



Technical Publications

**Direction 5304351-1EN
Rev.2**



Discovery NM/CT 570c Hybrid Imaging System Pre-Installation Manual

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ESTE MANUAL DE SERVIÇO SÓ É DISPONÍVEL EM INGLÊS. CASO O PROVEDOR DE SERVIÇOS DO USUÁRIO NECESSITE DE UMA TRADUÇÃO, ESTA É DE RESPONSABILIDADE DO CLIENTE.

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Revision History

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Chapter 1 – Introduction to Pre-Installation

1.1 Overview

1.1.1 The Hybrid System

The Hybrid system is combined Discovery NM 530c (referred to in this manual as the **NM** system), and a VCT LightSpeed 7.X (referred to in this manual as the **VCT** system).

The Hybrid combination will be referred to as the **NM/VCT** system.

The purpose of this manual is to simplify the site preparation process and to provide the purchaser (or the purchaser's contractor) with the information necessary to prepare the site for the installation of the Discovery NM 530c/VCT LightSpeed 7.X Hybrid system.

The official name of the system is **Discovery NM/CT 570c**

Important

This manual must be used together with the VCT LightSpeed 7.X Pre-installation manual to prepare the room lay out and infrastructure for the NM-CT Hybrid System

The following information is also essential to the architects, construction engineers, electrical contractors, and all other personnel involved in the site preparation process:

- Planning the site
- Ensuring adequate accessibility to the site
- Physical layout

- Providing construction, mechanical, electrical and environmental specifications
- Cables routing
- Connectivity
- Time Schedule
- Site Safety

Important

Good site preparation is essential for a smooth and efficient installation.
Poor site planning may compromise usability and/or patient comfort.

1.2 Overview of the NM-CT Hybrid System

The purpose of this section is to outline the site preparation process and to provide the purchaser (or the purchaser's contractor) and the PMI with the information necessary to prepare the site for the installation of the NM/CT hybrid system

It is important that the information contained in this manual is used in conjunction with the drawings prepared specifically for each site.

Important

This section contains important information which must be read and taken into consideration before pre-installation planning begins

The VCT LightSpeed 7.X system must be installed before the Infinia II with Hawkeye Option System

When installing the NM/CT Hybrid system, be aware of the following changes

1. The Room size and free-space areas change.
See [Section 1.1 – Room Sizes for NM/CT Hybrid System on page 1-6](#)
2. The Control room size change
See [Section 1.1 – Room Sizes for NM/CT Hybrid System on page 1-6](#)
3. The VCT LightSpeed 7.X will always be installed with the GT 2000 mm Table
4. No Table is installed with the NM system - The CT Table is used
5. The NM Console cart is not available with the Hybrid System
6. NM Acquisition Station, and the Workstation are located in the Control Room

These changes are clearly explained in [Section 1.1– Room Sizes for NM/CT Hybrid System](#)

1.0.1 How the Hybrid System Works

The combination of structural clinical information obtained from a CT scanner with functional information obtained from a gamma camera or a PET scanner via acquisition on hybrid scanners (like Infinia Hawkeye or Discovery LS) is already considered a common technological and clinical fact.

The combination of the VCT LightSpeed 7.X and Infinia II with Hawkeye Option system creates the means to provide a complex clinical assessment, including top-quality anatomical and functional elements as well as a convenient exam flow

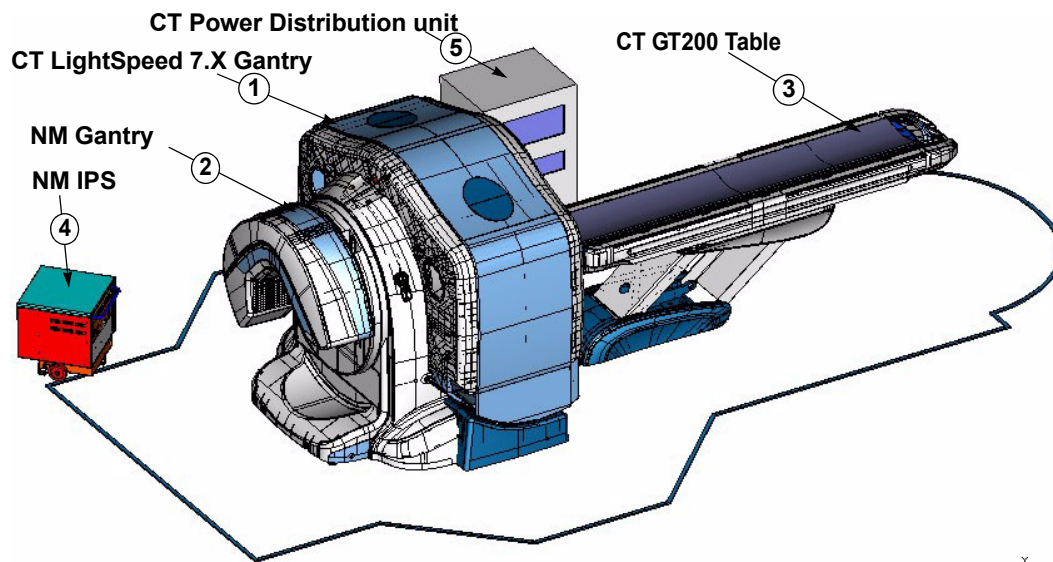


Figure 1-1 NM/CT Hybrid system

1.0.2 NM/CT Key Features

- Designed to be easily integrated into the hybrid SPECT/CT system, using LightSpeed VCT 64
- VCT LightSpeed 7.X GT200 Table is also used for NM scans
- Possibility to use each modality component (NM or CT) independently for scans.
- System ensures automatic correlation between CT reference point and NM field-of-view.
- Hybrid protocols, having a SPECT component and a CT component, can be defined and maintained by the user
- The hybrid scan results intergrate into the same study, when transferred to a workstation (Xeleris or AW).
- SPECT processing is supported by Xeleris, CT study processing by AW
- Functional-structural fusion can be achieved on Xeleris (via EmoryToolBox) or on AW (via CardIQFusion)

1.1 Room Sizes for NM/CT Hybrid System

1.1.1 Recommended Room Size - Operational Configuration

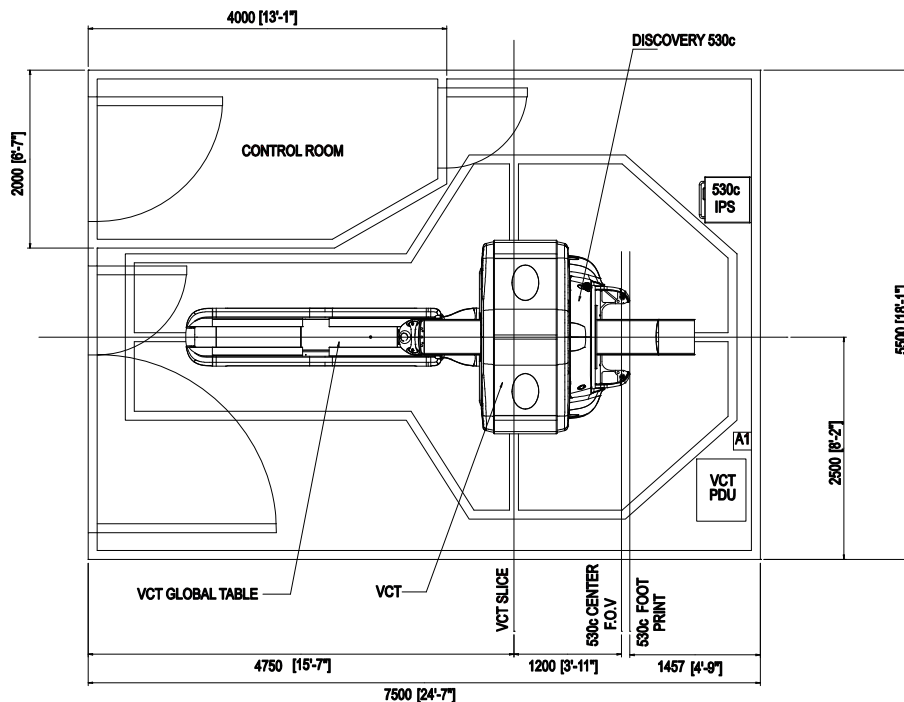


Figure 1-2 Recommended NM/CT Room Size - Operational Configuration

1.1.2 Recommended Room Size - Service Configuration

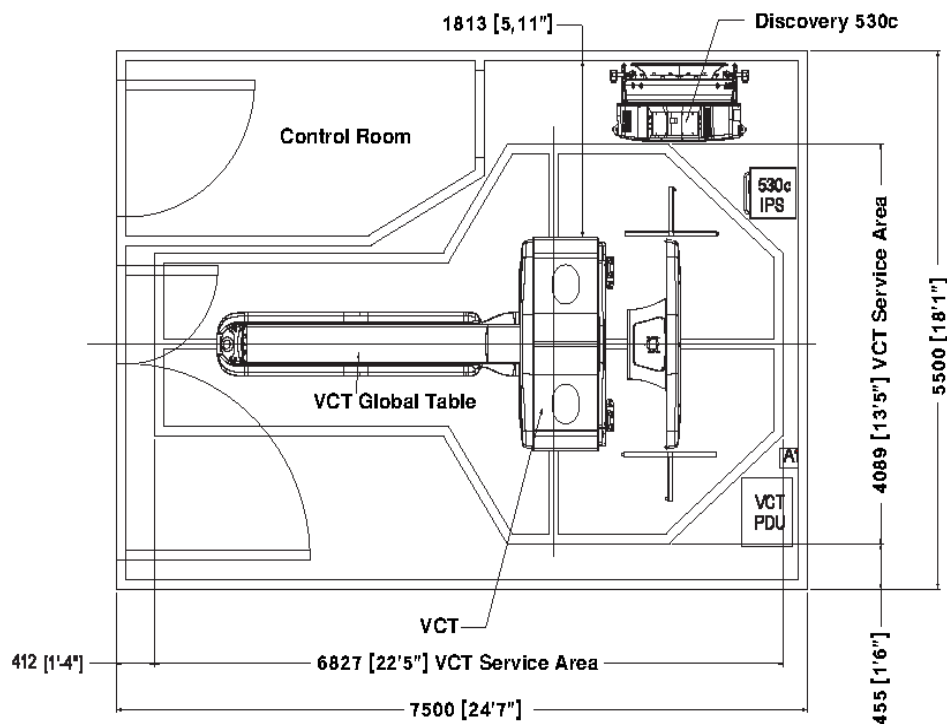


Figure 1-3 Recommended NM/CT Room Size - Service Configuration

1.1.3 Minimum Room Size - Operational Configuration

In this configuration, service, egress, and work-space (1) are compromised around the gantry's left side. See [Figure 1-4](#)

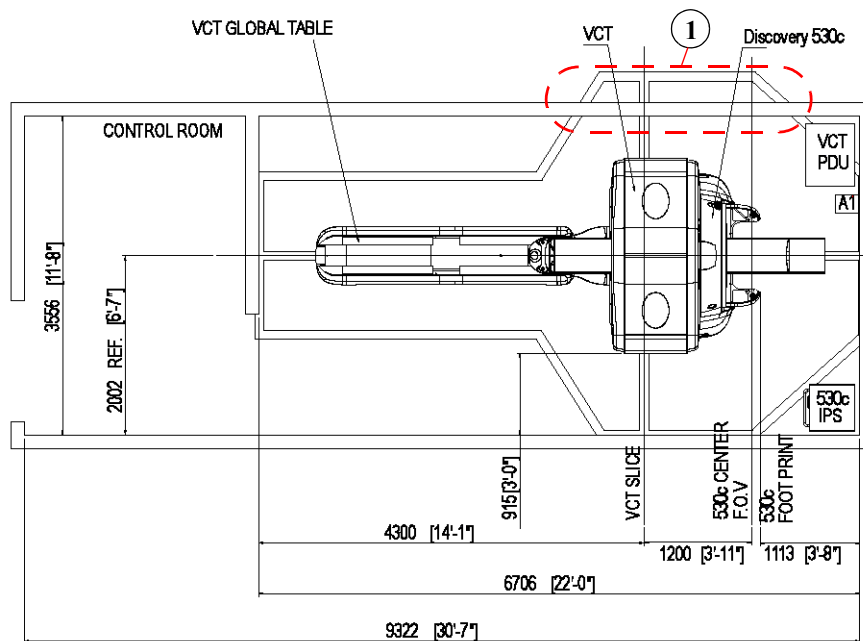


Figure 1-4 Minimum NM/CT Room Size - Operational Configuration

Minimum Room Size - Service Configuration

In this configuration, service, egress, and work-space (1) are compromised around the gantry's left side. See [Figure 1-5](#)

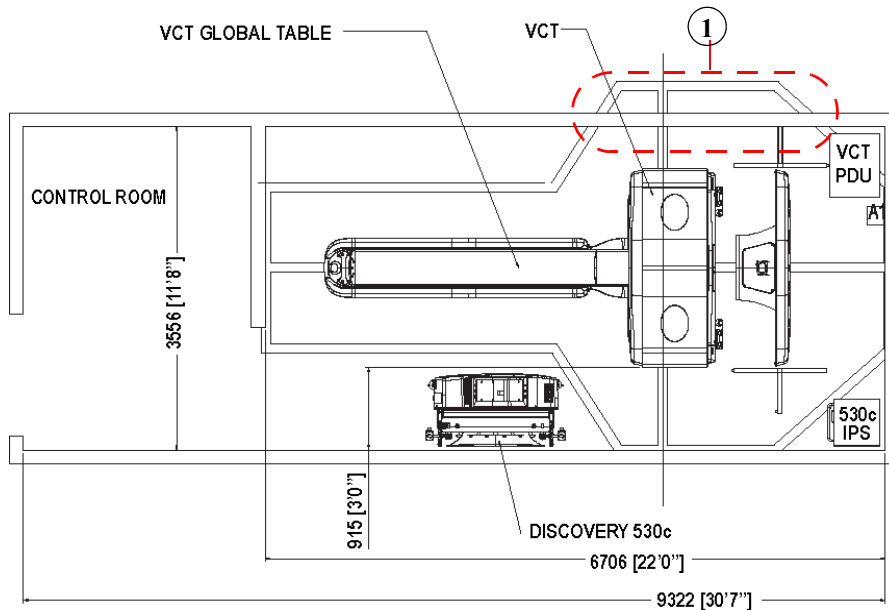


Figure 1-5 Minimum NM/CT Room Size - Service Configuration

1.1.4 System Input Power

1.1.4.1 Power Source Requirements and Configuration

The LightSpeed 7.X CT Scanner is designed to operate on a three-phase, four-wire Wye power source.

A solidly grounded Wye source is preferred. A neutral wire must be run to the system, for the NM system.

A dedicated feeder from the nearest Main Distribution Panel (MDP) should supply power to the scanner. In accordance with the National Electric Code (U.S.), and similar applicable national and local codes, a protective disconnect device must be provided in the power line supplying the PDU. It must be located within 10 m (32 ft.) of the PDU, visible to PDU service personnel, and must have lockout /tagout provisions. This disconnect device is identified as "A1" in the interconnection schematic diagrams.

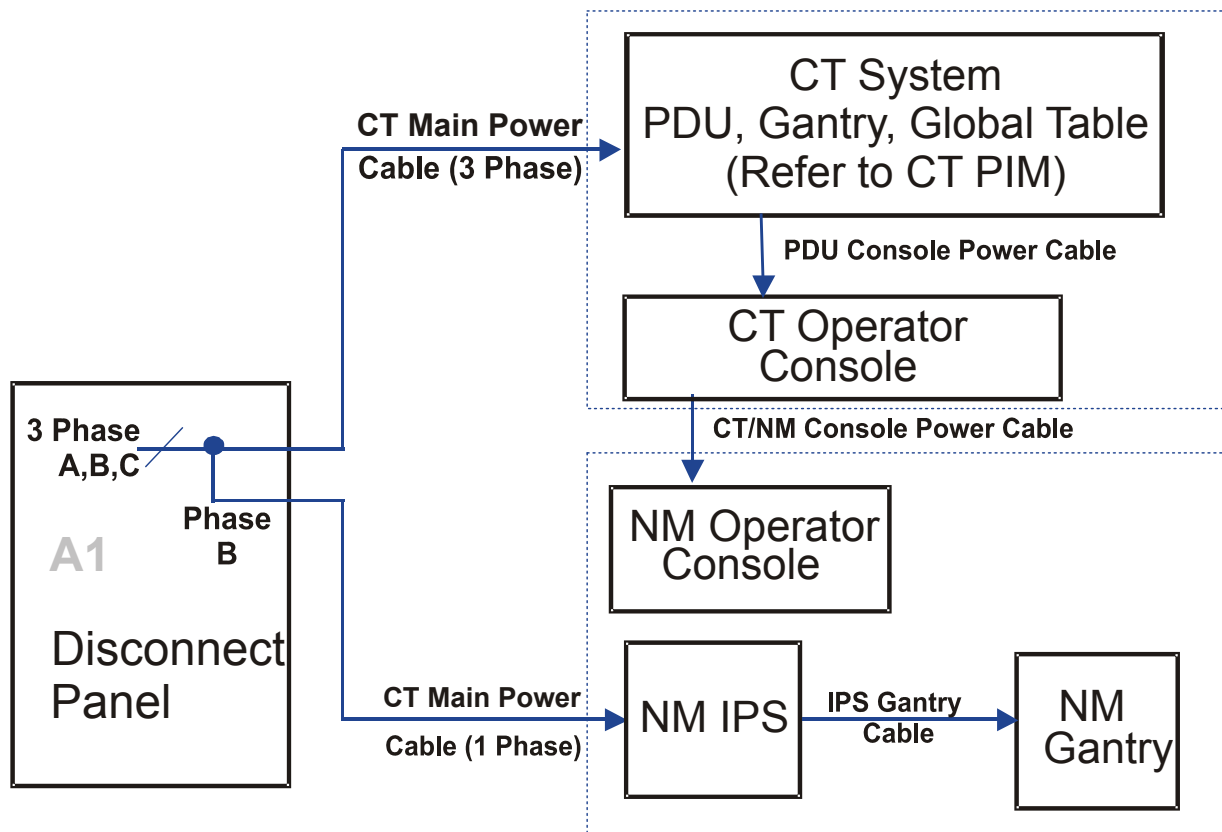


Figure 1-6 Block Diagram of Power Cable Connections

1.1.5 Recommended Power Distribution System

A dedicated feeder run from the facility main isolation transformer is recommended to power the LightSpeed 7.X CT scanner. If the scanner must be powered from an existing distribution transformer and secondary feeder, such as the equipment distribution panel of an X-ray department, installation with other X-Ray equipment that use rapid film changers should be avoided. These changers use a large number of high powered, closely-spaced exposures, which may coincide with the CT scan and produce image artifacts.

If a dedicated distribution transformer is provided for the scanner, the minimum recommended transformer size is 225 kVA, rated 2.4% regulation at unity power factor. For this configuration, the minimum recommended feeder size and overcurrent protection device based on line voltage is shown in 10-2 Minimum Feeder Wire Size.

In all cases, qualified personnel must verify that the transformer and feeder, at point of take-off, plus the run to the LightSpeed 7.X CT scanner, meet all the requirements stated in this document.

1.1.6 System Characteristics:

- Maximum power demand = 150kVA @ 0.85 PF: at a Selected Technique of 140 kV, 715 mA.
- • Continuous (average) power demand at maximum duty cycle = 25kVA. 27kVA
- Maximum allowable total source regulation is 6%.
- Minimum recommended transformer size: 225 kVA, with 2.4% rated regulation at unity power factor. Resultant maximum allowable feeder regulation is 3.4%.

(A1) Main Disconnect and UPS Control Panel

2391993 (125A) / 2391993-2 (150A)
2391993-3 (90A) / 2391993-4 (110A)

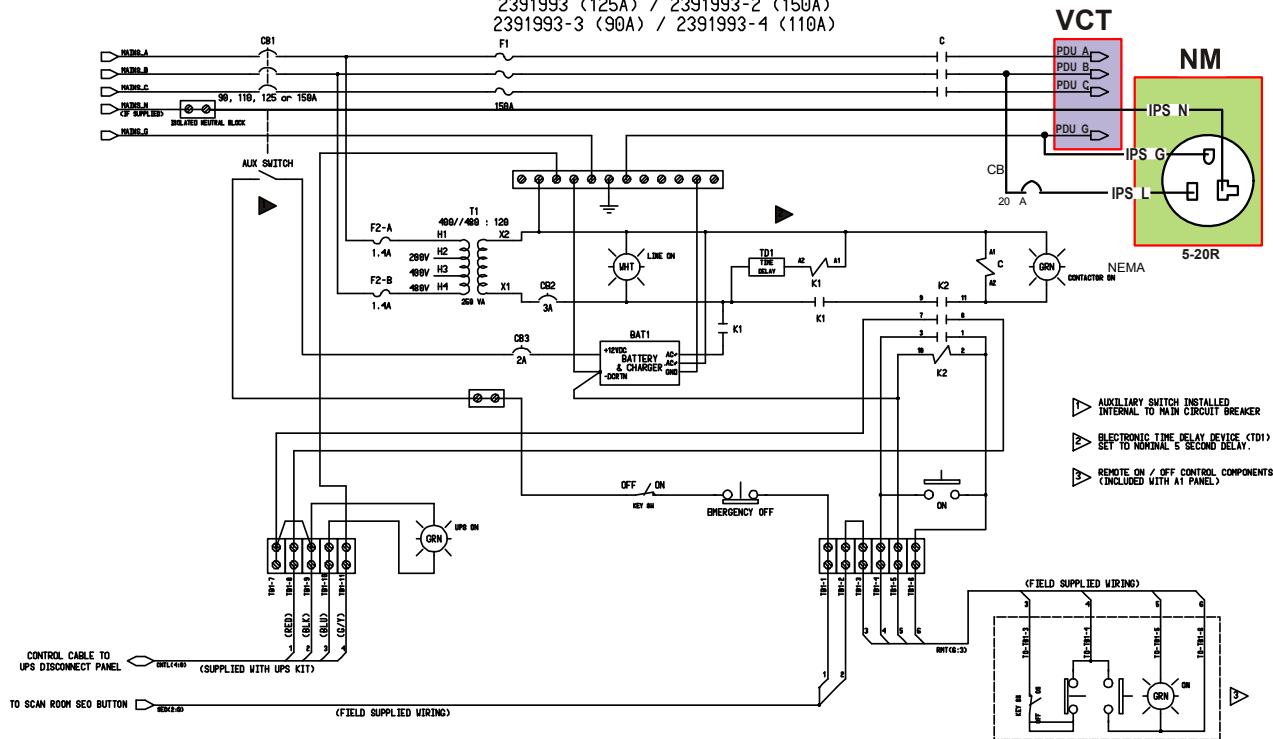


Figure 1-7 Primary Power Disconnect

1.1.7 System Grounding Distribution

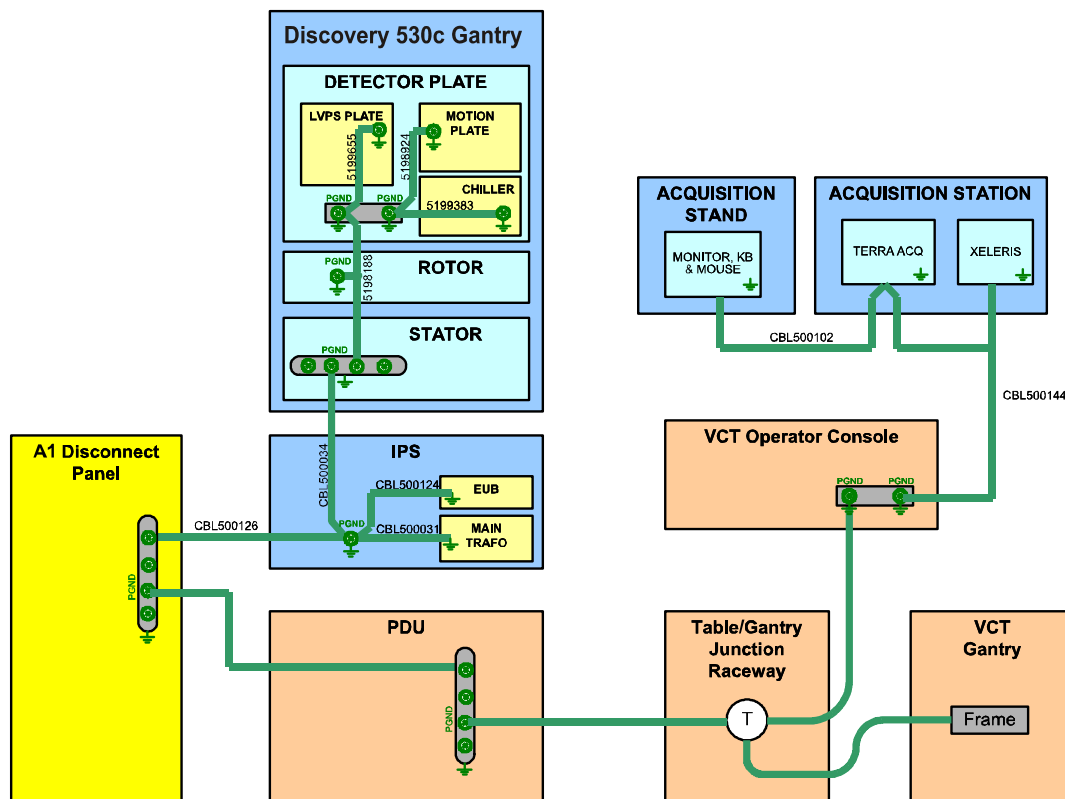


Figure 1-8 System Grounding Distribution

1.2 Prerequisites

Important

In addition to the prerequisites listed below, those contained in the latest VCT LightSpeed 7.X Pre-installation Manual must also be taken into account.

Verify all aspects of site configuration **before** construction is started. Once building operations have been completed, it may be difficult and/or costly to make changes.

It is advisable to use workers experienced in medical suite installations.

Personnel with only general construction experience may not have the expertise to complete the required tasks within the designated time frame.

Important

Since this equipment involves the use of radioactive isotopes, compliance with Nuclear Regulatory Commission regulations, or similar regulatory requirements (depending on the country), must be adhered to.

In most situations, this must be done prior to acquiring any source materials. This includes calibration sources which may have fairly long delivery lead times. These calibration sources may also have a short half life, and it may not be advisable to store them over long periods of time.

Regulatory compliance should be arranged early in the site planning process.

1.2.1 Prerequisite for Installing the NM System

1.2.1.1 Co57 Flood Source

Important

A Co57 Square Flood Source for QC and Maps creation, with an activity of 20 mCi, must be pre-ordered and available on site before installation commences.

See [Figure 1-9](#)

Part number BM00-99 Manufacturer – RadQual <http://www.radqual.com/>

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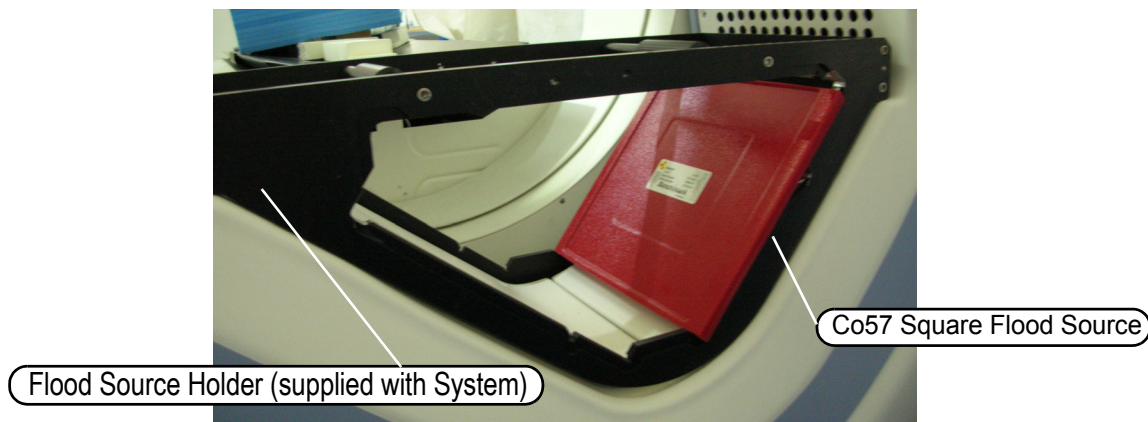


Figure 1-9 Co57 Square Flood Source and Holder

1.2.2 Torque Wrench Kit # 46-268445G1

In addition to the Torque Wrench kit contents, a 5 mm in- hex socket ① (not supplied) and a 3/8 inch drive extension piece (supplied with Triplets) ② are required.

The 3/8 torque wrench, extension piece, and 5mm in-hex socket, are essential for fitting the Triplets to the Gantry. See [Figure 1-10](#)

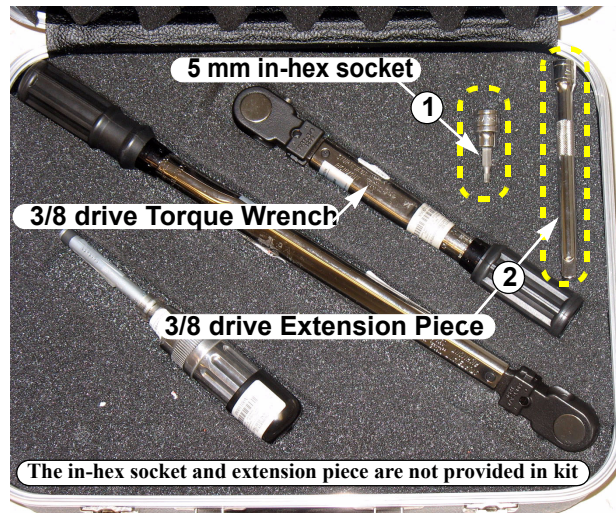


Figure 1-10 Torque Wrench Kit

Important

The Torque Wrench kit needs to be ordered from the tool pole prior the installation.

1.3 Project Coordination

To insure a successful installation, it is preferable to have one person (a project coordinator) manage the entire project. The project coordinator should be involved in every phase of the installation, from conceptual planning through to system start up.

Ideally, the project coordinator should be thoroughly familiar with construction procedures and have a background in medical suite construction. If such a person is not available from existing staff, it is recommended that the services of a local Site Planner or Construction Manager be secured.

This person will be the primary contact and liaison between the purchaser and GE Health care.

Note

The purchaser is responsible for assigning this post and providing GE with the relevant contact information.

The project coordinator should keep in close contact with all of the contractors, sub-contractors, GE Health care, and administrative personnel, as well as the planners and architects. Keeping a schedule (and adjusting that schedule if necessary) is part of the project coordinators responsibility.

GE can provide a site planning service to assist the purchaser / project coordinator with the site planning. Please contact your local GE representative should any such assistance be required. GE personnel are willing and well qualified to help ensure that your installation is a successful one.

1.4 Purchaser's Responsibility

The purchaser is responsible for all site preparation, unless a special agreement has been entered into with GE Medical Systems.

Such preparation may include, but is not limited to the following tasks:

- Cost analysis, construction, renovation or alterations and modifications when not specifically provided for in the contract.
- Procurement of all the material required to carry out the work.
- Safe storage of the system and equipment prior to and during installation.
- Installation of lighting.
- Air-conditioning and ventilation, suitable for the NM/CT System.
- Fitting of adequate thermal protection devices.
- Installation of electrical conduit, junction boxes, ducting and outlets as required.
- Facility input power supplies and wiring.
- Demolition, debris removal and cleaning of construction site.

- Fire control devices as may be required by local codes.
- Permits, inspections, radiation licensing etc.
- Installation of any required networking materials which are external to the system's internal sub-net.
- Removal of packing and shipping material.
- Floor tile removal and replacement in area of table and gantry.
- Floor Requirements
- Ensure that the scan room can be locked during the installation procedure, and that it will not be accessed by unauthorized people.
- Provide storage space with a minimum size of 3 x 3 meters for storing the system components, installation tools, and the removed system covers.

1.5 Regulatory Requirements

Every effort must be made to assure safe and efficient installation, and proper operation of the NM/CT Hybrid system.

Important

In addition to the regulatory requirements listed herein, those contained in the latest VCT LightSpeed 7.X Pre-installation Manual must also be taken into account.

Prepare the site, and install the equipment in compliance with all local regulatory requirements.



CAUTION

The NM system uses radioisotopes which are regulated by various governing agencies. You will need to obtain all relevant permits and licenses to comply with local regulations.

Stringent laws and standards apply to the installation and operation of any equipment that involves the use of radioactive isotopes. This section has been designed to alert the responsible personnel to the need for regulatory compliance. The purchaser is solely responsible for keeping the NM/CT facility in compliance during preparation, installation and operation.

It is not practical to include all of the regulatory information that might apply in all situations. The purpose of this chapter is to serve as a guideline only, and is not intended to be used as a regulatory standard in any manner. Government agencies are charged with the responsibility of protecting the general public from hazardous materials. For radioactive sources in the United States of America, that agency is the Nuclear Regulatory Commission (NRC)

The NRC monitors the activity of all industries that are engaged in the use and handling of hazardous radioactive materials and licenses organizations to make use of such material. The installation of an NM imaging system falls into the category of a facility that must be regulated and monitored by this agency.

Some states have signed agreements with the NRC, allowing that state to regulate the use of radioactive material within the confines of their borders. The NRC can supply a list of the agreement states, with addresses. Installation of projects in those states that have not signed such an agreement, require an application to the NRC for licensing.

Request for application should be made to:

United States Nuclear Regulatory Commission
Washington, D.C. 20555

1.6 Information Required Before Installation

All the information which must be obtained and recorded *prior* to start of installation can be found in the check lists in [Section 1.7](#).

Failing to acquire the information beforehand may cause serious delays in completing the system installation.

- Site parameters - to be decided in consultation with the customer.
- Local Area Network (LAN) information - provided by the local network administrator.
- Broadband information - to be decided in consultation with the local network administrator as well as with the network administrators of the remote network.
- Telephone Availability - if possible a telephone should be installed in the scan room

1.7 NM Pre-Installation Checklist

Important

In addition to the NM checklist, the VCT LightSpeed 7.X Pre-installation Manual checklist must also be completed.

The following checklist should be completed by both the customer and the Vendor's representative.

Equipment Arrival Date: _____

Planned Installation Date: _____

1.7.1 Site Information Contact Persons

Table 1–1: Site Information Contact Persons

Site Name		IT System Administrator	
Department		Chief Technologist	
Street		Facilities Engineer	
City, State, Zip		Shipping/Receiving	
Country		Physician	
Telephone			

The questions to be answered are arranged according to four topics:

- Site preparation and required cables
- Unloading and conveyance to installation site
- Networking
- Radio nuclides licenses

1.7.2 Site Checklist

Mark the appropriate **Yes** or **No** box, then sign the checklist.

Table 1–2: Site Checklist

Site Planning		Yes	No	Comment
Room Measurements	Does the camera room meet minimum size requirements?	<input type="checkbox"/>	<input type="checkbox"/>	
	Does room height meet the minimum height requirement?	<input type="checkbox"/>	<input type="checkbox"/>	
	Does the room layout leave sufficient free space for servicing and egress?	<input type="checkbox"/>	<input type="checkbox"/>	
Room Layout	Are final Site Layout drawings completed and approved by the customer?	<input type="checkbox"/>	<input type="checkbox"/>	
	Are final Site Layout drawings approved by the Vendor?	<input type="checkbox"/>	<input type="checkbox"/>	
Floor Preparation	Can the floor tolerate the specified loads?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is construction necessary?	<input type="checkbox"/>	<input type="checkbox"/>	
	If yes, what is the scheduled completion date?			
	Does floor leveling meet the requirements?	<input type="checkbox"/>	<input type="checkbox"/>	
	Does floor flatness meet the specified requirements?	<input type="checkbox"/>	<input type="checkbox"/>	

Table 1–2: Site Checklist (Continued)

Emergency Button	Is the planned location of the emergency button easily accessible by the operator?	<input type="checkbox"/>	<input type="checkbox"/>	
Power Requirements	Does the single-phase wall outlet meet the specified requirements?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is the single-phase power line stabilized?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is a wall outlet available for installation tools?	<input type="checkbox"/>	<input type="checkbox"/>	
Environmental Conditions	Are the specified requirements met, considering the system's thermal loads?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is the magnetic field in the camera and workstation room less than 1 Gauss?	<input type="checkbox"/>	<input type="checkbox"/>	
Communication Requirements	Is there a telephone available in the scan area?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is there a network connection available near the system?	<input type="checkbox"/>	<input type="checkbox"/>	
Unloading and Conveyance to Installation Site		Yes	No	Comments
Loading Dock	Does the institution have a truck-height (44") loading dock?	<input type="checkbox"/>	<input type="checkbox"/>	
	Can a full-size truck access the truck-height loading dock?	<input type="checkbox"/>	<input type="checkbox"/>	
	Does a short truck delivery need to be coordinated?	<input type="checkbox"/>	<input type="checkbox"/>	

Table 1–2: Site Checklist (Continued)

Unloading Equipment:	Does institution have a fork lift with weight capacity of at least 2000 kg to lift Gantry?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is a pallet jack or fork lift required?	<input type="checkbox"/>	<input type="checkbox"/>	
Riggers	If the camera can not pass through halls, elevators or doors, a rigging company must be employed. Will a rigging company be hired?	<input type="checkbox"/>	<input type="checkbox"/>	
Unloading by crane	Is an area for crane hoisting planned?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is closing off of this area for the required period of time approved by the authorities?	<input type="checkbox"/>	<input type="checkbox"/>	
	Please provide the following information (only if crane is used)			
	Name of rigging company: _____			
	Contact name: _____			
	Phone: _____			

Table 1–2: Site Checklist (Continued)

Halls, Elevators and Doors	Are <u>all</u> door openings/hallways from loading dock to the camera room large enough for passage of the Gantry and/or the patient table mounted on the moving kit/wheels?	<input type="checkbox"/>	<input type="checkbox"/>	
	Can all pathways tolerate the weight of the Gantry mounted on Moving Kit/Wheels?	<input type="checkbox"/>	<input type="checkbox"/>	
	If elevator passage is required, can the elevator tolerate the weight and size of the Gantry + Moving Kit/wheels and the length of the Table?	<input type="checkbox"/>	<input type="checkbox"/>	
	Will the Patient Table clear all 90° corners?	<input type="checkbox"/>	<input type="checkbox"/>	
	Will the Gantry assembled on Moving Kit/Wheels clear all corners?	<input type="checkbox"/>	<input type="checkbox"/>	
	Inclines: Are there any inclines on the route to the camera room?	<input type="checkbox"/>	<input type="checkbox"/>	
	If so, what is the angle of incline			
	Carpet & Tile: Will the camera be pushed across delicate carpets or tiles, requiring floor protection?	<input type="checkbox"/>	<input type="checkbox"/>	
Temporary Storage	Will institution store the crated camera in the department?	<input type="checkbox"/>	<input type="checkbox"/>	
	If not, will institution arrange for delivery on first install day?	<input type="checkbox"/>	<input type="checkbox"/>	

Table 1–2: Site Checklist (Continued)

Existing Equipment Moves	Does the institution want the Vendor to move existing equipment?	<input type="checkbox"/>	<input type="checkbox"/>				
	If yes, list the equipment and its required working conditions. <u>Equipment</u> <u>Working Conditions</u>						
Note that this may result in additional charges.							
Networking							
	Are network site name, hostname and IP address defined?	<input type="checkbox"/>	<input type="checkbox"/>				
	Is network cabling and hardware installation complete or has contractor been scheduled to complete work as required?	<input type="checkbox"/>	<input type="checkbox"/>				

Table 1–2: Site Checklist (Continued)

License		Yes	No	Comments
	Does the site have a licenser for the radionuclides used for system calibration (^{99m}Tc)?	<input type="checkbox"/>	<input type="checkbox"/>	
	If not, when will license be obtained?	<hr/>		
	Will customer insure that ^{99m}Tc is available during installation?	<input type="checkbox"/>	<input type="checkbox"/>	
Contact Persons	Is the primary field engineer identified?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is the primary field engineer trained on the equipment?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is the sales representative identified?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is the customer system administrator identified?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is the customer facility coordinator identified?	<input type="checkbox"/>	<input type="checkbox"/>	
General Access	Is the route to the installation room clear, are corridor / elevator requirements met?	<input type="checkbox"/>	<input type="checkbox"/>	
Room Shielding	Was the room shielding, relating to the other rooms and corridors, checked according to the site preparation requirements in this chapter?	<input type="checkbox"/>	<input type="checkbox"/>	

Table 1–2: Site Checklist (Continued)

Room Environments	The Thermal load of the NM/CT Hybrid is 17,500W / 60,000 BTU/H. Does the room meet GEHC environmental specifications temperature and humidity?	<input type="checkbox"/>	<input type="checkbox"/>	
Equipment Receiving	Is the receiving dock identified?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is a pallet truck available locally?	<input type="checkbox"/>	<input type="checkbox"/>	
	Does forwarder supply a pallet truck?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is the equipment delivery route defined / accepted by GEHC and the customer?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is the storage of 3m X 3m area defined in the site?	<input type="checkbox"/>	<input type="checkbox"/>	
	Could the room be locked for the installation period?	<input type="checkbox"/>	<input type="checkbox"/>	
	Are all conveying means and architectural changes required facilitating equipment delivery done?	<input type="checkbox"/>	<input type="checkbox"/>	
Waste Packing	Are there any facilities for the disposal of empty wooden cases, foam blocks and large cardboard boxes?	<input type="checkbox"/>	<input type="checkbox"/>	
Networking	Is network established with site name, host name, Ethernet addresses, and IP address for the workstation?	<input type="checkbox"/>	<input type="checkbox"/>	

Table 1–2: Site Checklist (Continued)

Completion Sign Off Pre-installation completed: _____ Date: _____ Customer: _____ Vendor's Representative: _____	
--	--

1.7.3 Network Readiness Table

Please fill in this table before equipment arrival.

Assigned by the Hospital Net Admin if connecting to the Hospital LAN. Otherwise assigned by local GE On-Line Center	Hostname	IP	AE Title	Dicom Port	Wired (Y/N)?
Acquisition Host					
Processing Host					
Hardcopy Host					
LAN Net Mask					
Gateway to other networks					
Other					
Insite phone line					
Hub or Switch					
Network Printer					
PACS system					

1.8 Time Schedule

1.8.1 Site Preparation

Time is a very important dimension for a project of this sort. If specific tasks are not completed in a timely manner, other tasks can be slowed, or even halted. It is important to allow the appropriate amount of time to accomplish each task. Before any work is started, it is advisable to secure commitments from contractors with respect to time requirements.

Checklists are provided in [Section 1.7.2](#) to ensure that nothing is overlooked.

1.8.2 Job Progression

It is rarely advisable to have several trades working together at the same time. Generally speaking, the work should progress in the following manner:

1. Application to Regulatory Agencies for Site License.
2. Planning and preliminary design work.
3. Review of plans.
4. Revision of plans.
5. Drafting of final plans.

6. Application for construction permits.
7. Demolition (if required).
8. Structural revisions and framing.
9. Heating Ventilation and Air Conditioning (HVAC) rough-in.
10. Electrical rough-in.
11. Rough-in inspection.
12. Dry wall and wall covering.
13. Heating Ventilation and Air Conditioning (HVAC) trim.
14. Electrical trim.
15. Flooring, trim and painting.
16. Cleaning.
17. Final inspection.
18. Equipment installation.

1.9 Unloading Area

A suitable unloading area must be allocated. The unloading area must be large enough to accommodate the packed units, with additional space to allow for some of the system components to be unpacked.

The Weight and Dimensions of the shipped packages are given in [Table 2–1](#) in Chapter 2.

From the unloading site, there must be a free path to wheel the units into the installation room or into an elevator which will carry them to the installation site. The path specifications are given in [Section 3.7](#). Special facilities must be provided if the units are to be transferred from an unloading site outside the building.

1.10 System Installation

The optimal installation time of the basic system, assuming that *all* system parts arrived in proper working conditions, and assuming proper site preparation and acceptable site temperature, is two working days plus an additional half day for the Xeleris installation.

Important

The presence of the Field Engineer is mandatory for the entire installation time period.

1.11 Manpower Requirements - NM

All personnel participating in unpacking, conveying and installing the camera must be suitably qualified and approved. Specific manpower requirements for the various installation stages of the camera are shown in [Table 1–3](#) and [Table 1–4](#).

Note

For VCT LightSpeed 7.X manpower requirements, refer to chapter 9 of the VCT PIM.

Table 1–3: Manpower Requirements - Unpacking, Conveying

Component	Task and Manpower
Gantry	Unpacking: 2 persons
	Conveying (with transport wheels) - 2 persons: <ul style="list-style-type: none"> • 1 persons (at least) to push the Gantry • 1 person in the front to steer the Gantry
Workstation	Unpacking and Conveying:1 person

Table 1–4: Manpower Requirements - Installation

Procedure	Manpower
System Installation	1 qualified Field Engineer
System Calibration	1 qualified Field Engineer
Acceptance Test	1 qualified Field Engineer

1.12 Dust and Dirt Removal

The computer hardware is cooled with small cooling fans mounted in various locations in the equipment. The equipment is sensitive to dust and dirt that may be drawn into the electronics by the cooling fans. Therefore, special attention should be given to cleaning the room. All dust and residue should be removed as an ongoing activity, and as a last step in the preparation process before bringing any of the equipment into the suite area. All such debris must be removed as it accumulates. The best cleaning method for removing dust and dirt, particularly fine dust is to use of a vacuum cleaner, not sweeping.

Note

Just before the equipment is set in place is a good time to perform a thorough cleaning and sanitizing of the site. There may never again be an opportunity to execute such a detailed cleaning of these areas.

1.13 Site Safety

1.13.1 Site Management

- Continually gather up and remove debris to keep the work site orderly.
- Plan for the disposal of scrap, waste and surplus materials.
- Keep the work area and all equipment tidy. Designate areas for waste materials and provide suitable containers.
- Keep stairways, passageways and gangways free of material, supplies and obstructions.
- Remove or bend over nails protruding from lumber.
- Do not allow rubbish to fall freely from any level of the project. Use chutes or other approved devices to dispatch the materials.
- Do not throw tools or other materials.
- Do not raise or lower any tool or equipment by its own cable or supply hose.

1.13.2 Flammable Material Storage

- Store flammable or explosive materials such as gasoline, oil and cleaning agents apart from other materials.
- Keep flammable and explosive materials in proper containers with contents clearly marked.
- Post signs prohibiting smoking, open flames and other ignition sources in areas where flammable and explosive materials are stored.
- Ventilate all storage areas properly.
- Ensure that all electric fixtures and switches are explosion-proof where flammable materials are stored.

1.13.3 Head Protection

Head protection (hard hats) must be worn in areas where there is a possible danger of head injuries from impact, flying or falling objects.

1.13.4 Fire Protection

Fire fighting equipment and fire warning systems should be installed on the site, in accordance with local regulations.

Fire fighting equipment must be strategically located, clearly marked and readily accessible at all times. The fire extinguishers must be periodically inspected, and maintained in operating conditions.



WARNING

Never throw water on an electrical fire

Water is an excellent conductor of electricity, and if water is thrown on an electrical fire, it will only increase the risk of shock.

For electrical fires a chemical fire extinguisher is recommended.

1.13.5 Electrical Protection

1.13.5.1 Power Tools

- Switch tools OFF before connecting them to a power supply.
- Disconnect power supply before making adjustments, fitting attachments or changing blades.
- Ensure tools are properly grounded or double-insulated. The grounded tool must have an approved 3-wire cord with a 3-prong plug and plugged into a properly grounded 3-pole outlet.
- Do not bypass the switch and operate the tools by connecting and disconnecting the power cord.
- Do not use electrical tools in wet conditions or damp locations unless tool is connected to a GFCI.
- Do not clean tools with flammable or toxic solvents.
- Do not operate tools in an area containing explosive vapors or gases.
- Keep power cords clear of tools during use.
- Suspend power cords over aisles or work areas to eliminate stumbling or tripping hazards.
- Do not carry electrical tools by the power cord.
- Do not tie power cords in tight knots. Knots can cause short circuits and shocks. Loop the cords or use a twist lock plug.
- Check the insulation around the power cord to make sure it is in good condition. You should not see any exposed wires or frayed ends. Power cords in poor condition should be replaced, never taped or spliced.

1.13.5.2

Outlets and Extension Cords

- Make sure all electrical outlets are three-hole, grounded outlets. If there is water in the area, there should be a GFI or Ground Fault Interrupter outlet.
- There should be ample electrical capacity to run equipment without tripping circuit breakers or blowing fuses.
- Minimize extension cord use. Never place them under rugs. Use extension cords sparingly and check them periodically
- Don't use extension cords in areas where a lot of traffic passes, because it may cause someone to trip, and the constant traffic will wear out the insulating rubber covering.

1.13.6

Personal Protective Equipment

Eye and face protection must be provided when machines or operations present potential for hazardous eye or face injury.

Chapter 2 – System Specifications

2.1 Overview

The NM/CT Hybrid system comprises five main components:

Each of the components listed are numbered, and correspond to the location in Figure 2-1.

- VCT LightSpeed 7.X Gantry - (1)
- Discovery NM 530c Gantry - (2)
- Global Table - GT200 Table - (3)
- IPS (Integrated Power Supply) - (4)
- Power Distribution Unit (PDU) - (5)

In addition, the Discovery NM 530c system is usually supplied together with an Xeleris Workstation. Normally, each computer (Acquisition and Xeleris workstations) use a dedicated mouse, keyboard and monitor. In cases where Xeleris is using the same keyboard and monitor as the acquisition station, the Xeleris workstation should be located close to the Acquisition workstation Both computers are located in the Operator's room.

The Discovery NM 530c and the Xeleris does not share any computer resources with the VCT LightSpeed 7.X.

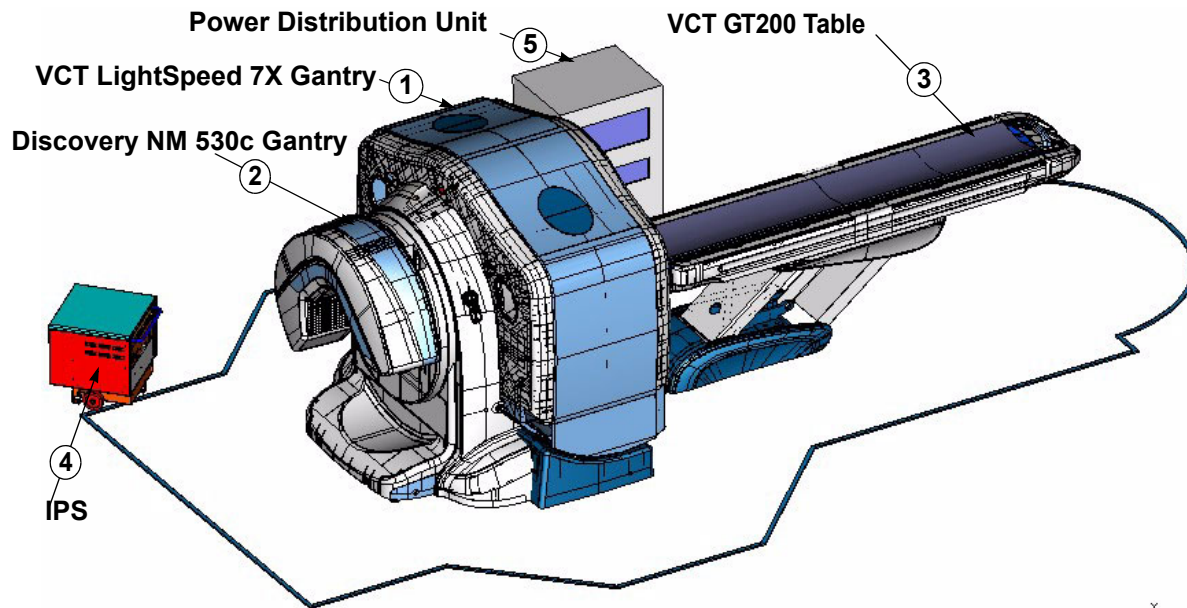


Figure 2-1 NM/CT System Components

2.2 Weights and Dimensions of Unpacked Discovery NM 530c Components

Table 2–1: Unpacked Discovery NM 530c Component Weights & Measurements

Unit	Net Weight	Measurements / mm (in)		
	kg (lbs)	Height	Width	Depth
Gantry (without triplets)	590 (1300)	1550 (61.0)	1350 (53)	735 (28.9)
Gantry Full Configuration (with triplets)	650 (1433)	1550 (61.0)	1350 (53)	735 (28.9)
IPS	78 (172)	545 (21.5)	520 (20.5)	565 (22.3)

Important

Weights & Measurements of the CT system are shown in Table 6-1 (page 81) of the VCT LightSpeed 7.X Pre-installation manual.

Chapter 3 – Unpacking, Unloading, Access and Conveyance

3.1 Overview

The best way to tackle a construction project of this complexity is to divide it into smaller, more easily managed tasks. Each task, now becomes a smaller project. At this point, the primary challenge is to coordinate all of these small projects in such a way as to have the entire project completed properly, and on time.

This document will help to bring the often overlooked details to the attention of the Project Coordinator. It will also simplify the task of site preparation for a first time NM/CT Hybrid Project Coordinator.

A list of equipment and tools required to unpack and convey the NM System are shown in [Section 3.4](#). These tools must be available on site before the components can be unpacked or moved

Important

The equipment and tools required to unpack and convey the CT System are listed in Chapter 9 of the VCT LightSpeed 7.X Pre-installation Manual

3.2 Delivered Containers

The system is delivered in the following containers:

3.2.1 Discovery 570c Gantry Container - see [Table 3-4 on page 3-52](#)

- Discovery 570c Gantry - without Triplets
- Gantry transportation dollies

3.2.2 Discovery 570c System Component Container - see [Table 3-1](#) below

The Weights and Measurements of Standard Equipment as well as the Upgrade Kit are listed in [Table 3-1](#) to [Table 3-2](#).

Table 3-1: System Components Container - Crated Weights and Measurements

Unit	Weight	Dimensions / mm (in)		
	kg (lbs)	Height	Width	Depth
System Components	~ 300 (660)* depending on options	800 (31.5)	1900 (74.8)	1400 (55.1)

* The System Components weight is approximate and may vary according to the options specified

Note

Since the NM/CT Hybrid system share the VCT GT200 patient table, the NM system is supplied without a patient table

3.2.3 530c to 570c Upgrade Kit

The 530c to 570c upgrade kit is shipped in 3 crates strapped together

3.2.3.1 Dimensions and weights - 3 Crates Combined

length: 185cm x width: 132cm x Height: 130cm

weight: 350kg

The contents of the 530c to 570c Upgrade Kit are listed in [Table 3-2](#)

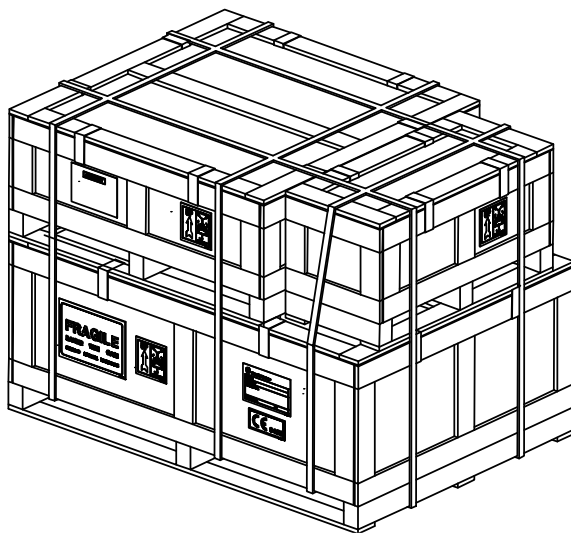


Figure 3-1 530c to 570c Upgrade Kit - Combined Package

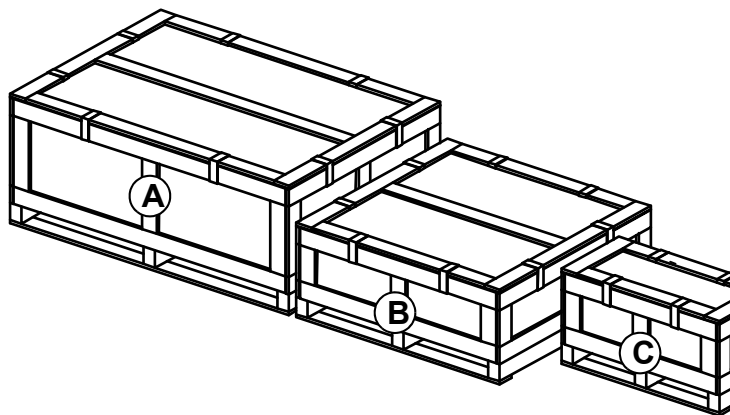


Figure 3-2 530c to 570c Upgrade Kit - 3 crates

Table 3-2: Contents of 530c to 570c Upgrade Kit

A	Left and Right side Gantry Covers LCD Monitor
B	Cone Cover Box of Electronic Components
C	Left and Right side Permanent Dollies Left and Right side VCT Adaptor Plates Left and Right side VCT Handles Alignment Kit

3.3 General Order of Unpacking and Procedures

Important

The VCT LightSpeed 7.X must always be installed first.
To avoid confusion, it is advisable to only unpack the NM system after the CT is installed. Refer to the VCT LightSpeed 7.X PIM (chapter 9) for more information.

1. **Before** unpacking the camera units, the supervisor must be well acquainted with the safety measures for system unpacking and conveying, detailed in the Safety and Regulatory section of the System Service Manual.
2. **Before** releasing the carrier:
 - a. Inspect the containers/boxes for external damage. If any damage has been found, inform immediately the carrier and your office.
 - b. Check the containers/boxes against the delivery slip and verify that you have all the boxes. Inform the carrier and your office immediately about any missing packages.
3. Unpack the NM Gantry in the unloading area as described in [Section 3.5.1](#).
All other units should be unpacked as close as possible to the installation area.
4. Check that no parts have been left in (or attached to) the packing material

Important

The Gantry is shipped **without** Triplets

5. Convey the Gantry into the installation area.
6. Transportation Dollies and accessories should be shipped back for recycling.

3.4 Discovery NM 530c Unpacking Tools

The tools which are required for unpacking the Discovery NM 530c containers are shown in [Table 3-3](#). These tools should be on site when the delivery truck arrives

Table 3-3: Unpacking Tools

Crowbar	
Carpenters Claw Hammer (large)	
Set of Allen keys (inch size)	
Set of Combination Wrenches (inch size)	
Socket Set - Inch Size(1/2 inch drive)	
Tin Snips (Metal band cutter)	

3.5 Discovery NM 530c Gantry

The gantry is shipped in a wooden container without the Detectors (Triplets) fitted. These are shipped separately. The container is designed to provide limited protection against mechanical impact during shipment.

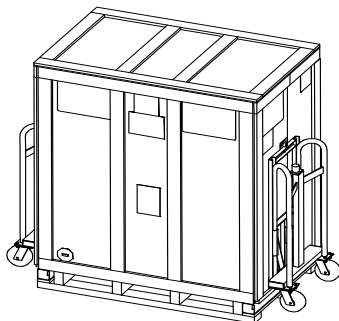


Figure 3-3 Discovery NM 530c Gantry Shipping Container

The weights and dimensions of the crates and packages are given in [Table 3-4](#)

Table 3-4: Gantry Crated Weights and Measurements


Unit	Weight	Dimensions / mm (inches)		
	kg (lbs)	Height	Length	Width
Gantry	800 (1764)	1800 (70.9)	1950 (76.8)	1000 (39.4)

Note

The equipment and tools required to unpack and convey the CT System are listed in Chapter 9 of the VCT LightSpeed 7.X Pre-installation Manual

3.5.1 Unpacking and Conveying the Discovery NM 530c Gantry

The Gantry is unloaded from the truck with a fork lift, and is unpacked on the ground.

	<p style="text-align: center;">CAUTION</p> <p>Check the G-limit indicator attached to the front of the Gantry packing crate (on top of the Fragile label) and verify that its color is white.</p> <p>If the color is red, please notify the carrier that the Gantry was subjected to impact exceeding 10 g, and proceed with unpacking.</p>
---	--



The type and make of G-limit indicator may change.

Figure 3-4 G-limit indicator

The weights and dimensions of the crated Gantry, as well as wheel base dimensions are shown in [Figure 3-5](#).

1. Adjust the forks of the Fork Lift to fit the steel rectangular openings in the Base Pallet of the gantry crate and unload the Gantry from the truck. See [Figure 3-5](#).

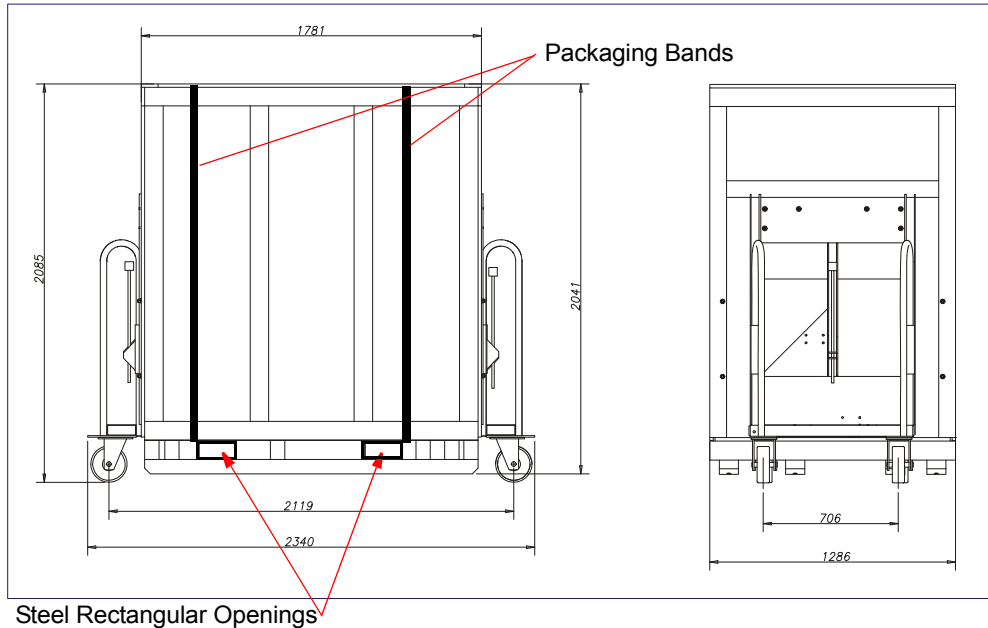


Figure 3-5 Crated Discovery NM 530c Gantry

2. Cut the Packaging Bands ([Figure 3-5](#)) and Remove the Gantry crate lid.
3. Remove the Gantry crate walls and Gantry plastic wrapping ([Figure 3-6](#)).



Figure 3-6 Removing the Gantry crate walls

4. Using lead screws on both Dollies, raise the Gantry (alternating a little on each side) until the wooden pallet is free.



Figure 3-7 Unpacked Gantry on Dolly

3.5.2 Wheeling the Discovery NM 530c Gantry into the Installation Area

Note

The Discovery NM 530c Gantry is usually only moved to the installation area after the VCT LightSpeed 7.X has been installed.

1. Before moving the Gantry to the installation area make sure that the conveyance path is free of obstacles and that the Gantry can pass through all Entrances, Exits and Corridors.

**CAUTION**

Move the Gantry very slowly and take extreme care as the Dolly wheels do not have braking mechanisms.

If conveying over sloping surfaces extra care should be taken and at least 2 people are required to ensure proper control.

2. Remove the wooden pallet from the Dolly.
3. Carefully wheel the Gantry into the installation area
See [Figure 3-8](#)



Figure 3-8 Wheeling the Gantry into the Installation Area

Important

The transportation wheels should remain attached to the Gantry to allow precise final positioning. They will be removed during installation.

3.6 Unloading Area

A suitable unloading area must be allocated. The unloading area must be large enough to accommodate the packed units, with additional space to allow for some of the system components to be unpacked.

3.6.1 Weight and Dimensions of the Discovery NM 530c shipped packages

- System Component Shipping Containers are shown in [Table 3-1](#)
- Unpacked System Modules are shown in [Table 2-1](#)
- Shipped Packages (crated) for 530c to 570c Upgrade Kit are shown in [Table 3-4](#).

From the unloading site, there must be a free path to wheel the units into the installation room or into an elevator which will carry them to the installation site. The path specifications are given in [Section 3.7](#). Special facilities must be provided if the units are to be transferred from an unloading site outside the building.

3.7 Access Path to Installation Area

From the unloading site, there must be a free path to wheel the components to the installation area, or into a lift which will carry them to the correct level.

The size and weight specifications of the system components are given in [Table 3-2](#).

It is important to verify that the route selected has sufficient clearance and load carrying capacity. Special facilities must be provided if the units are to be transferred from an unloading site outside the building.

Chapter 4 – Physical Planning of the Site

4.1 Selecting the Site

The NM/CT Hybrid System requires one room, which will contain the following sub-systems:

- Discovery NM 530c Gantry
- VCT LightSpeed 7.X Gantry
- GT200 Patient Table
- Integrated Power Supply - Discovery NM 530c
- PDU - power distribution unit - VCT LightSpeed 7.X
- VCT UPS

Optional separate rooms are recommended for the following utilities:

- Office/Viewing/Processing Room
- Computer, Monitor, Keyboard and Mouse
- Patient waiting room
- Patient preparation room
- Hot lab

Selecting the Site

Two examples of scan room layouts (minimum and recommended) are shown in [Room Sizes for NM/CT Hybrid System on page -6](#).

The selection of the scan area should be based on the following considerations:

- Feasibility of Emergency Stop Unit installation within operator reach
- Influence of the surrounding rooms (radioactive or magnetic sources)
- Distance to "hot areas" such as:
 - Hot laboratory
 - Patient toilets
 - Patient waiting/preparation rooms
- Distance from diagnostic area such as:
 - Processing room
 - Viewing room
- Floor loading capacity, as per [Section 4.5.1](#)

Selecting the Site

The layout of the system inside the room should be based on the following considerations:

- Position relative to the camera:
 - Gantry - Acquisition Station cable limitations
 - Convenient accessibility to Gantry and Table for daily activity
- Access to communication lines (for details refer to Chapter 7):
 - Ethernet connection
 - Connection to hardcopy device, if it is to be directly connected to the system
- The clearance area is required for servicing the NM/CT LightSpeed 7.X Hybrid system.

4.2 Discovery NM/CT 570c Operator Safety

4.2.1 Radiation Shielding

Appropriate barriers such as walls, lead-shielded glass, lead shields, etc. must be installed to protect staff from unnecessary exposure to radiation. Since the NM/CT system involves the use and storage of radio nuclides and produces X-ray radiation, a qualified radiological health physicist must be consulted in the design of walls, and/or safety barriers, to assure appropriate attenuation.

Keep in mind that patients become significant sources of radioactivity. Consideration should be given to maximize the distance between the patient and operator during the uptake and acquisition phases of scan procedures.

4.2.2 Background Radiation

In order to facilitate and improve service and field calibration, all radiation sources should be suitably shielded.

In case the room is close to the injection room or to the hot room (where the technologists prepare or receive the radioactive source) or to the patient waiting room (after injection), a careful background level verification should be performed.

Using a standard radiation counter, verify that at a height of between 0.5 to 1.5 meters above floor and a distance of between 0 to 10 cm of the room wall, the radiation background is lower than 0.1 mR/h. In case of failure, a lead shield wall should be added. In most of the cases a 5 mm lead wall will reduce the background level below the above value.

4.3 Required System Clearance and Egress

Consult your local GE Sales and Service Representative about your specific needs. Some possible room size dimensions are shown in the table below. These room size dimensions are table dependent.

4.3.1 NM/CT Room Size Dimensions

Room Options	Size in cm (feet)
Minimum room size	6.706 (22') x 3.556 (11'8")
Recommended room size	7.500 (24'1") x 5.500 (18'1")

Component dimensions and weights

Please refer to the VCT LightSpeed 7.X PIM (chapter 6) and Discovery NM 530c PIM (chapter 2)

Equipment Clearance and Egress Requirements are shown in [Section 4.3.3](#) and [Figure 4-1](#). It is important that the regulatory service and Egress clearance is maintained around equipment for operation, service, and safety.

4.3.2 Regulatory and Service Clearances

MINIMUM CLEARANCES UNDER U.S. FEDERAL REGULATIONS AND NATIONAL STANDARDS: 29 CFR 1910 (OSHA), NFPA 70E (STANDARD FOR ELECTRICAL SAFETY IN THE WORKPLACE), AND NFPA 101 (LIFE SAFETY CODE):

4.3.2.1 Clearance Requirements for U.S

A diagram of clearance requirements for U.S. regulatory compliance is shown in [Figure 4-1](#). See the clearance tables on the following pages for detailed dimensional clearances. Be aware that all systems installed in the United States must comply with all Federal and local regulations.

4.3.2.2 Clearance Requirements Outside of the US.

For installations outside the United States, country-specific or other local regulatory clearance requirements must be met.

Note

The Egress Area (see [Figure 4-1](#)) can be defined either side of the system, depending on equipment positioning and space availability

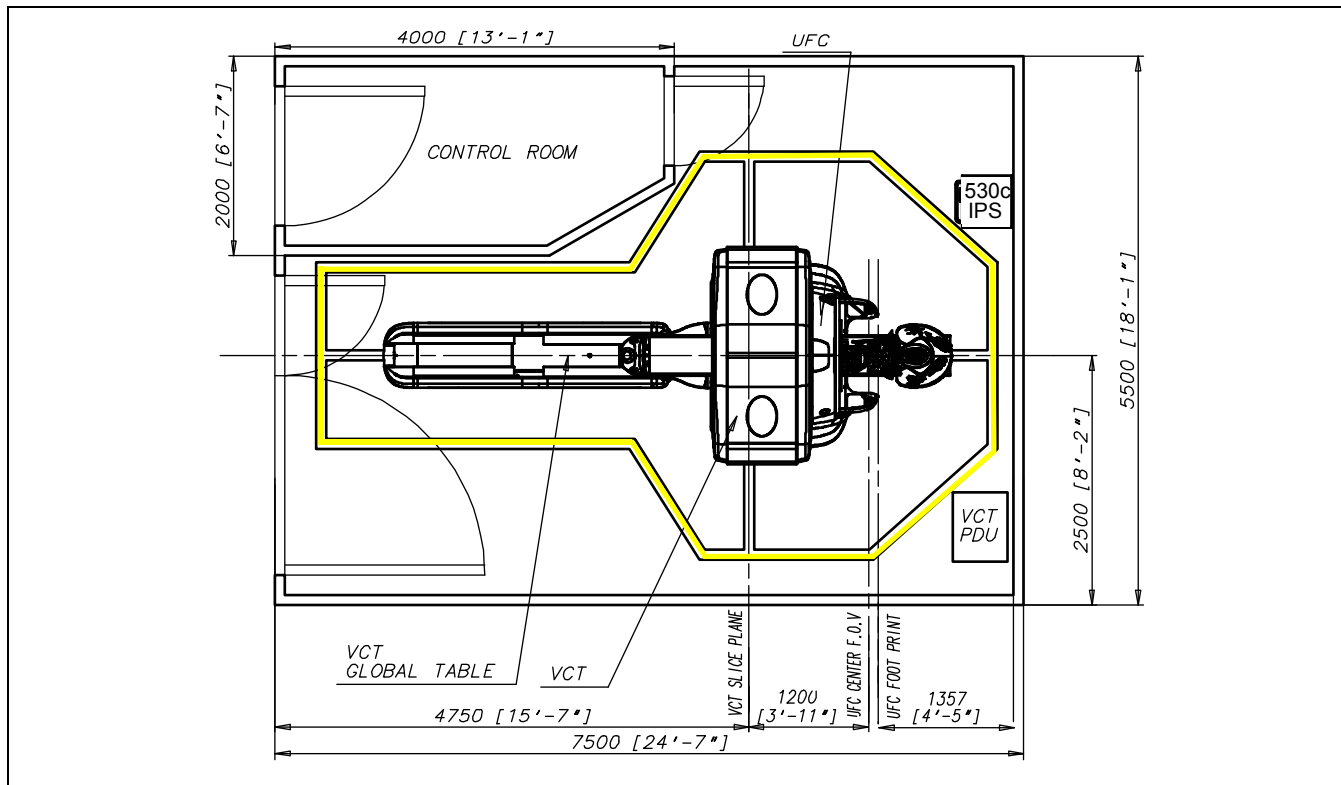


Figure 4-1 Clearance Requirements for U.S. Regulatory Compliance

4.3.3 Regulated Minimum Working Clearance for Major Subsystem

- Requirements apply to equipment operating at 600 V or less, where examination, adjustment, servicing, or maintenance is likely to be performed while live parts are exposed.
- Direction of Service Access is defined as perpendicular to the surface of the equipment being serviced.
- Required regulatory clearance distances must be maintained and may not be used for storage. This applies during normal system operation as well as service inspection or maintenance.
- For the Gantry and Table, distances are measured from the enclosure.

Work Space Requirement	Min. Clear Space in mm (inches)	Additional Conditions
Direction of Service Access	914.4 (36)	* 48 inches (1219.2 mm), if exposed live parts of 151 - 600 volts are present on both sides of workspace with the operator between * 42 inches (1066.8 mm), if opposite wall is grounded and exposed live parts of 151 - 600 volts are present.
Service Access Width	762 (30)	This is the width of the working space in front of the equipment. 30 inches (762 mm) min. or the width of the equipment, whichever is greater.

4.3.4 Terms and Definitions

EGRESS

The path of exit from within any room.

U.S. regulatory requires a minimum of **28 inches** (711.2 mm) of continuous, unobstructed space with no trip hazards along the path of exit.

WORK SPACE

This is the dimensional box required for safe inspection or service of energized equipment. It consists of depth, width, and height. The depth dimension is measured perpendicular to the direction of access. U.S regulation is minimum of **36 inches** (914.4 mm). Additional conditions can increase the minimum requirement. FCT defines this as the envelope of the component superstructure. For the gantry and table, it is with the patient or external covers removed.

SERVICE ACCESS WIDTH

This is the width of the working space in front of the equipment, a minimum of **30 inches** (762 mm), or the width of the equipment whichever is greater.

HEAD CLEARANCE

This is the height dimension of “Work Space”. The height of the workspace measured from floor at the front edge of equipment to ceiling or overhead obstructions, **78 inches** (1981.2 mm) or height of equipment, which ever is greater.

GROUNDING WALL

- Any wall that can be electrically conductive to earth ground. Masonry, concrete, or tile, are considered conductive. Additional commonly found components of a wall should also be considered as grounded. This is not an all-inclusive list:
- Medical Gas ports
- Metal door and window frames
- Water sources and metallic sink structures
- Metallic wall mounted cabinets
- A1 disconnect panel
- Equipment Emergency Off panels
- Industrial equipment such as air conditioners and vents
- Expansion joints
- The following are not considered as grounded elements of a common wall:
- Standard wall outlet
- Light switches
- Telephones
- Communication wall jacks

MINIMUM

The lowest limit permitted by law or other authority.

DIMENSIONS AND CLEARANCES

Consisting of, or representing the lowest possible amount of degree for freedom permissible for equipment siting. This relationship must meet all safety, service, and regulatory requirements to be acceptable.

PRE-INSTALLATION ESCALATION

Process to consult with Engineering, the Design Center or EHS regarding pre-installation issues related to your siting concerns.

4.4 Room Layouts

Examples of typical room layouts are shown in [Section 1.1 – Room Sizes for NM/CT Hybrid System on page 1-6](#):

4.5 Floor Preparation

The floor must be capable of supporting the weight of the equipment and accessories.

The floor slope and flatness must meet the requirements listed in [Section 4.5.3](#).

4.5.1 Floor Loading - NM System

The Static load of the NM Gantry is 650 kg (**1433 lbs**) on four pads above a footprint of 950 x 500 mm (**37.4 x 19.7"**). See [Table 4-1](#) and [Figure 4-2](#)

Important

The Static load of the NM Gantry must be combined with the floor loads of the VCT LightSpeed 7.X (see VCT LightSpeed 7.X PIM chapter 6).

4.5.2 Floor Loading - NM/CT System

ITEM	NET WEIGHT LB(KG)	OVERALL W X D INCH (MM)	MAX ANCHOR LOAD LB (N)	WEIGHT/ AREA LB/SQ. FT. (KG/M ²)	LOAD PATTERN / IN. (MM)	NORMAL METHOD OF MOUNTING IN. (MM) (GE SUPPLIED) ¹
Gantry NM	1433 (650)	37.4 X 19.7 (950 X 500)	compression 354 (1580)	280 (1368)	Four round 76 mm pads in a rectangular pattern.	Seismic anchor only Depends on geographic zone
Gantry CT (w/covers	~4050 (~1850)	89.25 X 39.65 (2267 X 1007)	compression 1100 (4895)	296 (1448)	Four round 64 mm pads in a rectangular pattern.	Hilti Kwik-Bolt II 1/2in (13 mm) diameter by 8in (203mm) long
Dollies (each)	250 (114)		(assume infinite floor stiffness)		Floor Print: 27.6 x 79.25 (700 x 2013)	per P/N 2106573 at four leveling pads into concrete floor.
Top Cover (each)	24.6 (11)					
Side Cover (each)	25 (11)					
Front Cover	95 (43)					
Rear Cover	100 (45)					
Patient Table:						
GT 2000	1250 (568)	25.6 x 114.5 (650 x 2910)	-	-	Four round 64 mm pads: 19.7 x 40.3	Hilti Kwik-Bolt II 1/2in (13 mm) diameter by 8in (203mm) long per P/N 2106573 at the leveling pads into concrete floor.
w/ 227kg patient	1750 (795)		591 (2630)	273 (1337)		
Footswitch (GT)	33 (15)	-	-	-	-	-
Power Distribution Unit	~700 (~336)	28 X 22 (711 X 559)		161 (788)	Four Casters support area of 28 X 22 (711 X 559).	Casters are for positioning and service. Set on floor. May be anchored to floor using angle brackets ² in seismic zones.
Console w/HP & w/o monitors	450 (204)	48 X 39 (1219x991)		140 (681)	Four Casters or Leveling Feet support area of 46 X 19 (1168 X 483).	Casters are for positioning. Set on floor. Console may be anchored to floor using angle brackets ³
Monitor - LCD (ea)	22 (10)					

Table 4-1: Floor Loading - NM/CT System

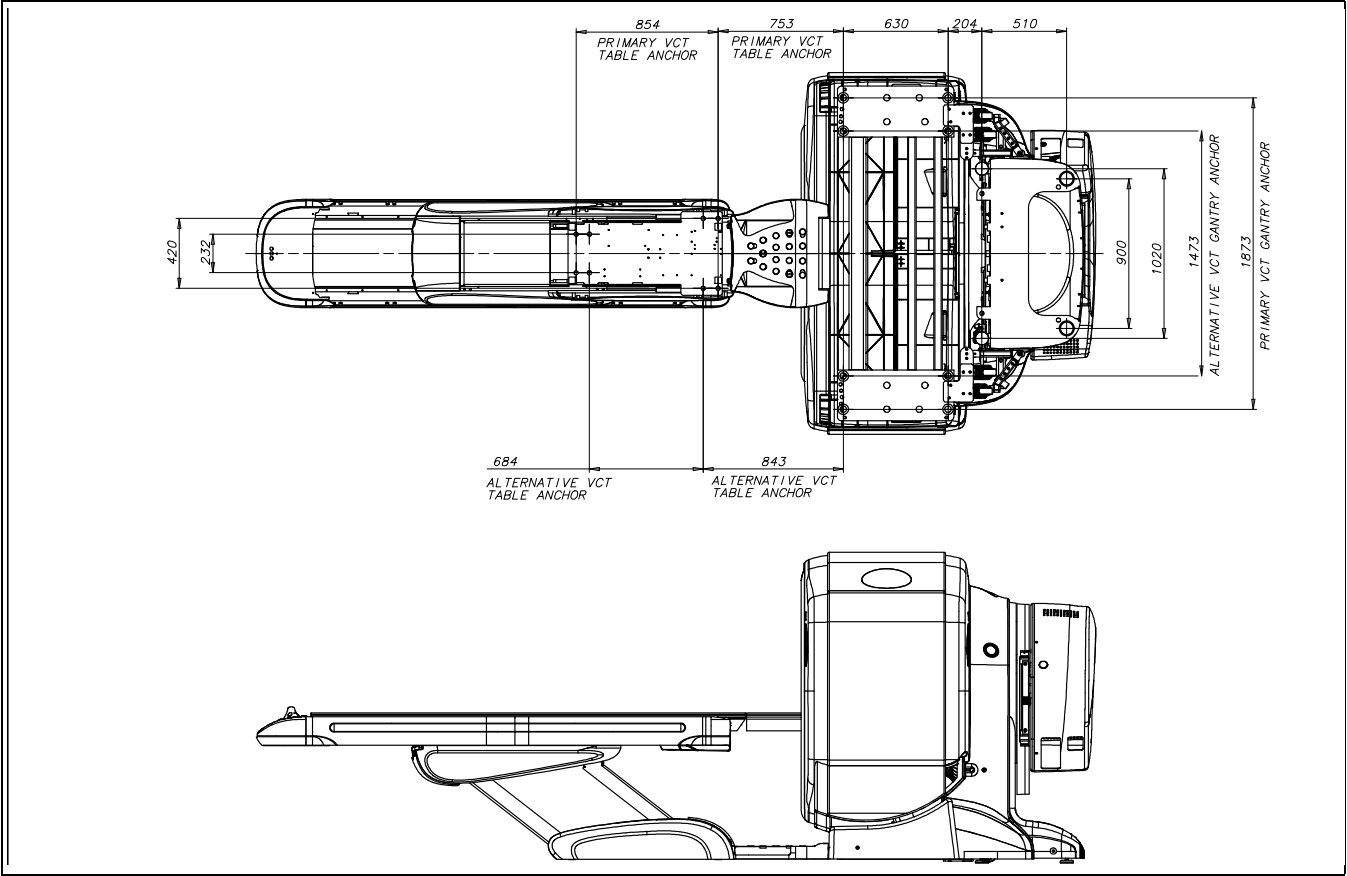


Figure 4-2 Dimensions and Weight Distribution Diagram

4.5.3 Leveling and Flattening the Floor Area

Important

Floor Levelness Specification are shown in Section 8.4 of the VCT LightSpeed 7.X PIM

4.6 System Cables

All system cables are routed in conduits below floor level, excluding the IPS-NM gantry cable and the IPS main power cable.

4.6.1 Cable Lengths and Connections

Cable Name	Cable Length	Cable Connections
530c System power cable	5 Meter	IPS to main distribution box
530c Gantry to IPS cable	4 Meter	Between Gantry and IPS
530c to VCT communication cable	3 Meter	RJ45 to RJ45
530c GCU to 530c PC communication cable	15 Meter	RJ45 to RJ45
530c -VCT signal cable	26 Meter	D type 9 pin connector to D type 9 pin connector
530c -VCT ECG cable	24.5 Meter	RJ45 to RJ45

Chapter 5 – NM Power Requirements

5.1 Introduction

5.1.1 Integrated Power Supply (IPS)

The Integrated Power Supply (IPS) supplied with the NM system transforms and distributes power to the NM gantry. The IPS receives its power from the VCT PDU (Power Distribution Unit)

The IPS must be connected to the CT PDU using the Electrical kit (20A CB, terminals block and cables supplied with the NM/CT electronic Kit.

In addition sufficient regular AC Electrical Outlets must be provided to power peripherals and other scan room equipment.

Recommendation:

- Two outlets close to the IPS
- Two outlets behind the gantry for service purposes

5.2 System Input Power

5.2.1 Power Source Configuration

The NM system is designed to operate on a single-phase power source.

A protective disconnect device must be provided in the power line supplying the IPS. It must be visible to system service personnel, and must have "lockout / tagout" provisions.

5.2.2 Rating

The NM component operates on single-phase power meeting the following specifications.

Line Voltage Requirements	115V/AC 20A 230V/AC 10A
Voltage Tolerance	+10%, -5% from nominal
Load Regulation	Maximum 5% for load of 20A
Frequency	50 or 60 Hz \pm 1Hz
Power Ratings	1.9 kVA

Spikes Line to Neutral		
Spikes	Phase Voltage	
	230 V Line	115 V Line
Spike "A"	< 1200 V	< 900 V
Pulse Width	< 10 μ s	< 10 μ s
Rise Time	> 1 μ s	> 1 μ s
Spike "B"	< 800 V	< 400 V
Pulse Width	< 100 μ s	< 100 μ s
Spike "C"	< 400 V	< 200 V
Pulse Width	< 200 μ s	< 200 μ s
High Frequency (Line to Neutral)	< 1V RMS 0.15 to 30 MHz	

5.2.3 NM Internal Grounding

The ground wire should be bonded to the distribution panel through which it passes in accordance with local codes.

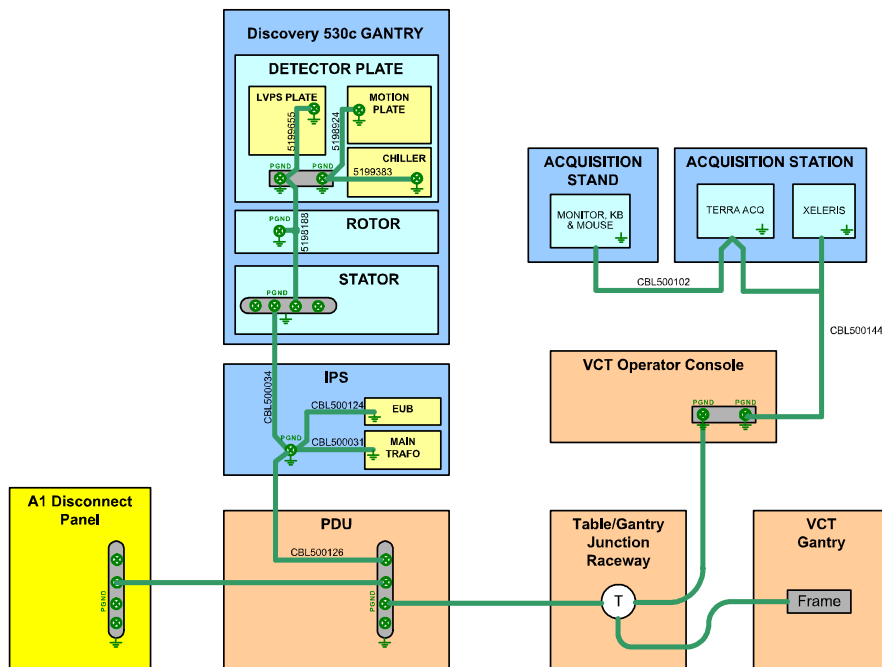


Figure 5-1 System Grounding Distribution

The resistance between the IPS ground and the facility earth ground must not exceed 0.5 ohm. In addition, the total resistance between the IPS ground and earth must not exceed 2 ohms. In the NM/CT system, the NM component is connected to the system main Ground at a single point via the NM/CT main distribution panel (A1) (see [Figure 5-1](#)).

5.3 Recommended Power Distribution System

A dedicated feeder run from the facility main isolation transformer is recommended to power the LightSpeed 7.X CT scanner. If the scanner must be powered from an existing distribution transformer and secondary feeder, such as the equipment distribution panel of an X-ray department, installation with other X-Ray equipment that use rapid film changers should be avoided. These changers use a large number of high powered, closely-spaced exposures, which may coincide with the CT scan and produce image artifacts.

If a dedicated distribution transformer is provided for the scanner, the minimum recommended transformer size is 225 kVA, rated 2.4% regulation at unity power factor. For this configuration, the minimum recommended feeder size and overcurrent protection device based on line voltage is shown in 10-2 Minimum Feeder Wire Size.

In all cases, qualified personnel must verify that the transformer and feeder, at point of take-off, plus the run to the LightSpeed 7.X CT scanner, meet all the requirements stated in this document.

Table 5–1: Cable Specifications

NM Main Power Cable	5252258	<ul style="list-style-type: none"> Length 197" (5 meters) Flexible power cord with 3 wires. Permanent connection to IPS via a Strain relief Plug In connection to A1 Power Disconnect
IPS – Gantry Cable	CBL500189	<ul style="list-style-type: none"> Length 157" (4 meters) Flexible – protected with 35mm conduit capable of withstanding 350N/100mm pressure 40mm diameter Clamps on ends
NM/CT Console Power Cable		<ul style="list-style-type: none"> Length 118" (3m)
IPS – Computer Cable	CBL500144	<ul style="list-style-type: none"> Length 63" (1.6 meter)

5.4 Patient Position Monitor - Optional

The Patient Position Monitor comprises a miniature video camera (attached to the wall) and display screen. The display screen provides a view into the center of the camera bore to allow patient positioning without the operator having to bend over and walk around the system to verify the patient's position.

The Patient Position Monitor is a stand-alone option.

5.4.1 Power Requirements

A dedicated mains power socket, located near to the Patient Position Monitor is required.

Table 5–2: UGP500007 Patient Position Monitor Set

Part Number	Item Description	QTY
5143617	Miniature black and white square camera + AC-DC Adaptor 12V	1
5143621	BNC Male to RCA Male Video Cable, 75ohm, Black long 2M	1
5143619	Patient Position Monitor LCD TFT 15" plus Monitor User Manual	1
5145849	Mini connector mounting on wall for LCD monitors	1
5167271	Camera Holder	1

5.4.2 Identifying Components

The LCD Display Screen - Front View

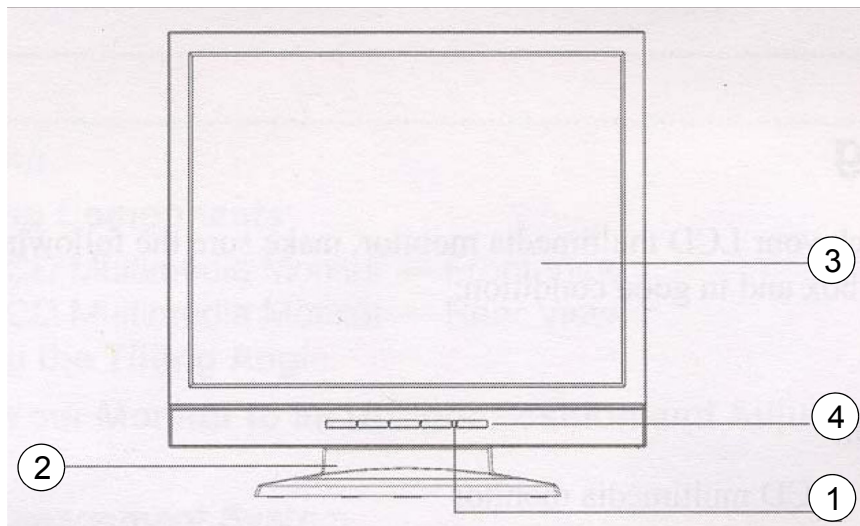


Figure 5-2 The LCD Display Screen - Front View

1	Power-On Indicator This LED indicator stays lit when the power is ON and blinks when the Patient monitor is in Power Saving Mode .
2	Screen Stand
3	LCD Screen
4	LCD Screen Control Panel

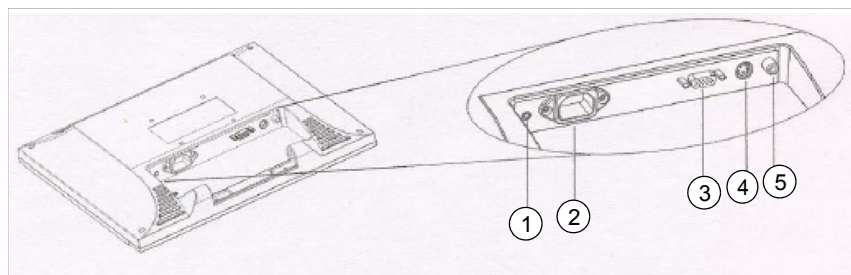


Figure 5-3 The LCD Screen - Rear View

1	Audio Line-in
2	AC Power-In
3	VGA Cable with I5-Pin D-Sub VGA Connector (Male)
4	S- Video connector
5	AV connector

5.4.3 Patient Position Monitor - Camera Connections

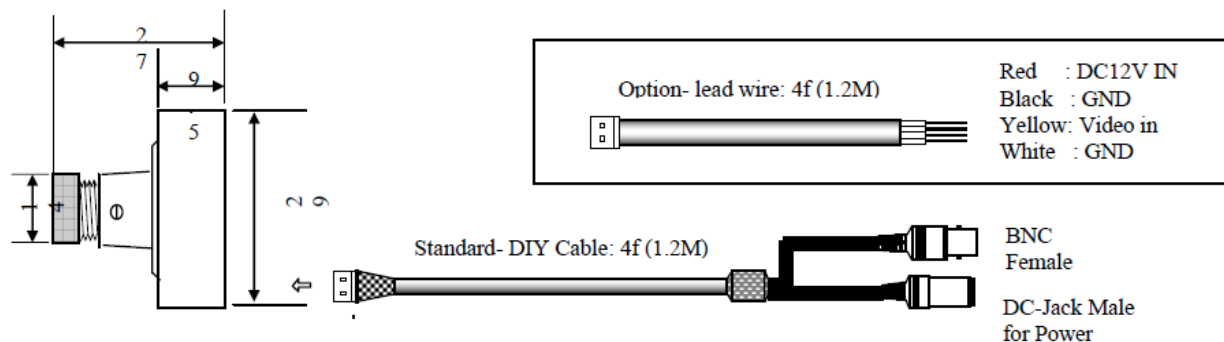


Figure 5-4 Patient Position Monitor Camera Connections

1. Use the “BNC Male to RCA Male Video Cable” to plug the BNC Male side to the BNC Female side
2. Plug the RCA side to the AV connector in the monitor as show in [Figure 5-4](#)

Chapter 6 – Environmental Conditions

6.1 Recommended Site Environment Specifications

Each system module comprises numerous electronic and mechanical components, which are sensitive to extreme temperatures, humidity, dirt and air pollution. The operational environment of any Nuclear Medicine system inevitably has a noticeable effect on its reliability. High temperatures increase the failure rate of almost any electronic component. Temperature cycling may induce temporary or permanent changes in electronic equipment and/or mechanical components and can influence the performance of the system. Fast temperature changes can cause physical damage to the system. Unfiltered air in the room can cause damage to the hard disk or optical disk, etc.

Therefore, the units of the Imaging System should be installed only in a clean, dust-free, temperature-controlled environment, as specified in [Table 6-1](#).

Table 6-1: Environment Specifications

PARAMETER	REQUIRED ENVIRONMENT SPECIFICATIONS
Temperature	18 - 26 °C (64 - 79 °F)
Maximum Gradient	3 °C / hour (5.4 °F / hour)
Humidity	40 - 60% RH non-condensing

In addition to the specifications listed in [Table 6-1](#), free flow of air is required around the Computer. The Scan Room temperature and humidity are influenced by such factors as volume, temperature, humidity and flow pattern of incoming room air.

Operation is guaranteed up to 27 °C (81 °F). When designing the equipment control system, it should be noted that system cooling is required even in winter months.

Many sites have shut down their cooling facilities in the past and have used external atmospheric air to cool the system. The use of external cold air must be carefully controlled, to correct the temperature, humidity and air cleanliness levels, and ensure proper operation of scanner system.

6.1.1 Ventilation (Gas) Studies

If the NM system is going to be used for ventilation (gas) studies, provision must be made for air extraction, as contaminated air near the detector may affect image quality

6.2 Thermal Loads

The following thermal loads are relevant to the site environment:

- Equipment heat dissipation
- Room heaters and lights
- Number of persons in the scan room
- Dissipation through walls, ceilings, floors, doors, windows
- In addition to the VCT LightSpeed 7.X thermal load (described in the VCT PIM ~56k BTU/H / ~16,400 W) there is the thermal load of the NM system without the patient table (~4000 BTU/H / ~1100W) the total load is 60,000BTU/H / 17,500W

Table 6–2: NM Component Thermal Loads

Equipment	Watts	BTU/Hour
Gantry	630	2150
Computer Acquisition	150	510
Computer Xeleris	150	682
Monitor	80	273
IPS	60	205
Chiller	300	1020
NM Video Monitor	30W in On state	102 in On state 7 in Off state
UPS (where applicable)	According to manufacturer's specifications	According to manufacturer's specifications
Total	1400	4782

Note

Any additional equipment such as processing station or multi imager should be considered while calculating the total thermal load.

In addition to the heat generation specifications, the amount of heat dissipated through walls, ceilings, and floors due to lighting, air ducting, heating, air conditioning, etc., should also be considered. The number of persons in the Scanning Site any given moment, will also have an effect on heat buildup.

As environmental factors change, varying levels of heat and humidity will be introduced or dissipate. Heating, cooling and humidity control equipment should therefore be used to maintain the required environmental conditions.

In order to maintain a proper air flow, the air conditioning duct arrangement should be planned so that cool air is not directed to the computer and the Gantry. Exhaust or return air vents should be located in the ceiling above the computer system. Air should be supplied by an overhead duct and diffuser or through a low wall system.

In planning the air conditioning installation, space must be provided for camera maintenance and environmental control system. Environmental control system installation plans must be submitted to the Vendor's Installation Department, in order to facilitate complete site planning.

6.3 EMC Compliance

6.3.0.1 Limitation Management

Adhering to the distance separation recommendations will reduce disturbances recorded at the image level but may not eliminate all disturbances. However, when installed and operated as specified herein, the system will maintain its essential performance by continuing to acquire, display, and store diagnostic quality images safely.

6.3.1 Limitations of Use

6.3.1.1 External components

The use of accessories, transducers, and cables other than those specified may result in degraded **Electromagnetic Compatibility** of the System

6.3.2 Installation Requirements & Environment Control

In order to minimize interference risks, the requirements listed below apply.

6.3.2.1 Cable shielding & grounding

All interconnect cables to peripheral devices must be shielded and properly grounded.

Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference.

6.3.2.2 Radiated Emissions

This product complies with the radiated emission specifications CISPR11 Group1 Class A standard limits.

The System is predominantly intended for use, in non-domestic environments, and not directly connected to the Public Mains Network. The System is predominantly intended for use (e.g. in hospitals) with a dedicated supply system, as described in the site preparation manual.

6.3.2.3 Power supply distribution - Subsystem & Accessories

All components, accessories subsystems, systems which are electrically connected to the System, must have all the AC power supplied by the same power distribution panel & line.

6.3.2.4 Stacked components & equipment

The System should not be used adjacent to or stacked with other equipment; if adjacent or stacked use is necessary, the System should be observed in order to verify normal operation in the configuration in which it will be used.

6.3.2.5 Static magnetic field limits

In order to avoid interference on the System system, static field limits from the

surrounding environment are specified below.

Static field must be less than <1 Gauss in Examination room, and in the Control Area.

Static field must be less than <3 Gauss in the Technical Room.

6.3.3 Electrostatic discharge environment & recommendations

In order to reduce electrostatic discharge interference, install a charge dissipative floor material to avoid electrostatic charge buildup.

The relative humidity shall be at least 30 percent.

The dissipative material shall be connected to the system ground reference, if applicable.

6.4 Environmental Tests

6.4.1 Power Source Test

Tests should be performed on site main supplies, prior to the camera installation. The mains tests can be done with a unit Power-line Disturbance analyzer such as “DRANETZ - series 606”. Voltage measurements are as follows:

1. Slow average of mains voltage - $< \pm 10\%$.
2. Surge or sag of RMS voltage - $< \pm 10\%$.
3. Frequency variations - $< \pm 1\%$.
4. Amplitude and duration of spikes higher than 400 V (230 V line), 200 V (120 V line).
5. Ground Conductivity - the resistance between the IPS ground and the facility earth ground must not exceed 0.5 ohm. In addition, the total resistance between the IPS ground and earth must not exceed 2 ohms.

6.4.2 Temperature Verification

Prior to installing the Imaging System, humidity and temperature tests must be performed at the site area. Surveillance requires seven working days on site.

Important

CAMERA WARRANTY AND SERVICE AGREEMENTS ARE CONTINGENT UPON MAINTAINING THE SITE ENVIRONMENT ACCORDING TO ENVIRONMENTAL SPECIFICATIONS.

Temperature parameters are provided in

[Table 6-1 – Environment Specifications on page 6-83](#)

Chapter 7 – Connectivity

7.1 General

The NM/CT LightSpeed 7.X system is designed to be connected to a Local Area Network (LAN) and a Remote Area Network (WAN) in order to transfer studies to Processing & Reviewing (P&R) stations, viewing stations and hardcopy devices. For the LAN, Ethernet connectivity is used, while WAN connectivity is provided via Modem or broadband connection. Both LAN and WAN use the Transmission Control Protocol / Internet Protocol (TCP/IP) or File Transfer Protocol (FTP).

Towards this goal the following must be prepared:

- Three Network connections
- IP Addresses for all three stations
- Insite pre-requisites

Broadband connection, if relevant must be prepared prior to system installation, to ensure that the system can be configured properly without delay.

7.2 LAN Connection

The connection to the LAN is done via an Ethernet Adapter installed in the Acquisition Station. Therefore, the LAN connection must be on the wall next to the Acquisition station, so that the cable is not in the path of operator and patient access to the Table.

The actual connection to the network depends on the physical network media of the hospital, which is normally a Twisted Pair Cable, implementing the 100Base-T standard.

The LAN connection must meet the requirements of the standard used in your hospital or installation area. Consult the hospital network specialist or your local service for specific instructions.

7.3 IP Address

An IP address identifies both the network and the host attached to it. Network IDs for networks that connect to the worldwide Internet are allocated by a central authority, the Internet Network Information Center (InterNIC), while the Host IDs are allocated by the Local Network Administrator.

For Internet connected networks, ask your local LAN Administrator to allocate an IP address for the camera or contact the InterNIC for allocating an IP address space for your hospital/installation area, whichever applies to your site.

For a camera to be connected over an internal network (that does not connect to the Internet), ask your local LAN Administrator, if any, for allocation of an IP address or consult your local service.

For description of the IP Address structure, refer to relevant chapter in the Installation Manual.

7.4 Broadband for Remote Connectivity

For broadband connection, a suitably located connection socket should be supplied.

Serviceability strategy for the NM/CT is based on remote accessibility via Insite over broadband connection.

Important

Broadband connectivity should be ready prior to system installation in order to allow remote service and customer support from Day One of the installation.

The following forms need to be completed to configure the broadband connection:

- [InSite Broadband - Add System\(s\) to a Connected Site on page 7-98](#)
- [Remote Service Broadband - Customer Site Assessment on page 7-95](#)

7.4.1 Remote Service Broadband - Customer Site Assessment

Site Name: _____	FE Name: _____
City, State: _____	FE Phone: _____
Date: _____	FE Email: _____

1. Does your site currently have a persistent (24x7) Internet connection?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2. Is the GEMS Diagnostic Imaging equipment on the Local Area Network and will it be accessible to the Internet?	Yes <input type="checkbox"/> No <input type="checkbox"/>
3. Does your site have a VPN device today?	Yes <input type="checkbox"/> No <input type="checkbox"/>

4. Is the VPN device one of the models below?

Please select the model from the options below."

- ☐ a) Cisco Pix Firewalls
- ☐ b) Cisco Routers
- ☐ c) Cisco 3000 Series (Altiga acquisition)
- ☐ d) Checkpoint Firewalls Software Version 4.1 and higher
- ☐ e) Nortel Contivity Software Version 3.2 or higher
- ☐ f) Redcreek
- ☐ g) Symantec (Raptor) firewalls
- ☐ h) Firebox
- ☐ i) Linux S/WAN
- ☐ j) Sidewinder
- ☐ k) Netscreen
- ☐ l) None
- ☐ m) Other _____

*If None, the GEMS Connectivity Support Team can help determine device compatibility.

5. Does your VPN device support "triple DES" Encryption?Yes ☐No ☐

6. Has approval been given to install this VPN connection? Site Approver's Name _____	Yes <input type="checkbox"/> No <input type="checkbox"/>																					
7. Provide your VPN Installer information. This is the person who will be contacted to schedule the VPN installation. Customer Installer Name: _____ Telephone: _____ Email : _____ Notes: _____ _____ _____																						
8. Field Engineer needs to provide compatible system information. All three fields required: <table><thead><tr><th data-bbox="124 735 263 762">System ID:</th><th data-bbox="555 735 702 762">IP Address:</th><th data-bbox="976 735 1205 762">Gateway Address:</th></tr></thead><tbody><tr><td>_____</td><td>_____</td><td>_____</td></tr><tr><td>_____</td><td>_____</td><td>_____</td></tr><tr><td>_____</td><td>_____</td><td>_____</td></tr><tr><td>_____</td><td>_____</td><td>_____</td></tr><tr><td>_____</td><td>_____</td><td>_____</td></tr><tr><td>_____</td><td>_____</td><td>_____</td></tr></tbody></table>		System ID:	IP Address:	Gateway Address:	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
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<p>If you have questions or need assessment support: Contact your Zone Champ or: HQ Support 1-262-524-5261</p>
<p>If you have questions or need assessment support in Europe: Contact +33-01-30-70-45-92</p>
<p>Once you have completed both pages of this form: Please send it to: Fax# 414-918-4707</p>

7.4.2 InSite Broadband - Add System(s) to a Connected Site

Site Name: _____	FE Name: _____
City, State: _____	FE Phone: _____
Date: _____	FE Email: _____

<p>1. Is this site already connected to GE InSite Broadband? If Yes, Enter the System ID of a device that is already connected via Broadband (this helps validate the site)</p> <p>System ID: _____</p> <p>If No, you are using the wrong form!</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p>2. Update/Confirm the Customer IT Contact information. This is the person who will be contacted to add the new System IP Address to their Encryption Domain.</p> <p>Customer IT Contact Name: _____</p> <p>Telephone: _____</p> <p>Email: _____</p> <p>Notes: _____ _____ _____</p>	

3. Field Engineer needs to provide the new system information.

All three fields required:

System ID:

IP Address:

Gateway Address:

If you have questions or need assessment support:

Contact your Zone Champ or:

HQ Support 1-262-524-5261

If you have questions or need assessment support in Europe:

Contact +33-01-30-70-45-92

Once you have completed both pages of this form:

Please send it to:

Fax# 414-918-4707

Chapter 8 – Site Specifications & Requirements Summary

Gantry / Detectors / IPS	
Gantry Depth	67" (170.2 cm)
Height	73" (185.4 cm)
Width	89.25" (226.7 cm)
Gantry Weight	5483 lbs (2487 kg)
SPECT Detector Configuration	90 degree
IPS Power Dissipation	60 watt; 205 BTU/Hour

Patient Table	
GT2000 Table Length	114.5" (291 cm)
GT2000 Table Top Width	25.6" (65 cm)
GT2000 Table Weight	1250 lbs (560 kg)
Maximum Patient Weight	500 lbs (227kg)

HP Workstation	
HP Workstation dimensions	6.6" x 17.9" x 17.7" (16.8 x 45.6 x 45.0 cm)
HP Workstation weight	33.3 lbs (15.1 kg)

Transport / Installation / Hallway Width (minimum)	
Elevator Load Capacity	>=4850lbs (2200 kg) Including: gantry, dolly and 2 persons inside elevator
Minimum hall width for Discovery to be wheeled around 90° corners	8 feet min corridor width
Clear doorways for moving equipment into building	42" x 82" (106.7 X 208.3 cm)
Recommended hallway width to allow for Gantry to be wheeled through	96" (243.9 cm)

CT Console			
Console Dimensions	Dm	Min	Max
	A	68cm (26.7")	88.3cm (34.7")
	B	68cm (26.7")	80.7cm (31.7")
	C	102cm (40.1")	122.8cm (48.3")
	D	42.6cm (16.7")	63.4cm (24.9")
Console Weight w/ HP & w/o monitors	450 lbs (204 kg)		
Monitor LCD (each)	22 lbs (10 kg)		
Console w/ HP & w/o monitors Width x Depth	48" x 39" (121.9 x 99.1 cm)		

Room	
Optimal Room Dimensions	Recommended: 18'1" x 24'7" (550.0 x 750.0 cm)
Minimum Room Dimensions*	13' 9" x 22' (419.1 x 670.6 cm)
Floor Flatness	Smooth surface < 3/16" (0.5 cm) deviation in any 60" (152 cm) throughout the installation area
Floor Levelness	Within + .125" over 120"
Floor Loading	8211 lbs (includes NM gantry, VCT gantry, GT 2000 table, & PDU)
Door Dimensions (Minimum)	42" x 82" (106.7 x 208.3cm)

Electrical	
Power	3 Phase 380 to 480 VAC 150 kVA
Voltage Tolerance	+10%/-10% from nominal
Load Regulation	Maximum 6% for load of 20A
Frequency	50 or 60 Hz \pm 1Hz

HVAC	
Temperature Range (operation)	64-79 ⁰ F (18-26 ⁰ C)
Temperature Range (storage)	45-104 ⁰ F (7-40 ⁰ C)
Max Temperature Gradient	5.4 ⁰ F /hr (3 ⁰ C /hr)
Humidity	40-60% RH non-condensing
BTU's (incl. Discovery NM/CT 570c & UPS)	63,607