TC2000 Maintenance Manual

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BBN Advanced Computers Inc.

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BBN Advanced Computers Inc
10 Fawcett St.
Cambridge MA 02138

RELEASE LEVEL

This manual conforms to the Released Version of the nX™ operating system software, released in August of 1989, for the TC2000™ multiprocessor.

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BBN ACI thanks the following contributors for their efforts in developing this manual:

Author:
J. Houlihan
C. Macfarlane

Illustrator:
J. Johnson

Reviewers:
M. Beeler
J. Campbell
M. Lefebvre
K. Mcgrattan
W. Rowe
D. Tash

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How to Use This Manual

Purpose of the Manual

This manual is a reference for working on the TC2000 hardware. After reading this document, you should be able to change any of the Field Replaceable Units (FRUs) in the TC2000 computer and peripherals.

Other Places to Find Answers

If you experience any problems with our product, or if you have questions or suggestions, please do one of the following:

- Send electronic mail from anywhere on the ARPAnet to:

  bf-questions@bbn.com

- Send mail to:

  TC2000 Bugs
  BBN Advanced Computers Inc.
  10 Fawcett St.
  Cambridge, MA 02138

- If you are under warranty, or have a software maintenance contract, you can also call our hotline number:

  1-800-4AC-BFLY in the United States
  1-617-873-8660 from any other location

If you are reporting a problem, please include as much information as you can, as follows:

- Your **version** of the nX operating system and the TC2000 system.

- The **size** of your TC2000 system (number of nodes and amount of memory)
- The **number of nodes** that were in your **cluster**
- The **total number of users** on the TC2000 system at that same time
- An **example** that illustrates the problem
- A **record** of the sequence of events that led to the problem; especially a stack backtrace (see the system administration guide)

We are also interested in your evaluation of our documentation. We would appreciate it if you would fill out the form at the back of this manual and return it to us.

Audience Level

The primary audience for this document consists of field service personnel who are new to the TC2000. The document does not assume that you have used a UNIX operating system before, but it does assume that you have used some operating system and that you are familiar with common computer terms, such as files and directories.

Other References

Using the TC2000 Document Set is a guide to the entire set of manuals that come with your TC2000 system. If you're not sure where to look for information, this is a good place to start.

For information on hardware functionality, see *Inside the TC2000 Computer*; on how to use the diagnostics, see the *TC2000 Diagnostic Guide.*

For information on the system console, see *Installing and Using the VT320 Video Terminal.* For information on the system printer, see *Installing and Using the LA75 Companion Printer.*

For information on the 1/2" magnetic tape unit, see the *M990 GCR CacheTape® Unit Technical Manual.*

For information on the Systech Terminal Controller Hardware, see *HPS Installation and Troubleshooting Reference Guide, HPS Host Adapter Technical Manual, HPS Cluster Controller Technical Manual, and HPS Remote Cluster Installation Guide.*

For information on the Excelan Ethernet Controller, see *EXOS 301 Reference Manual.*

For information on the Disk Controller, see *Xylogics Model 451 User's Manual.*

Organization

The manual is organized as follows:

- Chapter one contains an overview of the TC2000 system and the Field Replaceable Units (FRUs).
- Chapter two contains instructions for replacing each FRU in the Expansion cabinet.
- Chapter three contains instructions for replacing each of the FRUs in the Utility cabinet.
- Chapter four contains instructions for replacing the hardware in the Peripheral cabinet.
- Chapter five contains instructions for replacing the console.
- Chapter six describes when preventive maintenance routines should be performed and what is needed to perform them.
- Chapter seven describes how to troubleshoot for system problems.
- Appendix A describes the jumper locations and switch settings for everything in the TC2000.
- Appendix B contains power and data flow diagrams for referencing during repair procedures.
- Appendix C contains a list of all the FRUs in the system, including the part numbers.
- Appendix D contains the wiring diagrams for the expansion and utility cabinets.

Typographic Conventions

This manual uses the following conventions to present information:

bold	Text in **bold** indicates an exact filename, a command, or user input.
italics	Text in *italics* indicates a variable, or a value that the user supplies; for example, *filename* stands for the file under discussion.
`type`	Text in `typewriter` font represents computer output.
bold italics	Text in ***bold italics*** indicates an emphasized word or phrase.
<Delete>	Names enclosed in angle brackets indicate keyboard keys; for example, <Delete>, <Esc>, and <Return>.
<Control-Z>	Two key names enclosed in angle brackets indicate that you should press the keys simultaneously; for example,

	<Control-Z> means that you should hold down the Control key and press the Z key.<>
<Esc>Z	A single key name enclosed in angle brackets followed immediately by another key name indicates that you should press the first key and ***then*** the second; for example, <Esc>Z means that you press the Escape key and ***then*** press the Z key.
↲	This symbol represents the <Return> key in computer dialog examples.
[ ]	In command syntax descriptions, square brackets enclose optional items.
. . .	A horizontal ellipsis indicates a repetition of the previous command or input string.
. .	A vertical ellipsis indicates that irrelevant portions of a program have been omitted.

1

Overview

The TC2000 system, BBN's powerful new multiprocessor, is designed to execute many tasks rapidly, individually and efficiently. Because it uses shared memory, any one of its processors can access main memory as needed. This access to memory is enabled by means of an interconnection network called a Butterfly switch. This switch not only provides a fast and efficient access path, but also avoids bus saturation, thereby increasing the speed with which data can be sent and received.

The TC2000 system comprises three main units (refer to Figure 1–1 and Figure 1–2):

- Expansion Cabinet
- Utility Cabinet
- Peripheral Cabinet

Additionally, the system has a connection for a VT320 terminal that is used to run diagnostics software and also serves as a console.

Because of its increased sophistication, many of the components that make up a TC2000 system are small and/or difficult to access. Therefore, when a component fails and needs to be replaced, the larger unit of which it is a part is replaced. This larger, easier to access unit is called a Field Replaceable Unit, or FRU. For example, if a card-level component fails, the entire card is replaced. Or, if a disk platter fails, the entire disk drive is replaced.

In terms of its maintenance, the TC2000 system can be seen as a collection of Field Replaceable Units (FRUs), each of which has a certain location and function.

This chapter provides the location and a brief functional description of each FRU.

Figure 1–1 System Overview: Front

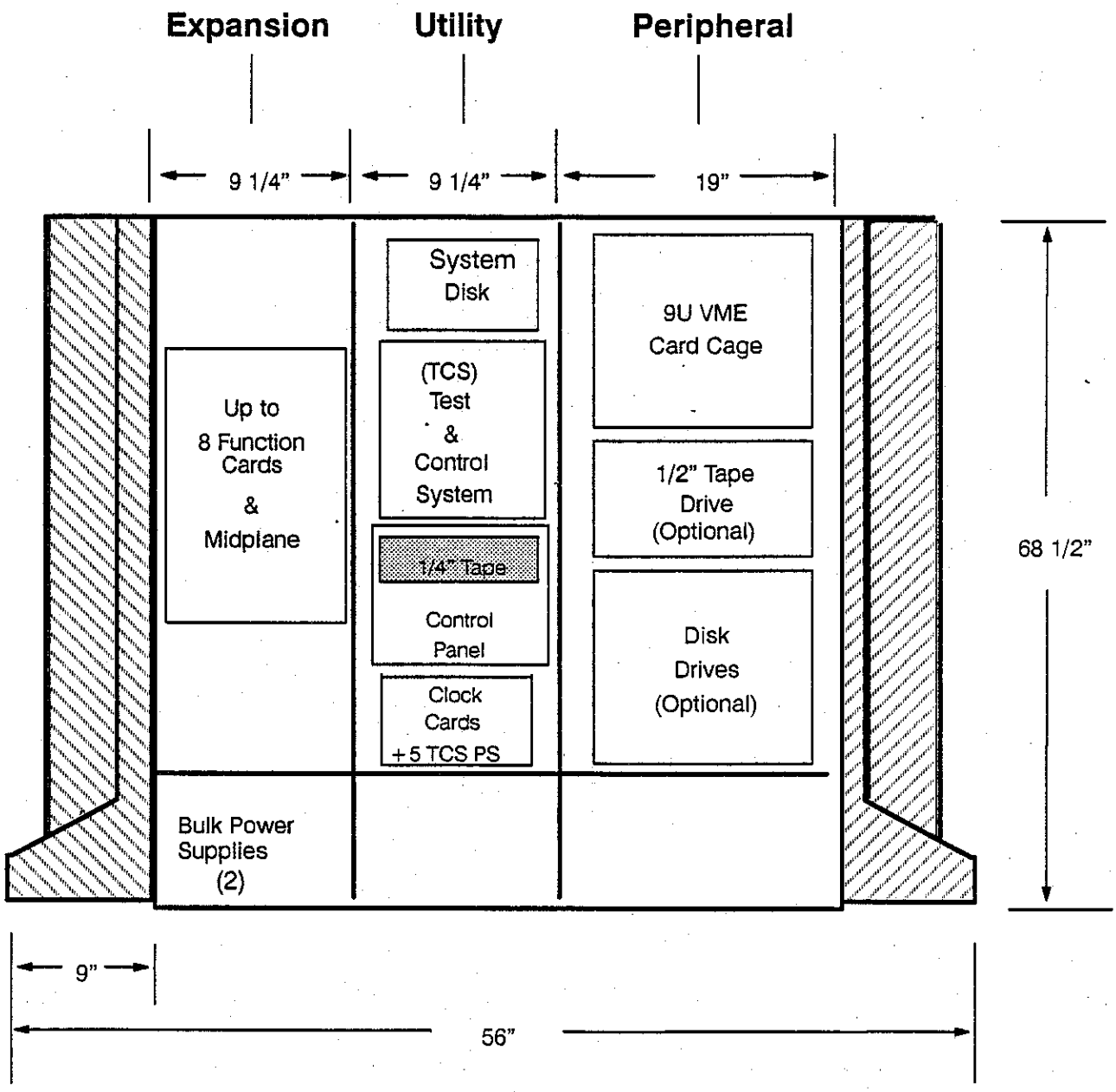
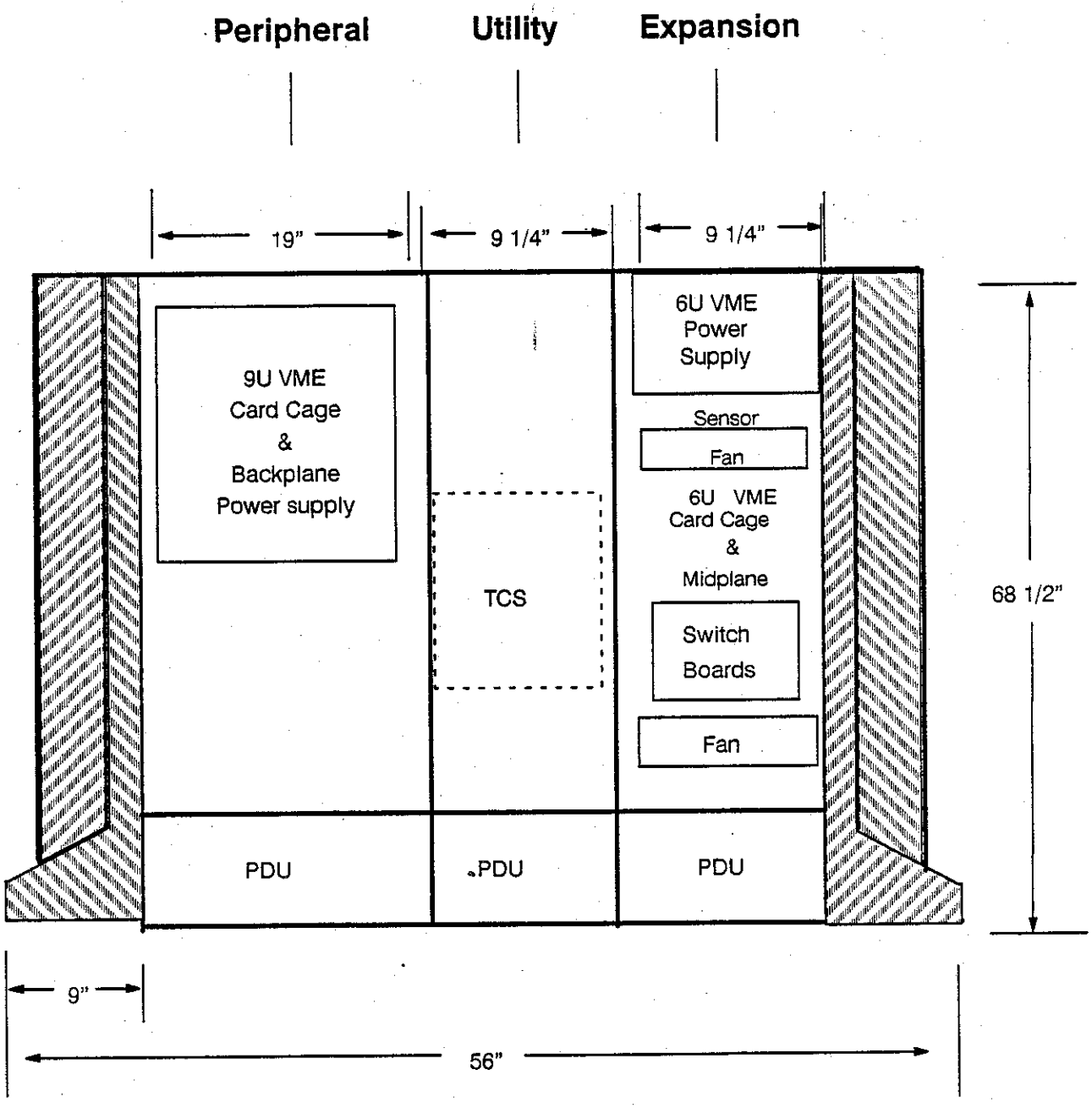


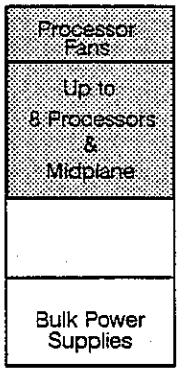
Figure 1–2 System Overview: Back



1.1 Expansion Cabinet

One expansion cabinet can accomodate up to function cards; however, the system can be expanded up to a total of 63 processors by adding up to seven more expansion cabinets. See Figure 1–3 and Figure 1–4.

A description of each FRU in the expansion cabinet follows.



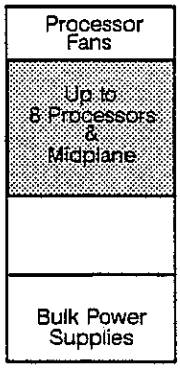
Front View

Function Card Fans

There are two fans located in the front topmost section of the expansion cabinet. They are automatically activated when the system power is turned on.

Function Cards

The function cards are located in the front middle section of the expansion cabinet. There can be a total of eight per cabinet. Based on the Motorola 88000 RISC microprocessor family, the TC2000 processor provides a particular capability in the system, such as processing power, I/O interfacing, and memory. The function card known as the TC/TPV currently provides all the essential features of a computer system.

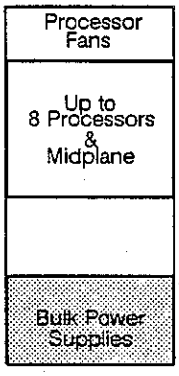


Front View

Midplane

The TC2000 Midplane (TC/MP), located in the front middle section, corresponds to a conventional backplane except that it has connectors on both sides instead of one, making it possible for cards to be connected on either side. The Midplane provides the signal connections among the switch cards, processors, and clock card cables. The Midplane also distributes power to the switch cards and processors.

Each Midplane connects processors, switch cards, and switch and clock cables.



Bulk Power Supply

The Bulk power supply unit takes 208V three-phase, five-wire power, converts the AC to DC (+/-24 volts) and distributes it to the function cards and switch cards in its cabinet via the midplane. There are two bulk power supply units located in the expansion cabinet.

For more detailed electrical specifications, see the site preparation guide.

Figure 1–3 Expansion Cabinet: Front

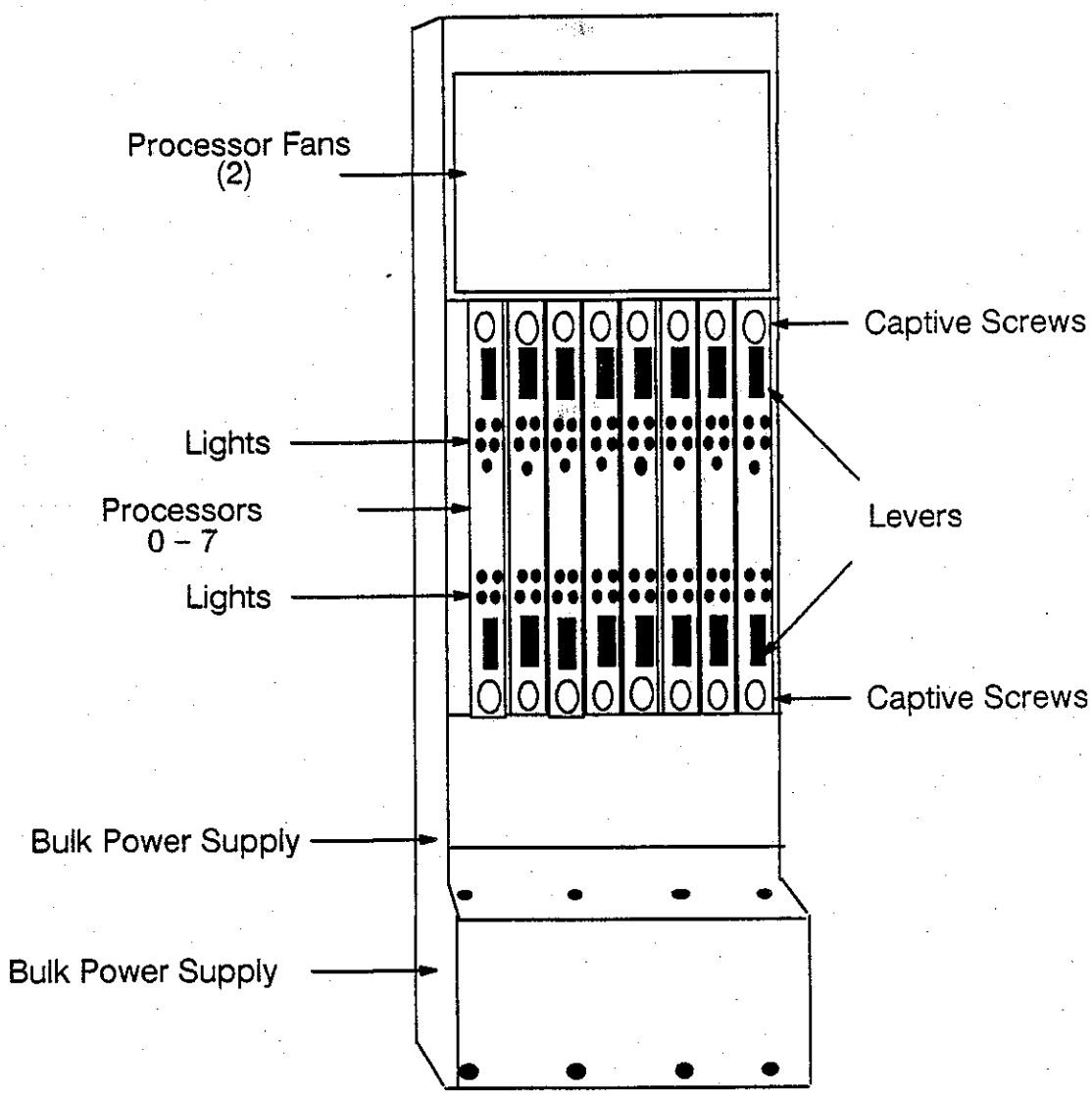
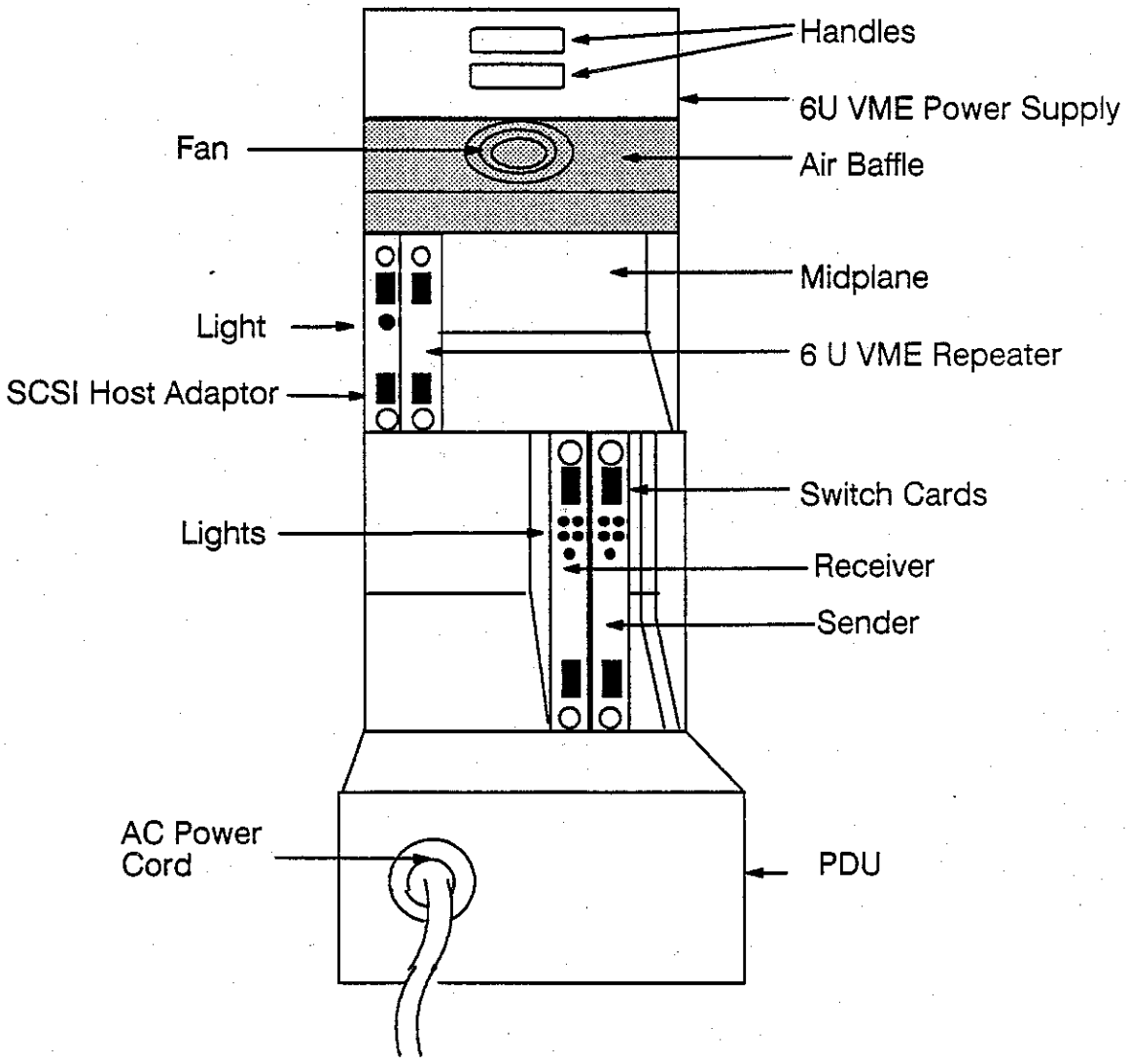
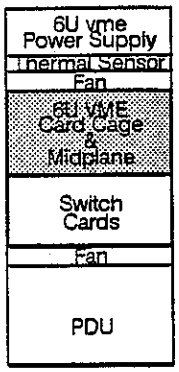


Figure 1–4 Expansion Cabinet: Back



6U VME Card Cage

The 6U VME card cage, located in the back middle section of the expansion cabinet, holds up to eight 6U VME cards. Currently, this card cage contains an Interphase SCSI VME Controller and a VMEbus Repeater.



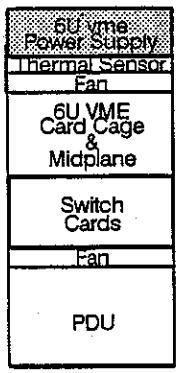
Back View

6U VME Repeater

The Repeater provides the connection between the peripheral controllers contained in the 9U VME card cage and the TC/FPV card in the expansion cabinet. It is always the rightmost card in the 6U card cage while the 9U Repeater is always the leftmost card in its card cage (in the Peripheral cabinet). The Peripheral Controllers in the 9U VME card cage are thereby connected to the computer via the Repeater card in the 6U VME card cage.

6U VME I/O Power Supply

This power supply is located in the back top section of the expansion cabinet. It provides power to the 6U VME cards in the 6U VME card cage.



Back View

6U VME Fan

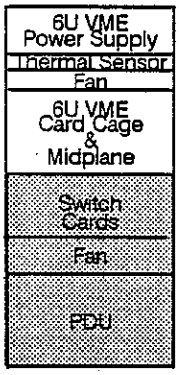
The 6U VME fan is located just below the I/O power supply and is automatically activated when the system power is turned on via the TCS.

Thermal Sensor

Located on the back wall behind the fan, the thermal sensor monitors temperature for the 6U VME card cage.

Switch Cards

The Switch cards, located in the back middle section of the expansion cabinet, are connected to the back side of the midplane. There is one pair, consisting of a server (TC/SS) and a requestor (TC/SR). Each of the eight function slots on the midplane is wired to each of the four switch card slots on the other side of the midplane. For communication with the rest of the system, each switch card has connectors that mate with the midplane, on which the signals are routed to connectors that accept cables.



Back View

Switch Card Fan

This fan is located just under the switch cards and is automatically activated when the system power is turned on.

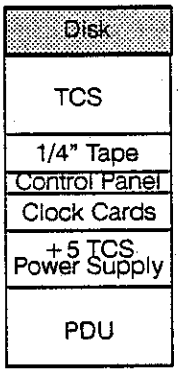
Power Distribution Unit (PDU)

The Power Distribution Unit (PDU), located at the bottom rear of the expansion cabinet, takes 3-phase 208 VAC power from the wall outlet and distributes it as single-phase power. It has a 30 amp plug.

1.2 Utility Cabinet

See Figure 1–5 and Figure 1–6 for locating FRUs in the utility cabinet. The following subsections describe the FRUs in the Utility Cabinet.

Hard Disk Drive



Front View

The hard disk drive is located at the front top of the Utility cabinet. It is an 850MB (686MB formatted) 8" Winchester disk drive. Additional (up to three more) Winchester disk drives are located in the Peripheral cabinet.

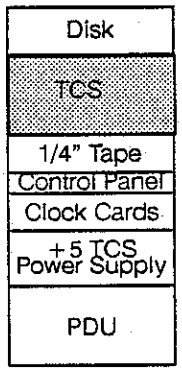
Test and Control System (TCS)

The Test and Control System (TCS) is a separate subsystem consisting of its own power supply, processor, disks, and software. The TCS controls, monitors, and tests the hardware components of the TC2000 system. It also boots the nX operating system on the TC2000 computer. The TCS software consists of an operating system (DOS), the master program, and the diagnostics. The master program, called the TCS Executive (TEX), controls the TCS and runs the diagnostics.

When power first comes on via the keyswitch, only the TCS gets power. The TCS, under operator control, then turns on the bulk power supplies and system fans, turns on the system circuit cards, tests the machine's components, and starts the load of system software.

For complete instructions on shutting down the operating system and powering on or off the system, refer to Chapter 7, *Troubleshooting.*

Having a separate CPU and disk enables the TCS to continue running diagnostic software when portions of the TC2000 system are down.



Front View

Figure 1–5 Utility Cabinet: Front

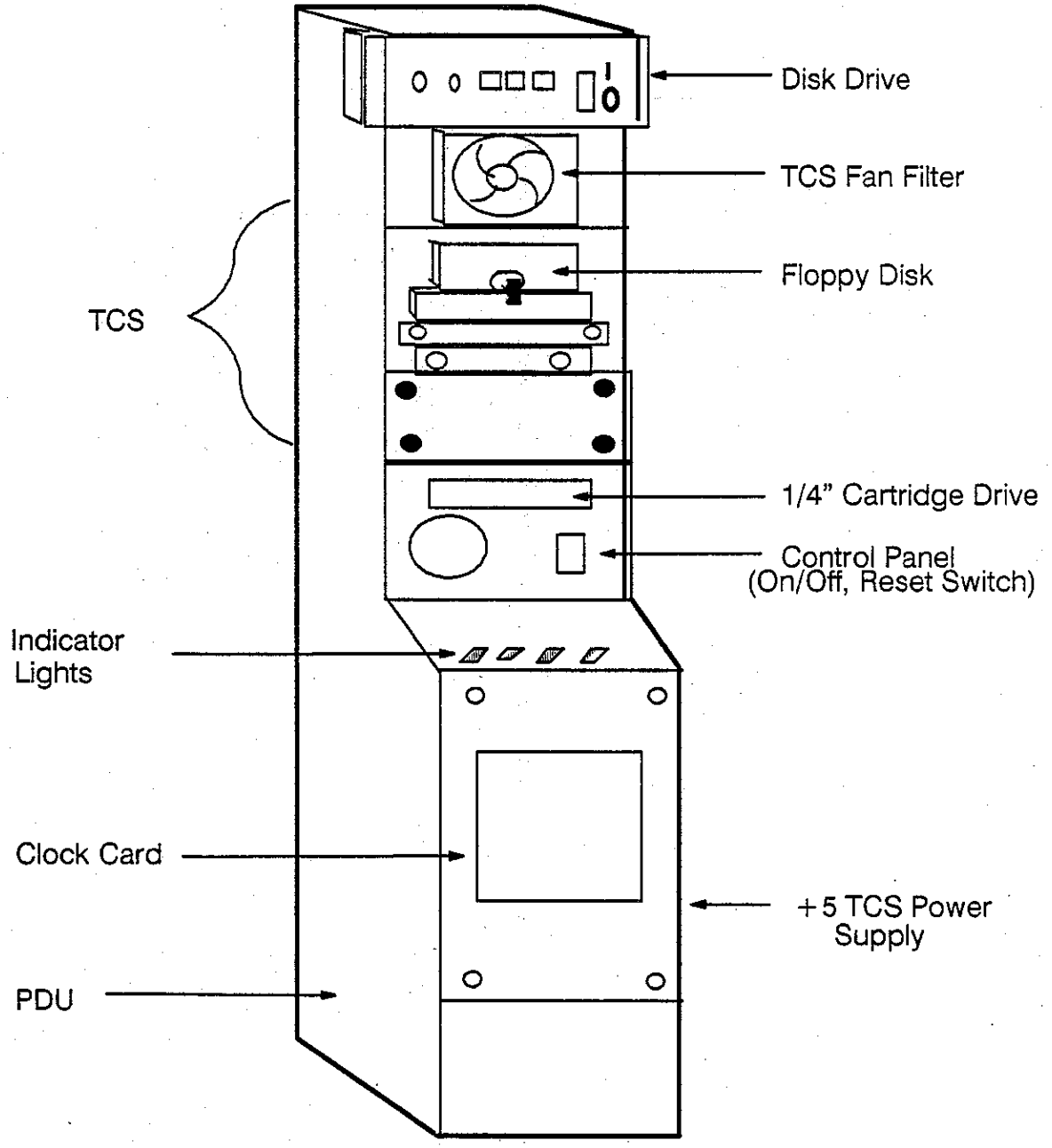
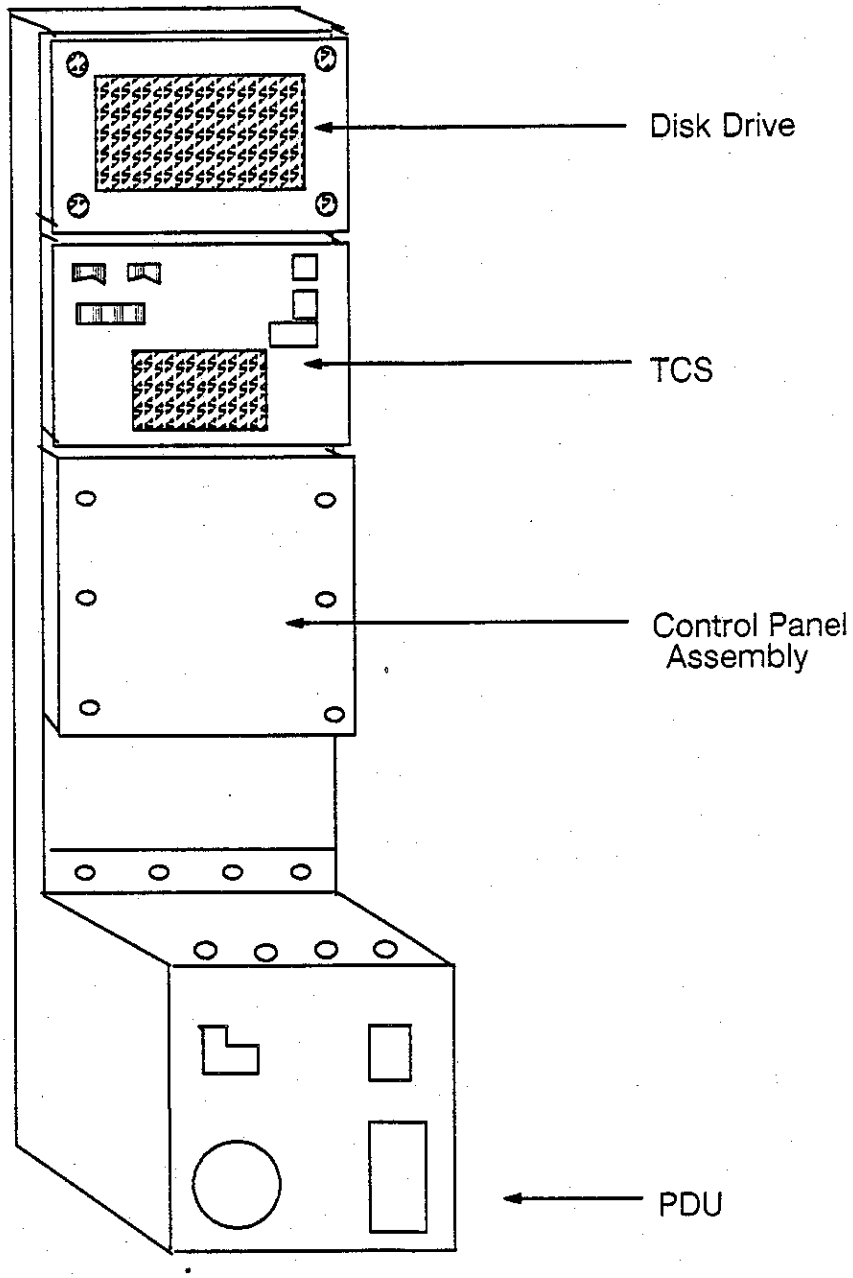
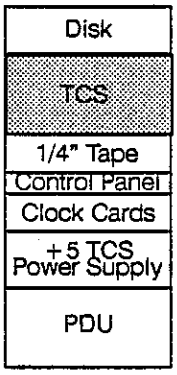


Figure 1–6 Utility Cabinet: Back



- Master Function Card

  The TCS master function card controls the system support devices, including the hard disk and floppy disk ports, two serial ports, the real time clock/calendar, and the keyboard interface.



Front View

- Modem Card

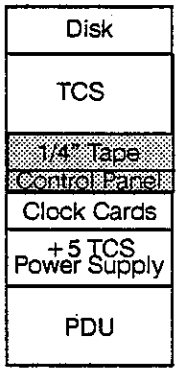
  The modem card is connected to the TCS rear panel phone jack with a cable. If the TC2000 system needs service from BBN, the system operator checks that the local phone line is connected. BBN Field Service calls the auto-answer modem, and TCS applications and function card diagnostics are used to diagnose the machine.

- TCS Floppy Disk Drive

  The 1.2MB floppy drive is located at the bottom left-hand corner of the PC chassis.

- TCS Hard Disk Drive

  The hard drive is located at the bottom left-hand corner of the PC chassis just above the floppy drive.



Front View

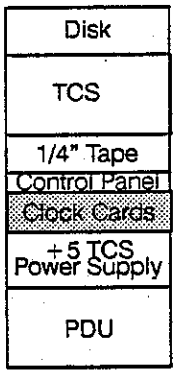
1/4" Tape Drive

The 1/4" Tape Drive is located just under the TCS and is part of the Control Panel Assembly.

Control Panel Assembly

The Control Panel Assembly is located just below the TCS on the front of the cabinet. It coontains the 1/4" Tape Drive, keyswitch, indicator lights, reset button and associated power and data cables.

Clock Card(s)

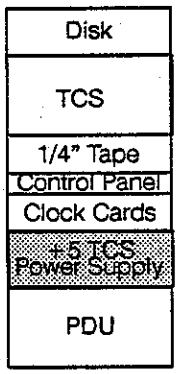


Front View

The clock card (TC/CLK) is located at the front of the Utility cabinet under the Control Panel. It provides the switch clock signals and other timing signals for a system of up to 63 processors.

The clock signal is generated by a clock master card. The distribution of the clock signals is from the clock master card, through clock slave cards as needed for larger systems, to switch cards where it is used and also passed on to the function cards and TCS subsystem.

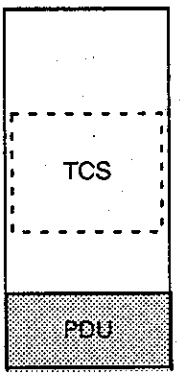
+5 TCS Power Supply



Front View

This power supply, located in the same section as the clock cards at the front of the Utility cabinet, provides +5 volt power directly to the TCS logic on the function, clock, and switch cards.

Power Distribution Unit (PDU)



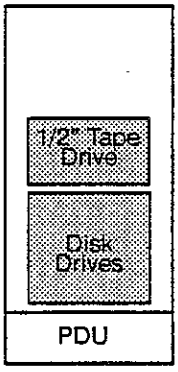
Back View

The PDU, located in the bottommost back section of the cabinet, distributes single-phase 208 VAC power from the wall outlet. Input is a 30 amp, 3-phase 208 VAC.

1.3 Peripheral Cabinet

See Figure 1–7 and Figure 1–8. The following subsections describe the FRUs in the Peripheral Cabinet.

Eight–Inch Disk Drives



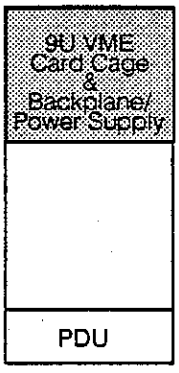
Front View

Up to three optional eight–inch disk drives are located at the front of the Peripheral cabinet.

1/2" Tape Drive

The optional 1/2" Tape Drive is located in the Peripheral cabinet above the disk drives. The system supports tape operation at 1600bpi, 3200bpi, and 6250bpi.

9U VME Card Cage Chassis



Back View

Located at the top back of the Peripheral cabinet is the 9U VME card cage. The card cage is an enclosure that contains the components of the 9U VME subsystem: the controller and repeater cards as well as the 9U VME backplane and the 750W switching power supply. Each of the Controller cards and the Repeater card is considered to be a separate FRU. The entire card cage, including the power supply and backplane, is considered to be another separate FRU.

The following cards are in the card cage:

- Disk Controller

  Controls the disk drives (up to four)

- Ethernet Controller

  Allows communication to the Ethernet network

Figure 1–7 Peripheral Cabinet: Front

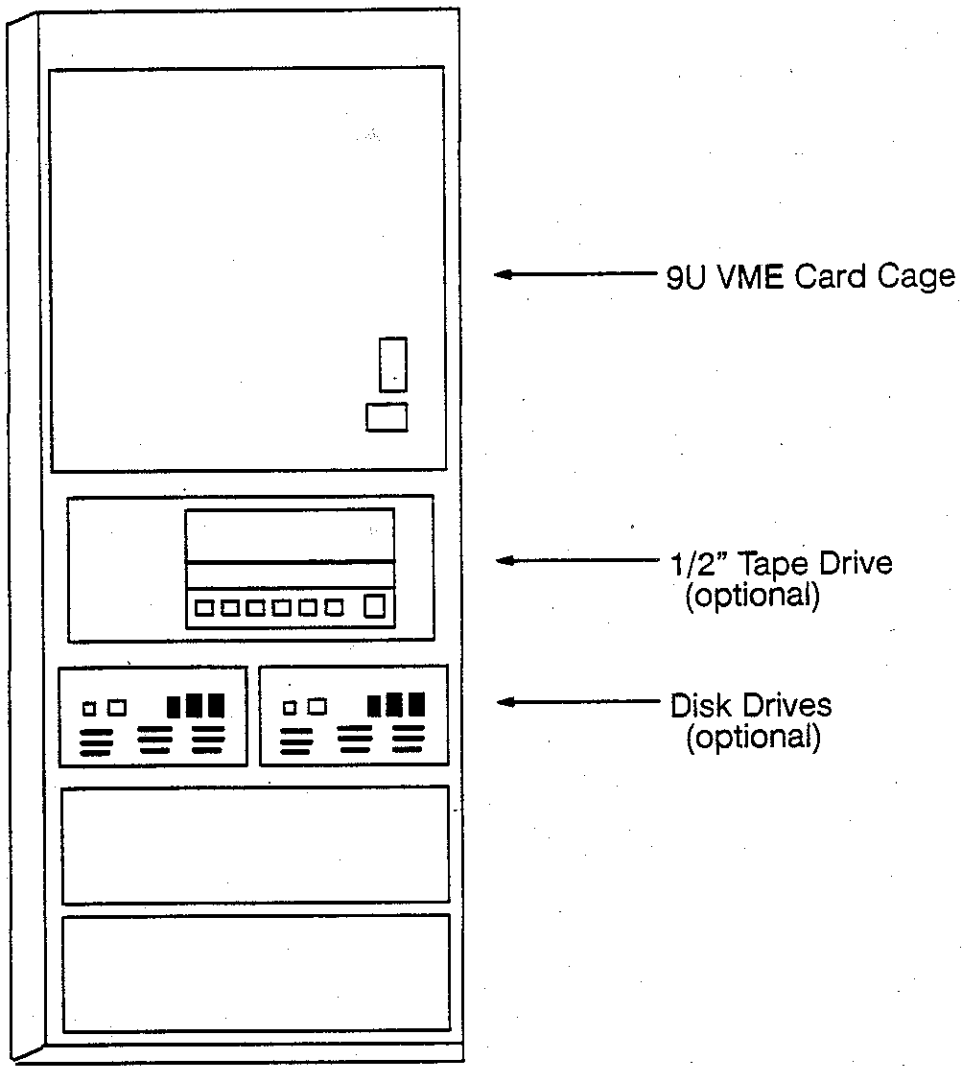
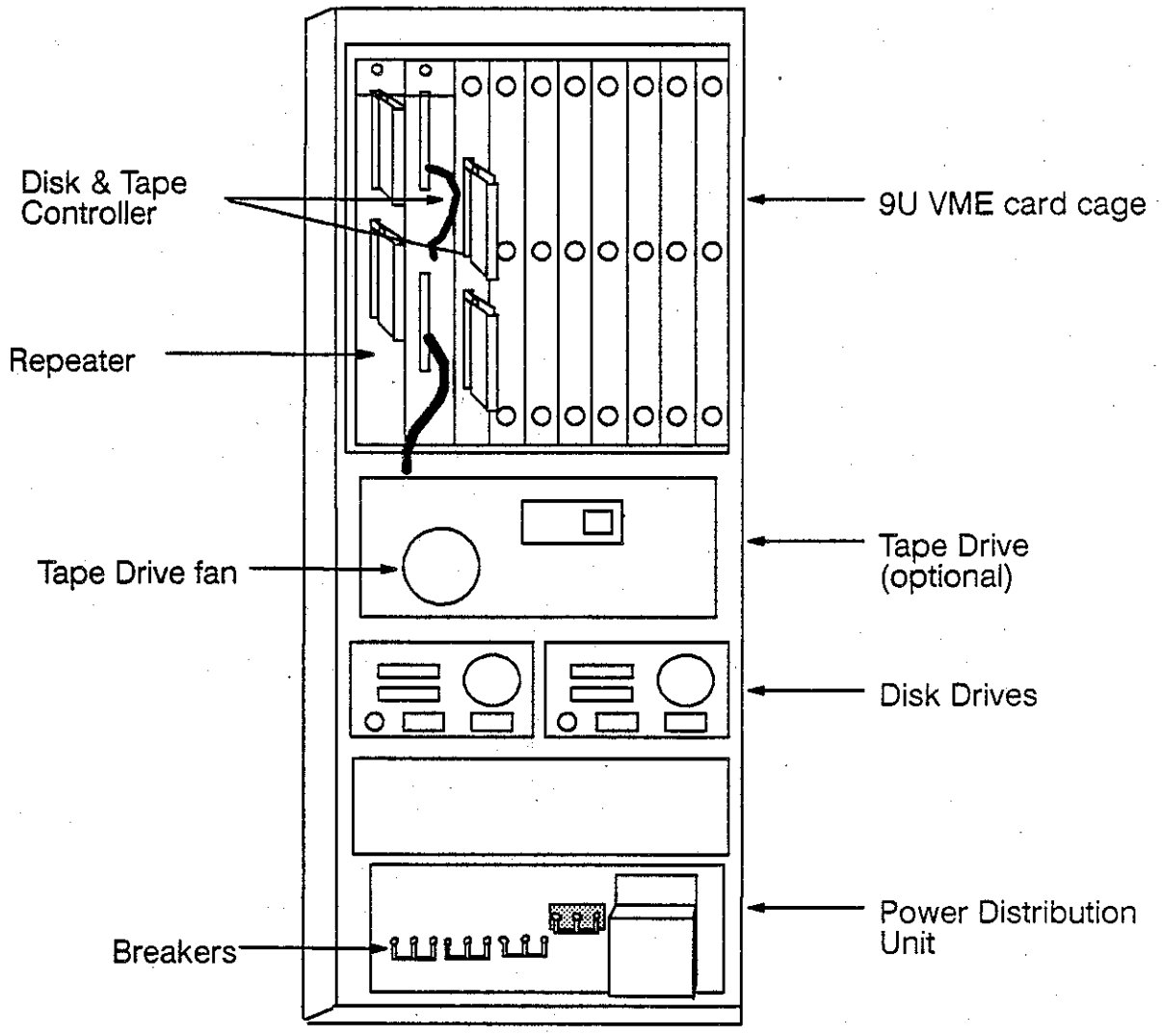


Figure 1–8 Peripheral Cabinet: Back



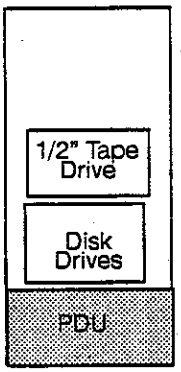
- 32-Port Terminal Controller (Optional)

  Supplies multiple serial lines connected to the TC2000 computer

- VME Repeater

Cabled to the 6U VME Repeater to extend control from the TC2000 master function card to the 9U card cage.

Peripheral PDU



Front View

The peripheral Power Distribution Unit (PDU), located at the bottom rear of the Peripheral cabinet, outputs 208 VAC single-phase for the 9U VME card cage, the disk drives (optional), and the 1/2" tape drive (optional). The Peripheral PDU has a 20 amp plug and requires 208 3-phase VAC input.

See the *Site Preparation Guide* for more detailed electrical information.

2

Expansion Cabinet

The expansion cabinet is located on the left end of the TC2000 system. (Refer to Figure 2–1 for a front view and Figure 2–2 for a back view.) This cabinet can contain as many as eight processors. There can be up to eight expansion cabinets per system. The first expansion cabinet is called the system base module.

The following sections provide instructions for the removal and replacement of each Field Replaceable Unit (FRU) in the expansion cabinet, as follows:

- Processor Fan
- Processor
- Midplane
- 6U VME Subsystem
  - I/O Power Supply
  - Card Cage/Midplane
  - 6U VME Repeater
  - SCSI Controller
- 6U VME Fan Assembly
- 6U VME Thermal Sensor
- Switch Cards
- Switch Card Fan Assembly
- Power Distribution Unit (PDU)
- Bulk power supplies

Figure 2–1 Expansion Cabinet--Front

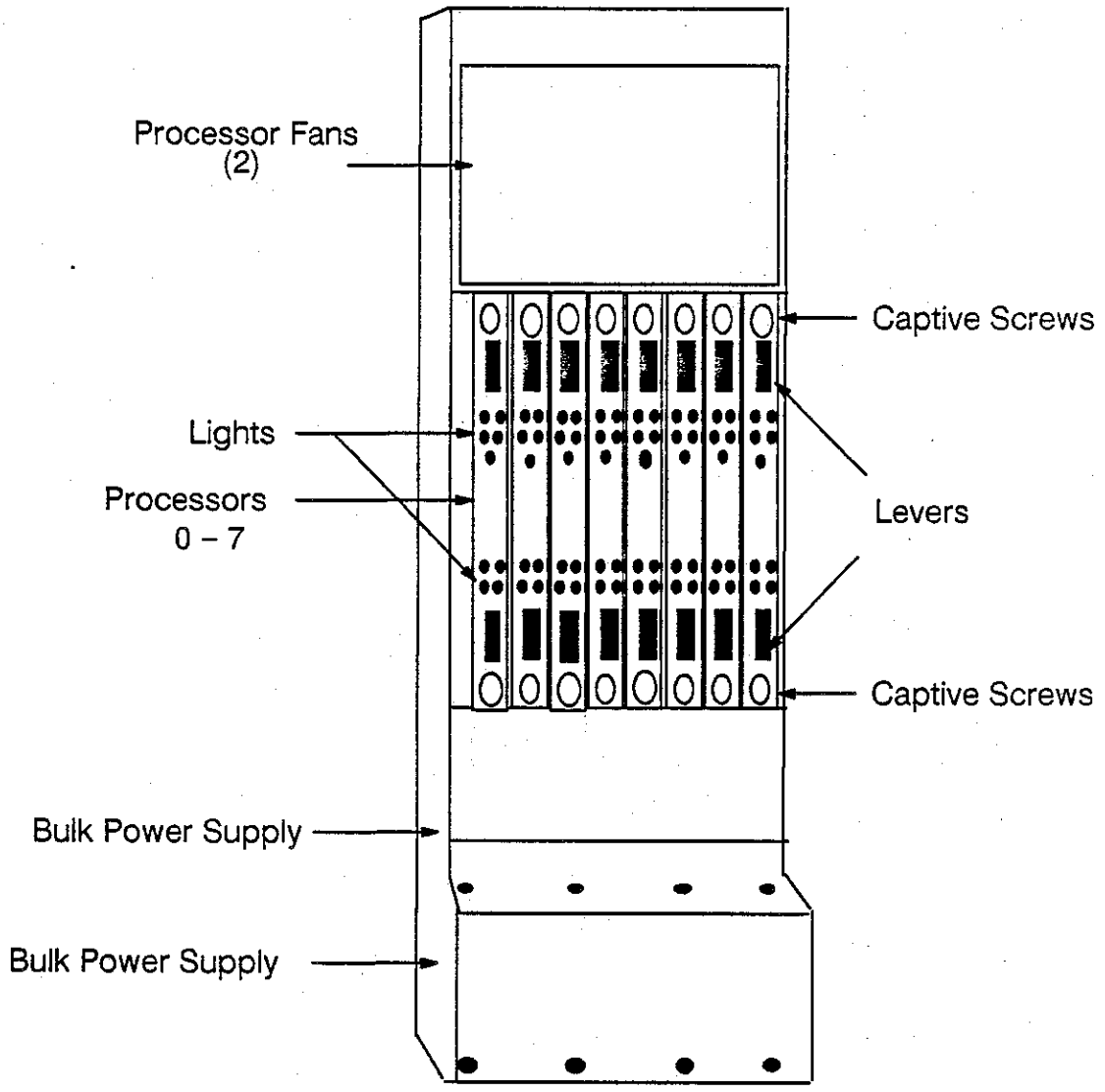
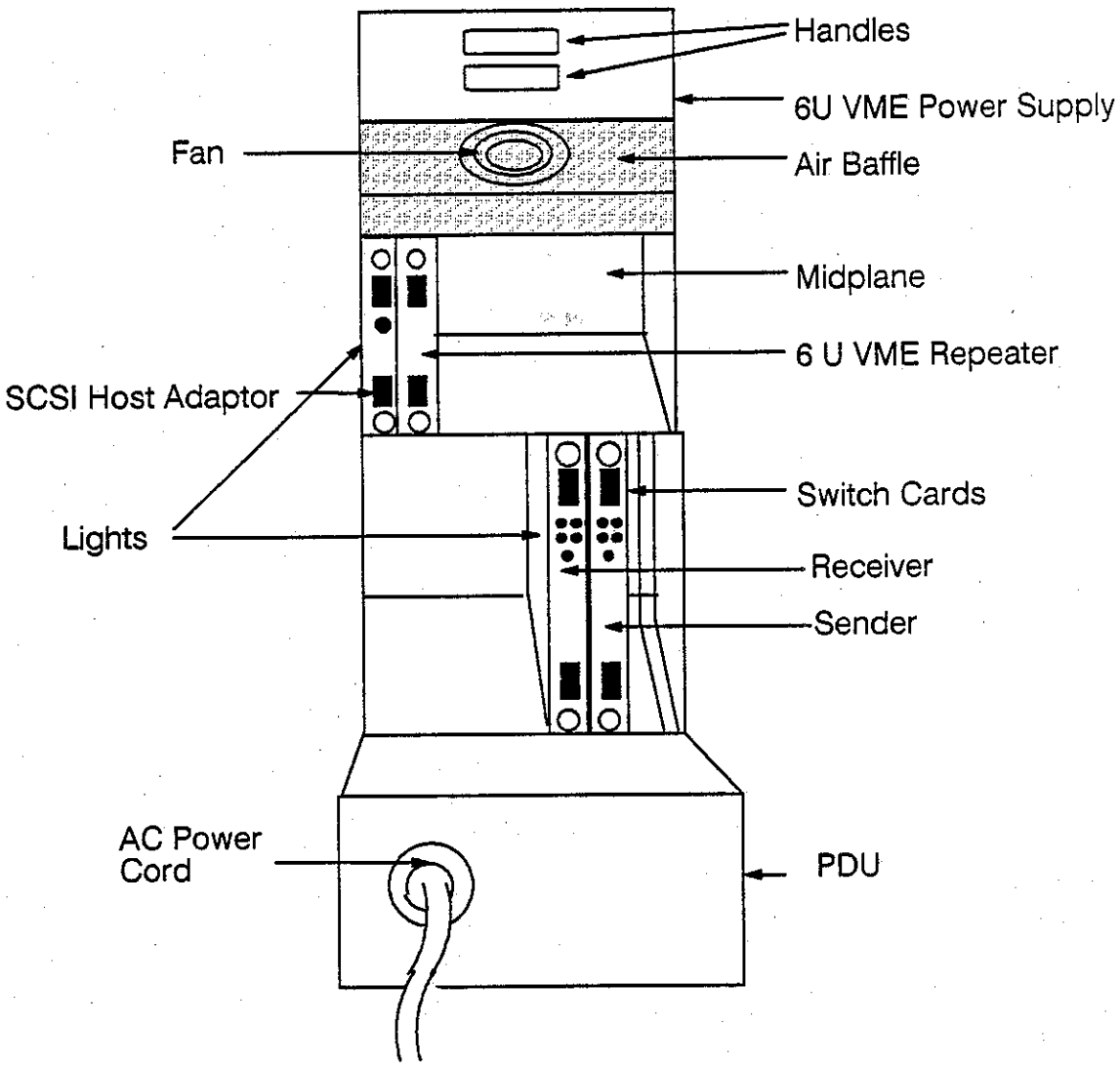


Figure 2-2 Expansion Cabinet -- Back



2.1 Removing the System Panels

Before you can begin working on the expansion cabinet FRUs, you need to remove the cabinet's outer panels ("skins") as follows (see Figure 2–3):

1. Using a 1/8–inch screwdriver, unscrew the two screws at the top of the panel.
2. Remove the panel by pulling the panel out at the top and lifting upwards.

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

WARNING

Unplug the system from the wall outlet before proceeding. Otherwise you risk severe electrical shock.

You can now access the Processor fans and cards. To access the bulk power supply:

3. Unscrew the two screws on the bottom left and right of the bulk power supply panel.
4. Lift the panel off.

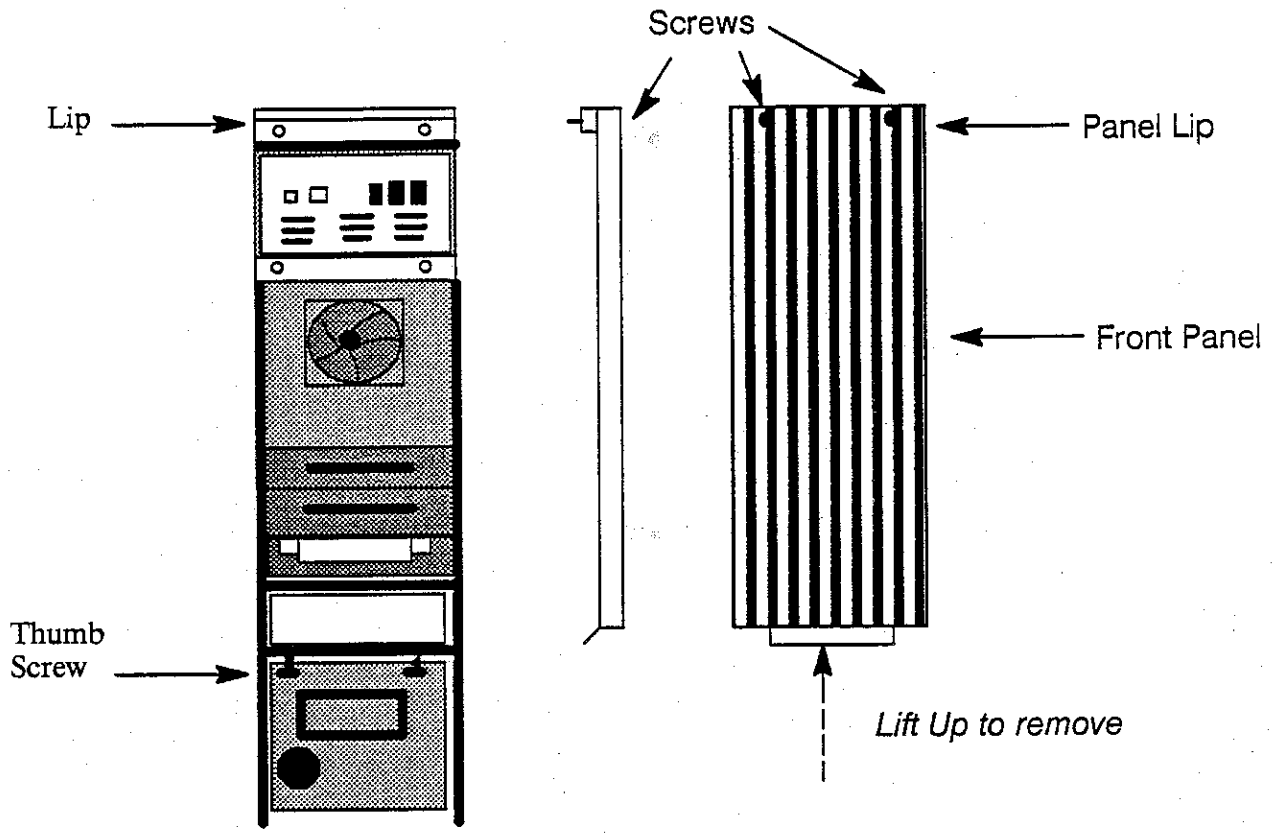
NOTE

If you wish, you can easily access the bulk power supply filter at this time. Unscrew the two Phillips screws under the panel and slide the filter out for cleaning or changing.

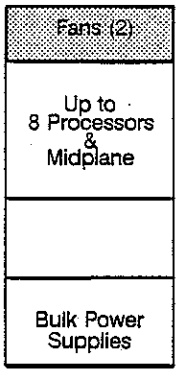
To access the components in the back of the cabinet (the I/O 6U VME power supply, 6U VME card cage, Switch cards and fan, PDU) you first need to remove the back panel as follows:

1. Unscrew the bottom two thumb screws.
2. Lift the entire piece up until the top two pins are free of their holes, then lift the panel off and put it aside.

Figure 2–3 Removing System Panels



2.2 Processor Fans



Front View

There are two Processor fans per expansion cabinet. They are located at the front in the topmost section.

You need the following tools:

- Large slotted screwdriver
- Phillips (#1 or #2) screwdriver

2.2.1 Removing a Processor Fan

To remove a processor fan:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

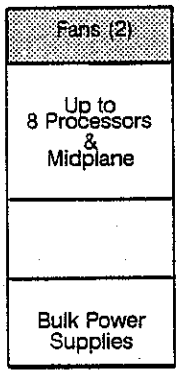
1. At the front of the utility cabinet, turn the key in the control panel counterclockwise to the OFF position.
2. Remove the four screws from the Processor fan panel and lift it off.
3. Remove the four screws—two front and two on the back wall—from the fan bracket.
4. Cut all tie wraps.
5. Unplug each of the plugs connected to the fans.
6. Lift out the whole fan assembly as far as it will go.

NOTE

The plugs on the back wall are one-way and cannot come out.

7. You can now access either fan for removal.

2.2.2 Replacing a Processor Fan

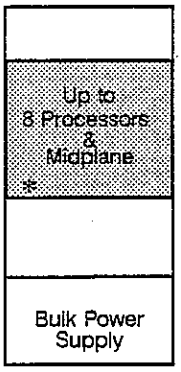


Front View

To replace a fan:

1. At the front of the utility cabinet, check that the key in the control panel is turned counterclockwise to the OFF position.
2. Place the new fan on the mounting bracket and tighten all screws.
3. Move the two cords out of the way and put the entire assembly back into the rack.
4. Connect the two fan plugs—the shorter cord to the back fan and the longer cord to the front fan.
5. Replace the four bracket screws.
6. Put the front panel in place and tighten the four panel screws.

2.3 Processor Cards



Front View

There can be up to eight processors per expansion cabinet. The Processors are located in the middle of the cabinet and are accessed from the front.

You need the following tool:

- Large slotted screwdriver

2.3.1 Removing a Processor Card

To remove a processor:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

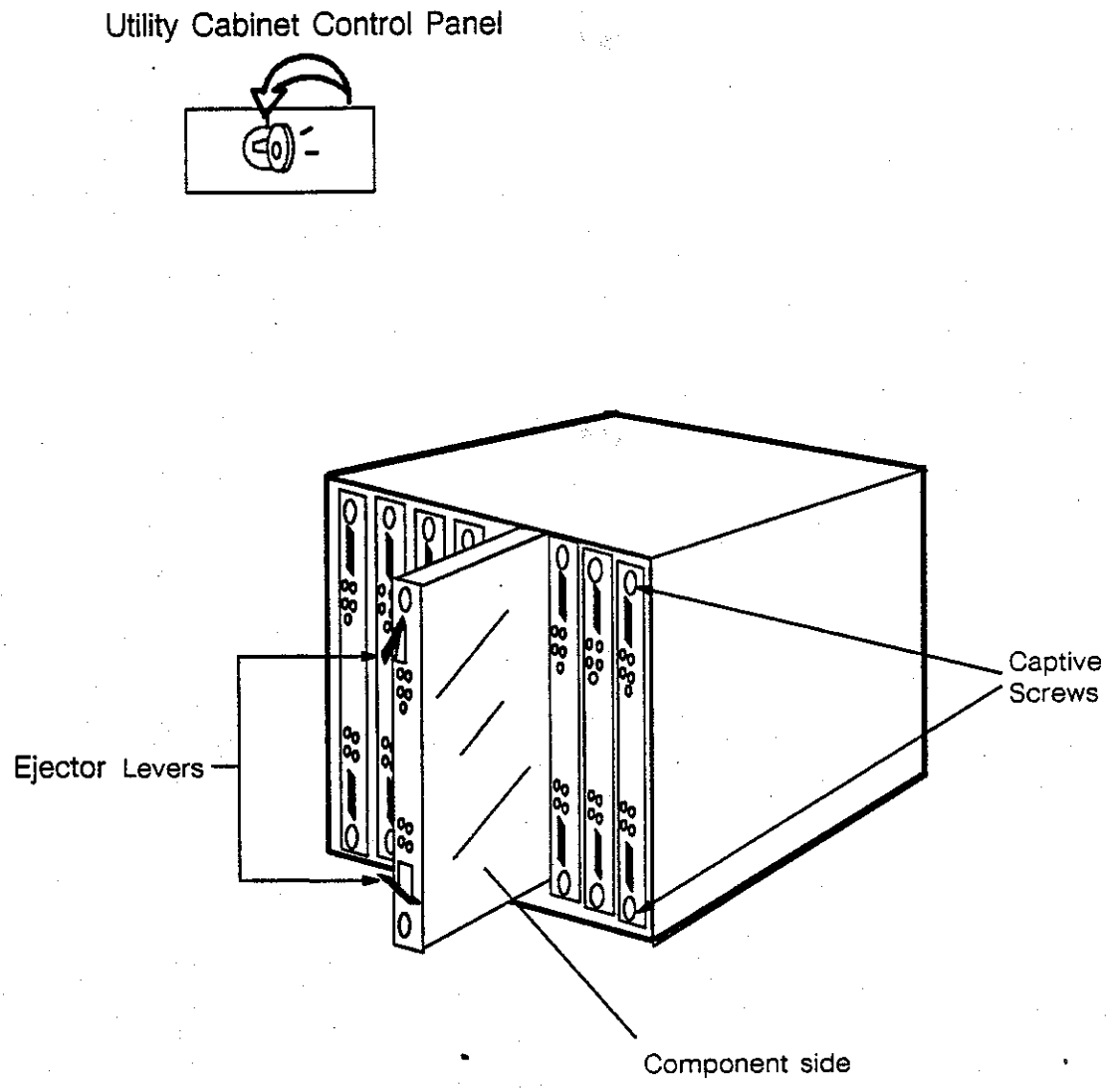
1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).

CAUTION

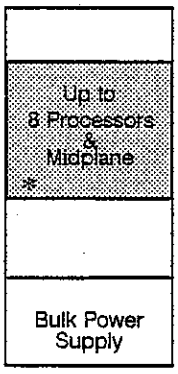
Be sure to put a ground strap on your wrist and plug the end into the ground socket (* on diagram.) This prevents static electricity from building up and discharging across a card while you are working. (Even a small static discharge to the card can destroy components, or weaken components so that they work briefly and then fail.)

2. Loosen each captive screw at the top and bottom of the processor enough to release it.
3. Grasp the top and bottom black levers and pull them out simultaneously — the top lever goes out and up; the bottom lever out and down.
4. Slide the processor out. If a processor sticks, rock it gently up and down.
5. Place the processor in the protective, static-free package provided.

Figure 2–4 Removing/Replacing a Processor Card



2.3.2 Replacing a Processor



Front View

To replace a Processor:

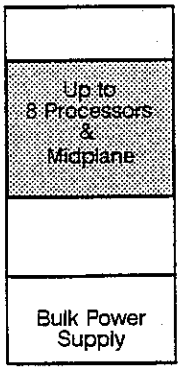
1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise).
2. Remove the Processor from its special packaging.

CAUTION

Be sure to put a ground strap on your wrist and plug the end into the ground socket (see * on diagram.) This prevents static electricity from building up and discharging across a card while you are working. (Even a small static discharge to the card can destroy components, or weaken components so that they work briefly and then fail.)

3. Configure the jumpers on the new Processor to match those on the old Processor. (Refer to Appendix A to verify the jumper/switch settings.)
4. Hold the Processor so that the five lights—Bulk, TCS, Vcc, Vee and Flag— are at the top and facing you.
5. Holding the Processor straight, place it carefully into the slot at the bottom of the bay. Hold the ejector levers horizontal so that they do not interfere with the seating.
6. Push the Processor in slowly until it connects to the Midplane.
7. Simultaneously push the top lever down and in, and the bottom lever up and in to lock the Processor in place.
8. Push and turn the captive screws then secure each with the screwdriver.

2.4 Midplane



Front View

The Midplane holds the Processors on one side (front) and the Switch cards on the other side (back). The Midplane may need to be replaced (refer to Chapter 7, *Troubleshooting,* for possible reasons).The Midplane is located in the middle of the expansion cabinet and is accessed from the front of the cabinet.

You need the following tools to work on the Midplane:

- Phillips (#1) screwdriver
- 9/64 Allen wrench

2.4.1 Removing a Midplane

NOTE

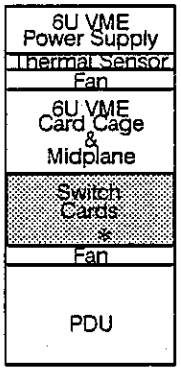
The VME Midplane is not currently a Field Replaceable Unit.

2.4.2 Replacing a Midplane

NOTE

The VME Midplane is not currently a Field Replaceable Unit.

2.5 Switch Server/Switch Requestor Cards



Back View

The Switch Server (TC/SS) and Switch Requestor (TC/SR) cards are located midway down the back of the expansion cabinet.

You need the following tool to work on the Switch cards:

- Large slotted screwdriver

2.5.1 Removing a Switch Card

To remove a Switch Server or Switch Requestor card (see Figure 2–5):

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).

CAUTION

Be sure to put a ground strap on your wrist and plug the end into the ground socket (see * on the diagram). This prevents static electricity from building up and discharging across a card while you are working. (Even a small static discharge to the card can destroy components, or weaken components so that they work briefly and then fail.)

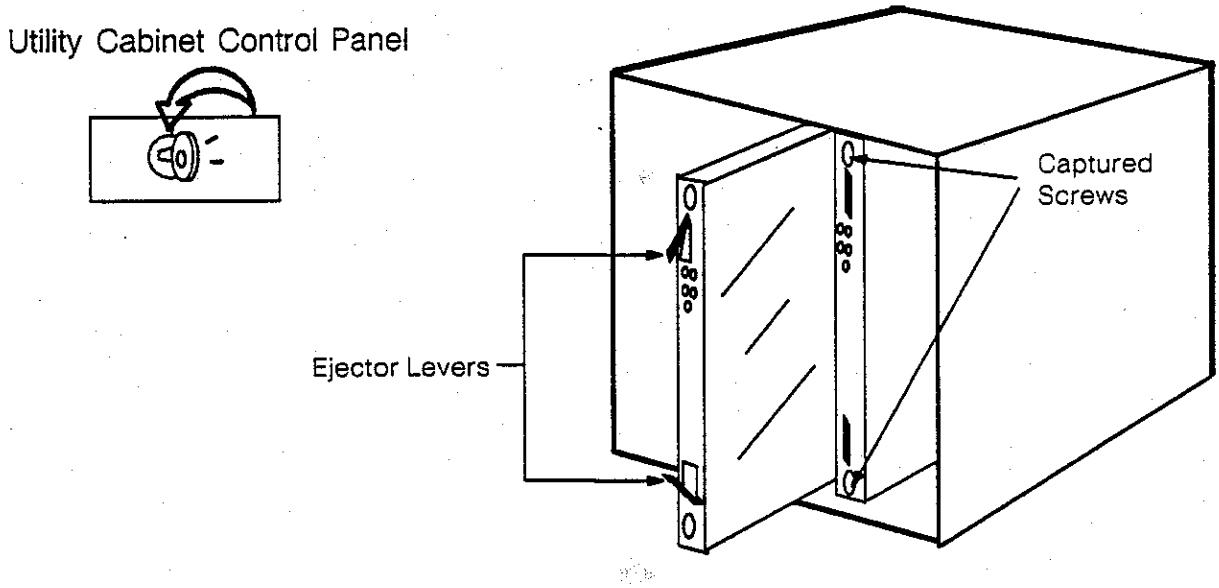
2. Loosen the card fasteners until each captive screw is released.
3. Grasp the top and bottom black levers and pull out simultaneously — the top goes out and up; the bottom out and down.
4. Slide the card out.

NOTE

Be sure to note the slot location of the card.

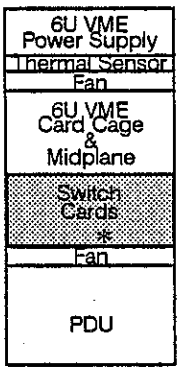
5. Place the card in the protective, static–free package provided.

Figure 2–5 Removing/Replacing a Switch Card



2.5.2 Replacing a Switch Card

CAUTION

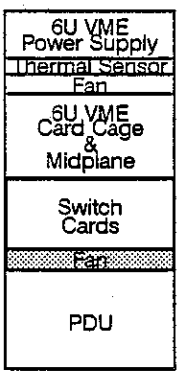


Be sure to put a ground strap on your wrist and plug the end into the ground socket (see * on the diagram) to prevent static electricity build up and discharge across a card. (Even a small static discharge to the card can destroy components, or weaken components so that they work briefly and then fail.)

To replace a Switch Server or Switch Requestor card:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise).
2. Remove the card from its protective packaging.
3. Configure the jumpers on the new card to match those on the old card. (Refer to Appendix A to verify the jumper/switch settings.)
4. Make sure the five lights—Bulk, TCS, Vcc, Vee and Flag are at the top of the card and facing you.
5. Holding the card straight, place it carefully into the slot at the bottom of the bay. Hold the ejector levers horizontal so that they do not interfere.
6. Push the card in slowly until it connects to the Midplane.
7. Grasp the black levers at the top and bottom of the card and simultaneously push the top lever down and in and the bottom lever up and in.
8. Push and turn the captive screws manually, then with the screwdriver.

2.6 Switch Card Fan Assembly



Back View

The Switch Card Fan Assembly is located at the back of the expansion cabinet just under the Switch cards.

You need the following tool:

- 3/16 or 1/4–inch slotted screwdriver

2.6.1 Removing a Card Fan Assembly

To remove a Switch Card Fan Assembly:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Loosen the four screws holding the assembly in place.
3. Unplug the connector.
4. Lift the assembly out.

2.6.2 Replacing a Card Fan Assembly

To replace a Switch Card Fan Assembly:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise).
2. Put the assembly in place and plug in the connector.
3. Screw in the four screws that hold it in place.
4. Plug in the two AC power cords.

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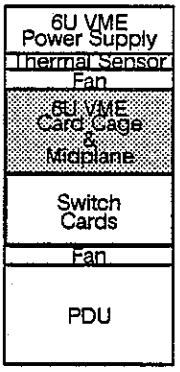
2.7 6U VME Repeater



Back View

The 6U VME Repeater is located in the 6U VME card cage at the top back of the expansion cabinet.

You need the following tool to work on the VME Repeater:

- 1/8-inch slotted screwdriver

2.7.1 Removing a 6U VME Repeater

To remove a VME Repeater:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

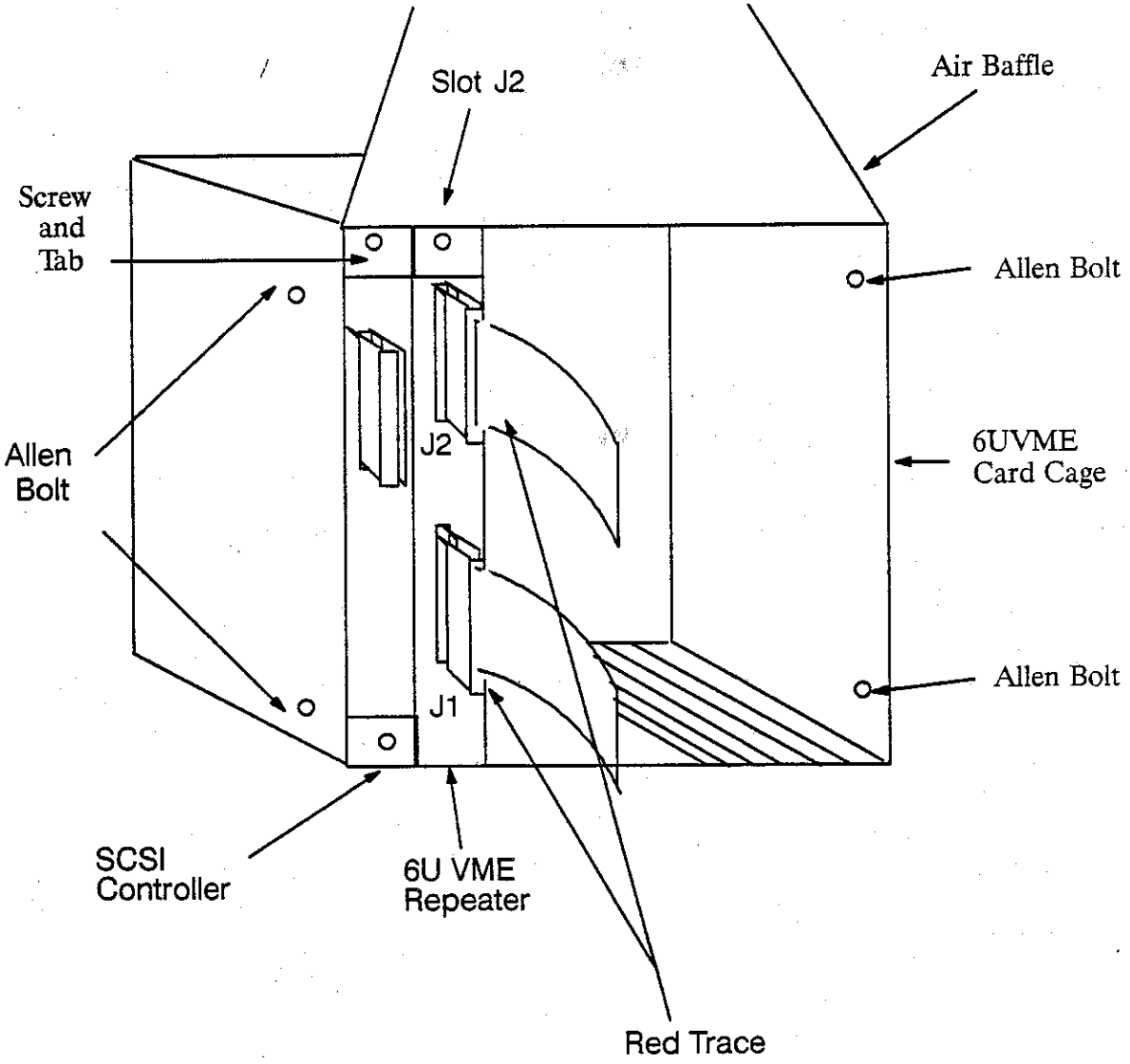
1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Locate the appropriate card. It is in the second slot from the left (Slot J2) and has cables to the 9U VME card cage.
3. Loosen the two screws — one at the top and one at the bottom of the card.
4. Disconnect the cables J1 (bottom) and J2 (top) by spreading the cable clips and pulling forward.

NOTE

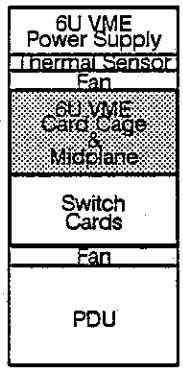
As you remove the cables, note the red trace on the bottom of each. This should always be down when the cables are connected. Also, remember which cable was J1 and which was J2.

5. Grasp the top and bottom tabs and pull them straight out simultaneously. These are not ejector tabs, so removing the card requires some force.
6. Slide the Repeater out.
7. Place the card in the protective, static-free package provided.

Figure 2-6 6U VME Card Cage



2.7.2 Replacing a 6U VME Repeater



Back View

To replace a VME Repeater:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise).
2. Remove the Repeater from its special packaging.
3. Configure the jumpers on the new Repeater to match those on the old. (Refer to Appendix A to verify the jumper/switch settings.)
4. Make sure the components are on the right side of the card.
5. Holding the card straight, place it carefully into the leftmost empty slot (immediately to the right of the Interphase Controller).

CAUTION

The Repeater *must* be inserted into the first open slot (just to the right of the last card), in order for the system to operate.

6. Grasp the black tabs at the top and bottom of the card and push them straight in simultaneously .
7. Secure the top and bottom screws.
8. Connect the cables, making sure that the red trace is down and the J1 and J2 cables go into the correct connectors on the card.

2.8 SCSI Controller

The SCSI Controller is located in the 6U VME card cage at the top back of the expansion cabinet. It is always in the leftmost slot of the card cage.

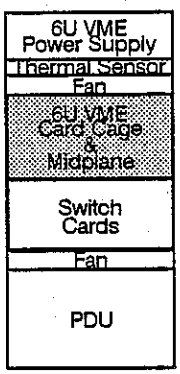
You need the following tool to work on this card:

- 1/8–inch slotted screwdriver

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

2.8.1 Removing a SCSI controller

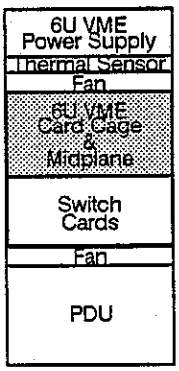


Back View

To remove a Controller:

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Locate the appropriate card; it will always be in the leftmost slot.
3. Loosen the two screws—one at the top and one at the bottom of the card.
4. Disconnect the only cable, which is located at the top of the card.
5. Pull the two black ejector levers away from the center simultaneously.
6. Slide the card out and place the card in the protective, static–free package provided.

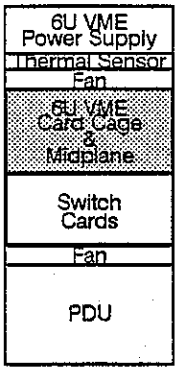
2.8.2 Replacing a SCSI controller



To replace a Controller:

1. Check that the key in the control panel is turned all the way to the left.
2. Remove the card from its special packaging.
3. Configure the jumpers and switches on the new card to match those on the old card. (Refer to Appendix A to verify the jumper/switch settings.)
4. Check that the ejector levers won't interfere with the seating, place the card carefully into the leftmost empty slot.
5. Push the card in slowly until it connects to the backplane.
6. Connect the cable at the top.
7. Secure the top and bottom screws.

2.9 6U VME Card Cage



Back View

The 6U VME card cage is located at the back of the expansion cabinet just under the 6U VME power supply. **Be prepared to spend about one hour on this task.** Also, make sure that there is enough room at the back of the cabinet to work; i.e., that the cabinet is not too close to the wall.

You need the following tools to work on the card cage:

- 1/8–inch Allen wrench
- 3/16–inch Phillips screwdriver
- 1/8–inch slotted screwdriver

In order to remove the card cage you need to remove other FRUs as well. These FRUs are:

- Processors
- 6U VME Repeater
- SCSI Controller
- 6U VME Fan assembly
- 6U VME Power Supply

Instructions for their removal can be found in this chapter under the appropriate name.

2.9.1 Removing a 6U VME Card Cage

To remove the card cage:

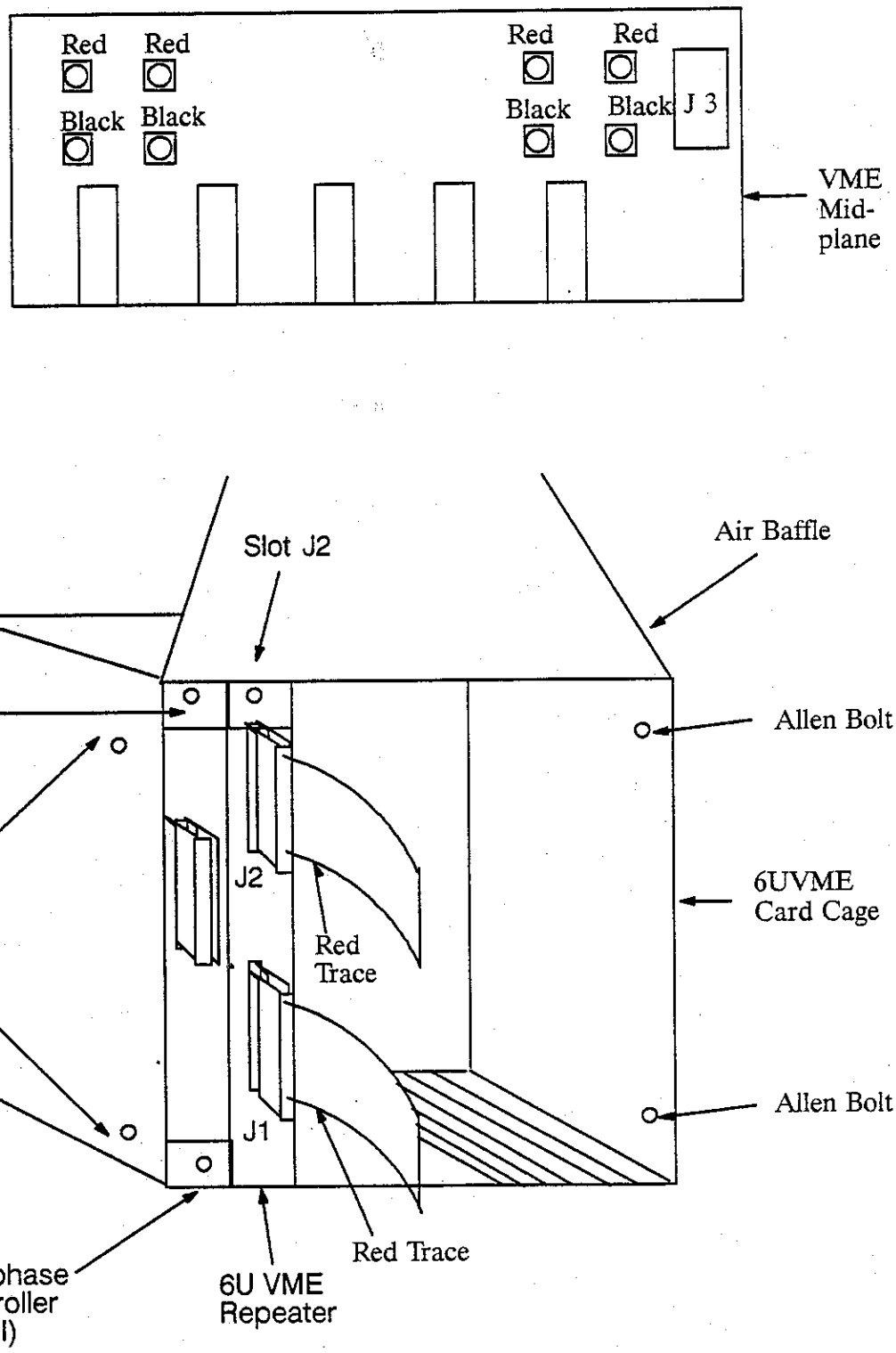
1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the front of the expansion cabinet, remove all the Processors. See *Processors, Remove* in this chapter.

NOTE

Before removing the Processors, make sure that you have a place to keep them while you are working; i.e., they should not be stacked up, but instead put separately into protective, static free bags.

3. Reach through the Processor card cage to unscrew the two Phillips screws on the left and right bottom corners of the VME Midplane.

Figure 2–7 Removing/Replacing the 6U VME Card Cage



NOTE

Be sure to keep track of all hardware that you remove and remember where it came from.

4. At the back of the expansion cabinet, remove the VME cards from the 6U VME card cage (refer to for instructions).
5. Loosen the two Allen bolts on each side of the card cage.
6. The air baffle panel is just above the 6U VME card cage. Unscrew the air baffle panel and lift it out.
7. Loosen the top two slotted screws on the power supply panel so that the entire power supply can be lifted up and out.

NOTE

The power supply does not come out easily; you need to lift it up in order to unhook its sides from the pins on the rack before you can lift it out.

8. On the left side of the power supply, loosen the two lug nuts holding two power cables and disconnect the wires. This gives enough slack to the remaining cables (connected to the Midplane and back wall) so that you can lift the power supply all the way out and rest it on top of the expansion cabinet.
9. You can now remove the VME fan assembly (refer to for instructions).

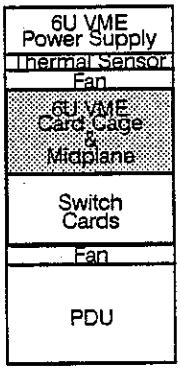
NOTE

When disconnecting cables remember where they connect.

10. Disconnect the eight power cables for the power supply from the VME Midplane.
11. Remove the two power cables from the back wall by squeezing the sides of each plug and pulling it out.
12. Disconnect the power supply plug (J3) from the VME Midplane.
13. Unscrew the two top screws in the top back of the Midplane.
14. Lift out the VME card cage, being careful not to catch any of the cables.

2.9.2 Replacing a 6U VME Card Cage

In order to replace the card cage you need to replace other FRUs as well. These FRUs are: the Processors, the 6U VME Repeater and Controller cards, the 6U VME Fan assembly, and the 6U VME Power Supply. Instructions for their replacement can be found in this chapter under the FRU name.



Back View

To replace the 6U VME card cage:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise).
2. Check inside the section of the rack for the 6U VME card cage to ensure that the AC power and thermal sensor cables are vertically dressed to the left of the cage so that the cage will not catch them as you insert it.
3. Push the cage partway in, then go to the front of the expansion cabinet.
4. Reach through the Processor card cage to push the cables around the edge (right corner) of the rack.
5. At the back of the expansion cabinet, pull the cables around the cage as you push the cage all the way in.
6. Lift the cables and check that they are free of the card cage.
7. Make sure that the card cage is pushed all the way forward and lifted so that the bottom of it overlaps the front screw tabs.
8. Align the two top screw holes in the top back of the Midplane.
9. Put the two top screws back in loosely.

NOTE

Hang the back bottom of the card cage over the screw holes on the back of the Processor cage in order to properly align the holes and replace the screws.

10. Go to the front of the cabinet and replace the two screws on the back of the VME card cage.
11. Insert processor card into the left and ride side of the processor cage.
12. Go to the back and tighten the top two screws on the VME card cage.
13. Go to the front, remove the left processor card, and tighten the left bottom screw. Repeat with the processor card on the right.
14. Replace the 6U VME Fan assembly.
15. Replace the 6U VME power supply.
16. Replace the 6U VME Repeater and Controller cards.
17. At the front of the cabinet, replace the Processors.

2.10 6U VME I/O Power Supply

The 6U VME I/O power supply is accessed from the back of the expansion cabinet and is located in the topmost section.

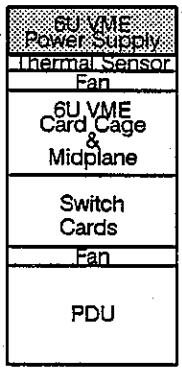
You need the following tools to work on the 6U VME power supply:

- Large slotted screwdriver
- Phillips (#2) screwdriver

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

2.10.1 Removing a 6U VME Power Supply



To remove the power supply (see Figure 2-8):

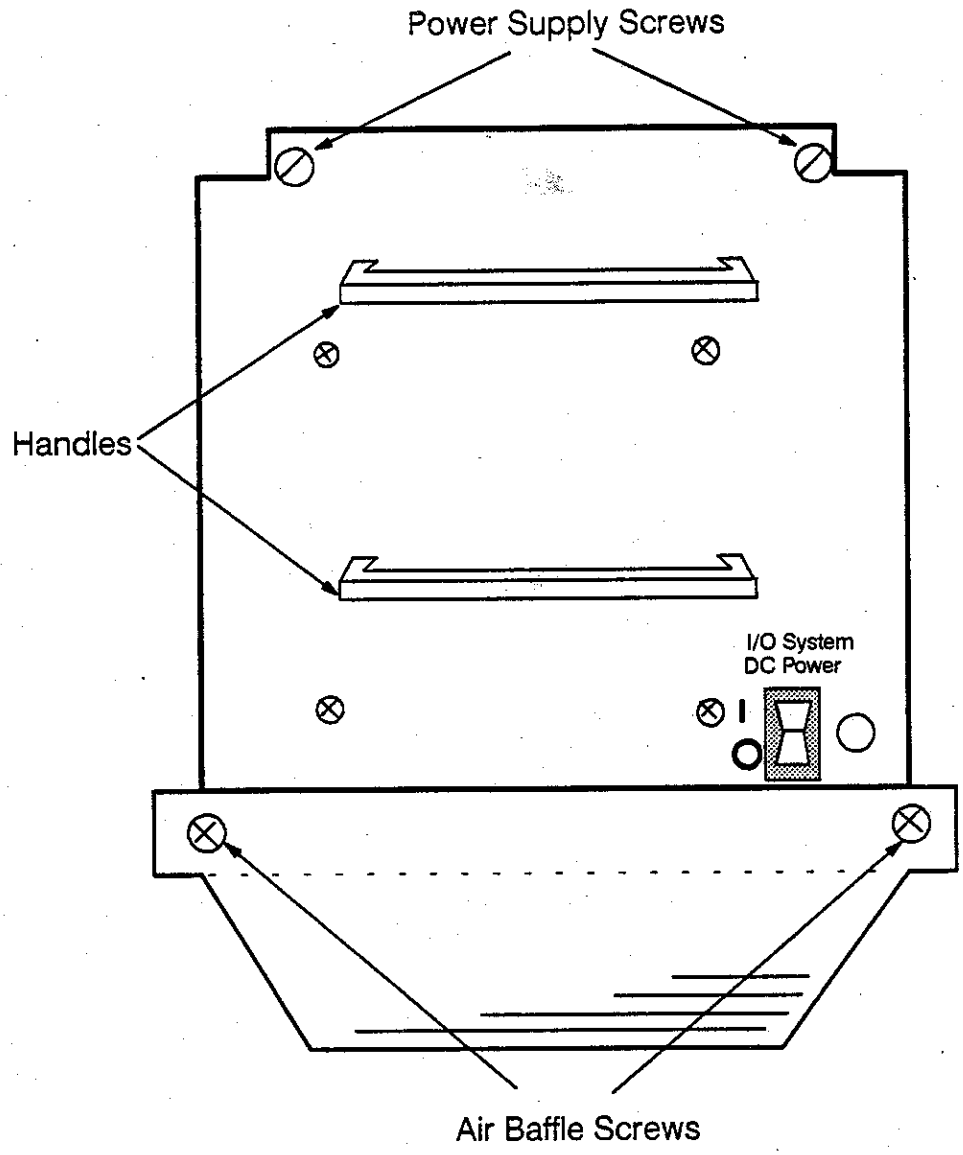
1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, turn off the PDUs for each cabinet by flipping all circuit breakers down. Additionally, twist off the two AC power cords for the expansion and utility cabinets and move them aside.
3. The air baffle panel is just under the 6U VME power supply. Unscrew the air baffle panel and lift it off.
4. Loosen the top two slotted screws on the power supply panel and lift the entire power supply up and out. Rotate the power supply toward you so that the top can rest on the VME cage, which allows you to work on it.

NOTE

The power supply does not come out easily; you need to lift it up in order to unhook its sides from the pins on the rack before you can lift it out.

5. Remove the four screws holding down the fan plate, disconnect the fan cable, and remove the fan assembly.
6. On the left side of the power supply, loosen the two lug nuts holding power cables and disconnect the wires. This gives enough slack to the remaining cables so that you can lift the power supply out and rest it on top of the expansion cabinet while you remove the remaining connections.
7. Disconnect the two right-hand ground wires (black).
8. Disconnect the two right-hand 5V wires (red).

Figure 2–8 Removing/Replacing the 6U VME Power Supply

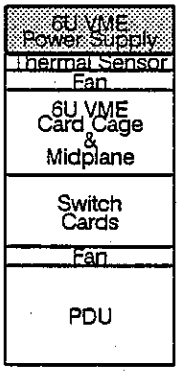


NOTE

Remember where the cables come from.

9. Remove the two power cables from the back wall by squeezing the sides of each plastic plug and pulling it out.
10. Disconnect the power supply plug (J3) from the VME Midplane.
11. Remove plate on the back of the power supply.
12. Unscrew the six wires as in Figure 2–9.

2.10.2 Replacing a 6U VME Power Supply

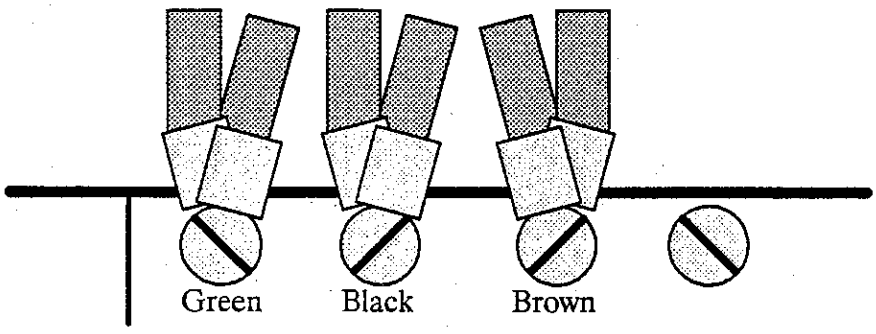


Back View

To replace the power supply:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise), that the circuit breakers for all PDUs are down and that the AC power plug is disconnected.
2. Connect the power supply plug (J3) to the VME Midplane making sure that it is keyed correctly before connecting.
3. Remove plate on the back of the power supply.
4. Secure the six wires to the appropriate connections as in Figure 2–9.
5. Connect the two right–hand ground wires (black) as in Figure 2–7.
6. Connect the two right–hand 5V wires (red) as in Figure 2–7.
7. Connect the two power cables into the back wall.
8. Tuck the cables into the back so that they are out of the way.
9. Check that the LED wires on the right of the power supply are connected.
10. Replace the power supply unit by lifting it up by the handles, engaging the top side slots on the rack pins first, then hooking the bottom, and pushing it firmly into the rack.
11. Put the panel in place and tighten the two screws on the top of the panel.
12. Replace the air baffle.
13. Plug in the AC power cord.
14. Push the circuit breakers up (on).

Figure 2–9 6U VME Power Supply Wiring



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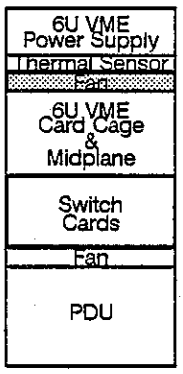
2.11 6U VME I/O Fan Assembly



Back View

The 6U VME I/O fan assembly is located at the back of the expansion cabinet just under the I/O power supply and behind the air baffle panel.

You need the following tools:

- Phillips screwdriver

2.11.1 Removing a 6U VME Fan Assembly

To remove the 6U VME fan assembly (see Figure 2-10):

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

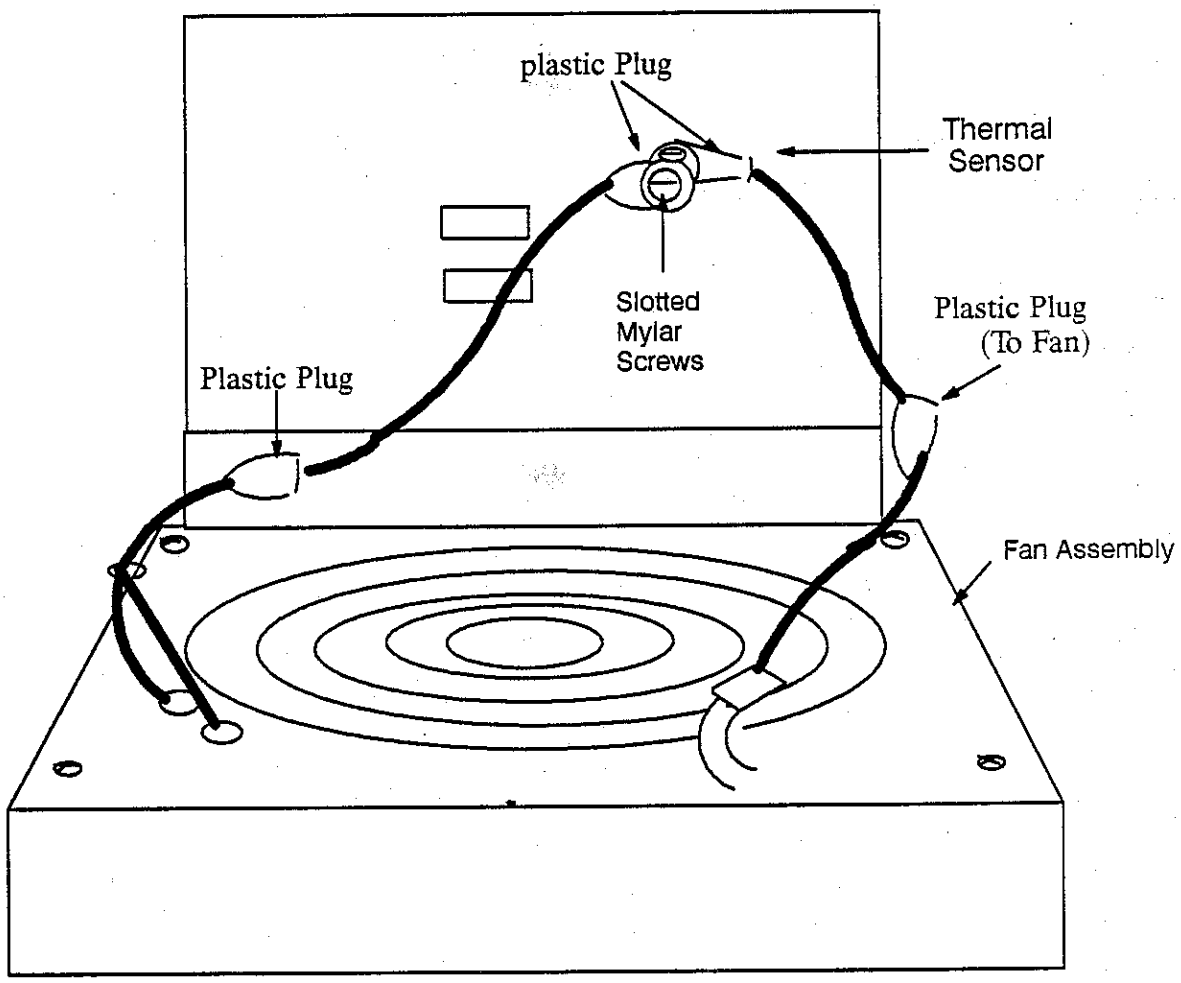
1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, turn off the PDUs for each cabinet by flipping all circuit breakers down. Additionally, twist off the two AC power cords for the expansion and utility cabinets and move them aside.
3. The air baffle panel is just under the 6U VME power supply. Unscrew the air baffle panel and lift it off.
4. Remove the power supply as described in *6U VME I/O Power Supply, Remove* but only enough to rest it on top of the cabinet and keep it out of the way while you work on the fan assembly.
5. Unscrew the four Phillips screws holding the fan assembly in place.

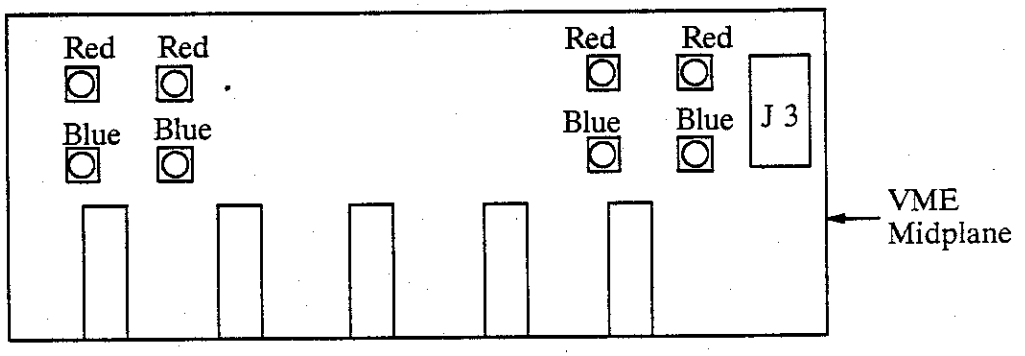
NOTE

Be sure to keep track of all hardware that you remove and where it came from.

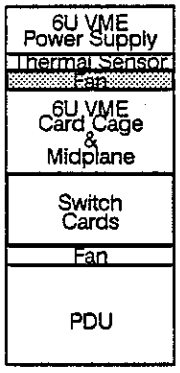
6. Unplug the plastic connector on the right (AC input cord).
7. Unplug the J3 connector from the back wall (VME Midplane).
8. Lift the assembly out.

Figure 2-10 Removing/Replacing the I/O 6U VME Fan Assembly





2.11.2 Replacing a 6U VME Fan Assembly



Back View

To replace the 6U VME fan assembly:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise), and that the circuit breakers for all PDUs are down.
2. Plug the J3 connector into the back wall (VME Midplane).
3. Put the fan assembly in at a 45–degree angle with the side up, then put it into place.
4. Replace the four fan assembly screws.
5. Plug the fan into the plastic connector on the right.
6. Replace the power supply as described in *6U VME I/O Power Supply, Replace.*
7. Replace the air baffle panel.
8. Plug the AC power plugs back into the wall and push the PDU circuit breakers up (on).

2.12 6U VME Thermal Sensor

The 6U VME thermal sensor is located at the back of the expansion cabinet on the back wall just behind and above the 6U VME fan assembly.

You need the following tool:

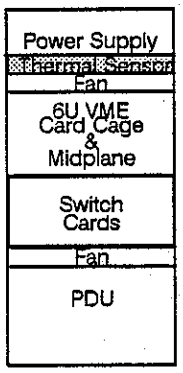
- Medium slotted screwdriver

2.12.1 Removing a 6U VME Sensor

To remove the 6U VME thermal sensor:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).



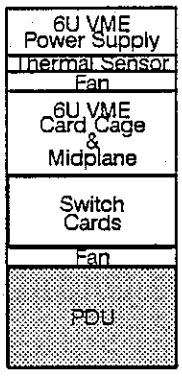
1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, turn off the PDUs for each cabinet by flipping all circuit breakers down. In addition, twist off the two AC power cords for the expansion and utility cabinets and move them aside.
3. At the back of the expansion cabinet, remove the air baffle.
4. Remove the power supply (see *6U VME I/O Power Supply, Remove*).
5. Unplug the two connectors from the sensor.
6. Unscrew the two plastic screws.
7. Lift the sensor out.

2.12.2 Replacing a 6U VME Sensor

To replace the 6U VME thermal sensor:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise), and that the circuit breakers for all PDUs are down.
2. Position the new sensor on the back wall and screw in the plastic screws.
3. Plug in the two sensor connectors.
4. Replace the power supply (see *6U VME I/O Power Supply, Replace*).
5. Replace the air baffle.
6. Plug the AC power plugs back into the wall and push the PDU circuit breakers up (on).

2.13 Power Distribution Unit (PDU)



Back View

The PDU is located at the back bottom of the expansion cabinet above the bulk power supply.

You need the following tool:

- #2 Phillips screwdriver

WARNING

Be sure to unplug the AC cord before removing the PDU cover. Failing to do so exposes you to live 208VAC terminals inside the PDU.

2.13.1 Removing a PDU

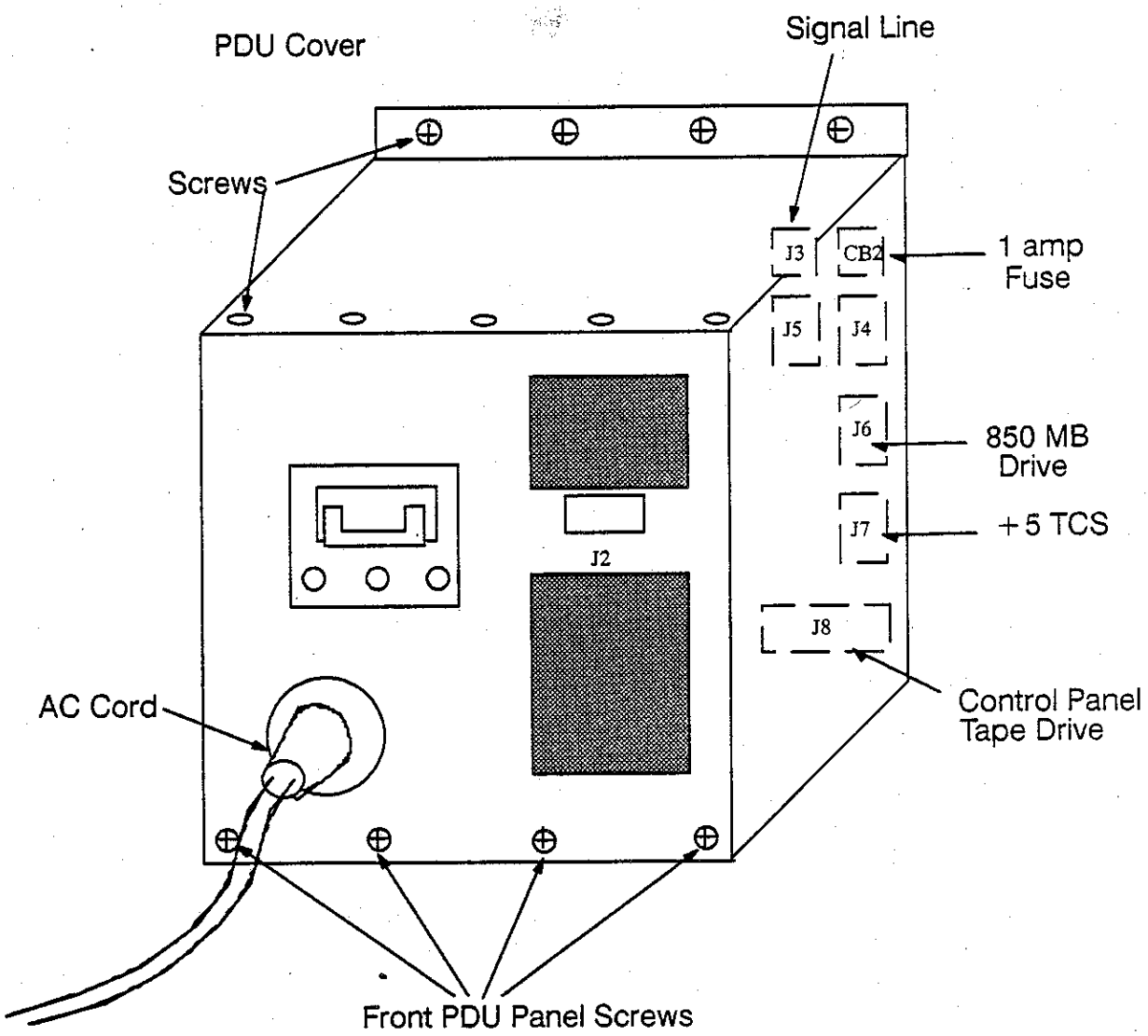
To remove the PDU (see Figure 2–11):

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, turn off the PDUs for each cabinet by flipping all circuit breakers down. In addition, twist off the two AC power cords for the expansion and utility cabinets and move them aside.
3. Unscrew the bottom four screws on the PDU drawer.
4. Unscrew the four screws at the top of the PDU panel.
5. Remove the PDU cover.
6. Unscrew the four screws holding the front PDU panel.
7. Reach in behind and disconnect J8, J7, J6, J5.
8. Slide the PDU out.

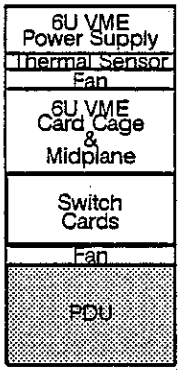
Figure 2-11 Removing/Replacing the PDU



2.13.2 Replacing a PDU

WARNING

Be sure that the PDU cover is closed before you plug in the AC cord. Failing to do so exposes you to live 208VAC terminals inside the PDU.



Back View

To replace the PDU:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise), that the AC power cords are unplugged, and that the circuit breakers for all PDUs are down.
2. Slide the PDU in.
3. Reach in behind and connect J8, J7, J6, J5. (These connectors are keyed.)
4. Screw in the four front PDU panel screws.
5. Screw in the four screws at the top of the PDU panel .
6. Replace the PDU cover.
7. Screw in the bottom four screws on the PDU drawer.
8. Plug in the AC cords and push the circuit breakers up (on).

2.14 Bulk Power Supply

Two bulk power supplies are located at the front of the expansion cabinet.

You need the following tools:

- Large slotted screwdriver
- Allen wrench
- Phillips screwdriver

WARNING

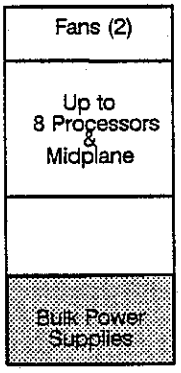
Be sure that the power is turned off to avoid exposure to live 208VAC.

2.14.1 Removing a Bulk Power Supply

To remove a bulk power supply:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).



Front View

1. At the front of the utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, turn off the PDUs for each cabinet by flipping all circuit breakers down. In addition, twist off the two AC power cords for the expansion and utility cabinets and move them aside.
3. At the front bottom of the cabinet, remove the panel in front of the bulk power supply section.
4. Remove the two lug nuts on the left-hand side of the power supply in order to take off the wires.

NOTE

Remember their placement—the positive (orange) wire is on the bottom, and the negative (blue) wire is on the top.

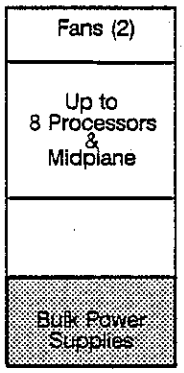
5. Disconnect the white plastic plug above the lug nuts.
6. Remove the two hex screws just above the plastic connector.
7. Remove the four screws holding the wires grouped into four.

NOTE

Remember their order (from left to right): green, black, red, and orange.

8. Loosen the two captive screws on the left and right corners of the mounting card and slide the bulk power supply out.

2.14.2 Replacing a Bulk Power Supply



Front View

To replace a bulk power supply:

1. At the front of the utility cabinet, check that the key in the control panel is turned all the way to the left (counterclockwise), that the AC power cords are unplugged, and that the circuit breakers for all PDUs are down.
2. Lift the wires out of the way and slide the new bulk power supply in.
3. On the left-hand side of the power supply, put the positive and negative output wires in place and replace the two lug nuts.

NOTE

Remember their placement—the positive (orange) wire is on the bottom, and the negative (blue) wire is on the top.

4. Connect the white plastic plug above the lug nuts.
5. With a Phillips screwdriver, replace the two screws just above the plastic connector.
6. Replace the four screws holding the wires grouped into four.

NOTE

Remember their order—from left to right the wires are green, black, red, and orange.

7. Tighten the two captive screws on the left and right corners of the mounting card
8. Replace the front panel.
9. Plug in the AC cords and push the circuit breakers up (on).

3

Utility Cabinet

The Utility cabinet is located between the Expansion cabinet and the Peripheral cabinet. (Refer to Figure 3–1 and Figure 3–2.) The following sections provide instructions for the replacement of each Field Replaceable Unit (FRU) in the Utility cabinet, as follows:

- Eight–inch Disk Drive
- Test and Control System (TCS)
- Control Panel Assembly
- Clock Card
- Clock Card Fan
- +5 TCS Power Supply
- Power Distribution Unit (PDU)

Figure 3–1 Utility Cabinet: Front

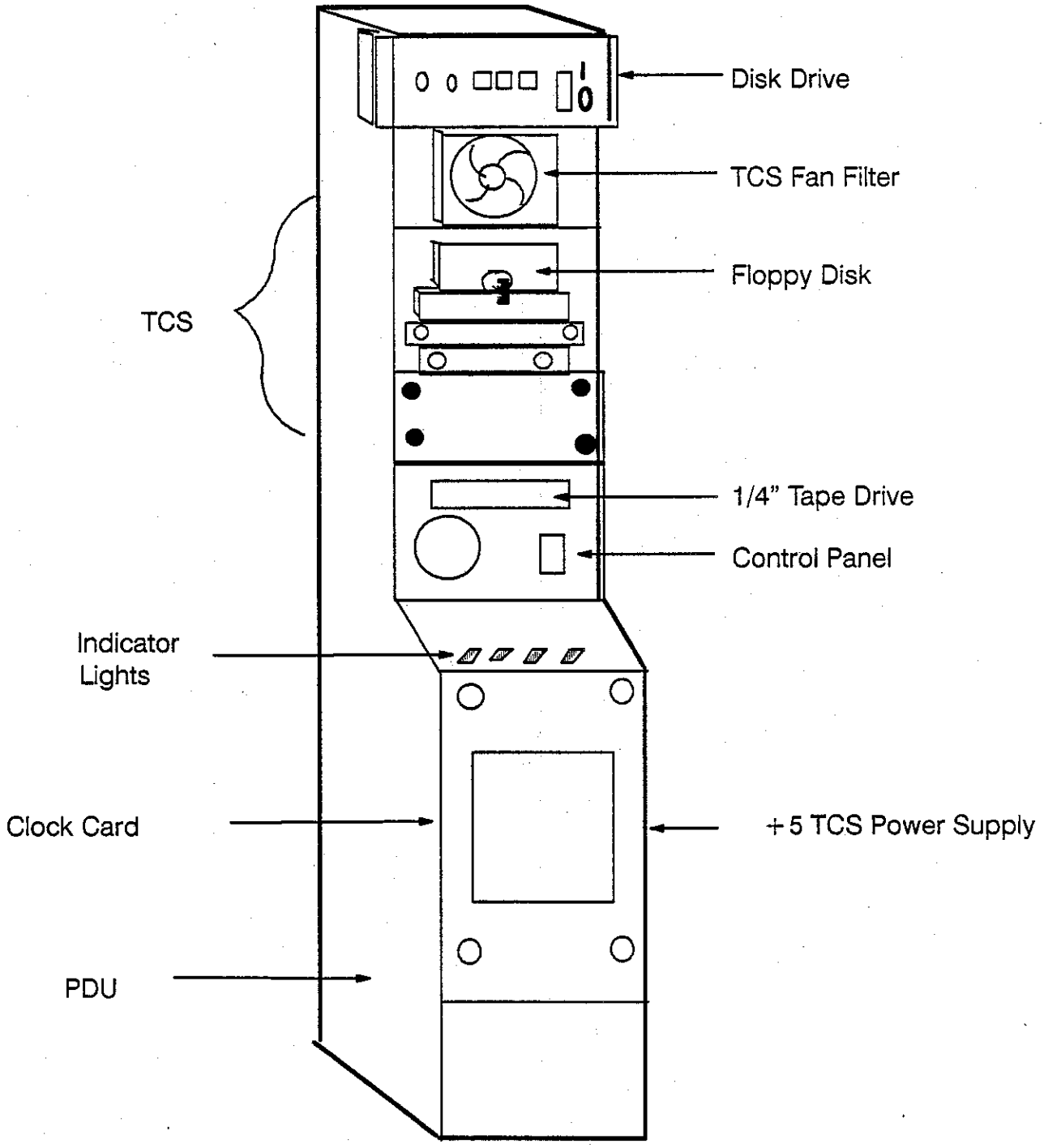
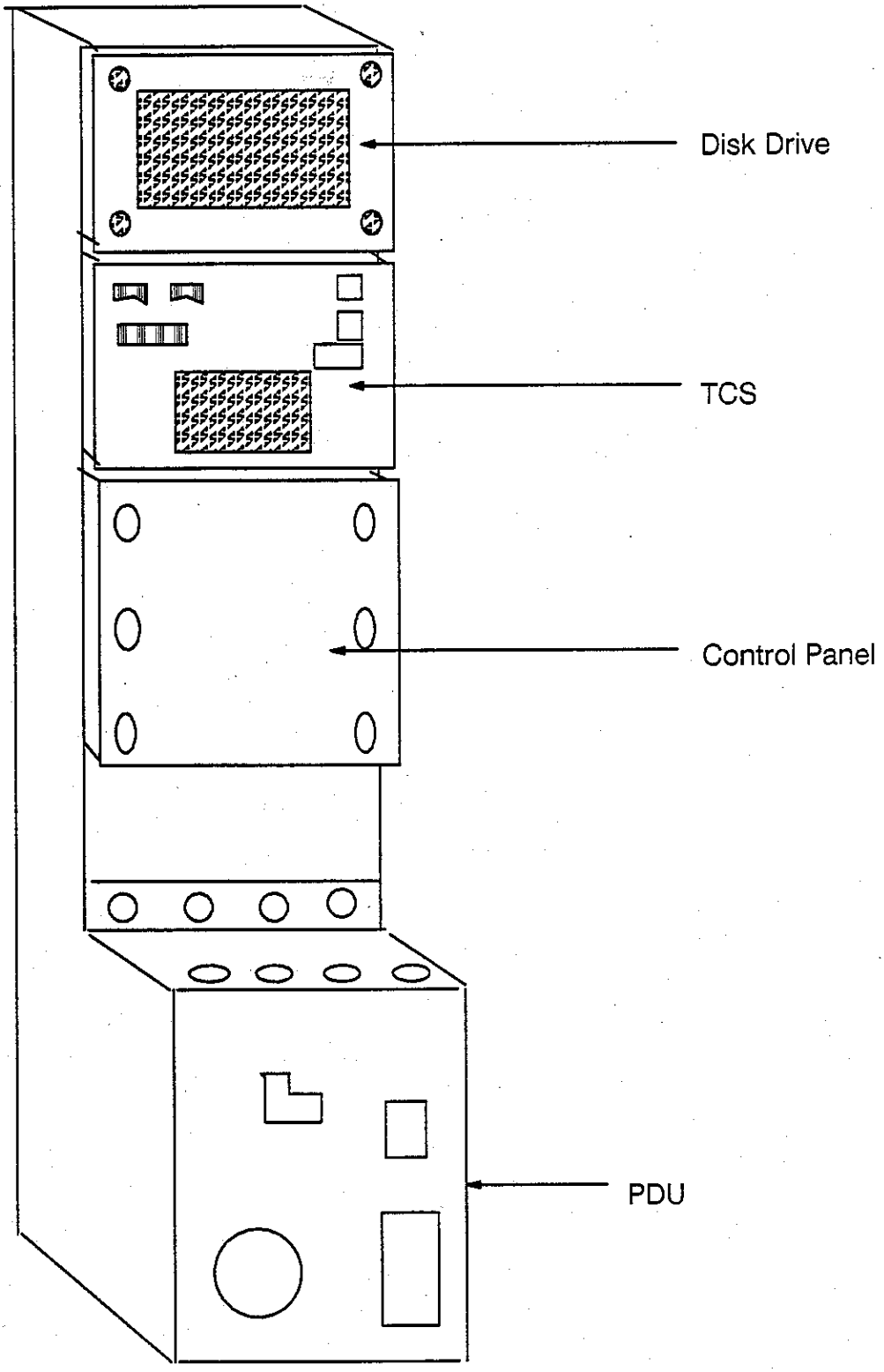


Figure 3–2 Utility Cabinet: Back



3.1 Removing the Utility Cabinet Panels

Before you can begin working on the Utility cabinet FRUs, you need to remove the cabinet's outer panels ("skins") as follows (see Figure 3–3):

1. Loosen the captive thumb screws at the bottom of the control panel.
2. Push gently on the panel to release the spring clip.
3. Lift off the entire piece.

To access the Bulk power supply:

4. Unscrew the two Phillips screws on the bottom left and right of the bulk power supply panel.
5. Lift the panel off.

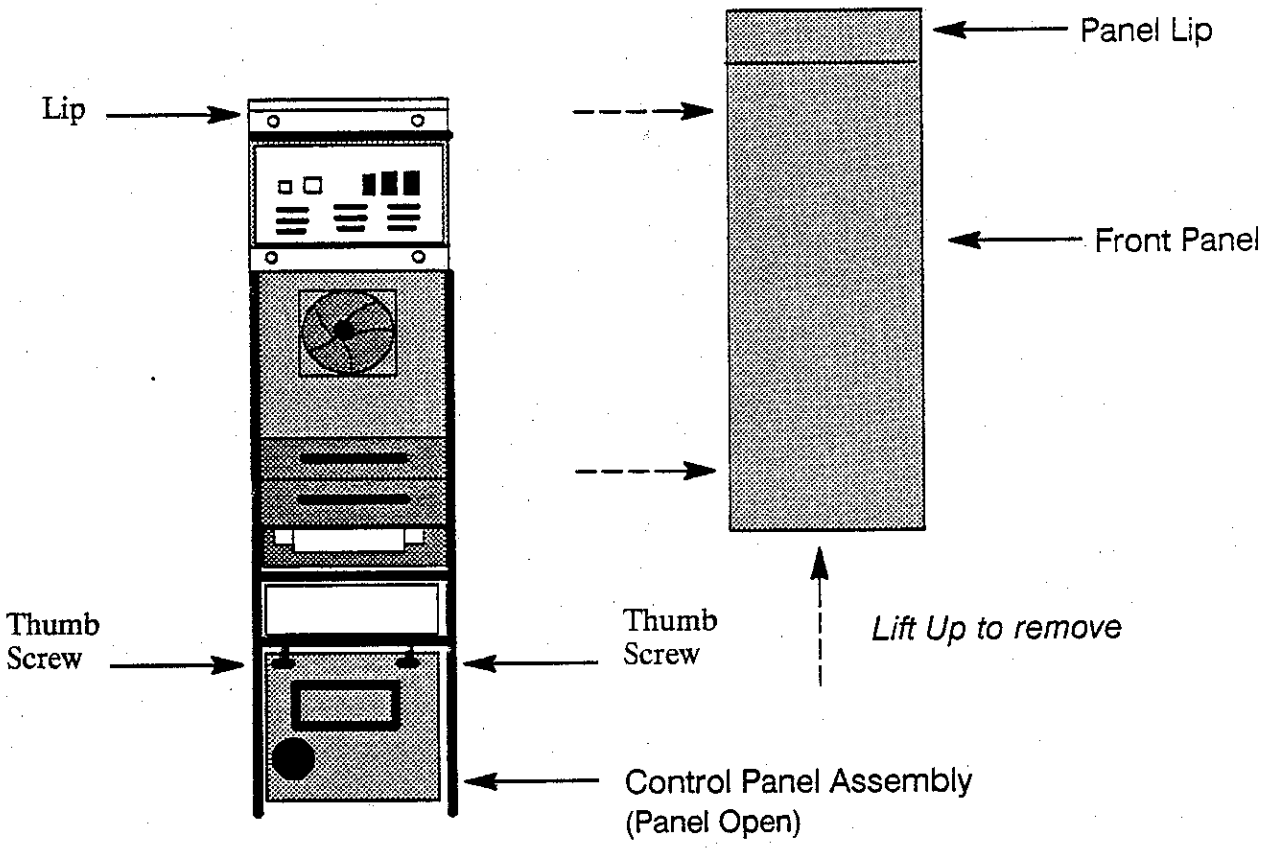
NOTE

If you wish, you can easily access the bulk power supply filter at this time. Unscrew the two phillips screws under the panel and slide the filter out for cleaning or changing.

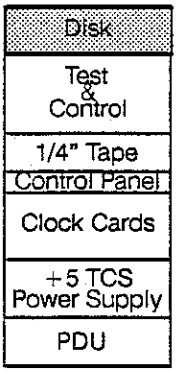
To access the components in the back of the cabinet you need to first remove the back panel as follows:

1. Unscrew the bottom two thumb screws.
2. Lift the entire piece up until the top two pins are free of their holes, then lift the panel off and put it aside.

Figure 3–3 Removing the Utility Cabinet Front Panel



3.2 Eight–Inch Disk Drive



Front View

An eight–inch disk drive is located at the top front of the Utility cabinet. This drive is accessed from the front of the cabinet.

You need the following tools:

- #1 or #2 Phillips screwdriver
- 9/64" Allen wrench
- Large slotted screwdriver

3.2.1 Removing the Disk Drive

To remove the disk drive (see Figure 3–4):

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

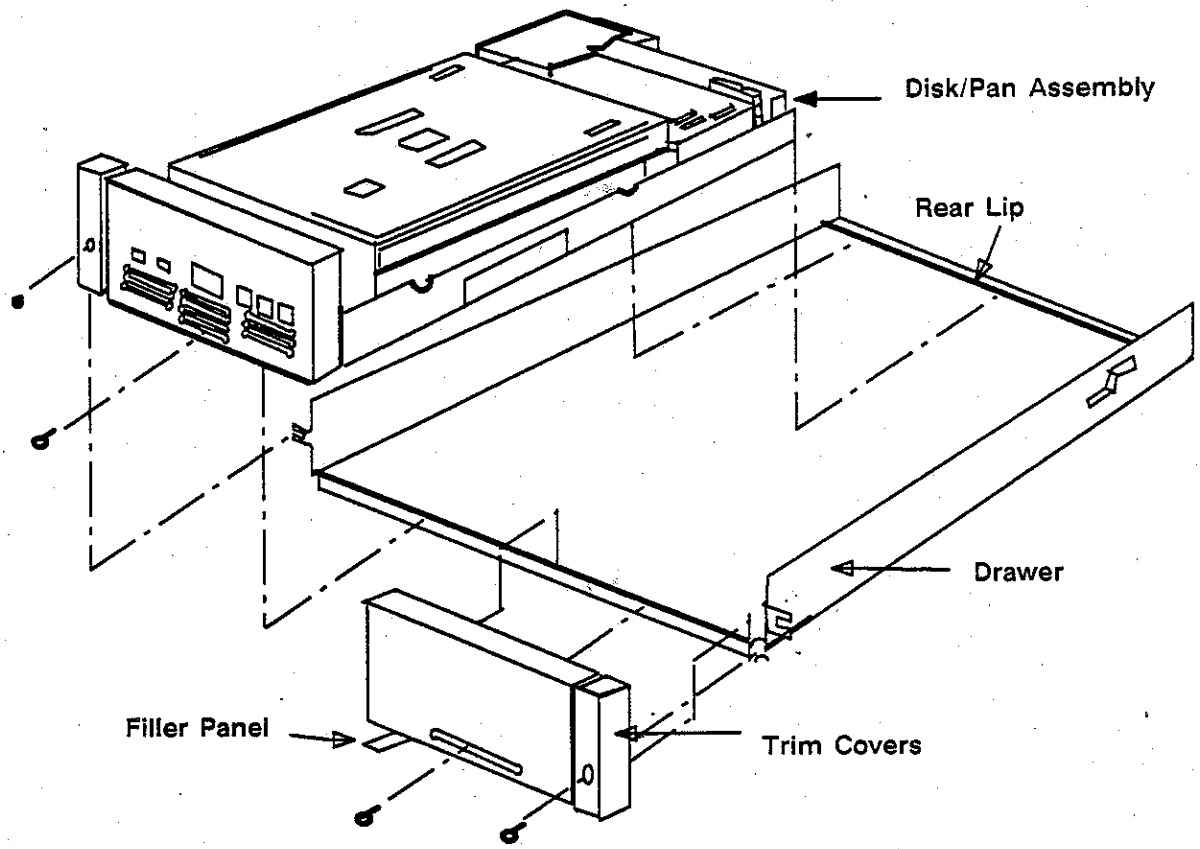
1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets by flipping all the circuit breakers down.
3. At the back of the Utility cabinet, remove the four screws from the screen panel.
4. Lift the panel off.
5. Disconnect the SMD A cable (top) and the SMD B cable (bottom).
6. Disconnect the power cord.
7. Return to the front and, using an Allen wrench, remove the Allen screw from the middle of the disk mounting bracket.

NOTE

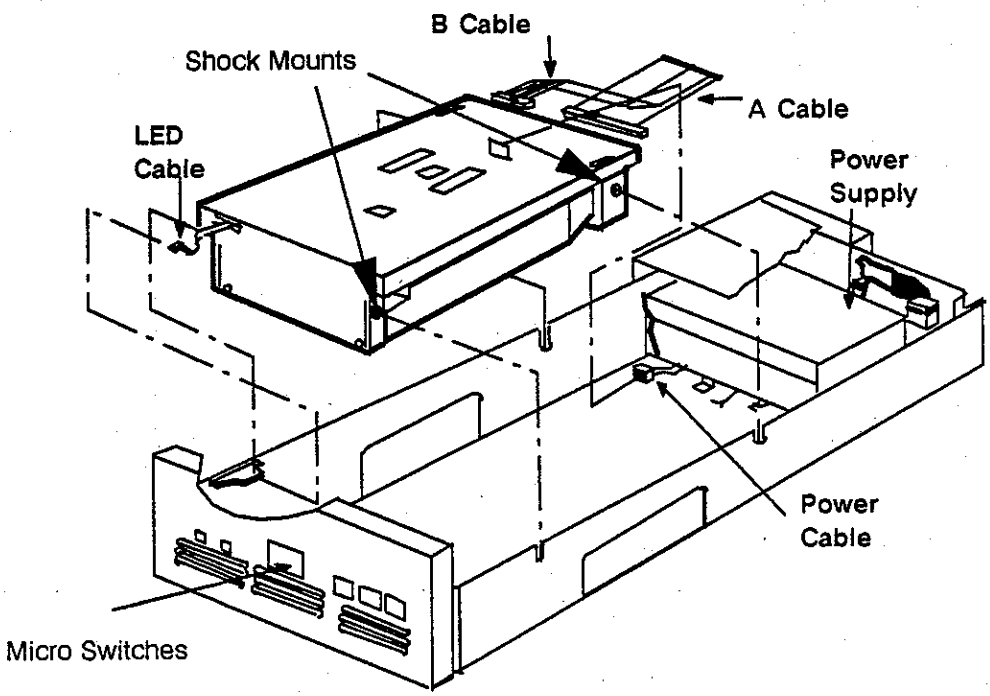
The bracket stays behind.

8. Loosen the remaining two slotted screws from the bracket.
9. Slide the disk drive all the way towards you and lift it out.

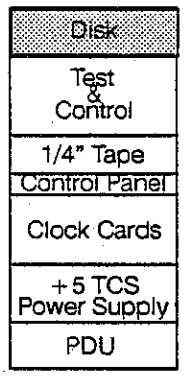
Figure 3–4 Disk Drive Removal/Replacement



Disk Drive and Pan Assembly



3.2.2 Replacing the Disk Drive

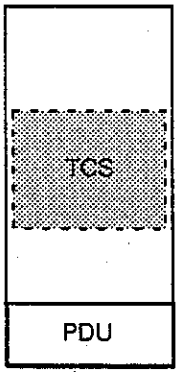


Front View

To replace the disk drive:

1. Check that the key in the control panel is turned all the way to the left and that the circuit breakers on the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets are down (off).
2. At the front of the Utility cabinet, slide the disk drive in.
3. At the back of the Utility cabinet, connect the data and power cables.
4. Mount the screen panel and secure the four screws.
5. Return to the front of the cabinet.
6. Replace the hex nut in the middle of the disk mounting bracket.
7. Replace the remaining two slotted screws in the mounting bracket.
8. Push the circuit breakers up (on).

3.3 Test and Control System (TCS)



Back View

The TCS is a separate subsystem consisting of its own power supply, processor, and software. The TCS is accessed from the back top bay of the Utility cabinet. The TCS controls, monitors, and tests the hardware components of the TC2000 system.

The entire TCS is one FRU. See Figure 3–5 for a top view of the TCS and Figure 3–6 for processor–TCS connections.

Figure 3–5 TCS (Top View)

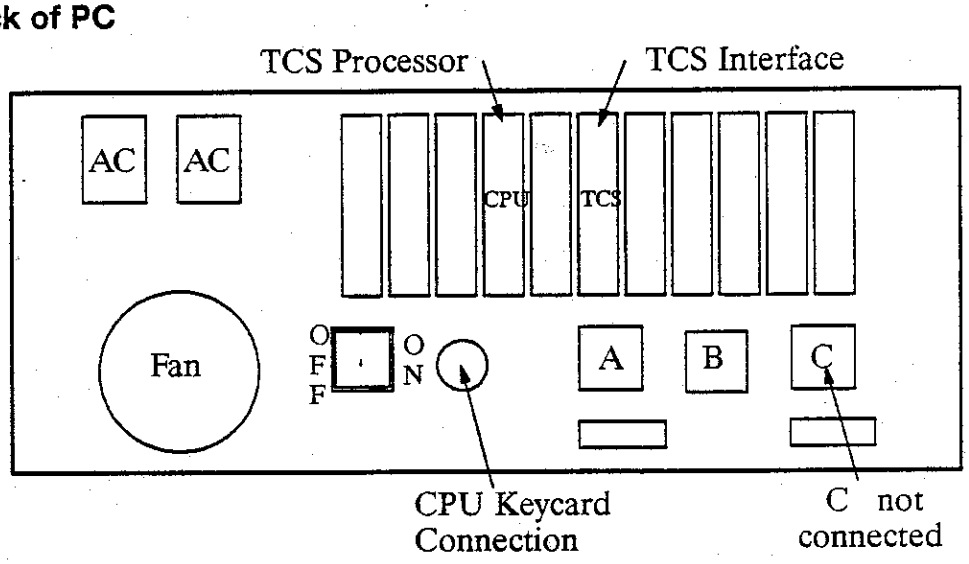
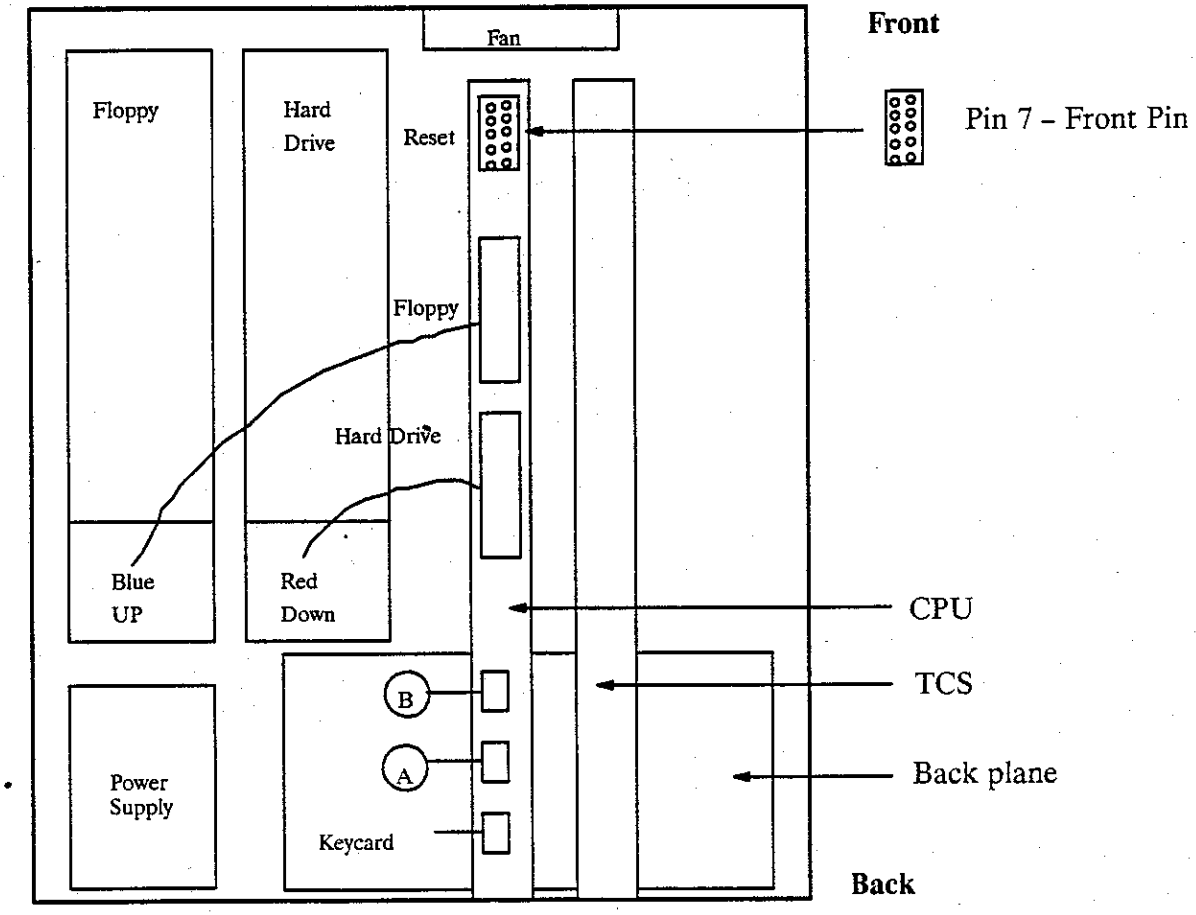


Figure 3–6 TCS Processor – Data Cables



3.4 PC Chassis

You need the following tools:

- Large slotted screwdriver
- # 2 Phillips screwdriver

3.4.1 Removing the PC Chassis

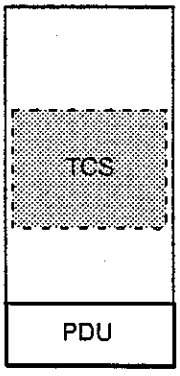
To remove the chassis (see Figure 3–7):

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets by flipping all the circuit breakers down.
3. At the front of the Utility cabinet, loosen, but do not remove, the two screws at the bottom of the TCS chassis.
4. At the back of the Utility cabinet, remove the six screws holding the chassis' back panel in place.
5. Take the panel off and disconnect the power cable.
6. Disconnect the upper left (clock) cable and the system console cable.
7. Slide the chassis out.

3.4.2 Replacing the PC Chassis

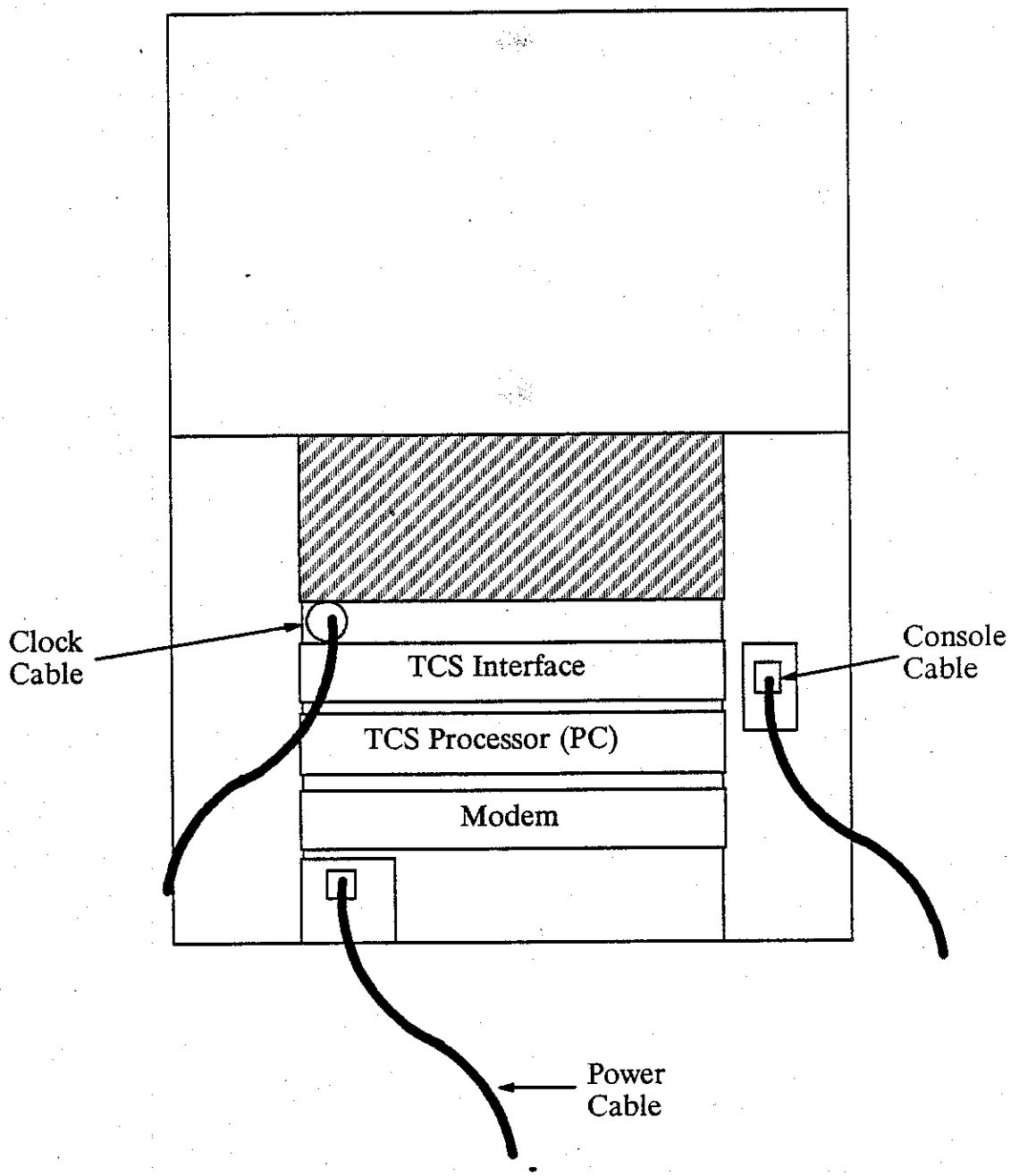


Back View

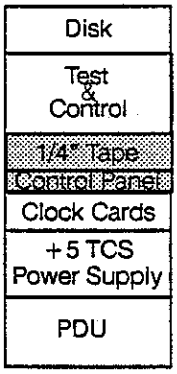
To replace a chassis:

1. Check that the key in the control panel is turned all the way to the left and that the circuit breakers on the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets are down (off).
2. At the back of the Utility cabinet, slide the chassis into the rack.
3. Connect the system consol, clock, and power cables.
4. Put the back panel on and replace the six screws that hold it in place.
5. Go to the front of the cabinet and tighten the two screws at the bottom of the chassis.

Figure 3–7 PC Chassis (Back View)



3.5 1/4–Inch Tape/Control Panel Assembly



Front View

The 1/4–inch tape and control panel assembly is located at the front of the Utility cabinet just under the TCS.

You need the following tools:

- Large slotted screwdriver
- Phillips screwdriver

3.5.1 Removing the 1/4–Inch Tape/Control Panel Assembly

To remove the assembly:

1. Remove any media from the tape drive.

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

2. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
3. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets by flipping all circuit breakers down.
4. Remove the four corner screws, being careful to hold onto the front unit.
5. Lift out the assembly far enough to reach the connectors.
6. Disconnect the power cable on the righthand side by pushing under the white plug with your thumb and pulling out.
7. Disconnect the data cable on the righthand side.
8. Disconnect the other power and data cables (to power supply).
9. Go to the back of the Utility cabinet. The back of the control panel assembly can be accessed through the third panel down.
10. Remove the six screws—three on each side—holding the back panel.
11. Lift off the panel and put it aside.
12. Remove the access hole plate and put it aside.

13. Remove the next panel down by removing the nine screws holding it, and put that panel aside.

NOTE

Be sure to keep track of all hardware that you remove and where it came from.

14. Remove the PDU partway; that is, far enough to access the control panel cables behind it. See *PDU, Remove* for instructions.
15. Disconnect the cables from J8 at the back of the PDU. (See Figure 3–10.)
16. Reach in behind the PDU to the control panel cables, and cut all the tie wraps holding them.
17. Pull the cables up, threading them through the access hole, and out to the front of the Utility cabinet.
18. At the front of the Utility cabinet, lift out the control panel assembly.

3.5.2 Replacing the 1/4–Inch Tape/Control Panel Assembly

To replace the assembly:

1. Pull the control panel assembly's cables forward.
2. Lift the assembly partway into place, take the power cable and, reaching back, thread it through to the back.
3. Connect the front panel ribbon cables to the assembly.
4. Connect the 1/4–inch tape drive data cable.
5. Connect the front panel plastic connector.
6. Make sure that the power connector is plugged in.
7. Slide the assembly into place taking care not to pinch any of the cables.
8. Lift the assembly to align its front panel with the screwholes on the rack.
9. Holding the panel in place, replace the four screws.
10. At the back of the utility cabinet, thread the power cable through.
11. Replace the access hole plate.
12. Thread the power cable down and plug it into J8 at the back of the PDU.
13. Replace the PDU. See *PDU, Replace* for instructions.
14. Replace the panel above the PDU.
15. At the front of the Utility cabinet, replace any media in the tape drive.
16. Push all circuit breakers up (on).

3.6 Clock Card

There can be one or two clock cards per system. These cards are located at the front of the Utility cabinet just under the 1/4 inch tape drive/control panel.

You need the following tools:

- 1/8–inch slotted screwdriver
- #1 Phillips screwdriver

3.6.1 Removing a Clock Card

To remove a clock card (see Figure 3–8):

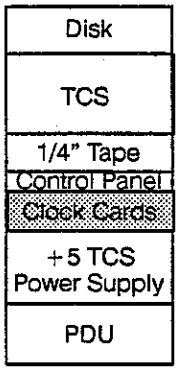
CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion and Utility cabinets by flipping both circuit breakers down.

CAUTION

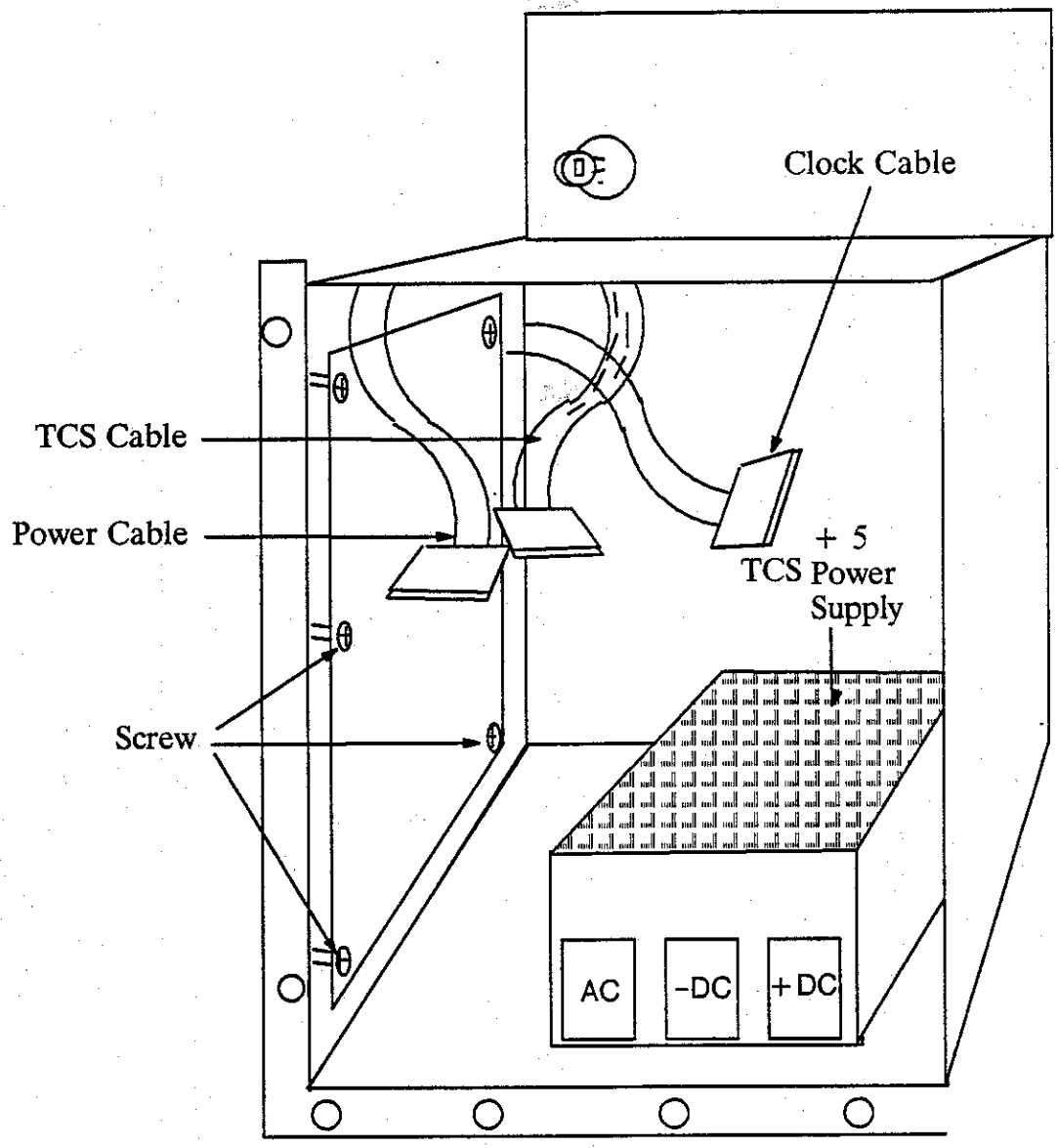
Put a ground strap on your wrist and plug the end into the ground socket at the bottom right of the Processor section in the Expansion cabinet. This prevents static electricity from building up and discharging across a card while you are working. (Even a small static discharge to the card can destroy components, or weaken components so that they work briefly and then fail.)



Front View

3. At the front of the Utility cabinet, remove the panel on the clock card section.
4. Disconnect the power cable on the top front (first of two).
5. Disconnect the TCS cable (top middle).
6. Disconnect the clock cable (bottom back). **This cable is keyed.**
7. Disconnect any switch cables.
8. Remove the five screws holding the card.
9. Pull the clock card out.
10. Place the card in its protective packaging.

Figure 3–8 Removing/Replacing a Clock Card



3.6.2 Replacing a Clock Card

To replace a clock card:

1. Check that the key in the control panel is turned all the way to the left and that all circuit breakers on the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets are down (off).

CAUTION

Put a ground strap on your wrist and plug the end into the ground socket at the bottom right of the Processor section in the Expansion cabinet. This prevents static electricity from building up and discharging across a card while you are working. (Even a small static discharge to the card can destroy components, or weaken components so that they work briefly and then fail.)

2. Remove the card from its packaging.
3. Configure the jumpers/switches on the new card to match those on the old card. (Refer to Appendix A for more information on jumper/switch settings.)
4. Position the clock card.
5. Replace the five screws.
6. Connect the clock cable (bottom back).
7. Connect the TCS cable (top middle).
8. Connect the power cable (top front).
9. Replace the panel.
10. Push the circuit breakers up (on).

3.7 Clock Card Fan

There is one clock card fan. It is located in the same section as the clock card(s) on the inside of the front panel door.

You need the following tools:

- 1/8–inch slotted screwdriver
- #1 Phillips screwdriver
- Allen wrench

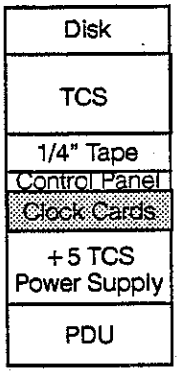
3.7.1 Removing a Clock Card Fan

To remove a clock card fan:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. On the front panel of the clock card section, loosen the two captive screws on the top and bottom corners of the panel.
3. Pull the panel out and to your right—it opens like a door.
4. The fan is mounted on the inside of the panel door. Unplug any cables connected to the fan so that you can lift it out.
5. Remove the four hex nuts that hold the mounting and lift the mounting out.
6. Remove the four screws holding the fan to the mounting and lift it off.



Front View

3.7.2 Replacing a Clock Card Fan

To replace a clock card fan:

1. Check that the key in the control panel is turned all the way to the left.
2. Place the new fan on the mounting with the four screws.
3. Position the mounted fan on the inside of the panel door and secure the four hex nuts.
4. Reconnect the cable(s).
5. Close the panel door and secure the two captive screws.

3.8 +5 Volt TCS Power Supply

The +5 volt TCS Power Supply is located at the bottom of the Utility cabinet and is accessed from the front (see Figure 3–9).

You need the following tool:

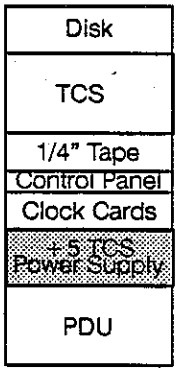
- 1/4–inch slotted screwdriver

3.8.1 Removing a TCS Power Supply

To remove the TCS power supply:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).



Front View

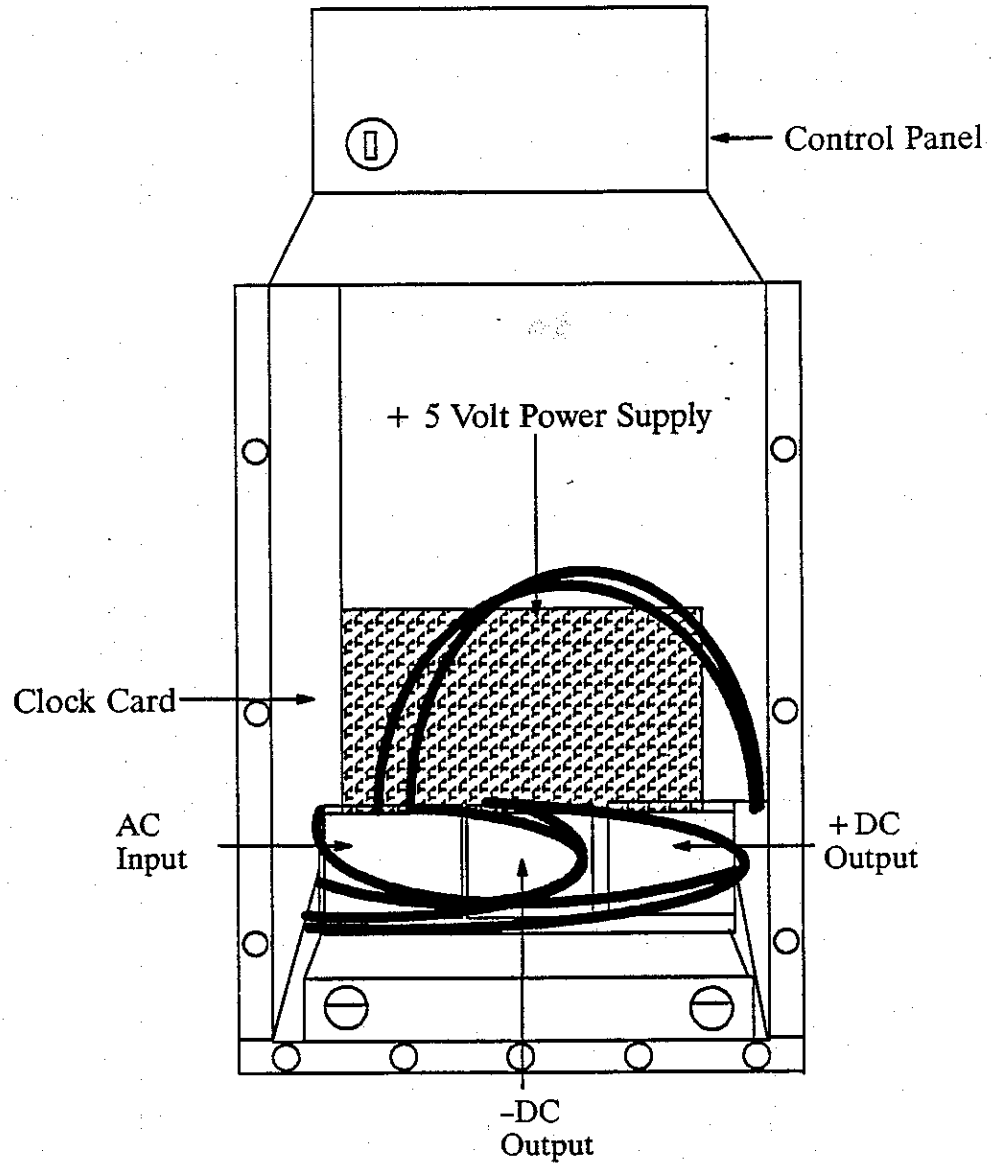
1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. At the back, shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets by flipping both circuit breakers down.
3. Remove the bottommost front panel of the Utility cabinet.
4. Disconnect all three connectors on the power supply: AC input (left), – DC output (middle), and + DC output (right).
5. Loosen the two screws at the front.
6. Slide the power supply out.

3.8.2 Replacing a TCS Power Supply

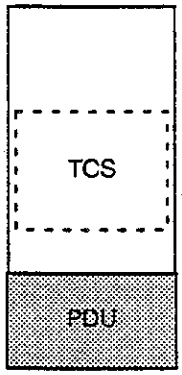
To replace the TCS power supply:

1. Check that the key in the control panel is turned all the way to the left and that all circuit breakers on the PDUs are down (off).
2. Slide the power supply unit partway into the rack.
3. Connect all three connectors on the power supply: AC input (left), – DC output (middle), and + DC output (right).
4. Tighten the two screws at the front.
5. Replace the panel.
6. Push the circuit breakers back up (on).

Figure 3–9 Removing/Replacing the +5 TCS Power Supply



3.9 Power Distribution Unit (PDU)



Front View

The PDU is located at the back bottom of the Utility cabinet.

You need the following tool:

- #1 Phillips screwdriver

3.9.1 Removing the PDU

To remove the PDU:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

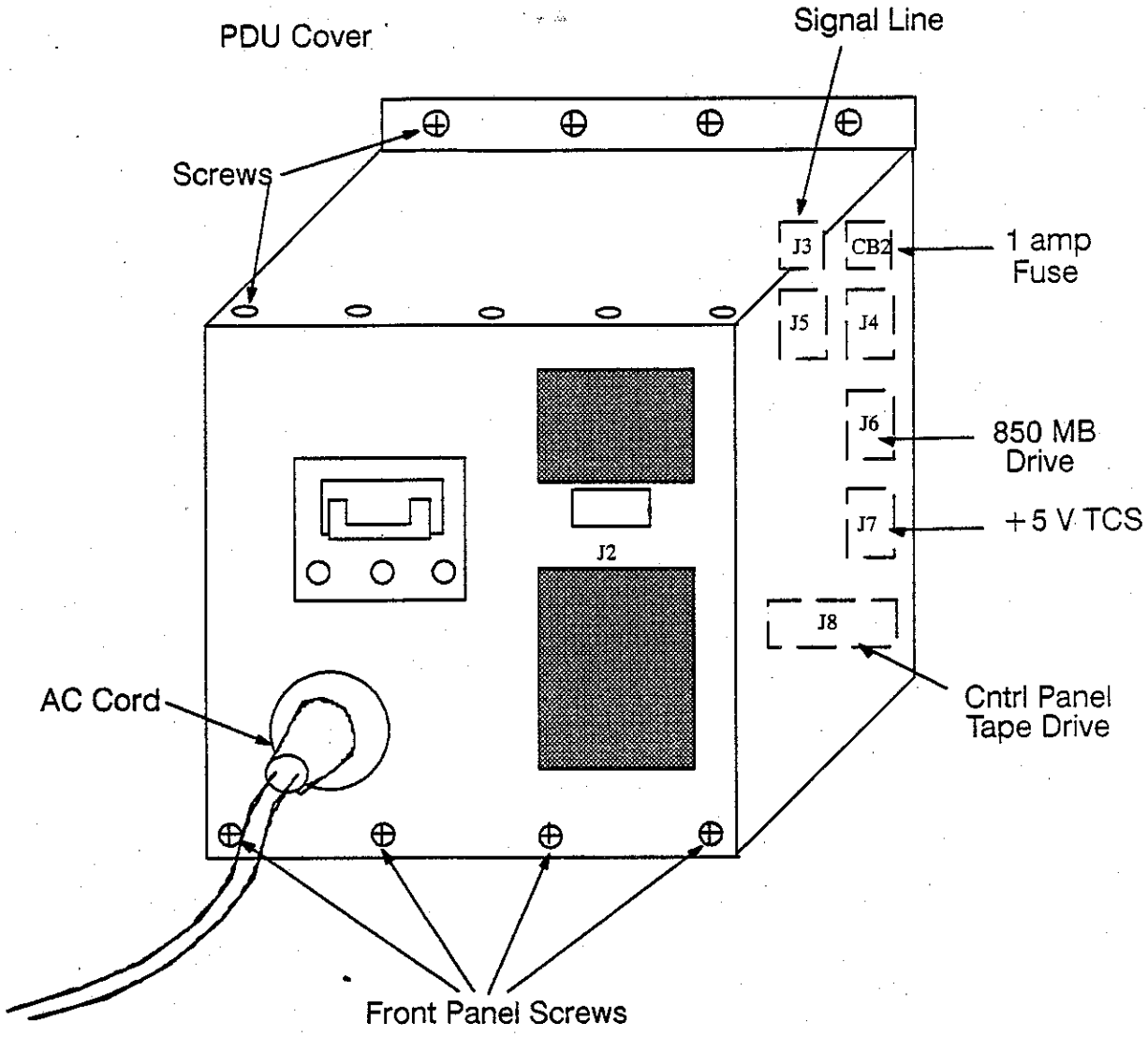
1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion and Utility cabinets by flipping both circuit breakers down.
3. Unplug the AC cord.

WARNING

Be sure to unplug the AC cord before removing the PDU cover. Failing to do so exposes you to live 208V terminals inside the PDU.

4. Unscrew the four bottom screws on the PDU drawer.
5. Unscrew the four screws at the top of the PDU panel.
6. Remove the PDU cover.
7. Unscrew the four screws holding the front panel.
8. Disconnect J8, J7, J6, J5.
9. Slide the PDU out.

Figure 3–10 Removing/Replacing the PDU



3.9.2 Replacing the PDU

To replace the PDU:

1. Check that the key in the control panel is turned all the way to the left and that all circuit breakers on the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets are down (off).

WARNING

Be sure to unplug the AC cord before removing the PDU cover. Failing to do so exposes you to live 208V terminals inside the PDU.

2. Slide the PDU into the rack.
3. Connect J8, J7, J6, J5. (See Figure 3-9.)
4. Screw in the four front panel screws.
5. Screw in the four screws at the top of the PDU panel .
6. Replace the PDU cover.
7. Screw in the four bottom screws on the PDU drawer.
8. Plug in the AC cord.
9. Push the circuit breakers back up (on).

4

Peripheral Cabinet

This chapter contains the procedures for removing and replacing all replaceable components in the Peripheral cabinet, as follows (see Figure 4–1 and Figure 4–2 for diagrams):

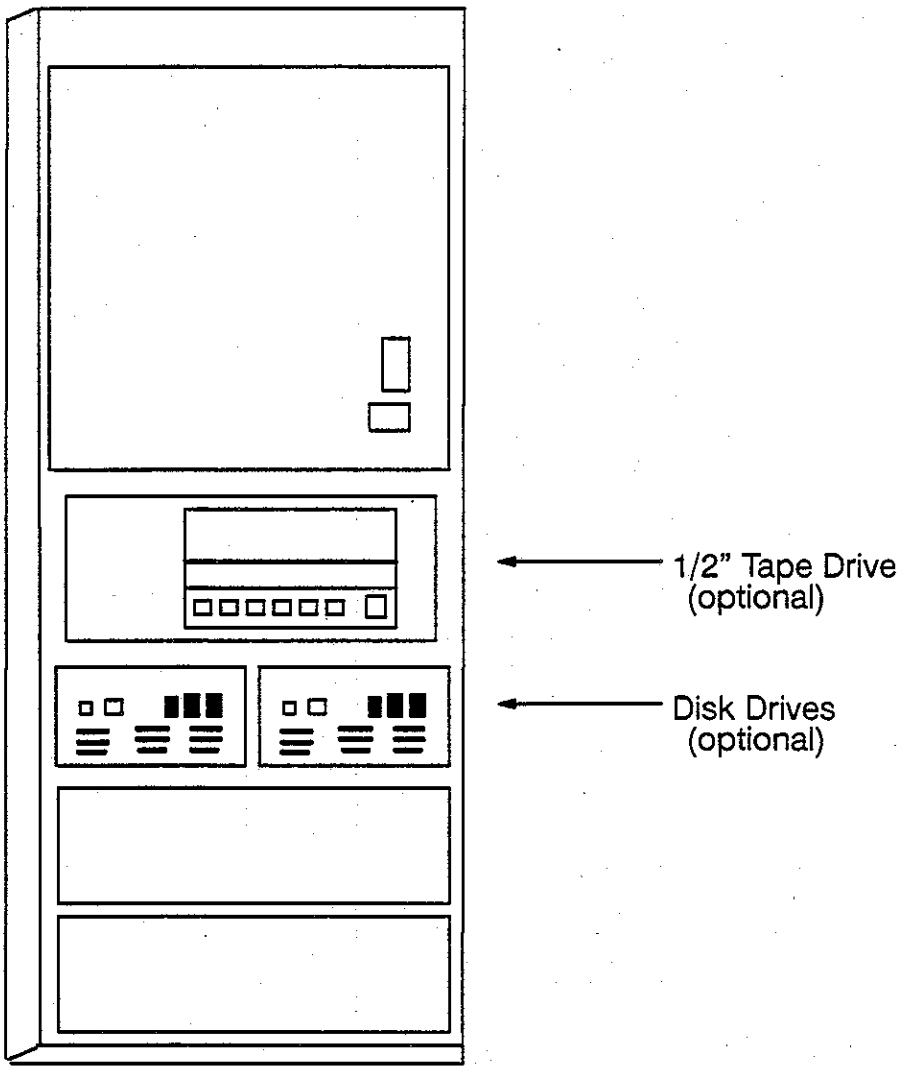
- 9U VME Card cage
  - 9U VME Chassis (including power supply and fans)
  - Disk Controller
  - Ethernet Controller
  - 32–Port Terminal Controller (Optional)
  - 9U VME Repeater
- Three 8–inch Disk Drives (Optional)
- 1/2–inch Tape Drive (Optional)
- PDU

4.1 Removing the System Panels

Before you can begin working on the Peripheral cabinet FRUs, you need to remove the cabinet's outer panels ("skins") as follows:

1. At the front of the Peripheral cabinet, reach up and pull the panel towards you. It will swing open like a door.
2. To access the front bottom half, push on the bottom panel until it clicks. Now this panel also swings open.

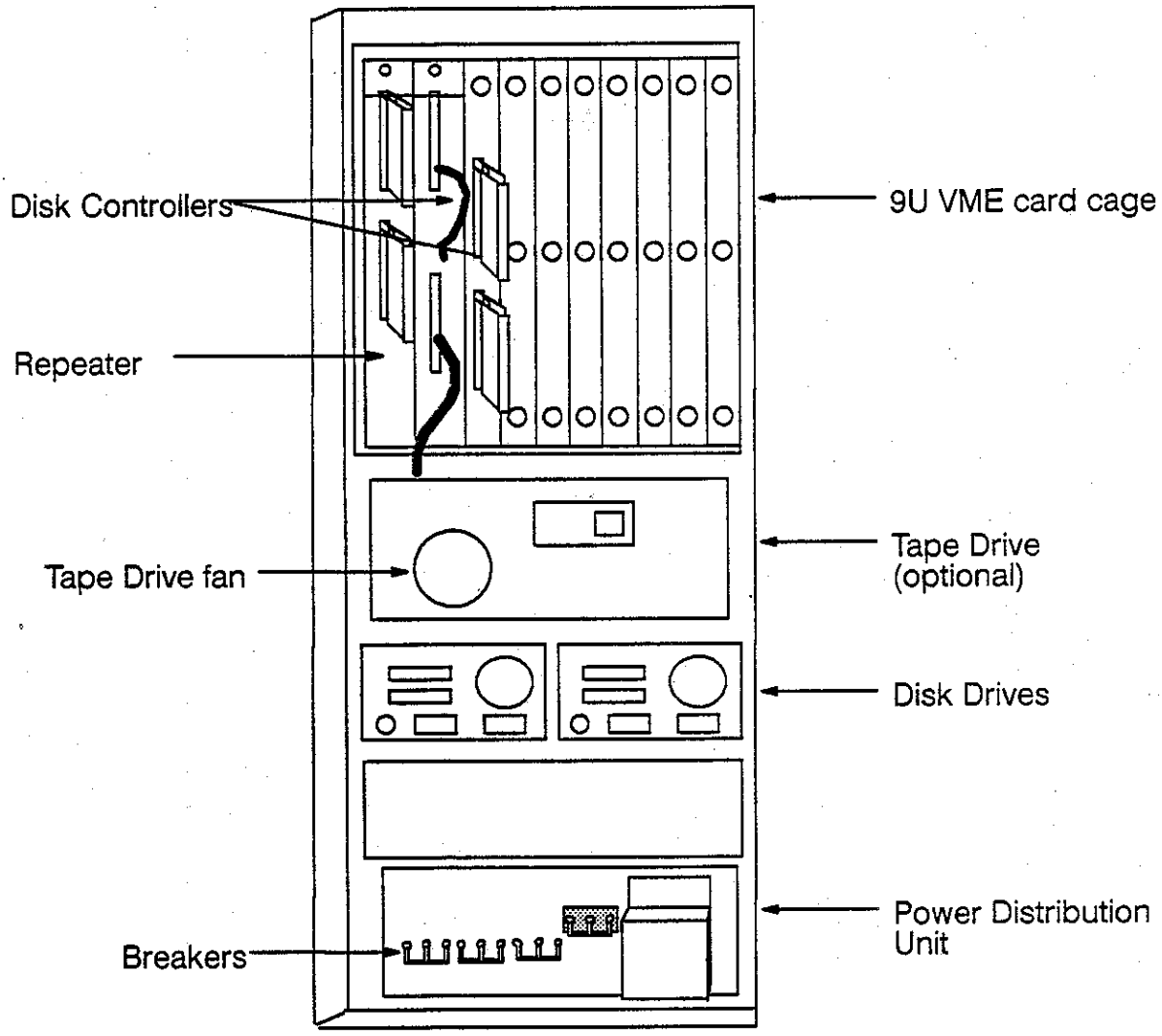
Figure 4–1 Peripheral Cabinet: Front



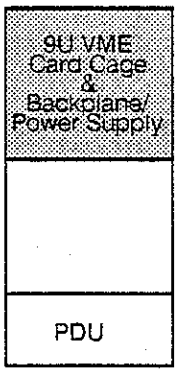
To access the components in the back of the cabinet you need to first remove the back panel as follows (see Figure 4–2):

1. Unscrew the bottom two thumb screws.
2. Lift the entire piece up until the top two pins are free of their holes, then lift the panel off and put it aside.

Figure 4–2 Peripheral Cabinet: Back



4.2 9U VME Card Cage



Back View

Located at the top back of the Peripheral cabinet is the 9U VME card cage. The 9U VME card cage contains the components of the 9U VME subsystem—the controller and repeater cards, the 750W switching power supply, and the fans. The following cards are located in this cage:

- Disk Controller
- Ethernet Controller
- 32–Port Terminal Controller (Optional)
- 9U VME Repeater

You need these tools to work on the 9U VME card cage:

- 3/16 or 1/8–inch slotted screwdriver
- #2 Phillips screwdriver

4.2.1 Removing the 9U VME Card Cage

CAUTION

Lifting the card cage requires two people.

To remove the card cage:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

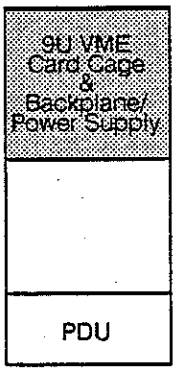
1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinets by flipping all the circuit breakers down (off).
3. Disconnect the twist off plugs from the Expansion and Utility cabinet PDUs and move the cords out of the way.
4. At the back of the Peripheral cabinet, unplug the AC cord from the PDU.
5. At the top back section of the Peripheral cabinet is the 9U VME card cage. Remove all the cards from the card cage (see *9U VME Card, Remove*).

6. At the back of the cabinet, loosen the twelve Phillips screws holding the card cage in place.
7. Lift the card cage out from the front.

4.2.2 Replacing the 9U VME Card Cage

NOTE

Lifting the card cage requires two people.



To replace a card cage:

1. Check that the key in the control panel is turned all the way to the left and that all circuit breakers on all the PDUs are down (off).
2. Check that the AC cords in the back of the PDUs are unplugged.
3. Position the card cage into the top of the rack.
4. At the back of the cabinet, replace the twelve screws.
5. Install the VME cards into the new card cage. (Refer to the section entitled *9U VME Card, Replace* for instructions on replacing a board.)
6. Plug the AC cords back in.
7. Push the circuit breakers up (on).

4.2.3 Removing the 9U VME Card

To remove a 9U VME card:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. Turn the key in the control panel all the way to the left (counterclockwise).

CAUTION

Put a ground strap on your wrist and plug the end into the ground socket at the bottom middle of the Switch card section in the Expansion cabinet. This prevents static electricity from building up and discharging across a card while you are working.

2. Loosen each captive screw at the top and bottom of the card.
3. Pull the two black levers away from the center.

4. Slide the card out partway to access the cables.
5. Disconnect the cables.
6. Slide the card out the rest of the way. If it sticks, move it gently from top to bottom, not side to side, to prevent damage to the card components.
7. Place the card in the protective, static-free package provided.

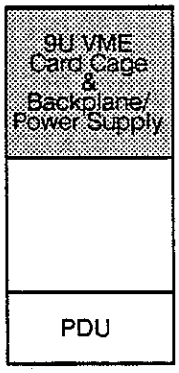
4.2.4 Replacing the 9U VME Card

To replace a 9U VME card:

1. Check that the key in the control panel is turned all the way to the left and that all circuit breakers on all the PDUs are down (off).
2. Check that the AC cords in the back of the PDUs are unplugged.
3. Remove the card from its special packaging.

CAUTION

Put a ground strap on your wrist and plug the end into the ground socket at the bottom middle of the Switch card section in the Expansion cabinet. This prevents static electricity from building up and discharging across a card while you are working. (Even a small static discharge to the board can destroy components, or weaken components so that they work briefly and then fail.)



Back View

4. Configure the jumpers on the new card to match those on the old card. (Refer to Appendix A to verify the jumper/switch settings.)
5. Make sure the card has the component side to the right.
6. Holding the board straight, line it up in the slots at the top and bottom of the card cage. Hold the ejector levers horizontal so that they do not interfere with the card seating.
7. Reconnect the cables to the card. (See Figure 4–3.)
8. Push the card slowly and firmly until it seats in the midplane.
9. Grasp the black levers at the top and bottom of the card and simultaneously push the top lever down and in and the bottom lever up and in.
10. Push and turn the captive screws then secure each with the screwdriver.

Figure 4–3 9U VME Card Cabling

To be supplied

4.3 Eight-Inch Disk Drives

The three optional SMD 850MB eight-inch disk drives are located at the front of the Peripheral cabinet just under the 9U VME Subsystem.

You need the following tools:

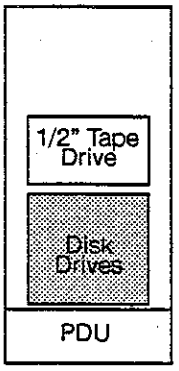
- Medium slotted screwdriver
- Allen wrench

4.3.1 Removing a Disk Drive

To remove a disk drive (see Figure 4–4):

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).



Back View

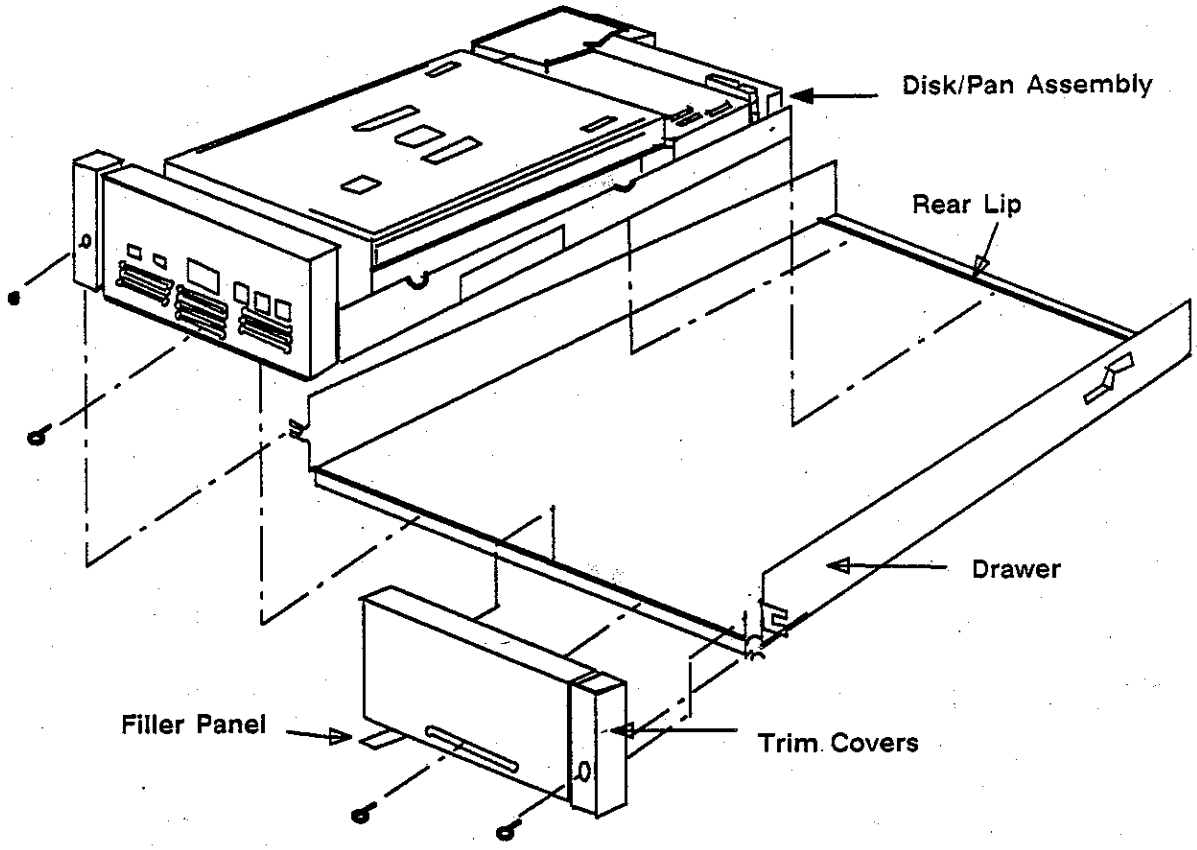
1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinet by flipping the circuits breakers down (off).
3. Unplug the twist off plugs from the Expansion and Utility cabinet PDUs and move the cords out of the way.
4. Go to the disk drive section' s back panel.
5. Remove the panel screws and lift the panel off.
6. Disconnect the control, data, daisy chain, grounding cables, and terminator cables (if present).

NOTE

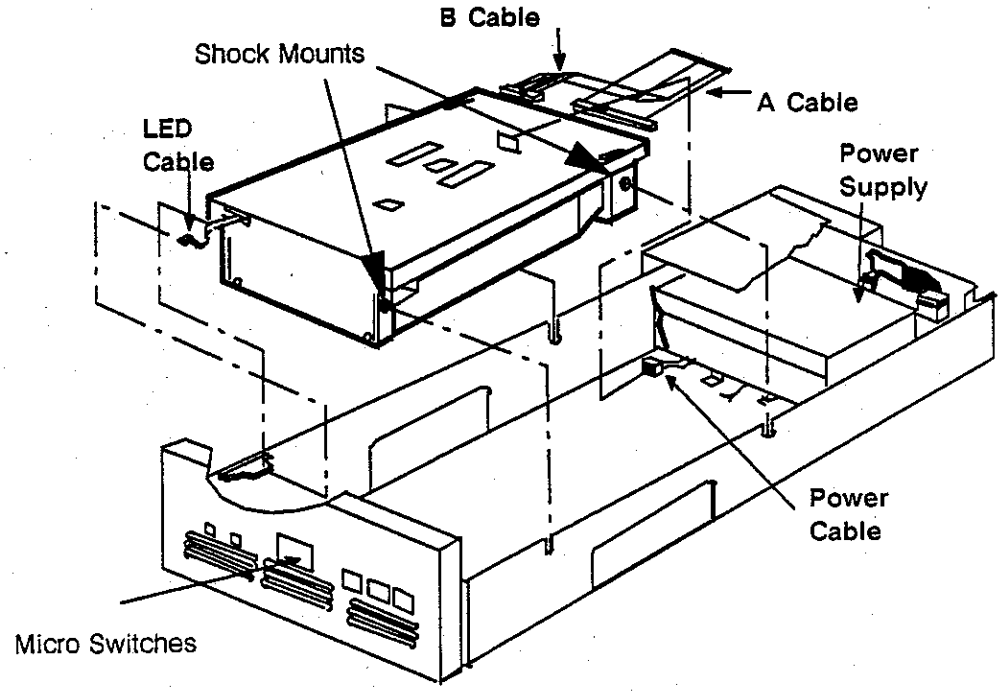
Remember where the cables come from!

7. Return to the front and, using an Allen wrench, remove the allen nut from the middle of the disk mounting bracket.
8. Remove the remaining two slotted screws from the bracket.
9. Slide the disk drive out.
10. Unscrew the front screw and remove the Disk/Pan Assembly.
11. Remove the Head Disk Assembly from the Pan Assembly if necessary for shipping.

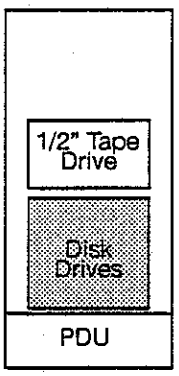
Figure 4–4 Disk Drive Removal/Replacement



Disk Drive and Pan Assembly



4.3.2 Replacing a Disk Drive



Back View

To replace the eight–inch disk drive (see Figure 4–4):

1. Check that the key in the control panel is turned all the way to the left and that all PDU circuit breakers are down (off).
2. Configure the front panel switches on the replacement drive to correspond to the old drive.
3. Gently place the Disk into the Pan.
4. Attach the LED cable, the power connector, and the ground wire.
5. Tighten the ground wire screws.
6. Slide the Disk/Pan Assembly into the drawer by inserting the Pan into the rear lip of the drawer and securing the front screw.
7. Reconnect the control, data, daisy chain, grounding cables, and the terminator (if present).

Intentionally blank.

4.4 1/2 Inch Tape Drive

This drive is at the bottom front of the Peripheral cabinet just under the three optional eight-inch disk drives.

You need the following tools:

- Medium slotted screwdriver

4.4.1 Removing the 1/2 Inch Tape Drive

To remove the 1/2-inch tape drive:

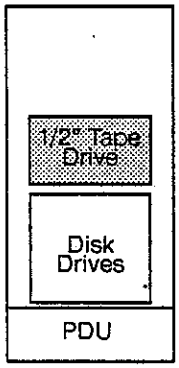
CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).

1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDU at the back bottom of the Peripheral cabinet by flipping the circuit breakers down.
3. At the back, disconnect any cables from the drive.

WARNING

Two people are necessary for this operation; the drive weighs about 110 lbs.



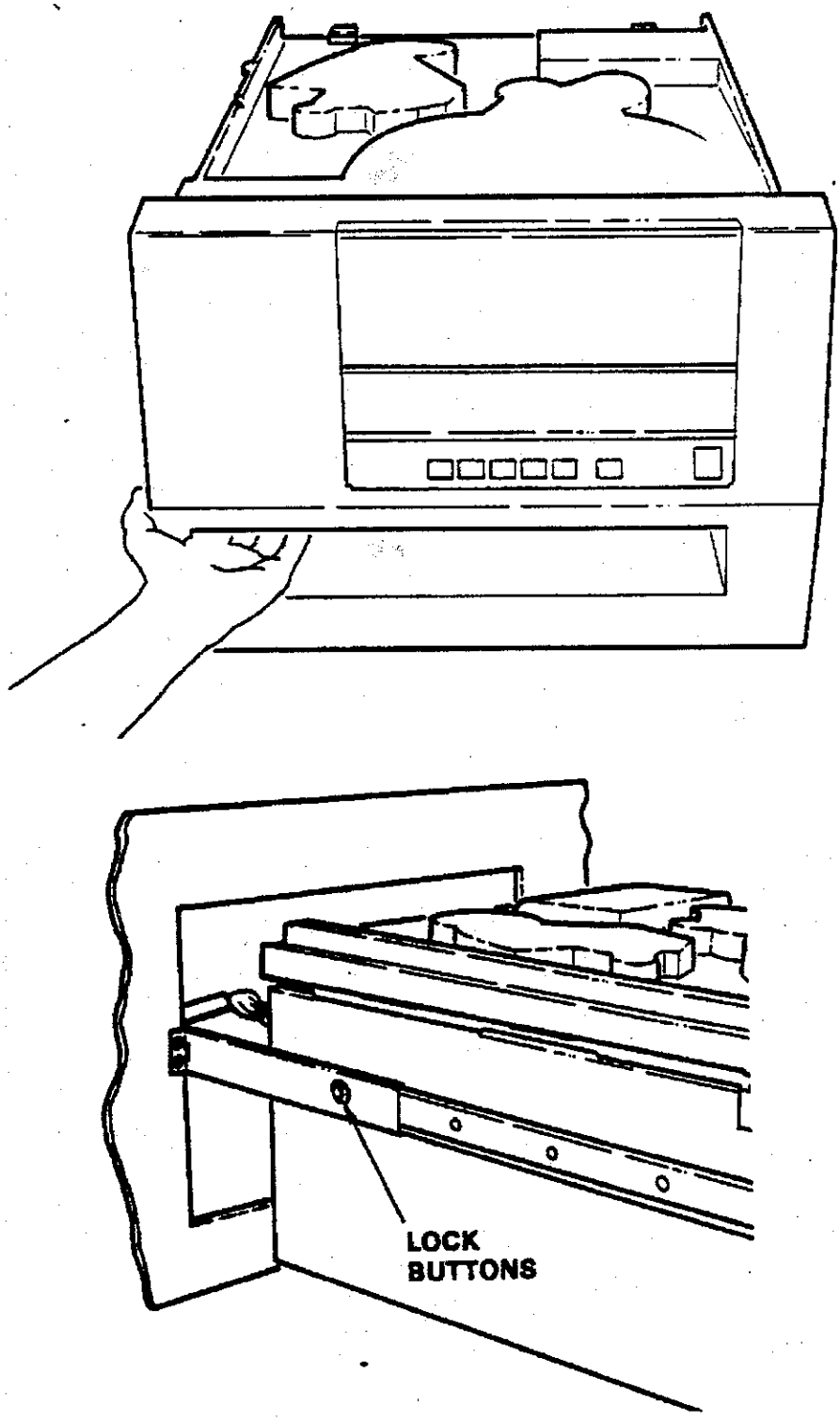
Back View

4. At the front of the Peripheral cabinet, release the rack latch just inside the lower left corner of the drive's control panel.
5. Grasp under the tape drive unit and slowly pull it out (see Figure 4–5).
6. Continue pulling the unit out on its slides until it is clear of the rack.
7. Push down on the locking lever of the slides to release the lock.
8. Pull the drive out another 1/2 inch.
9. Press and hold the round lock button (see Figure 4–5) on each slide and pull the drive completely out of the system rack.
10. Lift up the unit, off the rack sliders and set it on a workspace.

NOTE

As a precaution, always lift the drive from the bottom. If any of the top screws have been left out, lifting it from the top could cause it to open.

Figure 4–5 Removing/Replacing the 1/2-inch Tape Drive



11. Remove the remaining slide pieces from the drive by pressing inward on the leaf spring and moving the slide so that the hole towards the back is directly over the rear screw on the stationary part of the slide (see Figure 4–6).
12. Remove the rear screw, then move the slide hole as necessary to access the other two screws.
13. The tape unit, including slides and mounting hardware, is now ready to be packed and returned to BBN.

NOTE

Be sure to place the styrofoam "donut" inside the drive to prevent the tachometer arm from banging on the takeup hub during shipping.

For complete information on packing the 1/2-inch Tape Drive, refer to the repacking instructions contained in Chapter 1 of the *M990 GCR CacheTape Unit Technical Manual*.

4.4.2 Replacing the 1/2 Inch Tape Drive

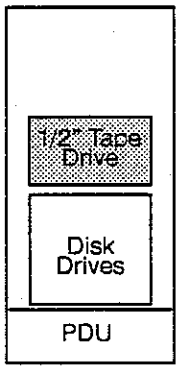
To replace the 1/2-inch tape drive, do the following (refer to Figure 4–6):

1. Check that the key in the control panel is turned all the way to the left and that the peripheral PDU circuit breakers are down (off).

WARNING

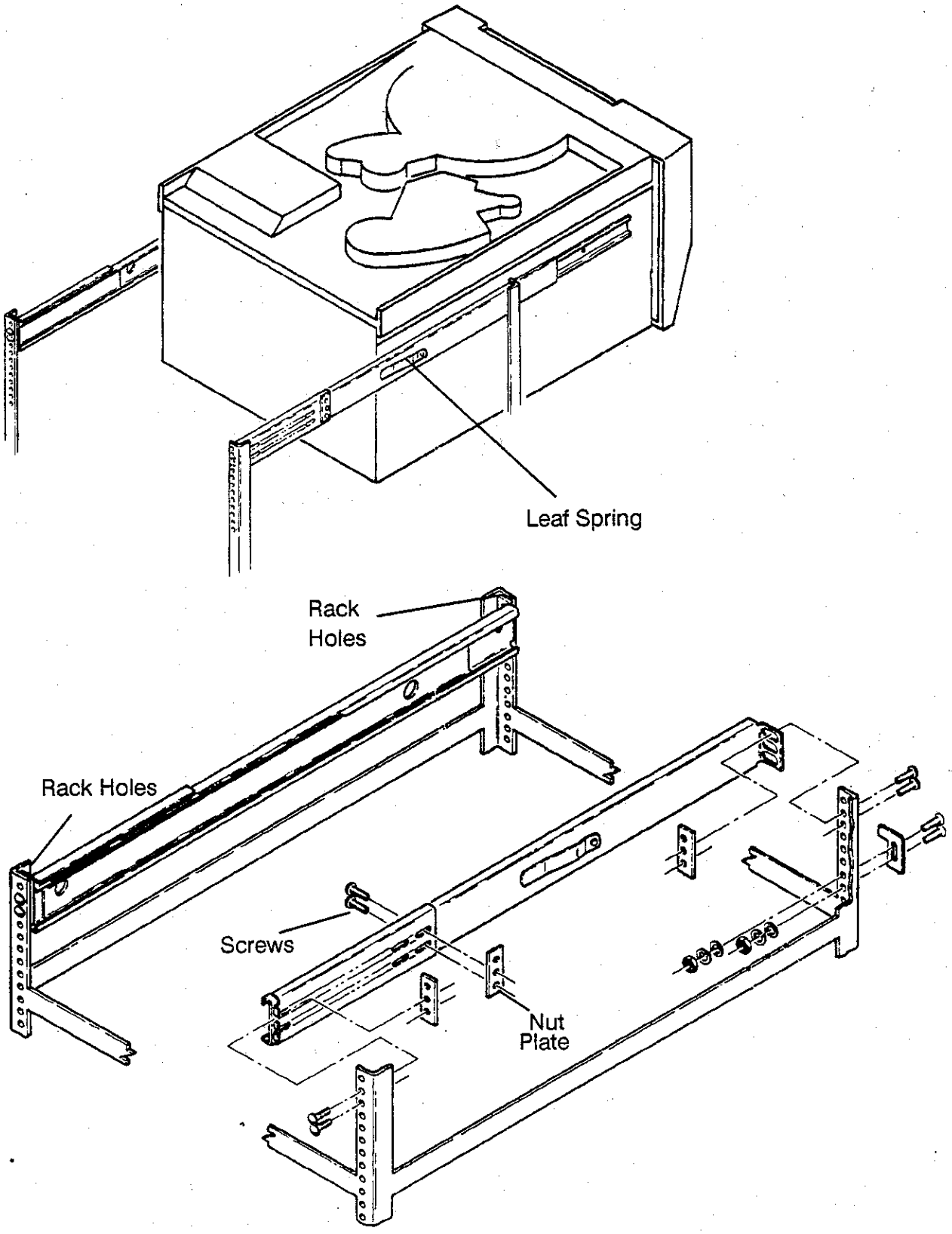
Two people are necessary for this operation; the drive weighs about 110 lbs.

2. Line up the disk drive slides with the rack slides.
3. Carefully slide the unit into the rack until it locks.
4. Reconnect the cables to the tape drive.



Back View

Figure 4–6 1/2-inch Tape Drive Slide Assembly



4.5 Peripheral PDU

The Power Distribution Unit (PDU) is located at the bottom back of the Peripheral cabinet.

You need the following tools:

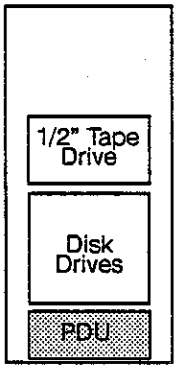
- #1 Phillips screwdriver

4.5.1 Removing the Peripheral PDU

To remove the PDU, do the following:

CAUTION

Before removing power be sure to shutdown the operating system (Section 7.3).



Back View

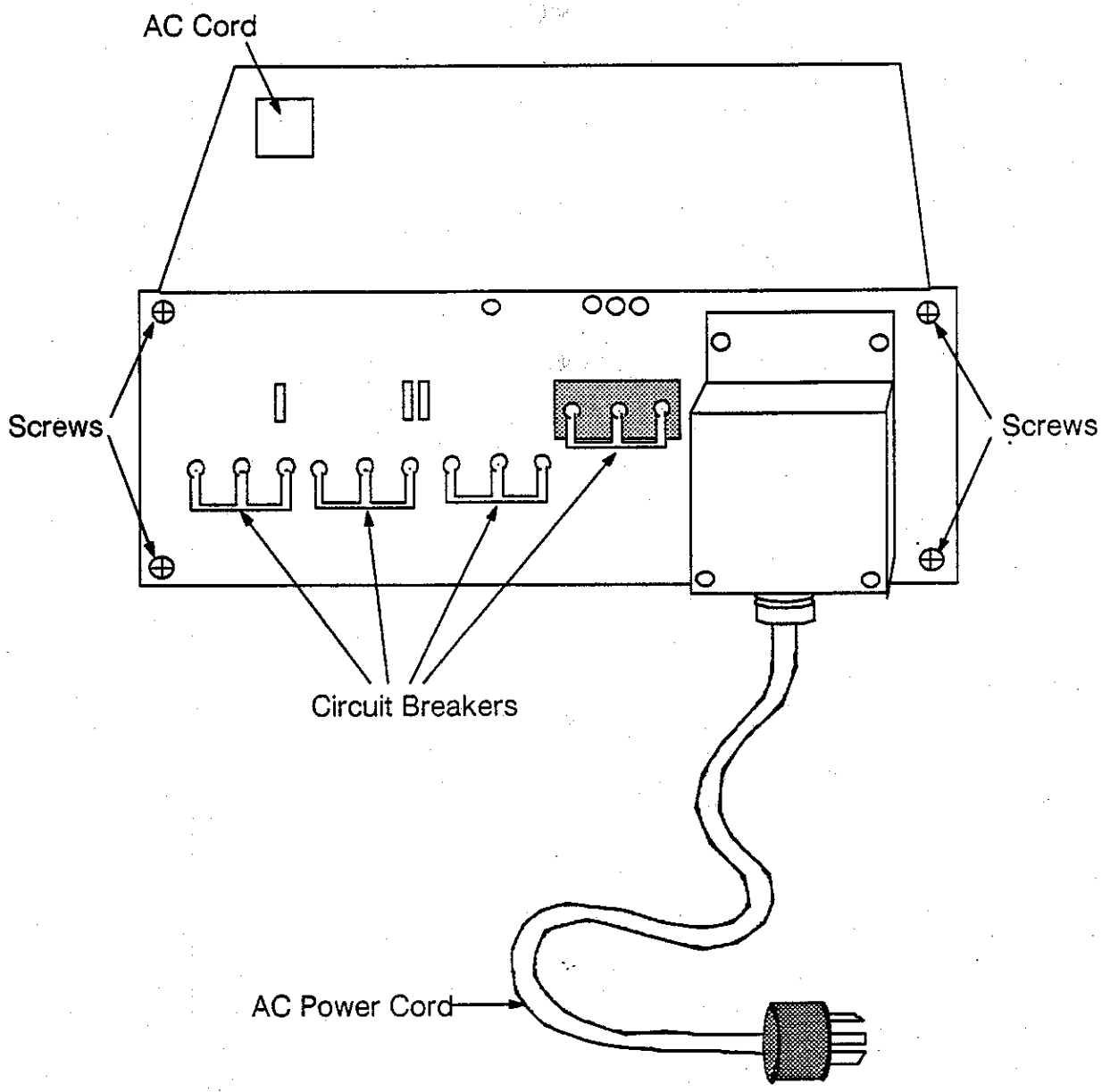
1. At the front of the Utility cabinet, turn the key in the control panel all the way to the left (counterclockwise).
2. Shut off the PDUs at the back bottom of the Expansion, Utility, and Peripheral cabinet by flipping the circuit breakers down (off).
3. Unplug the twist off plugs from the Expansion and Utility cabinet PDUs and move the cords out of the way.
4. Disconnect all of the AC power cables at the front of the PDU.
5. Loosen and remove the four screws holding the unit in place.
6. Slide the PDU out.

4.5.2 Replacing the Peripheral PDU

To replace the PDU, do the following:

1. Check that the key in the control panel is turned all the way to the left and that all PDU circuit breakers are down (off).
2. Slide the PDU into the bottom section at the back of the cabinet.
3. Connect the AC cords at the back of the unit.
4. Connect the control cables at the front of the unit.
5. Replace and secure the four screws.

Figure 4–7 Peripheral PDU



5

System Console

The TC2000 system console is a VT320 video terminal. The VT320 is composed of two units, as follows:

- Terminal
- Keyboard

The terminal uses a monochrome screen that can display 24 lines of text in 80 or 132 columns. You can also connect a printer directly to the terminal.

The keyboard has four groups of keys and four indicator lights. The main keypad is similar to a typewriter keyboard. The keyboard cable connects to the right side of the terminal.

You may need to replace the console. Replacement is actually a three-part process:

- Removal
- Replacement
- Changing Defaults

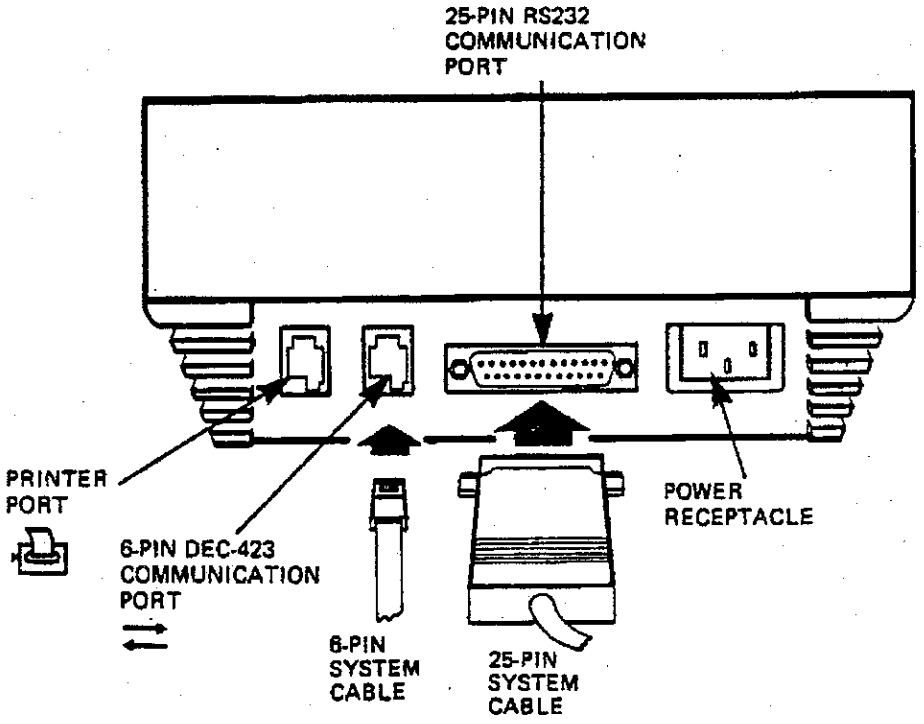
Each of these is discussed in the sections that follow.

5.1 Removing the System Console

To remove the system console (see Figure 5–1):

1. Disconnect the system cable from its communication port on the rear of the terminal.
2. Turn the terminal power switch off (to 0).
3. Unplug the power cord from the wall outlet and from the rear of the terminal.
4. Disconnect the keyboard from the terminal.

Figure 5–1 System Console Connections



5.2 Replacing the System Console

To replace the system console (see Figure 5–1):

1. Connect the keyboard to the terminal by inserting the other end of the keyboard cable into the connector on the right side of the terminal.

NOTE

Use the short groove on the keyboard to route the cable to the left, and the long groove to route the cable to the right (see Figure 5–1).

2. Make sure that the power switch on the lower rear left side of the terminal is off (to 0).
3. Plug the power cord into the terminal and into the wall outlet.
4. Turn on the terminal by turning the power switch on (to 1).
5. Listen for a bell tone from the keyboard. Then wait about 15 seconds for a "VT320 OK" message to appear on the screen.
6. Set the terminal's brightness and contrast controls to maximum.
7. Decrease the brightness until the background (raster) disappears.
8. Decrease the contrast to the desired intensity.
9. Adjust the viewing angle by grasping the terminal and raising the screen to the desired viewing angle.
10. Connect the system cable to the 25–pin RS232 connector.
11. Connect the printer cable (if used) to the printer port.

The console is now connected and ready for operation. However, before you can use the terminal, you must change some of the terminal settings from defaults to coincide with the TC2000 host system.

5.3 Changing Console Settings

Several changes must be made to the terminal's settings before you replace it. You must change the terminal settings from the defaults to coincide with the host system. Press the <Set-Up> key (the third key from the left on the top left of your keyboard). The Set–Up Directory menu appears on the bottom third of your screen.

To select another option, press the arrow keys on the editing keypad. To change a selected menu option, press <Enter> (***do not*** press <Return>).

(Underlined text represents reverse video.)

Set-Up Directory Menu

```
Set-Up Directory                                          VT320  V1.0
 Display   General   Comm    Printer   Keyboard   Tab

 On Line   Clear Display   Clear Comm   Reset Terminal      Recall   Save

 Set-Up English            North American Keyboard          Default  Exit

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```

Select the Default option by pressing the arrow keys until that option appears in reverse video and press <Enter>.

Set-Up Directory Menu

```
Set-Up Directory                                          VT320  V1.0
 Display   General   Comm    Printer   Keyboard   Tab

 On Line   Clear Display   Clear Comm   Reset Terminal      Recall   Save

 Set-Up English            North American Keyboard          Default  Exit

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```

Select the Display option by pressing the arrow keys until that option appears in reverse video and press <Enter>. The Display Set-Up menu appears on the bottom of your screen:

Display Set-Up Menu

```
Display Set-Up                                            VT320  V1.0
 To Next Set-Up     To Directory     80 Columns   Interpret Controls

  No Auto Wrap      Smooth Scroll   Light Text, Dark Screen

  Cursor          Block Cursor Style            No Status Display
```

1. Select the `No Auto Wrap` option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until `Auto Wrap` appears.
2. Select the `Smooth Scroll` option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the `Jump Scroll` option appears.
3. Select the `To Next Set-Up` menu option by pressing the arrow keys until that option appears in reverse video and press <Enter>. The General Set-Up menu appears on the bottom of your screen:

General Set-Up Menu

```
General Set-Up                                          VT320   V1.0
To Next Set-Up     To Directory   VT300 Mode, 7Bit Controls   VT220 ID

 User Defined Keys Unlocked      User Features Unlocked    8 Bit Characters

 Numeric Keypad    Normal Cursor Keys      No New Line

 UPSS DEC Supplemental
```

1. Select the `VT300 Mode, 7Bit Controls` option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the `VT 100 Mode` option appears.
2. Select the `VT320 ID` option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the `VT100 ID` option appears.
3. Select the `8 Bit Characters` option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the `7 Bit Characters` option appears.
4. Select the `To Next Set-Up` menu option by pressing the arrow keys until that option appears in reverse video. Press <Enter>. The Communications Set-Up menu appears on the bottom of your screen:

Communications Set-Up Menu

```
Communications Set-Up                                          VT320   V1.0
To Next Set-Up     To Directory   Transmit = 9600          Receive=Transmit

 XOFF at 64        8 Bits, No Parity    1 Stop Bit          No Local Echo

 RS232, Data Leads Only    Disconnect, 2 s Delay            Limited Transmit

 No Auto Answerback   Answerback=                             Not Concealed
```

1. Select the `Transmit = 9600` option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the `Transmit = 2400` option appears.
2. Select the `XOFF at 64` option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the `No XOFF` option appears.
3. Select the `To Next Set-Up` menu option by pressing the arrow keys until that option appears in reverse video. Press <Enter>. The Printer Set-Up menu appears on the bottom of your screen:

Printer Set-Up Menu

```
Printer Set-Up                                                 VT320   v1.0
 To Next Set-Up       To Directory    Speed=4800    No Printer  to  Host

  Normal Print Mode   XOFF 8 Bits,  No Parity      1 Stop Bit

  Print Full Page     Print National Only           No Terminator
```

NOTE

This manual recommends that you install your printer and leave the printer on to document any problems that may occur during the installation.

1. Select the `Normal Print Mode` option by pressing the arrow keys until that option appears in reverse video. Press <Enter> until the Auto Print option appears.

2. Return to the Set-Up Directory by pressing the arrow keys until the `To Directory` option appears in reverse video. Press <Enter>. The Set-Up menu appears on the bottom of your screen:

Set-Up Directory

```
Set-Up Directory                                          VT320  V1.0
 Display   General   Comm    Printer    Keyboard    Tab

 On Line   Clear Display   Clear Comm    Reset Terminal      Recall    Save

 Set-Up English .           North American Keyboard           Default   Exit

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```

1. To save your changes, select the `Save` option by pressing the arrow keys until the `Save` option appears in reverse video and press <Enter>.
2. After saving your changes, press the <Set-Up> key on the top left of your keyboard to continue with the installation. The text that was on the screen before entering Set-Up format appears on the screen.

The text that was on the screen before entering Set-Up appears on the screen.

If you need further information on the VT320, see *Installing and Using The VT320 Video terminal.*

For information on installing the diagnostics software for the TC2000 system, see *The TC2000 System Installation Guide.*

6

Preventive Maintenance Procedures

Certain procedures should be followed on a regular basis to ensure that your system continues to operate properly. Such procedures include checking that voltages are in tolerance and keeping the tape units and heads clean.

6.1 Checking Voltages

The following power checks should be made every three months to ensure that the system is wired correctly and that it has voltage.

6.1.1 Checking AC Power

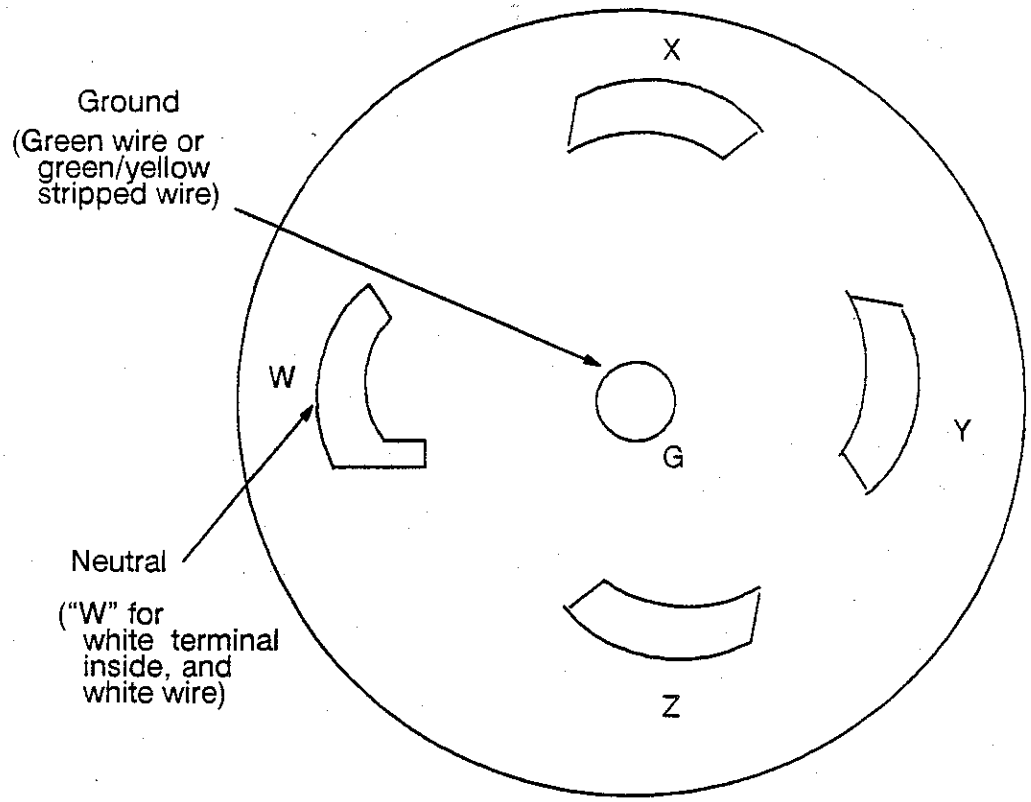
Check for AC power at power cords feeding the bulk power supply in back of the Expansion cabinet.

With the AC power cords unplugged, see Figure 6–1 for this procedure.

1. Set the meter for "Volts AC".
2. Place the black probe in the center of the receptacle (G).
3. With the black probe in the center (G), check all slots on the receptacle; these should all be between 115–120v (117v average):
   - G - X
   - G - Y
   - G - Z

   This should be less than 1v:
   - G - W

Figure 6–1 Checking AC Power



4. After checking the receptacles, reconnect the power cords to the plugs at the back of the system.
5. Push up the circuit breaker switch on each PDU. The three orange lights on each should light indicating that AC power is going to the system.

6.1.2 Checking DC Power

Check for DC power at the back of the Expansion cabinet on the portion of the midplane that can be accessed through the Switch Board section.

1. Set the meter to "Volts DC".
2. With the black probe on the midplane's RETN, and the red probe on the midplane's +48, you should read +48V.
3. With the black probe on the midplane's GND, and the red probe on the midplane's +5v, you should read +5V.

The +48v on the midplane supplies power to the Switch Boards and Processor Boards.

The +5v on the midplane supplies voltage to the TCS.

6.1.3 Checking Power to the TCS

Check the TCS for power beside the switching power supply unit in the PC chassis in the Utility cabinet. In order to do this, you first need to remove the PC chassis from the system and open the chassis to access the power syupply unit. (Refer to *Chapter 3, PC Chassis, Remove* for instructions.)

1. The TCS Interface Board should have a -12 and +5 voltage.
2. The TCS Processor Board has +5V only.

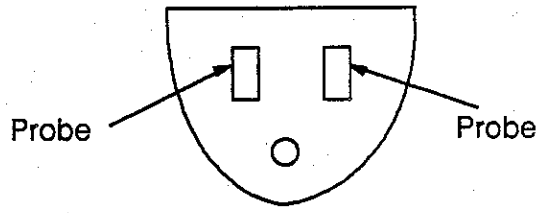
If there is no voltage, check the AC power on the cord supplying the TCS, as follows:

3. Unplug the power cord from the TCS.
4. Set the meter for "Volts AC".
5. Insert the probes into the power cord plug's two symmetrical slots, as shown in Figure 6–2.

You should read about 208V. If the cord has power, but when plugged in, the TCS still has no power, then the chassis may need to be replaced. (Refer to *Chapter 7, Troubleshooting* for more information.)

If there is no power in the cord, there is a problem with either the cord itself, or with the PDU supplying it.

Figure 6–2 TCS Voltage Check



6.2 Checking Fans

Fans should be checked on a regular basis by feeling for airflow and listening for any squealing sounds (indicating that the fan is wearing out and will soon need replacement).

To replace a fan, refer to the instructions according to its location in the system in the appropriate chapter.

6.3 Cleaning the 1/4 Inch Tape Drive

The 1/4–inch tape drive/control panel assembly is located on the front of the Utility cabinet.

After every eight hours of tape drive operation, clean the tape unit by following the instructions in the cartridge tape drive cleaning kit.

CAUTION

Use only the cleaning fluid supplied in the cartridge cleaning kit to clean the drive.

When you insert the cartridge and close the door of the drive, the characteristic "shoeshine" action will clean the heads.

NOTE

Do not attempt to clean the heads using swabs. Due to the head retraction mechanism in the drive, you will be unable to reach the write head.

6.4 Cleaning the 1/2 Inch Tape Drive

The 1/2–inch tape drive is located on the front of the Peripheral cabinet, just under the three 8–inch disk drives.

After every eight hours of tape drive operation, clean the tape unit by doing the following :

1. Turn off the tape drive.
2. Release the rack latch just inside the lower left corner of the front panel.
3. Grasp underneath the front panel and pull the unit towards you.

NOTE

Make sure the power cord is long enough. If not, unplug it from the back of the unit.

4. Slide the unit forward until it is fully extended from the rack.
5. Grasp the lower edges of the top cover and lift.
6. While holding the top cover in the raised position, place the retainer bar in its slot.

CAUTION

Rough or abrasive materials can scratch sensitive surfaces of the head resulting in permanent damage. Other cleaners, such as alcohol-based types, can cause read/write errors or load failures. USE ONLY FREON TF (Trichlorotrifluoroethane).

7. To clean the unit, use the Cipher tape drive cleaning kit (Part 960855-001). Moisten a swab applicator with tape drive cleaner and carefully swab the surface of the read/write head and tape cleaner. If the surfaces are extremely dirty, you may have to use more than one swab.

CAUTION

Hold the tachometer away from the take-up hub while cleaning the hub: if the cleaning solvent seeps into the tachometer housing, it could damage the tachometer. Also, do not release the tachometer suddenly while holding it away from the take-up hub since it will become damaged if it strikes sharply against the hub.

8. Clean the tachometer roller using the method described in step 8.
9. Use the felt pads provided in the tape cleaning kit to clean the hub pads, takeup hub and roller guides.
10. Lift the top cover until the retainer bar is clear of its slot.
11. While holding the top cover in the raised position, push the retainer bar back and up so that it lies flat against the underside of the top cover.
12. Close the top cover.
13. Press and hold the lock buttons on both slides and slide the unit back into the rack.

6.5 Cleaning Filters

Filters should be checked about every three months and either cleaned or replaced, as appropriate.

6.5.1 1/2-inch Tape Drive Filter

To clean the air filter, use the following procedure (see Figure 6–3).

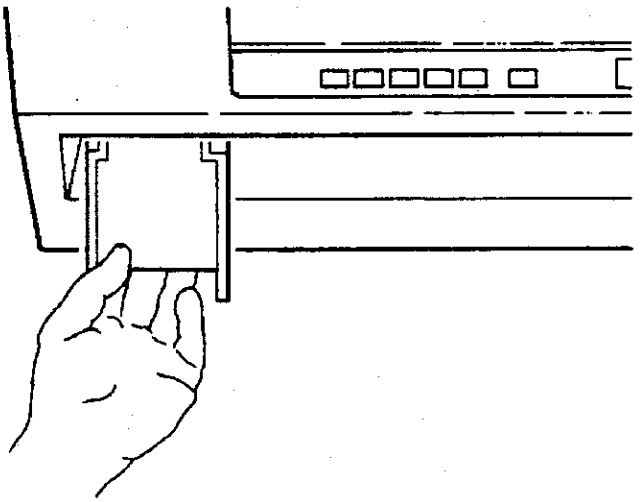
1. If the power is on, press the bottom of the Power switch/indicator to remove power from the unit.
2. The filter is located just behind the Rack Latch at the lower left side of the front panel. Feel for the filter tab and gently slide it down to remove.
3. If there is dust on the filter, vacuum or rinse it clean.
4. Return it to its proper location.

6.5.2 Processor Filter

The filter is under the processor card cage in the expansion cabinet.

1. Loosen the two slotted screws on the mounting bracket.
2. Remove the bracket and put it aside.
3. Reach underneath and pull the frame-mounted filter all the way out.
4. Take the filter out of the frame by loosening the sides of the frame.
5. You can either vacuum the filter or rinse it clean. If you want to replace it, the entire unit—filter and frame—is a FRU.

Figure 6–3 Cleaning the 1/2-inch Tape Drive Filter



7

Troubleshooting

This chapter is intended to aid you in finding a system problem. It contains a troubleshooting chart, a section on turning off and turning on the system: and a sample problem and its solution.

7.1 Finding the Problem

The instructions in the diagnostic guide deal with most problems you are likely to encounter. Your first step should be to collect as much information as you can about the system: LEDs, system console, crashdumps, etc. Then use the chart shown in Figure 7-1, look for the symptom that most closely represents your situation and check for each of the possible problems. The symptoms are listed from most critical to least critical. The possible problems are listed with the most likely first and least likely last for that particular symptom. If the problem is not easily identifiable, consult the diagnostic guide.

Before turning to the appropriate chapter to replace the questionable item, be sure that you are familiar with the section on turning the system off and on.

If the problem can't be fixed by a simple swap from on-site spare parts kits, call the BBN ACI Hotline listed in the front of this manual.

Figure 7-1 Troubleshooting Chart

Symptom	Possible problem	Action
System won't turn on	208VAC is not present.	Check the main power cords.
	The PDUs are turned off.	Turn on the PDUs. The three orange lights on each PDU must be on.
	Main Power Switch or Key Switch is off.	Turn on the switch and look for the green power indicator next to it to light up.
Console works, but no boot prompt	Console cables are loose or damaged.	Follow the cables from the fan-tail to the console.
System doesn't boot from the disk.	Disk drive is turned off (green light on disk drive is off).	Check the disk drive's power cord, circuit breaker, and the power switch.
	Disk controller board not active or bad.	Run the diagnostics on the disk controller board.
	Disk drive fails self- test (red light on disk is on.)	Call BBN ACI.
Booting fails with with DISK ERROR 14.	The disk drive's write protect switch is on.	Turn off the write protect switch.
Some nodes aren't seen by the rest of the system.	Nodes are turned off	Turn on nodes and check that its self-test passes (red LED goes out).
	Nodes are failing self-test	If the red LED on the node is on after a minute try resetting and then call BBN ACI. Also may fail self-test if cables are bad.
	Bad switch-processor cables	Try swapping the cables with those of a neighboring node that you know works.

Symptom	Possible problem	Action
All nodes in one cage aren't seen by the rest of the system	Card cage or nodes are turned off.	Check that green LED on each node is on and red LED is off.
	Clock board turned off or bad.	Check that green LED is on and red LED is off.
	Clock signal isn't getting to nodes.	Check for disconnected or damaged clock cables.
	Switch cables going from one cage to another are disconnected or damaged.	Check that the switch cables are all plugged in and none are damaged.
	Switch board is in reset mode or is bad.	Check that the rocker switches are in the up position and the green lights are lit on the two switch boards for that cage.
Ethernet isn't working	Ethernet cables are disconnected or damaged.	Check the connections from the Ethernet controller board to the fantail to the transceiver cable to the transceiver box.
	Ethernet controller board is not seen or is bad.	Run diagnostics on the Ethernet controller board.
	Ethernet controller board is hung.	Check the LEDs on the front of the board for an error code; restart the system and check again.
Non-console terminals don't work.	Terminal control software has not been configured to support MB/TERM board.	Consult the *System Administrator's Guide* for configuration instructions.
	Terminal cables are disconnected or damaged.	Check the connections from the board to the fantail to the coax cable to the cluster box to the terminals.
	Coax cables are bad or unterminated.	Check terminators and run diagnostics on the terminal controller board.

Symptom	Possible problem	Action
	Terminal Controller board is turned off or is bad.	Run diagnostics on the terminal controller board.
1/4 inch tape doesn't read.	SCSI cable is loose, plugged in backwards, or damaged.	Check the connections from the back of the tape drive to the tape controller in the Multibus.
	1/4 inch tape controller is bad.	Run the diagnostics on the 1/4 inch tape controller.
	The tape heads are dirty.	Clean the tape heads.
1/2 inch tape doesn't load	Packing material is still in the tape drive	Remove the "donut" from the take-up reel.
1/2 inch tape doesn't read	Cables are loose, backwards, or damaged.	Check all of the connections from the controller to the tape drive.
	The tape heads are dirty.	Clean the tape heads.
	1/2 inch tape controller is bad.	Run the diagnostics on the 1/2 inch tape controller.

7.1.1 Halting the System

Whenever possible, the system should be halted using the procedures outlined in sections 7.3 and 7.4. This will prevent loss of data. Turning off power to the machine will certainly stop the system, but is not advisable because of the likelihood that the data will be lost.

There are several ways to halt the system. The particular halt method you choose must be based on the circumstances that make a system halt desirable. In all cases, try to make sure users have been warned the system will be halted so that they can save as much of their work as possible before the halt.

7.1.2 TCS

During system operation, you will be interacting with the Test and Control System (TCS). In a broad sense, the TCS consists of the TC2000 hardware, a separate processor, software, and the slave processors. You may have encountered this system if you read the *TC2000 System Installation Guide*. The TCS lets you perform many functions, including booting the system, powering processor cards on and off, and performing diagnostics (for a discussion of diagnostics with the TCS, refer to the *TC2000 Diagnostics Manual*). The TCS has a master program, TEX (TCS Executive).

The TCS machine allows you to perform a number of monitoring and maintenance functions (such as system halting, reloading, and reconfiguring). In particular, you use the TCS software to:

You can only communicate to the TCS through its serial port. This is usually done through the TC2000 console, which is shipped as a VT320/LA75 printer. The TCS in turn communicates with the TC2000 processor card (B2VME) and the Butterfly switch.

The *TC2000 Software Installation Guide* has a description of how to format disks for the PC–AT compatible system on which the TCS software resides.

This chapter describes how to use the TCS software to reboot the system. Chapter 2 in the *TC2000 Diagnostics Manual* describes TCS in more detail, including the menu system and the commands you can issue.

7.2 The Power On/Off Procedure

It is important to power your system on and off correctly. Perform the following procedures in the given order. Refer to Chapter 1 for the locations of the components.

7.2.1 Step by Step Process for Powering On

Use the following steps to power on your system:

1. Turn on the Power Distribution Unit. The light on the cassette tape drive will come on. When the system is completely powered on, the processor card FLAG lights go OFF.
2. Turn the Key Switch to ON. The first indicator at the bottom of the control panel lights. This means that the TCS subsystem has received power and is turned on.
3. Turn the Key Switch in the SECURE position to disable resets.
4. Turn on the Disk Drive(s).

5. Turn on the ½ inch Tape Drive (if any).
6. Check that the built-in VME card cage ("6 UVME card cage") switch at the back of the TC2000 is ON.
7. Look at the Processor card lights. The Flag light on each of the cards should be on until it finishes the self-tests, then all lights *except* Flag should turn on.

When power is restored, the TCS proceeds to boot up. The TCS attempts to boot from the floppy disk first, and then from the hard disk.

As the system powers up, the TCS scans to see that every component is present and operating correctly. Check the console monitor while this diagnostic scan is taking place. It is useful source of information about any system problem.

NOTE

Remove the floppy disk from the TCS to allow it to boot from its hard disk.

7.2.2 Step by Step Process for Powering Off

Use the following steps to power off your system safely **after** you have halted the operating system:

1. Halt the nX operating system as described in sections 7.3 and 7.4.
2. At the terminal you should have the TEX-> prompt. Type **h po of a** (Hardware Power off all) at this prompt to turn off power to all the processors.

   TCS -> **h po of a** ↵
3. Turn the Key Switch to OFF. This also removes power from all individual peripherals.

NOTE

You can leave the machine in this state. Go to the next step *only* if you intend to disconnect the Main Power Cord.

4. The PDU breakers should also have been turned OFF by the Key Switch. After checking that these breakers have been turned OFF, disconnect the Main Power Cord. Leave the PDU breakers down for at least 15 seconds before powering up according to section 7.2.1, "Step by Step Process for Powering On".

7.3 Shutting Down the System

When shutting down the system, perform the following procedures

1. Check (using the **who** and **ps** commands, or by asking users) to see if anyone is using the system.
2. If there are other users on the machine, use **/etc/shutdown** as root to send a system warning message to users. If there were no other users on the system, or if the system is booted singleuser so that only the console is in use, go to step 3.

   If you are using **/etc/shutdown**, you can specify a time span in minutes before the system actually shuts down, plus send a message. For example

   # /etc/shutdown +2 Halting to install new disk ↵

   specifies that the system will halt in two minutes, and sends the message "Halting to install new disk" to all users logged onto the system. Users on the system then have to save their files and log out before the system shuts down to single user mode. When that is done, continue to step 3.

NOTE

You can also specify the **/etc/shutdown** command to halt or reboot the system all in one command. To reboot the system after shutting it down, use the **-r** option. For example:

 # /etc/shutdown -r +2 Rebooting to clear stuck processors ↵

To halt the system after shutting it down, use the **-h** option. For example:

 # /etc/shutdown -h +2 Halting to install new disk ↵

3. Use **/etc/halt** as described in section 7.4.

7.3.1 The Reset Switch

If your system is hung, press the ***reset*** switch (see Figure 7–2). This switch takes the system to the pre-boot state and brings up the TCS. From here you would reboot the system as described in section 7.6.

7.4 Halting the System

The **/etc/halt** command synchronizes the disks by writing out data stored in processor memory to the disks, and halts the system. When you use the **/etc/halt** command to halt the system, file system checks are performed automatically when the machine is rebooted multiuser.

CAUTION

You must check the file systems at every reboot in all because an inconsistent file system can cause serious, irretrievable loss of data.

To use **/etc/halt**, simply type the following command at the super user prompt:

 # /etc/halt ↵

You can then reboot the system as described in section 7.6, "Booting/Rebooting the System".

7.5 Halting the System After Root File System Checks (Singleuser)

Often, while testing, you may use the system in singleuser mode to be certain no one can use the system remotely while you are working. This saves boot time and protects the unmounted file systems from corruption.

If you boot the system singleuser to do administrative work, you should check the root file system for inconsistencies before you begin. Do this by typing the following at the prompt (assuming your boot disk is unit 0):

 # /etc/fsck /dev/xy0a ↵

It takes very little time to determine whether the root file system is inconsistent. If the file system is inconsistent, this message appears, followed by a prompt:

```
file system has been modified -- reboot using /etc/reboot -n
```

Following the instructions in this message will cause the system to boot multiuser, which is not desirable when you need to use the system in singleuser mode. Instead, type the command

 # /etc/halt -n ↵

and then reboot the system singleuser as described in section 7.6, "Booting/Rebooting the System".

The significant part of either of these commands is the **-n** flag. This signifies that when the system is halted (automatically before a reboot can occur, or ex-

plicitly due to your **halt** command), the disks will *not* be synchronized. This is essential to keep the file system consistent, since the **fsck** command corrects the file system ***directly on the disk***, not in the processor's memory. If you sync the disk before halting, the ***uncorrected*** image stored in the processor memory will be written over the corrected image on the disk, thereby re-corrupting the root file system.

7.6 Booting/Rebooting the System

If you **/etc/halt**ed the system, and the system gracefully halted, you are placed in TEX. You can then reboot the system by first pressing <Return> on the keyboard. This brings up the prompt TCS[7.7.7]->.

This puts you into the TCS, from which you can reboot the system with the following dialog:

If you **/etc/fasthalt**ed the system, file system check will not be performed on system boot (such as **/etc/fastboot**). (However, it is advised that you do not use **/etc/fasthalt** to halt the system.)

Look at the description of **fastboot(8)** in the list of system administration commands in the back of the *TC2000 System Administration Guide*. **/etc/fastboot** will perform a default boot without file system checking (**fsck**).

NOTE

You can use **/etc/fastboot** as long as the TCS file **BOOTCFG.TCS** has the *bootparam* switch set correctly. By default, the TC2000 machine is shipped so that one of the lines in **BOOTCFG.TCS** reads:

bootparam: 1: 5

which sets the boot parameter 1 (the number of consecutive reboots the TCS will initiate) to 5. This should be sufficient for your needs. If you must change this value, you will have to edit the file using a text editor, such as EDLIN, and propagate this change for all the various directories in the TCS (except **\DIAG\BOOT**), and then reboot the system.

For more information on halting and rebooting the GP1000, see **shutdown(8)**, **halt(8)**, **fasthalt(8)**, **reboot(8)**, **fastboot(8)**, **sync(8)**, and **fsck(8)** in the list of system administration commands in the *GP1000 System Administration Guide*.

7.7 Interpreting the LEDs

The TC2000 computer has three sets of LEDs:

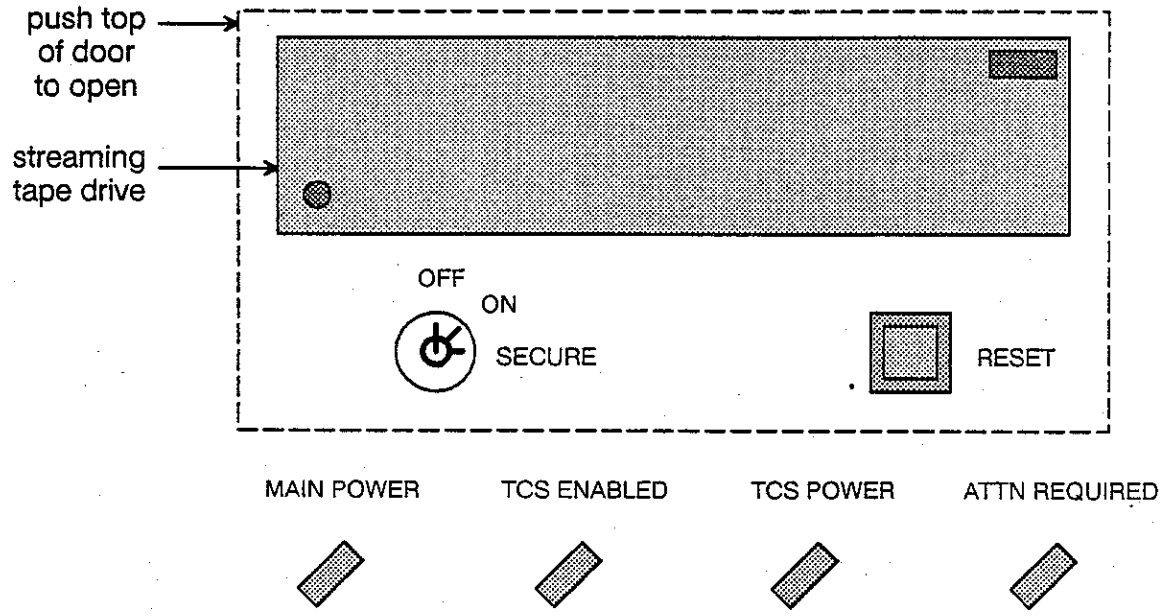
- front panel display
- processor card LEDs
- switch card LEDs

7.7.1 Front Panel Display

The front panel has four LEDs:

TCS POWER	indicates that the TCS has power.
MAIN POWER	turned on by the TCS master when the TCS master senses power.
TCS ENABLED	indicates that the TCS bus is available.
ATTN REQUIRED	also controlled by the TCS; see the diagnostic guide for more details.

Figure 7–2 Front Panel



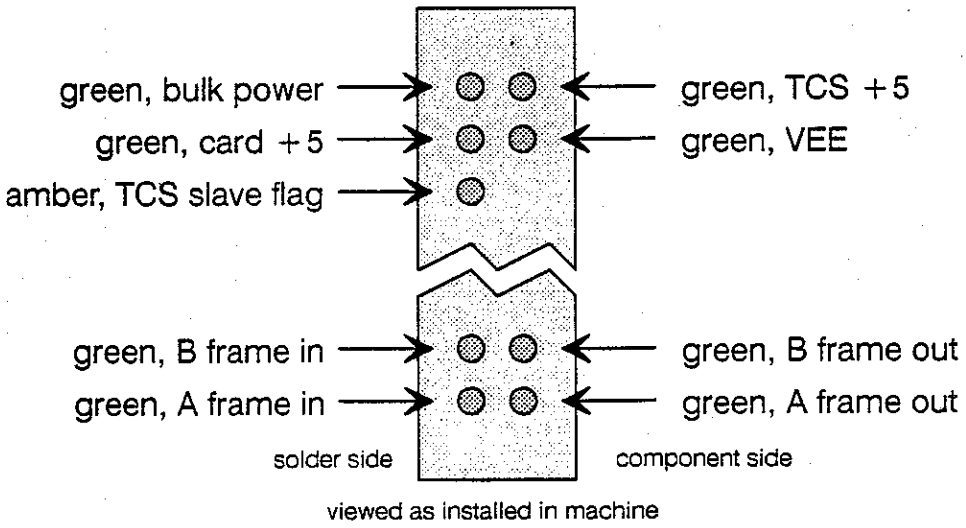
7.7.2 Processor card LEDs

An assortment of LEDs are visible on each processor card installed in the card cage, typically indicating (see Figure 7–3):

- TCS VCC present (green)
- Bulk 48 VDC (±24 VDC) present (green)
- Card VCC present (green)
- Card VEE present (green)
- TCS flag (amber)
- Card-specific data (four green LEDs indicate "frame" and "reverse" for each switch port)

Of these, two are directly controlled by the TCS. One indicates "card TCS power on" and is connected with a resistor to the card's TCS VCC power. The other is controlled by the TCS slave and can be set on, off, or blinking. Blinking the LED on and off is one of the TCS slave's tasks, and does not require further intervention from the TCS master. Two blink rates are defined in the original design, fast (about 3 Hz) and slow (about 1 Hz).

Figure 7-3 Processor Indicators



The TCS flag amber LED is intended to point out cards that fail diagnostics, and as an aid to a service person in locating a particular card in a large system. The convention for use of this LED is as follows:

on = dead card
slow blink = diagnostic in progress, or failure
off = passed diagnostic
fast blink = card locater signal

A hardware reset causes the LED to turn on. The slave should be programmed to leave the LED on at startup, so that an uninitialized or totally broken card will have its light on continuously.

The TCS master should start the LED blinking at the slow rate when it begins testing or configuration discovery. This indicates that the TCS has discovered the card, but has not yet approved it for use.

Once the TCS has completed diagnostics, the LEDs on cards that pass should be turned off. Cards that fail or become non-communicative will continue to blink at the slow rate.

The TCS master should provide a command that causes the LEDs on one or more slaves to blink at the fast rate to help a service person locate a particular card. The command should be arranged so that leaving the LED blinking indefinitely is difficult, probably by starting it blinking and then waiting for a carriage return to stop it again.

If the TCS discovers a failed card in the course of normal operation, it should try to set the LED blinking at the slow rate.

7.7.3 Switch Card LEDs

The switch card has the same five LEDs that as the top of a function card. It does not have the four bottom LEDs (see Figure 7–3). The LEDs indicate:

green:	VEE power-on indicator
green:	VTT power-on indicator
green:	TCS VCC power-present indicator
green:	main power (±24 volts) power-present indicator
amber:	TCS flag, to aid field service in locating the card

See subsection 7.7.2 for a detailed explanation of these LEDs.

Finally, note that the LEDs on each B2SS/B2SR pair of switch cards are both controlled by the same slave, on the B2SS. This hardware connection should be masked by the TCS master. The two switch cards should be treated as separate entities, and their LEDs controlled independently as described above.

7.8 Problems With the Midplane

Various system problems could be midplane-based. For example, the diagnostic scan does not find one or more of the Processors, or shows Processors in the wrong bay, midplane, or slot. First, check that all cards are completely connected to the midplane. If so, and the problem persists, do the following:

1. Power down the system. (Refer to NO TAG)
2. Remove the TC/FP (or TC/FPV) from the indicated Expansion cabinet.

3. Look at Figure 7–4 to orient yourself to the pin locations.

4. Look at the midplane section indicated by the figure; that is, the bottom-most, or J4, portion (start of this portion is indicated by the white line and number 1 on the left and 5 on the right on the green silkscreened portion of the midplane).

5. Figure 7–1 shows the pin numbers for each row of pins. These numbers are the same for the J4 portion of pins in every slot.

To verify the presence of the processor cards, the diagnostic software checks each slot in each specified bay and midplane. For an 8-slot system, the bay location, midplane ID and Slot ID are as follows:

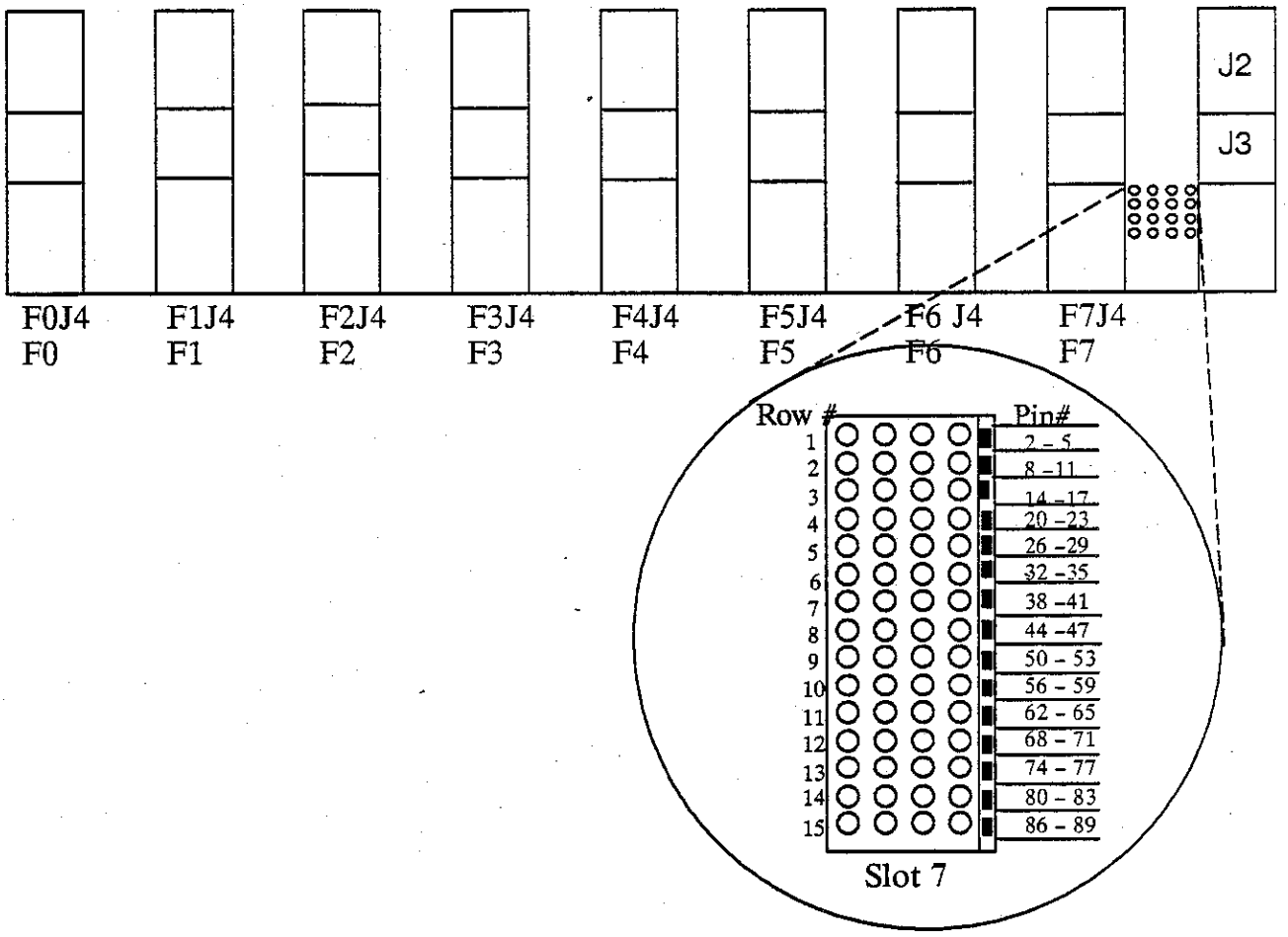
BAY	MIDPLANE	SLOT	(n)
111	001	000	(0)
111	001	001	(1)
111	001	010	(2)
111	001	011	(3)
111	001	100	(4)
111	001	101	(5)
111	001	110	(6)
111	001	111	(7)

The pins representing the midplane ID are 53, 50, 51, and the slot ID are 45, 47, 40. Therefore, with 0 = ground and 1 = open, the following should hold true:

MIDPLANE			SLOT (n)			
Pin 53	50	51	Pin 45	47	40	
Grnd	Grnd	Open	Grnd	Grnd	Grnd	(0)
Grnd	Grnd	Open	Grnd	Grnd	Open	(1)
Grnd	Grnd	Open	Grnd	Open	Grnd	(2)
Grnd	Grnd	Open	Grnd	Open	Open	(3)
Grnd	Grnd	Open	Open	Grnd	Grnd	(4)
Grnd	Grnd	Open	Open	Grnd	Open	(5)
Grnd	Grnd	Open	Open	Open	Grnd	(6)
Grnd	Grnd	Open	Open	Open	Open	(7)

6. Check the midplane and slot IDs.

Figure 7–4 Pin Locations on the Midplane



A

Jumper Settings

The following figures show the correct jumper settings for the TC2000 boards. Orientation for all boards is the top left corner as you are looking at the component side of the board. To find the jumper and switch locations on the actual board, measure from the top down and the left across using the same coordinates as those given on the figure. In addition, the Location column of the table that follows each figure provides the coordinates, in inches, needed to locate a jumper, switch, or fuse.

Figure A–1 Processor Board (Part Number: 2112472G01)

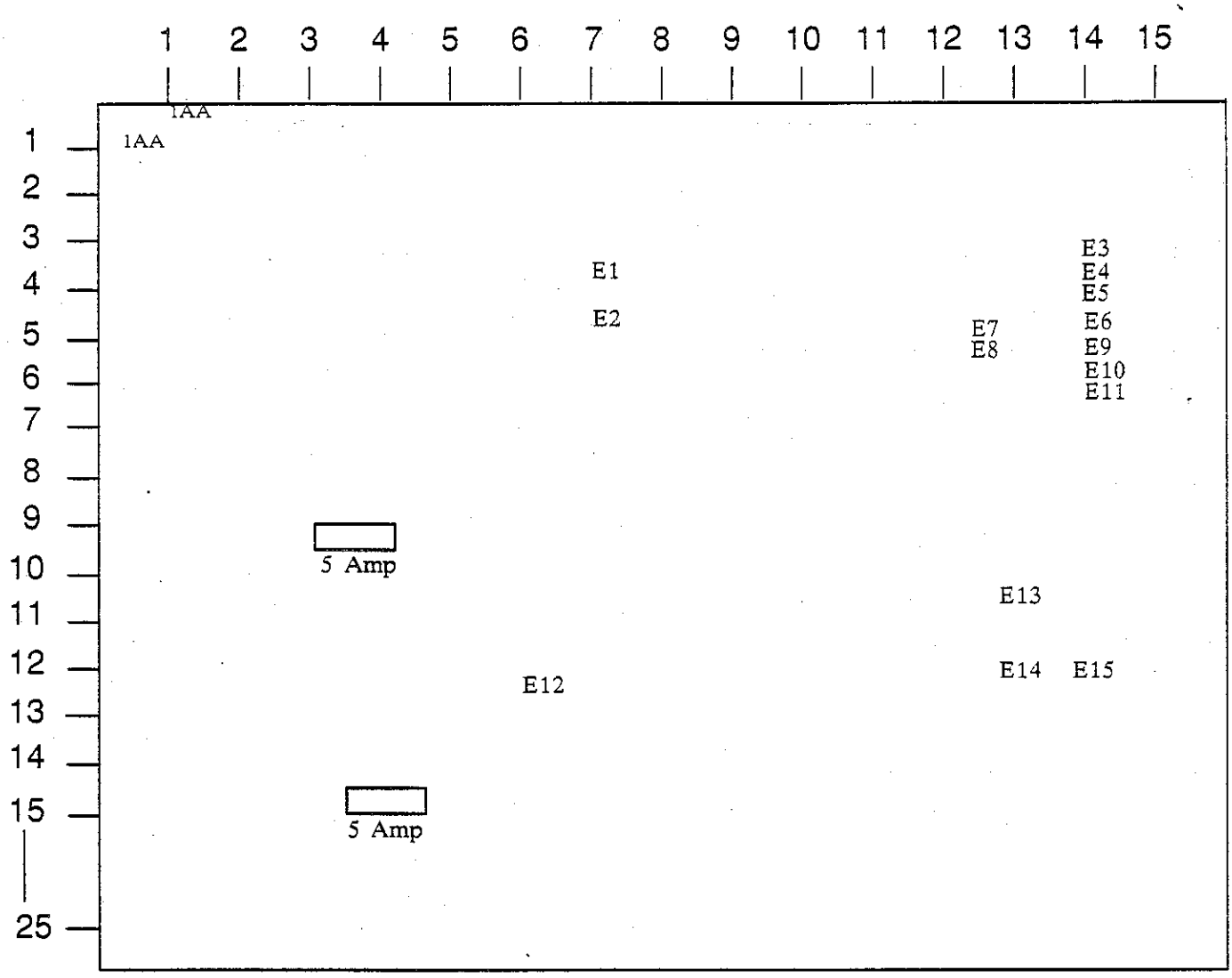
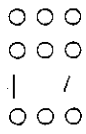
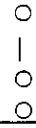


Figure A–2 Processor Board Jumper/Switch Table

Jumper	Configuration	Location (inches)	Description
E1	○ ○ | ○	3 3/4 down, 7 over	
E2	○ ○ | ○	4 1/2 down, 7 over	
E3,4,5	All Open	3 3/4 down, 14 over	

Figure A-2 Processor Board Jumper/Switch Table (cont)

E6		4 1/2 down, 14 over	
E7		5 down, 12 1/2 over	
E8		5 1/4 down, 12 1/2 over	
E9,10,11		5 1/2 down, 14 over	
E12		12 1/2 down, 6 3/4 over	For a 32 MHZ crystal at 11BD (88000 running at 16 MHZ.
E12		12 1/2 down, 6 3/4 over	For a 40 MHZ crystal at 11BD (88000 running at 20 MHZ.
E13		10 1/2 down, 13 over	
E14		12 down, 13 over	
E15		12 down, 14 over	

Fuse	Configuration	Location (inches)	Description
5 Amp	Handbag	at F1; 9 1/4 down, 3 3/4 over	
5 Amp	Handbag	at F2; 15 down, 4 over	

Figure A–3 Clock Card (Part Number: 2114872G01)

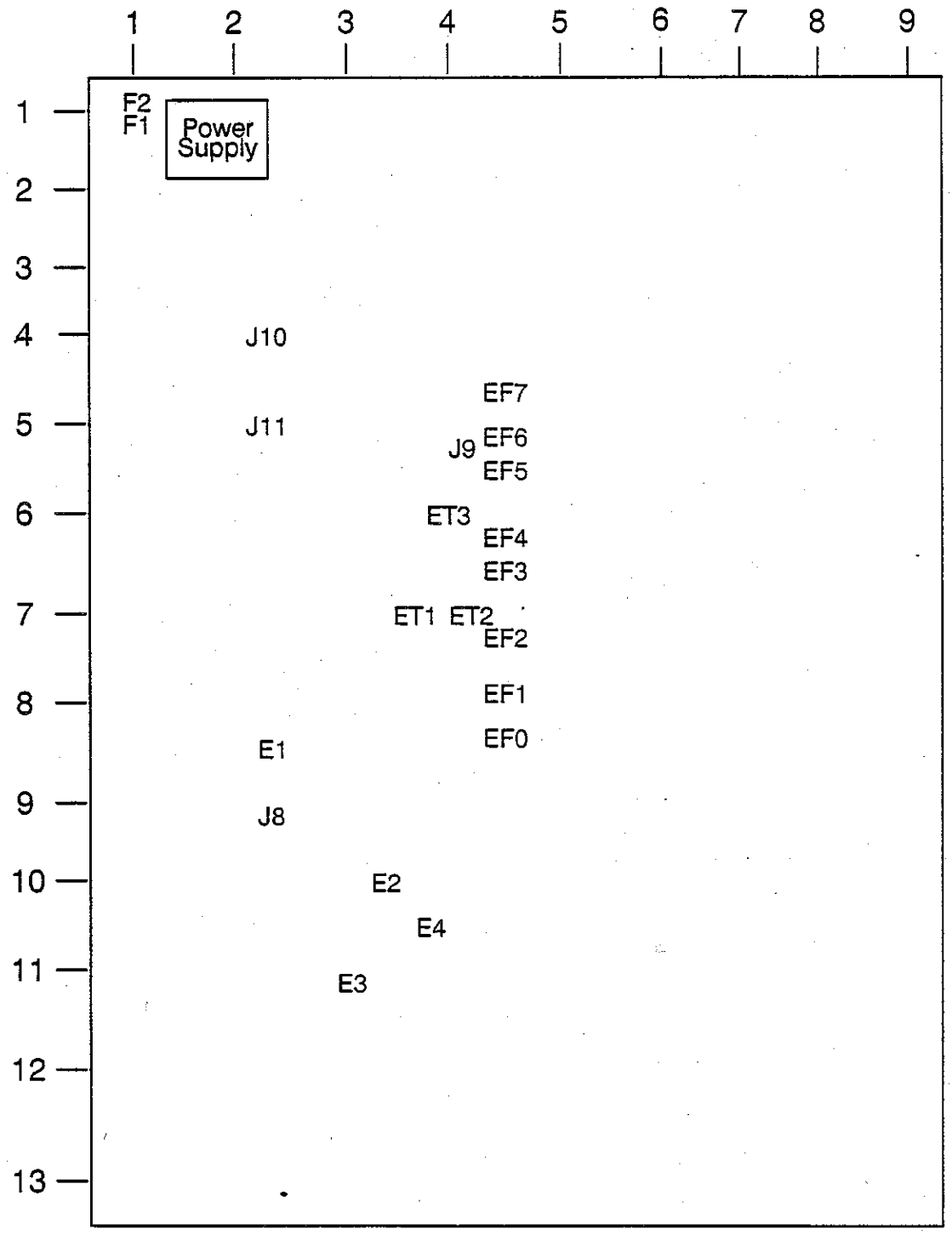


Figure A–4 Clock Card Jumper/Switch Table

Fuse	Configuration	Location (inches)	Description
F2		1/2 down, 1 over	1 1/2 amp
F1		1 down, 1 over	1 1/2 amp

Jumper	Configuration	Location (inches)	Description
ET1	O–O O O–O O O–O O O–O O O–O O O–O O O–O O O–O O O–O O O–O O	7 down, 3 1/2 over	
ET2	O–O O O–O O O–O O O–O O O–O O O–O O O–O O O–O O O–O O O–O O	7 down, 4 over	
ET3	O–O O O–O O O–O O O–O O O–O O O–O O O–O O O–O O O–O O O–O O	6 down, 4 over	
EF7	O–O O O–O O T O–O O N M O–O O T	4 3/4 down, 4 1/4 over	
EF6	O–O O O–O O T O–O O N M O–O O T	5 1/4 down, 4 1/4 over	
EF5	O–O O O–O O T O–O O N M O–O O T	5 3/4 down, 4 1/4 over	

Figure A–4 Clock Card Jumper/Switch Table (cont)

Fuse	Configuration	Location (inches)	Description
EF4	O-O O O-O O T O-O O N M O-O O T	6 1/4 down, 4 1/4 over	
EF3	O-O O O-O O T O-O O N M O-O O T	6 3/4 down, 4 1/4 over	
EF2	O-O O O-O O T O-O O N M O-O O T	7 1/4 down, 4 1/4 over	
EF1	O-O O O-O O T O-O O N M O-O O T	7 3/4 down, 4 1/4 over	
EF0	O O-O O O-O T O O-O N M O O-O T	8 1/4 down, 4 1/4 over	
E1	O-O	8 1/2 down, 2 over	
E2	O-O	10 down, 2 1/2 over	
E3	O | O	11 1/4 down, 2 3/4 over	
E4	O-O O	10 1/2 down, 3 1/2 over	

Connector	Configuration	Location (inches)	Description
J9	Plug	4 down, 5 1/2 over	
J8	Plug	9 down, 2 over	
J10	Plug	4 down, 2 over	
J11	Plug	5 down, 2 over	

Figure A–5 Switch Card (TC/SS) (Part Number: 2112470G01)

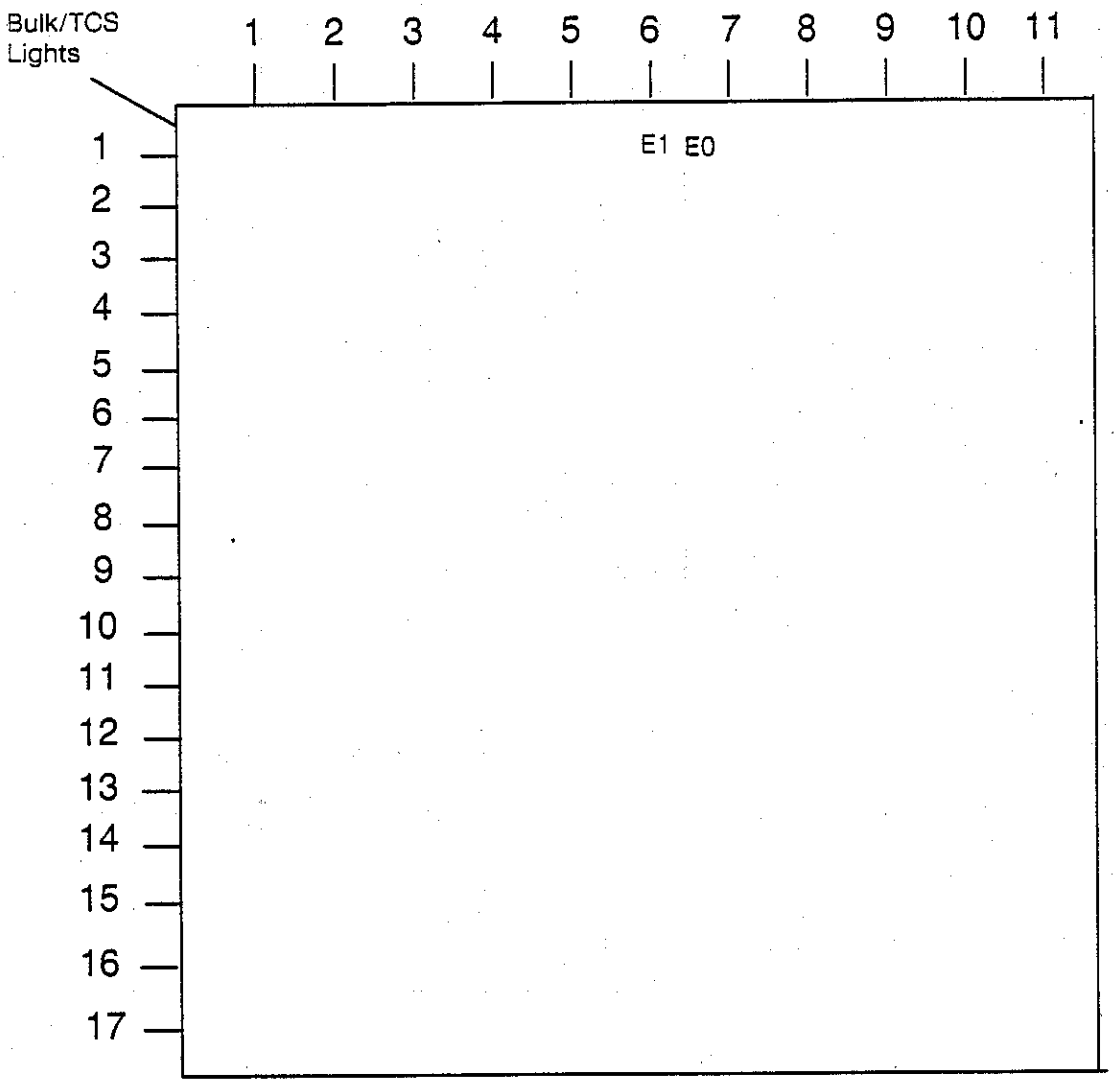


Figure A–6 Switch Card (TC/SS) Jumper/Switch Table

Jumper	Configuration	Location (inches)	Description
E1	O-O O	1 down, 6 over	
E0	O | O	1 down, 6 1/2 over	

Figure A–7 6U VME Repeater (Part Number: A101019G01)

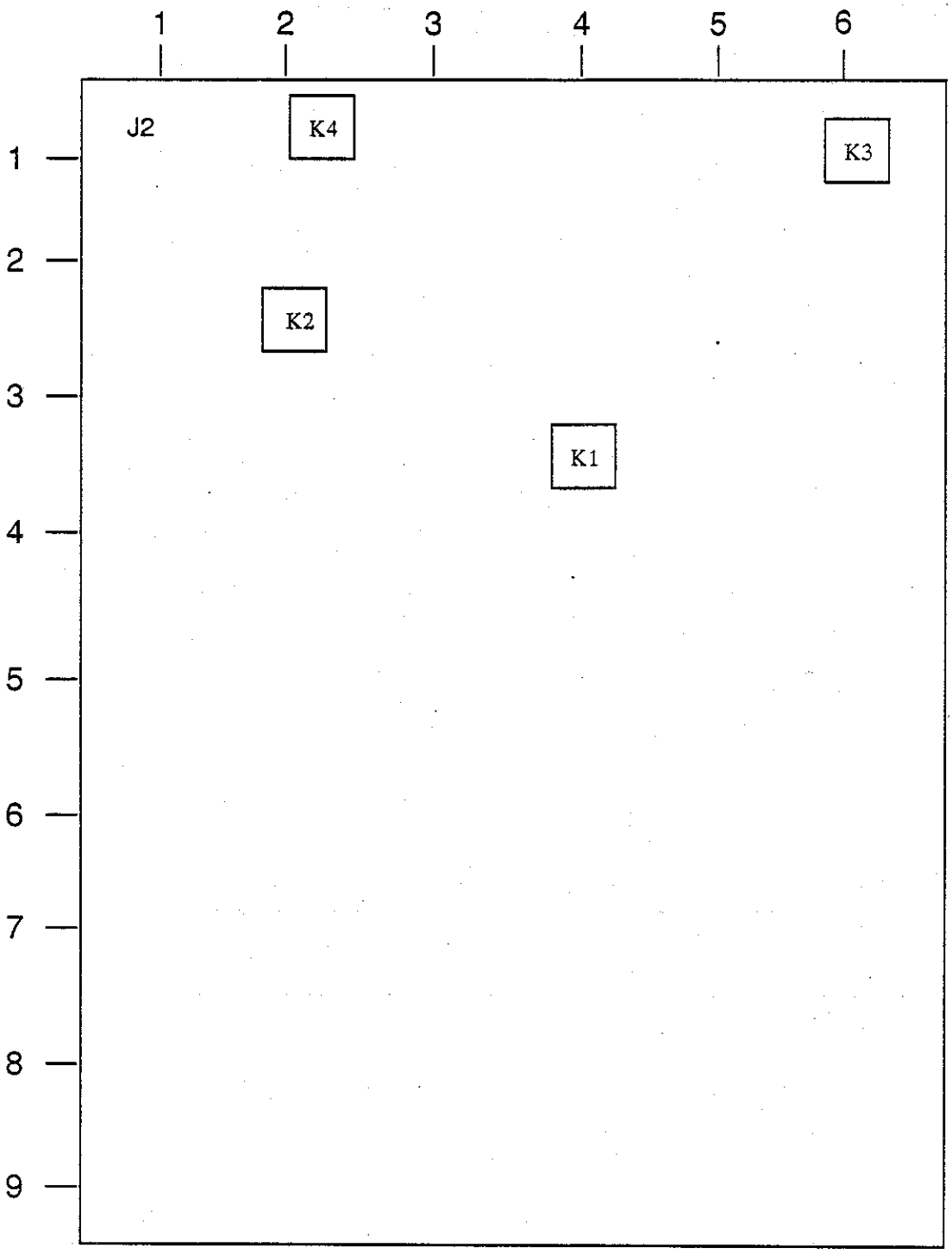


Figure A–8 6U VME Repeater Jumper/Switch Table

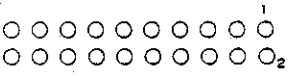
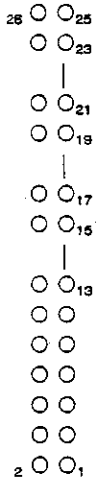
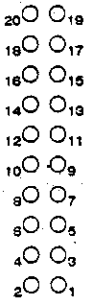
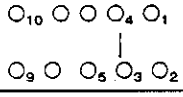
Jumper	Configuration	Location (inches)	Description
K4		1/4 down, 2 1/4 over	
K3		1 down, 6 over	
K1		3 1/2 down, 4 over	
K2		2 1/2 down, 2 over	

Figure A–9 9U VME Repeater (A117009601)

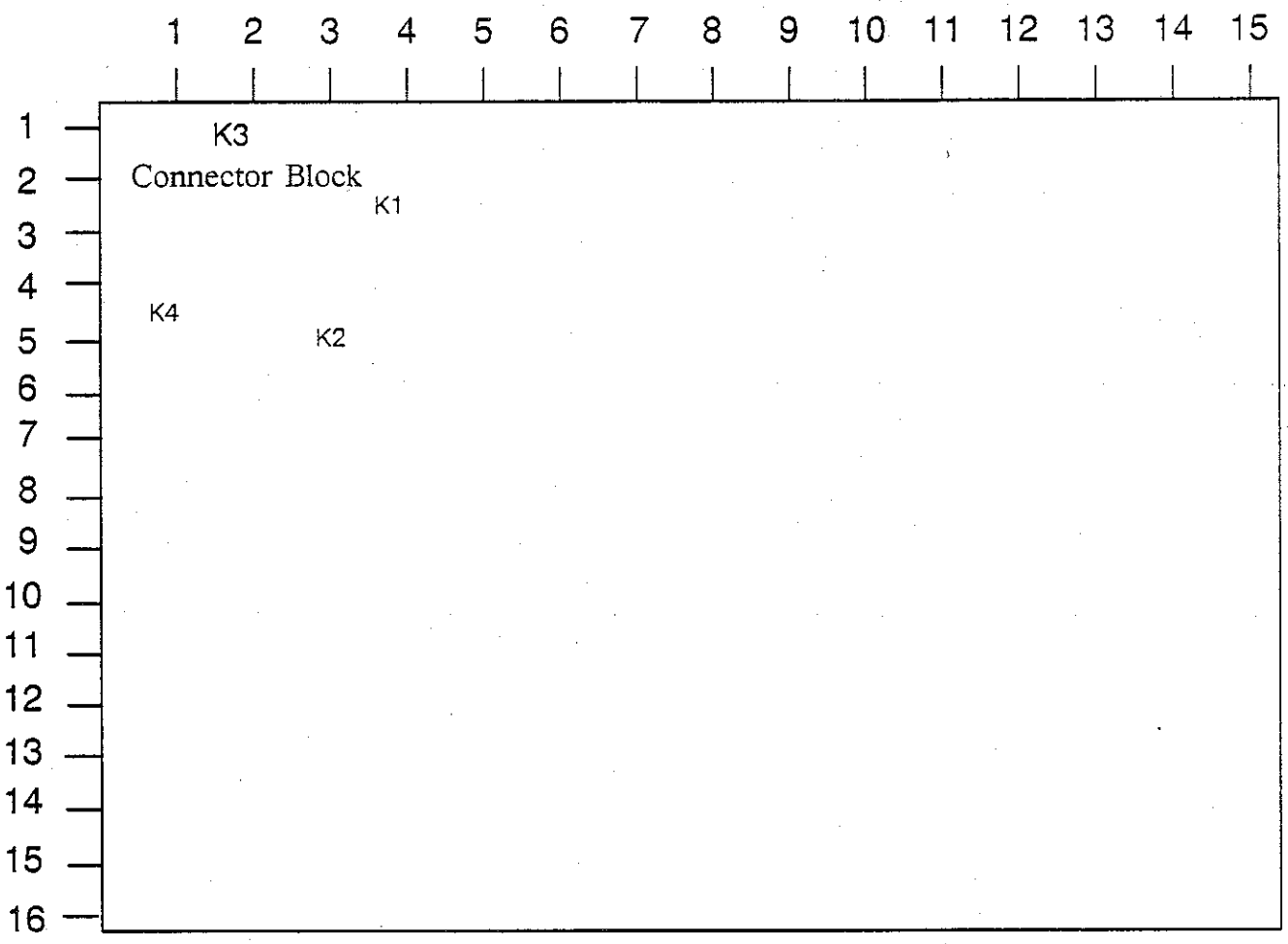


Figure A–10 9U VME Repeater Jumper/Switch Table

Jumper	Configuration	Location (inches)	Description
K3	○ ○–○ ○–○ ○–○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	1 down, 1 1/2 over	
K4	1 ○–○ 2 3 ○ ○ 4 5 ○ ○ 6 7 ○ ○ 8 9 ○ ○ 10	4 1/2 down, 1/4 over	
K2	1 ○ ○ 2 3 ○ ○ 4 5 ○ ○ 6 7 ○–○ 8 9 ○ ○ 10	5 down, 2 3/4 over	
K1	19 ○ ○ ○ ○ ○ ○ ○ ○ ○ 1 20 ○ ○ ○ ○ ○ ○ ○ ○ ○ 2	2 1/2 down, 3 1/2 over	

Figure A–11 Ethernet Controller

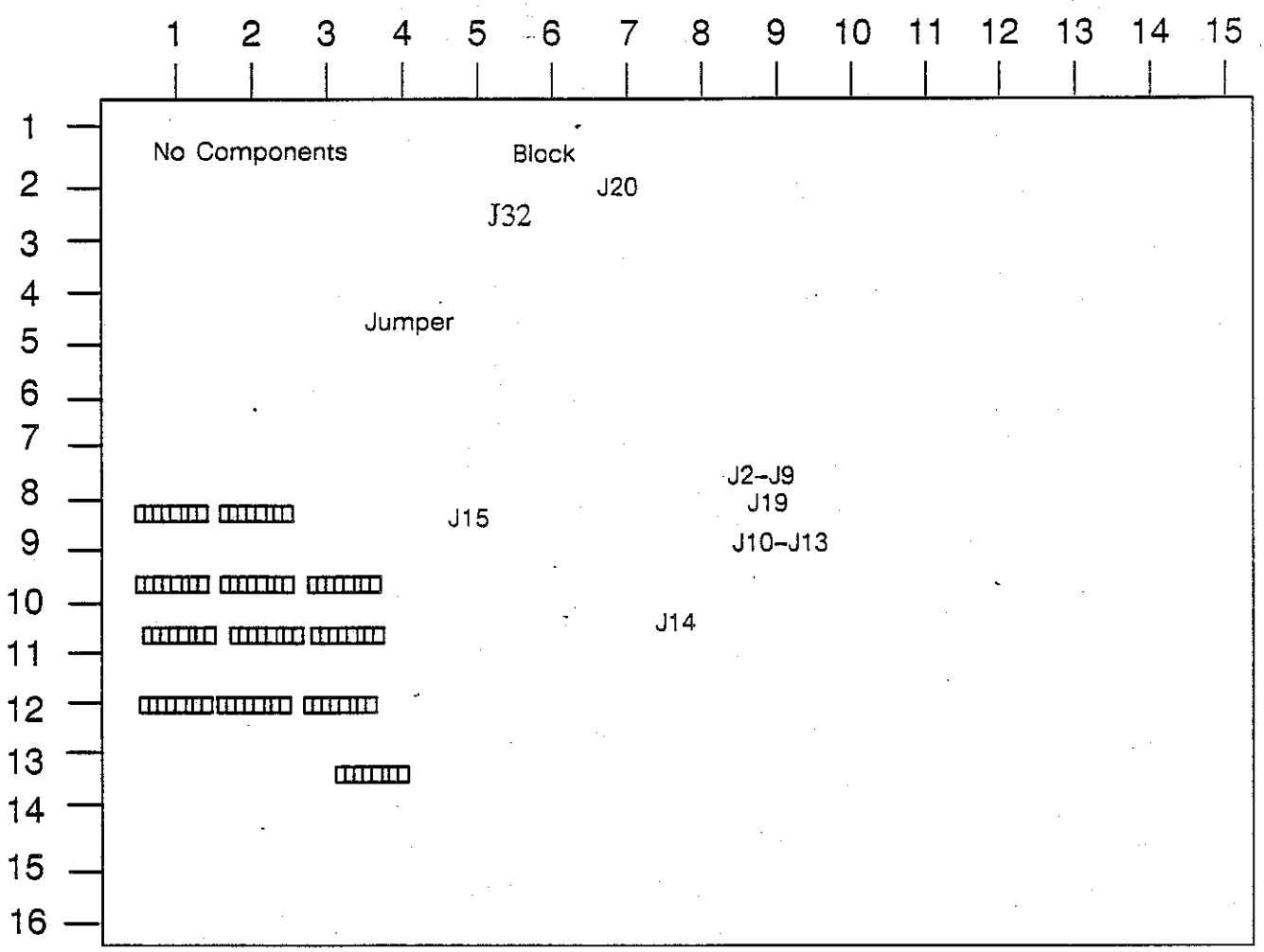


Figure A–12 Ethernet Controller Jumper/Switch Table

Switch	Configuration	Location (inches)	Description
S1–S8	OFF	8 1/4 down, 1 over	
S1–S8	OFF	8 1/4 down, 2 over	
S1–S8	S1,S8 = OFF S2–S7 = ON	9 3/4 down, 1 over	
S1–S8	S1,S8 = OFF S2–S7 = ON	9 3/4 down, 2 over	
S1–S8	ON	9 3/4 down, 3 over	

Figure A-12 Ethernet Controller Jumper/Switch Table (cont)

Jumper	Configuration	Location (inches)	Description
S1–S8	OFF	10 3/4 down, 1 1/4 over	
S1–S8	ON	10 3/4 down, 2 1/4 over	
S1–S8	ON	10 3/4 down, 3 1/2 over	
S1–S8	S1 = OFF, S2 = ON, S3 = OFF, S4 = ON S5 = OFF, S6–S8 = ON	13 1/2 down, 3 1/2 over	
J32	O | O O	2 down, 5 over	
Block	0 O OJ21 1 O O J22 2 O OJ23 3 O OJ24 HOST 4 O OJ25 INT 5 O OJ26 6 O OJ27 7 O OJ28	1 3/4 down, 5 1/2 over	
J20	O–O J20 EXT ST AT	2 1/4 down, 6 3/4 over	
J2–J9	O OJ2 O O J3 O OJ4 O OJ5 O OJ6 O OJ7 O OJ8 O OJ9	7 1/2 down, 8 1/4 over	
J15	O | O O	8 1/2 down, 4 1/4 over	
J19	O O	8 down, 8 1/2 over	
J10–J13	O OJ10 O O J11 O OJ12 O OJ13	8 1/2 down, 8 1/2 over	
J14	O O		

Figure A–13 SCSI Controller Board (Part Number: A101015601)

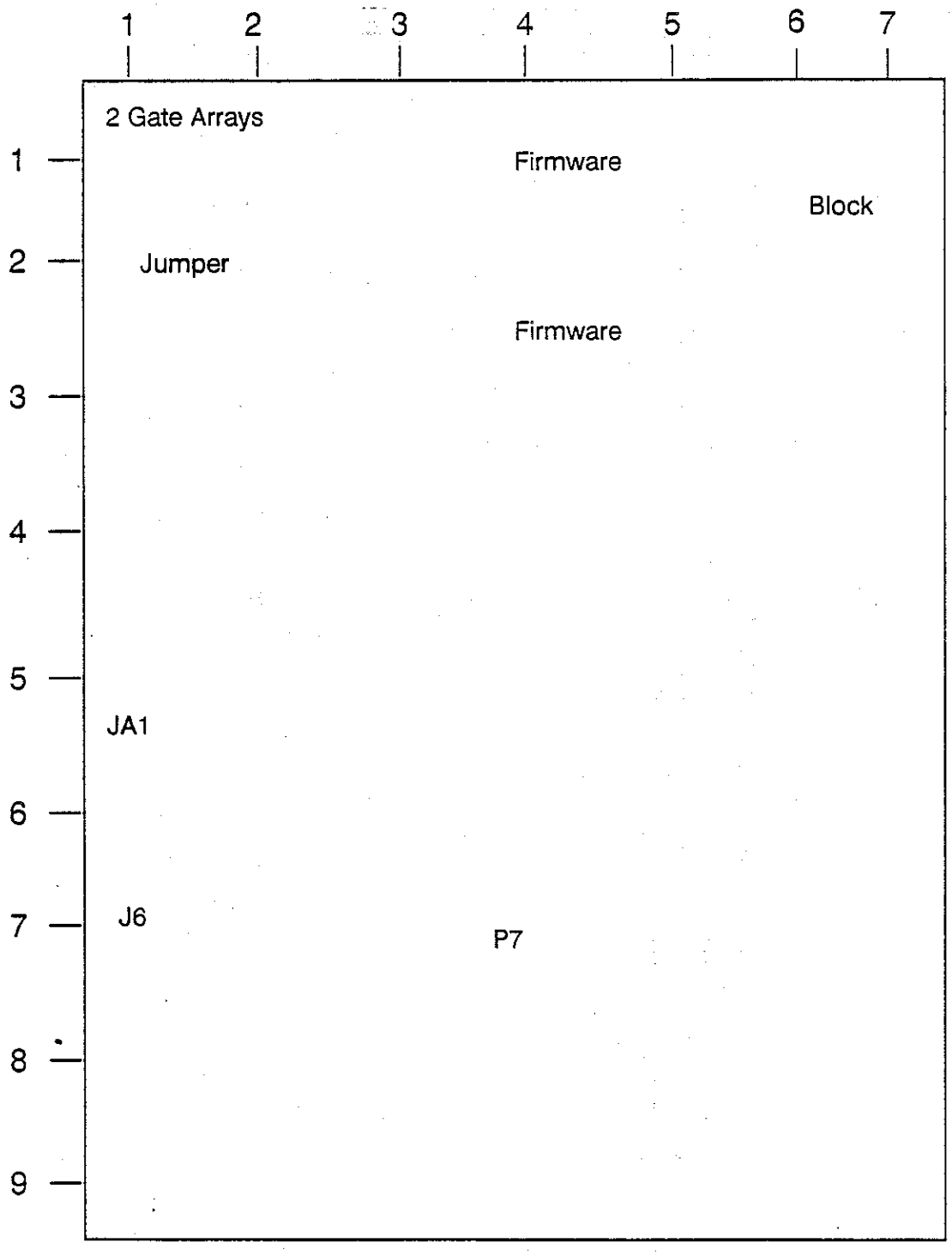


Figure A-14 SCSI Controller Board Jumper/Switch Table

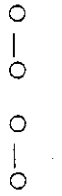
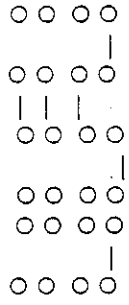
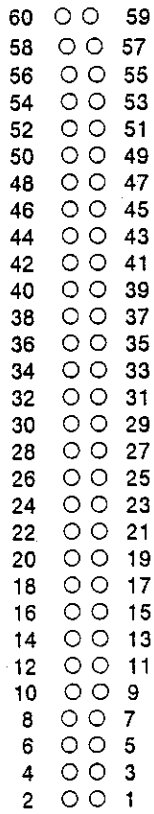
Jumper	Configuration	Location (inches)	Description
		2 down, 1 1/4 over	
JA1		5 1/4 down, 1/2 over	
		1 3/4 down, 6 over	
J6 Connector		7 down, 3/4 over	

Figure A–14 SCSI Controller Board Jumper/Switch Table (cont)

FIRMWARE		1 down, 4 over	
FIRMWARE		2 1/2 down, 4 over	

Figure A–15 Terminal Controller (Part Number: 2217224G04)

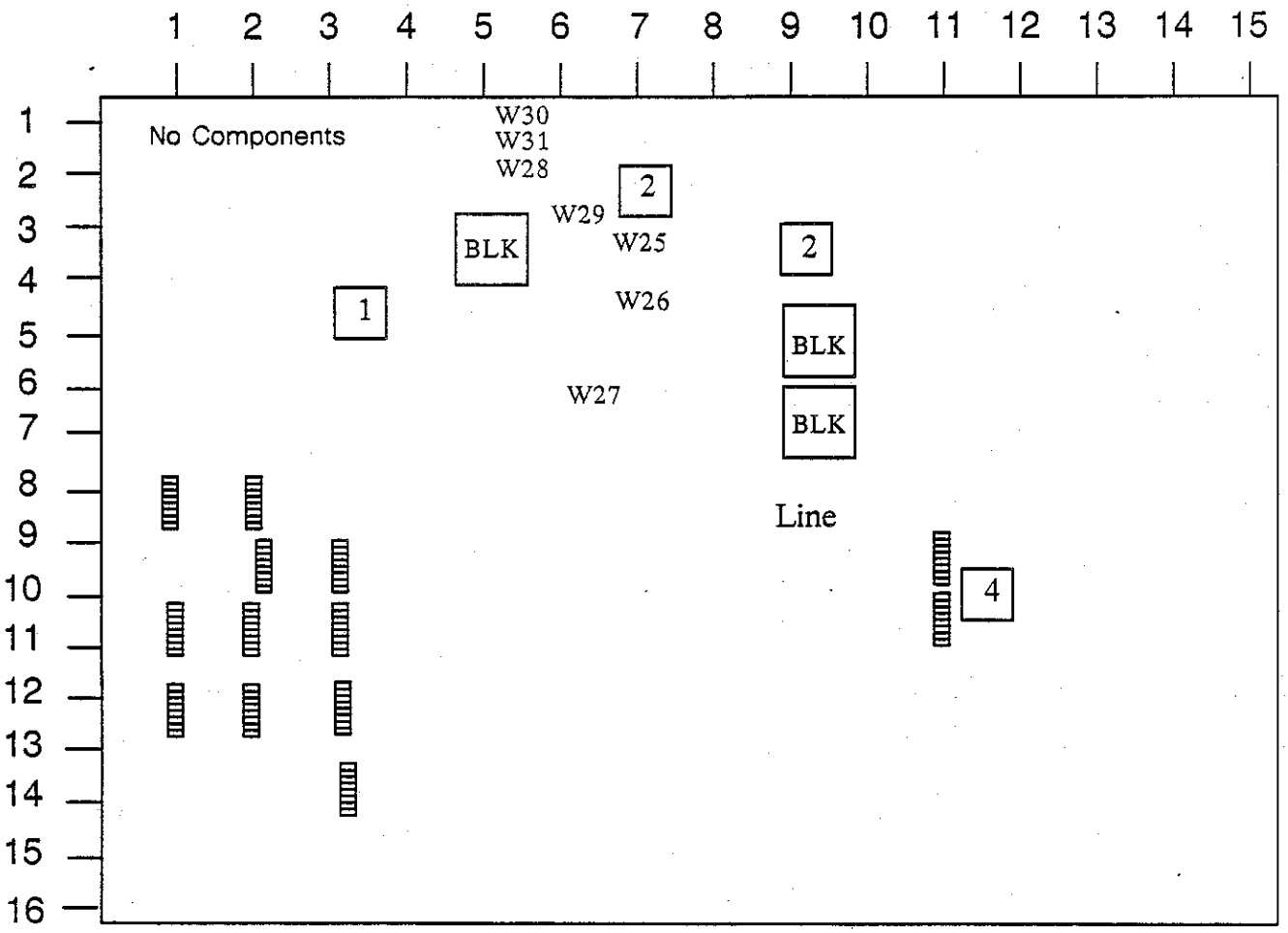


Figure A-16 Terminal Controller Switch/Jumper Table

Switch	Configuration	Location (inches)	Description
S1-S8	OFF	8 1/4 down, 1 over	
S1-S8	OFF	8 1/4 down, 2 over	
S1-S8	S1 = ON S2 = ON S3-S8 = OFF	9 1/2 down, 2 over	
S1-S8	S1-S7 = ON S8 = OFF	9 1/2 down, 3 over	
S1-S8	OFF	10 3/4 down, 1 1/4 over	
S1-S8	ON	10 3/4 down, 2 1/4 over	
S1-S8	ON	10 3/4 down, 3 1/2 over	
S1-S8	OFF	12 down, 1 1/4 over	
S1-S8	ON	12 down, 2 1/4 over	
S1-S8	S1-S4 = OFF S5-S8 = ON	12 down, 3 1/2 over	
S1-S8	S1,S2,S4,S6,S7,S8 = ON S3,S5 = OFF	14 down, 3 1/2 over	
S1-S8	S2 = ON S1 = OFF S3-S8 = OFF	9 down, 11 1/4 over	
S1-S8	S1-S8 = ON	10 1/4 down, 11 1/4 over	
1	O-O O-O	4 1/2 down, 31/2 over	
W30 W31 W28	O-O O-O O O	1 1/2 down, 5 3/4 over	

Figure A–16 Terminal Controller Jumper/Switch Table (cont)

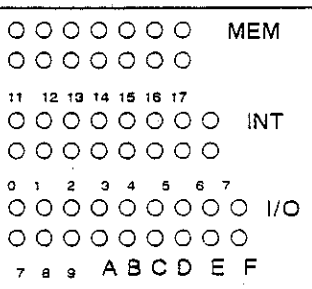
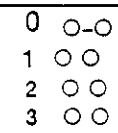
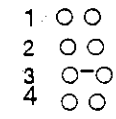
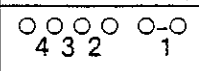
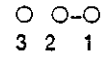
Jumper	Configuration	Location (inches)	Description
W29		2 3/4 down, 6 over	
Block		3 1/4 down, 51/2 over	
2		2 3/4 down, 7 over	
Block		5 down, 9 3/4 over	
W25		3 1/4 down, 7 over	
Block		7 down, 9 3/4 over	
W26		4 down, 7 over	
Line		81/2 down, 9 over	
W27		6 1/2 down, 6 3/4 over	
3		3 3/4 down, 9 3/4 over	
4		11 1/4 down, 11 over	

Figure A–17 Disk Controller (Part Number: A101016G01)

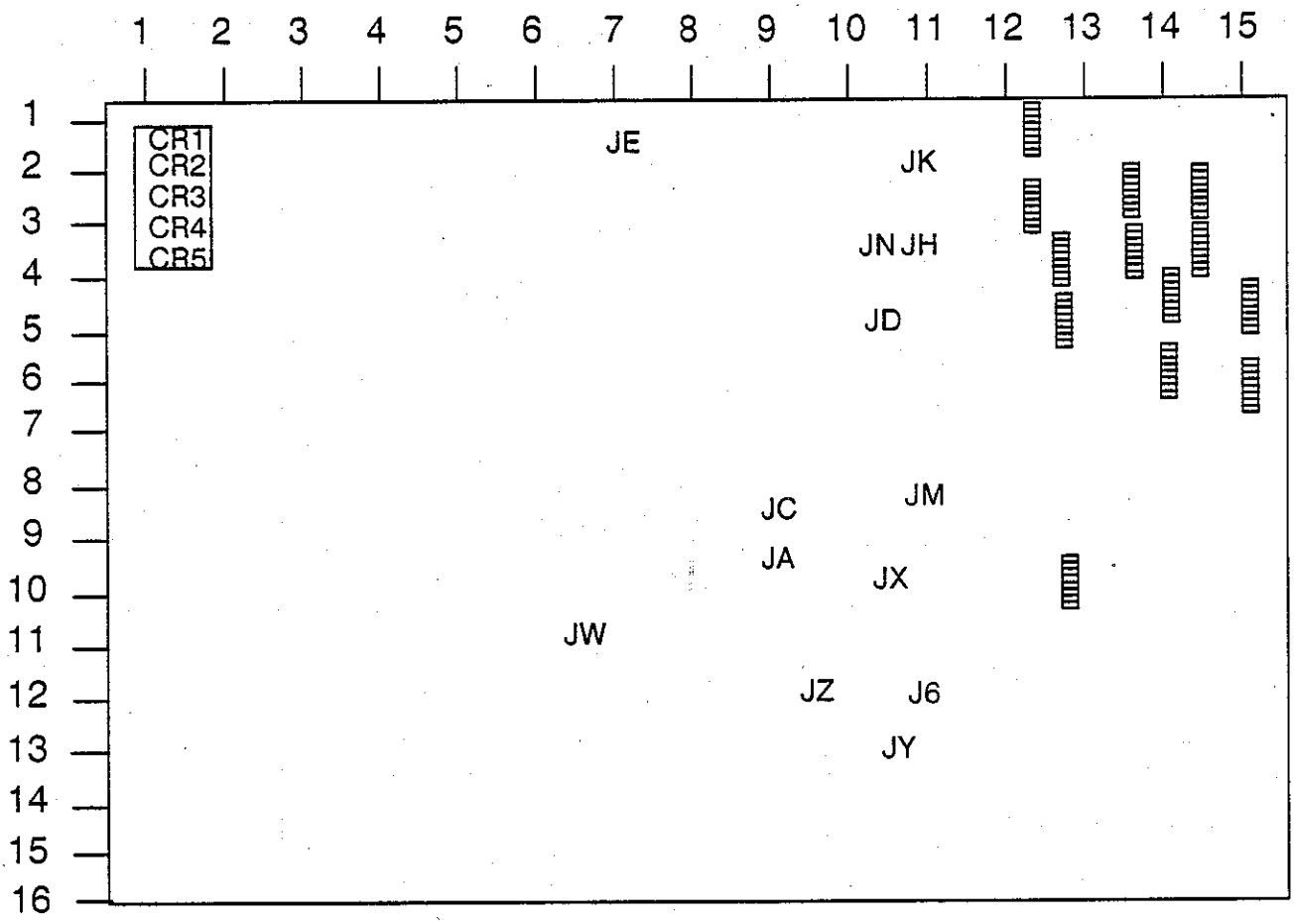


Figure A–18 Disk Controller Jumper/Switch Table

Jumper	Configuration	Location (inches)	Description
JE	4 o–o 3 2 o–o 1	1 1/2 down, 7 over	
JW	o o–o	11 down, 6 1/2 over	
JC	o 2 o 1	8 1/2 down, 9 over	

Figure A–18 Disk Controller Jumper/Switch Table (cont)

JA	26 ○ ○ 25 24 ○ ○ 23 22 ○ ○ 21 20 ○–○ 19 18 ○ ○ 17 16 ○ ○ 15 14 ○–○ 13 12 ○–○ 11 10 ○–○ 9 8 ○ ○ 7 6 ○–○ 5 4 ○–○ 3 2 ○–○ 1	9 1/2 down, 9 over	
JZ	○–○ ○ 3 2 1	12 down, 91/2 over	
JK	8 ○–○ 7 6 ○–○ 5 4 ○–○ 3 2 ○–○ 1	2 down, 10 3/4 over	
JN	○ 2 ○ 1	3 1/2 down, 10 1/2 over	
JH	○ 3 ○ 2 | ○ 1	3 1/2 down, 10 3/4 over	
JD	3 ○–○ 4 2 ○–○ 1	5 down, 10 1/2 over	
JM	○ 3 ○ 2 | ○ 1	81/2 down, 10 3/4 over	
JX	16 ○ ○ 15 14 ○ ○ 13 12 ○ ○ 11 10 ○ ○ 9 8 ○–○ 7 6 ○ ○ 5 4 ○ ○ 3 2 ○ ○ 1	10 down, 10 1/2 over	
JG	4 ○ ○ 3 2 ○ ○ 1	12 1/4 down, 10 3/4 over	
JY	○ 2 ○ 1	13 down, 10 1/2 over	

Figure A–18 Disk Controller Jumper/Switch Table (cont)

Switch	Configuration	Location (inches)	Description
S1–S8	S1–S3 = OFF S4 = ON S5 = OFF S6–S8 = ON	1 down, 12 1/4 over	
S1–S8	S1–S4 = OFF S5–S8 = ON	2 1/2 down, 12 1/4 over	
S1–S8	ON	3 3/4 down, 12 1/2 over	
Jumper	O–O O–O	10 down, 12 1/2 over	
S1–S8	S1–S3 = OFF S4 = ON S5–S7 = OFF S8 = ON	5 down, 12 3/4 over	
S1–S8	ON	2 1/2 down, 13 1/2 over	
S1–S8	ON	3 3/4 down, 13 1/2 over	
S1–S8	S1,S2 = ON S3 = OFF S4–S6 = ON S7, S8 = OFF	4 3/4 down, 14 over	
S1–S8	OFF	6 down, 14 over	
S1–S8	OFF	2 1/2 down, 14 1/2 over	
S1–S8	OFF	3 1/2 down, 14 1/2 over	
S1–S8	S1–S6 = ON S7, S8 = OFF	4 3/4 down, 15 over	
S1–S8	OFF	6 down, 15 over	

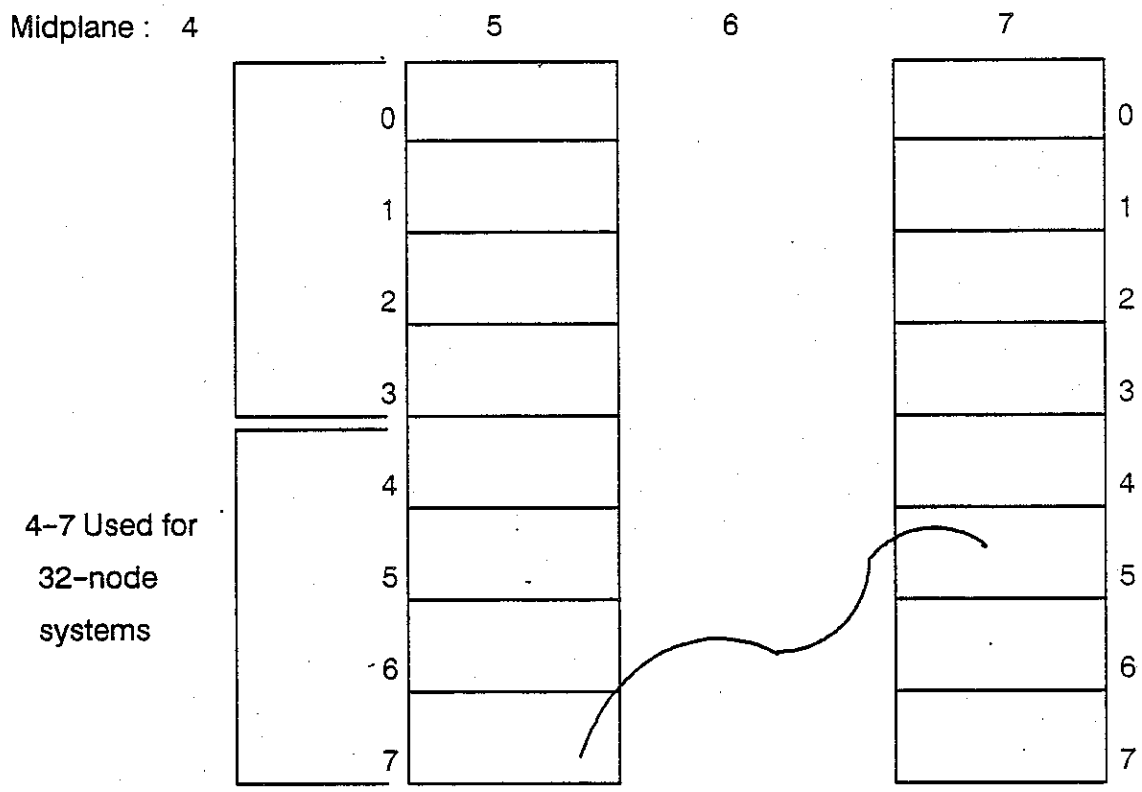
B

Cabling

The following describes the cabling used for a 32-processor TC2000 system.

- **TCS +5 power supply/midplane cable**—This is a pair of cables, black and red, that runs from the midplane to the TCS +5 power supply. There is one pair for each midplane in the system. For more than one midplane, the cables are tie-wrapped together.
- **Midplane/midplane data cable**—This is an intercabinet data cable that is connected according to the midplane identification number. In a 32-processor (4-expansion cabinet) system the midplanes are numbered from highest to lowest; i.e., 7 through 4. (If a new midplane is added, it becomes 3, etc.) The intercabinet midplane cable is always connected so as to correspond to its two midplane identifiers. For example, Figure B-1 illustrates a data cable connection between midplane 7 and midplane 5:

Figure B–1 Midplane to Midplane Connection



- **Midplane/Clock card data cable**—This cable connects to the same plug number on the clock card as the midplane number to which it is connected; e.g., midplane 7 connects to clock card plug 7. The clock card plugs are located on the bottom right of the clock card.
- **Midplane/Bulk Power Supplies**—There are two sets of cables per bulk power supply. One set
- **PDU/PDU**—One wire, daisy–chained, connects all the PDUs in the system together.
- **Peripheral PDU/TCS**—There is a control–out cord from the top of the TCS to the peripheral PDU.
- **SCSI Controller/1/4–inch Tape Drive**—There is one cable from the SCSI controller in the 6U VME Card Cage to the 1/4–inch tape drive in Control Panel assembly portion of the Utility cabinet.
- **6U VME Repeater/9U VME Repeater**—Two cables, one at the top and one at the bottom of each repeater, connects them to one another. (One cable is wider than the other.)

C

Field Replaceable Unit (FRU) Part Numbers

The following table lists the TC2000 Field Replaceable Units along with their part numbers.

Table C–1 TC2000 FRUs

Item	Part Number
scsi board kit	A101015G01
ethernet kit	A101004G03
b2vme, rptr kit	A101019G01
vme i/o option, 9u	A117009G01
b2loop kit	A101013G01
850 mb disk kit #1	A105004G01
1/4" tape & pwr cntrl	A107003G01
pdu	2214874G01
vme cardcage assy	2217303G01
i/o pwr supply assy	2217428G01
fan, 220/230 V	7014753–01
cable assy, fan ac	2417408G01
emi spring clips	8817286–01
disk controlr kit	A101016G01
tape controlr kit	A101018G01
term controlr kit	A101017G01
1/2" tape drive kit	A107004G01
perph cab pdu, domestic	2517355–01

pcb assy, modem, pc/at domestic	2514600-01
4 1/2" fan	7017373-01
tcs pc chassis, domestic	2214880G01
neon lamp, pdu	6015012-01
emi spring clips	8817286-01
air filter, slant area	8817411-01
air filter, drip screen	8817412-01
switch, drip screen, interlock	6717413-01
switch, thermal	6717414-01
pwr supply, 1500 W switcher	2517422-01
emi spring clips	8817286-01
base air filter	8814999-01
i/o pwr supply assy	2217428G01
vme cardcage assy 6U	2217303G01
850 mb disk kit #2	A105004G02
850 mb disk kit #3	A105004G03
850 mb disk kit #4	A105004G04
850 mb disk kit #5	A105004G05
16 port term kit	A113003G02
cable assy, clock	2414965-01
cable assy, b2clk power	2417372G01
cable assy, domestic pwr crd	2417369G01
cable assy, midplane tcs power	2417368G01
cable assy, logic to chassis gnd	2417370G01
cable assy, ground, bulk	2417494G01
cable assy, configuration,14"	2414966-01
cable assy, configuration, 24"	2414966-02
cable assy, configuration, 35"	2414966-03
cable assy, clock	2414965-01
cable assy, midplane tcs power	2417368G01

cable assy, pdu daisy chain	2417371G01
cable assy, domestic pwr crd	2417369G01
cable assy, pertec, flat shielded	2417479G01
cable assy, telco, tcs to rear panel	2414731G01
cable assy, telco, external	2417367G01
cable assy, uc internal ac dist.	2417374G01
cable assy, b2fp to pdu's	2417376G01
cable assy, tcs to fp	2414738G01
cable assy, ground jumper	2417480G01
cable assy, b2fp to switches	2417446G01
cable assy, uc pdu to bulkhead	2417473G01
cable assy, 1/4" tape scsi	2417448G01
cable assy, tcs to b2clk	2414732G01
cable assy, rs232, tcs to rear pnl	2415051G01
cable assy, tcs +5 power	2417375G01
cable assy, tcs +5 rtn	2417429G01
cable assy, 1/4" tape power	2417378G01
cable assy, upper fans ac dist.	2417447G01
cable assy, fan & i/o ac input	2417405G01
cable assy, safety control	2417407G01
cable assy, fan ac	2417408G01
cable assy, parallel	2417423G01
cable assy, jumper, bulk ac input	2417424G01

cable assy, bulk ac input	2417425G01
cable assy, i/o pwr & control	2417437G01
cable assy, i/o p/s ac	2417430G01
cable assy, bulk DC out	2417106G01
cable assy, i/o p/s, dc output	2417436G01
cable assy, smd a, flat, shld	2417477Gxx
cable assy, smd b, flat, shld	2417478Gxx
cable assy, repeater, J1	2417343-01
cable assy, repeater, J2	2417344-01
cable assy, rs232, 20' shielded	2417495G01
cable assy, uc to periph PDU	2417449G01
B2SS Assembly Rev A	2112470G01
B2SR Assembly Rev A	2114594G01
B2VME Assembly Rev A	2112472G01
B2CLK Assembly Rev B	2114872G01
B2MP Rev A SCD	A107004G01

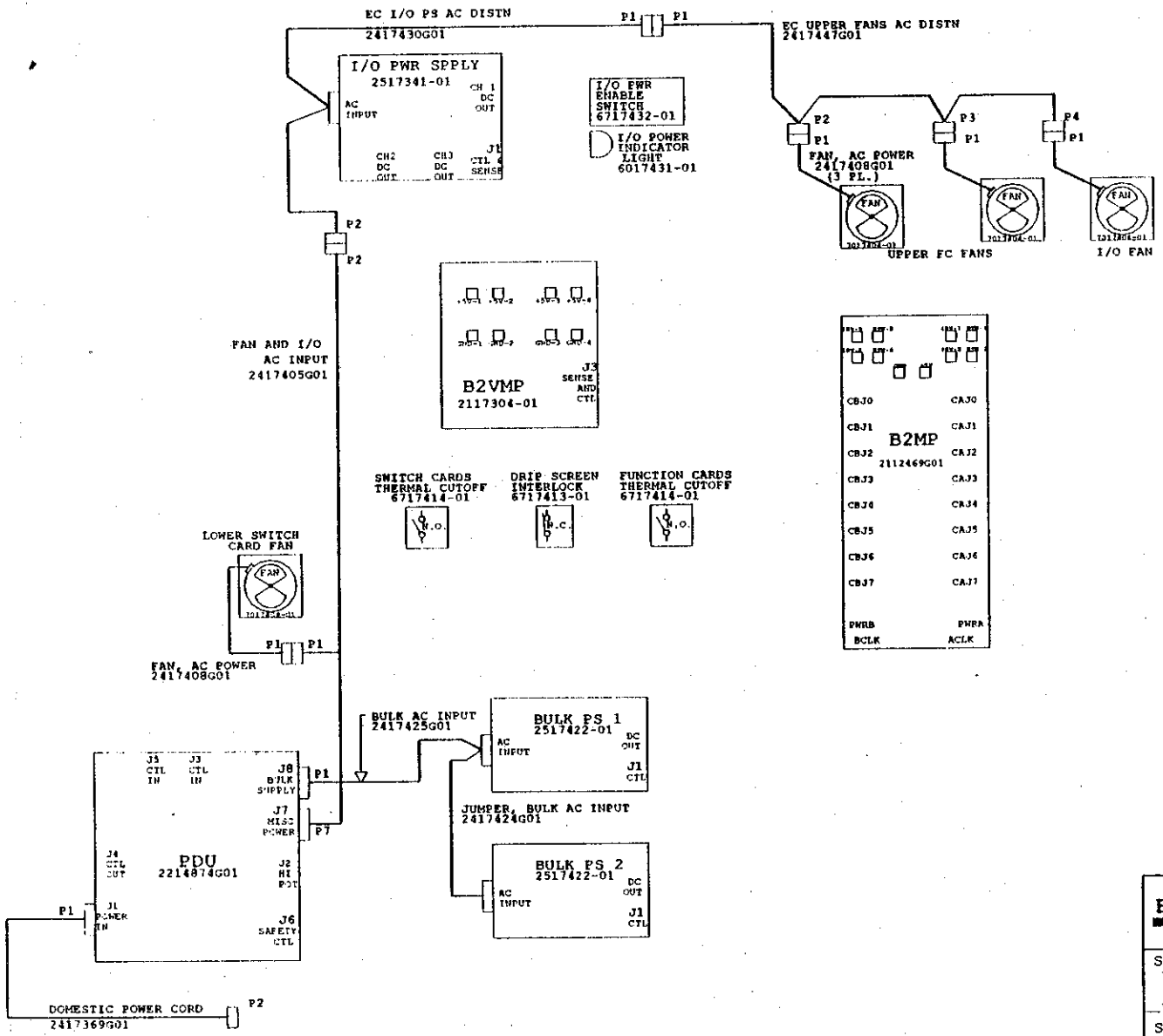
D

Wiring Diagrams

This appendix contains wiring diagrams for the expansion and utility cabinets:

- Expansion cabinet primary power wiring
- Expansion cabinet secondary control and power wiring
- Expansion cabinet data wiring
- Utility cabinet primary power wiring
- Utility cabinet secondary control and power wiring
- Utility cabinet data wiring

1	CURRENT REVISION LEVEL

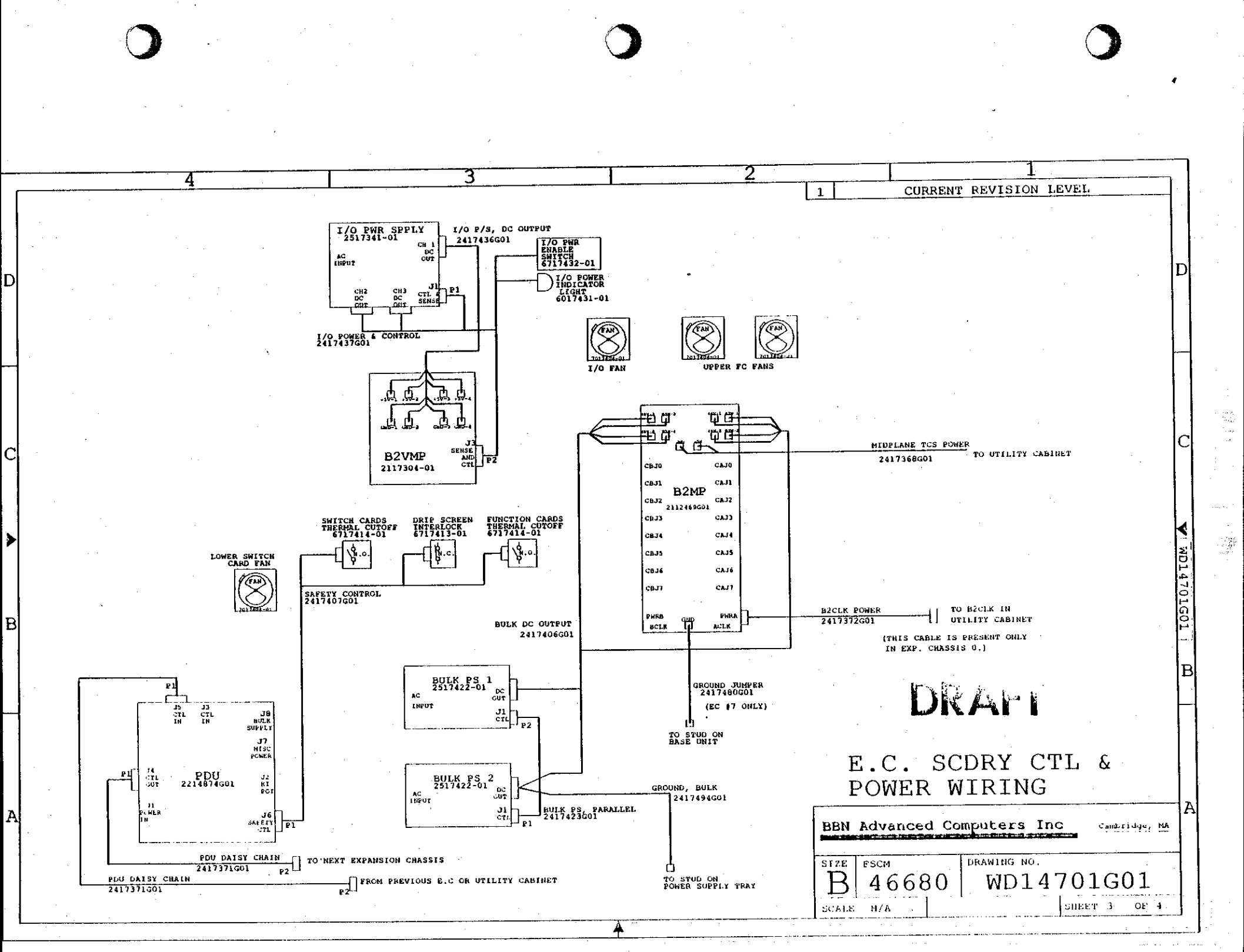


DRAFT

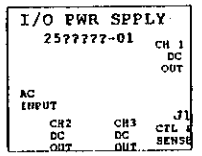
E.C. PRIMARY POWER WIRING

BBN Advanced Computers Inc		Cambridge, MA
SIZE B	FSCM 46680	DRAWING NO. WD14701G01
SCALE N/A		SHEET 2 OF 4

WD14701G01 : B

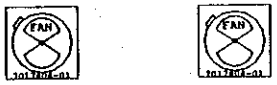

1 CURRENT REVISION LEVEL
I/O PWR SPPLY
2517341-01
AC INPUT
CH 1 DC OUT
CH2 DC OUT
CH3 DC OUT
J1 CTL & SENSE
P1
I/O P/S, DC OUTPUT
2417436G01
I/O PWR ENABLE SWITCH
6717432-01
I/O POWER INDICATOR LIGHT
6017431-01
I/O POWER & CONTROL
2417437G01
I/O FAN
UPPER FC FANS
B2VMP
2117304-01
J3 SENSE AND CTL
P2
B2MP
2112469G01
MIDPLANE TCS POWER
2417368G01
TO UTILITY CABINET
B2CLK POWER
2417372G01
TO B2CLK IN UTILITY CABINET
(THIS CABLE IS PRESENT ONLY IN EXP. CHASSIS 0.)
SWITCH CARDS THERMAL CUTOFF
6717414-01
DRIP SCREEN INTERLOCK
6717413-01
FUNCTION CARDS THERMAL CUTOFF
6717414-01
LOWER SWITCH CARD FAN
SAFETY CONTROL
2417407G01
BULK DC OUTPUT
2417406G01
GROUND JUMPER
2417480G01
(EC #7 ONLY)
TO STUD ON BASE UNIT
PDU
2214874G01
BULK PS 1
2517422-01
BULK PS 2
2517422-01
BULK PS, PARALLEL
2417423G01
GROUND, BULK
2417494G01
TO STUD ON POWER SUPPLY TRAY
PDU DAISY CHAIN
2417371G01
TO NEXT EXPANSION CHASSIS
PDU DAISY CHAIN
2417371G01
FROM PREVIOUS E.C OR UTILITY CABINET
DRAFT
E.C. SCDRY CTL & POWER WIRING
BBN Advanced Computers Inc
Cambridge, MA
SIZE B
FSCM 46680
DRAWING NO. WD14701G01
SCALE N/A
SHEET 3 OF 4

1	CURRENT REVISION LEVEL

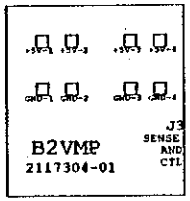


I/O PWR ENABLE SWITCH

I/O POWER INDICATOR LIGHT



UPPER FC FANS



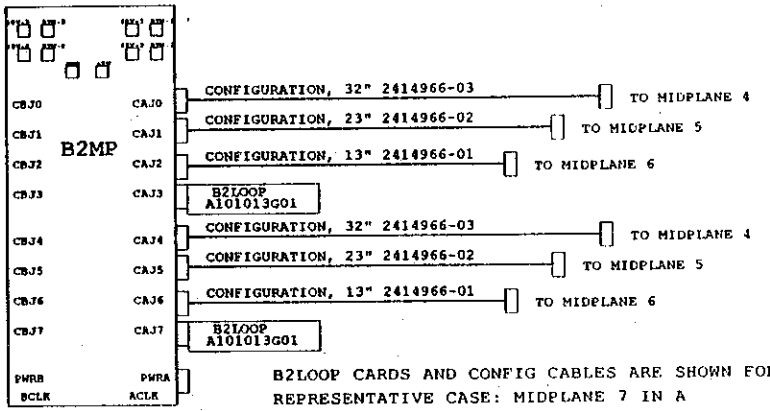
UPPER SWITCH CARD FAN

SWITCH CARDS THERMAL CUTOFF

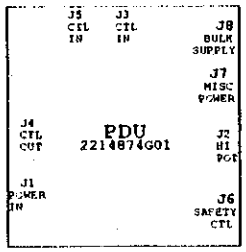
DRIP SCREEN INTERLOCK

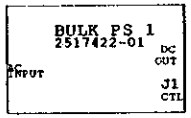
FUNCTION CARDS THERMAL CUTOFF

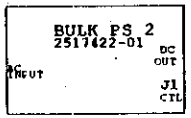
LOWER SWITCH CARD FAN



B2LOOP CARDS AND CONFIG CABLES ARE SHOWN FOR A REPRESENTATIVE CASE: MIDPLANE 7 IN A 32 SLOT (4 MIDPLANE) SYSTEM.







LOWER FC FANS

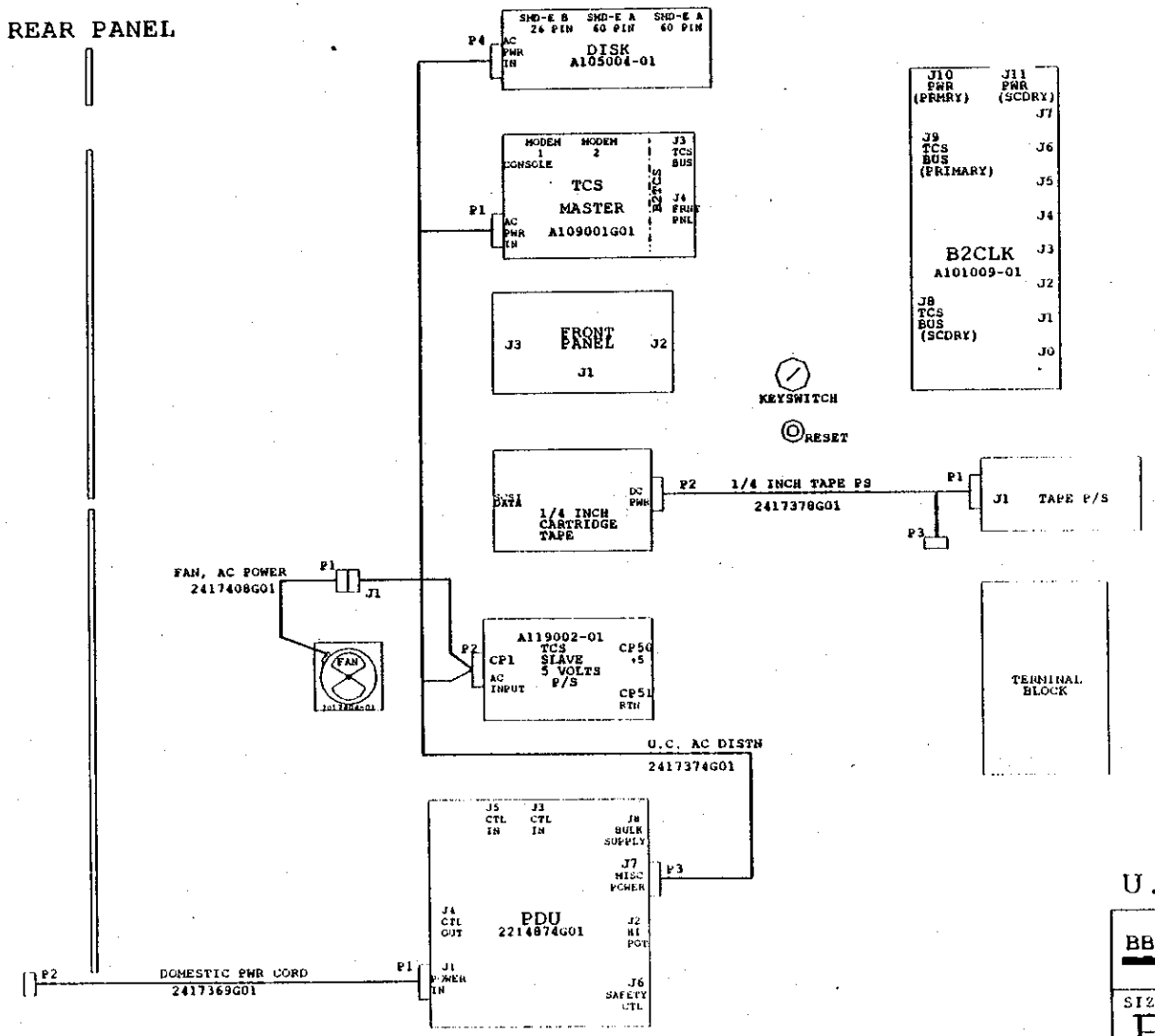
DRAFT

E.C. DATA WIRING

BBN Advanced Computers Inc — Cambridge, MA		
SIZE B	FSCM 46680	DRAWING NO. WD14701G01
SCALE N/A		SHEET 4 OF 4

WD14701G01 | B

1	CURRENT REVISION LEVEL



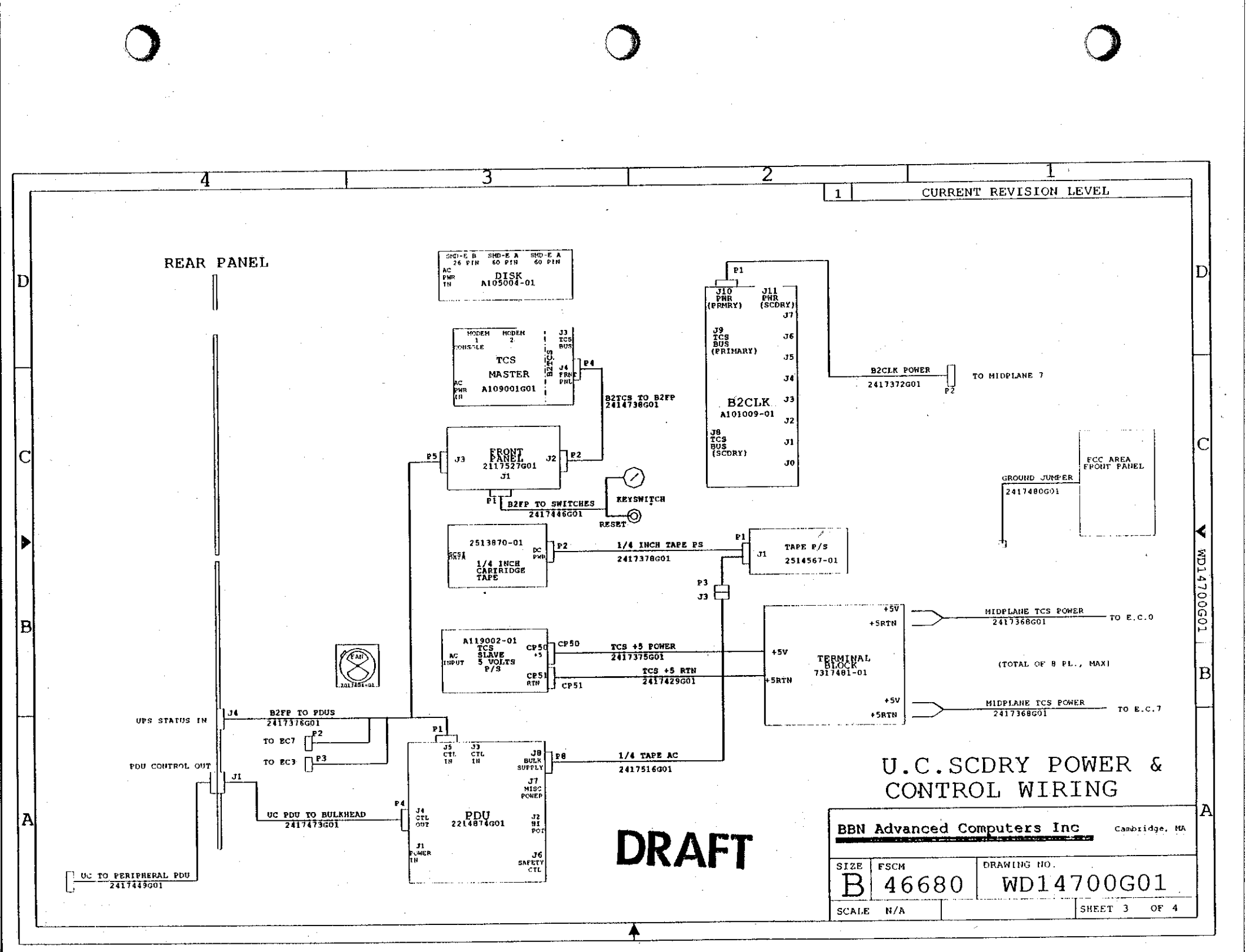
DRAFT

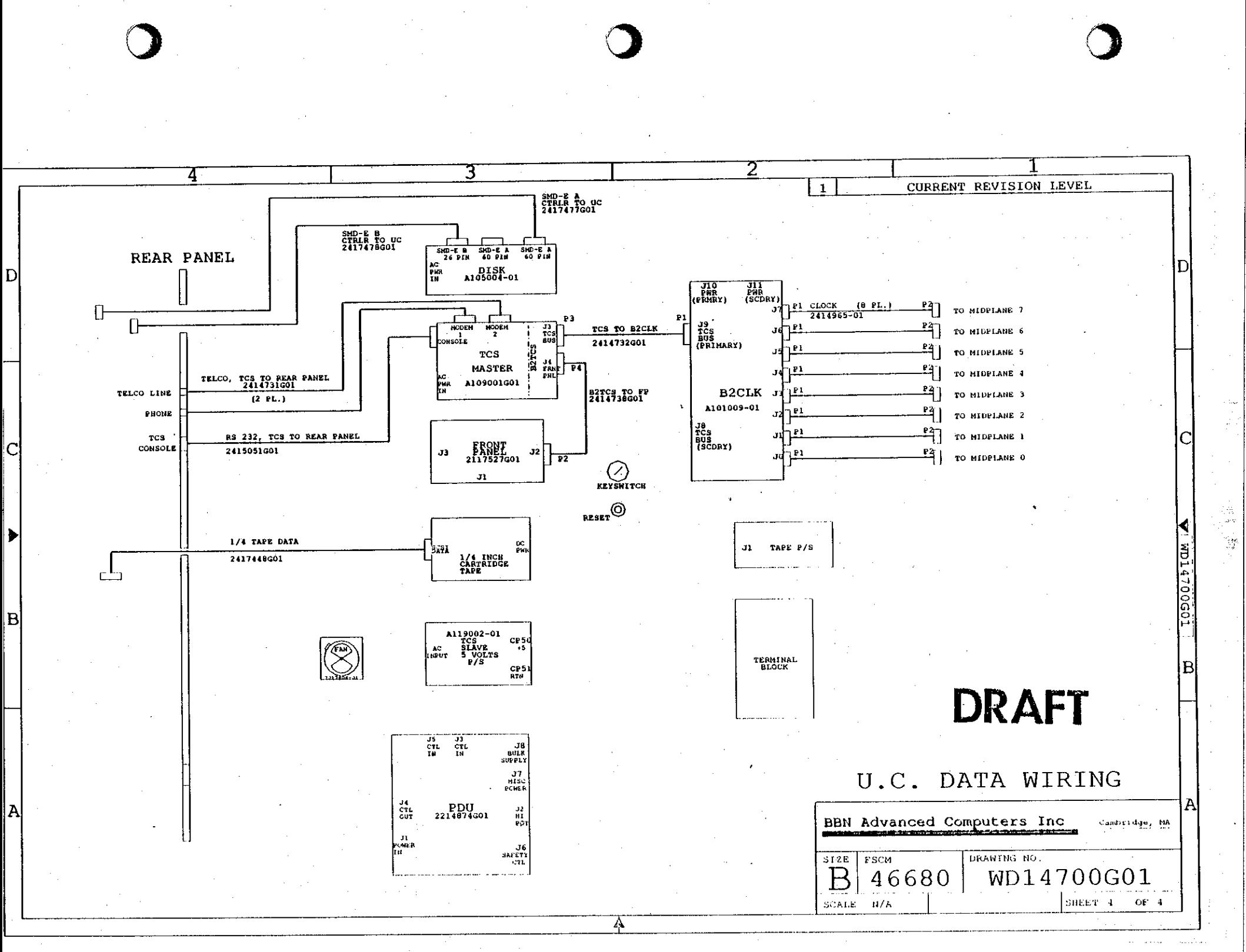
U.C. PRIMARY POWER WIRING

BBN Advanced Computers Inc — Cambridge, MA

SIZE	FSCM	DRAWING NO.
B	46680	WD14700G01

SCALE N/A — SHEET 2 OF 4


CURRENT REVISION LEVEL
REAR PANEL
DISK
A105004-01
TCS
MASTER
A109001G01
B2TCS TO B2FP
2414738G01
FRONT
PANEL
2117527G01
B2FP TO SWITCHES
2417446G01
KEYSWITCH
RESET
B2CLK
A101009-01
B2CLK POWER
2417372G01
TO MIDPLANE 7
GROUND JUMPER
2417480G01
ECC AREA
FRONT PANEL
2513870-01
1/4 INCH
CARIRIDGE
TAPE
1/4 INCH TAPE PS
2417378G01
TAPE P/S
2514567-01
A119002-01
TCS
SLAVE
5 VOLTS
P/S
TCS +5 POWER
2417375G01
TCS +5 RTN
2417429G01
TERMINAL
BLOCK
7317401-01
MIDPLANE TCS POWER
2417368G01
TO E.C.0
(TOTAL OF 8 PL., MAX)
MIDPLANE TCS POWER
2417368G01
TO E.C.7
FAN
UPS STATUS IN
B2FP TO PDUS
2417376G01
TO EC7
TO EC3
PDU CONTROL OUT
UC PDU TO BULKHEAD
2417473G01
PDU
2214874G01
1/4 TAPE AC
2417516G01
UC TO PERIPHERAL PDU
2417449G01
DRAFT
U.C.SCDRY POWER &
CONTROL WIRING
BBN Advanced Computers Inc
Cambridge, MA
SIZE B
FSCM 46680
DRAWING NO. WD14700G01
SCALE N/A
SHEET 3 OF 4
WD14700G01

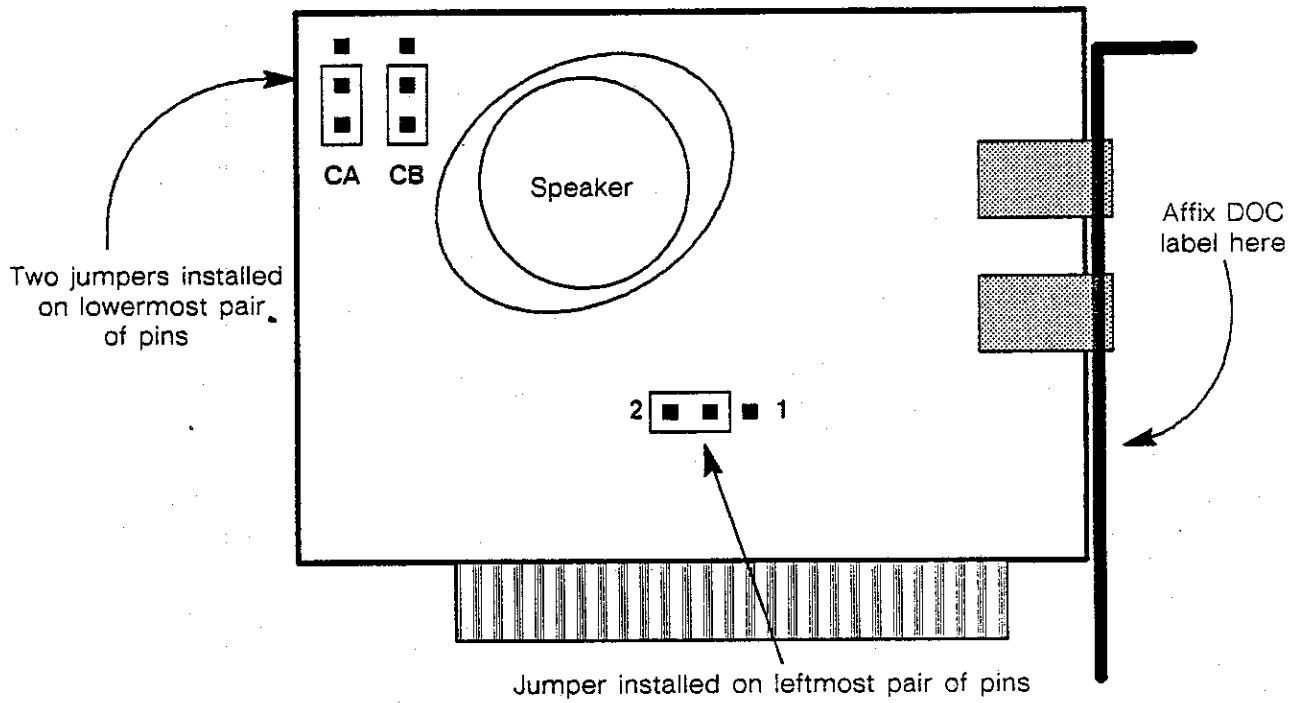

CURRENT REVISION LEVEL
REAR PANEL
SMD-E A CTRLR TO UC 2417477G01
SMD-E B CTRLR TO UC 2417478G01
SMD-E B 26 PIN
SMD-E A 60 PIN
SMD-E A 60 PIN
AC PWR IN
DISK A105004-01
MODEM 1
MODEM 2
CONSOLE
TCS MASTER
AC PWR IN
A109001G01
J3 TCS BUS
J4 FRNT PNL
P3
P4
TCS TO B2CLK 2414732G01
B2TCS TO FP 2414738G01
TELCO, TCS TO REAR PANEL 2414731G01 (2 PL.)
TELCO LINE
PHONE
TCS CONSOLE
RS 232, TCS TO REAR PANEL 2415051G01
FRONT PANEL 2117527G01
J3
J2
J1
P2
KEYSWITCH
RESET
J10 PWR (PRMRY)
J11 PWR (SCDRY)
J9 TCS BUS (PRIMARY)
B2CLK A101009-01
J8 TCS BUS (SCDRY)
P1 CLOCK (8 PL.) 2414965-01
TO MIDPLANE 7
TO MIDPLANE 6
TO MIDPLANE 5
TO MIDPLANE 4
TO MIDPLANE 3
TO MIDPLANE 2
TO MIDPLANE 1
TO MIDPLANE 0
1/4 TAPE DATA 2417448G01
1/4 INCH CARTRIDGE TAPE
DC PWR
J1 TAPE P/S
FAN
A119002-01 TCS SLAVE 5 VOLTS P/S
AC INPUT
CP50 +5
CP51 RTN
TERMINAL BLOCK
J5 CTL IN
J3 CTL IN
J8 BULK SUPPLY
J7 MISC POWER
J4 CTL OUT
PDU 2214874G01
J2 HI PDU
J1 POWER IN
J6 SAFETY CTL
DRAFT
U.C. DATA WIRING
BBN Advanced Computers Inc
Cambridge, MA
SIZE B
FSCM 46680
DRAWING NO. WD14700G01
SCALE N/A
SHEET 4 OF 4

Modem Installation

E.1 Pre-Installation Modem Set Up

The modem for the TCS Master is a Universal Data Systems "FasTalk 2400 PC". It must be configured to respond as the PC's COM1 communication device. Set the three jumpers as shown in Figure E-1 below. Affix the Canadian DOC label to the modem's metal bracket in the location as indicated.

Figure E-1 View of Component Side of FasTalk 2400 Modem Card



E.2 Modem Installation

Modem installation may occur during TC2000 site installation or at the factory.

In the case of on site installation the TCS Master enclosure will already be mounted in the TC2000's Utility Cabinet. The enclosure must be removed from the Utility Cabinet to install the modem.

1. Remove the cover from the TCS Master enclosure.
2. Remove the blank bracket from the 8th slot over from the power supply. Keep the original screw.
3. Install the modem card (SEQ# 1) in the 8th slot over from the power supply. Use the slot's original screw to secure.
4. Replace the TCS Master's cover using the original screws.
5. Replace the TCS Master enclosure into the TC2000 Utility Cabinet.

E.3 Cable Installation

There are three telephone cables in the Modem Kit. The modem comes with one, and BBNACI adds two more. The two short ones are installed between the modem and the Utility Cabinets rear panel.

1. Plug the cable that came with the modem into the modem's phone jack. Plug into the modem telephone jack that is farthest away from the TCS Master enclosure D connectors, labeled "WALL".
2. Plug the other end of this cable into the uppermost telco-jack in the Utility Cabinet rear panel labeled: "TELCO LINE". (This jack is a PC board assembly bolted onto the sheet metal rear panel. The cable is plugged into the jack on the *inside* of the cabinet.)
3. Plug the other short cable (SEQ# 3) into the modem. Plug into the telephone jack nearest the TCS Master enclosure D connectors, labeled "PHONE".
4. Plug the other end of this cable into the lowest telco-jack in the Utility Cabinet rear panel labeled: "PHONE". (This jack is a PC board assembly bolted onto the sheet metal rear panel. The cable is plugged into the jack on the *inside* of the cabinet.)
5. Plug the long telephone cable (SEQ# 2) into the Utility Cabinet telephone jack label "TELCO LINE" on the outside of the cabinet.
6. This completes the modem installation.

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Dear Customer:

To do a better job of serving you by providing improved documentation, we are asking you to help us. Please take a few minutes to answer the following questions and return them to us by folding up and taping this questionnaire. We value your comments and suggestions and appreciate the time you take to send them to us. Thank you.

1. What is your position/function? ☐ application user ☐ system manager/administrator ☐ programmer ☐ service engineer ☐ other

2. How many years have you been working with computer systems? _____

3. What system are you currently working on? (please check both **hardware** and *software*) ☐ **GP1000** ☐ **TC2000** ☐ *Mach 1000* ☐ *pSOS 1000* ☐ *nX* ☐ *pSOS+m*

4. What application are you using the product for? _____

5. How much of your time do you spend reading or referring to documents? ☐ 10% ☐ 20% ☐ 30% ☐ 40% ☐ 50%

Please answer the following questions about: TC2000 Maintenance Manual

6. Is the information accurate? ☐ always ☐ mostly ☐ seldom ☐ never

7. Is the material clear and logical? ☐ always ☐ mostly ☐ seldom ☐ never

8. Is it easy to find the information you need? ☐ always ☐ mostly ☐ seldom ☐ never

9. Does the index contain the words you look up? ☐ always ☐ mostly ☐ seldom ☐ never

10. Is the information located where you expect it in the book? ☐ always ☐ mostly ☐ seldom ☐ never

11. Are the illustrations and examples adequate? ☐ always ☐ mostly ☐ seldom ☐ never

12. Did you need information not available in this book or set of books? ☐ always ☐ mostly ☐ seldom ☐ never

13. What sections of the book did you use the most?

14. What areas need more or better examples? (Please list page numbers.)

_____

May we contact you for more information? If so, please give your name, address, and telephone number.

Do you have additional comments? If so, please write them on the reverse side.

After completing the form, **fold this end up to the dotted line**, fold down and tape the top, stamp, and mail. Thank you.

Additional Comments:

Documentation Department
BBN Advanced Computers Inc.
10 Fawcett St.
Cambridge, MA 02138

Tape here