Technical Publication
PI-1005R5

Pre-Installation

HF Series Generators

REVISION HISTORY

REVISION	DATE	REASON FOR CHANGE
0	JUL 15, 2002	First edition
1	SEP 20, 2003	kW correction for SHF-5xx model
2	FEB 17, 2004	New equipments
3	SEP 15, 2005	Revision of environmental and electrical requirements
4	NOV 24, 2009	Information update
5	SEP 13, 2012	IEC Standards update

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

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

ADVISORY SYMBOLS

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

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

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

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

Note ☞

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

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SECTION 1 INTRODUCTION

1.1 OBJECTIVE OF THIS MANUAL

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

This document considers only the X-ray Generator and its associated components. Product information, environmental and electrical requirements are specified.

Note ☞ *For system-related requirements, such as room layout and system interconnections, refer to documentation provided with other subsystems.*

1.2 AVOIDING UNNECESSARY EXPENSES AND DELAYS

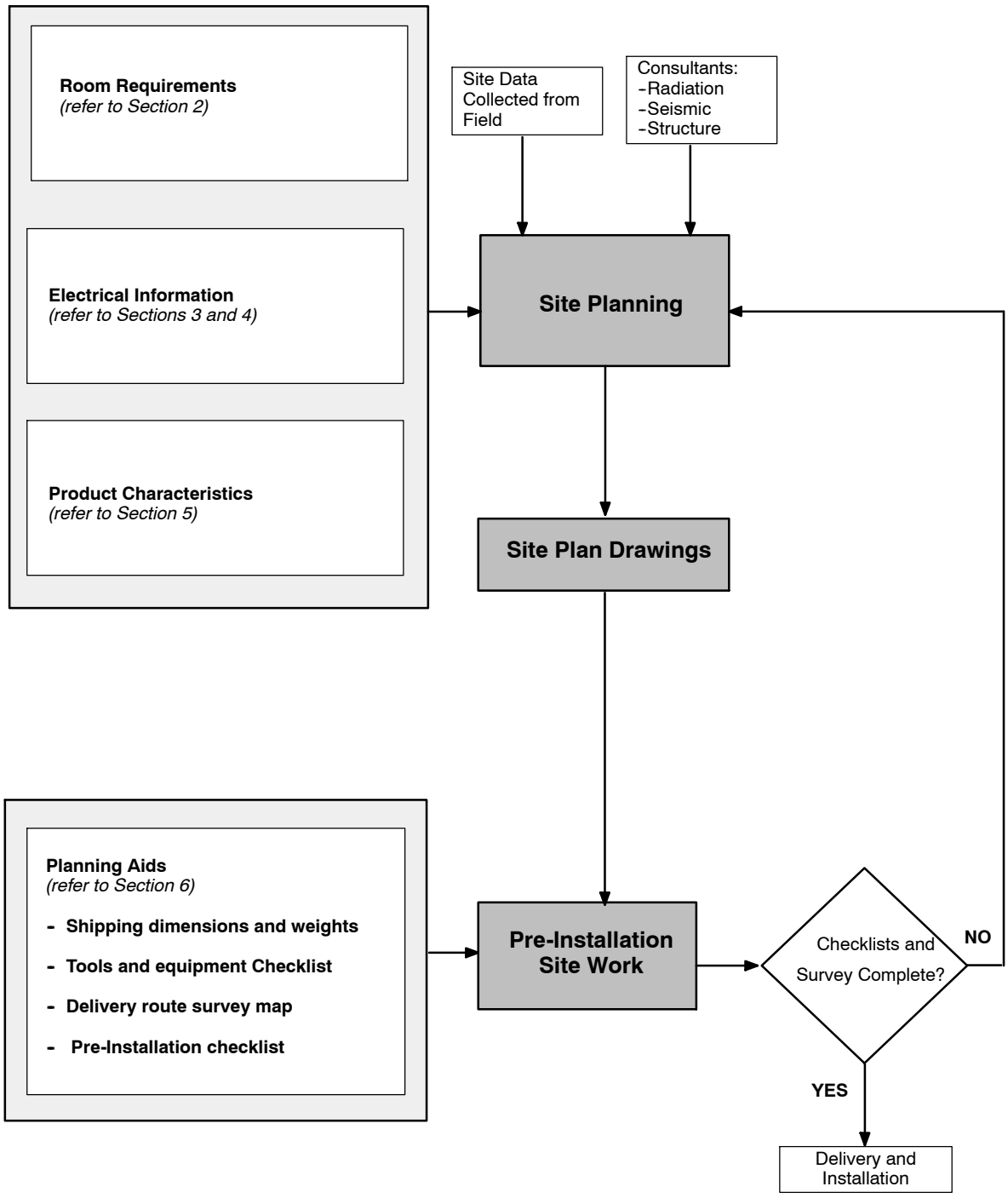
To avoid unnecessary expenses and delays use the "*Pre-installation Checklist*", located in Section 6.4, to determine if you are ready for the installation to begin. Once you believe that the room/location is ready for installation to begin, complete the "*Pre-installation Checklist*". The checklist is an important tool that helps verify that nothing has been missed. The checklist summarizes the preparations and allows you to permanently record the activities that have taken place.

1.3 AN OVERVIEW OF THE PRE-INSTALLATION PROCESS

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

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

Illustration 1-1
Pre-Installation Overview



1.4 RESPONSIBILITY OF PURCHASER / CUSTOMER

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

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

- Tools and Equipment Checklist (*refer to Section 6.2*)
- Pre-Installation Checklist (*refer to Section 6.4*)

1.5 RESPONSIBILITIES OF THE PURCHASER

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

- A clean and safe work environment for the installation of the product (finished floor, ceiling, walls, and proper room lighting).
- A location suitable for the installation of the product (*refer to Section 2 "Room Requirements"*).
    - Suitable support structures in the floor and walls necessary for the mounting of the product and/or its components (*refer to Section 2.2 "Structural Requirements"*).
    - Installation of conduit, ducts, and/or raceways necessary to route cables safely (*refer to Section 4 "Electrical Requirements," and Section 5 "Product Characteristics"*).

- Electrical power and grounds of specified quality and reliability (*refer to Section 4, "Electrical Requirements*").

  - Electrical power of the required voltage output and adequate kVA rating, including the emergency-off safety switch(es) in the room. Power and ground cables to the Room Electrical Cabinet (Main Disconnect).

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

  - Properly installed and sized junction boxes, including covers and fittings, at locations required and called out in architectural drawings.

- A location suitable for operation of the product.

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

- Current room dimensions plan, including hall way and entry door sizes.

Note ☞ *Complete and proper Pre-Installation will avoid delays and confusion.*

SECTION 2 ROOM REQUIREMENTS

2.1 ENVIRONMENTAL REQUIREMENTS

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

2.1.1 RELATIVE HUMIDITY AND TEMPERATURE

COMPONENT	RELATIVE HUMIDITY (Non-Condensing)				TEMPERATURE			
	IN USE		STORAGE		IN USE		STORAGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Line Powered Generator	30%	75%	10%	100%	10º C (50º F)	40º C (104 ºF)	-40º C (-40º F)	70ºC (158º F)
Capacitor Assisted Generator	30%	75%	10%	100%	10º C (50º F)	40º C (104 ºF)	-40º C (-40º F)	70ºC (158º F)
Battery Powered Generator	30%	75%	10%	100%	10º C (50º F)	40º C (104 ºF)	-20º C (-4º F)	40º C (104 ºF)
					for a longer life cycle of batteries it is recommended a temperature around 22ºC (72ºF)			
Control Console	30%	75%	10%	100%	10º C (50º F)	40º C (104 ºF)	-40º C (-40º F)	70ºC (158º F)

2.1.2 ATMOSPHERIC PRESSURE

COMPONENT	ATMOSPHERIC PRESSURE			
	IN USE		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Line Powered Generator	700 hPa	1060 hPa	500 hPa	1060 hPa
Capacitor Assisted Generator				
Battery Powered Generator				
Control Console				

2.1.3 HEAT OUTPUT

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

- for Line Powered Generators 0.16 kW (544 btu/hr)
- for Capacitor Assisted Generators 0.20 kW (682 btu/hr).
- for Battery Powered Generators 0.26 kW (890 btu/hr).

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

2.1.4 RADIATION PROTECTION

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

2.2 STRUCTURAL REQUIREMENTS

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

- Floor, wall and raceways for equipment installation.
- A plan distribution is strongly recommended prior equipment installation. Take into account dimensions, travels, operation and passing through areas.

2.2.1 DOOR SIZE REQUIREMENTS

Minimum door sizes also apply to the hallway and elevator.

The minimum door height must be 203 cm (80”) and door width must be 90 cm (35.4”) to take delivery and install system.

The elevator door must meet with the above door requirements and the minimum depth of the elevator measured from the back wall to the elevator door must be 140 cm (55”).

Note ☞ *The above dimensions are calculated as per dimensions of the shipping crates. For dimensions and weights of the crated and uncrated components refer to Table 2-1.*

Table 2-1
Component Crated and Uncrated

COMPONENT CRATED	DIMENSIONS			WEIGHT
	Length	Width	Height	
Line Powered Generator (for only 1 Tube (LSS)) with Control Console and Cables	107 cm (42.1”)	62 cm (24.4”)	74 cm (29.1”)	140 kg (308 lb)
Line Powered Generator (for 1 or 2 Tubes (LSS or HSS)) with Control Console and Cables	115 cm (45.3”)	82 cm (32.3”)	74 cm (29.1”)	170 kg (374 lb)
Capacitor Assisted Generator with Control Console and Cables	118 cm (46.5”)	57 cm (22.4”)	114 cm (44.9”)	204 kg (449 lb)
Battery Powered Generator with Control Console and Cables	118 cm (46.5”)	57 cm (22.4”)	114 cm (44.9”)	280 kg (617 lb)

COMPONENT UNCRATED	DIMENSIONS			WEIGHT
	Length	Width	Height	
Line Powered Generator (for only 1 Tube (LSS)) with Control Console and Cables	44.5 cm (17.5”)	36 cm (14.2”)	56.8 cm (22.4”)	72 kg (159 lb)
Line Powered Generator (for 1 or 2 Tubes (LSS or HSS)) with Control Console and Cables	59.2 cm (23.3”)	36 cm (14.2”)	69 cm (27.2”)	95 kg (209 lb)
Capacitor Assisted Generator with Control Console and Cables	50 cm (19.7”)	36 cm (14.2”)	79 cm (31.1”)	108 kg (238 lb)
Battery Powered Generator with Control Console and Cables	81.3 cm (32”)	43.6 cm (17.2”)	94.8 cm (37.3”)	235 kg (518 lb)

2.2.2 FLOOR AND WALL REQUIREMENTS

The method of installing the system is:

COMPONENT	NORMAL METHOD OF MOUNTING
GENERATOR CABINET	Floor freestanding, wall mounted (only for Line Powered Generators), or anchor to floor with four M10 (3/8") bolts.
CONTROL CONSOLES	Desk freestanding, wall mounted or anchor to an optional pedestal.
PC INTERFACE BOX	Desk freestanding.
Note: Anchoring hardware should be field supplied. For seismic areas all components must be anchored, Local Standards should be applied.	

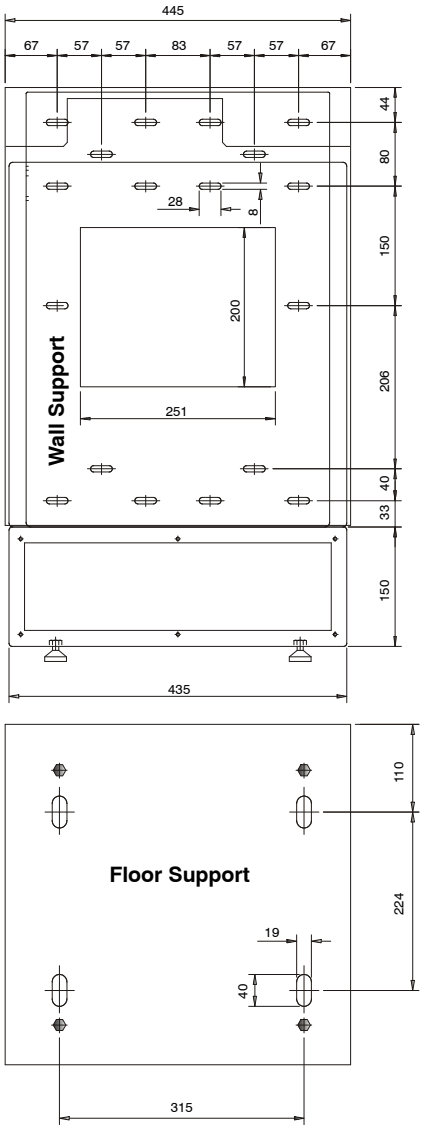
The Drill Templates of the anchoring holes are shown in the next illustrations.

Potential for Injury and/or Equipment Damage: Floor anchors must be a minimum of 150 mm (6") from any concrete edge including ducts and cracks. In addition, the general condition of the concrete in the immediate mounting area should be inspected to ensure that anchors will be set in good quality concrete.

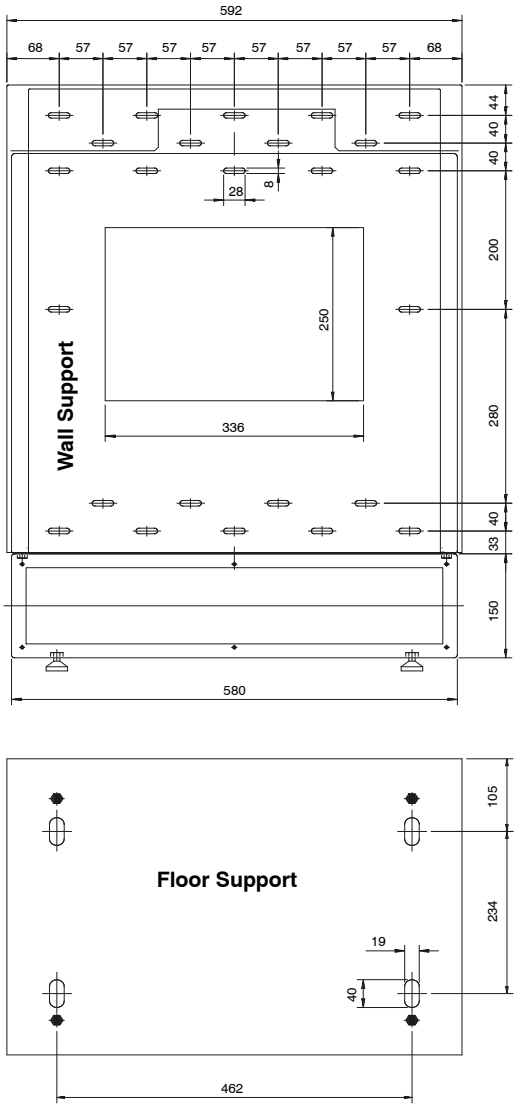
The floor bearing the Rad Room must be concrete and the thickness to be determined by a Structural Engineer to properly support the equipment loads. The anchors require a minimum embedment of 57.2 mm (2 $^{1}/_{4}$") into the concrete. If the floor thickness is less than 101.6 mm (4"), it is recommended that the unit be secured using a through-bolt method with a reinforcement plate on the back side.

Illustration 2-1
Drill Template of the optional Generator Supports (only for Line Powered Generators)

OPTIONAL FLOOR AND WALL SUPPORTS FOR LINE POWERED GENERATORS (ONLY 1 TUBE - LOW SPEED STARTER)



OPTIONAL FLOOR AND WALL SUPPORTS FOR LINE POWERED GENERATORS (1 OR 2 TUBES - HIGH OR LOW SPEED STARTER)



2.3 CLINICAL ACCESS

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

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

2.4 FIELD SERVICE ACCESS

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

COMPONENT	SURFACE					
	Left Side	Right Side	Front	Rear	Top	Bottom
GENERATOR CABINET	50 cm (20")	50 cm (20")	100 cm (40")	- *(see note)*	Completely free	-
CONTROL CONSOLE	10 cm (4")	10 cm (4")	Completely free	10 cm (4")	Completely free	-

Note: Ventilation conditions requires to keep a minimum free distance of 15 cm (6") from both lateral sides of the Generator Cabinet and also the same distance from the rear side when the Generator is provided with High Speed Starter (fans for the starter module).

SECTION 3 PLANNING ELECTRICAL CONNECTIONS

3.1 ROUTING CABLES

3.1.1 GENERAL

High voltage and power cables must be separated from other cables. Use a separate through in the duct system or use a separate conduit. Minimize cable length as possible between the Electrical Cabinet (Main Disconnect) and the System Generator Cabinet to reduce voltage regulation problems and wiring costs.

3.1.2 CONDUIT

Separate conduits must be used for power and signal wires. These wires must be kept separated from each other for proper system operation.

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

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

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

3.1.3 ELECTRICAL DUCTS

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

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

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SECTION 4 ELECTRICAL REQUIREMENTS

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

To ensure proper operation:

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

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

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

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

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

4.1 LINE POWERED GENERATORS – POWER LINE REQUIREMENTS

- Factors:

GENERATOR MODEL *(Refer to Identification Label)*	SINGLE-PHASE GENERATOR	THREE-PHASE GENERATOR	SINGLE-PHASE GENERATOR	THREE-PHASE GENERATOR
Maximum Power kW	**32 kW**		**40 kW**	
Maximum mA	400 mA		500 mA	
Maximum kVp	125 or 150 kVp		125 or 150 kVp	
Power Line	A	B / C / D	A	B / C / D

GENERATOR MODEL *(Refer to Identification Label)*	SINGLE-PHASE GENERATOR	THREE-PHASE GENERATOR	THREE-PHASE GENERATOR	THREE-PHASE GENERATOR
Maximum Power kW	**50 kW**		**64 kW *(or 65 kW under special order)***	**80 kW**
Maximum mA	640 mA *(or 630 mA under special order)*		640 mA *(or 650 mA under special order)*	800 mA *(or 1000 mA under special order)*
Maximum kVp	125 or 150 kVp		125 or 150 kVp	150 kVp
Power Line	A	B / C / D	C / D	D *(or E for 1000 mA)*

POWER LINE				
A	**B**	**C**	**D**	**E**
230 / 240 VAC, Single-Phase, 50 / 60 Hz	230 / 240 VAC, Three-Phase, 50 / 60 Hz	400 / 415 / 440 VAC, Three-Phase, 50 / 60 Hz	480 VAC, Three-Phase, 50 / 60 Hz	530 VAC, Three-Phase, 50 / 60 Hz
Line voltage automatic compensation: ±10%.				
Maximum line regulation for maximum kVA demand: 5%.				
NOTES: – For Generators operating with lines at 208 VAC or below an Auxiliary Boost Transformer is required to adequate the line voltage to 230 / 240 VAC. *– For 80 kW Generators operating with lines at 400 / 415 / 440 VAC an auxiliary boost transformer is required to adequate the line voltage to 480 VAC (or 530 VAC).*				

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

	SINGLE-PHASE GENERATOR				THREE-PHASE GENERATOR			
	32 kW (3)				32 kW			
LINE VOLTAGE	I_{RMS} (1)	CIRCUIT BREAKER TYPE (2)			I_{RMS} (1)	CIRCUIT BREAKER TYPE (2)		
		B	C	D		B	C	D
208 VAC	192 A	80 A	50 A	25 A	111 A	50 A	25 A	20 A
230 VAC	174 A	80 A	40 A	20 A	100 A	40 A	25 A	20 A
240 VAC	160 A	63 A	40 A	20 A	96 A	40 A	25 A	20 A
400 VAC (380 VAC)	–	–	–	–	58 A	25 A	20 A	20 A
415 VAC	–	–	–	–	56 A	25 A	20 A	20 A
440 VAC	–	–	–	–	52 A	20 A	20 A	20 A
480 VAC	–	–	–	–	48 A	20 A	20 A	20 A
Differential Sensitivity (Earth Leakage / Ground Fault)	30 mA							
Minimum kVA required	40 kVA (*Maximum kW x 1.25*)							
Stand-by Consumption	500 W							

***Notes**:*

(1) $I_{RMS\ (for\ single\text{-}phase)} = (1.25 \times P) / VAC$ (I_{RMS} = *maximum instantaneous current based on 100 ms X-ray exposure*).
$I_{RMS\ (for\ three\text{-}phase)} = (0.72 \times P) / VAC$ (I_{RMS} = *maximum instantaneous current based on 100 ms X-ray exposure*).

(2) Circuit Breaker (Differential, Thermomagnetic, Fuses and/or Contactor).
The selected circuit breaker type must have a minimum tripping current of 1.1 x I_{RMS} @ 0.1 seconds.
For example:

Type "B" breaker: $M_B = (I_{RMS} \times 1.1) / 3$
Type "C" breaker: $M_C = (I_{RMS} \times 1.1) / 5$
Type "D" breaker: $M_D = (I_{RMS} \times 1.1) / 10$

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

(3) For Generators operating with lines at 208 VAC or below an Auxiliary Boost Transformer is required to adequate the line voltage to 230 / 240 VAC.

	SINGLE-PHASE GENERATOR POWER				THREE-PHASE GENERATOR POWER			
	40 kW (3)				40 kW			
LINE VOLTAGE	I_{RMS} (1)	CIRCUIT BREAKER TYPE (2)			I_{RMS} (1)	CIRCUIT BREAKER TYPE (2)		
		B	C	D		B	C	D
208 VAC	240 A	100 A	63 A	32 A	138 A	63 A	32 A	20 A
230 VAC	217 A	80 A	50 A	25 A	125 A	50 A	32 A	20 A
240 VAC	200 A	80 A	50 A	25 A	120 A	50 A	32 A	20 A
400 VAC (380 VAC)	–	–	–	–	72 A	32 A	20 A	20 A
415 VAC	–	–	–	–	69 A	32 A	20 A	20 A
440 VAC	–	–	–	–	65 A	25 A	20 A	20 A
480 VAC	–	–	–	–	60 A	25 A	20 A	20 A
Differential Sensitivity (Earth Leakage / Ground Fault)	30 mA							
Minimum kVA required	50 kVA (*Maximum kW x 1.25*)							
Stand-by Consumption	500 W							

***Notes**:*

(1) $I_{RMS\ (for\ single\text{-}phase)} = (1.25 \times P) / VAC$ (I_{RMS} = *maximum instantaneous current based on 100 ms X-ray exposure*).
$I_{RMS\ (for\ three\text{-}phase)} = (0.72 \times P) / VAC$ (I_{RMS} = *maximum instantaneous current based on 100 ms X-ray exposure*).

(2) *Circuit Breaker (Differential, Thermomagnetic, Fuses and/or Contactor).*
The selected circuit breaker type must have a minimum tripping current of 1.1 x I_{RMS} @ 0.1 seconds.
For example:

Type "B" breaker: $M_B = (I_{RMS} \times 1.1) / 3$
Type "C" breaker: $M_C = (I_{RMS} \times 1.1) / 5$
Type "D" breaker: $M_D = (I_{RMS} \times 1.1) / 10$

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

(3) *For Generators operating with lines at 208 VAC or below an Auxiliary Boost Transformer is required to adequate the line voltage to 230 / 240 VAC.*

	SINGLE-PHASE GENERATOR POWER				THREE-PHASE GENERATOR POWER			
	50 kW (3)				50 kW			
LINE VOLTAGE	I_{RMS} (1)	CIRCUIT BREAKER TYPE (2)			I_{RMS} (1)	CIRCUIT BREAKER TYPE (2)		
		B	C	D		B	C	D
208 VAC	300 A	125 A	80 A	40 A	173 A	80 A	40 A	20 A
230 VAC	272 A	100 A	63 A	32 A	157 A	63 A	40 A	20 A
240 VAC	250 A	100 A	63 A	32 A	150 A	63 A	40 A	20 A
400 VAC (380 VAC)	–	–	–	–	90 A	40 A	20 A	20 A
415 VAC	–	–	–	–	87 A	32 A	20 A	20 A
440 VAC	–	–	–	–	82 A	32 A	20 A	20 A
480 VAC	–	–	–	–	75 A	32 A	20 A	20 A
Differential Sensitivity (Earth Leakage / Ground Fault)	30 mA							
Minimum kVA required	62.5 kVA (*Maximum kW x 1.25*)							
Stand-by Consumption	500 W							

***Notes**:*

(1) $I_{RMS\ (for\ single\text{-}phase)} = (1.25 \times P) / VAC$ (I_{RMS} = *maximum instantaneous current based on 100 ms X-ray exposure*).
$I_{RMS\ (for\ three\text{-}phase)} = (0.72 \times P) / VAC$ (I_{RMS} = *maximum instantaneous current based on 100 ms X-ray exposure*).

(2) Circuit Breaker (Differential, Thermomagnetic, Fuses and/or Contactor).
The selected circuit breaker type must have a minimum tripping current of 1.1 x I_{RMS} @ 0.1 seconds.
For example:

Type "B" breaker: $M_B = (I_{RMS} \times 1.1) / 3$
Type "C" breaker: $M_C = (I_{RMS} \times 1.1) / 5$
Type "D" breaker: $M_D = (I_{RMS} \times 1.1) / 10$

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

(3) For Generators operating with lines at 208 VAC or below an Auxiliary Boost Transformer is required to adequate the line voltage to 230 / 240 VAC.

	THREE-PHASE GENERATOR POWER							
	64 kW ***(or 65 kW)***				**80 kW**			
LINE VOLTAGE	I_{RMS} (1)	**CIRCUIT BREAKER TYPE (2)**			I_{RMS} (1)	**CIRCUIT BREAKER TYPE (2)**		
		B	**C**	**D**		**B**	**C**	**D**
400 VAC (380 VAC)	115 A	50 A	32 A	20 A	144 A	63 A	32 A	20 A
415 VAC	111 A	50 A	25 A	20 A	139 A	63 A	32 A	20 A
440 VAC	105 A	40 A	20 A	20 A	131 A	50 A	32 A	20 A
480 VAC	96 A	40 A	20 A	20 A	120 A	50 A	32 A	20 A
Differential Sensitivity (Earth Leakage / Ground Fault)	30 mA				30 mA			
Minimum kVA required	80 kVA (*Maximum kW x 1.25*)				100 kVA (*Maximum kW x 1.25*)			
Stand-by Consumption	500 W				500 W			

***Notes**:*

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

(2) *Circuit Breaker (Differential, Thermomagnetic, Fuses and/or Contactor).*
The selected circuit breaker type must have a minimum tripping current of 1.1 x I_{RMS} *@ 0.1 seconds.*
For example:

Type "B" breaker: $M_B = (I_{RMS} \times 1.1) / 3$
Type "C" breaker: $M_C = (I_{RMS} \times 1.1) / 5$
Type "D" breaker: $M_D = (I_{RMS} \times 1.1) / 10$

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

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

LINE VOLTAGE	SINGLE-PHASE GENERATOR								
	32 kW			40 kW			50 kW		
	Z_L Ω	Z_C Ω	Z_T Ω	Z_L Ω	Z_C Ω	Z_T Ω	Z_L Ω	Z_C Ω	Z_T Ω
208 VAC	0.043 Ω	0.012 Ω	0.068 Ω	0.035 Ω	0.010 Ω	0.054 Ω	0.028 Ω	0.008 Ω	0.043 Ω
230 VAC	0.053 Ω	0.015 Ω	0.083 Ω	0.042 Ω	0.012 Ω	0.066 Ω	0.034 Ω	0.010 Ω	0.053 Ω
240 VAC	0.058 Ω	0.016 Ω	0.090 Ω	0.046 Ω	0.013 Ω	0.072 Ω	0.037 Ω	0.010 Ω	0.058 Ω

Z_L Ω = maximum impedance of the distribution transformer.
Z_C Ω = maximum impedance of every feeder cable.
Z_T Ω = maximum impedance at the generator's input terminals.
NOTE: *The above values comply with the Standards IEC 60601-2-7:1998 and IEC 60601-2-54:2009.*

LINE VOLTAGE	THREE-PHASE GENERATOR								
	32 kW			40 kW			50 kW		
	Z_L Ω	Z_C Ω	Z_T Ω	Z_L Ω	Z_C Ω	Z_T Ω	Z_L Ω	Z_C Ω	Z_T Ω
208 VAC	0.074 Ω	0.024 Ω	0.118 Ω	0.060 Ω	0.020 Ω	0.094 Ω	0.048 Ω	0.016 Ω	0.075 Ω
230 VAC	0.091 Ω	0.030 Ω	0.144 Ω	0.073 Ω	0.024 Ω	0.115 Ω	0.058 Ω	0.019 Ω	0.092 Ω
240 VAC	0.099 Ω	0.032 Ω	0.157 Ω	0.079 Ω	0.026 Ω	0.125 Ω	0.063 Ω	0.021 Ω	0.100 Ω
400 VAC (380 VAC)	0.275 Ω	0.090 Ω	0.435 Ω	0.220 Ω	0.072 Ω	0.348 Ω	0.176 Ω	0.058 Ω	0.278 Ω
415 VAC	0.296 Ω	0.097 Ω	0.468 Ω	0.237 Ω	0.078 Ω	0.375 Ω	0.189 Ω	0.062 Ω	0.300 Ω
440 VAC	0.333 Ω	0.109 Ω	0.526 Ω	0.266 Ω	0.087 Ω	0.421 Ω	0.213 Ω	0.070 Ω	0.337 Ω
480 VAC	0.396 Ω	0.130 Ω	0.626 Ω	0.317 Ω	0.104 Ω	0.501 Ω	0.253 Ω	0.083 Ω	0.401 Ω

Z_L Ω = maximum impedance of the distribution transformer.
Z_C Ω = maximum impedance of every feeder cable.
Z_T Ω = maximum impedance at the generator's input terminals.
NOTE: *The above values comply with the Standards IEC 60601-2-7:1998 and IEC 60601-2-54:2009.*

LINE VOLTAGE	THREE-PHASE GENERATOR					
	64 kW *(or 65 kW)*			80 kW		
	Z_L Ω	Z_C Ω	Z_T Ω	Z_L Ω	Z_C Ω	Z_T Ω
400 VAC (380 VAC)	0.138 Ω	0.045 Ω	0.218 Ω	0.110 Ω	0.036 Ω	0.174 Ω
415 VAC	0.148 Ω	0.048 Ω	0.234 Ω	0.118 Ω	0.039 Ω	0.187 Ω
440 VAC	0.166 Ω	0.055 Ω	0.263 Ω	0.133 Ω	0.044 Ω	0.211 Ω
480 VAC	0.198 Ω	0.065 Ω	0.313 Ω	0.158 Ω	0.052 Ω	0.251 Ω

Z_L Ω = maximum impedance of the distribution transformer.
Z_C Ω = maximum impedance of every feeder cable.
Z_T Ω = maximum impedance at the generator's input terminals.
NOTE: *The above values comply with the Standards IEC 60601-2-7:1998 and IEC 60601-2-54:2009.*

RECOMMENDED WIRE SIZE

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

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

The recommended wire sizing is indicated in Table 4-1 and the wire size conversion in Table 4-2. These lengths are measured from the Distribution Transformer to the Room Electrical Cabinet (Main Disconnect). **From the Room Electrical Cabinet to the Generator Cabinet, wire sizes should be consistent with those shown in Table 4-1 and based on the length of wires required to complete the run. The maximum wire size that can be connected to the Generator Cabinet (Input Line Fuse Holder) is 35 mm^2 (AWG 2).**

Table 4-1
Minimum Wire Size from Distribution Transformer to Room Electrical Cabinet

GENERATOR	LINE VOLTAGE	WIRE SIZE AT:							
		15 m (50 ft)		30 m (100 ft)		45 m (150 ft)		60 m (200 ft)	
32 kW, 1ϕ	208 VAC	25 mm^2	AWG 2	50 mm^2	AWG 1/0	95 mm^2	AWG 3/0	120 mm^2	AWG 4/0
	230 VAC	25 mm^2	AWG 4	50 mm^2	AWG 1	70 mm^2	AWG 2/0	95 mm^2	AWG 3/0
	240 VAC	25 mm^2	AWG 4	50 mm^2	AWG 1	70 mm^2	AWG 2/0	95 mm^2	AWG 3/0
32 kW, 3ϕ	208 VAC	16 mm^2	AWG 6	25 mm^2	AWG 2	50 mm^2	AWG 1	50 mm^2	AWG 1
	230 VAC	10 mm^2	AWG 6	25 mm^2	AWG 4	35 mm^2	AWG 2	50 mm^2	AWG 1
	240 VAC	10 mm^2	AWG 6	25 mm^2	AWG 4	35 mm^2	AWG 2	50 mm^2	AWG 1
	400 VAC (380 VAC)	4 mm^2	AWG 12	10 mm^2	AWG 8	10 mm^2	AWG 6	16 mm^2	AWG 6
	415 VAC	4 mm^2	AWG 12	6 mm^2	AWG 8	10 mm^2	AWG 6	16 mm^2	AWG 6
	440 VAC	4 mm^2	AWG 12	6 mm^2	AWG 8	10 mm^2	AWG 8	16 mm^2	AWG 6
	480 VAC	4 mm^2	AWG 12	6 mm^2	AWG 10	10 mm^2	AWG 8	10 mm^2	AWG 6

Table 4-1 (cont.)
Minimum Wire Size from Distribution Transformer to Room Electrical Cabinet

GENERATOR	LINE VOLTAGE	WIRE SIZE AT:							
		15 m (50 ft)		30 m (100 ft)		45 m (150 ft)		60 m (200 ft)	
40 kW, 1ϕ	208 VAC	35 mm^2	AWG 2	70 mm^2	AWG 2/0	95 mm^2	AWG 4/0	120 mm^2	AWG 4/0
	230 VAC	25 mm^2	AWG 2	50 mm^2	AWG 1/0	95 mm^2	AWG 3/0	120 mm^2	AWG 4/0
	240 VAC	25 mm^2	AWG 2	50 mm^2	AWG 1/0	70 mm^2	AWG 3/0	95 mm^2	AWG 4/0
40 kW, 3ϕ	208 VAC	16 mm^2	AWG 4	35 mm^2	AWG 2	50 mm^2	AWG 1/0	70 mm^2	AWG 2/0
	230 VAC	16 mm^2	AWG 6	25 mm^2	AWG 2	50 mm^2	AWG 1	50 mm^2	AWG 1/0
	240 VAC	16 mm^2	AWG 6	25 mm^2	AWG 2	35 mm^2	AWG 2	50 mm^2	AWG 1/0
	400 VAC (380 VAC)	6 mm^2	AWG 10	10 mm^2	AWG 8	16 mm^2	AWG 6	25 mm^2	AWG 4
	415 VAC	4 mm^2	AWG 10	10 mm^2	AWG 8	16 mm^2	AWG 6	16 mm^2	AWG 4
	440 VAC	4 mm^2	AWG 10	10 mm^2	AWG 8	10 mm^2	AWG 6	16 mm^2	AWG 6
	480 VAC	4 mm^2	AWG 12	6 mm^2	AWG 8	10 mm^2	AWG 8	16 mm^2	AWG 6
50 kW, 1ϕ	208 VAC	50 mm^2	AWG 1	95 mm^2	AWG 3/0	N.A.	N.A.	N.A.	N.A.
	230 VAC	35 mm^2	AWG 2	70 mm^2	AWG 2/0	95 mm^2	AWG 4/0	N.A.	N.A.
	240 VAC	35 mm^2	AWG 2	70 mm^2	AWG 2/0	95 mm^2	AWG 4/0	N.A.	N.A.
50 kW, 3ϕ	208 VAC	25 mm^2	AWG 4	50 mm^2	AWG 1	70 mm^2	AWG 2/0	95 mm^2	AWG 3/0
	230 VAC	16 mm^2	AWG 4	35 mm^2	AWG 2	50 mm^2	AWG 1/0	70 mm^2	AWG 2/0
	240 VAC	16 mm^2	AWG 4	35 mm^2	AWG 2	50 mm^2	AWG 1	70 mm^2	AWG 2/0
	400 VAC (380 VAC)	6 mm^2	AWG 10	10 mm^2	AWG 6	16 mm^2	AWG 4	25 mm^2	AWG 4
	415 VAC	6 mm^2	AWG 10	10 mm^2	AWG 6	16 mm^2	AWG 4	25 mm^2	AWG 4
	440 VAC	6 mm^2	AWG 10	10 mm^2	AWG 8	16 mm^2	AWG 6	25 mm^2	AWG 4
	480 VAC	4 mm^2	AWG 10	10 mm^2	AWG 8	16 mm^2	AWG 6	16 mm^2	AWG 4
64 kW, 3ϕ *(or 65 kW, 3ϕ)*	400 VAC (380 VAC)	10 mm^2	AWG 8	16 mm^2	AWG 6	25 mm^2	AWG 4	35 mm^2	AWG 2
	415 VAC	10 mm^2	AWG 8	16 mm^2	AWG 6	25 mm^2	AWG 4	25 mm^2	AWG 2
	440 VAC	6 mm^2	AWG 8	16 mm^2	AWG 6	16 mm^2	AWG 4	25 mm^2	AWG 4
	480 VAC	6 mm^2	AWG 10	10 mm^2	AWG 6	16 mm^2	AWG 4	25 mm^2	AWG 4
80 kW, 3ϕ	400 VAC (380 VAC)	10 mm^2	AWG 8	25 mm^2	AWG 4	25 mm^2	AWG 2	35 mm^2	AWG 2
	415 VAC	10 mm^2	AWG 8	16 mm^2	AWG 4	25 mm^2	AWG 2	35 mm^2	AWG 2
	440 VAC	10 mm^2	AWG 8	16 mm^2	AWG 6	25 mm^2	AWG 4	35 mm^2	AWG 2
	480 VAC	6 mm^2	AWG 8	16 mm^2	AWG 6	25 mm^2	AWG 4	25 mm^2	AWG 2

Table 4-2
Wire Size Conversion and Ampacity

Cross Section (mm^2)	AWG	Ampacity (A)
3.31	**12**	20
4		24
5.26	**10**	30
6		39
8.37	**8**	47
10		55
13.3	**6**	61
16		70
21.15	**4**	80
25		90
33.6	**2**	108
35		115
42.4	**1**	122
50		132
53.5	**0 (1/0)**	141
67.4	**00 (2/0)**	164
70		170
85	**000 (3/0)**	188
95		200
107.2	**0000 (4/0)**	216
120		240
The selected cable must have an Ampacity equal or greater than the Circuit Breaker. The smallest size used is 4 mm^2 or AWG 12.		

4.2 CAPACITOR ASSISTED GENERATORS - POWER LINE REQUIREMENTS

Power Line	100 / 110 / 120 / 208 / 230 / 240 VAC - Single-Phase , 50 / 60 Hz Line Voltage Automatic Compensation ±10% VAC Power Line Adaptation for local conditions from 8 to 20 A Connection to line terminals and GND of the Room Electrical Cabinet by using tool and according to local standards.
Circuit Breaker / Thermomagnetic Interruptor minimum rating should be:	20 A for 100 or 110 VAC 16 A for 120 VAC 12.5 A for 208 VAC 10 A for 230 VAC 8 A for 240 VAC (1 Phase + Neutral, Curve Type C)
Differential Sensitivity (Earth Leakage / Ground Fault)	30 mA
Minimum kW required	2.0 kW
Maximum Input Power	4 kVA
Line Impedance	Due to the unit is a Capacitor Assisted Generator, a specific value of Line Impedance is not required.

RECOMMENDED WIRE SIZE

The minimum recommended wire size for the line voltage is:

LINE VOLTAGE	WIRE SIZE	
100 / 110 / 120 VAC	4 mm^2	AWG 12
208 / 230 / 240 VAC	2.5 mm^2	AWG 14

4.3 BATTERY POWERED GENERATORS - POWER LINE REQUIREMENTS

Power Line	110 / 208 / 230 / 240 VAC - Single-Phase , 50 / 60 Hz Line Voltage Automatic Compensation ±10% VAC Connection to line terminals and GND of the Room Electrical Cabinet by using tool and according to local standards.
Circuit Breaker / Thermomagnetic Interruptor minimum rating should be:	20 A for 110 VAC 12.5 A for 208 VAC 10 A for 230 VAC 8 A for 240 VAC (1 Phase + Neutral, Curve Type C)
Differential Sensitivity (Earth Leakage / Ground Fault)	30 mA
Minimum kW required	0.5 kW for unit with Stand-Alone option 2.2 kW for unit without Stand-Alone option
Maximum Input Power	1 kVA for unit with Stand-Alone option 3.3 kVA for unit without Stand-Alone option
Line Impedance	Due to the unit is a Battery Powered Generator, a specific value of Line Impedance is not required.

RECOMMENDED WIRE SIZE

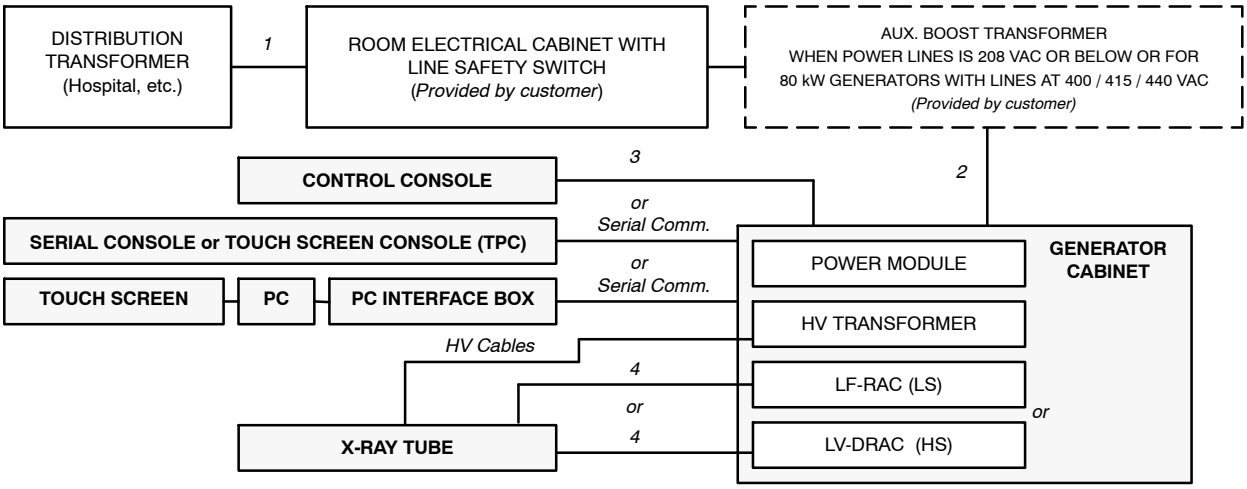
The minimum recommended wire size for the line voltage is:

LINE VOLTAGE	WIRE SIZE	
110 VAC	4 mm^2	AWG 12
208 / 230 / 240 VAC	2.5 mm^2	AWG 14

4.4 INTERCONNECTION AND GROUNDING REQUIREMENTS

Note ☞ *For more information about interconnection and grounding refer to "Installation" document.*

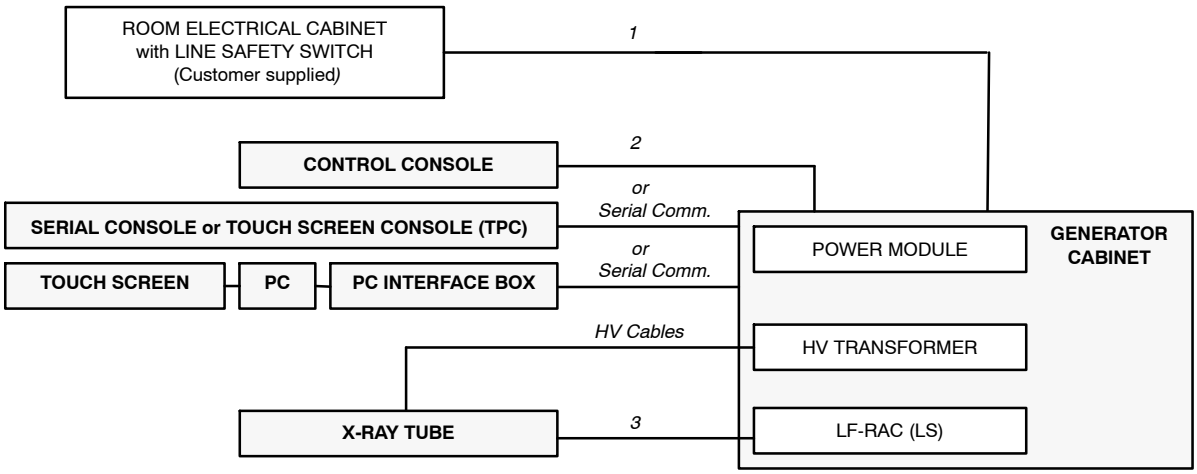
Illustration 4-1
Interconnection Block Diagram for LINE POWERED GENERATORS



Note ☞ *For Serial Generators (RS232 / RS422): Console CPUs are located inside the Generator Cabinet and Interconnections are factory made. Only one cable (serial communication) from J5 of the Generator Cabinet should be connected to the Serial Console, Touch Screen Console or PC Interface Box.*

CABLE RUN	FUNCTION	REMARKS
1	Single or Three Phase Input Power Line.	Connect to Room Electrical Cabinet according to the indicated electrical requirements. *Customer supplied.*
	Ground.	
2	Single or Three Phase Input Power Line.	Connect to Generator according to the indicated electrical requirements. Install an Auxiliar Boost Transformer when it is required. *Customer supplied.*
	Ground.	
3	Control Signals and Ground.	Cable quantity depends on the options installed (AEC, etc.)
4	Stator Supply.	*Provided with X-ray Tube.*
	Ground.	
	Generator provided with High Speed Starter requires a shielded stator cable. (*Refer to "Installation" document*).	*Field supplied.*
NOTES: - *For wire size refer to Section 4.1. Consult to Local Standards for feeder and ground wire size requirements.* - *The system power ground point is located in the Generator Cabinet.*		

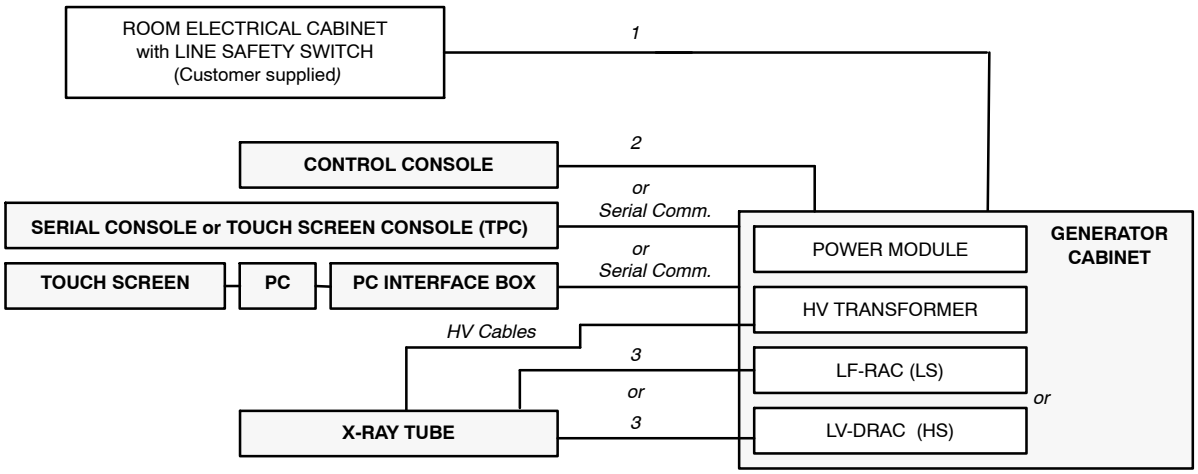
Illustration 4-2
Interconnection Block Diagram for CAPACITOR ASSISTED GENERATORS



Note ☞ *For Serial Generators (RS232 / RS422): Console CPUs are located inside the Generator Cabinet and Interconnections are factory made. Only one cable (serial communication) from J5 of the Generator Cabinet should be connected to the Serial Console, Touch Screen Console or PC Interface Box.*

CABLE RUN	FUNCTION	REMARKS
1	Single Phase Input Power Line.	Connect to Room Electrical Cabinet according to the indicated electrical requirements. *Customer supplied.*
	Ground.	
2	Control Signals and Ground	Cable quantity depends on the options installed (AEC, etc.)
3	Stator Supply.	*Provided with X-ray Tube.*
	Ground.	
NOTES: - *For wire size refer to Section 4.2. Consult to Local Standards for feeder and ground wire size requirements.* - *The system power ground point is located in the Generator Cabinet.*		

Illustration 4-3
Interconnection Block Diagram for BATTERY POWERED GENERATORS



Note ☞ *For Serial Generators (RS232 / RS422): Console CPUs are located inside the Generator Cabinet and Interconnections are factory made. Only one cable (serial communication) from J5 of the Generator Cabinet should be connected to the Serial Console, Touch Screen Console or PC Interface Box.*

CABLE RUN	FUNCTION	REMARKS
1	Single Phase Input Power Line.	Connect to Room Electrical Cabinet according to the indicated electrical requirements. *Customer supplied.*
	Ground.	
2	Control Signals and Ground	Cable quantity depends on the options installed (AEC, etc.)
3	Stator Supply.	*Provided with X-ray Tube.*
	Ground.	
	Generator provided with High Speed Starter requires a shielded stator cable. (*Refer to "Installation" document*).	*Field supplied.*
NOTES: - *For wire size refer to Section 4.3. Consult to Local Standards for feeder and ground wire size requirements.* - *The system power ground point is located in the Generator Cabinet.*		

4.5 SAFETY DEVICES

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

Devices such as Safety Switch / Emergency Switch, Warning Light, and a Door Interlock Switch should be supplied and installed by the customer. (*Refer to Illustration 4-4*).

SAFETY SWITCH / EMERGENCY SWITCH

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

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

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

For Battery Powered Generators, an optional Emergency Stop Button for isolating the Batteries and Power Line of the Generator can also be provided to be installed in the Room Electrical Cabinet or another location in the X-ray Room. (*Refer to Installation Chapter of the Generator Service Manual)*.

The minimum specification for this installation should be:

- Emergency Stop Button: *AC-15 , 240 V, 3 A, Ith 10 A.*
- Cable: *2.5 mm^2 (AWG 14), 600 V.*

DOOR INTERLOCK SWITCH

The Door Interlock Switch indicates to the operator when Doorways to the X-ray room are open. It inhibits or not the X-ray generation, according to the Local Standards and customer preferences.

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

WARNING LIGHT

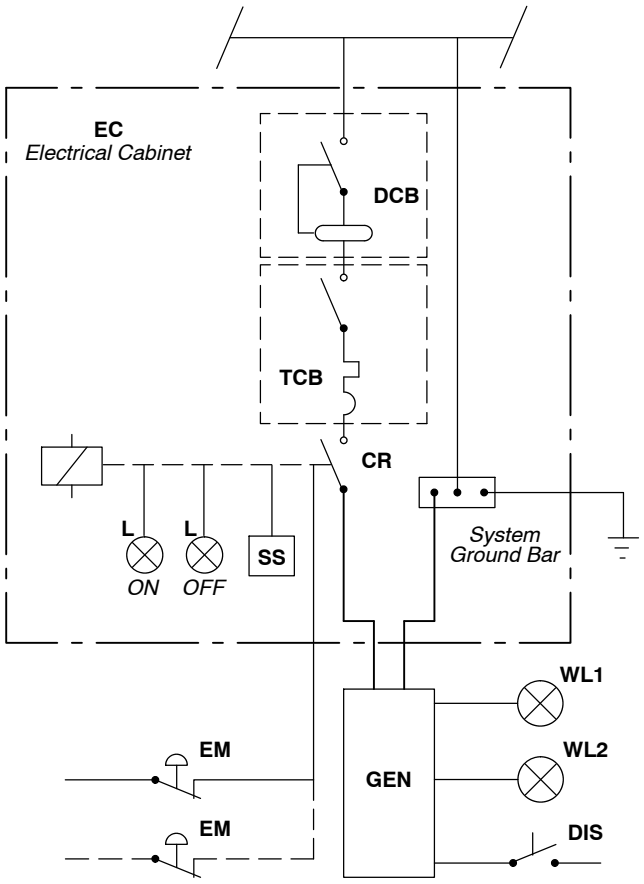
The Warning Lights are signal lamps installed outside of the X-ray room (near of the main entrance) that indicate:

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

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

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

Illustration 4-4
Room Electrical Cabinet and Mains Connection

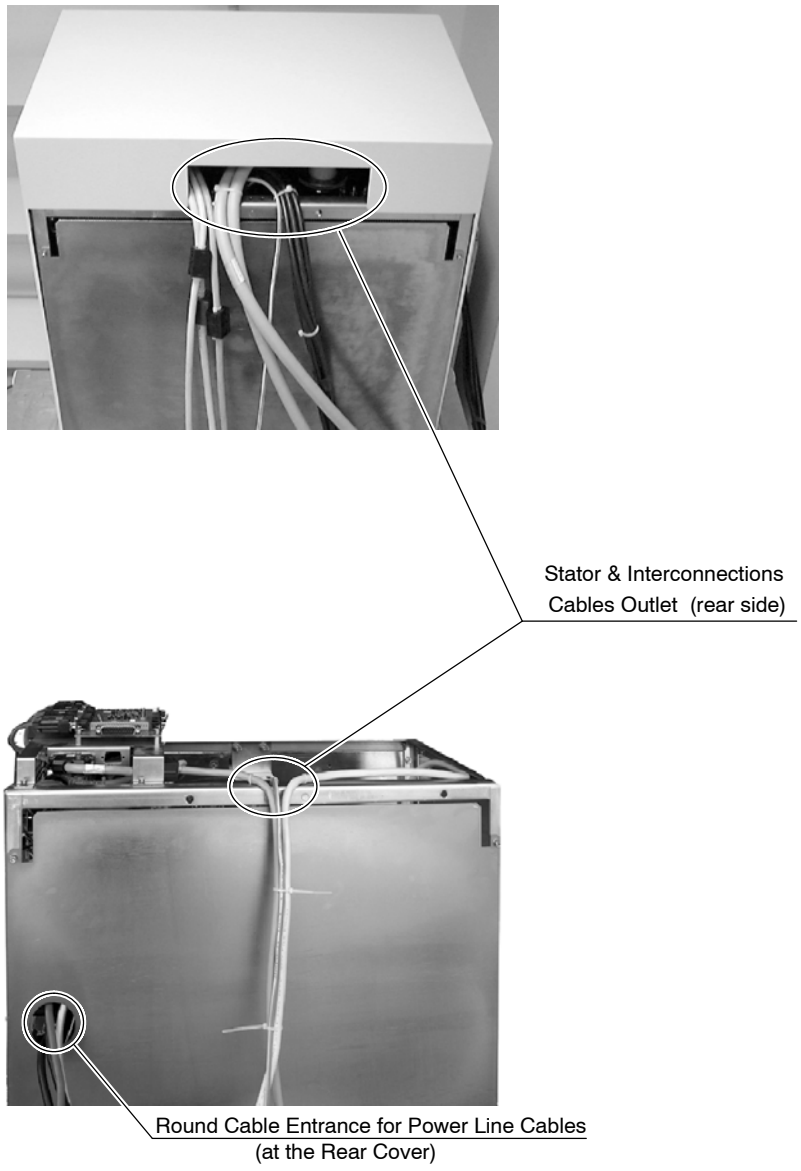


LEGEND

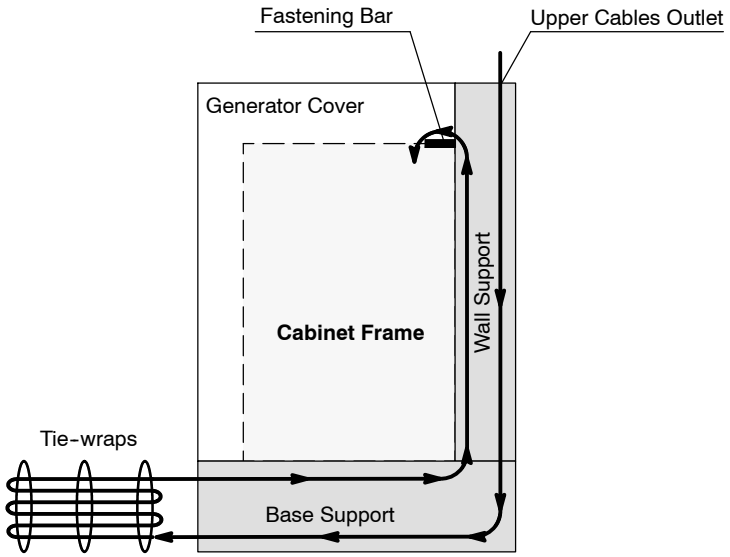
EC: Electrical Cabinet (Room Disconnect) for powering X-ray equipment. (*Customer supplied)*
DCB: Differential Circuit Breaker.
TCB: Thermomagnetic (or Fuses) Circuit Breaker.
CR: Contactor controlled by the Safety Switch (**SS**).
SS: Safety Switch used for Generator main disconnection, with ON/OFF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

4.6 GENERATOR CABLE ACCESS

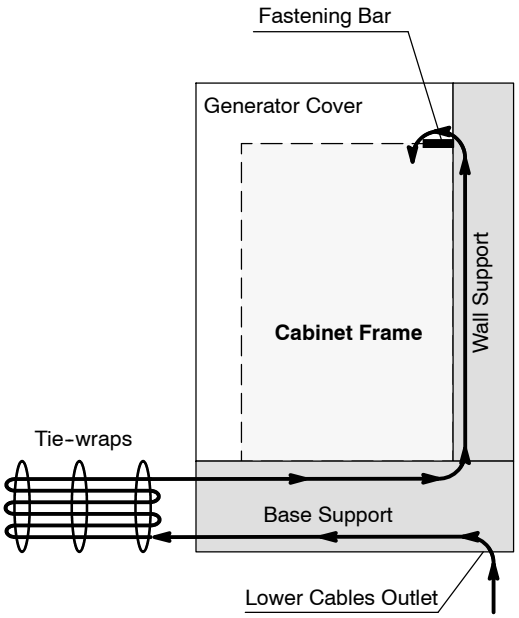
LINE POWERED GENERATOR
(WITHOUT FLOOR OR WALL SUPPORTS)



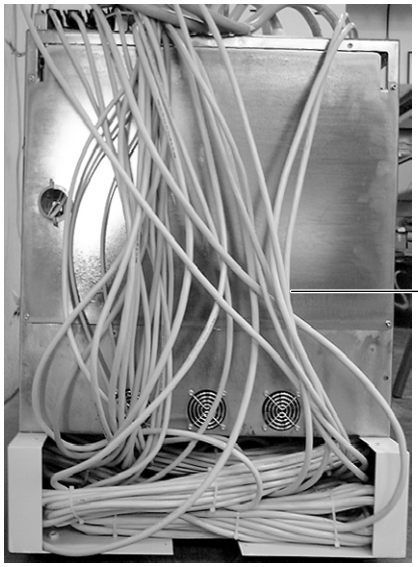
LINE POWERED GENERATOR (WITH FLOOR AND WALL SUPPORTS)



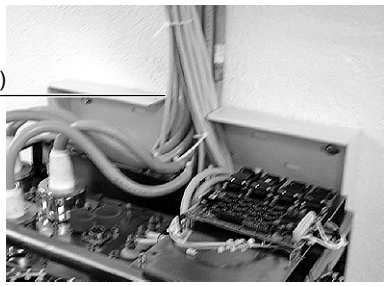
INTERNAL CABLE ROUTING FROM UPPER CABLES OUTLET



INTERNAL CABLE ROUTING FROM LOWER CABLES OUTLET



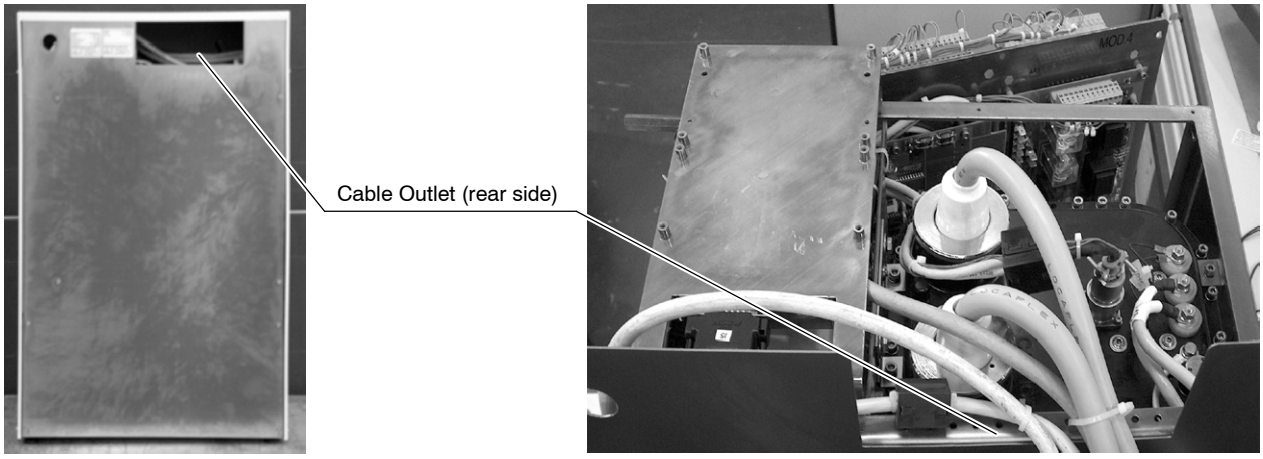
Cables Entrance (upper side of Wall Support)

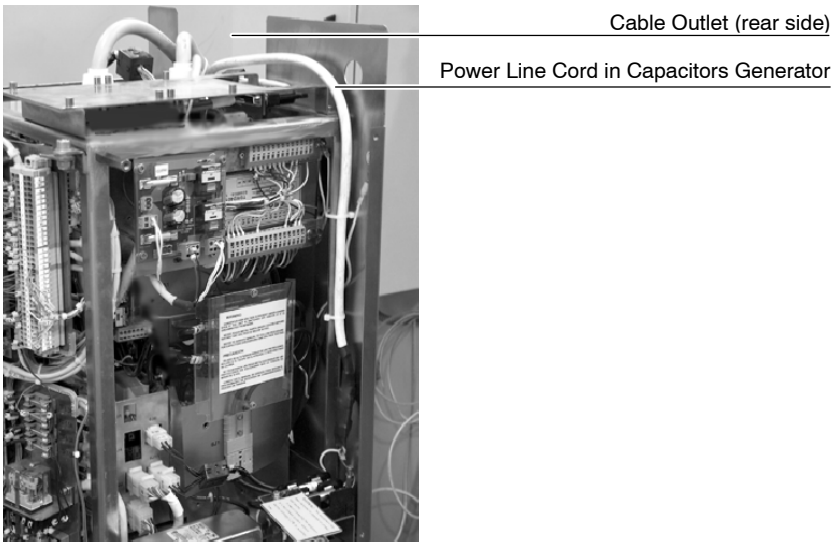


Cables Routing from Cabinet to Base Support (rear view)

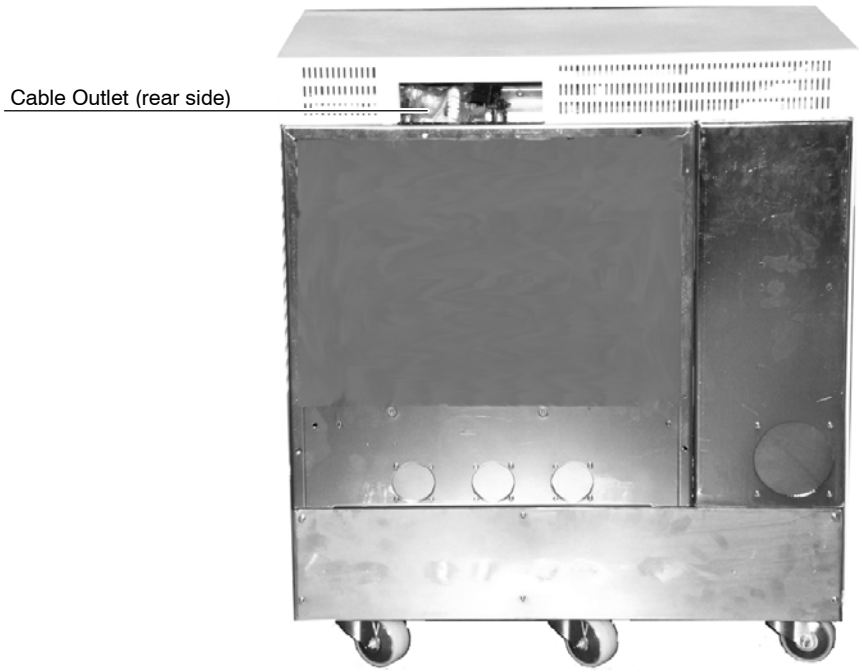
Cables Outlet (rear side of Cabinet Cover)

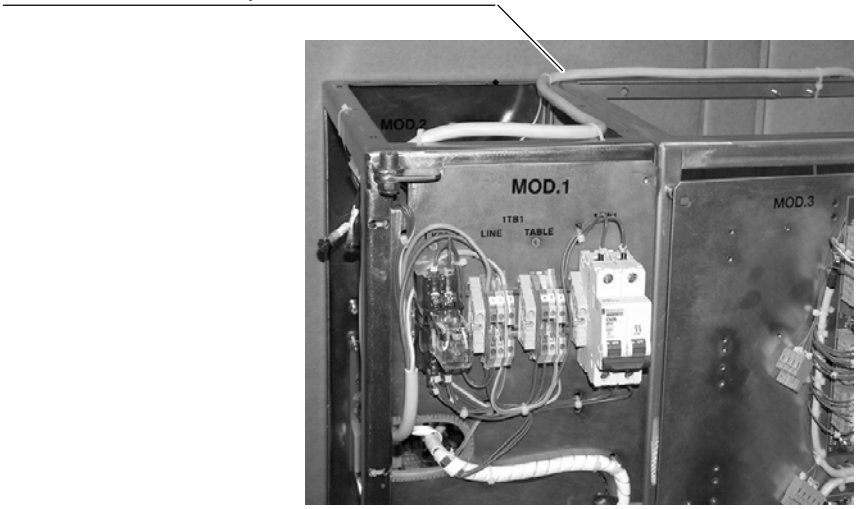
CAPACITOR ASSISTED GENERATOR





BATTERY POWERED GENERATOR





SECTION 5 PRODUCT CHARACTERISTICS

This section provides product information and illustrations showing physical dimensions, weight, mounting holes and cable access.

5.1 HIGH VOLTAGE CABLES

COMPONENT	STANDARD LENGTH	OPTIONAL LENGTH	OPTIONAL LENGTH
High Voltage Cables	9 m (29.5 ft)	12 m (39.4 ft)	16 m (52.4 ft)

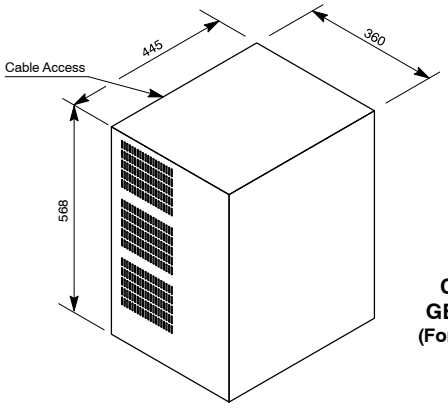
5.2 PHYSICAL CHARACTERISTICS

(Refer to Illustration 5-1)

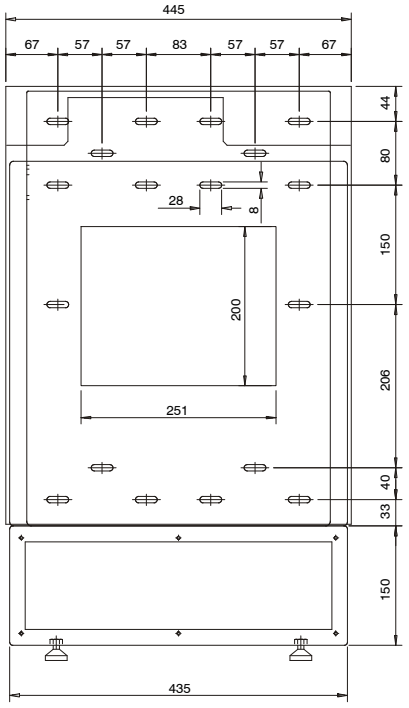
COMPONENT	DIMENSIONS			WEIGHT
	Length	Width	Height	
LINE POWERED GENERATORS				
Compact Generator Cabinet (for only 1 Tube LSS)	445 mm (17.5”)	360 mm (14.2”)	568 mm (22.4”)	72 kg (159 lb)
Compact Generator Cabinet (for 1 or 2 Tubes LSS / HSS)	592 mm (23.3”)	360 mm (14.2”)	690 mm (27.2”)	95 kg (209 lb)
CAPACITOR ASSISTED GENERATORS				
Compact Generator Cabinet with Capacitor Module (for only 1 Tube LSS)	500 mm (19.7”)	360 mm (14.2”)	790 mm (31.1”)	108 kg (238 lb)
BATTERY POWERED GENERATORS				
Compact Generator Cabinet with Battery Module	813 mm (32”)	436 mm (17.2”)	948 mm (37.3”)	235 kg (518 lb)

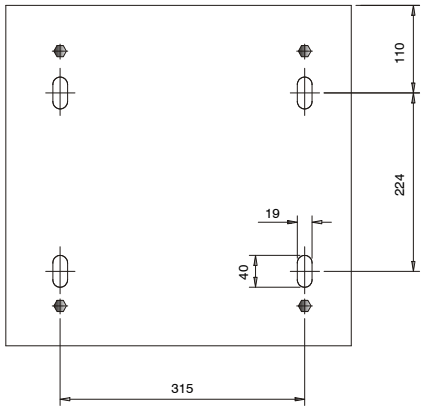
COMPONENT		DIMENSIONS			WEIGHT
		Length	Width	Height	
STANDARD CONTROL CONSOLES					
RAD Console Graphic Display	with Handswitch support	545 mm (21.4”)	290 mm (11.4”)	50 mm (1.9”)	6 kg (13.2 lb)
	w/o Handswitch support	430 mm (16.9”)	290 mm (11.4”)	50 mm (1.9”)	6 kg (13.2 lb)
Touch Screen Console	with Handswitch support	468 mm (18.4”)	290 mm (11.4”)	114 mm (4.4”)	8 kg (17.6 lb)
	w/o Handswitch support	360 mm (14.1”)	290 mm (11.4”)	114 mm (4.4”)	8 kg (17.6 lb)
Optional Pedestal for RAD Console Graphic Display or Touch Screen Console		298 mm (11.7”)	236 mm (9.3”)	930 mm (36.6”)	10 kg (22 lb)
Note.- Dimensions for no-standard Consoles are not indicated in this document.					
PC INTERFACE BOX					
PC Interface Box		130 mm (5.1”)	140 mm (5.5”)	46 mm (1.8”)	0.6 kg (1.3 lb)

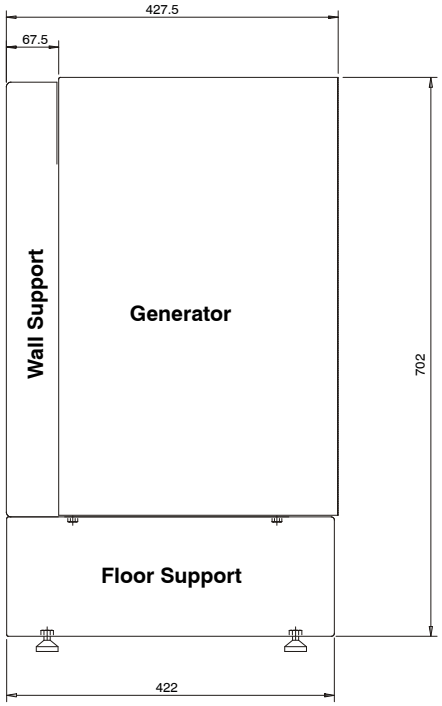
Illustration 5-1
Generators



COMPACT GENERATOR
(For only 1 Tube)

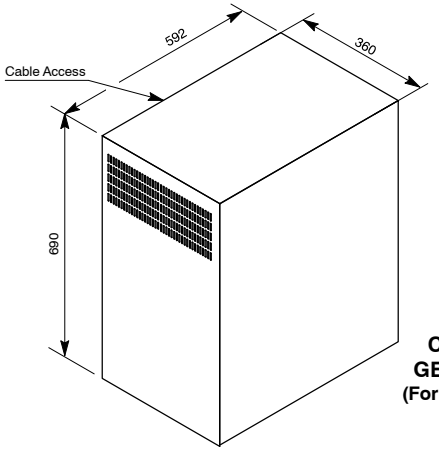




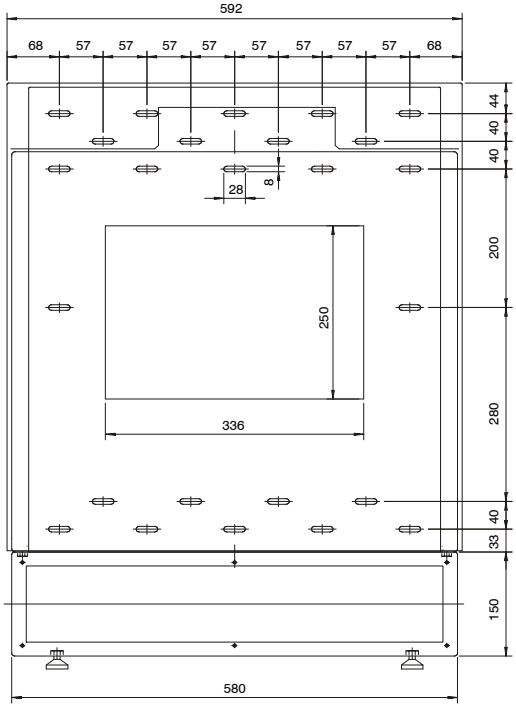


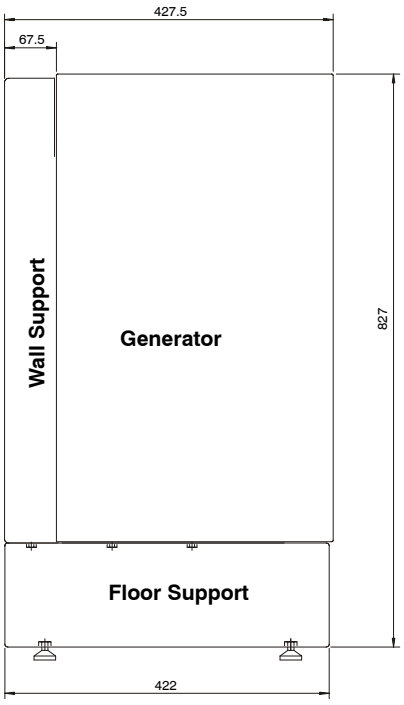
Wall and Floor Supports are options

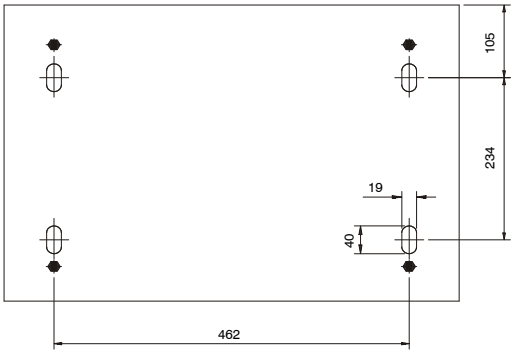
Illustration 5-1 (cont.)
Generators



COMPACT GENERATOR
(For 1 or 2 Tubes)







Wall and Floor Supports are options

Illustration 5-1 (cont.)
Generators

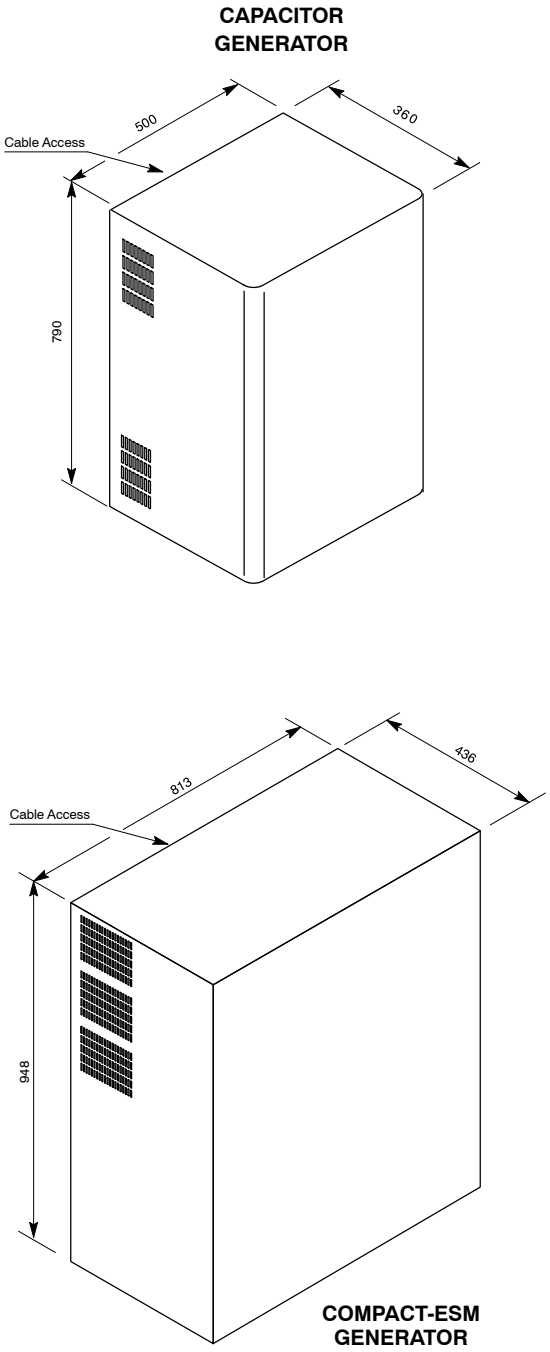
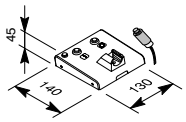
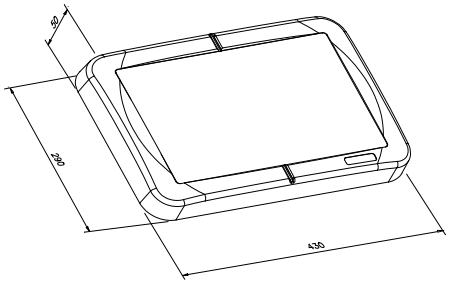


Illustration 5-1 (cont.)
Generators



PC INTERFACE BOX



RAD CONSOLES - GRAPHIC DISPLAY

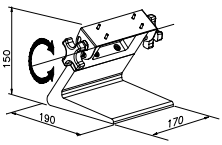
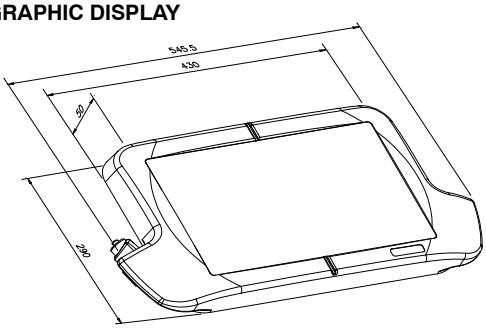
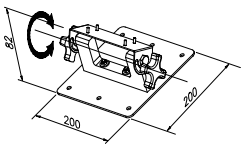
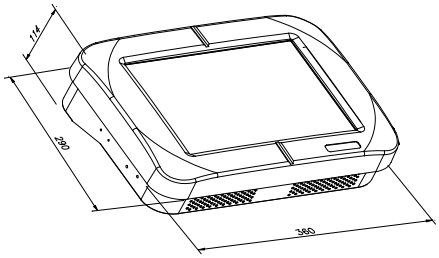


TABLE SUPPORT

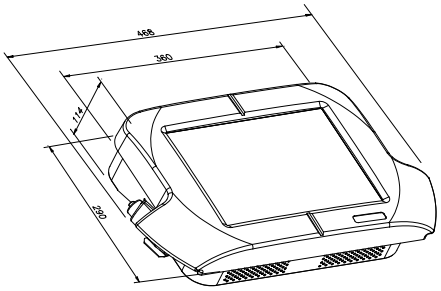


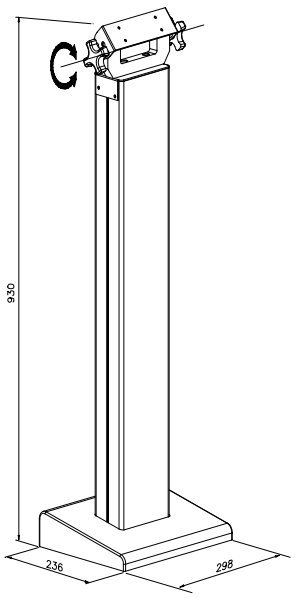


WALL SUPPORT



TOUCH SCREEN CONSOLES (TPC)





PEDESTAL

THESE CONSOLES CAN BE MOUNTED ON A TABLE SUPPORT, WALL SUPPORT OR PEDESTAL

SECTION 6 PLANNING AIDS

6.1 SHIPPING DIMENSIONS AND WEIGHTS

COMPONENT CRATED	DIMENSIONS			WEIGHT
	Length	Width	Height	
Line Powered Generator (for only 1 Tube (LSS)) with Control Console and Cables	107 cm (42.1”)	62 cm (24.4”)	74 cm (29.1”)	140 kg (308 lb)
Line Powered Generator (for 1 or 2 Tubes (LSS or HSS)) with Control Console and Cables	115 cm (45.3”)	82 cm (32.3”)	74 cm (29.1”)	170 kg (374 lb)
Capacitor Assisted Generator with Control Console and Cables	118 cm (46.5”)	57 cm (22.4”)	114 cm (44.9”)	204 kg (449 lb)
Battery Powered Generator with Control Console and Cables	118 cm (46.5”)	57 cm (22.4”)	114 cm (44.9”)	280 kg (617 lb)

6.2 TOOLS AND EQUIPMENT CHECKLIST

TOOLS AND EQUIPMENT CHECKLIST *The following tools and materials are needed for installation but are not shipped with the product.*	**COMPLETED**
Standard service engineer’s tool kit.	
Electric and hammer drill. Assorted masonry and high-speed bits in both metric and SAE sizes	
Assorted sizes of tongue and grove pliers, hammers, hex wrenches (metric and SAE), screw drivers, and metal files	
Wall and Floor anchoring hardware	
Assorted hardware for termination of electrical connections	
Assorted sizes of wire cutters and strippers, ratchet and standard crimpers, and a 75–watt soldering iron	
Tie wraps, heat and electrical tape, and wire markers	
Tags for labeling incomplete work according to regulatory requirements	
Movers, dollies, ladders, shop vacuum, and push-broom	

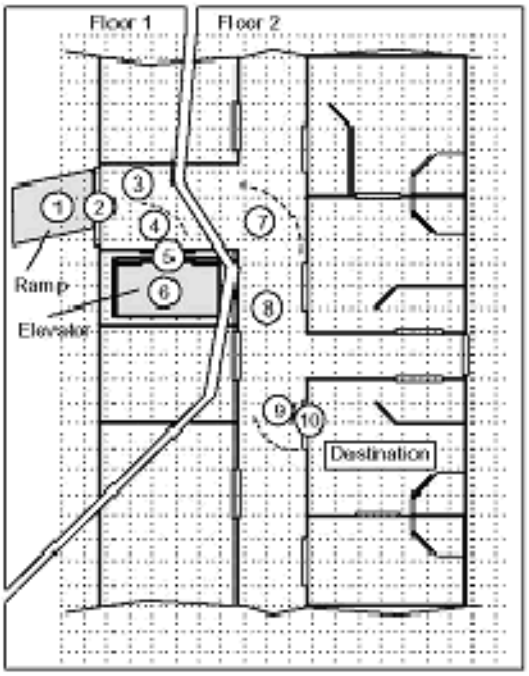
6.3 PREPARING THE DELIVERY ROUTE

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

1. **Sketch out the Route.**

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

Illustration 6-1
Sample Route



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

2. **Survey the Route.**

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

3. **Check the Route.**

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

6.4 PRE-INSTALLATION CHECKLIST

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

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

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

GENERAL	COMPLETED
1. Walls and floor clear of all obstructions?	
2. Walls finished?	
3. Finished floor installed?	
4. Room lights installed?	
5. Dust-creating work completed?	
6. Old equipment within room removed?	
7. Component positions clearly marked on floor?	
8. Space available to store equipment?	
9. Lock on door, or locked room available?	
10. Voice phone line connection provided?	
11. Have all fire/safety inspections for occupancy been completed?	

COMMENTS

INSPECTION DATE(S)

INSTALLATION PROJECT MANAGER SIGNATURE