Preparing for a System Installation

HR-04125
CRAY T932 System
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Figures

Tables

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Site Planning Introduction

Proper site planning and preparation is important for the successful installation of your computer system; Cray Research site planning personnel will assist you with the site planning process.

Each site has different site planning characteristics to consider. You can ensure effective site planning by identifying your initial system configuration as well as any upgrade plans.

Qualified electrical and mechanical facility engineers should be involved early in the site planning process. Prior to any site preparation activities, you must prepare electrical and mechanical design drawings to be approved by Cray Research site planning personnel.

Allow 2 to 4 months to plan and prepare your facility for the installation of your computer system. The following subsections describe various considerations and requirements that are involved in the site planning and preparation process.

Site Planning Meetings

Site planning meetings establish communications between you and Cray Research. Site planning personnel will schedule these site planning meetings with you at your facility. The purpose of these meetings is to answer questions and discuss concerns that you may have about the site planning and preparation process.

System Installation Overview

The installation of your computer system consists of the following stages:

- Shipping and installing the support equipment
- Preparing the system for shipping

- Transporting the system
- Installing the system
- Starting up and stabilizing the system
- Ensuring system on-site quality
- Preparing system operations

Approximately 4 to 6 weeks prior to system delivery, Cray Research delivers all necessary preshipment equipment. For most CRAY T932™ systems, the preshipment equipment consists of a water piping kit and two high-voltage DC cabinets (HVDC-185). You are responsible for receiving and installing the support equipment without the presence or supervision of Cray Research personnel.

Approximately 1 week before delivery, Cray Research prepares the computer system for shipment. Major components are packaged in protective shipping configurations. Cabling and miscellaneous materials are packaged and labeled for shipment.

The system equipment is transported to your facility by a commercial tractor-trailer with air-suspension ride and climate control. For intercontinental shipments, the equipment is transported by commercial cargo-carrying aircraft and then transported to your facility by tractor-trailer.

Under Cray Research supervision, you will unload and move the system equipment into your computer room. If necessary, you must make arrangements for any special equipment (such as forklifts, cranes, or platforms) that you will need to unload the computer system.

Cray Research installation personnel perform the following tasks:

- Position all equipment in designated locations
- Reassemble the computer system
- Connect all logic cables
- Attach water and dielectric-coolant hoses

NOTE: Normally, the tasks are completed on the day that the system arrives.

Upon completion of these tasks, Cray Research personnel perform system start-up and power and cooling stabilization tests. You must provide personnel to correct any problems involving contractor-installed electrical or cooling water circuitry that might occur during these tests.

Upon satisfactory completion of all quality assurance functions, Cray Research declares the system ready for use. At this point, Cray Research personnel install the operating system software to prepare the system for customer acceptance.

Site Evaluation

Site evaluation is important in the site planning and preparation process. Some considerations that might help you in your site selection include:

- Electrical power quality
- Air quality
- Cooling water quality

  Refer to the cooling water supply specification on page 25 for additional information on water quality requirements.

- Structural strength

  Examine the floor loading requirements of the computer equipment to ensure that the building structure will support the equipment.

Refer to the *Principles of Computer Room Design*, Cray Research publication number HR-04013, for a complete list and explanation of possible site selection concerns.

Site Access Requirements

Prior to system installation, your site must meet certain site access requirements. This subsection explains these requirements and provides specifications.

For computer system delivery, your building should have a loading dock that is approximately 46 in. to 50 in. (1168 mm to 1270 mm) high. The loading dock should not open directly into the computer room because the computer room environment must be carefully controlled. You should take special precautions when you move equipment if the loading dock or access route has an engraved floor pattern; an engraved pattern could cause vibration damage to computer equipment on casters. The dock access incline should not exceed 10 degrees.

If no loading dock exists or if your loading dock does not meet the requirements, you will have to provide a forklift to unload the computer equipment. Refer to *Forklift Size Requirements for the Handling of Cray Research Equipment*, Site Engineering document number 10658374, for forklift requirements.

If your computer room is on a different level than your loading dock and your building does not have an elevator that is sufficient for the size and weight of the Cray equipment, you may have to arrange for a crane or other special handling equipment to lift the computer equipment to the computer room level.

The complete access route from the loading dock to the computer room must accommodate the equipment that Table 1 describes.

Table 1. Dimensions and Weights, Access Route

Item	Shipping Specifications			
	Height	Width	Depth	Weight
CRAY T932 Mainframe Cabinet	61.85 in. [a] (1571 mm)	60.30 in. (1532 mm)	123.80 in. [b] (3145 mm)	10,900 lbs [c] (4944 kg)
PC-10 Cabinet	76.00 in. [a] (1930 mm)	34.50 in. (876 mm)	58.75 in. (1492 mm)	1,116 lbs (506 kg)
CRAY SSD-T90™ Cabinet	77.50 in. [a] (1969 mm)	39.25 in. (997 mm)	74.00 in. (1880 mm)	1,640 lbs (744 kg)
HVDC-185 Cabinet	75.50 in. [a] (1918 mm)	36.65 in. (931 mm)	67.00 in. (1702 mm)	4,250 lbs (1928 kg)
HEU-T2 Cabinet	67.75 in. [a] (1721 mm)	56.50 in. (1435 mm)	86.50 in. [b] (2197 mm)	3,132 lbs [c] (1421 kg)

[a] Add 1.00 in. (25 mm) for rolling height.

[b] Dimensions include lifts.

[c] Weight includes lifts.

Computer Room Design

Proper computer room design can minimize problems with static electricity, security, personnel safety, and air contamination. The following list contains important considerations for designing your computer room:

- Personnel safety
- Security
- Air quality
- Positive air pressure
- Future computer equipment plans
- Seismic vibration
- Raised flooring
- Sound reduction
- Lighting

- Handicapped personnel access
- Layout

Refer to the *Principles of Computer Room Design*, Cray Research publication number HR-04013, for a complete explanation of these considerations and for proper construction procedures.

Network Connections

Cray Research ships a 12-port, twisted-pair concentrator with at least one of the PC-10 cabinets in your system configuration. You may need to provide an Ethernet transceiver to match your network protocol to the system. The transceiver must support IEEE 802.3 and Ethernet version 2.0 specification and use the signal quality error (SQE) heartbeat feature. The available network interfaces for the system are Ethernet, FDDI, HIPPI, and asynchronous transfer mode (ATM).

NOTE: You must place the system workstation (SWS) within 45 ft (13.7 m) of the CRAY T932 cabinet and the PC-10 cabinet if you use the standard 50-ft (15.2-m) Ethernet cable that Cray Research supplies.

The maintenance Ethernet network connects the quad Ethernet in the SWS to the concentrator in the PC-10 cabinet. Use the maintenance Ethernet network for maintenance only.

You may connect the customer Ethernet network directly to the twisted-pair connector on the SWS. However, if you wish to connect the customer Ethernet network with an AUI connection to the SWS, you must use an adapter cable (Cray Research part number 90395800 or Sun™ Microsystems, Inc. part number X981A). For more information, refer to the remote support illustrations in the following subsection.

Remote Support

Remote support is an optional maintenance feature for your system. Cray Research support personnel use a modem as a data communication link to troubleshoot and maintain Cray Research computer systems.

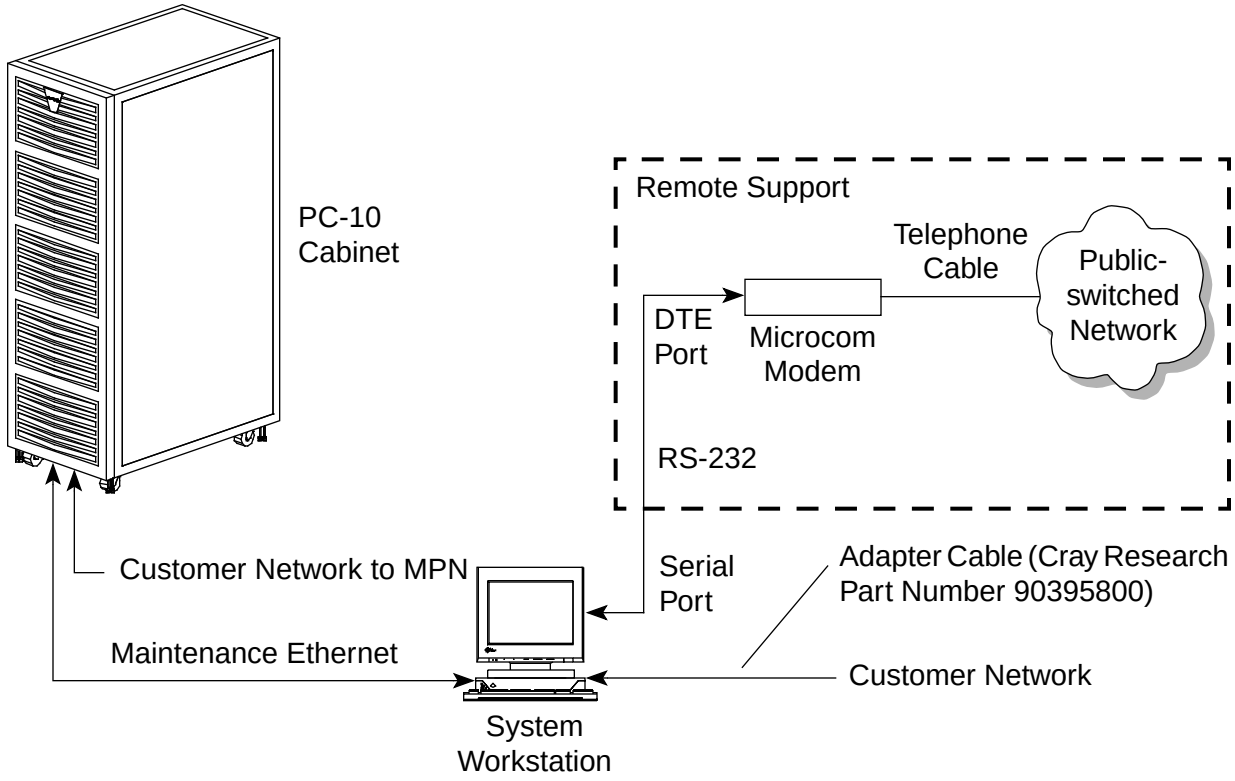
If site security regulations permit the use of a modem, contact the local telephone company well in advance of system delivery to arrange for installation of the appropriate telephone line. In the United States of America and Canada, you should install a public-switched dedicated data telephone line, such as a telephone, an X.25 pad, or an ISDN terminal adapter. Cray Research recommends that you install another telephone near the system for general use. For system installations outside the USA and Canada, please contact your account manager for the modem type and telephone line requirements.

Refer to Table 2 for modem requirements and settings and to Figure 1 for an illustration of a remote support configuration with the Microcom® modem.

Table 2. Modem Requirements

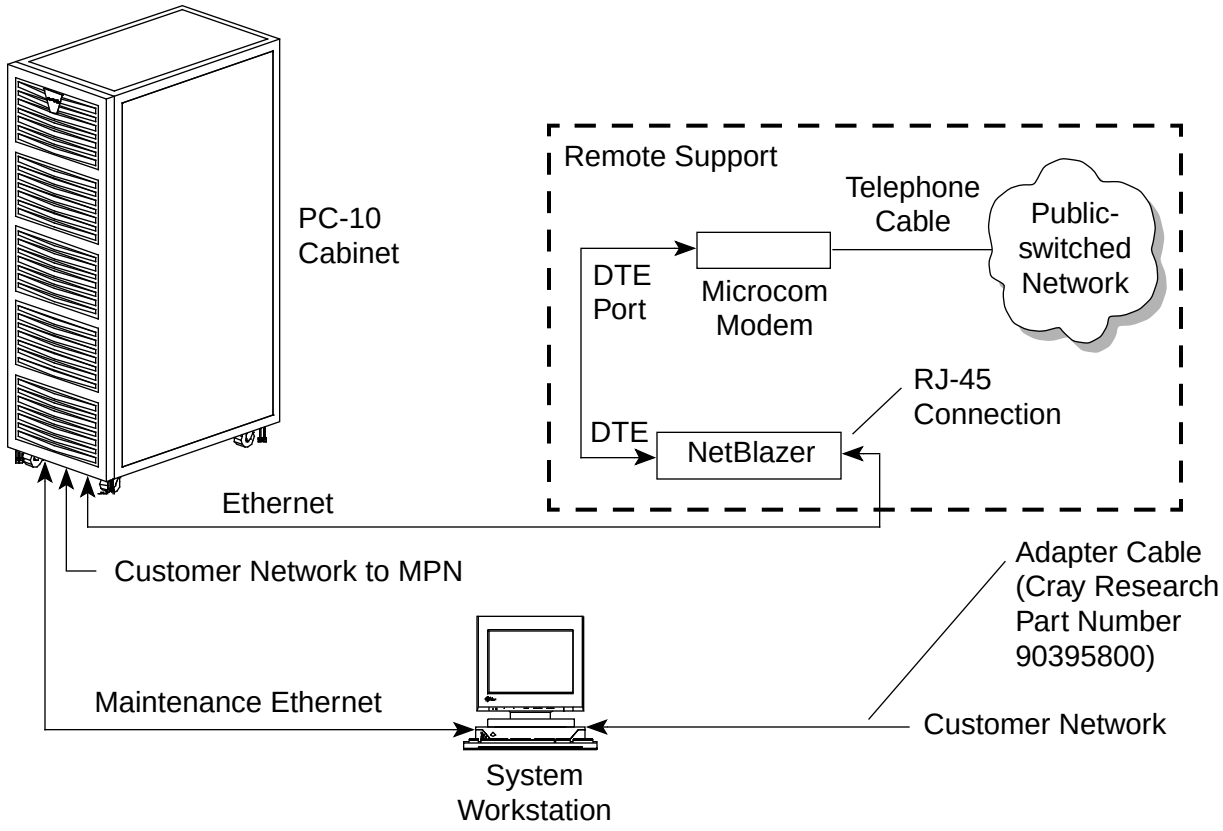
Option	Specification
FCC registration number	CLB USA-75946-MME
Transmission rate	V.34/V.32/V.42bis (28,800 bps)
Telephone	Standard, with voice-grade line
Telephone connector	RJ11C
Line interface connector	RJ45S
Touch tone/rotary dial	Touch tone preferred
Ringer equivalence	0.8 Bd
External/internal clock	Internal
Grounding	Chassis ground to signal ground
Transmit level	Up to 115.2 kBps
Private/dial-up line	Dial-up line
Receive long space disconnect	Disabled
Transmit long space disconnect	Disabled
Data terminal ready disconnect	Enabled
Carrier fail disconnect	Enabled
Auto-answer/manual-answer	Auto-answer
Make busy in analog loopback	Disabled
Permanent/DTR controlled auto-answer	DTR controlled auto-answer
Synchronous/asynchronous	Asynchronous
9-bit/10-bit/11-bit character	10-bit character

Figure 1. Remote Support, Modem-only Configuration



If you order the optional Telebit® NetBlazer® router, your local Cray Research service representative completes a network request form prior to shipment. A Remote Support network administrator will then assign a registered Internet address to the router. Remote Support administrators and Cray Research Service personnel install and configure the appropriate software on the Telebit NetBlazer router. Figure 2 illustrates the remote support configuration with the Telebit NetBlazer dial-up router.

Figure 2. Remote Support, Optional NetBlazer Configuration



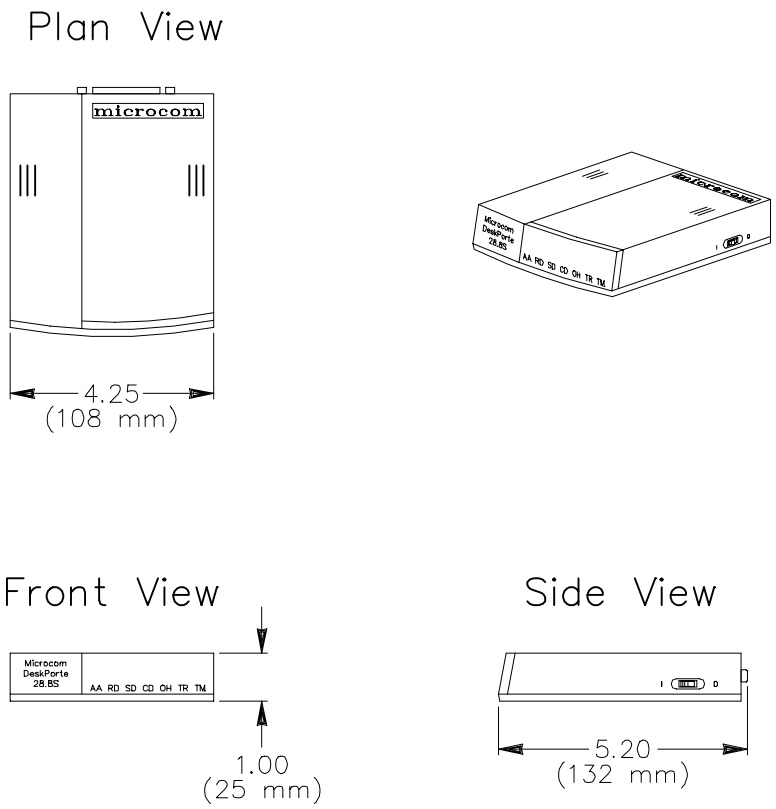
Microcom Modem

The CRAY T932 systems that are installed in North America use the Microcom DeskPorte™ 28.8S modem as the standard modem for remote support communications. The Microcom DeskPorte 28.8S modem offers V.fast data transfer at speeds nominally up to 28,800 bps with MNP® Class 10 Adverse Channel Enhancements™ (ACE), and Dynamic Transmit Level Adjustment™ (DTLA). Refer to Table 3 for the modem specifications and to Figure 3 for an illustration of the modem.

Table 3. Modem Specifications

Characteristic	Specification
Height	1.00 in. (25 mm)
Width	4.25 in. (108 mm)
Depth	5.20 in. (132 mm)
Weight	1 lb (0.5 kg)
Cooling requirement	Ambient air
Input voltage	Single phase, 100 – 120 Vac
Frequency	60 Hz
Maximum power requirement	10 watts
Power cable	6-ft (1.8-m) pluggable drop cord
Power receptacle	NEMA #5-15R or equivalent

Figure 3. Microcom Modem



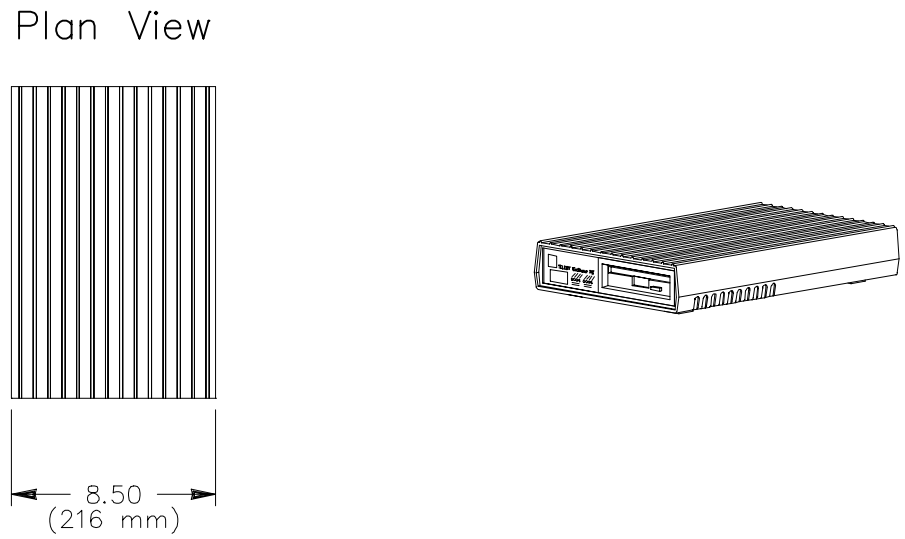
NetBlazer Dial-up Router

Cray Research uses the optional NetBlazer dial-up router model PN2 for remote hardware maintenance, system operation, and system monitoring. You may install the NetBlazer router with the CRAY T932 computer system for additional communication security. Table 4 lists the router specifications and Figure 4 illustrates the NetBlazer dial-up router.

Table 4. NetBlazer Dial-up Router Specifications

Characteristic	Specification
Height	2.40 in. (61 mm)
Width	8.50 in. (216 mm)
Depth	13.00 in. (330 mm)
Weight	4 lbs (1.8 kg)
LAN interface	Ethernet (AUI, BNC, 10BaseT), switch select
Input voltage	Single phase, 100 – 120 or 200 – 240 Vac
Frequency	50 or 60 Hz
Maximum power requirement	25 watts
Power cable	8-ft (2.4-m) pluggable drop cord
Power receptacles: North America International	 NEMA #5-15R or equivalent IEC 309, single phase, 16 amp
Agency approvals:	Safety: UL®478, CSA C22.2, EN 60950 TUV VDE 805 Emissions: FCC ER9 USA-74674-MD-E EN55022, TUV Vfg 243

Figure 4. NetBlazer Dial-up Router



Computer Room Environment

Cray Research designs computer equipment to operate within specific ranges of air quality, temperature, and relative humidity levels. Significant variations of these levels in a computer room environment could cause disruptions in equipment operation and decrease the life of the equipment. To ensure proper operation of your computer system, your facility must meet the operational requirements that the following paragraphs describe.

The computer system must operate in a controlled computer room environment. Although the requirements outlined in this subsection encompass the overall computer room, they particularly affect air-cooled devices such as peripheral cabinets, printers, and workstations. Therefore, the design and layout of your environmental control equipment (such as computer room air-conditioning units) must ensure that inlet air to the air-cooled device meets the specified environmental requirements.

The computer system requires a computer room environment that is closely monitored and controlled according to the following parameters:

Temperature	60 ˚F to 83 ˚F (16 ˚C to 28 ˚C) The maximum temperature change in a 1-hour period is 3 ˚F (2 ˚C). The rate of change cannot exceed 10 ˚F (6 ˚C) per hour.
Humidity	35% to 65% relative humidity (noncondensing) The maximum rate of change is 5% per hour.
Dewpoint	60 ˚F (16 ˚C) maximum

Air quality	For particles greater than 0.5 micron in size, the concentration must not exceed 1.0×10^5 particles/ft^3 (3.5×10^6 particles/m^3).
	For particles greater than 1.0 micron in size, the concentration must not exceed 2.0×10^4 particles/ft^3 (7.1×10^5 particles/m^3).
	For particles greater than 5.0 microns in size, the concentration must not exceed 6.5×10^2 particles/ft^3 (2.3×10^4 particles/m^3).
	Monitor and control the computer room air quality. Filter both the incoming, replacement air to the computer room and the circulating air in the computer room. To ensure good air quality, the computer room should receive at least one fresh air change per hour. In addition, maintain positive air pressure in the computer room (as compared to adjacent areas in the facility).
	Practice good environmental cleanliness and equipment maintenance to minimize airborne particles and to prevent equipment damage. Never allow smoking, food, or beverages in the computer room.

NOTE: Based on the performed tests, the essential requirements of the EMC Directive are met if this equipment is installed in an industrial area with less than 3 V/m radiated disturbance.

Support Equipment Room Environment

If you plan to install support equipment such as a Cray furnished uninterruptible power system (UPS), consult with your site planning representative for details.

Some customers choose to place their support equipment in the computer room. However, facility constraints sometimes make it necessary to place the support equipment in a support equipment room. The support equipment room must meet the following environmental specifications:

Temperature	65 ˚F to 95 ˚F (18 ˚C to 35 ˚C) The maximum rate of change must not exceed 20 ˚F (11 ˚C) per hour. **NOTE:** If your system uses a UPS, the UPS battery temperature must not exceed a temperature of 77 ˚F (25 ˚C).
Humidity	30% to 80% relative humidity (noncondensing)
Air quality	A clean, dirt- and dust-free environment

Locate the support equipment room as close as possible to the computer room.

Electrical Requirements

Cray Research makes every effort to minimize the effects of power failures and interruptions to the hardware. However, if the computer system experiences repeated power interruptions and fluctuations, it may also experience a higher component failure rate than it would with a stable power source.
Cray Research encourages you to install a stable power source, such as a UPS, to reduce the possibility of component failures.

The CRAY T932 system requires one of the listed voltages for each of the following pieces of equipment:

- HVDC-185 cabinet (powers CRAY T932 mainframe and HEU-T2)
  - 208 V 60 Hz +10% to –10% ± 8% Hz
  - 480 V 60 Hz +10% to –10% ± 8% Hz
  - 200 V 50 Hz +10% to –10% ± 8% Hz
  - 400 V 50 Hz +10% to –10% ± 8% Hz

- PC-10 cabinet
  - 208 V 60 Hz +6% to –10% ± 5% Hz
  - 200 V 50 Hz +10% to –10% ± 5% Hz
  - 400 V 50 Hz +6% to –10% ± 5% Hz

- CRAY SSD-T90 cabinet
  - 208 V 60 Hz +6% to –10% ± 5% Hz
  - 200 V 50 Hz +10% to –10% ± 5% Hz
  - 400 V 50 Hz +6% to –10% ± 5% Hz

- System workstation
  - 120 V 60 Hz +6% to –10% ± 5% Hz
  - 100 V 50 Hz +6% to –6% ± 5% Hz
  - 200 V 50 Hz +10% to –10% ± 5% Hz
  - 230 V 50 Hz +6% to –10% ± 5% Hz

- LP-7 laser printer
  - 120 V 60 Hz +6% to –10% ± 3% Hz
  - 100 V 50 Hz +6% to –6% ± 3% Hz
  - 200 V 50 Hz +10% to –10% ± 3% Hz
  - 230 V 50 Hz +6% to –10% ± 3% Hz

An optional uninterruptible power system is available if the existing facility power quality or existing UPS is inadequate. Contact your site planning representative for details about an optional UPS for your site. Table 5 provides additional electrical service requirements.

Table 5. Electrical Service Requirements

Electrical Service	Requirement
Phase imbalance	5% maximum (line-to-line, line-to-line neutral)
Voltage harmonics	5% maximum total, 3% largest
Voltage deviation from sine wave	5% to –10%
Voltage modulation	3% maximum
Transient voltage surges	+5%
Transient voltage sags	–5%
Frequency tolerance	5%
Frequency rate of change	Less than 1.0 Hz during any 10-cycle period

Total kilowatt power requirements depend on system configuration and equipment upgrade plans. Cray Research will provide documentation during the initial site planning meeting, which you can use to estimate the power requirements for your specific system configuration.

Equipment Grounding

All Cray Research computer equipment requires a protective power safety-ground system. The power safety-ground system protects personnel from shock hazards and protects the computer equipment from damage caused by electrical malfunctions. Local and national electrical codes regulate the power safety-ground system.

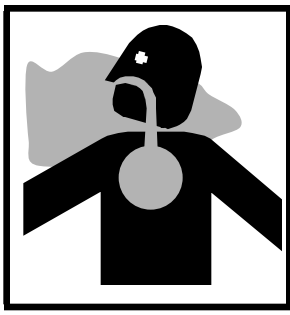
Cray Research computer equipment also requires a signal reference grid. The signal reference grid establishes an equipotential reference plane for high-frequency digital signals between interconnected computer equipment. Cray Research supplies braided ground straps with most equipment. The customer is responsible for supplying the connector and attaching the ground strap to the signal reference grid.

Cray Research provides the document *Equipment Grounding for Cray Research Computer Systems*, Site Engineering document number 10658002, during the initial site planning meeting. This document describes the grounding system requirements and identifies alternative methods for providing the signal reference grid. In addition, the document describes electrostatic discharge (ESD) precautions and maintenance of the facility's grounding systems. You must provide, install, and maintain the approved grounding systems as described in the equipment grounding document and this subsection.

Dielectric-coolant Systems

Dielectric coolant is an inert liquid that has insulating and noncorrosive properties. Cray Research computer systems use dielectric coolant (Fluorinert™ liquid) to cool the mainframe chassis (MFC). The dielectric coolant transfers heat from the integrated circuit modules and power supplies within the MFC to the heat exchanger unit.

You must ensure that there is one fresh air change per hour in the computer room and that there are no sources of excessive heat (temperatures greater than 390 ˚F [200 ˚C]) that might cause the dielectric coolant to decompose. Do not permit smoking in the computer room or any other area where the dielectric coolant is used or stored.



WARNING

Respiratory hazard. Do not expose dielectric coolant to excessive heat. Dielectric-coolant liquid can decompose and produce hazardous by-products when exposed to excessive heat.

Dielectric coolant is a safe product when used properly. Refer to *Safe Use and Handling of Fluorinert Liquid*, Cray Research publication number HR-00306-A, for information on Fluorinert liquid properties and precautionary requirements. All personnel must read this publication before they work in the computer room where the CRAY T932 system is located.

Cooling Water Supply

Cray Research computer systems require an adequate supply of clean cooling water to the water-cooled heat exchanger unit (HEU). The following information identifies the water quality requirements that are necessary to operate the computer system.

Operational Requirements

The heat exchanger unit (HEU-T2) accommodates water supply temperatures from 40 ˚F to 60 ˚F (4 ˚C to 16 ˚C).

The cooling water temperature, which is measured at the inlet of the HEU, must not vary more than ± 5 ˚F (3 ˚C) from the original startup temperature. The rate of change must not exceed 5 ˚F (3 ˚C) per 15-minute cycle.

The cooling water flow-rate requirements and pressure-drop values of the HEUs depend on the configuration, the cooling water supply temperature, and the percentage of treatment (antifreeze, corrosion inhibitors, etc.) in the water. At a 50 ˚F (10 ˚C) supply water temperature, there will be an approximate 16 ˚F (9 ˚C) rise in the water temperature across the HEU-T2. During the initial site planning meeting, Cray Research provides flow-rate and pressure-drop values that are based on your system configuration and a water supply temperature of 50 ˚F (10 ˚C).

NOTE: A water strainer (40 mesh) should be installed in the cooling water-supply line. A bypass or an additional strainer is recommended.

The HEU-T2 incorporates a two-way water-flow control valve to regulate the temperature of the coolant that is supplied to the mainframe cabinet. When the CRAY T932 mainframe cabinet is powered off, this two-way valve closes. A 0.75-in. (19-mm) bypass line is provided to allow chilled water to bypass the closed water valve. Depending on the chilled-water system design, other means may be required to bypass the chilled water or to de-energize the chilled water pumps while the CRAY T932 system is powered down.

Cooling Water Quality Requirements

The quality of cooling water in a closed loop cooling water (CLCW) system is critical for the performance and the life of the system. Cooling water of poor quality can cause adverse effects in a water system, such as reduced cooling capacity, increased energy consumption, and premature equipment failure.

Water Quality Problems

The most common problems in cooling systems are the result of one or more of the following causes:

- Corrosion: the dissolution of metals by water.

  Corrosion can occur in the form of general corrosion (entire surface) or localized corrosion (pitting), which causes metal perforation and rapid failure. The primary metals that can corrode in CLCW systems are aluminum, steel, and copper. Corrosion of steel and copper is often of a general nature (although it can be pitting); corrosion of aluminum is often in the form of pitting.

- Deposits: insoluble particulate matter in water.

  Insoluble particulate matter settles as a result of low flow velocity or adheres to hot or slime-covered surfaces and results in heat-insulating deposits. In a CLCW system, a deposit is generally iron with small amounts of copper and mineral scales such as calcium carbonate and silt.

- Scale: a deposition of water-insoluble constituents, formed directly on the metal surface.

  These substances change from a soluble state in water to an insoluble state on the metal surface. In a CLCW system, scale is typically calcium carbonate.

- Microbiological: basic organisms such as aerobic bacteria, anaerobic corrosive bacteria, fungi, and algae.

  In CLCW systems, aerobic bacteria cause slime and destruction of nitrite. Anaerobic corrosive bacteria and fungi generally do not grow well in CLCW systems because of the high pH. Algae is not usually a problem either because it requires sunlight to live.

Water Quality Specifications

Table 6 contains water quality specifications that will help prevent system cooling problems.

Table 6. Water Quality Specifications

Parameter	Recommended Limit
pH	9.5 to 10.5
Nitrite (as NO_2)	600 ppm minimum
Molybdate (as MoO_4)	250 ppm minimum
Conductivity	5,000 micromhos/cm @ 77 ˚F (25 ˚C)
Combined sulfate (as Na_2SO_4) and chloride (as NaCl)	500 ppm
Copper	0.2 ppm
Aerobic bacteria	1,000 organisms/ml
Anaerobic bacteria	10 organisms/ml
Total hardness (as $CaCO_3$) [a]	10 ppm
Iron [b]	1.0 ppm
Manganese	0.1 ppm
Suspended solids [b]	20 ppm
Turbidity [b]	20 NTU (Nephelometric)

[a] Refer to the "Replacement Water Guidelines" subsection.

[b] Install a side-stream cartridge filter if the limit is exceeded.

Replacement Water Guidelines

Observe the following quality guidelines for replacement water before you add water to your CLCW system.

- Water must be visibly clear and colorless (no haze).
- The iron level must be less than 0.5 ppm and the manganese level less than 0.1 ppm. (This is especially important when you use well water for replacement.)
- Anaerobic bacteria should be less than 10 organisms per ml.
- Aerobic bacteria should be less than 1,000 organisms per ml.
- Either hard or soft replacement water is acceptable, with the following limitations:

  Hard water is acceptable for replacement under the following conditions:

  - The treatment program contains enough polymeric dispersant (nonphosphonate) to handle the hardness in the water. Follow the recommendations of your water treatment supplier.
  - Side-stream filtration (minimum of 1% of the circulation rate) is mandatory.
  - The water replacement rate is less than 10% of the system volume per month. For a water replacement rate that is greater than 10%, use soft water.

  Soft water (less than 10 ppm total hardness as calcium carbonate) that is used for replacement can accommodate any acceptable (nitrite or molybdate based, with or without a polymeric dispersant) treatment program.

Water Quality Terms and Definitions

The following terminology is commonly used in discussions about water quality:

- Mg per liter equals ppm.
- pH: a measure of the hydrogen concentration. It is used to determine if the water has either corrosive or scaling tendencies.
- Nitrite: a commonly used corrosion inhibitor.
- Molybdate: another commonly used corrosion inhibitor.
- Conductivity: a measure of the mineral content in the water. In a nitrite program, high conductivity is generally an indicator of bacterial degradation of the nitrite.
- Sulfate: often an indication of a process or water tower leak into the CLCW system. High sulfates contribute to increased corrosion because of their high conductivity.
- Chloride: an indicator of water softener regeneration problems if the system chloride level is much higher than the chloride level of the replacement water. Increased levels of chloride can increase corrosion and indicate the need for the addition of higher levels of corrosion inhibitors.
- Copper: indicates increased copper corrosion and the need for a higher level of copper corrosion inhibitor.
- Anaerobic bacteria: generally absent in water with a high pH. Take remedial action when you detect 10 organisms/ml or greater.
- Aerobic bacteria: an indicator of slime that can foul equipment. Take remedial action when you detect 1,000 organisms/ml or greater.
- Total hardness: the sum of the calcium and magnesium ions in water. In a soft water program, a hardness of 10 ppm or greater indicates that the hardness is bypassing the softener, that the softener regeneration is improper, or that some contamination from another system is present, such as a cooling tower or city water.
- Iron: excessive iron indicates that corrosion has increased, existing corrosion products have been released by chemical treatment, piping has been added to the CLCW system, or the iron content has increased in the replacement water.

- Manganese: important only if manganese is present in concentrations greater than 0.1 ppm in the replacement water.

- Suspended solids and turbidity: indicates that corrosive products and other contaminants are collecting in the system. Excessive amounts may indicate corrosion, removal of old corrosive products by a chemical treatment program, or the contamination of the CLCW system by another water source. Suspended solids at high velocity can abrade equipment. Settled suspended matter of all types can contribute to deposit attack.

Special Problems in a CLCW System

Because there is no regular blow-down (sediment purge) from a CLCW system, you often need strainers or side-stream filters to remove debris that exists in the system.

In programs using nitrite, bacteria can develop in “dead legs” (unused runs of piping that have been isolated with valves from the rest of the system) where there is no water flow. Contamination may result when “dead legs” are reconnected to the system; the addition of molybdate is recommended in these situations.

The level of bacteria, which may indicate system contamination, is lower in the CLCW system than in the cooling tower water. Although the cooling tower can operate effectively with 100,000 or more organisms per ml, you should take corrective action immediately when total aerobic counts exceed 1,000 organisms per ml in the CLCW system.

The presence of copper and aluminum parts in the same CLCW system requires extra attention in controlling the treatment program. You should avoid the use of aluminum parts whenever possible.

Water Treatment

Before any new computer system is placed into operation, you should flush the CLCW system thoroughly to remove as much suspended material and debris as possible. A chemical detergent cleaning is also desirable.

To avoid CLCW problems later, you should seek the advice of a water treatment specialist early in the design stage of your system, and diligently follow the program that is created for you.

Tips for the Successful Operation of a CLCW System

Use the following tips to successfully operate your CLCW system:

- Use soft water for replacement.
- Maintain adequate levels of molybdate or nitrate for corrosion protection.
- Maintain a pH range of 9.5 to 10.5 to control bacteria and the corrosion of metals.
- Test the cooling water regularly.
- If the cooling water begins to look murky or rusty, treat the system by draining, flushing, refilling, and recharging the system with treatment products.
- As long as the water remains clean and clear and the pH is in the range of 9.5 to 10.5, expect good results from your CLCW system.

Floor Preparation

You must prepare the computer room with a static-dissipative raised-floor system that has a minimum clearance of 12 in. (305 mm) between the subfloor and the top of the raised floor system.

A properly designed and constructed raised floor serves several purposes. It can provide a signal reference grid for your computer system and provide space to route power cables, signal cables, and coolant piping. It can also provide space for airflow that is necessary for equipment cooling. Refer to *Equipment Grounding for Cray Research Computer Systems*, Cray Research Site Engineering document number 10658002.

All Cray Research equipment requires floor cutouts for power wiring, signal-cable entrances, and in some cases, dielectric-hose or water-hose entrances. In addition, some equipment requires reinforcement of the raised floor because of concentrated floor loading conditions.

System Configurations

Standard equipment for a CRAY T932 computer system consists of the following components:

- Mainframe cabinet (MFC)
- PC-10 peripheral cabinet(s)
- Heat exchanger units (HEU-T2)
- System workstation (SWS)
- High-voltage DC cabinets (HVDC-185)

Optional equipment for a CRAY T932 computer system consists of the following components:

- CRAY SSD-T90 cabinet(s)
- LP-7 laser printer

The CRAY T932 mainframe chassis houses various configurations of logic and memory modules, as well as power supplies and other components.

The PC-10 cabinet consists of an assortment of air-cooled subracks and an input power subrack. The individual subracks provide input/output capabilities for Cray Research computer systems; the input power subrack provides power to these subracks. Examples of subracks that a PC-10 cabinet contains include the node subrack (NSR-1), the multipurpose node (MPN-1) subrack, the disk subsystem fibre channel (DSF-1) subrack, and a disk subsystem SCSI (DSS-1) subrack.

The heat exchanger unit (HEU-T2) is a dielectric coolant-to-water heat exchanger that routes dielectric coolant through the CRAY T932 cabinet to absorb heat from the modules and power supplies. The heat that the coolant absorbs is transferred to customer-supplied chilled water.

The system workstation is a SPARC® based workstation that provides monitoring, diagnosis, control, and configuration management for Cray Research computer systems. Cray Research provides a table for the SWS.

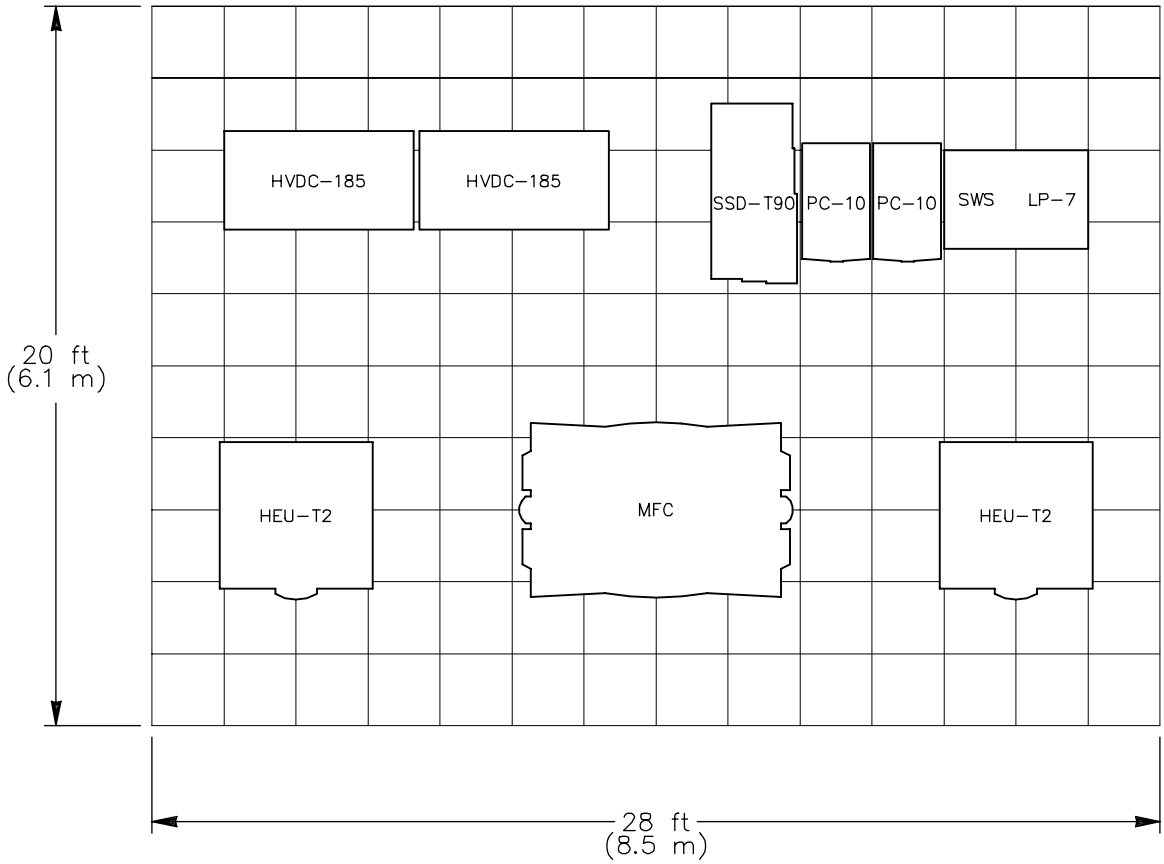
The high-voltage DC cabinet (HVDC-185) is a power conversion cabinet that receives input power from a UPS or building power and then transforms, rectifies, and regulates it to establish the 330-Vdc that the CRAY T932 mainframe requires. The HVDC-185 also serves as a power distribution cabinet for the mainframe (MFC) and the heat exchanger unit (HEU-T2).

The optional CRAY SSD-T90 cabinet (referred to in the diagrams as SSD-T90) is an air-cooled chassis that contains the logic modules and power supplies associated with an SSD® solid-state storage device (SSD).

The optional laser printer (LP-7) connects to the SWS; the LP-7 is located on a table that Cray Research provides.

Figure 5 illustrates a typical floor plan for a CRAY T932 system that is placed on 24 in. x 24 in. floor panels.

Figure 5. Floor Plan for a CRAY T932 System



Equipment Separation Limits

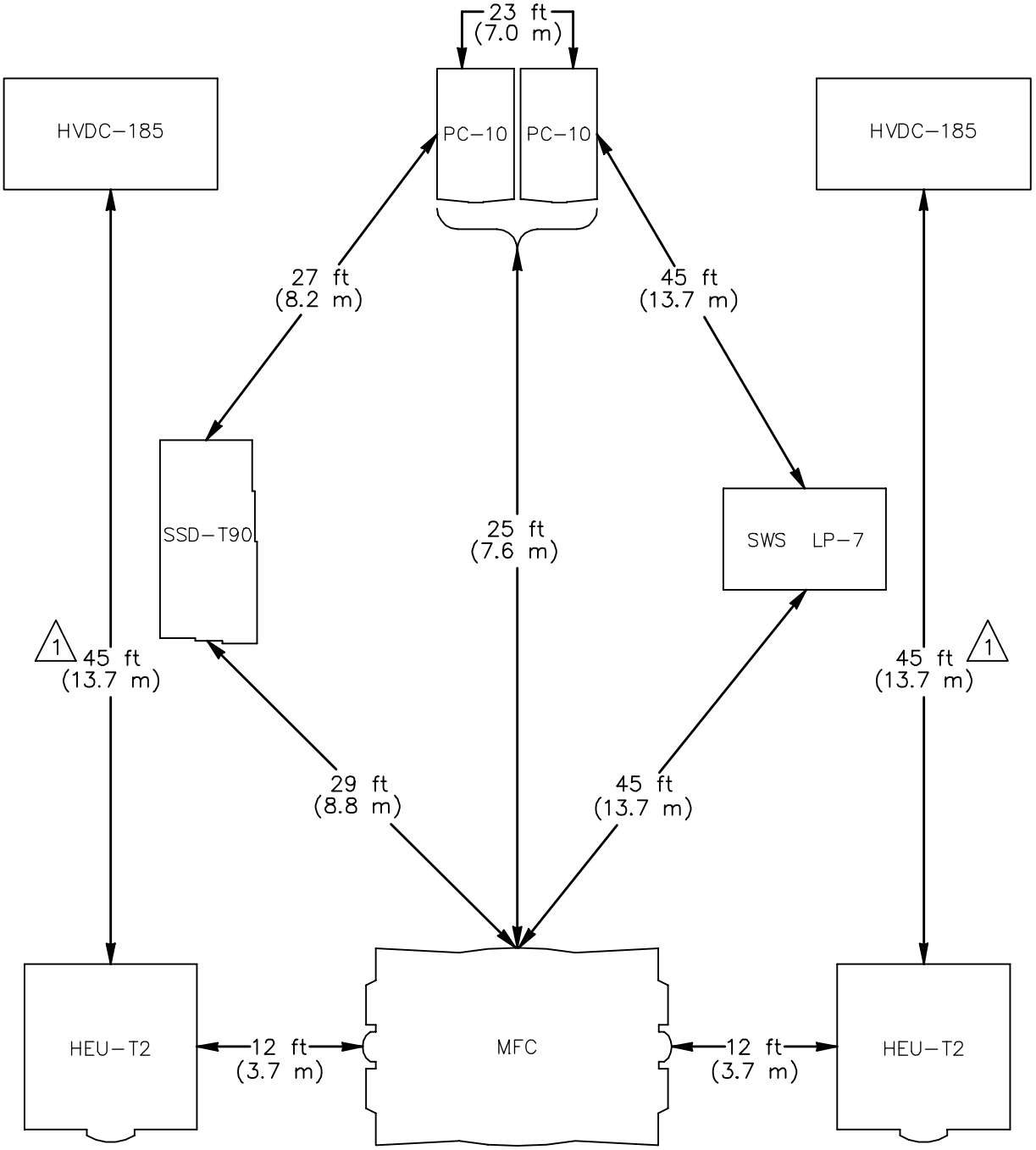
The arrangement of computer equipment within your facility must meet certain placement and separation requirements. You must prepare drawings that specify the arrangement and locations of the computer equipment. Cray Research site planning personnel must review and approve these drawings prior to any site preparation.

The arrangement of your computer room should be planned with the following considerations:

- Personnel safety
- Satisfactory system installation
- Satisfactory operator and maintenance access

All computer equipment arrangements must meet the separation limits that Figure 6 illustrates.

Figure 6. Computer System Equipment Separation Limits



1 The standard cable that Cray Research provides with the HVDC–185 is 45 ft (13.7 m). Longer cables up to 145 ft (44.2 m) may be ordered.

Power Wiring Requirements

You must install all power wiring for the following CRAY T932 computer system components: the CRAY T932 mainframe cabinet, the HEU-T2 cabinets, the HVDC-185 cabinets, the PC-10 cabinet(s), the CRAY SSD-T90 cabinet(s), and the SWS. This subsection provides general power wiring requirements for the CRAY T932 computer system. Refer to the specific component site planning and preparation document for additional power wiring requirements.

Figure 7 through Figure 9 illustrate the power wiring for CRAY T932 computer systems. Figure 7 provides the power wiring diagram for 480-Vac input power applications. Figure 8 provides the power wiring diagram for 400-Vac input power applications. Figure 9 provides the power wiring diagram for 200- or 208-Vac input power applications.

As stated previously, each component has specific wiring requirements. However, some general information applies to all circuits:

- Figure 7 through Figure 9 are guides for your electrical design engineer and must not be used as bid documents or working drawings.
- The equipment arrangements in Figure 7 through Figure 9 are not actual equipment layouts.
- Your site preparation design should enable you to add circuits if you plan to upgrade your system.
- All wiring should be prepared according to applicable local and national codes.
- Any circuit breakers that the customer provides must be capable of being locked out to facilitate “Lockout/Tagout” procedures. Delays in system installation may occur if the devices cannot be locked out.
- Cray Research recommends one emergency-off switch at each computer room exit. All emergency-off switches must be wired in series and must interrupt power to the computer equipment and to all air-circulating units in the computer room.
- The customer must provide and install all circuit breakers, circuit breaker panels, magnetic contactors, main power disconnect switches, junction boxes, power wiring, raceways, and conduits unless otherwise noted in Figure 7 through Figure 9.

- All conduits or cables that end at computer equipment must be secured with agency-approved fittings at the wire entrance to the equipment cabinet.

- Allow at least 36.00 in. (914 mm) of wire length above the floor surface so that the wire is long enough to connect to the system.

- Cray Research provides detailed wire diagrams that contain information regarding the input wiring connections to the mainframe cabinet, the HEU-T2 cabinets, and the HVDC-185 cabinets.

All Cray Research computer equipment must be earth grounded. Refer to *Equipment Grounding for Cray Research, Inc. Computer Systems*, Site Engineering document number 10658002, for more information about equipment grounding.

Figure 7. CRAY T932 480-Vac Power Wiring

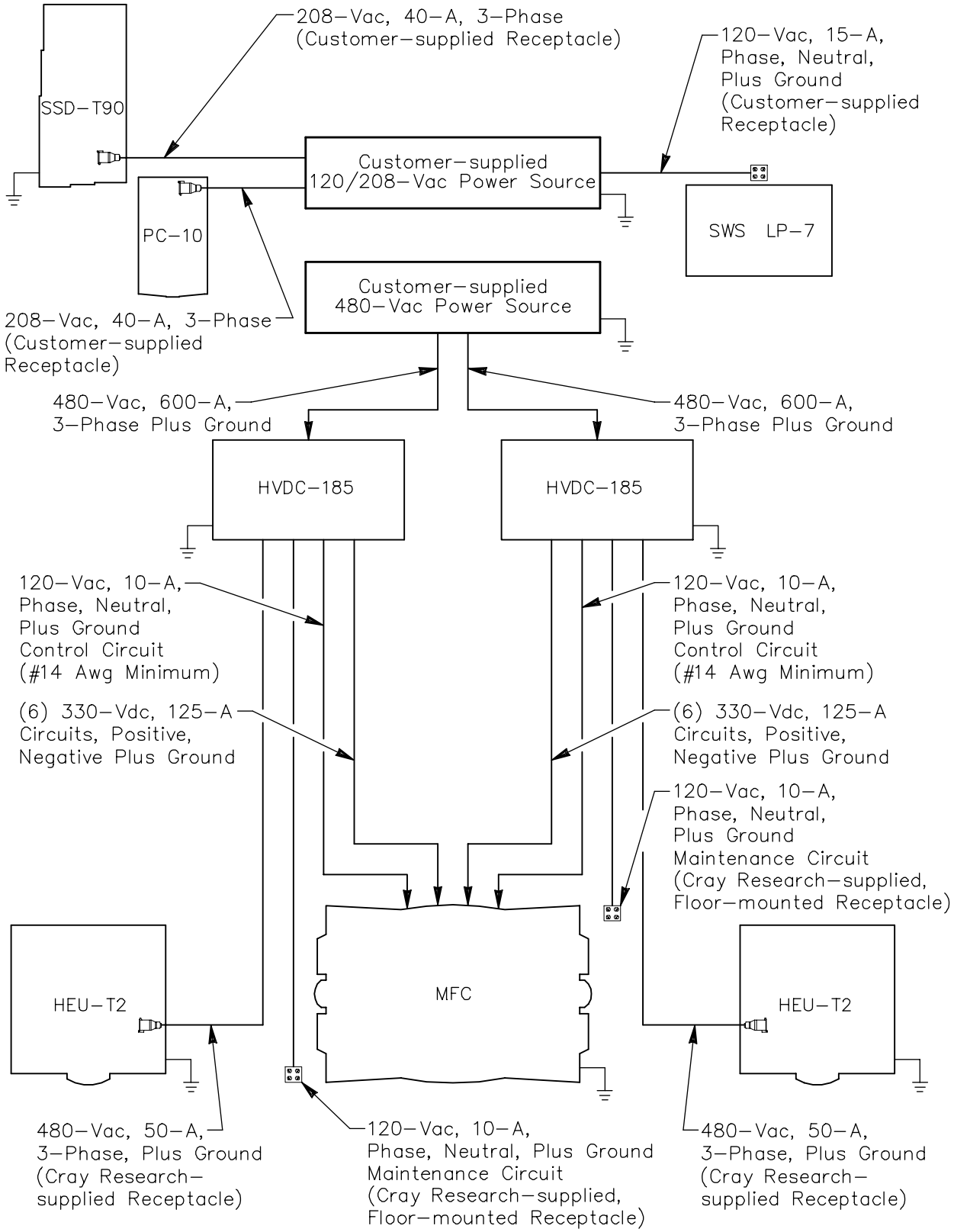


Figure 8. CRAY T932 400-Vac Power Wiring

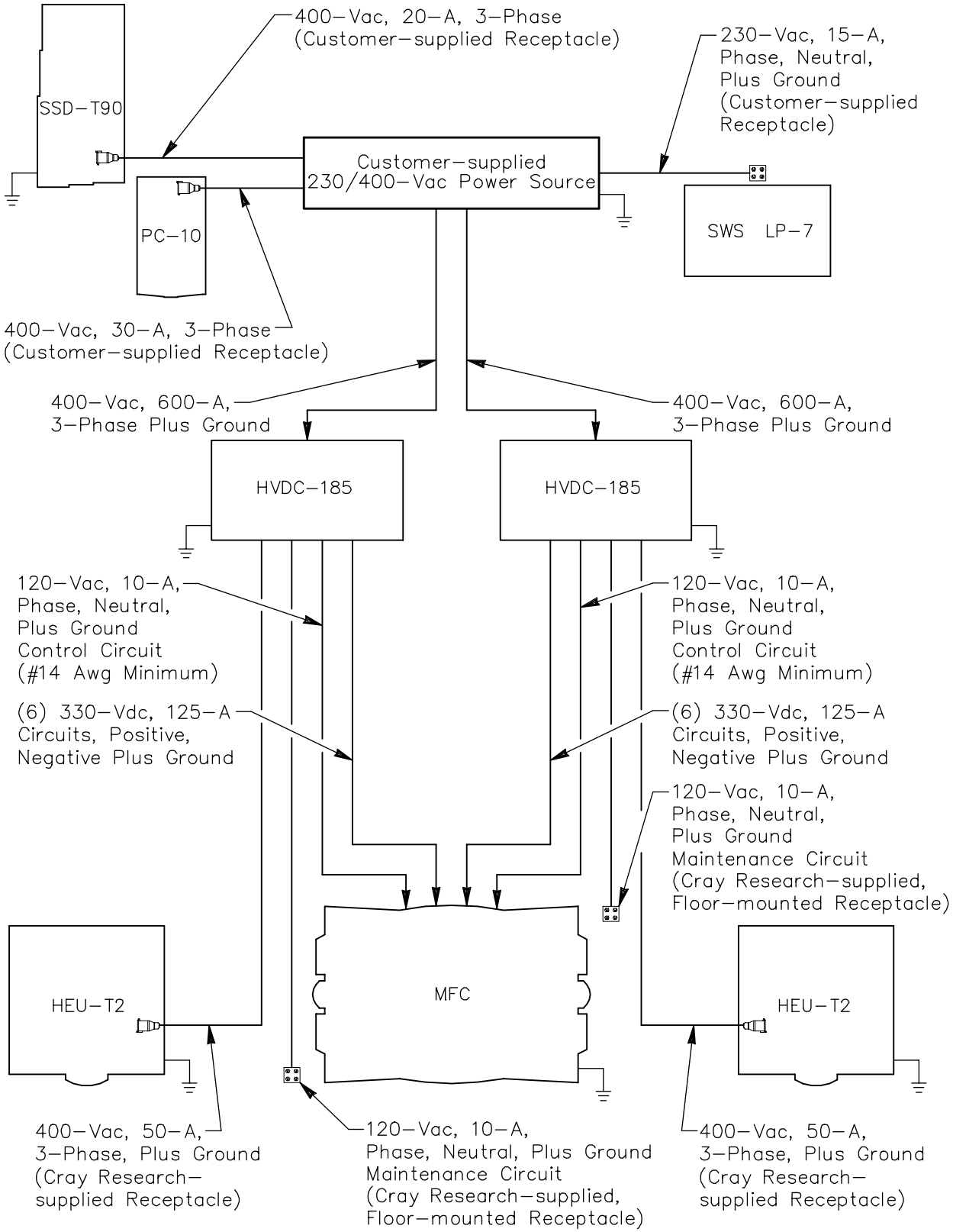
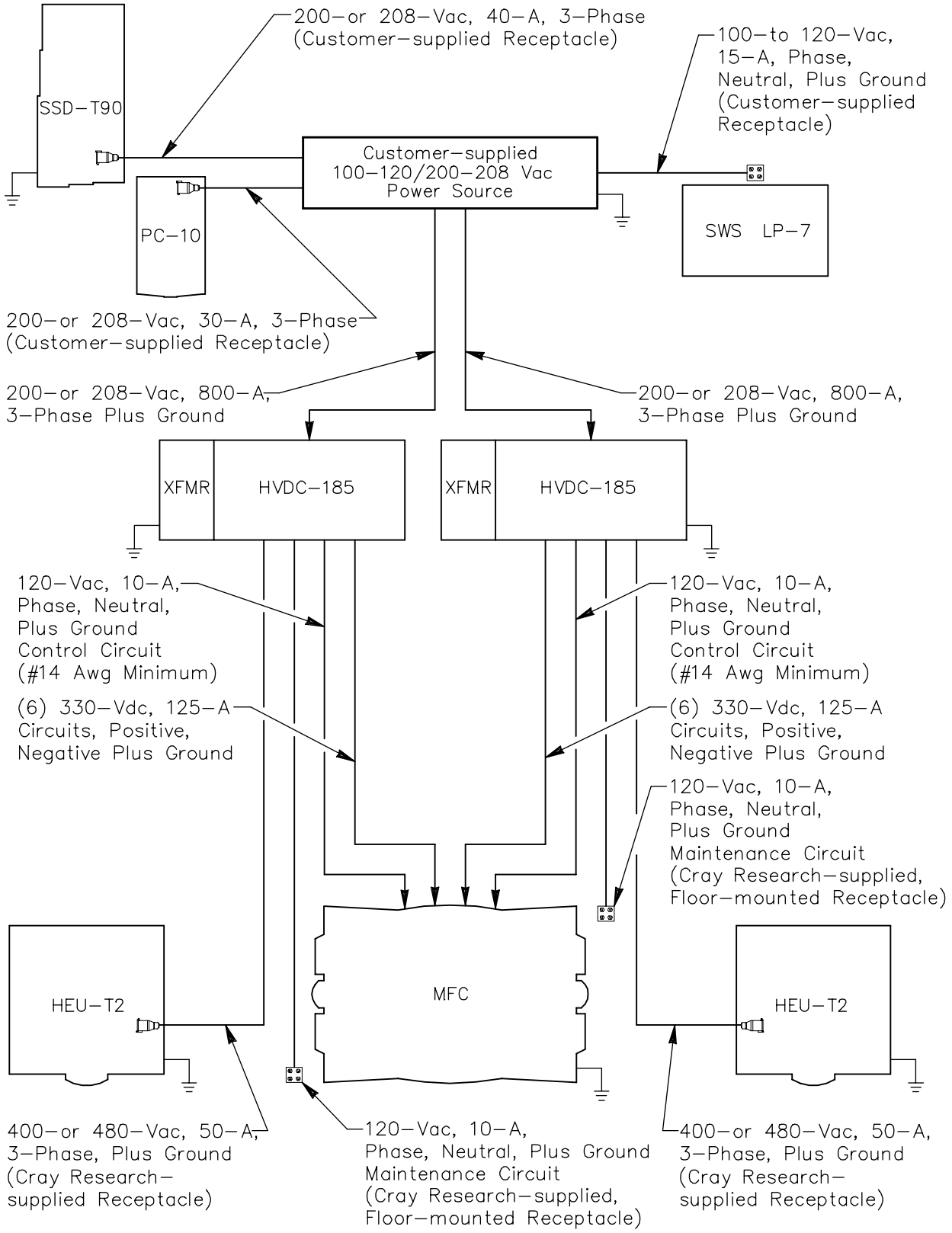


Figure 9. CRAY T932 200- or 208-Vac Power Wiring



System Cooling Requirements

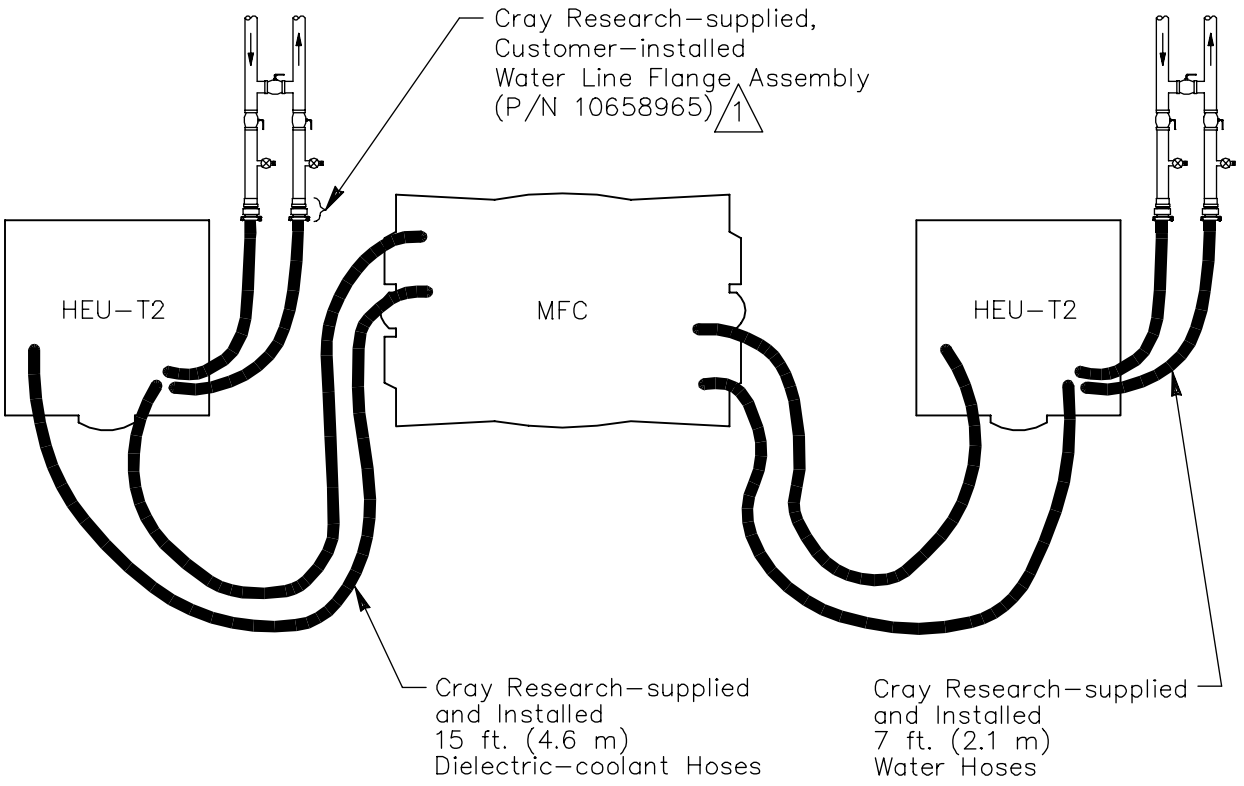
The CRAY T932 computer system uses a dielectric-coolant to customer chilled water cooling technique that requires special Cray Research-provided piping and hoses. Refer to Figure 10 for an illustration of the water line and dielectric-coolant assemblies.

In order to connect the customer-supplied water pipes to the HEU-T2, a Cray Research-supplied water line flange assembly is required on both the supply and return water lines. The customer installs these flange assemblies, which are shipped to the customer site 4 to 6 weeks prior to system installation.

The customer connections can be made with either a 3 1/8-in. (79-mm) copper tube using a brazed connection or with the Cray Research supplied 3-in. (76-mm) national pipe thread (NPT) fitting. The cooling water lines must be bonded to the signal-reference grid of the facility. Refer to Figure 11 for an illustration of the required HEU-T2 water piping.

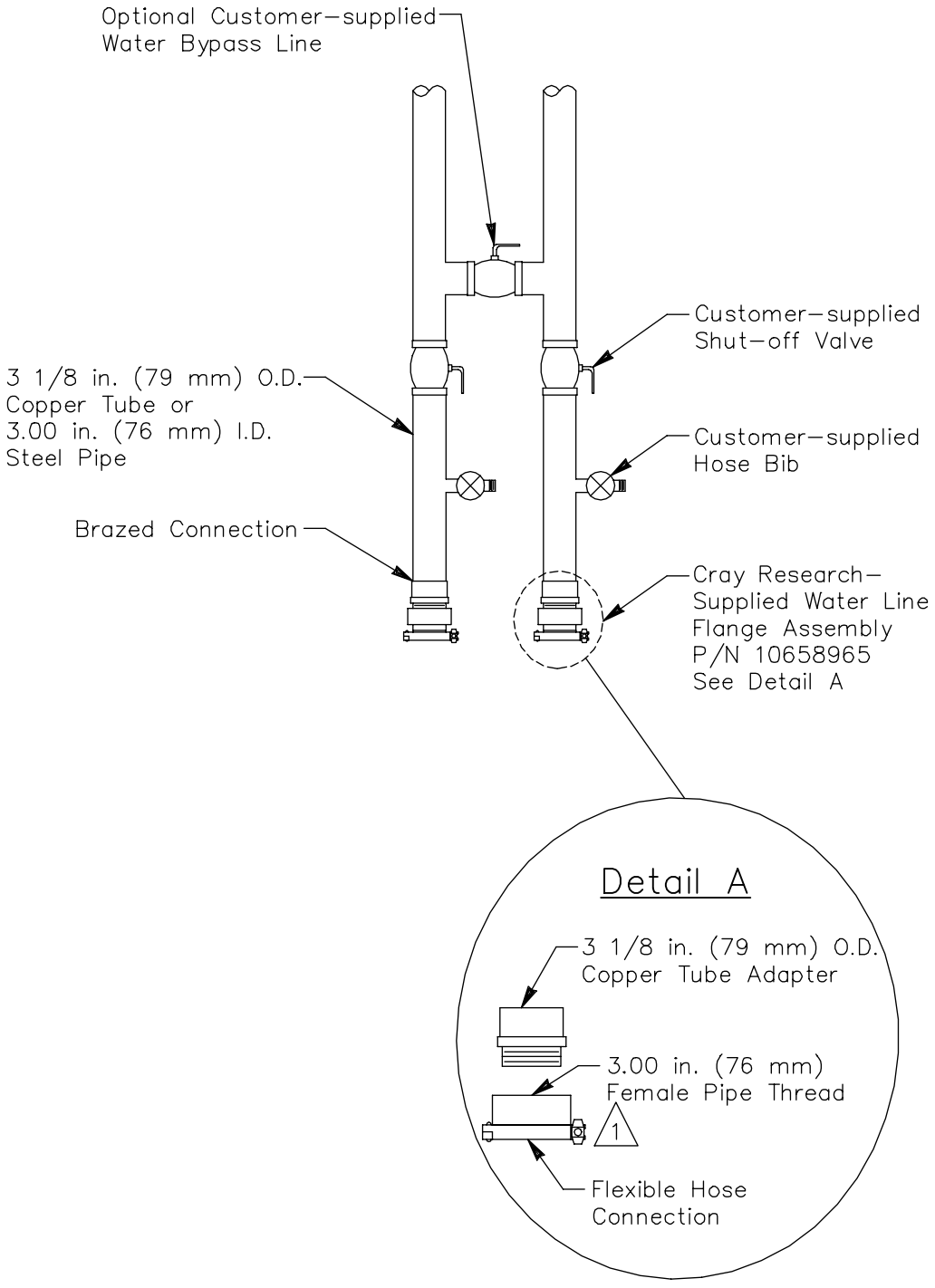
Flexible hoses and manifold assemblies are required to complete the dielectric-coolant network between the HEU-T2 and the CRAY T932 mainframe cabinet. Flexible hoses are also required to complete the water piping between the flange assemblies and the HEU-T2. Cray Research supplies and installs all flexible hoses for the dielectric coolant and water at the time of system installation.

Figure 10. Water- and Dielectric-coolant Assemblies



1 The exact water line flange assembly location depends on site conditions. Cray Research provides a drawing that will identify the correct location for the flanges at your site.

Figure 11. HEU-T2 Water Line Flange Assembly



1 Depending on the type of customer water piping used, the connection to the Cray Research–supplied water line flange assembly may be made with a copper–to–copper brazed connection or with a customer–provided steel 3.00 in. (76 mm) Male National Pipe Thread (MNPT).

CRAY T932 Mainframe Cabinet

The CRAY T932 mainframe chassis is a dielectric-cooled computer that contains electronic components such as logic modules and power supplies.

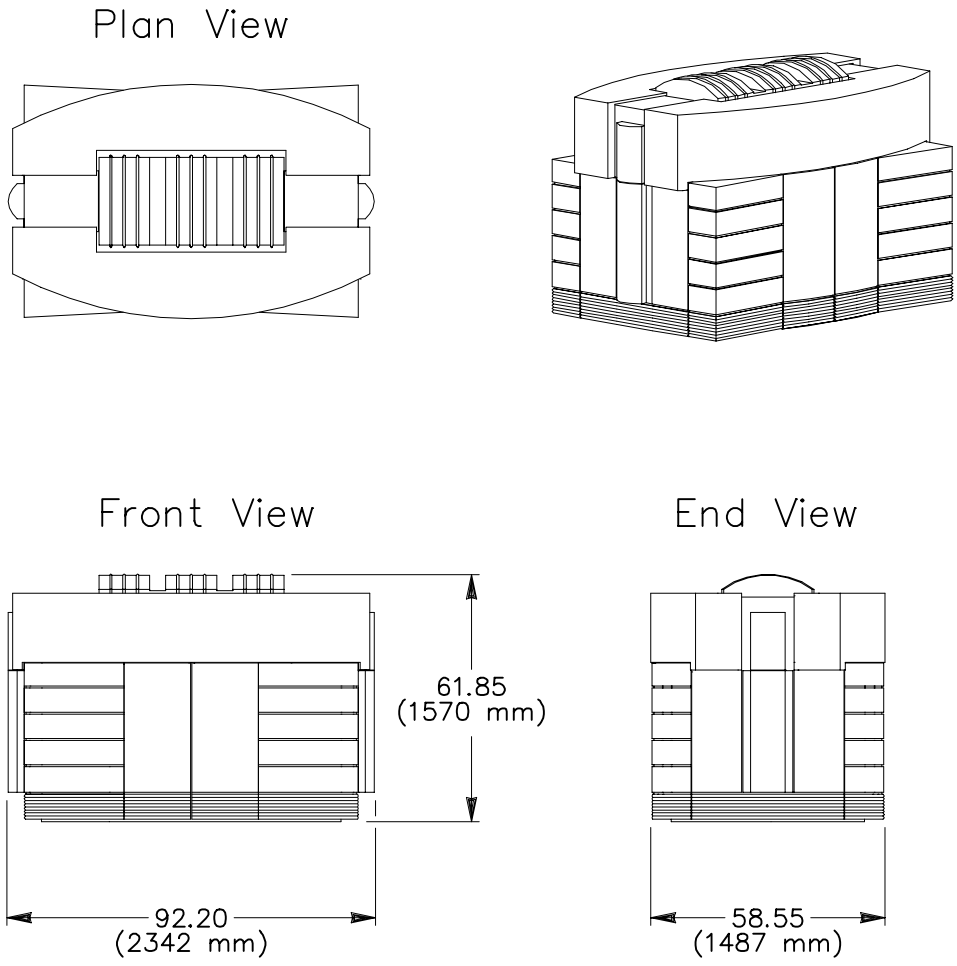
Table 7 provides the specifications for a CRAY T932 mainframe cabinet. Refer to Figure 12 for an illustration of the CRAY T932 mainframe cabinet.

Table 7. CRAY T932 Mainframe Cabinet Specifications

Characteristic	Specification
Height	61.85 in. (1570 mm)
Width	92.20 in. (2342 mm)
Depth	58.55 in. (1487 mm)
Operational weight (maximum)	16,282 lbs (7386 kg)
Access requirement	36.00 in. (914 mm) on all sides 92.50 in. (2350 mm) minimum ceiling height
Heat dissipation to air	Negligible
Cooling requirement	Dielectric coolant
Input voltage (supplied by the HVDC-185)	Twelve 330-Vdc, 125-amp power circuits Two 120-Vac, 10-amp control circuits
Input wiring connection	Compression lugs

NOTE: Total kilowatt power requirements depend on system configuration and expansion allowances. Cray Research provides documentation that outlines the power requirements for your specific computer system configuration.

Figure 12. CRAY T932 Mainframe Cabinet



Shipping Configuration

Cray Research ships the CRAY T932 mainframe cabinet as a single unit on lifts that Cray Research provides. Table 8 provides the shipping configuration specifications. Refer to Figure 13 for an illustration of the CRAY T932 mainframe cabinet shipping configuration.

Table 8. Mainframe Cabinet Shipping Configuration Specifications

Characteristic	Specification
Height	61.85 in. (1571 mm) [a]
Width	60.30 in. (1532 mm)
Depth	123.80 in. (3145 mm) [b]
Weight	10,900 lbs (4944 kg) [c]

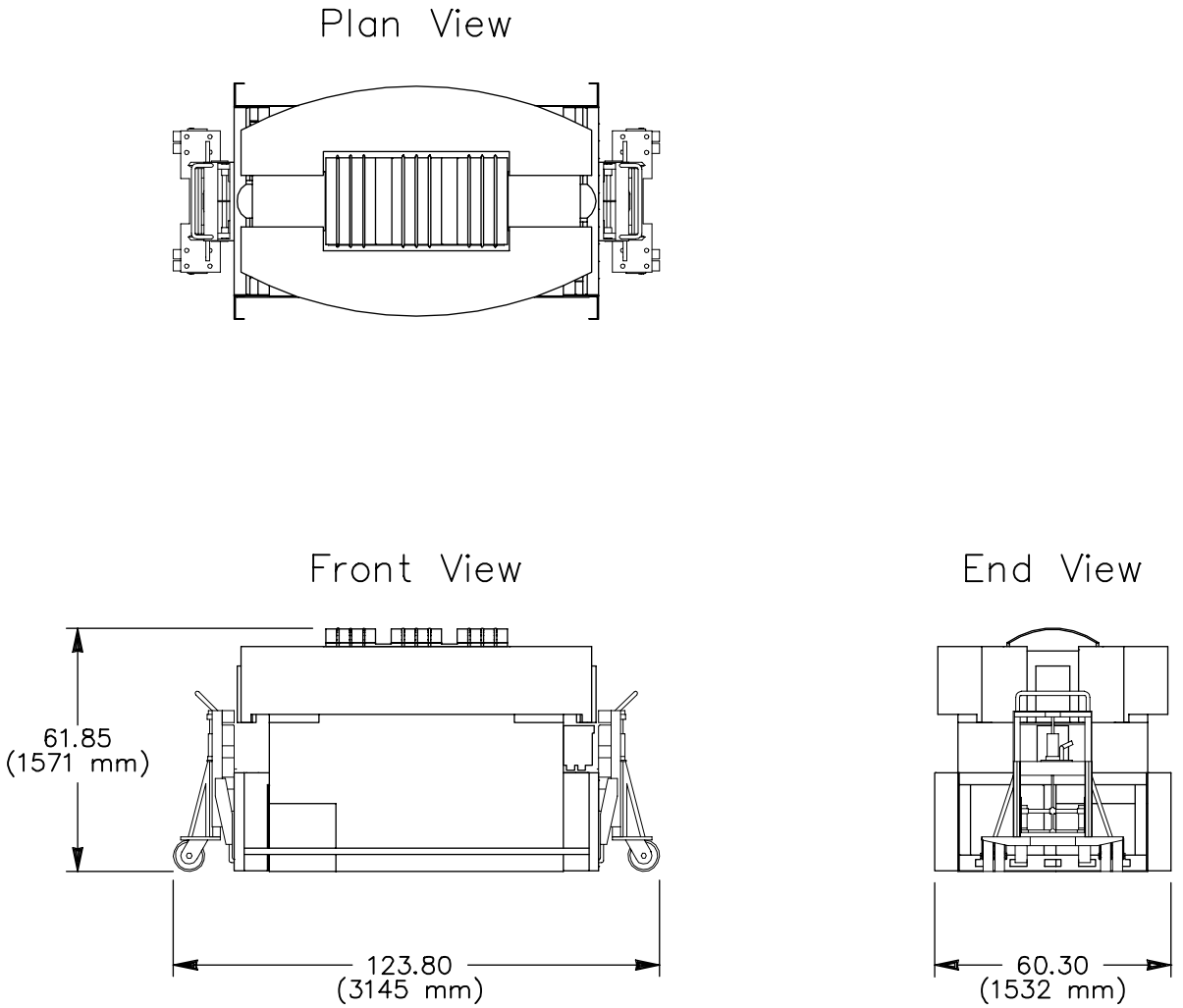
[a] Add 1.00 in. (25 mm) for rolling height.

[b] Dimension includes lifts.

[c] Weight includes lifts.

NOTE: The chassis shipping size can be reduced to accommodate some of your site constraints. Contact your site planning representative for details.

Figure 13. CRAY T932 Cabinet Shipping Configuration



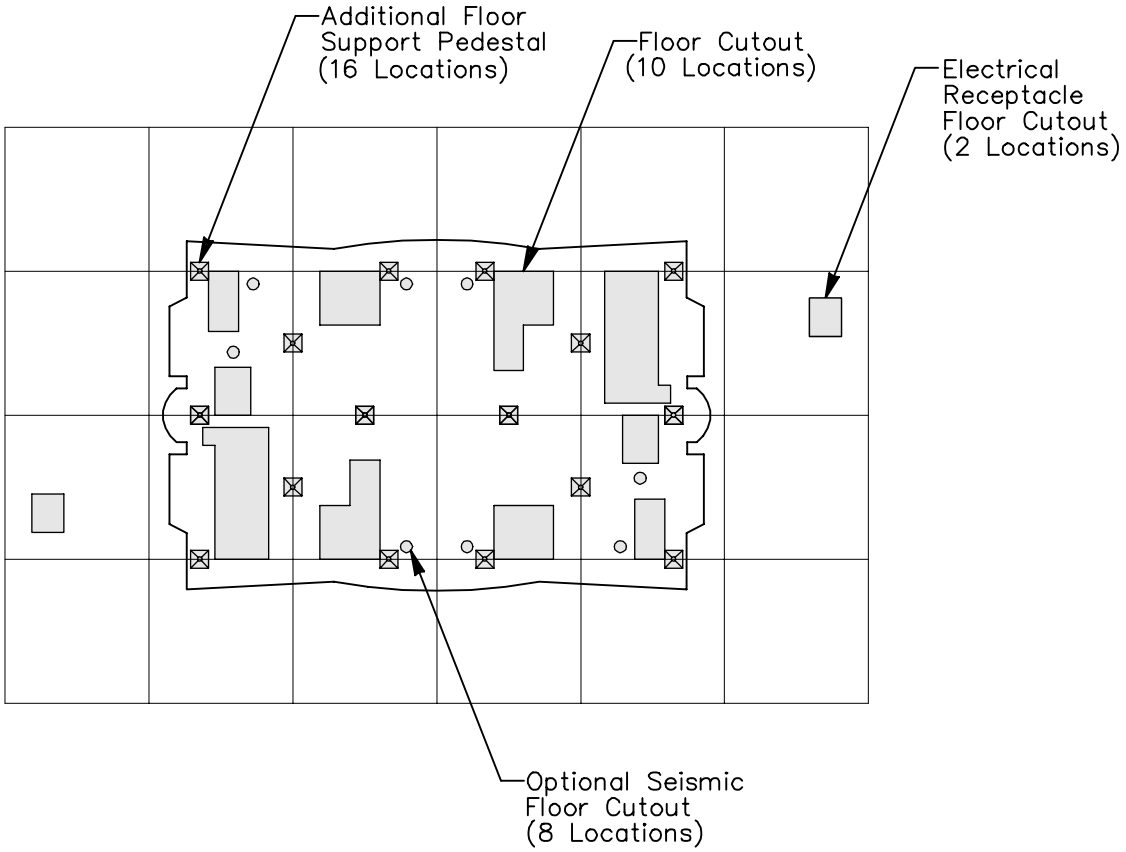
Floor Preparation

Before your system is delivered, you must prepare the raised floor for the CRAY T932 mainframe cabinet installation. Cray Research requires a minimum clearance of 12 in. (305 mm) between the subfloor and the underside of the raised-floor panels. Within this area, do not place any piping or underfloor obstructions. Clearances of less than the required 12 in. (305 mm) must be reviewed by Cray Research site planning personnel.

You must also prepare the twelve floor cutouts and install the sixteen additional floor support pedestals. (You may need to install additional floor support pedestals, depending on the raised-floor system.) To prevent damage to system connections, these floor cutouts must be free of sharp edges and burrs. Refer to Figure 14 for an illustration of the floor cutouts and the additional floor support pedestal locations.

NOTE: Cray Research provides full-scale templates that must be used to prepare the CRAY T932 mainframe cabinet floor cutouts and to determine the floor support pedestal locations.

Figure 14. CRAY T932 Cabinet Floor Cutouts



High-voltage DC (HVDC-185) Cabinet

The high-voltage DC cabinet (HVDC-185) is a power conversion cabinet that receives input power from a UPS and then transforms, rectifies, and regulates it to establish the 330-Vdc that the CRAY T932 mainframe requires. The HVDC-185 also serves as a power distribution cabinet for the mainframe and the heat exchanger unit (HEU-T2).

The HVDC-185 can receive electrical power from either the Cray Research-provided UPS or from a customer's existing UPS that meets Cray Research-specified voltage and electrical requirements. If the customer UPS is a 200- or 208-Vac supply, then a Cray Research-provided transformer cabinet is installed to provide the 400- or 480-Vac power that the HEU-T2 requires.

The CRAY T932 mainframe requires two HVDC-185 cabinets. You can install the HVDC-185 cabinets in either a computer room or a support equipment room. The HVDC-185 cabinets are equipped with leveling pads.

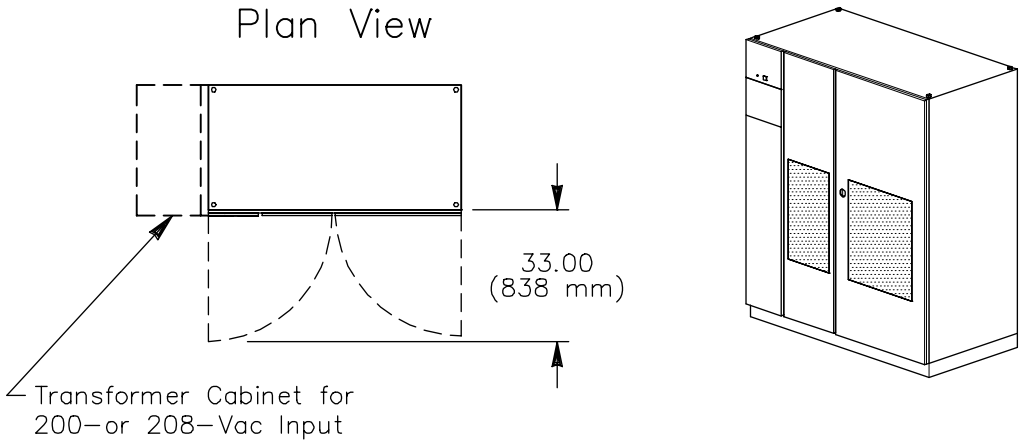
Table 9 provides the specifications for an HVDC-185 cabinet. Figure 15 illustrates an HVDC-185 cabinet.

Table 9. HVDC-185 Specifications

Characteristic	Specification
Height	74.50 in. (1892 mm)
Width: Main cabinet 200- or 208-Vac input transformer cabinet	 63.10 in. (1603 mm) 18.00 in. (457 mm)
Depth	32.75 in. (832 mm)
Weight: Main cabinet 200- or 208-Vac input transformer cabinet	 4,100 lbs (1859 kg) 1,832 lbs (831 kg)
Access requirements: Front Rear Sides	 36.00 in. (914 mm)[a] 24.00 in. (610 mm)[a] None
Cooling requirement	Ambient air
Airflow	2700 CFM (1.26 cubic meters per second) Inlet: front Exhaust: top
Heat dissipation to air	27.30 kBtu/hr (8.00 kW) maximum
Input voltage	200 Vac, 3 phase 208 Vac, 3 phase 380 to 415 Vac, 3 phase 460 to 480 Vac, 3 phase
Output voltage	330 Vdc
Noise level	Less than 60 dBa (A scale) when measured 39.37 in. (1 m) from all sides of cabinet
Input, output, and control wiring connections	Terminal blocks, bottom wire entry
Hold-up time	85 milliseconds at full load
Inrush current	750% of nominal current for less than one cycle
Total harmonic distortion (current)	Less than 7% at full load, less than 10% at 25% load

[a] Local or national electrical codes may require additional working clearance.

Figure 15. High-voltage DC (HVDC-185) Cabinet



Shipping Configuration

Cray Research ships the HVDC-185 cabinet as a single unit on a pallet.

NOTE: The transformer cabinet for the 200- or 208-Vac input ships separately from the HVDC-185 cabinet.

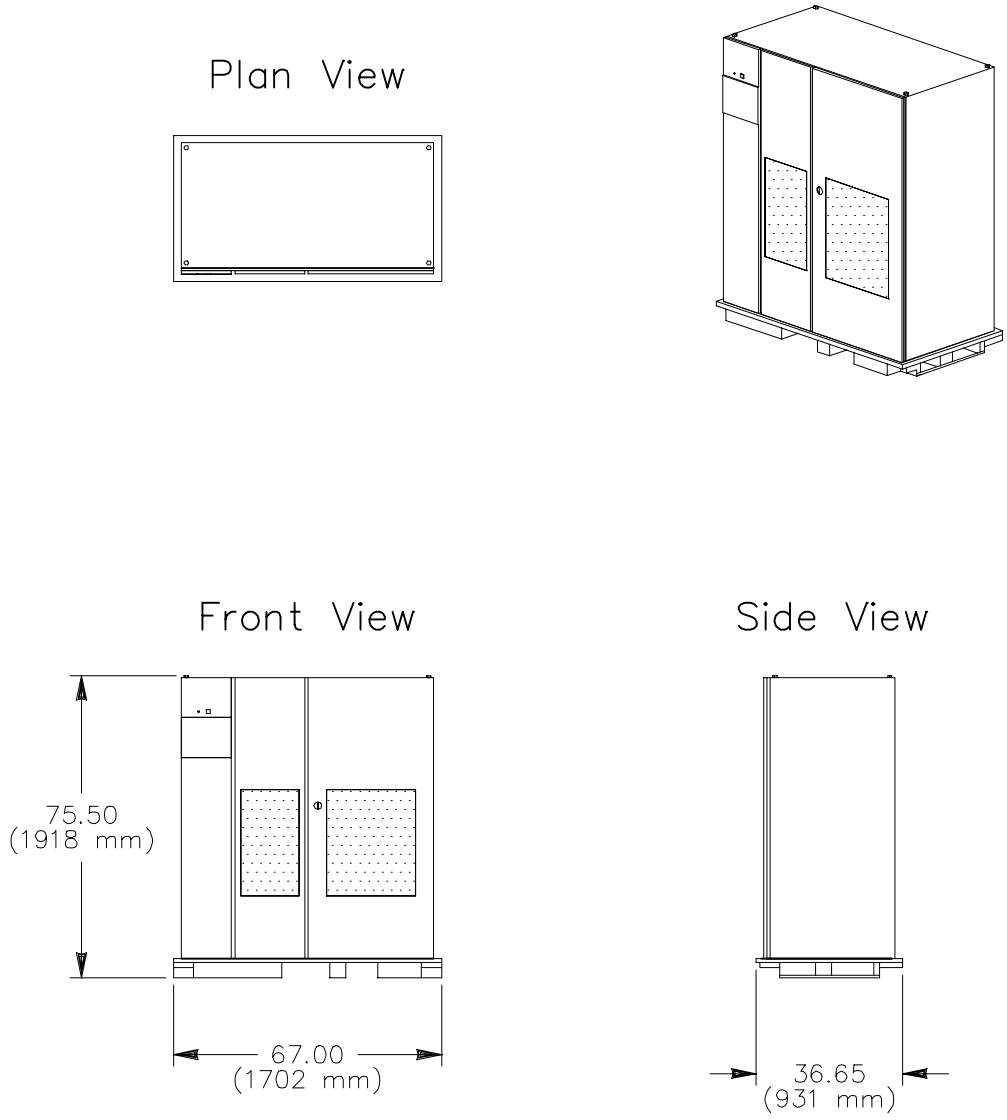
Table 10 provides the shipping configuration specifications. Refer to Figure 16 for an illustration of the HVDC-185 cabinet shipping configuration, including dimensions.

Table 10. HVDC-185 Shipping Configuration Specifications

Characteristic	Specification
Height	75.50 in. (1918 mm) [a]
Width	36.65 in. (931 mm)
Depth	67.00 in. (1702 mm)
Weight	4,250 lbs (1928 kg)

[a] Add 1.00 in. (25 mm) for rolling height.

Figure 16. HVDC-185 Cabinet Shipping Configuration



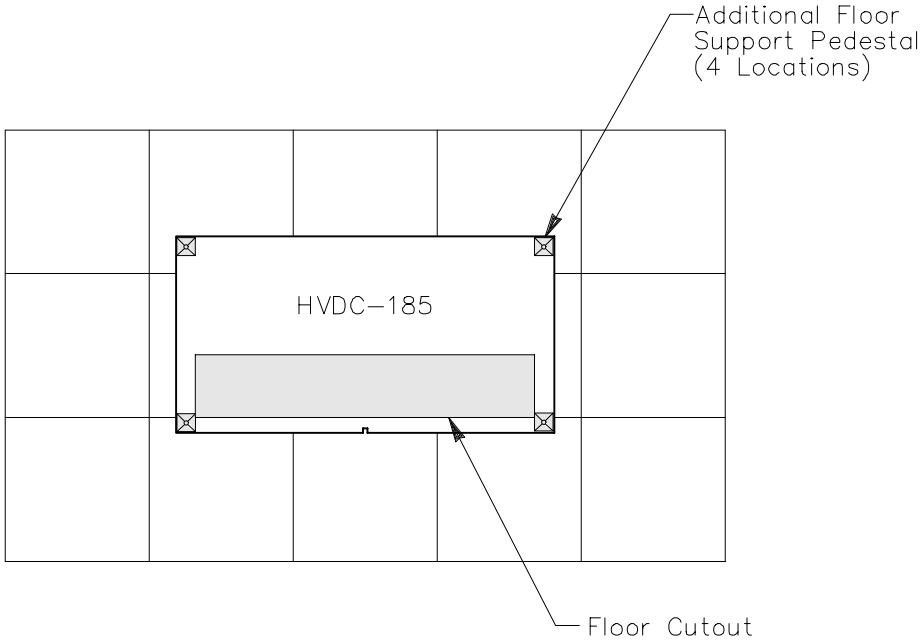
Floor Preparation

If you plan to install the HVDC-185 on a raised floor, you must prepare the floor prior to system delivery. You must prepare one floor cutout and install four additional floor support pedestals. The floor cutout provides an opening for data and power connections. This floor cutout must be free of sharp edges and burrs to prevent damage to these system connections.

NOTE: Cray Research provides full-scale templates that you can use to prepare the HVDC-185 floor cutout.

Refer to Figure 17 for an illustration of the HVDC-185 cabinet floor cutout.

Figure 17. HVDC-185 Floor Cutout



Heat Exchanger Unit (HEU-T2)

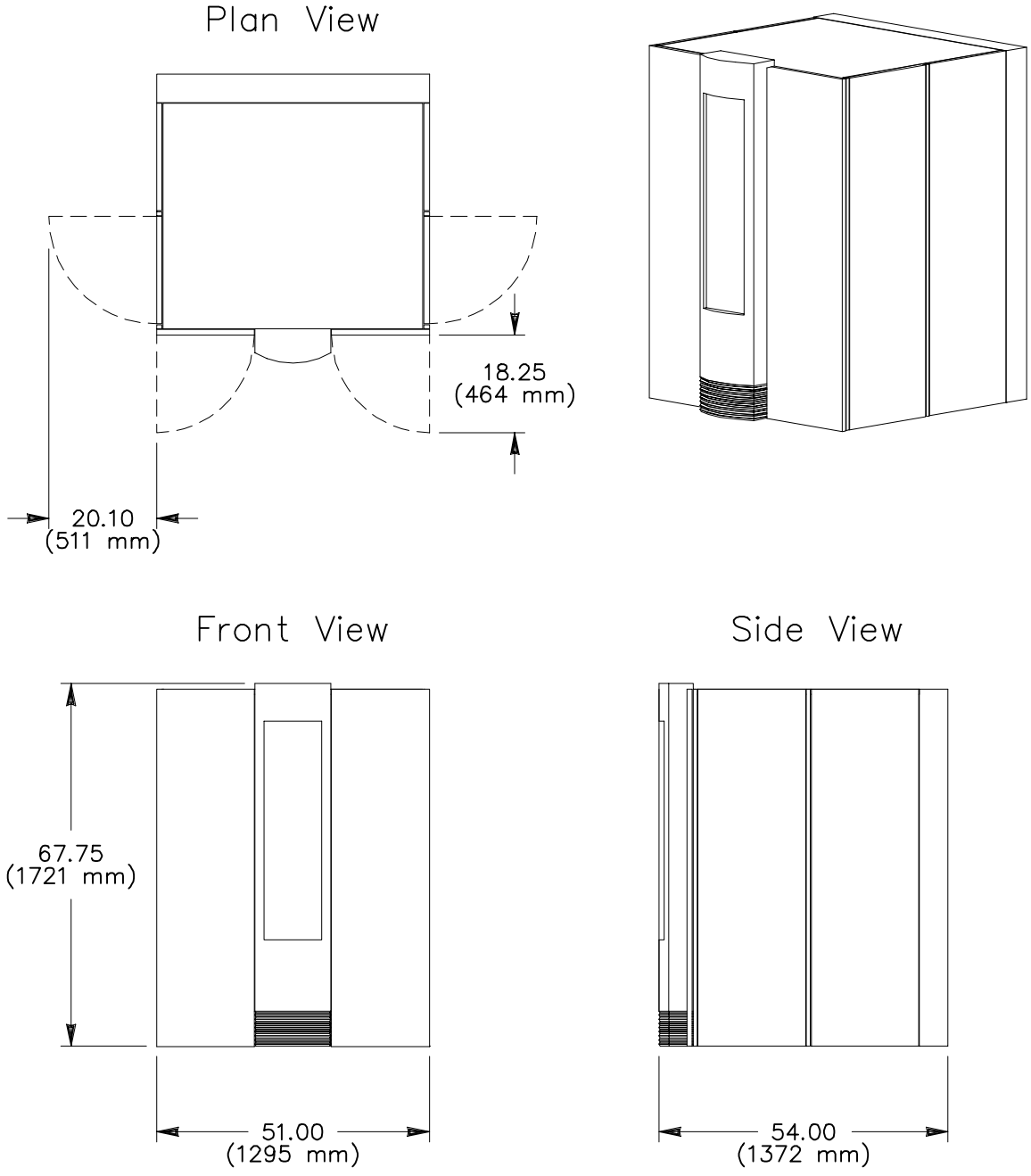
The heat exchanger unit (HEU-T2) removes the heat that the logic modules and power supplies generate within a Cray Research computer chassis. The HEU-T2 circulates dielectric coolant through the computer chassis to remove the heat. The dielectric coolant absorbs the heat from the computer chassis and then flows to the HEU-T2 where the heat transfers to customer-supplied water.

Table 11 provides the specifications for the HEU-T2. Refer to Figure 18 for an illustration of the HEU-T2.

Table 11. HEU-T2 Specifications

Characteristic	Specification
Height	67.75 in. (1721 mm)
Width	51.00 in. (1295 mm)
Depth	54.00 in. (1372 mm)
Weight	5,576 lbs (2529 kg)
Access requirements	36.00 in. (914 mm) on all sides
Heat dissipation to air	3.31 kBtu/hr (0.97 kW)
Cooling requirement	Customer-supplied cooling water
Input voltage	400/480 Vac, 3 phase
Frequency	50 or 60 Hz
Input wiring connections	Cray Research-supplied receptacle

Figure 18. Heat Exchanger Unit (HEU-T2)



Shipping Configuration

Cray Research ships the HEU-T2 cabinet as a single unit on lifts that Cray Research provides. Table 12 lists the shipping configuration specifications. Refer to Figure 19 for an illustration of the HEU-T2 cabinet shipping configuration, which includes dimensions.

Table 12. HEU-T2 Cabinet Shipping Configuration Specifications

Characteristic	Specification
Height	67.75 in. (1721 mm) [a]
Width	56.50 in. (1435 mm)
Depth	86.50 in. (2197 mm) [b]
Weight	3,132 lbs (1421 kg) [c]

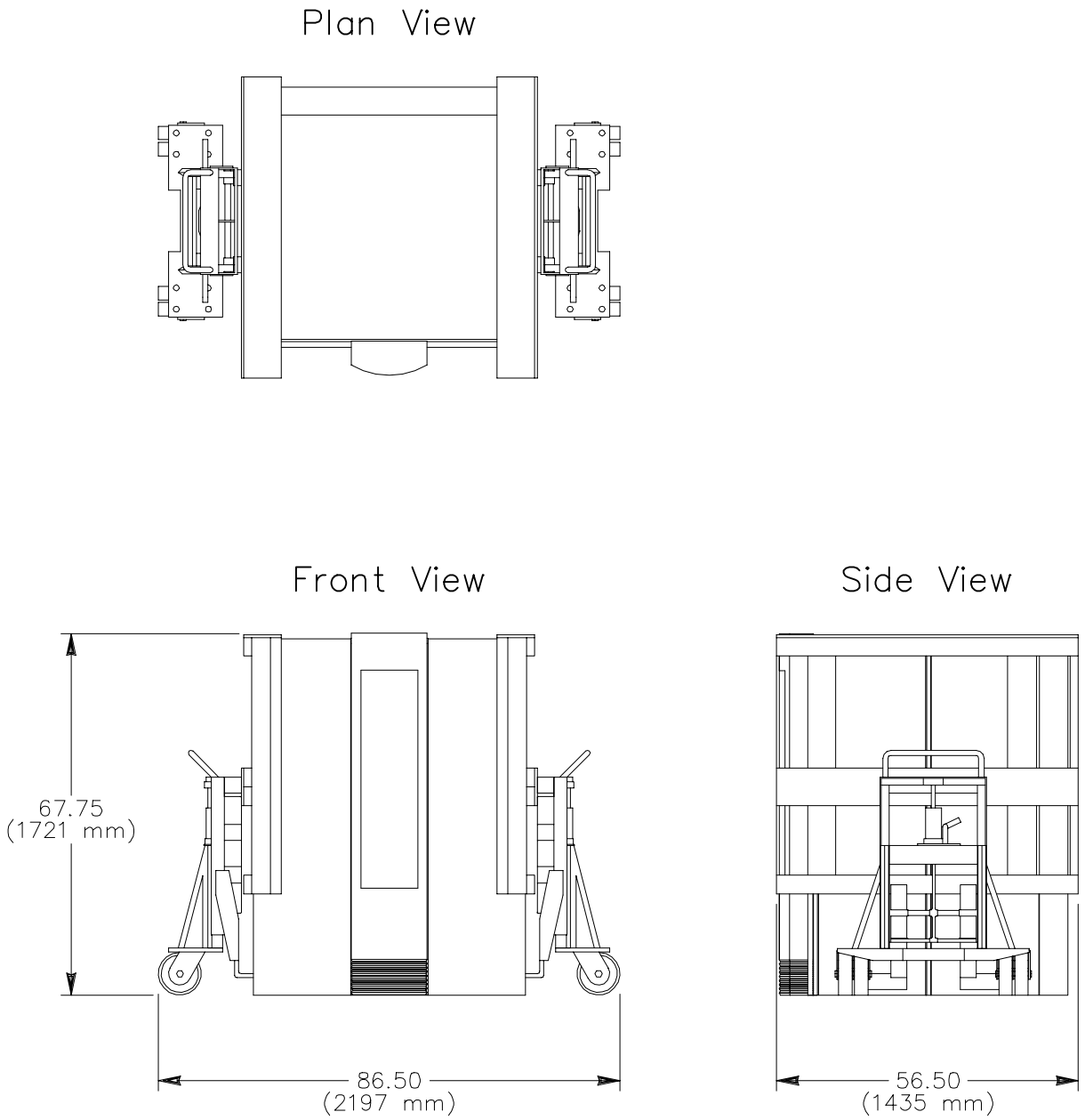
[a] Add 1.00 in. (25 mm) for rolling height.

[b] Dimension includes lifts.

[c] Weight includes lifts.

NOTE: The shipping size of the HEU-T2 can be reduced to accommodate some of your site constraints. Contact your site planning representative for details.

Figure 19. HEU-T2 Shipping Configuration



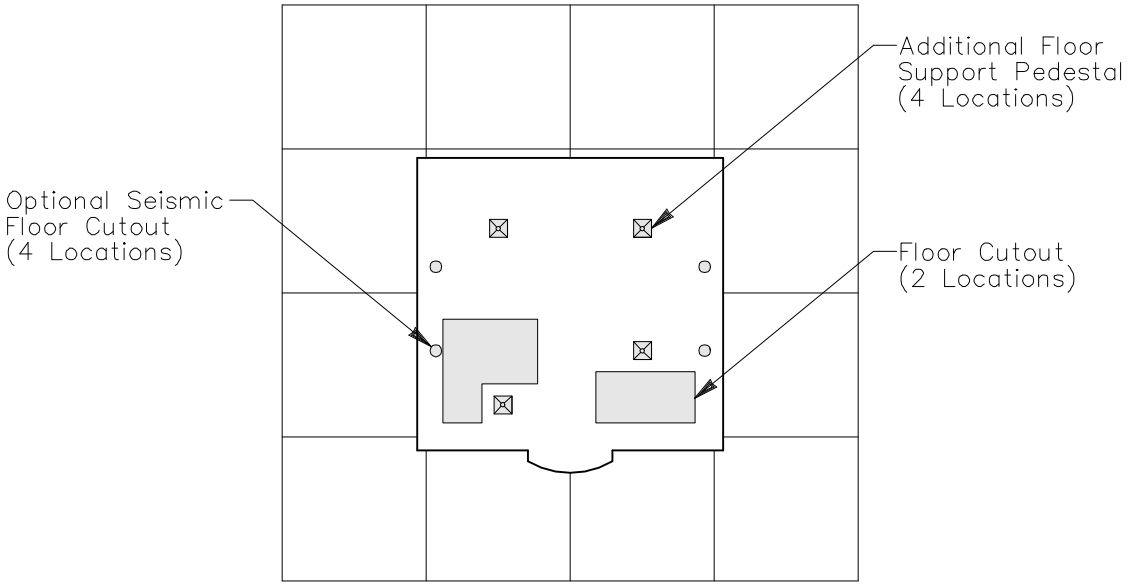
Floor Preparation

Before your system is delivered, you must prepare the raised floor for the HEU-T2 cabinet installation. Cray Research requires a minimum clearance of 12 in. (305 mm) between the subfloor and the underside of the raised-floor panels. Within this area, do not place any piping or underfloor obstructions. Clearances of less than the recommended 12 in. (305 mm) must be reviewed by Cray Research site planning personnel.

You must also prepare the two floor cutouts and install the four additional floor support pedestals. (You may need to install additional floor support pedestals, depending on the raised-floor system.) To prevent damage to system connections, these floor cutouts must be free of sharp edges and burrs. Refer to Figure 20 for an illustration of the floor cutouts and the additional floor support pedestal locations.

NOTE: Cray Research provides full-scale templates that must be used to prepare the HEU-T2 floor cutouts and to determine the floor support pedestal locations.

Figure 20. HEU-T2 Cabinet Floor Cutouts



Peripheral Cabinet (PC-10)

Each CRAY T932 system includes a minimum of one PC-10 cabinet. Each PC-10 cabinet contains an input power subrack and various air-cooled subracks that provide input/output and data storage capabilities. The input/output subracks network the CRAY T932 computer system, customer devices, user workstations, peripheral controllers, and various industry-standard communication channels. Depending on your peripheral requirements, the PC-10 cabinet can contain any combination of the following subracks:

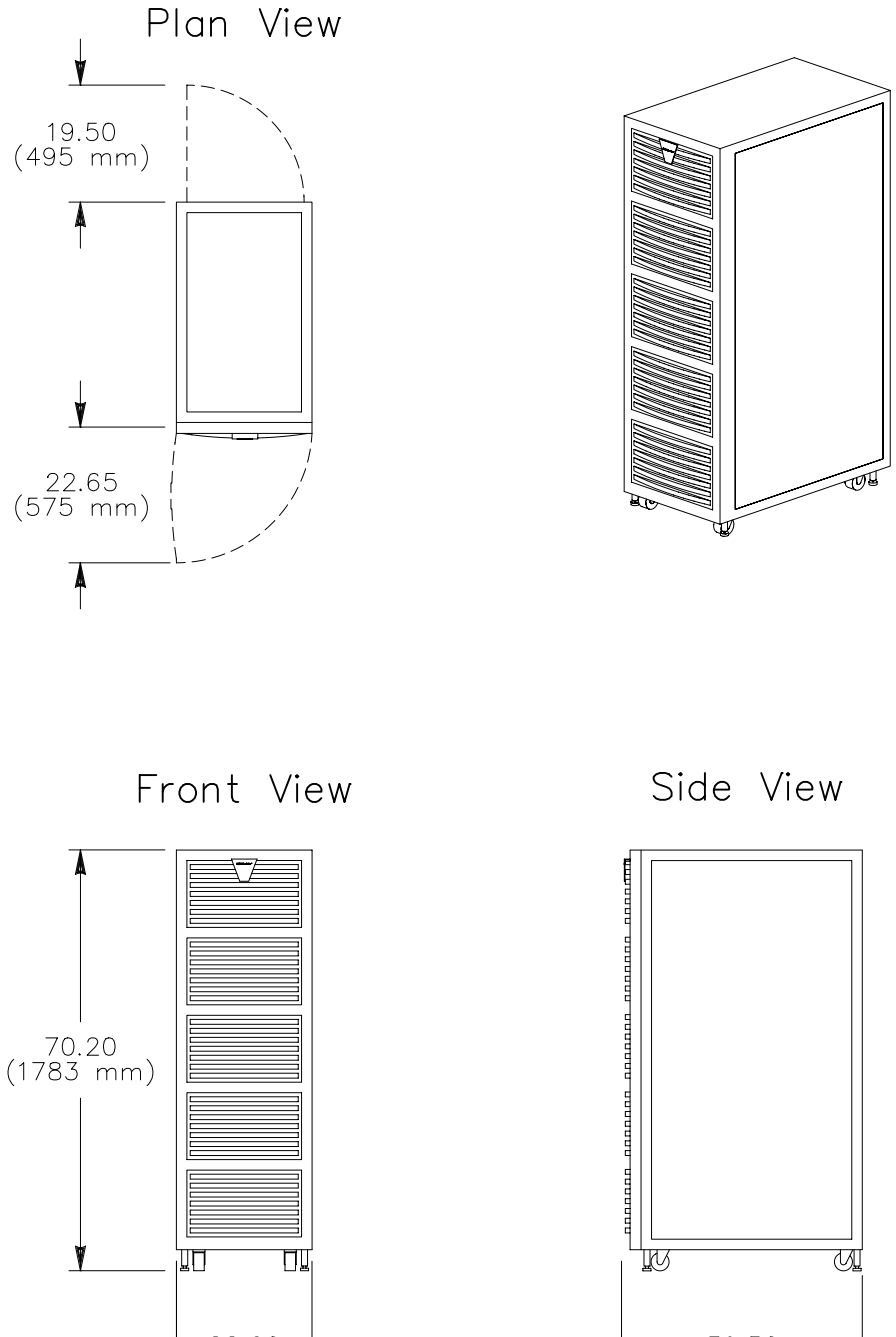
- Node subrack (NSR-1)
- Multipurpose node (MPN-1)
- Disk subsystem fibre channel (DSF-1)
- Disk subsystem SCSI (DSS-1)
- Fiber-optic extender (FOX-1)
- Ethernet concentrator
- Micro Annex™ communications server
- GigaRing™ bulkhead

Table 13 provides the specifications for a PC-10 cabinet. Refer to Figure 21 for an illustration of the PC-10 cabinet.

Table 13. PC-10 Specifications

Characteristic	Specification
Height	70.20 in. (1783 mm)
Width	22.60 in. (574 mm)
Depth	39.50 in. (1003 mm)
Weight (maximum)	951 lbs (431 kg)
Access requirements	36.00 in. (914 mm) front and back
Heat dissipation to air (maximum)	17.06 kBtu/hr (5.00 kW)
Cooling requirement	Ambient air
Airflow (maximum)	2700 CFM (1.27 m^3/s)
Acoustical noise level	67 dba at 3.3 ft (1.0 m)
Input voltage	200 or 208 Vac, 50/60 Hz, 3 phase, 4 wire 400 Vac, 50 Hz, 3 phase, 5 wire
Power requirement (maximum)	5.26 kVA (5.00 kW)
Hold-up time	16 milliseconds
Power cable	8-ft (2.4-m) pluggable drop cord
Power receptacle	208 Vac: Hubbell® 430C9W 400 Vac: Hubbell 532C6W

Figure 21. PC-10 Cabinet



Shipping Configuration

Table 14 provides the PC-10 cabinet shipping configuration specifications.

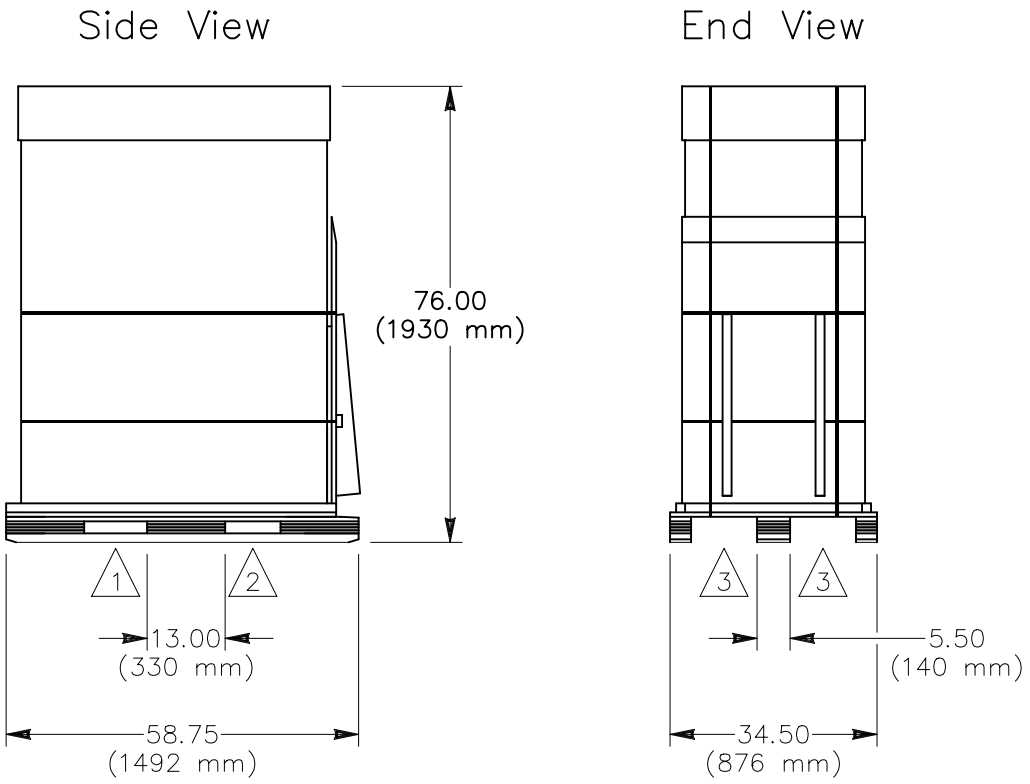
Figure 22 provides an illustration of the PC-10 cabinet shipping crate, which includes dimensions. Each PC-10 cabinet is shipped in a separate shipping crate. Cray Research provides an attached ramp to facilitate the removal of the cabinet from the shipping crate. You must provide a pallet jack to move each shipping crate to the system location.

Table 14. PC-10 Cabinet Shipping Configuration Specifications

Characteristic	Specification
Height	76.00 in. (1930 mm)[a]
Width	34.50 in. (876 mm)
Depth	58.75 in. (1492 mm)
Weight	1,116 lbs (506 kg)

[a] Add 1.00 in. (25 mm) for rolling height.

Figure 22. PC-10 Cabinet Shipping Configuration



1 Lift opening 10.50 x 2.00 (267 mm x 51 mm)

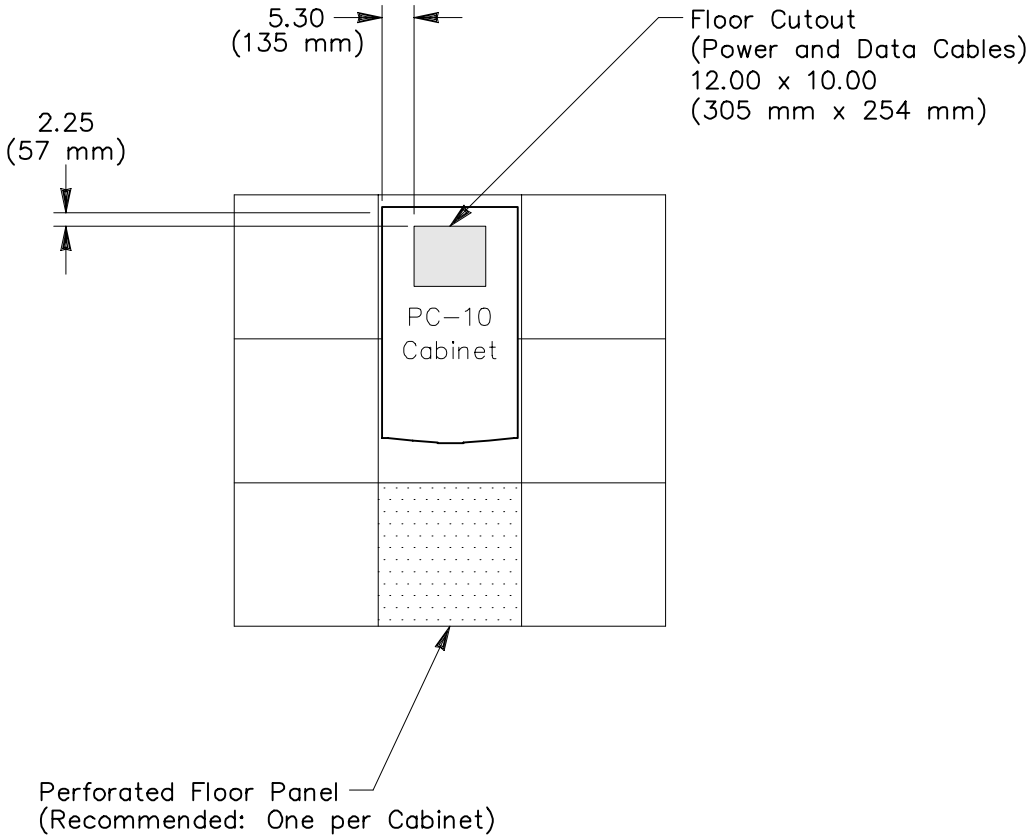
2 Lift opening 9.25 x 2.00 (235 mm x 51 mm)

3 Lift opening 11.00 x 4.25 (279 mm x 108 mm)

Floor Preparation

Refer to Figure 23 for the location of the PC-10 floor cutout. Each cabinet requires one floor cutout. Cray Research recommends the placement of a perforated floor panel in front of each cabinet (as shown in Figure 23) when the cabinet is located on a raised floor with a pressurized underfloor area. This perforated floor panel provides additional cooling air to the PC-10 cabinet.

Figure 23. PC-10 Floor Cutout



CRAY SSD-T90 Cabinet

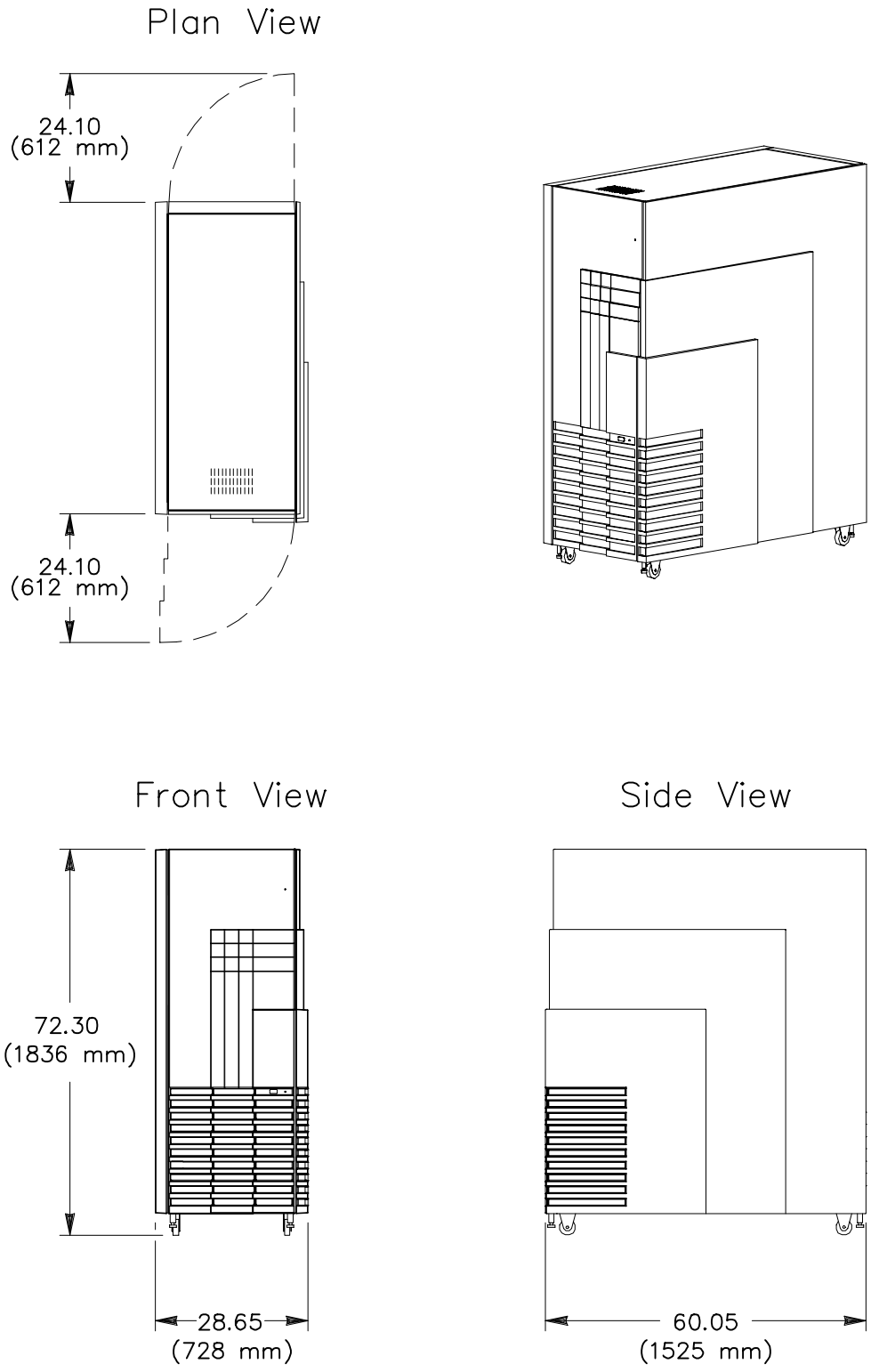
The optional CRAY SSD-T90 cabinet (referred to in the diagrams as SSD-T90) is an air-cooled chassis that contains the logic modules and power supplies for an SSD solid-state storage device (SSD).

Table 15 provides the specifications for a CRAY SSD-T90 cabinet. Refer to Figure 24 for an illustration of the CRAY SSD-T90 cabinet.

Table 15. CRAY SSD-T90 Specifications

Characteristic	Specification
Height	72.30 in. (1836 mm)
Width	28.65 in. (728 mm)
Depth	60.05 in. (1525 mm)
Weight (maximum)	1,423 lbs (645 kg)
Access requirements	36.00 in. (914 mm) front and back
Heat dissipation to air (maximum)	12.15 kBtu/hr (3.56 kW)
Cooling requirement	Ambient air
Airflow (maximum)	1500 CFM (0.71 m^3/s)
Acoustical noise level	58 dba at 3.3 ft (1.0 m)
Input voltage	200 or 208 Vac, 50/60 Hz, 3 phase, 4 wire 400 Vac, 50 Hz, 3 phase, 5 wire
Power requirement (maximum)	3.75 kVA (3.56 kW)
Hold-up time	60 milliseconds
Total harmonic distortion	Less than 15% at full load
Power cable	4-ft (1.2-m) pluggable drop cord
Power receptacle	208 Vac: Hubbell 460C9W 400 Vac: Hubbell 532C6W

Figure 24. CRAY SSD-T90 Cabinet



Shipping Configuration

Table 16 provides the CRAY SSD-T90 cabinet shipping configuration specifications.

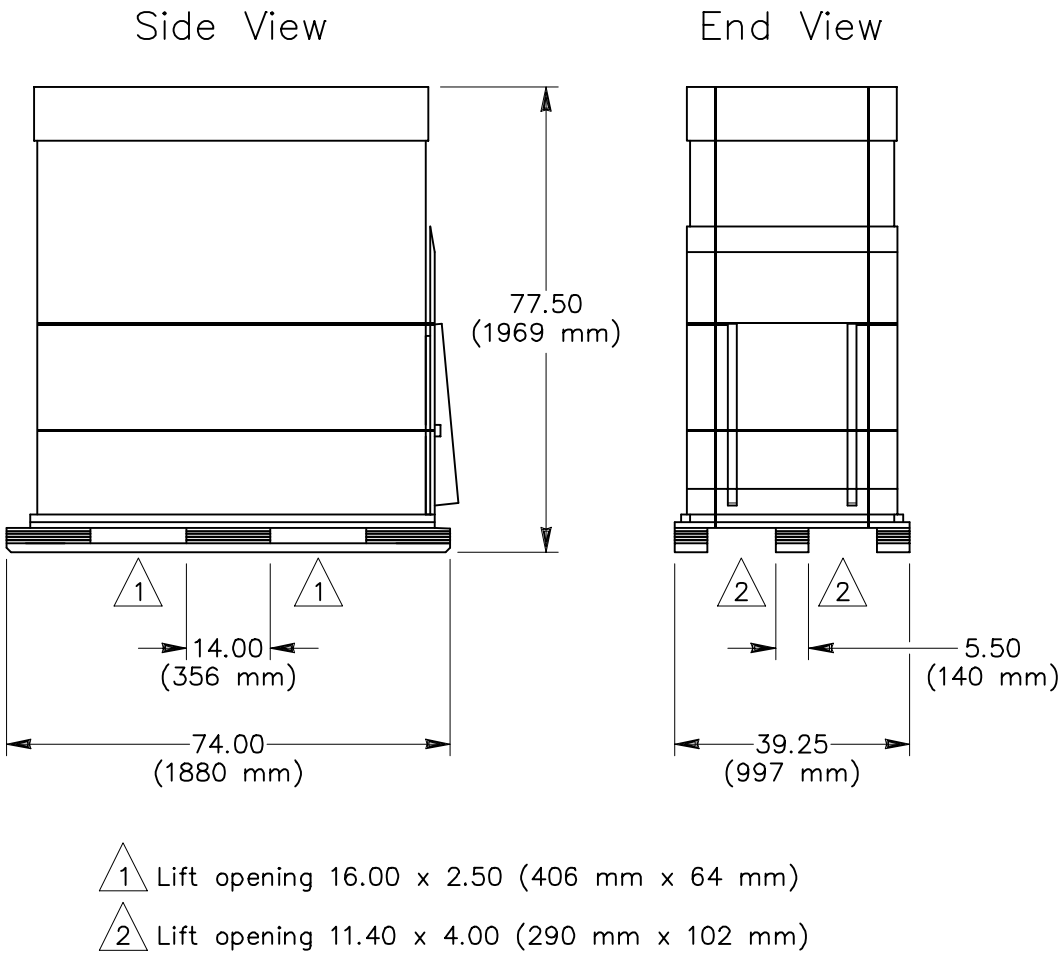
Figure 25 provides an illustration of the CRAY SSD-T90 cabinet shipping crate, which includes dimensions. Each CRAY SSD-T90 cabinet is shipped in a separate shipping crate. Cray Research provides an attached ramp to facilitate the removal of the cabinet from the shipping crate. You must provide a pallet jack to move each shipping crate to the system location.

Table 16. CRAY SSD-T90 Cabinet Shipping Configuration Specifications

Characteristic	Specification
Height	77.50 in. (1969 mm)[a]
Width	39.25 in. (997 mm)
Depth	74.00 in. (1880 mm)
Weight	1,640 lbs (744 kg)

[a] Add 1.00 in. (25 mm) for rolling height.

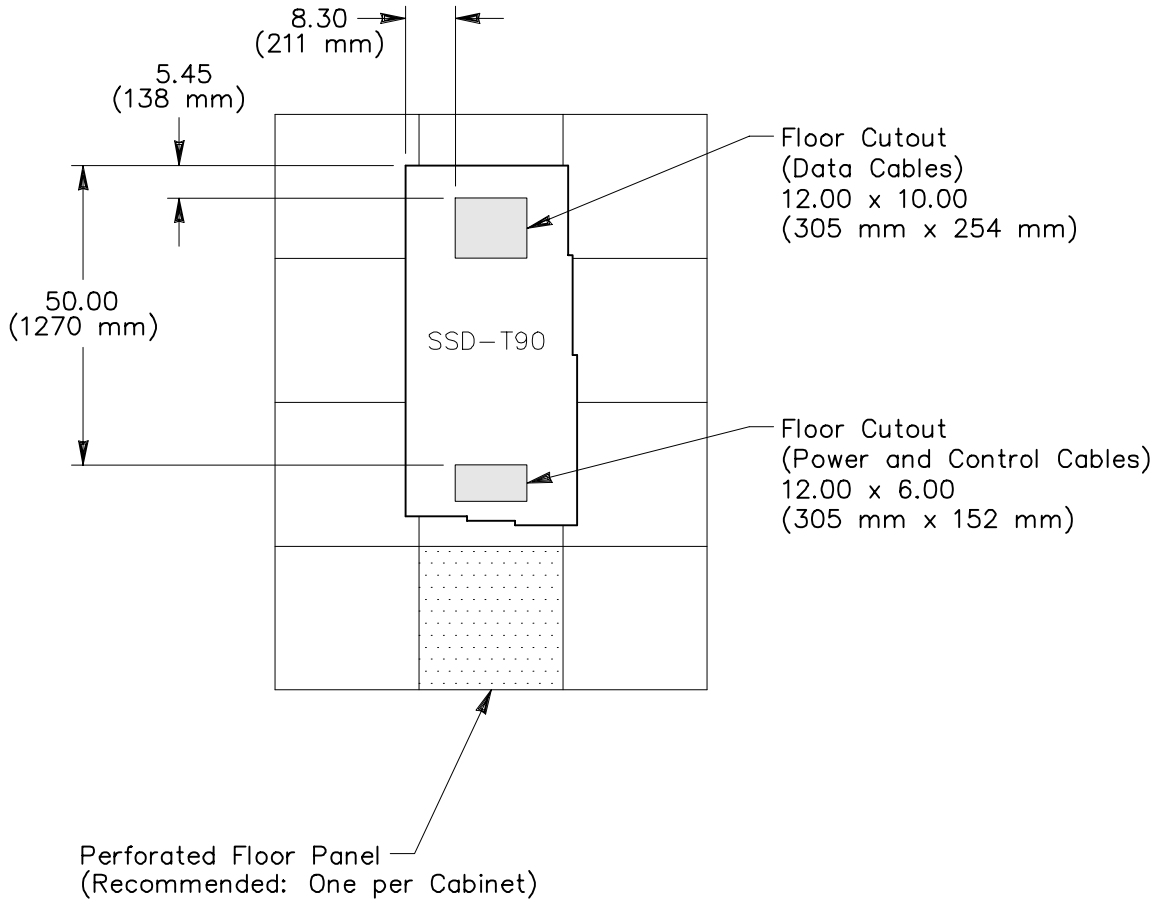
Figure 25. CRAY SSD-T90 Cabinet Shipping Configuration



Floor Preparation

Refer to Figure 26 for the location of the CRAY SSD-T90 floor cutout. Each cabinet requires two floor cutouts. Cray Research recommends the placement of a perforated floor panel in front of each cabinet (as shown in Figure 26) when the cabinet is located on a raised floor with a pressurized underfloor area. This perforated floor panel provides additional cooling air to the CRAY SSD-T90 cabinet.

Figure 26. CRAY SSD-T90 Floor Cutout



System Workstation

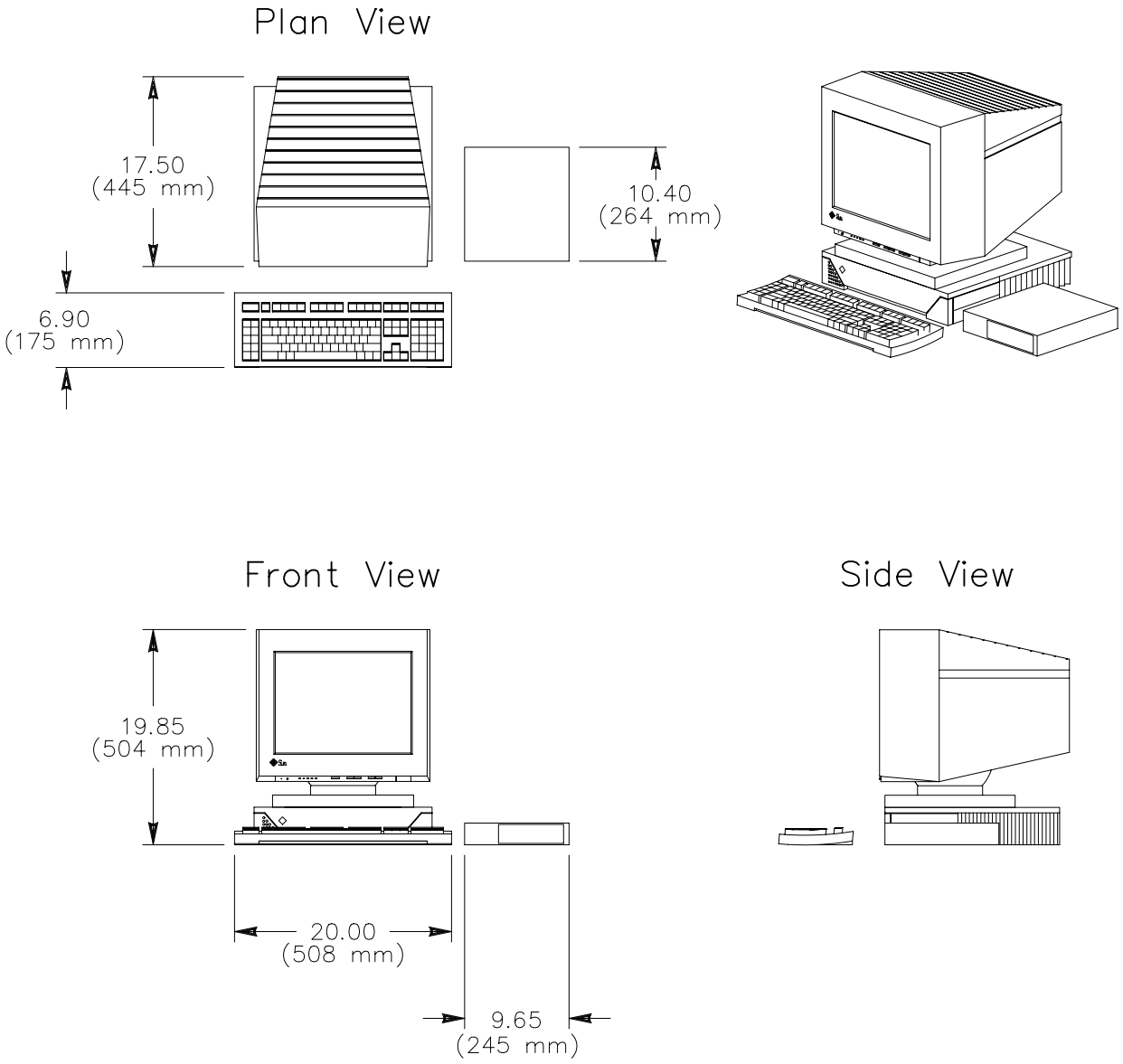
The system workstation is a SPARC based Sun Workstation™ that provides monitoring, diagnosis, control, and configuration management for the Cray Research computer systems. Cray Research provides a table (TBL-4) to accommodate the SWS, which can connect to an optional laser printer (LP-7).

Refer to Table 17 for the SWS specifications and to Figure 27 for an illustration of an SWS.

Table 17. SWS Specifications

Characteristic	Specification
Height	19.85 in. (504 mm)
Width	30.00 in. (762 mm)
Depth	25.50 in. (648 mm)
Weight	79 lbs (36 kg)
Heat dissipation to air (maximum)	2,010 Btu/hr (600 W)
Cooling requirement	Ambient air
Input voltage	100 to 120 or 200 to 240 Vac, single phase
Power requirement	600 W
Frequency	50 or 60 Hz
Power cable	8-ft (2.4-m) pluggable drop cord
Power receptacle: North America and Japan International	 NEMA #5-15R or equivalent IEC 309, single phase, 16 amp

Figure 27. System Workstation (SWS)



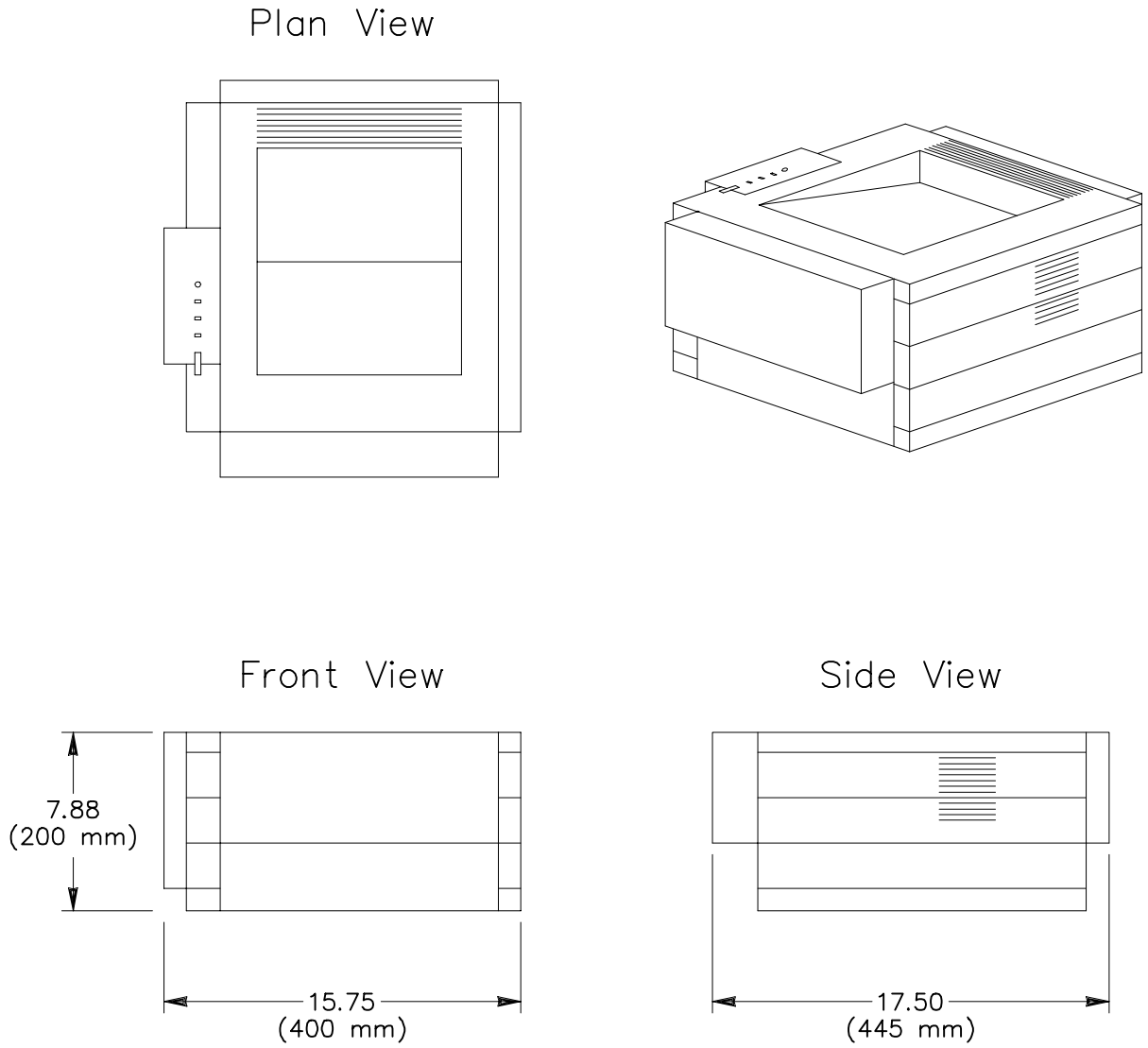
Laser Printer (LP-7)

The optional laser printer (LP-7) connects to the SWS. If your computer system includes this optional printer, Cray Research provides a table (TBL-4) for it. Refer to Table 18 for the LP-7 specifications and to Figure 28 for an illustration of the LP-7.

Table 18. LP-7 Specifications

Characteristic	Specification
Height	7.88 in. (200 mm)
Width	15.75 in. (400 mm)
Depth	17.50 in. (445 mm)
Weight	25 lbs. (11 kg)
Cooling requirement	Ambient air
Heat dissipation to air	610 Btu/hr
Power consumption	175 W
Input voltage	100 to 120 or 200 to 240 Vac, single phase
Frequency	50 or 60 Hz
Power cable	6-ft (1.8-m) pluggable drop cord
Power receptacle: North America and Japan International	 NEMA #5-15R or equivalent IEC 309, single phase, 16 amp

Figure 28. LP-7 Laser Printer



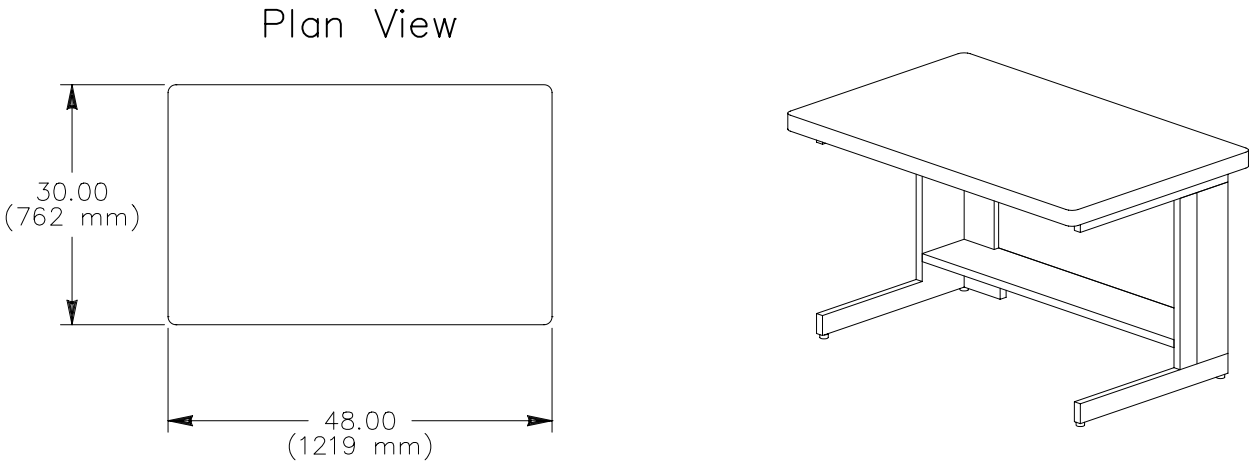
Support System Table (TBL-4)

The support system table (TBL-4) accommodates the system workstation (SWS) and the optional laser printer (LP-7). Refer to Table 19 for the TBL-4 specifications and to Figure 29 for an illustration of a TBL-4.

Table 19. TBL-4 Specifications

Characteristic	Specification
Height	28.50 in. (724 mm)
Width	48.00 in. (1219 mm)
Depth	30.00 in. (762 mm)
Weight	85 lbs (39 kg)

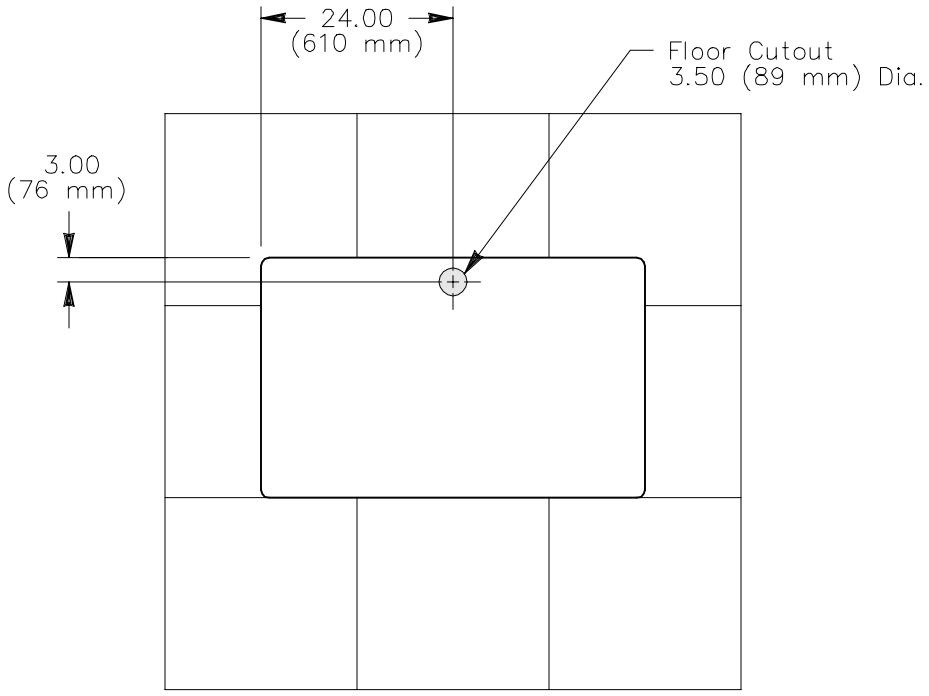
Figure 29. Support System Table (TBL-4)



Floor Preparation

As shown in Figure 30, each TBL-4 requires a 3.50-in. (89-mm) diameter floor cutout for the entry of power and data cables. The floor cutouts must be free of sharp edges and burrs to prevent damage to these system connections.

Figure 30. TBL-4 Floor Cutout



Site Planning Checklist

Table 20 provides a site planning checklist that you can use as an organizational tool during the site planning and preparation process. During the planning process, you might find additional preparation issues at your site that the checklist does not include. To discuss your site plans and to resolve these issues, contact a Cray Research site planning representative by one of the methods listed in the summary of this document.

Table 20. Site Planning Checklist

Yes	No	Computer Room Floor Preparation	Comments
		Are all floor cutouts complete?	
		Are all floor cutouts in the correct location? Do they match the Cray Research equipment layout drawing?	
		Does the equipment placement satisfy the equipment separation limits?	
		What is the height of the raised floor (subfloor to top of panel)?	
		Are there any underfloor obstructions beneath the equipment that will interfere with power wiring, cooling, hose connections, etc.?	
		Is the floor level?	
		Are additional underfloor support pedestals in place at the correct locations beneath the mainframe, HEUs, etc.?	
		Are all floor cutouts free of burrs?	
		Have all interfering floor stringers been removed?	
		Are the raised-floor panels static dissipative? (1,000,000 to 1,000,000,000 ohms of surface resistivity)	
		Will the raised-floor stringer system act as the signal reference grid? If so, are the stringers bolted to the pedestal heads?	
		How will the signal reference grid be constructed if the raised floor system is not used? (Low impedance conductor or solid metal plane construction, size and spacing of conductors, etc.)	
		Has the signal reference grid been connected to earth ground? How and where? What is the size of the conductor?	
		Have provisions been made to tie the Cray equipment braided bonding straps to the signal reference grid, preferably at pedestal heads or grid intersections?	

Table 20. Site Planning Checklist (continued)

Yes	No	Water Piping Preparation	
		Have the cooling water flange assemblies been installed according to the water piping diagram?	
		Is there a water bypass circuit?	
		Are there any obstructions beneath the equipment and near the water flange assemblies that will prevent hose connections?	
		What is the planned inlet water temperature to the HEU?	
		Are the cooling water lines insulated?	
		What are the water-loop line sizes?	
		Are the outboard ends of the water flange assemblies and piping well supported?	
		Have the cooling water pumps been tested?	
		Does the water system have a backup water pump?	
		Have the water temperature, pressure, and flow monitors been installed?	
		Has a cooling water strainer with bypass been installed? What is the size of the strainer mesh?	
		Is the water piping bonded to the signal reference grid?	
		Are the water pumps and chiller on UPS power?	
		Does a water storage tank exist? What is the size of the water storage tank?	
		Does the cooling water meet the specifications outlined in the water-quality subsection of this manual?	

Table 20. Site Planning Checklist (continued)

Yes	No	Computer Room Environmental	Comments
		Have the computer room air handlers been tested? Model: Quantity and size:	
		What is the computer room design temperature and humidity levels or settings?	
		Are the air handlers and air filters clean?	
		Is the computer room replacement air filtered? Is the replacement air volume satisfactory?	
		Does the computer room have positive air pressure relative to the rooms that are adjacent to the computer room?	
		Is the computer room vapor sealed?	
		Are the ceiling tiles a nonshedding, vapor-barrier type?	
		Do any unsealed penetrations exist in the underfloor that will allow plenum pressure to escape?	
		Is the concrete subfloor sealed?	
		Is the underfloor area clean?	
		Is there any corrosion on the subfloor structures?	
		Does the computer room have proper and adequate humidity control? What type of humidification process is used?	
		Has the computer room been tested to verify compliance with class 100,000 standards?	
		Is adequate cooling provided for the plant room (if applicable)? What is the design temperature (if applicable)?	
		Does the battery cabinet environment exceed 77 °F (25 °C)?	
		Is one of the following types of fire suppression systems used? Halon Underfloor Above floor Sprinklers Preaction Wet type	

Table 20. Site Planning Checklist (continued)

Yes	No	Facility Access	Comments
		Has the method of unloading the computer system from the shipping truck been determined (equipment and/or personnel)? What is the height of the loading dock?_____	
		Is the access to the truck-unloading area clear?	
		Has an access route from the truck-unloading area to the planned system location been identified?	
		Does the path satisfy the access requirements outlined in this site planning manual?	
		Is the path from the unloading areas to the planned system location clear?	
		Do all ramps in the path have a slope of less than 1 to 6? Length: Height: Width:	
		What are the measurements of the access doors to the computer room? Height: Width: Height: Width: Height: Width:	
		What is the elevator capacity?	
		What are the measurements of the elevator? Height: Width: Depth:	
		What are the measurements of the elevator door? Height: Width:	
		What is the ceiling height at the CRAY T932 mainframe location (must be greater than 92.50 in. [2350 mm])?	
		Will the following equipment be necessary? Crane Side travel forklift Pallet jack Dockplate Extra aluminum plates Plywood sheets Skid or roller plate Power pusher ROL-A-LIFTs Wedge Come-a-long	

Table 20. Site Planning Checklist (continued)

Yes	No	Computer Room Power Wiring Preparation	Comments
		Have the 125-amp, 330-Vdc power circuits from the HVDC-185 been installed? What is the size of the wire? What is the size of the conduit? Refer to the mainframe wire diagram to ensure that the conduit restraints will connect to the bottom of the mainframe (2 in. [51 mm] clearance for conduit).	
		Are the 10-amp, 120-Vac, 50/60-Hz control power circuits from the HVDC-185 cabinets to the CRAY T932 mainframe installed?	
		Are the 10-amp, 120-Vac, 50/60-Hz circuits from the HVDC-185 cabinets to the floor mounted convenience receptacles installed?	
		Have all of the HEU input power circuits been installed? Does the HEU-T2 receptacle extend 36 in. (914 mm) above the raised floor height?	
		Have the receptacles and circuits for the PC-10 cabinet(s), the CRAY SSD-T90 cabinet(s), and the SWS been installed? Are they the correct type? Are they positioned to satisfy the equipment power cord length?	
		Have the circuit breaker panels and receptacles been properly labeled?	
		Have the computer room circuit breaker panels and/or equipment power distribution unit been bonded to the signal reference grid?	
Yes	No	HVDC-185 Start-up and Operation	Comments
		What are the HVDC-185 serial numbers? Cabinet 1_____ Cabinet 2_____	
		Is the required service clearance maintained for each HVDC-185 (minimum 36 in. [914 mm] for front and 24 in. [610 mm] for rear)?	
		Are the additional underfloor support pedestals installed under the HVDC-185 cabinets?	
		What is the input voltage of each HVDC-185?	
		Are the HVDC-185 cabinets clean?	
		Are all of the input and output power wiring circuits connected to the HVDC-185 cabinets?	

Table 20. Site Planning Checklist (continued)

Yes	No	UPS Preparation	Comments
		Is Cray Research or the customer providing the UPS?	
		What is the model and size of the UPS? Model: Size: S/N: Quantity of battery cabinets:	
		Does the UPS have a bypass input circuit?	
		What is the size of the UPS input circuit? What is the size of the circuit breaker and the quantity of the conductors?	
		Is the required service clearance maintained for the UPS (minimum 36 in. [914 mm] for front)?	
		Have additional underfloor support pedestals been installed under the UPS?	
		What is the input voltage at the UPS?	
		Are the UPS cabinets clean?	
		Have all input and output power wiring circuits been connected to the UPS?	
		Is the procedure for starting and stopping the Cray Research UPS (if applicable) (10658634 for MGE UPS) attached to the front of the UPS?	
Yes	No	General Site Preparation	Comments
		Has the installation date and time been determined? Date: Time:	
		Have badges been acquired for the installation personnel? Will escorts be necessary?	
		Does the service personnel office space meet the standards outlined in this site planning manual?	
		Have dedicated telephone lines for remote maintenance been installed?	
		Have electricians been scheduled?	
		Have personnel that are knowledgeable about the facility water system been scheduled?	
		Has special rigging equipment been arranged?	

Summary

Now that you understand the basic configurations and requirements of the CRAY T932 computer system, you can make appropriate plans for your site. Cray Research site planning representatives are available for consultation regarding site planning and preparation. You may contact a Cray Research site planning representative by any of the following methods:

- Phone +1 715 726 2820, or the USA: 1 800 284 2729, extension 62820
- Fax +1 715 726 2969
- E-mail *site@cray.com*
- Web site *http://site.cray.com*