# U/S, sonography, or ultrasonography

BiomedGuy

# Sonosite U/S Plus

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# Safety

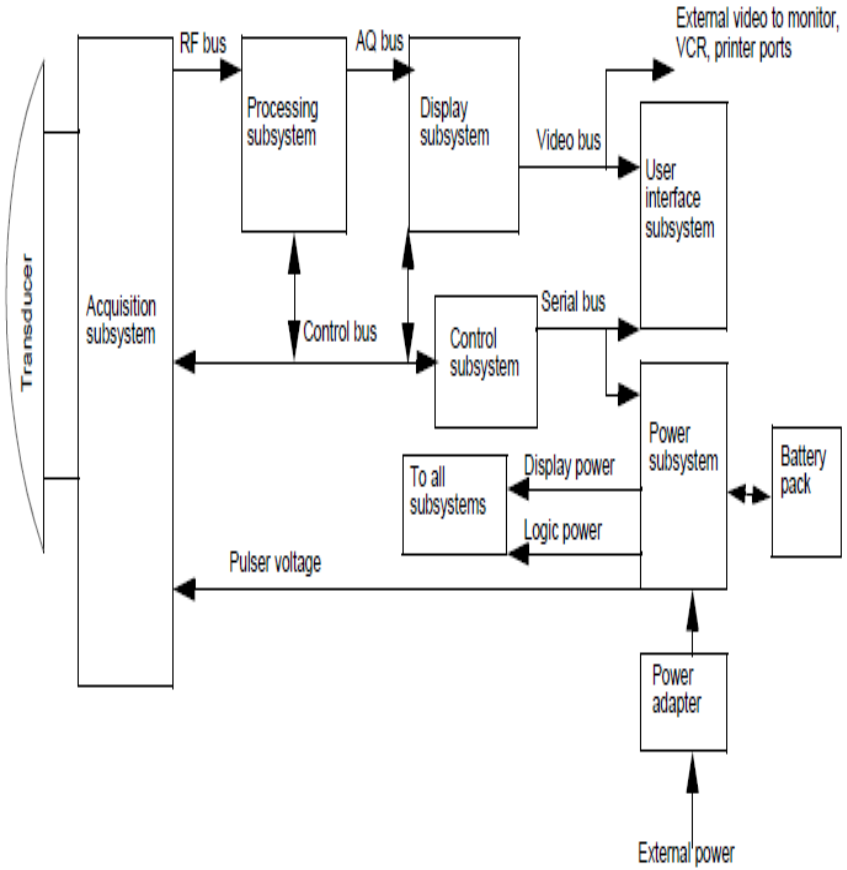
- Electrical Safety - The ECG cable emits electromagnetic interference when connected to the
- SonoSite system. It is not approved for use in-flight on aircraft.
- Do not submerge the transducer connector in solution. The cable is not liquid-tight beyond the transducer connector/cable interface.
- Do not expose the battery to temperatures over 60°C (140°F). Keep it away from fire and other heat sources. Do not leave the battery in direct sunlight

# Clinical Applications

- Ultrasound testing (commonly called sonography or ultrasonography) is done with a device that transmits sound waves through body tissues, records the echoes as the sounds encounter structures within the body, and transforms the recordings into images that can be viewed on a television screen, recorded on videotape, and printed. Recent developments have greatly increased the variety and usefulness of diagnostic ultrasound procedures. However, some practitioners are using sonography as a money-making endeavor, claiming that it is useful for diagnosing muscle spasm or inflammation and for following the progress of patients treated for back pain.

# Theory of Operation

- The SonoSite ultrasound system has seven major functional groups: the transducer, the acquisition subsystem, the processing subsystem, the display subsystem, the control subsystem, the user interface subsystem, and the power subsystem.



# Theory of Operation

- Transducer is a device that will convert some form of energy produced by physical stimulus to electrical signal.
- Ultrasonic transducers (also known as transceivers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively.

# Theory of Operation

- The system is powered by a rechargeable, six-cell, 11.1 V dc, 3.0 amp-hours, lithium-ion battery. A fully-charged battery has a run time of 1.5 to 4 hours, depending upon operating conditions.

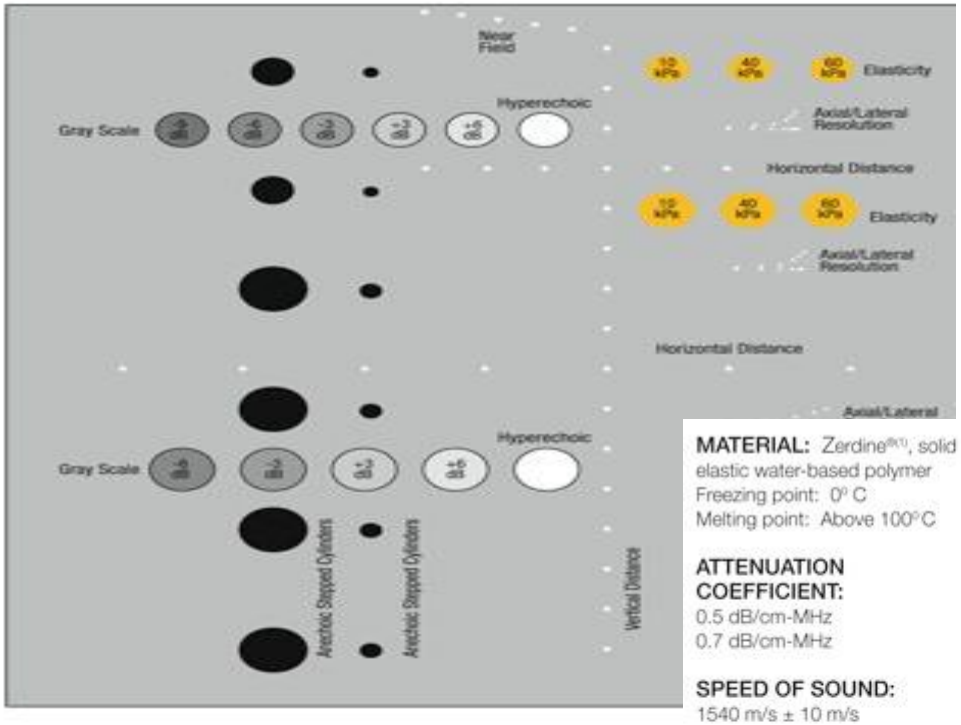
# PM’d

- Produce clear Phantom Images of probe measuring respective markings for accuracy
- Determine any existing problems or issues with system
- Check error logs, clear logs, run Diagnostic tests, evaluate errors
- Inspect system controls, power cord and cables for cracks, cuts, wear
- Inspect probes for damage or wear
- Clean transducers
- Check/replace backup battery
- Clean all external surfaces
- Clean all filters
- Check system and power supply fans
- Clean CRT and verify performance
- Clean and inspect keyboard, trackball, and electronics
- Perform keyboard/control panel tests, check lamps
- Verify complete system operation
- Clean trackball

# Phantom

- CIRS Model 040GSE Multi-Purpose Multi-Tissue Ultrasound Phantom
- allows for evaluation of transducers that range from 2 MHz - 15 MHz

# Phantom




**MATERIAL:** Zerdine®(1), solid elastic water-based polymer
Freezing point: 0° C
Melting point: Above 100°C

**ATTENUATION COEFFICIENT:**
0.5 dB/cm-MHz
0.7 dB/cm-MHz

**SPEED OF SOUND:**
1540 m/s ± 10 m/s

**SCANNING WELL:**
1 cm deep

**SCANNING MEMBRANE:**
Saran-based laminate

**NEAR FIELD GROUP:**
Material: Nylon monofilament
Number of targets: 5
Depth range: 1 to 5 mm
Distance between Targets: 1 mm

**HORIZONTAL AND VERTICAL GROUPS:**
Material: Nylon monofilament
Wire diameter: 100 microns

**VERTICAL GROUP:**
Number of targets: 15
Wire diameter: 100 microns
Depth range: 1 to 16 cm
Spacing: 10 mm

**HORIZONTAL GROUP**
Number of groups: 2
Wire diameter: 100 microns
Depth range: 4 and 9 cm
Number of targets: 4 & 7 respectively
Spacing: 10 & 20 mm respectively

**COMBINED AXIAL-LATERAL RESOLUTION GROUPS:**
Number of groups: 2
Wire diameter: 80 microns
Depth range: 3, & 6.5 cm
Axial Intervals: 4, 3, 2, 1, 0.5 & 0.25 mm
Number of groups: 1
Wire diameter: 80 microns
Depth range: 10.5 cm
Lateral Intervals: 4, 3, 2, 1, & 0.5 mm

**CYSTIC MASSES:**
Number of targets: 12
Diameter of targets: 1.33, 2.00, 2.99, 4.47, 6.69 & 10.00 mm
Depth of Targets: 1.5, 4.5, 7.0, 10.0, 13.0, 16.0 cm
Attenuation: 0.5 dB/cm-MHz ± 0.1
Speed: 1540 m/s ± 10 m/s
Contrast: Anechoic, Cyst-like

**GRAY SCALE TARGETS:**
Number of targets: 6
Diameter of targets: 8 & 10 mm
Depth of targets: 3 & 11.5 cm
Attenuation: 0.5 dB/cm-MHz ± 0.1
Contrast: -9, -6, -3, +3, +6 & <15 dB

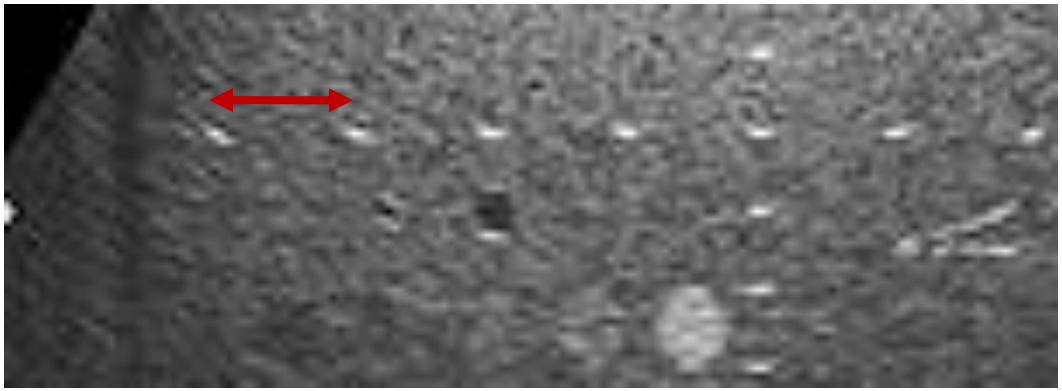
**ELASTICITY TARGETS:**
Number of targets: 3
Diameter of targets: 6 & 8 mm
Depth of targets: 1.5 & 5 cm
Attenuation: 0.5 dB/cm-MHz
Elasticity: 10, 40 & 60 kPa

# Performance Measurements

- Performance Measurements
  - Horizontal Distance
  - Vertical Distance
  - Depth of Penetration
  - Image Uniformity
  - Axial Resolution
  - Lateral Resolution

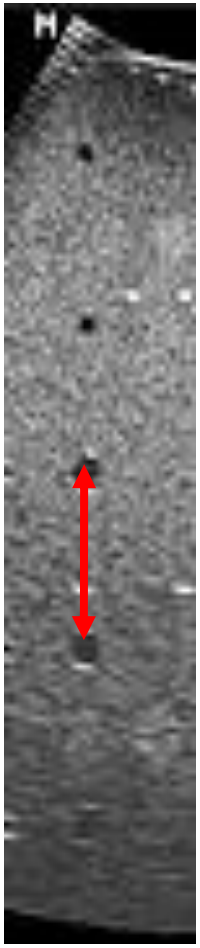
# Performance tests

- Horizontal Distance - Measure the distance, center to center, of two pins that are 4-10 cm. apart horizontally.



# Performance tests

Vertical Distance - Measure the distance, center to center, of two pins that are 4-10 cm. apart vertically.



# Performance tests

- Penetration - Measure from the center of the deepest vertical position where the scatter echoes start to break up and definition is lost.

# Performance tests

- Image Quality Verification Test – ensure there is a clear image and text is readable. Verify external monitor is operational.

# Dropout –defective PCB

# References


- http://en.wikipedia.org/wiki/Ultrasound
- http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/safety-code_24-securite/health-sante-eng.php
- http://www.aium.org/publications/jum/aboutJum.aspx
- http://www.aium.org/