Cryogenic System Site Requirements

Varian, Inc. NMR Cryogenic Systems
Pub. No. 01-999267-00, Rev. B0905
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Chapter 1. Introduction

A Varian Cryogenic system consists of a Cold Probe and closed-cycle cryogenic system:
- “Varian, Inc. Cold Probe,” next
- “Closed-Cycle Cryogenic System” on page 4

The cryogenic system circulates cold He gas to maintain key probe components at an operating temperature of approximately 25 Kelvin.

1.1 Varian, Inc. Cold Probe

Varian, Inc. Cold Probes (Figure 1) achieve significant gains in sensitivity through the application of advanced cryogenic technologies to cool key probe components.

![Figure 1. Varian, Inc. Cold Probe](image_url)
1.2 Closed-Cycle Cryogenic System

The Varian closed cycle cryogenic system, shown in Figure 2 and described in Table 1, is designed for continuous long-term operation. During normal operations, the system does not consume or require additional He after initial setup. Routine service operations uses some He gas. The system cools the probe components to their operating temperature in about 4 hours. Optimal performance is realized when the system is allowed to stabilize overnight.

Figure 2. Varian, Inc. Cold Probe and Cryogenic System

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed cycle chiller</td>
<td>(CCC), or helium (He) refrigerator, is shown in Figure 2. The CCC supplies cold He gas to the heat exchanger inside the Varian, Inc. Cold Probe.</td>
</tr>
<tr>
<td>CryoBay monitor software</td>
<td>Runs on the control PC — automates all routine cryogenic operations.</td>
</tr>
<tr>
<td>CryoBay (cryogenics bay)</td>
<td>Contains the intelligent temperature controller (ITC), control pc, and He compressor, see Figure 2 and Figure 3. The cabinet has a small foot print and reduces noise.</td>
</tr>
<tr>
<td>He compressor</td>
<td>The He compressor provides high-pressure He gas to the CCC.</td>
</tr>
<tr>
<td>Intelligent Temperature Controller (ITC)</td>
<td>The ITC regulates the temperature of the heat exchanger inside the Varian, Inc. Cold Probe.</td>
</tr>
<tr>
<td>Turbo pump</td>
<td>Maintains the vacuum in the Varian, Inc. Cold Probe. The turbo vacuum pump is connected to the probe's vacuum pump-out port using a flexible pumping line.</td>
</tr>
<tr>
<td>Damping pier</td>
<td>Reduces the transmission of vibrations from the CCC to the probe.</td>
</tr>
<tr>
<td>Vibration Isolation plate</td>
<td>Vibration isolation plate for vacuum line.</td>
</tr>
</tbody>
</table>
Figure 3. CryoBay - Left Side View
Chapter 2. Site Planning

Sections in this chapter
- 2.1 “Assistance,” page 7
- 2.2 “General Site Planning and Spectrometer Requirements,” page 7
- 2.3 “Installation Supplies and Hardware,” page 11
- 2.4 “Site Requirements,” page 12
- 2.5 “System Component Specifications,” page 15

2.1 Assistance

If you need assistance, contact Varian, Inc. Customer Support Center at:
Fax: 650-855-9265
Tel: 1 (800) 356-4437
E-mail: nmr.customersupport@varianinc.com

2.2 General Site Planning and Spectrometer Requirements

- “Site Planning Considerations,” page 8
- “Typical installation,” page 9
- “Optional installation,” page 10

All sites require the development of site plans that are specific to each facility. Placement of the magnet in a pit requires special planning. Use the blank grids provided in 3.2 “Room Layout Grids,” page 22, to arrange the cryogenic system.

The location of the magnet and magnetic field determines the placement of certain system components. Complete the site survey on Chapter 4 “Site Survey,” page 25 and Fax or send the survey to Varian, Inc. Customer Support. Contact Varian, Inc. Customer Support for assistance in completing this survey. Incomplete or inaccurate information can delay the installation of the Varian, Inc. Cryogenic system.
Site Planning Considerations

Consider the following when planning a site for the Varian, Inc. Cryogenic system:

- Components listed in Table 4 are sensitive to stray magnetic fields. Use the stray field Table 5 for correct positioning of these components.
- The flexible He transfer line with a minimum bending radius of 19.7 inches (50 cm), that extends from the CCC to the probe requires an unobstructed path. The recommended installation of flexible He transfer line is a bend of 90° from the probe to the CCC. The flexible He transfer line from the CCC ends in a stinger that penetrates the sidearm of the probe.
- The turbo pump is connected to the probe’s vacuum pump-out port along a path on the lab floor using two 4-inch (10.16 cm) diameter flexible corrugated stainless steel bellows pumping lines and a solid tube mounted to a vibration mitigation plate. The minimum bend radius of the flex tubing is 12-inch (30.5-cm). The turbo pump has an approximate 4-foot (0.42-meter) square footprint.
- The He compressor generates a significant amount of heat and requires a continuous supply of cooling water to prevent overheating. Water may be supplied from domestic water sources or by using a closed cycle water chiller see “Cooling Water Requirements,” page 13.
- The Varian, Inc. Cryogenic system requires either VNMR 6.1 C or VnmrJ 1.1 B and all current updates or newer version of VnmrJ.
- A 28–channel room temperature shim system is the minimum shim system for which Varian, Inc. Cold Probe line shape specifications are guaranteed.
**Typical installation**

A typical site plan is shown in Figure 4, refer to “Component–to–Component Distances,” page 15 for hose lengths and maximum component–to–component distances.

![Diagram of typical site plan for cryogenic system installation]

*Figure 4. General Floor Plan for Typical Closed Cycle Cryogenic System Installation*
Optional installation

An optional site plan is shown in Figure 5 and provides a layout with service room, refer to “Component–to–Component Distances,” page 15 for hose lengths and maximum component–to–component distances. The optional water chiller (and or the CryoBay - optional location not shown in this site plan) is located in either a utilities room or service chase. A special order flexible He hose extension (65.6 feet / 20 meters) is available.

Figure 5. General Floor Plan for Closed Cycle Cryogenic System with Water Chiller in a Service Hall
2.3 Installation Supplies and Hardware

- “Customer Supplied Equipment and Hardware,” this page
- “Varian, Inc. Supplied Equipment and Hardware,” this page

Customer Supplied Equipment and Hardware

Table 2 lists the equipment and supplies that the customer must provide for the installation of the Cryogenic system.

**Table 2. Customer Supplied Equipment and Material**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Power connectors</td>
<td>220 V single phase: 600 VAC, 10 gauge, 3-conductor wire with ground (US and North America). All connectors for single phase operation that must conforming local electrical codes. For sites outside US and North America, all wires and connectors must conform to local electrical codes.</td>
</tr>
<tr>
<td>High pressure He gas</td>
<td>He gas (99.999% purity) — full and unopened cylinder.</td>
</tr>
<tr>
<td>Compressed air or N₂ gas</td>
<td>Clean, dry, compressed air or N₂, min. 80 psi (5.6 bar).</td>
</tr>
<tr>
<td>5 micron water filter — for</td>
<td>Serfilco PL-P 5 x 9 3/4 pleated polyester filter cartridge and GSO 10-3/4 filter chamber (<a href="http://www.serfilco.com">www.serfilco.com</a>) or equivalent.</td>
</tr>
<tr>
<td>Water — for cooling He</td>
<td>Flow control located on the outlet side of the He compressor.</td>
</tr>
<tr>
<td>compressor pressure control and pressure regulation</td>
<td>Water pressure regulation located on the inlet side of the He compressor.</td>
</tr>
<tr>
<td>Pressure Regulator He gas</td>
<td>High purity, He cylinder regulator, 400 PSI (28 bar)— supplied to customers in North America - customers in other locations must supply the regulator. All must supply connector to 1/4” Cu tubing.</td>
</tr>
</tbody>
</table>

Varian, Inc. Supplied Equipment and Hardware

Varian, Inc. provides an installation kit, part number 01-909651-00, with the system, the contents are listed in **Table 3**. The customer must supply the electrical plugs and sockets that are in compliance with local ordinances, refer to “Electrical Requirements,” page 12 for requirements. An electrician and, in some cases, a plumber should be available at the beginning of the installation to make the utility connections.

**Table 3. Installation Components Supplied with the System**

<table>
<thead>
<tr>
<th>Component</th>
<th>Components (quantity and description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Disconnect, Male and Female, Water</td>
<td>2 each</td>
</tr>
<tr>
<td>with 1/2 inch barb. 1/2 inch NPT thread</td>
<td></td>
</tr>
<tr>
<td>Water hose, 1/2 inch ID</td>
<td>150 feet (45.7 meters)</td>
</tr>
</tbody>
</table>
2.4 Site Requirements

The cryogenic system electrical, water cooling, compressed gas, and air conditioning requirements must be met before the installation engineer arrives on site. These requirements are in addition to those requirements of the NMR console.

- “General Site Requirements,” this page
- “Electrical Requirements,” this page
- “Cooling Water Requirements,” page 13
- “Compressed Gas Requirements,” page 13
- “Component Heat Dissipation,” page 13
- “Magnetic Field Considerations,” page 14

General Site Requirements

The site must meet all site requirements for temperature, humidity, etc. as specified in the current INOVA Site Planning Guide. Requirements and specifications presented here are in addition to those specified in the current INOVA Site Planning Guide. Where there are potential conflicts in the specifications, the more stringent specification takes precedence.

Electrical Requirements

Determine the electrical power that is provided locally. If the local power does not conform to the following options, specify the power available in the space provided in the Chapter 4, “Site Survey.”

<table>
<thead>
<tr>
<th>Component</th>
<th>Voltage, Phase, and Line Frequency</th>
<th>Power Consumption</th>
<th>Outlets Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>CryoBay and turbo pump (excludes He compressor)</td>
<td>198 to 242 Vac 10 A 1 phase 50/60 Hz</td>
<td>750 W</td>
<td>1 outlet</td>
</tr>
<tr>
<td>He Compressor Model 6200</td>
<td>200 to 230 Vac 30 A 3 phase 60 Hz 180 to 220 Vac 30 A 3 phase 50 Hz</td>
<td>5.9-7.8 kW</td>
<td>1 outlet</td>
</tr>
<tr>
<td>He Compressor Model 6000</td>
<td>360 to 440 Vac 20 A 3 phase 50 Hz 414 to 504 Vac 20 A 3 phase 60 Hz</td>
<td>5.5-7.6 kW</td>
<td>1 outlet</td>
</tr>
</tbody>
</table>
Cooling Water Requirements

Use house water supply or a recirculating water chiller, see “Water Chiller Specifications,” page 16. Note that Cooling water pressure drop across compressor is typically 3 - 9 psi (0.2 to 0.6 bar).

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum inlet temperature</td>
<td>25º C</td>
</tr>
<tr>
<td>Minimum inlet temperature</td>
<td>5º C</td>
</tr>
<tr>
<td>Flow rate @ 25º C</td>
<td>Minimum 1.3 gal (5L)/min, max.2.6 gal (10L)/min.</td>
</tr>
<tr>
<td>Inlet pressure</td>
<td>Minimum 20 psi (2 bar) maximum 116 psi (11.6 bar)</td>
</tr>
<tr>
<td>Antifreeze (ethylene glycol) / Water ratio</td>
<td>≤ 50%</td>
</tr>
<tr>
<td>Particulate concentration</td>
<td>&lt;10 mg / L (requirement is met if recommended filter is installed on the supply line)</td>
</tr>
<tr>
<td>Alkalinity (calcium carbonate)</td>
<td>7-8.5 pH</td>
</tr>
<tr>
<td>Carbonate hardness</td>
<td>7 to 10 %dH</td>
</tr>
<tr>
<td>Compressor inlet and outlet hose barbs</td>
<td>see “Helium Compressor Specifications,” page 16</td>
</tr>
</tbody>
</table>

Compressed Gas Requirements

The Cryogenic system requires compressed gas as follows:

<table>
<thead>
<tr>
<th>Gas</th>
<th>Supply</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air or Nitrogen</td>
<td>House (independent of the magnet leg) or Cylinder</td>
<td>Minimum 80 psi (max 110 psi), clean and dry (dew point -40ºC)</td>
</tr>
<tr>
<td>He</td>
<td>Full Cylinder</td>
<td>99.999% purity</td>
</tr>
</tbody>
</table>

Component Heat Dissipation

The following table provides heat dissipation from Cryogenic system components to help determine the air conditioning load.

<table>
<thead>
<tr>
<th>Component</th>
<th>watts</th>
<th>BTUs / hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cryobay, turbo pump, and He compressor</td>
<td>150</td>
<td>512</td>
</tr>
<tr>
<td>Turbo pump — at start up only</td>
<td>736</td>
<td>2550</td>
</tr>
<tr>
<td>He compressor only</td>
<td>100</td>
<td>350</td>
</tr>
<tr>
<td>Closed Cycle Chiller (He refrigerator)</td>
<td>nil</td>
<td>nil</td>
</tr>
<tr>
<td>Water Chiller</td>
<td>See “Water Chiller Specifications,” page 16</td>
<td></td>
</tr>
</tbody>
</table>


Magnetic Field Considerations

More detailed magnetic field data can be found in the *INOVA Site Planning Guide*. Cryogenic systems contain one or more components that are sensitive to magnetic fields, these components are listed in Table 4.

**Table 4.** System Components Affected by Magnetic Fields

<table>
<thead>
<tr>
<th>Component</th>
<th>Maximum Magnetic Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>CryoBay</td>
<td>5 Gauss</td>
</tr>
<tr>
<td>CCC</td>
<td>100 Gauss</td>
</tr>
<tr>
<td>Turbo pump</td>
<td>10 Gauss</td>
</tr>
</tbody>
</table>

Refer to Table 5 to determine the distance from the center of the magnet bore to the 5 gauss line.

**Table 5.** Stray Field Data for NMR Magnet Systems

<table>
<thead>
<tr>
<th>Magnet Systems (MHz/mm)</th>
<th>Axial Distance from Magnet Center Line (5-gauss (m) 10-gauss (m) 25-gauss (m))</th>
<th>Radial Distance from Magnet Center Line (5-gauss (m) 10-gauss (m) 25-gauss (m))</th>
</tr>
</thead>
<tbody>
<tr>
<td>200/54</td>
<td>1.75 1.45 1.05</td>
<td>1.50 1.20 0.90</td>
</tr>
<tr>
<td>200/89</td>
<td>2.65 2.05 1.49</td>
<td>2.00 1.60 1.15</td>
</tr>
<tr>
<td>300/54</td>
<td>2.20 1.75 1.26</td>
<td>1.70 1.30 0.97</td>
</tr>
<tr>
<td>300/89</td>
<td>2.75 2.20 1.63</td>
<td>2.20 1.75 1.26</td>
</tr>
<tr>
<td>400/54</td>
<td>2.80 2.24 1.65</td>
<td>2.20 1.76 1.29</td>
</tr>
<tr>
<td>400/54 AS</td>
<td>1.50 1.25 0.90</td>
<td>1.00 0.80 0.60</td>
</tr>
<tr>
<td>400/89</td>
<td>3.80 3.00 2.21</td>
<td>3.05 2.40 1.74</td>
</tr>
<tr>
<td>400/89 AS</td>
<td>1.8 1.5 1.17</td>
<td>1.03 .80 0.74</td>
</tr>
<tr>
<td>500/51</td>
<td>3.50 2.70 2.00</td>
<td>2.75 2.20 1.60</td>
</tr>
<tr>
<td>500/51 AS</td>
<td>1.80 1.50 1.10</td>
<td>1.30 1.00 0.70</td>
</tr>
<tr>
<td>500/89</td>
<td>4.50 3.55 2.60</td>
<td>3.55 2.80 2.10</td>
</tr>
<tr>
<td>500/89 AS</td>
<td>2.5 1.9 1.50</td>
<td>1.75 1.4 0.96</td>
</tr>
<tr>
<td>600/51</td>
<td>4.00 3.17 2.34</td>
<td>3.17 2.52 1.86</td>
</tr>
<tr>
<td>600/51 AS</td>
<td>2.50 1.90 1.40</td>
<td>1.75 1.40 0.90</td>
</tr>
<tr>
<td>600/89</td>
<td>5.00 3.97 2.92</td>
<td>3.95 3.14 2.32</td>
</tr>
<tr>
<td>750/51</td>
<td>7.60 6.04 4.45</td>
<td>6.1 4.79 3.53</td>
</tr>
<tr>
<td>800/63 (4.2K)</td>
<td>8.69 6.35 4.68</td>
<td>6.89 5.00 3.69</td>
</tr>
<tr>
<td>800/63 (2.2K)</td>
<td>7.6 6.0 4.41</td>
<td>6.0 4.75 3.51</td>
</tr>
<tr>
<td>900/54</td>
<td>10.5 8.35 5.80</td>
<td>8.30 6.60 4.60</td>
</tr>
</tbody>
</table>
2.5 System Component Specifications

This section lists the specifications of the individual system components.

- “Component–to–Component Distances,” page 15
- “Cold Probe,” page 15
- “Helium Compressor Specifications,” page 16
- “CryoBay Specifications,” page 16
- “Closed Cycle Chiller Specifications,” page 16
- “Component–to–Component Distances,” page 15
- “Vibration Damping Pier Specifications,” page 16
- “Water Chiller Specifications,” page 16

The manufacturers of the individual components used in the Varian, Inc. Cryogenic System may have additional requirements not listed here. The requirements listed serve as a guide. Where the individual component manufacture’s requirements are more stringent than those presented here, the individual component manufacture’s requirements will take precedence.

Component–to–Component Distances

The distances provided are approximate maximum separation between components (or cabinets and components). The distances specified assume a 5 foot (1.5 meter) service or routing loss for the shortest cable, hose, or tubing that connects the components or cabinets. All distances are straight line distances. Routing around obstacles, for appearance, or traffic paths will reduce the distance between components. An optional extension kit is available for locating the CryoBay further from the CCC.

<table>
<thead>
<tr>
<th>Components or cabinets</th>
<th>Distance, systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>up to 600 MHz</td>
</tr>
<tr>
<td>CryoBay to CCC</td>
<td>14 ft (4.3 m)</td>
</tr>
<tr>
<td>CryoBay to AC power sources</td>
<td>25 ft (7.6 m)</td>
</tr>
<tr>
<td>CryoBay to turbo pump</td>
<td>50 ft (15.2 m)</td>
</tr>
<tr>
<td>CCC to He cylinder</td>
<td>45 ft (13.7 m)</td>
</tr>
<tr>
<td>CryoBay to pneumatics gas supply</td>
<td>25 ft (7.6 m)</td>
</tr>
<tr>
<td>CryoBay to cooling water</td>
<td>70 ft (21.3 m)</td>
</tr>
<tr>
<td>Turbo pump to probe vacuum valve</td>
<td>12 ft (3.7 m)</td>
</tr>
<tr>
<td>CCC to probe</td>
<td>5 ft (1.5 m)</td>
</tr>
</tbody>
</table>

Cold Probe

The probe requires a minimum clearance between the floor and bottom of the shim tube. The orientation of the probe is limited only by the position of the cryogenic sidearm of the probe in relation to the magnet legs.

<table>
<thead>
<tr>
<th>Probe</th>
<th>Minimum clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 MHz Cryogenic Probe</td>
<td>28 inches (71.1 cm)</td>
</tr>
</tbody>
</table>
Helium Compressor Specifications

Compressor is installed in the Cryobay.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>207 lb. (94 kg)</td>
</tr>
<tr>
<td>Height</td>
<td>23.6 inches (60 cm)</td>
</tr>
<tr>
<td>Length</td>
<td>20.2 inches (51.1 cm)</td>
</tr>
<tr>
<td>Width</td>
<td>17.4 inches (44 cm)</td>
</tr>
<tr>
<td>Flexible He hose diameter (supply)</td>
<td>1.13 inches (2.9 cm) / fitting 1.19 inches (3.07 cm)</td>
</tr>
<tr>
<td>Flexible He hose line diameter (return)</td>
<td>1.13 inches (2.9 cm) / fitting 1.63 inches (3.17 cm)</td>
</tr>
<tr>
<td>Cooling water supply and return</td>
<td>1.25 inches (3.2 cm) with fitting, 1/2 inch (1.27 cm) ID</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>5º C to 40º C</td>
</tr>
</tbody>
</table>

CryoBay Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>49 inches (124.46 cm)</td>
</tr>
<tr>
<td>Depth and width</td>
<td>30.5 inches x 21.75 inches (77.47 cm x 55.25 cm)</td>
</tr>
<tr>
<td>Minimum clearance, front and rear</td>
<td>3 feet (1 meter)</td>
</tr>
<tr>
<td>Weight with He compressor</td>
<td>470 lb. (213.2 kg)</td>
</tr>
</tbody>
</table>

Closed Cycle Chiller Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>29 inches (73.7 cm)</td>
</tr>
<tr>
<td>Depth and width</td>
<td>32 inches x 18 inches (45.72 cm x 81.28 cm)</td>
</tr>
<tr>
<td>Weight (with vibration plates)</td>
<td>267 lb. / 121 kg (498 lb. / 226 kg)</td>
</tr>
</tbody>
</table>

Vibration Damping Pier Specifications

Vibration damping pier height is 26 inches (66.04 cm) and footprint diameter is 10 inches (25.4 cm). The pier is located between the CCC and the probe.

Water Chiller Specifications

The water chiller must meet the following specifications:

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Capacity</td>
<td>8 kW (27,000 BTU)</td>
</tr>
<tr>
<td>Temperature range</td>
<td>+5ºC to +25ºC</td>
</tr>
</tbody>
</table>
The customer is responsible for verification that the water chiller specifications meet the He compressor requirements. Haskris Co. Cooling Systems has provided the following information about their chillers that meet these requirements — these water chillers are available through Varian Inc., other vendors offer compatible water chillers:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Heat Dissipation</th>
<th>Site Requirements</th>
<th>Voltage/Current (phase) @ 60 Hz</th>
<th>Fusing (Time Delay)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R300-R</td>
<td>Refrigerated water chiller with an air cooled condenser</td>
<td>Heat load of 10.4 kW from the Leybold compressor and Haskris chiller is transferred to room ambient air</td>
<td>Room/Lab ambient air temperature min. 40°F, max. 100°F.</td>
<td>208/230 V/18.0 A (3 phase)</td>
<td>25 A</td>
</tr>
<tr>
<td>R300-CR</td>
<td>Refrigerated water chiller with a water cooled condenser</td>
<td>Heat load from the Leybold compressor and Haskris chiller is transferred to building water source</td>
<td>Requires a source of building water 85°F or colder</td>
<td>208/230 V/15.4 A (3 phase)</td>
<td>20 A</td>
</tr>
<tr>
<td>WW1-R</td>
<td>Non-Refrigerated, water-to-water heat exchanger</td>
<td>Heat load from the Leybold compressor and Haskris chiller is transferred to building water source</td>
<td>Requires a source of building water 55°F or colder</td>
<td>115 V/6.87 A (1 phase) 208/230 V/ 3.4 A (1 phase)</td>
<td>10 A 5 A</td>
</tr>
</tbody>
</table>

Contact Haskris Co. Cooling Systems for any additional information.

**Haskris Co. Cooling Systems**

100 Kelly Street  
Elk Grove Village, Il 60007  
www.haskris.com  
Contact:  
Dan Falotico, Jr.  
Telephone: (847)-956-6420 ext. 222  
E-mail: dan@haskris.com
Chapter 3. Critical Measurements and Layout Grids

Sections in this chapter
- 3.1 “Critical Measurements,” page 19
- 3.2 “Room Layout Grids,” page 22

3.1 Critical Measurements

Provide answers to the following regarding your site, refer to Figure 6, and Figure 7 as necessary.
- “Side View,” this page
- “Top View,” page 21
Figure 6. Pit, Multi, and Single Level Lab Required Dimensions
Top View

Figure 7. Pit, Multi, and Single Level Lab Required Dimensions - Top Down View
3.2 Room Layout Grids

Use the provided grids to sketch the floor plan, Figure 8, and elevation, Figure 9. Include proposed location of cryogenic system components.

Figure 8. Grid for Floor Plane
Figure 9. Grid for Elevation
Chapter 4. Site Survey

Fill in the site survey form and fax it to 650-855-9265.

Use the following if you have questions regarding this form:
   E-mail: nmr.customersupport@varianinc.com
tel: 1-800-356-4437

The survey contains the following sections:
   • “Magnet,” page 26
   • “NMR System,” page 26
   • “Room and Floor,” page 26
   • “Utilities,” page 27
   • “Pit Information,” page 27
   • “Multi Level Room,” page 27
   • “Single Level Room,” page 28
   • “Installation and Delivery Contact,” page 28
### 4.1 Magnet

<table>
<thead>
<tr>
<th>Survey Element</th>
<th>Dimension</th>
<th>Measurements, Descriptions, other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet</td>
<td>Field</td>
<td></td>
</tr>
</tbody>
</table>

- Bore size
- Actively Shielded: ( ) Yes or ( ) No
- Distance from floor to the bottom of the shim tube
- Flange type
- Magnet bottom: ( ) Flat or ( ) Round

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Purchase Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Survey Element</th>
<th>Manufacturer</th>
<th>Serial Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.2 NMR System

<table>
<thead>
<tr>
<th>NMR System Element</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console (Serial number: )</td>
<td>Unity ( )</td>
</tr>
<tr>
<td></td>
<td>Unityplus ( )</td>
</tr>
<tr>
<td></td>
<td>Unity INOVA ( )</td>
</tr>
<tr>
<td>Shim System</td>
<td>Varian (channels ) ( )</td>
</tr>
<tr>
<td></td>
<td>Ultra Shim (channels ) ( )</td>
</tr>
<tr>
<td></td>
<td>RRI shim system ( )</td>
</tr>
<tr>
<td>Pulse Field Gradient Amplifier Type</td>
<td>Performa I ( )</td>
</tr>
<tr>
<td></td>
<td>Performa II ( ) Part Number:</td>
</tr>
<tr>
<td></td>
<td>Performa XYZ ( )</td>
</tr>
<tr>
<td></td>
<td>Other ( )</td>
</tr>
<tr>
<td>Accessories</td>
<td>SMS ( )</td>
</tr>
<tr>
<td></td>
<td>Carousel ( )</td>
</tr>
<tr>
<td></td>
<td>NMS ( )</td>
</tr>
<tr>
<td></td>
<td>LC-NMR ( )</td>
</tr>
<tr>
<td></td>
<td>VAST ( )</td>
</tr>
<tr>
<td>Software</td>
<td>( ) VNMR version: ( ) VnmrJ version:</td>
</tr>
</tbody>
</table>

### 4.3 Room and Floor

<table>
<thead>
<tr>
<th>Room Elements</th>
<th>Measurements, Descriptions, other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet in Pit</td>
<td>( ) yes ( ) No If yes complete Pit survey</td>
</tr>
<tr>
<td>Multi Level</td>
<td>( ) yes ( ) No If yes complete multi level survey</td>
</tr>
<tr>
<td>Single Level</td>
<td>( ) yes ( ) No If yes complete single level survey</td>
</tr>
<tr>
<td>Obstructions</td>
<td>( ) yes ( ) No If yes indicate on survey</td>
</tr>
<tr>
<td>Floor type</td>
<td>( ) raised ( ) solid</td>
</tr>
<tr>
<td>Provide digital pictures of the site</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Room Elements</th>
<th>Measurements, Descriptions, other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet in Pit</td>
<td>( ) yes ( ) No If yes complete Pit survey</td>
</tr>
<tr>
<td>Multi Level</td>
<td>( ) yes ( ) No If yes complete multi level survey</td>
</tr>
<tr>
<td>Single Level</td>
<td>( ) yes ( ) No If yes complete single level survey</td>
</tr>
<tr>
<td>Obstructions</td>
<td>( ) yes ( ) No If yes indicate on survey</td>
</tr>
<tr>
<td>Floor type</td>
<td>( ) raised ( ) solid</td>
</tr>
<tr>
<td>Provide digital pictures of the site</td>
<td></td>
</tr>
</tbody>
</table>
## 4.4 Utilities

<table>
<thead>
<tr>
<th>Utility</th>
<th>Measurements, Descriptions, other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC power</td>
<td></td>
</tr>
<tr>
<td>Single phase</td>
<td>Voltage= Current= Line frequency =</td>
</tr>
<tr>
<td>Three phase</td>
<td>Voltage= Current= Line frequency =</td>
</tr>
<tr>
<td>Cooling Water</td>
<td>Flow rate</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>Pressure</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>Pressure, at max flow</td>
</tr>
<tr>
<td>Air Conditioning</td>
<td>BTU/hr.</td>
</tr>
</tbody>
</table>

## 4.5 Pit Information

<table>
<thead>
<tr>
<th>Pit Element</th>
<th>Measurements, Descriptions, other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangular Pit</td>
<td>Length</td>
</tr>
<tr>
<td>Width</td>
<td></td>
</tr>
<tr>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td>Round Pit</td>
<td>Diameter</td>
</tr>
<tr>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td>Main floor elevation relative to:</td>
<td>Magnet Base</td>
</tr>
<tr>
<td>Location of Magnet in pit</td>
<td>Center line of magnet relative to pit center line</td>
</tr>
<tr>
<td>Diameter of Magnet</td>
<td></td>
</tr>
<tr>
<td>Obstructions</td>
<td>Inside the pit</td>
</tr>
<tr>
<td>Outside the pit</td>
<td></td>
</tr>
<tr>
<td>Provide digital pictures of the site</td>
<td></td>
</tr>
</tbody>
</table>

## 4.6 Multi Level Room

<table>
<thead>
<tr>
<th>Survey Element</th>
<th>Measurements, Descriptions, other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room upper level dimensions</td>
<td>Length</td>
</tr>
<tr>
<td>Width</td>
<td></td>
</tr>
<tr>
<td>Lower level dimensions</td>
<td>Length</td>
</tr>
<tr>
<td>Width</td>
<td></td>
</tr>
<tr>
<td>Main floor elevation relative to:</td>
<td>Magnet base</td>
</tr>
<tr>
<td>Main floor elevation relative to:</td>
<td>Magnet Floor</td>
</tr>
<tr>
<td>Obstructions</td>
<td>Obstructions - upper level</td>
</tr>
<tr>
<td>Outside the pit</td>
<td>Obstructions - lower level</td>
</tr>
</tbody>
</table>
4.7 Single Level Room

<table>
<thead>
<tr>
<th>Survey Element</th>
<th>Measurements, Descriptions, other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional</td>
<td></td>
</tr>
<tr>
<td>Magnets in the same room</td>
<td></td>
</tr>
</tbody>
</table>

Provide digital pictures of the site

<table>
<thead>
<tr>
<th>Survey Element</th>
<th>Measurements, Descriptions, other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room dimensions</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td></td>
</tr>
<tr>
<td>Obstructions and other magnets</td>
<td></td>
</tr>
<tr>
<td>Provide digital pictures of the site</td>
<td></td>
</tr>
</tbody>
</table>

4.8 Installation and Delivery Contact

Name
E-mail address
Street address
Street address
City
State Zip Code
Country

Contact listed is for: Installation (), Delivery (), Both ()

Name (Alternate)
E-mail address
Street address
Street address
City
State Zip Code
Country

Contact for: Installation (), Delivery (), Both ()