PHILIPS

Philips Medical Systems

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Revisions

Note for Architects and/or Contractors: "If revisions are listed, these drawings must be thoroughly reviewed so that all changes can be incorporated into your project"

Rev. Level	Date	Revision Descriptions	By
A	5/24/06	Final Package Added.	JPG
B	5/24/06	Final Package Added. Change A1 sheet to conform to room dimensions. Updated location of LCC. Updated S1 and E1	RF
		sheets. Updated drawing using latest SRD specifically AN1, EN2, E1, MP1, MP3 sheets.	

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- VA Iowa City -
Iowa City, IA
Achieva Nova 1.5T

Date 9-18-06

O.A. Number 9004000

Drawn By Florido, Ryan

Quote Number 1-3EIXLX Rev. 1

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C1

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Electrical Requirements

Supply Configuration: 3 phase, 3 wire power and ground.

Nominal Line Voltage: 208, 240, 380, 480 VAC, 60 Hz.

Branch Power Requirement: 75 kVA

Circuit Breaker: 3 pole, 200 (for 208 VAC), 175 (240 VAC), 125 (308 VAC), 100 Amps (480 VAC)

(03.0)

HVAC Requirement for General Equipment Locations

Heating, ventilation, air conditioning requirements concern all rooms (equipment room, magnet room, and control room) and must be maintained 24 hours a day, 7 days a week.

Examination Room:

Operating Temperature: 68° to 75° F (20° to 24° C)
Relative Humidity: 40% to 60%, non-condensing
Air Conditioning Capacity: 6830 btu / hr (2 kW)
- Energy dissipated in the examination room will be removed from the room by an additional air exhaust system.
- Gradient coil heat dissipation (3415 to 40949 btu / hr [1 to 12 kW]) will be removed via liquid cooling of the gradient coil.

Equipment Room:

Temperature: 59° to 75° F (15° to 24° C)
Maximum Temperature Change: 9° F (5° C) per 10 minutes
Relative Humidity: 30% to 70%, non-condensing
Air Conditioning Capacity:
- At Standby: 17076 btu / hr (5 kW)
- Peak Dissipation Scanning: 37567 btu / hr (11 kW)

Control Room:

Temperature: 64° to 75° F (18° to 24° C)
Maximum Temperature Change: 9° F (5° C) per 10 minutes
Relative Humidity: 30% to 70%, non-condensing
Air Conditioning Capacity: 1708 btu / hr (0.5 kW)

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Minimum Site Preparation Requirements

A smooth efficient installation is vital to Philips and their customers. Understanding what the minimum site preparation requirements are will help achieve this goal. The following list clearly defines the requirements which must be fulfilled before the installation can begin.

1. Walls to be painted or covered, baseboards installed, floors to be tiled and/or covered, ceiling shall have grid tiles and lighting fixtures installed.

2. Doors and windows, especially radio frequency shielding, installed and finished with locksets operational.

3. All electrical convenience, conduit, raceway and junction boxes installed.

4. Incoming mains power operational and connected to room MR mains breaker.

5. 115V convenience outlets operational.

6. All support structures correctly installed. All channels, pipes, beams and/or other supporting devices should be level, parallel, and free of lateral or longitudinal movements.

7. All contractor supplied cables pulled and terminated.

8. A dust-free environment in and around the procedure room.

9. All HVAC (heating, ventilating and air conditioning) installed and operational as per specifications.

10. Architectural features such as computer floor, wood floor, casework, bulkheads, installed and finished. When technical cabinets are installed in a closet with doors, it is suggested that the customer install a temperature alarm in the event of an air conditioning failure.

11. All plumbing installed and finished.

12. Philips does not install or connect developing tanks, automatic processors or associated equipment, built in illuminators, cassette pass boxes, loading benches and cabinets, lead protective screens, panels or lead glass window and frame. This is to be done by the customer/contractor.

13. Clear door openings for moving equipment (excluding the delivery of the magnet) into the building is recommended to be 48" (1219 mm) W x 83" (2100 mm) H minimum, minimum 32" (800 mm) W x 83" (2100 mm) or larger contingent on an 8'-0" (2438 mm) corridor width. Door into exam room and pathway leading into exam room after installation for gradient coils needs to be 48" (1219 mm) W x 83" (2100 mm) H minimum, contingent on an 8'-0" (2438 mm) corridor width.

14. The magnet is the only system part that in most cases cannot be transferred through the door of the RF enclosure. A special opening to allow its installation in the enclosure must therefore be made available. Without a rotation tool, the minimum transfer opening dimensions are 8' - 3" (2500 mm) H x 6' - 11" (2100 mm) W. With a rotational tool, the minimum transfer opening dimensions are 6' - 11" (2106 mm) H x 5' - 10" (1776 mm) W. **Refer to AD2 sheet in final package for additional details.**

15. Internet access is required to be available in the control area prior to the delivery of the system for Web FSE access. **See sheet EN2 of final drawing package for details.**

16. Remote Service Diagnostics - Medical imaging equipment to be installed by Philips Medical Systems is equipped with a service diagnostic feature which allows for remote and on site service diagnostics. To establish this feature, a RJ45 type ethernet 10/100/1000 Mbit network connector must be installed as shown on plan. Access to customer's network via their remote access server is needed for Remote Service Network (RSN) connectivity. All cost with this feature are the responsibility of the customer. **See Sheet N1 of final drawing package for details.**

Note
Once Philips has moved equipment into the suite and started the installation, the contractor shall schedule his work around the Philips installation team on site. It is suggested that a telephone be provided in the room to receive telephone calls. This would alleviate facility staff from answering calls for Philips personnel.

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General Specifications

1. Responsibility

The customer shall be solely responsible, at its expense for preparation of site, including any required structural alterations. The site preparation shall be in accordance with plans and specifications provided by Philips. Compliance with all safety electrical and building codes relevant to the equipment and its installation is the sole responsibility of the customer. The customer shall advise Philips of conditions at or near the site which could adversely affect the carrying out of the installation work and shall ensure that such conditions are corrected and that the site is fully prepared and available to Philips before the installation work is due to begin. The customer shall provide all necessary plumbing, carpentry work, or conduit wiring required to attach and install products ready for use.

2. Permits

Customer shall obtain all permits and licenses required by federal, state / provincial or local authorities in connection with the construction, installation and operation of the products and shall bear any expense in obtaining or in complying with any related rules, regulations, ordinances and statutes.

3. Asbestos and Other Toxic Substances

Philips assumes no hazardous waste (i.e., pcb's in existing transformers) exists at the site. If any hazardous materials are found, it shall be the sole responsibility of the customer to properly remove and dispose of this material at their expense. Any delays caused in the project for this special handling shall result in Philips time period for completion being extended by like period of time. Philips assumes that no asbestos material is involved in this project in any ceilings, walls or floors. If any asbestos material is found anywhere on the site, it shall be the customer's sole responsibility to properly remove and/or make safe this condition, at the customer's sole expense.

4. Labor

In the event local labor conditions make it impossible or undersirable to use Philips' regular employees for such installation and connection, such work shall be performed by laborers supplied by the customer, or by an independent contractor chosen by the customer at the customer's expense, and in such case, Philips agrees to furnish adequate engineering supervision for proper completion of the installation.

5. Schedule

The general contractor should provide Philips with a schedule of work to assist in the coordination of delivery of Philips supplied products, which are to be installed by the contractor, and the delivery of the primary equipment.

6. Extended Installation or Turnkey Work by Philips.

Any room preparation requirements for Philips equipment indicated on these drawings is the responsibility of the customer. If an extended installation or turnkey contract exists between Philips and the customer for room preparation work required by the equipment represented on these drawings, then some of the responsibilities of the customer as depicted in these drawings may be assumed by Philips. In the event of a conflict between the work described in the turnkey contract workscope and these drawings, the turnkey contract workscope shall govern.

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- VA Iowa City -
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08.30.06

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O.A. Number 9004000

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Quote Number 1-3EIXLX Rev. 1

Project Number N-MID060126 Rev. B

AN1

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Magnetic Field Homogeneity

I. Magnetic Field Homogeneity
Image quality is dependant on the homogeneity of the main magnetic field (B0). The homogeneity of the magnetic field can be distorted by static ferromagnetic objects such as ferrous floor reinforcement (i.e. rebar), ferrous structural beams, ferrous cabinets, motors, generators, transformers, etc.

Image quality is also dependant on the stability of the main magnetic field (B0). Variations of B0 can cause image artifacts such as ghosting. Moving ferromagnetic objects, such as cars, trains, and elevators can cause such B0 variations.

Current in power lines can also cause such a B0 variation. The amplitude of the B0 variation will decrease as the distance of the disturbing source to the magnet increases. For this reason, there is a minimum required distance to the magnet for every type of moving object or power line depending upon its properties (such as weight, current, etc.). Only disturbances measured in the Z-axis (direction of the patient table) are important regarding image quality.

If it is expected that a specific site location will violate the magnet's requirements, then the possible solutions will depend on the source of disturbances and the construction of the site. To help indicate the possible disturbances, influences of the magnetic field's stability can be classified into seven categories:

1. Influence of static ferromagnetic objects
2. Influence of moving ferromagnetic objects (cars, elevators, etc.)
3. Moving magnetized objects
4. Trains, subways, etc.
5. Influence of electromagnetic fields
6. Sensitivity to static magnetic fields
7. Coherent and non-coherent vibrations

1. Influence of Static Ferromagnetic Objects

a. **Floor Reinforcement:** To avoid unshimmable inhomogeneities, the average concentration of the ferromagnetic reinforcement of the floor should not exceed 5.12 lbs / ft² (25 kg / m²) in a square area of 9' - 10" x 9' - 10" (3 m x 3 m) symmetrically around the isocenter of the magnet. The reinforcement should be equally spread over the floor (ferromagnetic beams in the floor are not allowed).

b. **Ferromagnetic beams perpendicular to the Z-axis of the magnet** must be located at least 49.2" (1.25 m) from isocenter of the magnet.

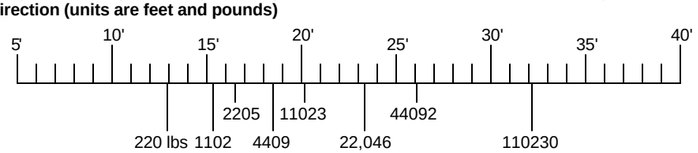
c. **All other ferromagnetic beams** must be located at least 63" (1.6 m) from isocenter of the magnet.

d. **Substantial ferromagnetic objects** or structures must be located at a minimum distance of 8' - 3" (2.5 m) from isocenter of the magnet.

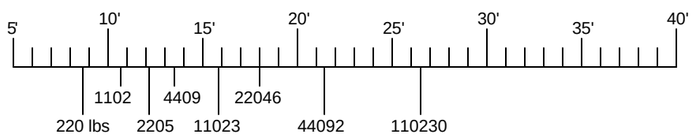
2. Influence of Moving Ferromagnetic Objects

a. **Minimum Distances:** Ferromagnetic objects such as trucks, cars, and trolleys are magnetized by the earth's magnetic field and can also be magnetized by the magnet's fringe field (when they are within this field). The following table shows the minimum distances allowed for moving ferromagnetic objects must be from isocenter.

Weight of Moving Ferromagnetic Object Versus Distance from Isocenter Along the Z Direction (units are feet and pounds)



Weight of Moving Ferro-Magnetic Object Versus Distance from Isocenter Along the X or Y Direction (units are feet and pounds)



b. **Possible Counter Measures:** If minimum given distances are not met, image quality problems are likely to occur. B0 variations can be measured at various angles in order to find the most optimum angle to site the future Z-axis of the MR system if the distances or the angle to the isocenter are not exactly known. If minimum distances are not met, contact local Philips service to test and evaluate the site.

Magnetic Field Homogeneity - Continue

3. Moving Magnetized Objects

a. **Minimum Distances:** Some ferromagnetic objects are magnetized because of local high currents or because they repeatedly enter the fringe field of the magnet (e.g. elevators). In this case, the B0 variation can be higher. A safety distance can be found by multiplying the weight of the moving ferromagetnetized mass by **10** and compare the outcome with the table in section 2, "Influence of Static Ferromagnetic Objects".

4. Trains, Trams, and Subways

a. **Minimum Distances:** Electric trains, tramways, and subways (typically) are powered by electrical traction. For railways with overhead power lines, the current through the power lines (and the returning current through the rails) will induce high magnetic field variations that will extend over a large region. These fields will have a small variation in the direction perpendicular to the power lines. Therefore, B0 variation depends on the distance from the power line to the isocenter, the current, and the angle between the power line and the magnet's axis (0° is parallel to Z-axis). The following table shows the minimum distance allowed (in feet) for electrically powered rail systems versus current and its angle to the magnet Z-axis.

Distance (feet) for Electrically Powered Subways and Trains	Angle (degrees), 0° is parallel to Z-axis						
	0°	15°	30°	45°	60°	75°	90°
Current = 750 Amps	59' (18 m)	65.5' (20 m)	69' (21 m)	72' (22 m)	75.5' (23 m)	79' (24 m)	79' (24 m)
Current = 2000 Amps	85' (26 m)	92' (28 m)	98.5' (30 m)	105' (32 m)	108' (33 m)	111' (34 m)	111' (34 m)

* Note that for short distances, the weight of the trains must also be considered.

b. **Possible Counter Measures:** B0 variations can be measured at various angle in order to find the most optimum angle to site the future Z-axis of the MR system if the distances or the angle to the isocenter are not exactly known. Contact local Philips service to arrange a test and evaluate the site.

5. Influence of Electromagnetic Fields

a. **Minimum Distances:** Currents in power lines, large transformers or electric motors near a MR system can affect the stability of the magnetic field since they also produce electromagnetic fields. The following table shows the minimum distances allowed:

Object with Electromagnetic Field		Safety Distance From Magnet Isocenter
Power Line	500 Amps	197" (5 m)
Transformer	650 kVA	394" (10 m)
Motor	30 kVA	197" (5 m)

In cases with other values, a safety distance can be calculated by using the following formula:

[Square Root (new value / table value)] x [table safety distance] = new safety distance

b. **Possible Counter Measures:** B0 variations can be measured at various angle in order to find the most optimum angle to site the future Z-axis of the MR system if the currents, distances, or the angle to the isocenter are not exactly known. Contact local Philips service to arrange a test and evaluate the site.

6. Sensitivity to Static Magnetic Fields

a. **Minimum Distances:** If an MR system be installed next to another MR system, ensure that the strength of the magnet field from the other system does not exceed the specified values at isocenter of the Intera system. If the field is between certain values, then the magnet must be re-shimmed when the other system's field goes on or off.

Allowed Field Strength of Another MR System at Isocenter of the Intera System	
Field Strength of Other System at Intera Isocenter	**Result**
< 0.5 Gauss (0.05 mT)	Always Possible
> 0.5 Gauss (0.05 mT) AND < 3 Gauss (0.3 mT)	Re-shimming Required
> 3 Gauss (0.3 mT)	Not Allowed

Note that these values are for Philips magnets only. Information from other systems must be given by that vendor.

Magnetic Field Homogeneity - Continue

7. Coherent and Non-Coherent Vibrations

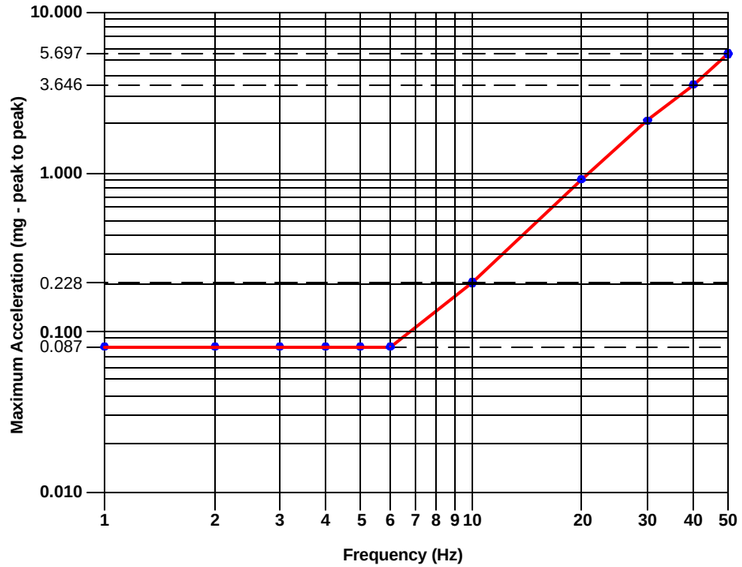
a. **Floor Vibration Testing:** Floor vibrations can affect the stability of the magnetic field which can then lead to poor image quality. **In order to evaluate the acceptance of a site, a visual survey of the site is required by local Philips service**. If a potential issue is noticed, then environmental testing is required. Measurements are to be completed by local Philips service and evaluations are completed by Philips Site Planning department. Contact local Philips service to arrange an environemental test and evaluation.

b. **Specifications**:

- **Coherent Vibration:** Coherent vibrations have a signal with a constant amplitude and frequency. Typical sources are electrical powered motors, air handling systems, etc. These vibrations provide a constant disturbance during the entire measurement period (scan). Coherent signals result in distinct artifacts which are the main source of image quality problems. However, disturbing sources can typically be handled once the source is found. Typical solutions involve rebalancing, isolating on springs, or re-installing the source on vibration pads.

- **Non-Coherent Vibration:** Non-coherent vibrations can be categorized into pulse, transient, or noise-like vibrations. Pulse and transient vibrations are single events, and these vibrations will decrease in a short time. A maximum of one pulse (or transient) per minute is allowed. Noise-like vibrations have no specific frequency and are broadband. Typical noise-like vibrations are caused by vehicular traffic, people walking, or the resonance of the building structure. These sources are difficult to elimiate. The only possible solution is to change the construction of the building (i.e. isolate MR floor slab). In this case, the customer must consult with a third party vibration and structural engineer.

- **Tolerances:** Coherent vibration levels at the magnet isocenter must not exceed the specified values. For all non-coherent vibratrions, the tolerance can be multiplied by 10.



c. **Third Party Consultation:** All third party solutions to external vibration disturbances (i.e. pneumatic isolated floors, vibration pads, etc.) must be designed to meet all of the MR system's specifications (vibration specification, shimming requirements, proximity of ferromagnetic material, etc.). In addition, long term affects (such as creeping), must be considered since the magnet's relationship with the patient table is extremely critical. Philips does not review or approve any third party designed solutions.

(04.0)

- VA Iowa City -
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Acoustical Noise - Exam, Control, and Equipment Rooms

1. Typical Acoustical Noise (dB)*

Operator Position - PICU	101 dBA
Patient Table - Front	97 dBA
39.37" (1 m) beside the magnet	95 dBA
39.37" (1 m) from equipment room cabinet	75 dBA
39.37" (1 m) from Operator Console	55 dBA

* Maximum levels can increase +4 dBA under certain circumstances. Also, these values do not include any noise produced by third party equipment. Acoustical noise levels for thir party equipment need to be verified by the third party vendor.

2. Sound Absorbent Material Requirement for Acoustical Noise (Control and Equipment)

Sound Absorption Coefficient of Materials To Be Used	
Suspended Ceiling - Exam Room	> 0.7
Suspended Ceiling - Control and Equipment Room	> 0.6
Main Frequency To Be Attenuated	600 to 1000 Hz

3. Sound Absorbent Materials Requirement for Acoustical Noise (Exam Room)

The use of sound absorbent materials in the examination room is required. Due to the large number of clinical uses of the MR system, acoustical noise will vary. To avoid possible acoustical nuisances, worst case sitauations must be considered for site design (see charts above).

Contact an architect to determine which of the following acoustical noise means can be provided, as required. Depending on the building construction, additional acoustical noise suppression to the same floor level or to other floor levels can be achieved by the following means:

- **a.** An additional brick wall between the RF enclosure and the control room or other rooms. Thickness to be approximately 4.33" to 4.72" (110 mm to 120 mm).
- **b.** A double wooden wall (0.07" x 0.50" [2 mm x 12.5 mm] thick) with 3.15" (80 mm) thick mineral fiber material in between parent structure and RF enclosure.
- **c.** The RF door and RF window can be assembled to a construction with suffiicient attenuation for acoustical noise (RF door: R' > 32 dB, RF window: R' > 40 dB [panes of different thicknesses]).
- **d.** The ceiling inside the RF enclosure can be finished with a 4" (100 mm) thick mineral fiber material.
- **e.** Limit the number of RF feedthroughs from examination room to other rooms.
- **f.** Free standing RF enclosure.
- **g.** No other coupling to the building other than the floor of the RF enclosure.
- **h.** All other interfaces off the RF enclosure to the building (wall and ceiling) must be de-coupled to avoid noise (flexible connection of air conditioning hoses, etc.).

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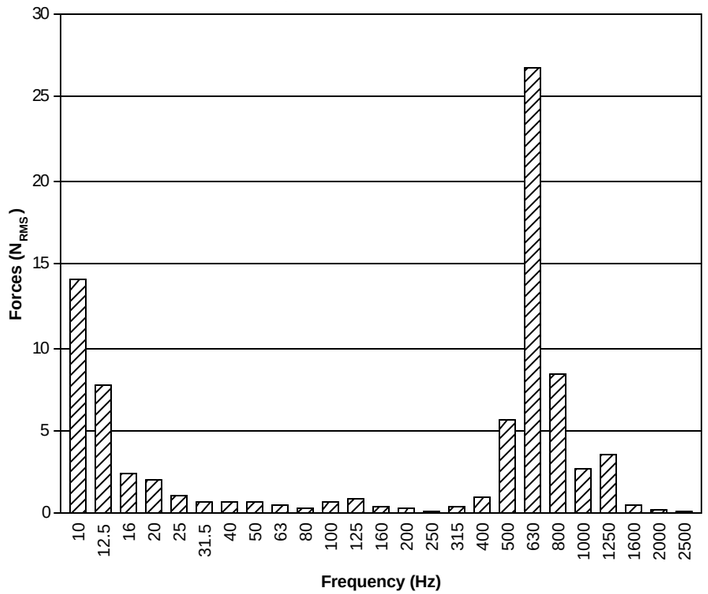
Noise Induced by Vibration Forces

1. Vibration Forces

During various scanning sequences, MR systems will produce vibration forces that will span over a range of frequencies. These forces will transmit through the MR feet, the footpads, the exam room floor, and then these forces may possibly transmit through nearby columns, beams, etc. Depending upon the building construction (i.e. floor slab type, floor isolation methods, beam / column size and type, etc.) and the location of the magnet (i.e. slab on grade or suspended floor, proximity to beam / columns, etc.) the MR system can produce structural noise to the building. To avoid possible structural noise nuisances, isolation methods should be considered to help dampen the various vibrations / mechanical noises. Site preparation is the responsibility of the customer. Contact an architect, structural engineer, and / or vibration specialist for consultation.

Below is a chart that includes the Philips MR system vibration forces across a range of frequencies.

Vibration Forces Applied on Rubber Pads in 1/3 Octave Bands



* Note:

- **a.** The vibration forces shown in the chart (above) are measured at the magnet feet rubber pads (Philips provided pads). Any dampening that the rubber pads provide are not accounted for in these measurements.
- **b.** Measurements could not be taken directly on the floor (thereby accounting for the dampening of the rubber pads) because vibration results on the floor will be dependant upon the construction of the floor. Actual floor vibrations will be site dependant.
- **c.** Measurements for frequencies less than 10 Hz were not taken due to instable and inaccurate data points.
- **d.** Acoustical noise transmitted via air is not integrated into these measurements. Acoustical noise (via air) valbues can be found under the "Acoustical Noise" section on this sheet.
- **e.** The measurements were taken over several different scans.
- **f.** All third party solutions to dampening vibration forces (i.e. pneumatic islated floors, vibration pads, etc.) must be designed to meet all of the MR system's specifications (vibration specification, shimming requirements, proximity of ferromagnetic material, etc.). In addition, long term affects, such as creeping, must be considered since the magnet's relationship with the patient table is extremely critical. Philips does not review or approve any third party designed solutions.

(04.0)

MRI Safety

1. Safety with Magnetic Fields

It is the responsibility of the customer that the following safety requirements are satisfied:

- **a.** Magnetic shielding requirements are to be determined on a site by site basis. If additional shielding is required, consult with Philips service. The customer accepts full responsibility for all cost associated with additional magnetic shielding.
- **b.** During the siting of a Philips MR system, a controlled access area around the MR system must be defined where the field strength will exceed 5 Gauss (0.5 mT). Warning signs "CAUTION" - Magnetic field permanently switched on" should be used to indicate this area.
- **c.** The controlled access area must be clearly visible, e.g. by markings on the floor, barriers or other means to control access to this area by unauthorized persons.
- **d.** Persons having pacemakers, neuro stimulators, insulin pumps or similar devices, or implants of ferromagnetic material (i.e. surgical clips, artifical cardiac valves, prostheses or metal splinters) must stay outside the controlled access zone.
- **e.** Ferromagnetic objects, such as scissors, tools, gas bottles, vacuum cleaners and stretchers, must not be brought into the neighborhood of the magnet and must be kept outside the examination room. Such objects will be pulled to the magnet, and may cause injury to the patient or staff, or may damage the equipment.
- **f.** The security procedures at the entrances of the examination room should prevent prohibited objects being brought into the examination room. Metal detection equipment can be used.
- **g.** The MR system is provided with a magnet emergency rundown unit with one or two remote push buttons to terminate the magnetic field. This should only be used in case of an emergency.
- **h.** If in a medical emergency instruments must be used, the patient must be removed from the examination room first.
- **i.** No liquid helium containers may be brought into the magnet area unless it has been ascertained that the container is made of non-ferrous material.
- **j.** Special non-ferrous containers are available from liquid gas suppliers and must be appropriately labelled as non-ferrous containers.
- **k.** In case of a deliberate quench (magnet shut down) by the operator to implement life supporting and other safety procedures, the magnet field strength at the isocenter is reduced to the value below 200 G (20 mT) within 30 seconds.
- **l. Gauss Proximity Limit Chart:** The fringe field limits listed below are provided for preliminary planning purposes and represent the approximate exposure to magnet field acceptable for the type of instrument or occurrence listed. It is the responsibility of the customer to have the vendor of the equipment in question set acceptable fringe field limits for proper operation of their equipment.

Typical Maximum Fringe Field	**Description**
≤ 1.0 G (0.1 mT)	Nuclear Cameras, Positron Emission, Chemistry Blood Analysers, Linear Accelerators, Electron Microscopes, Image Intensifiers Spectroscopy Color Monitors, Cyclotrons, PET Scanners, **Color Monitors**
2.5 G (0.25 mT)	CT Scanners, Power and Main Distribution Transformers, Ultrasound
5.0 G (0.5 mT)	Power Conditioners, Computers, Tape Storage, Disc Drives, **Pacemakers** Neurostimulators, Biostimulation Devices, Multi-Format Cameras
10.0 G (1.0 mT)	HVAC Equipment, Line Printers, Major Mechanical Equipment Room, X-Ray Tubes, **Computers w/o Disc Drives**, Emergency Generators, Food Prep Areas, AC Chillers, Telephone Switching, Credit Cards Analog Watches / Clocks, Fuel Storage Tanks, Motors (> 5 HP)
15.0 G (1.5 mT)	Film Processors, Cardiac Recorders, Electrical Pumps on Motors (> 5 HP)
25.0 G (2.5 mT)	Flat Panel (LCD) Monitors
50.0 G (5.0 mT)	Laser Imagers, Telephones, X-Ray Electronics, Metal Detectors
100.0 G (10.0 mT)	Oxygen Monitor
150.0 G (15.0 mT)	Hand Tools, Small Instruments

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MRI Safety - Continue

2. Safety with Liquid Helium and Helium Gases

a. A high concentration of helium gas in the examination room can lead to suffocation, as it will displace the oxygen in the air. Under normal operating conditions a small amount of helium may evaporate caused by boil-off of the liquid helium in the magnet. It will escape via the helium gas quench pipe. A large amount of helium gas may escape when the magnet emergency stop button is used for immediate shutdown of the magnetic field, or during spontaneous magnetic field shutdown.

Philips MR systems are equipped with a helium venting system, which ensures that under normal operation and emergency switch-off conditions the escaping helium gas from the magnet is vented outside the building.

In the very unlikely event of a failure of the venting system (i.e. venting system is blocked), and shutdown of the magnetic field occurs, a high concentration of helium gas may disperse quickly into the examination room, which will be visible as clouds of cold mist.

Do not switch off the air conditioning in the room (normal procedure in the event of fire). Instead, maintain circulation and replenishment the air to allow the helium gas to dissipate.

b. Liquid helium is extremely cold and will cause frostbite when in contact with the human body. Use protective gloves, goggles and clothing when handling liquid helium.

c. Only properly trained staff should handle cryogenic liquids.

d. The magnet system has a dedicated venting system, which is to be connected to a helium gas quench pipe, leading outside the building. This system prevents gaseous helium from escaping into the examination room. The helium gas quench pipe external opening should be located in a non-accessible area. It should be periodically checked to ensure the quench pipe is not blocked, dislocated or damaged.

e. Under no circumstances should the magnet be energized prior to the installation of the helium gas exhaust pipe and the emergency run-down unit.

f. Monitoring of the oxygen content of the ambient air maybe obligatory by local regulations. After a certian amount of time, the magnet must have its liquid helium replenished. Due these refills, an amount of helium gas will evaporate in the examination room and will dilute the oxygen in the air. For sites with small examination rooms or low ceilings, it is highly recommended to install an oxygen detector with audible alarm, and a remote sensor on top of the magnet. In cases where there are low oxygen levels, the engineer refilling the magnet will be warned. Oxygen monitors are to be provided and installed by customer / contractor.

3. RF Door(s)

For safety reasons, the RF door(s) should comply with the following:

a. To be opened or closed within 3 seconds.
b. To be opened or closed with a force less than 22.5 lbs (100 N).
c. manual shut (not automatic).
d. No closing by rebounce on rough handling.
e. Threshold no more than 0.8" (20 mm), or 2.4" (60 mm) if provided with ramps no steeper than 10%.
f. Simple to operate.
g. Opening direction outwards to enable the operator to open the door under conditions where tremendous pressure build-up occurs (i.e. in case of a quench and a failure of the venting system).
h. A power assisted door must, in the event of a failure, be opened within 10 seconds with a force no greater than 56.2 lbs (250 N). The design of the door posts should be such that they are no damaged by normal contact with patient trolleys and helium dewars.

4. Safety Zones

Philips drawings will comply with current MR safety guidlines, which recommend that MR facilities be zoned as a way to ensuring patient safety. It is the sole responsibility of the customer to regulate and / or restrict staff and patient flow within the MR environment as necessary. MR safety zones are described as follows:

Zone I - Entrance to facility, reception and waiting areas. No restrictions regarding patient access.

Zone II - Patient holding area and / or dressing rooms. Patient access maybe restricted, or staff supervision maybe required.

Zone III - MR control area and equipment room. Accessible only by authorized or properly trained MR personnel. It is recommended that a card-key locking device be used to gain access to these areas (to distinguish between authorized and non-authorized personnel).

Zone IV - Scanner room. This area should be accessible solely from Zone III, and access to the scanner room should be observed and controlled by authorized MR personnel while in control area. It is recommended that a warning light be illuminated at all times, with a 24-hour back-up power system in the event of a power outage.

Equipment Legend

A Furnished and installed by Philips
B Furnished by customer / contractor and installed by customer / contractor
C Furnished by Philips and installed by RF Enclosure Supplier
D Furnished by Philips and installed by contractor
E Existing
F Future
G Option
H Furnished by RF Enclosure Supplier and installed by RF Enclosure Supplier
J Furnished by Philips and Installed by Rigging Company

	Equipment Designation	Description	Max. Gauss	Weight (lbs)	Heat Load (btu / hr)	Detail Sheet
A	OC	Operator's Console	10	390	1706	AD3
A	GAC	Gradient Amplifier 281 Double Cabinet	150	2513	27878	AD4
A	DAC	Data Acquisition Cabinet	30	419	5800	AD4
A	RFAC	RF Amplifier Cabinet (S23)	30	463	6800	AD4
A	HEP	Helium Gas Exhaust Pipe (exam room only)	---	4/ft	0	
A	VFW	Viewforum Workstation	10	126	1006	
B	TSC	Tool Storage Cabinet	---	t.b.d	t.b.d.	AD5
B	RFSC	RF Coil Storage Cabinet	---	t.b.d.	0	AD5
B	CB1	Circuit Breaker (for system)	50	t.b.d	t.b.d.	
B	CB2	Circuit Breaker (for Schreiber Chiller)	50	t.b.d.	t.b.d.	
B	AC	Air Conditioner	t.b.d.	t.b.d.	t.b.d.	
B	CAF	Computer Access Flooring (min. 6" clear space)	---	t.b.d.	0	
C	HWG	Helium Gas Exhaust Wave Guide	---	10	0	
D	ERB	Emergency Run-Down Button (1-ea. Cntrl & Exam)	---	3	0	AD3
D	SFB	System Filter Box with Covers	70	199	0	AD4
D	PDU	Power Distribution Cabinet	50	650	2200	AD4
D	IMDU	Integrated Mains Distribution Unit	150	265	0	AD4
D	LCC	Liquid Cooling Cabinet	150	661	3412	AD5
D	PV	Patient Ventilation	150	56	--	AD5
D	HD	Helium Dewar (for Philips to refill magnet)	---	700	0	AD5
D	CH	Schreiber 15MED AC Chiller - GEN II	10	3583	245500	AD5
D	REM	Schreiber Chiller Remote Controller	10	1	0	
J	MAG	Magnet Assembly	---	10207	6825	AD3
J	PS	Patient Support (MT)	---	364	0	AD3
G	ID	Interactive Display	45	57	2047	AD6

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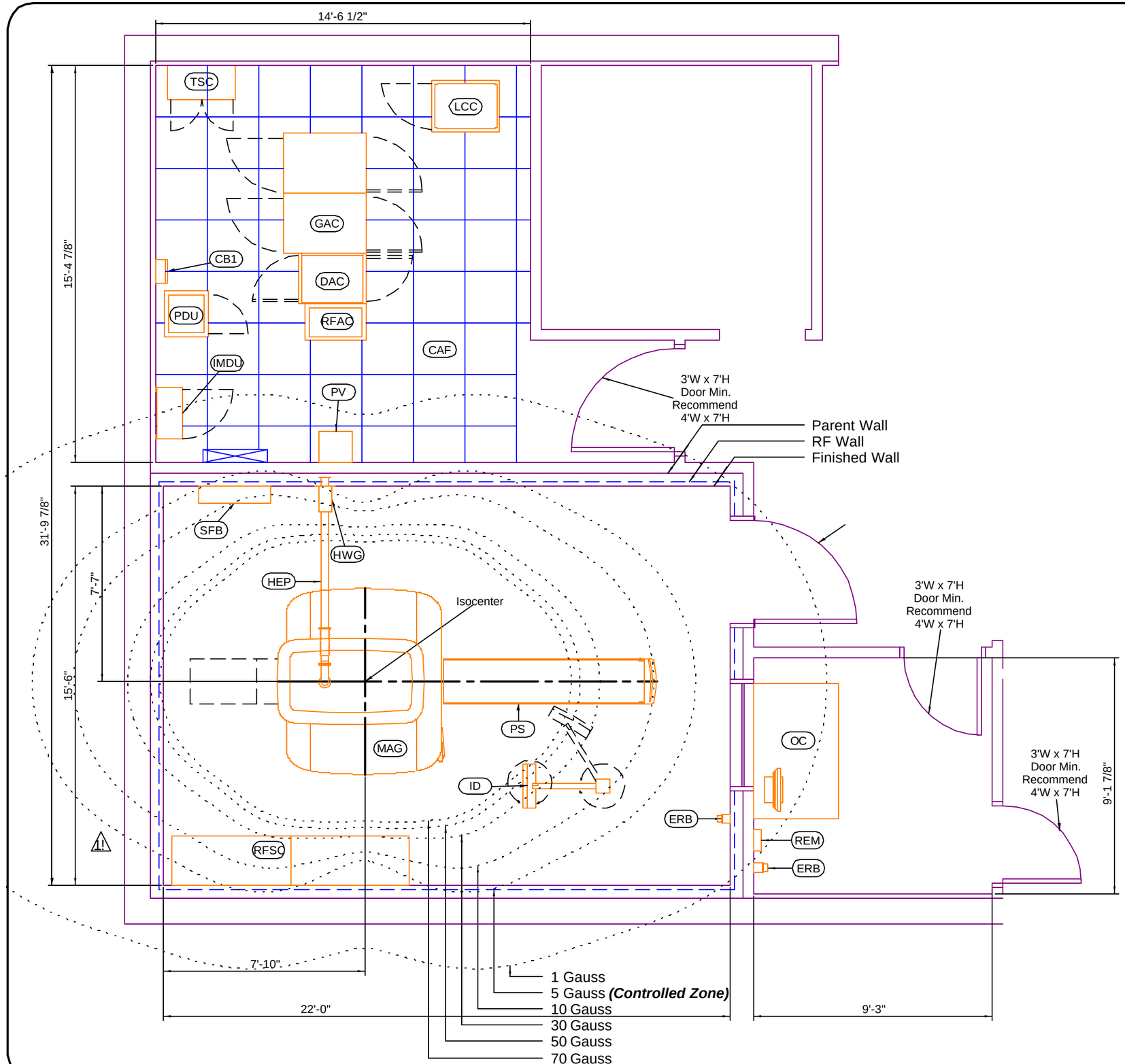
Equipment Layout

Required Ceiling Height
Equipment Room: 8' - 6 3/8" (2600 mm) - higher
RF Room: 9' - 2" (2794mm) - higher
RF Room Suspended Ceiling: 8' - 3" (2515 mm)
Control Room: 9' - 6" (2896 mm) - higher

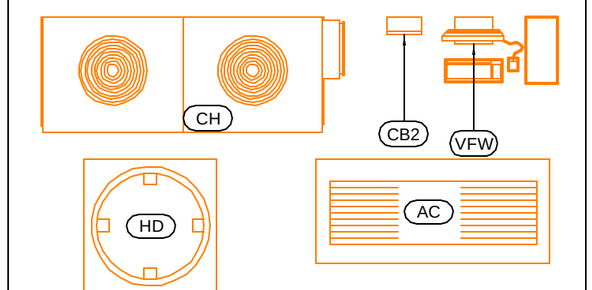
0 1' 2' 4' 8'



Controlled Zone
Exclusion zone for persons with cardiac pacemakers or other electrical implants - Magnetic field exceeds 5 Gauss (0.5 mT).

Site Planning Issues/Considerations

⚠ Passive magnetic shielding needed to contain 5 Gauss line.



Verify location with Customer and local Philips Service

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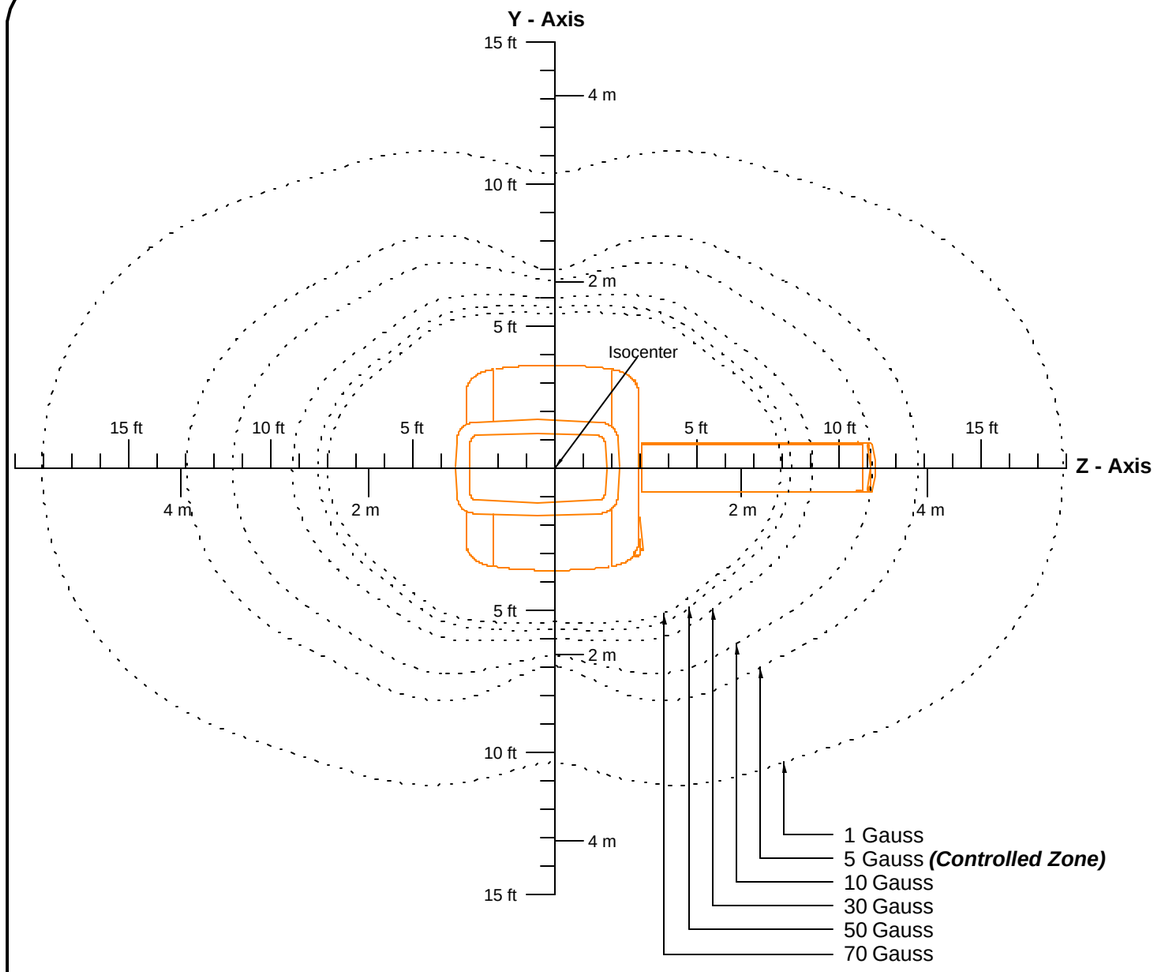
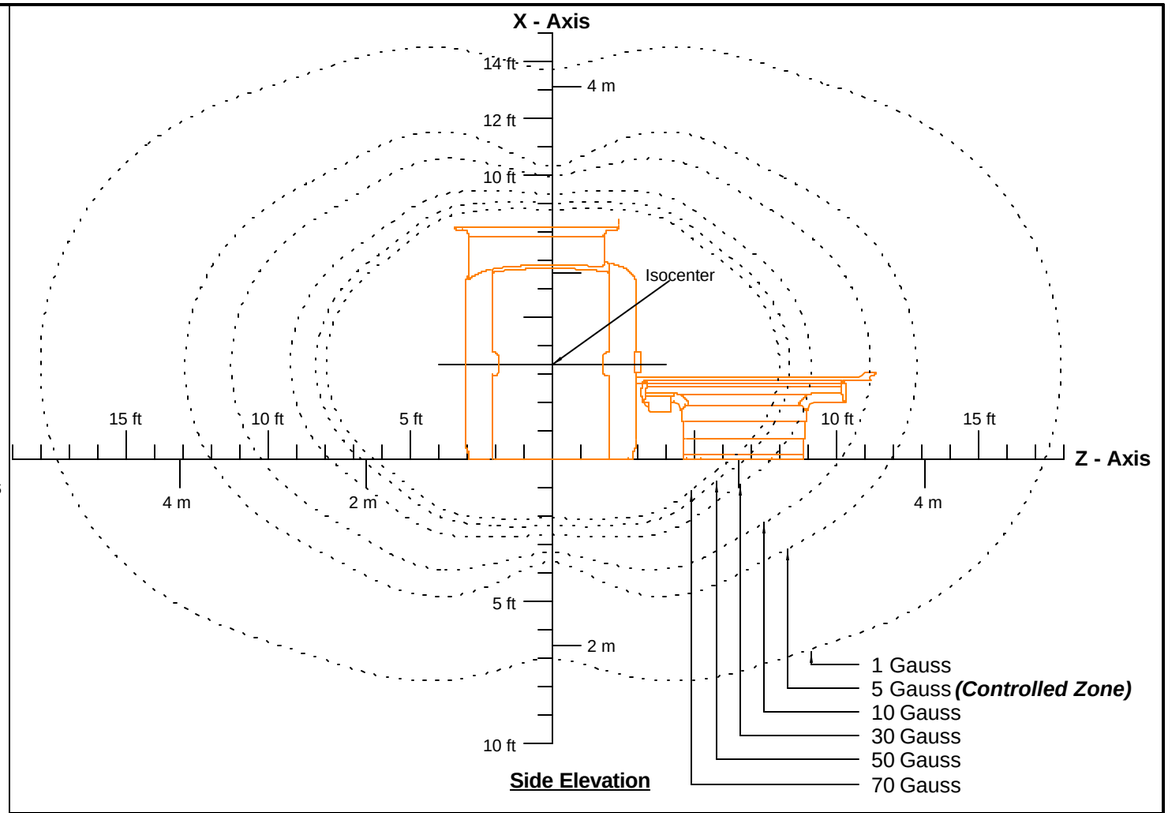
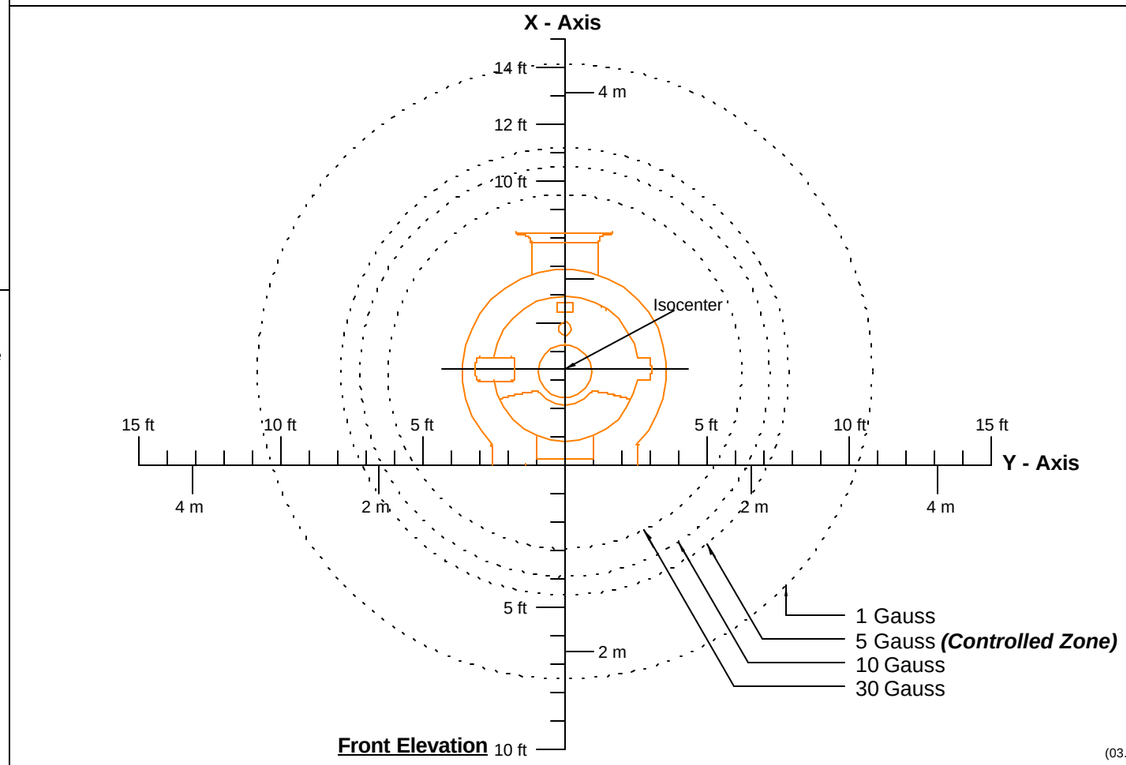


Plan View



Side Elevation



Front Elevation

(03.0)

Notes:

1. The fringe field diagrams indicated have been obtained from the magnet's manufacturer and have been empirically confirmed under unobstructed, greenfield conditions. Actual environmental parameters at this site may influence the true extent of the fringe field and affect the accuracy.
2. Isocenter in the X-direction is 39.37" (1000 mm) above finished floor.
3. The following tolerances should be taken into account depending on the site orientation with respect to the magnetic north and construction of the site:

Fringe Field Tolerances	
Fringe Field	**Tolerance**
1 Gauss	+/- 2' - 8" (+/- 1500 mm)
5 Gauss	+/- 8" (+/- 200 mm)
10 Gauss	+/- 4" (+/- 100 mm)

Notes - Continue

4. Magnetic shielding requirements are to be determined on a site by site basis. If additional shielding is required, consult with Philips service. The customer accepts full responsibility for all cost associated with additional magnetic shielding.

Magnetic Field Plot - (without magnetic shielding)

Static Fringe Field Shown

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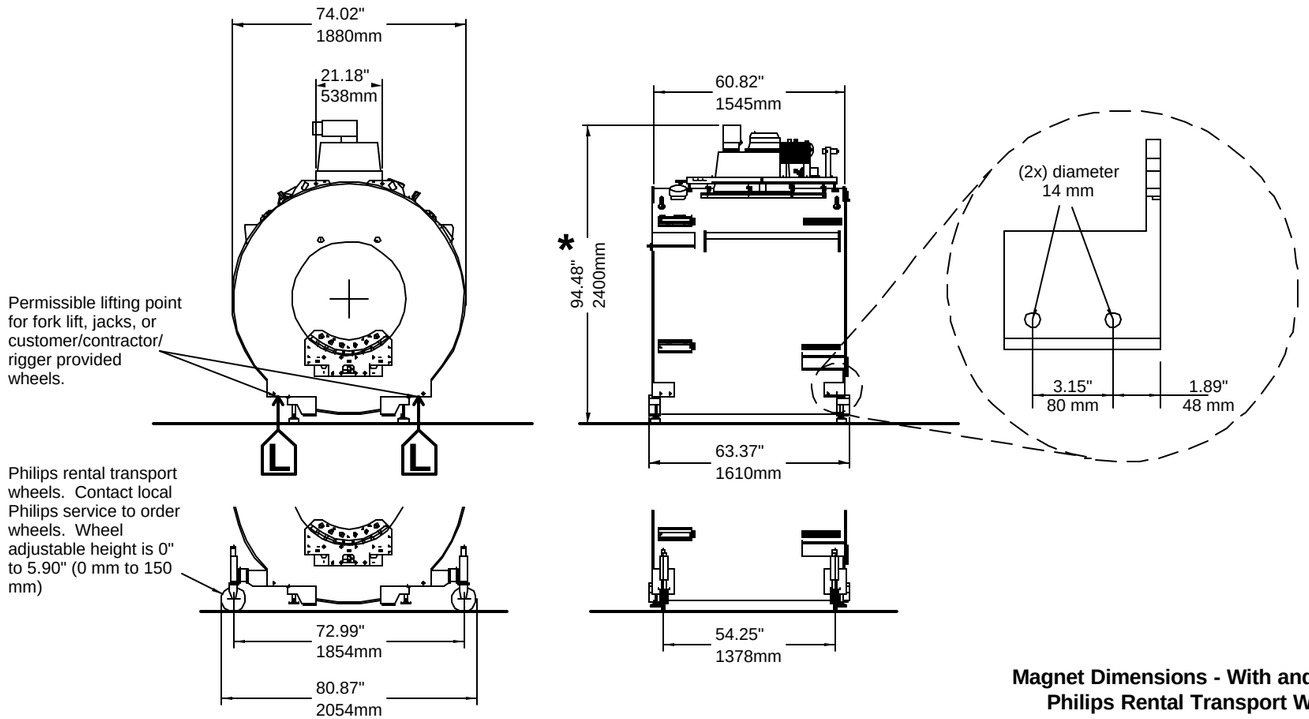
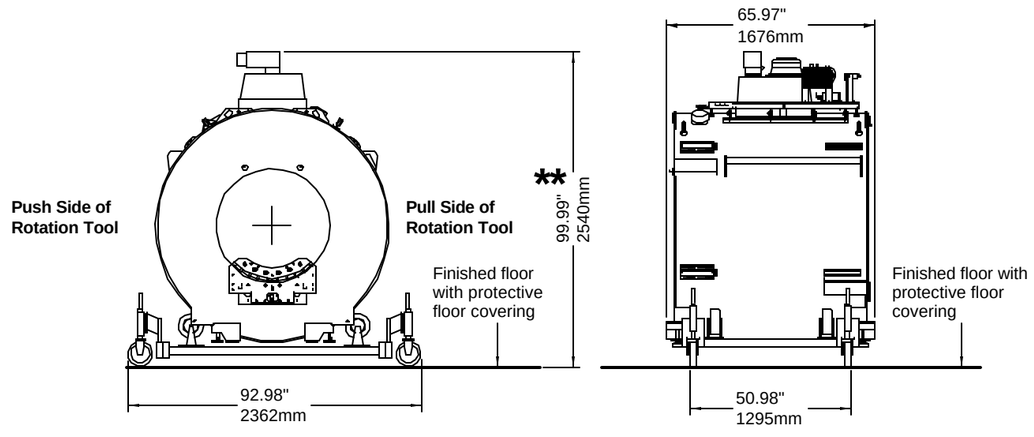
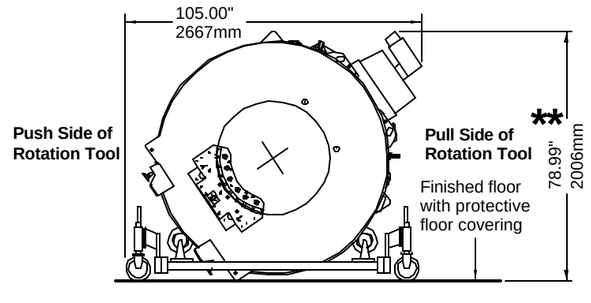


Magnet Dimensions - With and Without Philips Rental Transport Wheels



Magnet on Philips / IGC Provided Rotation Tool - Unrotated



Magnet Assembly on Philips / IGC Provided Rotation Tool - Fully Rotated

I. General Delivery and Rigging Notes:

L — Defines permissible lifting points or location for customer/contractor/rigger provided transportation wheels. Caution: Prying or lifting the magnet at any other location on the magnet aside from these points can damage the magnet.

* — Defines height of magnet assembly. Additional height for transportation wheels, protective floor covering, and/or site specific restrictions must be added to this height.

a. Rigging is the responsibility of the customer/contractor.
b. Magnet weight is 7496 lbs (3400 kg).

II. Notes Specific to Rigging / Delivery with Rotation Tool:

** — Defines height of magnet assembly mounted on rotation tool. Additional height for protective floor covering and/or site specific restrictions must be added.

1. Philips / IGC can provide a rotation tool for sites that have height restrictions. If a site is in need of this tool, the following should be considered:
- **a.** Philips / IGC handles all rotations. Philips does not support magnet rotations unless they are rotated by Philips / IGC.
- **b.** The rotation tool is shipped with the magnet to the site by IGC. As a result, an early lead-time is mandatory.
- **c.** Additional costs will be associated if this tool is used. Verify exact amount with local Philips service.

2. Scope of Responsibilities for Magnet Installations Requiring Use of Rotation Tool:
- **a.** Philips / IGC will provide a field service specialist and the magnet rotation tool.
- **b.** Philips / IGC will unpack and assemble the rotation tool and disassemble and repack the rotation tool.
- **c.** Philips / IGC will assist the riggers in positioning the magnet on the rotation tool.
- **d.** Philips / IGC will assist in moving the magnet on the rotation tool from outside the building to the exam room.
- **e.** Philips / IGC will provide instructions and assist in rotating the magnet on the rotation tool.
- **f.** Philips / IGC will assist in uprighting the magnet on the rotation tool and positioning it on the proposed isocenter location.

3. Items Required (and provided by):
- **a.** Magnet rotation tool and all tools needed to assemble it (provided by Philips / IGC).
- **b.** Template for aligning magnet up with proposed isocenter (provided by Philips).
- **c.** Equipment needed to unload magnet and place it on rotation tool (provided by rigger).
- **d.** Electric Johnson Bar (recommended) to aid in magnet delivery (provided by rigger).
- **e.** Jacks to lower the magnet from blocks onto its final position on the isolation pads (provided by rigger).
- **f.** Steel plates if needed to protect floors (provided by rigger).

4. Additional Magnet Rotation Tool Dimensions:
- **a.** Minimum width needed for 180° turn with magnet unrotated is 114.00" (2896 mm).
- **b.** Minimum width needed for 180° turn with magnet fully rotated is 124.00" (3150 mm).
- **c.** Magnet weight is 7496 lbs (3400 kg).
- **d.** Rotation tool weight is 1200 lbs (544 kg).
- **e.** Width of rotation tool track rollers is 4.13" (105 mm).

Magnet Rigging and Delivery
(not to scale)

(04.0)

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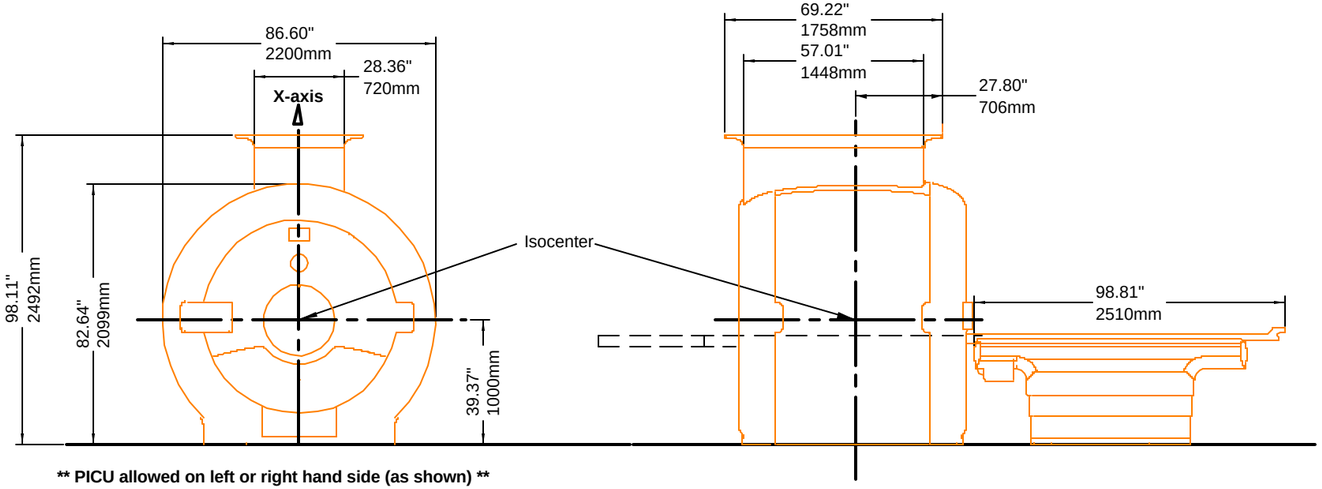
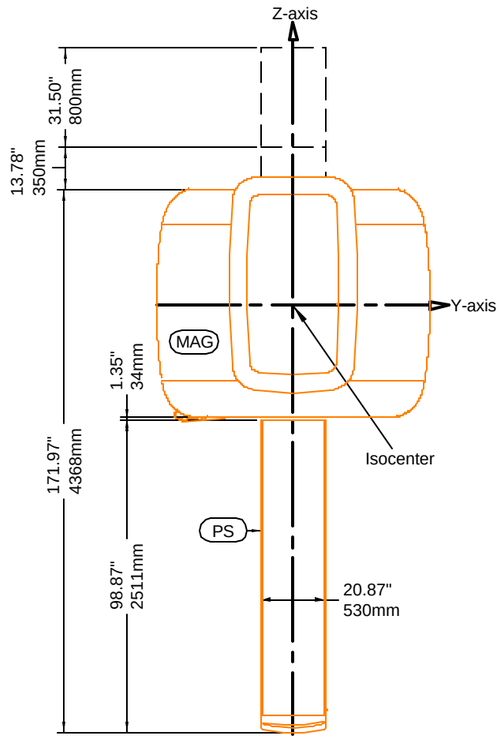
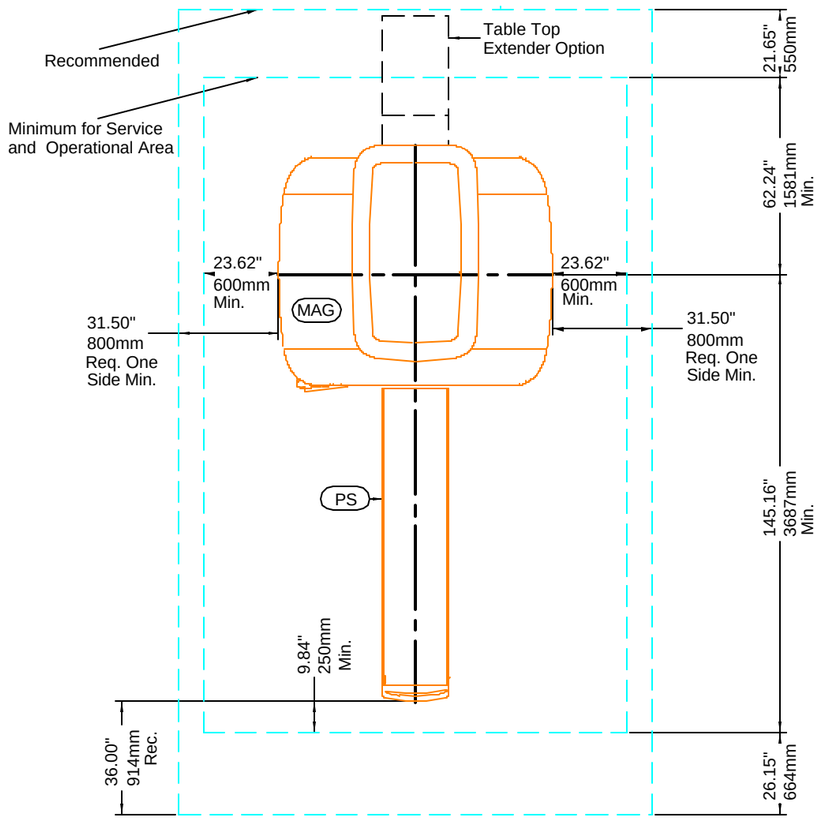


** PICU allowed on left or right hand side (as shown) **





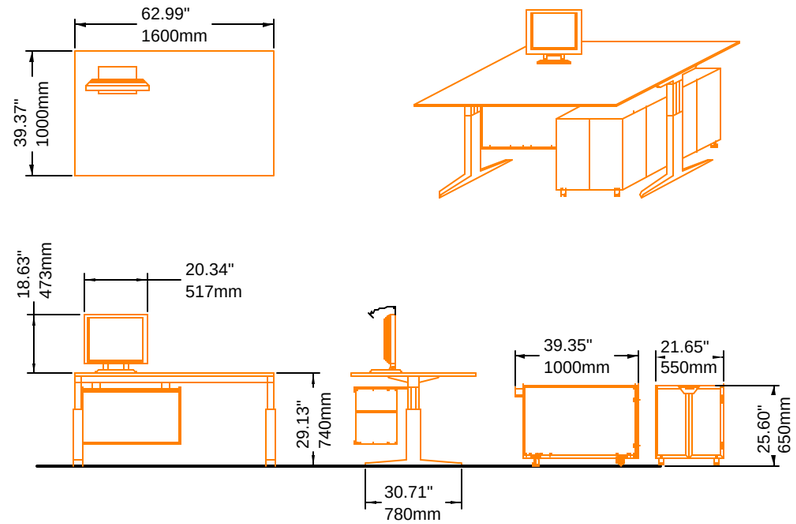
* For Achieva Nova gradient coil, 3412 - 40949 btu/hr removed via water cooling system.

(03.1)

MAG	Magnet Assembly	
Weight	10207 lbs	(4630 kg)
Heat Dissipation (To air)	6825 Btu/hr *	(1719 kcal/hr)

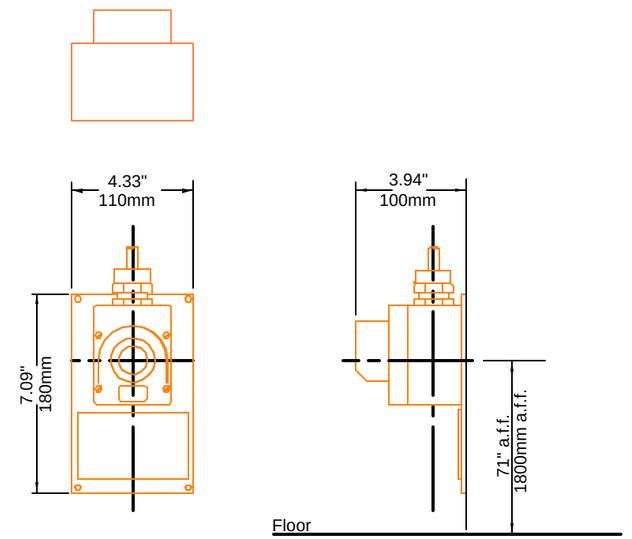
(03.0)

PS	Patient Support MT	
Weight	364 lbs	(165 kg)
Heat Dissipation	0 Btu/hr	(0 kcal/hr)



(99.2)

OC	Operator Console	
Weight	390 lbs	(177 kg)
Heat Dissipation	1706 Btu/hr	(430 kcal/hr)



(00.0)

ERB	Emergency Run-Down Button	
Weight	3 lbs	(1 kg)
Heat Dissipation	0 Btu/hr	(0 kcal/hr)

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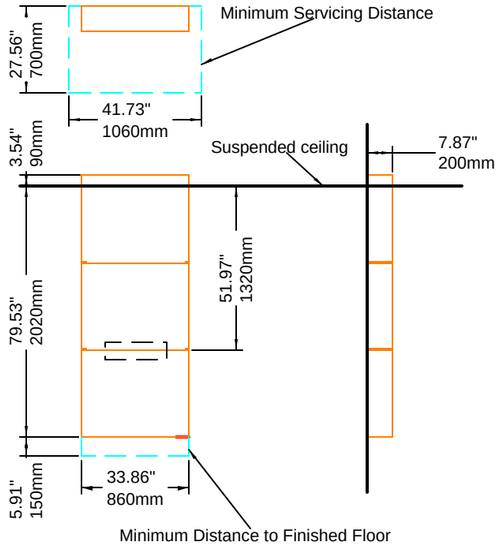
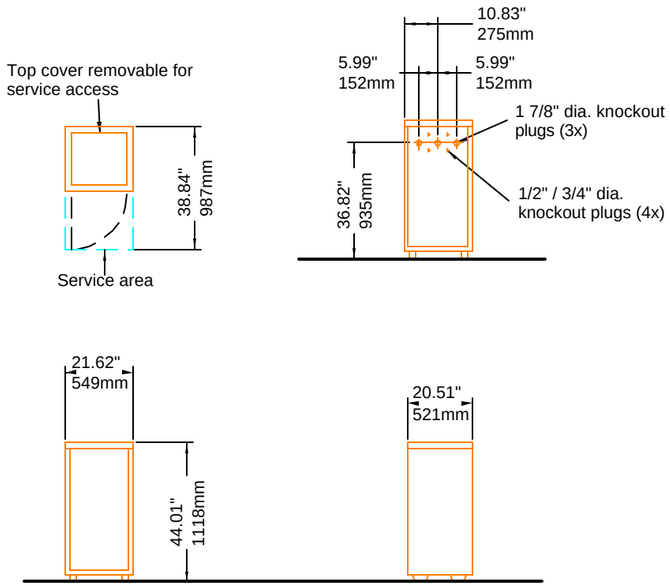


(99.3)

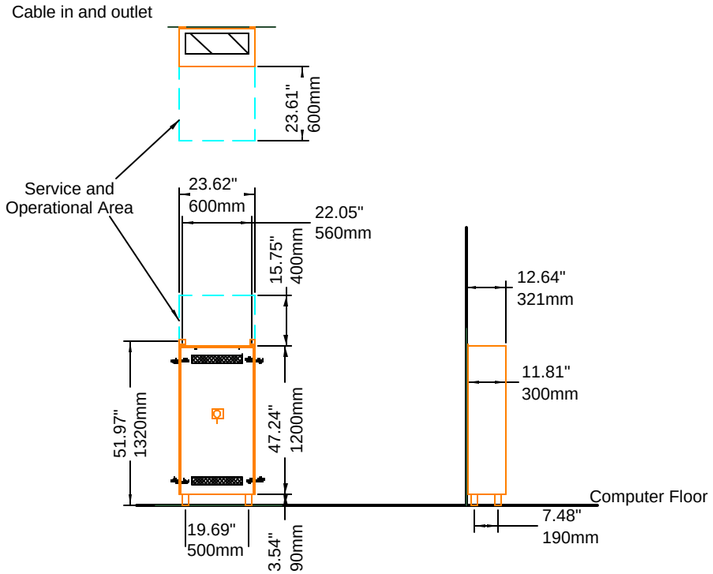
SFB	System Filter Box	
Weight	199 lbs	(90 kg)
Heat Dissipation	0 Btu/hr	(0 kcal/hr)



(01.0)

PDU	Power Distribution Unit	
Weight	650 lbs	(295 kg)
Heat Dissipation	2200 btu/hr	(554 kcal/hr)

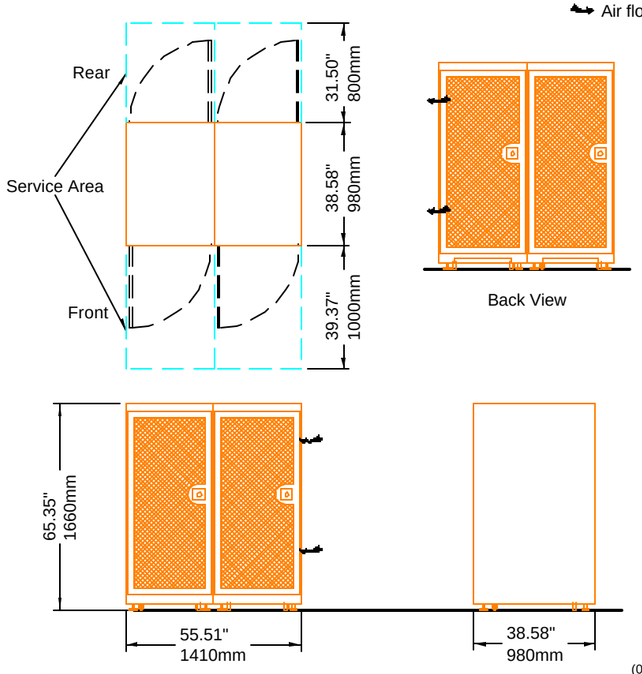
Air flow direction



(05.0)

IMDU	Integrated Mains Distribution Unit	
Weight	265 lbs	(120 kg)
Heat Dissipation	0 Btu/hr	(0 kcal/hr)

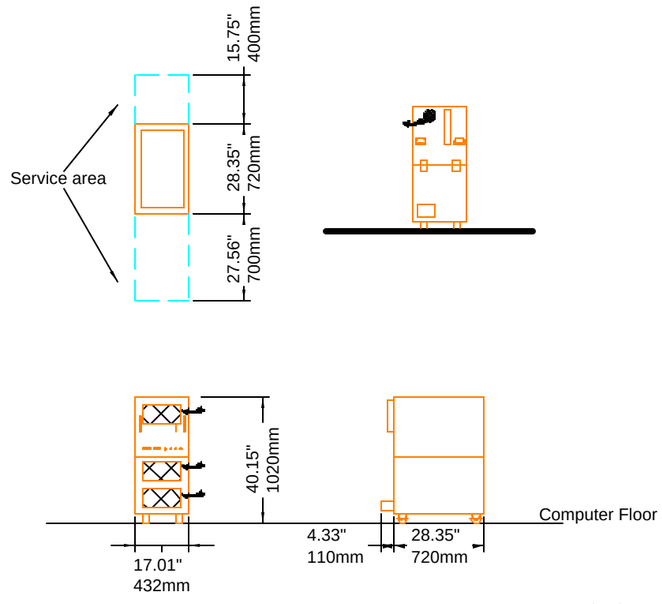
Air flow direction



(02.0)

GAC	Gradient Amplifier 281 Double Cabinet	
Weight	2513 lbs	(1140 kg)
Heat Dissipation	27878 Btu/hr	(7022 kcal/hr)

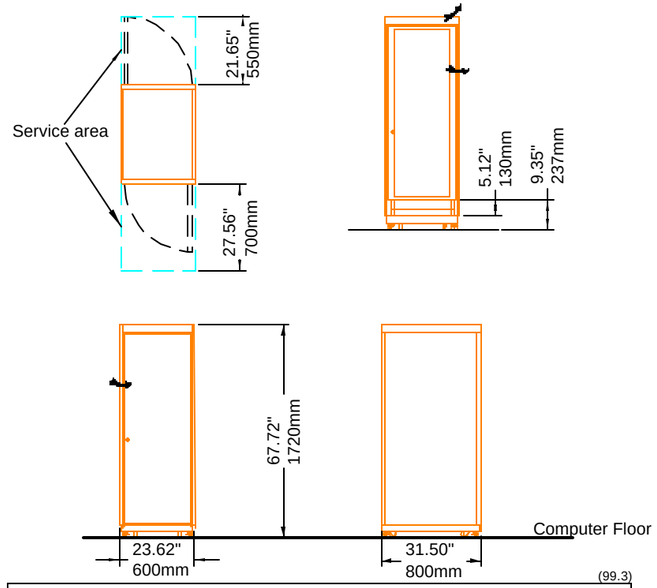
Air flow direction



(05.0)

RFAC	RF Amplifier Cabinet S23	
Weight	463 lbs	(210 kg)
Heat Dissipation	6800 Btu/hr	(1713 kcal/hr)

Air flow direction



(99.3)

DAC	Data Acquisition Cabinet	
Weight	419 lbs	(190 kg)
Heat Dissipation	5800 Btu/hr	(1461 kcal/hr)

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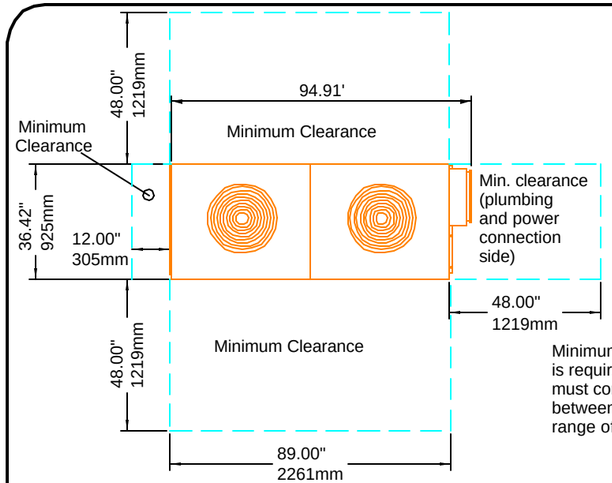
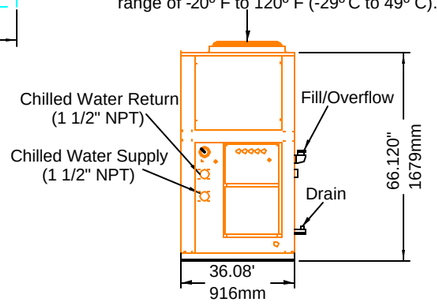
Note:
Turn to sheet MP1 and MP4 for additional notes and specifications information regarding the chiller.

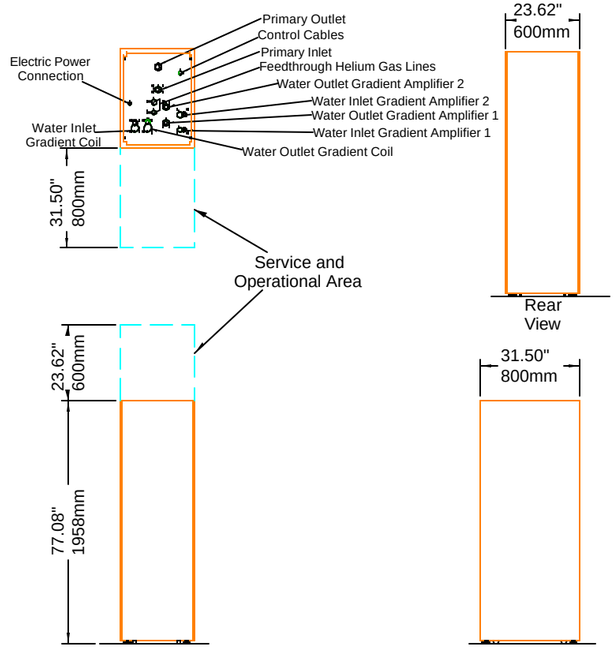


Minimum clearance of 25' (7620 mm) is required above exhaust fans. Chiller must continuously receive fresh air between an ambient temperature range of -20º F to 120º F (-29º C to 49º C).

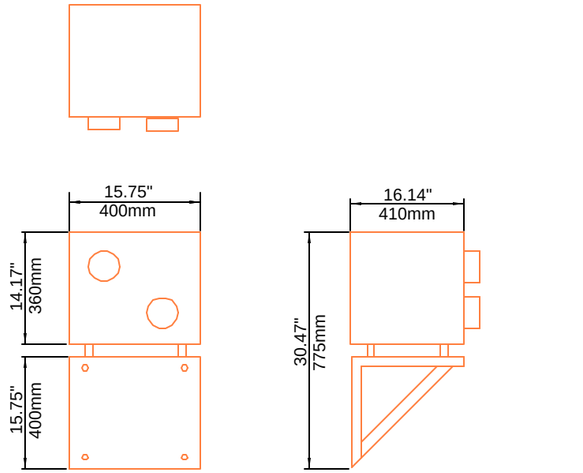


(05.0)

CH	Schreiber 15MED AC Chiller - GEN II	
Weight	3583 lbs	(1625 kg)
Heat Dissipation (To air)	245500 Btu/hr	(61847 kcal/hr)

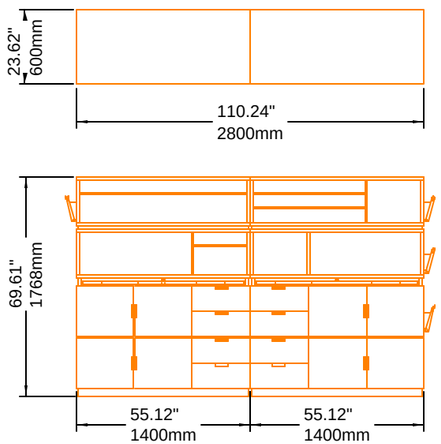


LCC	Liquid Cooling Cabinet	
Weight	661 lbs	(300 kg)
Heat Dissipation	3412 btu/hr	(860 kcal/hr)



(99.3)

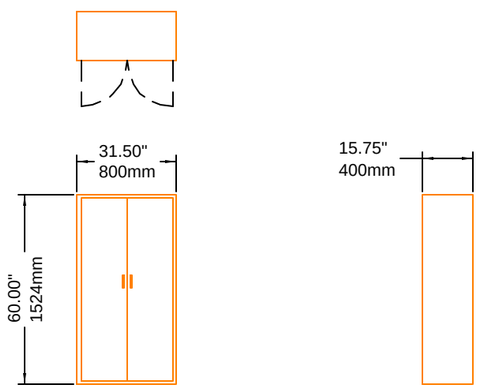
PV	Patient Ventilation Unit	
Weight	56 lbs	(25 kg)
Heat Dissipation	--- Btu/hr	(--- kcal/hr)



Provided and installed by customer.

(01.0)

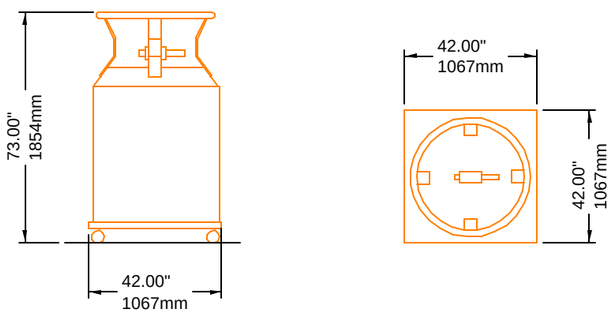
RFSC	RF Coil Storage Cabinet	
Weight	t. b.d.	t.b.d.
Heat Dissipation	0 Btu/hr	(0 kcal/hr)



Provided and installed by customer.

(99.4)

TSC	Tool Storage Cabinet	
Weight	t.b.d.	t.b.d.
Heat Dissipation	0 Btu/hr	(0 kcal/hr)



(02.0)

HD	500 L Helium Dewar	
Weight	700 lbs (full)	(295 kg)
Heat Dissipation	0 Btu/hr	(0 kcal/hr)

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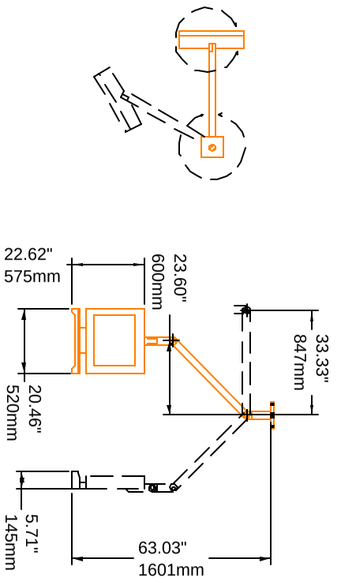
ID	Interactive Display (00.0)
Weight	57 lbs (26 kg)
Heat Dissipation	2047 Btu/hr (516 kcal/hr)



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RF Enclosure Requirements

1. Shielding Effectiveness

The room has to be built and tested to the following specifications that apply to all parts of the shielded enclosure, including seams, doors, windows, vents and mechanical penetrations:

Required overall attenuation of the RF shielding:

Values measured analogue to MIL-STD-285		Philips Part	
		Not included	Included
H field	0 MHz - 10 MHz	irrelevant	irrelevant
	10 MHz - 15 MHz	90 dB	90 dB
	15 MHz - 100 MHz	100 dB	100 dB
E field and Plane Wave	5 MHz - 100 MHz	100 dB	100 dB

The attenuation figures for "Philips parts not included" are given subject to the following conditions:

a. The RF shielding is completely installed.
b. Foundation provisions for the magnet and patient support are installed (with exception of the Philips part).
c. Protective earth wiring (inside and outside the RF Enclosure) is installed.
d. All components/equipment that have to be located inside the enclosure are installed and operational (including all external facilities and the interface between them and the systems inside the enclosure, but excluding the Philips parts).
e. All RF enclosure feedthrough frames covered with blind plates delivered by the RF enclosure supplier. These blind plates are needed for RF attenuation testing.

The attenuation figures for "Philips parts included" are given subject to the following conditions:

- All equipment inside and outside the enclosure is installed and operational.

2. RF Enclosure Materials

a. Copper RF Enclosures: In general, Philips recommends copper RF enclosures. Philips recommends copper enclosures because of its shielding effectiveness, long term stability, flexible design capabilities, availability, and cost.

b. Ferromagnetic (Galvanized Steel) RF Enclosures: Ferromagnetic RF enclosures, but are subjected to the following restrictions:

- The floor of the RF Enclosure must be made of non-ferrous material (i.e. copper).
- The total combined thickness of the ferrous material must guarantee the specified shielding effectiveness with the magnetic field on.
- All walls must be at least 63" (1600 mm) from magnet isocenter. The walls do not need to be symmetrically located around isocenter.
- The RF enclosure can not vibrate. This can introduce B0 variations (especially the RF enclosure ceiling).

c. Aluminum RF Enclosures: Aluminum RF enclosures can help dampen external electromagnetic disturbances however special attention is needed if aluminum is chosen. A thin layer of aluminum oxide will form, causing electrical contact between RF enclosure parts (especially around doors, feedthroughs, and windows). If no precautions are taken (e.g. special coating measures), the RF enclosure quality between the moving contact points will degrade. To improve the quality of the connection, a thin sheet of brass can be used between the surfaces. If the connection is made by an appropriate screw connection, then the electrical resistance between the brass and the aluminum will be in the 0 to 10 mOhm region.
The use of gaskets for the door, in combination with the disadvantages mentioned above cannot degrade the RF enclosure such that it does not meet the systems specifications (especially long term affects). Therefore, Philips strongly recommends the use of "finger stocks".

RF Enclosure Requirements - Continue

3. Environmental Conditions

The shielding must work correctly and must not suffer damage under the following conditions in normal conditions:

Temperature Range	50° to 104° F (10° to 40° C)
Humidity	20% to 90% non condensing
Air Pressure	7.25 to 16.0 PSI (50 to 110 kPa)
Water/Damp/Liquid	Drip
Mechanical Vibration	
Frequency	0 to 150 Hz
g-value	0 to 0.1 g
Mechanical Shocks	
g-value	0 to 0.1 g
Pulse Duration	6 to 10 ms

The above conditions also apply for the system wiring, ducts, gas exhausts and other interface provisions. During and after installation, the shielding may be subject to extreme conditions due to construction activities in the vicinity. Loss of power or failure of temperature control equipment can also cause extreme environmental conditions. Local earthquake protection regulations must be followed. Special measures may be required to fasten the magnet and patient support to the building. In such cases, the earthing principles mentioned earlier must be adhered to.

4. Reliability / General Policy

a. PMSNA specifies the MANDATORY REQUIREMENTS for the proper on-site functioning of the MR system. These requirements include details of how the RF enclosure should be installed and the conditions this shieldign must meet.
b. PMSNA accepts no responsibility for correct operation of the RF enclosure. The performance of the MR system is only guaranteed if the mandatory requirements are met.
c. The RF enclosure and all associated equipment must be formally accepted by Philips. PMSNA must make agreements with the supplier(s) for the on-site acceptance procedure of the RF enclosure.
d. The interfaces between the RF enclosure and the MR system must meet Philips standards described in drawing package.
e. If required by the customer, a Philips representative can be present to witness testing that shows the RF enclosure will meet the system specifications. The enclosure shall be tested upon completion, with all penetrations installed and before the cables are connected to the filters. The shielding effectiveness must be checked according to the following codes and standards applicable to the extent indicated:

- **MIL-STD-285:** Method of attenuation measurements for electromagnetic shielding enclosures for electronic test purposes.
- **MIL-STD-220A:** Standard of safety of electromagnetic interference filters.
- **UL 1283:** Standard for safety of electromagnetic interference filters.

f. The shielding must be designed for 100% operation throughout the year.

(04.0)

MRI Support Notes

1. Door(s)

For convenient and safe transport of patients on trolleys, and for installation and maintenance actions, a minimum clearance of 45.28" W x 86.67" H (1150 mm W x 2100 mm H) is recommended. The size of the door(s) may have to be greater than the above figures to allow access for heilium dewars, which vary in size depending on where they are obtained.
The RF enclosure is a potential handicap in an emergency situation. The hospital staff may be hindered in getting access to the patient and in transferring the patient to a place where life saving actions can be performed. For safety reasons the door(s) should comply with the following:

a. To be opened or closed within 3 seconds.
b. To be opened or closed with a force less than 22.5 lbs (100 N).
c. Manual operator action required to close the door (not automatic).
d. Threshold no more than 0.8" (20 mm), or 2.4" (60 mm) if provided with ramps no steeper than 10%.
e. Simple to operate.
f. Opening direction outwards to enable the operator to open the door under conditions of pressure built-up in case of a quench and a failure of the venting system.
g. A power-assisted door must, in the event of a failure, be opened within 10 seconds with a force no greater than 56.2 lbs (250 N). The design of the door posts should be done in a way that they are not damaged by typical contact with patient gurneys and helium dewars.

2. Magnet Transfer Opening

The magnet is the only system part that in most cases cannot be transferred through the door of the RF enclosure. A special opening to allow its installation in the enclosure must therefore be made available. See sheet AD2 for required dimensions.
The underside of the magnet transfer opening should be flush with the floor. If building constraints make this impossible, the RF enclosure supplier must deliver ramp(s) with slopes no steeper than 5% and the maximum height of 4.75" (120 mm). The location of the installation opening will naturally be site dependent. It should, however, comply with the following conditions:

a. It should preferably be accessible through existing hospital corridor(s), provided these meet with other necessary requirements (i.e. floor loading, corridor width and height).
b. It should be accessible from outside through a wall or the roof.

The magnet will be transported into the room only once, during installation of the MRI system. Once installation is complete, the magnet-transfer opening can be closed permanently. Although it must still be possible for Philips service to re-open the magnet transportation opening without invalidating the RF enclosure guarantee. Should specialist servicing be required, this should be done only by the RF shielding manufacturer's own personnel and any special tools used should be supplied by the RF shielding manufacturer.

3. RF Viewing Window

The recommended window size is 47.2" W x 39.4" H (1200 mm W x 1000 mm H) with the window base no more than 39.4" (1000 mm) above finished floor level. The minimum window size is 35.4" W x 23.6" H (900 mm W x 600 mm H) with its base no more than 39.4" (1000 mm) above finished floor level.
The transparency of window material (i.e. the mesh) must be better than:

a. 30% for an angle between 40 and 140 degrees.
b. 50% for an angle between 70 and 110 degrees.

The window material must have an attenuation factor less than 2 in the light color range of 2600 to 4200 K. Moreover, it must cause no color change in the transmitted light to allow the operator to get an accurate impression of the patient's complexion.
The window shielding material (mesh) must be sandwiched between two panes of glass. All parts of the window (e.g. the mesh) that contribute to the attenuation must be made of non ferro-magnetic material.
For optional sound damping the two windowpanes should have a different thickness (e.g. 0.24" and 0.31" [6 and 8 mm].

4. Floor - Covering Material

To avoid electrostatic discharge problems the floor must have a resistivity of less than 1 Giga Ohm or it must comply with DIN 51953: "Testing of organic floor coverings; testing the ability for electrostatic charge derivation in confined spaces liable to contain explosion mixtures."

5. Foundation of Magnet and Patient Support

Shocks and vibrations up to 0.1 g, in all directions, have to be anticipated. The friction between magnet and floor will normally be great enough to keep the magnet in place (friction factor $\geq$ 0.1) so no fixing measures are required.
The patient support is subject to forces induced by operators and patients. To prevent tilting, the patient support will be fastened to the floor.

6. Suspension Provisions

The provisions for system wiring, suspended ceiling, helium gas lines, and helium gas exhaust are not part of the RF enclosure delivery by Philips. However, fixing points for the suspension of these items must be available in the enclosure ceiling. Requirements are determined by the local situation. In addition, suspension points for the lighting, air-conditioning equipment, etc. maybe required. Finally, the suspension provisions must not affect RF enclosure integrity. The responsibility for ensuring this integrity lies with the manufacturer of the RF enclosure.

(03.0)

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08.30.06

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Equipment Support Information

1. General
The customer shall be solely responsible, at its expense, for preparation of the site, including any required structural alterations. The site preparation shall be in accordance with this plan and specifications, the architectural/construction drawings and in compliance with all safety and building codes. The customer shall be solely responsible for obtaining all construction permits from jurisdictional authority.

2. Equipment Anchorage
Philips provides, with this plan and specifications, information relative to equipment size, weight, shape, anchoring hole locations and forces which may be exerted on anchoring fasteners. The customer shall be solely responsible, through the engineer of record for the building, to provide on the architectural/construction drawings, information regarding the approved method of equipment anchoring to floors, wall and/or ceiling of the building. Any anchorage test required by local authority shall be the customer's responsibility. Stud type anchor bolts should not be specified as they hinder equipment removal for service. Consult with Philips service prior to specifying anchor methods.

3. Floor Loading and Surface
Philips provides, with this plan and specifications, information relative to size, weight and shape of floor mounted equipment. The customer shall be solely responsible, through the engineer of record for the building, to provide on the architectural/construction drawings confirmation of the structural adequacy of the floor upon which the equipment will be placed. Any load test required by local authority, shall be the customer's responsibility.
The floor surface upon which Philips equipment is to be placed/anchored shall be flat and level to within plus or minus 1/16 inch (2 mm).

4. Ceiling Support Apparatus
Philips provides, with this plan and specifications, information relative to size, weight and shape of ceiling supported equipment. The customer shall be solely responsible, through the engineer of record for the building, to provide on the architectural/construction drawings, information regarding the approved method of structural support apparatus, fasteners and anchorage to which Philips will attach equipment. Any anchorage and/or load test required by local authority shall be the customer's responsibility.

The structural support apparatus surface to which Philips equipment is to be attached, shall have horizontal equipment attachment surfaces parallel, square and level to within plus or minus 1/16 inch (2 mm) for the area the system covers.

Contractor to clearly mark Philips equipment longitudinal centerline on bottom of each structural support.

Any drilling and/or tapping of holes required to attach Philips equipment to the structural support apparatus shall be the responsibility of the customer.

Fasteners/anchors (i.e., bolts, spring nuts, lock and flat washers) and strip closures shall be provided by the customer.

5. Suspended Ceiling
Special requirements for the suspended ceiling within the RF enclosure:

- **a.** It must be constructed from non-ferrous material
- **b.** It is recommended to have sound damping
- **c.** No hanging objects such as spot lamps are to hang lower than 102.4" (2600 mm) in order to give clearance for the removal of the magnet covers for servicing.
- **d.** The access panel or opening in the ceiling to enable a cold head change shall comply with specifications given on SD1.

6. Lighting
Lighting fixtures shall be placed in such a position that they are not obscured by equipment or its movement, nor shall they interfere with Philips ceiling rails and equipment movement. Such lighting fixture locations shall be the sole responsibility of the customer.

7. Ceiling Obstructions
There shall be no obstructions that project below the finished ceiling in the area covered by ceiling suspended equipment travel.

8. Seismic Anchorage (For Seismic Zones Only)
All seismic anchorage hardware, including brackets, backing plates, bolts, etc., shall be supplied and installed by the customer/contractor unless otherwise specified within the support legend on this sheet. Installation of electronic cabinets to meet seismic anchorage requirements must be accomplished using expansion type (HILTI HDI, or eq.) anchor/bolt systems to facilitate the removal of a cabinet for maintenance. Do not use threaded rod/adhesive anchor systems. Consult with Philips regarding any anchor system issues.

9. Floor Obstructions
There shall be no obstructions on the floor (sliding door tracks, etc.) in front of the Philips technical cabinets. Floor must be clear to allow cabinets to be pulled away from the wall for service.

(06.0)

Structural Support Legend

A Furnished and installed by Philips
B Furnished by customer / contractor and installed by customer / contractor
C Furnished by Philips and installed by RF Enclosure Supplier
D Furnished by Philips and installed by contractor
E Existing
F Future
G Option
H Furnished by RF Enclosure Supplier and installed by RF Enclosure Supplier
J Furnished by Philips and Installed by Rigging Company

	Item Number	Description	Detail Sheet
H	S1	Aluminum magnet support pads (4x) by RF enclosure supplier.	SD1
H	S2	Aluminum patient table support pads (2x) by RF enclosure supplier.	SD1
B/H	S3	No false ceiling (tile or grid) in this area, 28.36" x 56.69" (720 mm x 1440 mm). This 10' - 0" H (8' - 9" min H) service area must be clear of obstructions.	SD1
B	S4	Wall anchorage for Integrated Mains Distribution Unit. Not to penetrate RF shield.	
B	S5	Wall anchorage for System Filter Box. Not to penetrate RF shield.	SD2
B	S6	Wall anchorage for Emergency Run-Down Button. Not to penetrate RF shield.	SD2
B/H	S7	Limit ferrous material in finished floor to a total of 5.1 pounds per square foot.	
B/H	S8	31.50" x 56.69" (800 mm x 1440 mm) removable ceiling area for servicing equipment. Grid work must be easily removed for access.	SD1
B	S9	Schreiber 15MED AC Chiller - GEN II support pad. Exterior location t.b.d. by customer and local Philips service (not shown).	SD2
C	S10	System Filter Box RF feedthrough.	SD2 MP5
C	S11	Liquid Cooling Cabinet helium gas lines and water hoses RF feedthrough. Locate above suspended ceiling and within 39" (1000 mm) of System Filter Box.	SD2 MP5 SD2
C	S12	Helium Gas Exhaust Pipe RF feedthrough (exact location t.b.d., not shown).	MP1 MP2 MP5
H	S13	Emergency Air Escape/Overpressure grid RF feedthrough (exact location and size t.b.d., not shown).	MP3 MP5
H	S14	Gradient air exhaust RF feedthrough (exact location t.b.d., not shown).	MP3 MP5
H	S15	Patient Ventilation RF feedthrough (exact location t.b.d., not shown).	SD3 MP3 MP5
B	S16	Wall anchorage for Patient Ventilation. (can be above or below ceiling)	SD3 MP5
B/H	S17	Openings in finished ceiling for ceiling speakers (not shown).	SD3
B/H	S18	Helium exhaust pipe / wave guide RF feedthrough exclusion area (not shown).	MP1 MP2 MP5
B	S19	Mounting plate for Interactive Display (exact location t.b.d.)	SD3
H	S20	Air Escape RF feedthrough. Optional pressure balancing feedthrough between magnet room and adjacent room (exact location and size t.b.d., not shown).	MP3 MP5
H	S21	Air Grid RF feedthrough for conditioned air entering exam room (exact location t.b.d., not shown).	MP3 MP5

CUSTOMER / CONTRACTOR SHALL RECOMMEND AND / OR PROVIDE EQUIPMENT ANCHORING SYSTEMS (I.E. "HILTI", "REDHEAD", ETC) BASED UPON SPECIFIED "PULL" FORCES AND WALL / CEILING / FLOOR COMPOSTIONS

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08.30.06

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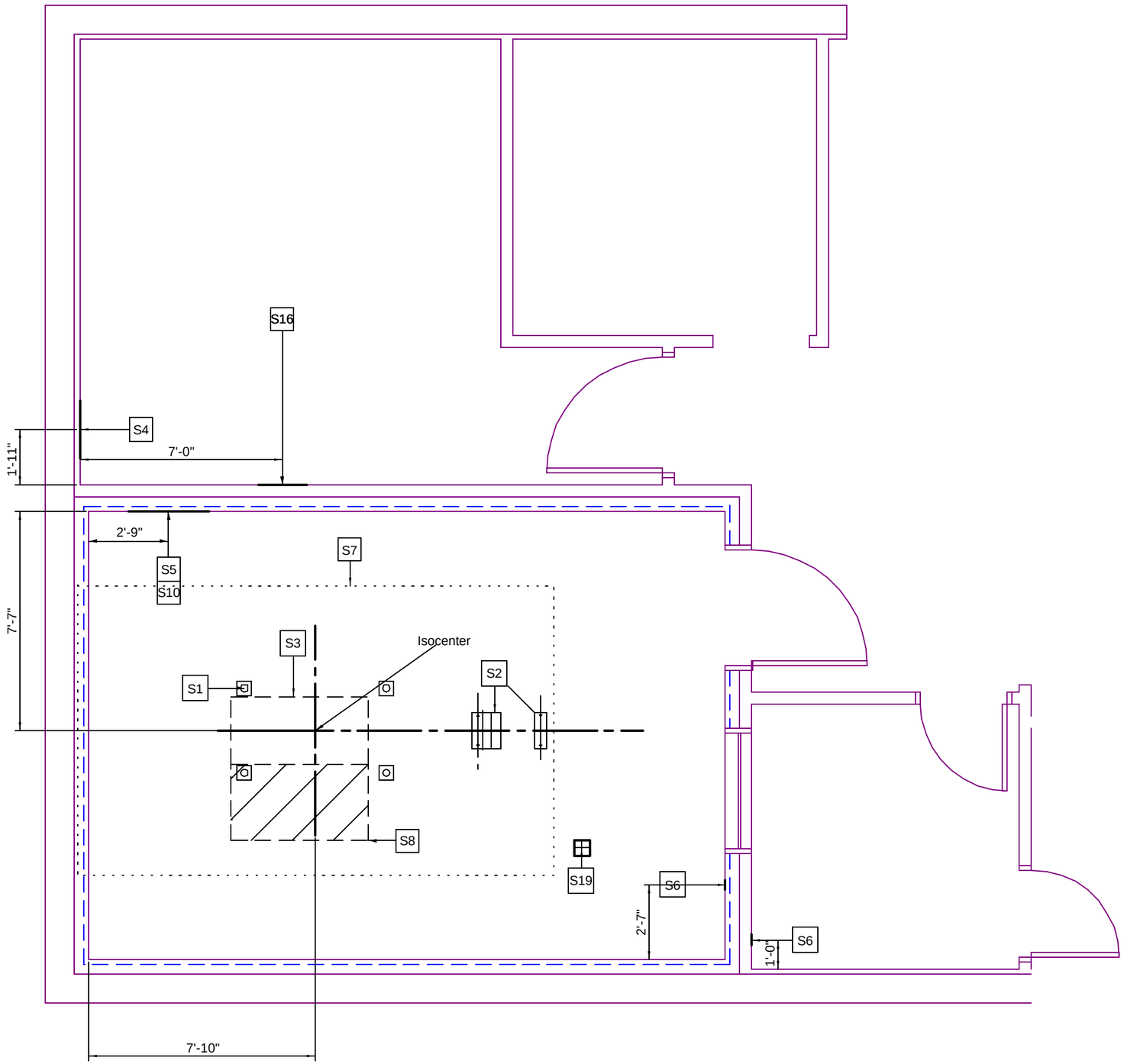
Support Layout

Required Ceiling Height
Equipment Room: 8' - 6 3/8" (2600 mm) - higher
RF Room: 9' - 2" (2794mm) - higher
RF Room Suspended Ceiling: 8' - 3" (2515 mm)
Control Room: 9' - 6" (2896 mm) - higher

0 1' 2' 4' 8'

All wall anchorages are measured to centerlines.



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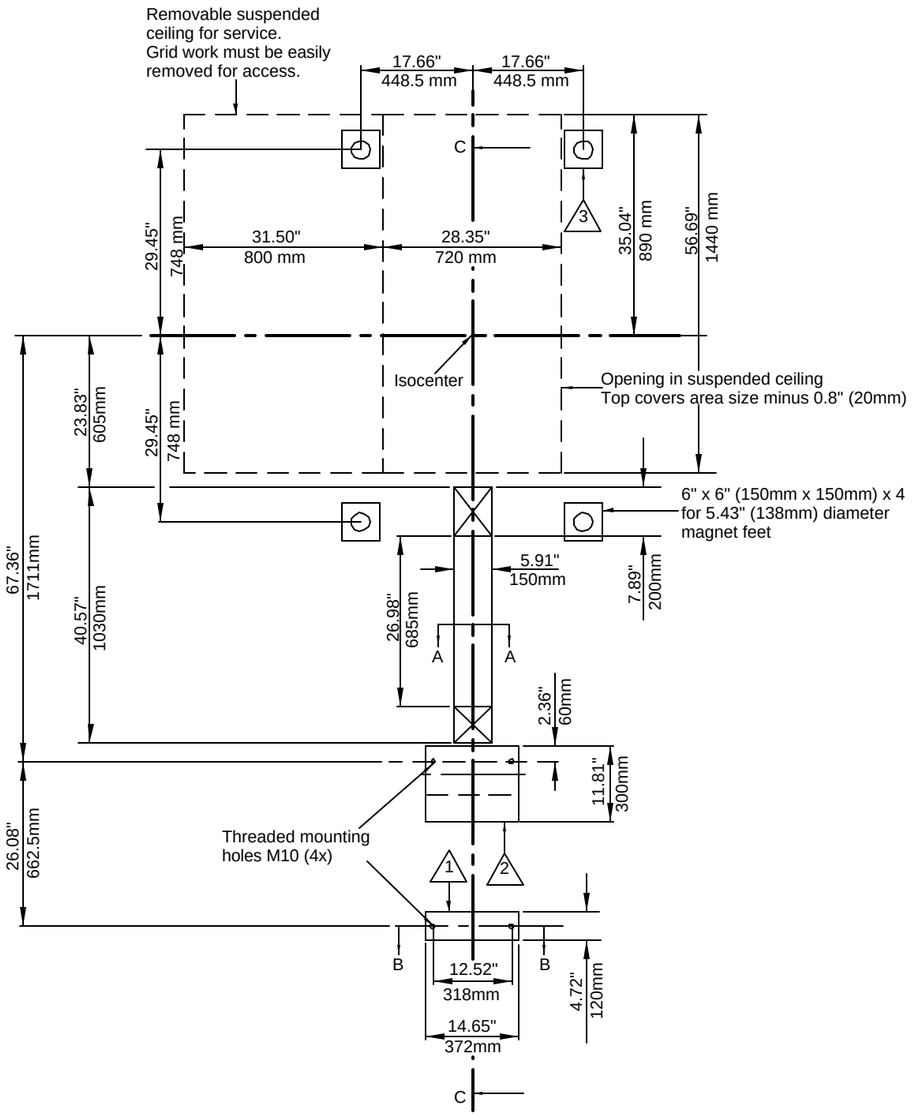

Floor pads must have minimum thickness of:
Pad 3: 0.4" (10mm) for stainless steel or 0.6" (15mm) for aluminium.
Pad 1 & 2: 0.6" (15mm) for stainless steel or aluminium.

Floorload Forces on Floor Pads:

	Pad 1 & 2	Pad 3
Horizontal:	900 lbs (4 kN)	337.2 lbs (1.5 kN)
Upwards:	2248 lbs (10 kN) per bolt or 3597 lbs (16 kN) per pad	n.a.
Downwards:	2248 lbs (10 kN)	2810 lbs (12.5 kN)

Threaded mounting holes must have at least 0.6" (15mm) thread.
Bolts must be electrically isolated and anchored to a medium that can support above mentioned forces.

Magnet and Patient Support Detail

S1 S2 S3 S8 FR1

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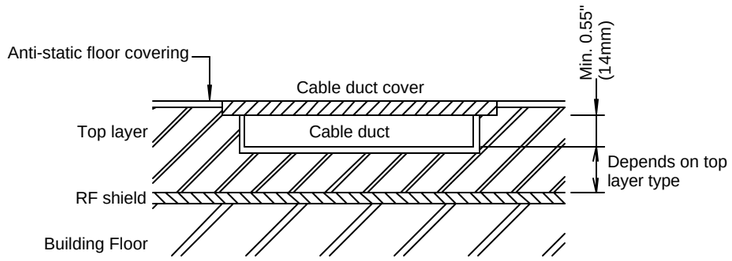
CUSTOMER / CONTRACTOR SHALL RECOMMEND AND / OR PROVIDE EQUIPMENT ANCHORING SYSTEMS (I.E. "HILTI", "REDHEAD", ETC) BASED UPON SPECIFIED "PULL" FORCES AND WALL / CEILING / FLOOR COMPOSTIONS

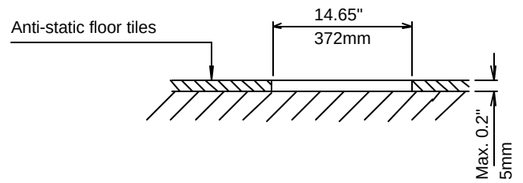


Cable Duct Cover Requirements:

- 1 cover with length of 26.98" (685mm)
- Pressure force: 2000N
- Max. bending-through: 0.02" (0.4mm)
- Removable
- Smooth and well rounded edges
- Non-magnetic material
- Flush with finished floor

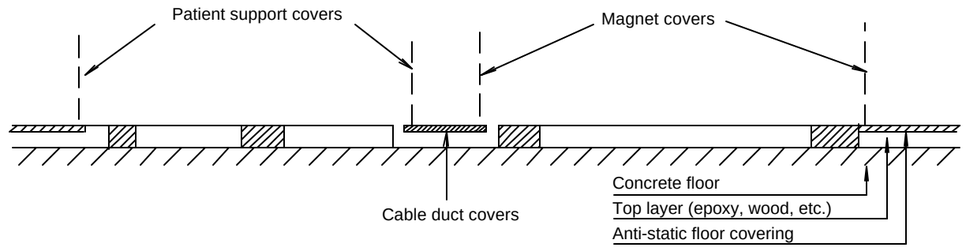
Cross Section A-A

(00.0)



Cross Section B-B

(00.0)



S1 S2

Cross Section C-C

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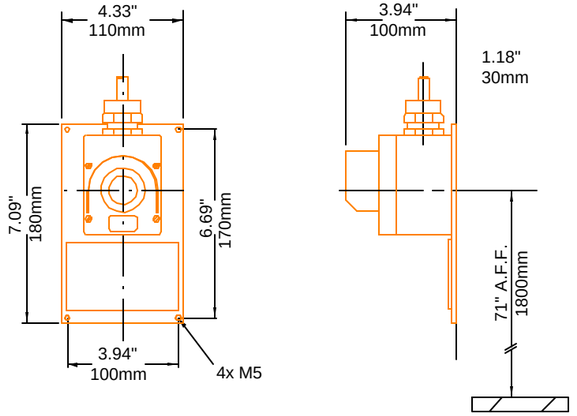
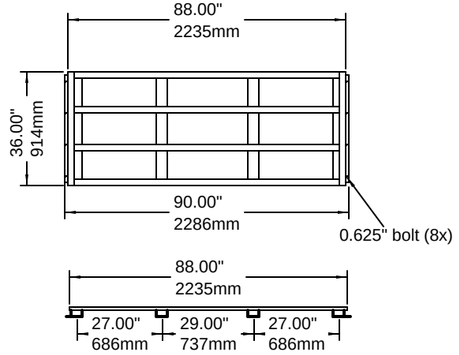


Emergency Run Down Button Mounting Detail

S6

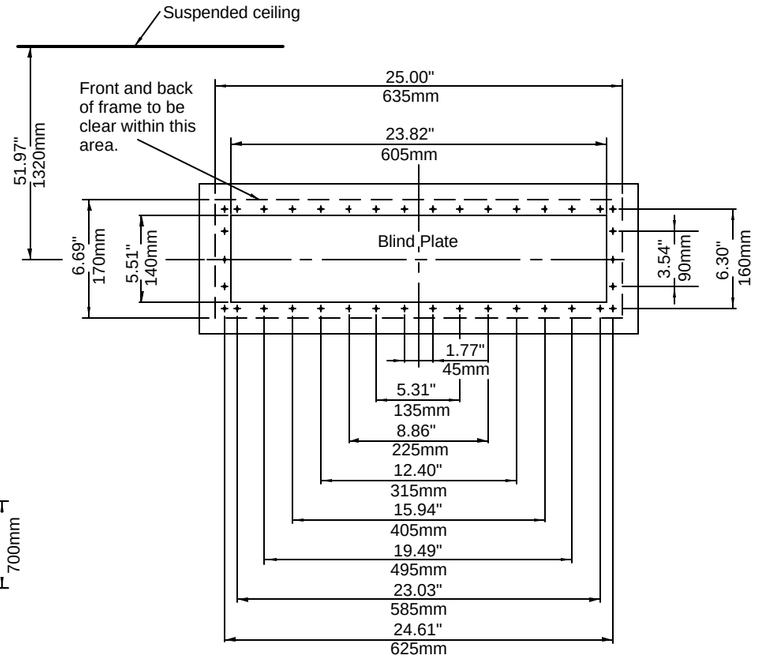
(99.1)

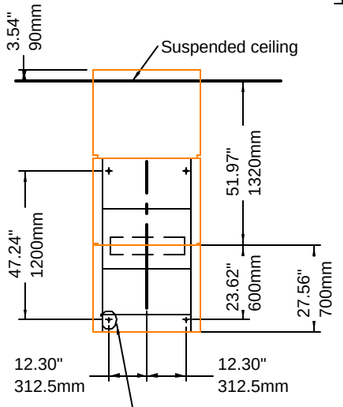


Schreiber 15MED AC Chiller - GEN II Support Pad

S9

(05.0)





Notes:

1. 4x stainless steel nuts and washers M10.

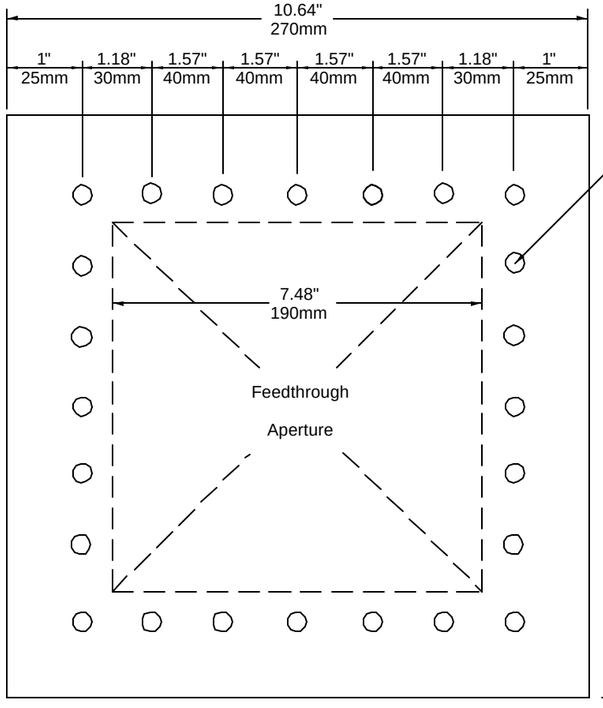
Notes:

1. 38 stainless steel screws (10 mm L) and washers (M5) to be provided by RF Enclosure supplier.
2. Mounting holes to be unblocked to ensure screws can fully penetrate frame. Leave a minimum 0.19" (5 mm) clearance around mounting holes.
3. Wooden Mounting Frame to be provided and installed by RF Enclosure supplier.

System Filter Box RF Feedthrough

S5 S10

(04.0)

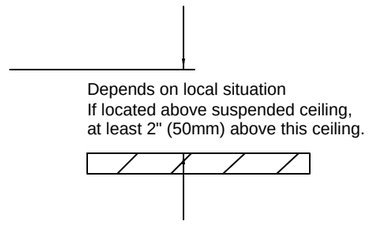


Front View

Notes:

1. Threaded holes shall provide reliable electrical contact with RF shield andRF tight fixation screws for interface plate.
2. 24x stainless steel screws and washers (M5) to be delivered by RF Enclosure supplier.
3. Mounting holes to be unblocked to ensure screws can fully penetrate frame. Leave a minimum 0.19" (5 mm) clearance around mounting holes.
4. Wooden mounting frame to be provided and installed by RF Enclosure supplier.
5. Dimensions shown are to be used on all sides of helium panel.

Note: Dimensions shown are to be used on all sides of helium panel.



Liquid Cooling Cabinet Gas Lines and Water Hoses RF Feedthrough / Helium Gas Exhaust Pipe RF Feedthrough

S11 S12

(01.0)

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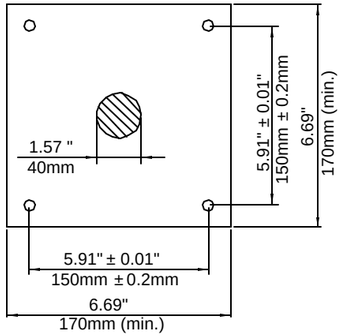

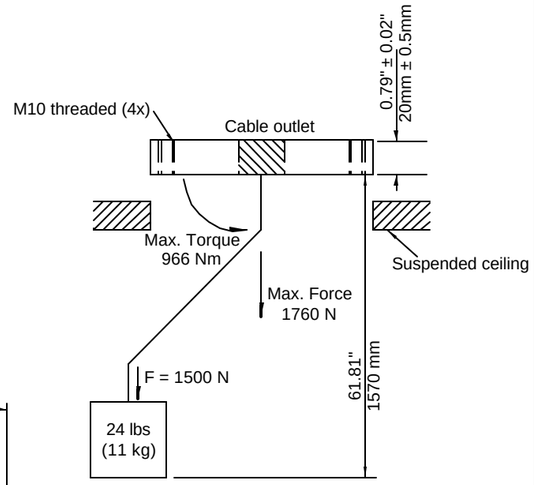

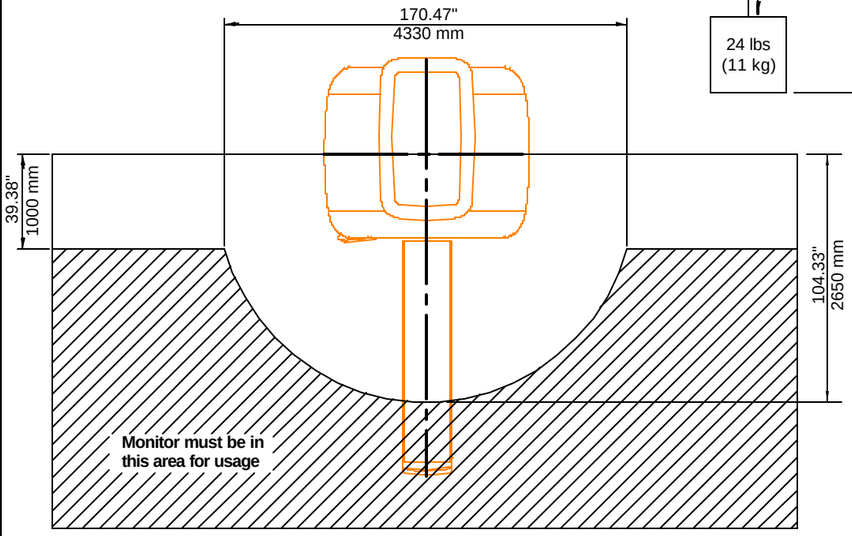

S19

ID

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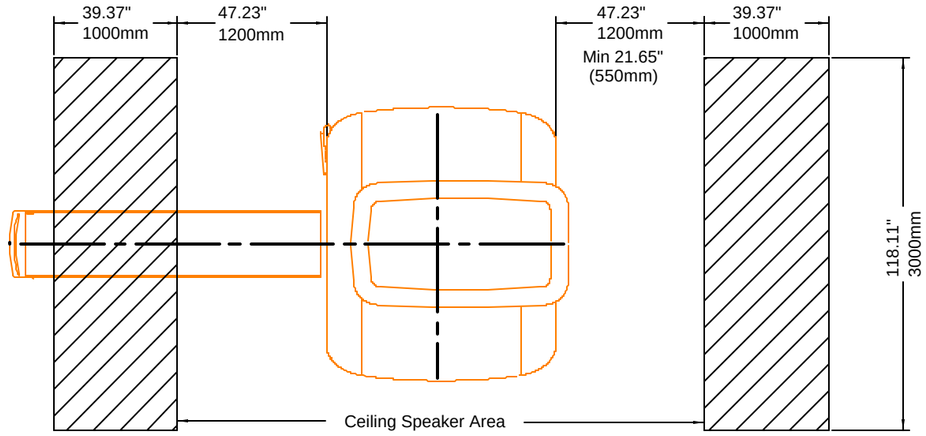
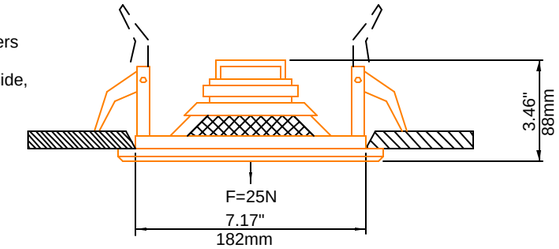
Interactive Display Mounting Detail



Two Philips communication speakers supplied. Customer/Contractor to flush mount one speaker, each side, in suspended ceiling.

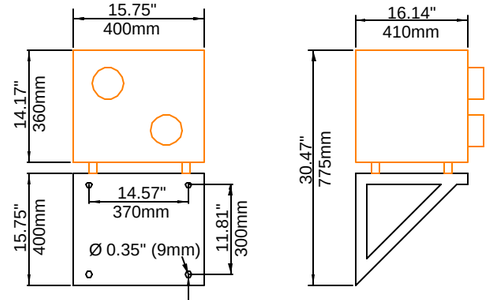


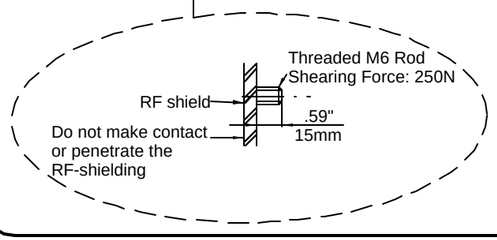
S17

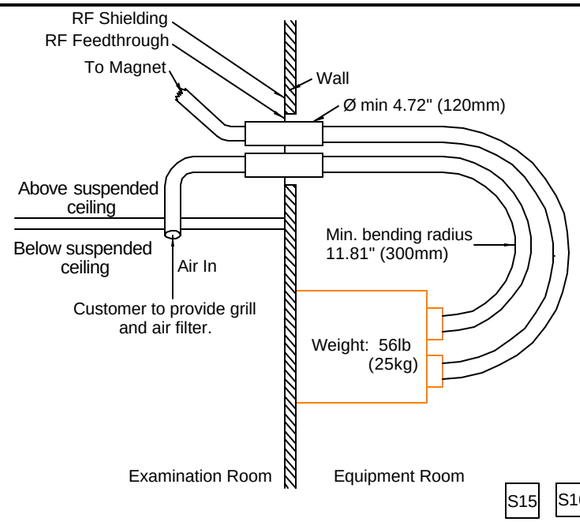
CS

(99.2)

Ceiling Speakers in Exam Room







S15 S16

(99.2)

Patient Ventilation Mounting Detail

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08.30.06

Date
9-18-06

O.A. Number
9004000

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Quote Number
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SD3

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RF Enclosure Electrical Notes

1. **Mains Safety Switches -** Mains safety switches may be installed inside the RF enclosure. Installation must follow all local regulations. There are no RF filters in the System Filter Box made for this purpose.
2. **Door Open / Closed Switch -** Each door must be provided with a switch that signals the open/closed status of the door to the system. The switch(es) must be mounted (mechanically or electrically) outside the RF enclosure. The switch(es) must have a contact that closes when the door is closed. Switches must be wired in series with screened cable, and must be rated at a minimum of 30 V DC, 100 mAmps.
3. **Protective Earth -** The RF enclosure requires one central protective earth (PE) bus-bar/terminal. This PE point must be connected to the PDU ground point by means of the conductor at least 16 mm² in cross section. See ED1 sheet for details.
   The central PE bus-bar/terminal of the enclosure must be as close as possible to the central earth terminal of the System Filter Box (≤ 39.4" [≤ 1000 mm]) and there cannot be any seams in the shielding between both earth points. The MR system parts must connect to the earth point inside the System Filter Box. All other items, such as facilities heating and water supply, must be connected to the central RF enclosure PE bus-bar/terminal.
   The impedance between any conductive part and the central PE bus-bar/terminal cannot exceed 100 mOhms. All PE conductors used must be at least 6 mm² in cross section. An earth leakage switch is not required.
   For optimum shielding performances, "loops" inside and outside the RF enclosure must be minimized. This leads to the following precautions:
   a. Galvanic isolation layer between the RF enclosure and the building is recommended. Local regulations or the installation instructions of the RF enclosure supplier may require that the RF enclosure be isolated from the building.
   b. Isolated in the context means DC impedance greater than 3 kOhms.
   c. All suspensions (e.g. for the quench pipe, helium gas lines, air ducts) must also serve to isolate these items from the RF enclosure.

   See sheet ED1 for "Basic MR Safety Grounding Schematic".
4. **Auxiliary Electrical Filters -** Any electrical interconnection, that are not part of the MR system, entering the RF enclosure require electrical filters. These filters may give rise to earth leakage currents in the RF enclosure, which could present a safety hazard. For complete safety, the total of all the earth leakage currents generated by all auxiliary electrical filters must not exceed 5 mAmps. If necessary, use an isolation transformer with the filters to minimize the effects of current leakage.

(06.0)

General Electrical Notes

1. The contractor will supply and install all breakers, shunt trips and incoming power to the breakers. The exact location of the breakers and shunt trips will be determined by the architect/contractor.
2. The contractor shall supply and install all pull boxes, raceways, conduit runs, stainless steel covers, etc. Conduit/raceways must be free from burrs and sharp edges over its entire length. A Greenlee pull string/measuring tape (part no. 435, or equivalent) shall be provided with conduit runs.
3. All pre-terminated, cut to length cables, will be supplied and installed by Philips service. All cables to the breakers, will be supplied and installed by the contractor, subject to local arrangements.
4. Electrical raceway shall be installed with removable covers. The raceway should be accessible for the entire length. In case of non - accessible floors, walls and ceilings, an adequate number of access hatches should be supplied to enable installation of cabling. Approved conduits may be substituted. All raceways will be designed in a manner that will not allow cables to fall out of the raceway when the covers are removed. In most cases, this will require above - ceiling raceway to be installed with the covers removable from the top. Raceway system as illustrated on this drawing are based upon length of furnished cables. Any changes in routing of raceway system could exceed maximum allowable length of furnished cables. Conduit or raceway above - ceiling must be kept as near to finished ceiling as possible.
5. Conduit sizes shall be verified by the architect, electrical engineer or contractor, in accordance with local or national electrical codes, whichever govern. Conduit sizes shown on these plans are minimum sizes. This is based on fill factor and cable connector size. Substituting smaller conduits is not permitted.
6. Convenience outlets are not illustrated. Their number and location are to be specified by the customer/architect.
7. All sections of raceway and conduit shall be grounded with an independent #6 a.w.g.green wire that is to be attached using solderless lugs. All ceiling mounted structural support members and ceiling plates shall also be grounded. All grounding connections, terminals, etc. shall be installed in a manner to provide accessibility for inspection, maintenance, repair, etc.

(03.0)

General Electrical Information

1. **General**
   The customer shall be solely responsible, at its expense, for preparation of the site, including any required electrical alterations. The site preparation shall be in accordance with this plan and specifications, the architectural/construction drawings and in compliance with all safety and electrical codes, the customer shall be solely responsible for obtaining all electrical permits from jurisdictional authority.
2. **Materials and Labor**
   The customer shall be solely responsible, at its expense, to provide and install all electrical ducts, boxes, conduit, cables, wires, fittings, bushing, etc., as separately specified herein.
3. **Electrical Ducts and Boxes Outside the RF Enclosure**
   Electrical ducts and boxes shall be accessible and have removable covers. Floor ducts and boxes shall have watertight covers. Ducts shall be divided into as many as three separate channels by metal dividers, separately specified herein, to separate wiring and/or cables into groups as follows: Group a: power wiring and/or cables. Group b: signal and/or data and protective ground wiring and/or cables. Group c: x-ray high voltage cables. The use of 90° ells is not acceptable. On ceiling duct and wall duct use 45° bends at all corners. All intersecting points in duct to have cross over tunnels supplied and installed by contractor to maintain separation of cables.
4. **Conduit Outside RF Enclosure**
   Conduit point-to-point runs shall be as direct as possible. Empty conduit runs used for cables may require pull boxes located along the run. Consult with Philips. A pull wire or cord shall be installed in each conduit run. All conduits which enter duct prior to their termination point must maintain separation from other cables via use of dividers, cross over tunnels, or flex conduit supplied and installed by contractor from entrance into duct to exit from duct. Maximum conduit lengths shown on these plans are calculated from electrical box entrance to electrical box entrance.
5. **Conductors / Earth Conductor**
   All conductors, separately specified, shall be 75° c stranded copper, rung out and marked. Do not use metal conduit or raceway as a ground conductor. The earth conductor for the MRI system must be dedicated and totally separate from the conduit, raceway, or structural ground. This is required to maintain the MR system "Quiet Ground" as permitted by NFPA 99. The earth conductor has a recommended size of 35 mm², AWG 2.
6. **Disconnecting Means**
   A disconnecting means shall be provided as separately specified.
7. **Grounding**
   Grounding must conform with current requirements for electrically susceptible patient areas. See Article 517, National Electrical code.
8. **Lighting and Wall Sockets Inside the RF Enclosure**
   The use of incandescent AC lamps with reinforced filaments or quartz (halogen) lamps is recommended. The magnetic field may shorten the lifetime of the filament of the light bulb. For patient comfort, avoid direct light above the patient support and the rear of the magnet. A spotlight with a separate switch to assist the doctor during intervention procedures is recommended. Two lighting levels (separate control) are required around the magnet:
   a. 200 lux for patient examination
   b. 500 lux for servicing

   The use of fluorescent lamps (e.g. energy saving lamps) and electronic light dimmers is strictly prohibited to avoid RF interference. Wall outlets should be located inside the enclosure for use of third party equipment. A double socket outlet (20 Amp) and a light with switch for servicing purposes must be provided above the suspended ceiling in the RF enclosure in the vicinity of the magnet turret.

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Electrical Requirement Notes for Systems with PDU

Electrical power distribution at the facility shall comply with:

Utilization voltages per ANSI C84.1 - 1982 range A.

Voltage to be supplied is 3 phase, delta or wye.

Phase conductors to be sized for instantaneous voltage drop per NEC 517 - 73 and Philips recommendations.

On sites with a PDU, the ground conductor for the power feeder shall be sized per NEC requirements. The size of the ground conductor shall never be less than 1/2 the cross-sectional area of the phase conductors, and never smaller than #5 AWG. On sites without a PDU, the ground conductor for the power feeder shall be sized equal to the phase conductors. The separate ground wire connections to building steel and to the ground busbar shall be sized as #1 AWG.

Metal conduit shall not be used as the equipment ground conductor.

ANSI / NFPA 70 - National Electrical Code
Article 250 - grounding
Article 517 - health care facilities

ANSI / NFPA 99 - health care facilities

NEMA standard XR9 - power supply guideline for x-ray machines

(03.0)

Power Quality Guidelines

1. Power supplied to medical imaging equipment must be separate from power feeds to air conditioning, elevators, outdoor lighting, and other frequently switched or motorized loads. Such loads can cause waveform distortion and voltage fluctuations that can hinder high quality imaging.
2. Equipment that utilizes the facility power system to transmit control signals (especially clock systems) may interfere with medical imaging equipment, thus requiring special filtering.
3. The following devices provide a high impedance, nonlinear voltage source, which may affect image quality:
   Static UPS systems, Series filters, Power conditioners, and Voltage regulators.

   Do not install such devices at the mains supply to medical imaging equipment without consulting Philips installation or service personnel.
4. Line impedance is the combined resistance and inductance of the electrical system and includes the impedence of the power source, the facility distribution system, and all phase conductors between the source and the imaging equipment. Philips publishes recommended conductor sizes based on equipment power requirements, acceptable voltage drops, and assumptions about the facility source impedance. The minimum conductor size is based on the total line impedance and NEC requirements. Unless impedance calculations are performed by an electrical engineer, the recommended values must be used.

(03.0)

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Drawn By Florido, Ryan
Quote Number 1-3EIXLX Rev. 1
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EN1
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Electrical Legend

A Furnished and installed by Philips
B Furnished by customer / contractor and installed by customer / contractor
C Furnished by Philips and installed by RF Enclosure supplier
D Furnished by Philips and installed by contractor
E Existing
F Future
G Option
H Furnished by RF Enclosure Supplier and installed by RF Enclosure supplier
J Furnished by Philips and Installed by rigging company

	Item Number	Description	Detail Sheet
B	CR1	4" H x 16" W non-ferro magnetic cable ladder tray mounted above ceiling behind the magnet. Divided into 3 compartments: 4" H x 6" W, 4" H x 6" W, and 4" H x 4" W.	
B	CR2	4" H x 24" W non-ferro magnetic cable ladder tray mounted above ceiling from "CR1" to "SFB". "CR1" + "CR2" must be between 13' - 3" and 24' - 3". Divided into 3 compartments: 4" H x 8" W, 4" H x 10" W, and 4" H x 6" W.	
B	CR3	Ceiling mounted 4" H x 4" W cable tray. Cannot run through RF exam room. Cable between "OC" - "DAC" (max. 55' - 9") routed through "WR1", "R1", "R2", "CR3", and "CAF".	ED1
B	WR1	4" W x 4" D wall raceway, surface mounted 12" A.F.F. to bottom with removable screw-type coverplate.	
B	WR2	16" W x 6" D cable ladder tray with removable screw-type coverplate. Bottom of ladder tray to be 60" above computer floor. Divided into 2 compartments: 12" H x 6" W and 4" H x 6" W for separation of cables. Surface mounted to "R4".	EN2
B	WR3	16" W x 6" D cable ladder tray with removable screw-type coverplate. Bottom of ladder tray to be 80" above computer floor. Divided into 2 compartments: 12" H x 6" W and 4" H x 6" W for separation of cables. Surface mounted to "R6".	EN2
B	ID	Cable in and outlet for Interactive Display. Location t.b.d.	SD3

Electrical Legend

A Furnished and installed by Philips
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C Furnished by Philips and installed by RF Enclosure supplier
D Furnished by Philips and installed by contractor
E Existing
F Future
G Option
H Furnished by RF Enclosure Supplier and installed by RF Enclosure supplier
J Furnished by Philips and Installed by rigging company

	Item Number	Description	Detail Sheet
B	R1	4" W x 4" D riser duct with removable screw-type coverplate. Surface mounted from "WR1" to "CR3".	ED1
B	R2	4" W x 4" D riser duct with removable screw-type coverplate. Surface mounted from "CR3" to below "CAF".	ED1
B	R3	30" W x 6" D riser duct with removable screw-type coverplate. Surface mounted from System Filter Box penetration to below "CAF".	ED1
B	R4	16" W x 6" D cable ladder tray with removable screw-type coverplate. Divided into 2 compartments: 12" W x 6" D and 4" W x 6" D for separation of cables. Surface mounted from "WR2" to below "CAF".	ED1
B	R5	10" W x 4" D riser duct with removable screw-type coverplate. Surface mounted from "PBK" to below "CAF".	ED1
B	R6	16" W x 6" D cable ladder tray with removable screw-type coverplate. Divided into 2 compartments: 12" W x 6" D and 4" W x 6" D for separation of cables up riser duct with removable screw-type coverplate. Surface mounted from "WR3" to below "CAF".	ED1
B	FR1	Flush mounted floor duct.	SD1
B	PBK	18" W x 18" H x 4" D wall box with removable screw-type coverplate, surface mounted 22" A.F.F. to bottom of box. Provide three 1 1/2" chase nipples through "PBK" coverplate to PDU cabinet.	ED1
B	ERB	2" W x 4" H x 2" D wall box with removable screw-type coverplate. Flush mounted 71" A.F.F. to bottom of box.	
B	CB1	480 V, 3 phase, 100 Amp circuit breaker. Run power from breaker to "PBK", leaving an 8' tail at "PBK".	ED1
B	CB2	Circuit breaker for Schreiber Chiller. See ED1 for power requirements. Run power from breaker to chiller.	ED1
D	CS	Flush mounted ceiling speakers (not shown).	SD3
B	CAF	Raised computer floor (by customer). Minimum 6" clear space underneath flooring. All Philips equipment in equipment room will require grommetted openings for cable connections. Consult with local Philips service.	ED1
B	DS	RF door open switch - 120 V, 5 Amp switch limited to open when door is open. Mounted in upper corner on strike side of entry door.	
D	SFB	Wall mounted System Filter Box.	
B	SFT	Ceiling mounted electrical switch for service light. Mounted above finished ceiling.	
B	FT	Ceiling mounted incandescent AC lighting (500 lux) above finished ceiling.	EN1
B	WS	Twin wall socket, single phase. See EN1 sheet for detals.	EN1
B	CZ	Patient comfort zone. No direct lighting in this area.	
D	REM	Schreiber Chiller Remote Controller.	
B		Required 120 VAC convenience outlet. Additional outlets may be desired by customer or required by code.	
B	T	Remote technical service - provide dedicated analog phone line with telephone jack for modem hook-up. Outlet to be located in equipment room.	
B	N1	RJ45 type ethernet 10/100/1000 Mbit network connector. Access to customer's network via their remote access server is needed for Remote Service Network (RSN) connectivity.	N1
B	N2	RJ45 type ethernet 10/100/1000 Mbit network connector with access to customer's network. Locate within 10' of network card. Network fiber optic and ethernet cabling, connectors, wall boxes, patch panels, etc. are the responsibility of the purchaser. Philips assumes no responsibility for procurement, installation, or maintenance of these components.	N2
B	e	RJ45 type ethernet 10/100/1000 Mbit network connector with internet access for Philips Field Service Engineer connectivity to on-line system documentation.	

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Conduit Required

General Notes

1. All conduit runs must take most direct route point to point.
2. All conduit runs must have a pull string.

A Conduit supplied / installed by contractor - Philips cables installed by Philips
B Conduit supplied / installed by contractor - Philips cables installed by contractor
C Conduit and cables supplied and installed by contractor
D Conduit existing - cables supplied and installed by Philips
E Conduit exisiting - cables supplied by Philips, installed by contractor
F Conduit exisiting - cables supplied and installed by contractor

P Power/ Ground Cables
S Signal Cables
* **V** Video Cables
H High Tension Power
C Cooling Hoses

	Conduit			Conduit Quantity	Minimum Conduit Size	Maximum Conduit Length	Special Requirements
	Run No.	From	To				
C	1	hosp power	HVAC system	PER NEC (P)	PER NEC	PER NEC	
C	2	hosp power	RF filters	PER NEC (P)	PER NEC	PER NEC	
C	3	hosp power	CB1	PER NEC (P)	PER NEC	PER NEC	
C	4	PBK	CB1	1 (P)	PER NEC	50'	
A	5	ERB	"SFB"	1 (P)	3/4"	98.5'	ERB in control room.
A	6	ERB	"SFB"	1 (P)	3/4"	49'	ERB in exam room.
C	7	"DAC"	DS	1 (S)	1/2"	65.5'	See EN1 sheet for details.
A	8	WR1	"SFB"	1 (S)	2"	65.5'	
A	9	PV	"SFB"	1 (P)	1 1/2"	-	
C	10	hosp power	CB2	PER NEC (P)	PER NEC	PER NEC	
C	11	Schreib Chiller	CB2	1 (P)	2"	PER NEC	
B	12	Schreib Chiller	REM	1 (S)	1/2"	150'	

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EN3
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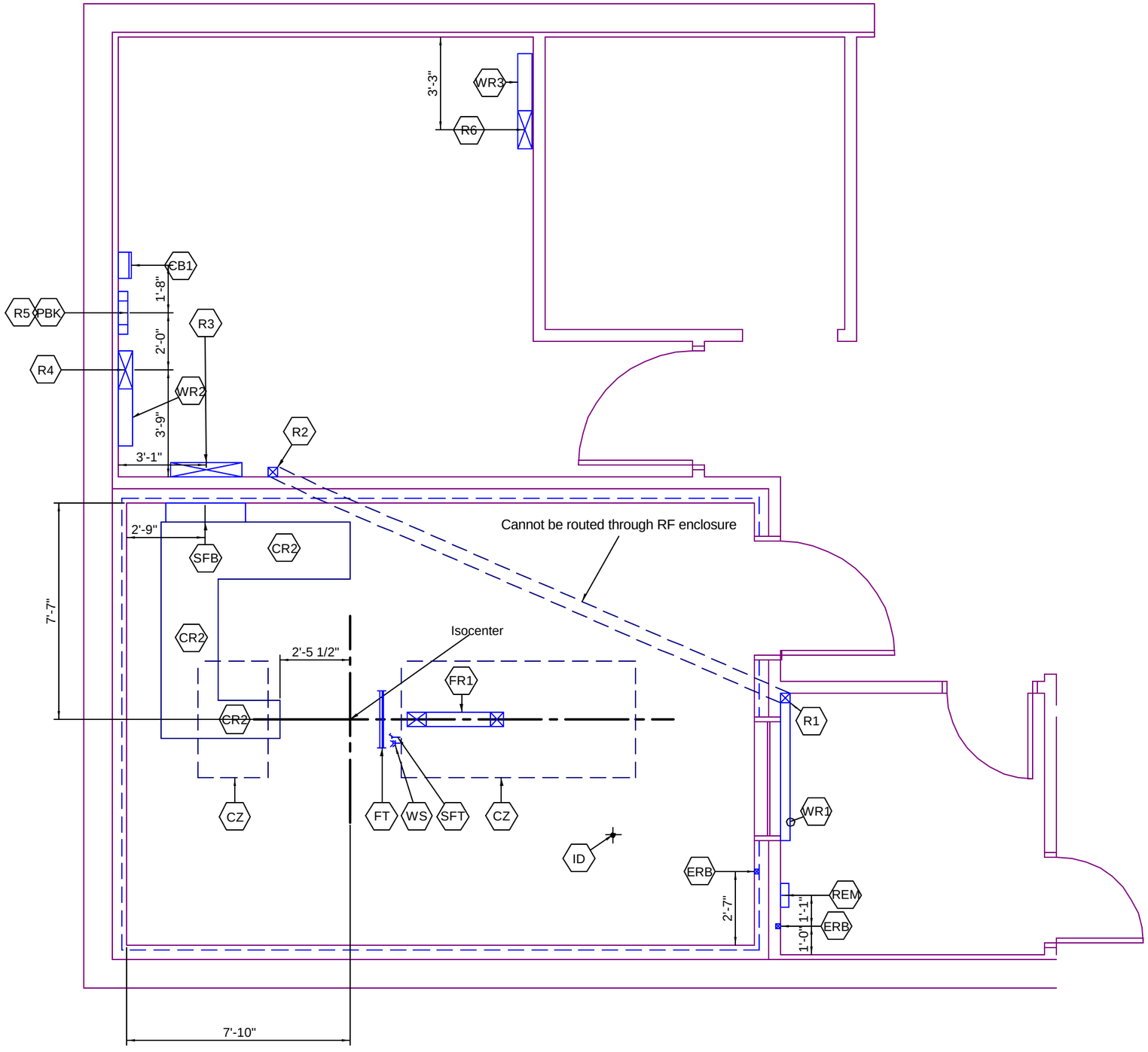
Electrical Layout

Required Ceiling Height
Equipment Room: 8' - 6 3/8" (2600 mm) - higher
RF Room: 9' - 2" (2794mm) - higher
RF Room Suspended Ceiling: 8' - 3" (2515 mm)
Control Room: 9' - 6" (2896 mm) - higher

0 1' 2' 4' 8'

All risers and circuit breakers are dimensioned to centerlines.



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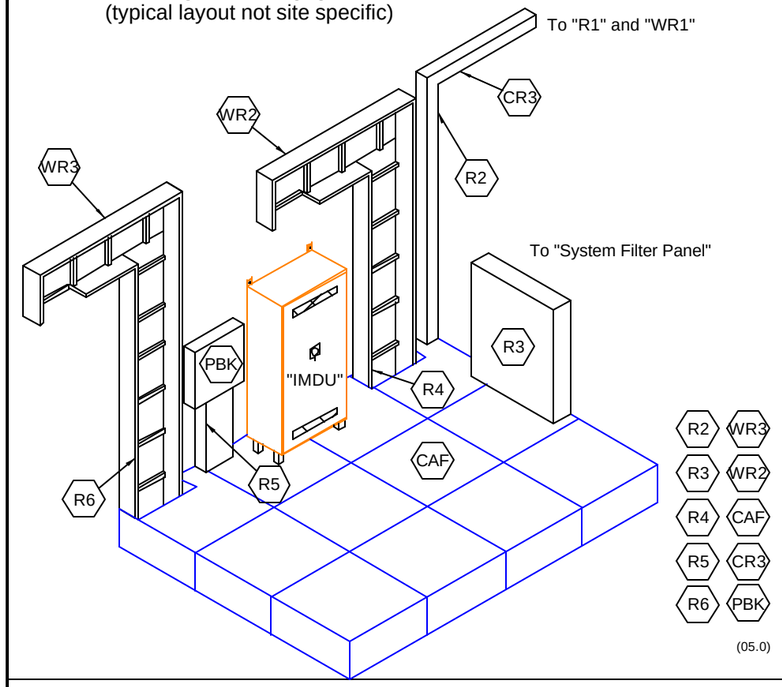
Isometric Diagram for Equipment Room

(typical layout not site specific)



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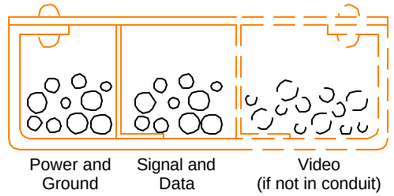
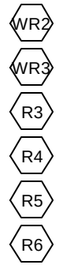
Cable Trough Divisions Outside RF Enclosure

Troughs or ducts must be separated by metal barriers into three sections:

1. Power cables and ground cables can be run together.
2. Signal cables and data cables can be run together but must be separated power cables.
3. Video cables to be run separately from all other cables.



4. It is important that all cables are placed in the appropriate trough and at no given point do any cables from one division cross with cables from another. Trough separation must be continuous from the beginning to the end of the run.
5. Trough or ducts: steel with steel dividers grounded to building ground.
6. Contractor to provide cable restraints in all troughs.



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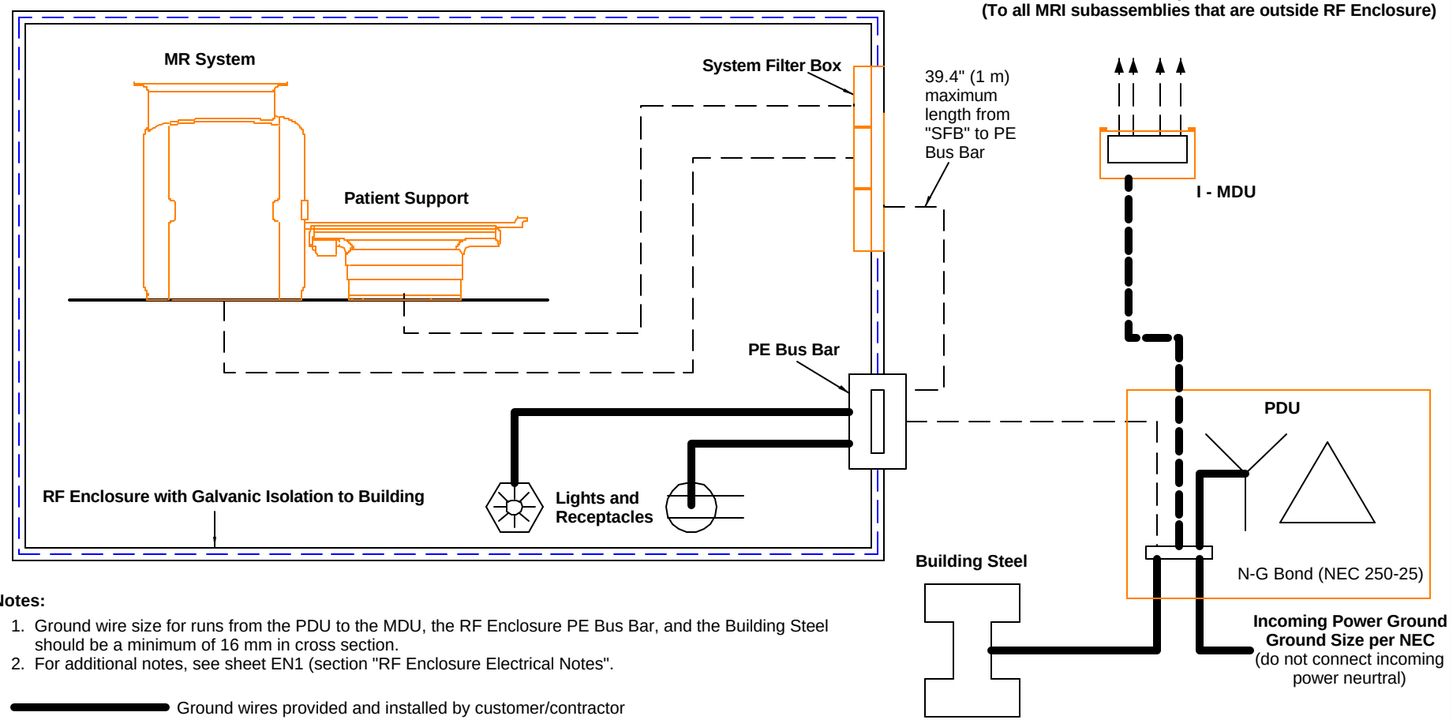
Power Quality Requirements

(with Cryocooler [5 kVA])

Branch Power Required:	75 kVA			
Maximum Power Required:	70 kVA			
Supply Configuration:	3ø + ground			
Nominal Input Power:	208 VAC	240 VAC	380 VAC	480 VAC
Circuit Breaker Size: 3 phase, 60 Hz, 3 pole	200 Amps	175 Amps	125 Amps	100 Amps
Phase-to-phase Impedance:	0.05 Ohms	0.064 Ohms	0.16 Ohms	0.26 Ohms
Max. Load Voltage Drop:	9.72 V	10.78 V	17.02 V	21.89 V
% Load Voltage Regulation:	4.67 %	4.49 %	4.48 %	4.56 %
% Voltage Drop Allowed in Cable:	0.5 %	0.5 %	0.5 %	0.5 %
Instantaneous Current:	194 Amps	168 Amps	106 Amps	84 Amps
Voltage Drop in Cable:	1.04 V	1.2 V	1.9 V	2.4 V
Conductor Impedance:	0.0054 Ohms	0.0071 Ohms	0.0178 Ohms	0.0285 Ohms
Cable Length per Wire Size (based on 20 C copper ambient temperature):				
#2 AWG				85.9'
#1 AWG			68.2'	108.8'
#1/0 AWG			85.9'	137.0'
#2/0 AWG		43.1'	108.0'	172.3'
#3/0 AWG	40.8'	54.3'	136.2'	217.3'
#4/0 AWG	51.5'	68.5'	171.8'	274.1'
250 MCM	60.8'	81.0'	203.0'	323.9'

Basic MR Safety Grounding Schematic



Notes:

1. Ground wire size for runs from the PDU to the MDU, the RF Enclosure PE Bus Bar, and the Building Steel should be a minimum of 16 mm in cross section.
2. For additional notes, see sheet EN1 (section "RF Enclosure Electrical Notes".

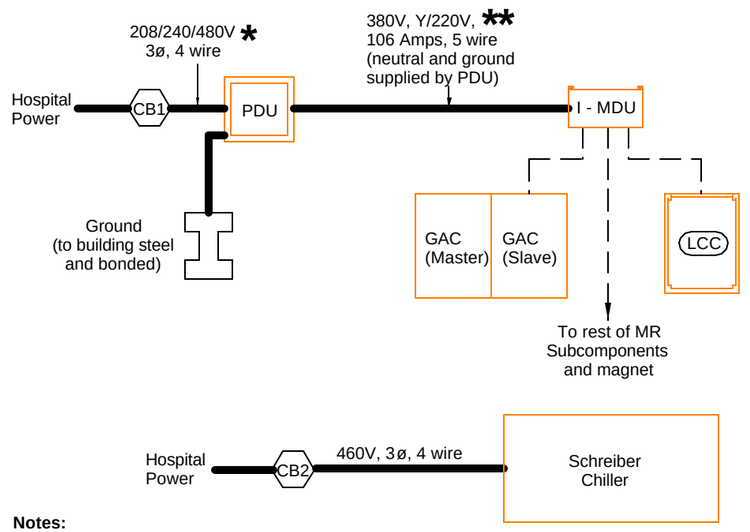
Ground wires provided and installed by customer/contractor

Ground wires provided and installed by Philips

Ground wires provided by Philips and installed by customer/contractor

(04.0)

1. Supply for Schreiber 15MED Chiller - GEN II (CH) [line provided/installed by customer/contractor]
460V, 60 Hz, 3ø + ground, FLA =40.15 Amps, Max Fuse = 55 Amps, Min. Supply = 48.8 Amps



Notes:

* If incoming power has a neutral line, DO NOT connect line to PDU

** Neutral from the PDU secondary needs to be wired to MDU and connected to the ground bus bar internal to the PDU.

Provided and installed by customer/contractor

Provided and installed by Philips

Provided by Philips and installed by customer/contractor

CB1

CB2

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ED1

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Helium Gas Exhaust and Wave Guide Pipe Notes

1. Helium Gas Exhaust Pipe

a. A helium exhaust pipe is required to evacuate helium gas (evaporating from the cryostat) to a safe location outside the building. This system must be capable of exhausting a large amount of helium gas that is between -438° F (12° Kelvin) and the ambient temperature range. The pipe inside the RF enclosure (including the RF wave guide) in the RF enclosure is provided by Philips.

b. **The Philips provided exhaust pipe and/or wave guide CANNOT be modified (i.e. cut, etc.) or replaced under any circumstances.**

c. The exhaust pipe outside the RF enclosure has to be provided and installed by customer/contractor.

d. **The entire helium gas exhaust pipe must be thermally insulated** with 3" (75 mm) of insulation by 2.00 lbs/ft³ (32 kg/m³) expanded polystyrene or fiberglass insulation equivalent to R1.9 or better (e.g. Armaflex) and externally sealed by a vapor barrier. Failing to do so will cause a quench, magnetic field change, and will cause the quench pipe to drip excessive water (condense and liquid oxygen) during a liquid helium fill. Insulation for the entire helium exhaust pipe must be provided and installed by customer/contractor.

2. Helium Gas Exhaust Pipe Inside RF Enclosure Specifications

a. The following chart is a list of helium gas exhaust pipe parts delivered with the system:

Item		Length
1x	RF Feedthrough / Helium Wave Guide	15.75" (400 mm)
1x	Flexible pipe wall side	15.75" (400 mm)
3x	Straight pipe	39.37" (1000 mm)
1x	Straight pipe	19.69" (500 mm)
1x	Straight pipe	9.84" (250 mm)
1x	Flexible pipe magnet side	59.10" (1500 mm)
The Interal pipe diameter is 4" (100 mm)		

b. The following points must be considered when determining the route of the helium exhaust pipe internal to the RF enclosure (HEP) and location of the helium wave guide (HWG).

- Maximum distance between helium gas exhaust interface on magnet and helium wave guide is 18.04' (5.5 m). This is the absolute maximum length. **This length CANNOT be extended under any circumstances.**
- The minimum allowed bending radius of the helium exhaust pipe is 1.5 times its diameter (6" [150 mm]).
- The HEP cannot be routed above the patient support. Routing the HEP above the patient support can lead to cold burns if condensation builds up and liquidified air drops fall on the patient. Due to the optional Table Top Extender, the same requirements apply behind the magnet (Z-axis direction).*
- It is strongly recommended to locate the HWG on one of the RF walls, not the RF enclosure ceiling. However, if due to site constraints the HWG has to be located on the RF enclosure ceiling, then the RF enclosure ceiling height needs to minimally be 11' - 2.25" (3410 mm). At this RF enclosure ceiling height, the HWG must be installed backwards (short part installed inside RF enclosure, long part installed outside RF enclosure). For this reason, the customer/contractor must verify that the space provided outside the RF enclosure will accommodate the length of the HWG. *

*** = See "Helium Gas Exhaust Pipe and Wave Guide Exclusion Zone" details on sheet MP2.**

3. Helium Gas Exhaust Pipe Outside RF Enclosure Specifications

a. All materials including couplings, insulation, etc. must withstand the minimum temperature of helium gas in the pipe during a quench. The minimum temperature is -438° F (12° K).

b. The material of the pipe shall be aluminum with a minimum wall thickness of 0.12" (3 mm), or stainless steel with a minimum wall thickness of 0.019" (0.5 mm).

c. All bend radii shall be a minimum of 1.5 times the diameter of the pipe.

d. All pipe joints to be gas-tight welded.

e. The outlet shall be pointing towards ground. A minimum length twice the pipe diameter is required for the part pointing downward.

f. In between the outlet and any restricting area (e.g. the roof or a wall) there must be between 3' - 3" and 9' - 10" (1 m and 3 m) clear space. Special attention is needed if in winter conditions (wind driven) snow accumulates under the outlet.

g. If the distance between the outlet and any restricted area is met (item **f**), then the restricted area must be protected against frost damage due to the cold helium gas.

h. There should be restricted access under the gas exhaust pipe and an area within 9' - 10" (3 m) left and right of the gas exhaust outlet.

Helium Gas Exhaust Pipe and Wave Guide Notes - con't

3. Helium Gas Exhaust Pipe Outside RF Enclosure Specifications - con't

i. There should be no hospital air inlet above the gas exhaust pipe and an area within 9' - 10" (3 m) left and right of the gas exhaust outlet.

j. The gases should not be vented into a closed area as helium gas heats up, it expands. This will pressurize the volume of this area. Helium can also cause suffocation by displacing the oxygen in the air.

k. If a screen is used to keep the exit clean, then the net area should be twice the exhaust pipe exit surface and the screen or mesh should be 0.59" x 0.59" (15 mm x 15 mm).

l. If a screen is used in combination with lateral exhaust slots, then the exhaust area should be twice the exhaust pipe exit surface and the openings should have the following dimensions:

- Screen or mesh 0.59" x 0.59" (15 mm x 15 mm)
- Lateral exhaust slots 0.39" W x 5.11" L (10 mm W x 130 mm L)
- Evaporating helium gas heats up and expands; therfore the diameter of the helium exhaust pipe should increase (if applicable) away from the cryostat.
- The exit shall be checked once a year.

m. The diameter of the helium exhaust pipe can be calculated with the following helium gas exhaust pressure drop table. The maximum allowed pressure drop over the whole exhaust pipe outside the RF enclosure is 0.725 PSI (50 mBar).

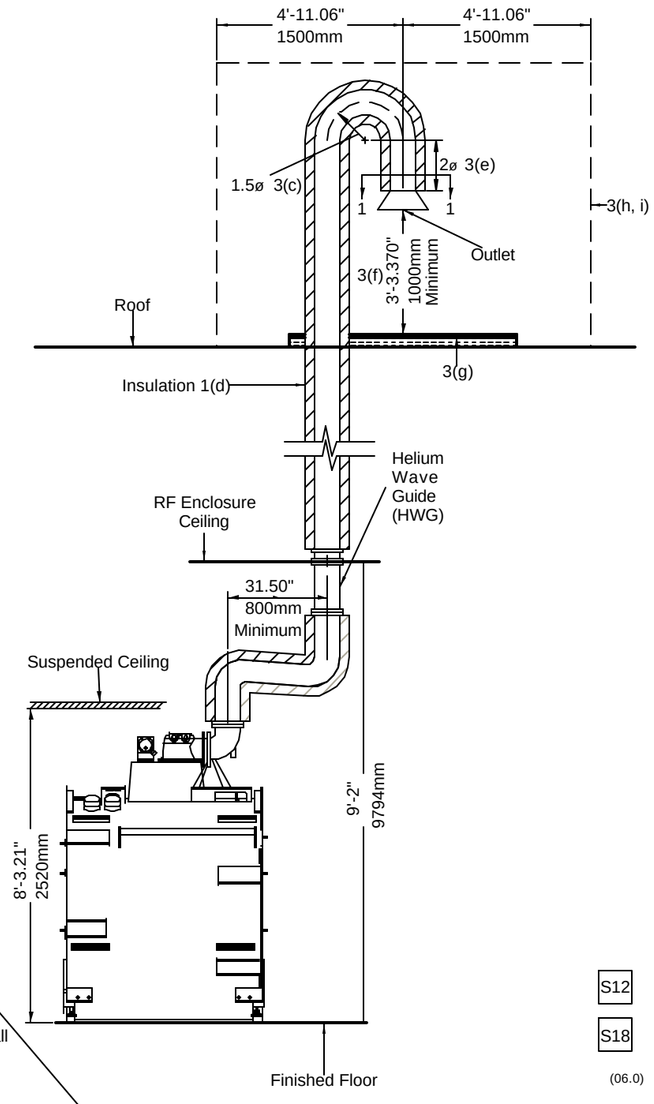
Exhaust Pipe Building Blocks	Diameter = 4" (100 mm)	Diameter = 6" (150 mm)	Diameter = 8" (200 mm)
Pressure Drop	**(mBar)**	**(mBar)**	**(mBar)**
39" Pipe	5.25	1.00	0.25
one 15° bend	3.50	0.75	0.25
one 30° bend	10.0	2.00	0.50
one 45° bend	16.0	3.00	1.00
one 60° bend	22.0	4.25	1.50
one 90° bend	24.0	4.75	1.50
Maximum allowed pressure drop over exhaust pipe outside RF enclosure is 0.725 PSI (50 mBar)			

n. The exhaust pipe outlet **MUST** point downwards and the following must also apply for the outlet:

- A minimum of at least twice the pipe diameter of the exhaust pipe is required for the length of the pipe that points downward.
- The outlet must be positioned such that no (wind driven) rain or snow, small animals (birds, mice), or debris (like paper, leaves, etc.) can enter or block the exhaust

(06.0)

Helium Gas Exhaust Pipe shown exiting roof



S12 S18

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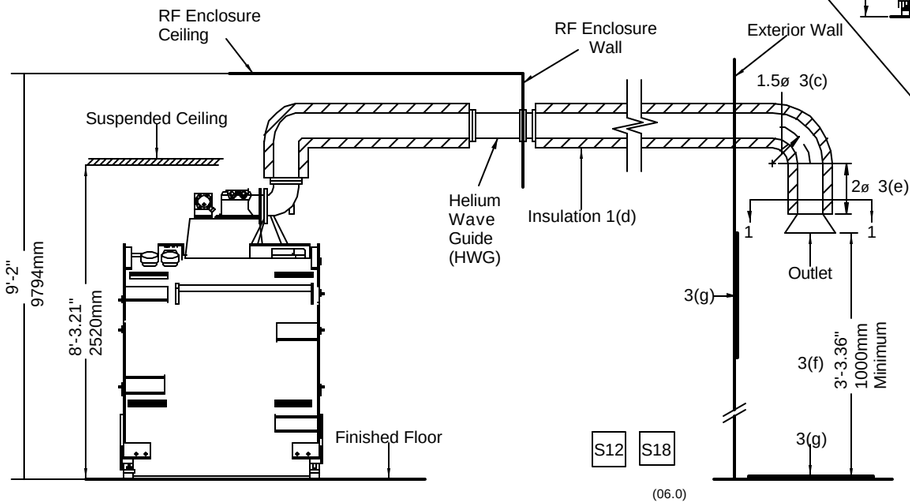
Helium Gas Exhaust Pipe shown exiting exterior wall



S12 S18

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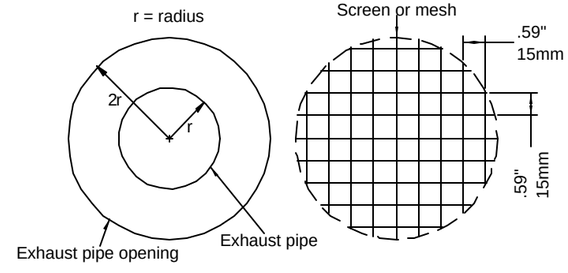

Cross Section 1-1

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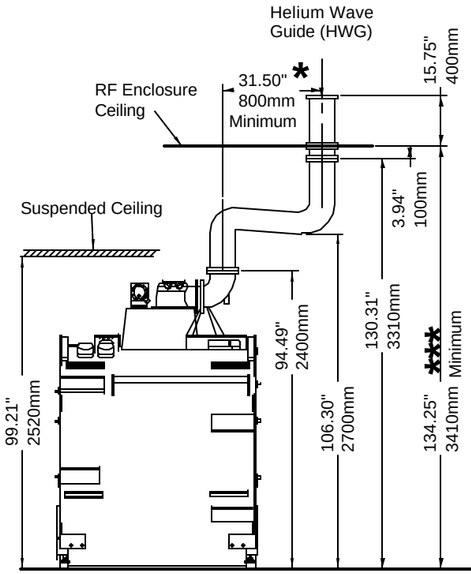
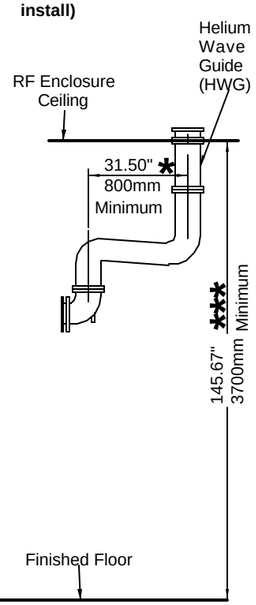
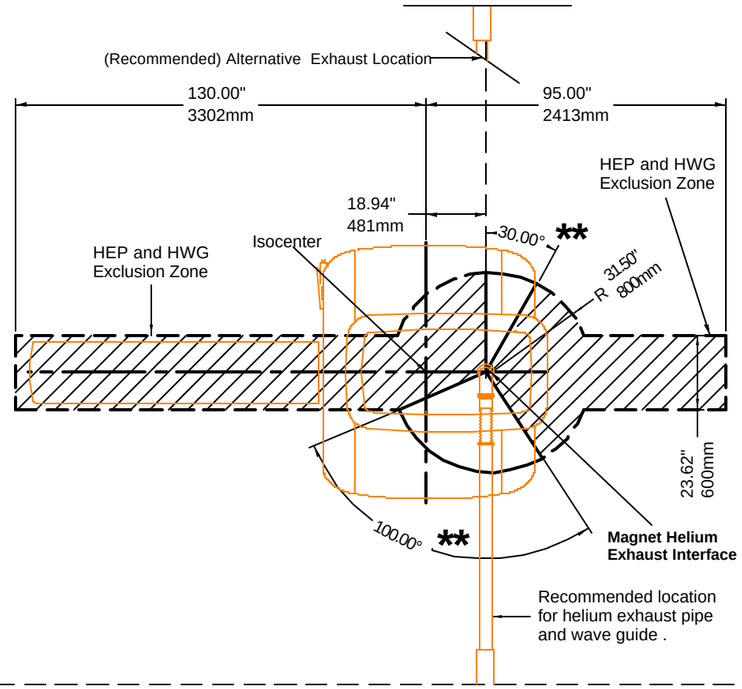
Short part of HWG installed inside RF Enclosure



Long part of HWG installed inside RF Enclosure (typical install)





Notes:

* If the Helium Wave Guide (HWG) is located in the RF Enclosure ceiling, then minimally it must be outside a 31.50" (800 mm) radius around the helium exhaust pipe interface on the magnet.

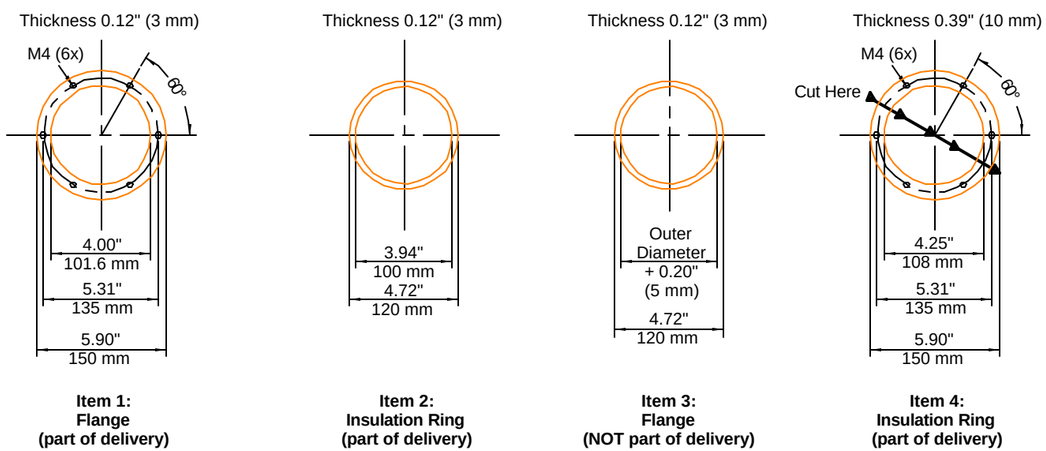
** Helium Gas Exhaust Pipe (HEP) must be routed in between one of the two provided angles when routed through the RF Enclosure wall or ceiling. If HEP is routed through the RF ceiling (HWG is located in the RF Enclosure ceiling), then the HWG must be located outside the 31.50" (800 mm) radius AND must be contained within one of the two angles provided.

*** 134.25" (3410 mm) is the absolute minimum RF enclosure ceiling height when HWG is located in the RF ceiling and the short part of HWG is installed inside the RF enclosure. 145.67" (3700 mm) is the absolute minimum RF enclosure ceiling height when long part of HWG is installed insde the RF enclosure.

See sheet MP1 for additional HEP and HWG specifications and requirements.

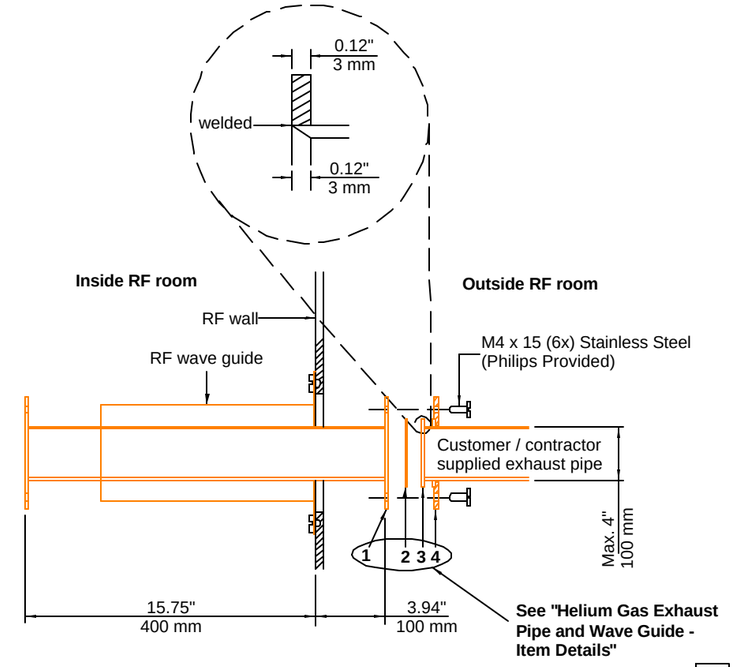
S12 S18 (04.0)

Helium Gas Exhaust Pipe and Wave Guide Exclusion Zone



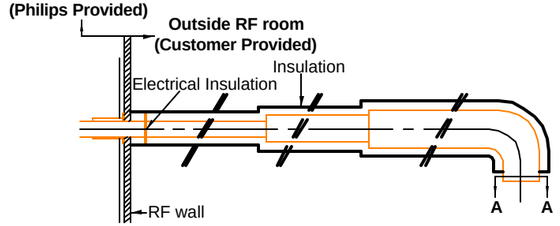
S12 (04.0)

Helium Gas Exhaust Pipe and Wave Guide - "Item Details"



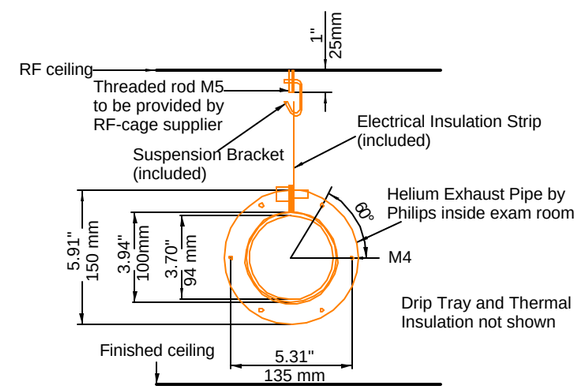
Helium Gas Exhaust Pipe and Wave Guide

S12 (04.0)



Helium Gas Exhaust Pipe (Outside RF Enclosure)

S12 (03.0)



Helium Gas Exhaust Pipe (Inside RF Enclosure) Cross Section View (A-A)

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Air Conditioning Requirements

1. Equipment Room Specifications

Ambient Requirements	
Temperature	59º to 75º F (15º to 24º C)
Maximum Temperature Change	9º F per 10 min (5º C per 10 min.)
Relative Humidity	30% to 70%, no condensation

Requirements are given specified at the cabinet air intake.

Total Heat Dissipation to Air	
Dissipation Standby	17061 Btu/hr (5 kW)
Peak Dissipation Scanning	37537 Btu/hr (11 kW)

a. The MR system heat dissipation is dependant on the type and duration of the acquisition. Therefore the actual heat dissipation will by site dependant. Air conditioning (for the equipment room) at an average heat dissipation will result in having undesirably high temperatures due to peak loads of system parts.

b. Heat dissipation of an optional chiller, if installed in the equipment room, is not included.

c. If a dedicated HVAC system is used in the exam room, it is recommended that a system be designed to provide malfunction warnings, since excessive over/under temperatures or extremely high/low relative humidity may damage the MR system.

d. A slight air overpressure is recommended to avoid dust build-up. The HVAC system must be designed around the equipment cabinet's air flow/circulation. Modifying the equipment room layout is allowed only after consulting the HVAC provider to avoid insufficient cooling or "hot spots".

e. Pollution: The equpiment room is equipped with highly technical medical electronics. To avoid any potential failures due to pollution, dust containment should be considered (despite individual system parts having air filters). Ceilings walls and floors must be sealed to prevent dust particles from releasing into the air. Special attention shall also be considered when there is a cement floor slab under raised computer floors. Before the delivery of any equipment and after any construction, the site must be cleaned before turning on the MR system. The air conditioning system must be equipped with 90% less than 10 micron particles and 80% less than 5 micron particles filters.

2. Control Room Specifications

a. Comfort not only depends on the temperature and humidty, but it also depends on local practice. For this reason, it is the responsibility of the customer to define the appropiate conditions for the control room. The following values are recommended for patient and staff comfort;
The Operator Console ambient requirements ranges from 50º to 90º F (10º to 32º C).

Ambient Requirements	
Temperature	64º to 75º F (18º to 24º C)
Maximum Temperature Change	9º F per 10 min (5º C per 10 min.)
Relative Humidity	30% to 70%, no condensation
Total Heat Dissipation to Air	
Dissipation	1706 Btu/hr (0.5 kW)

3. Exam Room Specifications

a. Scan procedures involves the emission of RF energy. This can raise the patient's temperature. The amount of energy absorption (Specific Absorption Rate) has a direct relationship with the ambient requirements. Therefore, the ambient requirements given are mandatory and a safety issue.

Ambient Requirements	
Temperature	68º to 75º F (20º to 24º C)
Maximum Temperature Change	9º F per 10 min (5º C per 10 min.)
Relative Humidity	40% to 60%, no condensation
Total Heat Dissipation to Air *	
Dissipation Standby	6824 Btu/hr (2 kW)
Peak Dissipation Scanning **	6824 Btu/hr (2 kW)

*** =** Energy dissipated in the examination room will be removed from the room by the gradient air exhaust system.

**** =** Gradient coil heat dissipation (3412 to 40949 btu/hr [1 to 12 kW]) will be removed by the Liquid Cooling Cabinet (LCC) - (liquid cooling)

b. List of Exam Room Air Conditioning Requirements

i. The conditioned air must enter the examination room through RF feedthrough air grids.

ii. A slight overpressure is required to avoid dust penetration.

iii. The air exchange rate in the examination room (under the suspended ceiling) must minimally be 5 times per hour at a minimum air flow of 294 CFM (500 m³/h). The air inflow under the suspended ceiling must disburse evenly to ensure comfort.

Air Conditioning Requirements - Con't.

b. List of Exam Room Air Conditioning Requirements - Con't.

iv. The air under the suspended ceiling must be routed via air grids (openings) in the suspended ceiling to the void above the suspended ceiling but stay inside of the RF enclosure.

v. 294 CFM (500 m³/h) air flow must be removed from the RF enclosure through the air exhaust interface on top of the magnet.

vi. Although the gradient coil is liquid cooled, this 294 CFM (500 m³/h) generates the necessary air flow needed to cool the gradient coil and body coil.

vii. If local codes dictate higher amounts of air circulation rates due to the use of helium or anaesthetic gases, this extra volume must be removed via separate air ducts and RF air grids in the RF enclosure and **NOT** via the magnet. Extra volume of air through the magnet assembly will create a higher pressure drop, acoustic noise, and possible MR image distortion due to vibration of the body coil.

viii. This air exhaust system must consist of one hose going from the air exhaust interface on top of the magnet assembly, via the RF shielding, to a fan located outside the RF enclosure.

ix. Use one flexible non-metal (non-conducting) hose (provided by customer/contractor) to avoid spikes. An inner diameter of 7" (180 mm) is needed to connect to the air exhaust interface on the magnet.

x. It is recommended that all air ducts inside the RF enclosure and any associated openings through the RF enclosure are made and installed by the RF enclosure supplier.

xi. Due to the use of helium in the magnet room, a high air refreshment degree (100 %) is recommended, no recirculation.

xii. Consult an air conditioning supplier and/or RF enclosure supplier to determine the best solution.

xiii. The air flow through the magnet assembly must always be maintained while the system is in use.

c. Air Exhaust Interface

i. The following parts are not delivered with the system and must be determined by customer/contractor/mechanical engineer of record.

Dedicated Fan Requirements	
Capacity measured at air exhaust on top of the magnet *	294 CFM (500 m³/h) @ 85 Pa (0.34 inches of water) under pressure
Connected to the local mains supply and located outside the RF enclosure	

* = The air flow and pressure drop specifications shown for the MR system are measured at specific points on the magnet. The appropriate fan specifed by the designing mechanical engineer must meet the pressure specification at the specified measureing point(s) and must take into account the following factors:
- type and length of ductwork used
- anticipated number of bends and offsets
- any discharge relief vents or louvers
- the RF shield wave guide
- any filters, etc.
- the MR system requirements with covers installed.

After taking the previously-mentioned factors into account, it is common to see the gradient coil exhaust fan specified as an in-line direct drive centrifugal unit with speed control, properly sized by the mechanical engineer responsible for the project. A larger fan size should not be arbitrarily selected (without the proper design calculations being done) as this could lead to unacceptable noise levels for the patients and/or image quality problems. When in doubt, increase the CFM and pressure drop specifications for the fan and dial the fan speed down once all final connections to the magnet have been completed. It is critical that all connections along the exhaust fan ductwork path be well sealed and as free from unecessary bends and elbows as possible so that the designed level of pressure drop is maintained.

The gradient air cooling system will be tested approximately midway through the installation of the MR system. The Mechanical Engineer and HVAC contractor should be aware that some final re-work of the system may be required to allow the installation to proceed within the allotted schedule.

Air Duct(s) Requirements (non-metal to prevent spikes)	
Maximum air speed in air duct	32.8 ft/s (10 m/s)
Connect the duct to the air exhaust interface on the magnet; this air system is also used for air venting the RF enclosure. Air duct and connections must withstand underpressure requirement.	
Air RF Feed Throughs in RF Enclosure Specifications	
Capacity	294 CFM (500 m³/h)
The air feed throughs are part of the inlet and outlet air ducts	
The pressure drop must not inhibit the functioning of the exhaust system	
The RF room shielding must comply with the current "RF room shielding requirements"	

S14 (06.0)

Additional Exam Room Air Feedthrough Requirements

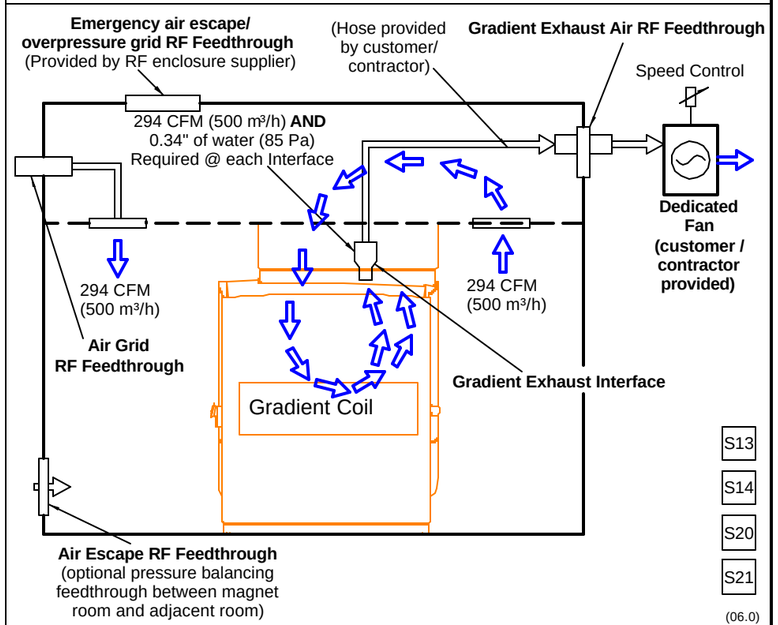
1. Emergency Overpressure Grid RF Feedthrough

a. It is required that an air escape/overpressure RF feedthrough be installed to avoid high over/under pressure, in case of an air exhaust or air conditioning malfunction. This feedthrough will also help avoid pressure build-up if a quench were to ever occur and the helium gas exhaust venting were to fail. The volume behind this grid must be able to evacuate possible large volumes of helium gas. Possible volume is 24720 ft³ (700 m³) He gas released in approximately 20 minutes. The minimum dimension of this grid is 24" x 24" (600mm x 600 mm.)

2. Patient Ventilation RF Feedthrough

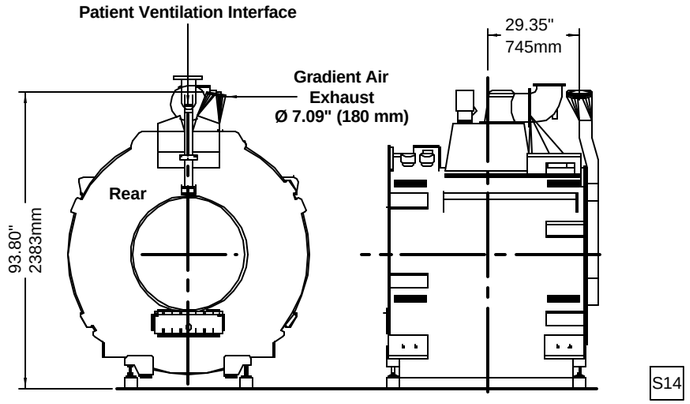
a. For the Patient Ventilation (PV), a RF feedthrough is required between the equipment room the examination room, above the suspended ceiling. This feedthrough should consist of 2 wave guides, separated 3.15" (80 mm) apart with an inner diameter of at least 4.72" (120 mm).

S13 S15 (06.0)



S13 S14 S20 S21 (06.0)

Gradient Air Exhaust/Emergency Air Escape/ Air Escape RF Feedthrough



S14 S15

Gradient Air Exhaust and Patient Ventilation Interface

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Schrieber 15MED AC/RC Chiller - GEN II Specifications/Notes

1. Schreiber 15MED AC/RC Chiller Siting Requirements

a. Customer/contractor required to flush out (with water) all piping prior to connecting to chiller. There should be no debris in the piping when final connections are made.
b. Mechanical contractors must fill chiller/piping with 30% glycol and 70% water solution prior to "startup service" arriving.
c. Chiller must have a minimum of 25' (7.6 m) overhead clearance in order to exhaust hot air from the condenser. Siting must be such that the condenser constantly receives fresh outside air. In addition, chiller must be located such that there is no possibility of condenser fans ingesting lint (from hospital industrial dryers), sand, dirt or any other materials that can quickly obstruct the condenser fans.
d. Locating the chiller in any fully enclosed area (e.g. pits, unused stairwells, closets, etc.) is prohibited.
e. Locating the chiller in any partially enclosed area (e.g. parking garages, partially fenced areas, etc.) is possible only if all clearances are met (see item 1c and the chiller details on sheet AD5).
f. Chiller cannot be sited next to other heat generating devices or systems (HVAC condensers, etc.). Chiller must be positioned such that it avoids other systems hot air discharge.
g. Any actions and/or add-ons for noise abatement beyond what is provided by Schrieber Engineering (if any) for the chiller is solely and exclusively the responsibility of the customer/contractor. Any actions and/or add-ons installed by the customer/contractor for noise abatement must not violate any of clearances (see item **1c** and chiller details on sheet AD5).
h. Required ambient temperature range must be between (-20º F to 120º F [(-28.9º C) to 48.9º C]).
i. Only use copper or PVC (schedule 80) piping, provided and installed by customer/contractor. Customer/contractor to insulate to prevent condensation and to minimize heat gain from ambient air.
j. Recommended chiller tempurature set point for chiller water reservoir is 48º F to 50º F (8.89º C to 10º C).
k. Standard cable length from chiller to equipment is 150 feet.
l. See sheet MP5 for mechanical/plumbing layout.

2. Schreiber 15MED AC/RC Chiller Start-Up Notes

a. Start-up service will be provided and included in the purchase of the Schreiber 15MED AC/RC Chiller. It includes factory trained personnel to check the chiller installation and to start the chiller for the first time. During this inital start-up, the start-up technician will check and record the initial operating characteristics. Minor work to the chiller may be performed (i.e. checking and tightening electrical connections and plumbing fittings). Under normal conditions, this procedure will take 4 hours.
b. Mandatory Start-Up Conditions:
- Completion of the chiller installation is required. This includes all piping connected and finished to equipment room, the reservoir being filled with proper water/glycol solution, and the chiller wired to electrical service.
- The technician must be able to run the chiller under full load.
- 14 working days notice is required for start-up service. Local Philips service is responsible for contacting Schreiber.
- The technician is not obligated to perform any work outside of the chiller.

c. Start-Up Summary: The start-up technician will verify:
i. The start-up technician will: verify inlet voltage, verify proper pump compresor rotation, verify control voltage (adjust primary multi-tap as required), check proper water levels in tank, confirm pumps and condenser fans rotation.
ii. The start-up technician will start unit and check: refrigerant operation, pumps and water hose connections for leaks, operation of remote controller (per customer's requirements), amperage of compressor/pump/condenser fans, correct minor installation problems, review proper operation with maintenance personnel, provide report to Schreiber.

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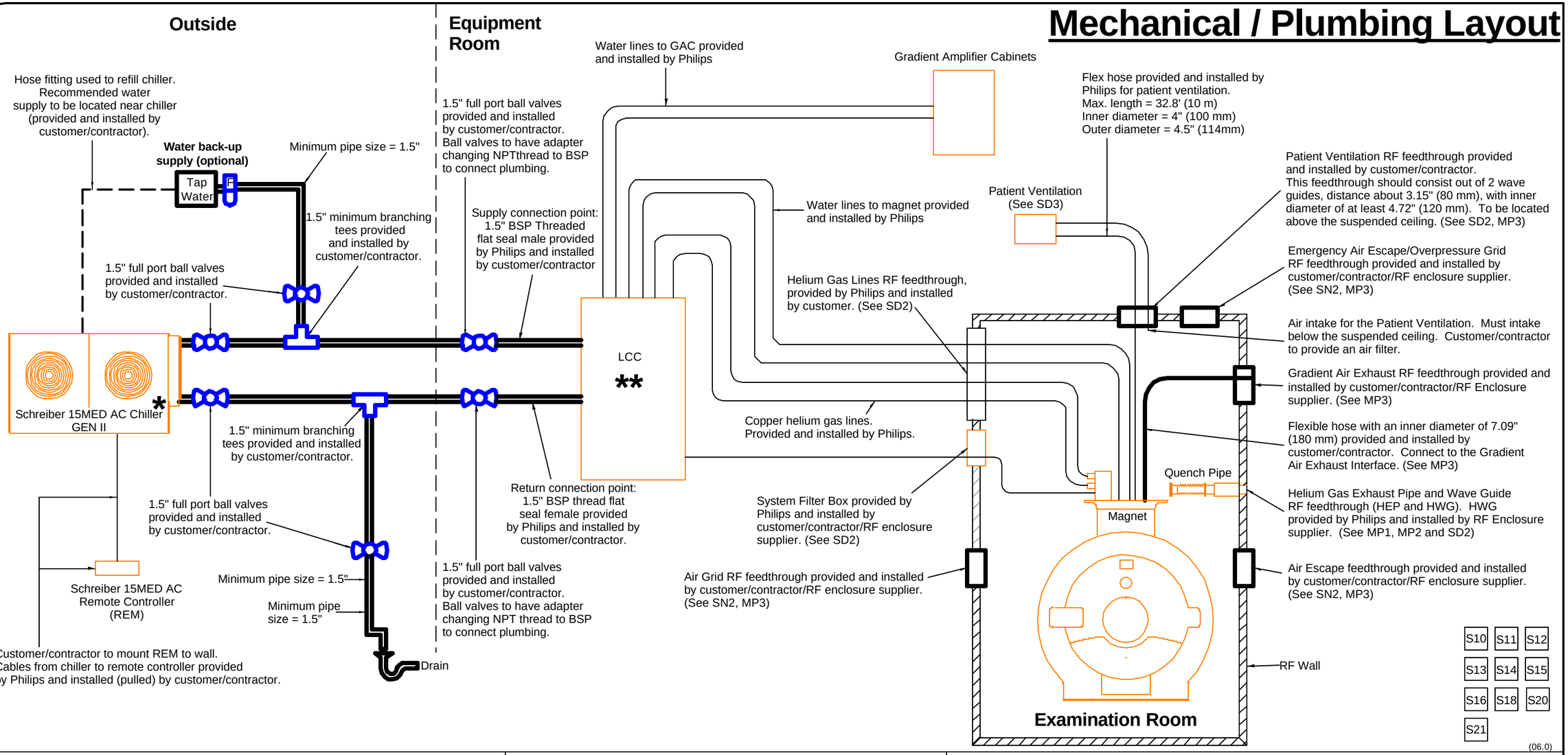
Mechanical / Plumbing Layout



Mechanical/Plumbing Notes:

Schreiber 15MED AC Chiller - GEN II Specifications/Notes

* **a.** See sheet MP4 for chiller specifications/notes and sheet AD5 for chiller details.

Liquid Cooling Cabinet Specifications

** **a.** See sheet AD5 (equipment details) for equipment specific specifications.

1. Customer/contractor/RF Enclosure supplier is to supply and/or installed items are shown in bold.
2. Only use copper or PVC (schedule 80) piping, provided and installed by customer/contractor. Customer/contractor to insulate all piping to prevent condensation and to minimaize heat gain from ambient air.
3. Customer/contractor is responsible to provide and determine the type all ball valves, flow meters, temperature gauges, pressure gauges, branching tees, unions, and filters as required or unless otherwise specified in the mechanical/plumbing layout above.
4. Liquid cooling is needed 24 hours a day, 7 days a week.
5. It is strongly recommended to provide a city water back-up system in case chiller is down (due to servicing or failure). It is the customer/contractor responsibility to ensure that the alternate water source meets the flow, temperature, pressure, and purity requirements provided in the chart to the right.
6. If a city water back-up system is used, it is the customer/contractor responsibility to meet all codes concerning the dumping of glycol. The amount of glycol (by volume) drained during a switch-over is the total volume of pipes between the chiller and MR equipment (LCC) multiplied by the concentration.

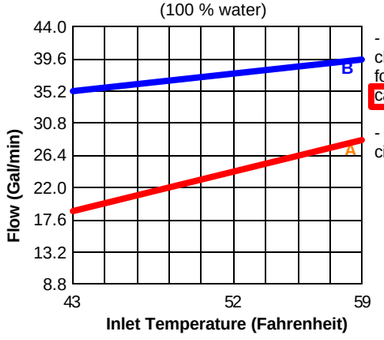
Mechanical/Plumbing Notes - con't:

7. Primary Coolant Requirements:
(For city water back-up or house chilled water supply)

Inlet Water Quality	Potable Tap Water
Inlet Water Acidity	6.0 to 8.0 pH
$CaCO_3$	< 250 ppm
Chlorine	< 200 ppm
Maximum Suspended Matter	< 10 mg / L, < 100 micron particle size
Inlet Water Temperature	43 to 59° F (6 to 15° C) - [12° C preferred]
Maximum flow allowed to avoid temperature instability in the secondary circuit	8000 Liters / Hour at 43°F (6° C) 9000 Liters / Hour at 59° F (15° C)
Maximum primary cooling liquid pressure	6 Bar (600 kPa)
Inlet Water Temperature Stability	+/- 3.6° F (+/- 2° C)
Ethylene Glycol Concentration	Minimum: 0% Maximum: 40%
Heat Dissipation to Liquid	20475 to 136498 btu/hr (6 to 40 kW)

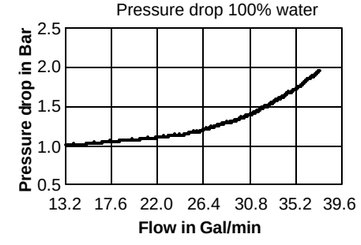
Mechanical/Plumbing Notes - con't:

8. Flow Requirements.



- Flow in gallons per minute / inlet temperature in °F of the chilled water needs to fall into the area on or above the curve for each of the graphs in order to maintain enough coolling capacity.

- Maximized flow to avoid temperature instability in the secondary circuit.



A. 40 kW heat lead to LCC
B. Maximum allowed primary liters to LCC

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Philips Medical Systems Remote Services Network (RSN)

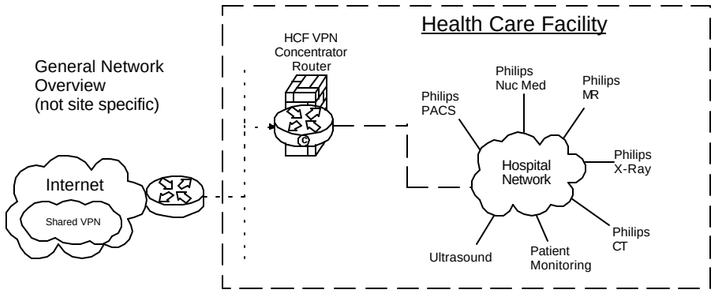
Secure broadband connection required for Philips remote technical support, diagnostics, and applications assistance

Broadband Site-to-Site Connectivity (Preferred)

This connectivity method is designed for customers who prefer a connection from the RSN Data Center to the Health Care Facility (HCF) utilizing their existing VPN equipment.

Connectivity Details:

- A Site-to-Site connection from the RSN data center's Cisco router will be established to the HCF's VPN concentrator
- The VPN Tunnel will be an IPSEC, 3DES encrypted Tunnel using IKE as standard, but alternative standards are also available, such as AES, MD5, SHA, Security Association lifetime and Encryption Mode
- Every system that we will be servicing remotely will have a static NAT IP that we configure on the RSN Data center side.



Action Required by Hospital:

- Review and approve connection details
- Complete appropriate Site Checklist
- Configure and allow Site-to-Site access prior to setting up connectivity depending on the access criteria that the HCF decides to implement (ex: Source IP filtering, destination IP filtering, NAT assignment, etc.)
- Route traffic from within the hospital network with destination addresses 192.68.48.0/22 to the designed IP provided by Philips

Broadband Router Installed at Health Care Facility

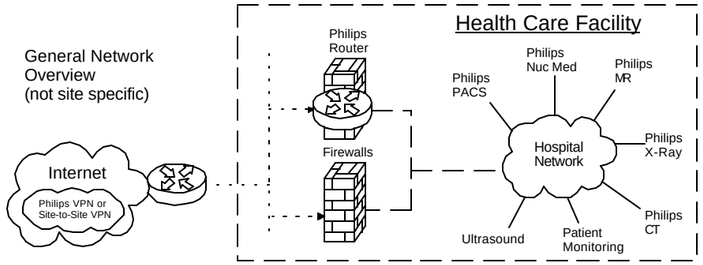
This connectivity method is designed for customers who have a dedicated high speed connection for Philips equipment.

Connectivity Details:

- An RSN Cisco 1711 or 1712 router will be preconfigured and installed at the HCF by Philips in conjunction with the HCF IT representative.
- The VPN Tunnel will be an IPSEC, 3DES encrypted Tunnel using IKE and will be established from the RSN-DC and terminated at the RSN Router on-site
- One to One NAT is used to limit access to Philips eqiupment only
- Router Config and IP auditing is enabled for Customer IT to view via website 24/7
- Dedicated DSL connections are also supported

Option 1: Parallel to HCF Firewall Connectivity Method

This connectivity method is designed for customers who prefer a Philips RSN Router installed on site utilizing all the security features provided and managed by Philips.

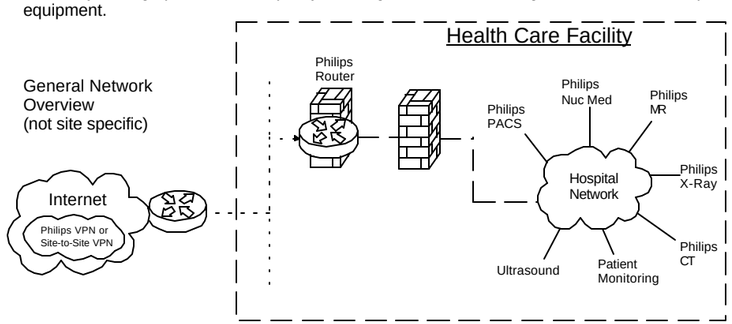


Action Required by Hospital:

- Assign a fixed public IP Address from the ISP to be configured on the Philips router. This is the DOTTED link on the picture connected to the firewall.
- Assign a Back end IP for the Philips router on the Hospital Network
- Complete appropriate Site Checklist
- Route traffic from within the hospital network with destination addresses 192.68.48.0/22 to internal Philips router Ethernet interface. This is the DASHED line connected to the firewall.

Option 2: Back End Connected to the HCF Firewall Connectivity Method

This connectivity method is designed for customers who prefer a Philips RSN Router installed on site by setting up an IP-Based policy allowing access thru existing HCF Firewall to Philips equipment.

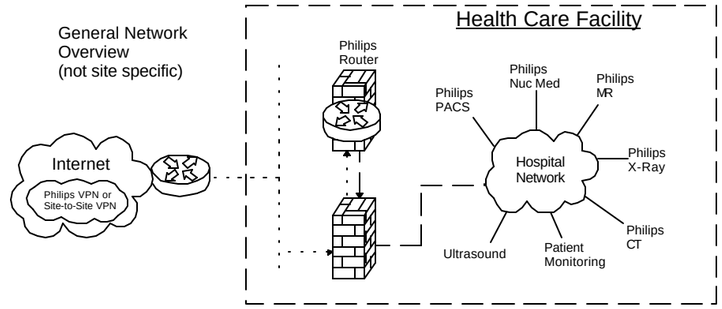


Action Required by Hospital:

- Assign a fixed public IP Address from the ISP to be configured on the Philips router. This is the DOTTED link on the picture connected to the firewall.
- Assign a Back end IP for the Philips router on the Hospital Network
- Complete appropriate Site Checklist
- Route traffic from within the hospital network with destination addresses 192.68.48.0/22 to internal Philips router Ethernet interface. This is the DASHED line connected to the firewall.
- Configure and allow on the firewall on the DASHED line interface access between the IP address allocated by the hospital to the Philips internal Ethernet router interface and the target modality IP address.

Option 3: Router Installed Inside the HCF's DZM

This connectivity method is designed for customers who prefer the RSN Router installed inside and existing, or new DMZ, allowing access to Philips equipment.



Action Required by Hospital:

- Assign a fixed public IP Address from the ISP to be configured on the Philips router. This is the DOTTED link on the picture connected to the firewall.
- Assign a Back end IP for the Philips router on the Hospital Network
- Complete appropriate Site Checklist
- Route traffic from within the hospital network with destination addresses 192.68.48.0/22 to internal Philips router Ethernet interface. This is the DASHED line connected to the firewall.
- Configure and allow on the firewall on the DASHED line interface IPSec protocol communication by opening protocol 500, 50, 51, 47 and port 23 + TACACS. Traffic should be between external IP Address located on the Philips router and the RSN Data center IP address 192.68.48/24 and IP address AOSN TACAS
- Configure and allow on the firewall on the DASHED line interface access between the IP address allocated by the hospital to the Philips internal Ethernet router interface and the target modality IP address

- VA Iowa City -
Iowa City, IA
Achieva Nova 1.5T

08.30.06

Date 9-18-06

O.A. Number 9004000

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Project Number N-MID060126 Rev. B

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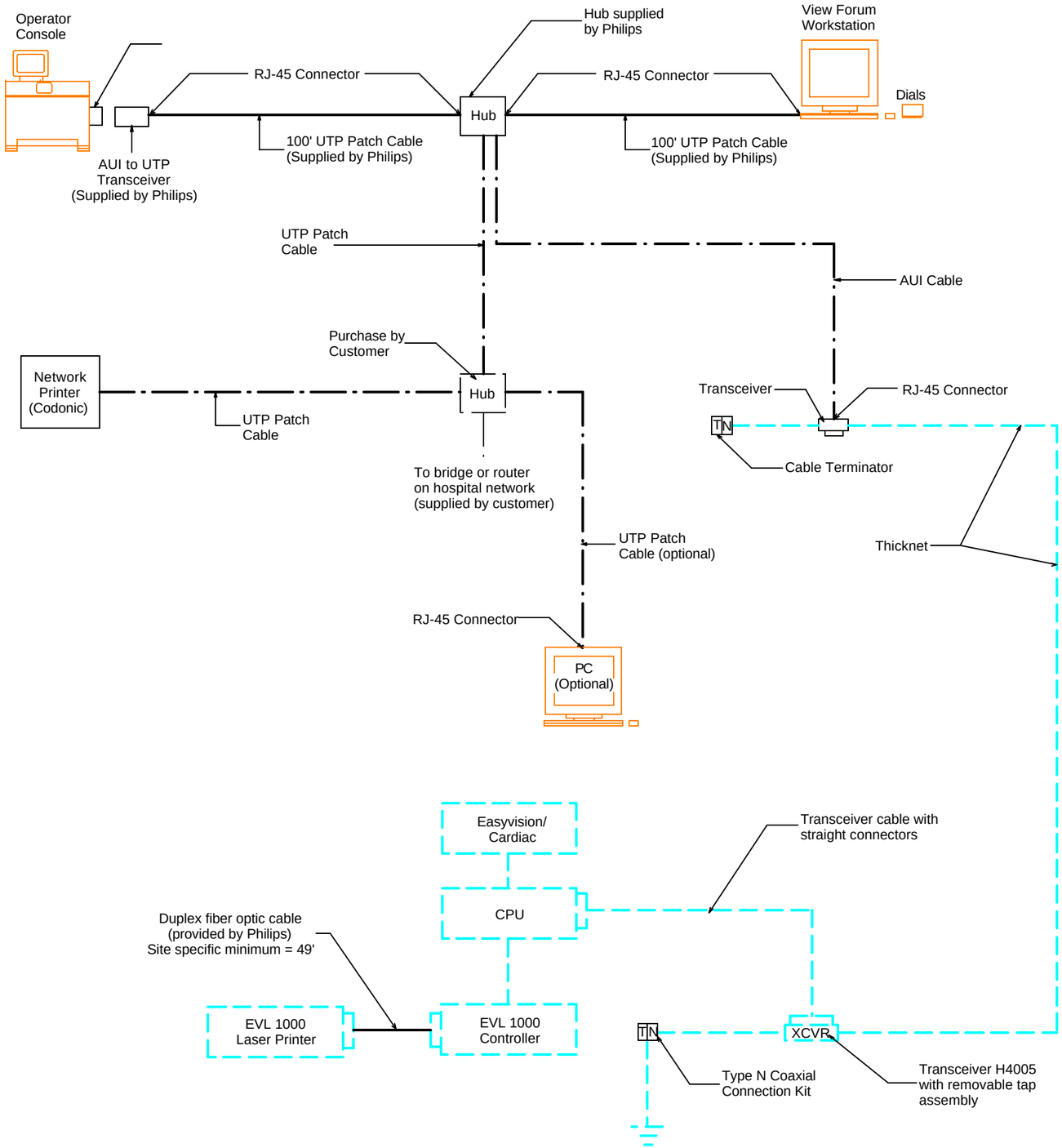

Network Notes

1. Install network cables avoiding motors, parallel runs with unshielded power wires and cables, clock timing circuits, fluorescent lamp fixtures, meters and other electrical components.
2. Thicknet cable is usually installed in a corridor above the ceiling along with the transceivers. The prefabricated transceiver cables are attached to the Thicknet ethernet cable and "dropped" down to the network outlet locations in a room.
3. AUI cable is usually installed through the wall.
4. Network cables shall not be cut and/or spliced! Avoid sharp edges which could cut, shred, or otherwise damage cables during installation. Follow cable manufacturers specifications relative to bend radius and pulling tension.
5. Cable ties, supports, boxes, conduits, etc. as well as any coring, boring, smoke/fire wall penetrations, et al, relative to network installation is the responsibility of the network installer.
6. Only 1 cable terminator shall be grounded. (Thicknet/Thinnet only)
7. An deviation from network requirements provided herein by the network installer must be submitted to Philips for review.

Supplied by PMSNA

Existing Hospital Network

Supplied by customer/contractor

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Site Readiness Checklist

Instructions:

- This form is to be used by Project Manager, Contractor and Service Engineer.
- Information is used to develop and determine site ready date.
- The site requirements tab is to be used for all modalities.
- Then select modality specific tab to be used with the site requirement list.
- Items listed are go/no go items for delivery unless noted as delay only items.
- Items identified with *** as delayed items must be completed after hours or on weekend. These items cannot be accomplished while installation is in progress. Also, these items must be completed within 2 days of installation start or they may stop installation.

Site Requirements:

- ☐ Customer site preparation verified in general against the Philips final Planning drawings.
- ☐ Walls finished including painting
- ☐ Doors installed
- ☐ Floor leveled according to Philips drawings and specifications
- ☐ Floors are tiled/covered finished. Flooring is covered with protective covering (scratch protection)
- ☐ Ceiling lights installed
- ☐ Cable conduit and ductwork installed and clean. Position checked. Duct covers in place but not finally closed. Cable opening are clear, without sharp edges. Pull strings in conduits. Installation per Philips Specifications.
- ☐ HVAC environmental equipment installed and working according to Philips Specifications.
- ☐ Ceilings installation completed.
- ☐ Electrical preparation according to Philips Specifications.
- ☐ All network cabling, drops installed according to Philips specifications. (Including hardcopy cameras)
- ☐ All pre-cabling identified on Philips drawings has been installed.
- ☐ Pre-move survey completed - Delivery route identified.
- ☐ Dedicated phone line for modem use ***
- ☐ Room has been cleaned ***
- ☐ Cabinets and casework installed ***

Site Readiness Checklist

Items Specific for the MRI Systems:

- ☐ All Ferromagnetic materials removed from magnet room.
- ☐ Quench pipe installed from Philips connection point to the outside.
- ☐ RF shield installed, initial testing done, and prepared for magnet delivery.
- ☐ Chiller (PMSNA or customer supplied) installed and tested.
- ☐ Magnetic shielding installed.
- ☐ All required plumbing, valves and gauges installed and tested.
- ☐ Rigging team and delivery route prepared for delivery.
- ☐ Wave guides installed.
- ☐ Final RF testing after magnet delivery, access opening enclosed
- ☐ Gradiendt air cooling complete and working according to specifications
- ☐ Blocking support as required for wall mounted equipment
- ☐ RF glass installed
- ☐ RSN Surveys completed and submitted.
- ☐ Philips RSN Champion contacted.

(06.0)

Approved for Delivery:

Project Manager **Date**

Service Engineer **Date**

- VA Iowa City -
Iowa City, IA
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Florido, Ryan

Date
9-18-06

Quote Number
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