# CRAY T3E AC Multiple-cabinet Installation

**HMM-369-0**



(continued)

**Complete the following tasks when you bolt cabinets together:**

**Complete the following tasks when you DO NOT bolt cabinets together:**



**Complete the following tasks for ALL cabinets:**

## Figures

## Tables

## Record of Revision

**Revision 0: October 1996**

Original printing.

## Overview

These installation procedures are intended to assist Cray Research personnel with the mechanical installation of 2 or more CRAY T3E air-cooled (AC) cabinets. The installation includes the following tasks:

- Unpacking and positioning the system components
- Connecting cables
- Powering on the system and verifying operation
- Verifying system function with diagnostics

This document provides an efficient sequence for the installation. You may deviate from the sequence as required; however, when possible, **perform the procedures in the order shown.**

Cray Research ships CRAY T3E AC cabinets in three shipping configurations: 1 cabinet per shipping crate, 2 cabinets per crate, and 3 cabinets per crate. When a crate contains 2 or 3 cabinets, the cabinets are bolted together and the wires that pass between cabinets are connected.

As a result of these variable shipping configurations, you may not be required to complete internal cabinet wiring. For example:

- If your system contains 2 or 3 cabinets, and the cabinets are bolted together during shipment, then you do not need to complete internal cabinet wiring.

- If your system contains 4 or more cabinets, or if you must otherwise bolt cabinets together, then you must complete internal cabinet wiring.

Your system configuration and site access restrictions determine how your system ships.

**NOTE:** This document uses the term *prejoined* to refer to cabinets that are bolted together during shipment.

This document does not contain troubleshooting procedures, nor does it contain installation procedures for peripheral equipment.

For information on the PC-10 installation, refer to *Peripheral Cabinet (PC-10) Installation*, publication HMM-371. For information on the SWS installation, refer to *System Workstation*, publication HMM-222.

For information on the CRAY T3E software installation, refer to the *CRAY T3E Software Installation and Configuration Guide*, publication SG-2610. For information on a single-cabinet installation, refer to *CRAY T3E AC Single-cabinet Installation Procedures*, HMM-164.

Installation personnel should have a basic knowledge of computer system power processes. They should also have a basic understanding of the control system, the layout of the various cabinet components, and of running offline diagnostics.

The installation coordinator is responsible for CRUISE (Cray Research Unified System Enterprise) registration and for installation reporting. The system log book in the “OPEN FIRST” box contains a copy of the Web-based Installation Reporting tool. You may use the paper copy to help track the installation and, if necessary, to fax the information.

# Safety Information

The following subsections contain important safety information that you must read and understand before you begin the CRAY T3E AC system installation.

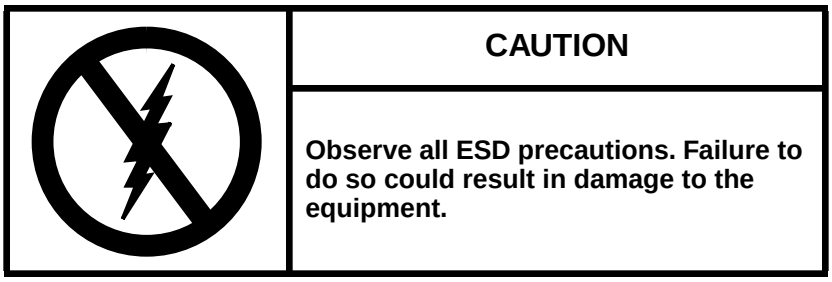
## Hazard Statements

During the installation of the computer system, be alert for hazard advisory statements. The following list describes the hazard statement signal words:

- **Danger** indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.
- **Warning** indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
- **Caution** indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. This signal word is also used to alert personnel against unsafe practices that can result in equipment damage and/or data corruption.

## ESD Precautions

Observe electrostatic discharge (ESD) precautions during the entire installation process. Required apparel includes an ESD smock and an ESD wrist strap.




### ESD Smock

Wear a Cray Research-approved static-dissipative smock when servicing or handling an ESD-sensitive device. Completely button the smock and wear it as the outermost layer of clothing. You must have a portion of the smock's sleeves in direct contact with the skin of your arms. Skin contact is essential for a dissipative path-to-earth ground through your wrist strap. Tuck hair that exceeds shoulder length inside the back of the smock.

### Wrist Strap

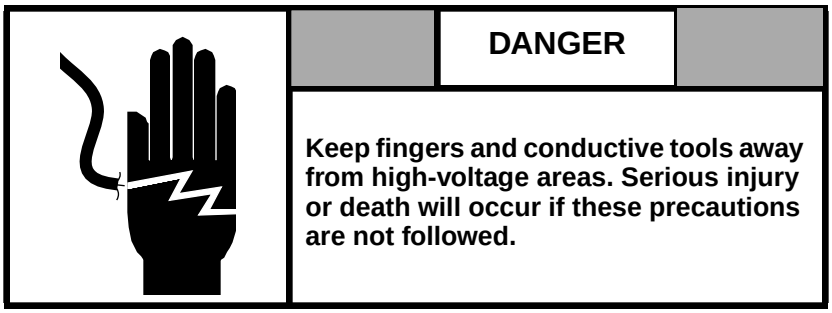
Wear a Cray Research-approved wrist strap when servicing or handling an ESD-sensitive device to eliminate possible ESD damage to equipment. Connect the wrist strap cord directly to earth ground.

**NOTE:** The CRAY T3E AC cabinet contains two sets of jacks (front and rear) for a mating ESD ground strap.

## Safety Precautions

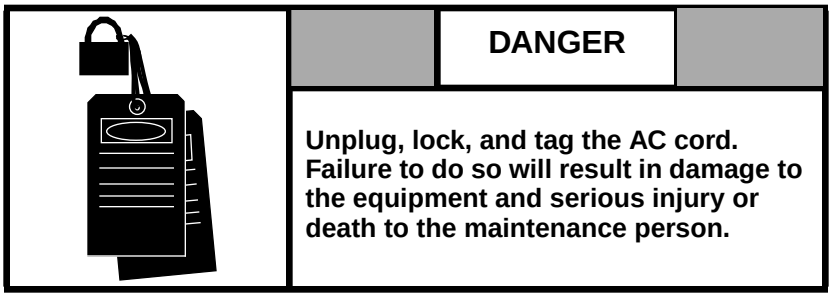
Before you perform the procedures in this document, take a few minutes to review the *Safety and ESD Guidelines*, publication number HGM-016. In addition, observe the following safety measures when installing, repairing, or maintaining the system.

- Use caution when removing the cabinets from the ramps. Moving these cabinets can cause personal injury or property damage if the cabinets are not handled properly.
- Ensure that the cabinet crates are positioned close to their final positions before you unpack them.
- Do not move the cabinets while they are connected to power.
- Do not wear watches or jewelry when you work on a CRAY T3E system cabinet.




- Keep fingers and conductive tools away from high-voltage areas and from high-current areas.
- Ensure that a qualified electrician has properly installed the power receptacles.

- Set all circuit breakers to the OFF (0) position before you plug in the system power cord.
- Unplug, lock, and tag the cabinet power plug before you work on the power system components.




- Remove all tools from the system cabinets after you service them.
- Replace all covers and panels that you removed from the system during servicing.
- Power off the system only after the system software has been shut down in an orderly manner.

**CAUTION**

**If you power off the system before you halt the operating system, you may lose system and customer files (data).**

# Preinstallation Activities

Before you install your system, read the following subsections and verify that your site meets all site requirements.

## Tools Required

Ensure that you have the following tools, which are necessary to complete the hardware installation. These tools are available from Cray Research's Customer Service Logistics department or from any hand-tool vendor. (The Logistics part number for the CRAY T3E tool kit is 57247800.)

- Multimeter
- Cutters
- Adjustable wrench or 11-mm, 15-mm, and 16-mm wrenches
- 0.5-in., 3-mm, and 4-mm hex (Allen) wrenches with driver
- #1 and #2 Phillips screwdrivers
- Small and medium flatblade screwdrivers
- Flashlight
- Heat gun (optional)
- Wiring tools (if you must join cabinets), including:
  - 0.3-mm mechanical pencil, with no lead (or a wire removal tool)
  - Dental pick
  - Hemostats, tweezers, or wire insertion tool (all optional)

## Checking Site Planning Requirements

Before you install your CRAY T3E system, ensure that your site meets all of the site planning requirements included in *Preparing for a CRAY T3E Air-cooled System Installation*, Cray Research publication number HR-04118. For example, take some time to verify the following things:

- Verify that the site has appropriate means (pallet jacks, etc.) for unloading and transporting the system components.
- Verify that the route to the computer room is free of obstacles.
- Verify that the computer room floor is prepared according to the floor layout diagram for the system.
- Verify that floor cutouts are complete, correct, and free of sharp edges and burrs.

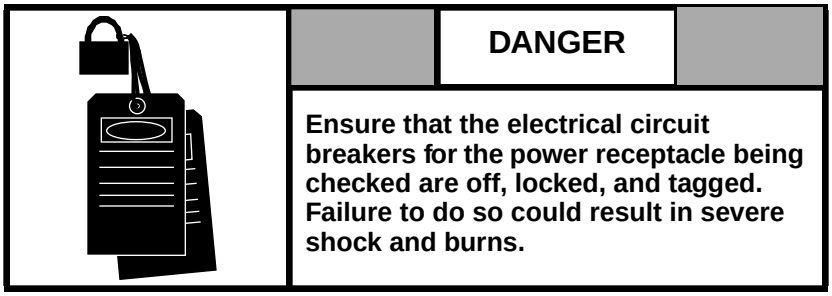
- Verify that all electrical services meet site planning specifications.
- Verify that the air-conditioning equipment meets site planning specifications.
- Verify that the ground clamps (for grounding the cabinets to the floor grid) are in the correct locations (near the floor cutouts for I/O cables).

## Checking the Power Cord Receptacles

Ensure that a qualified electrician installed the correct power receptacles according to site planning specifications. Then Cray Research-trained personnel should use the following procedure to ensure that the power receptacles are properly wired. Refer to Figure 1 for drawings of the 3-phase power plugs and receptacles that are available for CRAY T3E AC cabinets.

Perform the following procedure for each power cord receptacle that will support a CRAY T3E AC cabinet:

1. Turn off, lock, and tag the customer's circuit breaker(s) that control power for the CRAY T3E AC cabinet power receptacle before you perform Step 2 and Step 3.




2. Set the multimeter to a low-resistance setting.
3. Measure between the power receptacle ground-post hole and an appropriate earth-ground location and ensure that resistance is less than 1 ohm. Figure 1 shows the post hole locations. (Appropriate earth-ground locations could include the floor grid, a metal case receptacle, and a circuit breaker shell.)
4. Remove the lock and tag and restore power through the customer's circuit breaker(s).
5. Set the multimeter to a high AC-voltage range.

6. Measure between the ground-post hole and an appropriate earth-ground location. **If you detect voltage on the ground-post hole, contact a site-approved electrician. Do not proceed with the installation.**

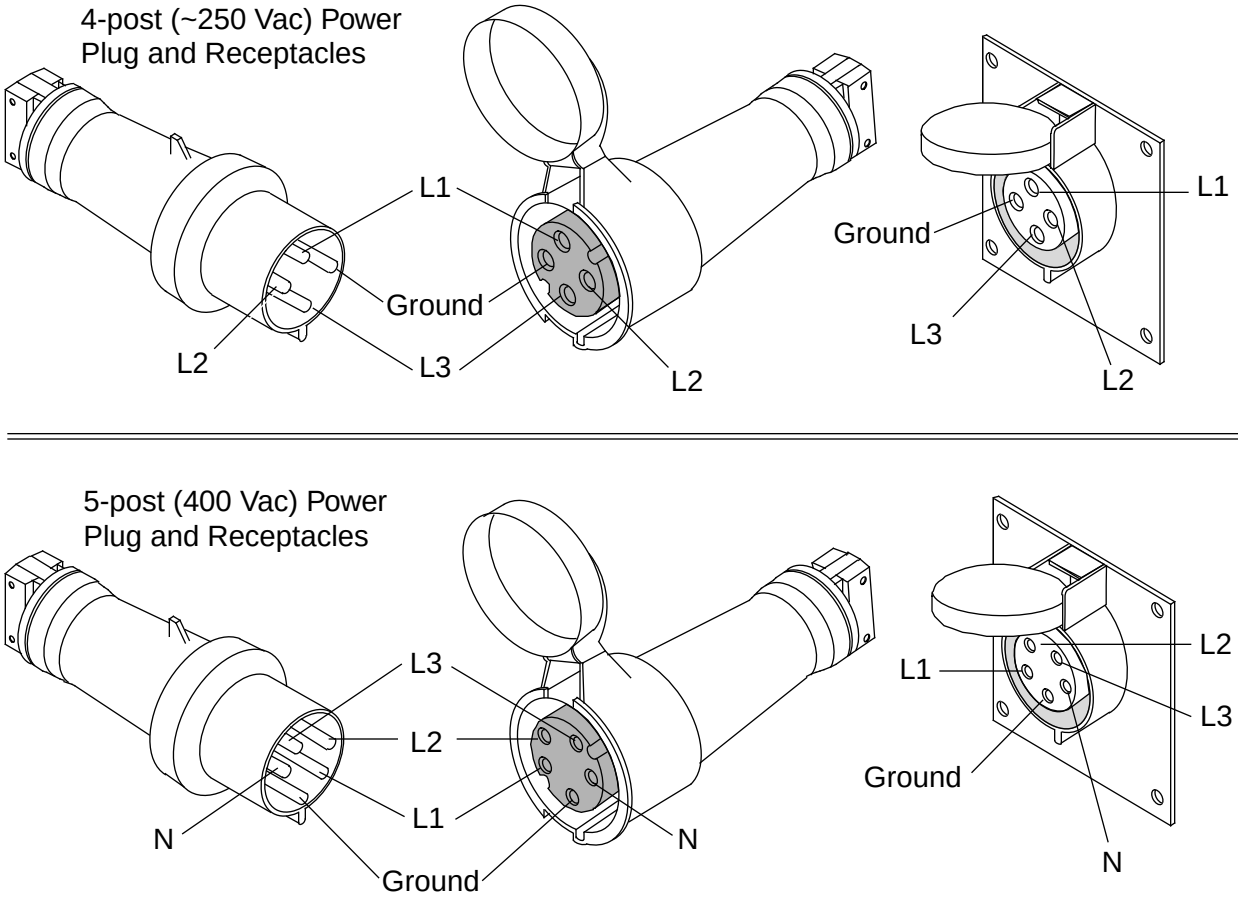
   **NOTE:** The ground wire may act as an antenna and, through impedance, generate a low voltage (usually less than 1 Vac). This is normal.

7. Perform voltage checks between the posts listed in Table 1. Refer again to Figure 1, which shows the post locations.

*Table 1. Required Power Receptacle Test Readings*

| Cord Assembly | From Post | To Post | Meter Reading |
|---|---|---|---|
| P/N 57181600 60 A, 250 Vac (4-post cord [delta] used commonly in North America and Japan) | L1 | G | Not to exceed 140 Vac |
| | L2 | G | Not to exceed 140 Vac |
| | L3 | G | Not to exceed 140 Vac |
| | L1 | L2 | Between 180 and 240 Vac |
| | L2 | L3 | Between 180 and 240 Vac |
| | L1 | L3 | Between 180 and 240 Vac |
| P/N 57181700 32 A, 400 Vac (5-post cord [wye] used commonly in Europe) | L1 | N | Not to exceed 260 Vac |
| | L2 | N | Not to exceed 260 Vac |
| | L3 | N | Not to exceed 260 Vac |
| | L1 | L2 | Between 360 and 440 Vac |
| | L2 | L3 | Between 360 and 440 Vac |
| | L1 | L3 | Between 360 and 440 Vac |

*Figure 1. Power Plugs and Receptacles*




## Power Wiring for High-leakage Current

Please note the following statement by Underwriters Laboratories, Inc.

An insulated earthing conductor that is identical in size, insulation material, and thickness to the earthed and unearthed branch-circuit supply conductors except that it is green with or without one or more yellow stripes is to be installed as part of the branch circuit that supplies the unit or system. The earthing conductor described is to be connected to earth at the service equipment or, if supplied by a separately derived system, at the supply transformer or motor-generator (UL 60 95).

## Unloading the Computer System

Cray Research ships CRAY T3E AC cabinets in three shipping configurations: 1 cabinet per shipping crate, 2 cabinets per crate, and 3 cabinets per crate. Your configuration and site access restrictions determine how your system ships.

If your system includes 1 or more cabinets that ship singly (1 cabinet per crate), the side panels are installed on the single cabinet(s). If your system does not include a cabinet that ships singly, then the side panels ship in separate boxes.

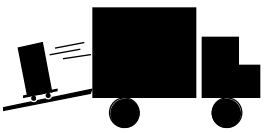
Figure 2 shows the CRAY T3E AC single-cabinet shipping configuration, lift openings, and dimensions. Figure 3 shows the CRAY T3E AC 3-cabinet shipping configuration, lift openings, and dimensions. The 2-cabinet shipping configuration is a smaller version of the 3-cabinet configuration.

In most cases, if your loading dock is the same height as the transportation vehicle, you may use ROL-A-LIFTs or pallet jacks to unload the system from the transportation vehicle. Specifically, you may use a pallet jack to unload a shipping crate that contains only 1 cabinet, and you must use ROL-A-LIFTs to unload shipping crates that contains 2 or 3 cabinets.

When you use ROL-A-LIFTs, position the ROL-A-LIFTs on the ends of the shipping crate as shown in Figure 3. Ensure that you place a board between each ROL-A-LIFT and the side of the shipping crate as shown in Figure 3; position the board 35 to 40 in. (889 to 1,016 mm) from the top of the shipping crate. (Two 2 in. x 4 in. boards are supplied with each crate that contains 2 or 3 cabinets; the boards are strapped to the outside of the crate.)

**NOTE:** You will use the ROL-A-LIFTs when you **unpack** crates that contain 2 or 3 cabinets.

If the loading dock is not level with the vehicle, you must provide a forklift or another approved method to unload the system. A platform or ramp may be used to obtain the desired level as long as the ramp does not exceed a ratio of 1 unit vertical to 6 units horizontal. Refer to *Preparing for a CRAY T3E Air-cooled System Installation*, publication HR-04118, for more information on site requirements.



**CAUTION**

**Prevent computer equipment from rolling off the transportation vehicle. Failure to do so could result in serious damage to the computer equipment.**

If the computer site does not have a loading dock, arrange for a forklift to remove the computer from the transportation vehicle.

Ensure that at least two people are available to help move the mainframe cabinets. (We recommend that four or more people help move crates that contain 2 or 3 cabinets.) Perform all movement of the cabinets slowly and carefully. Follow any instructions that are printed on the packing crates.

*Figure 2. Single-cabinet Shipping Configuration*

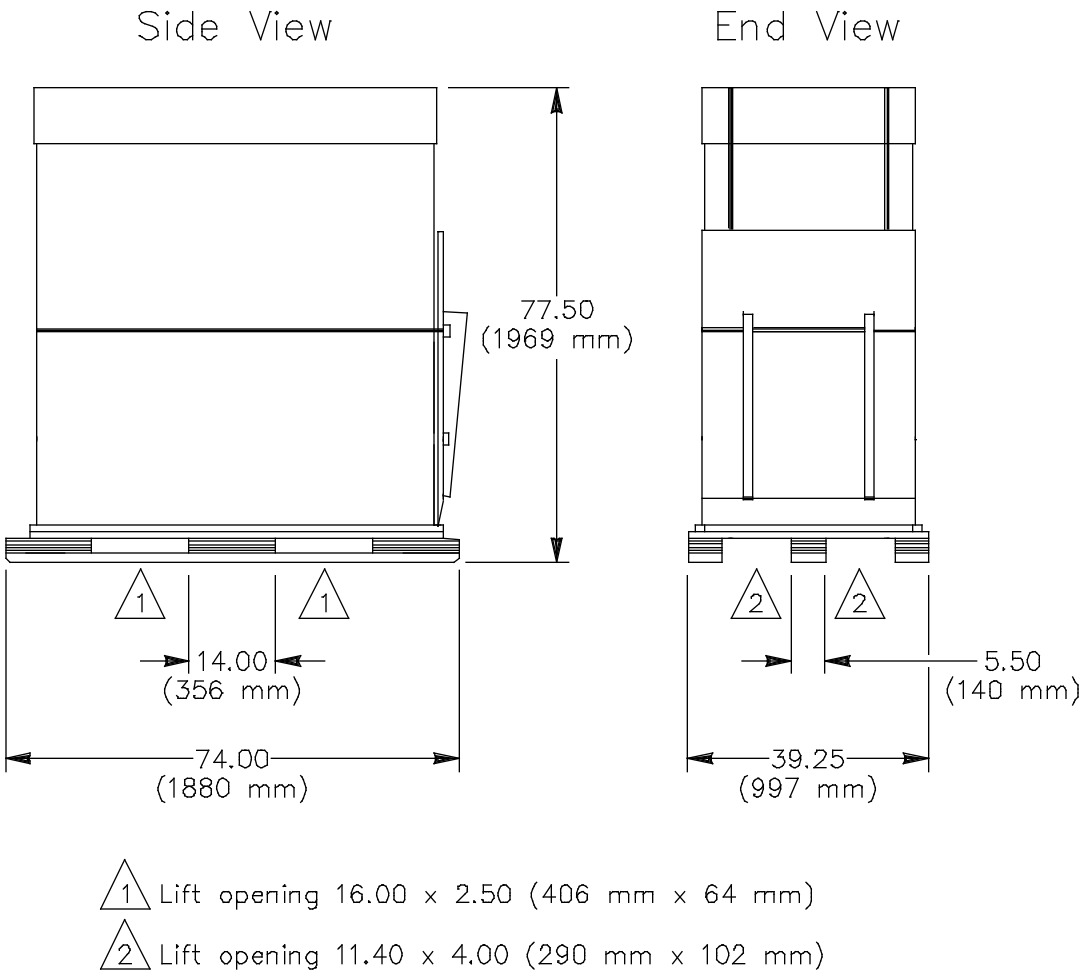
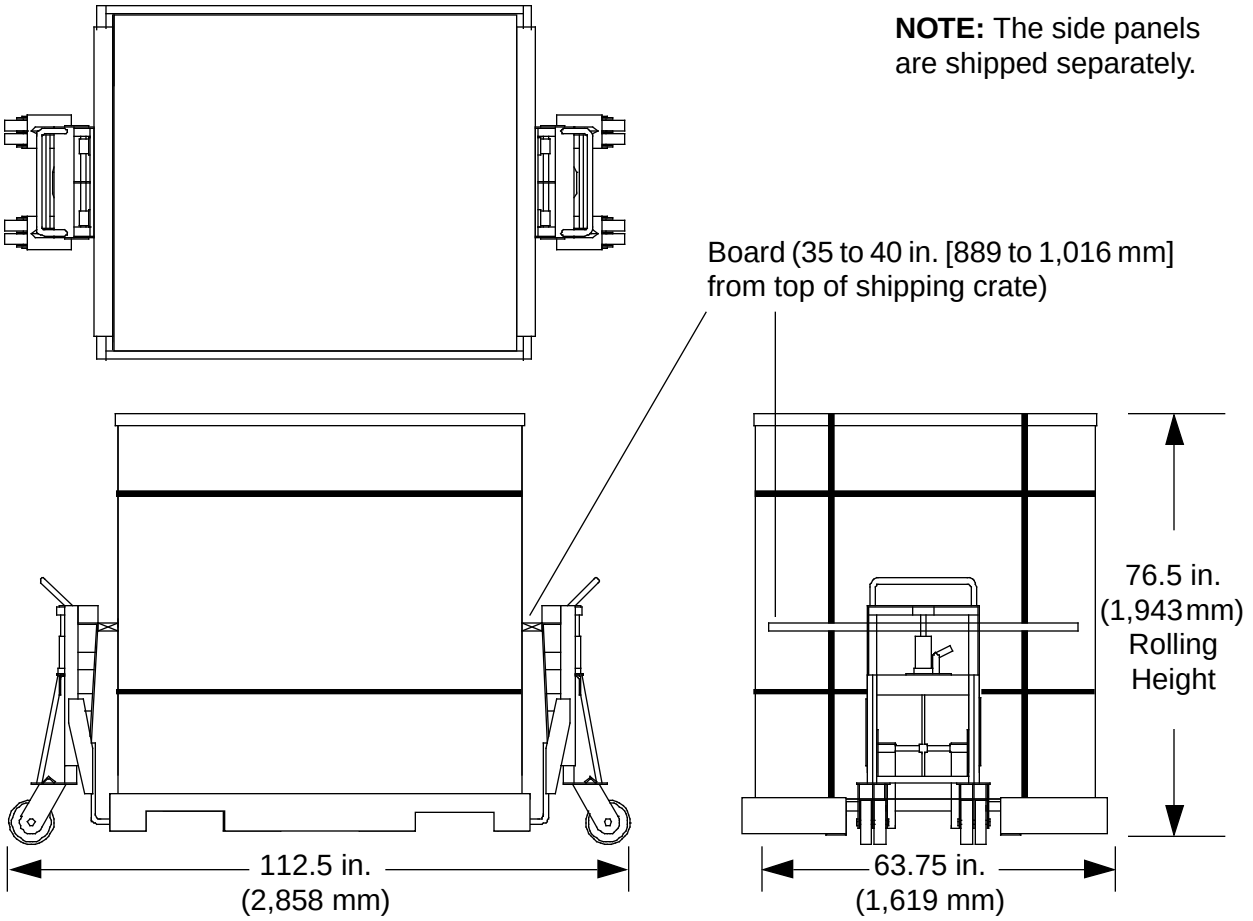


*Figure 3. Three-cabinet Shipping Configuration*




## Inspecting the System

The shipping crates contain the mainframe cabinets, PC-10, system workstation, additional system components, and system maintenance and user documentation. After the system is unloaded from the truck, perform the following steps before you transport and unpack it.

1. Ensure that the boxes arrived unopened. If any boxes are open, identify and record the opened boxes through the CRUISE system.

2. Inspect the shipping crate for signs of external damage such as dents, holes, crushed corners, and water marks. Record any signs of external damage as an installation defect through the CRUISE system.

Later, when you unpack the system, check the contents of each shipping crate against the packing list, which is attached to the outside of the shipping crate.

## Opening the “OPEN FIRST” Box

After you inspect the shipping crates and boxes for damage, open the box marked “OPEN FIRST.” This box contains up-to-date versions of this document and associated installation documents. This box also includes the following documents that you will refer to during the installation:

- System configuration documentation
- System deviation documentation
- Cable list

To ensure that you have the most accurate information available, use the installation documents from the “OPEN FIRST” box to complete the installation.

## Transporting the Mainframe to the Designated Location

The method you use to move the CRAY T3E AC cabinets depends on the shipping configuration. This section provides general guidelines. In addition, follow any instructions that are printed on the packing crates.

You may use the following methods to transport each shipping crate that contains 1 CRAY T3E cabinet:

- One pallet jack on the *side* of the crate
- One long pallet jack (approx. 60 in. [152 cm]) on the *end* of the crate
- Two pallet jacks (one at each *end* of the crate) – short distances only

You may use the following methods to transport each shipping crate that contains 2 CRAY T3E cabinets:

- ROL-A-LIFTs at each *end* of the crate (refer again to Figure 3)
- One pallet jack on the *side* of the crate – short distances only

For each pallet that contains 3 CRAY T3E cabinets, you must use ROL-A-LIFTs (positioned on the ends of the crate) to transport the cabinets.

Cray Research recommends that you leave each system cabinet in its shipping crate until it reaches its final location. If the crate does not fit through the planned access route, you may partially disassemble the crate.

## Shipping Specifications

The following list contains the specifications for a shipping crate that contains 1 cabinet:

- Weight: 1,640 lbs (744 kg)
- Height: 77.5 in. (1,969 mm)
- Rolling height: 78.5 in. (1,994mm)
- Width: 39.25 in. (997 mm)
- Depth: 74.00 in. (1,880 mm)

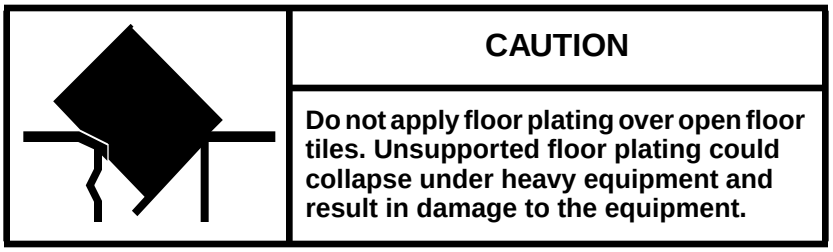
The following list contains the specifications for a shipping crate that contains 2 cabinets:

- Weight: 3,000 lbs (1,361 kg)
- Height: 75.5 in. (1,918 mm)
- Rolling height: 76.5 in. (1,943 mm)
- Width: 54.5 in. (1,384 mm)
- Width with lifts: 88.5 in. (2,248 mm)
- Depth: 63.75 in. (1,619 mm)
- Depth with doors and bumpers removed: 58.25 in. (1,480 mm)

The following list contains the specifications for a shipping crate that contains 3 cabinets:

- Weight: 4,400 lbs (1,996 kg)
- Height: 75.5 in. (1,918 mm)
- Rolling height: 76.5 in. (1,943 mm)
- Width: 78.5 in. (1,994 mm)
- Width with lifts: 112.5 in. (2,858 mm)
- Depth: 63.75 in. (1,619 mm)
- Depth with doors and bumpers removed: 58.25 in. (1,480 mm)

Refer to the appropriate installation documents for details on other equipment.



**CAUTION**

**Do not apply floor plating over open floor tiles. Unsupported floor plating could collapse under heavy equipment and result in damage to the equipment.**

# Unpacking the CRAY T3E AC Cabinets

This section contains unpacking instructions for shipping crates that contain 1 cabinet and for shipping pallets that contain 2 or 3 cabinets.

If the system shipping or storage environment is significantly different than the environment in which it is to be installed (40 °F [22 °C] or greater disparity), leave the system cabinets in their shipping crates for at least 24 hours at room temperature before you start the installation. This acclimation prevents damage to the equipment that could result from thermal shock and condensation.

## Unpacking a Crate that Contains a Single Cabinet

After you move the system to its designated location, use the following procedure to unpack each shipping crate that contains 1 cabinet.

**CAUTION**

**Steps 1 through Step 11 require two people to ensure personal safety and to protect the equipment. Failure to use two people could result in injury to personnel or damage to the equipment.**

1. Locate the front of the shipping crate; it is marked FRONT. The ramp is attached to the front of the crate. Refer to Figure 4.

2. Cut the vertical straps that hold the cardboard shipping panels in place. These straps are tight and may snap when you cut them.

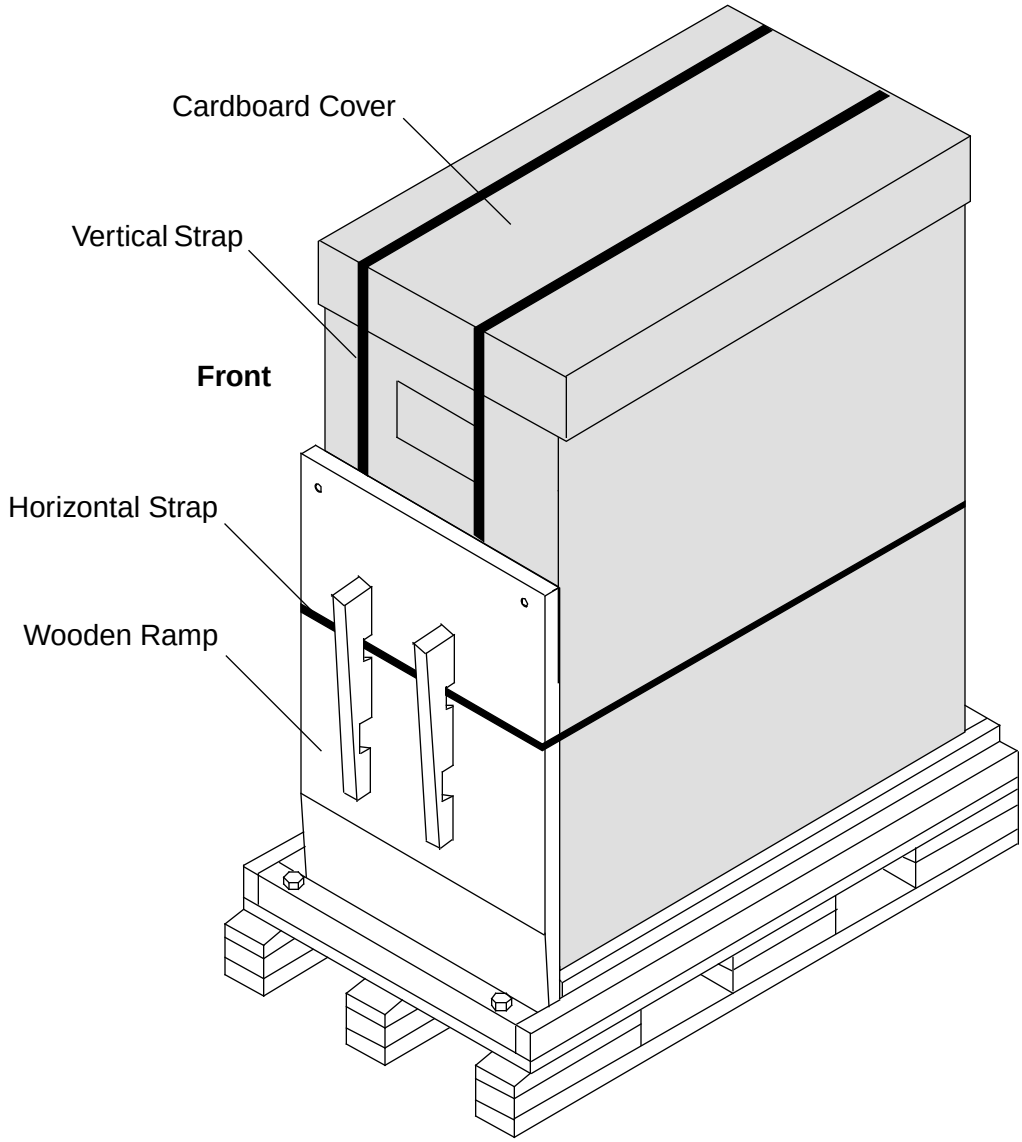
**CAUTION**

**The restraining straps are tight and may hit you or someone nearby when you cut them. Wear eye protection and protect your body and face when you cut the straps. Ensure that other personnel either stand clear or protect themselves. Failure to do so may result in injury.**

3. While someone holds the ramp, cut the horizontal strap. Set the ramp aside temporarily.

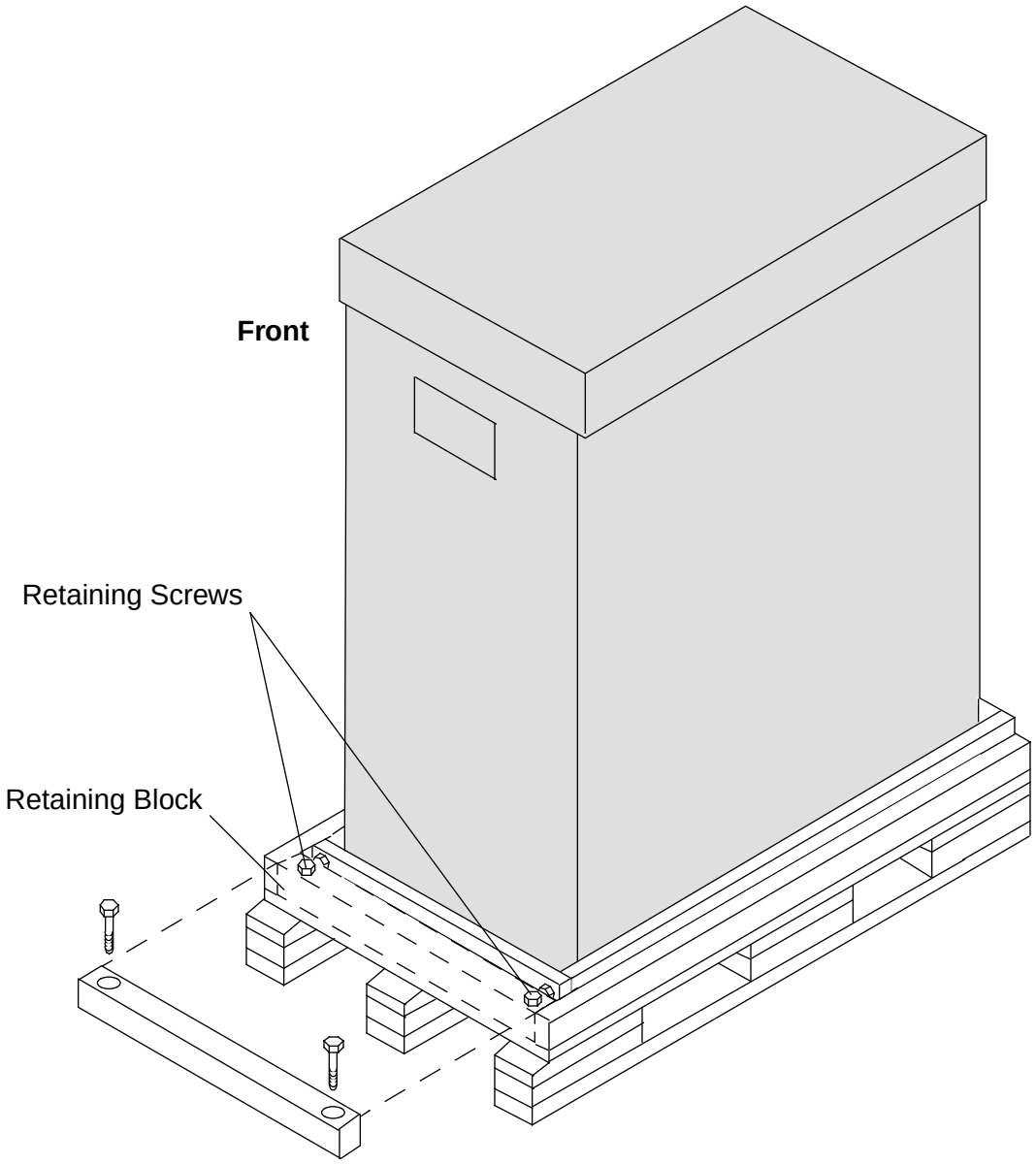
| CAUTION |
| --- |
| **Someone must hold the ramp when you cut the strap. Failure to do so may cause the ramp to fall and result in injury to personnel.** |

*Figure 4. Cabinet Shipping Crate*



4. With an 11-mm wrench, remove the 2 retaining screws that secure the retaining block to the shipping crate, then remove the block, as shown in Figure 5. Retain the screws for the next step.

*Figure 5. Retaining Block and Screws*

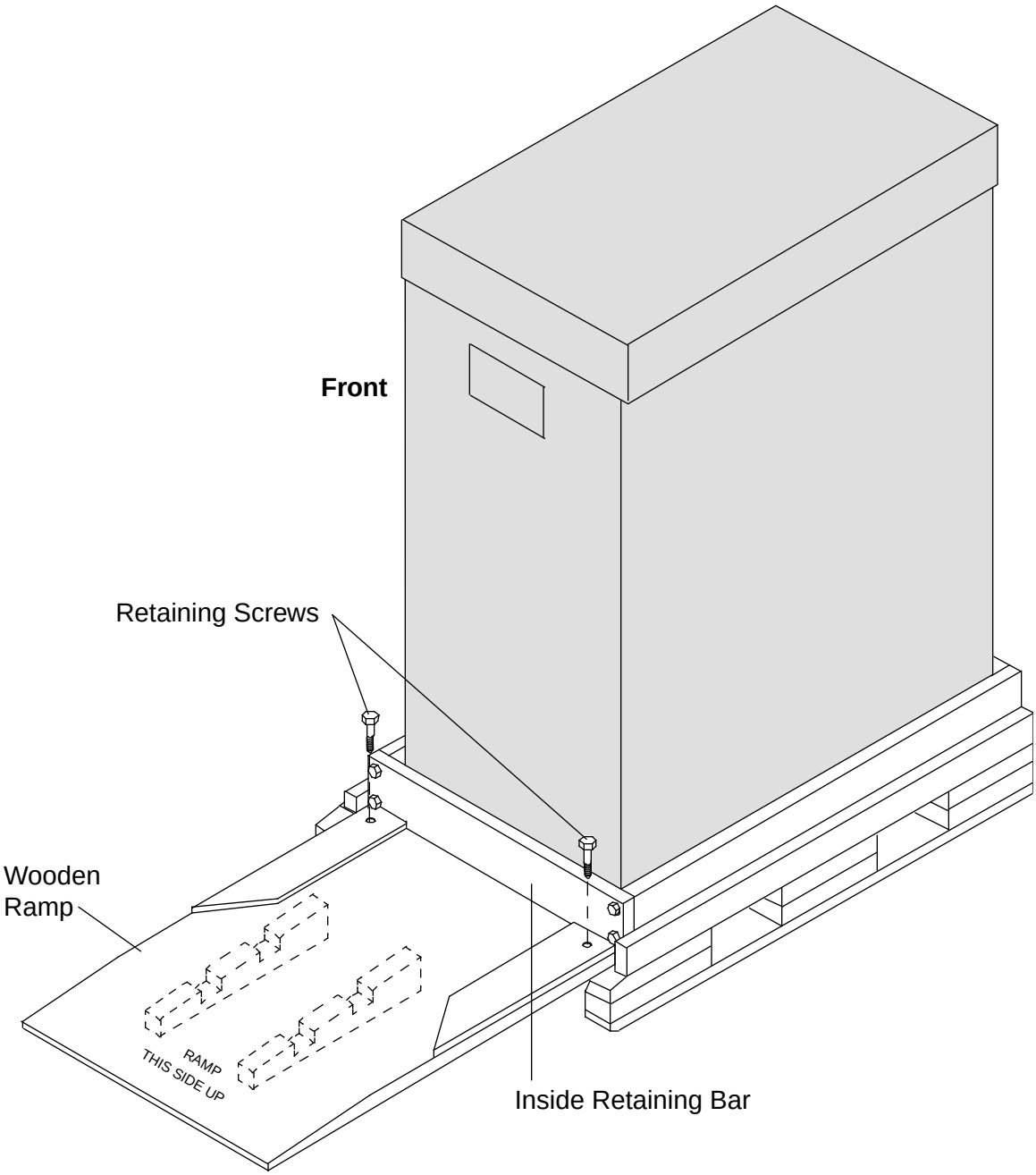


5. Install the wooden ramp:

   a. Position the ramp as shown in Figure 6, so that the screw holes on the ramp align with the holes on the pallet.

   b. Insert the screws that you removed in Step 4 through the holes.

*Figure 6. Installing the Ramp*



6. Remove the cardboard cover, the side panels, and the pad:

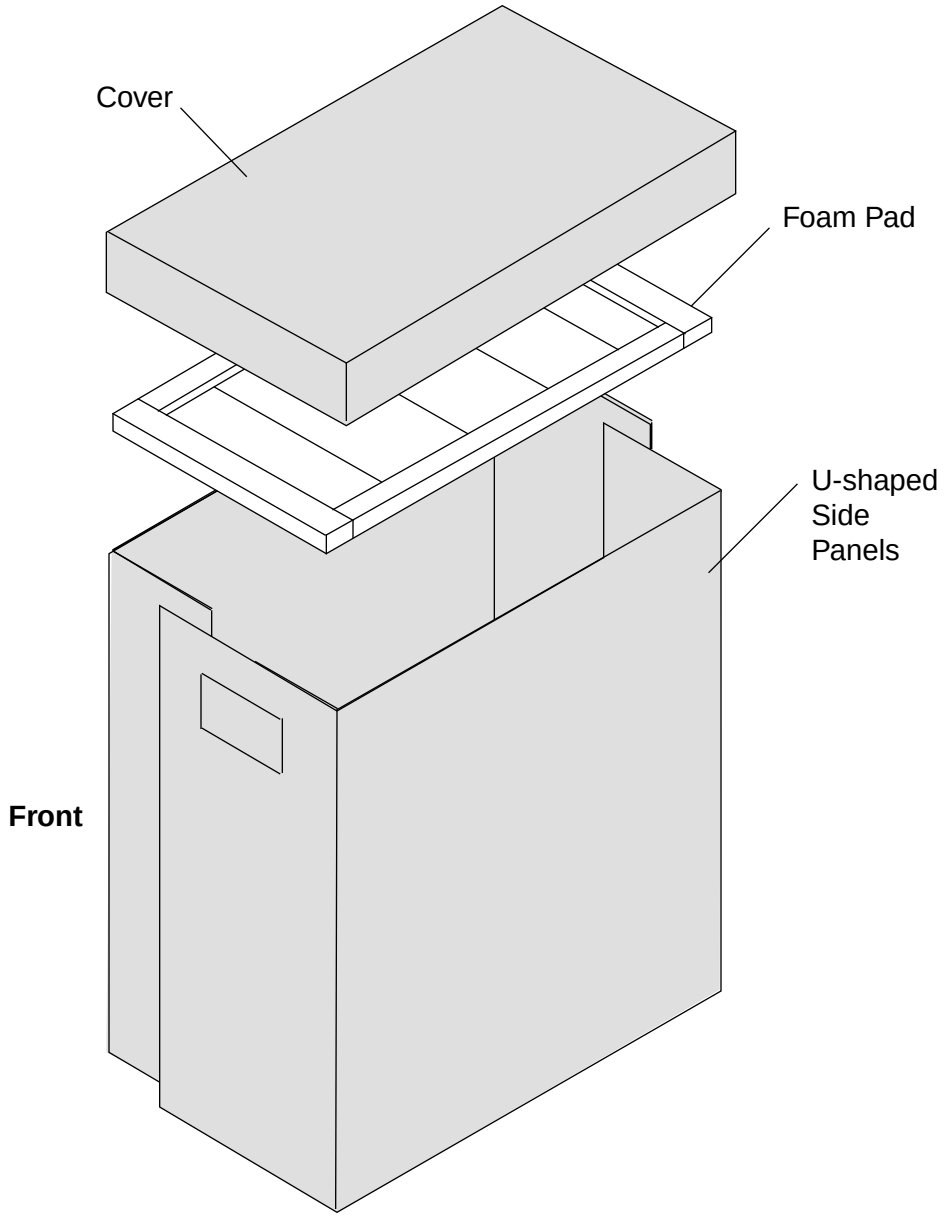
   a. Lift the cardboard cover from the top of the crate.

   b. Remove the two U-shaped side panels from the crate by lifting up and then out. Refer to Figure 7.

   c. Remove the foam pad from the top of the cabinet.

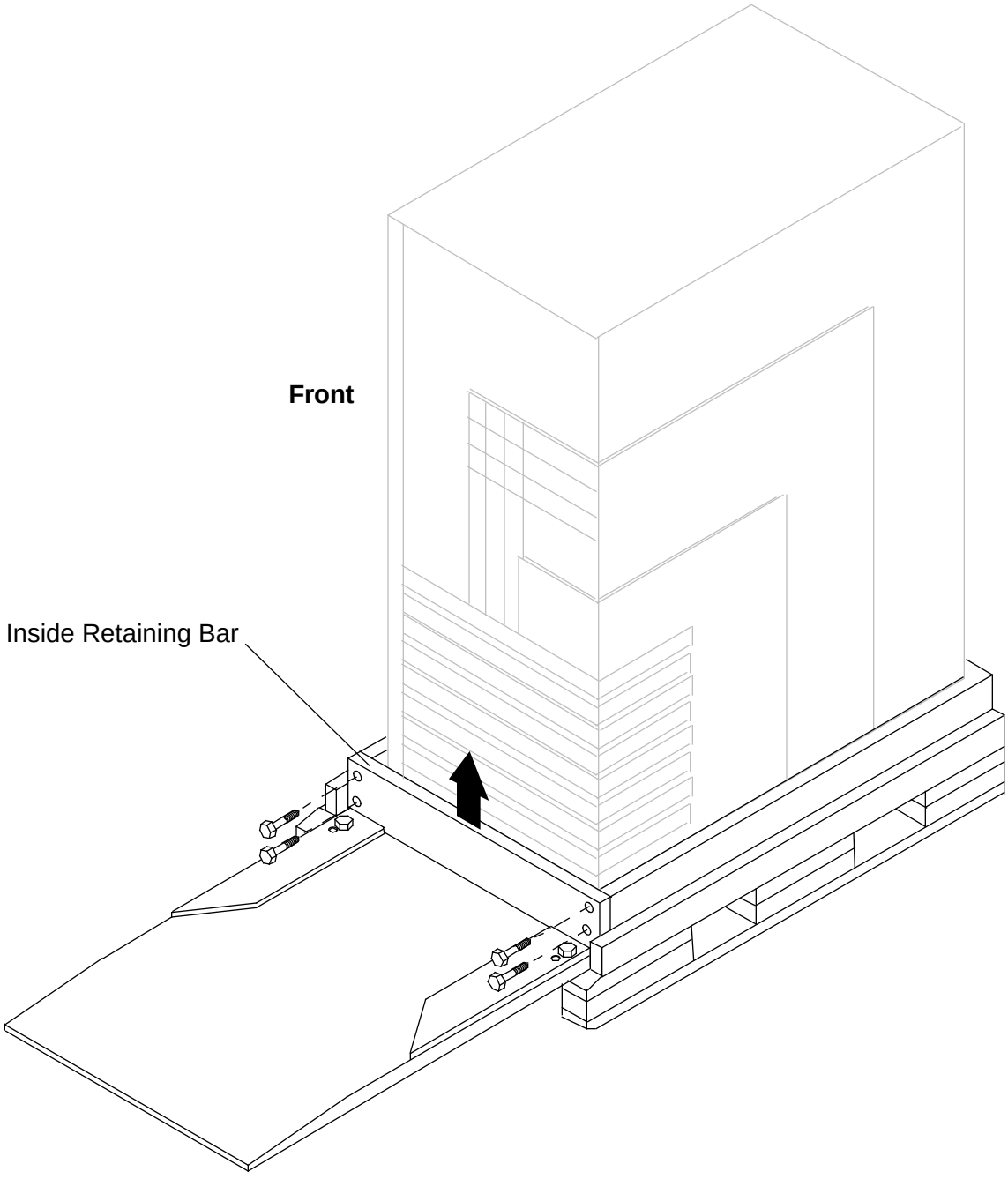
   d. If applicable, remove any additional pads or panels from the crate.

*Figure 7. Cardboard Shipping Container*



7. Use an 11-mm wrench to remove the inside retaining bar. Four screws secure the bar to the shipping crate as shown in Figure 8.

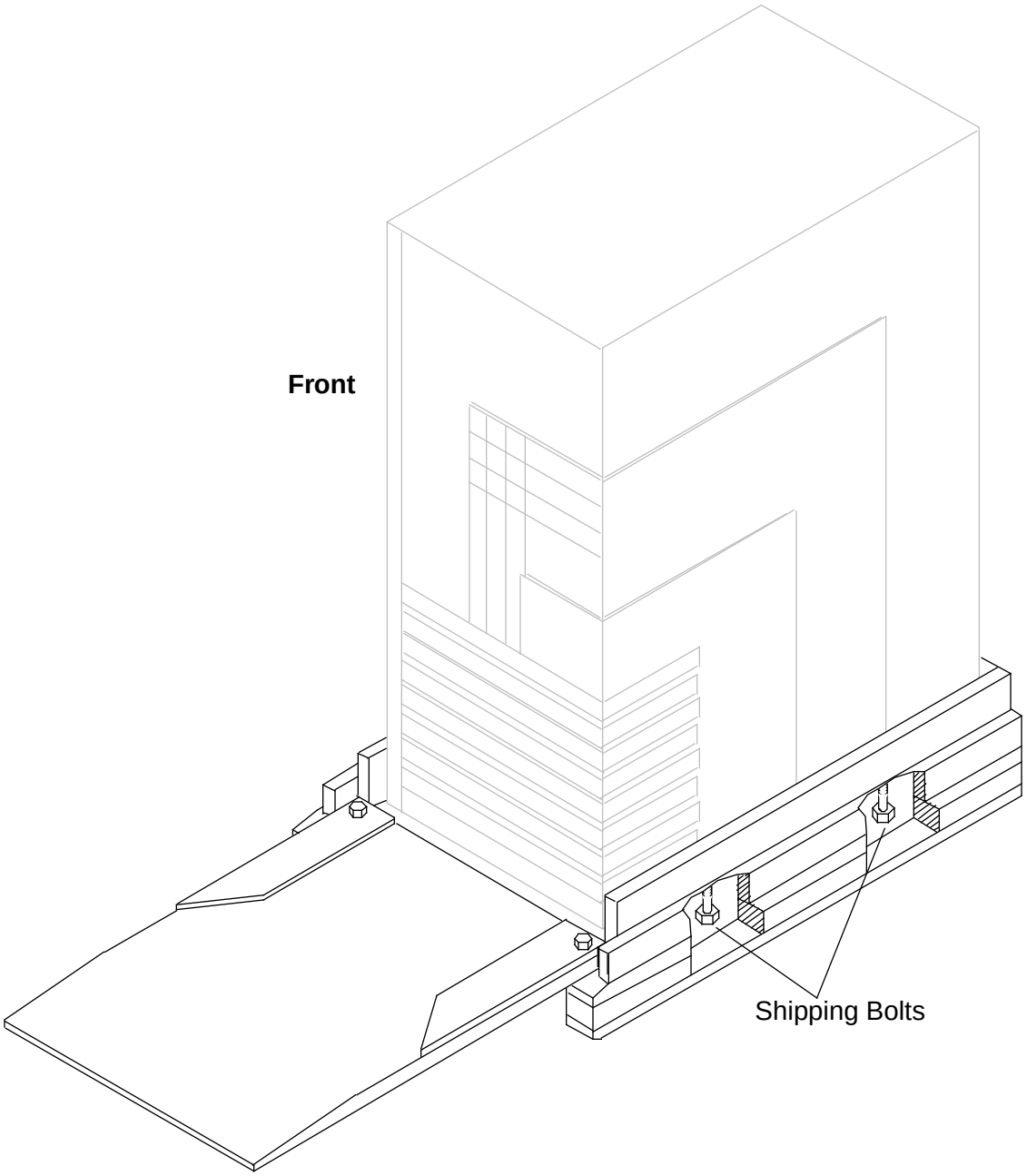
*Figure 8. Removing the Inside Retaining Bar*



8. Use an adjustable wrench (or a 16-mm wrench) to remove the 4 shipping bolts that secure the cabinet to the pallet. To access them, reach under the shipping pallet between the floor pads. There are 2 bolts (with washers) on each side of the pallet. Refer to Figure 9.

9. Ensure that the cabinet levelers (legs) are raised completely and, if possible, ensure that the front casters (wheels) face the ramp.

*Figure 9. Shipping Bolts*

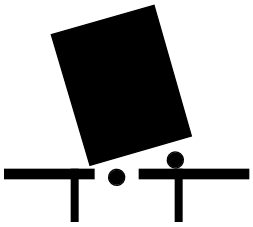


10. With one or more partners, carefully roll the cabinet down the ramp.

**CAUTION**

**The system is heavy, and momentum may carry it down the ramp quickly. Ensure that the system does not roll off the pallet or the system may be damaged. Do not attempt to perform this step without help.**

11. Move the cabinet close to the final location indicated on your site plan.



**CAUTION**

**Ensure that cabinet casters (wheels) do not fall into floor cutouts. Failure to do so could result in damage to the computer equipment and injury to personnel.**

12. Remove the protective plastic cover from the cabinet.

13. Remove the UL tag from the front air grill.

## Unpacking a Crate that Contains Two or Three Cabinets

After you move the shipping crates to the designated location, use the following procedure to remove the cabinets from the crate.

**NOTE:** The illustrations in this section show a 3-cabinet shipping configuration. The 2-cabinet shipping configuration is smaller, but functionally identical.

**CAUTION**

**Steps 1 through Step 12 require a minimum of two people to ensure personal safety and to protect the equipment (four people are recommended). Failure to use two or more people could result in injury to personnel or damage to the equipment.**

**CAUTION**

**Do not lift the shipping crate via the wooden bumper (or skirt), which is on the perimeter of the shipping pallet. Lift the shipping crate via the pallet.**

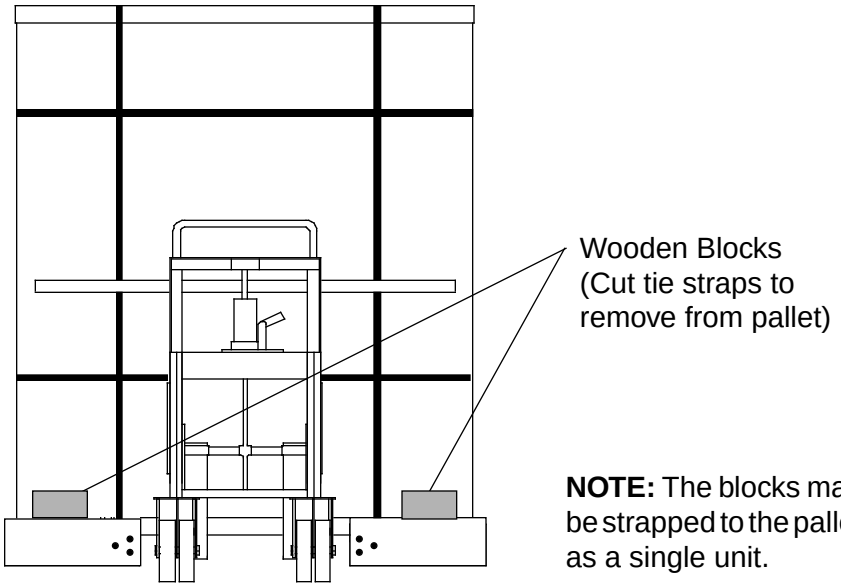
**CAUTION**

**Never position your hand or any other part of your body beneath the pallet where it could be injured if the cabinet drops to the floor.**

1. Position the shipping pallet close to the final position indicated on the site floor plan. Leave the pallet on the ROL-A-LIFTs.

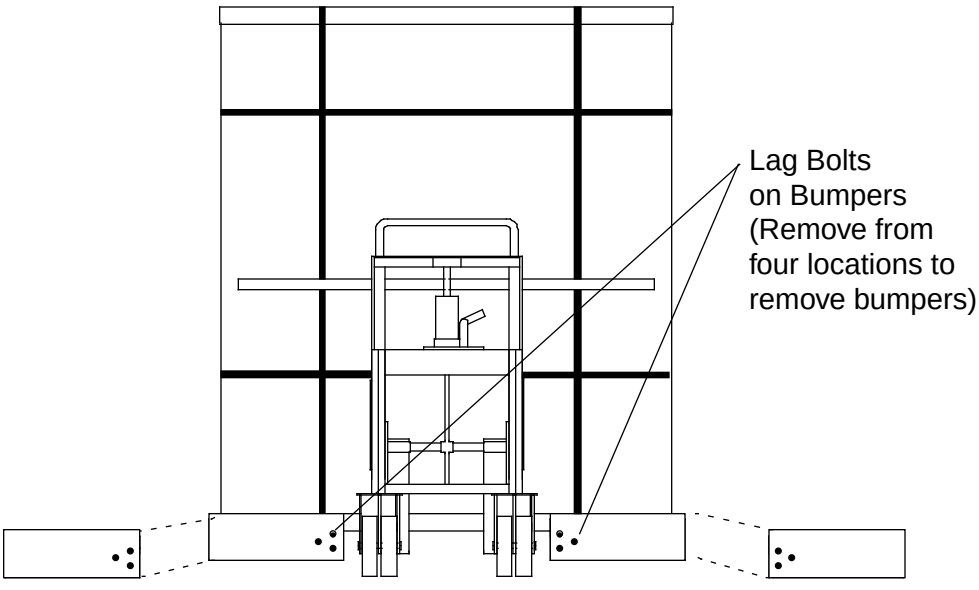
2. Remove the 4 wooden blocks from the shipping pallet. The blocks may be secured by tie straps as shown in Figure 10. Set the blocks aside for use in Step 4.

*Figure 10. Remove the Blocks*



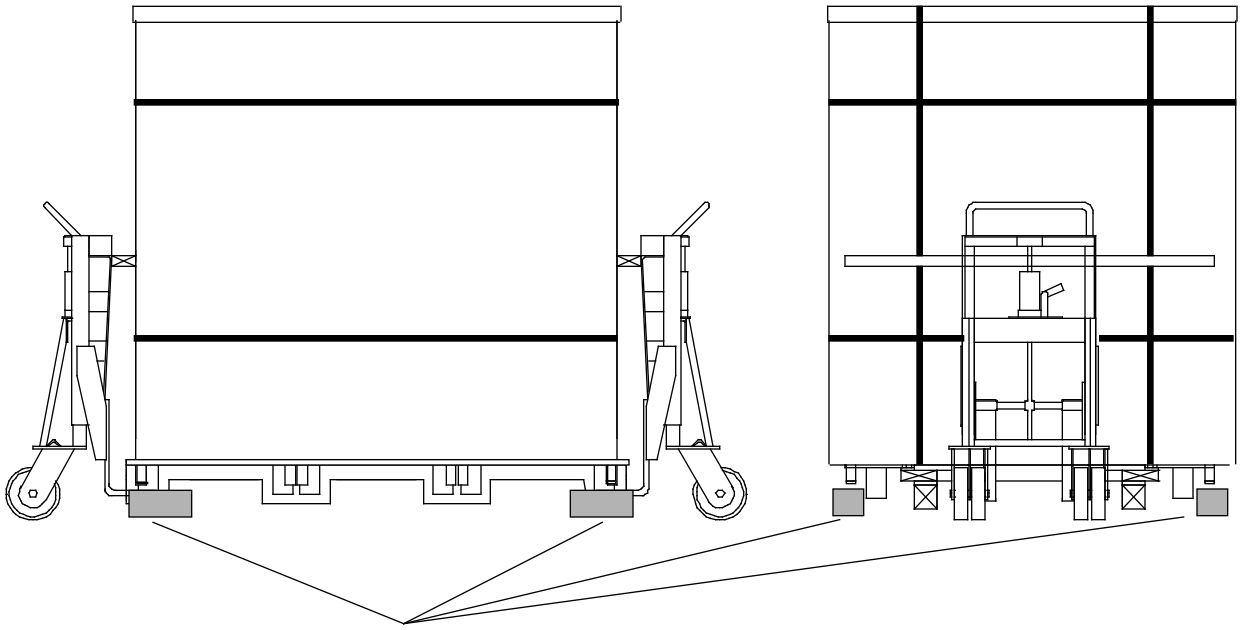

3. Remove the 2 wooden bumpers from the shipping pallet. Lag bolts secure the bumpers to the shipping pallet. Use an adjustable wrench to remove the bolts. Figure 11 shows the lag bolts on one end of the shipping pallet.

*Figure 11. Remove the Bumpers*



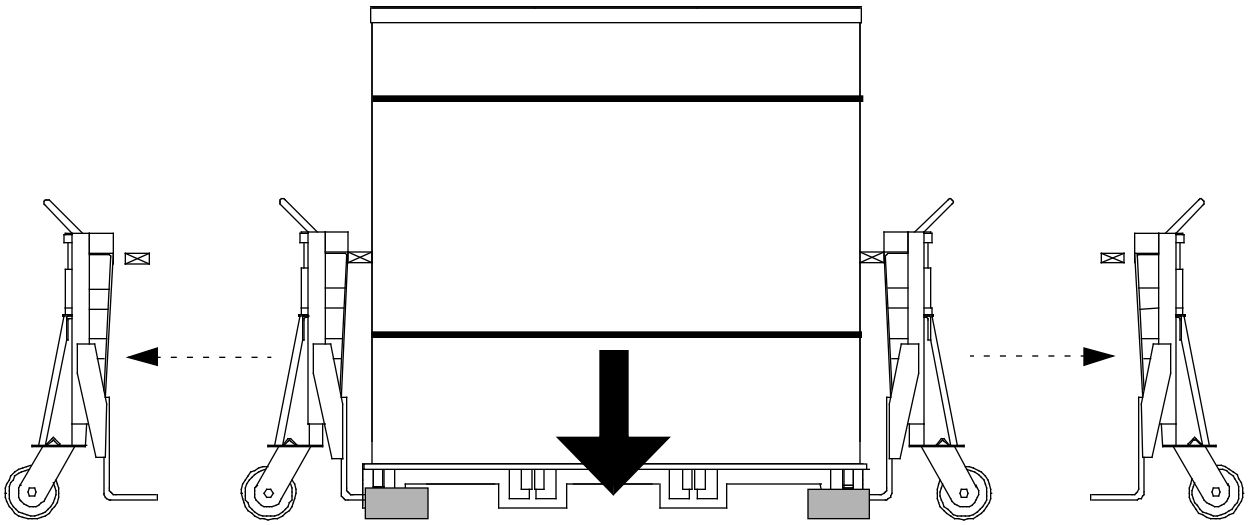
4. Raise the system and place a block beneath the cabinet leveler (leg) at each corner of the system. Refer to Figure 12.

*Figure 12. Place the Blocks beneath the Corner Levelers*




5. Carefully, lower the pallet until the cabinet levelers rest on the blocks. Ensure that the blocks hold the cabinets safely and securely, then remove the lifts.

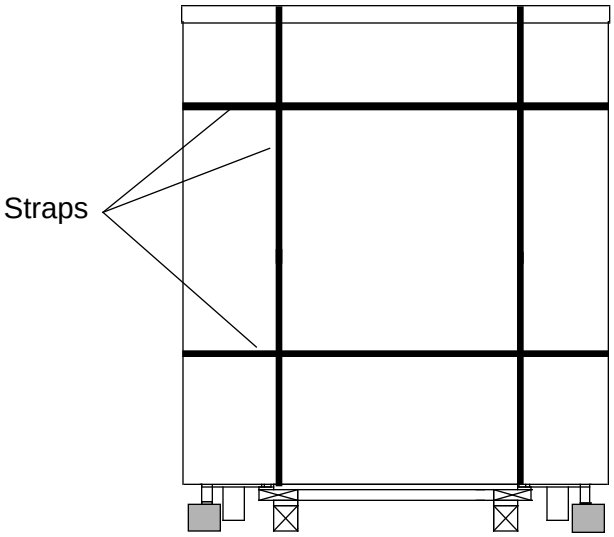
*Figure 13. Lower the Cabinets onto the Blocks and Remove the Lifts*



6. Cut the horizontal and vertical straps (bands).

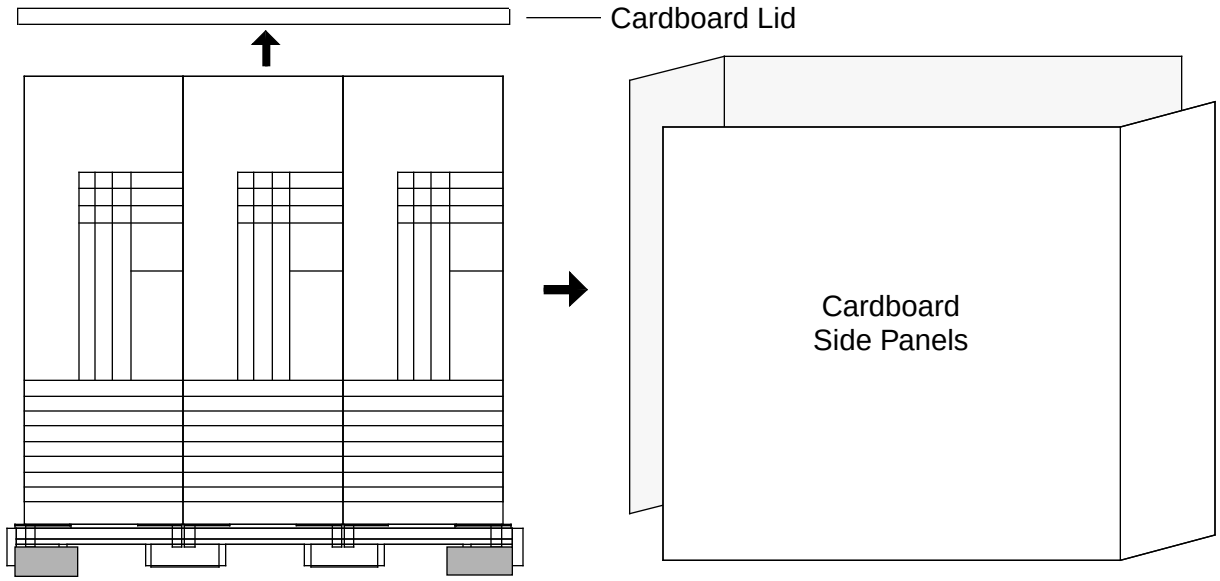
| CAUTION |
| --- |
| **The straps are tight and may hit you or someone nearby when you cut them. Wear eye protection and protect your body and face when you cut the straps. Failure to do so may result in injury.** |

*Figure 14. Remove the Straps*



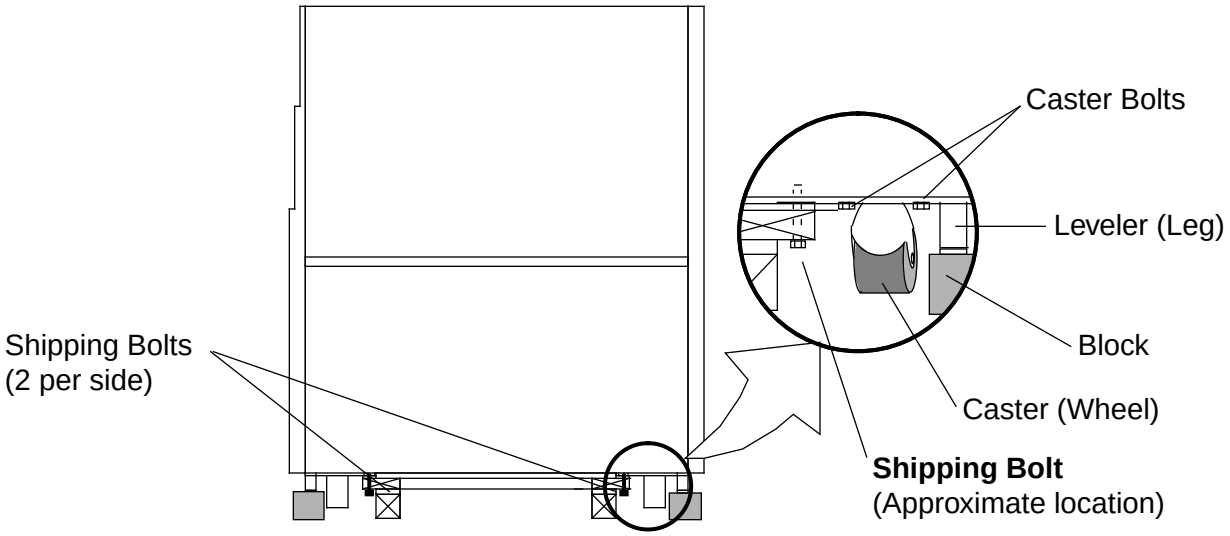

7. Remove the cardboard lid, then remove the two cardboard side panels.

*Figure 15. Remove the Cardboard Lid and Panels*



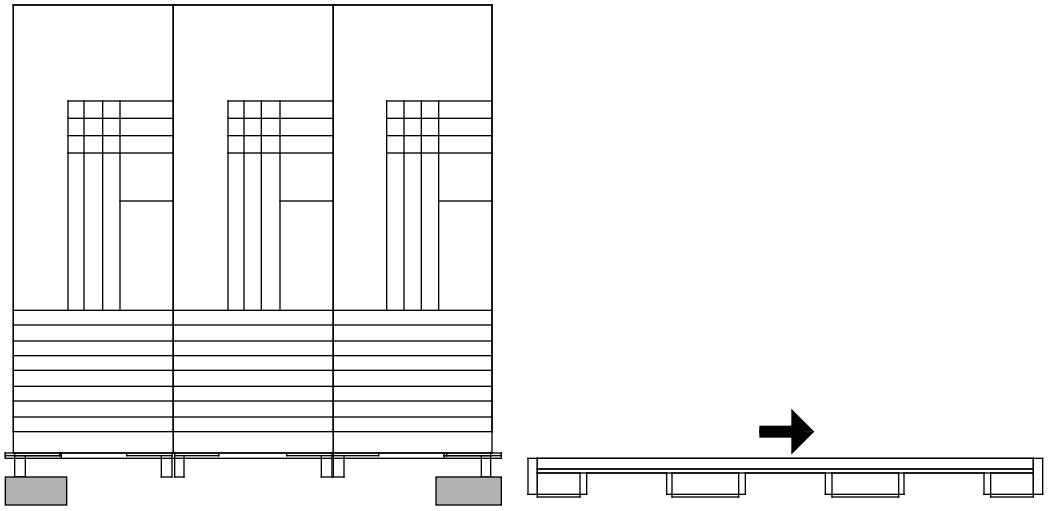
8. Remove the 4 shipping bolts that secure the cabinets to the pallet, using an adjustable wrench (or a 16-mm wrench). There are 2 bolts on each side of the pallet. The bolts are located behind the 4 cabinet casters (wheels) at the corners of the system, as shown in Figure 16. Access the bolts from the front and rear ends of the pallet (i.e. the *door ends*).

*Figure 16. Remove the Four Shipping Bolts*



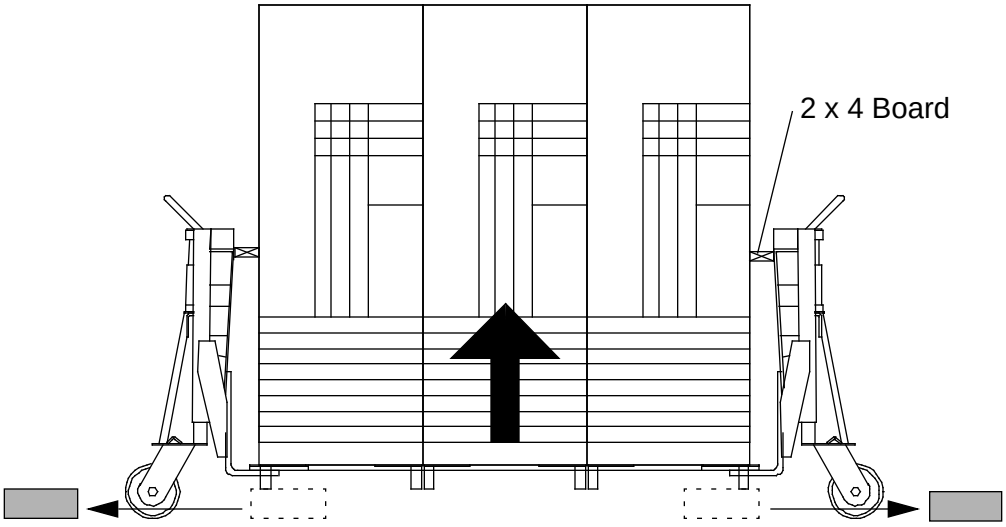

9. Remove the pallet from beneath the cabinets.

*Figure 17. Remove the Pallet*



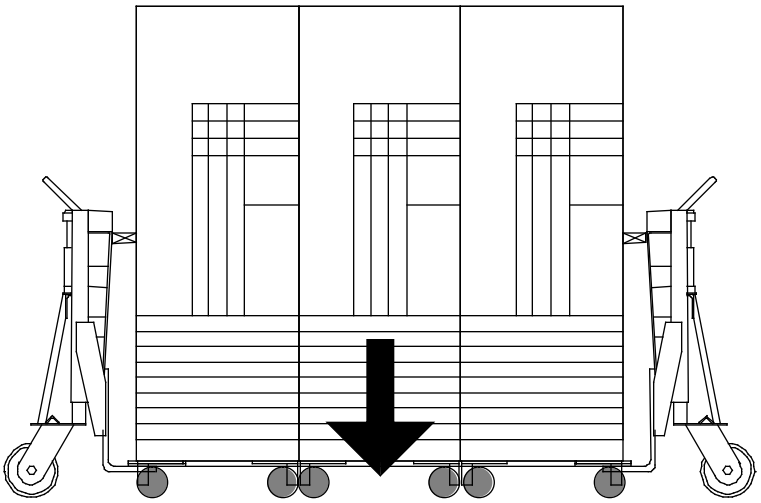
10. Raise the cabinets with the ROL-A-LIFTs and remove the blocks. (To do this, reposition the ROL-A-LIFTs on the sides of the cabinets. Ensure that you position the 2 x 4 boards between the ROL-A-LIFTs and the cross braces on the cabinets.)

*Figure 18. Remove the Blocks*

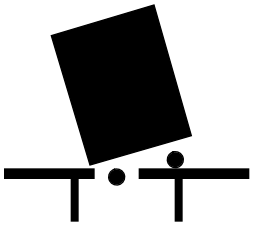



11. Ensure that the cabinet casters (wheels) and levelers are not positioned above any floor cutouts. Then carefully, lower the cabinets to the floor, and remove the ROL-A-LIFTs.

*Figure 19. Lower the Cabinets to the Floor*



12. If necessary, roll the cabinets into the final location indicated on your site plan. This requires two or more personnel.



**CAUTION**

**Ensure that cabinet casters (wheels) do not fall into floor cutouts. Failure to do so could result in damage to the computer equipment and injury to personnel.**

13. Remove the protective plastic bag from the cabinets, and cut the tags from the air grills on the front cabinet doors.

14. Unpack the side panels, which are shipped in two separate boxes. (You will not need the side panels until you complete the cabling; therefore, you may unpack them later.)

**CAUTION**

**The edges of the fiberglass panels are fragile. When you set the panels aside, ensure that the weight is supported by portions of the fiberglass that can bear the weight. In other words, lay the panels flat or rest them on the curved portion of the fiberglass rather than the edge.**

## Unpacking and Positioning the PC-10

At this point, you should unpack and position the PC-10 cabinet. Refer to *Peripheral Cabinet (PC-10) Installation*, Cray Research publication HMM-371, for details on unpacking the PC-10.

**NOTE:** Do not begin cabling the system until you read "Completing the Cabling," which starts on page 112 of this document. In addition, do not plug in or power up the PC-10.

## Unpacking and Positioning the System Workstation (SWS)

At this point, you should unpack and position the system workstation (SWS), then connect the mouse, keyboard, and monitor. Refer to *System Workstation*, Cray Research publication HMM-222, for details on unpacking and positioning the SWS. You will cable and power up the SWS later.

## Unpacking and Positioning Additional System Components

At this point, you should unpack and position any additional system components that shipped with your CRAY T3E AC cabinet. Refer to the appropriate installation documents for details on unpacking additional system components.

# Joining Two or More CRAY T3E AC Cabinets

If your system contains CRAY T3E cabinets that you must physically join together, then you must complete the procedures in this section.

**If all of your CRAY T3E cabinets are shipped prejoined as a single unit, you may skip this section and go to page 97 "Positioning Cabinets (for Prejoined Cabinets)"**

## Preparing the CRAY T3E Cabinets for Internal Wiring

This section contains procedures that you must perform to assemble the cabinets and prepare them for wiring.

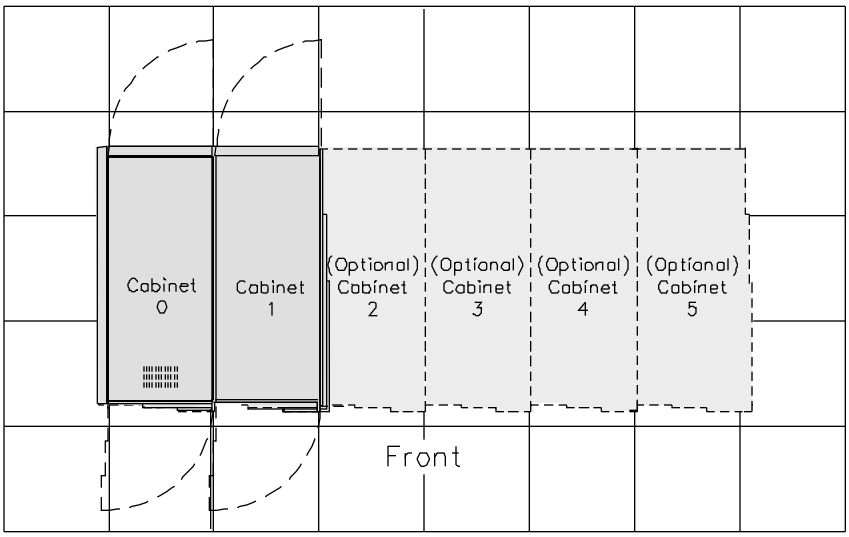
### Positioning Cabinets Temporarily When No Cabinets Are Prejoined

Use this procedure when all of your CRAY T3E cabinets were shipped with 1 cabinet per shipping crate.

1. Position cabinet 0 (the master cabinet, which contains clock module 0) in the computer room as designated in the site floor plans.

   **NOTE:** The front of the cabinet is the end with the Cabinet Power switch, WACS display, and power supplies.

*Figure 20. CRAY T3E AC Cabinet Layout*



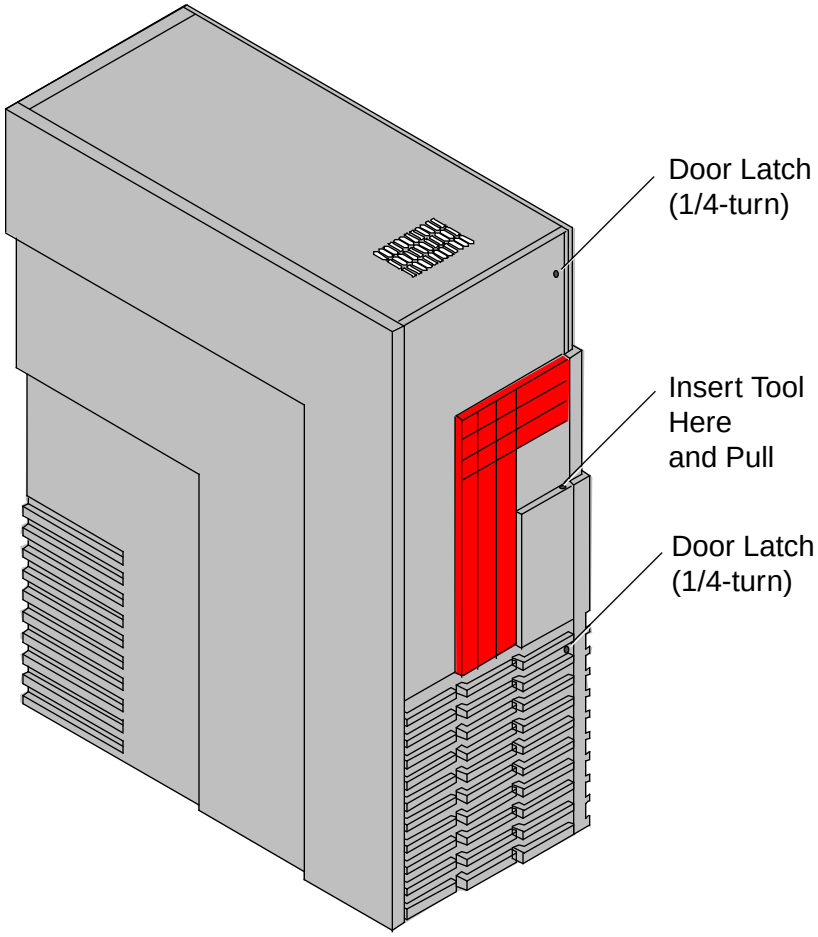

**NOTE**: The grids represent 24 in. X 24 in. (61 cm X 61 cm) floor tiles.

2. Open the front cabinet door:

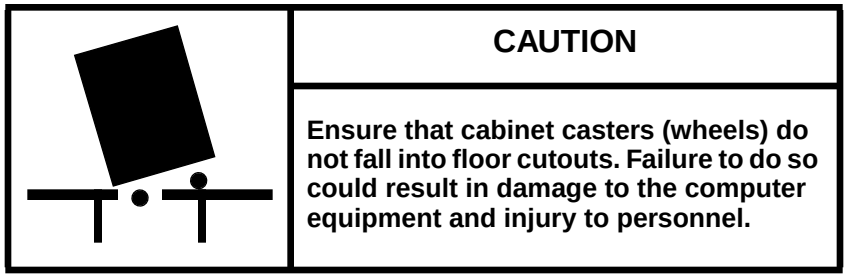
   a. The door has two latches: top and bottom. For each latch, insert a 4-mm ball-end hex (Allen) wrench into the latch and turn the latch counterclockwise 1/4 turn.

   b. Grasp the door and swing it open. (The door contains a hole that aids in opening. You may insert a tool, such as a #2 Phillips screwdriver, in the hole to improve grip and serve as a door handle. Refer to Figure 21. **NOTE:** Be careful not to press the tool against the fiberglass trim. The fiberglass cracks and chips easily.)

*Figure 21. Door Latches and Handle (Front Door)*



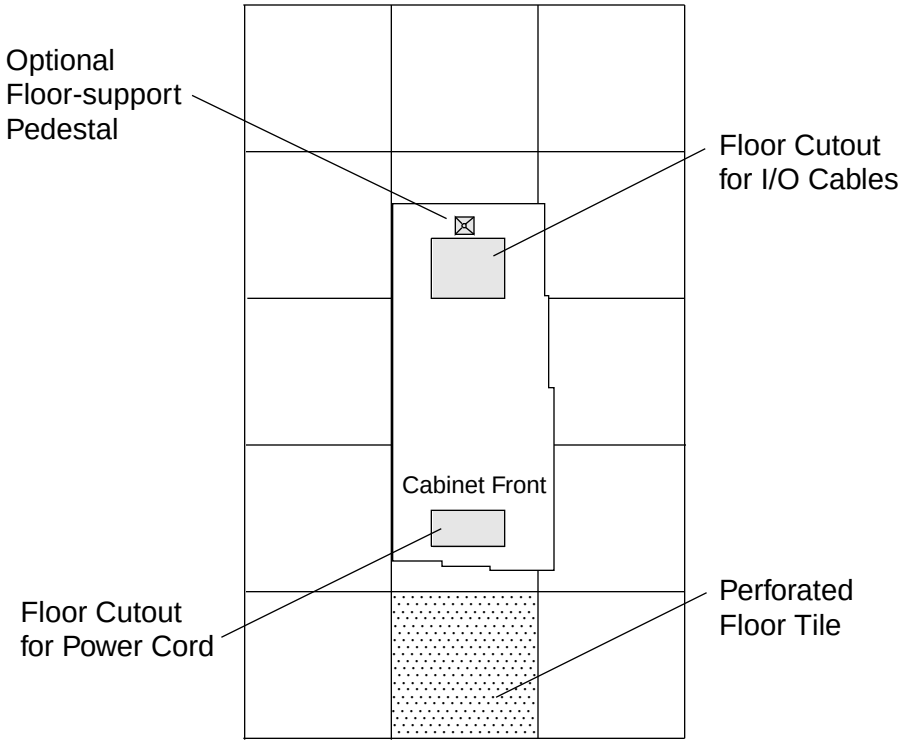
3. Lower the cabinet power cord through the bottom of the cabinet, through the appropriate floor cutout, and into the underfloor area. If needed, move the cabinet to provide access to the floor cutout. If the computer area does not have a raised floor, position the power cord under the cabinet.



**CAUTION**

**Ensure that cabinet casters (wheels) do not fall into floor cutouts. Failure to do so could result in damage to the computer equipment and injury to personnel.**

*Figure 22. Cabinet Floor Plan*



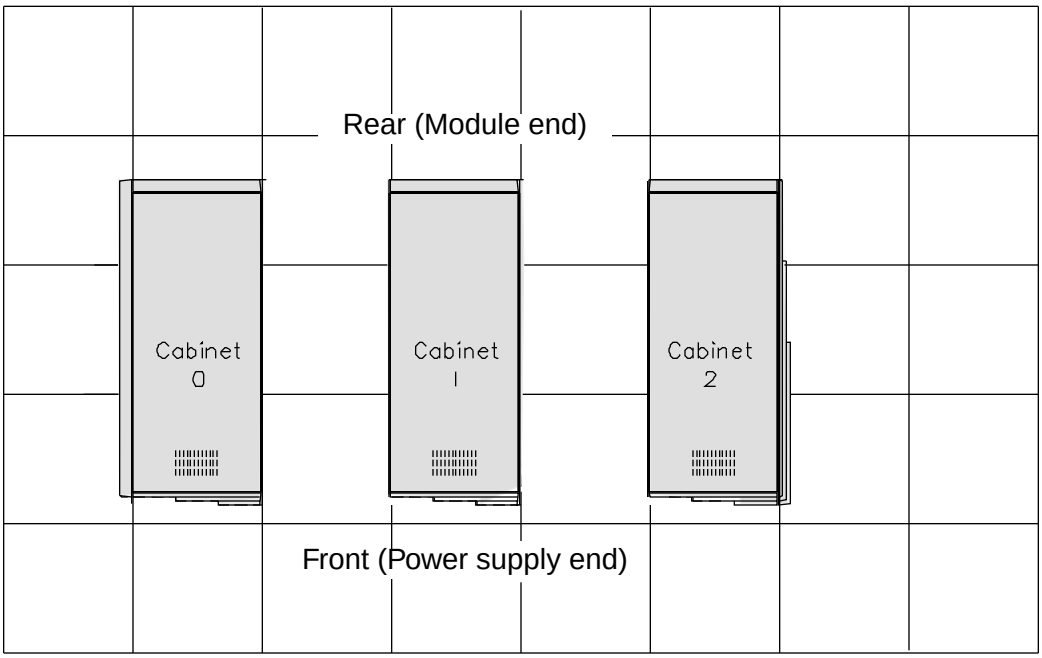

4. Position the cabinet in the final location as indicated on your site plan.

5. Use an adjustable wrench to lower the cabinet levelers (legs) on cabinet 0. Adjust the levelers so that the cabinet is level and cannot be rolled out of place. Use the bottom of the cabinet frame for leveling purposes.

6. Position cabinet 1 on the right side of cabinet 0, as you face the front of the cabinets. Separate the cabinets temporarily by approximately 24 in. (60 cm) as shown in Figure 23.

   If your system configuration includes 3 or more CRAY T3E cabinets, place the third cabinet (cabinet 2) to the right of cabinet 1, place the fourth cabinet (cabinet 3) cabinet to the right of cabinet 2, etc.

*Figure 23. Temporary Cabinet Positions*



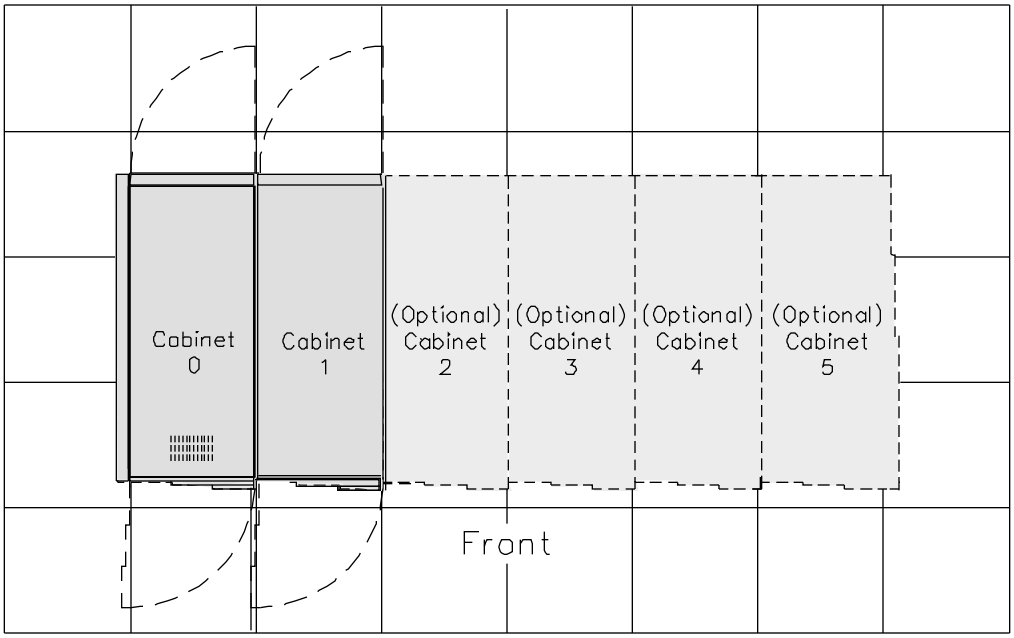

**NOTE**: The grids represent 24 in. X 24 in. (61 cm X 61 cm) floor tiles.

### Positioning Cabinets Temporarily When Some Cabinets Are Prejoined

Use this procedure when 2 or more of your CRAY T3E cabinets were bolted to one another during shipment.

1. Position cabinet 0 (the master cabinet, which contains clock module 0) and the attached cabinet(s) in the computer room as designated in the site floor plans.

*Figure 24. CRAY T3E AC Cabinet Layout*




**NOTE**: The grids represent 24 in. X 24 in. (61 cm X 61 cm) floor tiles.

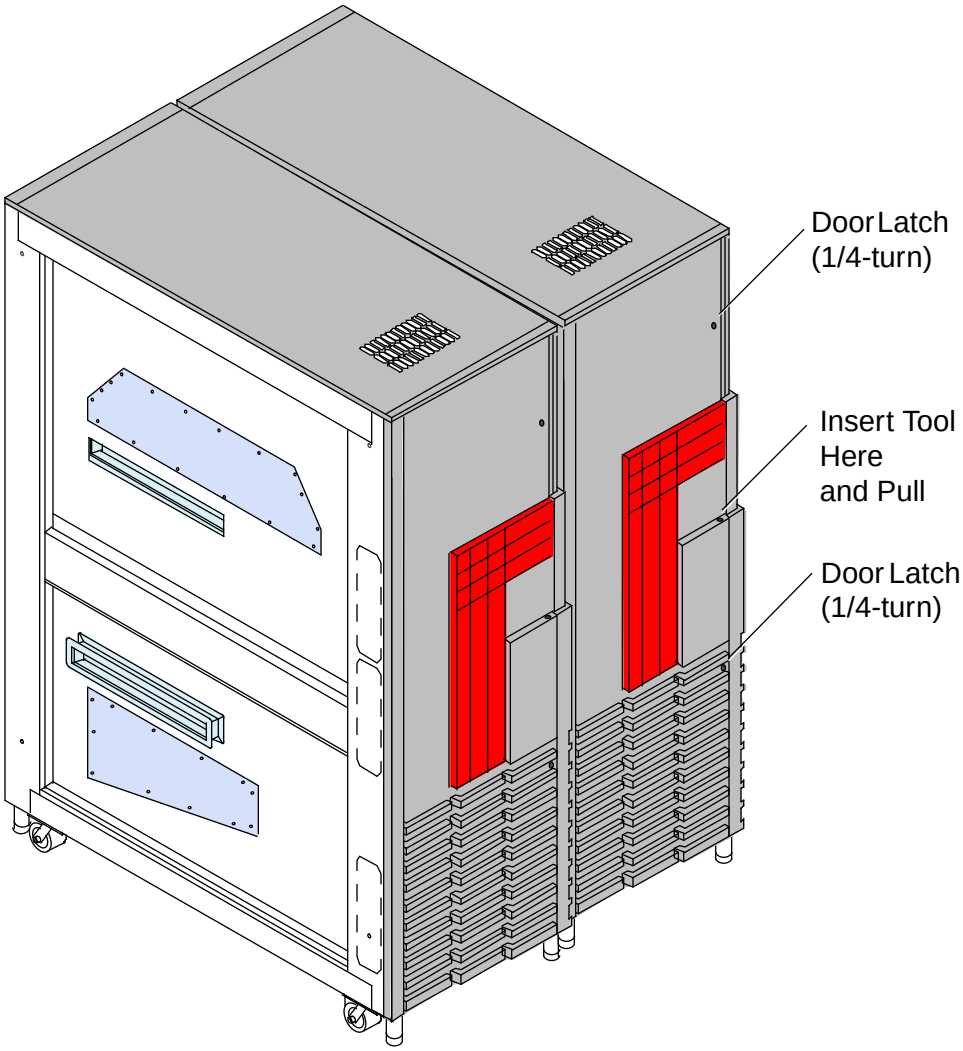
2. Open the front cabinet doors:

   **NOTE:** The front of the cabinet is the end with the Cabinet Power switch, WACS display, and power supplies.

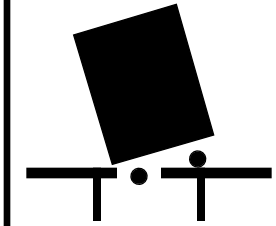
   a. The door has two latches: top and bottom. For each latch, insert a 4-mm ball-end hex (Allen) wrench into the latch and turn the latch counterclockwise 1/4 turn.

   b. Grasp the door and swing it open. (The door contains a hole that aids in opening. You may insert a tool, such as a #2 Phillips screwdriver, in the hole to improve grip and serve as a door handle. Refer to Figure 25. **NOTE:** Be careful not to press the tool against the fiberglass trim. The fiberglass cracks and chips easily.)

*Figure 25. Door Latches and Handle (Front Door)*



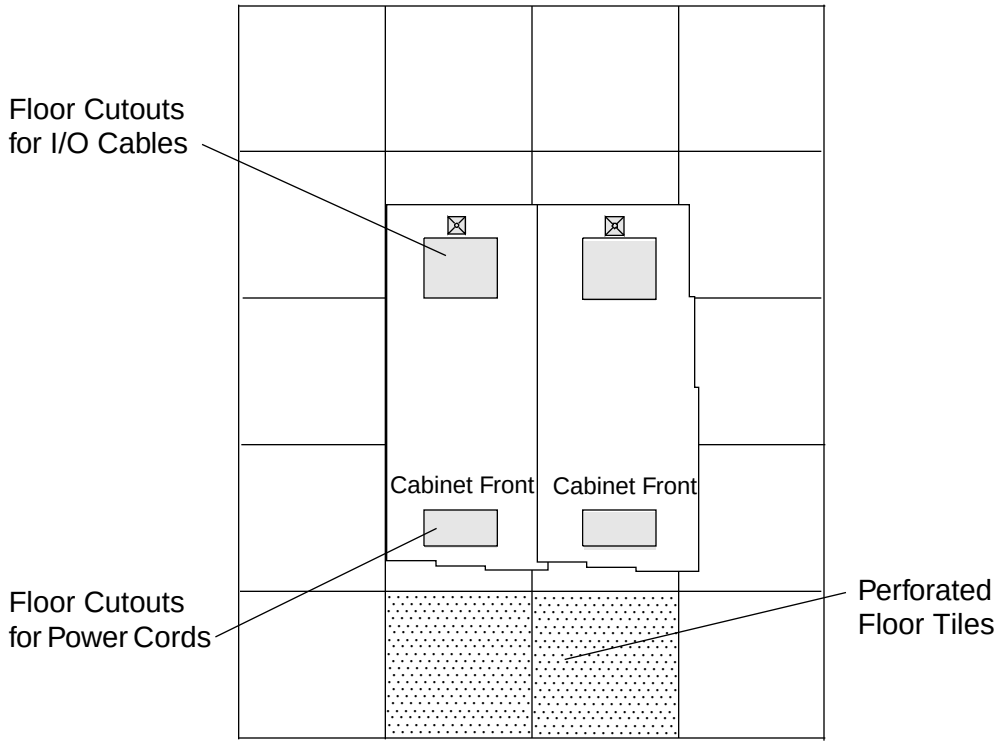

3. Lower the cabinet power cord through the bottom of each cabinet, through the appropriate floor cutouts, and into the underfloor area. If needed, move the cabinets to provide access to the floor cutout. If the computer area does not have a raised floor, position the power cords under the cabinets.



**CAUTION**

**Ensure that cabinet casters (wheels) do not fall into floor cutouts. Failure to do so could result in damage to the computer equipment and injury to personnel.**

*Figure 26. Cabinet Floor Plan*

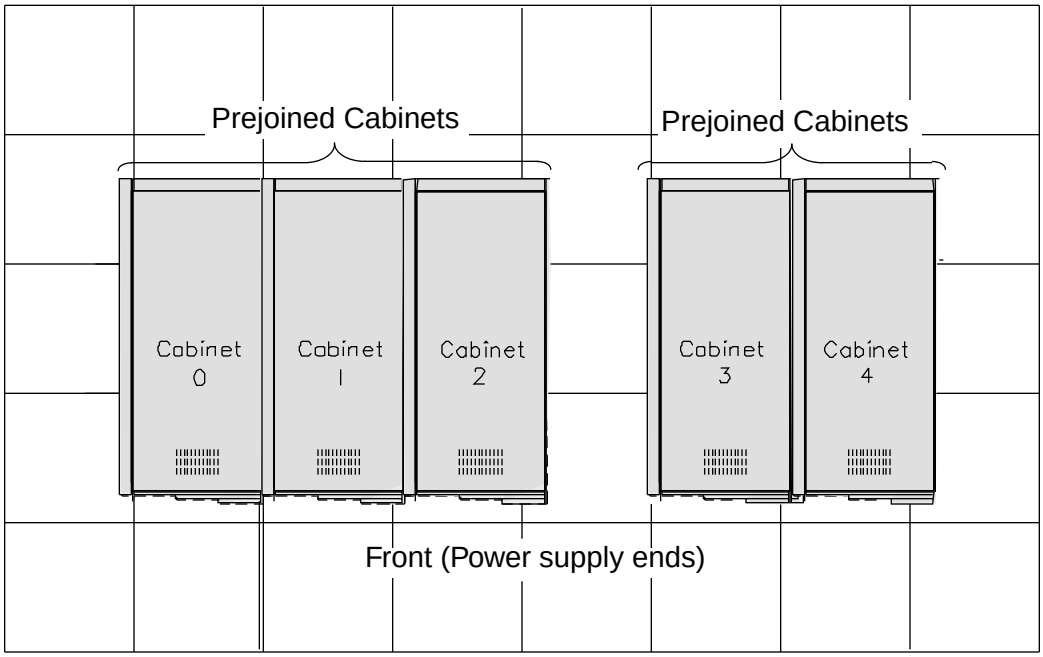



4. Position the cabinets in the final location as indicated on your site plan.

5. Use an adjustable wrench to lower the cabinet levelers (legs) on cabinet 0 and the attached cabinet(s). Adjust the levelers so that the cabinets are level and cannot be rolled out of place. Use the bottom of the cabinet frames for leveling purposes.

6. Position the other cabinet(s) on the right side of cabinet 0, as you face the front of the cabinets. Separate the cabinets temporarily by approximately 24 in. (60 cm) as shown in Figure 27.

*Figure 27. Temporary Cabinet Positions for Prejoined Cabinets*




**Note**: The grids represent 24 in. X 24 in. (61 cm X 61 cm) floor tiles.

### Removing Doors

Remove the following doors from the cabinets. A door removal procedure follows the list.

- Remove the rear door of each cabinet where you will connect internal wires, except the last cabinet (highest-numbered cabinet) in the system. This will improve access to the wiremat and to frame-joiner bolts.

- Wherever you will join cabinets, remove the front door of the cabinet on the right (as you look at the power supply end). This will improve access to the frame-joiner bolts.

| **CAUTION** |
| --- |
| **Each door weighs approximately 40 lbs. (18 kg) and may be difficult to lift and hold. Be careful to avoid personal injury or equipment damage. Ensure that a second person is available to assist with the procedure.** |

1. Open each door:

   a. Each door has two latches: top and bottom. For each latch, insert a 4-mm ball-end hex (allen) wrench into the latch and turn the latch counterclockwise 1/4 turn.

   b. Grasp the door and swing it open. (The door contains a hole that aids in opening. You may insert a tool, such as a #2 Phillips screwdriver, in the hole to improve grip and serve as a door handle. The hole on the rear door is located near the middle right portion of the door, on the underside of a raised panel. **NOTE:** Be careful not to press the tool against the fiberglass trim. The fiberglass cracks and chips easily.)

2. Use a #2 Phillips screwdriver to disconnect one end of the ground wire that connects to the top of the door. (After you disconnect the wire, replace the screw and washer in the threaded hole.)

3. Disconnect the Cabinet Power switch connector (front doors only). The connection is near the top left corner of the front door. To release the connector, press the end of the locking lever while you pull up on the connector.

4. Carefully lift the door straight up about 1 in. (2.54 cm) until the door hardware clears the frame hinge, then remove the door.

5. Set the door in a protected location.

| CAUTION |
| --- |
| **The edges of the fiberglass door panel are fragile. Be careful not to drop the door. When you set the door aside, ensure that the weight is supported by portions of the fiberglass that can bear the weight. In other words, lay the door flat or rest the door on the curved portion of the fiberglass rather than the edge.** |

### Removing the Blower Exhaust Shields

Use the following procedure to remove the blower exhaust shield from each cabinet where you will connect internal wires:

1. Disconnect the cable from the clock switch board, using a small flatblade screwdriver.

2. Remove the blower exhaust shield. Six #2 Phillips screws (with washers) hold the shield to the cabinet. The shield is supported by the screws, so you (or a partner) must hold the shield while you remove the last screws.

### Removing Access Panels

Use the following procedure to remove the access panels from each cabinet where you will connect internal wires. Figure 28 shows the access panel locations.

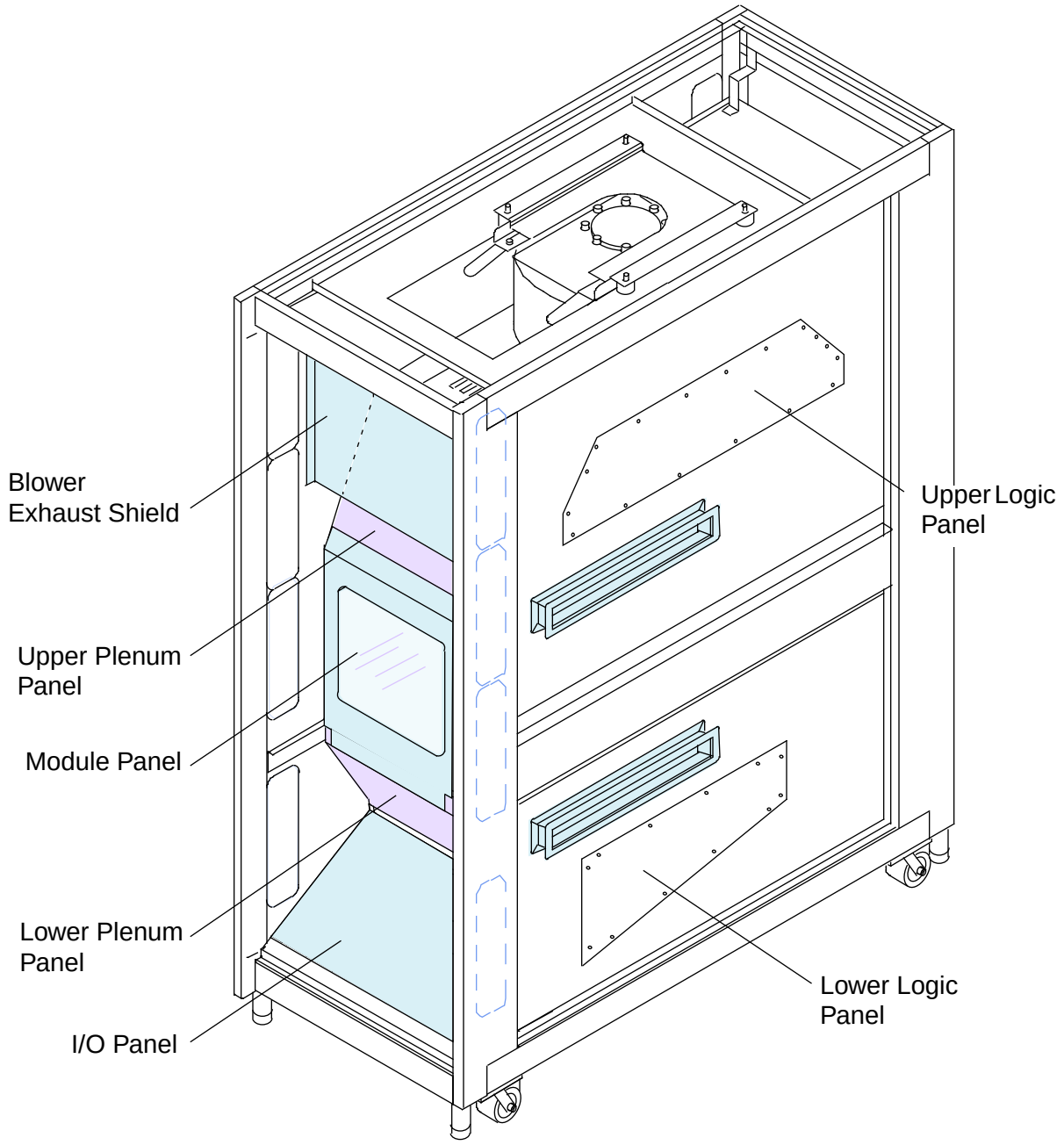
1. Remove the module panel from each of the cabinets. Eight 1/4-turn captive screws secure each module panel.

2. Remove the upper plenum panel from each of the cabinets. Six #1 Phillips screws (with washers) hold each panel to the cabinet.

3. Remove the I/O panel from each of the cabinets. Six 1/4-turn captive screws secure each I/O panel.

4. Remove the lower plenum panel from each of the cabinets. Ten #1 Phillips screws (with washers) hold each panel to the cabinet: 3 screws on the left side secure it to the cabinet frame, 3 screws on the right side secure it to the cabinet frame, and 4 screws across the bottom secure it to the I/O bulkhead.

*Figure 28. Access Panel Locations*



### Removing Wire-duct Covers

The side trim bolts to the system through four frame-bolt holes in the side of the cabinet, one hole at each corner, as shown in Figure 29. These holes are also used to bolt cabinets together.

To bolt the cabinets together or to install the side panels, you must ensure that you can access these frame-bolt holes from the inside of the frame. You must remove wire-duct covers to access the holes. For example:

- In all systems, you must remove the lower-left wire-duct cover from the front side of any cabinet that you bolt to the right side of another cabinet. (Refer again to Figure 29.)

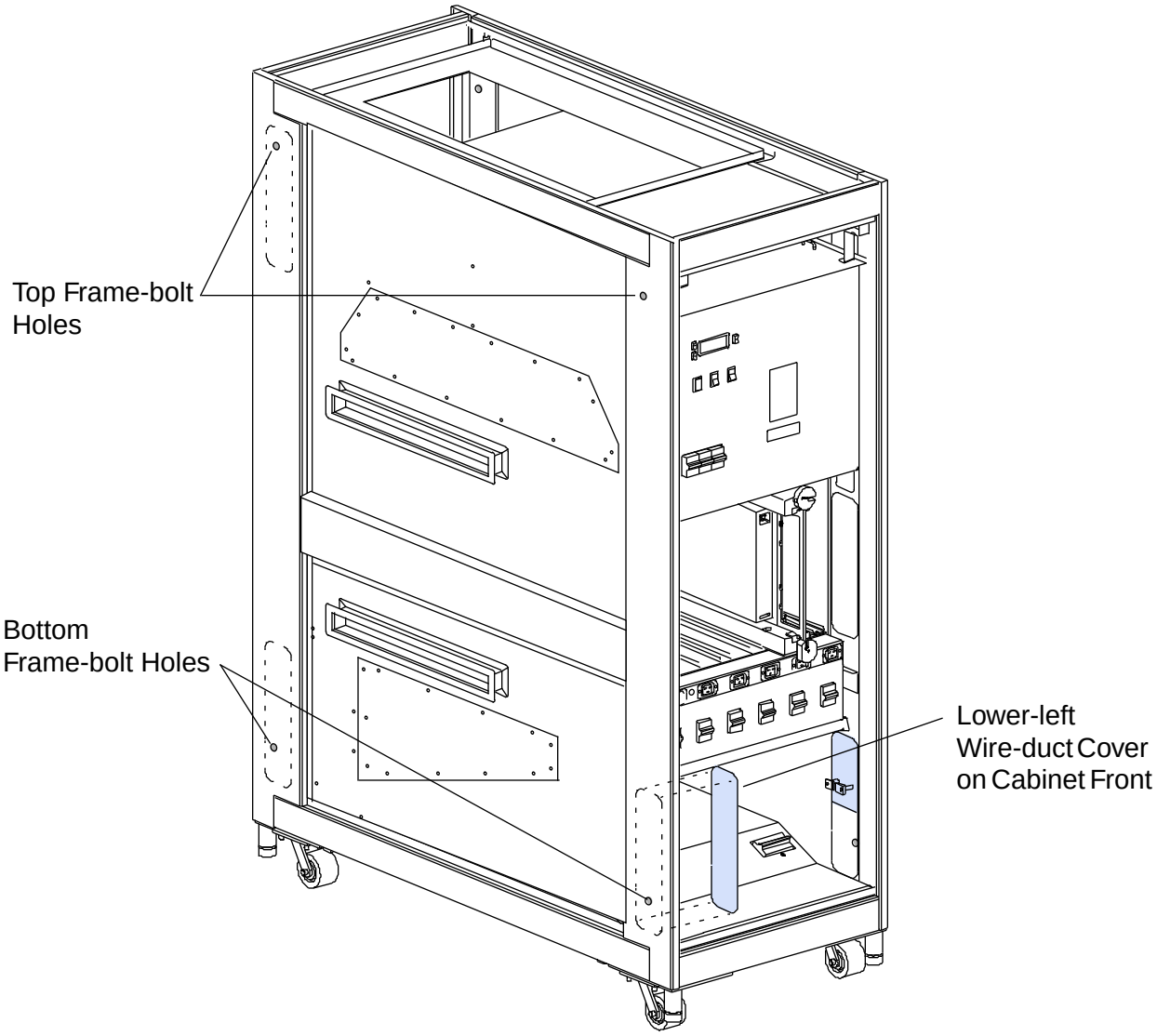
- In some systems, you must remove wire-duct covers from the following locations:

  **NOTE:** This is not necessary on all systems; some systems do not have these wire-duct covers.

  - The lower-right wire-duct cover on the front side of any cabinet that you bolt to the left of another cabinet.
  - The lower-right and upper-right wire-duct covers on the back side of any cabinet that you bolt to the left of another cabinet.
  - The lower-left and upper-left wire-duct covers on the back side of any cabinet that you bolt to the right of another cabinet.

Eight #2 screws and washers secure each cover to the frame.

*Figure 29. Frame-bolt Holes and Wire-duct Locations*



### Removing the Side Trim and Logic Panels (Optional)

If you choose to remove side trim panels and outside access panels (logic panels) for more light and additional access, use the following procedure:

**NOTE:** This procedure requires two people, and is not recommended.

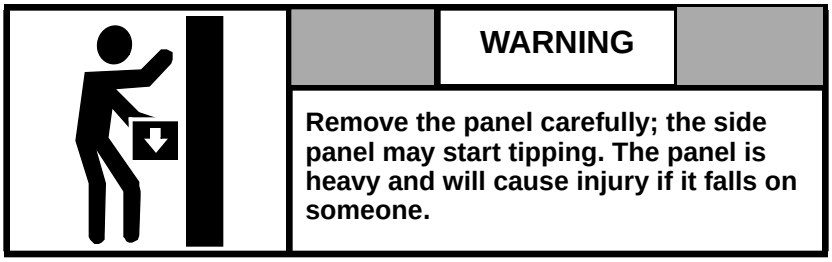
1. On cabinet 0, disconnect the connector for the Cabinet Power switch (SW2). The connection is located near the top stud on the power supply end of the left panel.

2. Use a 10-mm socket to remove the nuts and washers from the bottom retaining studs. (Be careful not to drop any nuts or washers.)

3. While someone else holds the panel in place, remove the nuts and washers from the top retaining studs. (Again, be careful not to drop any nuts or washers.)

4. Remove the panel:

   a. With a partner, carefully lift the panel slightly, then pull the panel straight out from the side of the cabinet. Keep the panel in a vertical position.




   b. Set the panel in a protected location.

5. Repeat Step 2 through Step 4 for the other side panel, if desired.

6. Use a #2 Phillips screwdriver to remove the upper and lower logic panels from the side(s) where you removed the trim. (Do not remove the logic panels from the side where you will join the cabinets; the panels are necessary to maintain airflow integrity.)

### Attaching Cable Troughs

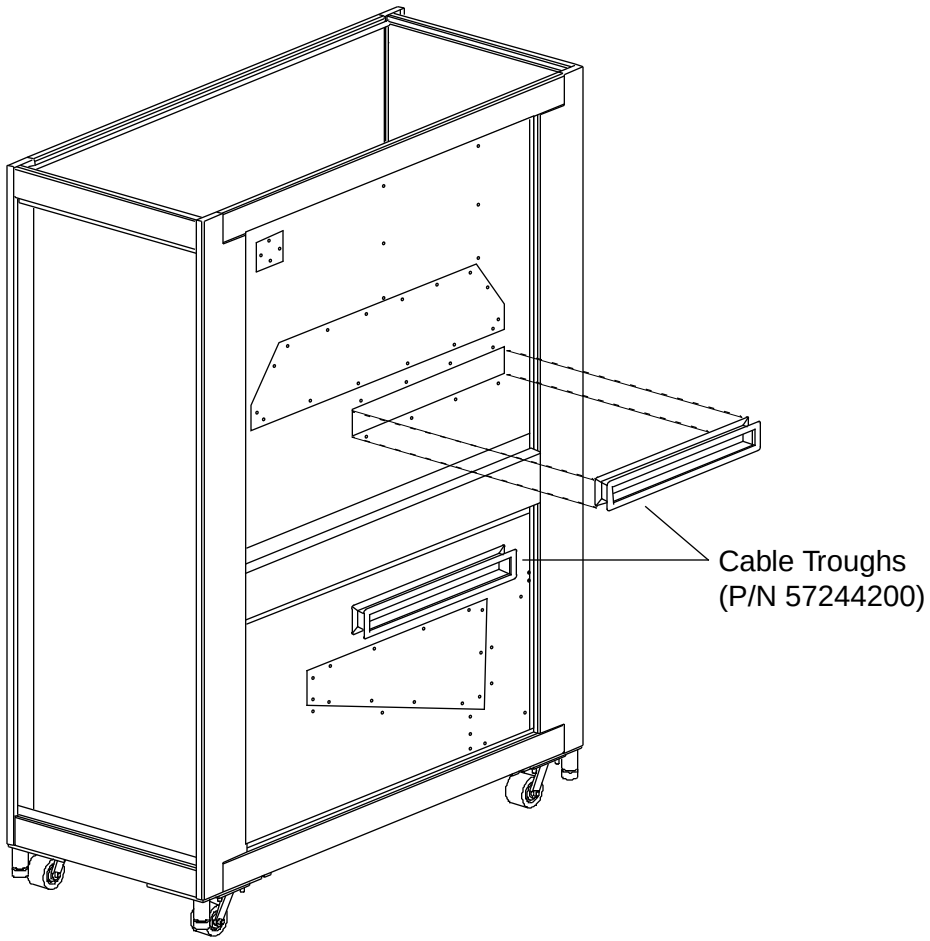
Check to see whether intercabinet cable troughs are installed on the cabinets that you must bolt together. (One set of cable troughs must be installed between each pair of cabinets.) Figure 30 shows a set of cable troughs.

If the cable troughs are not installed, use the following procedure to install them. The cable troughs are part of the frame-joiner assembly (P/N 57243100).

Attach a cable trough (channel cable plenum assembly - P/N 57244200) to each cable duct (upper and lower) on the right side of each cabinet (except the last cabinet).

Use 8 M4 Phillips screws (P/N 13159003) with lock washers (P/N 13161503) to attach each cable trough to the cabinet. Start each screw by hand, then angle the screwdriver to access the screwheads. The screws are #2 Phillips, but a #1 Phillips may work better.

*Figure 30. Cable Troughs*

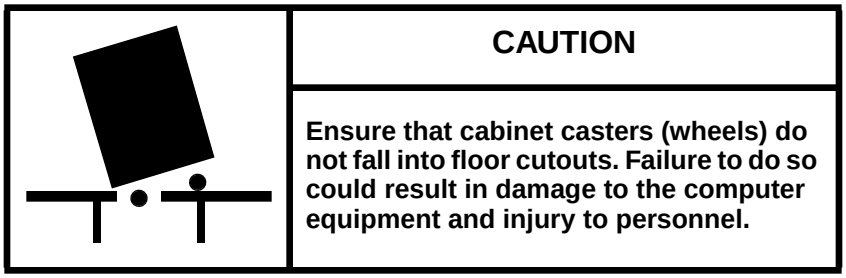


### Joining the Cabinets

We recommend that you join all of the cabinets before you begin the wiring process. For **each** cabinet that you add, complete the following steps -- **one cabinet at a time**. You will need a 4-mm hex (allen) wrench and a 10-mm socket wrench.

1. Position the cabinet in the location indicated on your site plan. Ensure that the module end of the cabinet is on the same side as the module end of cabinet 0.

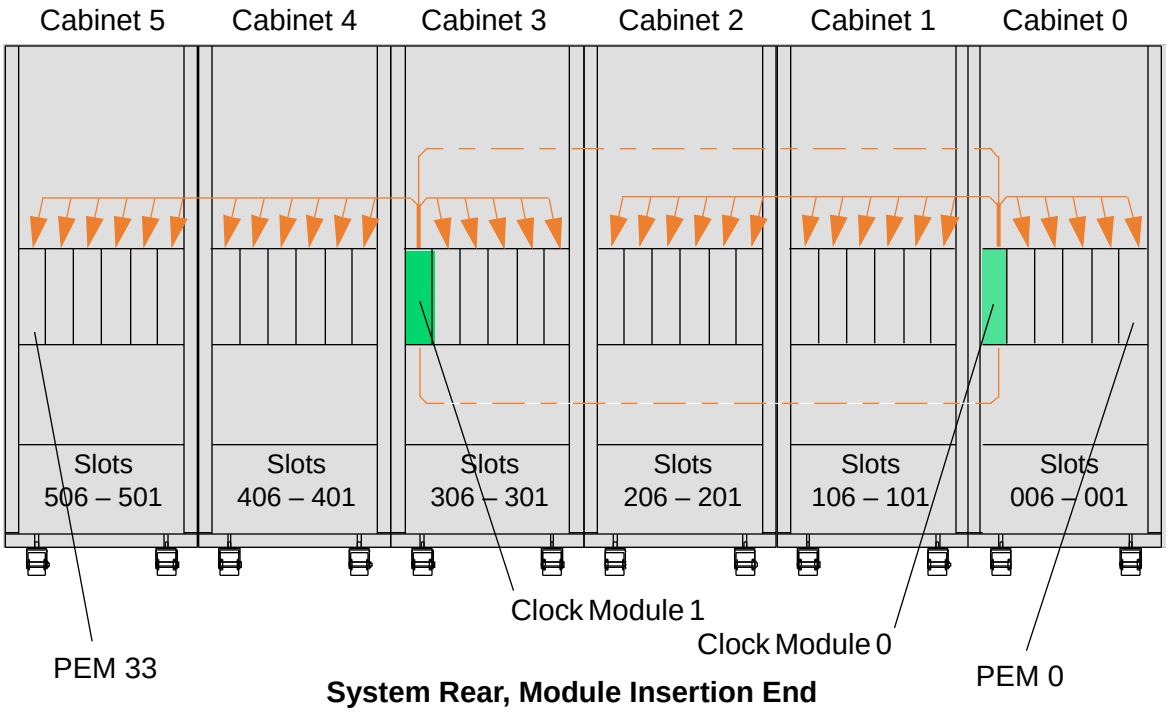
   Place mainframe cabinet 1 against the left side of cabinet 0 as you face the module end of the cabinets. Place each additional cabinet to the left of the previous one as shown in Figure 31.



**CAUTION**

**Ensure that cabinet casters (wheels) do not fall into floor cutouts. Failure to do so could result in damage to the computer equipment and injury to personnel.**

*Figure 31. Six-cabinet System*

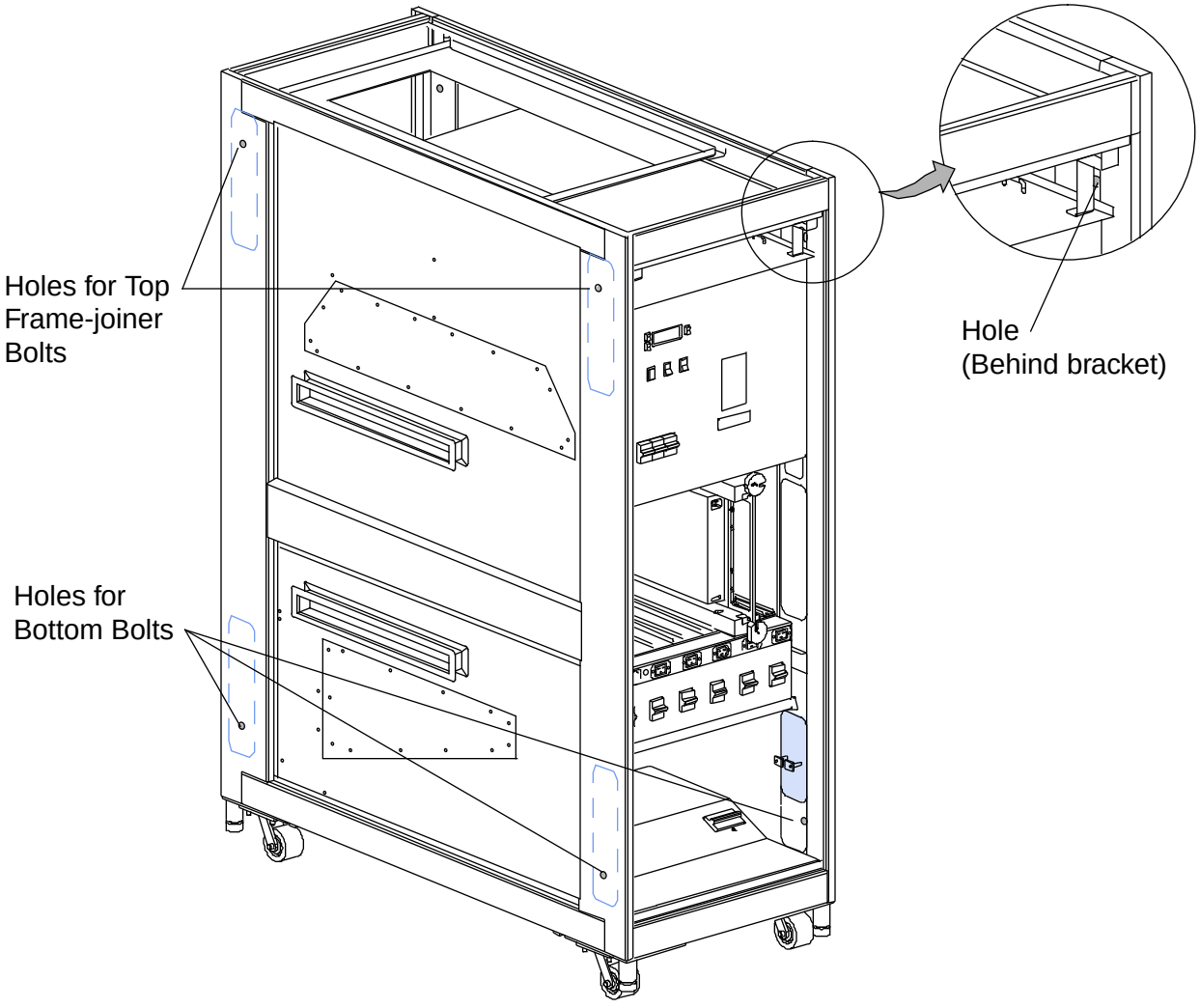


2. Lower the cabinet power cord through the bottom of the cabinet, through the appropriate floor cutout, and into the underfloor area. If needed, move the cabinet to provide access to the floor cutout. If the computer area does not have a raised floor, position the power cord under the cabinet.

3. Align the cabinet with cabinet 0 (or any cabinet that you already attached to cabinet 0 using this procedure). Ensure that the side of the new cabinet contacts the side of the adjacent cabinet.

   **NOTE:** The left side of a cabinet is offset from the right side of the cabinet to enable the door to swing. Therefore, you must align the cabinets by aligning the holes for the frame-joiner bolts. Refer to Figure 32.

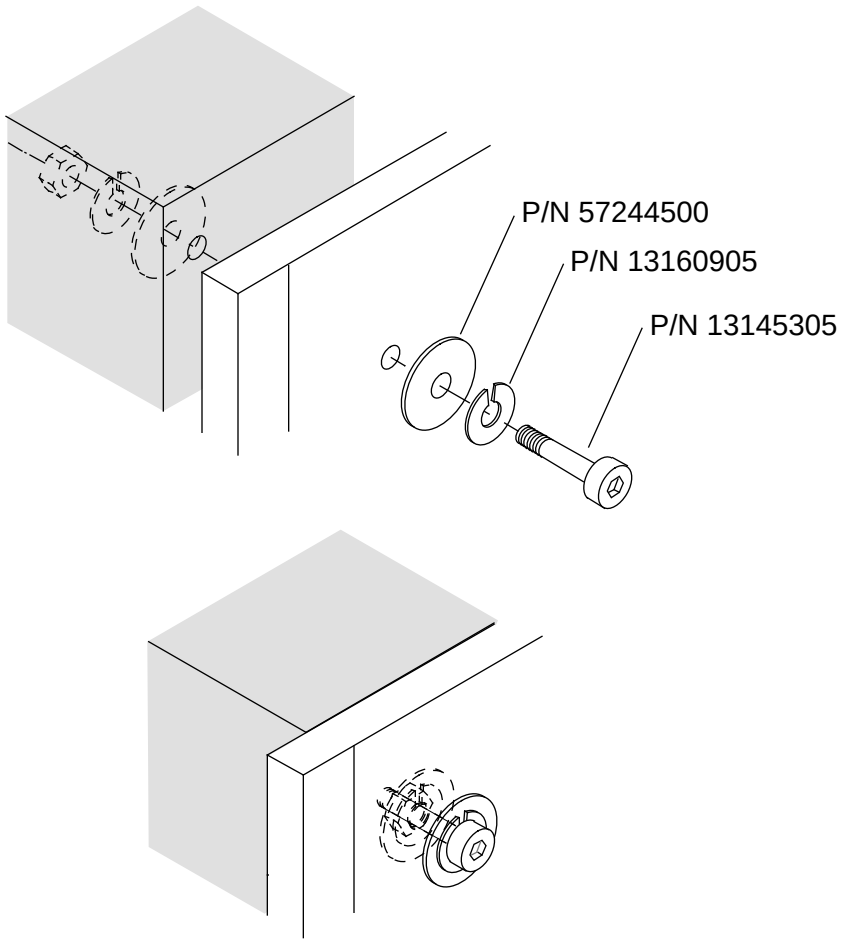
*Figure 32. Frame-joiner Bolt Locations*



4. For each of the 4 frame bolt holes: insert a 4-mm hex (allen) bolt (P/N 13145305), with lock washer (P/N 13160905) and flat washer (P/N 57244500), through the hole so that it passes through the frames of both cabinets. Then add another flat washer, a lock washer, and a 10-mm nut (P/N 13161806) as shown in Figure 33.

   It does not matter which direction you install the screws from. Tighten the nuts only until finger tight. You will tighten them after you level the cabinet.

*Figure 33. Frame-joiner Bolts*




5. After you install the 4 frame-joiner bolts, use an adjustable wrench to lower the 4 cabinet levelers (legs). Adjust the levelers so that the cabinet is level and will not roll when pushed.

6. Tighten the frame-joiner bolts and nuts until secure.

7. Repeat this procedure for each additional cabinet.

### Opening the Cable Ducts

In order to complete the intercabinet wiring, you must open the top and bottom cable ducts between the cabinets, as noted in the following list. Use the procedure that follows the list.

- The left side of cabinet 0 as you look at the module end of the system
- The right side of the leftmost (highest-numbered) cabinet in the system as you look at the module end of the system
- The left and right sides of every other cabinet

1. Use a #1 Phillips screwdriver to loosen the 5 Phillips screws that secure each duct seal. Figure 35 shows the cable duct seals.
2. Lift (or lower, in the case of the Y-side wiremat) the duct seals to provide room for the new wires and cables.
3. Secure the upper duct seals in the open position by tightening screws.

*Figure 34. Intercabinet Cable Duct Locations*

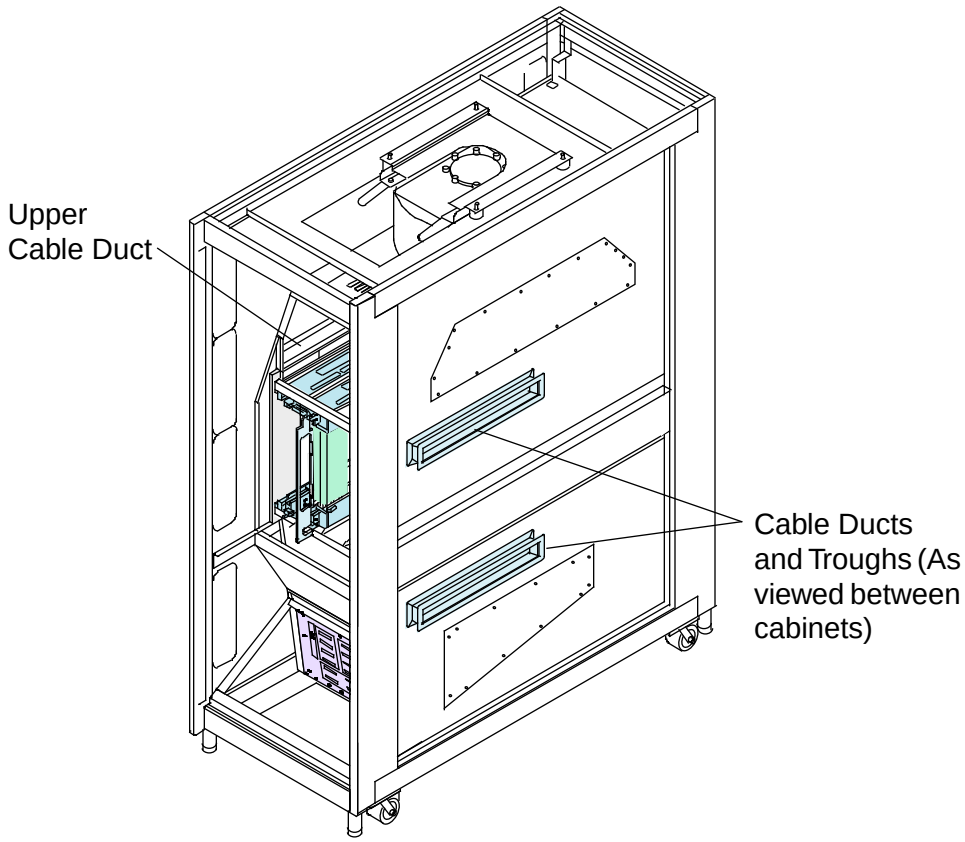
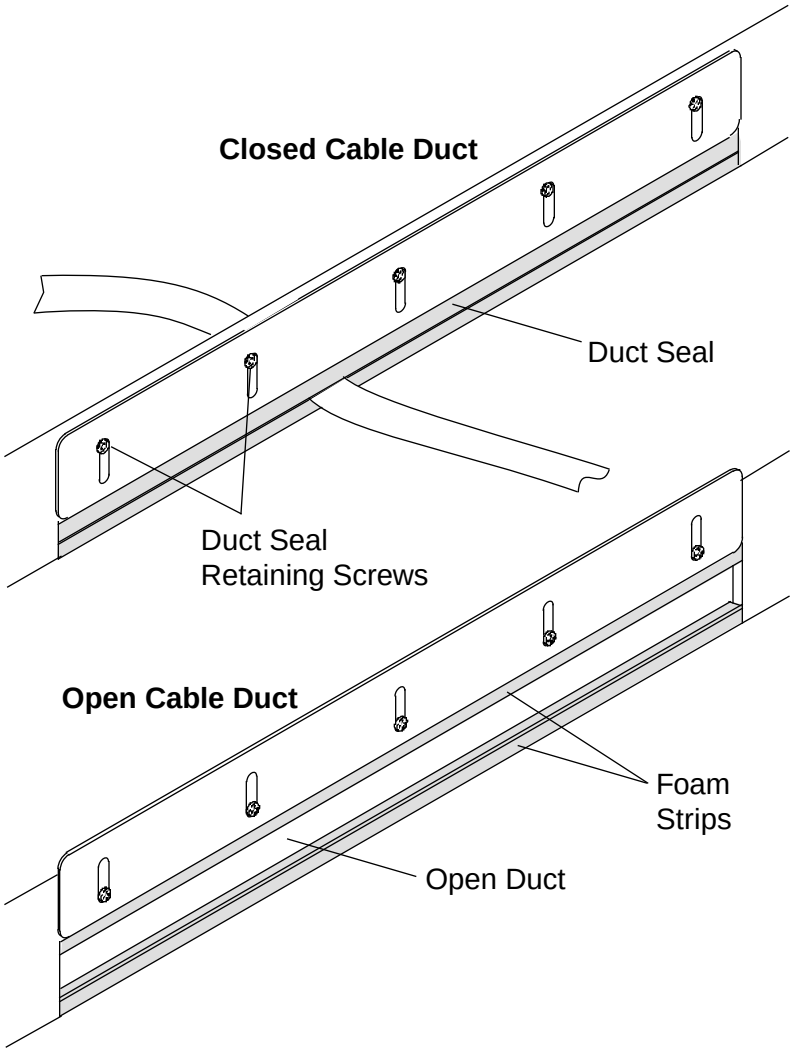


*Figure 35. Intercabinet Cable Duct (as viewed from inside cabinet)*



### Grounding the Mainframe Chassis

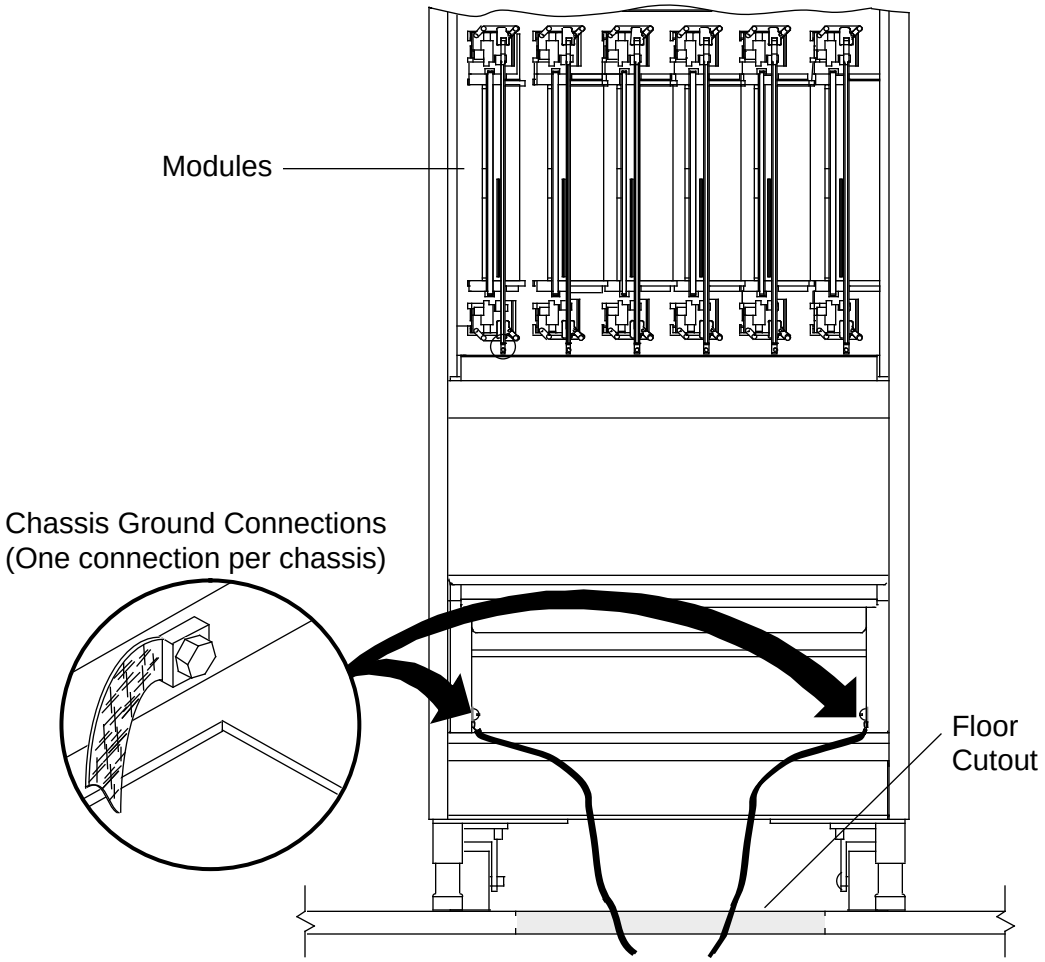
Use the following procedure to ground each mainframe chassis:

**NOTE:** Each chassis is grounded through the power cord; however, Cray Research recommends that you connect an additional chassis ground to each chassis. If your site chooses not to connect an additional ground for a chassis, you must remove the ground strap, which could act as an antenna.

1. Locate the grounding strap (near the I/O bulkhead), and uncoil the grounding strap. Figure 36 shows two possible locations for the chassis ground connections; your cabinet will have a single ground strap.

2. Ground the mainframe. For example, connect the ground strap to the floor grid via a ground clamp.

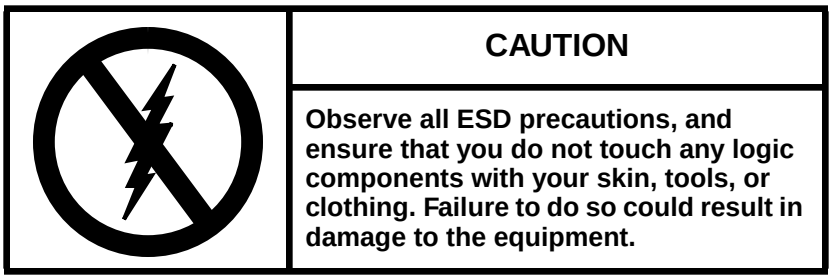
*Figure 36. Chassis Ground Connections (Rear View of Cabinet)*



### Removing Clock and Logic Modules

When you install two or more cabinets, you must connect clock wires to the clock rail connectors. To make these connections, you must remove the clock module(s). In addition, you must remove adjacent PEMs to provide access to the clock connectors; you will access the connectors via the card cage.

Use the following procedure when you remove modules:

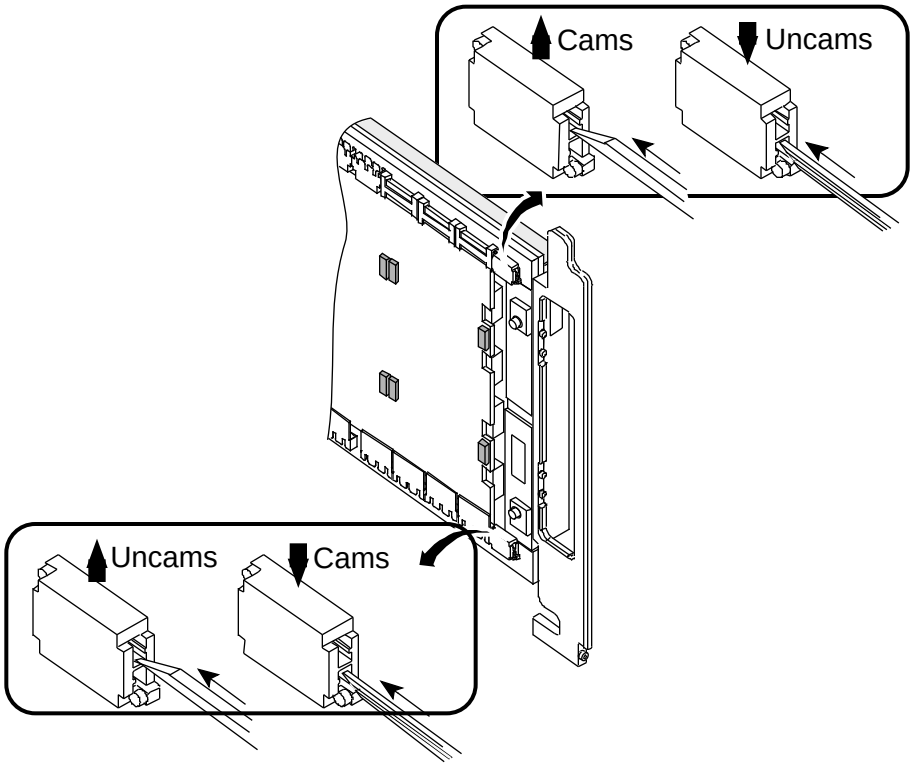


**CAUTION**

**Observe all ESD precautions, and ensure that you do not touch any logic components with your skin, tools, or clothing. Failure to do so could result in damage to the equipment.**

1. Prepare an ESD-safe surface (or surfaces) where you can set the modules.
2. Uncam clock module 0, which is in slot 6 of cabinet 0. Figure 37 shows an overview of module camming.

*Figure 37. Module Camming*



3. If applicable, uncam clock module 1, which is in slot 6 of cabinet 3.

4. Disconnect the clock connector that plugs into each clock PCB near the lower part of the clock handle.

5. Uncam the PEMs that you will remove to provide access to the clock module(s).

   We recommend that you leave a **maximum** of two PEMs (slots 1 and 2) in a cabinet where you connect clock wires. For extra protection, you may want to remove all of the PEMs in cabinet 0 (and cabinet 3, if applicable).

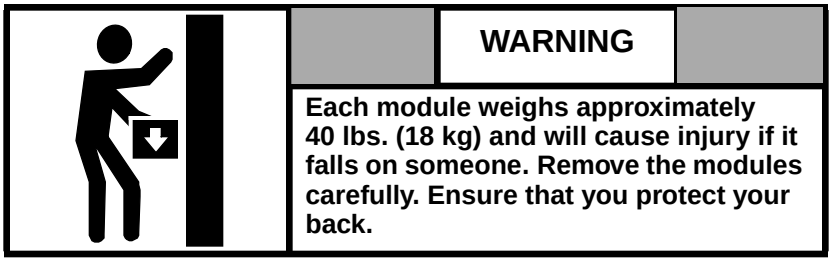
6. Remove each clock module and PEM:

   a. Use a 3-mm hex wrench to remove the module setscrew from the module handle. Refer to Figure 38.

   b. Grasp the module handle with both hands and pull with firm even pressure until the module is halfway out of the cabinet.

   c. When the module is halfway out of the cabinet, place one hand on the underside of the module assembly for support. For example, place your right hand (flat with palm up) beneath the module.

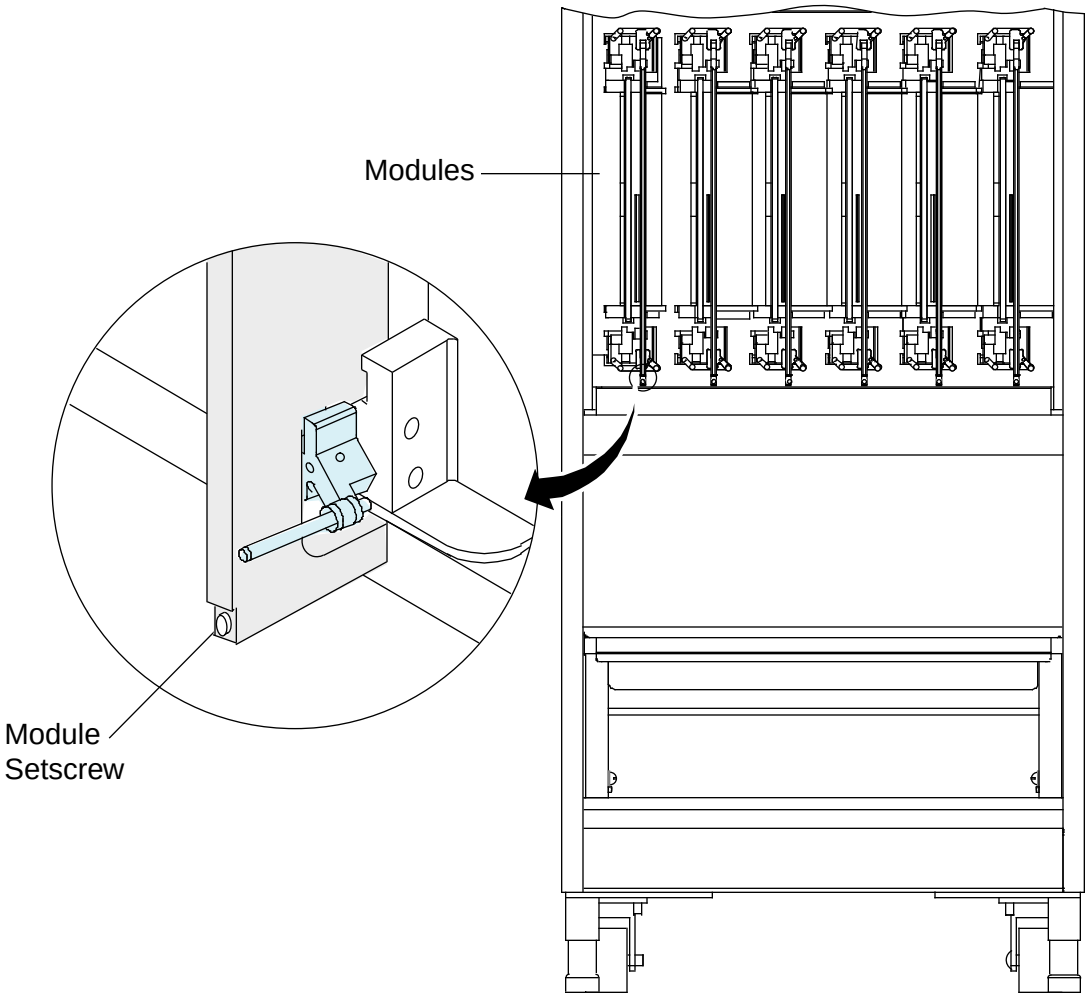
   d. With one hand on the module handle and the other hand supporting the bottom of the module, pull the module from the cabinet.




7. Place each module on an ESD-safe surface. Ensure that the module rests upon the module heat sink.

   **NOTE:** If you don’t have enough room to store all of the modules, you may remove cabinet 0’s modules first, complete the wiring to cabinet 0, then reinstall the modules. After this, you may remove modules from cabinet 3 and complete the wiring.

*Figure 38. Module Setscrew Locations (Rear View of Cabinet)*



### Preparing the Rails for Wire Insertion

For most people, the most efficient way to install the clock wires is to unscrew the clock connectors, pull the connectors into the card cage, and then complete the wiring. Perform the following steps to prepare the clock rail connectors for wire insertion.

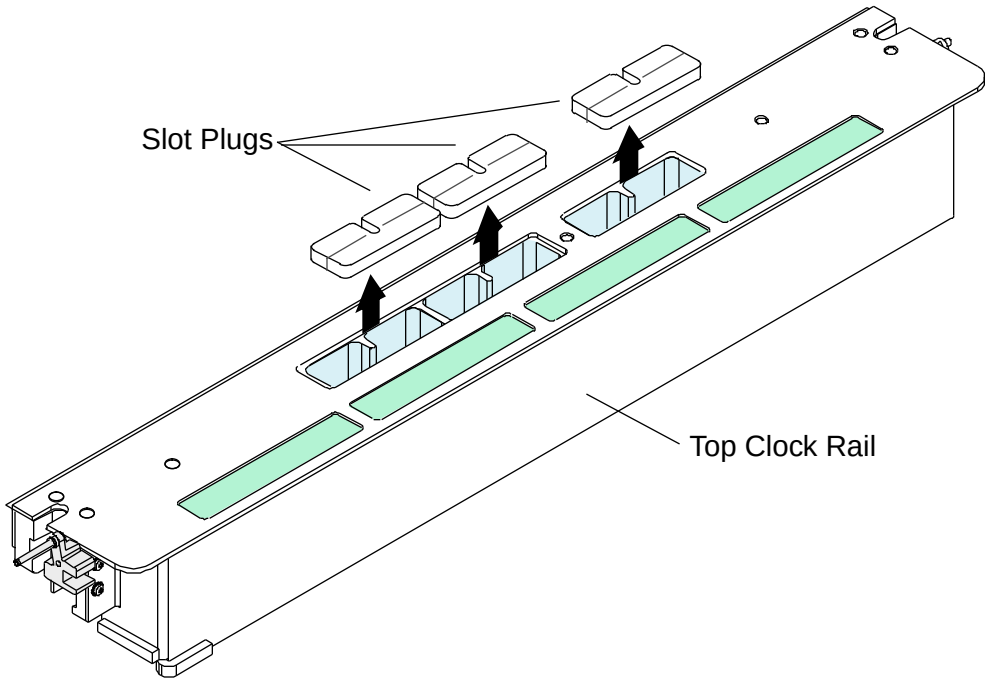
#### Removing Slot Plugs

1. Remove the foam plugs that seal the three connector slots in the top clock rail(s). Refer to Figure 39.

   You will insert clock and boundary scan wires through these slots.

2. If your system contains 4 or more cabinets, carefully remove the plugs from the third connector slot in the *bottom* clock rails. (In other words, remove the foam from the slot closest to the power supplies so that you expose connector yah.)

*Figure 39. Removing Plugs from the Top Clock Rail*



Removing Rail Connectors

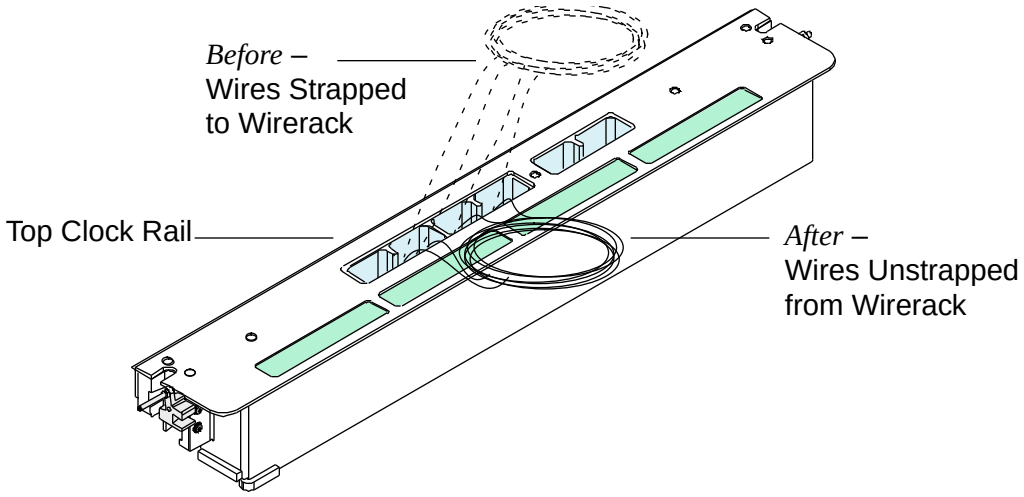
Use the following procedure to loosen the connectors and pull them into the card cage, where you can access them easier:

1. Remove rail connectors from the top clock rail in cabinet 0:

   a. *Loosen* the wires that connect to the clock rail by disconnecting the tie wraps that hold these wires to the wirerack. Refer to Figure 40. Most of the tie wraps are reusable; however, in some cases, you may need to use snippers to cut the tie wraps.

   **NOTE:** Be careful not to cut any wires or to let the wires uncoil.

*Figure 40. Loosening the Wires*




   b. Set a sheet of ESD-safe foam in the card cage to catch any screws, spacers, or tools that you might drop.

   c. From the inside of the card cage, use a 0.5-in. hex (allen) wrench to remove the hex screws and brass spacer from the rail connector (zae) that is closest to you. Refer to Figure 41 and Figure 42.

   **NOTE:** Ensure that you do not lose the brass spacer that is on connector zae's first hex screw.

   d. If you are installing 2 or 3 CRAY T3E cabinets:

      Remove the hex screws from the next 3 connectors in the top rail: zaf, zag, and zah. Loosen but *do not* remove the last hex screw from connector zai. (In other words, leave connector zai secured by the hex screw that is closest to the power supplies.)

e. If you are installing 4, 5, or 6 CRAY T3E cabinets:

   Remove the hex screws from all of the other connectors in the top rail: zaf, zag, zah, and zai.

**NOTE:** Ensure that you do not lose the brass spacer that is on connector zai's last hex screw.

f. Carefully slide the connector that is closest to you (zae) toward you and then down into the card cage. Repeat this step for the next 3 connectors (zaf, zag, zah) and for connector zai if applicable.

*Figure 41. Clock Connector Locations*

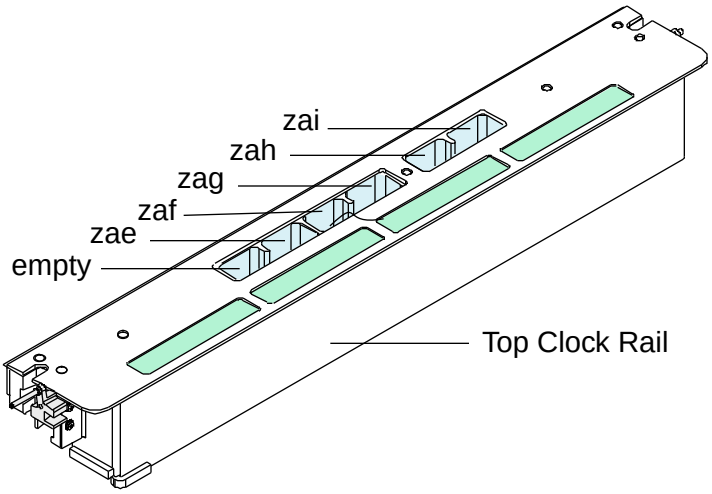
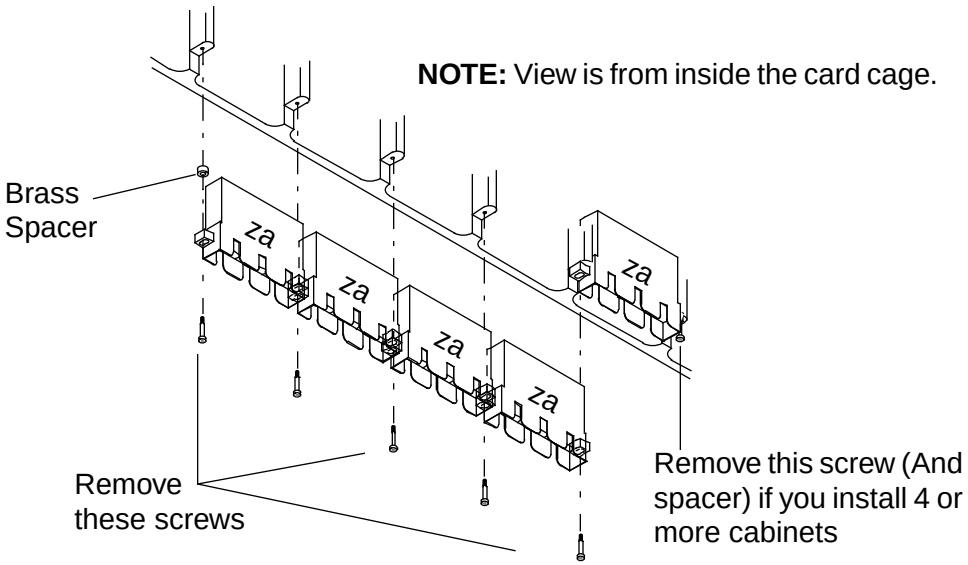



*Figure 42. Removing Clock Rail Connectors*



2. If you are installing 4, 5, or 6 CRAY T3E cabinets:

   Remove connectors from the top clock rail in cabinet 3. Use the method you used in Step 1; do not remove the last hex screw from connector zai.

3. If you are installing 4, 5, or 6 CRAY T3E cabinets:

   Remove rail connector yah from the *bottom* clock rail **in both cabinet 0 and cabinet 3**. Connector yah is the second connector from the power-supply end of the cabinet, as shown in Figure 43.

4. Optional: Remove the associated connector springs. (Remove them only if they come off easily.) To remove a spring, insert the tip of a pair of tweezers between the spring and the edge of the rail, then pry the spring loose as shown in Figure 44.

   **NOTE:** Removing the springs ensures that you do not accidently wrap a wire around the spring when you reinsert the connectors. If you guard against this, you may leave the springs on the rail.

5. Remove the springs, screws, and brass spacer(s) from the cabinet.

*Figure 43. Connector Locations – Bottom Clock Rail*

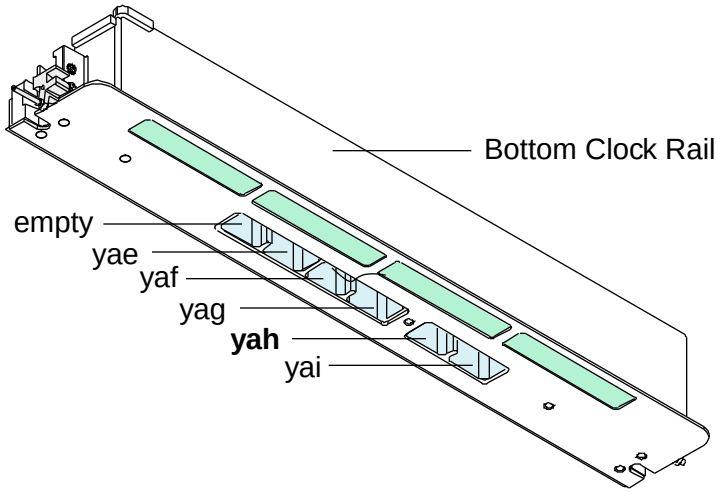
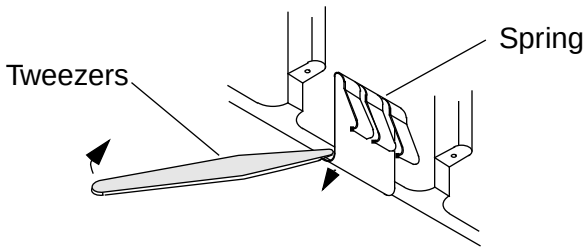



*Figure 44. Removing a Connector Spring*



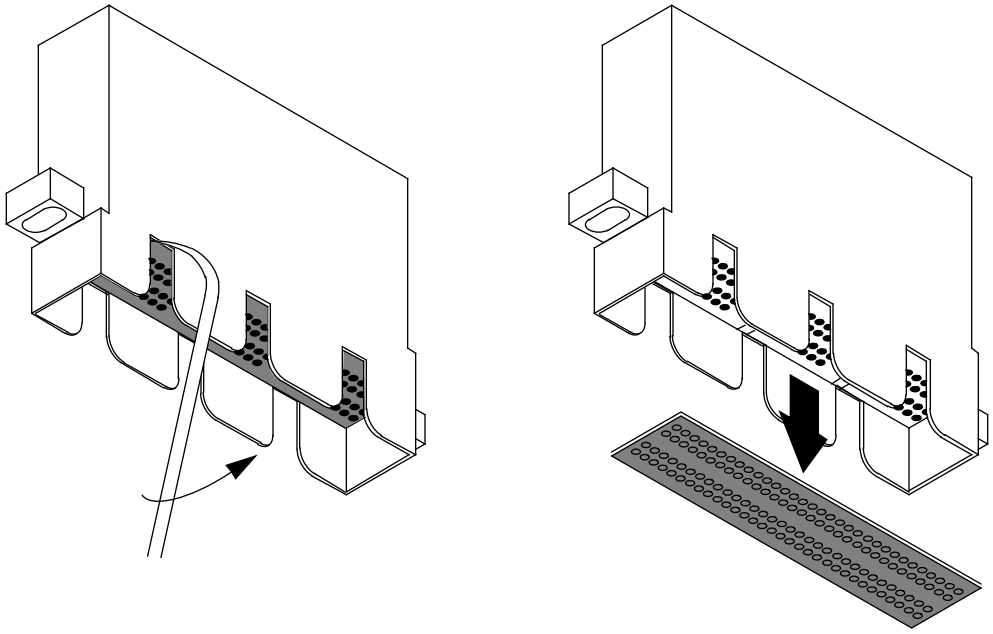
Removing Connector Pin Locks

Carefully remove the plastic pin lock (P/N 01775900) from the module side of each loose connector.

You may use a dental pick, or another sharp instrument, to pry the pin lock loose from the connector. At various locations around the pin lock, place the tip of the dental pick between the edge of the pin lock and the connector and pry the pin lock out of the connector, as shown in Figure 45. Be careful not to damage any pins.

The pin locks tear easily; replace them as needed.

*Figure 45. Removing a Connector Pin Lock*



## Completing the Internal Wiring

This section contains details on the intercabinet cabling and wiring that you must complete when you connect CRAY T3E air-cooled cabinets.

You will make connections in the following order:

- Clock connections
- Boundary scan connections
- Torus connections

### Completing the Clock Connections

You must make some or all of the following clock connections when you connect multiple CRAY T3E cabinets (the procedure for connecting wires begins on page 70):

- From cabinets 1 and 2 to cabinet 0:
  - You must make a direct *system* clock connection from each PEM in cabinets 1 and 2 to the top rail of clock module 0, which is in slot 6 of cabinet 0.

    One end of each wire assembly is preinstalled in connector zah, pin 03, of each PEM rail. You will connect the other end to connector zag in the clock rail.
  - You must make a direct *GigaRing* clock connection from each PEM in cabinets 1 and 2 to the top rail of clock module 0.

    One end of each wire assembly is preinstalled in connector zah, pin 07, of each PEM rail. You will connect the other end to connector zah in the clock rail.
- From cabinets 4 and 5 to cabinet 3:
  - You must make a direct *system* clock connection from each PEM in cabinets 4 and 5 to the top rail of clock module 1, which is in slot 6 of cabinet 3.

    One end of each wire assembly is preinstalled in connector zah, pin 03, of each PEM rail. You will connect the other end to connector zag in the clock rail.

- You must make a direct *GigaRing* clock connection from each PEM in cabinets 4 and 5 to the top rail of clock module 1.

  One end of each wire assembly is preinstalled in connector zah, pin 07, of each PEM rail. You will connect the other end to connector zah in the clock rail.

- From cabinet 0 to cabinet 3 (synchronization):

  - You must make a master system-clock connection between clock module 0 (connector zai, pin 07) and clock module 1 (connector zah, pin 03).

    One end of this wire assembly is preinstalled in a top clock rail.

  - You must make a master GigaRing clock connection between clock module 0 (connector yah, pin 51) and clock module 1 (connector yah, pin 52).

    One end of this wire assembly is preinstalled in a bottom (Y-side) clock rail.

You do not have to make clock connections between clock module 0 and the PEMs in cabinet 0 or between clock module 1 and the PEMs in cabinet 3. These wires remain connected during shipment.

The clock wires are labeled on each end with the slot, connector, and pin location as shown in Figure 46.

*Figure 46. Example – Clock Wire Labels*

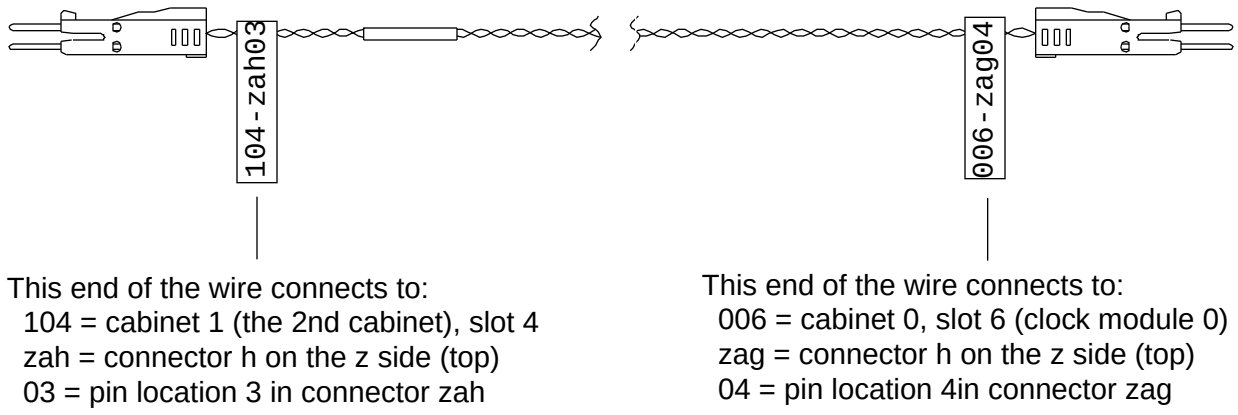


Figure 47 provides an overview of the clock connections in 6 fully-populated CRAY T3E AC cabinets. Figure 48 shows the clock connectors where the system clock and GigaRing clock wires connect.

*Figure 47. Clock Connections*

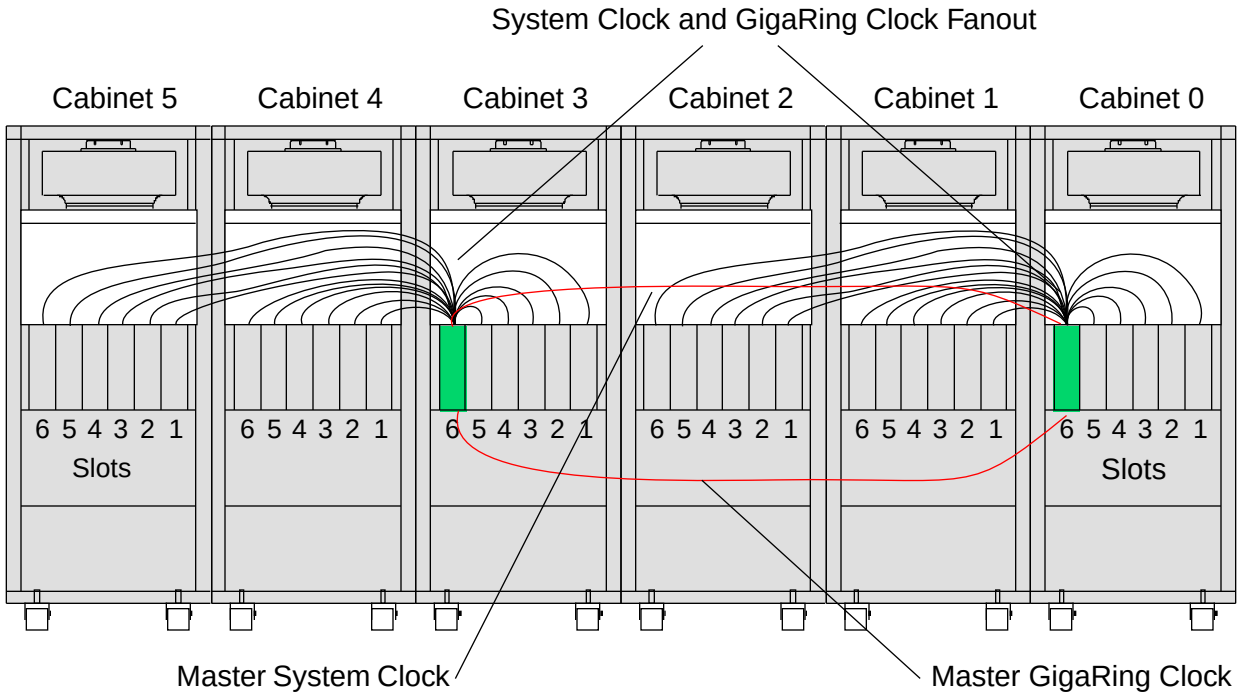
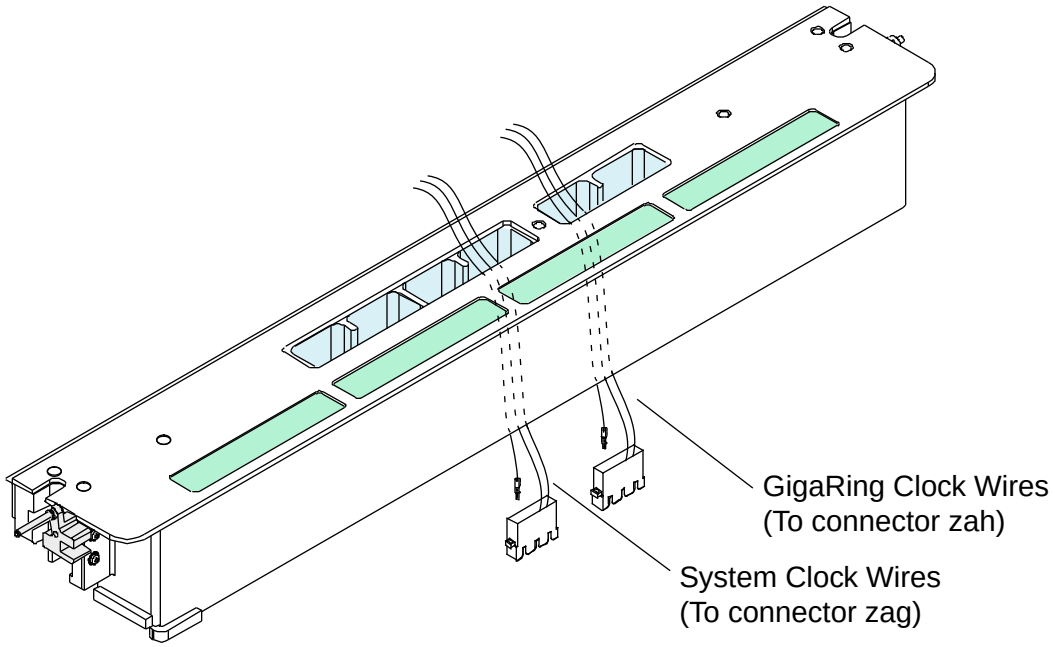



*Figure 48. System and GigaRing Clock Wire Connections*



Use the following procedure to connect the clock wires:

1. Locate the disconnected clock wires and carefully route them from cabinet to cabinet. (You must route all cables that pass from cabinet to cabinet through the cable ducts above [or below] the modules.)

   To make individual clock wires easier to locate in the future, try to keep the clock wires from each cabinet separate. For example, do not bundle the clock wires from the PEMs in cabinet 2 with the clock wires from the PEMs in cabinet 1.

   Position the clock wires in relatively safe locations where they will be out of the way during the rest of the cabling procedure. Coil the wires, and use tie straps to secure the wires in the coil; trim the tie straps as appropriate. Do not secure the wires to the wireracks yet; instead, ensure that you leave some slack on the ends that connect to the clock rail. When you complete the wiring, you will remove slack and secure the wires to the wireracks.

   **TIP:** Place a piece of heat shrink (approximately 6-in. (15 cm] long) on the end of a thin metal rod (approximately 8-in. [20 cm] long). To help you pass wires between cabinets, insert the wire's 2-pin connector in the loose end of the heat shrink, then pass the rod through the cable trough. Next, go to the adjacent cabinet and pull the rod and wire into the cabinet.

2. Use the following steps to connect each clock wire. It may be helpful to connect the wires in the following order:

   - Wires from cabinet 1
   - Wires from cabinet 2
   - Wires from cabinet 4
   - Wires from cabinet 5
   - Clock synchronization wires

   **NOTE:** Always double check the connections to ensure proper location and that the wires are not damaged. If you connect a 2-pin connector to the wrong rail connector location, refer to the Appendix for a removal procedure.

   a. Select a disconnected clock wire, and refer to its label to determine where you should connect it.

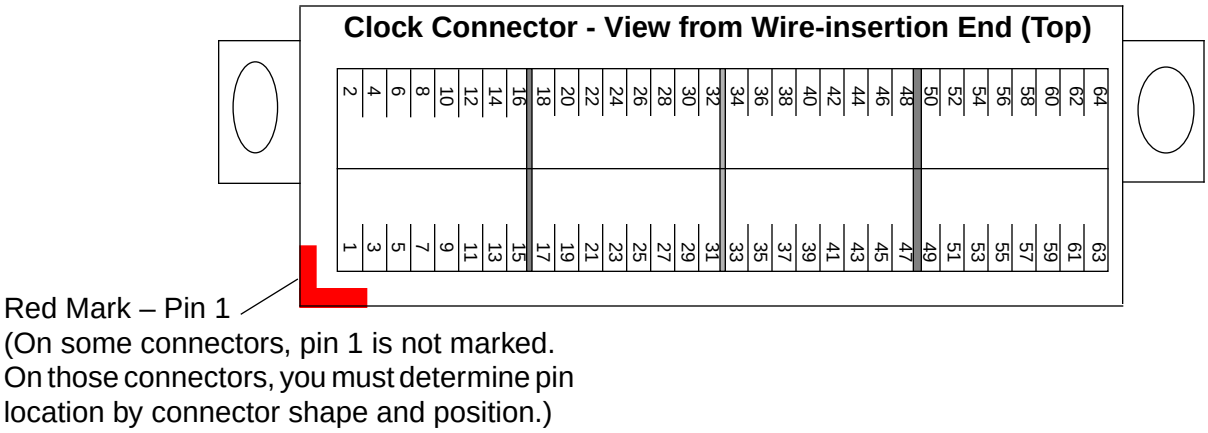
      If necessary, refer to the clock wire list (Engineering specification #800569) for source/destination information.

b. Route the wire to the appropriate rail connector. You will pass the wire through the rail and to the connector. Ensure that the wire passes through the same slot as the connector.

c. Working inside the card cage, determine the exact location (connector and pin slot) where you will connect the wire. (In most connectors, pin slot 1 is located in the corner that is marked with red, as shown in Figure 49.)

   The rail connector contains two rows of pins: an even-numbered row and an odd-numbered row. Regardless of which row you insert the 2-pin connector in, ensure that you position the *curved* edge of the 2-pin connector toward the *outside* wall of the connector. You can only insert the 2-pin connector one way, as shown in Figure 50.

*Figure 49. Pin Locations*




d. Use your fingers (or an appropriate tool such as a hemostat) to gently push the 2-pin connector into the pin slot. Then carefully press the top of the 2-pin connector to fully insert it. Refer to Figure 51. (Figure 52 shows an alternate method of inserting a 2-pin connector.)

| CAUTION |
| --- |
| **The clock wires are fragile. Ensure that you do not damage the wires when you insert them in the connector.** |

*Figure 50. 2-pin Connector Position*

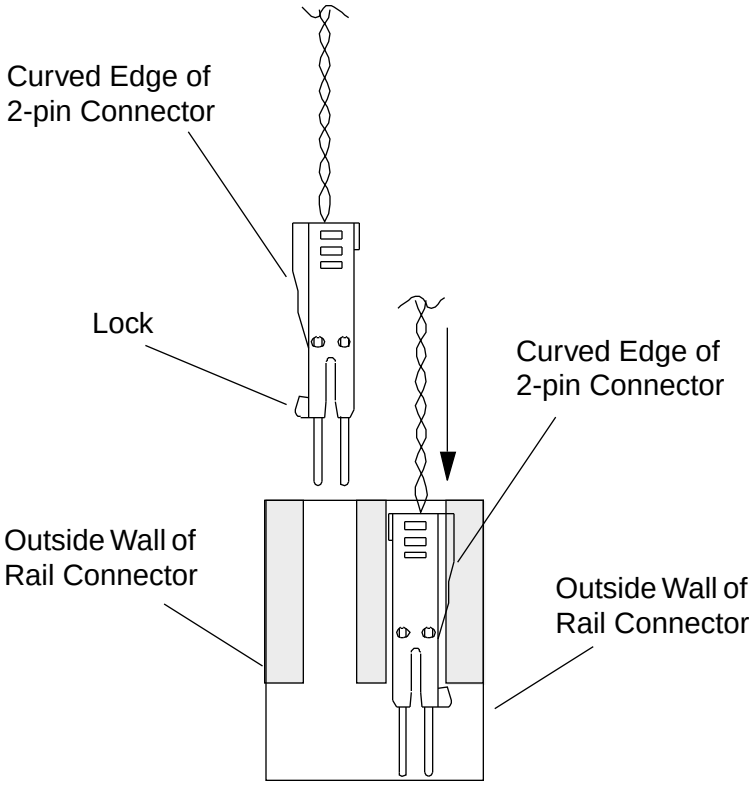



*Figure 51. Wire Insertion*

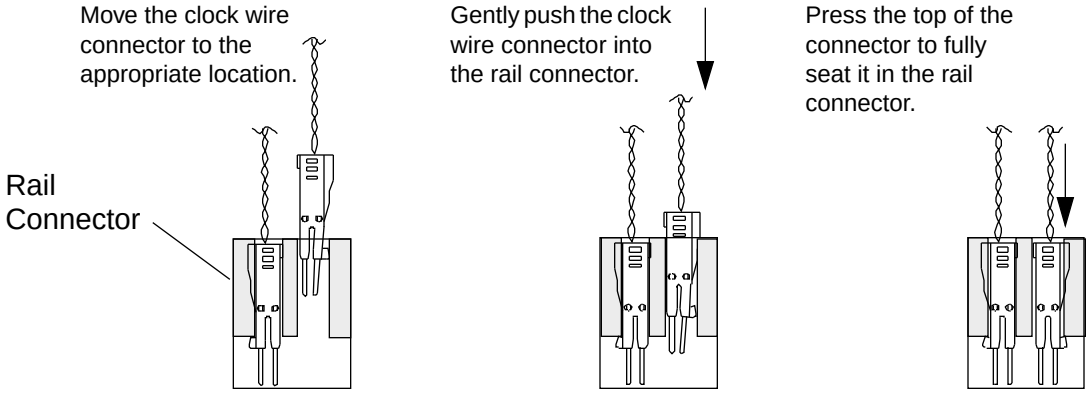
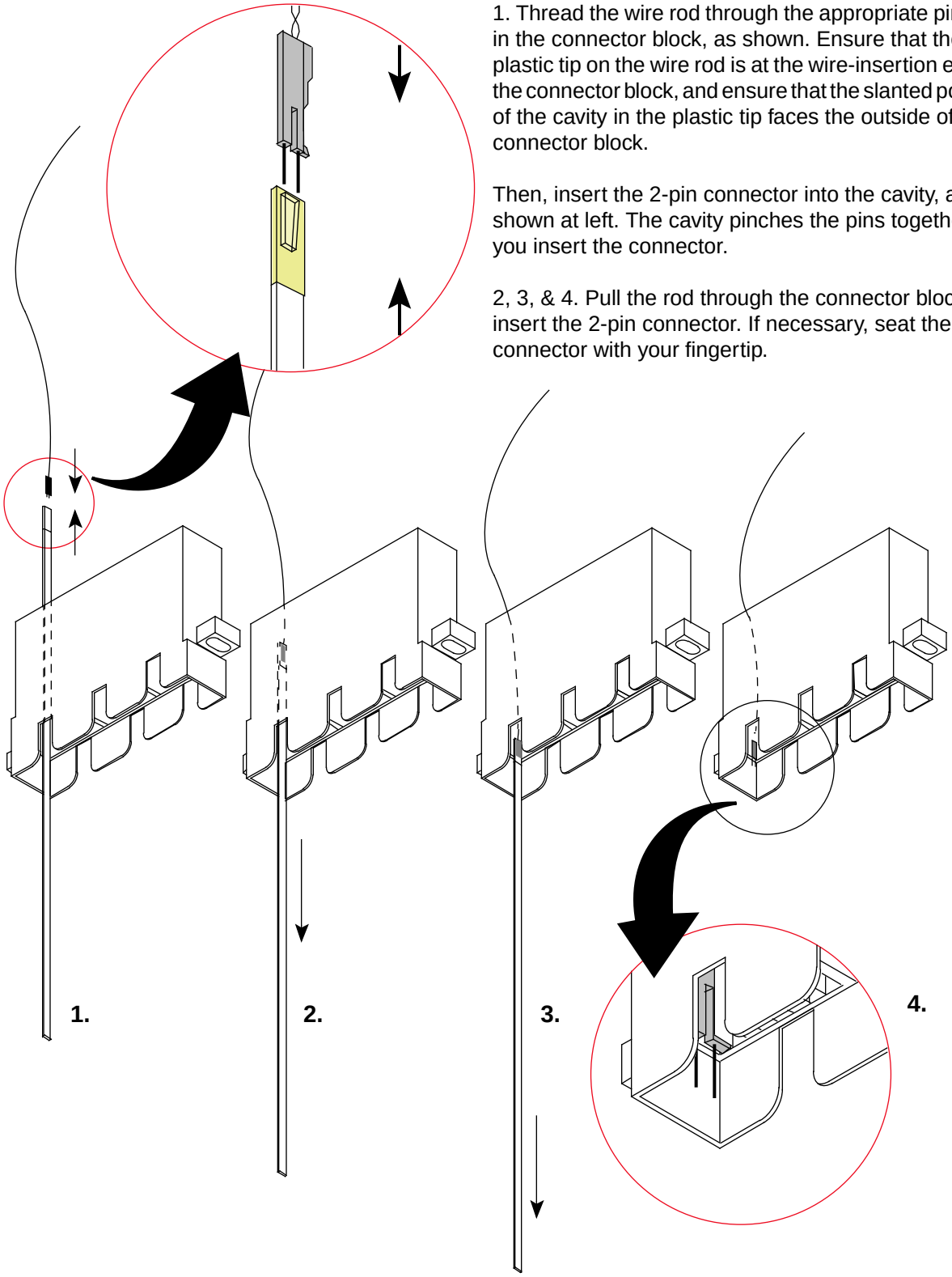


*Figure 52. Wire Insertion with Wire Rod*




1. Thread the wire rod through the appropriate pin slot in the connector block, as shown. Ensure that the plastic tip on the wire rod is at the wire-insertion end of the connector block, and ensure that the slanted portion of the cavity in the plastic tip faces the outside of the connector block.

Then, insert the 2-pin connector into the cavity, as shown at left. The cavity pinches the pins together as you insert the connector.

2, 3, & 4. Pull the rod through the connector block to insert the 2-pin connector. If necessary, seat the connector with your fingertip.

### Completing the Boundary Scan Connections

You must make some or all of the following boundary scan connections when you install a multiple-cabinet CRAY T3E system (the procedure for connecting wires begins on page 75):

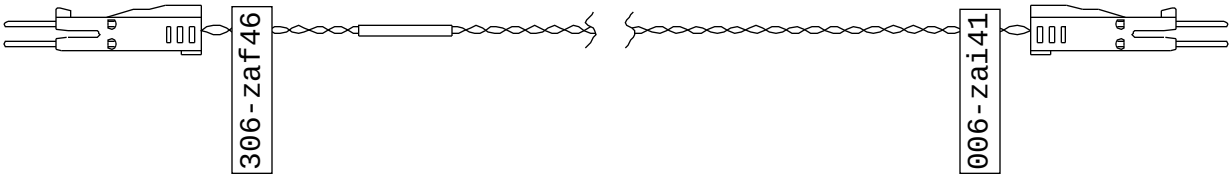
- Cabinets 0, 1, and 2 – scan chain 0:
  - Make a wiremat connection between clock module 0 and each associated PEM – except the PEMs in cabinet 0, which are already connected. (This connection carries the TCK/TMS fanout signals.)
  - Make a wiremat daisy chain connection between the last PEM (highest-numbered PEM) in each cabinet and the first PEM (lowest-numbered PEM) in the next cabinet – except between cabinet 2 and cabinet 3. (TDOM > TDIM)
  - Make a wiremat connection between the scan master PEM and the last PEM in cabinet 1 or 2. In other words, you must link the scan master PEM to the last PEM in scan chain 0. (TDOF[0] < TDOM)
- Cabinets 3, 4, and 5 – scan chain 1:
  - Make a direct connection between clock module 0 and clock module 1. (TCKC[1] > 1-68 TCK FO)
  - Make a direct connection between the scan master PEM (PEM 0) and clock module 1. (TMSFb[1] > 1-34 TMS FO)
  - Make two wiremat connections between the scan master PEM and PEM 17 (the PEM in slot 1 of cabinet 3). (TDIF[1] > TDIM and TDOF[1] < REPEATO)
  - Make a wiremat connection between clock module 1 and each associated PEM – except for the PEMs in cabinet 3, which are already connected. (TCK/TMS fanout)
  - Make a wiremat daisy chain connection between the last PEM (highest-numbered PEM) in each cabinet and the first PEM (lowest-numbered PEM) in the next cabinet – except between cabinet 2 and cabinet 3. (TDOM > TDIM)
  - Make a wiremat connection between PEM 17 (the PEM in slot 1 of cabinet 3) and the last PEM in cabinet 4 or 5. In other words, you must link PEM 17 to the last PEM in scan chain 1. (REPEATI < TDOM)

Connecting the Point-to-point Wires – 4 or More Cabinets

1. If your system contains 4 or more cabinets, connect clock module 0 to clock module 1:

   a. Locate the edge-to-edge connection (P/N 15224009) that links clock module 0 to clock module 1. This wire carries the TCKC[1] > TCK fanout signal. If it is not connected to slot 6 of cabinet 0 (specifically, 006-zai41), then it is connected to slot 6 in cabinet 3 (specifically, 306-zaf46). Figure 53 shows the wire. Figure 55 shows the location.

*Figure 53. Edge-to-edge Connection – P/N 15224009*



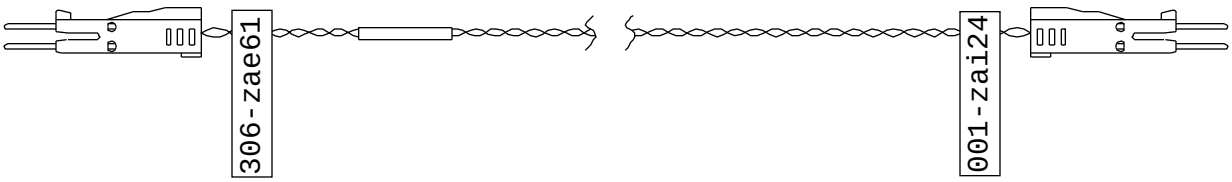

   b. Route the wire through the intercabinet cable troughs between cabinet 0 and cabinet 3.

   c. Connect the wire using the same technique you used to connect clock wires.

2. If your system contains 4 or more cabinets, connect the scan master PEM to clock module 1:

   a. Locate the edge-to-edge connection (P/N 15223701) that links the scan master to clock module 1. This wire carries the TMSFb[1] > TMS fanout signal. If it is not connected to slot 1 of cabinet 0 (specifically, 001-zai24), then it is connected to slot 6 in cabinet 3 (specifically, 306-zae61). Figure 54 shows the wire. Figure 55 shows the location.

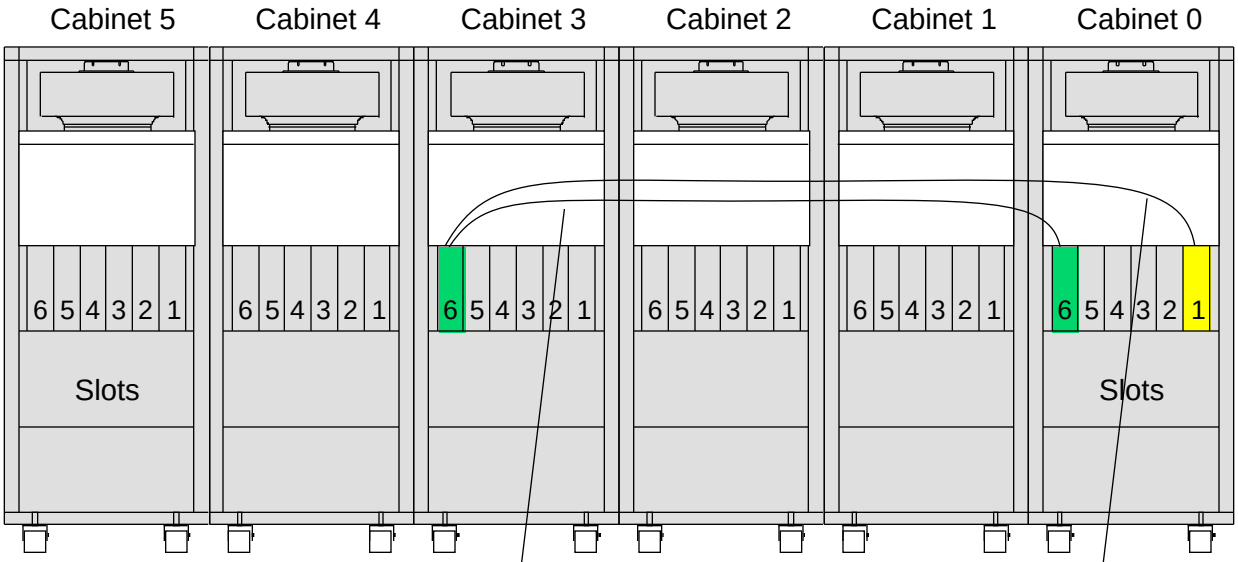
*Figure 54. Edge-to-edge Connection – P/N 15223701*




   b. Route the cable between cabinet 0 and cabinet 3.

   c. Connect the cable using the technique used for clock wires (refer to page 70).

*Figure 55. Direct Boundary Scan Connections*



## Connecting 4-pin Edge-to-Pigtail Cables – P/N 15237701

Complete this procedure if your cabinets were split in any location other than between cabinet 2 and cabinet 3 (the third and fourth cabinets).

### Background

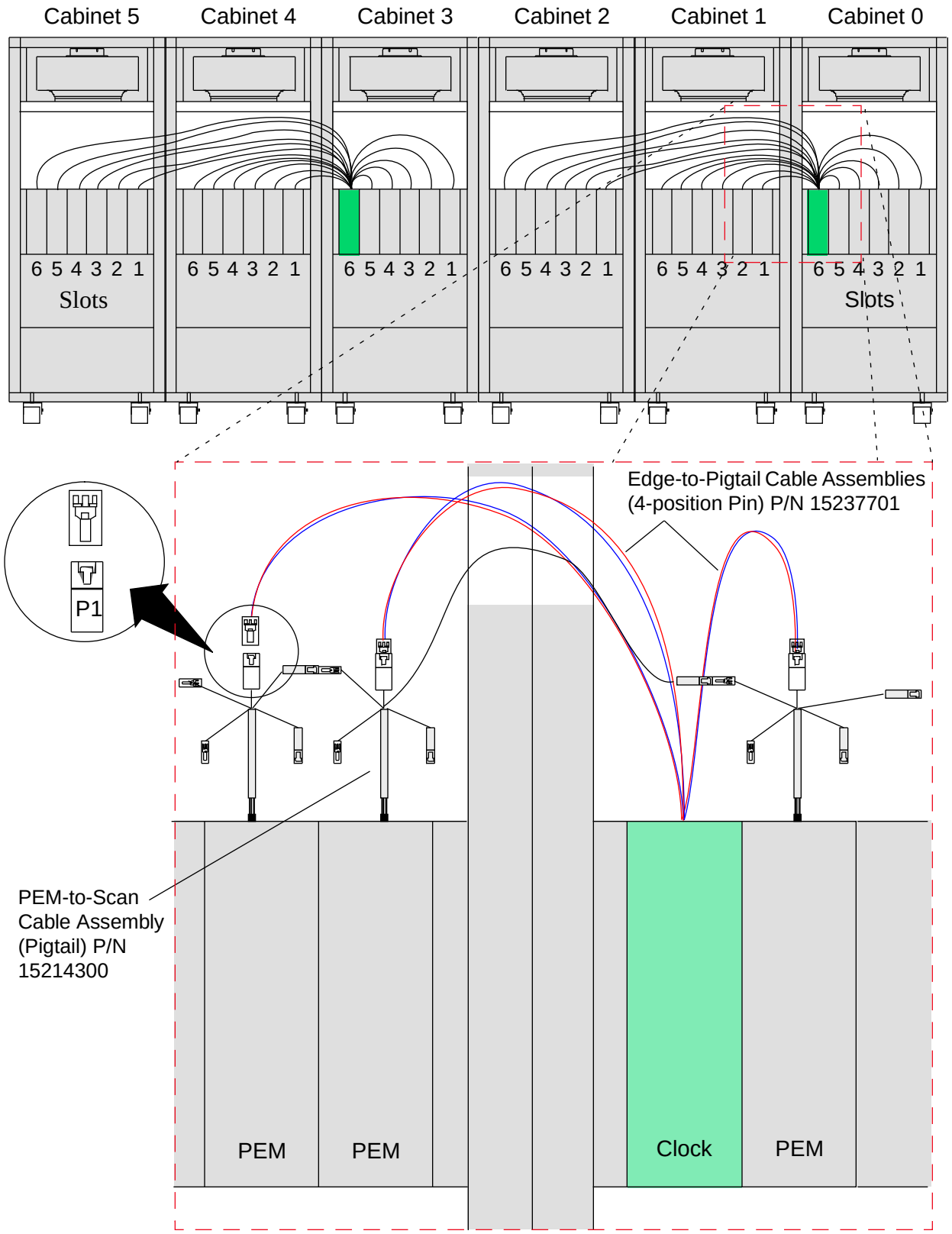
Each PEM has a 4-pin cable (edge-to-pigtail cable assembly – P/N 15237701) that carries TCK FO > TCKM and TMS FO > TMSMb signals from the clock module. Clock module 0 sends signals to the PEMs in cabinets 0, 1, and 2. Clock module 1 sends signals to the PEMs in cabinets 3, 4, and 5. Refer to Figure 56.

If your cabinets were split in any location other than between cabinet 2 and cabinet 3 (the third and fourth cabinets), then some of these 4-pin cables were disconnected in the wiremat for shipment (the other end of each cable remains connected to the top clock rail). Therefore, you must make connections as noted in the following list:

- If your cabinets were split between cabinet 0 and cabinet 1, then you must connect 4-pin cables to the top PEM rails in cabinet 1.
- If your cabinets were split between cabinet 1 and cabinet 2, then you must connect 4-pin cables to the top PEM rails in cabinet 2.
- If your cabinets were split between cabinet 3 and cabinet 4, then you must connect 4-pin cables to the top PEM rails in cabinet 4.
- If your cabinets were split between cabinet 4 and cabinet 5, then you must connect 4-pin cables to the top PEM rails in cabinet 5.

In cabinets 0 and 3, the cables remain connected during shipment.

*Figure 56. 4-pin Edge-to-pigtail Connections*

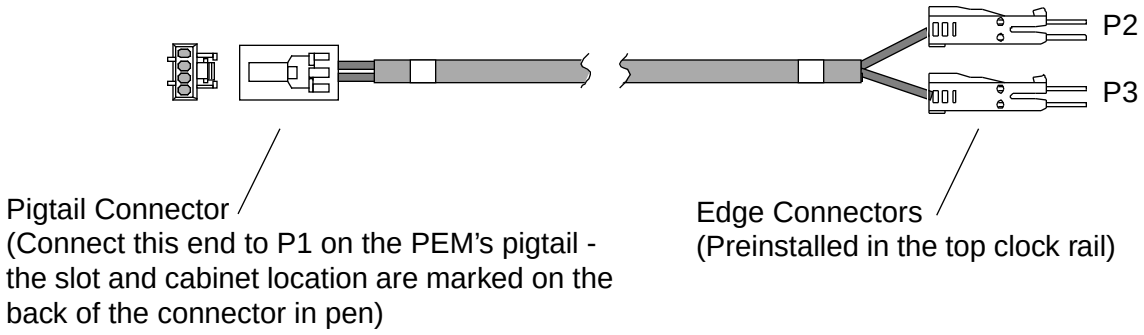


Procedure

1. At the clock module's top rail, select a disconnected boundary scan cable (P/N 15237701). One end of the cable is plugged into the top clock rail. The other end, which is not connected, is marked with the cabinet and slot location where it connects. The cables are easy to recognize due to their 4-pin connectors. Figure 57 shows the cable.

   If the cable is not marked or otherwise labeled, refer to the Engineering boundary scan wire list specification for source/destination information.

*Figure 57. 4-pin Edge-to-Pigtail Cable – P/N 15237701*




2. Route the cable to the appropriate cabinet and PEM slot and connect it to the 4-position socket (connector P1) on the PEM's *pigtail* (PEM-to-scan cable assembly – P/N 15214300). Push the connectors together until they snap into place.

| CAUTION |
| --- |
| **Handle the boundary scan wires carefully. They are fragile and can damage from excessive force or strain.** |

3. Repeat this procedure for each applicable PEM in the system.

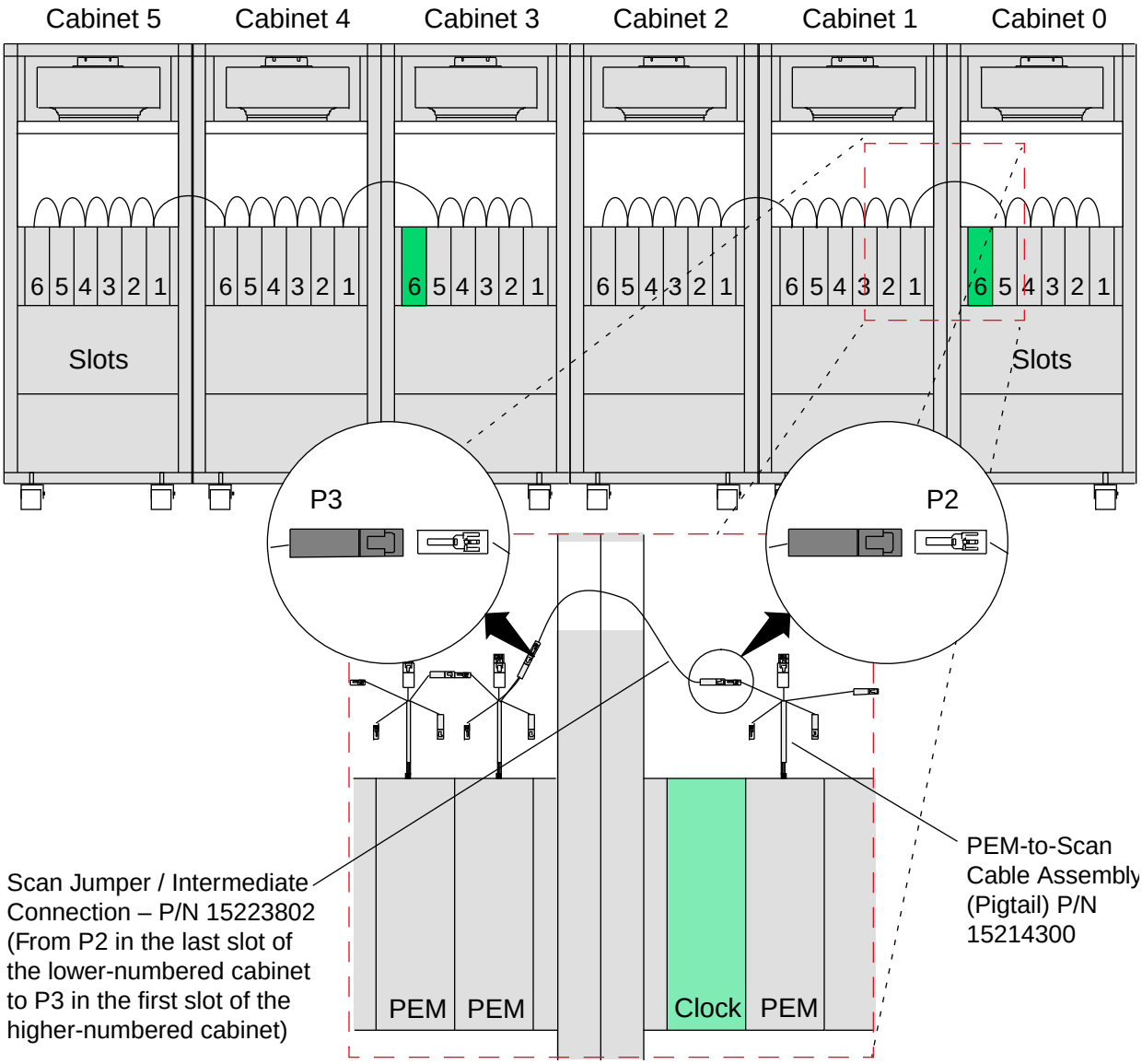
## Connecting the Daisy Chain

Complete this procedure if your cabinets were split in any location other than between cabinet 2 and cabinet 3 (the third and fourth cabinets).

### Background

In a connected system, the PEMs in cabinets 0, 1, and 2 are daisy chained and the PEMs in cabinets 3, 4, and 5 are daisy chained, as shown in Figure 58. When your system ships, the daisy chains are disconnected between the cabinets; therefore, you must complete these connections on site.

*Figure 58. TDOM > TDIM Daisy Chain Connection - Between Cabinets*



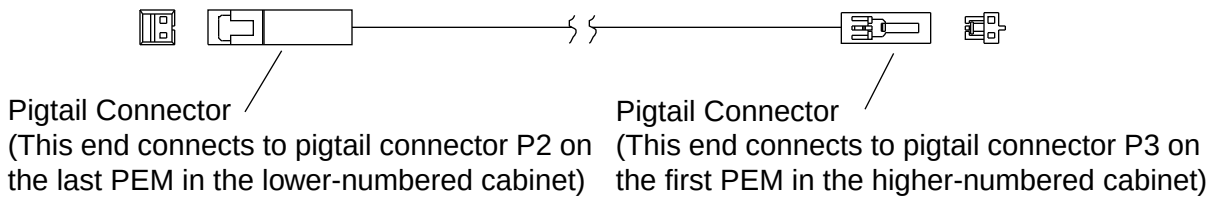
Procedure

Use the following procedure to connect the daisy chain between cabinets that you bolt together (except between cabinet 2 and cabinet 3):

1. Go to the lower-numbered cabinet of the two cabinets where you must connect the daisy chain. Locate the top rail in the last PEM slot in the cabinet (for example, slot 5 in cabinet 0), and locate connector P2 on the rail's pigtail (P/N 15214300).

   If connector P2 is connected to a jumper wire (scan jumper / intermediate connection – P/N 15223802), carefully route the jumper wire through the intercabinet cable duct and into the next cabinet. Figure 59 shows the jumper wire. (The connectors on the jumper wire may be marked with the cabinet and slot locations where they connect.)

*Figure 59. Scan Jumper/Intermediate Connection – P/N 15223802*




2. Go to the higher-numbered cabinet of the two cabinets where you must connect the daisy chain. Locate the top rail in the first PEM slot in the cabinet (for example, slot 1 in cabinet 1), and locate connector P3 on the rail's pigtail (P/N 15214300).

   If connector P3 is connected to a jumper wire (P/N 15223802), route the jumper wire through the cable duct and into the lower-numbered cabinet.

3. Connect the jumper wire to the appropriate connector (either P2 or P3). Push the connectors together until they snap into place.

| **CAUTION** |
| --- |
| **Handle the boundary scan wires carefully. They are fragile and can damage from excessive force or strain.** |

4. Repeat this procedure between each pair of cabinets in the system – except between cabinet 2 and cabinet 3 (the third and fourth cabinets).

## Connecting Scan Chain 0 to the Scan Master

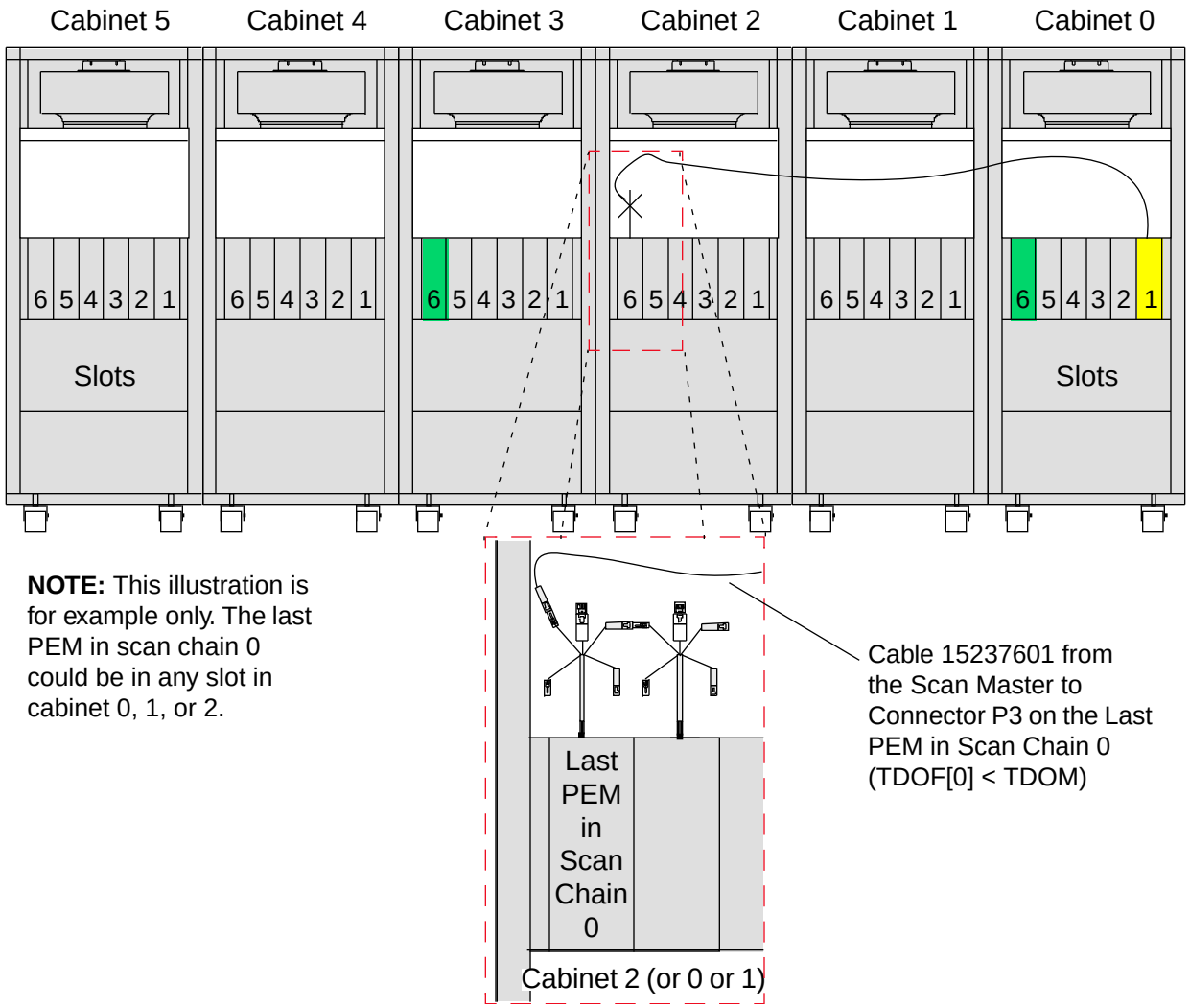
Complete this procedure if your cabinets were split between cabinet 0 and cabinet 1 and/or between cabinet 1 and cabinet 2.

### Background

The PEMs in cabinets 0, 1, and 2 are all on a single daisy chain. The last PEM in this daisy chain connects back to the scan master PEM (in slot 1 of cabinet 0) via a 2-position socket, edge-to-pigtail cable assembly (P/N 15237601).

When your system ships, this cable assembly is disconnected from the last PEM in scan chain 0 (it remains connected to the scan master). Therefore, you must reconnect the cable to the last PEM in the scan chain to complete the daisy chain.

*Figure 60. Connection – Scan Master to End of Daisy Chain – Scan Chain 0*

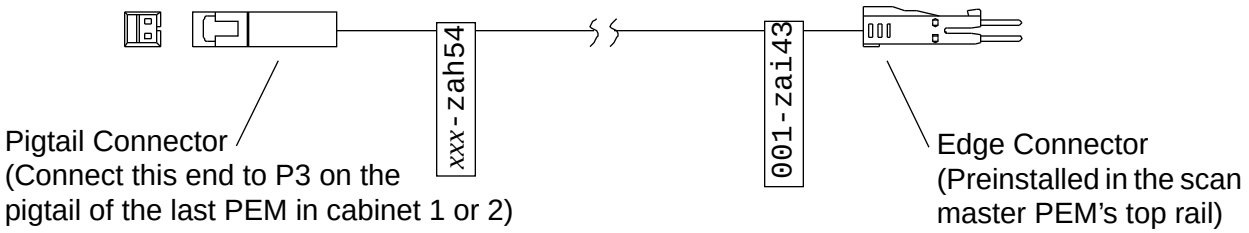


Procedure

Use the following procedure to complete the daisy chain in cabinets 0, 1, and 2 (i.e., to link the last PEM in the daisy chain to the scan master PEM):

1. In cabinet 0, locate cable 15237601, which is labelled for connection to the last PEM in cabinet 1 (or to the last PEM in cabinet 2, if applicable). Figure 61 shows the cable.

*Figure 61. 2-position Socket, Edge-to-Pigtail Cable – P/N 15237601*




2. Route the cable through the intercabinet cable trough(s) and to the last PEM.

3. Connect the cable to connector P3 (marked white) on the last PEM's pigtail. Push the connectors together until they snap into place.

| CAUTION |
| --- |
| **Handle the boundary scan wires carefully. They are fragile and can damage from excessive force or strain.** |

4. Secure the cable in the wirerack.

## Connecting Scan Chain 1 to the Scan Master

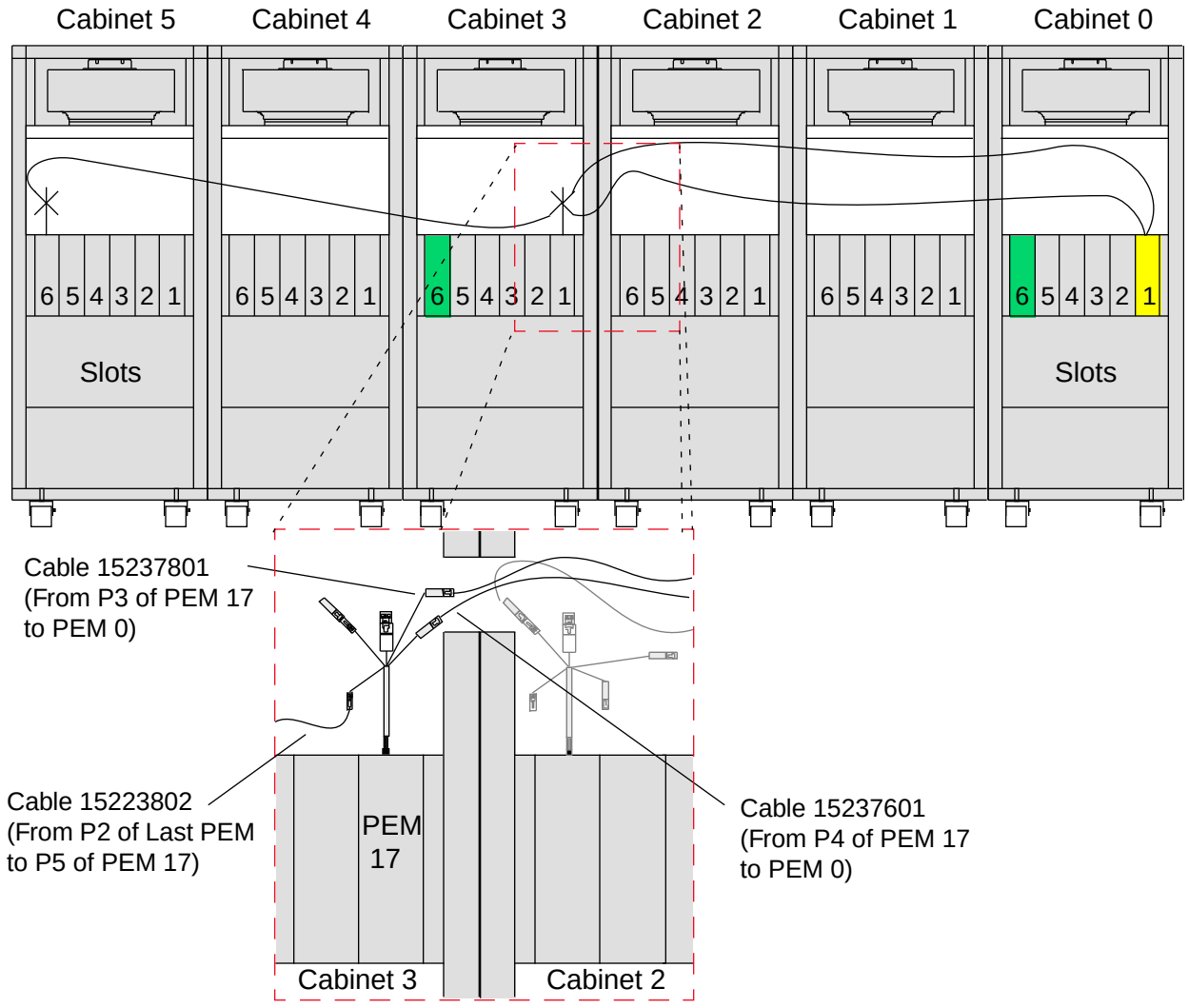
Complete this procedure if your system includes 4 or more CRAY T3E cabinets.

### Background

The PEMs in cabinets 3, 4, and 5 are all on scan chain 1. Scan chain 1 connects to the scan master via 3 cable connections to PEM 17 in slot 1 of cabinet 3.

When your cabinets ship, these connections to PEM 17 are disconnected. Two of the cables remain connected to the scan master; therefore, you must reconnect the cables to PEM 17 to complete the daisy chain. You must connect the other cable between PEM 17 and the last PEM in scan chain 1.

*Figure 62. Boundary Scan Connections to Cabinet 3, Slot 1*



Procedure

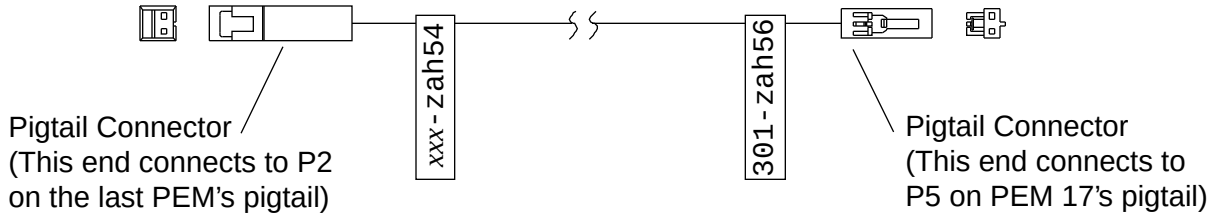
Use the following procedure to connect scan chain 1:

1. Connect the jumper wire between the last PEM in scan chain 1 and the PEM in slot 1 of cabinet 3:

   **NOTE:** In a 4-cabinet system, this jumper wire is connected at both ends during shipment. You do not need to connect it. Simply verify the connections, then go to Step 2.

   a. Locate the jumper wire (P/N 15223802) that links the last PEM in the system to the PEM in slot 1 of cabinet 3 (PEM 17). If it is not connected to P5 (marked yellow) on PEM 17's pigtail, then it is connected to P2 (marked black) on the pigtail of the last PEM in the system. Figure 63 shows the jumper wire.

*Figure 63. Scan Jumper/Intermediate Connection – P/N 15223802*




   b. Route the wire through the intercabinet cable trough(s) between cabinet 3 and the last cabinet in the system.

   c. Connect the wire to the appropriate pigtail connector (either connector P5 on PEM 17's pigtail or connector P2 on the last PEM's pigtail). Push the connectors together until they snap into place.

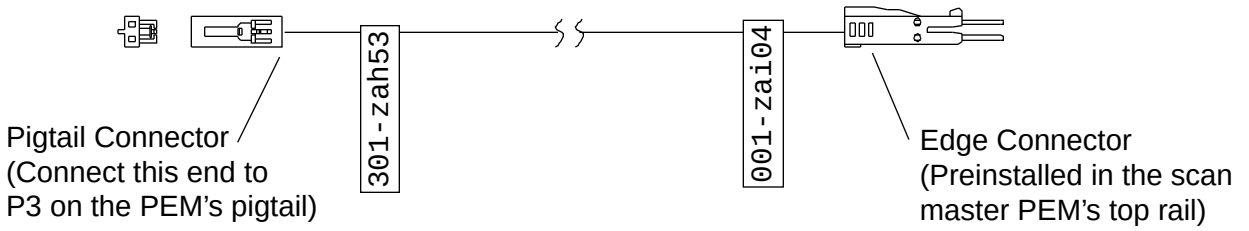
   d. Secure the wire in the wirerack.

2. Connect cable 15237801 between the scan master and the PEM in slot 1 of cabinet 3:

   a. In cabinet 0, locate cable 15237801, which is labelled for connection to the PEM in slot 1 of cabinet 3 (specifically, 301-zah53).

      This cable carries the TDIF[1] > TDIM signal between the scan master and scan chain 1. Figure 64 shows the cable.

*Figure 64. 2-position Pin, Edge-to-Pigtail Cable – P/N 15237801*




   b. Route the cable through the intercabinet cable troughs and into cabinet 3.

   c. Connect the cable to connector P3 (marked white) on the pigtail of the PEM in slot 1 of cabinet 3. Push the connectors together until they snap into place.

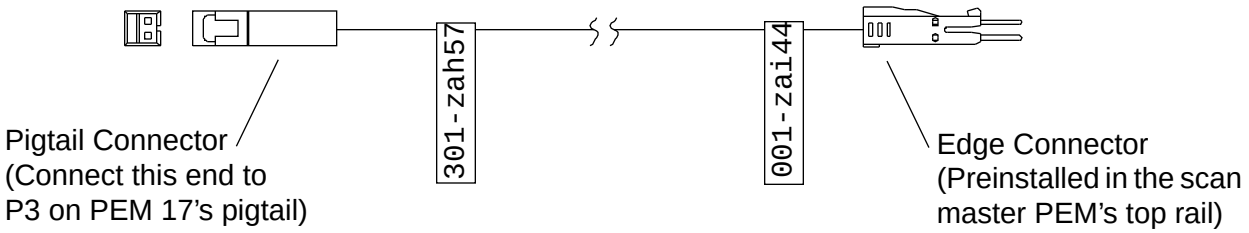
   d. Secure the cable in the wirerack.

3. Connect cable 15237601 between the scan master and the PEM in slot 1 of cabinet 3:

   a. In cabinet 0, locate cable 15237601, which is labelled for connection to the PEM in slot 1 of cabinet 3 (specifically, 301-zah57).

      This cable carries the TDOF[1] < REPEATO signal between the scan master and scan chain 1. Figure 65 shows the cable.

*Figure 65. 2-position Socket, Edge-to-Pigtail Cable – P/N 15237601*




   b. Route the cable through the intercabinet cable trough(s) and into cabinet 3.

   c. Connect the cable to connector P4 (marked green) on the pigtail of the PEM in slot 1 of cabinet 3. Push the connectors together until they snap into place.

   d. Secure the cable in the wirerack.

### Reinstalling the Connectors in the Top Clock Rail

When you complete the clock and boundary scan wiring, reinstall the clock connectors in the rails.

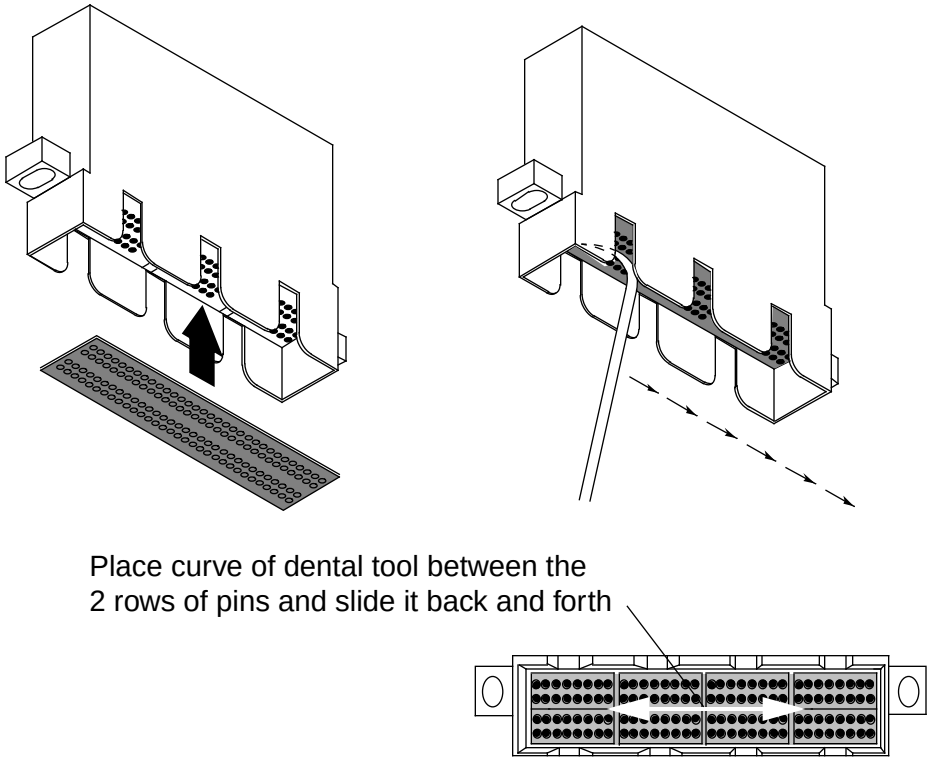
1. Insert plastic pin locks (P/N 01775900) in any connector blocks that do not contain them and ensure that the pins are straight.

   a. Use your fingers to position the pin lock on the connector. Place the rough side toward the pins and the smooth side toward the module.

   b. Use a dental tool to fully insert the pin lock in the connector. Press the curve of the dental tool against the center of the pin lock, between the 2 sets of pins. Then gently slide the dental tool back and forth as you push the pin lock into position. Refer to Figure 66.

   c. Ensure that the pins are straight. (If necessary, use a 0.3-mm mechanical pencil to straighten a misaligned pin. Slip the tip of the pencil over the pin and gently bend the pin into the proper position.)

*Figure 66. Inserting and Seating a Plastic Connector Pin Lock*



2. Install each connector in the top clock rail. Start with the connector that is closest to the power supplies, then work your way to connector zae.

    a. Carefully insert the connector in the rail. Ensure that the connector is properly oriented and that the wires are not tangled with the spring (if installed).

    b. Insert the farthest hex screw (the hex screw that is closer to the power supplies). Do not tighten the screw.

    c. Repeat Step a and Step b for all of the connectors that you removed earlier, then install the last hex screw and brass spacer in connector zae.

    d. Tighten all of the hex screws to 15 in-oz.

3. If you removed them earlier, install the connector springs and center them in relation to the connector blocks.

4. Push each connector toward its spring to ensure that the connector moves laterally, then springs back into position.

5. Insert the foam plugs in the connector slots.

6. Use tie wraps to secure the wires in the wiremat.

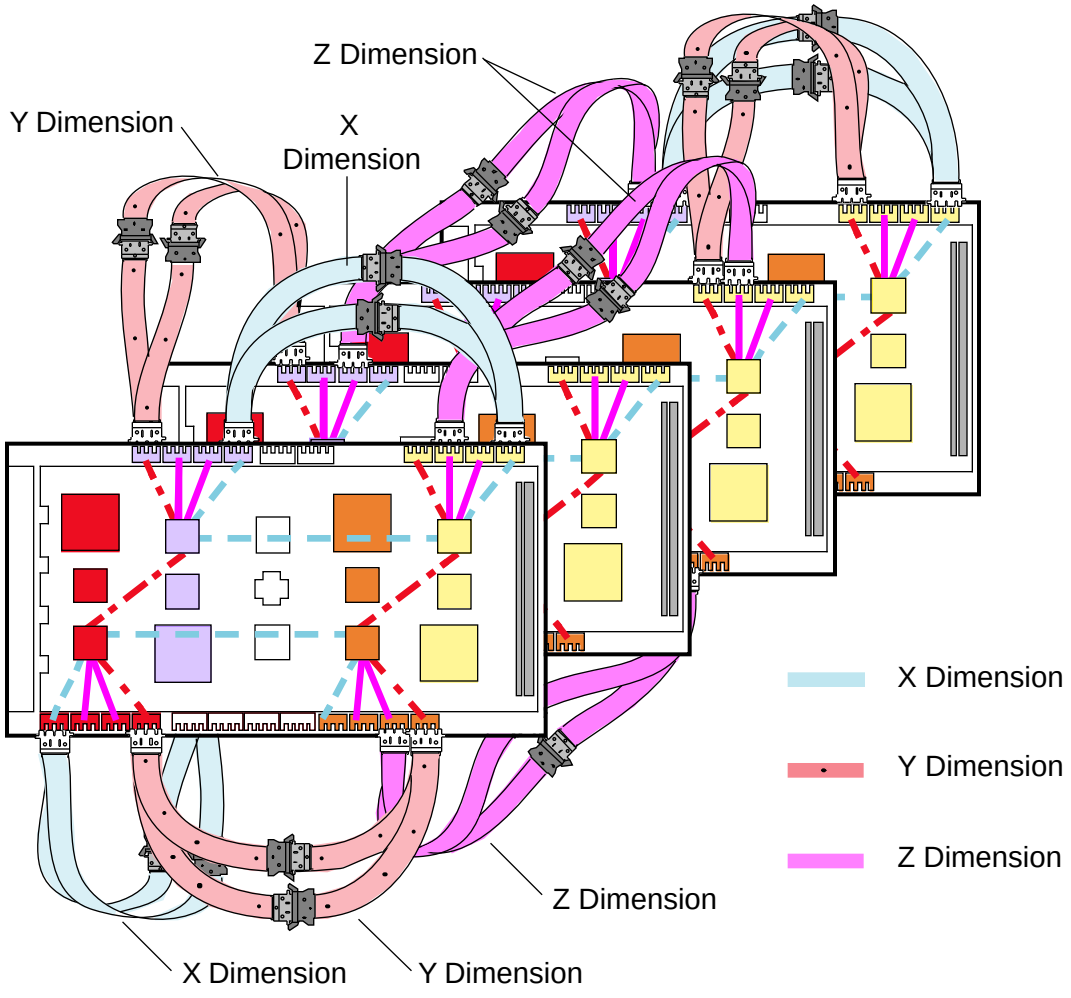
### Completing the Torus Interconnect Network Connections

When you complete the clock and boundary scan connections, you are ready to complete the torus wiring. The torus wire list Engineering Specification (#800502) that you received with your installation materials specifies the required torus connections for your size CRAY T3E AC system.

#### Background

Figure 67 is a simplified illustration of torus connections. It shows how both ribbon cables from one torus cable assembly connect to both ribbon cables from another assembly. The two ribbon cables on a cable assembly always connect to a single cable assembly.

*Figure 67. Example of Torus Connections*

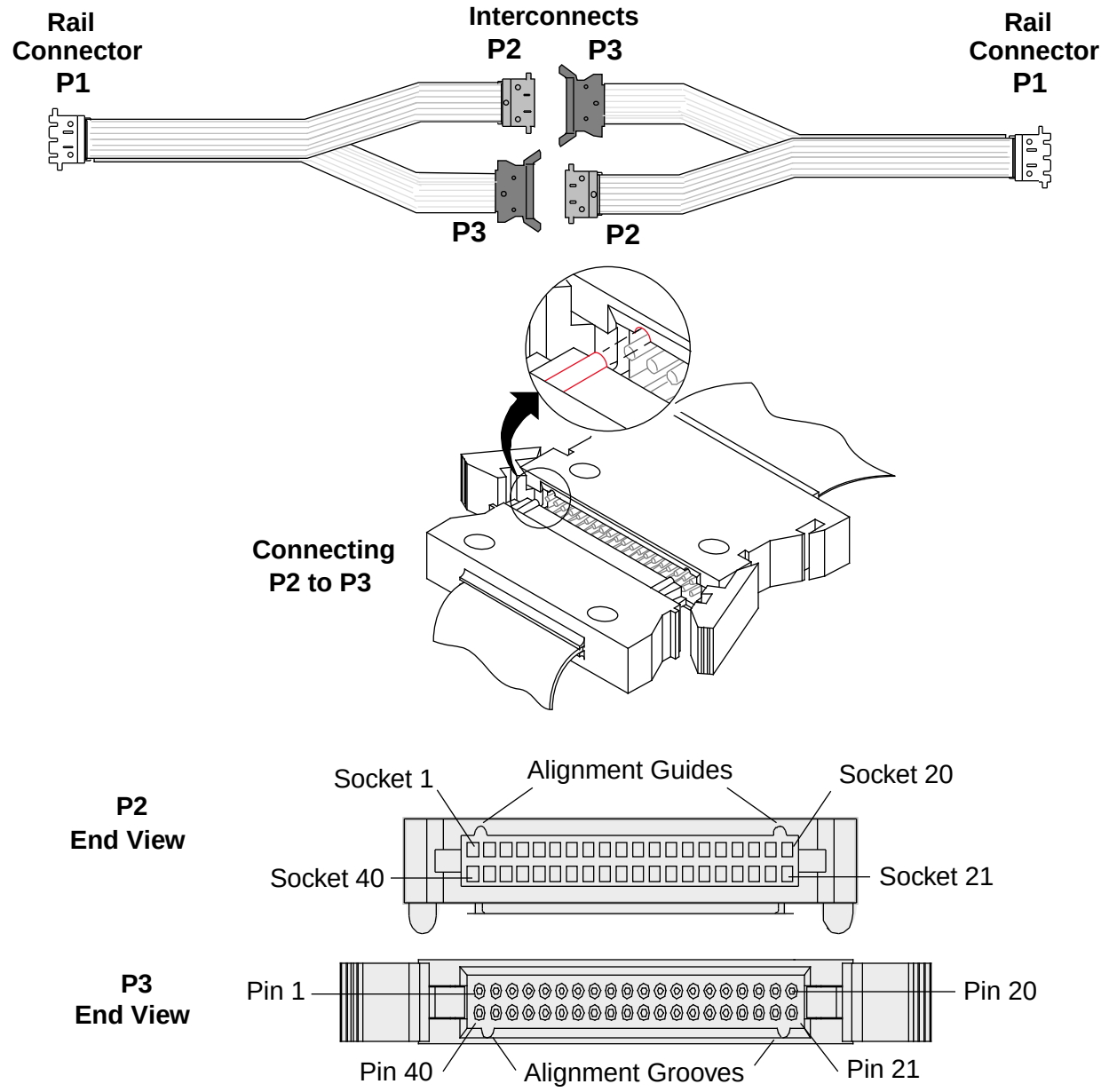



**NOTE:** For clarity, this figure shows fewer than half of the total torus connections and does not show rails.

Two locking levers hold each connector pair together. To connect a torus connection: align the alignment pins with the alignment grooves in the connector pair, then push the two connectors together until the locking levers snap into place, as shown in Figure 68.

**NOTE:** It is possible to connect the torus cables upside down despite the alignment grooves. Study the sides of the connectors to determine the subtle differences that will help you identify the pin/groove side in those cases where you cannot see the pins/grooves easily.

*Figure 68. Connectors P2 and P3 – Torus Cable Assembly*



Procedure

1. Study the torus wire list specification. If the wires that you must connect (those that pass from cabinet to cabinet) are not marked or otherwise identified in the specification, take a moment to mark them.

2. Take a moment to study the torus layout in the cabinet. Try to determine an advantageous method by which you will connect the torus. For example, it may be easier to complete connections near the power supplies before you complete connections that are nearer the module end.

   Likewise, it may be easier to complete connections that span fewer than six slots before you complete connections that span more than six slots.

3. Connect the Y-side torus cables as required to complete the installation. For each connection, complete the following tasks:

   - Locate the cables and remove the tie straps
   - Carefully route the cables from chassis to chassis
   - Ensure that you orient the connectors correctly (alignment pin to alignment groove) and connect the cables
   - Double-check the wire list to ensure that you connect the cables to the correct locations
   - Coil the cables and secure them with a tie strap
   - Check off the connection on the wire list

   **TIP:** Here is a technique to help you pass the ribbon cables between cabinets. Slide the reference card (the rail connector insert that is included with this document) through the cable trough so that it overlaps the cable trough on both ends. Then, straighten out the ribbon cable that you will pass between cabinets. With one hand on the reference card, place the ribbon cable connector on the card and slide the cable into the next cabinet. The reference card will serve as a guide plane to help prevent the cable from coiling inside the cable trough.

4. Connect the Z-side torus cables as required to complete the installation. For each connection, complete the same tasks that you completed for the Y-side torus cables.

5. Remove any unused/cut tie straps from the cabinet.

6. Ensure that you did not disturb any clock, boundary scan, or WACS connections.

## Closing the Cable Ducts

When you complete the wiring, seal the intercabinet cable troughs by “closing” the duct seals.

1. Carefully close the cable ducts between the chassis to restrict air leaks (and to secure the wires and cables). Secure the retaining screws with a #1 Phillips screwdriver.

2. Use tie straps to secure the wires and cables as needed; trim the tie straps as appropriate.

## Installing Modules

1. Install any modules that you removed:

   a. Position the module with the heat sink to your right, the connector blades toward the ground, and the handle toward your chest.

   b. Align the module assembly with the module rails, then insert the module partially into the rails with even pressure.

   c. When the module handle is near the upper mechanical interlock, rotate the interlock until the slot aligns with the power supply handle.

   d. Insert the handle partially into the upper mechanical interlock, then release the upper interlock and rotate the lower interlock until the slot aligns with the module handle.

   e. Fully insert the module, then release the lower interlock. Press firmly to ensure a good connection of module and power supply.

   f. Install the setscrew in the bottom of the module handle and tighten it with a 32-mm hex (allen) wrench until the module is secured to the rail.

      The setscrew helps ensure that the modules are installed to a uniform depth in the card cage (module box), and it protects the module and module connectors against damage related to movement.

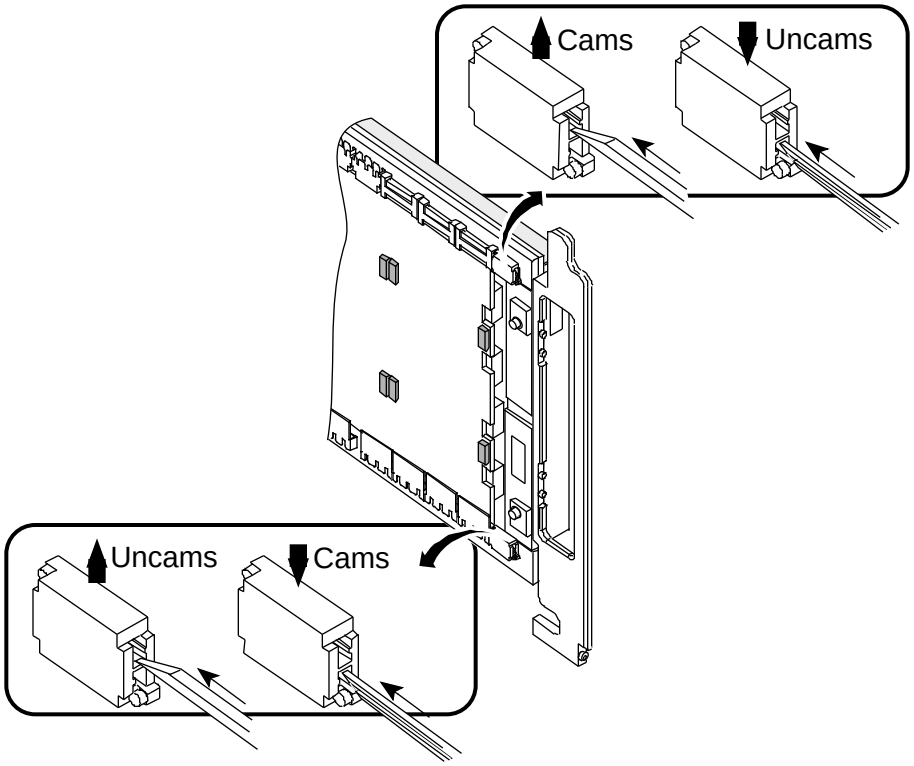
2. Cam the modules that you installed in Step 1. Refer to Figure 69.

   If you feel resistance, remove the cam, remove the module, and check the rail connectors and pins. Then check the shuttle connectors on the module. Correct any problems, then install the module again. Ensure that

it is fully seated, then try to cam it.

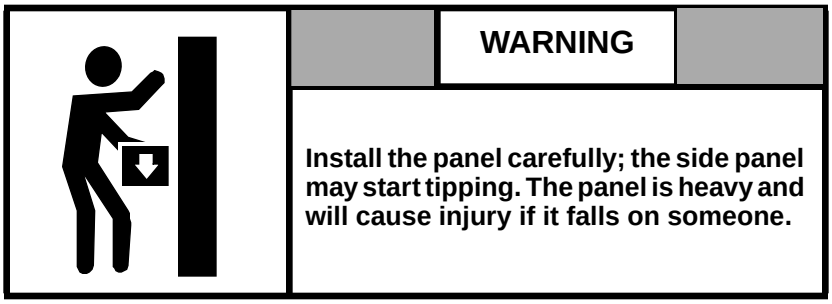
3. Insert plastic shuttle locks in the modules, if applicable.

*Figure 69. Module Camming*



## Installing Side Access Panels and Trim

If applicable, install side access panels and system side trim using the following procedure:




1. If you removed any side access panels from the end cabinets, install them with a #2 Phillips screwdriver.

2. Collect the bolts, washers, and 10-mm socket wrench required for side-trim installation, and position them so that you can access them when you need them.

3. With a partner, position a side panel next to the cabinet. Ensure that it is oriented correctly.

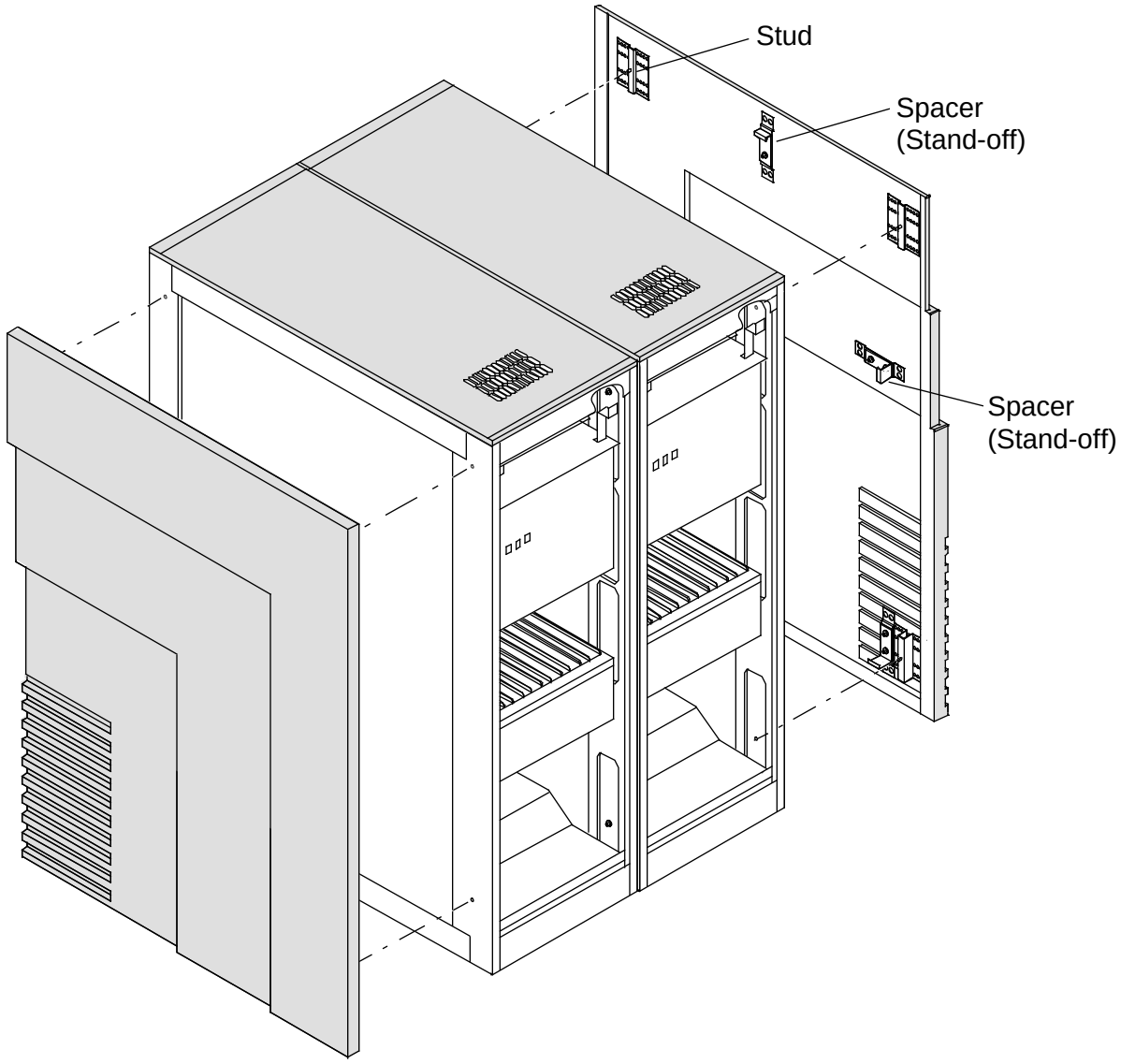
   For either panel, position the panel so that the louvered section is at the bottom left side of the panel, as shown in Figure 70. Note that on the left side of the system, you must position the louvered section toward the module end of the system; and on the right side of the system, you must position the louvered section toward the power-supply end of the system.

4. With a partner, carefully position the retaining studs in line with the corresponding holes in the frame. Refer to Figure 70.

5. Push the studs through the holes until the panel contacts the frame.

6. While your partner holds the panel in position, replace the washers and nuts on the retaining studs. Secure the nuts with a wrench and the 10-mm socket.

*Figure 70. Installing the Side Panels*

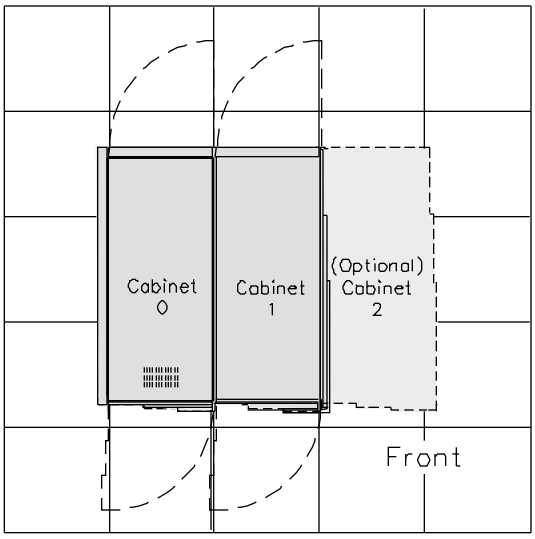


## Positioning Cabinets (for Prejoined Cabinets)

If your cabinets did not require any joining. use the following procedure to position and level the cabinets. **Complete this procedure only if you did not join any cabinets.**

1. Position the cabinets in the computer room as designated in the site floor plans.

*Figure 71. CRAY T3E AC Cabinet Layout*



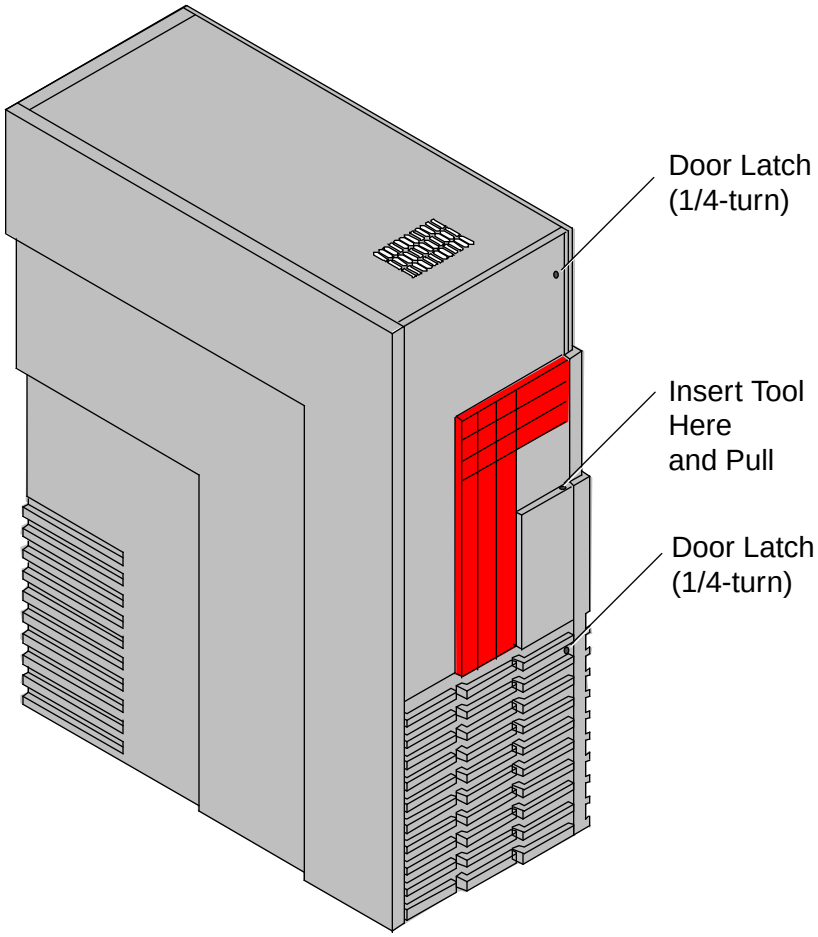

**NOTE**: The grids represent 24 in. X 24 in. (61 cm X 61 cm) floor tiles.

2. Open the front door of each cabinet:

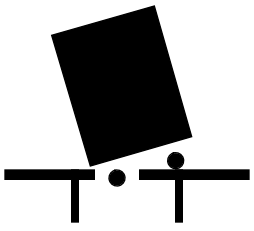
   a. The door has two latches: top and bottom. For each latch, insert a 4-mm ball-end hex (Allen) wrench into the latch and turn the latch counterclockwise 1/4 turn.

   b. Grasp the door and swing it open. (The door contains a hole that aids in opening. You may insert a tool, such as a #2 Phillips screwdriver, in the hole to improve grip and serve as a door handle. Refer to Figure 72. **NOTE:** Be careful not to press the tool against the fiberglass trim. The fiberglass cracks and chips easily.)

*Figure 72. Door Latches and Handle (Front Door)*



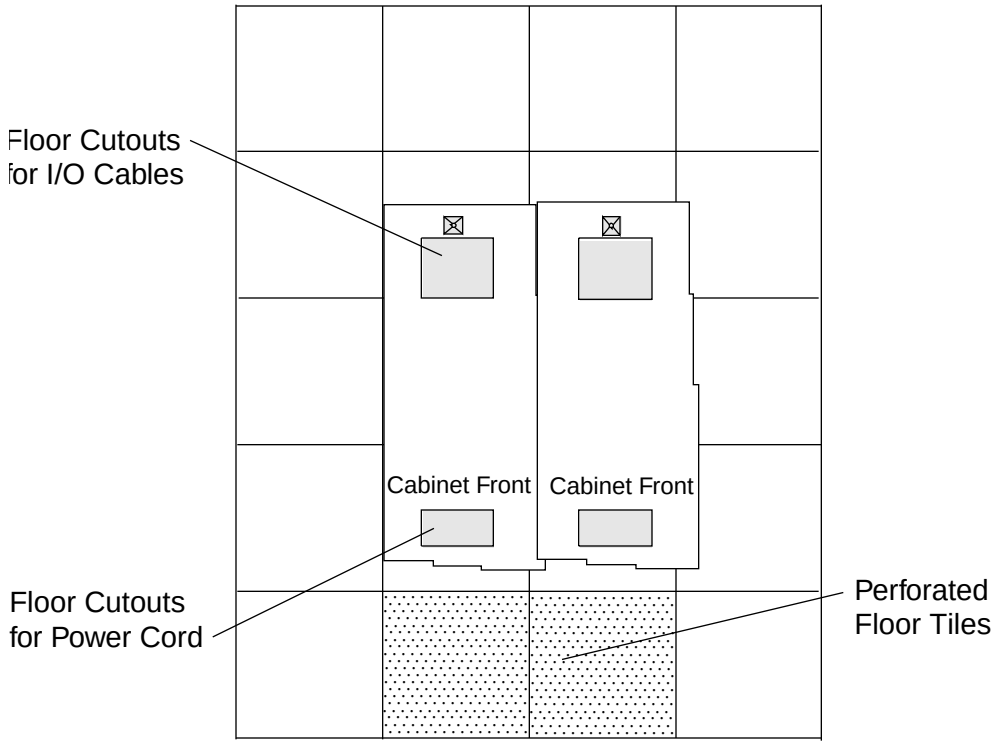

3. For each cabinet, lower the cabinet power cord through the bottom of the cabinet, through the appropriate floor cutout, and into the underfloor area. If needed, move the cabinets to provide access to the floor cutout. If the computer area does not have a raised floor, position the power cords under the cabinets.



**CAUTION**

**Ensure that cabinet casters (wheels) do not fall into floor cutouts. Failure to do so could result in damage to the computer equipment and injury to personnel.**

*Figure 73. Cabinet Floor Plan*




4. If necessary, position the cabinets in the final location as indicated on your site plan.

5. Use an adjustable wrench to lower the cabinet levelers (legs). Adjust the levelers so that the cabinets are level and cannot be rolled out of place. Use the bottom of the cabinet frames for leveling purposes.

## Grounding the Mainframe Chassis (for Prejoined Cabinets)

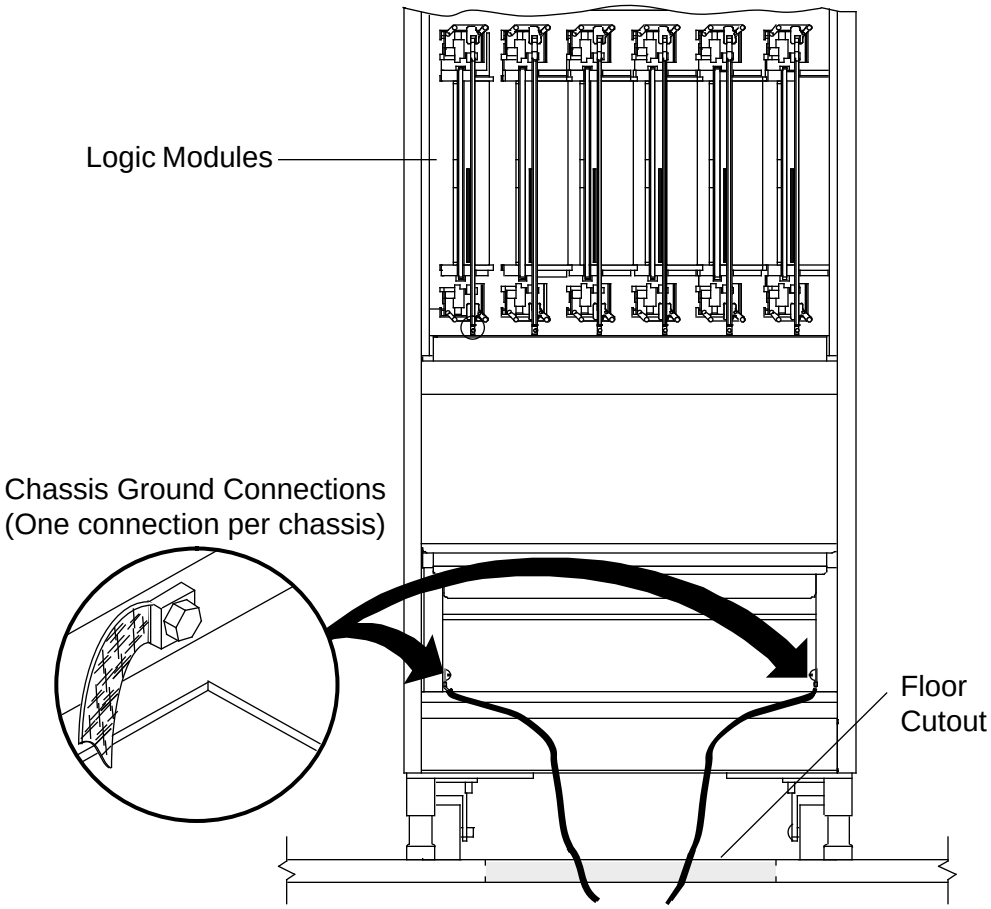
If you did not ground each mainframe chassis earlier, use the following procedure to ground them now. **Complete this procedure if you did not join any cabinets.**

**NOTE:** Each chassis is grounded through the power cord; however, Cray Research recommends that you connect an additional chassis ground to each chassis. If your site chooses not to connect an additional ground for a chassis, you must remove the ground strap, which could act as an antenna.

1. Locate the grounding strap (near the I/O bulkhead), and uncoil the grounding strap. Figure 74 shows two possible locations for the chassis ground connections; your cabinet will have a single ground strap.

2. Ground the mainframe. For example, connect the ground strap to the floor grid via a ground clamp.

*Figure 74. Chassis Ground Connections (Rear View of Cabinet)*



## Installing the Cabinet Side Panels (for Prejoined Cabinets)

Use the following procedure to install each of the two side panels, one on each end of the system. **Complete this procedure if you did not join any cabinets.**

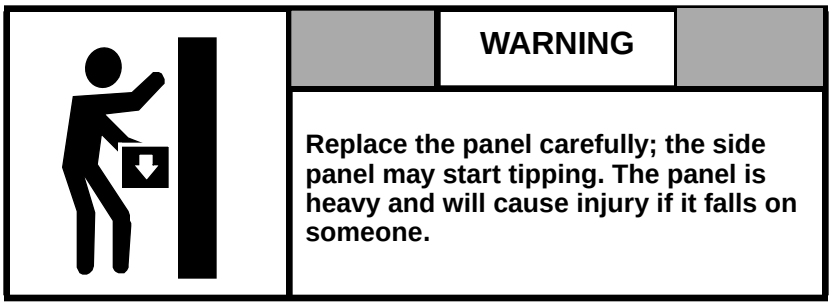
1. Collect the bolts, washers, and 10-mm socket wrench required for side-trim installation, and position them so that you can access them when you need them.

2. With a partner, position a side panel next to the cabinet. Ensure that it is oriented correctly.

   For either panel, position the panel so that the louvered section is at the bottom left side of the panel, as shown in Figure 75. Note that on the right side of the system, you must position the louvered section toward the module end of the system; and on the left side of the system, you must position the louvered section toward the power-supply end of the system.

3. With a partner, carefully position the retaining studs in line with the corresponding holes in the frame. Refer to Figure 75.

4. Push the studs through the holes until the panel contacts the frame.



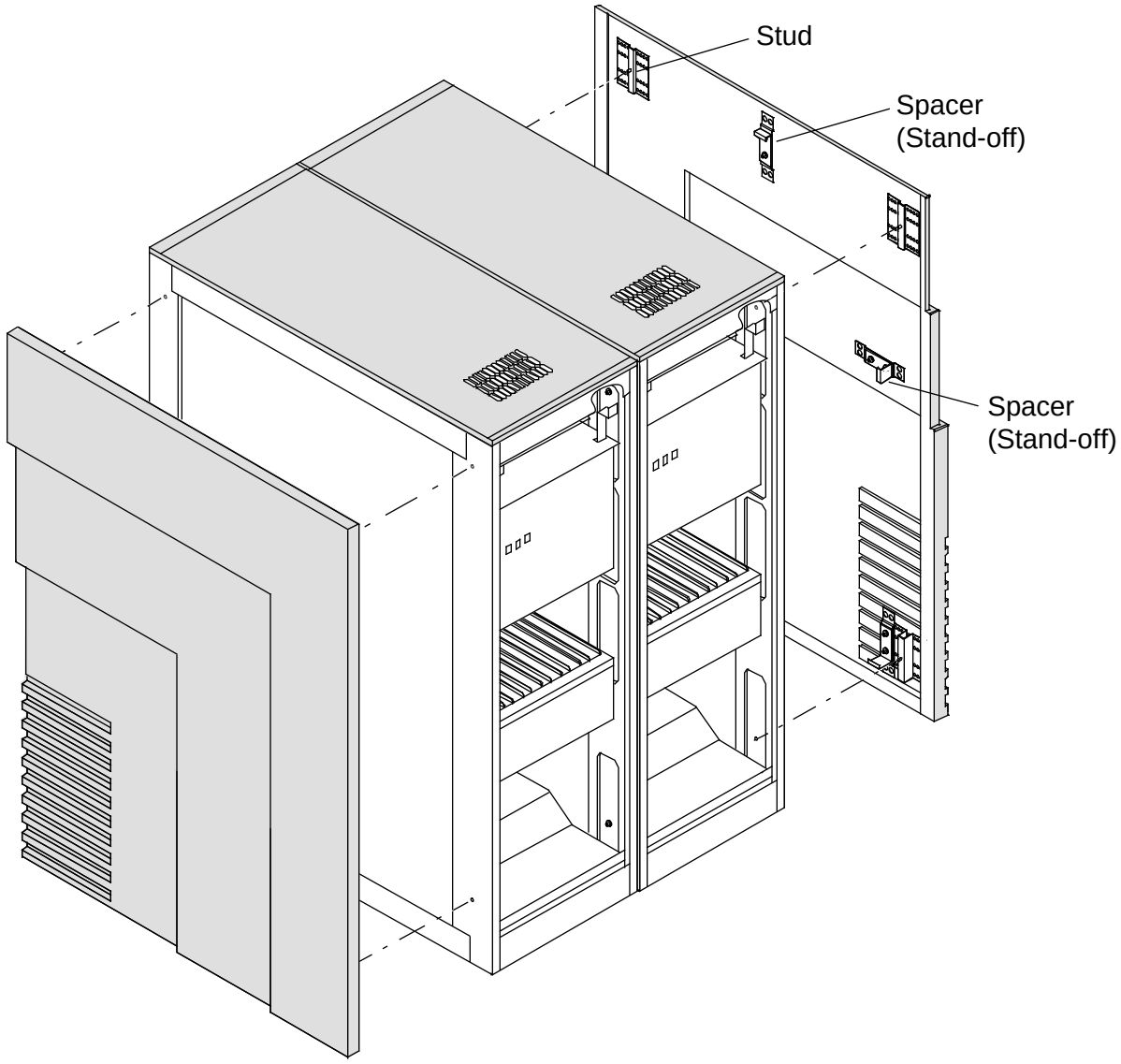

5. While your partner holds the panel in position, replace the washers and nuts on the retaining studs. Secure the nuts with the 10-mm socket.

6. Reconnect the Cabinet Power switch (SW2) on cabinet 0 if necessary.

7. Replace the wire-duct covers.

8. Replace the blower exhaust shield and connect the clock switches.

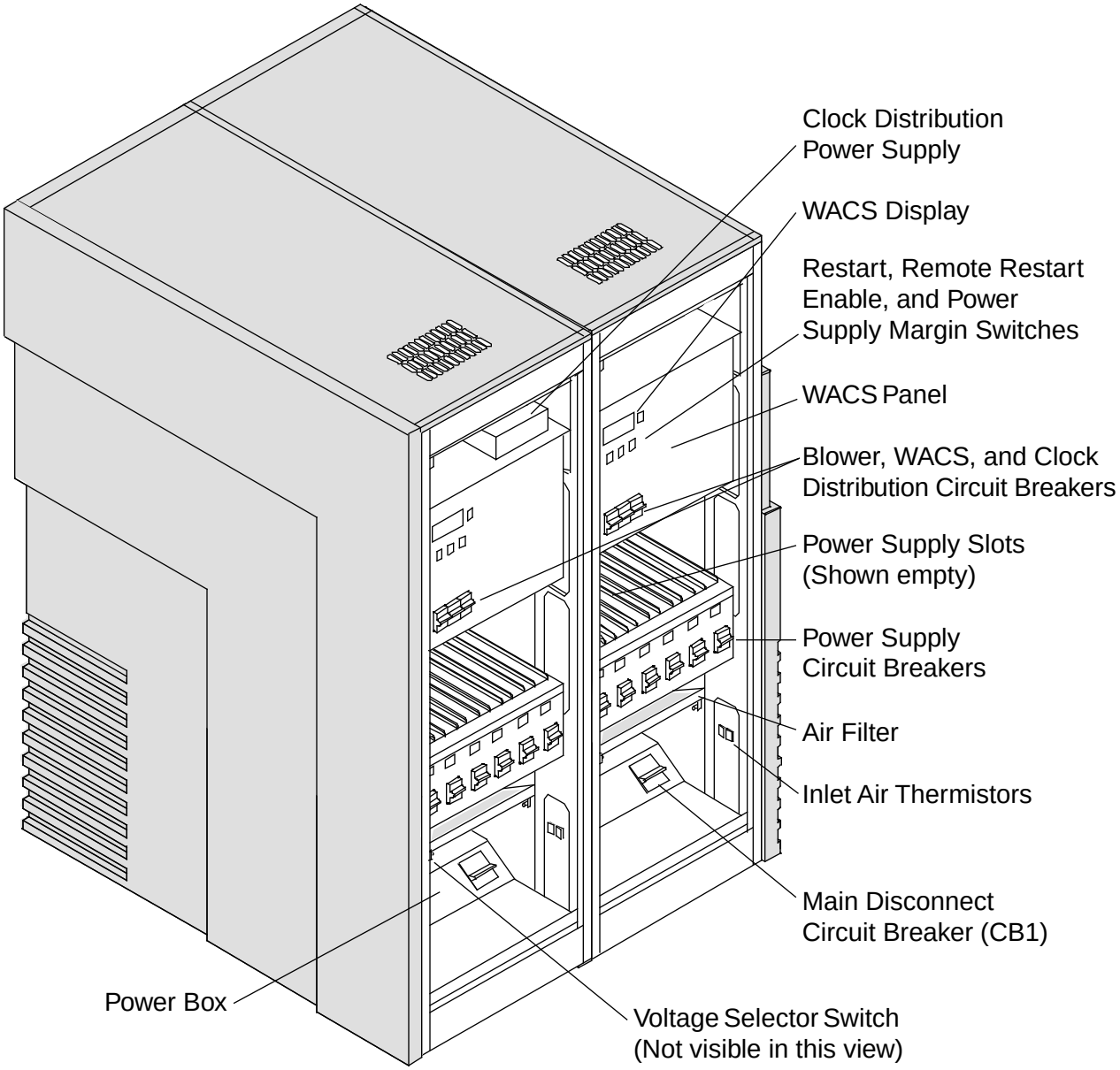
*Figure 75. Installing Side Panels*



## Verifying the CRAY T3E AC Hardware

This section contains procedures that you must complete to ensure that the condition of cabinet components is suitable for power-up. **You must complete these procedures for every CRAY T3E AC cabinet in the system.** Refer to Figure 76, which shows several of the cabinet components, as you work.

*Figure 76. CRAY T3E Cabinet Components -- Front View*

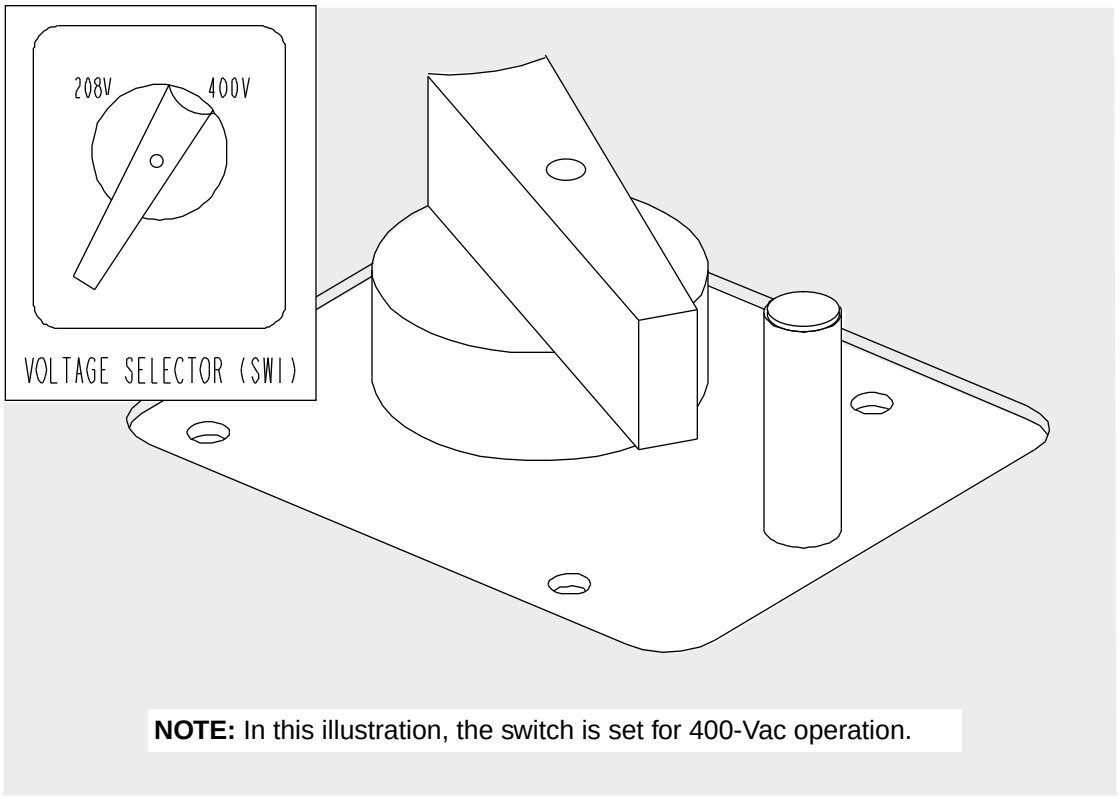


## Verifying the Voltage Selector Switch

1. Locate the Voltage Selector switch (SW1), which is on the top of the power box at the front of the cabinet.

2. Ensure that the voltage selector switch is set for the proper customer-site voltage. Figure 77 shows the switch (set for 400-Vac operation).

*Figure 77. Voltage Selector Switch (SW1)*

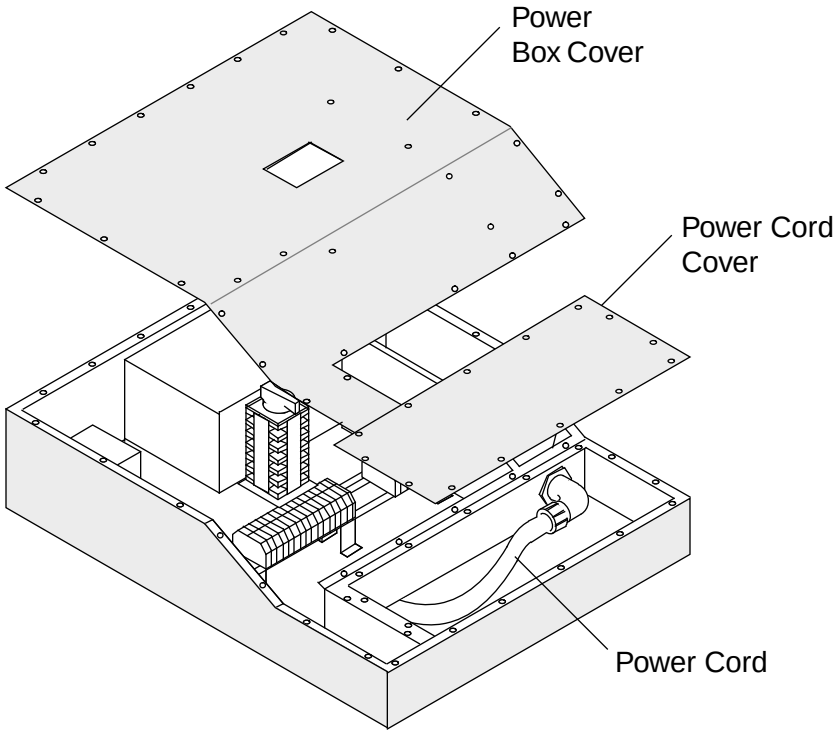



**NOTE:** In this illustration, the switch is set for 400-Vac operation.

3. If the customer *does not* plan to connect an optional alarm to the CRAY T3E AC cabinet, install the power cord cover now. (The cover is not preinstalled. Instead, it is wedged between the left side of the power box and the side of the cabinet. The screws are in a plastic bag that is taped to the power box cover.) Figure 78 shows the power cord cover.

   If the customer does plan to connect the alarm, complete the following procedure.

*Figure 78. Power-cord Cover and Power-box Cover (Removed)*




## Connecting the Optional Customer Alarm

If the CRAY T3E cabinet will connect to the customer's alarm system, use the following procedure to connect it now.

1. Remove the air filter, which will provide greater access to the power box and remote alarm contacts:

   a. Use a medium flatblade screwdriver to loosen the retaining screw on the front end of one filter bracket. Refer to Figure 79.

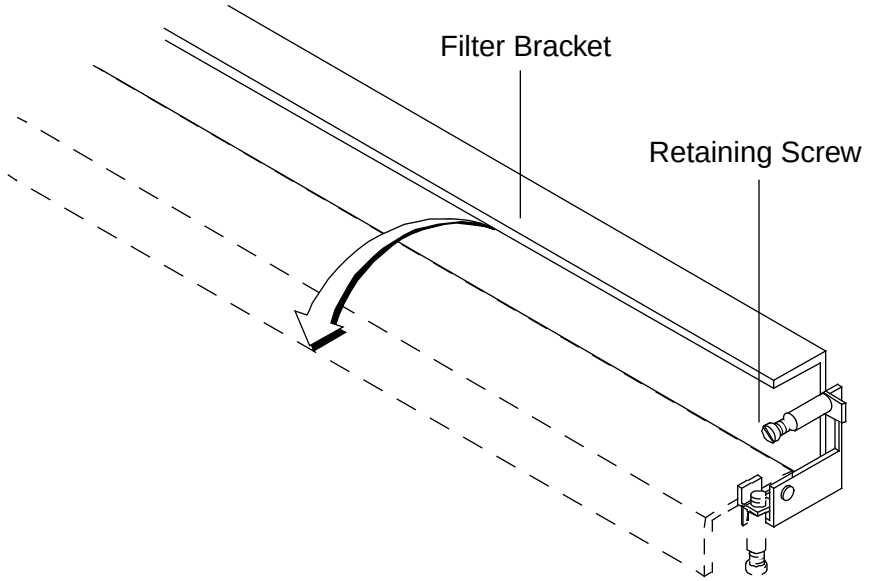
   b. Rotate the filter bracket 90˚ toward the center of the cabinet, as shown in Figure 79.

   c. Repeat Step a and Step b for the other bracket.

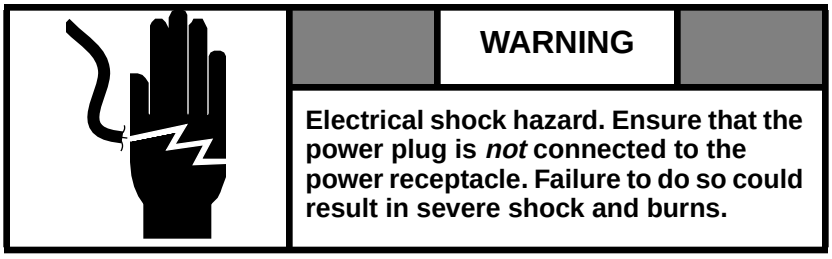
      With the brackets in the new position, the filter should drop down approximately 1.5 inches (4 cm).

   d. Ensure that the cabinet door is fully open, then pull the filter out of the cabinet. Set the filter in a clean, protected location.

*Figure 79. Filter Bracket*




2. Remove the cover from the power box:




   a. Use a #2 Phillips screwdriver to remove the 33 screws that hold the cover in place. Figure 78 shows the power box cover removed.

   b. Pull the cover straight up, then angle it as you remove it from the cabinet. Be careful not to damage the inlet air thermistors or the EMI gasket on the bottom of the cover.

3. Remove the knock-out plug that is near the remote alarm contacts terminal block (TB2).

4. Pass the customer's alarm wires through the knock-out hole. (If a clamp is provided, use it to secure the wires as they pass through the hole.)

5. Connect the customer's alarm wires to the terminal blocks, using a medium flatblade screwdriver. Figure 80 shows TB2, and Table 2 contains descriptions of the terminal blocks.

*Figure 80. Remote Alarm Contacts - Locations*

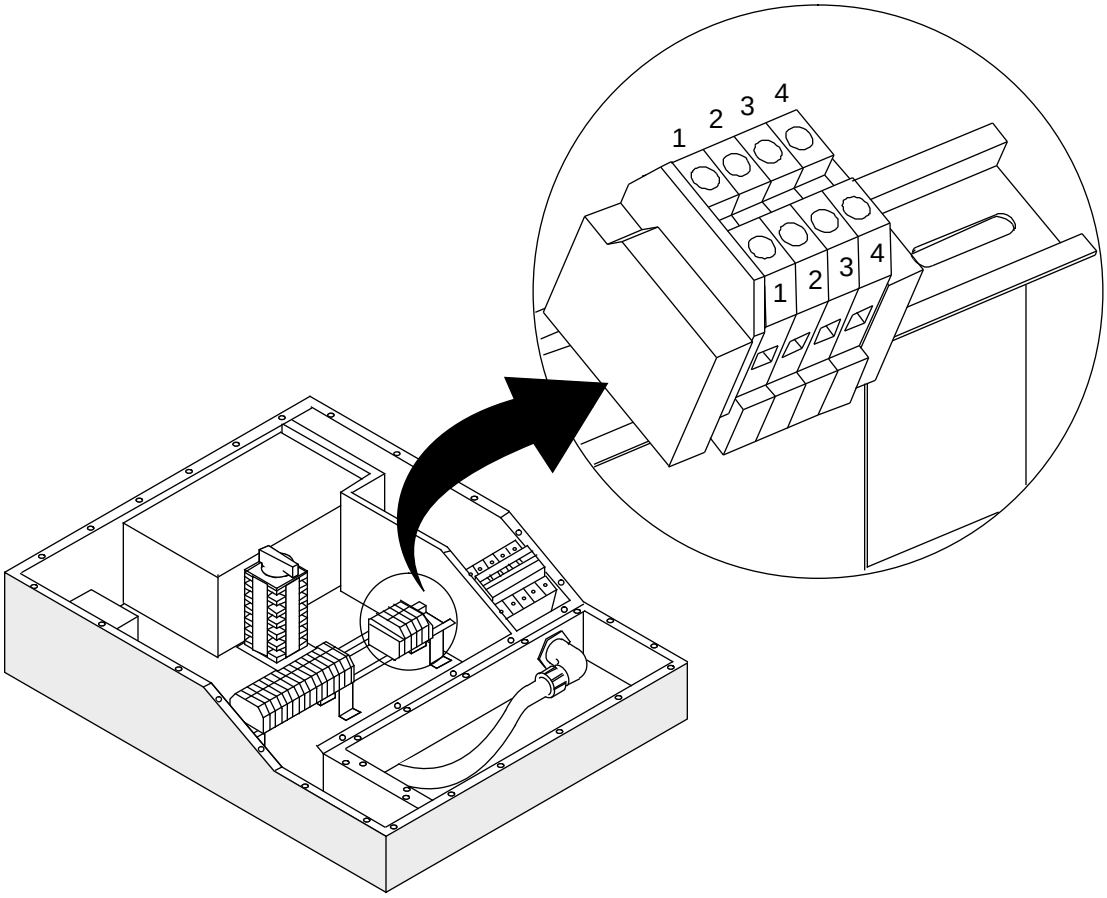



*Table 2. Remote Alarm Contacts - Descriptions*

| Contact | Description |
|---|---|
| TB2-1 | NC (normally closed) |
| TB2-2 | Remote alarm common |
| TB2-3 | NO (normally open) |
| TB2-4 | Shield (ground) |

6. Ensure that the opposite ends of the alarm wires are connected to the customer’s alarm system.

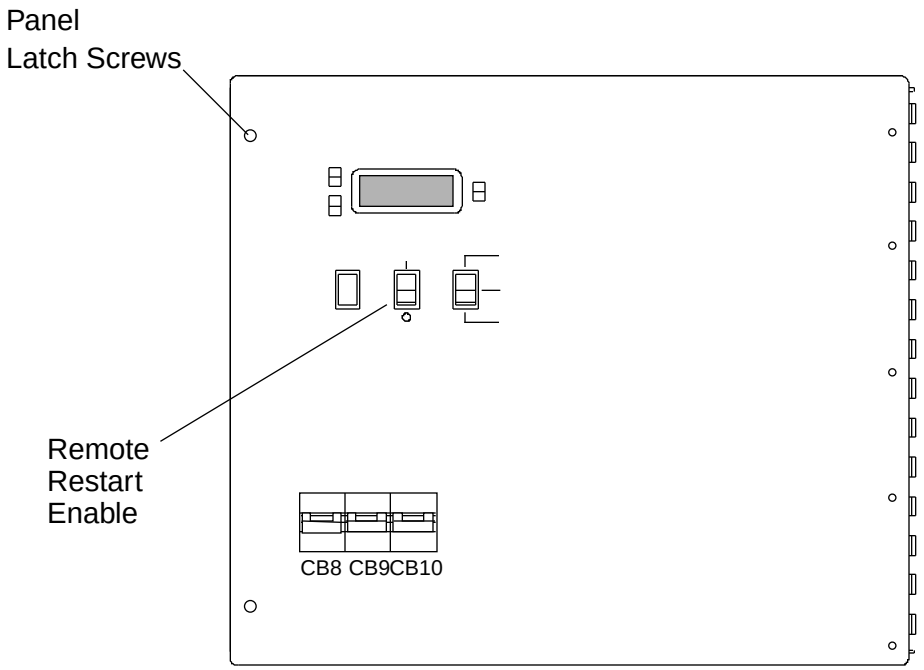
7. Replace the power box cover and power cord cover. Tighten the screws.

8. Replace the air filter and install it in the operating position. If necessary, use tie straps to prevent the logic and GigaRing cables from touching the filter.

## Verifying the Control System Hardware

1. Open the warning and control system (WACS) panel, which is shown in Figure 81. Use a medium flatblade screwdriver to turn the 2 panel-latch screws *clockwise*, which loosens them. Then rotate the latches clockwise by hand and open the panel.

*Figure 81. WACS Front Panel*




2. Visually inspect the WACS scanner boards for any defects and ensure that the connections are complete.

3. Verify on the *bottom* WACS scanner (labelled *Scanner A* or *Backup Scanner*) that DIP switch position 1 is On (pushed in), and set the other WACS DIP switches as needed for your site.

   DIP switches on scanner A determine the remote alarm functions, the display temperature scale (celsius or Fahrenheit) and whether the WACS displays the auxiliary (clock) voltages. Figure 82 shows the switch locations. Table 3 lists the switch functions.

*Figure 82. WACS with Front Panel Open*

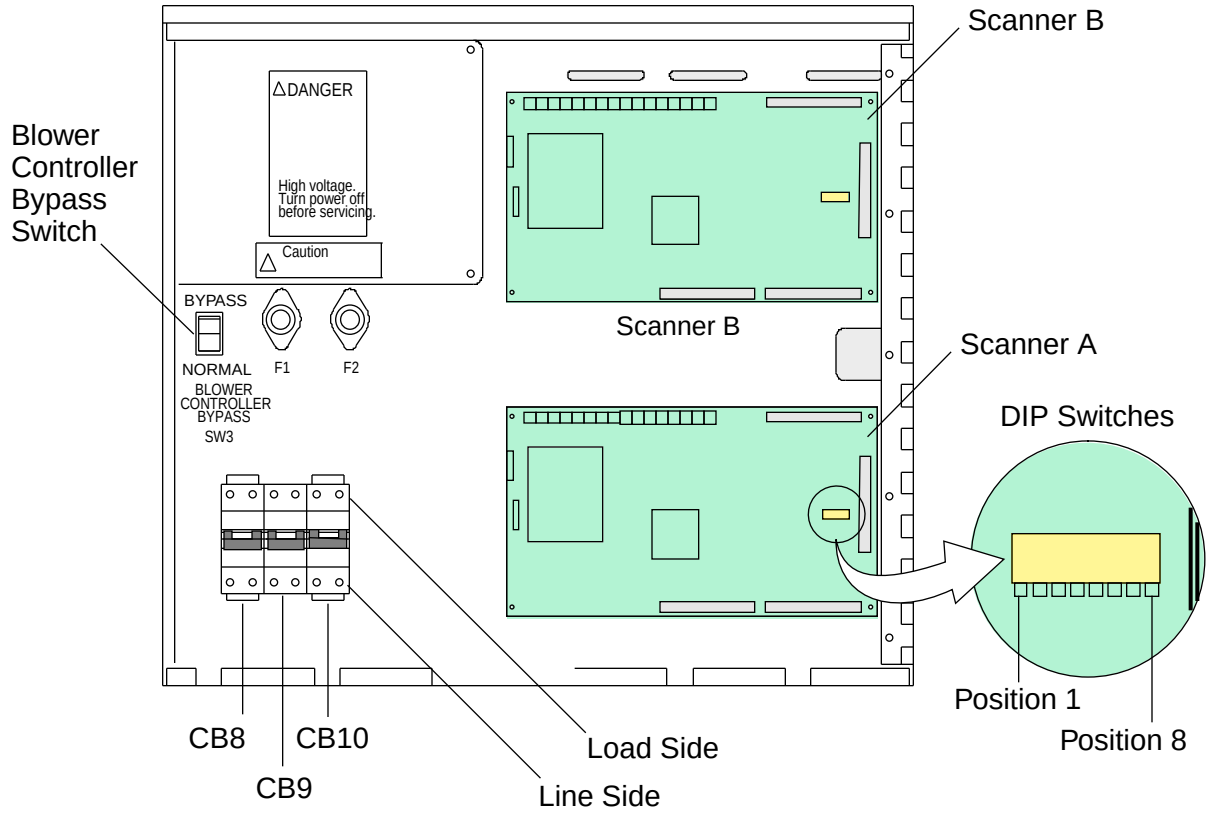



*Table 3. Bottom Scanner DIP Switch Functions*

| Positions | "On" (Pushed In) Function |
|---|---|
| 1 | Display auxiliary (clock) voltages |
| 2 through 4 | Not used |
| 5 | Remote alarm energized (picked) if good – dropped if input power is lost (Determines whether a 1 equals "Good" or "Bad." Normally set to "Off.") |
| 6 | Remote alarm enabled on warning and fault (off = alarm on fault only) |
| 7 | Remote alarm enabled if cabinet is powered off |
| 8 | WACS display temperature scale in Celsius (off = Fahrenheit) |

4. Ensure that the Blower Controller Bypass switch (refer again to Figure 82) is in the Off (0) position.

5. Close the WACS panel and latch it.

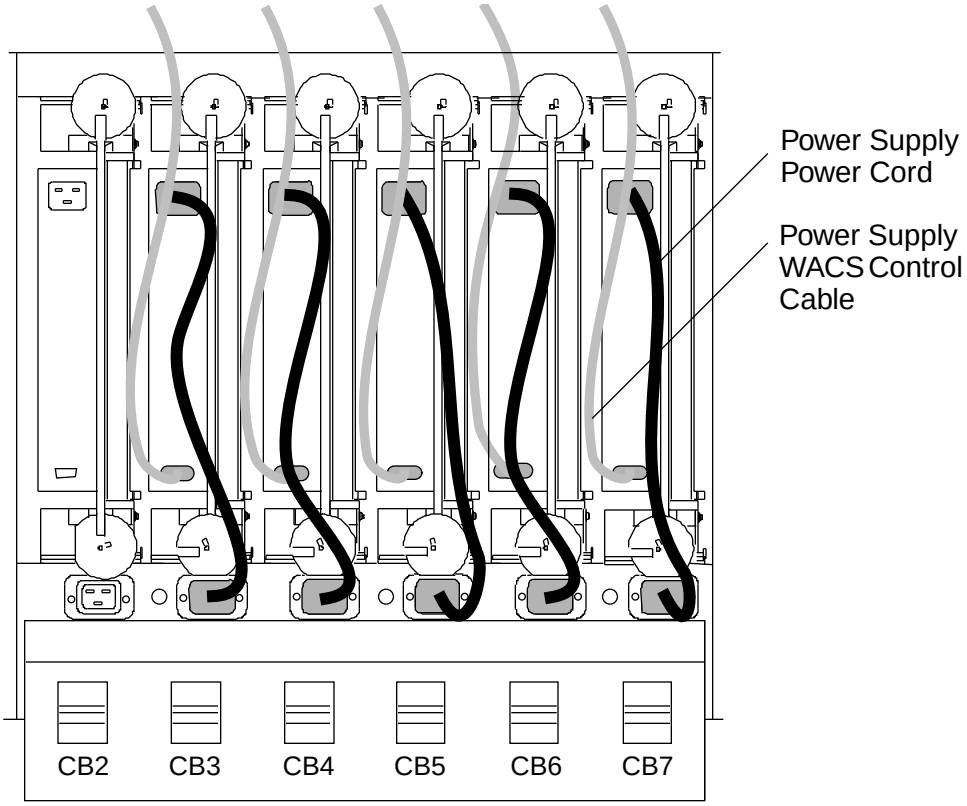
## Verifying Additional Power Hardware

1. Ensure that all of the power supply cords and power supply control cables are properly seated. Refer to Figure 83.

2. Ensure that the Remote Restart Enable switch is in the disabled (0) position.

3. Ensure that the Cabinet Power switch is in the on (1) position. The Cabinet Power switch (SW2) is on the front cabinet door.

*Figure 83. Power Supply Rack*

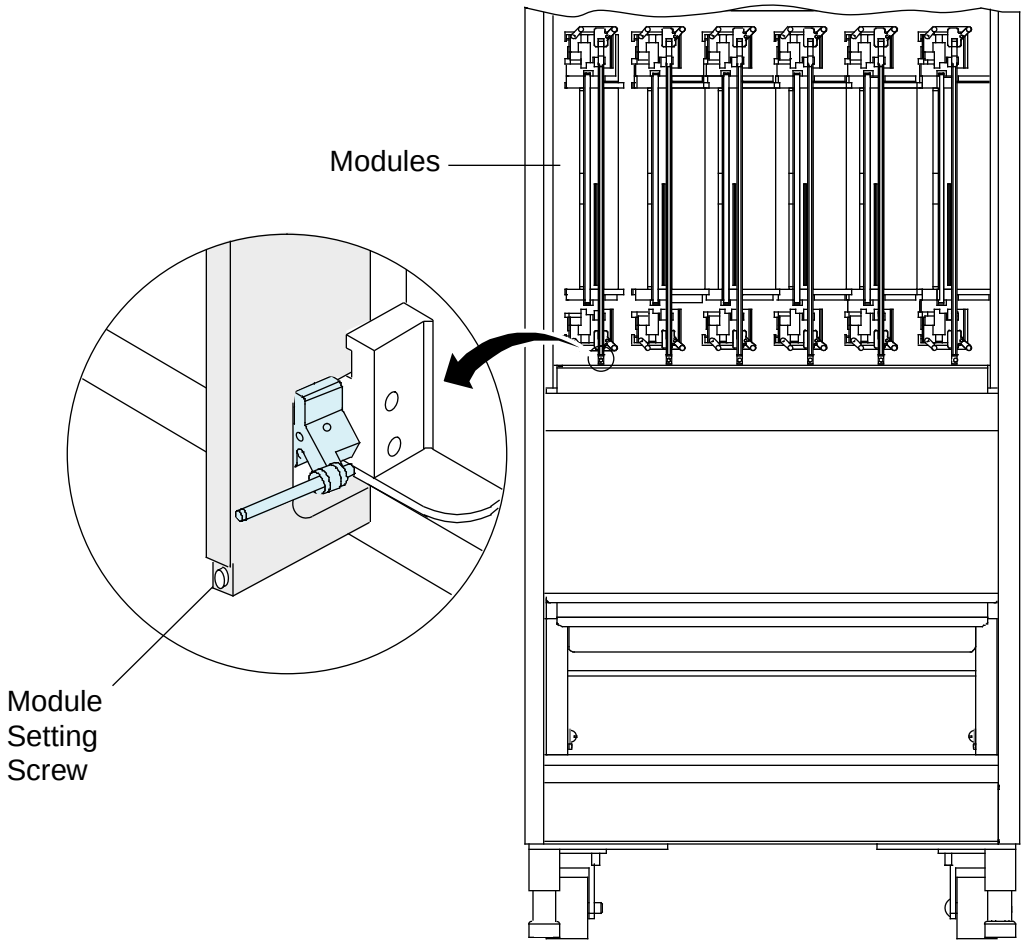


## Verifying that the Modules Are Seated and Cammed

1. On the module end of the chassis, use a #2 Phillips screwdriver to remove the module panel. Eight 1/4-turn screws secure the panel. Pull the panel out at an angle.

2. Visually inspect the module area for damage or debris. Ensure that the module setscrews are tight. Refer to Figure 84 for the location of the module setscrews, which require a 3-mm hex (allen) wrench.

*Figure 84. Module Setscrew Locations (Rear View of Cabinet)*




3. Visually inspect the modules to ensure that they are cammed and contain plastic cams. If the modules do not contain plastic cams, recam them to ensure that the connections are good. Refer again to Figure 37, if needed.

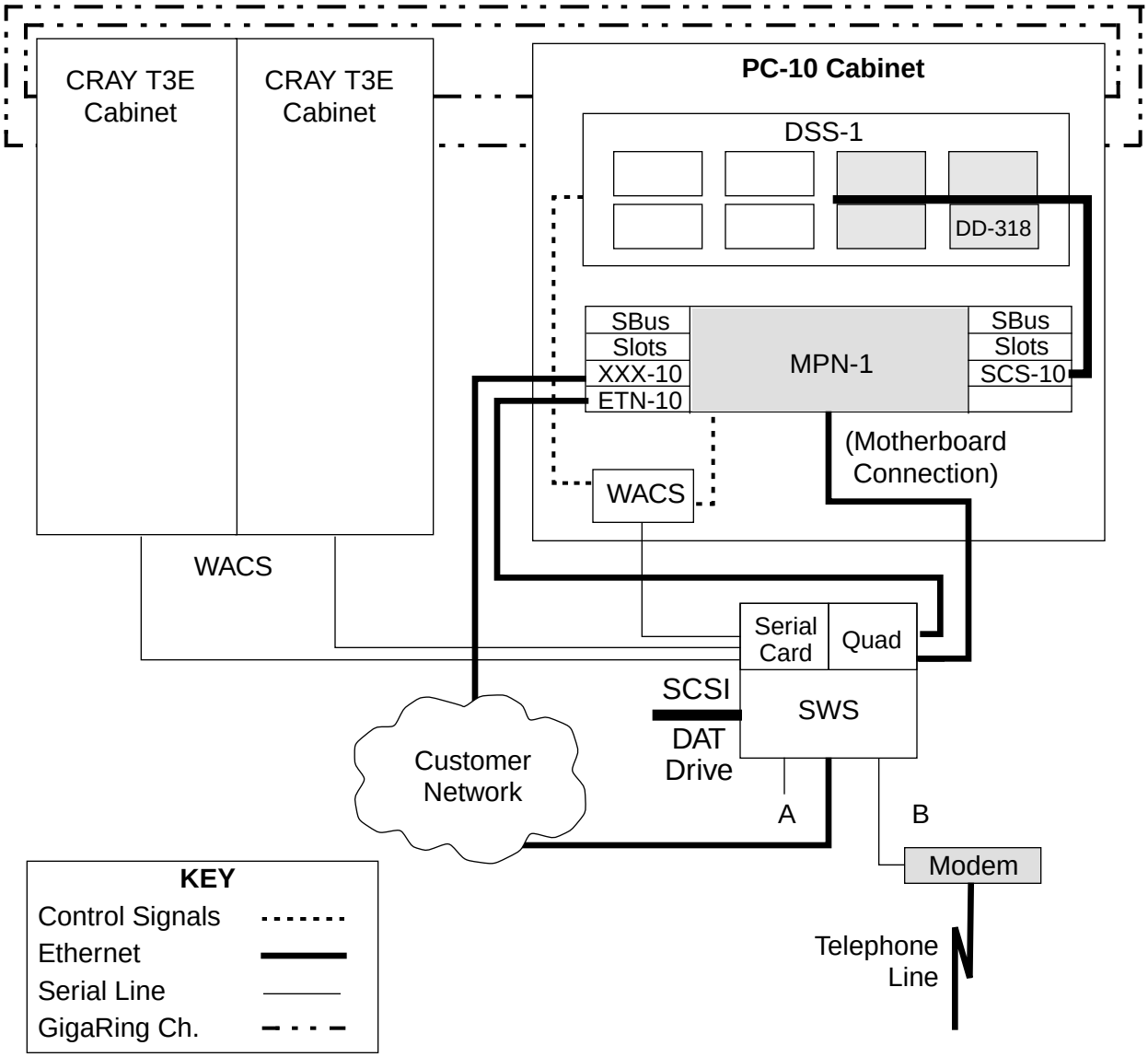
   **NOTE:** The plastic cams help keep the shuttles in place during shipment and operation. The plastic cams should be in the *outside* cam slots.

## Completing the System Cabling

Before you connect external cables to the CRAY T3E cabinet, become familiar with the layout of your system by reading the configuration and cabling documents that ship with your system, as well as other installation documents that apply to your system. System cabling is variable, and the cabling plan for your system may require modification of the following cabling procedures.

Figure 85 is a block diagram of a typical CRAY T3E system (the GigaRing channels are simplified).

*Figure 85. Typical System - Block Diagram*



## Cable Labels

Cable connections depend upon the customer's system configuration. Ensure that each cable is labeled at both ends with the source and destination connection.

For connections to the PC-10, the cable labels refer to the position of the PC-10 subrack where the cable connects. The position is designated in standard units (SUs). If applicable, the cable labels also refer to the NSR-1 module slot where the cable connects. The position is designated from left to right as N1, N2, N3, or N4.

Refer to Table 4 for a description of PC-10 cable labels and to Table 5 for an example.

*Table 4. Cable Labels*

| Cable Label Line | Description |
|---|---|
| 1 | States the mainframe serial number; the peripheral cabinet serial number; or the type of attached device. |
| 2 | States the lowest standard unit (SU) that the subrack occupies; states both the lowest SU that the subrack occupies and the node slot; or states the product name of the attached device. |
| 3 | States the port name for the cable connection. |

*Table 5. Example Cable Label*

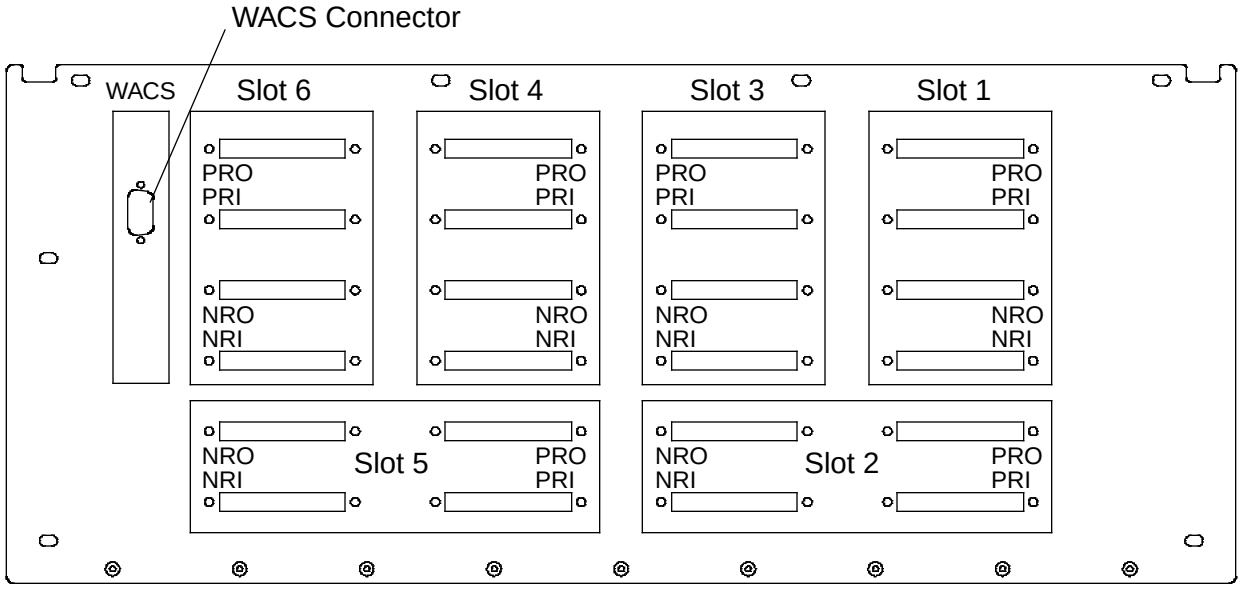
| Connection | Source | Destination |
|---|---|---|
| SPN to Mainframe | S/N 8008 IPN-1<br>SU20/N3/GigaRing<br>NEG IN | S/N 6502 T3E<br>SLOT #2/GigaRing<br>NEG OUT |

## Connecting the WACS

Use the following procedure to connect the CRAY T3E AC WACS serial-port cable to each cabinet:

1. Locate the WACS serial-port cable (P/N 13303300).
2. Refer to the cable labels and to the system configuration documentation for details on the WACS cabling configuration.
3. Route the serial-port cable between the CRAY T3E cabinet and the SWS (or the serial-port concentrator). The 9-pin connector connects to the CRAY T3E cabinet, and the RJ45 connector connects to the SWS. If applicable to the site environment, route the cable beneath the floor tiles.
4. Connect the serial-port cable's 9-pin connector to the DSub (DB9) WACS connector on the CRAY T3E cabinet. The connector is on the I/O bulkhead on the rear (module side) of the cabinet. Refer to Figure 86. Use a small flatblade screwdriver to secure the connector to the bulkhead.
5. Connect the other end of the serial-port cable to the appropriate connector. (For example, depending on your system configuration, you may connect it to a connector in the WACS SBus slot on the SWS or to a connector in the serial-port concentrator.)

*Figure 86. WACS Connector Location on I/O Bulkhead*

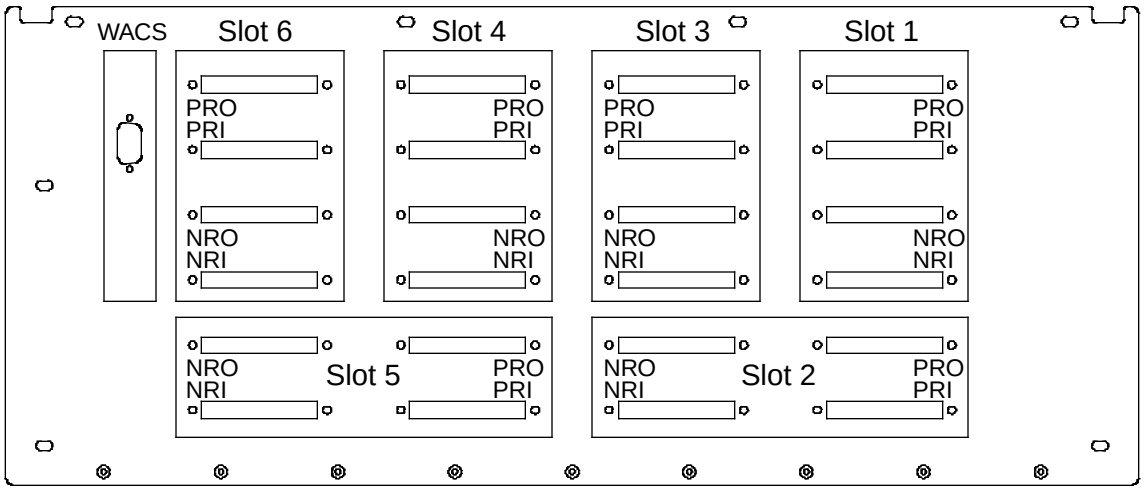


## Connecting the GigaRing Cables

### Background

In the CRAY T3E system, data input and output takes place via GigaRing channels. If connected on a GigaRing channel, a PEM serves as a GigaRing node and connects to an MPN (and to other nodes, if applicable) via four GigaRing connections: two for the positive ring and two for the negative ring. These connections are made through GigaRing cables that connect to the PEMs at the cabinet's I/O bulkhead. Figure 87 shows the cabinet I/O bulkhead.

*Figure 87. I/O Bulkhead – Connector Locations*




**NOTE:** In some cabinets, GigaRing connections are made in the wiremat via loopback adapters (P/N 15255500), internal to the I/O bulkhead.

One end of each cable has two screws (male), and the other end has two threaded posts (female). These correspond to jackposts on the I/O bulkhead, as described in Table 6. Use a flatblade screwdriver (straight slot) to make the connections.

*Table 6. CRAY T3E AC I/O Bulkhead GigaRing Connections*

| Description | Jackpost Screw Reference (on bulkhead) |
|---|---|
| Negative Ring In – NRI | Female |
| Positive Ring Out – PRO | Male |
| Negative Ring Out – NRO | Male |
| Positive Ring In – PRI | Female |

**Procedure**

1. Connect the boundary scan GigaRing channel to slot 1 of cabinet 0 (slot 1 contains the scan master, which requires a dedicated MPN). Refer to the cable labels and to the system configuration documentation for details on the GigaRing cabling configuration. Refer to Figure 88 for an example.

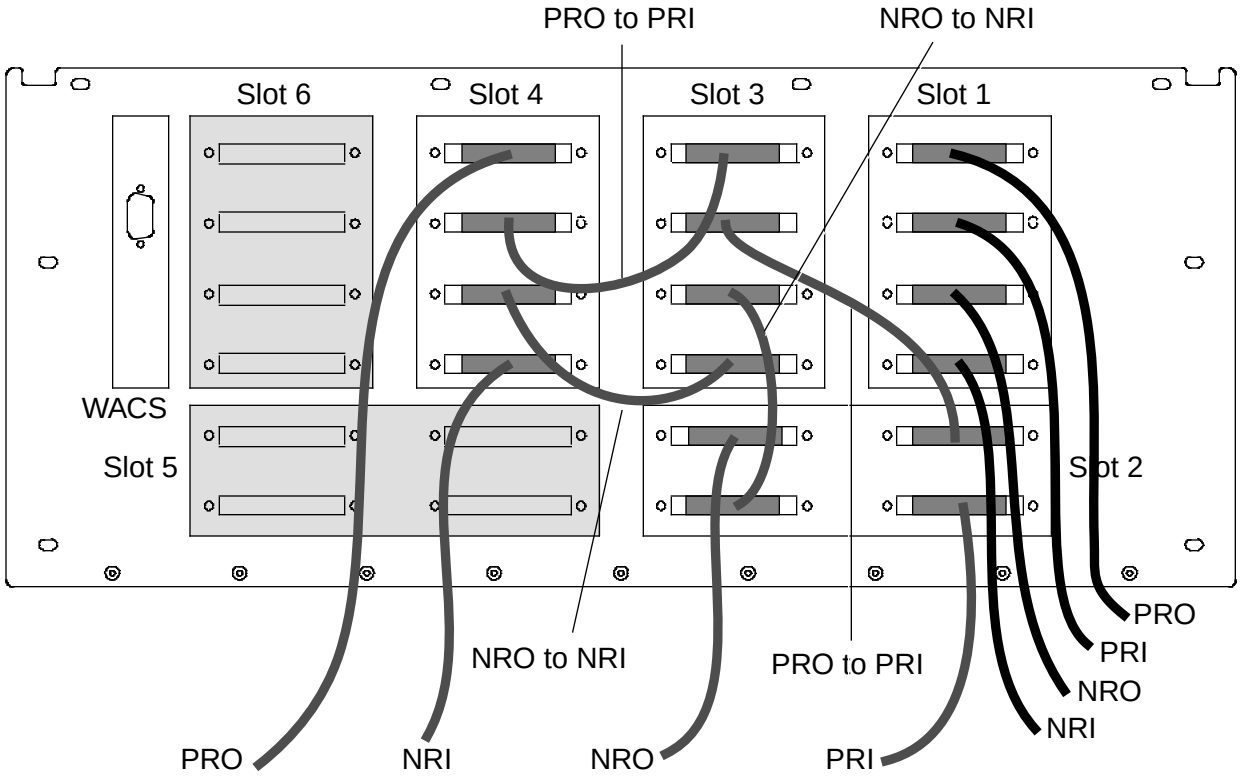
   **NOTE:** The scan master PEM must connect to one (and only one) MPN. No other nodes (including CRAY T3E nodes) may physically connect to this ring.

2. If applicable, connect the support GigaRing channel.

   In many configurations, the support GigaRing channel connects to the PEM with the greatest number in the system (such as PEM 9 in a 10-PEM system) and to one or more additional PEMs.

3. Connect the customer I/O GigaRing channel(s) to the cabinet. Refer to the cable labels and to the configuration documentation for the locations.

*Figure 88. Example GigaRing Connections*




**NOTE:** In this example, slots 2, 3, and 4 are on a customer I/O GigaRing channel. PEM 0, in slot 1, is the only CRAY T3E node on the boundary scan channel.

4. Ensure that the other ends of the GigaRing cables connect to the MPN, SPN, etc. Figure 89 is a rear view of a PC-10 cabinet and shows GigaRing connections on the MPN-1 and NSR-1 subracks. Figure 90 shows detail of an NSR-1 subrack, and Figure 91 shows detail of an MPN-1.

*Figure 89. GigaRing Connectors on PC-10 (Rear View)*

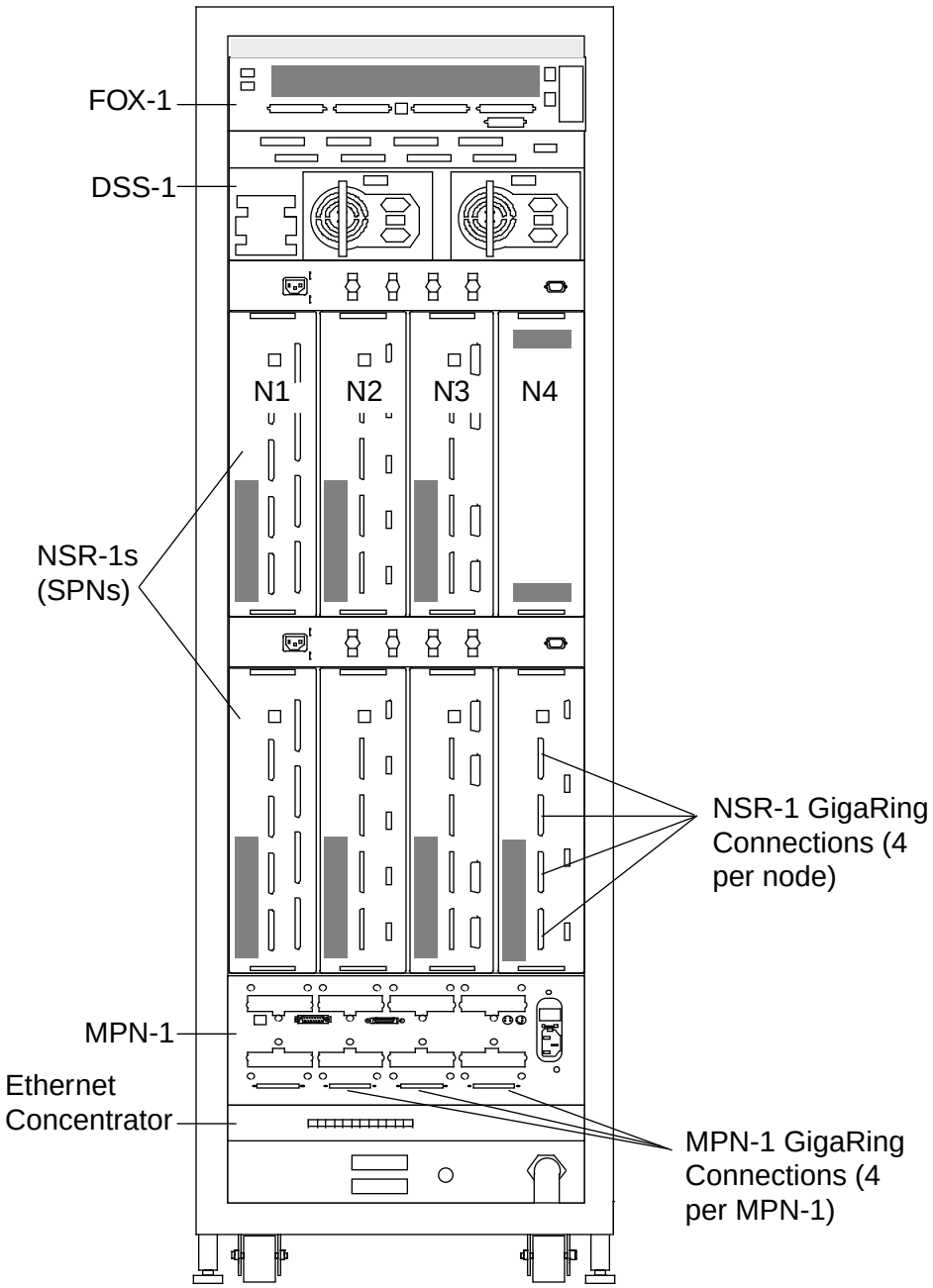


*Figure 90. NSR-1 GigaRing Connectors*

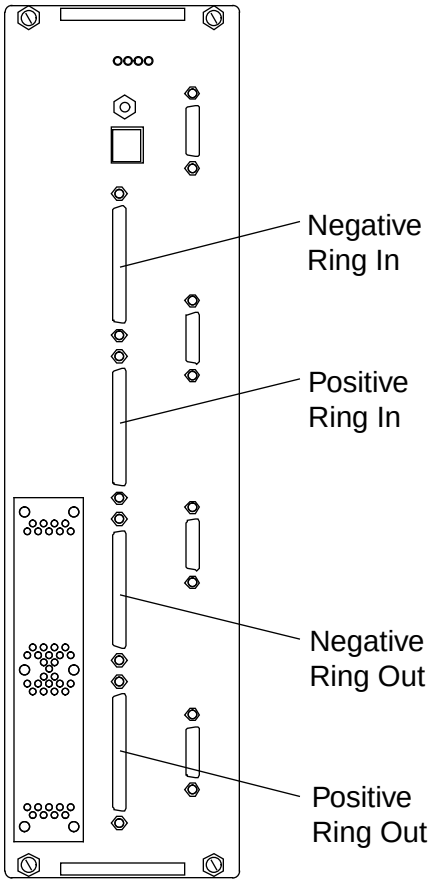
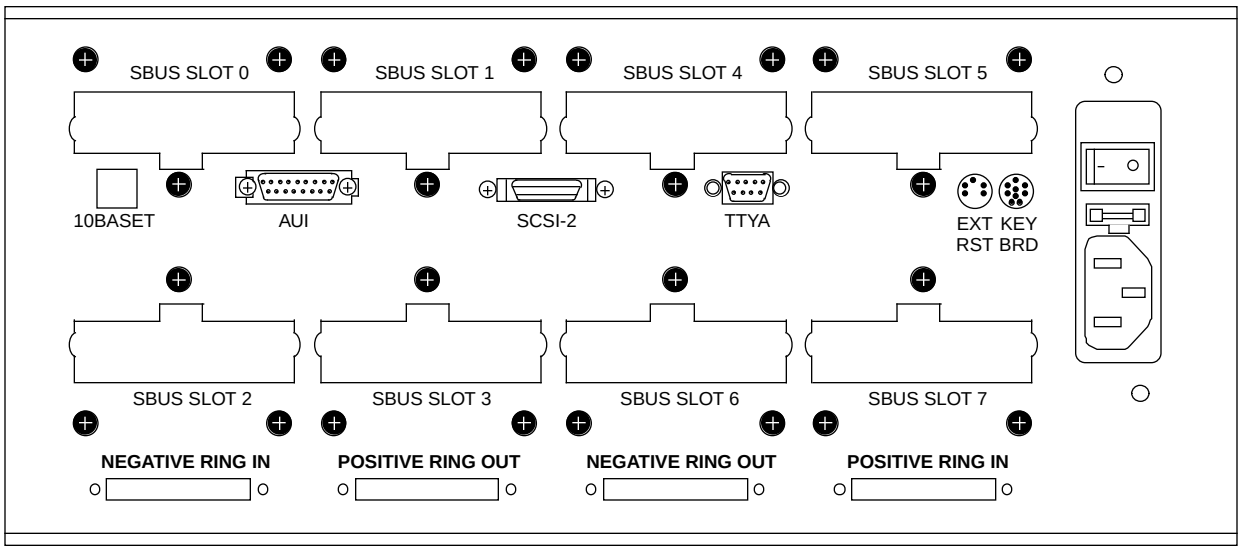



*Figure 91. MPN-1 GigaRing Connectors*



### Verifying System Cabling

When you complete the cabling between the CRAY T3E cabinet and the other system components, ensure that all other system connections are complete, including GigaRing, WACS, and Ethernet connections.

## Powering Up the System Workstation (SWS)

At this point, you should power up the SWS and bring up the common desktop environment (CDE). Refer to *System Workstation*, Cray Research publication HTM-222.

## Powering Up the PC-10

At this point, you should power up the PC-10(s) as described in the *Peripheral Cabinet (PC-10) Installation* document, Cray Research publication HMM-371.

## Connecting the Input Power to the CRAY T3E Cabinets

Complete the following procedure for each cabinet:

1. Verify that the main-disconnect circuit breaker (CB1), blower circuit breaker (CB8), WACS circuit breaker (CB9), auxiliary circuit breaker (CB10), and power supply circuit breakers (CB2 through CB7) are in the open (0) position.
2. Open (0) the customer breaker that supplies power to the CRAY T3E cabinet.
3. Plug the cabinet power cord into the power receptacle.
4. Close (1) the customer breaker that supplies power to the CRAY T3E cabinet.
5. Close (1) the cabinet’s main disconnect circuit breaker (CB1).

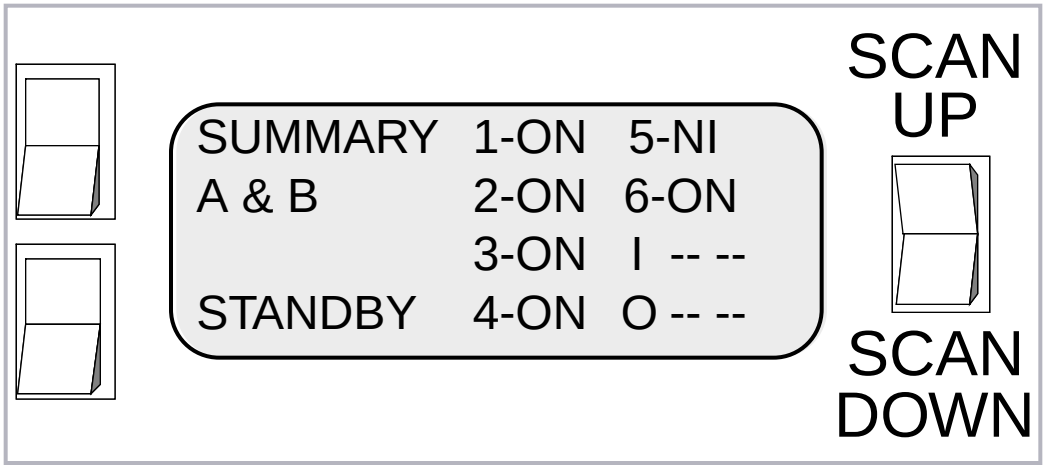
## Verifying Cabinet Operation

Complete the following procedure for each cabinet to verify correct operation of the cabinet components.

### Verifying WACS Control

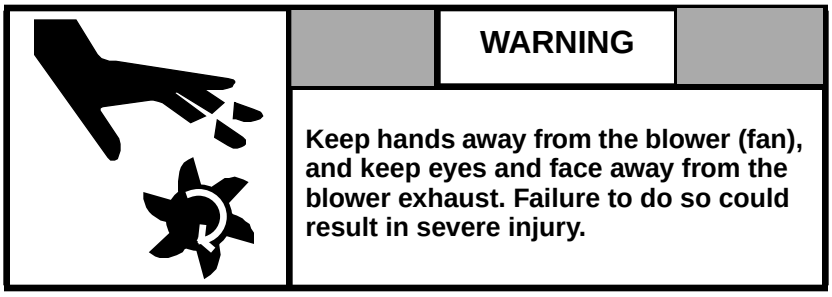
1. Close the WACS circuit breaker (CB9).
2. Set the Remote Restart Enable switch to the enable (1) position. Verify that the switch indicator light is on.
3. Check the WACS display. It should display a summary page. Verify that the bottom line on the summary page reads STANDBY (as shown in Figure 92).
4. Set the Remote Restart Enable switch to the disable (0) position, then press the Restart button and listen for the main contactor to close. Verify that the summary page now reads CAB ON instead of STANDBY.

*Figure 92. WACS Summary Screen - Standby Mode*



## Verifying Operation of the Blower

1. Turn on the blower circuit breaker (CB8).




**NOTE:** If none of the modules are cammed, the WACS will not close the contactor; therefore, the blower will not function.

2. Close (1) the Blower Controller Bypass switch, and verify that the blower operates at full speed.

3. Open the Blower Controller Bypass switch, and verify that the blower speed drops. (The blower normally operates at approximately half speed.)

## Verifying Operation of the Thermistors

1. At the WACS display, scroll through the screens to verify that the module thermistor readings show temperatures that are equal to the computer room temperature ±5 $^{o}$F or ±3 $^{o}$C.

2. At the WACS display, verify that the Air In and Air Out readings show a temperature that is equal to the computer room temperature ±5 $^{o}$F or ±3 $^{o}$C.

## Verifying Cabinet Power Switch and Shunt Trip Operation

1. Toggle the Cabinet Power switch to the Off (0) position and verify that the main input circuit breaker (CB1) trips. This verifies that the CB1 shunt/trip is operational. The Cabinet Power switch is on the front door of the cabinet.

2. Return the Cabinet Power switch (SW2) to the On (1) position.

3. Reset CB1.

### Verifying Remote Alarm Operation (Optional)

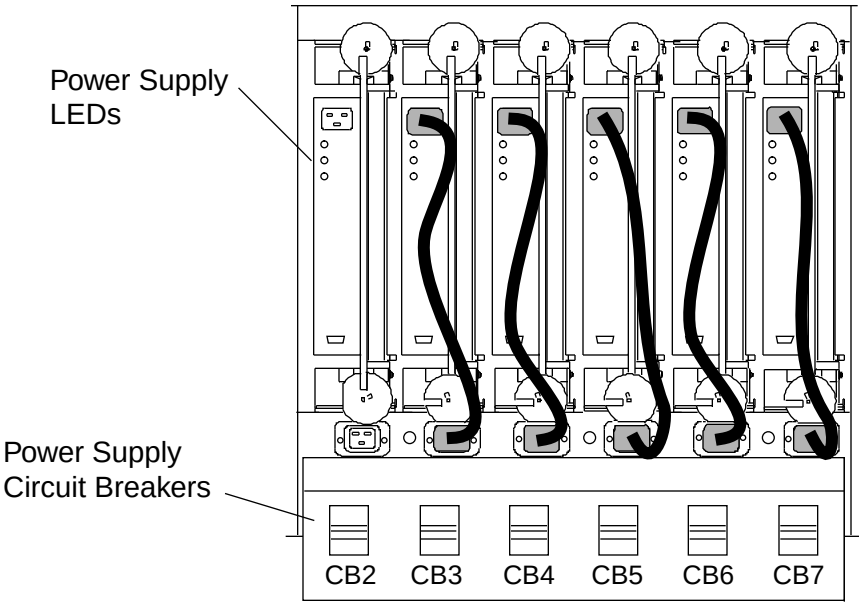
1. Apply heat to the inlet air thermistors to create a fault.
2. Listen for the main contactor (CT1) to open and remove power from the blower (and module power supplies).
3. Verify that the customer's remote alarm system detects the fault.
4. Check the cabinet WACS and the nwacs display for the fault information.
5. Push the Restart switch.

## Powering Up the Modules

1. Turn on (1) the Clock Power Supply circuit breaker (CB10) in cabinet 0 and cabinet 3. CB10, which is on the WACS panel next to the WACS breaker, controls power for the clock distribution power supply.
2. Turn on (1) the clock circuit breakers (CB7) in cabinets 0 and 3.
3. Turn on (1) the power supply circuit breakers. Start with cabinet 0 and work your way to the right.
4. Verify that the green LEDs (located on the end of each power supply) are on. Verify that no amber fault LEDs are illuminated on the power supplies. Refer to Figure 93.
5. At the WACS display, verify power supply output voltages:
   - The voltage on each PEM should be approximately -3.4 Vdc.
   - The main voltage on each clock module should be approx. -3.5 Vdc.
   - The auxiliary voltage on each clock should be approx. -4.4 Vdc.
6. At the Power Supply Margin switch, which is below the WACS display, press the Margin High (top) portion of the switch. Check the WACS display to ensure that the voltage increased by approximately 0.1 Vdc.

   **NOTE:** On most cabinets, the Power Supply Margin switch does not affect the voltage on the clock module.
7. Press the Margin Low (bottom) portion of the Power Supply Margin switch. Check the WACS display to ensure that the voltage decreased by approximately 0.1 Vdc.

*Figure 93. Power Supply Circuit Breakers and LEDs*




## Verifying Remote Power On/Off

Before you begin the following procedure, you must bring up nwacs.

1. Close (1) the Remote Restart Enable switch to enable remote power on/off.
2. At the SWS, use the nwacs Switches window to perform a remote power-off.
3. Check the CRAY T3E AC cabinet to ensure that the main contactor opened and removed power from the blower and the module power supplies.
4. At the SWS, use the nwacs Switches window to perform a remote power-on.
5. Check the CRAY T3E AC cabinet to ensure that the main contactor closed and supplied power to the blower and the module power supplies.

## Running Boundary Scan and Diagnostics

After you complete the mechanical installation of the CRAY T3E AC cabinets, the PC-10(s), and the SWS, you are ready to prepare the system for operation. At the time of this publication, the procedure consists of the following tasks:

1. Ensure that all system connections are complete, including GigaRing, WACS, and Ethernet connections.

2. Ensure that the SWS is powered up.

3. Ensure that the nodes (MPN and SPN) are powered up.

   Firmware that resides in each node initiates power-up self-tests and broadcasts the IP address. The SWS then recognizes the nodes and downloads VxWorks onto the nodes.

4. Ensure that the MPNs and SPNs are checked out with appropriate tests.

5. Ensure that the CRAY T3E system is powered up.

6. Check the following switch settings on the CRAY T3E AC system:

   - Ensure that the margins are set to normal.
   - Ensure that the clocks are set to normal.
   - Ensure that the boundary scan hard enable switches are set to enable.

7. Run the GigaRing channel clearing utility for each GigaRing channel that connects to your system. For example:

   ```
   sws# /opt/CYRIsws/bin/ring_clear -l sn6505-mpn0
   ```

   Where `sn6505-mpn0` is the name of the MPN on the ring.

   **NOTE:** As noted in FN #2242a, use only the released version of the ring_clear command, which is located in /opt/CYRIsws/bin. The virtual channel (VC) mask is incorrect for some variations of ring_clear commands. The VC mask on the send side is set to use specific paths, which may cause SCX DMA packet time-outs.

8. Use the pull-down menu to start T3EMS, which establishes communication with the CRAY T3E AC cabinet. Figure 94 shows the T3EMS main window.

9. In nwacs, set the CRAY T3E soft switches for boundary scan operation:

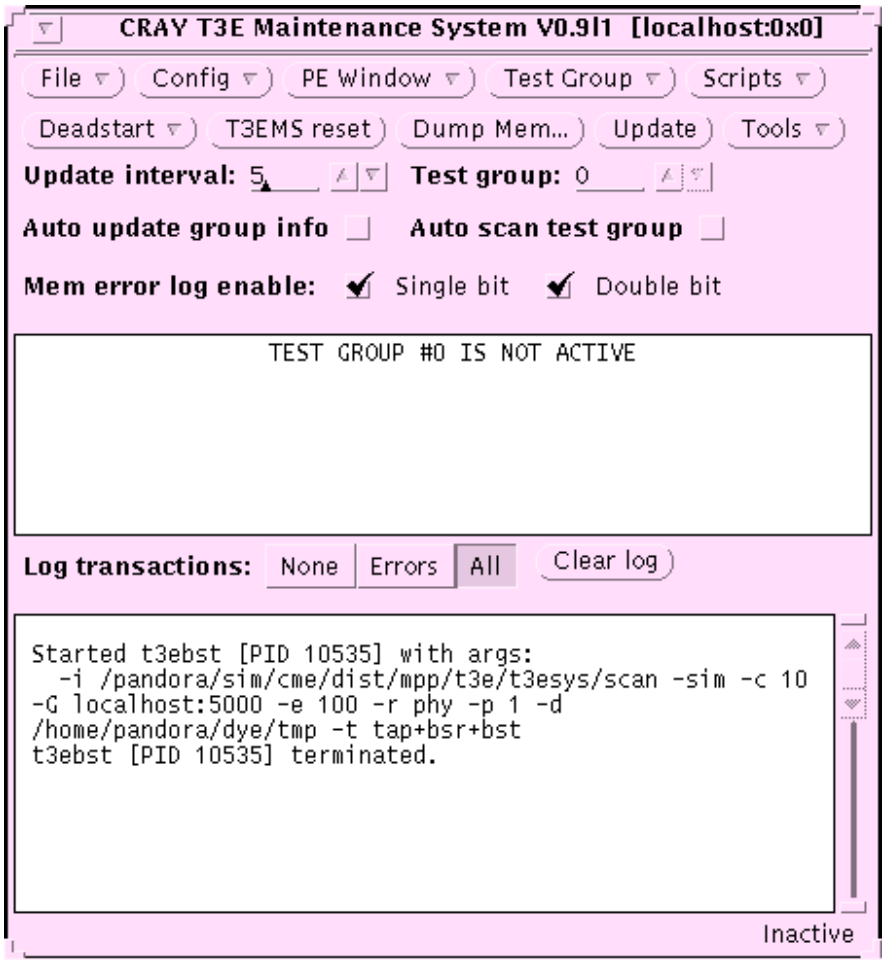
   a. Set the Soft Scan Enable switch (formerly the Testmode switch) to ON.

   b. Set the TCK Select (test clock select soft switch) to TCKS.

   c. Press the Write Switches button.

   **NOTE:** Run boundary scan at normal volts, as noted in FN #2228.

*Figure 94. T3EMS Main Window*

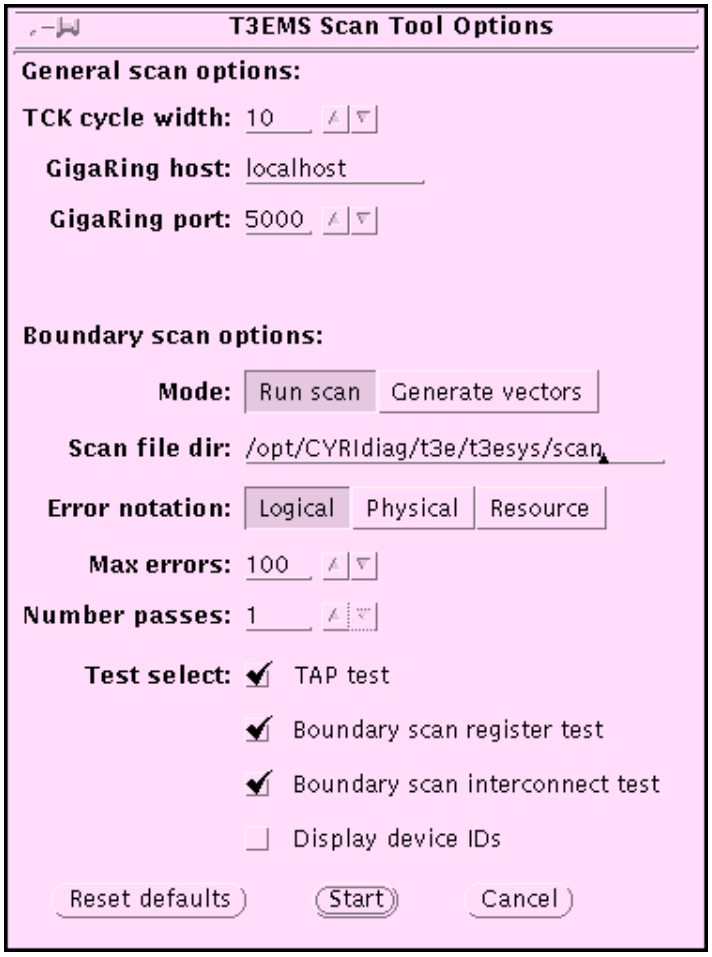


10. Under the Tools menu item in the T3EMS main window, select Boundary Scan. When the T3EMS Scan Tool Options window appears, click on the Start button to run boundary scan. Figure 95 shows the T3EMS Scan Tool Options window.

11. When boundary scan is complete, close the window and check off the Boundary Scan item from the Offline Diagnostic Test checklist in the *Installation Checklist*, HMM-374.

12. Under the Tools menu item in the T3EMS main window, select Scan clear (t3etap) to reset the clock for normal operation.

*Figure 95. T3EMS Scan Tool Options Window*



13. Under the Scripts menu item in the T3EMS main window, select Load & Run. The Load Program window appears, as shown in Figure 96.

14. Select the giga_diag.pgm diagnostic from the Load Program window and click on the Accept button. The giga_diag.pgm diagnostic offers a series of interactive windows that contain program choices. The following list contains a current set of program choices; base your choices on the status of the diagnostic when you run it and on any installation-specific needs:

    a. When the Section Selects window appears, click on the Done button.

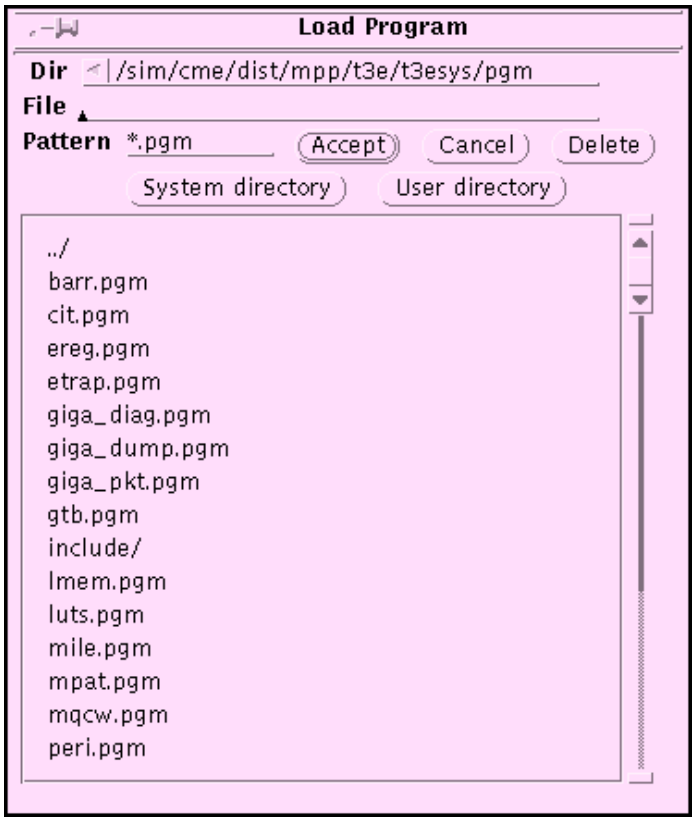
    b. When the SCX Node Select window appears, ensure that the correct target node ID(s) are entered, then click on Done.

    c. When the Target Router Selects window appears, click on Done.

    d. When the Number Of Passes To Run window appears, change the pass count to 1 and click on Done. The diagnostic will then run.

    e. When the diagnostic completes, close the window and check off the giga_diag item from the Offline Diagnostic Test checklist in the *Installation Checklist*, HMM-374.

*Figure 96. Load Program Window*



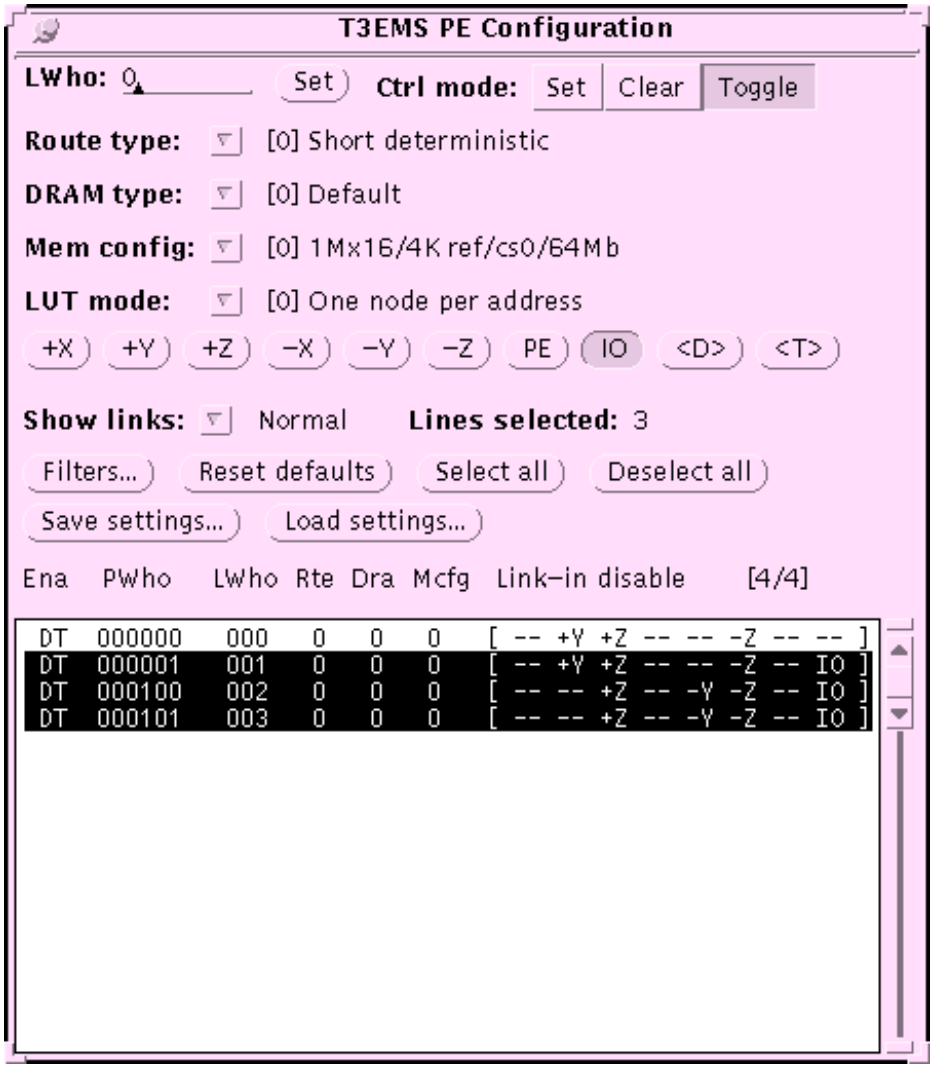
15. Disable the I/O ports on all PEs that do not connect to GigaRing channels:

    a. Under the Config menu item in the T3EMS main window, select PE configuration. The PE Configuration window appears. Refer to Figure 97.

    b. In the bottom half of the PE Configuration window, click and drag your cursor over the PEs where you will disable the I/O ports.

    c. Click on the IO button to disable the I/O ports on the selected PEs. The letters IO appear on the right side of the selected PEs to signify that the I/O ports are disabled (as shown in Figure 97).

*Figure 97. PE Configuration Window*



16. Select the mile.pgm command buffer from the Load Program window and click on the Accept button. This starts the offline diagnostic suite listed in Table 7. This diagnostic offers a series of interactive windows that contain program choices. The following list contains a current set of program choices; base your choices on the version of the diagnostic and on any installation-specific needs:

    **NOTE:** The mile.pgm command buffer performs deadstart functions, which clear memory and load PAL (Privileged Architecture Language) code.

    a. The first window provides a choice about which test to begin with. Click on the Done button to start the diagnostic suite with the todt test.

    b. The next window enables you to choose which tests run. Click on Done; you will run all of the tests.

    **NOTE:** For cit to run under mile.pgm, the rings must be initialized and the IO ports on all PEs – except for the PEs on modules that connect to GigaRing channels – must be disabled.

    c. The next window enables you to choose whether the program will log single-bit errors (SBEs) or stop when it detects an SBE. Select the button that logs SBEs, then click on Done.

    d. The next window enables you to choose whether to dump the SBE information to a file. Select Yes, then click on Done.

    e. The next window enables you to choose whether the suite will run once or continuously. Select Single, then click on Done.

    f. The next window enables you to choose the margins (clock speed and power margin). Select Normal/Normal, then click on Done.

    The diagnostic suite will run now.

    g. When the diagnostics complete, close the window and check off the individual diagnostics from the Offline Diagnostic Testing checklist in the *Installation Checklist*, HMM-374.

*Table 7. Offline Diagnostic Tests*

| Test | Pass Count |
|---|---|
| The following test runs alone under the *T3EMS scripts:* | |
| giga_diag | 1 |
| | |
| The following tests run under the *mile.pgm* command buffer: | |
| todt (time_of_day_test) | 1,000 |
| ereg (E-register local test) | 40 |
| barr (barrier/eureka) | 50 |
| lmem (local memory test)<br>Preset the config file for correct memory size | 1 |
| peri (PE random instruction test) | 2,000 |
| rchip (basic router test) | 10 |
| xnet (network test) | 50 |
| luts (look-up table) | 5 |
| mqcw (message test) | 3,000 |
| gtb (global translation test) | 4 |
| segt (segment translation test) | 5 |
| etrap (error trap test) | 100 |
| pst (processor stall test) | 20 |
| rmem (remote memory test) | 1 |
| rlo | 2,000 |
| cit | 5 |

17. If applicable, have remote support tested from a remote location. Contact the local technical support office if necessary. Refer to *System Workstation*, HTM-222, for details.

## Installing Panels and Doors

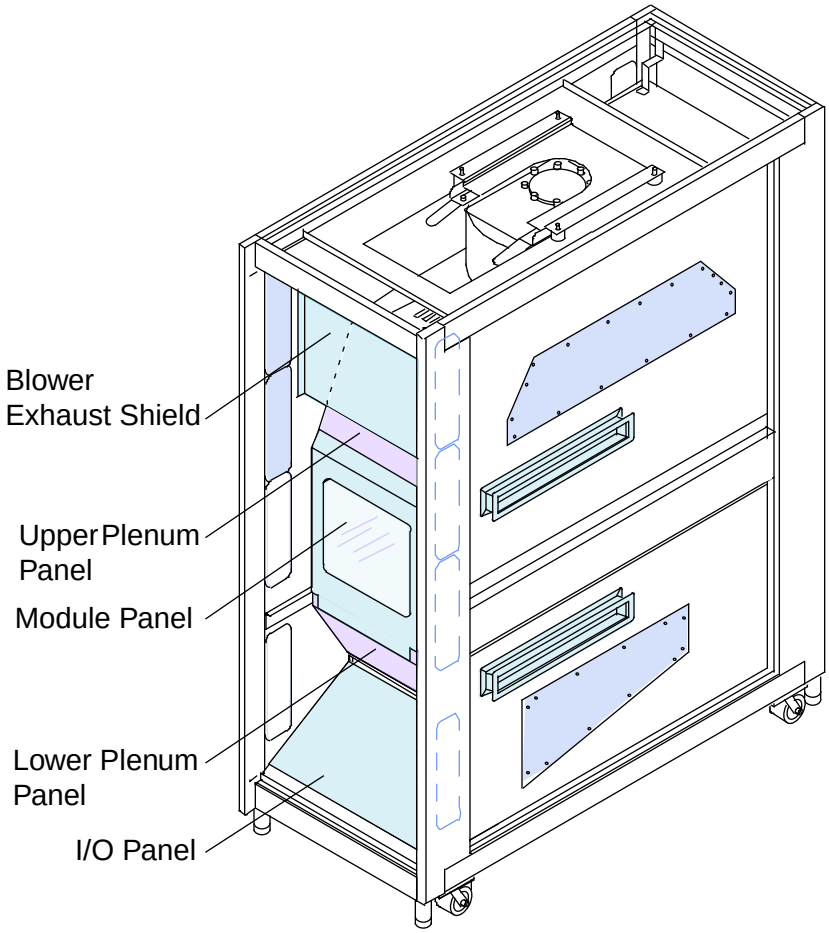
When you confirm that the system is fully functional and ready for customer operation, replace the access panels and doors that you removed earlier.

### Installing Rear Access Panels

Install the rear access panels that you removed earlier. Figure 98 shows the various panels on the rear of the cabinet.

1. Install the upper and lower plenum panels on each cabinet.
2. Install the module panels on each cabinet.
3. Install the blower exhaust shield on each cabinet and connect the clock switch connectors.

*Figure 98. Access Panel Locations*



## Installing the Doors

Replace each cabinet door that you removed earlier by using the following procedure. The procedure may require two people.

1. Ensure that all washers are in place, then carefully position the door's hinge hardware directly above the frame hinge pins.
2. You may need to flex the door slightly to align the hardware.
3. Carefully lower the door onto the frame hinge pins.
4. Ensure that the door opens and closes properly.
5. Connect the ground wire.

This completes the mechanical installation procedures for a CRAY T3E single-cabinet system. Refer to the *CRAY T3E Software Installation and Configuration Guide*, publication SG-2610, for the software installation and initialization procedures.

# Appendix – Wire Removal

Use the following procedure to remove a 2-pin connector (clock or boundary scan wire) from a rail connector:

1. Position yourself so that you can see the pins.
2. Identify the pin location of the wire that you must remove.
3. Carefully slide the hollow tip of a 0.3-mm mechanical pencil over the *outermost* pin of the pin pair. Then apply a gentle force both toward the other pin in the pin pair and toward the wire, away from the module area and toward the base of the rail. Refer to Figure 99.
4. Return to the wiremat and pull the defective clock wire from the rail.

*Figure 99. Connector Removal with Mechanical Pencil*