Technical
Publications

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Revision 6

Infinia II with Hawkeye Options
Pre-installation Manual
Nuclear Medicine Imaging System

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NÃO TENTE UTILIZAR O EQUIPAMENTO ANTES DE CONSULTAR E COMPREENDER O MANUAL DE SERVIÇO.
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Revision History

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Chapter 1 – Introduction to Site Preparation

1.1 Overview

This manual will help to bring often overlooked details to the attention of the Project Coordinator. It will also simplify the task of site preparation for a first time Infinia Project Coordinator by outlining the planning procedures required prior to installation and assist the site preparation team with the following:

- 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

This manual also provides the electrical, mechanical and environmental specifications necessary to determine construction requirements and cost evaluation.

It is important that the information contained herein is used in conjunction with the drawings prepared specifically for each site.The equipment and tools required to unpack, convey and install the Imaging System are detailed later in this Manual.

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1.1.1 Purpose

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 a Infinia system

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

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

1.1.2 Prerequisites

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.

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1.1.3 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 Healthcare.

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 Healthcare, 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 planing 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.

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1.1.4 Purchaser's Responsibility

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

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.
- Fitting of cable trays and troughs.
- Installation of lighting.
- Air-conditioning and ventilation, suitable for the Infinia System.
- Fitting of adequate thermal protection devices.
- Installation of electrical conduit, junction boxes, ducting and outlets as required.
- Installation of special leaded wall covering (Hawkeye 4 Option).
- 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.

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- Floor tile removal and replacement in area of table and gantry.
- Floor Requirements

Important If the purchaser intends to use the Infinia II with Hawkeye Options system for the purpose of Aerosol/Gas Ventilation Scintigraphy, special precautions should be taken in accordance with local laws and safety regulations. A meeting should be held with the local Radiation Safety Officer with respect to room planning.

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1.2 Manpower Requirements

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 1–1 and Table 1–2.

Table 1–1: Manpower Requirements - Unpacking, Conveying

Component	Task and Manpower
Gantry	Unpacking: at least 4 persons
	Conveying (with transport wheels) - at least 4 persons: • 1 person to direct the operation • 3 persons (at least) to push the Gantry
Patient Table	Conveying with integral wheels - 2 persons
Collimator Cart	Unpacking: at least 2 persons
	Conveying: at least 2 persons
Hawkeye 4	Unpacking: 1 person
	Conveying: 1 person
	Installing: 2 persons

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Table 1–2: Manpower Requirements - Installation

Procedure	Manpower
System Installation	1 qualified Field Engineer and at least 1 assistant
System Calibration	1 qualified Field Engineer
Acceptance Test	1 qualified Field Engineer
Hawkeye 4 Installation	1 qualified Field Engineer (1 extra person for X-ray Tube installation)
Hawkeye 4 Acceptance	1 qualified Field Engineer

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1.3 Additional Considerations

1.3.1 Advance Information Requirements

Below is a list of information which must be obtained and recorded *prior* to commencement of the system setup. This is usually carried out on the fifth day of Installation.

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

The required information is divided into four groups:

1. System parameters - to be decided in consultation with the customer.
2. Local Area Network (LAN) information - provided by the local network administrator.
3. Wide Area Network (WAN) information - to be decided in consultation with the local network administrator as well as with the network administrators of the remote network.

1.3.2 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 Section B.1 – Crated Components - Weights and Measurements.

From the unloading site, there must be a free path to wheel the units into the installation room or into a lift which will carry them to the installation site. The path specifications are given in Section 3.2. Special facilities must be provided if the units are to be transferred from an unloading site outside the building.

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1.3.3 Cleaning

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.

1.3.4 Work Scheduling

The preparation of a Infinia Suite is much like that of other modalities that involve the installation of a Gantry, Patient Table, and Acquisition Computer.

One 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 the attention of the Project Coordinator and will also simplify the task of site preparation for the first time Infinia Project Coordinator. Check lists are provided in Appendix A to assure that nothing is overlooked.

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1.4 Regulatory Requirements

Every effort must be made to assure safe and efficient installation, and proper operation of the Infinia suite. Prepare the site, and install the equipment in close compliance with all local regulatory requirements.

	CAUTION Infinia uses radioisotopes which are regulated by various governing agencies. You will need to obtain all pertinent 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 Infinia 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 a PET imaging system falls into the category of a facility that must be regulated and monitored by this agency.

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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 which 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

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1.5 Time Schedule

1.5.1 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.

1.5.2 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).

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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.

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1.5.3 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 three working days plus one additional day for installing the Hawkeye 4 option.

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

1.5.4 System Options

The installation time for system options are covered separately in the Service Manuals specific to each option.

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1.6 Site Safety

1.6.1 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.

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1.6.2 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.

1.6.3 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.

1.6.4 Fire Protection

Fire fighting equipment and fire warning systems should be installed on-site, in accordance with local regulations. The equipment must be strategically located, clearly marked and readily accessible at all times. The fire extinguishers must be periodically inspected, and maintained.

Important **Never throw water on an electrical fire.**
For electrical fires a chemical fire extinguisher is recommended.

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1.6.4.1 Using a Fire Extinguisher

1. Hold the fire extinguisher upright and pull the pin out.
2. Stand back at least 10 feet and aim the nozzle at the base of the fire.
3. Squeeze the lever or handle to release the extinguishing agent.
4. Sweep the nozzle from side to side.

1.6.4.2 Types of Fire Extinguishers

Class A Extinguishers will put out fires in ordinary combustibles, such as wood and paper.

Class B Extinguishers should be used on fires involving flammable liquids, such as grease, gasoline, oil, etc.

Class C Extinguishers are suitable for use on electrically energized fires.

Class D Extinguishers are designed for use on flammable metals and are often specific for the type of metal in question.

Important Before trying to extinguish a Class C fire, you must first remove the electrical power source.

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1.6.5 Electrical Protection

1.6.5.3 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.

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1.6.5.4 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 that receive a lot of traffic because not only will it cause someone to trip, but constant traffic will wear out the insulating rubber cover.

1.6.6 Eye and Face Protection

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

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Chapter 2 – System Specifications

2.1 Overview

The Infinia System is made up of five main components:

- Gantry (with Detectors) (see Section 2.1.1)
- Integrated Power Supply (IPS) (see Section 2.1.2)
- Patient Table (see Section 2.1.3)
- Acquisition Station (see Section 2.1.4)
- Collimator Cart (see Section 2.1.5)

This chapter also provides specifications for the Optional UPS (see Section 2.1.7).

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All Hawkeye 4 system components are assembled on the Gantry Rotor.

Figure 2-1 Infinia System Components

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2.1.1 Gantry

The gantry is shipped in a wooden container with the detectors already fitted. The container is designed to provide limited protection against mechanical impact during the shipments. The Gantry covers are shipped in a separate container.

Important All the Cover Screws are located in a plastic bag which is attached to the inside of the cover container.

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Figure 2-2 Gantry Shipping Container

The crated Gantry Weights and Measurements are listed in Table B–1 on page B-2.

Weights and dimensions of the un-packaged system modules are shown in Table 2–1 on page 2-10 and Table B–6 on page B-5.

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2.1.2 Integrated Power Supply (IPS)

The Integrated Power Supply (IPS) is shipped separately and is attached to the Gantry during installation.

Figure 2-3 IPS Shipping Container

Note The IPS packing crate also contains the computer (packed in its own packing material). Refer to Table B–2 on page B-2 for crated weight and dimensions.

Weights and dimensions of the un-packaged system modules are shown in Table 2–1 on page 2-10 or Table B–6.

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2.1.3 Patient Table

The Patient Table is shipped in a wooden container designed to support the table and provide limited protection against mechanical impact.

Figure 2-4 Patient Table Packing Container

The crated Weights and Measurements of the Patient Table are listed in Table B–3 on page B-3.

Weights and dimensions of the un-packaged system modules are shown in Table 2–1 on page 2-10 or Table B–6 on page B-5.

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2.1.4 Acquisition Station

The Acquisition Computer is packed in its own packing material (cardboard box) inside the IPS packing crate.

Refer to Table B–2 on page B-2 for crated weights and measurements.

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2.1.5 Collimator Cart

The Collimator Cart is designed to transport and store two collimators, and is shipped with the collimators attached.

Figure 2-5 Collimator Cart Packing Container

The crated Collimator Cart Weight and Measurements are listed in Table B–4 on page B-3(includes weights for the different collimators).

Weights and dimensions of the un-packaged system modules are shown in Table 2–1 on page 2-10 or Table B–6 on page B-5.

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2.1.6 Hawkeye 4 Components

These components of the Hawkeye option are shipped in four packages:

- X-ray Source assembly
- X-ray Detector assembly
- Mechanical Assembly, Documentation and Software CD
- Motorized Pallet Support

The crated weights and measurements are listed in Table B–5 on page B-4.

Weights and dimensions of the unpacked Hawkeye system option modules are shown in Table 2–2 on page 2-11 and Section B.2 on page B–5.

2.1.7 Optional UPS

The UPS components are shipped in two packages

- POWER^{+} SA UPS
- Battery Cabinet

Weights and dimensions of the unpacked UPS option modules are shown in Table 2–3 on page 2-12.

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2.2 System Components - Weights & Measurements (Unpacked)

Table 2–1: System Components (Unpacked)

Unit	Nett Weight		Nett Dimensions					
			Height		Length		Width	
	Kg	Lbs	cm	in	cm	in	cm	in
Gantry (incl. Detectors 3/8”)	2309[a]	5090.5[a]	168	66.1	103.5	40.8	160	63
Gantry (incl. Detectors 1”)	2327[a]	5130.2[a]	168	66.1	103.5	40.8	160	63
Collimator Cart	65	143	125.7	49.5	90.8	35.7	50	19.7
Collimator LEGP	50	110	69.8	27.5	6	2.4	62	24.4
Collimator LEHR	60	132	69.8	27.5	6	2.4	62	24.4
Collimator HEGP	131	289	69.8	27.5	8.7	3.4	61.6	24.3
Collimator MEGP	103	227	69.8	27.5	7.9	3.1	61.6	24.3
Collimator Pinhole	98	216	69.8	27.5	17.8	7	61.6	24.3
Collimator Pinhole Dummy	50	110	69.8	27.5	6	2.4	61.6	24.3
Ultra High Energy - High Resolution UHEHR	171	376	69.8	27.5	10	3.9	62	24.4

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Table 2–1: System Components (Unpacked) (Continued)

Patient Table and Stretcher	400	882	Raised 86.7	Raised 34.1	250	98.4	70	27.6
			Lowered 56.7	Lowered 22.3				
IPS	48	105.8	41.8	16.5	87.7	34.5	45.4	17.9
Computer	16	35.3	N/A	N/A	N/A	N/A	N/A	N/A

a. If the Hawkeye option is installed, weight is increased by 125.5 Kg (276.7 lb)

Table 2–2: Hawkeye System Integrated Options (Unpacked)

Unit	Weight	
	Kg	Lbs
X-ray Generator Assy.	62	136.7
X-ray Detectors Assy.	27	59.5
Motorized Pallet Support	45	99.2
Hawkeye Covers	56.5	124.3
Wireless Communication Units	5	11

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2.3 Optional UPS - Weights & Measurements (Unpacked)

Table 2–3: Optional Components

Unit	Nett Weight		Nett Dimensions					
			Height		Length		Width	
	Kg	Lbs	cm	in	cm	in	cm	in
POWER+ SA UPS	18	40	56	22	60	24	9	3½
Battery Cabinet	90	198	45	18	60	24	20	8

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Chapter 3 – Unloading, Access and Conveyance

3.1 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 Appendix B. See Section B.1 – Crated Components - Weights and Measurements.

From the unloading site, there must be a free path to wheel the units into the installation room or into a lift which will carry them to the installation site. The path specifications are given in Section 3.2. Special facilities must be provided if the units are to be transferred from an unloading site outside the building.

Note

Step-by-step Unpacking and Conveying instructions are provided in the *Infinia II with Hawkeye Options Installation Manual* which is packed inside the crate containing the IPS and computer.

These instructions may also be downloaded from the Common Document Library, at the following site:

http://olcweb.olc.med.ge.com:8020/servlet/ClientServletProp?REQ=Enter+Documentation+Library

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3.1.1 Cleaning

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 use of a vacuum cleaner, not sweeping.

Note Just before the equipment arrives 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.

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3.2 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 crated system components are given in Table B.1 through Table B–4.

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.

3.2.1 Access Specifications

Section B.3 provides specific details regarding Conveyance Access and Clearance. Refer to the information in the following tables, as applicable:

- Table B–9 - Gantry - Unpacked and Mounted on the Dolly
- Table B–10 - Patient Table - Unpacked and Mounted on the Moving Wheels

Note The Dolly wheels have no braking mechanism.
Do NOT move or leave the Gantry on inclined surfaces.

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Chapter 4 – Physical Planning of the Site

4.1 General

This chapter provides information required for room layout, site considerations and provides the requirements for the Nuclear Medicine Suite.

When laying out the installation room, thought should be given to provide the best possible functional and personnel working conditions.

Evaluate with respect to the room size the best possible relative positioning of the Gantry / Patient Table and PC Acquisition console within the room.

Allow access around the entire Gantry / Patient Table for personnel to move and help with patient positioning, and patient assistance during emergencies. Access to the system by patients confined to hospital beds should also be considered (enough room to maneuver and position the bed).

Bear in mind that the front of the patient table must be moved during the changing of the collimators. Consider where to position the collimator carts (one for each set of collimators) when these are not in use and where to move the patient table front during collimator change.

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Consider cable lengths between system components and the power connections to mains sockets and the position of those sockets.

Note After these provisional site plans are completed, they should be submitted to your GEHC representative for validation.

GEHC accepts no responsibility for installation problems resulting from site plans which have not been approved by GEHC.

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4.2 Selecting the Site

The Nuclear Imaging System requires one room, which will contain the following sub-systems:

- Gantry
- Table
- Computer + Monitor
- Collimator Cart(s)

Separate rooms are recommended for the following utilities:

- Office/Viewing/Processing Room
- Patient waiting room
- Patient preparation room
- Hot lab
- Printing room

Figure 4-1 shows an example of a site layout.

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

- Easy access to Emergency Switch
- Influence of the surrounding rooms (radio active or magnetic sources)
- Influence of the local wireless environment

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- Distance to "hot areas" such as:
  - Hot laboratory
  - Patient toilets
  - Patient waiting/preparation rooms
- Distance from diagnostic area such as:
  - Processing room
  - Viewing room
- If the patient is wheeled in on a bed, facilities should be provided to "slide" the patient onto the Scanning Table.
- Floor loading capacity, as per Section 4.7 and Figure 4-12.

The selection of the Acquisition Station area 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
  - Telephone connection for Modem, if relevant
  - Connection to hardcopy device, if it is to be directly connected to the system
- Feasibility of Emergency Unit installation within operator reach

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Figure 4-1 Example Area Layout

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4.3 Room Size

Examples of typical and minimum room layouts are shown in Figure 4-7, and Figure 4-8, respectively. In the examples shown, the following items are included:

- Gantry
- Table
- Collimator Carts
- Acquisition Station
- Multi Imager
- Operator's Chair
- Emergency Button

When planning your room layout you must take into consideration the clearance area required for servicing the imaging system (see Figure 4-7 and Figure 4-8).

Note **For Systems installed in China Only**

The **room height**, should be minimum 2.5 meters. This height is required for mounting the Crane used to lift and install the Detectors.

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4.4 Operator Safety

4.4.1 Room Shielding

The Infinia II with Hawkeye Options system produces X-ray radiation and involves the use and storage of radio nuclides. Appropriate barriers such as walls, lead-shielded glass, lead shields, etc. must be installed to protect staff from unnecessary exposure to radiation.

Patients become significant sources of radioactivity, therefore consideration should be given to maximize the distance between the patient and operator during the uptake and acquisition phases of scan procedures.

Scatter-room shielding requirements must be reviewed by a qualified radiological health physicist taking into consideration:

- Scatter radiation levels within the scanning room (see Section 4.4.3)
- Equipment Placement
- Weekly projected workloads (#patient/day technique (kvp*ma)
- Materials used for construction of walls, floors, ceilings, doors and windows
- Access to surrounding scan room areas
- Equipment in surrounding scan room area (e.g. film developer, film storage)

⚠	**CAUTION** Specific room shielding requirements should be determined by local regulatory considerations, facility policy and if available, the facility physicist.

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4.4.2 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 (were 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.

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4.4.3 X-ray Scatter Plots

4.4.3.1 Scatter Isocontour Plot for Hawkeye 4

The X-ray Scatter Isocontour Plots shown in Figure 4-2 to Figure 4-5 were created using the following parameters:

- Body phantom
- Slice thickness 4*5mm
- High Voltage – 140kV
- Current – 2.5mA
- 61mAsec/scan - full scan duration time is 24.4 seconds/slice
- H-Mode (2.6 rpm)

Important All scatter radiation measurements have an accuracy of ± 20% due to measurement equipment, techniques and system-to-system variation.

Probe surface was always positioned parallel to the Body Phantom.

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Isodose Contours at 47cm above floor:

The Iscontour levels in the elevation plot are:
15 - 250 MicroGrays per hour (1.5 - 25 mR/hour).

Since half scan time is 14.7 second per slice in half scan, the isocontours levels are 0.0061 - 0.1021 mR/SCAN, respectively.

Isodose Contours at 97cm above floor:

The Iscontour levels in the elevation plot are:
15 - 500 MicroGrays per hour (1.5 - 50 mR/hour).

Since half scan time is 14.7 second per slice in half scan, the isocontours levels are 0.0061 - 0.2042 mR/SCAN, respectively.

Isodose Contours at 147cm above floor:

The Iscontour levels in the elevation plot are:
70 - 300 MicroGrays per hour (7 - 30 mR/hour).

Since half scan time is 14.7 second per slice in half scan, the isocontours levels are 0.0286 - 0.1225 mR/SCAN, respectively.

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Figure 4-2 X-ray Scatter Radiation Isocontours in µGray/hr at 47 cm Above the Floor (Hawkeye 4)

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Figure 4-3 X-ray Scatter Radiation Isocontours in µGray/hr at 97 cm Above the Floor (Hawkeye 4)

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Figure 4-4 X-ray Scatter Radiation Isocontours in µGray/hr at 147 cm Above the Floor (Hawkeye 4)

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4.4.3.2 Elevation Scatter Plot

The X-ray Elevation Scatter Plot shown in Figure 4-5 was created using the following parameters:

- Body phantom
- Slice thickness 4*5mm
- High Voltage - 140kV
- Current - 2.5mA,
- 61mAsec/scan - full scan duration time is 24.4 seconds/slice
- H-Mode (2.6 rpm)

The Iscontour levels in the elevation plot are:
75 - 495 MicroGrays per hour (7.5 - 49.5 mR/hour).

Since half scan time is 14.7 second per slice, the isocontours levels are
0.0306 - 0.2021 mR/SCAN respectively.

The dose rate to the operator when standing at the end of the table, 3.0 m from the scan plane is less then 75 µGray/hr (7.5 mR/hr) + 15 µGray/hr.

The elevation plot used has cylindrical symmetry 180 degrees around the center of rotation axis (from right to left of the COR axis above the floor).

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Figure 4-5 X-ray Scatter Radiation Isocontours in µGray/hr - Elevation Plot (Hawkeye 4)

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4.5 Required Systems Clearances

Consult your local GE Sales and Project Manager of Installation (PMI) about your specific needs. Some possible room size dimensions are shown in the table below.

4.5.1 Room Size Dimensions

Room Options	Size in cm (feet)
Minimum room size	549 (18’0”) x 386 (12’8”)
Typical room size	600 (19’8”) x 400 (13’2”)

For system component dimensions refer to Table B–6 on page B-5 .

For clearance requirements, refer to Table B–1 through Table B–4 in Appendix B.

Consult your local General Electric Project Manager of Installation (PMI) for your appropriate room specifications.

Remember, sufficient Regulatory, Service and Egress clearances must be maintained around equipment for full operation, service and safety.

Cable length is an important consideration in room layout. The system is shipped with standard length cables.

Excess cable length can be stored behind the IPS. Long cable must not be cut or shortened. All NEC 70-E Electrical Regulations must be observed.

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4.5.2 Regulatory and Service Clearances

4.5.3 Regulatory 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):

A diagram of clearance requirements for U.S. regulatory compliance is shown in Figure 4-6. See the clearance tables on the following pages for detailed dimensional clearances.

Please note all systems installed in the United States must comply with all Federal and local regulations.

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

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Figure 4-6 Clearance Requirements for U.S. Regulatory Compliance

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Note The Egress Area can be defined on either side of the system, depending on equipment positioning and space availability.

4.5.4 Regulated Minimum Working Clearance by 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 includes normal system operation as well as service inspection or maintenance.
- For the Gantry and Table, distances are measured from the enclosure, not the finish covers.

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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 the work space 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.

4.5.5 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 and unobstructed space including trip hazards along the path of exit.

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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. GE Healthcare 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 work space measured from floor at the front edge of equipment to ceiling or overhead obstruction(s), 78 inches (1981.2 mm) or height of equipment, which ever is greater.

GROUNDED WALL

Any wall that can be electrically conductive to earth ground. Masonry, concrete, or tile, are considered conductive. Additional commonly found aspects 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

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- 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.

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4.5.6 Typical Room Layout

Figure 4-7 shows a typical (standard) room layout drawing showing location of all basic units for an Infinia II with Hawkeye Options system. Observe that requirements for clinical access, and for peripheral clinical equipment placement, such as storage cabinets, sinks, *etc*., must be taken into considerations during the room layout.

- For General Requirements, see Table 4–2.
- For Service Conditions, see Table 4–3.

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Figure 4-7 Typical Room Layout

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Table 4–1: Typical Room: Dimensions

Room Dimensions	Length & Width	Ceiling Height
Optimal Floor Space	6000 mm x 4000 mm 19’8" x 13’ 2"	2300 mm 7’6"

Table 4–2: Typical Room: General Requirements

- Stationary items (storage, UPS) must fit in vacant area.
- Wheeled items must not interfere with normal operation.
- Underground IPS cabling.

Table 4–3: Typical Room: Service Conditions

- All Gantry servicing is done on the right side as shown in Figure 4-7.
- Patient Table rotates for rear service access, as shown in Figure 4-7.

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4.5.7 Minimum Room Layout

Figure 4-8 shows a minimum room layout drawing showing location of all basic units for a Hawkeye 4 system. Observe that the dimensions given are for installation of the system only, requirements for clinical access, and for peripheral clinical equipment placement, such as storage cabinets, sinks, etc., must be taken into considerations during the room layout.

- For General Requirements, see Table 4–5.
- For Service Conditions, see Table 4–6.

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Figure 4-8 Minimum Layout for System

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Table 4–4: Minimum Room: Dimensions

Room Dimensions	Length & Wide	Ceiling Height
Minimum Floor Space	5490 mm x 3860 mm 18’0" x 12’8"	2300 mm 7’6"

Table 4–5: Minimum Room: General Requirements

- Stationary items (storage, UPS) must fit in blank spaces.
- Wheeled items must not interfere with normal operation.
- Underground IPS cabling.

Table 4–6: Minimum Room: Service Conditions

- All Gantry servicing is done on the right side as shown in Figure 4-8.
- Patient Table rotates for rear service access, as shown in Figure 4-8.

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4.6 Room Layouts

The layout of the system with and without the Hawkeye Option is shown in Figure 4-9 and Figure 4-10, respectively.

The examples include the following items:

- Gantry
- Patient Table
- Collimator Carts
- Acquisition Station
- Printing
- Operator's Chair
- Emergency Button

The room layout for the Infinia with Hawkeye option differs from that recommended for the basic system in two respects:

- Location of the Acquisition Station. This change is required to protect the operator from exposure to X-ray radiation

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- Distance of Gantry from the rear wall:
  - Infinia GP system - 1080 mm (42.5”)

    For systems without the Hawkeye option, clearance of 880 mm (34.65") is sufficient for maximum Stretcher extension. However, the default clearance of 1080 mm (42.5") should be considered wherever possible.
  - Infinia GP with Hawkeye Option
    - Recommended: 1380 mm (54”)
    - Typical Room: 1310 mm (52”)
    - Minimum Room: 1260 mm (49”)

    Clearance of 1380 mm (54") includes maximum Stretcher extension for systems with the Hawkeye option. This is the default clearance. However, the default clearance of 1380 mm (54") should be allowed when possible to enable upgrading the system for future use of the Hawkeye Option.

For system positioning in order to avoid X-ray penetration of adjacent rooms, please refer to Figure 4-2. Note that 10 µGray = 1 mRem.

Note The dose values in Figure 4-2 were measured while scanning a phantom, and represent the dose rate from leakage and scatter from the phantom while X-rays are ON.

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4.6.1 Scan Room Design Considerations

1. When designing the layout of the system inside the scan room, make sure that the Table rotates to its slanted position away from the entrance to the room. This allows for adequate space to place a hospital bed under the Heads of the Gantry.

2. Collimator carts should NOT be positioned on the side of the Gantry to which the Table rotates. This ensures that the Collimator Carts may be moved directly to the Gantry by the shortest route (Collimator Cart footprint is 500 x 900 mm (19.7 x 35.4 inches).

3. The Alignment Point (located on the system axis) must be clearly defined for each site by providing measurements to adjacent walls, either by physically marking it on the floor or by providing a site diagram.

4. When planning your room layout you must take into consideration the clearance area required for servicing the imaging system (see Figure 4-19).

5. If the floor is covered with soft Linoleum, consider ordering the Infinia II floor wheel plate (H2505ZG) in order to prevent damage to the floor when performing the Collimator Exchange procedure.

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Figure 4-9 Example of Typical Room Layout for Infinia GP with Hawkeye Option

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Figure 4-10 Example of a Room Layout for Infinia GP Systems (No Hawkeye)

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Figure 4-11 Example of a Room Layout for Infinia Systems fitted with Hawkeye

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Note

1. Clearance of 1380 mm (54") includes maximum Stretcher extension for systems with the Hawkeye option. This is the default clearance.
2. For systems without the Hawkeye option, clearance of 880 mm (34.65") is sufficient for maximum Stretcher extension. However, the default clearance of 1380 mm (54") should be allowed for, whenever room size considerations permit, to enable upgrading the system to use the Hawkeye option in the future.

4.7 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 4.7.2, to ensure smooth access for loading/unloading collimators and phantoms to/from Collimator Carts and Heads.

Floor preparation differs according to its construction and level:

- Floor preparation of site where the construction is made of concrete and the site is on ground level (and on real ground), or where there is a possibility to cast concrete. This information should be obtained from the structural engineer for the building in which the system is to be installed.
- Floor preparation of site where the floor is made of a thin layer of concrete and is supported by a beam construction. See Section 4.7.1.2 for an example.

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4.7.1 Floor Loading

Important The load-bearing capability of the floor in the scan area is an essential consideration. These calculations should be obtained from the structural engineer for the building in which the system is to be installed.

The floor, under certain circumstances, may require additional reinforcing.
It is recommended to use cast concrete B-300 or stronger.
These decisions should be made by the structural engineer for the building.

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Figure 4-12 Floor Loading

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Figure 4-13 Center Of Gravity (COG) Location

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4.7.1.1 Center Of Gravity (COG) Location

COG LOCATION	A	B
STATIC COG	50	125
DYNAMIC COG	30	170

The Static and Dynamic Loads of the gantry on the floor and the Center Of Gravity (COG) location are calculated for the worst case – Detectors in L-Mode, with Heavy Collimators fitted, stopped during CW rotation in 3 o'clock position.

Important For L-Mode, stopped during CCW rotation in 9 o'clock, COG will be **(B)** shifted left from the gantry center (not right as shown on the picture for the 3 o'clock case). So Gantry left side will be more loaded than the right side.

Pad Points Load and Pressure (refer to Figure 4-14)

	Gantry Pads	Pad Area,cm^2	Static Load, kgf	Overall Dynamic, kgf	Static Pressure, kgf/cm^2	Overall Dynamic Pressure, kgf/cm^2
A	Rear Right	105.60	385.64	385.64	3.65	3.65
B	Front Right	105.60	1764.31	2254.31	16.71	21.35
D	Rear Left	105.60	110.18	110.18	1.04	1.04
C	Front Left	105.60	939.86	449.86	8.90	4.26

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Figure 4-14 Pad Points Load and Pressure

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The Scanning Table weighs approximately 400 kg (896 lb.).

The Collimator Cart loaded with two Collimators weighs between 170 to 430 kg (375 - 950 lb.), depending on the Collimators' type.

The entire room floor must tolerate the load of the loaded Collimator Cart.

The floor loading areas for the Gantry, Table and Collimator Carts (floor loading areas A, B, and C, respectively) are shown in Figure 4-1.

4.7.1.2 Reinforced Area

In situations where the Imaging System is to be installed on ground level and the floor is constructed of concrete, a suitably-reinforced area must be prepared.

It is recommended that the reinforced area be of cast concrete B-300 or stronger. The size and shape of the area should be in accordance with that shown in Figure 4-1.

Additional information should be obtained from the structural engineer for the building in which the system is to be installed.

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4.7.2 Leveling and Flattening the Floor Area

Important No fill material should be used to compensate for holes or depressions in the floor surface. If necessary, level and flatten the entire floor area. See Section 4.7.2.1.1.

The scan room floor must be leveled, and its surface must be smooth. Any deviation in levels will have a detrimental effect on the Table-to-Gantry alignment which may effect collimator exchange.

It is recommended that the floor in the entire room will be leveled and flattened, according to the specifications given in Section 4.7.2.1.1. If this is not possible, it is imperative that the system installation area (inside the dotted lines - see Figure 4-12) is leveled and flattened. The dimensions are shown in Figure 4-12.

Upon completion of the installation area, verify the surface flatness (of the entire area), using a straight edge of 150 cm (5’) in length (or longer).

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Leveling specifications are listed in Table 4–7.

Table 4–7: Floor Leveling Specifications

Floor Leveling Area	14’ X 16’ (427 cm x 488 cm) minimum
Slope	Within ± $1^{3}/_{16}$” over 170” (± 3 cm over 430 cm)
Flatness	Surface should be smooth and have no more than 3/16” (0.5 cm) deviation in any 60” (150 cm) throughout the room or system installation area
Floor Surface	Floor should have one single poured surface.

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4.7.2.1 Floor Checking Procedure

This procedure provides details on how to verify that the floor is both flat and level before system installation is to begin. Measurements should be taken left-to-right **or** right-to-left, front-to-back **or** back-to-front, and diagonally in **either** direction. Refer to Figure 4-15.

Figure 4-15 Measurement Directions

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1. The floor slope should be within ± $1^{3}/_{16}$" over 170" (± 3 cm over 430 cm). Refer to Figure 4-15.

   a. Place laser level on floor.

   b. Make sure that the laser leveling device is absolutely level.

   c. Turn on laser.

   d. Use a ruler to measure the height of the laser light from the floor next to the laser level. (This is reference point on the ruler for all other measurements.) Refer to Figure 4-16.

Note Depending on make and model of the laser level, the beam will be fanned out to form a horizontal line, typically having a spread of 90 .

   e. Keep the laser ON and use a ruler to measure the height of the laser light beam at various points 170” from the laser. The measurement from the floor should be within $1^{3}/_{16}$"(3 cm) of the original laser light reference point. Repeat at various points and directions as shown in Figure 4-15.

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Figure 4-16 Slope Measurement

The floor surface should be smooth and have no more than 3/16" (0.5 cm) deviation in any 60 “. (150 cm) segment in all the room area.
Refer to Figure 4-17.

Any measurements out of acceptable limits are an indication that the floor needs to be leveled with some type of leveling compound.
See Section 4.7.2.1.1 for details.

Figure 4-17 Surface Flatness

2. Verify surface flatness for the entire room; use a straight edge that is 60" (150 cm) long, upon completion of the room.

Note

No fill material is allowed as a patch to compensate for surface deviations. Patches will eventually crack and pop out.

Where unacceptable deviations exist, the whole room (minimum system area) should be re-surfaced. See Section 4.7.2.1.1.

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4.7.2.1.1 Corrective Action

When the floor does not meet level and flatness specifications, the floor will need to be corrected. The entire area of the room 4200 mm x 4700 mm (14 ft x 16 ft) should be levelled. The GE Field Engineer (FE) performing the inspection must immediately notify the Project Manager of Installation (PMI) of any deviation in specifications. The Project Manager of Installation (PMI) will notify the customer, and together they can work with their contractors, to develop a schedule to correct the floor.

Note It is imperative that this deviation in specifications and its follow-up plan be promptly communicated to all applicable personnel.

It is recommended to use Micorox X-tra Fluid Grout, Mipolam 410, or any other similar material. The materials used to flatten the floor must be anti static.

4.7.3 System Cables

To avoid damage to the system cables, three options are available for cable routing:

- Sunken ducts - usually only possible when the site is on ground level
  See Preparation of Built-in Floor Ducts on page 4-49.
- Under floor - in cases where the floor is supported by beam construction.
  See Under Floor Cable Routing on page 4-51.
- Above ground.

Note It is also possible to route the system cables in ducts above floor level
See Section 4.7.3.2 and Figure 4-19.

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4.7.3.1 Preparation of Built-in Floor Ducts

If floor ducts are **not** going to be used proceed to Section 4.7.3.2

- The Gantry-Table cable must be routed within a duct either beneath or above the floor surface.
- The Gantry-Computer cable should also be routed within a duct, or at least part of it between the Gantry and the near-by wall.
- Ducts built in the floor should be beneath the floor surface, at 75 mm depth, at least.
- The minimum duct width is 70 mm.
- The optional Persistence (P-scope) Monitor can be installed on a mechanical arm attached to any wall in the Gantry room according to the customer requirements. The Persistence Monitor cable of 15 meters length (49.215 ft.) may be routed in a plastic duct attached to the wall.
- An example of locations and measurements of floor ducts is provided in Figure 4-19.

A few recommendations for duct preparation are given below:

1. The Table/Gantry cable must approach the Table from the rear.
2. The duct that will house the Table cable should be accurate in length: 9.5 ± 0.5 meters (31.17 + 1.64 ft.).
3. Building ducts under the Floor Plates should be avoided, except for the Rear Table Plate.
4. Ducts should not be routed under the Gantry.

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Figure 4-18 Recommended Floor Duct Layout

Note

1. Ducts are 75mm (2.95”) deep with a drainage opening.
2. Ducts path should:
   A. Not pass through the system’s footprint.
   B. Be 160mm (6.3”) minimum away from the Gantry base.
3. Inner radius of ducts path: 50mm (1.97”).
4. Maximum length of ducts:
   - Table to IPS: 9 meters (354.33”)
   - Operator to IPS: 7 meters (275.6”)
5. Above scheme does not include:
   A. Cable routing for X-ray indication room entrance to IPS.
   B. Cable routing from monitor to acquisition station.
6. Collimator cart footprint: 500 x 900mm (19.69 x 35.43”)
7. Hatched area in diagram: Cutout section showing one side of Gantry case footprint (see also positioning template).

4.7.3.2 Alternatives to Floor Ducts

In situations where floor ducts are not used:

4.7.3.2.1 Under Floor Cable Routing

1. Drill through the floor
2. Route the cables beneath the floor securing the cables at intervals along the way. Cable trays may also be used.

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4.7.3.2.2 Above Ground Cable Routing

A diagram detailing the above ground cable layout is shown in Figure 4-19.

Figure 4-19 Above Ground Cable Layout

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Chapter 5 – Electric Installation Requirements

5.1 Voltage Requirements

The Infinia II with Hawkeye Options System is adaptable to the following international types of Mains power supplies:

- **3- phase 400V to 415V plus Neutral and Ground, Star connection.**

  OR

- **3- phase 208V Neutral and Ground Delta connection.**
- The Infinia Input Transformer is connected according to the available mains.

Note For site power requirements, see Section B–5 and Table B–12.

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5.2 Power Requirements

Power consumption is 4.2 kVA (including Hawkeye Option), 3.6 kVA (without Hawkeye Option). Maximum load (current) is:

- 15 A per phase in case of three-phase star, 400 V AC line voltage (3 x 230 V for Europe), 20 A Circuit Breaker.
  In-rush current/phase, 30A for 15 m sec.
- 17 A per phase in case of three-phase delta, 208 V AC line voltage (3 x120 V for USA), 20 A Circuit Breaker. (For systems with UPS see below).
  In-rush current/phase, 60A for 12 m sec.
- The circuit breaker should support the In-rush current and be capable of withstanding the short circuit current available. It should be the Thermal-Magnetic type.
- If a UPS is installed, refer to the requirements of the UPS manufacturer. See Section 5.3.9.

The power source must be independent of all other loads.

The three-phase power must be dedicated circuit and include the following:

1. **Permanent - not plug-in connection.**
2. The connection must include THREE PHASE lines, NEUTRAL line and INSULATED Ground line. The Ground wire is the same as or larger than the power wire.

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3. The connection must include an ON/OFF switch, 3-pole 600V rated for the appropriate current, with phase indicator for each phase, located at the Mains power supply box mounted on the wall. The type of ON/OFF switch should be determined by a local specialist according to local regulations (US code requires a lockable switch). If this switch is under a decorative or protective cover, the label will be on the cover underneath the Main Switch. The switch or covers shall not be locked and the switch will be reachable for operators or service engineers.

   In addition, the camera room should have several single phase wall outlets to be used for connection of general use. The location of these outlets depends on the specific site equipment and room layout.

	CAUTION For minimum noise and interference, the electrical power to Infinia must be independent from other non-system electrical equipment.

The Gantry - Computer cable is terminated by a 3-outlets power box. One outlet to connect the computer, one to connect to the monitor and one free. The free outlet provides maximum 5 A.

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5.2.1 Power Circuits

1. The Infinia system has one non-detachable, 5-conductors power cable:

Wires:	5 x AWG 10 (6mm sq.)
Diam:	15 mm
Length:	9 meters
Connection to 3-phase Mains: (permanent NOT plug-in)	• 3-phase Mains • Neutral • Ground • Crimped terminal lugs (1/4” holes), nuts, washers and spring washers

2. Other power cables:

Table electrical cable:	• Connected to Gantry • Length: 11 meters • Flexible - protected with 35mm conduit capable of withstanding 350N/100mm pressure • 40mm diam. clamps on ends

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Computer electrical cable:	• Connected to Gantry • Length: 9.5 meters • Flexible - protected with 35mm conduit capable of withstanding 350N/100mm pressure • 40mm diam. clamps on ends

3. Additional Mains wall outlets:
   - Several additional single-phase 5A outlets for service engineer use. These are fed from the same Mains as the Infinia circuit breaker.
   - Other mains outlets for clinical staff use are also fed from the Power Mains. However, it is recommended to separate these or mark them with a different color. Their Ground will be the same as for the whole room PE (Potential Equalization).

5.2.2 Grounding Requirements

The Infinia System is connected to Ground at a single point (see Figure 5-1). This point will be on the wall as a Ground Bus with a connection to a 5/16” hole Terminal Lug with a 1/4” screw, flat washer, spring washer and nut.

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Figure 5-1 System Grounding and Power Distribution

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Note The wall GND point is the patient room PE point, which is the Potential Equalization point.

The frame ground of the Patient Table and the frame ground of the Computer are connected to the IPS frame ground to form a common ground. The Gantry frame ground is connected via the main ground screw to the main IPS ground. System grounding and power distribution are shown in Figure 5-1.

5.2.3 Additional Information

1. **Line Conditioner and/or a Lightning Arrestor -** may be required to meet the above power requirements.
2. Customers should consider the advantages of raised flooring, conduits, floor ducts and surface raceway for running cables in accordance with local codes.

⚠	**CAUTION** Whenever possible, keep power cables away from signal and data cables.

3. Missing Line phase or Over-voltage spikes will not endanger the system, but protection against these events is recommended.

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⚠	**WARNING** The Infinia has an isolated transformer which is the only power input to the system. Therefore it is strictly forbidden to connect any electrical equipment not authorized by GE Healthcare to the system.

4. **Power Audit -** A site power audit is required for the Infinia product.This site power audit can be arranged with the GE Healthcare Power Quality team, or through your sales person. A sample audit form is located in Section A.4 on page A–14.

5. **Power line analyzer** - should be used to check the proposed Infinia site power for average line voltage, surges, sags, impulses, frequency and microcuts. A period that includes two weekends should be used to simulate several days of normal use. Analysis of the data and site history of any previous power problems with other X-ray systems or computer installations should be reviewed with your Power and Ground representative. Verify "brown-out" (low voltage) conditions which may occur during summer months will not exceed the allowable range, as shown in Table B–12 on page B-11 .

   Some analyzer models which are suitable for power line monitoring are:

   - Dranetz Model 658
   - Dranetz Model 656
   - Dranetz Model 626 with 6003, 3-phase AC monitor option
   - BMI 3630
   - RPM

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5.3 Requirements for Installing Optional UPS

5.3.1 Purpose of the UPS

The UPS is designed to isolate the load from any interruption in the power line, including spikes, over and under voltage and black out, by supplying continuous sinewave voltage at a fixed frequency. In case of blackout, the UPS will power the equipment for a period of time.

	WARNING Only an authorized electrician may wire the UPS power connections. Do not attempt to wire any of the power connections on your own

Important Electrical codes may vary according to location. Observe all local, state, and federal electrical codes for acceptable external wiring practices.

	CAUTION If the UPS is not installed according to the instructions in this manual, it may interfere with radio communications equipment. The UPS has been tested and found to comply with the limits for a Class A computing device pursuant to Part 15 of the FCC rules, which are designed to provide reasonable protection when operated in a commercial environment.

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5.3.2 Major Subsystems

The device consists of the following modules:

5.3.2.1 Charger

POWER^{+} SA includes a 3-phase charger with PFC.

5.3.2.2 Batteries

The POWER^{+} SA battery bank is used as a backup in the event that the utility AC input fails. The batteries are housed in an external cabinet next to the POWER^{+} SA cabinet. Batteries are charged by the rectifier/charger, which supplies both the inverter and the battery charger.

5.3.2.3 Inverter

A 3-phase PWM (Pulse-width modulation) inverter is connected to batteries by a classic DC link.

5.3.2.4 Static Switch (ST/ SW / BYPASS)

The Static Switch enables an automatic transfer of the load from the output of the inverters to an alternate source whenever the inverter can no longer supply power to the load. The static switch transfers current at high speed.

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5.3.3 Installation Considerations

1. Use the shortest possible output distribution cable runs at the installation site. Make sure that the cable run is consistent with logical equipment arrangements and complies with NEC and local electrical codes. Allow space for additional future equipment.
2. The recommended ambient temperature for operation is 20-30°C (68-86°F). Humidity must be less than 95% non-condensing. In altitudes above 2000 meters (6560 feet), the UPS rating will be reduced.
3. Place electrical equipment (load, computer monitor, etc.) at least one meter away from the UPS.

Note Refer to Section 2.3 for information regarding the cabinet size and weight.

5.3.4 Connections

The terminal connectors are located on the rear side of the UPS and may be accessed only after removal of their protective cover with a screwdriver.

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5.3.5 Protective Earth

The protective earth terminal of the UPS should be connected to the protective earth terminal of the IPS

Figure 5-2 UPS Rear Panel Terminal Connections

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5.3.6 UPS Location Options

Figure 5-3, and Figure 5-4 show the options available for positioning the UPS

Figure 5-3 UPS Located Outside the Scan Room

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Note The UPS may be installed in any convenient location inside the Scan Room as long as it is **not** within the dotted line which defines the Patient Area in Figure 5-4.

Figure 5-4 UPS Inside Scan Room

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5.3.6.1 Considerations

1. As with all electrical equipment, installation and serviceability will be easier if access is provided on all sides of the equipment.
2. Verify adequate clearance around cabinet to allow unrestricted exhaust air to flow, minimum 20.3 cm (8 inches).
3. Verify that the UPS system is installed in a clean, cool, and dry location.

Figure 5-5 Site Connection Block Diagram

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5.3.7 Wiring Schematic for UPS Connection to Mains Power

Figure 5-6 shows the typical wiring schematic. There may be slight variations depending on local regulatory requirements.

Figure 5-6 Site Connection Schematic

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5.3.8 Electrical Wiring to UPS

1. Only cables rated in accordance with the values shown in Table 5-1 on page 5-18 may be used. This table complies with NEC requirements. (Verify that the grades specified are in compliance with your local electrical codes.)

2. The power wiring must be run in a separate, individual conduit or cable tray. Verify that control wiring is run in an individual separate conduit.

3. Verify that all power lines coming into the POWER$^+$ SA are equipped with circuit breakers rated according to the values shown in Table 5-1 on page 5-18 .

4. Refer to the site connection block diagram in Figure 5-5 and the site connection schematic in Figure 5-6 for reference as you proceed.

5. For detailed instructions on connecting the UPS to its environment, see the POWER$^+$ SA User Guide (supplied).

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5.3.9 Electrical and Wiring Requirements

Table 5-1: Ratings and External Wiring Requirements

Ratings & External Wiring Requirements For The POWER+ SA, 3:3 Phase, 10 Kva, 60 HZ GE Model						
Basic unit ratings at full load		**kW**	**VOLTAGE (Volts)**	**CURRENT (Amps)**	**Conductor SIZE**	**TERMINAL**
AC INPUT	**AC Input to UPS** Full Load Current 3, Gnd, N, L1, L2, L3	-	208	28	(5) x 8 AWG	50 A, 600 V, #22-#8 AWG
AC OUTPUT	**UPS AC Output** Full Load Current 3, Gnd, N, L1, L2, L3	8	208	24	(5) x 10 AWG	50 A, 600 V, #22-#8 AWG
PE GND	**Protective Earth Ground-**	-	-	-	(1) x 10 AWG	Metal screw, 6 mm diameter
BATTERY INPUT	**Gnd, +, N, –**	-	+192, -192	24	(4) x 10 AWG	50 A, 600 V, #22-#8 AWG

5.3.9.1 Required Circuit Breaker Ratings

Line	Circuit Breaker Rating
AC input	35 A

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5.4 X-ray Exposure Warning Lights

The Infinia provides the ability to power a series of exposure warning lights, which can be sited at the entry points to the scan room. Power is applied to the designated outlets on the rear gantry panel when the X-rays are ON. The light fittings are not part of the Infinia and should be procured by the customer. The external wiring to the lights is also not part of the Infinia.

5.5 Exposure Light Specifications

- Voltage: 24 V AC
- Current: Up to 2 A
- Fuse: 2.5 A S.B.
- Cable Connector: P2 “PHoenix Contact” PC 4/5-ST-7.62; No.18-04-93-3
- Housing: “PHoenix Contact” KGG-PC 4/5-F; No.18-37-34-0
- Location: “Header is located on the IPS Front Panel - J2 Hawkeye” shown in Figure 5-1.

Note The system provides active 24V AC output to the exposure warning light. The customer should provide passive light bulbs that can receive direct 24V AC input from the system.

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5.6 Exposure Lights Cable

- The customer should provide a cable to the light fitting.
- The cable should have 3 wires, (GND Wire - Green/Yellow color).
- The nominal cross-sectional area of conductors of the power supply cords should not be less than 0.75 mm^2 Cu, and insulation 600 V.

Note For systems with Hawkeye Option only.

5.7 X-ray Exposure Interlock

To prevent accidental exposure of someone entering the scan room when X-rays are ON, provision for an interlock system is made. When activated, the interlock issues an X-ray Disable signal. The interlock switch can be installed on any barrier such as a door, which limits access to the camera room. If the switch is open, the X-rays are disabled.

The interlock switch and associated cabling are not part of the Hawkeye option.

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5.8 Interlock Signal Specifications

- Voltage: 5 V
- Current: 50 mA
- Cable Connector: P2 “PHoenix Contact” PC 4/5-ST-7.62; No.18-04-93-3
- Location: Header is located on the IPS Front Panel - J2 Hawkeye shown in Figure 5-1.

5.9 Exposure Door Switch Cable

- The customer should provide a cable to the door fitting.
- The cable should have 2 wires.
- The nominal cross-sectional area of conductors of the power supply cords should not be less than 0.75 mm^2 Cu, and insulation 300 V.
- The Door Switch Cable should be connected to P2, Pin #4, and #5.

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5.10 Customer’s Responsibility

To ensure a successful installation of the Infinia, the customer is required to:

- Schedule a service survey to verify that the system is working properly and meets the prerequisites listed in Appendix A of this manual, ***before*** scheduling the installation of the Infinia.
- Ensure that the camera 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 option, installation tools, and the removed system covers.

Failing to meet the above requirements will prolong the installation period.

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5.11 Inter-Cabling

There are five major cables in the Imaging System, as specified in Table 5–2 below.

Table 5–2: List of Supplied Cables

Cable Type		Length	
		m	ft
Table Cable	(from Gantry to Patient Table)	11.0	36.10
Computer Cable[a]	(from Gantry to Computer)	10.0	32.81
Long Computer Cable (optional)		15.0	49.22
Main Power Cable	(from Power Outlet to Gantry)	9.52	31.23

a. The nominal cable length is 10m (32.8 ft). An optional long computer cable (Part No. H2505ZF) is available; this has an extended length of 15m (49.2 ft)

Note

The optional Persistence (P-scope) Monitor can be installed on a mechanical arm attached to any wall in the Gantry room according to the customer requirements.

The Persistence Monitor cable of 15 meters length (49.215 ft.) may be routed in a plastic duct attached to the wall.

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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 Detector's crystal. Unfiltered air in the room can cause damage to the hard disk, floppy disk drive, optical disk, *etc*.

Therefore, the Imaging System units should be installed only in a clean, dust-free, temperature-controlled environment, as specified in Table B–13 on page B-12 .

In addition to the specifications listed in Table B–13, 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 designed for up to 25 ^{o}C (77 ^{o}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.

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6.2 EMC Compliance

This system complies with IEC60601-1-2 (2nd Edition - 2001) EMC standard for medical electrical equipment. For additional information, see Appendix C – EMC Compliance.

6.2.1 Ventilation (gas) Studies

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

6.3 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
- The thermal loads of the camera main units are listed in Table B–14 on page B-12 .

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

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In addition to the heat generation specifications listed in Table B–14, the amount of heat dissipated through walls, ceilings, and floors due to lighting, air ducking, 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.

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6.4 Environmental Tests

6.4.1 Power Source Test

Tests must 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”. Surveillance requires seven working days on site, on all three phases. Voltage measurements are as follows:

1. Slow average of mains voltage beyond ± 10%.
2. Surge or sag of RMS voltage beyond ± 10%.
3. Frequency variations beyond ± 1%.
4. Spikes higher than 400 V (230 V line), 200 V (120 V line), their amplitude and time duration.
5. Line regulation tests - should be performed after loading each phase (at the point where the camera switchboard will be connected).
6. Ground Conductivity - the resistance between True Ground point and the Electrical connection to the equipment must be less than 1.2 Ohm.

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6.4.2 Temperature Tests

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 the above Specifications

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Chapter 7 – Connectivity

7.1 General

The gamma camera 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 is used, while WAN connectivity is provided via a 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:

- Network connection
- IP Addresses for all stations
- Insite pre-requisites
- Telephone line for modem connectivity, if relevant
- Broadband connection, if relevant

In addition, network information, hardcopy devices data and DICOM data must be prepared prior to system installation, to ensure that the system can be configured properly without delay. Refer to Chapter 2 in the Installation Manual for the required information.

An internal wireless communication network is in use for seamless data transmission the between Hawkeye 4 components and the Acquisition Station.

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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 the Collimator Carts, or patient and operator 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 10Base-T standard.

The LAN connection must meet the requirements of the standard used in your hospital or clinic. 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/clinic, 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 Chapter 2 in the *Infinia II with Hawkeye Options Installation Manual*.

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7.4 Telephone Line or Broadband Connection for InSite

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

7.5 Broadband for Remote Connectivity

Serviceability strategy for the Infinia 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 7-4
- Remote Service Broadband - Customer Site Assessment on page 7-6

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

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

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) System ID: _____ If No, you are using the wrong form!	Yes ☐ No ☐

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2. **Update/Confrm the Customer IT Contact information.**
This is the person who will be contacted to add the new System IP Address to their Encryption Domain.

Customer IT Contact Name: _____

Telephone: _____

Email: _____

Notes: _____

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 General Electric Project Manager of Installation (PMI)

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7.5.2 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 ☐ No ☐
2. Is the GEMS Diagnostic Imaging equipment on the Local Area Network and will it be accessible to the Internet?	Yes ☐ No ☐
3. Does your site have a VPN device today?	Yes ☐ No ☐

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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 ☐

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6. Has approval been given to install this VPN connection? **Site Approver's Name** _____	Yes ☐ No ☐

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:

System ID: **IP Address**: **Gateway Address**:

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If you have questions or need assessment support: Contact your General Electric Project Manager of Installation (PMI)
If you have questions or need assessment support in Europe: Contact your General Electric Project Manager of Installation (PMI)
Once you have completed both pages of this form: Please send it to your General Electric Project Manager of Installation (PMI)

7.6 Internal Wireless Network

The purpose of the Hawkeye 4 internal wireless channel is to provide seamless communication between the Data Acquisition System (DAS) devices and the Acquisition Station. This reliable, cost-effective and secure data transfer solution utilizes 802.11g network technology.

The internal Wireless network can operate in an environment that has other wireless devices such as wireless voice over IP (VOIP) phones, personal digital assistant (PDAs) and laptops. In a diverse environment, it is highly recommended to evaluate the local wireless network before installing the Infinia II with Hawkeye Options system.

Because many different wireless devices can be used in the same area, GE Healthcare recommends collecting information about the customer's wireless network and their specific configuration details. Please refer to "Wireless Pre-Quote Survey" see Section 7.6.1.

Both the customer and the vendor's representative should complete this survey.

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7.6.1 Hawkeye 4 Systems 802.11g Wireless Pre-Quote Survey

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Hawkeye 4 Systems 802.11g Wireless Pre-Quote Survey

The purpose of this document is to gather information about the customer's wireless network and address specific configuration details needed to implement these devices on the facility's network.

The first 3 pages are to be completed by the GE Healthcare Sales representative with input from the customer. The ND&I Team representative will complete the assessment portion of the Survey after discussion with the customer. The assessment will document specifics regarding the customer's network and any updates or changes that will better accommodate our devices and ensure proper operation.

This survey form is then sent back to the sales representative with information on compatibility and next steps. It will also be archived on GE Healthcare shared drive with access through Support Central.

Date	_____
Sales Representative	_____
Phone	_____
Customer Name .	_____

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Hawkeye 4 Systems 802.11g Wireless Pre-Quote Survey

Address	_____
City, State	_____
Primary IS Contact	_____
Email Address	_____
Phone	_____
Alternate IS Contact	_____
Email Address	_____
Phone	_____

Upon Completion by Sales Representative, email or FAX to:
General Electric Project Manager of Installation (PMI)

1 of 4

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Hawkeye 4 Systems 802.11g Wireless Pre-Quote Survey

1. Wireless Infrastructure

Does your facility have a WLAN infrastructure, or are you deploying within the next 6 months? ☐ Yes ☐ No

If answered yes,

What are the site existing Access points Type(s):

Manufacturer _____

Model _____

Channel _____

Use _____

Frequency _____

Are there any other wireless devices in the site at close proximity to the Hawkeye 4 intended location? ☐ Yes ☐ No

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Hawkeye 4 Systems 802.11g Wireless Pre-Quote Survey

If answered yes,

What are they?

Cordless Phone _____

Microwave oven _____

Bluetooth _____

Other _____

2. Wireless Security

Is wireless security currently employed? ☐ Yes ☐ No

If yes, please describe:

Authentication (i.e. LEAP, VPN, WPA, etc.): _____

Encryption (i.e. 128 bit WEP, PSK): _____

Access Control (filtering): _____

Other: (i.e. bridge mode): _____

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Hawkeye 4 Systems 802.11g Wireless Pre-Quote Survey

3. Wireless Infrastructure

Total number of Hawkeye 4 systems in site _____

Approx. sq. footage of the intended coverage area for the Hawkeye 4 room _____

Number of Access Points in the intended Hawkeye 4 room & in close proximity _____

4. Wireless Network Usage/Bandwidth

Each Hawkeye 4 wireless bridge assembly has a bandwidth utilization of 3 kb/s. GE Healthcare recommends that the local hospital wireless network be designed such that the local Access Point utilization does not exceed 50% of full capacity

Will this be achievable? ☐ Yes ☐ No

If answered No, what is the local Utilization of the hospital Wireless network: _____

Does the network configuration include QoS or CoS? ☐ Yes ☐ No

Are there any site concerns about RF coverage in areas that the Hawkeye 4 system is to be used? ☐ Yes ☐ No

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Hawkeye 4 Systems 802.11g Wireless Pre-Quote Survey

Have you been provided any of the Wireless LAN documentation including the Wireless LAN Configuration Guide, Wireless LAN FAQ or Wireless LAN Whitepaper? ☐ Yes ☐ No

Other Comments/Concerns: _____

_____

_____

_____

_____

_____

_____

Thank you for your time and input.

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Hawkeye 4 Systems 802.11g Wireless Pre-Quote Survey

Customer Network Assessment

This page is to be completed by the ND & I team after a follow-up discussion with the customer.

Customer Name _____

City, State _____

Reviewed by Network Design and Implementation

Name _____

Date _____

Approved for Final Quote ☐ Yes ☐ No

Infrastucture Details: _____

_____

_____

_____

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Hawkeye 4 Systems 802.11g Wireless Pre-Quote Survey

Recommendations to make wireless network Unity (Hawkeye 4 802.11g) compatible:

_____

_____

_____

Quote Recommendations

☐ Wireless Hawkeye 4 Consulting w/ On-site Support (Quantity (1) per site)

☐ Network Integration Charge (NETWORKING INT = B) (Quantity (1) per site)

Pre-Quote Reference Number _____

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Appendix A – Pre-Installation Checklist

The following checklist should be completed by both the customer and the Vendor's representative. Mark each **Yes** or **No** box, then sign the checklist.

Equipment Arrival Date: _____

Planned Installation Date: _____

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A.1 Site Information Contact Persons

Table A–1: Site Information Contact Persons

Site Name	
Department	
Street	
City, State, Zip	
Country	
Telephone	

System Administrator	
Chief Technologist	
Facilities Engineer	
Shipping/Receiving	
Physician	

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

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

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A.2 Site Checklist

Table A–2: Site Checklist

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

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Table A–2: Site Checklist (Continued)

Ducts	Is installation of the necessary ducts completed?	☐	☐	
	Do the ducts meet the required specifications?	☐	☐	
Emergency Button	Is the planned location of the emergency button easily accessible by the operator?	☐	☐	
Power Requirements	Does the three-phase wall outlet meet the specified requirements?	☐	☐	
	Is the three-phase power line stabilized?	☐	☐	
	Is a wall outlet available for installation tools?	☐	☐	
Environmental Conditions	Are the specified requirements met, considering the system's thermal loads?	☐	☐	
	Is the magnetic field in the camera room less than 1 Gauss?	☐	☐	
Unloading and Conveyance to Installation Site		Yes	No	Comments
Loading Dock	Does the institution have a truck-height (44") loading dock?	☐	☐	
	Can a full-size truck access the truck-height loading dock?	☐	☐	
	If not, will institution arrange for a short truck delivery?	☐	☐	

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Table A–2: Site Checklist (Continued)

Unloading by fork lift:	Does institution have a fork lift with weight capacity to lift a fully crated Gantry?	☐	☐	
	If not, will institution arrange for an appropriate fork lift?	☐	☐	
Unloading by crane	Is an area for crane hoisting planned?	☐	☐	
	Is closing off of this area for the required period of time approved by the authorities?	☐	☐	
	Please provide the following information: Name of rigging company: _____ Contact name: _____ Phone:_____			

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Table A–2: Site Checklist (Continued)

Halls, Elevators and Doors	Are all 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?	☐	☐	
	Can all pathways tolerate the weight of the Gantry mounted on Moving Kit/Wheels?	☐	☐	
	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?	☐	☐	
	Will the Patient Table clear all 90° corners?	☐	☐	
	Will the Gantry assembled on Moving Kit/ Wheels clear all corners?	☐	☐	
	Inclines: Are there any inclines on the route to the camera room?	☐	☐	
	If so, what is the angle of incline			
	Carpet & Tile: Will the camera be pushed across delicate carpets or tiles, requiring floor protection?	☐	☐	

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Table A–2: Site Checklist (Continued)

Unloading and Conveyance to Installation Site (Continued)		Yes	No	Comments
Riggers	If camera can not pass through halls, elevators or doors, a rigging company must be employ. Will a rigging company be hired?	☐	☐	
	If so, please provide this information: Name of rigging company: _____ Contact name: _____ Phone: _____ Attach a copy of the riggers company insurance policy.			
Temporary Storage	Will institution store the crated camera in the department?	☐	☐	
	If not, will institution arrange for delivery on first install day?	☐	☐	

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Table A–2: Site Checklist (Continued)

Existing Equipment Moves	Does the institution want the Vendor to move existing equipment?	☐	☐	
	If yes, list the equipment and its required working conditions. EquipmentWorking Conditions **Note that this may result in additional charges**.			
Networking				
	Are network site name, hostname and IP address defined?	☐	☐	
	Is network cabling and hardware installation complete or has contractor been scheduled to complete work as required?	☐	☐	
	Is a phone line installed for the Modem?	☐	☐	
	If so, the telephone number is:			

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Table A–2: Site Checklist (Continued)

License		Yes	No	Comments
	Does the site have a licenser for the radionuclides used for system calibration (^{99m}Tc)?	☐	☐	
	If not, when will license be obtained?	_____		
	Will customer insure that ^{99m}Tc is available during installation?	☐	☐	
	If Attenuation Correction option was ordered, does the site have a license for handling ^{153}Gd?	☐	☐	
	If Coincidence option was ordered: Has the site license for handling ^{18}FDG or ^{68}Ge?	☐	☐	
	If Coincidence option was ordered: Has the site license for handling ^{131}I?	☐	☐	
	If Coincidence option was ordered, will customer insure that ^{18}FDG/^{68}Ge and ^{131}I are available during the installation?			

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Table A–2: Site Checklist (Continued)

Contact Persons	Is the primary field engineer identified?	☐	☐	
	Is the primary field engineer trained on the equipment?	☐	☐	
	Is the sales representative identified?	☐	☐	
	Is the customer system administrator identified?	☐	☐	
	Is the customer facility coordinator identified?	☐	☐	
General Access	Is the route to the installation room clear, are corridor / elevator requirements met?	☐	☐	
Room Shielding	Was the room shielding, relating to the other rooms and corridors, checked according to the site preparation requirements in this chapter?	☐	☐	
	Is the acquisition station area shielded properly?	☐	☐	

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Table A–2: Site Checklist (Continued)

Room Environments & X-ray Accessories	The Thermal load of the Infinia is 2100W / 7200 BTU/H, does the room meets GEMS environmental specifications temperature and humidity?	☐	☐	
	Is the external X-ray exposure light installed?	☐	☐	
	Is the X-ray Interlock system available and installed?	☐	☐	
	Could the room be locked for the installation period?	☐	☐	
Equipment Receiving	Is the receiving dock identified?	☐	☐	
	Is a pallet truck available locally?	☐	☐	
	Does forwarder supply a pallet truck?	☐	☐	
	Is the equipment delivery route defined / accepted by GEMS and the customer?	☐	☐	
	Is the storage of 3m X 3m area defined in the site?	☐	☐	
	Are all conveying means and architectural changes required facilitating equipment delivery done?	☐	☐	

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Table A–2: Site Checklist (Continued)

Waste Packing	Are there any facilities for the disposal of empty wooden cases, foam blocks and large cardboard boxes?	☐	☐	
Networking	Is network established with site name, host name, Ethernet addresses, and IP address for the workstation?	☐	☐	
Completion Sign Off Pre-installation completed: Date: _____ Customer: _____ Vendor's Representative: _____				

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A.3 Network Readiness Table

Please fill in this table before equipment arrival.

Table A–3: Network Readiness Table

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					

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A.4 Power & Grounding Survey

Table A–4: Infinia Power & Grounding Survey

Customer Name:					
System ID:			Date of Audit:		
Equipment:			Location:		
CONDITIONS/ PARAMETER	VOLTAGE (V RMS)	CONDITIONS/ PARAMETER	VOLTAGE (V RMS)	CONDITIONS/ PARAMETER	CURRENT (A RMS)
Phase A - Neutral		Phase C - A		Phase A	
Phase B - Neutral		Phase A - Ground		Phase B	
Phase C - Neutral		Phase B - Ground		Phase C	
Phase A - B		Phase C - Ground		Neutral	
Phase B - C		Neutral - Ground		Ground	
	Ground Currents to Load:				
Ground Current at MDC (A1) Power off:				mA	
Ground Current at MDC (A1) Power on:				mA	
	Grounding Electrode:				
Location:					
Ground impedance:	Ohms		Current measured:	mA	

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Appendix B – Weights, Measurements & Miscellaneous Requirements

The information in this Appendix is provided in table format for easy reference, arranged in the following topics:

- Crated Components - Weights and Measurements - see page B-2
- System Components (Unpacked) - Weights & Measurements - see page B-5
- Conveyance Access and Clearance - see page B-8
- Site Floor Requirements - see page B-10
- Site Power Requirements - see page B-11
- Environmental Requirements - see page B-12

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B.1 Crated Components - Weights and Measurements

Table B–1: Gantry (Crated)

Unit	Weight		Dimensions					
			Height		Width		Depth	
	Kg	Lbs	cm	in	cm	in	cm	in
Gantry and Detector Heads	2800	6173	209	82	234	92	129	50.8
Covers (with Hawkeye option)	157.5	347	157	61.8	169	66.5	111	43.7
Covers (No Hawkeye option)	130	286.6	119	46.9	169	66.5	106	41.7

Table B–2: IPS (Crated)

Unit	Weight		Dimensions					
			Height		Length		Width	
	Kg	Lbs	cm	in	cm	in	cm	in
IPS[a]	101.5	223.8	101	39.8	114	44.9	63	24.8

a. Crate also contains the computer (packed in its own packing material)

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Table B–3: Patient Table (Crated)

Unit	Weight		Dimensions					
			Height		Length		Width	
	Kg	Lbs	cm	in	cm	in	cm	in
Patient Table	600	1323	127.5	50.2	285.4	112.4	87.2	34.3

Table B–4: Collimator Cart (Crated)

Unit	Weight		Dimensions					
			Height		Length		Width	
	Kg	Lbs	cm	in	cm	in	cm	in
LEGP-35	260	573	146.2	57.6	108	42.5	75	29.5
LEHR-45	280	617	146.2	57.6	108	42.5	75	29.5
MEGP-5	367	809	146.2	57.6	108	42.5	75	29.5
MEGP-6	423	933	146.2	57.6	108	42.5	75	29.5
Pinhole and Dummy	309	681	146.2	57.6	108	42.5	75	29.5

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Table B–5: Hawkeye System Integrated Options (Crated)

Unit	Weight		Dimensions					
			Height		Length		Width	
	Kg	Lbs	cm	in	cm	in	cm	in
X-ray Generator Assy.	107	235.5	61	24	82	32.3	63	24.8
X-ray Detectors Assy.	67	147.7	45	17.7	112	44	82	32
Mech. Assy., Documentation + Software	30	66	80	31.5	60	23.6	70	27.6
Motorized Pallet Support	77	169.8	84	33	88	34.6	63	24.8

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B.2 System Components (Unpacked) - Weights & Measurements

Table B–6: System Components (Unpacked)

Unit	Nett Weight		Nett Dimensions					
			Height		Length		Width	
	Kg	Lbs	cm	in	cm	in	cm	in
Gantry (incl. Detectors 3/8”)	2309[a]	5090.5[a]	168	66.1	103.5	40.8	160	63
Gantry (incl. Detectors 1”)	2327[a]	5130.2[a]	168	66.1	103.5	40.8	160	63
Collimator Cart	65	143	125.7	49.5	90.8	35.7	50	19.7
Collimator LEGP	50	110	69.8	27.5	6	2.4	62	24.4
Collimator LEHR	60	132	69.8	27.5	6	2.4	62	24.4
Collimator HEGP	131	289	69.8	27.5	8.7	3.4	61.6	24.3
Collimator MEGP	103	227	69.8	27.5	7.9	3.1	61.6	24.3
Collimator Pinhole	98	216	69.8	27.5	17.8	7	61.6	24.3
Collimator Pinhole Dummy	50	110	69.8	27.5	6	2.4	61.6	24.3

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Table B–6: System Components (Unpacked) (Continued)

Ultra High Energy - High Resolution UHEHR	171	376	69.8	27.5	10	3.9	62	24.4
Patient Table and Stretcher	400	882	Raised 86.7	34.1	250	98.4	70	27.6
			Lowered 56.7	22.3				
IPS	48	105.8	41.8	16.5	87.7	34.5	45.4	17.9
Computer	16	35.3	N/A	N/A	N/A	N/A	N/A	N/A

a. If the Hawkeye option is installed, weight is increased by 125.5 Kg (276.7 lb)

Table B–7: Hawkeye System Integrated Options (Unpacked)

Unit	Weight	
	Kg	Lbs
X-ray Generator Assy.	62	136.7
X-ray Detectors Assy.	27	59.5
Motorized Pallet Support	45	99.2
Hawkeye Covers	56.5	124.3
Wireless Communication Units	5	11

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B.2.1 Supplied Cables - Types and Lengths

Table B–8: List of Supplied Cables

Cable Type		Length	
		m	ft
Table Cable	(from Gantry to Patient Table)	11.0	36.10
Computer Cable	(from Gantry to Computer)	10.0	32.81
Long Computer Cable (optional)		15.0	49.22
Main Power Cable	(from Power Outlet to Gantry)	9.52	31.23

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B.3 Conveyance Access and Clearance

Table B–9: Gantry - Unpacked and Mounted on the Dolly

Unit	Weight		Dimensions					
			Height		Length		Width	
	Kg	Lbs	cm	in	cm	in	cm	in
Gantry (mounted on Dolly)[a]	2550	5621.8	179.4	70.63	247	97.24	100	39.3
Clearance							**cm**	**in**
Minimum hall width to allow Gantry to be wheeled around 90° corners							180	70.9
Minimum width to allow Gantry to move through doorway 48 in (121.9 cm) wide							260	102.4
Minimum door width							114	44.9

a. Dolly allows for floor clearance of 4.5 cm

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Table B–10: Patient Table - Unpacked and Mounted on the Moving Wheels

Unit	Weight[a]		Dimensions[a]					
			Height		Length		Width	
	Kg	Lbs	cm	in	cm	in	cm	in
Patient Table (mounted on moving wheels)[a]	410	903.9	127.5	50.2	250.5	98.6	87.2	34.3
Clearance							**cm**	**in**
Minimum hall width to allow Patient Table to be wheeled around 90° corners							200	78.7
Path Slope	< 4% (4cm / 100cm; 1.57 in / 39.37in)							

a. Weight and dimensions include the moving wheels

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B.4 Site Floor Requirements

Table B–11: Floor Surface and Leveling Specifications

Requirement	Specifications
Floor Leveling Area	14’ x 16’ (427 cm x 488 cm) minimum
Slope	Within ± $1^{3}/_{16}$" over 170" (± 3 cm over 430 cm)
Flatness	Surface should be smooth and have no more than 3/16" (0.5 cm) deviation in any 60" (150 cm) throughout the room or system installation area
Floor Surface	Floor should be single poured surface

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B.5 Site Power Requirements

The Infinia II with Hawkeye Options system is designed to comply with the IEC-61000-4-5 power requirements.
Power requirements for the installation site must meet these standards.

Table B–12: Allowable Input Voltages/Current Demand

Nominal Voltage	Absolute Range	Current (Amps)		Minimum Standard Overcurrent Protection
		Momentary	Continuous	
400	368-432	137	36	110-A
440	405-475	125	33	110-A
480	442-518	114	30	110-A

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B.6 Environmental Requirements

Table B–13: Environmental Specifications Required

Parameter	Required Specifications
Temperature	20 - 25 ^{o}C (68 - 77 ^{o}F)
Maximum Gradient	3 ^{o}C / hour (5.4 ^{o}F / hour)
Relative Humidity (non-condensing)	40 - 70 %
Magnetic Field in Camera Room	Less than 1Gauss

Table B–14: Equipment Thermal Loads

Equipment	Watts	BTU/Hour
Gantry	2,100	7,200
Patient Table	100	342
Hawkeye Option	420	1438
Computer	460	1,570
Monitor	65	222
UPS (where applicable)	According to manufacturer's specifications	
Total (without Hawkeye Option)	2,725	9,334
Total (including Hawkeye Option)	3,145	10,772

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Appendix C – EMC Compliance

This system complies with IEC60601-1-2 (2nd Edition - 2001) EMC standard for medical electrical equipment.

C.1 General Scope

The System is suitable to be used in the electromagnetic environment, within the limits & recommendations shown in the following tables:

- Table C–1 – Emission Declaration on page C-5.
- Table C–2 – Immunity Declaration on page C-6.

Note This system complies with above-mentioned EMC standard when used with the standard supplied cables.

C.2 Electromagnetic Emission

See Table C–1 – Emission Declaration on page C-5.

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C.3 Electromagnetic Immunity

- Table C–2 – Immunity Declaration on page C-6
- Table C–3 – Immunity Declaration on page C-7
- Table C–4 – Separation Distances on page C-10

C.3.1 Limitations Management

Adhering to the distance separation recommended in Table C–4, between 150KHz & 2.5GHz, 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.

C.4 Limitations of Use

C.4.1 External Components

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

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C.5 Installation Requirements & Environment Control

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

C.5.1 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.

C.5.2 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.

C.5.3 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.

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C.5.4 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.

C.5.5 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.

C.5.6 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.

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Table C–1: Emission Declaration

EMC Emissions Guidance & Declaration for the System		
The System is intended for use in the electromagnetic environment specified below. The customer or the user of the System should assure that it is used in such an environment.		
Emissions Test	**Compliance**	**Electromagnetic Environment Guidance**
RF emissions CISPR 11	Group 1	The System uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
Harmonic emissions IEC 61000-3-2	Not applicable	The System is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Not applicable	

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Table C–2: Immunity Declaration

EMC Immunity Guidance & Declaration for System			
The System is intended for use in the electromagnetic environment specified below. The customer or the user of the System should assure that it is used in such an environment.			
Immunity Test	**IEC 60601-1-2 Test Level**	**Compliance Level**	**Electromagnetic Environment Guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/ output lines	± 2 kV for power supply lines ± 1 kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment
Surge IEC 61000-4-5	± 1 kV line-line ± 2 kV line-earth	± 1 kV line-line ± 2 kV line-earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5% U_T (> 95% dip in U_T) for 5 sec	< 5% U_T (> 95% dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the System requires continued operation during power mains interruptions, it is recommended that the System be powered from an uninterruptible power supply or a battery.
Power frequency (50/ 60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the a.c. mains voltage prior to application of the test level.			

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Table C–3: Immunity Declaration

EMC Immunity Guidance & Declaration for System			
The System is intended for use in the electromagnetic environment specified below. The customer or the user of the System should assure that it is used in such an environment.			
Immunity Test	**IEC 60601-1-2 Test Level**	**Compliance Level**	**Electromagnetic Environment Guidance**

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Table C–3: Immunity Declaration (Continued)

			Portable and mobile RF communications equipment should be used no closer to any part of the System, including cables, than the recommended separation distance calculated from the equation appropriate for the frequency of the transmitter. Recommended Separation Distance
Conducted RF IEC 61000-4-6	3 V_{RMS} 150 kHz to 80 MHz	3 V_{RMS} 150 kHz to 80 MHz	$d = [\frac{3,5}{3}]\sqrt{P}$ (see Table 4)
Radiated RF IEC 61000-4-3 (alternative method: IEC 61000-4-21)	3 V/m 80 MHz to 2.5 GHz	3 V/m 80 MHz to 2.5 GHz	$d = [\frac{3,5}{3}]\sqrt{P}$ 80 MHz to 800 MHz (see Table 4) $d = [\frac{7}{3}]\sqrt{P}$ 800 MHz to 2,5 GHz (see Table 4)

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Table C–3: Immunity Declaration (Continued)

			Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol:

[a] **Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast, and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the System is used exceeds the applicable RF compliance level above, the System should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the System.**

[b] **Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.**

Note These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

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Table C–4: Separation Distances

Recommended separation distances between portable and mobile RF communications equipment and the System			
The System is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the System can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the System as recommended below, according to the maximum output power of the communications equipment.			
	Separation distance according to frequency of transmitter		
	150 kHz to 80 MHz $d = [\frac{3,5}{3}]\sqrt{P}$	80 MHz to 800 MHz $d = [\frac{3,5}{3}]\sqrt{P}$	800 MHz to 2,5 GHz $d = [\frac{7}{3}]\sqrt{P}$
Rated Maximum Output Power (P) of Transmitter Watts (W)	Separation Distance meters	Separation Distance meters	Separation Distance meters
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.69	3.69	7.38
100	11.7	11.7	23.3
For transmitters rated at a maximum output power not listed above, the separation distance can be estimated using the equation in the corresponding column, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. **NOTE 1**: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies. **NOTE 2**: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.			

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Appendix D – Detailed Revision History

This Appendix provides a list of significant changes made in the *Infinia II with Hawkeye Options Pre-installation Manual*.

Table D-1: Changes Compared to Previous Version (Direction 5516775 Rev 5)

Chapter	Section #	Section Name	Comments
General	Minor changes to Document User Interface		

Table D-2: Changes in Direction 5167775-100, Rev 5 Compared to Direction 5167775-100, Rev 4

Chapter	Section #	Section Name	Comments
General	Some graphics updated and improved		
1 – Introduction	*No significant changes*		
2 – System Specifications	2.1.7	Optional UPS	New section
3 – Unloading, Access and Conveyance	*No significant changes*		
4 – Physical Planning of the Site	4.7.1	Floor Loading	Updated
5 – Electric Installation Requirements	5.3	Requirements for Installing Optional UPS	New section
6 – Environmental Conditions	*No significant changes*		
7 – Connectivity	*No significant changes*		

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Table D-2: Changes in Direction 5167775-100, Rev 5 Compared to Direction 5167775-100, Rev 4

Chapter	Section #	Section Name	Comments
Apx A – Pre-Installation Checklist	*No significant changes*		
Apx B – Weights, Measurements & Misc	*No significant changes*		
Apx C – EMC Compliance	*No significant changes*		
Apx D – Detailed Revision History	This Appendix (new)		

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