Principles of Servicing Computed Tomography Systems (Phase I)

Hands-On Training Course

Course Length: 2 Weeks
CEUs Awarded: 8 CEUs

Introduction

Principles of Servicing Computed Tomography Systems is designed for the new service professional. It teaches all the cognitive skills necessary to understand the CT system and its application to the medical industry.
The program is divided into seven major areas:

- Basic CT principles
- Safety procedures
- System operation
- Verification of system specifications
- Backing up software
- Troubleshooting to major subsystems
- Preventive maintenance

The course contains lecture, demonstration, and hands-on training, which teach participants proper operation, calibration, and preventive maintenance of the CT system. Upon completion of the course, the student will be able to perform first-level service on the computed tomography system.

Prerequisites

Recommended completion of Phase I or a service background and two year Associate's Degree in electronics or equivalent service experience.

Objectives

At the conclusion of this course, participants will:

- Have a thorough understanding of CT principles and image production
- Follow safety procedures for patients, physicians, and individuals
- Be able to load and back up system and diagnostic software
- Be able to completely operate the CT system including local operation
- Troubleshoot to the major subsystem level
- Perform preventive maintenance

Course Outline

DAY 1

I. Introduction
  A. Overview of CT
    1. What is it
    2. Advantages/disadvantages
    3. Different generations of scanners
    4. Detector differences
II. CT principles
  A. Matrix sizes
  B. CT numbers
  C. Window width and level
  D. Slice thickness
  E. Collimators
  F. Algorithm

Lab Activities

I. Proper power up and power down procedures
II. Location of E-stop/emergency off switches
III. Booting computer into scan software
IV. Measurement of power requirements
V. X-ray tube warm up procedure

DAY 2

I. CT principles cont'd
  A. CT X-ray principles
  B. Sampling rates and number of detectors
  C. Back projection
  D. Attenuation coefficients
  E. Tomographic blurring
  F. Scan parameters
  G. Noise/algorithms
  H. Image manipulation techniques
    1. Standard deviation
    2. Isodensity
    3. Region of interest
    4. Multiviewing of images
II. Simplified block diagram

Lab Activities

I. Introduction to scanning software operation
II. Pilot/scout scans
III. Scanner parameter manipulation
IV. Patient transport operation

DAY 3

I. Computer fundamentals review
  A. CPU/memory/input, output
  B. DMA transfers
  C. Special CT applications
II. CT imaging principles
  A. Filtered back projection
  B. Air calibration-why needed
    1. Pilot/scout scans
    2. Normal scan
  C. Spectrum correction

Lab Activities

I. Scanner parameter manipulation cont'd
II. Technique selection/application

DAY 4

I. System hardware overview- block diagram
  A. Power distribution block diagram
  B. X-ray system block diagram
  C. Gantry block diagram
  D. Patient transport block diagram
  E. Data acquisition block diagram
  F. Computer block diagram

PRINCIPLES OF SERVICING COMPUTED TOMOGRAPHY SYSTEMS (PHASE I) CONTINUED

Lab Activities

I. Major component locations

II. Major signal flow

- A. kV/mA
- B. Detector data
- C. Motor feedbacks

DAY 5

I. Types and uses of phantoms

- A. Spatial resolution
- B. Contrast resolution
- C. Linearity
- D. CT numbers of water equal to zero
- E. Slice thickness

II. Manufacturers' specification

Lab Activities

I. Verification of manufacturers' specification

- A. Linearity
- B. CT number
- C. Spatial/contrast resolution

DAY 6

I. Backing up software

- A. Scan software
- B. Diagnostic software
- C. Images
- D. Raw data

II. Loading software onto a CT system

- A. How to do a "cold" boot
- B. Minimum diagnostics hardware

Lab Activities

I. Make back-up tapes

II. Load software

DAY 7

I. Operate subsystem locally

- A. X-ray subsystem
- B. Gantry subsystem
- C. Computer subsystem
- D. Data acquisition subsystem

II. Introduction to system troubleshooting

Lab Activities

I. Operation of all subsystems locally

II. Location of problems to major subsystems

DAY 8

I. System troubleshooting cont'd

- A. Recognizing and localizing problems
- B. Most common problems to watch for

II. Introduction to P.M.

- A. What constitutes a P.M.
- B. How often should they be performed

Lab Activities

I. System troubleshooting

DAY 9

I. Preventive maintenance

- A. Items to do weekly
- B. Items to do monthly
- C. Items to do quarterly
- D. Equipment needed to do a P.M.

Lab Activities

I. Perform PM procedures

DAY 10

I. System review

II. Final exam

III. Course evaluation