Servicing the GE CT Family (Non-HD): Revolution, Discovery, Optima, Brivo, VCT, LightSpeed, BrightSpeed

RSTI

Introduction

GE CT Family (Non-HD) Systems Maintenance is a skills development course designed as a continuation of the Principles of Servicing Multivendor Computed Tomography Systems course. Through attending this course, the service professional will become confident in servicing the LightSpeed, BrightSpeed, Revolution, Discovery, Optima, and Brivo Non-HD CT systems. This is accomplished by working through the various gantry systems, table systems, detector configurations, 4/8/16/32/64 slice DAS systems, console configurations, X-ray Tubes and Generators, rotor controls, and power distribution systems of the GE Non-HD CT family of systems. Individual systems will be discussed in a modular format where a system is viewed as a collection of the various subsystems covered in class. Hands-on lab time is emphasized and makes up approximately 80% of the overall course content.

Prerequisites

To attend this course, the service professional must have an extensive knowledge of CT physics, physical principles and service procedures gained through attendance at the RSTI Principles of Servicing Multivendor Computed Tomography Systems course or equivalent training and experience.

Objectives

Following attendance of this course, participants will be able to:

- Perform scheduled maintenance on GE Non-HD CT systems
- Change the X-ray tube, realign and recalibrate the system
- Calibrate, test, repair/replace and align the collimator
- Calibrate, repair, align, and use diagnostic tools to test/evaluate performance of the DAS and detector assemblies
- Calibrate, test, replace and align the hardware associated with the gantry and patient transport systems
- Diagnose and correct faults occurring during the scanning sequence
- Troubleshoot gantry, patient transport and X-ray system problems
- Diagnose and correct problems in the digital acquisition system (DAS) and detector array
- Diagnose and correct problems in the data transport and image processing systems
- Troubleshoot and resolve console problems, reload software, backup/restore system settings

Course Outline

Lab functions will be repeated on each system available.

Day 1

- System operation and power distribution
  - Systems operational parameters
  - Major system/component identification
  - System controls
    - Safety
    - Interlocks
  - Patient registration/scheduling
    - Exam/technique settings
- System architectures
  - System block diagrams
  - System revisional changes
- Power distribution
  - Power distribution diagrams
    - Main AC power
    - Sub-system AC power
    - DC power supplies

Day 2
Lab Activities

- Scheduling an exam
  - Patient registration
  - Selecting technique parameters
    - Scout view
    - Axial views
    - Helical views
- Component ID
- Power distribution
  - Verify AC power supplies
    - Main power distribution
    - Gantry AC power
    - Table AC power
    - Console Power
  - Verify DC power supplies
    - Control system DC power supplies
    - Gantry DC power supplies
      - Stationary
      - Rotating
    - Table DC power supplies
    - X-ray system DC power supplies
      - X-ray generator
      - X-ray tube rotor control
      - Collimator
    - Detector/DAS area DC power supplies

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Hands-On Training Course
Course Length: 2 Weeks
CEU's Awarded: 8 CEU's
State of Ohio Registration No. 93-09-1377T

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Day 3

- Gantry systems
  - Gantry control
  - Gantry rotation
    - Axial speed control
    - Axial motor driver
    - Harmonization/encoding
  - Tilt control
  - Operator interface
- Patient transport (table) systems
  - Safety
  - Patient transport/table movement and indexing
    - Tabletop horizontal control
      - □ Speed control
      - □ Motor drivers
      - □ Harmonization/Encoding
    - Table vertical travel
      - □ Speed control
      - □ Motor drive
      - □ Position indication
  - Patient transport/table movement and indexing
    - Tabletop horizontal control
      - □ Sub top movement
      - □ Speed control
      - □ Motor drivers
      - □ Harmonization/Encoding
    - Table vertical travel
      - □ Speed control
      - □ Motor drive
      - □ Position indication
    - Laser position indicators

Lab Activities

- Gantry rotation
  - Axial driver verification
    - Axial motor driver waveforms
    - Rotational speed tests

- Drive assembly mechanical adjustments
  - Encoder verification
- Patient transport
  - Vertical motor driver waveforms
  - Vertical position indication
  - Horizontal motor driver waveforms
  - Encoder verification
- Laser adjustments

Day 4

- X-ray generation
  - High voltage control
  - Filament controls
    - Filament drive
  - Rotor controller
  - Collimator controls
  - Filter control
- X-ray tube change
  - Tube selection
  - De-install/install issues
  - Required calibrations and alignment

Lab Activities

- X-ray tube change
  - De-install procedures
  - Installation procedures
- High voltage control
  - Intermediate voltage verification
  - kV
- kV calibration
- Filament drive
  - Filament drive
  - mA actual
- mA calibration

Day 5
Lab Activities

- Rotor control

- Collimator control
- Collimator alignment/calibration
- Filter position control verification
- Beam on window adjustment
- Plane of rotation adjustment
- ISO center adjustment

Day 6

- Detector and DAS
  - Detector architectures
    - Maintenance issues
    - Detector replacement
  - DAS architectures
    - Pre-amp/channel boards
    - FRDM/DIFB
    - DAS control
  - Data transmission
    - Fiber optics
  - Slip ring data transfers
    - Brushes
    - RF transmitters/receivers

Day 7
Lab Activities

- Detector verification
  - Software assisted evaluation
  - Fault identification
  - Replacement part selection
- Detector/DAS board replacements
  - Removal procedures
  - Installation and alignment
  - Calibration
- Data transfer verification
  - DAS data output
  - Data transfer verification
  - Data to image processing verification

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Day 8

- Image processing and handling
  - Front end processing
  - Scan Data Drive maintenance and testing
  - Image reconstruction
  - Processed image handling
    - Image generation for display
    - Image storage
      - ☐ System drive
      - ☐ MOD
      - ☐ USB
      - ☐ CD/DVD ROM
      - ☐ Print services
      - ☐ DICOM

Lab Activities

- Image reconstruction testing
  - Real time reconstruction
  - Retro-reconstruction
- System software
  - Load from cold
  - Drive/RAID management
  - DICOM setup

Day 9

- System control and image quality
  - System host computer
    - Field replaceable units
    - System hard drives
- System control/communication
  - TCP/IP communication
  - CAN bus
    - Testing/ Verification
  - System to gantry control
    - Stationary controls
    - Rotating controls
  - System to x-ray system control
    - X-ray generation

- Collimation/filter
  - System to image processing/handling
  - Image quality control tests

Lab Activities

- System control communications verification
- System state back-up and restore
- QC phantom image evaluation
  - Resolution
  - Contrast
  - CT number tracking
  - Image noise
- System troubleshooting
  - Electronic
  - Software assisted

Day 10

- Course review
- Final exam
- Course evaluation

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