Health problem addressed

These devices are used primarily for abdominal and OB/GYN scanning. Some systems include additional transducers to facilitate more specialized diagnostic procedures, such as cardiac, vascular, endovaginal, endorectal, or small-parts (e.g., thyroid, breast, scrotum, prostate) scanning.

Product description

General-purpose ultrasonic scanning systems provide two-dimensional (2-D) images of most soft tissues without subjecting patients to ionizing radiation. These systems typically consist of a beamformer, a central processing unit, a user interface (e.g., keyboard, control panel, trackball), several probes (transducers or scanheads), one or more video displays, some type of recording device, and a power system.

Principles of operation

Ultrasound refers to sound waves emitted at frequencies above the range of human hearing. For diagnostic imaging, frequencies ranging from 2 to 15 megahertz (MHz) are typically used. Ultrasonic probes contain one or more elements made of piezoelectric materials (materials that convert electrical energy into acoustic energy and vice versa). When the ultrasonic energy emitted from the probe is reflected from the tissue, the transducer receives some of these reflections and reconverts them into electrical signals. These signals are processed and converted into an image. Lower sound frequencies provide decreased resolution but greater tissue penetration, while higher frequencies improve resolution when deep penetration is not necessary.

Operating steps

To perform ultrasonic imaging, a probe is either placed on the skin (after an acoustic coupling gel is applied) or inserted into a body cavity. Scanned structures can be measured by ultrasound technicians using digital calipers (i.e., cursors electronically superimposed over the scanned cross-sectional image that calculate the size of the scanned structure). The caliper system can also be used by technicians to plot and measure the area, circumference, or volume of a structure. A data-entry keyboard permits information such as patient name, date, and type of study to be entered and displayed along with the scanned image.

Reported problems

Ultrasound diagnostic imaging appears to be risk-free when used properly. Ultrasound transducers should be handled carefully to avoid damage. Electromechanical problems, such as cracks in piezoelectric elements, can alter beam width and/or spatial pulse length, thereby affecting lateral and axial resolution. Errors in distance measurements can cause incorrect calculations.

Use and maintenance

User(s): Ultrasound technician
Maintenance: Medical staff; technician; biomedical or clinical engineer
Training: Initial training by manufacturer and manuals

Environment of use

Settings of use: Hospital radiology departments; private physician offices
Requirements: Stable power source

Product specifications

Approx. dimensions (mm): 1340x420x630
Approx. weight (kg): 75
Consumables: NA
Price range (USD): 25,000 - 220,000
Typical product life time (years): 5
Shelf life (consumables): NA

Types and variations

General-purpose; OB/GYN; small parts; vascular; cardiology; endocavity