

# Servicing the GE VCT System

## 32/64 Slice



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### Introduction

The GE VCT maintenance course is a skills development course designed as a continuation of the GE BrightSpeed & LightSpeed CT courses. Through attending this course, the service professional will become self-confident in working on the gantries, patient transports, detector assemblies, 32 & 64 slice DAS systems, image processing systems, X-ray control systems, rotor controls, and operator console types of the GE VCT. 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 GE BrightSpeed & LightSpeed CT courses, or equivalent training and experience.

### Objectives

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

- Perform scheduled maintenance on GE VCT systems
- Change the X-ray tube, realign and recalibrate the X-ray generator
- Calibrate, replace and align the collimator
- Calibrate, service, align, and use diagnostic tools to evaluate

performance of the DAS and detector assembly

- Calibrate, replace and align the hardware associated with the gantry and patient transport
- Diagnose and correct problems in the scanning sequence
- Troubleshoot gantry, patient transport and X-ray system problems
- Diagnose and correct problems in the digital acquisition system and detector array
- Diagnose and correct problems in the image generation system
- Troubleshoot the operator workstation problems

### Course Outline

#### Day 1

- System Overview & Specifications
  - o Documentation
  - o Terms & Acronyms
  - o Patient Support
    - Types & Lab
  - o Generator
    - Hercules Tube
    - JEDI Generator
  - o VCT DAS Types
    - 32/64
    - VDAS
    - HDAS
    - HDAS Saturn
- System operation and power distribution
  - o Systems operational parameters
  - o Major system component identification

- o System controls
  - Safety
  - Interlocks
- o Patient registration/scheduling
- o Exam/technique settings
- System architectures
  - o System block diagrams
  - o System revision changes
- Power distribution
  - o Power distribution diagrams
    - Main AC power
    - Sub-system AC power
    - DC power supplies

#### Lab Activities

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

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## Day 2

- Console Types
  - o GOC 5
  - o GOC 6
  - o GOC 6.5
  - o GOC 6.6
- Motor verification and replacement
  - o Gantry rotation
    - Axial speed control
    - Axial motor driver
    - Harmonization/encoding
  - o Patient transport/table movement and indexing
    - Tabletop horizontal control
      - Speed control
      - Motor drivers
      - Harmonization/Encoding
    - Table vertical travel
      - Speed control
      - Motor drive
      - Position indication
  - o Laser position indicators
    - Operation
    - Alignment

## Lab Activities

- Command line troubleshooting
- Functional Checks
- Daily QA
- Gantry rotation
  - o Axial driver verification
    - Axial motor driver waveforms
    - Rotational speed tests
  - o Drive assembly mechanical adjustments
  - o Encoder verification
- Patient transport
  - o Vertical motor driver waveforms

- o Vertical position indication
- o Horizontal motor driver waveforms
- o Encoder verification
- Laser adjustments

## Day 3

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

## Lab Activities

- Hercules X-ray tube change
  - o De-install procedures
  - o Installation procedures
- High voltage control waveforms
  - o Intermediate voltage verification
  - o kV demanded
  - o kV actual
  - o VCO frequency
  - o IGBT/SCR gate drive
- kV calibration
- Filament drive waveforms
  - o Filament drive demanded
  - o Filament drive actual
  - o mA demanded
  - o mA actual
- mA calibration

## Day 4

- Detector and DAS
  - o Detector architectures
    - Maintenance issues
    - Detector replacement
  - o DAS architectures
    - Pre-amp/channel boards
    - DAS control
    - Data convolution
  - o Data transmission
    - Fiber optics
  - o Slip ring data transfers
    - Brushes
    - RF transmitters
- Image processing and handling
  - o Front end processing
  - o Temporary preprocessed data storage
  - o Image reconstruction
  - o Processed image handling
    - Image generation for display
    - Image storage
      - System disk
      - MOD
      - CD/DVD ROM
      - Print services
      - DICOM

## Lab Activities

- SUIF
  - o Diagnostics
  - o Error Reporting
- Pre-amp/channel board verification
  - o Detector output mapping
  - o Pre-amp measurements
- Detector/DAS replacement
  - o Removal procedures
  - o Installation and alignment

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- o Calibration
- Data transfer verification
  - o DAS data output
  - o Data transfer verification
  - o Data to image processing verification
- Image reconstruction system testing
  - o Image processor
  - o Image generator
- Image reconstruction testing
  - o Real time reconstruction
  - o Retro-reconstruction
- Manage image files
  - o Image disks
    - Replacement
    - Managing storage space
  - o MOD
  - o DICOM setup
  - o Printer setup
- System control communications verification
- System state back-up and restore
- QC phantom image evaluation
  - o Resolution
  - o Contrast
  - o CT number tracking
  - o Image noise
- System troubleshooting
  - o Electronic
  - o Software assisted
- Course review
- Final exam
- Course evaluation

## ***Day 5***

- System control and image quality
  - o System host computer
    - Field replaceable units
    - System hard drives
  - o System to gantry control
    - Stationary controls
    - Rotating controls
  - o System to x-ray system control
    - X-ray generation
    - Collimation/filter
  - o System to image processing/handling
  - o Image quality control tests

## ***Lab Activities***