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VAXft Systems Site Preparation and
Installation Guide

EK–VXFT1–IN.004

Digital Equipment Corporation

VAXft Systems Documentation Road Map

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MR–5490–RA

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About This Guide

Intended Audience

This manual is intended for use by Digital Customer Services and other personnel responsible for planning, preparing, and installing a fault-tolerant VAXft system.

Document Structure

Part 1 of this manual provides the requirements and guidelines for planning and preparing the computer facility. It includes one chapter:

- **Chapter 1, Site Preparation** — Provides guidelines for preparing the computer facility. Describes the system space, environmental, and power requirements.

Part 2 of this manual contains procedures for installing the model 110 VAXft system.

- **Chapter 2, Unpacking and Inspecting the Model 110 System** — Provides guidelines for unpacking and inspecting the model 110 system components and explains what to do if there is a problem.

- **Chapter 3, Installing the Model 110 System** — Describes how to install, power up, and verify the operation of the VAXft 110 system

Part 3 of this manual contains procedures for installing the model 310 and 410 VAXft systems.

- **Chapter 4, Unpacking and Inspecting the Model 310 and 410 System** — Provides guidelines for unpacking and inspecting the model 310 and 410 system components and explains what to do if there is a problem.

- **Chapter 5, Preparing the Model 310 and 410 System Cabinets** — Describes how to open the model 310 and 410 cabinets, prepare the equipment for installation, and how to position the cabinets in the installation area.

- **Chapter 6, Installing the Model 310 and 410 System Cables** — Describes how to route and connect the system cables in a model 310 and 410 base system or system with expansion.

- **Chapter 7, Completing the Model 310 and 410 System Installation** — Describes how to connect the system to facility power, connect the terminals and modems, and start up the system.

Part 4 of this manual contains procedures for installing the model 610 and 612 VAXft systems.

- **Chapter 8, Unpacking and Inspecting the Model 610 and 612 System** — Provides guidelines for unpacking and inspecting the model 610 and 612 system components and explains what to do if there is a problem.

- **Chapter 9, Preparing the Model 610 and 612 System Cabinets** — Describes how to open the model 610 and 612 cabinets, prepare the equipment for installation, and how to position the cabinets in the installation area.

- **Chapter 10, Installing the Model 610 and 612 System Cables** — Describes how to route and connect the system cables in a model 610 and 612 base system or system with expansion.

- **Chapter 11, Completing the Model 610 and 612 System Installation** — Describes how to connect the system to facility power, connect the terminals and modems, and start up the system.

This manual also contains the following appendixes:

- **Appendix A, Module Handling, Removal, and Installation /Replacement Procedures** — Describes how to remove, replace, or install a logic module in the system backplanes.

- **Appendix B, DEC WANcontroller 620 Configuration and Installation** — Describes how to install the WAN communications adapter modules and Y-boxes.

- **Appendix C, System Drive Removal and Replacement** — Describes how to remove, replace, or install system storage media.

- **Appendix D, Model 310 and 410 Rackmount System Site Preparation and Installation** — Describes how to prepare the facility and install the model 310 and 410 OEM rackmount systems.

- **Appendix E, Model 110 Rackmount System Site Preparation and Installation** — Describes how to prepare the facility and install the model 110 OEM rackmount systems.

Related Documentation

The VAXft documentation set includes the following manuals:

- *VAXft Systems Site Preparation and Installation Guide* (EK-VXFT1-IN) — Provides site preparation guidelines and system specifications. Describes how to install, boot, and verify the system. Provides procedures for removing, handling, and replacing the logic modules, and for removing and replacing the system drives.

- *VAXft Systems Owner's Manual* (EK-VXFT1-OM) — Provides a functional description of the VAXft system. Describes the system controls and indicators, console commands, bootstrap functions, and tape drive operation. Provides procedures for removing and replacing the system drives and for removing, handling, and replacing the logic modules.

- *VAXft Systems Mini-Reference Guide* (EK-VXFT1-HR) — Provides summaries of the system controls and indicators, console operation, console commands, bootstrap functions, and system registers.

Additional Documentation

Other documents related to the VAXft system include:

- *VAXft Systems Configuration Guide* — Describes the VAXft system and describes fault tolerant computing.

- *VAX Wide Area Network Device Drivers* — Describes the software utilities used in wide area network communications.

- *VAXft System Services Installation Guide* — Provides step-by-step procedures for installing the VAXft system services software on your VAXft system.

- *VAXft System Services Manager's Guide* — Describes the VAXft system and the VAXft system services software. Provides information on managing a fault tolerant system running VAXft system services software.

- *VAXft System Services Release Notes* — Provides information related to the current version of VAXft system services. Provides additional information for installing and maintaining your VAXft system.

- *VAXft System Services Reference Manual* — Provides reference information on VAXft system services operation. Describes the DCL commands used on a VAXft system.

- *VAXft System Services Online Help* — Provides information about using the VAXft system services specific information and the DCL commands used on a VAXft system.

- *VAXft System Services Error Message Manual* — Provides descriptions of error messages that may be encountered in using VAXft system services. Provides a reference for fault tolerant and system error messages.

- *VAXft System Services Master Index* — Provides a complete index for the software documentation set.

- *VMS Upgrade and Installation Manual* — Describes the installation and upgrade procedures for the current release of the VMS operating system. Provides information on the user environmental test package (UETP).

- *VMS Upgrade and Installation Supplement: VAXft Systems* — Supplements the *VMS Upgrade and Installation Manual* with information specific to the VAXft computer including startup, shutdown, and backup procedures.

- *VMS Release Notes* — Provides notes on various aspects of the VMS operating system.

- *VMS Volume Shadowing Manual* — Provides an in-depth discussion of volume shadowing (phase II), shadow sets, mount utility, and DCL commands used to mount, monitor, and dismount volume shadow sets.

Part 1

1
Site Preparation

This chapter provides guidelines for preparing a computer facility for the VAXft system.

This chapter provides electrical and environmental specifications that must be observed for optimum performance and are required if the system is maintained under a Digital Equipment Corporation maintenance agreement.

The *Site Environmental Preparation Guide* (EK-CSEPG-MA) provides further information on site planning and computer room environments. This chapter includes:

- Site planning guidelines

- Floor space requirements

- Environmental limits

- Power requirements

1.1 Site Planning Guidelines

When planning a computer facility, the recommended guidelines are to:

1. Identify space, environmental, and power requirements.

2. Determine whether the computer facility meets the requirements and list necessary enhancements or changes.

3. Prepare the computer facility accordingly. The following steps are recommended:

   a. Prepare a layout diagram of the installation area. Section 1.2 lists the system dimensions and weights.

   b. Determine the air quality and cooling capabilities of the installation area. Section 1.3 lists the system temperature and humidity requirements.

   c. Determine the required number, type, and location of ac power receptacles and circuit breakers. Section 1.4 lists the system power requirements.

1.1.1 Fire and Safety Codes

The computer facility should conform to local fire and safety codes. The power distribution panel and master circuit breaker or switch must be easily accessible.

For further information on fire and safety codes and practices, refer to the following U.S. National Fire Protection Association publications or to equivalent associations and codes:

- Standard for the Protection of Electronic Computer/Data Processing Equipment (NFPA 75)

- National Electrical Code (NFPA 70)

1.1.2 Computer Security

Computer security can be important even where confidential work is not common practice. It is advisable to provide a separate computer room or facility, or to improve or extend the existing building security practices. The goal is to provide protection for the computer area against potential damage to the equipment or its programs through carelessness, vandalism, or unauthorized operation.

1.1.3 Data Protection

Consider the security of the system media, programs, and databases. Personnel, medical, financial, research, and other sensitive information should be safeguarded from unauthorized access, tampering, or disclosure.

Special safeguards should be considered for protecting vital data such as business records or information that is expensive or difficult to duplicate. Important data should be "backed up" (copied onto removable media) on a regular basis and stored away from the computer area, preferably in a fireproof storage vault.

1.1.4 Remote Communications

The VAXft system supports connections for remote services and facilities. The system provides dial-out capabilities for system-generated service requests and dial-in capabilities for remote users. The customer must provide the necessary number of dedicated telephone lines.

NOTE
Direct dialing must be used. The telephone lines must not be "party" lines (having other users). The telephone lines must not be routed through a switchboard that allows outside interference or could be shut down during hours of computer operation or maintenance.

1.2   Floor Space Requirements

This section describes the top, front, and rear clearances needed for the installation, operation and maintenance of the VAXft systems. Figure 1–1 shows the footprint of the VAXft model 110 pedestal system. The rackmount system can be installed in a standard 19-inch RETMA rack cabinet. The clearances for the rackmount system are not addressed because they are specific to the rack in which it is mounted. Dimensions and weights for the rackmount system are given in Appendix E.

Table 1–1 lists the model 110 cabinet dimensions and weights. Figures 1–2 and 1–3 show the footprints of the model 310 and 410 systems. Table 1–2 lists the model 310 and 410 cabinet dimensions and weights. Figures 1–4 through 1–8 show the footprints of the model 610 and 612 systems. Table 1–3 lists the model 610 and 612 cabinet dimensions and weights.

Table 1–1   Model 110 Pedestal Cabinet Dimensions and Weights

Specification	Value
Skid and packaging removed:	
Height	68.6 cm (27.0 in)
Width	53.3 cm (21.0 in)
Depth	44.5 cm (17.5 in)
System cabinet weight	68.5 kg (151 lb), maximum
Skid and packaging intact:	
Height	75.3 cm (29.6 in)
Width	58.4 cm (23.0 in)
Depth	85.7 cm (33.3 in)
System cabinet weight	87.1 kg (192 lb), maximum

Figure 1–1   Model 110 Pedestal System
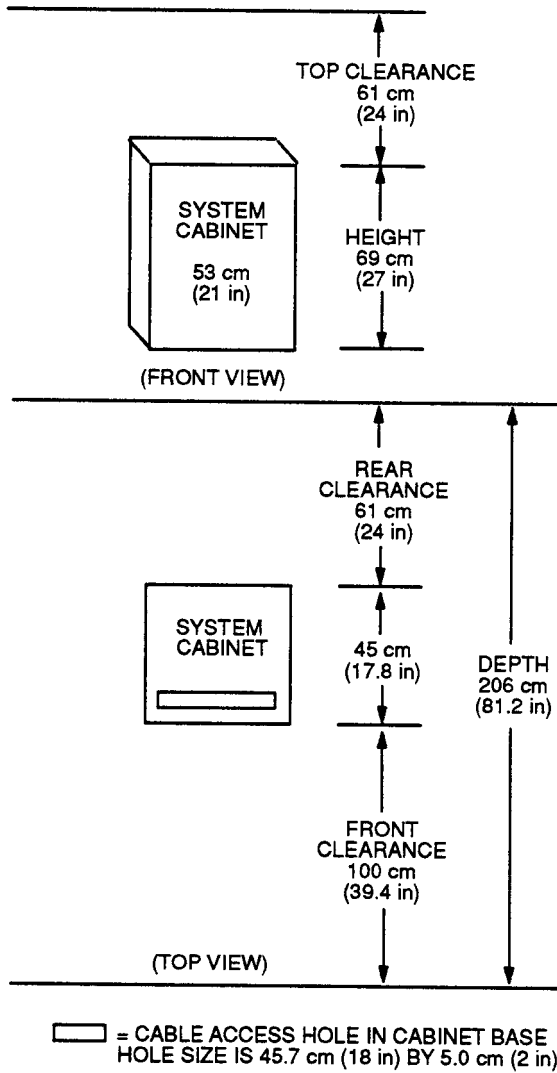
TOP CLEARANCE
61 cm
(24 in)

SYSTEM
CABINET

53 cm
(21 in)

HEIGHT
69 cm
(27 in)

(FRONT VIEW)

REAR
CLEARANCE
61 cm
(24 in)

SYSTEM
CABINET

45 cm
(17.8 in)

DEPTH
206 cm
(81.2 in)

FRONT
CLEARANCE
100 cm
(39.4 in)

(TOP VIEW)

= CABLE ACCESS HOLE IN CABINET BASE
HOLE SIZE IS 45.7 cm (18 in) BY 5.0 cm (2 in)

CS–8821

Figure 1–2   Model 310 and 410 Base System

TOP CLEARANCE
61 cm
(24 in)

SYSTEM
CABINET

SYSTEM
CABINET

HEIGHT
69 cm
(27 in)

53 cm
(21 in)

53 cm
(21 in)

REAR
CLEARANCE
61 cm
(24 in)

SYSTEM
CABINET

SYSTEM
CABINET

45 cm
(17.8 in)

DEPTH
206 cm
(81.2 in)

WIDTH
109 cm (43 in)

FRONT
CLEARANCE
100 cm
(39.4 in)
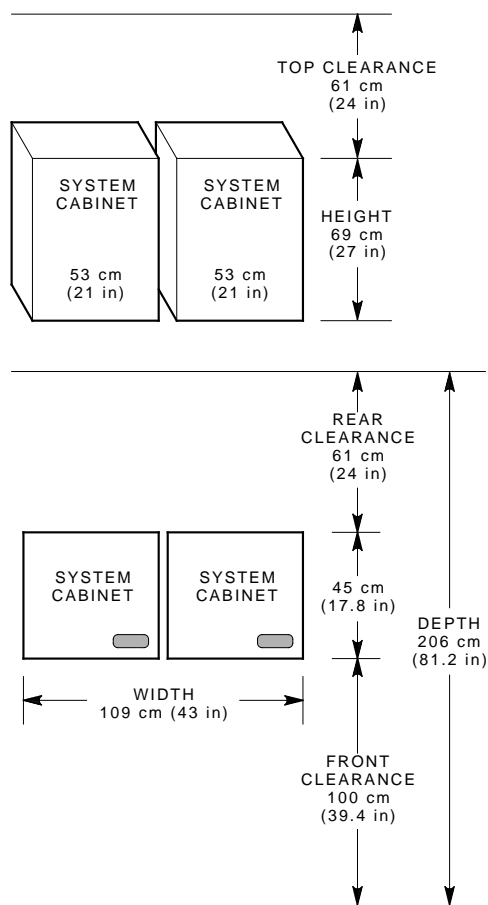
= CABLE ACCESS HOLE IN CABINET BASE.
  HOLE SIZE IS 18.7 cm (7.38 in) BY 6 cm (2.38 in).

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Figure 1–3   Model 310 and 410 System with Expansion

TOP CLEARANCE
61 cm
(24 in)

EXPANDER CABINET	SYSTEM CABINET	SYSTEM CABINET	EXPANDER CABINET
53 cm (21 in)	53 cm (21 in)	53 cm (21 in)	53 cm (21 in)

HEIGHT
69 cm
(27 in)

REAR
CLEARANCE
61 cm
(24 in)

EXPANDER CABINET   SYSTEM CABINET   SYSTEM CABINET   EXPANDER CABINET

45 cm
(17.8 in)

DEPTH
206 cm
(81.2 in)

WIDTH
222 cm (87 in)

FRONT
CLEARANCE
100 cm
(39.4 in)

⬤ = CABLE ACCESS HOLE IN CABINET BASE.
HOLE SIZE IS 18.7 cm (7.38 in) BY 6 cm (2.38 in).

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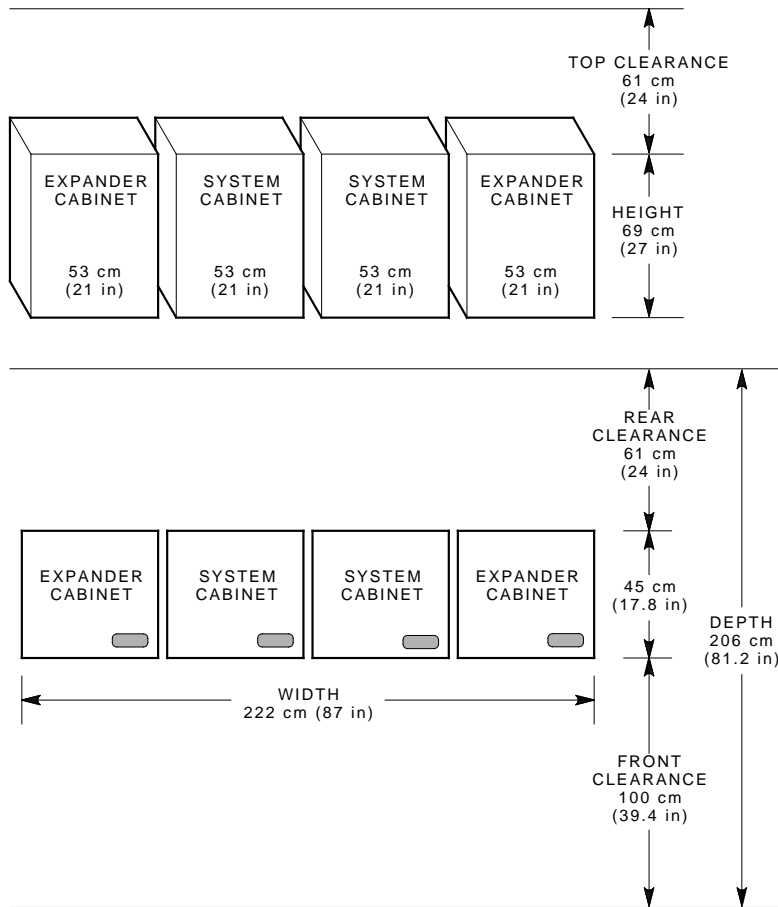
Table 1–2   Model 310 and 410 Cabinet Dimensions and Weights

Specification	Value
Skid and packaging removed:	
Height	68.6 cm (27.0 in)
Width	53.3 cm (21.0 in)
Depth	45.2 cm (17.8 in)
System cabinet weight	100 kg (220 lb), maximum
Expander cabinet weight	118 kg (260 lb), maximum
Skid and packaging intact:	
Height	114.3 cm (45.0 in)
Width	78.7 cm (31.0 in)
Depth	60.7 cm (23.9 in)
System cabinet weight	118 kg (260 lb), maximum
Expander cabinet weight	137 kg (302 lb), maximum

Figure 1–4   Model 610 Base System

SYSTEM
CABINET

HEIGHT
152.4 cm
(60 in)

91.4 cm
(36 in)

SYSTEM
CABINET

76.2 cm
(30 in)

WIDTH
91.4 cm
(36 in)
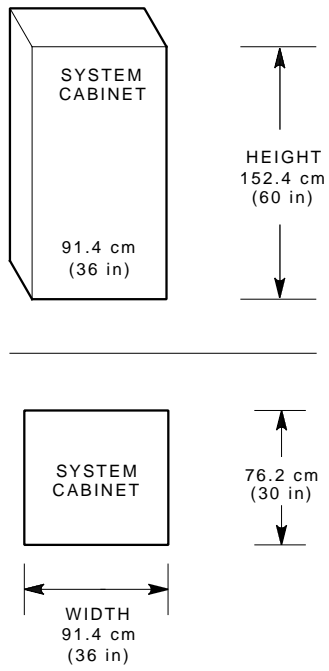
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Figure 1–5   Model 610 System with One Expander Cabinet

SYSTEM
CABINET

EXPANDER
CABINET

HEIGHT
152.4 cm
(60 in)

91.4 cm
(36 in)

60.9 cm
(24 in)

SYSTEM
CABINET

EXPANDER
CABINET

76.2 cm
(30 in)

WIDTH
154.8 cm
(61 in)
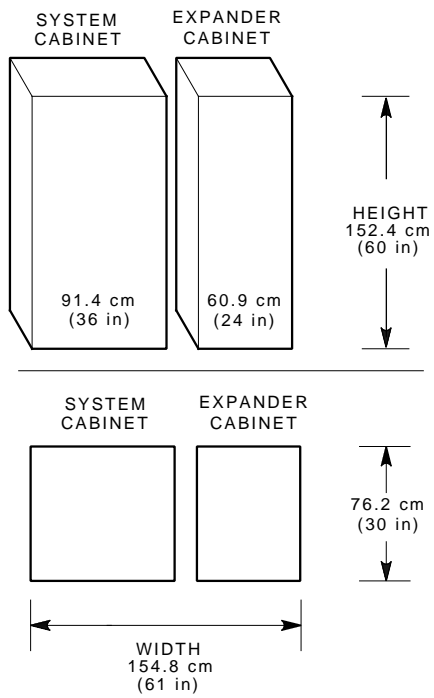
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Figure 1–6   Model 610 System with Two Expander Cabinets

EXPANDER
CABINET

SYSTEM
CABINET

EXPANDER
CABINET

HEIGHT
152.4 cm
(60 in)

60.9 cm
(24 in)

91.4 cm
(36 in)

60.9 cm
(24 in)

EXPANDER
CABINET

SYSTEM
CABINET

EXPANDER
CABINET

76.2 cm
(30 in)

WIDTH
218.2 cm
(116 in)
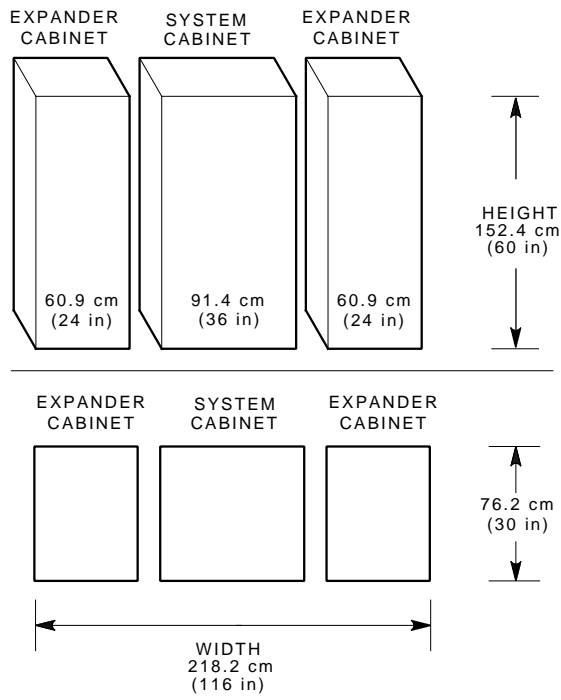
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Figure 1–7   Model 612 Base System

SYSTEM
CABINET

EXPANDER
CABINET

SYSTEM
CABINET

HEIGHT
152.4 cm
(60 in)

91.4 cm
(36 in)

60.9 cm
(24 in)

91.4 cm
(36 in)

SYSTEM
CABINET

EXPANDER
CABINET

SYSTEM
CABINET

76.2 cm
(30 in)

WIDTH
218.2 cm
(98 in)
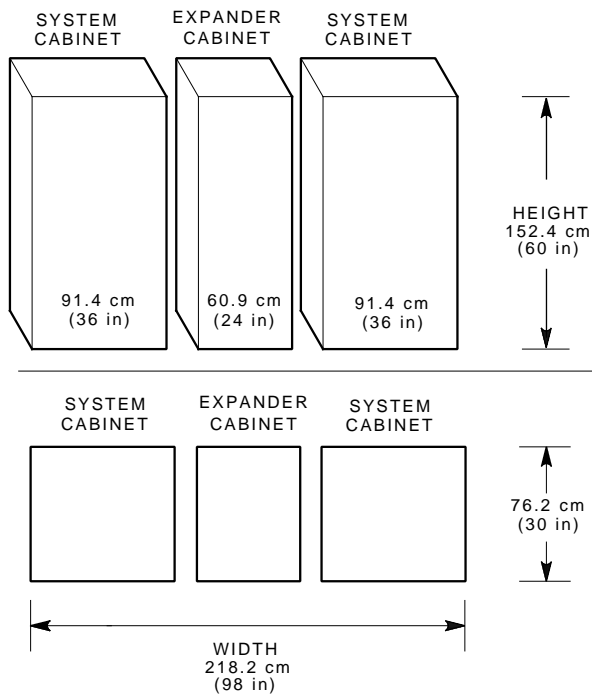
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Figure 1–8   Model 612 System with Expansion


```
SYSTEM        EXPANDER  EXPANDER      SYSTEM
CABINET       CABINET   CABINET       CABINET


                                                    HEIGHT
                                                    152.4 cm
                                                    (60 in)

 91.4 cm      60.9 cm   60.9 cm       91.4 cm
 (36 in)      (24 in)   (24 in)       (36 in)


   SYSTEM      EXPANDER   EXPANDER    SYSTEM
   CABINET     CABINET    CABINET     CABINET

                                                    76.2 cm
                                                    (30 in)



                      WIDTH
                     312.1 cm
                     (126 in)
```
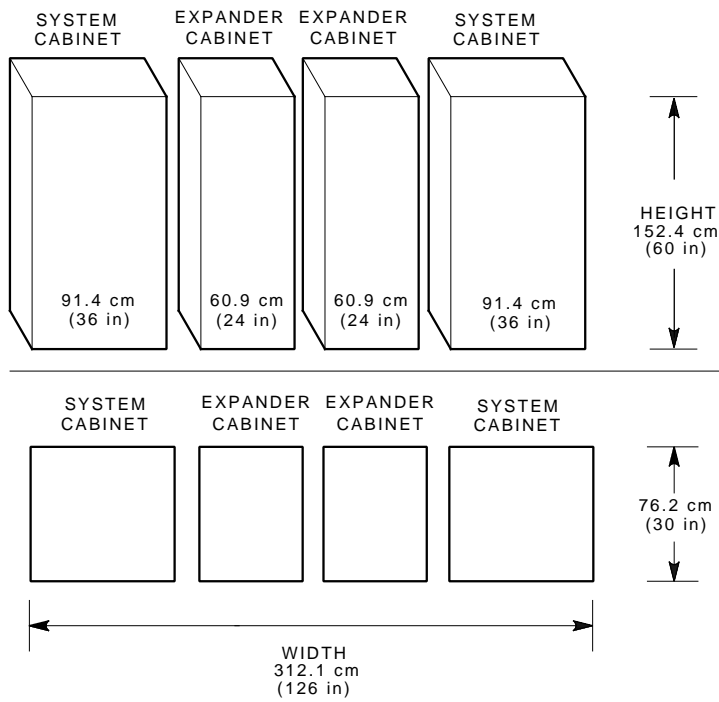
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Table 1–3   Model 610 and 612 Cabinet Dimensions and Weights

Specification	Value
Skid and packaging removed:	
System cabinet	
Height	152.4 cm (60.0 in)
Width	91.4 cm (36.0 in)
Depth	76.2 cm (30.0 in)
System cabinet weight	433 kg (956 lb), maximum
Expander cabinet	
Height	152.4 cm (60.0 in)
Width	60.9 cm (24.0 in)
Depth	76.2 cm (30.0 in)
Expander cabinet weight	309.9 kg (684 lb), maximum
Skid and packaging intact:	
System cabinet	
Height	191.1 cm (75.25 in)
Width	106.7 cm (34.0 in)
Depth	109.9 cm (43.25 in)
System cabinet weight	475.7 kg (1050 lb), maximum
Expander cabinet	
Height	191.1 cm (75.25 in)
Width	86.4 cm (34.0 in)
Depth	112.4 cm (44.25 in)
Expander cabinet weight	385 kg (850 lb), maximum

1.2.1 Preparing for Delivery

In advance, review the route over which the equipment will be moved after delivery. Factors to consider are availability of an elevator, width and location of doors and aisles along the route, hallway restrictions (bends, slopes, or obstructions), and floor surfaces/protection.

If problems require the equipment to be unpacked and removed from the skids, remember that a cabinet is too heavy to be handled by one person.

Doors along the route should allow passage for the equipment and be without saddles or sills to allow for the movement of dollies.

To protect against marring of the floor surface, a suitable material such as 0.64 cm (0.25 in) plywood should be used to cover the floor along the route.

1.2.2 Layout

In advance, prepare the layout of the computer facility to determine the area required for the complete system configuration plus airflow and service access areas. Allow enough space for two console terminals with printers (if so equipped), and for operating access.

Remember to consider human factors in the layout. The relationship of the computer system to high-traffic areas or quiet areas, for example, is important.

Figures 1–2 through 1–8 show the minimum space requirements for cooling airflow and service access to the system. Figures 1–2 and 1–3 also show the location of the cable access hole (model 310 and 410 only) under the base frame of each cabinet. (Each cabinet uses a separate power cord.)

In a raised floor environment, cutouts may be provided in the floor tiles for routing power cords and communication cables. The cutouts need to be large enough to allow the connectors to pass through them. The cutouts should be rounded or have molding to prevent cuts or damage to the cables.

Important factors to consider include:

- **System access clearances** — A minimum of 100 cm (39.4 in) is required in front of the cabinets for service and operating access.

- **Cooling airflow clearances** — A minimum of 61 cm (24 in) is required above and behind the cabinets for cooling intake airflow.

NOTE
If the system is to be installed in an enclosed space, additional air cooling equipment may be required.

- **Floor requirements** — The system must rest on a firm surface to allow full exhaust airflow from the bottom. Soft surfaces, such as shag or deep-pile carpeting, must be avoided unless a firm surface (like floor tile) is installed on top of the carpeting. The floor should be made of a material that minimizes static electricity, which can cause computer failures or media damage.

- **Storage area** — A safe storage area should be provided for magnetic computer media, supplies, documents, spare parts, and maintenance tools.

CAUTION
Do not place food, beverages, office supplies, or other materials on top of the cabinets. Areas around the system should not be used for storage.

1.2.3 Airflow

Figure 1–9 shows the cabinet airflow pattern for the VAXft model 110 pedestal system. Cool air enters through the upper areas of the cabinet and warm air exits from the bottom. The airflow pattern for the rackmount system is not addressed because they are specific to the rack in which it is mounted. Figure 1–10 shows the cabinet airflow pattern for the model 310 and 410 systems. Cool air enters through the upper areas of the cabinets and warm air exits from the bottom. Figure 1–11 shows the cabinet airflow pattern for the model 610 and 612 systems. Cool air enters through the upper and lower vent areas of the cabinets and warm air exits from the rear.

The system layout must allow enough cool air to be delivered to the cabinet(s). Position the cabinet(s) so the heated air from one system is not directed into the intake airflow of other systems.

Figure 1–9   Model 110 Pedestal Cabinet Airflow Pattern

INTAKE AIRFLOW

EXHAUST AIRFLOW
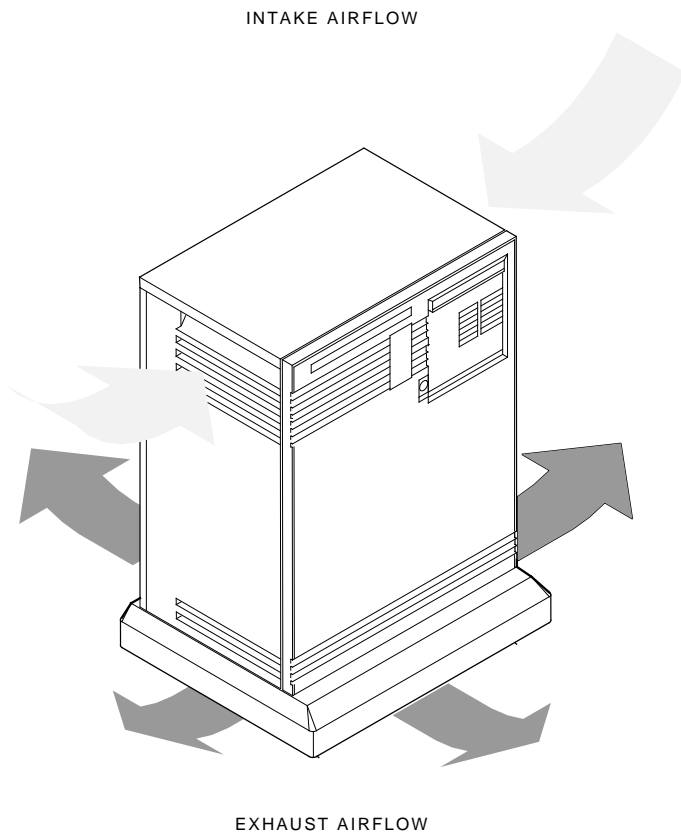
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Figure 1–10   Model 310 and 410 Cabinet Airflow Pattern

INTAKE AIRFLOW

EXHAUST AIRFLOW

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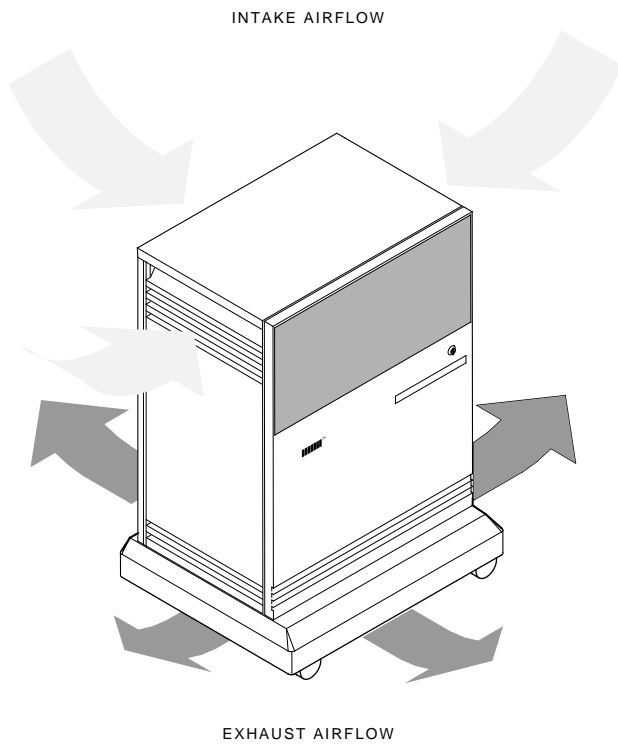
Figure 1–11   Model 610 and 612 Cabinet Airflow Pattern

INTAKE AIRFLOW
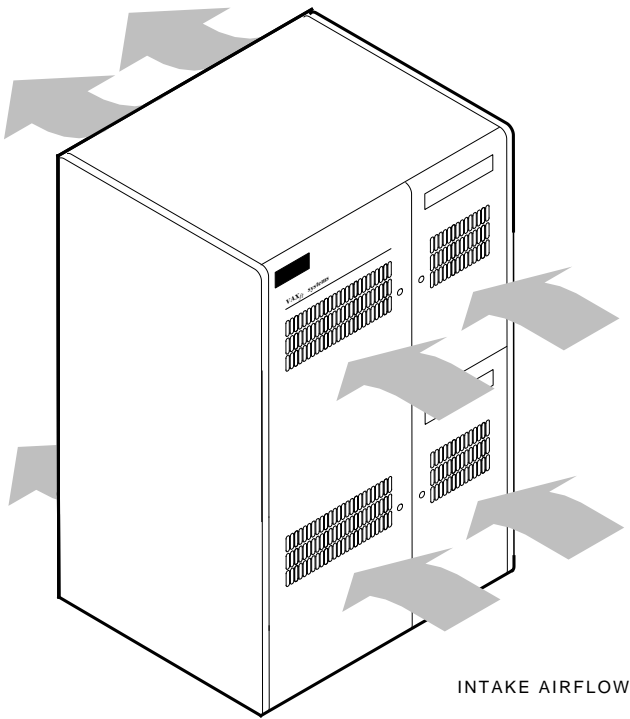
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1.2.4 Raised Floor Environment

Raised flooring is frequently used in an air-conditioned computer facility. A raised floor provides optimum cooling, and reduces hazards and obstructions caused by power cords and cabling at computer installations. The cutouts in the floor tiles must be large enough to allow the connectors to pass through them and should be rounded to protect the cables. Do not position the system directly over cool air outlets, perforations, or grills.

1.3 Environmental Limits

The limits described in this section must be observed for maximum availability.

The VAXft system is designed and tested for operation within the environmental limits shown in Tables 1–4, 1–5, and 1–6. Figure 1–12 shows the overall environmental test limits for VAXft systems.

1.3.1 Temperature and Humidity

A computer system may generate heat that cannot be dissipated without the use of air cooling equipment. The ideal computer room is capable of:

- Heating the room with all equipment off

- Cooling all equipment with all the equipment operating at maximum capacity on the warmest day

- Humidifying/dehumidifying the room within predetermined limits under all anticipated weather conditions

Low humidity allows static electricity to build up, while high humidity promotes corrosion. Both can affect storage media and should be avoided (Figure 1–12).

Temperature and humidity should be monitored and recorded at all times. The relative humidity may be increased or decreased, as necessary, using humidification/dehumidification equipment.

Figure 1–12   Psychrometric Chart

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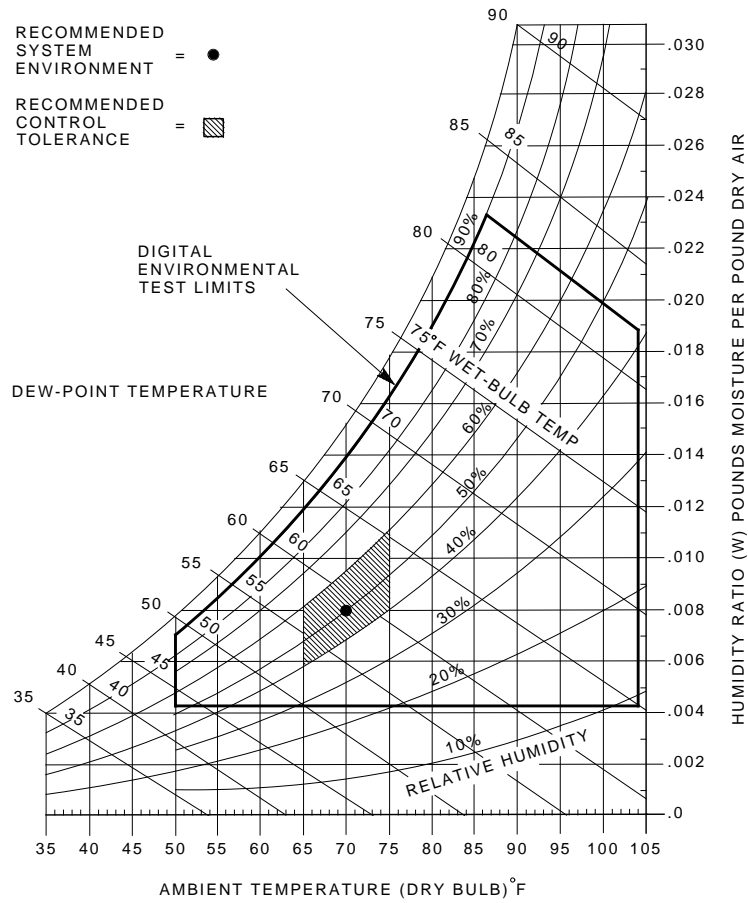
Table 1–4   Model 110 Environmental Limits

Specification	Value
Temperature:	
Operating, test[1]	10°C to 40°C (50°F to 104°F)
Operating, nominal[2]	18.3°C to 24.0°C (65°F to 75°F)
Nonoperating	-40°C to 66°C (-40°F to 151°F)
Relative humidity:	
Operating, test[1]	10% to 90% (noncondensing)
Operating, nominal[2]	40% to 90% (noncondensing)
Nonoperating	10% to 95% (noncondensing)
Maximum wet-bulb temperature	28°C (82°F)
Minimum dew point temperature	2°C (36°F)
Heat dissipation	1075 Btu typical per cabinet per hour
Shock:	
Operating	7.5 g vertical for 10 milliseconds
Nonoperating	8 in at 20.32 cm vertical for 1.01 milliseconds
Vibration:	
Operating	5.25 g at 500 Hz maximum
Nonoperating	1.19 g rms at 5 Hz to 300 Hz vertical; 5 Hz to 200 Hz longitudinal
Operating altitude[3]	Sea level to 2.4 km (8000 ft)

[1]These limits indicate the broad range of conditions under which Digital Equipment Corporation devices are tested and are not to be construed as the recommended operating or storage environments.

[2]Recommended operating limits.

[3]If operation is above 2.4 km, decrease the operating temperature by 1.8°C per additional 1000 m (1°F per additional 1000 ft) above sea level.

Table 1–5   Model 310 and 410 Environmental Limits

Specification	Value
Temperature:	
Operating, test[1]	10°C to 40°C (50°F to 104°F)
Operating, nominal[2]	18.3°C to 24.0°C (65°F to 75°F)
Nonoperating	-40°C to 66°C (-40°F to 151°F)
Relative humidity:	
Operating, test[1]	10% to 90% (noncondensing)
Operating, nominal[2]	40% to 60% (noncondensing)
Nonoperating	10% to 95% (noncondensing)
Maximum wet-bulb temperature	28°C (82°F)
Minimum dew point temperature	2°C (36°F)
Heat dissipation	2561 Btu maximum per cabinet per hour
Shock:	
Operating	10 g vertical for 10 milliseconds
Nonoperating	20 g vertical for 10 milliseconds
Vibration:	
Operating	0.254 mm (0.010 in) double amplitude at 5 to 30 Hz; 0.5 g at 30 to 500 Hz
Nonoperating	1.4 g rms at 10 to 300 Hz vertical; 0.687 g rms at 10 to 200 Hz horizontal and lateral
Operating altitude[3]	Sea level to 2.4 km (8000 ft)

[1]These limits indicate the broad range of conditions under which Digital Equipment Corporation devices are tested and are not to be construed as the recommended operating or storage environments.

[2]Recommended operating limits.

[3]If operation is above 2.4 km, decrease the operating temperature by 1.8°C per additional 1000 m (1°F per additional 1000 ft) above sea level.

Table 1–6   Model 610 and 612 Environmental Limits

Specification	Value
Temperature:	
Operating, test[1]	10°C to 40°C (50°F to 104°F)
Operating, nominal[2]	18.3°C to 24.0°C (65° to 75°F)
Nonoperating	-40°C to 66°C (-40°F to 151°F)
Relative humidity:	
Operating, test[1]	10% to 90% (noncondensing)
Operating, nominal[2]	40% to 60% (noncondensing)
Nonoperating	10% to 95% (noncondensing)
Maximum wet-bulb temperature	28°C (82°F)
Minimum dew point temperature	2°C (36°F)
Heat dissipation	2561 Btu maximum per cabinet per hour
CPU cabinet	6826 Btu per hour per cabinet
Expander cabinet	3413 Btu per hour per cabinet
Shock:	
Operating	10 g vertical for 10 milliseconds
Nonoperating	Incline impact on four sides for 1 millisecond (3.25 feet per second)
	Two tilt drops of 20.3 cm (8.0 in)
Vibration:	
Operating	0.254 mm (0.010 in) double amplitude at 5 to 22 Hz; 0.5 g at 22 to 500 Hz

[1]These limits indicate the broad range of conditions under which Digital Equipment Corporation devices are tested and are not to be construed as the recommended operating or storage environments.

[2]Recommended operating limits.

Table 1–6   (Continued)   Model 610 and 612 Environmental Limits

Specification	Value
Nonoperating	1.4 g rms at 10 to 300 Hz vertical; power spectral density 0.029 Hz^2 from 10 to 50 Hz with 8 dB octave rolloff from 50 to 300 Hz
	0.687 g rms at 10 to 200 Hz longitudinal and lateral; power spectral density 0.007 Hz^2 from 10 to 50 Hz with 8 dB octave rolloff from 50 to 200 Hz
Operating altitude[3]	Sea level to 2.4 km (8,000 ft)

[3]If operation is above 2.4 km, decrease the operating temperature by 1.8°C per additional 1000 m (1°F per additional 1000 ft) above sea level.

1.3.2 Air Filtration

Air cleanliness is important for the reliability of the disk drives and computer logic. The air conditioning system should filter the air to minimize dust, pollen, and other air contaminants. If salt air, corrosive gases, or other pollutants are present, special chemical filtering may be required. In this case, consult a specialist in air conditioning and electronic corrosion. Figure 1–13 shows some common air contaminants in relation to a typical disk head.

1.3.3 Shock and Vibration

The VAXft system is constructed to withstand normal intermittent building vibrations (Tables 1–5 and 1–6). However, it is impossible to anticipate all vibration conditions that might be encountered at all computer facilities. If shock and vibration levels at the site are severe or continuous, they should be measured and discussed with a Digital environmental support engineer and/or an engineering consultant in this field.

Figure 1–13 Common Air Contaminants

CERAMIC HEAD

HUMAN HAIR
.004 in

LINT AND
DUST

FINGERPRINT
SMUDGE

ACTUAL
FLYING
HEIGHT
20–100 μ in

SMOKE
PARTICLE
250 μ in

MAGNETIC
RECORDING
SURFACE

UP TO 140 MILES PER HR.

200 μ in

DISK
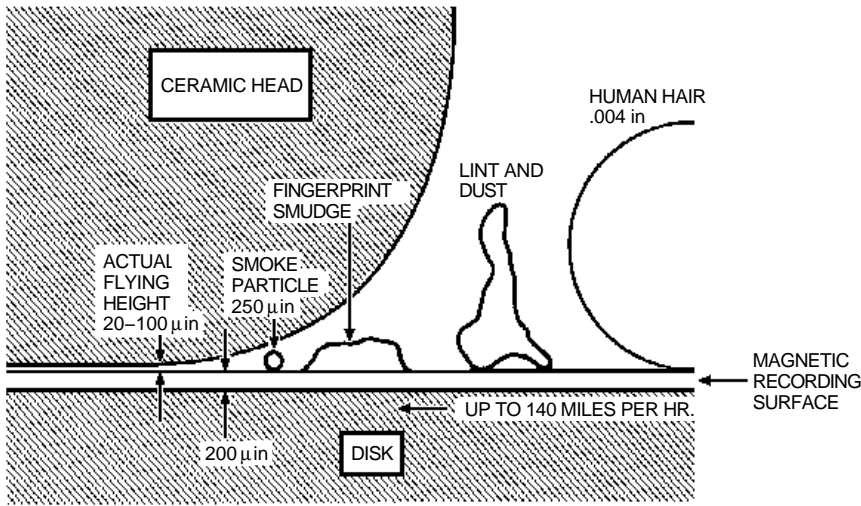
GSF_1918_89.RAGS

1.4 Power Requirements

The model 110, 310, and 410 systems are designed to operate on either of
two types of single-phase ac power at 47 to 63 Hz:

- 120 Vac (nominal)

- 220 or 240 Vac (nominal)

The model 610 and 612 systems are designed to run on three-phase ac
power at 49 to 61 Hz:

- 120 Vac (nominal)

- 220 or 240 Vac (nominal)

1.4.1 Power Distribution

To maintain hardware redundancy, a separate, dedicated circuit is required for each zone (Figures 1–14 and 1–15). Table 1–7 lists the ac power requirements of the model 110 cabinet. Table 1–8 lists the ac power requirements of the model 310 and 410 cabinets. Table 1–9 lists the ac power requirements of the model 610 and 612 cabinets.

The recommended power source includes three additional, unused circuits for future equipment expansion. The electrical system must also conform to applicable national and local codes and ordinances.

Convenience outlets are not provided in the cabinets. Separate circuits are required for each terminal, modem, printer, or any other additional piece of equipment connected to the system.

An independent, uninteruptable, auxiliary power source should be considered for one of the following circumstances:

- Console terminals and modems to provide console support during temporary power outages

- Entire system as a safeguard against prolonged power failures

During a total power failure, the battery backup in the model 310, 410, 610, and 612 cabinets supports all internal components (including logic modules and drives) for a minimum of 30 minutes. (The model 110 system does not have a battery backup.) Battery backups do not support any external devices such as console terminals, user terminals, modems, or printers.

The VAXft system design ensures satisfactory operation on the line power supplied by most power companies. However, there are many outside variables over which neither Digital Equipment Corporation nor the power companies have any control.

Figure 1–14   Model 110, 310, and 410 System Power Distribution

BULK DISTRIBUTION OR
AUXILIARY POWER PANEL
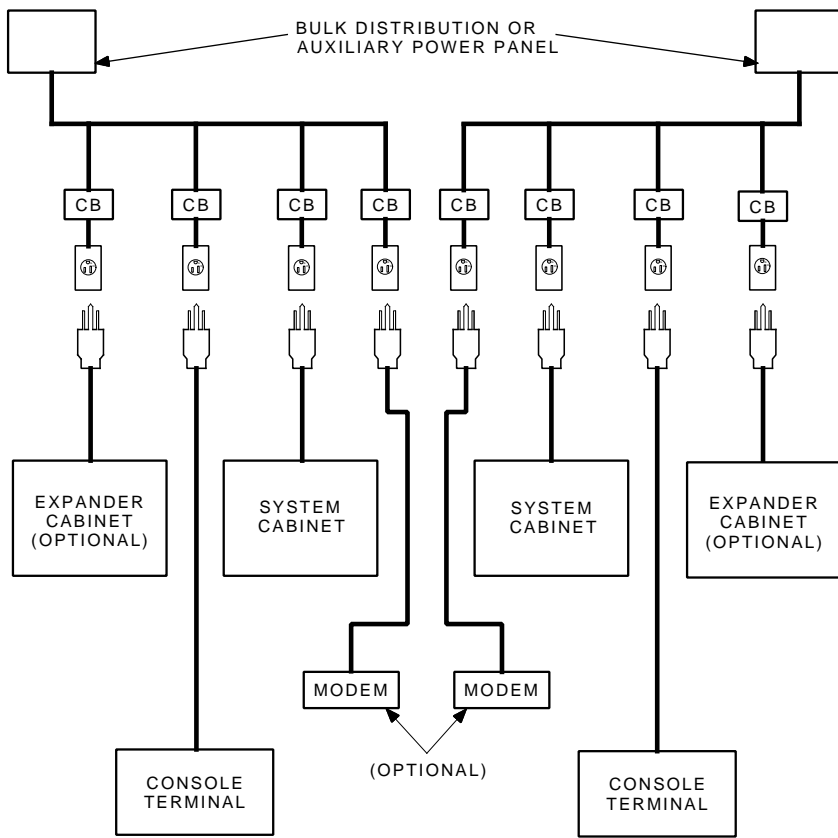
CB = CIRCUIT BREAKER: 20 A @ 120 Vac OR 10 A @ 240 Vac

= POWER RECEPTACLE:

NOTE: ALL OUTLETS TO THE SYSTEM COMPONENTS MUST BE
      CONNECTED TO THE SAME GROUND REFERENCE
      (GREEN OR GREEN-YELLOW WIRE) IN THE
      AC DISTRIBUTION SYSTEM.

MR-0639-91DG

Table 1–7   Model 110 Power Requirements

Specification	Value
120 Vac installations:	
Voltage range	88 to 132 Vac (rms)
Frequency	47 to 63 Hz
Phase type	Single-phase
Power dissipation	730 W maximum per cabinet
	315 W typical per cabinet
Heat dissipation	315 Btu typical per cabinet per hour
	2500 Btu maximum per cabinet per hour
Steady state current	5.4 A (rms) at 120 Vac
Power cord	3-wire
Power connector	NEMA no. 5-15P
220 or 240 Vac installations:	
Voltage range	190 to 256 Vac (rms)
Frequency	47 to 63 Hz
Phase type	Single-phase
Power dissipation	730 W maximum per cabinet
	315 W typical per cabinet
Heat dissipation	315 Btu typical per cabinet per hour
	2500 Btu maximum per cabinet per hour
Steady state current	2.0 A (rms) at 240 Vac
Power cord	3-wire
Power connector	NEMA no. 6-15P

Table 1–8   Model 310 and 410 Power Requirements

Specification	Value
120 Vac installations:	
Voltage range	90 to 128 Vac (rms)
Frequency	47 to 63 Hz
Phase type	Single-phase
Power dissipation	750 W maximum per cabinet
	375 W typical per cabinet
Heat dissipation	2561 Btu maximum per cabinet per hour
Steady state current	8.9 A (rms) at 120 Vac
Power cord	3-wire
Power connector	NEMA no. 5-15P
220 or 240 Vac installations:	
Voltage range	190 to 256 Vac (rms)
Frequency	47 to 63 Hz
Phase type	Single-phase
Power dissipation	750 W maximum per cabinet
	375 W typical per cabinet
Heat dissipation	2561 Btu maximum per cabinet per hour
Steady state current	4.9 A (rms) at 240 Vac
Power cord	3-wire
Power connector	NEMA no. 6-15P

Figure 1–15   Model 610 and 612 System Power Distribution
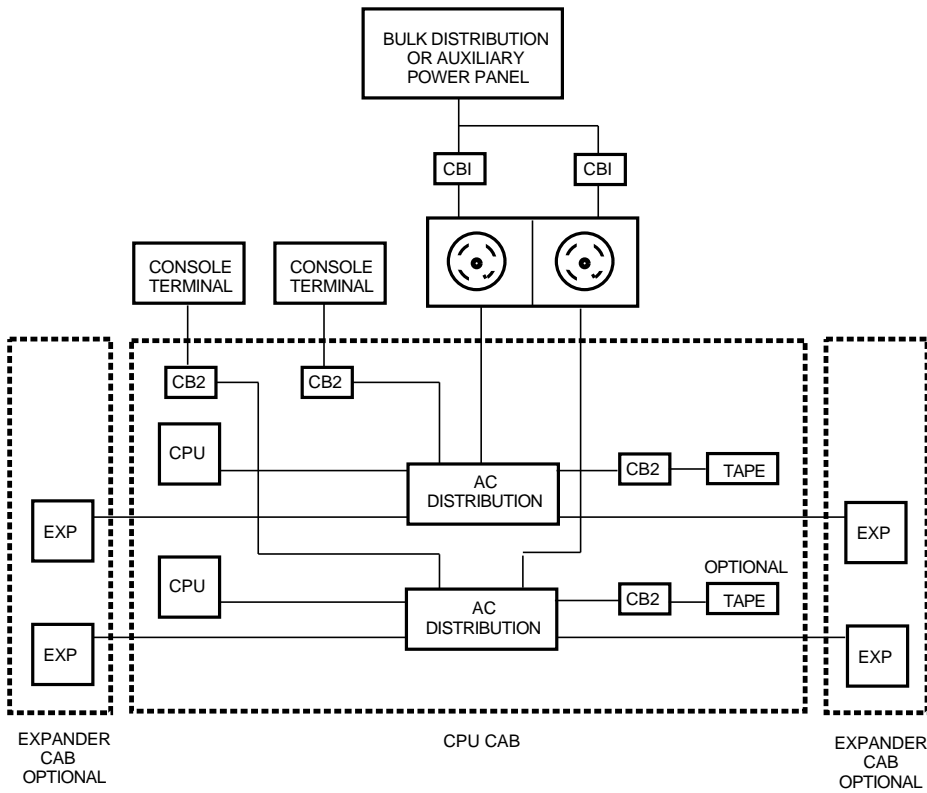
ZKO–050–000079–15–RGS

Table 1–9   Model 610 and 612 Power Requirements

Specification	Value
120 Vac installations:	
Voltage range	90 to 128 Vac (rms)
Frequency	49 to 61 Hz
Phase type	3-phase wye, 5-wire with neutral and ground
Power dissipation	2000 W maximum per system cabinet with two zones; includes power losses from two console terminals
	1000 W per expander cabinet
Heat dissipation	6826 Btu maximum per system cabinet per hour
	3413 Btu per expander cabinet per hour
Steady state current at 120 Vac:	
Phase A	10 A
Phase B	10 A
Phase C	10 A
Neutral	17.3 A
Power cord	5-wire, 10 awg
Power connector	NEMA no. L21-30P plug, NEMA no. L21-30R receptacle
220 or 240 Vac installations:	
Voltage range	190 to 250 Vac (rms)
Frequency	49 to 61 Hz
Phase type	3-phase wye, 5-wire with neutral and ground
Power dissipation	2000 W maximum per system cabinet with two zones; includes power losses from two console terminals
	1000 W per expander cabinet

Table 1–9 (Continued) Model 610 and 612 Power Requirements

Specification	Value
Heat dissipation	6826 Btu maximum per system cabinet per hour
	3413 Btu per expander cabinet per hour
Steady state current at 120 Vac:	
Phase A	5 A
Phase B	5 A
Phase C	5 A
Neutral	8.7 A
Power cord	5-wire, 12 awg
Power connector	Hubbel 516P6W plug, Hubbel 516R6W receptacle

Receptacles and circuit breakers should be installed and tested by a licensed electrician prior to the delivery of the system to the computer facility. To guard against possible malfunctions from externally radiated or conducted transient voltages, or from electrical signals superimposed on the power lines, power distribution within the facility should comply with the following requirements:

- Each piece of equipment must receive single-phase ac power through a single, dedicated power receptacle and circuit breaker of the recommended value (Figures 1–14 and 1–15). No other equipment or loads may be connected to these circuits.

- All ac power must come from the same bulk distribution panel to ensure reliable operation. If the building has dedicated lines for auxiliary power or a backup generator, the power should come from that source.

- The same ground point must be used in all circuits to the system and to any equipment connected to it. This ensures the ground (earth) references for all equipment are at the same potential. For 120 Vac installations, the potential between neutral and ground (earth) should be no greater than 1 Vac at each receptacle. In Europe, apply local standards and codes.

If circuit problems exist, rewiring or rerouting of the circuits may be necessary.

1.4.2 Electrical System

The electrical system within the facility should comply with the following requirements:

- The power distribution panel must be easily accessible, or a master switch or circuit breaker provided, to remove all power to the computer facility in the event of an emergency.

CAUTION
Turning off the master switch or circuit breaker on a model 310, 410, 610, and 612 does not immediately shut down the VAXft system. The system is designed to continue normal operation on battery power for a minimum of 30 minutes.

The circuit breaker to each zone in the VAXft configuration must be placed in the off (down) position to remove battery power within the zone.

- The electrical system must be stable and free from electrical noise and transients. Do not connect electric motors, air conditioners, office copiers, or convenience outlets to the same circuits or panels where the system components are connected. If power disturbances cannot be avoided, power conditioning equipment may be required.

- Single-point grounding is required. This is important if the building power supplies heavy-duty electrical equipment or machinery. The ground terminals from the receptacles shown in Figures 1–14 and 1–15 must be connected to the building ground only at the distribution panel. No equipment connected to the VAXft system should be connected to any other electrical box, conduit, or water pipe that could cause heavy ground currents to flow during an electrical malfunction in another part of the building.

1.4.3 Feed Line Capacity/Circuit Breaker Size

Figure 1–14 shows the recommended power distribution method from the bulk distribution panel for the model 110, 310, and 410 systems. Each feed line must supply the following single-phase currents through a circuit breaker of the same rating:

- 120 Vac lines: one 15 A circuit with a 15 A breaker for each model 110 device

- 120 Vac lines: one 20 A circuit with a 20 A breaker for each model 310 and 410 device

- 240 Vac lines: one 10 A circuit with a 10 A breaker for each device

Figure 1–15 shows the recommended power distribution method from the bulk distribution panel for the model 610 and 612 systems. Each feed line must supply the following 3-phase currents through a circuit breaker of the same rating:

- 120 Vac lines: one 20 or 25 A circuit with a 20 or 25 A breaker for each ac distribution box

- 240 Vac lines: one 12.5 A circuit with a 12.5 A breaker for each ac distribution box

When selecting circuit breakers, use the guidelines listed in Table 1–10 to allow for power-on surge and stabilization.

Table 1–10   Recommended Circuit Breaker Trip Delay Times

Percent of Rated Current	Minimum Time to Trip (Seconds)
125	13.0
150	6.0
200	2.1
400	0.46
600	0.03
800	0.013
1000	0.01

1.4.4 AC Power Connectors

Figure 1–16 shows the single-phase plug and receptacle configurations for the power cords provided with the model 110, 310, and 410 systems. Figure 1–17 shows the 3-phase plug and receptacle configurations for the power cords provided with the model 610 and 612 systems. Digital does not supply circuit breakers, power receptacles, or other items that may be purchased locally.

Figure 1–16   Model 110, 310, and 410 AC Power Connectors

SOURCE	PLUG	RECEPTACLE
120 V 15 A 1-PHASE	HUBBEL #6255-C NEMA #5-15P DEC #90-08938	#5262 5-15R 12-05351
240 V 15 A 1-PHASE	NEMA #6-15P DEC #90-08853	6-15R 12-11204

MR_X1409_89.DG

CAUTION

To install a Hubbel #2811 plug into a Hubbel #2810 receptacle, push them together and twist the receptacle to the right until it locks. This prevents inadvertent disconnection.

To install a Hubbel #516P6W plug into a Hubbel #516R6W receptacle, push them together, and then push the receptacle's locking sleeve up and to the right until it locks. This prevents inadvertent disconnection.

Other outlet types or configurations are available with country kits.

Figure 1–17   Model 610 and 612 AC Power Connectors

RATING	PLUG	RECEPTACLE
120 V / 208 V 30 A 3-PHASE 5 WIRE	HUBBEL #2811 5 PIN NEMA #L21-30P TWIST LOCK 30 A DEC #12-12314-00	HUBBLE #2810 NEMA L21-30R TWIST LOCK DEC #12-12315-01
240 V / 415 V 16 A 3-PHASE 5 WIRE	HUBBLE #516P6W IEC 389 DEC #12-14379-04	HUBBLE #516R6W IEC 309 DEC #12-14378-04

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Part 2

2

Unpacking and Inspecting the Model 110 System

This chapter describes how to unpack and inspect the model 110 cabinet and options and explains what to do if there is a problem. This chapter includes:

- Inspecting the shipment

- Unpacking the options

- Opening the shipping cartons

- Unpacking the cabinets

2.1 Inspecting the Shipment

The computer cabinet and all items included with the shipment should be moved to the installation area before you start unpacking. Make sure the installation area provides a firm surface for the system to rest on. The floor must allow full exhaust airflow from the bottom of the cabinets. Soft surfaces such as shag or deep-pile carpeting must be avoided unless a firm surface (like floor tiles) is installed on top of the carpeting.

Be sure you have everything before you begin to unpack any equipment:

1. Refer to the product delivery document to make sure you received the correct number of shipping cartons.

2. If any cabinet or option is missing or damaged, report it on the labor activity reporting system (LARS). Include a note to clarify the extent of the problem. Then notify the customer and responsible Customer Services manager.

NOTE

If there is a problem, stop the installation until the customer notifies the carrier or insurance company and gives you permission to continue.

2.2 Unpacking the Options

1. Check each carton for external damage (dents, holes, crushed corners, water marks).

2. Open each carton. Compare the contents of the carton to the items listed on the side of the carton (including power cord, interface cable, and documentation). If any item is missing, report it on LARS. Then notify the customer and responsible Customer Services manager.

3. Look for damaged items. If you notice any damage, report it on LARS. Include a note to clarify the extent of the problem. Then notify the customer and responsible Customer Services manager.

NOTE

If there is a problem, stop the installation until the customer notifies the carrier or insurance company and gives you permission to continue. Save the cartons and packing material in case you need to return an item.

2.3 Opening the Shipping Cartons

Open the shipping carton for each of the computer cabinets:

1. Check each carton for external damage (dents, holes, crushed corners, water marks).

2. See Figure 2–1. Open the top of the shipping carton by cutting the shipping straps and the tape holding the carton flaps.

3. Remove the accessories tray and all of the accessories. Compare the contents of each carton to the items listed on the side of the carton. If any item is missing, report it on LARS. Then notify the customer and responsible Customer Services manager.

4. Remove both top cushions. Then remove the shipping carton by lifting it up and over the cabinet.

Figure 2–1   Opening the Model 110 System Cabinet Shipping Carton

Accessories
Tray

Shipping
Carton

Bar Code
Labels

Top
Cushions

Unloading
Ramp

Bottom
Cushions

Door
(Pedestal
Only)

Shipping
Straps

MR-0654-91DG
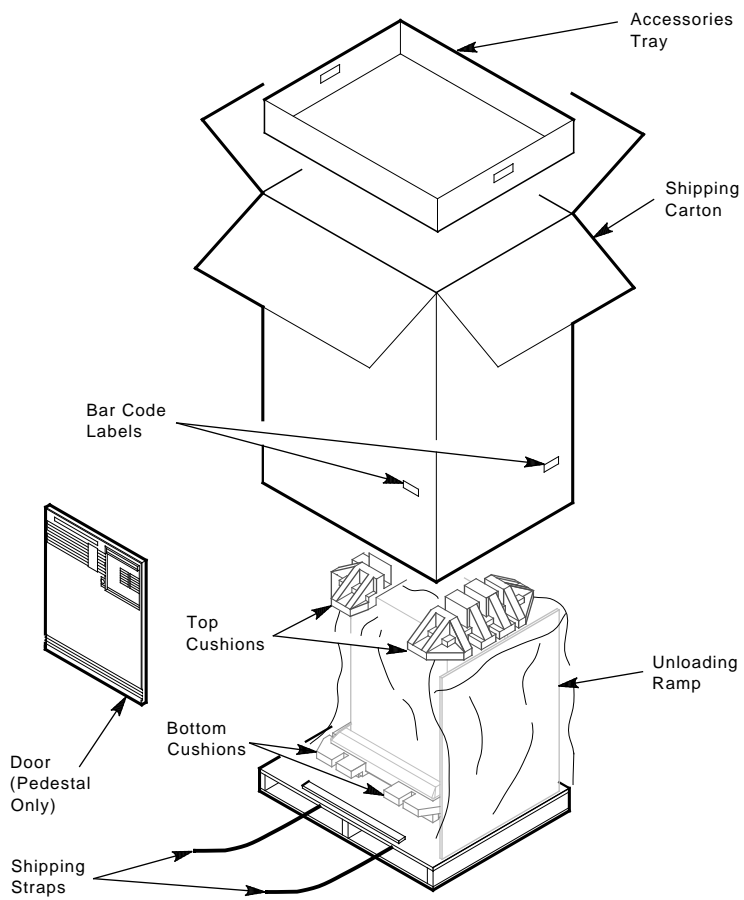
2.4   Unpacking the Cabinet

Remove each computer cabinet from its shipping skid:

1. See Figure 2–2. The unloading ramp is attached by hinges to the top platform on the skid. Grasp the ramp and lower it to the floor (unloading position).

2. Remove the packing materials from around the base and the plastic bag that covers the cabinet.

3. Look for cabinet damage. If you notice any damage, report it on LARS. Include a note to clarify the extent of the problem. Then notify the customer and responsible Customer Services manager.

NOTE
If there is a problem, stop the installation until the customer notifies the carrier or insurance company and gives you permission to continue. Save the cartons and packing material in case you need to return a cabinet.

4. Carefully guide the cabinet down the ramp.

WARNING
A fully loaded pedestal system may weigh as much as 69 kg (151 lb). A rackmount system may weigh as much as 61 kg (135 lb). These systems are too heavy to be handled by one person. At least two two people are required to move a cabinet. Do not allow the cabinet to roll uncontrolled down the ramp.

5. See Figure 1–1. Place the system cabinet in the center of the installation area.

Figure 2–2   Unpacking a Model 110 System Cabinet
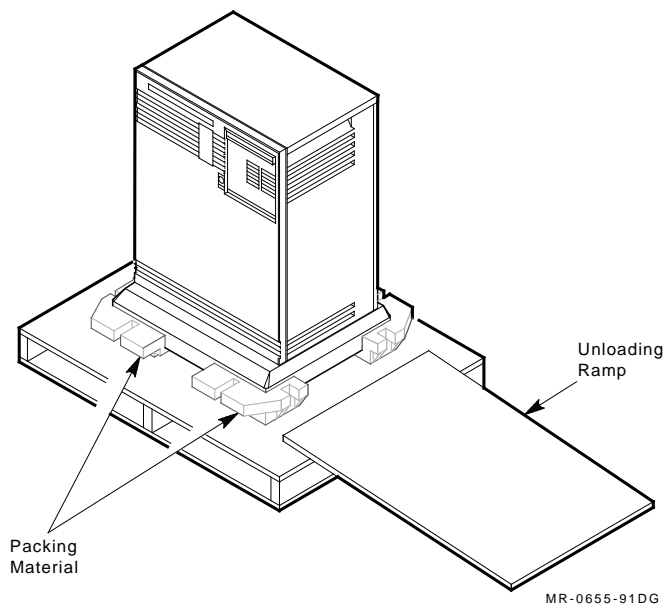
MR-0655-91DG

3

Installing the Model 110 System

This chapter describes how to install, power up, and verify the operation of the VAXft model 110 system.

CAUTION
To avoid damage to the system, do not plug it into a power source until instructed to do so.

NOTE
These installation procedures apply to the VAXft model 110 pedestal system. Appendix E provides the installation procedures for the rackmount system.

3.1 Hardware Installation

After you verify the installation site and unpack the system, install the VAXft model 110 system hardware. Follow this sequence:

- Section 3.1.1, Removing the Base Cap

- Section 3.1.2, Ensuring Correct AC Operating Voltage

- Section 3.1.3, Checking the Logic Modules

- Section 3.1.4, Installing Module Options

- Section 3.1.5, Installing the Cross-Link Cables

- Section 3.1.6, Connecting the System to Facility Power

- Section 3.1.7, Applying Power to the System

3.1.1 Removing the Base Cap

The base cap is located on the front of the base and is held in place by
spring latches. To remove the base cap, steady the system with one hand,
grasp the center of the base cap, and pull it straight out from the base
(Figure 3–1). Removing the base cap makes installing the cabling easier.

Figure 3–1   Removing the Base Cap

BASE
CAP
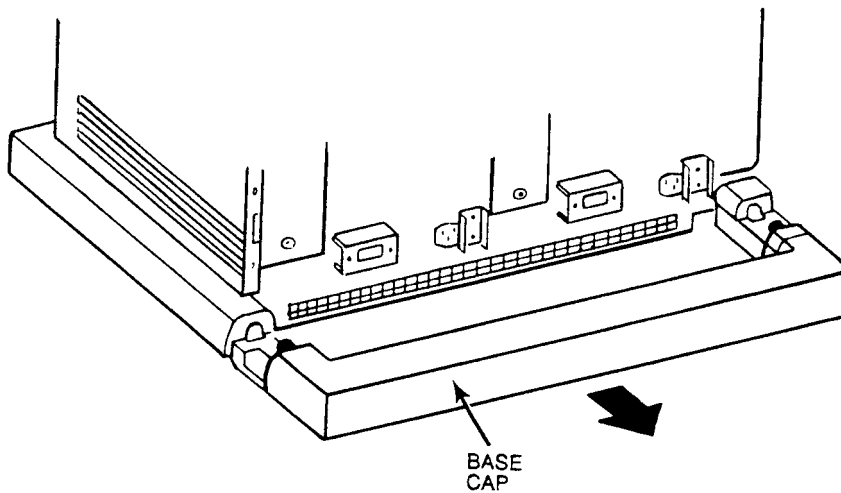
CS-8835

3.1.2 Ensuring Correct AC Operating Voltage

The model 110 system is shipped as a 120 Vac or 240 Vac system. The 120
Vac system has a fan assembly and power supply (PN H7868-A) suitable
for 120 Vac operation. The 240 Vac system has a fan assembly and power
supply (PN H7868-B) suitable for 240 Vac operation.

The label covering the ac power receptacle specifies the ac operating
voltage (120 Vac or 240 Vac). Make sure that the operating voltage on the
label matches the operating voltage available at the installation site.

3.1.3 Checking the Logic Modules

Check the placement of the logic modules in the system. Also check the settings on the system I/O controller modules (Figures 3–2 and 3–3).

If you remove any modules, use the module removal and replacement procedure in Appendix A.

CAUTION
An ESD wrist strap must be worn during the following procedures. Appendix A provides module handling, removal, and installation/replacement procedures.

Figure 3–2   Model 110 Logic Module Placement

PRIMARY SYSTEM I/O
CONTROLLER MODULE

PROCESSOR
MODULE

1/4 – TURN
FASTENER

ASSIST
LEVER

MEMORY MODULE 1

MEMORY MODULE 2
OR WAN MODULE

MEMORY MODULE 3
OR WAN MODULE

1   2   3   4   5
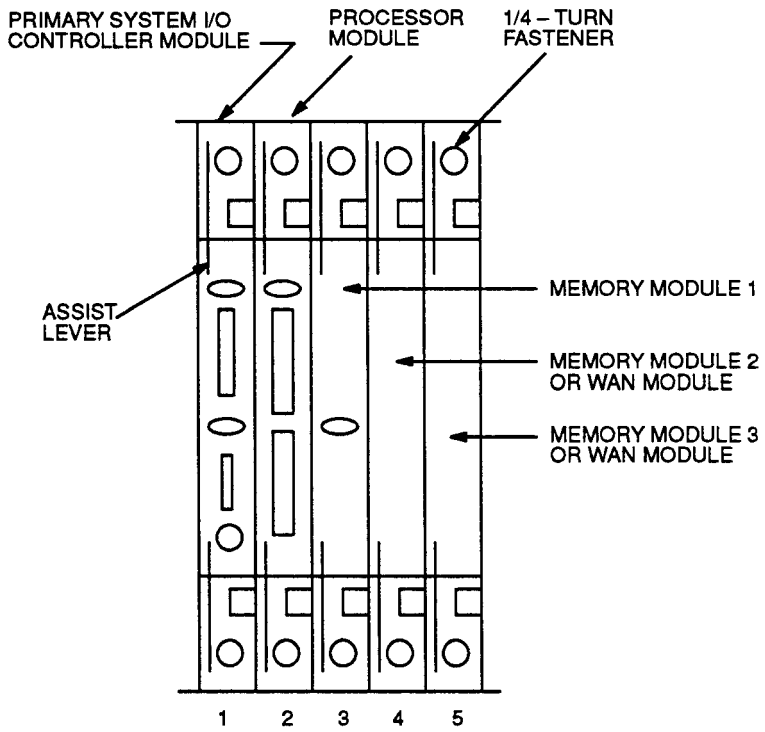
CS–8781

Figure 3–3   Model 110 System I/O Controller Module Settings

DSSI
JUMPER
PLUGS

DSSI
TERMINATOR
PLUG

THICKWIRE
CONNECTOR

ThinWire
CONNECTOR

1   THICKWIRE

2   ThinWire

Ethernet
SWITCH

MR-0174-90.DG
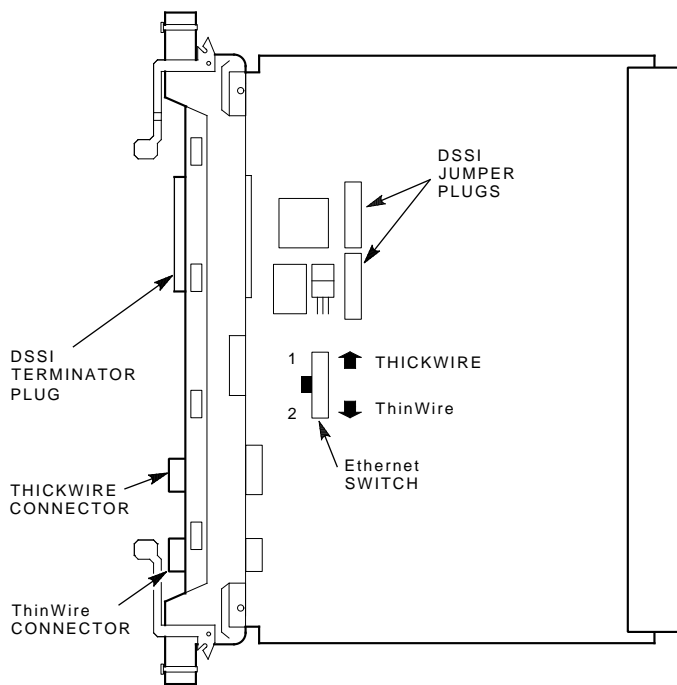
3.1.3.1 Module Placement

Table 3–1 describes the logic modules and their locations in the system backplanes. The types and complements of memory modules must be the same in both zones of the cabinet. Figure 3–2 shows the correct placement of the logic modules in the system backplane of each zone.

Table 3–1   Model 110 Logic Modules

Slot	Module	Description
1	T3001 [1]	Primary KFE52 system I/O controller module
2	T3005-BA [1]	KA510 processor module
3	T3003 [1]	First MS520 memory module
4	T3003 or T3004	Second MS520 memory module (optional) or wide area network (WAN) module (optional)
5	T3003 or T3004	Third MS520 memory module (optional) or WAN module (optional)

[1]Slots 1, 2, and 3 contain the primary system I/O controller module, a processor module, and a memory module. This is the minimum required for operation.

NOTE

Unused module slots require a T3999 filler module to maintain cooling airflow. The module handles also maintain ground continuity to meet FCC regulations and provide electrostatic discharge (ESD) protection.

3.1.3.2 System I/O Controller Module Settings

System I/O controller modules are shipped with the correct DSSI jumper plug states (installed or removed) for the system. The Ethernet switch is set to the traditional (thickwire) position. Use the procedures in this section to check or change the DSSI jumper plugs or the Ethernet switch.

Figure 3–3 identifies the DSSI terminator, DSSI jumper plugs, and Ethernet switch on the system I/O controller module. A primary system I/O controller module is located in slot 1 in each zone of the VAXft model 110 cabinet.

- The DSSI terminator and two DSSI jumper plugs must be:

  — In place on the system I/O controller in slot 1 to enable the internal DSSI bus

- If the module is to be connected to an Ethernet, set the Ethernet switch as follows:

  — Position 2 (down) for ThinWire applications

  — Position 1 (up) for traditional (thickwire) applications (factory default setting)

3.1.4 Installing Module Options

If you are installing any module at this time (T3003 expanded memory), use the module removal and replacement procedure described in Appendix A.

If you are installing the wide area network (WAN) module option, refer to Appendix B for the DEC WANcontroller 620 installation procedure and Y-box connections.

3.1.5 Installing the Cross-Link Cables

The cross-link cables connect between the processor modules in slot 2 of zone A and slot 2 of zone B in the cabinet.

NOTE
The upper and lower connectors on the processor modules are arranged so that the cables cannot be installed incorrectly. The connectors must be plugged in with the cable routed downward as shown in Figure 3–4.

Locate the two cross-link cables (PN 17-02194-01). Then refer to Figure 3–4 and connect the cables as follows:

❶ Plug one end of the cross-link cable into the lower connector of the processor in zone A (slot 2) and secure the spring clips. Do **not** connect the other end of the cable at this time.

❷ Plug one end of the second cross-link cable into the lower connector of the processor in zone B (slot 2) and secure the spring clips.

❸ Plug the other end of the cable into the upper connector of the processor in zone A and secure the spring clips.

❹ Plug the other end of the first cable into the upper connector of the processor in zone B and secure the spring clips.

Figure 3–4   Model 110 Cross-Link Cable Connections

SYSTEM CABINET

ZONE A   ZONE B

1 2 3   4   5   1   2 3   4   5
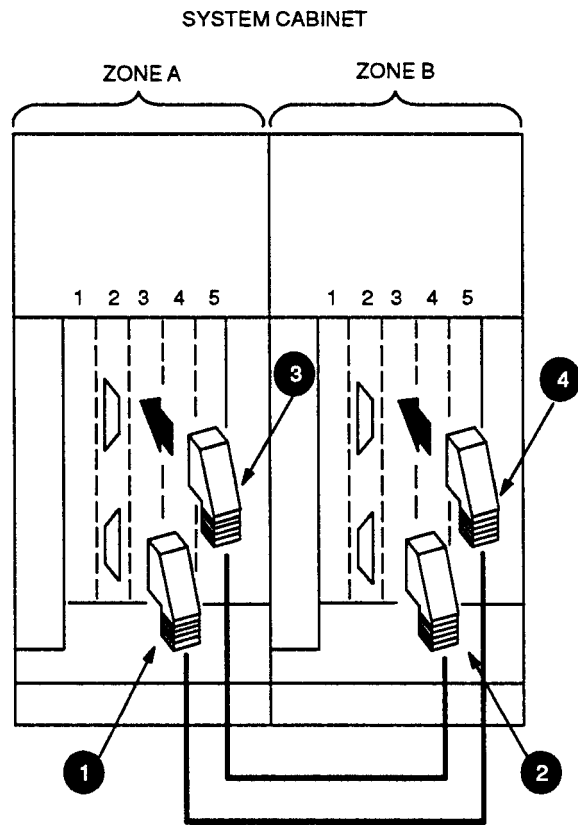
CS–8833

3.1.6 Connecting the System to Facility Power

Every terminal, modem, and printer, and any other piece of equipment connected to the system requires a dedicated power receptacle and circuit breaker. Before connecting to facility power, check the following:

• Make sure the circuit breakers for all dedicated power receptacles are set to the ON position.

• If a separate power source is provided (such as auxiliary power for the console terminals), make sure the circuit panels, breakers, and receptacles are labeled accordingly.

3.1.6.1 Connecting the Cabinet Power Cords

Refer to Figure 3–5 and connect the power cords to each zone of the model 110 system as follows:

NOTE
Before performing the first step, make sure that the power switch in each zone of the model 110 system is set to off (0).

1. Locate the label covering the ac power receptacle in each zone of the model 110 system. The labels specify the ac operating voltage needed for the system.

2. Remove and save the power cord retainer plates and attaching hardware.

3. Locate the two power cords shipped with the system. Plug the connectors into the power receptacles (one in each zone).

4. Install the two power cord retainer plates and attaching hardware you removed in step 2.

CAUTION
Before performing the next step, make sure that the electrical outlet provides the same voltage as indicated on the label covering the ac power receptacle. Also, make sure that the model 110 power switches are set to off (0).

5. Plug the pronged connector of each power cord into a dedicated power receptacle.

Figure 3–5   Model 110 Power Cord Connections

ENSURE
BOTH POWER
SWITCHES
ARE IN OFF(O)
POSITION

ZONE B

ZONE A

AC POWER
CORDS

RETAINER
PLATES

ATTACHING
HARDWARE

REMOVE

120

POWER LABEL
FROM BOTH AC
RECEPTACLES

CAUTION:
ENSURE ELECTRICAL
OUTLET PROVIDES SAME
VOLTAGE AS INDICATED
ON POWER LABEL

CS-8852
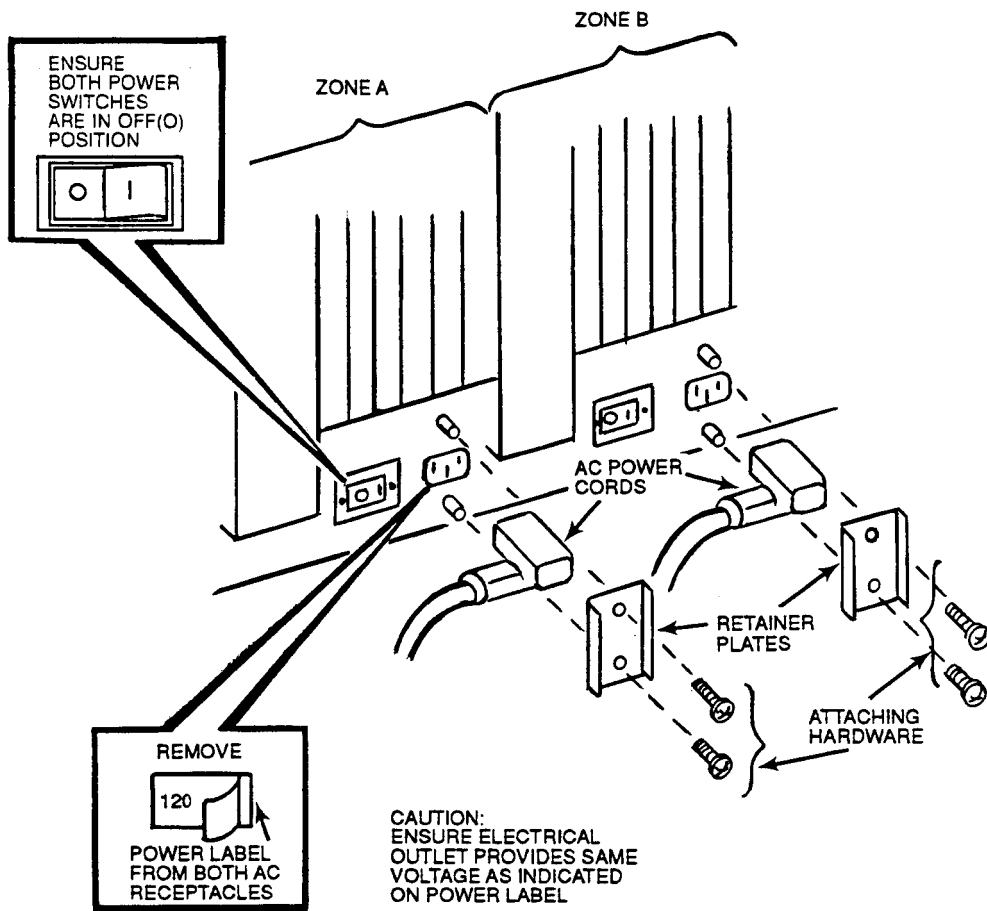
3.1.6.2 Connecting Interface Cables and Power Cords for Terminals and Modems

Connect the interface cables and power cords for the terminals and modems as follows:

1. Assemble the terminals and modems according to the documentation supplied with them.

2. Make sure the voltage selector switch is set to the correct voltage range (120 Vac or 240 Vac).

3. Make sure the power switch is set to the off (0) position.

CAUTION
An ESD wrist strap must be worn while connecting the interface cables.

4. Refer to Figure 3–6 and connect the terminal and modem interface cables to each zone of the model 110 system as follows:

   a. Route the interface cables from one terminal and modem to each zone of the VAXft 110.

   b. Plug the interface cable from the terminal into the local console terminal connector through an H8571-A passive adapter.

   c. Plug the interface cable from the modem into the remote console terminal connector.

   d. Repeat steps a. through c. to connect the interface cables going to the other zone.

5. Remove the ESD wrist strap. Plug the power cord from each console terminal and modem into a dedicated power receptacle.

6. Set the power switch on each console terminal and modem to the on (1) position.

3.1.6.3 Setting the Terminal Baud Rates

The factory default baud rate is 9600 for the local and remote terminal ports in both zones of the model 110 system. Refer to the documentation provided with the terminals for how to set the baud rates.

The available model 110 system baud rates are: 300, 600, 1200, 2400, 4800, 9600, and 19200.

Figure 3–6   Model 110 Terminal and Modem Connections

ZONE A

REMOTE
CONSOLE
TERMINAL
CONNECTOR

LOCAL
CONSOLE
TERMINAL
CONNECTOR

H8571–A

FROM
TERMINAL

FROM MODEM
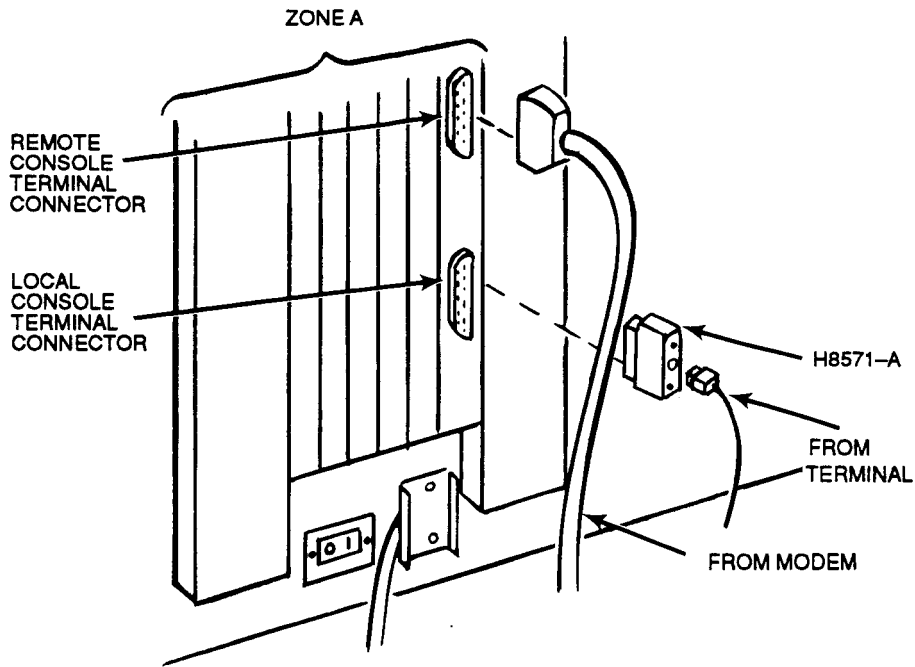
NOTE:
MAKE SAME
CONNECTIONS TO
ZONE B, WHICH IS NOT
SHOWN FOR CLARITY.

CS-8851

3.1.7 Applying Power to the System

Figure 3–7 identifies the ac power switches, magnetic fault indicators (MFIs), and LEDs in each zone.

1. Set the ac switches in zone A and zone B to on (1).

2. At the end of the power-on sequence, check all the indicators as follows:

    a. **Disk drives —** When the power-on sequence is successful, the DRIVE READY indicators of all active disk drives are lit (green) and the DC OK led is lit (green). If an error is detected within a drive, the associated DRIVE FAULT indicator is lit (red). Repair or replace the faulty drive as required.

    b. **TK70 tape drive —** When the power-on sequence is successful, the green indicator is lit (steady). If the drive fails the power-on sequence, its orange, yellow and green indicators will identify the fault. Repair or replace the faulty drive as required.

    c. **H7868 power supply —** When the power-on sequence is successful, the DC OK LED located at the top of each power supply is lit (green). If a power supply fails the power-on sequence, its DC OK LED is not lit. Repair or replace the faulty power supply as required.

    d. **Logic modules —** When the power-on sequence is successful, the MFIs (see Figure 3–7) are not lit. When an MFI is yellow, the module has a fault and must be replaced. For more information about the power-on tests, see Section 3.2. For information about module handling and removal, see Appendix A.

    e. **System I/O controller modules —** The LED indicator must be off if the two DSSI jumper plugs are installed correctly on a primary system I/O controller module in slot 1 of a base system. If the LED indicator is on, check the jumpers.

Figure 3–7   Model 110 Switches and MFIs

PROCESSOR
MODULE

WAN
MODULE

SYSTEM I/O
CONTROLLER
MODULE

MEMORY
MODULES

LED
INDICATOR

MAGNETIC
FAULT
INDICATORS

◯ = HOLE IN MODULE HANDLE
FOR VIEWING INDICATOR

POWER
SWITCHES

CS–8832
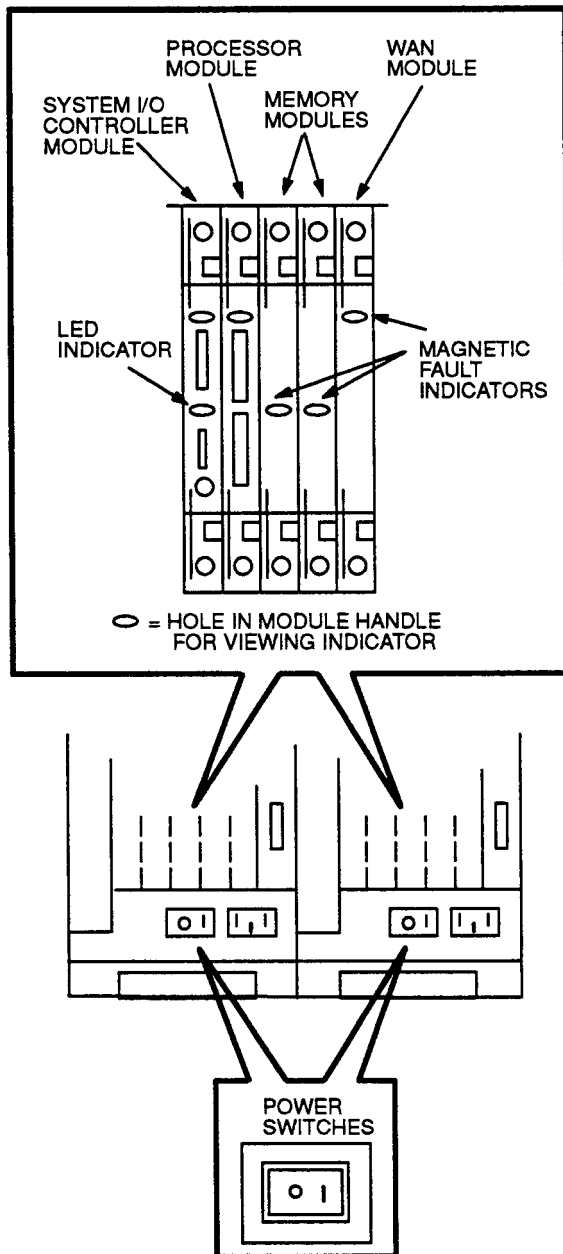
3.2 Power-On Tests

In each zone of the model 110 system, the processor, system I/O controller, and WAN modules each contain a set of ROM-based diagnostic (RBD) tests that are invoked during a power-on sequence. The processor diagnostics test the CPU, as well as the memory, zone, and system. When a failure is detected in any module, the number of the test and a brief explanation of the failure are reported to the respective console terminal.

If all tests on the processor, system I/O controller, and WAN modules are successful, each processor module performs a series of zone tests that include internal memory and I/O functions. If the zone tests are successful (no detected errors), each processor module enters a restart procedure that initializes the zone.

3.3 Final System Tests

All of the diagnostic software required by the system is provided in the RBD tests described in Section 3.2.

The RBD command description in Chapter 6 of the *VAXft Systems Owner's Manual* (EK-VAXFT1-OM) provides information and guidelines for writing DSSI parameters to the storage devices under the diagnostic/utility protocol (DUP) facility.

Run the user environmental test package (UETP) as a final check. Refer to the *VMS Upgrade and Installation Supplement: VAXft Systems* for more information on installing and booting the VMS operating system. The *VAX/VMS UETP User's Guide* describes how to log in and run UETP.

CAUTION
UETP can be configured to run write/read tests on the RF-series disks. UETP should be run only at the completion of a system installation because of the risk of corrupting data on shadowed disks. Do not run UETP without contacting the responsible customer representative or application manager.

When you are satisfied the system is operating correctly, turn it over to the responsible customer representative for installation and testing of the application software.

3.4   Installing the Front Cover and Base Cap

After you connect the cables and apply power to the pedestal system, install the front cover and base cap:

1. Refer to Figure 3–8. Insert the antistatic key (supplied with each cabinet) in the keyhole on the front cover. Turn the key to the right until it stops.

2. Position the front cover so that its brackets slide into, and rest in, the notches in the frame.

3. Push in the release latch.

4. Slide the front cover window up (see Figure 3–9).

5. To lock the cover in place, turn the key to the left until it stops.

CAUTION
Before performing steps 6 and 7, make sure that the power cords and module, interface, and cross-link cables are positioned so that they are not pinched between the base and base cap when the base cap is installed.

6. Align the locating pins of the base cap with the locating holes in the base (see Figure 3–10).

7. Push the base cap straight into the base until it snaps in place.

Figure 3–8   Unlocking and Positioning the Front Cover (Pedestal Model)

CS-8847
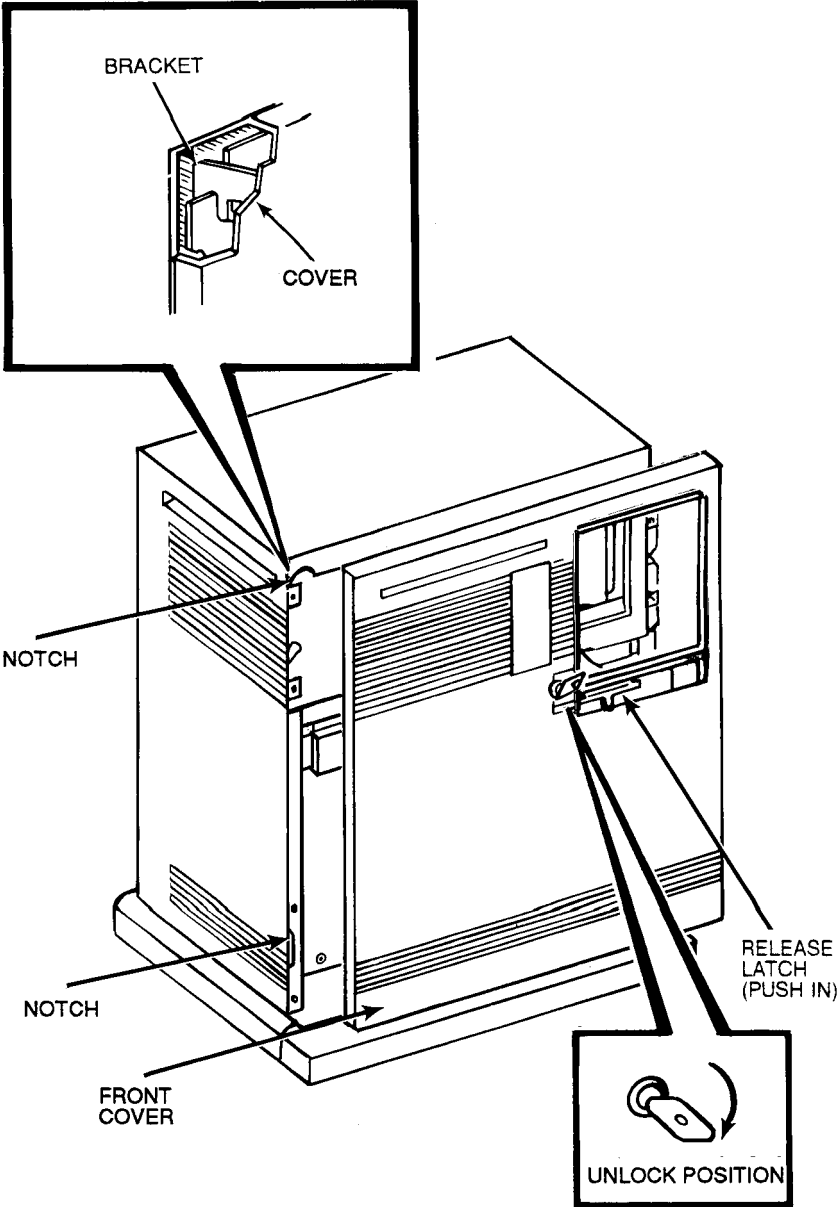
Figure 3–9   Locking the Front Cover (Pedestal Model)

WINDOW

KEY

TURN
TO LOCK
POSITION

CS-8839
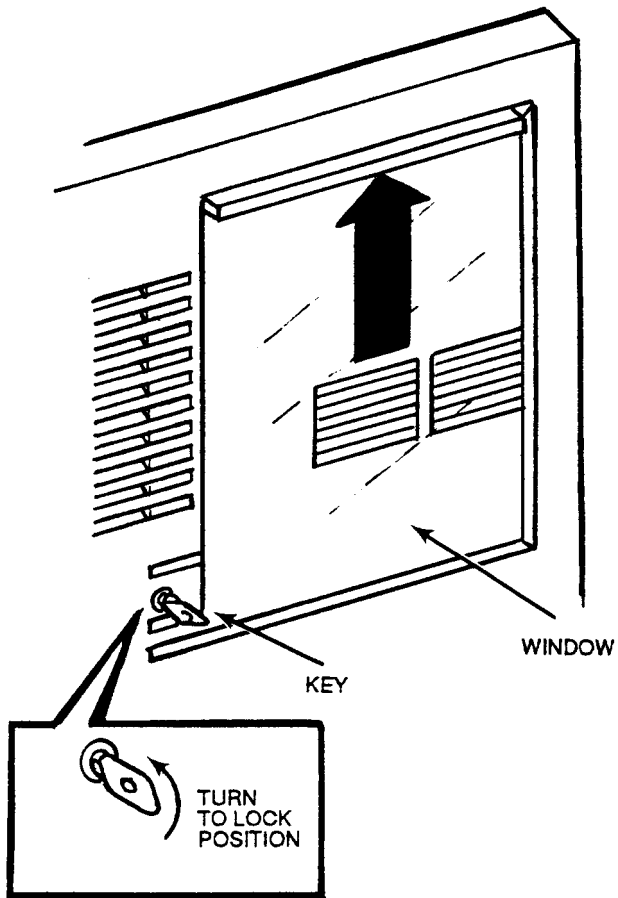
Figure 3–10   Installing the Base Cap (Pedestal Model)

BASE
LOCATING
HOLE

BASE CAP
LOCATING
PIN

BASE
CAP

CS-8834
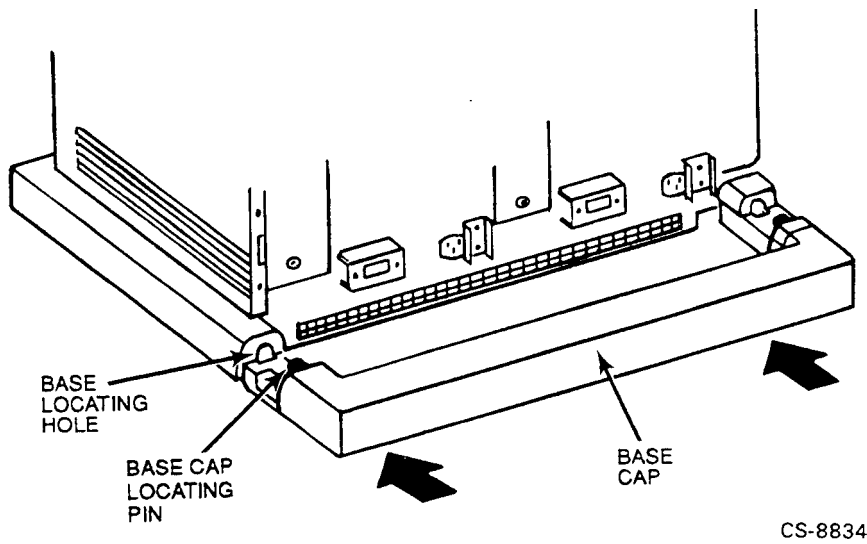
Part 3

4
Unpacking and Inspecting the Model 310 and 410 System

This chapter describes how to unpack and inspect the VAXft cabinets and options and explains what to do if there is a problem. This chapter includes:

- Inspecting the shipment
- Unpacking the options
- Opening the shipping cartons
- Unpacking the cabinets

4.1 Inspecting the Shipment

The computer cabinets and all items included with the shipment should be moved to the installation area before you start unpacking. Make sure the installation area provides a firm surface for the system to rest on. The floor must allow full exhaust airflow from the bottom of the cabinets. Soft surfaces such as shag or deep-pile carpeting must be avoided unless a firm surface (like floor tiles) is installed on top of the carpeting.

Be sure you have everything before you begin to unpack any equipment:

1. Refer to the product delivery document to make sure you received the correct number of shipping cartons.

2. If any cabinet or option is missing or damaged, report it on the labor activity reporting system (LARS). Include a note to clarify the extent of the problem. Then notify the customer and responsible Customer Services manager.

NOTE

If there is a problem, stop the installation until the customer notifies the carrier or insurance company and gives you permission to continue.

4.2   Unpacking the Options

1. Check each carton for external damage (dents, holes, crushed corners, water marks).

2. Open each carton. Compare the contents of the carton to the items listed on the side of the carton (including power cord, interface cable, and documentation). If any item is missing, report it on LARS. Then notify the customer and responsible Customer Services manager.

3. Look for damaged items. If you notice any damage, report it on LARS. Include a note to clarify the extent of the problem. Then notify the customer and responsible Customer Services manager.

NOTE

If there is a problem, stop the installation until the customer notifies the carrier or insurance company and gives you permission to continue. Save the cartons and packing material in case you need to return an item.

4.3   Opening the Shipping Cartons

Open the shipping carton for each of the computer cabinets:

1. Check each carton for external damage (dents, holes, crushed corners, water marks).

2. See Figure 4–1. Open the top of the shipping carton by cutting the shipping straps and the tape holding the carton flaps.

3. Remove the accessories tray and all of the accessories. Compare the contents of each carton to the items listed on the side of the carton. If any item is missing, report it on LARS. Then notify the customer and responsible Customer Services manager.

4. Remove both top cushions. Then remove the shipping carton by lifting it up and over the cabinet.

Figure 4–1   Opening the Model 310 and 410 System Cabinet Shipping Carton

SHIPPING
STRAPS

ACCESSORIES
TRAY

TOP
CUSHIONS

BAR CODE
LABELS

SHIPPING
CARTON

MR_X1412_89.DG
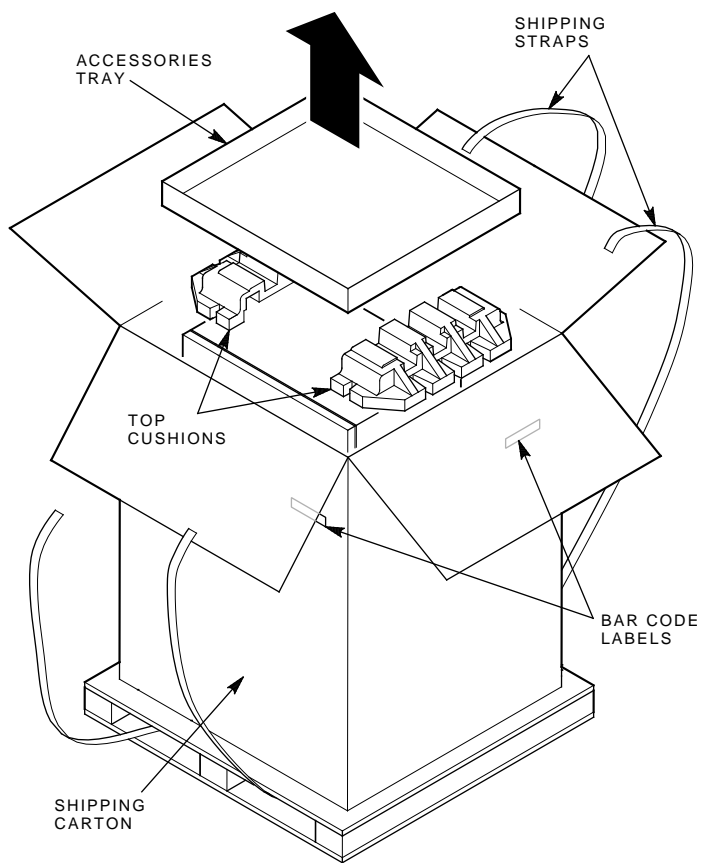
4.4   Unpacking the Cabinets

Remove each computer cabinet from its shipping skid:

1. See Figure 4–2. The unloading ramp is attached by hinges to the top platform on the skid. Grasp the ramp and lower it to the floor (unloading position).

2. Remove the packing materials from around the base and the plastic bag that covers the cabinet.

3. Look for cabinet damage. If you notice any damage, report it on LARS. Include a note to clarify the extent of the problem. Then notify the customer and responsible Customer Services manager.

NOTE
If there is a problem, stop the installation until the customer notifies the carrier or insurance company and gives you permission to continue. Save the cartons and packing material in case you need to return a cabinet.

4. Carefully guide the cabinet down the ramp.

WARNING
A cabinet may weigh as much as 118 kg (260 lb) and is too heavy to be handled by one person. At least two two people are required to move a cabinet. Do not allow the cabinet to roll uncontrolled down the ramp.

5. See Figures 1–2 and 1–3. Place the system cabinets in the center of the installation area. If expander cabinets are part of this installation, place one on each side of the system cabinets as shown in Figure 1–3.

    In Chapter 5, Figures 5–3 and 5–4 show the layout of the system and expander cabinets. The preferred configuration places the cabinet containing the TF70 tape drive on the left.

Figure 4–2   Unpacking a Model 310 and 410 System Cabinet

PLASTIC
BAG

UNLOADING
RAMP

PACKING
MATERIAL
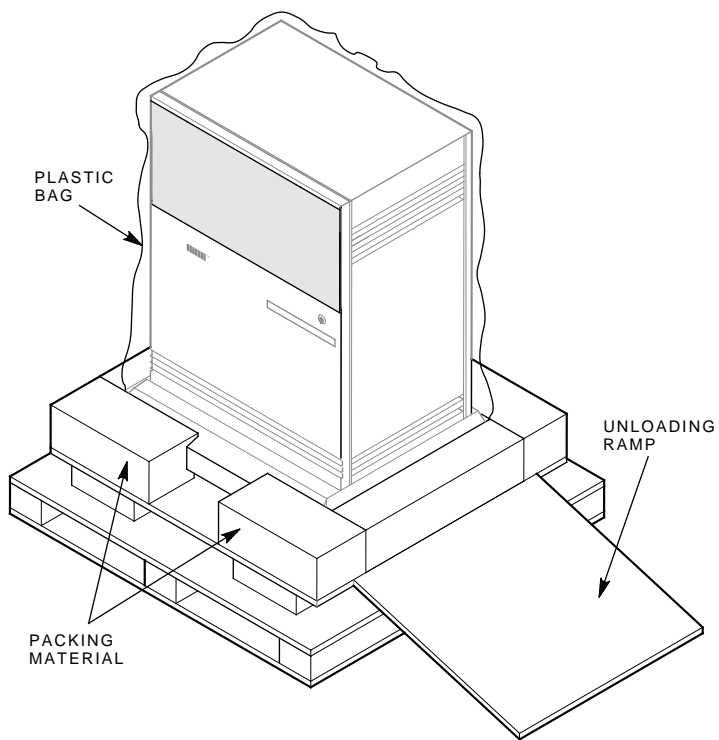
MR_X1413_89.DG

5

Preparing the Model 310 and 410 System Cabinets

This chapter describes how to the open model 310 and 410 system cabinets and prepare for installation of a base system or system with expansion. This chapter includes:

- Opening the cabinets
- Checking the ac voltage selector switches
- Checking the logic modules
- Installing module options

5.1 Opening the Cabinets

Figure 5–1 identifies the front doors and base cap on the computer cabinets. It also shows the front panel latch and its functions. (The upper door may be opened by itself or both doors may be opened together.) A key (supplied with each cabinet) must be used to turn the latch.

All operating and service access takes place from the front of the system:

- The upper door provides access to the summary panel and cannister drives.

- The lower door is opened only for maintenance purposes. The lower door provides access to the cables and main circuit breaker in each cabinet, logic modules in the system cabinets, and carrier disk drives in the expander cabinets.

CAUTION

Installation and maintenance procedures may be performed only by qualified personnel. They must be familiar with the electrostatic discharge (ESD) procedures and power procedures for the VAXft system.

- The base cap provides additional access for routing and installing cables.

WARNING

A cabinet may weigh as much as 118 kg (260 lb) and is too heavy to be handled by one person. At least two people are required to move a cabinet.

Figure 5–1   Front View of a Model 310 or 410 System Cabinet

UPPER
DOOR

VAXft systems

OPEN UPPER DOOR

DOORS LOCKED

OPEN BOTH DOORS

LOWER
DOOR

BASE
CAP

MR_X1414_89.DG
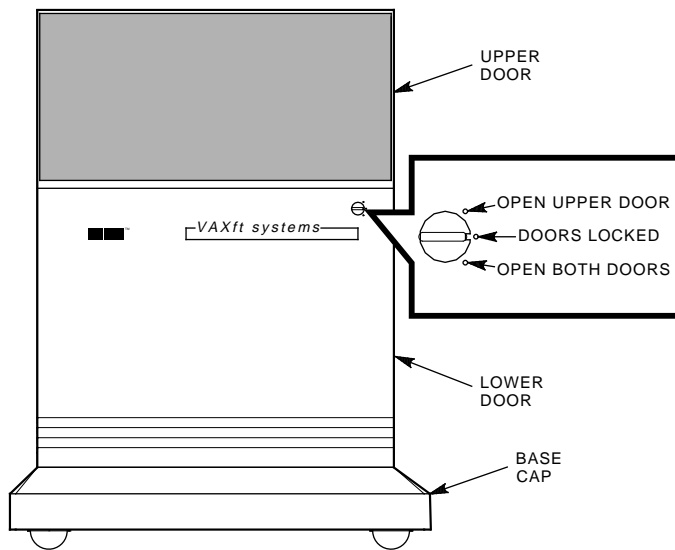
5.1.1 Removing the Doors and Base Caps

Removing the base cap provides access for routing and connecting the system cables as described in Chapter 6. The doors may also be removed if desired. Figure 5–2 numbers the steps used to remove the doors and base caps. The removal steps follow:

❶ Remove the upper door. Using the key, turn the latch to the left (up) and open the door. Lift the door from its hinges. Move it away from the work area to prevent damage to the finish.

❷ Remove the lower door. Using the key, turn the latch to the right (down) and open the door. Remove the grounded wrist strap and module box straps from the storage pocket and leave the cord attached to the cabinet frame. Lift the door from its hinges. Move it away from the work area to prevent damage to the finish.

❸ The base cap is held in place by two spring latches. Pull the base cap straight out from the base. Move it away from the work area to prevent damage to the finish.

**Figure 5–2   Removing the Model 310 and 410 System Cabinet Doors
and Base Cap**

GROUND STRAPS *

1 REMOVE UPPER
DOOR

2 REMOVE LOWER
DOOR

3 REMOVE
BASE CAP

* NOTE: LEAVE GROUND STRAPS
ATTACHED TO CABINET FRAME.

MR-0172-90.DG
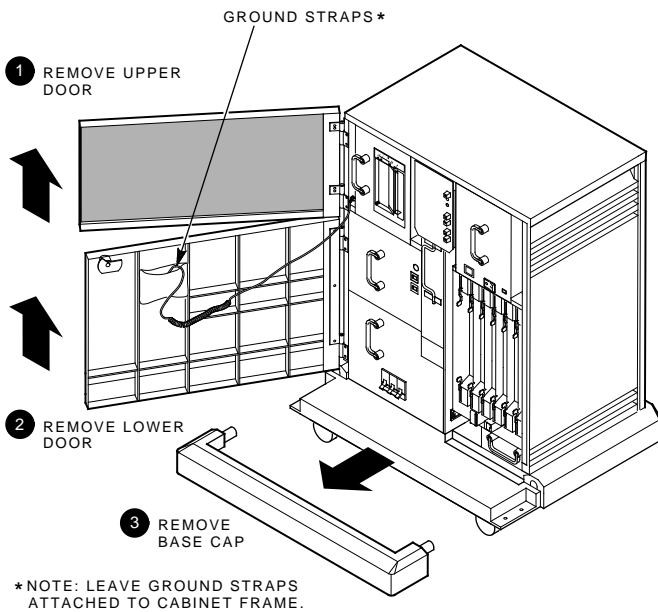
5.1.2 System Cabinet Layout

Figure 5–3 shows the layout of a system cabinet and identifies the components:

- Summary panel with control switches and indicators

- Removable TF70 cannister tape drive or removable RF-series cannister disk drive on the left side in unit 5 (DSSI node ID 5)

- Removable RF-series cannister disk drive on the right side in unit 7 (DSSI node ID 7)

- System logic modules (slots 1 through 7)

- Power modules (ac power input box, dc power supply, and battery pack)

In a base system, both system cabinets contain an RF-series cannister disk drive in unit 7. Unit 7 drives serve as the system operating media.

One system cabinet contains a TF70 cannister tape drive in unit 5. This is the system backup and software load device. The other system cabinet may contain a TF70 or RF-series option, or blank cannister module in unit 5.

In a system with expansion, the system cabinets do not contain any drives. The unused drive slots must contain blank cannister modules to maintain cooling airflow.

Figure 5–3   Model 310 and 410 System Cabinet Layout, Front View

MR–0156–90.RAGS
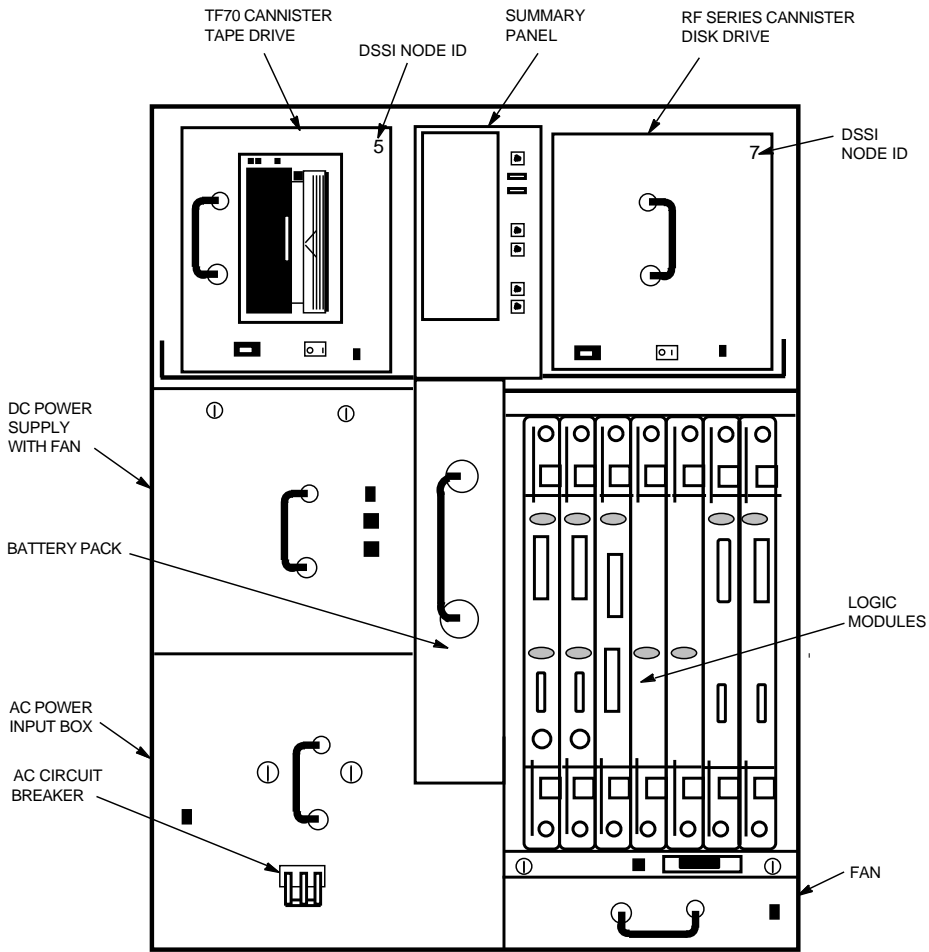
5.1.3 Expander Cabinet Layout

If you are installing a system with expansion, make sure the system cabinets are in the center of the installation area as shown in Figure 1–3. The expander cabinets must be placed on each side of the system cabinets.

Figure 5–4 shows the layout of an expander cabinet and identifies the components:

- Summary panel with control switches and indicators

- Removable TF70 cannister tape drive or removable RF-series cannister disk drive on the left side in unit 5 (DSSI node ID 5)

- One to five nonremovable RF-series carrier disk drives on the right side in units 0 to 4 (DSSI node IDs 0 to 4)

- Power modules (ac power input box, dc power supply, and battery pack)

In a system with expansion, all the drives are in the expander cabinets. Each expander cabinet may contain up to six drives.

One expander cabinet contains a TF70 cannister tape drive in unit 5 as shown in Figure 5–4. This is the system backup and software load device. The other expander cabinet may contain a TF70 or RF-series option, or blank cannister module in the cannister slot for unit 5. It may also contain an RF-series carrier drive in the carrier slot for unit 5. However, it cannot contain drives in both slots because the two slots share the same DSSI node ID (5).

Unused drive slots must contain a blank carrier or cannister module to maintain cooling airflow.

Figure 5–4   Model 310 and 410 Expander Cabinet Layout, Front View

MR–0157–90.RAGS
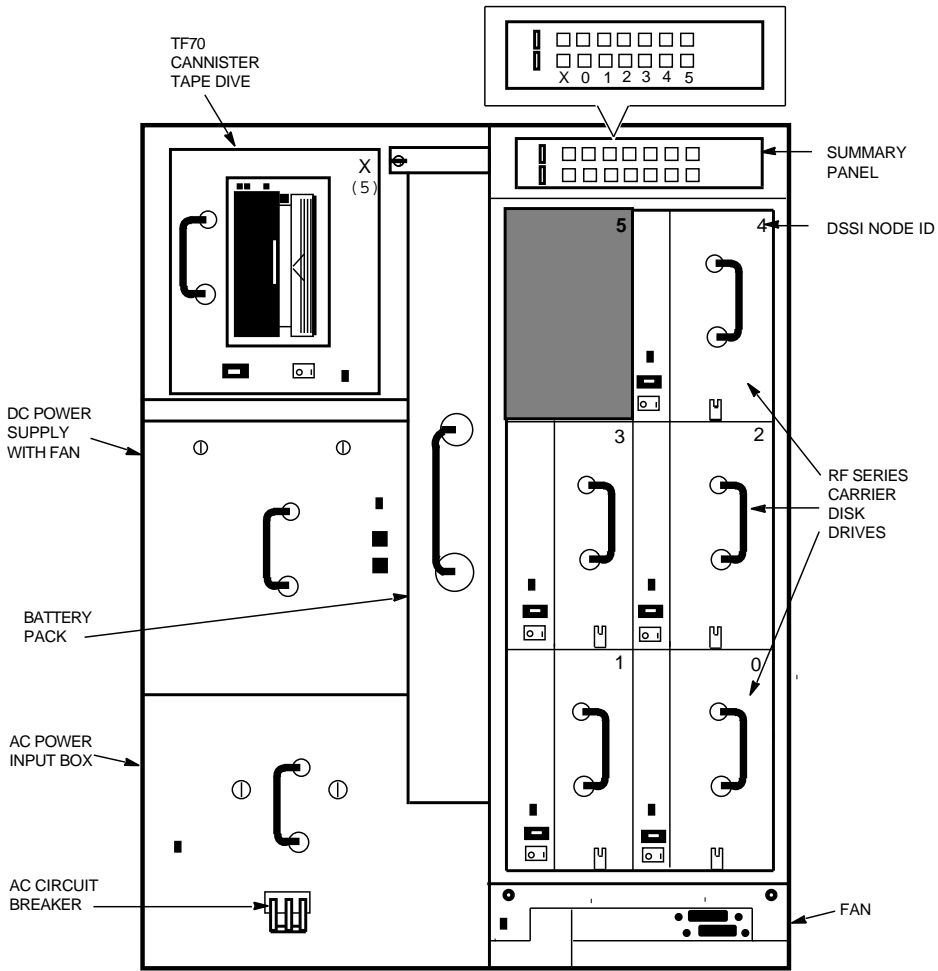
5.2   Checking the AC Voltage Selector Switches

Use the procedures in this section to check or change the ac voltage selector switch setting in any of the cabinets.

Figure 5–5 identifies the power modules, which are accessed from the front of the cabinets. The power transformer and voltage selector switch are located behind the ac power input box and battery pack. To access the switch, remove the ac power input box and the battery pack.

5.2.1   Removing the AC Power Input Box

Remove the ac power input box as follows:

1. See Figure 5–5. Remove the power cord from the ac power input box.

2. Loosen the two captive screws holding the ac power input box in place.

3. Grasp the handle and pull the box straight out. Put it where no one can trip over it or damage it.

Figure 5–5   Removing the Model 310 and 410 AC Power Input Box

MR−0158−90.RAGS
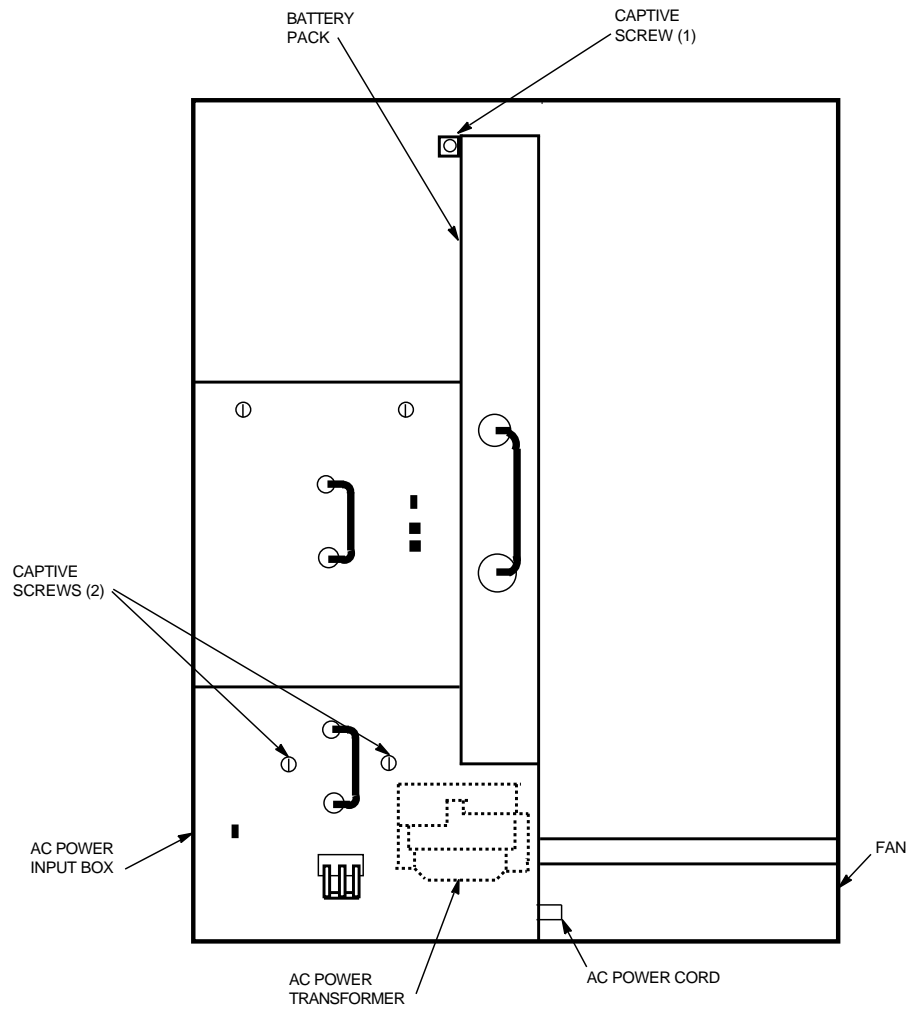
5.2.2 Removing the Battery Pack

Remove the battery pack as follows:

1. Remove the panel or label cover from the top of the battery pack.

2. See Figure 5–5. Loosen the captive thumbscrew holding the top of the battery pack.

3. See Figure 5–6. Grasp the front handle and slowly pull the battery pack until the safety catch on the top handle contacts the chassis.

WARNING
The battery pack weighs 17.3 kg (38 lb). Use care when removing, handling, and inserting the battery pack.

4. Support the battery pack with one hand as you raise the top handle. This lowers the safety catch to clear the chassis.

5. Lift the battery pack and pull it straight out of the chassis. Put it where no one can trip over it or damage it.

Figure 5–6   Model 310 and 410 Battery Pack Safety Catch

WARNING

THE BATTERY PACK
WEIGHS 17.3 kg (38 lb).
USE CARE WHEN REMOVING,
HANDLING, AND INSERTING
THE BATTERY PACK.

HANDLE UP,
SAFETY CATCH
DOWN

HANDLE DOWN,
SAFETY CATCH UP

THUMBSCREW

MR-0047-90.DG
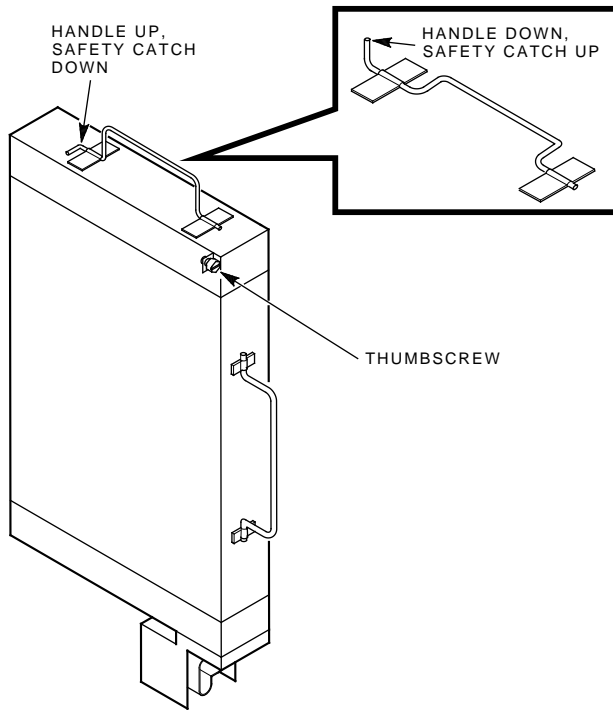
5.2.3 Checking the Voltage Selector Switch Setting

Figure 5–7 shows the location of the voltage selector switch on the power transformer chassis. Make sure the switch is in the correct position for the ac power supplied by the facility (115 V or 230 V).

NOTE

The voltage selector switch is factory set to 115 V. You may need to change the switch position.
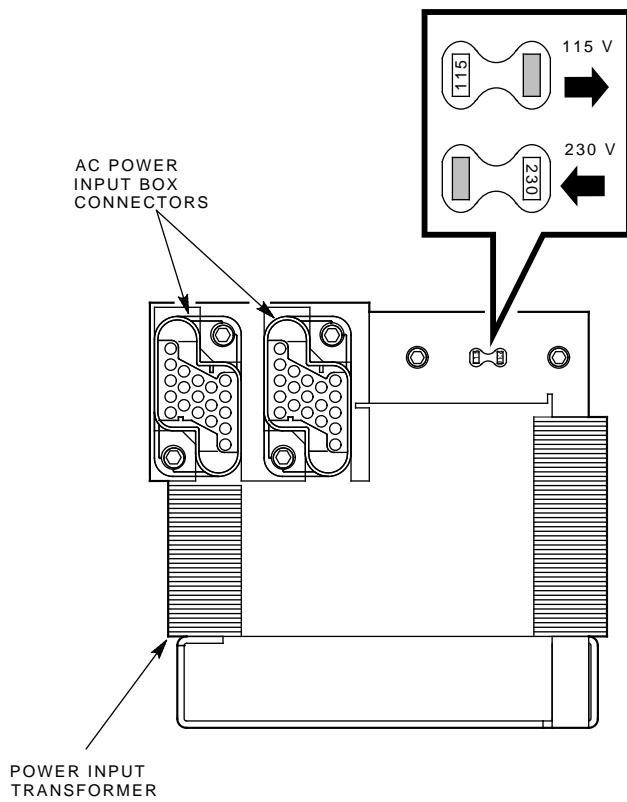
To change the switch position, use a ballpoint pen or a small, slotted screwdriver to move it to the correct position.

5.2.4 Replacing the Battery Pack and AC Power Input Box

Replace the battery pack and ac power input box as follows:

1. Lift the battery pack and place it in the chassis.

    a. Raise the top handle and push the battery pack in until the top handle contacts the chassis.

    b. Support the battery pack with one hand as you lower the top handle to clear the chassis. Push the battery pack straight in and seat it firmly.

    c. Replace the holding screw and summary panel logo.

2. Place the ac power input box in the chassis.

    a. Push the box straight in and seat it firmly.

    b. Replace and tighten the two captive screws.

Figure 5–7   Model 310 and 410 AC Voltage Selector Switch Settings

MR-0048-90.DG

5.3   Checking the Logic Modules

Check the placement of the logic modules in the system cabinets. Also check the settings on the system I/O controller modules (Figures 5–8 and 5–9).

If you remove any modules, use the module removal and replacement procedure in Appendix A.

5.3.1   Module Placement

Table 5–1 describes the logic modules and their locations in the system backplanes. The type and complement of memory modules must be the same in both system cabinets. Figure 5–8 shows the correct placement of the logic modules in the system backplane.

Table 5–1   Model 310 and 410 Logic Modules

Slot	Module	Description
1	T3001 or T3004	Secondary KFE52 system I/O controller module or WAN module
2[1]	T3001[2]	Primary KFE52 system I/O controller module
3	T3005 or T3007[2]	KA520 or KA550 processor module, respectively
4	T3003[2]	First MS520 memory module
5	T3003 or T3004	Second MS520 memory module or (optional) WAN module
6	T3003 or T3004	Third MS520 memory module or (optional) WAN module
7	T3003 or T3004	Fourth MS520 memory module or (optional) WAN module

[1]Slot 2 contains the primary system I/O controller module, which supports console functions.

[2]Slots 1, 2, and 3 contain the primary system I/O controller module, a processor module, and a memory module. This is the minimum required for operation.

NOTE

Unused module slots require a T3999 filler module to maintain cooling airflow. The module handles also maintain ground continuity to meet FCC regulations and provide electrostatic discharge (ESD) protection.

Figure 5–8   Model 310 and 410 Logic Module Placement

PROCESSOR
MODULE

PRIMARY SYSTEM I/O
CONTROLLER MODULE

1/4 – TURN
FASTENERS

ASSIST
LEVERS

SECONDARY SYSTEM I/O
CONTROLLER MODULE OR
WAN MODULE

MEMORY MODULE 1

MEMORY MODULE 2
OR WAN MODULE

MEMORY MODULE 3
OR WAN MODULE

MEMORY MODULE 4
OR WAN MODULE

1   2   3   4   5   6   7

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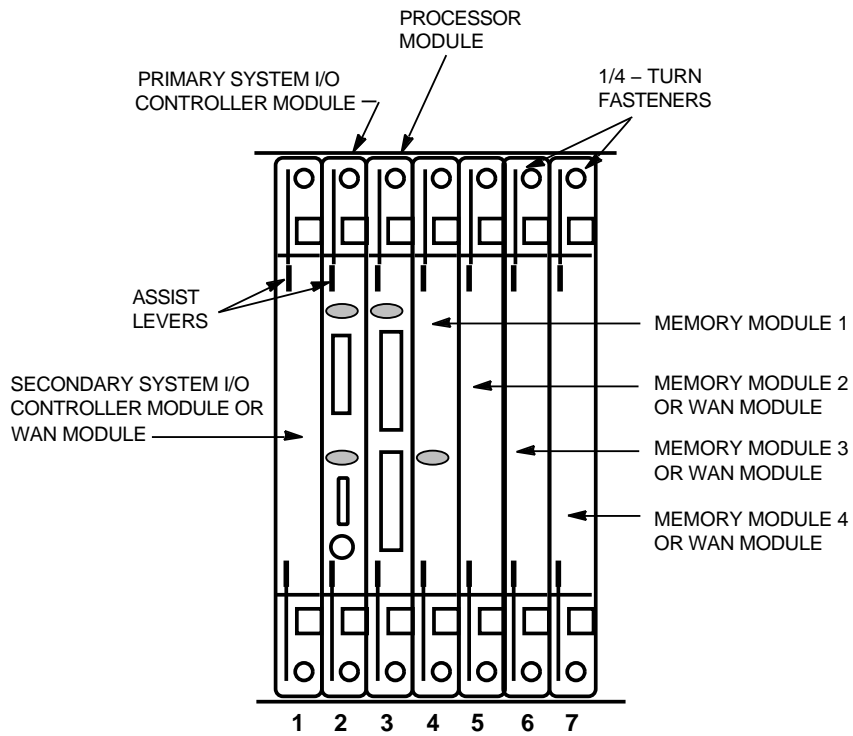
5.3.2 System I/O Controller Module Settings

System I/O controller modules are shipped with the correct DSSI jumper plug states (installed or removed) for the system. The Ethernet switch is set to the traditional (thickwire) position. Use the procedures in this section to check or change the DSSI jumper plugs or the Ethernet switch.

Figure 5–9 identifies the DSSI terminator, DSSI jumper plugs, and Ethernet switch on the system I/O controller module. A primary system I/O controller module is located in slot 2 of both system cabinets. In a system with expansion, a secondary system I/O controller module is located in slot 1 of both system cabinets.

- The DSSI terminator and two DSSI jumper plugs must be:

  — In place on the primary system I/O controller module in slot 2 for a base system.

  — Removed from all system I/O controller modules in a system with expansion. (All drives are mounted in the expander cabinets of a system with expansion.)

- If the module is to be connected to an Ethernet, set the Ethernet switch as follows:

  — Position 2 (down) for ThinWire applications.

  — Position 1 (up) for traditional (thickwire) applications (factory default setting).

5.4   Installing Module Options

If you are installing any module options at this time (T3003 expanded memory or secondary T3001 system I/O controller modules), use the module removal and replacement procedure in Appendix A.

If you are installing the wide area network (WAN) module option, refer to Appendix B for the DEC WANcontroller 620 installation procedure and Y-box connections.

Figure 5–9 Model 310 and 410 System I/O Controller Module Settings

DSSI
JUMPER
PLUGS

DSSI
TERMINATOR
PLUG

THICKWIRE
CONNECTOR

ThinWire
CONNECTOR

1 THICKWIRE

2 ThinWire

Ethernet
SWITCH

MR-0174-90.DG

6
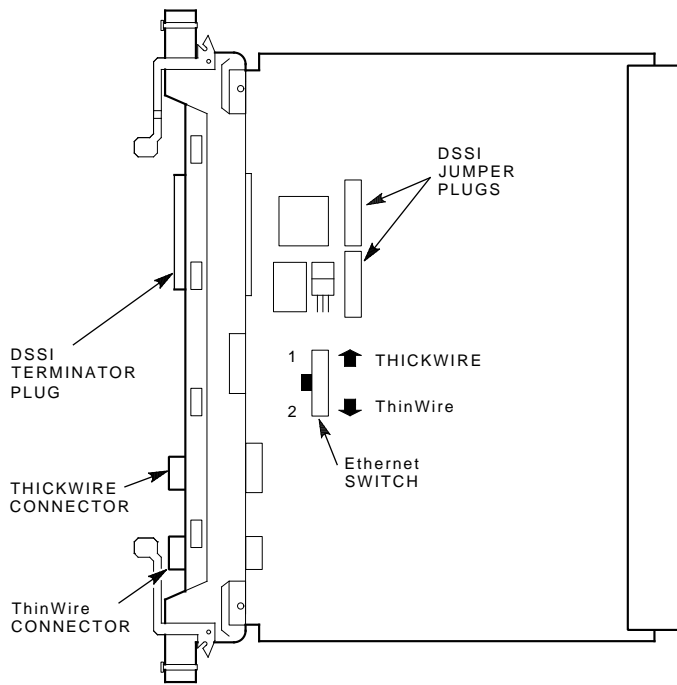
Installing the Model 310 and 410 System Cables

This chapter describes how to route and connect the cables in a base system or system with expansion. It also describes how to install the ground straps between the cabinets. This chapter includes:

- Routing the cross-link cables

- Routing the DSSI cables

- Installing the PCIM cables

- Connecting the cross-link cables

- Connecting the DSSI cables

- Installing the ground straps

CAUTION

An ESD wrist strap must be worn during the following procedures until all cables are connected and secured to the module handles.

6.1   Routing the Cross-Link Cables

All cables should be routed under the cabinets before making any of the connections. This makes it easier to handle and position the cables within the limited access space. The connections may be made when all of the cables are in place.

Figure 6–1 numbers the steps used to connect the cross-link cables between the processor modules in slot 3 of the system cabinets. (The lower connectors cannot be plugged in with the upper connectors in place.)

NOTE

The upper and lower connectors on the processor modules are arranged so the cables cannot be installed incorrectly. The connectors must be plugged in with the cable routed downward as shown in Figure 6–1.

Locate the two cross-link cables (PN 17-02194-01). Route each cable between the system cabinets, behind the front wheels, and on top of the floor surface. Do **not** bring the cables up through the cabinet front at this time.

System with expansion: If you are installing a system with expansion, skip the following steps and proceed to Section 6.2.

Base system: If you are installing a base system, connect the cross-link cables as follows:

❶ In the left system cabinet, bring the lower processor module connector up through the cabinet access hole.

Plug the cable into the lower connector and secure the spring clips. Do **not** connect the other end of the cable at this time.

❷ In the right system cabinet, bring the lower processor module connector up through the cabinet access hole.

Plug the cable into the lower connector and secure the spring clips.

❸ In the right system cabinet, bring the upper processor module
connector up through the cabinet access hole.

Plug the cable into the upper connector and secure the spring clips.

❹ In the left system cabinet, bring the upper processor module connector
up through the cabinet access hole.

Plug the cable into the upper connector and secure the spring clips.

Proceed to Section 6.6 and complete the installation.

Figure 6–1   Model 310 and 410 Cross-Link Cable Connections

LEFT SYSTEM CABINET   RIGHT SYSTEM CABINET

UNIT 5   UNIT 7   UNIT 5   UNIT 7

1 2 3 4 5 6 7   1 2 3 4 5 6 7

AC
CIRCUIT
BREAKER

CB

4

AC
CIRCUIT
BREAKER

CB

3

1   CROSS-LINK CABLE   2

CROSS-LINK CABLE

NOTE: IN AN EXPANDED SYSTEM THE SYSTEM CABINETS DO NOT
        CONTAIN ANY DRIVES. THE DRIVE SLOTS CONTAIN BLANK
        CANNISTER MODULES TO MAINTAIN COOLING AIRFLOW.

MR_X1416_89.DG

6.2   Routing the DSSI Cables

Locate the two short DSSI cables (PN 17-02245-01). The short cables
are 92 cm (36 in) in length. Also locate the two long DSSI cables (PN
17-02245-02). The long cables are 153 cm (60 in) in length.

Figure 6–2 shows how to connect the DSSI cables between the expander
cabinets and system cabinets.

NOTE

**The connectors on the system I/O controller module end of the
cables must be plugged in with the cables routed downward as
shown in Figure 6–2. The T-shaped connectors must be plugged in
to the expander cabinets.**

Route each DSSI cable between the system cabinets, behind the front
wheels, and on top of the floor surface as follows. Do not bring the cables
up through the cabinet access holes at this time:

1. Route a short DSSI cable from the left (adjoining) expander cabinet to
    the left system cabinet.

2. Route a short DSSI cable from the right (adjoining) expander cabinet
    to the right system cabinet.

3. Route a long DSSI cable from the left expander cabinet to the right
    system cabinet.

4. Route a long DSSI cable from the right expander cabinet to the left
    system cabinet.

Figure 6–2   Model 310 and 410 DSSI Cable Connections
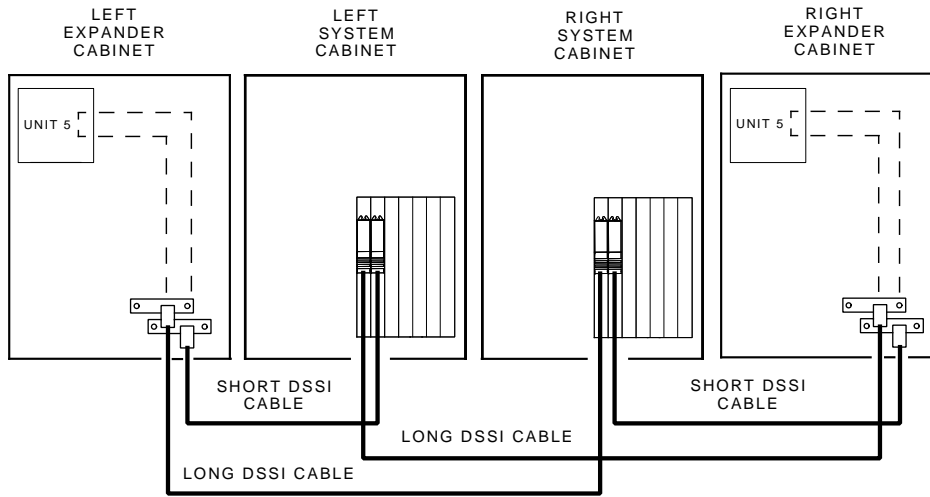
NOTE: SYSTEM CABINET DRIVES ARE NOT PRESENT IN THIS CONFIGURATION.
       DASHED LINES INDICATE THE INTERNAL DSSI BUS PATHS.

MR_X1418_89.DG

6.3   Installing the PCIM Cables

Locate the two PCIM cables (PN 17-02285-02).

Figure 6–3 shows how to connect the PCIM cables between the expander cabinets and system cabinets.

Route and connect one PCIM cable from the dc power supply in each expander cabinet to the dc power supply in the adjoining system cabinet as shown in Figure 6–3.

Figure 6–3   Model 310 and 410 PCIM Cable Connections


```
    LEFT            LEFT           RIGHT          RIGHT
  EXPANDER        SYSTEM          SYSTEM        EXPANDER
  CABINET         CABINET         CABINET        CABINET
```

H7233-AB   H7233-AA   H7233-AA   H7233-AB

UNIT 5   UNIT 5

PCIM CABLE   PCIM CABLE

MR_X1419_89.DG
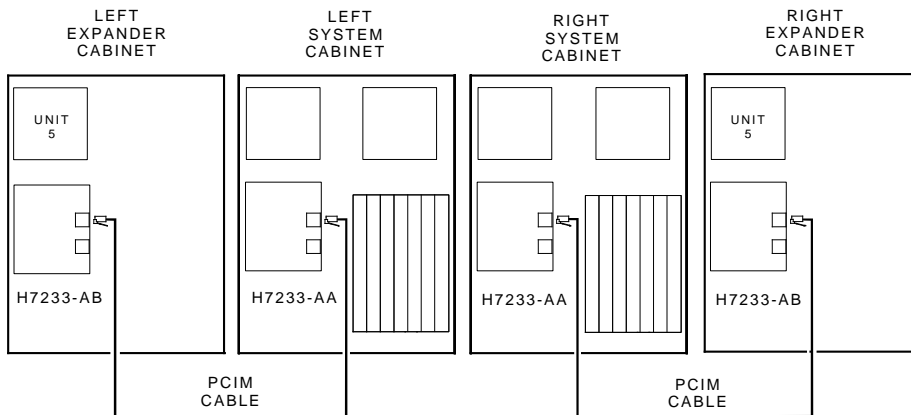
6.4 Connecting the Cross-Link Cables

Refer to Figure 6–1 as you connect the cross-link cables between the processor modules in slot 3 of the system cabinets:

❶ In the left system cabinet, bring the lower processor module connector up through the cabinet access hole.

 Plug the cable into the lower connector and secure the spring clips. Do **not** connect the other end of the cable at this time.

❷ In the right system cabinet, bring the lower processor module connector up through the cabinet access hole.

 Plug the cable into the lower connector and secure the spring clips.

❸ In the right system cabinet, bring the upper processor module connector up through the cabinet access hole.
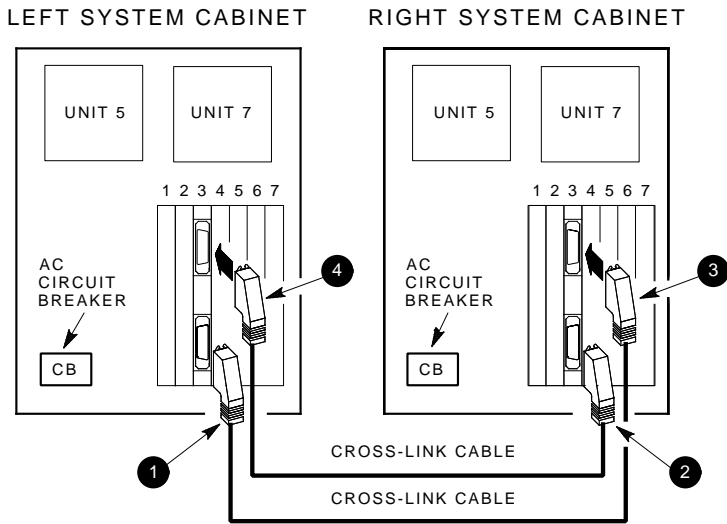
 Plug the cable into the upper connector and secure the spring clips.

❹ In the left system cabinet, bring the upper processor module connector up through the cabinet access hole.

 Plug the cable into the upper connector and secure the spring clips.

6.5   Connecting the DSSI Cables

Refer to Figure 6–2 as you connect the DSSI cables between the system cabinets and expander cabinets.

First connect the short DSSI cables:

1. In the left system cabinet, bring the short DSSI cable connector up through the access hole. Plug the connector into the primary system I/O controller module in slot 2 and secure the captive screws.

2. In the left (adjoining) expander cabinet, bring the short DSSI cable connector up through the access hole. Plug the T-shaped connector into the lower DSSI connector (DSSI 2) and secure the captive screws.

3. In the right system cabinet, bring the short DSSI cable connector up through the access hole. Plug the connector into the primary system I/O controller module in slot 2 and secure the captive screws.

4. In the right (adjoining) expander cabinet, bring the short DSSI cable connector up through the access hole. Plug the T-shaped connector into the lower DSSI connector (DSSI 2) and secure the captive screws.

Now connect the long DSSI cables:

1. In the left system cabinet, bring the long DSSI cable connector up through the access hole. Plug the connector into the secondary system I/O controller module in slot 1 and secure the captive screws.

2. In the right expander cabinet, bring the long DSSI cable connector up through the access hole. Plug the T-shaped connector into the upper DSSI connector (DSSI 1) and secure the captive screws.

3. In the right system cabinet, bring the long DSSI cable connector up through the access hole. Plug the connector into the secondary system I/O controller module in slot 1 and secure the captive screws.

4. In the left expander cabinet, bring the long DSSI cable connector up through the access hole. Plug the T-shaped connector into the upper DSSI connector (DSSI 1) and secure the captive screws.

6.6 Installing the Ground Straps

The cabinets must be connected together at the front corners with a ground strap (PN 17-02702-01) as shown in Figure 6–4.

Figure 6–4   Model 310 and 410 Ground Strap Location

GROUND
STRAP

MR-0173-90.DG
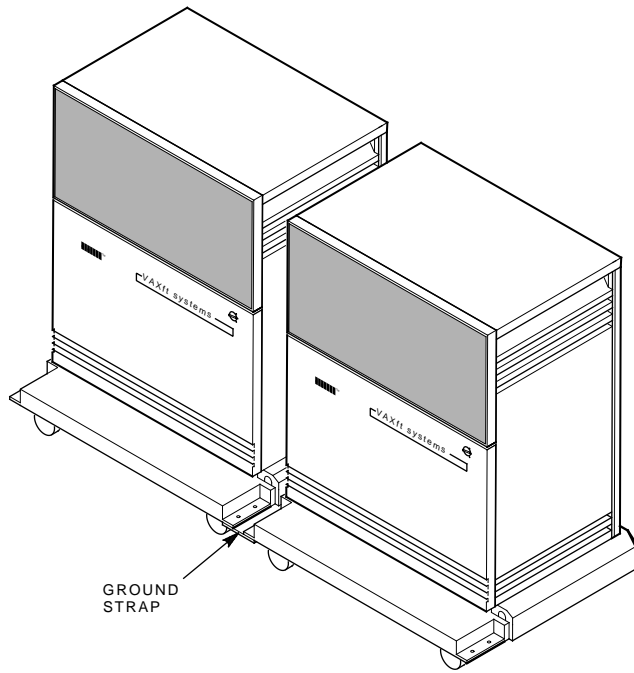
Figure 6–5 shows how the ground strap is installed between each pair of adjoining cabinets.

1. Place a ground strap under the front corners of the cabinets as shown with the painted side up. Make sure the ground strap contacts the cabinet bases.

2. Insert four screws through the holes in the adjoining bases and into the ground strap. Adjust the space between the bases as necessary, and make sure the cabinets are straight.

3. Tighten all four screws.

CAUTION
The system must not be moved as a unit with the ground straps in place. Each cabinet must be moved separately or damage to the base frames could result. The ground straps are the only mechanical connection between the cabinets.

Figure 6–5   Model 310 and 410 Ground Strap Installation
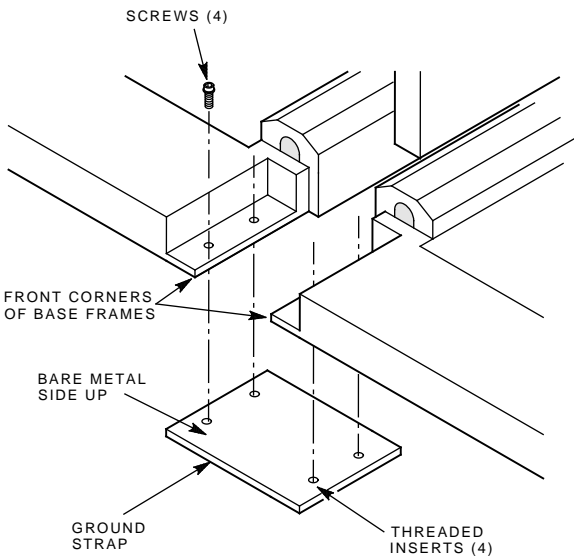
MR_X1415_89.DG

7

Completing the Model 310 and 410 System Installation

This chapter describes how to complete the installation and start up the VAXft system. This chapter includes:

- Connecting the system to facility power

- Applying power to the system

- Power-on tests

- Final system tests

7.1   Connecting the System to Facility Power

The VAXft system cabinets do not provide convenience outlets. Every terminal, modem, printer, and any other piece of equipment connected to the system requires a dedicated power receptacle and circuit breaker as described in Chapter 1.

- Make sure the circuit breakers for all dedicated power receptacles are set to the ON position.

- If a separate power source is provided (such as auxiliary power for the console terminals), make sure the circuit panels, breakers, and receptacles are labeled accordingly.

Refer to Figure 7–1 during the following procedures. The figure shows the location of the male receptacle in the ac power input box in each of the cabinets. (The lower right corner of a system cabinet is shown.) The figure also shows the location of the local console terminal and remote modem connectors.

Figure 7–1   Model 310 and 410 Terminal, Modem, and Power Cord Connectors

BATTERY
PACK

LOGIC MODULES

SLOT 1 | SLOT 2 | SLOT 3 | SLOT 4 | SLOT 5 | SLOT 6 | SLOT 7

AC POWER CORD
RECEPTACLE

REMOTE CONSOLE
TERMINAL CONNECTOR

LOCAL CONSOLE
TERMINAL CONNECTOR

AC POWER CORD

MR_X1417_89.DG
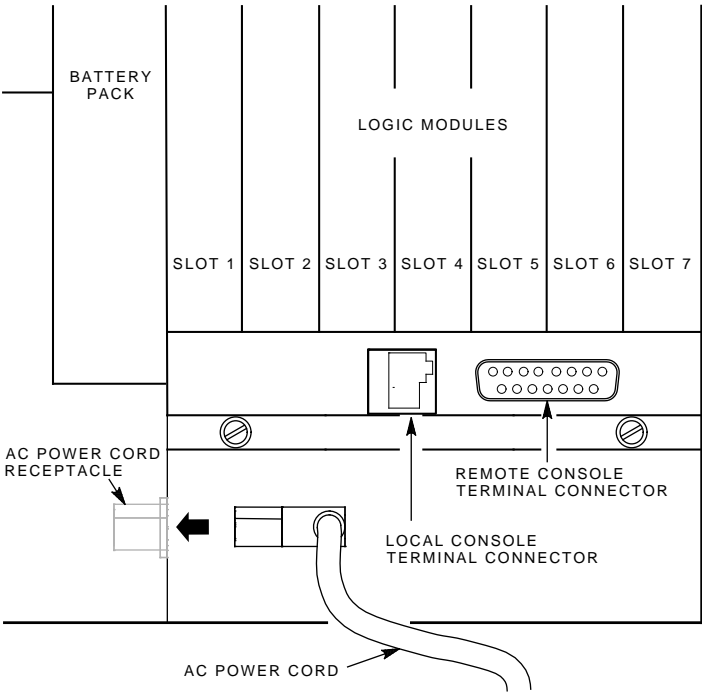
7.1.1 Connecting the Cabinet Power Cords

Connect the power cord for each cabinet as follows:

1. Make sure the cabinet ac circuit breaker is set to the OFF (down) position. Locate the power cord.

2. See Figure 7–1. Route the female connector under the base frame and up through the base frame cutout. Plug the connector into the receptacle on the side of the ac power input box as shown.

3. Plug the male end of the power cord into one of the dedicated power receptacles.

4. **Do not** set the cabinet ac circuit breaker to ON (up) at this time.

7.1.2 Connecting the Terminals and Modems

Connect the interface cables and power cords for the terminals and modems as follows:

1. Assemble each unit using the documentation supplied with it.

2. Make sure the voltage selector switch is set to the correct voltage range (115 V or 230 V).

3. Make sure the power switch is set to the off (0) position.

CAUTION
An ESD wrist strap must be worn while connecting the interface cables to the system cabinets.

4. See Figure 7–1. Route the interface cable from one console terminal and modem under the base frame of one system cabinet. Bring the connectors up through the base frame cutout and connect as follows:

    a. Plug the interface cable from the terminal into the local console terminal connector.

    b. Plug the interface cable from the modem into the remote console terminal connector.

    c. Repeat steps a and b for the other system cabinet.

5. Remove the ESD wrist strap. Plug the power cord from each unit into one of the dedicated power receptacles.

6. Set the power switches on the terminals and modems to the on (1) position.

7.1.3 Setting the Terminal Baud Rates

The factory default baud rate is 9600 for the local and remote terminal ports in both system cabinets. Refer to the documentation provided with the terminals for how to set the baud rates.

The *VAXft Systems Owner's Manual* describes how to set the system baud rates using the SET PORT and SET REMOTE commands. The available system baud rates are: 300, 600, 1200, 2400, 4800, 9600, and 19200.

7.2   Applying Power to the System

If you are installing a system with expansion, power on the expander cabinets first as described in Section 7.2.2.

7.2.1   System Cabinets

Figure 7–2 identifies the drive power switches and magnetic fault indicators (MFIs) in the system cabinets.

1. In both system cabinets (in a base system), make sure the power switches for all drives are set to the on (1) position.

    NOTE
    In a system with expansion, the system cabinets do not contain any drives. The drive slots contain blank cannister modules to maintain cooling airflow.

2. Power on the system cabinets by setting the ac circuit breakers to the ON (up) position.

    NOTE
    All MFIs are set to the fault state (yellow) at the beginning of the cabinet power sequence and reset during the sequence.

3. When the cabinet power sequence completes (less than a minute), check the MFIs in all drive units and power modules. Any MFI that shows yellow indicates a problem in the unit.

    a. **Tape or disk drives** — If a problem is indicated in a tape or disk drive, you do not need to power off the cabinet. Set the power switch of the faulty drive to off (0) and repair or replace as required. Appendix C provides removal and replacement procedures for the cannister drives. (Refer to the *VAXft Systems Maintenance Guide* for the repair procedures.)

    b. **Power modules and fans** — If a problem is indicated in a power module or fan, set the cabinet ac circuit breaker to OFF (down), and repair or replace the faulty component. (Refer to the *VAXft Systems Maintenance Guide* for the repair procedures.)

Figure 7–2   Model 310 and 410 System Cabinet Switches and MFIs

MR−0161−90.RAGS
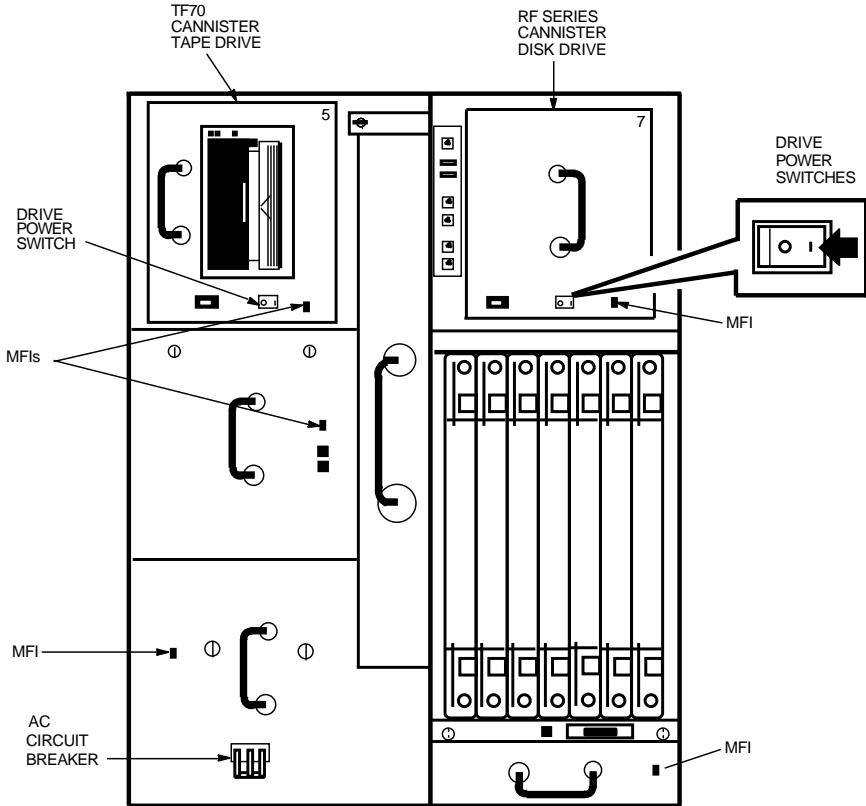
4. See Figure 7–3. Check the LED indicators and magnetic fault indicators (MFIs) on the system logic modules.

   a. **Logic modules —** The MFIs should **not** be yellow when the power-on tests are completed (Section 7.3). When an MFI is yellow, the module has a fault and must be replaced.

   b. **System I/O controller modules —** The LED indicator must be:

      1. Off if the two DSSI jumper plugs are installed correctly on the primary system I/O controller module in slot 2 of a base system (drives are present in the system cabinets).

      2. On if both DSSI jumper plugs are removed from slots 1 and 2 of a system with expansion (drives are not present in the system cabinets).

Figure 7–3   Model 310 and 410 Logic Module LED Indicators and MFIs

SYSTEM I/O
CONTROLLER
MODULES

PROCESSOR
MODULE

MEMORY
MODULES

WAN
MODULES

MAGNETIC
FAULT
INDICATORS

MAGNETIC
FAULT
INDICATORS

LED
INDICATORS

⬭ = HOLE IN MODULE HANDLE
FOR VIEWING INDICATOR

MR−0162−90.RAGS

7.2.2 Expander Cabinets

Figure 7–4 identifies the drive power switches and magnetic fault indicators (MFIs) in the expander cabinets.

1. In both expander cabinets, make sure the power switches for all drives are set to the on (1) position.

2. Power on the expander cabinets by setting the ac circuit breakers to the ON (up) position.

NOTE
All MFIs are set to the fault state (yellow) at the beginning of the cabinet power sequence and reset during the sequence.

3. When the cabinet power sequence completes (less than a minute), check the magnetic fault indicators (MFIs) in all drive units and power modules. Any MFI that shows yellow indicates a problem in the unit.

CAUTION
To prevent a system fault, you must set the expander cabinet circuit breaker to OFF (down) whenever all the expander cabinet disks are powered off.

a. **Tape or disk drives —** If a problem is indicated in a tape or disk drive, you do not need to power off the cabinet. Set the power switch of the faulty drive to off (0) and repair or replace as required. Appendix C provides removal and replacement procedures for the cannister and carrier drives. (Refer to the *VAXft Systems Maintenance Guide* for the repair procedures.)

b. **Power modules and fans —** If a problem is indicated in a power module or fan, set the cabinet ac circuit breaker to OFF (down), and repair or replace the faulty component. (Refer to the *VAXft Systems Maintenance Guide* for the repair procedures.)

Figure 7–4   Model 310 and 410 Expander Cabinet Switches and MFIs

MR–0160–90.RAGS
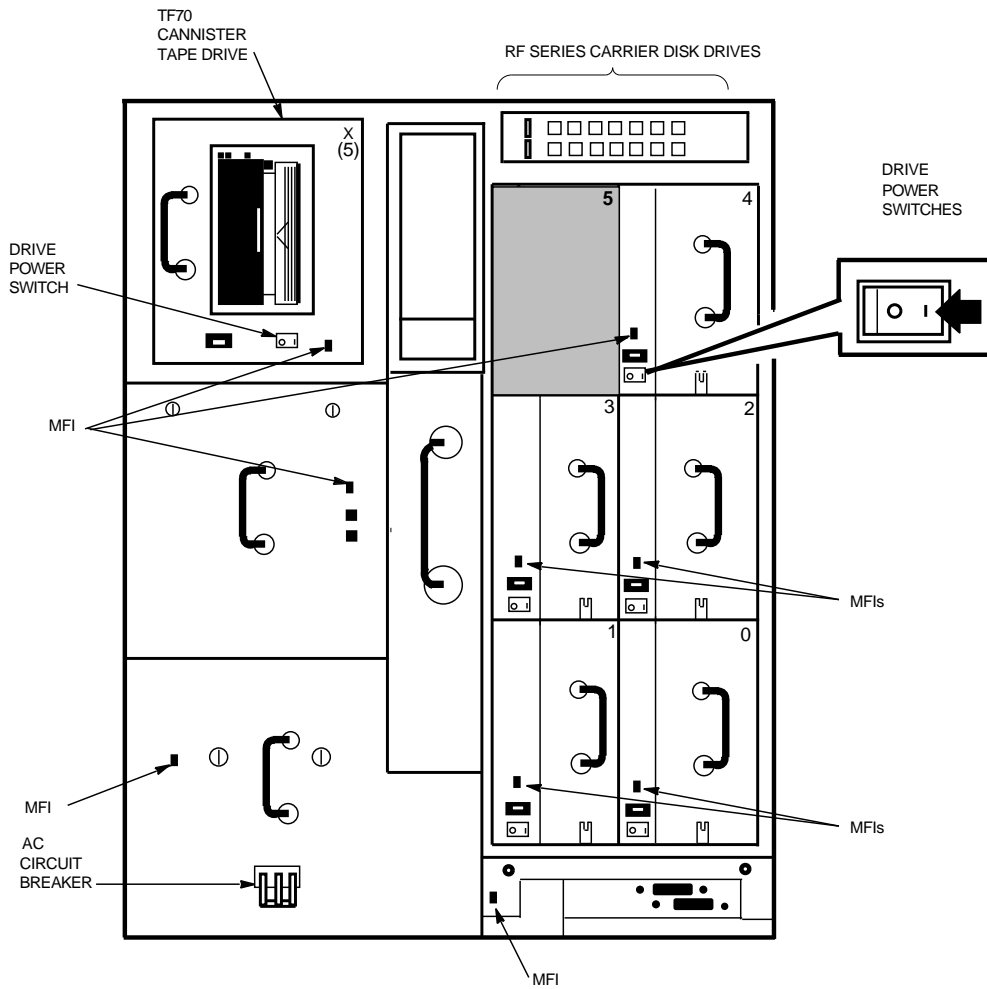
7.3   Power-On Tests

The processor, system I/O controller, and WAN modules each contain a
set of ROM-based diagnostic (RBD) tests invoked on a power-on sequence.
The processor diagnostics test the CPU, as well as the memory, zone, and
system. When a failure is detected in any module, the number of the test
and a brief explanation of the failure are reported to the console terminal.

If all tests on the processor, system I/O controller, and WAN modules
are successful, each processor module performs a series of zone tests
that include internal memory and I/O functions. If the zone tests are
successful (no detected errors), each processor module enters a restart
procedure that initializes the zone.
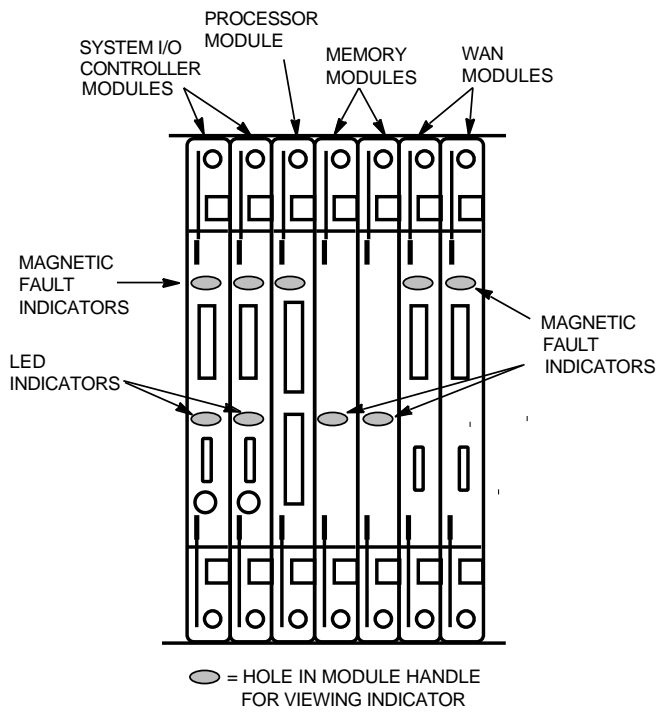
7.4   Final System Tests

All of the diagnostic software required by the system is provided in the
RBD tests described in Section 7.3.

NOTE
**It is not necessary to run the diagnostics manually if the system
has passed the power-on tests.**

The RBD command description in Chapter 6 of the *VAXft Systems Owner's
Manual* (EK-VXFT1-OM) provides information and guidelines for writing
DSSI parameters to the storage devices under the DUP facility.

Run the user environment test package (UETP) as a final check. Refer to
the *VMS Upgrade and Installation Supplement: VAXft Systems* for more
information on installing and booting the VMS operating system. The
VAX/VMS UETP User's Guide describes how to log in and run UETP.

CAUTION
**UETP can be configured to run write/read tests on the RF-series
disks. UETP should be run only at the completion of a system
installation because of the risk of corrupting data on shadowed
disks. Do not run UETP without contacting the responsible
customer representative or application manager.**

When you are satisfied the system is operating correctly, turn it over to
the responsible customer representative for installation and testing of the
application software.

Part 4

8

Unpacking and Inspecting the Model 610 and 612 System

This chapter describes how to unpack and inspect the VAXft cabinets and options and explains what to do if there is a problem. This chapter includes:

- Inspecting the shipment
- Unpacking the options
- Opening the shipping cartons
- Unpacking the cabinets

8.1 Inspecting the Shipment

Model 610 and 612 systems are shipped in cartons on skids. Figure 8–1 shows a model 610 and 612 cabinet shipping carton.

The computer cabinets and all items included with the shipment should be moved to the installation area before you start unpacking. Make sure the installation area provides a firm surface for the system to rest on. The installation area must also allow full exhaust airflow from the rear of the cabinets. Soft surface such as shag or deep-pile carpeting must be avoided unless a firm surface (like floor tiles) is installed on top of the carpeting.

Be sure you have everything before you begin to unpack any equipment.

1. Refer to the product delivery document to make sure you received the correct number of shipping cartons.

Figure 8–1   Model 610 and 612 System Cabinet Shipping Carton

OUTER
SHIPPING
CAP

SHIPPING
BANDS

METAL
CLOSURES
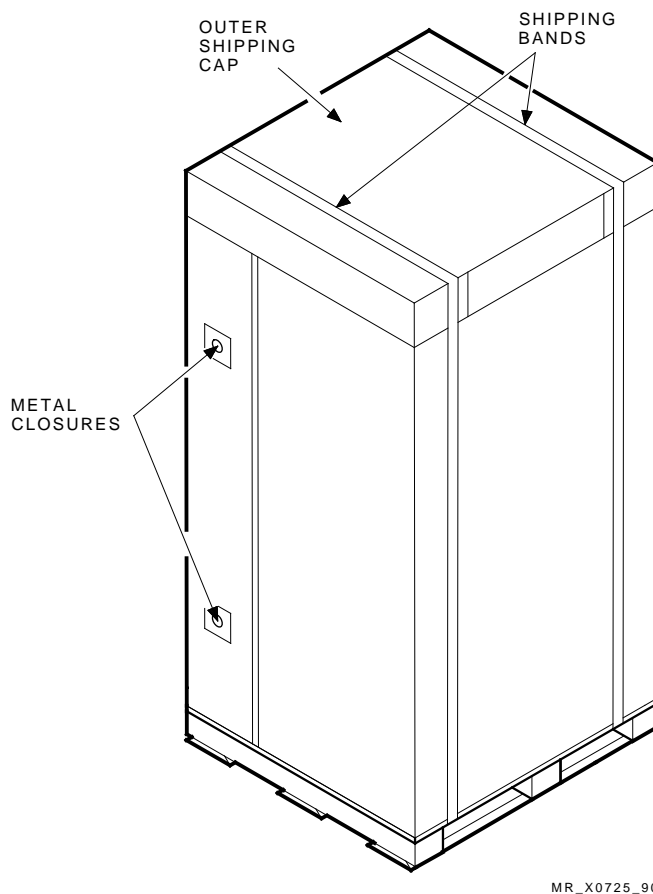
MR_X0725_90

2. If any cabinet or option is missing or damaged, report it on the labor
   activity reporting system (LARS). Include a note to clarify the extent
   of the problem. Then notify the customer and responsible Customer
   Services manager.

NOTE
**If there is a problem, stop the installation until the customer
notifies the carrier or insurance company and gives you
permission to continue.**

8.2 Unpacking the Options

Unpack the console terminals and other system options (terminal stands, modems) included with the shipment:

1. Check each carton for external damage (dents, holes, crushed corners, water marks).

2. Open each carton. Compare the contents of the carton to the items listed on the side of the carton (including power cord, interface cable, and documentation). If any item is missing, report it on LARS. Then notify the customer and responsible Customer Services manager.

3. Look for damaged items. If you notice any damage, report it on LARS. Include a note to clarify the extent of the problem. Then notify the customer and responsible Customer Services manager.

NOTE
If there is a problem, stop the installation until the customer notifies the carrier or insurance company and gives you permission to continue. Save the cartons and packing material in case you need to return an item.

8.3   Opening the Shipping Cartons

1. Check each carton for external damage (dents, holes, crushed corners, water marks).

2. Remove the shipping/accessory list from the Customer Services box and check the contents of the boxes against the shipping list. This Customer Services box is identified by the international information symbol — a blue circle containing the letter *i*. Notify the branch manager or branch supervisor of any missing, incorrect, or damaged items. Advise the customer to contact the carrier about any missing items.

NOTE
Look at the unpacking illustrations on the shipping cartons.

3. See Figure 8–1. Remove all shipping bands.

4. Remove the outer shipping cap.

5. Use a 7/16-inch wrench to remove the machine screws and metal closures that secure the short carton flaps over the front and back sides of the cabinet. There are four metal closures, two on the front side of the carton and two on the back side of the carton.

6. Remove the shipping carton.

7. See Figure 8–2. Remove the deskidding ramps box from the side of the cabinet.

Figure 8–2 Opening the Model 610 and 612 System Shipping Cartons
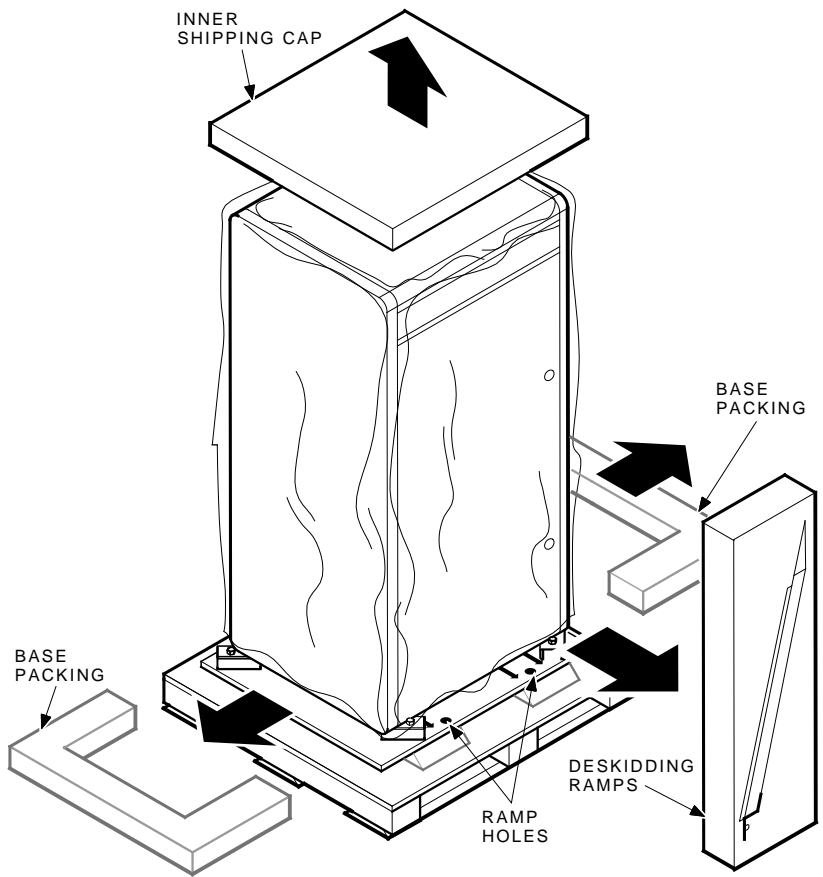
ZKO-050-000079-26-DG

8.4 Unpacking the Cabinets

Remove each computer cabinet from its shipping skid:

1. Remove the inner shipping cap.

CAUTION
For cold weather installations, all cabinets are shipped in vapor barrier bags. To avoid condensation on the cabinets, allow the cabinets to warm to the temperature of the computer room. Then cut the vapor barrier bag.

2. System cabinets are shipped in vapor barrier bags. Cut the bag at the base of the cabinet and lift it up and off the cabinet. Expander cabinets are shipped in polyethylene bags. Lift the bag up and off the cabinet.

3. Remove the desiccant bags from the shipping pallet.

4. Remove the wheel stops on the pallet with a Phillips screwdriver.

5. Open the deskidding ramps box. Remove the contents of the box.

6. See Figure 8–3. Match the arrows on the ramp with the arrows on the skid. Install the brackets on the edge of the skid, with the tabs in the skid holes.

7. Use a 9/16-inch wrench to remove the four shipping brackets from the cabinet's leveling feet.

8. Use the wrench part of the shipping bracket to fully retract the leveling feet.

WARNING
Four people are required to deskid a system cabinet. Two people are required to deskid an expander cabinet. Do not allow a cabinet to roll uncontrolled down the ramps.

9. Carefully guide the cabinet down the ramp.

Figure 8–3   Unpacking a Model 610 and 612 System Cabinet

RAMP
GUARD
RAILS

MR_X0750_90

9
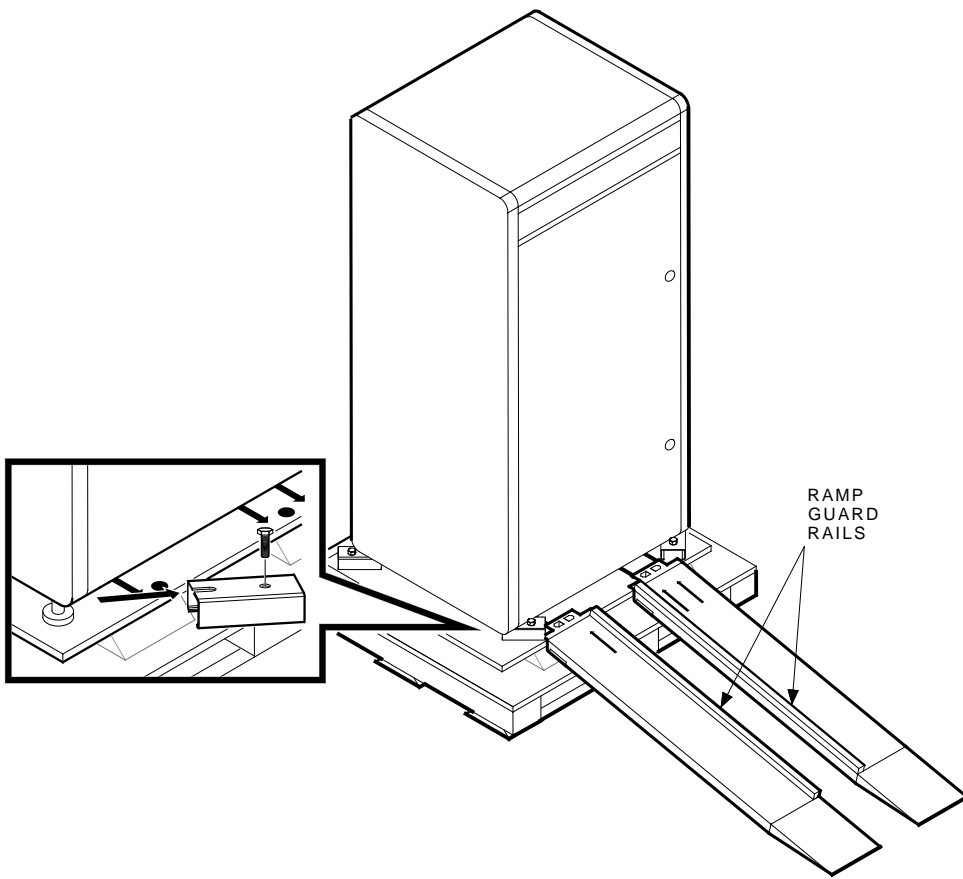
Preparing the Model 610 and 612 System Cabinets

This chapter describes how to open the model 610 and 612 system cabinets and prepare for installation of a base system or system with expansion. This chapter includes:

- Opening the cabinets
- Checking the ac voltage selector switches
- Checking the logic modules
- Installing module options
- Bolting the cabinets together
- Leveling the cabinets

9.1   Opening the Cabinets

Figure 9–1 identifies the front doors on the computer cabinets. A key (supplied with the system) must be used to turn the latch.

All operating and service access takes place from the front of the system:

- The upper door provides access to zone A of the system or expander cabinet.

- The lower door provides access to zone B of the the system or expander cabinet.

CAUTION
Installation and maintenance procedures may be performed only by qualified personnel. They must be familiar with the electrostatic discharge (ESD) procedures and power procedures for the VAXft system.

WARNING
A cabinet may weigh as much as 433 kg (956 lb) and is too heavy to be handled by one person. At least two people are required to move a cabinet.

Figure 9–1   Front View of a Model 610 or 612 System Cabinet
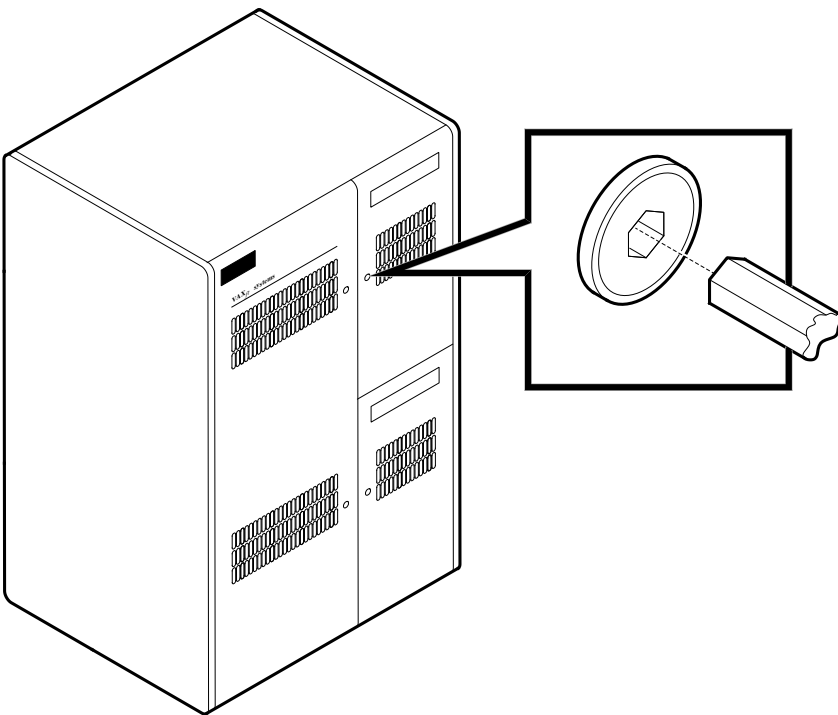
MR-0423-91DG

9.1.1 System Cabinet Layout

Figure 9–2 shows the layout of a system cabinet (zone A and B) and identifies the components:

- Summary panel with control switches and indicators

- Removable TF70 cannister tape drive or removable TF857 tape subsystem

- One or two removable RF-series cannister disk drives

- System logic modules (slots 1 through 7)

- Power modules (ac power input box, dc power supply, and battery pack)

In a base system, the system cabinet contains an RF-series cannister disk drive in unit 7. Unit 7 drives serve as the system operating media.

In a system with expansion, the system cabinets do not contain any drives. The unused drive slots must contain blank cannister modules to maintain cooling airflow.

Figure 9–2   Model 610 and 612 System Cabinet Layout, Front View

ZKO–050–000079–08–RGS
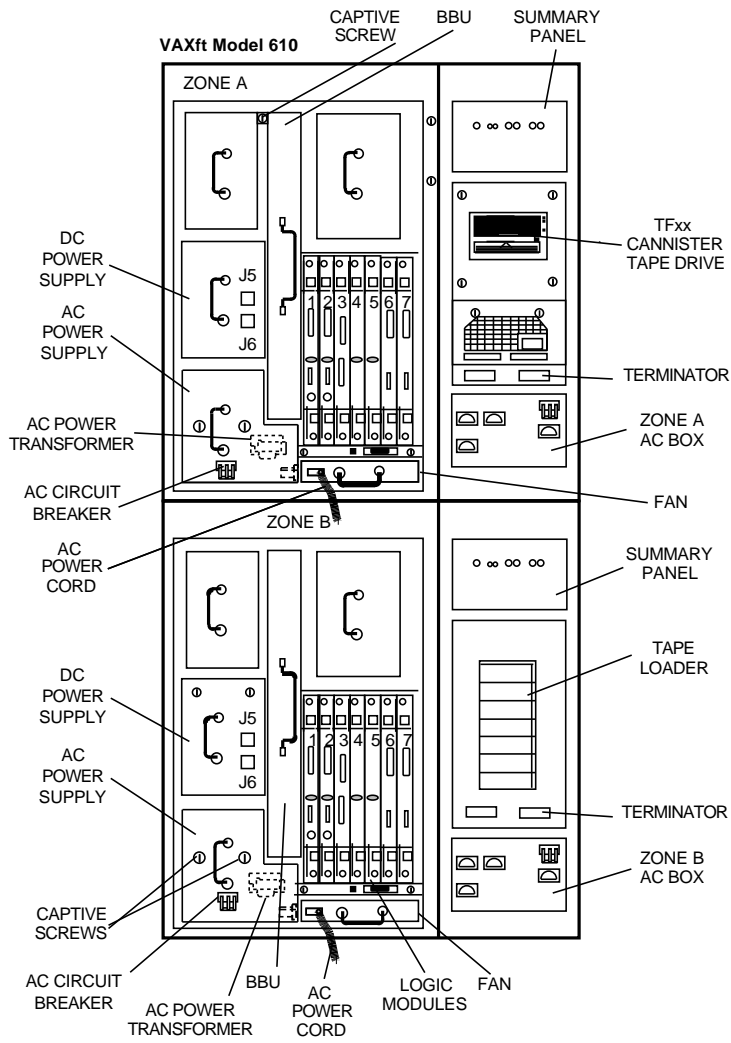
9.1.2 Expander Cabinet Layout

If you are installing a system with expansion, make sure the system cabinets are in the center of the installation area. The expander cabinets may be placed on either side of the system cabinets, depending on the configuration.

Figure 9–3 shows the layout of an expander cabinet and identifies the components:

- Summary panel with control switches and indicators

- Removable TF70 cannister tape drive or removable RF-series cannister disk drive

- One to five nonremovable RF-series carrier disk drives

- Power modules (ac power input box, dc power supply, and battery pack)

In a system with expansion, all the drives are in the expander cabinets. Each expander cabinet may contain up to six drives.

One expander cabinet contains a TF70 cannister tape drive in unit 5. This is the system backup and software load device. The other expander cabinet may contain a TF70 or RF-series option, or blank cannister module in the cannister slot for unit 5. It may also contain an RF-series carrier drive in the carrier slot for unit 5. However, it cannot contain drives in both slots because the two slots share the same DSSI node ID (5).

Unused drive slots must contain a blank carrier or cannister module to maintain proper airflow.

Figure 9–3   Model 610 and 612 Expander Cabinet Layout, Front View

ZKO–050–000079–13–RGS
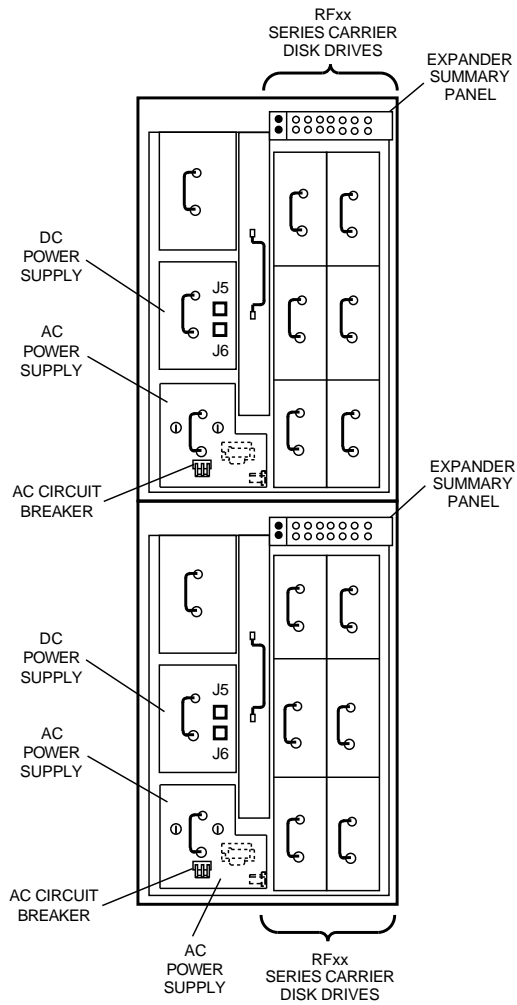
9.2 Checking the AC Voltage Selector Switches

Use the procedures in this section to check or change the ac voltage selector switch setting in any of the cabinets.

Figure 9–2 identifies the power modules, all of which are accessed from the front of the cabinets. The power transformer and voltage selector switch are located behind the ac power input box and battery pack. To access the switch, remove the ac power input box and the battery pack.

9.2.1 Removing the AC Power Input Box

Remove the ac power input box as follows:

1. See Figure 9–2. Remove the power cord from the ac power input box.

2. Loosen the two captive screws holding the ac power input box in place.

3. Grasp the handle and pull the box straight out. Put it where no one can trip over it or damage it.

9.2.2 Removing the Battery Pack

Remove the battery pack as follows:

1. Remove the panel or label cover from the top of the battery pack.

2. See Figure 9–2. Loosen the captive thumbscrew holding the top of the battery pack.

3. See Figure 9–4. Grasp the front handle and slowly pull the battery pack until the safety catch on the top handle contacts the chassis.

WARNING
The battery pack weighs 17.3 kg (38 lb). Use care when removing, handling, and inserting the battery pack.

4. Support the battery pack with one hand as you raise the top handle. This lowers the safety catch to clear the chassis.

5. Lift the battery pack and pull it straight out of the chassis. Put it where no one can trip over it or damage it.

Figure 9–4   Model 610 and 612 Battery Pack Safety Catch

WARNING

THE BATTERY PACK
WEIGHS 17.3 kg (38 lb).
USE CARE WHEN REMOVING,
HANDLING, AND INSERTING
THE BATTERY PACK.

HANDLE UP,
SAFETY CATCH
DOWN

HANDLE DOWN,
SAFETY CATCH UP

THUMBSCREW

MR-0047-90.DG
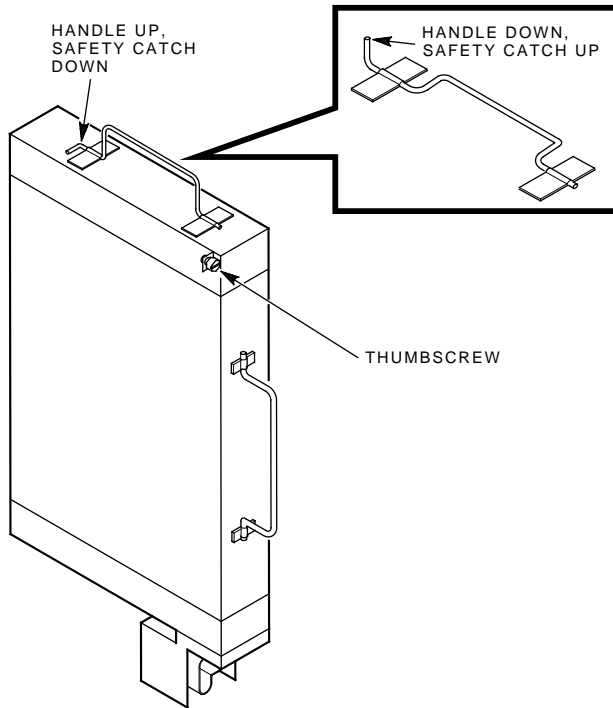
9.2.3 Checking the Voltage Selector Switch Setting

Figure 9–5 shows the location of the voltage selector switch on the power transformer chassis. Make sure the switch is in the correct position for the ac power supplied by the facility (115 V or 230 V).

NOTE
The voltage selector switch is factory set to 115 V. You may need to change the switch position.

To change the switch position, use a ballpoint pen or a small, slotted screwdriver to move it to the correct position.

9.2.4 Replacing the Battery Pack and AC Power Input Box

Replace the battery pack and ac power input box as follows:

1. Lift the battery pack and place it in the chassis.

    a. Raise the top handle and push the battery pack in until the top handle contacts the chassis.

    b. Support the battery pack with one hand as you lower the top handle to clear the chassis. Push the battery pack straight in and seat it firmly.

    c. Replace the holding screw and summary panel logo.

2. Place the ac power input box in the chassis.

    a. Push the box straight in and seat it firmly.

    b. Replace and tighten the two captive screws.

Figure 9–5   Model 610 and 612 AC Voltage Selector Switch Settings

MR-0048-90.DG

9.3 Checking the Logic Modules

Check the placement of the logic modules in the system cabinets. Also check the settings on the system I/O controller modules (Figures 9–6 and 9–7).

If you remove any modules, use the module removal and replacement procedure in Appendix A.

9.3.1 Module Placement

Table 9–1 describes the logic modules and their locations in the system backplanes. The type and complement of memory modules must be the same in both system cabinets. Figure 9–6 shows the correct placement of the logic modules in the system backplane.

Table 9–1   Model 610 and 612 Logic Modules

Slot	Module	Description
1	T3001 or T3004	Secondary KFE52 system I/O controller module or WAN module
2[1]	T3001[2]	Primary KFE52 system I/O controller module
3	T3005 or T3007[2]	KA520 or KA550 processor module, respectively
4	T3003[2]	First MS520 memory module
5	T3003 or T3004	Second MS520 memory module or (optional) WAN module
6	T3003 or T3004	Third MS520 memory module or (optional) WAN module
7	T3003 or T3004	Fourth MS520 memory module or (optional) WAN module

[1]Slot 2 contains the primary system I/O controller module, which supports console functions.

[2]Slots 1, 2, and 3 contain the primary system I/O controller module, a processor module, and a memory module. This is the minimum required for operation.

NOTE

Unused module slots require a T3999 filler module to maintain cooling airflow. The module handles also maintain ground continuity to meet FCC regulations and provide electrostatic discharge (ESD) protection.

Figure 9–6   Model 610 and 612 Logic Module Placement

MR–0159–90.RAGS
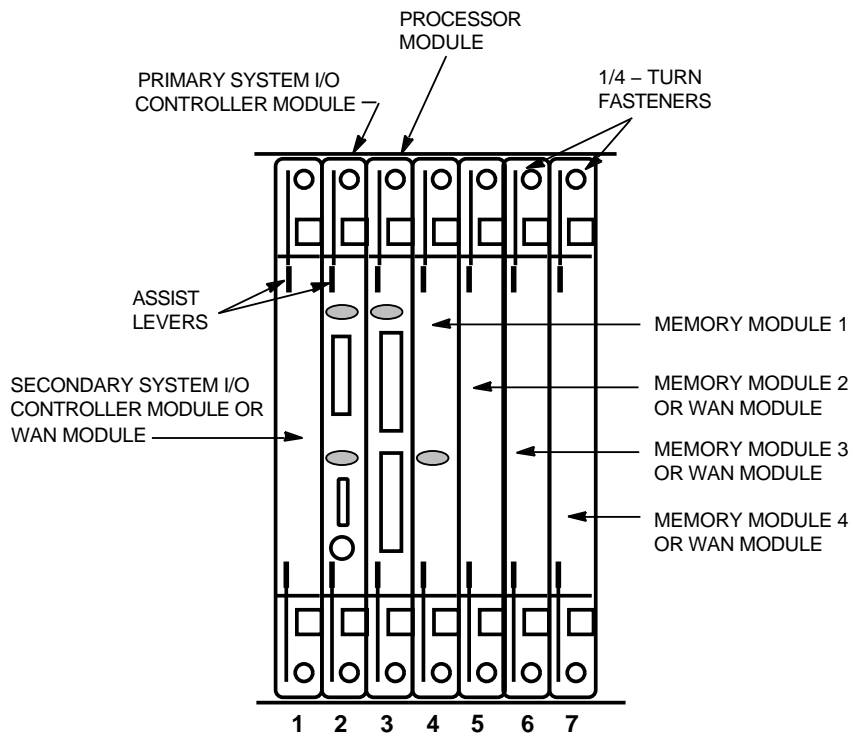
9.3.2 System I/O Controller Module Settings

System I/O controller modules are shipped with the correct DSSI jumper plug states (installed or removed) for the system. The Ethernet switch is set to the traditional (thickwire) position. Use the procedures in this section to check or change the DSSI jumper plugs or the Ethernet switch.

Figure 9–7 identifies the DSSI terminator, DSSI jumper plugs, and Ethernet switch on the system I/O controller module. A primary system I/O controller module is located in slot 2 of both system cabinets. In an expanded system, a secondary system I/O controller module is located in slot 1 of both system cabinets.

- The DSSI terminator and two DSSI jumper plugs must be:

  — In place on the primary system I/O controller module in slot 2 for a base system.

  — Removed from all system I/O controller modules in a system with expansion. (All drives are mounted in the expander cabinets of a system with expansion.)

- If the module is to be connected to an Ethernet, set the Ethernet switch as follows:

  — Position 2 (down) for ThinWire applications.

  — Position 1 (up) for traditional (thickwire) applications (factory default setting).

9.4 Installing Module Options

If you are installing any module options at this time (T3003 expanded memory or secondary T3001 system I/O controller modules), use the module removal and replacement procedure in Appendix A.

If you are installing the wide area network (WAN) module option, refer to Appendix B for the DEC WANcontroller 620 installation procedure and Y-box connections.

Figure 9–7   Model 610 and 612 System I/O Controller Module Settings
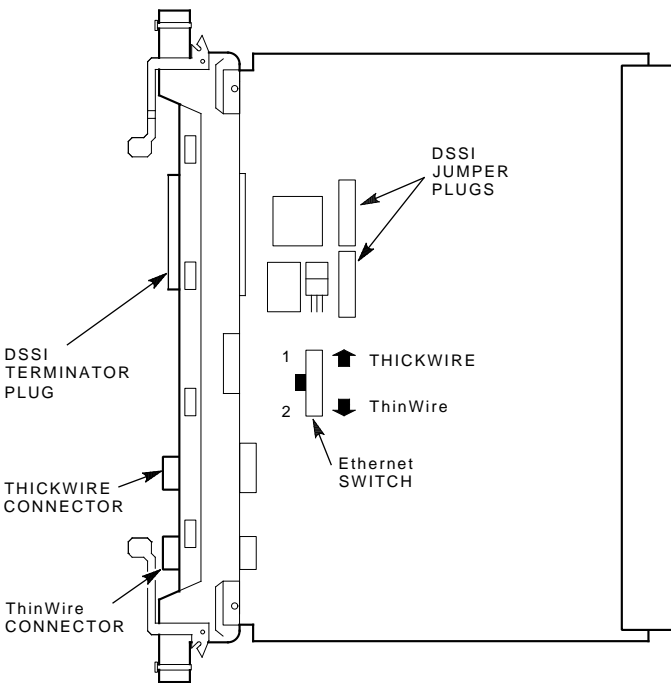
MR-0174-90.DG

9.5   Bolting the Cabinets Together

The cabinets are positioned according to the floor plan of an installation area. Move the CPU system cabinet(s) into position first, and then move the expander cabinet(s).

Each expander cabinet comes with a joiner panel (Figure 9–8) attached to the left side. Depending on your configuration, you may need to remove the joiner panel from the left side of the expander cabinet and install it on the right side of the expander cabinet.

In a model 610 with one expander cabinet, the joiner panel remains on the left side of the expander cabinet. The right side panel of the CPU cabinet is moved to the right side of the expander cabinet.

In a model 610 with two expander cabinets, the joiner panel remains on the left side of the right expander cabinet (EXP 1). The right side panel of the CPU cabinet is moved to the right side of EXP 1. The joiner panel on the left expander cabinet (EXP 2) is moved to the right side of EXP 2. The left side panel of the CPU cabinet is moved to the left side of EXP 2.

In both model 612 systems (base system and system with expansion), an additional joiner panel is required. The joiner panels on the left side of EXP 1 and EXP 2 remain in place. The additional joiner panel is installed on the right side of EXP 2. The right side panel of the left CPU cabinet (CPU 1) is removed, as is the left side panel of the right CPU cabinet (CPU 2). These side panels are not used.

CAUTION
When you move the cabinets together, do not pinch the cables or their connectors between the frames.

Repeat the following steps until all cabinets are bolted together. See Figure 9–8.

1. Remove the intercabinet hardware consisting of 12 sets of: spacer nuts (PN 74-41149-01), flat washers (PN 90-06646-00), lock washers (PN 90-07797-00), and $1/4 \times 20$ machine hex screws (PN 90-06245-09).

NOTE
When the floor is not level, the following hints may help:

- **If the bottom edges of the cabinet are closer together than the top edges, bolt from the bottom up.**

- **Be careful if you use a screwdriver to help align the mounting holes. Do not damage the holes.**

2. Using the top two screws as guide pins, carefully slide the two cabinets together and install the spacer nuts, washers, and lock washers on the screws. Do not tighten them yet.

3. Working from the top down, install all remaining screws, flat washers, lock washers, and spacer nuts.

4. Use a 7/16-inch wrench to tighten all 12 sets of screws, flat washers, lock washers, and spacer nuts.

Figure 9–8   Bolting the Model 610 and 612 System Cabinets

CPU

JOINER PANEL

HEX SCREW (12)
LOCK WASHER (12)
FLAT WASHER (12)
SPACER (12)

EXPANDER
CABINET

CPU SIDE PANEL

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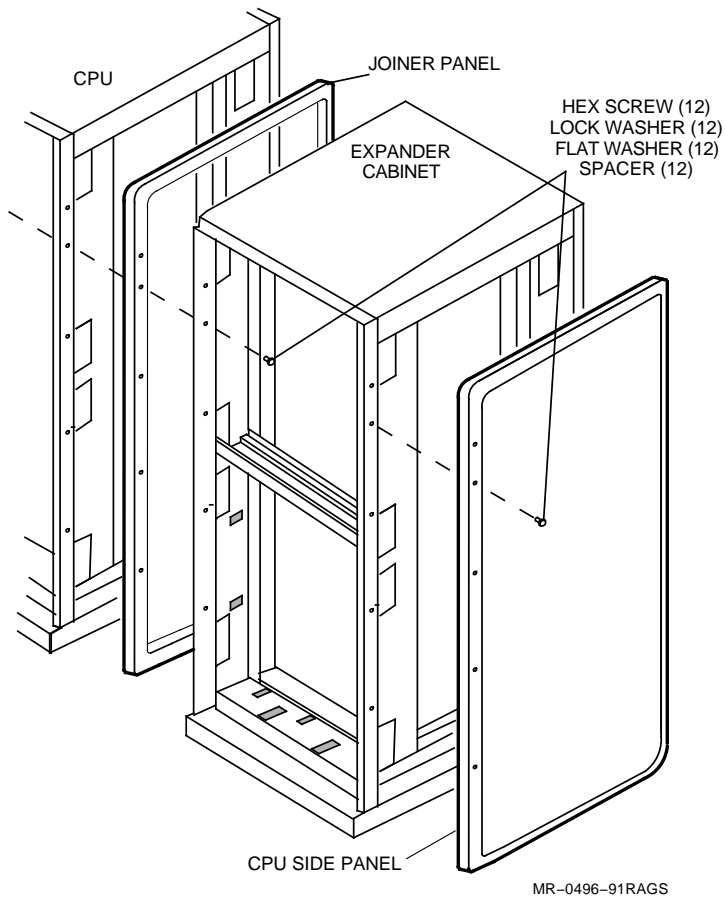
9.6   Leveling the Cabinets

Use a 9/16-inch wrench to level each cabinet. Lower each of the four
cabinet leveling feet.

10

Installing the Model 610 and 612 System Cables

This chapter describes how to install the cross-link, power, PCIM, and DSSI cables in the following VAXft systems:

- Model 610 base system

- Model 610 system with one expander cabinet

- Model 610 system with two expander cabinets

- Model 612 base system

- Model 612 system with expansion

NOTE
Refer to Appendix B for instructions on how to install a DEC WANcontroller 620 module in a VAXft system.

CAUTION
An ESD wrist strap must be worn during the following procedures until all cables are connected and secured to the module handles.

10.1   Installing the System Cables in a Model 610 Base System

This section describes how to install the system cables in a model 610 base system. Before you begin, review the following guidelines and refer to Figures 10–1 and 10–2.

- When routing cables between cabinets, place the cables in the cable tray at the bottom of each zone and feed them through the access holes in the vertical rails.

- When routing cables within a system cabinet (CPU 1 or CPU 2), route the cables along the middle vertical rail.

- When routing cables within expander cabinet one (EXP 1), route the cables along the left vertical rail.

- When routing cables within expander cabinet two (EXP 2), route the cables along the right vertical rail.

- After routing, secure the cables with cable clamps.

- Route console A and B cables to the consoles from the rear of the CPU cabinets.

- One terminator connector is provided with each CIO modules kit.

NOTE

The system cables in the model 610 base system are connected at the factory. If any of the cables have been disconnected, refer to Figure 10–3 and follow the steps in Sections 10.1.1 through Section 10.1.3.

Figure 10–1   Model 610 CPU Cabinet Cable Routing
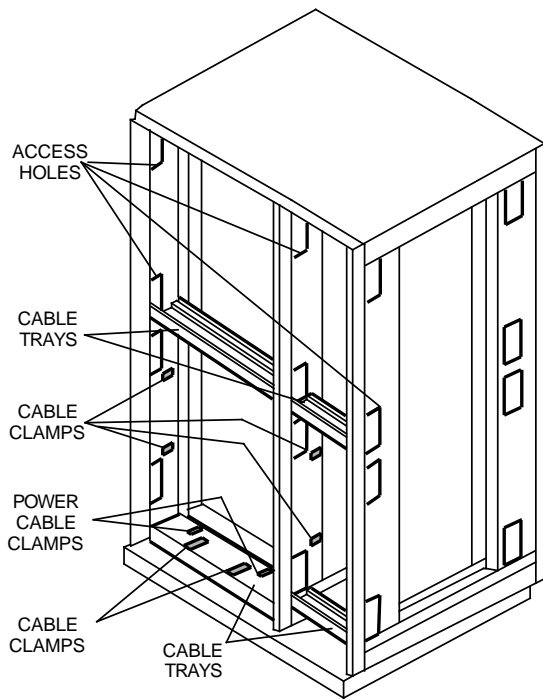
MR−0495−91RAGS

Figure 10–2   Model 610 Expander Cabinet Cable Routing

ACCESS
HOLES

CABLE
TRAY

CABLE
CLAMPS

POWER
CABLE
CLAMPS

CABLE
CLAMPS
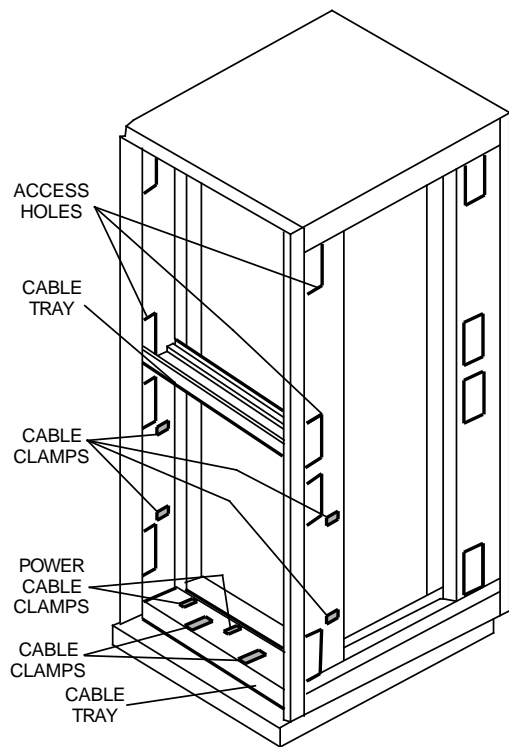
CABLE
TRAY

MR–0497–91RAGS

Figure 10–3   Cable Connections in a Model 610 Base System

MR–0490–91RAGS
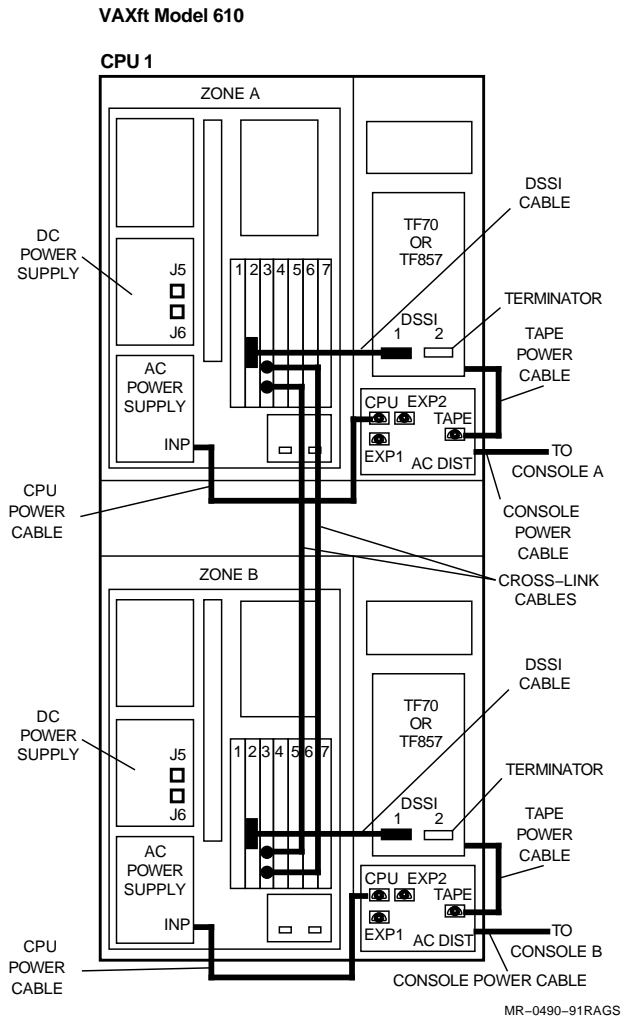
10.1.1 Cross-Link Cables

The following steps apply to all configurations. Refer to Figure 10–3 as you install the cross-link cables in the CPU cabinets.

1. Plug one end of a cross-link cable (PN 17-02194-01) into the lower connector of the processor module in slot 3 of zone A. Secure the spring clips.

2. Plug the other end of the same cross-link cable into the lower connector of the processor module in slot 3 of zone B. Secure the spring clips.

3. Plug one end of a cross-link cable (PN 17-02194-01) into the upper connector of the processor module in slot 3 of zone A. Secure the spring clips.

4. Plug the other end of the same cross-link cable into the upper connector of the processor module in slot 3 of zone B. Secure the spring clips.

10.1.2 Power Cables

Refer to Figure 10–3 as you install the power cables.

1. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone A of the system cabinet (CPU 1). Connect the other end of the same power cable to console A.

2. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone B of the system cabinet (CPU 1). Connect the other end of the same power cable to console B.

3. Connect one end of a power cable (PN 17-00442-38) to the input plug of the ac power supply in zone A of CPU 1. Connect the other end of the same power cable to the CPU plug of the ac distribution box in zone A of CPU 1.

4. Connect one end of a power cable (PN 17-00442-38) to the input plug of the ac power supply in zone B of CPU 1. Connect the other end of the same power cable to the CPU plug of the ac distribution box in zone B of CPU 1.

5. Connect one end of a power cable (PN 17-00422-39) to the tape plug of the ac distribution box in zone A of CPU 1. Connect the other end of the same power cable to the power plug at the rear of the TF-series storage device in zone A of CPU 1.

6. Connect one end of a power cable (PN 17-00422-39) to the tape plug
    of the ac distribution box in zone B of CPU 1. Connect the other end
    of the same power cable to the power plug at the rear of the TF-series
    storage device in zone B of CPU 1.

10.1.3 DSSI Cables

Refer to Figure 10–3 as you install the DSSI cables in any zone in which
a TF-series storage device is present.

1. Connect one end of the DSSI cable (PN 17-02420-01) to the KFE52 I/O
    module in slot 2. Secure the screws.

2. Connect the other end of the DSSI cable to the DSSI 1 connector.
    Secure the screws.

3. Install a terminator (PN 12-29258-01) at the DSSI 2 connector.

> **NOTE**
> **If you do not install a terminator, the DSSI cable does not
> function correctly.**

10.2 Installing the System Cables in a Model 610 System with One Expander Cabinet

This section describes how to install the system cables in a model 610
system with one expander cabinet. Before you begin, review the following
guidelines and refer to Figure 10–4.

*   When routing cables between cabinets, place the cables in the cable
    tray at the bottom of each zone and feed them through the access
    holes in the vertical rails.

*   When routing cables within a system cabinet (CPU 1 or CPU 2), route
    the cables along the middle vertical rail.

*   When routing cables within expander cabinet one (EXP 1), route the
    cables along the left vertical rail.

*   When routing cables within expander cabinet two (EXP 2), route the
    cables along the right vertical rail.

*   After routing, secure the cables with cable clamps.

*   Route console A and B cables to the consoles from the rear of the CPU
    cabinets.

• One terminator connector is provided with each CIO modules kit.

Figure 10–4   Cable Connections in a Model 610 System with One Expander Cabinet

MR–0491–91RAGS
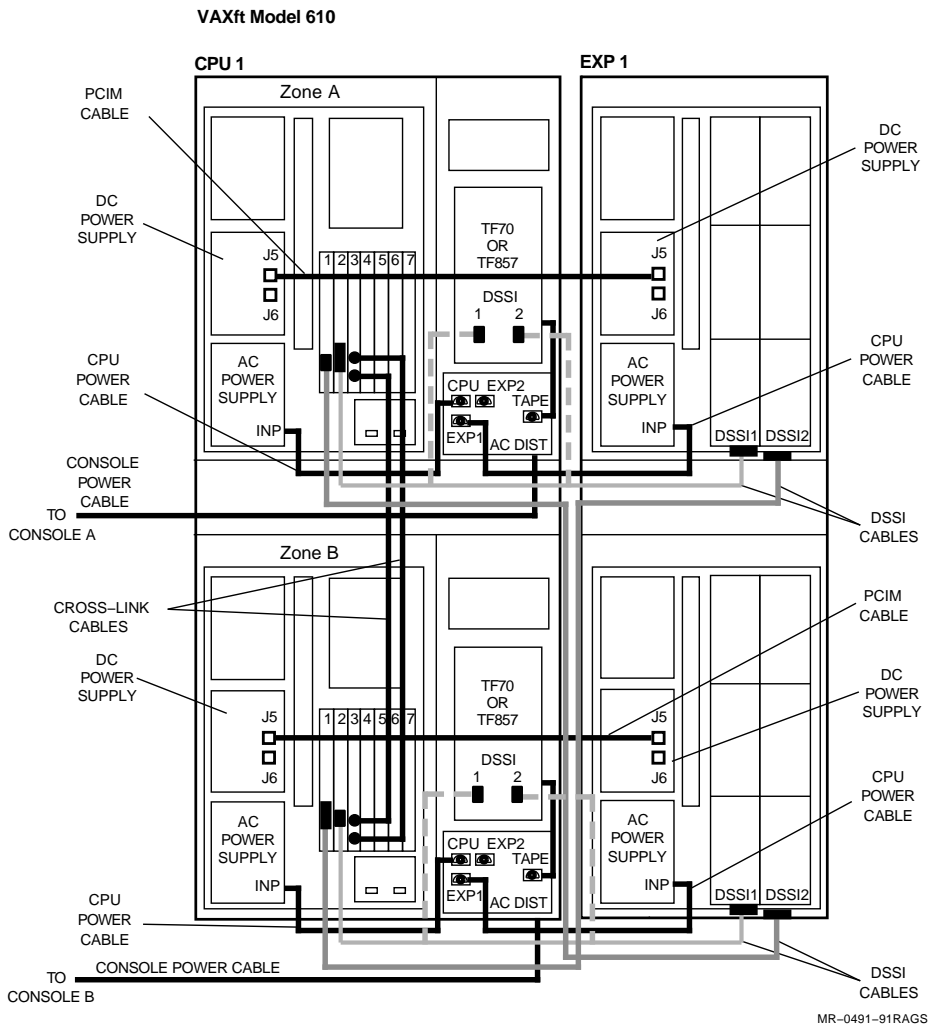
- Verify that the cross-link cables are installed correctly. See Section 10.1.1.

10.2.1 Power Cables

Refer to Figure 10–4 as you install the power cables.

1. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone A of the system cabinet (CPU 1). Connect the other end of the same power cable to console A.

2. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone B of the system cabinet (CPU 1). Connect the other end of the same power cable to console B.

3. Connect one end of a power cable (PN 17-00442-38) to the EXP 1 plug of the ac distribution box in zone A of CPU 1. Route the power cable into zone A of EXP 1. Connect the other end of the same power cable to the input plug of the ac power supply in zone A of EXP 1.

4. Connect one end of a power cable (PN 17-00442-38) to the EXP 1 plug of the ac distribution box in zone B of CPU 1. Route the power cable into zone B of EXP 1. Connect the other end of the same power cable to the input plug of the ac power supply in zone B of EXP 1.

5. Connect one end of a power cable (PN 17-00442-39) to the tape plug of the ac distribution box in zone A of CPU 1. Connect the other end of the same power cable to the power plug at the rear of the TF-series storage device in zone A of CPU 1.

6. Connect one end of a power cable (PN 17-00442-39) to the tape plug of the ac distribution box in zone B of CPU 1. Connect the other end of the same power cable to the power plug at the rear of the TF-series storage device in zone B of CPU 1.

10.2.2 PCIM Cables

Refer to Figure 10–4 as you install the PCIM cables.

1. Connect one end of a PCIM cable to J5 of the dc power supply in zone A of CPU 1. Route the PCIM cable to zone A of EXP 1. Connect the other end of the same PCIM cable to J5 of the dc power supply in zone A of EXP 1.

2. Connect one end of a PCIM cable to J5 of the dc power supply in zone B of CPU 1. Route the PCIM cable to zone B of EXP 1. Connect the other end of the same PCIM cable to J5 of the dc power supply in zone B of EXP 1.

10.2.3 DSSI Cables

Refer to Figure 10–4 as you install the DSSI cables.

If a TF-series storage device is present in zone A or B:

1. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone A in CPU 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of CPU 1.

2. Connect one end of a DSSI cable (PN 17-03023-01) to the DSSI 2 connector in zone A of CPU 1. Route the DSSI cable into zone A of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of EXP 1.

3. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone B in CPU 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of CPU 1.

4. Connect one end of a DSSI cable (PN 17-03023-01) to the DSSI 2 connector in zone B of CPU 1. Route the DSSI cable into zone B of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of EXP 1.

If no TF-series storage device is present:

1. Connect one end of a DSSI cable (PN 17-02245-02, blue color code) to the KFE52 I/O module in slot 2 of zone A in CPU 1. Route the DSSI cable into zone A of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of EXP 1.

2. Connect one end of a DSSI cable (PN 17-02245-02, blue color code) to the KFE52 I/O module in slot 2 of zone B in CPU 1. Route the DSSI cable into zone B of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of EXP 1.

3. Connect one end of a DSSI cable (PN 17-02245-03, green color code) to the KFE52 I/O module in slot 1 of zone A in CPU 1. Route the DSSI cable into zone B of EXP 1. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone B of EXP 1.

4. Connect one end of a DSSI cable (PN 17-02245-03, green color code) to the KFE52 I/O module in slot 1 of zone B in CPU 1. Route the DSSI cable into zone A of EXP 1. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone A of EXP 1.

10.3   Installing the System Cables in a Model 610 System with Two Expander Cabinets

This section describes how to install the system cables in a model 610 system with two expander cabinets. It also explains how to set the summary panel switches in the second expander cabinet. Before you begin, review the following guidelines and refer to Figure 10–5.

- When routing cables between cabinets, place the cables in the cable tray at the bottom of each zone and feed them through the access holes in the vertical rails.

- When routing cables within a system cabinet (CPU 1 or CPU 2), route the cables along the middle vertical rail.

- When routing cables within expander cabinet one (EXP 1), route the cables along the left vertical rail.

- When routing cables within expander cabinet two (EXP 2), route the cables along the right vertical rail.

- After routing, secure the cables with cable clamps.

- Route console A and B cables to the consoles from the rear of the CPU cabinets.

- One terminator connector is provided with each CIO modules kit.

- Verify that the cross-link cables are installed correctly. See Section 10.1.1.

10.3.1   Power Cables

Refer to Figure 10–5 as you install the power cables.

1. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone A of the system cabinet (CPU 1). Connect the other end of the same power cable to console A.

2. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone B of the system cabinet (CPU 1). Connect the other end of the same power cable to console B.

Figure 10–5   Cable Connections in a Model 610 System with Two Expander Cabinets
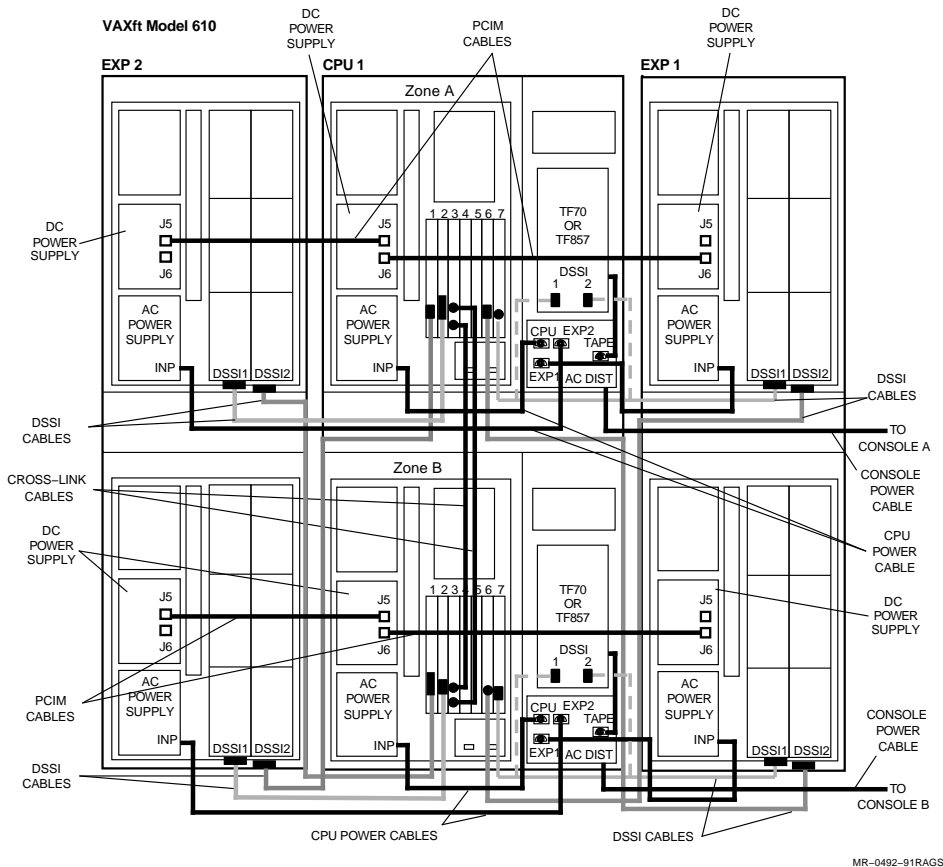
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3. Connect one end of a power cable (PN 17-00442-38) to the EXP 1 plug of the ac distribution box in zone A of CPU 1. Route the power cable into zone A of EXP 1. Connect the other end of the same power cable to the input plug of the ac power supply in zone A of EXP 1.

4. Connect one end of a power cable (PN 17-00442-17) to the EXP 1 plug of the ac distribution box in zone B of CPU 1. Route the power cable into zone B of EXP 1. Connect the other end of the same power cable to the input plug of the ac power supply in zone B of EXP 1.

5. Connect one end of a power cable (PN 17-00422-39) to the tape plug of the ac distribution box in zone A of CPU 1. Connect the other end of the same power cable to the power plug at the rear of the TF-series storage device in zone A of CPU 1.

6. Connect one end of a power cable (PN 17-00422-39) to the tape plug of the ac distribution box in zone B of CPU 1. Connect the other end of the same power cable to the power plug at the rear of the TF-series storage device in zone B of CPU 1.

7. Connect one end of a power cable (PN 17-00422-39) to the EXP 2 plug of the ac distribution box in zone A of CPU 1. Route the power cable into zone A of EXP 2. Connect the other end of the same power cable to the input plug of the ac power supply in zone A of EXP 2.

8. Connect one end of a power cable (PN 17-00422-39) to the EXP 2 plug of the ac distribution box in zone B of CPU 1. Route the power cable into zone B of EXP 2. Connect the other end of the same power cable to the input plug of the ac power supply in zone B of EXP 2.

10.3.2 PCIM Cables

Refer to Figure 10–5 as you install the PCIM cables.

1. Connect one end of a PCIM cable to J6 of the dc power supply in zone A of CPU 1. Route the PCIM cable to zone A of EXP 1. Connect the other end of the same PCIM cable to J6 of the dc power supply in zone A of EXP 1.

2. Connect one end of a PCIM cable to J5 of the dc power supply in zone A of CPU 1. Route the PCIM cable to zone A of EXP 2. Connect the other end of the same PCIM cable to J5 of the dc power supply in zone A of EXP 2.

3. Connect one end of a PCIM cable to J6 of the dc power supply in zone B of CPU 1. Route the PCIM cable to zone B of EXP 1. Connect the other end of the same PCIM cable to J6 of the dc power supply in zone B of EXP 1.

4. Connect one end of a PCIM cable to J5 of the dc power supply in zone B of CPU 1. Route the PCIM cable to zone B of EXP 2. Connect the other end of the same PCIM cable to J5 of the dc power supply in zone B of EXP 2.

10.3.3 DSSI Cables

Refer to Figure 10–5 as you install the DSSI cables.

If a TF-series storage device is present in zone A or B:

1. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 7 of zone A in CPU 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of CPU 1.

2. Connect one end of a DSSI connector (PN 17-03023-01) to the DSSI 2 connector in zone A of CPU 1. Route the DSSI cable into zone A of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of EXP 1.

3. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 7 of zone B in CPU 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of CPU 1.

4. Connect one end of a DSSI connector (PN 17-03023-01) to the DSSI 2 connector in zone B of CPU 1. Route the DSSI cable into zone B of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of EXP 1.

If no TF-series storage device is present:

1. Connect one end of a DSSI cable (PN 17-02245-02, blue color code) to the KFE52 I/O module in slot 7 of zone A in CPU 1. Route the DSSI cable into zone A of EXP 1. Connect the other end of the DSSI cable to the DSSI 1 connector in zone A of CPU 1.

2. Connect one end of a DSSI cable (PN 17-02245-02, blue color code) to the KFE52 I/O module in slot 7 of zone B in CPU 1. Route the DSSI cable into zone B of EXP 1. Connect the other end of the DSSI cable to the DSSI 1 connector in zone B of CPU 1.

3. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone A in CPU 1. Route the cable into zone A of EXP 2. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of EXP 2.

4. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone B in CPU 1. Route the cable into zone B of EXP 2. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of EXP 2.

5. Connect one end of a DSSI cable (PN 17-02245-02, blue color code) to the KFE52 I/O module in slot 1 of zone A in CPU 1. Route the DSSI cable into zone B of EXP 2. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone B of EXP 2.

6. Connect one end of a DSSI cable (PN 17-02245-02, blue color code) to the KFE52 I/O module in slot 1 of zone B in CPU 1. Route the DSSI cable into zone A of EXP 2. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone A of EXP 2.

7. Connect one end of a DSSI cable (PN 17-02245-03, green color code) to the KFE52 I/O module in slot 6 of zone A in CPU 1. Route the DSSI cable into zone B of EXP 1. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone B of EXP 1.

8. Connect one end of a DSSI cable (PN 17-02245-03, green color code) to the KFE52 I/O module in slot 6 of zone B in CPU 1. Route the DSSI cable into zone A of EXP 1. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone A of EXP 1.

10.3.4 Expander Cabinet Summary Panel

When you add a second expander cabinet to a model 610 system, you must set the summary panel switches in the second expander cabinet. Use the following steps.

1. In zone A of EXP 2, loosen the four screws that hold the summary panel in place.

2. Gently pull the summary panel toward you until you can reach the eight switches with a screwdriver. Do **not** disconnect the summary panel from its cables.

3. Use a flat-blade screwdriver (or similar tool) to set the switches as follows:

   - SW1 = on

   - SW2 = off

   - SW3 = on

   - SW4 to SW8 = off

4. Replace the summary panel.

5. Secure the four screws you loosened in step 1.

6. Repeat steps 1 to 5 for the summary panel in zone B of EXP 2.

10.4   Installing the System Cables in a Model 612 Base System

This section describes how to install the system cables in a model 612 base system. Before you begin, review the following guidelines and refer to Figure 10–6.

- When routing cables between cabinets, place the cables in the cable tray at the bottom of each zone and feed them through the access holes in the vertical rails.

- When routing cables within a system cabinet (CPU 1 or CPU 2), route the cables along the middle vertical rail.

- When routing cables within expander cabinet one (EXP 1), route the cables along the left vertical rail.

- When routing cables within expander cabinet two (EXP 2), route the cables along the right vertical rail.

- After routing, secure the cables with cable clamps.

- Route console A and B cables to the consoles from the rear of the CPU cabinets.

- One terminator connector is provided with each CIO modules kit.

- Verify that the cross-link cables are installed correctly. See Section 10.1.1.

10.4.1   Power Cables

Refer to Figure 10–6 as you install the power cables.

1. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone A of the system cabinet (CPU 1). Connect the other end of the same power cable to console A of CPU 1.

2. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone B of the system cabinet (CPU 1). Connect the other end of the same power cable to console B of CPU 1.

Figure 10–6   Cable Connections in a Model 612 Base System

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3. Connect one end of a power cable (PN 17-00442-17) to the console plug
    at the rear of the ac distribution box in zone A of the system cabinet
    (CPU 2). Connect the other end of the same power cable to console A
    of CPU 2.

4. Connect one end of a power cable (PN 17-00442-17) to the console plug
    at the rear of the ac distribution box in zone B of the system cabinet
    (CPU 2). Connect the other end of the same power cable to console B
    of CPU 2.

5. Connect one end of a power cable (PN 17-00442-38) to the EXP 1 plug
    of the ac distribution box in zone A of CPU 1. Route the power cable
    into zone A of EXP 1. Connect the other end of the same power cable
    to the input plug of the ac power supply in zone A of EXP 1.

6. Connect one end of a power cable (PN 17-00442-38) to the EXP 1 plug
    of the ac distribution box in zone B of CPU 1. Route the power cable
    into zone B of EXP 1. Connect the other end of the same power cable
    to the input plug of the ac power supply in zone B of EXP 1.

7. Connect one end of a power cable (PN 17-00422-39) to the tape plug
    of the ac distribution box in zone A of CPU 1. Connect the other end
    of the same power cable to the power plug at the rear of the TF-series
    storage device in zone A of CPU 1.

8. Connect one end of a power cable (PN 17-00422-39) to the tape plug
    of the ac distribution box in zone B of CPU 1. Connect the other end
    of the same power cable to the power plug at the rear of the TF-series
    storage device in zone B of CPU 1.

10.4.2 PCIM Cables

Refer to Figure 10–6 as you install the PCIM cables.

1. Connect one end of a PCIM cable to J5 of the dc power supply in zone
    A of CPU 1. Route the PCIM cable to zone A of EXP 1. Connect the
    other end of the same PCIM cable to J5 of the dc power supply in zone
    A of EXP 1.

2. Connect one end of a PCIM cable to J5 of the dc power supply in zone
    B of CPU 1. Route the PCIM cable to zone B of EXP 1. Connect the
    other end of the same PCIM cable to J5 of the dc power supply in zone
    B of EXP 1.

10.4.3 DSSI Cables

Refer to Figure 10–6 as you install the DSSI cables.

If a TF-series storage device is present in zone A or B:

1. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone A in CPU 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of CPU 1.

2. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone B in CPU 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of CPU 1.

3. Connect a terminator (PN 12-29258-01) to the DSSI 2 connector in zone A of CPU 1.

4. Connect a terminator (PN 12-29258-01) to the DSSI 2 connector in zone B of CPU 1.

5. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone A in CPU 2. Route the DSSI cable into zone A of EXP 1. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone A of EXP 1.

6. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone B in CPU 2. Route the DSSI cable into zone B of EXP 1. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone B of EXP 1.

7. Connect one end of a DSSI cable (PN 17-02245-02) to the KFE52 I/O module in slot 1 of zone A in CPU 1. Route the DSSI cable into zone A of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of EXP 1.

8. Connect one end of a DSSI cable (PN 17-02245-02) to the KFE52 I/O module in slot 1 of zone B in CPU 1. Route the DSSI cable into zone B of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of EXP 1.

10.5   Installing the System Cables in a Model 612 System with Expansion

This section describes how to install the system cables in a model 612 system with expansion. Before you begin, review the following guidelines and refer to Figure 10–7.

- When routing cables between cabinets, place the cables in the cable tray at the bottom of each zone and feed them through the access holes in the vertical rails.

- When routing cables within a system cabinet (CPU 1 or CPU 2), route the cables along the middle vertical rail.

- When routing cables within expander cabinet one (EXP 1), route the cables along the left vertical rail.

- When routing cables within expander cabinet two (EXP 2), route the cables along the right vertical rail.

- After routing, secure the cables with cable clamps.

- Route console A and B cables to the consoles from the rear of the CPU cabinets.

- One terminator connector is provided with each CIO modules kit.

- Verify that the cross-link cables are installed correctly. See Section 10.1.1.

10.5.1   Power Cables

Refer to Figure 10–7 as you install the power cables.

1. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone A of the system cabinet (CPU 1). Connect the other end of the same power cable to console A of CPU 1.

2. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone B of the system cabinet (CPU 1). Connect the other end of the same power cable to console B of CPU 1.

Figure 10–7   Cable Connections in a Model 612 System with Expansion

3. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone A of the system cabinet (CPU 2). Connect the other end of the same power cable to console A of CPU 2.

4. Connect one end of a power cable (PN 17-00442-17) to the console plug at the rear of the ac distribution box in zone B of the system cabinet (CPU 2). Connect the other end of the same power cable to console B of CPU 2.

5. Connect one end of a power cable (PN 17-00442-38) to the EXP 1 plug of the ac distribution box in zone A of CPU 1. Route the power cable into zone A of EXP 1. Connect the other end of the same power cable to the input plug of the ac power supply in zone A of EXP 1.

6. Connect one end of a power cable (PN 17-00442-38) to the EXP 1 plug of the ac distribution box in zone B of CPU 1. Route the power cable into zone B of EXP 1. Connect the other end of the same power cable to the input plug of the ac power supply in zone B of EXP 1.

7. Connect one end of a power cable (PN 17-00422-39) to the tape plug of the ac distribution box in zone A of CPU 1. Connect the other end of the same power cable to the power plug at the rear of the TF-series storage device in zone A of CPU 1.

8. Connect one end of a power cable (PN 17-00422-39) to the tape plug of the ac distribution box in zone B of CPU 1. Connect the other end of the same power cable to the power plug at the rear of the TF-series storage device in zone B of CPU 1.

9. Connect one end of a power cable (PN 17-00422-39) to the EXP 1 plug of the ac distribution box in zone A of CPU 2. Route the power cable into zone A of EXP 2. Connect the other end of the same power cable to the input plug of the ac power supply in zone A of EXP 2.

10. Connect one end of a power cable (PN 17-00422-39) to the EXP 1 plug of the ac distribution box in zone B of CPU 2. Route the power cable into zone B of EXP 2. Connect the other end of the same power cable to the input plug of the ac power supply in zone B of EXP 2.

10.5.2 PCIM Cables

Refer to Figure 10–7 as you install the PCIM cables.

1. Connect one end of a PCIM cable to J5 of the dc power supply in zone A of CPU 1. Route the PCIM cable to zone A of EXP 1. Connect the other end of the same PCIM cable to J5 of the dc power supply in zone A of EXP 1.

2. Connect one end of a PCIM cable to J5 of the dc power supply in zone A of CPU 2. Route the PCIM cable to zone A of EXP 2. Connect the other end of the same PCIM cable to J5 of the dc power supply in zone A of EXP 2.

3. Connect one end of a PCIM cable to J5 of the dc power supply in zone B of CPU 1. Route the PCIM cable to zone B of EXP 1. Connect the other end of the same PCIM cable to J5 of the dc power supply in zone B of EXP 1.

4. Connect one end of a PCIM cable to J5 of the dc power supply in zone B of CPU 2. Route the PCIM cable to zone B of EXP 2. Connect the other end of the same PCIM cable to J5 of the dc power supply in zone B of EXP 2.

10.5.3 DSSI Cables

Refer to Figure 10–7 as you install the DSSI cables.

If a TF-series storage device is present in zone A or B:

1. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone A in CPU 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of CPU 1.

2. Connect one end of a DSSI cable (PN 17-03023-01) to the DSSI 2 connector in zone A of CPU 1. Route the DSSI cable into zone A of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of EXP 1.

3. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone B in CPU 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of CPU 1.

4. Connect one end of a DSSI cable (PN 17-03023-01) to the DSSI 2 connector in zone B of CPU 1. Route the DSSI cable into zone B of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of EXP 1.

If no TF-series storage device is present:

1. Connect one end of a DSSI cable (PN 17-02245-02, blue color code) to the KFE52 I/O module in slot 2 of zone A in CPU 1. Route the DSSI cable into zone A of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of EXP 1.

2. Connect one end of a DSSI cable (PN 17-02245-02, blue color code) to the KFE52 I/O module in slot 2 of zone B in CPU 1. Route the DSSI cable into zone B of EXP 1. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of EXP 1.

3. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone A in CPU 2. Route the DSSI cable into zone A of EXP 2. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone A of EXP 2.

4. Connect one end of a DSSI cable (PN 17-02245-01, red color code) to the KFE52 I/O module in slot 2 of zone B in CPU 2. Route the DSSI cable into zone B of EXP 2. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone B of EXP 2.

5. Connect one end of a DSSI cable (PN 17-02245-02, blue color code) to the KFE52 I/O module in slot 1 of zone A in CPU 2. Route the DSSI cable into zone A of EXP 1. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone A of EXP 1.

6. Connect one end of a DSSI cable (PN 17-02245-02, blue color code) to the KFE52 I/O module in slot 1 of zone B in CPU 2. Route the DSSI cable into zone B of EXP 1. Connect the other end of the same DSSI cable to the DSSI 2 connector in zone B of EXP 1.

7. Connect one end of a DSSI cable (PN 17-02245-03, green color code) to the KFE52 I/O module in slot 1 of zone A in CPU 1. Route the DSSI cable into zone A of EXP 2. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone A of EXP 2.

8. Connect one end of a DSSI cable (PN 17-02245-03, green color code) to the KFE52 I/O module in slot 1 of zone B in CPU 1. Route the DSSI cable into zone B of EXP 2. Connect the other end of the same DSSI cable to the DSSI 1 connector in zone B of EXP 2.

11

Completing the Model 610 and 612 System Installation

This chapter describes how to complete the installation and start up the VAXft system. This chapter includes:

- Connecting the system to facility power

- Applying power to the system

- Power-on tests

- Final system tests

11.1   Connecting the System to Facility Power

The VAXft system cabinets do not provide convenience outlets. Every terminal, modem, and printer, and any other piece of equipment connected to the system requires a dedicated power receptacle and circuit breaker.

- Make sure that the circuit breakers for all dedicated power receptacles are set to the ON position.

- If a separate power source is provided (such as auxiliary power for the console terminals), make sure that the circuit panels, breakers, and receptacles are labeled accordingly.

Refer to Figure 11–1 during the following procedures. It shows the location of the local console terminal and remote modem connectors.

Figure 11–1   Model 610 and 612 Terminal, Modem, and Power Cord Connectors


```
                                    ZONE A




REMOTE
CONSOLE
TERMINAL
CONNECTOR

LOCAL
CONSOLE
TERMINAL
CONNECTOR

AC
POWER
CORD
                                    ZONE B




REMOTE
CONSOLE
TERMINAL
CONNECTOR

LOCAL
CONSOLE
TERMINAL
CONNECTOR

AC
POWER
CORD
                            mr–0500–91RAGS
```
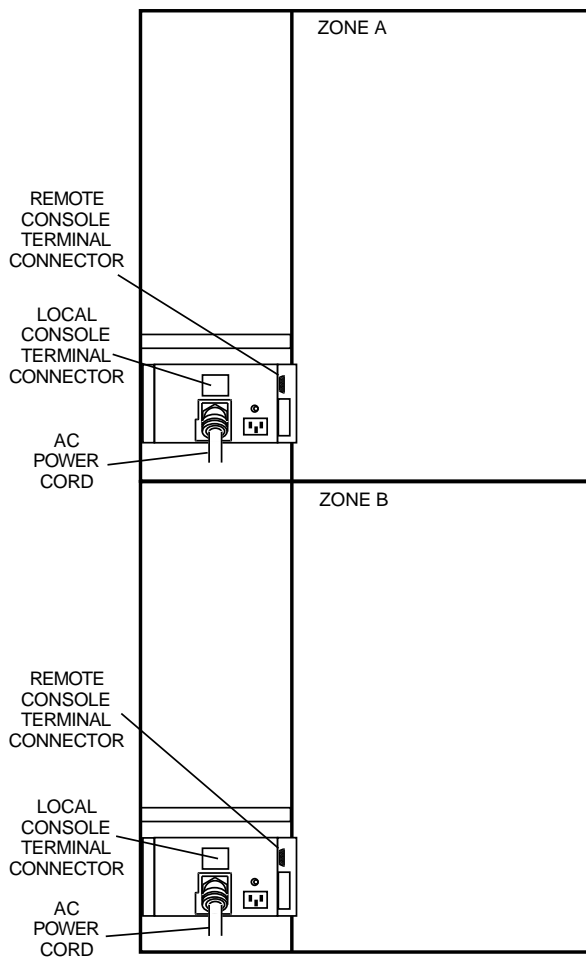
11.1.1 Connecting the Cabinet Power Cords

Connect the power cord for each CPU cabinet as follows:

1. Make sure that the cabinet ac circuit breaker is set to the OFF (down) position. Locate the power cord.

2. Plug each power cord into a dedicated power receptacle.

3. **Do not** set the cabinet ac circuit breaker to ON (up) at this time.

11.1.2 Connecting the Terminals and Modems

Connect the interface cables and power cords for the terminals and modems as follows:

1. Assemble each unit using the documentation supplied with it.

2. Make sure that the voltage selector switch is set to the correct voltage range (115 V or 230 V).

3. Make sure that the power switch is set to the off (0) position.

CAUTION
An ESD wrist strap must be worn while connecting the interface cables to the system cabinets.

4. See Figure 11–1. Connect the interface cables as follows:

    a. Plug the interface cable from the terminal into the local console terminal connector.

    b. Plug the interface cable from the modem into the remote console terminal connector.

    c. Repeat steps a. and b. for the other system cabinet.

5. Remove the ESD wrist strap. Plug the power cord from each unit into one of the dedicated power receptacles.

6. Set the power switches on the terminals and modems to the on (1) position.

11.1.3 Setting the Terminal Baud Rates

The factory default baud rate is 9600 for the local and remote terminal ports in both system cabinets. Refer to the documentation provided with the terminals for how to set the baud rates.

The *VAXft Systems Owner's Manual* describes how to set the system baud rates using the SET PORT and SET REMOTE commands. The available system baud rates are: 300, 600, 1200, 2400, 4800, 9600, and 19200.

11.2   Applying Power to the System

If you are installing a system with expansion, power on the expander cabinets first as described in Section 11.2.2.

11.2.1 System Cabinets

Figure 11–2 identifies the magnetic fault indicators (MFIs) and circuit breakers in the CPU cabinet.

1. In both system cabinets (in a base system), make sure that the power switches for all drives are set to the on (1) position.

NOTE
In a system with expansion, the system cabinets do not contain any drives. The drive slots contain blank cannister modules to maintain cooling airflow.

2. Power on the system cabinets by setting the ac circuit breakers to the ON (up) position.

NOTE
All MFIs are set to the fault state (yellow) at the beginning of the cabinet power sequence and are reset during the sequence.

Figure 11–2   Model 610 and 612 System Cabinet Switches and MFIs

mr–0499–91RAGS

3. When the cabinet power sequence completes (less than a minute), check the MFIs in all drive units and power modules. Any MFI that shows yellow indicates a problem in the unit.

    a. **Tape or disk drives** — If a problem is indicated in a tape or disk drive, you do not need to power off the cabinet. Set the power switch of the faulty drive to off (0), and repair or replace as required. Appendix C provides removal and replacement procedures for the cannister drives. (Refer to the *VAXft Systems Maintenance Guide* for the repair procedures.)

    b. **Power modules and fans** — If a problem is indicated in a power module or fan, set the cabinet ac circuit breaker to OFF (down), and repair or replace the faulty component. (Refer to the *VAXft Systems Maintenance Guide* for the repair procedures.)

4. See Figure 11–3. Check the LED indicators and magnetic fault indicators (MFIs) on the system logic modules.

    a. **Logic modules** — The MFIs should **not** be yellow when the power-on tests are completed (see Section 11.3). When an MFI is yellow, the module has a fault and must be replaced.

    b. **System I/O controller modules** — The LED indicator must be:

        — Off if the two DSSI jumper plugs are installed correctly on the primary system I/O controller module in slot 2 of a base system (drives are present in the system cabinets).

        — On if both DSSI jumper plugs are removed from slots 1 and 2 of a system with expansion (drives are not present in the system cabinets).

Figure 11–3   Model 610 and 612 Logic Module LED Indicators and MFIs

MR–0162–90.RAGS

11.2.2 Expander Cabinets

Figure 11–4 identifies the drive power switches, magnetic fault indicators (MFIs), and circuit breakers in an expander cabinet.

1. In both expander cabinets, make sure that the power switches for all drives are set to the on (1) position.

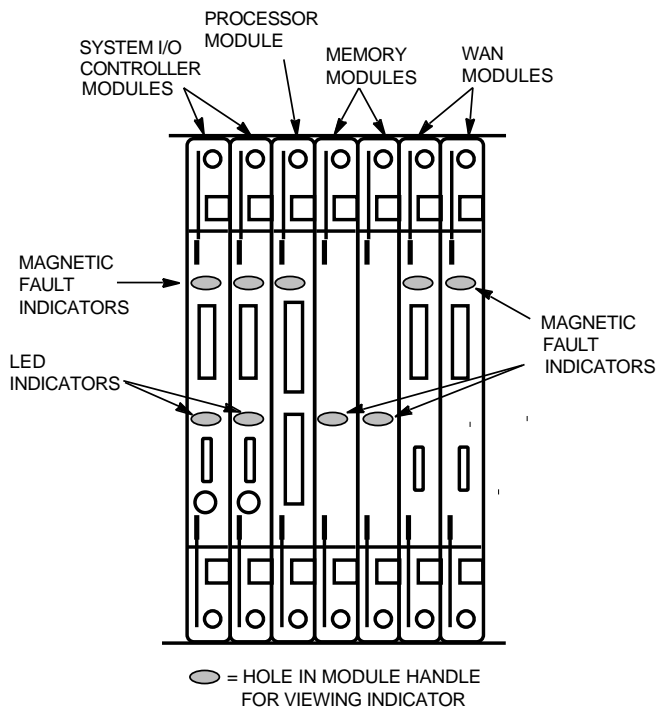2. Power on the expander cabinets by setting the ac circuit breakers to the ON (up) position.

NOTE
All MFIs are set to the fault state (yellow) at the beginning of the cabinet power sequence and are reset during the sequence.

3. When the cabinet power sequence completes (less than a minute), check the magnetic fault indicators (MFIs) in all drive units and power modules. Any MFI that shows yellow indicates a problem in the unit.

CAUTION
To prevent a system fault, you must set the expander cabinet circuit breaker to OFF (down) whenever all the expander cabinet disks are powered off.

   a. **Tape or disk drives —** If a problem is indicated in a tape or disk drive, you do not need to power off the cabinet. Set the power switch of the faulty drive to off (0), and repair or replace as required. Appendix C provides removal and replacement procedures for the cannister and carrier drives. (Refer to the *VAXft Systems Maintenance Guide* for the repair procedures.)

   b. **Power modules and fans —** If a problem is indicated in a power module or fan, set the cabinet ac circuit breaker to OFF (down), and repair or replace the faulty component. (Refer to the *VAXft Systems Maintenance Guide* for the repair procedures.)

Figure 11–4   Model 610 and 612 Expander Cabinet Switches and MFIs

MR−0498−91RAGS
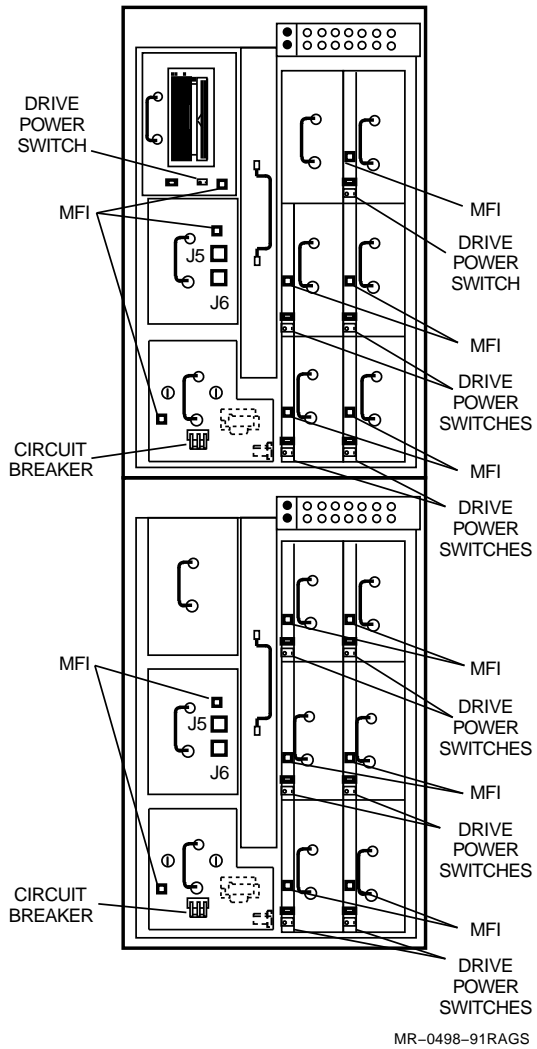
11.3 Power-On Tests

The processor, system I/O controller, and WAN modules each contain a set of ROM-based diagnostic (RBD) tests that are invoked on a power-on sequence. The processor diagnostics test the CPU, as well as memory, the zone, and the system. When a failure is detected in any module, the number of the test and a brief explanation of the failure are reported to the console terminal.

If all tests on the processor, system I/O controller, and WAN modules are successful, each processor module performs a series of zone tests that include internal memory and I/O functions. If the zone tests are successful (no detected errors), each processor module enters a restart procedure that initializes the zone.

11.4 Final System Tests

All of the diagnostic software required by the system is provided in the RBD tests described in Section 11.3.

The RBD command description in Chapter 6 of the *VAXft Systems Owner's Manual* (EK-VXFT1-OM) provides information and guidelines for writing DSSI parameters to the storage devices under the DUP facility.

You may then want to run the user environment test package (UETP) as a final check. Refer to the *VMS Upgrade and Installation Supplement: VAXft Systems* for more information on installing and booting the VMS operating system. The *VAX/VMS UETP User's Guide* describes how to log in and run UETP.

CAUTION

UETP can be configured to run write/read tests on the RF-series disks. UETP should be run only at the completion of a system installation because of the risk of corrupting data on shadowed disks. Do not run UETP without contacting the responsible customer representative or application manager.

When you are satisfied that the system is operating correctly, turn it over to the responsible customer representative for installation and testing of the application software.

A
Module Handling, Removal, and Installation/Replacement Procedures

This appendix describes how to remove or install a logic module in a system cabinet. This appendix includes:

- Module handling and ESD procedures

- Removing a module

- Installing/replacing a module

NOTE
The following procedures are intended for use during system installation. Before using any of these procedures on a system that is running, you must first contact the responsible customer representative, system manager, or application manager to shut down the zone and power off the system cabinet.

Observe the module handling and ESD procedures (Section A.1) whenever you need to remove, install, or replace a logic module in a system cabinet. Refer to Chapter 5, Section 5.3.1 for module placement information.

CAUTION

An ESD wrist strap, ground clip, and grounded ESD workmat must be used as described in Section A.1 whenever you handle the logic modules.

If you **must** use any of these procedures on a system that is running, first contact the responsible customer representative, system manager, or application manager to shut down the zone and power off the system cabinet. The *VAXft System Services Manager's Guide* (AA-NL35A-TE) describes how to shut down the zone and power off the system cabinet from the console.

A.1   Module Handling and ESD Procedures

Two grounding cords are stored in the lower front door of the system cabinet (Figure 5–2) in the model 310, 410, 610, and 612 systems. (No wrist strap is supplied with a model 110 rackmount system.) One cord is connected to a wrist strap. The other cord is connected to a grounding clip for attaching to an antistatic ESD box. When the wrist strap is in place, there must be no more than 10 MΩ through the grounding cord, wrist strap, and your wrist.

T3000-series modules are very fragile and static sensitive. Use the grounding cords and observe the following precautions when handling logic modules.

- Always put on a grounded wrist strap **before** handling a logic module.

- Be sure that nothing touches the module or the components on the module because leads can be damaged. Avoid contact with the wrist strap, grounding cord, clothing, jewelry, cables, or other modules.

- Minimize any potential for physical or ESD damage as follows:

  — Remove all unnecessary materials in the service area (tools, documents, paper, plastics, polystyrene).

  — Avoid clothing that contains more than 80% nonconductive materials (silk or synthetic fiber).

  — Do not wear a jacket. Wear a short-sleeve shirt or roll up the sleeves on a long-sleeve shirt.

  — Do not wear jewelry.

— Loose clothing, such as a necktie, must be fastened in place.

• Before removing a module from an ESD box, place the box on a clean surface. Do not allow the box to fall.

NOTE
Never place an ESD box on the floor.

• Keep the module in the antistatic ESD box until you are ready to install it.

• Before removing a module from an ESD box, attach the grounding clip to the ESD box.

• If you are replacing a module, put the module you just removed on a grounded ESD workmat on a clean surface in the service area. Put the module side 2 down on the ESD workmat.

• Save the ESD box for future use. Store a module in the ESD box until you are ready to install it.

• When removing or installing a module, be sure the module does not come into contact with a cable or another module. And be sure that nothing else touches the module or any module components.

• Hold a module **only** by the handle or by the edges with your hands flat and perpendicular to the circuit board. Do not touch the etch circuit or any components, leads, or connector pins. Do not bend the module.

• Do not slide the module across any surface because the leads are fragile and can be damaged.

• An ESD sensitive module may come into contact with the following items **only**:

— An approved ESD workmat

— Antistatic packaging on the ESD workmat

— Tools and test equipment on the ESD workmat

— The chassis being serviced

— The hands of someone wearing an ESD wrist strap

A.2   Removing a Module

To remove a module (or a T3999 blank module) from a system backplane:

CAUTION
An ESD wrist strap, ground clip, and grounded ESD workmat must be used as described in Section A.1 whenever you handle the logic modules.

1. Locate the module to be removed. Attach the grounded wrist strap to your wrist.

2. If the module has cables attached, remove the cables.

3. Release the fasteners at the top and bottom of the module handle. Push in each fastener and turn it one quarter turn to the left.

4. Use both hands to remove the module. Pull the module levers to disengage the backplane connector. You may hear a "snap" when the connector disengages.

5. Grasp the module handle. Slide the module out of the card cage slot.

6. Put the module in an ESD box or grounded ESD workmat.

A.3   Installing/Replacing a Module

To install/replace a module in the system backplane:

CAUTION
An ESD wrist strap, ground clip, and grounded ESD workmat must be used as described in Section A.1 whenever you handle the logic modules.

1. Before removing the module from the ESD box, attach a grounding clip to the ESD box.

2. Holding the module **only** by the handle, remove it from the ESD box. Hold the module vertically with the backplane connector on the right.

3. Guide the edges of the module into the upper and lower tracks of the card cage slot. Gently push the center of the module (near the handle). Slide the module all the way into position.

4. Use both hands to seat the module. Press the module levers at the top and bottom with equal force, starting with the bottom lever. You may hear a "snap" when the module is fully seated.

5. Secure the fasteners at the top and bottom of the module handle. Push in each fastener and turn it one quarter turn to the right.

6. Attach any cables that must be connected.

7. Make sure that the cables are connected correctly and verify your installation procedures.

8. Contact the responsible customer representative, system manager, or application manager **before** you power on the system cabinet.

9. When you are ready, power on the system cabinet by turning the ac circuit breaker to the ON position.

B

DEC WANcontroller 620 Configuration and Installation

This appendix describes the configuration requirements and explains how to install a DEC WANcontroller 620 (WAN) module in a VAXft system.

B.1 Configuration

This section describes the configuration requirements.

B.1.1 Minimum Revisions

Before installing a WAN module into a VAXft system, the following revision requirements must be met:

- VMS 5.4-1 or later

- FTSS V1.1 or later

- WANDD 1.1B or later

- T3004 N04 or later

B.1.2 Supported Layered Products

The following are the supported layered products:

- VAX PSI

- VAX 2780/3780

- VMS SNA

- DECnet Phase IV

B.1.3 Cable Requirements

Specific cables and loopbacks are required for different protocols. Refer to Table B–1 to select the correct adapter cables, extension cables, and loopbacks to support your protocol.

NOTE

To ensure compliance with British and European telecommunications standards, each 100-pin connector on the Y-box must be cabled to a T3004 module or terminated with a 100-pin terminator.

Table B–1   Adapter, Extension, and Loopback Cables

Protocol	Adapter Cable	Extension Cables	Length (feet)	Loopbacks
RS422, V.11	BC19B-02	BC55D-XX	10, 25	H3198
RS232, V.24	BC19D-02	BC22F-XX	10, 25	H3248
RS423, V.10	BC19E-02	BC55D-XX	10, 25	H3198
V.35	BC19F-02	BC19L-XX	25	H3250

Figure B–1 illustrates how the cables are connected in a typical configuration.

Figure B–1   Typical WAN Module Cabling

MR_X1423_89.DG
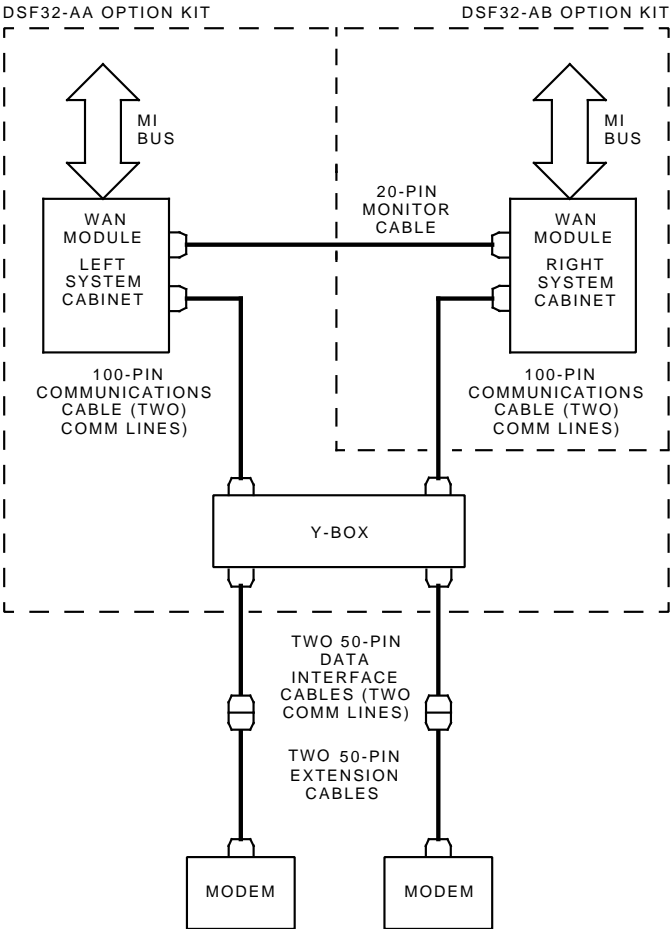
B.1.4 Recommended Spares List

Recommended WAN module spare parts follow:

Description	Pins	Part No.
WAN module		T3004-AA
Y-box		70-27483-01
100-pin terminator		12-33191-01
100-pin cable		17-02390-01
20-pin cable		17-02740-01
BC19B — Personality cable RS422, V.11	50 to 37	17-01108-01
BC19D — Personality cable RS232, V.24	50 to 27	17-01110-01
BC19E — Personality cable RS423, V.10	50 to 34	17-01111-01
BC19F — Personality cable V.35	50 to 25	17-01112-01

B.1.5 Troubleshooting Tools

WAN module troubleshooting tools follow:

Description	Part No.
100-pin loopback connector	12-33192-01[1]
20-pin loopback connector	12-33193-01[1]
Universal loopback	12-25852-01 (H3199)
Personality loopback V.35	H3250
Personality loopback RS232, V24	H3248
Personality loopback RS422, 423, 449, V.11	12-26259-01 (H3198)
Personality loopback X.21	12-26811-01 (H3047)

[1]A 100-pin and 20-pin loopback ships with every WAN module.

B.1.6 Redundant Communications Using the WAN Module

The WAN module hardware and driver software provide synchronous communications facilities for the VAXft systems. Use the Wide Area Network Device Driver Failover Set Manager (WANDD$FSM) software described in this manual to create and manage a WAN module configuration that provides a redundant communications link.

Unlike the VAXft system Ethernet driver, the WAN module driver does not automatically configure **failover sets** to provide a redundant communications link. For the WAN module, use the WANDD$FSM software to pair WAN modules and form the failover set. In a failover set, one WAN module handles current network traffic and the second WAN module remains in standby mode. If the first WAN module fails, the software automatically attempts to switch to the second WAN module. This switch is transparent to the operator, though system operators are notified by OPCOM messages.

Once the failover sets are created and the system is started, enter the DCL command:

```
$ SHOW DEVICES
```

Note that:

- Each failover set has a device name of the form SF*x* (where *x* is a single character)

- Each physical WAN module has a device name of the form SM*x* (where *x* is a single character)

For fault-tolerant purposes, the communications link is defined as coming through the logical device (SF*x*), rather than through the specific physical device (SM*x*).

Pair SM*x* devices with an SF*x* device to form the failover set. This can be done by executing WANDD$FSM commands at system startup or by entering WANDD$FSM commands later. Failover sets can have one of three configurations:

- Empty — failover set contains no WAN modules

- Single — failover set contains one WAN module

- Partnered — failover set contains two WAN modules

A failover set with only one WAN module is not fault tolerant. However, failover sets can be created with only one WAN module to have separate communications links, rather than occupying both WAN modules on just one redundant link.

NOTE
Two WAN modules from the same zone cannot be configured in the same failover set.

The failover set driver software constructs failover sets according to the configuration received by the WANDD$FSM utility. This configuration takes precedence over the physical cable configuration. When the driver discovers the physical cable configuration does not match the configuration given by WANDD$FSM, an error is reported through **OPCOM messages**.

B.1.7 Recommended Configurations and Restrictions

The recommended configurations are based on the following principles:

- Single failover sets have the same SF and SM controller letters in the set (SMB, SFB).

- Partnered failover sets have the SF controller letters based on the zone A controller (SMB + SMG SFB).

- Partnered failover sets have WAN modules located in the same slot in each zone. See Figure B–2.

Table B–2 lists the recommended configurations.

Table B–2   Redundant Failover Set Configurations

Partnered SMs	Single SMs	SF Controller	Zone
SMB + SMG	SMB	SFB	A
SMC + SMH	SMC	SFC	A
SMD + SMI	SMD	SFD	A
SME + SMJ	SME	SFE	A
	SMG	SFG	B
	SMH	SFH	B
	SMI	SFI	B
	SMJ	SFJ	B

B.1.8 Physical Device Names

Figure B–2 shows how the WAN module physical device names relate to the slots in the VAXft system backplane.

Figure B–2   WAN Module Physical Device Names and Related Slot Assignments
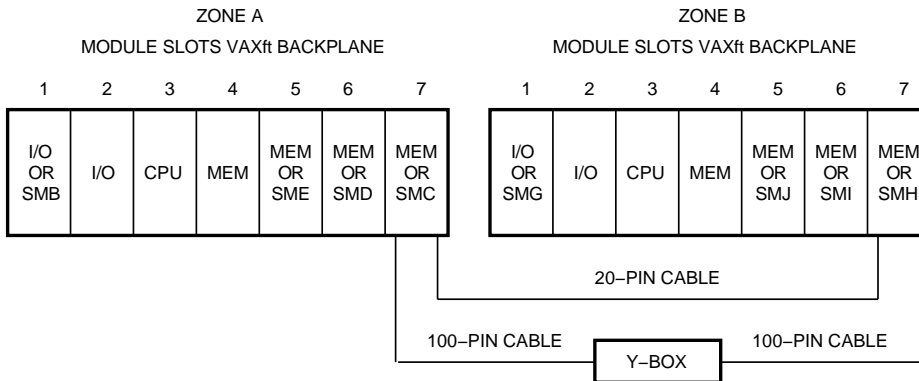
ZKO–050–000079–02–RGS

The external cabling between the WAN modules and respective Y-boxes must match the configuration established by the failover set manager (FSM). A failover set represents how the logical (SF) devices are associated with the physical (SM) devices. In Figure B–2, SFC is made up of SMC and SMH. See Table B–2.

B.1.9 Managing Failover Sets

WANDD$FSM provides four basic commands for managing failover sets:

- ADD
- REMOVE
- MODIFY
- SHOW

NOTE

To use the ADD, REMOVE, and MODIFY commands, you must have OPER privilege. The supplied startup procedure installs WANDD$FSM with SHARE privilege, which is also required to use WANDD$FSM commands.

WANDD$FSM is used to:

- Create the initial failover set configurations for a VAXft system
- Reconfigure a failover set if a zone must be stopped for repairs
- Reconfigure a failover set if both the WAN modules fail
- Reassign failover set membership to take advantage of unused WAN modules
- Obtain information on failover set membership and status

WANDD$FSM commands are used in system startup procedures to configure communication link failover sets. However, WANDD$FSM can also be used interactively when the system is live.

To start WANDD$FSM, enter the command:

```
$ RUN SYS$SYSTEM:WANDD$FSM
WANDD$FSM>
```

To stop WANDD$FSM, enter the command:

```
WANDD$FSM> EXIT
$
```

WANDD$FSM can also be executed as a foreign command. To use the foreign command line interface, use this DCL code:

```
$ ! Define a symbol to be the name and location of the
$ ! image – NOTE the preceding $
$ FSM = "$SYS$SYSTEM:WANDD$FSM"
$ ! Now enter the Failover Set Management command as follows
$ FSM SHOW/ALL
   .
   .
   .
$ ! Immediately returned to the $ prompt
```

This may be useful if you write DCL command procedures that invoke WANDD$FSM.

B.2   Installation

This section describes how to install a DEC WANcontroller 620 (WAN) module in a VAXft system.

B.2.1   Y-Box Mounting Methods

Figure B–3 shows Y-box mounting methods using the mounting bracket.

The mounting bracket kits (PN H043A) include screws to attach the first Y-box. The Y-box housings have clips that allow two or more Y-boxes to be mounted together on one bracket.

The top brackets are used for mounting on an office partition and are removed for wall, floor, or cabinet mounting. Two loop/hook straps are included with each kit for mounting on a pole. One or two straps may be required, depending on the size of the pole.
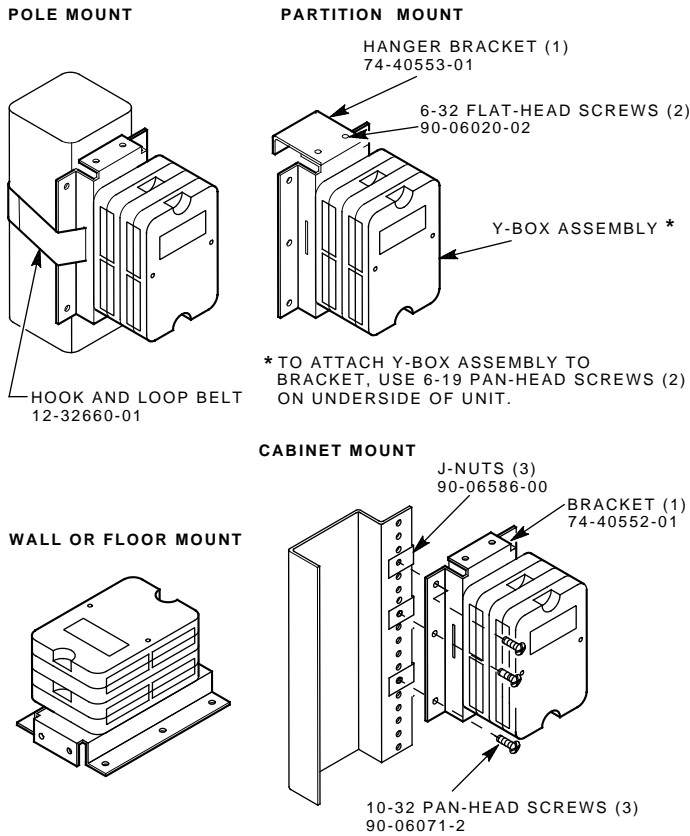
B.2.2   Y-Box Cable Connections

Open the WAN module option kits and remove the 100-pin, 3.05-meter (10-foot) cables. Carefully unroll each cable and mark both ends for zone A or zone B.

Referring to Figure B–1, connect one end of each cable to the appropriate Y-box connector. For nonredundant configurations, install the 100-pin terminator on the unused Y-box connectors.

Route each cable under the base frame of a system cabinet. Bring the end
of each cable up through the access hole in the base frame.

Figure B–3   Y-Box Mounting Methods

POLE MOUNT

PARTITION MOUNT

HANGER BRACKET (1)
74-40553-01

6-32 FLAT-HEAD SCREWS (2)
90-06020-02

Y-BOX ASSEMBLY *

* TO ATTACH Y-BOX ASSEMBLY TO
BRACKET, USE 6-19 PAN-HEAD SCREWS (2)
ON UNDERSIDE OF UNIT.

HOOK AND LOOP BELT
12-32660-01

CABINET MOUNT

J-NUTS (3)
90-06586-00

BRACKET (1)
74-40552-01

WALL OR FLOOR MOUNT

10-32 PAN-HEAD SCREWS (3)
90-06071-2

MR-0175-90.DG

B.2.3 WAN Module Installation

Section B.2.3.1 describes how to install the WAN module with the system running. Section B.2.3.2 describes how to install the WAN module with both zones shut down.

B.2.3.1 With System Running

Perform the following procedure:

1. Install the WAN DRIVERS V1.1B or later kit, ensuring a product authorization key (PAK) is available.

2. Select the WAN module slots. Remember the recommended slot partnership scheme. See Table B–2 and Figure B–2.

3. Enter the STOP/ZONE A (or targeted zone) command at the system prompt.

4. Remove power.

5. Install the WAN modules into the selected slots in zone A. See Table B–2 and Figure B–2.

6. Power up the system.

7. Enter the START/ZONE A command at the system prompt.

8. Wait for both zones to synchronize.

9. Enter the STOP/ZONE B command at the system prompt.

10. Remove power.

11. Install the WAN modules into the selected slots in zone B.

12. Connect the partnered WAN modules together with the 20-pin monitor cable. See Figures B–1 and B–2.

13. Connect each WAN module in a partnered pair to the Y-box using two 100-pin cables.

14. Enter the START/ZONE B command at the system prompt.

15. Enter the SHOW DEV SM command to DCL to reveal the SM devices.

16. Edit SYS$STARTUP:SF$STARTUP to configure the failover sets. See the example in Section B.2.4.

17. Enter the @SYS$STARTUP:SF$STARTUP command.

B.2.3.2 With Both Zones Shut Down

Perform the following procedure:

1. Install the WAN DRIVERS V1.1B or later kit, ensuring a PAK is available.

2. Select the WAN module slots. Remember the recommended slot partnership scheme. See Table B–2 and Figure B–2.

3. Shut down the system by entering the @SYS$SYSTEM:SHUTDOWN command.

4. Remove power.

5. Install the WAN modules into the selected slots in zone A and zone B.

6. Power up the system.

7. Reboot the system.

8. Enter the SHOW DEV SM command to DCL to reveal the SM devices.

9. Connect the partnered pairs of WAN modules together with the 20-pin monitor cable.

10. Connect each WAN module in a partnered pair to the Y-box using two 100-pin cables.

11. Edit SYS$STARTUP:SF$STARTUP to configure the failover sets. See the example in Section B.2.4.

12. Enter the @SYS$STARTUP:SF$STARTUP command.

B.2.4 Example

This section provides an example of a WAN module installation.
Table B–3 describes the nonpaged pool requirements.

Table B–3   Nonpaged Pool Requirements

Module	Kbyte Requirements
SMdriver	1 Kbyte
# DSF modules $\times$ 1 Kbyte =	
SFdriver	64 Kbytes
# configured SF units $\times$ 3.5 Kbyte =	
Total nonpaged pool =	

The installation requires 2200 free disk blocks. After the installation,
10,000 disk blocks are used for the files.

The following steps contain an example of a WAN module installation:

1. Insert a tape.

2. Enter @SYS$UPDATE:VMSINSTAL SYNC011 TAPE$MIA0: at the
    system prompt.

3. Create the failover set for the WAN modules by performing the
    following steps:

    • Ensure the VAX Wide Area Network Device Drivers software has
       been installed.

    • Issue the DCL command:

       ```
       $ SHOW DEVICES SM
       ```

       This lists the WAN module devices installed on the system.

    • Decide which WAN modules are to be paired, remembering they
       should be from different zones within the VAXft system. (The
       system installation engineer can advise you on which devices are
       in each zone.)

    • Edit the SF$STARTUP.COM file (found in SYS$STARTUP) to
       include the WANDD$FSM ADD commands that create the failover
       set at system startup.

       The SF$STARTUP.COM file already contains an example template
       of WANDD$FSM commands commented out. Enter your own
       commands in place of, or following, the template commands.
       DO NOT edit the rest of the procedure. This may cause the
       configuration of the system to be incomplete.

    • The SYS$STARTUP.SF$STARTUP.COM should now look like the
       following:

```
$ saved_verify = f$verify(0)
$ ! ****************************************************************************
$ ! *                                                                        *
$ ! *  COPYRIGHT (c) 1990 BY                                                  *
$ ! *  DIGITAL EQUIPMENT CORPORATION, MAYNARD, MASSACHUSETTS.                 *
$ ! *  ALL RIGHTS RESERVED.                                                   *
$ ! *                                                                        *
$ ! *  THIS SOFTWARE IS FURNISHED UNDER A LICENSE AND MAY BE USED AND COPIED  *
$ ! *  ONLY IN  ACCORDANCE WITH  THE  TERMS  OF  SUCH  LICENSE  AND WITH THE  *
$ ! *  INCLUSION OF THE ABOVE COPYRIGHT NOTICE. THIS SOFTWARE OR  ANY  OTHER  *
$ ! *  COPIES THEREOF MAY NOT BE PROVIDED OR OTHERWISE MADE AVAILABLE TO ANY  *
$ ! *  OTHER PERSON.  NO TITLE TO AND OWNERSHIP OF  THE  SOFTWARE IS  HEREBY  *
$ ! *  TRANSFERRED.                                                           *
$ ! *                                                                        *
$ ! *  THE INFORMATION IN THIS SOFTWARE IS  SUBJECT TO CHANGE WITHOUT NOTICE  *
$ ! *  AND  SHOULD  NOT  BE  CONSTRUED AS  A COMMITMENT BY DIGITAL EQUIPMENT  *
$ ! *  CORPORATION.                                                           *
$ ! *                                                                        *
$ ! *  DIGITAL ASSUMES NO RESPONSIBILITY FOR THE USE  OR  RELIABILITY OF ITS  *
$ ! *  SOFTWARE ON EQUIPMENT WHICH IS NOT SUPPLIED BY DIGITAL.                *
$ ! *                                                                        *
$ ! ****************************************************************************
$ !
$ !
$ !
$ ! SF$STARTUP.COM - Load the DSF32 driver software for the VAXft 3000
$ ! This procedure should be invoked from SYS$MANAGER:SYCONFIG.COM by inserting
$ ! the line @SYS$STARTUP:SF$STARTUP.COM.
$ !
$ !
$ ! Set up some error handling
$ !
$ on error then goto errexit
$ on warning then goto errexit
$ on control_y then continue
$
$ !
$ ! useful symbols
$ !
$
$ ss$_duplnam = 148
$ sysgen = "$sys$system:sysgen"
$
$!
$! check that there are enough contiguous SPTEs for WANDD
$! and LES NETMAN
$!
$   operation = "findptmax"
$   run sys$system:les$findptmax
$   status = $status
$   if .not. status then goto errexit
$   spte_count = status/2
$   if spte_count .lt. 560
$   then
$ write sys$output "%WANDD-E-INSFPTS, Insufficient SPTEs to map WANDD
$       Exec extensions"
$ write sys$output "_   560 required, only ''spte_count' contiguous
$       SPTEs available."
$ write sys$output ""
$ write sys$output "Increase SYSGEN parameter SPTREQ to resolve this
$       problem."
$ write sys$output ""
$ goto errexit
```

```
$   endif
$
$ !
$ ! Load microcode into non paged pool and point the SM driver DPT to it.
$ !
$
$ operation = "load firmware"
$ run sys$system:wandd$dsf$fw_load
$
$ !
$ ! Load the WANDD support module.
$ !
$
$ load_support_module:
$ operation = "load support module"
$ run sys$system:wandd$services_load
$
$ !
$ ! Create some SF devices
$ !
$
$ create_sf_devices:
$ device_string:==ABCDEFGHIJ
$ i=0
$ 40$:
$   controller_letter = f$extract ( i, 1, device_string )
$   controller = "SM" + controller_letter
$   sf_controller = "SF" + controller_letter
$   if f$getdvi(controller,"exists") then call create_failover_set
$   'controller_letter
$   if controller .eqs. "SMJ" then goto 50$
$   i = i + 1
$ goto 40$
$
$ 50$:
$ !
$ ! Install WANDD$FSM.EXE with SHARE privilege
$ !
$
$ if .not. f$file("sys$system:wandd$fsm.exe", "known") then -
    install add sys$system:wandd$fsm /priv=share/log
$ !
$ ! The next section of this procedure contains template commands for setting up
$ ! the failover sets for your system.  You should add commands to this
$ ! procedure to create the appropriate failover sets for your system.
$ !
$ ! See the Failover Set Management Utility Reference Manual for more
$ ! information
$ !
$ Fsm = "$sys$system:wandd$fsm"[1]
```

---

[1] See Table B-2 for the redundant failover set configurations.

```
$ ! 2 Non-fault tolerant lines : SFB0,SFB1
$ FSM ADD SMB SFB
$ ! 4 Fault tolerant lines : SFC0,SFC1,SFD0,SFD1
$ FSM ADD SMC,SMH SFC
$ FSM ADD SMD,SMI SFD
$ ! displays all configured failover sets
$ FSM SHOW/ALL/FULL
$ !
$ temp = f$verify('saved_verify')
$ exit
$
$ !
$ ! Subroutine to sysgen connect to SF units for an SM device
$ !
$
$ create_failover_set: Subroutine
$ sfdevice = "SF" + p1 + "0"
$ smdevice = "SM" + p1 + "0"
$ if  (f$getdvi(smdevice,"sts") .eq. 0)
$ then
$     write sys$output "''smdevice' paired with ''sfdevice'"
$     sysgen conn 'sfdevice/noada
$ endif
$ sfdevice = "SF" + p1 + "1"
$ smdevice = "SM" + p1 + "1"
$ if  (f$getdvi(smdevice,"sts") .eq. 0)
$ then
$     write sys$output "''smdevice' paired with ''sfdevice'"
$     sysgen connect 'sfdevice/noadap
$ endif
$ exit
$ Endsubroutine
$
$ !
$ ! Error handler
$ !
$ errexit:
$ !
$ ! Anything but ss$_duplnam bad news
$ !
$ if $status .ne. ss$_duplnam
$ then
$   write sys$output "Failed to start up SF devices"
$   exit $status
$ else
$   !
$   ! Re-establish error handler
$   !
$   on error then goto errexit
$   on warning then goto errexit
$   !
$   ! Resume processing at correct place
$   !
$   if operation .eqs. "load firmware"
$   then
$      goto load_support_module
$   else
$      goto create_sf_devices
$   endif
$ endif
```

4. Edit the SYSTARTUP_V5.COM file (found in SYS$STARTUP) and
    include the line:

    ```
    @SYS$STARTUP:SF$STARTUP.COM
    ```

    The WANDD$FSM commands execute at system reboot (unless
    autoconfiguration of the system is prohibited) or when the
    SF$STARTUP.COM is run interactively. (For more information on
    prohibiting autoconfiguration, see the *Guide to Setting Up a VMS
    System*.) The WANDD$FSM commands create the failover set and
    complete the configuration of the fault-tolerant communications link.

5. Enter the @SYS$STARTUP:SF$STARTUP command.

6. Run FSM. See Section B.1.9.

7. Use the following command to show the failover sets:

    ```
    WANDD$FSM> SHOW SFE

    Failover set SFE contains two devices in different zones.
    Cable state is bad.

    Physical        Adapter        Device          Cable Partner
    Adapter         State          State           20 Pin /100 Pin
    --------        -------        ------          ---------------
    SME             Current        Initialized     None    None
    SMC             Standby        Initialized     None    None
    ```

8. Force failover by issuing a STOP/ZONE command to the current
    physical adapter. This causes the standby adapter to become current.

B.2.5 Troubleshooting with FSM

This section describes how to use the FSM SHOW command to determine cable states, adapter states, device states, and partnered failover sets.

```
SHOW  [logical-adapter]

WANDD$FSM> SHOW/FULL SFB

Failover set SFB contains two devices in the same zone.
Cable state is good.

Physical       Adapter      Device          Cable Partner
Adapter        State        State           20 Pin /100 Pin
--------       -------      ------          ---------------
SMD            Current      Initialized     SMB     SMB
SMB            Standby      Initialized     SMD     SMD
```

The FSM SHOW fields may contain the following information:

- The name of the failover set. This is a device name beginning with the letters SF.

- The number of WAN modules in the failover set with additional information for partnered configurations. The information displayed can include the following configuration details:

  — Empty — failover set does not contain any WAN modules.

  — One device — failover set contains one WAN module.

  — Two devices in the same zone — failover set contains two WAN modules. Both WAN modules are installed in the same zone.

  — Two devices in different zones — failover set contains two WAN modules. The WAN modules are in different zones. This is the ideal configuration for fault-tolerant operation.

- For partnered configurations, a cable configuration diagnostic is displayed. The information displayed can include the following information:

  — Cable state is good — WAN modules in the failover set are physically partnered to each other through the 20-pin and 100-pin connections.

  — Cable state is bad — WAN modules in the failover set are not cabled to each other. The cable partner column in the /FULL display details the cabling arrangement of the failover set members. This message also sounds the terminal bell to warn of the incorrect cabling.

- — Cable state is indeterminate — software drivers cannot determine how the WAN modules are cabled. This situation can arise, for example, if one of the zones containing a failover set member loses power.

- Physical adapter — physical adapter field lists each of the WAN modules currently in the failover set. WAN module membership is defined by WANDD$FSM.

- Adapter state — adapter state field informs the system manager about the current state of WAN modules in the failover set. The information displayed can include the following states:

  - — Current — this WAN module is the currently active WAN module for this failover set.

  - — Standby — this WAN module is currently in the standby state. It is made current if the "Current" WAN module fails or if the MODIFY command is issued for this failover set.

  - — Failed — this WAN module has been failed by software. The cause of the failure is usually related to a WAN module hardware problem.

- Device state — device state field displays the current state of the WAN module hardware in the failover set. The information displayed can include the following states:

  - — Initialized — WAN module hardware and microcode have passed device initialization tests.

  - — Not initialized — WAN module hardware and microcode failed to initialize correctly.

- Cable partner — cable partner field displays the name of the other WAN module to which a WAN module is connected. A WAN module is connected to another WAN module by a 20-pin cable and a 100-pin cable. The information displayed can include the following:

  - — SMx — name of the WAN module to which this WAN module is paired. The display includes the 20-pin and 100-pin partner, and these two should be the same.

  - — None — displayed if the 20-pin or 100-pin cable is not currently connected to another WAN module.

  - — Unknown — displayed if the cable configuration cannot be determined; for example, if the zone containing one of the WAN modules is currently stopped.

C
System Drive Removal and Replacement

This appendix describes how to remove or insert system storage devices. This appendix includes:

- Removing a system drive

- Replacing or installing a drive

- Power-on procedures

- Using the server setup switch

NOTE
The model 110 system drives are installed internally. Refer to the *VAXft Systems Maintenance Guide* for removal and replacement procedures.

C.1   Removing a System Drive

You do not need to power off the cabinet to remove a system drive. To remove a cannister or carrier drive from the system backplane:

1. Write protect a disk drive by pressing the summary panel Write Protect switch in. The Write Protect indicator should be on.

    Then take the disk drive off-line by pressing the summary panel On Line switch in.

    The summary panel switches have no effect on the cannister tape drives. Tape may be write protected by setting the Write Protect switch on the TK cartridge.

2. Set the drive power switch to off (0). Wait 15 to 20 seconds (for disk drive to stop spinning and interlock solenoid to release).

3. Attach the grounded wrist strap to your wrist.

CAUTION
Use great care when removing, replacing, or transporting a drive. Do not drop the drive or allow it to come into contact with any object while you carry it.

Always wear a grounded wrist strap when you remove or replace a tape or disk drive.

4. If you are removing a cannister drive, see Figure C–1. Push the drive latch down and pull the drive straight out of the slot.

    If you are removing a carrier drive, see Figure C–2. Release the captive thumb screw. Then pull the drive straight out of the slot.

5. If you are not replacing the drive with another, a blank cannister or carrier module must be inserted in the slot to maintain cooling airflow.

Figure C–1   Cannister Drive Controls and Drive Latch

MR-0183-90.DG
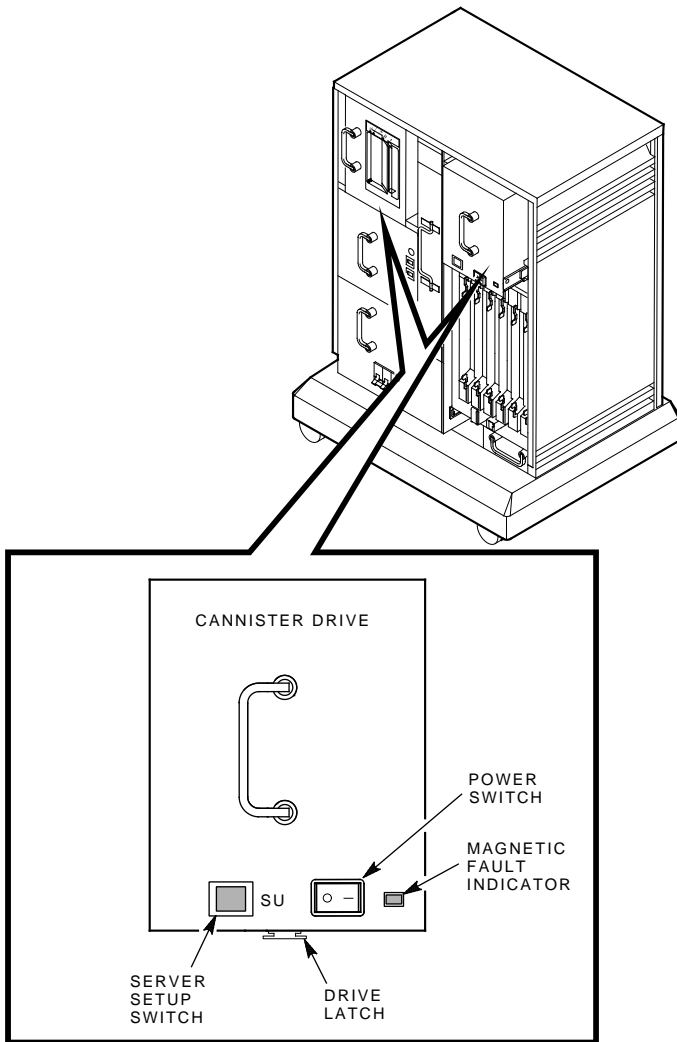
Figure C–2   Carrier Drive Controls and Captive Thumb Screw
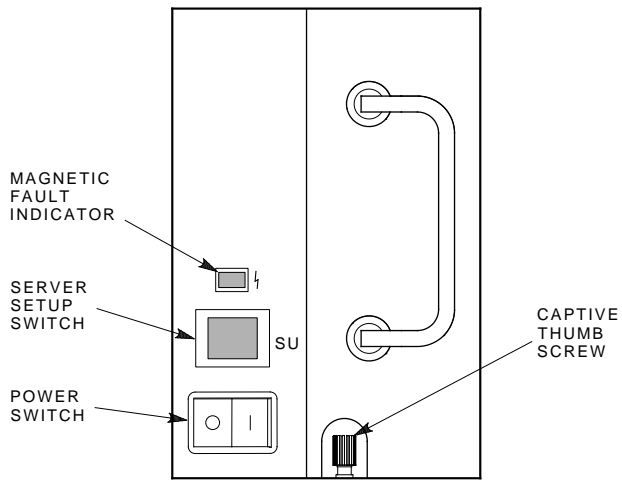
MR-0184-90.DG

C.2   Replacing or Installing a Drive

To insert a cannister or carrier drive in the system backplane:

1. If you are installing a drive, first remove the cannister or carrier module that occupies the slot.

2. Attach the grounded wrist strap to your wrist.

> **CAUTION**
>
> **Carrier drives must not be removed, except by qualified maintenance personnel.**
>
> **Always wear a grounded wrist strap when you remove or replace a tape or disk drive.**

3. Insert the drive in the slot. Push the drive straight in and seat it firmly.

4. A cannister drive must have the drive latch secured as shown in Figure C–1.

    A carrier drive must be secured with the captive thumb screw shown in Figure C–2.

C.3   Power-On Procedures

When you remove a disk or tape drive and then replace it in the same slot, the drive keeps the same unit number and DSSI node address. Power on the drive as follows:

1. Set the drive power switch to on (1). Wait 15 to 20 seconds (for disk drive to come up to speed and Ready indicator to turn on).

2. Write protect the drive, if necessary. Then bring the drive on-line by releasing the On Line switch (button out).

    The summary panel switches have no effect on the cannister tape drives. Tape is write protected by setting the Write Protect switch on the TK cartridge.

C.4 Using the Server Setup Switch

The server setup (SU) switch is provided for use on a running system and has no effect when the system is halted.

CAUTION
The server setup switch must only be used during maintenance procedures.

Using the server setup switch when you power on a drive inhibits the drive from joining the DSSI cluster. This allows the console operator to set host from DCL and write DSSI parameters to the drive under the diagnostic/utility protocol (DUP) facility without halting the system.

DSSI parameters must be set whenever you install a tape or disk drive with unknown parameters. Placing a drive in service without first writing the parameters could cause irretrievable loss of data. You must write DSSI parameters if the drive you are installing or replacing is:

• A new drive with factory-set parameters.

• An existing drive with a new DSSI controller/interface module.

The diagnostics chapter of the *VAXft Systems Maintenance Guide* (EK-VXFT1-MG) provides information on setting host from DCL. The RBD command description in Chapter 6 of the *VAXft Systems Owner's Manual* (EK-VXFT1-OM) provides information and guidelines for writing DSSI parameters to the storage devices under the DUP facility.

If you are going to set drive parameters on a running system, power on the drive as follows:

1. Press and hold the server setup switch.

2. Set the power switch to on (1).

3. Release the server setup switch.

It takes 15 to 20 seconds for a disk drive to come up to speed and the Ready light to turn on (light). Then set the drive switches as follows:

1. Place a disk drive on-line by releasing the summary panel On-Line button to the out position.

2. Write-enable a disk drive by releasing the summary panel Write Protect button to the out position.

3. The summary panel switches and indicators have no effect on a tape drive.

When you have set host and written the DSSI parameters, place the drive in service as follows:

1. Set the drive power switch to off (0).

2. Wait a few seconds for the drive power to bleed off. Wait 15 to 20 seconds for a disk drive to stop spinning.

3. Set the drive power switch to on (1). Wait 15 to 20 seconds for a disk drive to come up to speed and the Ready indicator to turn on (light).

4. Set the Write Protect switch to the desired state and add the drive into the system configuration.

D

Model 310 and 410 Rackmount System Site Preparation and Installation

This appendix describes the procedure for OEM customers to mount model 310 and 410 BA22 boxes into custom 19-inch cabinets.

The VAXft system is offered in two basic mounting styles: office pedestal and OEM rackmount. The processor and mass storage expanders are contained in BA22-style equipment boxes.

The office pedestal is designed to operate in office or computer room environments and has the following features:

- Enclosure skins and covers

- Split-entry front door

- Base casters

The OEM rackmount box version differs from the office pedestal version:

- No skins or covers

- Rackmount base instead of base casters

- Operates with ac power or optional H407-B dc front-end module

The rackmount base ensures support for the transformer and allows spacing for required airflow. The rackmount base provides:

- Separate air paths between the units

- Mounting support for a lifting device, such as a forklift

The rackmount option consists of:

- Attached rackmount assembly
- Front cover
- Instructions

D.1   Design Concerns

The design concerns for rackmount installation into a custom cabinet are:

- Unit weight
- Unit dimensions
- Center of gravity
- Rack construction
- Heat and airflow management
- Data cable management
- Grounding considerations
- Power distribution

D.1.1   Unit Weight

Each model 310 and 410 BA22 box can weigh up to 108 kg (240 lb) for the processor box and up to 122 kg (270 lb) for the mass storage expander box. Therefore, the cabinet's 19-inch Radio-Electronics-Television Manufacturers Association (RETMA) rail system must be designed to handle a hang weight of 231 kg (510 lb) (one BA22 processor and one BA22 expander box mounted on a one rail system), plus a safety margin. It is recommended the final rail assembly with two BA22 boxes be designed to withstand a 10 gravity peak, 10-ms shock pulse in the vertical plane.

Another concern while handling the BA22 boxes is safety. When rack mounting the BA22 boxes into the cabinet, use a lifting device. The suggested lifting device is a flat-blade forklift.

CAUTION
The BA22 boxes must be picked up from the bottom. Never use any sort of hook or try to lift the unit by its skins.

D.1.2 Unit Dimensions

The VAXft system BA22 boxes are designed to be mounted into 19-inch RETMA rail cabinets. If your cabinet does not have a 19-inch RETMA rail system, design a conversion bracket. For example, many phone company racks are based on a 1-inch center hole pattern, so conversion brackets have to be custom made.

The dimensions for the model 310 and 410 BA22 boxes are:

- 60.96 cm (24.0 in) height of main box

- 66.14 cm (26.04 in) height of main box plus rackmount base

- 44.55 cm (17.54 in) width of main box (inside of rails)

- 46.78 cm (18.42 in) width of main box (flange to flange)

- 29.90 cm (11.77 in) depth plus 10.16 cm (4.0 in) for the rackmount base extension in the rear

See Figures D–1 and D–2 for front views. See Figure D–3 for the rail hole pattern. See Figure D–4 for a side view.

D.1.3 Center of Gravity

As seen in Figures D–1 and D–2, the BA22 boxes are 29.90 cm (11.77 in) deep. Therefore, much of the center of gravity is toward the front rail system. If your cabinet is, for example, 121.9 cm (48.0 in) deep, the center of gravity is in the front quarter of the cabinet, causing a possible tip hazard. If you use a cabinet 76.2 cm (30.0 in) wide by 152.4 cm (60.0 in) high by 66.14 cm (26.04 in) deep, the center of gravity is acceptable at approximately 35.56 cm (14.0 in) from the front of the cabinet. See Figures D–5 and D–6.

If deep cabinets (for example, 121.9 cm (48.0 in)) are used, and if no equipment is going to be mounted on the cabinet's rear rails to counterbalance the front load of the BA22 boxes, an anti-tip front foot plate must be used if the cabinet is mounted on casters. If the cabinet is bolted to the floor, an anti-tip plate can be omitted. In either case, the shipping skid must be designed to handle the cabinet's center of gravity correctly and not accidentally tip while being moved.

Figure D–1   Model 310 and 410 BA22A Box, Front View

MR_0539_90.DG
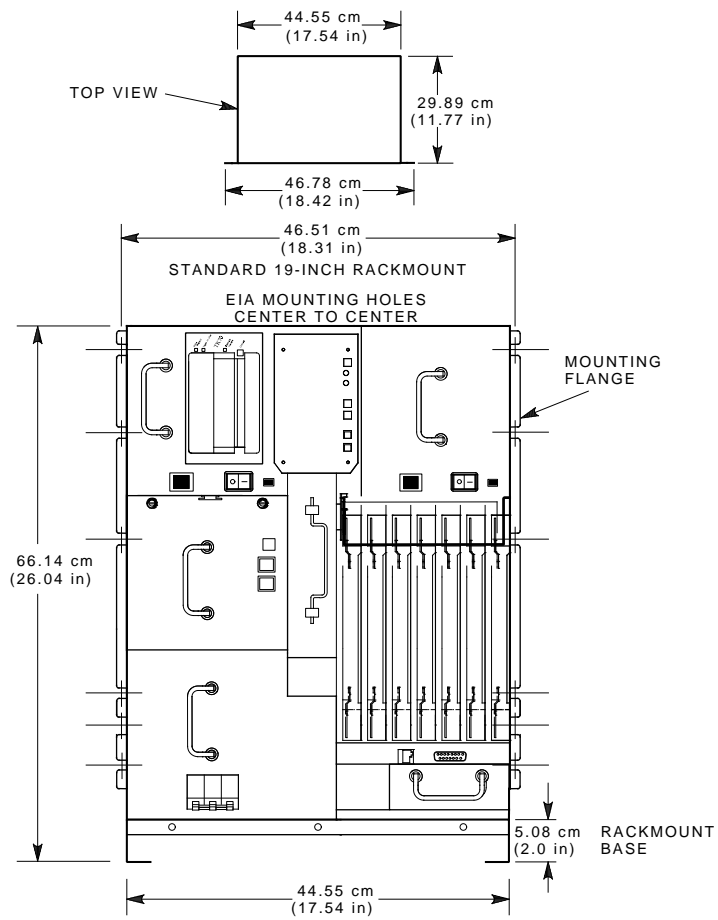
Figure D–2   Model 310 and 410 BA22B Box, Front View

MR–0544–90.RAGS
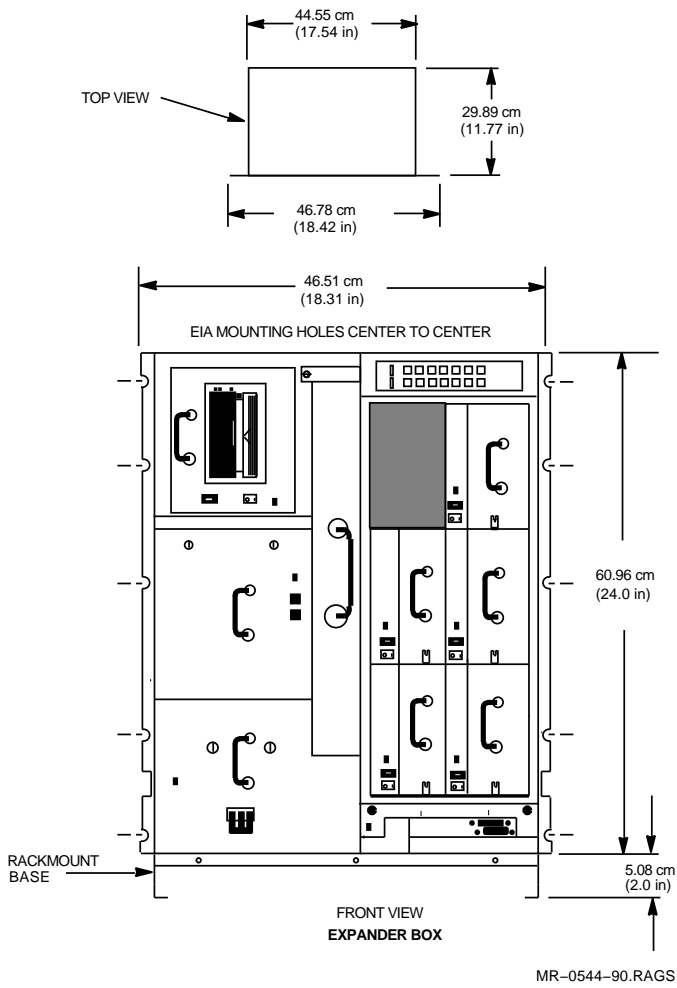
Figure D–3   Model 310 and 410 Flange Mounting Holes

TOP

MOUNTING FLANGE

46.51 cm
(18.31 in)
EIA MOUNTING HOLES CENTER TO CENTER

3.33 cm
(1.31 in)

TAPE OR
DISK

8.89 cm
(3.50 in)

21.91 cm
(8.63 in)

40.96 cm
(16.13 in)

DC BOX

49.85 cm
(19.63 in)

60.96 cm
(24.00 in)

AC BOX

SUPPORT
BRACKET

BOTTOM

5.08 cm
(2.00 in)

RACKMOUNT BASE

FLANGE MOUNTING HOLES

2.86 cm
(1.12 in)
MAX

MR–0546–90.RAGS
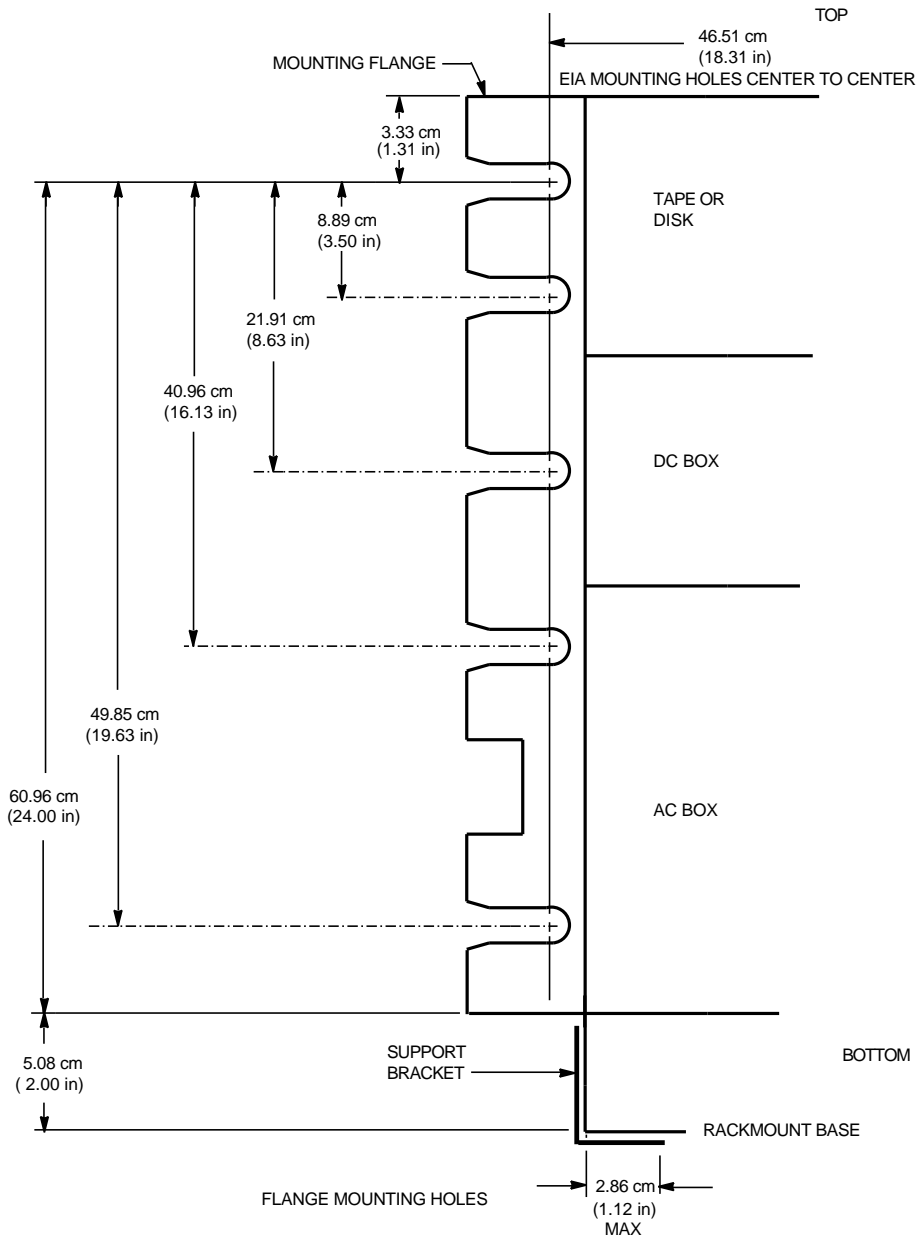
Figure D–4   Model 310 and 410 BA22 Box, Side View
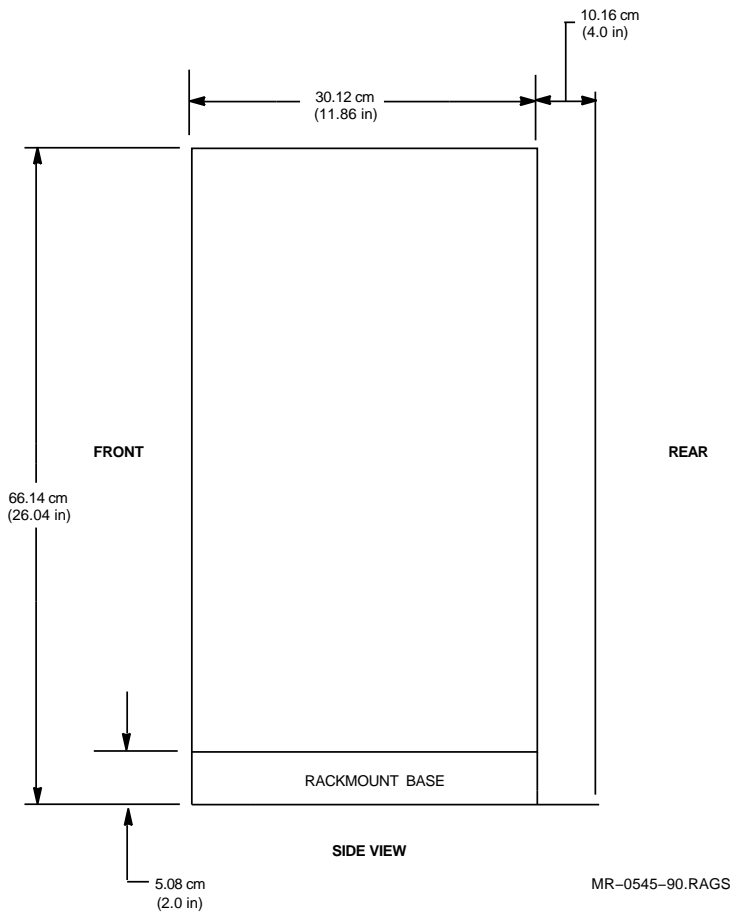
Figure D–5   Model 310 and 410 Rackmount Example, Front View

70-24742-02 FRAME

46.51 cm
(18.31 in)

CABLE
AREA

CABLE
TO
RIGHT

HOLE 54

.64 cm
(.25 in)

152.4 cm
(60.0 in)   MUST SIT ON
MOUNTING
ANGLE BRACKETS

REQUIRED
MINIMUM SPACE
FOR AIR
CIRCULATION

SHELF CAN BE
AN L BRACKET
TO REAR RAILS.

CABLE
TO
RIGHT

HOLE 9

BASE COVER
(AIR PLENUM)
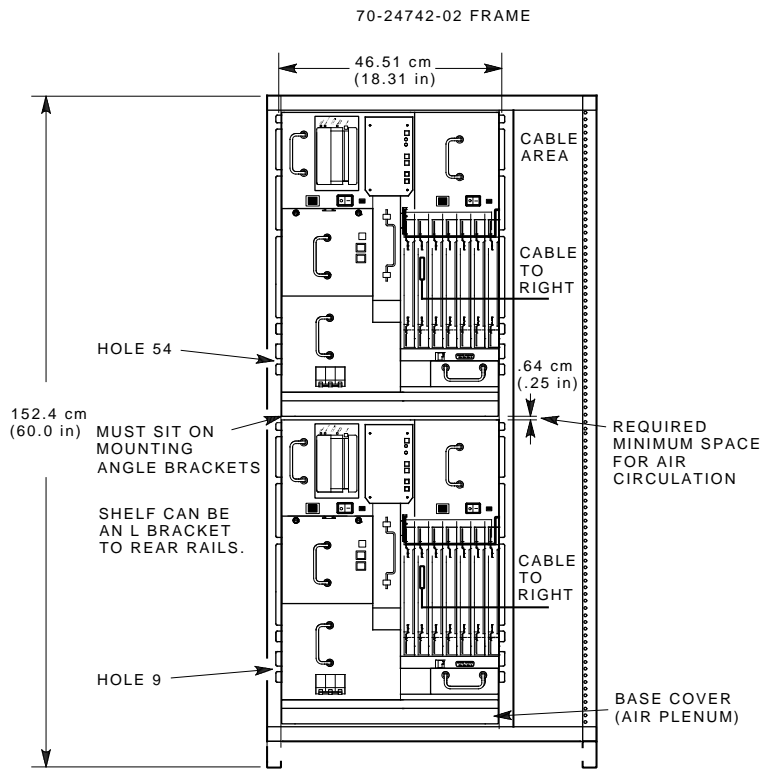
MR_0542_90.DG

Figure D–6   Rackmount Example, Side View

TOP

FRONT RAIL

VAXft 3000
BA22 BOX

RACKMOUNT BASE

OEM DESIGNED
SUPPORT
ANGLE BRACKETS

FRONT

REAR

INDENT FRONT RAILS
SO THAT DOOR CAN
OPERATE
(IF THERE IS A
FRONT RACK DOOR).

REAR RAIL

BOTTOM

PLACE CENTER OF
GRAVITY NEAR CABINET
CENTER OF GRAVITY.

MR_0541_90.DG
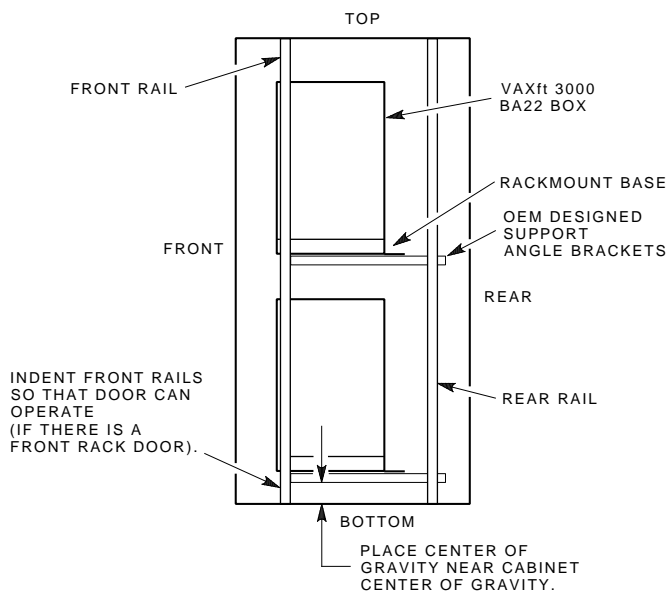
D.1.4 Rack Construction

Many 19-inch RETMA rail racks are not designed to support a heavy
weight on the front rail system alone. Such racks are designed to hold
front to back equipment boxes where the box weight is distributed
between the front and rear rails. See Figure D–7. This distribution
makes sure the cabinet does not flex.

The VAXft system BA22 boxes are designed to be mounted on the front
and rear rail system. See Figures D–4, D–6, and D–7. The front flanges
are designed for a RETMA hole pattern. The unit sits on an integral
rackmount base assembly that extends 10.16 cm (4.0 in) beyond the
rear of the box (Figure D–4). The BA22 boxes must be supported by a
customer-designed right angle bracket that connects to the front and rear
mounting rack rails (Figure D–6).

CAUTION
**Never mount the BA22 boxes by the front mounting flanges only.
Always include supporting angle brackets so that the weight can
be distributed to the rear rail system. The front mounting flanges
can be damaged without the use of the angle brackets.**

Figure D–7   Traditional Rackmount, Side View

TOP

FRONT RAIL

REAR RAIL

SLIDES

FRONT

REAR

TYPICAL 48.26 cm (19.0 in)
RACKMOUNT FOR
CONVENTIONAL BOX-MOUNTED
EQUIPMENT ON SLIDES.

BOTTOM

MR_0540_90.DG
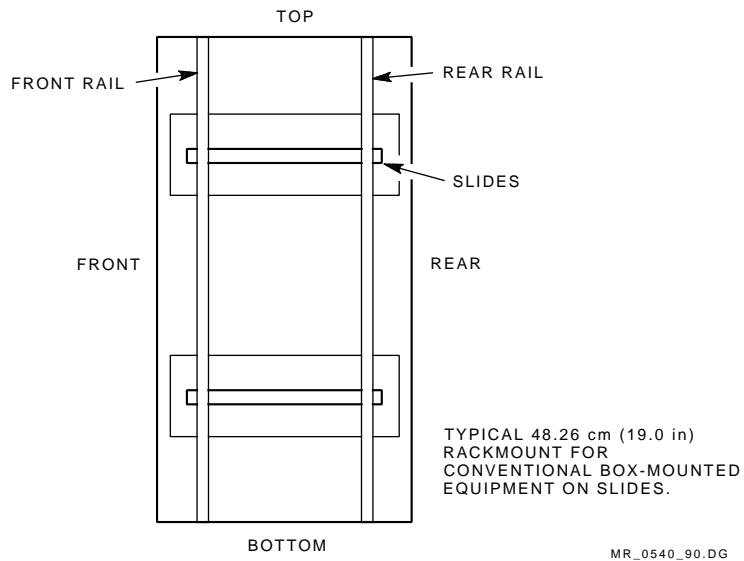
D.1.5 Heat and Airflow Management

The maximum power for each model 310 and 410 BA22 box is 750 W, or 2557 Btus. It is recommended that the cabinet be designed for the maximum configuration per the user's environment (temperature, humidity).

The tested operating ranges for the VAXft system are:

- 10°C to 40°C (50°F to 104°F)

- 10% to 90% RH noncondensing

- 28°C (82°F) maximum wet-bulb temperature

- 2°C (36°F) minimum dew point

It is recommended that the rack environment be near the middle of the tested operating ranges. This would be in the area of 40% to 60% RH, and 18.3°C to 23.8°C (75°F to 65°F).

The rackmount system BA22 boxes come with a rackmount base. The base adds 5.08 cm (2.0 in) to the overall height of the unit and 10.16 cm (4.0 in) to the overall depth (Figures D–1 through D–4). The rackmount base adds the 10.16 cm (4.0 in) so air can be baffled correctly. If the rack has enough free airspace surrounding the BA22 boxes, a flushing fan is not needed inside the rack.[1]

Initial tests of two boxes mounted in a one and one-half bay cabinet with dimensions of 152.4 cm (60.0 in) height, 76.2 cm (30.0 in) width, and 66.04 cm (26.0 in) depth showed a flushing fan is not needed provided that the ambient temperature is held below 40°C (104°F). If the rack has smaller dimensions, some sort of blower, heat exchanger, or active cooling (air conditioner) needs to be considered.

The cabinet rackmount and airflow design depends on the following factors:

- Internal Btus generated in the cabinet

- Temperature differential between the inside of the cabinet and outside of the cabinet

- Surface area of all the outside walls of the cabinet

- Whether cabinet rack walls are insulated or not insulated

- Mounting configuration of the BA22 boxes within the cabinet

---

[1] If a flushing fan is used, the BA22 airflow is from top to bottom.

- Airspace within the cabinet

- Air vents on the front and rear doors or panels

D.1.5.1 Internal Btus

The internal Btus generated by a dual zone VAXft system mounted in a single cabinet would be a maximum of 750 W $\times$ 2 zones $\times$ 3.41 equals 5115 Btus. A 20 percent safety factor should be added to this.

$$5115 \times 1.2 = 6138 \; Btus$$

Therefore, a maximum system cabinet should be designed to remove 6138 Btus of heat (one cabinet with two processor cabinets or one cabinet with a processor and expander cabinet).

D.1.5.2 Air Vents

The air intake slots in the front rack door should be a minimum of 225.82 cm (35.0 sq in) to allow for adequate intake airflow. This is also true for the rear cabinet exhaust panel or door.

D.1.6 Data Cable Management

All cables connect to the VAXft system BA22 boxes by means of the front module panels, DSSI cable bulkheads, and console bulkheads. This means all cable routing must be addressed from the front of the units.

Figure D–8 shows the recommended cable routing.

If the BA22 boxes are mounted in a 152.4 cm (60.0 in) high rack, there is no room between the BA22 boxes for the routing of cables. All I/O cables must be routed to the right or left sides. Cross-link cables must be mounted vertically.

If the BA22 boxes are mounted in a 165.1 cm (65.0 in) or higher rack, cables may be routed between the BA22 boxes.

Figure D–8   Model 310 and 410 Cable Routing, Front View

FRONT VIEW

IF CABINET IS
165.1 cm (65.0 in)
OR TALLER,
CABLE UP/DOWN.

BASE COVER
(AIR PLENUM)

LEAVE OPENING
BETWEEN UNITS
FOR CABLING.

BASE COVER
(AIR PLENUM)

MR_0543_90.DG
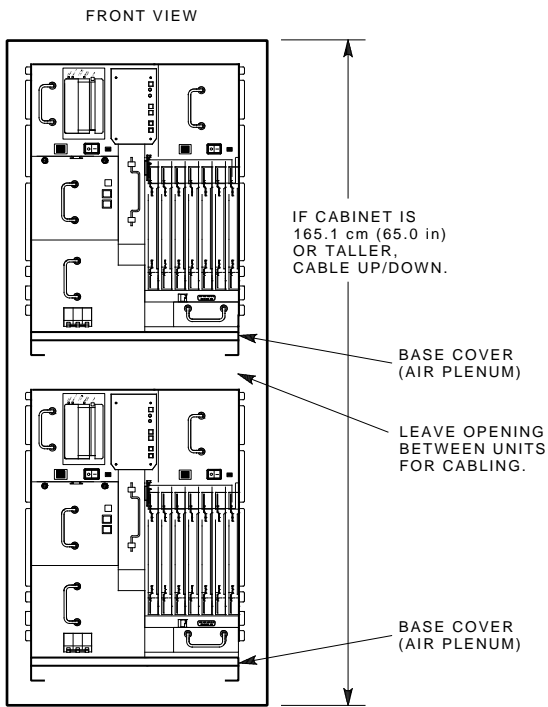
D.1.7 Grounding Considerations

It is important to have a common ground for both of the BA22 boxes mounted in a rack assembly. The following rules apply:

- Mounting rails should be conductive, so there is ground contact between the upper BA22 front mounting rails and the bottom BA22 front mounting rails.

- If the rails are to be painted, consult with Digital Equipment Corporation.

- The mounting rails should be connected to a cabinet ground.

- In multiple cabinet systems, all cabinet grounds must be tied together.

D.1.8 Power Distribution

The VAXft system BA22 box is designed to operate on 120 Vac or 240 Vac, or on a 48 Vdc bus.

Each model 310 and 410 BA22 box has its own power cord. Each cord is rated for a 12 A, 120 Vac outlet or 6 A, 240 Vac outlet, maximum. These are standard wall outlets.

The one major concern when adding power controllers to a cabinet or rack is that a single point of failure should be avoided. For example, it would be easy to add a 30 A, 120 Vac rated power controller to the cabinet for 120 Vac systems and plug both BA22 boxes into the one power controller. This is fine, but by doing this, a single point of failure is introduced — the power controller. If the relays or EMI/RFI filter fail, both BA22 boxes go down.

D.2   Optional H407-B DC Power Supply Connections

Tables D–1 and D–2 list the dc power requirements for the H407-B dc power supply.

Table D–1   H407-B DC Input Power Requirements

Input Operating Voltage	
Minimum	40 Vdc
Maximum	75 Vdc
Input Transient Voltage	
200 V	For 1 µs
Input Undervoltage	
0 to 40 Vdc	With no system damage

Table D–2   H407-B DC Output Power Requirements

Output Operating Voltage	
Minimum	38 Vdc at minimum input operating voltage
Maximum	75 Vdc at maximum input operating voltage
Output Operating Currents	

Output voltage	**Output Current (Maximum)**
38 Vdc	15 A
48 Vdc	12.5 A
60 Vdc	10 A
73 Vdc	8 A

Auxiliary Bias Outputs

Specification	**Value**
Minimum +5 V output voltage	4.75 Vdc at full input operating voltage and full output current
Maximum +5 V output voltage	5.25 Vdc at full input operating voltage and full output current

Table D–2   (Continued)   H407-B DC Output Power Requirements

Minimum +5 V output current	0 A
Maximum +5 V output current	1.5 A
Minimum +12 V output voltage	11.4 Vdc at full input operating voltage and full output current
Maximum +12 V output voltage	12.6 Vdc at full input operating voltage and full output current
Minimum +12 V output current	0 A
Maximum +12 V output current	0.4 A

NOTE

The H407-B dc power cable has a connector on one end that attaches to the H407-B dc power supply on the VAXft system. The other end of the dc power cable does not have connectors. The outer jacket of the cable at the nonconnector end has been cut back to expose three color-coded wire leads (brown, blue, and green).

Perform the following procedure to install the H407-B dc power cable:

1. Attach the connector end of the dc cable (PN 17-03129-01) to the dc connector on the H407-B dc power supply. See Figure D–9.

2. Attach the color-coded wire leads at the other end of the dc cable to a 48 Vdc source as follows:

    •   Brown — to 48 Vdc source

    •   Blue — to return

    •   Green — to ground

Figure D–9   H407-B DC Power Supply Connections

48 Vdc
BOX

GREEN
BROWN
BLUE

CONNECTOR
DC CABLE

MR–0394–91RAGS
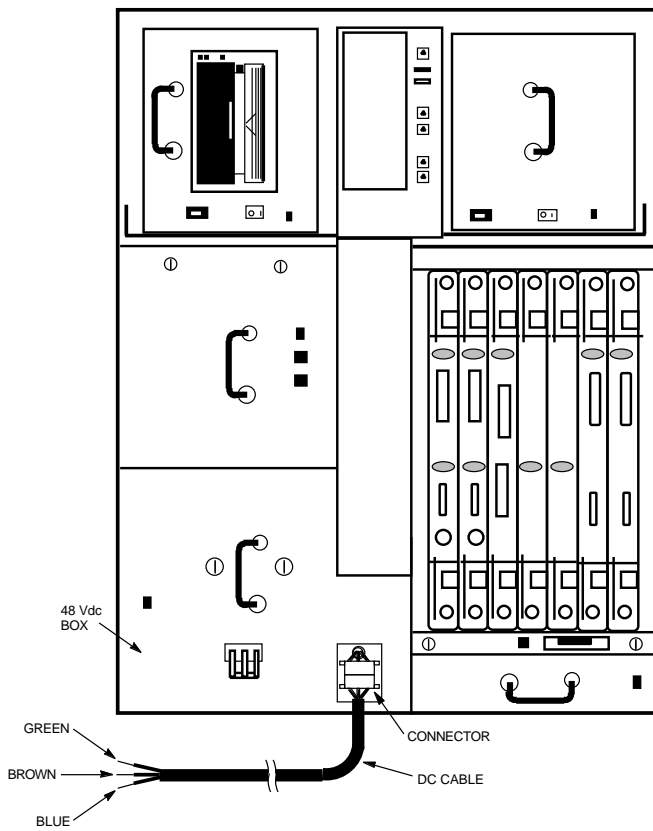
D.3 Summary

The OEM designer should use the following guidelines when designing a 19-inch cabinet rack for the model 310 and 410 systems:

- Use the rackmount version of the VAXft system. Do not try to convert an office version, since the office version is not supplied with the appropriate rackmount base.

- Two BA22 boxes weigh up to 108 kg (240 lb) for the processor BA22, plus 122 kg (270 lb) for the expander BA22, for a total of 231 kg (510 lb). The cabinet and rail system must be designed to support this weight plus a safety margin. Both the front and rear rails must be used to distribute the weight. A custom mounting shelf or angle brackets must be designed by the OEM customer to do this.

- The BA22 boxes are shallow (29.89 cm or 11.77 in). Consider the cabinet's center of gravity, especially during transportation.

- The maximum heat generated by a single BA22 box is 2557 Btus. A single 60-inch cabinet could be designed to hold two BA22 boxes, therefore generating 5115 Btus. It is suggested a 20 percent safety factor be added to this resulting in a 6138 Btu design center, maximum.

- A minimum of 225.82 sq cm (35.0 sq in) must be allowed for air intake vent open area (total slot size open area). The same is true for the exhaust area.

- If the air temperature outside of the cabinet is expected to be above the range of 18.3°C to 23.8°C (65°F to 75°F), active cooling such as industrial cabinet air conditioners should be investigated.

- Airflow in the BA22 boxes is from top to bottom. If cabinet flushing fans are needed as a result of airflow studies, the flushing fans should not work against the BA22 airflow.

- The use of a single power controller for two BA22s within the same 19-inch cabinet can introduce a single point of failure.

- Grounding is very important. Use conductive mounting rails.

E
Model 110 Rackmount System Site Preparation and Installation

This appendix describes the procedure for OEM customers to mount model 110 BA22 boxes into custom 19-inch cabinets.

The VAXft system is offered in two basic mounting styles: office pedestal and OEM rackmount. The processor and mass storage expanders are contained in BA22-style equipment boxes.

The office pedestal is designed to operate in office or computer room environments and has the following features:

- Enclosure skins and covers
- Base casters

The OEM rackmount box version differs from the office pedestal version:

- No skins or covers
- Rackmount chassis

The rackmount option consists of:

- Attached rackmount assembly
- Instructions

E.1 Design Concerns

The design concerns for rackmount installation into a custom cabinet are:

- Unit weight

- Unit dimensions

- Center of gravity

- Rack construction

- Heat and airflow management

- Data cable management

- Grounding considerations

- Power distribution

E.1.1 Unit Weight

Each model 110 BA22 box can weigh up to 68 kg (151 lb) for the processor box. Therefore, the cabinet's 19-inch Radio-Electronics-Television Manufacturers Association (RETMA) rail system must be designed to handle a hang weight of 136 kg (302 lb) (two BA22 processors on a one rail system), plus a safety margin. It is recommended the final rail assembly with two BA22 boxes be designed to withstand a 10 gravity peak, 10-ms shock pulse in the vertical plane.

Another concern while handling the BA22 boxes is safety. When rack mounting the BA22 boxes into the cabinet, use a lifting device. The suggested lifting device is a flat-blade forklift.

CAUTION
The BA22 boxes must be picked up from the bottom. Never use any sort of hook or try to lift the unit by its skins.

E.1.2 Unit Dimensions

The VAXft system BA22 boxes are designed to be mounted into 19-inch RETMA rail cabinets. If your cabinet does not have a 19-inch RETMA rail system, design a conversion bracket. For example, many phone company racks are based on a 1-inch center hole pattern, so conversion brackets have to be custom made.

The dimensions for the model 110 BA22 boxes are:

*   63.83 cm (25.13 in) height of main box

*   44.55 cm (17.54 in) width of main box (inside of rails)

*   47.78 cm (18.81 in) width of main box (flange to flange)

*   30.48 cm (12.00 in) depth plus 10.16 cm (4.0 in) for the rackmount base extension in the rear

See Figure E–1 for a front view. See Figure E–2 for the rail hole pattern. See Figure E–3 for a side view.

E.1.3 Center of Gravity

As seen in Figure E–1, the BA22 box is 30.48 cm (12.00 in) deep. Therefore, much of the center of gravity is toward the front rail system. If your cabinet is, for example, 121.9 cm (48.0 in) deep, the center of gravity is in the front quarter of the cabinet, causing a possible tip hazard. If you use a cabinet 76.2 cm (30.0 in) wide by 152.4 cm (60.0 in) high by 66.14 cm (26.04 in) deep, the center of gravity is acceptable at approximately 35.56 cm (14.0 in) from the front of the cabinet. See Figures E–4 and E–5.

If deep cabinets (for example, 121.9 cm (48.0 in)) are used, and if no equipment is going to be mounted on the cabinet's rear rails to counterbalance the front load of the BA22 boxes, an anti-tip front foot plate must be used if the cabinet is mounted on casters. If the cabinet is bolted to the floor, an anti-tip plate can be omitted. In either case, the shipping skid must be designed to handle the cabinet's center of gravity correctly and not accidentally tip while being moved.

Figure E–1   Model 110 BA22A Box, Front View

TOP VIEW

30.48 cm
(12.00 in)

46.78 cm
(18.42 in)

46.51 cm
(18.31 in)
STANDARD 19-INCH RACKMOUNT

EIA MOUNTING HOLES
CENTER TO CENTER

62.89 CM
(24.79 IN)

MOUNTING
FLANGE

44.55 CM
(17.54 IN)
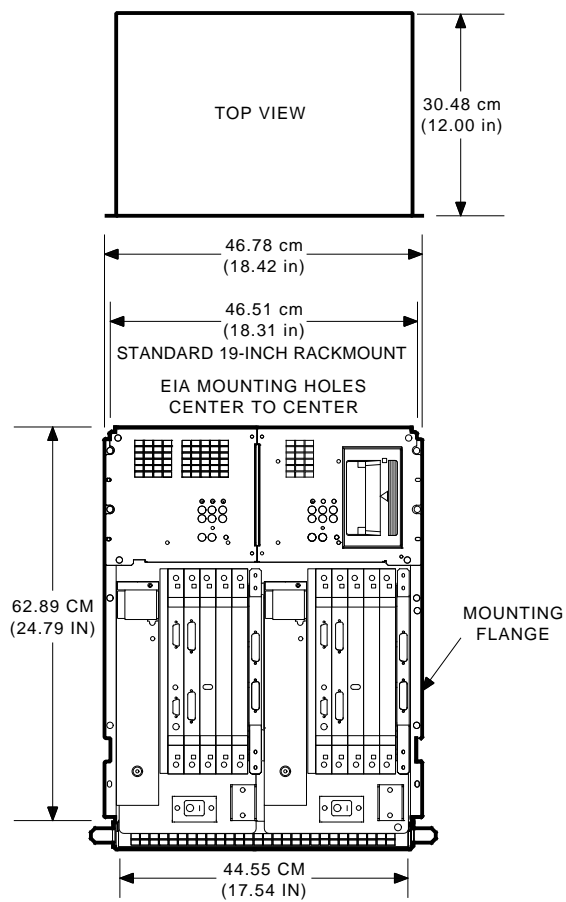
MR-0651-91DG

Figure E–2   Model 110 Flange Mounting Holes

TOP

MOUNTING FLANGE

46.51 cm
(18.31 in)

EIA MOUNTING HOLES CENTER TO CENTER

3.33 cm
(1.31 in)

8.89 cm
(3.50 in)

21.91 cm
(8.75 in)

41.28 cm
(16.25 in)

AC BOX

50.17 cm
(19.75 in)

62.89 cm
(24.79 in)

BOTTOM

MR-0643-91DG
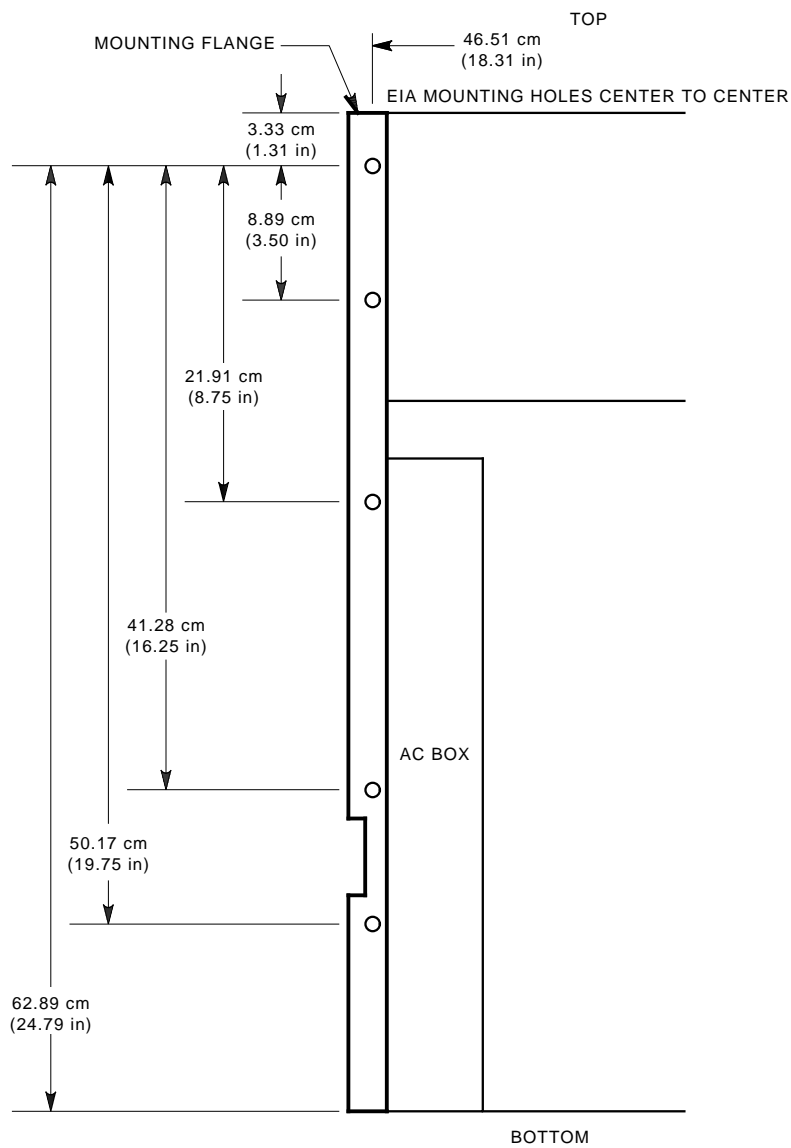
Figure E–3   Model 110 BA22 Box, Side View

30.48 cm
(12.00 in)

FRONT

REAR

62.89 cm
(24.79 in)

SIDE VIEW

MR-0644-91DG
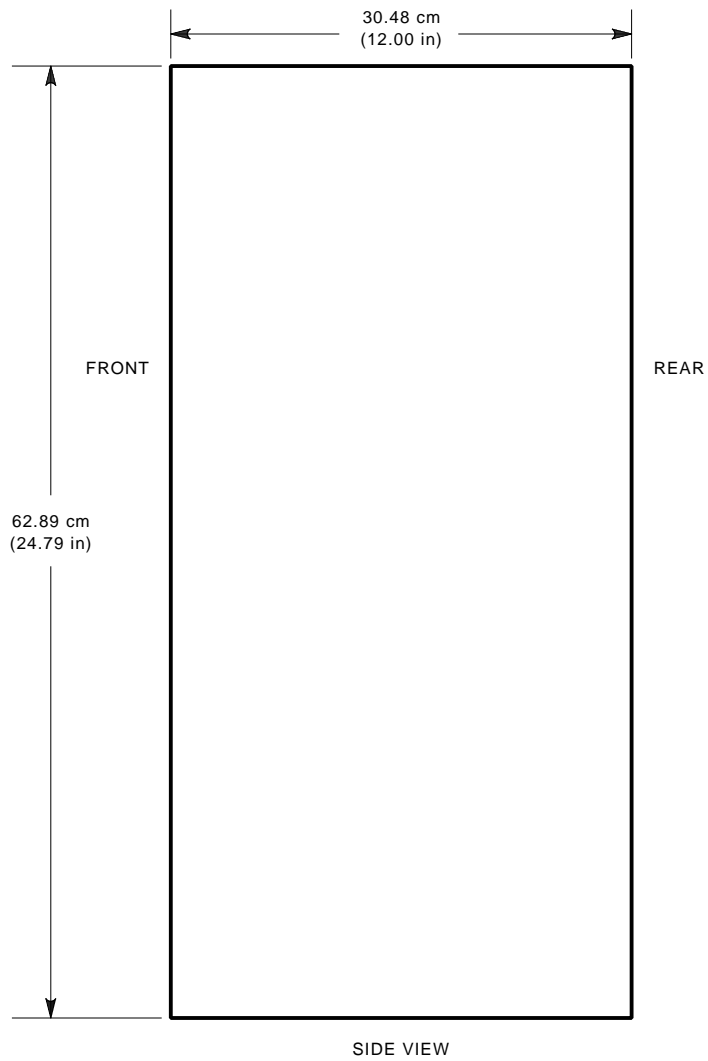
Figure E–4   Model 110 Rackmount Example, Front View

MR-0653-91DG
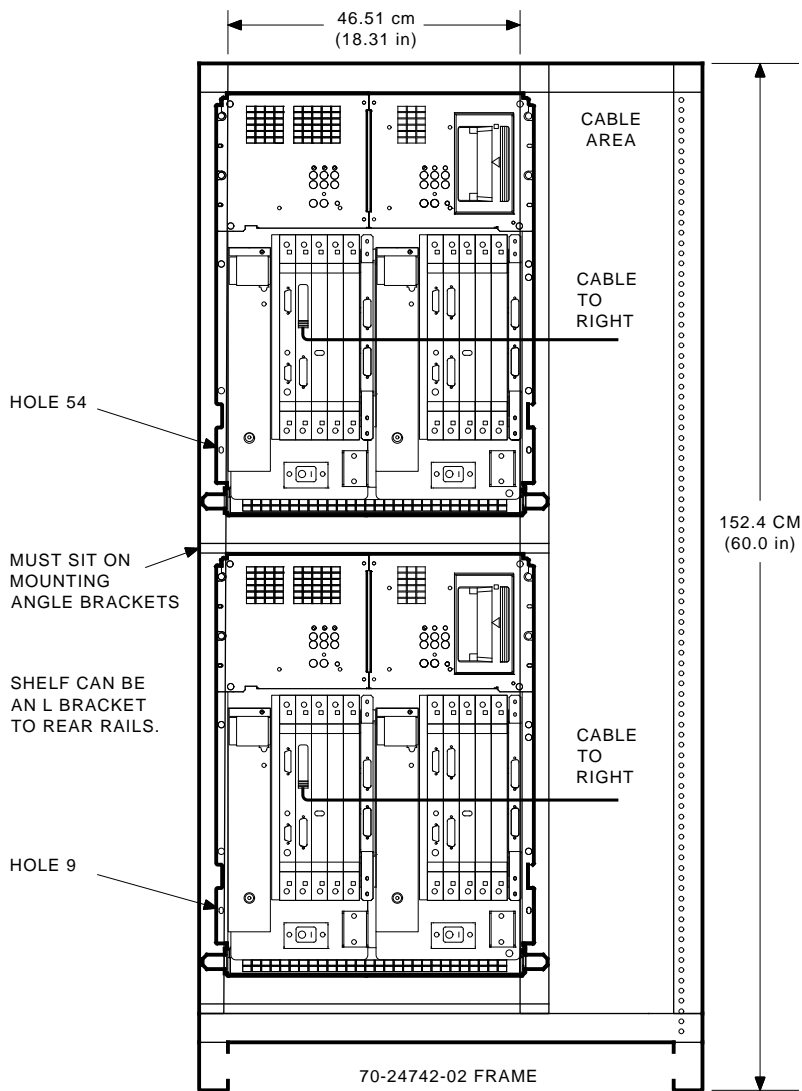
Figure E–5   Rackmount Example, Side View

TOP

FRONT RAIL

VAXft 3000
BA22 BOX

RACKMOUNT BASE

OEM DESIGNED
SUPPORT
ANGLE BRACKETS

FRONT

REAR

INDENT FRONT RAILS
SO THAT DOOR CAN
OPERATE
(IF THERE IS A
FRONT RACK DOOR).

REAR RAIL

BOTTOM

PLACE CENTER OF
GRAVITY NEAR CABINET
CENTER OF GRAVITY.

MR_0541_90.DG
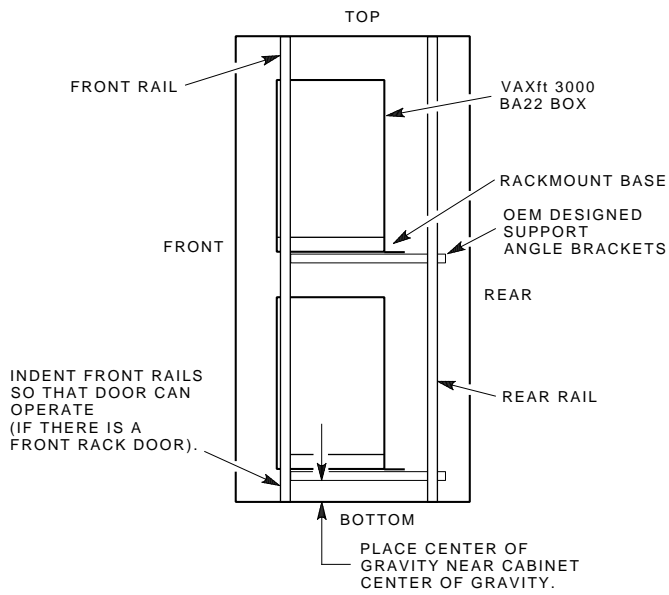
E.1.4 Rack Construction

Many 19-inch RETMA rail racks are not designed to support a heavy
weight on the front rail system alone. Such racks are designed to hold
front to back equipment boxes where the box weight is distributed
between the front and rear rails. See Figure E–6. This distribution
makes sure the cabinet does not flex.

The VAXft system BA22 boxes are designed to be mounted on the front
and rear rail system. See Figures E–3, E–5, and E–6. The front flanges
are designed for a RETMA hole pattern. The BA22 boxes must be
supported by a customer-designed right angle bracket that connects to
the front and rear mounting rack rails (Figure E–5).

CAUTION
**Never mount the BA22 boxes by the front mounting flanges only.
Always include supporting angle brackets so that the weight can
be distributed to the rear rail system. The front mounting flanges
can be damaged without the use of the angle brackets.**

Figure E–6   Traditional Rackmount, Side View

TYPICAL 48.26 cm (19.0 in)
RACKMOUNT FOR
CONVENTIONAL BOX-MOUNTED
EQUIPMENT ON SLIDES.

MR_0540_90.DG
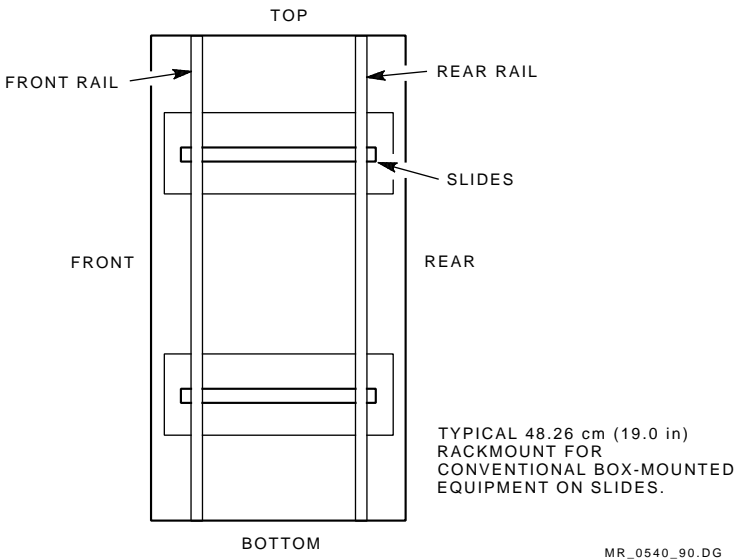
E.1.5 Heat and Airflow Management

The maximum power for each BA22 box is 730 W, or 2500 Btus. It is recommended that the cabinet be designed for the maximum configuration per the user's environment (temperature, humidity).

The tested operating ranges for the VAXft system are:

- 10°C to 40°C (50°F to 104°F)

- 10% to 90% RH noncondensing

- 28°C (82°F) maximum wet-bulb temperature

- 2°C (36°F) minimum dew point

It is recommended that the rack environment be near the middle of the tested operating ranges. This would be in the area of 40% to 60% RH, and 18.3°C to 23.8°C (65°F to 75°F).

If the rack has enough free airspace surrounding the BA22 boxes, a flushing fan is not needed inside the rack.[1]

Initial tests of two boxes mounted in a one and one-half bay cabinet with dimensions of 152.4 cm (60.0 in) height, 76.2 cm (30.0 in) width, and 66.04 cm (26.0 in) depth showed a flushing fan is not needed provided that the ambient temperature is held below 40°C (104°F). If the rack has smaller dimensions, some sort of blower, heat exchanger, or active cooling (air conditioner) needs to be considered.

---

[1] If a flushing fan is used, the BA22 airflow is from top to bottom.

The cabinet rackmount and airflow design depends on the following factors:

- Internal Btus generated in the cabinet

- Temperature differential between the inside of the cabinet and outside of the cabinet

- Surface area of all the outside walls of the cabinet

- Whether cabinet rack walls are insulated or not insulated

- Mounting configuration of the BA22 boxes within the cabinet

- Airspace within the cabinet

- Air vents on the front and rear doors or panels

E.1.5.1 Air Vents

The air intake slots in the front rack door should be a minimum of 225.82 cm (35.0 sq in) to allow for adequate intake airflow. This is also true for the rear cabinet exhaust panel or door.

E.1.6 Data Cable Management

All cables connect to the VAXft system BA22 boxes by means of the front module panels, DSSI cable bulkheads, and console bulkheads. This means all cable routing must be addressed from the front of the units.

Figure E–7 shows the recommended cable routing.

If the BA22 boxes are mounted in a 152.4 cm (60.0 in) high rack, there is no room between the BA22 boxes for the routing of cables. All I/O cables must be routed to the right or left sides. Cross-link cables must be mounted vertically.

If the BA22 boxes are mounted in a 165.1 cm (65.0 in) or higher rack, cables may be routed between the BA22 boxes.

Figure E–7   Model 110 Cable Routing, Front View

LEAVE OPENING
BETWEEN UNITS
FOR CABLING.

IF CABINET IS
165.1 CM (65.00 IN)
OR TALLER,
CABLE UP/DOWN.

FRONT VIEW

MR-0652-91DG
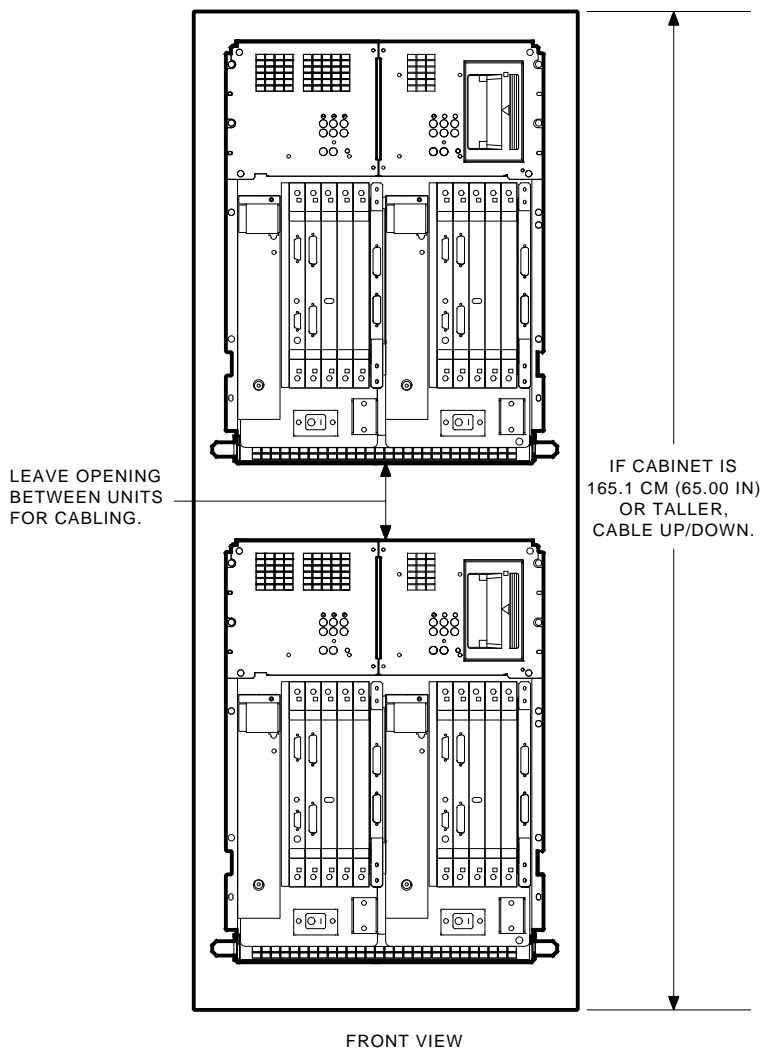
E.1.7 Grounding Considerations

It is important to have a common ground when two BA22 boxes are mounted in a rack assembly. The following rules apply:

- Mounting rails should be conductive, so there is ground contact between the upper BA22 front mounting rails and the bottom BA22 front mounting rails.

- If the rails are to be painted, consult with Digital Equipment Corporation.

- The mounting rails should be connected to a cabinet ground.

- In multiple cabinet systems, all cabinet grounds must be tied together.

E.1.8 Power Distribution

The VAXft system BA22 box is designed to operate on 120 Vac or 240 Vac.

Each model 110 BA22 box has two power cords. Each cord is rated for a 15 A, 120 Vac outlet or 6 A, 240 Vac outlet, maximum. These are standard wall outlets.

The one major concern when adding power controllers to a cabinet or rack is that a single point of failure should be avoided. For example, it would be easy to add a 30 A, 120 Vac rated power controller to the cabinet for 120 Vac systems and plug both BA22 boxes into the one power controller. This is fine, but by doing this, a single point of failure is introduced — the power controller. If the relays or EMI/RFI filter fail, both BA22 boxes go down.

E.2   Summary

The OEM designer should use the following guidelines when designing a 19-inch cabinet rack for the model 110 systems:

- Two BA22 boxes weigh up to 136 kg (302 lb). The cabinet and rail system must be designed to support this weight plus a safety margin. Both the front and rear rails must be used to distribute the weight. Custom mounting angle brackets must be designed by the OEM customer to do this.

- The BA22 boxes are shallow (30.48 cm or 12.00 in). Consider the cabinet's center of gravity, especially during transportation.

- The maximum heat generated by a single BA22 box is 2500 Btus. A single 60-inch cabinet could be designed to hold two BA22 boxes, therefore generating 5000 Btus. It is suggested a 20 percent safety factor be added to this resulting in a 6000 Btu design center, maximum.

- A minimum of 225.82 sq cm (35.0 sq in) must be allowed for air intake vent open area (total slot size open area). The same is true for the exhaust area.

- If the air temperature outside of the cabinet is expected to be above the range of 18.3°C to 23.8°C (65°F to 75°F), active cooling such as industrial cabinet air conditioners should be investigated.

- Airflow in the BA22 boxes is from top to bottom. If cabinet flushing fans are needed as a result of airflow studies, the flushing fans should not work against the BA22 airflow.

- The use of a single power controller for two BA22s within the same 19-inch cabinet can introduce a single point of failure.

- Grounding is very important. Use conductive mounting rails.

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