

Advanced Concepts of Fluoroscopic Imaging Maintenance - Level III

Course length: 2 Weeks
CEU's Awarded: 8

COURSE INTRODUCTION

Advanced Concepts of Fluoroscopic Imaging Maintenance - Level III, is designed to teach the service professional the skills necessary to build an excellent foundation in the servicing of fluoroscopic diagnostic imaging systems. The program provides in-depth coverage of each component in fluoroscopic systems used in the radiology department. Emphasis is placed on testing, evaluation, and calibration of the fluoroscopic system to enhance image quality and reduce patient dose.

DAY 1

- I. Introduction to fluoroscopic imaging
 - A. Fluoroscopic system overview
 - B. Components of a fluoro system
- II. Image quality terminology
 - A. Contrast
 - B. Sharpness
 - C. Detail visibility
 - D. Resolution
- III. Common fluoroscopic studies
 - A. Gastro-intestinal
 - B. Myelogram
 - C. Renal / Urinary
 - D. Coronary Arteries
 - E. Angioplasty
- IV. Fluoroscopic system configurations
 - A. The undertable system
 - B. The remote system
 - C. Mobile C-arms
 - D. Specials room
 - E. The cardiac cath lab
- V. Manual and automatic modes of operation

LAB ACTIVITIES

- I. Operation of fluoroscopic systems
- II. Location of fluoroscopic components
- III. Fluoroscopic system image quality tests

DAY 2

- I. The fluoroscopic x-ray control
 - A. Kv control circuits
 - B. mA control circuits
- II. Fluoroscopic shutter control
 - A. Central ray
 - B. Manual and Automatic control circuit
- III. Factors affecting image quality
 - A. Focal spot size
 - B. Half-value layer
 - C. Maximum "R"
 - D. Scatter

LAB ACTIVITIES

- I. Focal spot measurement
- II. Half-value layer measurement
- III. Maximum "R" adjustment
- IV. Shutter alignment

DAY 3

- I. Image intensifier
 - A. Construction and operation
 - B. Power supplies
 1. Single and Multiple modes
 - C. Factors affecting image quality
 1. QDE
 2. Conversion factor
 3. Contrast ratio
 4. Quantum mottle
 5. Scintillation noise
 6. Resolution
 7. Low contrast sensitivity
- D. Common I.I. problems
 1. Power supplies
 2. Gas spot
 3. S-distortion
 4. Pincushion
 5. Artifacts
- E. Typical image intensifier input doses for fluoro, photospot, and cine

COURSE OBJECTIVES

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

- Use the proper test equipment and procedures to test the fluoroscopic system.
- Verify and calibrate the fluoroscopic system within CDRH compliance.
- Evaluate the fluoroscopic system's overall performance.
- Evaluate the performance of the individual components of the fluoroscopic system.
- Perform complete fluoroscopic system calibration.
- Perform image system glassware installation and calibration.

LAB ACTIVITIES

- I. Conversion factor measurement
- II. Contrast ratio measurement
- III. High contrast resolution measurement
- IV. Minimum contrast sensitivity measurement
- V. Quantum mottle level check
- VI. Gas spot check

DAY 4

- I. Optics
 - A. Principles of light
 - B. Lens requirements
 1. Focal length and lens speed
 2. Relative apertures
 - C. Optimum / infinity focus
 - D. Image coupling / image size
- II. Image distribution
 - A. Mirrors
 - B. Beam splitter
 - C. Folded optics
- III. Photospot camera
 - A. PMT pickup and AEC circuit
 - B. Image framing
 - C. Density
 - D. Input dose
 - E. Focus
 - F. Cut / roll film
- IV. Cine camera overview
 - A. Cine AEC
 - B. Density
 - C. Focus
 - D. Input dose
 - E. Secondary switching

LAB ACTIVITIES

- I. Infinity focus adjustment
- II. Image sizing check
- III. Photospot input dose measurement
- IV. Photospot density and focus run

DAY 5

- I. Automatic brightness stabilizer
 - A. PMT and video pickups
 - B. ABS control- Kv, mA, and Kv/mA
 - C. Sample window size
 1. PMT aperture
 2. Video circuit
 - D. Multiple dose modes

LAB ACTIVITIES

- I. Stabilized input dose adjustments
- II. Sample window measurement
- III. ABS sensitivity check

DAY 6

- I. Introduction to TV camera systems
 - A. Raster formation
 1. Timing
 2. Sweeps
 - B. Composite video
 1. Video and Sync
 2. Blanking and pedestal
- II. TV camera system block diagram
 - A. Sweep section
 - B. Video section

PREREQUISITE FOR ADMISSION

Attendees must possess the knowledge of servicing diagnostic imaging systems as taught by the course Fundamentals of Servicing Diagnostic Imaging Systems - Level I, or the equivalent electronics and service experience.

C. Timing section

LAB ACTIVITIES

- I. Composite video evaluation
- II. Camera and Monitor sweep circuit adjustments

DAY 7

- I. Detailed TV camera block diagram
 - A. Tube construction
 - B. Power supplies
 - C. Horizontal and vertical sweeps
 - D. Preamp and video amplifier
 - E. Timing and control circuits
- II. TV camera troubleshooting techniques

LAB ACTIVITIES

- I. Camera tube voltage measurement
- II. Camera focus adjustments
- III. Video circuit adjustments
- IV. Camera troubleshooting

DAY 8

- I. Camera tube terminology
 - A. Gamma
 - B. Dark current and beam reserve
 - C. Sensitivity and resolution
 - D. Persistence / lag
- II. Tube selection / types
 - A. Vidicon
 - B. PBO
 - C. Saticon
 - D. Newvicon
- III. TV camera tube troubleshooting techniques
- IV. TV camera calibration techniques
 - A. Camera tube
 - B. Video circuits
 1. Aperture correction
 2. Streaking, smearing
 3. AGC / manual gain
 4. White clipper
 5. Clamps (restoration)
 - C. Horizontal and vertical sweeps
 - D. Circular blanking

LAB ACTIVITIES

- I. Camera tube removal / insertion
- II. Camera tube biasing
- III. Complete camera system calibration

DAY 9

- I. Monitors circuit description
 - A. Power supplies
 - B. Video amps
 - C. Sync stripper
 - D. Sweep circuits
- II. New fluoroscopic design techniques
 - A. Pulsed fluoro
 - B. Progressive scanning

LAB ACTIVITIES

- I. Complete camera system calibration
- II. Complete camera system troubleshooting

DAY 10

- I. Final exam
- II. Final exam critique
- III. Course evaluation
- IV. Parts sourcing