

# Fundamentals of Diagnostic Ultrasound Maintenance

on the Acuson 128XP / ATL Ultramark / HP Sonos systems

Course length: 1 Week

CEU's Awarded: 4

## COURSE INTRODUCTION

The Fundamental of Diagnostic Ultrasound Maintenance course is a hands-on course for service professionals new to the Ultrasound modality. It is designed to teach all of the skills necessary to service the: Acuson, ATL, HP systems. Heavy emphasis is placed on Ultrasound principles, image analysis, operation, safe laboratory practices, system troubleshooting, and preventive maintenance. The lectures, hands-on lab procedures, and documentation are designed to provide the student with all of the knowledge needed to service the: Acuson, ATL, HP ultrasound systems.

### DAY 1

- I. Introduction to Ultrasound principles
- II. Overview of medical Ultrasound
  - A. Comparisons to other modalities
  - B. Ultrasound's position as a diagnostic tool in medicine
  - C. Biological hazards
  - D. Diagnostic application of Ultrasound
- III. Scanning formats
  - A. Linear
  - B. Sector
- IV. System basic operation
  - A. Front panel controls
  - B. System specifications

### LAB ACTIVITIES (Acuson, ATL, HP)

- I. Ultrasound operation
- II. Component location

### DAY 2

- I. Ultrasound physics
  - A. Acoustic wave
  - B. Acoustic impedance
  - C. Acoustic reflection, transmission, and refraction
  - D. Absorption and attenuation

## COURSE OBJECTIVES

At the conclusion of this course, attendees will be able to:

- Demonstrate their understanding of Ultrasound principles.
- Verify system operation.
- Verify image specifications.
- Troubleshoot system problems.
- Perform first and second level preventive maintenance procedures.

- II. Generation of the acoustic wave
  - A. Piezoelectric effect
  - B. Transducer construction
  - C. Fraunhofer and Fresnel zones
- III. Quality assurance
  - A. Axial, lateral resolution
  - B. Contrast resolution
  - C. Tissue mimicking phantoms

### LAB ACTIVITIES (Acuson, ATL, HP)

- I. Axial, lateral resolution evaluation
- II. Contrast resolution evaluation
- III. Image evaluation

### DAY 3

- I. Focus of the transmitted and reflected acoustic waves
  - A. Mechanical
  - B. Electrical
- II. Absorption and attenuation of acoustic waves
  - A. Pulser power
  - B. Time gain curves
  - C. Depth gain curves
- III. Technology of Ultrasound
  - A. A- mode
  - B. M-mode
  - C. B-mode
- IV. Realtime Ultrasound
  - A. Mechanical scanners
  - B. Annular array
  - C. Phased array
  - D. Linear array

## PREREQUISITE FOR ADMISSION

Attendees must possess an associates degree in electronics or equivalent experience. A background in imaging, although not a requirement, will be helpful. A strong microprocessor background is recommended

## LAB ACTIVITIES (Acuson, ATL, HP)

- I. Transmitter circuit analysis
- II. Receiver circuit analysis
- III. Time gain circuit analysis

### DAY 4

- I. Doppler principles
  - A. IQ, PQ
  - B. Niquist limit
  - C. Doppler applications
- II. Doppler modes of operation
  - A. Continuous wave
  - B. Pulsed wave
    1. Window gate
    2. High pulse rate
- III. Computer fundamentals
  - A. DMA transfers
  - B. Central processing unit
  - C. Memory
  - D. I/O techniques
  - E. Numbering systems
- IV. System troubleshooting

### LAB ACTIVITIES (Acuson, ATL, HP)

- I. Doppler calibration verification
- II. System diagnostics

### DAY 5

- I. Common system problems
- II. The future of Ultrasound
- III. Final exam
- IV. Final exam review
- V. Course evaluation
- VI. Parts sourcing