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## Chapter 5 – Electric Installation Requirements

### 5.1 Voltage Requirements

The Infinia System is adaptable to the following international types of Mains power supplies:

- **3- phase 400V to 415V plus Neutral and Ground, Star connection.**

OR

- **3- phase 208V Neutral and Ground Delta connection.**
- The Infinia Input Transformer is connected according to the available mains.

Voltage Tolerance	+10%, -5% from nominal
Load Regulation	Maximum 5% for load of 20A per phase
Frequency	50 or 60 Hz $\pm$ 1Hz

Spikes Line to Neutral		
Spikes	Phase Voltage	
	230 V Line	120 V Line
Spike "A"	< 1200 V	< 900 V
Pulse Width	< 10 $\mu$ s	< 10 $\mu$ s
Rise Time	> 1 $\mu$ s	> 1 $\mu$ s
Spike "B"	< 800 V	< 400 V
Pulse Width	< 100 $\mu$ s	< 100 $\mu$ s
Spike "C"	< 400 V	< 200 V
Pulse Width	< 200 $\mu$ s	< 200 $\mu$ s
High Frequency (Line to Neutral)	< 1V RMS 0.15 to 30 MHz	

## 5.2 Power Requirements

Power consumption is 4.2 kVA (including Hawkeye Option), 3.6 kVA (without Hawkeye Option). Maximum load (current) is:

- 15 A per phase in case of three-phase star, 400 V ac line voltage (3 x 230 V for Europe), 20 A Circuit Breaker.  
In-rush current/phase, 30A for 15 m sec
- 17 A per phase in case of three-phase delta, 208 V ac line voltage (3 x 120 V for USA), 20 A Circuit Breaker  
In-rush current/phase, 60A for 12 m sec
- The circuit breaker should support the In-rush current and be capable of withstanding the short circuit current available. It should be the Thermal-Magnetic type.
- If a UPS is installed, refer to the requirements of the UPS manufacturer.

The power source must be independent of all other loads.

The three-phase power must be dedicated circuit and include the following:

- 1. Permanent - not plug-in connection.**
2. The connection must include THREE PHASE lines, NEUTRAL line and INSOLATED Ground line. The ground wire is same as or larger than the power wire.
3. The connection must include an ON/OFF switch, 3-pole 600V rated for the appropriate current, with phase indicator for each phase, located at the Mains power supply box mounted on the wall. The type of ON/OFF switch should be determined by a local specialist according to local regulations (US code requires a lockable switch). If this switch is under a decorative or protective cover, the label will be on the cover underneath the Main Switch. The switch or covers shall not be locked and the switch will be reachable for operators or service engineers.

In addition, the camera room should have several single phase wall outlets to be used for connection of general use. The location of these outlets depends on the specific site equipment and room layout.



### CAUTION

For minimum noise and interference, the electrical power to Infinia must be independent from other non-system electrical equipment.

The Gantry - Computer cable is terminated by a 3-outlets power box. One outlet to connect the computer, one to connect to the monitor and one free. The free outlet provides maximum 5 A.

## 5.2.1 Power Circuits

1. The Infinia system has one non detachable 5-conductors power cable:

Wires:	5 x AWG 10 (6mm sq.)
Diam:	15 mm
Length:	9 meters
Connection to 3-phase Mains: (permanent NOT plug-in)	<ul style="list-style-type: none"> <li>• 3-phase Mains</li> <li>• Neutral</li> <li>• Ground</li> <li>• Crimped terminal lugs (1/4" holes), nuts, washers and spring washers</li> </ul>

2. Other power cables:

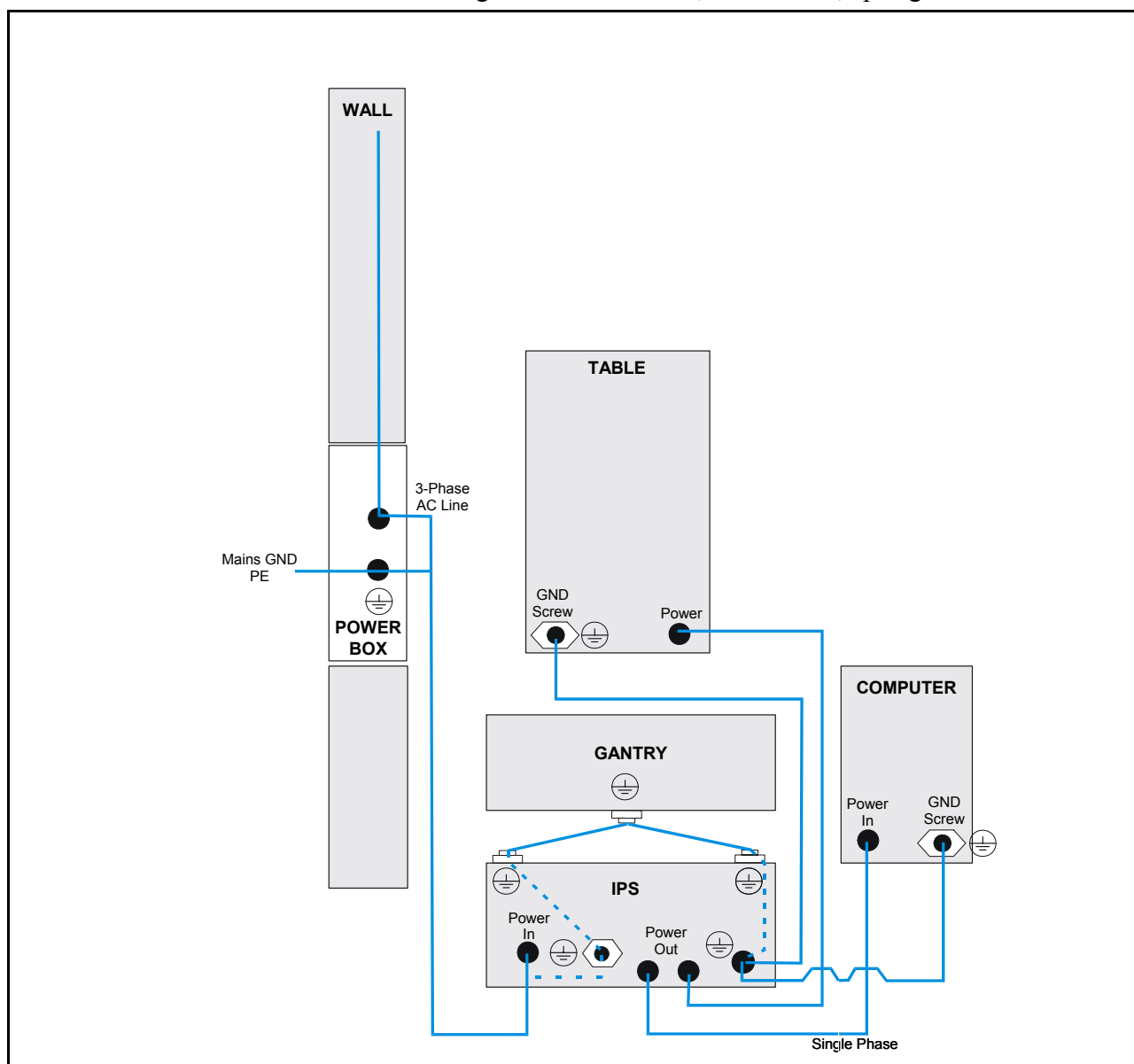
Table electrical cable:	<ul style="list-style-type: none"> <li>• Connected to Gantry</li> <li>• Length: 11 meters</li> <li>• Flexible - protected with 35mm conduit capable of withstanding 350N/100mm pressure</li> <li>• 40mm diam. clamps on ends</li> </ul>
Computer electrical cable:	<ul style="list-style-type: none"> <li>• Connected to Gantry</li> <li>• Length: 9.5 meters</li> <li>• Flexible - protected with 35mm conduit capable of withstanding 350N/100mm pressure</li> <li>• 40mm diam. clamps on ends</li> </ul>

3. Additional Mains wall outlets:

- Several additional single-phase 5A outlets for service engineer use. These are fed from the same Mains as the Infinia circuit breaker.
- Other mains outlets for clinical staff use are also fed from the Power Mains. However, it is recommended to separate these or mark them with a different color. Their Ground will be the same as for the whole room PE (Potential Equalization).

## 5.2.2 Grounding Requirements

The Infinia System is connected to Ground at a single point (see [Figure 5-1](#)). This point will be on the wall as a Ground Bus with a connection to a 5/16" hole Terminal Lug with a 1/4" screw, flat washer, spring washer and nut.



**Figure 5-1** System Grounding and Power Distribution

**Note**

The wall GND point is the patient room PE point, which is the Potential Equalization point.

The frame ground of the Table and the frame ground of the Computer are connected to the IPS frame ground to form a common ground. The Gantry frame ground is connected via the main ground screw to the main IPS ground. System grounding and power distribution are shown in [Figure 5-1](#).

### 5.2.3 Additional Requirements

1. **Line Conditioner and/or a Lightning Arrestor** - may be required to meet the above power requirements.
2. Customers should consider the advantages of raised flooring, conduits, floor ducts and surface raceway for running cables in accordance with local codes.

	<p style="text-align: center;"><b>CAUTION</b></p> <p>Whenever possible, keep power cables away from signal and data cables.</p>
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3. Missing Line phase or Over-voltage spikes will not endanger the system, but protection against these events is recommended.

	<p style="text-align: center;"><b>WARNING</b></p> <p>The Infinia has an isolated transformer which is the only power input to the system. Therefore it is strictly forbidden to connect any electrical equipment not authorized by GE to the system.</p>
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4. **Power Audit** - A site power audit is required for the Infinia product. This site power audit can be arranged with the GE Power Quality team, or through your sales person. A sample audit form is located in [Section A.4 on page A-9](#).
5. **Power line analyzer** - should be used to check the proposed Infinia site power for average line voltage, surges, sags, impulses, frequency and microcuts. A period that includes two weekends should be used to simulate several days of normal use. Analysis of the data and site history of any previous power problems with other X-ray systems or computer installations should be reviewed with your Power and Ground representative. Verify "brown-out" (low voltage) conditions which may occur during summer months will not exceed the allowable range shown in [Table 5-1](#).

**Table 5-1:** Allowable Input Voltages/Current Demand

Nominal Voltage	Absolute Range	Current (Amps)		Minimum Standard Overcurrent Protection
		Momentary	Continuous	
400	368-432	137	36	110-A
440	405-475	125	33	110-A
480	442-518	114	30	110-A

Some analyzer models which are suitable for power line monitoring are:

- Dranetz Model 658
- Dranetz Model 656
- Dranetz Model 626 with 6003, 3-phase AC monitor option
- BMI 3630
- RPM

## 5.3 X-ray Exposure Warning Lights

The Infinia provides the ability to power a series of exposure warning lights, which can be sited at the entry points to the scan room. Power is applied to the designated outlets on the rear gantry panel when the X-rays are ON. The light fittings are not part of the Infinia and should be procured by the customer. The external wiring to the lights is also not part of the Infinia.

## 5.4 Exposure Light Specifications

- Voltage: 24 V AC
- Current: Up to 2 A
- Fuse: 2.5 A S.B.
- Cable Connector: P2 “PHoenix Contact” PC 4/5-ST-7.62; No.18-04-93-3
- Housing: “PHoenix Contact” KGG-PC 4/5-F; No.18-37-34-0
- Location: “Header is located on the IPS Front Panel - J2 Hawkeye” shown in [Figure 5-1](#).

**Note**

The system provides active 24V AC output to the exposure warning light. The customer should provide passive light bulbs that can receive direct 24V AC input from the system.

## 5.5 Exposure Lights Cable

- The customer should provide a cable to the light fitting.
- The cable should have 3 wires, (GND Wire - Green/Yellow color).
- The nominal cross-sectional area of conductors of the power supply cords should not be less than  $0.75 \text{ mm}^2$  Cu, and insulation 600 V.

**Note**

For systems with Hawkeye Option only.



## 5.6 X-ray Exposure Interlock

To prevent accidental exposure of someone entering the scan room when X-rays are ON, provision for an interlock system is made. When activated, the interlock issues an X-ray Disable signal. The interlock switch can be installed on any barrier such as a door, which limits access to the camera room. If the switch is open, the X-rays are disabled.

The interlock switch and associated cabling are not part of the Hawkeye option.

## 5.7 Interlock Signal Specifications

- Voltage: 5 V
- Current: 50 mA
- Cable Connector: P2 “PHoenix Contact” PC 4/5-ST-7.62; No.18-04-93-3
- Location: Header is located on the IPS Front Panel - J2 Hawkeye shown in [Figure 5-1](#).

## 5.8 Exposure Door Switch Cable

- The customer should provide a cable to the door fitting.
- The cable should have 2 wires.
- The nominal cross-sectional area of conductors of the power supply cords should not be less than  $0.75 \text{ mm}^2$  Cu, and insulation 300 V.
- The Door Switch Cable should be connected to P2, Pin #4, and #5.

## 5.9 Customer's Responsibility

To ensure a successful installation of the Infinia, the customer is required to:

- Schedule a service survey to verify that the system is working properly and meets the prerequisites listed in Section 8.1.3 of the Infinia Service Manual, *before* scheduling the installation of the Infinia.
- Ensure that the camera room can be locked during the installation procedure, and that it will not be accessed by unauthorized people.
- Provide storage space with a minimum size of 3 x 3 meters for storing the option, installation tools, and the removed system covers.

Failing to meet the above requirements will prolong the installation period.

## 5.10 Inter-Cabling

There are five major cables in the Imaging System, as specified in [Table 5–2](#) below:

**Table 5–2:** Major Cables List

Cable Type	Length
A. Table Cable (from Gantry to Table)	11.0 m (36.1 ft)
B. Computer Cable (from Gantry to Computer)	9.5 m (31.17 ft)
C.Long Computer Cable	15.0 m (49.22)
D. Main Power Cable (from Power Outlet to Gantry)	9.4 m (30.84 ft)
E. Computer to Persistence Monitor (optional)	15.0 m (49.22 ft)