

Technical Publication
PI-1207R5

Pre-Installation

Ceiling Suspension

The information comprised in this manual applies to the following equipments
La información contenida en este manual se aplica a los siguientes equipos
L'information contenue dans ce manuel est appliquée aux équipements suivants

Ceiling Suspension NOVA:

NOVA FA, NOVA ST & NOVA AT

Manufactured by:

Fabricado por:

Fabriqué par:

SEDECAL

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REVISION HISTORY

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| 1 | JUL 13, 2011 | Ceiling Recommendations Upgrade |
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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 HEDED OR AVOIDED WILL CAUSE SERIOUS PERSONAL INJURY OR DEATH.



ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEDED 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.

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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 a Ceiling Suspension.

This Pre-installation document provides the information and data needed to plan and qualify the customer site prior to equipment delivery and installation.

This document considers only the Ceiling Suspension and its associated components. Product information, environmental and electrical requirements are specified.

Note 

For more Pre-installation requirements, also refer to Pre-installation Manual of the Generator.

1.2 AVOIDING UNNECESSARY EXPENSES AND DELAYS

To avoid unnecessary expenses and delays use the “Pre-installation Checklist” (*refer to Section 8.3*) 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.

1.3 AN OVERVIEW OF THE PRE-INSTALLATION PROCESS

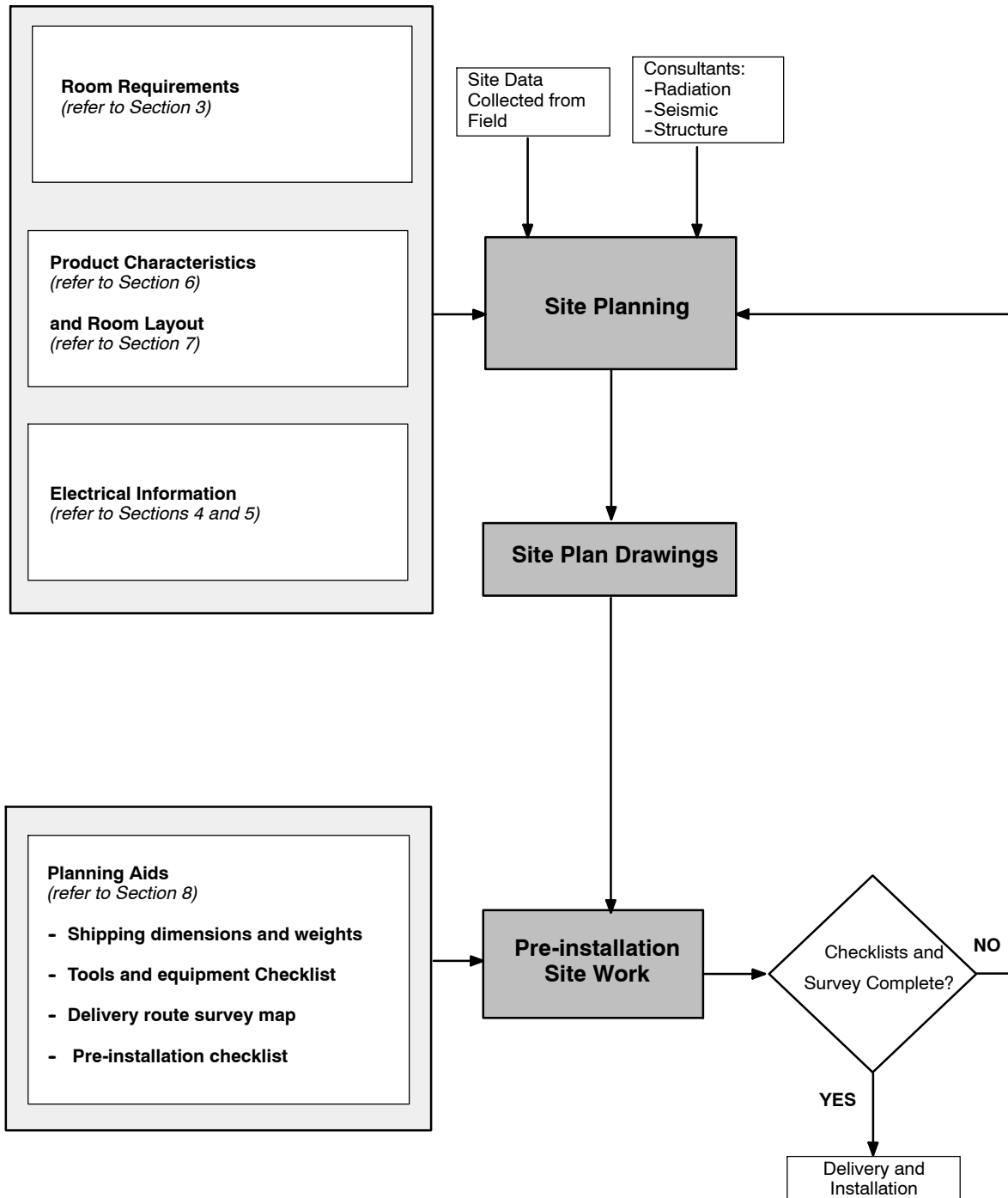
Complete the checklists contained in this manual. They are an important part of the Pre-installation process. The checklists summarize the required preparations and verify the completion of the Pre-installation procedures.

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

Ceiling Suspension

Pre-Installation

Illustration 1-1
Pre-installation Overview



1.4 RESPONSIBILITY OF PURCHASER/CUSTOMER

To ensure that the installation of the 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 8.1*)
- Pre-installation Checklist (*refer to Section 8.3*)

1.5 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, and the cost of alterations and modifications when not specifically provided in the sales contract.

Delay, confusion and waste of manpower can be avoided by adequate Service and Pre-installation.

The purchaser’s responsibility includes providing:

- A clean and safe work environment for the installation of the product (ceiling and proper room lighting).
- A location suitable for the installation of the product (*refer to Section 3*).
 - Installation of conduit, ducts, and/or raceways necessary to route cables safely (*refer to Section 5 and Section 6*).

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- Electrical power and grounds of specified quality and reliability. Refer to *Section 5*.
 - 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.
 - 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 7*.

- Installation of non-electric services (if required).

- Installation of room environment control equipment.

- Provide current room dimensions, including hallway and entry door sizes. Refer to *Section 3*.

Note 

Complete and proper Pre-installation will avoid delays and confusion.

1.6 EQUIPMENT OR ACCESSORIES AT END-OF-LIFE

The elimination of equipment and accessories must be in accordance with local regulations for waste processing. The waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. All materials and components that could pose a risk to the environment must be removed from the end-of-life equipment and accessories (example: dry and wet cell batteries, transformer oil, etc.). Please contact an authorized representative of the manufacturer or an authorized waste management company for information concerning the decommissioning of your equipment.

1.7 PACKING MATERIALS

The materials used to pack our equipment are recyclable. They must be collected and processed in accordance with the regulations in force in the country where the machines or accessories are unpacked.

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SECTION 2 EQUIPMENT DESCRIPTION

2.1 GENERAL OVERVIEW

This equipment is a heavy duty X-ray Tube Overhead Support system characterized by its simple and functional design. Thanks to its vertical and horizontal displacements, the Suspension can cover almost all the room in which it is installed. It can operate with a Table, Wall Stand or R/F Table allowing all radiographic and fluoroscopic procedures.

With its new lightweight design, the system guarantees highly precise positioning for optimal radiographic results.

The new support system can operate on an horizontal or vertical Bucky/Detector Stand, or be installed with a Table.

2.2 CONTROL CONSOLE

Depending on the equipment configuration, the Control Console look may change. Two different Control Consoles could be provided with the Ceiling Suspension depending on the model.

Illustration 2-1
Control Console



**Control Console with TFT
for Automatic and Auto-tracking with TFT
Ceiling Suspensions**



**Analogical Control Console
for Standard and Analogical Auto-tracking
Ceiling Suspension**

2.3 SUSPENSION FEATURES

The Ceiling Suspension can be provided with analog or Touchscreen Control Console.

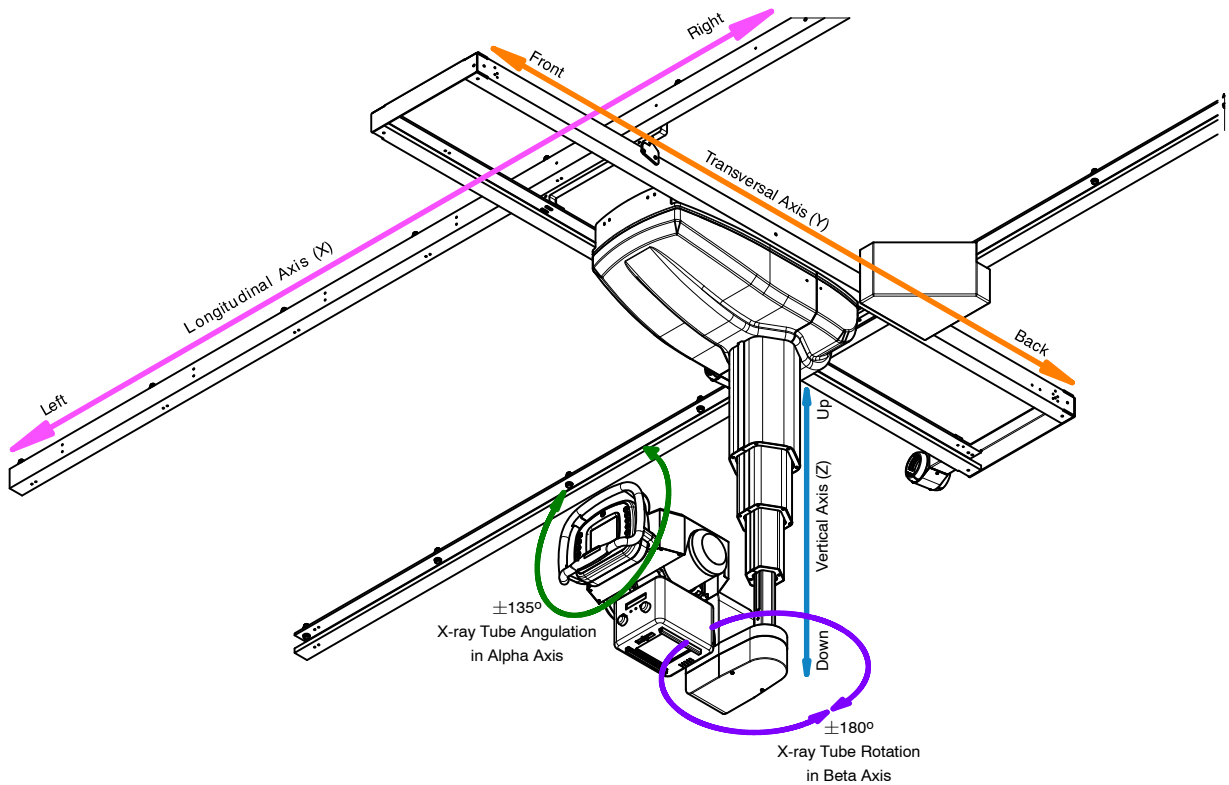
The **Standard Ceiling Suspension** is provided with analog Control Console and fully manual positioning in all axis, with Vertical Axis motorized and servo-controlled for assisted movement.

The **Auto-tracking Ceiling Suspension** is provided with analog Control Console and fully manual positioning in all axis, with Vertical Axis motorized to allow the auto-tracking function.

The **Auto-tracking Ceiling Suspension with TFT** is provided with Touchscreen Control Console and fully manual positioning in all axis with Vertical Axis motorized. The operator controls and displays for radiographic operations and X-ray Tube positioning are shown on the Touchscreen Control Console.

The **Automatic Ceiling Suspension** is provided with Touchscreen Control Console and motorized positioning in all axis for automatic movement.

Illustration 2-2
Ceiling Suspension Axes and travels



SECTION 3 ROOM REQUIREMENTS

3.1 ENVIRONMENTAL REQUIREMENTS

There are no special environmental conditions required for the safe operation of the Ceiling Suspension. However, it is not designed for the use in the presence of explosive or flammable gases as might be found in operating rooms.

Note 

STORAGE values only refer to equipment that is still in shipping containers. If the equipment is partially or completely installed, refer to IN USE values.

| ATMOSPHERIC PRESSURE | | | | RELATIVE HUMIDITY (Non-Condensing) | | | | TEMPERATURE | | | |
|----------------------|----------|---------|----------|---------------------------------------|-----|---------|-----|------------------|-------------------|-------------------|------------------|
| IN USE | | STORAGE | | IN USE | | STORAGE | | IN USE | | STORAGE | |
| MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX |
| 700 hPa | 1060 hPa | 500 hPa | 1060 hPa | 20% | 85% | 10% | 95% | 10° C (50° F) | 40° C (104 °F) | -20° C (-4° F) | 70°C (158° F) |

3.1.1 LIGHT SPECIFICATION

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

3.1.2 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.

3.2 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 Ceiling Suspension such as:

- Raceways for equipment installation.
- A plan distribution is strongly recommended prior equipment installation. Take into account dimensions, travels, operation and passing through areas. Minimum room space required to allow installation and travels of the equipments depends on:
 - Longitudinal Rails from 3358 mm (132.2") to 6000 mm (236.22").
 - Transversal Rails from 2000 mm (78.74") to 3500 mm (137.80").
 - Ceiling height. The recommended height is 2700 mm (106.30"). A height up to 2800 mm (110.23") can be used, but, in that case, the Ceiling Suspension cannot be aligned with the Wall Stand at the lowest part of the Wall Stand travel.
 - The needed distance between the Cable Rail and the Wall must be, at least, of 102 mm (4").

3.2.1 DOOR SIZE REQUIREMENTS

Minimum door sizes also apply to the hallway and elevator.

The minimum door height must be 2030 mm (80") and door width must be 1000 mm (39.3") to take delivery and install system based on a 2600 mm (102.3") 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 2150 mm (84.6") to transport the Main Assembly and other components of the System, except the Ceiling Suspension Rails.

Note 


The above dimensions are calculated as per dimensions of the shipping crates.

For dimensions and weights of the crated components refer to Table 3-1

For dimensions and weights of the uncrated components refer to Section 6.

**Table 3-1
Ceiling Suspension Crates**


| SHIPPING CRATE | DIMENSIONS | | | WEIGHT | |
|---|---------------------|-------------------|-------------------|----------------------|---------------------|
| | Length | Width | Height | GROSS | NET (UNCRATED) |
| Main Crate | 1480 mm (58.2") | 775 mm (30.5") | 995 mm (39.1") | 264 kg (582 lb) | 230 kg (507 lb) |
| Auxiliary Crate | 1065 mm (41.9") | 615 mm (24.2") | 730 mm (28.7") | 108 kg (238.1 lb) | 80 kg (176.4 lb) |
| Large Longitudinal Rails & Transversal Rails | 6200 mm (244.1") | 280 mm (11") | 350 mm (13.8") | 120 kg (264.5 lb) | 85 kg (187.4 lb) |
| Medium Longitudinal Rails & Transversal Rails | 4850 mm (190.9") | 280 mm (11") | 350 mm (13.8") | 100 kg (220.5 lb) | 65 kg (143.3 lb) |

Note  *It will be shipped always the Main Crate and the Rails Crate, Auxiliary Crate will be shipped just it is required due to the shipping needs.*

3.2.2 FLOOR AND WALL REQUIREMENTS

Not applicable.

3.2.3 CEILING REQUIREMENTS

Note  *There should not be anything mounted in the ceiling (i.e. lights, A/C returns, etc.) between the stationary rails. This is because the Ceiling Suspension may come into contact with those ceiling-mounted items during normal use.*

Stationary rails are designed for top (ceiling) mounting. Rails can be ordered and are supplied in 660.4 mm (26") increments between 3358.4 mm (132.22") and 6000 mm (236.22"), totaling five different sizes. The choice of length depends on room size, configuration and the possible presence of obstructions.

Complete details of room dimensions must be known when planning an installation. Work with the architect or building engineer and obtain approval from the customer before proceeding with the layout plan.

Methods of support that will permit attachment to structural steel or through bolts in concrete construction should be favored. Do not use anchors in direct tension.

The recommended height is 2700 mm (106.30"). A height up to 2800 mm (110.23") can be used, but, in that case, the Ceiling Suspension cannot be aligned with the Wall Stand at the lowest part of the Wall Stand travel.

Note 

Following distances can vary ± 10 mm (0.39") depending on the tube.

- The distances between the Focal Spot and the floor, with a 2700 mm (106.30") ceiling height are:
 - minimum - 393 mm (15.47").
 - maximum - 1963 mm (77.28").
- The distances between the Focal Spot and the ceiling are:
 - minimum - 737 mm (29.01").
 - maximum - 2307 mm (90.83").

The ceiling must have a structure which accepts, at least, 500 kg/m (336 lb/ft), for a safety operation.

For low ceiling height, the stationary rails may be mounted directly to the ceiling slab or to flush-mounted Unistrut or similar structure. For higher rooms in which a false ceiling is to be used, the stationary rails may be attached to rigid vertical members hung from ceiling slab. A supplementary channel may be secured to the bottom of the vertical members to facilitate provision for mounting holes. A Unistrut system or equivalent is a convenient type of support to employ.



CEILING WORK MUST BE ABSOLUTELY DONE AS REQUIRED IN THE NEXT PROCEDURE.

- Make sure that the ceiling structure complies with the Ceiling recommendations.
- Make sure that the room complies with all the room specifications.
- Make sure that the drilled holes for the Longitudinal Rails comply with the Ceiling recommendations.
- Make sure that the drilled holes for the Longitudinal Rails comply with the next specifications: **Rails are mounted on Screws M12 and quality 8.8 and 45 mm (1.77") length; and Nuts M12 class 8.**

- Mounting holes every 660.4 mm (26"), maximum distance. Check distances between holes in the table below.

Table 3-2
Holes Distances depending on the Rails Length 15 Foot Length STANDARD for AMRAD

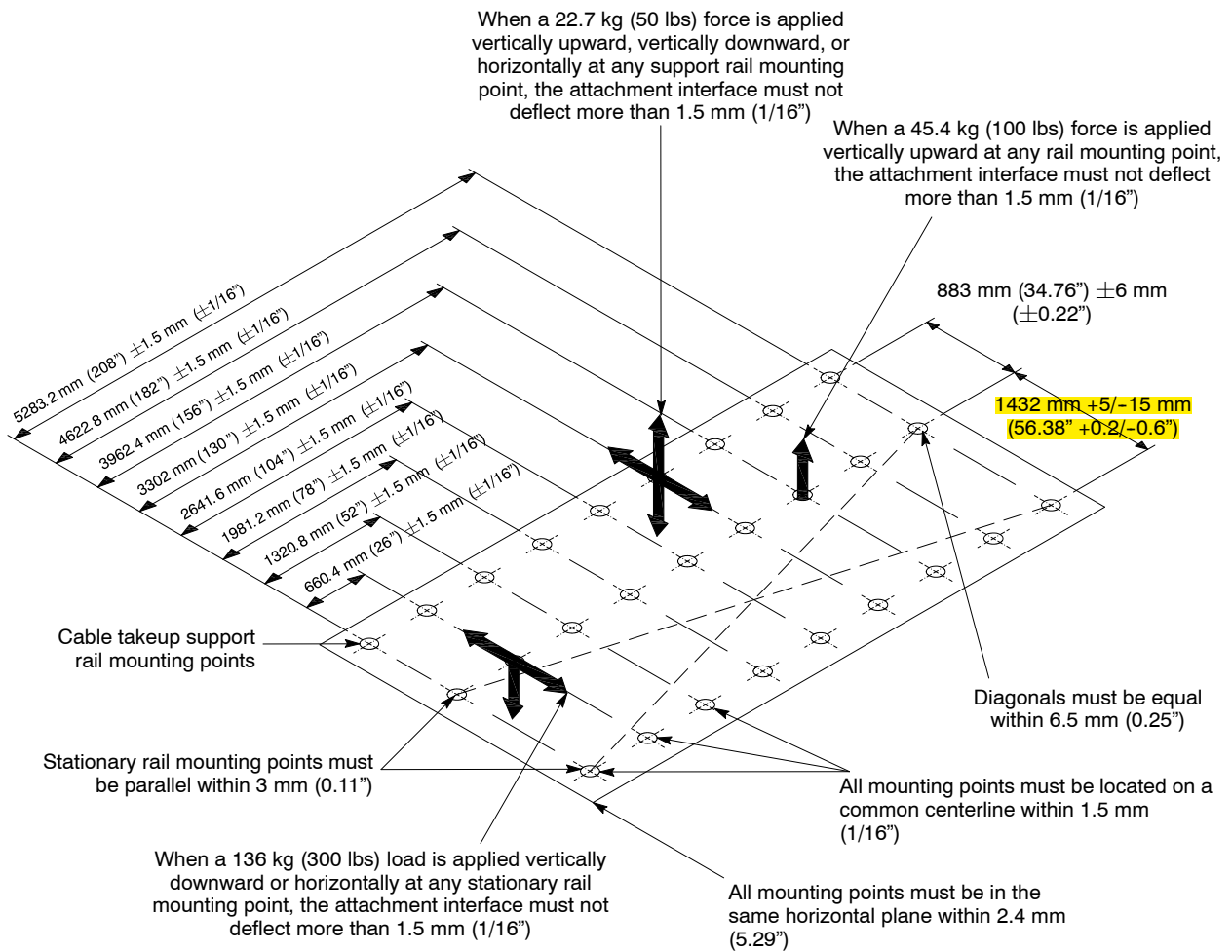
| Length | Holes Pitch | Holes | First Distance | Last Distance |
|------------------------------|---------------------------|---------------|----------------------------|----------------------------|
| 3358 mm (132.22") | 660.4 mm (26") | 6 | 28.2 mm (1.11") | 28.2 mm (1.11") |
| 4019 mm (158.22") | 660.4 mm (26") | 7 | 28.2 mm (1.11") | 28.2 mm (1.11") |
| 4679 mm (184.22") | 660.4 mm (26") | 8 | 28.2 mm (1.11") | 28.2 mm (1.11") |
| 5340 mm (210.22") | 660.4 mm (26") | 9 | 28.2 mm (1.11") | 28.2 mm (1.11") |
| 6000 mm (236.22") | 660.4 mm (26") | 10 | 28.2 mm (1.11") | 28.2 mm (1.11") |

- 156 kg (343.92 lb) load each ceiling point and screw.
- Make sure the alignment of the drilled holes in along each Longitudinal Rail and between rails are correct.
- Make sure that vertical level of the ceiling is the same along all the Longitudinal Rails.
- If a Cable Support rail is supplied, its length and part numbers are the same as those of the Longitudinal Rails. This Rail is a Strut channel (Unistrut/Alphen Rail). For its fixation, it is recommendable as minimum to drill the same holes as the drilled before for the Longitudinal Rails.
- Cable Rail Distances. If **T** means the length of the Transversal Rails, **D** the distance between the end of the Transversal Rails and the closer Longitudinal Rail, a minimum distance **A** between the Cable Guide Rail, and the closer Longitudinal Rail must be respected according to the following table:

Table 3-3
Distances between Longitudinal rail and Transverse and cable rails 10 Foot Length Standard.

| T | D | A |
|--|-----------------------------|-----------------------------|
| 2000 mm (78.74") | 284 mm (11.18") | 330 mm (12.99") |
| 2250 mm (88.58") | 409 mm (16.10") | 455 mm (17.91") |
| 2500 mm (98.42") | 534 mm (21.02") | 580 mm (22.83") |
| 2750 mm (108.27") | 659 mm (25.94") | 705 mm (27.75") |
| 3000 mm (118.11") | 784 mm (30.87") | 830 mm (32.68") |
| 3500 mm (137.80") | 1034 mm (40.71") | 1080 mm (42.52") |
| D = (Length of Transverse rail - 1432 mm [56.38"] / 2 A = D + 46 mm (1.81") | | |

Illustration 3-1
Rail Mounting Specifications



SECTION 4 PLANNING ELECTRICAL CONNECTIONS

4.1 ROUTING CABLES

4.1.1 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.

Avoid to pass the wires next to high magnetic field devices (microwaves, amplifiers, etc.)

4.1.2 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.

4.1.3 ELECTRICAL DUCTS

It is important that electrical ducts have separate compartments for power and signal wires. These wires must be kept separate 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.

4.1.4 BROADBAND NETWORK CONNECTION FOR REMOTE SERVICE

The Automatic and Autotracking with TFT Control Console equipments are optionally equipped with Broadband fast Ethernet hardware for Service diagnostics. The Ceiling Suspensions equipped with Digital Imaging are capable of placing electronic images on the Hospital image Ethernet Network. It is the purchasers responsibility to provide the Ethernet connection (rated at 100Mb/sec transfer rate for optimal performance) within 10 meters of the Suspension.

Note 

Only the Automatic and the Autotracking with TFT Control Console models can be optionally provided with Broadband Network connection, depending on the customer's request.

The network connection is made at the Suspension.

- 100BaseT network connection is preferred.
- 10BaseT network connection is acceptable.

To enable an easier installation and to benefit from remote support (service and engineering teams), equipments should be Insite 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 RJ45 dedicated to connect the new equipment on the LAN. In case of Broadband, this connection will also be used for the remote service of the equipment.

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.

In case Broadband is not available: Modem. A dedicated phone line using a RJ11 used only for the connection to a modem must be located at 1 m maximum from the operator Control Console. This line will be a direct classical phone line.

4.1.5 SYSTEM INTERCONNECTIONS

System interconnect cables are described in the General Wiring Schematics shipped with the system. These documents specify all interconnections between components within the system and its options.

For specific interconnections maps and connection details, refer to the Service Manual shipped with the system.

SECTION 5 ELECTRICAL REQUIREMENTS

To ensure proper operation of the Ceiling Suspension:

- Size feeder and ground wires as 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 10Ω.**

The electrical requirements in this document (wire sizes, etc.) relating to the Ceiling Suspension power and Power Line are the recommended specification.



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



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

5.1 POWER LINE REQUIREMENTS

| FREQUENCY (HZ) | | VOLTAGE (V~) | | MAX CURRENT (A) | |
|----------------|-----|--------------|-----|-----------------|-----------|
| MIN | MAX | MIN | MAX | at 115 V~ | at 240 V~ |
| 50 | 60 | 115 | 240 | 3.5 | 1.6 |

Circuit Breaker type and value, differential sensitivity (mA), Generator stand-by consumption(W), should be:

| LINE VOLTAGE | CIRCUIT BREAKER TYPE | | |
|--------------------------|----------------------|---|---|
| | B | C | D |
| 115 - 240 V~ | 16 A | | |
| Differential Sensitivity | 30 mA | | |
| Standby Consumption | 400 W | | |

5.2 RECOMMENDED WIRE SIZE

Correct sizing of the feeder wires is critical to proper Ceiling Suspension operation. The recommended wire size is the same for all Ceiling Suspension power, line voltage and distances from distribution transformer to the equipment. **The wire size is 1.5 mm² AWG16 and 20 m long.**

5.3 SAFETY DEVICES

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

Devices such as Safety Switch / Emergency Switch, Warning Light, and a Door Interlock Switch should be supplied and installed by the customer. (*Refer to Illustration 5-1*).

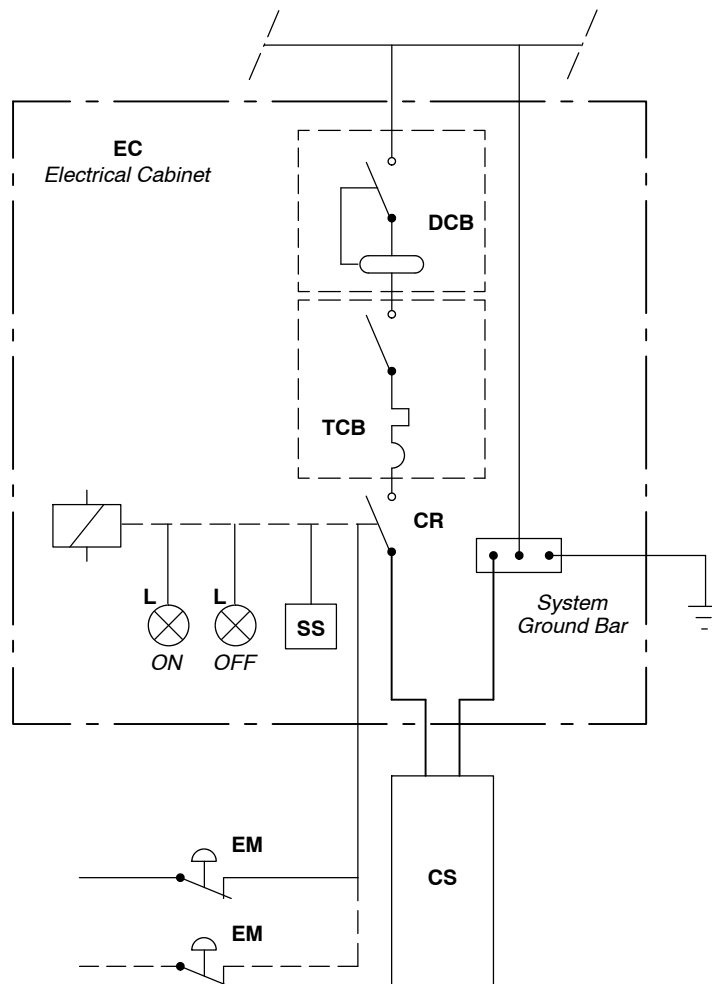
SAFETY SWITCH / EMERGENCY SWITCH

The main Safety Switch should be installed in the Room Electrical Cabinet (Main Disconnect) close to the Ceiling Suspension 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 (Room Disconnect) so that they cut power to the Generator when they are activated.

The rating of these switches should be: 10 A, 500 VAC, NC.

Illustration 5-1
Room Electrical Cabinet and Mains Connection



LEGEND

- EC:** Electrical Cabinet (Room Disconnect) for powering X-ray equipment. (*Customer supplied*)
- DCB:** Differential Circuit Breaker.
- TCB:** Thermomagnetic (or Fuses) Circuit Breaker.
- CR:** Contactor controlled by the Safety Switch (**SS**).
- SS:** Safety Switch used for Ceiling Suspension 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.
- CS:** Ceiling Suspension.

5.4 SYSTEM CABLE INFORMATION

5.4.1 SUGGESTED CABLE RUN

1. Cable duct: 200x50 mm (7.87x1.97") on floor.
2. Cables output: 200x100 mm (7.87x3.94") on floor over (1).
3. Cables output: 200x100 mm (7.87x3.94") on floor over (1).
4. Cables output: 200x100 mm (7.87x3.94") on floor over (1).
5. Cables output: 200x100 mm (7.87x3.94") on floor over (1).
6. Wall Support of 200x50 mm (7.87x1.97") connected to (1) with cable output over the useful ceiling.
7. Electrical Cabinet connected to (5).
8. ON/OFF buttons panel for the Electrical Cabinet (7).
9. Emergency-OFF Switch of the Electrical Cabinet (7) on wall, 1200 mm (47.24") height.
10. Lead screen.

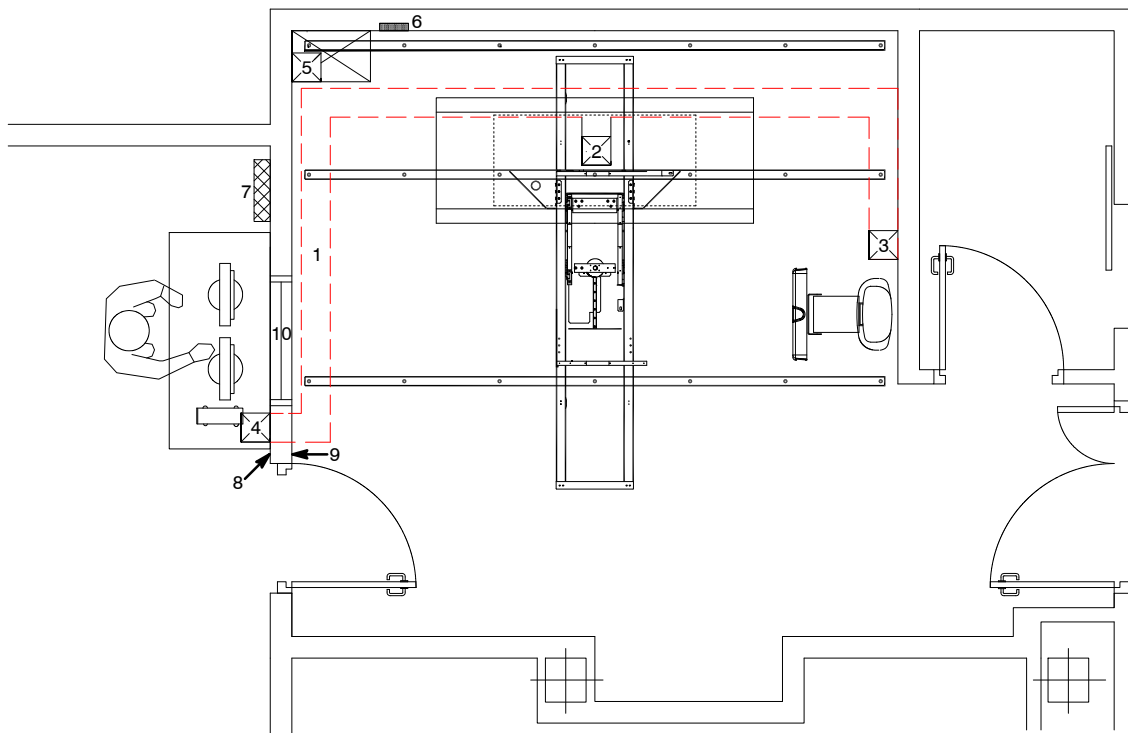
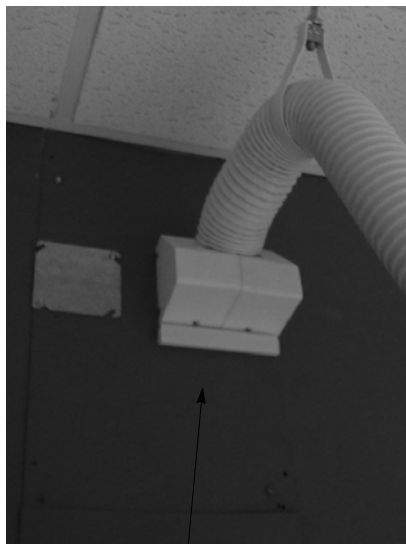


Illustration 5-2
Cable Access

WALL SUPPORT



External duct



Internal duct

CEILING SUSPENSION



Ceiling Suspension

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SECTION 6 PRODUCT CHARACTERISTICS

This section provides product information and illustrations showing physical dimensions, weight and normal access areas for cabling and service.

POWER LINE REQUIREMENTS

Power Line for Ceiling Suspension:

| | |
|-----------------------|--------------|
| Voltage | 115 – 240 V~ |
| Maximum Current | 3.5 – 1.6 A |
| Frequency | 50 / 60 Hz |
| Input Power | 0.5 kVA |

| | |
|--------------------------------|--------------------------------|
| Power line for Collimator Lamp | 24 VAC, 6.5 A 50 / 60 Hz |
|--------------------------------|--------------------------------|

OPERATING ENVIRONMENTAL CONDITIONS

| | |
|--|-----------------|
| Temperature range | 10 °C to 40 °C |
| Relative Humidity range (non-condensing) | 20% to 85% |
| Atmospheric Pressure range | 700 to 1060 hPa |

STORAGE / TRANSPORT ENVIRONMENTAL CONDITIONS

| | |
|--|-----------------|
| Temperature range | -20 °C to 70 °C |
| Relative Humidity range (non-condensing) | 10% to 95% |
| Atmospheric Pressure range | 500 to 1060 hPa |

PRODUCT CHARACTERISTICS

- Dimensions
 - Maximum Height 2641 mm (103.98")
 - Minimum Height 1068 mm (42.05")
 - Width 3500 mm (137.79") Max
 - Length 6000 mm (118.1") Max

- Distance between Longitudinal Rails 1432 +5/-15 mm
(56.38" +0.2/-0.6)

- Weights
 - Main assembly and Control Console 230 kg (507.06 lb)
 - Longitudinal and Transversal Rails ... 85 kg (187.39 lb) Max
 - X-ray Tube, Collimator, Hose and cables .. 80 kg (176.37 lb)

- Travels
 - Max. longitudinal for 6000 mm rails 4866 mm (191.6")
with End Stops at the end * 5166 mm (203.3")

Note 

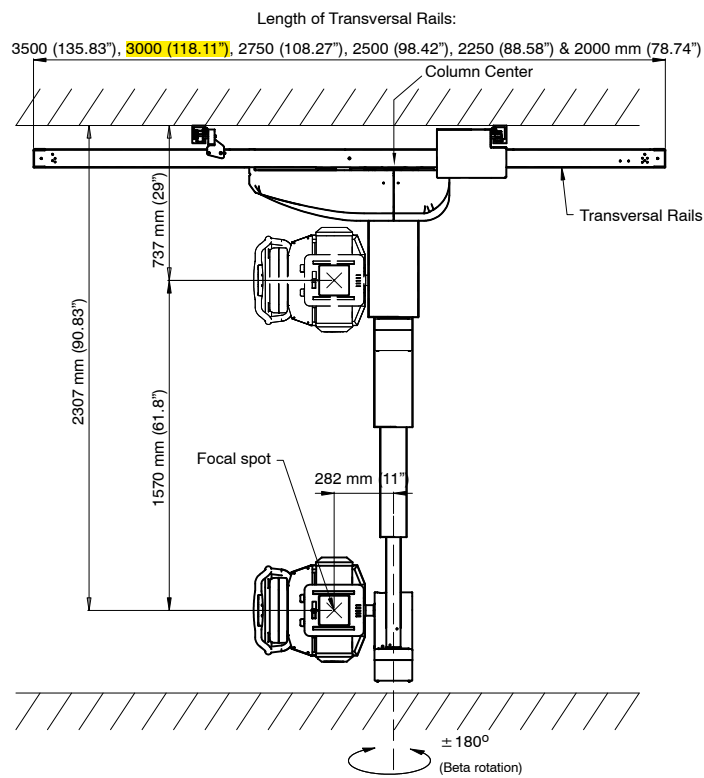
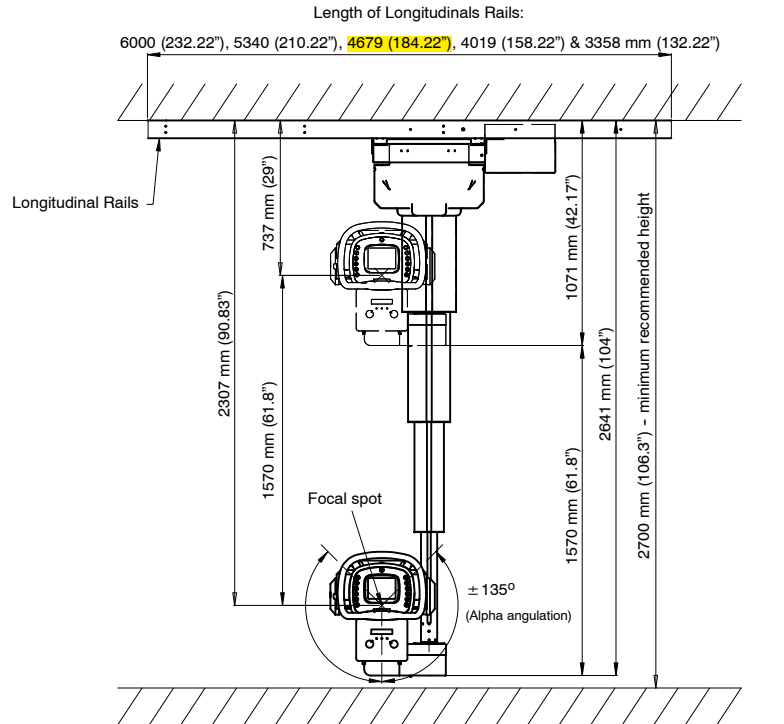
End Stops mounted at the end of the Longitudinal Rails just for Auto-tracking Ceiling Suspensions.

- Transversal travel 1901 mm (74.84") Max
- Vertical travel 1570 mm (61.81")

- X-ray Tube rotation (Beta Axis) $\pm 180^\circ$
- X-ray Tube angulation (Alpha Axis) $\pm 135^\circ$

- Maximum and Minimum SID from X-ray Tube facing the Table and Wall Stand depends on the Room dimensions and longitudinal Rails of the unit.

Illustration 6-1
Dimensions and Travels (Steering Wheel Control Console)



Ceiling Suspension

Pre-Installation

Table 6-1

Rails Dimensions and Carriage Travels AMRAD Standard Length Rails are highlighted

| Longitudinal Rails Length | Carriage Longitudinal Travel * | Distance from the column's center | |
|---------------------------|--------------------------------|-----------------------------------|------------------------------|
| | | To the Left | To the Right |
| 3358 mm (132.22") | 2224 mm (87.57") | 405 mm (min) 15.94" (min) | 729 mm (min) 28.70" (min) |
| 4019 mm (158.22") | 2885 mm (113.57") | | |
| 4679 mm (184.22") | 3545 mm (139.57") | | |
| 5340 mm (210.22") | 4206 mm (165.57") | | |
| 6000 mm (236.22") | 4866 mm (191.57") | | |

* With the End Stops position changed the travel can be increased 300 mm (11.81"), just for Auto-tracking Ceiling Suspensions.

| Transversal Rails Length | Carriage Travel | Distance from the column's center | |
|--------------------------|------------------------|-----------------------------------|------------------------------|
| | | To the Front | To the Back |
| 2000 mm (78.74") | 901 mm (35.4") | 762 mm (min) 30" (min) | 343 mm (min) 13.50" (min) |
| 2250 mm (88.58") | 1151 mm (45.3") | | |
| 2500 mm (98.42") | 1401 mm (55.1") | | |
| 2750 mm (108.27") | 1651 mm (65") | | |
| 3000 mm (118.11") | 1901 mm (74.8") | | |
| 3500 mm (137.80") | 2401 mm (94.5") | | |

Illustration 6-2

Focal Spot Travel

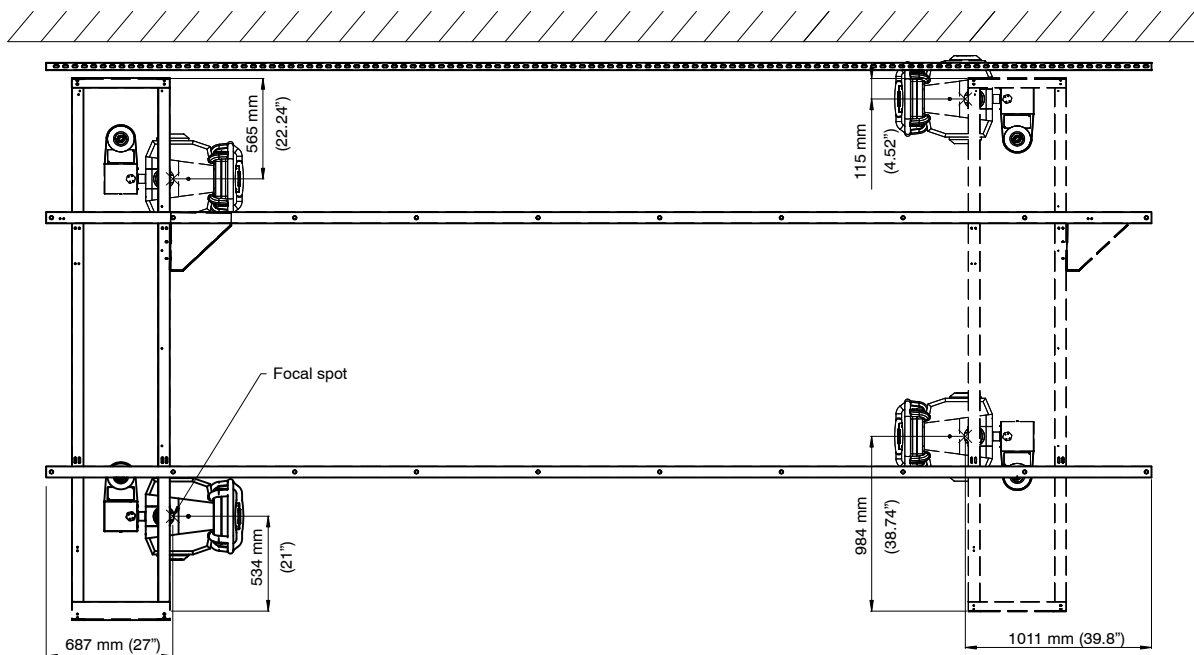


Illustration 6-3
Rails Dimensions and Travels

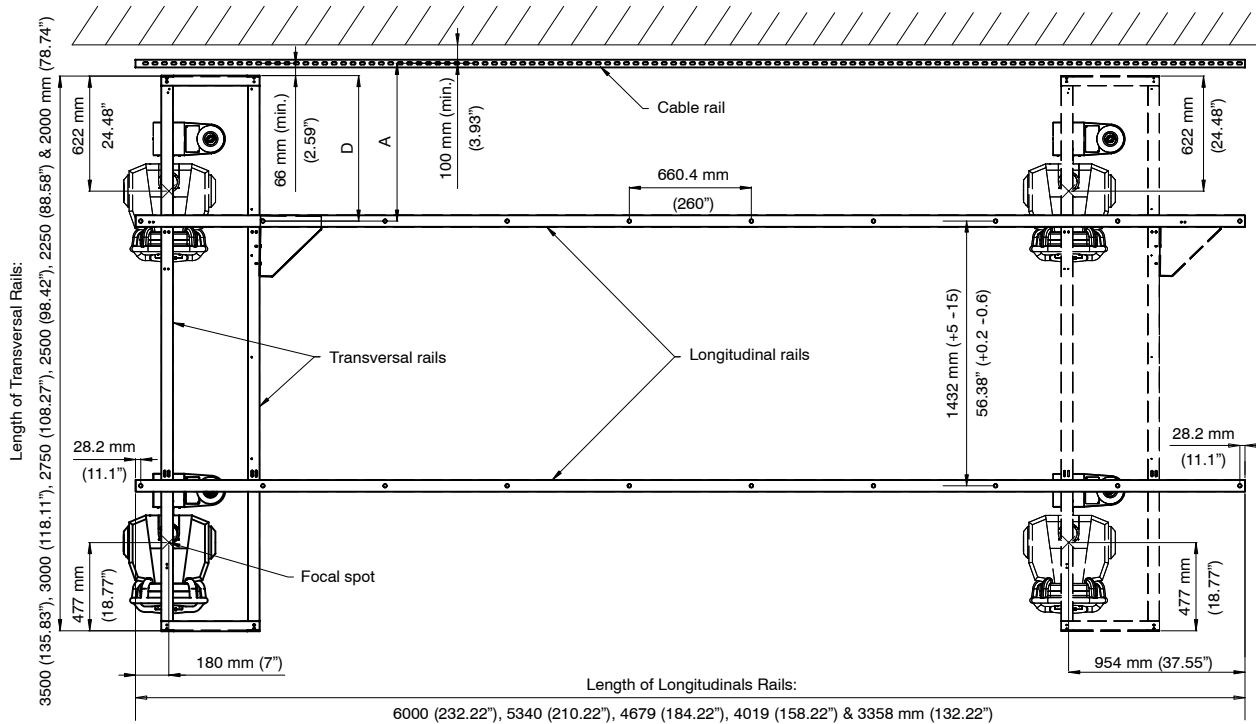


Table 6-2
Distances between Longitudinal rail and transversal and cable rails

| Transversal Rails Length | D | A |
|--------------------------|------------------|------------------|
| 2000 mm (78.74") | 284 mm (11.18") | 330 mm (12.99") |
| 2250 mm (88.58") | 409 mm (16.10") | 455 mm (17.91") |
| 2500 mm (98.42") | 534 mm (21.02") | 580 mm (22.83") |
| 2750 mm (108.27") | 659 mm (25.94") | 705 mm (27.75") |
| 3000 mm (118.11") | 784 mm (30.87") | 830 mm (32.68") |
| 3500 mm (137.80") | 1034 mm (40.71") | 1080 mm (42.52") |

$D = (\text{Length of transversal rail} - 1432 \text{ mm} - 56.38") / 2$
 $A = D + 46 \text{ mm} (1.81")$

Ceiling Suspension

Pre-Installation

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SECTION 7 ROOM LAYOUT

7.1 RADIATION PROTECTION

Because X-ray equipment produces radiation, you may need to take special precautions or make special site modifications. The manufacturer 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.

7.2 CLINICAL ACCESS

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

- Provide easy access to the equipments.
- 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 Control 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.

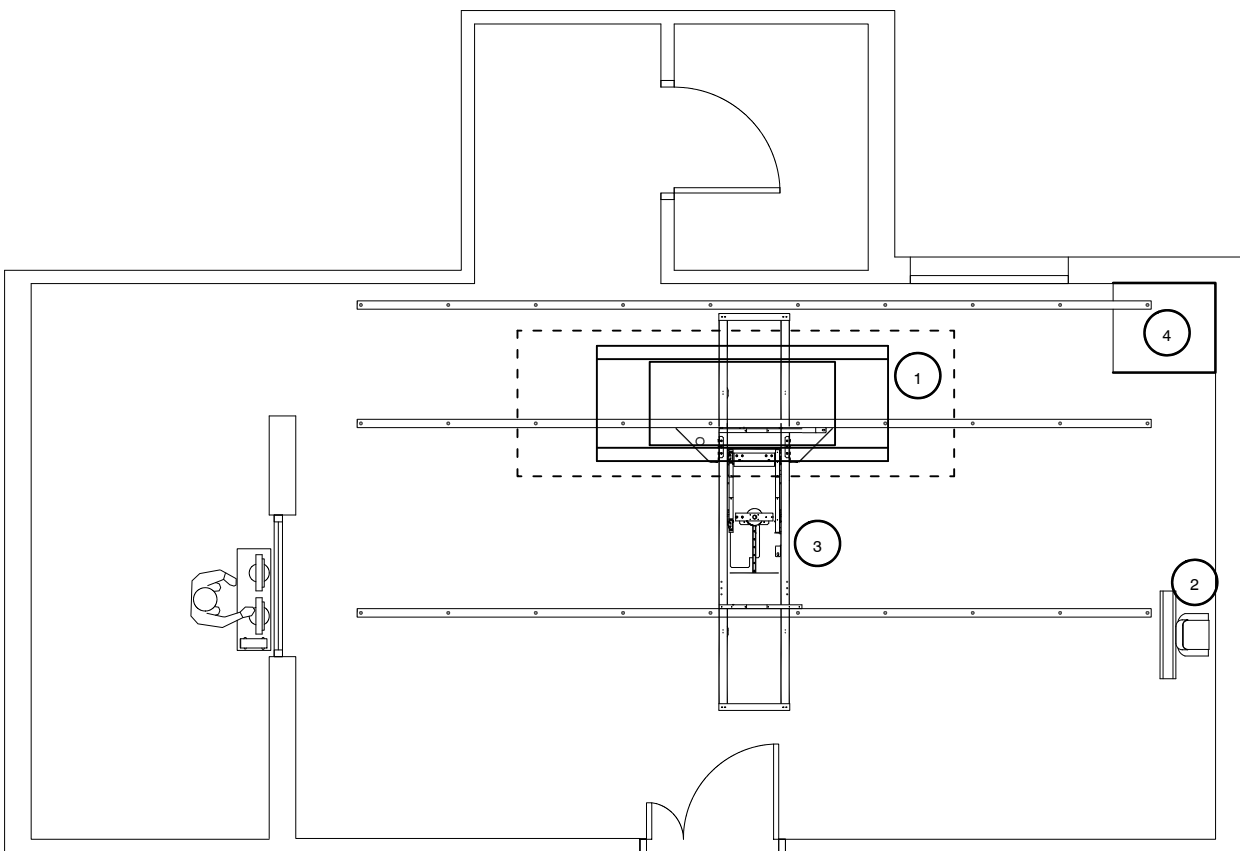
7.3 SERVICE ACCESS

Allow appropriate space for service access of the equipment.

7.4 ROOM LAYOUTS

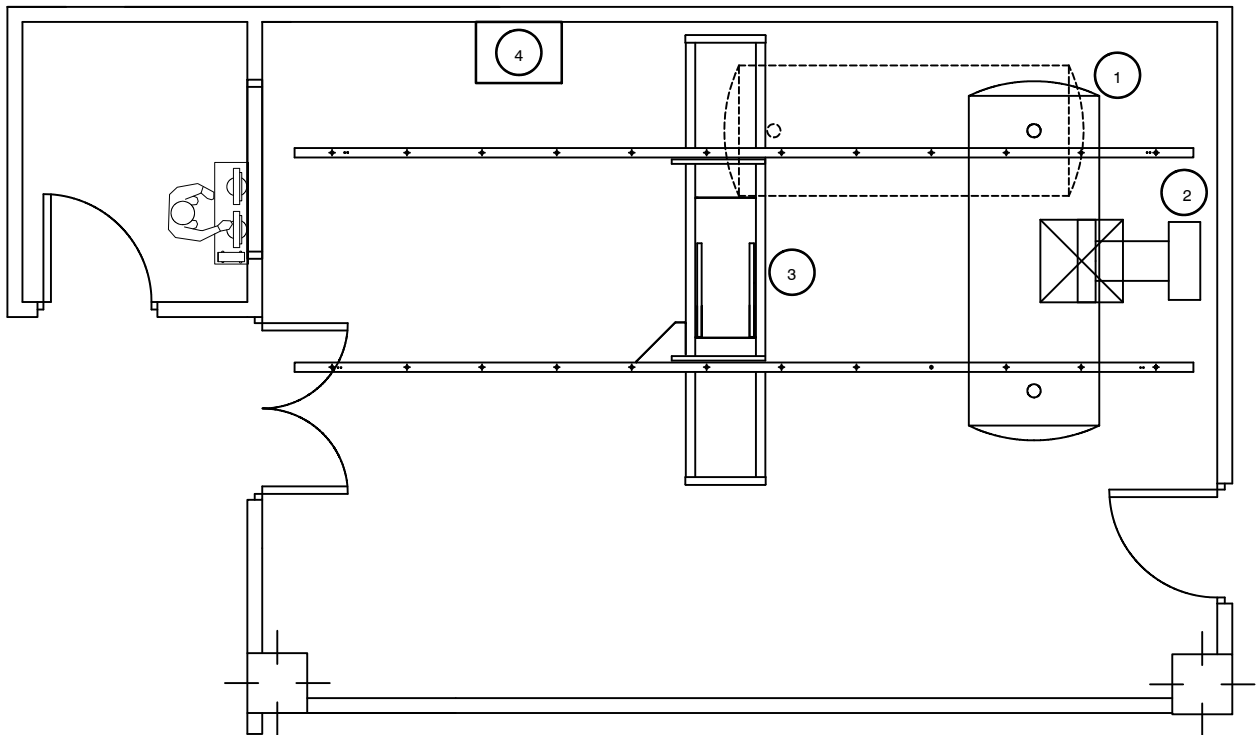
The following illustrations show the typical Room Layout for 6000 mm Longitudinal Rails and 3000 mm Transversal Rails. The Wall Stand can be provided with its Handle installed at the left or right side.

Illustration 7-1
Typical Room Layout for Double Panel System



1. Elevating Table.
2. Wall Stand.
3. Ceiling Suspension.
4. X-ray Generator.

Illustration 7-2
Typical Room Layout for Single Panel System



1. Mobile Table.
2. Wall Stand.
3. Ceiling Suspension.
4. X-ray Generator.

Ceiling Suspension

Pre-Installation

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SECTION 8 PLANNING AIDS

8.1 TOOLS AND EQUIPMENT CHECKLIST

| TOOLS AND EQUIPMENT CHECKLIST <i>The following tools and materials are needed for installation but are not shipped with the product:</i> | COMPLETED |
|--|------------------|
| Standard service engineer's tool kit. | |
| Lever. | |
| Electric and hammer drill. Assorted masonry and high-speed bits in both metric and SAE sizes. | |
| Assorted sizes of tongue and groove pliers, hammers, hex wrenches (metric and SAE), screw drivers, and metal files. | |
| Ceiling anchoring hardware. | |
| 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. | |
| Movers, dollies, ladders, shop vacuum, and push-broom. | |

8.2 PREPARING THE DELIVERY ROUTE

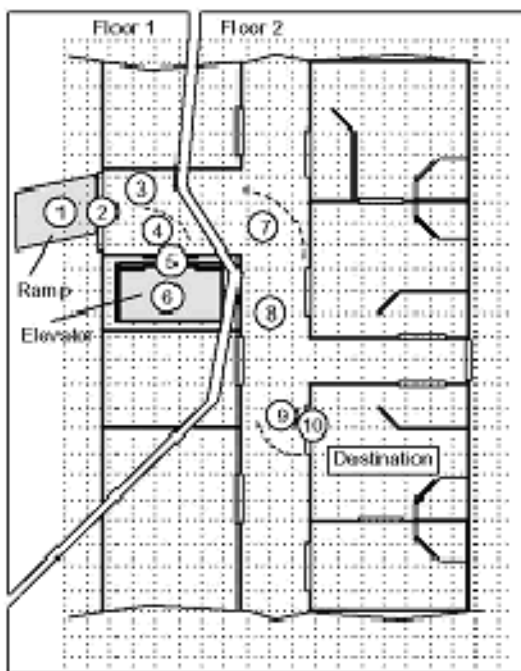
Note 

Refer to Section 3.2.1 "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 8-1
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 radius, 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.

8.3 PRE-INSTALLATION CHECKLIST

| | |
|-----------------------|--|
| Delivery Date: | |
| Sales Person: | |
| Customer: | |
| FDO No.: | |
| Room # | |
| Equipment: | |

| PHYSICAL REQUIREMENTS OF SITE | COMPLETED |
|---|------------------|
| 1. Room size adequate for intended equipment configuration? | |
| 2. Ceiling is 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, suspensions, ceiling materials have been provided? | |
| 8. Support structures installed for ceiling mounted equipment? | |
| 9. Ceiling Unistrut rails leveled? | |
| 10. Has floor been modified for cable ducts? | |
| 11. Electrical service in place – at the ratings specified in Pre-installation documentation? | |
| 12. Power available to operate power tools? | |
| 13. 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? | |

Ceiling Suspension

Pre-Installation

| GENERAL | COMPLETED |
|--|-----------|
| 1. 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. Have all fire/safety inspections for occupancy been completed? | |
| 13. Send completed checklist to the installation team. | |

| COMMENTS |
|----------|
| |

| INSPECTION DATE(S) |
|--------------------|
| |

| INSTALLATION PROJECT MANAGER SIGNATURE |
|--|
| |