CRAY Y-MP8 Computer Systems Site Planning Reference Manual

Mainframes with S/N 1010, 1014, 1016 and up

HR-4000 A

Cray Research, Inc.

The CRAY Y-MP8 computer system is exempt from the technical requirements of the FCC's Part 15 Subpart J rules pursuant to Section 15.801 (C).

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Record of Revision

Each time this manual is revised and reprinted, all changes issued against the previous version are incorporated into the new version, and the new version is assigned an alphabetic level which is indicated in the publication number on each page of the manual.

Changes to part of a page are indicated by a change bar in the margin directly opposite the change. A change bar in the footer indicates that most, if not all, of the page is new. If the manual is rewritten, the revision level changes but the manual does not contain change bars.

REVISION	DESCRIPTION
	January 1988 - Original printing.
A	March 1989 - Rewrite. The CRAY Y-MP8 computer system configuration has changed. Numerous editorial changes were made.

PREFACE

The manual contains technical information to plan and prepare a typical site for a CRAY Y-MP8 computer system installation.

Site planning and facility preparation are important early steps in the successful installation of a computer system. Close communication and mutual cooperation between you and Cray Research, Inc. (CRI) is essential during all phases of the preparation and installation sequence. CRI maintains a staff of highly qualified site planning engineers who are experienced in handling a wide variety of site planning and preparation problems. CRI recommends that you involve qualified mechanical and electrical facility engineers early in the design stages of site preparation.

This manual contains site planning information for the following computer equipment:

- CRAY Y-MP8 computer system mainframe chassis (MFC)
- Mainframe heat exchanger unit (HEU)
- I/O subsystem chassis (IOC)
- I/O subsystem chassis power distribution unit (IOC/PDU)
- SSD solid-state storage device chassis
- SSD power distribution unit (SSD/PDU)

AUDIENCE

This manual is for the management and personnel responsible for preparing the facility for a CRAY Y-MP8 computer system.

ORGANIZATION

This manual is organized as follows:

SECTION 1 - INSTALLATION PROCESS describes site planning meetings and CRAY Y-MP8 computer system installation stages.

SECTION 2 - GENERAL REQUIREMENTS describes general requirements for the CRAY Y-MP8 computer system.

SECTION 3 - SYSTEM CONFIGURATIONS lists the available equipment for the CRAY Y-MP8 computer system.

SECTION 4 - MAINFRAME CHASSIS describes specific requirements for the CRAY Y-MP8 mainframe chassis (MFC).

SECTION 5 - I/O SUBSYSTEM CHASSIS - describes specific requirements for the I/O subsystem chassis (IOC).

SECTION 6 - SSD SOLID-STATE STORAGE DEVICE CHASSIS - describes specific requirements for the SSD chassis.

SECTION 7 - POWER DISTRIBUTION UNITS - describes specific requirements for the IOC power distribution unit (IOC/PDU), and SSD power distribution unit (SSD/PDU).

SECTION 8 - HEAT EXCHANGER UNIT - describes specific requirements for the heat exchanger unit (HEU).

SECTION 9 - EQUIPMENT SEPARATION LIMITS discusses the restrictions associated with the arrangement of CRAY Y-MP8 computer system equipment.

NOTATIONAL CONVENTIONS

Measurements in the figures of this manual are in inches unless otherwise specified.

RELATED PUBLICATIONS

This manual is one of several site planning manuals that are required to prepare for your installation. For complete site planning information, refer to the latest revision of the following CRI publications:

- HR-0080 *Cray Peripheral Equipment Site Planning Reference Manual*
  This manual provides site planning information for operator and maintenance workstation equipment, disk storage units, and front-end interface equipment.
- HR-0082 *Cray Support Equipment Site Planning Reference Manual*
  This manual provides site planning information for refrigeration condensing units (RCUs) and motor-generator sets (MGSs).
- HR-0306 *Safe Use and Handling of Fluorinert Liquids*
  This manual discusses the Fluorinert Liquid properties, stabilities, and precautionary requirements in detail.

Because the information in this manual is subject to change, consultation with CRI site planning personnel and CRI approval of the actual site preparation working drawings is required before preparing a site. Direct questions involving site planning and preparation to CRI as early as possible in the installation sequence.

Submit requests for site planning information to the following address:

CRAY RESEARCH, INC.
Site Engineering Building
21 East Grand Avenue
Chippewa Falls, WI 54729

Telephone (715) 723-1560
Facsimile (715) 723-6846

READER COMMENT FORM

A reader comment form is included in the back of this manual.

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1 - INSTALLATION PROCESS

Site planning and preparation is a major step in the successful installation of a CRAY Y-MP8 computer system. This manual explains facility planning and preparation shared by you and Cray Research, Inc. (CRI). To assist you during the planning stages and to ensure that site preparations meet the specified requirements, CRI employs site planning personnel who are in direct communication with you during planning and preparation. CRI recommends that you involve qualified electrical and mechanical facility engineers early in the design stage of site preparation. CRI site planning personnel must review and approve customer-prepared mechanical and electrical design drawings before any site preparation begins. We encourage direct communication with our site planning personnel. Planning and preparation requirements ensure the following:

- Personnel safety
- The highest degree of system performance achievable
- Satisfactory system installation
- Satisfactory operator and maintenance access

You should allow at least 6 months to plan and prepare your facility for the installation of a CRAY Y-MP8 computer system. Each site presents a set of unique problems to be investigated and resolved.

Identifying the initial system configuration as well as future upgrade plans ensures effective site planning. The CRAY Y-MP8 computer system is available in a variety of configurations and options.

Each site must conform to local and national building and electrical codes.

SITE PLANNING MEETINGS

Site planning meetings establish a communication link between you and CRI. CRI site planning personnel schedule a minimum of three site planning meetings with you at your facility to ensure proper site preparation.

Initial Meeting

The first site planning meeting is preferably held 6 months before system delivery. At this meeting, site planning personnel perform the following tasks:

- Tour and review your facility
- Identify potential site difficulties
- Review the site planning manual with you

- Define the materials and labor to be supplied by you
- Define the materials and labor to be supplied by CRI
- Provide specifications and documentation (not working drawings) for the equipment ordered

From CRI specifications and documentation, your facility or consulting engineering staff will prepare the working drawings and specifications used to perform the electrical and mechanical work required for site preparation.

Interim Meeting

Interim meetings are held at your facility as required to review your progress and to resolve any site problems.

Final Meeting

Approximately 2 to 4 weeks before system delivery, a final meeting and site review are held to ensure that your facility is properly prepared. By this time, you will have installed the pre-installation equipment shipped by CRI. CRI personnel will review the preshipped equipment installation, floor cutout preparations, refrigerant piping, and electrical wiring. The motor-generator sets (MGSs) will be run during the final site review. The refrigeration condensing units (RCUs) will not be operated during the final site review.

SYSTEM INSTALLATION

The installation of a CRAY Y-MP8 computer system consists of seven basic stages:

1. Preshipment/installation of support equipment
2. System shipping preparation
3. System transportation
4. System installation
5. System startup/stabilization
6. System on-site quality assurance
7. System operations preparation

Preshipment/Installation of Support Equipment

Approximately 8 weeks prior to the system delivery, CRI delivers all necessary equipment classified as support equipment. Support equipment, typically consisting of MGSs, RCUs, and refrigeration piping kits are delivered to your site through a commercially available transportation organization.

You are responsible for receiving, unloading, and installing the support equipment without CRI attendance or supervision.

System Shipping Preparation

At least 1 week before delivery, the computer system is prepared for shipping. Major components are disassembled into the shipping configuration and are structurally and protectively prepared. Cabling and miscellaneous materials are packaged and identified for shipment.

System Transportation

The system equipment is transported to your facility by commercially available, dedicated, tractor-trailer semis with air-suspension ride and climate control.

For intercontinental shipments, the system equipment is prepared for shipment and transported by commercial cargo-carrying aircraft.

System Installation

Under CRI supervision, you will unload and move the system equipment into your facility. You must arrange and provide for any special equipment (such as forklifts, cranes, platforms, and so on) required to unload the computer equipment. You must also arrange and provide for all labor associated with the equipment unloading and movement.

CRI installation personnel perform the following tasks:

- Ensure that all equipment is properly located
- Mechanically reassemble the computer system
- Connect all logic cables
- Attach refrigeration hoses and dielectric coolant hoses

During the installation process, contractors, arranged for and supplied by you, connect all power and control wiring to the equipment.

Site planning representatives generally accompany CRI installation personnel during system installation.

System Startup/Stabilization

During system startup and power/cooling stabilization, CRI personnel activate all necessary electrical and refrigeration controls. If problems are discovered involving contractor installed electrical or refrigeration circuitry, you must provide personnel to correct the problem.

System On-site Quality Assurance

Upon completion of system startup and power/cooling stabilization, CRI personnel will perform all necessary CRI-defined system installation quality assurance functions and tests.

System Operations Preparation

CRI declares the system ready for use upon satisfactory completion of all CRI installation quality assurance functions. At this point, CRI on-site personnel perform the software activities to prepare the system for customer acceptance or use.

2 - GENERAL REQUIREMENTS

For proper installation and operation of the CRAY Y-MP8 computer system, your facility must meet the general requirements outlined in this section. Specific equipment requirements are defined in Sections 4 through 8. The equipment separation limits are described in Section 9.

Equipment requirements for support equipment and peripheral equipment are found in the CRI site planning reference manuals listed in the preface.

COMPUTER ROOM ENVIRONMENT

The CRAY Y-MP8 computer system must be operated in a controlled computer room environment. Although the requirements encompass the overall computer room, they are particularly oriented towards air-cooled devices such as disk drives, printers, CRTs, and so on. Therefore, the design and component placement of your environmental control system (such as computer room air conditioning units) must ensure inlet air to the air-cooled device meets the environmental requirements specified in this section.

CRI makes every effort to improve the hardware's immunity to environmental irregularities. However, emphasis must be placed on your facility's environment to ensure that hardware reliability is not adversely affected. Likewise, emphasis must be placed on your ongoing housekeeping and maintenance practices to ensure continued hardware reliability.

The CRAY Y-MP8 computer system requires a computer room environment controlled within the following ranges.

- **Temperature:** 60 °F to 80 °F (16 °C to 27 °C)
  Maximum temperature change in a one hour period is 3 °F (1.6 °C), at a rate of change not exceeding 10 °F (5.5 °C) per hour
- **Humidity:** 35% to 65% relative humidity (non-condensing)
  Maximum rate of change is 5% relative humidity per hour
- **Dew point:** 55 °F (13 °C) maximum

- Air quality: For particles greater than 0.5 micron in size, 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, 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, concentration must not exceed 6.5×10^2 particles/ft^3 (2.3×10^4 particles/m^3)

One fresh air change per hour is required in the computer room environment.

Note: No smoking materials, food, or beverages are allowed in the vicinity of the CRI computer room equipment.

POWER PLANT ROOM ENVIRONMENT

Although it is desirable to locate the MGSs and RCU(s) in the computer room, facility constraints may make it necessary to locate the MGSs and RCU(s) in a plant room. The plant room must meet the following environmental specifications.

- Temperature: 65 °F to 95 °F (18 °C to 35 °C) with maximum rate of change not to exceed 20 °F (11 °C) per hour
- Humidity: 30% to 80% relative humidity (non-condensing)
- Air Quality: A clean, dirt- and dust-free environment must be maintained

The plant room should be located as close as possible to the computer room (refer to Section 9, "Equipment Separation Limits").

SITE ACCESS REQUIREMENTS

Prior to system delivery, you must ensure that site accesses meet the provisions discussed later in this section.

CRI provides protective covering (aluminum sheets) for raised floor panel areas during the moving-in process.

SHIPPING AND INSTALLATION

The CRAY Y-MP8 mainframe chassis (MFC) is shipped and installed with all modules and power-supply sections in place. The approximate shipping weight of the MFC is 5,800 lb (2,631 kg). Figure 2-1 illustrates the MFC shipping configuration. Note the lifts secured to the MFC.

The central section of the I/O subsystem chassis (IOC) and the optional SSD solid-state storage device are shipped, moved, and installed separately from their power-supply sections. The approximate shipping weight of the IOC or optional SSD is 2,600 lb (1,179 kg). Figure 2-2 illustrates the IOC and optional SSD chassis shipping configuration. Note the specially designed lifts secured to the chassis.

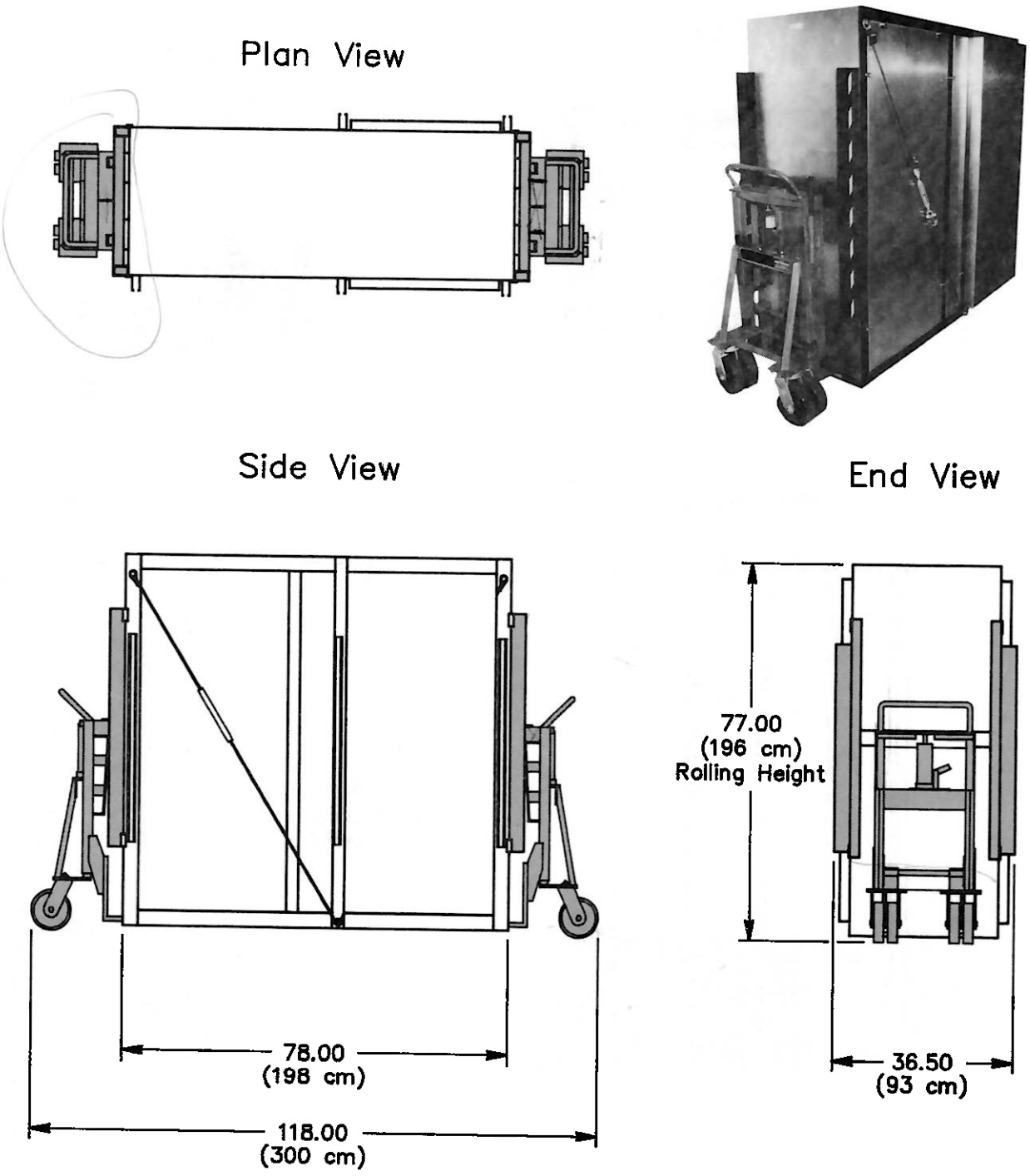


Figure 2-1. CRAY Y-MP8 Mainframe Chassis Shipping Configuration

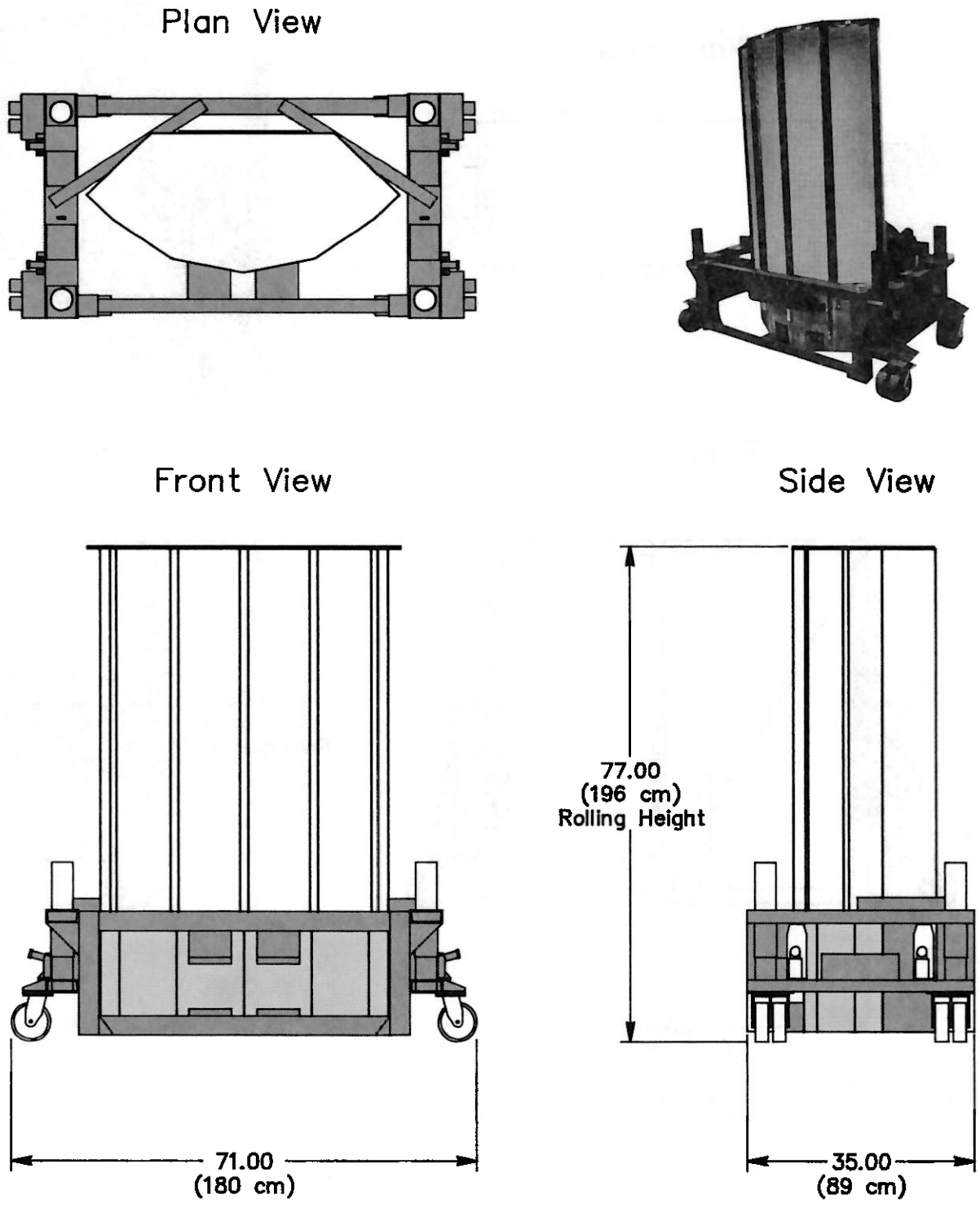


Figure 2-2. IOC and Optional SSD Chassis Shipping Configuration

The MFC, IOC, and SSD chassis lifts are capable of elevating the units to an adequate height for mobility.

Access routes to the computer room must be able to support rolling casters with 750-lb (334-kg) loads. This load support requirement applies especially to inclines, where the equipment is more vulnerable to possible damage. The slope of any incline negotiated during the installation of CRI computer equipment must not exceed 1 unit in height by 6 units in length.

Installation of CRI computer equipment requires openings with minimum clearances of 80 in. (203 cm) in height and 60 in. (152 cm) in width along the access route to the computer room. If a doorway is located close to an incline, the door height requirement may be greater.

You must also verify that adequate clearance and load support capability exists along the access route for the installation of the CRI support equipment. Refer to the appropriate section of the *Cray Support Equipment Site Planning Reference Manual,* publication number HR-0082, for details.

ELECTRICAL REQUIREMENTS

CRI makes every effort to improve the hardware's immunity to power failures and interruptions. However, a system of this complexity, if subjected to repeated power fluctuations or interruptions, will suffer a higher component failure rate than it would with a stable power source. CRI encourages you to make every effort to provide a stable power source so that hardware reliability is not adversely affected.

CRI computer equipment requires the following electrical services:

- 460±10% Vac, 3 phase, 60 ±3 Hz
- 208 Vac, 3 phase, 60 Hz
- 120 Vac, 1 phase, 60 Hz

The 208/120-Vac, 60-Hz electrical service must conform to the following specifications:

• Voltage tolerance:	+5% to -10%
• Phase imbalance:	5% maximum (line to line, line to 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:	±1%
• Frequency rate of change:	Less than 1.0 Hz/s during any 10-cycle period

Total kilowatt power requirements depend on the system configuration and expansion allowances. CRI provides documentation during the initial site planning meeting to estimate the power requirements based on your specific system configuration.

Exceptional Electrical Requirements

If your facility's electrical services are 50 Hz (and not 60 Hz as defined previously in this section) you must provide the following electrical services:

- 398±5% Vac, 3 phase, 50±3 Hz
- 208/120 Vac, 60 Hz (as defined in this section)

When a CRI computer system is installed in a location supplying only 50-Hz power, CRI provides the heat exchanger unit (HEU) and support equipment [RCU(s) and MGS(s)] in models equipped for operation at 50 Hz.

The 208/120-Vac, 60-Hz electrical requirement may require you to provide a 50-Hz to 60-Hz frequency convertor. When selecting the frequency convertor, size it in accordance with your anticipated system expansion plans.

Equipment Grounding Requirements

All CRI computer equipment requires a protective power safety-ground system and a signal-ground reference system.

The power safety-ground system protects personnel from shock hazards and protects the computer equipment from damage due to electrical malfunctions. The power safety-ground system is regulated by your local and national electrical codes.

The signal-ground reference system is a low impedance network (or plane) of conductors providing multiple parallel conducting paths to establish an equipotential reference point for low current, high frequency, digital signals between interconnected computer equipment.

CRI provides an equipment grounding document during the initial site planning meeting that describes the ground system requirements and identifies alternative methods for providing the signal-ground reference system. In addition, the document discusses electro-static discharge (ESD) precautions and maintenance of the facility's grounding systems.

You must provide, install, and maintain the approved grounding systems described in the CRI equipment grounding document.

All CRI computer equipment is supplied with braided ground straps. You are responsible for connecting the ground straps to the signal-ground reference system.

POWER WIRING REQUIREMENTS

Approximately 8 weeks prior to scheduled system installation, CRI will ship the MGS(s), RCU(s), and refrigeration piping kits to your facility.

You must install the support equipment and provide all necessary power wiring, circuit breakers, circuit breaker panels, refrigerant piping, etc. (for detailed information regarding installation of the support equipment, refer to the *Cray Support Equipment Site Planning Reference Manual*, publication number HR-0082). In addition, prior to computer system delivery, you must install all remaining power and control wiring (between the PDUs and the chassis power supplies for example) which will be required to complete the installation at the time of computer system delivery.

During installation of the computer system, CRI personnel perform the mechanical reassembly of the computer equipment, attach all dielectric-coolant and refrigerant hoses, and install all associated logic cabling. You are required to supply and connect all remaining 50/60-Hz and 400-Hz power and control wiring needed to complete the installation.

Figures 2-3 and 2-4 are block diagrams of the basic power and control wiring for the CRAY Y-MP8 computer system configured with the optional SSD and second IOC. If your system configuration does not include the optional SSD, all wiring associated with the optional SSD, its SSD/PDU, and the RCU-4 need not be installed. If your system configuration does not include the optional second IOC, all wiring associated with the optional second IOC, its IOC/PDU, and the RCU-4 need not be installed.

The optional standby motor-generator set (MGS) is also illustrated in Figures 2-3 and 2-4. The following notes provide additional information to the block diagrams:

- Figures 2-3 and 2-4 are guides for your electrical design engineer and must not be used as bid documents or working drawings.
- The component arrangements shown in Figures 2-3 and 2-4 do not represent actual equipment layout.
- All wiring should be prepared according to applicable local and national codes. Wire gauges indicated in Figure 2-4 suggest minimum size requirements and should be used for reference only.
- Actual wire sizes must be selected to ensure that the maximum voltage drop from the 400-Hz MGS to the MFC, IOC, and SSD chassis input does not exceed 2%.
- All circuit breakers, circuit breaker panels, magnetic contactors, main power disconnect switches, junction boxes, power wiring, and wiring raceways and conduits required, must be provided and installed by you.
- Conduits or raceways used for 400-Hz power distribution must be aluminum or nonferrous.
- Circuit breakers used for 400-Hz power distribution can be 60-Hz rated, but must be sized for 400-Hz application.
- Your site preparation design should allow for circuit additions proportionate to system expansion plans.
- CRI recommends the installation of one emergency OFF switch at each computer room exit. All emergency off switches should be wired in series and should interrupt power to the computer equipment and to all air circulating units in the computer room.
- Secure all conduits terminating at floor-mounted computer equipment with approved fittings at the equipment entrance. Refer to specific equipment sections in this manual for detailed requirements.
- All CRI equipment must be earth-grounded. Refer to the "Equipment Grounding Requirements" subsection in this section and to specific equipment sections for detailed requirements.
- Detailed point-to-point diagrams for all wiring connections to the MFC, HEU, IOC, optional SSD, PDUs, RCU(s), and MGS(s) are included in the CRI-supplied site planning documentation.

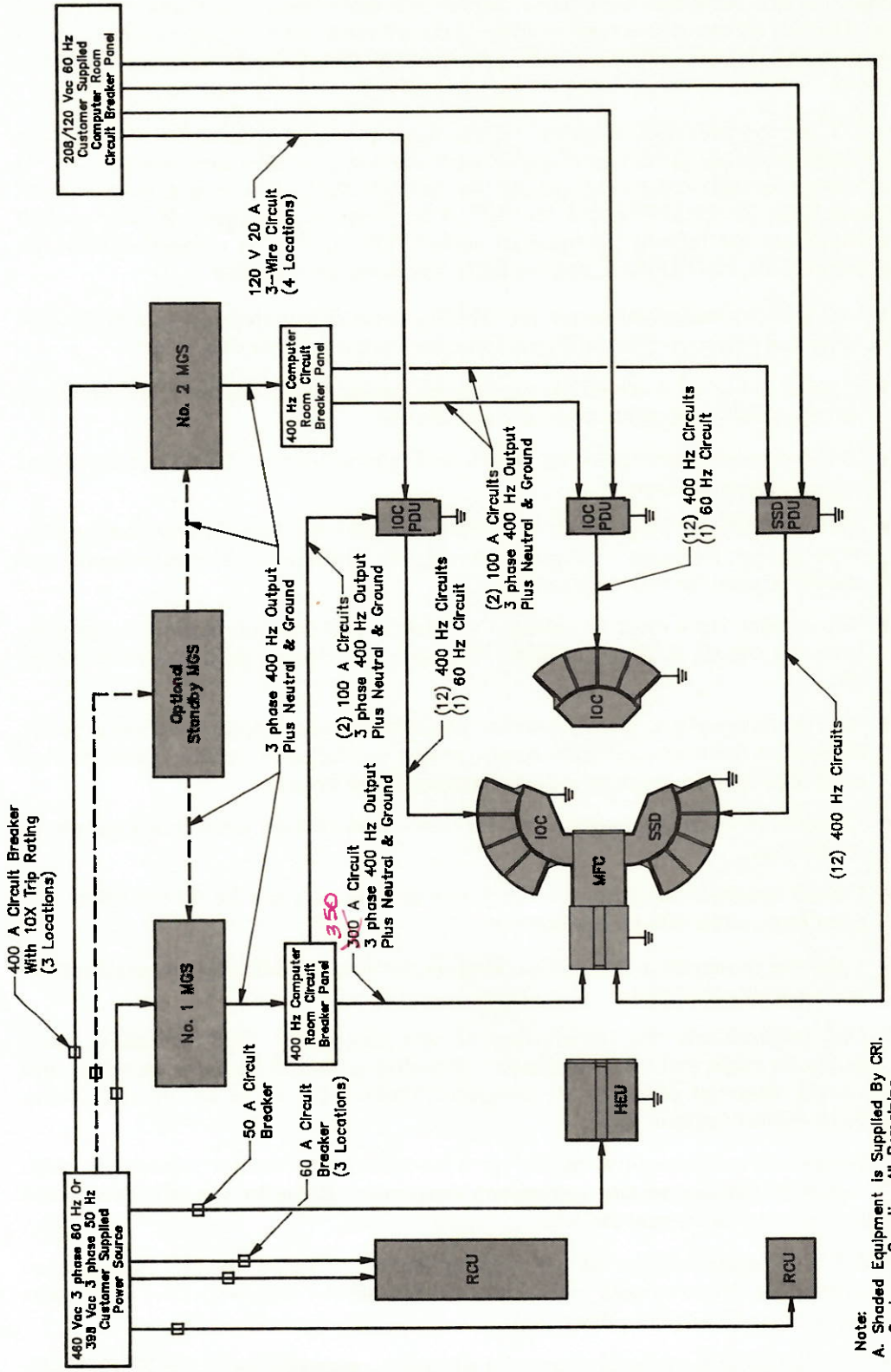


Figure 2-3. Basic Power Wiring for a CRAY Y-MP8 Computer System

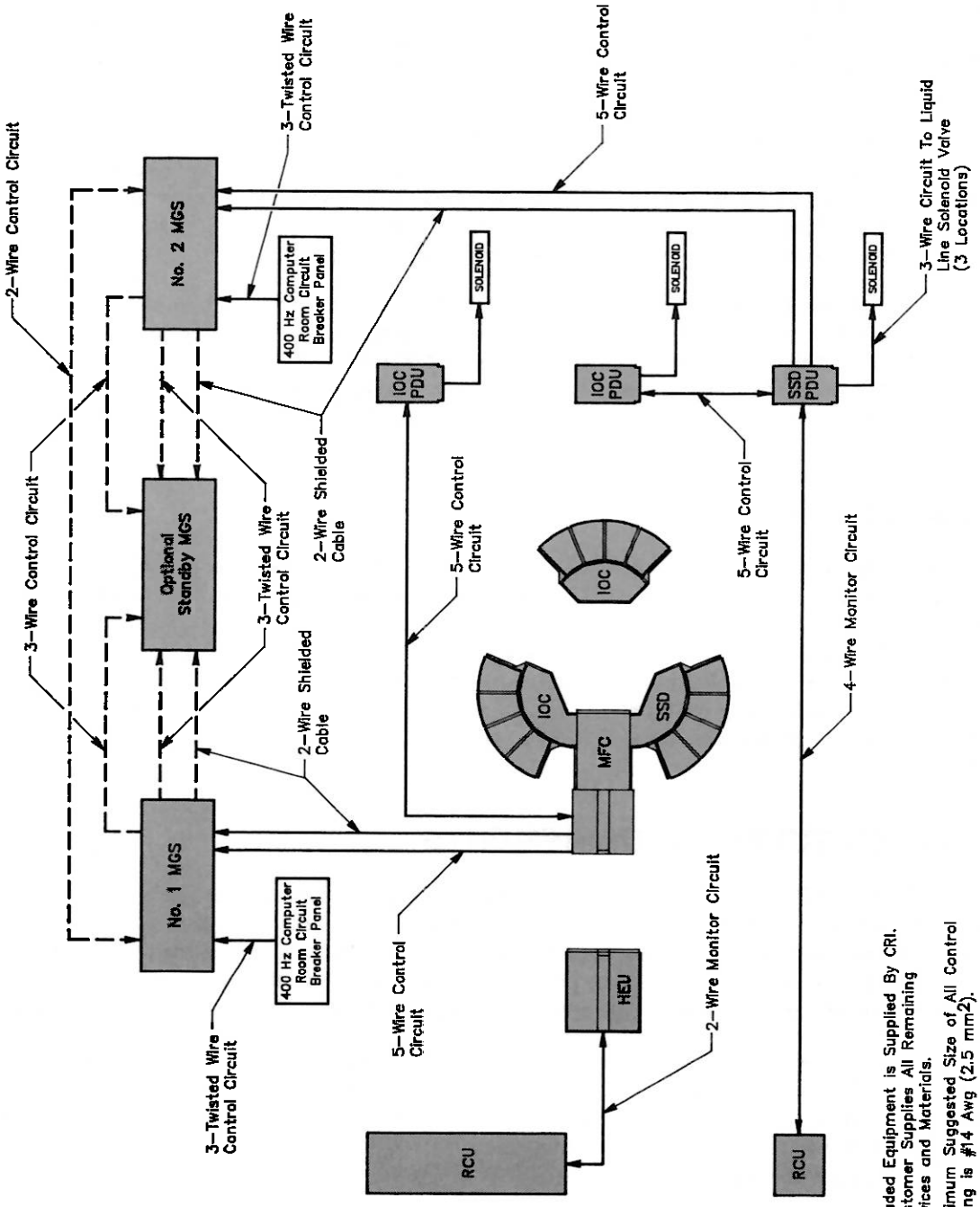


Figure 2-4. Basic Control Wiring for a CRAY Y-MP8 Computer System

DIELECTRIC COOLANT

The CRAY Y-MP8 computer system uses a dielectric coolant (Fluorinert liquid) to cool the computer mainframe. Heat dissipated from the integrated circuit modules and power supplies within the mainframe is absorbed by the dielectric coolant. The dielectric coolant is circulated through the mainframe by a pump located within the HEU. The HEU also contains a heat exchanger that transfers the heat from the dielectric coolant to the RCU(s).

You must ensure that there is one fresh air change per hour in the computer room and that there are no excessive heat sources that may cause Fluorinert liquid decomposition; this includes smoking which must not be allowed in the computer room or any other areas where Fluorinert liquid may be used or stored. Refer to the "Computer Room Environment" subsection in this section for more information.

Note: Fluorinert Liquid is a safe product when used properly. When exposed to an excessive heat source, Fluorinert liquid can decompose and produce hazardous by-products. Refer to *Safe Use and Handling of Fluorinert Liquids*, CRI publication number HR-0306, for information on Fluorinert liquid properties and precautionary requirements. All personnel must read this publication before working in the CRAY Y-MP8 computer room.

Dielectric-coolant Hoses

Flexible hoses and special manifolds are required to complete the dielectric-coolant circuitry between the MFC and HEU. CRI supplies and installs all associated flexible hoses and manifolds for the dielectric coolant at the time of system installation. Figure 2-5 illustrates the standard arrangement of dielectric-coolant hoses and manifolds. To ensure adequate space exists in the underfloor area, you must maintain a zone clear of underfloor obstructions in the area occupied by the hoses and manifolds. This zone must extend downward at least 12 in. (30.5 cm) from the underside of the raised floor panels.

COOLING WATER SUPPLY REQUIREMENTS

The CRAY Y-MP8 computer system requires an adequate source of clean cooling water be supplied to the RCU(s). CRI provides a document identifying the water quality requirements during the initial site planning meeting. CRI water quality requirements must be met; you may be required to provide a closed-loop chilled water system. An open system (cooling tower) does not guarantee satisfaction of the water quality requirements.

Cooling water temperature, (measured at the RCU's inlet) must not vary more than ±10 °F (5.6 °C) from the original design/start-up temperature. The rate of change must not exceed 5 °F (2.8 °C) per 15-minute cycle. Although the RCUs are designed to accommodate water supply temperatures from 40 °F to 70 °F (4.4 °C to 21.1 °C), CRI recommends a water supply temperature of 50 °F (10 °C).

The RCU's cooling water flow rate requirements and pressure drop values vary depending on the cooling water supply temperature as well as the percentage of treatment (antifreeze, corrosion inhibitors, and so on) in the water. During the initial site planning meeting, CRI provides flow rate and pressure drop values, based on your system configuration and 50 °F (10 °C) water supply temperature. For more information regarding the RCU(s), refer to the *Cray Support Equipment Site Planning Reference Manual*, publication number HR-0082.

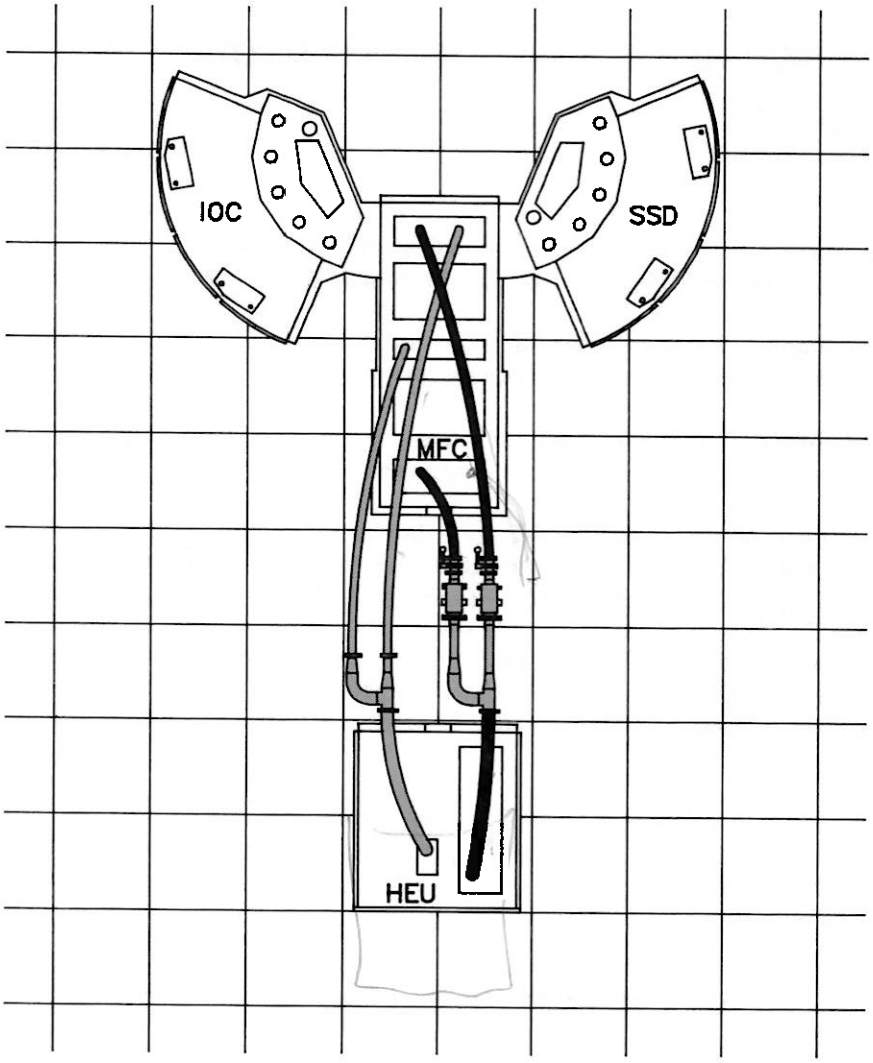


Figure 2-5. Dielectric-coolant Hoses and Manifolds

HEU, IOC, and SSD REFRIGERANT PIPING REQUIREMENTS

The HEU, IOC, and optional SSD are cooled by a refrigerant cooling technique that requires refrigerant piping to distribute the refrigerant liquid and return the refrigerant vapor to the remote RCU(s).

Your mechanical design engineering staff must prepare working drawings and documentation providing detailed information on planned refrigerant piping.

Approximately 8 weeks before delivery of the computer system, CRI will deliver the RCU(s) and special refrigeration piping component kits to your facility.

The refrigeration piping component kits consist of special manifold assemblies, but do not include all refrigeration piping components and materials needed to prepare the facility.

Installation of the special refrigeration components and the RCU(s) are your responsibility (for detailed information regarding the support equipment, refer to the *Cray Support Equipment Site Planning Reference Manual*, publication number HR-0082). You must supply and install all piping materials, couplings, and elbows needed to interconnect the CRI supplied components and to prepare the facility refrigerant piping for the computer installation. In addition, you must test the refrigerant piping and prepare for final connection before delivery of the computer system.

CRI provides a refrigeration piping and component installation document during the initial site planning meeting. This document describes the required materials, proper installation procedures, leak testing procedures, and evacuation procedures that must be followed by your facility personnel.

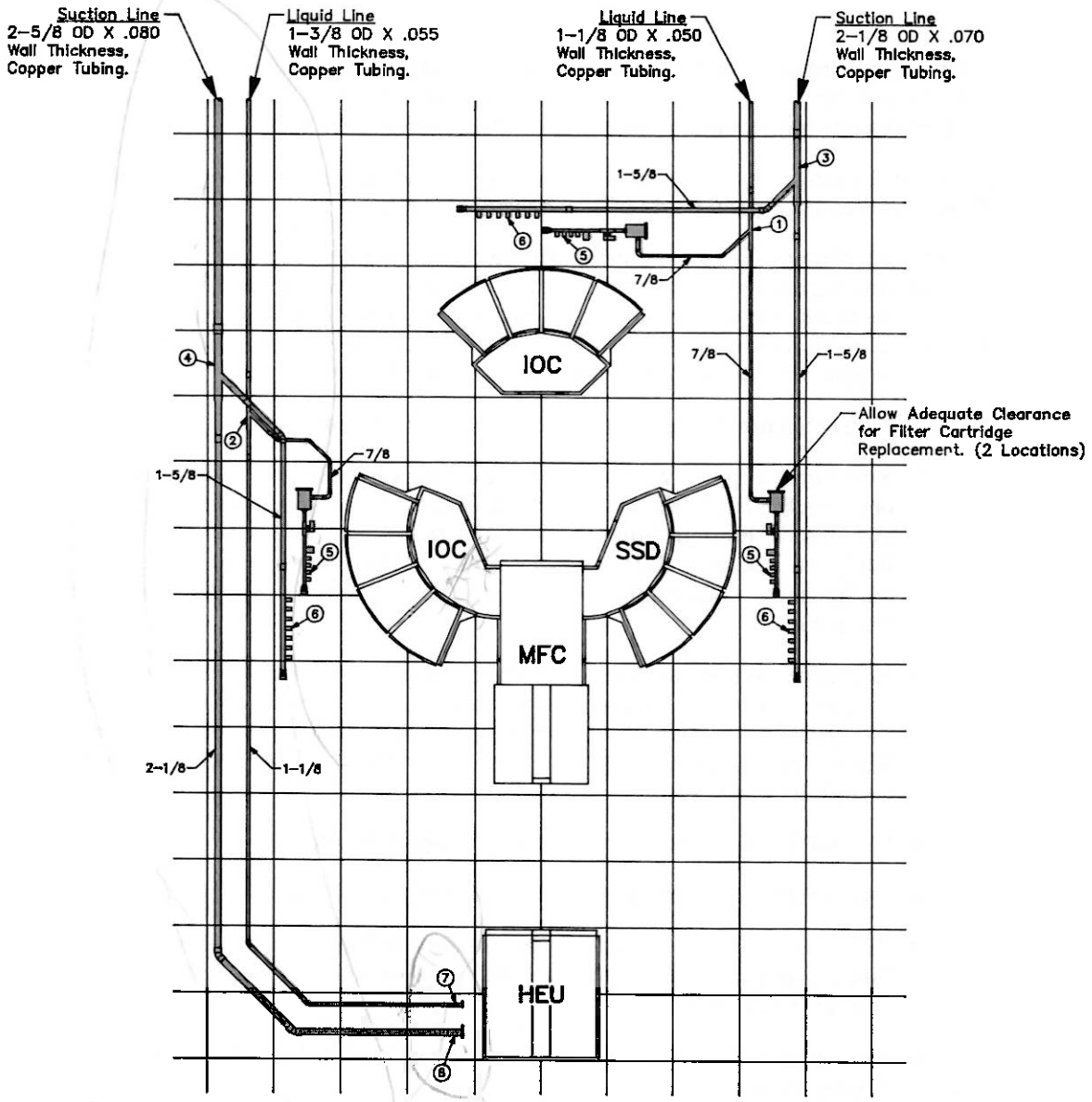
CAUTION

Do not energize the refrigeration condensing units (RCUs) prior to system installation. The RCU's compressor motor windings will overheat if operated without a heat load.

At the time of the computer system installation, CRI supplies and installs the flexible refrigeration hoses required to complete the refrigerant piping network. In addition, CRI system installation personnel will charge the refrigeration system, adjust all controls and valves, and apply power to initialize operation of the RCU(s). You must supply an adequate amount of R-22 refrigerant to fully charge the system (refer to the *Cray Support Equipment Site Planning Reference Manual*, publication number HR-0082).

The HEU and primary IOC are cooled by a common RCU. The optional SSD and second IOC are cooled by a second RCU. You must install the refrigeration piping beneath the computer room raised floor between the RCU(s) and the CRI-supplied components illustrated in Figure 2-6.

If your system configuration does not include either the optional SSD or second IOC, the piping associated with this equipment is not required.



ITEM	QUANTITY	PART NUMBER	DESCRIPTION
1	1	10563400	1–1/8 x 7/8 x 7/8 "Y" FITTING
2	1	02197500	1–3/8 X 1–1/8 X 1–1/8 "Y" FITTING
3	1	02197600	2–1/8 X 1–5/8 X 1–5/8 "Y" FITTING
4	1	10569700	2–5/8 X 2–1/8 X 2–1/8 "Y" FITTING
5	3	10540900	LIQUID MANIFOLD WITH FILTER AND VALVE
6	3	10509800	SUCTION MANIFOLD, 7 PORT
7	1	01043900	HEU LIQUID LINE FLANGE ASSY
8	1	01044100	HEU SUCTION LINE FLANGE ASSY

Figure 2-6. Refrigeration Piping Requirements

Design considerations for routing the refrigerant piping from the RCU(s) to the computer equipment must take into account the total equivalent lineal piping restriction of 100 ft (30.5 m) maximum, including directional and elevational changes.

Directional changes in pipe routing should be minimal, but if necessary, at 45° angles. All refrigerant piping elbows must be long radius types.

Elevational changes in pipe routing should also be minimal. When the routing of refrigeration piping requires a vertical rise, the total vertical rise must not exceed 25 ft (7.6 m) maximum. In most instances, an extensive vertical rise requires the construction of a double riser within the suction line. In this case, CRI site planning personnel will provide the preferred design requirements for the double riser.

The following notes provide additional information for Figure 2-6:

- You must supply, route, and install the liquid-line and suction-line piping between the HEU, the primary IOC, and the RCU. You must also supply, route, and install the liquid-line and suction-line piping between the optional second IOC, the optional SSD, and the RCU. These items must conform to CRI engineering requirements and must be approved by CRI site planning personnel.
- Refrigerant-grade piping components and materials for the refrigeration piping network must be installed in accordance with locational requirements illustrated in Figure 2-6 and must conform to CRI engineering requirements. Variations to the illustrated piping network must be approved by CRI site planning personnel.
- CRI will furnish and you must install items 1 through 8.
- You must furnish and install all other refrigerant piping components.
- CRI will furnish and install the flexible refrigerant hoses that connect the liquid and suction lines to the HEU, IOC(s), and optional SSD at the time of system installation.
- Dimensions of refrigeration piping are standard refrigerant pipe outside diameters in inches.
- Piping support clamps must have a compressible insert between the clamp and the refrigeration piping.
- Refrigerant piping and components must not contact concrete, raised flooring, raised floor support pedestals, water or refrigerant piping, electrical conduits, raceways, or other fixed or movable objects.
- All refrigerant piping and components must be assembled by you using silver solder and silver soldering techniques in accordance with CRI engineering requirements.
- All refrigerant piping and components must be leak tested, evacuated, and prepared for service by you in accordance with the CRI component installation document.
- All suction-line piping must be insulated by you after verification that it passed all tests.

COMPUTER ROOM FLOOR

Prepare the computer room with a static-dissipative raised floor system that allows a minimum of 12-in. (30.5-cm) free clearance between the subfloor and the underside of the raised floor panels. This free clearance zone accommodates routing of the various power circuits, signal cables, and cooling components. All CRI computer equipment requires floor cutouts for power wiring, signal-cable entrances, and in some cases, dielectric or refrigerant-line entrances. In addition, some equipment requires reinforcement of the raised floor due to concentrated floor loading conditions. Refer to Sections 4 through 8 of this manual for specific equipment requirements.

The size of the raised floor panels described in this manual is 24 in. (61 cm) square. Raised floor panels other than 24 in. (61 cm) square must be reviewed by CRI site planning personnel for placement of equipment, floor cutouts, and refrigeration piping.

SUPPORT PERSONNEL REQUIREMENTS

CRI provides trained field engineers (FEs) and software analysts on a contractual basis to support the computer system. CRI personnel on-site generally include a field engineer-in-charge (EIC) and one or more additional FEs, as well as an analyst-in-charge (AIC) and one or more additional analysts.

Field Engineering Office

You must provide the FEs with a quiet office environment and the following items as a minimum. The field engineering office should be located as close to the computer room as possible.

- One locking office, approximately 150 ft^2 (14 m^2), or two offices, approximately 75 ft^2 to 100 ft^2 (7 m^2 to 9 m^2) each
- Two locking desks
- Two 3-shelf bookcases
- One locking 4-drawer file cabinet
- One CRT table
- Three chairs
- One telephone
- Additional items may be required due to the system configuration

Field Engineering Repair Shop

You must provide the FEs with a maintenance repair shop environment equipped with adequate lighting and power outlets for tools and test equipment. The field engineering repair shop should be adjacent to the field engineering office and close to the computer room. The repair shop must include the following items as a minimum:

- One locking workshop, approximately 150 ft^2 (14 m^2)
- One workbench with a static-dissipative work surface and power outlets
- One workbench chair with static-dissipative casters
- Three locking parts cabinets approximately 36 in. × 72 in. (92 cm × 183 cm)
- Two 3-shelf bookcases
- One worktable, 30 in. × 60 in. (76 cm × 152 cm) with a static-dissipative work surface
- Two 120-Vac, 60-Hz, 15-A circuits with National Electrical Manufacturer's Association (NEMA) 5-15R receptacles for the CRI module test station
- One chair with static-dissipative casters
- One telephone with data-quality telephone line
- One locking 4-drawer file cabinet
- Additional items may be required due to the system configuration

Software Analyst's Office

You must provide the software analyst with a quiet office environment and the following items as a minimum. Locate the software analyst's office as close as possible to the computer room.

- One locking office, approximately 150 ft^2 (14 m^2), or two offices approximately 75 ft^2 to 100 ft^2 (7 m^2 to 9 m^2) each
- Two locking desks
- Two 3-shelf bookcases
- One locking 4-drawer file cabinet
- One worktable, 30 in. × 60 in. (76 cm × 152 cm)
- Four chairs
- Two telephones
- One terminal connected to the CRI computer system
- One terminal connected to your front-end systems

Modem

CRI systems support personnel use a modem data communications link as a diagnostic aid in their administration, troubleshooting, and maintenance activities.

Providing that site security restrictions allow the use of this device, you should contact the local telephone company well in advance of the system delivery to arrange for installation of the telephone line required for the modem. A private outside line is recommended to avoid interruptions caused by customer PBX equipment and local operators. Make arrangements with CRI to take care of the monthly service charges.

The CRI-supplied modem for systems located in the United States and Canada is a Telebit Model T2SAA 19200 BPI Ext. For CRAY Y-MP8 computer system installations outside of the United States and Canada, contact your local CRI field engineering office for modem telephone line requirements.

The following information will be helpful when talking with the telephone company representatives:

- FCC registration number = ER95W5-16287-MD-E
- Transmission rate = 19.2K Baud
- The modem uses a standard telephone with a voice grade line; jack type = RJ11C
- Touch tone /rotary dial = Touch tone preferred
- Ringer equivalence = 0.4 db
- External/internal clock = internal
- Grounding = chassis ground to signal ground
- Transmit level = -7 dBm
- Force answer/originate = originate
- 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 = permanent

- Synchronous/asynchronous = asynchronous
- 9-bit/10-bit/11-bit character = 10-bit character

Install modem equipment prior to the installation of the computer system. Locate the telephone and modem on the maintenance workstation table.

3 - SYSTEM CONFIGURATIONS

The CRAY Y-MP8 computer system is available with a number of options in a variety of system configurations. This arrangement makes it possible to configure a CRAY Y-MP8 computer system well suited to most applications, while allowing for a wide range of expansion capabilities through additional memory, an SSD solid-state storage device, disk drive units, I/O channel and interface adaptations, and so on.

If your system is not configured with a stand-alone SSD, a false cabinet will be installed in the SSD position. If an integrated SSD is configured, a false cabinet will be installed in the SSD position. In other words, the CRAY Y-MP8 computer system will always have the same external appearance regardless of whether an SSD is configured.

Configurations vary from facility to facility, depending upon the application requirements of each customer. For site planning purposes, you must know the number and type of equipment units to be included in the initial system. It is also advantageous to know future system expansion plans.

Table 3-1 lists the equipment and quantities available for the CRAY Y-MP8 computer system model configurations. The range of quantities define minimum to maximum capabilities. Detailed equipment descriptions and site planning requirements are described in this manual, or in the *Cray Peripheral Equipment Site Planning Reference Manual*, publication number HR-0080, or in the *Cray Support Equipment Site Planning Reference Manual*, publication number HR-0082. The table includes references to the appropriate section of this manual or the appropriate CRI site planning manual.

Table 3-1. CRAY Y-MP8 Computer System Configuration

Quantity	Equipment	Refer to
1	CRAY Y-MP8 mainframe chassis (MFC)	Section 4
1	I/O subsystem chassis (IOC)	Section 5
1	Operators workstation (OWS)	HR-0080
1	Peripheral expander cabinet	HR-0080
1	Line printer	HR-0080
3	CRT display terminals	HR-0080
1	VME-based microcomputer	HR-0080
1	Maintenance workstation (MWS)	HR-0080
3	CRT display terminals	HR-0080
1	VME-based microcomputer	HR-0080
2-48	Disk storage units	HR-0080
1-7	Front-end interface device(s)	HR-0080
1	IOC power distribution unit (IOC/PDU)	Section 7
1	MFC heat exchanger unit (HEU)	Section 8
1	Refrigeration condensing unit (RCU-1)	HR-0082
1-3	Motor-generator sets [MGS(s)]	HR-0082
†	If the system is configured with the optional second I/O subsystem chassis (IOC), the following additional equipment is included:	
1	I/O subsystem chassis (IOC)	Section 5
1	IOC power distribution unit (IOC/PDU)	Section 7
†	If the system is configured with the optional SSD solid-state storage device, the following additional equipment is included:	
1	SSD solid-state storage device chassis	Section 6
1	SSD power distribution unit (SSD/PDU)	Section 7

† If the system is configured with either the optional second I/O subsystem chassis (IOC), or the optional SSD, an RCU-4 and an additional MGS are included. Refer to the Cray Support Equipment Site Planning Reference Manual, publication number HR-0082, for more information.

If your system is not configured with a stand-alone SSD, a false cabinet will be installed in the SSD position. In other words, the CRAY Y-MP8 computer system will always have the same external appearance regardless of whether an SSD is configured.

4 - MAINFRAME CHASSIS

The CRAY Y-MP8 mainframe chassis (MFC) is a dielectric cooled unit (refer to Figure 4-1). The memory and computer logic modules are architecturally arranged into a single column in the front of the mainframe. The power supplies for the system are located in the back portion of the mainframe.

The MFC is equipped with a microprocessor-based control system that monitors and displays mainframe 400-Hz input voltage, DC output voltages of MFC power supplies, module temperatures, dielectric-coolant pressures, and dew point.

In addition, the MFC control system contains on-off control circuitry, warning and fault indicators, and alarm circuits.

WEIGHT

The MFC weighs approximately 5,500 lb (2,495 kg). Average floor loading for the mainframe is approximately 2 psi (1406 kg/m^2).

LOCATION

The MFC is the focal point of all associated equipment arranged within the facility computer room.

The location of the MFC may depend on the constraints of the dielectric cooling, refrigerant piping, and access requirements described in this manual.

Future expansion plans must also be considered.

ACCESS REQUIREMENTS

Adequate access to the MFC is required for maintenance activities. You must provide a 4-ft (1.2-m) minimum clearance around the base of the MFC for maintenance purposes and the removal of raised floor panels for access to the underfloor logic cabling and dielectric-cooling components.

COOLING REQUIREMENTS

The MFC is cooled by dielectric coolant. The integrated circuit components are mounted to memory and logic modules. Dielectric coolant circulates through the modules, dissipating the heat generated by the components. The dielectric coolant is then circulated through the heat exchanger unit (HEU), where it is cooled.

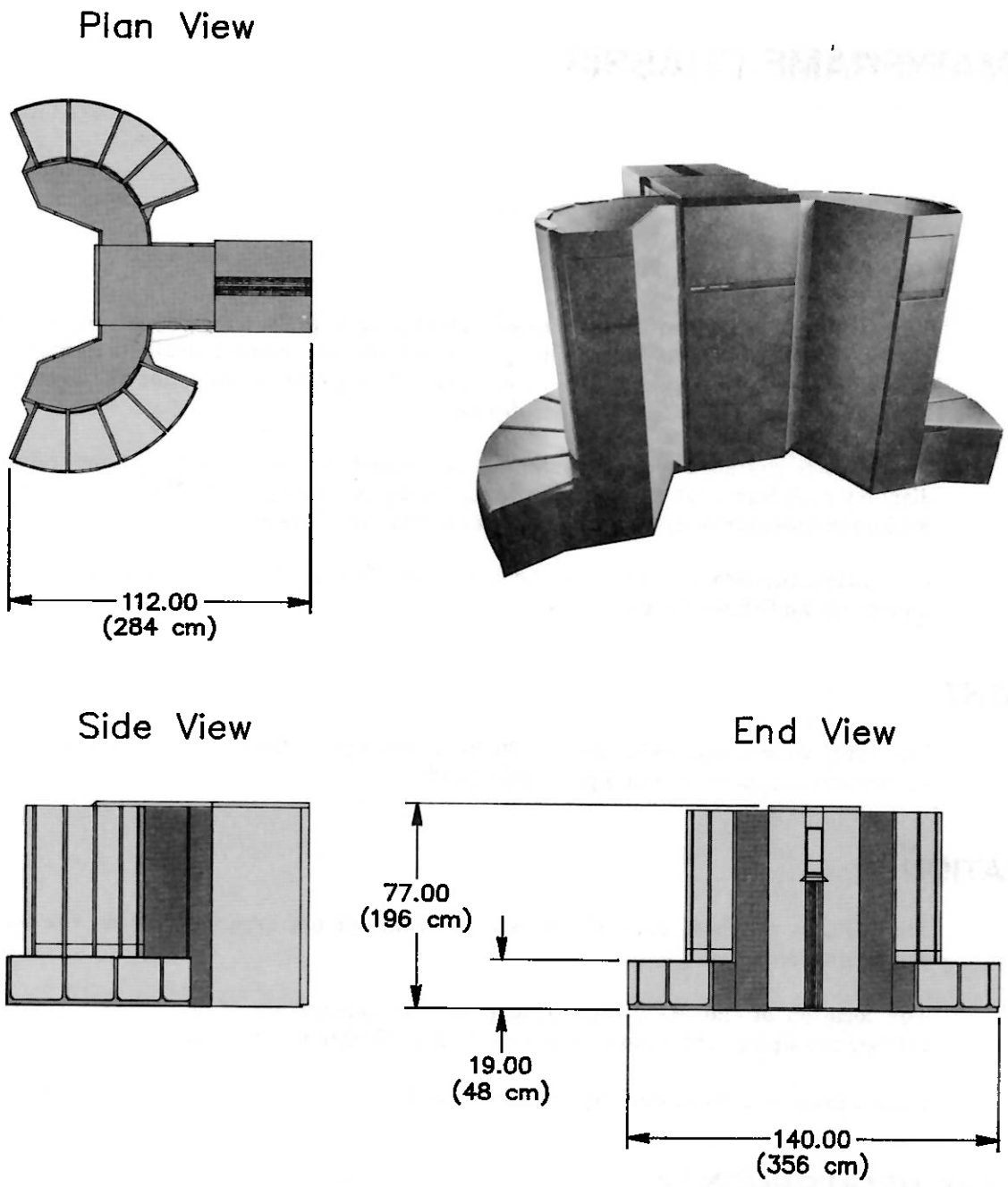


Figure 4-1. CRAY Y-MP8 Mainframe Chassis (MFC) with IOC and Optional SSD

ROOM HEAT LOADING CHARACTERISTICS

The room heat loading produced by the mainframe is approximately 33,000 Btu/hr (9,669 W).

FLOOR PREPARATION

The required orientation of the mainframe to the IOC(s) and optional stand-alone SSD is shown in Figure 4-2. This orientation is essential to ensure that logic cabling requirements are met. The dimensions given in Figure 4-2 can be used to locate reference lines A-A, B-B, and C-C.

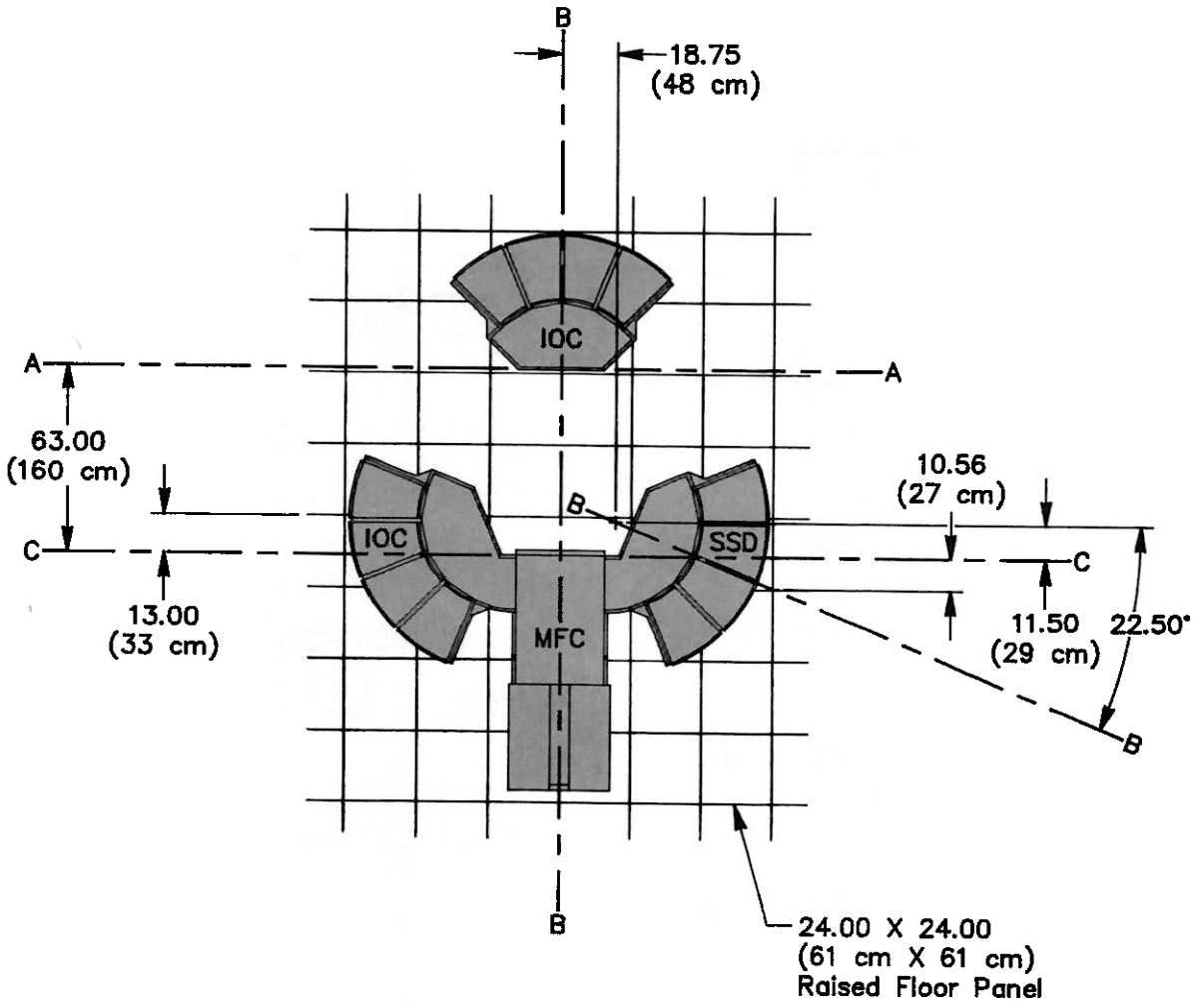


Figure 4-2. Standard Orientation of the CRAY Y-MP8 Computer System

The tile size and stringer style of the computer room raised floor system will determine how many stringers interfere with the floor penetrations and must be removed. Additional floor support pedestals may be required to restore the structural integrity of the floor system in areas where stringers are removed.

You must prepare several floor cutouts in order to install the MFC. Cutouts must be located within ±1/8 in. (0.32 cm) of the specified dimensions. CRI provides full-scale templates to be used for locating and marking all MFC floor cutouts. Figures 4-3 through 4-9 are included in this manual for reference only.

Prepare all floor cutouts and install additional underfloor support pedestals prior to system delivery. All floor cutouts must be free of burrs and sharp edges. Floor preparation is reviewed during the final site planning meeting.

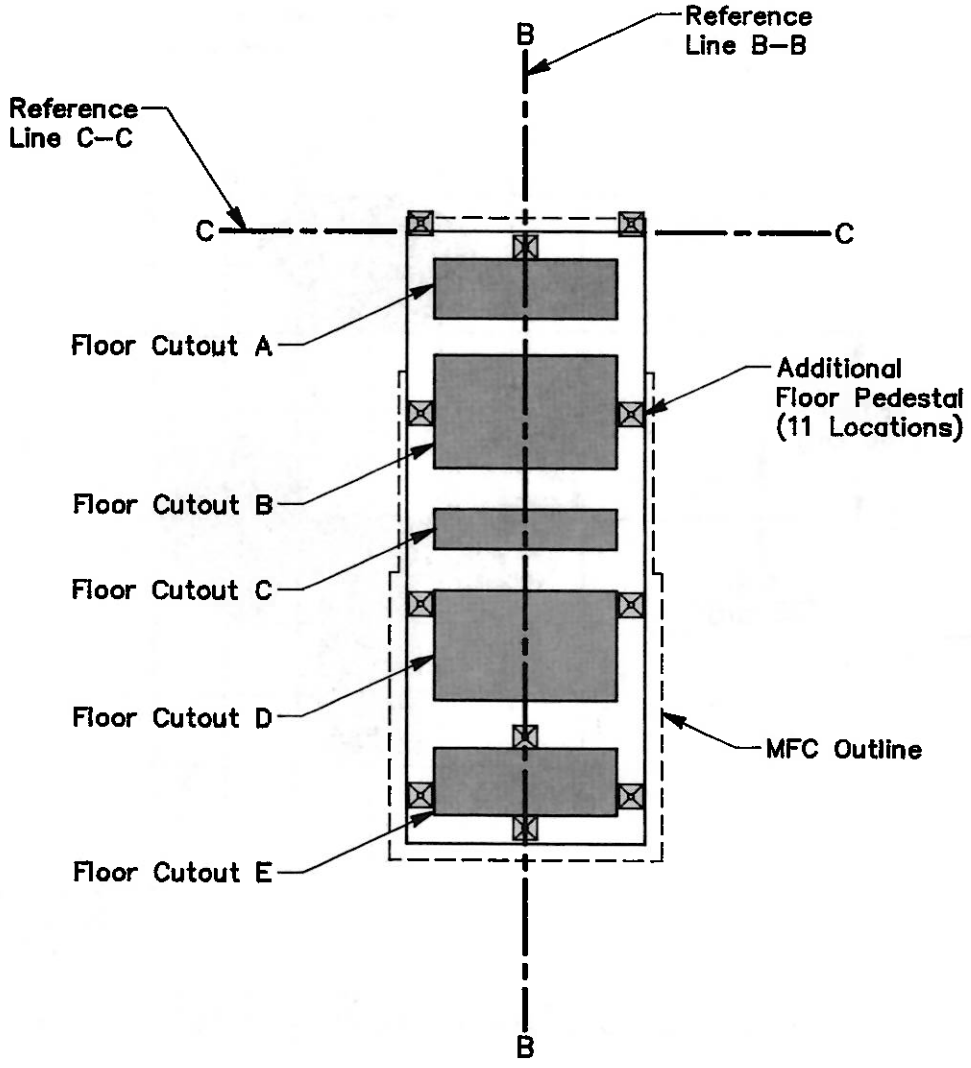


Figure 4-3. MFC Floor Preparation Requirements

The mainframe is designed to rest on a surface that is flat within ±1/16 in. (0.16 cm) over the MFC, IOC, and optional SSD area. Edging materials must not protrude above the surface of the floor panels in this area.

Floor Cutout A

Floor cutout A permits the connection of dielectric-coolant hoses to the MFC. The location and dimensions of floor cutout A are illustrated in Figure 4-4. Floor stringers running through floor cutout A must be removed.

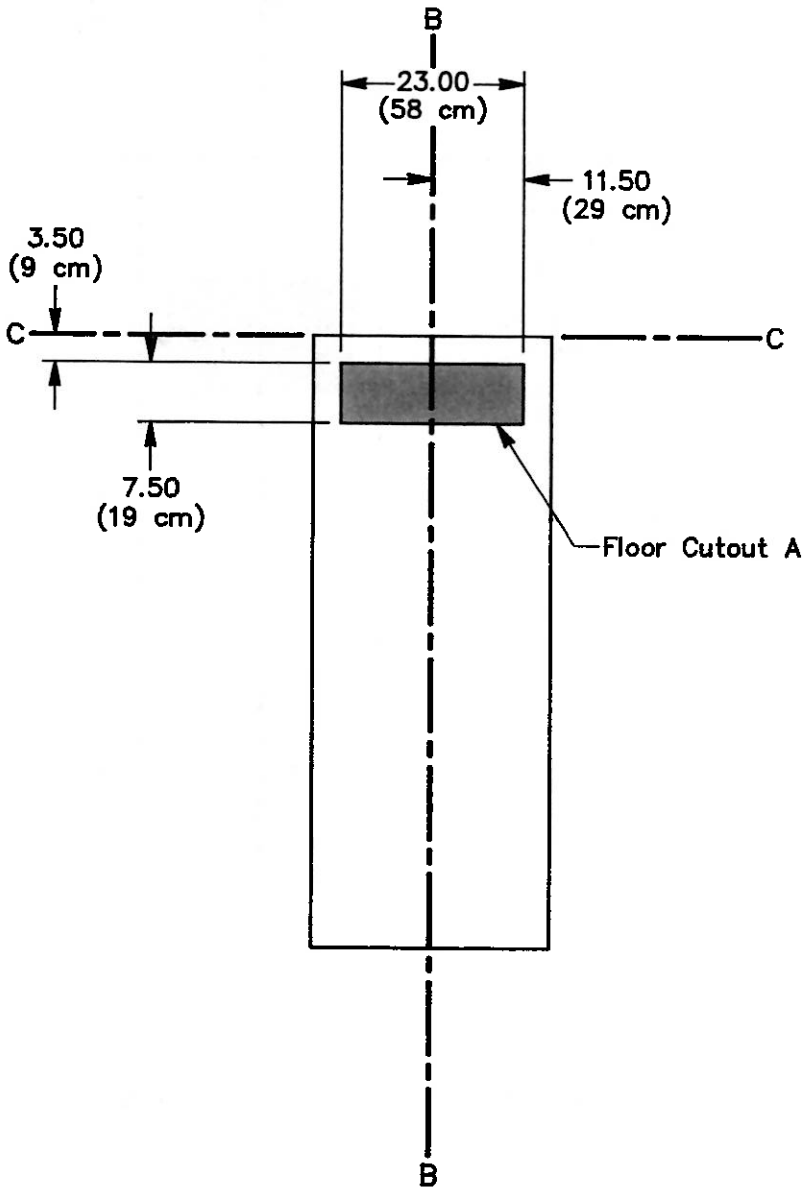


Figure 4-4. Location and Dimensions of MFC Floor Cutout A

Floor Cutout B

Floor cutout B permits the underfloor routing of interconnecting data and signal cables. The location and dimensions of floor cutout B are illustrated in Figure 4-5. Floor stringers running through floor cutout B may remain intact and in place.

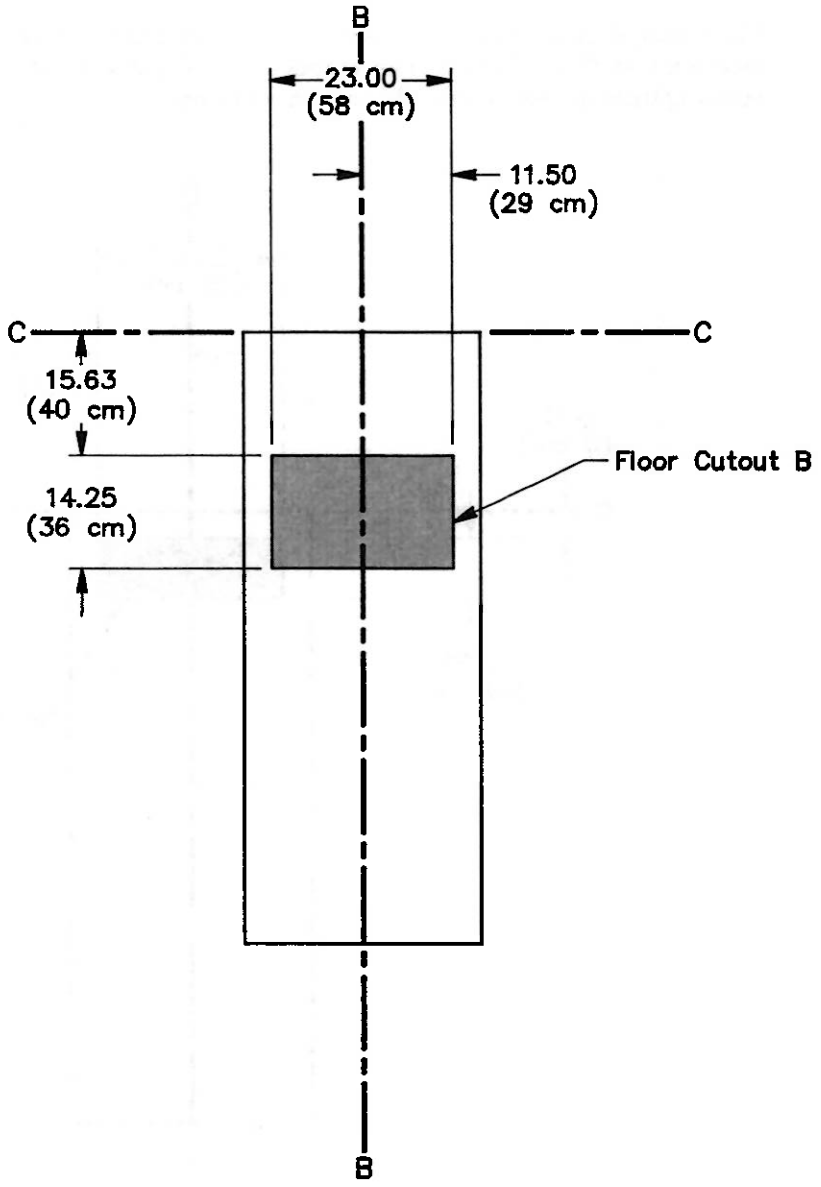


Figure 4-5. Location and Dimensions of MFC Floor Cutout B

Floor Cutout C

Floor cutout C permits the connection of a dielectric-coolant hose. The location and dimensions of floor cutout C are illustrated in Figure 4-6. Floor stringers running through floor cutout C may remain intact and in place.

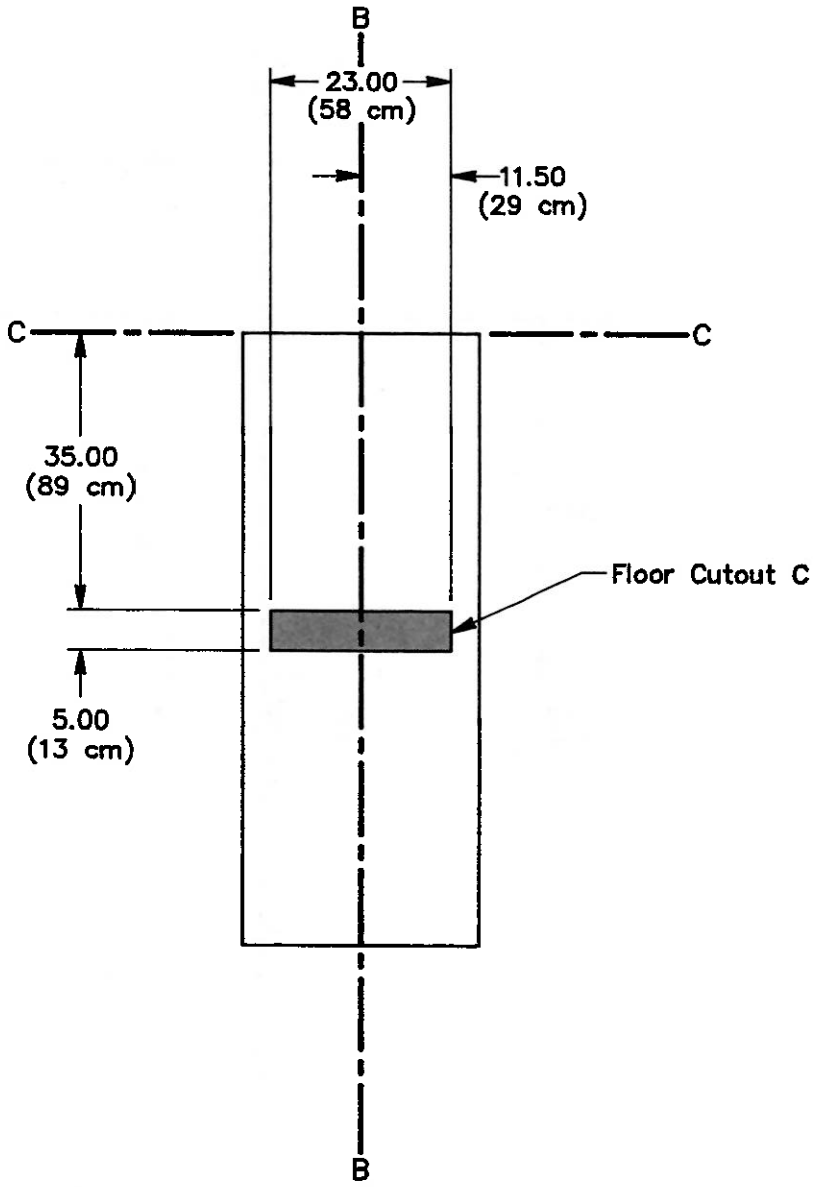


Figure 4-6. Location and Dimensions of MFC Floor Cutout C

Floor Cutout D

Floor cutout D permits the connection of control wiring to the MFC. The location and dimensions of floor cutout D are illustrated in Figure 4-7. Floor stringers running through floor cutout D may remain intact and in place.

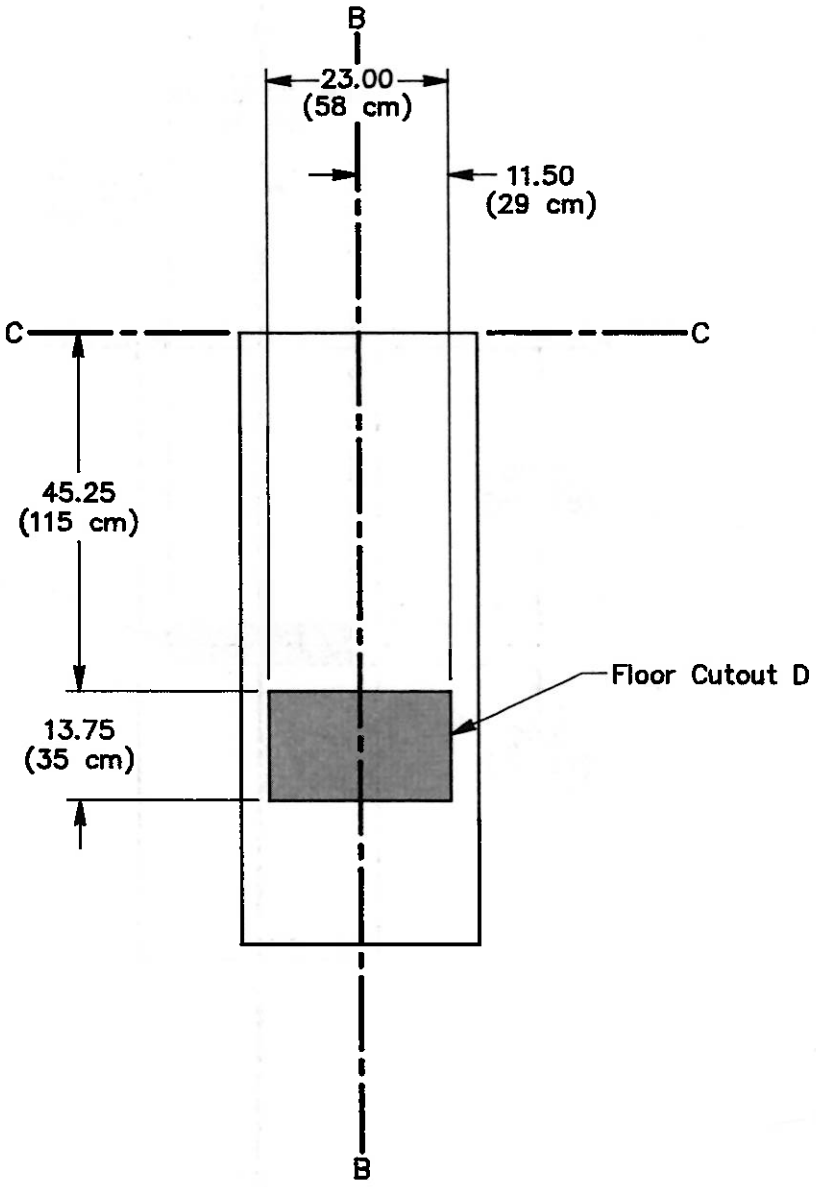


Figure 4-7. Location and Dimensions of MFC Floor Cutout D

Floor Cutout E

Floor cutout E permits the connection of 400-Hz power and a dielectric-coolant hose to the MFC. The location and dimensions of floor cutout E are illustrated in Figure 4-8. Floor stringers running through floor cutout E must be removed.

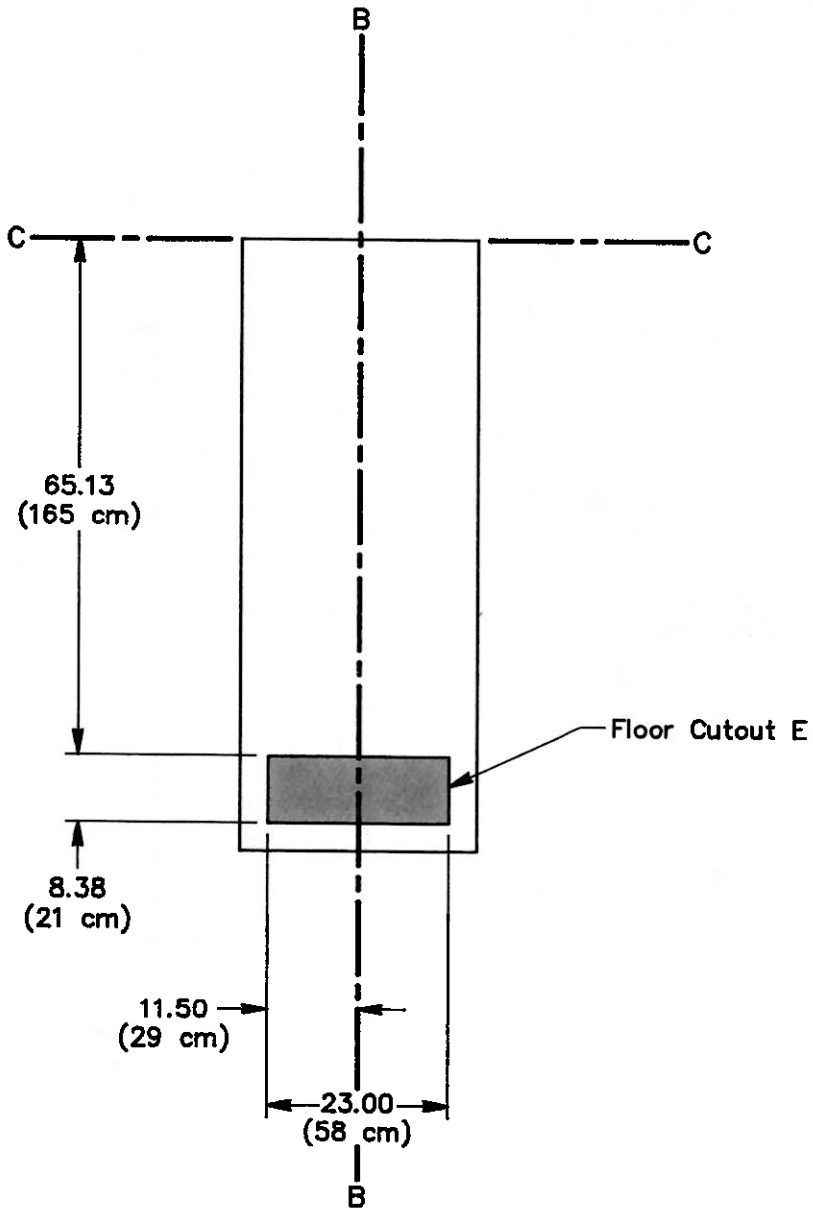


Figure 4-8. Location and Dimensions of MFC Floor Cutout E

Floor Support Pedestals

The MFC's concentrated floor loading characteristics require installation of additional floor support pedestals. You must furnish and install approximately 11 additional floor support pedestals to reinforce the computer room floor panels after floor cutouts and holes are made (refer to Figure 4-9). Additional floor support pedestals may also be required to restore the structural integrity of the floor system where stringers that interfere with floor penetrations are removed.

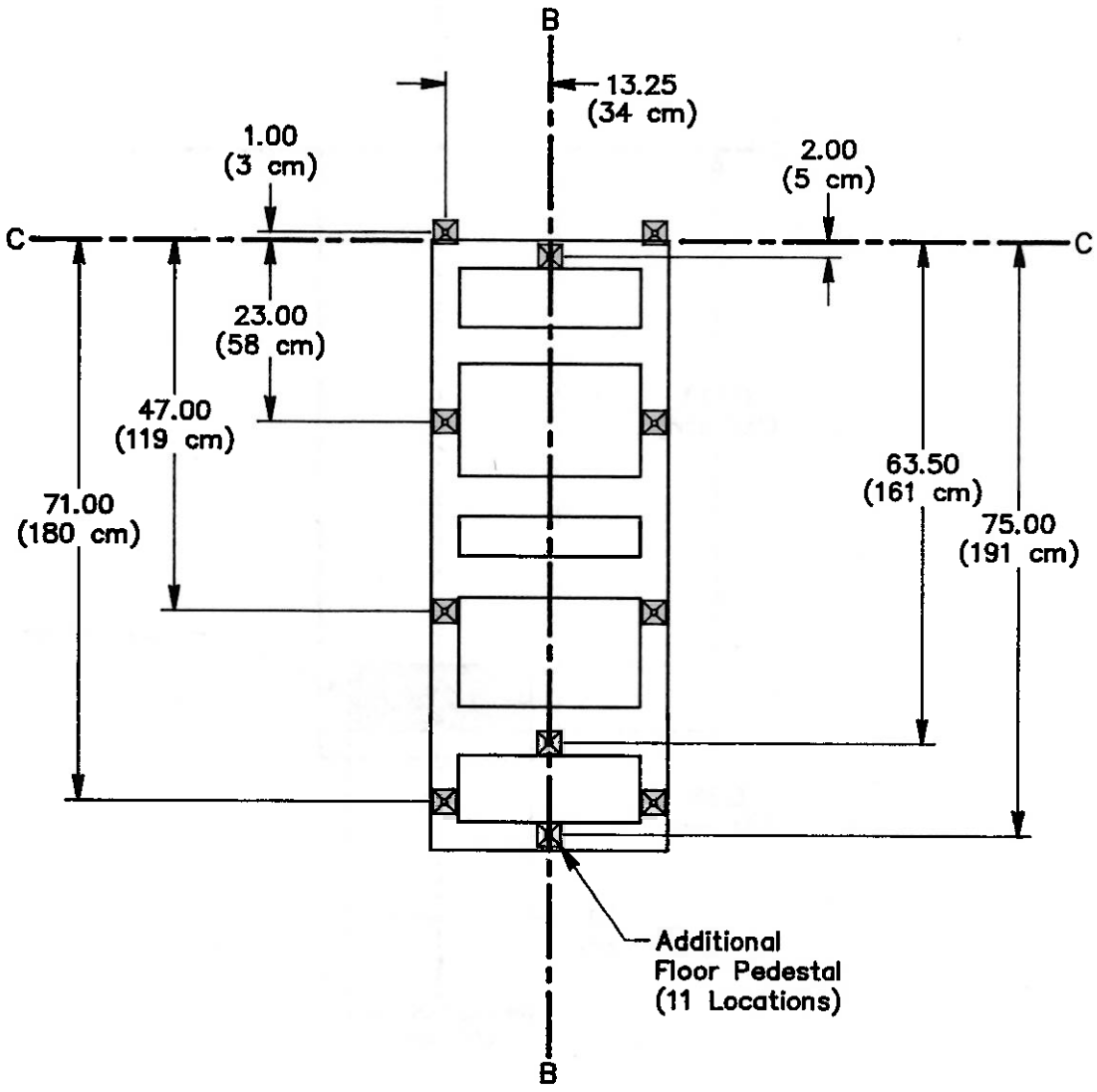


Figure 4-9. MFC Pedestal Locations

POWER WIRING REQUIREMENTS

You must provide and install the following power and control wiring for the MFC:

- One 120-Vac, 60-Hz, 3-wire (including ground) circuit
- One 208-Vac, 3-phase, 5-wire (including ground), 400-Hz circuit rated at 300 A
- One 5-wire control circuit between the MFC and the No. 1 MGS for remote control of the MGSs
- One 2-wire shielded cable between the MFC and the No. 1 MGS for remote voltage control of the MGSs
- One 5-wire control circuit between the MFC and the primary IOC/PDU

All electrical connections are accessed through floor cutouts D and E. Knockouts are provided for cable restraint. Individual conductors must extend 2 ft (0.61 m) above the raised floor panel cutouts to ensure adequate length for termination. Refer to the basic wiring diagrams in Section 2, Figures 2-3 and 2-4.

EARTH GROUNDING REQUIREMENTS

You must install one CRI-supplied braided ground strap between the MFC and the computer room signal-ground reference system. Refer to "Equipment Grounding Requirements" in Section 2 of this manual for additional information regarding equipment grounding.

5 - I/O SUBSYSTEM CHASSIS

The I/O subsystem chassis (IOC) is a refrigerant-cooled unit (refer to Figure 5-1). The IOC memory and logic are architecturally integrated into an ultra-compact central assembly composed of four vertical columns in a wedge configuration. Power supplies for each column rest beside the column base, forming a semicircular bench. When disassembled for shipment, the IOC breaks down into two power-supply assemblies plus the central assembly (refer to Section 2, Figure 2-2).

The requirements in this section also apply to IOCs with an SSD solid-state storage device integrated into the IOC.

The floor preparation requirements in this section also apply to the optional stand-alone SSD chassis.

WEIGHT

The IOC weighs approximately 3,220 lb (1,460 kg). The central assembly weighs approximately 2,050 lb (930 kg). The two power supplies each weigh approximately 585 lb (265 kg). Central assembly floor loading is approximately 5 psi (3,515 kg/m^2), and power supply floor loading is 1 psi (703 kg/m^2).

LOCATION

The primary IOC must be located and attached to the CRAY Y-MP8 mainframe chassis (MFC) as illustrated in Section 4, Figure 4-2. This location is also required when the IOC is configured with an integrated SSD.

The optional second IOC may be located up to 9.5 ft (2.9 m) from the MFC. Section 4, Figure 4-2, illustrates the recommended location.

ACCESS REQUIREMENTS

Adequate access to the IOC is required for maintenance activities. You must provide a 4-ft (1.2-m) minimum clearance around the base of the IOC for maintenance purposes such as the removal of raised floor panels for access to the underfloor refrigeration piping network.

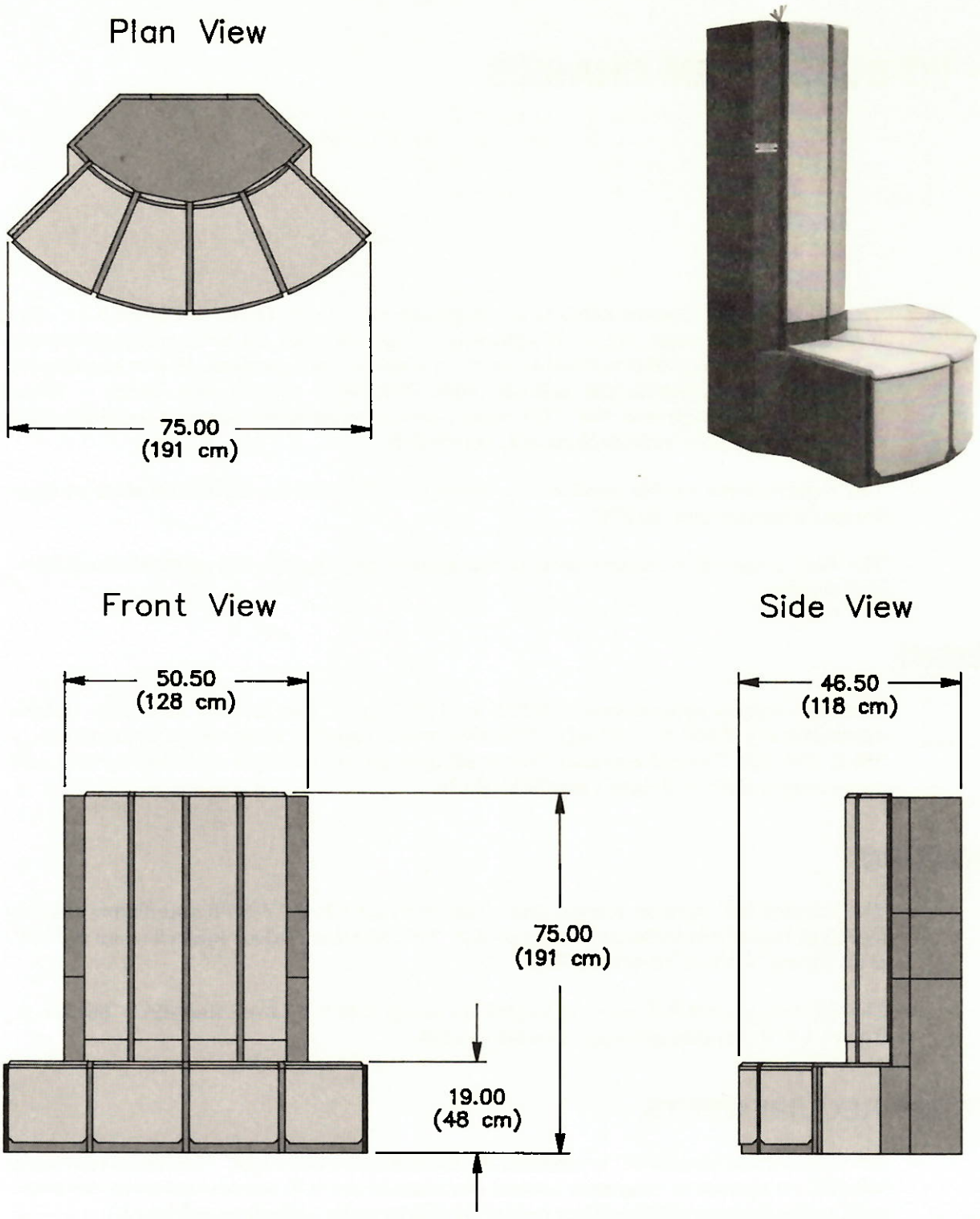


Figure 5-1. I/O Subsystem Chassis (IOC)

COOLING REQUIREMENTS

The refrigerant-cooled IOC dissipates heat from the integrated circuits throughout the IOC memory and logic sections and power-supply assemblies. To protect the integrated circuits and power supplies from overheating, the IOC incorporates refrigeration components built into the power-supplies and the central assembly.

The refrigeration condensing unit(s) [RCU(s)] contains other major components of the refrigeration system. Refer to the *Cray Support Equipment Site Planning Reference Manual,* publication number HR-0082 and the "Refrigerant Piping Requirements" subsection in Section 2 of this manual.

ROOM HEAT LOADING CHARACTERISTICS

The room heat loading produced by the IOC is approximately 4,000 Btu/hr (1,170 W).

FLOOR PREPARATION

You must prepare several floor cutouts and various holes in order to install the IOC. Cutouts and holes must be located within ±1/8 in. (0.32 cm) of the specified dimensions. Figures 5-2 through 5-8 illustrate the floor preparation requirements and are included in this manual for reference only. CRI provides full-scale templates to locate and mark all IOC floor cutouts.

The optional SSD solid-state storage device requires the same floor preparations as the IOC. Refer to Section 6 for more information regarding the SSD.

The floor panel size and stringer style of the computer room's raised floor system determines how many stringers interfere with floor penetrations and require removal. Additional floor support pedestals are required to restore the structural integrity of the floor system in areas where stringers are removed.

Prepare all floor cutouts and install additional underfloor support pedestals prior to system delivery. All floor cutouts must be free of burrs and sharp edges. Floor preparation is reviewed during the final site planning meeting.

The IOC must rest on a surface that is flat within ±1/16 in. (0.16 cm) over the IOC area. Edging material must not protrude above the surface of the floor panels within the unit base area.

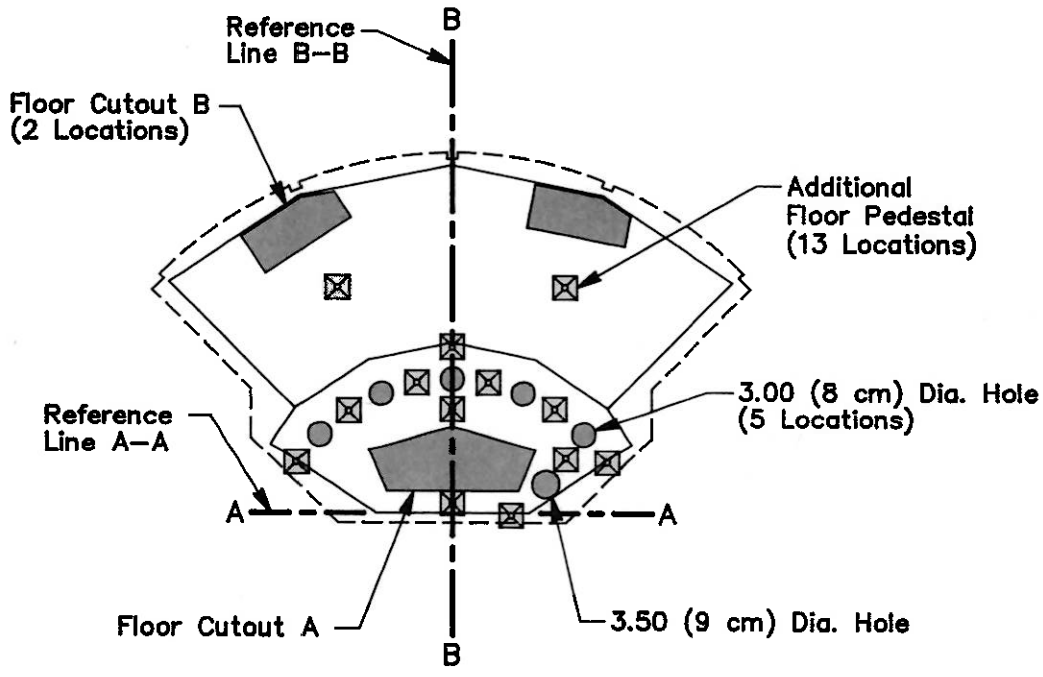


Figure 5-2. IOC or SSD Chassis Floor Preparation Requirements

Floor Cutout A

Floor cutout A permits the underfloor routing of interconnecting data and control signal cables between the IOC or SSD and other equipment. The location of floor cutout A is illustrated in Figure 5-3. Floor stringers running through floor cutout A may remain intact and in place. Dimensions for floor cutout A are given in Figure 5-4.

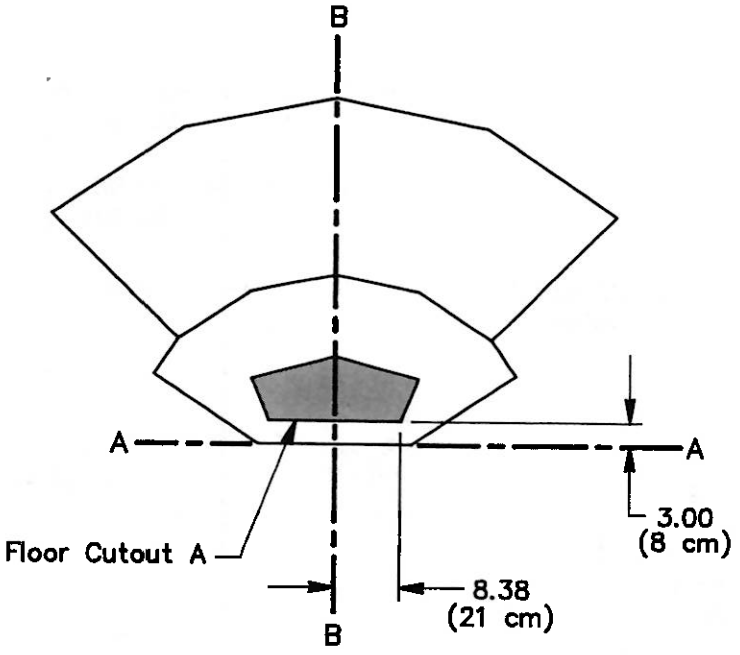


Figure 5-3. Location of IOC or SSD Chassis Floor Cutout A

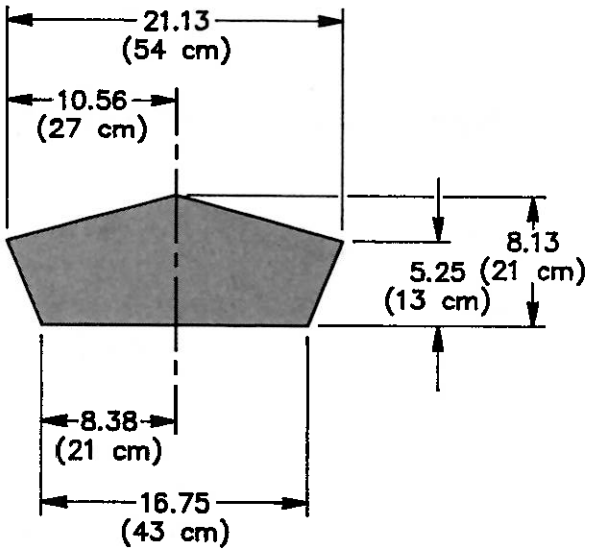


Figure 5-4. Dimensions of IOC or SSD Chassis Floor Cutout A

Floor Cutout B

The two cutouts labeled floor cutout B permit the connection of refrigeration hoses and 60- and 400-Hz power wiring. The location of each floor cutout B is illustrated in Figure 5-5. Dimensions of floor cutout B are illustrated in Figure 5-6. Floor stringers running through these floor cutouts must be removed.

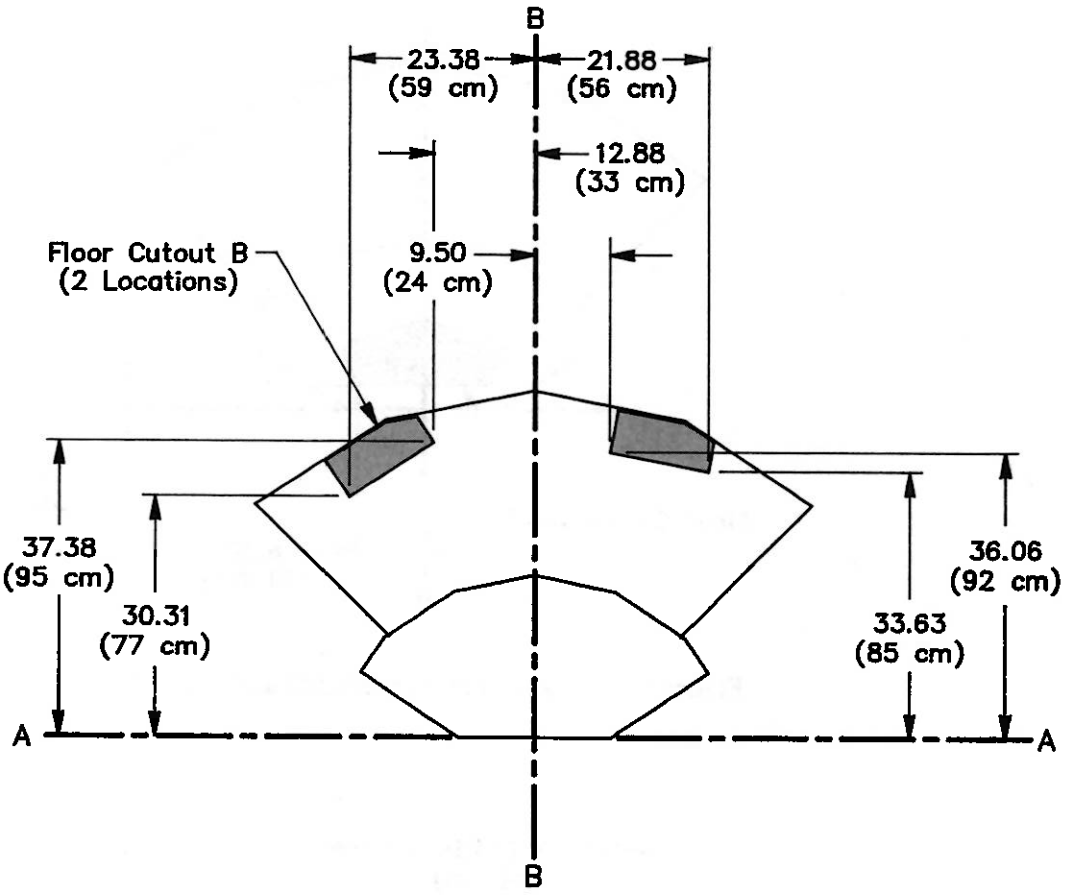


Figure 5-5. Locations of IOC or SSD Chassis Floor Cutout B

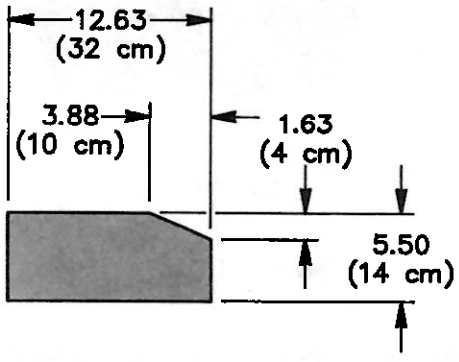


Figure 5-6. Dimensions of IOC or SSD Chassis Floor Cutout B

Refrigeration Hose Access Holes

Figure 5-7 illustrates the location of five 3-in. (7.62-cm) and one 3 1/2-in. (8.89-cm) diameter holes that allow the connection of refrigeration hoses to the IOC. Floor stringers running through the access holes must be removed.

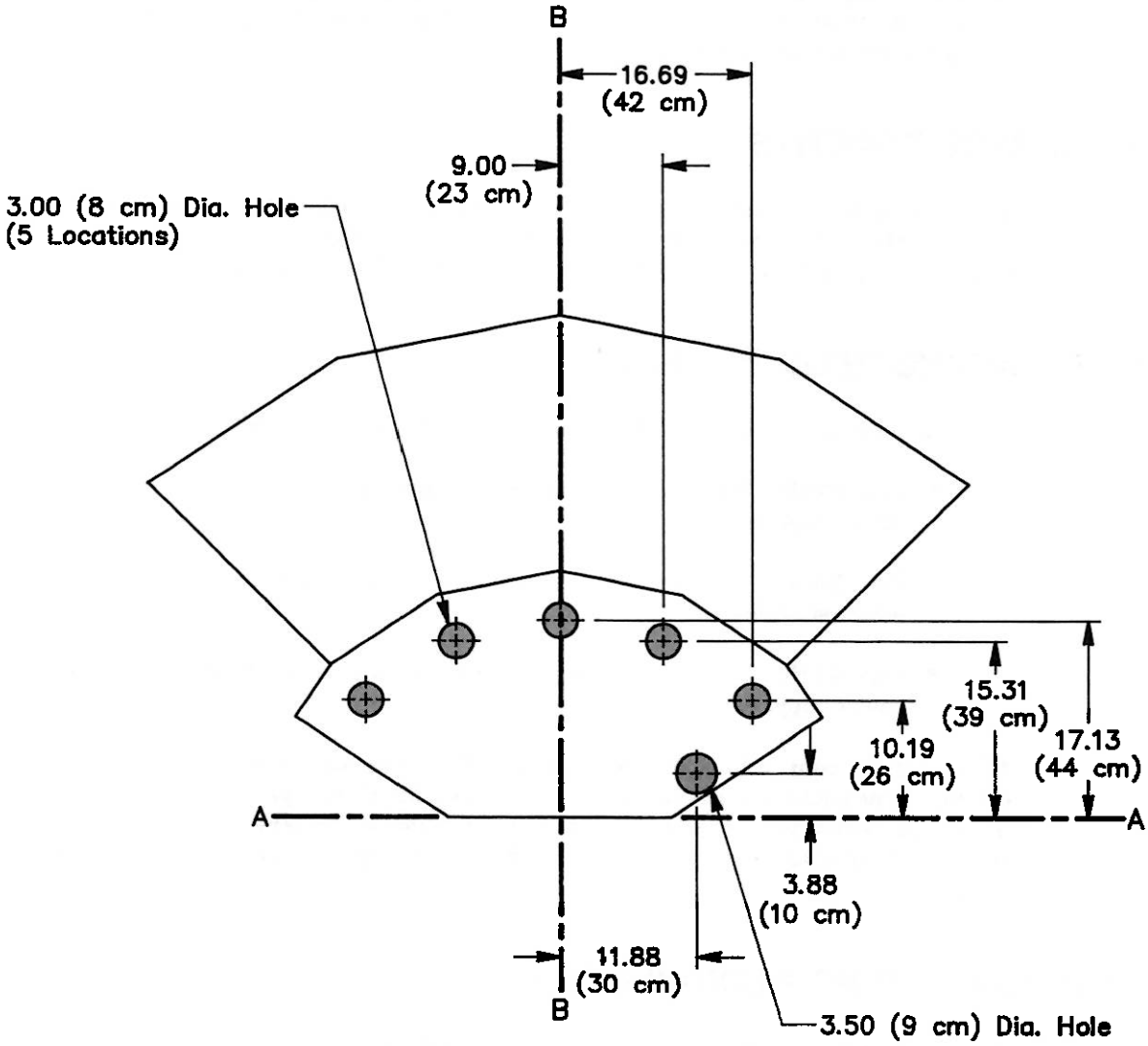


Figure 5-7. IOC or SSD Chassis Hole Locations

Floor Support Pedestals

The IOC's concentrated floor loading characteristics require installation of additional floor support pedestals. You must furnish and install approximately 13 additional floor support pedestals to reinforce the computer room floor panels after floor cutouts and holes are made (refer to Figure 5-8). Additional floor support pedestals may be required to restore the structural integrity of the floor system where stringers that interfere with floor penetrations are removed.

PIPING REQUIREMENTS

You must install refrigeration piping components underneath the computer room floor for the IOC. You must also install the RCU. Refer to the "Refrigerant Piping Requirements" subsection in Section 2 of this manual for detailed piping requirements.

POWER WIRING REQUIREMENTS

You must provide and install the following power wiring for the IOC:

- Ten 400-Hz, 5-wire (including ground) circuits from the IOC/PDU to the IOC power supplies
- Two 400-Hz, 4-wire (including ground) circuits from the IOC/PDU to the IOC power supplies
- One 60-Hz, 3-wire (including ground) circuit from the IOC/PDU to the IOC power supplies

All electrical connections are performed within the power supply sections accessed through floor cutout B. There are 3/4-in. (1.9-cm) knockouts provided for cable restraint. Individual conductors must extend 4 ft (1.2 m) above the false floor cutouts to ensure adequate length for termination. Refer to Section 2, Figure 2-3 for the basic power wiring diagram.

EARTH GROUNDING REQUIREMENTS

You must install four CRI-supplied braided ground straps between the IOC and the computer room signal-ground reference system. Refer to the "Equipment Grounding Requirements" subsection in Section 2 of this manual for additional information regarding equipment grounding.

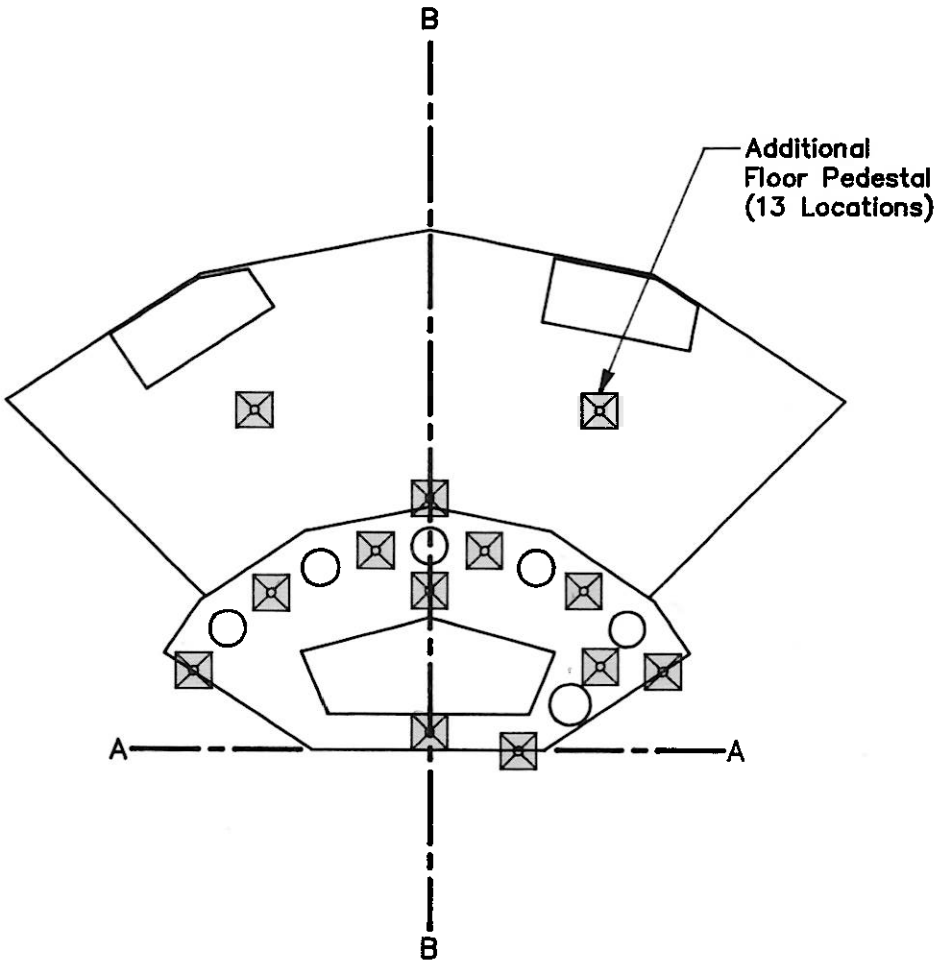


Figure 5-8. IOC or SSD Chassis Pedestal Locations

6 - SSD SOLID-STATE STORAGE DEVICE CHASSIS

The optional SSD solid-state storage device is a refrigerant-cooled unit (refer to Figure 6-1). The SSD memory and logic are architecturally integrated into an ultra-compact central assembly composed of four vertical columns in a wedge configuration. Power supplies for each column rest beside the column base, forming a semicircular bench. When disassembled for shipment, the SSD breaks down into two power-supply assemblies plus the central assembly (refer to Section 2, Figure 2-2).

This section applies to the stand-alone SSD only. For configurations with the SSD integrated into the I/O Subsystem chassis (IOC), refer to Section 5 of this manual for IOC site planning requirements.

The stand-alone SSD chassis has the same floor preparation requirements as the IOC. Refer to Section 5 of this manual for SSD and IOC floor preparation requirements.

If your system is not configured with a stand-alone SSD, a false cabinet will be installed in the SSD position. If an integrated SSD is configured, a false cabinet will be installed in the SSD position. In other words, the CRAY Y-MP8 computer system will always have the same external appearance regardless of whether an SSD is configured.

WEIGHT

The SSD weighs approximately 3,220 lb (1,460 kg). The central assembly weighs approximately 2,050 lb (930 kg). The two power supplies each weigh approximately 585 lb (265 kg). Central assembly floor loading is approximately 5 psi (3,515 kg/m^2), and power supply floor loading is 1 psi (703 kg/m^2).

LOCATION

The SSD chassis must be located and attached to the CRAY Y-MP8 mainframe chassis (MFC) as illustrated in Section 4, Figure 4-2.

ACCESS REQUIREMENTS

Adequate access to the SSD is required for maintenance activities. You must provide a 4-ft (1.2-m) minimum clearance around the base of the SSD for maintenance purposes such as the removal of raised floor panels for access to the underfloor refrigeration piping network.

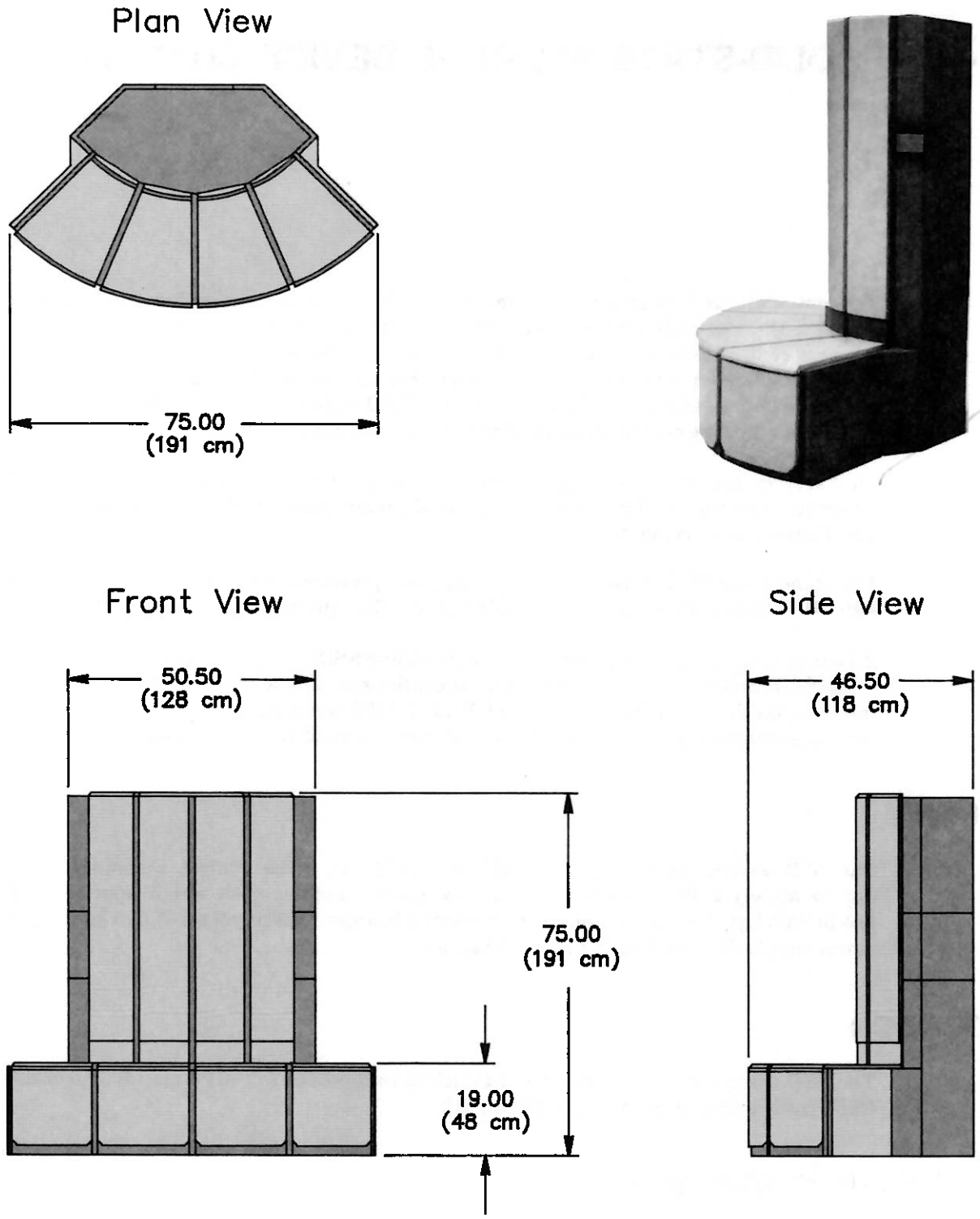


Figure 6-1. SSD Solid-state Storage Device

COOLING REQUIREMENTS

The refrigerant-cooled SSD dissipates heat from the integrated circuits throughout the SSD memory and logic sections and power-supply assemblies. To protect the integrated circuits and power supplies from overheating, the SSD incorporates refrigeration components built into the central and power-supply assemblies.

The refrigeration condensing unit(s) [RCU(s)] contains other major components of the refrigeration system. Refer to the *Cray Support Equipment Site Planning Reference Manual,* publication number HR-0082 and the "Refrigerant Piping Requirements" subsection in Section 2 of this manual.

ROOM HEAT LOADING CHARACTERISTICS

The room heat loading produced by the SSD is approximately 4,000 Btu/hr (1,170 W).

FLOOR PREPARATION

You must prepare several floor cutouts and various holes in order to install the SSD. Cutouts and holes must be located within ±1/8 in. (0.32 cm) of the specified dimensions. The floor preparation requirements for the SSD are identical to those of the IOC as illustrated in Section 5, Figures 5-2 through 5-8, and are included in this manual for reference only. CRI provides full-scale templates to locate and mark all SSD floor cutouts.

The floor panel size and stringer style of the computer room raised floor system determines how many stringers interfere with floor penetrations and require removal. Additional floor support pedestals are required to restore the structural integrity of the floor system in areas where stringers are removed.

Prepare all floor cutouts and install additional underfloor support pedestals prior to system delivery. All floor cutouts must be free of burrs and sharp edges. Floor preparation is reviewed during the final site planning meeting.

The SSD must rest on a surface that is flat within ±1/16 in (0.16 cm) over the SSD area. Edging material must not protrude above the surface of the floor panels within the unit base area.

PIPING REQUIREMENTS

You must install refrigeration piping components underneath the computer room floor for the SSD. You must also install the RCU. Refer to the "Refrigerant Piping Requirements" subsection in Section 2 of this manual for detailed piping requirements.

POWER WIRING REQUIREMENTS

You must provide and install the following power wiring for the SSD:

- Nine 400-Hz, 5-wire (including ground) circuits from the SSD power distribution unit (SSD/PDU) to the SSD power supplies.
- Three 400-Hz, 4-wire (including ground) circuits from the SSD/PDU to the SSD power supplies.

All electrical connections are performed within the power-supply sections accessed through floor cutout B. There are 3/4-in. (1.9-cm) knockouts provided for cable restraint. Individual conductors must extend 4 ft (1.2 m) above the raised floor panel cutouts to ensure adequate length for termination. Refer to the basic power wiring diagram in Section 2, Figure 2-3.

EARTH GROUNDING REQUIREMENTS

You must install four CRI-supplied braided ground straps between the SSD and the computer room signal-ground reference system. Refer to the "Earth Grounding Requirements" subsection in Section 2 of this manual for additional information regarding equipment placement.

7 - POWER DISTRIBUTION UNITS

The I/O Subsystem chassis power distribution unit (IOC/PDU) and the SSD solid-state storage device power distribution unit (SSD/PDU) are manufactured by CRI and are integral parts of the CRAY Y-MP8 computer systems. This section provides site preparation requirements for installation of the IOC/PDU and SSD/PDU in your facility.

IOC POWER DISTRIBUTION UNIT

The IOC/PDU (refer to Figure 7-1) is a fan-cooled unit that uses room air for cooling purposes. It contains variable transformers for the control of input power to the power supplies located around the base of the IOC.

The IOC/PDU is equipped with a microprocessor-based control system that monitors and displays IOC/PDU 400-Hz input voltage, DC output voltages of IOC power supplies, column temperatures, and dew point.

In addition, the IOC/PDU contains on-off control circuitry, warning and fault indicators, and alarm circuits.

Weight

The IOC/PDU weighs approximately 950 lb (431 kg).

Location

You must locate the IOC/PDU in the computer room within the equipment separation limits illustrated in Section 9 of this manual. Position the IOC/PDU so that the controls and indicators on the front panel are fully visible from the maintenance workstation (MWS) display terminals.

Access Requirements

You must provide a 3-ft (.91-m) minimum clearance between the back of the IOC/PDU and any other equipment or wall surface to ensure proper circulation of intake and exhaust air and to allow for maintenance. A 2-in. (5-cm) side clearance is required as well.

Cooling Requirements

The IOC/PDU is a fan-cooled unit that uses room air for cooling purposes. If your computer room uses the underfloor area to supply conditioned air, air grilles, or perforated floor panels must be placed in the floor immediately in back of the IOC/PDU. If your computer room does not use the underfloor area to supply conditioned air, you must ensure that cool air is supplied to the air inlet openings at the back of the IOC/PDU.

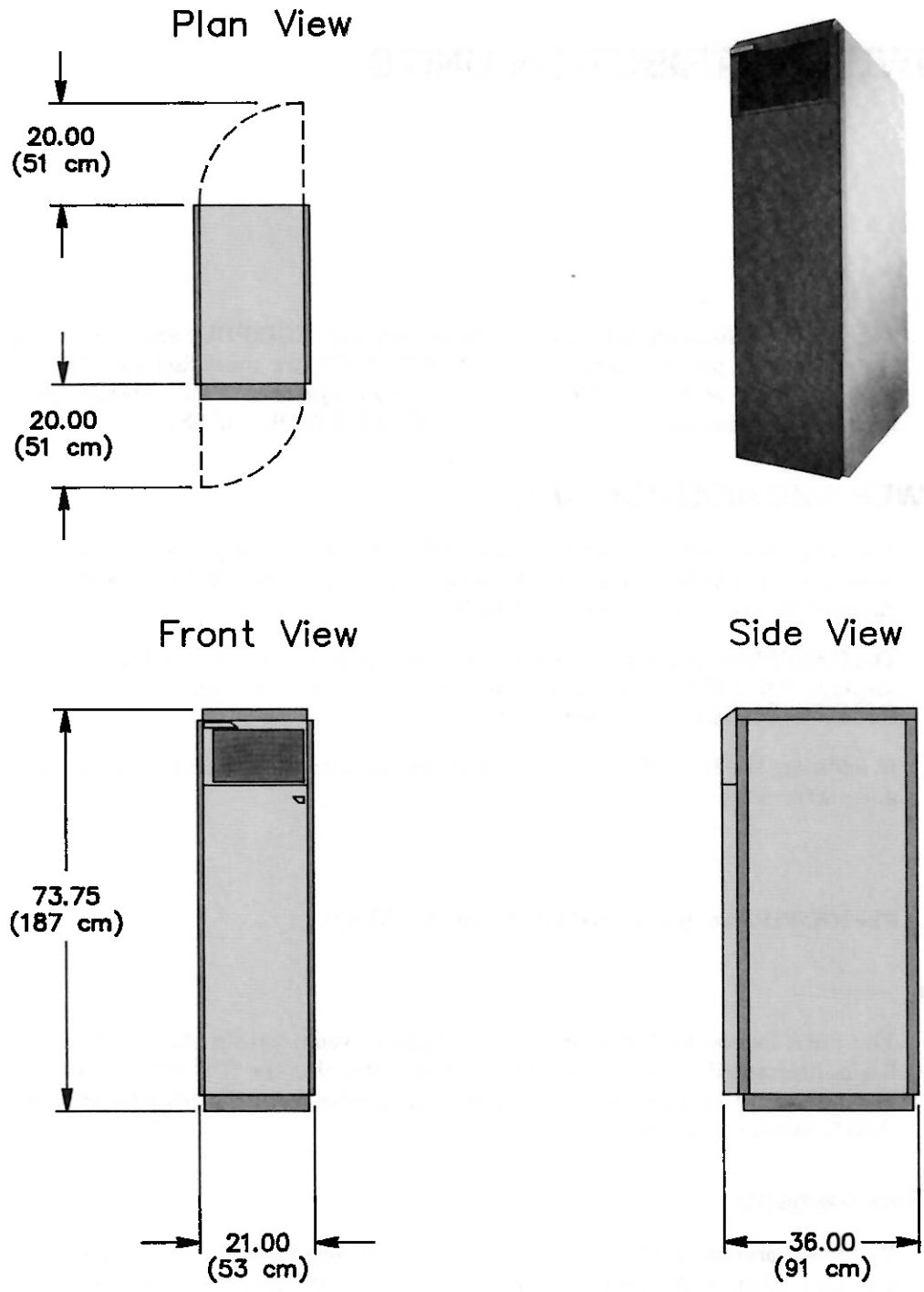


Figure 7-1. IOC Power Distribution Unit (IOC/PDU)

Room Heat Loading Characteristics

The room heat loading produced by the IOC/PDU is approximately 3,200 Btu/hr (940 W).

Floor Preparation

You must prepare a single floor cutout directly beneath the IOC/PDU for the entrance of power and control cables (refer to Figure 7-2). Floor stringers are not permitted in the cutout area. Additional underfloor support (not shown) may also be required to keep the cut floor panels in place, depending on the type of floor construction used in the facility. The floor cutout must be free of burrs and sharp edges.

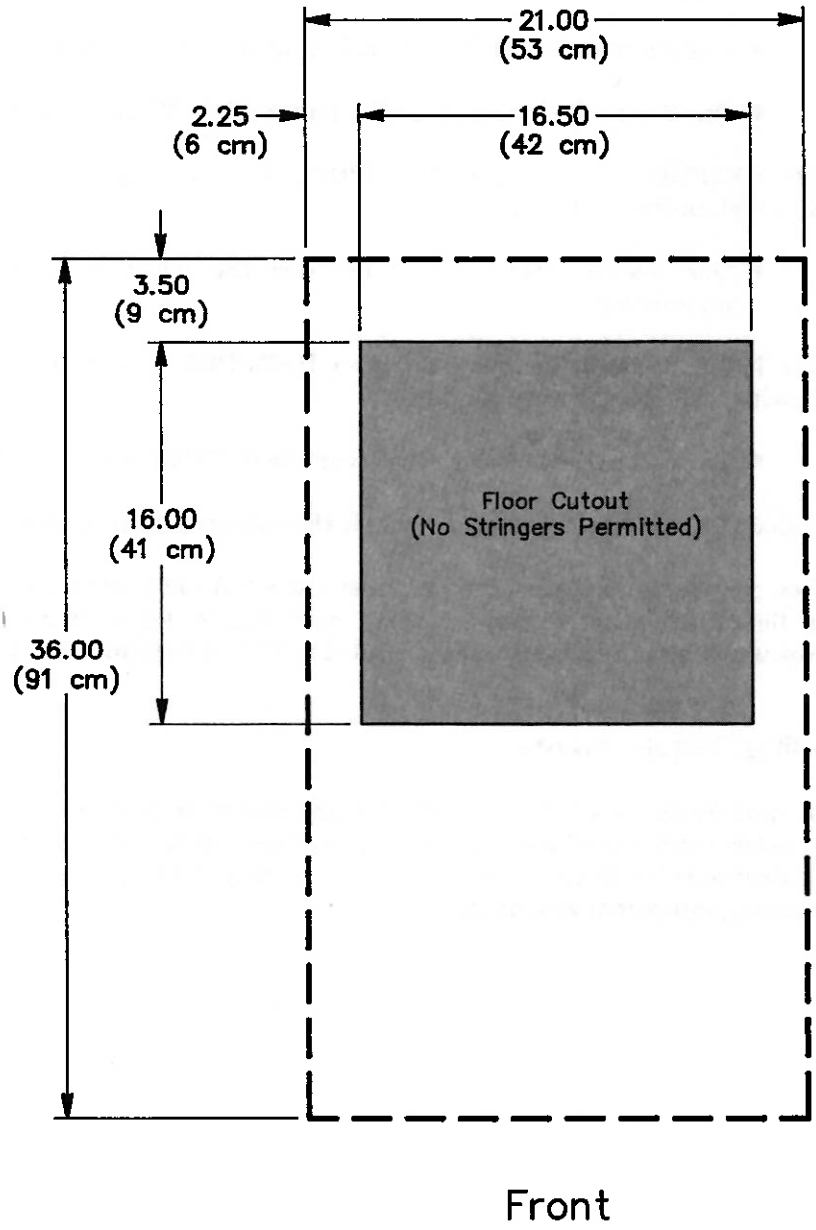


Figure 7-2. IOC/PDU Floor Cutout

Power Wiring Requirements

You must provide and install the following power and control wiring for the IOC/PDU:

- Two incoming 400-Hz, 5-wire (including ground) circuits
- One incoming 60-Hz, 3-wire (including ground) circuit
- Ten outgoing 400-Hz, 5-wire (including ground) circuits to the IOC power supplies
- Two outgoing 400-Hz, 4-wire (including ground) circuits to the IOC power supplies
- One outgoing 60-Hz, 3-wire (including ground) circuit to the IOC power supplies
- One 3-wire (including ground) circuit to the IOC liquid-line solenoid valve

If the IOC/PDU is the primary IOC's PDU, you must supply and install the following additional control wiring:

- One 5-wire control circuit between the IOC/PDU and the CRAY Y-MP8 mainframe

If the IOC/PDU is the optional secondary IOC's PDU, you must supply and install the following additional control wiring:

- One 5-wire control circuit between the IOC/PDU and the SSD/PDU

All electrical connections are made inside the cabinet base from the back of the unit.

When preparing these circuits, you must allow 2 ft (0.61 m) of excess wire length above the floor surface to ensure adequate wire length for termination. All additional nonpower cables are supplied and installed by CRI at the time of system installation.

Earth Grounding Requirements

You must install one CRI-supplied braided ground strap between the IOC/PDU and the computer room signal-ground reference system. Refer to the "Equipment Grounding Requirements" subsection in Section 2 of this manual for additional information regarding equipment grounding.

SSD POWER DISTRIBUTION UNIT

The SSD/PDU (refer to Figure 7-1) is a fan-cooled unit that uses room air for cooling purposes. It contains variable transformers for the control of input power to the power supplies located around the base of the SSD.

The SSD/PDU is equipped with a microprocessor-based control system that monitors and displays SSD/PDU 400-Hz input voltage, DC output voltages of SSD power supplies, column temperatures, and dew point.

In addition, the SSD/PDU contains on-off control circuitry, warning and fault indicators, and alarm circuits.

Weight

The SSD/PDU weighs approximately 950 lb (431 kg).

Location

You must locate the SSD/PDU in the computer room adjacent to the IOC/PDU and within the equipment separation limits illustrated in Section 9 of this manual. Position the SSD/PDU so that the controls and indicators on the front panel are fully visible from the MWS display terminals.

Access Requirements

You must provide a 3-ft (.91-m) minimum clearance between the back of the cabinet and any other equipment or wall surface to ensure proper circulation of intake and exhaust air and to allow for maintenance. A 2-in. (5-cm) side clearance is required as well.

Cooling Requirements

The SSD/PDU is a fan-cooled unit that uses room air for cooling purposes. If your computer room uses the underfloor area to supply conditioned air, air grilles or perforated floor panels must be placed in the floor immediately in back of the SSD/PDU. If your computer room does not use the underfloor area to supply conditioned air, you must ensure that cool air is supplied to the air inlet openings at the back of the SSD/PDU.

Room Heat Loading Characteristics

The room heat loading produced by the SSD/PDU is approximately 3,200 Btu/hr (940 W).

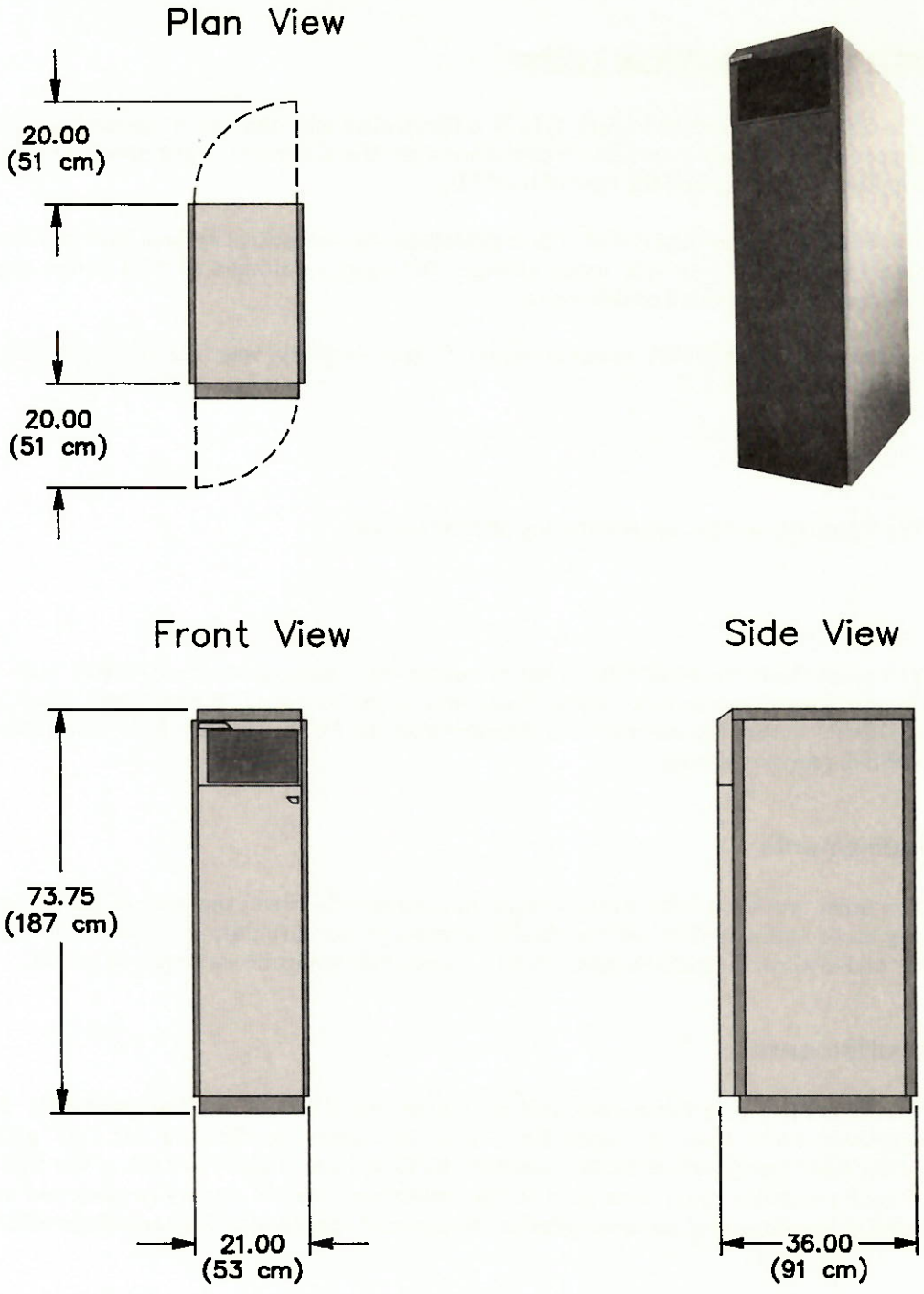


Figure 7-3. SSD Power Distribution Unit (SSD/PDU)

Floor Preparation

You must prepare a single floor cutout directly beneath the SSD/PDU for the entrance of power and control cables (refer to Figure 7-4). Floor stringers are not permitted in the cutout area. Additional underfloor support (not shown) may also be required to keep the cut floor panels in place, depending on the type of floor construction used in the facility. The floor cutout must be free of burrs and sharp edges.

Power Wiring Requirements

You must supply and install the following power and control wiring for the SSD/PDU:

- Two incoming 400-Hz, 5-wire (including ground) circuits
- One incoming 60-Hz, 3-wire (including ground) circuit
- Nine outgoing 400-Hz, 5-wire (including ground) circuits to the SSD power supplies
- Three outgoing 400-Hz, 4-wire (including ground) circuits to the SSD power supplies
- One 5-wire control circuit between SSD/PDU and the optional second IOC/PDU (if configured)
- One 4-wire control circuit to the RCU
- One 3-wire circuit (including ground) to the SSD liquid-line solenoid valve
- One 5-wire circuit to the number 2 MGS
- One 2-wire shielded cable to the number 2 MGS

All electrical connections are made inside the cabinet base from the back of the unit.

When preparing these circuits, allow 2 ft (0.61 m) of excess wire length above the floor surface to ensure adequate wire length for termination. All additional nonpower cables are supplied and installed by CRI at the time of system installation.

Earth Grounding Requirements

You must install one CRI-supplied braided ground strap between the SSD/PDU and the computer room signal-ground reference system. Refer to the "Equipment Grounding Requirements" subsection in Section 2 of this manual for additional information regarding equipment grounding.

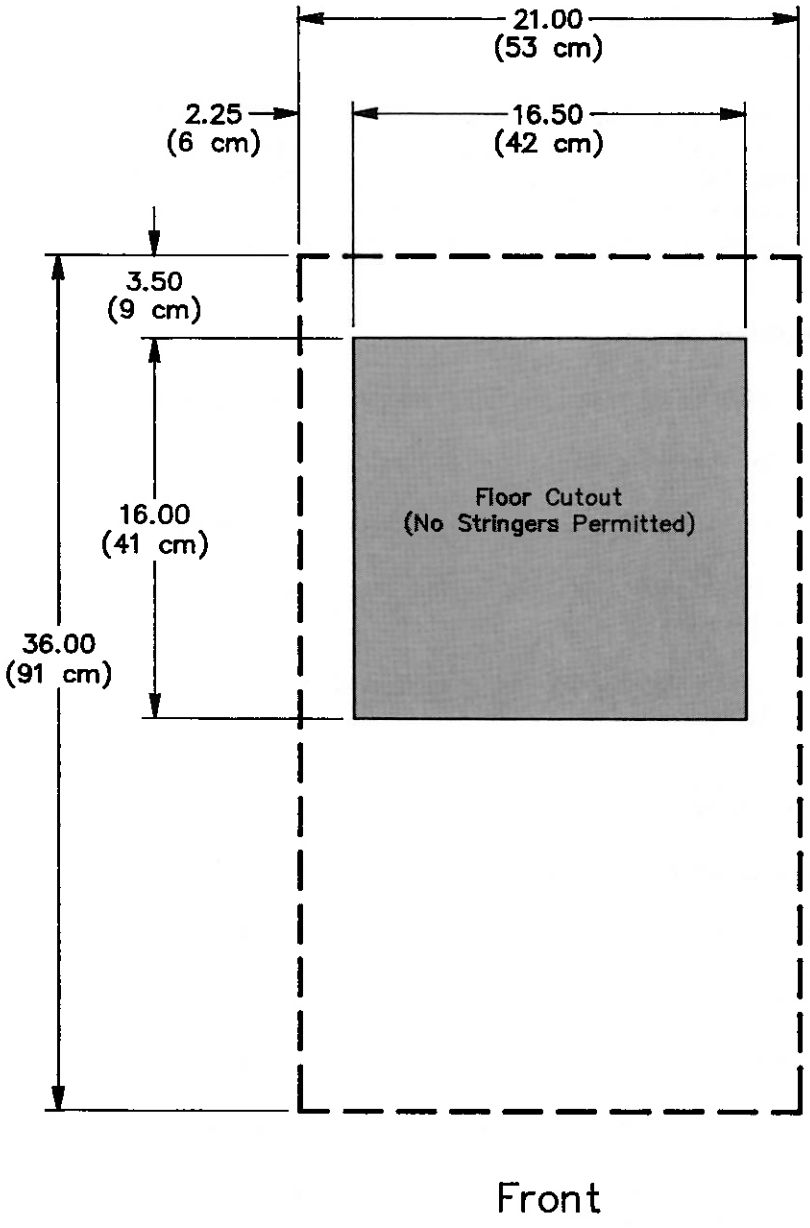


Figure 7-4. SSD/PDU Floor Cutout

8 - HEAT EXCHANGER UNIT

The heat exchanger unit (HEU) is manufactured by CRI and is an integral element of the CRAY Y-MP8 computer system. The HEU (refer to Figure 8-1) contains a pump and associated controls required to circulate the dielectric coolant through the CRAY Y-MP8 computer system's MFC. It also houses a dielectric coolant-to-refrigerant heat exchanger. Heat generated by the components within the MFC is transferred to the HEU through the dielectric coolant and then transferred to the RCU's refrigeration circuitry.

WEIGHT

The HEU weighs approximately 1,800 lbs (816 kg).

LOCATION

The standard location for the HEU is illustrated in Figure 8-2. This location ensures satisfaction of the dielectric-coolant hose lengths. If facility constraints prevent locating the HEU as illustrated, alternative locations must be discussed with CRI's site planning personnel.

ACCESS REQUIREMENTS

You must provide a 2-ft (0.61-m) minimum clearance around all sides of the HEU for maintenance purposes.

COOLING REQUIREMENTS

The HEU is primarily refrigerant-cooled.

ROOM HEAT LOADING CHARACTERISTICS

The room heat loading produced by the HEU is approximately 4,717 Btu/hr (1,380 W).

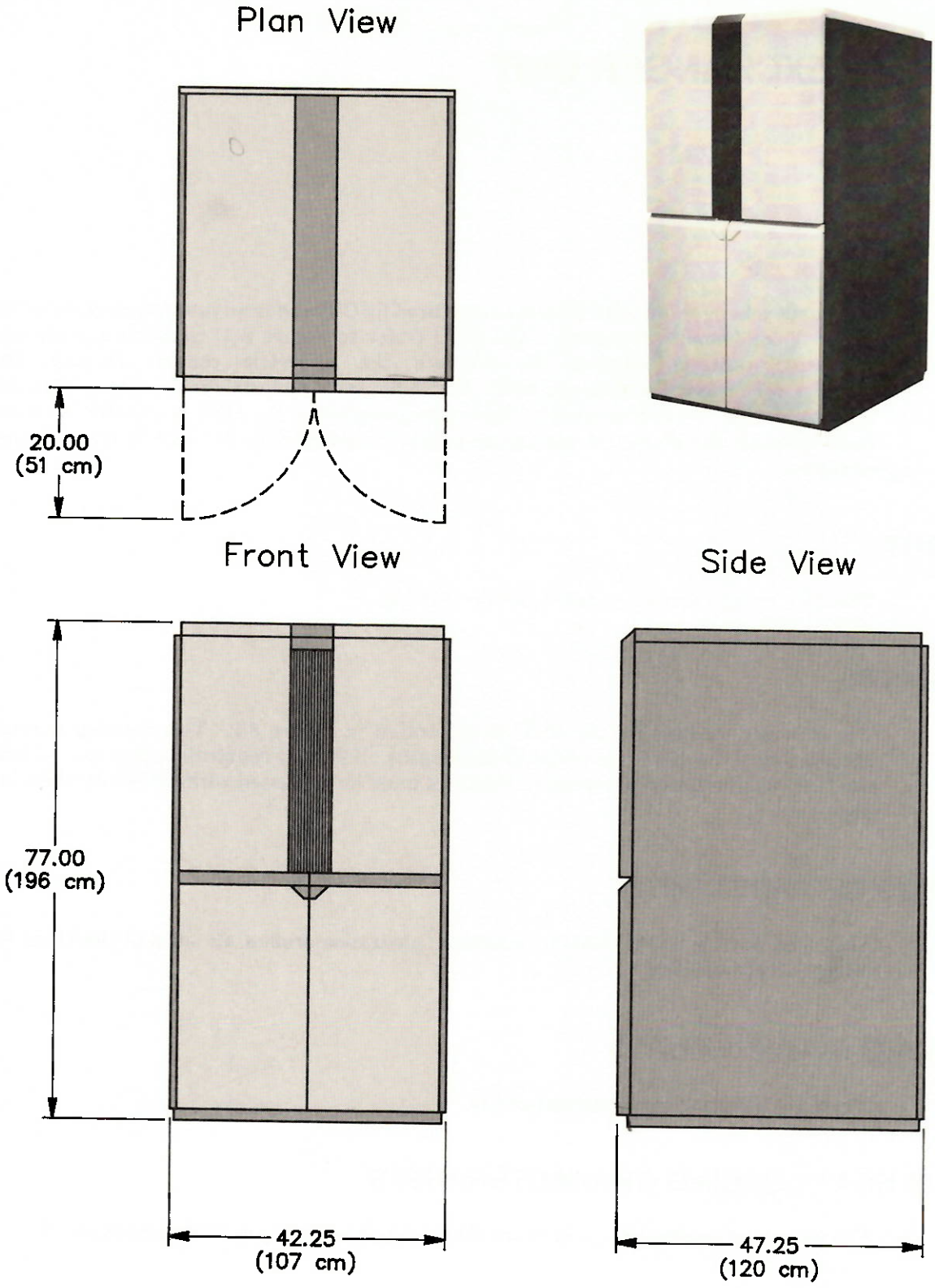


Figure 8-1. CRAY Y-MP8 Heat Exchanger Unit (HEU)

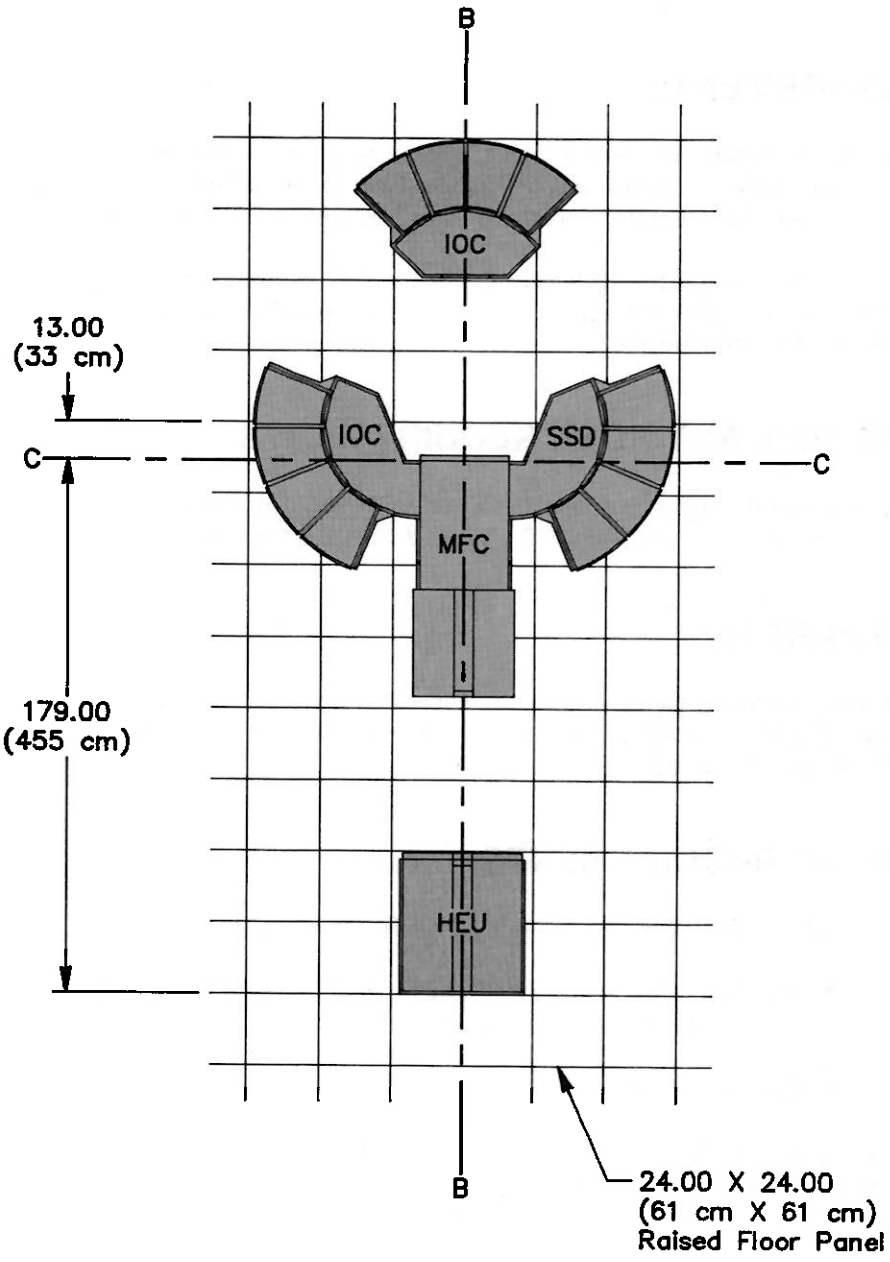


Figure 8-2. HEU Standard Placement

PIPING REQUIREMENTS

You must install the refrigeration piping to connect the HEU to the RCU prior to computer system installation. Piping must be installed as illustrated in Section 2 (Figure 2-6). For more details on refrigeration piping, refer to Section 2 of this manual.

At the time of computer system installation, CRI personnel moves the HEU into position and connects flexible refrigeration hoses with special liquid- and suction-line adapters to your refrigeration piping.

DIELECTRIC-COOLANT HOSE REQUIREMENTS

CRI personnel supply and install all dielectric coolant hoses and manifolds between the MFC and HEU (refer to Section 2, Figure 2-5) at the time of system installation.

FLOOR PREPARATION

The HEU requires two floor cutouts (refer to Figure 8-3) for the entrance of refrigeration piping, dielectric cooling hoses, and power and control wiring. Floor cutouts must be free of burrs and sharp edges.

POWER WIRING REQUIREMENTS

You must supply and install the following circuits for the HEU:

- One incoming 460-Vac, 3-phase, 60-Hz (or 398-Vac, 50-Hz) 4-wire circuit (including ground) rated at 50 A
- One 2-wire control circuit to the RCU

When preparing this circuit, allow 2 ft (0.61 m) of excess wire length above the floor surface to ensure adequate wire length for termination.

EARTH GROUNDING REQUIREMENTS

You must install one CRI-supplied braided ground strap between the HEU and the computer room signal-ground reference system. Refer to "Equipment Grounding Requirements" in Section 2 of this manual for additional information regarding equipment grounding.

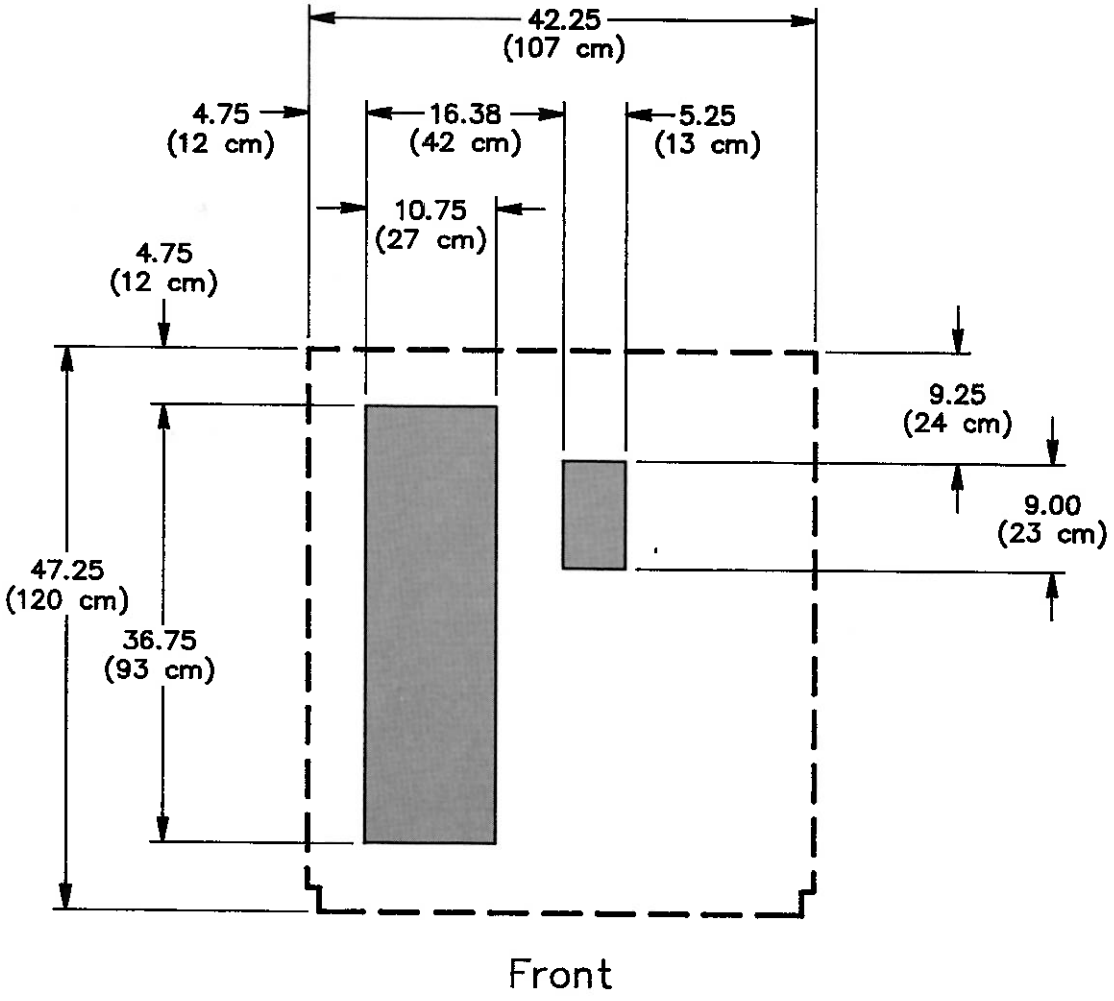


Figure 8-3. HEU Floor Preparation Requirements

9 - EQUIPMENT SEPARATION LIMITS

This section discusses the restrictions associated with the arrangement of CRAY Y-MP8 computer system equipment. Technical data and references contained within this section are intended as an overview of general requirements and are given for a typical installation only. Many of the detailed requirements vary from site to site; therefore, some of this information may change.

You must prepare drawings and adequate documentation to provide specific, detailed information about the arrangement and location of individual CRI equipment units. You should submit proposed floor plans for review and approval at an early stage of the site planning sequence. Prior to beginning site preparations, CRI site planning personnel must approve the proposed equipment arrangement.

GENERAL REQUIREMENTS

The arrangement of computer equipment within the facility must meet certain placement and separation requirements while satisfying the following general requirements:

- Personnel safety
- The highest degree of system performance achievable
- Satisfactory system installation
- Satisfactory operator and maintenance access

Although many different equipment arrangements are feasible, all must meet the signal cable and refrigerant piping length restrictions. Consideration should also be given to the 400-Hz power wiring lengths to minimize voltage drops.

FLOOR PLAN ARRANGEMENTS

Figure 9-1 illustrates equipment separation limits for the CRAY Y-MP8 computer system. The optional SSD and second IOC are included in this illustration. Figure 9-2 illustrates an acceptable arrangement of a CRAY Y-MP8 computer system. This floor plan represents a computer room of 896 ft^2 (83 m^2). The equipment units are located on a 14 × 16 grid, each grid representing a 24 in. square (61 cm) computer room floor panel. A triangular symbol located on each of the equipment units indicates the operator's access to the equipment unit.

Figure 9-2 does not illustrate the front-end interface cabinet (FEC-1), refrigeration condensing unit(s) [RCU(s)], and motor-generator sets [MGS(s)] due to their possible remote locations.

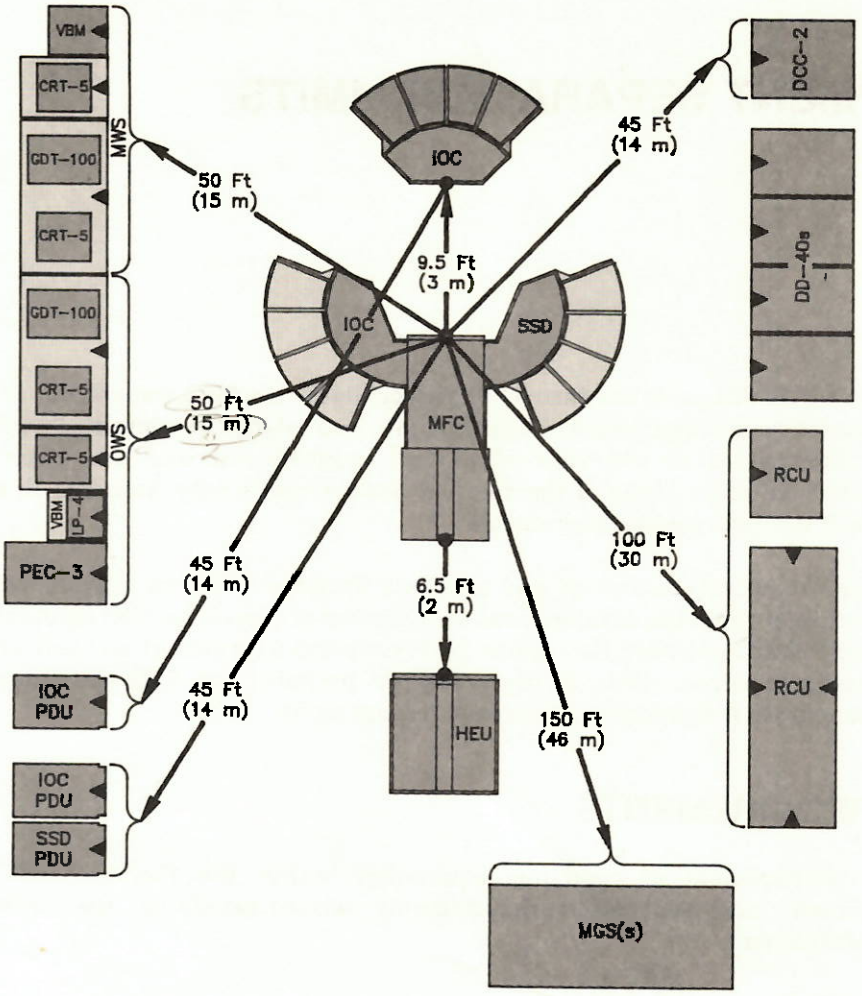


Figure 9-1. Maximum Equipment Separation Limits for the CRAY Y-MP8 Computer System

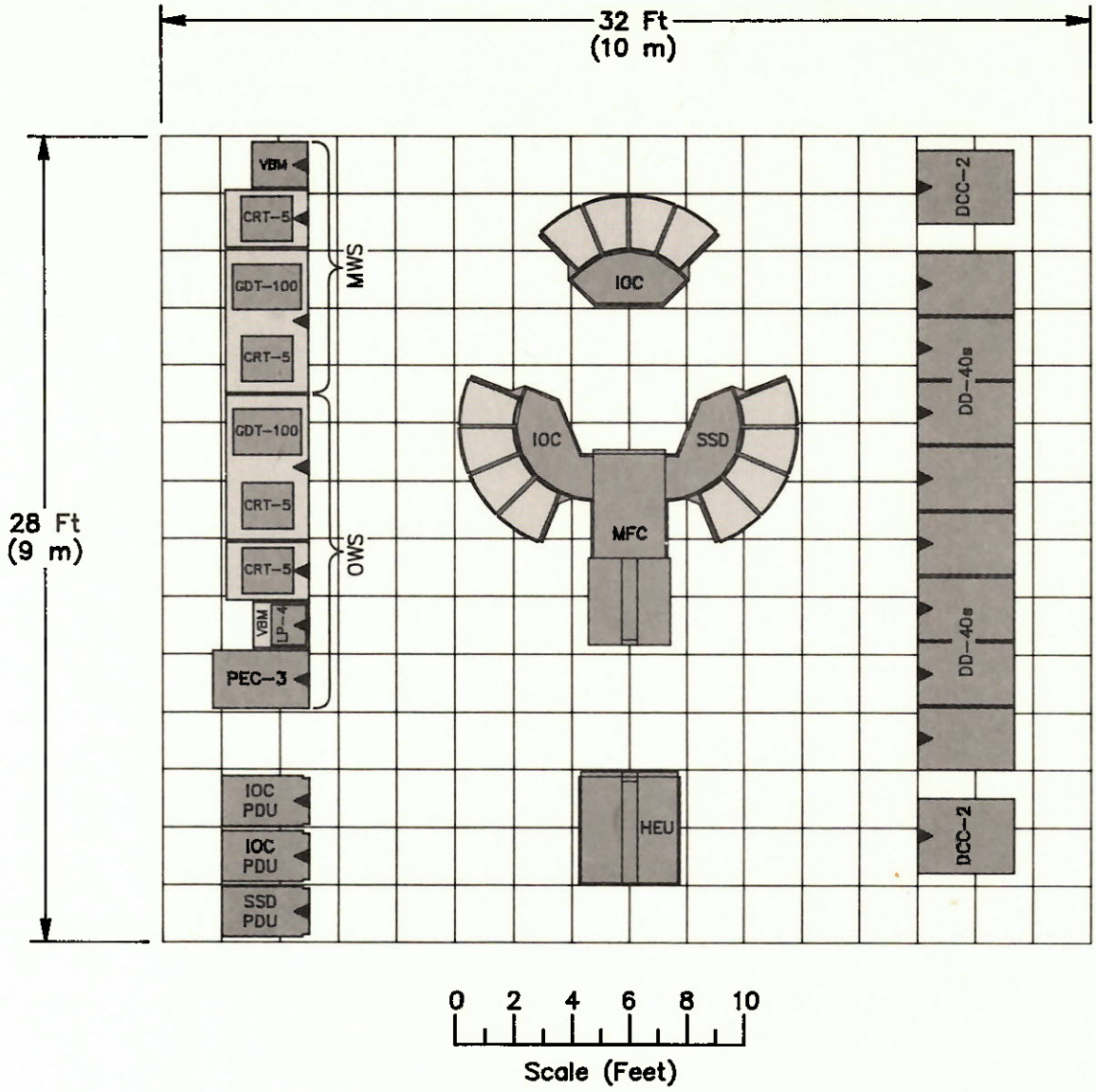


Figure 9-2. Typical Computer Room Floor Plan for a CRAY Y-MP8 Computer System

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