

# Multi-Product C-Arm Training: OEC 9900 & OEC 9800



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## Introduction

This course is designed to provide the advanced service professional with the skills and knowledge to maintain the OEC 9900 and OEC 9800 at the highest state of readiness. All adjustments will be discussed to establish optimum performance criteria. Theory and hands-on sessions will develop the skills necessary to troubleshoot system failures and restore it to operation.

## 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 completion of this course participants will be able to:

- Operate the OEC 9900 and OEC 9800
- Identify all systems, subsystems and components of the OEC 9900 and OEC 9800
- Verify power supplies for accuracy and function
- Service and calibrate system batteries and charger circuits
- Utilize all communication interfaces to calibrate and evaluate the systems
- Evaluate the performance of the X-ray generator, imaging and workstation sections of each system

- Calibrate and adjust all components of the X-ray generator, imaging chain and workstation
- Utilize all diagnostic indicators to troubleshoot system failures
- Restore the system to proper functional state following a system failure
- Evaluate and repair mechanical systems
- Load system software
- TV/ II controls
- o Physical layout and component ID
  - Covers and panels
  - Power supplies
  - Circuit boards
  - Battery removal
  - X-Ray tube removal and installation
  - I.I. removal and replacement
  - Mechanical systems

## Course Outline

### DAY 1

- Introduction
  - o Course objectives
  - o System
    - Major components
    - Configurations
    - Documentation
- System operation
  - o C-arm controls
    - X-ray subsystem
    - I.I., collimator and CCD camera controls
    - Mechanical systems
  - o Workstation controls
- Physical layout and component identification
- Lab Activities
  - o System operation
    - Fluoroscopic modes
      - Low dose
      - High dose
      - Boost
    - Radiographic mode
    - Patient data input
    - Recall stored images
    - Collimator controls

### Day 2

- AC power distribution
- DC power distribution
- Batteries and charger
- Lab Activities
  - o Power supply verifications
  - o Battery charger calibration
  - o Battery charger test points and waveforms

### Day 3

- System communications
- Interlocks
- Calibration software interface
  - o Direct connect procedure
  - o Using RUT and RUS
- Lab Activities
  - o Verify ARCNET communication
  - o Initialize calibration modes for 9900

#### NOTE:

Due to copyright laws, students are required to purchase and bring to class a copy of OEC's Service Documentation CD.

**9800 P/N 00-880927-08**

**9900 P/N 5441245-2EN-03**

To order this CD, Please call OEC/GE (800)874-7378.

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- o RUT or RUS communication
  - Calibration screens
  - Logging
  - Calibration process
- o Connect external system monitors
- o Connect external keyboard
- o Initiate service mode for 9900

## Day 4

- X-ray generator
  - o Stator power and control
  - o Pre-charge
  - o X-ray on, x-ray disable
  - o High voltage control
  - o Filament/ mA control
- Lab Activities
  - o Verify stator operation
  - o Pre-charge test
  - o Verify x-ray enable signals

## Day 5

- Lab Activities
  - o Calibrate x-ray generator
  - o High voltage test points and waveforms
  - o Filament/mA control test points and waveforms
  - o Max "R" adjustment

## Day 6

- Imaging system components
  - o X-ray tube
    - Central ray adjustment
    - Filtration
  - o Image/Fluoro functions control PCB's
    - Collimator control
      - Collimator iris size and center

- Semi-transparent leafs
  - Width
  - Rotation
- Image intensifier
  - Size control
  - Focusing
- Camera
  - Centering
  - Focus
  - TV camera iris
  - Thermoelectric cooling

- Lab Activities
  - o HVL measurement
  - o Central ray adjustment
  - o Collimator centering
  - o Collimator size tracking calibration
  - o Verify and adjust II viewed field
  - o I.I. focus adjustment

## Day 7

- Dose/ brightness control
  - o Video path
  - o Brightness control processing
  - o Iris adjustment
- Lab Activities
  - o TV camera focus
  - o TV camera center adjustment
  - o TV camera rotation adjustment
  - o TEC verification and adjustment
  - o TV camera iris adjustment

## Day 8

- Image display
  - o Image processor
    - Image manipulation
      - Window/level
      - Subtraction
    - Noise suppression
      - Motion artifact suppression

- o Video distribution board
  - Video input
  - High resolution video output
  - Standard resolution video output
- o Monitors
- o Touch screen
- Image storage
  - o Single disk
  - o 2/4 disk cine
- Mechanical systems
  - o Flip flop
  - o Orbital motion
  - o Wig-wag motion
  - o Horizontal cross arm motion
  - o L-Arm
  - o Vertical lift
  - o Steering and breaking
- Lab Activities
  - o Monitor adjustments
  - o Image centering
  - o Enable/disable MAS
  - o Capture and evaluate subtraction images
  - o Vertical lift drive tests
  - o Wig-wag adjustment
  - o Mechanical evaluation

## Day 9

- Diagnostics
  - o Error messages
  - o LED displays
  - o Bar graphs
  - o Seven segment displays
  - o VGA monitor "debug" screens
  - o Status monitor
  - o Status/error logs
- System software installation
- Lab Activities

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- o Evaluate for diagnosis
  - LED functions
  - Bar graphs
  - Seven segment displays
- o Use "debug" monitor verify system operation (Service mode for 9900)
- o View status logs
- o View error logs
- o Reload system software
- o System troubleshooting

## **Day 10**

- System review
- Course evaluation
- Exam