEM LTD.		OCP		BS	ORD	EMPLOYEE NO.	
		DISTRICT		ROOM		DATE (MO - DA - YR)	
<h1>INSTALLATION</h1>		CUSTOMER NO.					
		DESTINATION NAME AND ADDRESS					
		_____					
		_____					
46-303268 Rev 5		ZIP CODE					

Figure 3-26 Product Locator Card

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# Chapter 4

## Functional Checks

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### Section 4-1 Overview

#### 4-1-1 Purpose of Chapter 4

This chapter provides procedures for quickly checking major functions of the LOGIQ™ 180 scanner, diagnostics by using the built-in service software, and power supply adjustments. For remaining functional checks please refer to the LOGIQ™ 180 Operator's Manual.

### CONTENTS IN CHAPTER 4

Table 4-8 Contents in chapter 4

Section	Description	Page Number
4-1	Overview	4-1
4-2	General Procedures	4-2
4-3	Functional Check Procedures	4-4
4-4	Diagnostics	4-9
4-5	Software Configuration Checks	4-10
4-6	Peripheral Checks	4-10
4-7	Patient contact tools	4-11

## Section 4-2 General Procedures

### 4-2-1 Power On/Boot Up

**NOTE:** After turning off the 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.

 **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.

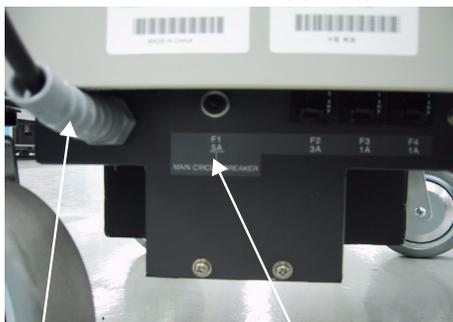


#### 4-2-1-1 System Boot-UP/Shutdown

Purpose: This is a description on how to Shut Down/Power-UP the system.

#### 4-2-1-2 Power Up

- 1.) Connect the Power cable to an appropriate mains power outlet

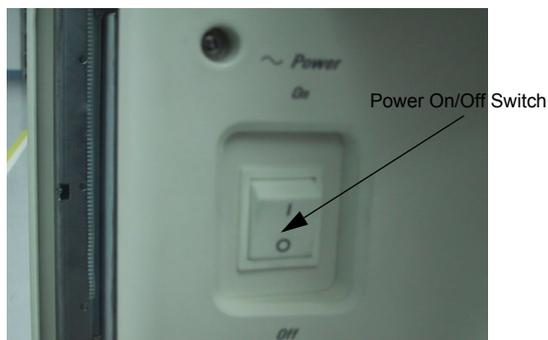


Mains Power  
Cable Connector

Main Circuit Breaker

**Figure 4-27 Mains Circuit Breaker and Mains Power Cable**

- 2.) Press Front Panel ON/OFF key once to Switch ON/OFF



**Figure 4-28 ON/OFF key on Front Panel**

When power is applied to the Scanner, Power is distributed to the Fan, Control panel, Monitor, Internal and External I/O's, Boards & Peripherals. Back End Processor starts and its software code is distributed to initiate the scanner.

Power Up Display Comes Up. Refer figure [4-29](#).

#### 4-2-1-3 Power Shutdown

- 1.) Switch OFF the ON/OFF at the Front of the system.
- 2.) Disconnect the Mains Power Cable if needed.

## Section 4-3 Functional Check Procedures

To perform these tests, you will need a micro-convex, linear or a convex probe. These procedures should be performed during installation. These procedures are also used as basic checks to use when service of the system is required.

Turn "ON" the LOGIQ™ 180 system. The 2 LEDs, External Video and Freeze blink and go off. The system beeps once and runs a self test.

The Monitor displays the following. Refer figure 4-29 for details.

- 1.) B-Mode Image appears
- 2.) Gray Scale Display
- 3.) Horizontal Scale Marker
- 4.) Vertical Scale Marker
- 5.) Hospital Name (If previously entered)
- 6.) Date
- 7.) Time
- 8.) Probe Type
- 9.) Focus Marker on vertical scale
- 10.) Depth (150mm) \*
- 11.) Gain (G50) \*
- 12.) Dynamic Range (D54) \*

\* Points 10-12 form a continuous code in the lower left hand corner of the monitor and they are factory default values.

### 4-3-1 Power Up Monitor Display (Convex Probe)

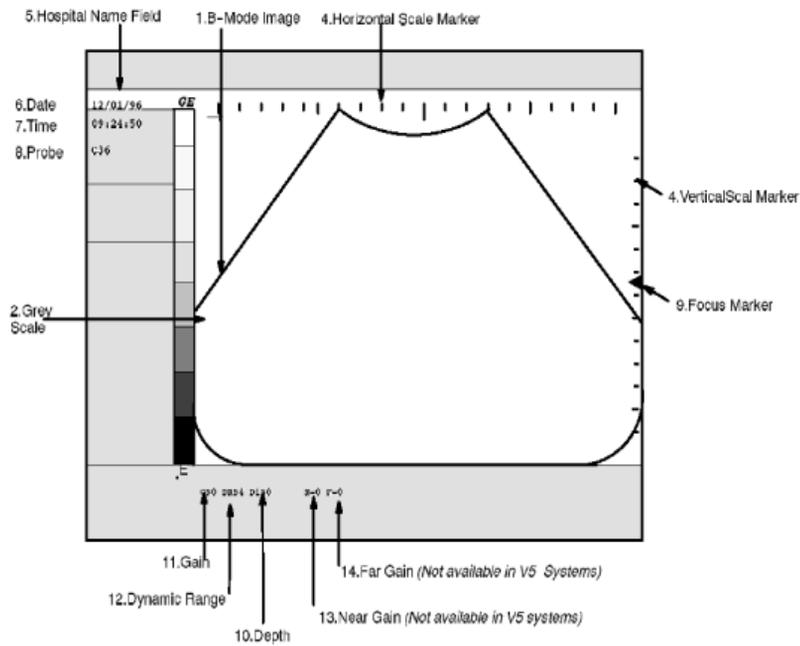


Figure 4-29 Power Up Monitor Display (Convex Probe)

## 4-3-2 Basic Controls

Table 4-9 describes basic controls which helps in checking the LOGIQ™ 180 during installation. Connect the sector or convex transducer to connector on the right side of the base.

**Table 4-9 Basic Controls**

TASK	Expected Result
Turn 'ON' Power Switch	B-Mode screen as in figure Table 4-30 should appear
Press <b>New Patient Key</b> Press <b>ID/Name</b>	A pop-up window appears. Enter Patient Name/ID. It presets the system. A pop-up window appears. Enter Patient Name/ID. It does not preset the system.
Press <b>Dyn Range Up/Down</b>	Image grows softer and harder depending on position.
Rotate <b>Gain Knob</b>	Image grows lighter and darker with rotation.
Press <b>Reverse</b> Press <b>Reverse</b> a second time Press <b>SHIFT + Reverse</b> Press <b>SHIFT+ Reverse</b> a second time	The image will be displayed Left/Right The image will be displayed Right/Left. The image will be displayed Top/Bottom The image will be displayed Bottom/Top
Press <b>M</b> key Roll Trackball Press <b>M</b> key a second time	B/M Mode with M-line cursor appears. (Use trackball to move the M-line cursor). Refer Figure Table 4-30 The M-Line cursor should follow the trackball movement and the real-time image varies on the M-Mode display. Only M-Mode image appears on the screen. Press B Mode Key to exit M-Mode.
Press <b>Freeze</b> key	The image will freeze.
Press <b>ATO</b>	ATO, Automatic Tissue Optimization, optimizes the image based upon a specified Region Of Interest (ROI) or anatomy within the display. ATO Gray scale map is available only in B-Mode.
Press <b>Zoom</b> Roll Trackball	Zoom is used to magnify an image. The magnification factor for zoom is fixed at 2.0. The system adjusts all imaging parameters accordingly. To select the ROI for Zoom
Press <b>Probe Select</b>	<b>Probe Select</b> is used to select Probe Port 1 or Probe Port 2.
CINE Press Freeze and Rotate <b>B/M Gain/Cine Scroll</b> Cine Menu: Press 1 ( <b>Start Frame</b> ) Press 2 ( <b>End Frame</b> ) Press 3 ( <b>Cine Loop</b> ) Press 4 ( <b>Cine Gauge</b> )	The Cine Gauge, menu and the Cine frame number appears at the bottom of the display. Rotate the <b>Cine Scroll</b> dial to move through the images in Cine Memory. Cine frame number is displayed on the left side of the screen. Move the Cursor by rotating the <b>Cine Scroll</b> dial to the frame you want and press 1 again to select the Start frame. Move the Cursor by rotating the Cine Scroll dial to the frame you want and press 2 again to select the End frame. Enters into Cine loop within the selected Start & End frames. To toggle between the Cine Gauge display

**Table 4-9 Basic Controls**

TASK	Expected Result
Flash Memory (Image storage)  Freeze the image Press <b>Store</b>  Press <b>Recall</b>	Comment column appears at the bottom of the display. Enter the comment in that and press <b>Store</b> again to Store the image.  <b>Image Archive</b> screen appears with option menu at the bottom. Select the image using the trackball (Use Dynamic Range to page up/down in the Image Archive screen). Press <b>1</b> to View the selected image. Press <b>2</b> to Clear the selected image. Press <b>3</b> to Clear All the stored images. Press <b>4</b> to Sort the images by name or date. To Exit Image Archive, press <b>Freeze</b> .
TGC	The <b>TGC</b> is used to adjust the Gain at a specific depth. Slide the control to the right or left to increase or decrease gain. Gain is displayed in a range from +/- 20db.

Refer User Manual for the Remaining Operations

## Basic Controls (Continued)

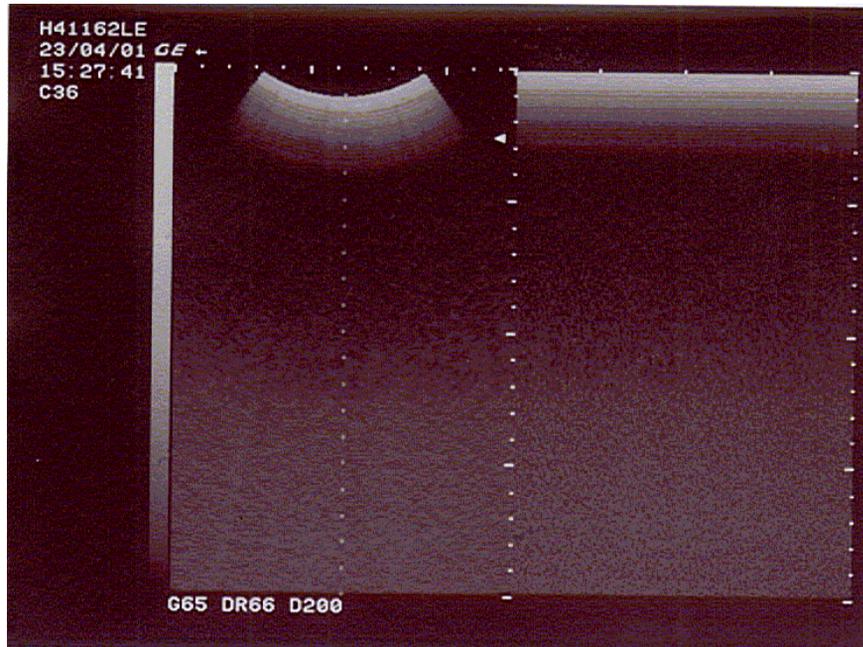


Figure 4-30 B/M Mode Display

### 4-3-3 Phantom Check

RMI Phantom 403GS (Part No. 2113294) to be used to check image quality and proper functioning of the system

## Section 4-4 Diagnostics

The LOGIQ™ 180 System service diagnostics comprises of:

- 1.) Self test or power on diagnostics
- 2.) Service diagnostic tools

The self test or power on diagnostics are run every time the system is booted. The service diagnostic tools include test procedures for testing the system at PCB level as well as block level. The diagnostic tools provides a pop-up menu to enable selection of various tests to test various blocks on the system.

### 4-4-1 Power On Diagnostics

The power on diagnostics or self tests are run every time the system is booted. This self tests include testing the validity of the system software through EPROM checksum test and testing the system RAM. It checks whether the keyboard and the trackball are properly interfaced to the system. It also initiates the self test of analog subsystem. The two LED's and the beeper are used to indicate error conditions.

### 4-4-2 Service Diagnostics

For More Details on Service Diagnostic refer Chapter 7.

## Section 4-5 Software Configuration Checks

Table 4-10 Software Configuration Checks

Step	Check	Expected Result(s)	If Not Remedy
1.	Check Date and Time setting	Date and Time are correct	Adjust the Date and Time setting
2.	Check that Location (Hospital Name) is correct	Location Name is correct	Re-enter the correct Location Name

## Section 4-6 Peripheral Checks

Check that peripherals work as described below:.

Table 4-11 Peripheral checks

Step	Check	Expected Result(s)	If Not Remedy
1.	Press Freeze Key	to stop image acquisition.	
2.	Press <b>RECORD</b> Key on the Control panel	The image displayed on the screen is printed on B&W Video Graphic Printer	
3.	Press <b>SHIFT + RECORD</b> Key on the Control Panel.	To image or report page displayed on the screen is printed on the Parallel Printer connected to the Parallel Port of the System	
4.	Press <b>SHIFT + STORE</b> Key on the Control Panel.	To start the Image Transfer Operation	
5.	Press <b>EXTERNAL VIDEO</b> Key on the Control Panel	Enables an External Video Input Playback on the LOGIQ™ 180 monitor. Press once again to return to the scan mode	

## Section 4-7 Patient contact tools

### 4-7-1 Probe/Connectors Check

Take the probes and check them as described below:.

**Table 4-12 Probe and connectors check**

Step	Check	Expected Result(s)	If Not Remedy
1.	To test each delivered Probe, Connect it to the System	It will display the probe name on the screen	
2.	Hold the probe connector horizontally with the cable pointing Sideways. Turn the connector locking handle to the Vertical position. Align the connector with the probe port and carefully push into place. Rotate the locking handle to the full Horizontal position to lock in place. Position the probe cable so that it is not resting on the floor  CAUTION: Do not allow the probe head to hang freely. Impact to the probe head may result in irreparable damage.	To connect a probe:	
3.	Rotate the lock handle counter-clockwise to the Vertical position to unlock the connector. Remove the connector from the port Ensure that the probe head is clean before placing the probe in its storage case.	<b>To disconnect probes:</b> <i>The probes that are not connected to the unit should be stored in their storage case.</i>	
4.	Two Probes can be Switched by pressing the Key on the Two Probe Port	The LED toggles to indicate the probe change & a click is also heard to indicate change over  The system initializes the new probe & the image from the newly selected probe is displayed in the B-Mode	
5.	Presetting Parameters to a Probe, Select the desired probe & adjust the desired parameters Press CTRL + W + Enter	The Parameters selected will be set as Default Values	

**Table 4-12 Probe and connectors check**

Step	Check	Expected Result(s)	If Not Remedy
6.	Hold the probe connector horizontally with the cable pointing Sideways. Turn the connector locking handle to the Vertical position. Align the connector with the probe port and carefully push into place. Rotate the locking handle to the full Horizontal position to lock in place. Position the probe cable so that it is not resting on the floor  CAUTION: Do not allow the probe head to hang freely. Impact to the probe head may result in irreparable damage.	It will display the Probe name on the Screen	



**WARNING** *Probes can be connected at any time, whether the unit is on or off.*



**WARNING** *Do NOT touch the patient and any of the connectors on the ultrasound unit simultaneously, including ultrasound probe connectors.*

# Chapter 5

## Theory

### Section 5-1 Overview

#### 5-1-1 Purpose of Chapter 5

This chapter explains LOGIQ™ 180's system concepts, component arrangement, and subsystem function. It also describes the Power Distribution System (PDS) and probes.

### CONTENTS IN CHAPTER 5

Table 5-13 Contents in Chapter 5

Section	Description	Page Number
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5-5	Video Specifications	5-13
5-6	Rear Panel Signal List	5-13

## Section 5-2 Block Diagram

Block Diagram

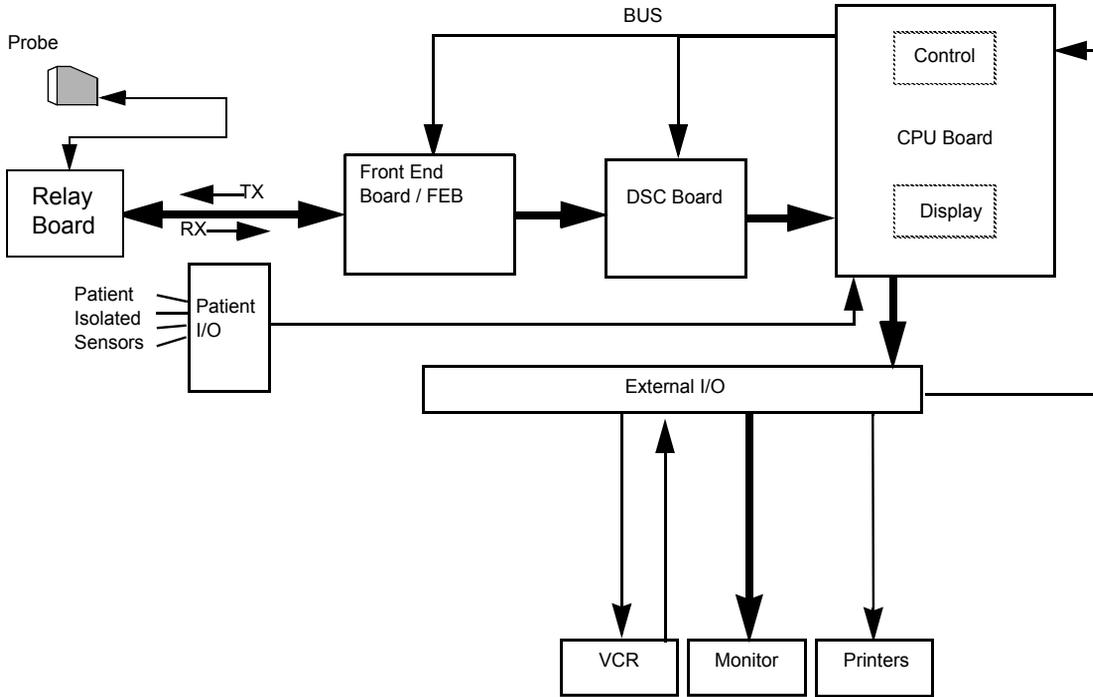
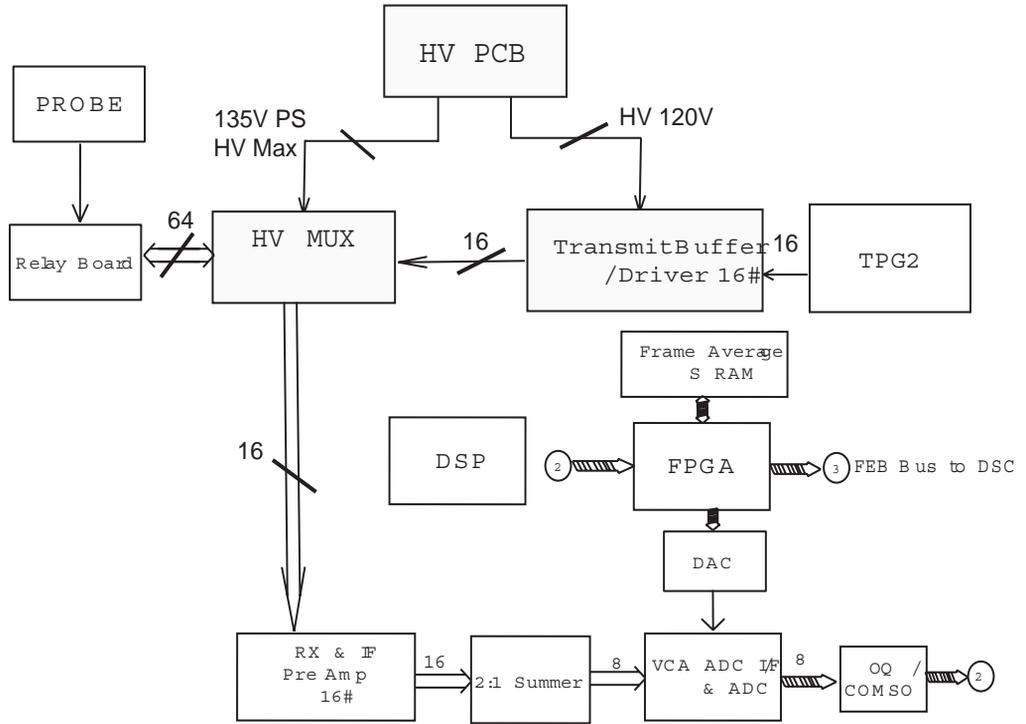


Figure 5-31 Block Diagram, LOGIQ™ 180 (General)

Block Diagram



OQ CARD -> Octal Quad Channel Asic Receiving Delay  
 COMSO -> COMplex Mode Mig Processor

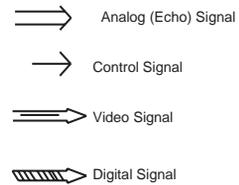
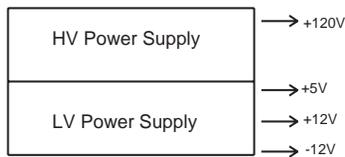
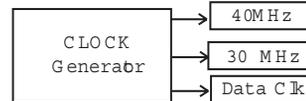


Figure 5-32 Block Diagram LOGIQ™ 180

Block Diagram Continued

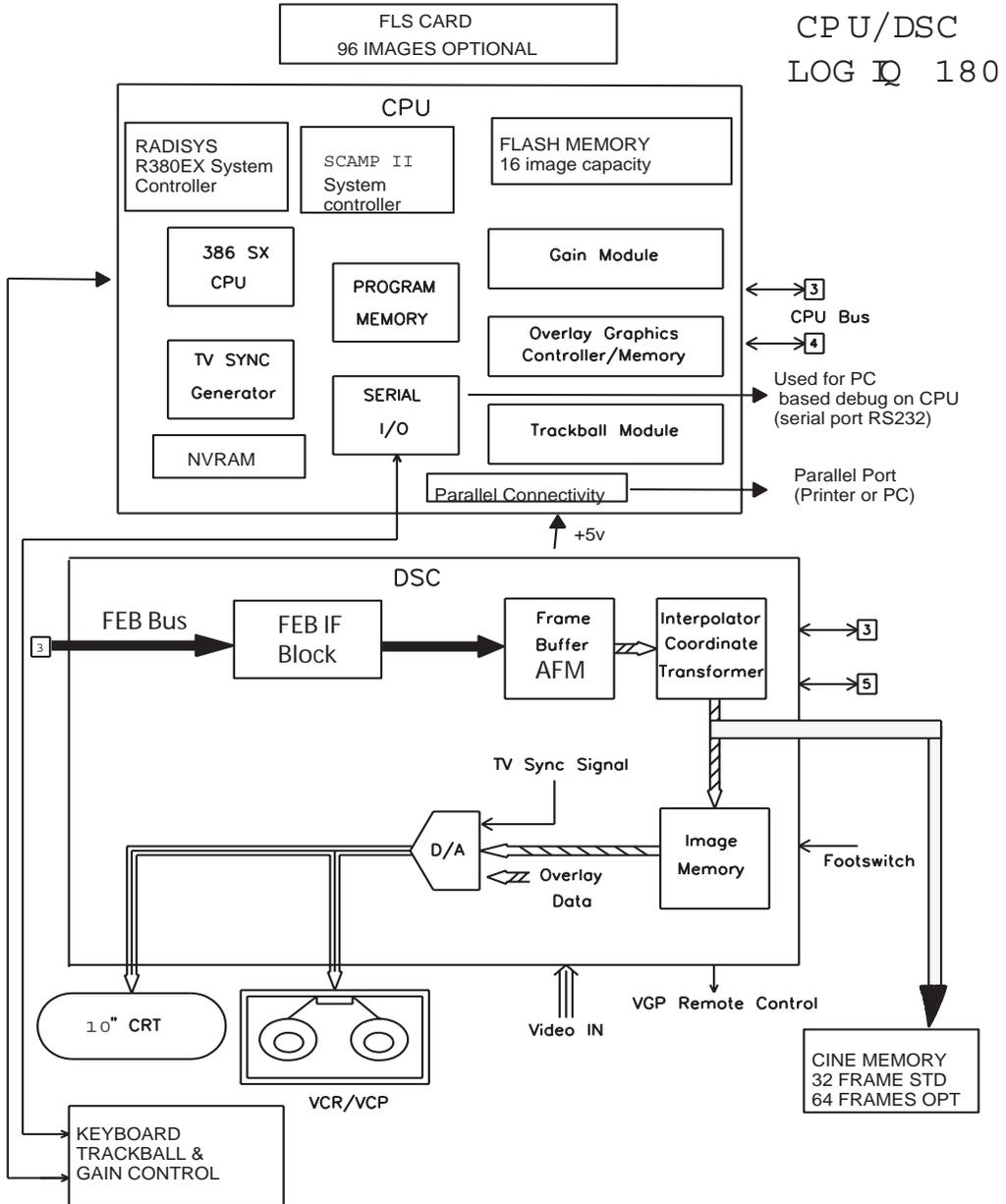


Figure 5-33 Block Diagram for LOGIQ™ 180

## 5-2-1 PCB Nomenclature

The following table lists the Circuit boards on LOGIQ™ 180 system.

**Table 5-14 Circuit board on LOGIQ™ 180**

Board Abbrv	Description	Remarks
CPU	Central Processing Unit	For LOGIQ™ 180 (V7.0HC)
DSC	Digital Scan Converter	For LOGIQ™ 180 (V7.0HC)
KBD	Keyboard	For LOGIQ™ 180 (V7.0HC)
FEB	Front End Board	For LOGIQ™ 180 (V7.0HC)
PDB	Power Distributor PCB	For LOGIQ™ 180 (V7.0HC)
RLB	Relay Board	For LOGIQ™ 180 (V7.0HC)

## 5-2-2 Dip Switch Setting

### 5-2-2-1 FEB Board



**CAUTION** The Settings are valid only when jumper JP1 and JP20 are in Test mode and is used for PCB testing in the production line. The equipment at the customer site should have JP1 and JP20 in normal mode which makes DIP switch S1 ineffective.

**Table 5-15**

S1	1	Probe Type 0
	2	Probe Type 1
	3	Probe Type 2
	4	Probe Type 3
	5	Probe Type 4
	6	SDO (Shutdown 0) 0: Enables probe type indicator (Indicates probe is connected) 1: Disables probe type indication (Indicates probe is disconnected)
	7	SD1 (Shutdown 1) 0: HV low (Not Used) 1: HV high (Not Used)

FEB Board (Continued)

Table 5-16 Probe Code

Probe Name	PT5-PT0	Frequency
Convex (C36)	010111(17)	3.5MHz
Convex (C55)	010110(16)	5.0MHz
Sector (TV) (E72)	010000(10)	6.5MHz
Linear (L76)	101101(2D)	7.5MHz
Micro convex (C31)	010101(15)	3.5MHz

5-2-2-2 CPU Board

Table 5-17 CPU Board SW1/SW3

Location	Switch No	Settings
SW1/SW3#	2	0: STDOUT is LOGIQ™ 180 Display 1: STDOUT (Standard Output) AUX (PC)
	3	0: STDIN (Standard Input) is AUX (PC) 1: STDIN is LOGIQ™ 180 Keyboard*
	4	0: NTSC Setup 1: PAL Setup
	5	0: 2MB DRAM 1: 512KB DRAM
	6,7,8	000: Debug Monitor 100: Application (Ultrasound Mode) 001: Service Diagnostics

Table 5-18

Location	Switch No.	Settings
SW2	S1	0(OFF): Flash Assembly Enable 1 (ON): Flash Assembly Disable
	S2	0: Enable 64 Frame Cine 1: Disable 64 Frame Cine
	S3 to S8	Don't Care

Section 5-3Wiring Diagrams

5-3-0-1 Power Distributor/Power Supply Wiring Diagram

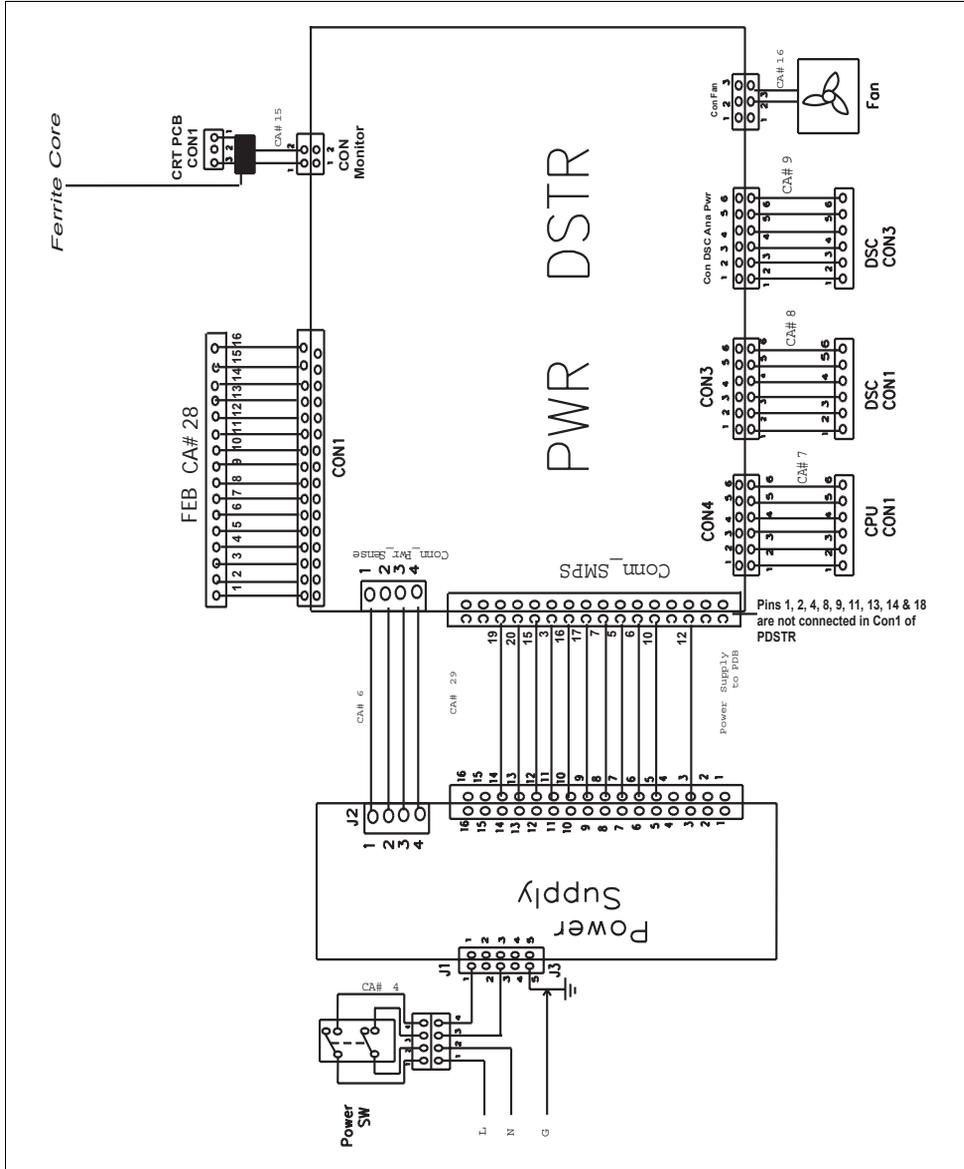


Figure 5-34 Power Distributor/Power Supply Wiring Diagram

Connector	Pin No.	Voltage	Connector	Pin No.	Voltage	Connector	Pin No.	Voltage
CON 1 Power Supply to PDB	1	NC	PWR DSTR CON4 to CPU CON1	1	GND	PWR DSTR CON Monitor to CRT	1	GND
	2	NC		2	GND		2	12V
	3	D GND		3	GND			
	4	NC		4	5V			
	5	C GND		5	5V			
	6	12V		6	GND			
	7	C GND	PWR DSTR CON DSC to DSC CON3	1	5V			
	8	NC		2	GND			
	9	NC		3	-12V			
	10	12V		4	GND			
	11	NC		5	12V			
	12	- 12V		6	GND			
	13	NC	PWR DSTR CON FAN to FAN	1	-			
	14	NC		2	12V			
	15	D GND		3	GND			
	PWR DSTR CON 2	16	A GND	PDB to FEB	1		-9V	
		17	A GND		2		GND	
		18	NC		3		-5V	
		19	5V		4	GND		
	PWR DSTR CON 3 to DSC CON1	20	5V		5	GND		
1		5V	6		GND			
2		GND	7		12V			
3		5V	8		GND			
4		GND	9		9V			
1		GND	10		GND			
2		GND	11		5V			
3	GND	12	GND					
4	5V	13	5V					
5	5V	14	GND					
6	5V	15	3.3V					
		16	3.3V					

Table 5-19 Power Distributor Connector Voltages for LOGIQ™ 180

5-3-0-2 Cable Assembly Diagrams

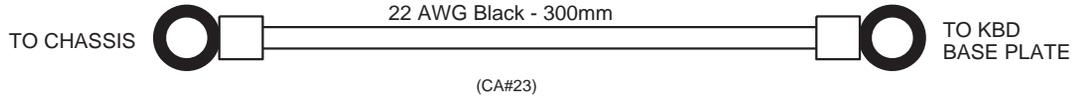


Figure 5-35 Cable Assembly Wiring Diagram

Cable Assembly Diagrams (Continued)

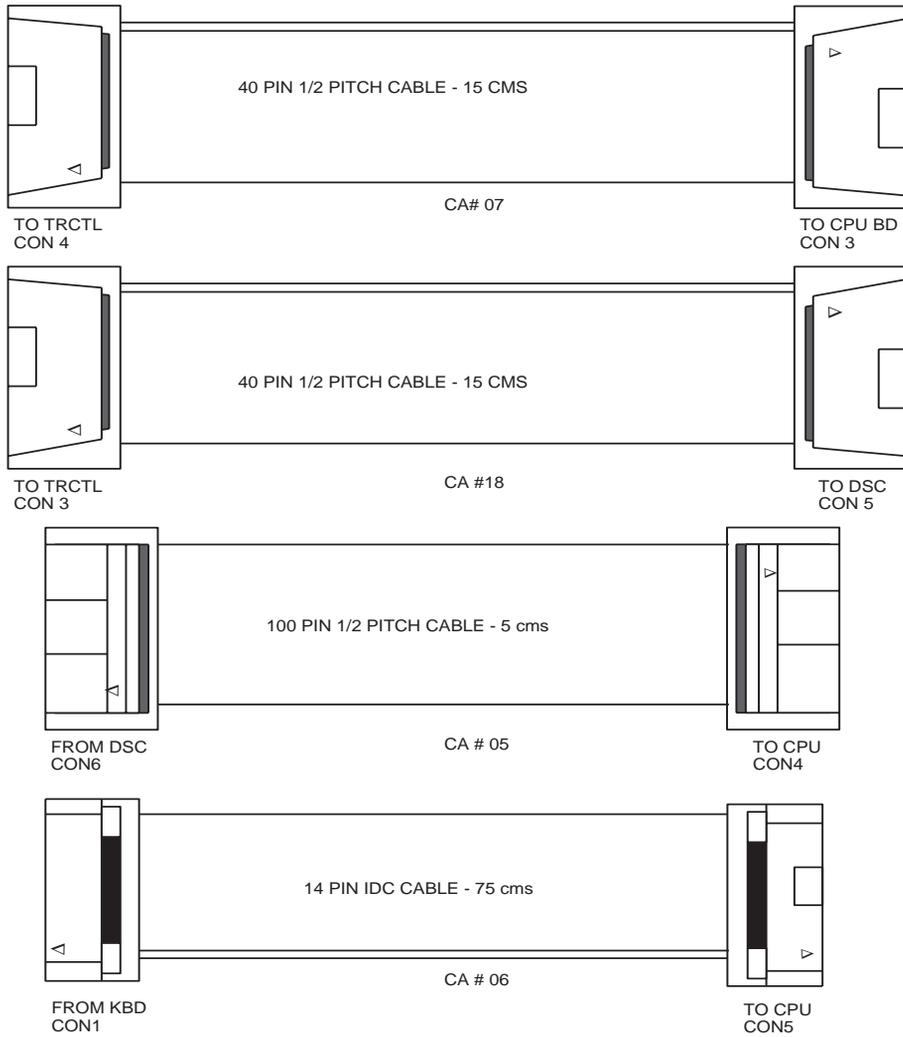


Figure 5-35

Cable Assembly Diagrams (Continued)

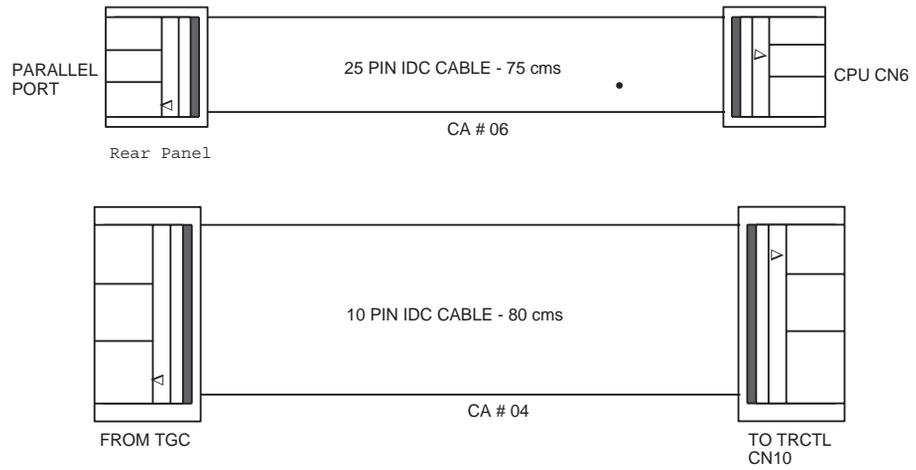


Figure 5-35

## Section 5-4 Functional Subsystems

### 5-4-1 Front End Board

The Front End generates the strong transmit bursts, transmitted by the probes as ultrasound into the body. It also receives weak ultrasound echoes from blood cells and body structure, amplifies the signals and convert them to a 16 bit digital signal.

The digital representation of the signal is presented to DSC.

### 5-4-2 DSC Board

DSC (Digital Scan Converter) function is to convert analog data to digital data and stores in AFM (Acoustic Frame Memory), then the Acoustic Frame Memory is transformed to X-Y plane memory (XYM). While doing transformation from Acoustic Frame Memory to X-Y plane memory, it does Quad point interpolation.

This also houses the electronics to display the plane memory data on NTSC or PAL TV monitor.

### 5-4-3 CPU Board

CPU Board Controls the overall system function including man-machine interface. It also has an Overlay graphics controller which generates Overlay Graphics/Text for the screen. The Overlay data output goes to the DSC Block.

The CPU performs the following functions:

- 1.) RTC for time and date
- 2.) DRAM for intermediate data storage
- 3.) EPROM for program memory
- 4.) Address Decoder for control signals
- 5.) Gain Encoder
- 6.) Overlay Graphics Controller and memory for overlay text data storage and manipulation
- 7.) TV Sync Generator for generating Sync and blank signal for composite video.
- 8.) It interfaces with Digital Scan Converter
- 9.) NV RAM for System Preset Parameters Storage
- 10.) Flash memory for storing upto 16 images. The CPU also interfaces with the Flash board (Optional Module) which can increase the storage capacity to 112 images. The Back End Processor grabs the data from the Image Port, stores it in a memory, performs scan.

### 5-4-4 Peripherals

VCR, Black & White Video Graphic Printer and Printer can be connected to the scanner. For more details on recommended peripherals refer Chapter 3.

## **Section 5-5 Video Specifications**

Refer to Section [section 3-6-6 on page 26](#) for more details about the Video Specifications.

## **Section 5-6 Rear Panel Signal List**

Refer to Section [section 3-6-4 on page 23](#) for more details about the rear panel signal list.

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# Chapter 6

## Service Adjustments

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### Section 6-1 Overview

#### 6-1-1 Purpose of Chapter 6

This section describe how to test and adjust the scanner. These tests are optional. You may use them to check the system for errors.

### CONTENTS IN CHAPTER 6

Table 6-20 Contents in Chapter 6

Section	Description	Page Number
6-1	Overview	6-1
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6-3	Caster Brake Function Adjustment	6-3
6-4	Monitor Adjustments	6-4
6-5	Jumper and Dip Switch Setting	6-5

## Section 6-2 Power Supply Adjustment

This system has SMPS Assy, which contains two power supply modules; HVPS Assy, LVPS Assy.

### 6-2-1 Caution

 **CAUTION** To avoid injury of electrical hazard, disconnect the main power cable from the power outlet when adjusting the power supply.

### 6-2-2 Access to Adjustments

For more information on how to remove the SMPS Assy (FRU No.703), please refer to the section 8-3-46.

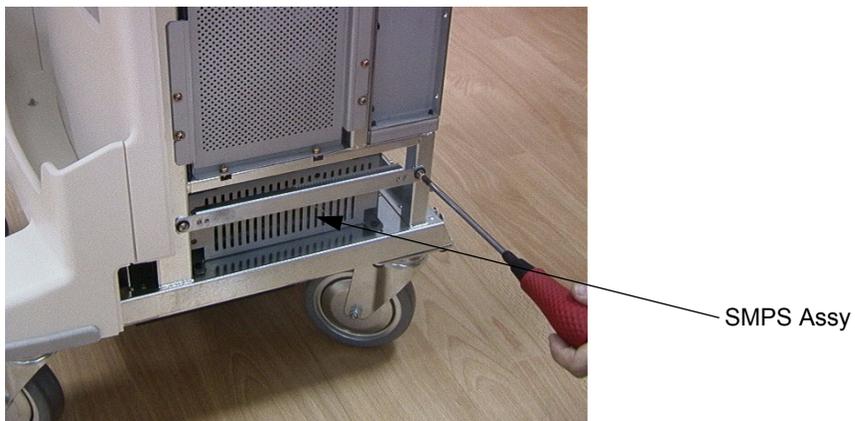


Figure 6-36 Remove the SMPS Assy



Figure 6-37 HVPS Assy and LVPS Assy

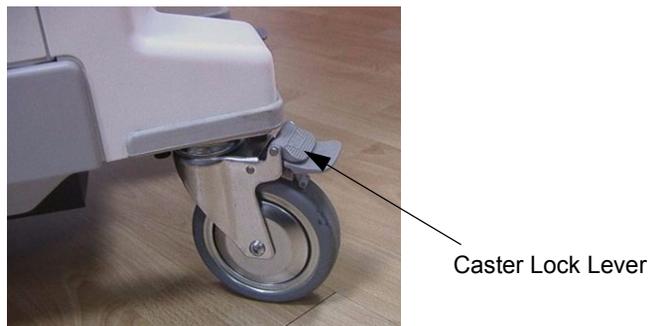
## Section 6-3 Caster Brake Function Adjustment

The LOGIQ™ 180 contains front brake lock adjusters. They are separately adjusted using the same method.



**Figure 6-38** Locations of Brake Lock Adjusters

Press the brake lock adjuster and tighten it securely.

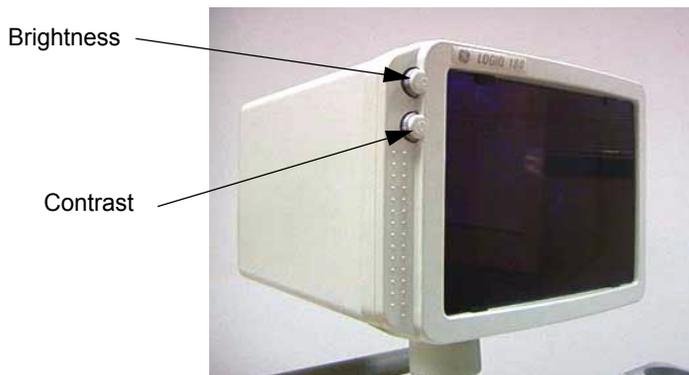


**Figure 6-39** Adjusting the Brake

## Section 6-4 Monitor Adjustments

To adjust the contrast and brightness:

- 1.) Turn the Knob for brightness. Turn clockwise / counter clockwise to increase / decrease brightness.
- 2.) Turn the knob for contrast. Turn clockwise / counter clockwise to increase / decrease contrast.



**Figure 6-40** Monitor adjustment

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

## Section 6-5 Jumper and Dip Switch Setting

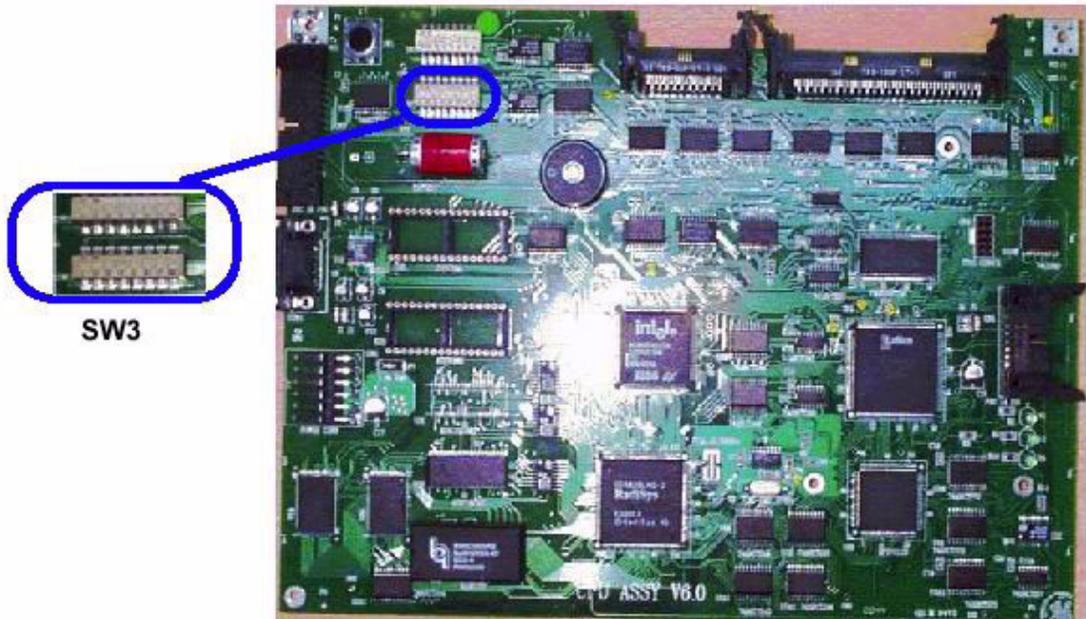


Figure 6-41 CPU Dip Switch Setting for NTSC & PAL

**NOTE:** Ensure that the Dip Switch 3 (SW3) 4th switch of CPU Assy is set to NTSC or PAL. If ON it is PAL, if OFF it is NTSC.

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# Chapter 7

## Diagnostics

### 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. Very basic host, system and board level diagnostics are run whenever power is applied. Some Service Tools may be run at the application level.

The LOGIQ™ 180 System service diagnostics comprises of:

- 1.) Self test or power on diagnostics
- 2.) Service diagnostic tools

The self test or power on diagnostics are run every time the system is booted. The service diagnostic tools include test procedures for testing the system at PCB level as well as block level. The diagnostic tools provides a pop-up menu to enable selection of various tests to test various blocks on the system.

### CONTENTS IN CHAPTER 7

Table 7-21 Contents in Chapter 7

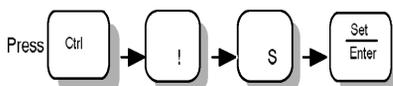
Section	Overview	Page Number
7-1	Overview	7-1
7-2	Power On Diagnostics	7-2
7-3	Error Reporting	7-13

## Section 7-2 Power On Diagnostics

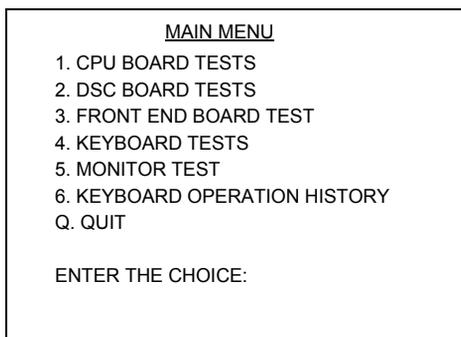
The power on diagnostics or self tests are run every time the system is booted. This self tests include testing the validity of the system software through EPROM checksum test and testing the system RAM. It checks whether the keyboard and the trackball are properly interfaced to the system. It also initiates the self test of analog subsystem. The two LED's on the keyboard (Freeze & Ext. Video) and the beeper are used to indicate error conditions.

**NOTE:** *Power on Diagnostics works only when the system is in application (imaging) mode and not while on service diagnostics. The application mode is controlled by DIP Switch SW1/SW3\* - 6,7,8 on the CPU which is set to ON,OFF,OFF respectively which is the normal setting. For more details refer section [section 5-2-2-2 on page 6](#).*

### 7-2-1 Service Diagnostics



Press (CTRL +! + S + Enter) keys on the keyboard to enter the service diagnostics. In response, a pop-up menu appears as shown in [Table 7-42](#)



For LOGIQ™ 180 V7.0HC

**Figure 7-42 Main Menu For LOGIQ™ 180 V7.0HC**

**NOTE:** *Option Q (Quit) can be used to come out of the diagnostic and enter the application mode.*

## 7-2-2 CPU Board Tests

When this test is select the following screen will appear.

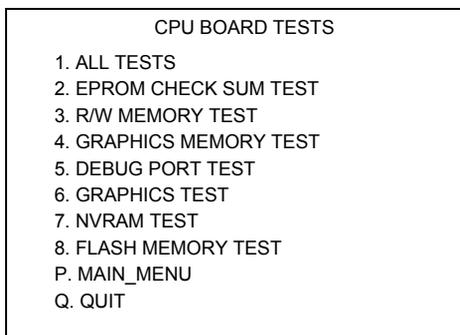


Figure 7-43 CPU Board Tests

### All Tests

This option is used to run all tests in the menu. Once all the tests are completed, press any key to exit.

### EPROM Checksum Test

The validity of the software residing in the EPROM on the CPU Board is tested by performing the Checksum test. The word Checksum of the program is computed and its one's compliment is stored in the EPROM as the last word. In this test the contents of the memory are added word wise and the computed sum is compared against zero. If the resulting sum is non-zero the test is reported to have failed.

### Read/Write Memory Test

The Read/Write memory on the CPU Board is tested by filling the memory with test patterns and reading them back and validating the read data. If any of the memory byte does not contain the expected data it is declared as faulty.

### Graphics Memory Test

The overlay or the graphics memory is tested in the same way as Read/Write memory.

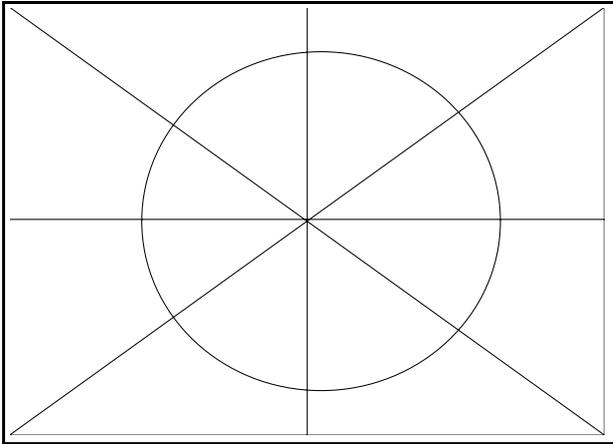
### Debug Port Test

*Internal Loop Back Test* - In this test the port is programmed for internal loop back mode so that a byte transmitted can be received back.

## CPU Board Tests (Contd.)

### Graphics Test

The pattern shown below is displayed on the monitor when this test is enabled.



**Figure 7-44 Graphics Test**

Press any key to exit the Graphics Test

### NVRAM Test

When this test is selected the following will appear

```
NVRAM TEST
NVRAM TEST
START OF NVRAM  0X400000
END OF NVRAM    0X403fff
TEST LOCATION   0X403f00 TO 403fff
WRITING TO NVRAM
.....
WRITING IS COMPLETED
READING FROM THE NVRAM
.....
NVRAM TEST PASSED
NOTE: NON-VOLATILITY HAS NOT BEEN TESTED
```

**Figure 7-45 NVRAM TEST**

**NOTE:** *WRITING SUCCESSFUL and READING SUCCESSFUL indicate NVRAM test is Passed.*

## CPU Board Tests (cont'd.,)

### Flash Memory Test

The Following Menu is Displayed

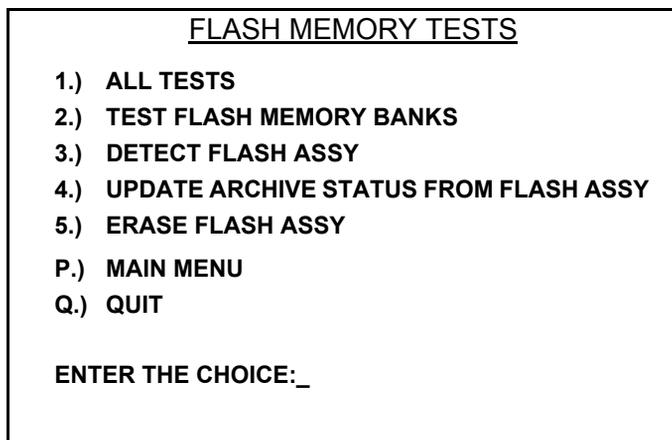


Figure 7-46 FLASH MEMORY TESTS

#### All Tests

This option is used to run all tests in the menu.

#### Test Flash memory banks

This test programs one image location in each bank and reads them back. This is done to check the functionality of all Image\_select and Bank\_select signals. The failure in any bank is indicated by the error message "FAILED". Else the message "OK" is displayed.

#### Detect Flash Assembly

This will check the presence of the Flash assy attachment and display the message "Flash assy card detected" or "Flash assy card not detected"

#### Update archive status from flash assy

This option has been provided to facilitate the interchange of Flash assy cards between CPU boards. The CPU software stores and keeps updating status information on all available flash image slots.

This status info is stored in the NVRAM. When a flash assy is inserted, the status info is stored in the NVRAM will not indicate the true status anymore. When we run this option, the CPU will check the Flash assy and update its status stored in NVRAM.

**NOTE:** *This option must be run during the following instance without fail*

- A.) Whenever the CPU board or the Flash assy gets replaced in the field
- B.) When the NVRAM gets replaced during a debugging operation.

## CPU Board Tests (cont'd.)

### Erase Flash memory

When this option is run all the images stored in the flash assy is erased.

### Main Menu

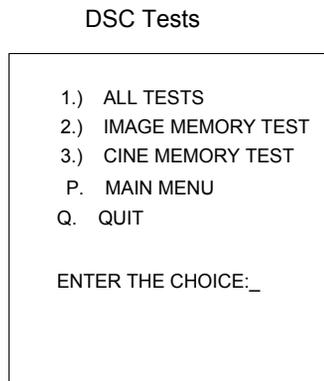
This option is used to return to the main menu.

### Quit

This option is used to come out of the diagnostic and enter the application mode.

## 7-2-3 DSC Board Tests

When this Option is selected following menu appears



**Figure 7-47 DSC Board Tests**

### All Tests

This option is used to run all tests in the menu.

### Image Memory Test

The image memory is tested in the same way as the memories on the CPU board.

### Cine Memory Test

All the Cine Frames have been tested one by one by writing 4 test patterns and then reading the same.

### Main Menu

This option is used to return to the main menu.

### Quit

This option is used to come out of the diagnostic and enter the application mode.

### 7-2-4 FEB Test for LOGIQ™ 180 (V7.0HC)

When self test for the FEB is selected, the DPRAM on the FEB Board will be written on and read back. Read data is checked for validity. This will prove the communication between FEB & CPU boards.

### 7-2-5 Keyboard Tests

When this Option is selected following Menu appears

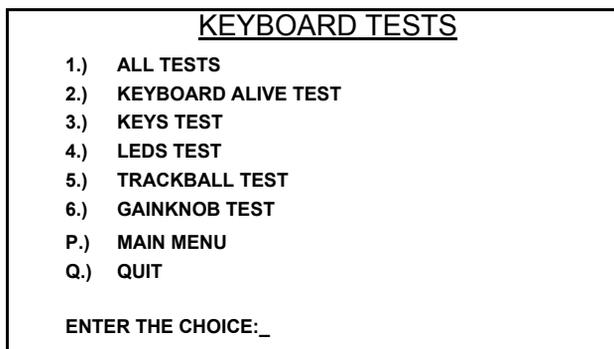


Figure 7-48 Keyboard Tests

#### All Tests

This option is used to run all tests in the menu.

#### Keyboard Alive Test

In this test, keyboard alive condition is tested by interacting with the keyboard firmware directly.

#### Keys Test

In this test, all the keys in the keyboard can be tested. The user is prompted to press the keys on the keyboard and the pressed keys are highlighted on the screen. (This is a toggle operation).

*NOTE: During Keys Test Press "Ext. Video" at the last. Pressing "Ext. Video" key interrupts the test and return to main keyboard Tests Menu.*

#### LEDS Test

During this test *FREEZE* field and *EXTERNAL VIDEO* field will be displayed on the monitor. The *FREEZE* and *EXTERNAL VIDEO* LEDs blink for a while sequentially and the corresponding field gets highlighted.

#### Trackball Test

A cursor is displayed on the monitor and the user can move the trackball and move the cursor over the screen.

#### Gain Knob Test

In this test, the user can check for the operation of the gain knob. The current gain value is displayed on the screen.

## Keyboard Tests (cont'd)

### Main Menu

This option is used to return to the main menu.

### Quit

This option is used to come out of the diagnostic and enter the application mode.

### 7-2-6 Monitor Test

The following test patterns are displayed on the monitor when this test is enabled. Please match the patterns displayed on your monitor with the given patterns figures Figure 7-49 to Figure 7-55. The Gain Knob is used for selection of patterns 1-10. To exit out of any pattern and return to the main menu, press *EXTERNAL VIDEO*.

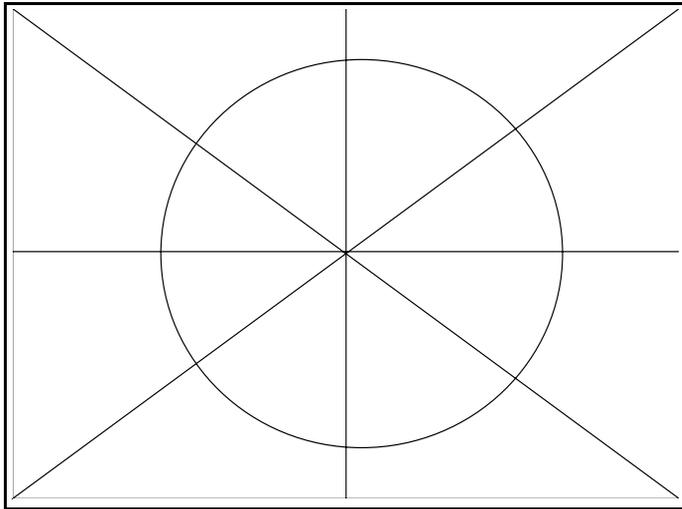


Figure 7-49 Monitor Test

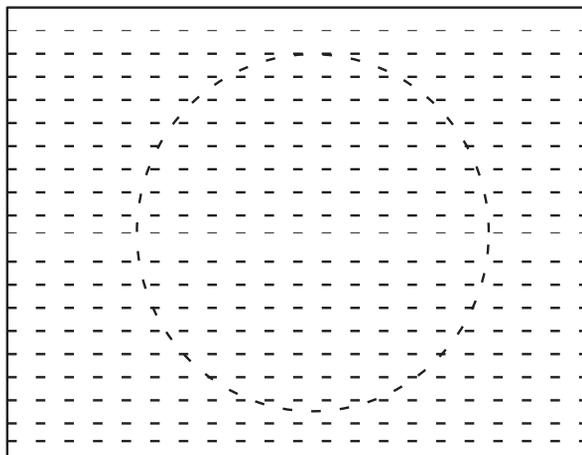


Figure 7-50 Monitor Test

Monitor Test (Contd.)

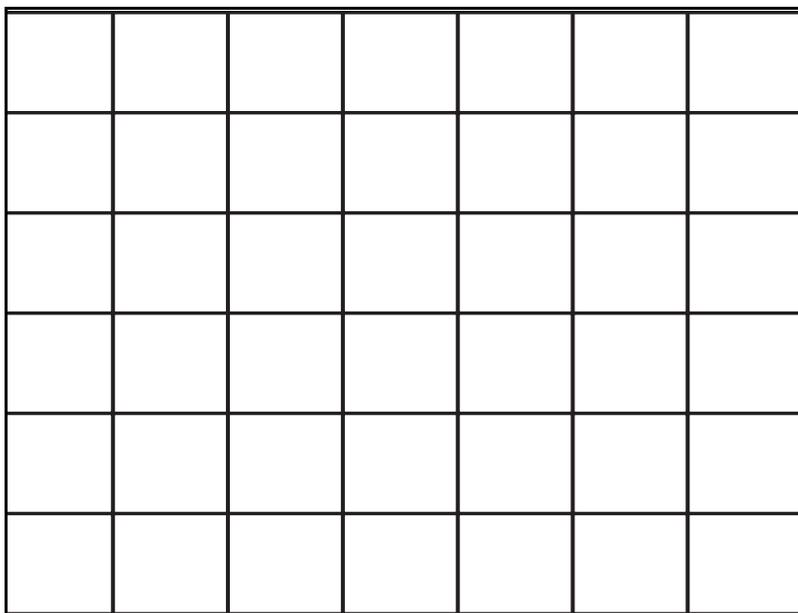


Figure 7-51 Monitor Test

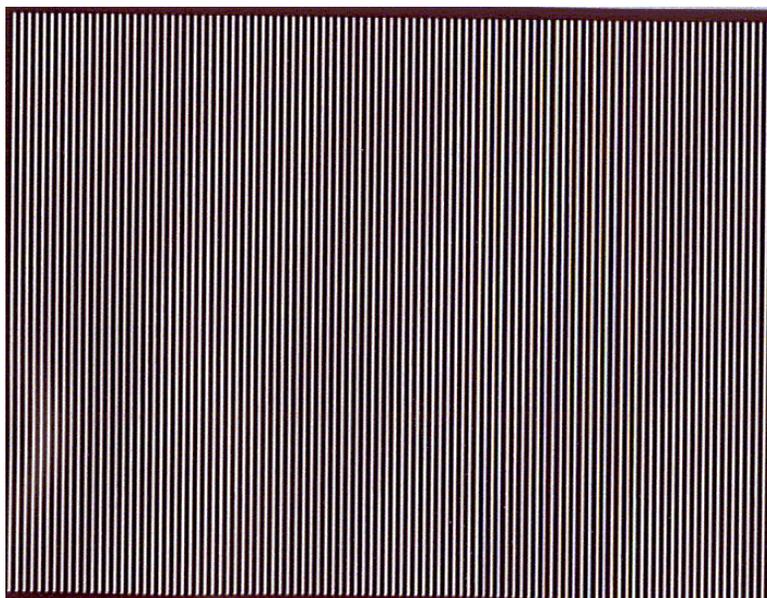
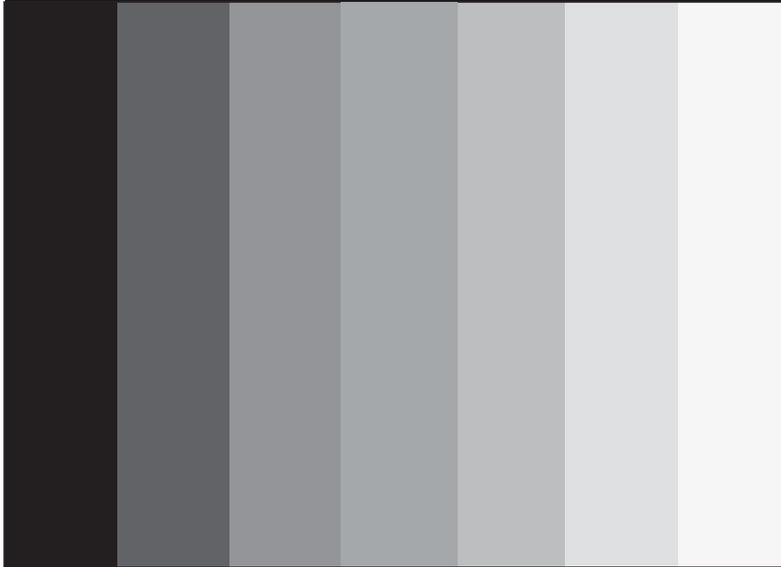
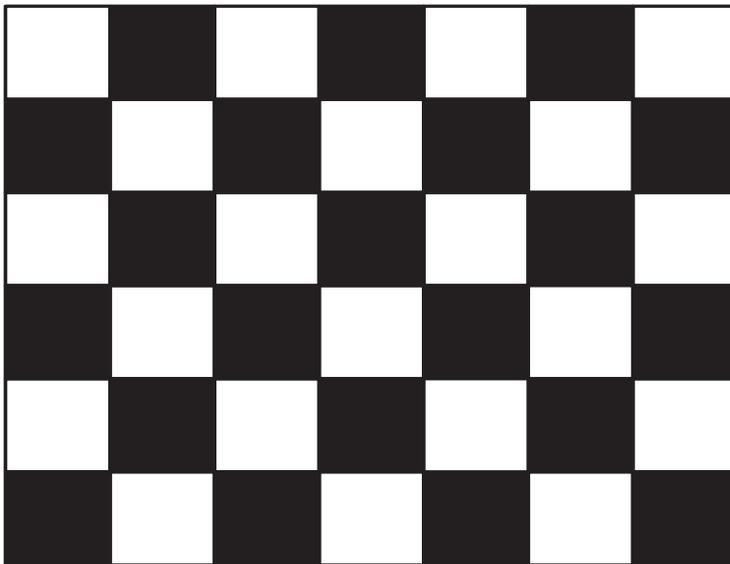


Figure 7-52 Monitor Test

**Monitor Test (Contd.,)**

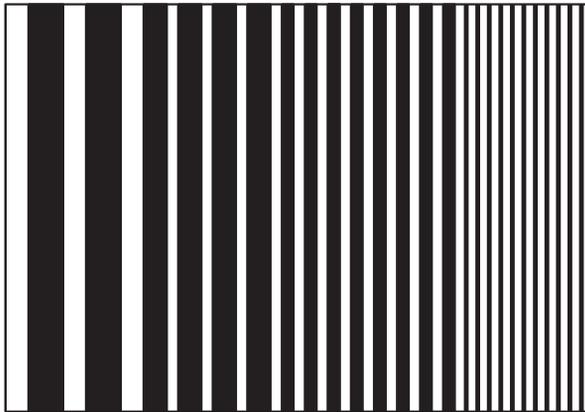


**Figure 7-53 Monitor Test**



**Figure 7-54 Monitor Test**

## Monitor Test (Contd.)



**Figure 7-55 Monitor Test**

**NOTE:** The patterns in Figure 7-49 to Figure 7-52 are written on the overlay where as the pattern in Figure 7-53 to Figure 7-55 is written on the image memory.

Figure 7-49 to Figure 7-51 are also available in reverse video.

### 7-2-7 Key Operation History

When this option is selected from the Main Menu the following appears indicating a maximum of 32 keys last activated. The history of keys used is stored even after powered off.

<u>KEY OPERATION HISTORY</u>	
KEY OPERATED	KEY OPERATED
1.	17.
2.	18.
3.	19.
4.	20.
5.	21.
6.	22.
7.	23.
8.	24.
9.	25.
10.	26.
11.	27.
12.	28.
13.	29.
14.	30.
15.	31.
16.	32.

PRESS EXT\_VIDEO TO QUIT

**Figure 7-56 Key Operation History**

## Section 7-3 Error Reporting

### 7-3-1 Error Reporting

The following are the error messages available:

**Table 7-22 Error Messages**

Errors	Remarks
"THE EVEN CHECKSUM FAILED"	This Message comes up during the diagnostics of the CPU Board. When the Eprom checksum (even) test for the CPU board fails, this message is displayed.
"THE ODD CHECKSUM FAILED"	This Message comes up during the diagnostics of the CPU Board. When the Eprom checksum (odd) test for the CPU board fails, this message is displayed.
"THE RAM TEST FAILED"	This Message comes up during the diagnostics of the CPU Board. When the R/W memory test for the CPU board fails, this message is displayed.
"THE GRAPHICS MEMORY TEST FAILED"	This Message comes up during the diagnostics of the CPU Board. When the Graphics memory test for the CPU board fails, this message is displayed.
"NVRAM TEST FAILED"	This Message comes up during the diagnostics of the CPU Board. When the NVRAM test for the CPU board fails, this message is displayed.
"TESTING FLASH BANK 0 ---- FAILED"	This Message comes up during the diagnostics of the CPU Board. When the Flash memory Bank test for the Flash memory fails, this message is displayed.
"NO FLASH ASSY CARD DETECTED"	This Message comes up during the diagnostics of the CPU Board. When the Detect Flash Assy test for the Flash memory fails, this message is displayed.
"TESTING CINE DEVICE U3E1S -- FAILED"	This Message is displayed during the diagnostics of the DSC board. When the cine memory test for the DSC board fails, this message is displayed. U3E1S may be different depending on the name of the cine device.
"THE IMAGE MEMORY TEST FAILED "	This Message is displayed during the diagnostics of the DSC board. When the image memory test for the DSC board fails, this message is displayed.
"THE KEYBOARD SUBSYSTEM FAILED TO RESPOND"	This Message is displayed during the diagnostics of the Keyboard. When the keyboard firmware is not alive, this message is displayed.
"KEYBOARD NOT CONNECTED"	If the keyboard is not connected then this message is displayed during system boot up.
"NO DSC FRAME FREEZE ACKNOWLEDGE"	This message is displayed during system boot up when the DSC is failed.
"NO SCBF FRAME FREEZE ACKNOWLEDGE"	This message is displayed during system boot up when FEB is failed.
"SCAMP MOUSE CONTROLLER SELF TEST ERROR"	This message is displayed during system boot up when CPU is failed.
"TRACKBALL INTERFACE ERROR"	This message is displayed during system boot up and the trackball interface to keyboard is not proper.
"NO TRACKBALL ACKNOWLEDGEMENT"	This message is displayed during system boot up and keyboard connection is not there.
"NO SCBF SYSTEM MODE ACKNOWLEDGE"	This message is displayed when the system boots up in the normal mode. when FEB is failed.
"NO SCBF SCAN MODE ACKNOWLEDGE"	This message is displayed during system boot up when FEB is failed.
"CINE HARDWARE NOT PRESENT" CINE HARDWARE DIAGNOSTICS FAILED"	This message is displayed during system boot up and cine hardware is not present or some error is there.
"NO CINE HARDWARE TO SUPPORT 64 FRAMES" CINE HARDWARE SUPPORTS 32 FRAMES ONLY"	This message comes up during the system boot up, when the DIP Switch is set for 64 frames and cine hardware for only 32 frames are connected.
"PLEASE POWER OFF AND RESTART THE SYSTEM! "	This message is displayed when the system boots up in the normal mode and any error which needs the system to be restarted comes up.
"PRINTER IS BUSY"	This message comes up when shift + record is pressed without connecting the printer.
"PRINTER ERROR"	This message comes up when an error occurs in the printing process.
"PRINTING ABORTED"	This message is displayed during Printing & due to printer error.

**Table 7-22 Error Messages**

Errors	Remarks
"WARNING: THIS WILL ERASE ALL IMAGES! 1:YES 2:NO"	This message is displayed when the '3' (Clear ALL) is pressed after going to the recall screen.
"ARCHIVE FULL "	This message is displayed when the store key is pressed while the archive is full.
"PC TRANSFER STARTS.PRESS 'CLEAR' TO ABORT"	This message is displayed when the PC Transfer is initiated.
"PC IS NOT READY"	This message is displayed when shift + store is pressed without connecting the PC.
"PC TRANSFER ERROR"	This message is displayed when some error occurs in the PC transfer process.

# ***Chapter 8***

## ***Replacement Procedures***

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### **Section 8-1** **Overview**

#### **8-1-1 Purpose of Chapter 8**

This chapter holds replacement procedures for the following modules/subsystems.

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# Chapter 9

## Replacement Parts

### Section 9-1 Overview

#### 9-1-1 Purpose of Chapter 9

This chapter gives you an overview of Spare Parts for LOGIQ™ 180 .

### CONTENTS IN CHAPTER 9

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9-1-4	Covers	9-5
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**MATERIAL LIST - LOGIQ™ 180**

Part Name	Part No.	QTY.							Description
Operator Console Assembly	2336833	1							220-240VAC, 50Hz, PAL, 220-240VAC, 50Hz, PAL, 220-240VAC, 50Hz, PAL, 220-240VAC, 60Hz, NTSC,
	2336833-2		1						
	2336833-3			1					
	2378171				1				
User Manual	2317228-141	1							Chinese
User Manual	2317228-100		1	1	1				English
Holder Supporter	2185704	1	1	1	1				
Probe Protector L	2158045	1	1	1	1				
Gel Holder	2157984	1	1	1	1				
Printer Install kit	2232078	1	1	1	1				
Installation Instruction Guide	2184414	1	1	1	1				English
BNC cable	2183140	1	1	1	1				
Shutter cable	2183139	1	1	1	1				
Gel. And <<MSDS>>	U0403BD	1	1	1	1				
96 frame cine memory (hardware)	2341523		1	1	1				
64 frame cine memory (hardware)	2341524		1	1	1				
Foot switch	2162242	1	1	1	1				
Service Manual	2317229		1						English
Sony Printer	2288503								
Image Transfer Kit (cable & disc)	2344566								
H41542LA China									
H41542LB Europe									
H41542LC India									
H41542LD Korea									

9-1-2 Monitor

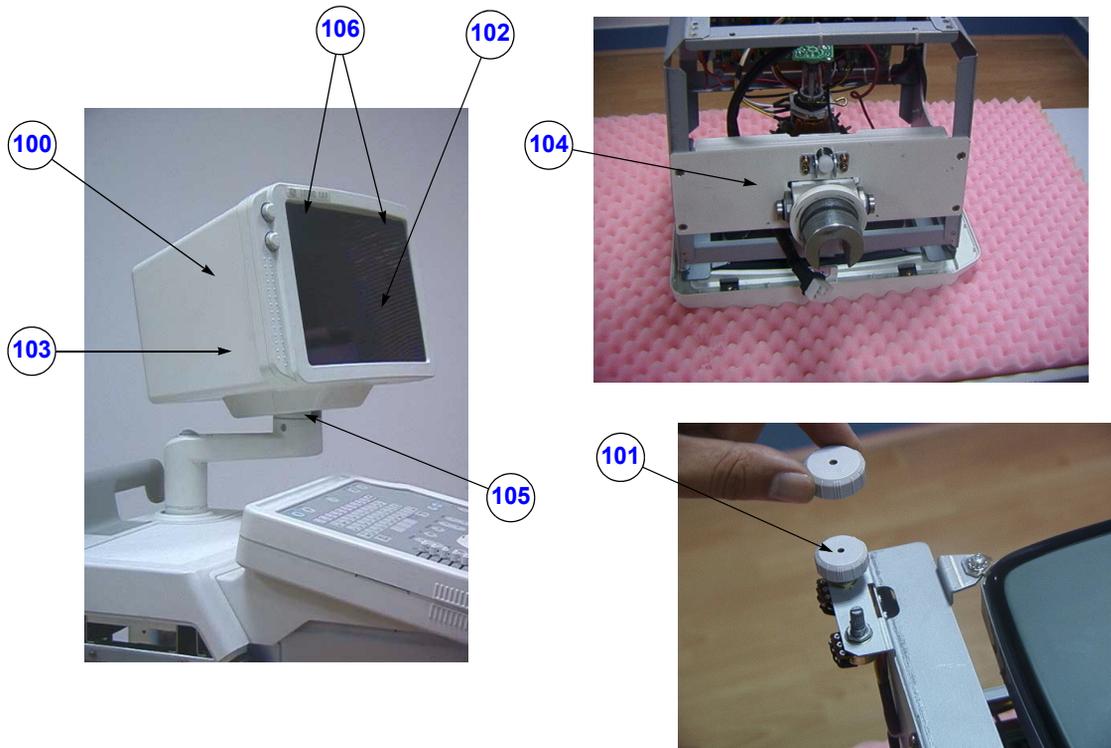


Figure 9-57 Monitor

Table 9-24 Monitor

Item	Part Name	Part No.	Description	Qty	FRU
100	Monitor Assembly	2330215	CRT set and Plastic cover (PAL)	1	1
		2379318	CRT set and Plastic cover (NTSC)	1	1
101	Pot Set	2341708	Bright and Contract knob	1	2
102	CRT Filter (plastic)	2217745	Include 2 brackets for China, India, Europe	1	2
103	Monitor cover set	2148195	Rear Cover of the 10" monitor	1	2
104	Tilt Assy	2341709	Rotation device under the monitor	1	2
105	Monitor Space Plate	2148197-2	White Plastic Washer	1	1
106	Filter Clamp set	2214397	For plastic filter	1	2

9-1-3 Casters

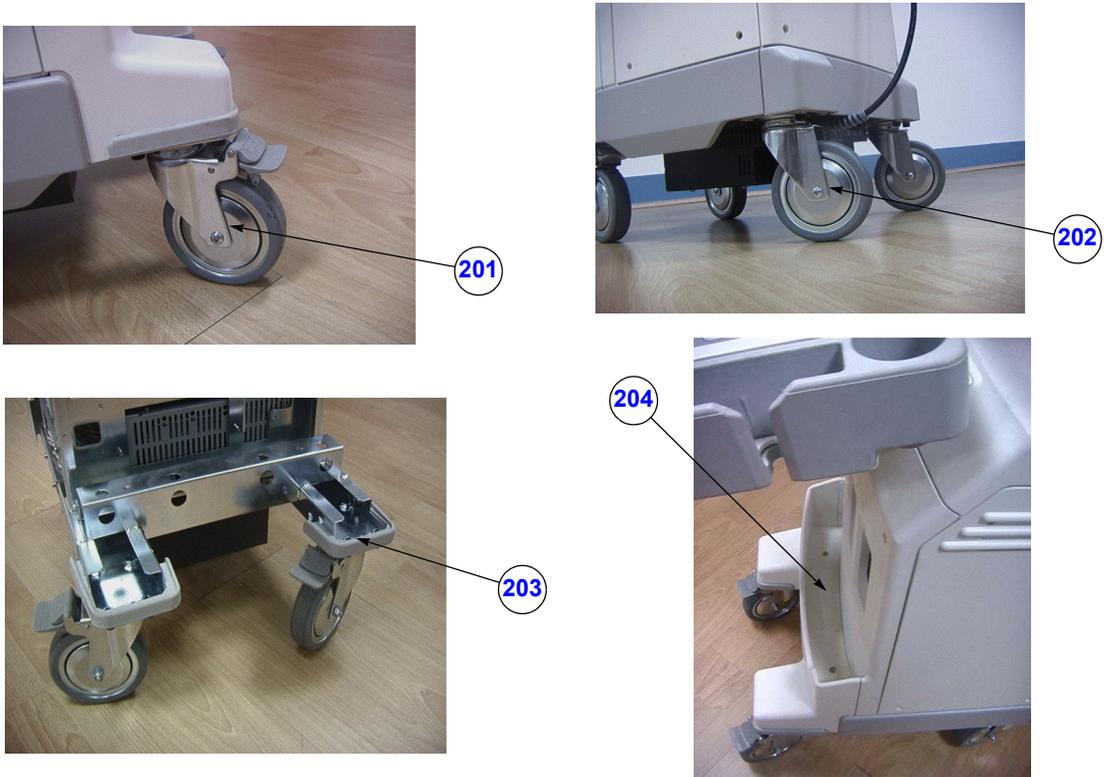


Figure 9-58 Casters

Table 9-25 Casters

Item	Part Name	Part No	Description	Qty	FRU
201	Catis Caster (lock)	2192111	Lock Caster	2	1
202	Catis Caster (swivel)	2192112	swivel	2	1
203	Bumper set	2148230	including right and left bumper	1	2
204	Front Base Cover	2148217	The cover above the front caster	1	1

9-1-4 Covers



Figure 9-59 Covers

Covers (cont'd)

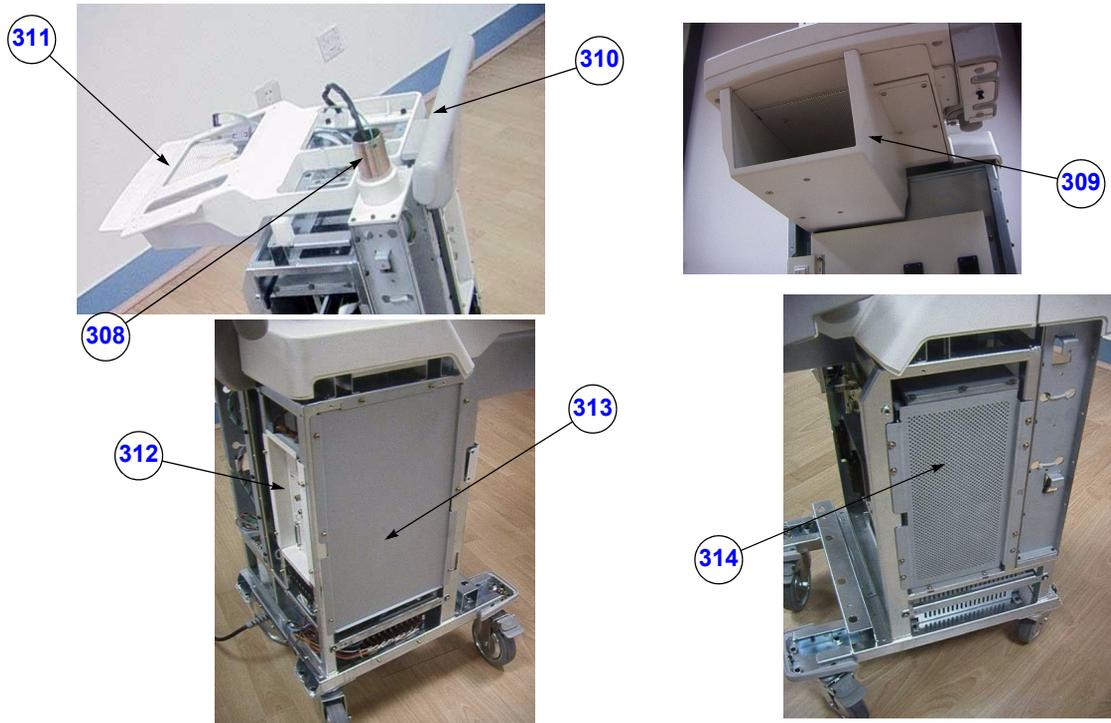


Figure 9-60 Covers (cont'd)

Table 9-26 Covers

Item	Part Name	Part No.	Description	Qty	FRU
301	Left Cover	2158024	Left plastic cover	1	1
302	Right Cover	2158053	Right plastic cover	1	1
303	Front Cover	2148218-2	Front plastic cover	1	1
304	Rear Cover	2347339	Include Caution Label	1	2
305	Top Cover	2158086	Top plastic cover	1	1
306	Swing Arm	2191769	Swing arm device under the monitor	1	1
307	Pole Cover Assy	2148214-2	Include Cover Pole, Curtain Pole	1	2
308	Pipe Assy	2338036	Included Cable Assy	1	1
309	Printer Cover	2148220-2	Plastic cover around the printer	1	2
310	Rear Handle	2148222	The handle for pushing	1	2
311	Neck Frame	2148223-2	Under the keyboard bottom cover	1	2
312	Rear Panel Assy	2336462	Rear panel for input and output	1	1
313	EMI Cover L	2169025	Left metal cover	1	2
314	PCB Guide Assy	2169263	Right metal cover	1	2

9-1-5 Probe Port and Front Panel

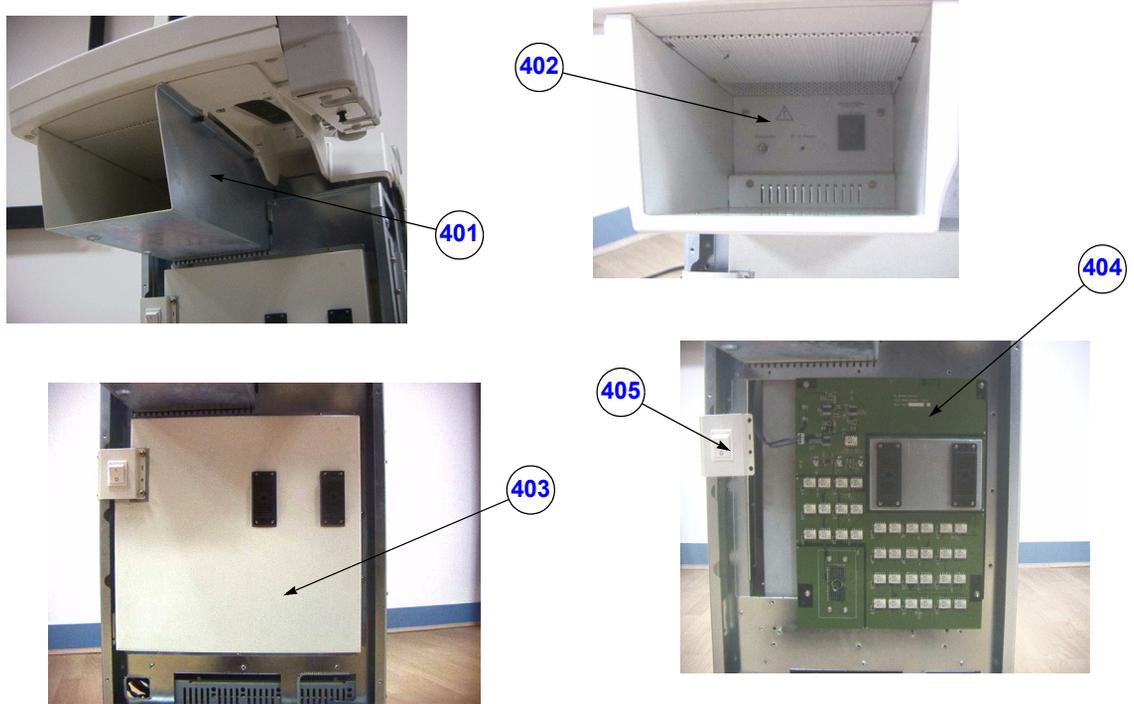


Figure 9-61 Probe Port and Front Panel

Table 9-27 Probe Port and Front Panel

Item	Part Name	Part No.	Description	Qty	FRU
401	Printer Bracket Assy	2347371	Include the back bracket assy (P/N:2346982)	1	2
402	Back Breakout Assy	2346982	Print input port include breaker	1	2
403	Shield Panel	2326058	Shield panel above the relay board assy	1	2
404	Relay board Assy	2341406	Board include Bracket Probe	1	1
405	Power S/W Assy	2148226	Power on/off switch include the bracket	1	1

9-1-6 Keyboard



Figure 9-62 Keyboard

**Keyboard (cont'd)**

**Table 9-28 Keyboard**

Item	Part Name	Part No.	Description	Qty	FRU
501	Probe Holder	2148198	Include Probe Cup Holder and Probe Sheet	1	2
502	P.G Rivet	2160325	Plastic screw to fix probe holder	1	2
503	Holder bracket out	2157993	Support the probe	1	2
504	Holder bracket in	2157992	Metal bracket to fix holder bracket out	1	2
505	Keyboard Cover Bottom	2158940	Keyboard plastic bottom cover	1	2
506	Probe Protector S	2158046	short probe protector	1	2
507	Probe Protector L	2158045	long probe protector	1	2
508	Keyboard Assy	2330205	Keyboard component include PCB and bracket keyboard sheet	1	1
509	TGC Assy	2329699	TGC component include plastic cover and potentiometer	1	1
510	TGC top cover	2330873	6 Knobs	6	2
511	Trackball	2327348	2" penny trackball assy	1	1
512	Gain Knob	2139703	Plus 2139513 Gain control module	1	1
513	Freeze Board	2326387	Plus Spring 2340110; Plus Freeze key top 2330874	1	1
514	Keyboard PWA	2326384	Board	1	1
515	Key Sheet	2326059	Plus Keyboard bracket 2326060; Plus Freeze PCB bracket 2337558	1	2

9-1-7 Circuit Board Assembly

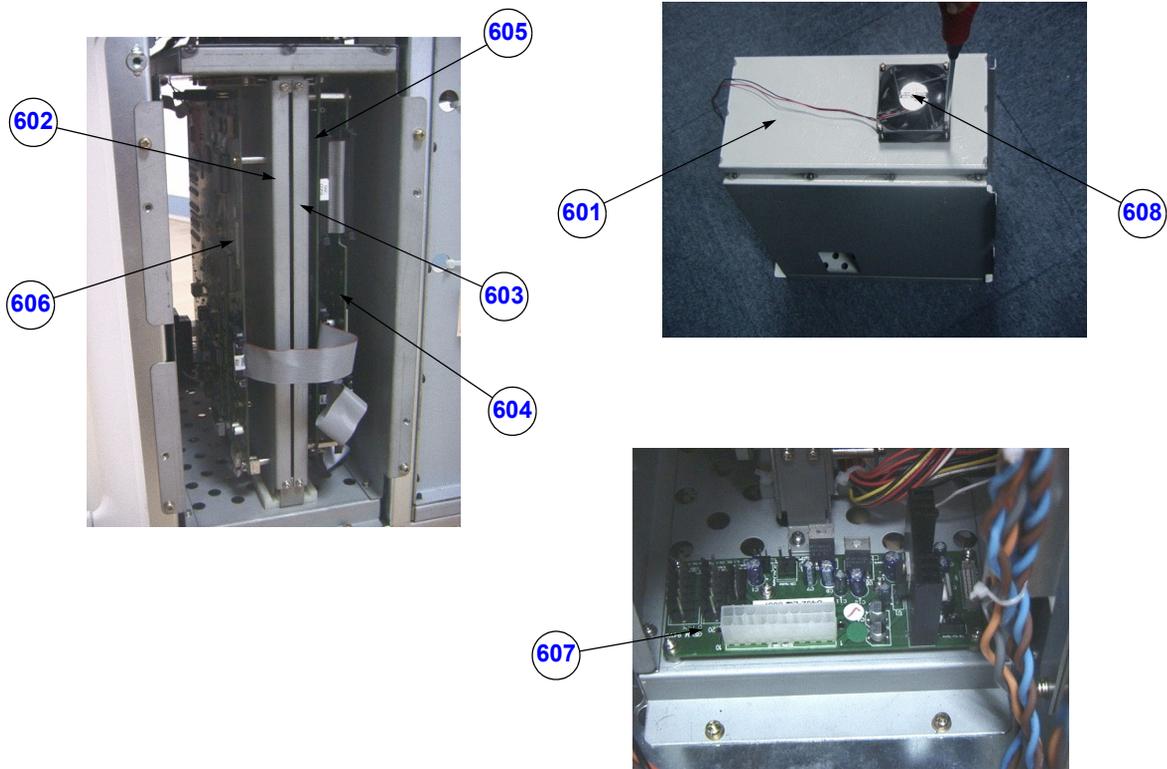
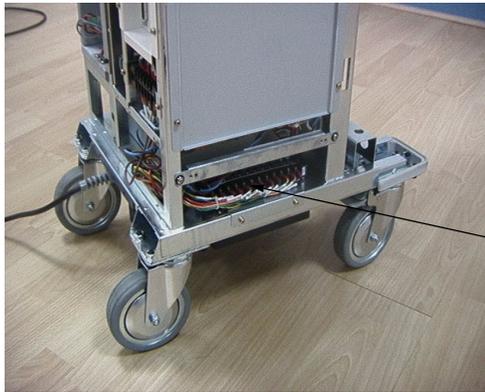


Figure 9-63 Circuit Board Assembly

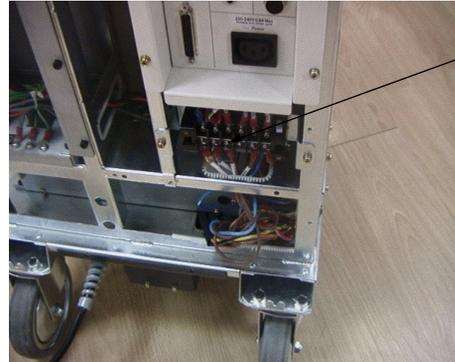
Table 9-29 Circuit Board Assembly

Item	Part Name	Part No.	Description	Qty	FRU
601	Nest Box	2326061	the box to fix the PCB	1	2
602	Single PCB Bracket	2326052	Bracket	1	2
603	Multi PCB Bracket	2326051	Bracket	1	2
604	CPU Assy	2352811	Board	1	1
605	DSC Assy	2352813	Board	1	1
606	FEB Assy	2352815-2	Board	1	1
607	Power Distribution	2300762	Board	1	1
608	Fan	2300226	DC Fan	1	1

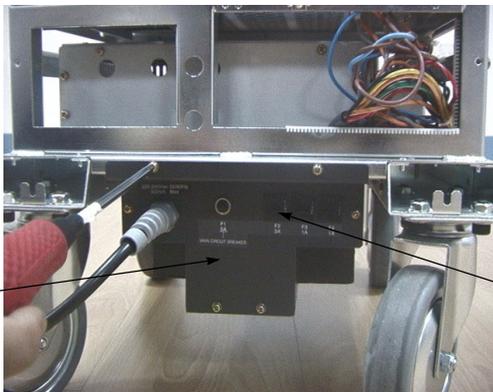
9-1-8 Power Supply and TRANS Assy



701

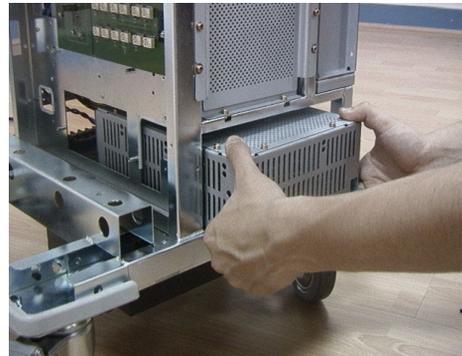


702



705

706



12V voltage  
adjustment  
(11.6-12.2V)

5V voltage  
adjustment  
(4.9-5.1V)

703



LVPS Assy

704

HVPS Assy

Figure 9-64 Power Supply and TRANS Assy

**Power Supply and TRANS Assy (cont'd)**

**Table 9-30 Power Supply and TRANS Assy**

Item	Part Name	Part No.	Description	Qty	FRU
701	Terminal Block 12 Assy	2148231	12 Pins terminal block	1	2
702	Terminal Block 6 Assy	2341371	6 Pins terminal block	1	2
703	HVPS Assy	2300757	High Voltage Power supply	1	1
704	LVPS Assy	2237916	Power supply with shield (=2139739+2139726-2)	1	1
705	TRNAS Assy	2160583	Isolation Transformer	1	1
706	Circuit Breaker Set	2174993	Include 1A, 3A and 5A circuit breaker	1	1

9-1-9 Options

Table 9-31 Options

Item	Part Name	Part No.	Description	Qty	FRU
801	C36 Probe	2268634			1
802	C31 Probe	2175994			1
803	C55 Probe	2107925			1
804	E72 Probe	2274908			1
805	L76 Probe	2274906			1
806	Foot Switch	2162242		1	2

9-1-10 Cables

Table 9-32 Cables

Item	Part Name	Part No.	Description	Qty	FRU
901	Cable Assy Set	2347341	Panda Cable 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21. Cable Assy 2, 3, 5, 10, 11, 12, 13, 14, 15, 17, 19, 20, 21, 22, 61, 62, 63, 64, 65 and Power Cable Assy	1	1
	Panda Cable 1	2329701	Cable Assembly for power distributor to DSC Assembly	1	
	Panda Cable 2	2329702	Cable Assembly for power distributor to CPU Assembly	1	
	Panda Cable 3	2329703	Cable Assembly for keyboard to Freeze Assembly	1	
	Panda Cable 4	2329704	Cable Assembly for keyboard to Freeze Assembly	1	
	Panda Cable 5	2329705	TGC-FEB interface	1	
	Panda Cable 6	2329706	CPU-DSC interface	1	
	Panda Cable 7	2329707	CPU-KBD interface	1	
	Panda Cable 8	2329708	Cable Assembly for Low voltage power supply to power distributor Assembly	1	
	Panda Cable 9	2329709	CPU-Rear Panel Parallel port cable	1	
	Panda Cable 10	2329710	Cable Assembly for Keyboard to trackball Assembly	1	
	Panda Cable 11	2329711	Cable Assembly for Keyboard to relay board Assembly	1	
	Panda Cable 12	2329712	KBD-Chassis (GDN) cable	1	
	Panda Cable 13	2329713	Cable Assembly for Low voltage power supply to power distributor Assembly	1	
	Panda Cable 14	2330381	Cable Assembly for power distributor to FEB Assembly	1	
	Panda Cable 16	2330383	Cable Assembly for power distributor to CPU Assembly	1	
	Panda Cable 17	2330384	Cable Assembly for Low voltage power supply to 220-240VAC input Assembly	1	
	Panda Cable 18	2335414	Cable Assembly for FEB to FH1 (connect with FH2)	1	
	Panda Cable 19	2337330	Cable Assembly for High voltage power supply to FH2 (connect with FH1)	1	
	Panda Cable 20	2337331	Cable Assembly DH1 (connect with DH2) to DSC Assembly	1	
	Panda Cable 21	2337332	DSC-CPU interface cable	1	
	Power Cable Assy	2169670	220-240VAC input (2A)	1	
	Cable Assy 3	2160462	isolation transformer internal cable	1	
	Cable Assy 2	2160461	isolation transformer internal cable	1	

**Cables (cont'd)**

**Table 9-33 Cables**

Item	Part Name	Part No.	Description	Qty	FRU
	Cable Assy 14	2160473	Cable Assembly for isolation transformer to terminal block Assembly	1	
	Cable Assy 15	2160474	Cable Assembly for isolation transformer to terminal block Assembly	1	
	Cable Assy 12	2160471	Cable Assembly for isolation transformer to terminal block Assembly	1	
	Cable Assy 63	2211954	Cable Assembly for Video Out to DH2 (connect with DH1)	1	
	Cable Assy 17	2160475	220-240VAC output (0.8A)	1	
	Cable Assy 62	2211953	Cable Assembly for Foot Switch to DH2 (connect with DH1)	1	
	Cable Assy 19	2160476	220-240VAC output (0.8A)	1	
	Cable Assy 64	2211955	Cable Assembly for Video Out to DH2 (connect with DH1)	1	
	Cable Assy 65	2211956	Cable Assembly for Shutter to DH2 (connect with DH1)	1	
	Cable Assy 61	2211952	Cable Assembly for Monitor to Power distributor Assembly	1	
	Cable Assy 13	2160472	Cable Assembly for isolation transformer to terminal block Assembly	1	
	Cable Assy 20	2160477	Terminal block internal cable	1	
	Cable Assy 21	2160478	Terminal block internal cable	1	
	Cable Assy 22	2160479	Cable Assembly for terminal block to Chassis (GND)	1	
	Cable Assy 5	2160464	Cable Assembly for isolation transformer to terminal block Assembly	1	
	Cable Assy 10	2160469	Terminal block internal cable	1	
	Cable Assy 11	2160470	Terminal block internal cable	1	
<b>902</b>	Image Transfer Cable	2344566	Standard 25 pin Dsub male to male cable		1

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# Chapter 10

## Quality Assurance

### Section 10-1 Overview

#### 10-1-1 Periodic Maintenance Inspections

It has been determined by engineering that your LOGIQ™ 180 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 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 10-34 Contents in Chapter 10

Section	Description	Page Number
10-1	Overview	10-1
10-2	Why do Periodic Maintenance	10-2
10-3	Periodic Maintenance Schedule	10-2
10-4	Tools Required	10-4
10-5	System Periodic Maintenance	10-5
10-6	Using a Phantom	10-9
10-7	Electrical Safety Tests	10-10
10-8	When There's Too Much Leakage Current...	10-19



**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 REAR PANEL THAT ARE DANGEROUS. BE SURE TO DISCONNECT THE SYSTEM POWER PLUG AND OPEN THE MAIN CIRCUIT BREAKER 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 Periodic Maintenance

### 10-2-1 Keeping Records

It is good business practice that ultrasound facilities maintain records of periodic and corrective maintenance. The Ultrasound Periodic Maintenance Inspection Certificate 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 designee.

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 Periodic Maintenance Schedule

### 10-3-1 How often should PMs be performed?

The Care & Maintenance Task Schedule specifies how often your LOGIQ™ 180 should be serviced and outlines items requiring special attention.

**NOTE:** *It is the customer's responsibility to ensure the LOGIQ™ 180 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 LOGIQ™ 180 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 LOGIQ™ 180 for an average patient load (10-12 per day) and 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.*

**Table 10-35 Periodic Maintenance Schedule**

Service at Indicated Time	Daily	Weekly	Monthly	Annually	Notes
Clean Probes	•*				* or before each use
Clean Probe Holders	•				
Inspect AC Mains Cable			•		Mobile Unit Check Weekly
Inspect Cables and Connectors			•		
Clean Console			•		
Clean Monitor			•		
Inspect Wheels, Casters, brake locks			•		
Check Control Panel Movement			•		Mobile Unit Check Daily
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					<b>Twice Annually</b>
Transesophageal Probe Leakage Current Checks					<b>As Prescribed in probe manual</b>
Surgical Probe Leakage Current Checks					<b>As Prescribed in probe manual</b>
Measurement Accuracy Checks				•	also after corrective maintenance or as required by your facilities QA program
Probe/Phantom Checks				•	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 Periodic Maintenance

See Chapter 7

**Table 10-36 Overview of Requirements for Periodic Maintenance**

Tool	Part Number	Comments
Digital Volt Meter (DVM)		
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
QIQ Phantom	E8370RB	RMI Grayscale Target Model 403GS
B/W Printer Cleaning Sheet		See printer user manual for requirements
Disposable Gloves		

## Section 10-5 System Periodic Maintenance

### 10-5-1 Preliminary Checks

The preliminary checks take about 15 minutes to perform. Refer to the system user documentation whenever necessary.

**Table 10-37 System Preliminary 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	Take printout of all customer presets as a backup.

**10-5-2 Functional Checks (See Also Chapter 4)**

The functional checks take about 30 minutes to perform. Refer to the system user documentation whenever necessary.

**10-5-2-1 System Checks**

**Table 10-38 System Functional Checks**

÷	Step	Description
	B-Mode	Verify basic B-Mode (2D) operation. Check the basic system controls that affect this mode of operation.
	M-Mode	Verify basic M-Mode operation. Check the basic system controls that affect this mode of operation.
	System Diagnostic	Perform the Automatic Tests, to verify that all boards function according to specifications.
	Control Panel Test	Perform the Control Panel Test Procedure, to verify that all keyboard controls are OK. This is performed by the internal PC (backend processor) which does a normal keyboard run through.
	Monitor	Verify basic Monitor display functions. Refer to Chapter 3 of the User Manual.
	Measurements	Scan a gray scale phantom and use the measurement controls to verify distance and area calculation accuracy. Refer to the User Manual, Chapter 18, for measurement accuracy specifications.

**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 the User Manual for a list of approved peripherals/options.

**Table 10-39 GE 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	VGP Printer	Verify hardcopy output of the video graphic printer. Clean heads and covers if necessary.
3	B/W Printer	Verify hardcopy output of the B/W printer. Clean heads and covers if necessary.
4	Footswitch	Verify that the footswitch is functioning as programed. Clean as necessary.

**10-5-3 Input Power**

**10-5-3-1 Mains Cable Inspection**

**Table 10-40 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 kinds.
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 10-41 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).

## 10-5-5 Physical Inspection

**Table 10-42 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 all acceptable directions. Ensure that it latches in position as required.
5	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.
6	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.
7	External I/O	Check all connectors for damage and verify that the labeling is good.

## 10-5-6 Probe Maintenance

### 10-5-6-1 Probe Related Checks

**Table 10-43 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

### 10-5-6-2 Basic Probe Care

The system user manuals and various probe handling cards provide 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. See the User Manual and probe care cards 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.

TEE and Interoperative probes often have special considerations and individual probe user manuals. For TEE and Interoperative probes also refer to their separate user manuals.

**10-5-6-3 Basic Probe Cleaning**

Refer to the User's Manual for details on probe 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.*

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.

Disinfect a defective probe before you return it. Be sure to tag the probe as being disinfected.

## **Section 10-6 Using a Phantom**

See the Basic User Manual "*Customer Maintenance*" for information on using a phantom and quality assurance tests.

## 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 10-44 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 10-45 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 10-46 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.

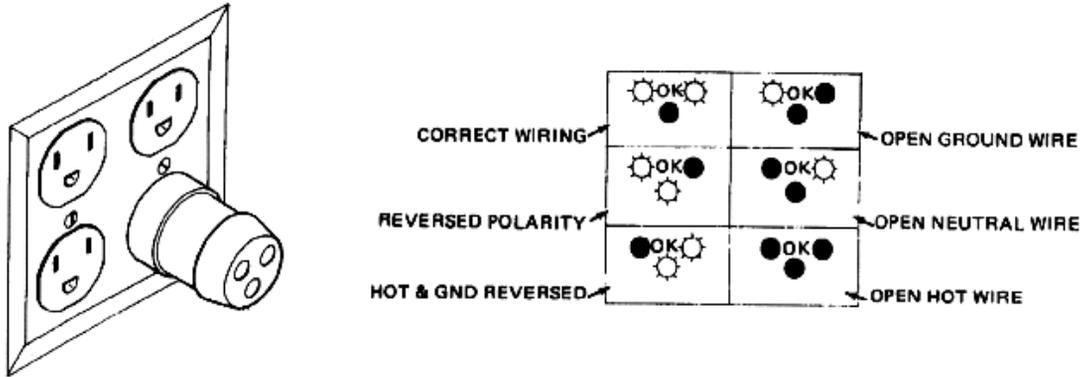


Figure 10-65 Typical Alternate Outlet Tester

**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.

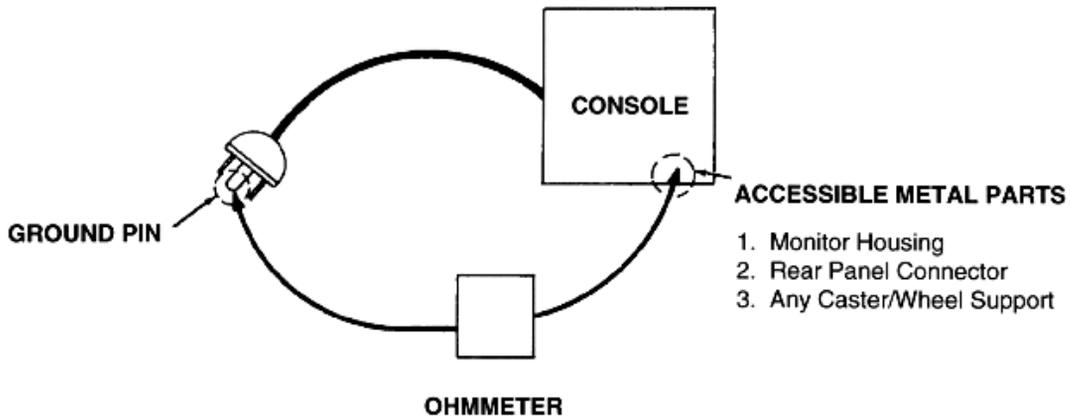


Figure 10-66 Ground Continuity Test

**10-7-4-1 Meter Procedure**

Follow these steps to test the ground wire resistance.

- 1.) Turn the LOGIQ™ 180 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 LOGIQ™ 180 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

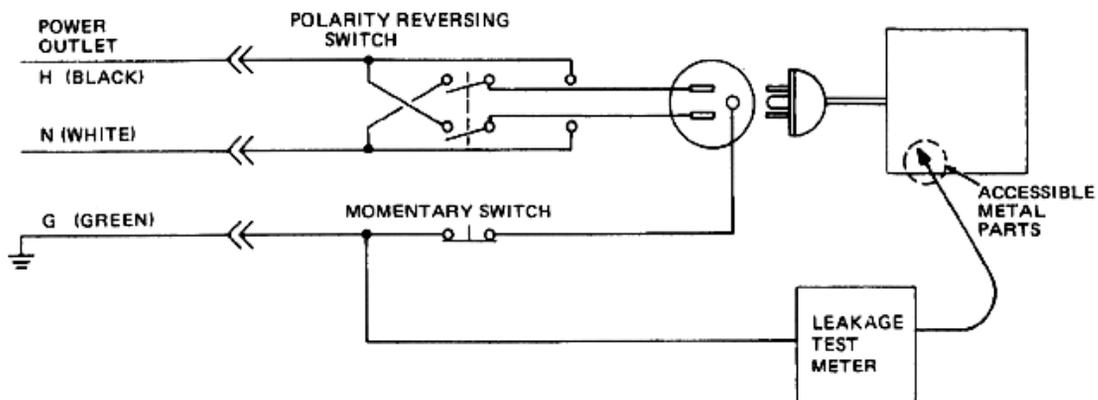
This test measures the current that would flow in a grounded person who touched accessible metal parts of the bedside station if the ground wire should break. The test verifies the isolation of the power line from the chassis. The meter is connected from accessible metal parts of the case to ground. 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 10-67 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 10-44](#).

7.) Follow the test conditions described for respective test points shown in [Table 10-47](#).

**Table 10-47 Chassis Leakage Current Test Condition**

TEST	CONDITION
1	Mounting screw for probe receptacle
2	Wheel support

**Table 10-47 Chassis Leakage Current Test Condition**

TEST	CONDITION
3	Mounting screw for peripheral plugged into unit
4	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 10-44](#). Record all data on the PM Inspection Certificate.

**Table 10-48 Typical Data Sheet for Chassis Source Leakage Current**

Unit Power	Tester Polarity Switch	Tester Neutral or Ground Switch	Test 1 Probe Connector Screw	Test 2 Rear Panel	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 Probe Leakage Current Test

### 10-7-6-1 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.

### 10-7-6-2 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 probe must be active to find the worst case condition.

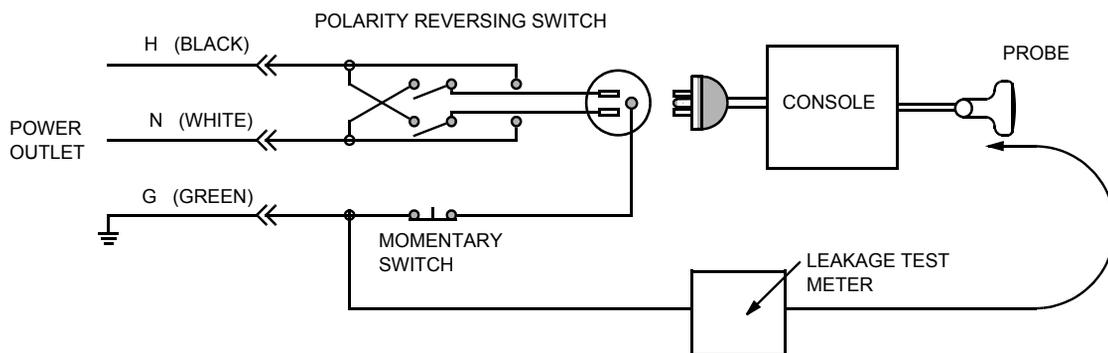


Figure 10-68 Set Up for Probe Leakage Current

#### 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.**

### 10-7-6-3 General procedure

Follow these steps to test each transducer for leakage current.

- 1.) Turn the LOGIQ™ 180 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 10-49](#) for every transducer.
- 10.) Keep a record of the results with other hand copies of PM data.

**10-7-6-4 Data Sheet for Transducer Source Leakage Current**

The test passes when all readings measure less than the values shown in [Table 10-45](#) and [Table 10-46](#). Record all data on the PM 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 10-49 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.

**PM 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**

Functional Check (if applicable)	OK? or N/A
B-Mode Function	
M-Mode Function	
Control Panel	
Monitor	
Applicable Software Options	
Applicable Hardware Options	
Measurement Accuracy	
GE Approved Peripherals	

**PHYSICAL INSPECTION AND CLEANING**

Physical Inspection and Cleaning (if applicable)	Inspect	Clean
Console		
Monitor		
Cables and Connectors		
GE Approved Peripherals (VCR, VGP)		
Probe Holders		
External I/O		

**COMMENTS:**

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**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				
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:				

Final Check. All system covers are in place. System scans with all probes as expected.

Accepted by: \_\_\_\_\_

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