

Module 1 General Safety Precautions

This section is not intended to be an all-inclusive safety procedure guide. It is only brief overview of best practices that applies to all health care facilities and types of medical equipment. You should be familiar with the policies and procedures of the facility where you work AND the safety precautions and procedures described in the manufacturer's documentation for a particular OEM.

Electrical Safety

The system is a Class I medical device with Type BF and Type CF isolated patient-applied parts. Only CF isolated transducers can be used for invasive (internal) exams.

The following are warnings recommended by the manufacturer:

- Grounding prevents shock hazards. The chassis is grounded with a three wire plug and cable which must be plugged into a grounded outlet.
- Never connect the system using a power strip or extension cord.
- The ultrasound system should never be connected to the same circuit as life-support devices.
- All devices that have patient contact: transducers, ECG leads and pencil probes that are not specifically labeled as defibrillation proof must be removed from contact with the patient before defibrillation.
- Non-medical peripherals such as printers should not be used within 1.5 meters (5ft) of a patient unless the device is powered with an isolated outlet on the back of the system or an isolated transformer that meets medical safety standards; IEC 60601-1.
- Wrist straps should not be worn when working on a system when the power turned on. The +5 V_{dc} supply is a very-high current supply. Use caution when troubleshooting.

Electromagnetic Interference

Electromagnetic Interference (EMI) between wireless electronic transmitting devices and medical equipment can cause degradation of the ultrasound image. The system is in compliance with existing EMI/EMC requirements. However, the use of this system in proximity of an electromagnetic field can cause degradation of the ultrasound image at times. Review the environment in which the system is being used, to identify possible sources of radiated emissions. Sources of these emissions can be from electrical devices used in the same or adjacent room. Communication devices that transmit or receive RF signals; cellular phones, pagers, radio, TV, or microwave transmission equipment located nearby can cause these

emissions. If EMI from an outside source is causing disturbances, you may need to relocate your system. Electrosurgical units (ESUs), MRI's and many other medical devices introduce radio frequency (RF) electromagnetic fields to the environment. Because ultrasound imaging frequencies are in the RF range, ultrasound transducer circuits are also susceptible to RF interference. For example, the noise generated by an ESU in use can easily impair or eliminate the ultrasound's ability to capture an image. Some measures to reduce the chance of EMI interference include:

- Three-meter rule – no powered on cell phones, or pagers within three meters of the system while in operation.
- Locate the system away from other imaging equipment such as MRI's that produce strong electromagnetic fields.

Electrostatic Discharge ESD Precautions

Electrostatic discharge (ESD), commonly referred to as a static shock, is a naturally occurring phenomenon. Electrical charges naturally build up on individuals and can create static shocks. The human body can build up a charge as high as 25,000 volts, therefore a discharge from a system user or patient to the ultrasound system can cause damage to the system or transducers. Digital ICs are particularly vulnerable. Low humidity is a condition that favors the build-up of electrostatic charge.

The following are the most common causes of ESD:

- Moving equipment
- Moving people
- Low humidity (hot and dry conditions)
- Improper grounding
- Unshielded cables
- Poor connections

Use the following precautions in order to reduce ESD:

- Wrist straps
- Antistatic mats
- Antistatic spray on carpets or linoleum

Before handling a board or other ESD susceptible component you can touch a grounded surface such as the power supply housing to discharge any built-up charge.

Fire Safety

The following general fire safety practices are relevant for all electrical equipment:

- If there is any evidence of smoke or fire disconnect system power immediately.
- On electrical or chemical fires use only extinguishers that are specified for this use. Using water or other liquids is very dangerous and can lead to injury.

General Cautions

The following are general cautions that apply to all ultrasound systems:

- Batteries must be handled as hazardous waste. Check that the cases are intact and the terminals are clean. Follow your facilities procedures regarding disposal should they become damaged.
- If the system has been stored below 10°C allow it to reach room temperature before connecting or turning on to prevent damaged caused by internal condensation.
- System transducers cannot be cleaned/decontaminated by any sort of heat process. Refer to manufacturer's specifications and hospital procedures for the particular transducer.