

ADVANCED DIAGNOSTIC IMAGING SYSTEM ANALYSIS (PHASE IV)

Course Length: 2 weeks
CEUs Awarded: 8

Introduction

This course is designed to provide the service professional with the skills and knowledge necessary to restore an X-ray imaging system to optimum performance after replacing the system glassware. This will include hands on installation and calibration of the X-ray tube, the image intensifier, the photo multiplier tube, the TV camera tube and CRT of the monitor. The course will conclude with a discussion of customer satisfaction skills.

Prerequisites

To attend this course, the service professional must have good fundamental knowledge and understanding of the principles gained through attendance at our Phase I, Phase II, and Phase III X-ray courses or equivalent field experience.

Objectives

At the conclusion of the course, participants will be able to:

- Use proper test procedures to determine the need for glassware replacement
- Select the proper glassware for application
- Perform proper de-installation procedures
- Perform proper pre-installation inspections
- Perform proper installation procedures
- Perform the calibration procedures necessary to restore the system to optimum performance
- Perform the necessary compliance tests
- Complete all necessary paperwork
- Apply the appropriate customer satisfaction skills for opening and closing the service call

Course Outline

DAY 1

- I. Introduction
 - A. X-ray tube fundamentals
 1. Construction
 2. Electrical and mechanical requirements
 3. X-ray tube failures
 4. Cables and terminations
 - B. Isolating X-ray tube failures
 1. Evaluating system performance
 2. Evaluating the X-ray tube

Lab Activities

- I. Knobology and system familiarization
- II. Evaluate system performance
- III. Evaluate X-ray tube performance

DAY 2

- I. X-ray tube selection
 - A. Resolution vs. focal spot size
 - B. Target angle/area of coverage
 - C. Instantaneous/cumulative ratings
 - D. Stator/housing considerations
- II. Preinstallation
 - A. Visual inspection of system
 - B. Visual inspection of replacement tube
 - C. Tools and test equipment

Lab Activities

- I. Preinstallation checks on system
- II. Preinstallation checks on replacement tube
- III. Documentation, tools, and test equipment
- IV. Removal of the old X-ray tube

DAY 3

- I. Installing the new X-ray tube
 - A. Mounting the new tube
 1. Overhead installation
 2. Undertable installation

- B. Pre-hookup
 1. Cables, terminations, receptacles
 2. Filament limits
 - a. Maximum/peak/rms
 3. Tube protector circuitry
- C. Hookup
 1. Electrical/mechanical considerations
 - a. Wavy washers
 2. Verifying filament operation
 3. Verifying anode rotation/speed
- D. Rotor controllers
 1. European style
 2. American style
- E. X-ray tube seasoning
- F. Calibrating the X-ray generator
 1. kVp, mA, time
 2. AEC
 3. Fluoro considerations

Lab Activities

- I. Mounting the replacement tube
- II. Pre-hookup checks and calibrations
- III. Replacement X-ray tube hookup
- IV. Verify filament operation
- V. Calibrate filament limits/standby/prelight levels
- VI. Check anode rotation/speed; stator voltages
- VII. Calibrate the tube protector
- VIII. Season the tube
- IX. Calibrate kV, mA and time circuits
- X. Check AEC operation
- XI. Fluoro calibrations

DAY 4

- I. System performance tests
 - A. Lead star radiograph (resolution)
 - B. Beam quality (HVL)
 - C. Beam alignment (central ray)
 - D. X-ray field and image receptor center alignment
 - E. Light field to X-ray field

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II. Completing the installation

- A. Required forms
- B. Record keeping
- C. Closing the service call

Lab Activities

- I. Beam quality (HLV)
- II. Beam alignment (central ray)
- III. X-ray field to image receptor center alignment
- IV. Light field to X-ray field alignment
- V. Focal spot resolution (lead star radiograph)
- VI. Complete the paperwork

DAY 5

- I. Image tube (I.I.) fundamentals
 - A. Construction
 - B. Conversion factor (G_x)
 - C. Resolving capabilities
 - 1. High/low contrast resolution
 - D. Contrast ratio
 - E. Quantum detection efficiency

Lab Activities

- I. Evaluate present I.I. performance
 - A. Conversion factor measurement
 - B. Resolution determination
 - C. Contrast ratio measurement

DAY 6

- I. Installing new I.I.
 - A. Old I.I. removal
 - B. Mounting new I.I. in housing
 - C. Electrical considerations
 - 2. High voltage power supply
 - a. Check out
 - b. Replacement

Lab Activities

- I. I.I. Replacement
 - A. Remove present I.I.
 - B. Install new I.I.
 - C. Mount housing on system
 - D. Focusing

DAY 7

- I. Imaging system evaluation
 - A. Optics system
 - 1. Lens
 - 2. Image splitting/coupling
 - 3. Focusing
 - B. Auto brightness stabilization systems
 - 1. Types of controls
 - a. kV
 - b. mA
 - c. Pulse width
 - d. Isowatt
 - 2. Feedback controls
 - a. Video
 - b. PMT
 - c. Solid state
 - 3. Stabilized input dose
 - a. Quantum sink/mottle

Lab Activities

- I. Replacing the PMT
- II. Align the PMT

DAY 8

- I. Video systems
 - A. TV camera
 - 1. Composite video
 - 2. Camera tubes construction/selection
 - a. Vidicon
 - b. Plumbicon
 - c. Hybrids
 - 3. Camera tube selection

Lab Activities

- I. Evaluate present camera tube performance
 - A. Resolution
 - B. Saturation point
 - C. Video levels
- II. Removing camera tube
- III. Installing new tube
- IV. Video levels

DAY 9

- I. Video systems
 - A. Monitors
 - 1. CRT evaluation
 - a. Resolving capabilities
 - b. Saturation point
 - c. Linearity
 - 2. CRT removal
 - 3. Installation
 - 4. Set-up

Lab Activities

- I. Evaluate present CRT
- II. Remove CRT
- III. Install new CRT
- IV. Align sweeps/linearity

DAY 10

- I. Customer satisfaction skills
 - A. Opening the service call
 - B. On call communications
 - C. Closing the service call
- II. Course review
- III. Final exam
- IV. Course evaluation