NM 830 & Discovery NM 630

Pre-Installation Manual

5491539-1EN
Revision 9
US English

Revision History - 830 & D630

Revision	Date	Description of Changes
5491539_r9	May 2022	• Figure 1-1 NM Gantry on Dolly Measurements on page 36 • Table 5-2 Nominal Power Line Ranges on page 83

5491539_r8	March 2021	• New format, typos and minor corrections across manual
		• Updated Table 2-4 Floor Leveling Specifications on page 65
		• Updated EMI and EMC to comply with IEC60601-1-2 Edition 4.0 EMC standard for medical electrical equipment, including:
		  • 3.5 EMI Considerations on page 76
		  • Appendix C EMC Compliance on page 105
		• Table 5-3 Power Supply Requirements on page 83:
		  • Added comment to **Line voltage specifications**
		  • Added **Inrush Current** specifications

5491539_r7	July 2019	• Updated Table 1-1, Components and Clearance — Metric, p.1-11 • Updated Table 1-2, Components and Clearance — Imperial, p.1-13 • Updated Table 2-2, Weight of Components, p.2-18 • Added Figure 2-10: NM Acquisition Computer Center of Gravity Points, p.2-22 • Added section RSVP Requirements, p.6-2
5491539_r6	June 2018	• Added floor slope specifications for Model B table in Table 2-9, under Floor Levelness and Flatness, p.2-103.
5491539_r5	March 2018	• Incorporated NM 830 system into the manual • Added a reference to the global site readiness checklist in Project Coordination, p.1-4. • Reduced room height requirement Ceiling Requirements, p.2-112

Revision	Date	Description of Changes
5491539_r4	January 2018	• Added a reference to the global site readiness checklist in Project Coordination, p.1-4. • Added rigging information in Rigging, p.1-12 • Added a description of the NM Gantry configuration during the transportation in Table 1.3.4, p.1-13 • Added new Center Of Gravity diagram for the NM gantry in Figure 2-44 • Corrected the Pass/Fail values for the example in the Floor Flatness & Slope specification in Table 2-9 • Updated Altitude requirements in Table 4-1 • Modified a typo in the Heat Output specification in Table 4-2 • IN Table 5-13, Sub-system Inter-connection Cables, p.5-26, changed Working Length to Total Length • General: • Fixed previous revision history • Updated the system diagrams to show only one cable duct in the table pivot plate • Modified a typo that removed the detector-less configuration from previous revision
5491539_r3	July 2016	• Updated table and detector weight in Table 1-2, p.1-14, Table 1-5, p.1-19, Table 2-4, p.2-63 • Updated COG values in Figure 2-39, p.2-68, Figure 2-48, p.2-79, Table 2-10, p.2-118 • Updated anchor information in Table 2-5 • Updated center of gravity values in Subsystem Centers of Gravity and Anchoring Points, p.2-118 • Updated the maximum altitude specification in Table 4-1

Revision	Date	Description of Changes
5491539_r2	April 2015	• Ch.1, General System Requirements: • Addition of IMPORTANT note to Detector Head Precautions, p.1-7 Update of corridor width for gantry, and UPS specifications in Table 1-2, Components and Clearance — Metric, p.1-14 and Table 1-5, Components and Clearance — Imperial, p.1-19 Update of corridor width for gantry, and UPS specifications in Figure 1-5: Relative Required Width for Corridor and Scan Room Door to Convey NM Sub-systems, p.1-29 and Figure 1-8: Required Corridor Width for 90° Turns to Convey NM Sub-systems, p.1-32 • Ch.2, Equipment Description and General Construction Requirements: • Addition of head holder to Figure 2-3: System Components, p.2-7 • Removed Fig 2-6 OSHA-compliant Minimum Room • Update of Table 2-1, Components in Scan Room, p.2-26 • Addition of upgrade and safety considerations in 2.2.4 Layout Considerations, p.2-56 • Update of UPS specifications in Table 2-4, Weight of Components, p.2-63 • Update of Figure 2-39: Floor Loading and Center of Gravity Points for Gantry, Table & Cart, p.2-68 • Update of Figure 2-48: Table Center of Gravity Points, p.2-79 • Update of Figure 2-55: Drilling Map, p.2-87 • Update of Figure 2-5: Drilling and Anchor Chart, p.2-89 • Update of Figure 2-67: Patient Table Pivot Floor-Plate Anchoring Holes[15-30-40-5060-70], p.2-102

Revision	Date	Description of Changes	
		• Update of 2.3.1.4 Floor Levelness and Flatness, p.2-103 • Update of 2.3.5 Vibration Specifications, p.2-114 • Update of 2.4 Seismic Requirements, p.2-117 and Table 2-10, Subsystem Centers of Gravity and Anchoring Points, p.2-118 • Ch.4, Environmental HVAC Requirements: • Addition of UPS to Table 4-2, Heat Output in Scan Room, p.4-6 • Ch.5, Electrical Requirements: • Update of transformer size and minimal feeder size in 5.1 Power Feed, p.5-1 • Update of fuse rating in Table 5-12, Power Supply Requirements, p.5-10 • Update of Figure 5-6: Example of Suggested Cable Ducts Routing in Standard Room, p.5-21 • Update of Table 5-13, Sub-system Inter-connection Cables, p.5-26 • Update of 5.6.1 Primary Power Disconnect, p.5-35 • Removal of Cable Wiring Diagram from Chapter 5 • Appendices: • Addition of App.B, Measuring Floor Flatness	
5491539_r1	Sept 2013	Anchor type and hole depth updated	All
5462386_r1	Nov 2012	Creating neutral documents	2-22, 2-24, 2-32
5409274_r1	April 2011	New manual	

Language Policy

DOC0371395 - Global Language Procedure

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ATENÇÃO (PT-BR)	Este manual está disponível em vários idiomas. • Se o prestador de serviços de um cliente necessitar de um idioma diferente dos fornecidos no Portal da Documentação do Cliente, o fornecimento dos serviços de tradução é de responsabilidade do cliente. • Não tente realizar manutenção do equipamento a menos que o manual de serviço tenha sido consultado e seja entendido. • O não cumprimento deste aviso resultará em lesões ao provedor de serviço, operador ou paciente de choque elétrico, mecânico ou outros riscos.
ATENÇÃO (PT-PT)	Este manual está disponível em vários idiomas. • Se o fornecedor de serviços de um cliente necessitar de um idioma diferente dos fornecidos no Portal de Documentação do Cliente, é da responsabilidade do cliente assegurar os serviços de tradução. • Não experimente reparar o equipamento sem primeiro consultar, e compreender, o presente manual de assistência. • O incumprimento deste aviso pode resultar em ferimentos para o técnico de reparação, o operador ou o paciente decorrentes de perigos de eletrocussão, mecânicos ou outros.

ATENȚIE (RO)	Acest manual este disponibil în mai multe limbi. • Dacă furnizorul de servicii al unui client necesită o limbă diferită de cele furnizate în Customer Documentation Portal (Portalul cu documentație pentru clienți), este responsabilitatea clientului să furnizeze servicii de traducere. • Nu încercați să efectuați întreținerea echipamentului decât dacă ați consultat și ați înțeles acest manual de service. • Nerespectarea acestei avertizări poate duce la rănirea furnizorului de servicii, a operatorului sau a pacientului din cauza șocurilor electrice, mecanice sau a altor pericole.
ПРЕДУПРЕЖДЕНИЕ (RU)	Это руководство доступно на нескольких языках. • Если поставщику услуг заказчика требуется языковая версия, отличная от предложенных на портале документации для заказчиков, перевод руководства на необходимый язык осуществляется стороной заказчика. • Не начинайте эксплуатацию оборудования без предварительного надлежащего ознакомления с этим руководством. • Если вы проигнорируете это предупреждение, поставщик услуг, оператор или пациент могут получить механические травмы, травмы вследствие поражения электрическим током или другие увечья.
UPOZORENJE (SR)	Ovaj priručnik je dostupan na nekoliko jezika. • Ako korisnikov serviser zahteva neki drugi jezik osim onih koji su dostupni na portalu sa korisničkom dokumentacijom (Customer Documentation Portal), klijent mora da obezbedi prevod. • Nemojte pokušavati da servisirate opremu ako niste proučili i razumeli ovaj priručnik za servisiranje. • Nepoštovanje ovog upozorenja može da izazove povrede servisera, operatera ili pacijenta kao posledicu strujnog udara, mehaničkih ili drugih opasnosti.
UPOZORNENIE (SK)	Táto príručka je k dispozícii v niekoľkých jazykoch. • Ak poskytovateľ služieb daného zákazníka požaduje jazyk odlišný od jazykov dostupných na portáli s dokumentáciou pre zákazníkov, za prekladateľské služby zodpovedá zákazník. • Nepokúšajte sa vykonávať servis na zariadení, pokiaľ ste si neprečítali a nepochopili pokyny v servisnej príručke. • Nedodržanie tohto varovania môže byť príčinou úrazu poskytovateľa servisu, obsluhy alebo pacienta v dôsledku zásahu elektrickým prúdom alebo v dôsledku mechanických alebo iných nebezpečenstiev.
OPOZORILO (SL)	Ta priročnik je na voljo v več jezikih. • Če ponudnik storitev stranke potrebuje priročnik v jeziku, ki ni na voljo na portalu z dokumentacijo stranke, mora stranka zagotoviti prevod. • Opreme ne poskušajte servisirati, če niste prebrali in razumeli tega servisnega priročnika. • V primeru neupoštevanja tega opozorila lahko pride do telesnih poškodb ponudnika storitev, upravljavca ali pacienta zaradi električnega udara, mehanskih ali drugih nevarnosti.

ADVERTENCIA (ES)	Este manual se encuentra disponible en varios idiomas. • Si el proveedor de servicios de un cliente requiere un idioma distinto de los proporcionados en el Customer Documentation Portal (Portal de documentación para clientes), es responsabilidad del cliente proporcionar los servicios de traducción. • No intente realizar el mantenimiento del sistema a menos que haya consultado y comprendido este manual de servicio. • El incumplimiento de esta advertencia puede causar lesiones al suministrador de servicios, el operador o el paciente debido a descarga eléctrica, mecánica u otros riesgos.
VARNING (SV)	Denna manual är tillgänglig på flera språk. • Om en kunds tjänsteleverantör behöver ett annat språk än de som tillgängliggjorts på portalen för kunddokumentation är det kundens ansvar att erbjuda översättningstjänster. • Försök inte att reparera utrustningen utan att först rådfråga och förstå denna servicehandbok. • Om denna varning inte beaktas kan det leda till skada för tjänsteleverantör, operatör eller patient genom elektrisk stöt, mekaniska eller andra faror.
DİKKAT (TR)	Bu kılavuz birden fazla dilde sunulmaktadır. • Bir müşterinin servis sağlayıcısı Müşteri Belgeleri Portalı'nda sağlananlardan farklı bir dil talep ederse çeviri hizmeti sağlamak müşterinin sorumluluğundadır. • Bu servis kılavuzuna başvurmadan ve içeriğini anlamadan ekipman üzerinde servis işlemi yapmayı denemeyin. • Bu uyarıya uyulmaması; elektrik çarpması, mekanik tehlikeler veya başka tehlikelerden ötürü servis sağlayıcı, operatör veya hastanın yaralanmasıyla sonuçlanabilir.
ПОПЕРЕДЖЕННЯ (UK)	Цей посібник доступний кількома мовами. • Якщо постачальник послуг замовника використовує мову, яку не вказано на порталі з документацією для замовників, послуги з перекладу має забезпечити замовник. • Не починайте роботу з обладнанням без попереднього належного ознайомлення з посібником із використання. • Якщо ви проігноруєте це попередження, постачальник послуг, оператор або пацієнт можуть зазнати механічних травм, ураження електричним струмом або інших тілесних ушкоджень.
CẢNH BAO (VI)	Tài liệu hướng dẫn này có sẵn ở một số ngôn ngữ. • Nếu nhà cung cấp dịch vụ của khách hàng yêu cầu ngôn ngữ khác với ngôn ngữ được cung cấp trong Cổng Thông Tin Tài Liệu Khách Hàng, khách hàng có trách nhiệm cung cấp dịch vụ dịch thuật. • Không cố bảo dưỡng thiết bị trừ khi đã tham khảo và hiểu rõ hướng dẫn sử dụng này. • Việc không chú ý đến cảnh báo này có thể dẫn đến thương tích cho nhà cung cấp dịch vụ, người vận hành hoặc bệnh nhân do điện giật, nguy hiểm cơ học hoặc các mối nguy hiểm khác.

Contents

Figures

Tables

Safety Notices - NM800 & NM600

Safety Labels in This Document

This manual addresses the following safety classifications:

⚠ DANGER

Danger is used to identify conditions or actions for which a *specific hazard* is known to exist, which *will cause severe or fatal personal injury* or substantial property damage if the instructions are ignored.

⚠ WARNING

Warnings are used to identify conditions or actions for which a *specific hazard* is known to exist, which *may cause severe or fatal personal injury* or substantial property damage if the instructions are ignored.

⚠ CAUTION

Cautions are used to identify conditions or actions for which a *potential hazard* may exist, which *may cause minor personal injury* or property damage if the instructions are ignored.

Safety Information in the System Documentation Set

Safety-related Documents

Safety-related and general information is available in the manuals provided with the system as follows:

- ***Service Safety Manual***
  - Spatial orientation
  - Service clearance
  - Service-related safety mechanisms and procedures
  - Service-related safety labels and labels on interior system components (under system covers)
  - EMC and service tools information
- **Information provided within the Operator Manual Set:**

- ***Safety and Regulatory User Guide***
  - Intended use (including medical purpose, patient population and operator profile)
  - General safety warnings and instructions
  - Safety mechanisms and procedures
  - Operator and patient safety during clinical operation
  - Equipment and data safety
- ***System Description and Safety Manual for Operators***
  - Detailed system description
  - System specifications
  - Startup and shutdown procedures
- ***Quality Control Operation Guide***
  - Tests and other QC procedures performed by the operator
  - Daily QC
  - Periodical tests and retuning
- ***Adhesive Labels and Rating Plates User Guides***
  - Labels on the exterior of system components

Indications, Terminology and NM800 & NM600 System Names

Indications

The following indications are relevant for all documents in the Service documentation set.

- The images in this manual are for demonstration only. There may be minor differences that do not affect functionality.
- Some of the described features may be optional, depending on system model/configuration. Whenever items or procedures differ between the different configurations, this is indicated.
- This manual might refer to different hybrid patient table configurations or different gantry rotor mechanics. Whenever procedures differ between the different configurations, this is indicated at the beginning of the procedure.
- When there are system-specific differences, this is indicated using system-specific abbreviations as detailed in:

- NM800 Series - Table 1 NM800 Series on page 22
- NM600 Series - Table 2 NM600 Series on page 22

- **General Terminology:**
  - **NM** is an abbreviation for **Nuclear Medicine**.
  - The terms **NM System**, **Gamma camera** and **Camera** are used interchangeably.
  - **SPECT** stands for Single Photon Emission Computed Tomography.

System Names and Coding for System-Specific Differences

This manual may use the following abbreviations/terms to indicate differences between systems.

NOTE

- To identify the configuration of a specific system, go to **System Configuration** > **Admin** tab and view the information in the **System Information** area (not accessible with Operator login).
- When details are relevant only for a specific model or configuration, the abbreviation will be followed by additional model identification, for example 870CZT.

Table 1 NM800 Series

System full name	NM Detector Technology	Integrated CT Sub-system	Abbreviation
NM800 Series refers to all of the following systems:			**NM800**
• **NM 830**	Single NaI crystal	NA	**830**
• **NM/CT 850**	Single NaI crystal	CT850	**850**
• **NM/CT 860**	Single NaI crystal	CT860	**860**
• **NM/CT 870, including:**			**870**
• **NM/CT 870 DR**	Single NaI crystal	Optima CT540	
• **NM/CT 870 CZT**	Multiple CZT crystals	Optima CT540	

Table 2 NM600 Series

System full name	Abbreviation
NM600 Series refers to all of the following systems:	**NM600**

Table 2 NM600 Series (Table continued)

System full name	Abbreviation
• **Brivo NM 615**	**B615**
• **Discovery NM 630**	**D630**
• **Optima NM/CT 640**	**O640**
• **Discovery NM/CT 670**	**D670(*)**
• **Discovery NM/CT 670 Pro**	
• **Discovery 670 DR**	
• **Discovery NM/CT 670 ES**	
• **Discovery NM/CT 670 CZT**	

(*) D670 systems are available in several models, with different CT devices and/or NM detector technology. In contexts where the specific CT model and/or NM detector technology is relevant, this is indicated as follows:

System full name	NM Detector Technology	Integrated CT Sub-system	Abbreviation / Markings for system-specific material
Discovery 670 DR	Single NaI crystal	Optima CT540	D670-OPT or D670-OPT – Material specific to all D670 systems with Optima CT540 CT sub-system
Discovery NM/CT 670 Pro			
Discovery NM/CT 670 ES			
Discovery NM/CT 670 CZT	Multiple CZT crystals	Optima CT540	D670-OPT – When related to the CT sub-system D670CZT – When related to the CZT NM detectors
Discovery NM/CT 670	Single NaI crystal	Brightspeed Elite CT	D670-BSE – Material specific to D670 with Brightspeed CT

Service Documentation Set

Safety-Related Documents

Name	Additional Details
Safety Manual for Service Users	Part of Service documentation collection. Single manual applicable to all NM800 & NM600 systems.

Name	Additional Details
Operator Guides: • *System Description & Safety Manual for Operators* • *NM Cameras Safety and Regulatory User Guide* • *Quality Control Guide*	Available via the *Operator Documentation set* on the system (via [?] at the NM acquisition station.

Service Manuals

Name	Comments
Pre-Installation Manual *Installation Manual* *Planned Maintenance Manual* *Wiring Diagrams*	Part of Service documentation collection. Separate manuals available per system or group of systems.
System Configuration Manual *Calibrations, Map Creation and System Tests Manual* *Service Utilities Manual* *FRU Replacement Procedures*	Part of Service documentation collection. Manuals are applicable to all NM800 & NM600 systems.
FRU Spare Parts List *Software Installation Manual*	Provided separately

Document Conventions

The following conventions are used throughout the manual:

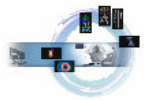
Important

Calls attention to important comments.

NOTE

Contains tips and general comments.

Description	Example
Keys on the operator keyboard, hand-held controller (RCU) or gantry control panels and the gantry	• Press **<SET>** / **<Ctrl>**
Software interface buttons	• Click **[OK]** / **[Apply]** / **[Cancel]**
Names of items in the graphical interface including:	

Description	Example
• Names of dialog boxes, windows, tabs, areas and lists • Menu items • Field and icon labels	• Click **System Setup** (tools icon), then select **Maintenance** > **Utilities** • **To Do List** • **Properties** field
System messages	`Press Y to continue.`
System parameters whose actual values must be defined by the user	Type-in the **`Patient ID`**
Hyperlinks	See Figure 1 Sample Image on page 25
File names or paths	`root/opt/tacqdb/manuals`
References to other documents	*Safety Manual*
Sample Image	**Figure 1 Sample Image** 

Chapter 1 General System Requirements

1.1 Objectives and Overview

This manual provides all information necessary to prepare the site for the installation of the system, taking into consideration the information required for different professionals such as architects, construction engineers, electrical contractors, and all other personnel involved in construction and preparation of the site.

Important

Good site preparation is essential for smooth and efficient installation and for proper functioning of the system. Poor site planning may compromise system efficiency, operator efficiency, operator comfort, and/or patient comfort.

The information provided in this *Pre-Installation Manual* is general in its nature, and must always be used in conjunction with the drawings and specifications prepared specifically for your site.

If the site is considering a future system upgrade, use the pre-installation manual of the intended system type, during site planning. Special attention should be paid to room size, floor requirements, electrical power requirements, cable paths (ducts), and environmental requirements (air conditioning for heat dissipation).

When upgrading a system, the site's power, structure and floor loading requirements must be evaluated for upgrade suitability according to this manual.

1.2 Customer Responsibilities

It is the customer's responsibility to prepare the site in accordance with all the specifications provided in this manual, and in conjunction with the site-specific drawings. It is essential to verify all aspects of the site configuration before construction is started, as subsequent changes can be costly or impractical.

A detailed checklist is provided in Appendix A Customer Checklist on page 92. It is the customer's responsibility to ensure that all requirements in the checklist are fulfilled and the site conforms with all the specifications and requirements in this manual.

The customer is responsible for all aspects of site preparation, including, but not limited to, the following tasks:

- Assigning a project coordinator (see 1.2.2 Project Coordination on page 28)

- Planning and construction or renovations required for installation of the system, in accordance with the specifications included in this manual, including:
  - 2.2 Room Size, Layout and Considerations on page 45
  - Chapter 2 Equipment Description and General Construction Requirements on page 40
  - 3.1 Radiation Protection and Shielding Requirements on page 75
  - Chapter 4 Environmental HVAC Requirements on page 80
  - 5.1 Power Feed on page 82
  - Chapter 6 Network and GE Remote Access Requirements on page 90
- Complying with all national, state, or local regulatory requirements for the country in which the installation occurs, for example:
  - Fire control devices as required by local codes
  - Permits, inspections, radiation licensing etc.
  - Earthquake-related regulations
  - Local regulations for service clearance and egress
- Assuring regulatory compliance for the use of radioactive isotopes and preparation of the required isotopes (see 1.2.1 Using Radioactive Isotopes on page 27)
- Safe storage of the system and auxiliary equipment prior to and during installation
- Floor tile removal and replacement in area of table and gantry
- Ensuring adequate accessibility for all system components and auxiliary equipment to the site

1.2.1 Using Radioactive Isotopes

Since the system involves the use of radioactive isotopes, compliance with Nuclear Regulatory Commission regulations, or similar regulatory requirements (depending on the country), must be adhered to and all permissions obtained well in advance. It is recommended that regulatory compliance is arranged early in the site planning process.

It is essential that all preparations are completed so that required source materials can be obtained prior to installation, including calibration sources. Take into consideration that these sources may have fairly long delivery lead times, yet may also have a short half life, so that it may not be advisable to store them for long periods of time.

The site must provide a list of isotopes in order to coordinate the calibrations plan prior to installation.

1.2.2 Project Coordination

The site project coordinator is the primary contact and liaison between GE and all site-related functions, including the purchaser, the construction planners, architects and contractors, and other site administrative personnel.

To ensure a successful installation, it recommended that the site nominates a single site project coordinator, preferably a person familiar with similar medical construction projects, manages the entire project. Ideally, the project coordinator is involved in every phase from pre-installation and installation, from conceptual planning through to system start up, working closely with GE to ensure that the client upholds all requirements in this *Pre-Installation Manual*.

At the end of site preparation, the site project coordinator must verify that:

- The latest **Global Site Readiness Checklist** is being used (available via “GLOBAL HPM LINKS”)
- The checklist has been completed and submitted prior to equipment delivery

1.3 Delivery Requirements

The system is packed for shipment with the minimum number of component packages.

⚠ CAUTION

DAMAGE TO EQUIPMENT

The system components are sensitive to excessive mishandling, including dropping, shock, vibration, tipping or hoisting. Vibration damage to components may not be evident until after system installation is complete.

The system components must **never** be dropped. A drop from a height greater than 1 cm (½") may induce structural damage to the frame or other major components.

To avoid damage to sensitive components, dock-to-dock shipment is recommended. Other methods are acceptable, provided the system is not dropped or otherwise mishandled.

1.3.1 Temperature and Detector Precautions During Transportation and Delivery

1.3.1.1 Temperature Precautions

Extreme temperatures must be avoided during system transportation and delivery. Ensure that the system is not exposed, for an extended period of time, to temperatures or humidity outside the following specifications.

Temperature range:	-34°C to +60°C (-29°F/+140°F)
Humidity range (non-condensing):	5% to 95%

NOTE

Component freezing occurs if the system is exposed to temperatures below -18°C (0°F) for a period of longer than two days. Allow a minimum of 12 hours for the system to adjust to ambient room temperature, prior to installation.

1.3.1.2 Detector Head Precautions

⚠ CAUTION

DAMAGE TO DETECTORS

Detector heads are very fragile. Always handle with extra care.

Detector heads are extremely sensitive to temperature gradients (sudden changes in temperature).

Failing to comply with the following instructions could cause irreversible damage to the detector heads.

Important

The conveyance path from the unloading area to the temperature-controlled area must be wide enough to allow passage of the detector heads packed in the original containers.

The detector heads must be transported in their original packages, which are designed to provide good mechanical stabilization as well as a certain amount of thermal insulation.

- As soon as the detector heads are unloaded from the transportation vehicles, they must be moved to a temperature-controlled area while still in their original containers, until they are ready to be installed into the system.
- If the temperature in the storage or installation areas differs from that of the delivery route and/or ambient temperature, a stabilization period of 1 hour per 3°C (5.4°F) difference must be allowed.

1.3.2 Delivery Unloading Area and Equipment

- The minimal unload area adjacent to the delivery truck is 15m×15m (50'×50'). Make sure that the unloading and storage areas are large enough to maneuver a forklift with crates.
- It is recommended to select the delivery site so as to provide the shortest and smoothest route for component conveyance:
  - If delivered on the installation day, as close as possible to the scan room for installation
  - If delivered prior to the installation day, as close as possible to the storage area
- If a forklift is required in order to unload or move system components:
  - Allocate a forklift capable of lifting more than the maximum weight of the heaviest unit, see **Components and Clearance**: Table 1-1 Components and Clearance — Metric on page 32 (metric) or Table 1-2 Components and Clearance — Imperial on page 33 (imperial)
  - Take into account sufficient floor space to maneuver the forklift near the delivery truck.

1.3.3 Conveyance of Crated System Components Within the Site

Regardless of whether the system is being delivered from the unloading area to storage, from the unloading area to unpacking area for installation or from storage to the installation area, take care to adhere to the following guidelines:

- Ensure that there is a free path, including an elevator if necessary, to wheel the components to the installation area.
- Verify that the route selected has sufficient clearance and load carrying capacity.
  - **Components and Clearance**: Table 1-1 Components and Clearance — Metric on page 32 (metric) or Table 1-2 Components and Clearance — Imperial on page 33 (imperial)
- The subsystems may be lifted only with a forklift and only when attached to their original shipping pallets.

⚠ CAUTION

DAMAGE TO SYSTEM COMPONENTS

Lifting of the gantry without its original shipping pallet or using a crane may damage the system and is prohibited.

- If the outer crating is removed after delivery, do not detach the subsystems from their original shipping pallets before they are conveyed to the scan room for installation.
- The center of gravity of each item, including lifting height and position, is marked on the subsystem crate. When conveying the subsystems within the site, and particularly if there are slopes in the delivery path, make sure to take the center of gravity into account.

- Always lower system components at the slowest reasonable rate.
- If the system components are to be transferred from an unloading site outside the building, special facilities must be provided to ensure smooth conveyance.
- Uneven temporary ramps may cause vibrations that could damage some components.
- System components may be moved via flat-bed tow truck or by rolling them across **smooth** sidewalks or other paved surfaces.
- When moving the gantry off a flat-bed tow truck, attach the straps to the lowest point possible on the dolly.

1.3.3.1 Rigging Limitations

Do not lift the gantry assemblies by their dollies. Do not transport the gantry assemblies across any surface by any means other than the dollies provided by GE. The assemblies have no lifting points and are not designed to be lifted by any special rigging attached to the gantry assemblies themselves.

⚠ DANGER

POSSIBLE SEVERE PERSONAL INJURY OR DEATH

The dollies are not designed to be used as an attachment point for any method of lifting the subsystems.

Attaching lifting straps, cables or mechanisms to the dolly handles or any other part of the dolly is strictly prohibited.

NOTE

If it is determined that the subsystems must be lifted by crane or other lifting method the PM or person responsible for local siting of the system shall NOT proceed with the installation without consulting directly with GE Engineering.

Lifting the subsystems by crane or other lifting method should always be avoided. All alternate methods of delivery should be evaluated including the removal of any obstructions, doorways, walls, and windows.

If lifting is still required:

- The entire gantry assembly and both gantry transport side dollies must be placed on a lifting platform. GE does not provide a lifting platform.
- The entire patient table must be lifted while sitting on a lifting platform. The patient table shall be lowered to its transport position so the table base is in contact with the platform.

- The platform must be designed so no lifting straps or cables come in contact with any part of the gantry or table subsystems or its side dollies.
- The lifting platform shall bear the entire load. No part of the subsystem shall bear any load during the lift.

1.3.4 Crated and Uncrated Weights, Measurements and Clearance - Tables

The following tables provide you with crate and component measurements, weights and other data, in order to assist you in planning conveyance routes and storage areas. The order of the components in the list constitutes the recommended order of conveyance and delivery to the scan room for installation.

- **Components and Clearance**: Table 1-1 Components and Clearance — Metric on page 32 (metric) or Table 1-2 Components and Clearance — Imperial on page 33 (imperial)

Table 1-1 Components and Clearance — Metric

	Crated		Uncrated					
Component name	**Crate size (cm) (without dollies) (H×W×L)**	**Weight (kg)**	**Minimal dimensions (cm)**					**Weight (kg)**
			Door width	**Corridor / elevator width**	**Corridor / elevator length**	**Width corridors w.90° turns**	**Height**	
Pre-installation kit	75×40×175	15	any	any	any	any	any	15
NM gantry with detectors and dollies; **without collimators**	220×150×168	2413	140	140	222	250	200	2238
Table	140×90×300	562	100	100	280.9	250	any	360
NM acquisition station	80×60×60	30	any	any	any	any	any	<20
Peripherals and accessories	115×100×150	50	any	any	any	any	any	50
Collimators on cart/s	170×90×115	370 (heaviest coll. set)	55	55	100	112	150	330 (heaviest coll. set)
Optional Items								
NM UPS	May vary but not more than 60×40×80	May vary but not more than 80	any	any	any	May vary but not more than 60	any	May vary but not more than 60
ECG Trigger Monitor	May vary but not more than 80×80×80	May vary but not more than 15	any	any	any	any	any	<13
Xeleris (optional)								
Monitor								

Table 1-1 Components and Clearance — Metric (Table continued)

	Crated		Uncrated					
Component name	**Crate size (cm) (without dollies) (H×W×L)**	**Weight (kg)**	**Minimal dimensions (cm)**					**Weight (kg)**
			Door width	**Corridor / elevator width**	**Corridor / elevator length**	**Width corridors w.90° turns**	**Height**	
Detectors Dismount Option								
NM gantry without detectors	220×150×168	2175	94.5	94.5	222	188	195	1690 (with dollies)
Detector 1	93×86×100	320	86	86	100	100	98	320
Detector 2	93×86×100	320	86	86	100	100	98*6	320*7

*1 The minimum door width required in order to bring the system components into the scan room also depends on the width of the corridor leading to the room. In order to verify that the measurements comply with the requirements, when planning or measuring the width of the scan room door, use the graphs provided in Figure 1-2 Required Door Opening vs Corridor Width When 90° Turn Required on page 37.

*2 The corridor width required in order to move system components from unloading area to scan room depends on the angles of turns in the corridor. See Figure 1-3 Required Corridor Width for 90° Turns to Convey NM Sub-systems on page 38 for the required width when the angle is 90°.

*3 May be delivered a few days prior to system delivery, as part of the final room check and preparation for installation.

*4 20 mm clearance above the floor

*5 Weight of gantry in the in-site transportation configuration: 1380 kg + weight of the dolly: 310 kg

*6 50 mm clearance above the floor

*7 The specified weight includes the packing. The detectors must be conveyed crated (unpacking is allowed only at the room or designated area where the detectors to be installed)

Table 1-2 Components and Clearance — Imperial

	Crated		Uncrated					
Component name	**Crate size (") (without dollies) (H×W×L)**	**Weight (lb)**	**Minimal dimensions (“)**					**Weight (lb)**
			Door width	**Corridor / elevator width**	**Corridor / elevator length**	**Width of corridors w.90° turns**	**Height**	
Pre-installation kit	29.5×15.7×68.9	33	any	any	any	any	any	33
NM gantry with detectors and dollies; **without collimators**	86.6×59×66.1	5320	55.1	55.1	88.6	98.4	78.75	4934

Table 1-2 Components and Clearance — Imperial (Table continued)

	Crated		Uncrated					
Component name	**Crate size (") (without dollies) (H×W×L)**	**Weight (lb)**	**Minimal dimensions (“)**					**Weight (lb)**
			Door width	**Corridor / elevator width**	**Corridor / elevator length**	**Width of corridors w.90° turns**	**Height**	
Table	55×35.4×118.1	1239	39.4	39.4	111.4	98.4	any	794
NM acquisition station	31.5×23.62×23.62	66	any	any	any	any	any	<44
Peripherals and accessories	45.3×39.4×59	110	39.4	43.3	59	70.8	any	110
Collimators on carts	67×35.4×45.3	816 (heaviest coll. set)	22	22	39.4	45.3	59	727.5 (heaviest coll. set)
Optional Items								
NM UPS	May vary but not more than 23.6x15.7x31.5	May vary but not more than 174	any	any	any	any	any	May vary but not more than 130
ECG Trigger Monitor	May vary but not more than 31.5×31.5×31.5	May vary but not > 33	any	any	any	any	any	<28.6
Xeleris (optional)								
Monitor								
Detectors Dismount Option								
NM gantry without detectors and with dollies	86.6×59×66.1	4795	37.2	37.2	87.4	74	76.7	3726
Detector 1	66.6×33.8×39.4	705	33.8	33.8	39.3	39.3	38.5	705
Detector 2	66.6×33.8×39.4	705	33.8	33.8	39.3	39.3	38.5*6	705*7

*1 The minimum door width required in order to bring the system components into the scan room also depends on the width of the corridor leading to the room. In order to verify that the measurements comply with the requirements, when planning or measuring the width of the scan room door, use the graphs provided in Figure 1-2 Required Door Opening vs Corridor Width When 90° Turn Required on page 37.

*2 The corridor width required in order to move system components from unloading area to scan room depends on the angles of turns in the corridor. See Figure 1-3 Required Corridor Width for 90° Turns to Convey NM Sub-systems on page 38 for the required width when the angle is 90°.

*3 May be delivered a few days prior to system delivery, as part of the final room check and preparation for installation.

*4 0.75" clearance above the floor

*5 Weight of gantry in the in-site transportation configuration: 3042 lbs + weight of the dolly: 683 lbs

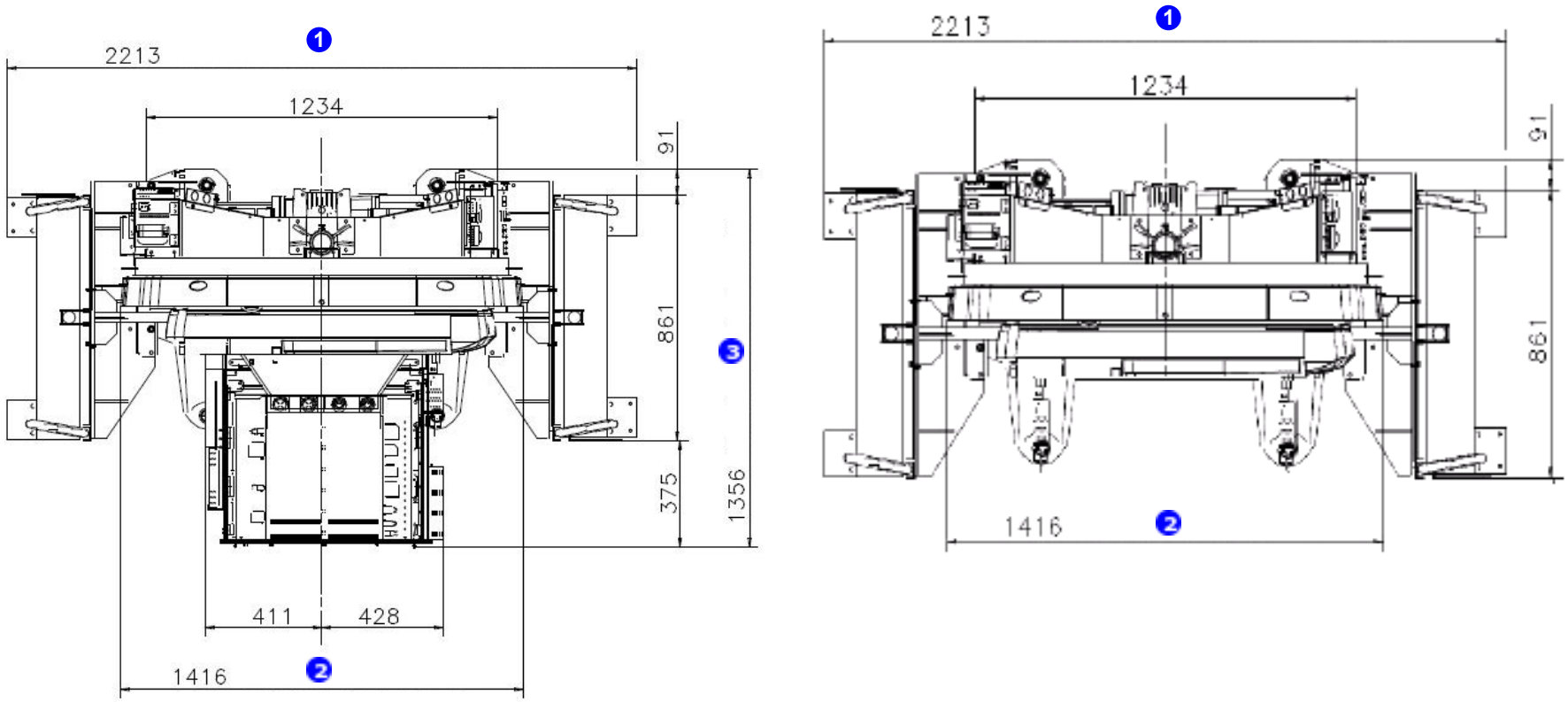
*6 2" clearance above the floor

*7 The specified weight includes the packing. The detectors must be conveyed crated (unpacking is allowed only at the room or designated area where the detectors to be installed)

1.3.5 Crated and Uncrated Weights, Measurements and Clearance - Figures

The following figures provide you with crate and component measurements, weights and other data, in order to assist you in planning conveyance routes and storage areas.

Figure 1-1 NM Gantry on Dolly Measurements



Left: WITH Detectors | **Right: WITHOUT Detectors**

NOTE

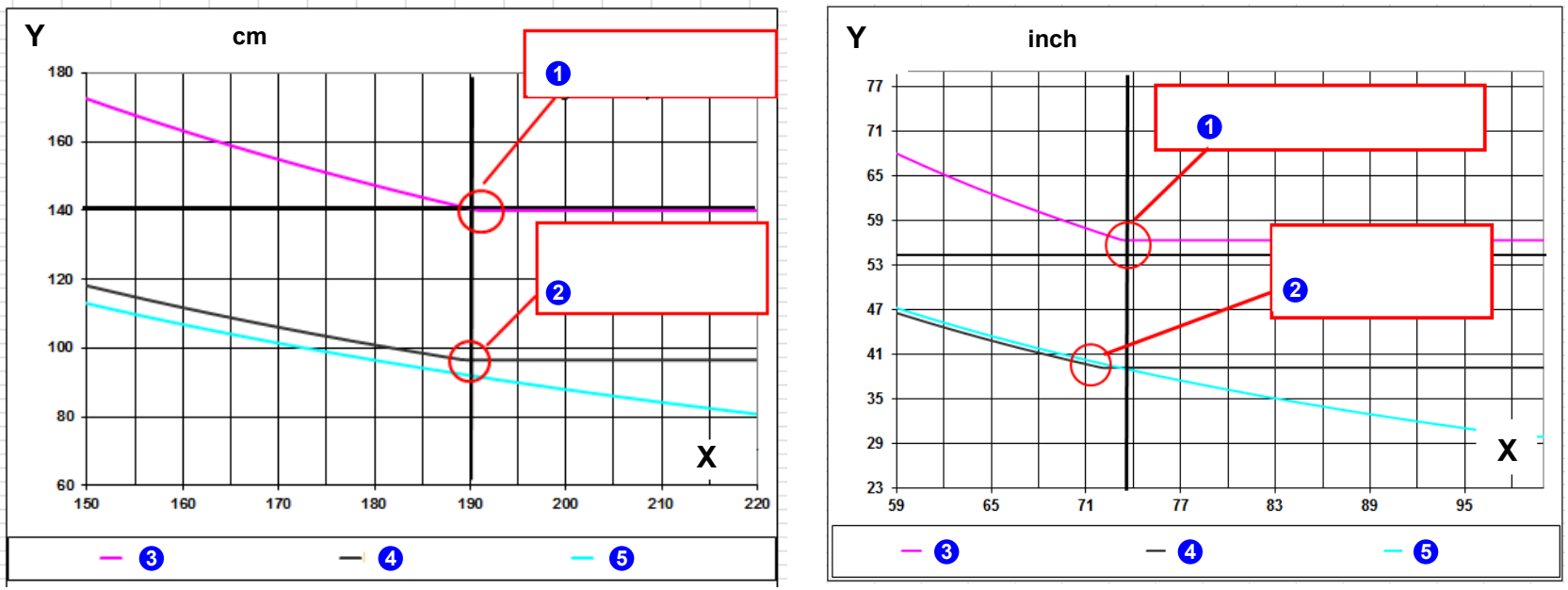
Measurements are in mm

Legend

(1) The total width depends on the position of the wheels.
(2) Gantry net width
(3) Gantry net height

Figure 1-2 Required Door Opening vs Corridor Width When 90° Turn Required

X=Corridor OUT width / Y=Required door opening

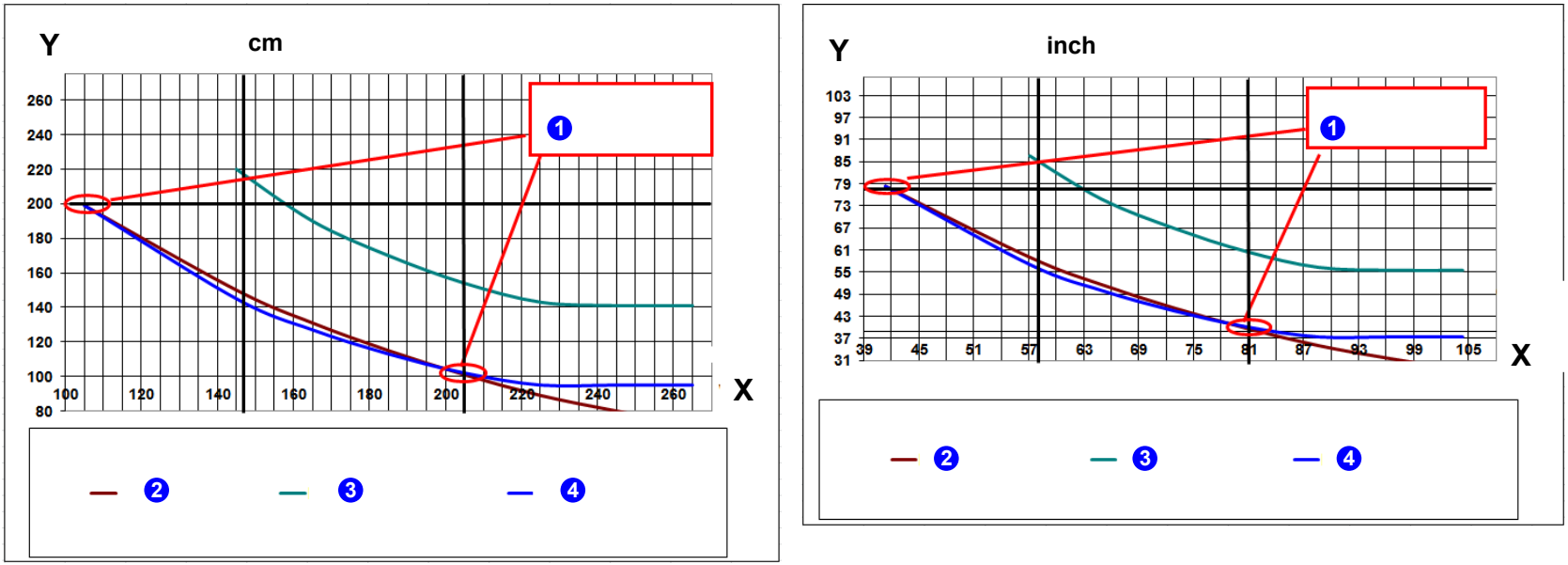


Legend

(1) Minimum door opening required to convey sub-systems **WITH detectors** into the room from corridor when 90° turn is required.
(2) Minimum door opening required to convey sub-systems **WITHOUT detectors** into the room from corridor when 90° turn is required.
(3) NM gantry with detectors
(4) NM gantry without detectors
(5) Table requirement

Figure 1-3 Required Corridor Width for 90° Turns to Convey NM Sub-systems

X=Corridor OUT width / Y=Required door opening



Legend

(1) Minimum required width of corridor to pass 90° turns.
(2) Patient table
(3) NM gantry with detectors
(4) NM gantry without detectors

1.4 Product Storage and Handling Requirements

All components must be stored in their original crating.

If the system is to be stored before installation, store in a temperature and humidity controlled environment, and protect from weather, dirt and dust. Storage longer than 12 months is not recommended. Meeting these requirements prevents rust and corrosion from forming on bearing surfaces due to condensation.

⚠ CAUTION

DAMAGE TO DETECTORS

Component freezing occurs if the system is exposed to temperatures below -18°C (0°F) for a period of longer than two days.

Gradually adjust the system to ambient room temperature prior to installation, with a change of no more than 3°C (5.4°F) per hour.

Table 1-3 Storage Conditions

Conditions	Short term storage (1-12 months)	
Storage temperature	+4°C to +27°C	+40°F to +80°F
Maximum temperature rate of change	3°C/hr.	5°F/hr.
Relative humidity (non-condensing)	Between 20% and 60%	
Maximum relative humidity rate of change	5%/hr	
Air pressure	Between 700 hPa and 1060 hPa	

2

Chapter 2 Equipment Description and General Construction Requirements

This chapter provides the following:

- 2.1 Equipment and System Components on page 40

  Describes the system and its components.

- 2.2 Room Size, Layout and Considerations on page 45

  Provides guidelines for determining the size and layout of the scan room and of the above components, including example layouts of typical rooms, illustrating the position and dimensions of the components.

- 2.3 Room Structural Requirements on page 54

  Provides floor, ceiling and wall requirements, and acoustic and vibration specifications for the scan room.

- 2.4 Seismic Requirements on page 73

  Provides center of gravity information for the different system components.

2.1 Equipment and System Components

The following figures illustrate the different system components:

- System Components - Figure 2-1 System Components on page 41
- Gantry - Figure 2-2 Gantry on page 43
- Table Views - Figure 2-3 Table Views on page 44
- Collimator Cart -Figure 2-4 Collimator Cart on page 45

Figure 2-1 System Components

Legend

(1) Collimator carts (see Figure 2-2 Gantry on page 43)	(8) Boom

(2) Acquisition station cart (optional)	(9) NM detectors
(3) NM UPS (optional)	(10) NM gantry (see Figure 2-2 Gantry on page 43)
(4) Head holder extender (optional)	(11) NM acquisition computer
(5) Patient table (see Figure 2-3 Table Views on page 44)	(12) Xeleris workstation (optional); can be located in a remote location such as a reading room.
(6) Hand-held controller (RCU)	(13) Emergency Stop and Emergency OFF buttons
(7) Gantry display (p-scope)	

Figure 2-2 Gantry

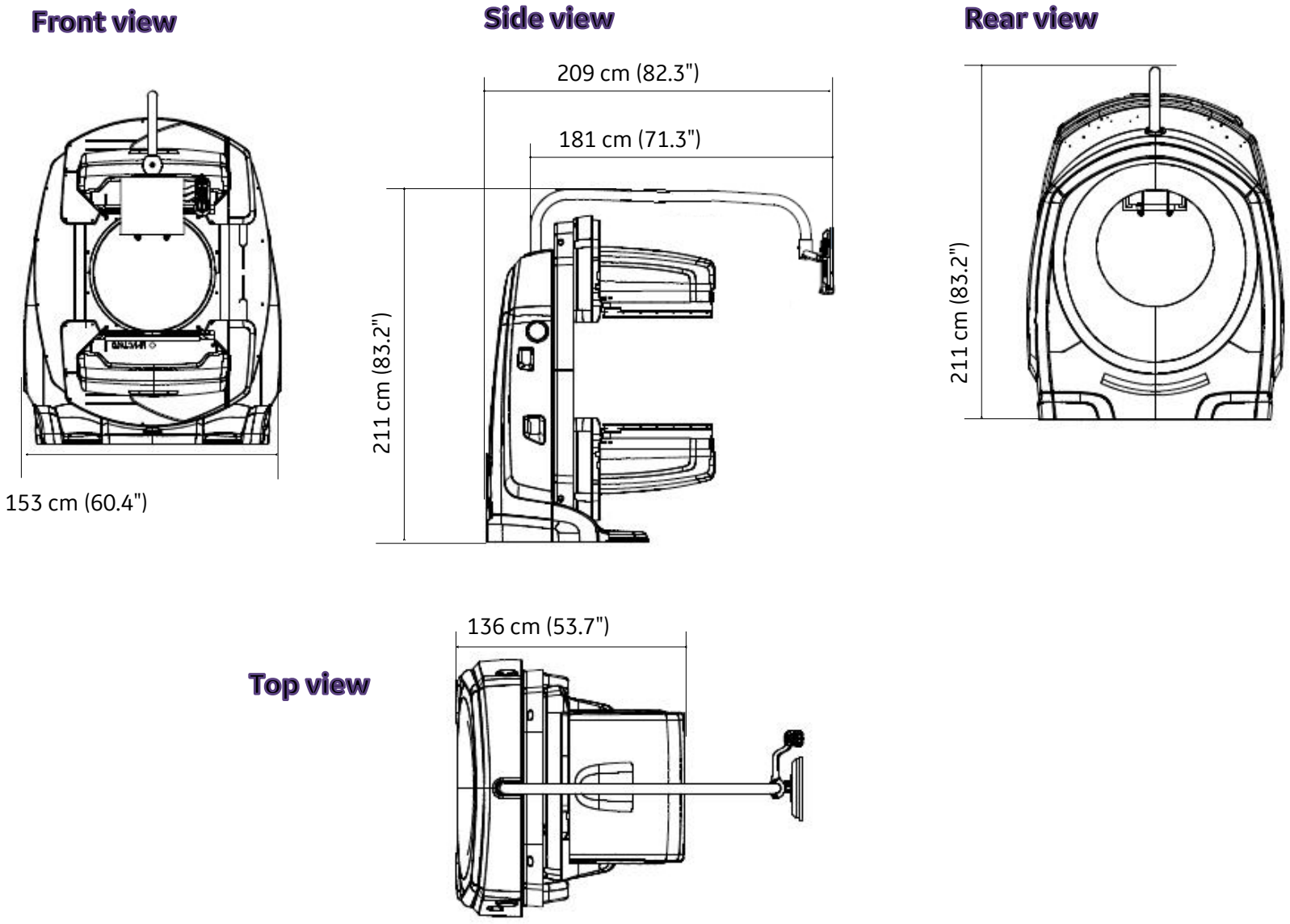


Figure 2-3 Table Views

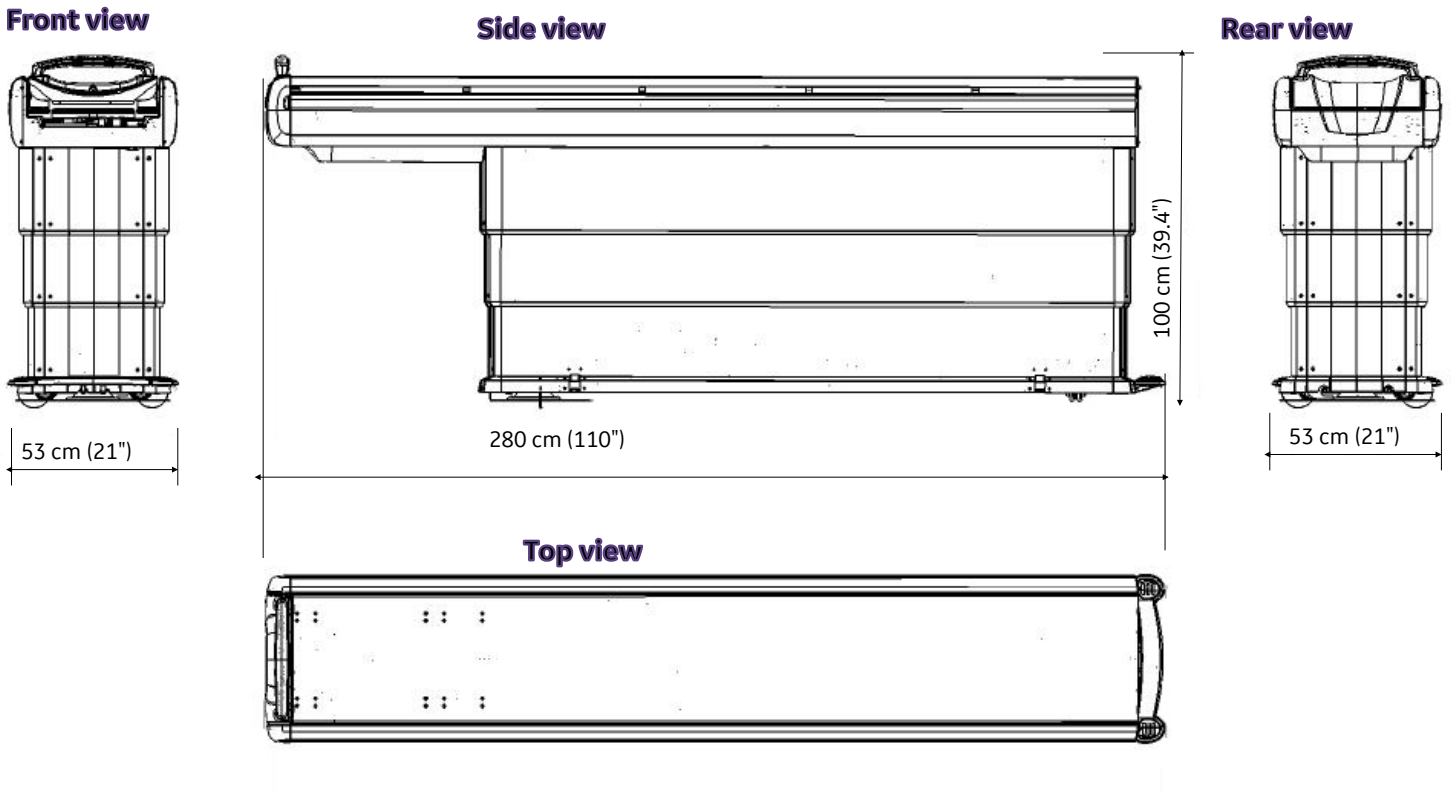
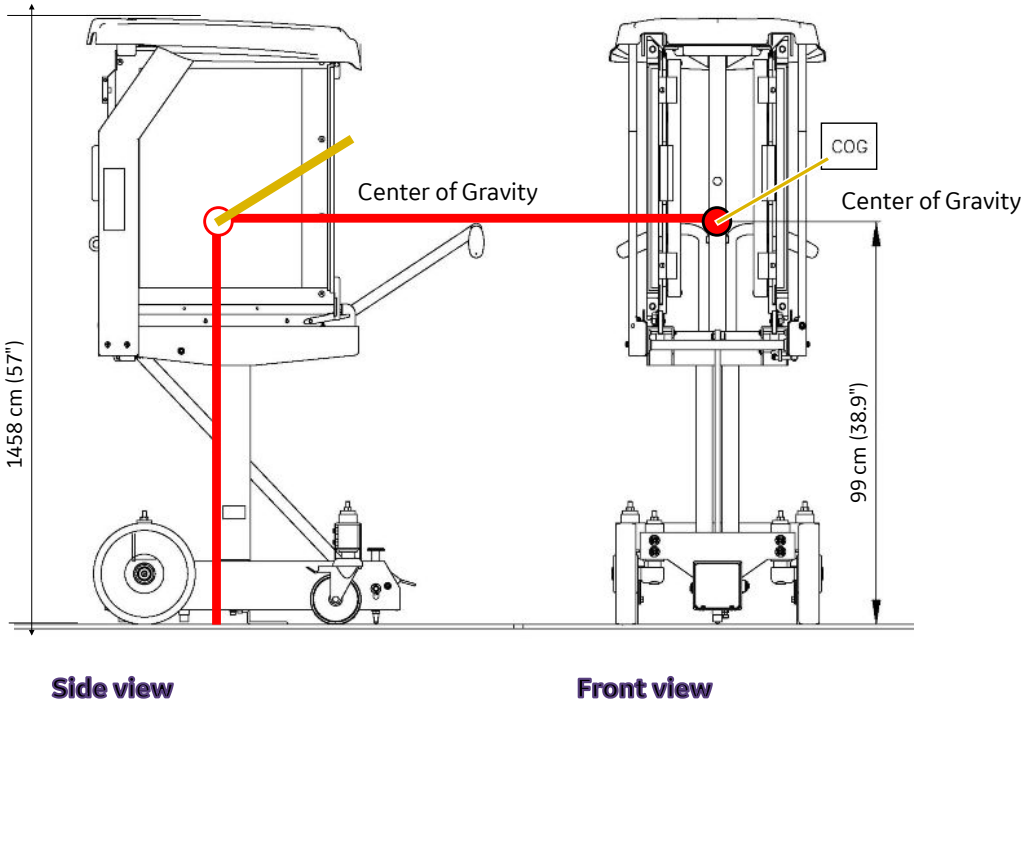
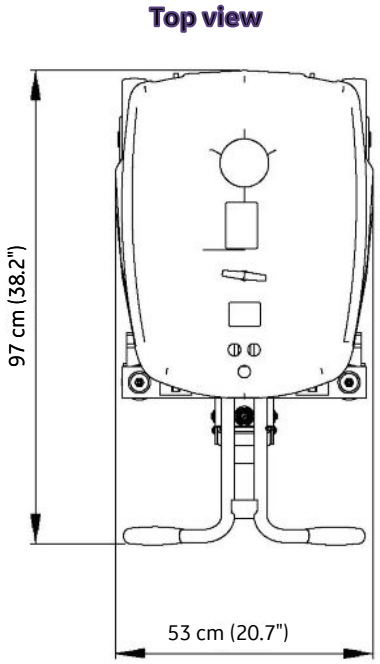


Figure 2-4 Collimator Cart





2.2 Room Size, Layout and Considerations

The system requires a Scan Room, which contains the following sub-systems:

Table 2-1 Components in Scan Room

Scan Room	
Fixed Components (see Figure 2-1 System Components on page 41)	**Moving Components**
NM gantry	Collimator carts
NM acquisition station	Acquisition station cart (optional)
Patient table	
MDP	
EMO (wall mounted)	
E-stop	
UPS (optional)	

This section provides guidelines for determining the size and layout of the scan room and of the above components, and example layouts of typical rooms, illustrating the position and dimensions of the components.

The room layouts provided take into consideration all aspects of operation, operator and patient requirements and service clearance requirements.

Egress

The room layouts, diagrams and dimensions in this manual provide the required clearances for proper equipment operation and service only. The customer/purchaser is responsible for compliance with federal, state and/or local codes regarding facility egress and related facility requirements (see Appendix D Regulatory Clearances on page 112).

2.2.1 Room Dimension Requirements

NOTE

The minimal and standard system layouts described in this manual may not comply with specific local/regional/country/state requirements (such as OSHA in the USA).

Take into consideration the local regulations in force when planning room dimensions and layout (see Appendix D Regulatory Clearances on page 112).

Minimal scan room size (L × W × H)

5.12 m×3.74 m×2.25 m (16' 9"×12' 3"×7' 4.6")

See Figure 2-5 Minimal Room Layout on page 48)

2.2.2 System Layout Drawings

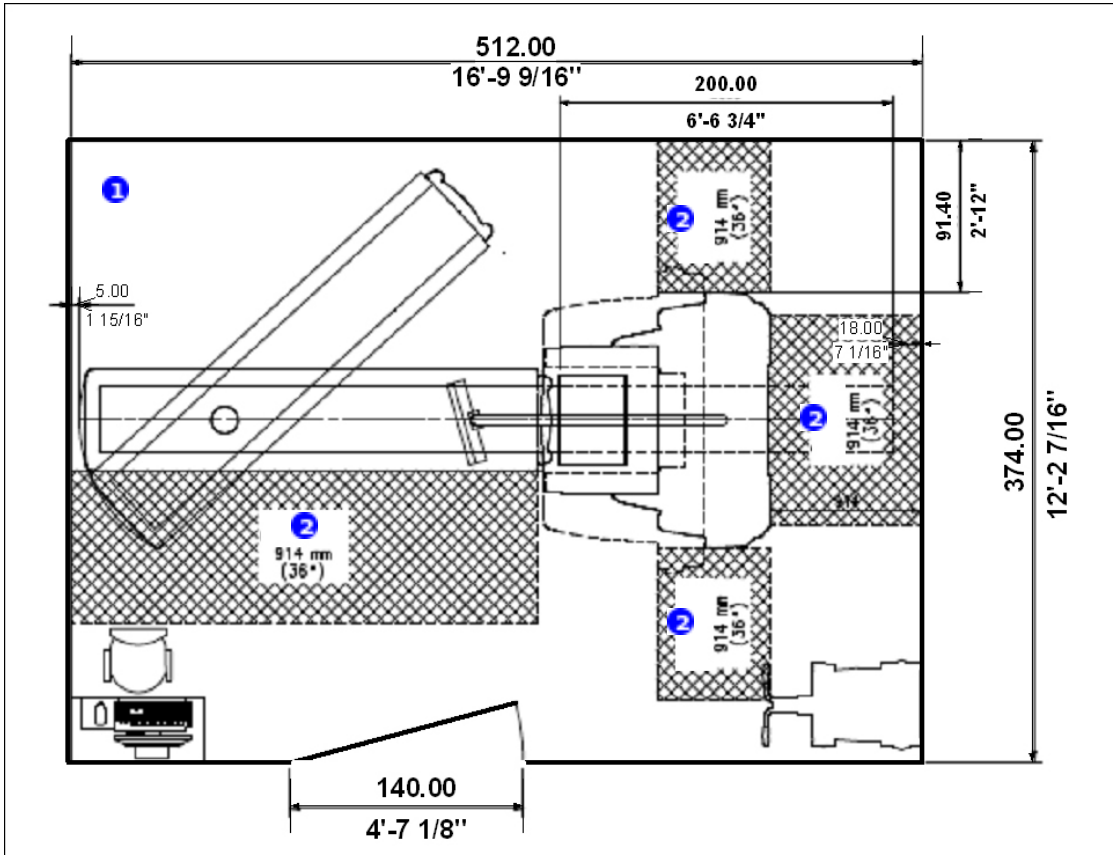
This section provides typical sample layouts, illustrating the position and dimensions of the scan room and the system components, including:

- Minimal Room Layout - Figure 2-5 Minimal Room Layout on page 48

The room layout dimensions take into consideration all aspects of operation, operator and patient requirements and service clearance requirements (see 2.2.4 Layout Considerations on page 50).

Sufficient regulatory and service clearances must be maintained around the equipment for full operation, service, and safety.

Figure 2-5 Minimal Room Layout



Legend

(1) Scan room

(2) Service clearance

Notes to figure:

- Dimensions are in mm (inches)
- Defines the minimum area required to enable installation, operation and service the system in safe conditions.
- Does not take into account local requirements.

- Operator movement around the system is limited.
- Cannot use table extender.

2.2.3 System Mechanical Curves

Component Movement Curves Figure 2-6 Component Movement Curves on page 50 illustrates the table and gantry movement.

In addition, the ECG trigger monitor and collimator carts can be moved to different locations in the scan room, as demonstrated in the layout illustrations in:

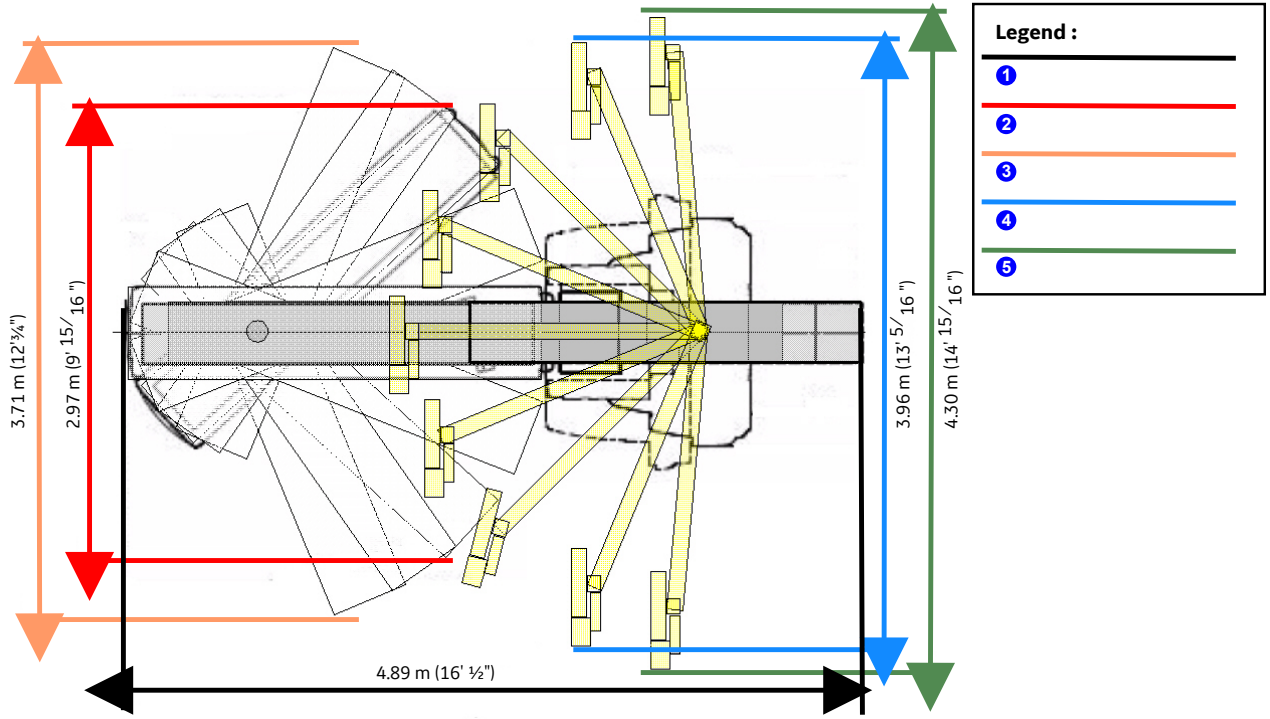
- *Minimum Room Layout* Figure 2-5 Minimal Room Layout on page 48

NOTE

In order to prevent collision with the gantry display boom, do not mount any equipment from the ceiling.

Table slanted at	Farthest point relative to system's center line
67.5°	190.5 cm (75")
55°	181.5 cm (71.5")
42.5°	157.5 cm (62")

Figure 2-6 Component Movement Curves



Legend

(1) Absolute minimum length
(2) Absolute minimum width
(3) Tight working width
(4) Good working width
(5) Recommended minimum width

2.2.4 Layout Considerations

This section describes the considerations you must take into account when selecting a site and planning the room size and layout. In addition, it is the responsibility of the customer to ensure that all aspects of the scan and operator rooms conform with the local requirements.

Room Dimensions and System Placement

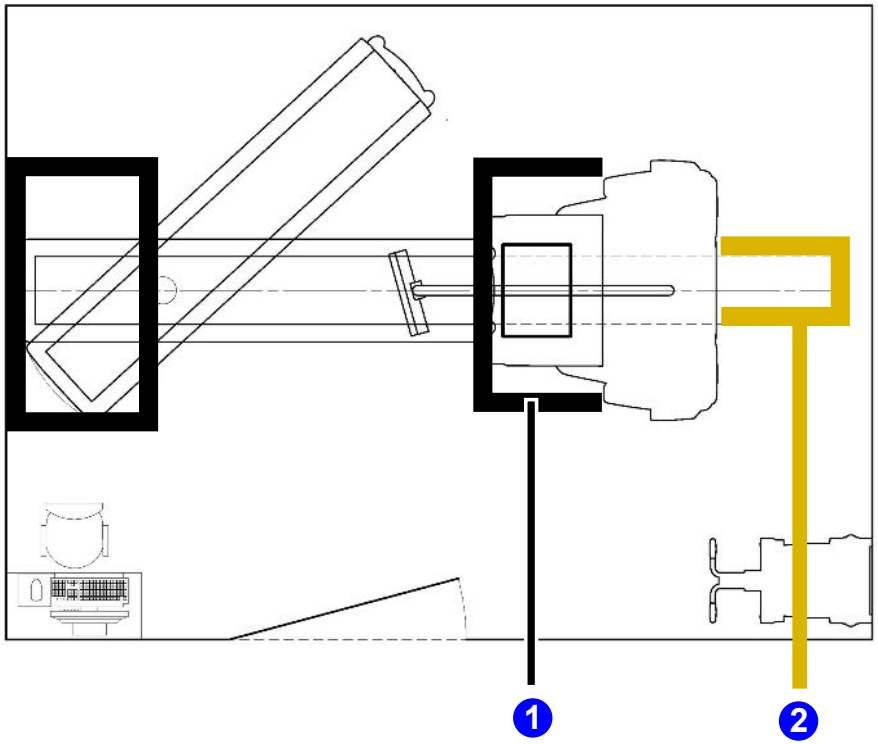
The room size and shape and the placement of the system components must enable optimal functional and working conditions, including the best possible relative positioning of the gantry, patient table and acquisition console in operator room, including:

- **Operator access in scan room**, around the gantry and patient table in order to:
  - Assist patient positioning
  - Perform examination routines
  - Act efficiently and quickly in case of an emergency, including easy access to emergency switch
- **Upgrade considerations:**
  - If a system upgrade is planned or possible, the requirements for the larger system should be assessed to avoid unnecessary future rework:
    - Room dimensions
    - Power requirements
    - HVAC requirements
    - Floor loading requirements
- **Seismic considerations**:

  The room dimension requirements are different for seismic systems. For example, the table must have the clearance necessary to swing both ways in order to access all anchoring.
- **Safety zone considerations**

  The safety zone is designated by tape on the floor, usually yellow (can also be differentiated by a change in floor coloring). This designates the area that must be free of obstructions to avoid a collision during automatic motion.

Figure 2-7 Safety Zone Marking



Legend

(1) Detector motion area

(2) Pallet motion area

- **Operation-related considerations**:
  - Enable access for hospital beds, including maneuvering and positioning the bed and moving the front of the patient table during collimator exchange.
  - Storage of collimator cart/s when not in use
  - ECG Trigger Monitor– cable position and lengths and storage when not in use
  - Space for storage and usage of ECG Trigger Monitor

- Installation and service considerations:
- Location of power connections
- Access to communication lines (Ethernet, external hardcopy device)
- Floor loading capacity and weight of system components, including storage and path of collimator carts
- Service clearance areas (see Appendix D Regulatory Clearances on page 112)
- Storage cabinet for storage of service tools (optional). Depending on the room layout, it is recommended that sufficient area is allocated for a cabinet.
- Placement of acquisition station and/or gantry display monitor to allow easy viewing of both the patient and screen. Try to position so that both the patient and the monitor are in one line of sight.
- Patient path from entry door to table should be without any floor hazards such as a table floor puck, conduit or cables.

- **Operator room** (if applicable)
  - Operator field of view, enabling direct view of patient in bore, or taking into consideration viewing via remote closed-circuit camera in the scan room and screen in the operator room
  - Space, power and network connections for additional equipment such as PACS workstation, archiving devices, etc.
- **Proximity of scan room to other utilities**
  - Avoid detrimental influences from surrounding rooms and activities, such as:
    - Radioactive or magnetic sources
    - A local wireless environment
    - Vibrations
    - Transformers from elevators, compressors, or other high power devices.
  - Plan the optimal proximity of the scan room to related utilities. In addition to patient comfort, take into consideration that background radiation activity from such utilities could negatively affect image quality and system calibration. These utilities include:
    - Waiting/injection areas, toilets
    - Viewing and processing rooms
    - Radionuclide storage and preparation area
    - Office facilities
    - Smoke detectors that use/have radioactive activity

2.3 Room Structural Requirements

Room requirements consist of the following:

2.3.1 Floor Requirements

Important

It is the customer's responsibility to have appropriate tests performed and to obtain a construction engineer’s assessment of the floor’s suitability to meet the requirements of this section.

2.3.1.1 Floor Strength

In order to enable system mounting using the supplied floor anchors, concrete floors must have a minimum cube strength of f'c = 4350 psi (30 MPa) at 28 days (curing time) for 25/30 concrete and must be at least 140 mm (5.5") thick.

order to enable system mounting using the supplied floor anchors, concrete floors must have a minimum cube strength of f'c = 4350 psi (30 MPa) at 28 days (curing time) for 25/30 concrete.

NOTE

- Concrete strength is determined by the “Cylinder Test” (used in the USA) or “Cube Test” (used in Europe), where a cylinder or cube of concrete is cast, cured for the appropriate time and then compressed between two parallel faces until failure. The stress at the failure is taken to be the compressive strength of the concrete. The 25/30 concrete required for the system installation is concrete with a strength of 25 in the cylinder test (resulting 3625 psi), or strength of 30 in the cube test (resulting 4350 psi).
- If the system is expected to be upgraded in the future, the floor strength requirements for the larger model should be used.

It is the customer’s responsibility to have appropriate tests performed to determine and measure concrete strength, and to obtain a construction engineer’s assessment of the floor load capability.

2.3.1.2 Floor Loading Requirements

Table 2-2 Weight of Components

Component	Weight (kg)	Weight (lb)	Load Distribution	Comments
NM gantry (with HEGP collimators mounted on system)	2190	4828	4 pads, Ø83 mm each: +845 kg each on front pads +250 kg each on rear pads	
Patient table (without patient)	360	794	2 wheels + axis anchored to floor	Weight of table without patient
Collimator cart (with 2 HEGPs on cart)	330	728	4 wheels	COG point at 99 cm height
NM Acquisition station	11.3	25		
Personnel and patient	< 500	< 1102	Variable	Normally 3-4 people in room during scan/service operations
LEHR collimator	62	137		2 per system/cart
LEGP collimator	55	121		2 per system/cart
ELEGP collimator	62	137		2 per system/cart
MEGP collimator	103	227		2 per system/cart
HEGP collimator	131	288		2 per system/cart
NM UPS (optional)	May vary but no more than 60	May vary but no more than 130	4 feet	

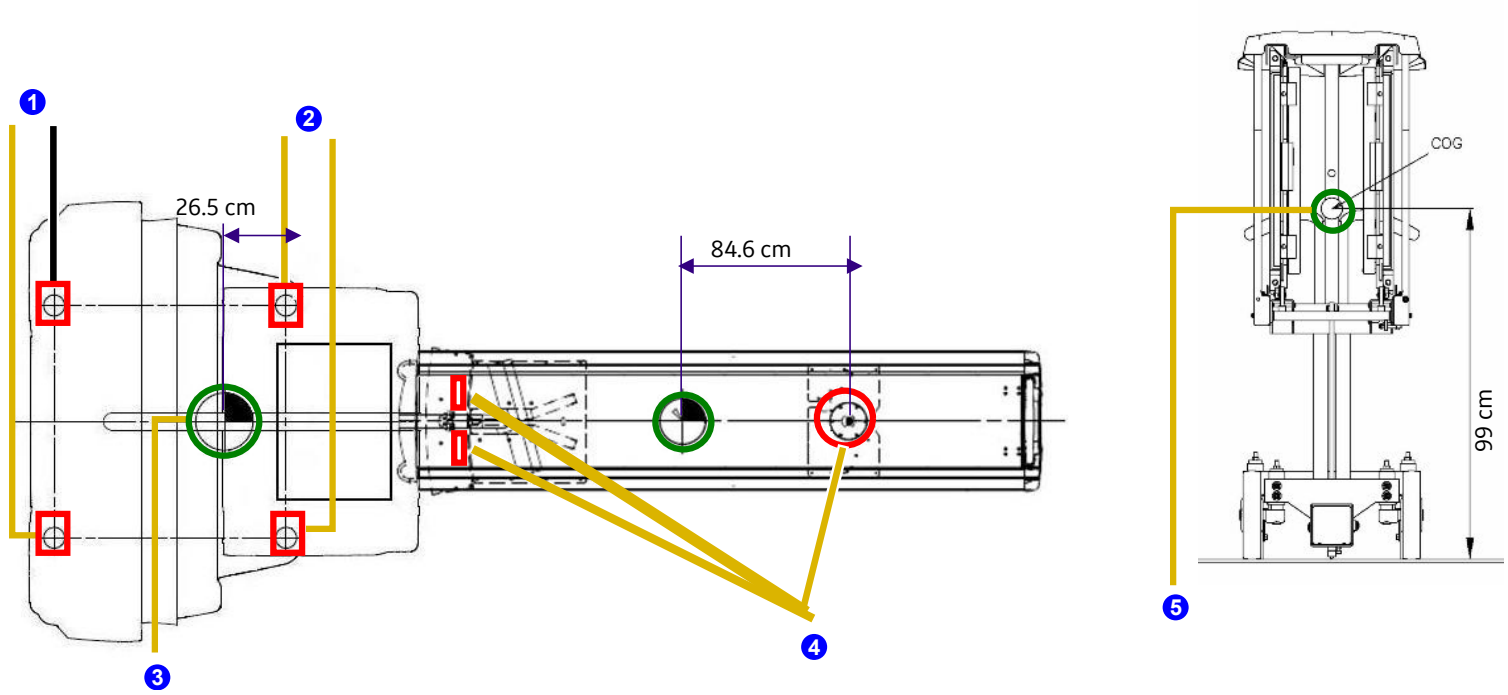
⚠ CAUTION

ENSURE CORRECT FLOOR AND ANCHORING

If the system is installed on a floor type thinner than a 140 mm (5.5") concrete floor, the customer shall, at their expense, provide acceptable anchoring and mounting methods that meet all structural specifications provided in sections 2.3.1.2 Floor Loading Requirements on page 55 and 2.3.1.3 Floor Anchoring on page 59 of this manual.

The customer shall ensure that the floor strength in the collimator cart storage area and along the movement routes for collimator exchange are suitable for the collimator cart load (approx. 250 kg each).

Figure 2-8 Floor Loading and Center of Gravity Points for Gantry, Table & Cart

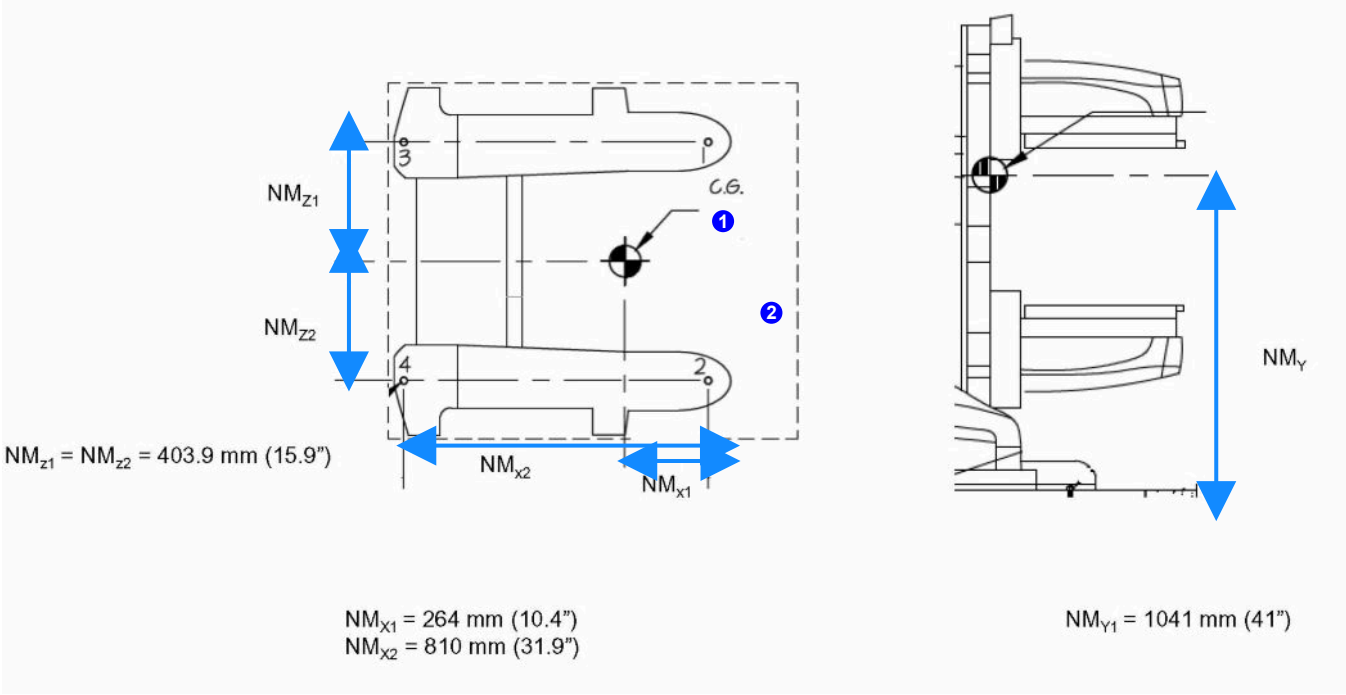


Legend

(1) Gantry rear pads 250 kg load per pad
(2) Gantry front pads 845 kg load per pad
(3) Gantry center of gravity 2190 kg
(4) Table center of gravity 360 kg load (distributed on 2 wheels + pivot). For details, see Figure 2-10 Table Center of Gravity Points on page 58.
(5) Collimator cart center of gravity 330 kg load (for heaviest set), including collimator; up to 3 carts in the scan room.

Figure 2-9 NM Gantry with HEGP Collimators Center of Gravity Points

NM gantry CoG weight: 2190 Kg (4828 Lb.)



Legend

(1) Center of gravity

(2) Front

Figure 2-10 Table Center of Gravity Points

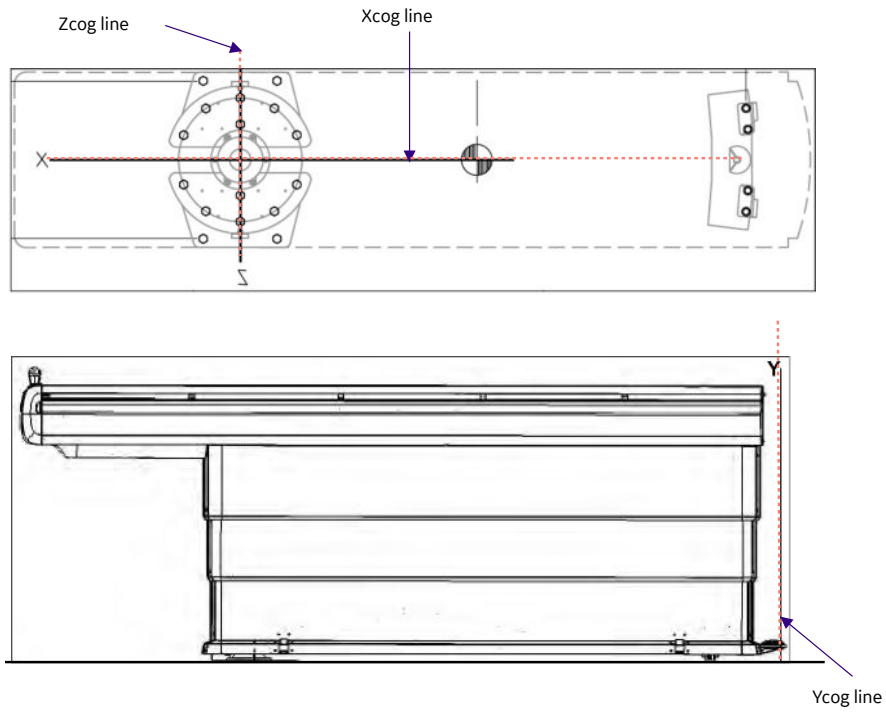
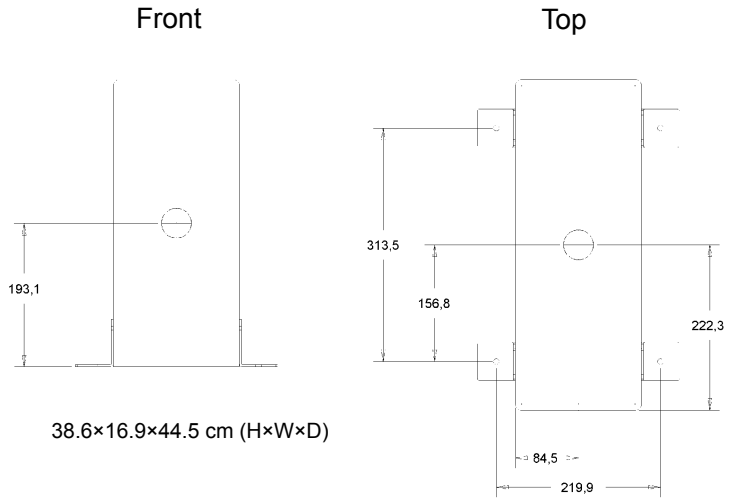


Table configuration	Weight of table with patient kg (lb)	X mm (")	Y mm (")
• Unloaded (no patient) • Pallet OUT (out of gantry) • Max UP	360 kg (794 lb)	830 mm (32.7")	483 mm (19")
• Loaded (160 kg/352.7 lb) • Pallet OUT (out of gantry) • Max UP	520 kg (1146 lb)	846 mm (33.3")	699 mm (27.5")

Table configuration	Weight of table with patient kg (lb)	X mm (")	Y mm (")
• Loaded (160 kg/352.7 lb) • Pallet fully IN (in the gantry) • Max UP	520 kg (1146 lb)	1598 mm (62.9")	699 mm (27.5")

Figure 2-11 NM Acquisition Computer Center of Gravity Points



2.3.1.3 Floor Anchoring

The system's floor anchors are designed for use **only** on concrete floors that meet the minimal 140 mm (5.5") concrete floor requirements.

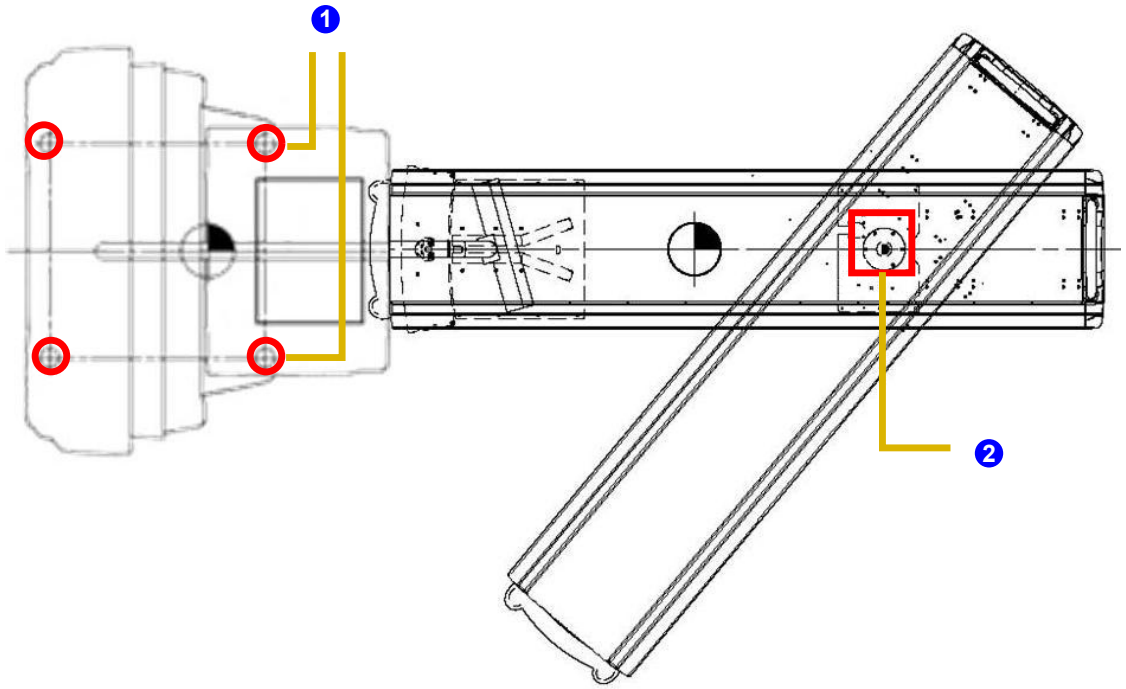
⚠ CAUTION

ENSURE CORRECT FLOOR AND ANCHORING

For concrete floors thinner than 140 mm or different floor types other anchoring methods might be required. These must comply with the minimum load requirements (see 2.3.1.2 Floor Loading Requirements on page 55) and must be installed and tested at the customer's expense, by the customer's structural contractor. The selected anchoring method must have a pulling tensile force of 19.7 kN on each of the anchors bolting the NM gantry to the floor.

In such a case, the alternative anchors shall be installed during system installation, and this must be coordinated with the installation team. For anchor point information, see Figure 2-12 Floor Anchor Points on page 61.

Figure 2-12 Floor Anchor Points

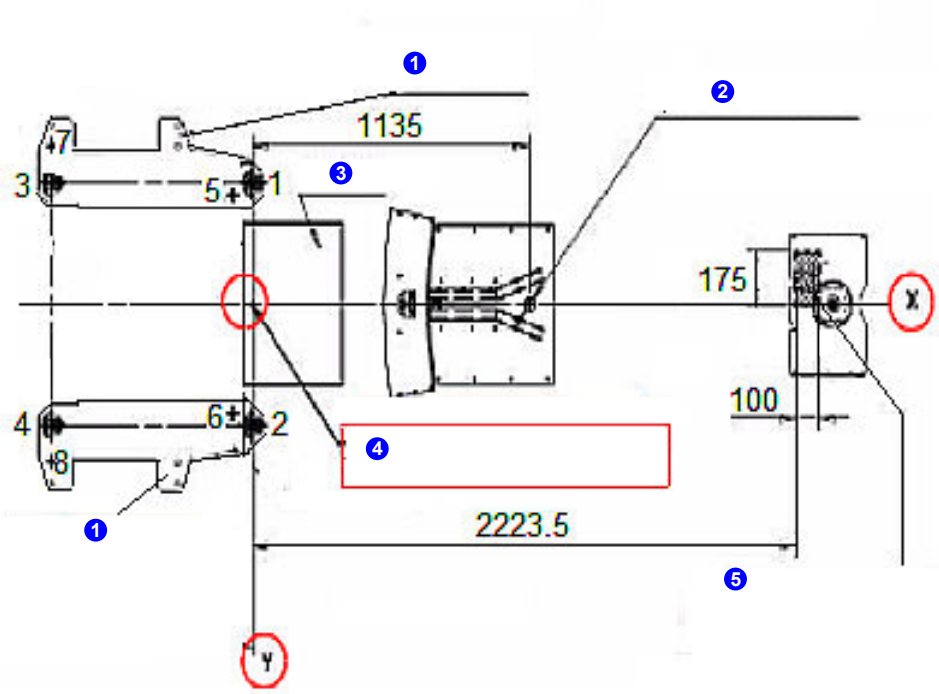


Legend

(1) NM gantry anchor points 4 × HILTI-HSL-3 M10/40 anchors

(2) Table anchor plate 6 X Hex Head Sleeve Bolt 0.25" x 1.75" anchor screws

Figure 2-13 Drilling Map



Legend

(1) NM gantry	(4) Coordinate table origin
(2) Pocket for collimator cart pin - Ø15 depth 35 mm	(5) Table cables outlet 60 mm depth
(3) NM FOV	

Table 2-3 Drilling and Anchor Chart

No.	X	Y	Drill Hole	Hole Depth	Anchored Part	Hole Purpose	Drilling Method	Anchor Type	Torque Nm.	Section
1	-0.00	405.00	Ø15.0	90	NM gantry	Main Anchor	Metal Drilling Template	HILTI HSL-3 M10/40	35	Figure 2-14 Gantry Anchoring on page 63
2	-0.00	-405.00								
3	-810.00	405.00								

Table 2-3 Drilling and Anchor Chart (Table continued)

4	-810.00	-405.00								
5	-80.00	365.00				Alternative Anchor				Figure 2-12 Floor Anchor Points on page 61
6	-80.00	-365.00								
7	-810.00	530.00								
8	-810.00	-530.00								

Figure 2-14 Gantry Anchoring

4 mm minimum, 21 mm maximum after proper torque

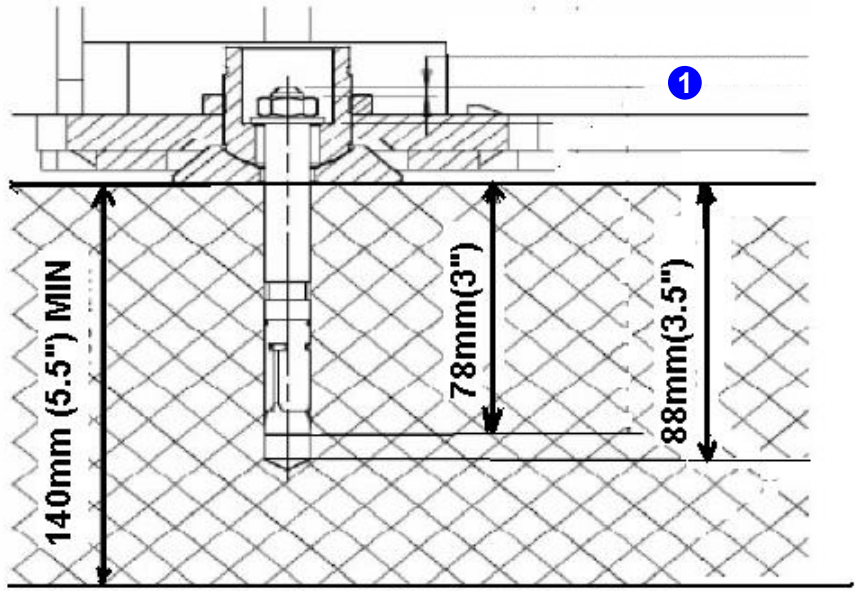
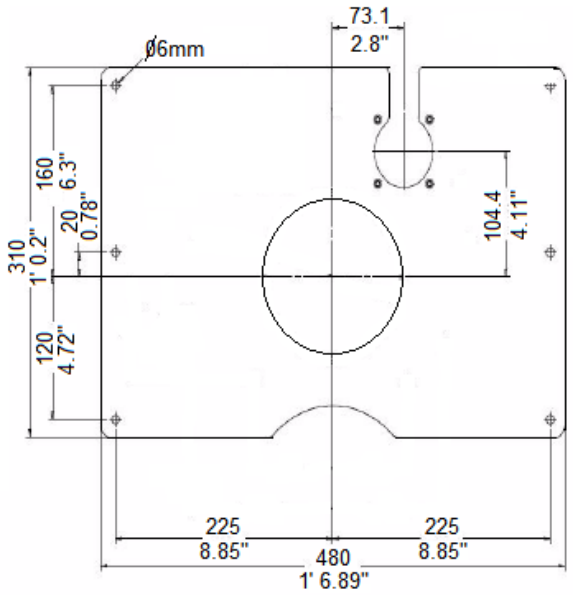


Figure 2-15 Patient Table Pivot Floor-Plate Anchoring Holes



2.3.1.4 Floor Levelness and Flatness

The scan room floor must be leveled, and its surface must be smooth.

It is recommended that the floor in the entire scan room is leveled and flattened. If this is not possible, it is a minimum requirement for the gantry/table installation area to be level and flat.

The floor levelness requirement is essential for proper alignment of the table and the gantry, which affects accurate patient positioning, collimator exchange and other aspects of system functionality. Table levelling may not be achievable if overall floor levelness does not conform to these specifications. For more details, see Appendix B Measuring Floor Flatness on page 99.

⚠ CAUTION

FLOOR LEVELING REQUIRED

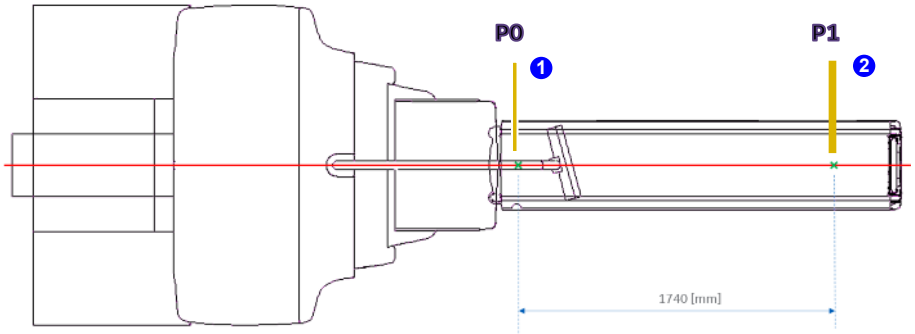
- The use of floor shims is not suitable to achieve floor levelness.
- Do not use fill material to compensate for holes or depressions in the floor surface.
- Thin fill areas under load will crack and deteriorate over time causing issues with system leveling that may lead to image quality problems. If necessary, level and flatten the entire floor area.

Table 2-4 Floor Leveling Specifications

Item	Requirement
Floor leveling area	512 cm×374 cm (16'-9"×12'-2") (covering the entire planned area of table and gantry installation, depending on room layout)

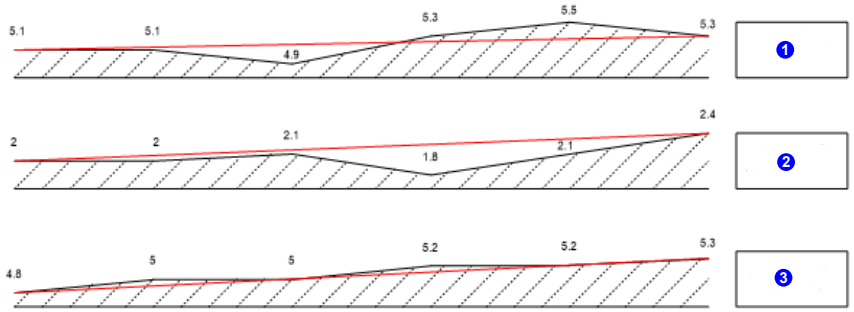
Table 2-4 Floor Leveling Specifications (Table continued)

Item	Requirement

Slope	**Table B** slope: 30 mm over 4300 mm
	Table A and **seismic installations** slope: 3 mm (0.125") over 3048 mm (120")
	Table Duct Considerations
	• If the slope is **under** 13 mm over 4300 mm, then no additional measurements are required.
	• If:
	  • The slope is **above** 13 mm over 4300 mm (but still smaller than 30 mm over 4300 mm)
	  • The pivot point **P1** is **higher** than the table wheels **P0**
	  Then additional measurements are required to determine table duct planning, as described in 2.3.1.5 Planning Table Conduits/Ducts on page 67.
	 
	Legend
	(1) Table wheels
	(2) Pivot plate

Floor surface	A single poured surface

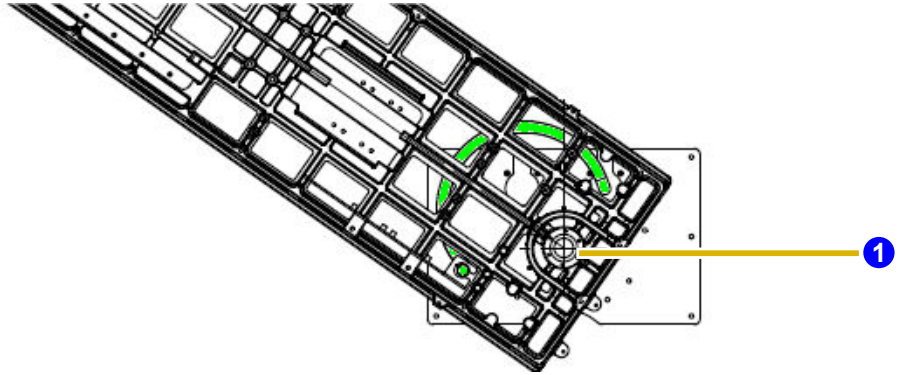
Table 2-4 Floor Leveling Specifications (Table continued)

Item	Requirement
Flatness	The surface must be smooth and without significant valleys or peaks. The entire surface area must have an overall flatness of 5 mm over 1500 mm in any direction (see Appendix B Measuring Floor Flatness on page 99 for measurement procedure).  **Legend** Example (1): The slope (red line) = Pass; the flatness (black line) = Fail Example (2): The slope (red line) = Fail; the flatness (black line) = Fail Example (3): The slope (red line) = Fail; the flatness (black line) = Pass

2.3.1.5 Planning Table Conduits/Ducts

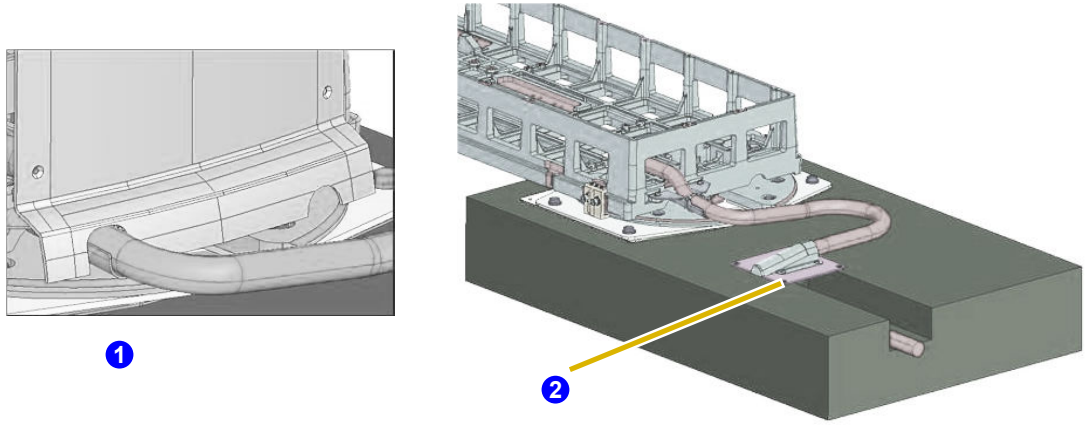
Optimally, the table conduit is routed through the pivot plate.

Figure 2-16 Table Conduit via Pivot Plate (A)



At certain floor slopes, when the table conduit is routed through the pivot plate, the table base might contact the table conduit. In such a case, the cable conduit must be routed via a duct outside of the table base.

Figure 2-17 Table Conduit via Duct



Legend

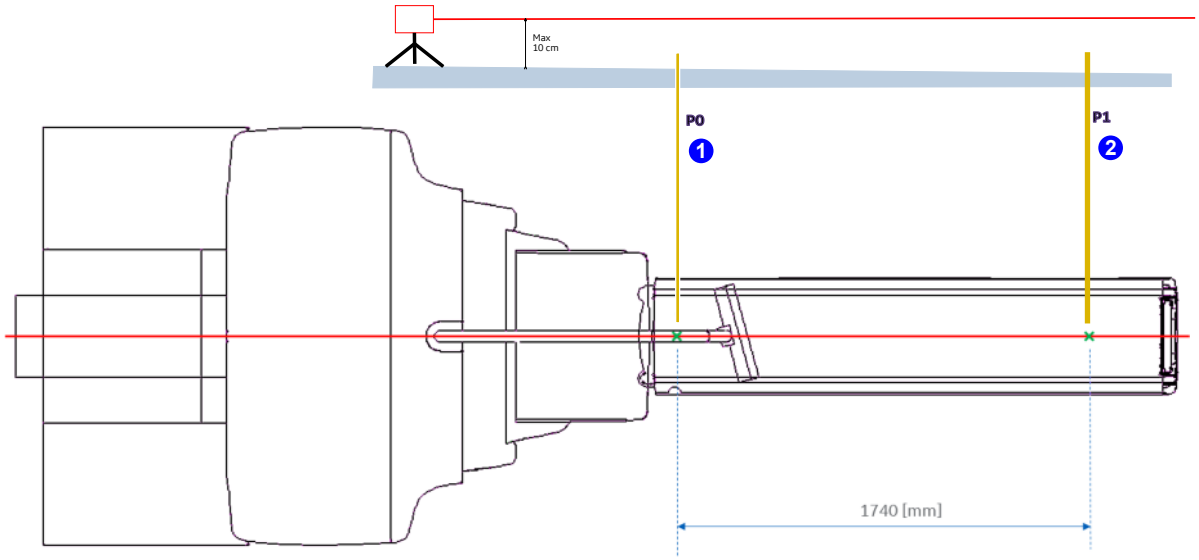
(1) External table conduit	(2) Cable entrance cover

NOTE

The same external conduit routing is equally applicable for seismic and non-seismic installations.

In order to determine whether the slope on the site requires an external duct, measure the height difference between the two points where the patient table will be installed as follows:

1. Place a self-leveling laser as close as possible to the floor and not more than 10 cm high, so that the beam passes through two points **P0** (table wheels) and **P1** (pivot plate).

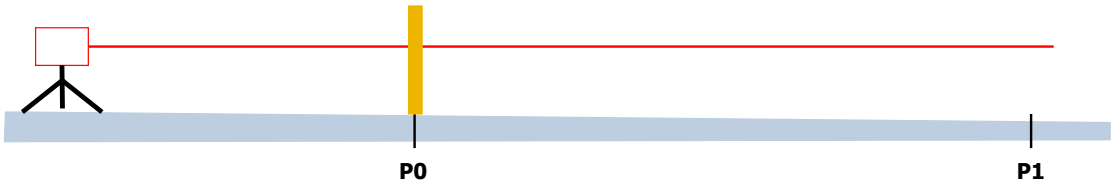


Legend

(1) P0 = Table wheels

(2) P1 = Pivot plate

2. Position a measuring stick perpendicular to the floor at **P0** and record the height at which the laser intersects the stick.



3. Position the measuring stick perpendicular to the floor at **P1** and record the height at which the laser intersects the stick.

4. If `P1 – P0 > 5 mm`, then the table cable conduit cannot be routed through the pivot plate duct and it must be routed through an external duct.

   NOTE

   If the exact location of points **P0** and **P1** is not clear:

   Repeat the measurement at several points around the estimated **P0** and **P1** locations.

   - **P1**: Use the **maximum** value measured
   - **P0**: Use the **minimum** value measured

2.3.1.6 Floor Vibration

Floor vibration requirements are included in the general vibration requirements (see 2.3.5 Vibration Specifications on page 71).

2.3.1.7 Floor Conductivity Recommendations

The purpose of this section is to measure the electrical conductivity of the floor surface to the 'GND' (Ground).

- The surface of the conductive floor shall provide a patch of electrical conductivity between all persons and equipment making contact with the floor.
- Using a DVM, measure the impedance between the upper surface of the floor – where the NM gantry is planned to be positioned, and the system power supply GND terminal in the room. The readout should be <35 M Ohm.
- Repeat the measurement in the area where the patient table will be positioned. The readout should be < 35 M Ohm.

2.3.1.8 Additional Floor Requirements

The floor finish must take into consideration magnetic field and EMI considerations
(see 3.5 EMI Considerations on page 76).

2.3.2 Ceiling Requirements

Scan room height must be at least 2.25 meters (7' 4.5").

2.3.3 Wall Requirements

Operator room window

If there is an operator room, the operator must be able to view the patient from the operator room during a scan. The location of the window depends on the position of operator room relative to the scan room. It is recommended that the window is positioned in front of the console so that the operator can look down the length of the bore.

The recommended patient viewing window dimensions are approximately 120 cm wide by 110 cm high (48"×42").

Consult a qualified radiological health physicist for radiation protection requirements for the window glass (lead content and thickness), in accordance with 3.1 Radiation Protection and Shielding Requirements on page 75 and with local requirements.

Radiation protection

For details on wall, door and window radiation protection, see 3.1 Radiation Protection and Shielding Requirements on page 75.

Other

Verify that all walls conform with local regulations, such as washability.

2.3.4 Acoustic Specifications

The system creates acoustic noise. In compliance with IEC 601-1-1 standard the measured noise (at 1m distance away from the system) is less than 70 db. It is recommended that the wall and ceiling surface is of a sound dampening material to avoid noise reverberation and amplification.

2.3.5 Vibration Specifications

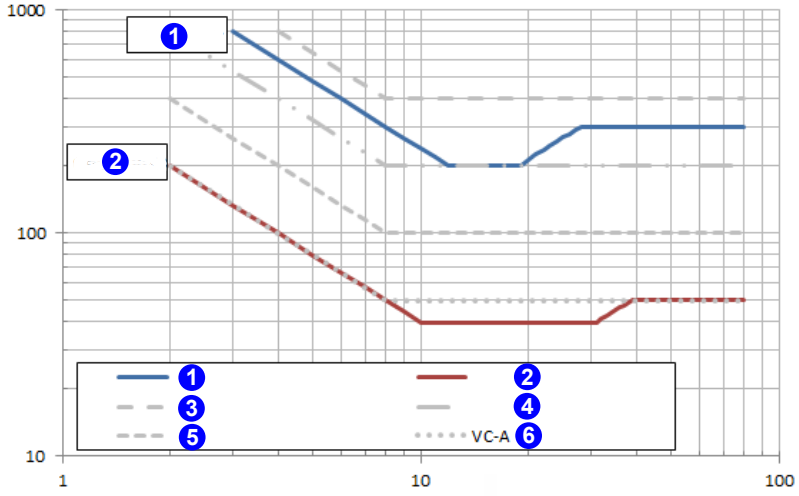
The system components are sensitive to vibration in the frequency range of 0.5 to 20 Hz, depending on the amplitude of the vibration. It is the customer's responsibility to contract a vibration consultant or qualified engineer to verify that these specifications are met and implement an appropriate solution.

To minimize vibrations, the system must be installed on a solid floor, as far as possible from the following vibration sources:

Outside building	Inside building	Other
• Parking lots • Roadways • Subways • Heliports • Trains	• Hallways • Elevators	• Hospital power plants containing pumps, motors, air handling equipment and air conditioning units

Figure 2-18 Speed Profile Specifications Micro m/s

X = Frequency [Hz] / Y= Speed RMS [Micro m/s per 1/3 octave band]

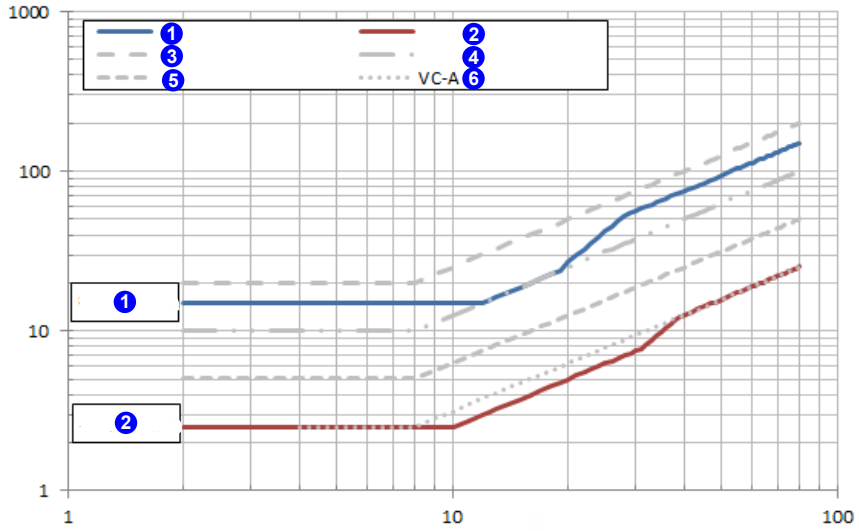


Legend

(1) 830, D630, B615
(2) 870, D670, 850, 860, O640
(3) Office
(4) Residential
(5) Operating Theatre
(6) Velocity Curve-A

Figure 2-19 Acceleration Profile mm/s^2

X = Frequency [Hz] / Y= Speed RMS [Micro m/s per 1/3 octave band]



Legend

(1) 830, D630, B615
(2) 870, D670, 850, 860, O640
(3) Office
(4) Residential
(5) Operating Theatre
(6) Velocity Curve-A

2.4 Seismic Requirements

Important

For special seismic kit details and information refer to the system-specific installation instructions.

Seismic requirements are determined and specified by the hospital design professional of record and must be approved by the specific state or country agency. Seismic attachment hardware shown on seismic calculations may differ from hardware supplied with system. Any additional hardware that is

required will be the responsibility of the institution and/or their contractor.
For additional center of gravity information, see Table 2-5 Seismic Subsystem Centers of Gravity and Anchoring Points on page 74.

Table 2-5 Seismic Subsystem Centers of Gravity and Anchoring Points

IMPORTANT! For special seismic kit details and information, refer to the specific ITF released for the system seismic install.			
Component	**Center of Gravity Location (cm)**	**Anchoring Method**	**See also**
Patient table	See Figure 2-10 Table Center of Gravity Points on page 58	Anchor plate + 6 × Hex Head Sleeve Bolt 0.25" × 1.75" anchor screws	Figure 2-15 Patient Table Pivot Floor-Plate Anchoring Holes on page 64; Figure 2-10 Table Center of Gravity Points on page 58
NM gantry with heaviest collimators	See Figure 2-9 NM Gantry with HEGP Collimators Center of Gravity Points on page 57	4×HILTI HSL-3-G M 12/25 anchors	Figure 2-12 Floor Anchor Points on page 61
NM acquisition station	See Figure 2-11 NM Acquisition Computer Center of Gravity Points on page 59	Belts and brackets with 4x HILTI anchor and HLC sleeve anchor	
Collimator cart/s	See Figure 2-4 Collimator Cart on page 45	Carts cannot be anchored, as they must move freely in the room for collimator exchange.	

Chapter 3 Special Construction Requirements

3.1 Radiation Protection and Shielding Requirements

Radiation shielding regulations differ from one country or state to another. It is the customer's responsibility to ensure that radiation protection and shielding comply with such regulations and requirements during site preparation and system installation and operation.

3.2 Background Radiation

When the system is calibrated, background radiation from surrounding areas may adversely affect calibration. Therefore all radiation sources must be suitably shielded, including:

- Waiting/Injection areas
- Radionuclide storage and preparation area (sometimes known as "hot lab")

As a general guideline, if the anticipated background radiation in the Scan Room will be higher than 0.1mR/h (1microGy/h), then appropriate additional shielding should be installed.

If radioactive gases are used in the scan room or in nearby rooms, for example gases used during ventilation lung scans; there must be mitigations to keep the gases away from the detectors. Some gases can settle on the floor while other gases can be drawn into the detector via the cooling fans. A detector's recovery from a gas contamination will depend on the half life of the radioactive gas. Negative room pressure and other air flow mitigations should be considered if radioactive gases are expected to be present in the department.

3.3 Scan Room Shielding

The system 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

- 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 (for example: film developer, film storage)

⚠ CAUTION

RADIATION HAZARD

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

3.4 Magnetic Field Considerations

Low Frequency Magnetic Field

N/A

Static Magnetic Field Limits

In order to avoid interference on the system, the static field limits from the surrounding environment must be less than 1 Gauss in both the scan and the operator rooms.

3.5 EMI Considerations

3.5.1 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.

3.5.2 Electro-Magnetic Interference (EMI) System Placement

NOTE

If power sub-stations exist under or above the scan room, or near the operator room, consider EMI testing to determine if your proposed room meets the published acceptable EMI room limits. This also includes high voltage lines under the scan or operator room floor.

EMI Reduction

If fields of excessive EMI are known or suspected to be present, consult GE Sales & Service for recommendations. Consider the following if you attempt to reduce EMI:

- External field strength decreases rapidly with distance from source of magnetic field.
- External magnetic field leakage of a three-phase transformer is much less than that of a bank of three single phase transformers of equivalent power rating.
- Large electric motors are a source of substantial EMI.
- High-powered radio signals are a source of EMI.
- Ensure sufficiently good screening of cables and cabinets.
- Consider and measure EMI fields of sites with main facility power running under the floor or within the walls or ceilings of the scan room.
- Pay special attention to power substations or high-voltage power lines in proximity to the scan facility.
- If any concerns remain regarding excessive EMI fields, be sure to measure to confirm that your site meets all required specifications.

Table 3-1 Electro-Magnetic Interference (EMI) Constraints

Component	Ambient magnetic fields		System attributes affected	Comments
	Static	AC		
Gantry and Table	< 10^{-4} tesla (1,000 milligauss)	< 10^{-6} tesla (10 milligauss) peak	Imaging performance	
Color Monitor	< 10^{-3} tesla (10,000 milligauss)	NA	Color purity and display geometry	The gantry produces an electromagnetic field that radiates outward in all directions. The UPS provides a consistent power supply in normal conditions and during a site-wide power outage. Do not place sensitive electronics, for example console or computer equipment within 1 m of the gantry or 1 m of the UPS, in any direction (including above or below) The UPS and gantry are not classified as sensitive electronics.
Console / Computer Equipment	< 10^{-3} tesla (10,000 milligauss)	NA	Data integrity	

Table 3-1 Electro-Magnetic Interference (EMI) Constraints (Table continued)

Component	Ambient magnetic fields		System attributes affected	Comments
	Static	AC		
Magnetic Media	< 10^{-3} tesla (10,000 milligauss)	NA	Data integrity	

3.5.3 Electromagnetic Immunity

The system is intended for use in the electromagnetic environment specified in Appendix C EMC Compliance on page 105. The customer must assure that the system is installed and used in such an environment.

The system should not be used adjacent to or stacked with other equipment. If adjacent/stacked use is necessary, the system should be observed to verify normal operation.

3.5.4 Recommended Separation Distances

The system is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer 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.

NOTE

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

For transmissions between 150 kHz and 2.5 GHz, adhering to the recommended distance separation 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. For example, in order to avoid image interference risks, a 1 W mobile phone (800 MHz to 2.5 GHz carrier frequency) must be placed 2.3 meters away from the system.

See also Table C-4 Separation Distances for Portable and Mobile RF Communications Equipment on page 110.

3.5.5 Cable Shielding and Grounding

All interconnect cables to peripheral devices must be shielded and properly grounded, except when technologically prohibited. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference. GE Healthcare is not responsible for any interference caused by using other than recommended interconnect cables or panels, or by unauthorized changes or modifications to this equipment.

Unauthorized changes or modifications could void the users' authority to operate the equipment.

Electromagnetic Emission

This equipment complies with IEC 60601-1: 2: 2004, IEC 60601-1: 2: 2007 and IEC 6061-1-2: 2014; EMC standards for medical devices.

NOTE

This system complies with the EMC standard when used with supplied cables. If cables of different lengths are required, contact your PM. Cables cannot be cut, shortened, lengthened, or spliced.

The system is suitable to be used in an electromagnetic environment, in compliance with the limits and recommendations provided in Table C-5 Electromagnetic Compliance on page 111.

Chapter 4 Environmental HVAC Requirements

⚠ WARNING

IMPEDED SYSTEM OPERATION / IMAGE QUALITY

Ratings and duty cycles of the system apply only if site environment meets the standards of this section. If environmental specifications are not respected, system operation and image quality may be affected.

The environmental conditions listed in this chapter are essential to maintain proper cooling for the system. These conditions must be maintained at all times, including overnight, weekends and holidays. Only when the system is shut down, for example for major repair, may the air conditioning also be shut down.

Failure to adhere to these requirements can lead to image quality issues.

⚠ WARNING

OVERHEATING

If air conditioning is not functioning correctly, the system must be shut down.

4.1 General Guidelines

Maintaining constant temperature and humidity levels is essential in order to ensure system stability over time.

Overheating or underheating, or changes in humidity that exceed the requirements provided in this section can cause technical difficulties and system failures and can cause damage to system components. You must conform to the requirements in Table 4-1 Requirements for Ambient Temperature, Humidity and Altitude on page 81 both during system storage and in as long as the system is operational after installation.

Cooling requirements do not include cooling for room lighting, personnel or other equipment.

Locate a wall air-conditioning vent at floor level beside and behind gantry to meet gantry cooling needs and to provide patient comfort. Do not locate any cooling vents directly above the gantry. Air returns above the gantry are recommended.

Table 4-1 Requirements for Ambient Temperature, Humidity and Altitude

	Maximum	Minimum	Recommended	Maximum rate of change
Temperature	26°C (79°F)	18°C (64°F)	22°C (72°F)	3°C/hr (5°F/hr)
Humidity	60% non- condensing relative humidity	30% non- condensing relative humidity		5%/hr
Altitude	4100 m (13,451 ft.)	-150 m (-492 ft.)		

4.2 Heat Output

Table 4-2 Heat Output in Scan Room

System Component	BTU/hr	Watt	Comments
Gantry	4,500	1320	
Table	682	200	
Recommended subtotal	5,182	1520	
NM acquisition station	256	75	(computer only)
Recommended subtotal without options	256	75	
NM UPS (optional)	< 1500	< 440	

4.3 Air Quality

The system is especially sensitive to the presence of sulfide, chloride and nitrate contaminates, with sulfur being the most damaging element. If high levels of contaminates exist, it is recommended that appropriate air filtration systems are installed.

If the system will be used for aerosol/gas ventilation studies, special precautions must be taken:

- Local laws and regulations must be reviewed for compliance.
- Room planning should be evaluated by a Radiation Safety Officer.

Consult your local radiation safety officer or regulatory body for best practices to minimize aerosol leakage and subsequent contamination.

5

Chapter 5 Electrical Requirements

5.1 Power Feed

A dedicated feeder run from the facility main isolation transformer is recommended to power the system. If a dedicated distribution transformer is provided for the scanner, the minimum recommended transformer size is as follows, rated 2.4% regulation at unity power factor:

8 kVA

In all cases, qualified personnel must verify that the transformer and feeder, at point of take-off, plus the run to the system, meet all the requirements provided in this document.

Table 5-1 System Power Characteristics

Maximum power demand	6 kVA @ 0.85 PF
Continuous (average) power demand at maximum duty cycle	3 kVA
Maximum allowable total power source regulation	6%
Minimum recommended transformer size	8 kVA

The following tables, and Table 5-3 Power Supply Requirements on page 83) are based on the use of copper wire, rated 75 C and run in steel conduit. The current rating (ampacity) is determined in accordance with the National Electrical Code (NFPA 70), Table 310-16 (2002).

NOTE

Ampacity, or Current Rating, is the RMS current which a device can carry within specified temperature limitations in a specified environment, depending upon: a) temperature rating, b) power loss, c) heat dissipation.

The ampacity for a power cable depends on properties of the conductor and the insulation and on environmental conditions adjacent to the cable.

The minimum feeder size is determined by the current rating (ampacity) of the circuit protection device listed below. In some cases a larger size may be necessary in accordance with local regulations for total source.

The Minimum Feeder Wire Size is 10 AWG (6 mm^2).

Table 5-2 Nominal Power Line Ranges

Nominal line voltage (Volt)	173	190	200	208	220	230	240	250	280
Hi-Line Limit, +10% (Volt)	190	209	220	230	242	253	264	275	308
Lo-Line Limit, -10% (Volt)	155	171	180	187	198	207	216	225	252
Continuous line current (Amp)	15	15	12.5	12	11.5	11	10.5	10	9
Maximum line current (Amp)	34	31	30	29	27	26	25	24	21.5
Minimum recommended circuit protection rating (Amp)	40	40	40	30	30	30	30	30	25

5.2 Power Supply Requirements

The system must receive its power supply via a dedicated feeder run from the nearest Main Distribution Panel (MDP).

NOTE

According to local regulations, a primary power disconnect device must be provided on the power line supplying the gantry .

The system is designed to operate on a one-phase plus neutral, or two-phase, three-wire power source (depending on input voltage).

Table 5-3 Power Supply Requirements

	Characteristics	Comments
Line voltage specifications	173 to 250 VAC	1. When power supply source is a single phase of 173VAC to 250VAC via power cord of 3 wires, it is connected to: a. L (Line) b. N (Neutral) c. G (GND) 2. When power supply source is a 3 phases of 120VAC via power cord of 4 wires, it is conencted to: a. Phase-1 to L (Line) b. Phase-2 to N (Neutral) c. Ground to G (GND)
Line frequency specifications	50-60 Hz ± 3 Hz	

Table 5-3 Power Supply Requirements (Table continued)

	Characteristics	Comments		
Measured kVa load characteristics	6 kVA	Maximum power demand	6 kVA	@ 0.85 PF, at a selected technique of rotation 3 RPM, L shape with LEHR collimator
		Average (continuous) power demand	3 kVA	At maximum duty cycle
Line Impedance	0.4 Ohm			
Fuse or Circuit Breaker Ratings	30 A			
Power requirements for equipment not powered from the system	In scan room and in operator room: 2 one-phase regular power outlets for service tools (such as vacuum cleaner, electric drill, soldering iron etc.)	For service activities		
Power stability (transient etc) requirements	Maximum transient voltages should be limited to 1500 V peak	Sags and surges of the power line must not exceed the absolute range limits shown in the **Nominal Power Line Ranges** table in 5.1 Power Feed on page 82.		
Inrush current	Can withstand up to x10 of the recommended Circuit Breaker Ratings that could be reached during system power up, due to the system main transformer.			

Total load regulation as measured at the system mains input terminals must not exceed 6%. The capacity of the facility transformer and the size and length of feeder wires directly affect the load regulation presented to the system.

NOTE

- The electrical rating is described on the system rating label attached to the gantry.

5.3 Grounding

5.3.1 Grounding Requirements

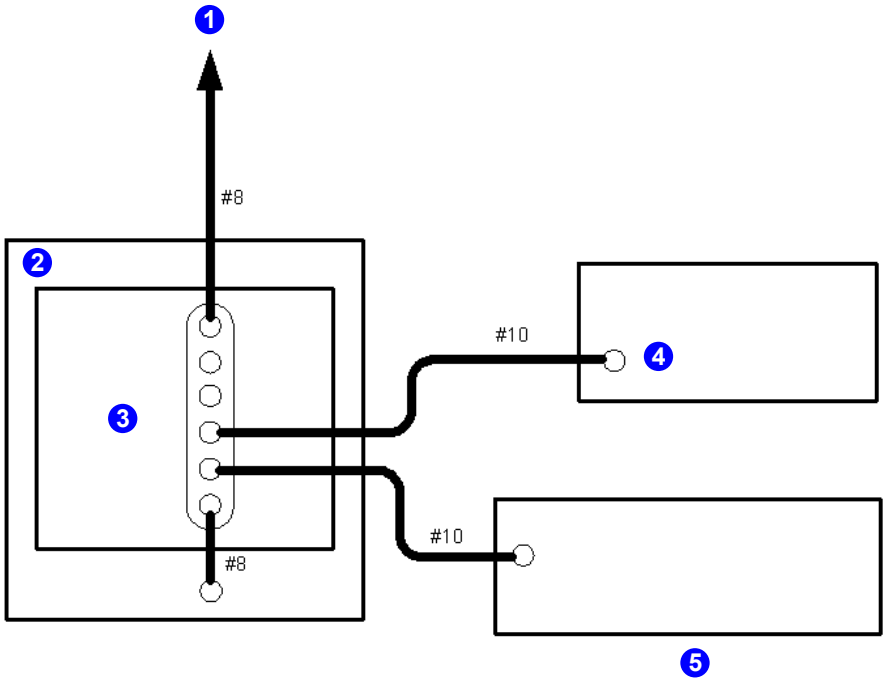
The system has been designed to use an equal potential grounding system. The required ground system is shown in Figure 5-1 System Grounding Map on page 85.

The primary grounding point is located at the gantry base.

All exposed metal surfaces in the patient vicinity are grounded to the reference ground point.

Figure 5-1 System Grounding Map

Note: Shield/signal grounds are not shown



Legend

(1) To power vault ground	(4) Operator console (computer)
(2) NM gantry	(5) Patient table
(3) NM gantry ground bar (located at gantry side)	

5.3.2 Grounding of System Input Power

Make sure to comply with both of the following grounding requirements:

- Connecting to the gantry base

  Connect the metal conduit, raceway, or the armor of the armored cable used to power the system, to the system gantry ground.

- **Grounding wire**

  Only if required by local electrical code:

  - Run a dedicated 8 (8 mm^2) or larger insulated copper ground wire with the phase wires from the main distribution panel to the main facility ground.
  - Connect the ground wire to the MDP (A1) through which it passes, in accordance with local codes.
  - Ensure that the resistance between the gantry ground and the facility earth ground at the MDP does not exceed 0.5 Ohm. Measure with an ohm meter and a piece of wire.
  - Ensure that the total resistance between the gantry ground and earth does not exceed 2 Ohm. The system's ground conductor must be in the same conduit as the system phase conductors. This ground conductor must be bonded to the main facility ground.

    NOTE

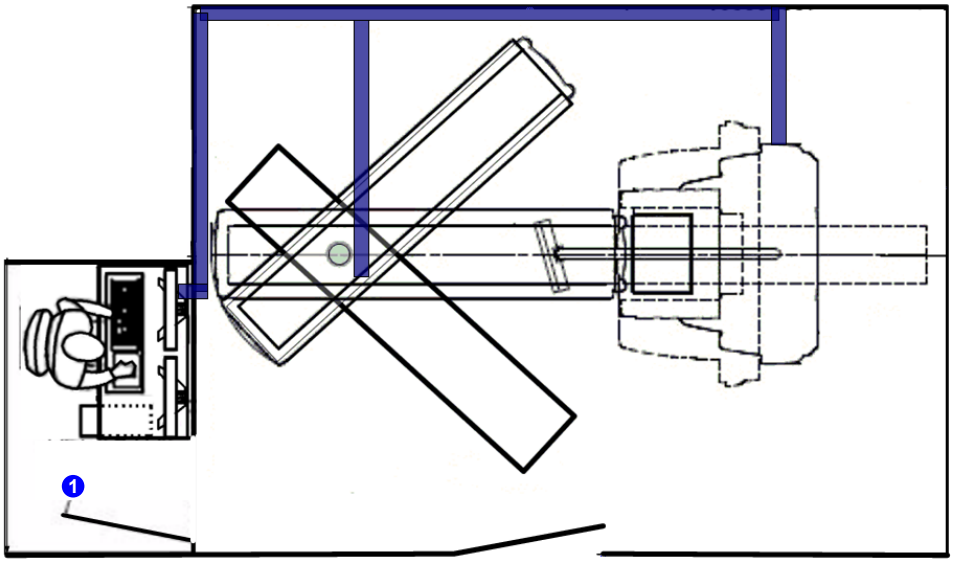
    The shield or armor of armored cable is not sufficient for this purpose.

5.4 Interconnections

It is recommended that all cables are run inside ducts or conduits, as illustrated below.

Ensure adequate duct or conduit sealing to prevent penetration of liquids or other objects that may damage the cables.

Figure 5-2 Example of Suggested Cable Ducts Routing in Standard Room



Legend

(1) Operator room

5.5 System Cable Information

This section provides technical information regarding system cables connecting different sub-systems, in order to facilitate the planning of cable routing.

Table 5-4 Sub-system Inter-connection Cables

Start / Destination		H/V Separation (Y or N)	Total Length	Description
From	To			
Wall	Gantry	Y	10 m (32.8')	NM mains power
Gantry	Table	N	12 m (39.4')	Table bundle
Gantry	Operator console	N	14 m (45.9')	OC bundle

Table 5-4 Sub-system Inter-connection Cables (Table continued)

Start / Destination		H/V Separation (Y or N)	Total Length	Description
From	To			
Gantry	EMO	N	19 m (62.3')	EMO (Emergency Off)

*1 The standard NM power cable provided is 10 m. It is possible to replace it (if needed) with a 19 m cable available as a spare part.

*2 The standard patient table cable provided is 12 m. It is possible to replace it (if needed) with a 19 m cable available as a spare part.

5.6 Typical Customer Supplied Cables and Wiring

5.6.1 Primary Power Disconnect

MDP with lockout /tagout (LOTO)

In order to install and service the system, the customer must have a lockout /tagout (LOTO) compatible Main Disconnect Panel (MDP) installed in the room.

The MPD and the lockout /tagout must be visible when servicing the system.

The customer must ensure that all cables and wiring specified in this section are prepared in advance. These cables and wiring components are not supplied with the system.

5.7 Lighting Specifications

5.7.1 Scan Room Lighting

The lighting should be planned so there is sufficient light for:

- Scan preparation
- Scan setup
- Patient unloading
- Working light for service and maintenance activities

The lighting should be designed so that it can be dimmed or otherwise changed in order to minimize discomfort for patients lying supine for extended periods on the patient table with the ceiling in view.

NOTE

- Scan room lighting above the gantry and patient table area should consist of fluorescent lights only (no direct sunlight or direct bright light from filament light bulbs).
- During system servicing in the scan room, a relatively bright light is required in the area behind and around the gantry.

5.7.2 Operator Room Lighting

The lighting should be planned taking into account that operators will be working with computer monitors and reading digital images during much of the day. Reflections in monitors should be avoided, and other ergonomic factors taken into account.

The operator room lighting must also take into account that relatively bright light is required while servicing the acquisition station.

5.8 Power Line Outlets for Service

It is recommended to install at least two standard power outlets in the scan room and in the operator room, to be used for electrically powered service tools. The exact location of these outlets should be defined according to regulatory and service clearances around the system.

6

Chapter 6 Network and GE Remote Access Requirements

6.1 Network Requirements

The system requires the following network connections:

- Broad-Band Network Connection (BBNC) (required): broad-band network connection wall jack, located within 1 m (40") of the operator computer location, for internal hospital networking and GE remote broadband connectivity.
- Local Area Network (LAN) (required)
  - LAN connections are usually required in the operator room for:
    - Xeleris workstation
    - Main system
    - DICOM LAN printer (optional)

      The LAN and WAN Networks sockets/outlets (minimum 3) must be available in the operator room within a distance of 1 m (40") of the operator computer location, processing workstations (Xeleris) and LAN printer installed in the operator room.
  - In the scan room it is recommended to have one LAN socket/outlet available in close proximity to the gantry for service engineer activities actions.
- Wide Area Network (WAN) (optional)

6.2 RSVP Requirements

From SP62XX and above, the system requires direct internet connectivity as follows:

- The system allows for DNS configuration or Proxy server connection to the internet.
- If replacing an existing system that has a remote GE connection, the current internet connection supporting GE remote access (InSite) connection can be reused.
- RSVP meets the security specifications defined in the product's Privacy and Security manual or relevant software document.
- Proxy configuration for internet access may also include authentication credentials (user name and password). Local IT contact must be able to authenticate these details on the system if necessary.

- If the site would like to whitelist only certain URLs, the following addresses can be used for RSVP connectivity. All service traffic is via port 443:
  - Initial connectivity: https://insite.gehealthcare.com:443
  - Remote access: https://as1-insite.gehealthcare.com:443
  - Remote access: https://as2-insite.gehealthcare.com:443
- It is not recommended to route the connection over an existing site VPN tunnel (instead of over the internet). If the customer requires the use of a VPN tunnel, a case must be escalated to the local connectivity team.

Appendix A Customer Checklist

The checklist must be completed by the customer and delivered to GE prior to installation.

Important

This checklist is general in nature and is intended to assist the customer in verifying site preparation. The checklist does not cover all details in this manual, and it is the customer's responsibility to fully prepare the site, taking into account all details and specifications set out in this manual.

Site Information	Contact Information	Contact Persons	Name	Telephone	email
Site name		Site project coordinator			
Department		System administrator			
Street		Chief technologist			
City, State, Zip		Facilities engineer			
Country		Shipping / Receiving			
Telephone		Physician			
Fax		Other			
Safety Declaration					
I hereby confirm that the relevant site personnel have read the *Safety and System Overview Manual*, in conjunction with this Pre-Installation Manual.			Name		
			Position		
			Signature		
Completion Sign Off					
I hereby confirm that pre-installation is complete and that I have examined and confirmed all items in the Pre-Installation Customer Checklist			Name		
			Position		
			Signature		

Table A-1 Deviation from Specifications in Site Preparation Manual

Description		Personal Details	
Floor and anchoring	I hereby confirm that the site takes full responsibility for the floor and anchoring methods differing from the specifications in this manual	Name	
		Position	
		Signature	

Table A-2 Site Preparation Timetable

Description		Status	See	Comments
Scheduling	Project schedule verified with GE			
	3rd party vendors scheduled			
	Can meet the committed site ready date			
	Construction completion date matches delivery date			
	System delivery date scheduled for			
	Detectors delivery date scheduled for			
	Installation dates scheduled for			
	Applications/Training date scheduled for			
	Site Ready date scheduled for			
	First Use date scheduled for			

Table A-3 Room Preparation

Description		Status	See	Comments
Pre-construction	Site layout drawings completed and approved			
	Radiologist health physician has reviewed the room layout			

Table A-3 Room Preparation

Description		Status	See	Comments
	3rd party vendors identified: _____ _____ _____			
Post-construction: Room measurements and layout	• Length			
	• Height			
	• Width			
Servicing clearance	Meets all requirements, including local codes and local regulatory requirements as detailed in Appendix D Regulatory Clearances on page 112. No grounded walls are present in the regulatory clearance areas.			
Egress	Sufficient egress space per local regulatory requirements			
Structural and floor preparation	Floor tolerates specified loads			
	Floor meets thickness requirements or alternate anchoring has been specified and is available from the customer's structural engineer			
	Floor meets leveling requirements			
	Floor meets flatness requirements			
	Floor meets vibration requirements			
Ducts	Ducts installed in floor, according to approved room layout			
	Ducts meet requirements (size, depth, sealing, high voltage separation)			
Electricity requirements	Main Distribution Panel (MDP (A1)) meets requirements and is installed			

Table A-3 Room Preparation (Table continued)

Description		Status	See	Comments
	Power line meets requirements			
	Wall outlets are live and available for installation and service tools			
Environmental conditions	Ample working light is available for service			
	Air-conditioning meets requirements for system thermal loads			
	Air-conditioning meets humidity requirements			
	Magnetic field in camera room is < 1 Gauss			
	Room is clean and free of dust, ready for installation			
Room shielding	Shielding of scan room meets requirements			
	Shielding of operator room (if applicable) meets requirements			
Safety	Planned location of emergency button in scan room is easily accessible by operator			
	Interlock system installed			

Table A-4 Unloading, Conveyance and Storage

Description		Status	See	Comments
Temporary storage	System will be delivered on first install day **or** Some or all crated components will be stored until installation date			
	Site has sufficient storage area			
Staging area	If a staging area is required, its size and all environmental conditions meet the system's requirements.			

Table A-4 Unloading, Conveyance and Storage (Table continued)

Description		Status	See	Comments
Loading dock	Is a loading dock with 112 cm (44") truck-height available?			
	Full-size truck can access loading dock **or** Site will arrange for short truck delivery			
Unloading by forklift	Site has forklift with weight capacity to lift a fully crated gantry (2230 kg) (4917 lbs.) **or**			
	Site will arrange for appropriate forklift			
Rigging (required if halls/ elevator/doors access is not available)	Rigging company details: Name: _____ Contact person: _____ Phone: _____			
	Rigging company has insurance policy			
	Insurance policy of rigger company is attached			
Pallet truck	Site has pallet truck **or** Site will arrange for pallet truck			
Delivery route	Delivery route is defined by site and meets requirements			
	Delivery route is tested by site			
Installation room	Room can be locked during installation			
Suitability of halls, elevators and doors for conveyance of all components, when mounted on moving kit/wheels **Note:** All items must refer to conveyance as follows: - From truck to installation room (crated or uncrated) or	All door openings, hallways are large enough			
	Pathways can tolerate weight			
	Elevator openings and size are large enough			
	Elevator can tolerate weight			
	Gantry can clear all corners			

Table A-4 Unloading, Conveyance and Storage (Table continued)

Description		Status	See	Comments
- From truck to storage (crated) and from storage to installation room (crated or un-crated)	Inclines on the route to the camera room are suitable (weight, size and incline angle)			
	State the incline angle			
	There are delicate carpets or tiles along the conveyance route			
	Floor protection is supplied for delicate surfaces			
	Patient table can clear all 90° corners			
Waste materials	Site has arranged for disposal of empty wooden cases, foam blocks and large card-board boxes after installation			

Table A-5 Network Preparation

Description		Status	See	Comments
Local networking or IT Contact information	Info provided			
Network cabling and hardware	Installation complete			
Broadband	Installed and tested			
Network definitions and testing	Acquisition station site name, hostname and IP address defined and tested			
	Xeleris workstation site name, hostname and IP address defined and tested			

Network Definition Details					
Item	Hostname	IP	Wired (Y/N)	DICOM Port	AE Title
NM Acquisition Station					
Processing host					
Hardcopy host					
LAN Net Mask					

Network Definition Details					
Gateway to other networks					

Table A-6 Radioactive Isotopes for System Calibration

Description		Status	See	Comments
Basic calibration	Site has license for Tc^{99m}			
	Tc^{99m} will be available during installation			
Isotopes to be used at site are available for installation. Specify age and strength of source in Comments	Co^{57} (Rectangular Flood Source)			
	Tl^{201}			
	I^{131}			
	I^{123}			
	In^{111}			
	Ga^{67}			
	Xe^{133} (inhalation gas)			

Appendix B Measuring Floor Flatness

The floor must meet strict flatness specifications. The information in this appendix is provided as a tool for accurate measurement of the floor flatness.

Required Tools

- Self-leveling fan beam laser tool (self-leveling for at least 3 degrees)
- Masking tape
- Chalk line
- 1 m (3') level with minimum 1 mm (1/16") gradations (alternatively, use a tape measure securely taped to a spirit level)

1. Map the floor as follows:

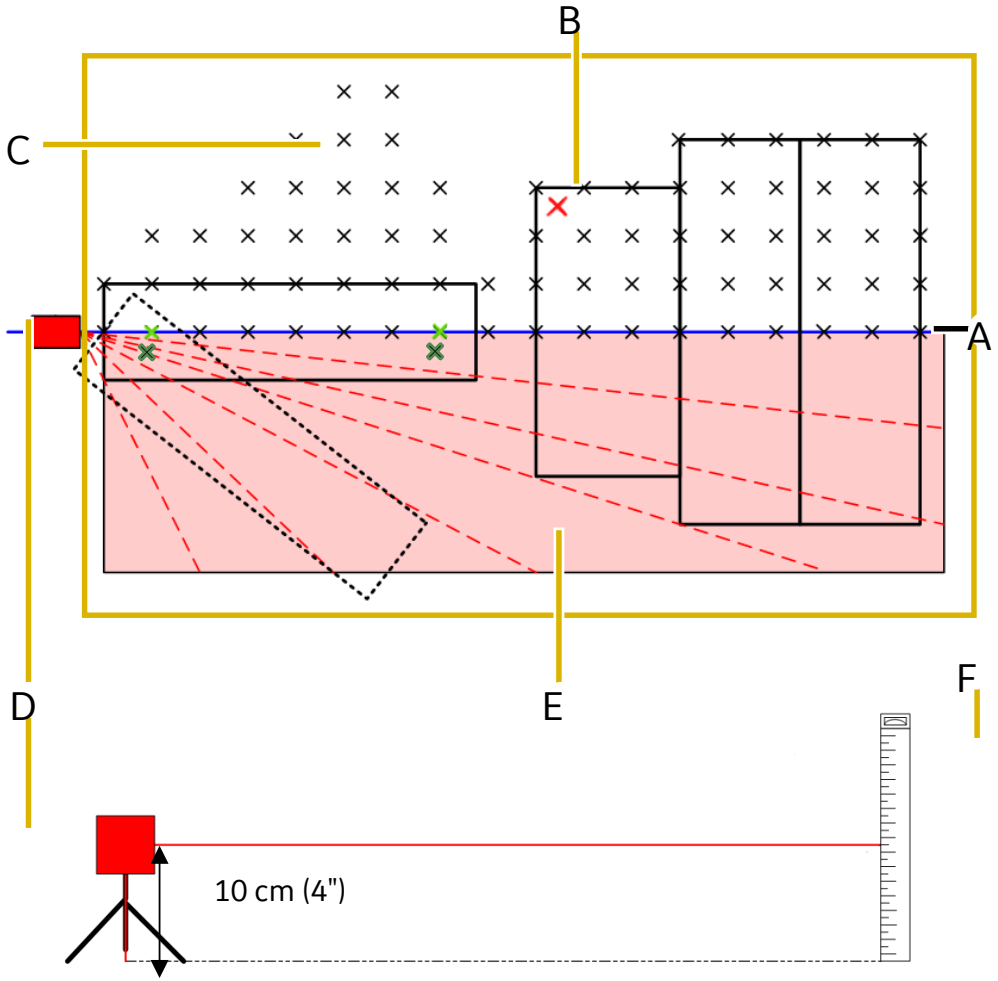
   NOTE

   In the following graphic:

   The "interest area" that needs to be checked (marked with two green X markers in the diagram) differs depending on the system type. This example demonstrates the area for 870 and D670 systems.

   The "interest area" for table installation is indicated by the two green X marks.

   Maximum height of laser: 10 cm (4")



2. Place the laser (D) at the end of the center line.

   The laser must be high enough for the fan beam to be visible over the entire footprint area (E), but no more than 10 cm (4") high (the closer to the floor the more accurate).

   a. Using a chalk line, mark the center line (A) (refer to site drawings or proposal for exact location).

   b. Using masking tape, place × marks at 30 cm (1 ft) intervals along the center line.

c. Add × marks at 30 cm (1 ft) intervals from center line, so that the system footprint is covered with a grid of × marks (C).

d. Place the level flat on the floor and move it around the footprint area. Visually inspect the floor for any significant highs/lows, and add × marks (B) to identify them.

3. Keeping the measuring stick (F) exactly perpendicular to the floor, at each tape mark record the height at which the laser hits the ruler.

4. Record the measurements in a table that represents the system footprint. Add notes for any significant high/low measurements found in between the grid locations.

The table provides a visual contour of the floor, where each cell in the grid represents 30 cm (1 ft). Compare to the system specifications to determine whether the floor meets the requirements.

Table B-1 Floor Flatness Conforming with 0.5 cm over 150 cm Specs (0.5 Deviation) on page 101 shows a floor that meets the specification of 0.5 cm over 150 cm: there is no deviation greater than 0.5 between any 5 cells in the grid.
Table B-2 Floor Flatness Outside 0.5 cm over 150 cm Specs (1.1 Deviation) on page 102 shows a floor with three areas out of specification.

Table B-1 Floor Flatness Conforming with 0.5 cm over 150 cm Specs (0.5 Deviation)

Measurements in CM					Center					Notes
	1.3	1.2	1.1	1.1	1	1.1	0.9	0.9	1		Greatest Deviation: 1.4 - 0.9 = 0.5
	1.2	1.1	1.1	1.1	1	1	1	0.9	1		
	1.2	1	1	1	1	1	1	1	1		
	1.1	1	1	1	1	1	1.1	1.1	1.1		
	1	1	1	1	1	1	1.1	1.2	1.2		
	1	1	1	1	1	1	1.2	1.2	1.3		
	1.1	1.1	1.1	1	1	1.1	1.2	1.3	1.3		
		1.1	1.1	1.1	1.1	1.1	1.2	1.3			
		1.2	1.2	1.1	1.1	1.1	1.2	1.2			
		1.2	1.2	1.2	1.1	1.1	1.2	1.2			
				1.2	1.2	1.2					
		1.2	1.2	1.2	1.2	1.2	1.2	1.2			
1.3	1.3	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.1	1	
1.3	1.3	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.1	1	
	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.1		

Table B-1 Floor Flatness Conforming with 0.5 cm over 150 cm Specs (0.5 Deviation) (Table continued)

Measurements in CM					Center						Notes
		1.2	1.3	1.3	1.3	1.3	1.3	1.3			
			1.3	1.4	1.3	1.3	1.3				
				1.4	1.4	1.3					

Table B-2 Floor Flatness Outside 0.5 cm over 150 cm Specs (1.1 Deviation)

Measurements in CM					Center						Notes
	5.2	5.3	5.4	5.4	5.4	5.4	5.4	5.4	5.5		Greatest Deviation: 5.9 - 4.8 = 1.1
	5.3	5.4	5.4	5.3	5.4	5.4	5.4	5.4	5.4		
	5.4	5.4	5.3	5.2	5.2	5.3	5.1	5.3	5.4		
	5.3	5.3	5.2	5.1	5.1	5.2	5	5.3	5.6		
	5.4	5.4	5.4	5.2	5	5.1	5.2	5.2	5.3		
	5.3	5.3	5.3	5.1	5	5	5.1	5.2	5.2		
		5.1	5.1	5	5	5.1	5.3	5.3			
		5	5	5.1	5.1	5.3	5.4	5.6			
		4.8	4.9	5.1	5.2	5.4	5.6	5.9			
				5.1	5.2	5.3					
		5.1	5.2	5.2	5.2	5.3	5.4	5.5			High spot between orange blocks = 4.8
5.1	5.1	5.1	5.2	5.2	5.3	5.3	5.5	5.6	5.8	5.9	
5	5.1	5.2	5.2	5.3	5.4	5.4	5.5	5.6	5.8	5.9	
	5.2	5.2	5.3	5.4	5.5	5.5	5.6	5.6	5.7		
		5.3	5.4	5.5	5.6	5.6	5.6	5.7			
			5.5	5.6	5.7	5.6	5.7				
				5.7	5.8	5.7					
	5.2	5.3	5.4	5.4	5.4	5.4	5.4	5.4	5.5		

Table B-3 Blank Table for Measurements

Measurements in CM					Center						Notes
											Greatest Deviation:

Table B-3 Blank Table for Measurements (Table continued)

Measurements in CM					Center						Notes

C

Appendix C EMC Compliance

This equipment complies with IEC60601-1-2 Edition 4 EMC Standard for medical electrical equipment.

The system is suitable to be used in an electromagnetic environment, in compliance with the limits and recommendations provided in the following tables:

- Emission compliance level and limits
- Immunity compliance level and recommendations to maintain equipment clinical utility

Table C-1 EMC Emission Declaration

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.
RF emissions CISPR 11	Class A	
Harmonic emissions IEC 61000-3-2	NA	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 61000-3-2	NA	

Table C-2 Immunity Guidance and Declaration

Immunity Test	EC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air ±8 kV contact ±15 kV air	[Edition 2 and 3] • ±6 kV contact ±8 kV air [Edition 4] • ±8 kV contact • ±15 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%.

Table C-2 Immunity Guidance and Declaration (Table continued)

Immunity Test	EC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines 100 Khzrate ± 1 kV for input/ output lines 100 Khzrate	[Edition 2 and 3] • ±2 kV for power supply lines, 100Khz rate • ±1 kV for input/ output lines, 100Khz [Edition 4] • ±2 kV for power supply lines, 100Khz rate • ±1 kV for input/ output lines, 100Khz rate	Mains power quality should be a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV line-line ±2 kV line-earth	[Edition 2,3, and 4] • ±1 kV line-line • ±2 kV line-earth	Mains power quality should be a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	0% UT for 5 sec	[Edition 2 and 3] • < 5 % UT (>95% dip in UT) for 5 sec [Edition 4] • 0% UT for 5 sec	Mains power quality should be 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 is powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m 30 A/m	[Edition 2 and 3] • 3 A/m [Edition 4] • 30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE UT equals the alternating current mains voltage prior to application of the test level.			

Table C-2 Immunity Guidance and Declaration (Table continued)

Immunity Test	EC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz 6 Vrms in ISM bands 150 kHz to 80 Mhz	[Edition 2, 3, and 4] • 3 Vrms • 150 kHz to 80 MHz [Edition 4] • 6 Vrms in ISM bands • 150 kHz to 80 Mhz	Do not use portable and mobile RF communications equipment closer to any part of the system, including cables, than the recommended separation distance (d) calculated from the equation appropriate for the frequency of the transmitter. Recommended Separation Distance (d): $d = \left[\frac{3.5}{3}\right]\sqrt{P}$ See Table C-4, 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 meters (m) . Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol: 

Table C-2 Immunity Guidance and Declaration (Table continued)

Immunity Test	EC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Radiated RF Fields / Proximity Fields from Wireless Transmitters IEC 61000-4-3	3 V/m 80 MHz to 2.7 GHz 80% AM 1 kHz 9V/m to 28 V/m Spot frequencies 385 / 450 / 710 / 745 / 780 / 810 / 870 / 930 / 1720 / 1845 / 1970 / 2450 / 5240 / 5500 / 5785 MHz PM 18 Hz or 217 Hz (50% duty cycle) See Table C-4 for details.	[Edition 2 and 3] • 3 V/m • 80 MHz to 2.5GHz • 80%AM 1 kHz [Edition 4] • 3 V/m • 80 MHz - 2.7 GHz • 80%AM 1 kHz [Edition 4] • 9 V/m to 28 V/m • spot frequencies 385 / 450 / 710 / 745 / 780 / 810 / 870 / 930 / 1720 / 1845 / 1970 / 2450 / 5240 / 5500 / 5785 MHz • PM 18 Hz or 217 Hz • (50% duty cycle) See Table C-4 for details.	Do not use portable and mobile RF communications equipment closer to any part of the system, including cables, than the recommended separation distance (d) calculated from the equation appropriate for the frequency of the transmitter. Recommended Separation Distance (d): $d = \left[\frac{3.5}{3}\right]\sqrt{P}$ $d = \left[\frac{7}{3}\right]\sqrt{P}$ See Table C-4 , 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 meters (m) . Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, *1 should be less than the compliance level in each frequency range.*2 Interference may occur in the vicinity of equipment marked with the following symbol: 

*1 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 reorienting or relocating the system.

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

Table C-3 Spot Frequencies

Spot Frequency (Mhz)	Band (Mhz)	Service	Maximum Power (Watts)
385	380-390	TETRA 400	1,8
450	430-470	GMRS 460 FRS 460	2,0
710	704-787	LTE Band 13, 17	2
745			
780			
810	800-960	GSM 800/900 TETRA 800 IDEN 820 CDMA 850 LTE Band 5	2
870			
930			
1720	1700-1990	GSM 1800 CDMA 1900 GSM 1900 DECT LTE Band 1, 3, 4, 25 UTMS	2
1845			
1970			
2450	2400-2570	Bluetooth WLAN 802.11 b/g/n RFID 2450 LTE Band 7	2
5240	5100-5800	WLAN 802.11 a/n	0,2
5300			
5785			

Table C-4 Separation Distances for Portable and Mobile RF Communications Equipment

Rated Max Output Power (P) of Transmitter (Watts)	Separation distance according to frequency of transmitter (meters)			Comments
	150 kHz to 80 MHz $d = \left[\frac{3.5}{3}\right]\sqrt{P}$	80 MHz to 800 MHz $d = \left[\frac{3.5}{3}\right]\sqrt{P}$	800 MHz to 2.7 GHz $d = \left[\frac{7}{3}\right]\sqrt{P}$	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 meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked accordingly.
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	

*1 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, and 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 relocation the system.

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

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 power (P) is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE

- At 80 MHz to 800 MHz, the separation distance for the higher frequency range applies.
- These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people. As an example, keep a 1 W mobile phone (800 MHz to 2.7 GHz carrier frequency) at least 2.3 m from the NM/CT system (to avoid image interference risks).

Limitations Management: Adhering to the distance separation recommended in (150 KHz to 2.7 GHz) reduces disturbances recorded at the image level, but may not eliminate all disturbances. However, when installed and operated as specified, the system maintains its essential performance by continuing to acquire, display, and store diagnostic quality images safely.

Table C-5 Electromagnetic Compliance

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 not likely to cause interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	When installed in such a shielded location, the scanner 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.
Harmonic emissions IEC 61000-3-2	N/A	N/A
Voltage fluctuation/ flicker emissions IEC 61000-3-2	N/A	N/A

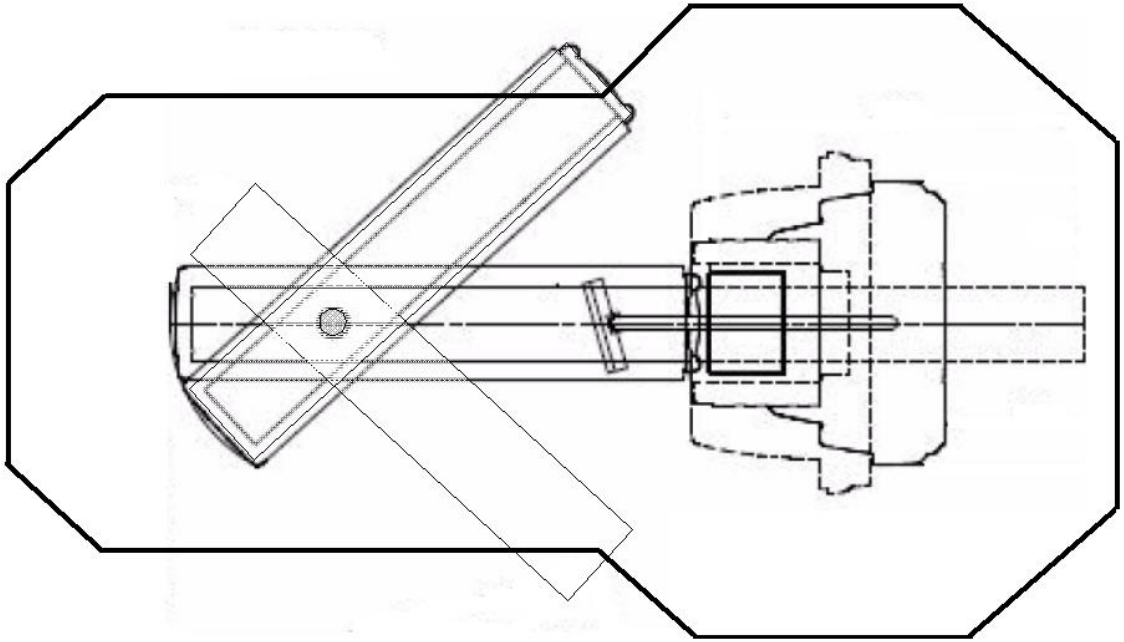
D

Appendix D 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):

Figure D-1 Regulatory Clearance Requirements on page 112 is a map of clearance requirements for U.S. regulatory compliance. See 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. See D.5 Service Clearances on page 117 for additional information.

Figure D-1 Regulatory Clearance Requirements



D.1 Regulatory Code Description

Egress: 29 CFR 1910 Subpart E (OSHA) and NFPA 101 (Life Safety Code) define the minimum requirements for means of egress. The requirement most applicable to equipment installation and room layout is minimum width of exit access. Under OSHA 1910.37(f)(6), the minimum width of exit access shall in no case be less than 28 in. from any potentially occupied point in the room.

Under NFPA 101 (2006 edition) 7.3.4.1, the minimum width of any means of egress is 36 in. However, NFPA allows this to be reduced to 28 in. around furniture or equipment, provided that a 36 in. clearance would otherwise be available without moving permanent walls.

Electrical Clearance: 29 CFR 1910 Subpart S (OSHA) and NFPA 70E (Standard for Electrical Safety in the Workplace) define minimum clearance requirements for the workspace around electrical equipment. Under both OSHA 1910.303(g)(1) and NFPA 70E (2004 edition) 400.15, a minimum clear space of 36" depth (with minimum 30" width and 78" height) must be provided in front of electrical equipment with parts operating at 600 volts or below and likely to require examination, adjustment, servicing, or maintenance while energized.

This safety clearance requirement applies to all GEHC equipment. Although 36 in. is the minimum clearance for most installations, the standards require an increased minimum clearance distance where parts operate above 150 volts (but still below 600 volts) under the following circumstances:

- If the wall or surface directly facing the electrical equipment is grounded (for example: brick, concrete, or tile) or includes grounded protrusions (such as medical gas ports, metal door or window frames, water sources and metallic sink structures, metallic cabinetry, electrical disconnects or emergency off panels, air conditioners or vents), then a 42" clearance depth is required.
- If the possibility exists of exposed and unguarded live parts on both sides of the workspace (for example if a power distribution unit were positioned on the wall directly facing the GEHC equipment), then a 48" clearance depth is required.

D.2 Regulated Minimum Working Clearance by Major Subsystem

Requirements apply to equipment operating at 600V 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.

Table D-1 Gantry Subsystem

Work Space Requirement	Minimum Clear Space	Additional Conditions
Direction of service access (all sides)	914 mm (36")	If exposed live parts of 151 - 600 volts are present, 1219 mm (48 in.) on both sides of workspace with the operator between is required. If the opposite wall is grounded and exposed live parts of 151-600 volts are present, 1067 mm (42 in.) is required.
Service access width (left-right of workspace)	762 mm (30")	This is the width of the working space in front of the equipment. A minimum of 762 mm (30 in.) or the width of the equipment, whichever is greater, is required.

Table D-2 Table Subsystem

Work Space Requirement	Minimum Clear Space	Additional Conditions
Direction of service access (table head or foot)	914 mm (36")	There are no exposed live parts hazards with the cover in place. This component is typically serviced from all four sides. This is the width of the workspace on each side of the equipment. A minimum of 914.4 mm (36 in.), or the width of the equipment, whichever is greater, is required.
Direction of service access (table sides)	914 mm (36")*	*This distance can be reduced to 711 mm (28 in.) provided a written and signed approval is obtained by the local team from the local AHJ (Authority Having Jurisdiction). The signed document must be on file with GE.
Direction of Service access (table foot)	711 mm (28")	For the front gantry cover removal, a minimum of 457 mm (18 in.) is allowed only if an unobstructed egress space of 711 mm (28 in.) is maintained around the equipment for room exit. This also means no trip hazards exist along the path of egress.
Service access width (left-right of workspace)	762 mm (30")	This is the width of the working space in front of the equipment. A minimum of 762 mm (30 in.) or the width of the equipment, whichever is greater, is required.

Table D-3 Console Subsystem

Work Space Requirement	Minimum Clear Space	Additional Conditions
Direction of service access: front of console	914 mm (36")	There are no exposed live part hazards with the cover in place. If the console is placed under a counter, the front edge of the console must be even with the vertical edge of the console workspace. This component is typically serviced from the front with access to the rear.
Service access width: Front of console	762 mm (30")	This is the width of the workspace in front of the equipment. A minimum of 762 mm (30 in.) or the width of the equipment, whichever is greater, is required.

Table D-3 Console Subsystem (Table continued)

Work Space Requirement	Minimum Clear Space	Additional Conditions
Head clearance	1981.2 mm (78")	This is the height of the workspace measured from the floor at the front edge of the equipment to the ceiling or overhead obstruction(s). A minimum of 1981.2 mm (78 in.) or the height of the equipment, whichever is greater, is required.

Table D-4 UPS Subsystem

Work Space Requirement	Minimum Clear Space	Additional Conditions
Direction of service access (front of UPS)	914.4 mm (36")*	There are no exposed live part hazards with the cover in place. This component is typically serviced from the front with access to the rear. • If exposed live parts of 151 - 600 volts are present, 1219 mm (48 in.) is required on both sides of the workspace with the operator between. • If the opposite wall is grounded and exposed live parts of 151 - 600 volts are present, 1067 mm (42 in.) is required.
Service access width (right side and length of UPS)	762 mm (30")	This is the width of the working space in front of the equipment. A minimum of 762 mm (30 in.) or the width of the equipment, whichever is greater, is required
Head clearance	1981 mm (78")	This is the height of the workspace measured from the floor at the front edge of the equipment to the ceiling or overhead obstruction(s). A minimum of 1981 mm (78 in.) or the height of the equipment, whichever is greater, is required.

Table D-5 MDP (A1) Disconnect Subsystem

Work Space Requirement	Minimum Clear Space	Additional Conditions
Direction of service access (front of MDP/A1)	914.4 mm (36")*	There are no exposed live part hazards with the cover in place. This component is typically serviced from the front with access to the rear. • If exposed live parts of 151 - 600 volts are present, 1219 mm (48 in.) is required on both sides of the workspace with the operator between. • If the opposite wall is grounded and exposed live parts of 151 - 600 volts are present, 1067 mm (42 in.) is required.
Service access width (right side and length of MDP/A1)	762 mm (30")	This is the width of the working space in front of the equipment. A minimum of 762 mm (30 in.) or the width of the equipment, whichever is greater, is required.

Table D-5 MDP (A1) Disconnect Subsystem (Table continued)

Work Space Requirement	Minimum Clear Space	Additional Conditions
Head clearance	1981 mm (78")	This is the height of the workspace measured from the floor at the front edge of the equipment to the ceiling or overhead obstruction(s). A minimum of 1981 mm (78 in.) or the height of the equipment, whichever is greater, is required.

D.3 Terms and Definitions

Egress: The path of exit from within any room, constituting a continuous and unobstructed space, without trip hazards along the path of exit.

Workspace: 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. Additional conditions can increase the minimum dimension requirement. GE defines this as the envelope of the component superstructure with the external covers in place.

Service Access Width: The width of the workspace in front of the equipment. A minimum of 762 mm (30"), or the width of the equipment, whichever is greater.

Head Clearance: The height dimension of the workspace. The height of the workspace measured from the floor at the front edge of the equipment to the ceiling or overhead obstruction(s). 1981.2 mm (78"), or the height of the equipment, whichever is greater.

Grounded Wall: Any wall that can be electrically conductive to earth ground. Masonry, concrete, and tile are considered conductive. Additional commonly found aspects of a wall should also be considered grounded.

The following is not an all-inclusive list:

• Medical gas ports and plates • Metal doors and window frames • Water sources and metallic sink structures • Metallic wall-mounted cabinetry • MDP (A1) • Equipment Emergency OFF panels • Industrial equipment (such as air conditioners and vents) • Expansion joints • Surface raceway • Exposed wall conduits • Floor outlets boxes	The following are not considered as grounded elements of a common wall: • Standard wall outlet • Light switches • Telephones • Communication wall jacks • Ceiling tile grids

D.4 Additional Regulatory Clearance Information

D.4.1 Regulatory Caution

Site prints are required for all system installations including relocation and moves. The room layout, as shown on your site print, shall meet all regulatory requirements as described in the installation manual. Additional room components, such as cabinets, reduce room size. Equipment not shown on the site print may void the caution statement, making the room non-compliant. Actual site measurements before installation will be taken to determine room size and compliance.

D.4.2 Egress Clearance

Egress requires a clear, unobstructed route out of the room, either around the back of the gantry or around the back of the table. If your egress route is not around the back of the table, maintain 457 mm (18”) of clearance between the back of the table, with a continuous width of 3200 mm (126”), 1600 mm (63”) on each side of the table center line, on each side to any obstruction so that the front cover can be removed.

Exceptions: Rooms smaller than 512 cm×374 cm (17 ft.×12 ft.), require construction to meet the minimum requirements. The design center or your GE PMI may have additional recommendations for your room size.

D.5 Service Clearances

Servicing of the system can be safely performed within the regulatory envelopes defined in Appendix D Regulatory Clearances on page 112; however sufficient space must be maintained to remove the covers from the system.

To achieve clearance for the gantry, clear space must be available to maneuver the gantry covers. One Service Engineer can accomplish this.

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