GE Healthcare

Optima CT660

Installation Manual

(Book 2 of 2)

Optima CT660

OPERATING DOCUMENTATION

5368511-1EN
Rev 16

Book 2 of 2: Electrical Calibration, Integration & Testing

Pages 205 - 312

Effectivity

The information in this manual applies to the following Optima CT Systems:

- Optima CT660

Table of Contents: Book 2

Installer/FE Notices

NOTICE Read Before Proceeding!

Shipping, Warehouse and Transportation Warning

- **This gantry is designed to be moved using the shipping dollies and should not be lifted or moved using a lift truck.**
- **Do Not Hoist Gantry or Table using Dollies.**

International Shipments

- **Dollies must be used to remove the gantry from the shipping skid and to transport the gantry to the customer's site.**
- **If lifting is required, refer to the Pre-Installation Manual for instructions.**

On Site Warning

This system requires a gantry bearing gap inspection *before* electrical calibration is started. See Gantry Bearing Gap Inspection, on page 38, which refers to Appendix D, on page 141.

Service Actions

Open a dispatch and record the bearing inspection results first, then close the dispatch and continue with the electrical calibration procedures.

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Chapter 5
Electrical Introduction

Section 1.0 Installer/FE Notices

Section 2.0 Introduction

Use the continuity and ground checks to verify that the system power connections have not shorted to ground and that the ground and neutral connections are intact.

Section 3.0 Review Mechanical Hand Off Material

Complete the Mechanical Hand Off checklist:

- ❒ All options were installed. If not, contact your install specialist.
- ❒ Check for short ships.
- ❒ Complete paperwork and phone calls as needed.
- ❒ Review cable connections with mechanical team.

Section 4.0 Calibration Training Requirements

See requirements outlined in Book 1.

Section 5.0 Required FE Common Tools and Supplies

TOOL	COMMENT
Standard FE Tool Kit	See new tool list
Fluke 87 DVM or equivalent	must be calibrated yearly.
AC Clamp-on amp meter	must be calibrated yearly.
Dale 600 or 601	must be calibrated yearly.
QA Phantom and phantom holder	
Lockout/Tagout kit, or equivalent	
Safety Glasses	

Table 5-1 FE Tools and Supplies

5.1 Safety Materials

Note: Items with "checks" (√) are included in the Install Support Kit

√ Lockout/Tagout kit, or equivalent

Safety Glasses

5.2 Cleanliness

The system must not be located in, near, or around construction. The room should be clean and clear of construction dust and installation materials. Do not power on the system if requirement in Book 1, Chapter 1, Section 3.13

⚠

NOTICE NEVER USE AN ERASER TO CLEAN ANY PART OF THE DAS.

Section 6.0 Requirements/Assumptions

- The procedures in this manual are performed by an appropriately trained GE engineer.
- You need the Internet (IP) addresses the first time you execute a reconfig on the system.
  - When you connect the system to a network, contact the system administrator to obtain the IP addresses for all the computers in the suite.

Section 7.0 FE Workflow

1.) Review mechanical hand-off material. Check that the Mechanical section of GE Form e4879 is completed.
2.) Obtain required FE common tools and supplies.
3.) Perform electrical power-on and ground checks.
4.) Gather all customer information needed for reconfiguration.
5.) Perform computer integration.
6.) Complete Table/Gantry integration.
7.) Complete the calibration process.
8.) Perform tube warm-up and fast calibration.
9.) Complete tomographic plane indication.
10.) Check table/gantry alignment.
11.) Run image series tests.
12.) Run system functional test.
13.) Verify that all options were installed.
14.) Create system state DVD.
15.) Complete network connections.
16.) Perform Patient Touch Leakage test.
17.) Perform the CT System Chassis Leakage test, as required by local code.
18.) Complete installation and verification of any customer options.
19.) Complete and return GE Form e-4879 Installation Data Verification for all installations.

Section 8.0 Overview for Completing Installation

8.1 System-Level Tasks

Complete the tasks listed and check the appropriate box on the GE e-4879 form (explained in Section 8.0 on page 229).

8.1.1 General

- ❒ HVAC system is operational and environmental data reported on the GE e-4879 form.
- ❒ System realignments completed, if required.
- ❒ Broadband installed and operational.
- ❒ Power and ground audit completed.

8.1.2 Optional and Regional

- ❒ Seismic mounting kit installed, if required in your area.
- ❒ Generator recalibration completed, if necessary.
- ❒ Collimator recalibration completed, if necessary.

8.2 Site Clean-Up

- ❒ All DVDs for customer options placed in the GE service cabinet.
- ❒ All system software and service tools placed in the GE service cabinet.
- ❒ System cleaned and nicks touched up with paint.
- ❒ Room is cleaned and all trash disposed of properly.
- ❒ Room is cleaned and all trash disposed of properly.

8.3 Dolly Return

- ❒ Return of dollies arranged and dolly pick-up made.

8.4 Options

Check the appropriate box on the GE e-4879 form to verify the installation and proper functionality of all customer-ordered options.

- ❒ Injector installed and operational.
- ❒ Advantage Windows Workstation installed and functional tests completed.
- ❒ Advantage 4D installed and functional tests completed.
- ❒ Filming/Camera/DASM installed and operational.
- ❒ Modem installed and functional tests completed.
- ❒ UPS installed and functional tests completed.
- ❒ Network items installed and functional tests completed.
- ❒ Customer software options installed and operational.

- ❒ Teleradiology connections completed.
- ❒ Remote monitor installed and operational.
- ❒ Bar Code Reader installed and operational.
- ❒ Cardiac monitor and stand installed and operational.

8.5 Final Activities (Paperwork)

- ❒ GE e-4879 completed; see Section 9.0. (Required for installations in ALL countries.)
- ❒ FDA 2579 completed; see Section 9.0. (Required ONLY for U.S. installations.)
- ❒ Any PQRs or PSRs encountered have been reported.
- ❒ All FMIs for system completed, if necessary.
- ❒ All dispatching activities (03-04-10 codes) completed.
- ❒ Customer acceptance checks completed.
- ❒ System transfer completed and appropriate GE Healthcare personnel notified.
- ❒ All outstanding customer installation issues have been addressed.

Section 9.0 GE and Regulatory Forms

Field Engineers must complete and submit the documents listed in Section 9.1 for ALL installations, regardless of the country. In addition, for installations performed within the United States, Field Engineers must ALSO complete and submit the documents listed in Section 9.2.

9.1 All Countries

9.1.1 GE e-4879 Form

The Field Engineer should:

1.) Locate the GE e-4879 form on the Service CD.
2.) Complete the form.
3.) E-mail the completed form to the HHS Administrator.

9.1.2 Product Locator Cards

The Field Engineer should:

1.) Enter the Product Locator Card information on the Product locator Website. Go to the following address to access the site: http://gib.gehealthcare.com/gib/gib_entry.jsp
2.) Leave one (1) Product Locator Card (or a copy) at the customer site for EACH piece of equipment installed there.

Note: CT Manufacturing completes the GE HHS Data Sheets and provides them to the HHS Administrator.

9.2 U.S. Installations Only

9.2.1 FDA 2579 Form

The Field Engineer should:

1.) Download the FDA 2579 form from the HHS Support Central Web site: http://supportcentral.ge.com/products/sup_products.asp?prod_id=16442

2.) Complete the form.

3.) E-mail the completed form to the HHS Administrator.

Note: Do NOT print this form after completion. The HHS Administrator will e-mail a printable version to the FE for customer site records.

Note: **Some states require a State Registration Number to complete this form. For any questions concerning your state, contact the HHS Administrator or check the HHS Support Central Website.**

Some states may also require additional information and test information. For instructions, contact the Project Manager of Installation.

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Chapter 6
Electrical Integration and Safety Verifications

Section 1.0 Computer Integration and Configuration

1.1 Introduction and Flowchart

This section describes the reconfiguration, system state restore, options installation, and monitor adjustment procedures.

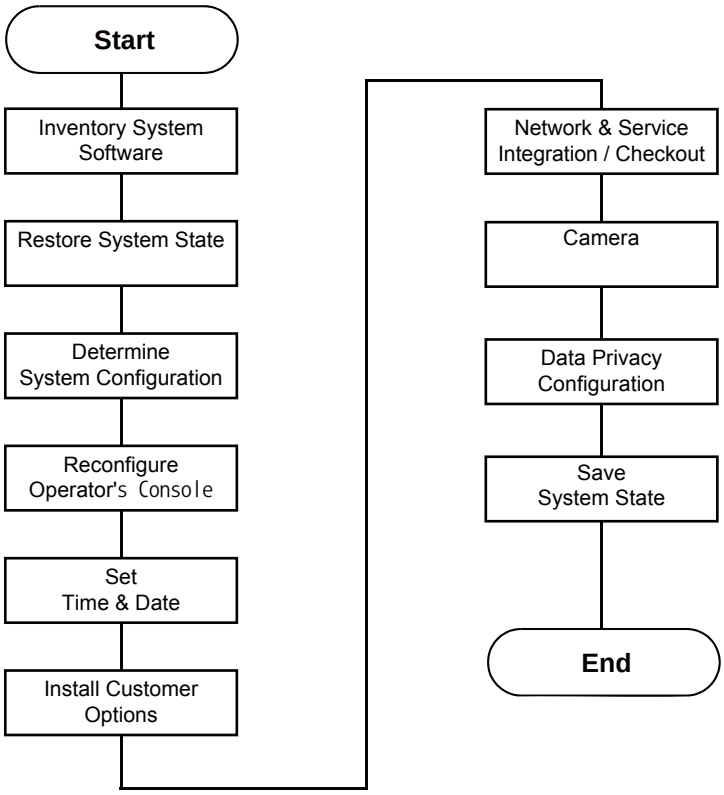


Figure 6-1 Computer Integration and Configuration Process Overview

1.2 Inventory System Software and Restore System State

Locate the box with the system software and option DVD disks, system order sheets, product locator cards, and system reconfig DVD.

You should find the following software CD documents:

- System Operating Software CD set
- Learning and Reference Guide
- Tip Simulator
- Advanced Applications
- Service Information

Note: There may be other items in addition to those above.

1.2.1 Restore System State

1.2.1.1 Time & Personnel

Required Persons	Preliminary Reqs	Procedure	Finalization
1 (FE or mechanical supplier)			

1.2.1.2 Tools and Test Equipment

None required.

1.2.1.3 Preparation

Your system should have a system state DVD, located in the software box.
The system state DVD contains:

- Characterization
- Calibrations
- Gen Cal
- Other Data

If you cannot locate the shipped system state DVD and your console data is not present, you must do a **complete recalibration** of your system. If the system data is present and your Save State disk is missing, complete a Save State now.

1.2.1.4 Procedures

The installation process uses all the system state files. At this time, use the system state DVD to restore all files.

1.) If you are not on the Service Desktop, click the ***SERVICE DESKTOP*** Icon.
2.) Click the ***UTILITIES*** icon.
3.) Select ***SYSTEM STATE***.
4.) Insert the DVD into the DVD drive.
5.) Select ***CHARACTERIZATION AND CAL***.
6.) Select ***CALS***.

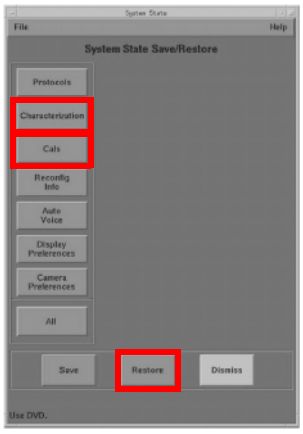


Figure 6-2 System State Restore

7.) Select ***RESTORE*** to restore the system characterization and phantom calibration files to the system.

Restore State can take as long as ten minutes, although typical times average about three minutes. When Restore State completes, dismiss the tool, and proceed to the next section.

If any error should occur during the restore process, see the Software Load Procedure manual (Load From Cold) for information regarding possible error messages and their recovery.

8.) Click ***NO*** for the Reset Scan Hardware popup message.

9.) Click ***DISMISS***.

1.3 Determine System Configuration

1.3.1 Preparation

For convenient removal and use during installation, System Configuration Data Sheets are located in System Configuration Data Sheets on page 303.

Below is a summary of key information, some of which is required from the customer, to complete system configuration. When gathering this information, refer to Configure Site Specific Set Up on page 237.

System File Information:

- Hospital name (Ask the customer for ALL related fields.)_____
- Service ID_____

Patient Info:

- Next MOD#_____
- Exam #, Diagnostic # 50000 default_____
- Click ***YES*** to regenerate database.
- Click ***NO*** for Mobile System.
- HIPAA _____

Preference File Information:

- Doctor's title_____
- Date Format_____
- Time Format_____
- Language type_____
- Selected Fast Cal KV's . default - ALL unless instructed otherwise_____
- Dose Information . default - Unless instructed otherwise_____
- Dicom . default - Unless instructed otherwise_____

Hardware File Information:

- Select table type GT 1700V or Lite Table_____
- Default for all others
- Network printer . default_____

Network file Information:

- Suite Name . (from FE or hospital)_____
- Host Name . (from FE or hospital)_____
- IP Address_____
- Net Mask _____
- Broadcast Address_____
- Default Gateway_____
- Advanced options . default - Unless instructed otherwise by the FE_____

_____

1.4 Configure Site Specific Set Up

Note: The document collector box that arrived with your system contains the *Software Installation Procedures* manual, which documents the reconfiguration procedure in more detail.

1.4.1 Preparation

On the following screens, you should make the changes necessary, pressing the corresponding button at the top of the screen to move from screen to screen. When you are done, you can either press the ***ACCEPT*** button to start the reconfiguration process, or press the QUIT button to exit without changing the system configuration.

While the reconfiguration is going on, messages are displayed in a shell window that closes when reconfiguration is complete. Should you later want to review the reconfiguration output, it is logged in:

`/var/adm/install.log.`*`YYYYMMDDWWWHHMMSS`*

Where

`YYYYMMDDWWWHHMMSS` is the Date/Time that the reconfiguration was started.

To view the file, type: more `/var/adm/install.log.`*`YYYYMMDDWWWHHMMSS`*

It is possible to abort the reconfiguration while entering information on the reconfiguration screens. Press the ***QUIT*** button at the top of the screen. There is NO safe way to abort the reconfiguration after pressing the ***ACCEPT*** button. If the entries made in the screens were incorrect, DO NOT try to stop the reconfiguration, instead wait for it to complete, and rerun reconfig, entering the correct parameters.

1.4.2 Procedure

1.) Shut down applications from the Service Desktop.

2.) In an xterm window, log in as root:

a.) Type: `su -` **ENTER**

b.) Type the root password; press **ENTER**

3.) Launch the Install utility:

Type: `reconfig` **ENTER** at the prompt.

The OC displays the Install Utility Window as shown in Figure 6-3.

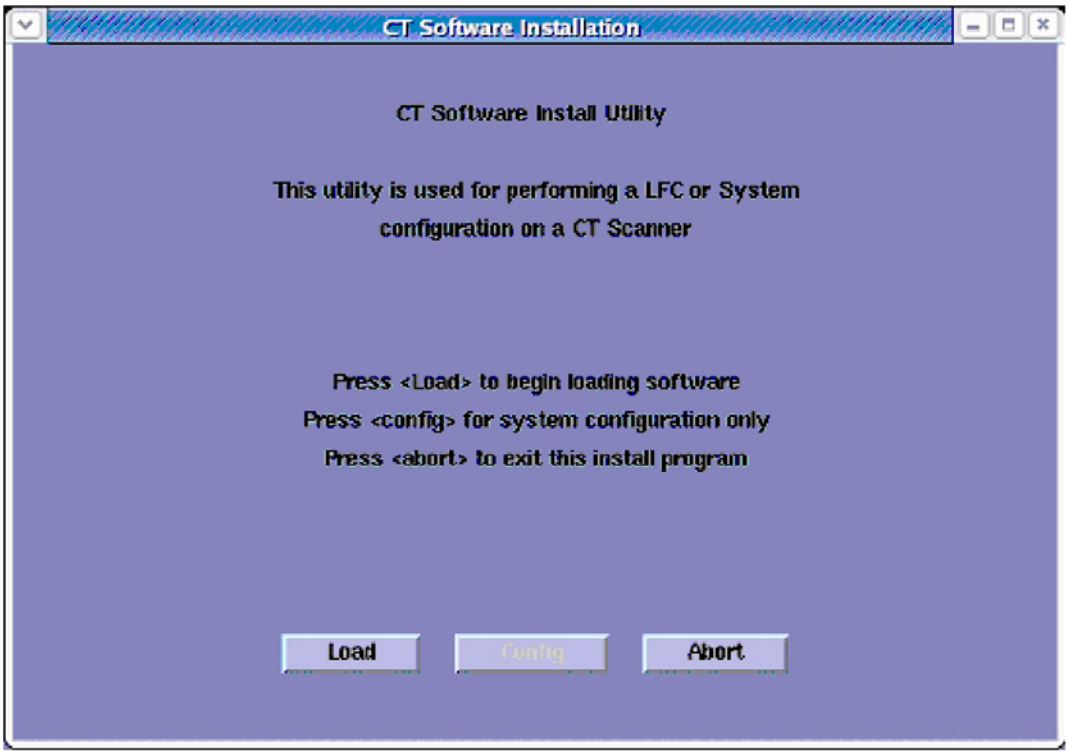


Figure 6-3 Install Utility Window

Comment: *The following pages show the screens that are used to change the configuration of the system. These screens are the same as those used for the Software Configuration during Load From Cold. The actual screens will vary depending on the current configuration of your system.*

4.) Click the ***CONFIG*** button.

The OC displays the System Configuration - System Settings Screen as shown in Figure 6-4.

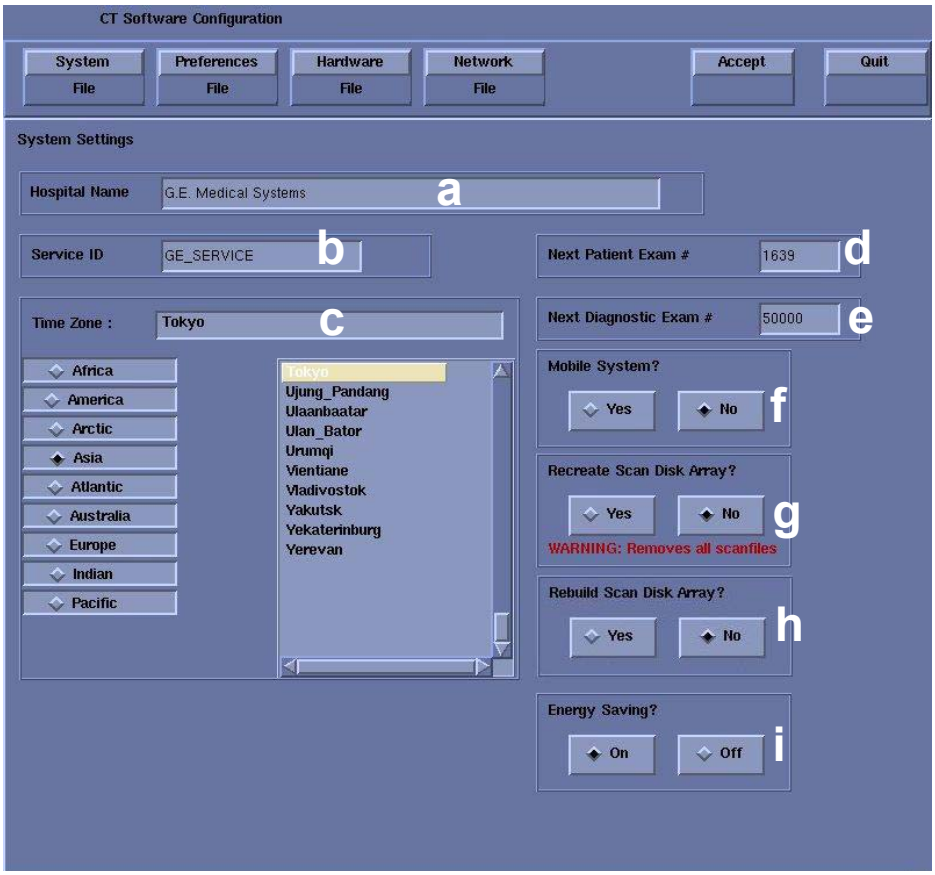


Figure 6-4 System Settings Screen

ID	Item	Description
a	Hospital Name	Configures the name that appears on images produced by this scanner. *Example:* St Marys Hospital
b	Service ID	Issued by the service organization. *Example:* 262785CT2 (no spaces)
c	Time Zone	Selects the time zone for this site.
d	Next Patient Exam #	Configures the next exam number the scan user interface uses.
e	Next Diagnostic Exam #	Customer-selected; configures the next exam number the scan user interface uses.
f	Mobile System	Indicates to the software if this CT is in a mobile environment or not.
g	Recreate Scan Disk Array	Determines whether the Scan Array is recreated during reconfiguration. Used only after multiple Hard Disk Drive replacement

Table 6-1 System Setting Screen

ID	Item	Description
h	Rebuild Scan Disk Array	Used only if replacing a single scan data disk. When a new hard drive is installed and the reconfig utility is executed, a new set of buttons are displayed to allow the inclusion of the new hard Disk Drive into the array. This is not displayed during normal operation; it is displayed only after a new HDD is installed in the console, and the console recognizes it.
i	Energy Saving	Indicates to the software if this CT is in Energy Saving mode or not.

Table 6-1 System Setting Screen

5.) Configure System Settings:

a.) Enter the `Hospital Name`.

b.) Enter the `Service ID`.

c.) Select the `Time Zone` for this site.

Use the scrollbar at the bottom of the time-zone selection list to view the entire description of a time-zone, to ensure that you are selecting the correct time-zone for your location.

If the time-zone of your location is not in the list, select one of the universal times in the selection menu. In this case, automatic changes for daylight savings time do not take effect. See the LFC manual for more information regarding time-zone setting and selection

d.) At `Next Patient Exam #`, ENTER 1 (during installation only; this is customer-selected).

e.) `Next Diagnostic Exam #`, ENTER 1 (during installation only; this is customer selected.

f.) `Mobile System`, select the correct answer for this installation site.

g.) `Recreate database`. Select ***YES*** if this is an installation with no customer data present.

Important: This destroys any Scan Data present.

h.) `Rebuild Scan Disk Array`, Not used during system installation.

i.) `Energy Saving`, select the correct answer after confirming with a customer.

6.) Click the ***PREFERENCES*** button to display the Preference Settings Screen as shown in Figure 6-5.

VCT example below:

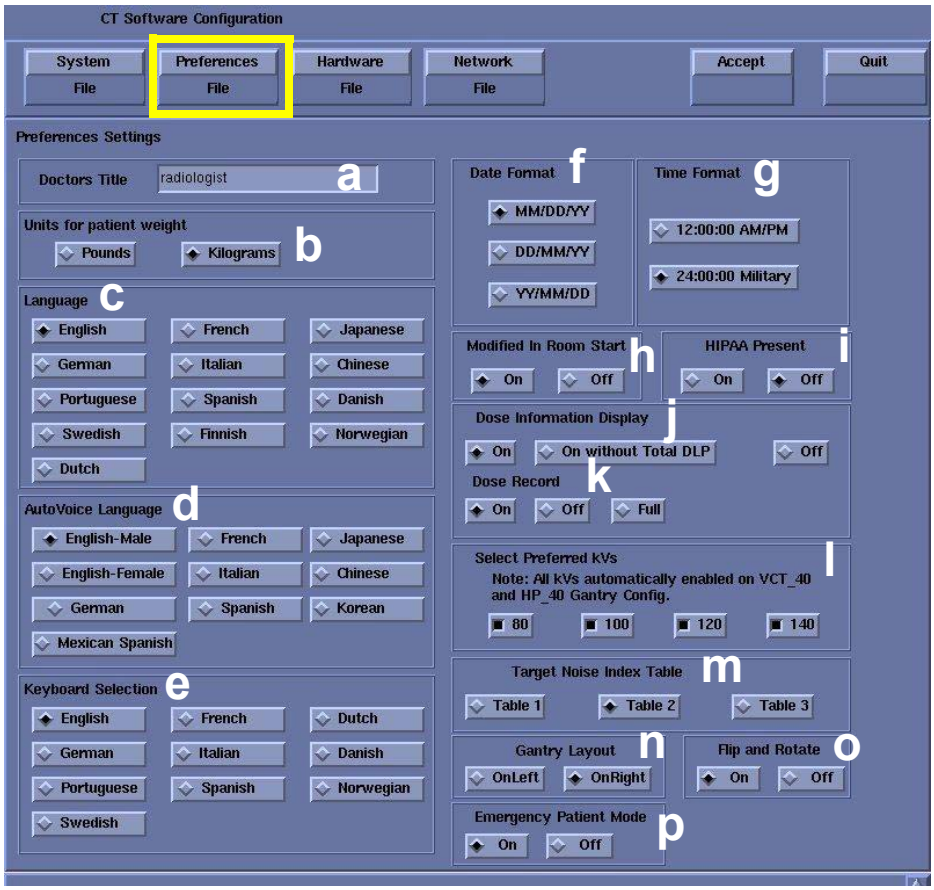


Figure 6-5 Preferences Setup Screen

ID	Item	Description
a	Doctor's Title	Title of the doctor (e.g. radiologist)
b	Units for Patient Weight	Identifies to the software if this site uses pounds or kilograms.
c	Language	Selects the language to display on the Application screens.
d	Autovoice Language	Configures the language heard in the scan room.
e	Keyboard Selection	Configures the language specific keyboard character set.
f	Date Format	Configures the format in which the date will be displayed on the images.
g	Time Format	Configures the format in which the time will be displayed on the images.
h	Modified in Room Start	Be sure OFF is selected, unless the site is in Japan, in which case, this feature should be ON.
i	HIPPA Present	Be sure OFF is selected, unless told differently
j	Dose Information Display	Option for the site to use in monitoring calculated patient dose. Use the default selection unless told differently. Select ON (full CTDiw Display); Select ON WITHOUT TOTAL DLP (no Dose Length Product Display); Select OFF (no CTDIw Display or Dose Report, series 999 created).

Table 6-2 Preferences Settings

ID	Item	Description
k	Dose Record	Configures support for DICOM Dose SR Record option for saving dose information with study. Default is OFF. The dose information is saved in a DICOM structured report. Select ON - Saves the dose information. Select OFF- turn off the option. Select FULL- Save the does information in a DICOM X-RAY Radiation Dose SR SOP Class.
l	Preferred Fast Cal kV	Configures the preferred kV that the Fast Cal Routine will calibrate. Defaulted ON for HD systems.
m	Target Noise Index Table	Be sure Table 2 is selected.
n	Gantry Layout	Configures the preference for Patient loading. Choose correct orientation depending on site specific Gantry layout. Default is ON RIGHT.
o	Flip and Rotate	Configures the preference for allowing the Flip and Rotate feature to be turned on in the User Interface on the (Left) SCAN monitor. Default is OFF.
p	Emergency Patient mode	Configures the preference for allowing the Emergency Patient to be turned on in the user interface.

Table 6-2 Preferences Settings

7.) Configure Preferences Settings:

a.) Enter the `Doctors Title`.

b.) Select the `Units for Patient Weight` for this installation site

c.) Select the `Language` for the customer's preference for the Applications screen.**

d.) Select the `Autovoice Language` for the customer's preference.**

e.) Select the `Keyboard Selection` for the language specific keyboard configuration. **

** To change this setting the Radiology Manager (or equivalent) must signoff on e4879 Installation Form.

f.) Select the `Date Format` for the customer's preference.

g.) Select the `Time Format` for the customer's preference.

h.) Make sure OFF is selected for the `Modified in Room Start`, unless the site is in Japan.

i.) Select OFF for the `HIPAA Present`, unless the customer requests differently.

j.) Select the site preferred `Dose Information Display` option for the site to use in monitoring calculated Patient Dose. Use the default selection unless told differently.

k.) Select the site-preferred `Dose Record`. Configures support for DICOM Dose SR Record option for saving dose information with study. Default is OFF. The dose information is saved in a DICOM structured report. The DICOM standard defines a new DICOM X-RAY Radiation SR SOP class, which the other systems must support. The Dose SR feature saves an exam's dose information in this format.

* ON = Saves the dose information in a DICOM Enhanced SR SOP Class
* OFF = Turns off the option
* FULL = Saves the dose information in a DICOM X-Ray Radiation Dose SR SOP Class

Note: This preference shall not be enabled unless specifically requested by the Customer and *Evaluation of Dose SR Compatibility* functional check procedure has been executed and indicates that the other hospital systems support the Dose Report SOP classes!

l.) Select the `Preferred kVs` for Fast Cal.

This is not used for Optima CT660.

m.) Verify that Table 2 is selected for `Target Noise Index`

n.) Choose the correct orientation for `Gantry Layout` depending on the orientation of the gantry table as viewed from the operator's console. Default is ON RIGHT.

o.) `Flip and Rotate:` Configures the preference for allowing the `Flip and Rotate` feature to be turned on in the User interface on the (Left) SCAN Monitor. Default is OFF. This preference allows the Customer to apply custom orientation changes based on Exam Type and reconstructions methods on the DICOM images that will be transferred to PACS and related systems.

Note: This preference shall not be enabled unless specifically requested by the Customer and *Evaluation of Image Flip and Rotate Compatibility* functional check procedure has been executed and all DICOM test images pass orientation check!

p.) `Emergency Patient mode,` select the correct answer after confirming with a customer.

8.) Click the ***HARDWARE*** button to display the Hardware Settings Screen. See Figure 6-6.

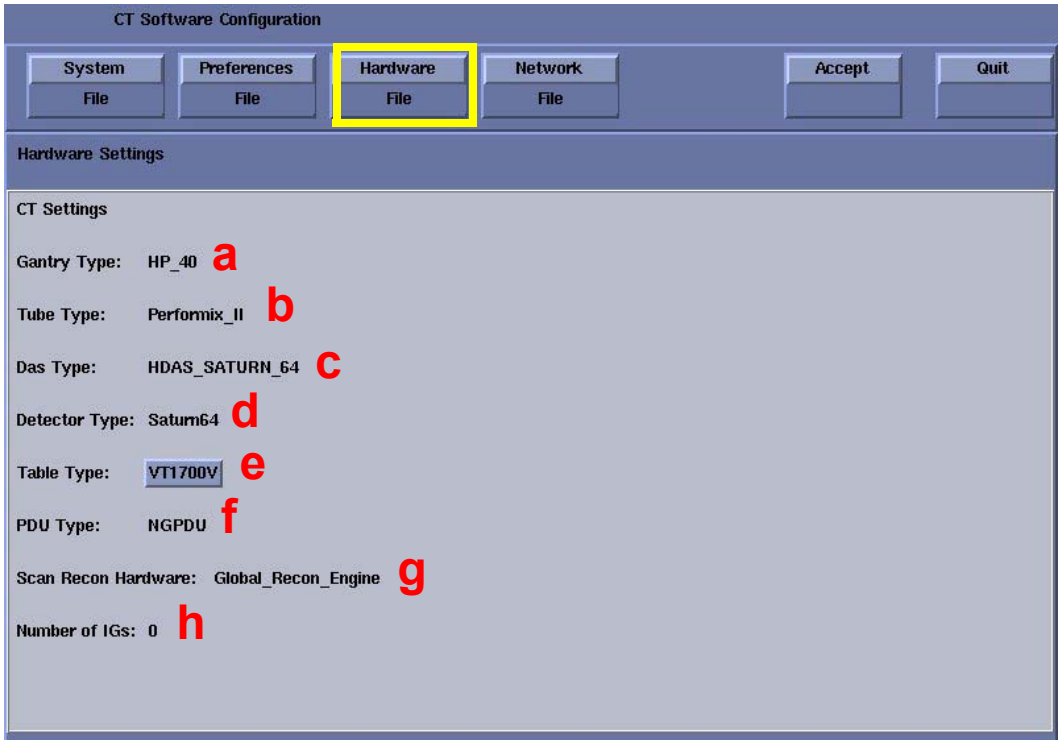


Figure 6-6 Hardware Settings

ID	Item	Description
a	Gantry Type	Indicates the type of gantry installed with this system.
b	Tube Type	Indicates the type of X-ray tube installed in this system.
c	DAS Type	Indicates the type of DAS installed in this system
d	Detector Type	Indicates the type of detector installed in this system.

Table 6-3 Hardware Settings

ID	Item	Description
e	Table Type	Select the table type: VT2000 VT2000x GT1700V Lite Table
f	PDU Type	Indicates the type of PDU installed in this system.
g	Scan Recon Hardware	Indicates the type of Recon Hardware.
h	Number of IGs	Indicates the number of IGs installed in this system. Cj always indicates 0.

Table 6-3 Hardware Settings

9.) Configure Hardware Settings

a.) Review the information for `Gantry Type, Tube Type` and `DAS Type` for this system.

b.) Select the `Table Type` installed with this system.

Determine the Table Type using the product locator card shipped with the order information.

c.) Review the `PDU Type and Scan Recon Hardware Type` for this system.

10.) Click the NETWORK button to display the Network Settings Screen, as shown in Figure 6-7.

Comment: *This screen provides the ability to declare the CT system on a hospital network. Key information such as Host Name, IP Address, Net Mask (for CT systems on a subnet) must be obtained from the hospital network administrator.*

See Chapter 8 for more information and complete details of setting the Hospital/System Network Configuration.

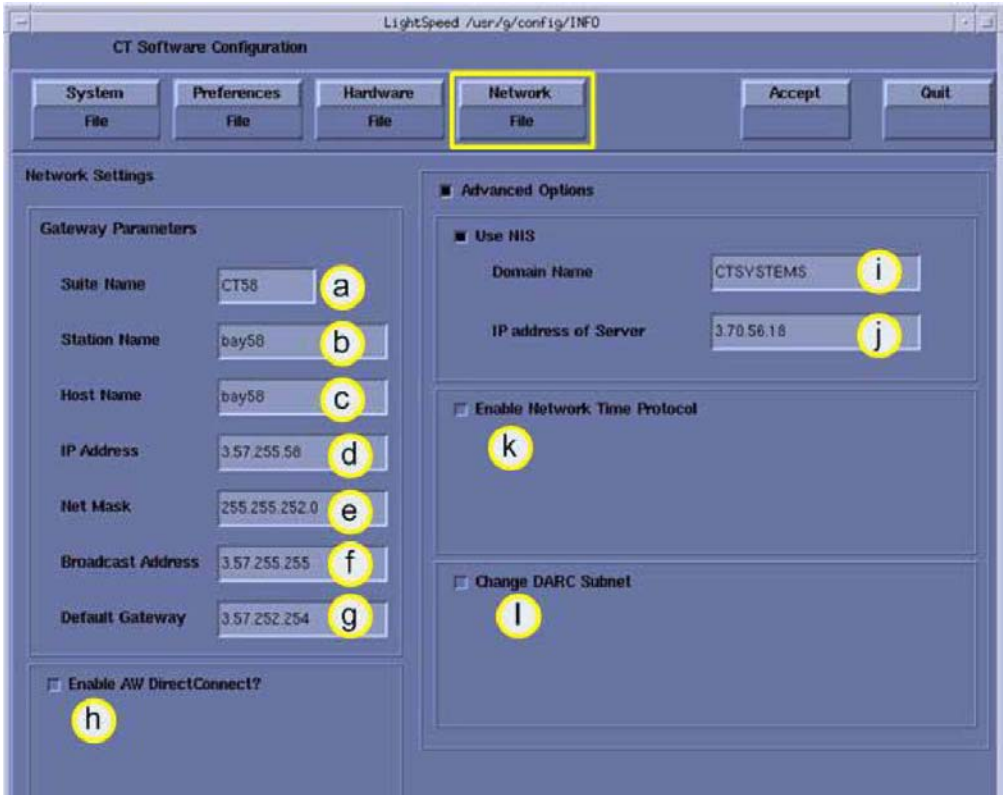


Figure 6-7 Network Settings Screen :

ID	Item	Description
a	Suite Name	The name this site is using on the system to identify the CT suite.
b	Station Name	
c	Host Name	Identifies the network hostname and AE Title of the CT system to the hospital's network
d	IP Address	Hospital's IP Address for the system.
e	Net Mask	Hospital-provided; used if the CT system is on a subnet
f	Broadcast Address	Same as the IP Address, except the last digit group is set to 1's or 0's, depending on the network configuration.
g	Default Gateway	Hospital-provided.
h	AW DirectConnect	Enable if the option is provided with the system.
i	NIS Domain Name:	Customer-provided site domain name.
j	IP Address	The IP Address for the NIS Server, if used. Hospital-provided.
k	Enable Network Time Protocol	Hospital decision.
l	Change DARC Subnet	Hospital decision.

Table 6-4 Configure Network Settings

11.) Configure Network Settings:

a.) Enter the `Suite Name`.

The Suite Name must start with a letter, followed by three alphanumeric characters (a total of four characters). The name of the OC interface is <*Suite Name*>_*OC*, within the scanner's subnet. *Example:* **su01** or **ct01** (su and ct must be lowercase)

b.) Enter the Station Name.

* It cannot exceed 16 characters
* It can only contain **a** though **z**, and **0** through **9**.
  Example: **stmary** or **ct01**

c.) Enter the Host Name.

* It cannot exceed 16 characters
* It can only contain **a** though **z**, and **0** through **9**.
  Example: **stmary** or **ct01**

d.) Enter the `IP Address`.

e.) Enter the `Net Mask`, if the CT system is on a subnet.

f.) Enter the `Broadcast Address`

g.) Enter the `Default Gateway IP Address`.

h.) Enable the AW DirectConnect, if this option is provided with this system.

i.) Enter the hospital-provided NIS Domain Name for the system, if NIS is utilized on-site.

j.) Enter the hospital-provided IP Address for NIS Service for the system, if NIS is utilized on-site.

k.) Check the `Enable Network Time Protocol` box, if instructed to do so by the hospital.

l.) Check the `Change DARC Subnet` box, if instructed to do so by the hospital.

12.) Review all screens to be sure the information is correct before proceeding to the next step.

13.) Click the ***ACCEPT*** button.

Figure 6-8 Accept Button

14.) When the configuration changes are complete, the system displays a prompt to reboot. Click on ***YES***. (See Figure 6-9)

Figure 6-9 Reboot Screen

15.) The system automatically logs in as ctuser after the reboot. Select OK on the Autostart Disabled popup message.

16.) Open a Shell window.

1.5 Set Time and Date

Important: **You must set the time and date on the Host Computer with Application Software down.**

1.) Open a Unix Shell and log in as root:

a.) Type: **`su -`** **ENTER**

b.) Type the root password and press **ENTER**

2.) Set the date and time for your time zone by updating the fields in the *setdate* routine.

a.) Type the following: **`{root@hostname}# setdate`**

Note: Type **`q`** to quit at any time; press **ENTER** to proceed.

To be accurate, this tool prompts you to enter the *Second*. Watch your clock or PC carefully to enter the proper value, and press **ENTER** at the right second to set the accurate time. Press **ENTER** to proceed.

b.) Type the current Year (1980-2030).

c.) Type the current Month (1-12).

d.) Type the current Day (1-30).

e.) Type the current Hour (Military time, 0-23).

f.) Type the current Minute (0-59).

g.) Type the current Second (0-59).

```
\Updating the time on the OC and DARC, Please Wait…
Ping darc (172.16.0.2) 56(84) bytes of data.
```

3.) Boot system to application level.

1.6 Install Customer Options

1.6.1 Time & Personnel

Required Persons	Preliminary Reqs	Procedure	Finalization
1 (FE or mechanical supplier)			

1.6.2 Tools and Test Equipment

Laptop

1.6.3 Standard Options Installation

1.) Install Standard Options by following the procedure located on your *Optima Service Methods CD* under the Chapter entitled **Software > Install Software Options**.

Note: Standard options are loaded before additional options.

Note: Some options have dependency to other options. Refer to the table below

Marketing Name	Option Key Name	Dependency/Comments
64SLICE OPTION SW KEY	Patient-64-Slice	needs to be installed before installing the following option(s): • Helical Shuttle
Neuro 3D Filter	NeuroFilter	needs to be installed before installing the following option(s). • AutoFilter-and-Transfer

Marketing Name	Option Key Name	Dependency/Comments
48kw (75kVA) 62kW (90kVA) 72kW (100kVA)	75kVA 90kVA 100kVA	If multiple kVA option keys are installed, the last installed option key will become effective.

1.6.4 Additional Options Installation

1.) Install Additional Options by following the procedure located on your *Optima CT660 Service Methods CD* under the Chapter entitled **Software > Install Software Options**.

Note: Some options require that data field(s) be completed. Refer to the inventory sheet for the options with data requirements. Have this information available when completing this section.

- Check the FDO to see what options were ordered.
- Compare FDO options to those on the Options DVD.
- If different, contact your local sales representative.

Note: Some options have dependency to other options. Refer to the table below.

Marketing Name	Option Key Name	Dependency/Comments
Connect Pro	Connect Pro	needs to be installed before installing the following option(s). • ExamSplit
Smart Score Pro	SmartScore Pro	needs to be installed before installing the following option(s). • EKG Viewer
Volume Viewer	Volume Viewer	VolumeViewer needs to be installed before installing the following option(s). • AdvVesselAnalysis • AutoBone • CardEP • CardIQPlus • CTColonoPro • AVA_Xpress • AutoBone_Xpress • CardIQ_Xpress_Reveal • CT_Colono_Pro3D_EC • CT_Perfusion_4D_Neuro or CT_Perfusion_4D_MultiOrgan • DentaScan
Snap Shot Assist	SnapShot Assist	SnapShot Assist requires the following option(s): ・Sub-0.4-Second-Scan ・EKG Viewer ・CardIQSnapShot-Cine
Snap Shot Freeze	SnapShotAssist Temporal Enhance	SnapShotAssist Temporal Enhance requires the following option(s): ・SnapShot Assist

2.) Select INSTALL**.** A box may appear while the options are loading. When an option is displayed in the `Installed Options` list on the right side, then installation of that option is complete. Note that some options take a fraction of a second to install, while options like 3D may take a half minute.

3.) When all options have been installed, check the permanent options on the right side of the screen against those ordered. Make changes as required and close this screen.

4.) Run `Verify Options` to confirm that all options are loaded.
5.) After the options are installed, select QUIT then QUIT again.
6.) Remove the DVD and write-protect the side with options.
7.) When the system prompts to reboot, click YES, and reboot the system to complete the installation.

1.6.5 Enabling the Cardiac Monitor

1.) At the console select:
   a.) Common Service Desktop.
   b.) *Configuration* tab.
   c.) [Install Gating Monitor].
2.) From the [Install Gating Monitor] menu, select the model number of the cardiac monitor connected to the system.

Note: In case of 10HW33.8 software version, selection of [IVY7800] is not available. If IVY7800 is connected to the system, select [IVY3150].

3.) Click [Accept].

Note: This automatically sets up the monitor at IP address 10.44.22.21.

1.7 Network and Service Integration and Checkout

- If additional network connections are needed for this installation, complete as required. Confirm network operation.
- If additional service integration is required to complete this installation, complete as required.
- Verify that the system information on the service home page is correct and that system service information is present on the service desktop.

1.8 ENABLE THE CONSOLE LAPTOP PORT

1.) On the console in a unix shell, change user to root and enable the console laptop port:
   a.) Type: `su -` **ENTER**
   b.) Type the root password; press **ENTER**
   c.) Type: `enableFEport` **ENTER**

1.9 Camera

1.9.1 Time & Personnel

Required Persons	Preliminary Reqs	Procedure	Finalization
1 (FE or mechanical supplier)			

1.9.2 Tools and Test Equipment

- Data collected from data sheets (See System Configuration Data Sheets on page 303.)
- Software Load Procedures manual
- System Service manual.

1.9.3 Preparation

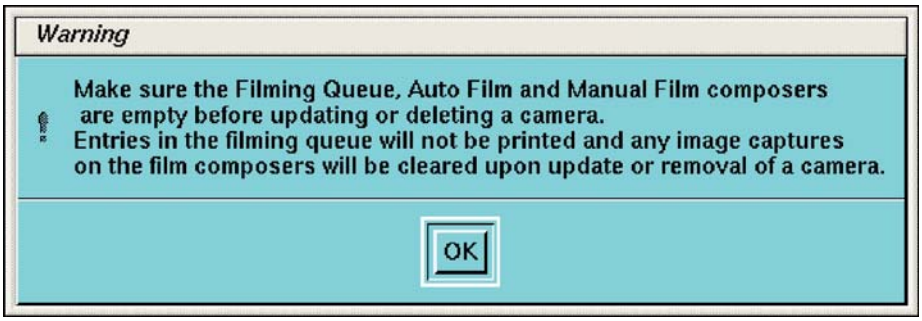
If a DASM is required, notify the PMU that the DASM is not supported on this systems.

For details on camera configuration, refer to the Software Load Procedures manual.

For details on troubleshooting the camera, refer to the System Service manual.

1.9.4 Procedures

1.) Click on the SERVICE DESKTOP icon.
2.) Select UTILITIES icon.
3.) Select INSTALL CAMERA.
4.) Read WARNING message, and click OK.



5.) From the remote printer list select a camera, and select ADD for new install.
   a.) ADD
   b.) UPDATE
   c.) DELETE
6.) Select DICOM or POSTSCRIPT*.
   * Follow the manufacturers suggested setup instructions.
7.) Follow the procedures on the screen.

Note: Camera and film information is required. Review this information with the customer. Data sheets are available in Service Information CD under Alignment, Setup and Calibrations.

8.) Return to the Home Page
9.) Click the SERVICE DESKTOP icon.
10.) Click SHUTDOWN
11.) Click REBOOT.
12.) Restart the system.

1.10 Data Privacy Configuration

If "HIPAA present" was enabled in reconfig, apply the following procedure to fully configure the Data Privacy (EA3 User Authorization) feature. Refer to *Data Privacy (EA3 User Authorization) Configuration* procedure in the Service Methods CD-ROM.

1.11 Initial Setup of EA3 Administrator Account

Service assistance is required for initial setup of User Accounts using EA3 Admin Browser. Complete the Section 4 of the *Dose Check Management and EA3 Configuration* procedure in the Service Methods CD-ROM.

1.12 Save System State and Start Up Applications

1.) Insert a new Save State DVD into the SCSI Tower DVD RAM drive.
2.) Click the SERVICE DESKTOP icon.
3.) If reloading software, click UTILITIES.
4.) Select SYSTEM STATE.

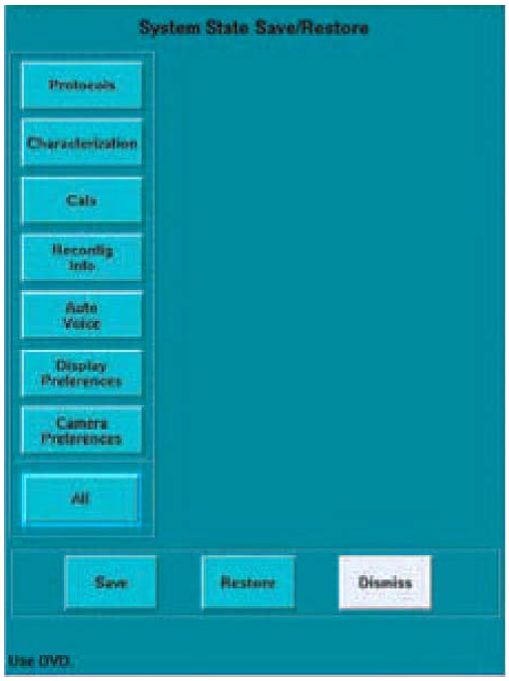


Figure 6-10 System State Save

5.) Click ALL to select all the cals, characterizations, etc.
6.) Click SAVE.
7.) If the following message appears, insert a DVD into the DVD drive and then click YES.

Figure 6-11 Save System State Prompt

8.) When completed, click DISMISS.
9.) Label and date the disk including the suite name.
10.) Close the Service Desktop window at the upper left corner of the screen.

Section 2.0 Table Gantry Integration

2.1 Introduction

Use these procedures to functionally check every part of the table/gantry subsystem.

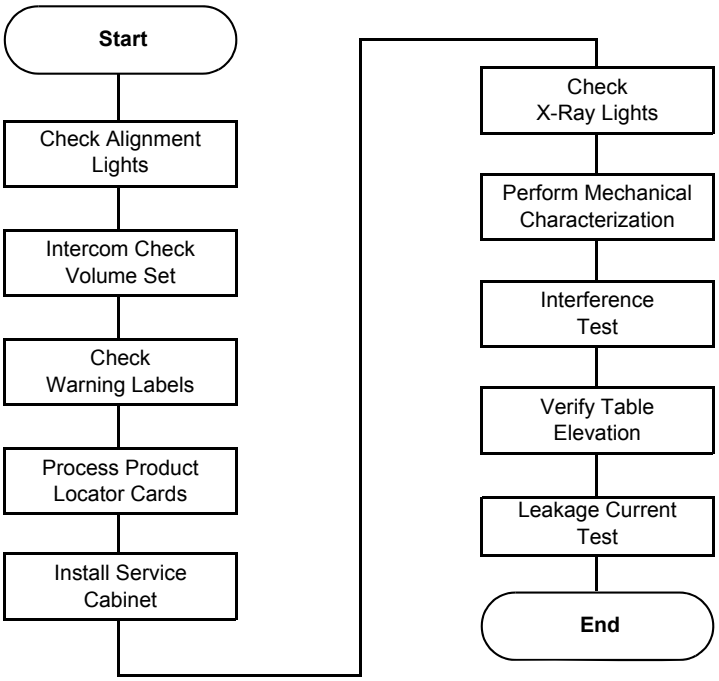


Figure 6-12 Table Gantry Integration Process Overview

Required Tool

- Multimeter

2.2 Check Alignment Lights

2.2.1 Time and Personnel

Required Persons	Preliminary Reqs	Procedure	Finalization
1 (FE or mechanical supplier)		labor on-site	

2.2.2 Tools and Test Equipment

2.2.3 Procedures

CAUTION **Verify all personnel have cleared the system. The Gantry rotates during this check.**

1.) Adjust the scan room lights to normal customer operating levels.

2.) Turn ON the **AXIAL DRIVE ENABLE** and **HVDC ENABLE** switches (located on the service switch panel.

3.) Turn on the alignment light switch on the gantry service panel. The gantry will rotate and the alignment lights will turn ON.

CAUTION LASER EYE INJURY!

NEVER STARE DIRECTLY INTO THE LASER BEAMS WHEN YOU OPERATE THE ALIGNMENT LIGHTS. STARING INTO THE BEAMS CAN CAUSE PERMANENT EYE DAMAGE.

4.) Place a sheet of plain white paper over the output port of each light.

5.) Verify that the two laser lines coincide and appear as a single line.

Note: GE designed the internal axial lasers on the current CT system to shine *down* on the collimator. Do NOT adjust the internal alignment lights at this time. The tomographic plane tests use the QA phantom to check the internal axial lasers alignment to the collimator.

Note: 6.) Ensure that cradle is level.

7.) Raise the table to its highest elevation.

8.) Extend the cradle until you see both the internal and external laser lights shining on the cradle.

9.) Place a metric rule on the right edge of the cradle, and measure the distance from the internal axial laser line to the external axial line. Verify this distance equals 240.0 mm ±1.0 mm.

10.) Place the rule on the left edge of the cradle, and measure again.

11.) Leave the cradle in its current position, and lower the table to the minimum elevation.

12.) Measure the distance between the internal and external lights on both edges of the cradle, as above. Verify the distance remains equal to 240.0 mm ±1.0 mm.

13.) Press the alignment light button on the gantry control panel to turn the lights OFF.

2.2.4 Alignment Light Characterization

1.) Start the Mechanical Characterization tool from the Calibration tab on the Common Service Desktop.

2.) Select the CHARACTERIZE ALIGNMENT LIGHTS button from the interface.

3.) Follow the on-screen instructions.

2.3 Autovoice/Intercom Checks

2.3.1 Time and Personnel

Required Persons	Preliminary Reqs	Procedure	Finalization
2 people required		labor on-site	

2.3.2 Tools and Test Equipment

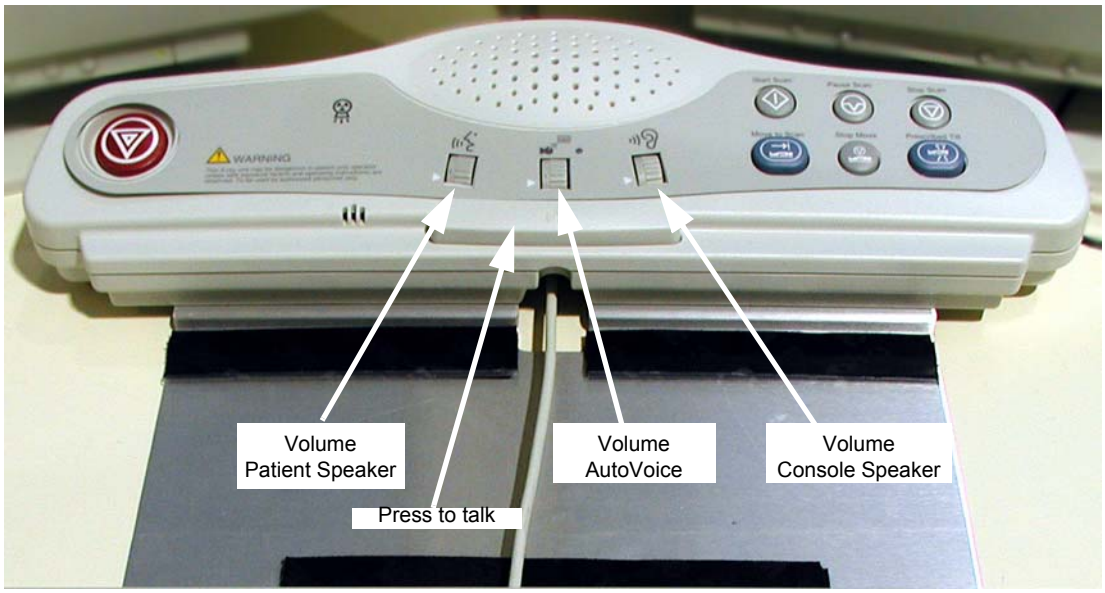


Figure 6-13 SCIM Volume Controls

Figure 6-14 GSCB Volume Controls

2.3.3 Procedures

PATIENT SPEAKER

To adjust the volume of the patient speaker in the table:

1.) Adjust the "Volume Patient Speaker" thumb wheel on the SCIM/GSCB while speaking into the console microphone. (Press the bar on the SCIM/GSCB to talk; release the bar to listen.)
2.) The patient should be able to clearly hear the operator.

OPERATOR CONSOLE SPEAKER

To adjust the console speaker volume:

1.) Have an assistant speak into the gantry microphone.
2.) Adjust the SCIM/GSCB console volume knob until you can clearly hear the assistant.

AUTOVOICE VOLUME

1.) On the Scan Desktop, select PROTOCOL MANAGEMENT.
2.) Select AUTO VOICE RECORD.
3.) Click the 3.4 button, to the right of “FF2. Inspiration”.
4.) Click the PLAY button, to play the Inspiration AutoVoice message.
5.) Adjust the center volume thumb wheel while Autovoice is playing, to set the volume for the gantry speaker.
6.) Repeat steps 4 and 5 as necessary to achieve satisfactory volume.
7.) Select DONE, then select QUIT.

Note: If a satisfactory volume can not be achieved, refer to the system service manual and review the intercom module setup procedure.

2.4 CT System X-Ray ON Indicators, Cautions & Warning Labels

2.4.1 Check And Install System Warning Labels

All labels are installed in English and present on PDU, Console, Table, Gantry and Accessories. Add the labels listed below (Table 6-5 and Section 2.5) for the appropriate language for the country in which this system is installed. Additionally, apply any other warning labels if present, on equipment where appropriate.

Important: Do not cover English labels already on the system.

Subsystem	Subsystem	Label(s)
Console	SCIM / GSCB	Language overlay label X-ray warning label
	Keyboard	Keyboard warning label Function key overlay label Back warning label

Table 6-5 System Warning Labels

Subsystem	Subsystem	Label(s)
Gantry	Scan Window	Laser warning label
	Laser Window	Laser warning label
	Front Cover	Laser warning label Information labels
	System GIB	System Global Installation Base (rating) label
Table (GT1700V / VT2000 / VT2000x)	Front Side Cover	Pinch Hazard warning label - each side of cover
	Back Cradle Pan	Pinch Hazard warning label - each side of cover
Table (Lite Table)	Top Side Cover	Pinch hazard warning label - each side of cover
NGPDU	Front Cover	Emergency OFF label Gantry Enable label Power ON label
Accessories	Table Foot Extender	Warning label
	Coronal Head Holder	Warning label
	Accessory Tray	Warning label
	IV Pole	Caution label

Table 6-5 System Warning Labels

2.4.2 Documentation - Verification

When finished update GE Form e4879 and the installation completion form that all appropriate language labels were installed and present.

2.5 Check Warning Labels

The labels on the system and the system manuals must comply with the country law. Compliance to the law must be completed prior to releasing the system to the customer.

Important: **Do not cover English labels already on the system.**

2.5.1 On SCIM / GSCB

1.) Make sure the X-Ray warning label appears in the correct location on the SCIM / GSCB.
2.) Record this information on GE Form e4879 located on the Service CD.

2.5.2 On Gantry

1.) Check that all laser warning labels are present on the gantry near the laser opening.
2.) There should also be warning labels on the lower right side of the gantry front cover.
3.) Record this information on GE Form e4879 located on the Service CD.

2.5.3 On Laser

1.) Make sure all laser warning labels appear in the correct location on the outside of the gantry.
2.) Obtain and install replacements for any missing labels.

Figure 6-15 Laser Warnings and Precautions

2.6 Process Product Locator Cards

1.) Collect the product locator cards shipped with the system. There should be approximately 28 product locator cards with the average system.

2.) Update the online product locator web site with the required hospital information.

3.) Confirm that the serial numbers on the cards shipped with the system match those found on the web site for that GON number. Update the information, as required.

4.) Place the cards in a plastic bag, then place them in the service cabinet.

2.7 Install Service Cabinet (Optional)

The service cabinet is shipped assembled.

2.7.1 Time and Personnel

Required Persons	Preliminary Reqs	Procedure	Finalization
1 (FE or mechanical supplier)		1. 5 hours labor on-site	

2.7.2 Tools and Test Equipment

•

2.7.3 Procedures

1.) Place the cabinet in the location shown on the site print.
2.) Verify and place all of the service materials shipped with the system in the service cabinet.

2.8 Check X-Ray Lights / GSCB Beep Sound Setting

Perform several scans following the steps below. Verify that the X-ray ON lights are ON during the scans. In case of NIO64, confirm that GSCB does NOT make beep sound during X-ray exposure.

If GSCB generates beep sound, set the DIP SW of GSCB not to make beep sound. Refer to GSCB Configuration and Intercom setup procedure in Service Method.

1.) Make sure the axial drive enable and HVDC enable switches are ON.
2.) If you are not on the Service Desktop, click on the Service Desktop icon.
3.) Select DIAGNOSTICS.
4.) Select DIAGNOSTIC DATA COLLECTION.
5.) Set the scan time to 2.00.
6.) Set the kV to 80.
7.) Set the mA to 40.
8.) Press **ACCEPT RX**.
9.) Press **START SCAN** button when flashing.
10.) Record the above information on GE Form e4879 located on the Service CD.

2.9 Table Height Characterization

The relationship of table height to ISO center and internal-to-external landmarks must be characterized for proper interference matrix functionality.

Important: **Do NOT perform tilt characterization.**

1.) Select the CHARACTERIZE TABLE HEIGHT button from the interface.
2.) Follow the on-screen instructions.

Note: If the table height is less than 21mm or greater than 25mm, relative to ISO, you must adjust the table height using the table leveling pad and adjusters. Raise or lower all four adjusters equally to achieve desired results.Refer to Drill the Anchor Holes on page 69, Book 1 Installation Manual.

2.10 Short Footprint Setting (GT1700V and Lite Table)

Normally, the table cradle can travel up to 1712mm (67.4 in.) for GT1700V or 1537mm (60.5 in.) for Lite table from scan central line. The Short Footprint function can limit this distance to a value shorter than maximum cradle extension (in 1mm (0.04 in.) increments).

Note: If you moved the cradle into the set maximum distance while the table is not at the highest position, then the system will inhibit the table upward operation.

Note: During the table characterization procedure, or while operating the cradle with the service switches on the GTCB board, the cradle is enabled to move up to full extension, regardless of the short footprint set distance.

Note: Short Footprint mode is not available for VT2000 and VT2000x.

CAUTION **Potential for injury to a person.**
Small space present.
The IN-limit position of Cradle short footprint mode should be set in order not to pinch patient between the cradle edge and scanning room wall.

NOTICE It is recommended that safety clearance from cradle IN-limit to wall should be no less than 150mm (5.9 in.).

1.) Attach the cradle extender on the cradle.
2.) Launch the MECHANICAL CHARACTERIZATION tool from the Service Desktop, select CALIBRATION tab.
3.) Select SHORT FOOT PRINT.
4.) Follow the on-screen instructions.
5.) After the setting, verify that you can not move the cradle inward further from the set position, with the following conditions:
   - The table is at the highest position.
   - The table is at a lowest position where scanning is possible.

2.11 Interference Test

PREREQUISITES

- Be sure that the System State was restored from DVD per Section 1.2.1 on page 234.
- Reset the hardware to download the new characterization values before performing the table/ gantry interference tests in this section.

CONFIGURATION

1.) Be flashed with latest software.
2.) Have elevation and cradle and IMS characterized.
3.) Be mechanically aligned to gantry.
4.) Have had the table-gantry characterization completed.
5.) Have the table extender is installed.

☐ Check box when complete.

TEST OUTLINE

The following tests verify the proper tilt and table interference matrix on the gantry.

- Verify Table Elevation - Section 2.13
- Position Tilt, Move Table to Interference Limit - Section 2.13.1
- Position Table, Move Tilt to Interference Limit - Section 2.13.2
- Tilt Limits When Table Below Scan Plane Lower Limit - Section 2.13.3

REQUIREMENTS

The following requirements are tested in this series of tests:

1.) No motion shall cause the table to hit the gantry (or gantry to hit the table)
2.) Requirement #1 shall include the use of the table extender.
3.) No tilt motion shall cause the gantry tilting frame to touch the stationary base covers for any tilt angle.

LIMITATIONS

These requirements will only be met when the table is NOT in service mode.

INTERPRETING TEST RESULTS

If test results indicate that elevation and/or tilt display readings fail to meet specifications, DO NOT adjust the limit switches. Instead, re-characterize and/or adjust tilt speed. Perform elevation and cradle and IMS first, then repeat the test. If it still fails, perform tilt.

2.12 Disconnection of the CT Table Foot Pedal Cables

Tables installed in a Surgical Environment must have their foot pedals permanently disabled. Vertical motion may still be accomplished through the use of the push buttons found on the gantry control panels. To proceed with the disconnection:

1.) Inform you Customer prior to disconnection.
2.) Escalate the issue through the Customer Satisfaction Opportunity (CSO) tool using the Customer Escalation Issue Process (CEIP).
3.) Obtain and follow Engineering Instruction 5328450INS to disconnect the pedals.

2.13 Verify Table Elevation

Test	Steps	Expected Results
1	Reset the gantry firmware. Wait the firmware starts up.	
2	Install the Cradle Extender if it is not installed.	
3	Make notes of "Distance from ISO center" by selecting "View Values" button on Mechanical Characterization in Calibration Menu of CSD.	The value of distance "V" = _____ This value should be used following tests.
4	Move the cradle (and IMS) to home position. Push the table down gantry push-button to lower the table to the minimum height.	With GT1700V / VT2000: Elevation Display should read 560.0 + V ± 3 mm. VT2000x 465.0 + V ± 3 mm. With Lite Table: Elevation Display should read 550.0 + V ± 3 mm.
5	Raise the table to the maximum height using the gantry controls.	Elevation Display should read V ± 3 mm.

Table 6-6 Table Elevation Tests

2.13.1 Position Tilt, Move Table to Interference Limit

The following tests verify the table interference limits at different tilt locations.

Note:
- "S" means top of gantry tilts away from the table base.
- "I" means top of gantry tilts toward the table base.

Important: **For all tests, make sure there is 2.5 cm of clearance between the gantry and table. Also, for all tilt angles used in this test, make sure that the Gantry Tilting frame covers do not touch the stationary base covers.**

Test	Steps	Expected Results
1	Move cradle (and IMS) to home position and set internal landmark.	Cradle position on display should read 0.0.
2	With GT1700V / Lite Table: Raise table height to maximum height, set the internal landmark, move cradle into gantry 1m. With VT2000 / VT2000x: Raise table height to maximum height, set the internal landmark, move cradle into gantry 1.2m.	With GT1700V / Lite Table: Table elevation on display should read V ± 3mm. Cradle position on display should read 1000.0 mm. With VT2000 / VT2000x: Table elevation on display should read V ± 3mm. Cradle position on display should read 1200.0 mm.

Table 6-7 Position Tilt, Move Table to Interference Limit Tests

Test	Steps	Expected Results
3	Tilt the gantry to I30.0, then lower table until motion stops.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 64.5 ± 3mm. Tilt display should read I30. With Lite Table: Table elevation on display should read 72.0 ± 3mm. Tilt display should read I30.
4	Tilt the gantry to I23.0, then lower table until motion stops.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 134.0 ± 3mm. Tilt display should read I23. With Lite Table: Table elevation on display should read 142.5 ± 3mm. Tilt display should read I23.
5	Tilt the gantry to I20.0, then lower table until motion stops.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 156.0 ± 3mm. Tilt display should read I20. With Lite Table: Table elevation on display should read 164.5 ± 3mm. Tilt display should read I20.
6	Raise the table elevation to maximum height.	Table elevation on display should read V ± 3mm.
7	Tilt the gantry to S30.0, then lower table until motion stops.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 146.5 ± 3mm. Tilt display should read S30. With Lite Table: Table elevation on display should read 156.0 ± 3mm. Tilt display should read S30.
8	Tilt the gantry to S23.0, then lower table until motion stops.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 174.5 ± 3mm. Tilt display should read S23. With Lite Table: Table elevation on display should read 182.0 ± 3mm. Tilt display should read S23.
9	Tilt the gantry to S20.0, then lower table until motion stops.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 184.0 ± 3mm. Tilt display should read S20. With Lite Table: Table elevation on display should read 192.0 ± 3mm. Tilt display should read S20.

Table 6-7 Position Tilt, Move Table to Interference Limit Tests (Continued)

Test	Steps	Expected Results
10	With GT1700V / VT2000 / VT2000x: Raise the table to 146 mm. With Lite Table: Raise the table to 154 mm.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 146mm. With Lite Table: Table elevation on display should read 154mm.
11	With GT1700V / VT2000 / VT2000x: Tilt gantry to S30 and verify the table height can be adjusted from 146 to 25mm. With Lite Table: Tilt gantry to S30 and verify the table height can be adjusted from 154 to 25mm.	With GT1700V / VT2000 / VT2000x: Tilt display should read S30. Table lower limit should be 146 ± 3mm. Upper table limit should be V ± 3 mm. With Lite Table: Tilt display should read S30. Table lower limit should be 154 ± 3mm. Upper table limit should be V ± 3 mm.
12	With GT1700V / VT2000 / VT2000x: Set the table height to 62 mm. With Lite Table: Set the table height to 70 mm.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 62 mm. With Lite Table: Table elevation on display should read 70 mm.
13	Tilt gantry to I30.	Tilt display should read I30.

Table 6-7 Position Tilt, Move Table to Interference Limit Tests (Continued)

2.13.2 Position Table, Move Tilt to Interference Limit

The following tests verify the tilt interference limits at different table heights.

Note:
- "I" means top of gantry tilts toward the table base
- "S" means top of gantry tilts away from the table base.

Important: For all tests, make sure there is 2.5 cm of clearance between the gantry and table.

Test	Steps	Expected Results
1	Move cradle (and IMS) to home position and set internal landmark. Set gantry tilt to zero.	Cradle position on display should read 0.0. Gantry tilt on display should read 0.0.
2	With GT1700V / Lite Table: Raise table height to maximum height, set the internal landmark, move cradle into gantry 1m. With VT2000 / VT2000x: Raise table height to maximum height, set the internal landmark, move cradle into gantry 1.2m.	With GT1700V / Lite Table: Table elevation on display should read V ± 3mm. Cradle position on display should read 1000.0 mm. With VT2000 / VT2000x: Table elevation on display should read V ± 3mm. Cradle position on display should read 1200.0 mm.

Table 6-8 Position Table, Move Tilt to Interference Limit Tests

Test	Steps	Expected Results
3	Lower table until height is 115mm. Tilt the gantry top away from the table ("S") until it stops.	Table elevation on display should read 115mm. Tilt display should read S30 ± 0.5º.
4	Tilt the gantry top toward the table ("I") until it stops.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 115 mm. Tilt display should read I25.0 ± 0.5º. With Lite Table: Table elevation on display should read 115 mm. Tilt display should read I26.0 ± 0.5º.
5	Tilt the gantry to 0. Lower table until height is 200 mm. Tilt the gantry top away from the table ("S") until it stops.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 200 mm. Tilt display should read S14.5 ± 0.5º. With Lite Table: Table elevation on display should read 200 mm. Tilt display should read S17.0 ± 0.5º.
6	Tilt the gantry top toward the table ("I") until it stops.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 200 mm. Tilt display should read I11.0 ± 0.5º. With Lite Table: Table elevation on display should read 200 mm. Tilt display should read I13.0 ± 0.5º.
7	Tilt the gantry to 0. Lower table until height is 210 mm. Tilt the gantry top away from the table ("S") until it stops.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 210 mm. Tilt display should read S10.5 ± 0.5º. With Lite Table: Table elevation on display should read 210 mm. Tilt display should read S13.5 ± 0.5º.
8	Tilt the gantry top toward the table ("I") until it stops.	With GT1700V / VT2000 / VT2000x: Table elevation on display should read 210 mm. Tilt display should read I8.5 ± 0.5º. With Lite Table: Table elevation on display should read 210 mm. Tilt display should read I10.5 ± 0.5º.

Table 6-8 Position Table, Move Tilt to Interference Limit Tests

2.13.3 Tilt Limits When Table Below Scan Plane Lower Limit

The following tests verify the table and tilt interference limits when the table height is below the scan plane.

Note:
- "I" means top of gantry tilts toward the table base
- "S" means top of gantry tilts away from the table base.

Important: For all tests, make sure there is 2.5 cm of clearance between the gantry and table.

	Steps	Expected Results
1	Set gantry tilt to zero. Move cradle (and IMS) to home position, lower the table all the way, and set the internal landmark.	With GT1700V / VT2000: Cradle position on display should read 0.0. Gantry tilt on display should read 0.0. Table height should read 560.0 +V ± 3 mm. With VT2000x: Cradle position on display should read 0.0. Gantry tilt on display should read 0.0. Table height should read 465.0 +V ± 3 mm. With Lite Table: Cradle position on display should read 0.0. Gantry tilt on display should read 0.0. Table height should read 550.0 +V ± 3 mm.
2	Tilt the gantry forward and backwards and verify the following tilt limits: With GT1700V: 0.0 and I30.0 With VT2000:S0.5 and I30.0 With VT2000x: S2.5 and I30.0 With Lite Table: S4.5 and I30.0	With GT1700V: Gantry tilt on display should read 0.0 ± 0.5º. Gantry tilt on display should read I30.0 ± 0.5º. With VT2000: Gantry tilt on display should read S0.5 ± 0.5º. Gantry tilt on display should read I30.0 ± 0.5º. With VT2000x: Gantry tilt on display should read S2.5 ± 0.5º. Gantry tilt on display should read I30.0 ± 0.5º. With Lite Table: Gantry tilt on display should read S4.5 ± 0.5º. Gantry tilt on display should read I30.0 ± 0.5º.

Table 6-9 Tilt Limits When Table Below Scan Plane Lower Limit Tests

	Steps	Expected Results
3	Set Gantry tilt to 0. Then, using the gantry push-buttons, move the cradle in towards the gantry until it is stopped.	With GT1700V: Gantry tilt on display should read 0.0. Cradle should stop at 3.0 mm ± 6 mm from the home position. With VT2000: Gantry tilt on display should read 0.0. Cradle should stop at 7.5 mm ± 6 mm from the home position. With VT2000x: Gantry tilt on display should read 0.0. Cradle should stop at 31.5 mm ± 8 mm from the home position. With Lite Table: Gantry tilt on display should read 0.0. Cradle should stop at 58.0 mm ± 6 mm from the home position.
4	Set gantry tilt to zero. Move cradle to home position.	Cradle position on display should read 0.0 Gantry tilt on display should read 0.0.
5	Raise the table to a height of 386 mm and verify the following tilt limits: With GT1700V: S1.5 and I30.0. With VT2000 / VT2000x: S6.0 and I30.0. With Lite Table: S6.5 and I30.0.	With GT1700V: Table height should read 386 mm. Gantry tilt on display should read S1.5 ± 0.5º. Gantry tilt on display should read I30.0 ± 0.5º. With VT2000 / VT2000x: Table height should read 386 mm. Gantry tilt on display should read S6.0 ± 0.5º. Gantry tilt on display should read I30.0 ± 0.5º. With Lite Table: Table height should read 386 mm. Gantry tilt on display should read S6.5 ± 0.5º. Gantry tilt on display should read I30.0 ± 0.5º.

Table 6-9 Tilt Limits When Table Below Scan Plane Lower Limit Tests (Continued)

	Steps	Expected Results
6	Set Gantry tilt to 0. Set the internal landmark. Then, using the gantry push buttons, move the cradle in towards the gantry until it is stopped.	With GT1700V: Gantry tilt on display should read 0.0. Cradle should stop at 19.0 mm ± 6 mm from the home position. With VT2000 / VT2000x: Gantry tilt on display should read 0.0. Cradle should stop at 70.0 mm ± 6 mm from the home position. With Lite Table: Gantry tilt on display should read 0.0. Cradle should stop at 75.0 mm ± 10 mm from the home position.
7	Set gantry tilt to zero. Move cradle (and IMS) to home position.	Cradle position on display should read 0.0.
8	Raise the table to a height of 242 mm and verify the following tilt limits: With GT1700V: S11.5 and I30.0. With VT2000 / VT2000x: S16.5 and I30.0. With Lite Table: S15.0 and I30.0.	With GT1700V: Table height should read 242 mm. Gantry tilt on display should read S11.5 ± 0.5º. Gantry tilt on display should read I30.0 ± 0.5º. With VT2000 / VT2000x: Table height should read 242 mm. Gantry tilt on display should read S16.5 ± 0.5º. Gantry tilt on display should read I30.0 ± 0.5º. With Lite Table: Table height should read 242 mm. Gantry tilt on display should read S15.0 ± 0.5º. Gantry tilt on display should read I30.0 ± 0.5º.
9	Set Gantry tilt to 0. Raise the table to 210 mm. Then, using the gantry push buttons, move the cradle in towards the gantry until it is stopped.	Gantry tilt on display should read 0.0. Cradle should go all the way through the gantry bore to the full-extended position.
10	Set gantry tilt to zero. Move cradle to home position, lower the table all the way and set the internal landmark.	With GT1700V / VT2000: Cradle position on display should read 0.0. Gantry tilt on display should read 0.0. Table height should read 560.0 +V ± 3 mm. With VT2000x: Cradle position on display should read 0.0. Gantry tilt on display should read 0.0. Table height should read 465.0 +V ± 3 mm. With Lite Table: Cradle position on display should read 0.0. Gantry tilt on display should read 0.0. Table height should read 550.0 +V ± 3 mm.

Table 6-9 Tilt Limits When Table Below Scan Plane Lower Limit Tests (Continued)

	Steps	Expected Results
11	Tilt the gantry top toward the table to a tilt of 30 degrees.	Display should read I30.
12	With the table down all the way, move the cradle in until it stops.	With GT1700V: Cradle position should be 340.0 ± 3 mm. With VT2000: Cradle position should be 343.0 ± 3 mm. With VT2000x: Cradle position should be 328.0 ± 3 mm. With Lite Table: Cradle position should be 385.0 ± 10 mm.
13	Move the cradle (and IMS) to the home position, raise the table to a height of 386 mm, set the internal landmark, and then move the cradle in until it stops.	With GT1700V: Cradle position should be 306 ± 3 mm. With VT2000 / VT2000x: Cradle position should be 357 ± 3 mm. With Lite Table: Cradle position should be 363 ± 10 mm.
14	With GT1700V / VT2000 / VT2000x: Raise the table to a height of 62 mm, then move the cradle in. With Lite Table: Raise the table to a height of 70 mm, then move the cradle in.	Cradle should go all the way through the gantry bore to the full-extended position.

Table 6-9 Tilt Limits When Table Below Scan Plane Lower Limit Tests (Continued)

2.14 Leakage Current Test

Follow the instructions listed in System-Level Safety Tests on page 299.

Chapter 7
Image Quality

CAUTION

Shock Hazard.

Voltage Present.

No service on left side while energized.

NOTICE
Potential for Data Loss and/ or Equipment Damage

To prevent potential data loss, please do the following:

- **Record data collected from procedures in this chapter into Form F4879 when directed, located in GE and Regulatory Forms on page 230 of this book.**
- **Only use the Installation manual that arrives with your system for installation. Any other revisions of this manual may not exactly match your system.**

Section 1.0 Image Quality Process Overview Flowchart

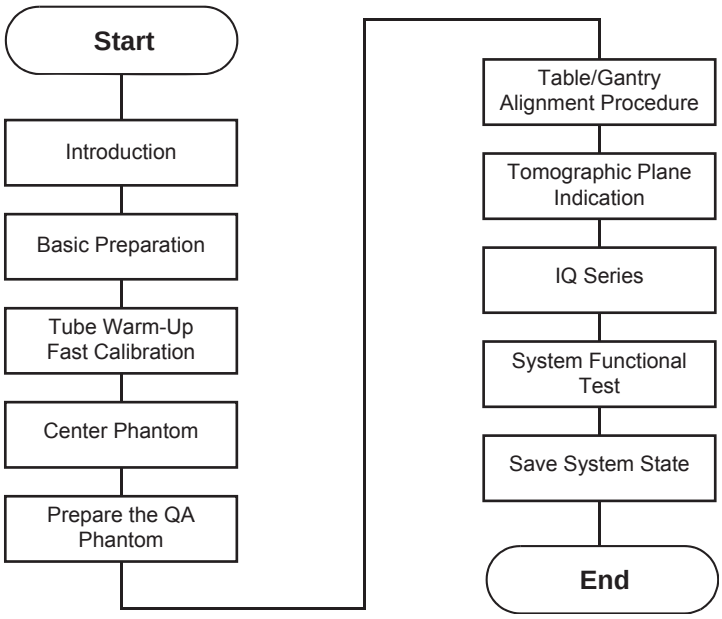


Figure 7-1 Image Quality Process Overview

Section 2.0 Reference Procedure - Scanning w/Service Protocols

⚠

NOTICE **Do not perform the following procedure until instructed to do so in other sections of this chapter.**

This procedure is used to locate the Manufacturing and Installation protocols on the SERVICE tab.

Note: **Manufacturing and Service share this Protocol list. Different product option offerings also use this list. Carefully follow the scan section instructions and verify you acquired the images with the correct technique before filling out the data sheet. Otherwise you may troubleshoot an image problem that only exists because you used the wrong technique.**

PROCEDURE

1.) Select the NEW PATIENT icon on the left monitor.

2.) Enter a Patient ID (e.g., **`getest`**)for easy identification.

3.) Click on the box labeled SERVICE to access the necessary protocols.

Section 3.0 Tube Warm Up and Fast Cal

1.) Select DAILY PREP and TUBE WARMUP. Follow the steps on screen until all scans are completed.

2.) Select FAST CALIBRATION from the Daily Prep menu.

Four basic steps will be performed: Gantry Balance Check, Mylar Window Check (Warm up scans if tube is cold), Interconnectivity Map Scan List, and Fast Cal Air Scans.

Note: **Use the default Fast Cal selections determined by the system configuration. (The system defaults to all four kV stations, but you can choose kV stations to calibrate during reconfig.)**

3.) Run the selected air calibrations.

4.) When the calibration process completes, click on QUIT.

Section 4.0 Prepare the QA Phantom

Note: **The QA-3 phantom is shipped water-filled.**

1.) Locate the multi-language sticker packet in the QA phantom shipping box.

2.) Attach the sticker with the customer's language to the face of the phantom hanger bracket.

3.) Check for bubbles.

4.) Purge and refill if necessary.

Section 5.0 Center Phantom

5.1 Required Tools

- Standard FE Tool Kit
- 9" Level

5.2 Procedure

1.) Locate the QA phantom and mount it and the phantom holder on the table.
2.) Use the adjustment knobs on the phantom holder to level the phantom front-to-back and side-to-side with a bubble level.
3.) Select SCANNER UTILITIES on the left monitor.
4.) Select CENTER PHANTOM.
5.) Follow the on-screen procedures.

Note: The phantom center spec is ± 0.5mm.

6.) Select QUIT when the phantom is within specification.

Level the phantom both front-to-back and side-to-side. (Use a 6" level.)

Section 6.0 Tomographic Plane Indication

1.) Place the QA phantom on the phantom holder.
2.) Turn ON the internal alignment lights, and drive the phantom into the gantry opening, until the line on the phantom lines up with the internal laser lights.
3.) Verify that BOTH internal axial lasers line up along the line on the QA phantom. If not, check table/gantry, cradle, and/or laser alignment.
4.) Center the phantom in the scan plane with the CENTER PHANTOM found in the “Scanner Utilities” on the left monitor in the lower right corner.
5.) Click on CONFIRM.
   a.) Adjust phantom as needed to achieve +/- 1.0 mm in both X and Y. Use CONFIRM to retry each time.
   b.) Click DONE and QUIT when centered.
6.) Select NEW PATIENT.
7.) Select the service protocol, MANUFACTURING, TOMO PLANE INDICATION. The protocol should appear as shown in Table 7-1.

Scan Type	Start Location	End Location	No. of Images	Thick Speed	Interval (mm)	Gantry Tilt	SFOV	kV	mA	DFOV	Recon Type
Helical Full 0.8 sec	I3.000	S3.200	32	0.625 10.62 0.531:1	0.200	S0.0	Small Body	120	100	25.0	Bone

Table 7-1 Tomographic Plane Protocol

8.) Select IMAGE WORKS and select Exam, Series, Image 1.
9.) Click on VIEWER.

10.) Select FORMAT and choose single image format view.

11.) Locate the scan plane indicator, the longest bar in the bar pattern on the right side of the phantom. The right side of the phantom corresponds to the side of the image labeled **L** on the display screen. See Figure 7-2.

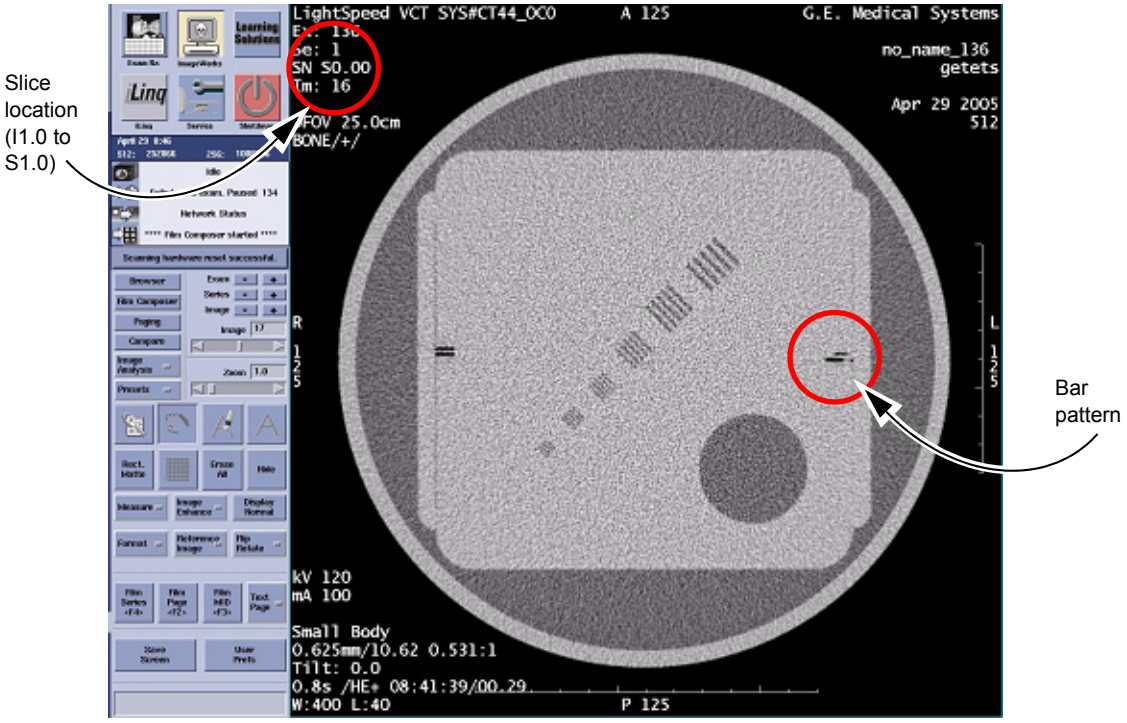


Figure 7-2 Exam, Series, Image 1

12.) On the GE Form e4879 Data Sheet, record the scan location (shown on the image annotation) of the image with the darkest scan plane indicator (darkest long bar).

13.) If your system meets all the installation and alignment specifications, the image at scan location zero (S0.0) should contain the scan plane indicator. If scan location S1.0 or scan location I1.0 has the darkest bar, the system still meets the specification. The scan plane deviation should equal S0.0 ± 1.0mm. If necessary, adjust the internal alignment light position to meet the S0.0 ± 1.0mm requirement.

14.) Repeat the Tomographic Plane Indication test with the external alignment lights.

a.) Use the external alignment light, and press the external landmark.

b.) Verify the external light lines up along the black line on BOTH the left and right sides of the QA phantom.

c.) The scan plane indication must fall within the S0.0 ±1.0mm specification.

15.) Initial below.

Section 7.0 Image Quality Test

7.1 Preparation

- All table mechanical alignment procedures are completed.
- The table perpendicular alignment test passed.
- The table tilt alignment test passed.
- Table anchors are in place and within specification.

7.2 Procedures

Important: Run ALL Image Series Tests in Auto Mode.

SETUP

1.) Check that the table cradle is level in all directions. Correct, if necessary.
2.) Check the scan window for proper installation
3.) From the operator's desktop, select SCANNER UTILITY.
4.) Complete section 4, CENTER PHANTOM procedure.
5.) Locate the white service CD that ships with the system, located in the tech pub tray of the lean cart.
6.) Load the CD into the lapto drive. Look under the Functional Checks tab located on the left hand side. Run the QA procedure.
7.) Record all pass/fail information on the GE e4879 form.

Section 8.0 System Functional Test

Use the system tests in the following sections to exercise all aspects of the system and to ensure system integrity before releasing to the customer. Although the means, standard deviation, and resolution specifications do not apply during system functional tests, treat any artifact or image anomaly as a failure.

8.1 Preparation

- All table mechanical alignment procedures are completed.
- The IQ test passed.
- All options are installed and operational.

If you encounter a failure during the system tests:

- Record any evidence of artifacts, such as rings, streaks, shading, cupping, noise, or center artifacts.
- Correct artifacts, system test, or image series failures when they occur. Any delay in repairs could increase the number of retests.
- Correct artifacts, system test, or image series failures when they occur.
- Record failure information in the comment section of the GE Form e4879.

8.1.1 What is Tested

- Scanning modes, including Cardiac.
- Installed hardware options, including:
  - UPS operation
  - cardiac monitor
  - remote monitor
  - bar code Reader
  - image transfer (if the network is operational)
  - confirm that customer network features are operational, based on options ordered and the network.
  - modem, if it is installed
  - saving an image to DVD
  - injector functional tests
  - AW functional tests
  - filming/camera functional tests
  - SmartStep

8.2 Procedure

1.) Locate the white service CD that ships with the system, located in the tech pub tray of the lean cart.

2.) Load the CD into the laptop drive. Look under the Functional Checks tab located on the left hand side. Run the System Scanning Test procedure.

3.) Record all pass/fail information on the GE e4879 form.

8.2.1 Confirm the following:

1.) The UPS goes into a backup mode when the power fails. Confirm that you can shut down the console and the table is operational before the loss of battery power.
Follow the procedure in the UPS startup/shutdown procedure.

2.) The remote monitor displays the same images as shown on the console image monitor.

3.) The bar code reader is operational and data is displayed.
   - From the APPLICATION screen, select NEW PATIENT.
   - Enter the Patient ID.
   - Using the barcode reader, scan a bar code to verify the information shown here.

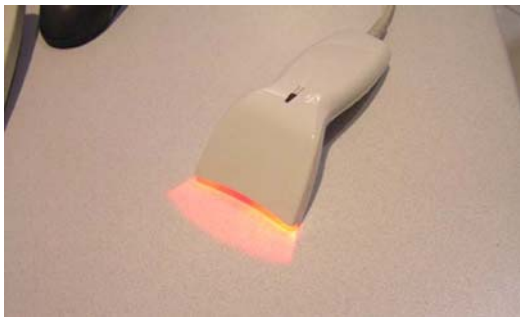


Figure 7-3 Barcode Reader

4.) If installed, confirm the following:
- An image can be filmed, saved to DVD, and networked to another network device or AWW.
- The Nomoto injector is operational, and all setup and calibration procedures are completed.
- All other installed injectors must power on.
- The SmartStep option is operational. Set up a SmartStep scan and confirm that the foot switch and the hand switch operate.

8.3 Cardiac Functional Test

8.3.1 Procedure

CARDIAC MONITOR SETUP

1.) Install these cables on the gantry option interface panel
- IEC (power cord to gantry) cable
- Cat 5 (cable between monitor and gantry) cable
- Lemo connector (between monitor and gantry) cable
- Ground Connection cable

2.) Turn on the monitor. Follow the monitor self test setup procedure using the document shipped with the system.

3.) From the APPLICATION screen, select NEW PATIENT. Fill out:
- Patient ID: `GE Test`
- Name: `Cardiac Functional System Functional Test`
- Select from Protocol Menu
  * User
  * Chest
- On the dark blue bar on the scan monitor select `Gating "On"`

4.) Check for presence of these items:
a.) Heart rate on the gantry display board
b.) Cardiac pulses shown on the screen
c.) Gating BPM displayed on the screen
d.) ECG trace highlighted on the screen

8.4 Connect Pro Functional Test

8.4.1 Procedure

PATIENT SCHEDULER

1.) On the scan desktop select Patient scheduler
2.) Select the button labeled `Update`
3.) The customer list should be present select `Export data`
4.) Send a test image to a workstation `AWW` or `what ever is available`.

8.5 Finalization

This section is complete when all of the above items pass.
Check all appropriate boxes on the GE Form e4879.

Section 9.0 Save System State

Use the following commands to create the System State DVD.

1.) Insert a DVD into the DVD drive.
2.) If you are not on the Service Desktop, click the SERVICE DESKTOP icon,.
3.) Click on UTILITIES icon.
4.) Select SYSTEM STATE to open the System State Save/Restore menu.
5.) Select ALL
6.) Select SAVE
7.) When the save operation completes, select FILE and QUIT from the pull-down menu.
8.) Remove the DVD from the drive.

Chapter 8
Customer Options Installation & Verification

Note: **Only use the Installation manual that arrives with your system for installation. Any other revisions of this manual may not exactly match your system.**

Section 1.0 DICOM Network

1.1 Introduction

DICOM networks operate on the **tasks** or services that various devices on the network use or provide. These services are labeled as Application Entity Titles (AE Titles). The CT scanner system is uses six DICOM Network Services and is provides two DICOM Services:

1.1.1 As a DICOM Service User:

- Send or "**Push**" images to another network device.
- Send or "**Push**" images to a DICOM Printer.
- Review image database on another device and retrieve or "**Pull**" selected images from that device (Query/Retrieve User).
- Send or "**Push**" images to a an image storage device and obtain confirmation that the images were archived (Storage Commitment).
- Obtain Patient Worklist Information from the Hospital HIS/RIS System.
- Store images on MOD media.

1.1.2 As a DICOM Service Provider:

- Receive "**Pushed**" images from another network device.
- Allow another network device to review the image database and to retrieve or "**Pull**" selected images (Query/Retrieve Provider).

For each DICOM Service that the CT system is a **User** (except for storing images on MOD media), you must **declare** this device on the CT system using three menu selections. For some devices, you must declare not only the device, but each service (AE Title) that the device provides.

For example, you may need to declare a PACS System twice on the CT system: once as a destination to **push** images and, second, as destination that provides storage commitment capability after images have been **pushed**.

For each DICOM Service that the CT system is a **Provider**, you must **declare** the CT system on the network device that is using these services.

Information required to complete configuring a hospital DICOM network is provided by:

- The hospital network administrator (hostnames, IP Addresses)
- The DICOM Conformance Statement document (AE Titles, Port Numbers), provided with each DICOM compatible network device on the network.

1.2 Preparation

1.2.1 Network Physical Requirements

Before setting up the CT scanner system on the hospital network, verify the following physical items are complete:

- Scanner console, monitor, keyboard, and mouse are installed and connected.
- CT system power is ON.
- Hospital Ethernet network RJ45 Class IV twisted pair cable is connected to the scanner console network receptacle.
- Hospital network connection is operational and is running 10baseT or 100baseT.

1.2.2 Network Identity Information

You need to gather network identity information to do the following tasks:

- Declare the CT system on the network
- Declare the DICOM remote hosts (PACS systems, archival devices, review workstations) on the CT system.
- Declare the DICOM Hospital HIS/RIS Interface devices (Mitra and others) on the CT system.
- Declare the DICOM on the CT System,

Ensure the following network identity information is available:

- From the Hospital Network Administrator:
  - Hostname (No more than 16 Characters).
  - Internet Protocol (IP) Address.
  - Subnet Net Mask IP Address (if applicable).
  - Broadcast Address (if applicable).
  - Network Protocol (DICOM for CT Systems)
- From the Remote Host Device DICOM Conformance Statement Document:
  - DICOM Application Entity Title or AE Title (DICOM service that remote host provides or uses).
  - DICOM Listening Port Number.
- From the HIS/RIS Interface Device DICOM Conformance Statement Document:
  - DICOM Application Entity Title or AE Title (DICOM Service that the HIS/RIS interface provides).
  - DICOM Listening Port Number.
- From the Printer DICOM Conformance Statement Document:
  - DICOM Application Entity Title or AE Title (DICOM service that remote host provides or uses).
  - DICOM Listening Port Number.

1.3 Procedures

1.3.1 Enter Configuration Routine

1.) On the operator's console, open a shell window.

2.) Enter root as a superuser:

At the prompt, type: `su -` ENTER

At the password prompt: type the password; press ENTER

3.) Change directory to scripts.
Type: `cd /user/g/scripts` ENTER at the root prompt.

4.) Launch the Install Utility:
At the prompt, type: `reconfig` ENTER
The OC displays the Install Utility Window as shown in Figure 8-1.

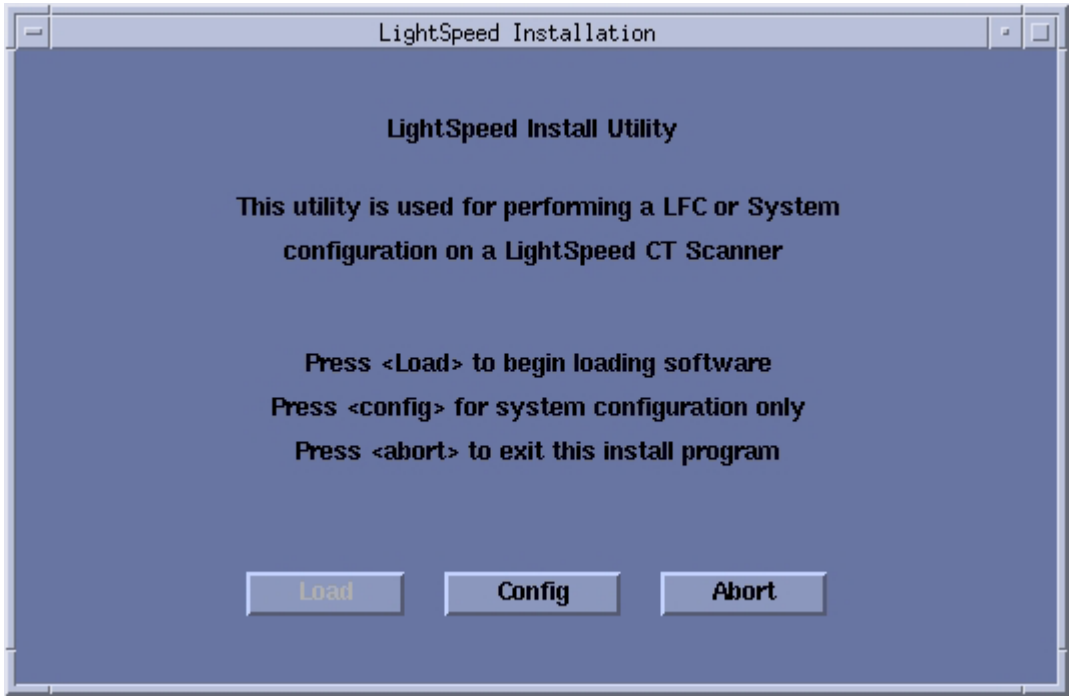


Figure 8-1 Install Utility Window

5.) Enter the Configuration Routine:
Click the CONFIG button.
The OC displays the System Configuration - System Settings screen, as shown in Figure 8-2.

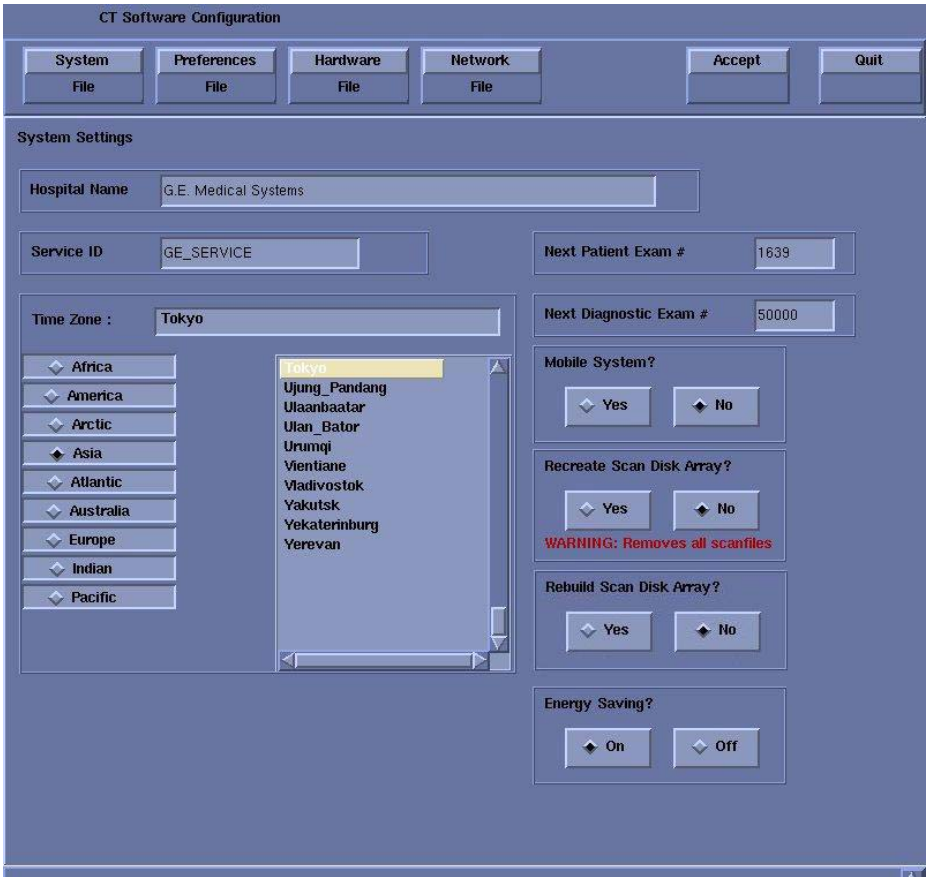


Figure 8-2 System Settings Screen

1.3.2 Configure Network Settings

This screen allows you to declare the CT system on a hospital network. Key information such as Host Name, IP Address, Net Mask (for CT systems on a subnet) must be obtained from the hospital network administrator.

1.) Select the NETWORK button to display the Network Settings screen as shown in Figure 8-3.

Figure 8-3 Networks Settings Screen

2.) Enter the `Suite Name`.

The Suite Name is a means of identifying this particular CT system as a part of a group of CT Systems in a suite configuration. This Suite Name will appear on all image headers.

The Suite Name must start with a letter, followed by three alphanumeric characters (total MUST be four characters long). The name of the OC interface will be *<Suite Name>*`_oc` and the SBC interface will be *<Suite Name>*`_sbc`.

3.) Enter the hospital provided `Host Name`.

The Host Name identifies the network hostname and AE Title of the CT system.

The Host Name:

- **MUST NOT** be *<Suite Name>*`_oc` or *<SUITE NAME>*`_OC`.
- **MUST NOT** exceed 16 Characters.
- **MUST** only contain the following characters: **a** through **z**, **0** through **9**

4.) Enter the hospital provided `IP Address`.

5.) Enter the hospital provided `Net Mask` (if the CT system is on a subnet).

6.) Enter the `Broadcast Address`:

The Broadcast Address should be the same as the IP Address except for the bits of the host id portion (last digit group) set to 1s or 0s depending on the configuration of the network. The standard default is 1s but older SunOS machines used 0s.

Example: If the IP Address is 192.100.9.17, the Broadcast Address should be 192.100.9.255 if the network is configured to use 1's to specify the broadcast address.

If the network contains genesis based scanners or other SunOS 3.5 or 4.1 computers, the Broadcast Address should be 192.100.9.0.

7.) Enter the hospital provided `Default Gateway` IP Address in the `Default Gateway` field (if applicable). If the site network does not use a default gateway, leave the field blank.

8.) Select NIS (Yellow Pages database) `Advanced Option` only if requested by the hospital

network administrator as follows:

a.) Select ADVANCED OPTIONS button on the Network Settings screen.

b.) Select Use NIS? button.

c.) Enter the hospital provided Domain Name.

9.) Record all the Network parameters in the *Software Installation Procedures* Document, or on the worksheet in Appendix F on page 303.

1.3.3 Initiate System Reconfiguration

1.) Select ACCEPT on the System Configuration Screen.

The system loads the application software, OS patches, and kernal changes, and configures the system on both the OC and the SBC.

This loading process takes approximately 15 minutes. While the load is going on, the results are displayed in a Shell window, which closes when the loading process is complete. All the window output is logged to a file named:

`/var/adm/install.log.YYYYMMDDWWWHHMMSS.`

(Where *YYYYMMDDWWWHHMMSS* is the Date/Time that the loading process was started.)

2.) When the loading process and configuration changes are complete, the system displays a prompt to reboot. Click on YES.

3.) The system will automatically login as ctuser after the reboot. Select OK on the Autostart Disabled popup message.

4.) To startup Applications, in the console Shell window, type **`startup`** **ENTER**.

1.3.4 Declaring Remote Hosts on the CT System

1.) On the OC, select the IMAGE WORKS icon.

2.) Select NETWORK.

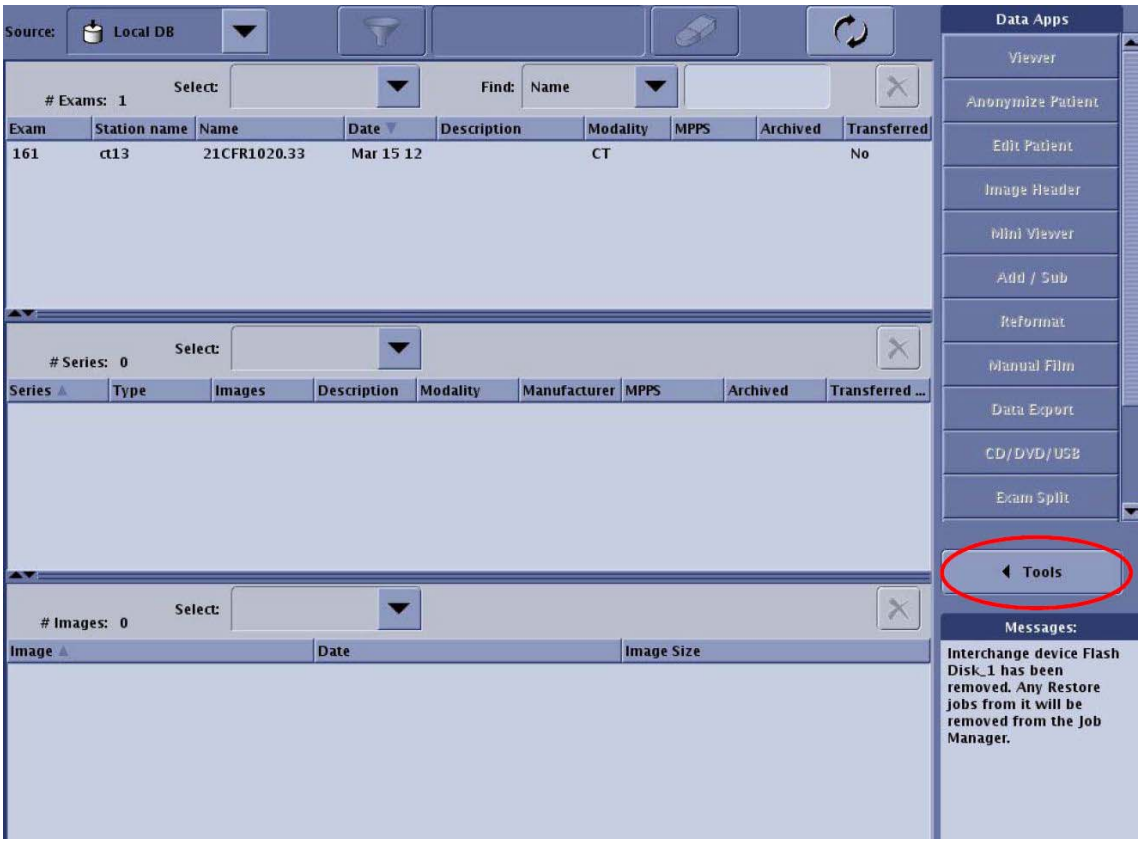
1.3.5 Declaring DICOM Remote Hosts on the Scanner

Enter Remote Host Configuration Screen

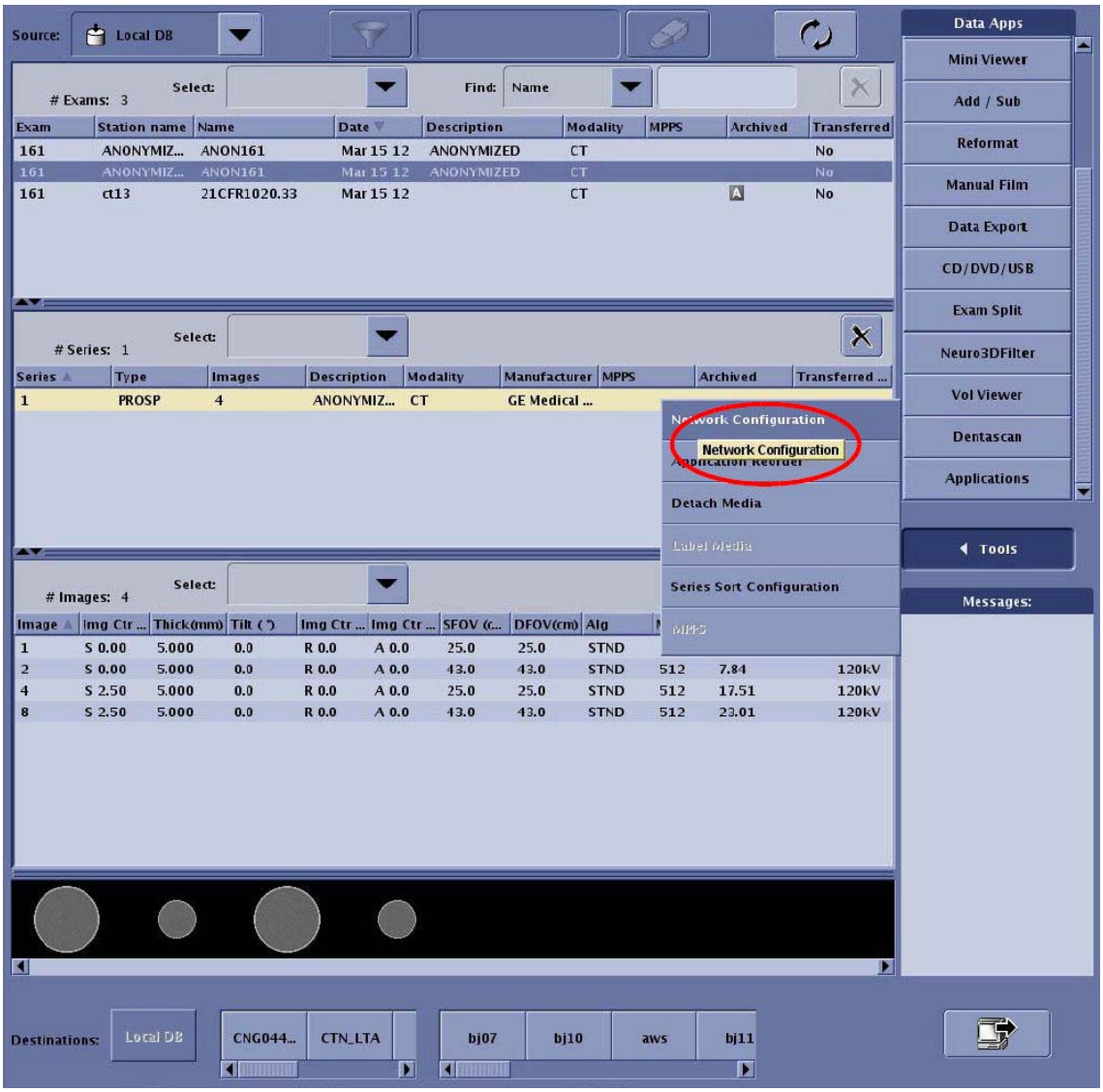
1.) On the OC, select the IMAGE WORKS icon 

.

2.) Select TOOL.



3.) Select NETWORK CONFIGURATION.



4.) Select ADD.


Configured Hosts
Display Name
Host Name
IP Address
Port
AE Title
ct09 ct09 3.36.231.119 4006 ct09
vctcon2 vctcon2 3.57.48.88 4006 vctcon2
bay63 bay63 3.57.254.63 4006 bay63
ctconsole063 ctconsole063 3.57.48.63 4006 ctconsole063
iqtar2 iqtar2 3.36.10.32 4006 iqtar2
iqtar3 iqtar3 3.36.10.33 4006 iqtar3
bj13 bj13 3.36.231.123 4006 bj13
ct11 ct11 3.36.231.121 4006 ct11
AWHinoMK02 AWHinoMK02 3.36.10.77 4006 AWHinoMK02
ct99 ct99 3.36.233.138 4006 ct99
Add
Edit
Ping
Remove
Save As
Default Storage Commit Host
Set As Default
Remote Host Information
Host Name:
Display Name:
IP Address:
Port:
AE Title:
Archive Node Settings
Archive Node
Storage Commitment Host Details
Host Name:
IP Address:
Port:
Services
SCU Settings:
Query/Retrieve
Custom Search
SCP Settings:
Allow Query
Save
Clear

5.) Detail Setting of Remote Host

Repeat the following procedure for each DICOM remote host device that the customer expects to have this CT system communicating with.

a.) Enter the hospital provided `Host name`.

b.) Enter the hospital provided `IP Address`.

c.) Enter the TCP/IP Listening `Port` from the DICOM Conformance Statement provided with the device.

d.) Enter the `AE Title` from the DICOM Conformance Statement provided with the device.

Application Entity Titles (also known as ACR-Nema or Dicom Name) refer to the DICOM Network Services that a device provides to the CT System. For most devices, the AE Title is the same as the hostname (CT systems are equipped with this feature).

However, some devices such as PACS systems may have separate AE Titles and port numbers for each of the services that the PACS system provides. In these cases, you must enter a separate remote host (same hostname and IP Address) for each of the independent AE Title Services that the host provides (one host as an image **push-to** destination, another host as a **query/retrieve** provider, and another host as a **storage/ commitment** provider).

Be sure to review the DICOM Conformance Statement for each device that will provide a remote host network service for the CT system (image **push-to** or store destination, Query/Retrieve, and Storage Commitment) to ensure that each service is correctly configured.

e.) Select the correct `Archive Node` choice for the device. The Archive Node selection defines the ability of the remote host to act as a DICOM Storage/Commitment provider and indicate to the operator that a study/series/image was archived.

* Select `Archive Node` if the device is the hospital designated DICOM Storage/ Commitment Provider. During an Application Study Archive process, the local browser screen will indicate `Archive Status = Y` to the operator.
* Don't select `Archive Node` if the device is not a DICOM Storage/Commitment Provider.

f.) SCU Settings: The following two selections allow you to selectively block the remote host from using the Optima CT660 Series DICOM services as a provider (image push-to destination, and a **Query/Retrieve** provider).

* `Query/Retrieve:` select if the customer wants the remote host to be able to review the image database (query) and **pull** selected images from the database. Don't select if the customer does not want the remote host to have this ability.
* `Custom Search:` This selection allows the CT scanner to selectively search through the remote host's image database when the operator is using remote browser screen to **query** the remote host. The search parameters that the CT system allows the customer to use are: last name contains, patient ID, exam number, accession number, and exam date.
  - Select if the device supports custom searches as part of the devices **Query/ Retrieve** DICOM Provider service.
  - Don't select if the device does not support custom searches.

g.) Select the correct `SCP Settings:`setting.

h.) Select "Default Storage Commit Host". This shall be done to enable "Auto Store" function. If nothing is selected, "Auto Store" becomes dimmed.

i.) Record all the remote host network parameters for each remote host in the *Software Installation Procedures* Document.

j.) Select SAVE to store the parameter settings of the remote host.

1.3.6 Declaring the CT System on Remote Hosts

Refer to the appropriate Service Manual provided with the DICOM protocol device or system to find instructions how to declare the CT System as a DICOM remote host.

The CT System provides two DICOM Services as a provider to remote hosts:

- A remote host can **push** images to the CT image database.
- A remote host can review the CT image database (query) and **pull** selected images (retrieve).

Use the following parameter information to configure the DICOM device/system to either **push** images to the CT scanner and/or perform a **Query/Retrieve** operation:

- `Hostname:` Provided by the Hospital Network Administrator. Exactly the same scanner assigned hostname entered in Network Configuration Screen.
- `Application Entity Title:` Exactly the same entry as the Hostname.
- `Network Address:` Provided by the Hospital Network Administrator. Exactly the same scanner assigned IP Address entered in Network Configuration Screen.
- `Network Protocol:` DICOM 3.0.
- `Port Number:` For all DICOM service that the CT System provides, use 4006.
- `Provider Type:` This field concerns the LightSpeed DICOM **Query/Retrieve** provider capability. All CT systems are wtudy root systems, which allow queries at the exam, series, and image level.
- `Support Worklist:` This field concerns whether a DICOM **Query/Retrieve** provider capable device or system supports a filter search of the image database. All CT systems support a filtered search of the image database as part of the LightSpeed DICOM **Query/Retrieve** provider capability.

Section 2.0 DICOM HIS/RIS Setup

2.1 Prerequisites

Most hospital HIS/RIS systems are not DICOM compatible and require a DICOM HIS/RIS Worklist Interface to provide patient scheduling information to the CT system. Contact your local HNS support engineer to determine exactly what DICOM HIS/RIS Interface is appropriate for the customer.

In addition, the CT system must have the ConnectPRO software option installed to utilize the DICOM Protocol Worklist capability.

2.2 Loading ConnectPRO Software Option on the CT System

Load and Configure the ConnectPro software option on the CT system according to "*ConnectPro Software Option Install and Checkout*" procedure in Service Methods -> Installation -> Option.

2.3 Troubleshooting Tips

The following is a summary of troubleshooting information for DICOM print that was gathered during software testing and validation of the DICOM print feature.

There is also a significant amount of additional troubleshooting procedures, and the theory of the DICOM print feature in the System Service Manual. Should you have problems installing a DICOM print camera, first read the information in System Service Manual.

ERROR BRINGING UP THE CAMERA INSTALLATION/FILMING APPLICATION

- **Symptom**: After creating/modifying the DICOM print camera the install camera interface does not come up and the filming application indicates it cannot bring up the film composer.

  Cause: The configuration field contains invalid information such as a backslash (\) as the final character in the field or brackets ({}).
- **Solution**: The camera.dev file in `~ctuser/app-defaults/devices` must be manually edited to remove the offending characters in the set configuration line. Invalid characters include `\{}`

CONFIGURATION INFORMATION FIELD

- **Symptom**: Cannot view the entire configuration field (> 25 characters)
- **Solution**: Hold down the middle mouse button and move the field contents

NEED TO SET DICOM PRINT ATTRIBUTES NOT SUPPORTED BY SOFTWARE

- **Symptom**: User wants the white border around each image box ON/OFF permanently for this system and it cannot be set as the default for the camera.
- **Solution**: Using your favorite editor, add the following line to the camera.dev file located in `~ctuser/app-defaults/devices` after the DICOM print device has been otherwise configured.

  For Trim Off - set `TRIM NO`

  For Trim On - set `TRIM YES`
- **Symptom**: DICOM print camera supports multiple film sizes and the user only wants to print if the film size is correct for LightSpeed 7.X (14x17). [Otherwise the camera will queue the films or return an error causing the queue to pause (based upon the DICOM print camera specifications).]
- **Solution**: Using your favorite editor, add the following line to the camera.dev file located in `~ctuser/app-defaults/devices` after the DICOM print device has been otherwise configured.

  To force a 14x17 film size - set `filmSize 14INX17IN`

NEED TO PREVENT DICOM PRINT ATTRIBUTES FROM BEING SENT TO DICOM PRINT CAMERA

- **Symptom**: Some DICOM print attributes are optional, and may result in fatal errors. For example, the Fuji camera does not support the Empty Image Density parameter for the film box.
- **Solution**: Using your favorite editor, add the following line(s) to the camera.dev file located in `~ctuser/app-defaults/devices` after the DICOM print device has been otherwise configured.
  - To prevent sending the Smoothing Parameter set `FB_Smooth FALSE`
  - To prevent sending the Border Density set `FB_Border FALSE`
  - To prevent sending the Empty Image Density set `FB_EID FALSE`
  - To prevent sending the Minimum Density set `FB_MinD FALSE`
  - To prevent sending the Trim Parameter set `FB_Trim FALSE`

ERROR TRYING TO CONNECT TO THE DICOM PRINT CAMERA

- **Symptom**: DICOM print server can be reached (ping), but Application error indicates `"Unable to start filming interface"` and the help message talks about running the install.dasm (Association Error)
- **Solution**: The system is unable to complete the association. Check the `AE Title` and the `Port number` of the DICOM print server and correct them through the Install Camera procedure.

FILM COMPOSER ERROR NOT USABLE

- **Symptom**: Film composer error says "`unrecognized status - code 0`"
- **Solution**: Review the log file, the attention and status windows. These areas have the correct filming status (for example, **film jam** and **supply empty**).

DEBUGGING CONNECTION ISSUES DIFFICULT

- **Symptom**: The timeouts for the DICOM print are very long, which means one needs to wait a long time before you know the application is not working.
- **Solution**: The timeouts for the DICOM print were setup to ensure that the system would work regardless of whether the DICOM print camera was on a LAN or a WAN halfway around the world. The DICOM print timeouts for the association and DIMSE classes (for example, **N-GET**, **N-DELETE**) can be modified within the DICOM print camera installation. They can be reduced down to 90 seconds.

DICOM PRINT ERROR ON N-GET TIMEOUT CONFUSING

- **Symptom**: When the N-GET timeout goes off, the error message in the prslog file will be "`Could not get printer status, invalid command sequence for N-GET`".
- **Solution**: When the user sees the above error they may want to consider that the issue may be an inactivity timer on the N-GET DIMSE service.

DICOM PRINT CAMERA SLIDE SUPPORT

- **Symptom**: Current implementation of DICOM print does not allow selection of slide format.
- **Solution**: Feature not currently supported. Possibly in future releases.

CONFUSION ON FILM FORMAT NOTATION

- **Symptom**: GE Healthcare Laser Camera and DICOM Print film format notations are opposite.
- **Solution**:
  - GE Healthcare Laser Camera film format notation has always been row x col (for example, 12 on 1 = 4x3)
  - DICOM Print Standard film format notation is col x row (for example, 12 on 1 = 3x4)

Section 3.0 Network Connections

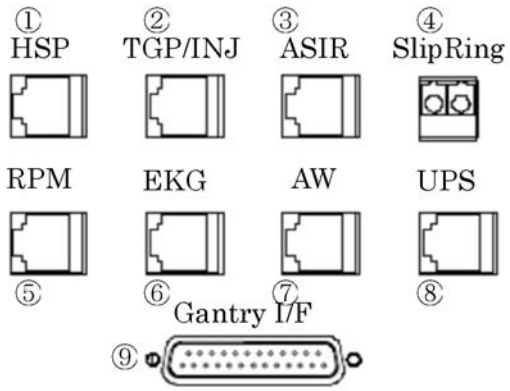
BROAD-BAND

Broadband is considered the standard network connection for Optima CT660.

Broadband connections should use the appropriate ethernet cables for these connections.

The CT system is connected to the network through the Console.

- An ethernet cable (not to exceed 10 feet) should be provided by the customer, and it is used to connect the console to a wall box. Use of STP (Shielded Twisted Pair) cable is not allowed.
- Some customer-site units may require cable duct-work or conduit to route connecting network cables to the workstation, camera and console.
- The run from the hospital switch to the CT wall outlet must not exceed 290 ft. (88m). Bandwidth performance is degraded when the length reaches 300 ft. (91m) or greater.



1.) Hospital Network
2.) RUN #102 TGP LAN
3.) ASIR (not used)
4.) RUN #103 DAS Data
5.) RPM (Option)
6.) EKG (Option)
7.) AW (Option)
8.) UPS (not used)
9.) RUN #101 Scan INTL (Interlock)

Figure 8-4 Console Rear Bulkhead

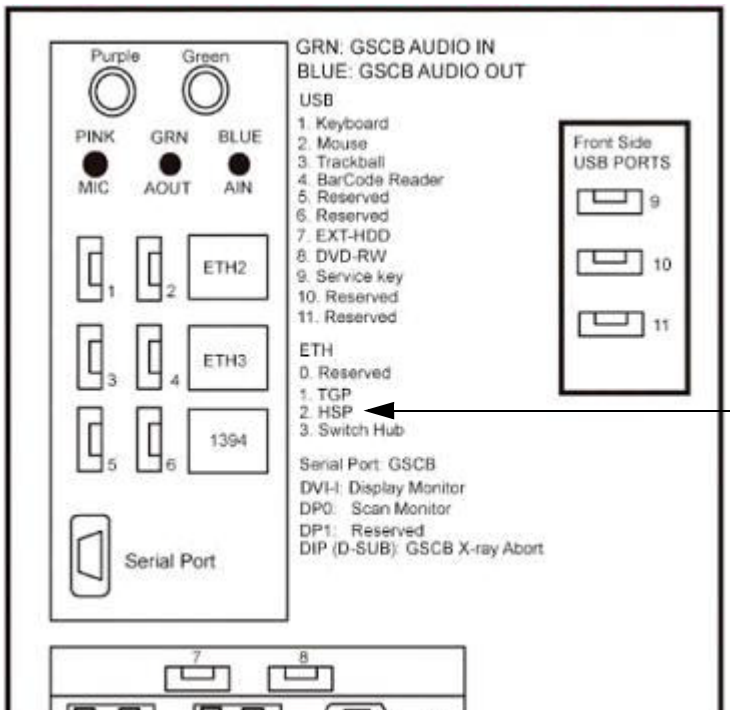


Figure 8-5 NIO64 Hospital Network

US PROCESS OVERVIEW

The United States network connectivity requirement for this product is broad-band. The US process relies on the Install Specialist to select a Customer Champion and identify an IT contact for the site. Together, those individuals then complete a site assessment to gauge what tasks are needed to fulfill the connection.

Anyone can contact the GE Connectivity team at 800.321.7937, Option #3, with questions.

CUSTOMER BROADBAND RESPONSIBILITIES

Provide GE Healthcare Installation Specialist with an accurate site address, telephone number, contact name, and e-mail address for the:

- Customer Champion
  - Coordinate VPN activities between Radiology/Cardiology and the Information Technology (IT) departments
  - Act as a focal point in assuring site broadband infrastructure meets GE Healthcare requirements for connection as determined by a mutual assessment with the GE Healthcare Connectivity team.
- IT Contact
  - Complete an equipment assessment with GE Healthcare Connectivity team to determine site readiness for broadband
  - Work with the Customer Champion to complete any identified infrastructure changes
  - Provide IP addresses for new CT equipment
  - Provide a VPN compatible appliance that will support the IPSec tunneling protocol and 3DES data encryption
  - To utilize an Internet Service Provider that supports static routing

Section 4.0 Special operation about Smart Step/Smart View option installation (Cj M40 only)

If no camera setting was existed, dummy camera setting shall be set in order to prevent multiple message pop-up (no printer installed). Execute the following procedure.

1.) If any DICOM camera or Postscript printer will be connected to this system, no action is required. Proceed to next step.

2.) If DICOM camera or Postscript printer is not planned to be connected to this system, configure a dummy camera settings in *Common Service Desktop* → *Configuration* → *Install Camera*.

Select ***Other DICOM Protocol Camera*** in Camera selection screen (Figure 8-6) and enter dummy information as shown in Figure 8-7.

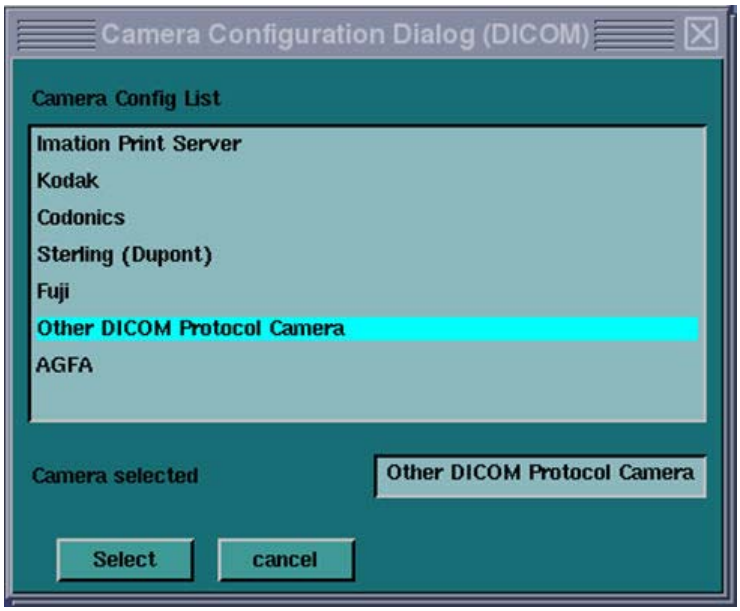


Figure 8-6 Camera selection screen

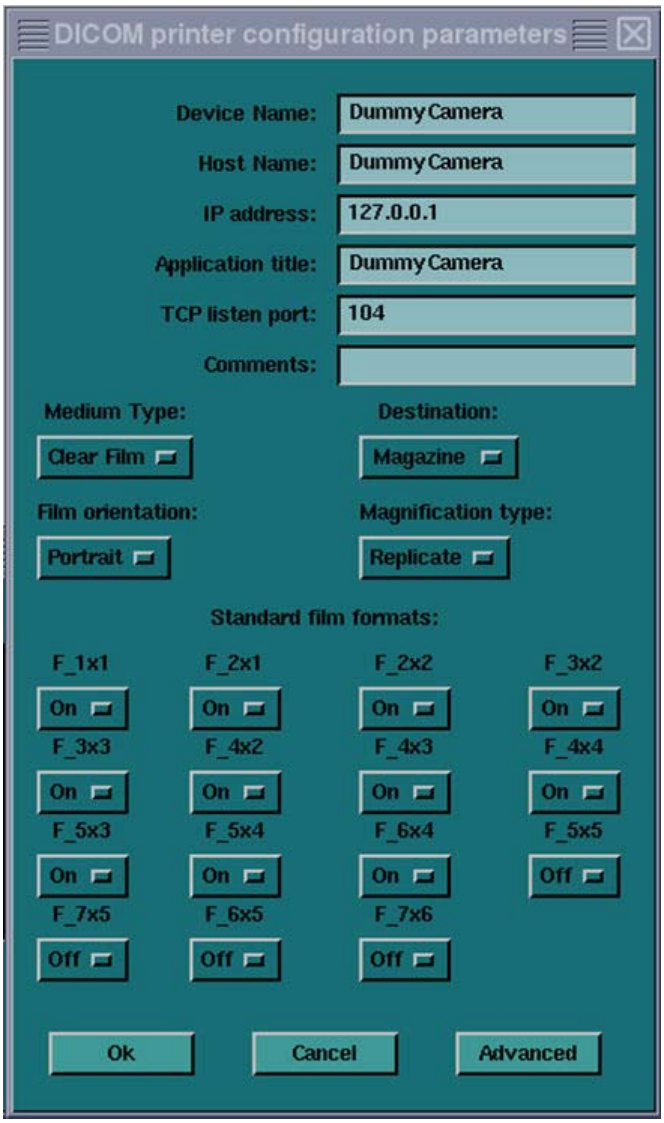


Figure 8-7 DICOM Camera Dummy Information

Section 5.0 Special operation about DentaScan option installation (Cj M40 only)

In the Russian language was set, it shall be changed to English when DentaScan option is installed.

Procedure:

1.) Change the language setting to English. Then reboot the system.
2.) Install DentaScan option from option install menu.
3.) Return the language setting to original one. Then reboot the system.
4.) Execute "install.camera" command to start set up procedure.

This must be done at LFC or Restore State operation with DentaScan option.

LFC:

After application DVD is set, reconfig. is requested after INFO file loading from System State. Change the language setting to English, execute LFC procedure. The setting is automatically returns to Russian after final Restore State.

Restore State:

When Restore State is done with All or Option is selected, language setting must be English.

Section 6.0 Flat Tabletop Installation

1.) Install the Flat Tabletop according to the Installation and Setup Manual shipped with the option.
2.) Perform Gantry Rotation Characterization procedure.
(The procedure can be found in Service Methods CD under the chapter entitled *Align, Setup, Calibration > Gantry*.)
3.) Perform the following system checks according to "Technical Reference Manual Addendum for providing Radiotherapy Treatment Planning" which is shipped with system.
- Alignment of the PATIENT SUPPORT in the vertical plane (tilt)
- Alignment of the PATIENT SUPPORT in the horizontal plane
- The difference between the center of the top of the PATIENT SUPPORT and the sagittal light marker
- Gantry tilt
- Angular alignment of CT images
- Accuracy of image z-position for helical scans

4.) If ant test fails, check and perform the following adjustment.
- Failure of Alignment of the PATIENT SUPPORT in the vertical plane (tilt)
  * Check the installation of the flat tabletop to the table according to the Installation and Setup Manual shipped with the option.
  * Check the level of the table level according to the "*Level and Center the Table to the Gantry*" procedure in chapter 1 of this manual.

- Failure of Alignment of the PATIENT SUPPORT in the horizontal plane
  * Check the installation of the flat tabletop to the table according to the Installation and Setup Manual shipped with the option.
  * Check the horizontal alignment of the table according to the "*Level and Center the Table to the Gantry*" procedure in chapter 1 of this manual.
- Failure of The difference between the center of the top of the PATIENT SUPPORT and the sagittal light marker
  * Check the accuracy of the external laser light.
  * Check the horizontal position of the flat tabletop to the table according to the Installation and Setup Manual shipped with the option.
  * Check the horizontal alignment of the table according to the "*Level and Center the Table to the Gantry*" procedure in chapter 1 of this manual.
- Failure of Gantry tilt
  * Check the level of the gantry according to "Level the Gantry" procedure in chapter 1 of this manual.
  * Check the Tilt characterization according to "Gantry Tilt Pot Adjustment" procedure in Service Methods CDROM.
- Failure of Angular alignment of CT images
  * Check the Gantry Rotation Characterization according to the procedure in Service Methods CDROM.
- Failure of Accuracy of image z-position for helical scans
  * Check the installation of the flat tabletop to the table according to the Installation and Setup Manual shipped with the option.
  * Check the level of the table level according to the "*Level and Center the Table to the Gantry*" procedure in chapter 1 of this manual.
  * Check the horizontal alignment of the table according to the "*Level and Center the Table to the Gantry*" procedure in chapter 1 of this manual.
  * Check the level of the gantry according to "Level the Gantry" procedure in chapter 1 of this manual.
  * Check the Tilt characterization according to "Gantry Tilt Pot Adjustment" procedure in Service Methods CDROM.

Chapter 9
System-Level Safety Tests

You must complete these tests after all options are installed. They cover three safety and leakage current checks:

- Patient Touch Current Test (completed after installation)
- System Ground Resistance Measurement (completed during installation)
- Ground Current Typical (completed after installation - optional)

Refer to the Optima CT660 Service Methods CD to locate the latest Enclosure Leakage (Patient Touch) and System Chassis Leakage Tests under the Functional Checks chapter.

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Chapter 10
Product Registration

Field Engineers must complete and submit the documents listed for ALL installations, regardless of the country. In addition, for installations performed within the United States, Field Engineers must ALSO complete and submit the documents listed in Section 2.0.

Section 1.0 GE Form e-4879 (All Countries)

The Field Engineer should:

1.) Use the e-4879 form.
2.) Complete the form.
3.) E-mail the completed form to the HHS Administrator- Sendhhs@ge.com.

Section 2.0 U.S. Installations Only

The Field Engineer should:

1.) Access information regarding FDA Form 2579 from the USA Imaging Field Service Quality Support Central Web site.
2.) Complete the form.
3.) E-mail the completed form to the HHS Administrator- Sendhhs@ge.com.

Note: Do NOT print this form after completion. The HHS Administrator will e-mail a printable version to the FE for customer site records.

Note: Some states require a State Registration Number to complete this form. For any questions concerning your state, contact the HHS Administrator or check the HHS Support Central Website.

Some states may also require additional information and test information. For instructions, contact the Project Manager of Installation.

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Appendix F
System Configuration Data Sheets

Section 1.0 Requirements

Record valuable system information in the data sheets that follow. Consult with your customer or network administrator to obtain the information. Understanding how the customer plans to use their CT scanner and their network and filming expectation reduces the time required to reconfigure the system.

Section 2.0 Manual Film Composer Options

MANUAL FILM COMPOSER OPTIONS	
Slide Format (if available):	
Greyscale:	
Auto Printing:	
Auto Clear Page:	
Icon Labels:	
Expose Order:	
No. of Copies:	

Table F-1 Manual Film Composer Options

Section 3.0 System Network Configuration

SYSTEM NETWORK CONFIGURATION			
	FIELD NAME:	**SETENV NAME:**	**FIELD VALUE:**
System Settings:	Service ID	SERVICE_ID	
	Hospital Name	HOSPITAL_NAME	
	Exam Number *	* Ask customer or check log	
	DAS Type	DASTYPE	
	PDU Type	PDUTYPE	
Network Settings:	Gateway Host Name	GATEWAY_HOSTNAME	
	Gateway IP	GATEWAY_IP	
	Gateway Net Mask	GATEWAY_NETMASK	
	Gateway Broadcast Mask	GATEWAY_BROADCAST	
	Suite Name	SUITEID	
Option	Network Printer IP Address		
Option	HIS Server IP Address		
Option	HIS Server AE Title		
Option	HIS server AE Port		
Option	CT Server AE Title		
Option	Connect Pro IP Address		

Table F-2 System Network Configuration

HOST ETHERNET ADDRESS

_____:_____:_____:_____:_____:_____

Section 4.0 Network Application (Image Transfer) Configuration

Record the network application (image transfer) configuration.

NETWORKING APPLICATION (IMAGE TRANSFER) CONFIGURATION				
AE TITLE OR HOST NAME	**NETWORK ADDRESS**	**NETWORK PROTOCOL**	**PORT NUMBER**	**COMMENTS**

Table F-3 Networking Application (Image transfer) Configuration

Section 5.0 Camera Application Configuration

Record the camera application configuration for the DASM or DICOM print camera.

DASM LASER CAMERA CONFIGURATION	
Camera Type:	
DASM Type:	
Film Smooth/Sharp Setting:	
Options:	
Valid Film Formats:	
Default Film Formats:	

Table F-4 DASM Laser Camera Configuration

DICOM PRINT CAMERA CONFIGURATION	
Camera Type:	
Host Name:	
IP Address:	
AE Title:	
TCP/IP Listen Port:	
Comments (Optional):	
Valid Film Formats:	
Default Film Formats:	
Destination:	
Orientation:	
Medium Type:	
Magnification Type:	

Table F-5 DICOM Print Camera Configuration

DICOM PRINT CAMERA ADVANCED CONFIGURATION	
Smoothing Type:	
Configuration:	
Minimum Density:	
Maximum Density:	
Empty Density:	
Border Density:	
Association Timeout:	
Session Timeout:	
N-Set Timeout:	
N-Action Timeout:	
N-Create Timeout:	
N-Delete Timeout:	
N-Get Timeout:	

Table F-6 DICOM Print Camera Advanced Configuration

Appendix G
Symbols

Section 1.0 Symbols

SYMBOL	PUBLICATION	DESCRIPTION
	417-5032	Alternating Current
	335-1	Three-phase Alternating Current
	335-1	Three-phase Alternating Current with neutral conductor
		Direct Current
	417-5019	Protective Earth (Ground)
	348	Attention, consult ACCOMPANYING DOCUMENTS (For IEC 60601-1 2nd Edition)
		General Warning Symbol
	7010-M002	Attention, consult ACCOMPANYING DOCUMENTS (For IEC 60601-1 3rd Edition)
	417-5008	OFF (Power: disconnection from the mains)
	417-5007	ON (Power: connection to the mains)
		Input Power

Table G-1 Symbols

SYMBOL	PUBLICATION	DESCRIPTION
		Output Power
		Functional Earth Ground
		Warning, HIGH VOLTAGE
		Emergency Stop (For IEC 60601-1 2nd Edition)
		Emergency Stop (For IEC 60601-1 3rd Edition)
		Type B
	417-5339	X-ray Source Assembly Emitting
	417-5009	Standby
		Start
		Table Set

Table G-1 Symbols

SYMBOL	PUBLICATION	DESCRIPTION
		Abort
		Intercom
		(on Operator Console) Power On: light on Standby: light off

Table G-1 Symbols

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GE Medical Systems, a General Electric Company, going to market as GE Healthcare.
3000 N. Grandview Boulevard
Waukesha, Wisconsin 53188
USA

www.gehealthcare.com