GE Healthcare

Technical Publications

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Revision 11

Radiographic System: Proteus XR/f

Pre-Installation Manual

do not duplicate

WARNING

THIS EQUIPMENT IS DANGEROUS TO BOTH PATIENT AND OPERATOR UNLESS MEASURES OF PROTECTION ARE STRICTLY OBSERVED

Though this equipment is built to the highest standards of electrical and mechanical safety, the useful radiation beam becomes a source of danger in the hands of the unauthorized or unqualified operator. Excessive exposure to radiation causes damage to human tissue.

Therefore, adequate precautions must be taken to prevent unauthorized or unqualified persons from operating this equipment or exposing themselves or others to its radiation.

Before operation, persons qualified and authorized to operate this equipment should be familiar with the Recommendations of the International Commission on Radiological Protection, contained in Annals Number 60 of the ICRP, with applicable National Standards, and should have been trained in use of the equipment.

ENVIRONMENTAL STATEMENT ON THE LIFE CYCLE OF THE EQUIPMENT OR SYSTEM

This equipment or system contains environmentally dangerous components and materials (such as PCB‘s, electronic components, used dielectric oil, lead, batteries etc.) which, once the life-cycle of the equipment or system comes to an end, becomes dangerous and need to be considered as harmful waste according to the international, domestic and local regulations.

The manufacturer recommends to contact an authorized representative of the manufacturer or an authorized waste management company once the life-cycle of the equipment or system comes to an end to remove this equipment or system.

REVISION HISTORY

REVISION	DATE	REASON FOR CHANGE
8	SEP 05, 2018	Added floor leveling activity (page 27) and Proteus XR/f ST layouts (pages 108 and 109). Modified dimension drawings of Proteus XR/f ST (pages 99 and 100).
9	FEB 27, 2019	New diameter of holes in positioners, new anchoring kits and new Wall Stand Packaging.
10	SEP 17, 2019	Text about grout pad reworded and ammended ST Table number of holes.
11	MAR 13, 2020	Added new Room Layouts, improved Anchoring Drawings and Dimensions Drawings.

This Document is the English original version, edited and supplied by the manufacturer.

The Revision state of this Document is indicated in the code number shown at the bottom of this page.

ADVISORY SYMBOLS

The following advisory symbols will be used throughout this manual. Their application and meaning are described below.

DANGERS ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEEDED OR AVOIDED WILL CAUSE SERIOUS PERSONAL INJURY OR DEATH.

ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEEDED OR AVOIDED COULD CAUSE SERIOUS PERSONAL INJURY, OR CATASTROPHIC DAMAGE OF EQUIPMENT OR DATA.

Advise of conditions or situations that if not heeded or avoided could cause personal injury or damage to equipment or data.

Note ☞

Alert readers to pertinent facts and conditions. Notes represent information that is important to know but which do not necessarily relate to possible injury or damage to equipment.

SAFETY SYMBOLS

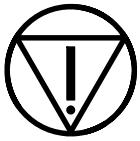
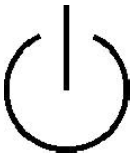
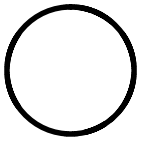
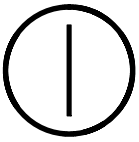
The following safety symbols may appear in the equipment.

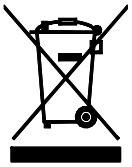
Their meaning are described below.

	**Caution. Consult accompanying documents.**
	**Safety Symbol. Follow instructions for use, especially those instructions identified with Advisory Symbols to avoid any risk for the Patient or Operator.** *(Only applies to Standard IEC 60601-1:2005 and IEC 60601-1:2005+AMD1:2012)*
	**Manufacturer.**
	**Date of Manufacture.**
	**Medical Device.**
	**Catalogue Number (Model reference).**
	**Serial Number.**
	**Model Configuration.**

	**General Mandatory action.**
	**Type B applied part.**
IPX0	**Protection against harmful ingress of water or particulate matter.** **IP Classification: Ordinary.**
	**Ionizing radiation.**
	**Non-ionizing electromagnetic radiation.**
	**Radiation of Laser apparatus.** Do not stare into beam. *(Only applicable to equipment with Laser Pointer)*
	**Dangerous voltage.**
	**General warning, caution, risk of danger.**
	**Warning: Ionizing radiation.**

	**Warning: Non-ionizing radiation.**
	**Warning: Laser beam.**
	**Warning: Electricity.**
	**Warning: Do not place fingers between mobile and fixed parts of the equipment, it may cause serious injuries to patient or operator. As well, make sure the patient extremities are correctly positioned into limit areas during operation, movement of parts may cause serious damages to patient.**
	**Electrostatic sensitive devices.**
	**No pushing.**
	**No sitting.**
	**No stepping on surface.**
	**Do not handle.**

	**Emergency stop.**
	**“Stand-by” power.** *(Only applies to IEC 60601-1:2005 and IEC 60601-1:2005+AMD1:2012)*
	“ON” power.
	**“OFF” power.**
	**“ON” / “OFF” (push-push).** *Each position, “ON” or “OFF”, is a stable position.*
	**Alternating current.**
	**Three-phase alternating current.**
	**Three-phase alternating current with neutral conductor.**
N	**Connection point for the neutral conductor on Permanently Installed equipment.**

	**Direct current.**
	**Both direct and alternating current.**
	**Protective Earth (Ground).**
	**Earth (Ground).**
	**This symbol according to the European Directive indicates that the Waste of Electrical and Electronic Equipment (WEEE) must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer or an authorized waste management company for information concerning the decommissioning of your equipment.**
 Li/Pb/Cd/Hg	**This separate collection symbol is affixed to a battery or its packing, to advise that the battery must be recycled or disposed of in accordance with local or country laws. The letters below the symbol indicate whether certain elements (Li=Lithium, PB=Lead, CD=Cadmium, Hg=Mercury) are contained in the battery. All batteries removed from the equipment must be properly recycled or disposed. Please contact an authorized representative of the manufacturer or an authorized waste management company for information concerning the decommissioning of your equipment.**
	**Pollution Control.** *(Only applicable to People's Republic of China (PRC)).* **This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese Standards. It must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer or an authorized waste management company for information concerning the decommissioning of your equipment.**

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SECTION 1 INTRODUCTION

1.1 OBJECTIVE AND SCOPE OF THIS MANUAL

This document is intended as a guide and informational resource for planning and properly preparing a location for the installation of the Generator and Positioners (Tube Stand, Wall Stand and Radiographic Table) of the Proteus XR/f System.

1.2 AVOIDING UNNECESSARY EXPENSES AND DELAYS

To avoid unnecessary expenses and delays use the “Pre-installation Checklist” located in Section 7.4, to determine if you are ready for the installation to begin. Once you believe that the room/location is ready for installation to begin, complete the “Pre-installation Checklist.” The checklist is an important tool that helps verify that nothing has been missed. The checklist summarizes the preparations and allows you to permanently record the activities that have taken place.

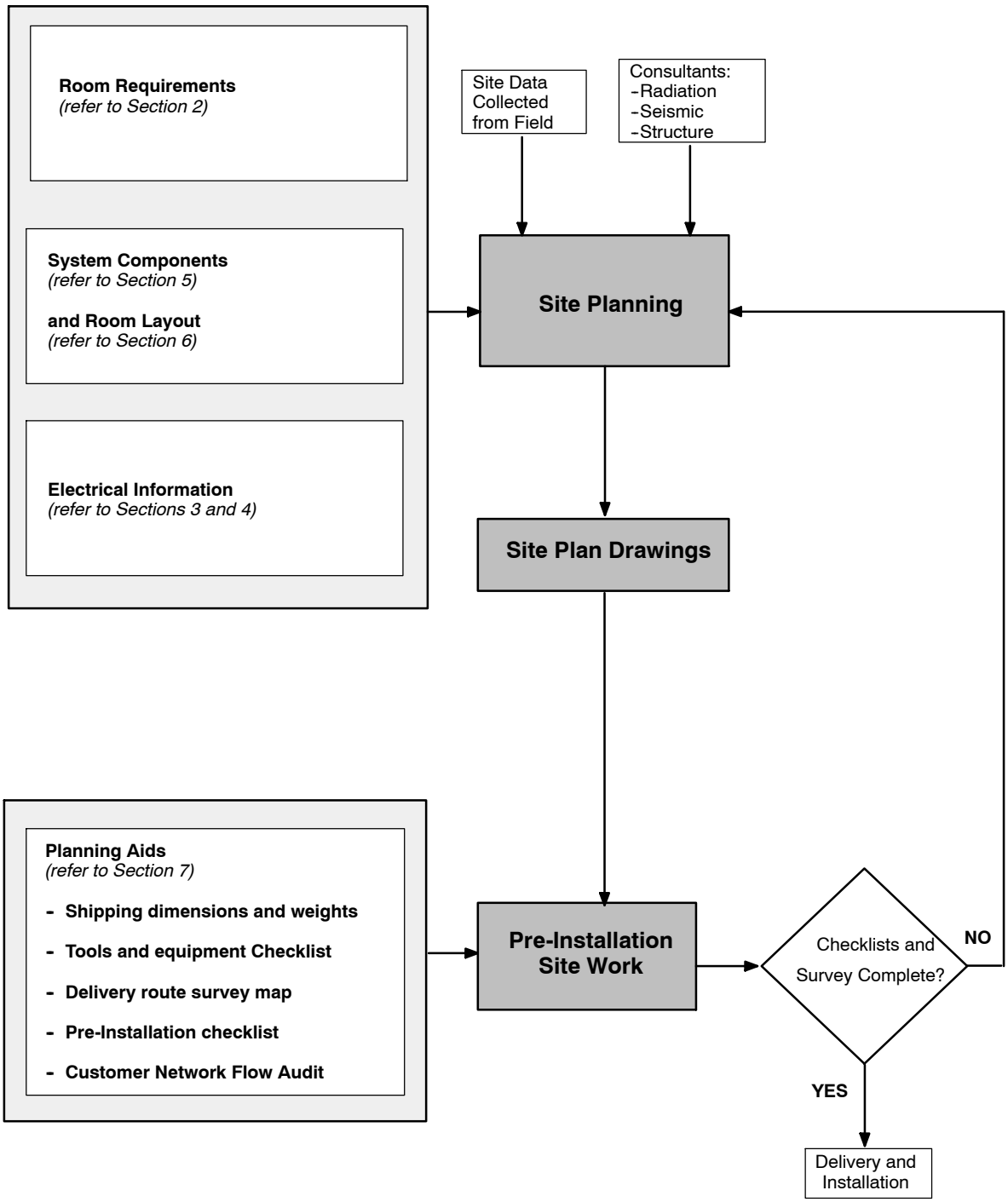
Section 7.5 “Customer Network Flow Audit,” aids in understanding the customer environment into which the Proteus XR/f System will be installed.

1.3 AN OVERVIEW OF THE PRE-INSTALLATION PROCESS

Pre-Installation is a co-operative effort between the customer/purchaser and GE Healthcare (GEHC). Complete the checklists contained in this manual. They are an important part of the Pre-Installation process. The checklists summarize the required preparations and verify the completion of the Pre-Installation procedures.

Illustration 1 outlines the information in this document and its place in the Pre-Installation process.

Illustration 1
Pre-Installation Overview



1.4 RESPONSIBILITY OF PURCHASER / CUSTOMER

To ensure that the installation of a Proteus XR/f System meets the Purchaser or Customer expectations, it is important to determine who will take responsibility for various items in the course of the system installation process.

To determine these responsibilities, review the following checklists with the customer and assign responsibilities as appropriate:

- Tools and Equipment Checklist (refer to Section 7.2)
- Pre-Installation Checklist (refer to Section 7.4)
- Customer Network Flow Audit (refer to Section 7.5)

1.5 CONTRACT CHANGES

Be sure to inform the customer that the cost of any alterations or modifications not specified in the sales contract are the responsibility of the customer.

1.6 RESPONSIBILITIES OF THE PURCHASER

The purchaser is responsible for the completion of “Pre-Installation.” This includes the procurement and installation of all required materials and services to get the room ready for the installation of the product. This responsibility includes providing:

- A clean and safe work environment for the installation of the product (finished floor, ceiling, walls, and proper room lighting).
- A location suitable for the installation of the product. Refer to Section 2, “Room Requirements.”
  - Suitable support structures in the floor, walls, or ceiling necessary for the mounting of the product and/or its components. (Refer to Section 2.2.)
  - Installation of conduit, ducts, and/or raceways necessary to route cables safely. Refer to Section 4, “Electrical Requirements,” and Section 5, “Product Characteristics.”
  - Electrical power and grounds of specified quality and reliability. Refer to Section 4, “Electrical Requirements.”
    - Electrical power of the required voltage output and adequate kVA rating, including the emergency-off safety switch(es) in the room. Power and ground cables to the Room Electrical Cabinet (Main Disconnect).

      Install all safety devices according to this document and Local Codes.

      The Electrical Room Cabinet (Main Disconnect) must be UL and cUL listed, and must be an under voltage trip device and be capable of Lock-Out / Tag-Out (LOTO).
    - Properly installed and sized junction boxes, including covers and fittings, at locations required and called out in architectural drawings.
- A location suitable for operation of the product. Refer to Section 6, “Room Layout.”
- Installation of non-electric services (if required).
- Provide current room dimensions, including hall way and entry door sizes. (Refer to Section 2.2.1, “Door Size Requirements.”)

1.7 WHAT YOU WILL RECEIVE (SYSTEM COMPONENTS)

The Proteus XR/f System consists of the following main components: (refer to Illustration 2).

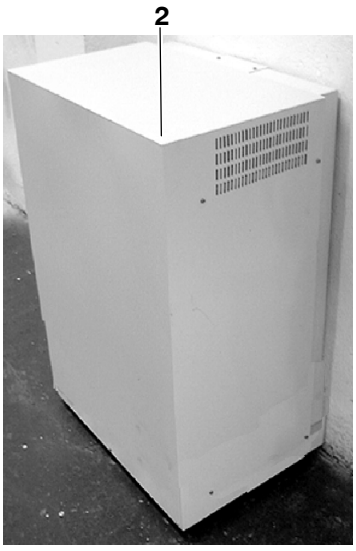
Table 1
Proteus XR/f Components

ITEM		COMPONENT
1		**Operator Console**:
	1A	• Multitouch Screen LCD Monitor
	1B	• Control Station (Computer)
	1C	• PC Interface Box (ON / OFF BOX with Handswitch)
2		**System Generator**
	2	• X-Ray Generator 50 kW – Single Phase 230 / 240 V~ • X-Ray Generator 50 kW – Three Phase 400 V~ • X-Ray Generator 50 kW – Three Phase, 480 V~ • X-Ray Generator 65 kW – Three Phase, 400 V~ • X-Ray Generator 65 kW – Three Phase, 480 V~ • X-Ray Generator 80 kW – Three Phase, 400 V~ • X-Ray Generator 80 kW – Three Phase, 480 V~
3		**Positioner**:
	3A	• XR/f Tube Stand
	3B	• X-ray Tube: Canon or Toshiba E7884X or • X-ray Tube: Canon or Toshiba E7254FX
	3C	• Collimator
	3D	• XR/f Wall Stand
	3E	• XR/f Radiographic Table
	3F	• CAN Connection Box
	3G	• Digital Detector
	3H	• Grid: 100 cm (40”) / 150 cm (59”) / 180 cm (70”)
	3I	• HV Cables of 12 m (pair)

Illustration 2
Proteus XR/f System Component Identification

1 Operator Console

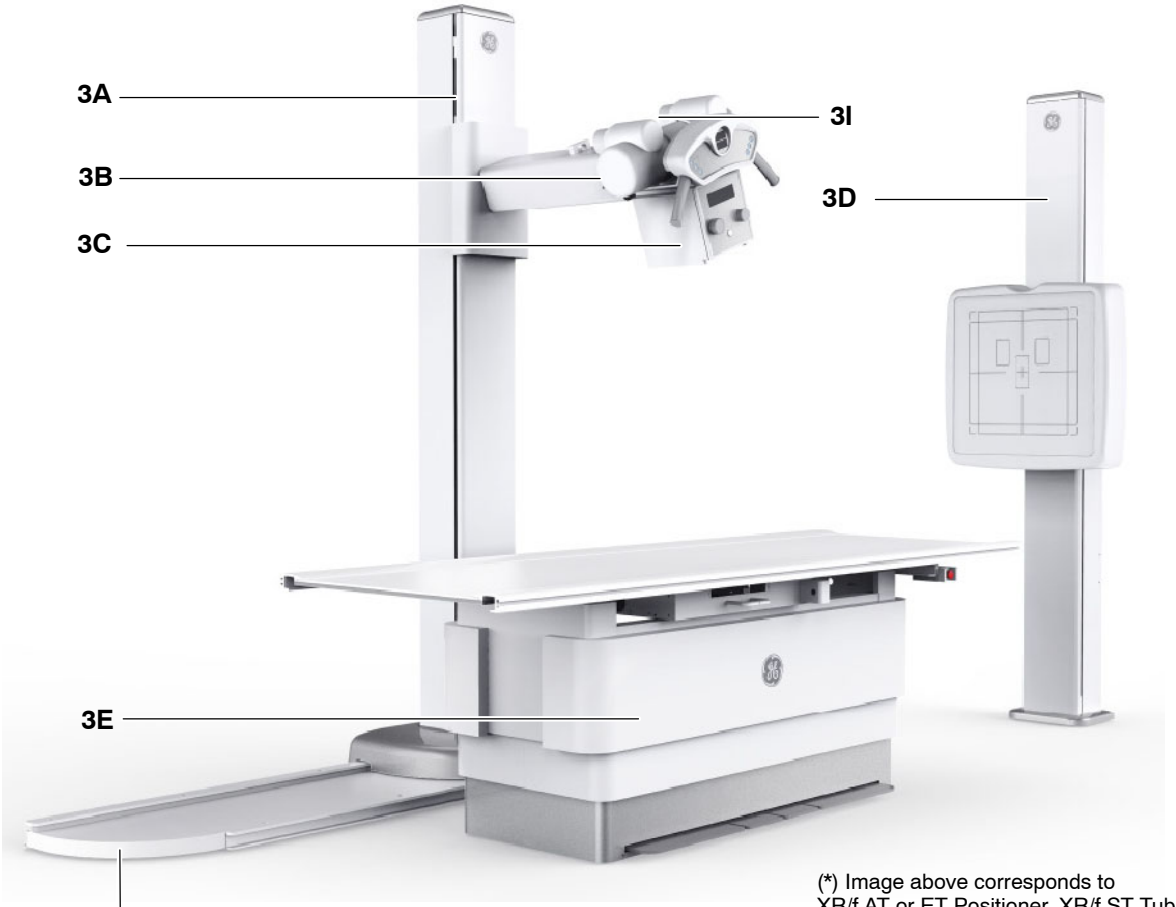
2 System Cabinet



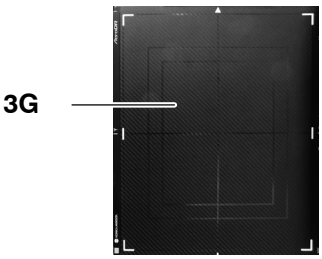
LINE POWERED GENERATOR

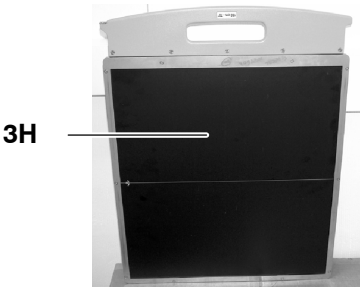
Illustration 2 (cont.)
Proteus XR/f System Component Identification

3 Positioner (*)



(*) Image above corresponds to XR/f AT or ET Positioner. XR/f ST Tube Stand and Table show a different aspect.





The Proteus XR/f System can include the following options:
(refer to Illustration 3).

Table 2
Proteus XR/f Options

ITEM	COMPONENT
4	**Compression Band**
5	**Hand Grips**
6	**Automatic Collimator** (one of them and only for XR/f AT)
	• Automatic Collimator with Led centering Detector Light, Centering Laser Beam, timer and Meter
	• Automatic Collimator with Led centering Detector Light, Centering Laser Beam, timer, Meter and integrated DAP Kerma and Motorized Filters
7	**Hands Support for Wall Stand**
8	**Lateral Detector Holder 35x43 cm**
9	**Lateral Detector Holder on Table 35x43 cm**
10	**Lateral Detector Holder with Trolley 35x43 cm**

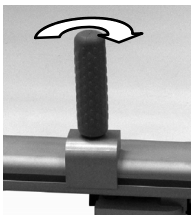
Note ☞ *The Radiographic Table of the XR/f ST System (not elevating Table) includes a Flat Table-top which means that the options attached to it are different from the options attached to the Elevating Table. The functionality of those options remains the same.*

Illustration 3
Proteus XR/f System Component Identification – Options

4 Compression Band

5A Hand Grips for Wall Stand (Pair).

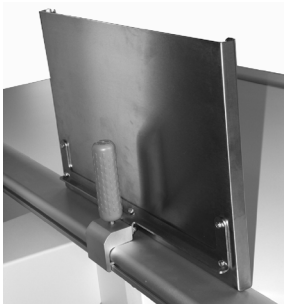
5B Hand Grips for Table (Pair).



6 Automatic Collimator (only for XR/f AT)

7 Hands Support for Wall Stand

8 Lateral Detector Holder (only XRf AT and ET)



9 Lateral Detector Holder on Table

10 Lateral Detector Holder with Trolley 35 x 43

1.8 HHS COMPLIANCE COMPATIBILITY LIST

PRODUCT CATEGORY	PRODUCT DESCRIPTION
X-Ray Control	X-Ray Generator 50 kW – Single Phase 230 / 240 V~ X-Ray Generator 50 kW – Three Phase 400 V~ X-Ray Generator 50 kW – Three Phase, 480 V~ X-Ray Generator 65 kW – Three Phase, 400 V~ X-Ray Generator 65 kW – Three Phase, 480 V~ X-Ray Generator 80 kW – Three Phase, 400 V~ X-Ray Generator 80 kW – Three Phase, 480 V~
Ion Chamber	Ion Chamber
X-Ray Tube	X-ray Tube: Toshiba E7884X X-ray Tube: Toshiba E7254FX
Beam Limiting Device (Collimator)	Ralco 225 Manual Collimator with Led centering Detector Light, Centering Laser Beam, Timer and Meter Ralco 225 Automatic Collimator with Led centering Detector Light, Centering Laser Beam, Timer and Meter Ralco 225 Automatic Collimator with Led centering Detector Light, Centering Laser Beam, Timer, Meter and integrated DAP Kerma and Motorized Filters

SECTION 2 ROOM REQUIREMENTS

2.1 ENVIRONMENTAL REQUIREMENTS

2.1.1 RELATIVE HUMIDITY AND TEMPERATURE

PRODUCT OR COMPONENT	RELATIVE HUMIDITY (Non-Condensing)				TEMPERATURE			
	IN USE		STORAGE		IN USE		STORAGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Generator:								
X-Ray Generator	30%	75%	10%	100%	10º C (50º F)	40º C (104 ºF)	5º C (41º F)	60ºC (140º F)
Positioner:								
Tube Stand, Radiographic Table and Wall Stand	30%	75%	10%	100%	10º C (50º F)	40º C (95º F)	-40º C (-40º F)	70ºC (158º F)
X-ray Tube: Toshiba E7254FX X-ray Tube: Toshiba E7884X	30%	85%	20%	90%	10º C (50º F)	40º C (104 ºF)	-20º C (-4º F)	60ºC (140º F)

Note ☞ *STORAGE values refer to equipment that is still in shipping containers (Generator and Positioners only). If the equipment is partially or completely installed, refer to IN USE values.*

Note ☞ *For Workstation and Digital Detector details, refer to the corresponding manual of each item.*

2.1.2 ATMOSPHERIC PRESSURE

PRODUCT OR COMPONENT	ATMOSPHERIC PRESSURE			
	IN USE		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Generator:				
X-Ray Generator	700 hPa (20.7 inHg)	1060 hPa (31.3 inHg)	500 hPa (14.7 inHg)	1060 hPa (31.3 inHg)
Positioner:				
Tube Stand, Radiographic Table and Wall Stand	700 hPa (20.7 inHg)	1060 hPa (31.3 inHg)	500 hPa (14.7 inHg)	1060 hPa (31.3 inHg)
X-ray Tube: Toshiba E7254FX X-ray Tube: Toshiba E7884X	700 hPa (20.7 inHg)	1060 hPa (31.3 inHg)	500 hPa (14.7 inHg)	1060 hPa (31.3 inHg)

Note ☞ *STORAGE values refer to equipment that is still in shipping containers (Generator and Positioners only). If the equipment is partially or completely installed, refer to IN USE values.*

Note ☞ *For Workstation and Digital Detector details, refer to the corresponding manual of each item.*

2.1.3 HEAT OUTPUT

In normal environmental circumstances the maximum heat output of the equipment can reach:

PRODUCT OR COMPONENT	HEAT OUTPUT
Generator:	
X-Ray Generator (*for a working cycle of one [1] patient every two [2] minutes during one [1] hour*)	544 BTU/h (160 W)
Positioner:	
Tube Stand, Radiographic Table and Wall Stand	425 BTU/h (124.6 W)
X-ray Tube: Toshiba E7254FX X-ray Tube: Toshiba E7884X	450.7 BTU/h (132 W)

Note ☞ *Overheating of components can cause system malfunction.*

2.1.4 LIGHT SPECIFICATION

The system screens are adjusted for an optimum ambient light level of 50 lux.

2.1.5 RADIATION PROTECTION

Because X-ray equipment produces radiation, special precautions may need to be taken or special site modifications may be required. The manufacturer does not make recommendations regarding radiation protection. It is the purchasers responsibility to consult a radiation physicist for advice on radiation protection in X-ray rooms.

2.2 STRUCTURAL REQUIREMENTS

Prior to beginning installation, it is recommended to inspect the site and verify that the X-ray room complies with Pre-installation requirements for the X-ray system such as:

- Floor, wall and raceways for equipment installation.

Note ☞ *The ground surface must be flat and leveled, maximum tolerance for leveling is ±1.5 mm per meter (0.2 in per 10 feet). If the Specs are not met by using the spacers provided, a grout pad shipped with the System is to be used by the contractor to meet this specification. The maximum pad thickness is 6.3 mm (0.25 in).*

- A plan distribution is strongly recommended prior equipment installation. Take into account dimensions, travels, operation and passing through areas.
- XR/f AT and ET minimum room space required to allow installation and travels of the equipments:
  - Minimum recommended surface *(refer to Illustration 34 in Section 6.4 Room Layouts):* 4.87 x 3.96 meters (16 x 13 ft).
  - Minimum functional surface *(refer to Illustration 35 in Section 6.4 Room Layouts):* 4.20 x 3.96 meters (13.8 x 13 ft).
  - Minimum ceiling height with lifting fixture: 2.59 meters (8.5 ft).
  - Minimum ceiling height for system functionality: 2.52 meters (8.27 ft).
- XR/f ST minimum room space required to allow installation and travels of the equipments:
  - Minimum recommended surface *(refer to Illustration 41 in Section 6.4 Room Layouts):* 4.77 x 3.96 meters (15.8 x 13 ft).
  - Minimum functional surface *(refer to Illustration 42 in Section 6.4 Room Layouts):* 4 x 3.68 meters (13.2 x 12.1 ft).
  - Minimum ceiling height with lifting fixture: 2.54 meters (8.35 ft).
  - Minimum ceiling height for system functionality: 2.46 meters (8.1 ft).

2.2.1 DOOR SIZE REQUIREMENTS

Minimum door sizes also apply to the hallway and elevator.

The Positioner is the biggest component in the system. The minimum door height must be 203 cm (80”) and door width must be 90 cm (35.4”) to take delivery and install system based on a 240 cm (8 ft.) corridor.

The elevator door must meet with the above door requirements and the minimum depth of the elevator measured from the back wall to the elevator door must be 290 cm (9’ 6”).

Note ☞ *The above dimensions are calculated as per dimensions of the Positioner shipping crates. For dimensions and weights of the crated and uncrated components refer to Table 3.*

Table 3
XR/F AT and ET Component Crated and Uncrated

COMPONENT CRATED	DIMENSIONS			WEIGHT
	Length	Width	Height	
Column of Floor Mounted Tube Stand with Collimator, X-Ray Tube, HV cables and Table-Top of Elevating Table	242 cm (95.3”)	87 cm (34.3”)	105 cm (41.3”)	414 kg (912 lb)
Tube Stand Base	282 cm (111”)	67 cm (26.4”)	35 cm (13.8”)	104 kg (229 lb)
Elevating Table (without Tabletop)	154 cm (60.6”)	84 cm (33.1”)	96 cm (37.8”)	376 kg (828 lb)
Wall Stand	228 cm (89.7”)	85 cm (33.4”)	50cm (19.6“)	208 kg (458 lb)
Line Powered Generator	107 cm (42.1”)	62 cm (24.4”)	74 cm (29.1”)	140 kg (308 lb)

COMPONENT UNCRATED	DIMENSIONS			WEIGHT
	Length	Width	Height	
Tube Stand Column	237 cm (93.3”)	50 cm (19.6”)	133.7 cm (52.6”)	230 kg (507 lb)
Tube Stand Base	275.5 cm (108.4”)	43.6 cm (17.2”)	6.7 cm (2.6”)	61 kg (134.4 lb)
Elevating Table (with Tabletop)	220 cm (86.6”)	80 cm (31.4)	90 cm (max.) (35.4”)	280 kg (617 lb)
Wall Stand	223.5 cm (88”)	71.2 cm (28”)	38.1 cm (15”)	145 kg (320 lb)
Line Powered Generator	59.2 cm (23.3”)	36 cm (14.2”)	69 cm (27.2”)	95 kg (209 lb)

Table 4
XR/F ST Component Crated and Uncrated

COMPONENT CRATED	DIMENSIONS			WEIGHT
	Length	Width	Height	
Tube Stand with Base, Collimator, X-Ray Tube, HV Cables and Table-Top of RAD Table	230 cm (90.6”)	85 cm (33.5”)	114 cm (44.9”)	390 kg (859 lb)
RAD Table (without Tabletop)	154 cm (60.6”)	84 cm (33.1”)	96 cm (37.8”)	143 kg (315 lb)
Wall Stand	228 cm (89.7”)	85 cm (33.4”)	50cm (19.6“)	208 kg (458 lb)
Line Powered Generator	107 cm (42.1”)	62 cm (24.4”)	74 cm (29.1”)	140 kg (308 lb)

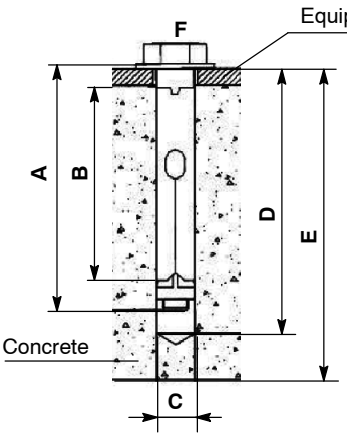
COMPONENT UNCRATED	DIMENSIONS			WEIGHT
	Length	Width	Height	
Tube Stand Column	231.8 cm (91.2”)	46 cm (18”)	109 cm (43”)	184 kg (405 lb)
Tube Stand Base	46 cm (18”)	200 cm (78.7”)	6 cm (2.4”)	40 kg (88 lb)
RAD Table (with Tabletop)	220 cm (866”)	72.5 cm (28.5“)	77.5 (30.5”)	80 kg (176 lb)
Wall Stand	223.5 cm (88”)	71.2 cm (28”)	38.1 cm (15”)	145 kg (320 lb)
Line Powered Generator	59.2 cm (23.3”)	36 cm (14.2”)	69 cm (27.2”)	95 kg (209 lb)

2.2.2 XR/F AT AND ET FLOOR AND WALL REQUIREMENTS

Different anchor types are used to install the components of the system:

BOLT LOADS	ANCHOR TYPE			
	Anchor-A	**Anchor-B**	**Anchor-C**	**Anchor-D**
	Bolt B2 + Washer W4	Bolt B2 + Washer W3	Bolt B1 + Washer W1	Bolt B2 + Washer W2
Maximum Tension Load (T_{max})	530 kg / bolt (1168 lbs / bolt)	530 kg / bolt (1168 lbs / bolt)	200 kg / bolt (441 lbs / bolt)	530 kg / bolt (1168 lbs / bolt)
Maximum Shear Load (V_{max})	853 kg / bolt (1880 lbs / bolt)	853 kg / bolt (1880 lbs / bolt)	320 kg / bolt (705 lbs / bolt)	853 kg / bolt (1880 lbs / bolt)

Bolts	Specifications	A	B	C	D	E	F
B1	M6 (1/4") - 60 mm (2.4") length. Metric property class: 6.8 (Carbon Steel)	60 mm (2.4")	≥ 40 mm (≥ 1.6")	⌀ 8 mm (⌀ 5/16")	≥ 60 mm (≥ 2.4")	≥ 70 mm (≥ 2.8")	8 Nm
B2	M8 (5/16") - 80 mm (3.1") length. Metric property class: 8.8 (Carbon Steel)	80 mm (3.1")	≥ 52 mm (≥ 2.04")	⌀ 10 mm	≥ 80 mm (≥ 3.1")	≥ 100 mm (≥ 3.9")	20 Nm



Anchoring dimensions and torque:

***A**: Nominal Bolt Length*

***B**: Effective drill depth in concrete.*

Any other scenarios will need a drill depth and anchor lengh to be adjusted to match the floor composition according to the Minimum Load Requirement per Bolt (refer to table in next page)

***C**: Drill Bit diameter*

***D**: Drill depth*

***E**: Base Material Thickness*

***F**: Torque applied.*

Washers	Specifications
W1	⌀ 18 mm x 1.5 mm - Flat washer Stainless Steel A2, 140 HV hardness, DIN 9021. For M6 bolts.
W2	⌀ 20 mm x 1.5 mm - Flat washer Stainless Steel A2, 140 HV hardness, DIN 9021. For M8 bolts.
W3	⌀ 24 mm x 2 mm - Flat washer Stainless Steel A2, 140 HV hardness, DIN 9021. For M8 bolts.
W4	⌀ 19 mm x 3 mm - Flat washer Stainless Steel A2, 140 HV hardness, DIN 9021. For M8 bolts.

The method of installing the Proteus XR/f AT or ET System is:

COMPONENT	NORMAL METHOD OF MOUNTING	ANCHORING TYPE USED	MINIMUM LOAD REQUIREMENT PER BOLT
GENERATOR CABINET	Floor freestanding or anchor to floor	Anchor-D x 4 plus 4 spacers ⌀ 35 mm x 20 mm (⌀ 1.4" x 0.8") between floor and Generator cabinet *(*spacers are included in the Generator anchor bag)*	Min. Tension Load required T_{min} = 221 kg / bolt (487 lbs / bolt) Min. Shear Load required V_{min} = 47 kg / bolt (103 lbs / bolt)
TUBE STAND BASE	Anchor to floor	Front and Rear: Anchor-A x 10	Min. Tension Load required T_{min} = 87.6 kg / bolt (193 lbs / bolt) Min. Shear Load required V_{min} = 23 kg / bolt (51 lbs / bolt)
ELEVATING TABLE	Anchor to floor	Anchor-B x 10	Min. Tension Load required T_{min} = 42 kg / bolt (92 lbs / bolt) Min. Shear Load required V_{min} = 22 kg / bolt (48 lbs / bolt)
WALL STAND	Anchor to floor and wall	Floor: Anchor-A x 2 *Wall: Anchor-A x 2 *(*only in case of concrete, brick or equivalent wall material, if not, use the appropriate anchors according to the wall material)*	Min. Tension Load required $T_{min\ floor}$ = 19 kg / bolt (42 lbs / bolt) $T_{min\ wall}$ = 24 kg / bolt (53 lbs / bolt) Min. Shear Load required V_{min} = 8 kg / bolt (18 lbs / bolt)
CAN CONNECTION BOX ***(only with Proteus XR/f AT)***	Floor freestanding or anchor to wall	Anchor-C x 4	Min. Tension Load required T_{min} = 5 kg / bolt (11 lbs / bolt) Min. Shear Load required V_{min} = 5 kg / bolt (11 lbs / bolt)
CABLE WALL SUPPORT	Anchor to wall	Anchor-C x 4	Min. Tension Load required T_{min} = 12 kg / bolt (26 lbs / bolt) Min. Shear Load required V_{min} = 12 kg / bolt (26 lbs / bolt)
***Note**: For seismic areas all components must be anchored, local Standards should be applied.*			

The Drill Templates of the anchoring holes are shown in the next illustrations.

CAUTION

Potential for Injury and/or Equipment Damage: If the equipment is installed on a concrete slab, anchors must be installed at a minimum distance of 150 mm (6") in the case of the Tube Stand Base and 90 mm (3.5") for the rest of equipment from any concrete edge including ducts and cracks. In addition, the general condition of the concrete in the immediate mounting area should be inspected to ensure that anchors will be set in good quality concrete.

For Equipment anchored to the wall, the wall and the anchoring system have to be strong enough to ensure a safe installation. Some non-brick walls may require additional anchorage installation.

The thickness and material of the floor / wall bearing the room equipment is to be determined by a Structural Engineer to properly support the equipment loads. The anchors require a minimum embedment into the floor / wall material as indicated in the "*Anchor Type*" table. If the floor / wall thickness is less than the size indicated in the "*Anchor Type*" table, it is recommended to secure the unit using a through-bolt method with a reinforcement plate on the back side. In this case, the through-bolt specifications should match the anchor specifications (hardness, material, etc.) of the replaced anchor.

Note ☞

The ground surface must be flat and leveled, maximum tolerance for leveling is ±1.5 mm per meter (0.2 in per 10 feet). If the Specs are not met by using the spacers provided, a grout pad shipped with the System is to be used by the contractor to meet this specification. The maximum pad thickness is 6.3 mm (0.25 in).

Illustration 4
Drill Template of a Typical Room Layout XR/f AT - ET

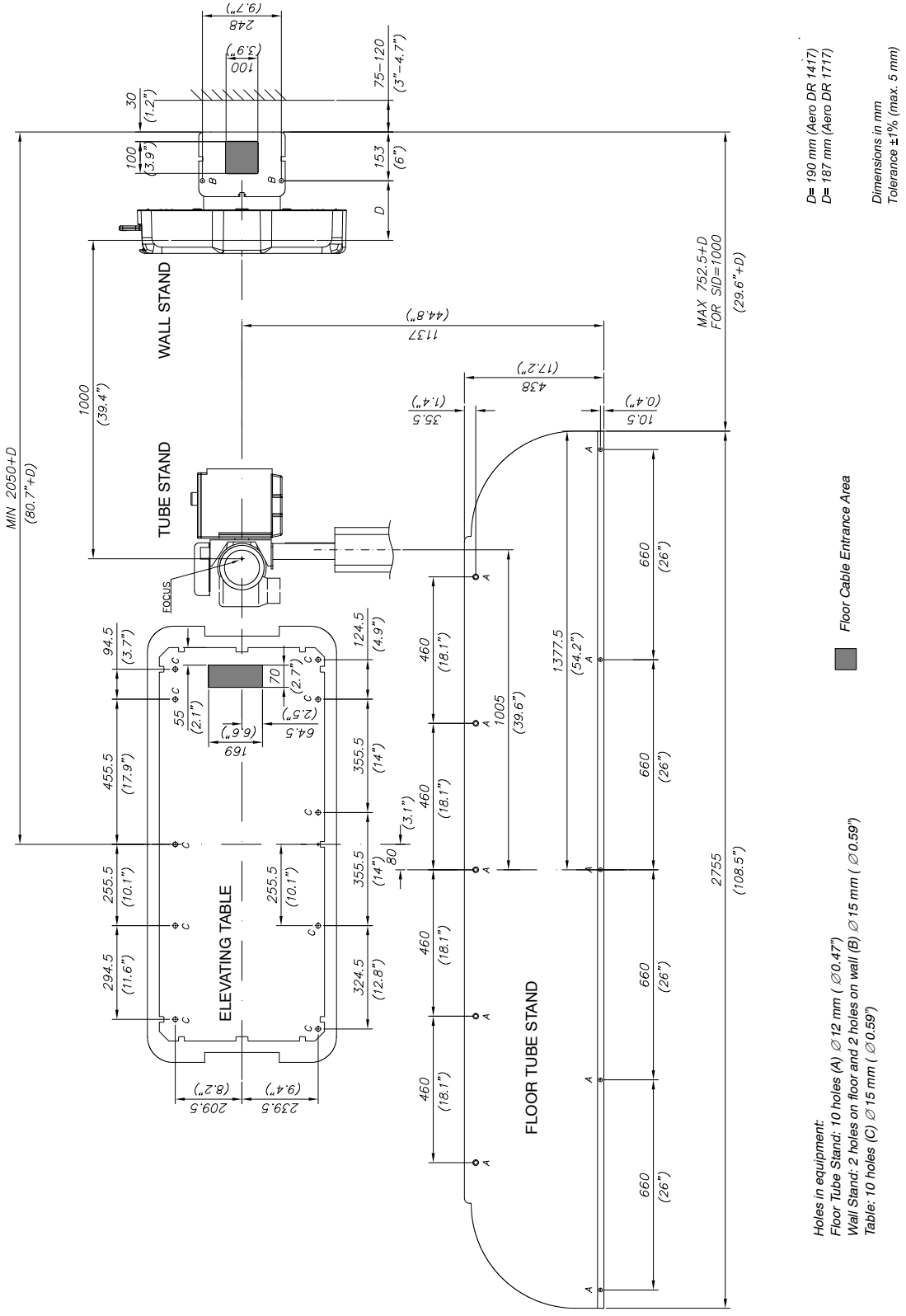


Illustration 5
Drill Template of the Wall Stand

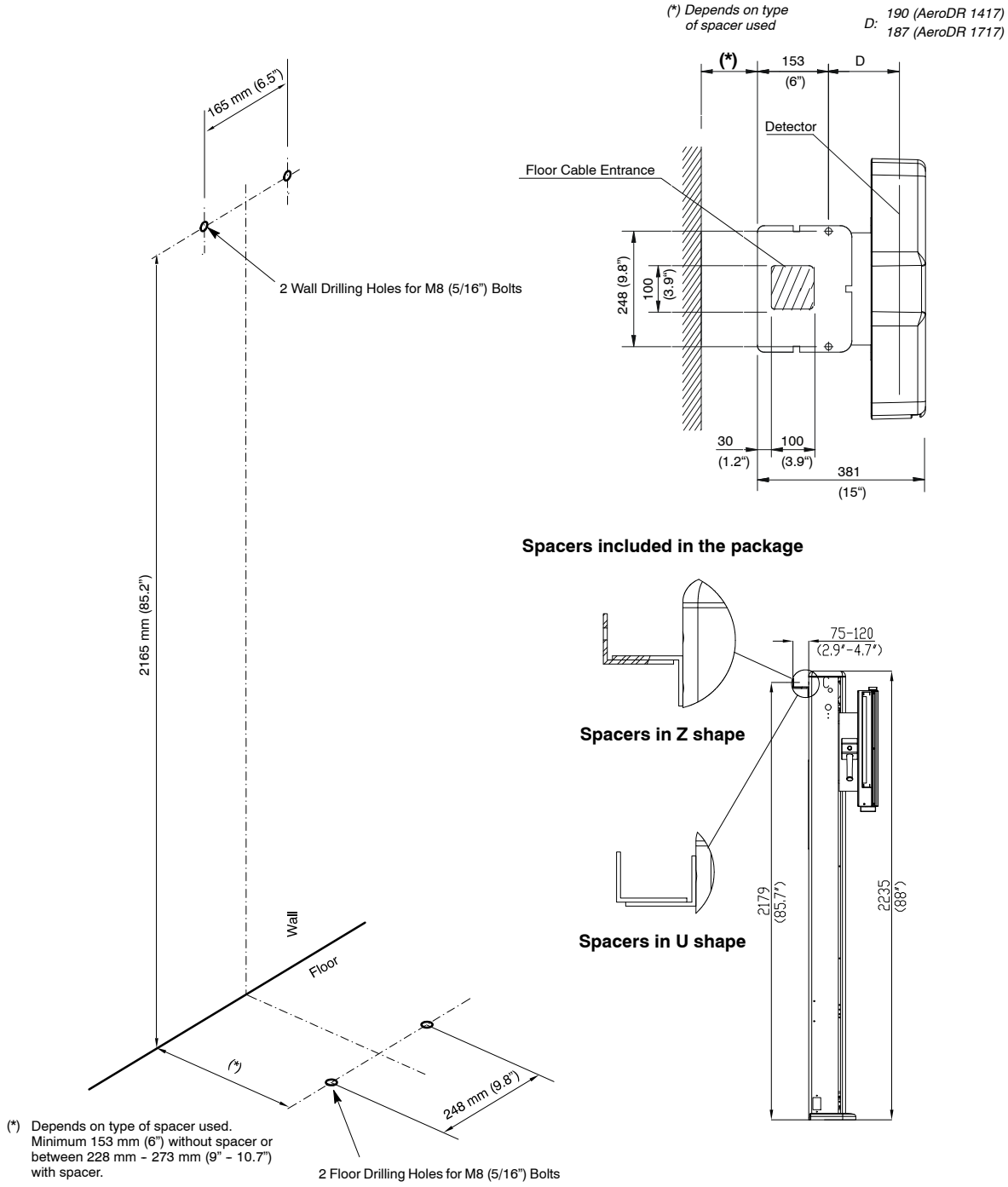


Illustration 6
Proteus XR/f AT-ET Center of Gravity - Tube Stand

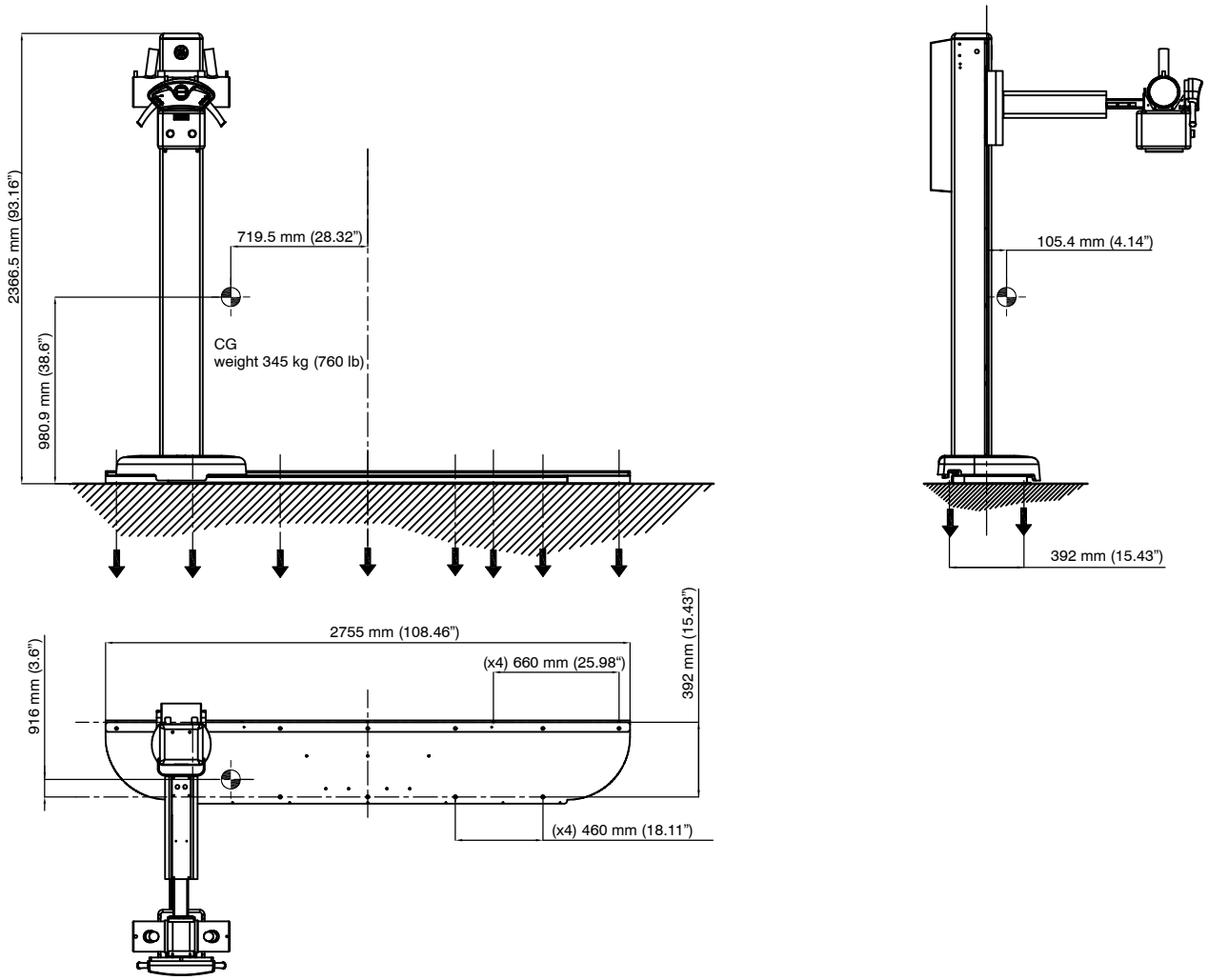


Illustration 7
Proteus XR/f AT-ET Center of Gravity - Elevating Table

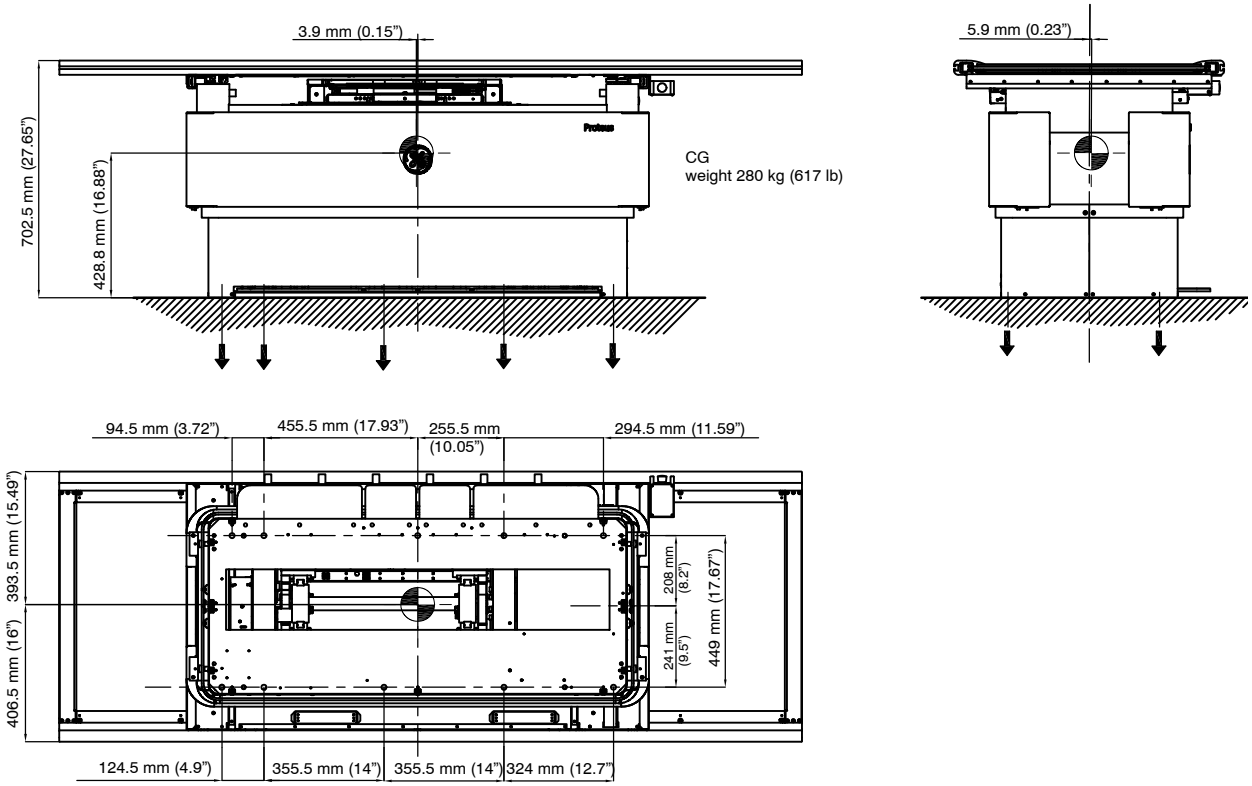


Illustration 8
Proteus XR/f AT-ET Center of Gravity - Wall Stand

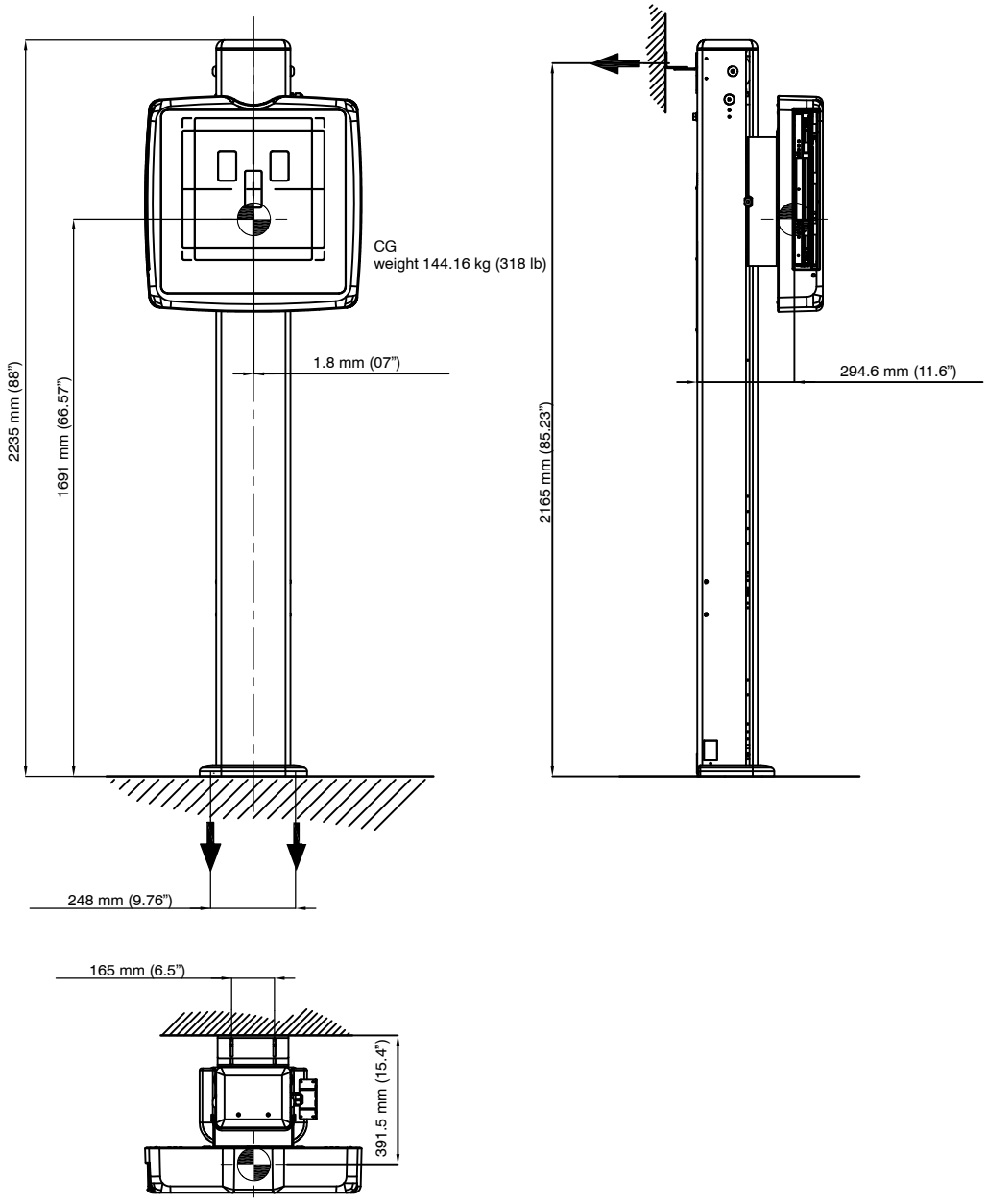
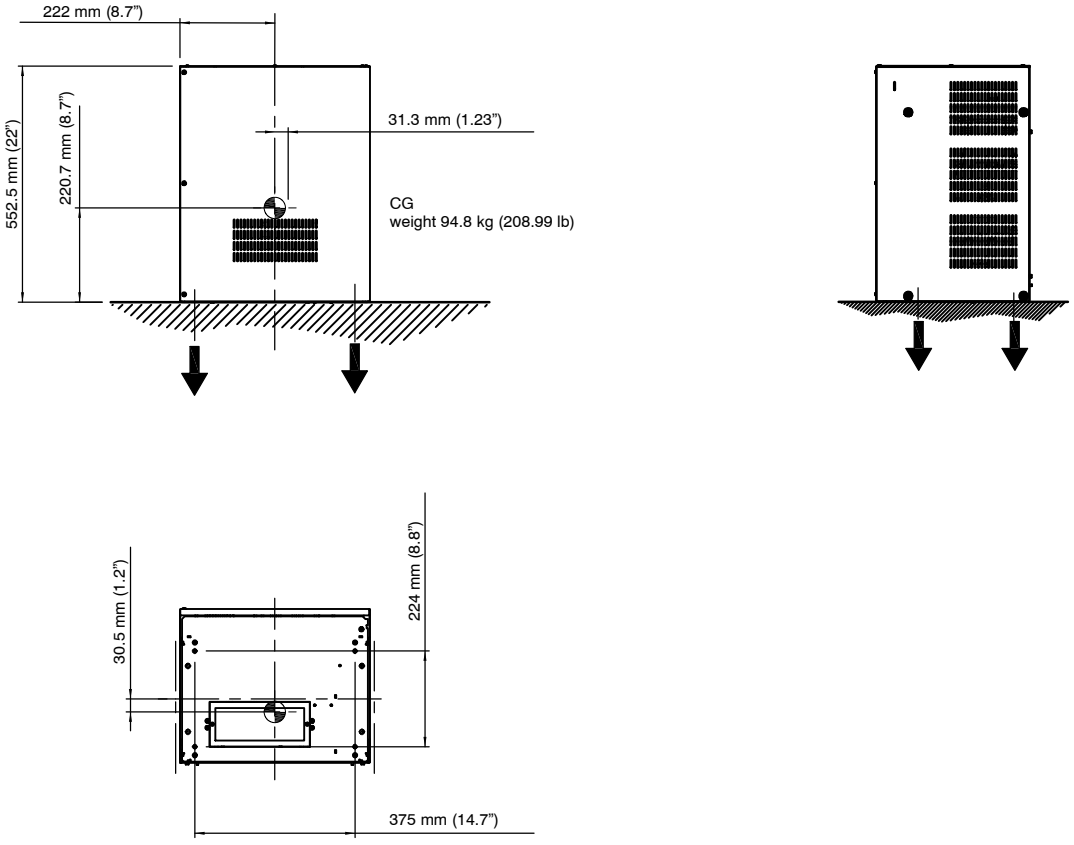


Illustration 9
Proteus XR/f AT-ET Center of Gravity - Generator

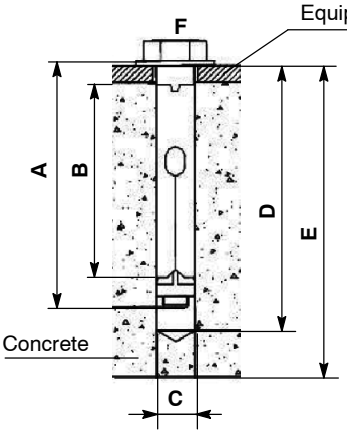


2.2.3 XR/F ST FLOOR AND WALL REQUIREMENTS

Different anchor types are used to install the components of the system:

BOLT LOADS	ANCHOR TYPE			
	Anchor-A	**Anchor-B**	**Anchor-C**	**Anchor-D**
	Bolt B2 + Washer W4	Bolt B2 + Washer W3	Bolt B1 + Washer W1	Bolt B2 + Washer W2
Maximum Tension Load (T_{max})	530 kg / bolt (1168 lbs / bolt)	530 kg / bolt (1168 lbs / bolt)	200 kg / bolt (441 lbs / bolt)	530 kg / bolt (1168 lbs / bolt)
Maximum Shear Load (V_{max})	853 kg / bolt (1880 lbs / bolt)	853 kg / bolt (1880 lbs / bolt)	320 kg / bolt (705 lbs / bolt)	853 kg / bolt (1880 lbs / bolt)

Bolts	Specifications	A	B	C	D	E	F
B1	M6 (1/4") - 60 mm (2.4") length. Metric property class: 6.8 (Carbon Steel)	60 mm (2.4")	≥ 40 mm (≥ 1.6")	⌀ 8 mm (⌀ 5/16")	≥ 60 mm (≥ 2.4")	≥ 70 mm (≥ 2.8")	8 Nm
B2	M8 (5/16") - 80 mm (3.1") length. Metric property class: 8.8 (Carbon Steel)	80 mm (3.1")	≥ 52 mm (≥ 2.04"	⌀ 10 mm	≥ 80 mm (≥ 3.1")	≥ 100 mm (≥ 3.9")	20 Nm



Anchoring dimensions and torque:

***A**: Nominal Bolt Length*

***B**: Effective drill depth in concrete.*

Any other scenarios will need a drill depth and anchor lengh to be adjusted to match the floor composition according to the Minimum Load Requirement per Bolt (refer to table in next page)

***C**: Drill Bit diameter*

***D**: Drill depth*

***E**: Base Material Thickness*

***F**: Torque applied.*

Washers	Specifications
W1	⌀ 18 mm x 1.5 mm - Flat washer Stainless Steel A2, 140 HV hardness, DIN 9021. For M6 bolts.
W2	⌀ 20 mm x 1.5 mm - Flat washer Stainless Steel A2, 140 HV hardness, DIN 9021. For M8 bolts.
W3	⌀ 24 mm x 2 mm - Flat washer Stainless Steel A2, 140 HV hardness, DIN 9021. For M8 bolts.
W4	⌀ 19 mm x 3 mm - Flat washer Stainless Steel A2, 140 HV hardness, DIN 9021. For M8 bolts.

The method of installing the Proteus XR/f ST System is:

COMPONENT	NORMAL METHOD OF MOUNTING	ANCHORING TYPE USED	MINIMUM LOAD REQUIREMENT PER BOLT
GENERATOR CABINET	Floor freestanding or anchor to floor	Anchor-D x 4 plus 4 spacers ⌀ 35 mm x 20 mm (⌀ 1.4" x 0.8") between floor and Generator cabinet *(*spacers are included in the Generator anchor bag)*	Min. Tension Load required T_{min} = 221 kg / bolt (487 lbs / bolt) Min. Shear Load required V_{min} = 47 kg / bolt (103 lbs / bolt)
TUBE STAND BASE	Anchor to floor	Front and Rear: Anchor-A x 10	Min. Tension Load required T_{min} = 87.6 kg / bolt (193 lbs / bolt) Min. Shear Load required V_{min} = 23 kg / bolt (51 lbs / bolt)
TABLE	Anchor to floor	Anchor-B x 4	Min. Tension Load required T_{min} = 42 kg / bolt (92 lbs / bolt) Min. Shear Load required V_{min} = 22 kg / bolt (48 lbs / bolt)
WALL STAND	Anchor to floor and wall	Floor: Anchor-A x 2 *Wall: Anchor-A x 2 *(*only in case of concrete, brick or equivalent wall material, if not, use the appropriate anchors according to the wall material)*	Min. Tension Load required $T_{min\ floor}$ = 19 kg / bolt (42 lbs / bolt) $T_{min\ wall}$ = 24 kg / bolt (53 lbs / bolt) Min. Shear Load required V_{min} = 8 kg / bolt (18 lbs / bolt)
BRAKE BOX *(only for Proteus XR/f ST with Telescopic Arm in Tube Stand)*	Anchor to wall	Anchor-C x 4	Min. Tension Load required T_{min} = 9 kg / bolt (20 lbs / bolt) Min. Shear Load required V_{min} = 9 kg / bolt (20 lbs / bolt)
CABLE WALL SUPPORT	Anchor to wall	Anchor-C x 4	Min. Tension Load required T_{min} = 12 kg / bolt (26 lbs / bolt) Min. Shear Load required V_{min} = 12 kg / bolt (26 lbs / bolt)
***Note**: For seismic areas all components must be anchored, local Standards should be applied.*			

The Drill Templates of the anchoring holes are shown in the next illustrations.

CAUTION

Potential for Injury and/or Equipment Damage: If the equipment is installed on a concrete slab, anchors must be installed at a minimum distance of 150 mm (6") in the case of the Tube Stand Base and 90 mm (3.5") for the rest of equipment from any concrete edge including ducts and cracks. In addition, the general condition of the concrete in the immediate mounting area should be inspected to ensure that anchors will be set in good quality concrete.

For Equipment anchored to the wall, the wall and the anchoring system have to be strong enough to ensure a safe installation. Some non-brick walls may require additional anchorage installation.

The thickness and material of the floor / wall bearing the room equipment is to be determined by a Structural Engineer to properly support the equipment loads. The anchors require a minimum embedment into the floor / wall material as indicated in the "*Anchor Type*" table. If the floor / wall thickness is less than the size indicated in the "*Anchor Type*" table, it is recommended to secure the unit using a through-bolt method with a reinforcement plate on the back side. In this case, the through-bolt specifications should match the anchor specifications (hardness, material, etc.) of the replaced anchor.

Note ☞

The ground surface must be flat and leveled, maximum tolerance for leveling is ±1.5 mm per meter (0.2 in per 10 feet). A grout pad provided by the contractor is required to meet this specification. The maximum pad thickness is 6.3 mm (0.25 in).

Illustration 10
Drill Template of a Typical Room Layout XR/f ST – Tube Stand with Telescopic Arm

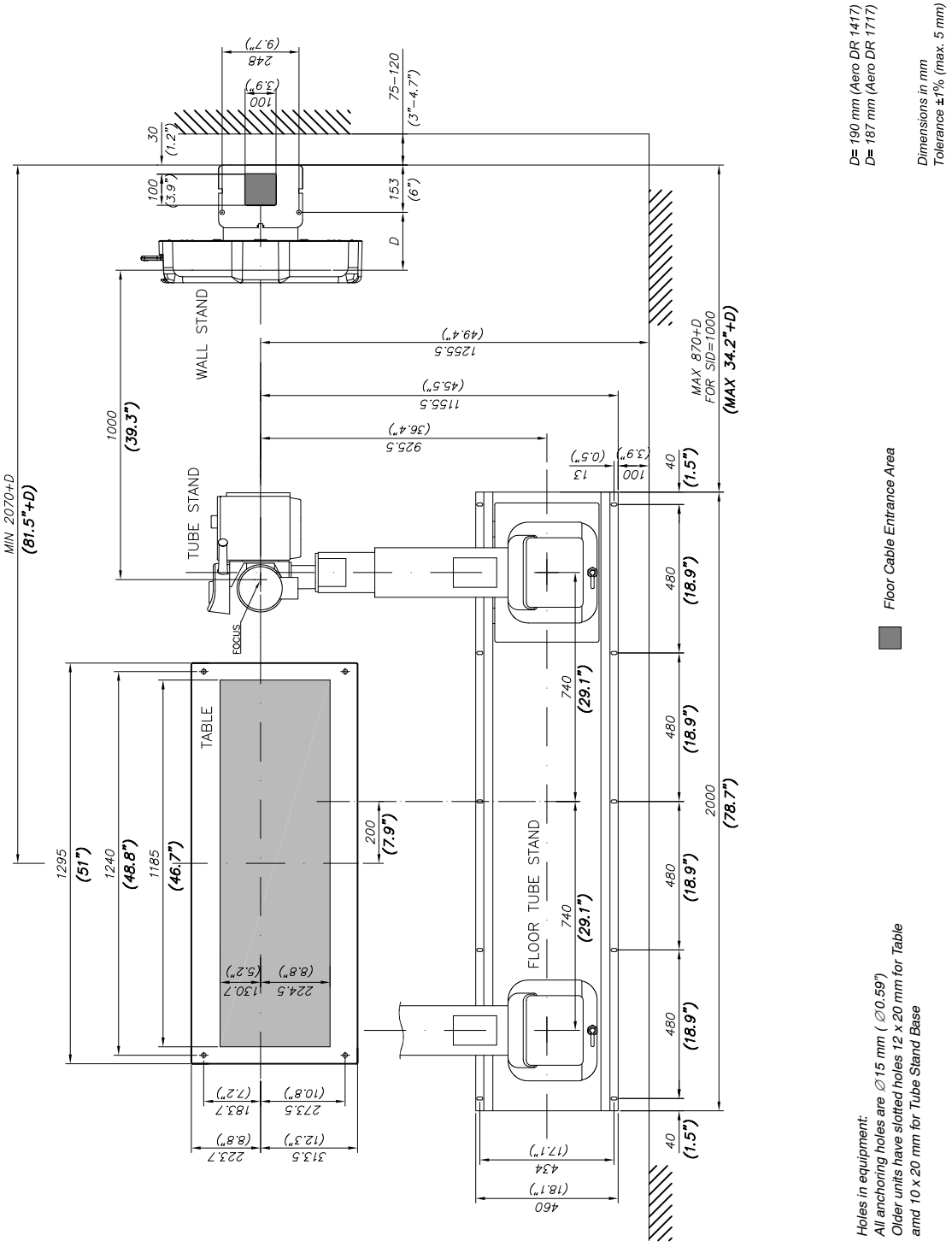


Illustration 11
Drill Template of a Typical Room Layout XR/f ST – Tube Stand with Fixed Arm

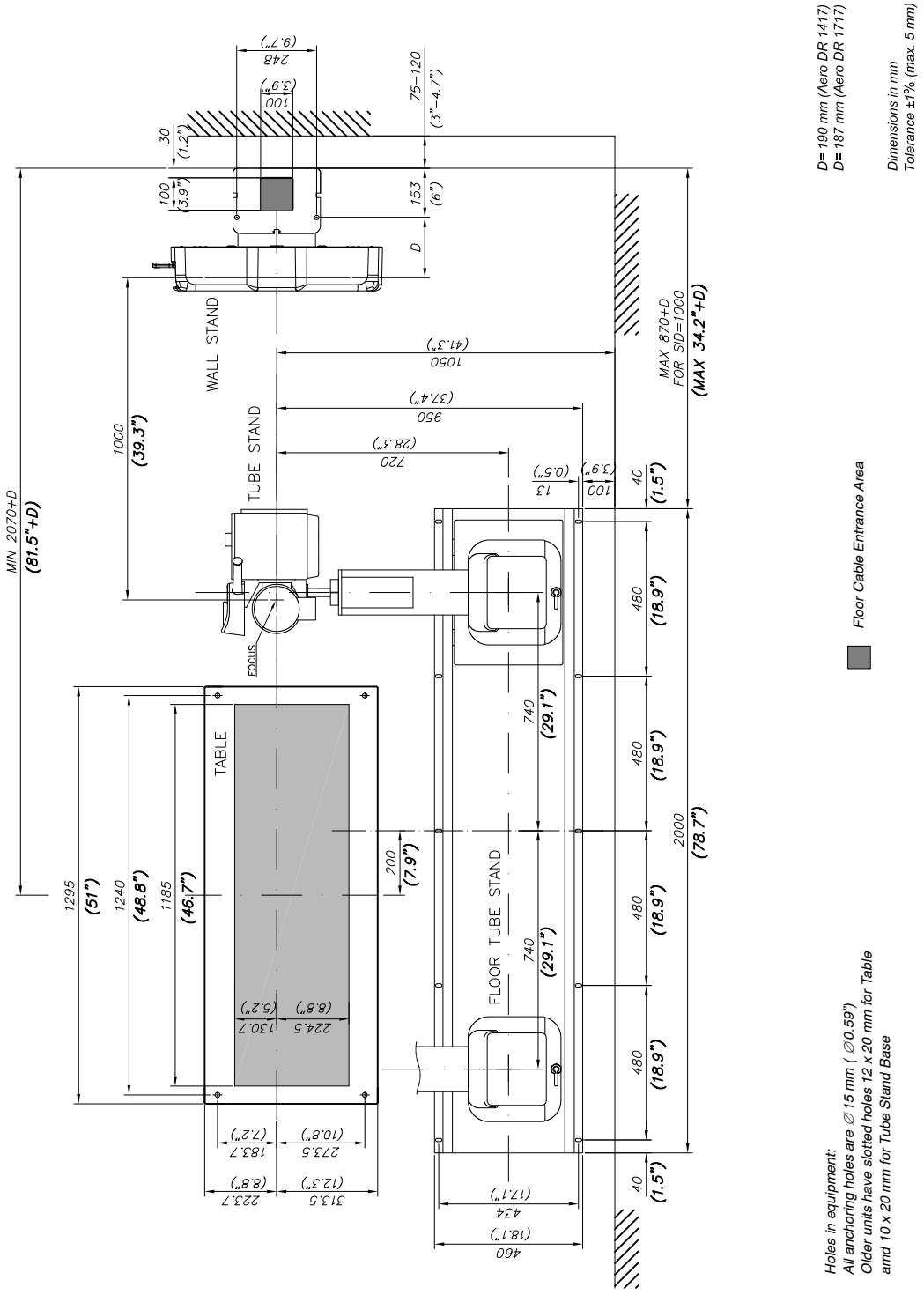


Illustration 12
Drill Template of the Wall Stand

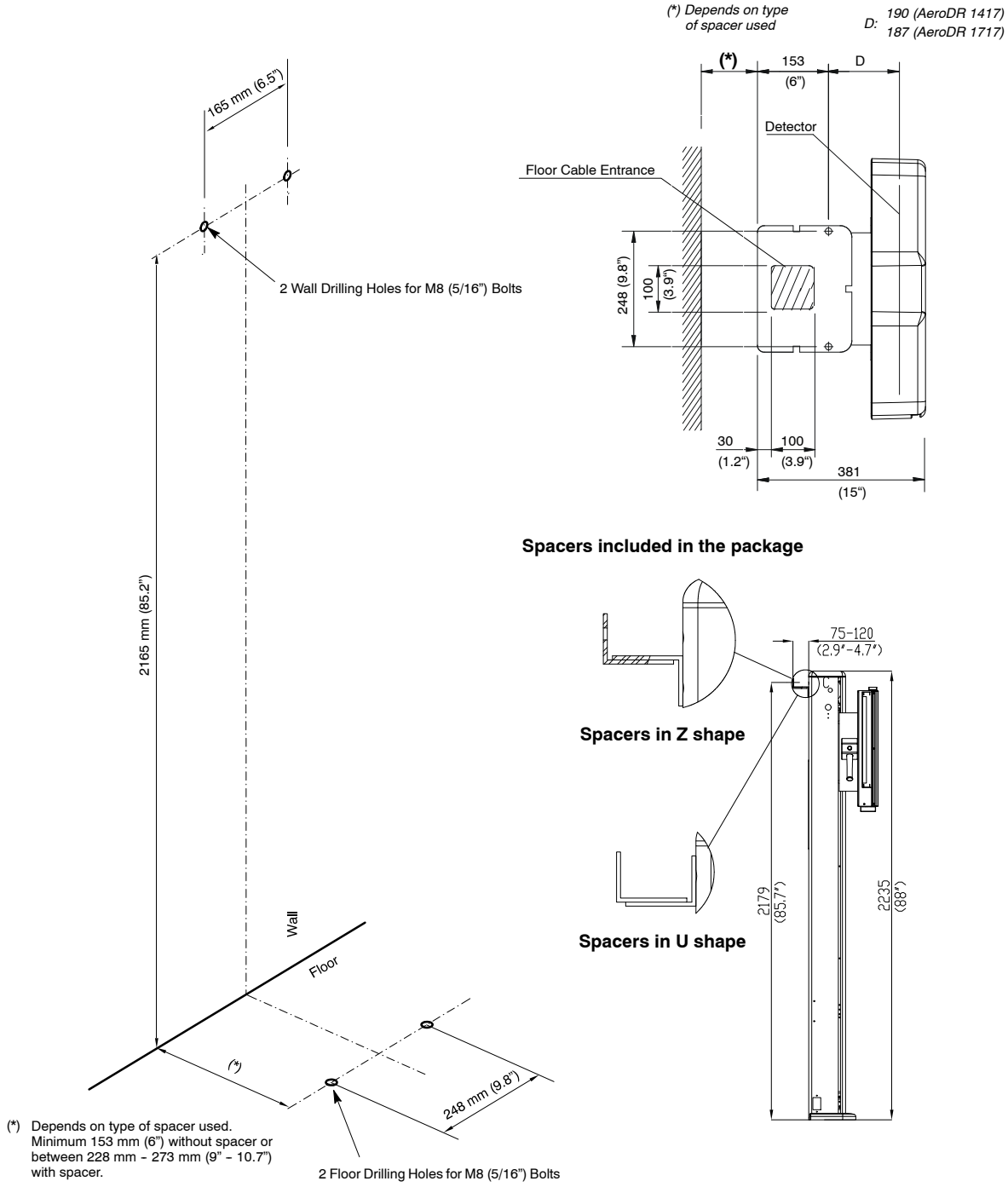


Illustration 13
Proteus XR/f ST Center of Gravity – Tube Stand with Telescopic Arm

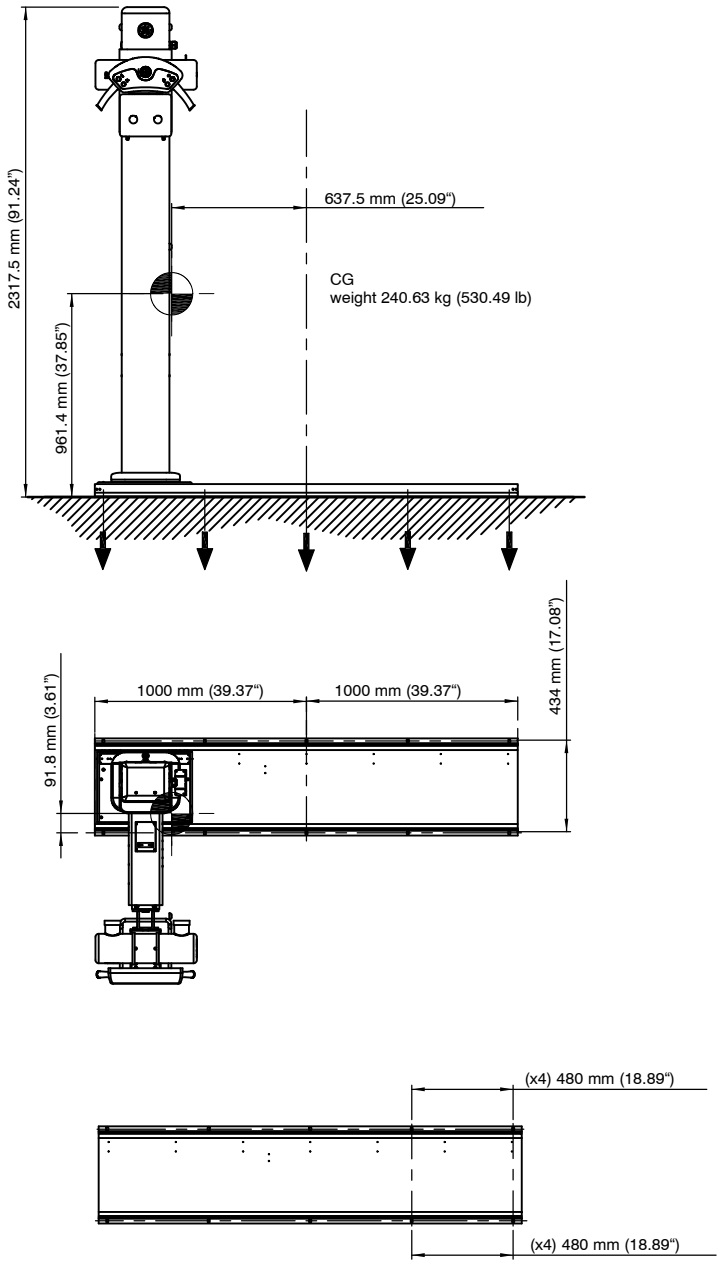


Illustration 14
Proteus XR/f ST Center of Gravity - Tube Stand with Fixed Arm

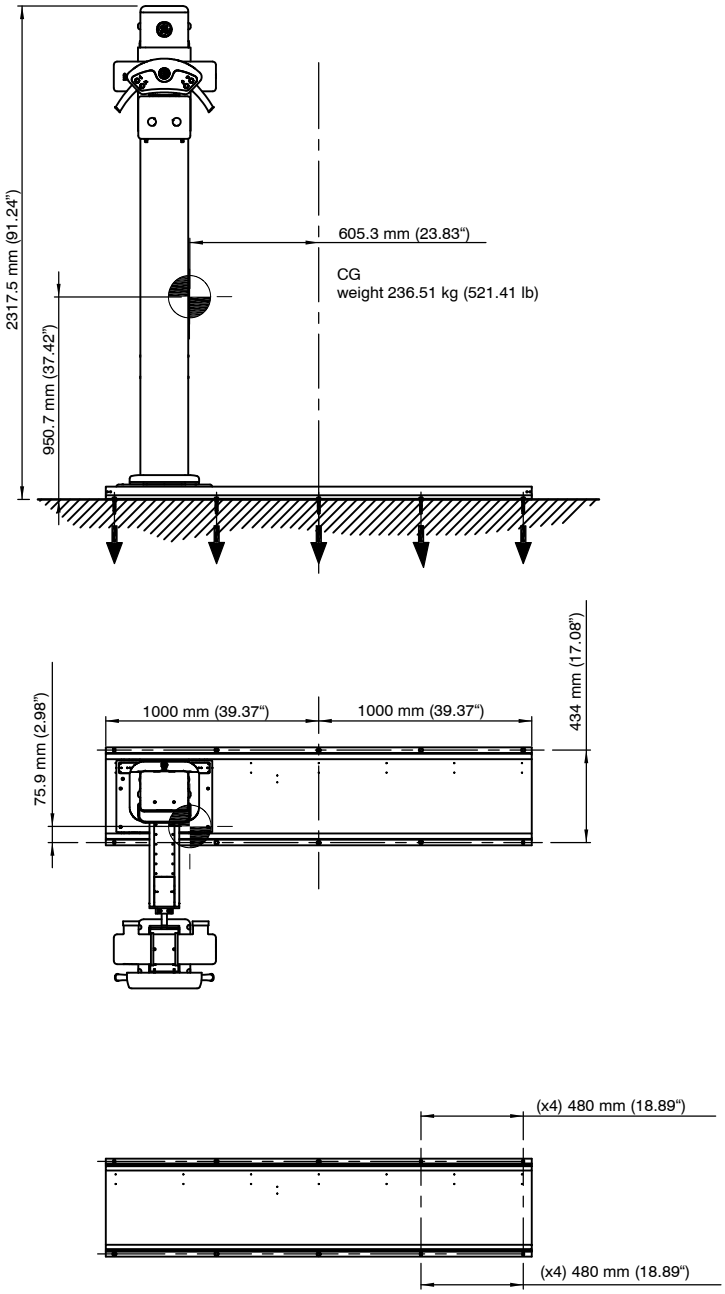


Illustration 15
Proteus XR/f ST Center of Gravity - Table

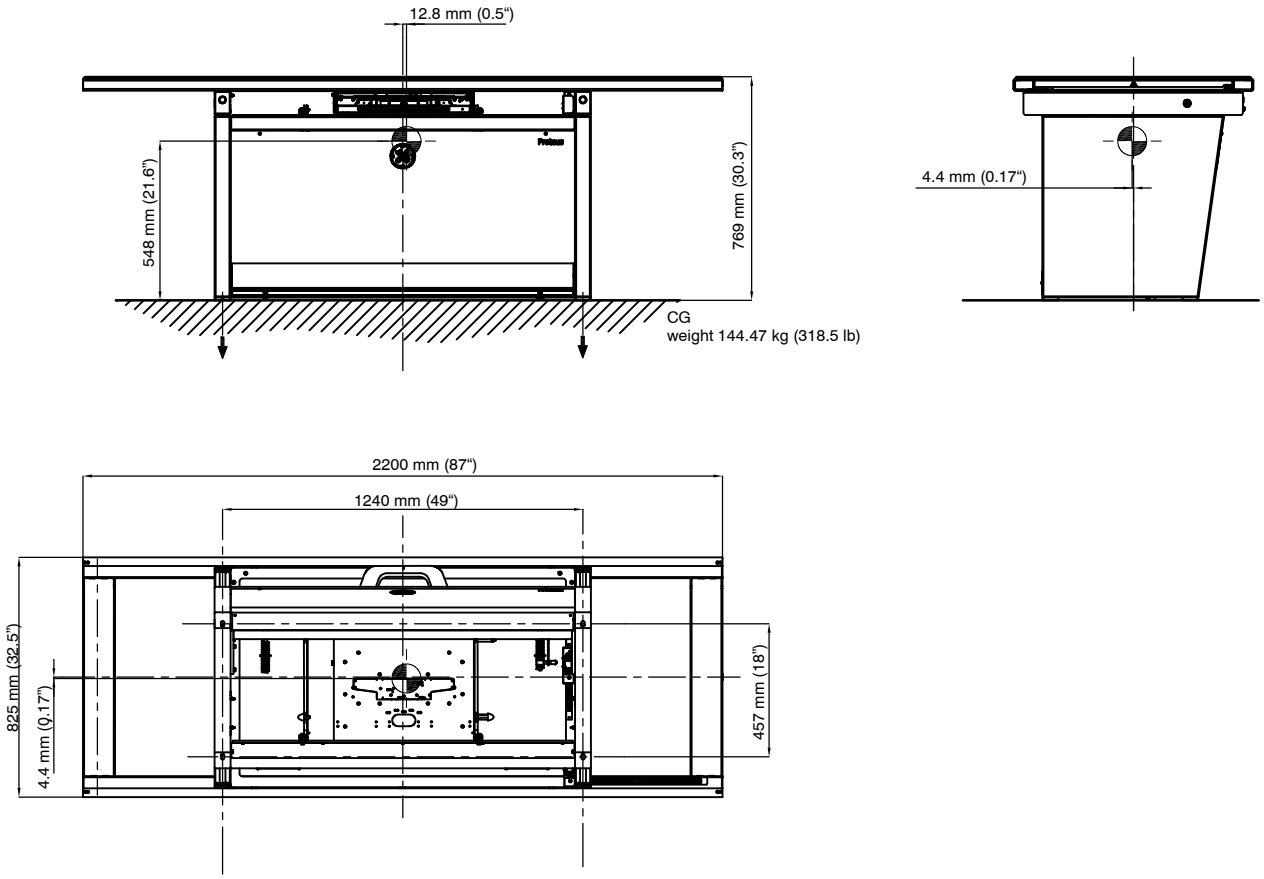


Illustration 16
Proteus XR/f ST Center of Gravity – Wall Stand

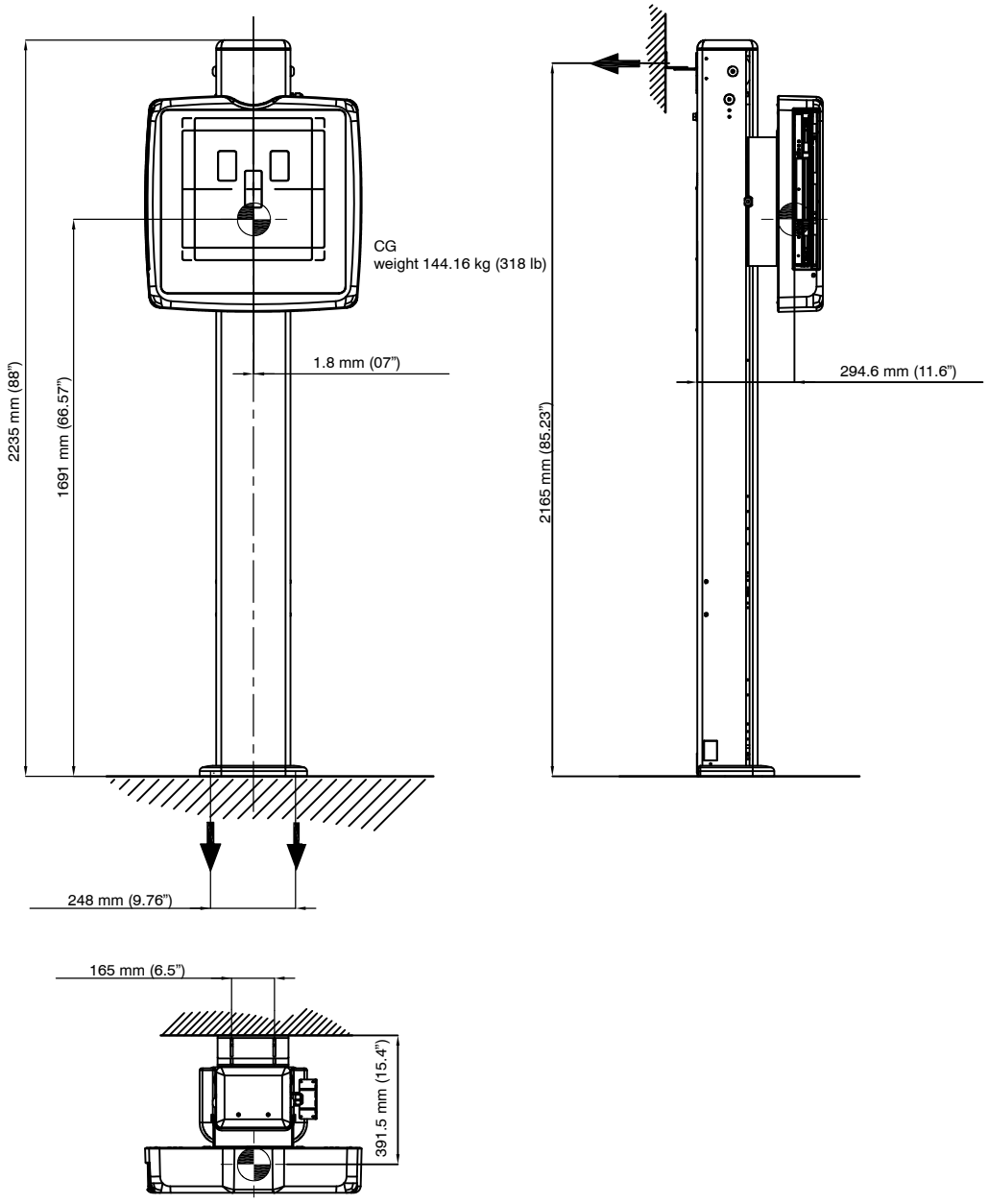
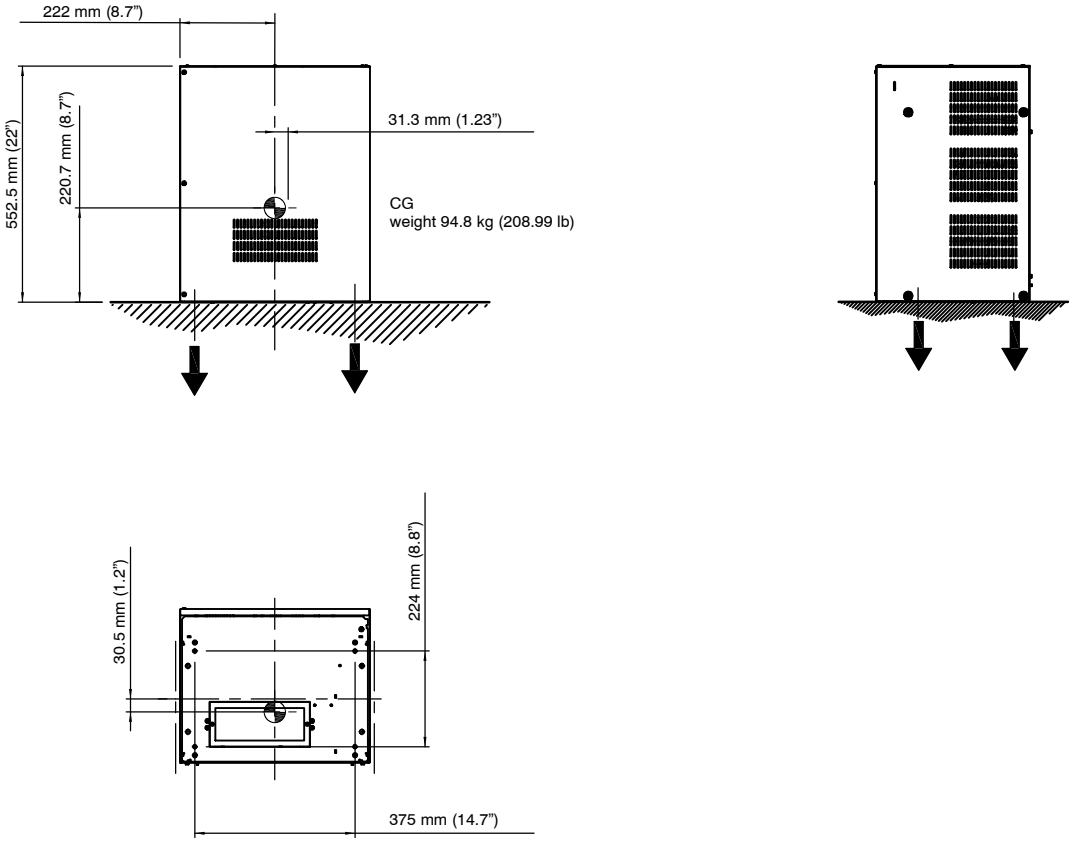


Illustration 17
Proteus XR/f ST Center of Gravity - Generator



SECTION 3 PLANNING ELECTRICAL CONNECTIONS

3.1 ROUTING CABLES

3.1.1 GENERAL

High voltage and power cables must be separated from other cables. Use a separate trough in the duct system or use a separate conduit. Minimize cable length between the line disconnect and the System Cabinet power unit to reduce voltage regulation problems and wiring costs.

For information about the cables supplied with your system, please refer to Section 4, “Electrical Requirements.”

3.1.2 CONDUIT

Separate conduits must be used for power and signal wires. These wires must be kept separate from each other.

Using conduit imposes some important considerations when used with this system. Of primary concern, the majority of cables used are pre-terminated. Pre-termination greatly simplifies interconnection but makes cable-pulling difficult because of the added dimensions of the connectors.

Conduit must be large enough to pass the cable and connector through with all other cables already in the conduit. Also, the size of the conduit chosen must allow for future growth. There is the possibility of additional cables being added later as the system is developed and options are added.

The use of conduit is recommended for cables running overhead between rooms, especially when a diagonal run provides the shortest cable path.

3.1.3 ELECTRICAL DUCTS

It is important that electrical ducts have separate compartments for power and signal wires. These wires must be kept separated from each other for proper system operation.

Electrical ducts have advantages when used with a single room or two (2) adjacent rooms. Electrical ducts combine cabling in a neat and functional appearance, with accessibility and room for expansion.

3.1.4 POWER DISTRIBUTION

The power distribution consists of two (2) major components that must either be customer supplied or GEHC supplied. These are:

- Feeder power from Hospital Distribution Center to the Room Electrical Cabinet (Main Disconnect).
- Power distribution from the Room Electrical Cabinet (Main Disconnect) to the Proteus XR/f System Cabinet and Radiographic Table.

Usually the feeder power from the Hospital Distribution Center is customer supplied and the power distribution within the Proteus XR/f System is supplied by GEHC.

The Operator Room should be supplied with at least five (5) electrical outlets for Computer connection.

Note ☞ *For Hospital facility feeder power and ground requirements to the Room Electrical Cabinet (Main Disconnect) refer to Chapter 4, "Electrical Requirements."*

For system power distribution from Room Electrical Cabinet, refer to the schematic section in the Proteus XR/f Installation Manual. Also refer to Chapter 4, "Electrical Requirements."

3.2 HOSPITAL NETWORK AND PHONE CONNECTIONS

3.2.1 BROADBAND NETWORK CONNECTION

To enable an easier installation and to benefit from remote support (service and engineering teams), the equipment should have broadband connection connected at installation.

Thus the connectivity solution to implement should be decided during pre installation and all related data should be available before installation starts.

For all installations make sure that you have at least one (1) RJ45 dedicated to connect the new equipment on the LAN. In the case of Broadband, this connection will also be used for the remote service of the equipment.

GEHC offers a wide range of connectivity solutions, from the full GEHC package (GEHC supplies Router and customer buys the line) to customized solutions (GEHC adapts to the customer's infrastructure).

Network devices (like CISCO Routers for instance) can be shipped with the equipment **only** if the Sales Representative has added the connectivity item in the order.

For complete descriptions of these connectivity solutions, please refer to the Broadband Solutions catalogue available through your local GEHC sales and service representative.

Connectivity Process and pre-checklists are available in the Broadband Connectivity PIM available through your local GEHC sales and service representative.

For each solution selected by the customer the pre-installation checklist must be fulfilled by site IT manager in order to get connectivity information (site IT manager contacts, IP address) available at installation. Refer to Section 7.5, “Customer Network Flow Audit.”

3.2.2 PHONE VOICE LINE

Phone voice line(s) must be installed within 1 m (3 ft.) from the Operator Console and be operational prior to installation.

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SECTION 4 ELECTRICAL REQUIREMENTS

The product contains advanced circuitry which will maintain the selected X-ray techniques during adverse line conditions. However, there is a limit to the Generator's ability to correct for inadequate line power.

To ensure proper operation:

- Do not under-size the Distribution Transformer. The secondary of the Distribution Transformer can be a "WYE" ("Star") or "DELTA" wire configuration.
- Size feeder and ground wires per this document.
- Ensure and maintain input mains voltage to specification. **Ensure that the earth ground resistance of the installation (hospital/clinic) is lower than 10 Ω.**

With the exception of high current carrying conductors and grounds, low voltage connections are made with finished wires.

TO AVOID THE RISK OF ELECTRIC SHOCK, THIS EQUIPMENT MUST ONLY BE CONNECTED TO A SUPPLY MAINS WITH PROTECTIVE EARTH.

ACCORDING TO THE MDD/93/42/EEC, THIS UNIT IS EQUIPPED WITH EMC FILTERS. THE LACK OF THE PROPER GROUNDING MAY PRODUCE ELECTRICAL SHOCK TO THE USER.

The installation should comply with all the electrical requirements indicated in this document. These requirements should be upgraded if Local Standards were more stringent.

4.1 GENERATOR – POWER LINE REQUIREMENTS

- Operation:

GENERATOR MODEL *(Refer to Identification Label)*	**SINGLE-PHASE GENERATOR**	**THREE-PHASE GENERATOR**		
Maximum Power kW	**50 kW**	**50 kW**	**65 kW**	**80 kW**
Maximum mA	650 mA	650 mA	650 mA	800 mA
Maximum kVp	125 kVp	150 kVp	150 kVp	150 kVp
Power Line	230 / 240 V~, Single-Phase, 50 / 60 Hz	400 / 415 / 440 V~, Three-Phase, 50 / 60 Hz or 480 V~, Three-Phase, 50 / 60 Hz		
	Line voltage automatic compensation: ±10%.			
	Maximum line regulation for maximum kVA demand: 5%.			
NOTES: – For Generators operating with lines at 208 V~ or below an Auxiliary Boost Transformer is required to adequate the line voltage to 230 / 240 V~.				

- I_{RMS} line current during an X-ray exposure, continuous current (stand-by), circuit breaker type, differential sensitivity (mA), minimum line power required (kVA), Generator stand-by consumption (W), should be:

	SINGLE-PHASE GENERATOR POWER					
	50 kW					
LINE VOLTAGE	**I_{RMS} (1)**	**Continuous Current (Stand-by)**	**CIRCUIT BREAKER TYPE (2)**			
			IEC Standard			**NEC Standard**
			B	**C**	**D**	
208 V~ (3)	300 A	2.4 A	125 A	80 A	40 A	150 A
230 V~	272 A	2.2 A	100 A	63 A	32 A	150 A
240 V~	250 A	2.1 A	100 A	63 A	32 A	125 A
Differential Sensitivity (Earth Leakage / Ground Fault)	30 mA					
Minimum kVA required	62.5 kVA (*Maximum kW x 1.25*)					
Stand-by Consumption	500 W					

Notes:

(1) $I_{RMS\ (for\ single\text{-}phase)}$ *= (1.25 x P) / V~(*I_{RMS} *= maximum instantaneous current based on 100 ms X-ray exposure).*

(2) *Circuit Breaker (Differential, Thermomagnetic, Fuses and/or Contactor).*

Based on IEC Standard: The selected Circuit Breaker type must have a minimum tripping current of 1.1 x I_{RMS} *@ 0.1 seconds.*
For example:
Type "B" breaker: $M_B = (I_{RMS} \times 1.1) / 3$
Type "C" breaker: $M_C = (I_{RMS} \times 1.1) / 5$
Type "D" breaker: $M_D = (I_{RMS} \times 1.1) / 10$

Based on NEC Standard: The capacity of the selected Circuit Breaker must have at least 50% of the input required for the momentary rating of the X-ray equipment (I_{RMS}*).*

The selected circuit breaker should be equal or bigger than the calculated value. Minimum value should be 20 A.

IEC classification of circuit breakers: 20 A, 25 A, 32 A, 40 A, 50 A, 63 A, 80 A, 100 A, 125 A.
NEC classification of circuit breakers: 20 A, 25 A, 30 A, 35 A, 40 A, 45 A, 50 A, 60 A, 70 A, 80 A, 90 A, 100 A, 110 A, 125 A, 150 A.

(3) *For Generators operating with lines at 208 V~ or below an Auxiliary Boost Transformer is required to adequate the line voltage to 230 / 240 V~.*
The Auxiliary Boost Transformer should be dimensioned 25% above the actual kVA requirement of the Generator (a.e. for 50 kW Generator -> 62.5 kVA Minimum required -> Auxiliary Boost Transformer should be dimensioned to 80 kVA (62.5 x 1.25).

	THREE-PHASE GENERATOR POWER					
	50 kW					
LINE VOLTAGE	**I_{RMS} (1)**	**Continuous Current (Stand-by)**	**CIRCUIT BREAKER TYPE (2)**			
			IEC Standard			**NEC Standard**
			B	**C**	**D**	
400 V~ (380 V~)	90 A	1.3 A	40 A	20 A	20 A	45 A
415 V~	87 A	1.2 A	32 A	20 A	20 A	45 A
440 V~	82 A	1.1 A	32 A	20 A	20 A	45 A
480 V~	75 A	1.0 A	32 A	20 A	20 A	40 A
Differential Sensitivity (Earth Leakage / Ground Fault)	30 mA					
Minimum kVA required	62.5 kVA (*Maximum kW x 1.25*)					
Stand-by Consumption	500 W					

***Notes**:*

(1) $I_{RMS\ (for\ three\text{-}phase)}$ *= (0.72 x P) / V~ (*I_{RMS} *= maximum instantaneous current based on 100 ms X-ray exposure).*

(2) *Circuit Breaker (Differential, Thermomagnetic, Fuses and/or Contactor).*

Based on IEC Standard: The selected Circuit Breaker type must have a minimum tripping current of 1.1 x I_{RMS} *@ 0.1 seconds.*
For example:
Type "B" breaker: $M_B = (I_{RMS} \times 1.1) / 3$
Type "C" breaker: $M_C = (I_{RMS} \times 1.1) / 5$
Type "D" breaker: $M_D = (I_{RMS} \times 1.1) / 10$

Based on NEC Standard: The capacity of the selected Circuit Breaker must have at least 50% of the input required for the momentary rating of the X-ray equipment (I_{RMS}*).*

The selected circuit breaker should be equal or bigger than the calculated value. Minimum value should be 20 A.

IEC classification of circuit breakers: 20 A, 25 A, 32 A, 40 A, 50 A, 63 A, 80 A, 100 A, 125 A.
NEC classification of circuit breakers: 20 A, 25 A, 30 A, 35 A, 40 A, 45 A, 50 A, 60 A, 70 A, 80 A, 90 A, 100 A, 110 A, 125 A, 150 A.

	THREE-PHASE GENERATOR POWER					
	65 kW					
LINE VOLTAGE	**I_{RMS} (1)**	**Continuous Current (Stand-by)**	**CIRCUIT BREAKER TYPE (2)**			
			IEC Standard			**NEC Standard**
			B	**C**	**D**	
400 V~ (380 V~)	115 A	1.3 A	50 A	32 A	20 A	60 A
415 V~	111 A	1.2 A	50 A	25 A	20 A	60 A
440 V~	105 A	1.1 A	40 A	20 A	20 A	60 A
480 V~	96 A	1.0 A	40 A	20 A	20 A	50 A
Differential Sensitivity (Earth Leakage / Ground Fault)	30 mA					
Minimum kVA required	80 kVA (*Maximum kW x 1.25*) (A Distribution Transformer of **75 kVA** can be used whenever the maximum impedance meets the requirements stated in this section and exposures at the highest power can be performed).					
Stand-by Consumption	500 W					

***Notes**:*

(1) $I_{RMS\ (for\ three\text{-}phase)}$ *= (0.72 x P) / V~ (*I_{RMS} *= maximum instantaneous current based on 100 ms X-ray exposure).*

(2) Circuit Breaker (Differential, Thermomagnetic, Fuses and/or Contactor).

Based on IEC Standard: The selected Circuit Breaker type must have a minimum tripping current of 1.1 x I_{RMS} *@ 0.1 seconds.*
For example:
Type "B" breaker: $M_B = (I_{RMS} \times 1.1) / 3$
Type "C" breaker: $M_C = (I_{RMS} \times 1.1) / 5$
Type "D" breaker: $M_D = (I_{RMS} \times 1.1) / 10$

Based on NEC Standard: The capacity of the selected Circuit Breaker must have at least 50% of the input required for the momentary rating of the X-ray equipment (I_{RMS}*).*

The selected circuit breaker should be equal or bigger than the calculated value. Minimum value should be 20 A.

IEC classification of circuit breakers: 20 A, 25 A, 32 A, 40 A, 50 A, 63 A, 80 A, 100 A, 125 A.
NEC classification of circuit breakers: 20 A, 25 A, 30 A, 35 A, 40 A, 45 A, 50 A, 60 A, 70 A, 80 A, 90 A, 100 A, 110 A, 125 A, 150 A.

	THREE-PHASE GENERATOR POWER					
	80 kW					
LINE VOLTAGE	**I_{RMS} (1)**	**Continuous Current (Stand-by)**	**CIRCUIT BREAKER TYPE (2)**			
			IEC Standard			**NEC Standard**
			B	**C**	**D**	
400 V~ (380 V~)	144 A	1.3 A	63 A	32 A	20 A	80 A
415 V~	139 A	1.2 A	63 A	32 A	20 A	70 A
440 V~	131 A	1.1 A	50 A	32 A	20 A	70 A
480 V~	120 A	1.0 A	50 A	32 A	20 A	60 A
Differential Sensitivity (Earth Leakage / Ground Fault)	30 mA					
Minimum kVA required	100 kVA (*Maximum kW x 1.25*)					
Stand-by Consumption	500 W					

***Notes**:*

(1) $I_{RMS\ (for\ three\text{-}phase)}$ *= (0.72 x P) / V~ (*I_{RMS} *= maximum instantaneous current based on 100 ms X-ray exposure).*

(2) *Circuit Breaker (Differential, Thermomagnetic, Fuses and/or Contactor).*

Based on IEC Standard: The selected Circuit Breaker type must have a minimum tripping current of 1.1 x I_{RMS} *@ 0.1 seconds.*
For example:
Type "B" breaker: $M_B = (I_{RMS} \times 1.1) / 3$
Type "C" breaker: $M_C = (I_{RMS} \times 1.1) / 5$
Type "D" breaker: $M_D = (I_{RMS} \times 1.1) / 10$

Based on NEC Standard: The capacity of the selected Circuit Breaker must have at least 50% of the input required for the momentary rating of the X-ray equipment (I_{RMS}*).*

The selected circuit breaker should be equal or bigger than the calculated value. Minimum value should be 20 A.

IEC classification of circuit breakers: 20 A, 25 A, 32 A, 40 A, 50 A, 63 A, 80 A, 100 A, 125 A.
NEC classification of circuit breakers: 20 A, 25 A, 30 A, 35 A, 40 A, 45 A, 50 A, 60 A, 70 A, 80 A, 90 A, 100 A, 110 A, 125 A, 150 A.

- The Maximum Impedance must be lower than the value indicated below:

LINE VOLTAGE	SINGLE-PHASE GENERATOR		
	50 kW		
	Z_L Ω	Z_C Ω	Z_T Ω
208 V~	0.028 Ω	0.008 Ω	0.043 Ω
230 V~	0.034 Ω	0.010 Ω	0.053 Ω
240 V~	0.037 Ω	0.010 Ω	0.058 Ω

Z_L Ω = maximum impedance of the distribution transformer.
Z_C Ω = maximum impedance of every feeder cable.
Z_T Ω = maximum impedance at the generator's input terminals.
NOTE: *The above values comply with the Standards IEC 60601-2-54:2009 and IEC 60601-2-54:2009+AMD1:2015.*

LINE VOLTAGE	THREE-PHASE GENERATOR								
	50 kW			65 kW			80 kW		
	Z_L Ω	Z_C Ω	Z_T Ω	Z_L Ω	Z_C Ω	Z_T Ω	Z_L Ω	Z_C Ω	Z_T Ω
400 V~ (380 V~)	0.176 Ω	0.058 Ω	0.278 Ω	0.138 Ω	0.045 Ω	0.218 Ω	0.110 Ω	0.036 Ω	0.174 Ω
415 V~	0.189 Ω	0.062 Ω	0.300 Ω	0.148 Ω	0.048 Ω	0.234 Ω	0.118 Ω	0.039 Ω	0.187 Ω
440 V~	0.213 Ω	0.070 Ω	0.337 Ω	0.166 Ω	0.055 Ω	0.263 Ω	0.133 Ω	0.044 Ω	0.211 Ω
480 V~	0.253 Ω	0.083 Ω	0.401 Ω	0.198 Ω	0.065 Ω	0.313 Ω	0.158 Ω	0.052 Ω	0.251 Ω

ZL W = maximum impedance of the distribution transformer.
ZC W = maximum impedance of every feeder cable.
ZT W = maximum impedance at the generator's input terminals.
NOTE: The above values comply with the Standards IEC 60601-2-54:2009 and IEC 60601-2-54:2009+AMD1:2015.

4.2 GENERATOR - RECOMMENDED WIRE SIZE

Correct sizing of the feeder wires is critical to proper Generator operation. Wire size is dependent on the Generator power, the line voltage and the distance from the Distribution Transformer to the Generator Cabinet. The maximum voltage drop during an exposure must not exceed 5% of the nominal mains value.

It is recommended that the Distribution Transformer (Hospital / Clinic) used as the power source have at least 25% more power than the maximum power of the X-ray Generator.

The recommended wire sizing is indicated in Table 5 and the wire size conversion in Table 6. These lengths are measured from the Distribution Transformer to the Room Electrical Cabinet (Main Disconnect). **From the Room Electrical Cabinet to the Generator Cabinet, wire sizes should be consistent with those shown in Table 5 and based on the length of wires required to complete the run. The maximum wire size that can be connected to the Generator Cabinet (Input Line Fuse Holder) is 35 mm^2 (AWG 2).**

Table 5
Minimum Wire Size from Distribution Transformer to Room Electrical Cabinet

GENERATOR	LINE VOLTAGE	WIRE SIZE AT:							
		15 m (50 ft)		30 m (100 ft)		45 m (150 ft)		60 m (200 ft)	
50 kW, 1ϕ	208 V~	50 mm^2	AWG 1	95 mm^2	AWG 3/0	N.A.	N.A.	N.A.	N.A.
	230 V~	35 mm^2	AWG 2	70 mm^2	AWG 2/0	95 mm^2	AWG 4/0	N.A.	N.A.
	240 V~	35 mm^2	AWG 2	70 mm^2	AWG 2/0	95 mm^2	AWG 4/0	N.A.	N.A.
50 kW, 3ϕ	400 V~ (380 V~)	6 mm^2	AWG 10	10 mm^2	AWG 6	16 mm^2	AWG 4	25 mm^2	AWG 4
	415 V~	6 mm^2	AWG 10	10 mm^2	AWG 6	16 mm^2	AWG 4	25 mm^2	AWG 4
	440 V~	6 mm^2	AWG 10	10 mm^2	AWG 8	16 mm^2	AWG 6	25 mm^2	AWG 4
	480 V~	4 mm^2	AWG 10	10 mm^2	AWG 8	16 mm^2	AWG 6	16 mm^2	AWG 4
65 kW, 3ϕ	400 V~ (380 V~)	10 mm^2	AWG 8	16 mm^2	AWG 6	25 mm^2	AWG 4	35 mm^2	AWG 2
	415 V~	10 mm^2	AWG 8	16 mm^2	AWG 6	25 mm^2	AWG 4	25 mm^2	AWG 2
	440 V~	6 mm^2	AWG 8	16 mm^2	AWG 6	16 mm^2	AWG 4	25 mm^2	AWG 4
	480 V~	6 mm^2	AWG 10	10 mm^2	AWG 6	16 mm^2	AWG 4	25 mm^2	AWG 4
80 kW, 3ϕ	400 V~ (380 V~)	10 mm^2	AWG 8	25 mm^2	AWG 4	25 mm^2	AWG 2	35 mm^2	AWG 2
	415 V~	10 mm^2	AWG 8	16 mm^2	AWG 4	25 mm^2	AWG 2	35 mm^2	AWG 2
	440 V~	10 mm^2	AWG 8	16 mm^2	AWG 6	25 mm^2	AWG 4	35 mm^2	AWG 2
	480 V~	6 mm^2	AWG 8	16 mm^2	AWG 6	25 mm^2	AWG 4	25 mm^2	AWG 2

Table 6
Wire Size Conversion and Ampacity

Wire Cross Section (mm^2)	IEC Standard		NEC Standard	
	Wire Size (mm^2)	Ampacity (A)	AWG Wire Size	Ampacity (A)
3.31			**12**	25
4	**4**	24		
5.26			**10**	35
6	**6**	39		
8.37			**8**	50
10	**10**	55		
13.3			**6**	65
16	**16**	70		
21.15			**4**	85
25	**25**	90		
33.6			**2**	115
35	**35**	115		
42.4			**1**	130
50	**50**	132		
53.5			**0 (1/0)**	150
67.4			**00 (2/0)**	175
70	**70**	170		
85			**000 (3/0)**	200
95	**95**	200		
107.2			**0000 (4/0)**	230
120	**120**	240		

The selected cable (copper) must have an Ampacity equal or greater than the Circuit Breaker.
Ampacity (A) values at Ambient Temperature of 30°C (86°F) and Cable Temperature rating of 75°C (167°F)
The smallest size used is 4 mm^2 or AWG 12.

4.3 POSITIONERS POWER LINE REQUIREMENTS

Proteus XR/f AT Rad Room System

Note ☞ *The Tube Stand, the Elevating Table and the Wall Stand are power supplied through the Elevating Table.*

- XR/f AT System . . . . . Single Phase, 50 / 60 Hz, 100 / 110 / 120 / 208 / 230 / 240 V~ ±10%

  Minimum input power required 1.4 kVA
  Power Output . . . . . 0.18 kW

Proteus XR/f ET Rad Room System

Note ☞ *The Tube Stand and the Elevating Table are power supplied through the Elevating Table.*

The Wall Stand is power supplied through the Generator.

- ELEVATING TABLE . . . . . Single Phase, 50 / 60 Hz, 115 / 208 / 230 / 240 V~ ±10%

  Minimum Input Power required 0.6 kVA
  Power Output . . . . . 0.18 kW

- WALL STAND
  Minimum Input Power required 0.5 kVA
  Brake power supply . . . . . 24 $V^{=}$, 2 A

Proteus XR/f ST Rad Room System

Note ☞ *Power Line for System is supplied from the Generator in case of Non-Telescopic Tube Stand or from Brake Box in case of optional Telescopic Tube Stand.*

- TUBE STAND

Power Line for Collimator Lamp	24 V~, 6.5 A 50 / 60 Hz
Power Line for Locks	24 $V^{=}$, 100 VA

- RADIOGRAPHIC TABLE

Power Line for Locks	24 $V^{=}$, 50 VA

- BRAKE BOX (*with optional Telescopic Tube Stand*)

Power Line	Single Phase, 50 / 60 Hz 120 / 208 / 230 / 240 V~ ±10%
Output Voltage (V~)	24V~, 7A – Duty cycle: 25%, 15 seconds ON – 45 seconds
OFF Output Voltage ($V^{=}$) . . .	24 $V^{=}$, 8 A
Isolation	Double isolation between Input and Output as per IEC 60601-1
Maximum Input Current	3.1 A for 120 V~ line 1.8 A for 208 V~ line 1.6 A for 230 V~ line 1.5 A for 240 V~ line

4.4 SAFETY DEVICES

Every installation must be provided with a main line disconnect device (Thermomagnetic breaker) and the remote disconnect devices required at all Consoles that are not located next to the line safety switch.

Devices such as a Safety Switch / Emergency Switch, Warning Lights, and a Door Interlock Switch should be supplied and installed by the customer. (Refer to Illustration 18.)

SAFETY SWITCH / EMERGENCY SWITCH

The main Safety Switch should be installed in the Room Electrical Cabinet (Main Disconnect) (close to the Generator Cabinet) and provided with light indicators for “Power On / Off.” It should be used for main disconnection of the whole System and located in an accessible place where it can be seen and controlled during operation and service.

Other Emergency Switches should be installed in accessible locations in the room (near the main entrance door or the Control Console) for use in an emergency. They should be connected to the Room Electrical Cabinet (Main Disconnect) so that they cut power to the whole System when they are activated.

The rating of these switches should be: 10 A, 500 V~, NC, and should have at least 3.42 mm as Creepage Distances and Air Clearances in accordance with Standards IEC 60601-1:2005, IEC 60601-1:2005+AMD1:2012 and IEC 61058-1:2000 requirements.

DOOR INTERLOCK SWITCH

The Door Interlock Switch indicates to the operator when Doorways to the X-ray room are open. This switch may inhibit X-ray generation, according to Local Standards and customer preferences.

This switch should be installed in the entrance door(s) and its connecting cable should be routed to the Generator Cabinet.

WARNING LIGHT

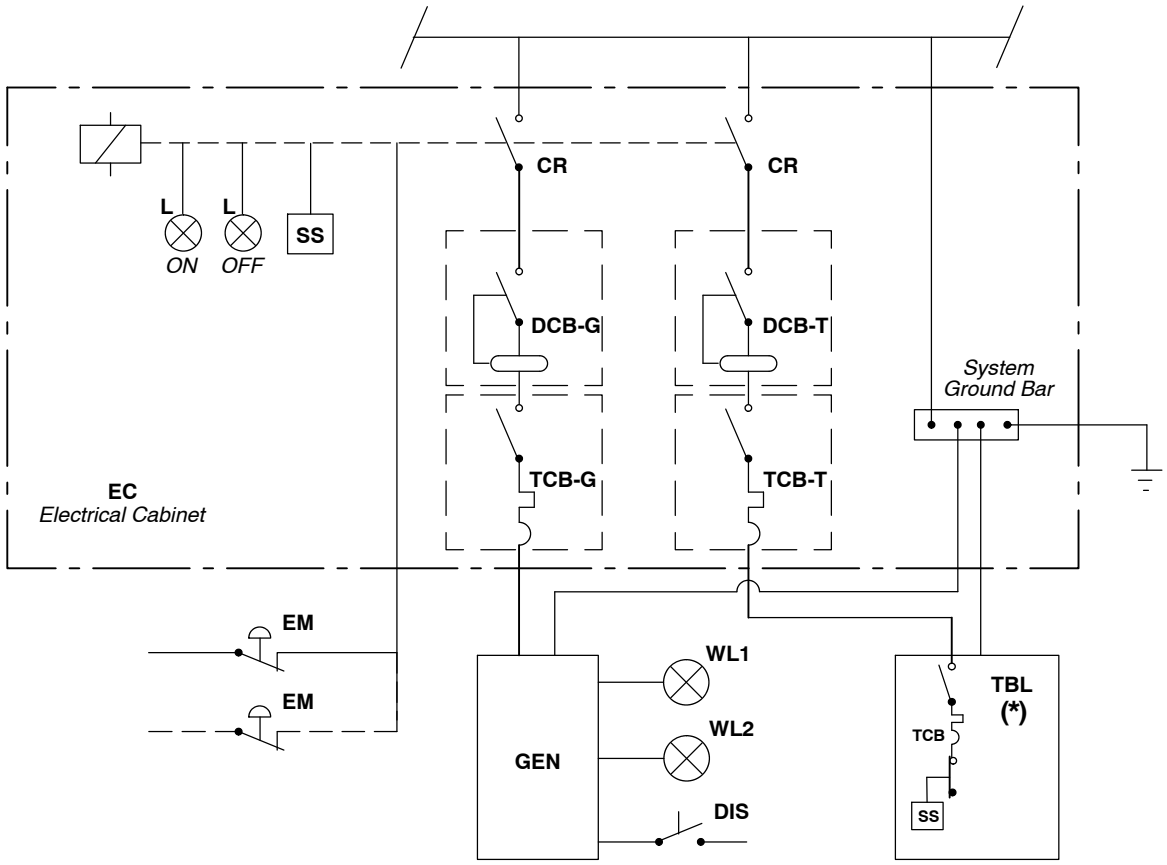
The Warning Lights are signal lamps installed outside of the X-ray room (near of the main entrance) that indicate:

1. The system is under voltage (red lamp “ON”).
2. X-ray exposure in process (yellow lamp “ON”). (For connection refer to the Installation document.)

The Warning Lights connection cables should be routed to the Generator.

Note ☞ *The installation must be in compliance with all local regulations.*

Illustration 18
Room Electrical Cabinet and Mains Connection



(*) Only XR/f AT and ET

LEGEND

EC: Electrical Cabinet (Room Disconnect) for powering X-ray equipment. (*Customer supplied)*
DCB-G: Differential Circuit Breaker according to the Generator rating.
DCB-T: Differential Circuit Breaker according to the Table rating.
TCB-G: Thermomagnetic (or Fuses) Circuit Breaker according to the Generator rating.
TCB-T: Thermomagnetic (or Fuses) Circuit Breaker according to the Table rating.
CR: Contactor controlled by a Safety Switch (**SS**).
SS: Safety Switch used for main disconnection, with ON/OFF positions.
L: ON / OFF Indicator Lamps located on the Electrical Cabinet.
EM: Emergency Switch near to Control Console and/or to the Room main entrance.
GEN: Generator Cabinet.
TBL: RAD Table with a Thermomagnetic and a Safety Switch (**SS**)
WL1: X-ray Emission Indicator Lamp (yellow lamp) connected to the Generator Cabinet, located outside of the X-ray Room (above the exam room entrance).
WL2: Warning Light (red lamp) located outside of the X-ray Room (above the exam room entrance).
DIS: Door Interlock Switch located on the main entrance(s).

4.5 SYSTEM CABLE INFORMATION

4.5.1 CABLE ROUTING AND CONNECTIONS XR/F AT

Table 7
Cable Data and Routing for Proteus XR/f AT

RUN #	CABLE CODE (Mfg. Ref.)	CABLE VOLTAGE (V)	TOTAL CABLE LENGTH	USABLE CABLE LENGTH	CABLE DIAM	CABLE DESCRIPTION	FROM	TO	CONNECTOR TYPE (1) BOTH ENDS OR SPECIFIED (2)
1, 2	-		Cables length and size depends on the position of the Room Electrical Cabinet (Main Disconnect) in the Room			Power Line (1Ph + GND, or 3 Ph + GND, according to the Generator model).	Room Electrical Cabinet (Main Disconnect)	Input Line Fuses at Generator	-
8A, 7, 5B,5C	A7311-01	24 V~	11 m (36.1 ft)	10 m (32.8 ft)	8 mm	Tube Stand Supply Cable	Tube Stand AT TS15	Table Base J1	Molex 6 / Faston x4
8B	A7322-03	24 V~	1.5 m (4.9 ft)	1.5 m (4.9 ft)	8 mm	Collimator	Tube Stand - A3507-03 Bd. J8	Ralco Auto Collimator COL	Molex 3 Molex 3/ AMP 14
	A7381-01	24 V~	1.5 m (4.9 ft)	1.5 m (4.9 ft)	8 mm	Collimator	Tube Stand - A3507-03 Bd. J13&J5	Ralco Manual Collimator COL	Molex 3 Weidmuller 3/ Round Terminals
8A, 7, 6	A7312-07	CAN 12 V	8 m (26.2 ft)	6.8 m (22.3ft) (3)	7 mm	Tube Stand Can Connection	Tube Stand A3541-02 Bd. J13	Can Bus Conn Box A7805-01 Bd. J7	RJ45
8B, 8A, 7, 6	A7312-09	CAN 12 V	12 m (39.4 ft)	7.5 m (24.6 ft) (3)	7 mm	Collimator Can Connection	Tube Stand A3507-03 Bd. J12	Can Bus Conn Box A7805-01 Bd. J6	RJ45
8B, 8A, 7, 5A, 2	HV Cables	40-150 kVp	12 m (39.4 ft)	8 m (26.2 ft) (3)	2 x 17 mm	Anode and Cathode High Voltage Cables	Tube Stand - X-Ray Tube	Generator Cabinet - HV Transformer	HV Cables
	A7014-03	300 V	12 m (39.4 ft)	6.8 m (22.3 ft) (3)	12 mm	Stator	Tube Stand - X-Ray Tube	Generator Cabinet - TS2	Wire terminals
	55902025	24V	20 m (65.6 ft)	14.5 m (47.5 ft) (3)	10 mm	DAP Interface Cable (optional)	External Dosemeter V~udap for Manual Collimator	Generator Cabinet - TS2 - Radiation Meter Bd. A3170-01 IC1-P2	RS232
5C, 5B, 5A, 1	A7379-01	100-240 V~	12 m (39.4 ft)	10.5 m (34.4 ft)	10 mm	Elevating Table Power Supply	Table SW1	Mains	Wire terminals
Aerial	AERODR UF	16.5V	5 m (16.4 ft)	1.7 m (5.6 ft)	9 mm	Detector Cable (* Supplied by KM)	Table Digital Detector	AeroDR I/F Cable	Special Connector 79x14x42 mm
5C, 5B	AERODR I/F	16.5V	10 m (32.8 ft)	10 m (32.8 ft)	9 mm	Detector Cable (* Supplied by KM)	AeroDR UF Cable of Table Digital Detector	AeroDR Interface Unit	Special Connector 79x14x42 mm / RJ15 + Molex 10
5C, 5B, 5A, 2	A3253-02	±12 V=	12 m (39.4 ft)	10 m (32.8 ft)	8 mm	Ion Chamber	Table Base IC	Generator Cabinet AEC Adapt Board	Sub-D9
	A6383-10	—	12 m (39.4 ft)	10.3 m (33.8 ft)	5 mm	GND	Table Base GND	Generator Cabinet GND	Round Terminal
	A7338-02	220 V~	12 m (39.4 ft)	10 m (32.8 ft)	12 mm	Table Remote ON	Table Base K2	Generator Cabinet TS1	Wire terminal x2

(continues in next page)

Table 7 (cont.)
Cable Data and Routing for Proteus XR/f AT

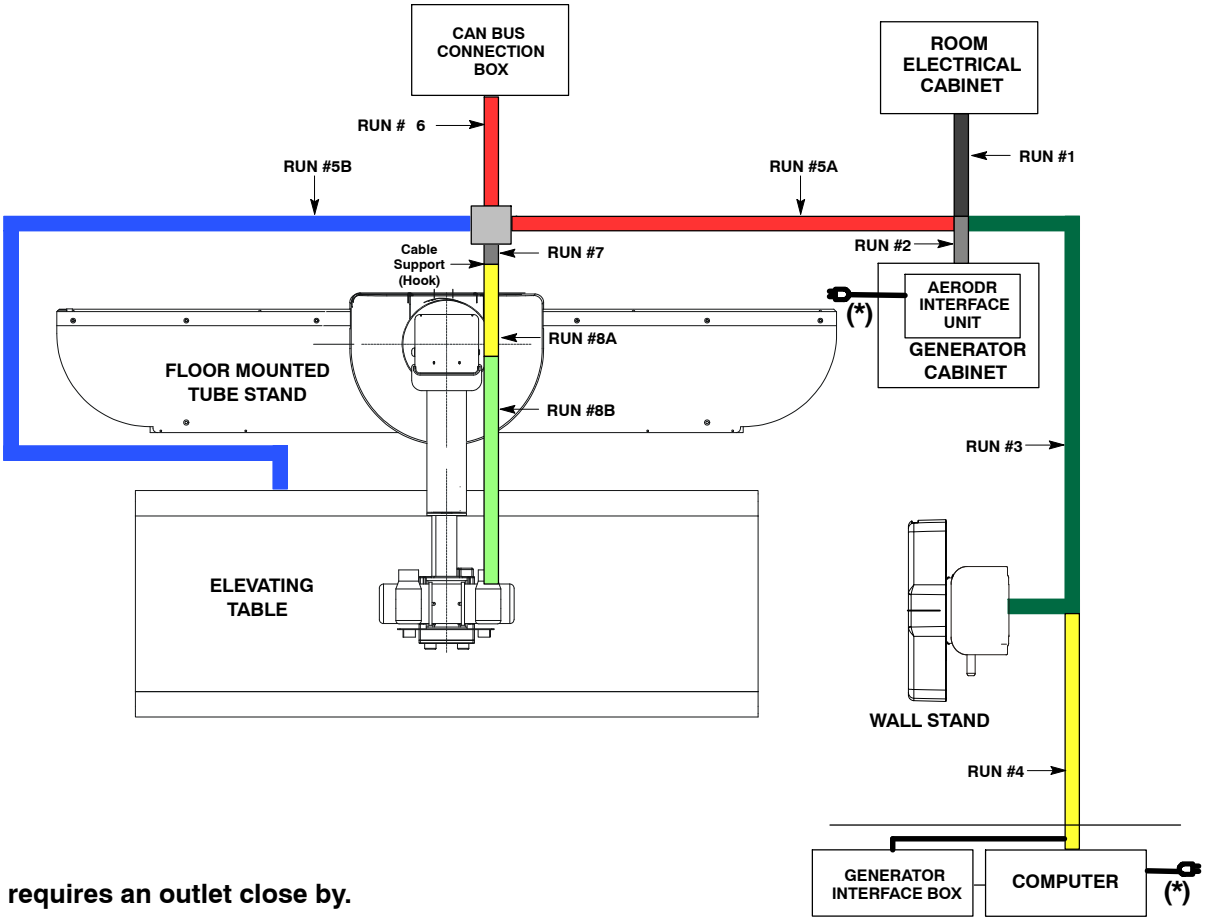
RUN #	CABLE CODE (Mfg. Ref.)	CABLE VOLTAGE (V)	TOTAL CABLE LENGTH	USABLE CABLE LENGTH	CABLE DIAM	CABLE DESCRIPTION	FROM	TO	CONNECTOR TYPE (1) BOTH ENDS OR SPECIFIED (2)
5C, 5B, 5A, 3	A7373-02	24 V=	18 m (59.1 ft)	13 m (42.7 ft)	8 mm	Table to Wall Stand	Table Base J3/J5	Wall Stand TS2 & J1	Molex 15 Wire Term. x10 Molex 2 Molex 18
5C, 5B, 6	A7312-06	CAN 12 V	6 m (19.7 ft)	4.8 m (15.7 ft)	7 mm	Table Can Bus	Table A3538-01 Bd. - J9	Can Bus Conn Box A7805-01 Bd.- J1	RJ45
5C, 5B, 6	A7315-03	24 V=	10 m (32.8 ft)	9 m (29.5 ft)	8 mm	Table Connection Box	Can Bus Conn Box A7805-01 Bd.- J11	Table Base J20	Molex 15V
Aerial	AERODR UF	16.5V	5 m (16.4 ft)	1.7 m (5.6 ft)	9 mm	Detector Cable (* Supplied by KM)	Wall Stand Digital Detector	AeroDR I/F Cable	Special Connector 79x14x42 mm
3, 5A	AERODR I/F	16.5 V	10 m (32.8 ft)	9.5 m (31.2 ft)	9 mm	Detector Cable (* Supplied by KM)	Wall Stand Digital Detector - AERODR UF cable	AeroDr Interface Unit	Special Connector 79x14x42 mm / RJ15 Molex 10
5A, 2	AERODR XG	24V	10 m (32.8 ft)	9.2 m (30.2 ft)	9.1 mm	Generator Interface Cable (* Supplied by KM)	AeroDr Interface Unit	Generator Cabinet - Interface Panel J4	JST: 10x19x29 mm Molex: 6x8x5.8 mm JST: 19x7x4 mm / Sub D 15
3, 2	A3253-02	±12 V=	12 m (39.4 ft)	10.5 m (34.4 ft)	8 mm	Ion Chamber	Wall Stand IC	Generator AEC Adapt Bd	Sub-D9
	A6383-02	—	15 m (49.2 ft)	14.3 m (46.9 ft)	5 mm	GND	Wall Stand GND	Generator Cabinet GND	Round Terminal
4, 3, 5A, 6	A3352-01	24 V=	15 m (49.2 ft)	14.7 m (48.2 ft)	8 mm	Interface Box Cable	Interface Box	Can Bus Conn Box - Remote Control J5	Sub-D25
-	A3363-01 *(with old Interface Box A6509-40)*	12 V=	**6 m** (19.7 ft)	**5.6 m** (18.4 ft)	6 mm	Interface Box Cable	Interface Box J3	**PC Auto ON OFF PCB** J1/J2 and Com1	Sub-D9
	A21089-06 *(with new Interface Box A16296-01)*								
6, 5A, 2	A7067-04	24 V=	6 m (19.7 ft)	5.6 m (18.4 ft)	7 mm	Remote Console	Can Bus Connection Box - Generator	Generator Cabinet - Interface Panel J5	Sub-D25
	A6824-01	5 V=	6 m (19.7 ft)	5 m (16.4 ft)	9 mm	Serial Connection GCA	Can Bus Conn Box COM1	Generator GCA Bd. A3548-01 J2	Sub-D9 / Molex 3
	A6824-01	5 V=	6 m (19.7 ft)	5 m (16.4 ft)	9 mm	Serial Connection GCA	Can Bus Conn Box COM4	Generator GCA Bd. A3548-01 J1	Sub-D9 / Molex 3
	A7312-06	12 V	6 m (19.7 ft)	5 m (16.4 ft)	7 mm	Generator Can Bus	Can Bus Conn Box A7805-01 J8	Generator GCA Bd. A3548-01 J4	RJ45
4, 3, 2	A6383-02	—	15 m (49.2 ft)	14.6 m (47,9 ft)	5 mm	GND	Interface Box	Generator Cabinet GND	Ring Terminal
5A, 3, 4	S0025659-02	12 V	18 m (59.1 ft)	17.6 m (57.7 ft)	8 mm	Ethernet Cable	AeroDr Interface Unit	PC	RJ45
-	S0025659-02	12 V	18 m (59.1 ft)	17.6 m (57.7 ft)	8 mm	Ethernet Cable	AeroDr Interface Unit	Access Point	RJ45

NOTES: *(1) Refer to Illustration 19 for "Harness Runs", and refer to Table 8 for dimensions of the Connector Type.*
(2) If same Connector at both ends only one type is stated. If different connectors, a slash splits each Type (From / To)
(3) Distance taken from the Cable Support of the Tube Stand Column

Table 8
Dimensions of the Connector Type

CONNECTOR TYPE	DIMENSIONS (mm)	DIMENSIONS (inches)
Faston	7 x 10 x 3	0.27 x0.4 x 0.11
Molex 3V	15 x 6 x 35	0.6 x 0.23 x 1.37
Molex 9V	15 x 15 x 35	0.6 x 0.6 x 1.37
Molex 15V	15 x 20 x 45	0.6 x 0.78 x 1.77
Round Terminal	10 x 15 x 6	0.4 x 0.6 x 0.23
Sub D 9V	30 x 50 x 15	1.1 x 2 x 0.6
Sub D 15V	35 x 60 x 15	1.37 x 2.36 x 0.6
Sub D 25V	55 x 60 x 15	2.1 x 2.36 x 0.6
RJ45	18 x 12 x 15	0.7 x 0.47 x 0.6
Special Connector	79 x 14 x 42	3.11 x 0.55 x 1.6
JST 1	10 x 19 x 29	0.4 x 0.74 x 1.1
JST 2	0.74 x 0.27 x 4	19 x 7 x 0.15

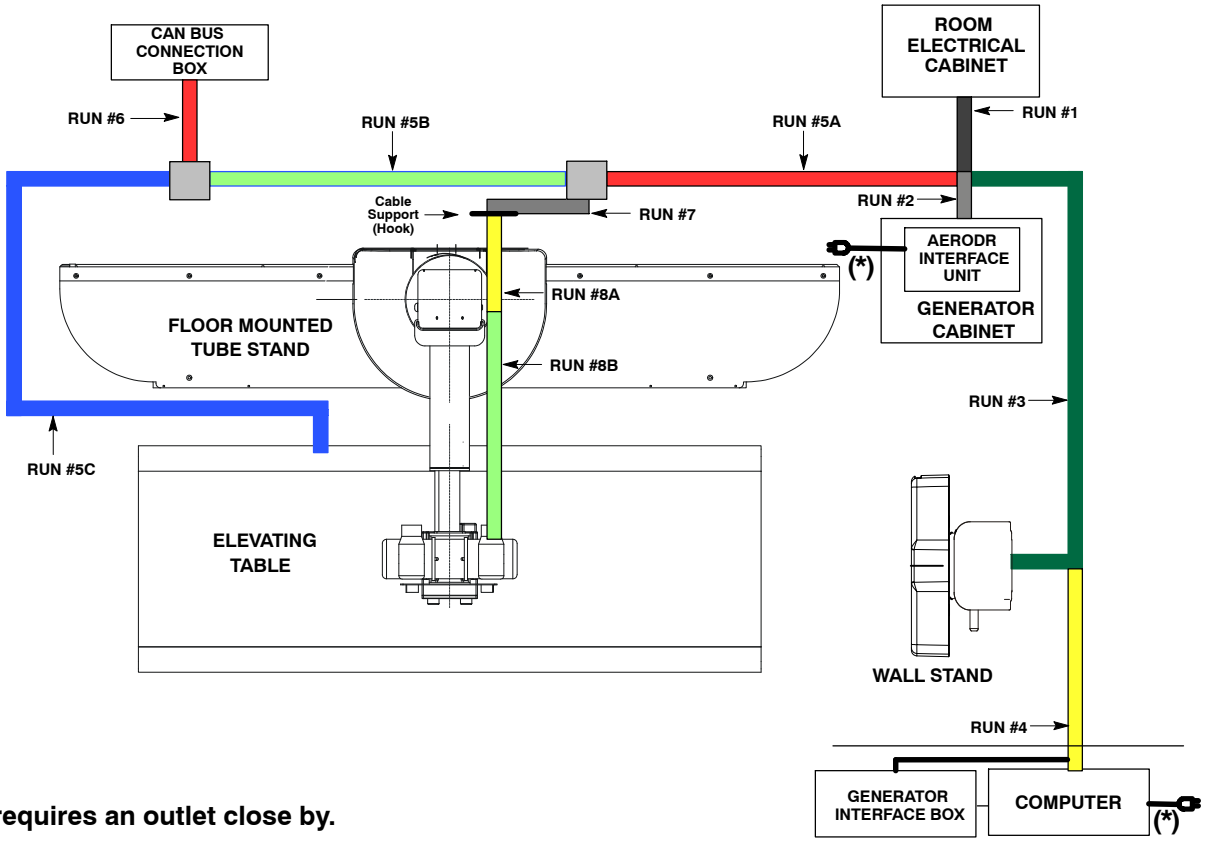
Illustration 19
Harness Runs XR/f AT



(*) requires an outlet close by.

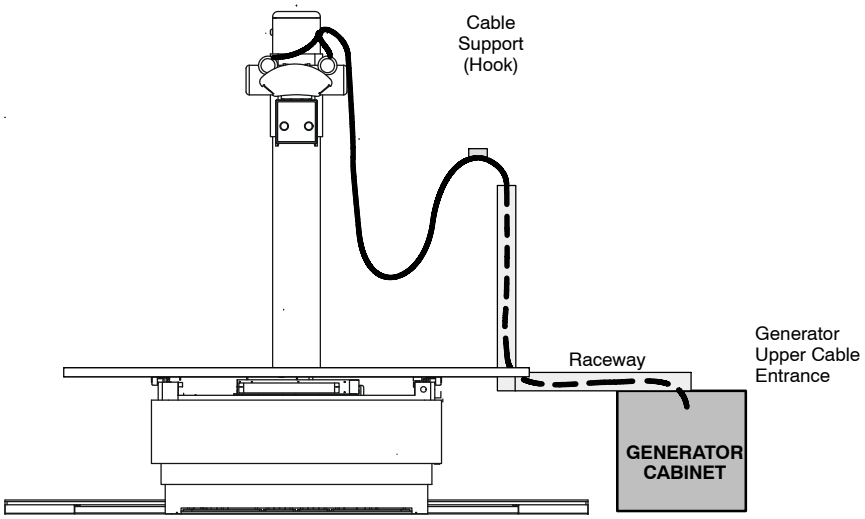
RUN #	LENGTH	RUN TYPE
1	Variable length	Cable conduit or raceway from the Room Electrical Cabinet to the lower end of Run #2. (Power Line: 1 Phase or 3 Phase + GND)
2	1 m (3.28 ft)	Vertical cable conduit or raceway on the wall close to the Generator Cabinet.
3	1.7 m (5.58 ft)	Horizontal cable conduit or raceway between the lower end of Run #2 and the cable entrance of the Wall Stand.
4	Variable length maximum 11.5 m (37.7 ft)	Cable conduit or raceway of variable length between the cable entrance of the Wall Stand and the Control Console.
5A	1.8 m (5.90 ft)	Horizontal cable conduit or raceway between the lower end of Run #2 and the lower end of Run #5B – #6 – #7.
5B	5 m (16.4 ft)	Horizontal cable conduit or raceway between the end of Run #5A – #6 – #7 and the cable entrance of the Table Base.
6	1.2 m (3.94 ft)	Vertical cable conduit or raceway between the end of Run #5A – #5B – #7 and the cable entrance of the Can Connection Box.
7	1.5 m (4.92 ft)	Vertical cable conduit or raceway between the end of Run #5A – #5B – #6 and the Cable Hook on the wall.
8A	2 m (6.56 ft)	Cable sleeve between the Cable Hook on the wall and the Cable Hook on the Column (upper cable entrance of the Column).
8B	1.5 m (4.92 ft)	Cable sleeve between the Tube-Collimator Assembly and the Cable Hook on the Column.

Illustration 20
Harness Runs XR/f AT



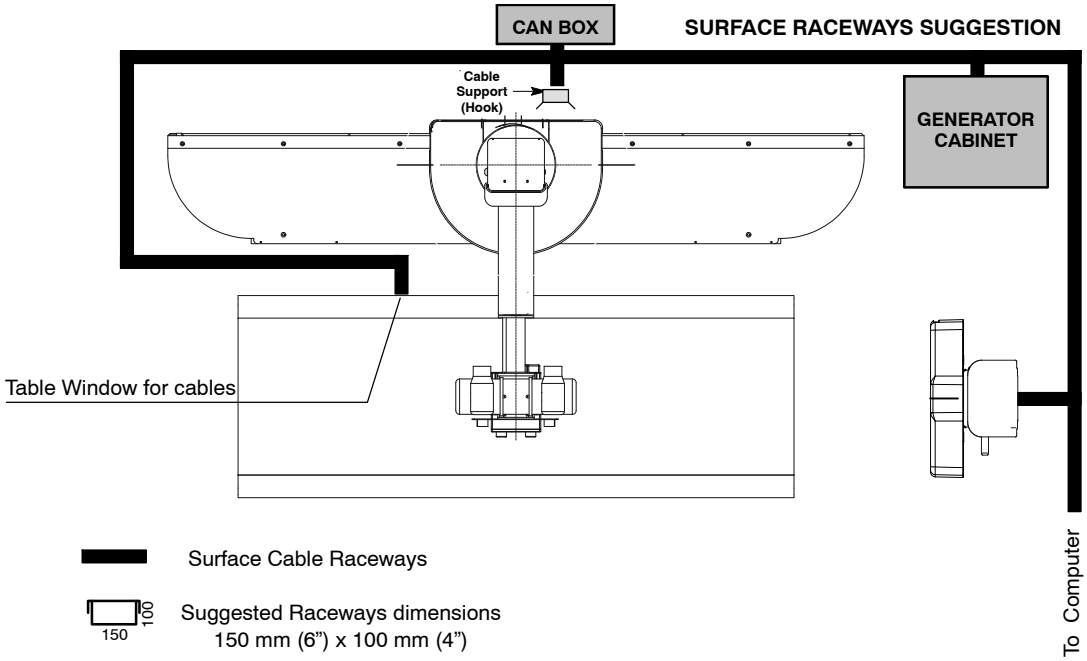
(*) requires an outlet close by.

Illustration 21
Cabling and Room Raceways suggestions XR/f AT

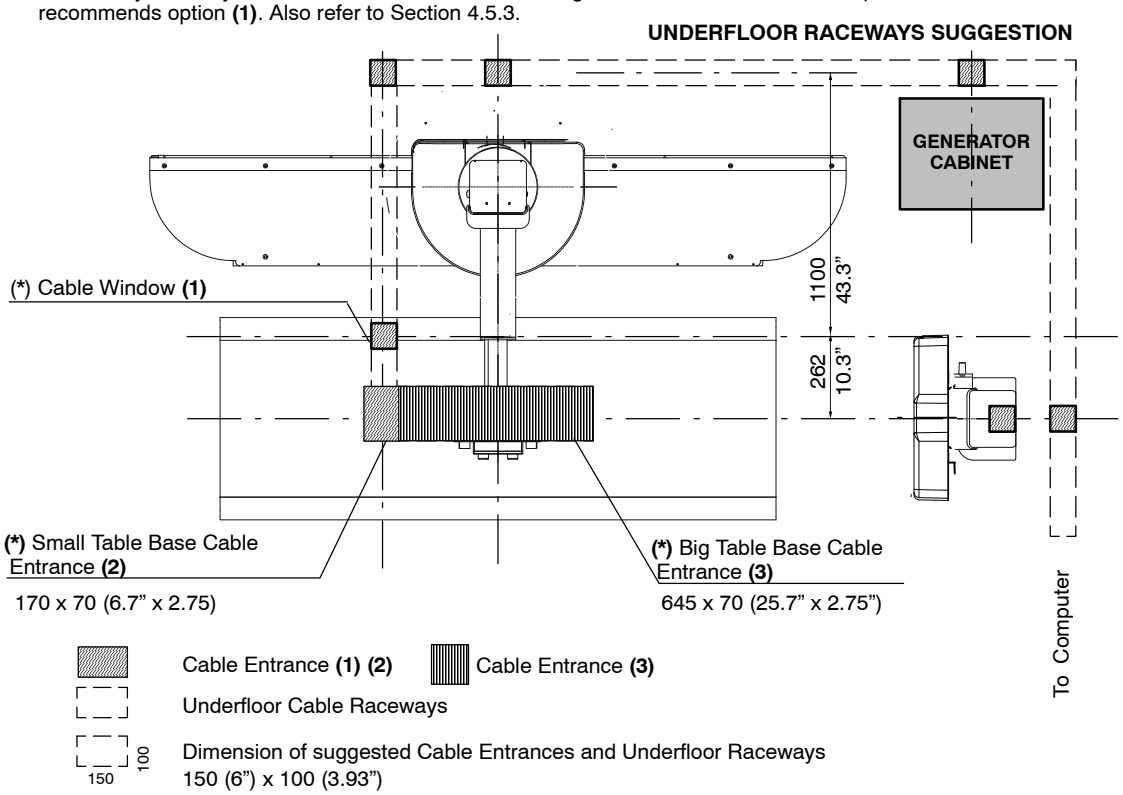


For Stator and High Voltage Cables, install a Cable Support (Hook) on the wall and position the Generator as close as possible to the Column Base.

Illustration 21 (cont.)
Cabling and Room Raceways suggestions XR/f AT



(*) Cables in the Table are factory guided through the Cable window **(1)** located at the back of the Table lower cover. Some installations may require to use the Small Table Base Cable entrance **(2)**. As a third option, the Big Table Base Cable entrance **(3) may be used**, in this case, the cables should be carefully routed in a flat harness such a way that they are not smashed when the Elevating Table is moved to the lowest position. The manufacturer recommends option **(1)**. Also refer to Section 4.5.3.



4.5.2 CABLE ROUTING AND CONNECTIONS XR/F ET

Table 9
Cable Data and Routing for Proteus XR/f ET

RUN #	CABLE CODE (Mfg. Ref.)	CABLE VOLTAGE (V)	TOTAL CABLE LENGTH	USABLE CABLE LENGTH	CABLE DIAM	CABLE DESCRIPTION	FROM	TO	CONNECTOR TYPE (1) BOTH ENDS OR SPECIFIED
1, 2	-		Cables length and size depends on the position of the Room Electrical Cabinet (Main Disconnect) in the Room			Power Line (1Ph + GND, or 3 Ph + GND, according to the Generator model).	Room Electrical Cabinet (Main Disconnect)	Input Line Fuses at Generator	-
7B, 7A, 6, 5A, 5B	A6779-01	24 V~	16 m (52.5 ft)	11.8 m (39 ft) (3)	6 mm	Table-Column Supply	Tube Stand	Table Base TS8	Faston & Round / Round & Molex 3V
	A6750-01	24V~	16 m (52.5 ft)	11.8 m (39 ft) (3)	9 mm	Table-Column Control	Tube Stand	Table Base J4	Molex 15V
	A6784-01	24 V~	16 m (52.5 ft)	11.8 m (39 ft) (3)	8 mm + 9 mm	Collimator	Tube Stand - Collimator	Table Base J3	Molex 9V
	A6754-01	+24 V	12 m (39.4 ft)	10.5 m (34.5 ft) (3)	8 mm	+24V Table-Column	Tube Stand	Table Base J4A	Molex 3V
7B, 7A, 6, 5A, 2	HV Cables	40-150 kVp	12 m (39.4 ft)	8 m (26.3 ft) (3)	2 x 17 mm	Anode and Cathode High Voltage Cables	Tube Stand - X-Ray Tube	Generator Cabinet - HV Transformer	HV Cables
	A7014-03	300 V	12 m (39.4 ft)	6.8 m (22.3 ft) (3)	12 mm	Stator	Tube Stand - X-Ray Tube	Generator Cabinet - TS2	Wire terminals
	55902025	24V	20 m (65.6 ft)	14.5 m (47.5 ft) (3)	10 mm	DAP Interface Cable (optional)	External Dosemeter V~udap for Manual Collimator	Generator Cabinet - TS2 - Radiation Meter Bd. A3170-01 IC1-P2	RS232
5B, 5A, 1	A6739-01	100-240 V~	12 m (39.4 ft)	10.9 m (35.8 ft)	8 mm	Room Power Supply	Table TS1	Mains	Wire terminals
5B, 5A, 2	A3253-02	±12 V=	12 m (39.4 ft)	10 m (32.8 ft)	8 mm	Ion Chamber	Table Base IC	Generator Cabinet AEC Adapt Board	Sub-D9
	A7163-03	220 V~	12 m (39.4 ft)	10.9 m (35.8 ft)	9 mm	Table Remote ON	Table Base J1	Generator Cabinet TS1	Wire terminal x2
5B, 5A, 1	A6383-10	-	12 m (39.4 ft)	10.9 m (35.8 ft)	5 mm	GND	Table Base GND	Room Electrical Cabinet	Round Terminal
Aerial	AERODR UF	16.5V	5 m (16.4 ft)	1.7 m (5.6 ft)	9 mm	Detector Cable (* Supplied by KM)	Table Digital Detector	AeroDR I/F Cable	Special Connector 79x14x42 mm
5B	AERODR I/F	16.5V	10 m (32.8 ft)	10 m (32.8 ft)	9 mm	Detector Cable (* Supplied by KM)	AeroDR UF Cable of Table Digital Detector	AeroDR Interface Unit	Special Connector 79x14x42 mm / RJ15 + Molex 10
3, 2	A6707-03	24 V=	12 m (39.4 ft)	8.5 m (27.9 ft)	8 mm	Locks	Wall Stand	Generator Cabinet - Lock Board	Faston
3, 1	A6383-02	-	15 m (49.2 ft)	14.3 m (46.9 ft)	5 mm	GND	Wall Stand GND	Room Electrical Cabinet GND	Round Terminal
3, 2	A3253-02	±12 V=	12 m (39.4 ft)	10.5 m (34.4 ft)	8 mm	Ion Chamber	Wall Stand IC	Generator Cabinet - AEC Adapt Bd	Sub-D9
Aerial	AERODR UF	16.5V	5 m (16.4 ft)	1.7 m (5.6 ft)	9 mm	Detector Cable (* Supplied by KM)	Wall Stand Digital Detector	AeroDR I/F Cable	Special Connector 79x14x42 mm

(continues in next page)

Table 9 (cont.)
Cable Data and Routing for Proteus XR/f ET

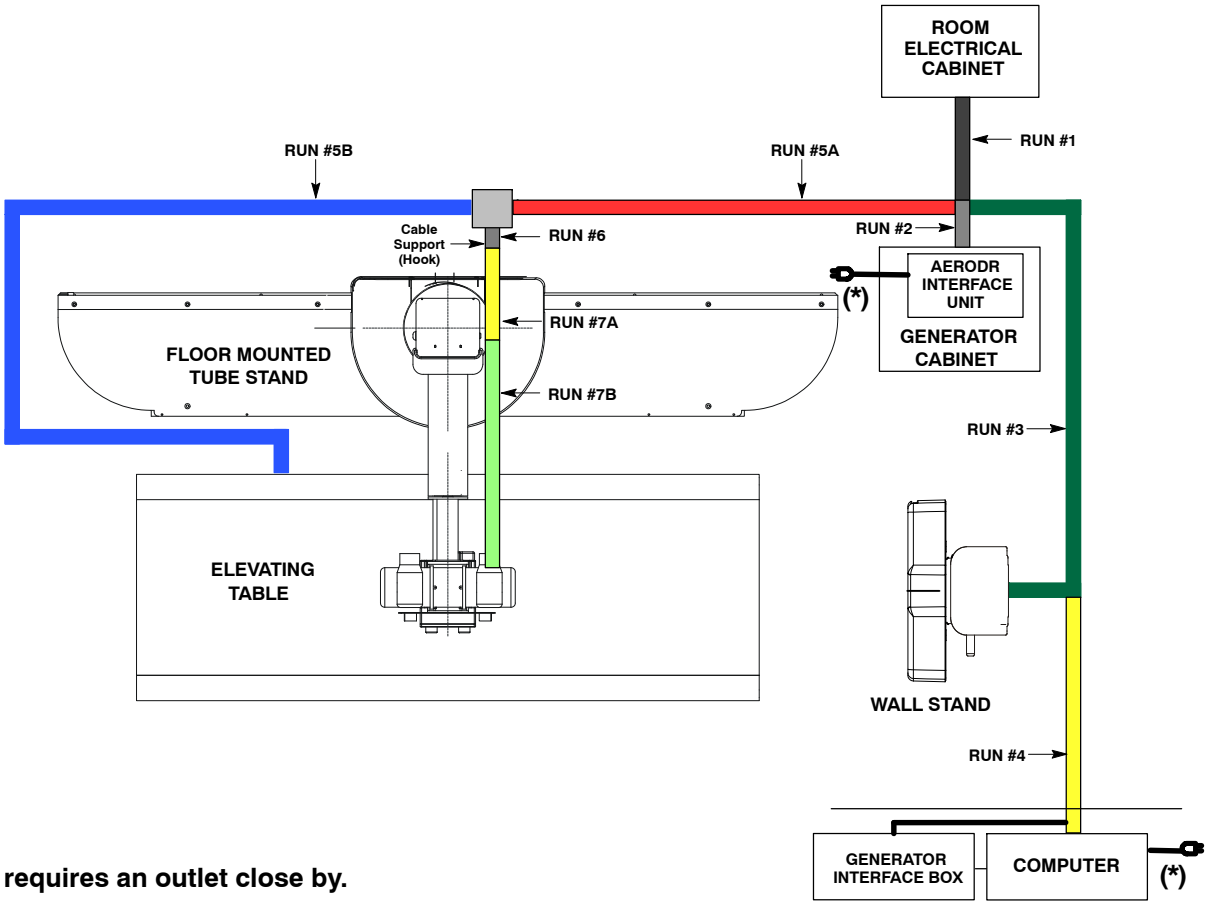
RUN #	CABLE CODE (Mfg. Ref.)	CABLE VOLTAGE (V)	TOTAL CABLE LENGTH	USABLE CABLE LENGTH	CABLE DIAM	CABLE DESCRIPTION	FROM	TO	CONNECTOR TYPE (1) BOTH ENDS OR SPECIFIED
3, 5A	AERODR I/F	16.5 V	10 m (32.8 ft)	9.5 m (31.2 ft)	9 mm	Detector Cable (* Supplied by KM)	Wall Stand Digital Detector - AERODR UF cable	AeroDr Interface Unit	Special Connector 79x14x42 mm / RJ15 Molex 10
4, 3, 2	A3352-01	24 V=	15 m (49.2 ft)	14.7 m (48.2 ft)	8 mm	Interface Box Cable	Interface Box J1	Generator Cabinet - Interface Panel J5	Sub-D25
-	A3363-01 *(with old Interface Box A6509-40)* A21089-06 *(with new Interface Box A16296-01)*	12 V=	**6 m** (19.7 ft)	**5.6 m** (18.4 ft)	6 mm	Interface Box Cable	Interface Box J3	PC Auto ON OFF PCB J1/J2 and Com1	Sub-D9
2,1	A6383-02	—	15 m (49.2 ft)	14.6 m (47.9 ft)	5 mm	GND	Generator Cabinet GND	Room Electrical Cabinet	Ring Terminal
5A, 2	AERODR XG	24V	10 m (32.8 ft)	9.2 m (30.2 ft)	9.1 mm	Generator Interface Cable (* Supplied by KM)	AeroDr Interface Unit	Generator Cabinet - Interface Panel J4	JST: 10x19x29 mm Molex: 6x8x5.8 mm JST: 19x7x4 mm / Sub D 15
5A, 3, 4	S0025659-02	12 V	18 m (59 ft)	17.6 m (57.7 ft)	8 mm	Ethernet Cable	AeroDr Interface Unit	PC	RJ45
-	S0025659-02	12 V	18 m (59 ft)	17.6 m (57.7 ft)	8 mm	Ethernet Cable	AeroDr Interface Unit	Access Point	RJ45

NOTES: *(1) Refer to Illustration 22 for "Harness Runs", and refer to Table 10 for dimensions of the Connector Type.*
(2) If same Connector at both ends only one type is stated. If different connectors, a slash splits each Type (From / To)
(3) Distance taken from the Cable Support of the Tube Stand Column

Table 10
Dimensions of the Connector Type

CONNECTOR TYPE	DIMENSIONS (mm)	DIMENSIONS (inches)
Faston	7 x 10 x 3	0.27 x0.4 x 0.11
Molex 3V	15 x 6 x 35	0.6 x 0.23 x 1.37
Molex 9V	15 x 15 x 35	0.6 x 0.6 x 1.37
Molex 15V	15 x 20 x 45	0.6 x 0.78 x 1.77
Round Terminal	10 x 15 x 6	0.4 x 0.6 x 0.23
Sub D 9V	30 x 50 x 15	1.1 x 2 x 0.6
Sub D 15V	35 x 60 x 15	1.37 x 2.36 x 0.6
Sub D 25V	55 x 60 x 15	2.1 x 2.36 x 0.6
RJ45	18 x 12 x 15	0.7 x 0.47 x 0.6
Special Connector	79 x 14 x 42	3.11 x 0.55 x 1.6
JST 1	10 x 19 x 29	0.4 x 0.74 x 1.1
JST 2	0.74 x 0.27 x 4	19 x 7 x 0.15

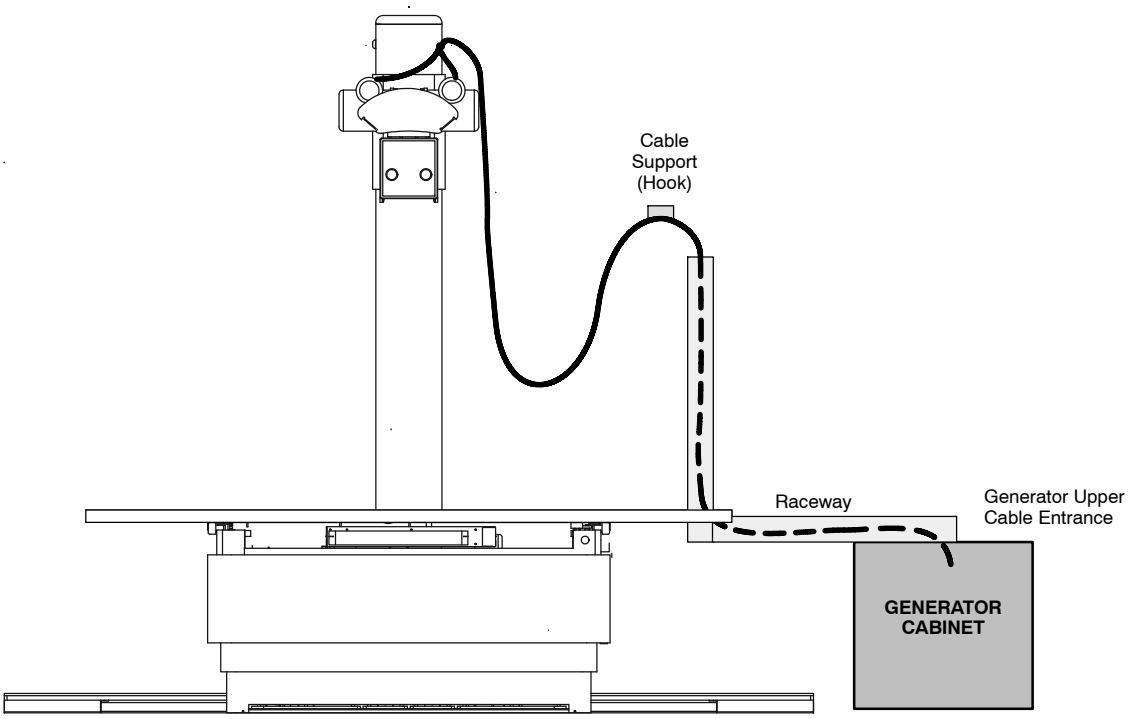
Illustration 22
Harness Runs XR/f ET



(*) requires an outlet close by.

RUN #	LENGTH	RUN TYPE
1	Variable length	Cable conduit or raceway from the Room Electrical Cabinet to the lower end of Run #2. (Power Line: 1 Phase or 3 Phase + GND)
2	1 m (3.28 ft)	Vertical cable conduit or raceway on the wall close to the Generator Cabinet.
3	1.7 m (5.58 ft)	Horizontal cable conduit or raceway between the lower end of Run #2 and the cable entrance of the Wall Stand.
4	Variable length maximum 11.5 m (37.7 ft)	Cable conduit or raceway of variable length between the cable entrance of the Wall Stand and the Control Console.
5A	1.8 m (5.90 ft)	Horizontal cable conduit or raceway between the lower end of Run #2 and the lower end of Run #7.
5B	5 m (16.4 ft)	Horizontal cable conduit or raceway between the end of Run #5A and the cable entrance of the Table Base.
6	1.5 m (4.92 ft)	Vertical cable conduit or raceway between the end of Run #5A-5B and the Cable Hook on the wall.
7A	2 m (6.56 ft)	Cable sleeve between the Cable Hook on the wall and the upper cable entrance of the Column.
7B	3 m (9.84 ft)	Cable sleeve between the Tube-Collimator Assembly and the Cable Hook on the Column.

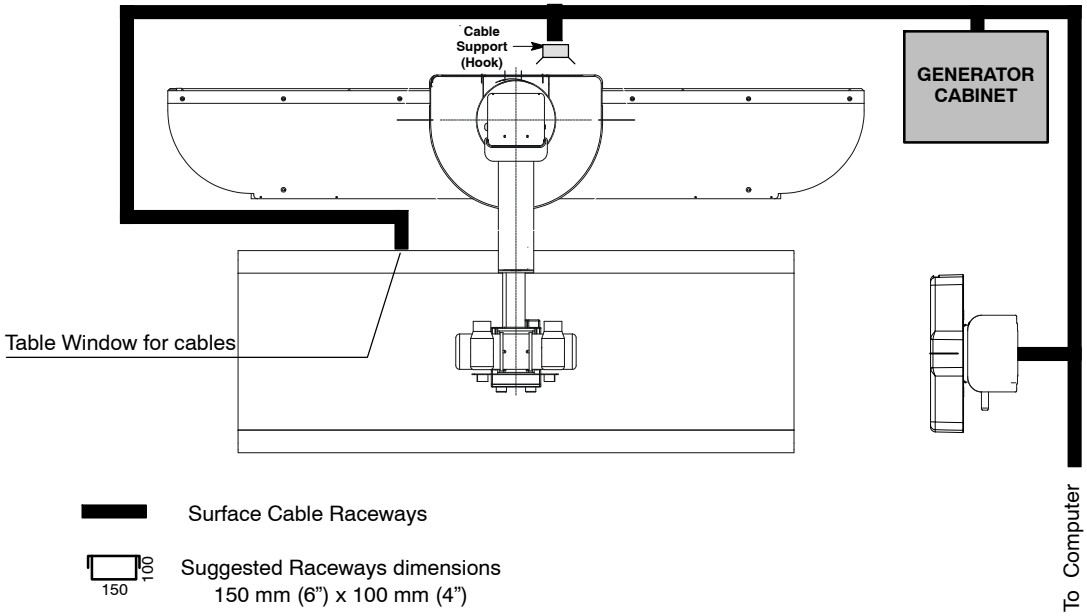
Illustration 23
Cabling and Room Raceways suggestions XR/f ET



For Stator and High Voltage Cables, install a Cable Support (Hook) on the wall and position the Generator as close as possible to the Column Base.

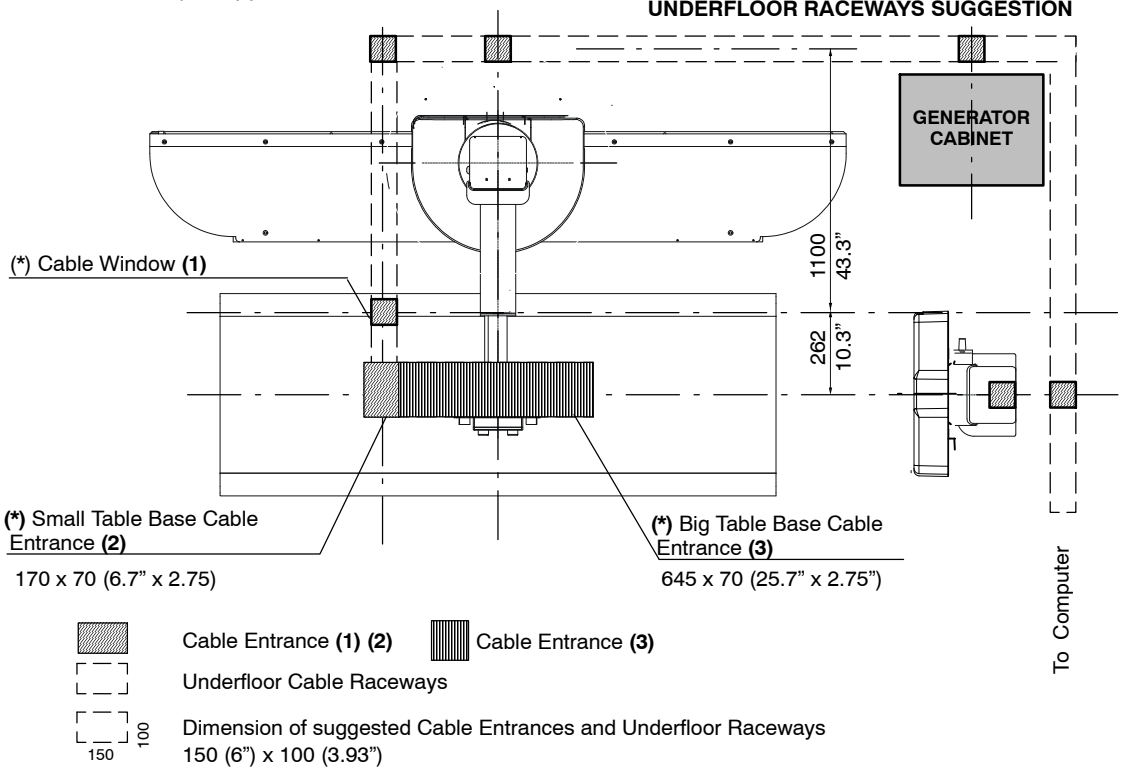
Illustration 23 (cont.)
Cabling and Room Raceways suggestions XR/f ET

SURFACE RACEWAYS SUGGESTION



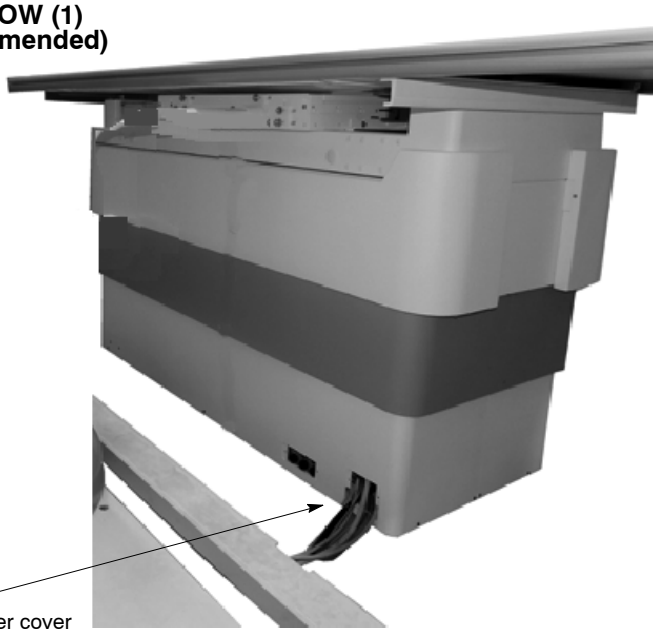
(*) Cables in the Table are factory guided through the Cable window **(1)** located at the back of the Table lower cover. Some installations may require to use the Small Table Base Cable entrance **(2)**. As a third option, the Big Table Base Cable entrance **(3) may be used**, in this case, the cables should be carefully routed in a flat harness such a way that they are not smashed when the Elevating Table is moved to the lowest position. The manufacturer recommends option **(1)**. Also refer to Section 4.5.3.

UNDERFLOOR RACEWAYS SUGGESTION

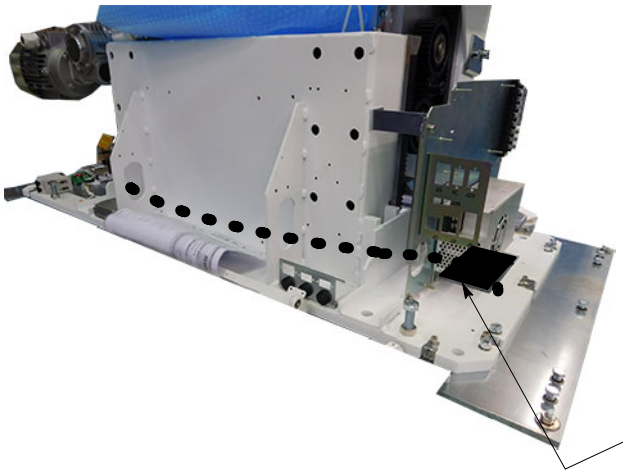


4.5.3 CABLE ACCESS XR/F AT AND ET

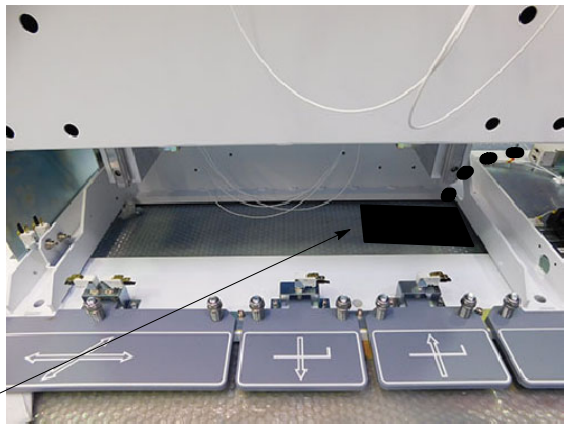
TABLE CABLE WINDOW (1)
(Manufacturer recommended)



XR/f AT /ET Cable access (2)

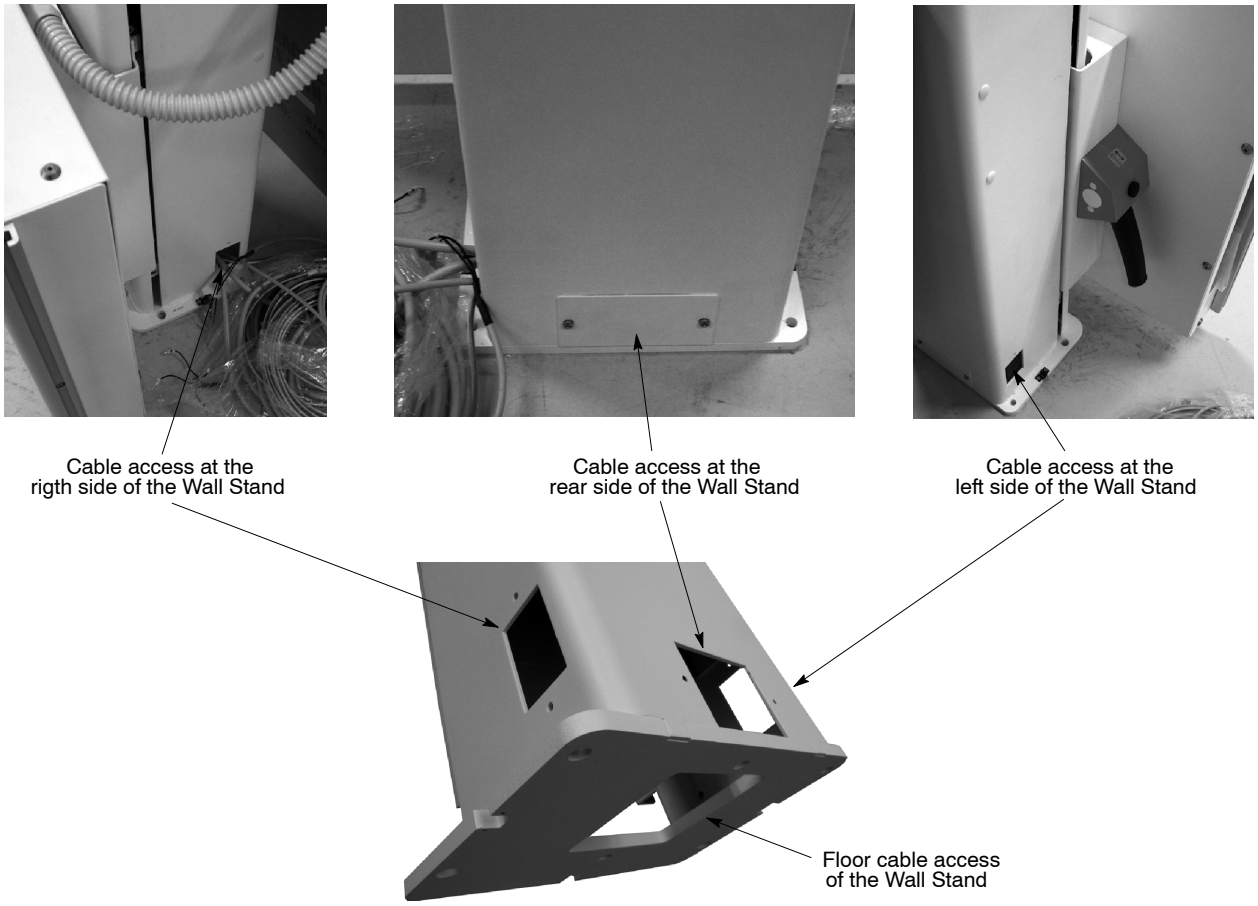


XR/f AT /ET Cable access (3)

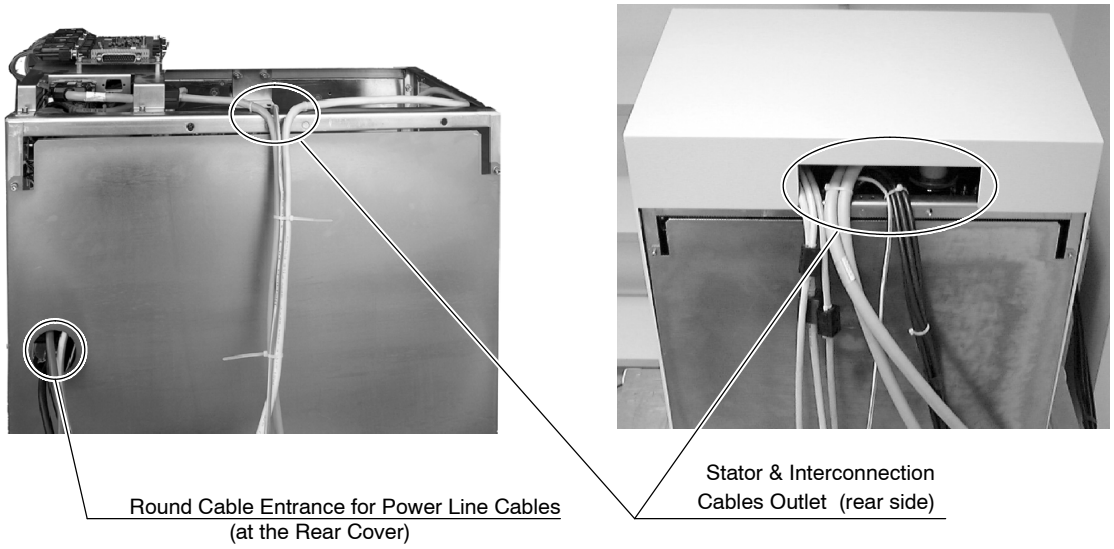


Please remember that this option (3) requires the cables guided in a flat harness to avoid cables smashed by the table down movement.

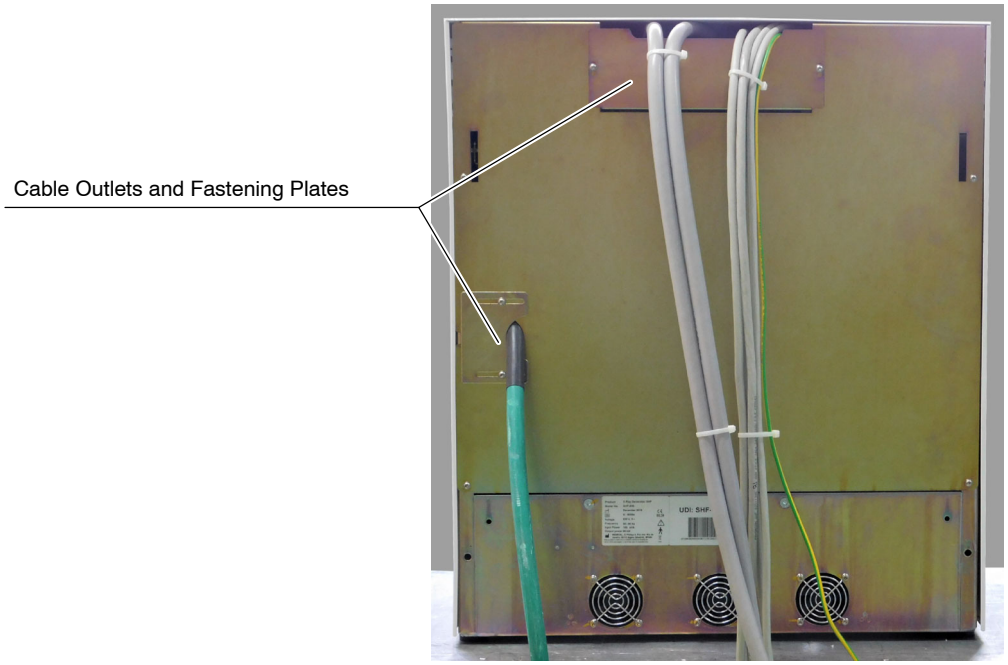
WALL STAND



LINE POWERED GENERATOR



(with the cover in only one part)



(with the cover divided in two parts)

4.5.4 CABLE ROUTING XR/F ST

Table 11
Cable Data and Routing XR/f ST (Non Telescopic Arm in Tube Stand)

RUN #	CABLE CODE (Mfg. Ref.)	CABLE VOLTAGE (V)	TOTAL CABLE LENGTH	USABLE CABLE LENGTH	CABLE DIAM	CABLE DESCRIPTION	FROM	TO	CONNECTOR TYPE (1) BOTH ENDS OR SPECIFIED (2)
1, 2	-		Cables length and size depends on the position of the Room Electrical Cabinet (Main Disconnect) in the Room			Power Line (1Ph + GND, or 3 Ph + GND, according to the Generator model).	Room Electrical Cabinet (Main Disconnect)	Input Line Fuses at Generator	-
5D, 5C, 5B, 5A, 2	HV Cables	40-150 kVp	12 m (39.4 ft)	8m (26.3 ft) (3)	2 x 17 mm	Anode and Cathode High Voltage Cables	Tube Stand - X-Ray Tube	Generator Cabinet - HV Transformer	HV Cables
	A7014-03	300V	12 m (39.4 ft)	6.8 m (22.3 ft) (3)	12 mm	Stator	Tube Stand - X-Ray Tube	Generator Cabinet - TS2	Wire terminals
	A3111-04	+24 V~	12 m (39.4 ft)	6.8 m (22.3 ft) (3)	10 mm	Collimator	Tube Stand - Collimator	Generator Cabinet - Lock Board TB7	Faston
	A6736-03	+24 V=	12 m (39.4 ft)	8.7 m (28.6 ft) (3)	7 mm	+24V Column Power Supply	Tube Stand - TS1	Generator Cabinet - Lock Board TB7	Faston
5D, 5C, 5B, 5A, 1	A6383-09	-	9 m (29.5 ft)	7.5 m (24.6 ft) (3)	5 mm	GND	Tube Stand - GND	Room Electrical Cabinet GND	Round Terminal
5D, 5C, 5B, 5A, 2	55902025	24V	20 m (65.6 ft)	14.5 m (47.5 ft) (3)	10 mm	DAP Interface Cable (optional)	External Dosemeter V~udap for Manual Collimator	Generator Cabinet - TS2 - Radiation Meter Bd. A3170-01 IC1-P2	RS232
6, 5A, 2	A7235-03	+24 V=	9 m (29.5 ft)	8.2 m (26.9 ft) (4)	7 mm	+24V Table Power Supply	Table Base TS1	Generator Cabinet - Lock Board TB7	Faston
	A3253-02	±12 V=	12 m (39.4 ft)	10 m (32.8 ft) (4)	8 mm	Ion Chamber	Table Base - Ion Chamber	Generator Cabinet AEC Adapt Board	Sub D 9
6, 5A, 1	A6383-09	-	9 m (29.5 ft)	8.2 m (26.9 ft) (4)	5 mm	GND	Table Base GND	Room Electrical Cabinet - GND	Round Terminal
Aerial	AERODR UF	16.5V	5 m (16.4 ft)	2.3 m (7.5 ft) (4)	9 mm	Detector Cable (* Supplied by KM)	Table Digital Detector	AeroDR I/F Cable	Special Connector 79x14x42 mm
6, 5B	AERODR I/F	16.5V	10 m (32.8 ft)	10 m (32.8 ft)	9 mm	Detector Cable (* Supplied by KM)	AeroDR UF Cable of Table Digital Detector	AeroDR Interface Unit	Special Connector 79x14x42 mm / RJ15 + Molex 10
3, 2	A6707-03	24 V=	12 m (39.4 ft)	8.5 m (27.9 ft)	8 mm	Locks (only with Electrical Locks version)	Wall Stand	Generator Cabinet - Lock Board TB7	Faston
	A3253-02	±12 V=	12 m (39.4 ft)	10 m (32.8 ft)	8 mm	Ion Chamber	Wall Stand IC	Generator Cabinet AEC Adapt Board	Sub-D9
3, 1	A6383-02	-	15 m (49.2 ft)	14.3 m (46.9 ft)	8 mm	GND	Wall Stand GND	Room Electrical Cabinet - GND	Round Terminal
Aerial	AERODR UF	16.5V	5 m (16.4 ft)	1.7 m (5.6 ft)	9 mm	Detector Cable (* Supplied by KM)	Wall Stand Digital Detector	AeroDR I/F Cable	Special Connector 79x14x42 mm

(continues in next page)

Table 11 (cont.)
Cable Data and Routing XR/f ST (Non Telescopic Arm in Tube Stand)

RUN #	CABLE CODE (Mfg. Ref.)	CABLE VOLTAGE (V)	TOTAL CABLE LENGTH	USABLE CABLE LENGTH	CABLE DIAM	CABLE DESCRIPTION	FROM	TO	CONNECTOR TYPE (1) BOTH ENDS OR SPECIFIED (2)
3, 5A, 5B	AERODR I/F	16.5 V	10 m (32.8 ft)	9.5 m (31.2 ft)	9 mm	Detector Cable (* Supplied by KM)	Wall Stand Digital Detector – AERODR UF cable	AeroDr Interface Unit	Special Connector 79x14x42 mm / RJ15 Molex 10
5B, 5A, 2	AERODR XG	24V	10 m (32.8 ft)	9.2 m (30.2 ft)	9.1 mm	Generator Interface Cable (* Supplied by KM)	AeroDr Interface Unit	Generator Cabinet – Interface Panel J4	JST: 10x19x29 mm Molex: 6x8x5.8 mm JST: 19x7x4 mm / Sub D 15
5B, 5A, 3, 4	S0025659-02	12 V	18 m (59.1 ft)	17.6 m (57.7 ft)	8 mm	Ethernet Cable	AeroDr Interface Unit	PC	RJ45
-	S0025659-02	12 V	18 m (59.1 ft)	17.6 m (57.7 ft)	8 mm	Ethernet Cable	AeroDr Interface Unit	Access Point	RJ45
4, 3, 2	A3352-01	24 V=	15 m (49.2 ft)	14.7 m (48.2 ft)	8 mm	Interface Box Cable	Interface Box J1	Generator Cabinet – Interface Panel J5	Sub-D25
	A6383-02	-	15 m (49.2 ft)	14.7 m (48.2 ft)	8 mm	GND	Interface Box GND	Generator GND	Round Terminal
-	A3363-01 *(with old Interface Box A6509-40)*	12 V=	**6 m** (19.7 ft)	**5.6 m** (18.4 ft)	6 mm	Interface Box Cable	Interface Box J3	PC Auto ON OFF PCB J1/J2 and Com1	Sub-D9
	A21089-06 *(with new Interface Box A16296-01)*								

NOTES: *(1) Refer to Illustration 24 for "Harness Runs", and refer to Table 13 for dimensions of the Connector Type.*
(2) If same Connector at both ends only one type is stated. If different connectors, a slash splits each Type (From / To)
(3) Distance taken from the Cable Support of the Tube Stand Column
(4) Distance taken from the rear right cable access of the Table. If cables are routed through the rear left cable access discount 1 meter (3.3 ft)

Table 12
Cable Data and Routing XR/f ST (With Telescopic Arm in Tube Stand)

RUN #	CABLE CODE (Mfg. Ref.)	CABLE VOLTAGE (V)	TOTAL CABLE LENGTH	USABLE CABLE LENGTH	CABLE DIAM	CABLE DESCRIPTION	FROM	TO	CONNECTOR TYPE (1) BOTH ENDS OR SPECIFIED (2)
1, 2	-		Cables length and size depends on the position of the Room Electrical Cabinet (Main Disconnect) in the Room			Power Line (1Ph + GND, or 3 Ph + GND, according to the Generator model).	Room Electrical Cabinet (Main Disconnect)	Input Line Fuses at Generator	-
7, 5B, 5A, 2	A9781-02	+24 V=	12 m (39.4 ft)	11 m (36.1 ft)	5 mm	Power ON Cable (Brake Box)	Brake Box	Generator TS1	Wire Terminals
7, 5B, 5A, 1	A9782-01	100-240 V~	12 m (39.4 ft)	11 m (36.1 ft)	12 mm	Brake Box Supply Cable	Brake Box	Room Electrical Cabinet (Main Disconnect)	Wire Terminals
5D, 5C, 5B, 5A, 2	HV Cables	40-150 kVp	12 m (39.4 ft)	8m (26.3 ft) (3)	2 x 17 mm	Anode and Cathode High Voltage Cables	Tube Stand - X-Ray Tube	Generator Cabinet - HV Transformer	HV Cables
	A7014-03	300V	12 m (39.4 ft)	6.8 m (22.3 ft) (3)	12 mm	Stator	Tube Stand - X-Ray Tube	Generator Cabinet - TS2	Wire terminals
	A6383-09	-	9 m (29.5 ft)	7.5 m (24.6 ft) (3)	5 mm	GND	Tube Stand - GND	Generator Cabinet GND	Round Terminal
	55902025	24V	20 m (65.6 ft)	14.5 m (47.5 ft) (3)	10 mm	DAP Interface Cable (optional)	External Dosemeter V~udap for Manual Collimator	Generator Cabinet - TS2 - Radiation Meter Bd. A3170-01 IC1-P2	RS232
5D, 5C, 7	A3111-04	+24 V~	12 m (39.4 ft)	7.2 m (23.6 ft) (3)	10 mm	Collimator Supply Cable	Tube Stand - Collimator	Brake Box TB7	Faston
5C, 7	A6736-03	+24 V=	12 m (39.4 ft)	8.7 m (28.6 ft) (3)	7 mm	+24V Column Power Supply	Tube Stand - TS1	Brake Box TB7	Faston
6, 5B, 7	A7235-03	+24 V=	9 m (29.5 ft)	8.5 m (27.9 ft) (4)	7 mm	+24V Table Power Supply	Table Base - TS1	Brake Box TB7	Faston
6, 5A, 2	A3253-02	±12 V=	12 m (39.4 ft)	10 m (32.8 ft) (4)	8 mm	Ion Chamber	Table Base - Ion Chamber	Generator Cabinet AEC Adapt Board	Sub D 9
6, 5A,1	A6383-09	-	9 m (29.5 ft)	8.2 m (26.9 ft) (4)	5 mm	GND	Table Base GND	Room Electrical Cabinet GND	Round Terminal
Aerial	AERODR UF	16.5V	5 m (16.4 ft)	2.3 m (7.5 ft) (4)	9 mm	Detector Cable (* Supplied by KM)	Table Digital Detector	AeroDR I/F Cable	Special Connector 79x14x42 mm
6, 5B	AERODR I/F	16.5V	10 m (32.8 ft)	10 m (32.8 ft)	9 mm	Detector Cable (* Supplied by KM)	AeroDR UF Cable of Table Digital Detector	AeroDR Interface Unit	Special Connector 79x14x42 mm / RJ15 + Molex 10
3, 2, 5B, 7	A6707-03	24 V=	12 m (39.4 ft)	8.9 m (29.2 ft)	8 mm	Locks (only with Electrical Locks version)	Wall Stand	Brake Box TB7	Faston
3, 2	A3253-02	±12 V=	12 m (39.4 ft)	10 m (32.8 ft)	8 mm	Ion Chamber	Wall Stand IC	Generator Cabinet AEC Adapt Board	Sub-D9
3, 1	A6383-02	-	15 m (49.2 ft)	14.3 m (46.9 ft)	8 mm	GND	Wall Stand GND	Room Electrical Cabinet - GND	Round Terminal

(continues in next page)

Table 12 (cont.)
Cable Data and Routing XR/f ST (With Telescopic Arm in Tube Stand)

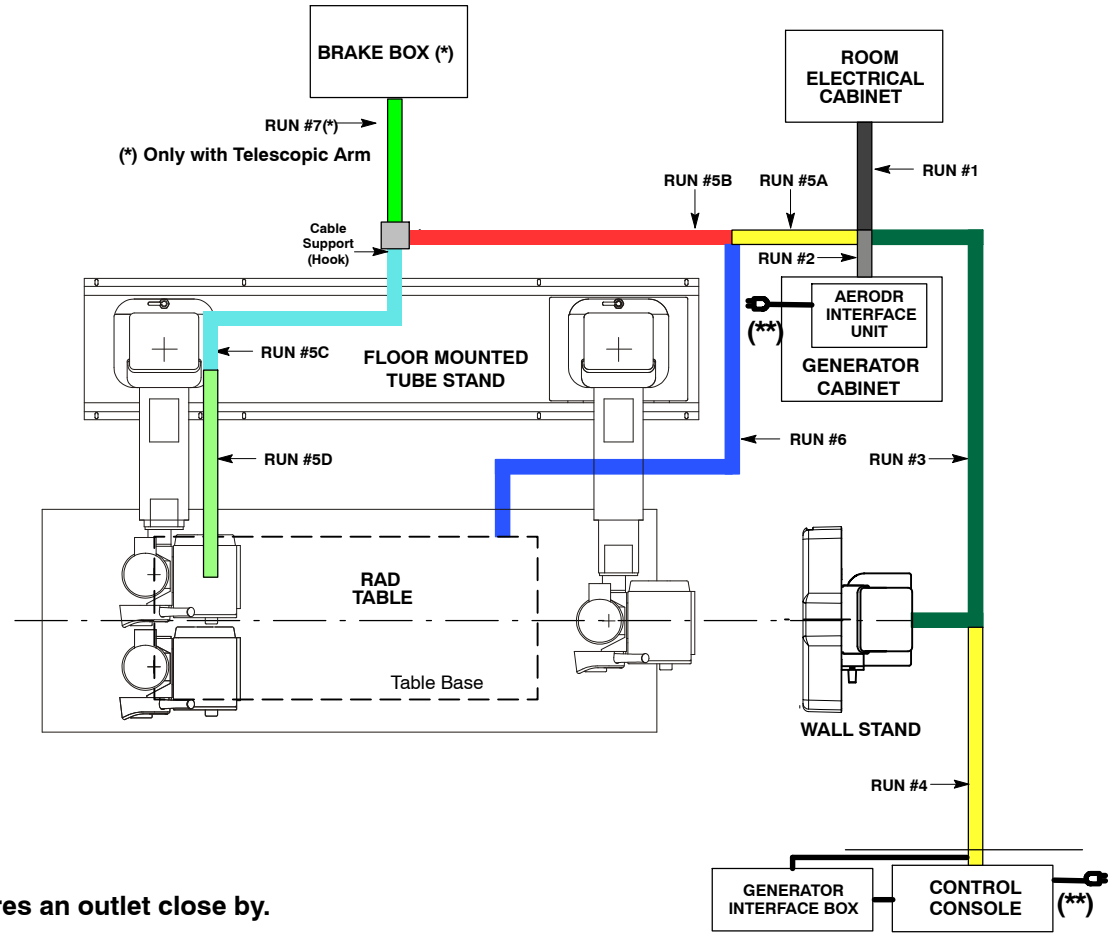
Aerial	AERODR UF	16.5V	5 m (16.4 ft)	1.7 m (5.6 ft)	9 mm	Detector Cable (* Supplied by KM)	Wall Stand Digital Detector	AeroDR I/F Cable	Special Connector 79x14x42 mm
3, 5A, 5B	AERODR I/F	16.5 V	10 m (32.8 ft)	9.5 m (31.2 ft)	9 mm	Detector Cable (* Supplied by KM)	Wall Stand Digital Detector – AERODR UF cable	AeroDr Interface Unit	Special Connector 79x14x42 mm / RJ15 Molex 10
5B, 5A, 2	AERODR XG	24V	10 m (32.8 ft)	9.2 m (30.2 ft)	9.1 mm	Generator Interface Cable (* Supplied by KM)	AeroDr Interface Unit	Generator Cabinet – Interface Panel J4	JST: 10x19x29 mm Molex: 6x8x5.8 mm JST: 19x7x4 mm / Sub D 15
5B, 5A, 3, 4	S0025659-02	12 V	18 m (59.1 ft)	17.6 m (57.7 ft)	8 mm	Ethernet Cable	AeroDr Interface Unit	PC	RJ45
-	S0025659-02	12 V	18 m (59.1 ft)	17.6 m (57.7 ft)	8 mm	Ethernet Cable	AeroDr Interface Unit	Access Point	RJ45
4, 3, 2	A3352-01	24 V=	15 m (49.2 ft)	14.7 m (48.2 ft)	8 mm	Interface Box Cable	Interface Box J1	Generator Cabinet – Interface Panel J5	Sub-D25
	A6383-02	-	15 m (49.2 ft)	14.7 m (48.2 ft)	8 mm	GND	Interface Box GND	Generator GND	Round Terminal
-	A3363-01 *(with old Interface Box A6509-40)* A21089-06 *(with new Interface Box A16296-01)*	12 V=	**6 m** (19.7 ft)	**5.6 m** (18.4 ft)	6 mm	Interface Box Cable	Interface Box J3	PC Auto ON OFF PCB J1/J2 and Com1	Sub-D9

NOTES: *(1) Refer to Illustration 24 for "Harness Runs", and refer to Table 13 for dimensions of the Connector Type.*
(2) If same Connector at both ends only one type is stated. If different connectors, a slash splits each Type (From / To)
(3) Distance taken from the Cable Support of the Tube Stand Column
(4) Distance taken from the rear right cable access of the Table. If cables are routed through the rear left cable access discount 1 meter (3.3 ft)

Table 13
Dimensions of the Connector Type

CONNECTOR TYPE	DIMENSIONS (mm)	DIMENSIONS (inches)
Faston	7 x 10 x 3	0.27 x0.4 x 0.11
Molex 3V	15 x 6 x 35	0.6 x 0.23 x 1.37
Molex 9V	15 x 15 x 35	0.6 x 0.6 x 1.37
Molex 15V	15 x 20 x 45	0.6 x 0.78 x 1.77
Round Terminal	10 x 15 x 6	0.4 x 0.6 x 0.23
Sub D 9V	30 x 50 x 15	1.1 x 2 x 0.6
Sub D 15V	35 x 60 x 15	1.37 x 2.36 x 0.6
Sub D 25V	55 x 60 x 15	2.1 x 2.36 x 0.6
RJ45	18 x 12 x 15	0.7 x 0.47 x 0.6
Special Connector	79 x 14 x 42	3.11 x 0.55 x 1.6
JST 1	10 x 19 x 29	0.4 x 0.74 x 1.1
JST 2	0.74 x 0.27 x 4	19 x 7 x 0.15

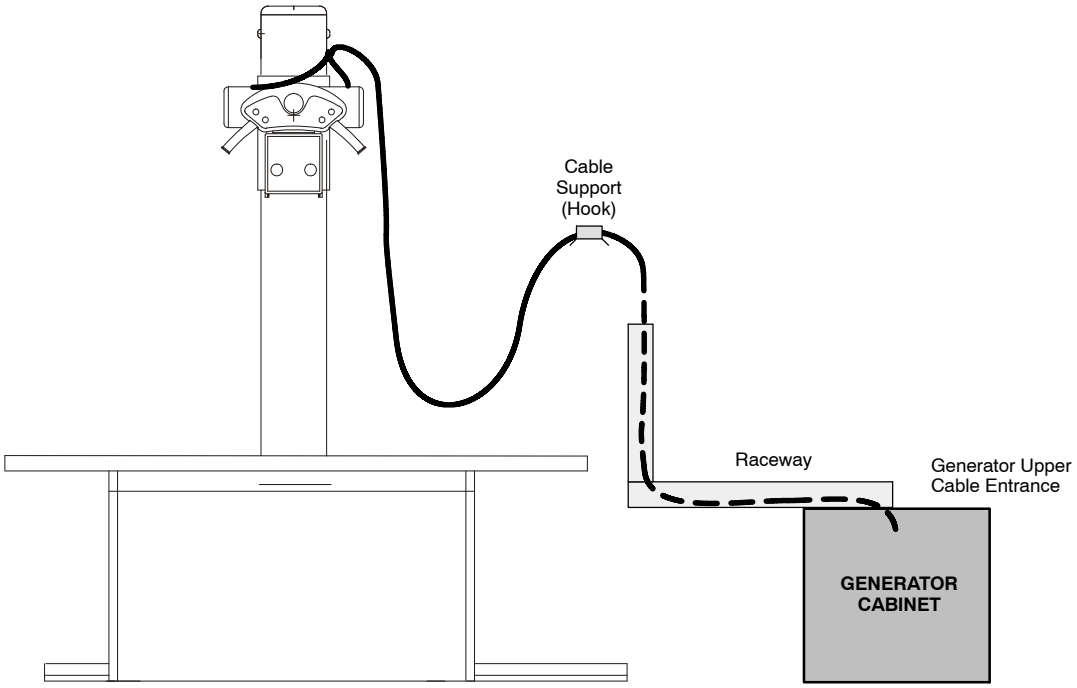
Illustration 24
Harness Runs XR/f ST



(**) requires an outlet close by.

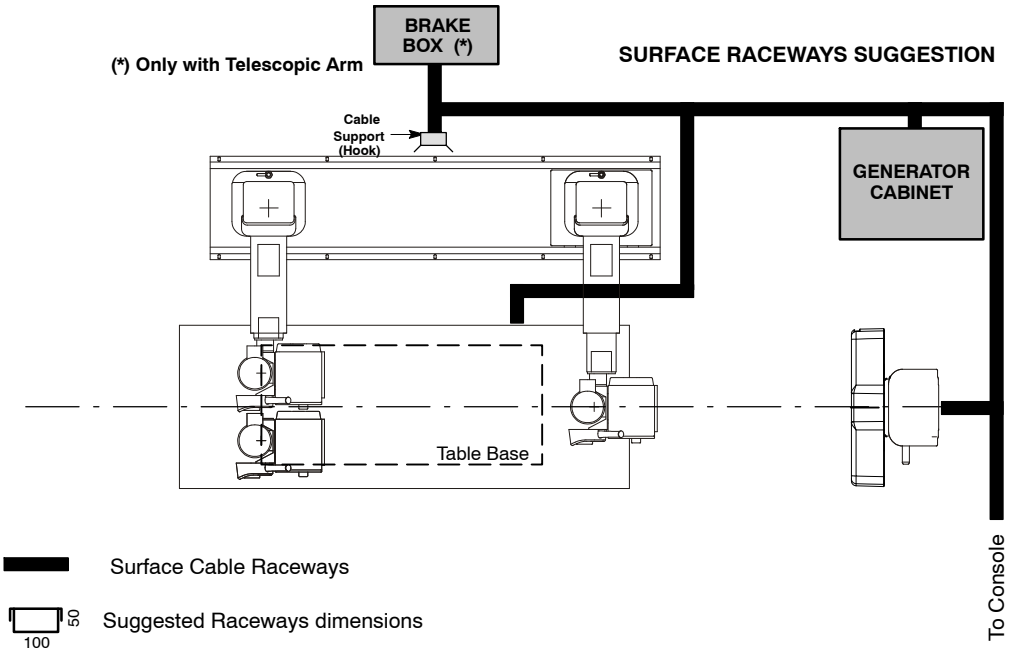
RUN #	LENGTH	RUN TYPE
1	Variable length	Cable conduit or raceway from the Room Electrical Cabinet to the lower end of Run #2. (Power Line: 1 Phase or 3 Phase + GND)
2	1 m (3.28 ft)	Vertical cable conduit or raceway on the wall close to the Generator Cabinet.
3	1.7 m (5.58 ft)	Horizontal cable conduit or raceway between the lower end of Run #2 and the cable entrance of the Wall Stand.
4	Variable length maximum 11.5 m (37.7 ft)	Cable conduit or raceway of variable length between the cable entrance of the Wall Stand and the Control Console.
5A	1 m (3.28 ft)	Horizontal cable conduit or raceway between the lower end of Run #2 and the end of Runs #5B and #6.
5B	2.7 m (8.86 ft)	Horizontal cable conduit or raceway of 1.2 m (3.94 ft) from the end of Run #5A and a Vertical cable conduit or raceway of 1.5 m (4.92 ft) up to the Cable Hook on the wall.
5C	2.2 m (7.22 ft)	Cable sleeve between the Cable Hook on the wall and the upper cable entrance of the Column.
5D	1.3 m (4.26 ft)	Cable sleeve between the Tube-Collimator Assembly and the Cable Hook on the Column.
6	2.5 m (8.20 ft)	Horizontal cable conduit or raceway between the end of Run #5A and the cable entrance of the Table Base.
7	Variable length Minimum 25 cm (9.8") from the floor	Cable conduit or raceway from the Brake Box to to the lower end of Run #5B.

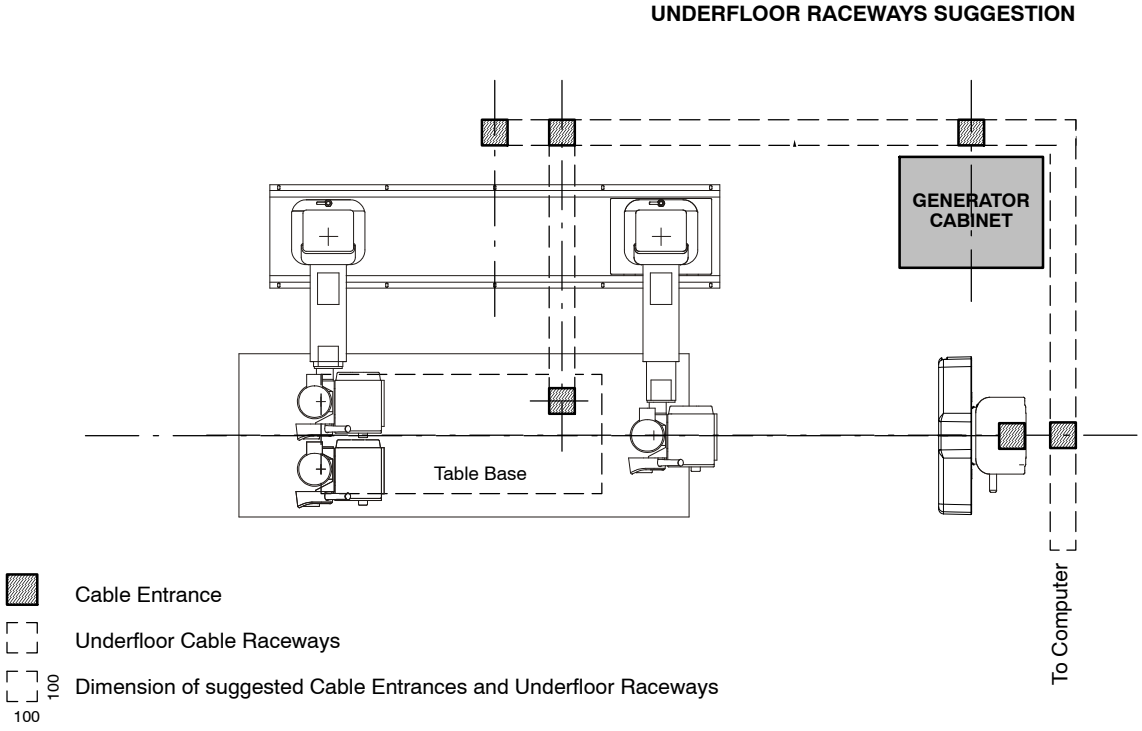
Illustration 25
Cabling and Room Raceways suggestions



For Stator and High Voltage Cables, install a Cable Support (Hook) on the wall and position the Generator as close as possible to the Column Base.

Illustration 25 (cont.)
Cabling and Room Raceways suggestions

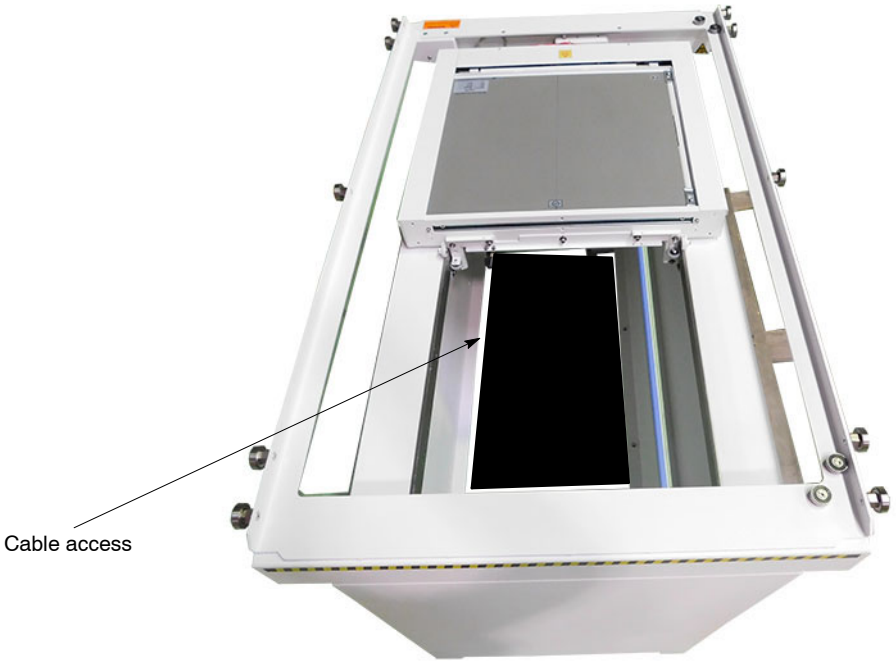




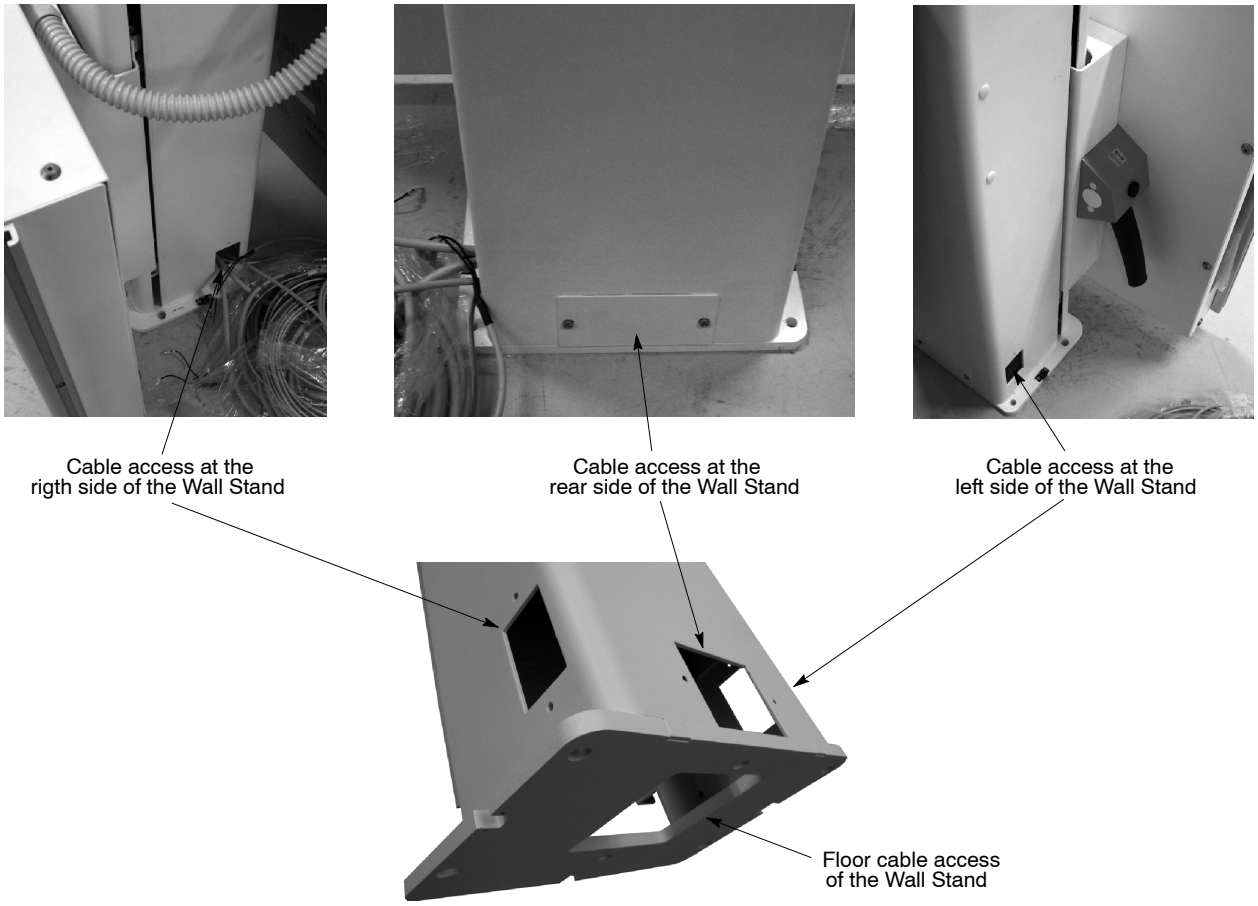
4.5.5 CABLE ACCESS XR/F ST

RADIOGRAPHIC TABLE XR/f ST

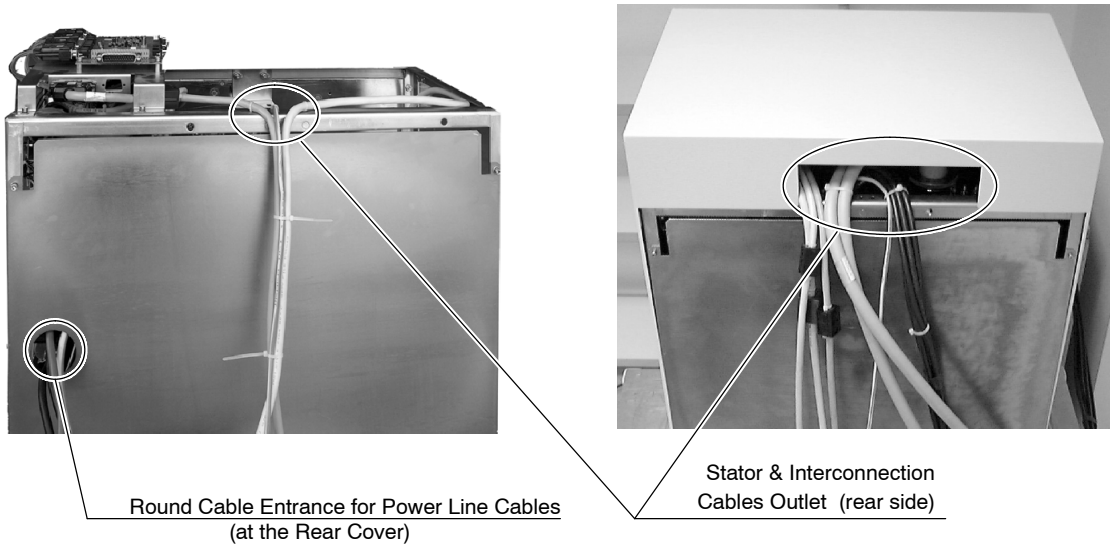
XR/f ST Floor Cable Access



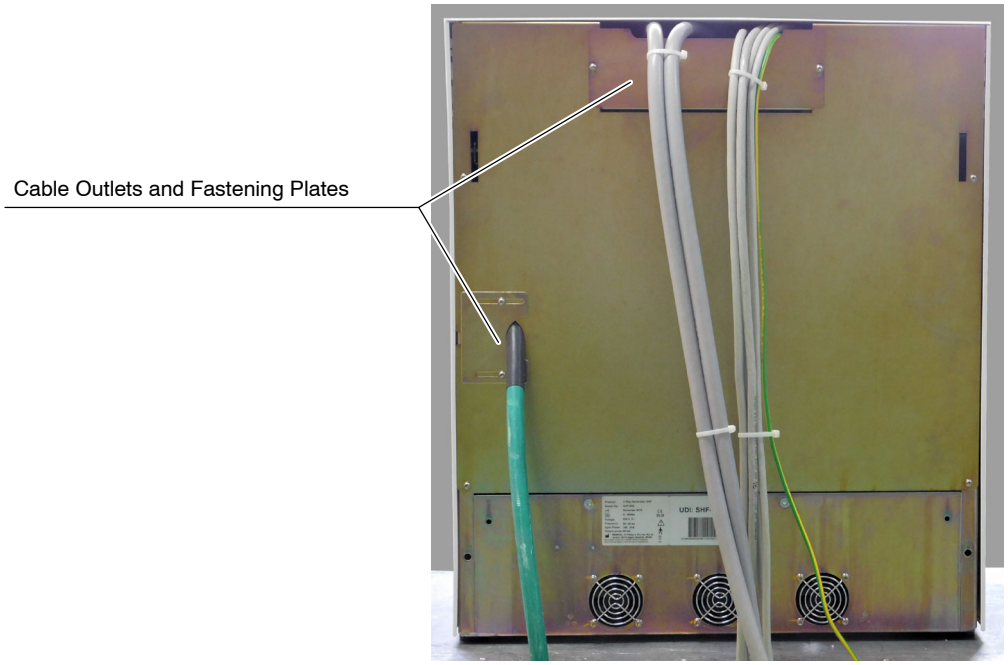
WALL STAND



LINE POWERED GENERATOR



(with the cover in only one part)



(with the cover divided in two parts)

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SECTION 5 PRODUCT CHARACTERISTICS

This section provides information and illustrations showing physical dimensions and weight of the system components.

5.1 XR/F AT - ET DIMENSIONS AND WEIGHT

ELEVATING TABLE

Dimensions	
Maximum Height	900 mm (35.4”)
Minimum Height	500 mm (19.6”)
Width	2200 mm (86.6”)
Length	800 mm (31.4”)
Weight	280 kg (617.2 lb)
Dimensions of Floating Table-Top	2200 x 800 mm (86.6” x 31.4”)
Radiotransparent Area of Table-Top	2099 x 618 mm (82.6” x 24.3”)
Table-Top / Film distance	85 mm (3.3”)
Table-Top Attenuation	<1.3 mm Al eq.
Longitudinal travel of Table-Top	1100 mm (43.3”)
Transverse travel of Table-Top	240 mm (9.4”)
Detector size	max. 43 x 43 cm (17 x 17”)

FLOOR MOUNTED TUBE STAND

Dimensions	
Height	2370 mm (93.3”)
Width	2755 mm (108.4”)
Length (XR/f AT)	1425 mm (56.1”)
Length (XR/f ET)	1390 mm (54.7”)
Weight	345 kg (760 lb)
Maximum Height of X-ray Tube focus (vertical position)	2020 mm (79.5”)
SID from horizontal axis of X-Ray Tube facing the Elevating Table (maximum)	1605 mm (63.1”)
Distances from the floor for vertical axis of the X-Ray tube facing the Wall Stand	
Minimum height	400 mm (15.7”)
Maximum height	1900 mm (74.8”)
SID from horizontal axis of X-Ray Tube facing the Wall Stand (typical room Layout)	
Minimum SID	1000 mm (39.4”)
Maximum SID	3010 mm (118.5”)
Column longitudinal motion	2010 m (79.1”)
Rotation of Column with respect to its vertical axis *(Rotation may be limited by cables)*	±180°
Rotation of Tube-Collimator Assembly with respect to its transverse axis *(Rotation may be limited by cables)*	±150°
Connection Box (Height x Width x Length)	380 x 175 x 83 mm
Connection Box Weight	4.5 kgs (9.9 lb)

WALL STAND

Dimensions	
Height	2235 mm (88”)
Width	712 mm (28”)
Length	381 mm (15”)
Weight	145 kg (319.6 lb)
Table-Top Dimensions	559 x 485 mm (22” x 19”)
Table-Top / Detector distance	40 mm (± 3) (1.57” (±0.11”))
Table-Top Attenuation	<0.85 mm Al eq.
Height from horizontal axis of receptor	
Maximum height	1900 mm (74.8”)
Minimum height	345 mm (13.5”)
Table-Top Vertical Travel	1555 mm (61.2”)
Detector size	max. 43 x 43 cm (17 x 17”)

Illustration 26
Dimensions of the Equipments in the XR/f AT Radiographic Room

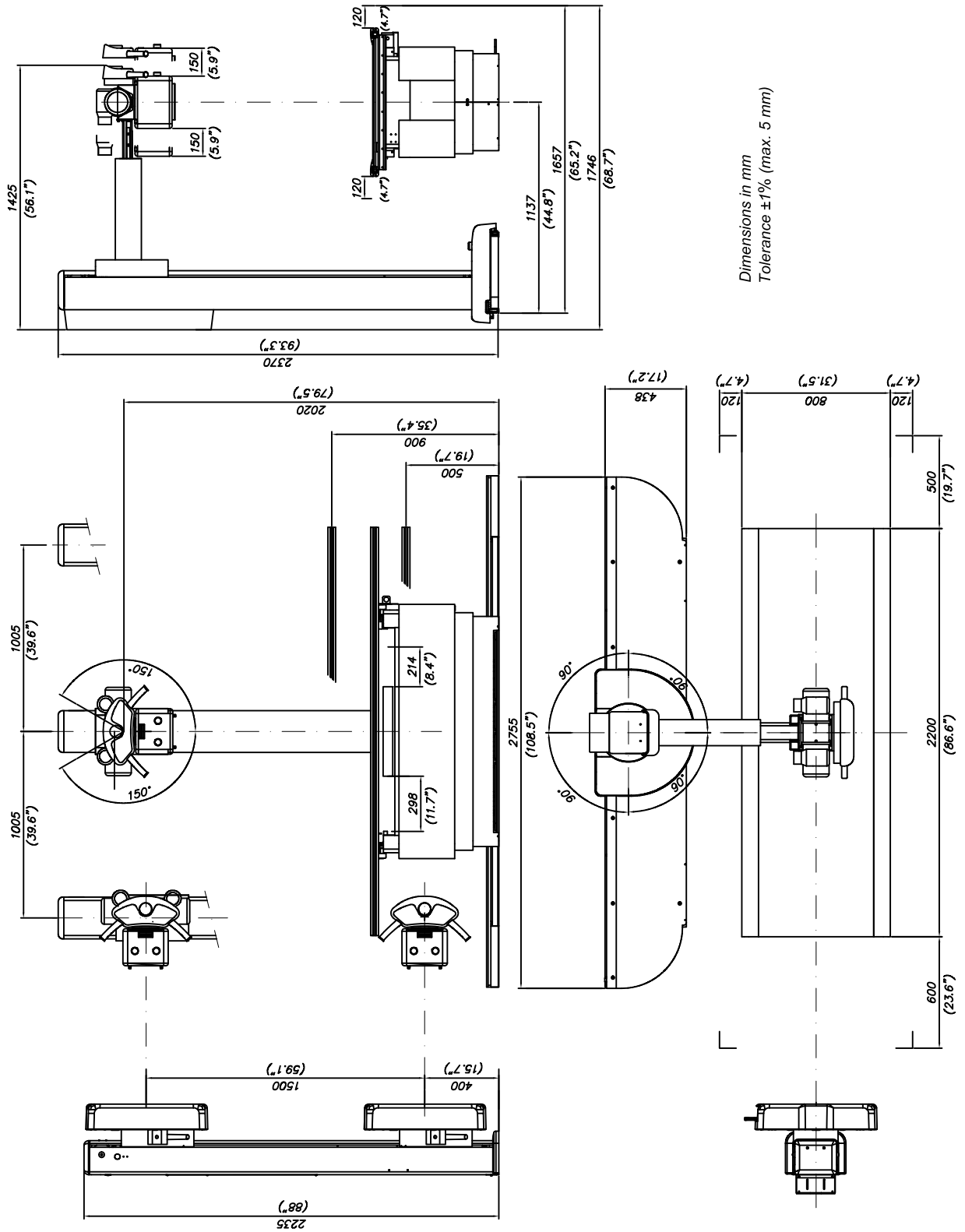


Illustration 27
Dimensions of the Equipments in the XR/f ET Radiographic Room

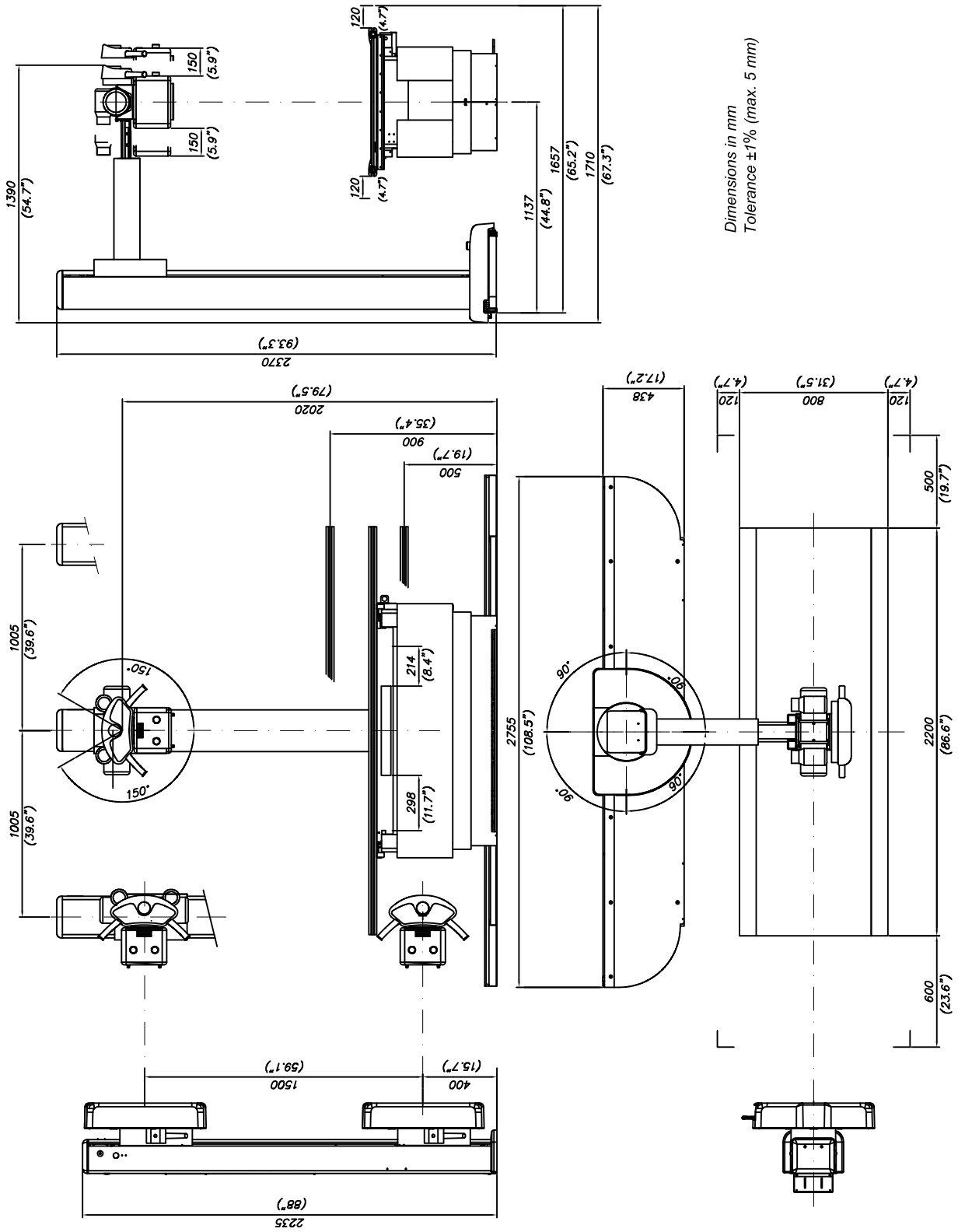
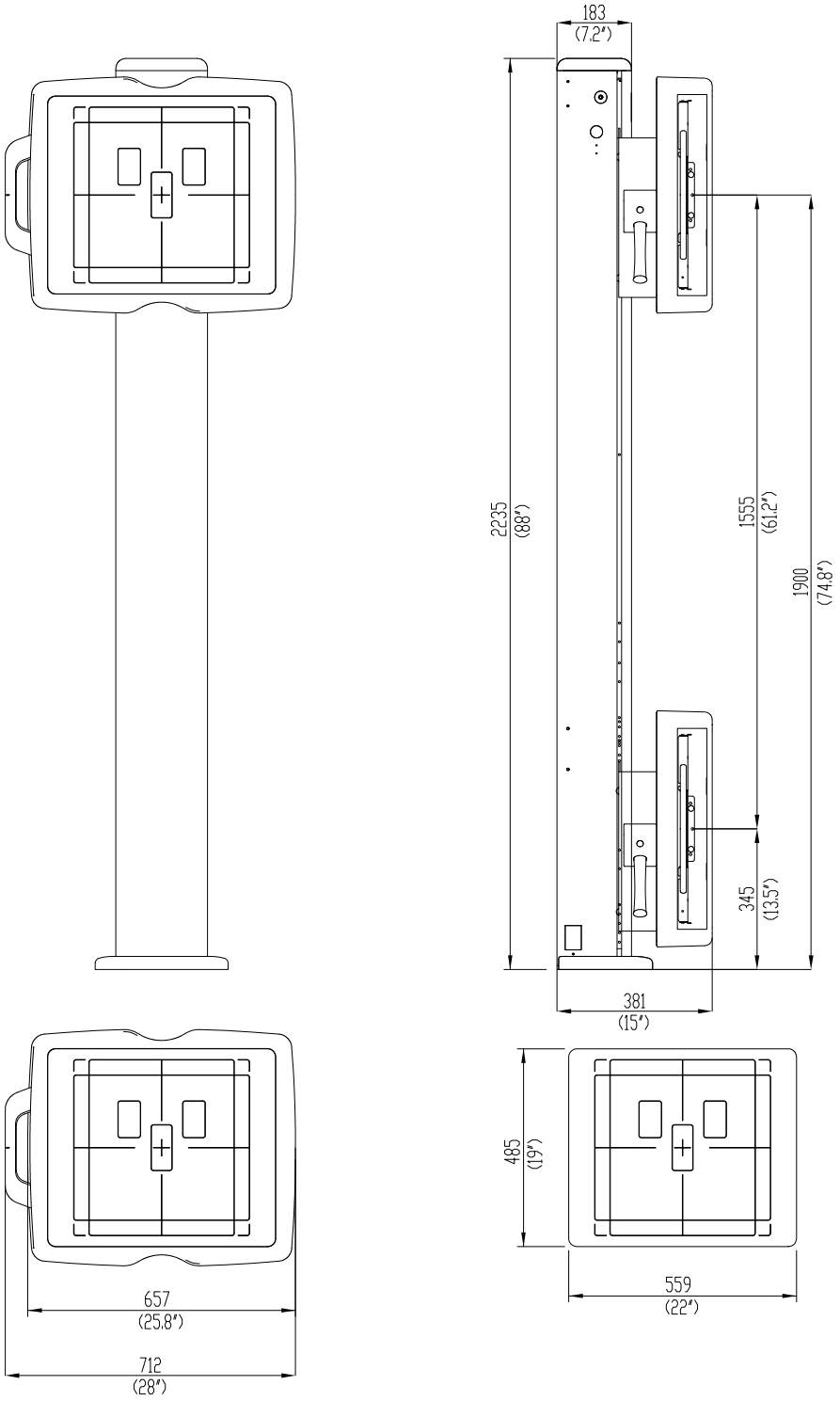


Illustration 28
Dimensions of the Wall Stand for Portable Detector



5.2 XR/F ST DIMENSIONS AND WEIGHT

TUBE STAND

Height	2318 mm (91.3”)
Width with Telescopic Arm	1337 mm (52.7”)
Width with Non Telescopic Arm	1132 mm (44.6”)
Length	2000 mm (78.7”)
Weight	224 kg (493 lb)
SID from horizontal axis of X-Ray Tube facing the Table (maximum)	1300 mm (51.1”)
SID from horizontal axis of X-Ray Tube facing the Table (maximum with Telescopic Arm)	1250 mm (49.2”)
Height from vertical axis of X-Ray Tube facing the Wall Stand	
Minimum height	400 mm (15.7”)
Maximum height	1900 mm (74.8”)
Useful SID from Horizontal axis of X-Ray Tube facing the Wall Stand (typical room layout)	
Minimum SID	1000 mm (39.4”)
Maximum SID (standard)	2480 mm (97.6”)
Column longitudinal motion	1480 mm (58.2”)
Telescopic Motion of Tube-Collimator Assembly	300 mm (11.8”)
Rotation of Tube-Collimator Assembly with respect to its transverse axis *(Rotation may be limited by cables)*	±180°
Rotation of Column with respect to its vertical axis *(Rotation may be limited by cables)*	±180°

BRAKE BOX (WITH OPTIONAL TELESCOPIC TUBE STAND)

Height	182 mm (7.1”)
Width	385 mm (15”)
Length	130 mm (5”)
Weight	8.3 kg (18 lb)

RADIOGRAPHIC TABLE

Dimensions	
Height	770 mm (30.3”)
Length	2200 mm (86.6”)
Width	825 mm (32.4”)
Weight	150 kg (330.7lb)
Dimensions of Floating Table-Top	2200 x 825 mm (86.6” x 32.4”)
Radiotransparent Area of Table-Top	1980 x 681 mm (78” x 26”)
Table-Top / Film distance	80 mm (±4) (3.14”, ±0.15”)
Table-Top Attenuation	<1.0 mm Al eq.
Longitudinal travel of Table-Top	900 mm (35”)
Transverse travel of Table-Top	230 mm (9”)
Detector sizes	max. 43 x 43 cm (17 x 17”)

WALL STAND

Dimensions	
Height	2235 mm (88”)
Width	712 mm (28”)
Length	381 mm (15”)
Weight	145 kg (319.6 lb)
Table-Top Dimensions	559 x 485 mm (22” x 19”)
Table-Top / Detector distance	40 mm (± 3) (1.57” (±0.11”))
Table-Top Attenuation	<0.85 mm Al eq.
Height from horizontal axis of receptor	
Maximum height	1900 mm (74.8”)
Minimum height	345 mm (13.5”)
Table-Top Vertical Travel	1555 mm (61.2”)
Detector size	max. 43 x 43 cm (17 x 17”)

Illustration 29
Dimensions (Telescopic Arm)

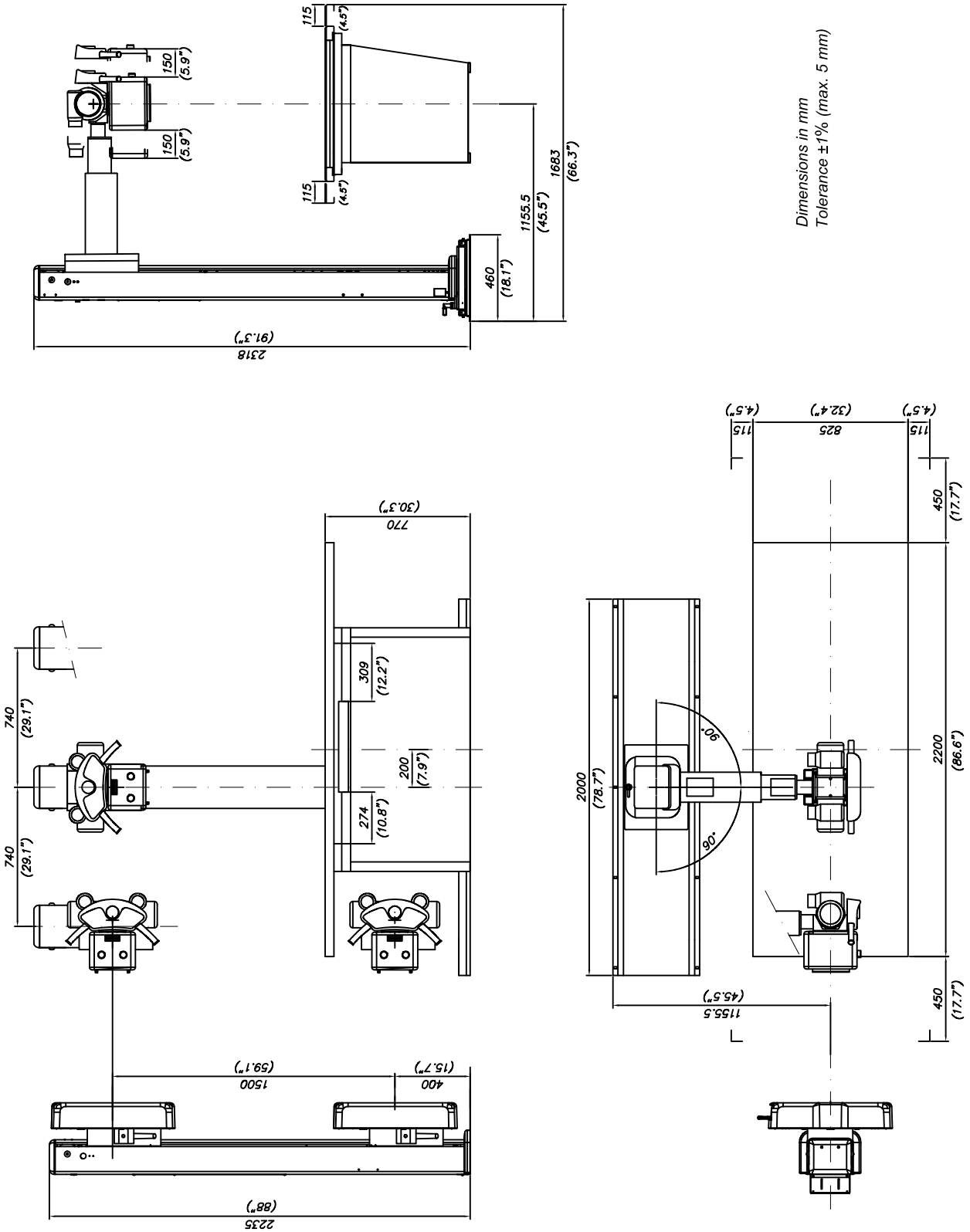


Illustration 30
Dimensions (Non Telescopic Arm)

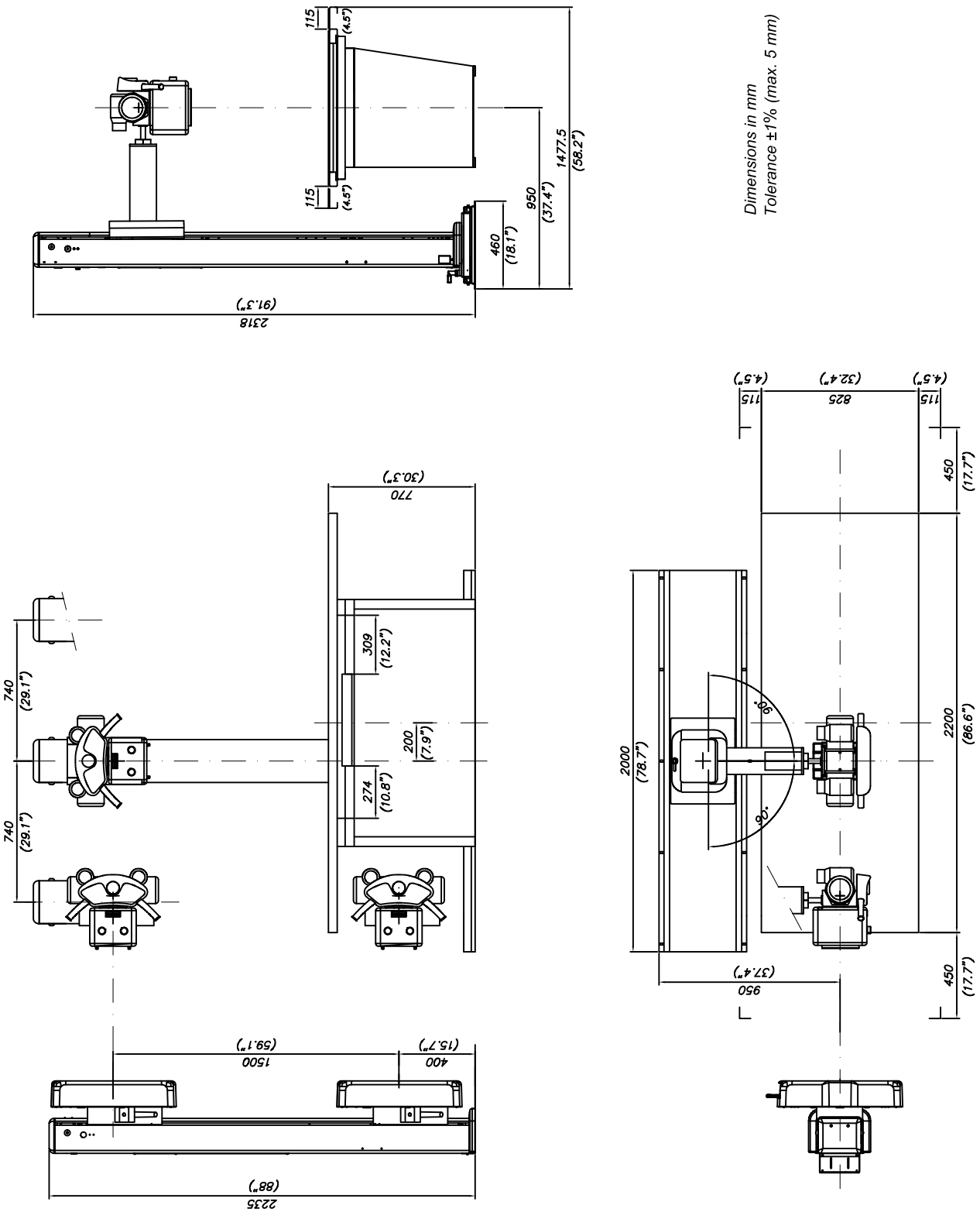


Illustration 31
Dimensions of the Wall Stand for Portable Detector

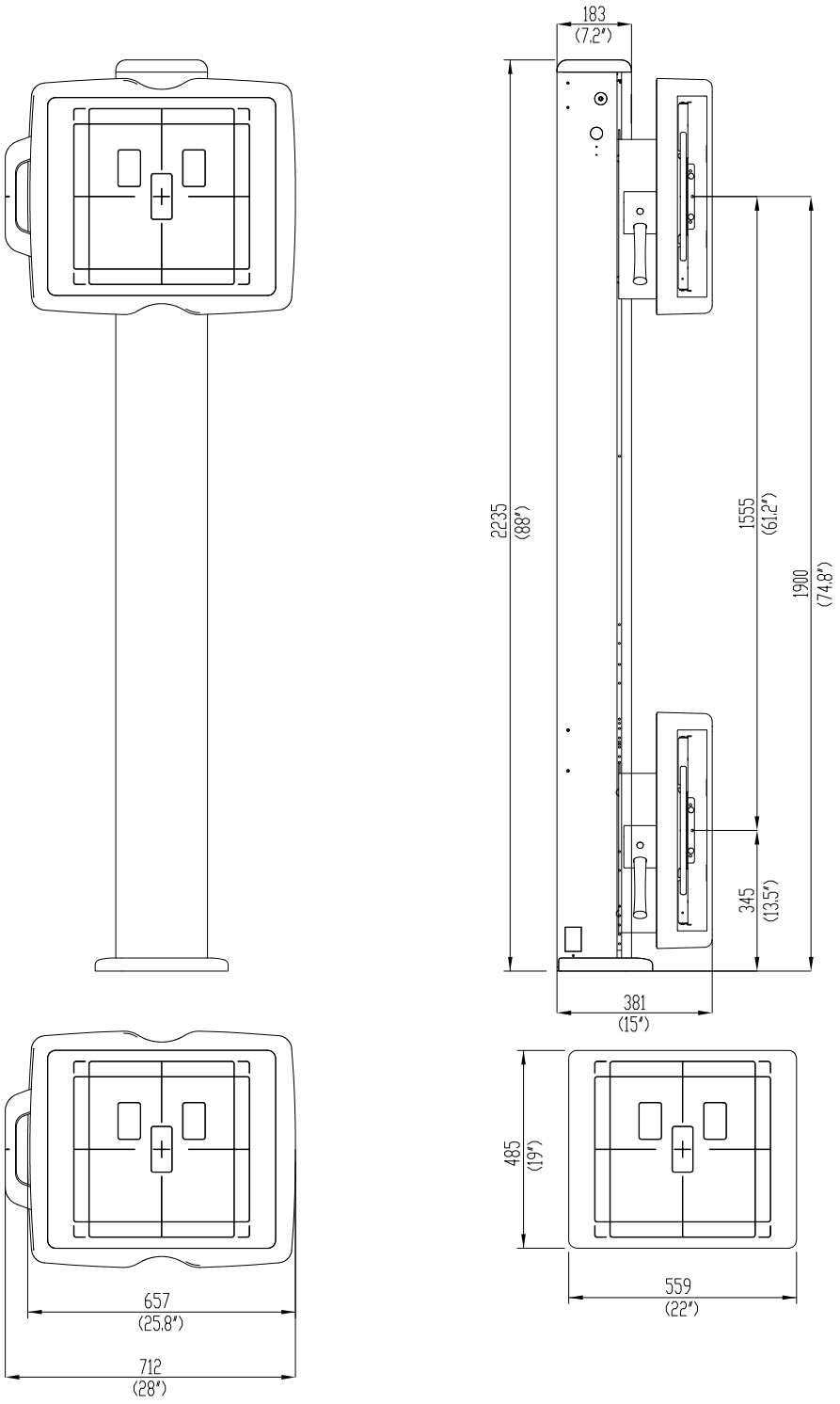
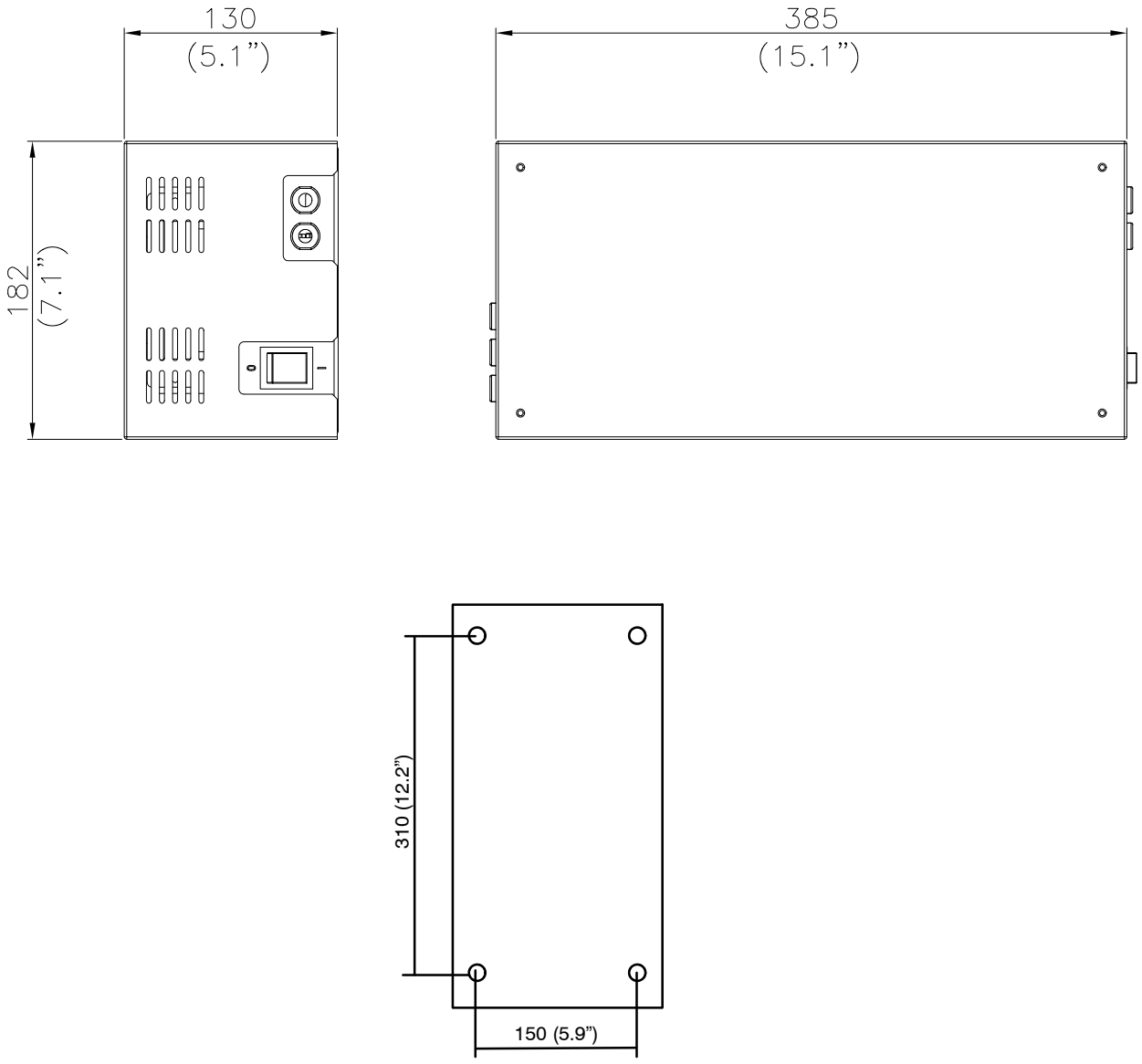


Illustration 31-1
Dimensions of the Brake Box (XR/f ST with Telescopic Arm Option)

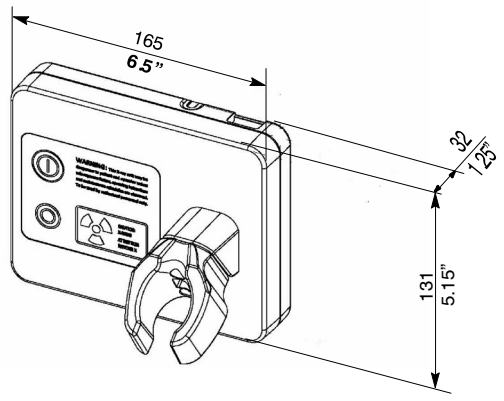


Minimum installation distance to floor: 25 cm (10")

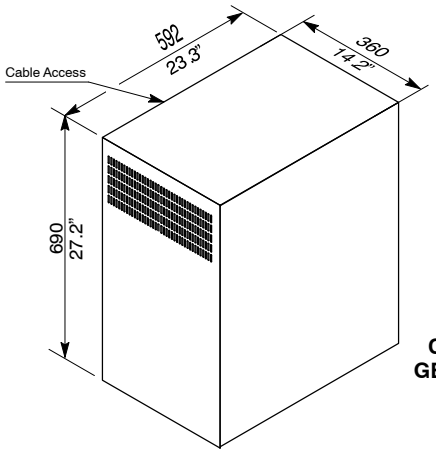
5.3 GENERATOR AND PC INTERFACE BOX DIMENSIONS AND WEIGHT

COMPONENT	DIMENSIONS			WEIGHT
	Length	Width	Height	
X-ray Generator	592 mm (23.3”)	360 mm (14.2”)	690 mm (27.2”)	95 kg (209 lb)
PC Interface Box (ABS Case)	131 mm (5.15”)	165 mm (6.5”)	32 mm (1.25”)	0.5 kg (1.1 lb)
PC Interface Box (Metal case)	130 mm (5.1”)	140 mm (5.5”)	45 mm (1.7”)	0.6 kg (1.3 lb)

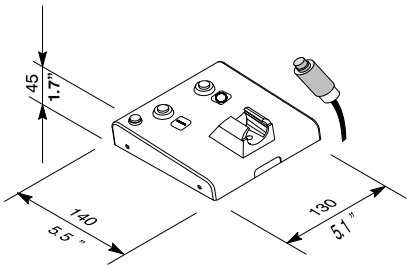
Illustration 32
Generator and PC Interface Box Dimensions



PC INTERFACE BOX (ABS CASE)



COMPACT GENERATOR



PC INTERFACE BOX (Metal Case)

5.4 X-RAY TUBES

Canon or Toshiba E7884X	Low Speed – Rotating Anode, Focal Spots: 0.6 mm / 1.2 mm Anode kHU / kVp: 300 kHU / 150 kVp, Target Angle: 12° Maximum Specified Energy Input in 1 hour: 150 kVp @ 3408 mAs Inherent Filtration of X-ray Source (Tube + Collimator): refer to Identification Label
Canon or Toshiba E7254FX	High Speed – Rotating Anode, Focal Spots: 0.6 mm / 1.2 mm Anode kHU / kVp: 400 kHU / 150 kVp, Target Angle: 12° Maximum Specified Energy Input in 1 hour: 150 kVp @ 4800 mAs Inherent Filtration of X-ray Source (Tube + Collimator): refer to Identification Label

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SECTION 6 ROOM LAYOUT

6.1 RADIATION PROTECTION

Because X-ray equipment produces radiation, you may need to take special precautions or make special site modifications. The General Electric Healthcare Company (GEHC) does not make recommendations regarding radiation protection. It is the purchaser's responsibility to consult a radiation physicist for advisement on radiation protection in X-ray rooms.

6.2 CLINICAL ACCESS

Make sure that the room is planned with the following clinical access requirements:

- Provide easy access to the Positioner.
- Clinicians at the patient table must be able to communicate with assistants in the control area.
- Operators in the control area must have easy access to the Operator Console. However, position the controls (including handswitches) so the operator cannot take exposures while looking around or standing outside the control booth's lead glass window.
- Consult customer on the number and location of nonelectrical lines (air, oxygen, vacuum, water, etc.) in the radiographic room.

6.3 SERVICE ACCESS

Allow appropriate space for service access of the equipment. The minimum recommended free area for service access is:

COMPONENT	SURFACE					
	Left Side	Right Side	Front	Rear	Top	Bottom
GENERATOR CABINET	50 cm (20")	50 cm (20")	100 cm (40")	- *(see note)*	Completely free	-
COMPUTER	10 cm (4")	10 cm (4")	Completely free	10 cm (4")	Completely free	-
POSITIONERS (Table, Wall Stand and Tube Stand)	40 cm (15.8")	40 cm (15.8")	40 cm (15.8")	20 cm (7.9")	Completely free	-

Note: Ventilation conditions require to keep a minimum free distance of 15 cm (6") from both lateral sides of the Generator Cabinet and also the same distance from the rear side when the Generator is provided with High Speed Starter (fans for the starter module).
Due to the reduced dimensions of some rooms, the distance for service access at both sides can be set to the minimum required for ventilation (15 cm - 6"). If this is the case, some service procedures may require to unscrew the anchoring of the Generator from the floor in order to move the Generator to gain working space. Also, enough cable slack should have been kept during installation to allow the Generator being moved.

6.4 ROOM LAYOUTS

The following illustrations show some examples of Room Layouts. The Wall Stand can be ordered with its Handle installed at the left or right side.

Illustration 33
Example of Typical Room Layout XR/f AT or XR/f ET.

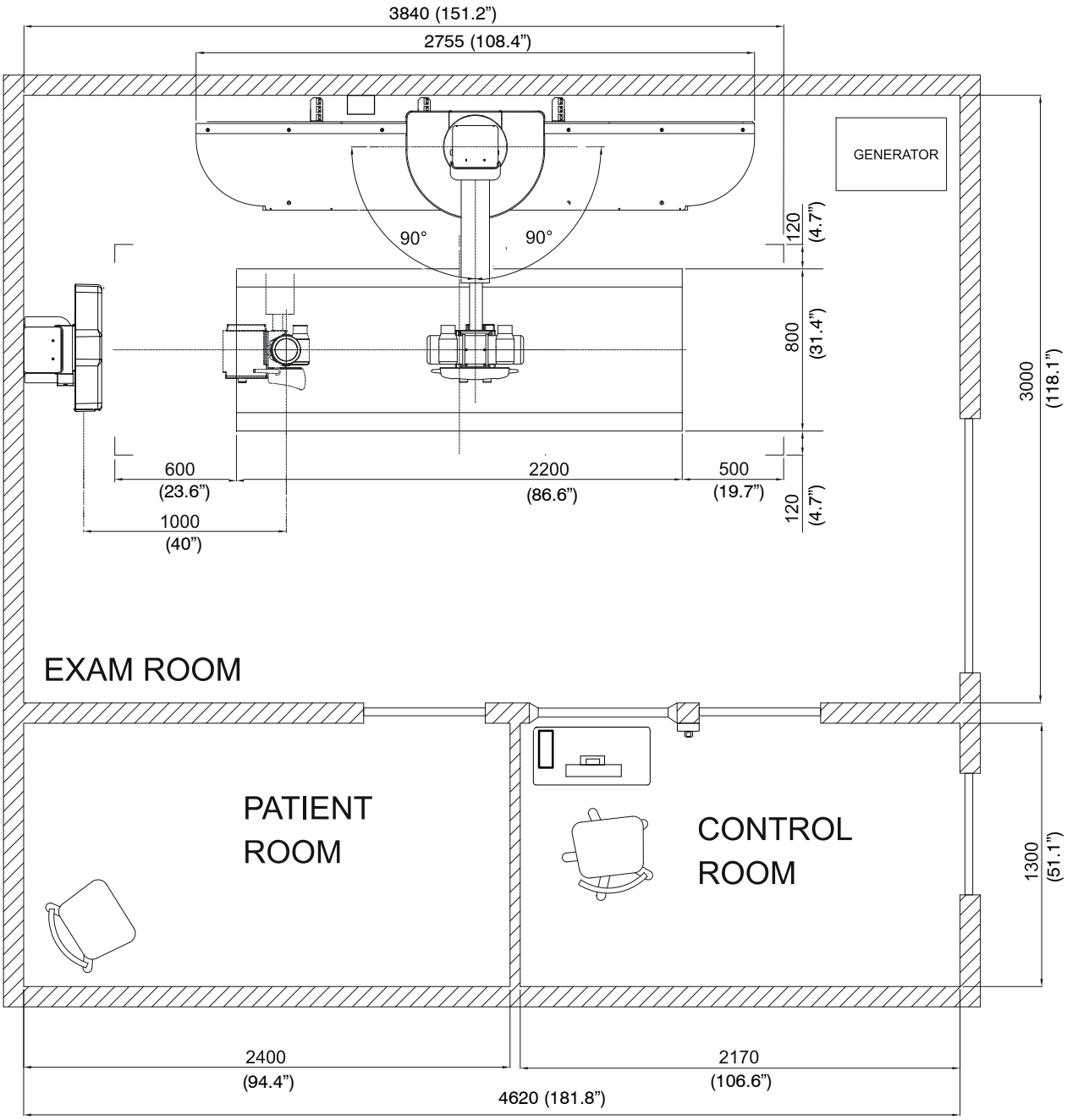
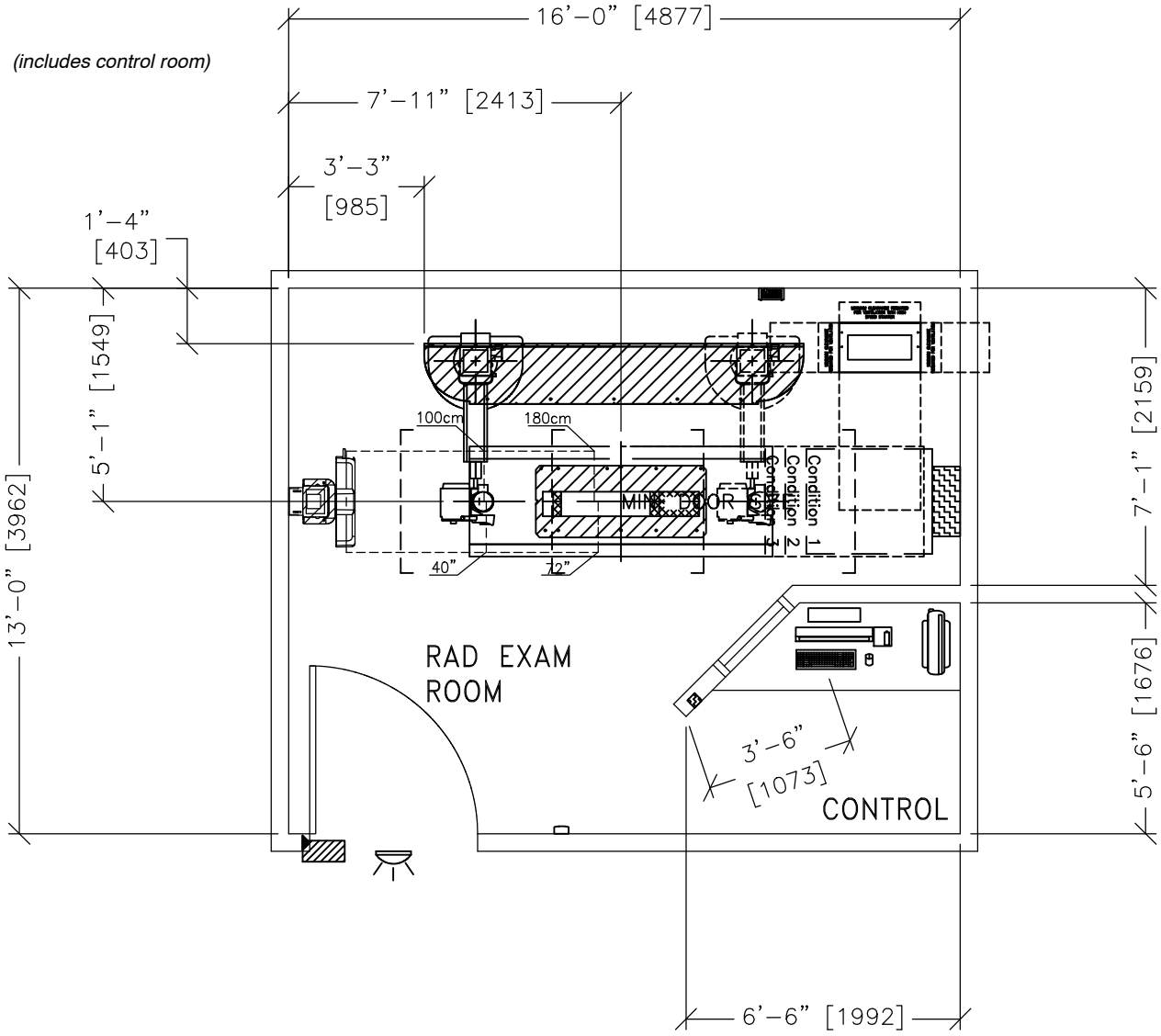


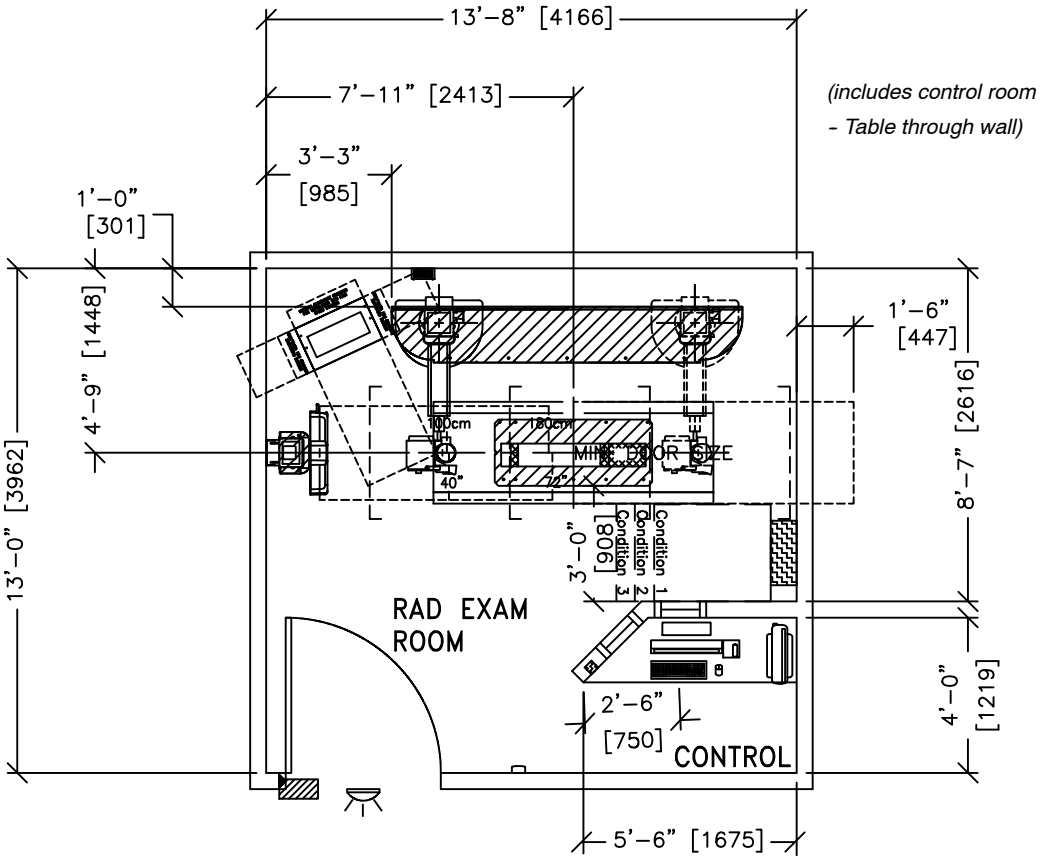
Illustration 34
Proteus XR/f AT and ET - Minimum Recommended Layout



THE FOLLOWING SHOTS ARE NOT AVAILABLE IN THIS LAYOUT:

180° OFF-TABLE IMAGING

Illustration 35
Proteus XR/f AT and ET – Minimum Functional Layout



THE FOLLOWING SHOTS ARE NOT AVAILABLE IN THIS LAYOUT:

180° OFF–TABLE IMAGING

TABLE TOP SERVICE CLEARANCE IS THROUGH THE WALL. LOCAL DOS TO APPROVE A TWO PERSON SERVICE TEAM TO REMOVE THE TABLE TOP.

If the recommended 2250mm [88.6"] from lateral table centerline cannot be applied to the room layout for table service clearance, this distance can be reduced to 1650mm [65"] provided a minimum clear space of 900mm [35.4"] from the front of the table base to any obstruction, for the removal of the table top to the front side. The following text must be added on the room layout proposal reviewed and approved by customer and Director of Service (translated in customer local language):
Please note that your Proteus XRf installation in selected room does not meet the following minimum requirement: 2250mm [88.6"] recommended distance from lateral table centerline to wall.
This may require 2 persons to remove the table top to gain access to the ion chamber and detector housing. Service downtime may be longer. Alternatively, table may be de-installed to allow service access, which will require re-installation and calibration of the table after servicing the equipment.

Illustration 36
Typical Room Layout XR/f AT or XR/f ET.
Wall Stand at Right Side.

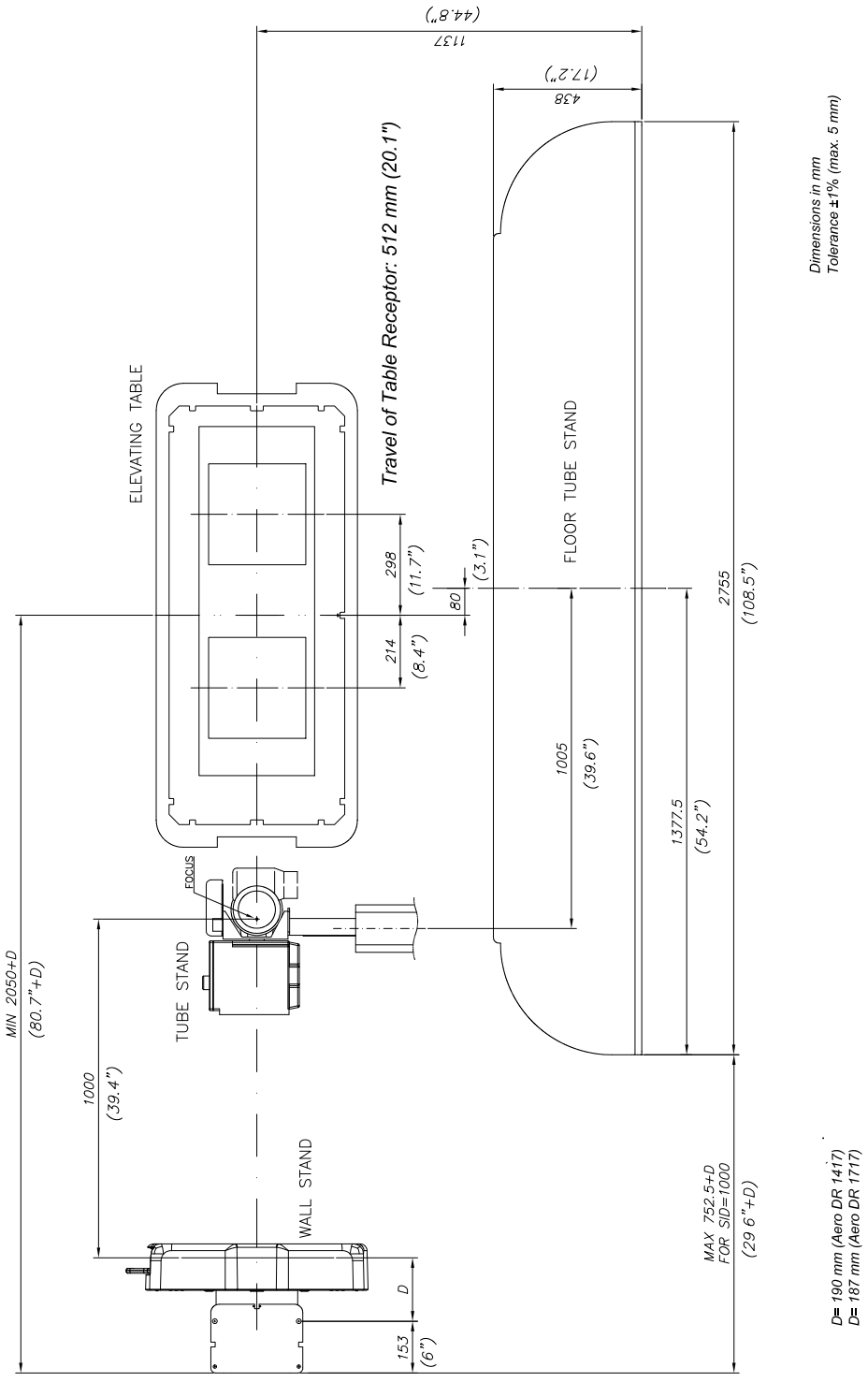


Illustration 37
Room Layout XR/f AT or XR/f ET with the Tube Stand as close as possible to the Wall Stand. Wall Stand at Right Side.

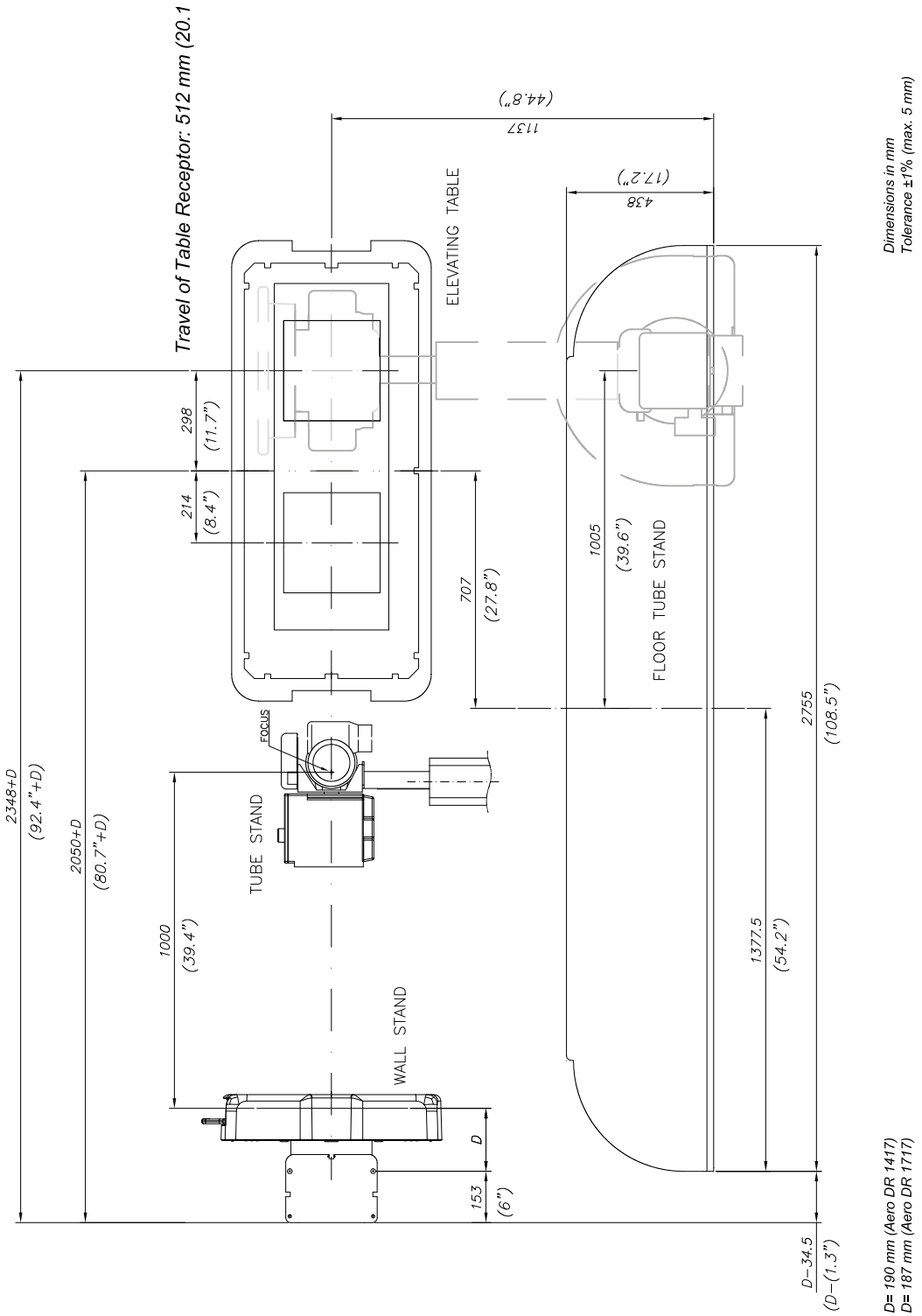


Illustration 38
Typical Room Layout XR/f AT or XR/f ET.
Wall Stand at Left Side.

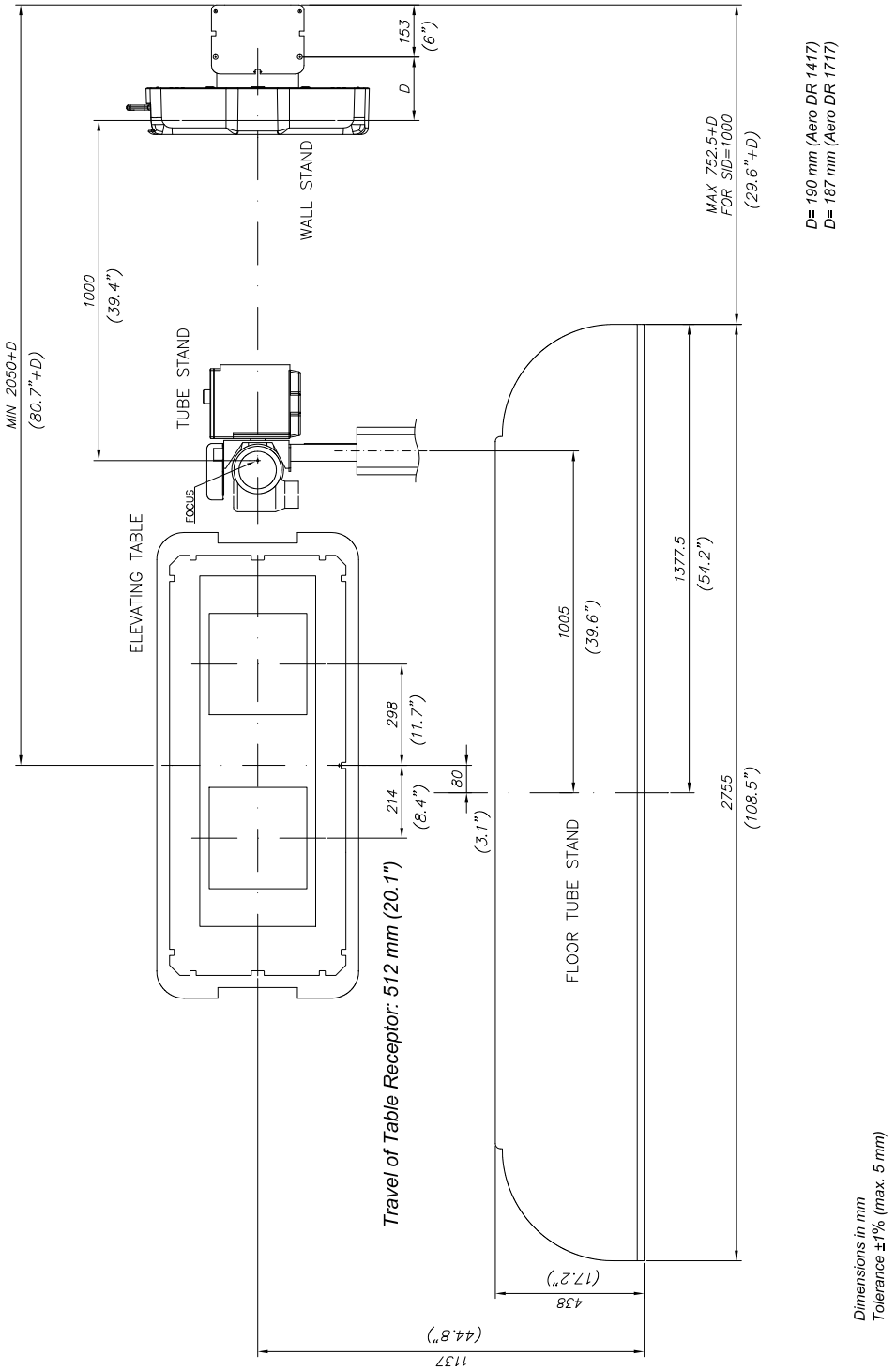


Illustration 39
Room Layout XR/f AT or XR/f ET with the Tube Stand as close as possible to the Wall Stand. Wall Stand at Left Side.

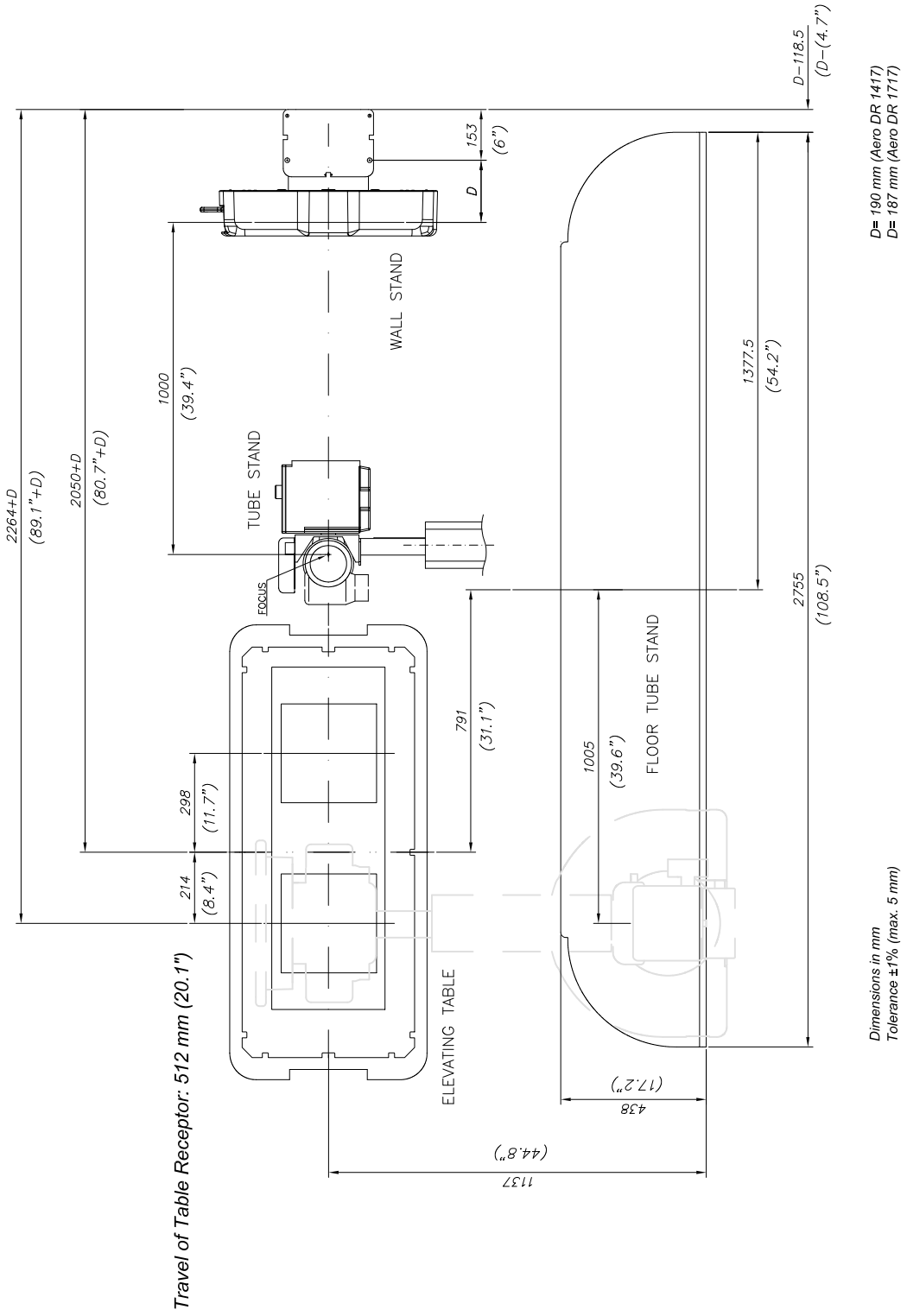


Illustration 40
Example of Typical Room Layout XR/f ST

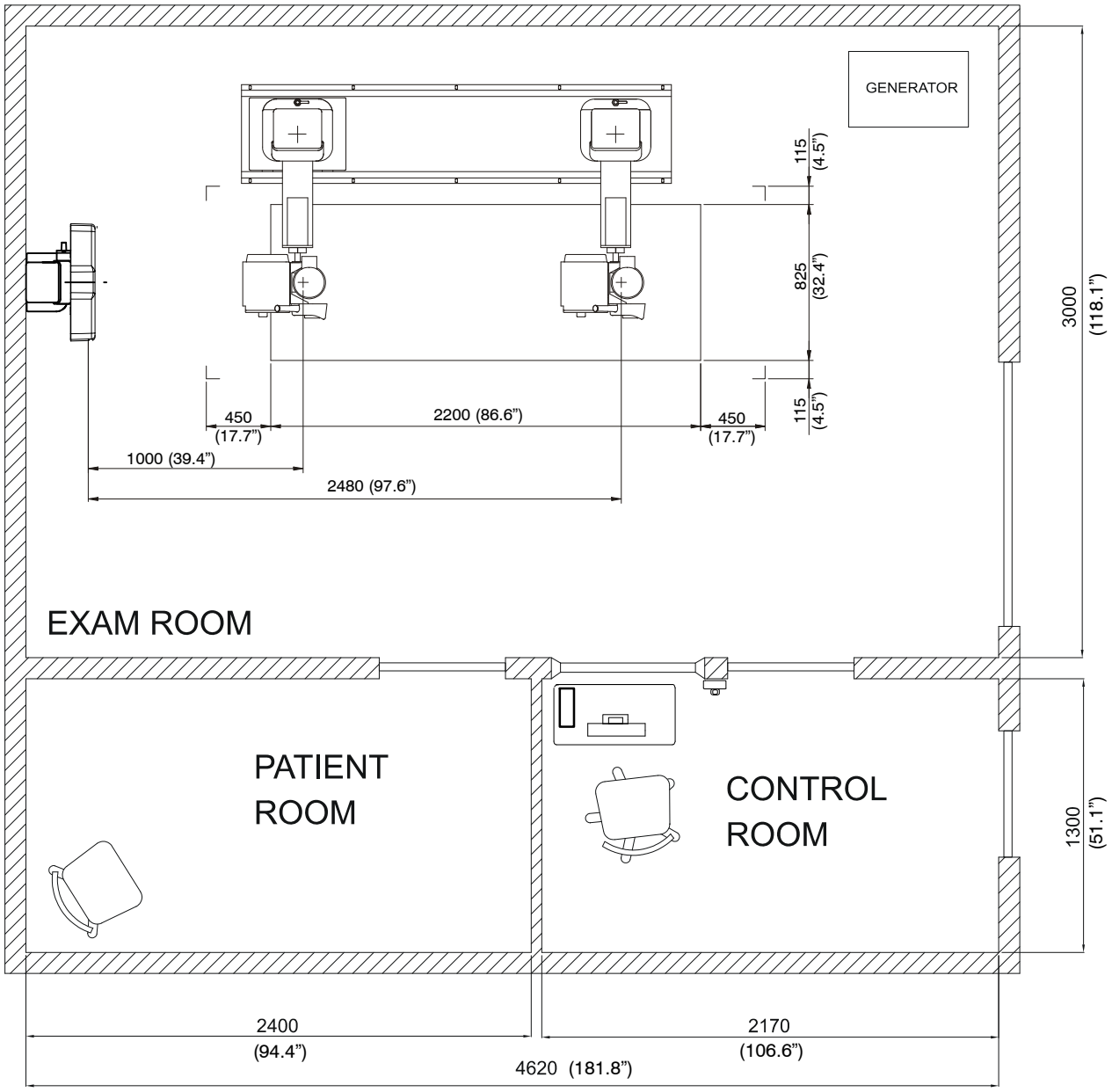
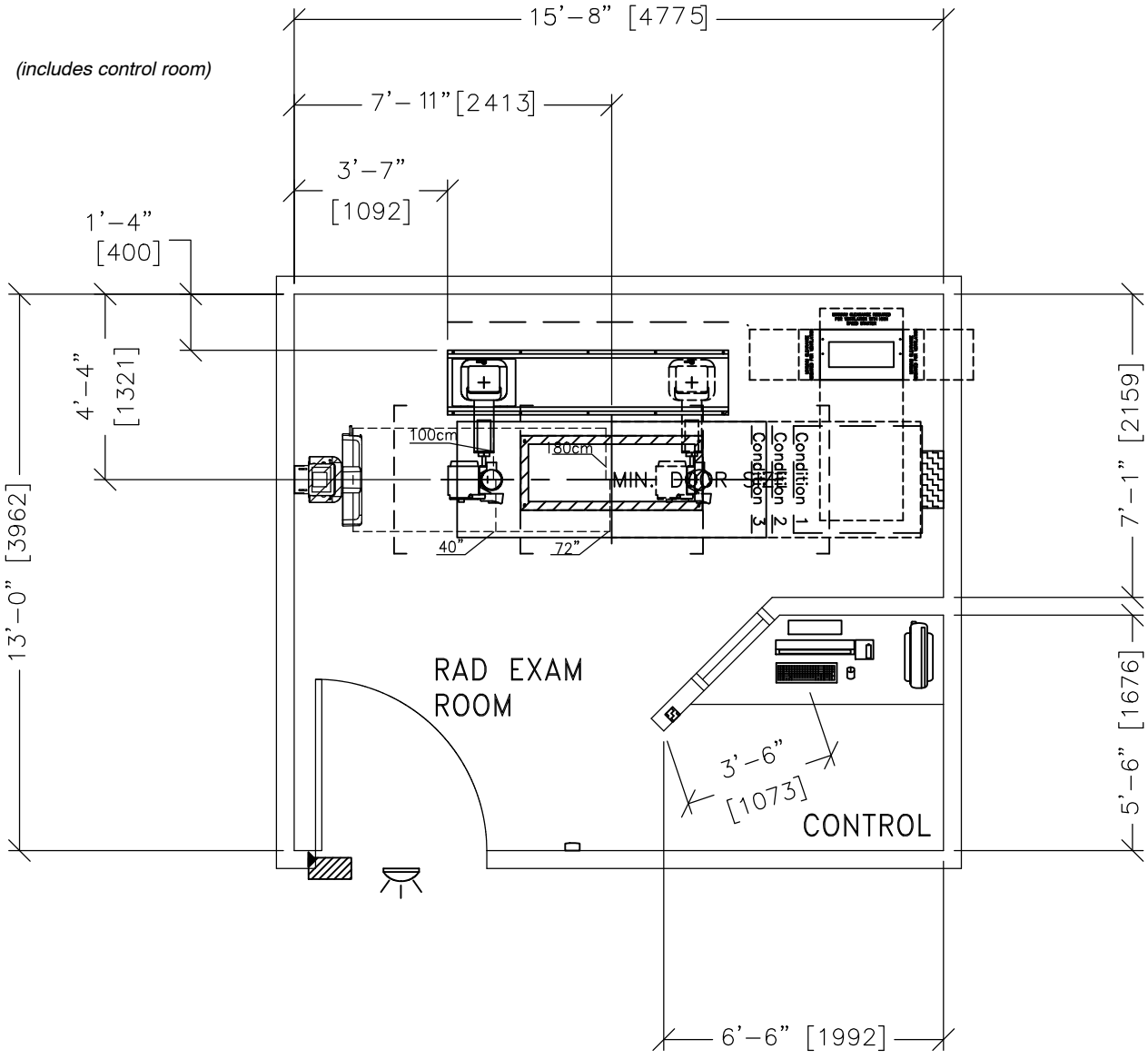


Illustration 41
Proteus XR/f ST - Minimum Recommended Layout



THE FOLLOWING SHOTS ARE NOT AVAILABLE IN THIS LAYOUT:

180° OFF–TABLE IMAGING

Illustration 42
Proteus XR/f ST - Minimum Functional Layout

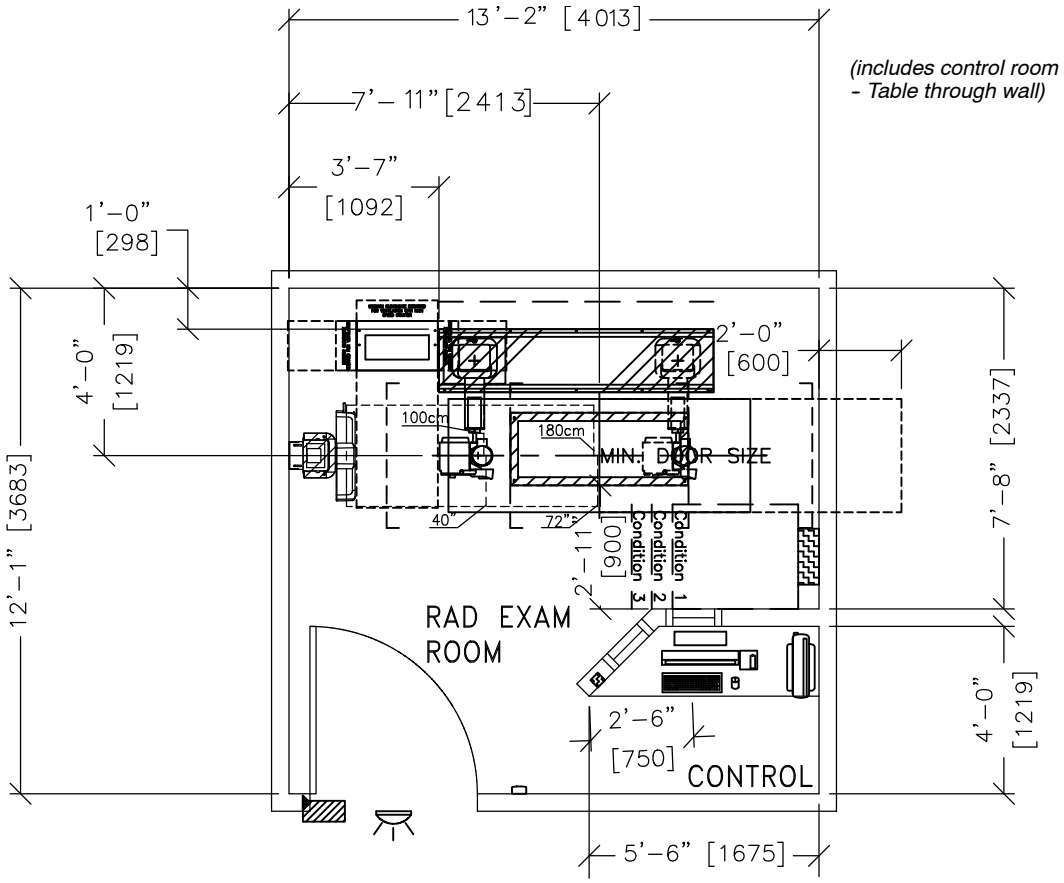


TABLE TOP SERVICE CLEARANCE IS THROUGH THE WALL. LOCAL DOS TO APPROVE A TWO PERSON SERVICE TEAM TO REMOVE THE TABLE TOP.

If the recommended 2250mm [88.6"] from lateral table centerline cannot be applied to the room layout for table service clearance, this distance can be reduced to 1650mm [65"] provided a minimum clear space of 900mm [35.4"] from the front of the table base to any obstruction, for the removal of the table top to the front side. The following text must be added on the room layout proposal reviewed and approved by customer and Director of Service (translated in customer local language):
Please note that your Proteus XRf installation in selected room does not meet the following minimum requirement: 2250mm [88.6"] recommended distance from lateral table centerline to wall.
This may require 2 persons to remove the table top to gain access to the ion chamber and detector housing. Service downtime may be longer. Alternatively, table may be de-installed to allow service access, which will require re-installation and calibration of the table after servicing the equipment.

Illustration 43
Typical Room Layout XR/f ST with Telescopic Arm.
Wall Stand at Right Side

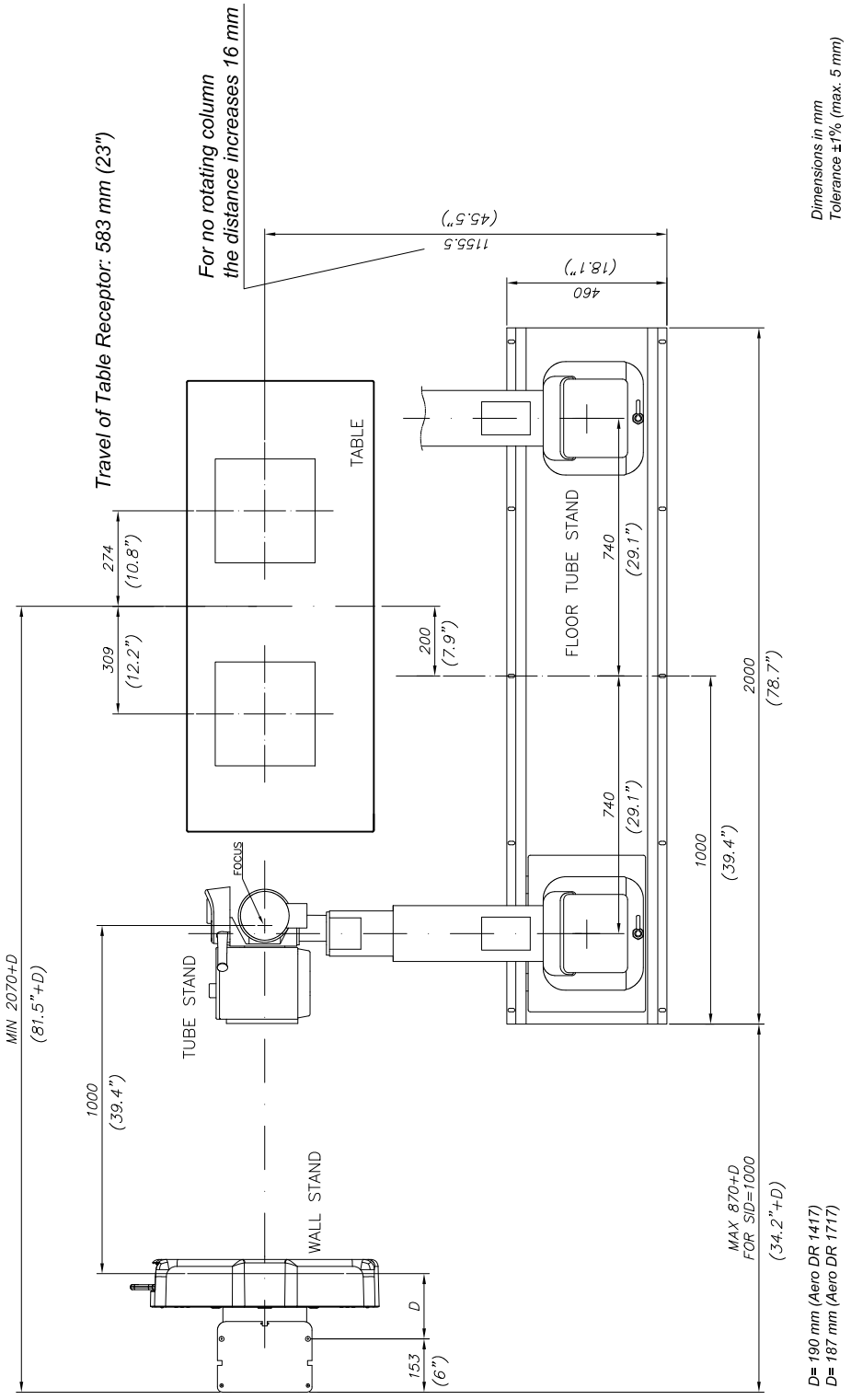


Illustration 44

Room Layout XR/f ST with Telescopic Arm and the Tube Stand as close as possible to the Wall Stand. Wall Stand at Right Side.

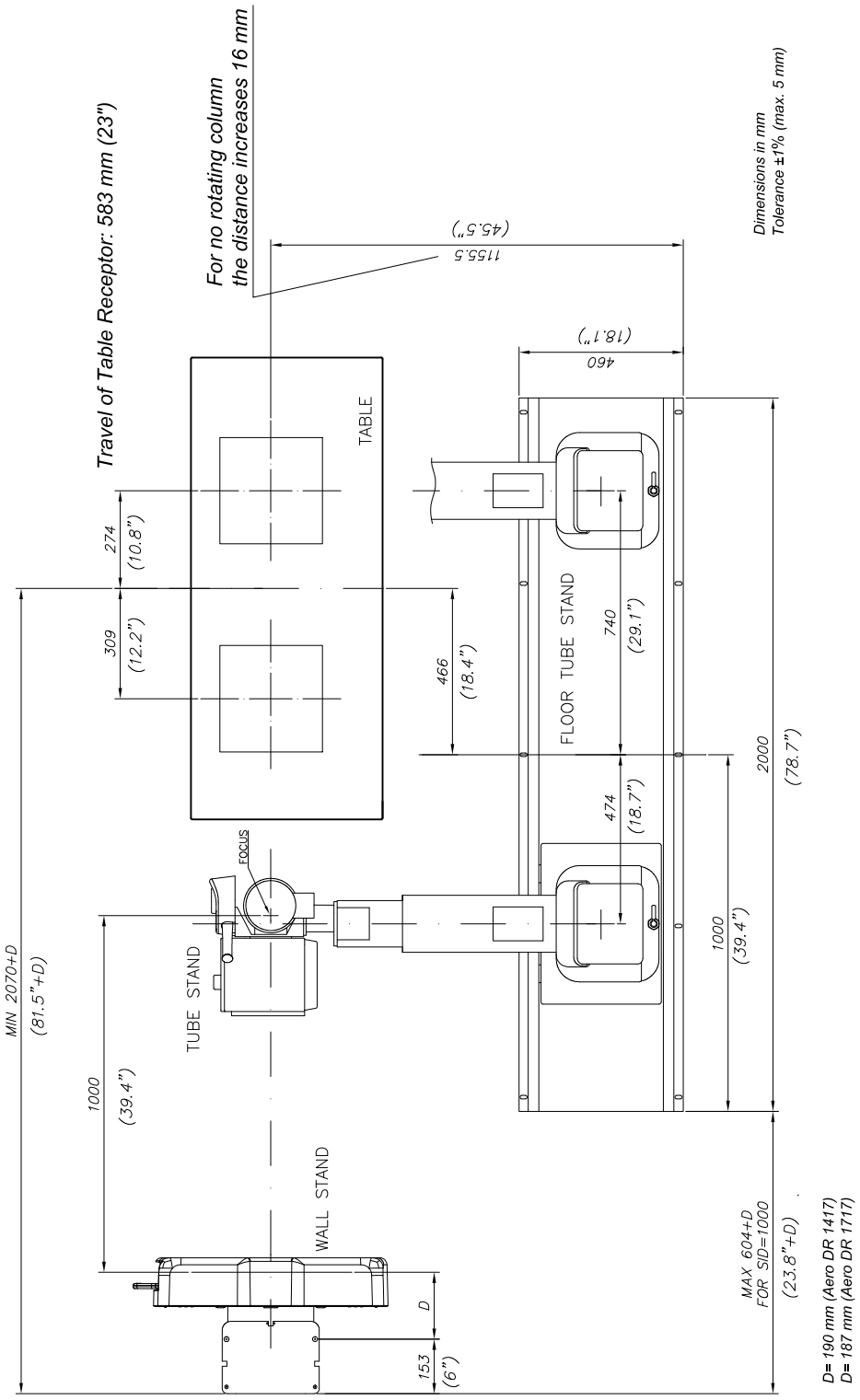


Illustration 45
Typical Room Layout XR/f ST with Telescopic Arm.
Wall Stand at Left Side.

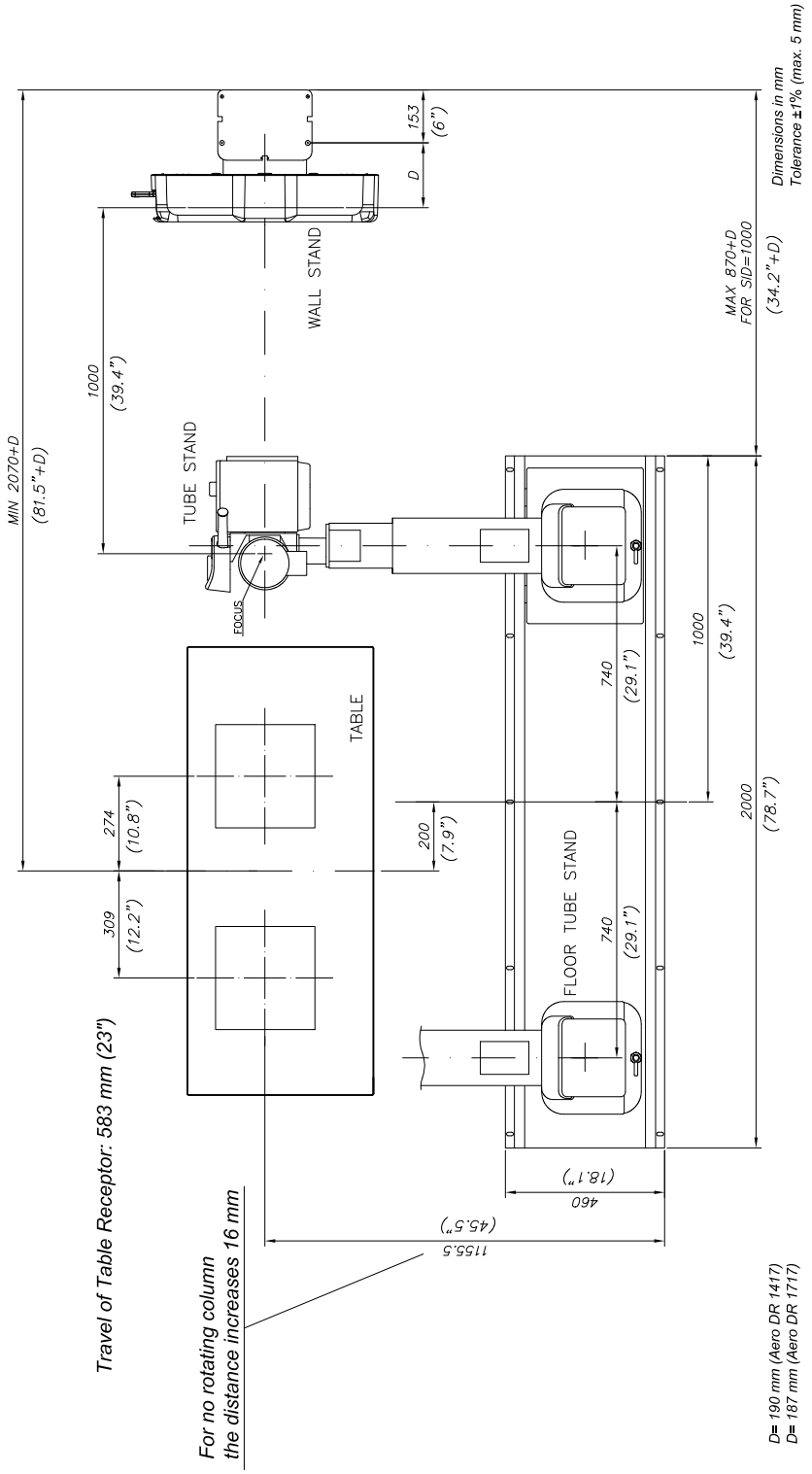


Illustration 46

Room Layout XR/f ST with Telescopic Arm and the Tube Stand as close as possible to the Wall Stand. Wall Stand at Left Side.

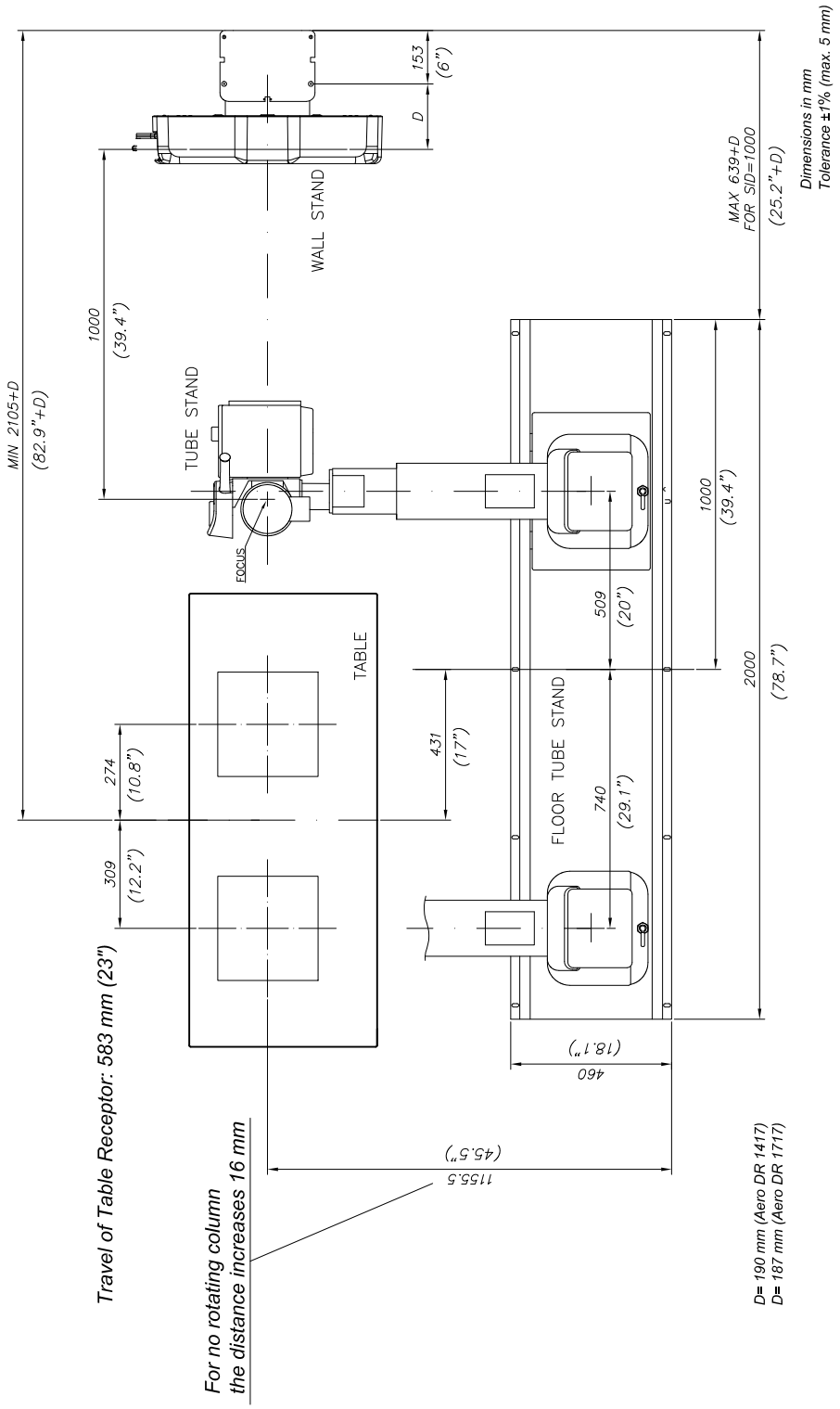


Illustration 47
Typical Room Layout XR/f ST with Fixed Arm.
Wall Stand at Right Side.

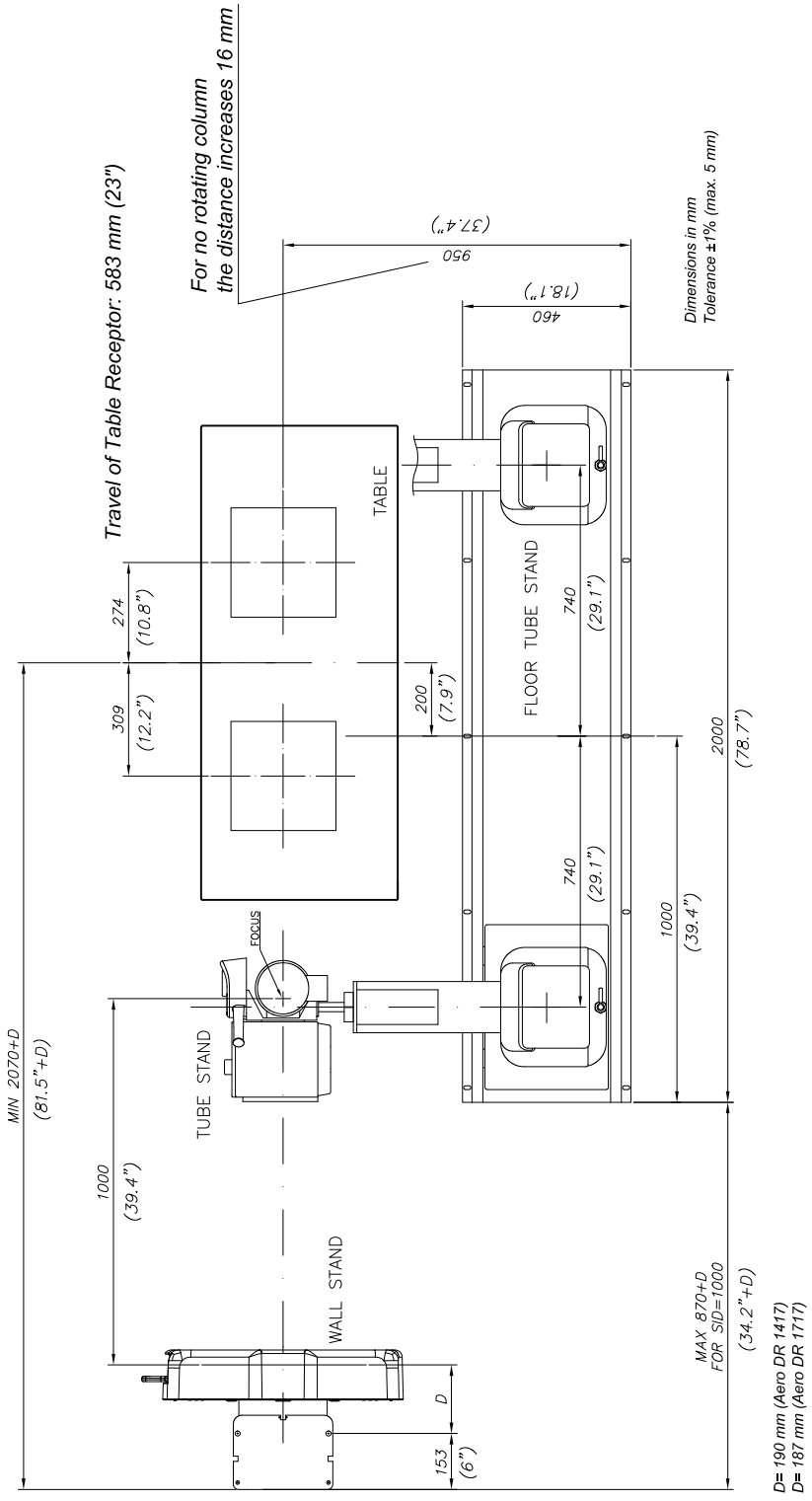


Illustration 48
Room Layout XR/f ST with Fixed Arm and the Tube Stand as close as possible to the Wall Stand. Wall Stand at Right Side.

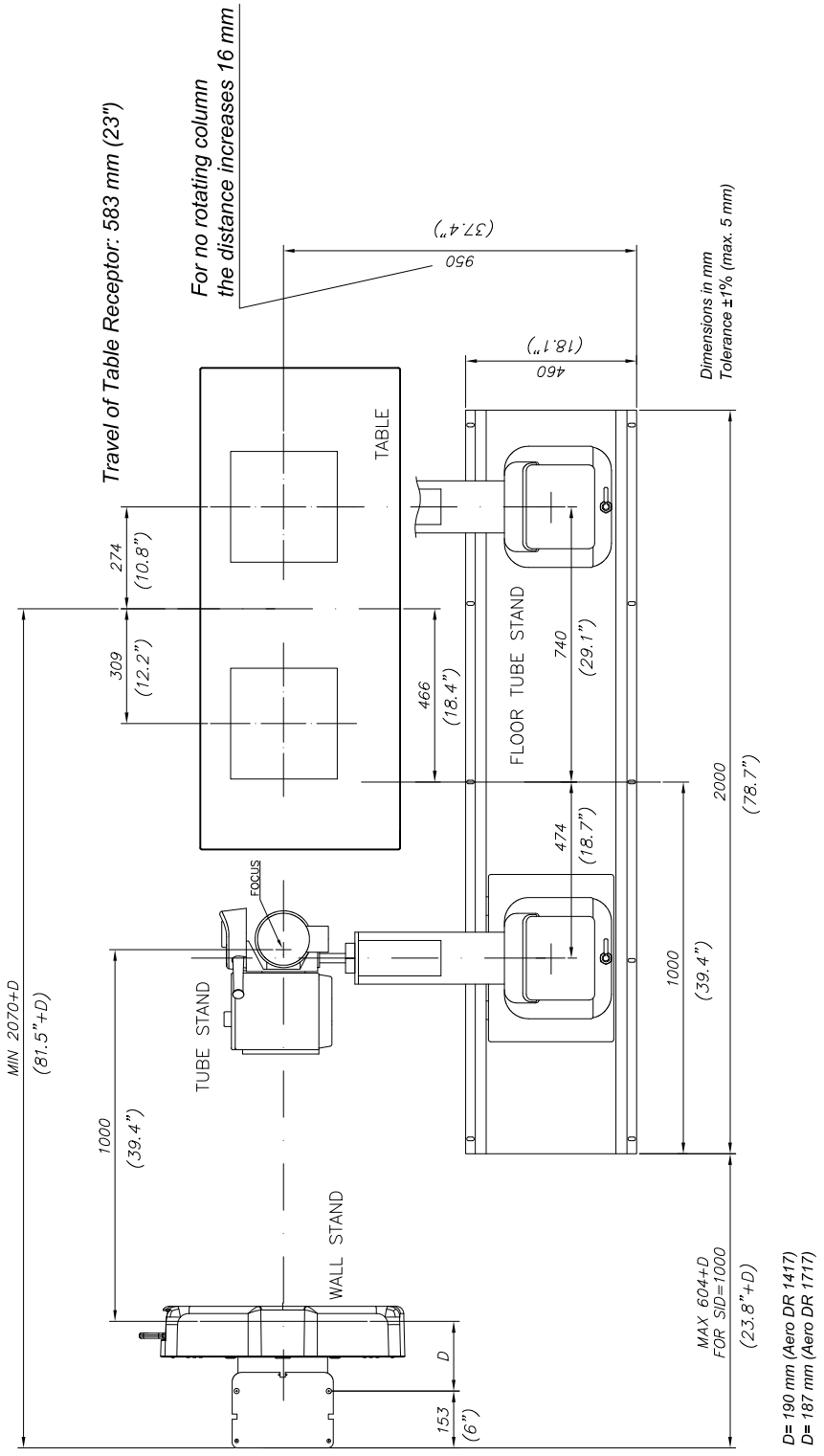


Illustration 49
Typical Room Layout XR/f ST with Fixed Arm.
Wall Stand at Left Side.

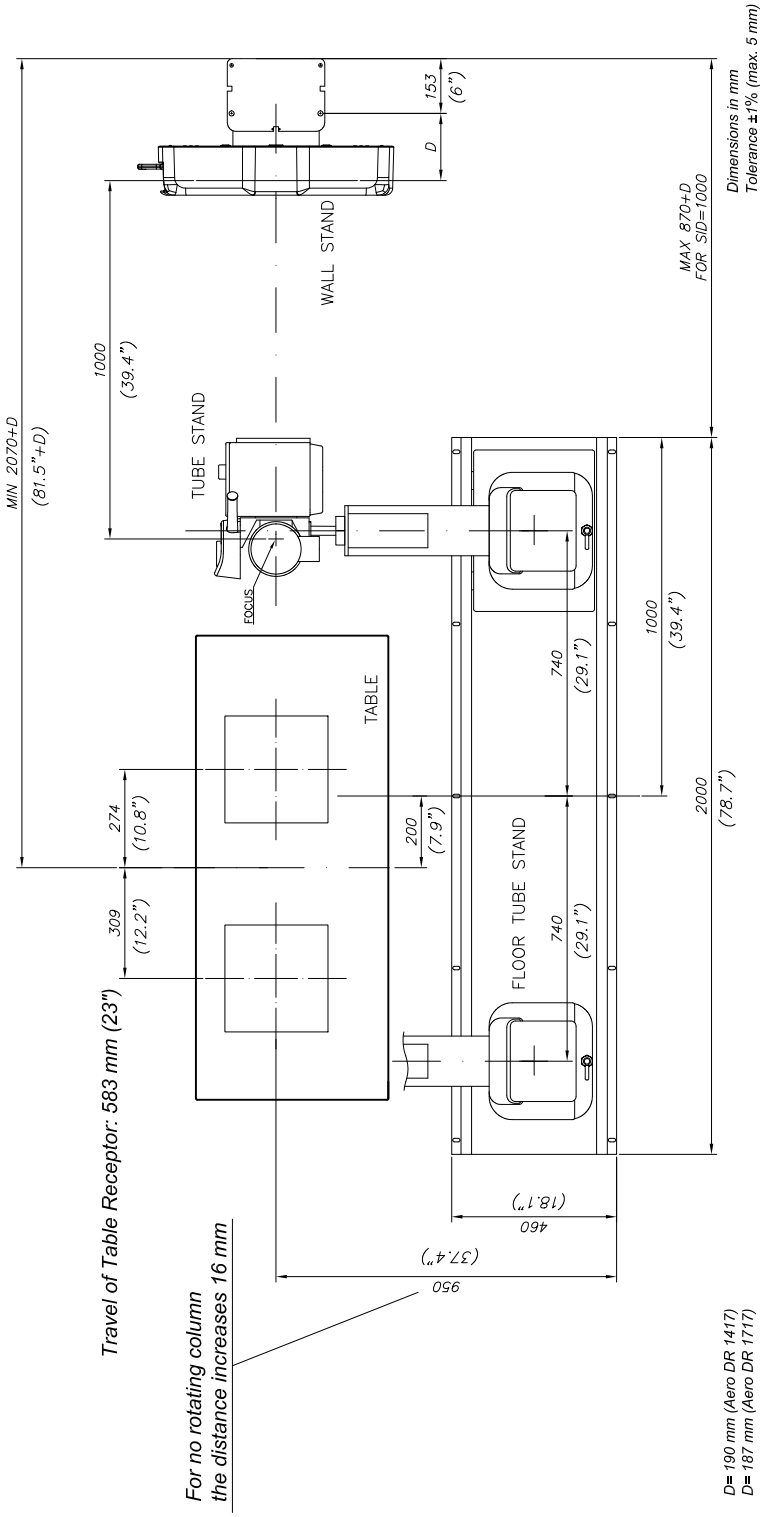
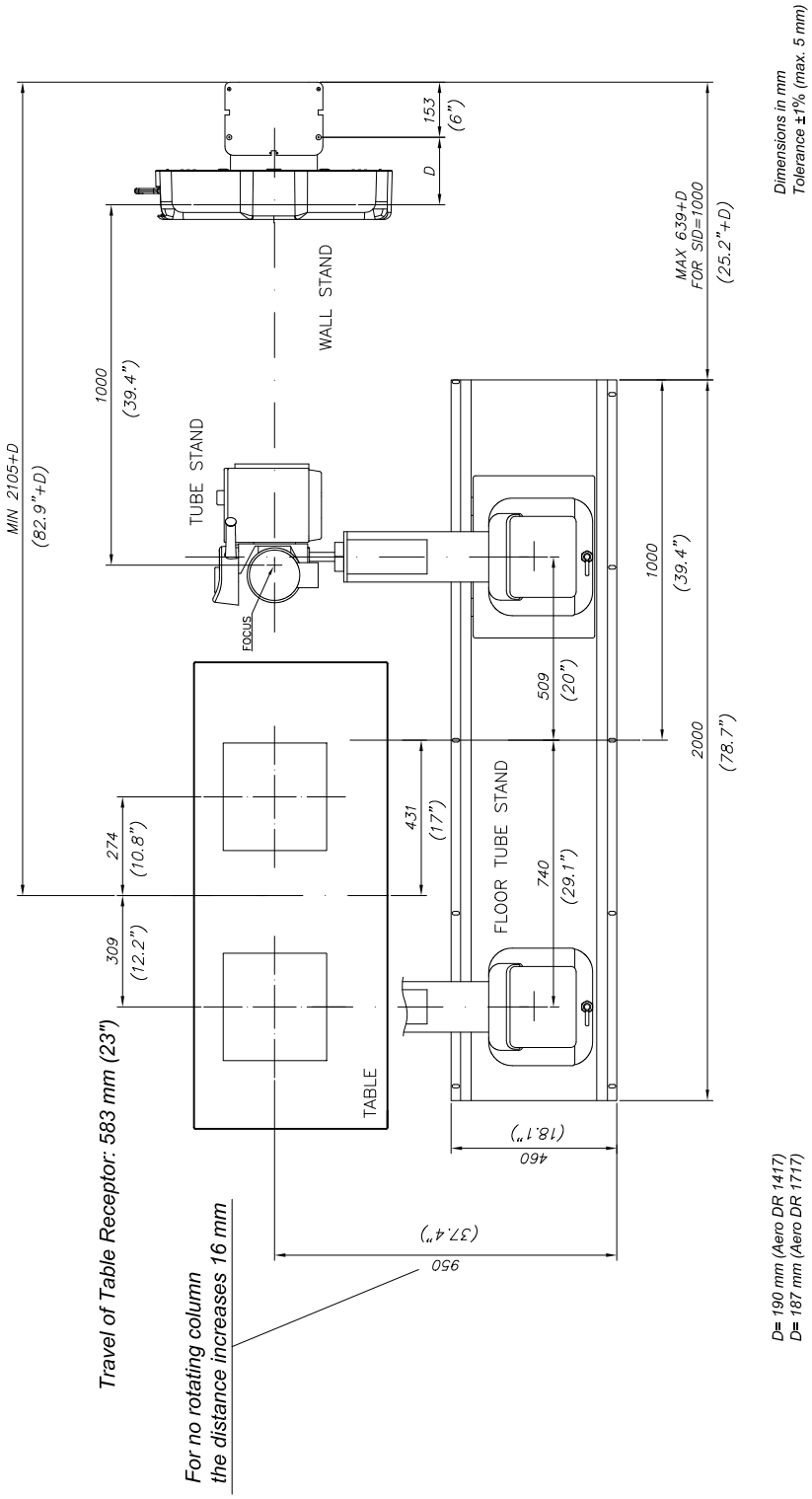


Illustration 50
Room Layout XR/f ST with Fixed Arm and the Tube Stand as close as possible to the Wall Stand. Wall Stand at Left Side.



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SECTION 7 PLANNING AIDS

7.1 SHIPPING DIMENSIONS AND WEIGHTS

XR/f AT and ET COMPONENT CRATED	DIMENSIONS			WEIGHT
	Length	Width	Height	
Column of Floor Mounted Tube Stand with Collimator, X-Ray Tube, HV cables and Table-Top of Elevating Table	242 cm (95.3”)	87 cm (34.3”)	105 cm (41.3”)	414 kg (912 lb)
Tube Stand Base	282 cm (111”)	67 cm (26.4”)	35 cm (13.8”)	104 kg (229 lb)
Elevating Table (without Tabletop)	154 cm (60.6”)	84 cm (33.1”)	96 cm (37.8”)	376 kg (828 lb)
Wall Stand	228 cm (89.7”)	85 cm (33.4”)	50cm (19.6“)	208 kg (458 lb)
Line Powered Generator	107 cm (42.1”)	62 cm (24.4”)	74 cm (29.1”)	140 kg (308 lb)

XR/f ST COMPONENT CRATED	DIMENSIONS			WEIGHT
	Length	Width	Height	
Tube Stand with Base, Collimator, X-Ray Tube, HV Cables and Table-Top of RAD Table	230 cm (90.6”)	85 cm (33.5”)	114 cm (44.9”)	390 kg (859 lb)
RAD Table (without Tabletop)	154 cm (60.6”)	84 cm (33.1”)	96 cm (37.8”)	143 kg (315 lb)
Wall Stand	228 cm (89.7”)	85 cm (33.4”)	50cm (19.6“)	208 kg (458 lb)
Line Powered Generator	107 cm (42.1”)	62 cm (24.4”)	74 cm (29.1”)	140 kg (308 lb)

7.2 TOOLS AND EQUIPMENT CHECKLIST

TOOLS AND EQUIPMENT CHECKLIST *The following tools and materials are needed for installation but are not shipped with the product.*	**COMPLETED**
Standard service engineer's tool kit.	
Assorted 12-point sockets (SAE and metric), drives, wrenches, and torque wrench (Nm and ft.-lbs), including a reversible ratchet with socket set.	
Electric and hammer drill. Assorted masonry and high-speed bits in both metric and SAE sizes.	
Assorted sizes of tongue and grove pliers, hammers, hex wrenches (metric and SAE), screw drivers, and metal files.	
Wall / Ceiling and Floor anchoring hardware *(Hilti KB-III).*	
Assorted hardware for termination of electrical connections.	
Assorted sizes of wire cutters and strippers, ratchet and standard crimpers, and a 75-watt soldering iron.	
Tie wraps, heat and electrical tape, and wire markers.	
Tags for labeling incomplete work according to regulatory requirements.	
Lock-Out and Tag-Out equipment.	
Movers, dollies, ladders, shop vacuum, and push-broom.	

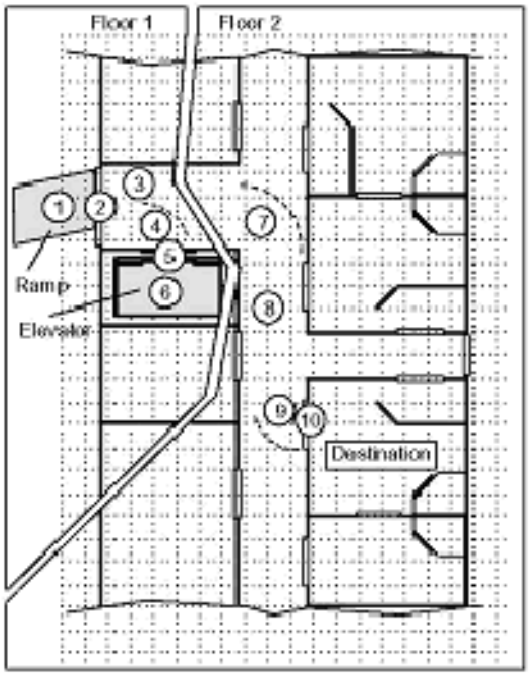
7.3 PREPARING THE DELIVERY ROUTE

Note ☞ *Refer to Section 2.2.1, "Door Size Requirements," for more information about the crated / uncrated dimensions and weights of the Components.*

1. **Sketch out the Route.**

   Begin preparing a Route Survey by sketching the area of the hospital or clinic which will receive the equipment. Include all areas on the delivery route from outside of the building to destination. See the sample sketch below.

Illustration 51
Sample Route



Reference Numbers:
Numbers in circles refer to the Route Survey data.
The Route Survey is a form on which site data is listed (step 2).

2. **Survey the Route.**

   Record all loading capacities, corridor widths, door openings, turning radii, flooring materials, elevator sizes, obstructions, and so on for reference.

3. **Check the Route.**

   Verify that the equipment can actually be transported via the route determined in step 1.

7.4 PRE-INSTALLATION CHECKLIST

Delivery Date: **Sales Person:**

Customer: **GNO / FDO No.:**

Room #

Equipment:

PHYSICAL REQUIREMENTS OF SITE	**COMPLETED**
1. Room size adequate for intended equipment configuration?	☐
2. Floor, wall, and ceiling are strong enough for intended equipment and mounting methods approved – seismic regulatory codes considered?	☐
3. Delivery route accommodates all intended equipment?	☐
4. Radiation physicist consulted?	☐
5. Necessary alterations made to circumvent obstructions?	☐
6. Modifications to room finished?	☐
7. Supports, platforms, wall – ceiling materials have been provided?	☐
8. Support structures installed for floor, ceiling, and wall mounted equipment?	☐
9. Wall – ceiling supports leveled?	☐
10. Has floor level been checked and if necessary levelled with grout pad?	☐
11. Has floor been modified for cable ducts?	☐
12. Electrical service in place – at the ratings specified in Pre-Installation documentation?	☐
13. Power available to operate power tools?	☐
14. All non-electrical lines (air, water, oxygen, vacuum) installed?	☐

INTERCONNECTIONS	**COMPLETED**
1. Signal cable, power, and grounding plans produced?	☐
2. Necessary interconnection hardware, such as junction boxes, conduit or raceways, and fittings, provided?	☐
3. Interconnection hardware installed?	☐
4. Flexible, stranded wire provided for System input power connection?	☐
5. System “feeder” power cables pulled and sufficient length available at disconnect box for connections?	☐
6. Interconnecting cables continuity checked, and labeled?	☐
7. All high voltage cable lengths verified?	☐
8. Interface information available for equipment?	☐

GENERAL		COMPLETED
1.	Ceiling, walls, and floor clear of all obstructions?	☐
2.	Walls finished?	☐
3.	Finished floor installed?	☐
4.	Room lights installed?	☐
5.	Dust-creating work completed?	☐
6.	Old equipment within room removed?	☐
7.	Component positions clearly marked on floor?	☐
8.	Space available to store equipment?	☐
9.	Lock on door, or locked room available?	☐
10.	Room IP Addresses for DICOM and Broadband identified?	☐
11.	Broadband connection provided for InSite connection? OR If Broadband connection will not be used, is dedicated inbound ”dialup” phone line provided for InSite connection?	☐
12.	Voice phone line connection provided?	☐
13.	Have all fire/safety inspections for occupancy been completed?	☐
14.	Send completed checklist to the GE Healthcare installation team.	☐

COMMENTS

INSPECTION DATE(S)

INSTALLATION PROJECT MANAGER SIGNATURE

7.5 CUSTOMER NETWORK FLOW AUDIT

7.5.1 PROTEUS XR/F AT NETWORK AUDIT CHECKLIST

Who: Sales Manager/Rep and Installation Project Leader (IS) or PMI.

What: Networking and workflow assessment of the customer's Printers, PACS, and HIS/RIS. All networking configuration information to be documented in the survey.

When: Pre-Installation.
Completed checklist to be sent to the Application Specialist and the Primary FE at least seven (7) days prior to the start of Installation.

Understanding how your facility leverages its network investment through our Network flow process will help better integrate the Proteus XR/f system into your operations. The following is intended to identify the various ways the Proteus XR/f system can fit into your workflow and the ramifications of selecting one path or another. We would like to start at the beginning, with the patient arriving at your facility, going through registration/admittance/patient scheduling, and proceed all the way to the read images being archived.

7.5.2 WHAT IS THE NETWORK FLOW AUDIT?

This audit was designed to collect information on your network, your DICOM equipment, your workflow, and your data flow. Once this information is collected, it will be used to ease and speed the Installation of the system into your facility.

You should fill this out with the GE Healthcare representative. The representative will be able to answer any questions you may have.

Facility Information

Facility Information			
Name of facility:		Room #:	
Workflow contact:		Phone:	
Network Infrastructure contact:		Phone:	
DICOM Device contact:		Phone:	
Other contact:		Phone:	
GEMS Sales Representative:			
GEMS Auditor:			

7.5.3 WORKFLOW ANALYSIS

1. When the patient arrives in the Proteus XR/f system room for the exam, how is the patient data entered into the system?
   - ☐ Manually typed
   - ☐ Entered via barcode reader
     Barcode format:_____
   - ☐ Downloaded from HIS/RIS

2. If the patient information was downloaded from a HIS/RIS system, how would the query be structured? (Pick all that apply)
   - ☐ By date
   - ☐ By modality
   - ☐ By patient information
   - ☐ By procedure
   - ☐ By product (AE Title)
   - ☐ Other method – Please explain:
     _____

3. In retrieving patient schedule information, do you query
   - ☐ Once at the start of the shift
   - ☐ Several times during a shift
   - ☐ Before each patient

4. What percent of the images acquired are reviewed via softcopy?____%

5. What percent of the images acquired are printed?_____%

6. Once the digital diagnostic images are acquired, what is your facility's default workflow? (Pick one [1])
   - ☐ Manually send
   - ☐ Automatically push

   (Pick all that apply)
   - ☐ Review station(s)
   - ☐ Archive system(s)
   - ☐ Printer(s)

7. When images are configured for automatic push, what would you like to be sent to PACS/archive/review stations?
   - ☐ Raw
   - ☐ Processed
   - ☐ Raw and Processed

8. When images are printed, on what device is the print command originated? (Pick all that apply)
   - ☐ the Proteus XR/f system
   - ☐ A review workstation
   - ☐ A PACS system

9. How soon after the images are acquired is the first image quality check done?
   - ☐ Before the next image is shot
   - ☐ Before the patient leaves
   - ☐ After the patient leaves

10. When it comes to image quality, would you prefer to;
    - ☐ Consider all images good unless marked bad
    - ☐ Consider all images bad unless marked good

7.5.4 THE PHYSICAL NETWORK

Physical infrastructures vary widely from institution to institution. GE Healthcare tried to pick the most popular networking connection to ease integration into your facility's network.

1. In the Proteus XR/f system room, this facility;
   - ☐ Has 100baseT installed
   - ☐ Has 10baseT installed
   - ☐ Has a different network installed
   - ☐ Will have 100baseT installed
   - ☐ Will have 10baseT installed
   - ☐ We don't have a network installed

2. Do you segment your network using subnets?
   ☐ Yes ☐ No

3. Our equipment's IP addresses are:
   - ☐ Static
   - ☐ Acquired via DHCP
   - ☐ A combination of both methods

7.5.5 PROTEUS XR/F SYSTEM PARAMETERS

Proteus XR/f System	
Host Name:	
Network (IP) Address:	_ _ _ . _ _ _ . _ _ _ . _ _ _
Subnet Mask:	_ _ _ . _ _ _ . _ _ _ . _ _ _
Router IP:	_ _ _ . _ _ _ . _ _ _ . _ _ _
Scheduled Station AE Title:	

Host Name: The Host Name is the network's name for the Proteus XR/f system.

IP address IP addresses uniquely identify a device on a network. IP addresses are constructed of 32 bits, usually displayed as four (4) numbers separated by a period. Please indicate the Network (IP) Address that will be assigned to the Proteus XR/f system.

Subnets Subnets are a method of logically dividing a network into smaller blocks. This is usually done based upon locality, functionality, or security requirements. If your facility will place the Proteus XR/f system on a subnet, please list the Subnet Mask and Router IP.

Scheduled Station The Scheduled Station AE (Application Entity) Title is the name your HIS/RIS system will use to send worklist information to the Proteus XR/f system.

7.5.6 REMOTE HOSTS

Remote Hosts	*Include a DICOM Compliance Statement for each device*			
This remote Host is a:	☐ Review Work Station ☐ Archival Device ☐ PACS System ☐ MPPS Server	☐ Review Work Station ☐ Archival Device ☐ PACS System ☐ MPPS Server	☐ Review Work Station ☐ Archival Device ☐ PACS System ☐ MPPS Server	**Information onProteus XR/f** The system allows you to configure only one (1) HIS/RIS server. The system allows you to configure only one (1) MPPS server. The system allows configuration of multiple printers and multiple PACS/archive/review stations. The Host Name of all the nodes configured on the system should be unique within the system.
Manufacturer/Model: Software/Firmware version: Network (IP) Address:	___.___.___.___	___.___.___.___	___.___.___.___	
DICOM Compliance Level:	☐ 1.0 ☐ 2.0 ☐ 3.0 ☐ Not DICOM Compliant	☐ 1.0 ☐ 2.0 ☐ 3.0 ☐ Not DICOM Compliant	☐ 1.0 ☐ 2.0 ☐ 3.0 ☐ Not DICOM Compliant	
Image Types Supported:	☐ DX ☐ CR	☐ DX ☐ CR	☐ DX ☐ CR	
Supports Multi-framing:	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
Host Name:	_____	_____	_____	
Do you plan to use this device as a:				
Remote Host Server? AE Title: Port Number:	☐Yes ☐No; If "yes" provide:	☐Yes ☐No; If "yes" provide:	☐Yes ☐No; If "yes" provide:	
Query/Retrieve? Query/Retrieve AE Title: Port Number:	☐Yes ☐No; If "yes" provide:	☐Yes ☐No; If "yes" provide:	☐Yes ☐No; If "yes" provide:	
Query/Retrieve by:	☐ Study ☐ Patient	☐ Study ☐ Patient	☐ Study ☐ Patient	
Storage Commitment? Storage Commitment AE Title: Port Number: Network (IP) Address:	☐Yes ☐No; If "yes" provide: ___.___.___.___ ☐Yes ☐No; If "yes" provide:	☐Yes ☐No; If "yes" provide: ___.___.___.___ ☐Yes ☐No; If "yes" provide:	☐Yes ☐No; If "yes" provide: ___.___.___.___ ☐Yes ☐No; If "yes" provide:	
MPPS Server? AE Title: Port Number: Network (IP) Address:	___.___.___.___	___.___.___.___	___.___.___.___	

7.5.7 DEVICES & SERVICES AUDIT

Use the following narrative to complete the form on the previous page.

REMOTE HOSTS: Remote hosts are DICOM devices to which the Proteus XR/f system can push an image. Remote hosts can be review workstations, archival devices, or PACS systems. Please indicate the type of remote host. Now indicate the manufacturer and model name or number. Compatibility can vary with software versions, please indicate the version of device firmware/software the device will be running. List the device's **IP address**. (IP = Internet Protocol) The answers to the next several items can be found in the device's DCS (DICOM Conformance Statement). Please indicate the highest level of **DICOM conformance** for this device. If the device is not DICOM compliant, please indicate so and move on to the next device. **If the device does have some level of DICOM conformance please return a copy of the DICOM Conformance Statement with this completed form.** DICOM supports a number of **image types**. Please indicate if this device supports the DX and/or the CR image types. The **host name** is the name that will appear on the screen and users will use to indicate this device. Please list the host name. The next four (4) sections address the four (4) services that remote host devices may offer. Each of the services will have its own AE (application entity) title and port number. The AE title is the name given to a service or application provided by a DICOM device. The port number is a logical designation within the device. These pieces of information are available in the device's DCS.		Being a **remote host server** allows the Proteus XR/f system to push images to other devices. If you want the device to accept this service, check "Yes" and provide the AE title and port number. Being a **query**/**retrieve** service class provider allows the Proteus XR/f system to query this device and retrieve images stored there. If you want this device to provide these services to the Proteus XR/f system check "Yes" and fill in the requested items. The **query**/**retrieve by** study or patient controls how much the user is able to retrieve at one (1) time. For study, the user may retrieve studies, series, and/or images. For patient, the user may retrieve all of the study attributes plus a patient's entire image collection. A **storage commitment** provider confirms that images sent by the Proteus XR/f system to an archival system were received and stored. **NOTE:** This option is only available when the Proteus XR/f system is sending DX type images. If your device supports both DX image types and storage commitment, check "Yes" and provide the AE title, the port number, and the network (IP) address. The **MPPS server** receives the messages sent by the Proteus XR/f system. These messages consist of information such as when the exam started and closed, how many images were acquired, dose information, etc. This information is then updated on the Hospital Scheduling system. If the site has an MPPS server, provide the AE Title, IP address, and port number.

7.5.8 PRINTERS

Printers	Include a DICOM Compliance Statement for each printer	
Manufacturer/Model:		
Software/Firmware Version:		
Prints via Spooler:	☐ Yes ☐ No	☐ Yes ☐ No
Network (IP) Address:	_ _ _ . _ _ _ . _ _ _ . _ _ _	_ _ _ . _ _ _ . _ _ _ . _ _ _
DICOM Compliance Level:	☐ 1.0 ☐ 2.0 ☐ 3.0 ☐ Not DICOM Compliant	☐ 1.0 ☐ 2.0 ☐ 3.0 ☐ Not DICOM Compliant
Host Name:		
Printer AE Title:		
Port Number:		

Printers: As with the remote hosts, please list the manufacturer and the model name/number. The software/firmware version should also be entered. Next, supply the IP address of the printer.

Indicate the DICOM compliance level of the printer. If it is not DICOM compatible, please indicate so.

DICOM compatibility does not guarantee all functions will work properly. **Include every unique printer's DICOM Compliance Statement.**

Supply the Host name for the printer.

Look in the DCS for the printer's AE title and port number.

7.5.9 RIS SYSTEMS

RIS Systems	Include a DICOM Compliance Statement for each device	
Manufacturer/Model:		
Software/Firmware Version:		
Network (IP) Address:	_ _ _ . _ _ _ . _ _ _ . _ _ _	_ _ _ . _ _ _ . _ _ _ . _ _ _
DICOM Compliance Level:	☐ 1.0 ☐ 2.0 ☐ 3.0 ☐ Not DICOM Compliant	☐ 1.0 ☐ 2.0 ☐ 3.0 ☐ Not DICOM Compliant
Host Name:		
HIS/RIS AE Title:		
Port Number:		
Modality used for Scheduling:	☐ DX ☐ CR	☐ DX ☐ CR

RIS Systems: As with the remote hosts please list the manufacturer and the model name/number. The software/firmware version should also be entered.

Indicate the IP address the device is using as well as the DICOM compliance level. **Please include the DCS for the RIS with this completed form.**

Fill in the Host name.

Look in the DCS for the AE title and port number.

Please indicate if this device supports the DX and/or the CR image types. This information should also be in the device's DCS.

7.5.10 DATAFLOW ANALYSIS

Now that we have outlined the way your facility works and the devices you work with, we would like to define how the images flow through your network.

the Proteus XR/f system is an acquisition–only device. Because of that fact you will need to move acquired images off the Proteus XR/f system and into your work/data flow. Please use the chart below to describe your data flow. As an example, if your facility reviewed images as the first step after acquisition, the review box would be checked in the first column of the Task row and the review workstation would be checked in the first column of the Device row. You should use each of the functions once.

	1st step after acquisition	2nd step after acquisition	3rd step after acquisition
Task	☐ Archive ☐ Print ☐ Review	☐ Archive ☐ Print ☐ Review	☐ Archive ☐ Print ☐ Review
Device	☐ Archive device ☐ PACS ☐ Printer ☐ Review Workstation ☐ Spooler –> Printer(s) ☐ Spooler –> Review Workstation(s)	☐ Archive device ☐ PACS ☐ Printer ☐ Review Workstation ☐ Spooler –> Printer(s) ☐ Spooler –> Review Workstation(s)	☐ Archive device ☐ PACS ☐ Printer ☐ Review Workstation ☐ Spooler –> Printer(s) ☐ Spooler –> Review Workstation(s)

Printing: It is important to us to understand the path your images follow before they are printed. We are now looking to answer the question of what road an image most typically travels on its way to be printed regardless if that is the first step in your process or not. Please try to find in the list below the path that best describes the path the image takes from acquisition to printing.

☐ Proteus XR/f System ⇨ Printer

☐ Proteus XR/f System ⇨ Spooler ⇨ Printer(s)

☐ Proteus XR/f System ⇨ Archive Device ⇨ Printer

☐ Proteus XR/f System ⇨Archive Device ⇨ Spooler ⇨ Printer(s)

☐ Proteus XR/f System ⇨ Archive Device ⇨ Review Workstation ⇨ Printer

☐ Proteus XR/f System ⇨ Archive Device ⇨ Review Workstation ⇨ Spooler ⇨ Printer

☐ Proteus XR/f System ⇨ PACS⇨ Printer

☐ Proteus XR/f System ⇨ PACS ⇨ Spooler ⇨ Printer

☐ Proteus XR/f System ⇨ Review Workstation ⇨ Printer

☐ Proteus XR/f System ⇨ Review Workstation ⇨ Spooler ⇨ Printer(s)

☐ Proteus XR/f System ⇨ Other:_____ ⇨ Printer(s)

Image Review: Now let's trace the path from acquisition to image review. Again, pick the item below that best describes how the image flows from the Proteus XR/f system to the radiologist.

☐ Proteus XR/f System ⇨ Printer ⇨ Printed Film ⇨ Radiologist

☐ Proteus XR/f System ⇨ Review Workstation⇨ Radiologist

☐ Proteus XR/f System ⇨ Archive Device ⇨ Review Workstation ⇨ Radiologist

☐ Proteus XR/f System ⇨ PACS ⇨ Radiologist

☐ Proteus XR/f System ⇨ PACS ⇨ Review Workstation ⇨ Radiologist

☐ Proteus XR/f System ⇨ Other:_____ ⇨ Radiologist

Archive: The final part of this triad is archiving images. Pick the item below that best describes the flow of images to be archived.

☐ Proteus XR/f System ⇨ Archive Device

☐ Proteus XR/f System ⇨ PACS

☐ Proteus XR/f System ⇨ Printer ⇨ Printed Film ⇨ Filing System

☐ Proteus XR/f System ⇨ Review Workstation ⇨ Archive Device

☐ Proteus XR/f System ⇨ Review Workstation ⇨ PACS

☐ Proteus XR/f System ⇨ Other:_____ ⇨ Archive Device

7.5.11 COMPLETED AUDIT

When the Network Audit has been completed it is to be sent to the following people:

☐ Primary X-Ray FE for the Proteus XR/f system