SMS

SMS 1000
MICROCOMPUTER SYSTEM
MODELS 40, 41 AND 50
OEM MANUAL
FEBRUARY 1987

Scientific Micro Systems, Inc.

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FIGURE LIST

HOW TO USE THIS MANUAL

Here's a brief directory that will point you to the basic things you'll need to know to understand and operate your SMS 1000.

Fig. 1-1   SMS 1000 Microcomputer System

(Rack-mount, floor-mount and table-mount versions)

SECTION 1

SYSTEM OVERVIEW

INTRODUCTION

The SMS 1000 (Figure 1-1) is a single- or multiple-user micro-
computer system based on the DEC LSI-11 Q-bus architecture. It
is made in either a rack-mount, table-mount or a floor-mount
design. The basic system consists of (1) a six-slot Q-bus
backplane in which user-selected CPU's, memory cards, and other
modules can be installed; (2) a front panel with a sixteen-
character display and switches for controlling the SENSE Moni-
tor; (3) the system power supply; and (4) a system-integration
circuit board called the Foundation Module that includes a mul-
tifunction peripheral controller, two RS-232 serial ports, and
a set of special programs known as the SENSE Monitor. SENSE
reports system status, performs a wide variety of diagnostic
and utility functions and enables rapid changes in system par-
ameters. The SENSE functions can be carried out either from
your video display terminal or from the system's front panel
16-character display and controls.

Depending upon user requirements, various combinations of up to
two fixed-disk Winchester disk drives, one removable-cartridge
Winchester disk drive, one 8-inch floppy drive, up to two 5
1/4-inch floppy drives and a half-height streaming tape drive
can be selected. Also, an add-on start/stop cartridge tape
subsystem is available for software distribution and high-
capacity backup.

The SMS 1000 is designed to be fully customer installable. It
operates from standard 115- or 230-volt line power and has no
special wiring or cooling requirements.

The SMS 1000 is fully software compatible with DEC LSI-11 sys-
tems. All application and system software developed for the
LSI-11/23 and LSI-11/73 CPU's may be operated on the SMS 1000
without modification.

MANUAL APPLICABILITY: MODELS 40, 41 AND 50

This manual applies to the SMS 1000 Models 40, 41 and 50. Information on the SMS 1000 Model 41, including differences between it and the Model 40, and complete installation procedures, is given in Appendix F. A description of the SMS 1000 Model 50, including differences from the Model 40, as well as complete installation procedures, is given in Appendix G.

MODEL DIFFERENCES

The present manual describes the SMS 1000 Model 40 as a baseline system, and describes two other models in terms of their differences from the Model 40. These models are:

1. The SMS 1000 Model 41. The Model 41 is a data-storage subsystem that will operate with any MicroVAX II or LSI-11 computer system. In many respects the Model 41 is identical with the Model 40. The primary difference is that the Model 41 has no backplane slots for CPU or RAM. Instead, programs are run in the host system (to the backplane of which the Model 41 is connected by a 50-conductor cable) and the Model 41 provides additional peripheral data-storage such as hard disks, floppies and tape. See Appendix F for a description of the Model 41.

2. The SMS 1000 Model 50. The basic difference between the Model 40 and the Model 50 is that the Model 50 has a 12-slot backplane (versus six slots in the Model 40). For a description of the Model 50, see Appendix G.

PROCESSING POWER

The SMS 1000 provides you with a high degree of flexibility and rapid data throughput by use of an enhanced version of the DEC MSCP high-speed I/O architecture, a powerful disk controller, and the availability of the latest in fast-access Winchester drives. CPU power is provided by your choice of either the LSI-11/23 or the LSI-11/73 processors. Full floating-point capability is available on the LSI-11/23 and standard on the LSI-11/73. Also, RAM is available from SMS sized in increments as small as 256K bytes, from 256KB up to 4.0 MB, by adding the appropriate boards to the backplane. The SMS 1000 has the processing power to run a wide variety of operating systems, as described in the following paragraphs.

SOFTWARE

The following paragraphs describe the various operating systems and languages that can run on your SMS 1000. Included is a complete list of these operating systems with a brief description of each.

1. RSX-11. This family of real-time operating systems is designed to execute multiple programs concurrently. It includes RSX-11M, RSX-11M-PLUS, RSX-11S, and MICRO/RSX. It is suitable for real-time process control or data acquisition as well as multiple-user time sharing tasks involving large-scale transaction processing and information management. SMS currently distributes RSX-11M and RSX-11M-PLUS on 8-inch diskettes and 1/4-inch tape cartridges.

2. RSTS. This includes RSTS/E and MICRO/RSTS. These are multiple-user job oriented time sharing systems. They can support either batch or real time operation. Communication with either operating system is through the Digital Command Language (DCL). MICRO/RSTS is an application-only subset of RSTS/E that leaves more space available on a hard-disk drive for application programs and user data.

3. RT-11. RT-11 is a single-user system that permits a background job to run while real-time foreground tasks are being performed. Both can have access to all the system's resources. RT-11 supports one command terminal and up to 16 additional terminals. Some typical applications of RT-11 are instrument control, process control, word processing, and record management. Communication with RT-11 is through the Digital Command Language (DCL). The RT-11 system features an interactive installation procedure. SMS currently distributes this system on 8-inch or 5 1/4-inch diskettes and on 1/4-inch tape cartridges.

4. CTS-300. This system is designed to support commercial applications. It consists of RT-11 plus the DIBOL business-oriented language. CTS-300, like RT-11, supports one command terminal plus multiple additional terminals.

5. TSX-PLUS. This system can support up to 31 concurrent time-sharing users. TSX-PLUS can simultaneously support a wide variety of jobs and programming languages including COBOL-Plus, FORTRAN, BASIC, DIBOL, DBL, Pascal, C, MACRO-11, TECO, and KED. Most programs that run under RT-11 will run without modification under TSX-PLUS.

6. MICROPOWER/PASCAL. With MicroPower/Pascal you can design, build and test real-time application software on a host devel-

opment system running under a subset of RT-11.   The resultant
application programs can then be linked with appropriate run-
time software and downloaded to a target system.

7. ULTRIX-11. This is a multiple-user system consisting of the
Bell Laboratories' UNIX Timesharing System (Version 7) with
enhancements for systems such as the SMS 1000. ULTRIX-11 lan-
guages include C, FORTRAN-77, a BASIC-like interpretive
language, and RATFOR (FORTRAN with a C-like control structure).
ULTRIX-11 is designed to be easy to install.

8. DSM-11 and MUMPS. This is a multiuser system with data-
management capabilities and the high-level interactive language
MUMPS. DSM-11 is oriented toward the quick production of work-
ing code.   The MUMPS language has a semantic and syntactic
structure aimed at solving data-base related problems.

SCOPE OF THIS MANUAL

This manual contains complete information on site selection,
unpacking, installation, operation and user-performable service
for the SMS 1000 Models 40, 41 and 50. Section coverage of the
manual is as follows:

Section 1.	Introduction, general description, list of compatible software that can run with the SMS 1000, equipment supplied, and tables of system characteristics.
Section 2.	Site selection considerations
Section 3.	Installation and post-installation checkout
Section 4.	Includes rules governing power supply loading, bus loading, board strapping instructions, peripheral-strapping instructions, and bus priority specifications.
Section 5.	How to operate your SMS 1000 system, including how to boot and run the host and how to operate the SENSE Monitor.
Section 6.	Status Menu Commands for the SENSE Monitor

Section 7.   Operation Menu Commands for the SENSE
                  Monitor

Section 8.   Evaluation Menu Commands for the SENSE
                  Monitor

Section 9.   Configuration Menu Commands for
                  the SENSE Monitor

Section 10.   Preventive and corrective
                  maintenance, and
                  assembly/disassembly instructions

Appendix A.   Summary of SENSE commands

Appendix B.   Peripheral-device Specifications

Appendix C.   SMS 1000 Models 40 and 50: Table of
                  major system components.

Appendix D.   Table of Decimal/Octal/Hexadecimal
                  equivalent numeric values

Appendix E.   Error Messages

Appendix F.   Description of SMS 1000 Model 41

Appendix G.   Description of SMS 1000 Model 50

Appendix H.   Description of file-tape option

RELATED PUBLICATIONS

The following publications provide background and reference
information on the SMS 1000 microcomputer systems.

1. MICRO/PDP-11 Handbook. Digital Equipment
Corporation, 1983. Publication No.
EB-24944-18. This manual describes the various
configurations and options available with
MICRO/PDP-11 and LSI-11 based systems. A related
volume is: Microsystems Handbook, Digital Equipment
Corporation, Publication No. EB-26085-41.

2. PDP-11 Architecture Handbook. Digital
Equipment Corp., 1982. Pub. No. EB-23657-18.
Explains architecture of PDP-11/LSI-11 family,
including data representation, addressing modes,
instruction set, memory, busses,etc.

3. PDP-11 Processor Handbook. Digital Equipment

Corporation, 1981. Publication No. EB-19402-20.
Describes various levels of CPU's in PDP-11/LSI-11
family. Includes memory management, addressing,
and detailed instruction-set description.

4. PDP-11 Microcomputer Interfaces Handbook.
Provides users with reference material on
characteristics, configuration, and strapping
for various interface modules that operate with the
DEC LSI-11 Q-bus. Digital Equipment Corporation,
1983, publication No. EB-23144-18. NOTE: This
manual is the companion volume to the DEC
"Microcomputers and Memories Handbook" (1982),
Publication No. EB-20912-DP.

5. PDP-11 Systems and Options Handbook. Digital
Equipment Corporation, 1984. Publication
No. ED-30046-41. This is a catalog of all products
associated with the PDP-11/LSI-11. Includes brief
descriptions, ordering information, and an index
by part number.

6. PDP-11 Software Handbook. Digital Equipment
Corporation, 1982. Publication No. EB-25398-41

7. PDP-11 Software Source Book. Digital
Equipment Corp., 1985 (in two volumes). Pub. No.
EB-27333-41. This is a catalog of software available
for PDP-11/LSI-11 family. Includes full descriptions
and ordering information for each program.

8. Guide to RT-11 Documentation. Digital
Equipment Corporation., 1983. Pub. No. AA-5285G-TC.
This guide explains the various intricacies and
convolutions of RT-11 documentation so that you can
get where you need to go.

9. Introduction to RSX-11M and RSX-11M-PLUS.
Digital Equipment Corporation, 1981.
Publication No. AA-L763A-TC

10. TSX-PLUS System Manager's Guide (no document
number). S&H Computer Systems, Nashville, TN,
37212. This is the introductory volume for
TSX-PLUS.

11. ULTRIX Software Guidebook: A Reference to UNIX
Software. Digital Equipment Corporation, 1984.
Publication No. EJ-26153-20. This manual describes
a wide variety of applications that run on
ULTRIX software.

MODULES
PLUGGED INTO
BACKPLANE

BACK PANEL

COOLING FAN 1
(CARDCAGE AREA)

EXTERNAL CONNECTORS

POWER CORD

COOLING FAN 2
(PERIPHERALS AREA)

AC ON/OFF SWITCH

PEDESTAL

AC POWER INPUT
CONNECTOR

POWER SUPPLY BOARD

FLOPPY DISK DRIVE

BACKPLANE

FRONT PANEL
DOOR

CONTROLS AND
INDICATORS

WINCHESTER DISK DRIVE

FOUNDATION MODULE

SIDE COVERS

FRONT PANEL

0 0 0 2
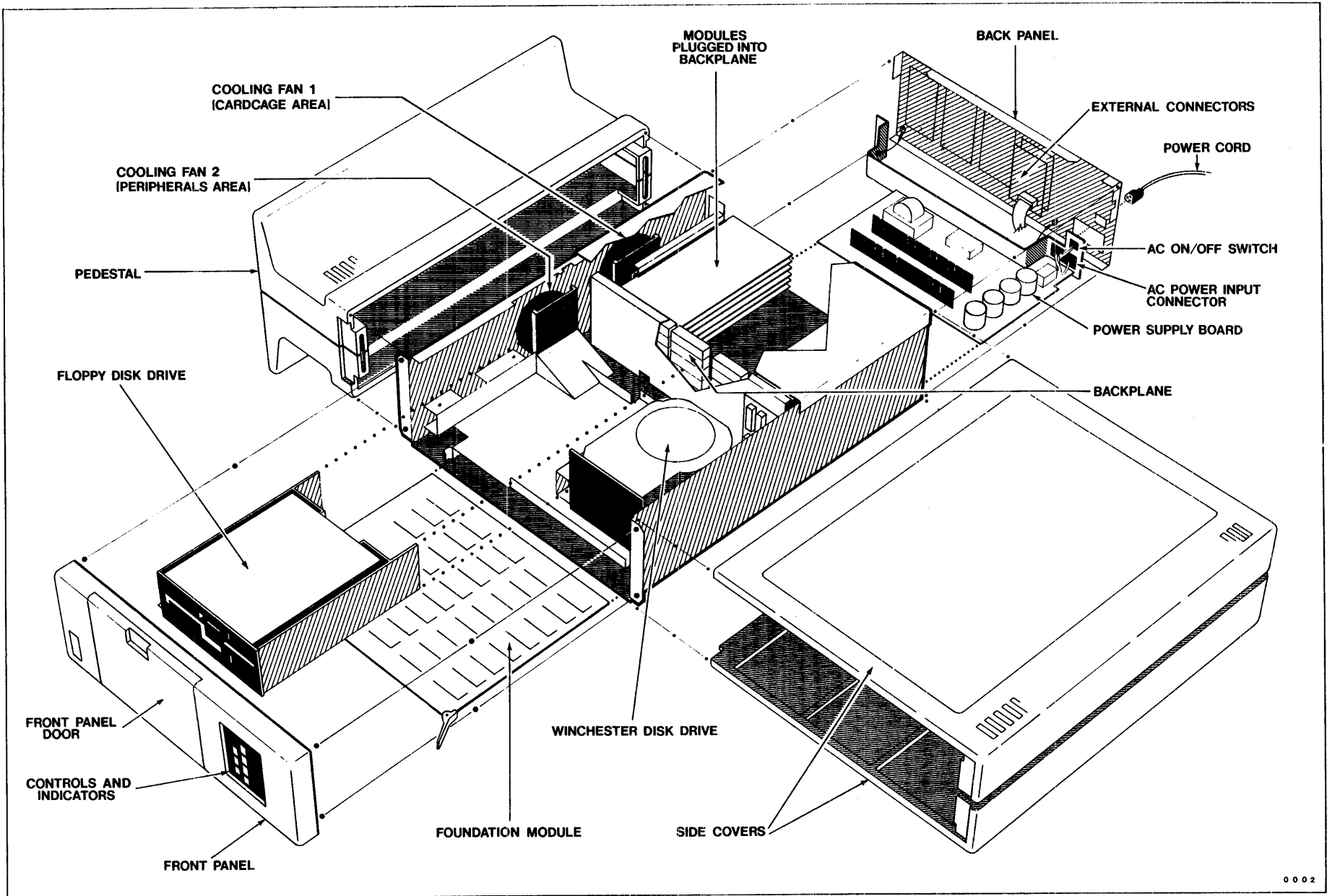
Fig. 1-2   Disassembly of SMS 1000

16-CHARACTER DISPLAY WINDOW

16-CHAR DISPLAY

MENU   ◁   ▷   *

RE START   RUN HALT   WRT PROT

BACK PANEL

FUSE

AC POWER CORD RECEPTACLE

AC ON/OFF SWITCH AND LAMP

SUPPORT MONITOR SUBSYSTEM AND CPU SWITCHES

DC ON/OFF SWITCH

FLOPPY DRIVE

A0 (CONSOLE)

A1 (PRINTER)

EXTERNAL CONNECTORS

SYSTEM ENCLOSURE

FRONT PANEL

0 0 0 3
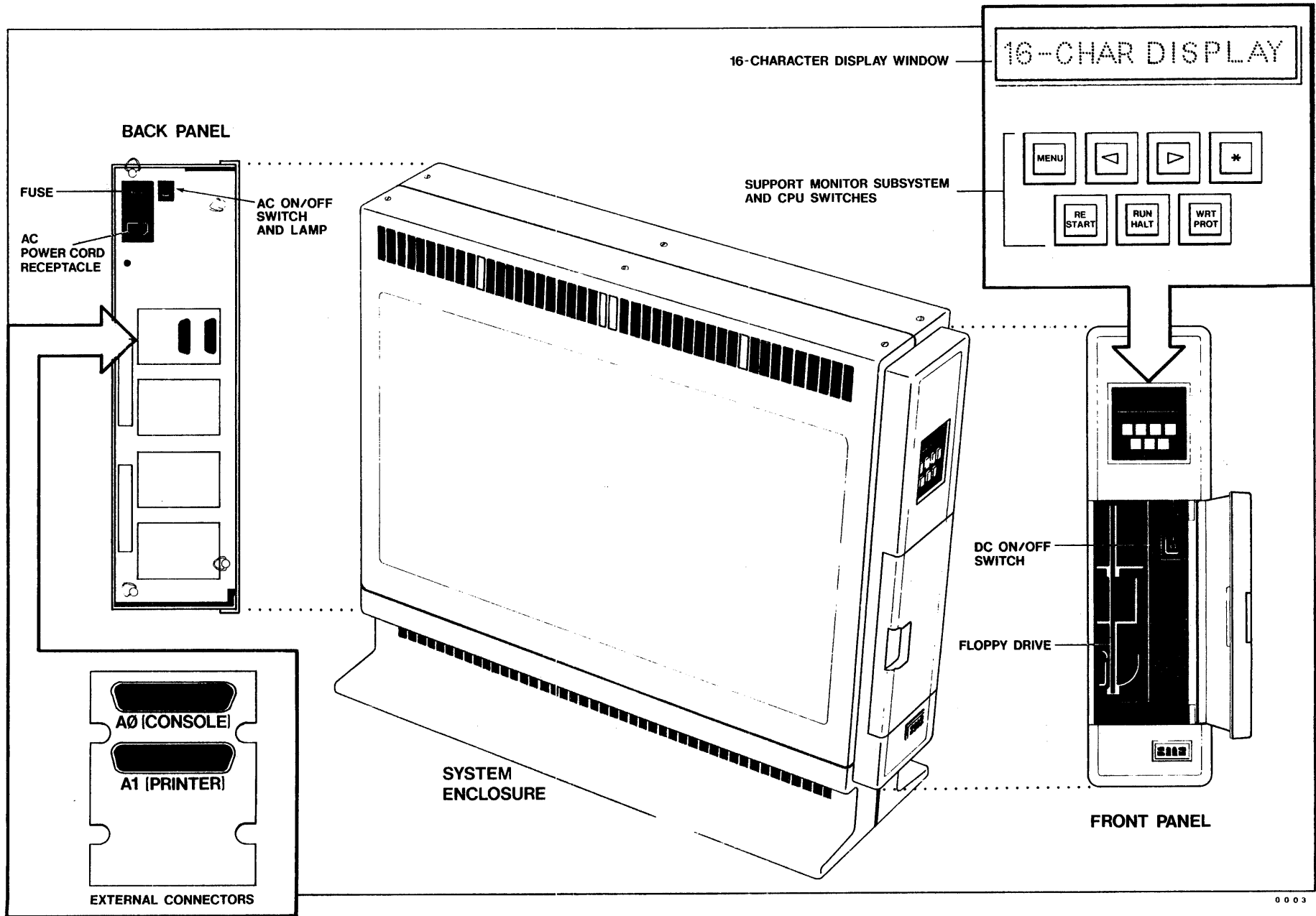
Fig. 1-3   Enclosure, front panel and rear panel

SYSTEM DESCRIPTION

PHYSICAL DESCRIPTION. An assembly view of the units that
make up the SMS 1000 is shown in Figure 1-2.   The system is
designed for ease of disassembly.   All fasteners attaching
units to the frame are easily releasable either by hand or by a
standard screwdriver. The units that make up the SMS 1000 are
described as follows:

1. ENCLOSURE, FRONT PANEL AND REAR PANEL (Figure 1-3).   The
enclosure itself contains mounting brackets for the system
components and two cooling fans. The front panel contains a
16-character vacuum-fluorescent display (VFD) for status-
,message- or parameter-readout, and seven pushbutton switches
that permit communication with the SENSE Monitor. A door in
the front panel opens to allow access to the floppy disk
drive(s) and to the DC ON/OFF switch.

2. FOUNDATION MODULE (Figure 1-4). The foundation module is
a single PCB that is held in place by two slide rails and two
latches. It plugs into two connectors at the bottom edge of
the backplane.

3. BACKPLANES WITHOUT RESTRICTED C/D SLOTS (Figure 1-5A).
The backplane is a group of six quad-width sockets connected
together to operate as an LSI-11 bus. It contains the CPU,
memory, and other modules that make up the basic SMS 1000
microcomputer. The backplane and the card cage are attached
to the rear cover panel and associated brackets by twelve
screws. The backplane can accomodate six quad-wide Q-bus
modules, 12 dual-wide Q-bus modules or any combination of
these. "Quad" and "dual" refer to the number of backplane
connector sections required by a module; that is, quad occupy
four connector sections and dual occupy two connector sec-
tions.   NOTE: Systems with this type of backplane do NOT have
a caution sticker on the left side of the cardcage supporting
structure. Refer to Figure 1-6.

4. BACKPLANES WITH RESTRTICTED C-D SLOTS (Figure 1-5B).   The
C-D connectors of backplane slots 1 and 2 on later versions of
the SMS 1000 Model 40 backplane (or slots 1, 2 and 3 on Model
50 backplanes) have been connected differently from those of
earlier versions. Because of this new wiring, dual-width
cards plugged into the slot 1 or 2 C-D connectors of the new
backplane may be damaged. If your system has this type of
backplane, there will be a CAUTION label on the left rear
flange of the cardcage supporting structure, as shown in
Figure 1-6. This caution applies to all Model 50 backplanes.

5. POWER SUPPLY (Figure 1-6).   The power supply for the
system is contained on a single board which is held in place

by two slide rails and two latches. It plugs into an 80-pin card-edge connector located on the opposite side of the back-plane from the foundation module.

6. 8-INCH FLOPPY DRIVE . One 8-inch floppy drive can be accommodated in the SMS 1000. This and other floppy drives used in this system are of the slim-line (i.e. half-height) design. The 8-inch floppy drive is mounted so that easy access for insertion or removal of diskettes can be gained by opening the front-panel door. See Figure 1-7 for a diagram of all currently available SMS 1000 peripheral configurations.

7. 5-1/4-INCH FLOPPY DRIVE . The SMS 1000 can accomodate up to two 5-1/4-inch, half-height floppy drives, as shown in Figure 1-7. As with the 8-inch floppy, access to the drive is gained through the front-panel door.

8. 5-1/4-INCH WINCHESTER DRIVE. The SMS 1000 can contain up to two 5-1/4-inch, full-height Winchester-type hard-disk drives. If two Winchester drives are used, they are mounted in a side-by-side configuration, as shown in Figure 1-7.

9. CARTRIDGE-TYPE TAPE DRIVE. Two types of tape drive are available. A 5-1/4-inch slimline (i.e. half-height) stream-ing tape drive can be mounted in the system enclosure (see Figure 1-7). This drive can be used for image backup or, if the option is selected, for file-oriented backup. For a full description of the file-oriented backup option, see Appendix H. Also, a start/stop tape drive in a stand-alone cabinet (including its own controller and power supply) can be speci-fied. Either type of drive can be used for high-capacity backup and for software distribution.

10. CARTRIDGE-TYPE WINCHESTER DRIVE. A 5-1/4 inch slimline removable-cartridge Winchester drive can be mounted in the system enclosure. It can be used for all normal Winchester-drive purposes as well as for such functions as rapid, high-capacity backup and software distribution. Cartridge inser-tion and removal is rapid and simple.

TO FRONT-PANEL
CONTROLS AND INDICATORS

SELF-TEST LED

TO DC ON/OFF
SWITCH
(FRONT PANEL)

J112

J115

CONTROLLER AND
SYSTEM MONITOR
PROMS

U7

U6

U5

80188
PROCESSOR

U20

GATE
ARRAY

U30

U114

U113

J109

J104

J107

J106

J105

P110

J108

P111

SIGNAL CONNECTORS
TO
PERIPHERAL UNITS

BOOT PROMS

CONNECTORS TO BACKPLANE

0021
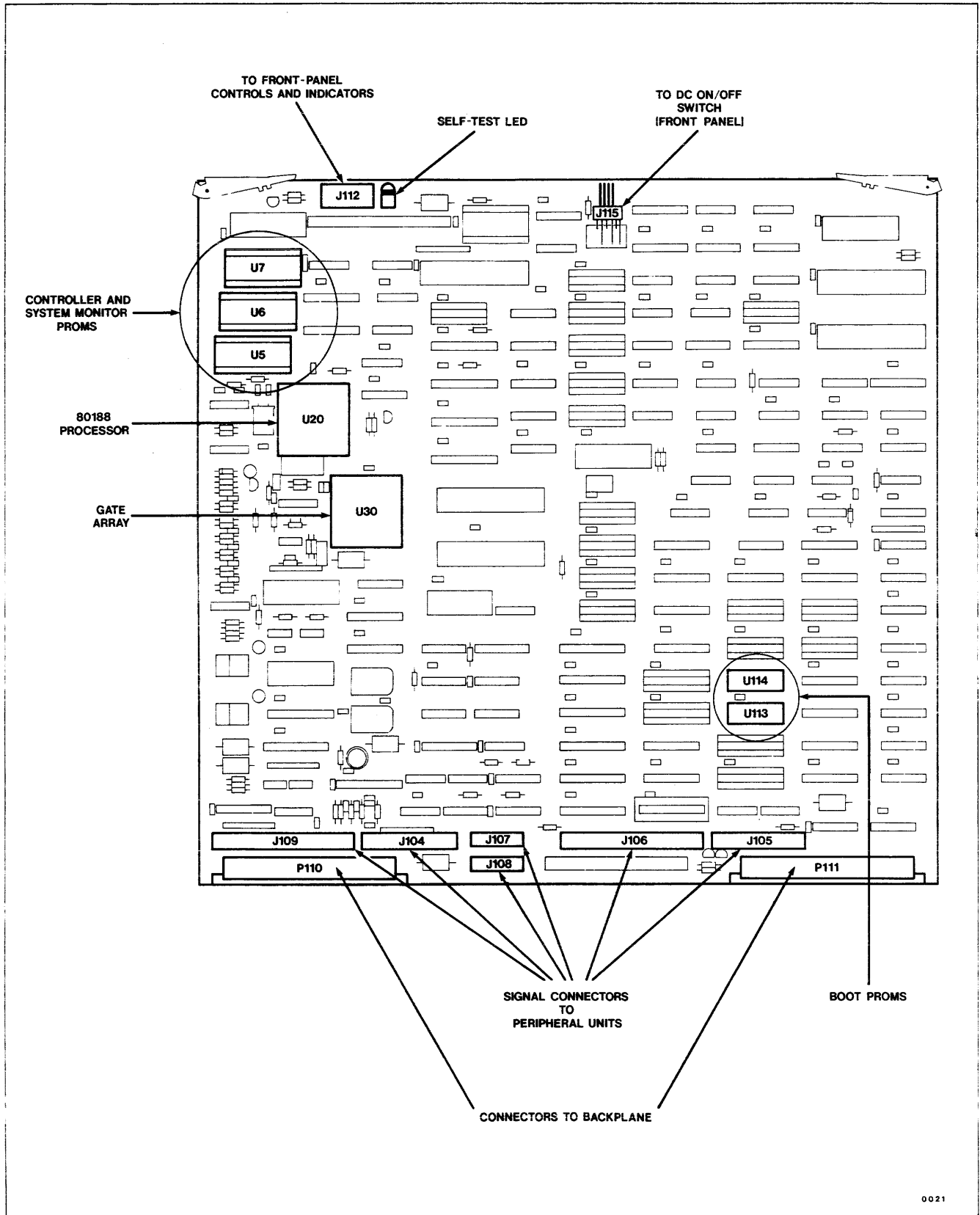
Fig. 1-4   Foundation Module

NOTES: 1. IF JUMPER W5 IS CONNECTED, FULL POWER IS APPLIED TO
CARDCAGE AREA FAN B1 (VIA J11)

2. IF JUMPER W6 IS CONNECTED , FULL POWER IS APPLIED TO
PERIPHERAL AREA FAN B2 (VIA J12)

3. CORRESPONDING PINS OF J13, J14, J15 AND J16 ARE ALL
CONNECTED IN PARALLEL
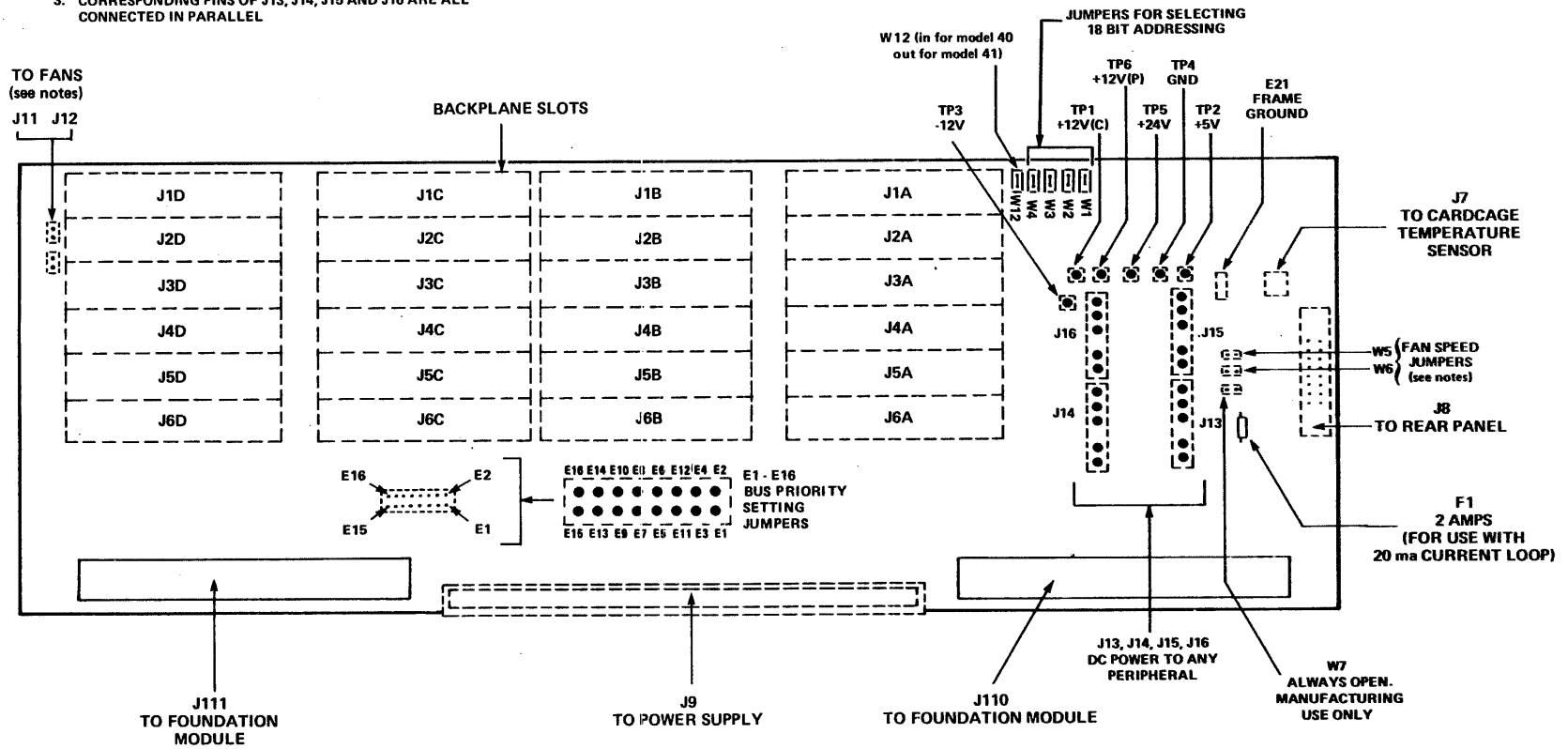
Fig. 1-5A   Backplane without restricted C-D connectors
in slots 1 and 2

DETAIL A

DETAIL B

NOTES: 1. CAUTION: DUAL WIDTH Q-BUS MODULES PLUGGED INTO
C-D CONNECTOR SLOTS 1 OR 2 MAY BE DAMAGED.

2. IF JUMPER W5 IS CONNECTED, FULL POWER IS APPLIED TO
CARDCAGE AREA FAN B1 (VIA J11)

3. IF JUMPER W6 IS CONNECTED, FULL POWER IS APPLIED TO
PERIPHERAL AREA FAN B2 (VIA J12)

4. CORRESPONDING PINS OF J13, J14, J15 AND J16 ARE ALL
CONNECTED IN PARALLEL

W10

W11

W8

W9

JUMPERS FOR SELECTING
18 BIT ADDRESSING

W12 (in for model 40
out for model 41)

TO FANS
(see notes)

J11 J12

SEE NOTE

BACKPLANE SLOTS

TP3
-12V

TP6
+12V(P)

TP1
+12V(C)

TP4
GND

TP5
+24V

TP2
+5V

E21
FRAME
GROUND

J1D

J1C

J1B

J1A

J7
TO CARDCAGE
TEMPERATURE
SENSOR

J2D

J2C

J2B

J2A

J3D

J3C

J3B

J3A

J4D

J4C

J4B

J4A

J16

J15

W5 FAN SPEED
JUMPERS
W6 (see notes)

J5D

J5C

J5B

J5A

J6D

J6C

J6B

J6A

J14

J13

J8
TO REAR PANEL

E16

E2

E16 E14 E10 E6 E8 E12 E4 E2

E1 - E16
BUS PRIORITY
SETTING
JUMPERS

DETAIL B

DETAIL A

E15

E1

E16 E13 E9 E7 E5 E11 E3 E1

F1
2 AMPS
(FOR USE WITH
20 ma CURRENT LOOP)

J111
TO FOUNDATION
MODULE

J9
TO POWER SUPPLY

J13, J14, J15, J16
DC POWER TO ANY
PERIPHERAL

J110
TO FOUNDATION MODULE

W7
ALWAYS OPEN.
MANUFACTURING
USE ONLY

Fig. 1-5B   Backplane with restricted C-D connectors
in slots 1 and 2

SYSTEM OPERATION

Figure 1-8 is a block diagram showing information flow between components of an SMS 1000 system. The basic SMS 1000 system is made up of the foundation module; the system enclosure, which includes the front panel with its 16-character display and accompanying controls, and the rear panel with its external connectors to user-selected video terminals, keyboards and printers; the backplane into which plug the user-selected CPU, memory boards and other modules; and the power supply. Also mounted within the system enclosure are various possible combinations of user-selected peripherals (see Figure 1-7).

FOUNDATION MODULE

As shown in Figure 1-8 the foundation module performs the following functions:

1. COMMUNICATION. The foundation module provides a two-channnel RS-232 communication interface between the Q-bus and external units such as terminals and printers. Each of these asynchronous serial communication ports operates in the same manner as a DEC DLV11-J line. Transmit and receive speeds for each channel are the same. You can select baud rates for each channel by means of controls on the front panel or by means of a menu-driven video terminal. The SENSE Monitor also uses the RS-232 interface in order to communicate with external devices.

2. DISK AND TAPE I/O CONTROL. The foundation module acts as a mass-storage peripheral controller for hard- and soft-disk storage units and tape units. Communication between the Q-bus and these peripherals is handled by a DEC-compatible SMS implementation of the MSCP (Mass Storage Control Protocol) architecture. This controller architecture arbitrates all I/O resource contention, executes all peripheral access requests, provides overlapped seeking and non-interleaved disk access, and performs flaw mapping and error correction. The foundation module also supports block-mode transfers between the disk and main memory.

3. SYSTEM SUPPORT. The foundation module contains the SENSE Monitor, a ROM-resident set of programs that allow you to perform diagnostics, isolate component failures, examine system status, change various system parameters and perform utility functions such as backup and load, and format disks. Because SENSE resides in ROM, it is always available for your use without the necessity of loading or reloading. The various system-configuration parameters are stored in EEPROM so that

IF CAUTION LABEL APPEARS HERE,
YOUR SYSTEM HAS A BACKPLANE
WITH RESTRICTED C-D CONNECTORS
IN SLOTS 1 & 2. DUAL-WIDTH CARDS
PLUGGED INTO THOSE CONNECTORS
MAY BE DAMAGED.

CARDCAGE

BACKPLANE
CARDCAGE
STRUCTURE

POWER SUPPLY
BOARD

POWER SUPPLY
1/4-TURN FASTENERS (2)

SLOT FOR PRYING OPEN
COMPARTMENT DOOR

AC POWER SWITCH

AC POWER CORD RECEPTACLE

AC FUSE AND 115V/230V- SELECTION
COMPARTMENT

0009

Fig. 1-6   Power Supply

they can be changed as necessary, through interaction with the SENSE menu system. SENSE supplies the 16-character front-panel display (or your video display terminal) with menus, status indications, parameters and test results. Signals from the seven front-panel pushbuttons (or your terminal keyboard) permit selection of menus, choice of parameters, the selection of other system functions, and write protection.

4. BOOT PROM. When you power-up or restart the system, the host calls upon the boot prom for the code necessary to initially locate and load either an applicaton or the operating system software to be run on the LSI-11 CPU.

5. LINE TIME CLOCK. The line time clock provides a user-selectable 50 Hz, 60 Hz, or 800 Hz signal that the system can use to generate time-of-day information for general system timing.

BACKPLANE

Modules such as CPU card, memory cards, interface cards, etc., are plugged into a common-circuit board called the backplane (Figures 1-5A and 1-5B). The SMS 1000 backplane consists of an LSI-11 22-bit Q-bus with six slots, each capable of taking one quad-height printed-circuit board or two dual-height printed-circuit boards. The backplane can accomodate any combination of dual- or quad- height cards.

In order to allow for the use of certain newer quad-wide CPU boards in addition to the dual-wide LSI-11/23 and LSI-11/73 CPU's, the C-D connectors of backplane slots 1 and 2 on later versions of the Model 40 backplane have been connected differently from those of earlier versions (see Figures 1-5B and 1-6). Dual-width boards plugged into these C-D slots may be damaged. Backplanes with restricted C-D slots may be identified by the presence of a CAUTION label on the left rear flange of the card-cage supporting structure. The A-B connectors of slots 1 and 2 function in the same manner as before the change.

The Q-bus provides communication among CPU, memory, peripheral devices and system control units. There are 22 address lines in the Q-bus , corresponding to the 22 bits of the system's physical address space. Sixteen of these 22 lines are timeshared for data transfer. Optionally, 18-bit addressing can be selected by opening four traces on the backplane. All bus transactions are asynchronous.

Note that both the foundation module and the power supply board plug into connectors along the lower edge and on opposite sides

of the backplane. This method leaves all six backplane slots free for the insertion of other system modules. The backplane is the central point from which DC power is distributed to the foundation module and to all integral peripheral storage units, as well as to the modules plugged into the backplane itself.

The backplane also provides d-c power connections to the two cooling fans. Three levels of fan speed are obtainable. Either of the two slower fan speeds is selectable from the front panel or the console (using SENSE commands), depending upon noise and cooling requirements. The third (and fastest) level of fan speed is obtainable by making jumper connections on the back-plane. Depending upon the jumpers selected, either or both fans can be set to operate at a constant maximum speed.

FRONT-PANEL AND BACK-PANEL CIRCUITS

As shown in Figure 1-8, the front panel contains a 16-character display and seven pushbutton switches. The display is driven by the SENSE circuits on the foundation module. SENSE causes various menus associated with its four main system functions to appear on the display. These four functions are: Status, Configuration, Operation, and Evaluation. The seven pushbutton switches on the front panel are used to invoke and control various phases of SENSE operation. These functions include: moving from menu to menu; advance to next item within a menu; going back to previous item within a menu; selection of a displayed menu, item within a menu, or a command; restart; CPU run/halt; and write-protecton of Winchester drives. See Sections 5 through 9 of this manual for a full descripton of SENSE operation and commands.

The front panel also contains an ON/OFF switch that controls the application of DC power to all units of the SMS 1000. This switch is located behind the door on the front panel. Power consumption with a-c on and d-c off is negligible.

The rear panel (Figure 1-8) contains all external connectors for RS-232 communication with units such as terminals, printer, or to additional users or peripherals. The rear panel also contains cutouts to permit the addition of other connectors and external cables. All cutout shapes and dimensions are DEC compatible. Jumpers behind the rear panel permit selection of the 20-ma current-loop communication mode in conjunction with user-supplied equipment.

SMS 1000: POSSIBLE PERIPHERAL COMBINATIONS

LEGEND:

W0 = 5¼" Winchester 0   5F1 = 5¼" Floppy 1

W1 = 5¼" Winchester 1   8F = 8" Floppy

5F0 = 5¼" Floppy 0   T = 5¼" Streaming tape drive
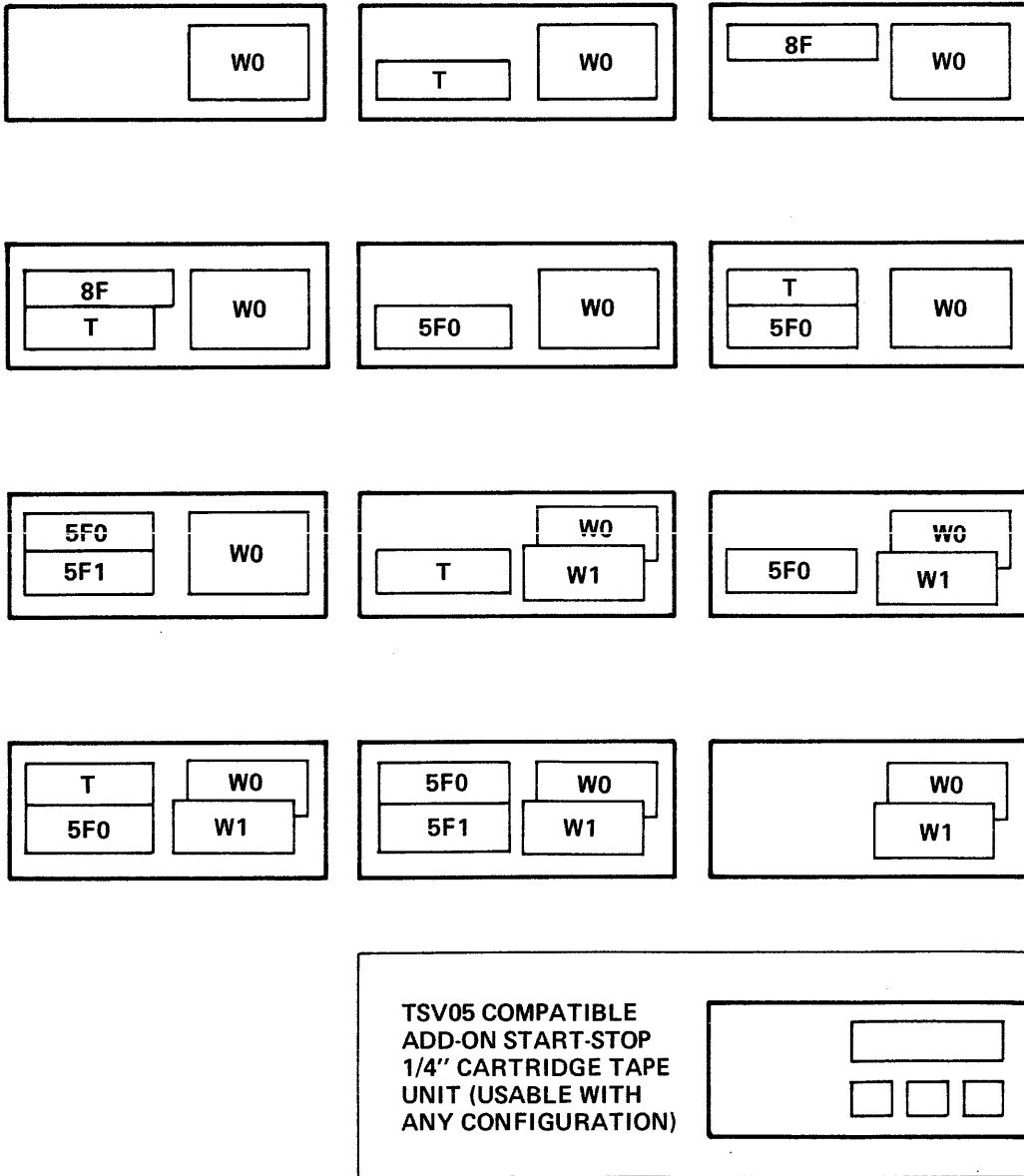
Fig. 1-7   System Peripheral Configurations

FOUNDATION MODULE *

VIDEO TERMINAL & KEYBOARD (USER-SELECTED)

PRINTER OR SECOND TERMINAL (USER-SELECTED)

REAR PANEL *

EXTERNAL CONNECTORS

RS-232 INTERFACE

LINE TIME CLOCK

BOOT PROM

LSI-11 22-BIT Q-BUS BACKPLANE *

LSI-11/23 OR LSI-11/73 CPU

MEMORY RANGE: 256K to 4.0MB

USER-SELECTED MODULES

80188 SUPPORT- AND PERIPHERAL- MICROPROCESSOR

FRONT PANEL *

16-CHARACTER DISPLAY

MENU ◁ ▷ *

RE START | RUN HALT | WRT PROT

CONTROLS

DC ON/OFF SWITCH

TO DISPLAY

FROM SWITCHES

SENSE MONITOR

MASS-STORAGE- CONTROL- PROTOCOL PERIPHERAL CONTROLLER

M S C P

SIX QUAD-WIDTH SLOTS

START-STOP CARTRIDGE TAPE UNIT

PERIPHERAL INTERFACE

POWER SUPPLY *

AC ON/OFF SWITCH

+5V
+12V
+24V
-12V

115V/230V AC IN

5¼" CARTRIDGE- WINCHESTER DISK DRIVE (1)

5¼" WINCHESTER DISK DRIVE (1 or 2)

8" FLOPPY (1)

5¼" FLOPPY (1 or 2)

5¼" STREAMING TAPE DRIVE (1)

LEGEND

* THESE UNITS ARE COMMON TO ALL CONFIGURATIONS

Fig. 1-8   Functional Block Diagram of SMS 1000 Model 40

POWER SUPPLY

The power supply for the SMS 1000 (Figure 1-6) is contained on a single board that plugs into an 80-pin connector on one edge of the backplane board. The a-c input power connector and the AC ON/OFF switch are located on a bracket at the rear of the power-supply board. The a-c input receptacle also includes a line filter.

The power supply provides operating voltages to all units of the SMS 1000 including peripherals mounted in the cabinet. These voltages include +5 volts, +12(P) volts (to peripherals), +12(C) volts (to the backplane), -12 volts and +24 volts. The input a-c power source can be in either of two selected ranges: 90 to 130 volts or 180 to 250 volts. The input frequency can vary from 47 Hz to 63 Hz without causing a degradation of output. The power supply has both overvoltage and overcurrent protection features. An input line fuse is also provided.

An ON/OFF switch behind the front-panel door is provided to control application of d-c power to the SMS 1000. Use of this switch effectively turns off the entire system while a-c continues to be applied to the power-supply input, ready to activate the system without turn-on delays.

EQUIPMENT SUPPLIED

The following table describes both the basic SMS 1000 system that is common to all configurations and also describes the user-selectable modules, options and peripherals that are available with this system.

TABLE 1-1

EQUIPMENT SUPPLIED

==

NAME	PART NO. OR DESIGNATION	DESCRIPTION

==

BASIC SYSTEM

==

| LSI-11
Q-bus
backplane | 0004530-0001 | This is a 22-bit bus. It contains six quad-width slots that can accomodate any Q-bus compatible card of dual or quad height. 18-bit addressing is selectable by opening four jumpers on the backplane. |

NOTE: In Model 40 systems that have a CAUTION label on the rear of the cardcage supporting structure (see Figures 1-5B and 1-6), the C-D connectors of backplane slots 1 and 2 have been rewired to allow for use of certain quad-width CPU cards. Because of this rewiring, dual-width cards plugged into the C-D connectors of slots 1 or 2 may be damaged. The A-B connectors of slots 1 and 2 function in the same manner as before the change.

Front Panel	0004559-0001	Contains 16-character readout and seven pushbutton switches that provide communication with the SENSE Monitor. Also contains d-c ON/OFF switch (behind door).
Rear Panel Assembly	0004561-0001	Contains AC power switch and external connectors. Removable panels permit addition of extra connectors, depending upon configuration. Jumpers behind the rear panel permit optional selection of the 20-ma current-loop mode in conjunction with user-supplied equipment.
Floor-mount, table-mount or rack-mount system enclosure	0004562-0001	Provides mounting locations for all components of the system, including various choices of peripherals. Also contains cooling fans. Rack-mount configuration includes slides.
Foundation module	1002086-0001	Contains peripheral control circuits; two RS-232 serial ports; Q-bus control circuits; and all circuits necessary to run the SENSE monitor.
Power supply	9001076-0001	Switch-selectable for input a-c power of 115 or 230 volts. Provides +5, +12, +24 and -12 volts to the SMS 1000. Power-supply fuse is accessible through opening on rear panel.

==

USER-SELECTABLE CPU MODULES

==

LSI-11/23	SMS No.: CPU23.	KDF11-AA dual-width board. 16-bit CPU with memory management.

LSI-11/73	SMS No.: CPU73.	KDJ11-AB dual-width board. 16-bit CPU with 8KB cache, floating point and memory management. Can accommodate FP-73 floating-point upgrade option.

===

USER-SELECTABLE MEMORY MODULES

===

256KB Card	SMS No.: MEM256.	22 bit addressing. Does not support block mode. This option includes the MSV11-LK module or equivalent, integration and test.
512KB Card	SMS No.: MEM512.	22-bit addressing. Supports block mode. This option includes the MSV11-PL module or equivalent, integration and test.
1024KB Card	SMS No.: MEM1024	22-bit addressing. Supports block mode. This option includes a CMV-1000 or equivalent module, SMS strapping, integration and test.
2048KB Card	SMS No.: MEM2048	22-bit addressing. Supports block mode. This option includes a CMV-504 or equivalent module, SMS strapping, integration and test.

===

OTHER USER-SELECTABLE MODULES

===

Serial Line Unit	SMS No.: DLV4.	Interfaces four asynchronous serial RS-232 I/O ports to the LSI-11 bus. This option includes the DLV11-J dual-height module, or equivalent, internal cables, rear panel plate, integration, and test.
Four-Port MUX	SMS No.: DZQ4.	Enables program-controlled multiplexing of four asynchronous serial lines with modem control on all lines. Interfaces RS-232 I/O lines to the LSI-11 bus. This option includes the DZQ11 dual width module, or equivalent, internal cables, rear panel plate, integration and test.
Eight-Port MUX	SMS No.: DHV8.	This option is an asynchronous multiplexer which provides eight full-duplex asynchronous serial data

		channels for Q-bus systems. Applications include data concentration, terminal interfacing, and cluster controlling. The DHV8 option includes the DHV11 quad width module (or equivalent), internal cables, rear panel plate, integration and test.
Floating Point Microcode Option for LSI-11/23 CPU	SMS No.: FP11.	Provides single- and double-precision floating-point capability for the LSI-11/23 (KDF11-AA) CPU. This option consists of the KEF11-AA 40-pin dual-chip carrier, which mounts on the KDF11-AA CPU board. NOTE: When this option is added to an LSI-11/23 board, no changes to jumpers are necessary.
Floating Point Accelerator for LSI-11/73 CPU	SMS No.: FP73.	15 MHz CPU accelerator for the LS-11/73. The FP73 option consists of the FPJ11-AA accelerator board, which mounts on the KDJ11-AB CPU board.

===

USER-SELECTABLE PERIPHERALS

===

8" Floppy (slimline)	9001258-0001	Tandon Model TM848-2E, double sided/double density, or equivalent.
5-1/4" Floppy (slimline)	9001256-0001	Panasonic Model JU465, double sided/ 96 TPI, or equivalent.
5-1/4" Winchester hard-disk drive	9001006-0001	12 MB. Full height. Seagate Model ST412; Computer Memories Inc. (CMI) Model CM5412; or equivalent.
	9001385-0001	12MB. Half height (4 Heads). Seagate Model ST212, or equivalent.
	9001468-0001	12MB. Half height (2 Heads). Seagate Model ST213, or equivalent.

	9001024-0001	19 MB. Seagate Model ST419; Computer Memories Inc. (CMI) Model CM5619; or equivalent.
	9001336-0001	25MB. Half height. Seagate Model ST225, or equivalent.
	9001081-0001	42 MB. Quantum Model Q540, or equivalent.
	9001135-0001	70 MB. Vertex Model V170, or equivalent.
	9001331-0001	85 MB. Maxtor Model XT-1085, or equivalent.
	9001136-0001	140 MB. Maxtor Model XT1140, or equivalent.
5-1/4" Cartridge-type Winchester disk drive (slimline)	9001292-0001	12MB. DMA Systems Inc. Model 360, or equivalent.
	9001296-0001	Removable 12MB cartridge for DMA Systems Inc. Model 360, or equivalent.
	9001524-0001	12MB. SyQuest Model SQ312RD.
	9001525-0001	Type SQ200 removable cartridge used with SyQuest Model SQ312RD drive.
5-1/4" Cartridge-type streaming tape drive (slimline)	9001315-0001	Tandberg TDC 3309 9-track drive with TDC 3350 Mk. II QIC-02 formatter board.
	9001056-0001	DC600A-type 1/4"-inch data cartridge for use with streaming tape drive
	9001425-0001	Interface module for use with streaming tape drive when file-tape option is installed. For a full description of the file-tape option refer to Appendix H.
Start-stop 1/4-inch Tape Drive	SMS No.: FWT01180	This is a cartridge-type stand-alone unit with its own power supply. Includes cables for connection to SMS 1000.

SYSTEM CHARACTERISTICS

The following table lists various physical and operational characteristics of the SMS 1000.

TABLE 1-2

SYSTEM CHARACTERISTICS

CHARACTERISTIC	DESCRIPTION
Rack-mount system	
Height	5.25 inches
Width	19 inches
Depth	25 inches (27 inches including bezel)
Weight	50-60 lbs., based on configuration
Table-mount system	
Height	6.55 inches
Width	19.8 inches
Depth	26.65 inches (including bezel)
Weight	55-65 lbs., based on configuration
Floor-mount system	
Height	25 inches
Width	10 inches (at base)
Depth	25 inches (27 inches including bezel)
Weight	65-75 lbs., based on configuration
Operating temperature	10 deg C to 35 deg C
Storage temperature	-20 deg C to 50 deg C
Humidity	20 percent to 80 percent
Altitude	Sea level to 50,000 feet
Supply voltage and current	90 volts to 130 volts AC, 6 amps; or 180 volts to 250 volts AC, 3 amps, depending upon switch setting on power supply. Input a-c line is fused. The a-c input receptacle includes a line filter.
Supply frequency	47 Hz to 63 Hz without degradation of operation

DC power supply output voltages	+5 volts at 45 amps. +12(C) volts at 4 amps to backplane (cardcage). +12(P) volts at 10 amps to peripherals. -12 volts at 4 amps. +24 volts at 2 amps for peripherals and fans. Supply has automatic short-circuit protection. All d-c voltages are regulated. Maximum peak-to-peak ripple and noise is 50 millivolts for +5 volts, and 100 millivolts for all other voltages, when measured under a constant load of at least 250 watts. Maximum power output is 325 watts.
DC ON/OFF switch	Located behind door on front panel. Controls all d-c power to system.
Cooling	Two fans, each under independent front-panel control, can be set at either a low or medium speed. Also, a third (and highest) speed for either fan can be selected by means of a jumper setting on the backplane.
R-F Interference	Meets or exceeds FCC Class A requirements.

SECTION 2

SITE SELECTION

SITE SELECTION CONSIDERATIONS

In selecting a site for installing your SMS 1000 the main
considerations relate to such matters as temperature, air
flow, air quality (i.e., contaminants in the air, etc.),
input a-c line quality and dependability, traffic pattern
near the machine, and security. In general, an office envi-
ronment that is comfortable for people is suitable for the
SMS 1000. Place the SMS 1000 where it has adequate air cir-
culation. It is especially important to provide free air
flow to the fan inlet, which must not be blocked by cables
or mounting hardware.

In selecting a site for the SMS 1000 system, attention must
also be paid to the following points:

1. ROOM ATMOSPHERE. Avoid areas having high levels of
dust or other particulates, or vapor-type contaminants
in the air. Also, extremes of heat, cold and humidity
must be avoided. If the system is used in an environ-
ment that has very low humidity, it is advisable to
employ antistatic measures. Such measures include
spraying with an antistatic aerosol spray, using antis-
tatic carpets and mats, or placing the system on a tile
floor instead of a carpet.

2. TRAFFIC PATTERN. If the SMS 1000 is to be floor
mounted, pay attention to the traffic pattern in the
vicinity of the unit. Avoid wire runs that are not
protected from floor traffic. Also, avoid locations
where passing traffic is likely to raise a significant
amount of dust.

3. WIRE RUNS. In planning wire runs to terminals and
printers, observe the RS-232 requirements regarding
line length, shielding and adequacy of grounding.

4. INPUT A-C LINE. The a-c input source to the system
must be as dependable as possible and free from surges,

noise and spikes. It may be necessary to plan the use of a dedicated line and to employ line-protection and conditioning devices such as isolation transformers, line voltage regulators, surge protectors, line filters, shielding, etc.

5. MAINTENANCE ACCESSIBILITY. Be sure that the system location allows easy accessibility for routine maintenance. In particular, with floor-mounted units, be sure that cables to the unit are long enough to permit the system to operate when pulled from its normal location to an area that allows accessibility for service. For diagrams showing actual system dimensions, refer to Figures 3-1, 3-2, and 3-3 (for the Models 40 and 41); and G-2 and G-3 (Model 50).

6. SITE SECURITY. Pay attention to the security aspects of potential sites. Avoid high-traffic sites and sites in which access to your SMS 1000 cannot be adequately controlled. Remember that no system or software can be made totally secure and that there is, therefore, no substitute for the security awareness and security training of each individual who works with that system.

7. ANALYSIS OF COMPUTER SECURITY. If proprietary, financial or other sensitive information is stored in your system, having a computer-security professional perform an analysis of (1) your physical- and procedural-security policies and (2) the adequacy of their implementation, will always repay the effort.

8. PROXIMITY TO OTHER EQUIPMENT. Because magnetic fields and radiated emissions can have adverse effects on disks, the SMS 1000 system should not be located near sources of these emissions. Some typical examples of such sources include electric motors, particularly large ones that are nor properly shielded; copying machines; x-ray machines; elevators; certain types of telephones; and stereo equipment.

9. RADIATION. Site planning must take note of the fact that the SMS 1000 is designated as an FCC class A computing device and is therefore designed exclusively for commercial environments. The SMS 1000 is not meant for use in residential areas.

SYSTEM GROUNDING

The SMS 1000 signal ground is connected to the chassis at the power supply. The chassis is then connected to the ground wire of the a-c input. Safety demands that ground continuity be provided at the user's installation. The three-wire a-c line supplied with the system provides such ground continuity.

SECTION 3

SYSTEM INSTALLATION
AND
POST-INSTALLATION CHECKOUT

UNPACKING

Before unpacking the system, check the shipping containers for obvious damage. Report any damage to the shipper before unpacking the system. As unpacking proceeds, exercise normal industrial-safety precautions with respect to such matters as lifting, breakage, etc.

Next, check the system for any damage that may have happened during shipment. Also, check each item against the packing slip to be sure that all items have been received. Proceed with unpacking as follows:

1. Cut the nylon bands binding the shipping package.

2. Lift off the top cover of the shipping box.

3. Remove the four corner-type foam blocks from the inner-box top cover.

4. Lift off the inner-box top cover.

5. Remove the foam protective top from the SMS 1000 computer unit.

6. Now lift the computer unit from the shipping box. CAUTION: The computer weighs approximately 50 pounds. Because of its weight and its size, two people may be required to lift the computer out of the box.

7. Remove the plastic wrapping from the computer.

8. Remove the system's side panels (in the case of
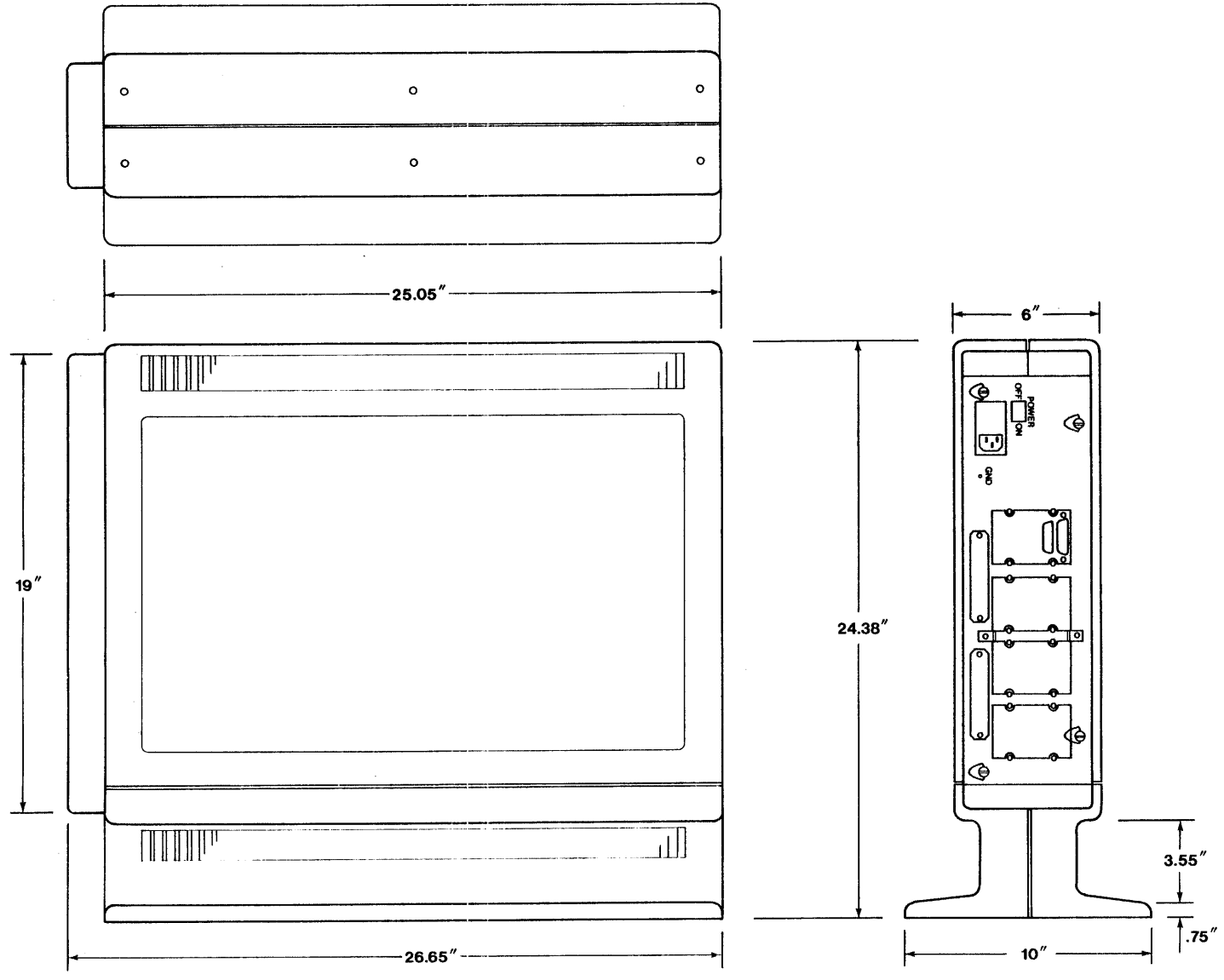
Fig. 3-1   SMS 1000 Floor-mount configuration

floor-mounted units) and the front and rear panel. See Section 10 of this manual for removal/replacement instructions. Check all boards to be sure that they are firmly seated in place in the backplane. Also, make sure that all other components and connectors are securely in place. If any internal cables are not connected, refer to the appropriate interconnection cabling diagram, Figures 10-14 through 10-21, for the correct connection.

CAUTION

In the case of floor-mounted units
check to be sure that all foam
packing used in shipping has been
removed from the pedestal. If it
is not removed, the flow of cooling
may be seriously impeded.

9. After completing inspection followed by replacement of panels, floor-mounted units are ready to be moved to their working locations.

INSTALLING RACK-MOUNTED SYSTEMS

After unpacking is complete, the following steps must be performed in order to install the slides of rack-mounted units:

1. Rack-mounted SMS 1000 systems come equipped with three-section slides. The inner rail of each slide is bolted to the SMS 1000 system case. The two outer sections are separable from the inner rail so that the slides can be installed in the rack before installing the computer itself. To do this, first pull apart the two outer sections of a slide until stopped by the innermost catch. The release-arm of the catch will now be visible. Press down on this catch so that the two outer slide sections can be pulled free. Do this with both slides.

2. Install the removed slide sections in the desired position on the rack using 10-32 mounting hardware.

3. Now slide the SMS 1000 back into the slide rails on the rack. Because of the size and weight of the unit, two people should be used for this operation. After partial insertion into the slide rails, the inner spring-loaded latch will close and stop further slide movement. For complete insertion press down on the levers of the spring-loaded latches on both slides and push the unit the rest of the way into the rack.

NOTE: THIS UNIT FITS INTO ANY 19"
EIA STANDARD (RS-310) OR
RETMA RACK WITH A 17.75"
MINIMUM OPENING.

5.22"

5.25" MAX.

25.05"

SLIDES

24"

1.12

2.75

19"

17"

1.98

2.6

3.23
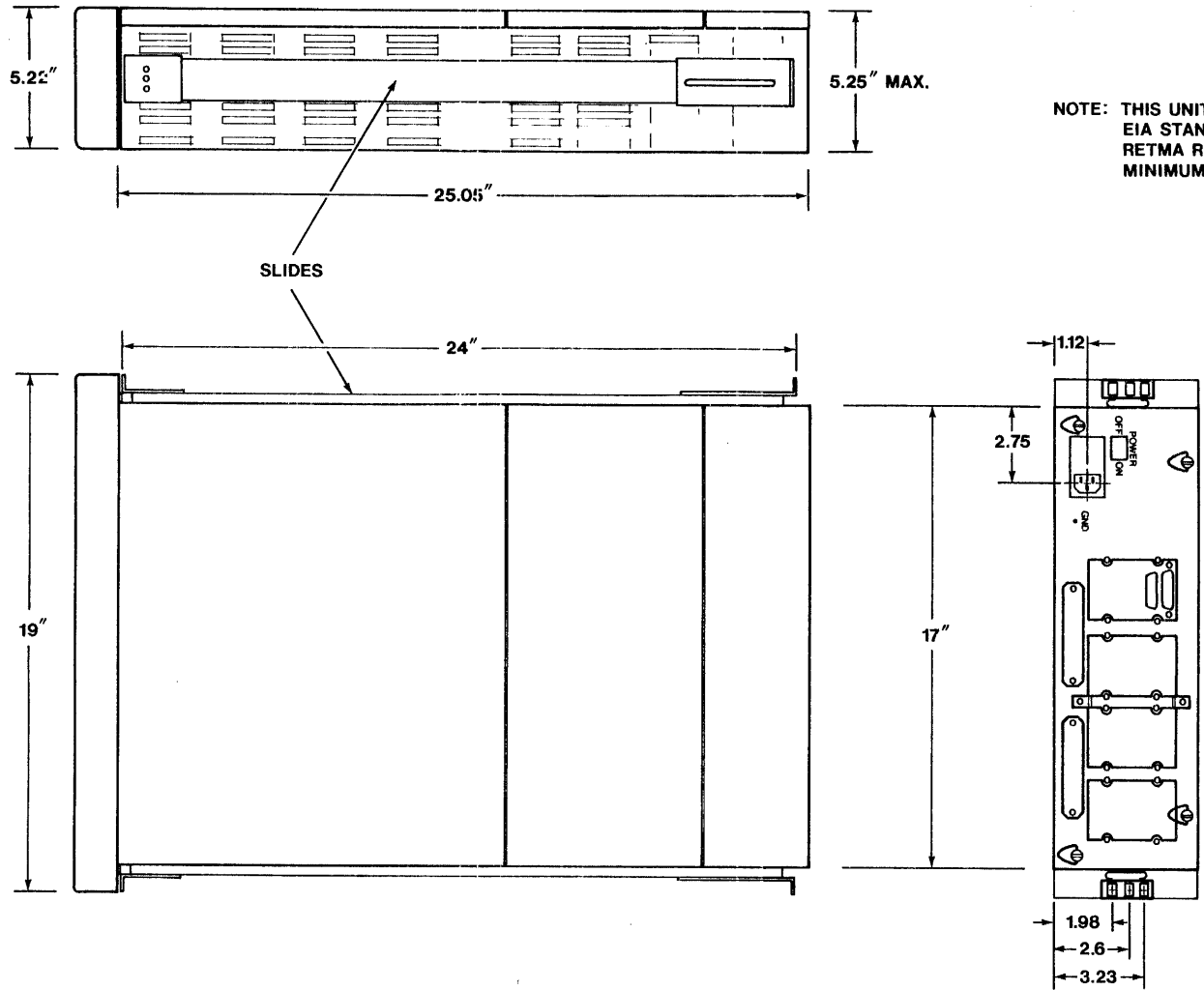
Fig. 3-2   SMS 1000 Rack-mount configuration

SELECTION OF 115-VOLT OR 230-VOLT A-C POWER

The SMS 1000 system can operate on either of two ranges of
input power: (1) 90 to 130 volts ac, nominally 115 volts; or
(2) 180 to 250 volts ac, nominally 230 volts. Either type
of operation can be selected by making a corresponding set-
ting of a rotor-type cam that actuates the voltage-selection
switch at the rear of the system enclosure. Note, also,
that for each supply voltage there is a correct size of
power-supply fuse that must be used. These will be de-
scribed in the following procedure. See Figure 1-6 for
location of the fuse and voltage-selection compartment. To
make the fuse selection and voltage setting, proceed as fol-
lows:

CAUTION

An incorrect voltage setting can damage your
SMS 1000. Before applying power, be sure you
know what the line voltage is, that you have
made the corresponding voltage setting on the
SMS 1000, and that you have the correct
power-supply fuse installed.

1. REMOVAL OF POWER. Turn off the SMS 1000 a-c switch on the
rear panel and then remove all input power by unplugging the
a-c power cord from the receptacle at the rear of the enclo-
sure.

DANGER

Potentially lethal voltages can be
encountered in the power supply for
as long as two minutes after a-c power
is removed from it. Therefore, wait
at least two minutes after removing
power before working on it.

2. FUSE SELECTION. Using a small screwdriver, carefully pry
open the fuse- and voltage-select door at the rear of the
enclosure, as shown in Figure 1-6. There is a slot for prying
open the door at its left edge.

TOP VIEW

NOTE:
ALL DIMENSIONS ARE IN INCHES

19.00

19.80

1.60

26.65

REAR VIEW

POWER
OFF   ON

GND

AC POWER
INPUT

SIDE VIEW

5.22

FRONT VIEW

FRONT-PANEL
DOOR

6.55

0.65
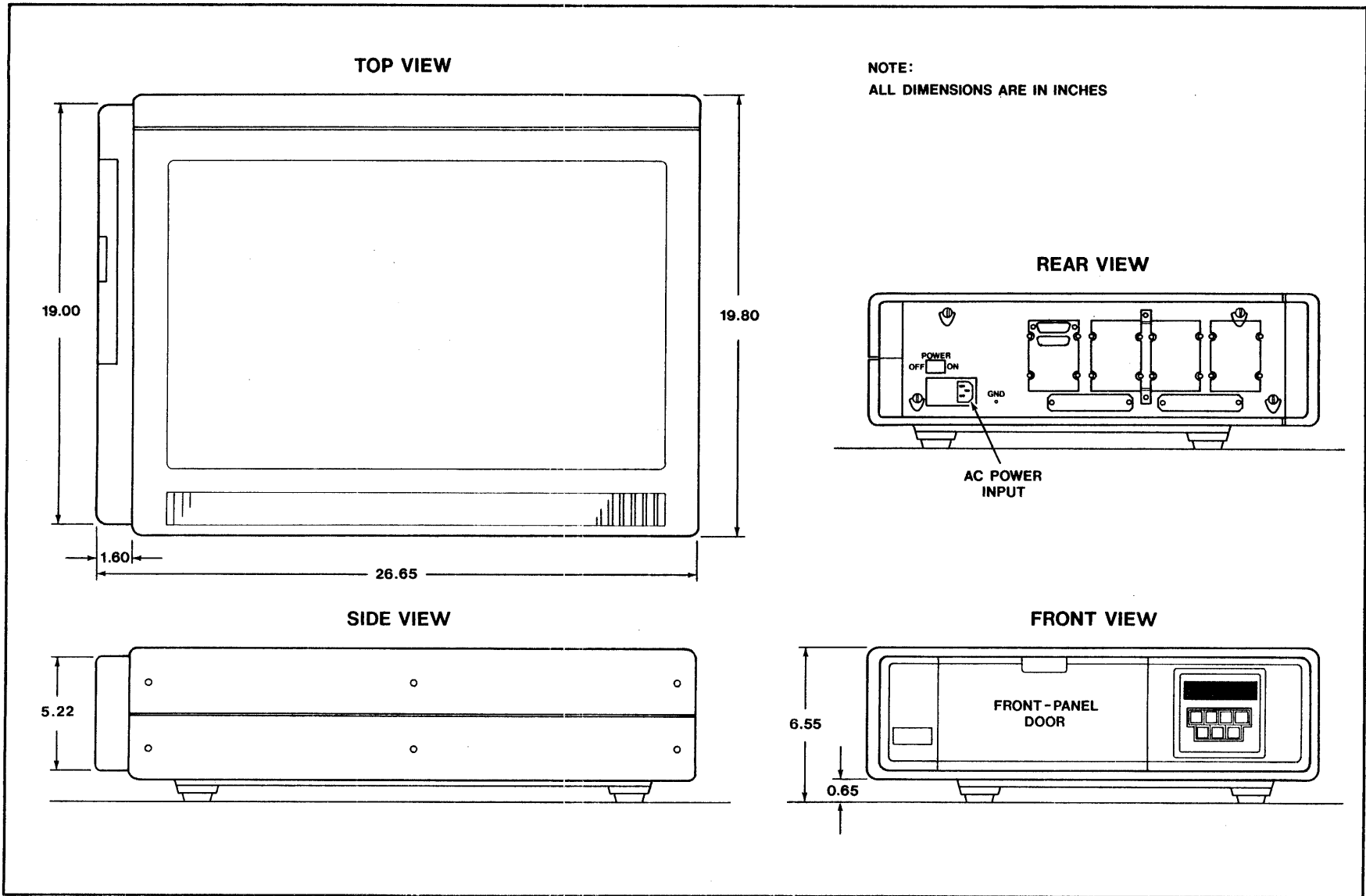
Fig. 3-3   SMS 1000 Table-mount configuration

3. Using a small screwdriver, carefully pry out the white plastic fuse holder from the fuse compartment. If the system is to be set for 115-volt operation, the fuse must be a Buss type ABC (ceramic body), or equivalent, rated at <u>6 amps</u>. If the system is to be set for 230-volt operation, the fuse must be the same type, but rated at <u>3 amps</u>.

4. Place the correct fuse in the fuse holder, replace the holder in the fuse compartment, and press the holder all the way to the end of its travel.

5. VOLTAGE SELECTION. Carefully remove from the compartment the irregular-shaped cam having the markings "115Vac" and "230Vac". Note that the shafts on each end of the cam are of different diameters and that they fit into corresponding-width slots. Thus, the cam cannot be re-installed backwards.

6. Turn the cam so that, depending upon the system operating voltage desired, either of the two "115Vac" cam markings, or either of the two "230Vac" cam markings, is facing you after the cam is replaced in its slots.

7. After the cam has been replaced, with the desired voltage marking facing outward, firmly close the compartment door. Be sure that it is fully closed and that the selected voltage setting can be seen through the opening in the door after closure.

8. Reconnect the a-c power cord to its receptacle on the rear panel. Power can now be re-applied to the system.

FLOPPY DRIVES: REMOVAL OF SHIPPING INSERTS BEFORE USE

As received from Scientific Micro Systems, most floppy drives contain a cardboard shipping insert in the disk slot. It is imperative to remove this insert before turning on the drive. To remove the insert after unpacking, you need only open the drive's door slot and pull out the insert by its protruding tab. NEVER turn on your SMS 1000 system while one of these inserts is in a drive.

CONNECTION TO CONSOLE AND PRINTER

The next step in installation is to make connections to external units such as a video terminal or printer. Usually, a terminal is connected using the rear-panel connector marked "A0 (CONSOLE)" (see Figure 1-3). Also, a printer would use the

rear-panel connector marked "A1 (PRINTER)". This corresponds to the following SMS 1000 console-port default settings:

1. Console port enabled
2. Console uses port A0
3. BREAK = HALT

If you wish to change these default settings to match the special requirements of your system, refer to the ADDRESSES menus and the CONSOLE SETTING menus (under SERIAL PORTS), both part of Chapter 9 of this manual.

Your SMS 1000 can operate with virtually any type of terminal or printer having an RS-232 serial interface. Both console and printer use the same type of interconnection cable. This cable is a DEC type BC22A, or equivalent, with 25-pin female EIA RS-232 connectors at both ends. The cable must be wired in a null-modem configuration with pins 2 and 3 cross connected, that is, with pin 2 at one end connected to pin 3 at the other end, and pin 3 at the first end connected to pin 2 at the other. This cabling also requires the connection of the two pin 7's and the ground pins.

SETTING UP CONSOLE TERMINAL FOR COMMUNICATION WITH SERIAL PORT A0 OR A1

IMPORTANT

In the following procedure, if you wish to reconfigure any of the the characteristics of either of the two SMS 1000 serial ports (A0 or A1), you must communicate with the CONFIGURATION menus of SENSE through the SMS 1000 front-panel controls and 16-character readout. Terminal characteristics listed in capital letters (e.g. "DUMB") refer to CONFIGURATION menu options. Refer to Section 9 of this manual.

Set the communication parameters in your terminal to match the characteristics of the selected serial port (A0 or A1) as follows:

1. TERMINAL TYPE. The terminal-type default in the SMS 1000 is DUMB. This means that your terminal, whether smart or dumb, will interact with the system as though it were dumb until you change the TERMINAL TYPE option in the SERIAL PORTS portion of the CONFIGURATION menus under SENSE. Note that the console port default is A0. If you wish to configure A1 as the console port instead of A0, refer to the CONSOLE

SETTING option of the SERIAL PORTS menus. If you
have a smart terminal and want to change TERMINAL
TYPE to SMART, set your smart terminal to VT100 emul-
ation mode. Note that a dumb terminal will not
operate properly with TERMINAL TYPE set to SMART.

2. BAUD RATE. The SMS 1000 baud rate default is
9600. If your terminal operates at a different rate,
enter this baud rate using the BAUD RATE menu in the
SERIAL PORTS section of the CONFIGURATION menus.

3. NUMBER OF DATA BITS. The SMS 1000 default for
this parameter is 8 bits. If your terminal operates
at 7 data bits, change to this value using the DATA
BITS menu in the SERIAL PORTS section of the CONFI-
GURATION Menus.

4. PARITY. The SMS 1000 default for this parameter
is NO PARITY. If your terminal operates with odd or
even parity, make the corresponding change using the
PARITY BIT menu in the SERIAL PORTS section of the
CONFIGURATION menus.

5. STOP BITS. The SMS 1000 default for this parame-
ter is ONE stop bit. If your terminal operates with
two stop bits, make the corresponding change using
the STOP BITS menu in the SERIAL PORTS section of the
CONFIGURATION menus.

6. ADDRESS AND VECTOR ASSIGNMENTS. If you want to
change the address and vector assignments for ports
A0 and A1, refer to the ADDRESSES and CONSOLE SETTING
portions of the CONFIGURATION menus (Chapter 9).

POST-INSTALLATION CHECKOUT

After installing your system in its working location, making
connections to external units and plugging in both the SMS
1000 and the external units to a-c power, the next thing to do
is to perform a confidence test of system operation. Proceed
as follows:

CAUTION

Before applying power to the system for the
first time, be sure that the supply voltage
(i.e. 115V or 230V) shown in the window next
to the power-cord receptacle is the same as

the line voltage at the wall receptacle to be used. If your system is set for 115 volts and it is plugged into a 230-volt source, a power-supply fuse will blow, and damage to other components will occur. If your SMS 1000 is set for 230 volts and it is plugged into a 115-volt receptacle, the system will not operate at all, although it will not be damaged.

1. APPLYING POWER. Apply a-c power by pressing the "1" side of the switch at the rear of the system enclosure (see Figure 1-3). A light in the a-c switch will glow as long as a-c power is applied. Next, apply d-c power to the system by opening the door on the front panel and pressing the d-c power switch to its "1" position.

2. VIDEO DATA TERMINAL. Apply a-c power to your video data terminal (refer to the terminal-connection and interfacing instructions given earlier in this section). Note that the following procedure for checking out initial system operation is based on use of a video data terminal. (Although it is possible to configure the system in such a way that booting in the absence of a terminal (i.e. from the front panel alone) is possible, it is not recommended because the front-panel controls are only set up for such things as restart, run/halt and write protect, but not for any other type of communication with a running program).

3. SELF TEST: GENERAL. For a short period after d-c power is applied, the front panel display flashes:

POWER-ON/RESTART

and the system performs a multi-step automatic self-test sequence. Note that during the self test procedure, an LED on the front edge of the System Foundation Module (see Figure 1-4) will turn on for the duration of the tests (about a second). If the system fails any part of the self test, the LED will remain on. For diagnostic purposes, the system can be operated with the front panel removed and hanging by its safety wires so that you can observe the state of the LED during self test.

The self-test sequence includes steps 4, 5, and 6 of this procedure.

4. EPROM VERSION TEST. The first thing the system does is to compare the current controller firmware version number stored in the Foundation Module EPROM with the corresponding version

number read from the EEPROM (i.e. the electrically erasable and reprogrammable read-only memory in which various configurable system characteristics are stored). If the numbers match, the test goes to its next step (Step 5 of this procedure). If the numbers do not match, it means that the EEPROM must be reloaded from the EPROM and the following two front-panel messages are displayed in sequence:

> EEPROM mismatch!
> Re-load EEPROM?

You must press the "*" button on the front panel to initiate the EEPROM reload sequence. During the reload the front panel will display the message:

> Changing EEPROM!

Once the EEPROM has been reloaded from the EPROM the following messages are displayed on the front panel:

> Please reconfig!
> Please RESTART!

These messages remind the operator that when EEPROM is reloaded from EPROM, all configuration parameters are returned to the default values stored on the EPROM and, thus, previously configured (i.e. non-default) values that were entered by means of the CONFIGURATION menus of SENSE are lost. Therefore, to start the re-configuration process, you must first press the RESTART and "*" buttons simultaneously and then enter SENSE (as described in step 19 of this procedure). Next, reconfigure by means of the CONFIGURATION menus, as described in Section 9 of this manual. After reconfiguring, you must again restart the system by pressing the front-panel "*" and RESTART buttons simultaneously.

<div align="center">NOTE</div>

> At any time during the complete start-up process, as well as when the system is running applications, you can restart from the beginning of the self-test sequence by simultaneously pressing the RESTART and "*" buttons on the front panel.

5. HARDWARE SELF-TEST. After performing its test of firmware version-number compatibility (see previous step), the system then performs a self test of major hardware components. If this test runs to completion without detecting any failures, the following message is displayed, only if the system has been restarted from a power-off condition:

Self Test OK

and the test goes on to Step 6 of this procedure. This message is not displayed if the self test took place during a restart, i.e. as the result of simultaneously pressing the RESTART and "*" buttons.

If an error is detected, the following error message is displayed:

Self Test Err <nn>

where nn is the decimal number of the self-test error that was detected. The self-test error numbers and a description of the corresponding errors are listed in Appendix E. Note that some types of error are sufficiently severe that no front-panel error display is possible. In the case of all displayable errors, however, the operator has the option of continuing processing by pressing the "*" button on the front panel.

6. CHECKSUM TEST. In this test, a checksum test is performed on the contents of the EEPROM. If there is no checksum error, the system goes to Step 7 of this procedure.

If a self-test checksum error is reported, the following message is displayed on the front panel:

Self Test Err256

See Table E-1 of Appendix E for descriptions of this and other self-test error messages. The above message means that if processing continues, correct results cannot be assured. In this case, pressing the "*" button (in order to continue) produces the message:

Re-load EEPROM?

To reload the EEPROM from the EPROM you must again press the "*" button. This starts the reload process during which the following message is displayed:

Changing EEPROM!

At the completion of the reload the following two messages are flashed in sequence:

Please reconfig!
Please RESTART!

These messages remind the operator that when EEPROM is reloaded from EPROM, all configuration parameters are returned to the default values stored in the EPROM and, thus, previously configured (i.e. non-default) values that were entered by means of the CONFIGURATION menus of SENSE are lost. Therefore, to start the re-configuration process, you must first press the RESTART and "*" buttons simultaneously and then enter SENSE (as described in step 19 of this procedure). Next, reconfigure by means of the CONFIGURATION menus, as described in Section 9 of this manual. After reconfiguring, you must again re-enter the system by simultaneously pressing the front-panel "*" and RESTART buttons.

7. MEMORY SIZING. At the completion of self test the host memory size is measured, during which the message:

MEM sizing

is flashed on the front panel display. At the completion of the measurement, the memory size in K words (KW) is added to the end of the "MEM sizing" message.

NOTE

In performing tests on Winchester drives during the power-up sequence, the system tests access to each drive. The order followed in these tests is: Winchester 0, Winchester 1, cartridge-Winchester 0. The following steps apply only to those systems that are configured to include one or more Winchester drives.

8. WINCHESTER SPINUP. As soon as d-c power is applied, any Winchester drives in your system are energized and start to come up to their normal rotational speed. Note that, starting with the application of power, there is a fixed time delay before the system can load and run programs. This delay, which is configurable in the WINCHESTR SPINUP portion of the CONFIGURATION menus (see Section 9 of this manual), has a default value of 20 seconds. This corresponds to the spinup delay of most fixed-disk Winchester drives. Cartridge-type Winchesters require a delay of at least 45 seconds. During the delay period, the message

Winchestr spinup

is displayed on the front panel. When each Winchester drive is up to speed and initialized, the following message is displayed:

xx ONLINE OK

where xx can be W0, W1 or C0, depending upon how your system is configured. The abbreviations W0, W1, etc. are defined as follows:

```
W0 = Fixed-disk Winchester 0
W1 = Fixed-disk Winchester 1
C0 = Removable-cartridge Winchester 0
```

9. WINCHESTER FLAW TABLES. After spinup, the system looks for the flaw table stored on each Winchester drive in order to reade it into controller RAM. If this is done successfully, the following message is displayed and the system then goes on to Step 10 of this procedure:

xx FlaTbl OK

where xx can be W0, W1 or C0, depending upon how your system is configured.

If the flaw table cannot be successfully loaded, one of the following two messages is displayed:

xx FlaTbl Err nn
xx FlaTbl Bad

where xx can be W0, W1 or C0, depending upon how your system is configured; and nn is the decimal number assigned to the error as listed in Table E-3 of Appendix E.

NOTE

If the EEPROM was reloaded prior to this step and you have not yet reconfigured the system, then a flaw-table error is always generated.

The first message indicates that, for the reason listed in Table E-3, the flaw table cannot be read from disk. The second message will appear in place of the first if the table can be read but the contents are invalid. If either message is issued, you can escape by pressing the "*" button on the front panel. This causes a so-called "null" flaw table (i.e. an empty flaw table) to be built, and the following message to be displayed:

xx Entries = 0

where xx can be W0, W1 or C0, depending upon how your system is configured. CAUTION: with a null flaw table,

you must be aware that hard disk flaws are no longer known and automatically passed over, and that data already stored on spare sectors is not accessed until the flaw table is fully restored. This means that continued processing has a high degree of risk of data being corrupted. Hence, it is advisable to contact your service organization in order to restore the flaw table.

If the flaw-table error message was issued for C0, then the following additional message appears:

> C0 Ready?

This message is issued to cover the situation in which the only problem with C0 is that you may have forgotten to insert a cartridge or to close the drive door. If this is the problem, insert the cartridge or close the door and press the front-panel "*" button. The system will now repeat the last sequence of steps, starting with Winchester spinup.

Another possible cause of the error may be that the spinup delay configured into the system is too short for a cartridge-type Winchester. This type of drive requires a spinup delay of at least 45 seconds. If this is the problem, reconfigure, using the WINCHESTR SPINUP portion of the POWER-ON/RESTART menus, as described in Section 9 of this manual.

If you deliberately did not load a cartridge into the cartridge Winchester, then press the "->" button (right arrow, indicating a "no" response). The system then displays the message:

> Not Ready?

Press the front-panel "*" button (i.e. a "yes" response). This tells the system that the absence of a cartridge in C0 is deliberate and to continue with power-on processing.

10. WINCHESTER ACCESS TEST. An access test is now performed on each Winchester. This test attempts to read a sector from the first track on the last configured cylinder. If the access is successful, the following message is displayed and the system goes to Step 11 of this procedure:

> xx Access OK

> where xx can be W0, W1 or C0, depending upon how your system is configured.

If the track cannot be accessed, for example, because the actual number of cylinders does not agree with the configured

value stored in EEPROM, the system returns the message:

xx Access Err nn

where xx can be W0, W1 or C0, depending upon how your system is configured and nn is the error number as listed in Table E-3 of Appendix E. Proceed by pressing the "*" button on the front panel. The system then sends the following message, which warns that there may be a conflict between the actual hardware and how the system is configured:

Check config!

Also, any time the Winchester under test is write protected, the system sends the following message:

xx Writ Prot

where xx can be W0, W1 or C0, depending upon how your system is configured.

11. A row of stars ("****") is now scrolled across the front-panel display. This signifies that the system is now ready to branch to the next phase of the power-up sequence: that is, either booting the host or calling SENSE.

12. OPTIONS FOR OPERATION AT THE CONCLUSION OF INITIAL TESTS. Depending upon how your system is configured, (see STARTUP MODE portion of the CONFIGURATION menus in Section 9 of this manual) there are three possible modes of going into full operation. These are:

(1) The as-shipped (i.e. default) option is for the system to go automatically into bootstrapping the host at the completion of the initial tests described in this procedure. Bootstrapping is discussed in Step 13.

(2) A second option is for the system to automatically call the SENSE menus. This mode can be selected by means of the POWER ON/RESTART portion of the CONFIGURATION menus.

(3) The third option involves testing and exercising the system and is of interest primarily to system engineers.

NOTE

If you wish to run SENSE either in stand-alone mode or concurrently with the host, go to Step 19 of this

procedure.

13. BOOTING THE HOST. After the system passes all steps of the preceding tests, it then goes directly to the start of bootstrap mode. The booting process is indicated on the front panel by the rapid flashing of the message:

Booting host

The system then boots in the manner described in Step 14 of this procedure.

If any kind of hardware failure prevents booting, the following front-panel message is displayed:

Boot failure

This message could be caused by such types of failure as a bad or missing CPU card, an incorrectly strapped CPU or memory card, bad or missing memory cards, or a bad Foundation Module. If the system senses a bad or missing CPU, the "Boot failure" message is replaced by the message:

Bad CPU?

If the system senses bad or missing memory cards, the "Boot failure" message is replaced by the message:

No memory?

If any of these three messages appears, the booting process goes no further and your support organization should be informed. NOTE: In this case, it is still possible to enter the SENSE menus by pressing the "*" button on the front panel.

14. AUTOBOOT TIMEOUT DELAY. After the display of the message "Booting host", there are three possible modes of booting the system, depending upon the configured autoboot delay. This delay period is configurable using the AUTOBOOT TIMEOUT portion of the CONFIGURATION menus (Section 9). The three delay modes are:

(1) ZERO DELAY. System immediately searches for first valid boot block among configured devices (see Section 9) in order to load and run bootstrap.

(2) CONFIGURED DELAY. During the configured delay period you enter the logical name and unit number of the boot device and the system searches it for a valid boot block. See Step 16 of this procedure for a discussion of logical-device names and numbers.

(3) DELAY TIMEOUT. If no boot device is entered before the end of the configured delay period, the autoboot sequence automatically searches for the first valid boot block among the drives configured in the BOOTSTRAP portion of the CONFIGURATION menus.

MODE (1). In the first mode, autobooting is immediate, that is, the timeout delay is zero. The user is informed of this mode by the message:

AUTO - BOOT

The configurable autoboot drive sequence (see BOOTSTRAP portion of CONFIGURATION menus) is used to load the first valid boot block.

MODE (2). In the second mode, the boot device name and unit number is entered manually and the time allotted for this purpose is configurable. The time can range from zero to an indefinite period. The as-shipped default value supplied with the system is 10 seconds. The following typical display (see sample screen below) appears on your video display terminal screen if the delay is non-zero. The sample screen shows typical responses of the RT-11 operating system and includes operator responses to the prompt:

ENTER DEVICE NAME AND UNIT NUMBER:

The purpose of this prompt is to allow you to choose an alternate drive for booting when special circumstances require it. For example, the stand-alone add-on tape unit (device name MS) is not part of the autoboot sequence and must be specified manually in order to be used as a boot device. The response "DU1" (see sample screen) means that a DU device with a unit number of 1 is being selected. In the sample screen, the operator responses are underlined.

MODE (3). The third mode occurs automatically if a valid device name and unit number is not entered within the autoboot timeout period. At the end of that period the response:

AUTO - BOOT

appears at the end of the "ENTER DEVICE NAME AND UNIT NUMBER" prompt on your terminal. The autoboot sequence then looks for the first valid boot block among the configured devices, booting takes place, and the logical-device unit number containing the boot block is displayed in the following format:

BOOTING FROM DEVICE <unit No.> [Displayed in autoboot only. See following sample screen.]

IMPORTANT

In order to boot from a peripheral
device such as a floppy-disk drive it
must contain a DU-bootable diskette.
Similarly, to boot from a Winchester
drive, it must have been created as a
DU-bootable device

SAMPLE SCREEN WHEN BOOTING SYSTEM (USING RT-11 SYSTEM)

SMS 1000   BOOTSTRAP

256KW MEMORY   11/73 CPU

BOOTABLE DEVICES:

DEVICE NAME	DEVICE TYPE	UNIT NUMBERS
DU	DSA	0-3
MS	TS	0

ENTER DEVICE NAME AND UNIT NUMBER: <u>DU1</u> [Entry consists of two
                 parts: Device name ("DU"), and Unit No. ("1").
                 Operator then presses Return.]

BOOTING FROM DEVICE 1   [Appears in autoboot only]

RT-11SJ V05.01

.SET TT SCOPE

.SET KMON IND

.SET EDIT KED

.   (The RT-11 dot prompt shown at left means that the
                 operating system is now ready for commands)

<u>LEGEND</u>

DU - Disk device
MS - External tape device
DSA - Digital Storage Architecture
TS - Tape System
---

15. BOOTSTRAP ERROR MESSAGES. If the specified boot device does not exist or is not recognized (for any reason) the following message appears on your terminal:

   DEVICE NOT IN SYSTEM

If the response was misspelled, the following message is displayed and the prompt is repeated:

   ILLEGAL DEVICE
   ENTER DEVICE NAME AND UNIT NUMBER:

If no boot block is found, the following message is displayed:

   NOT A BOOTABLE DEVICE

If the specified unit is not online, the system returns the following message:

   UNIT OFF LINE

If you are attempting to boot from an external tape device (device name MS) and a bad or blank tape is detected, the following message is displayed:

   TAPE READ ERROR

If a valid boot block is not found on any of the devices searched in the autoboot sequence, the following message is displayed:

   NO BOOTABLE DEVICE IN SYSTEM

At the conclusion of this message, the standard bootstrap screen (see sample screen above) is again displayed.

16. DESIGNATION OF LOGICAL DEVICE NAMES. Floppy and Winchester drives are designated with the prefix DU followed by a number. The numbers are assigned by SENSE according to the following rules:

(1) Fixed-disk Winchester drives are assigned the lowest DU numbers (starting with DU0).

(2) Floppy drives are assigned the next higher DU numbers.

(3) Removable-cartridge Winchester drives are assigned the highest DU numbers.

(4) No more than four devices can be specified.

NOTE

At present, no logical (i.e. DU) device name for host-type access exists for the integral image-oriented streaming tape drive that may be part of your SMS 1000 system. That is, booting cannot take place from an image-oriented streaming tape drive. Booting can, however, take place from a streaming tape drive operating in conjunction with a TSV05 file-oriented tape interface module (see Appendix H), or from an external TSV05-equivalent tape unit such as the SMS FWT01180.

For example, in a system with two fixed-disk Winchesters and two floppy drives, the device numbering would be as follows:

```
Winchester 0 = DU0
Winchester 1 = DU1
    Floppy 0 = DU2
    Floppy 1 = DU3
```

A second example might be a system with a cartridge Winchester drive, one fixed-disk Winchester drive, and one floppy drive. In this case the device designations would be:

```
    Winchester 0 = DU0
       Floppy 0 = DU1
Cartridge Winchester = DU2
```

In the sample screen shown above, the "DU" portion of the operator response (i.e. the response to the query "ENTER DEVICE NAME") designates a Winchester of either type or a floppy drive. Similarly, the response "MS" designates an external tape unit. The logical unit numbers 0 to 3 (for DU devices) and 0 (for an MS device) are designated in response to the portion of the query: "AND UNIT NUMBER".

17. CONVENTIONS WHEN SPECIFYING A BOOT DEVICE. When responding to the prompt "ENTER DEVICE NAME AND UNIT NUMBER", type the selected boot-device name and unit number (see previous steps) without a space (e.g. DU3) and followed by a carriage return.

18. SYSTEM RESPONSE AFTER BOOTING. If you have successfully bootstrapped from the designated unit, an operating-system message such as: "RT-11SJ" and a version number (as in the current example) now appears. In the operating system example shown here, these messages are also followed by a command string, and the RT-11 operating system's normal prompt of a single dot (i.e. ".") at the completion of the command string. The system is now in its normal operating mode and is ready to run your

applications, accept commands, etc.

19. RUNNING THE SENSE MONITOR IN STAND-ALONE MODE.   Referring
back to Step 12 of this procedure, if you wish to access SENSE
at the conclusion of the initial system tests, press the front
panel MENU button any time between the start of initial self
tests and the display of a group of stars scrolling across the
front-panel display (see step 11 of this procedure). This
tells the system to display the SENSE menus rather than boot
the operating system.   When the group of stars moving across
the front panel display goes away (after having pressed MENU),
they are replaced by the message:

     VDU prompting

which tells you to look at your video terminal (i.e. "VDU") for
the message:

     HIT ANY KEY WITHIN TIME LIMIT

You have a (configurable) time delay period in which to press
any key on your terminal in order to select terminal display of
the SENSE menus. If you wish to select front-panel operation
of SENSE menus, simply allow the delay to expire or press the
front-panel MENU button before the expiration of the delay.
See the following steps.

20. SELECTING SENSE OPERATION FROM THE TERMINAL.   When the
message "*HIT ANY KEY WITHIN TIME LIMIT*" is displayed on your
terminal you have about ten seconds in which to press a key on
the keyboard.   (NOTE: The delay period is configurable by
means of the VDU ONLINE DELAY portion of the CONFIGURATION
menus.   The default value is ten seconds.) Pressing a key
transfers control to the console. The system now indicates
that you are at the start of the SENSE menus by displaying and
highlighting the first word of the menus:

     STATUS

on the video display. At the same time, the front panel dis-
plays a user-selected logo (entered from the SPECIAL section of
the CONFIGURATION menus) or the "SMS 1000" default logo.   Note
that the RESTART, RUN/HALT, and WRT PROT buttons on the front
panel can still be used during console operation.

                              NOTE

          At any time during the complete start-up
          process, as well as when the system is run-
          ning applications, you can restart from the
          beginning of the self-test sequence by simul-

taneously pressing the RESTART and "*"
buttons on the front panel.

21. SELECTING SENSE OPERATION FROM THE FRONT PANEL. During
the (configurable) time delay period (the default is ten sec-
onds) during which you can select either the front panel or
the terminal, the message "VDU prompting" is displayed on the
front panel. By allowing the time delay to elapse without
hitting a key on the terminal keyboard (or by simply pressing
the MENU button before the end of the delay), control of
SENSE is given to the front panel, from which its menus can
be accessed. The system now indicates that you are at the
start of the SENSE menus by displaying the word:

    STATUS

on the front-panel display.

22. RUNNING SENSE CONCURRENTLY WITH THE HOST. Once the host
is booted and running applications, you can still run certain
areas of SENSE at the same time as the host.   To do this,
after the host is running and a logo appears on the SMS 1000
front panel, press the front-panel MENU button.   This will
call SENSE and, after a brief delay, the word STATUS will
appear on the front-panel display to indicate that you are at
the start of the SENSE menu system.   While in the menu
system, if you attempt to perform a task that interferes with
the host, the error message:

    HOST IS RUNNING

is issued and the task is aborted.

SECTION 4

HARDWARE CONFIGURATION

INSTRUCTIONS

POWER-SUPPLY LOADING RULES

All of the following four basic power-supply loading rules, power-consumption specifications and individual-supply current limits must be observed when adding or changing modules in the card cage and when changing or adding peripheral units that receive their d-c power from the SMS 1000 power supply. The four basic rules are:

1. TOTAL POWER OUTPUT. The total power output must not exceed 325 watts (Model 40) or 500 watts (Model 50).

2. CURRENT OUTPUT PER SUPPLY. The total current drawn from any individual supply must not exceed the following values:

SUPPLY	MAXIMUM CURRENT (AMPERES) (MODEL 40)	MAXIMUM CURRENT (AMPERES) (MODEL 50)
+5 VOLTS	45	75
+12(C) VOLTS	4	4
+12(P) VOLTS	10	10
-12 VOLTS	4	4
+24 VOLTS	2	2

3. TOTAL 12-VOLT CURRENT (Model 40 only). The aggregate total current drawn from the three 12-volt supplies (i.e., +12(C) volts, +12(P) volts, and -12 volts) must not exceed 12 amps.

4. CURRENT CONSUMPTION OF INDIVIDUAL UNITS. The following table lists the current consumption (by supply) of SMS 1000 individual system components including some typical backplane modules. (For the current consumption of other modules consult

the manufacturer's literature.) Use these values when computing the total power consumption of a projected system configuration (where power (in watts) is expressed as the product of volts times amperes). See sample computations in Tables 4-2 and 4-3 below. NOTE: For Winchester drives, the range of current-consumption values is expressed as "maximum except surge".

TABLE 4-1

CURRENT CONSUMPTION OF INDIVIDUAL UNITS

COMPONENT NAME	CURRENT CONSUMPTION (BY SUPPLY) (AMPERES)				
	+5V	+12V(C)	+12V(P)	-12V	+24V
Foundation Module	7.0	0.1	0.1	0.1	0.1
Each Winchester drive (Range of typical values)	0.6 to 1.7	–	0.9 to 4.5	–	–
Each 5 1/4-inch floppy	1.0	–	1.5	–	–
8-inch floppy	1.0	–	–	–	1.8
Streaming tape drive (Tandberg TDC 3309/3350)	3.1	–	1.0	–	–
File tape interface board	3.0				
Each cooling fan	–	–	–	–	0.3
KDF11-AA (LSI-11/23)	2.0	0.2	–	–	–
KDJ11-AB (LSI-11/73)	4.5	–	–	–	–
MSV11-LK (256KB)	3.45	–	–	–	–

MSV11-PL (512KB)	3.60	-	-	-	-
CMV-250 (256KB)	2.0	-	-	-	-
CMV-500 (512KB)	2.0	-	-	-	-
CMV-1000 (1024 KB)	2.8	-	-	-	-
CMV-254 (1024 KB)	2.0	-	-	-	-
CMV-504 (2048 KB)	2.0	-	-	-	-
DLV11-J (Serial line unit)	1.0	0.25	-	-	-
DZQ11 (Four-port MUX)	1.15	0.39	-	-	-
DHV11 (Eight-port MUX)	4.3	0.475	-	-	-

EXAMPLES OF TYPICAL SYSTEM CONFIGURATIONS

The following two examples (Table 4-2 and Table 4-3) show typical ways the system might be configured within the limits of the previously given power supply loading rules.

TABLE 4-2

EXAMPLE 1:
TYPICAL SYSTEM CONFIGURATION WITHIN
POWER-SUPPLY LOADING RULES

COMPONENT		CURRENT CONSUMPTION (BY SUPPLY) (AMPERES)				
NAME	QUAN-TITY	+5V	+12V(C)	+12V(P)	-12V	+24V
FOUNDATION MODULE	1	7.0	0.1	0.1	0.1	0.1
COOLING FANS	2	-	-	-	-	0.6
WINCHESTER DRIVE	1	1.0	-	2.5	-	-
8-INCH FLOPPY	1	1.0	-	-	-	1.8
KDF11-AA (LSI-11/23)	1	2.0	0.2	-	-	-
MSV11-LK (256KB)	1	3.45	-	-	-	-
TOTAL CURRENT: (BY SUPPLY)		14.45	0.3	2.6	0.1	2.5
POWER (WATTS): (BY SUPPLY)		72.25	3.6	31.2	1.2	60

TOTAL POWER
CONSUMPTION: 168.25 WATTS

NOTE: SINCE NO CURRENT AND POWER LIMITS HAVE BEEN EXCEEDED
(SEE RULES ABOVE), THIS IS A WORKABLE CONFIGURATION.

TABLE 4-3

EXAMPLE 2:
TYPICAL SYSTEM CONFIGURATION WITHIN
POWER-SUPPLY LOADING RULES

COMPONENT		CURRENT CONSUMPTION (BY SUPPLY) (AMPERES)				
NAME	QUAN-TITY	+5V	+12V(C)	+12V(P)	-12V	+24V
FOUNDATION MODULE	1	7.0	0.1	0.1	0.1	0.1
COOLING FANS	2	-	-	-	-	0.6
WINCHESTER DRIVES	2	2.0	-	5.0	-	-
5 1/4-INCH FLOPPIES	2	2.0	-	3.0	-	-
KDJ11-AA (LSI-11/73)	1	4.5	-	-	-	-
MSV11-PL (512KB)	2	7.2	-	-	-	-
DZQ11 (FOUR-PORT MUX)	2	2.3	0.8	-	-	-
TOTAL CURRENT: (BY SUPPLY)		25.0	0.9	8.1	0.1	0.7
POWER (WATTS): (BY SUPPLY)		125.0	10.8	97.2	1.2	16.8

TOTAL POWER
CONSUMPTION: <u>251 WATTS</u>

NOTE: SINCE NO CURRENT AND POWER LIMITS HAVE BEEN EXCEEDED
(SEE RULES ABOVE), THIS IS ANOTHER WORKABLE CONFIGURATION.

BUS-LOADING SPECIFICATIONS

DEFINITIONS. For the LSI-11 Q-bus, one A-C unit load is defined as 9.35 pF of shunt capacitance, measured between a given signal line and ground. One D-C unit load is defined as a leakage current of 105 microamperes, measured between a given bus line and ground, when the line is in the high (i.e. undriven or unasserted) condition. Bus-loading figures for various modules are listed in the following table (Table 4-4).

MAXIMUM BUS LOADING. For any configuration, the maximum bus loading must not exceed 20 dc loads and 35 ac loads.

TABLE 4-4
BUS LOADING OF SMS 1000 MODULES

MODULE DESIGNATION	A-C LOAD	D-C LOAD
Foundation Module	2.5	1
KDF11-AA (LSI-11/23)	2.0	1
KDJ11-AB (LSI-11/73)	3.4	1
MSV11-LK (256KB)	2.0	1
MSV11-PL (512KB)	2.0	1
CMV-1000 (1024KB)	2.0	1
CMV-504 (2048KB)	1.0	1
CMV-254 (1024KB)	1.0	1
CMV-250 (256KB)	1.0	1
CMV-500 (512KB)	1.0	1
DLV11-J	1.0	1
DZQ11	1.0	1
DZV11	4.1	1
DHV11	2.9	1
File-tape interface board	2.0	1

NOTE: For any system configuration, the maximum bus loading must not exceed 20 DC loads and 35 AC loads.

ASSIGNING BUS PRIORITY: STRAPPING E1-E16 ON SMS 1000 MODEL 40
BACKPLANES WITHOUT RESTRICTED C-D SLOTS

IMPORTANT

The following procedure refers to SMS 1000 Model 40
backplanes that do NOT have restricted C-D slots.
These backplanes can be identified by the ABSENCE
of a CAUTION label on the left rear flange of the
cardcage supporting sheet metal. See Figure 1-6.

The SMS 1000 Model 40 backplane priority-assignment jumper
pins, E1 through E16 (see Figure 1-5A) can be strapped to
implement any of three possible priority schemes. These are:

1. SMS AS-SHIPPED CONFIGURATION:

> (1) HIGHEST PRIORITY: CPU (J1A/B on backplane)
>
> (2) SECOND HIGHEST PRIORITY: Foundation Module
>
> (3) NEXT HIGHEST PRIORITY: Backlpane slots J1C/D,
>   J2C/D, J2A/B, J3A/B, and J3C/D
>
> (4) LOWEST PRIORITY: Backplane slots J4C/D, J4A/B,
>   J5A/B, J5C/D, J6C/D, J6A/B

NOTE

Backplane priority runs in a serpentine
path, starting with J1A/B (highest),
then to J1C/D, next J2C/D, followed by
J2A/B, J3A/B, etc. Using this scheme
in the following discussion, backplane
slots are listed in order of descending
priority. That is, J1C/D has a higher
priority than J2C/D; J2C/D has a higher
priority than J2A/B, etc.

The SMS-shipped jumper connections are as follows (refer to
Figure 1-5A for the location of bus-priority jumper pins):

> E1 TO E2
> E3 TO E4
> E5 TO E6
> E7 TO E8
> E9 TO E10
> E11 TO E12
> E13, E14, E15, E16: NO CONNECTION

2. FIRST OPTIONAL CONFIGURATION:

      (1) HIGHEST PRIORITY: CPU (J1A/B on backplane)

      (2) SECOND HIGHEST PRIORITY: Backplane slots
         J1C/D, J2C/D, J2A/B, J3A/B, J3C/D

      (3) NEXT HIGHEST PRIORITY: Foundation Module

      (4) LOWEST PRIORITY: Backplane slots J4C/D,
         J4A/B, J5A/B, J5C/D, J6C/D, J6A/B

To implement this priority scheme, make the following connec
tions:

            E1 TO E9
            E2 TO E8
            E3 TO E11
            E4 TO E6
            E5 TO E12
            E7 TO E10
            E13, E14, E15, E16: NO CONNECTION

3. SECOND OPTIONAL CONFIGURATION:

      (1) HIGHEST PRIORITY: CPU (J1A/B on backplane)

      (2) SECOND HIGHEST PRIORITY: Backplane slots
         J1C/D, J2C/D, J2A/B, J3A/B, J3C/D

      (3) NEXT HIGHEST PRIORITY: Backplane slots J4C/D
         J4A/B, J5A/B, J5C/D, J6C/D, J6A/B

      (4) LOWEST PRIORITY: Foundation Module

To implement this priority scheme, make the following connec
tions:

            E2 TO E8
            E4 TO E6
            E5 TO E15
            E7 TO E13
            E9 TO E10
          E11 TO E12
          E1, E3, E14, E16: NO CONNECTION

ASSIGNING BUS PRIORITY: STRAPPING JUMPERS ON SMS 1000 MODEL 40 BACKPLANES WITH RESTRICTED C-D SLOTS

IMPORTANT

The following procedure refers to SMS
1000 Model 40 backplanes that HAVE res-
tricted C-D slots. These backplanes can
be identified by the PRESENCE of a CAU-
TION label on the left rear flange of
the cardcage supporting sheet metal (see
Figure 1-6).

BACKPLANES WITH RESTRICTED C-D SLOTS

In order to allow for the use of certain newer quad-wide CPU's in
addition to the dual-wide LSI-11/23 and LSI-11/73 CPU's, the C-D
connectors of backplane slots 1 and 2 on later versions of the
Model 40 backplane have been connected differently from those of
earlier versions (see Figure 1-5B). Because of this new wiring,
dual-width cards plugged into the slot 1 or 2 C-D connectors of
the new backplanes may be damaged. Systems containing the newer
backplane can be identified by the presence of a CAUTION label on
the left rear flange of the cardcage supporting structure.   See
Figure 1-6 for the location of these labels on the newer systems.
Note that the CAUTION label also shows the serpentine priority
path in the modified backplanes. The CAUTION label has the fol-
lowing appearance:

CAUTION
DUAL-WIDTH Q-BUS MODULES
PLUGGED INTO C-D CONNECTOR
SLOTS 1 OR 2 MAY BE DAMAGED.
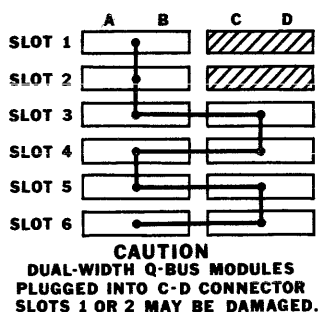
SPECIAL JUMPER CONNECTIONS ON BACKPLANES WITH RESTRICTED C-D SLOTS

Make the following jumper assignments (see Figure 1-5B):

1. CONNECT jumpers between jumper pairs W8,
W9 and W12.

2. REMOVE all jumpers from jumper groups or pairs
W7, W10 and W11

PRIORITY ASSIGNMENT FOR BACKPLANES WITH RESTRICTED C-D SLOTS

With the exception of the special jumper connections described in
the previous paragraph, the priority assignment procedure for the
newer backplanes is the same as that for the older backplanes
(see previous procedure describing priority assignment for back-
planes without restricted C-D slots).

USING THE SMS 1000 BUS-GRANT CONTINUITY CARD

If the priorities of the modules you insert in the backplane
require a dual module to be located between two quads, you will
have to insert a bus-grant continuity card (part number 004670)
next to the dual module. The bus-grant continuity card is a
dual-width module with two pairs of shorted contacts that provide
an uninterrupted path for the interrupt-request and DMA request
lines. The card must be inserted so that its contacts are plug-
ged into into A or C connectors only, except in backplanes with
restricted C-D slots 1 and 2, as described in the rules given
below.In using a bus-grant continuity card the following rules
must be observed:

1. When plugging it into a backplane socket,
the solder side of the bus-grant continuity
card must always face the Power Supply.

2. Do NOT insert the card into C-D slots 1 or 2 of
backplanes with restricted C-D slots. Such
backplanes have a CAUTION sticker on the
cardcage supporting structure (see Figure 1-6).

STRAPPING THE SMS 1000 SYSTEM MODULES

GENERAL. The following instructions describe how to perform
strapping, i.e. adding configuration jumpers, to various SMS 1000
modules. These instructions describe, first, the default (i.e.
as shipped by SMS) jumper configuration for each module, followed
by data on how to jumper for user-specific requirements. These
instructions cover the following modules:

1. KDF11-AA (LSI-11/23) CPU (Figure 4-1).

2. KDJ11-AB (LSI-11/73) CPU (Figure 4-2).

3. MSV11-LK (256K byte memory module). These instructions cover the installation of up to eight MSV11-LK modules (Figure 4-3).

4. MSV11-PL (512K byte memory module). These instructions cover the installation of up to eight MSV11-PL modules (Figure 4-4).

5. CMV-1000 (1024K byte memory module). These instructions cover the installation of up to two CMV-1000 modules (Figure 4-5).

6. CMV-504 (2048K byte memory module); CMV-254 (1024K byte memory module); CMV-500 (512K byte memory module); CMV-250 (256K byte memory module). These instructions cover the installation of up to two of any of these modules (Figure 4-6).

7. DLV11-J Serial Line Unit. These instructions cover the installation of up to two DLV11-J modules. Instructions are given for DLV11-J boards made by both DEC and Camintonn (Figures 4-7A and 4-7B).

8. DZQ11 (Four-Port MUX). These instructions cover the installation of up to two DZQ11 modules (Figure 4-8).

9. DHV11 (Eight-Port MUX). Instructions are for strapping DHV11 boards made by both DEC and Camintonn (Figures 4-9A and 4-9B).

10. System Foundation Module

11. File-tape interface module. For strapping information see Appendix H and Figure H-2.

ADDING JUMPERS. Generally, when a module has jumpers in groups of two pins, jumpering is most easily performed by adding standard shorting plugs between them. When the jumper options require making selections from groups of three or more pins, wire wrapping is usually the fastest and easiest method. Normally, there should be no more than two wire wraps per jumper pin.

SMS-SHIPPED CONFIGURATION. In the following tables, the column heading "SMS-SHIPPED CONFIGURATION" refers to the actual strapping that Scientific Micro Systems (SMS) performs on boards that are shipped to users for operation with the SMS 1000. In some cases this strapping differs from that performed by the board manufacturer. Thus, the SMS-shipped strapping represents the baseline or default board configuration for the SMS 1000 that you receive.

MULTIPLE MODULES. The "SMS-shipped configuration" applies only to the first module if more than one of a given type is being used. An example of this would be the installation of several MSV11 memory boards on the backplane. In this case, the SMS-

shipped configuration applies to the first board, i.e. the board with memory location 00000000. The proper strapping for the second and subsequent boards can be determined from the instructions given in this section.

STRAPPING THE KDF11-AA (LSI-11/23) CPU

The KDF11-AA has eighteen pairs of jumper pins that can be configured to implement various user-selectable features. These jumpers, the various configuration options, and the SMS-shipped jumper configuration are listed in Table 4-5. Refer to Figure 4-1 for locations of jumper pins.

TABLE 4-5

KDF11-AA

STRAPPING JUMPERS W1 THROUGH W18

JUMPER DESIG- NATION	JUMPER FUNCTION	SMS- SHIPPED CONFIGURATION	ALTERNATE CONFIGURATION AND/OR REMARKS
W1	Enable master clock	IN	Do not remove (Manufacturing only)
W2	Reserved (Mfg. only)	REMOVED	Do not install
W3	Reserved (Mfg. only)	IN	Do not remove
W4	BEVENT line enable	REMOVED	
	BEVENT line disable		Jumper IN = disable BEVENT line
W5 W6	Power-up Mode 2. Execute boot.	W5 REMOVED W6 IN	
	Power-up Mode 0. PC@24, PS@26 (octal)		W5 REMOVED W6 REMOVED
	Power-up Mode 1. Enter ODT.		W5 IN W6 REMOVED
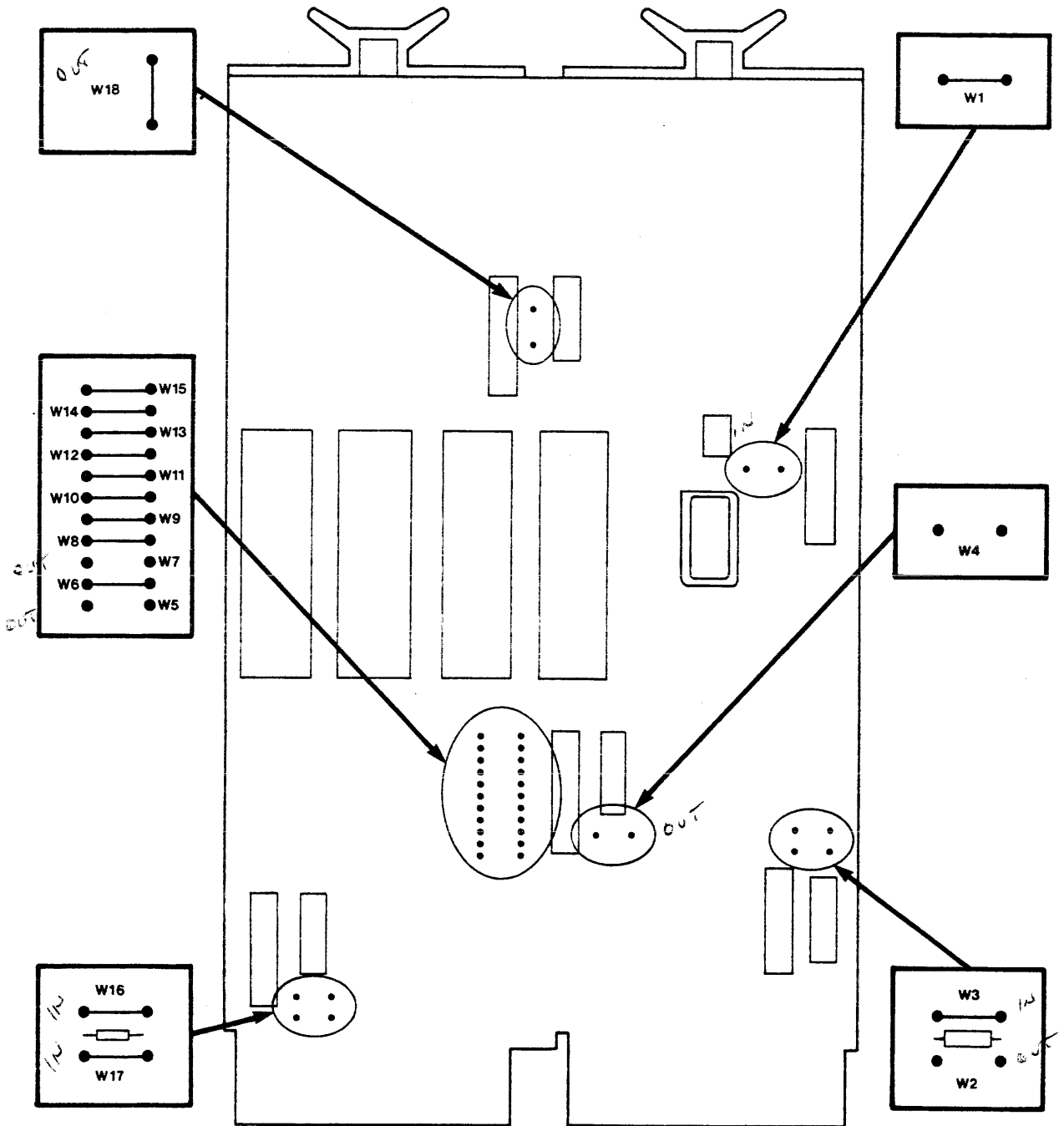
Fig. 4-1   Location of jumper pins on KDF11-AA (LSI-11/23)

	Power-up Mode 3. Reserved (extended microcode)		W5 IN W6 IN
W7	Enter ODT on halt	REMOVED	
			Jumper IN = Trap to location 10 (octal) on halt
W8	Power-up bootstrap address = 173000 (octal)	IN	
			Jumper REMOVED = power-up bootstrap address is given by jumpers W9-W15
W9 W10 W11 W12 W13 W14 W15	Select the high seven bits of the bootstrap starting address	W9-W15 IN	This address disregarded when jumper W8 is IN
W16	Reserved (Mfg. only)	IN	Do not remove
W17	Reserved (Mfg. only)	IN	Do not remove
W18	Wake-up circuit disable	IN	
			Jumper REMOVED = enable wake-up circuit

STRAPPING THE KDJ11-AB (LSI-11/73) CPU

The KDJ11-AB has nine pairs of jumper pins that can be configured to implement various user-selectable features. These jumpers, the various configuration options, and the SMS-shipped jumper configuration are listed in Tables 4-6 and 4-7. Refer to Figure 4-2 for locations of jumper pins.

TABLE 4-6

KDJ11-AB

SETTING UP JUMPERS W1 THROUGH W9

JUMPER DESIG-NATION	JUMPER FUNCTION	SMS-SHIPPED CONFIG-URATION	ALTERNATE CONFIGURATION AND/OR REMARKS
W1	Set bit 15 of bootstrap start address in Power-up Option 3.	IN	System is jumpered to operate in Power-up Option 2. Hence, this setting is ignored.
W2	Set bit 14 of bootstrap address in Power-up Option 3.	IN	System is jumpered to operate in Power-up Option 2. Hence, this setting is ignored.
W3	Power-up option selection	REMOVED	W3 OUT and W7 IN select Power-up Option 2. See Table 4-7 for Power-up options resulting from various connect-ions of W3 and W7.
W4	Set bit 13 of bootstrap start address in Power-up Option 3.	IN	System is jumpered to operate in Power-up Option 2. Hence, this setting is ignored.
W5	Determines processor response to a HALT.	IN	With W5 IN, a HALT causes processor to enter Micro-ODT mode.
			With W5 REMOVED, a HALT causes the pro-cessor to trap to

			location 4 and set bit 7 of CPU error register.
W6	Set bit 12 of bootstrap start address in Power-up Option 3.	IN	System is jumpered to operate in Power-up Option 2. Hence, this setting is ignored.
W7	Power-up option selection	IN	W3 OUT and W7 IN select Power-up Option 2. See Table 4-7 for Power-up options resulting from various connections of W3 and W7.
W8	Disable wakeup circuit	IN	With W8 IN, the KDJ11-AB wakeup circuit is disabled. The BDCOK signal is sequenced from logic on the System Foundation Module.
			With W8 REMOVED, the KDJ11-AB wakeup circuit is enabled.
W9	BEVENT register enable. Permits external-event interrupt request to processor.	REMOVED	With W9 removed, the BEVENT input is recognized and is under control of bit 6 of the line time clock register.
			With W9 IN, the BEVENT feature is disabled. Line time clock register is also disabled.

POWER-UP OPTIONS FOR THE KDJ11-AB

The user can select four possible power-up options by making various settings of the jumpers W3 and W7. These options are described as follows (and summarized in Table 4-7):

     1. POWER-UP OPTION 0. The processor reads physical memory locations 24 and 26 (octal) and loads the data into the PC and PS,
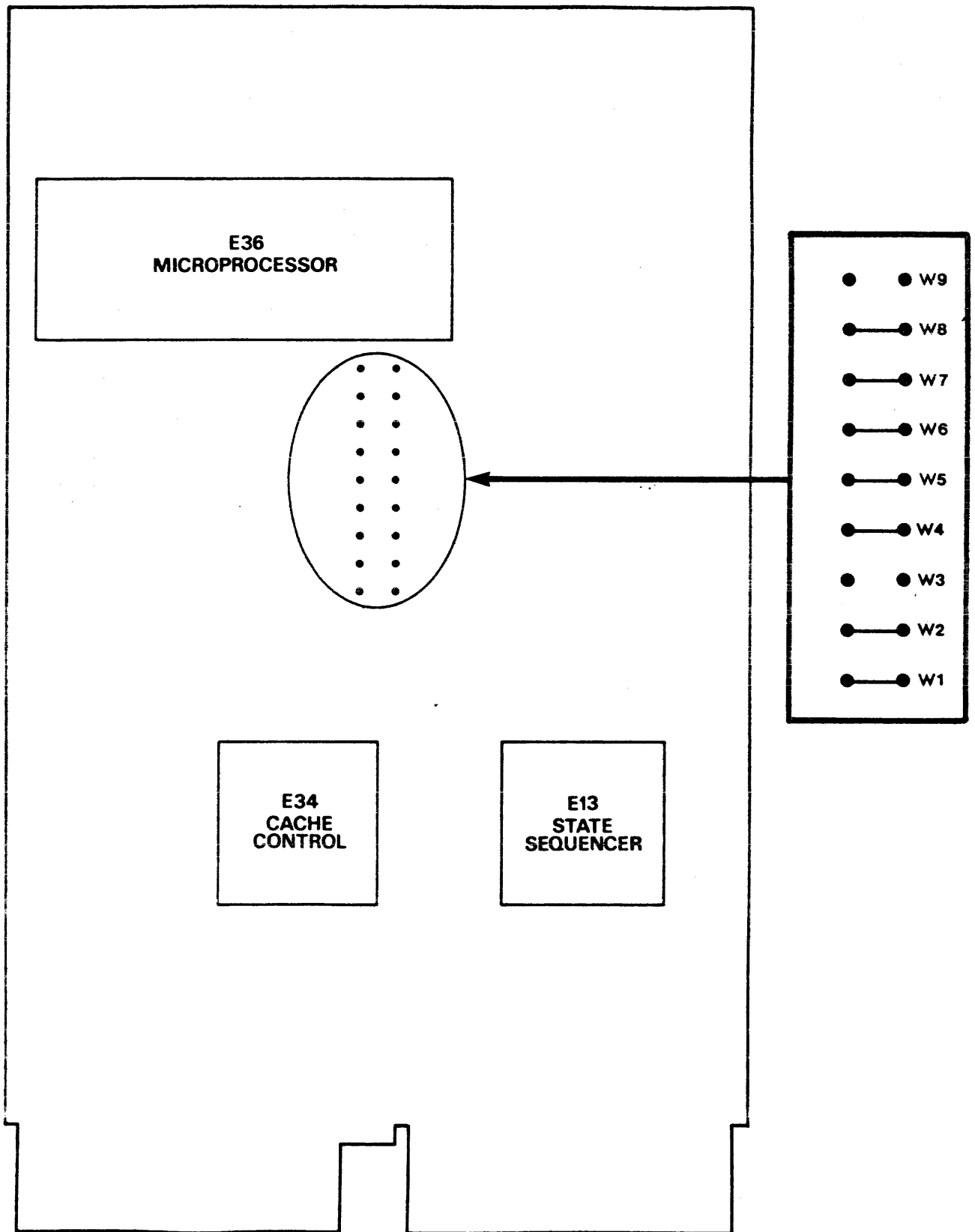
Fig. 4-2   Location of jumper pins on KDJ11-AA (LSI-11/73)

respectively.   The processor then either services pending interupts or starts program execution beginning at the memory location pointed to by the PC.

2. POWER-UP OPTION 1.   The processor unconditionally enters Micro-ODT with the PS cleared. Pending service conditions are ignored.

3. POWER-UP OPTION 2. Bootstrapping is controlled by the boot proms on the System Foundation Module. The KDJ11-AB boot prom is not used. The processor sets the PC at 173000 and the PS at 340 (octal). The processor then either services pending interrupts or starts program execution, beginning at the memory location pointed at by the PC. This is the SMS-shipped configuration for the SMS 1000.

4. POWER-UP OPTION 3.   The processor reads the four bootstrap jumpers, W1, W2, W4, W6, and loads the result into bits 15 through 12 of the PC. Bits 11 through 0 of the PC are set to zero, and the PS is set to 340 (octal). The processor then either services pending interrupts, or starts bootstrap program execution, beginning at the memory location pointed to by the PC.

TABLE 4-7

W3 AND W7 POWER-UP OPTION STRAPPING FOR THE KDJ11-AB

POWER-UP OPTION NO.	JUMPER W3	JUMPER W7	REMARKS
0	IN	IN	PC = 24 PS = 26
1	IN	REMOVED	Micro-ODT PS = 0
2 NOTE: This strapping is the SMS-shipped configuration.	REMOVED	IN	PC = 173000 PS = 0
3	REMOVED	REMOVED	W1,W2,W4,W6 give bootstrap starting address. PS = 340.

NOTE: All addresses are in octal.

STRAPPING THE MSV11-LK 256K-BYTE MEMORY MODULE

The process of strapping the jumper pins of the MSV11-LK falls into four main categories. These are:

1. Setting up the basic board functions (see Table 4-8)

2. Determining the Module Starting Address, the First Address Range (FAR), and the Partial Starting Address (PSA) for each MSV11 board being used (see Tables 4-9 and 4-10)

3. Selecting the CSR parity-register address for each MSV11 board in use (see Table 4-11)

4. Making the board's power jumper connections

STRAPPING SUMMARY

The following list of jumper connections summarizes the SMS-shipped configuration of the MSV11-LK. Refer to Figure 4-3 for location of jumper pins.

1. There are connections between the following jumper pins:

                     1 TO 2
                     6 TO 7
                    10 TO 11
                    15 TO 16
                    19 TO 20
                    25 TO 26
                    27 TO 28
                    33 TO 34
                     F TO H
                     R TO T

2. There are NO jumpers on any other pins.

3. The above strapping applies to the first MSV11-LK board in a system. To strap the second and subsequent boards in a system, follow the procedure in the remainder of these MSV11-LK strapping instructions.

STRAPPING PROCEDURE.

The various steps in strapping an MSV11-LK are described in Tables 4-8 through 4-11. Refer to Figure 4-3 for location of jumper pins.

TABLE 4-8

MSV11-LK

SETTING UP BASIC BOARD FUNCTIONS

NOTE: THE STRAPPING IN THIS TABLE IS THE SAME FOR ALL MSV11-LK
      BOARDS IN A SYSTEM.

JUMPER DESIGNATION OR FUNCTION	SMS-SHIPPED CONFIGURATION	ALTERNATE CONFIGURATION AND/OR REMARKS
MEMORY PARITY		
No parity		9 to 10
With parity	11 to 10	
Parity without CSR		18 to 19
Parity with CSR	20 to 19	
20ARITY ERROR REPORT		
Reported BDAL 16L (non-CSR)		3 to 2
Reported BDAL 16L & 17L (with CSR)	1 to 2	
SET WRITE-WRONG-PARITY DIAGNOSTIC BIT (TEST ONLY)		
Disable		8 to 7
Enable	6 to 7	
CSR SELECTION		
Non-CSR		J to H
With CSR	F to H	

PERIPHERAL PAGE SELECTION

2K peripheral page	29 to 28
4K peripheral page	27 to 28

FULL OR ONE-HALF MEMORY SELECTION

Half memory	32 to 33
Full memory	34 to 33

REMOVAL OF LOWER OR UPPER BANK (WITH A FAULT)

Failed lower bank	17 to 16
Normal operation or failed upper bank	15 to 16

EXTENDED OR NORMAL MEMORY SELECTION

128K words. (small system) Normal operation	R to T OUT
Greater than 128K words. (large system) Extended operation.	R to T IN

MODULE STARTING ADDRESS (MSA), FIRST ADDRESS RANGE (FAR),
AND PARTIAL STARTING ADDRESS (PSA)

FIRST MSV11 BOARD IN A SYSTEM. The first MSV11 board in a system
has a Module Starting Address (MSA) of zero, a First Address Range
(FAR) of zero, and a Partial Starting Address (PSA) of zero.   The
SMS-shipped boards are strapped to reflect this, as shown on the
first line of Tables 4-9 and 4-10. Also, the CSR address of the
first board in a system is strapped by the factory at octal
17772100, as shown in Table 4-11.

SECOND AND SUBSEQUENT BOARDS. The FAR, PSA and CSR strapping of
second and subsequent MSV11 boards is listed in Tables 4-9, 4-10,
and 4-11. Instructions for determining the values of MSA, FAR and
PSA are given in the following paragraphs.

REQUIREMENTS. Each MSV11-LK installed in the system must be jumpered to reflect its starting address (MSA) relative to its position within system memory; the first address in the range (FAR) of locations in which the MSA is found; and the 4K (words) starting-address boundary (PSA) if boards of unequal memory size are used in the backplane. The MSV11-LK's starting address can be set on any 4K word boundary within the system's address space.

MODULE STARTING ADDRESS. The Module Starting Address (MSA) is equal to the amount of memory (in K words of two bytes each, expressed in decimal) already present in a given system. The First Address Range (FAR) is the first address of the 128K-word range of addresses in which the MSA falls. The Partial Starting Address (PSA) identifies the 4K word boundary, within a specific group of 128K words, that the Module Starting Address falls in.

<div align="center">NOTE</div>

> All discussions of memory
> addresses and locations are
> expressed in decimal words,
> i.e. two bytes each.

SETTING FAR JUMPERS. To strap the module, first determine the MSA and then locate this figure within the various address ranges in the left-hand column of Table 4-9. For example, assume that the system has an MSA of 188K. From Table 4-9 we see that this lies within the range of 128 to 252. Hence, the FAR is 128. Therefore, as shown in the table, connect a jumper between pin L and pin K (ground).

SETTING PSA JUMPERS. The PSA is determined from the formula:

$$PSA = MSA - FAR.$$

Continuing the example, from the above formula the PSA is calculated as 188 - 128 or 60K. From Table 4-10 we see that a PSA of 60K requires strapping pins V, W, X and Y to pin U (ground). Note that the strapping rules require no more than two wire wraps per pin. Hence, these pins must be daisy chained and the last pin in line connected to pin U. Refer to Figure 4-3 for the location of the jumper pins.
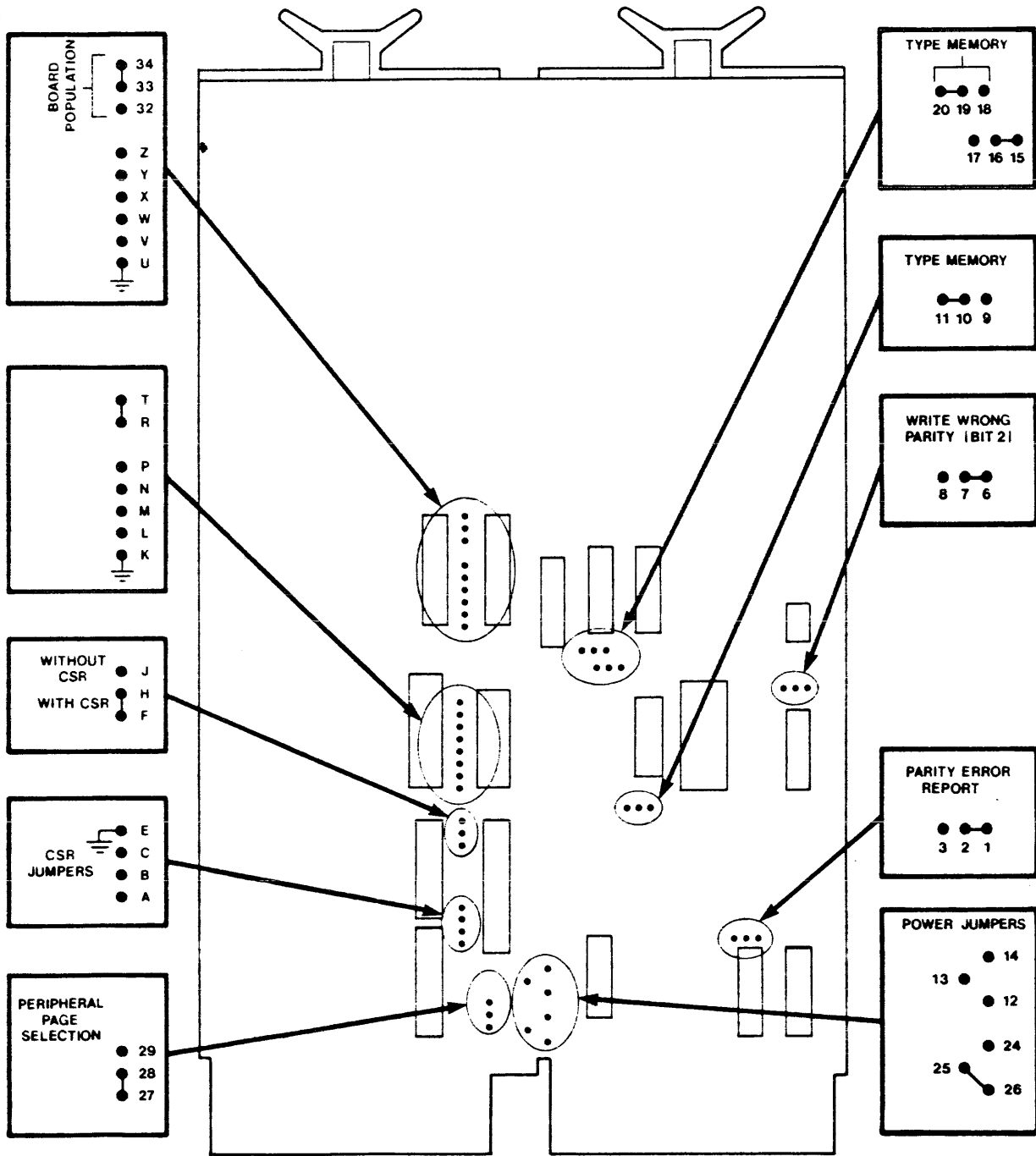
Fig. 4-3   Location of jumper pins on MSV11-LK

TABLE 4-9

MSV11-LK

DETERMINING FIRST ADDRESS RANGE (FAR) JUMPERS

STARTING ADDRESS RANGE (MSA)		FAR VALUE	JUMPERS TO BE CONNECTED TO GROUND (PIN K)			
DECIMAL WORDS (K)	OCTAL		P	N	M	L
			("X" = connect indicated pin to pin K)			
000-124	00000000-00760000	0	NO JUMPERS CONNECTED. THIS IS THE SMS-SHIPPED CONFIGURATION.			
128-252	01000000-01760000	128	-	-	-	X
256-380	02000000-02760000	256	-	-	X	-
384-508	03000000-03760000	384	-	-	X	X
512-636	04000000-04760000	512	-	X	-	-
640-764	05000000-05760000	640	-	X	-	X
768-892	06000000-06760000	768	-	X	X	-
896-1020	07000000-07760000	896	-	X	X	X
1024-1148	10000000-10760000	1024	X	-	-	-
1152-1276	11000000-11760000	1152	X	-	-	X
1280-1404	12000000-12760000	1280	X	-	X	-
1408-1532	13000000-13760000	1408	X	-	X	X

1536-1660	14000000-14760000	1536	X	X	-	-
1664-1788	15000000-15760000	1664	X	X	-	X
1792-1916	16000000-16760000	1792	X	X	X	-
1920-2044	17000000-17760000	1920	X	X	X	X

TABLE 4-10

MSV11-LK

DETERMINING PARTIAL STARTING ADDRESS (PSA) JUMPERS

PARTIAL STARTING ADDRESS (PSA)		JUMPERS TO BE CONNECTED TO GROUND (PIN U)				
DECIMAL WORDS (K)	OCTAL	Z	Y	X ("X" = connect indicated pin to pin U)	W	V
0	00000000	NO JUMPERS CONNECTED. THIS IS THE SMS-SHIPPED CONFIGURATION.				
4	00020000	-	-	-	-	X
8	00040000	-	-	-	X	-
12	00060000	-	-	-	X	X
16	00100000	-	-	X	-	-
20	00120000	-	-	X	-	X
24	00140000	-	-	X	X	-
28	00160000	-	-	X	X	X
32	00200000	-	X	-	-	-
36	00220000	-	X	-	-	X
40	00240000	-	X	-	X	-
44	00260000	-	X	-	X	X
48	00300000	-	X	X	-	-
52	00320000	-	X	X	-	X
56	00340000	-	X	X	X	-
60	00360000	-	X	X	X	X
64	00400000	X	-	-	-	-

68	00420000	X	-	-	-	X
72	00440000	X	-	-	X	-
76	00460000	X	-	-	X	X
80	00500000	X	-	X	-	-
84	00520000	X	-	X	-	X
88	00540000	X	-	X	X	-
92	00560000	X	-	X	X	X
96	00600000	X	X	-	-	-
100	00620000	X	X	-	-	X
104	00640000	X	X	-	X	-
108	00660000	X	X	-	X	X
112	00700000	X	X	X	-	-
116	00720000	X	X	X	-	X
120	00740000	X	X	X	X	-
124	00760000	X	X	X	X	X

CSR ADDRESS-SELECTION JUMPERS. There are eight jumper options that permit setting in CSR register addresses. Every MSV11 module has one CSR. The CSR is a 16-bit register with an address that starts in the top 4K of system address space. The memory modules closest to the CPU have the lowest module starting address (MSA). The module with the lowest MSA is assigned the lowest CSR address and is jumpered as shown on the first line of Table 4-11, where it is designated as "first MSV11" in the system. The next module in sequence ("second MSV11" in Table 4-11) is assigned the next higher CSR address, etc. Note that the CSR addresses are given for either 18-bit or 22-bit system addressing schemes.

TABLE 4-11

MSV11-LK

DETERMINING THE STRAPPING OF CSR JUMPERS

SEQUENCE OF MSV11 BOARDS IN THE SYSTEM	22-BIT CSR ADDRESS (OCTAL)	18-BIT CSR ADDRESS (OCTAL)	JUMPERS TO BE CONNECTED TO GROUND (PIN E)		
			C	B	A
			("X" = connect indicated pin to pin E)		
First	17772100	772100	NO JUMPERS CONNECTED. THIS IS THE SMS-SHIPPED CONFIGURATION.		
Second	17772102	772102	-	-	X
Third	17772104	772104	-	X	-
Fourth	17772106	772106	-	X	X
Fifth	17772110	772110	X	-	-
Sixth	17772112	772112	X	-	X
Seventh	17772114	772114	X	X	-
Eighth	17772116	772116	X	X	X

SETTING THE POWER JUMPERS. The power-jumper setting will be the same for all MSV11-LK boards in a system. To select either battery backup or no battery backup, jumper each MSV11-LK as follows:

NOTE

Scientific Micro Systems does
not support battery backup for
the MSV11-LK.

1. WITHOUT BATTERY BACKUP. Refer to Figure 4-3 for
location of jumper pins. Connect jumper pins
25 and 26. There is to be no connection to jumper
pins 12, 13, 14, and 24. This is the SMS-shipped
configuration.

2. WITH BATTERY BACKUP. Connect jumper pin 24 to
25 and pin 14 to 13. There is to be no connection
to jumper pins 12 and 26.

STRAPPING THE MSV11-PL 512K-BYTE MEMORY MODULE

The jumpering of the MSV11-PL falls into the following categories:

1. Setting the Module Starting Address (MSA), the First Address Range (FAR), and the Partial Starting Address (PSA) for each MSV11 board being used (see Tables 4-12 and 4-13).

2. Setting the CSR parity-register address for each MSV11 board in use (see Table 4-14)

3. Configuring the power jumpers (same for all boards)

4. Connecting the bus-grant continuity jumpers (same for all boards)

5. Configuring for system size (same for all boards)

6. Configuration of miscellaneous jumpers (same for all boards)

STRAPPING SUMMARY

The following list of jumper connections summarizes the SMS-shipped strapping configuration of the MSV11-PL. Refer to Figure 4-4 for locations of jumper pins.

1. There are connections between the following jumper pins or pin pairs (the reference designation "W" indicates a pin pair):

             W1
             W2
             W4
             W5
             W9
            W13
            W15
          3 TO 9
          4 TO 10
          6 TO 7
         13 TO 15
         14 TO 16
         43 TO 44

2. There are NO jumpers on any other pins

3. The above strapping applies to the first MSV11-PL board in a system. To strap the second and subsequent boards in a system, follow the procedure in the remainder of these MSV11-PL strapping instructions.

STRAPPING PROCEDURE

The various steps in strapping an MSV11-PL are described in Tables 4-12, 4-13, and 4-14. Refer to Figure 4-4 for location of jumper pins.

MODULE STARTING ADDRESS (MSA), FIRST ADDRESS RANGE (FAR), AND PARTIAL STARTING ADDRESS (PSA)

FIRST MSV11 BOARD IN A SYSTEM. The first MSV11 board in a system has a Module Starting Address (MSA) of zero, a First Address Range (FAR) of zero, and a Partial Starting Address (PSA) of zero. The SMS-shipped boards are strapped to reflect this, as shown on the first line of Tables 4-12 and 4-13. Also, the CSR address of the first board in a system is strapped by the factory at octal 17772100, as shown in Table 4-14.

SECOND AND SUBSEQUENT BOARDS. The FAR, PSA and CSR strapping of second and subsequent MSV11 boards is listed in Tables 4-12, 4-13, and 4-14. Instructions for determining the values of MSA, FAR and PSA are given in the following paragraphs.

GENERAL. Each MSV11-PL installed in the system must be jumpered to reflect its starting address (MSA) relative to its position within system memory; the first address in the range (FAR) of locations in which the MSA is found; and the 8K (words) starting-address boundary (PSA) if boards of unequal memory size are used in the backplane. The MSV11-PL's starting address can be set on any 8K word boundary within the system's address space.

MODULE STARTING ADDRESS. The Module Starting Address (MSA) is equal to the amount of memory (in K words of two bytes each, expressed in decimal) already present in a given system. The First Address Range (FAR) is the first address of the 256K-word range of addresses in which the MSA falls. The Partial Starting Address (PSA) identifies the 8K word boundary, within a specific group of 256K words, that the Module Starting Address falls in.

NOTE

All discussions of memory addresses and locations are expressed in decimal words, i.e. two bytes each.

SETTING FAR JUMPERS. To strap the module, first determine the
MSA and then locate this figure within the various address ranges
in the left-hand column of Table 4-12. For example, assume that
the system has an MSA of 336K words. From Table 4-12 we see that
this lies within the range of 256 to 504. Hence, the FAR is 256.
Therefore, as shown in the table, connect a jumper between pin V
and pin Y (ground).

SETTING PSA JUMPERS. The PSA is determined from the formula:

$$PSA = MSA - FAR.$$

Continuing the example, from the above formula the PSA is calcul-
ated as 336 - 256 or 80K words. From the left-hand column of
Table 4-13 we see that a PSA of 80K words requires strapping pins
N, and L to pin R (ground). Note that the strapping rules re-
quire no more than two wire wraps per pin. Hence, these pins
must be daisy chained and the last pin in line connected to pin
R. Refer to Figure 4-4 for the location of the jumper pins.

Here is a second example. Assume that the system already has
256K words of memory. Therefore, the MSA is 256K words. And, as
can be seen from the table, the FAR is also 256K words. Thus,
from the above formula: PSA = MSA - FAR, the PSA value in this
case is 256 - 256 or 0. That is, to generalize, with contiguous
boards of equal size, the PSA is always 0.

TABLE 4-12

MSV11-PL

DETERMINING FIRST ADDRESS RANGE (FAR) JUMPERS

STARTING ADDRESS RANGE (MSA)		FAR VALUE	JUMPERS TO BE CONNECTED TO GROUND (PIN Y)		
DECIMAL WORDS (K)	OCTAL		X ("X" = connect indicated pin to pin Y)	W	V
000-248	00000000-01740000	0	NO JUMPERS CONNECTED. THIS IS THE SMS-SHIPPED CONFIGURATION.		
256-504	02000000-03740000	256	-	-	X
512-760	04000000-05740000	512	-	X	-
768-	06000000-	768	-	X	X

1016	07740000				
1024–1272	10000000–11740000	1024	X	–	–
1280–1528	12000000–13740000	1280	X	–	X
1526–1784	14000000–15740000	1526	X	X	–
1742–2040	16000000–17740000	1742	X	X	X

TABLE 4-13

MSV11-PL

DETERMINING PARTIAL STARTING ADDRESS (PSA) JUMPERS

PARTIAL STARTING ADDRESS (PSA)		JUMPERS TO BE CONNECTED TO GROUND (PIN R)				
DECIMAL WORDS (K)	OCTAL	P	N	M	L	T
			("X" = connect indicated pin to pin R)			
0	00000000	NO JUMPERS CONNECTED. THIS IS THE SMS-SHIPPED CONFIGURATION.				
8	00040000	–	–	–	–	X
16	00100000	–	–	–	X	–
24	00140000	–	–	–	X	X
32	00200000	–	–	X	–	–
40	00240000	–	–	X	–	X
48	00300000	–	–	X	X	–
56	00340000	–	–	X	X	X
64	00400000	–	X	–	–	–
72	00440000	–	X	–	–	X
80	00500000	–	X	–	X	–
88	00540000	–	X	–	X	X
96	00600000	–	X	X	–	–
104	00640000	–	X	X	–	X
112	00700000	–	X	X	X	–

120	00740000	-	X	X	X	X
128	01000000	X	-	-	-	-
136	01040000	X	-	-	-	X
144	01100000	X	-	-	X	-
156	01140000	X	-	-	X	X
160	01200000	X	-	X	-	-
168	01240000	X	-	X	-	X
176	01300000	X	-	X	X	-
184	01340000	X	-	X	X	X
192	01400000	X	X	-	-	-
200	01440000	X	X	-	-	X
208	01500000	X	X	-	X	-
216	01540000	X	X	-	X	X
224	01600000	X	X	X	-	-
232	01640000	X	X	X	-	X
240	01700000	X	X	X	X	-
248	01740000	X	X	X	X	X

CSR ADDRESS SELECTION. There are sixteen jumper options that permit setting in CSR register addresses. Every MSV11-PL module has one CSR. The CSR is a 16-bit register with an address that starts in the top 4K of system address space. The memory modules closest to the CPU have the lowest module starting address (MSA). The module with the lowest MSA is assigned the lowest CSR address and is jumpered as shown on the first line of Table 4-14, where it is designated as "First MSV11" in the system. The next module in sequence ("Second MSV11" in Table 4-14) is assigned the next higher CSR address, etc. Note that the CSR addresses are given for either 18-bit or 22-bit system addressing schemes.
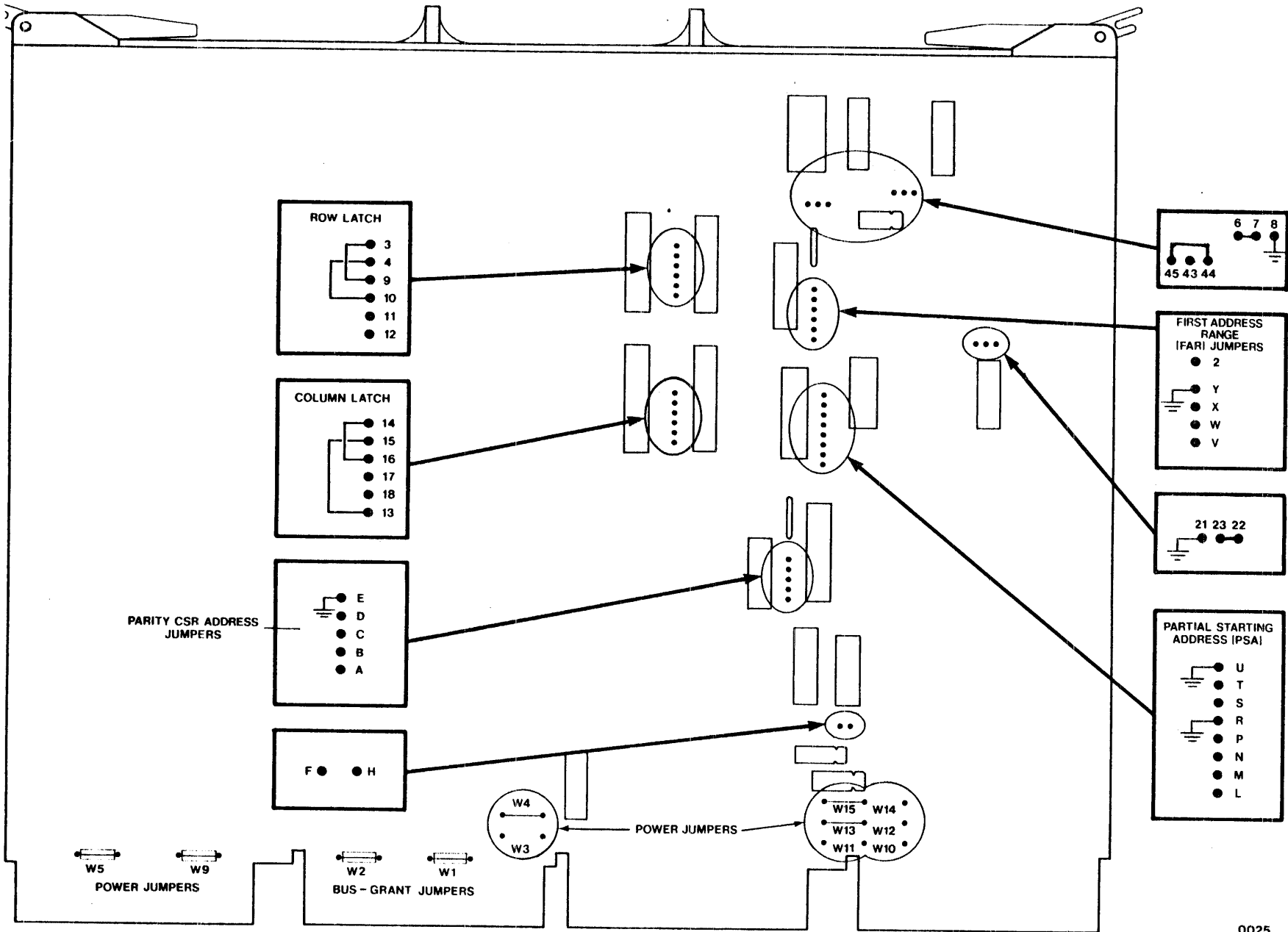
Fig. 4-4   Location of jumper pins on MSV11-PL

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TABLE 4-14

MSV11-PL

DETERMINING THE STRAPPING OF CSR JUMPERS

SEQUENCE OF MSV11 BOARDS IN THE SYSTEM	22-BIT CSR ADDRESS (OCTAL)	18-BIT CSR ADDRESS (OCTAL)	JUMPERS TO BE CONNECTED TO GROUND (PIN E)			
			D ("X" = connect indicated pin to pin E)	C	B	A
First	17772100	772100	NO JUMPERS CONNECTED. THIS IS THE SMS-SHIPPED CONFIGURATION.			
Second	17772102	772102	–	–	–	X
Third	17772104	772104	–	–	X	–
Fourth	17772106	772106	–	–	X	X
Fifth	17772110	772110	–	X	–	–
Sixth	17772112	772112	–	X	–	X
Seventh	17772114	772114	–	X	X	–
Eighth	17772116	772116	–	X	X	X
Ninth	17772120	772120	X	–	–	–
Tenth	17772122	772122	X	–	–	X
11th	17772124	772124	X	–	X	–
12th	17772126	772126	X	–	X	X
13th	17772130	772130	X	X	–	–
14th	17772132	772132	X	X	–	X
15th	17772134	772134	X	X	X	–
16th	17772136	772136	X	X	X	X

SETTING THE POWER JUMPERS. The power jumpers for the MSV11-PL are configured as follows:

    1. W3, W10, W11: ALWAYS OUT

    2. W4 and W5: ALWAYS IN

    3. W9, W13, W15: JUMPERS IN for non battery-backup.
    W12, W14: JUMPERS OUT for non battery-backup.
    This is the SMS-shipped configuration.

4. W12, W14: JUMPERS IN for battery backup.
W9, W13, W15: JUMPERS OUT for battery backup.

NOTE

Scientific Micro Systems does not
support MSV11-PL battery backup.

SETTING THE BUS-GRANT CONTINUITY JUMPERS. As shipped by SMS, the
two MSV11-PL jumpers W1 and W2 are always installed.

SETTING THE SYSTEM-SIZE JUMPERS. To configure an MSV11-PL for the
addressing size of the system, proceed as follows:

1. 22-BIT ADDRESSING. NO CONNECTION between jumper
pins 2 and Y (ground). This is the SMS-shipped
configuration.

2. 18-BIT ADDRESSING. Connect jumper pins 2 and Y.

MISCELLANEOUS JUMPERS. The following jumper connections are not
to be altered by the user. This list describes the SMS-shipped
configuration:

```
ALWAYS IN:     3 TO 9
               4 TO 10
               6 TO 7
              13 TO 15
              14 TO 16
              22 TO 23
              44 TO 45

ALWAYS OUT:    8 TO 7
               F TO H
              21 TO 22
              43 TO 44
```

STRAPPING THE CMV-1000 1024K-BYTE MEMORY MODULE

GENERAL. These instructions cover the strapping of up to two CMV-1000 1024KB memory modules. Refer to Figure 4-5. For each board, both the board parameters and the corresponding strapping instructions are given.

PARAMETERS FOR FIRST CMV-1000

>   Starting memory address = 0
>   Ending memory address = 1024K
>   CSR address = 17772100 (octal)
>   CSR parity enabled
>   22-bit CSR address
>   I/O page size = 4K words
>   Block mode enabled

STRAPPING PROCEDURE FOR FIRST CMV-1000

Note that jumper pairs A & B, C & D, F & G, H & J, K & L, and W1 & W2 are each located on the board with a common pin between them. Installing a jumper on pin A, for example, means making a connection, either by a shorting plug or by wire wrapping, between pin A and the common pin (with no connection to pin B). In the same way, installing a jumper on pin B means making a connection between pin B and the common pin (with no connection to pin A). To strap the first CMV-1000, proceed as follows:

1. Install the following jumpers:
    B, L, C, W1, R, P, N, M

2. Make the following settings on switch SW1. To make these settings use a fine-pointed tool such as the tip of a ball point pen to press directly down on the OFF or the ON side of each switch section. The SW1 settings are:

>   Section 1: ON
>   Section 2: ON
>   Section 3: ON
>   Section 4: ON
>   Section 5: ON
>   Section 6: not used

3. Make the following settings on switch SW2:

>   Section 1: ON
>   Section 2: ON

             Section 3: ON
             Section 4: OFF
             Section 5: OFF
             Section 6: ON

PARAMETERS FOR SECOND CMV-1000

        Starting memory address = 1024K
        Ending memory address = 2048K
        CSR address = 17772102 octal
        CSR parity enabled
        22 bit CSR address
        I/O page size = 4K words
        Block mode enabled

STRAPPING INSTRUCTIONS FOR SECOND CMV-1000

Proceed as follows:

        1. Install the following jumpers:
                B, L, C, W1, P, N, M

        2. Make the following settings on Switch SW1:

                Section 1: ON
                Section 2: ON
                Section 3: ON
                Section 4: OFF
                Section 5: OFF
                Section 6: not used

        3. Make the following settings on Switch SW2:

                Section 1: ON
                Section 2: ON
                Section 3: ON
                Section 4: ON
                Section 5: OFF
                Section 6: OFF

STRAPPING THE CMV-504 2048K-BYTE MEMORY MODULE

GENERAL. These instructions cover the strapping of up to two CMV-504 2048KB memory modules. Refer to Figure 4-6. For each board, both the board parameters and the corresponding strapping instructions are given. NOTE: THESE STRAPPING INSTRUCTIONS ARE THE SMS AS-SHIPPED CONFIGURATIONS FOR FIRST AND SECOND CMV-504 BOARDS.
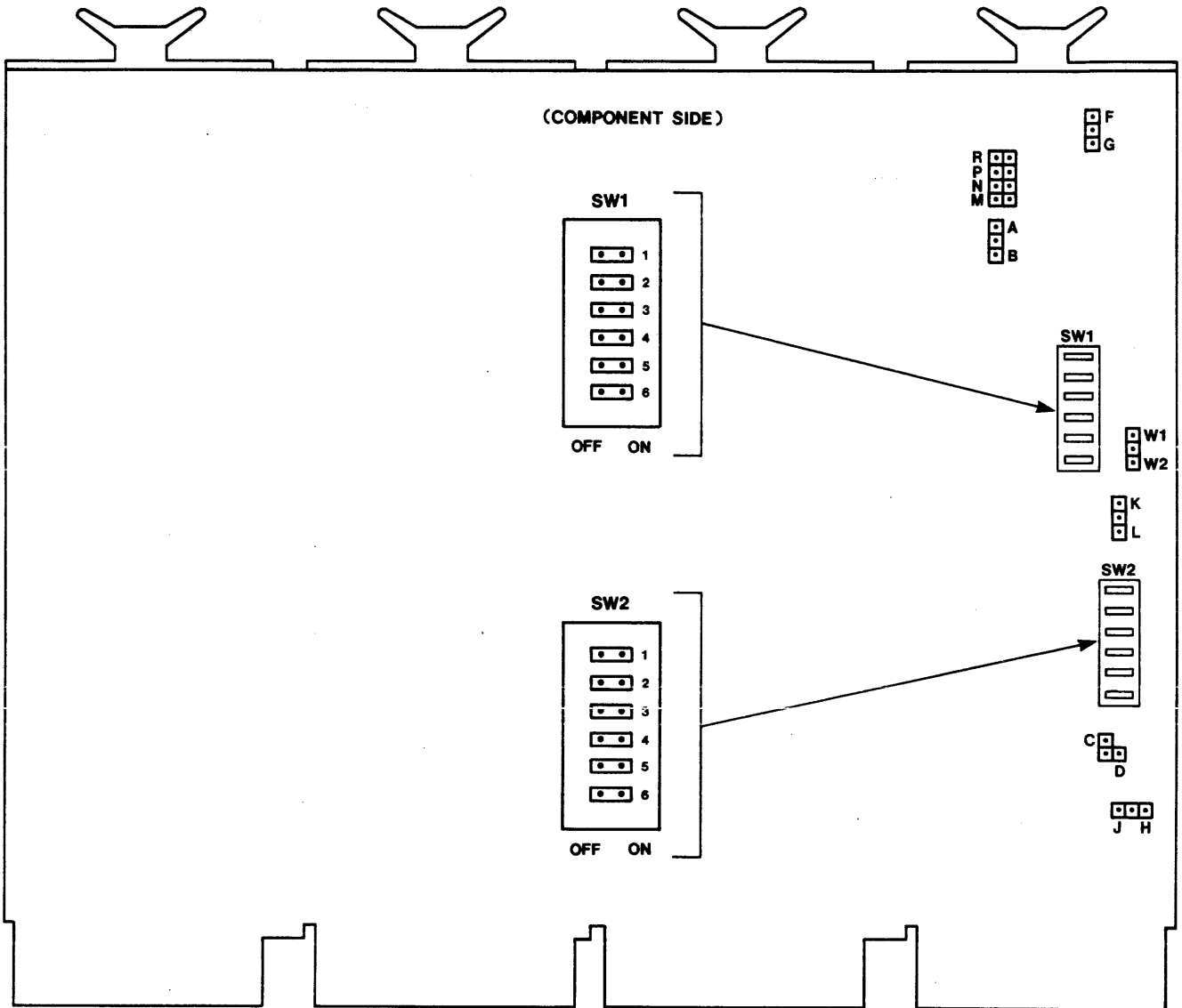
Fig. 4-5   Location of jumper pins on CMV-1000

HARDWARE CONFIGURATION INSTRUCTIONS

FUNCTIONS OF JUMPERS

The following table describes the functions of the CMV-504 jumpers.

TABLE 4-15

FUNCTIONS OF CMV-504 JUMPERS

JUMPER DESIGNATIONS	JUMPER FUNCTIONS
+5V & +5VB	Set +5 volt mode
C and D	Set CSR parity
A and B	Select 18/22 bit CSR
M, N, P, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16	Set starting and ending address boundary
G, H, J	CSR register address selection
K, L	2K/4K I/O page size
S and T	Block mode/non-block mode

PARAMETERS FOR FIRST CMV-504

        Starting memory address = 0
        Ending memory address = 2048K
        CSR address = 17772100 (octal)
        CSR parity enabled
        22-bit CSR address
        I/O page size = 4K words
        Block mode enabled

STRAPPING PROCEDURE FOR FIRST CMV-504

Note that jumper pairs A & B, C & D, K & L, S & T, 15 & 16 and +5V & +5VB are each located on the board with a common pin between them. Installing a jumper on pin A, for example, means making a connection, either by a shorting plug or by wire wrapping, between pin A and the common pin (with no connection to pin B). In the same way, installing a jumper on pin B means making a connection between pin B and the common pin (with no connection to pin A). To strap the first CMV-504, proceed as follows:

1. INSTALL the following jumpers:

B, C, K, T, J, H, G, 1, 2, 3, 4, 5, 6, 7, 8, 9,
10, 11, 12, 13, 15

2. The following jumpers are REMOVED:

A, D, L, S, 14, 16

PARAMETERS FOR SECOND CMV-504

Starting memory address = 2048K
Ending memory address = 4096K
CSR address = 17772102 (octal)
CSR parity enabled
22-bit CSR address
I/O page size = 4K words
Block mode enabled

STRAPPING PROCEDURE FOR SECOND CMV-504

1. INSTALL the following jumpers:

B, C, K, T, H, G, 1, 2, 3, 4, 5, 6, 7, 8, 10,
11, 12, 13, 14, 16

2. The following jumpers are REMOVED:

A, D, L, S, J, 9, 15

JUMPER SETTINGS FOR ALTERNATE STARTING AND ENDING MEMORY ADDRESSES
FOR CMV-504 AND CMV-254.

NOTE: This table applies to both the CMV-504 and the CMV-254.
For the CMV-254 strapping instructions, see below.

The following tables list the jumper settings for starting and
ending memory addresses that differ from the SMS factory-shipped
default values.

STARTING AND ENDING ADDRESS JUMPER CONNECTIONS
IN 512K-BYTE INCREMENTS (CMV-504 and CMV-254)

DESIRED STARTING ADDRESS (K BYTES)	STARTING ADDRESS JUMPER CONNECTIONS (SEE FIGURE 4-6)										
	1	2	3	4	5	6	7	8	9	15	16
0	I	I	I	I	I	I	I	I	I	I	R
512	I	I	I	I	I	I	R	R	R	R	I
1024	I	I	I	I	I	I	I	R	R	R	I
1536	I	I	I	I	I	I	R	I	R	R	I
2048	I	I	I	I	I	I	I	I	R	R	I
2560	I	I	I	I	I	I	R	R	I	R	I
3072	I	I	I	I	I	I	I	R	I	R	I
3584	I	I	I	I	I	I	R	I	I	R	I

DESIRED ENDING ADDRESS (K BYTES)	ENDING ADDRESS JUMPER CONNECTIONS (SEE FIGURE 4-6)				
	10	11	12	13	14
512	I	I	R	R	R
1024	I	I	I	R	R
1536	I	I	R	I	R
2048	I	I	I	I	R
2560	I	I	R	R	I
3072	I	I	I	R	I
3584	I	I	R	I	I
4096	I	I	I	I	I

LEGEND: I = INSTALLED
         R = REMOVED
NOTE: The above tables apply to both the CMV-504
       and the CMV-254.

STRAPPING THE CMV-254 1024K-BYTE MEMORY MODULE

These instructions cover the strapping of up to two CMV-254
1024K-byte memory modules. Refer to Figure 4-6 for the location

of jumper pins. For each board, both the default (i.e. as-shipped) parameters and the corresponding strapping instructions are given. Note that the functions of these jumpers are the same as those of the CMV-504 memory module.

PARAMETERS FOR FIRST CMV-254

        Starting memory address = 0
        Ending memory address = 1024K
        CSR address = 17772100 (octal)
        CSR parity enabled
        22-bit CSR address
        I/O page size = 4K words
        Block mode enabled

STRAPPING PROCEDURE FOR FIRST CMV-254

Note that jumper pairs A & B, C & D, K & L, S & T, 15 & 16 and +5V & +5VB are each located on the board with a common pin between them. Installing a jumper on pin A, for example, means making a connection, either by a shorting plug or by wire wrapping, between pin A and the common pin (with no connection to pin B). In the same way, installing a jumper on pin B means making a connection between pin B and the common pin (with no connection to pin A). To strap the first CMV-254, proceed as follows:

        1. INSTALL the following jumpers:

        B, C, K, T, J, H, G, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
        11, 12, 15

        2. The following jumpers are REMOVED:
        A, D, L, S, 13, 14, 16

PARAMETERS FOR SECOND CMV-254

        Starting memory address = 1024K
        Ending memory address = 2048K
        CSR address = 17772102 (octal)
        CSR parity enabled
        22-bit CSR address
        I/O page size = 4K words
        Block mode enabled

STRAPPING PROCEDURE FOR SECOND CMV-254

        1. INSTALL the following jumpers:

        B, C, K, T, H, G, 1, 2, 3, 3, 5, 6, 7, 10, 11
        12, 13, 16

2. The following jumpers are REMOVED:

A, D, L, S, J, 8, 9, 14, 15

ALTERNATE STARTING AND ENDING ADDRESS JUMPER CONNECTIONS

The jumper connections for alternate starting and ending addresses are the same as those for the CMV-504 module (see above).

STRAPPING THE CMV-500 512K-BYTE MEMORY MODULE

These instructions cover the strapping of up to two CMV-500 512K-byte memory modules. Refer to Figure 4-6 for the location of jumper pins. For each board, both the default (i.e. as-shipped) parameters and the corresponding strapping instructions are given. Note that the functions of these jumpers are the same as those of the CMV-504 memory module.

PARAMETERS FOR FIRST CMV-500

        Starting memory address = 0
        Ending memory address = 512K
        CSR address = 17772100 (octal)
        CSR parity enabled
        22-bit CSR address
        I/O page size = 4K words
        Block mode enabled

STRAPPING PROCEDURE FOR FIRST CMV-500

Note that jumper pairs A & B, C & D, K & L, S & T, 15 & 16 and +5V & +5VB are each located on the board with a common pin between them. Installing a jumper on pin A, for example, means making a connection, either by a shorting plug or by wire wrapping, between pin A and the common pin (with no connection to pin B). In the same way, installing a jumper on pin B means making a connection between pin B and the common pin (with no connection to pin A). To strap the first CMV-500, proceed as follows:

1. INSTALL the following jumpers:

B, C, K, T, J, H, G, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15

2. The following jumpers are REMOVED:

A, D, L, S, 12, 13, 14, 16

PARAMETERS FOR SECOND CMV-500

        Starting memory address = 500K
        Ending memory address = 1024K
        CSR address = 17772102 (octal)
        CSR parity enabled
        22-bit CSR address
        I/O page size = 4K words
        Block mode enabled

STRAPPING PROCEDURE FOR SECOND CMV-500

        1. INSTALL the following jumpers:

        B, C, K, T, H, G, 1, 2, 3, 4, 5, 6, 10, 11
        12, 16

        2. The following jumpers are REMOVED:

        A, D, L, S, J, 7, 8, 9, 13, 14, 15

JUMPER SETTINGS FOR ALTERNATE STARTING AND ENDING MEMORY
ADDRESSES FOR CMV-500 AND CMV-250.

NOTE: The following tables apply to both the CMV-500 and the CMV-250. For the CMV-250 strapping instructions, see below.

The following tables list the jumper settings for starting and ending memory addresses that differ from the SMS factory-shipped default values.

STARTING AND ENDING ADDRESS JUMPER CONNECTIONS
IN 128K-BYTE INCREMENTS (CMV-500 and CMV-250)

DESIRED STARTING ADDRESS (K BYTES)	STARTING ADDRESS JUMPER CONNECTIONS (SEE FIGURE 4-6)										
	1	2	3	4	5	6	7	8	9	15	16
0	I	I	I	I	I	I	I	I	I	I	R
128	I	I	I	I	R	R	R	R	R	R	I
256	I	I	I	I	I	R	R	R	R	R	I
384	I	I	I	I	R	I	R	R	R	R	I
512	I	I	I	I	I	I	R	R	R	R	I
640	I	I	I	I	R	R	I	R	R	R	I
768	I	I	I	I	I	R	I	R	R	R	I

16	I	R	R	R	R	R	R	R	R	R	I
24	R	I	R	R	R	R	R	R	R	R	I
32	I	I	R	R	R	R	R	R	R	R	I
40	R	R	I	R	R	R	I	R	R	R	I
48	I	R	I	R	R	R	R	R	R	R	I
56	R	I	I	R	R	R	R	R	R	R	I
64	I	I	I	R	R	R	R	R	R	R	I
72	R	R	R	I	R	R	R	R	R	R	I
80	I	R	R	I	R	R	R	R	R	R	I
88	R	I	R	I	R	R	R	R	R	R	I
96	I	I	R	I	R	R	R	R	R	R	I
104	R	R	I	I	R	R	R	R	R	R	I
112	I	R	I	I	R	R	R	R	R	R	I
120	R	I	I	I	R	R	R	R	R	R	I
128	I	I	I	I	R	R	R	R	R	R	I
136	R	R	R	R	I	R	R	R	R	R	I
144	I	R	R	R	I	R	R	R	R	R	I
152	R	I	R	R	I	R	R	R	R	R	I
160	I	I	R	R	I	R	R	R	R	R	I
168	R	R	I	R	I	R	R	R	R	R	I
176	I	R	I	R	I	R	R	R	R	R	I
184	R	I	I	R	I	R	R	R	R	R	I
192	I	I	I	R	I	R	R	R	R	R	I
200	R	R	R	I	I	R	R	R	R	R	I
208	I	R	R	I	I	R	R	R	R	R	I
216	R	I	R	I	I	R	R	R	R	R	I
224	I	I	R	I	I	R	R	R	R	R	I
232	R	R	I	I	I	R	R	R	R	R	I
240	I	R	I	I	I	R	R	R	R	R	I
248	R	I	I	I	I	R	R	R	R	R	I
256	I	I	I	I	I	R	R	R	R	R	I

LEGEND: I = INSTALLED
         R = REMOVED
NOTE: The above tables apply to both the CMV-500 and the CMV-250.

STRAPPING THE CMV-250 256K-BYTE MEMORY MODULE

These instructions cover the strapping of up to two CMV-250 256K-byte memory modules. Refer to Figure 4-6 for the location of jumper pins. For each board, both the default (i.e. as-shipped) parameters and the corresponding strapping instructions are given. Note that the functions of these jumpers are the same as those of the CMV-504 memory module.

PARAMETERS FOR FIRST CMV-250

        Starting memory address = 0
        Ending memory address = 256K
        CSR address = 17772100 (octal)
        CSR parity enabled
        22-bit CSR address
        I/O page size = 4K words
        Block mode enabled

STRAPPING PROCEDURE FOR FIRST CMV-250

Note that jumper pairs A & B, C & D, K & L, S & T, 15 & 16 and +5V & +5VB are each located on the board with a common pin between them. Installing a jumper on pin A, for example, means making a connection, either by a shorting plug or by wire wrapping, between pin A and the common pin (with no connection to pin B). In the same way, installing a jumper on pin B means making a connection between pin B and the common pin (with no connection to pin A). To strap the first CMV-250, proceed as follows:

    1. INSTALL the following jumpers:

    B, C, G, H, J, K, T, 1, 2, 3, 4, 5,
    6, 7, 8, 9, 10, 15

    2. The following jumpers are REMOVED:

    A, D, L, S, 11, 12, 13, 14, 16

PARAMETERS FOR SECOND CMV-250

        Starting memory address = 256K
        Ending memory address = 512K
        CSR address = 17772102 (octal)
        CSR parity enabled
        22-bit CSR address
        I/O page size = 4K words
        Block mode enabled

channels as 1, 2, 3 and 4. Later versions use the DEC designations. Throughout this documentation of the DLV11-J the four channels are referred to as 0, 1, 2 and 3.

The following table describes the default jumper configuration for DLV11-J boards as shipped by Scientific Micro Systems. Refer to Figures 4-7A (DEC) and 4-7B (Camintonn) for jumper locations. Also included is a discussion of alternate jumper connections in order to produce other configurations.

TABLE 4-16A (DEC)

DLV11-J (DEC)

SMS-SHIPPED JUMPER CONFIGURATIONS
FOR FIRST AND SECOND DLV11-J's (see Figure 4-7A)

JUMPER DESIG- NATION	SMS- SHIPPED CONFIGURATION	REMARKS
ADDRESS AND VECTOR JUMPERS FOR FIRST DLV11-J		
A/5 (bit 5)	X to 0	This connection of jumpers
A/6 (bit 6)	I	A/5 through A/12 implements
A/7 (bit 7)	R	the (octal) device base-
A/8 (bit 8)	X to 1	address assignment of 176500
A/9 (bit 9)	X to 0	for the RCSR register of
A/10 (bit 10)	X to 1	channel 0 (first DLV11-J). For
A/11 (bit 11)	X to 1	a complete list of the
A/12 (bit 12)	X to 1	register base-addresses for each channel see Table 4-17 at the end of this table.
V5 (First DLV11-J)	NONE	Remove jumper to implement an interrupt base vector of 300 (combination of V5, V6, and V7) for FIRST DLV11-J used. See Table 4-17.
V6	I	V6 and V7 set high-order bits
V7	I	in octal base-vector format.

NOTE: For address and vector jumpers, an installed jumper ("I") produces a bit value of 1; a jumper NOT installed ("R") produces a bit value of 0. Also, an "X to 0" connection produces a bit value of 0, and an "X to 1" connection produces a bit value of 1.

ADDRESS AND VECTOR JUMPERS FOR SECOND DLV11-J

A/5 (bit 5)	X to 1	This connection of jumpers
A/6 (bit 6)	I	A/5 through A/12 implements
A/7 (bit 7)	R	the (octal) device base-
A/8 (bit 8)	X to 1	address assignment of 176540
A/9 (bit 9)	X to 0	for RCSR register of channel
A/10 (bit 10)	X to 1	0 (second DLV11-J). For
A/11 (bit 11)	X to 1	a complete list of the
A/12 (bit 12)	X to 1	register base-addresses for
		each channel see Table 4-17
		at the end of this table.
V5	X to 1	Make the X to 1 connection to
(Second		implement an interrupt base
DLV11-J)		vector of 340 (combination of
		V5, V6, and V7) for the second
		DLV11-J. See Table 4-17.
V6	I	V6 and V7 set high-order bits
V7	I	in octal base-vector format.

NOTE: For address and vector jumpers, an installed jumper ("I")
produces a bit value of 1; a jumper NOT installed ("R") produces a
bit value of 0. Also, an "X to 0" connection produces a bit value
of 0, and an "X to 1" connection produces a bit value of 1.

                      CHANNEL 3 CONFIGURATION

C1	X to 0	The X to 0 connection for C1
C2	X to 0	and C2 configures channel 3
		as a port (not a console).

                     CHANNEL 3 BREAK RESPONSE

B-X-H	NONE	Absence of a jumper means that
		channel 3 makes no response in
		the presence of a received
		break signal.

                   COMMUNICATION LINE PARAMETERS

NOTE: The following jumper instructions apply to all
      four DLV11-J channels since each has the same
      SMS-shipped configuration. These jumpers determine
      the character format used by each channel.

      Refer to Table 4-18A for information on the alternate
      jumper configurations possible for each channel.

E	X to 0	Odd parity expected.
D	X to 1	Character contains 8 data bits.
S	X to 0	Selects a one-stop-bit width

```
                                            between adjacent characters.
P                    X to 1                 Parity not enabled.  Parity
                                            error bit held at 0.
```

BAUD-RATE SELECTION

NOTE: In the SMS-jumpered configuration, the baud-
       rate for all four channels is set to 9600 baud.
       Jumpers are connected from pins 0, 1, 2, or 3,
       corresponding to the respective channels (see
       Figure 4-7A), to baud-rate selection pins K, L, N,
       T, U, V, W, Y, and Z. Refer to Table 4-19 for
       complete baud-rate selection information.

```
0                    0 to N                 Sets Channel 0 to 9600 baud
1                    1 to N                 Sets Channel 1 to 9600 baud
2                    2 to N                 Sets Channel 2 to 9600 baud
3                    3 to N                 Sets Channel 3 to 9600 baud
```

CHANNEL 0-3 PERIPHERAL INTERFACE CONFIGURATIONS

NOTE: All four channels of the DLV11-J are set by SMS to be
      simultaneously compatible with both the EIA RS-423 and
      the RS-232C protocols. For jumpering instructions to
      implement the EIA RS-422 protocol or 20 mA Current-
      loop capability (in conjunction with the DLV11-KA
      module) refer to Table 4-20A.

```
M0                   X to 3                 Chan. 0 XMIT(+): RS-232C/423
N0                   X to 3                 Chan. 0 XMIT(-): RS-232C/423

M1                   X to 3                 Chan. 1 XMIT(+): RS-232C/423
N1                   X to 3                 Chan. 1 XMIT(-): RS-232C/423

M2                   X to 3                 Chan. 2 XMIT(+): RS-232C/423
N2                   X to 3                 Chan. 2 XMIT(-): RS-232C/423

M3                   X to 3                 Chan. 3 XMIT(+): RS-232C/423
N3                   X to 3                 Chan. 3 XMIT(-): RS-232C/423
```

MISCELLANEOUS

```
R10                  22K-ohm                Sets channels 0 and 1 for a
                     resistor               slew rate of 2 microseconds
                     installed              in RS-232C/423 operation.

R23                  22K-ohm                Sets channels 2 and 3 for a
                     resistor               slew rate of 2 microseconds
                     installed              in RS-232C/423 operation.
```

Fuse F1	2.0-amp fuse installed	Fuses 12-volt source line for all four channels for use in 20 mA current-loop operation.

LEGEND
I = Jumper installed
R = Jumper removed

IMPORTANT

Unless otherwise specified, the above configuration instructions apply to both the first and second DLV11-J.

TABLE 4-16B (Camintonn)

DLV11-J (Camintonn)

SMS-SHIPPED JUMPER CONFIGURATIONS
FOR FIRST AND SECOND DLV11-J's (see Figure 4-7B)

JUMPER DESIG-NATION	SMS-SHIPPED CONFIGURATION	REMARKS

ADDRESS AND VECTOR JUMPERS FOR FIRST DLV11-J

A/12 (bit 12)	OUT	This connection of jumpers A/12
A/11 (bit 11)	OUT	through A/5 sets eight bits of
A/10 (bit 10)	OUT	the (octal) device base address.
A/9 (bit 9)	IN	The address selected is 176500
A/8 (bit 8)	OUT	for the RCSR register of
A/7 (bit 7)	IN	channel 0 (first DLV11-J). For
A/6 (bit 6)	OUT	a complete list of the
A/5 (bit 5)	IN	register base-addresses for
		each channel see Table 4-17.
U20/6 (bit 5)	ON	An interrupt base vector of 300
U20/5 (bit 6)	OFF	is selected by setting sections
U20/4 (bit 7)	OFF	3, 4, 5 and 6 of DIP switch U20.
U20/3 (bit 8)	ON	These set bits V8, V7, V6 and V5,
U20/2	NOT USED	respectively, of the interrupt-
U20/1	NOT USED	vector base address.

NOTE: For address and vector jumpers on Camintonn boards, jumper IN assigns a 0 bit and jumper OUT assigns a 1 bit.

ADDRESS AND VECTOR JUMPERS FOR SECOND DLV11-J

A/12 (bit 12)	OUT	This connection of jumpers
A/11 (bit 11)	OUT	A/12 through A/5 sets eight bits of
A/10 (bit 10)	OUT	the (octal) device base address.

A/9 (bit 9)	IN	The address selected is 176540
A/8 (bit 8)	OUT	for the RCSR register of channel
A/7 (bit 7)	IN	0 (second DLV11-J). For
A/6 (bit 6)	OUT	a complete list of the
A/5 (bit 5)	OUT	register base-addresses for
		each channel see Table 4-17.

U20/6 (bit 5)	OFF	An interrupt base-vector of 340 is
U20/5 (bit 6)	OFF	selected by making the indicated
U20/4 (bit 7)	OFF	settings of switches U20/3, U20/4,
U20/3 (bit 8)	ON	U20/5, and U20/6. These set bits V8,
U20/2	NOT USED	V7, V6 and V5, respectively, of the
U20/1	NOT USED	interrupt-vector base address.

NOTE: For address and vector jumpers on Camintonn boards, jumper
IN assigns a 0 bit and jumper OUT assigns a 1 bit.

CHANNEL 3 CONFIGURATION

CON	IN	The IN connection for the CON
		jumper pins configures Channel
		3 as a serial port.

CHANNEL 3 BREAK RESPONSE

E4	OUT	Absence of these jumpers means that
E5	OUT	Channel 3 makes no response in the
		presence of a received break signal.

COMMUNICATION LINE PARAMETERS (same for each channel)

NOTE: The following jumper instructions apply to all
      four DLV11-J channels since each has the same
      SMS-shipped configuration. These jumpers determine
      the character format used by each channel.
      Refer to Table 4-18B for information on the alternate
      jumper configurations possible for each channel.

B5	IN	Odd parity expected.
B1	IN	

B3	OUT	Character contains 8 data bits.
B4	OUT	

B2	IN	Selects a one-stop-bit width
		between adjacent characters.

BAUD-RATE SELECTION

NOTE: In the SMS-jumpered configuration, the baud
       rate for all four channels is set to 9600 baud.

All four channels have the same strapping. Remember
that when a channel is strapped for a given baud
rate, no other baud-rate jumpers must be installed for
that channel. To change baud rates, move jumper plugs
to the correspondingly marked jumper pin pairs. Only
one jumper plug must be IN per channel. See Figure 4-7B.

CHAN 0/9600	IN	Sets Channel 0 to 9600 baud
CHAN 1/9600	IN	Sets Channel 1 to 9600 baud
CHAN 2/9600	IN	Sets Channel 2 to 9600 baud
CHAN 3/9600	IN	Sets Channel 3 to 9600 baud

CHANNEL 0-3 PERIPHERAL INTERFACE CONFIGURATIONS

NOTE: All four channels of the DLV11-J are set by SMS to be
simultaneously compatible with both the EIA RS-232C and
the RS-423 protocols. See Table 4-20B for RS-422
strapping and for instructions on strapping to permit
20-mA current-loop operation. (See Figure 4-7B.)

J0/232	IN	Chan. 0 (Receive): RS-232C/423
J1/232	IN	Chan. 1 (Receive): RS-232C/423
J2/232	IN	Chan. 2 (Receive): RS-232C/423
J3/232	IN	Chan. 3 (Receive): RS-232C/423
J0/X1	IN	Chan. 0 (Transmit): RS-232C/423
J0/X2	IN	
J1/X1	IN	Chan. 1 (Transmit): RS-232C/423
J1/X2	IN	
J2/X1	IN	Chan. 2 (Transmit): RS-232C/423
J2/X2	IN	
J3/X1	IN	Chan. 3 (Transmit): RS-232C/423
J3/X2	IN	

OPTIONS FOR MASTER RESET OF THE UART

E3	OUT	If used, Master Reset is DCOKL
E2	IN	Master Reset signal is INITH

SELECTION OF BUS-REQUEST (BR) INTERRUPT-LEVEL OPTIONS

E7	IN	Selects bus request (BR) level 4.
E10	IN	Jumpers E6, E8, E9 and E11 are OUT.
E12	IN	This is the SMS as-shipped (default) configuration.
E6		Selects bus request (BR) level 5.
E8		(If selected, jumpers E6, E8, E10
E10		and E12 are IN, and E7, E9 and E11
E12		are OUT.)
E6		Selects bus request (BR) level 6.
E9		(If selected, jumpers E6, E9
E11		and E11 are IN, and E7, E8, E10
		and E12 are OUT.)

LEGEND

IN = Jumper installed
OUT = Jumper removed

IMPORTANT

Unless otherwise specified, above configuration instructions
apply to both the first and second DLV11-J.

TABLE 4-17 (DEC and Camintonn)

CSR ADDRESSES AND VECTORS FOR FIRST AND SECOND DLV11-J

CSR ADDRESS (FIRST DLV11-J)	CSR ADDRESS (SECOND DLV11-J)	REGISTER	INTER-RUPT VECTOR (FIRST DLV11-J)	INTER-RUPT VECTOR (SECOND DLV11-J)
		CHANNEL 0		
176500	176540	RCSR		
176502	176542	RBUF	300	340
176504	176544	XCSR		
176506	176546	XBUF	304	344
		CHANNEL 1		
176510	176550	RCSR		
176512	176552	RBUF	310	350
176514	176554	XCSR		

176516	176556	XBUF	314	354

CHANNEL 2

176520	176560	RCSR		
176522	176562	RBUF	320	360
176524	176564	XCSR		
176526	176566	XBUF	324	364

CHANNEL 3

176530	176570	RCSR		
176532	176572	RBUF	330	370
176534	176574	XCSR		
176536	176576	XBUF	334	374

TABLE 4-18A (DEC)

DLV11-J (DEC)

ALTERNATE CHARACTER-FORMAT CONFIGURATIONS
(See Figure 4-7A)

JUMPERS (EACH CHANNEL)	CHANNEL PARAMETER	RESULT OF X TO 0 CONNECTION	RESULT OF X TO 1 CONNECTION
E*	Parity	Odd parity expected	Even parity expected
D	Bits per character	7 bits	8 bits
S	Number of stop bits	1 bit	2 bits
P	Parity on/off	Parity on	Parity off

* - The E jumpers must have an X-to-0 or an X-to-1 connection even if parity-off is selected for the P jumpers.
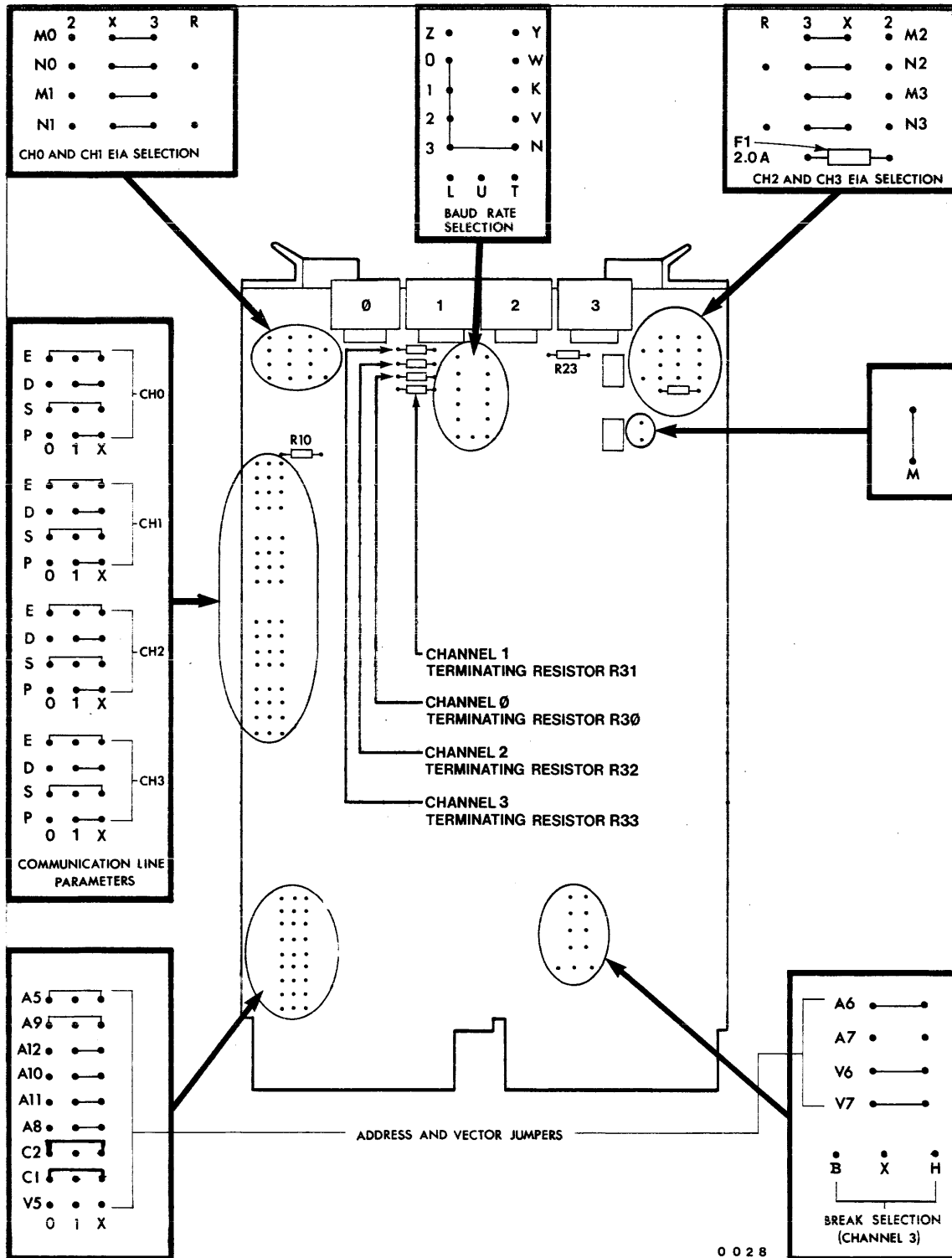
Fig. 4-7A   Location of jumper pins on DLV11-J (DEC)
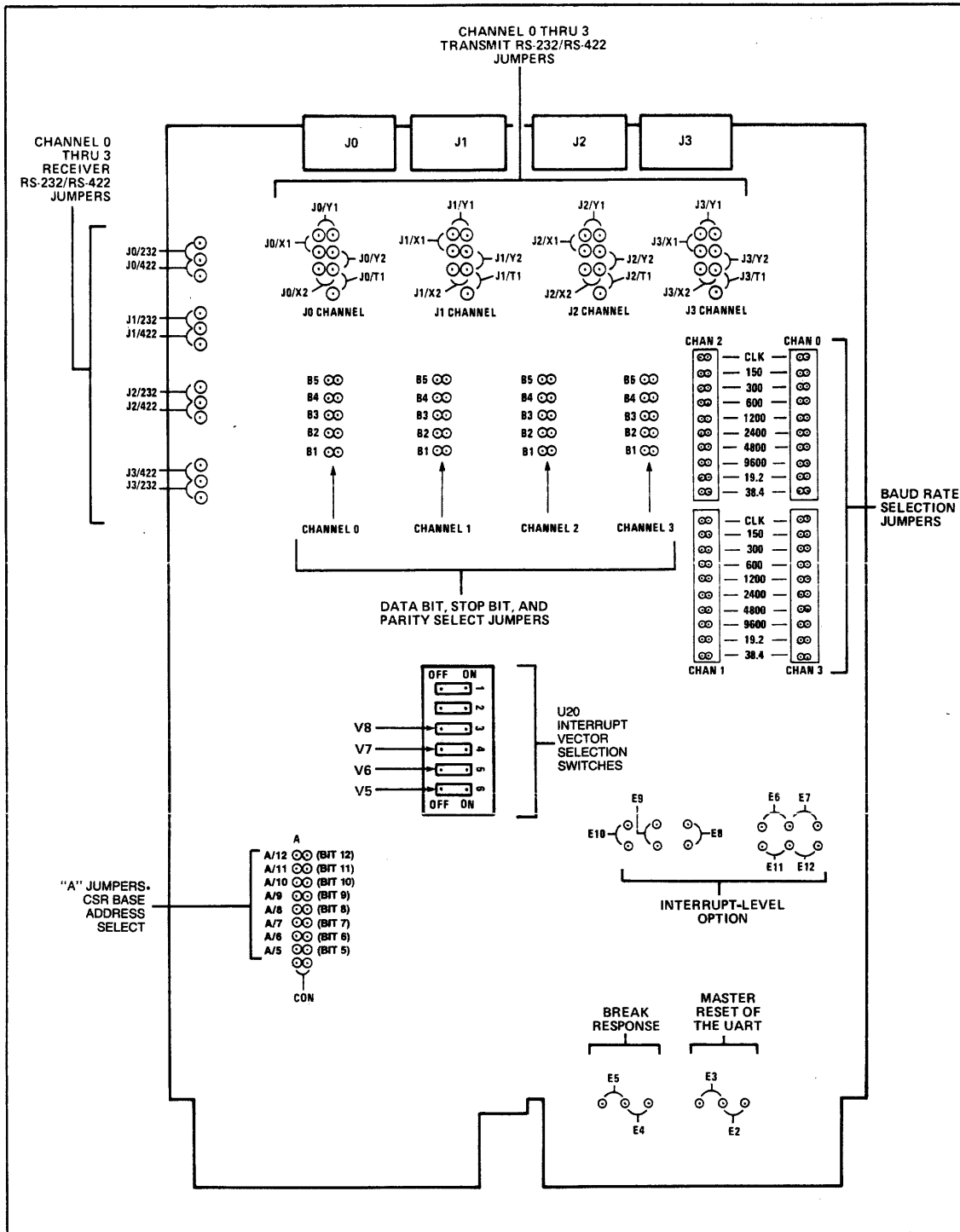
Fig. 4-7B   Location of jumper pins on DLV11-J (Camintonn)

TABLE 4-18B (Camintonn)

DLV11-J (Camintonn)

ALTERNATE CHARACTER-FORMAT CONFIGURATIONS
(See Figure 4-7B.)

JUMPERS (EACH CHANNEL)	CHANNEL PARAMETER	REMARKS
B5 IN B1 IN	Parity	Odd parity expected
B5 OUT B1 IN	Parity	Even parity expected
B2 OUT	No. of stop bits	Two stop bits between adjacent characters
B3 IN B4 IN	No. of data bits in a character	Five data bits/char.
B3 IN B4 OUT	No. of data bits in a character	Six data bits/char.
B3 OUT B4 IN	No. of data bits in a character	Seven data bits/char.
E4 IN E5 OUT	Break response	Halt on Break.
E4 OUT E5 IN	Break response	Re-boot on Break.

TABLE 4-19 (DEC only)

DLV11-J (DEC)

BAUD RATE OPTIONS

CONNECTION FROM PINS 0, 1, 2, OR 3 TO PIN:	CORRESPONDING BAUD RATE
U	150
T	300
V	600

W	1200
Y	2400
L	4800
N	9600
K	19,200
Z	38,400

NOTE: The connection of pins 0, 1, 2, and 3 to pin N is
the SMS-shipped configuration.

TABLE 4-20A (DEC)

DLV11-J (DEC)

ALTERNATE PERIPHERAL-INTERFACE CONFIGURATIONS
(See Figure 4-7A)

JUMPER OR COMPONENT	PROTOCOL AND REQUIREMENTS		
	RS-232C/ RS-423	RS-422	20 mA CURRENT LOOP
M0, M1, M2, M3	X TO 3	X TO 2	X TO 3
N0, N1, N2, N3	X TO 3	X TO 2	X TO R (SEE NOTE 1)
TERMINATION RESISTORS R30: Chan. 0 R31: Chan. 1 R32: CHAN. 2 R33: Chan. 3	(RS-422 ONLY) Install each resistor as shown in Figure 4-7A. Each resistor is 100 ohms, 1/4 watt, non-wire wound and fusible.		
SLEW-RATE RESISTORS R10: Chan. 0 and Chan. 1 R23: Chan. 2 and Chan. 3	(RS-232C/RS-423 ONLY) Install R10 and R23 at locations shown in Fig. 4-7A. Each resistor is 22K, 1/4 watt and non wire-wound. See Table 4-21 for values of R10 and R23 that correspond to various baud rates. Note that each resistor sets slew rate for two channels. The 22K resistor		

produces a two-microsecond slew rate at 9600 baud.	
FUSE F1	Fuses 12-volt source for all four 20 mA current-loop channels. Install a 2.0 amp Pico fuse at location shown in Figure 4-7A.

NOTE 1: In conjunction with a converter device such as a DLV11-KA, this interface permits program-controlled data transfers, on a single-character basis, from devices such as paper tape readers.

TABLE 4-20B (CAMINTONN)

DLV11-J (Camintonn)
ALTERNATE PERIPHERAL-INTERFACE CONFIGURATIONS
(see Figure 4-7B)

JUMPERS (EACH CHANNEL)	JUMPER CONN- ECTION	CHANNEL PROTOCOL	REMARKS
J0/422	IN	RS-422	Receive
J1/422	IN		
J2/422	IN		
J3/422	IN		
J0/Y1	IN	RS-422	Transmit
J0/Y2	IN		
J1/Y1	IN		
J1/Y2	IN		
J2/Y1	IN		
J2/Y2	IN		
J3/Y1	IN		
J3/Y2	IN		
J0/T1	IN	20-mA current loop	Enables 20-mA current-loop operation.
J1/T1	IN		
J2/T1	IN		
J3/T1	IN		

TABLE 4-21 (DEC only)

DLV11-J (DEC)

SELECTION OF RS-232C/423 SLEW-RATE RESISTOR VALUES

BAUD RATE	VALUE OF R10: CHAN. 0 AND 1 VALUE OF R23: CHAN. 2 AND 3
110 thru 600	1 megohm
1200	820K
2400	430K
4800	200K
9600	120K
19,200	51K
38,400	22K (see note)

NOTE: SMS-shipped default value is normally 22K. This
       provides a sufficiently accurate slew rate over a
       range of at least 9600 through 38,400 baud.

===

STRAPPING THE DZQ11 FOUR-PORT MUX

The strapping of the DZQ11 module involves the following steps:

1. Setting the ten CSR address switches on E28
    (A3 through A12). For the first DZQ11 used
    in your SMS 1000, refer to Table 4-22. For
    the second DZQ11 used, the CSR settings
    are given in Table 4-23. See Figure 4-8.

2. Setting the six interrupt vector switches on
    E13 sections 1 through 6 (V3 through V8).
    E13/7 is not used. For the first DZQ11 used
    in your SMS 1000, the interrupt-vector
    switch settings are given in Table 4-24.
    For the second DZQ11 the interrupt-vector
    switch settings are given in Table 4-25.

3. Setting DIP switch E13, sections 8, 9
    and 10. Section 8 is a test switch which
    can disconnect the DZQ11 oscillator.
    Sections 9 and 10 control the DZQ11
    response to a Break character received
    on line 3.

4. Setting the module's 13 configuration
    jumpers: W1 through W13.

SETTING THE CSR ADDRESS SWITCHES (E28).

The DZQ11 device base address is assigned by making the appropriate settings on ten DIP switches located on the card's base-address switch group E28 (see Figure 4-8). These switch settings affect ten of the sixteen bits of the CSR base address. The three most-significant address bits are preset to 1's and the three least significant bits are preset to 0's. The ten DIP switches control the setting of base address bits 12 through 3.

CSR BASE-ADDRESS SETTING. The E28 DIP switches are set by SMS to produce a CSR base address configuration of 160100 (octal) for the first DZQ11 and 160110 (octal) for the second. Refer to Tables 4-22 and 4-23.

SETTING THE SWITCHES. Note that the DIP switches are numbered 1 through 10 and that these switches control, respectively, base-address bits 12 through 3 of the 16-bit address. To set a switch to ON use a fine-pointed tool, such as the tip of a ball point pen, and press straight down on the dot-like depression on the side of the switch that is numbered, until the switch snaps down. To set the switch to OFF do the same thing on the side of the switch marked "OPEN".

An ON setting of a switch puts a 1 bit into its corresponding position in the base address. An OFF position sets in a 0 bit. The SMS-shipped base-address settings of these switches are as follows:

TABLE 4-22
FIRST DZQ11

SMS-SHIPPED CONFIGURATION
E28 SWITCH SETTINGS TO ASSIGN A CSR BASE-ADDRESS OF 160100

BASE-ADDRESS BIT	SWITCH NUMBER ON E28	SWITCH SETTING	BIT VALUE
12 (MSB)	1	OFF	0
11	2	OFF	0
10	3	OFF	0
9	4	OFF	0
8	5	OFF	0
7	6	OFF	0

6	7	ON	1
5	8	OFF	0
4	9	OFF	0
3 (LSB)	10	OFF	0

TABLE 4-23
SECOND DZQ11

SMS-SHIPPED CONFIGURATION
E28 SWITCH SETTINGS TO ASSIGN A CSR BASE-ADDRESS OF 160110

BASE-ADDRESS BIT	SWITCH NUMBER ON E28	SWITCH SETTING	BIT VALUE
12 (MSB)	1	OFF	0
11	2	OFF	0
10	3	OFF	0
9	4	OFF	0
8	5	OFF	0
7	6	OFF	0
6	7	ON	1
5	8	OFF	0
4	9	OFF	0
3 (LSB)	10	ON	1

SETTING THE INTERRUPT-VECTOR ADDRESS SWITCHES (E13).

The DZQ11 device interrupt-vector address is assigned by making the appropriate settings on six of the ten rocker-type DIP switches located on the card's vector-address switch E13 (see Figure 4-8). These switch settings affect six of the sixteen bits of the interrupt-vector address. The seven most-significant interrupt-vector-address bits and the three least significant bits are all preset to 0's. The six DIP switches of E13, numbered 1 through 6, control the setting of interrupt-

vector address bits 8 through 3, respectively, of the 16-bit
address.   Note that DIP switch group E13 has ten switches. The
settings of switches 7, 8, 9 and 10 are described below.

INTERRUPT-VECTOR ADDRESS SETTING. The switches of E13 are set
to produce an SMS-shipped interrupt-vector address of 400
(octal) for the first DZQ11 and 410 (octal) for the second.
Refer to Tables 4-23 and 4-24.

SETTING THE SWITCHES. To set a switch to ON, use a fine-pointed
tool, such as the tip of a ball point pen, and press straight
down on the dot-like depression on the side of the switch that
is numbered, until the switch snaps down. To set the switch to
OFF do the same thing on the side of the switch marked "OPEN".

An ON setting of a switch puts a 1 bit into its corresponding
position in the interrupt-vector address. An OFF position sets
in a 0 bit. The SMS-shipped interrupt-vector address settings of
these switches are as follows:

TABLE 4-24
FIRST DZQ11

SMS-SHIPPED CONFIGURATION
E13 SETTINGS TO ASSIGN INTERRUPT-VECTOR ADDRESS OF 400

INTERRUPT-ADDRESS BIT	SWITCH NUMBER ON E13	SWITCH SETTING	BIT VALUE
8 (MSB)	1	ON	1
7	2	OFF	0
6	3	OFF	0
5	4	OFF	0
4	5	OFF	0
3 (LSB)	6	OFF	0

TABLE 4-25
SECOND DZQ11

SMS-SHIPPED CONFIGURATION
E13 SETTINGS TO ASSIGN INTERRUPT-VECTOR ADDRESS OF 410

INTERRUPT-ADDRESS BIT	SWITCH NUMBER ON E13	SWITCH SETTING	BIT VALUE
8 (MSB)	1	ON	1
7	2	OFF	0
6	3	OFF	0
5	4	OFF	0
4	5	OFF	0
3 (LSB)	6	ON	1

SETTINGS OF DIP SWITCHES E13/7, E13/8, E13/9 AND E13/10

These DIP switches are to be set as follows:

SWITCH NUMBER ON E13	SMS AS-SHIPPED SETTING	REMARKS
7	Either	NOT USED
8	ON	Test switch. The OFF position disconnects the DZQ11 oscillator.
9	OFF	With 9 ON and 10 OFF, processor halts when a Break character is received. With 9 OFF and 10 ON, processor boots when a Break character is received.
10	OFF	
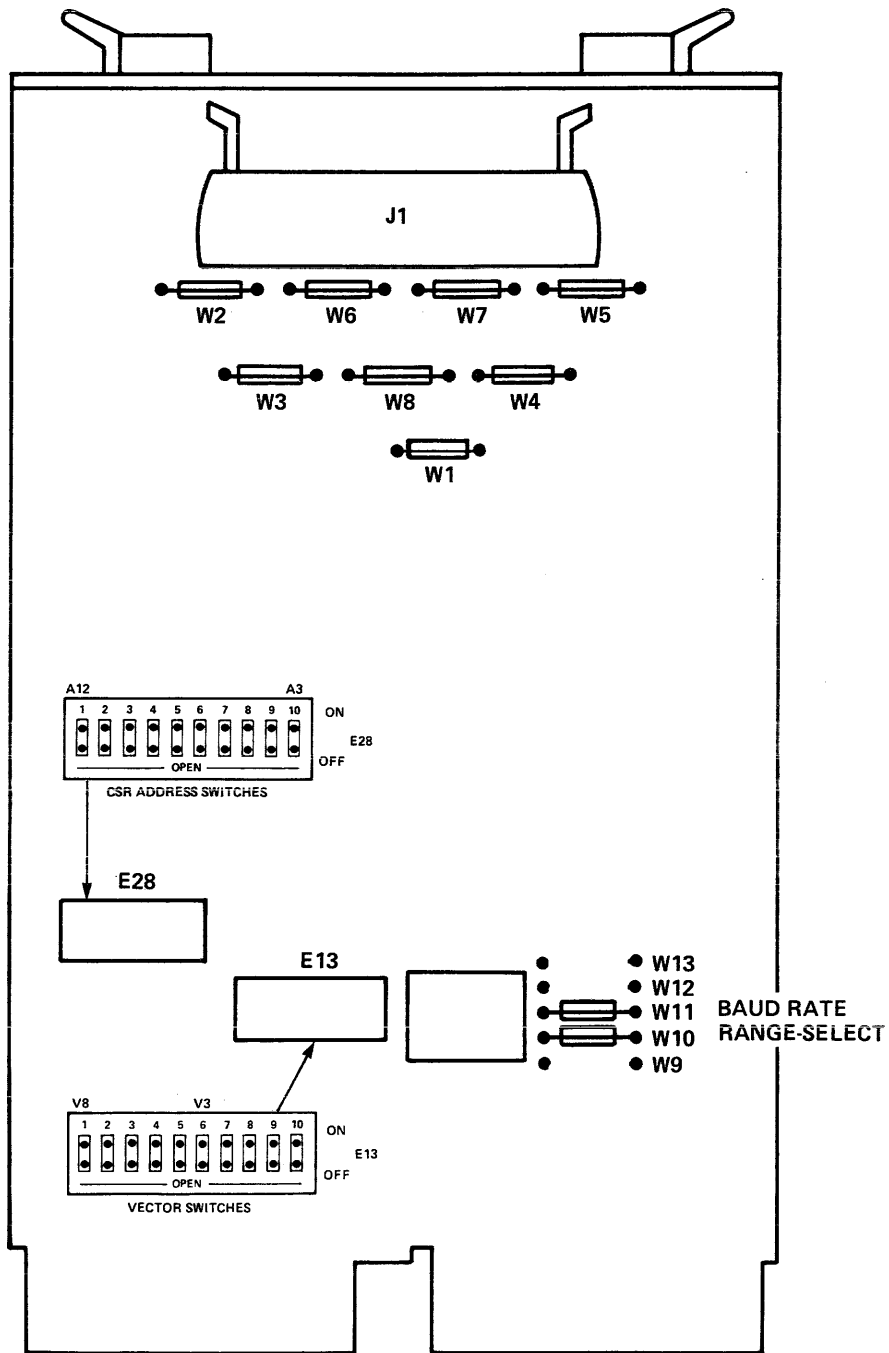
NOTE ON E28 AND E13:

ON = PRESS DOT ON NUMBERED SIDE OF SWITCH
OFF = PRESS DOT ON SIDE OF SWITCH MARKED "OPEN"

Fig. 4-8   Location of jumper pins on DZQ11

SETTINGS OF JUMPERS W1 THROUGH W16.

The following table describes the settings of the thirteen jumpers on the DZQ11. See Figure 4-8. NOTE: These jumper settings are the same for both a first and a second DZQ11.

TABLE 4-26

DZQ11

SETTING UP JUMPERS W1 THROUGH W16
(For first and second DZQ11)

JUMPER DESIG- NATION	JUMPER FUNCTION	SMS- SHIPPED CONFIG- URATION	ALTERNATE CONFIGURATION AND/OR REMARKS
MODEM-CONTROL JUMPERS W1 THROUGH W8			
W1	Line 3 DTR (Data- Terminal-Ready) to RTS (Request- to-send) connection.	IN	W1 through W4 must be installed to run the external cable and test diagnostic programs.
W2	Line 2 DTR to RTS connection	IN	
W3	Line 1 DTR to RTS connection	IN	
W4	Line 0 DTR to RTS connection	IN	
W5	Line 3 RTS (Ready- to-Send) to FB (Forced Busy) connection	IN	W5 through W8 are for modem use only
W6	Line 2 RTS to FB connection	IN	Modem use only
W7	Line 1 RTS to FB connection	IN	Modem use only
W8	Line 0 RTS to FB connection	IN	Modem use only
BAUD-RATE SELECT JUMPERS			

W9	OUT	
W10	IN	Baud rate = 9600
W11	IN	Baud rate = 9600
W12	OUT	
W13	OUT	

STRAPPING THE DHV11 EIGHT-PORT MUX (MANUFACTURED BY DIGITAL EQUIP-MENT CORPORATION OR CAMINTONN CORPORATION)

IMPORTANT

The DHV11 board provided with your SMS 1000 Model 40 may be supplied by two possible manufacturers: Digital Equipment Corporation (DEC) or Camintonn Corporation. These boards, although functionally identical, have somewhat different strapping requirements. The following strapping instructions will present DEC and Camintonn separately, as required for clarity.

STRAPPING THE DEC-MANUFACTURED DHV11

The strapping of the DHV11 eight-port MUX (see Figure 4-9A) involves the following steps:

> 1. Making device-address selection settings on switch group E58 and on one section of E43. The SMS-shipped setting of these switches gives an address of 160440 (octal).

> 2. Making vector-address selection settings on switch group E43. The SMS-shipped setting of these switches gives an address of 420 (octal).

SETTING THE DEVICE-ADDRESS SWITCHES (E58 and E43).

The DHV11 device address of 160440 (octal) is assigned by making corresponding settings to the eight sections of DIP switch E58 and to one section of DIP switch E43 (Figure 4-9A). These switches control the values of bits A4 through A12 of the device-address word. Bits A0 through A3 of the device-address word are preset to 0's, and bits A13 through A16 are preset to 1's.

SETTING THE SWITCHES. Note that the DIP switches are numbered 1

through 8 (see Figure 4-9A). Switch section 1 of E43 and sectioms 8 through 1 of E58 control the values of device address bits A4 through A12, respectively. Also, note that to set a switch to ON, use a fine-pointed tool, such as the tip of a ball point pen, and press straight down on the dot-like depression on the side of the switch that is numbered, until the switch snaps down. To set the switch to OFF do the same thing on the side of the switch marked "OPEN". An ON setting of a switch puts a 1 bit into its corresponding position in the device address. An OFF position sets in a 0 bit. The SMS-shipped device-address settings of these switches are as follows:

TABLE 4-27A

DHV11 (DEC)
SMS-SHIPPED CONFIGURATION
E43 AND E58 SETTINGS TO ASSIGN A DEVICE ADDRESS OF 160440
(See Figure 4-9A)

DEVICE-ADDRESS BIT	SWITCH NUMBER	SWITCH SETTING (AS SHIPPED)	CORRESPONDING BIT VALUE
A12	E58/1	OFF	0
A11	E58/2	OFF	0
A10	E58/3	OFF	0
A9	E58/4	OFF	0
A8	E58/5	ON	1
A7	E58/6	OFF	0
A6	E58/7	OFF	0
A5	E58/8	ON	1
A4	E43/1	OFF	0

SETTING THE VECTOR-ADDRESS SWITCHES (E43)

The DHV11 vector-address of 420 (octal) is assigned by making corresponding setting to sections 3 through 8 of DIP switch group E43. These switches control the value of bits V8 through V3 respectively of the DHV11 vector-address word.

SETTING THE SWITCHES. Note that the vector-address DIP switches (E43) are numbered 1 through 8 (see Figure 4-9A). Switch section 1 of E43 is used in the setting of the device address (above). Switch section 2 of E43 is not used. In general, to set a switch to ON, use a fine-pointed tool, such as the tip of a ball point pen, and press straight down on the dot-like depression on the side of the switch that is numbered, until the switch snaps down. To set the switch to OFF do the same thing on the side of the switch marked "OPEN". An ON setting of a switch puts a 1 bit into its corresponding position in the vector address. An OFF position sets in a 0 bit. The SMS-shipped vector-address settings of these switches are as follows:

TABLE 4-28A

DHV11 (DEC)
SMS-SHIPPED CONFIGURATION
E43 SETTINGS TO ASSIGN A VECTOR ADDRESS OF 420
(See Figure 4-9A)

VECTOR-ADDRESS BIT	SWITCH NUMBER	SWITCH SETTING (AS SHIPPED)	CORRESPONDING BIT VALUE
V8	E43/3	ON	1
V7	E43/4	OFF	0
V6	E43/5	OFF	0
V5	E43/6	OFF	0
V4	E43/7	ON	1
V3	E43/8	OFF	0

STRAPPING THE CAMINTONN-MANUFACTURED DHV11

The strapping of the Camintonn-manufactured DHV11 eight-port MUX (see Figure 4-9B) involves the following steps:

1. Making device-address selection settings on jumpers A12 through A4. The SMS-shipped setting of these jumpers gives an address of 160440 (octal).

2. Making vector-address selection settings on jumpers V8 through V3. The SMS-shipped setting of these jumpers gives a vector address of 420 (octal).

SETTING THE DEVICE-ADDRESS JUMPERS.

The DHV11 device address of 160440 (octal) is assigned by making corresponding strappings to the nine jumpers Al2 through A4 (Figure 4-9B). These jumpers control the values of bits 12 through 4 of the device-address word. See Table 4-27B.

TABLE 4-27B

DHV11 (CAMINTONN)
SMS-SHIPPED CONFIGURATION
JUMPER SETTINGS TO ASSIGN A DEVICE ADDRESS OF 160440
(See Figure 4-9B)

DEVICE-ADDRESS BIT	JUMPER DESIGNATION	JUMPER SETTING (AS SHIPPED)	CORRESPONDING BIT VALUE
A12	A12	OUT	0
A11	A10	OUT	0
A10	A10	OUT	0
A9	A9	OUT	0
A8	A8	IN	1
A7	A7	OUT	0
A6	A6	OUT	0
A5	A5	IN	1
A4	A4	OUT	0

NOTE: Remaining address jumpers are not used.

SETTING THE VECTOR-ADDRESS JUMPERS

The DHV11 vector-address of 420 (octal) is assigned by making corresponding setting to jumpers V8 through V3 (Figure 4-9B). These jumpers control the value of bits V8 through V3 respectively of the DHV11 vector-address word. See Table 4-28B.

TABLE 4-28B

DHV11 (CAMINTONN)
SMS-SHIPPED CONFIGURATION
JUMPERS SETTINGS TO ASSIGN A VECTOR ADDRESS OF 420
(See Figure 4-9B)

VECTOR-ADDRESS BIT	JUMPER DESIGNATION	JUMPER SETTING (AS SHIPPED)	CORRESPONDING BIT VALUE
V8	V8	IN	1
V7	V7	OUT	0
V6	V6	OUT	0
V5	V5	OUT	0
V4	V4	IN	1
V3	V3	OUT	0

NOTE: Remaining vector jumpers are not used.

SYSTEM FOUNDATION MODULE

All the jumpers on the System Foundation Module are for factory use only. The System Foundation Module has no user-configurable jumpers and must always be used in its as-received configuration.

STRAPPING PERIPHERAL DEVICES

GENERAL. The following paragraphs identify and describe the jumper connections (strapping) on the disk and tape drives that are part of the SMS 1000 system. Each description is supported by a table that lists the as-shipped (default) configuration of the user-configurable jumpers and by a diagram that shows the locations of the jumpers on the drive's printed circuit board (PCB).

A12 A11 A10 A9 A8 A7 A6 A5

A4 * V8 V7 V6 V5 V4 V3

ON = 1

OFF = 0

OPEN

E58

ON = 1

OFF = 0

OPEN

E43

* = SWITCH SECTION
NOT USED

E58
ADDRESS
SELECT

E43
ADDRESS AND
VECTOR SELECT

NOTE:
W1 AND W2 ARE
ALWAYS CONNECTED

W2   W1

E88   E74
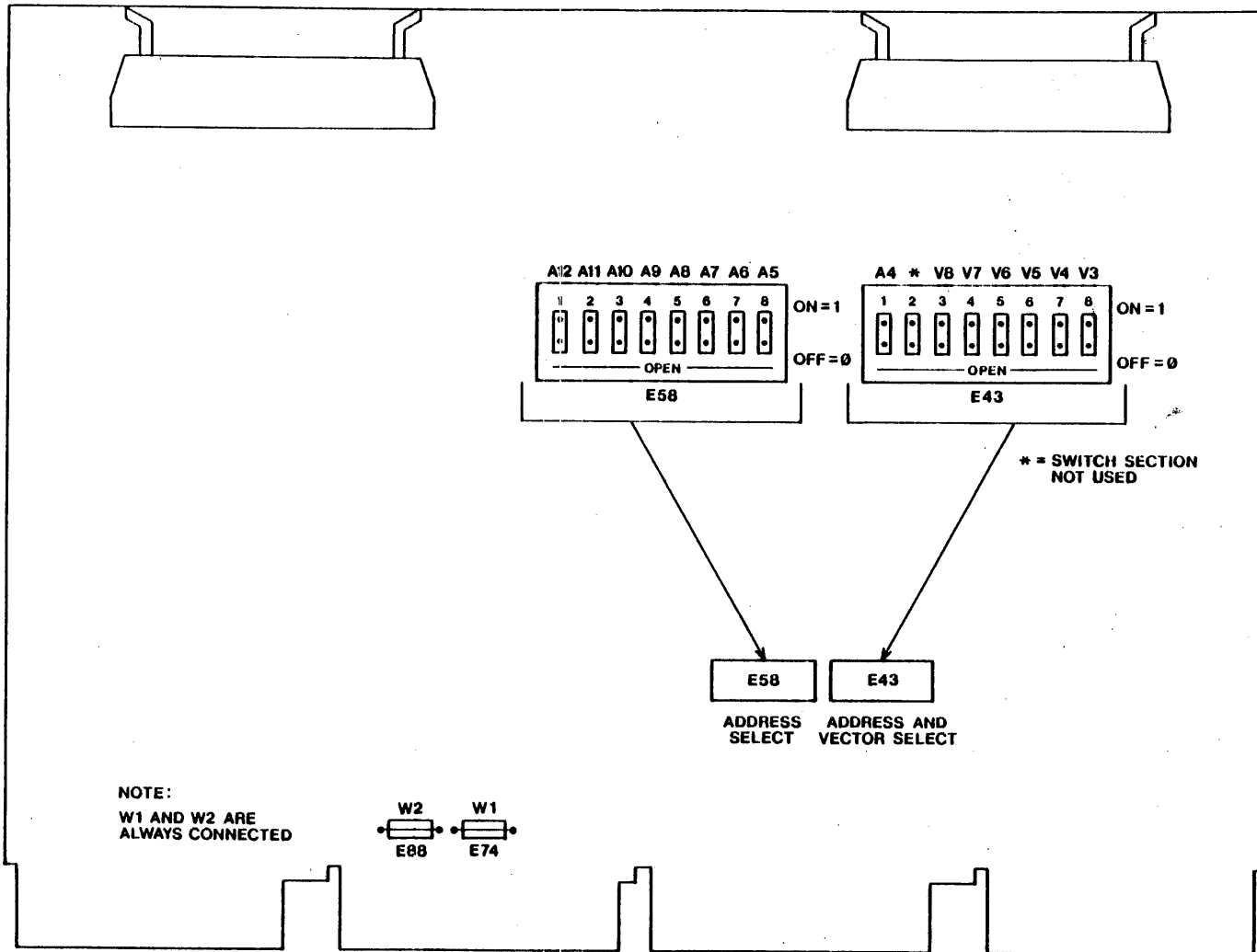
Fig. 4-9A   Location of jumper pins on DHV11 (DEC)

NOTE:
The as-shipped (default) strapping shown here is:
Vector address = 420 (octal)
Device address = 160440 (octal)

V8 V7 V6 V5 V4 V3 NC NC NC NC NC

A12 A11 A10 A9 A8 A7 A6 A5 A4 NC NC
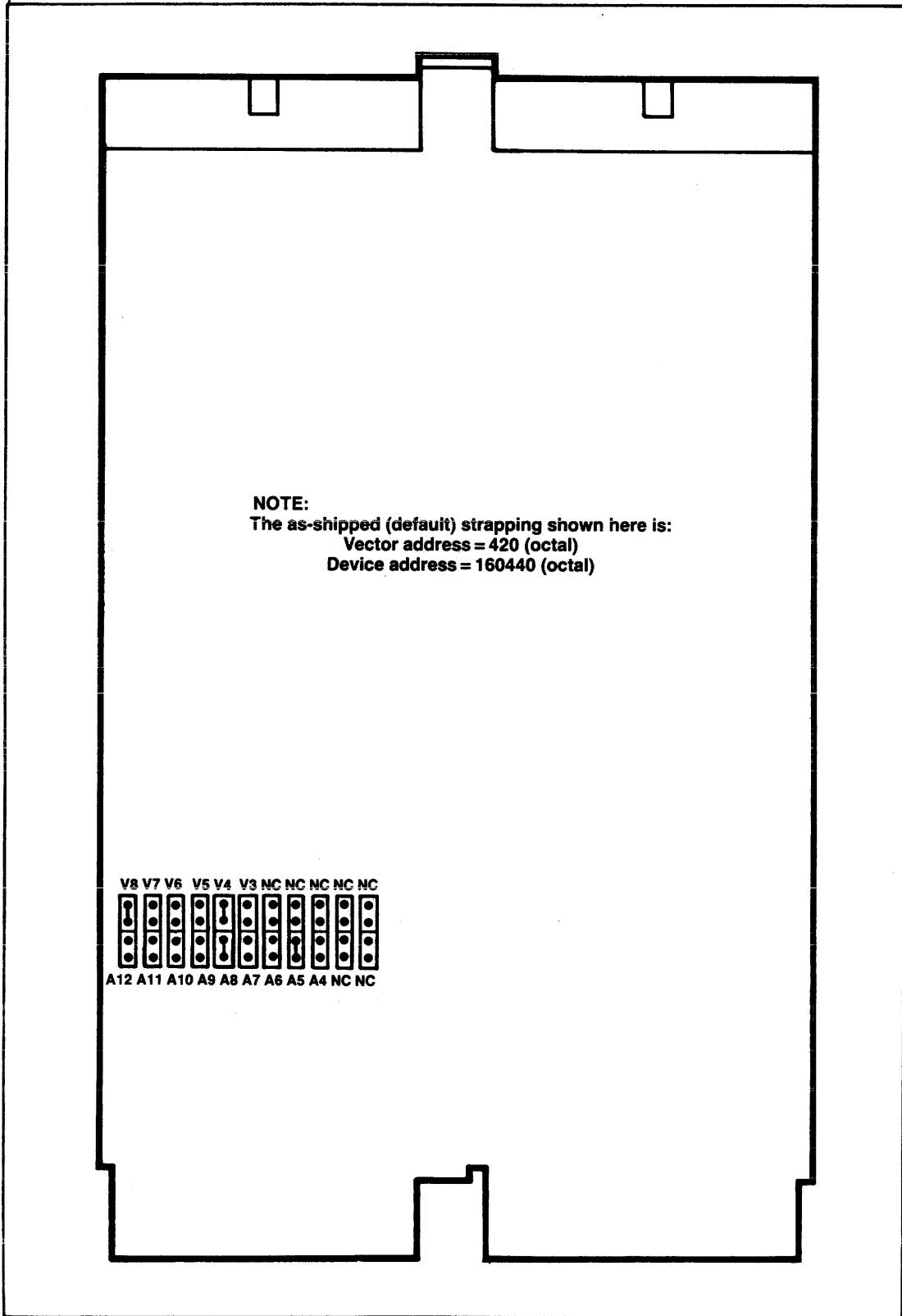
Fig. 4-9B   Location of jumper pins on DHV11 (Camintonn)

There are generally two types of jumper connections on the PC boards. One type uses a pair of jumper pins onto which the user can place a jumper plug or a wire wrap to short the pins. The other type uses an IC-type "shunt block" with exposed shorting leads. The shunt block plugs into a standard 14-pin or 16-pin IC socket and the exposed shorting leads are cut as required.

In the tables that follow, when the CONNECTION column contains the word IN, it means that either a jumper has been placed between a pair of pins or a shunt has NOT been broken. The word OUT means that there is NO jumper on the pins or that the jumper on a shunt block has been cut.

TERMINATING THE DRIVES

All input data and control lines to the drives require terminating resistors. When there are two or more drives daisy-chained together, only the drive at the end of the cable is terminated. For reference, the diagram for each drive shows, when possible, the location of the terminating resistor pack.

IMPORTANT

If you replace a drive in the field, be certain
that the new drive has the same jumper connections
and termination as the drive it replaced.

STRAPPING THE TANDON TM848-2E DISK DRIVE

The TM848-2E is an eight-inch, floppy disk drive with two read-write heads for double-sided diskettes. Table 4-29 describes the configurable jumpers, and Figure 4-10 shows their locations. For any drive, only one of the drive-select jumpers (DS1 through DS4) should be in. Jumper pins TR, HL, and M4 must be shorted. No other jumper pins on the board should be connected.

Table 4-29 shows that the drive-select jumper DS1 is plugged in, and the other drive-select jumpers (i.e. DS1, DS3 AND DS4) are open. This means that the drive is selected as drive one (i.e. F0).

Figure 4-10 also shows the location of the terminating resistor pack. The resistor pack must always be plugged in if the system is a single-drive system. In any multiple-drive system, the resistor pack must be plugged in only on the last drive.

TABLE 4-29

TANDON TM848-2E
JUMPER CONNECTIONS
(See Figure 4-10)

JUMPER DESIG-NATION/ PIN NO.	SMS FACTORY-SHIPPED CONNECTION	REMARKS
DS1	IN	Drive Select 1: When this jumper is in and the other three DS jumpers are out, the drive is selectable as floppy drive 1 (F0).

NOTE: The SMS 1000 can be configured to include a single 8"
floppy drive. Hence, the DS1 jumper pair is the only one used.

TR	IN	True Ready: When this jumper is in, the true-ready line indicates that the diskette is rotating at normal speed.
HL	IN	Head Load: When this jumper is in, the head-load line controls power for the stepper motor.
M4	IN	Motor Control: When this jumper is in, the head-load line turns on the spindle motor.

STRAPPING THE PANASONIC JU465 DISK DRIVE

The JU465 is a 5 1/4-inch, double-headed, 96 TPI, floppy disk
drive. As many as two drives can be daisy-chained together in
your SMS 1000 system. Jumper connections enable the user to
select various options. Table 4-30 describes the jumpers, and
Figure 4-11 shows the locations of the jumpers and the connec-
tions made by the factory.

Figure 4-11 also shows the location of the terminating resistor
pack, RP1. In a single-drive system, the resistor pack must be
plugged into the circuit board of the drive; in a multiple-drive
system, the resistor pack must be plugged into the circuit board
of the last drive. No other drive in the string should be termin-
ated.

TABLE 4-30

PANASONIC JU465
JUMPER CONNECTIONS
(See Figure 4-11)

JUMPER DESIG- NATION/ PIN NO.	SMS FACTORY- SHIPPED CONNECTION	REMARKS
DS1	IN	Drive Select 1: When this jumper is in and the other three are out, the drive is selected as floppy drive 1 (F0).
DS2	OUT	Drive Select 2: When this jumper is in and the other three are out, the drive is selected as floppy drive 2 (F1).

NOTE: The SMS 1000 is configurable to include up to two 5 1/4" floppy drives. Hence, jumper pairs DS3 and DS4 are always open.

MX	OUT	Drive Select Enabled: When this jumper is in, it allows any of the four drive-select lines to activate the drive. In the SMS 1000, this jumper is always out.
DS	IN	The DS jumper allows only a selected drive-select line to activate the drive.
+WP	IN	Enables write-protect mode in which diskettes with their write-protect notch COVERED are write protected. This is the standard convention for 5 1/4" diskettes.
-WP	OUT	Drive is shipped with this jumper OUT. If these jumper pins are connected, it enables the write-protect mode in which diskettes with their write-protect notch OPEN (NOT COVERED) are write protected. This connection gives 5 1/4" diskettes the same write-protect convention as 8" diskettes.

CAUTION: Be sure that your JU465 has its +WP/-WP strapping done
in accordance with the conventions adopted by your installation.
If it has the opposite strapping, data meant to be protected could
easily be written over.

MM,HS   IN   Factory installed: Always in.

MS,HM   OUT   Not used: Always out.
HL,IU

STRAPPING THE SEAGATE ST412 AND ST419 WINCHESTER DRIVES

The ST412 is a 5 1/4-inch Winchester disk drive with two platters
and four read-write heads. The ST419 has three platters and six
read-write heads. A shunt block on the drive's circuit board per-
mits the user to select the options described in Table 4-31.
Figure 4-12 shows the location of the shunt block.

Also, next to the shunt block is the terminating resistor pack.
The resistor pack terminates the drive's signal lines, and it must
be plugged in the circuit board of the drive in a single-drive
system.   In a multiple drive system, the resistor pack must be
plugged in only on the last drive. All other drives in the string
must not be terminated.

TABLE 4-31

SEAGATE ST412 AND ST419
JUMPER CONNECTIONS
(See Figure 4-12)

JUMPER DESIG- NATION/ PIN NO.	SMS FACTORY- SHIPPED CONNECTION	REMARKS
DS1 (8,9)	IN	Drive Select 1: When this jumper is in and the other three are out, the drive is selected as drive 1 (W0).
DS2 (7,10)	OUT	Drive Select 2: When this jumper is in and the other three are out, the drive is selected as drive 2 (W1).

Fig. 4-10   Location of jumpers on Tandon TM848-2E

TERMINATOR

1(DS1)

2(DS2)

3(DS3)

4(DS4)

DS ●──● ● MX

−WP

+WP

MS

MM

HM

HS

HL

IU

NOTES:

1. Soldered-in jumpers are for factory use only. Do not change.
2. + WP = Write protect when notch on diskette is covered. This is the SMS-shipped strapping.
3. − WP = Write protect when notch on diskette is open.
4. Jumpers are shown in their default configurations.
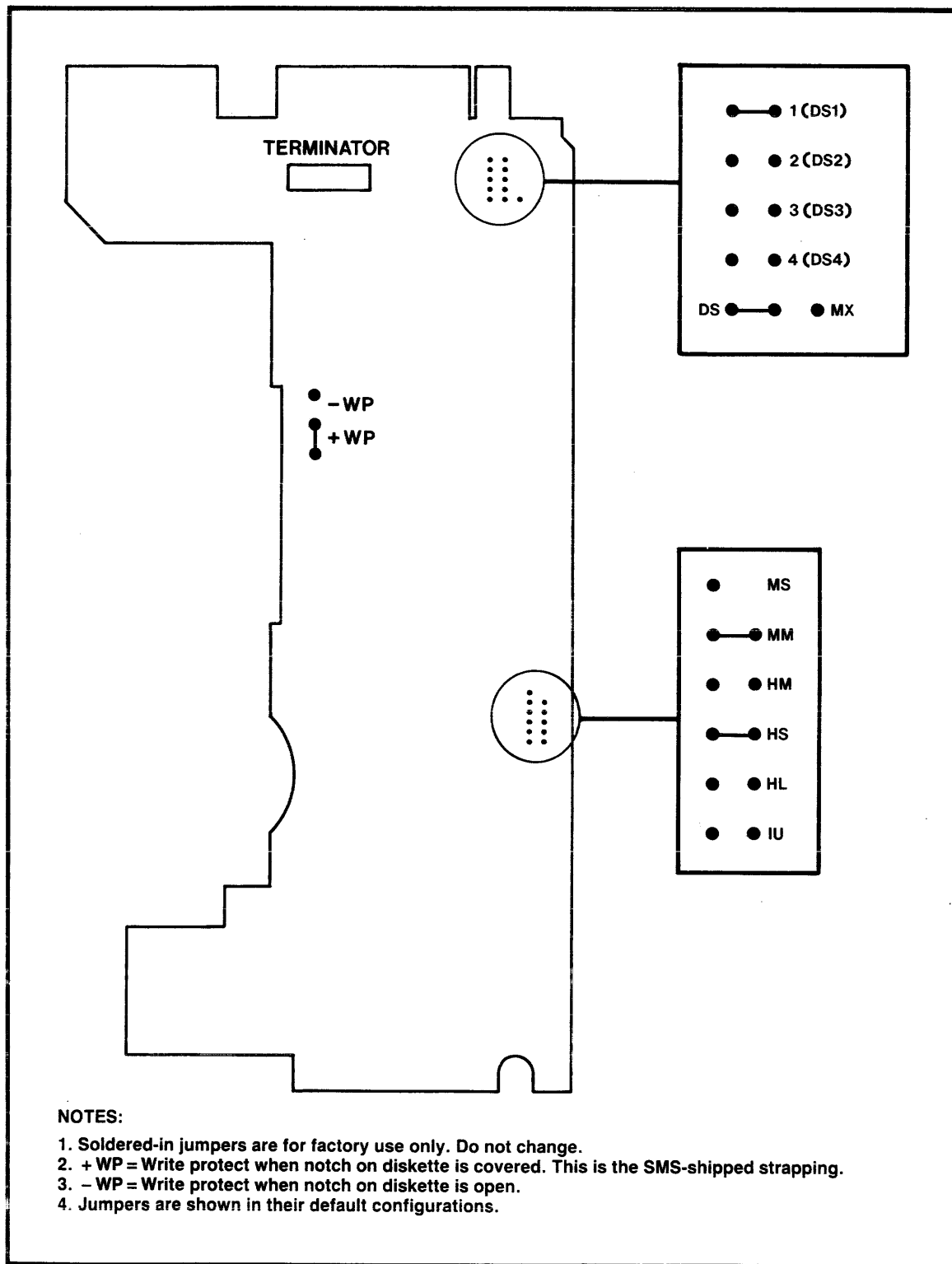
Fig. 4-11   Location of jumpers on Panasonic JUA465

NOTE: Since the SMS 1000 is configurable to include up to two Win chester drives, DS3 and DS4 are always open.

R (1,16)	OUT	Radial Option: When this jumper is in all output signals of the drive are active, even if the drive has not been selected.
D (2,15)	IN	Defeat Recal: When this jumper is in, the automatic recal operation is defeated. When this jumper is out, the drive heads are automatically re-positioned to track 0 during a power-up sequence. This is called "recal."
(3,14)	IN	Not used.
H (4,13)	IN	Half Step: When this jumper is in, the half-step option is defeated. The ST412 and ST419 do not use the half-step option.

STRAPPING THE SEAGATE ST212 WINCHESTER DRIVE

The Seagate ST212 is a single-disk half-height Winchester drive with a 12-megabyte unformatted capacity. Drive-selection strap- ping is accomplished by adding jumper plugs to pins of a 16-pin connector located at the P1/P2 end of the drive's printed circuit board. The last drive in a chain has chained signals terminated by a resistor pack located at the connector end of the circuit board. The following paragraphs describe the strapping procedure for the ST212.

JUMPER PINS. All jumper pins are located on connector J9, which can be found between the circuit board's connectors J1 and J2. Viewed from the connector-end of the drive with J1 on the left, the pins of J9 are numbered as follows (pins 13 and 14 are not used):

```
15  13  11  9  7  5  3  1
16  14  12  10 8  6  4  2
```

DRIVE-SELECT JUMPERS

(1). CONFIGURING AS DRIVE 0. To configure this drive as Drive 0,

place a jumper between pins 1 and 2. Remove jumpers from pins 3, 4, 5, 6, 7 and 8.

(2). CONFIGURING AS DRIVE 1. To configure this drive as Drive 1, place a jumper between pins 3 and 4. Remove jumpers from pins 1, 2, 5, 6, 7 and 8.

RADIAL OPTION

To configure the drive for radial instead of daisy-chain operation, place a jumper between pins 15 and 16. The as-shipped (default) option is NO jumper. Each radial drive must have its termination-resistance pack in place.

WRITE FAULT OPTION

To permit the Drive Select signal to reset the Write Fault latch, place a jumper between pins 11 and 12. The as-shipped (default) option is NO jumper.

LIFE TEST OPTION

This option is for manufacturing use only. The as-shipped (default) option is NO jumper between pins 9 and 10.

TERMINATION OF DAISY CHAINED SIGNALS

The last drive in a chain must include a 220/330-ohm termination-resistance IC pack in the green 16-pin socket located near the P1/P2 connectors on the circuit board. This pack must be removed from the other drives in the chain.

STRAPPING THE SEAGATE ST213 AND ST225 WINCHESTER DRIVES

Drive-selection strapping of both the ST213 and ST225 is done by adding jumper plugs to pins of a 16-pin connector (J7) at the P1/P2 end of the drive's printed circuit board. The last drive in a chain must have chained signals terminated by a resistor pack whose socket is located at the connector end of the circuit board.

JUMPER PINS. All jumper pins are located on connector J7, which can be found between the circuit board's connectors J1 and J2. Viewed from the connector-end of the drive with J1 on the left, the pins of J7 are numbered as follows:

```
1   3   5   7   9  11 13 15
2   4   6   8  10 12 14 16
```

DRIVE-SELECT JUMPERS

(1). CONFIGURING AS DRIVE 0. To configure this drive as Drive 0, place a jumper between pins 15 and 16. Remove jumpers from pins 9, 10, 11, 12, 13 and 14.

(2). CONFIGURING AS DRIVE 1. To configure this drive as Drive 1, place a jumper between pins 13 and 14. Remove jumpers from pins 9, 10, 11, 12, 15 and 16.

RADIAL OPTION

To configure the drive for radial instead of daisy-chain operation, place a jumper between pins 1 and 2. The as-shipped (default) option is NO jumper. Each radial drive must have its termination-resistor pack in place.

WRITE FAULT OPTION

To permit the Drive Select signal to reset the Write Fault latch, place a jumper between pins 5 and 6. The as-shipped (default) option is NO jumper.

LIFE TEST OPTION

This option is for manufacturing use only. The as-shipped (default) option is NO jumper between pins 7 and 8.

RECOVERY MODE OPTION

This option permits the read/write heads to microstep. To select this option. connect a jumper between pins 3 and 4. The as-shipped (default) option is NO jumper between pins 3 and 4.

TERMINATION OF DAISY CHAINED SIGNALS

The last drive in a chain must include a 220/330-ohm termination-resistance IC pack in the green 16-pin socket located near the P1/P2 connectors on the circuit board. This pack must be removed from the other drives in the chain.

STRAPPING THE CMI CM5412 AND CM5619 DRIVES

The CMI CM5412 is a 5 1/4-inch Winchester disk drive with two disks and four read-write heads. The CM5619 has three disks and 6 read-write heads. A shunt block that plugs into a socket on the circuit board allows the user to change the drive-select number (DS1 through DS4). This is the only option available to the user. Table 4-32 describes the shunt block, and Figure 4-13 shows its location.

Also, next to the shunt block is the terminating resistor pack. The resistor pack terminates the drive's signal lines, and it must be plugged into the drive's circuit board in a single-drive system. In a multiple drive system, the resistor pack must be plugged into only the last drive. All other drives in the string must not be terminated.

TABLE 4-32

COMPUTER MEMORIES, INC.
CM5412 AND CM5619
JUMPER CONNECTIONS
(See Figure 4-13)

JUMPER DESIG- NATION/ PIN NO.	SMS FACTORY- SHIPPED CONNECTION	REMARKS
DS0 (1,2)	IN	Drive Select 0: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 1 (W0).
DS1 (3,4)	OUT	Drive Select 1: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 2 (W1).

NOTE: Since the SMS 1000 is configurable to include up to two Winchester drives, DS3 and DS4 are always open.

9-10	OUT	Not used.
11-12	OUT	Not used.

STRAPPING THE QUANTUM Q540 WINCHESTER DRIVE

The Q540 is a 5 1/4-inch Winchester disk drive with 4 disks and 8 read-write heads. Five pairs of jumper pins on the circuit board provide the only user options. Table 4-33 describes the options, and Figure 4-14 shows the locations of the jumper pins on the circuit board.

Near the group of jumper pins is the terminating resistor pack. The resistor pack must be plugged in the circuit board of the
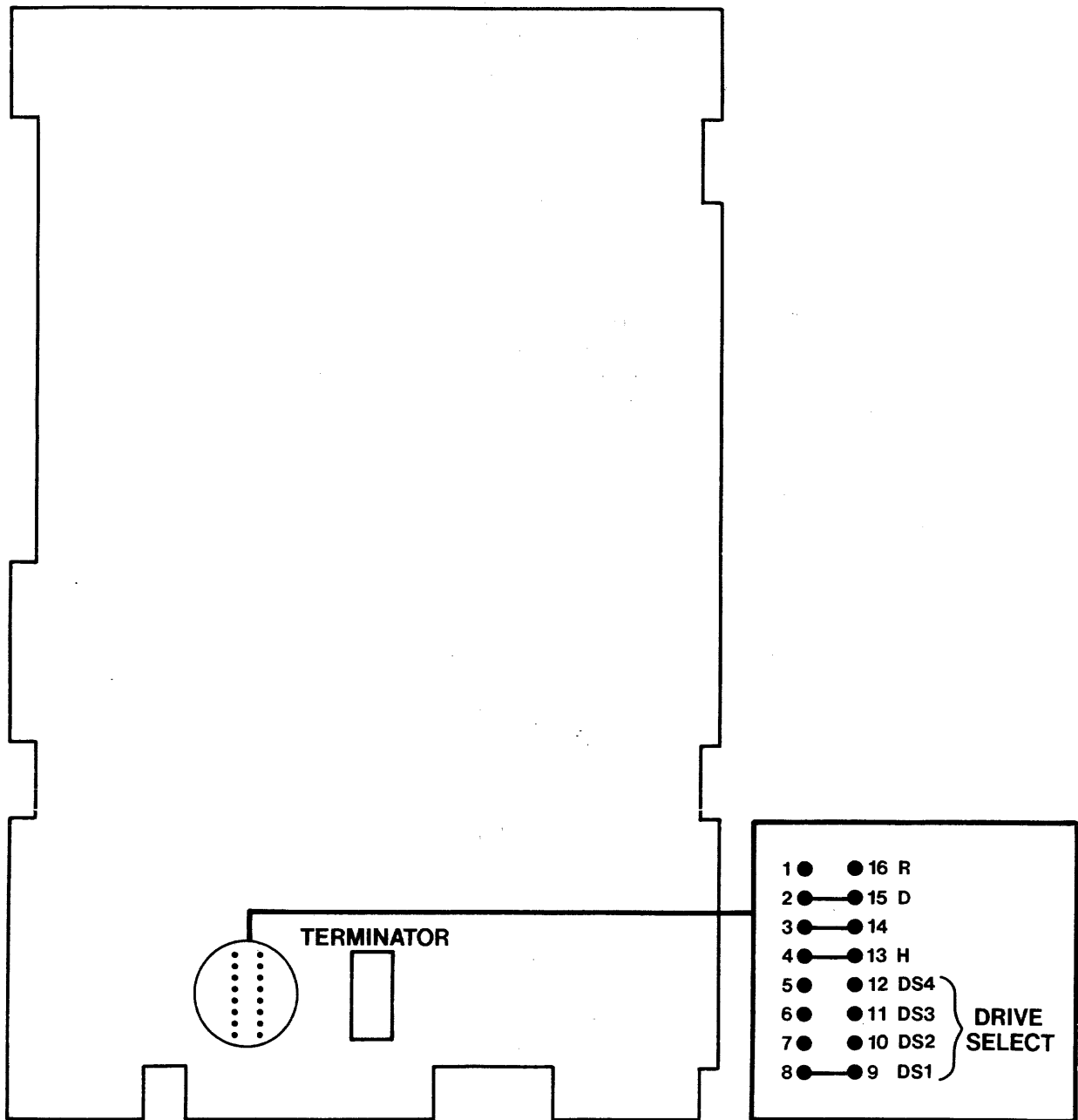
Fig. 4-12   Location of jumpers on Seagate ST412 and ST419
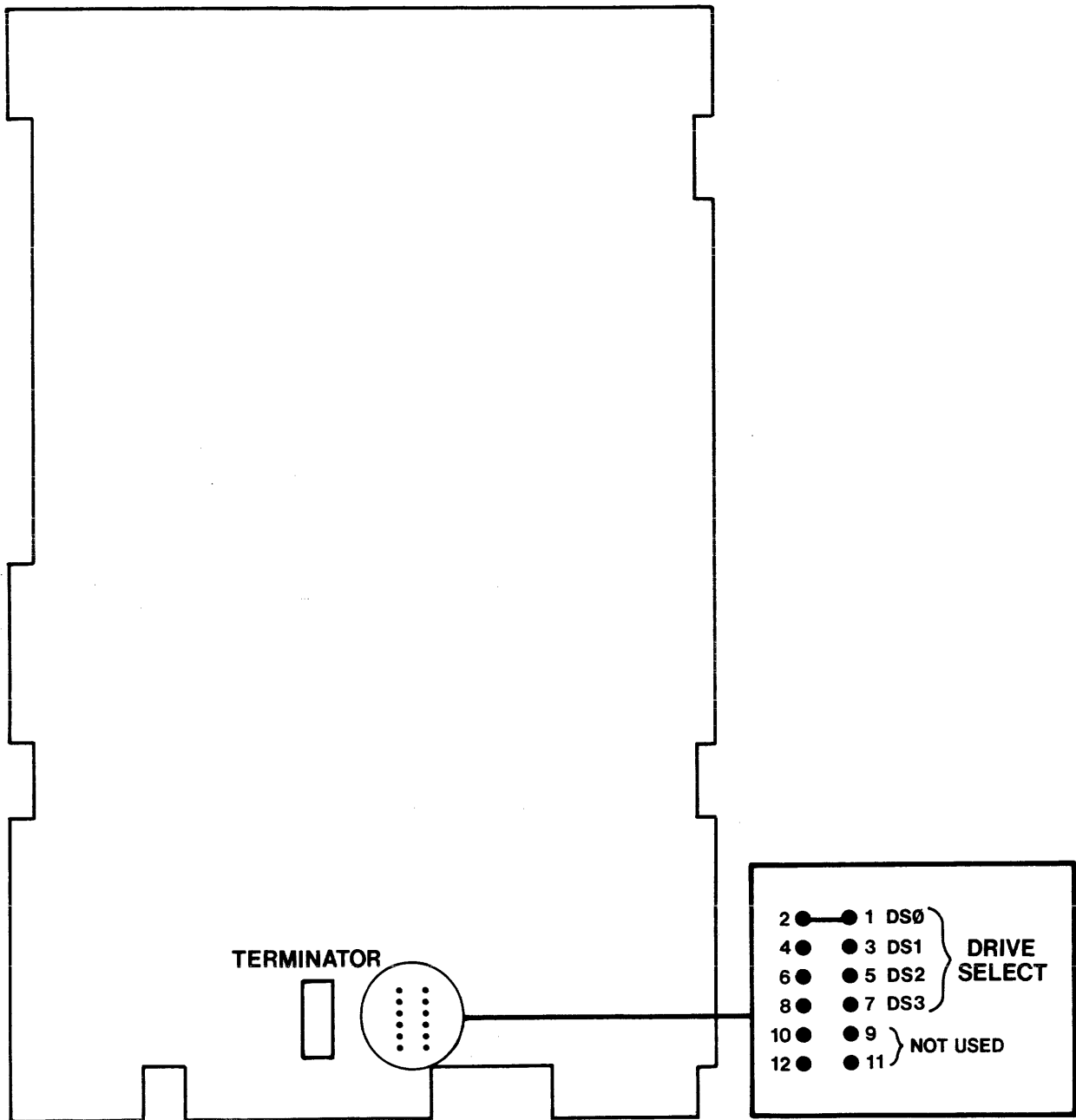
Fig. 4-13   Location of jumpers on CMI CM5412 and CM5619

drive in a single-drive system. In a multiple-drive system, the resistor pack must be plugged in the circuit board of the last drive and the other drives in the string must not be terminated.

TABLE 4-33

QUANTUM Q540
JUMPER CONNECTIONS
(See Figure 4-14)

JUMPER DESIG-NATION/ PIN NO.	SMS FACTORY-SHIPPED CONNECTION	REMARKS
DS1	IN	Drive Select 1: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 1 (W0).
DS2	OUT	Drive Select 2: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 2 (W1).

NOTE: Since the SMS 1000 is configurable to include up to two Winchester drives, DS3 and DS4 are always open.

| A | OUT | Drive Select Enabled: When this jumper is in, drive select is always enabled. |

STRAPPING THE VERTEX V170 WINCHESTER DRIVE

The V170 is a 5 1/4-inch Winchester disk drive with four disks, seven read-write heads, and one servo head. A shunt block provides the user options. Table 4-34 describes the options, and Figure 4-15 shows the location of the shunt block on the circuit board.

A terminating resistor pack, RP1, is located near the shunt block. The resistor pack must be plugged in the circuit board of the drive in a single-drive system. In a multiple-drive system, the resistor pack must be plugged in the circuit board of the last drive. The other drives must not be terminated.

TABLE 4-34

VERTEX V170
JUMPER CONNECTIONS
(See Figure 4-15)

JUMPER DESIG- NATION/ PIN NO.	SMS FACTORY- SHIPPED CONNECTION	REMARKS
DS1 (8,9)	IN	Drive Select 1: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 1 (W0).
DS2 (7,10)	OUT	Drive Select 2: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 2 (W1).

NOTE: Since the SMS 1000 is configurable to include up to two Winchester drives, DS3 and DS4 are always open.

RADIAL (1,16)	OUT	Drive Select Enabled: when this jumper is in, drive select is always enabled. This jumper is always OUT.
AUTO ACCESS (2,15)	OUT	Factory Use Only: When this jumper is in, the drive performs a series of pre-determined seek operations. This operation occurs on power up, and it does not require any interface signals. Always OUT.
CAPACITY ID (3,14) (4,13)	OUT IN	CAPACITY: Manufacturer uses these to indicate the number of heads and disks on the drive. Do not change these jumpers.
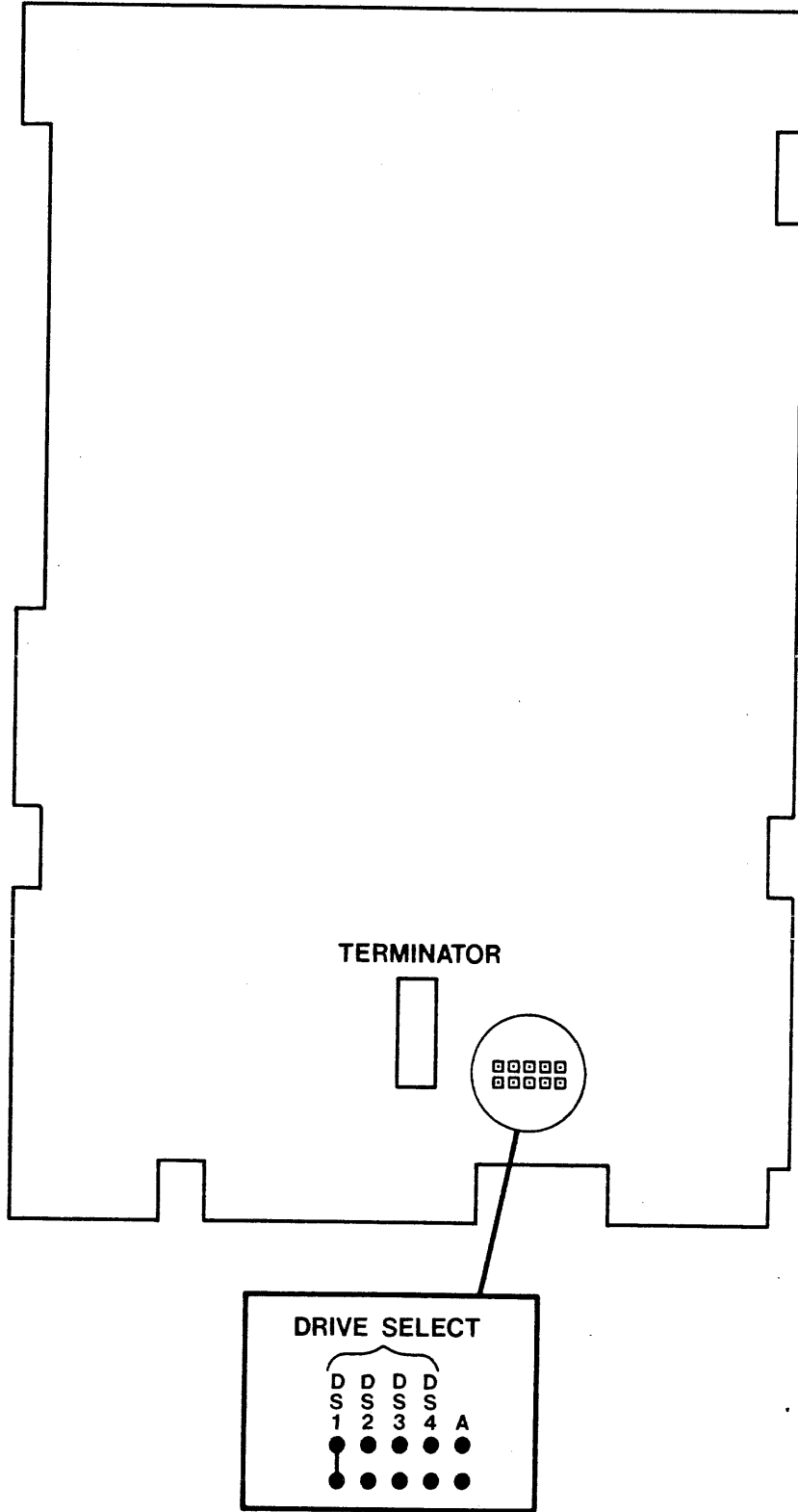
Fig. 4-14   Location of jumpers on Quantum Q540

TERMINATOR

1● ●16
2● ●15 AUTO ACCESS
3● ●14 ⎫
4●──●13 ⎬ CAPACITY ID
5● ●12 DS4 ⎫
6● ●11 DS3 ⎪ DRIVE
7● ●10 DS2 ⎬ SELECT
8●──●9 DS1 ⎭
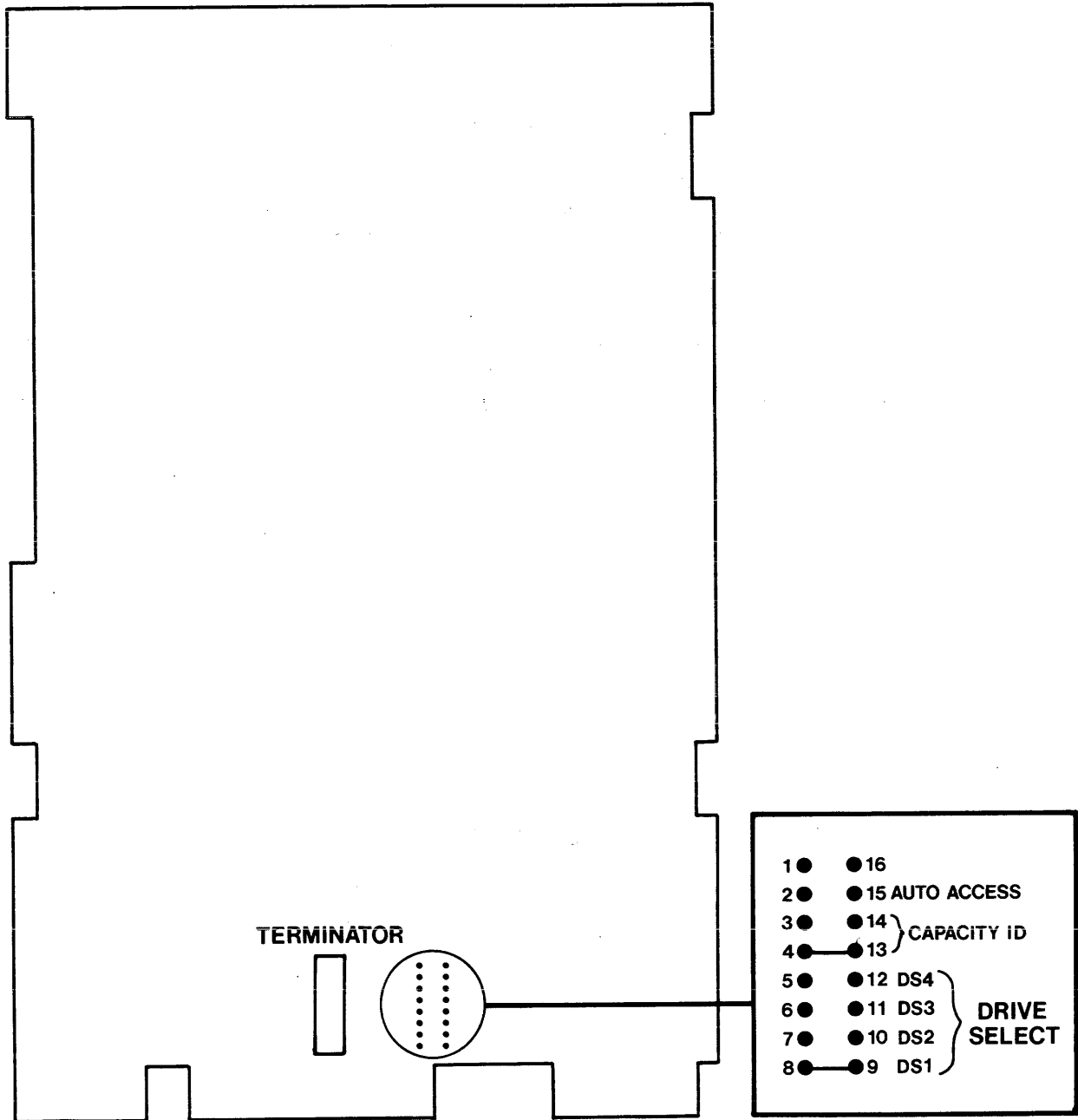
Fig. 4-15   Location of jumpers on Vertex V170

STRAPPING THE MAXTOR XT-1140 AND XT1085 WINCHESTER DRIVES

The XT-1140 is a 5 1/4-inch Winchester disk drive with 8 disks, 15 read-write heads, and one servo head. The XT-1085 is a 5 1/4-inch Winchester drive with 5 platters, 8 read-write heads, and one servo head. Jumper pins enable the user to select either drive as one of four in a system. Table 4-35 describes the jumpers, and Figure 4-16 shows the locations of the jumper pins on the circuit board.

Above the jumper pins is the terminating resistor pack. The resistor pack must be plugged into the circuit board of the drive in a single-drive system. When multiple drives are in the system, the resistor pack must be plugged into the circuit board of only the last drive.

TABLE 4-35

MAXTOR XT-1140 AND XT-1085
JUMPER CONNECTIONS
(See Figure 4-16)

JUMPER DESIG- NATION/ PIN NO.	SMS FACTORY- SHIPPED CONNECTION	REMARKS
DS0 (5,6)	IN	Drive Select 0: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 1 (W0).
DS1 (4,5)	OUT	Drive Select 1: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 2 (W1).

NOTE: Since the SMS 1000 is configurable to include up to two Winchester drives, DS2 and DS3 are always open.

DS2 (2,3)	OUT	Drive Select 2: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 3.
DS3 (1,2)	OUT	Drive Select 3: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 4.
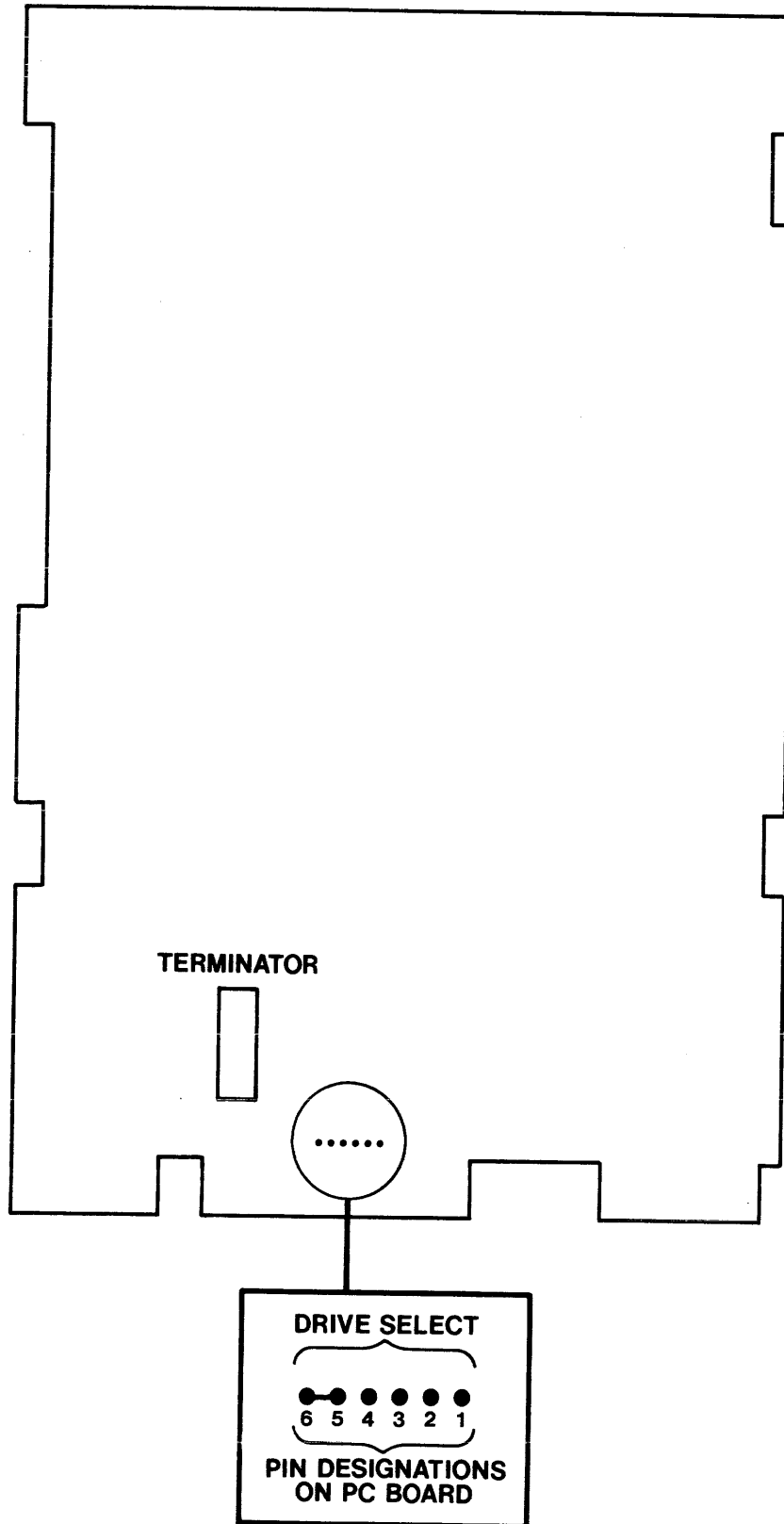
Fig. 4-16   Location of jumpers on Maxtor XT-1140 and XT-1085

STRAPPING THE DMA 360 REMOVABLE-CARTRIDGE WINCHESTER DRIVE

The DMA 360 is a 5 1/4-inch, half-height Winchester drive that uses a removable hard-disk cartridge. The cartridge contains a hard disk with two recording surfaces; the two read-write heads are inside the drive. As shipped from the SMS factory, the DMA 360 has no user re-configurable options. The drive must always be the first hard-disk drive in the system (i.e. C0). Table 4-36 describes the jumper connections; Figure 4-17, view A, shows the locations of the connections. The jumper wire at DS0 is soldered in place.

View B of Figure 4-17 shows the line terminators. The terminators are soldered in place; in the SMS 1000 system, they are not to be removed.

TABLE 4-36

DMA 360 JUMPER CONNECTIONS
(See Figure 4-17)

JUMPER DESIG- NATION/ PIN NO.	SMS FACTORY- SHIPPED CONNECTION (DEFAULT)	REMARKS
DS0	IN	Drive Select 0: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 1 (C0).
		NOTE: In the SMS 1000 system, this jumper is always connected, and the other three DS jumpers are always disconnected (OUT).
DS1	OUT	Drive Select 1: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 1.
DS2	OUT	Drive Select 2: When this jumper is in and the other three DS jumpers are out, the drive is selected as drive 2.

DS3   OUT   Drive Select 3: When this
                                 jumper is in and the other
                                 three DS jumpers are out,
                                 the drive is selected as
                                 drive 3.

STRAPPING THE TANDBERG TDC 3309 STREAMING TAPE DRIVE AND THE TDC
3350 MK. II FORMATTER BOARD

The TDC 3309 is a half-height 1/4-inch, streaming, cartridge-tape
drive.   The basic drive is the TDC 3309. The drive's separate
formatter board is the TDC 3350 Mk. II. Two hook-type connectors,
JP1 and JP2, on the rear of the drive's internal circuit board,
allow the user to select the drive-select number (see Figure 4-
18). In the SMS 1000 system the TDC 3309 is always set as drive 1
(T0). Table 4-37 describes the use of these hook-type connectors
JP1 and JP2, and Figure 4-18 shows their locations. Table 4-37
also includes information on jumpering the TDC 3350 Mk. II format-
ter board. The TDC 3350 Mk. II jumpers are shown in Figure 4-19.

In Table 4-37, with regard to the hook-type connectors used on the
TDC 3309, the term OUT means that the long part of the connector
is NOT hooked to the stationary part of the connector.   The term
IN   means that the long part of the connector IS hooked to the
stationary part of the connector. Figure 4-18 shows both connec-
tors in their default, or unhooked (OUT), position.

TERMINATORS. The terminating resistor pack (Figure 4-18) is
located behind the d-c power connector J2. This pack must be
plugged in its socket in all single-drive systems.

TABLE 4-37

TANDBERG TDC 3309/3350 MK. II
JUMPER CONNECTIONS
(See Figures 4-18 and 4-19)

JUMPER   SMS   REMARKS
DESIG-   FACTORY-
NATION/   SHIPPED
PIN NO.   CONNECTION
          (DEFAULT)

                 TDC 3309 DRIVE (see Figure 4-18)

JP1   OUT   When both JP1 and JP2 are unhooked (OUT)
JP2   OUT   the drive is selected as drive 1 (T0).

NOTE: The following alternate connections are NOT used on the SMS

1000 and are included here for reference only: When JP1 is
unhooked (OUT) and JP2 is hooked (IN), the drive is selected as
drive 2. When JP1 is hooked (IN) and JP2 is unhooked (OUT), the
drive is selected as drive 3. When both JP1 and JP2 are hooked
(IN), the drive is selected as drive 4.

JP3   OUT   While these jumper pins are shorted, the
                         drive runs repeated self-test cycles.
CAUTION: These pins should never be shorted for more than a few
self-test cycles.   To operate in this mode for long periods may
destroy the tape and injure the capstan motor.

TDC 3350 MK. II FORMATTER BOARD (see Figure 4-19)

JP1   IN   When this jumper is IN, +5 volts is
pins 1 and 2   supplied to pin 2 of connector J3 for use
("+5V CON")   by special test circuits drawing a max-
                         imum of 300 ma.

JP2   OUT   While this jumper is IN, The drive runs
pins 17 and 18   repeated self-test cycles.
("SELFT")
CAUTION: These pins should never be shorted for more than a few
self-test cycles.   To operate in this mode for long periods may
destroy the tape and injure the capstan motor.

JP2   OUT   When this jumper is IN, and a self-test of
pins 19 and 20   the drive has also been commanded, the
("WRTT")   self test then includes a write operation.

JP3   OUT   With this jumper OUT, parity checking is
pins 1 and 2   not performed. Wth the jumper IN, the
("PAR")   drive's parity circuits check for odd
                         parity.

JP3   OUT   Automatically seeks tape edge for head
pins 3 and 4   positioning befire writing. With the
("OPT 1")   jumper IN, the mechanical head switch is
                         used for head positioning before writing.

JP3 IN pins 5 and 6 ("8K RAM") JP5 IN pins 1 and 2 ("RAM SEL") JP6 IN pins 2 and 3 ("RAM SEL")	Enables a buffer size of 8K. This requires that an 8K RAM chip be inserted in socket U52 with U51 left open. An 8K buffer size is the default (as-shipped) value. The default jumper connections given in this table permit expansion to 16K by the simple addition of an extra 8K RAM chip in the U51 socket; i.e. with no further jumper strapping needed. Also, when JP3/5,6 are open, JP5/2,3 are shorted, and JP6/1,2 are shorted, the formatter is configured to operate with a 4K buffer. This requires 2K RAM chips in both U51 and U52.
JP4 OUT pins 9 and 10 ("OPT 2")	A status byte of A2H is sent out by drive at EORA (End Of Recorded Area). With jumper IN, EORA status byte = A0H.
JP4 OUT pins 11 and 12 ("OPT 3")	In the default mode, i.e. NO jumper, the formatter operates in QIC-11/QIC-24 mode. With the jumper IN, the formatter operates in QIC-11 mode only.
JP4 OUT pins 13 and 14 ("OPT 4")	Drive looks for physical BOT (Beginning Of Tape). With jumper IN, drive looks for logical BOT indication.
JP4 OUT pins 15 and 16 ("OPT 5")	Selects "hard" parity-error handling. With jumper IN, "soft" parity-error handling is selected. NOTE: "Soft" parity-error handling is available only in the "Dual Format Extended Command Set" firmware version.

FILE TAPE INTERFACE BOARD: Strapping of the file tape interface board used with the TDC 3309/3350 Mk. II is described in Appendix H as part of the general discussion of how to configure and use the file tape facility.

Fig. 4-17   Location of jumpers on DMA Model 360
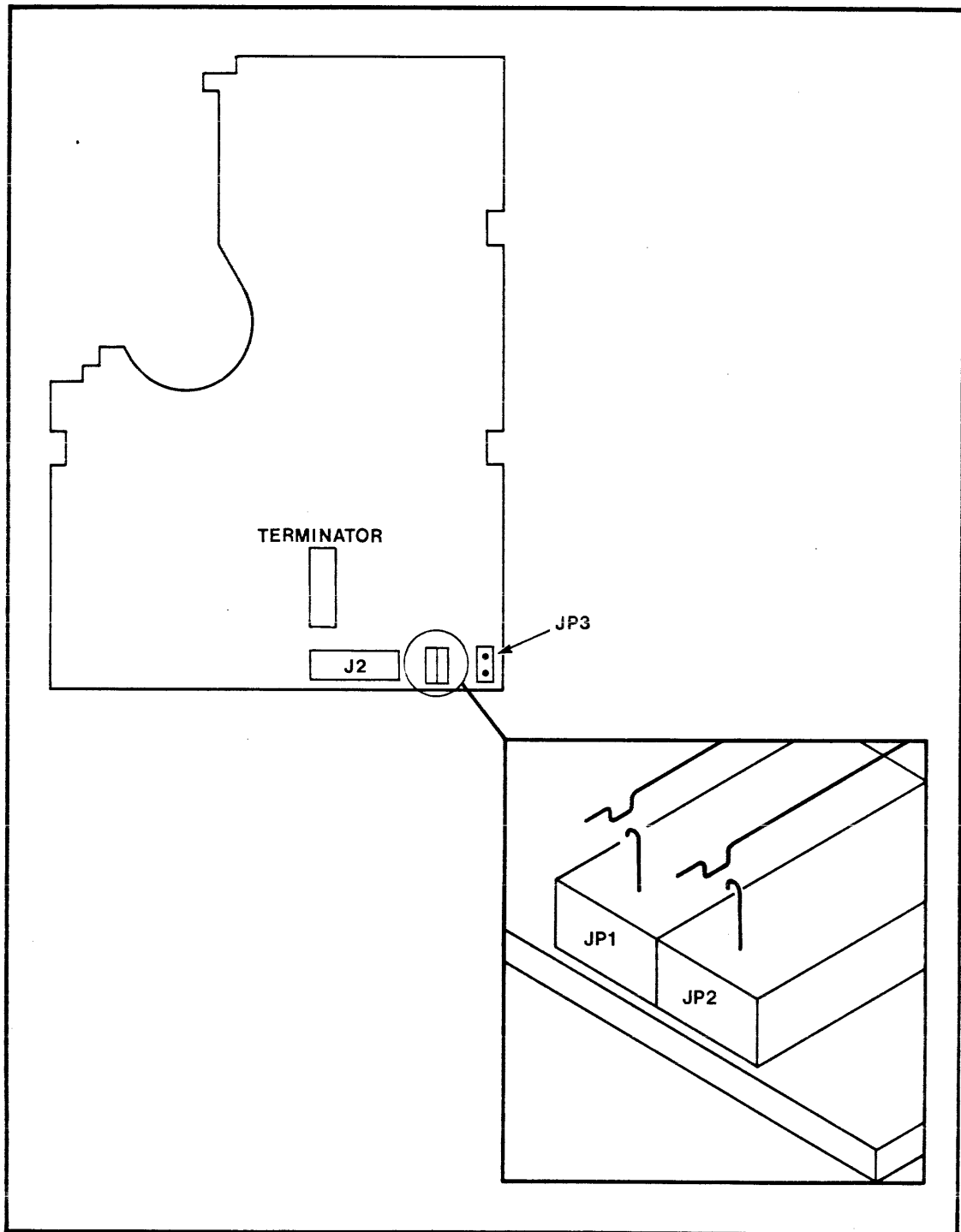
Fig. 4-18   Location of jumpers on Tandberg TDC 3309 control board

NOTES:
1. Jumpers are shown in their as-shipped (default) condition.
2. Jumpers are shown for the as-shipped 8K buffer size. This requires an 8K RAM chip in U52 with U51 left open.
3. For a 16K buffer size, add a second 8K RAM chip in U51. No change in jumpers is required.
4. For a 4K buffer size, open JP3 pins 5 and 6 ("8K RAM"); short JP5 pins 2 and 3 ("2K"); short JP6 pins 1 and 2 ("2K"); and plug 2K RAM chips into both U51 and U52.

Fig. 4-19   Location of jumpers on Tandberg TDC 3350 Mk. II formatter board.

STRAPPING THE SYQUEST SQ312RD CARTRIDGE-TYPE WINCHESTER DRIVE

The default (as shipped) jumper strapping for the SyQuest SQ312RD cartridge-type Winchester drive is given in the following table (Table 4-38). See Figure 4-20.

TABLE 4-38

SYQUEST SQ312RD
JUMPER CONNECTIONS
(See Figure 4-20)

JUMPER DESIG- NATION/ PIN NO.	SMS FACTORY- SHIPPED CONNECTION (DEFAULT)	REMARKS
W1	IN	Write-data termination
W2	IN	Read-data termination
W3	IN	Change-cartridge option
W4	IN	Fault-latch option
W5-W	OUT	Factory use only
W6-W	OUT	Factory use only
W7-W	OUT	Factory use only
W8	IN	Recovery option
W9	IN	Recalibrate option
W10	OUT	De-select auto-recovery mode

DRIVE-SELECT JUMPERS (DEFAULT CONNECTION): The drive is shipped from SMS with a jumper across drive-select pins 1 and 2. This selects the drive as DS1. All other drive-select pins are without jumpers (see Figure 4-20). To select the drive as DS2, jumper drive-select pins 2 and 3 only; for DS3, short pins 4 and 5 only; for DS4, short pins 5 and 6 only.

TERMINATION-RESISTOR PACK: The SQ312RD drives are shipped from SMS with a termination-resistor IC plugged into the drive's termination-resistance socket. Do not remove this IC unless two or more chained drives are used, in which case the IC is to be plugged only into the last drive in the chain.
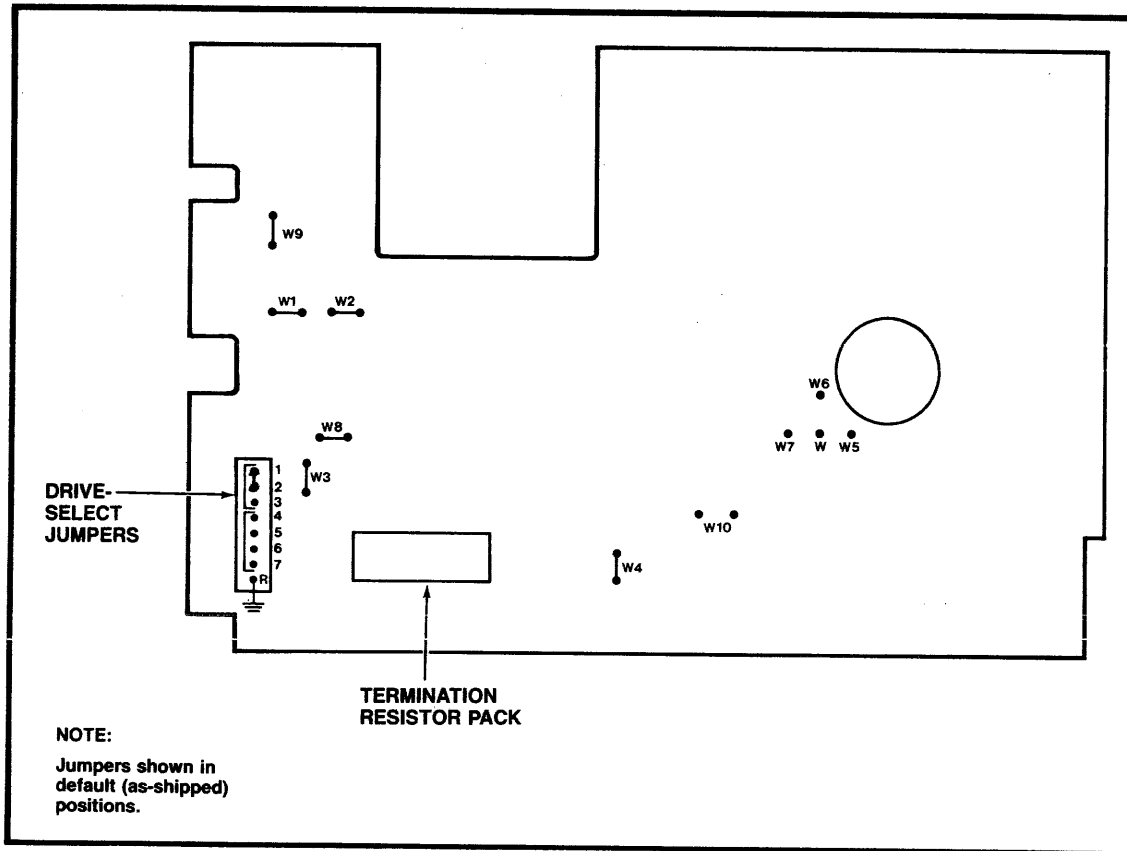
Fig. 4-20   Location of jumpers on SyQuest SQ312RD

SECTION 5

SMS 1000 SYSTEM OPERATION
AND
THE SENSE MONITOR

INTRODUCTION

MODES OF OPERATION

The SMS 1000 has two fundamental modes of operation:

      1. HOST OPERATION. In this mode the SMS 1000 system runs only host programs. Communication with the host is via a user-selected terminal. Booting from initial power-up, Restart, Run/halt, and write protection of Winchester drives must be initiated using the SMS 1000 front-panel display and controls.

      2. SENSE MONITOR OPERATION. The SENSE menu system can run either in the foreground, using your video data terminal, or in the background (i.e. while the host is operating) using the SMS 1000 front-panel display and controls. Not all SENSE functions can be performed while the host is running.

THE SENSE MONITOR

The SENSE Monitor (or "SENSE", as it will usually be called) is a group of utility, operational, system-configuration and analytical programs residing in ROM on the System Foundation Module and organized, for user purposes, as a set of menus and sub-menus. These programs interact with the system's peripherals as well as with the CPU and memory so as to permit you to configure system parameters, check system status, run system diagnostics, do backups, format disks, and identify component failures.

SENSE readouts can appear either on the 16-character front-panel display or on any console device. Also, seven pushbutton controls on the SMS 1000 front panel permit rapid movement through the SENSE menus; operator-initiated system-restart commands; operator-initiated run/halt commands; and write protection of fixed-disk Winchester drives. These controls and indicators are shown in Figure 5-1.
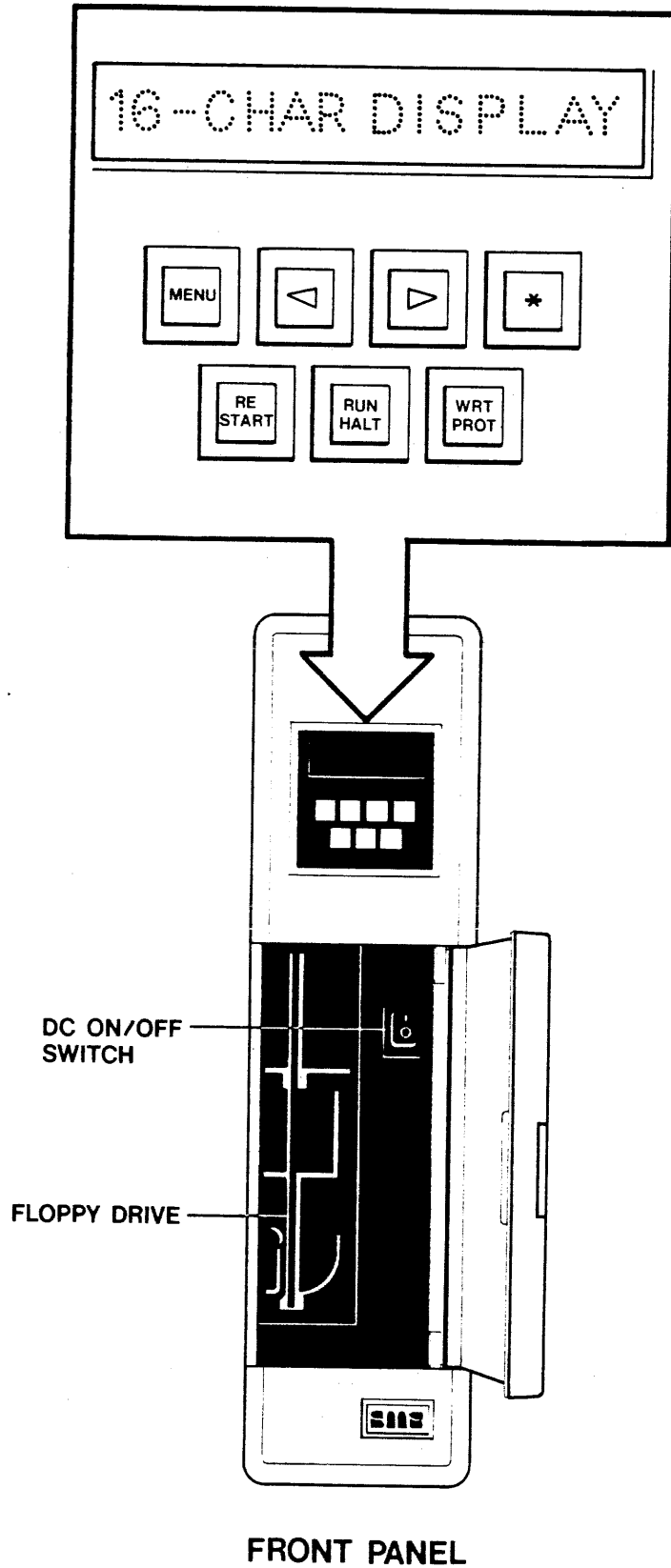
FRONT PANEL

Fig. 5-1   Front panel switches and display window

SENSE is designed so that even with no modules in the back-plane, its processor (see Figure 1-8) allows the user to perform diagnostics and self tests of the basic SMS 1000 system. Thus, the system can be fully checked out prior to installing modules in the backplane, and then, as each board is added to the backplane, further diagnostics and self tests can be performed. In this way, as your system is built up, it can be tested and checked out at each step of the system-integration process.

FRONT PANEL CONTROLS AND INDICATORS

The front panel controls and indicators include the DC power switch (located behind the front panel door), the 16-character readout and the seven pushbutton switches. These are described in Table 5-1.

IMPORTANT

If you are accessing SENSE from a
video display terminal, remember
that the front panel controls
(except for the DC POWER switch
and the RESTART, RUN/HALT and WRT
PROT buttons) are locked out once
video display terminal operation
begins.

TABLE 5-1

FRONT PANEL CONTROL AND INDICATOR FUNCTIONS

CONTROL OR INDICATOR	FUNCTION(S)
DC POWER SWITCH	Located behind door on front panel. Controls application of DC power to backplane, fans, and all integral peripherals.
16-CHARACTER FRONT-PANEL DISPLAY	Displays readouts of system status; environmental or operational conditions; evaluation test results; and system configuration parameters. The names of menus and menu contents are displayed as each level in the menu-selection process is reached.
MENU button	1. At system turn-on or reset, pressing MENU removes the "SMS 1000" logo display,

	starts the menu-selection process, and the first menu is then displayed. 2. Returns to start of current menu, if within a menu. 3. Aborts current command, if one is pending.
<-(left arrow) button	1. Steps back to previous menu entry. 2. Can shift from units to tens to hundreds positions when entering decimal data.
->(right arrow) button	1. Steps to next menu entry. 2. Can step through digits 0 to 9 when entering decimal data.
"*" button	1. Selects the current entry being displayed by the 16-character front panel readout. 2. Enables the RESTART button when both are being pressed at the same time.
RESTART button	Stops all current host activity and reboots the system. NOTE: This button is inter-locked with the "*" button. For RESTART to operate, it must be pressed at the same time as the "*" button. The RESTART button controls the restart function in both front-panel and external-terminal operation.
RUN/HALT button	Pressing this button makes the RUN/HALT menu appear on the 16-character front-panel display. This menu can then be used to either run or halt the CPU. RUN/HALT button can be used at any time, regardless of current system state. The RUN/HALT button controls the run/halt function in both front-panel and external-terminal operation. The RUN/HALT menu does not appear on your video terminal.
WRT PROT button	Enables the write protection of either Winchester fixed-disk drive. This button must be used for write protection both in external-terminal and front-panel operation. Pressing the WRT PROT button causes a menu of write-protect options to appear on the 16-character front-panel display. The WRT

PROT button can be used at any time, regard-
less of current system state. Note that
the write-protection menu does not appear
on your video display terminal.

BASIC OPERATION OF THE SENSE MONITOR

The basic operating procedure for SENSE is very simple: Read
through the list of commands in a SENSE menu until you find the one
you want, then select that command by using controls on the Front
Panel or your terminal. Because the basic operation is so simple,
you can run SENSE, if desired, using only the 16-character display
window and the front panel buttons. Therefore, even systems that
have no terminal available for use as a console can use SENSE.
Operating from a console is, of course, more convenient since the
terminal can display more information and provides a keyboard for
data input.

THE SENSE MENU SYSTEM

As mentioned previously, the basic operating principle of SENSE is
to select a desired command from a list, or menu, of commands.
Because a single menu of all possible commands would be too long,
the SENSE commands are divided up into four basic groups:

STATUS. The status commands check and report on the system's oper-
ating status.

OPERATION.   The operation commands duplicate some   functions
available in your operating system such as booting, restarting,
copying disks, etc. These commands are provided as a convenience
feature for use when the operating system is not available.
Because the operation commands run in the independent support pro-
cessor on the System Foundation Module, these utilities are
available even when the backplane is empty.

EVALUATION. Evaluation commands test and report the status of
peripheral devices controlled by the system foundation module
(i.e., Winchester and floppy disks, and cartridge tape).   These
commands help you isolate problems quickly and easily. Isolating a
problem often allows you to correct it yourself.   For example,
read/write errors on cartridge tape or floppy disk may occur simply
because the heads need to be cleaned. Problems that require repair
service can be handled more efficiently if you can identify the
faulty component when requesting help.

CONFIGURATION. Configuration commands enable you to define various
parameters that affect the system's operation. For example, the
system must know a terminal's baud rate before it can communicate

with the terminal. The configuration commands allow you to enter
this information directly and rapidly into the SMS 1000
controller's EEPROM. The information is then stored, and the con-
troller communicates at the baud rate you entered.

LEVELS WITHIN MENUS

The concept of levels within menus is important because the system
allows you to view only one level at a time. In the following
example, taken from the STATUS menus, the system presents the TEM-
PERATURE and POWER SUPPLY menus (Level 2) when you select the
ENVIRONMENT menu (Level 1) within the STATUS menu (level 0, or top
level).   If you try to position the cursor beyond the end of the
POWER SUPPLY commands (Level 3), the system simply wraps back
around to the TEMPERATURE subcommand.

This manual uses the convention of indentation to designate levels
within menus, as shown in the following sample listing of the
STATUS menu:


```
                            Level 3:
                   Level 2:            |
          Level 1:            |        |
     Level 0:        |        |        |
         STATUS      ▼        |        |
                   SYSTEM     ▼        |
                          <compact status>
                   IDENTIFY            |
                       <banner>
                       FIRMWARE V<n.n>
                       SFM S/N <nnnn>
                       SHIP <mm/dd/yy>
                   ENVIRONMENT   ▼
                       TEMPERATURE
                           DRIVES: <fff>F/<cc>C
                           CARDS: <fff>F/<cc>C
                       POWER SUPPLY
                           +5V:    <d.d>V
                           +12PV:  <dd.d>V
                           +12CV:  <dd.d>V
                           -12V:  -<dd.d>V
                           +24V:   <dd.d>V
```
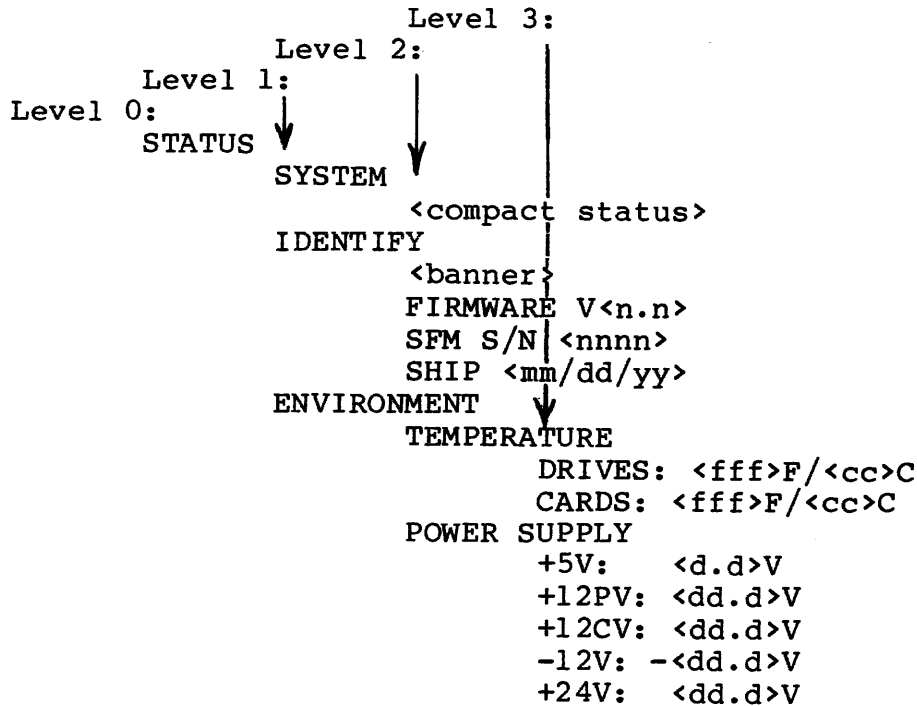

COMMAND FUNCTIONS

As seen in the example of the POWER SUPPLY command (above),
some commands display information. Other commands, such as
FORMAT, initiate disk-controller functions. Still other com-

mands display a parameter list and give you an opportunity to modify that parameter. For example the BAUD RATE command displays a list of the possible baud rates and allows you to change the current setting. The command always displays the currently configured setting first. Therefore, you can use this type of dual-purpose command to determine the current baud rate setting and/or to change the setting.

CONCURRENT OPERATION VERSUS OFF-LINE OPERATION

Concurrent operation allows SENSE to run certain commands while application programs are also running on the host CPU. Notice that concurrent operation applies only to SENSE commands run from the front panel. The console is always reserved for use by applications when the host CPU is running.

Although some commands can run concurrently, to accomplish certain other tasks it is often necessary to stop all applications and run SENSE in an off-line mode. For example, some evaluation tests write over data on the disks and cannot run concurrently with any application. If you attempt to carry out such tasks concurrent with host operation, the system issues the error message

HOST IS RUNNING

and aborts the task.

As a general guide, STATUS information is always available. EVALUATION, CONFIGURATION, and most OPERATION commands should be run in the off-line mode. The system will not allow you to perform SENSE tasks that would interfere with programs running on the host CPU.

COMMAND USER LEVELS

SENSE provides three levels of user access into the menu system: user, system manager or technician. The user access level includes all the commands required for normal system operation. The system manager level adds commands used to configure or change the system. The technician level allows access to all SENSE commands in order to permit the diagnosis of problems. See Appendix A for a complete list of SENSE menus and corresponding access levels.

By use of the ACCESS LEVEL commands in the CONFIGURATION menus of SENSE, you can assign passwords that control access at the Technician (abbreviated TECH) and System Manager (SYS MGR) levels. The USER level provides maximum convenience because

commands that you don't need are not displayed in the menus.

The TECH access level may be useful for isolating problems. The SYS MGR access level is typically used only for the initial system set up or for periods of system maintenance.

CONVENIENCE FEATURES

MOVING THROUGH THE MENUS. In moving through the menus, the system allows you to step backward in a list as well as forward. From the front panel, press the "<-" button (this is the move-backward key). From a smart terminal, use the "<" (less-than) key. Dumb terminals do not require this feature since you select commands by their number.

When running from a console (smart or dumb terminal) you can step back one level in the menu system by pressing the backspace key. For example, if your current choices are TEMPERATURE and POWER SUPPLY, press the backspace key to backup to the level that offers the choice of IDENTIFY or ENVIRONMENT. The backspace key has no effect if you are already at the beginning of a menu.

The ^R (control R) key combination jumps back to the beginning of a menu. For example, in the STATUS menus, if you have accessed the TEMPERATURE and POWER SUPPLY commands and want to return to the top of the menus, press the ^R key combination to return to the beginning of the STATUS menu.

READY MENU. When you select a command that requires operator intervention, the system displays the READY? NOT READY? menu. This gives you time to perform actions such as inserting a diskette into the drive. Select READY? when you are ready for the command to begin. Select NOT READY? (or simply wait before selecting READY?) if further operator intervention is required.

IN-PROGRESS MESSAGES. When a time-consuming command is running, the system displays appropriate messages to let you know what is happening. During flaw map installation, for example, the system displays messages when it sorts the new map, and when it writes the map.

A few commands, formatting a Winchester disk in particular, are so lengthy that the system concentrates its resources on the task rather than displaying messages. Be sure to wait for the format command to complete, even though the system may appear to be inactive for several minutes.

SYSTEM OPERATION AND THE SENSE MONITOR

HOW TO OPERATE THE SYSTEM

INTRODUCTION

There are three basic modes of system operation. These are:

1. HOST OPERATION ALONE. In this mode the host runs applications, and communication with programs is via the terminal.

2. SENSE ALONE. In this mode, only SENSE is running. Communication with SENSE can take place via either the terminal or the SMS 1000 front-panel display.

3. CONCURRENT OPERATION OF THE HOST AND SENSE. In this mode, the host runs programs while, at the same time, certain portions of SENSE can be run in a background mode. Communication with the host is via the terminal. Communication with SENSE is via the SMS 1000 front-panel display.

The following paragraphs provide you with a complete step-by-step procedure for system operation. This procedure covers the three modes of system operation described above. See Figure 5-1 for the identification of controls referred to in these examples.

COMPLETE SYSTEM OPERATING PROCEDURE

1. APPLYING POWER. Apply a-c power by pressing the "1" side of the switch at the rear of the system enclosure (see Figure 1-3). A light on the a-c switch will glow as long as a-c power is applied. Next, apply d-c power to the system by opening the door on the front panel and pressing the d-c power switch to its "1" position.

2. VIDEO DISPLAY TERMINAL. Apply a-c power to your video display terminal, if used (refer to the terminal-connection and interfacing instructions given in Section 3). Note that the following procedure for checking out initial system operation is based on use of a video display terminal. (Although it is possible to configure the system in such a way that booting in the absence of a terminal (i.e. from the front panel alone) is possible, it is not recommended because the front-panel controls are only set up for such things as restart, run/halt and write protect, but not for any other type of communication with

a running program).

3. SELF TEST: GENERAL. For a short period after d-c power is
applied, the front panel display flashes:

POWER-ON/RESTART

and the system performs a multi-step automatic self-test
sequence.   Note that during the self test procedure, an LED on
the front edge of the System Foundation Module (see Figure 1-4)
will turn on for the duration of the tests (about a second).
If the system fails any part of the self test, the LED will
remain on.   For diagnostic purposes, the system can be oper-
ated with the front panel removed and hanging by its safety
wires so that you can observe the state of the LED during self
test.

The self-test sequence includes steps 4, 5, and 6 of this pro-
cedure.

4. EPROM VERSION TEST. The first thing the system does is to
compare the current controller firmware version number stored
in the Foundation Module EPROM with the corresponding version
number read from the EEPROM (i.e. the electrically erasable and
reprogrammable read-only memory in which various configurable
system characteristics are stored). If the numbers match, the
test goes to its next step (Step 5 of this procedure).

If the numbers do not match, it means that the EEPROM must be
reloaded from the EPROM and the following two front-panel mes-
sages are displayed in sequence:

EEPROM mismatch!
Re-load EEPROM?

You must press the "*" button on the front panel to initiate
the EEPROM reload sequence. During the reload the front panel
will display the message:

Changing EEPROM!

Once the EEPROM has been reloaded from the EPROM the following
messages are displayed on the front panel:

Please reconfig!
Please RESTART!

These messages remind the operator that when EEPROM is reloaded
from EPROM, all configuration parameters are returned to the
default values stored on the EPROM and, thus, previously confi-
gured (i.e. non-default) values that were entered by means of

the CONFIGURATION menus of SENSE are lost. Therefore, to start the re-configuration process, you must first press the RESTART and "*" buttons simultaneously and then enter SENSE (as described in step 19 of this procedure). Next, reconfigure by means of the CONFIGURATION menus, as described in Section 9 of this manual. After reconfiguring, you must again restart the system by pressing the front-panel "*" and RESTART buttons simultaneously.

<div align="center">NOTE</div>

> At any time during the complete start-up process, as well as when the system is running applications, you can restart from the beginning of the self-test sequence by simultaneously pressing the RESTART and "*" buttons on the front panel.

5. HARDWARE SELF-TEST. After performing its test of firmware version-number compatibility (see previous step), the system then performs a self test of major hardware components. If this test runs to completion without detecting any failures, the following message is displayed, only if the system has been restarted from a power-off condition:

Self Test OK

and the test goes on to Step 6 of this procedure. This message is not displayed if the self test took place during a restart, i.e. as the result of simultaneously pressing the RESTART and "*" buttons.

If an error is detected, the following error message is displayed:

Self Test Err <nn>

where nn is the decimal number of the self-test error that was detected. The self-test error numbers and a description of the corresponding errors are listed in Appendix E. Note that some types of error are sufficiently severe that even the front-panel error display cannot appear. In the case of all displayable errors, however, the operator has the option of continuing processing by pressing the "*" button on the front panel.

6. CHECKSUM SELF-TEST. In this test, a checksum test is performed on the contents of the EEPROM on the system Foundation Module. If there is no checksum error as the result of this test, the system goes to Step 7 of this procedure.

If a self-test checksum error is reported, the following message is displayed on the front panel:

Self Test Err256

See Table E-1 of Appendix E for descriptions of this and other self-test error messages. The above nessage means that if processing continues, correct results cannot be assured. The system now waits for your response. In this case, pressing the "*" button produces the message:

Re-load EEPROM?

To reload the EEPROM from the EPROM you must again press the "*" button. This starts the reload process during which the following message is displayed:

Changing EEPROM!

At the completion of the reload the following two messages are flashed in sequence:

Please reconfig!
Please RESTART!

These messages remind the operator that when EEPROM is reloaded from EPROM, all configuration parameters are returned to the default values stored in the EPROM and, thus, previously configured (i.e. non-default) values that were entered by means of the CONFIGURATION menus of SENSE are lost. Therefore, to start the re-configuration process, you must first press the RESTART and "*" buttons simultaneously and then enter SENSE (as described in step 19 of this procedure). Next, reconfigure by means of the CONFIGURATION menus, as described in Section 9 of this manual. After reconfiguring, you must again re-enter the system by simultaneously pressing the front-panel "*" and RESTART buttons.

7. MEMORY SIZING. At the completion of self test the host memory size is measured, during which the message:

MEM sizing

is flashed on the front panel display. At the completion of the measurement, the memory size in K words (KW) is added to the end of the "MEM sizing" message.

NOTE

In performing tests on Winchester drives during the power-up sequence (see following

steps), the system tests access to each drive. The order followed is: Winchester 0, Winchester 1, cartridge-Winchester 0. The following steps apply only to those systems that are configured to include one or more Winchester drives.

8. WINCHESTER SPINUP. As soon as d-c power is applied, any Winchester drives in your system are energized and start to come up to their normal rotational speed. Note that, starting with the application of power, there is a fixed time delay before the system can load and run programs. This delay, which is configurable in the WINCHESTR SPINUP portion of the CONFIGURATION menus (see Section 9 of this manual), has a default value of 20 seconds. This corresponds to the spinup delay of most fixed-disk Winchester drives. Cartridge-type Winchesters require a delay of at least 45 seconds. During the delay period, the message

Winchestr spinup

is displayed on the front panel. When each Winchester drive is up to speed and initialized, the following message is displayed:

xx ONLINE OK

where xx can be W0, W1 or C0, depending upon how your system is configured. The abbreviations W0, W1, etc. are defined as follows:

W0 = Fixed-disk Winchester 0
W1 = Fixed-disk Winchester 1
C0 = Removable-cartridge Winchester 0

9. WINCHESTER FLAW TABLES. After spinup, the system looks for the flaw table stored on each Winchester drive in order to read it into controller RAM. If this is done successfully, the following message is displayed and the system then goes on to Step 10 of this procedure:

xx FlaTbl OK

where xx can be W0, W1 or C0, depending upon how your system is configured.

If the flaw table cannot be successfully loaded, one of the following two messages is displayed:

xx FlaTbl Err nn
xx FlaTbl Bad

where xx can be W0, W1 or C0, depending upon how your system is configured; and nn is the decimal number assigned to the error as listed in Appendix E.

NOTE

If the EEPROM was reloaded prior to this step and you have not yet reconfigured the system, then a flaw-table error is always generated.

The first message indicates that, for the reason listed in Appendix E, the flaw table cannot be read from disk. The second message will appear in place of the first if the table can be read but the contents are invalid. If either message is issued, you can escape by pressing the "*" button on the front panel. This causes a so-called "null" flaw table (i.e. an empty flaw table) to be built, and the following message to be displayed:

xx Entries = 0

where xx can be W0, W1 or C0, depending upon how your system is configured. CAUTION: with a null flaw table, you must be aware that hard disk flaws are no longer known and automatically passed over and that data already stored on spare sectors is not accessed until the flaw table is fully restored. This means that continued processing has a high degree of risk of data being corrupted. Hence, it is advisable to contact your service organization in order to restore the flaw table. See Section 7 of this manual.

If the flaw-table error message was issued for C0, then the following additional message appears:

C0 Ready?

This message is issued to cover the situation in which the only problem with C0 is that you may have forgotten to insert a cartridge or to close the drive door. If this is the problem, insert the cartridge or close the door and press the front-panel "*" button. The system will now repeat the last sequence of steps, starting with Winchester spinup.

Another possible cause of the error may be that the spinup delay configured into the system is too short for a cartridge-type Winchester. This type of drive requires a spinup delay of at least 45 seconds. If this is the problem, reconfigure, using the WINCHESTR SPINUP portion of the POWER-ON/RESTART menus, as described in Section 9 of this manual.

If you deliberately did not load a cartridge into the cartridge Winchester, then press the "->" button (right arrow, indicating a "no" response to the "C0 Ready?" query). The system then displays the message:

Not Ready?

Press the front-panel "*" button (i.e. a "yes" response). This tells the system that the absence of a cartridge in C0 is deliberate and to continue with power-on/restart processing.

10. WINCHESTER ACCESS TEST. An access test is now performed on each Winchester. This test attempts to read a sector from the first track on the last configured cylinder. If the access is successful, the following message is displayed and the system goes to Step 11 of this procedure:

xx Access OK

where xx can be W0, W1 or C0, depending upon how your system is configured.

If the track cannot be accessed, for example, because the actual number of cylinders does not agree with the configured value stored in EEPROM, the system returns the message:

xx Access Err nn

where xx can be W0, W1 or C0, depending upon how your system is configured, and nn is the error number as listed in Table E-3 of Appendix E. Proceed by pressing the "*" button on the front panel. The system then sends the following message, which warns that there may be a conflict between the actual hardware and how the system is configured:

Check config!

Also, any time the Winchester under test is write protected, the system sends the following message:

xx Writ Prot

where xx can be W0, W1 or C0, depending upon how your system is configured.

11. A row of stars ("****") is now scrolled across the front panel display. This signifies that the system is now ready to branch to the next phase of the power-up sequence: that is, either booting the host or calling SENSE.

12. OPTIONS FOR OPERATION AT THE CONCLUSION OF INITIAL TESTS. Depending upon how your system is configured, (see STARTUP MODE portion of the CONFIGURATION menus in Section 9 of this manual) there are three possible modes of going into full operation. These are:

(1) The usual as-shipped (i.e. default) option is for the system to go automatically into bootstrapping the host at the completion of the initial tests described in this procedure.

(2) A second option is for the system to automatically call the SENSE menus.

(3) The third option involves testing and exercising the system and is of interest primarily to system engineers (see LOOP UNTIL ERR option under STARTUP MODE in Section 9).

NOTE

If you wish to run SENSE either in stand-alone mode or concurrently with the host, go to Step 19 of this procedure.

13. BOOTING THE HOST. After the system passes all steps of the preceding tests, it then goes directly to the start of bootstrap mode. The booting process is indicated on the front panel by the rapid flashing of the message:

Booting host

The system then boots in the manner described in Step 14 of this procedure.

If any kind of hardware failure prevents booting, the following front-panel message is displayed:

Boot failure

This message could be caused by such types of failure as a bad or missing CPU card, an incorrectly strapped CPU or memory card, bad or missing memory cards, or a bad Foundation Module. If the system detects a bad or missing CPU, the "Boot failure" message is replaced by the message:

Bad CPU?

If the system detects bad or missing memory cards, the "Boot failure" message is replaced by the message:

No memory?

If any of these three messages appears, the booting process goes no further and your support organization should be informed. NOTE: In this case, it is still possible to enter the SENSE menus by pressing the "*" button on the front panel.

14. AUTOBOOT TIMEOUT DELAY. After the display of the message "Booting host", there are three possible modes of booting the system, depending upon the configured autoboot delay. This delay period is configurable using the AUTOBOOT TIMEOUT portion of the BOOTSTRAP commands (see CONFIGURATION menus in Section 9). The three delay modes are:

(1) ZERO DELAY. System immediately searches for first valid boot block among configured devices (see Section 9) in order to load and run bootstrap.

(2) CONFIGURED DELAY. During configured delay period you enter the logical name and unit number of the boot device and the system searches it for a valid boot block. See Step 16 of this procedure for a discussion of logical-device names and unit numbers.

(3) DELAY TIMEOUT. If no boot device is entered before the end of the configured delay period, the autoboot sequence automatically searches for the first valid boot block among the drives configured in the BOOTSTRAP portion of the CONFIGURATION menus.

MODE (1). In the first mode, autobooting is immediate, that is, the timeout delay is zero. The user is informed of this mode by the message:

AUTO - BOOT

The configurable autoboot drive sequence (see BOOTSTRAP portion of CONFIGURATION menus) is used to load the first valid boot block.

MODE (2). In the second mode, the boot device name and unit number is entered manually and the time allotted for this purpose is configurable. The time can range from zero to an indefinite period. The as-shipped default value supplied with the system is 10 seconds. The following typical display (see sample screen below) appears on your video display terminal screen if the delay is non-zero. The sample screen shows typical responses of the RT-11 operating system and includes operator responses to the prompt:

ENTER DEVICE NAME AND UNIT NUMBER:

The purpose of this prompt is to allow you to choose an alter-
nate drive for booting when special circumstances require it.
For example, the stand-alone add-on tape unit (device name MS)
is not part of the autoboot sequence and must be specified
manually in order to be used as a boot device.   The response
"DU1" (see sample screen) means that a DU device with a unit
number of 1 is being selected.   In the sample screen, the
operator responses are underlined.

MODE (3). The third mode occurs automatically if a valid
device name and unit number is not entered within the autoboot
timeout period. At the end of that period the response:

AUTO - BOOT

appears at the end of the "ENTER DEVICE NAME AND UNIT NUMBER"
prompt on your terminal. The autoboot sequence then finds the
first valid boot block among the configured devices, booting
takes place, and the logical-device unit number containing the
boot block is displayed in the following format:

BOOTING FROM DEVICE <unit No.> [Displayed in autoboot only]

IMPORTANT

In order to boot from a peripheral device
such as a floppy-disk drive it must con-
tain a DU-bootable diskette.   Similarly,
to boot from a Winchester drive, it must
have been created as a DU-bootable device.

SAMPLE SCREEN WHEN BOOTING SYSTEM
(EXAMPLE SHOWS RT-11 SYSTEM RESPONSES)

SMS 1000   BOOTSTRAP

256KW MEMORY   11/73 CPU

BOOTABLE DEVICES:

DEVICE NAME	DEVICE TYPE	UNIT NUMBERS
DU	DSA	0-3
MS	TS	0

ENTER DEVICE NAME AND UNIT NUMBER: DU1 [Entry consists of two
                     parts: Device name ("DU"), and Unit No. ("1").
                     Operator then presses Return.]

BOOTING FROM DEVICE 1 [Appears in autoboot only]

RT-11SJ V05.01

.SET TT SCOPE

.SET KMON IND

.SET EDIT KED

. [The RT-11 dot prompt shown at left means that the
        operating system is now ready for commands]

LEGEND

DU - Disk device
MS - External Tape device
DSA - Digital Storage Architecture
TS - Tape system
----

15. BOOTSTRAP ERROR MESSAGES. If the specified boot device does not exist or is not recognized (for any reason) the following message appears on your terminal:

DEVICE NOT IN SYSTEM

If the response was misspelled, the following message is displayed and the prompt is repeated:

ILLEGAL DEVICE
ENTER DEVICE NAME AND UNIT NUMBER:

If no boot block is found, the following message is displayed:

NOT A BOOTABLE DEVICE

If the specified unit is not online, the system returns the following message:

UNIT OFF LINE

If you are attempting to boot from an external tape device (device name MS) and a bad or blank tape is detected, the following message is displayed:

TAPE READ ERROR

If a valid boot block is not found on any of the devices searched in the autoboot sequence, the following message is displayed:

NO BOOTABLE DEVICE IN SYSTEM

At the conclusion of this message, the standard bootstrap screen (see sample screen above) is again displayed.

16. DESIGNATION OF LOGICAL DEVICE NAMES. Floppy and Winchester drives are designated with the prefix DU followed by a number. The numbers are assigned according to the following rules:

(1) Fixed-disk Winchester drives are assigned the lowest DU numbers (starting with DU0).

(2) Floppy drives are assigned the next higher DU numbers.

(3) Removable-cartridge Winchester drives are assigned the highest DU numbers.

(4) No more than four devices can be specified.

NOTE

At present, no logical (i.e. DU) device name for host-type access exists for the integral image-oriented streaming tape drive that may be part of your SMS 1000 system. That is, booting cannot take place from an image-oriented streaming tape drive. Booting can, however, take place from a streaming tape drive operating in conjunction with a TSV05 file-oriented tape interface module (see Appendix H), or from an external TSV05-equivalent tape unit such as the SMS FWT01180.

For example, in a system with two fixed-disk Winchesters and two floppy drives, the device numbering would be as follows:

```
Winchester 0 = DU0
Winchester 1 = DU1
    Floppy 0 = DU2
    Floppy 1 = DU3
```

A second example might be a system with a cartridge Winchester drive, one fixed-disk Winchester drive, and one floppy drive. In this case the device designations would be:

```
      Winchester 0 = DU0
          Floppy 0 = DU1
Cartridge Winchester = DU2
```

In the sample screen shown above, the "DU" portion of the operator response (i.e. in response to the query "ENTER DEVICE NAME") designates a Winchester of either type or a floppy drive. Similarly, the response "MS" designates an external tape unit. The logical unit numbers 0 to 3 (for DU devices) and 0 (for an MS device) are designated in response to the query: "AND UNIT NUMBER".

17. CONVENTIONS WHEN SPECIFYING A BOOT DEVICE. When responding to the prompt "ENTER DEVICE NAME AND UNIT NUMBER", type the selected boot-device name and unit number (see previous steps) without a space (e.g. DU3), followed by a carriage return.

18. SYSTEM RESPONSE AFTER BOOTING. If you have successfully bootstrapped from the designated unit, an operating-system message such as: "RT-11SJ" and a version number (as in the current example) now appears. In the operating-system example shown here, these messages are also followed by a command string and the RT-11 operating system's normal prompt of a single dot, i.e. ".", at the completion of the command string. The system is now in its normal operating mode and is ready to run your applications, accept commands, etc.

19. RUNNING SENSE IN STAND-ALONE MODE. Referring back to Step 12 of this procedure, if you wish to operate SENSE at the conclusion of the initial system tests, press the front panel MENU button any time between the start of initial self tests (see Step 3) and the display of the group of stars scrolling across the front-panel display (see Step 11). This tells the system to display SENSE menus rather than boot the operating system. After the MENU button has been pressed and the group of stars moving across the front-panel display goes away, the next message:

> VDU prompting

tells you to look at your video terminal (i.e. "VDU") for the message:

> *HIT ANY KEY WITHIN TIME LIMIT*

You have a (configurable) time delay period in which to press any key on your terminal in order to select terminal display of SENSE menus. If you wish to select front-panel operation of SENSE, simply allow the delay to expire or press the front-panel MENU button before the expiration of the delay. See the following steps.

20. SELECTING SENSE OPERATION FROM THE TERMINAL. When the message "*HIT ANY KEY WITHIN TIME LIMIT*" is displayed on your terminal you have about ten seconds in which to press a key on the keyboard. (NOTE: The delay period is configurable by means of the VDU ONLINE DELAY portion of the CONFIGURATION menus. The default value is ten seconds.) Pressing a key transfers control to the console. The system now indicates that you are at the start of the SENSE menus by displaying and highlighting the first word of the menus:

> STATUS

on the video display. The front panel then displays a user-selected logo (entered from the SPECIAL section of the CONFI-GURATION menus) or the "SMS 1000" default logo. Note that the RESTART, RUN/HALT, and WRT PROT buttons on the front panel can still be used during console operation.

<div align="center">NOTE</div>

> At any time during the complete start-up process, as well as when the system is running applications, you can restart from the beginning of the self-test sequence by simultaneously pressing the RESTART and "*" buttons on the front panel.

21. SELECTING SENSE OPERATION FROM THE FRONT PANEL. During the (configurable) time delay period (the default is ten seconds) during which you can select either the front panel or the terminal, the message "VDU prompting" is displayed on the front panel. By allowing the time delay to elapse without hitting a key on the terminal keyboard (or by simply pressing the MENU button before the end of the delay), control of SENSE is given to the front panel, from which its menus can be accessed. The system now indicates that you are at the start of the SENSE menus by displaying the word

> STATUS

on the front-panel display. `A full description of how to interact with the SENSE menus is given later in this section.

22. RUNNING SENSE CONCURRENTLY WITH THE HOST. Once the host is booted and running applications, you can still run certain areas of SENSE at the same time as the host. To do this, after the host is running and a logo appears on the SMS 1000 front panel, press the front-panel MENU button. This will call SENSE and, after a brief delay, the word STATUS will appear on the front-panel display to indicate that you are at the start of the SENSE menu system. While in the menu system, if you attempt to perform a task that interferes with the host, the error message:

> HOST IS RUNNING

is issued and the task is aborted.

AN EXAMPLE OF INTERACTION WITH THE SENSE MENUS

The following paragraphs provide instructions for running the SENSE menus. This will be done by using the example of the SENSE Monitor's POWER SUPPLY command (part of the STATUS menu system), which reads and displays the backplane voltage levels currently being produced by the power supply. You can run this example from the front panel even when there are other applications running in the system. Proceed as follows:

1. CALLING SENSE. Call SENSE as described in Step 19 of the complete system operation procedure (above).

2. SELECTING FRONT-PANEL OPERATION. Select front-panel operation of SENSE as described in Step 21 of the complete system operation procedure (above).

3. ENTERING SENSE MENUS. When the word

STATUS

appears on the front-panel display, it indicates that you are at the top of the SENSE menus. This is the entry point of the complete menu system. Note that pressing the MENU button repeatedly always returns you to the top level of whatever section of SENSE you happen to be in, i.e. CONFIGURATION, OPERATION, etc. You must then use the right or left arrow keys to get back to STATUS.

4. The following example displays system status information. First, press the "*" button to select the STATUS commands. The word SYSTEM now appears in the display window. That is, by selecting STATUS, you now go to the top of the next menu level under STATUS. This is the basic principle for moving between the various levels of SENSE menus. See panels 1 and 2 of the following group of front-panel displays. Note that pressing the "*" button, as shown in panel 1, produces the display shown in panel 2. This sequence applies to all the panels shown in this example.

5. Use the front panel "->" button to step through the list of STATUS commands. The first time you press the button, the word IDENTIFY appears in the display window; the second time, the word ENVIRONMENT appears, etc. See panels 2, 3, and 4.

6. This example displays status information about the system's electrical environment, so press the "*" button to select the list of environment commands (panel 4). The word TEMPERATURE now appears in the display window (panel 5).

7. Use the "->" button to step through the ENVIRONMENT commands until the words POWER SUPPLY appear (panel 6).

8. Press the "*" button (panel 6) to select the POWER SUPPLY command. The first value in the list of voltages appears in the display window as "+5V: 4.9", for example (panel 7), meaning that the currently measured value of the +5 volt supply is actually 4.9 volts.

9. Use the "->" button to step through the sequence of power supply voltages (panels 7 through 11). If you press the "->" button one more time after the last voltage in the list has been displayed, SENSE jumps back to the beginning of the list and displays the words "POWER SUPPLY" (panel 12). (To see a complete listing that shows how the STATUS commands are organized, refer to Chapter 6.)

10. Press the MENU button to return to the beginning of the STATUS menus. The front panel now displays the word STATUS (see panel 13).

The operating sequence for this example is illustrated in the
following 13 panels for the sake of readers who do not have a
system readily available. Shading over a button indicates
that the button has been pressed.

1.

STATUS
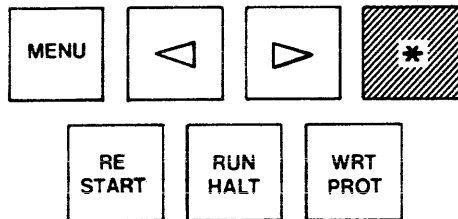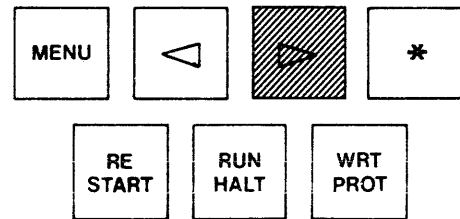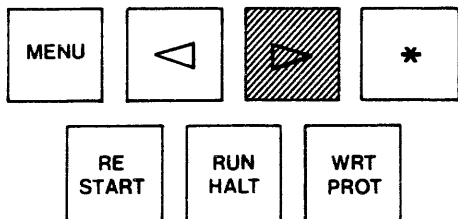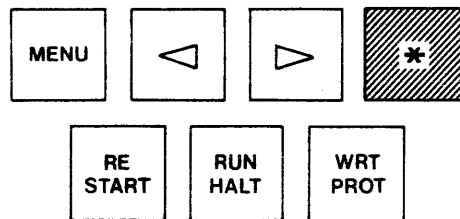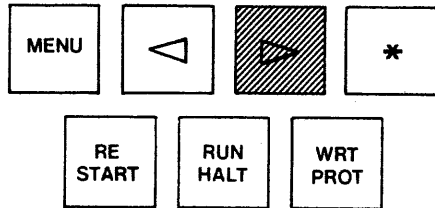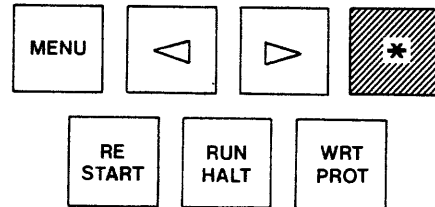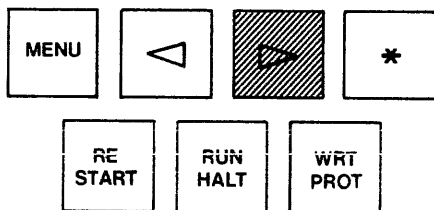
| MENU | ◁ | ▷ | ▓✳▓ |

| RE START | RUN HALT | WRT PROT |

2.

SYSTEM

| MENU | ◁ | ▓▷▓ | ✳ |

| RE START | RUN HALT | WRT PROT |

3.

IDENTIFY

| MENU | ◁ | ▓▷▓ | ✳ |

| RE START | RUN HALT | WRT PROT |

4.

ENVIRONMENT

| MENU | ◁ | ▷ | ▓✳▓ |

| RE START | RUN HALT | WRT PROT |

5.

TEMPERATURE

MENU	◁	▷	*

RE START	RUN HALT	WRT PROT

6.

POWER SUPPLY

MENU	◁	▷	*

RE START	RUN HALT	WRT PROT

7.

+5V: 4.9

MENU	◁	▷	*

RE START	RUN HALT	WRT PROT

8.

+12 PV: 11.8

MENU	◁	▷	*

RE START	RUN HALT	WRT PROT

9.

+12 CV: 11.9

MENU	◁	▷	*

RE START	RUN HALT	WRT PROT

10.

−12 V: −12.0

MENU	◁	▷	*

RE START	RUN HALT	WRT PROT

11.

```
+24V: 24.0
```

| MENU | ◁ | ▷ | * |

| RE START | RUN HALT | WRT PROT |

12.

```
POWER SUPPLY
```

| MENU | ◁ | ▷ | * |

| RE START | RUN HALT | WRT PROT |

13.

```
STATUS
```

| MENU | ◁ | ▷ | * |

| RE START | RUN HALT | WRT PROT |
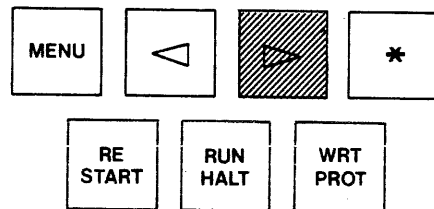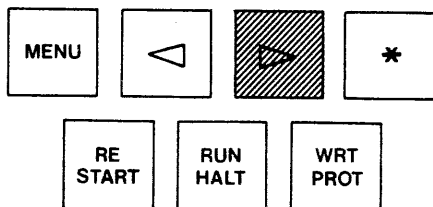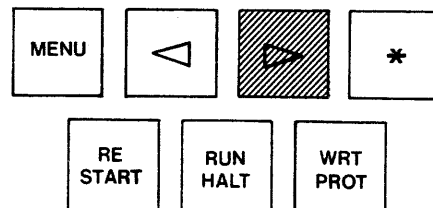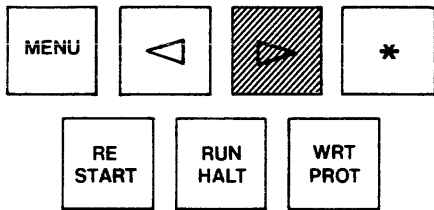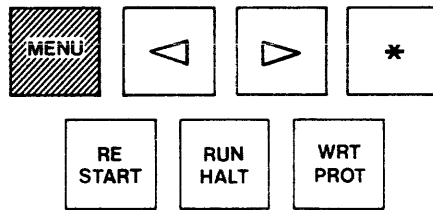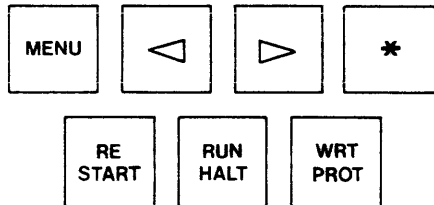
SMART TERMINAL OPERATION

TRANSFERRING CONTROL TO A TERMINAL. You can use a video display terminal to run SENSE only in the off-line mode (i.e. host not running). To transfer control from the front panel to a terminal refer to Step 20 of the complete operating procedure (above).

KEYBOARD CONTROLS. The following controls on your smart terminal have special meanings when interacting with the SENSE menus.

KEY	FUNCTION
Space bar or letter N or n	Step to next menu entry.
Return or letter Y or y	Select current entry.
^C	Abort current command.
^R	Go to top of current menu.
Backspace	Jump back one menu level.
">" (greater than)	Step to next menu entry. Same as space bar.
"<" (less-than)	Step back to previous menu entry.

SENSE OPERATION FROM A SMART TERMINAL

NOTE

The terminal-type default in the SMS 1000 is "dumb". This means that your terminal, whether smart or dumb, will interact with the system as though it were dumb until you change the TERMINAL TYPE option in the SENSE CONFIGURATION menus. If you have a smart terminal and want to change TERMINAL TYPE to SMART, set your smart terminal to VT100 emulation mode. Note that a dumb terminal will not operate properly with TERMINAL TYPE set to SMART.

Operating from the console differs significantly from front-panel operation. Note the following:

1. The terminal screen can display and accept a great deal more information than the front panel.

2. You enter commands and data through the keyboard rather than the front panel buttons. Notice that only the space bar and return key are needed for most SENSE operations with a smart terminal. NOTE: Remember that when using your terminal for running host programs only, the keyboard functions normally; that is, there are no special key functions other than those peculiar to your selected keyboard or to the operating system or application you are running. Note the following:

	DESIRED SENSE FUNCTION			
CONTROL LOCATION	RUN MENUS/ TOP OF MENUS	STEP TO NEXT LIST ITEM	STEP TO PREVIOUS LIST ITEM	SELECT CURRENT ENTRY
FRONT PANEL BUTTON	MENU	"->"	"<-"	"*"
SMART-TERMINAL EQUIVALENT	^R	Space bar, ">" or letter N/n	"<"	RETURN key or letter Y/y

NOTE: "N/n" and "Y/y" means that either the upper or lower case letter can be used.

Notice, also, that the display on a smart terminal is divided into three sections. These sections are used for the following functions:

```
/‾‾‾‾‾‾‾‾**Your configurable banner goes here**‾‾‾‾‾‾‾‾\
|                                                       |
|                                                       |
|                                                       |
|                  command selection                    |
|                                                       |
|                                                       |
|-------------------------------------------------------|
|                     data entry                        |
|                                                       |
|-------------------------------------------------------|
|                                                       |
|                   status display                      |
_____/
```
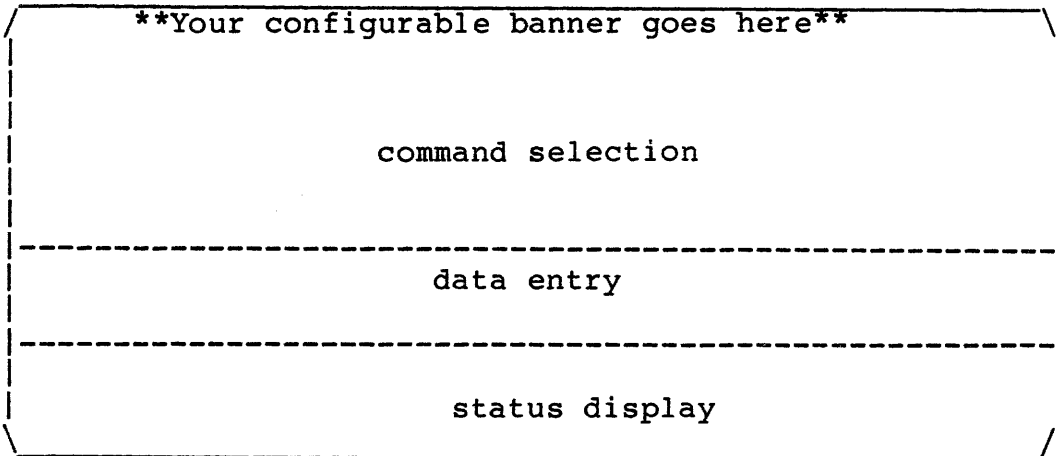
Certain commands such as the configuration commands for Winchester disks request input by issuing a prompt in the data entry section of the screen. If the Winchester has already been formatted, the command also displays the current format parameters in the status display section.

WARNING

Be certain that commands that both display and modify data terminate normally (i.e. the system displays a "TASK COMPLETE" status message) before you select another command, restart, or power down. Exiting the command before the completion message has the effect of altering configuration parameters.

3. The following examples show you how to move through the STATUS menus when operating from a smart terminal. The word STATUS is highlighted on the terminal when you initially enter the menu system. (At the same time, the front panel displays either your logo or a system status readout.)

```
/‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾**SMS 1000**‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾\
|                                                 |
| STATUS    OPERATION    EVALUATION   CONFIGURATION |
|                                                 |
|                                                 |
|                                                 |
```

                            NOTE

        The screen images shown in the following examples
        are compressed to save space.

4.   Tap the space bar until the cursor is positioned over
     the word IDENTIFY.   If you step past a desired entry,
     just keep tapping the space bar; the cursor will even-
     tually wrap around the end of the list and return to the
     desired item. This example displays status information,
     so press the carriage return key to select these com-
     mands. The system then sends the following list of the
     available status commands to the console (remember that
     the SYSTEM command is available only at the Front Panel
     display):


```
/‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾**SMS 1000**‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾\
|                                                 |
| STATUS     OPERATION    EVALUATION    CONFIGURATION |
|                                                 |
| IDENTIFY   ENVIRONMENT                           |
|                                                 |
```


5.   Use the space bar to step through the list of STATUS
     commands.   The first time you press the space bar, the
     cursor moves to the word ENVIRONMMENT.   Remember, if
     you space too far, just keep tapping the space bar until
     the cursor returns to the desired item.

```
/‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾**SMS 1000**‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾\
|                                               |
| STATUS      OPERATION   EVALUATION   CONFIGURATION |
|             ‾‾‾‾‾‾                             |
| IDENTIFY   ENVIRONMENT                         |
|            ‾‾‾‾‾‾‾‾‾‾‾                         |
|                                               |
|                                               |
```

6.   This example displays status information about the
     system's electrical environment, so type a carriage
     return to select the list of ENVIRONMENT commands:

```
/‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾**SMS 1000**‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾\
|                                               |
| STATUS       OPERATION   EVALUATION   CONFIGURATION |
| ‾‾‾‾‾‾                                         |
| IDENTIFY    ENVIRONMENT                        |
|             ‾‾‾‾‾‾‾‾‾‾‾                        |
| TEMPERATURE    POWER SUPPLY                    |
| ‾‾‾‾‾‾‾‾‾‾‾                                    |
|                                               |
|                                               |
```

7.   Use the space bar to step through the ENVIRONMENT com-
     mands until the cursor is positioned over the words
     POWER SUPPLY, and then type a carriage return to select
     that entry. Notice that the console can display all of
     the system's power levels at once.   Notice also that
     each previous selection remains highlighted to provide a
     visual audit trail of how you arrived at this particular
     command.

```
/                        **SMS 1000**                              \
|                                                                  |
|  STATUS        OPERATION  EVALUATION      CONFIGURATION           |
|                                                                  |
|  IDENTIFY      ENVIRONMENT                                        |
|                                                                  |
|  TEMPERATURE      POWER SUPPLY                                    |
|-----------------------------------------------------------------|
|                                                                  |
|                                                                  |
|-----------------------------------------------------------------|
|  +5V:   4.9        +12PV: 12.0   +12CV: 11.9   -12V: -12.0        |
|  +24V: 23.8                                                      |
|                                                                  |
\                                                                  /
 _____/
```

DUMB TERMINAL OPERATION

KEYBOARD CONTROLS ON DUMB TERMINAALS

In SENSE operation, a dumb terminal displays a list of the available menu entries. Each entry in the list has a number. You select entries by typing the number of the desired command. The keyboard controls with special meaning for dumb terminals are defined as follows:

KEY	FUNCTION
1 - 7	Select menu entry.
^C	Abort current command.
^R or 8	Go to top of current menu.
Backspace or 0	Jump back one menu level.

SENSE OPERATION FROM A DUMB TERMINAL

A smart terminal has circuits that tells SENSE where the cursor is located. Dumb terminals lack these circuits and communicate with SENSE only when you enter information from the keyboard.

When a dumb terminal is used for the console, SENSE displays a numbered list of the options that are available. You select an option by typing in its number as described in the following

steps. NOTE: Remember that when using your terminal for run-
ning host programs only, the keyboard functions normally; that
is, there are no special key functions other than those pecu-
liar to your selected keyboard or to the operating system or
application you are running.

1. TRANSFERRING CONTROL TO A TERMINAL. You can use a video
    display terminal to run SENSE only in the off-line mode
    (i.e. host not running). To transfer control from the
    front panel to a terminal refer to Step 20 of the com-
    plete operating procedure (above).

2. The following examples show you how to move through the
    STATUS menus when operating from a dumb terminal. The
    word STATUS is highlighted by an arrow on the terminal
    screen when you initially enter the menu system. (At
    the same time, the front panel displays either your logo
    or a system status readout.)

```
/ **SMS 1000**                                              \
|                                                           |
| 1   STATUS      <--                                       |
| 2   OPERATION                                             |
| 3   EVALUATION                                            |
| 4   CONFIGURATION                                         |
|                                                           |
| ENTER NUMBER -                                            |
|                                                           |
|                                                           |
```

3. Type the number 1 and a carriage return to select the
    status commands. SENSE now displays a numbered list of
    the STATUS command types:

```
/                                                           \
|                                                           |
| **STATUS**                                                |
|                                                           |
| 1   IDENTIFY    <--                                       |
| 2   ENVIRONMENT                                           |
|                                                           |
|                                                           |
| ENTER NUMBER - 2 [carriage return]                        |
|                                                           |
```

4. Type the number 2 and a carriage return to select the
    ENVIRONMENT commands. The screen now changes to:

```
**ENVIRONMENT**

1  TEMPERATURE     <--
2  POWER SUPPLY

ENTER NUMBER - 2 [carriage return]
```

5. Type the number 2 and a carriage return to select the
    POWER SUPPLY command. SENSE responds by displaying the
    system's current power supply levels:

```
**ENVIRONMENT**

1  TEMPERATURE
2  POWER SUPPLY   <--

ENTER NUMBER - 2 [carriage return]
+5V:    5.0V
+12PV: 12.1V
+12CV: 12.3V
-12V:  -12.1V
+24V:  23.7V
```

COMMAND TERMINATION (Abort)

If you have successfully run the example described above from
both the front panel and console, you can perform all necessary
SENSE functions except for terminating commands by use of the
abort menu.

ABORT MENU

To abort a command when running from the front panel, press the
MENU switch.

To abort a command when running from a console, type ^C by holding down the control key (CTRL on most terminals) while you type the letter C.

Aborting a command invokes the abort menu, which has only two possible options:

        MENU?
        RESUME?

Select the MENU option to return to the menu system; select RESUME to continue with the current command.

Proper command termination is critical with commands that display information and provide the option of changing that information. It is possible to reset command parameters to zero by terminating a command incorrectly. After you initiate the abort sequence, be certain to WAIT FOR THE ABORT MENU PROMPT.

Some commands have a lengthy termination sequence, so it may take several seconds for the abort menu prompt to appear. If you are running from a console, do not type a carriage return before the prompt appears, as the system may take the carriage return as a response to a data prompt.

ENTERING NUMERIC DATA

SENSE requires requires you to specify the number base to be used if you enter other than decimal numbers. When you enter a number that is not decimal, the number must include an upper-case letter suffix to indicate its base. Use the upper-case letter Q to indicate OCTAL values, or the upper-case letter H to indicate HEXADECIMAL values. Do not forget the letter if it is needed. If you forget, the value is interpreted as decimal. Remember that the following numbers represent very different values:

        17776500
        17776500Q
        17776500H

ENTERING NUMBERS FROM FRONT PANEL

Although the front panel does not have numeric keys, it is possible to enter DECIMAL values from the front panel when a command prompt requests numeric input. Note the following steps:

1. To select the least significant digit of the desired number, press the "->" (right arrow) button repeatedly to display a digit in the range 0 - 9. When you reach the desired digit, use the "*" button to enter it.

2. To enter the next most significant digit, press the "<-" (left arrow) button once to move one space to the left of the displayed digit. Again use the "->" button to select the desired digit value and then enter it, using the "*" button.

3. Repeat this process until all desired digits have been entered.

4. When all digits have been entered and are seen to be correct, enter the complete number by pressing the "*" button.

5. If at any point you notice that you have made an error in any of the preceding digit positions, you must clear the entire number by pressing the MENU button. Then reenter the complete number.

6. For a table of equivalent decimal, octal and hexadecimal values refer to the Appendix.

WRITE PROTECTION OF FIXED-DISK WINCHESTER DRIVES

The WRT PROT button on the front panel is used to change the current write-protection status of Wichester drives. Note the following:

1. You can change the write-protection status of Winchester drives at any time regardless of where you are in the menu system. After making changes to the write-protection status, the system automatically returns you to your last position in the menu system before the WRT PROT button was pressed.

2. Write-protection status changing cannot be done from an external terminal. It must always be done from the front panel.

The following two examples illustrate the write-protection procedure for (a) systems with a single Winchester drive and (b) systems with two Winchester drives.

HOW TO CHANGE THE WRITE PROTECTION STATUS OF A SINGLE WINCHESTER DRIVE.

Proceed as follows:

1. Press the front panel WRT PROT button whenever it is desired to change write protection status.

2. Assume that your drive (i.e. W0) is currently write protected and that you wish to remove its write protection. Pressing WRT PROT produces the following front-panel display:

        W0#!

The symbol # means that Winchester W0 is currently write protected.   The symbol ! means that the data on that line is a report of current status. Thus, each time WRT PROT is pressed, the first thing the system displays is a report of current write-protection status.

3. Press the "->" (right arrow) button.   The following now appears on the front-panel display:

        W0 ?

The system is here asking if you wish to change write-protection status to not-protected, as shown by the W0 and the absence of the "#" symbol. Therefore, to change status to not-protected, press the "*" (select) button. The status change is now in effect and the system automatically returns to your last position in the menu system.

4. If at any time you wish to abort the status-change process, press the MENU button.

HOW TO CHANGE WRITE PROTECTION STATUS IN SYSTEMS WITH TWO WINCHESTER DRIVES

Proceed as follows:

1. Press the WRT PROT button when it is desired to change the write-protection status of either Winchester drive. In this example, assume that both of your Winchester drives (i.e. W0 and W1) are currently write protected and that you want to remove the write protection from W0.

2. The following now appears on the front panel display:

        W0# W1# !

As discussed in the previous example, this current-status display indicates that both drives are write protected.

3. This step and the following steps will show you how to move through the three menu entries associated with the write-protection status of the two Winchester drives. Press the "->" (right arrow) button. The following now appears on the front panel display:

        W0 W1   ?

Selecting this menu permits removal of write protection for both drives.

4. Again press the "->" button. The following appears:

        W0# W1   ?

Selecting this menu permits write protecting W0 and not write protecting W1.

5. Again press the "->" button. The following appears:

        W0 W1#   ?

This menu permits selecting the write-protection conditions assumed in Step 1 of this example, i.e. write protection for W1 and none for W0. To make this selection, press the "*" (i.e. select) button. The menu system now returns to the state it was in before the WRT PROT button was pressed.

6. If at any time you wish to abort the write-protect menu, press the MENU button.

USING THE TANDBERG TDC 3309 CARTRIDGE TAPE DRIVE

HOW TO INSERT AND REMOVE CARTRIDGES

Proceed as follows:

1. If the front door of the drive is not already open, press the rectangular black button at the upper right side of the front panel. The cartridge can now be removed by pulling it directly out of the drive. CAUTION: If you wish, while the drive is running, a cartridge can be removed without physical damage to the cartridge or drive. However, doing so may terminate the program then in progress or cause a loss of data.

2. To insert a cartridge, open the front door of the drive and then orient the cartridge so that its aluminum base plate is down and the two base-plate notches are to the right. Then push in the cartridge until it hits a stop at the rear of the drive. Closing the door will now push the cartridge all the

way in. Continue to press the door until it latches.

HOW TO WRITE PROTECT TAPE CARTRIDGES

Along one edge of the cartridge there is a two-position rotary
cam that can be operated by a screwdriver. When this cam is
turned so that the arrow molded into it faces the word "SAFE"
that is molded into the cartridge itself, the cartridge is in
the write-protected condition. When the arrow on the cam is
turned 180 degrees away from the word "SAFE", both reading and
writing can take place with that cartridge.

USING THE DMA 360 REMOVABLE-CARTRIDGE WINCHESTER DRIVE

HOW TO INSERT AND REMOVE CARTRIDGES

To insert and remove cartridges from the DMA 360, proceed as
follows:

1. DEENERGIZING DRIVE. If your DMA 360 is in operation, as
shown by the steady illumination of the green front panel lamp,
then press the RUN/STOP switch at the right side of the front
panel. When this switch is pressed, the green lamp will start
flashing at a rate of about 2 Hz.   This indicates that the
spindle is coming to a stop, and should last for about 10 sec-
onds.

IMPORTANT

The DMA 360 can neither be opened
nor closed unless the d-c power is
turned on in your SMS 1000. Therefore,
before cartridge removal or insertion
both the a-c and d-c power switches
must be in their ON (i.e. "1")
positions.

2. UNLATCHING THE DOOR. When the spindle comes to a stop, the
green lamp will go out. Then, unlatch the drive door by rotat-
ing the door latch lever, at the left side of the front panel,
by rotating it 90 degrees clockwise.

3. EXTENDING THE DRIVE. Grasp the drive between its center
top and bottom grip areas and carefully slide it out until a
stop is felt. The drive now extends approximately 5 1/4 inches
out from the front panel.

4. PIVOTING DOOR DOWN. Now carefully pivot the drive door
downward.   Doing this raises the cartridge holder slides about
a quarter of an inch and provides clearance for the removal and

insertion of the cartridge. The door rotation must be slightly more than 90 degrees in order to raise the holder slides and unlock the cartridge.

5. REMOVING THE CARTRIDGE. The cartridge can now be removed by simply grasping it and sliding it out on its slides.

6. INSERTING A CARTRIDGE. Before inserting a new cartridge, be sure to remove the strip of plastic tape that is applied for shipping purposes to the round armature plate on the underside of the cartridge. Note that the cartridge must be inserted with the rectangular write-protect notch facing out, i.e. toward the door of the drive, and with its armature plate facing down.

7. CLOSING DOOR. After inserting the cartridge in its slides, rotate the door to its full up position. Then carefully rotate the drawer latch lever counterclockwise 90 degrees to its fully vertical position. The door is now locked.

8. RETURNING DRIVE INTO HOUSING. Carefully slide the drive back into its housing. Press the drive in securely until a click is heard, indicating that the drive is properly locked in place.

9. RESTARTING THE DRIVE. Restart the drive by pressing the RUN/START switch on the right side of the front panel. As the spindle comes up to speed the green front panel light flashes at a frequency of about 1 Hz. When the drive is up to speed the light glows steadily. The drive is now ready for operation.

10. If, at any time, the green front-panel light flashes at a frequency of about 4 Hz, this means that the embedded servo tracks on the cartridge cannot be found by the drive's circuits. The cartridge must then be reformatted.

WRITE PROTECTION OF DMA 360 CARTRIDGES

Changing the write protection status of DMA 360 cartridges is accomplished by adding or removing a plastic tab approximately 9/16-inch square covering the write-protect cavity at one corner of the cartridge. Note the following:

> 1. ADDING WRITE-PROTECTION. To write protect a cartridge, REMOVE the red plastic tab covering the write-protect cavity of the cartridge. The tab is easily slid out from its location over the cavity.

2. REMOVING WRITE PROTECTION. To stop write protection of a cartridge, slide the special DMA-supplied red plastic tab over the cartridge's write-protect cavity. These plastic tabs are supplied with each cartridge.

USING THE SYQUEST SQ312RD CARTRIDGE WINCHESTER DRIVE

HOW TO INSERT AND REMOVE CARTRIDGES

To insert and remove cartridges from the SyQuest SQ312RD, proceed as follows:

1. CARTRIDGE. The cartridge used with this drive is the SyQuest SQ200. Keep the cartridge in its protective sleeve when not in use. Before use, a cartridge must be allowed to stabilize for at least an hour at the temperature of the room in which it is to be used. In other words, if possible, store cartridges in the same room as the drive. Do not attach labels to the bottom of the cartridge (the bottom is where the round armature plate can be seen).

2. POWERING-DOWN THE DRIVE. Assume that the drive is operating and that the front panel light is glowing a steady green, indicating that the drive is up to speed and is not currently being accessed. To power down the drive, press the button on the front panel of the drive. The light changes from green to flashing red.

3. OPENING FRONT-PANEL DOOR. The flashing red light means that the drive motor is spinning down. When the motor stops, the light stops flashing and stays off. The front-panel door can now be opened by pressing the front-panel button and swinging the door down.

4. REMOVING THE CARTRIDGE. Press the door to its full horizontal position and the cartridge will partially eject. Place your hand in front of the door as you open it so that the cartridge does not accidentally drop out as it ejects. The cartridge can now be removed.

5. CARTRIDGE-LOADING PROCEDURE. Open the front-panel door by pressing the front-panel button. Swing the door down to its full horizontal position.

6. INSERTING THE CARTRIDGE. Position cartridge to be loaded so that the following two conditions are met:

(1) The round metal armature plate on the bottom
of the cartridge faces the door, i.e. down.

(2) The sliding black locking mechanism at one end of
of the cartridge is inserted into the drive first.

Gently slide the cartridge in until you encounter resistance (it
should, at first, slide in easily). Then push the cartridge in a
little bit further until it snaps in place.

7. CLOSING DOOR. After inserting the cartridge, rotate the door
back to its full up position. It should snap and lock when fully
closed. If the drive is energized, the front-panel light should
now glow a constant red, indicating that the motor is in the
process of spinning up. When the motor is up to speed, the lamp
will again glow green, indicating that the drive is ready for
use.

WRITE PROTECTION OF CARTRIDGES FOR THE SQ312RD

Changing the write protection status of the Type SQ200 cartridges
used with the SQ312RD drive is accomplished by adding or removing
a red plastic clip approximately 1/2-inch square to or from the
write-protect cavity at one corner of the cartridge. Note the
following:

1. ADDING WRITE-PROTECTION. To write protect a
cartridge, INSERT the red plastic clip over the
write-protect cavity of the cartridge. To insert
the clip, slide it over the two protruding edges
at each side of of the cavity. These plastic clips
are supplied with each cartridge.

2. REMOVING WRITE PROTECTION. To end write protection
so as to permit both reading and writing of a cartridge,
use a small screwdriver (or even your thumb nail) to
slide the red clip from the write-protect cavity. The
write-protect cavity will now be OPEN.

USING FLOPPY DISKETTES

INSERTING DISKETTES.

Open the large door in the front panel (see Figure 5-2) in order
to gain access to floppy-disk drive(s). This door protects the
diskette drive(s) from dust and should normally remain closed.

The system can access a diskette only when it is inserted into
the drive correctly. First, notice that the diskette has an

oblong opening to admit the read/write heads, as shown in Figure
5-2.   Next, insert the diskette with the oblong opening first,
making sure that the side of the diskette with the label faces
toward the door-latch handle of the drive. If the label faces
the wrong way the diskette or the drive could be injured.

WRITE PROTECTION OF DISKETTES

GENERAL. Refer to Figure 5-2.   Notice that diskettes have a
large notch on the front edge (eight inch diskettes) or on one
side (5-1/4 inch diskettes). This notch provides write protec-
tion for the diskette. When write protection is in effect, the
system can only read from the diskette.   Write protection pre-
vents accidental erasure of information. Diskettes containing
purchased software should usually be protected.

8" DISKETTES. With eight inch diskettes, write protection is
obtained when the notch is uncovered. Covering the notch allows
the system to both read and write on the diskette.

5 1/4" DISKETTES. Most 5-1/4 inch diskettes follow the opposite
procedure: covering the notch provides write protection; leaving
the notch uncovered allows the system to read and write on the
diskette.

IMPORTANT: If you cover the notch, use the self-sticking tabs
provided by the diskette manufacturer.

DISKETTE LABEL

LOCATION OF
WRITE-PROTECT NOTCH
FOR 8″ DISKETTES
[OPEN = WRITE PROTECT]

LOCATION OF
WRITE-PROTECT NOTCH
FOR 5¼″ DISKETTES
[COVERED = WRITE PROTECT]
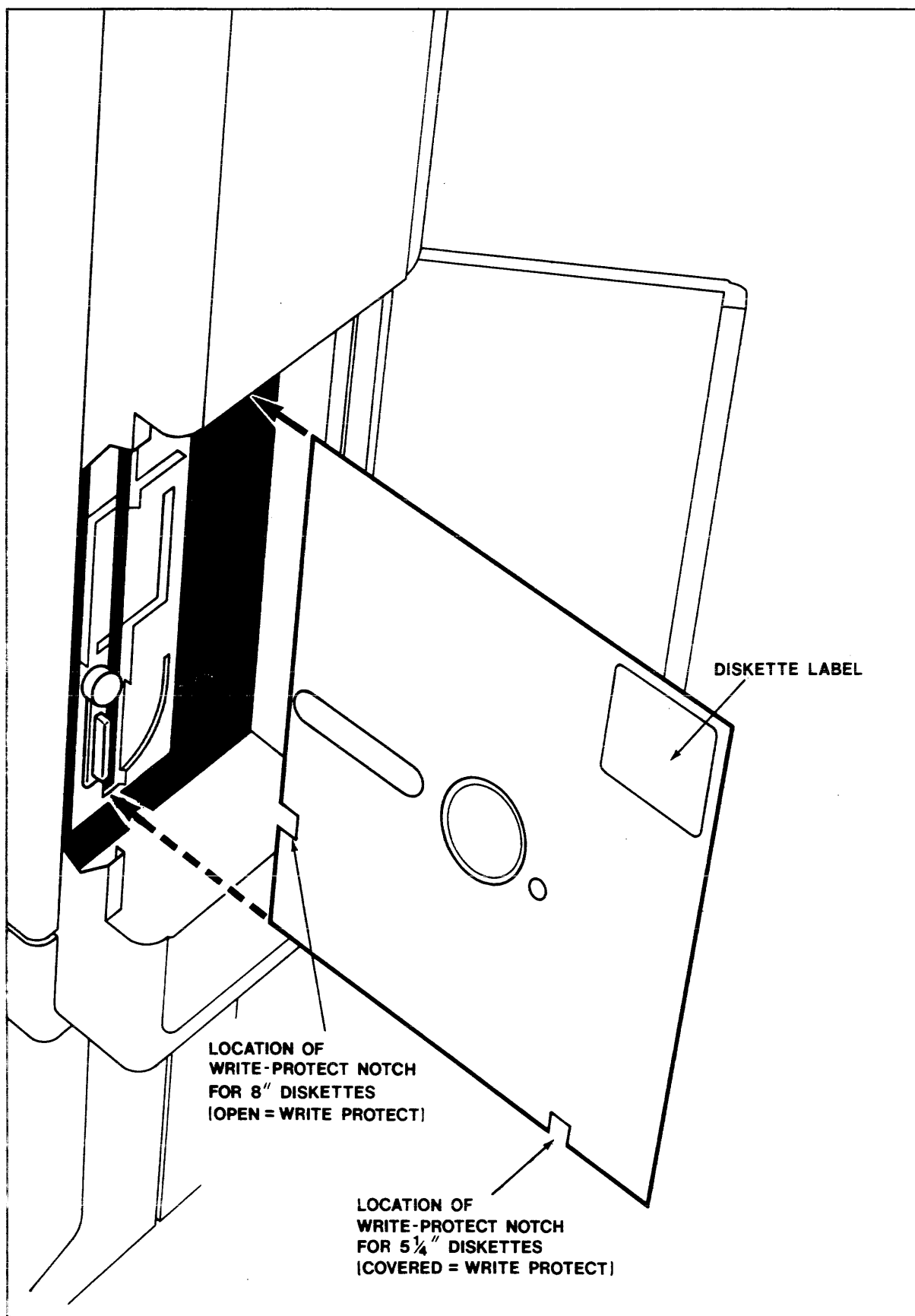
Fig. 5-2   Inserting diskettes

SECTION 6

SENSE MONITOR:

STATUS MENU COMMANDS

INTRODUCTION

The STATUS menu commands of SENSE check and report on the
system's operating status. Status information includes operat-
ing information such as which disk drives are write-protected,
and also hardware information such as the current voltages being
supplied to the backplane.

When SENSE is positioned at the beginning of the STATUS menu,
the STATUS entry appears in the display window. This entry is
the starting point of the complete menu system. All STATUS menu
commands can be run concurrently with host CPU operation.

Table 6-1 provides a summary of the STATUS menu commands.

Table 6-1. STATUS MENU COMMAND SUMMARY

COMMAND	FUNCTION
SYSTEM	Displays a 16-character system status message (known as the "compact status display") on the front-panel display. The compact status display is not available from a video display terminal.
IDENTIFY	Displays a user-configurable "banner", or logo-type, of up to 16 characters; firmware version number; system serial number and shipment date.
ENVIRONMENT	Displays the current values of system temperatures and voltage levels.

LEGEND

CO = Removable-Cartridge Winchester Drive 0
FO = Floppy Drive 0
Fl = Floppy Drive 1
TO = Tape Drive 0
WO = Fixed-Disk Winchester Drive 0
Wl = Fixed-Disk Winchester Drive 1

SYSTEM command

The SYSTEM command displays a compact status line, i.e. a brief summary of the current status of various system units, which appears in the front panel 16-character display window. The STATUS display does not appear on a video display terminal.

MENU STRUCTURE

        SYSTEM
                <compact status>

REMARKS

This command is not available when using a console device and must be run from the front panel.

The following is a typical <compact status> display:

        R*W0#W1#F0 F1

        where:

R (or H)   R indicates that the CPU is running. This value is re-
            placed by an H if the processor is halted.

*   Blinks to indicate that SENSE is active. If this field
            is blank or the asterisk fails to blink, SENSE is not
            operating, which may indicate a serious hardware or
            software error. Contact your service representative
            if a RESTART fails to restart SENSE.

            The remainder of the display identifies the peripherals
            configured into the system (as follows):

W0   Represents fixed-disk Winchester 0; W1 represents
            fixed-disk Winchester 1. Note that the system cannot
            be configured with more than two Winchester-type
            devices of any kind.

F0   Represents floppy drive 0; F1 represents floppy 1.

T0   Represents tape drive 0.

C0   Represents cartridge-type Winchester drive 0. Note
            that the system cannot be configured with more than two
            Winchester-type devices of any kind.

Indicates that a fixed-disk Winchester drive is write-

protected. In the example above, all disk drives
except F0 and F1 are write protected. Write protection
can be accomplished through the controller firmware,
the front panel WRT PROT button (Winchester disks
only), the write-protect notch on a diskette, the
write-protect cavity on the cartridge used with the
cartridge-type Winchester drive, or some combination of
the above. SENSE flags a disk as write-protected if
one or more of these write protection techniques is in
effect.

Only devices actually configured into your system appear in the
list. Thus, for example, W1 would not appear in the status
display for systems that have a single Winchester disk drive
configured as W0. Note, however, that a system could also be
configured in which W0 is absent and W1 is present. Remember
that the status of your system as displayed here is determined
by the configuration of Winchester, floppy and tape devices
entered into the DISK DEVICES portion of the CONFIGURATION
menus.

IDENTIFY command

The IDENTIFY command reports system characteristics such as
firmware version number, System Foundation Module serial
number, and system shipping date.

MENU STRUCTURE

        IDENTIFY
            <banner>
            Firmware V<n.n>
            Sfm S/N <nnnnnnnn>
            Ship <mm/dd/yy>

REMARKS

BANNER. In the SPECIAL section of the CONFIGURATION menus you
can create a message of up to 16 characters (known as the
"banner") that can be displayed at the top of your video-
terminal screen and also, as a default instead of the compact
status, on the front-panel display.

FIRMWARE VERSION. The firmware version number (Firmware V) is
a manufacturer-controlled value stored in the EPROM on the
system foundation module that contains the SMS 1000 firmware
programs.

SFM S/N and SHIP. The serial number of the System Foundation Module in your SMS 1000 (Sfm S/N) and the shipment date of the system from SMS (SHIP) are configurable parameters that can be entered through the SPECIAL portion of the CONFIGURATION menus. Your system is shipped with these values already entered. The user does not need to alter these values except in the event of installation of a new System Foundation Module, etc.

ENVIRONMENT command

The ENVIRONMENT command supplies information about the temperatures and voltage levels within the system.

MENU STRUCTURE

```
ENVIRONMENT
        TEMPERATURE
                DRIVES: <fff>F/<cc>C
                CARDS: <fff>F/<cc>C
        POWER SUPPLY
                +5V:    <d.d>V
                +12PV:<dd.d>V
                +12CV:<dd.d>V
                -12V:-<dd.d>V
                +24V:  <dd.d>V
```

REMARKS

The system reads internal sensors and supplies appropriate temperatures and voltages each time this command is executed.

TEMPERATURE

Temperature is displayed for two different areas of your SMS 1000: the area containing the peripherals and the cardcage area. Temperatures at either location should not exceed 140F (60C). If the ambient air is too hot to permit adequate cooling, turn the system off until the temperature drops. Overheating when the ambient temperature is reasonably cool, however, indicates a problem. Make sure that both fans are operating properly. If the condition persists, turn off the AC power switch and call for service.

POWER SUPPLY

The +12PV entry displays the +12V voltage level supplied to the peripherals; the +12CV entry displays the +12V voltage level supplied to the card cage.

These voltages are read as follows:

        1. Call the STATUS menus as described in Section 5 of this manual.   Repeatedly press the "->" button until the word ENVIRONMENT is displayed.

        2. Press the "*" button to select ENVIRONMENT. Then press the "->" button. The word POWER SUPPLY is now displayed. Again press the "*" button to select POWER SUPPLY and start the display of its voltages.

        3. The present level of the +5 volt power supply is now displayed. Each time the "->" button is pressed, the next power supply voltage in turn is displayed, i.e. +12 volts (P), +12 volts (C), -12 volts, and +24 volts. After the last vol- tage is displayed, you are returned to the POWER SUPPLY display the next time the "->" button is pressed.

The power-supply displays show the current voltage level for each of the system's power supplies. These displays are sub- ject to minor sampling errors, but are accurate enough for all but the most critical applications. For absolute accuracy, measure voltages at the test points provided on the backplane. Voltages should remain within the following limits:

VOLTAGE	LIMITS
+5	4.7 to 5.3
+24	21.6 to 26.4
+12	11.4 to 12.6

SECTION 7

SENSE MONITOR:

OPERATION MENU COMMANDS

OPERATION MENUS

Most OPERATION menu commands of the SENSE Monitor duplicate oper-
ating-system functions such as, for example, backup, restore, and
format commands. These commands are provided for your conven-
ience since many test procedures are performed when the CPU is
off-line and the operating system is not available.

The WINCHESTR MGT commands, for example, perform essential but
infrequently used functions such as building the tables that
allow the Winchester disks to skip flawed disk sectors effi-
ciently.

Note that all SENSE menus reflect the actual device configuration
of your system. This means that if, for example, your system has
only one floppy drive (i.e. F0), then the menus do not display
any F1 options.

Table 7-1 provides a summary of the OPERATION menu commands:

Table 7-1. OPERATION MENU COMMAND SUMMARY

BACKUP WINCHESTR	Copies the contents of a selected Winchester disk to a cartridge tape drive.
RESTOR WINCHESTR	Restores the data that has been copied to a cartridge tape drive, as the result of a previous BACKUP WINCHESTR command, back to a specified Winchester disk.
IDENTIFY	Displays the format (sector size, recording density, etc.) of the specified disk.
FORMAT FLOPPY	Formats the diskette in a specified floppy drive.
WINCHESTR MGT	Invokes a submenu of infrequently used commands. These subcommands enable you to format Winchester disks and enter flaw management information for Winchester disks.
BOOT HOST CPU	Runs the bootstrap program, which loads bootcode and starts the host CPU.

LEGEND

```
CO = Removable-Cartridge Winchester Drive 0
FO = Floppy Drive 0
Fl = Floppy Drive 1
TO = Tape Drive 0
WO = Fixed-Disk Winchester Drive 0
Wl = Fixed-Disk Winchester Drive 1
```

IMPORTANT

The commands in this section regarding tape involve only image-oriented streaming tape. If your SMS 1000 includes the file-oriented streaming-tape option, see Appendix H for full description, installation data and operating instructions.

BACKUP WINCHESTER COMMAND

The BACKUP WINCHESTR command copies a duplicate image of the selected Winchester disk to cartridge tape.

MENU STRUCTURE

```
    BACKUP WINCHESTR
        BACKUP W0
            BACKUP W0->T0
                READY?
        BACKUP W1
            BACKUP W1->T0
                READY?
```


REMARKS

GENERAL. Back up Winchester disks whenever there is a possibility that the integrity of the data on the disk might be compromised. For example, certain tests from the EVALUATION menu write on the disk. Also, a disk is always at risk when a system is moved from one site to another. Backup is recommended at such times.

TAPE. Backup to tape is independent of the amount of tape in a cartridge. Thus, for example, a combination of 450- and 600-foot tape cartridges can be used as part of the same backup process. Remember that backup always starts the transfer of data at the first normal data sector on the source disk.

EXAMPLES OF BACKUP TO TAPE. The following are some examples of the process of backup to tape. They include examples of how the system deals with disk errors and tape errors.

EXAMPLE 1: NORMAL COMPLETION. To back up from W0 to T0, proceed as follows:

1. Move through the OPERATION menus until you get to the command

        BACKUP W0->T0

Select this command by pressing the front panel "*" button or the carriage-return/line-feed key (hereafter designated as the "Return" key) if you are operating from your terminal.   NOTE: These examples will assume that you are operating from your terminal.

2. The system responds with the message:

    Insert next vol.

In response to this message the user must insert a cartridge into the tape drive. After a fixed period the following message appears:

    T0 ready?

If a cartridge has been inserted, press the Return key. The system then responds with the message:

    Retension+Rewind

NOTE: If you press Return before inserting a cartridge, the system responds with an error message indicating that no cartridge is present.

The "Retension+Rewind" message indicates that the tape cartridge is being wound to one end and then fully rewound so as to initialize tape position. This could take as much as several minutes to complete.

3. At the completion of the "Retension+Rewind" process, the following messages are displayed in sequence:

    LBN= 0
    Vol#=1

These messages indicate that the backup starts from logical block number 0 in the source device and that the backup is taking place on the first volume (i.e. cartridge) in the sequence. NOTE: If, for example, you have inserted a write-protected cartridge in the tape drive, the following error message is displayed:

    Error logging...
    Drive write prot
    e88 T0:90HC8H
    Action?

The field e88 indicates that error 88 has been detected (see Appendix E). T0: indicates that the error involves the tape drive. The remaining field is a QIC-02 status message. At this point, the operator has three possible options. If you press Return in response to the prompt "Action?" the system produces the first option:

    Restart?

This means that the system returns to the last major prompt, in this case the prompt: "Insert next vol.". To choose this option, press Return. This is the option that you would normally select in order to remove a write-protected cartridge from the drive, insert one that is not write-protected, and proceed with the backup. To move to the second option, press the space bar (or the "->" button on the front panel). The second option is

> Menu?

Choosing "Menu" returns you to your original menu option, i.e. "BACKUP W0->T0". To choose it, again press Return. The third option is obtained by pressing the space bar again. The third-option prompt is:

> Resume?

Choosing this option (by pressing Return) allows you to resume the backup from its stopping point. In the case of a write-protected cartridge, choosing this option prevents the copy process from taking place, and the error message "Done (error)" is issued.

4. After the successful completion of the previous step, the backup is now in process and the system displays the message:

> Backing up W0

When the end of the tape is reached, the following two messages appear, as in Step 2 (above):

> Insert next vol.
> T0 ready?

The user then removes the first cartridge, inserts the second and presses the Return key. The system again responds with the message:

> Retension+Rewind

Next, the following two messages are displayed:

> LBN= 7775
> Vol#=2

In this example, backup resumes at logical block number 7775 octal (note that, starting with firmware version V1.2, this value is expressed in decimal). The second message confirms that the second cartridge is being used. As the backup proceeds, the following message is displayed:

Backing up W0

Assuming for this example that backup runs to completion within the second volume, the following two messages now appear:

#Vols=2
Done (errs)

The "Done" message marks the completion of the backup process.

NOTE: You will remember that in this example, a write-protected cartridge was used in the tape drive, causing an error to be generated. Remember that after the cartridge was then replaced with one not protected, the above error report "(errs)" was still generated, even though the backup completed normally. In other words, errors of all types, fatal or benign, occurring in the course of the backup, will be reported.

EXAMPLE 2. BACKUP INTERRUPTED BY DISK ERROR. In the following example, backup is interrupted by a flaw detected in the source disk. The corresponding sector on the backup cartridge is filled with a characteristic data pattern. The backup proceeds as in Example 1 until the flaw is detected. Then, the message

Bad sector data
e76W0c123h12s17
Action?

is received. The message indicates that error 76 (decimal) has been detected (see Appendix E), that the error is on unit W0, and that the flaw is located at cylinder 123, surface 12 (i.e. "h" represents head), and sector 17. At this point, the operator has three possible options. If you press Return in response to the prompt "Action?" the system produces the first option:

Restart?

This means that the system returns to the last major prompt, in this case the prompt: "Insert next vol.". To choose this option, press Return. To move to the second option, press the space bar (or the "->" button on the control panel). The second option is

Menu?

Choosing "Menu" returns you to your original menu option, i.e. "BACKUP W0->T0". To choose it, again press return on your keyboard. The third option is obtained by pressing the space bar again. The response is:

Resume?

Choosing this option (by pressing Return) allows you to resume the backup from its stopping point. Most often, the operator will want to resume a backup after being informed of a disk error.

EXAMPLE 3. BACKUP INTERRUPTED BY TAPE ERROR. This example shows the opposite situation from Example 2: the backup process stops when a tape flaw is detected. The backup process proceeds as in Examples 1 and 2 until the error is discovered. Then the system displays the message:

```
Tape Error
e128T0:12H12H
Action?
```

The field e128 indicates that error 128 (see Appendix E) has occurred.   T0: indicates that the error is in the tape unit. The remaining fields are a QIC-02 status message that indicate the nature of the problem. You now have the same three options as in Example 2. Most often, after a tape error, the operator will want to restart on a new cartridge, especially when several cartridges have already been written. Restarting at this point will cause the backup to resume at its current position.

RESTORE WINCHESTER COMMAND

The RESTOR WINCHESTR command restores data saved by a previous BACKUP command (to cartridge tape) to a Winchester disk.

MENU STRUCTURE

```
RESTOR WINCHESTR
     RESTOR W0
          RESTOR W0<-T0
               Are you sure?
     RESTOR W1
          RESTOR W1<-T0
               Are you sure?
```

REMARKS

When carrying out a restore operation, you can insert tape cartridges in any order, except that, because the last cartridge (i.e. the one with the highest Logical Block Number (LBN)) con-

tains the double end-of-volume mark that terminates the restore operation, it must be inserted last.

Write protection status of the target disk drive used in a restore operation is checked before the restore operation can take place.

In carrying out a restore operation, any combination of cartridges can be used; e.g. intermixing 450 and 600 foot cartridges is acceptable.

IDENTIFY COMMAND

The IDENTIFY command displays information about how your disks are formatted.

MENU STRUCTURE

```
IDENTIFY
     IDENTIFY F0
          <Disk-format parameters>
     IDENTIFY F1
          <Disk-format parameters>
     IDENTIFY W0
          <Disk-format parameters>
     IDENTIFY W1
          <Disk-format parameters>
     IDENTIFY C0
          <Disk-format parameters>
```

REMARKS

The IDENTIFY command displays the following parameter list for the specified disk. The example given here is for an 8-inch double-sided floppy disk:

```
#Cyls=77
#Heads=2
CylOff=1
HeadOff=4
Cyl#=53
Head#=0
Format=RX02
Byt/Sct=256
```

NOTE: In the above example the information on the fifth and sixth lines represents the current cylinder and head numbers being looked at. Head and cylinder numberings begin at 0.

Fixed disk formats are fully defined under the DEVICE PARAMETERS command in the CONFIGURATION menu.

FORMAT FLOPPY COMMAND

The FORMAT FLOPPY command prepares a diskette for use in a system.

MENU STRUCTURE

```
     FORMAT FLOPPY
          FORMAT FLOPPY F0
               <Parameter list>
               READY?
          FORMAT FLOPPY F1
               <Parameter list>
               READY?
```


REMARKS

The FORMAT FLOPPY command formats diskettes according to the specifications entered through the FLOPPY FORMATS command of the CONFIGURATION menus. The format specifications must be verified, using the CONFIGURATION menu commands, before you use the FORMAT FLOPPY command. The default is RX02. Once entered, the specifications remain in effect until altered by a subsequent FLOPPY FORMATS command. Thus, most users need to specify diskette formats only once.

A new diskette is just a raw recording medium until it is formatted.   The format determines a diskette's storage capacity by establishing the number of bytes per sector, number of sectors per track, and the data encoding technique.

Systems with two diskette drives can be configured so that each drive formats diskettes according to different specifications.

EXAMPLE: If "FORMAT FLOPPY F0" is selected, the following list of formatting parameters and responses could appear (this example assumes a 5 1/4" drive):

```
Format=DEC PC
Intrlv=1
Byt/sct=512
#Cyls=80
#Heads=2
F0 Ready? [press Return for "yes" response]
Formatting F0
Done (no errs).
```

NOTE: For 8" drives "#Heads" is determined dynamically by the system if its value has been set to 0 in the DEVICE PARAMETERS portion of the CONFIGURATION menus.

Note that Intrlv means physical interleaving, not logical interleaving. Also, note that the previously defined parameter set is displayed before the READY? prompt is given.

WINCHESTER MGT COMMAND

The WINCHESTER MGT command prepares a Winchester drive for use in a system by formatting its disks in accordance with a previously selected format pattern; and by examining its disk surfaces and preparing a flaw map that enables defective areas to be passed over without loss of data.

MENU STRUCTURE

```
WINCHESTR MGT
     FORMAT W0?
          <Parameter list>
          Are you sure?
          Save flaw tbl?
          Clear flaw tbl?
          Formatting W0.
          <Flaw management message sequence>
     FORMAT W1?
          <Parameter list>
          Are you sure?
          Save flaw tbl?
          Clear flaw tbl?
          Formatting W1.
          <Flaw management message sequence>
     FORMAT C0
          <Parameter list>
          Are you sure?
          Save flaw tbl?
          Clear flaw tbl?
          Formatting C0.
```

<Flaw management message sequence>

REMARKS

The FORMAT W0, FORMAT W1, or FORMAT C0 commands format disks according to the specifications entered through the DEVICE PARAM-ETERS command of the CONFIGURATION menu. The format specifications must be verified before you use the FORMAT com-mands. When you start a format operation, the system displays a list of the previously entered formatting parameters before the actual formatting takes place.

EXAMPLE: If, for example, you select "FORMAT W0", the following typical list of previously selected parameters, messages and re-sponses would be displayed:

        Format=MFM
        Intrlv=1
        Byt/Sct=512
        CylOff=1
        HeadOff=4
        #Cyls=512
        #Heads=8
        Are you sure? (enter Return for yes)
        Save flaw tbl?
        Clear flaw tbl?
        Formatting W0
        <Flaw management message sequence, as follows:>
                Phase #1 [Sort raw flaw table]
                Phase #2 [Construct sector flaw records]
                Phase #3 [Sort revectoring table]
                Phase #4 [Allocate primary replacement blocks]
                Phase #5 [Allocate secondary replacement blocks]
                #Groups=xx [Calculate number of replacement blocks]
                #RawFla=xx [Calculate number of raw flaw records]
                #SctFla=xx [Calculate number of sector flaw records]
                Update tbls [Write updated support tables to disk]
                Reload FlaTbls [Reload all revectoring tables]
        Done (no errs).

If the disk has never been formatted, the operator should always elect not to save existing flaw information, since the SMS 1000 does not access flaw maps that may be preinstalled directly on the disk by the drive manufacturer.

Remember that formatting a Winchester disk modifies all data rec-orded on the disk except for the flaw table, which is saved if you answered the query SAVE FLAW TABLE? in the affirmative. Be sure to back up any data on the disk before performing a FORMAT command. Because formatting is destructive of data, the system

issues the ARE YOU SURE? prompt when you select this command.

Most Winchester disks require formatting only once, and that is when they are first installed. Disks shipped installed in the SMS 1000 system are already formatted and have the flaw map installed.

For the initial installation of a new Winchester disk, format the disk and then enter the flaw table information.

CAUTION

Reformatting a Winchester disk is a radical procedure that destroys all data stored on the disk except the flaw table. Do not reformat a disk unless there is some compelling reason to do so.

CAUTION

The flaw tables will be destroyed if the system is restarted or powered down during a Winchester formatting operation or during a flaw-table build sequence. If this should happen, reformat the Winchester using the CLEAR FLAW TABLE option. Then, reenter the flaw table entries and scan the disk (see DISK EXERCISE commands in EVALUATION menus) a number of times to further update the flaw tables.

FLAW MGT WO SUBCOMMAND

The FLAW MGT command is used to enter, maintain, and examine the flaw map for the Winchester disk. Winchester disks that are SMS-installed in the SMS 1000 system are shipped with the flaw map already installed. Therefore, users seldom need to use this command.

FLAW MAP INFORMATION. All Winchester disks are subject to minor manufacturing imperfections in the recording surface. These imperfections make a small portion of the surface unsuitable for recording data. The SMS 1000 system provides a flaw mapping facility that prevents errors by automatically mapping around flawed sectors.

The system stores a primary and a backup copy of a disk's flaw map on the disk. The flaw map is simply a list of the disk's known flaws. When power is applied, the disk controller reads the flaw map and then automatically excludes flawed sectors from any read or write operations to the disk.

The disk address of a flaw can be specified in three different formats:

    o   Raw flaw data
    o   Sector address
    o   Logical block number (LBN)

Most disk manufacturers provide raw flaw data because the raw data is independent from the disk format. Raw data identifies a flaw by cylinder number, head number, its displacement from the index ("starting point") in bytes, and its length in bits.

Sector addresses identify a flaw by cylinder number, head number, and sector number. This is the format used by the disk controller. The flaw mapping facility converts flaw data to this format, regardless of the format used for entering the flaw data.

MENU STRUCTURE

        FLAW MGT WO
            RAW FLAW MGT
                Entries= <system displays current number of entries
                         in flaw table, unless number is zero, in
                         which case this line is replaced by the
                         message: "Tbl empty">
                NEXT?
                    Cyl#=   xxxx
                    Head#=   xxxx
                    BytDsp= xxxx
                    BitCnt= xxxx
                    Entry#= xxxx
                PREVIOUS?
                    Cyl#=   xxxx
                    Head#=   xxxx
                    BytDsp= xxxx
                    BitCnt= xxxx
                    Entry#= xxxx
                NEW?
                    Cyl#=
                    Head#=
                    BytDsp=
                    BitCnt=(see note)
                    Cyl#=   xxxx

```
                    Head#=   xxxx
                    BytDsp=   xxxx
                    BitCnt=   xxxx
                    Are you sure?
                    BadSct#=xxxx
                    [BadSct#=xxxx]
                    LBN#=xxxxxxx
                    [LBN#=xxxxxxx]
                    Entry#= xxxx
                DONE/BLD TBL?
                <Flaw management message sequence.  System goes
                    through the following steps in building
                    the flaw table:>
                    Phase #1 [System sorts raw flaw table]
                    Phase #2 [Construct sector flaw records]
                    Phase #3 [Sort revectoring table]
                    Phase #4 [Allocate primary replacement blocks]
                    Phase #5 [Allocate secondary replacement blocks]
                    #Groups=xx [Calculate number of replacement blocks]
                    #RawFla=xx [Calculate number of raw flaw records]
                    #SctFla=xx [Calculate number of sect flaw records]
                    Update tbls [Write updated support tables to disk]
                    Reload FlaTbls [Reload all revectoring tables]
                REMOVE?
                    Cyl#=    xxxx
                    Head#=   xxxx
                    BytDsp=   xxxx
                    BitCnt=   xxxx
                    Entry#= xxxx
                    Are you sure?
                CLEAR?
                    Are you sure?
```

NOTE: If drive does not specify a bit   count   (BitCnt=),   enter   a
default of 1.   If bit count given is 255 then that raw flaw entry
was generated either by the autoflaw manager or by manually entering
a sector or logical block flaw entry. The maximum bit count that
can be entered manually is 254.

```
                SECTOR FLAW MGT
                    Entries= <system displays current number of entries
                             in flaw table, unless number is zero, in
                             which case this line is replaced by the
                             message: "Tbl empty">
                    NEXT?
                        Cyl#=    xxxx
                        Head#=   xxxx
                        Sector#=    xxxx
                        Entry#= xxxx
                        GrpDsp=+xxxx
                    PREVIOUS?
```

```
                    Cyl#=    xxxx
                    Head#=   xxxx
                    Sector#=   xxxx
                    Entry#= xxxx
                    GrpDsp=+xxxx
                NEW?
                    Cyl#=
                    Head#=
                    Sector#=
                    Cyl#=    xxxx
                    Head#=   xxxx
                    Sector=  xxxx
                    Are you sure?
                    GrpDsp=+xxxx
                    LBN#=xxxxxxx
                    BytDsp=xxxx
                    Entry#=xxxx
                DONE/BLD TBL?
                    <System displays the following in-process
                    messages when updating the revectoring table
                    during SECTOR FLAW MGT:>

                    Sorting  [Sort revectoring table]
                    Update tbls  [Write updated support tables
                                      to disk]
                    Reload tbls  [Reload all revectoring tables]
                REMOVE?
                    Cyl#=    xxxx
                    Head#=   xxxx
                    Sector=  xxxx
                    Entry#= xxxx
                    Are you sure?
                    Done (no errs).
                CLEAR?
                    Are you sure?
            BLOCK FLAW MGT
                NEXT?
                    LBN#=xxxxxxxxxx
                    Entry#=xxxx
                PREVIOUS?
                    LBN#=xxxxxxxxxx
                    Entry#=xxxx
                NEW?
                    LBN#=
                    Are you sure?
                    Cyl#=    xxxx
                    Head#=   xxxx
                    BytDsp=  xxxx
                    BitCnt=  xxxx
                    BadSct#=xxxx
                    GrpDsp=+xxxx
```

```
                    Entry#=xxxx
               DONE/BLD TBL?
                    Are you sure?
               REMOVE?
                    LBN#=xxxxxxxxxx
                    Entry#=xxxx
                    Are you sure?
               CLEAR?
                    Are you sure?
        FLAW MGT W1
            (Same as for W0)
        FLAW MGT C0
            C0 READY?
            (Otherwise same as for W0)
```

REMARKS

GENERAL. The basic sequence of steps by which you can inspect indi-
vidual entries in a flaw table or add entries to a flaw table are:

  1. NEXT?   Selecting this command permits you to view
sequentially each entry in the raw-flaw table or the sector-flaw
revectoring table. It also permits sequential viewing of flaw
entries expressed in logical block number (LBN) format.

  2. PREVIOUS? This command permits you to examine flaw-table
entries preceding the current entry. If this command is selected
when you are at the start of the table, wrap-around takes place and
entries are viewed from the end of the table back; i.e. last entry,
next-to-last entry, etc.

  3. NEW? Use the NEW? command when you want to enter or add
either new raw-flaw data or new sector-flaw data into their corres-
ponding tables. Use this command, also, to enter flaw data using
logical block numbers (LBN). After all data pertaining to a flaw is
entered, it is echoed back to show what has been entered.

  4. DONE/BLD TBL? After all new flaw data has been entered, a
new flaw revectoring table must be constructed. This is done by
selecting the DONE/BLD TBL command. The various steps in the proc-
ess of table construction are displayed. Note that this option
constructs a best-case mapping when selected within the RAW FLAW MGT
menu.

  5. CLEAR? Selecting this command clears all entries from the
tables in any of the three flaw management modes.

FLAW MANAGEMENT MODES. Three flaw management modes are supported.
These are:

1. Raw-flaw address mode.
2. Sector-flaw address mode.
3. Logical-block flaw address mode.

RAW-FLAW MODE. A raw flaw is defined by four components that spec-
ify a starting address and a length. These are:

1. Cylinder number
2. Head number
3. Byte displacement from index
4. Bit count (length)

SECTOR-FLAW MODE. A sector flaw is defined by three address
components:

1. Cylinder number
2. Head number
3. Logical sector number

LOGICAL-BLOCK MODE. A logical-block flaw is defined by a single
decimal address known as the logical block number (LBN). The value
of this address has as its upper limit the storage size of the
device. Mapping in terms of logical block numbers represents an
alternative way of describing the locations of defects and their
replacements.

During power-on processing the revectoring tables for each configu-
red Winchester are loaded into controller ram. Each revectoring
table contains two types of data: (1) a sorted list containing the
cylinder-, head- and sector number of each flaw on the disk, and (2)
for each flaw address the address of a reserve sector that is used
instead of the flawed sector. The entry "Grp Dsp" (group displace-
ment) is the address of the sector or block that replaces the
defective sector. Thus, the revectoring table contains all the data
necessary to map from a flawed sector to its replacement sector.

When the FLAW MGT menu is entered, the support tables pertaining to
the corresponding Winchester are loaded into controller ram. These
tables include a replacement-block bit map and the raw flaw table.

CAUTION

Note that when the raw-flaw table is rebuilt,
an optimal replacement mapping is used in
constructing the corresponding revectoring
table. This ignores all previous mappings
and, hence, could destroy data entered under
previous mappings. Therefore, always back up
data before rebuilding a revectoring table.

NOTE

The NEW commands accept and temporarily store
flaw map information. The flaw map is not
updated until you select the DONE/BLD TBL
command. The latter is also true for the
REMOVE and CLEAR commands.

The NEW commands request you to enter flaw data using the raw
data format or the sector format.

The NEXT and PREVIOUS commands display the contents of an exist-
ing flaw map. New flaw data that you have just entered is also
displayed even though the new data is not added to the flaw map
until you request DONE/BLD TBL and exit from the FLAW MGT com-
mand.

The REMOVE command removes the current entry from an existing
flaw map. Use the NEXT and PREVIOUS commands to display the
desired entry, then remove it with the REMOVE command. Use this
command to remove faulty entries caused by typing errors. You
should never remove valid entries from the flaw map.

DONE/BLD TBL updates the flaw map if any new entries have been
made with a NEW command and terminates the FLAW MGT command.
This process may take up to several minutes to complete; do not
interrupt it while it is in progress. Remember that when this
command is used with the SECTOR FLAW MGT or BLOCK FLAW menus a
revectoring table is rebuilt using a non-optimal replacement
block mapping. That is, the mapping allocates the nearest avail-
able replacement blocks for newly added sector flaw records.
Existing mappings are left unchanged.

The maximum number of raw flaws that can be managed is 200 per
disk. The maximum number of sector flaws, i.e. the size of each
revectoring table, is 250. Attempting to add to a table that
contains the maximum allowed number of entries will cause the
following message to be displayed:

Tbl full

FLAW MGT FOR W1 SUBCOMMAND

This command provides flaw-map management for Winchester drive
W1. This command is identical to FLAW MGT for W0, except it
applies to W1. This menu entry appears only if your system is
configured with two Winchester drives and W1 is enabled.

FLAW MGT FOR C0 SUBCOMMAND

This command provides flaw-map management for cartridge-type Winchester drive C0. This command is identical to FLAW MGT W0 except that it applies to C0. The menu only appears if your system is configured to include C0.

BOOT HOST CPU COMMAND

The BOOT HOST command terminates menu processing and runs the boot program.

MENU STRUCTURE

        BOOT HOST CPU
            Are you sure?

REMARKS

The BOOT HOST command runs the bootstrap program, which invokes the LSI-11 CPU. In systems configured for AUTO BOOT, the BOOT HOST command and the RESTART switch have similar effects. The BOOT HOST command may be somewhat faster than a RESTART because it bypasses any optional start-up self-test routines.

<div align="center">IMPORTANT</div>

> The BOOT HOST command reassigns the console device from SENSE to the LSI-11 CPU. After the BOOT HOST command is executed, SENSE commands must be entered using the front panel pushbuttons and 16-character display. Not all SENSE commands can be executed while the host is running. If a SENSE command would interfere with the host, an error message is issued and the command is aborted. SENSE issues an ARE YOU SURE? message before executing the BOOT HOST command.

<div align="center">CAUTION</div>

> If you have made configuration changes to the system (see Section 9) and want them to be stored, DO NOT restart the system by means of the

BOOT HOST CPU command. While this will restart
the system it will not store configuration chan-
ges. Instead, to store such changes, restart by
simultaneously pressing the front-panel RESTART
and "*" buttons.

SECTION 8

SENSE MONITOR:
EVALUATION MENU COMMANDS

INTRODUCTION

The EVALUATION menu commands of the SENSE Monitor are used
to exercise the circuits, mechanism and recording media of
peripherals integral to the system, and to set limits on
these tests.

One of the most used EVALUATION exercises is READ-ONLY SCAN.
This exercise scans the surface of a diskette or Winchester
disk and reports any imperfections on the media. Since it
is unwise to use diskettes with known flaws, this test
should be performed on each diskette after it is formatted,
but before it is used for recording data.

EVALUATION tests that write to memory or to the system peri-
pherals must run in the stand-alone mode since they could
interfere with application programs. Tests that do not
write to memory or the peripherals can run concurrently with
your applications.

The following table provides a summary of the commands sup-
ported by the EVALUATION menu:

Table 8-1.   EVALUATION MENU COMMAND SUMMARY

SPECIFY CONTROLS Specifies the devices to be tested and the
                  number of times an evaluation test is to be
                  repeated.

SYSTEM EXERCISES Enables or disables tests to write on storage
                  devices.

DISK EXERCISES   Performs random I/O tests on groups of sec-
                  tors. Reserved areas are avoided.

TAPE EXERCISES   Includes block write/read tests of tape drive
                  alone as well as tape/disk tests that verify
                  backup and restore capabilities.

LOGS   Lists Winchester and tape error events gener-
                  ated during various evaluation activities.

SPECIAL   Provides   facilities   for   displaying   the
                   contents of a sector. Also includes an option
                   enabling you to run a demonstration of the
                   capabilities of the total SENSE menu system.

                              LEGEND

          C0 = Removable-Cartridge Winchester Drive 0
          F0 = Floppy Drive 0
          F1 = Floppy Drive 1
          T0 = Tape Drive 0
          W0 = Fixed-Disk Winchester Drive 0
          W1 = Fixed-Disk Winchester Drive 1

SPECIFY CONTROLS COMMAND

The SPECIFY CONTROLS command speficies the number of times a test is to be performed, the extent of the test and the devices to be tested. This command can also be used to limit the testing of Winchester disks and/or memory to a specific range of physical addresses.

The SPECIFY CONTROLS command includes the following subcommands:

SPECIFY LIMITS   This command specifies the number of times a specific test is to be performed. Within the overall pass limit, you can also specify the number of soft and hard errors that may occur before the system pauses to display an error message.

SPECIFY DRIVES   This command specifies which of the configured peripherals are to be included in the test.

DISK RANGES   These commands set starting and ending track limits to establish a cylinder and head range used in calculating sector addresses for disk tests.

DATA PATTERNS   Permits configuring data patterns for use in disk evaluation tests.

MODES   Permits selection of various evaluation modes.

SPECIFY LIMITS SUBCOMMAND

The SET PASS LIMIT subcommand controls the number of times a test is performed.

MENU STRUCTURE

```
SPECIFY CONTROLS
     SPECIFY LIMITS
          PASS LIMIT
               Limit=
          HARD ERR LIM
               Limit=
          SOFT ERR LIM
               Limit=
```

REMARKS

One pass equals one complete execution of a test.   If the
test comprises subtests, one pass equals completing each
subtest one time. For the random tests, one pass equals one
seek followed by the specified test.

LIMITS. "No limit" is communicated to SENSE by setting
LIMIT = 0. NOTE: The system default for PASS LIMIT, HARD
ERR LIM, and SOFT ERR LIM is 0. "No limit" is useful for
long-duration tests such as, for example, where burn-in of
components may be necessary.

HARD AND SOFT ERRORS. Within the PASS limit, you can spec-
ify the number of hard and soft errors that may occur before
the system terminates the test. A soft error is a correct-
able read or write error on a disk. A hard error is a read
or write error with more incorrect bits than the error cor-
recting circuitry can handle. Both soft and hard errors
could also be caused by hardware malfunctions.

TEST TERMINATION. A test terminates when the PASS LIMIT is
reached, when either the SOFT or HARD ERROR limit is rea-
ched, or when the operator aborts the test (presses the
front panel MENU switch or types ^C (control C) at the
terminal keyboard).

WHEN ERRORS OCCUR. Notice that the error counter indicates
only the raw total of soft and hard errors without indicat-
ing the type or source of the errors. See later commands in
this section for a description of how errors are reported
during tests. In a properly functioning system, the error
count should be very low, usually zero. A significant error
count indicates the need for further testing to determine
the cause of the errors. The following guides may be help-
ful:

   o   Media problems, such as a damaged diskette, are the
       most common cause of errors. However, you should not
       swap diskettes until you have isolated the problem.

   o   Isolate the problem drive by testing only one drive at
       a time.   The READ-ONLY SCAN, rather than one of the
       random tests, is useful for finding faulty media. The
       disk tests are described under "DISK EXERCISES," later
       in this section.

   o   If a particular floppy drive is causing the errors,
       the problem is very likely a bad diskette. If so,
       there should be no errors when the drive is retested

with a diskette known to be good.   Notice, however,
that diskettes stored together are all subject to
damage if they have been exposed to excess heat, humi-
dity, dust, strong magnetic fields, or physical abuse.

o   If a floppy drive continues to generate errors even
     with a good diskette, the problem may be dirty
     read/write heads. Clean the heads in accordance with
     the manufacturer's instructions and retest the drive.
     If the problem still persists, contact your service
     representative.

o   After the flaw map is correctly installed, Winchester
     disks seldom generate large numbers of errors, parti-
     cularly when error correction and auto retry are in
     effect (see the SPECIAL commands of the CONFIGURATION
     menu). Use the FLAW MGT command of the OPERATION menu
     to enter the flaw map if it isn't already installed,
     then perform a scan test on the disk.   Contact your
     service representative if the scan generates errors.

SPECIFY DRIVES SUBCOMMAND

SPECIFY DRIVES names the peripheral device to be included in any
of the tests described under SYSTEM EXERCISES (see below).

MENU STRUCTURE

     SPECIFY DRIVES
          W0
                    Disable?
                    Enable?
          W1
                    Disable?
                    Enable?
          C0
                    Disable?
                    Enable?
          F0
                    Disable?
                    Enable?
          F1
                    Disable?
                    Enable?
          T0
                    Disable?
                    Enable?

REMARKS

Only those drives configured into your system appear in this menu. For example, W1 does not appear in the menu for systems that do not have W1 enabled in the CONFIGURATION menus.

Use this command when you want to select a drive or drives to be tested using the SYSTEM EXERCISES commands. Remember, first of all, that the default option for this command is ENABLE. Assume, for example, that you want to scan the diskette in drive F1. This requires you to DISABLE drives W0, W1, C0, F0, and T0 from the test. Then, drive F1 will be selected by default. It is only necessary to select the menu option ENABLE? if a drive has been previously excluded by use of the DISABLE? menu option.

DISK RANGES SUBCOMMAND

The DISK RANGES commands limit a test on a Winchester disk to a specific range of physical addresses. This allows you to test only a specific portion of the disk.

MENU STRUCTURE

```
        DISK RANGES
            SET W0 RANGE
                MIN CYL
                        Min cyl#=
                MAX CYL
                        Max cyl#=
                MIN HEAD
                        Min head#=
                MAX HEAD
                        Max head#=

            SET W1 RANGE
                MIN CYL
                        Min cyl#=
                MAX CYL
                        Max cyl#=
                MIN HEAD
                        Min head#=
                MAX HEAD
                        Max head#=

            SET C0 RANGE
                    (same as above)
            SET F0 RANGE
```

```
                    (same as above)
            SET F1 RANGE
                    (same as above)
```

REMARKS

The SET W0 RANGE (and the similar SET W1 RANGE, etc) command
allows you to specify the starting-track and ending-track range
to be included in the test of a Winchester drive. These physi-
cal addresses are in the cylinder and head number format.

The default setting for these commands is a range from the first
normal track to the last.

The minimum and maximum disk addresses specify an area of the
disk where the disk exercises can have unrestricted access. The
disk exercises are prevented by the system from accessing the
flaw table or any tracks reserved for diagnostic purposes.
IMPORTANT: Note that MAX CYL# must be equal to or less than the
total number of cylinders - 1; and that MIN CYL# must be equal
to or less than MAX CYL#.

In cases where the system itself senses such parameters as
number of heads, the measured value takes precedence over the
value entered by the user. Thus, for example, if a value of two
were entered for the number of heads with a single-sided disk-
ette in the drive, the system's measured value of one would be
the value actually used.

DATA PATTERNS SUBCOMMAND

This command is used to establish the data patterns that are
written to disks when undergoing various evaluation tests.

MENU STRUCTURE

```
        DATA PATTERNS
            PATTERN 1
                Byte#1=
                Byte#2=
                Byte#3=
            PATTERN 2
                Byte#1=
                Byte#2=
                Byte#3=
```

REMARKS

Note the following rules for entering the three bytes of each
data pattern:

1. Enter all bytes in hexadecimal.
2. Enter each byte as two hex characters. If you attempt
to enter more than two hex characters for each byte, the system
will truncate all characters after the second.
3. DEFAULT SETTINGS. If you make no entry for these pat-
terns, the system automatically supplies the following
worst-case patterns as defaults:

Pattern 1:

Byte#1 = 6D
Byte#2 = B6
Byte#3 = DB

Pattern 2:

Byte#1 = B6
Byte#2 = DB
Byte#3 = 6D

When performing a disk test, the system alternates patterns with
each pass. That is, on the first pass Pattern 1 is used, on the
second Pattern 2, on the third Pattern 1, etc. Also, when for-
matting disks using the OPERATION menus, Pattern 1 is always
used.

MODES SUBCOMMAND

The MODES subcommand permits the user to enable or disable vari-
ous features pertaining to auto-flaw management, error
correction and error logging.

MENU STRUCTURE

        MODES
            AUTO FLAW MODE
                DISABLE?
                ENABLE?
                    VrfyLim=
            ERROR LOGGING
                DISABLE?
                ENABLE?
            ERROR LOG WRAP
                DISABLE?
                ENABLE?

```
ERROR RECOVERY
     ECC CORRECTION
          DISABLE?
          ENABLE?      [This is the default setting]
     AUTO RETRY
          DISABLE?
          ENABLE?      [This is the default setting]
```

REMARKS

AUTO FLAW MODE. If AUTO FLAW MODE is disabled, flaw management must be done manually, as described in the OPERATION menus (see FLAW MGT commands). If AUTO FLAW MODE is enabled, then during an evaluation exercise, errors occurring as a result of defective sectors or tracks are processed automatically by the flaw-management facility. In this process, the defective sectors or tracks that are found are added to an existing flaw map. A new revectoring table is then created so that on succeeding tests these flaws are avoided. The system's default mode for this command is DISABLE. If you enable auto flaw management, controller event codes 70, 71, 75 or 76 (decimal) will trigger the automatic revectoring process. See Appendix E for event codes. Note that soft errors do not cause an auto-flaw-management response.

During the auto-flaw-management process, the system displays the following in-progress messages:

```
Autoflaw Manager [Sign-on message]
Load AuxTbls [Build auxiliary tables for device read]
Phase 1 [Sort newly appended auxiliary revectoring table]
Phase 2 [Allocate replacement blocks]
Update tbls [Write updated auxiliary tables to disk]
Reload tbls [Reload revectoring tables for all disks]
```

The autoflaw manager is called during evaluation exercises when the autoflaw mode is enabled. The autoflaw manager is automatically called by the error handler when ECC errors cannot be corrected.   The auxiliary tables are loaded and flawed sectors are cataloged in the same manner as in manual flaw management (see FLAW MGT portion of OPERATION menus). Note that if a defective sector is mapped to a sector that is itself defective, a further mapping will be performed after the first verify pass.

<div align="center">CAUTION</div>

> If AUTO FLAW mode is enabled, and a flawed sector
> is detected, data in the flawed sector could be
> lost when the new revectoring table is construc-
> ted.   Therefore, data should be backed up before
> entering the AUTO FLAW mode.

SETTING SCAN LIMIT FOR FLAW VERIFICATION. As part of the auto-flaw-management process the system can be configured to repeatedly scan the cylinder within which a flaw occurred before the pass counter is again incremented. By repeatedly scanning the cylinder, all possible flaws in that area can be detected and mapped. To configure the number of times a flaw area is scanned, supply a decimal number from 0 to 64,000 in response to the prompt "VrfyLim=". If no value is supplied, the system default is 10 (decimal).

ERROR LOGGING. If you select ENABLE in response to the command ERROR LOGGING, the system keeps a log of the two most recent flaws that have been detected by the auto-flaw facility. A separate log is kept for each configured Winchester drive. These logs can then be accessed by the commands in the LOGS menus (see below). The default for the ERROR LOGGING command is ENABLE.

ERROR LOG WRAP. If this command is disabled, error logging will stop when the error log is full. If the command is enabled, "wrap around" of the error log takes place; that is, the next error detected after the log is full displaces the first entry in the log. Then, every subsequent error displaces the oldest entry in the log. In this manner, the log stores only the most recent entries. The default setting for this command is ENABLE.

ERROR RECOVERY. The SMS 1000 supports ECC error correction for Winchester disks. This technique can detect an error up to sixteen bits in length and correct errors up to six bits in length. The ECC CORRECTION command enables error correction or limits the system to error detection only. If ECC CORRECTION is disabled, the controller detects but does not correct ECC events. The default setting for this parameter is ENABLE. The use of error correction is recommended for normal system operation. Error correction should be disabled when testing the Winchester disks since the purpose of the test is to find errors, correctable or otherwise.

When enabled, AUTO RETRY attempts to correct a read or write error up to ten times before reporting the error. AUTO RETRY is recommended for normal system operation, but should be disabled when testing the disk. The default setting for this parameter is ENABLE.

CAUTION

Disabling ECC CORRECTION and AUTO RETRY
is not recommended for normal system usage

since higher error rates are likely to occur

SYSTEM EXERCISES COMMAND

The SYSTEM EXERCISES commands test the reading and writing capabilities of the storage devices configured in your system. A write-on-Winchester test performs multiple read-after-write exercises. A read-only test performs multiple random-read exercises. Tape tests are also performed.

MENU STRUCTURE

```
SYSTEM EXERCISES
     WRITE ON WINCH?
          <evaluation parameter list appears here>
          Are you sure?
     READ-ONLY WINCH?
          <evaluation parameter list appears here>
          Are you sure?
```

REMARKS

GENERAL. Command parameters for these exercises allow you to select a read-only Winchester test or a test that both reads and writes on the disks. The write test must be run in the stand-alone mode. Note that the read-only Winchester test also writes to the tape unit (if so configured). Because the write test affects data on the Winchester disk, you should back up your Winchester disk before running the test.

CAUTION

Before using this command, be sure to back up data on the disks to be tested. If data is not backed up, it will be lost when disk is written over.

WRITE ON WINCH. This exercise consists of a group of repetitive tests that write on the Winchesters configured into your system, read what has been written, and then check that the two match. The number of complete passes in a test is set by the PASS LIMIT command in the SPECIFY LIMITS menus. When you give an affirmative response to the WRITE ON WINCH? menu item, a list of parameters governing the test appears. Its format is as follows:

VrfyLim= xxxx [will appear only if AUTO FLAW MODE
        is enabled]
PassLim= xxxx [value set under SPECIFY LIMITS]
HErrLim= xxxx [value set under SPECIFY LIMITS]
SErrLim= xxxx [value set under SPECIFY LIMITS]
Autoflaw [either "Enabled" or "Disabled" appears]
ECC [either "Enabled" or "Disabled" appears]
Retries [either "Enabled" or "Disabled" appears]
Err Log [either "Enabled" or "Disabled" appears]
Soft Err [either "Enabled" or "Disabled" appears]
In-prog [either "Enabled" or "Disabled" appears]
Ready?
        Not ready?
[Are you sure?]
        [Not ready?]

Thus, a typical parameter list for a test might appear as follows:

WO CO
VrfyLim= 10
PassLim= 0
HErrLim= 0
SErrLim= 0
Autoflaw Disabled
ECC   Enabled
Retries   Enabled
Err Log   Enabled
Soft Err Enabled
In-prog   Enabled
Ready? [User types: Return]
Are you sure? [User types: Return]

After the appearance of the parameter list, the WRITE ON WINCH test begins. Each complete pass of the WRITE ON WINCH test includes the following steps:

1. Pass-count appears. Controller self-test begins. (Note that one pass represents a complete sequence of disk tests. The number of passes to be performed is set by use of the PASS LIMIT command.)

2. The random-write exercise is repeated 2000 times on each disk. (See below for a description of the steps involved in the random-write exercise.) As the exercise is performed, the following is displayed:

<repetition-sequence number (from 1 to 2000)>
        and <disk address>

where <disk address> is defined as device designation
(i.e. W0, W1, C0, F0 or F1); cylinder number; head number; and
sector number.

3. The random-read exercise is repeated 2000 times on each
disk. (See below for a description of the steps involved in
the random-read exercise.) As the exercise is performed, the
following is displayed:

<repetition-sequence number (from 1 to 2000)>
and <disk address>

where <disk address> is defined as device designation
(i.e. W0, W1, C0, F0 or F1); cylinder number; head number; and
sector number.

4. If the drives selected for evaluation include a tape
and at least one Winchester, the disk-to-tape exercise and the
tape-to-disk exercise are performed on each Winchester.

If an error is found in any of the above steps, then the system
displays the following messages:

Error logging... [appears only if ERROR LOGGING
command has been enabled]
<name of error>
<event code> [refer to Appendix E for descriptions]

If the number of hard and soft errors measured as a result of
the test equals the previously configured HARD ERR LIMIT and
SOFT ERR LIMIT, then the system will issue the message:

Action?

If you now press Return (or "*" if using the front panel con-
trols) the system gives you the three options: Restart?, Menu?,
or Resume?. Selecting "Restart?" begins the sub-test again and
resets the error counter. Selecting "Menu?" takes you back to
the WRITE ON WINCH menu option again. Selecting "Resume?"
resets the error counter and allows you to resume the test from
its stopping point.

READ-ONLY WINCH. This exercise performs a series of reads on
the Winchester under test. The test is successful if data is
read on each seek. This test can exercise any configured peri-
pheral. After selecting the READ-ONLY WINCH command, the
system displays a parameter list showing the current values of
the parameters involved in the test. This list is in the same
format as that displayed in the WRITE ON WINCH test.

After the appearance of the parameter list, the READ-ONLY WINCH test begins.   Each complete pass of the READ-ONLY WINCH test includes the following steps:

1. Pass-count appears.   Controller self test begins. (Note that one pass represents a complete sequence of disk tests. The number of passes to be performed is set by use of the PASS LIMIT command.)

2. The random-read exercise is repeated 2000 times on each disk.   (See below for a description of the steps involved in the RANDOM-READ exercise.) As the exercise is performed, an in-progress message is displayed. It has the following format:

<repetition-sequence number (from 1 to 2000)>
        and <disk address>

where <disk address> is defined as device designation (i.e. W0, W1, C0, F0 or F1); cylinder number; head number; and sector number.

3. If the drives selected for evaluation include a tape and at least one Winchester, the disk-to-tape exercise is performed on each Winchester.

If an error is found in any of the above steps, then the system displays the following messages:

Error logging... [appears only if ERROR LOGGING
        command has been enabled]
<name of error>
<event code> [refer to Appendix E for descriptions]

If the number of hard and soft errors measured as a result of the test equals the previously configured HARD ERR LIMIT and SOFT ERR LIMIT, then the system will issue the message:

Action?

If you now press Return (or "*" if using the front panel controls) the system gives you the three options: Restart?, Menu?, or Resume?.   Selecting "Restart?" begins the test again. Selecting "Menu?" takes you back to the READ-ONLY WINCH menu option again. Selectimg "Resume?" resets the error counter and allows you to resume the test from its stopping point.

DISK EXERCISES COMMAND
_____

DISK EXERCISES presents a submenu of five commands that test the disk drives selected by the SPECIFY DISKS command described above.

MENU STRUCTURE

        DISK EXERCISES
            RANDOM WRITE?
                    <evaluation parameter list is displayed>
                    Are you sure?
            RANDOM READ?
                    <evaluation parameter list is displayed>
            RANDOM SEEK?
                    <evaluation parameter list is displayed>
            READ-ONLY SCAN?
                    <evaluation parameter list is displayed>
            WRITE/SCAN?
                    <evaluation parameter list is displayed>
                    Are you sure?

REMARKS

The RANDOM READ and READ-ONLY SCAN commands can be run concurrently with host processing. However, you should be aware that these commands, because they share disk accesses with the host, have the potential to slow down some applications.

Disk exercises terminate when the pass count is exceeded, when the hard or soft error limit is exceeded, or when the operator aborts the command.

One pass implies access to each disk selected in the SPECIFY DRIVES command.

The RANDOM tests generate a cylinder, head, and starting sector number using a random-number generation technique, and then perform a seek to that cylinder. These random seeks provide an effective test of the disk's head-positioning hardware. When a seek fails, the controller attempts to bring the heads back into registration by performing a seek to cylinder zero, then repeating the original seek (if RETRY is enabled). A persistent seek error indicates a need for service.

RANDOM WRITE. The RANDOM WRITE command generates a series of random disk addresses, then reads a sector, writes it back, reads it again, and compares the results of these operations. Any change in the data indicates an error.

CAUTION

> The RANDOM WRITE command is
> destructive; that is, it can destroy
> data that was previously written to
> a disk. Therefore, be sure to
> back up your disk before starting
> this exercise.

After the RANDOM WRITE command is selected, the system displays a list of the parameters involved in the test. This list has the same format as the parameter list described in the WRITE ON WINCH command (see above).

A complete cycle of the RANDOM WRITE test consists of the following steps:

1. The system generates a random disk address and displays an in-progress message that has the following format:

<pass number><disk address>

where: <pass number> is a decimal number less than or equal to the value set using the PASS LIMIT command (see SPEC-IFY LIMITS menu); and <disk address> is defined as device designation (i.e. W0, W1, C0, F0 or F1); cylinder number; head number; and sector number.

2. Read a group of logically consecutive sectors. Each group consists of two sectors (1K bytes). This step determines that the sectors are readable.

3. Write a bit pattern back to each sector. This pattern is configurable using the DATA PATTERNS command (see SPECIFY CONTROLS above).

4. Re-read the sectors just written and verify the accuracy of what was read by comparing it against the known pattern.

5. If an error is found in any of these steps, then the system displays the following messages:

Error logging... [appears only if ERROR LOGGING
     command has been enabled]
<name of error>
<event code> [refer to Appendix E for descriptions]

If the number of hard and soft errors measured as a result of the test equals the previously configured HARD ERR LIMIT and SOFT ERR LIMIT, then the system will issue the message:

Action?

If you now press Return (or "*" if using the front panel con-
trols) the system gives you the three options: Restart?, Menu?,
or Resume?.   Selecting "Restart?" begins the test again.
Selecting "Menu?" takes you back to the RANDOM WRITE menu
option again. Selecting "Resume?" resets the error counter and
allows you to resume the test from its stopping point.

RANDOM READ. After selecting the RANDOM READ command, the
system displays a parameter list showing the current values of
the parameters involved in the test. This list is in the same
format as that described for the WRITE ON WINCH test (see
above).

The RANDOM READ command performs the following steps on each
disk previously selected using the SPECIFY DRIVES command:

        1. The system generates a random disk address and displays
an in-progress message that has the following format:

        <pass number><disk address>

        where: <pass number> is a decimal number less than or
equal to the value set using the PASS LIMIT command (see SPEC-
IFY LIMITS menu); and <disk address> is defined as device
designation (i.e. W0, W1, C0, F0 or F1); cylinder number; head
number; and sector number.

        2. Read a group of logically consecutive sectors.

        3. If an error is found in the read operation, then the
system displays the following messages:

        Error logging... [appears only if ERROR LOGGING
            command has been enabled]
        <name of error>
        <event code> [refer to Appendix E for descriptions]

If the number of hard and soft errors measured as a result of
the test equals the previously configured HARD ERR LIMIT and
SOFT ERR LIMIT, then the system will issue the message:

        Action?

If you now press Return (or "*" if using the front panel con-
trols) the system gives you the three options: Restart?, Menu?,
or Resume?.   Selecting "Restart?" begins the test again.
Selecting "Menu?" takes you back to the RANDOM READ menu option
again. Selecting "Resume?" resets the error counter and allows
you to resume the test from its stopping point.

RANDOM SEEK. The RANDOM SEEK command performs a seek, then verifies that it reached the correct cylinder. After selecting the RANDOM SEEK command, the system displays a parameter list showing the current values of the parameters involved in the test. This list is in the same format as that displayed in the WRITE ON WINCH test (above). The RANDOM SEEK command performs the following steps on each disk previously selected using the SPECIFY DRIVES command:

1. The system generates a random disk address and displays an in-progress message that has the following format:

<pass number><disk address>

where: <pass number> is a decimal number less than or equal to the value set using the PASS LIMIT command (see SPEC-IFY LIMITS menu); and <disk address> is defined as device designation (i.e. W0, W1, C0, F0 or F1); cylinder number; head number; and sector number.

2. The system then does a seek to the sector determined in Step 1. No data is transferred.

3. The number of the sector found is compared with that of the sector determined in Step 1.

4. If an error (i.e. a miscompare) is found, then the system displays the following messages:

Error logging... [appears only if ERROR LOGGING
    command has been enabled]
<name of error>
<event code> [refer to Appendix E for descriptions]

If the number of hard and soft errors measured as a result of the test equals or exceeds the previously configured HARD ERR LIMIT and SOFT ERR LIMIT, then the system will issue the mes-sage:

Action?

If you now press Return (or "*" if using the front panel controls) the system gives you the three options: Restart?, Menu?, or Resume?. Selecting "Restart?" begins the test again. Selecting "Menu?" takes you back to the RANDOM SEEK menu option again. Selectimg "Resume?" resets the error counter and allows you to resume the test from its stopping point.

READ-ONLY SCAN. The READ-ONLY SCAN command reads the entire contents of a disk within the evaluation range defined by the

DISK RANGES command (see SPECIFY CONTROLS above), and reports any read errors. In addition to its function as a test of Winchester drives, this command is useful for detecting flawed diskettes. To avoid the inconvenience of using a flawed diskette in your system, use this test on each newly formatted diskette.

After the READ-ONLY SCAN command is selected, the system displays a list of the parameters involved in the test. This list has the same format as the parameter list described in the WRITE ON WINCH command (above).

After you select the READ-ONLY SCAN command, the following steps are performed:

1. Before starting a READ-ONLY scan test be sure that you have confirmed the numbers of the minimum and maximum cylinders to be scanned by use of the DISK RANGES command (see SPECIFY CONTROLS above).

2. The system starts the scan at the beginning of the configured or default cylinder/head range. The system reads every sector within the specified range of cylinders.

3. Assuming that the autoflaw mode is enabled (see MODES command under SPECIFY CONTROLS) and a hard error is found, mapping to an alternate sector will automatically take place. The cylinder with the defective sector is rescanned (or "verified") a number of times determined by the setting of the "VrfyLim=" parameter (see MODES) before the next cylinder is scanned.

4. For each device being scanned, a scan report is displayed at the conclusion of the test (if autoflaw mode is enabled). This report has the following format:

    G<total number of good passes> <device designation>
        g<number of passes in last string of passes unbroken
        by an error>f<new flaw count>

where <device designation> indicates W0, W1, etc, depending upon the actual configuration of your system; and <new flaw count> is the actual number of flaws detected since the last time the flaw table was constructed. NOTE: G, g, and f are prefixes designating values to follow.

A typical scan report might appear as:

    G296W0g200f5

The letter G and 296 indicate that a total of 296 good passes have taken place; W0 indicates that the unit configured as Winchester 0 is being scanned; the letter g and 200 indicate that the most recent number of passes unbroken by a flaw has been 200; the letter f and 5 indicate that the total number of flaws detected has been 5. The important point to remember about this report is that if the number of passes unbroken by a flaw (i.e. g followed by a number) is large relative to the total number of good passes (i.e. G followed by a number), then you have a reasonable assurance that essentially all of the detectable flaws have been found and mapped.

5. After each normal cylinder scan, the following in-progress message is displayed:

        <pass number><designation of device under test>c<number
            of last cylinder scanned><***[symbols displayed if
            a flaw was detected on this pass]>f<new flaw count>

If, for example, a flaw were detected on pass 1008, the message would appear as follows:

        1008W1c123***f12

where 1008 is the number of the most recent pass; W1 indicates that Winchester 1 is being tested; c123 indicates that cylinder 123 was just scanned; *** indicates that a flaw was detected on the last pass; and f12 indicates that 12 flaws have been detected since the start of the test. If a flaw had not been detected on pass 1008, the message would have been:

        1008W1c123   f12

6. When the autoflaw mode is enabled and the flaw table is updated, the in-progress messages are updated after each cylinder-verify pass. Note that these messages have a different format from those described in Step 5. These messages have the following format:

        <pass number><designation of device under test>
            c<number of last cylinder scanned>v<number of
            verification passes that have been run on the
            cylinder>f<new flaw count>

For example, on pass 244, if cylinder 123 is being verified for the 12th time, with a flaw count currently standing at 9, the message would appear as:

        244W1c123v12f9

WRITE/SCAN. The WRITE/SCAN command formats a disk under test with a data pattern determined by use of the DATA PATTERNS COMMAND (or its default data pattern); scans the disk for errors; and, in the case of Winchester disks when the autoflaw manager is enabled, performs flaw mapping and re-scanning as determined by the autoflaw "VrfyLim=" value.

CAUTION

The WRITE/SCAN command is
destructive; that is, it can destroy
data that was previously written to
a disk. Therefore, be sure to
back up your disk before starting
this exercise.

After the WRITE/SCAN command is selected, the system displays a list of the parameters involved in the test. This list has the same format as the parameter list described in the WRITE ON WINCH command (above).

The WRITE/SCAN command performs the following steps:

1. Each disk is formatted with a predetermined pattern (see DATA PATTERNS COMMAND). Reserved areas are not written over. Existing flaw-map information is preserved.

2. The system next scans each sector on the disk for errors or flaws, between the maximum and minimum head/cylinder limits set using the DISK RANGES command.

3. The number of times the system scans the complete disk looking for flaws is set by the value of the "VrfyLim=" command (see MODES). This is true whether or not AUTO FLAW MODE is enabled. The current value of this count is indicated by the letter "V" followed by a value in the in-progress message (see below).

4. The number of times the system performs a complete pass, consisting of formatting and then scanning the disk, is set by the value of the PASS LIMIT command (see SPECIFY LIMITS).

5. At the end of each cylinder scan the system issues an in-progress message whose format is:

<number of complete write/scan passes><designation of
     device being scanned>c<cylinder number just scanned>
     V<number of disk-verify scan passes thus far>

f<new flaw count>

Thus, for example, at the end of pass 1008, on Winchester W1, cylinder 123, at the completion of verification pass 18, and with 22 flaws thus far found, the following message would be issued:

1008W1cl23V18f22

6. If autoflaw mode is enabled and a flaw is found, the flaw is mapped as previously described in this chapter. The "VrfyLim=" counter is then reset and the disk is again scanned the number of times set in the "VrfyLim=" parameter (see MODES). A scan report is issued at the conclusion of the test. NOTE: Because of the ease with which flaws can be detected and mapped, it is recommended that you perform disk tests with the autoflaw mode enabled.

TAPE EXERCISES
_____

The TAPE EXERCISES commands permit tests of data transfers between Winchester disks and the integral streaming tape drive. A variety of verification options are possible. A tape-status log records errors such as rewrites, rereads and underruns.

MENU STRUCTURE

```
     TAPE EXERCISES
          DISK->TAPE
               <evaluation parameter list is displayed>
               Ready?
          DISK<-TAPE
               <evaluation parameter list is displayed>
               Ready?
               Are you sure?
          DISK <->TAPE
               <evaluation parameter list is displayed>
               Ready?
               Are you sure?
```

REMARKS

DISK->TAPE. The DISK->TAPE command performs a specialized form of the backup operation that requires no tape change. It permits the logging of various conditions detected by the tape drive during disk-to-tape (streaming) transfer. These conditions include logging the number of underruns, i.e. the tape running out of data to record and having to wait for the data stream to resume; and logging the number of blocks rewritten or

reread, i.e. retries because of bad spots on the tape.

After the DISK->TAPE command is selected, the system displays a list of the parameters involved in the test. This list has the same format as the parameter list described in the WRITE ON WINCH command (above).

Remember that this test will run only if an integral streaming tape drive and a Winchester are actually configured into your system. The following steps are involved in each pass of the test:

1. The tape is retensioned and rewound.

2. A test header is written to the tape.

3. A complete disk transfer to the tape (a "long" transfer) is initiated.

4. If either end of the Winchester's evaluation range has been reached, or if the end of the tape has been signaled, the tape status log is updated accordingly. The following is a typical in-progress message sequence:

```
<evaluation parameter list is displayed>
Ready? [user enters "Return" (or "*")]
Retension+Rewind
1    W0->T0u0 r0
Retension+Rewind
1    W1->T0u1 r1
Retension+Rewind
2    W0->T0u1 r1
```

where the first value in each message is the pass count; the value preceded by "u" is the number of underruns found on that pass; and the value preceded by "r" is the number of retries found on that pass.

Note that in the example above, two Winchesters (W0 and W1) are being tested at the same time. Refer to discussion of the ERROR LOGS commands for how to access the data logged on each pass.

DISK<-TAPE. The DISK<-TAPE command must be used in conjunction with the DISK->TAPE command. The DISK<-TAPE command writes from tape to Winchester and, as with the DISK->TAPE command, counts underruns and retries during this transfer process.

CAUTION

> The DISK<-TAPE command is
> destructive; that is, it can destroy
> data that was previously written to
> a disk. Therefore, be sure to
> back up your disk before starting
> this exercise.

If you attempt to perform the transfer from tape to disk using a cartridge that does not have an evaluation header created by a specific DISK->TAPE test (see above), the system assumes that you are using tape from some other backup operation and returns the error message:

> T0 has live data

The exercise is then terminated and you are returned to the "DISK<-TAPE" menu option. Similarly, if the tape has no header at all, it returns the message:

> Blank tape?

and terminates the test as before. The following is a typical in-progress message sequence:

> <evaluation parameter list is displayed>
> Ready? [user enters "Return" (or "*")]
> Retension+Rewind
> 1   T0->W0u0 r0
> Retension+Rewind
> 1   T1->W0u1 r1
> Retension+Rewind
> 2   T0->W0u1 r1

where the first value in each message is the pass count; the value preceded by "u" is the number of underruns found on that pass; and the value preceded by "r" is the number of retries found on that pass.

DISK<->TAPE. The DISK<->TAPE command permits you to perform both backup and restore tests that require no changes of tape cartridge. Thus, this command is, in effect, a combination of the two preceding commands.

CAUTION

> The DISK<->TAPE command is
> destructive; that is, it can destroy
> data that was previously written to
> a disk. Therefore, be sure to
> back up your disk before starting

this exercise.

After the DISK<->TAPE command is selected, the system displays a list of the parameters involved in the test. This list has the same format as the parameter list described in the WRITE ON WINCH command (above). The system then performs the following steps for each fixed-disk device listed under the SPECIFY DRIVES command (see SPECIFY CONTROLS at the beginning of this chapter):

    1. The tape is retensioned and rewound.

    2. A complete disk transfer (i.e. a "long" transfer) to the tape is initiated.

    3. The system updates the tape-status log if the end of either the disk or tape range has been reached.

    4. The tape is again rewound and retensioned.

    5. A complete tape transfer back to the disk is initiated.

    6. The system updates the tape-status log if the end of either the disk or tape range has been reached.

The following is an example of a typical message sequence for this test:

```
<evaluation parameter list is displayed>
Ready? [user enters "Return" (or "*")]
Are you sure? [user enters "Return" (or "*")]
Retension+Rewind
1    W0->T0u0 r0
Retension+Rewind
1    T0->W0u0 r0
Retension+Rewind
2    W0->T0u0 r0
```

    where the first value in each message is the pass count; the value preceded by "u" is the number of underruns found on that pass; and the value preceded by "r" is the number of retries found on that pass.

LOGS COMMAND

In the preceding tests, errors have been recorded in logs located in controller RAM. Each log can store information on the last two errors for each device. There is a separate log for each peripheral device configured into your system. This com-

mand permits you to examine the contents of each log, to save
the contents of any log in EEPROM, to call the contents of any
log back from EEPROM, and to clear the contents of any log.
The tape status log records the current count of retries and
underruns for each test performed. The log also maintains a
total count of retries and underruns for any series of tests.

MENU STRUCTURE

```
        COMMON ERROR LOG
                WO
                        <log parameter list is displayed>
                        NEXT?
                        PREVIOUS?
                        CLEAR?
                        SAVE?
                        RESTORE?
                W1
                        (same as above)
                C0
                        (same as above)
                F0
                        (same as above)
                F1
                        (same as above)
                T0
                        (same as above)
        TAPE STATUS LOG
                CURRENT
                        REWRITES/REREADS
                                Count=
                        UNDERRUNS
                                Count=
                TOTAL
                        REWRITES/REREADS
                                Count=
                        UNDERRUNS
                                Count=
                CLEAR?
                SAVE?
                RESTORE?
```

REMARKS

COMMON ERROR LOG. For each device configured into the system,
the error log records the last two error events that have oc-
curred since the last time the log was cleared. Depending upon
the status of the ERROR LOG WRAP command (see MODES above) the
log will record either the first two or the last two errors as
they occur. The error-log parameter list appears each time the
COMMON ERROR LOG command is selected. The parameter list has

the following structure:

```
#SysSErr=xxx [total soft errors for all devices]
#SysHErr=xxx [total hard errors for all devices]
#Wrap-ar=xxx [number of times #Records= wraps around]
#Records=xxx [where xxx = 0, 1, or 2]
```

where xxx is a decimal value supplied by the system. The first two entries in this list are global; that is they record the total number of hard and soft errors for all tests since the last time the log was cleared. The last two items of the list are local; that is, they apply only to the current or latest test. The maximum number of records in the log for a given unit can be a maximum of two. If ERROR LOG WRAP is enabled, the two most recent error records will always be stored. As further errors occur, the oldest record is displaced. The value shown by #Wrap-ar= is the number of times the log has had its two records replaced (i.e. "wrapped around"). If, for example, 9 errors have occurred in a specific device test and ERROR LOG WRAP is enabled, then the last two lines of the parameter list will be:

```
#Wrap-ar=4
#Records=1
```

NEXT? and PREVIOUS? These two commands permit you to display the first error entry in the log (using NEXT?) or the last entry (using PREVIOUS?). When an entry is displayed using either of these commands, it has the following format:

```
<display of record number>
<error-frequency count>
<error message>
e<error number><device designation>c<cylinder
    number>h<head number>s<sector number>
```

Thus, a typical log-entry display would be:

```
Record#= 1
FreqCnt= 5
"Drive not ready"
e64F0c1 h0 s1
```

Note that to display the next entry in the log after this entry, simply press Return again (or "*" if you are operating from the front panel).

CLEAR? The CLEAR? command, when selected, clears all entries in the error-log parameter list and also clears the two entries in the error log. Remember that CLEAR operates only with respect to one device at a time (see menu structure).

SAVE? and RESTORE? The SAVE? command causes error entries for
a selected device to be written to the system's EEPROM. This
means that the saved error-information is protected in the
event of system power-down. Note, however, that the system's
EEPROM is only large enough to store the error log of a single
device.   The RESTORE? command causes previously saved error-
information for a device to be written back to the error log
for that device.   Note that if data is saved and then later
restored after further entries have been made to the error log
for a device, the data currently in the log for that device
will be written over. Also, note that, because the log from
only one device can be stored in the system's EEPROM, if, for
example, you SAVE the log for W0 and then attempt to perform a
RESTORE for W1, the system issues the message:

        Wrong Error Log

TAPE STATUS LOG. The tape status log keeps a record of the cur-
rent and total count of both underruns and retries/rereads
(i.e. retries) since the last time the log was cleared.   All
operations involving tape, including BACKUP and RESTORE will
update this log. The CLEAR?, SAVE? and RESTORE? commands oper-
ate in the same manner as for the COMMON ERROR LOG command.

SPECIAL
‾‾‾‾‾‾‾

The SPECIAL command permits you to display the contents of any
sector on a selected disk device. It also enables the user to
use the MENU DEMO subcommand to perform a demonstration of the
various capabilities of the SENSE menu system.

MENU STRUCTURE

        MENU DEMO
        DISPLAY SECTOR
            W0?
                    <evaluation parameter list is displayed>
                    Even boundary?
                    Odd boundary?
                    Cyl#=
                    Head#=
                    Sector#=
            W1
                    (same as above)
            C0
                    (same as above)
            F0
                    (same as above)

```
        F1
                (same as above)
        TO
                (same as above)
```

REMARKS

While the SPECIAL menus are in effect, the hard and soft error limits that were set using the SPECIFY LIMITS command (see above) are temporarily changed from their assigned values to values of 1.

The DISPLAY SECTOR command permits you to display the contents of any sector for which you provide the cylinder-head-sector address. The system displays the contents of the sector, 16 or 17 words at a time, depending upon whether the word boundary specified for the first word is odd or even. The contents of the sector are displayed in hex. Note that by using this command you are able to display any sector, including reserved areas of Winchesters. The following is a typical message sequence:

```
        <evaluation parameter list is displayed>
        Even boundary? [user types Space, i.e. no]
        Odd boundary? [user types Return, i.e. yes]
        Cyl#=108
        Head#=8
        Sector#=6

        @0000: 0001
        @0002: 0002 0003
        @0006: 0004 0005
        @000A: 0006 0007
        @000E: 0008 0009
        @0012: 000A 000B
        @0016: 000C 000D
        @001A: 000E 000F
        @001E: 0010 0011
        More? [user types Space, i.e. no]
        Menu? [user types Return in order to return to
               the last menu option]
```

NOTE: In the above display of sector contents, the first part of each line (e.g. "@001E:") is the byte displacement (in hex) of that line from the start of the sector. The remainder of each line except the first contains the actual contents of the sector, expressed as two 16-bit words. The first line contains one word if you started on an odd boundary and two if on an even boundary.

SECTION 9

SENSE MONITOR:

CONFIGURATION MENU COMMANDS

GENERAL

The SENSE CONFIGURATION menus include commands used to enter or change system parameters. In effect, these commands answer questions such as: Is there a system console, and if so which serial port drives it? Or, what format specifications are to be used when formatting a floppy disk? The typical user may use the CONFIGURATION commands only for initial system set-up. Floppy disk formats can be an exception to this generalization: you may occasionally need to change formats if you exchange diskettes with other systems.

Note that every system is shipped with configurable parameters set in accordance with customer requirements. Where no specific customer requirement exists, each parameter is given a default setting determined by SMS.

VERY IMPORTANT:
STORING PARAMETER VALUES

WHEN MAKING CHANGES TO ANY OF THE PARAMETERS DE-SCRIBED IN THIS CHAPTER, REMEMBER THAT AFTER EACH CHANGE IS MADE YOU WILL SEE THE MESSAGE:

Task completed
Please RESTART!

IF YOU ARE MAKING A SERIES OF CHANGES, YOU DO NOT HAVE TO RESTART AFTER EACH CHANGE. BUT TO ACTUALLY STORE YOUR CHANGES IN THE SYSTEM, YOU MUST RESTART BY PRESSING THE RESTART AND "*" BUTTONS SIMULTANEOUSLY, AFTER THE LAST CHANGE IS MADE.

CONVENTIONS FOR USE IN THIS SECTION

The following conventions apply:

1. DEFAULT SETTINGS. Default settings are listed either to the right of the corresponding commands or in the accompanying REMARKS discussion.

2. Since storing parameter values requires a system restart, no configuration updates are allowed while the host is running.

3. CURRENT VALUES. You can query the system at any time as to current configuration settings. This is done by displaying the various levels in the menus. For each configurable parameter, the current setting is the first one displayed.

COMMAND SUMMARY

Table 9-1. CONFIGURATION MENU COMMAND SUMMARY

FLOPPY FORMATS   Specifies the format to be used by the formatting commands in the OPERATION menu.

BOOTSTRAP   Specifies search sequence for bootable devices.

POWER ON/RESTART   Specifies actions to be taken when the system is powered on or reset, such as whether to auto-boot or enter the SENSE menu system.

SERIAL PORTS   Specifies BAUD rates, parity bit setting, terminal type, etc. for serial ports A0 and A1.

DEVICE PARAMETERS   Invokes a submenu of commands used for installing disk drives. These commands specify characteristics of the drives.

ADDRESSES   Modifies hardware addresses for the boot prom, controller, and/or port base for special applications.

SPECIAL   Controls user access level, error recovery, etc.

LEGEND

C0 = Removable-Cartridge Winchester Drive 0
F0 = Floppy Drive 0
F1 = Floppy Drive 1
T0 = Tape Drive 0
W0 = Fixed-Disk Winchester Drive 0
W1 = Fixed-Disk Winchester Drive 1

NOTE: ALL DEFAULT SETTINGS LISTED IN THIS SECTION AND IN APPENDIX A APPLY TO MODELS 40 AND 50 UNLESS OTHERWISE SPECIFIED.

FLOPPY FORMATS COMMAND

The FLOPPY FORMATS command specifies the disk format to be written by a FORMAT command in the OPERATION menu.

MENU STRUCTURE

```
    FLOPPY FORMATS
        FO FMT                    (5-1/4" floppy)
            DEC PC?
        FO FMT                    (8" floppy)
            RX01?
            RX02?            [Default setting.  256 BPS]
            IBM 1D?
            IBM 2D/FW?
            OTHER
                IBM 1D/256
                IBM 1D/512?
                IBM 2D/128?
                IBM 2D/256?
                IBM 2D/512 15SPT
                RX03
        F1 FMT
        (same as for FO . . . see above)

LEGEND: SPT = Sectors per track
        BPS = Bytes per sector
```


REMARKS

When you select a particular format, that selection is high-lighted on smart terminals and marked with an arrow on dumb terminals. Note the following system characteristic. Assume that you have selected a format from the menu: RX01?, RX02?, IBM 1D? or IBM 2D/FW?. If you now move down the menu and select the command OTHER in order to simply look at what the other options are, you will notice that the arrow or highlighting is present on one of the menu items in this group also, even though it has not been selected. Disregard the second arrow.

Although the menu shows a FMT command for both 5-1/4 and 8" floppy drives, you will see only the FMT command that applies to the drives configured into your system.

If you exchange 8" diskettes with another system, you should select a diskette format compatible with the other system.

If you use the diskettes on your own system only, you may select the format that provides the most storage. The double-sided formats (RX02 and IBM 2D) increase storage capacity. It is important to note that the 8" formats can be either single sided or double sided, depending upon the type of diskette you select. For the IBM formats, specifying larger sector sizes yields more storage since larger sectors leave fewer unusable gaps between sectors. When formatting a diskette to be used for backup, the diskette must have the same sector size as the Winchester disk. All Winchester disks in the SMS 1000 have 512 bytes per sector.

RX02 AND RX03 FORMATS. Note that for RX02 the controller converts logical block numbers into physical block numbers by incrementing head numbers all the way to the maximum before incrementing cylinder numbers. For RX03, however, the controller increments cylinder numbers all the way to the maximum before incrementing head numbers.

All 5-1/4 floppy drives supplied with the SMS 1000 use the DEC PC format (512 bytes per sector, ten sectors per track, 96 tracks per inch).

Diskette format specifications such as physical interleave, head offset and cylinder offset default to the appropriate industry standards and cannot be modified.

BOOTSTRAP Command

The BOOTSTRAP command invokes a submenu of commands used to control bootstrap events.

The bootstrap provides a bridge from SENSE to the application programs. Remember, the bootstrap is performed after a RESTART or an initial power up, but before operating system facilities are available to help find and read any programs.

The bootstrap has two main parts. The first part resides in read-only memory on the System Foundation Module. This part determines the size of the system memory and optionally performs tests on the LSI-11 CPU and system memory. It then finds and loads the boot block. The boot block contains a special application program that controls the loading of additional application code. Typically, the boot block loads in your operating system or a dedicated application program.

AUTOBOOT TIMEOUT Subcommand

The AUTOBOOT TIMEOUT subcommand specifies an approximate time delay that occurs after power up or RESTART and before the automatic loading of the boot block.

MENU STRUCTURE

```
BOOTSTRAP
    AUTOBOOT TIMEOUT
        DELAY (SEC)=0?
        DELAY (SEC)=5?
        DELAY (SEC)=10?      [This is the default setting]
        DELAY (SEC)=20?
        DELAY (SEC)=30?
        DELAY (SEC)=45
        DELAY (SEC)=NL
```

REMARKS

The function of the AUTOBOOT TIMEOUT delay is to allow you to name an alternate drive for the boot operation as might be done to load a new version of the operating system from diskette.

Most users find an AUTOBOOT TIMEOUT of 10 seconds adequate. If you find this delay to be too short or too long, you can change it. The DELAY (SEC)=NL option specifies no time limit. This requires you to identify the boot device every time you RESTART or power up the system. Conversely, DELAY (SEC)=0 forces the system to boot immediately without allowing you to specify an alternate boot drive or use the menu system. This last option is sometimes used by dedicated applications such as those used for process control.

BOOT DRV Subcommand

The BOOT DRV subcommands specify the order in which the boot-strap searches through the disk drives when looking for the boot block.

MENU STRUCTURE

```
BOOT DRV#1
    BOOT DRV=W0?      [This is the default setting]
    BOOT DRV=W1?
    BOOT DRV=C0?
```

```
                    BOOT DRV=F0?
                    BOOT DRV=F1?
          BOOT DRV#2
                    BOOT DRV=W0?
                    BOOT DRV=W1?
                    BOOT DRV=C0?
                    BOOT DRV=F0?     [This is the default setting]
                    BOOT DRV=F1?
          BOOT DRV#3
                    BOOT DRV=W0?     [This is the default setting]
                    BOOT DRV=W1?
                    BOOT DRV=C0?
                    BOOT DRV=F0?
                    BOOT DRV=F1?
          BOOT DRV#4
                    BOOT DRV=W0?
                    BOOT DRV=W1?
                    BOOT DRV=C0?
                    BOOT DRV=F0?     [This is the default setting]
                    BOOT DRV=F1?
       FIRST DU#
               DU#=         [Default is 0 for all models]
```

REMARKS

The bootstrap checks the first drive for a boot block. If no
boot block is found and the drive has not been initialized, the
bootstrap checks the drive specified as the second boot drive.
The search terminates when the system locates a valid boot
block or when no valid boot block can be found among the speci-
fied drives.

Most users prefer to load the operating system as quickly as
possible so that application processing can begin. This is
done by naming the drive with the operating system (usually W0)
as the first boot drive.

Users who frequently load special software from diskette may
prefer to name a diskette drive as the first boot drive, and
the fixed disk as the second boot drive. In this case, the
system boots from diskette if the drive contains a DU bootable
diskette; otherwise, the system boots from the fixed disk, if
one exists.

FIRST DU#. This command is of importance only to users of the
SMS 1000 Model 41 subsystem (refer to Appendix F). Users of
the SMS 1000 Models 40 or 50 must either use the default value
of 0 or enter 0 directly, in response to the prompt "DU#=". In
the case of the Model 41, the first DU value must usually be
chosen so that the resulting DU number series does not contain

duplicates of any DU numbers already used in the host system.
Note that in the case of the Model 41 the choice of FIRST DU#
may be dependent on the requirements of the host operating
system.

POWER ON/RESTART COMMANDS

The POWER ON/RESTART command invokes a menu of commands that
determine system actions when the power is turned on or when
the front-panel RESTART and "*" buttons are pressed simulta-
neously. It includes the STARTUP MODE subcommand, the
WINCHESTER SPINUP subcommand, the RE-LOAD EEPROM subcommand,
the CPU TYPE subcommand, and the SYSTEM TYPE subcommand.

STARTUP MODE SUBCOMMAND

The STARTUP MODE subcommand allows you to determine the
system action to be performed when the system power is ini-
tially applied or when the front panel RESTART switch is
used.

MENU STRUCTURE

```
POWER-ON/RESTART
     STARTUP MODE
          LOOP UNTIL ERR?
          OPERATE MENUS?
          BOOTSTRAP HOST?    [This is the default setting]
```


REMARKS

These commands set the mode in which the system will operate
following initial power-on or restart. Thus, the system can
either enter the SENSE menus, boot-load the host CPU, or loop
through the power-on tests until an error occurs.

OPERATE MENUS invokes the menu system. This option is espe-
cially useful in new systems where the user wants to modify the
configuration, format diskettes, etc.

The SMS 1000 uses BOOTSTRAP HOST as its default option. When
this option is in effect, the system automatically locates and
loads your application software or the operating system when
the power is applied or after a RESTART.

The LOOP UNTIL ERR option is of interest only to system engineers since it puts the system into an endless test loop. This testing terminates only if an error occurs, which is unlikely, or if the operator terminates the test by pressing the MENU switch. If an error does occur, however, further diagnosis should be done by using the EVALUATION menu commands. Terminating the tests manually invokes the SENSE menu system.

WINCHESTR SPINUP SUBCOMMAND

Your system cannot load and run an application immediately after power on because it takes approximately 20 seconds for most fixed-disk Winchester drives, and about 45 seconds for removable-cartridge drives, to reach operating speed. The WINCHESTR SPINUP command gives you some control over this delay. Note that no spinup delay will take place in systems that are not configured to include a Winchester drive.

MENU STRUCTURE

```
WINCHESTR SPINUP
        DELAY (SEC)=0?
        DELAY (SEC)=5?
        DELAY (SEC)=10?
        DELAY (SEC)=20?      [This is the default setting]
        DELAY (SEC)=30?
        DELAY (SEC)=45?
        DELAY (SEC)=90?
```

REMARKS

DELAY (SEC)=0 specifies no delay. If your system is configured to run the menus after power-on, this option allows you to start work without waiting for the disks to reach operational speed. Also, this option can be specified if the system is configured to be booted from a floppy disk. Do not use this option if your system is configured to boot from a Winchester disk; attempting to boot when the disk is not ready causes an error. Similarly, the 5- and 10-second options may not allow enough time for the disk to reach speed.

DELAY (SEC)=20 is the default option configured for systems shipped by SMS. If you want to run SENSE utilities before the system loads the operating system, this delay also gives you an opportunity to press the front panel MENU switch. Use the 30-

or 45-second options if you need more time. If your system in-
cludes a removable-cartridge Winchester drive, a 45-second
delay period should be specified because of its longer spinup
time.

RE-LOAD EEPROM SUBCOMMAND

The RE-LOAD EEPROM subcommand permits you to reload the
system's EEPROM from the EPROM image stored in the controller
on the Foundation Module. The EEPROM stores the actual system
configuration parameters that have been entered using the menus
in the present section. The default values for these paramet-
ers are stored in the EPROM. Hence, by use of this command,
all configuration parameters are changed back to these default
values. THE SYSTEM WILL NOT WORK NORMALLY UNTIL IT IS RECONFI-
GURED USING THE MENUS IN THIS SECTION.

CAUTION

> Reloading the EEPROM changes all
> configuration parameters to their default
> values and requires full system reconfigur-
> ation after reloading. Hence, reloading
> should be regarded as a radical procedure
> and should not be undertaken unless there is
> a compelling reason to do so.

VERY IMPORTANT!
WHAT TO DO AFTER A RELOAD

> The first step in reconfiguration after an
> EEPROM reload should be to enter the SENSE
> menu system. Next, use the DEVICE PARAMET-
> ERS portion of the CONFIGURATION menus to
> enter the actual number of heads and cylin-
> ders, as well as the PRECOMP ENABLE/DISABLE
> status, for your Winchester drives. Doing
> this will set up the Winchester drives pro-
> perly and restore access to the data stored
> there.

MENU STRUCTURE

        RE-LOAD EEPROM
                Are you sure?

REMARKS

After you select this command and give an affirmative response
to "Are you sure?", the system displays the message:

    Changing EEPROM!

When the reloading process is complete, the system displays:

    Task completed.

However, to synchronize the new EEPROM image with the RAM data
structures you must restart the system. Therefore, at this
point, the following double prompt is displayed:

    Please RESTART!
    System shutdown.

RECONFIGURATION. The system now remains in a wait state until
it is restarted. After you restart the system, all EEPROM par-
ameters become the same as the default values stored in the
EPROM on the System Foundation Module. This means, for exam-
ple, that the configured number of cylinders and heads for each
Winchester drive have been reset to their default values of 0.
Attempting to operate the system in its default configuration
will cause various types of errors to be reported. Therefore,
the next step is to reconfigure the system to reflect its
actual physical and electrical characteristics, using the menus
in this chapter.

USING A CONFIGURATION LOG. As an aid in reconfiguring the
system, after you have installed your SMS 1000 and gone through
a complete system checkout, take some time to enter all your
system parameters on a form similar to the following sample log
of configuration settings. In this way, if you ever have to
reconfigure, the correct parameters can easily be found in one
place by reference to the log.

SAMPLE FORM

LOG OF SYSTEM CONFIGURATION SETTINGS

SYSTEM SERIAL NO. _____ MODEL NO. _____

NUMBER OF WINCHESTERS _____ WINCHESTER TYPE _____

NUMBER OF FLOPPYS _____ FLOPPY TYPE _____

STREAMER TAPE _____ CARTRIDGE WINCHESTER _____

CONFIGURATION MENU
        FLOPPY FORMAT
                F0 FMT _____
                F1 FMT _____
        BOOTSTRAP
                AUTOBOOT TIMEOUT DELAY (SEC) _____
                1ST BOOT DRV _____
                2ND BOOT DRV _____
                3RD BOOT DRV _____
                4TH BOOT DRV _____
                FIRST DU# _____
        POWER-ON/RESTART
                STARTUP MODE _____
                WINCHESTER SPINUP DELAY (SEC) _____
                CPU TYPE _____
                SYSTEM TYPE _____
        SERIAL PORTS
                SERIAL PORT A0
                        BAUD RATE (BAUD) _____
                        DATA BITS _____
                        PARITY BIT _____
                        STOP BITS _____
                SERIAL PORT A1
                        BAUD RATE (BAUD) _____
                        DATA BITS _____
                        PARITY BIT _____
                        STOP BITS _____
                CONSOLE SETTING
                        CONSOLE ENAB/DISAB _____
                        CONSOLE PORT _____
                        BREAK FUNCTION _____
                TERMINAL TYPE _____
                ONLINE DELAY (SEC) _____
        DEVICE PARAMETERS
                F0 CONFIGURATION
                        DEVICE PRESENT _____
                        SIZE STRAPPING _____
                        #HEADS _____
                        #CYLS _____

```
              TIMINGS
                      STEP (MSEC)    _____
                      SETTLE (MSEC)  _____
                      MOTOR ON       _____
         F1 CONFIGURATION
              DEVICE PRESENT   _____
              SIZE STRAPPING   _____
              #HEADS    _____
              #CYLS     _____
              TIMINGS
                      STEP (MSEC)    _____
                      SETTLE (MSEC)  _____
                      MOTOR ON       _____
         W0 CONFIGURATION
              DEVICE PRESENT   _____
              CAPACITY
                      #HEADS    _____
                      #CYLS     _____
              PHYS INTRLV  _____
              OFFSETS
                      CYL OFFSET   _____
                      HED OFFSET   _____
              PRECOMP   _____
         W1 CONFIGURATION
              DEVICE PRESENT   _____
              CAPACITY
                      #HEADS    _____
                      #CYLS     _____
              PHYS INTRLV  _____
              OFFSETS
                      CYL OFFSET   _____
                      HED OFFSET   _____
              PRECOMP   _____
         C0 CONFIGURATION
              DEVICE PRESENT   _____
              CAPACITY
                      #HEADS    _____
                      #CYLS     _____
              PHYS INTRLV  _____
              OFFSETS
                      CYL OFFSET   _____
                      HED OFFSET   _____
              PRECOMP   _____
         T0 CONFIGURATION
                      T0 ENABLE/DISABLED   _____
    ADDRESSES
         PORT VECTOR BASE
                 VECTOR=_____
         BUS ADDRESSES
                 BOOT PROM ADDR   _____
                 DU DEVICE ADDR   _____
```

```
                      PORT BASE ADDR _____
          SPECIAL
                  ACCESS LEVEL _____
                  BANNER ENABLE/DISABLE _____
                          DISPLAY DEFAULT _____
                  FAN SPEED _____
                  SHIP
                          DATE _____
                          S/N _____
                  CLOCK
                          CLOCK SPEED _____
                          CLOCK CSR _____
```

CPU TYPE COMMAND

The CPU TYPE command permits you to use a MicroVAX II quad-
width CPU card in backplane slot 1 or 2 if your SMS 1000 system
is equipped with a backplane that has specially wired C-D con-
nectors in these slots. Systems with this type of backplane
can be identified by the presence of a CAUTION label on the
left rear of flange of the cardcage supporting structure.

MENU STRUCTURE

```
    CPU TYPE
         LSI-11?         [This is the default option]
         VAX?
```

REMARKS

If you wish to use a MicroVAX II type quad-width CPU in an SMS
1000 equipped with a backplane having slot 1 and 2 C-D connec-
tors wired to accept it, then select the VAX? option.
Otherwise, select the LSI-11? option. LSI-11? is the default
option.

SYSTEM TYPE COMMAND

This command allows you to specify whether the present system
is to operate as a stand-alone system, as in the case of the
SMS 1000 Model 40; or a subsystem, as in the case of the SMS
1000 Model 41.

MENU STRUCTURE

```
        SYSTEM TYPE
             SYSTEM?          [Default for Models 40 and 50]
             SUBSYSTEM?       [Default for Model 41]
```

REMARKS

If your present system is a SMS 1000 Model 40 or 50, select the
SYSTEM? option. If your present system is a SMS 1000 Model 41,
select the SUBSYSTEM? option. NOTE: For the SMS 1000 Model 40,
the default setting is SYSTEM. For the SMS 1000 Model 41, the
default is SUBSYSTEM.

SERIAL PORTS COMMAND

The SMS 1000 provides support for two serial ports.   Although
you can use these ports to drive any serial devices, port A0 is
typically assigned to a terminal that can be used as the system
console.   Port A1 is frequently assigned to a printer or an-
other terminal. Use the SERIAL PORTS command to tell the
system the characteristics of the devices assigned to these
ports.

MENU STRUCTURE

```
SERIAL PORTS
     SERIAL PORT A0
          BAUD RATE
                BAUD=9600?       [This is the default setting]
                BAUD=19200?
                BAUD=300?
                BAUD=600?
                BAUD=1200?
                BAUD=2400?
                BAUD=4800?
          DATA BITS
                DATA BITS=7?
                DATA BITS=8?     [This is the default setting]
          PARITY BIT
                PARITY=NONE?     [This is the default setting]
                PARITY=ODD?
                PARITY=EVEN?
          STOP BITS
                STOP BITS=1?     [This is the default setting]
                STOP BITS=2?
     SERIAL PORT A1
           (same as for A0)
     CONSOLE SETTING
           CONSOLE ENAB/DISAB
```

```
                    DISABLE?            [Model 41 default setting]
                    ENABLE?             [Default for Models 40 and 50]
              CONSOLE PORT
                    CONSOLE=A0?         [This is the default setting]
                    CONSOLE=A1?
              BREAK FUNCTION
                    BREAK=NOP?
                    BREAK=HALT?         [This is the default setting]
           TERMINAL TYPE
              TERM=DUMB?
              TERM=SMART?               [This is the default setting]
           ONLINE DELAY
                 DELAY (SEC)=0
                 DELAY (SEC)=5
                 DELAY (SEC)=10         [This is the default setting]
                 DELAY (SEC)=20
                 DELAY (SEC)=30
                 DELAY (SEC)=45
                 DELAY (SEC)=90
```

REMARKS

These conventions apply to both serial port A0 and A1.

If you equip your system with a console, it must be connected
to port A0 or A1 or can be connected to the host system through
an I/O card such as the DLV11-J, or equivalent.

The BAUD RATE, DATA BITS, PARITY BIT, and STOP BITS subcommands
allow you to enter the information the controller needs to con-
trol the devices connected to these ports. These values must
be set according to the requirements of the peripheral device.
The owner's manual for the terminal should contain these speci-
fications.

If port A0 or A1 is to be used for console operation, you must
enter the information required by the CONSOLE SETTING commands.

The CONSOLE ENABLE/DISABLE subcommand enables or disables the
console. Disabling the console will cause the system to change
the port vector from 60 to the next vector not used by the
other port.   For example, if port A1 uses VECTOR=300, then
disabling port A0 as the console will change the A1 assignment
to VECTOR=310.   See the discussion of PORT VECTOR BASE under
the ADDRESSES command.

CONSOLE PORT identifies the port to which the console is con-
nected.   Port A0 must be selected as the console port if you
are to use a terminal for communication with SENSE.

The BREAK subcommand specifies the function of the BREAK key on a video console. The BREAK key can be set to NOP (no operation),or HALT. If the keyboard design positions the break key where it may be pressed accidentally, NOP is recommended. The break key is commonly assigned the HALT option in DEC systems, and this option is recommended when compatibility with DEC systems is desired.

TERMINAL TYPE identifies the type of terminal used for communication with SENSE. SMART terminals must be able to emulate a VT-100 or equivalent. DUMB terminals, such as a printer with a keyboard, have no local intelligence.

ONLINE DELAY. If, during the start-up sequence, you select SENSE operation, a further delay occurs at the end of the Winchester spinup period. The purpose of the delay is to allow the user time to decide whether to operate SENSE from the video display terminal or the system front panel. The length of the delay is configurable from 0 to 90 seconds by use of the ONLINE DELAY command. During this delay period, the following message is displayed on the video terminal:

    HIT ANY KEY WITHIN TIME LIMIT

Hitting any key will select the terminal as the device for communicating with SENSE. During the same period, the following message is displayed on the front panel:

    VDU prompting

If you press the MENU button on the front panel during the delay period, then the front panel is selected instead of the terminal.

DEVICE PARAMETERS COMMAND

The DEVICE PARAMETERS menus permit you to enter, change or examine the disk-drive parameters that are currently configured into your system and used by the disk controller in the Foundation Module.

FO CONFIGURATION SUBCOMMAND MENU STRUCTURE

        DEVICE PARAMETERS
            FO CONFIGURATION
                DEVICE PRESENT
                    DISABLE?
                    ENABLE?
                SIZE STRAPPING

```
                        SIZE=5"?
                        SIZE=8"?          [This is the default setting]
                CAPACITY
                        #HEADS
                                #HEADS=    [Default is 0]
                        #CYLS
                                #CYLS=     [Default is 77]
                TIMINGS
                        STEP (MSEC)
                                STEP=      [Default is 3]
                        SETTLE (MSEC)
                                SETTLE=    [Default is 15]
                        MOTOR ON (MSEC)
                                MOTOR ON=  [Default is 700]

        F1 CONFIGURATION
                (same as fo F0)
```

REMARKS

These remarks apply equally to F0 and F1.

SIZE STRAPPING specifies whether the drive is for 8" or 5-1/4"
floppies.

The #HEADS= and #CYLS= commands request the number of heads and
cylinders available on the disk drive.

The TIMINGS subcommands request you to enter information pertain-
ing to your particular floppy drives.   This information is
normally available in the drive manufacturer's literature.   Do
not attempt to use these commands without the proper information.
Notice that some manufacturers use the term "ring time" instead
of "settle time."

DEFAULTS. Drive strapping for an 8" floppy implies the following
configuration defaults:

    1. /FDSD drive signal enabled when #HEADS=0. This is
        overridden when #HEADS is greater than 0.
    2. Buffered seek = enabled.
    3. Precomp is always enabled.
    4. Number of cylinders = 77.
    5. Bytes per sector = 256.
    6. Format = RX02.
    7. #HEADS=0.

Drive strapping for a 5 1/4" floppy drive implies the following
configuration defaults:

1. Stepping = single.
2. /FDSD signal always disabled.
3. Bufferd seek = disabled.
4. Precomp is always enabled.
5. Number of cylinders = 80.
5. Bytes per sector = 512.
7. Format = DEC PC.
8. #HEADS=1.

W0 CONFIGURATION SUBCOMMAND

This subcommand, which is a continuation of the DEVICE PARAMETERS command, invokes a menu of commands used to define Winchester disk drive parameters for the disk controller.

W0 SUBCOMMAND MENU STRUCTURE

```
DEVICE PARAMETERS
    W0 CONFIGURATION
        DEVICE PRESENT?
            DISABLE?
            ENABLE?
        CAPACITY
            #HEADS
                #HEADS=     [Default is 0]
            #CYLS
                #CYLS=      [Default is 0]
        PHYS INTRLV
            INTRLV=     [Default is 1]
        OFFSETS
            CYL OFFSET
                CYL OFF=  [Default is 1]
            HEAD OFFSET
                HEAD OFF= [Default is 4]
        PRECOMP
            DISABLE?
            ENABLE?             [This is the default setting]

    W1 CONFIGURATION
        (same as for W0)

    C0 CONFIGURATION
        (same as for W0)

    T0 CONFIGURATION
        DEVICE PRESENT?
            DISABLE?        [This is the default setting]
            ENABLE?
```

REMARKS

These remarks apply to W0, W1 and C0.

IMPORTANT: If your system is configured with a removable-cartridge type Winchester drive (C0) in addition to a fixed-disk Winchester drive, the cartridge drive is designated as C0 and the fixed-disk drive must be designated as W0. The fixed-disk drive is, of course, also designated as W0 if it is the only Winchester drive in the system.

The DEVICE PRESENT command is used to take a drive off-line from the controller when it must be removed from the system for repairs. Respond DISABLE only if the drive is removed or is not to be accessed.

The #HEADS command specifies the number of heads provided by the drive. Obtain this information from Table B-1 of Appendix B.

The #CYLS command designates the highest cylinder number provided by the drive. Obtain cylinder-number information from Table B-1 of Appendix B.

INTRLV= specifies an interleave factor that controls the physical layout of sectors on the disk. The interleave factor can range from one (no interleave) through the maximum number of sectors per track. The SMS 1000 does not require interleaving, so a factor of one is recommended.

CYLINDER and HEAD offsets attempt to improve disk access time. These values may range from one through the maximum number of sectors per track. The SMS as-shipped defaults are one for cylinder offset and four for head offset. Depending upon the make, model and special characteristics of the Winchester drives in your system, careful experimentation with these values may improve access times. As a basis for experimentation, a typical optimized head-offset value is two.

PRECOMP should be enabled only if so indicated in Table B-1 of Appendix B for the drive in question. Precompensation is a recording technique used to make a signal easier to read. With ferrite media, and to a much smaller extent with plated media, the process of reading tends to exaggerate the spacing between adjacent bits. This is known as bit shift and needs to be compensated for only on the inner tracks of a platter. Precompensation causes bits to be written closer together so that they can be read back with the correct spacing between them. When PRECOMP=ENABLE is selected, the starting cylinder for precompensation is ((MAX CYL#)/2).

ADDRESSES COMMAND

The ADDRESSES command allows you to modify the interrupt vector addresses for the console, boot prom, controller, and the port base address.

MENU STRUCTURE

```
ADDRESSES
    PORT VECTOR BASE
            VECTOR=300    [This is the default setting]
            VECTOR=310
            VECTOR=320
            VECTOR=330
            VECTOR=340
            VECTOR=370
            VECTOR=270
    BUS ADDRESSES
        BOOT PROM ADDR
            DISABLE?
            17775000?
            17766000?     [Model 41 default setting]
            17773000?     [Default for Models 40 and 50]
        DU DEVICE ADDR
            17772150?     [Default for Models 40 and 50]
            17760334?     [Model 41 default setting]
            17760340?
            17760344?
            17760350?
            17760354?
            17772154?
        PORT BASE ADDR
            DISABLE?      [Model 41 default setting]
            17776500?     [Default for Models 40 and 50]
            17776540?
            17776600?
```

REMARKS

PORT VECTOR BASE assigns vector addresses to serial ports according to DLV11-J conventions. If the console is not selected, the vector for Port A1 will be the vector for Port A0 plus 10 (octal). If the console is enabled, the vector for the console will always be octal 60, and the vector for the other port will always be the port vector base address. For example, if the console is not selected, and the port vector base address is 300, then the vector for Port A0 is 300 (octal), and the vector for Port A1 is 310. Now, if Port A0 is selected as the console, the

vector for Port A0 is changed to 60, and the vector for Port A1 is changed to 300.

Serial ports A0 and A1 must have different interrupt vector addresses when both ports are used. Be careful to avoid duplicating interrupt vectors for any other devices included in the configuration. Notice that a port vector implies both the transmit and receive vector pair.

Initially, the first address (after DISABLE) displayed by a command is the one commonly used; remaining addresses are all the supported alternate addresses. If you select one of these addresses, you must pick an address not already in use by some other device such as a DL, DZ, or DU device. After you use this command to select an address, the system displays the address currently in effect first.

DISABLE indicates that the device is not used or is disabled. For the BOOT PROM, the DISABLE option applies to systems equipped with an LSI-11/23 Plus CPU or other boards that have on-board boot proms that use the same address as the boot prom on the System Foundation Module (SFM). Remember that the LSI-11 CPU will always attempt to boot from location 17773000. Therefore, the SFM boot prom's default address is 17773000. Also, If your system has two boot proms with the same address, you can either disable the boot prom on the System Foundation Module or the other board, or you can assign a different address to the SFM boot prom in order to have the option of booting the other device as well.

SPECIAL COMMAND

The SPECIAL commands enable the configuration of miscellaneous parameters and operating features. These pertain to entering passwords that limit access to various classes of users; setting of the system clock; fan speed; etc.

MENU STRUCTURE

```
    SPECIAL
        ACCESS LEVEL
            USER?
            SYS MGR?
                PWkey=
                New PWkey=
            TECH?
                PWkey=
                New PWkey=
```

```
BANNER
      DISABLE?
      ENABLE?              [This is the default setting]
            NewBanner=     [up to 16 characters]
FAN SPEED
      LOW?
      MED?                 [This is the default setting]
SHIP                       [Not displayed on front panel]
      DATE=
      S/N=
CLOCK
      CLOCK SPEED
            SPEED=60       [This is the default setting]
            CLOCK OFF
            SPEED=50
            SPEED=800?
      CLOCK CSR
            DISABLE?       [This is the default setting]
            ENABLE?
```

REMARKS

ACCESS LEVEL. The ACCESS LEVEL feature of SENSE restricts access to its menus to three levels or classes of users. These levels are:

1. Technician level (TECH). This level of access is primarily for technicians and other field support personnel and gives you access to the complete system. A special password having a value between 0 and 65535 must be entered using the TECH? command (see ACCESS LEVEL menus above) in order to gain this access level. Thus, at the TECH access level, you can gain entry to all the menus of SENSE. The system's as-shipped default value is the TECH access level.

2. System Manager level (SYS MGR). This level of access is for personnel such as system managers, who may require access to all commands except those that are either highly specialized or are primarily maintenance oriented. A special password having a value between 0 and 65535 (decimal) must be entered using the SYS MGR? command (see ACCESS LEVEL menus) in order to be granted the SYS MGR access level.

3. User level (USER). This level gives the user access to a subset of the commands available at the above two levels. As the name implies, these commands include all those required in normal day-to-day use. No password is required for access to the commands at this level.

ASSIGNING PASSWORDS. A password is assigned by entering a numeric value between 0 and 65535 (decimal) in response to the command "PWkey=" in the SYS MGR? and TECH? menus. As shipped from SMS, a default value of 0 is assigned to these two "PWkey=" fields. This means that the system will operate at the TECH level in its as-received condition. To change a password, proceed as follows:

1. In response to the query "PWkey=", supply your existing password or, if there is none, the default value of 0.

2. The query "NewPWkey=" now appears. In response, supply your new password. This password will now give you access at the corresponding level.

SPECIAL ACCESS. In certain cases, you may require access to special-purpose test and evaluation firmware not part of the normal SENSE menu system. Access to this firmware is restricted to field support personnel and a special password is required in order to use it. To obtain more information about this access level, contact your SMS representative.

COMPLETE LISTING OF ACCESS LEVELS. Appendix A of this manual contains a summary of all the commands that make up the SENSE menus. Listed next to each command is its access level expressed as TECH, SYS MGR or ALL (for USER level).

BANNER COMMAND. The function of the BANNER command is to enable you to control what is displayed on the front-panel 16-character display while this panel is not being used by SENSE. Note that enabling or disabling the banner can be done from the front panel, but entering a new banner must be done from your video terminal. You have three choices as to what is displayed:

1. COMPACT STATUS DISPLAY. To display a summary of current system status (see SYSTEM command under STATUS menus) press Return in response to the menu query "DISABLE?" (under the BANNER command).

2. USER-SELECTED BANNER. To enter a banner (or "logo") for display, first press the space bar in response to the query "DISABLE?". Then respond affirmatively to the query "ENABLE?" by pressing Return. To the query "NewBanner=" respond with a banner of up to 16 characters and then press return again.

3. DEFAULT BANNER. The system is shipped with the default banner "SMS 1000" installed. To display this banner, first press the space bar in response to the query "DISABLE?". Then respond affirmatively to the query "ENABLE?" by pressing return. Finally, when "NewBanner=" appears, press Return without making any other entry. NOTE: Once a user-generated banner has been

entered, it writes over the default banner in EEPROM.   If you
want to return to the default banner, it must be entered as in
Step 2 above.

FAN SPEED. The speed of the system's cooling fans can be set by
this command or by installing jumpers on the backplane. The
backplane jumpers set the fans to the highest speed and should
be used for maximum cooling.

When the backplane jumpers are not installed, the FAN SPEED com-
mand controls the fans. The LOW speed reduces fan noise, but
should be used in areas with controlled temperatures such as an
air conditioned office. Otherwise, use the MED speed.

SHIP. Use this command to enter the shipment date and serial
number of your system. If you elect to alter this information,
you are prompted for a character string specifying date and
serial number (S/N) of your SMS 1000.

CLOCK. The default parameters for this command are CLOCK SPEED =
60 and CLOCK CSR = DISABLED.

SECTION 10

MAINTENANCE

PREVENTIVE MAINTENANCE

The SMS 1000 has been designed to require a minimum of main tenance, both preventive and corrective. Under normal circumstances, continuous, dependable service should result if floppy disk maintenance is performed regularly. Instructions for this procedure are given in the following paragraph.

FLOPPY-DISK MAINTENANCE

1. SCHEDULE. The read-write heads of a drive may need to be cleaned only if read or write errors occur with any consistency or regularity. In any case, in the event of consistently occurring read/write errors, you should clean the heads before assuming that anything more serious is the problem. Note, however, that excessive zeal is not warranted, as cleaning the heads too often can wear them out.

2. MATERIALS. Heads should be cleaned only with the drive manufacturer's approved cleaning kit and while precisely following the manufacturer's instructions.

3. IMPORTANT. Never attempt to lubricate any part of a drive or the media. Lubricants are a magnet for dust and dirt, the greatest enemy of the diskette and drive.

4. DISKETTE PROTECTION. The diskette is a remarkably rugged storage medium, but it is far from indestructible. Protect diskettes from magnetic fields such as those from hi-fi speakers, electrical appliances, etc. Diskettes should always be stored in their protective envelopes. Never touch the recording surface of a diskette. Fingerprints leave traces of body oils that are detrimental to both the diskette and the read/write heads.

TROUBLESHOOTING

To be supplied.

POWER SUPPLY FUSE REPLACEMENT

There is only a single user-replaceable fuse in the power supply. __CAUTION: before replacing any fuse, always be sure that the problem that caused the fuse to blow has been corrected.__ To replace the fuse, proceed as follows:

1. Turn off the system a-c switch (on the rear panel) and then remove all a-c input power by unplugging the power cord from its receptacle.

DANGER

Potentially lethal voltages can be
encountered in the power supply for
as long as two minutes after a-c power
is removed from it. Therefore, wait
at least two minutes after removing
power before working on it.

2. Using a small screwdriver, carefully pry open the door of the fuse- and voltage-select compartment on the rear of the enclosure. There is a slot for prying open the door, at its left edge. Be careful not to disturb the voltage-selection cam at the left side of the compartment. See Figure 1-6.

3. Using a small screwdriver, carefully pry out the white plastic fuse holder from the fuse compartment.

4. Replace the defective fuse in the fuse holder with a Buss type ABC (ceramic body), or equivalent, rated at 3 amps if the system is operating at 230 volts, or 6 amps if the system operates at 115 volts.

CAUTION

Replace a blown fuse only if you have
found and corrected the fault that
caused it to blow. Be sure to re-
install only a correct-amperage fuse
corresponding to the supply voltage in
use. Too large a fuse will provide ina-

dequate protection. Too small a fuse
may fail unnecessarily.

5. Replace the fuse holder in the fuse compartment,
making sure that the arrow on the front of the fuse
holder points up. Then press in the fuse holder all
the way to the end of its travel.

6. Close the fuse-compartment door, making sure that,
after .it is closed, the correct a-c operating voltage
shows through the opening in the door.

7. Replace the a-c power cord in its receptacle.

SMS 1000 DISASSEMBLY SEQUENCE

Follow the disassembly sequence given here when it is neces-
sary to remove or replace a component of the SMS 1000
system. Proceed as follows:

1. Unless otherwise specified, the disassembly instruc-
tions given here apply equally to rack-mount,
floor-mount and table-mount models of the SMS 1000 .
Also, note that reassembly is essentially the reverse
of disassembly.

2. RACK-MOUNTED UNITS. If the unit to be disassembled
is rack mounted, first remove it from its rack by
extending the slides until they catch, pressing down on
the innermost slide-release levers, and then pulling
the unit forward. Place the unit on a bench for disas-
sembly. Because of the size and weight of the unit,
two people should be used for this operation.

3. SIDE PANELS (Floor-mount and table-mount models).
Remove the three captive slot-headed screws at the top
of each panel. Each panel can now be lifted free from
the pedestal. See Figure 10-1. After removing the
side panels, place the unit on a bench for disassembly.
NOTE: In the case of table-mount models, first fully
loosen the four captive slot-headed screws that can be
reached through access holes at the lower edges of the
sides of the system cover. The cover can then be remo-
ved.

4. FRONT PANEL. Remove the front panel by grasping it
firmly and pulling it away from the case. See Figure
10-2. Now disconnect the ribbon-cable connector and

the five-pin d-c power-switch connector from the front edge of the foundation module. Remove the two safety wires holding the front panel by rotating their fasteners a quarter turn.

5. REAR PANEL. As shown in Figure 10-3, remove the rear panel by rotating its four captive fasteners by hand one quarter turn. Remove the ribbon connector from the rear panel and then remove the two safety wires by rotating their fasteners a quarter turn.

6. TOP COVER (FRONT). Loosen the six captive quarter-turn fasteners holding this cover over the peripheral units. The cover can now be lifted free. See Figure 10-4.

7. CONNECTORS ON FOUNDATION MODULE. Remove all the ribbon-cable connectors from the inner (i.e. rear) edge of the foundation module (next to the backplane), as shown in Figure 10-5.

8. FOUNDATION MODULE. The foundation module can now be removed by rotating the two plastic holders at its front corners and then pulling the module directly out the front of the unit. See Figure 10-6.

9. POWER SUPPLY. Loosen the two captive quarter-turn fasteners that hold the power supply to the sides of the case. The power supply can then be removed by grasping its handle and pulling directly to the rear. See Figure 10-7.

10. 8-INCH FLOPPY DRIVE. Disconnect the drive's five-wire power connector from the backplane and its ribbon-type signal cable from connector J106 on the foundation module. Unfasten the two captive screws holding the left side of the drive to the case. Now push the drive toward the rear of the case and lift up. The drive is now removed. See Figure 10-8.

11. SINGLE 5-1/4-INCH FLOPPY DRIVE. Disconnect the drive's four-wire power connector from the backplane and its signal cable from the foundation module. Unfasten the two captive screws holding the left side of the drive to the case. Now push the drive toward the rear of the case and lift up. The drive is now removed. See Figure 10-9.

12. DUAL 5-1/4-INCH FLOPPY DRIVES. Unplug the power connectors for these drives from the backplane and the signal cables from the foundation module. As shown in

Figure 10-10, unfasten the four captive screws that are
on the plate holding the upper drive. This drive can
now be removed. Next, remove the two captive screws
holding the left side of the lower drive and slide the
drive toward the rear of the case. The lower drive can
now be lifted up and removed.

13. SINGLE WINCHESTER DRIVE. Disconnect the drive's
power connector from the backplane and its signal
cables from the foundation module. As shown in Figure
10-11, release the two captive screws that attach the
plate on which the drive is mounted, and push the drive
toward the rear of the cabinet. The drive can now be
lifted up and removed.

14. DUAL WINCHESTER DRIVES. First, disconnect the power
connectors of the two drives from the backplane, and
their signal cables from the foundation module. In the
double Winchester configuration, both drives are moun-
ted on a single removable mounting plate. To remove
this plate, release the two captive screws at the front
edge of the cabinet (see Figure 10-12) and then pull
the mounting plate as far as it will go toward the
front. The two drives can now be lifted up and remo-
ved.

15. BACKPLANE. To remove the backplane: the back panel,
the cover over the disk-drive compartment, the power
supply, the foundation-module connectors, and the
foundation module itself must all first be removed, as
previously described. Next, all four power connectors
at the rear of the backplane (i.e. J13, J14, J15,and
J16) must be disconnected. Also, on the backplane,
remove the connections from J8 (20-pin connector), the
two connectors going to the fans (J11 and J12), and the
single-pin ground connector E21. See Figure 10-5 for
these locations.

16. Now, as shown in Figure 10-4, release the six quar-
ter-turn fasteners that hold the backplane mounting
panel to the chassis. The backplane with its accom-
panying card cage and modules can then be lifted free.
Any module can be removed from the card cage by simply
grasping the plastic grip at the top of the card and
pulling it directly away from the backplane.

17. PEDESTAL (Floor-mounted systems). The pedestal
attaches to the chassis with four 10-32 screws, as
shown in Figure 10-13. Note that the two pedestal
halves are held together by metal braces at each end.
Therefore the pedestal should be removed as a single

unit. From the bottom side of the pedestal, using a
long-shank screwdriver, remove each of the four 10-32
screws. The pedestal can now be removed.

18. REASSEMBLY. Reassembly is the reverse of disassem-
bly.

INTERCONNECTION WIRING DIAGRAMS

Figures 10-14 through 10-21 show the interconnection of
SMS 1000 system components for a wide range of peri-
pheral combinations. Note that all connecting cables
between components of the system are identified by
their SMS part numbers. For major system-component
part numbers, refer to Appendix C.
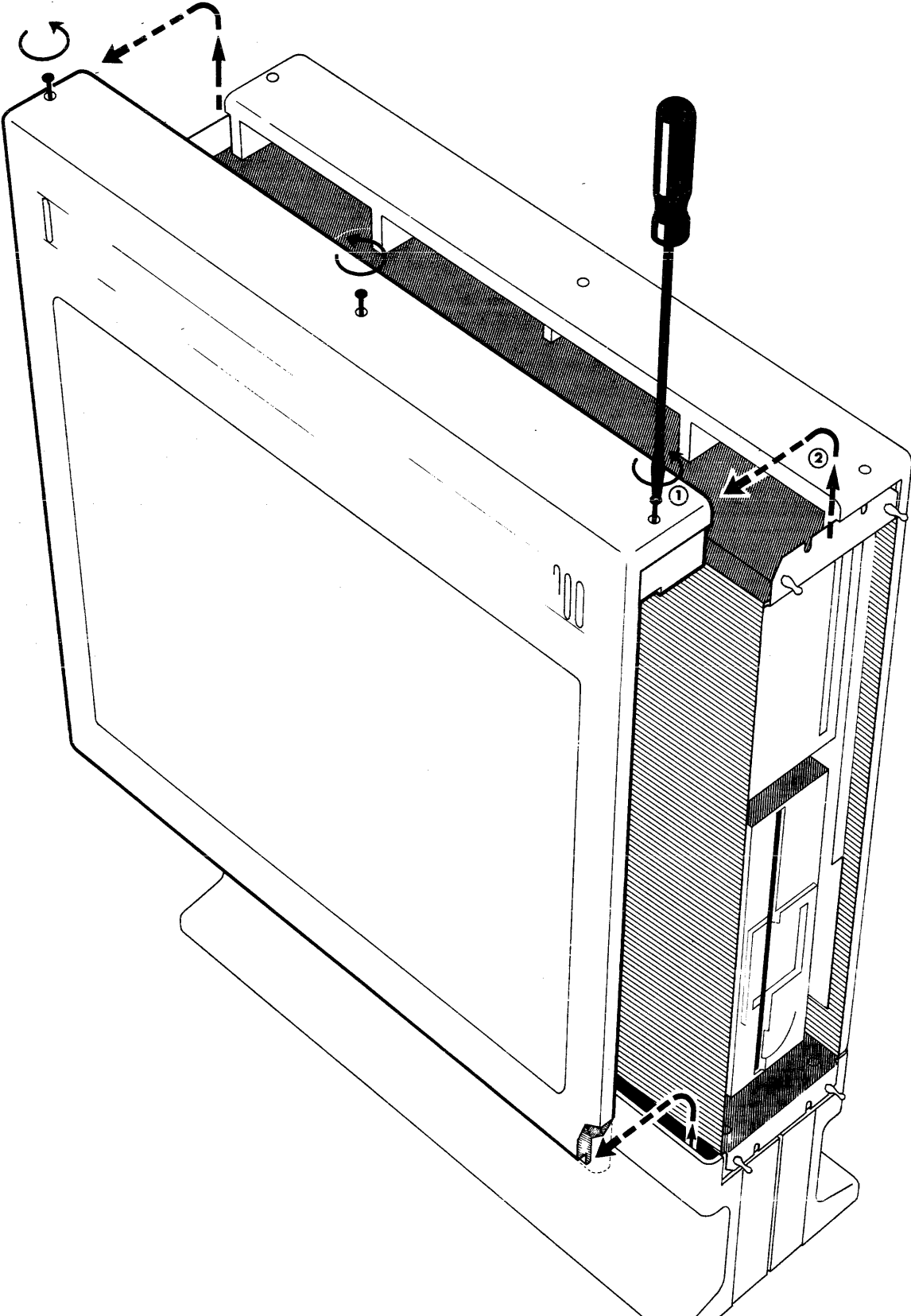
Fig. 10-1   Removal of side panels

FOUNDATION MODULE

20-WIRE CABLE TO
SUPPORT MONITOR SUBSYSTEM
CONTROLS AND INDICATOR
(FROM FOUNDATION MODULE)

5-WIRE CABLE TO
DC ON/OFF SWITCH
(TO FOUNDATION MODULE)

SAFETY
WIRES
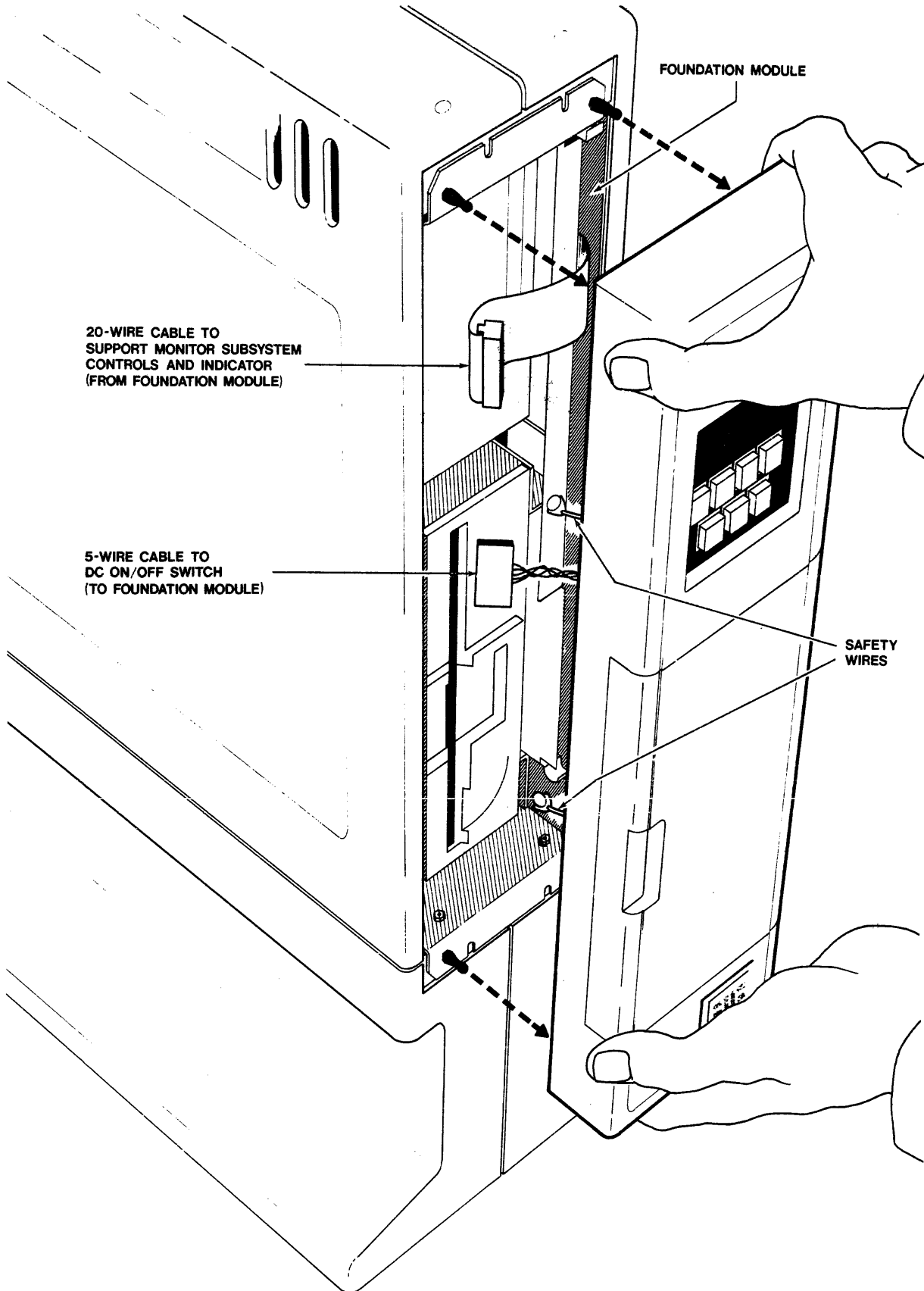
Fig. 10-2   Removal of front panel

POWER SUPPLY

TO REAR OF
EXTERNAL
CONNECTOR

EXPANSION OPENINGS

EXTERNAL CONNECTOR
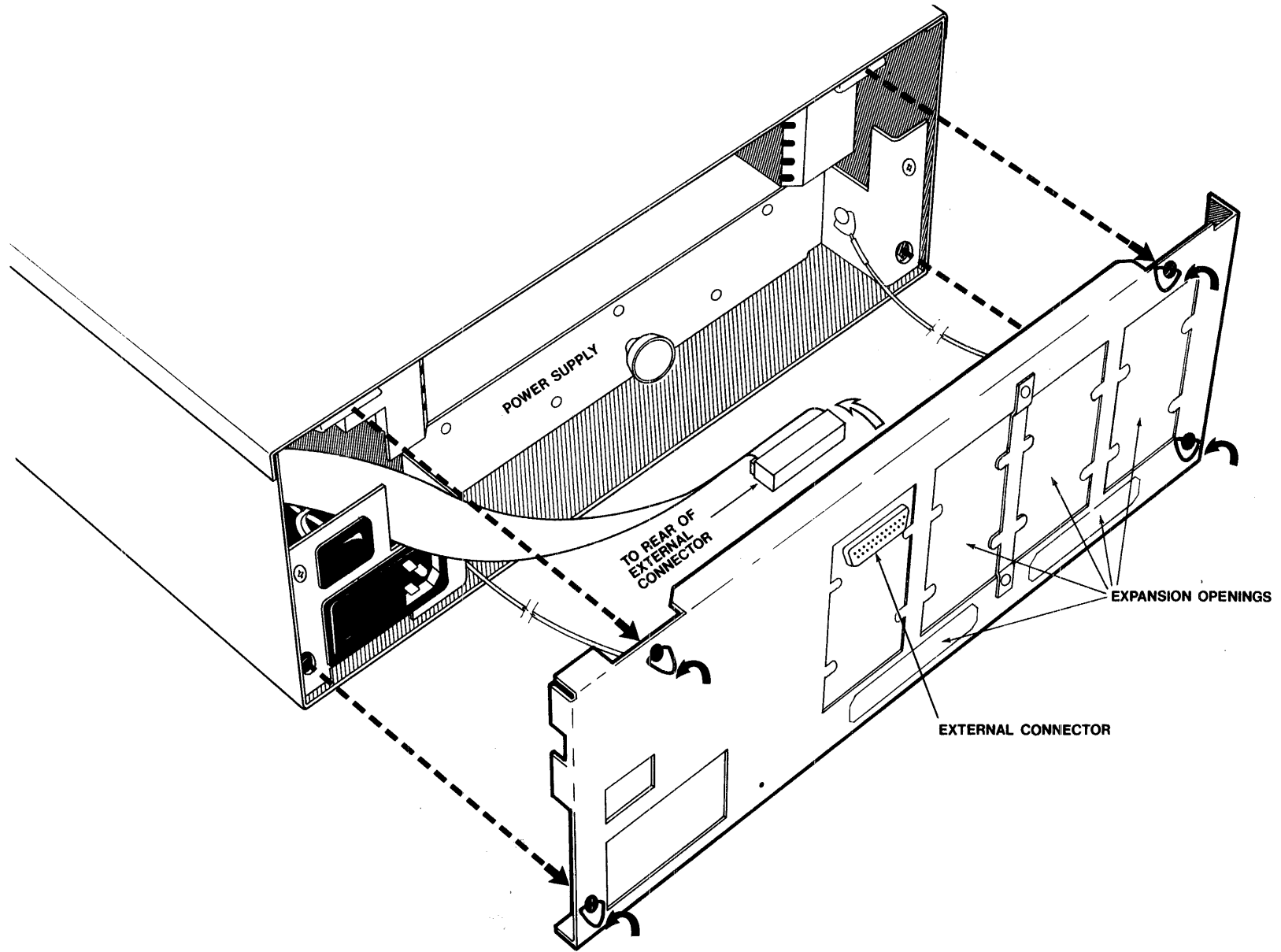
Fig. 10-3   Removal of rear panel

BACKPLANE AND CARDCAGE
ATTACHED TO THIS PANEL
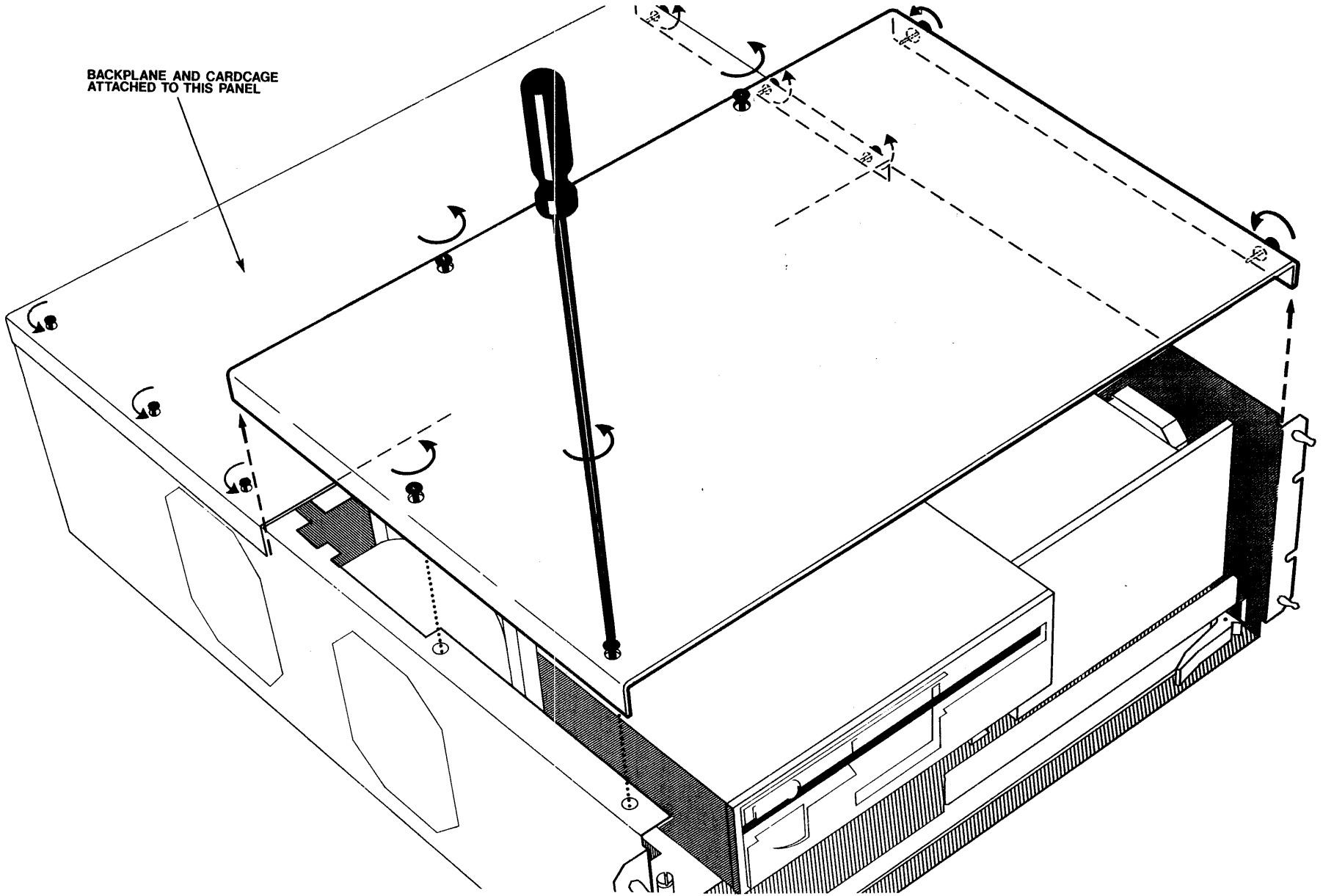
Fig. 10-4   Removal of cover over peripherals

**FRONT VIEW
OF BACKPLANE**

**REAR VIEW
OF BACKPLANE**

NOTE:
CORRESPONDING PINS OF
J13, J14, J15 AND J16 ARE
ALL CONNECTED IN
PARALLEL.

TO COOLING FANS

J11
J12
J1D

BACKPLANE CONNECTORS

J1C

J1B

J111

DC POWER TO ANY PERIPHERAL

FOUNDATION MODULE
CONNECTORS

J1A

W1 W2 W3 W4

J1A
J2A
J3A
J4A
J5A
J6A

USER-SELECTED
BACKPLANE MODULE

J105

TO 5¼" DISKETTE
DRIVES Ø AND 1

J106

TO 8" DISKETTE DRIVE

J14

J13

E21

J16

J15

J9

POWER SUPPLY
CONNECTOR

J108

J107

WINCHESTER 1 DATA LINES

WINCHESTER Ø DATA LINES
(FIXED-DISK OR CARTRIDGE TYPE)

J110

J7

J104

WINCHESTER Ø AND 1 CONTROL SIGNALS
(FIXED-DISK OR CARTRIDGE TYPE)

J109

J8

P9

TO 5¼" STREAMING TAPE DRIVE

TO BACK PANEL RS-232 PORTS

TO CARDCAGE TEMPERATURE SENSOR

FOUNDATION MODULE

POWER SUPPLY BOARD

Fig. 10-5   Backplane and foundation module connectors
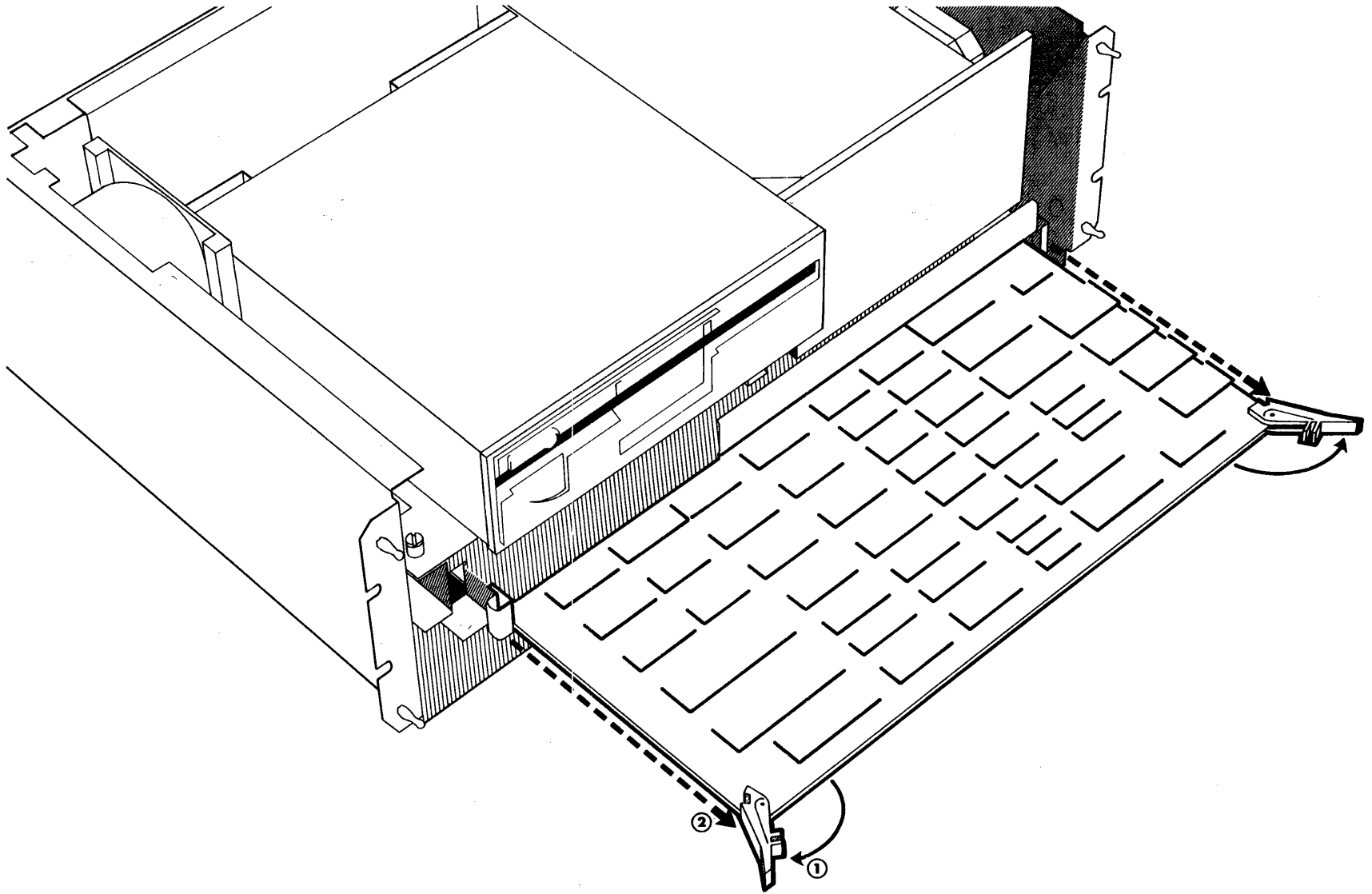
Fig. 10-6   Removal of foundation module
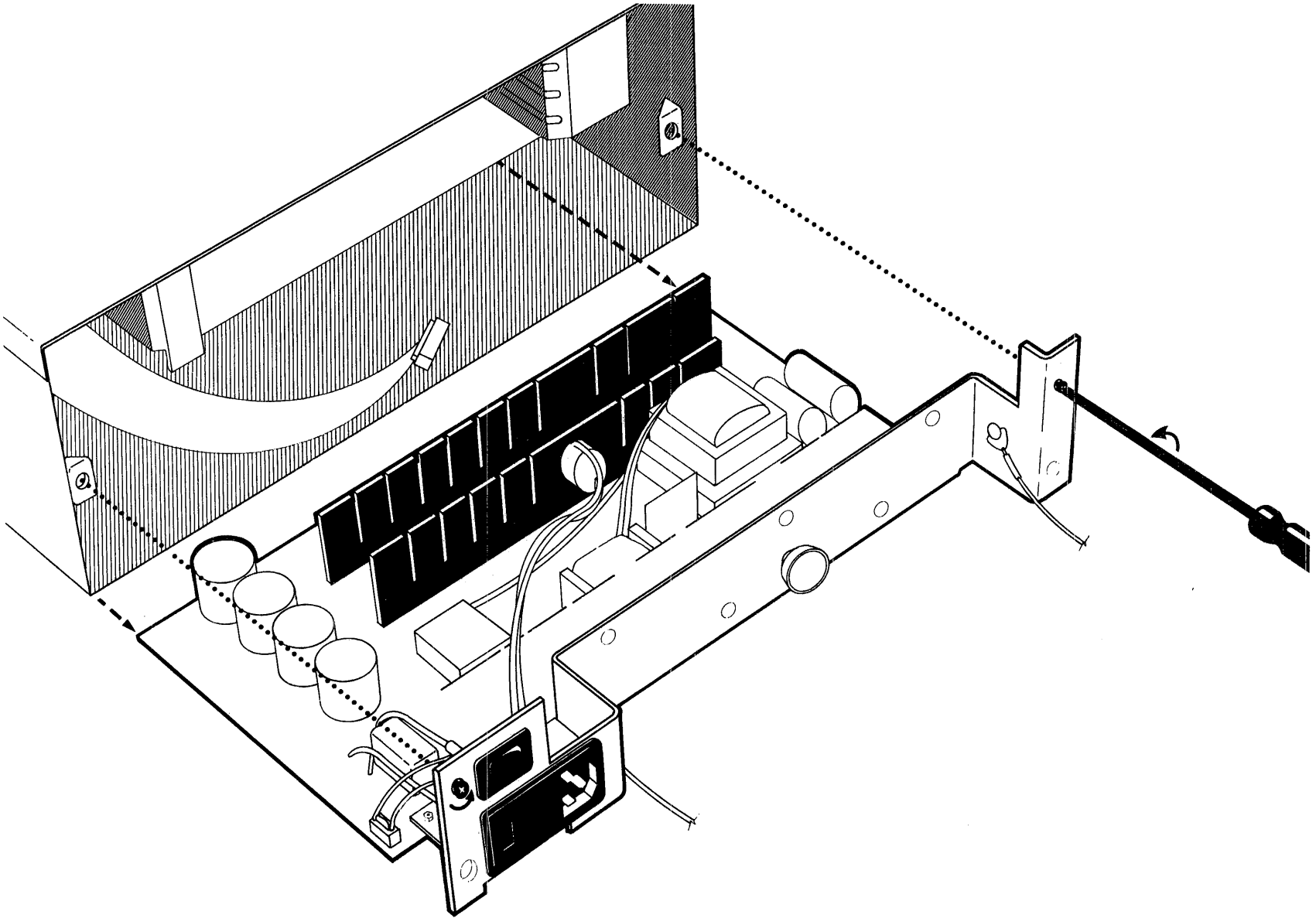
Fig. 10-7   Removal of power supply
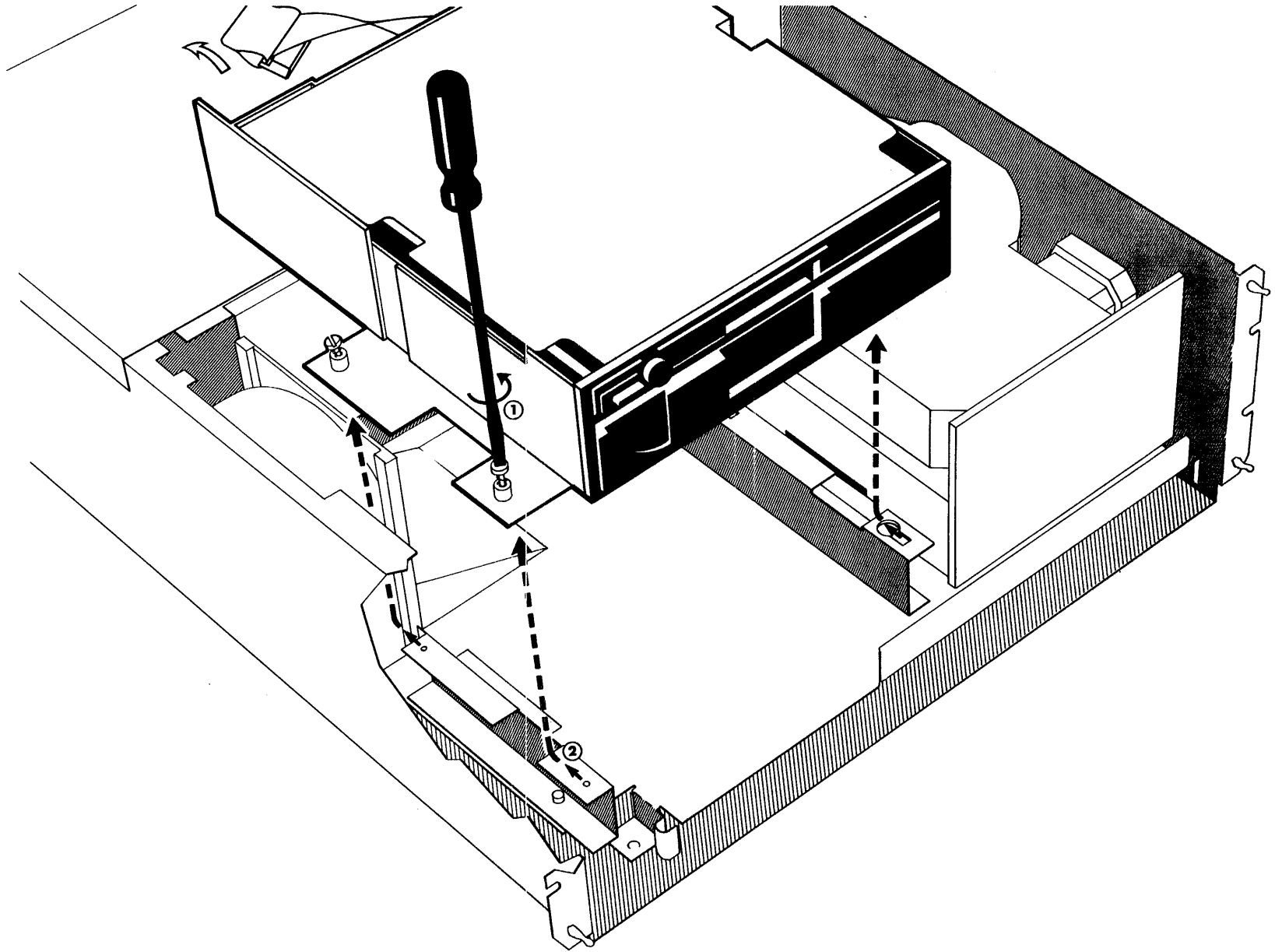
Fig. 10-8   Removal of 8-inch floppy
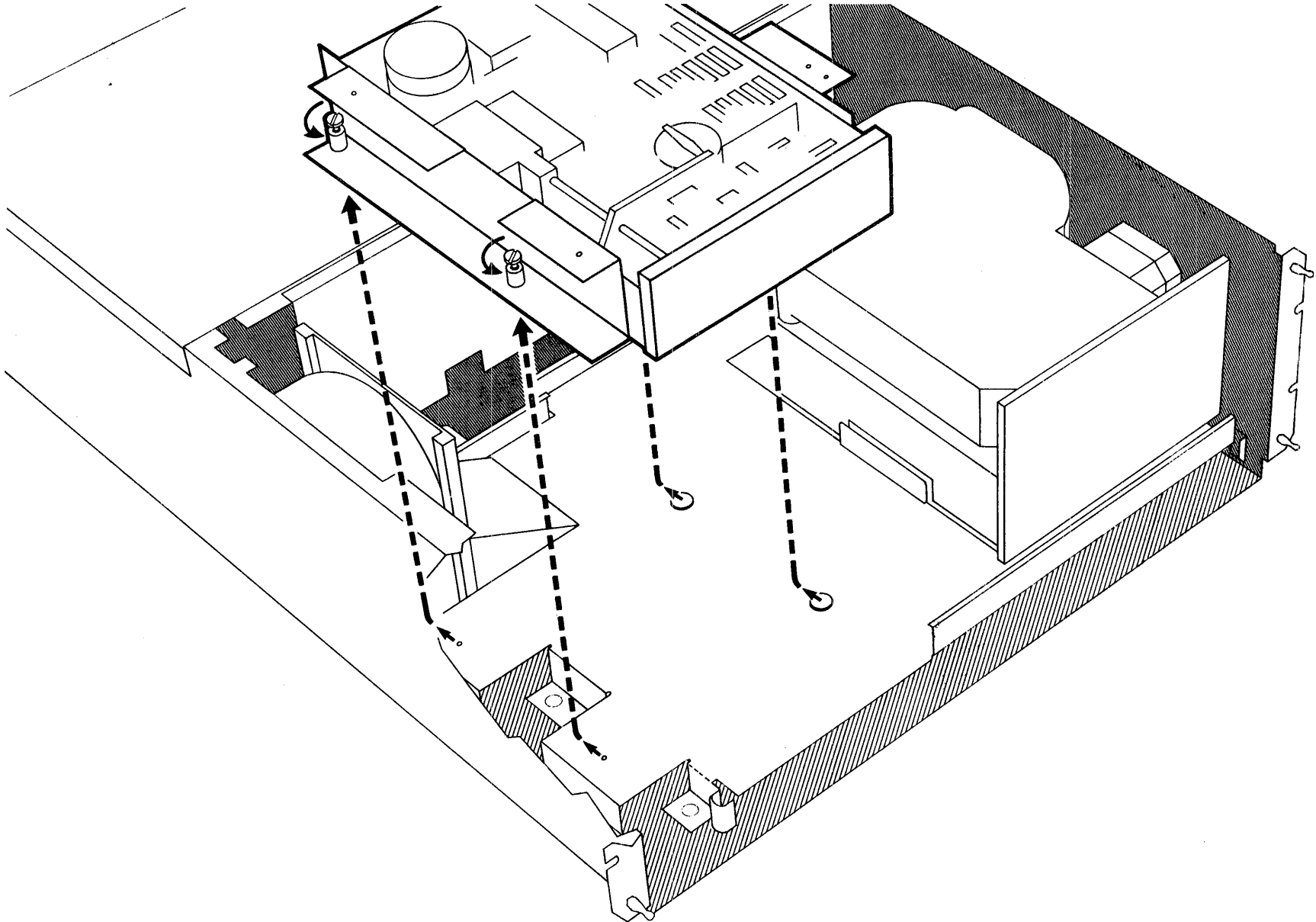
Fig. 10-9   Removal of single 5-1/4-inch floppy
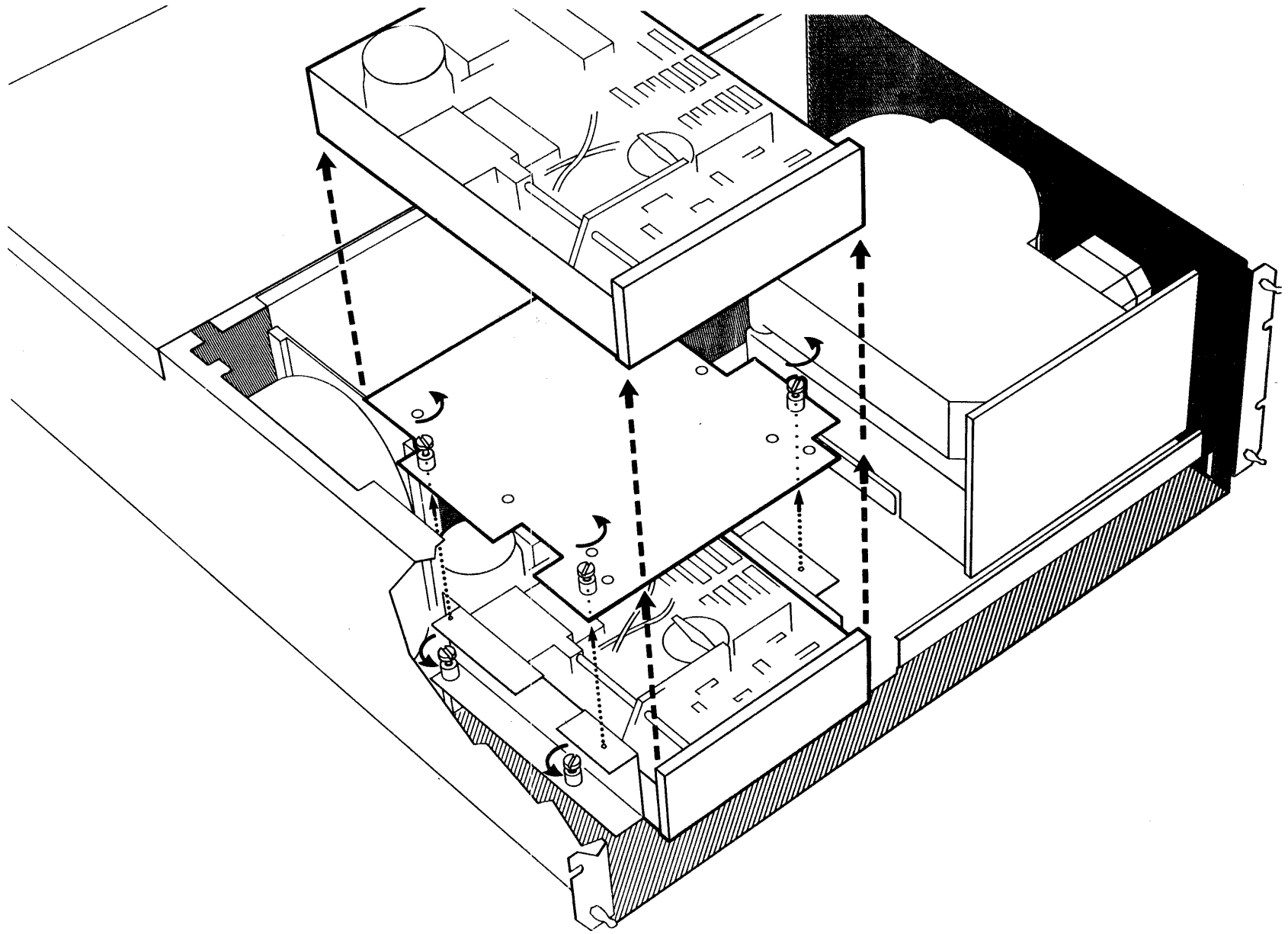
Fig. 10-10 Removal of dual 5-1/4-inch floppy drives
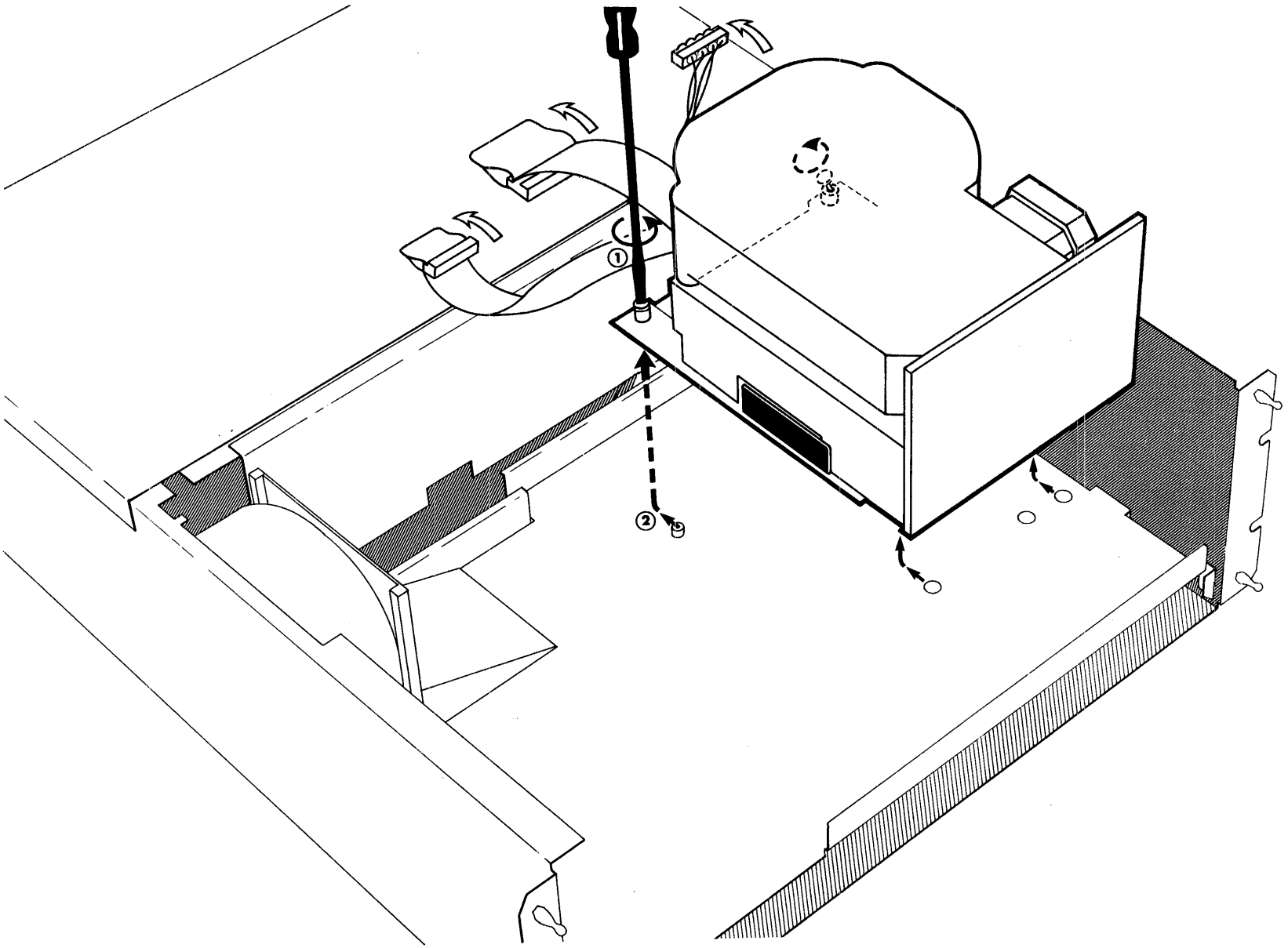
Fig. 10-11   Removal of single Winchester drive

MOUNTING SCREWS
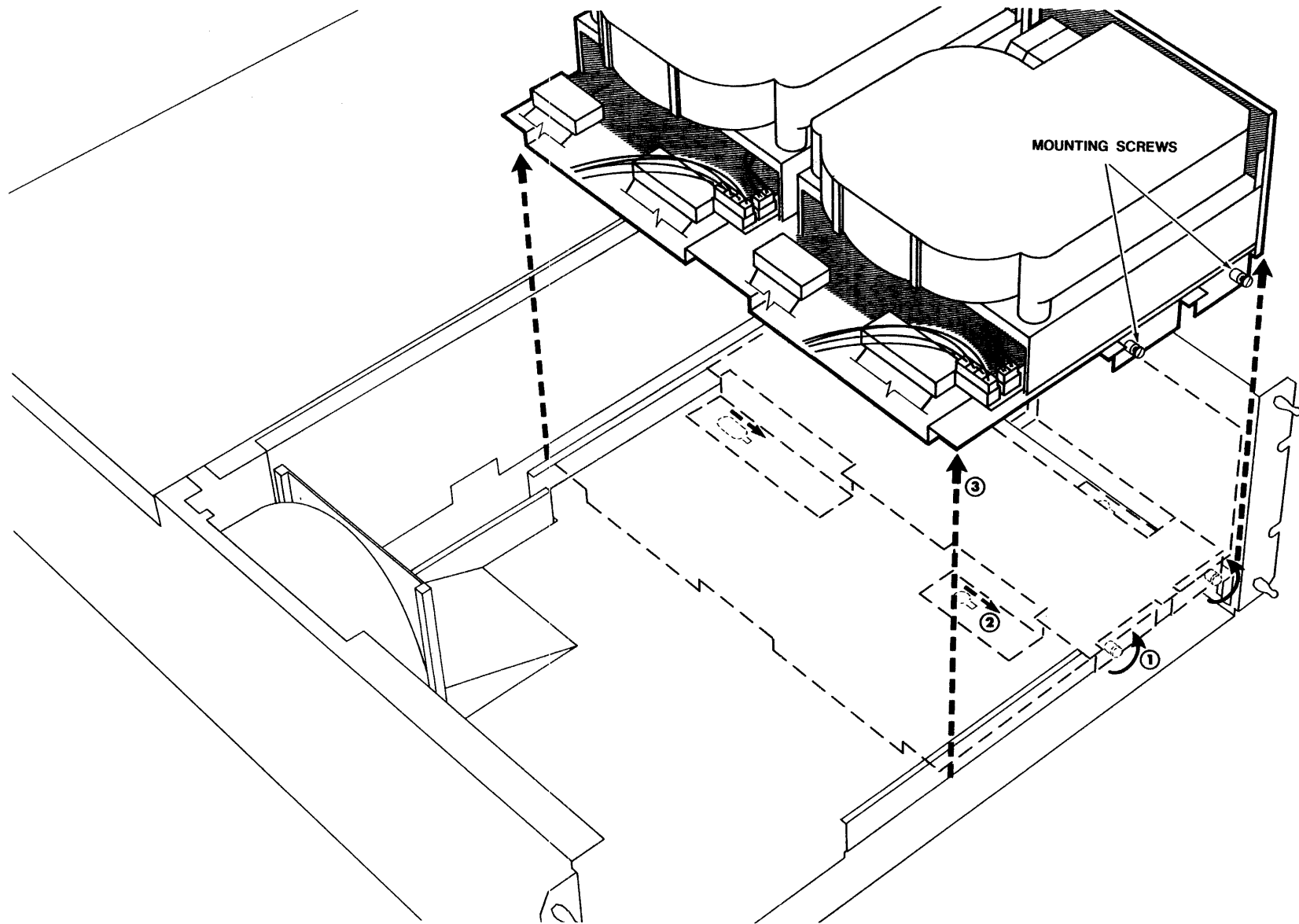
Fig. 10-12   Removal of dual Winchester drives

10-32 CAPTIVE NUTS

10-32 BOLTS
(ACCESS IS FROM UNDERNEATH)
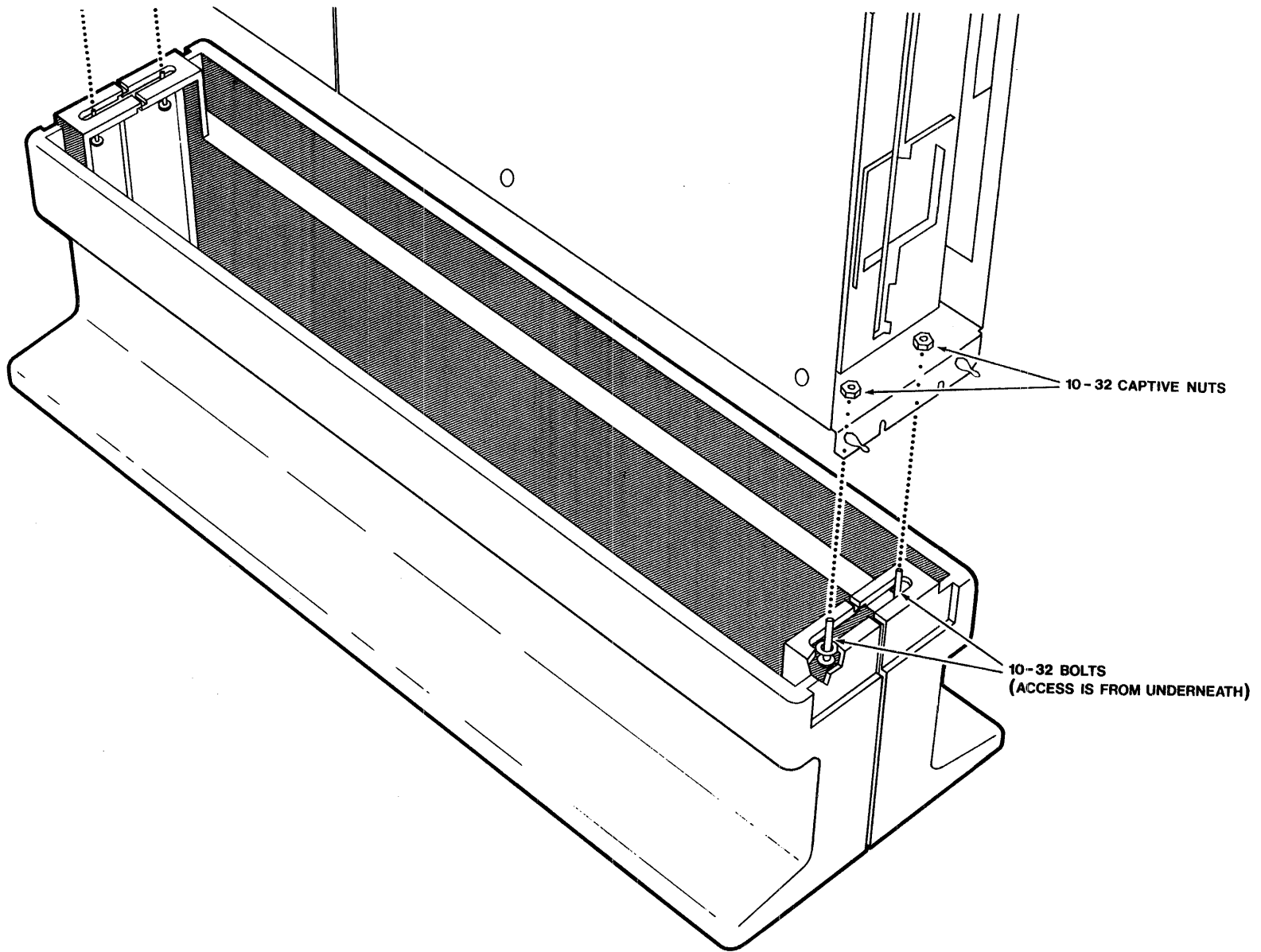
Fig. 10-13 Removal of pedestal
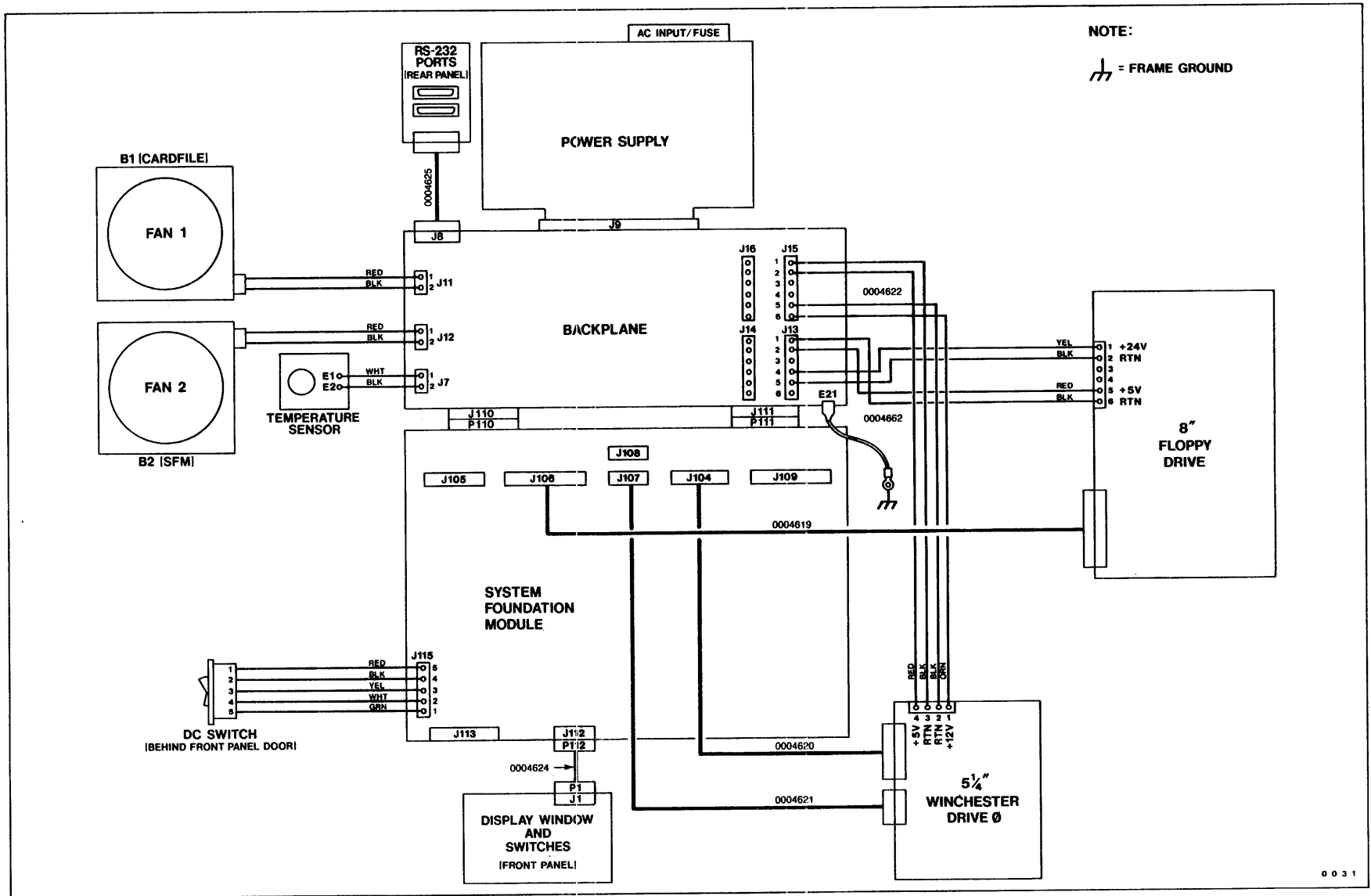
Fig. 10-14   SMS 1000 Model 40 cabling diagram.   Single Winchester
and 8" floppy configuration (1002100).
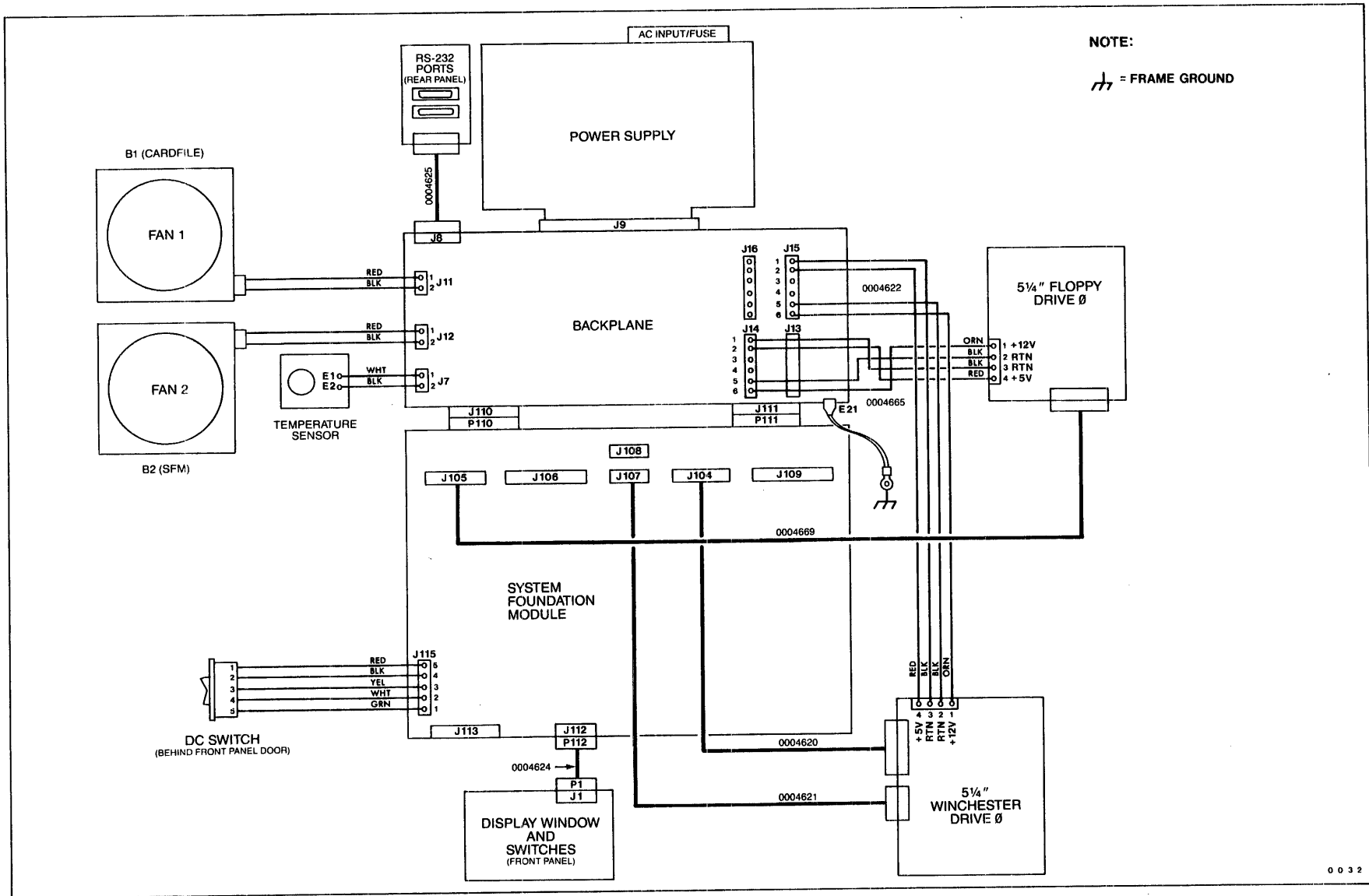
Fig. 10-15 SMS 1000 Model 40 cabling diagram. Single Winchester and one 5 1/4" floppy configuration (1002107).
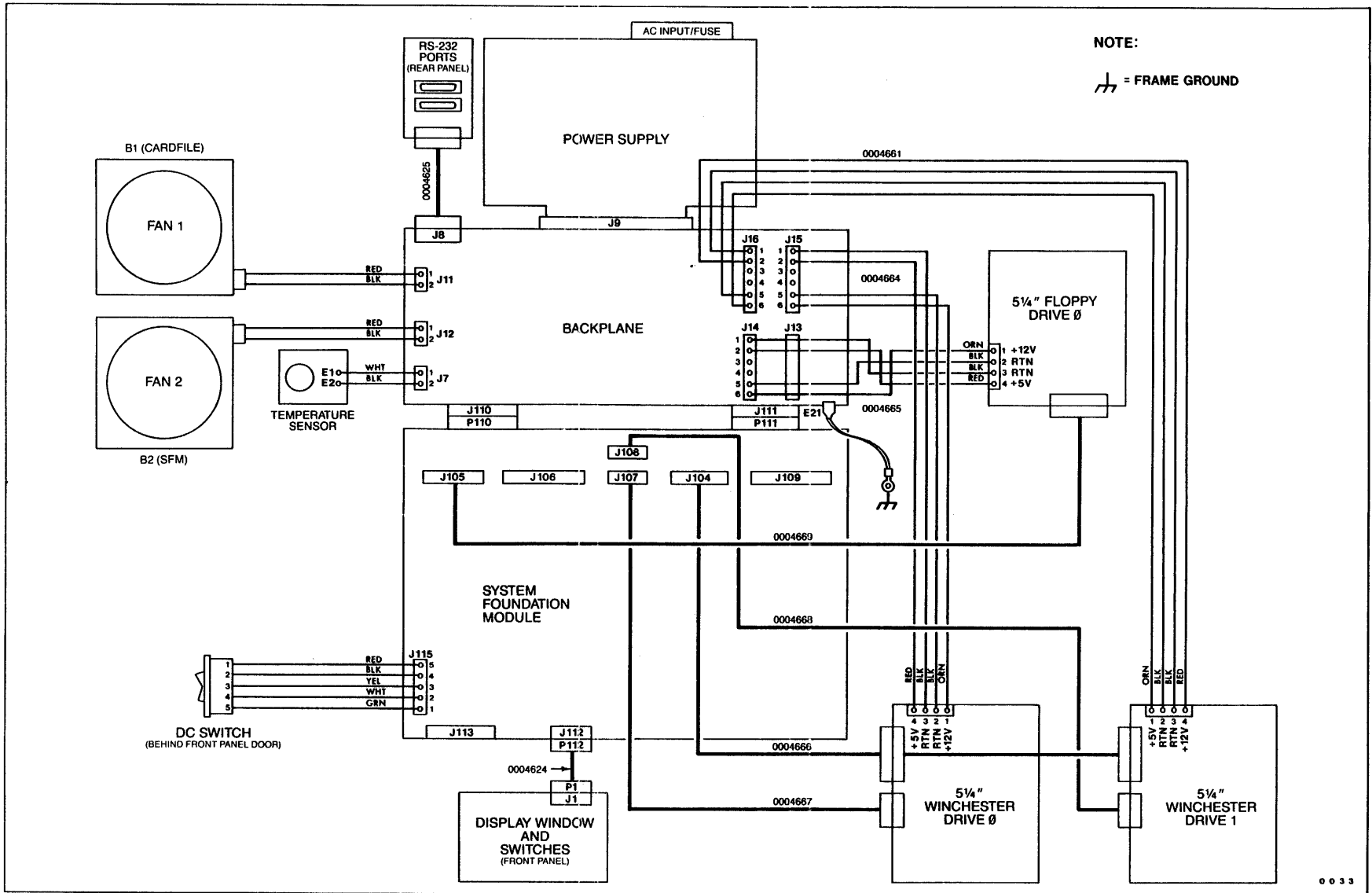
Fig. 10-16   SMS 1000 Model 40 cabling diagram.   Dual Winchester
and one 5 1/4" floppy configuration (1002102).
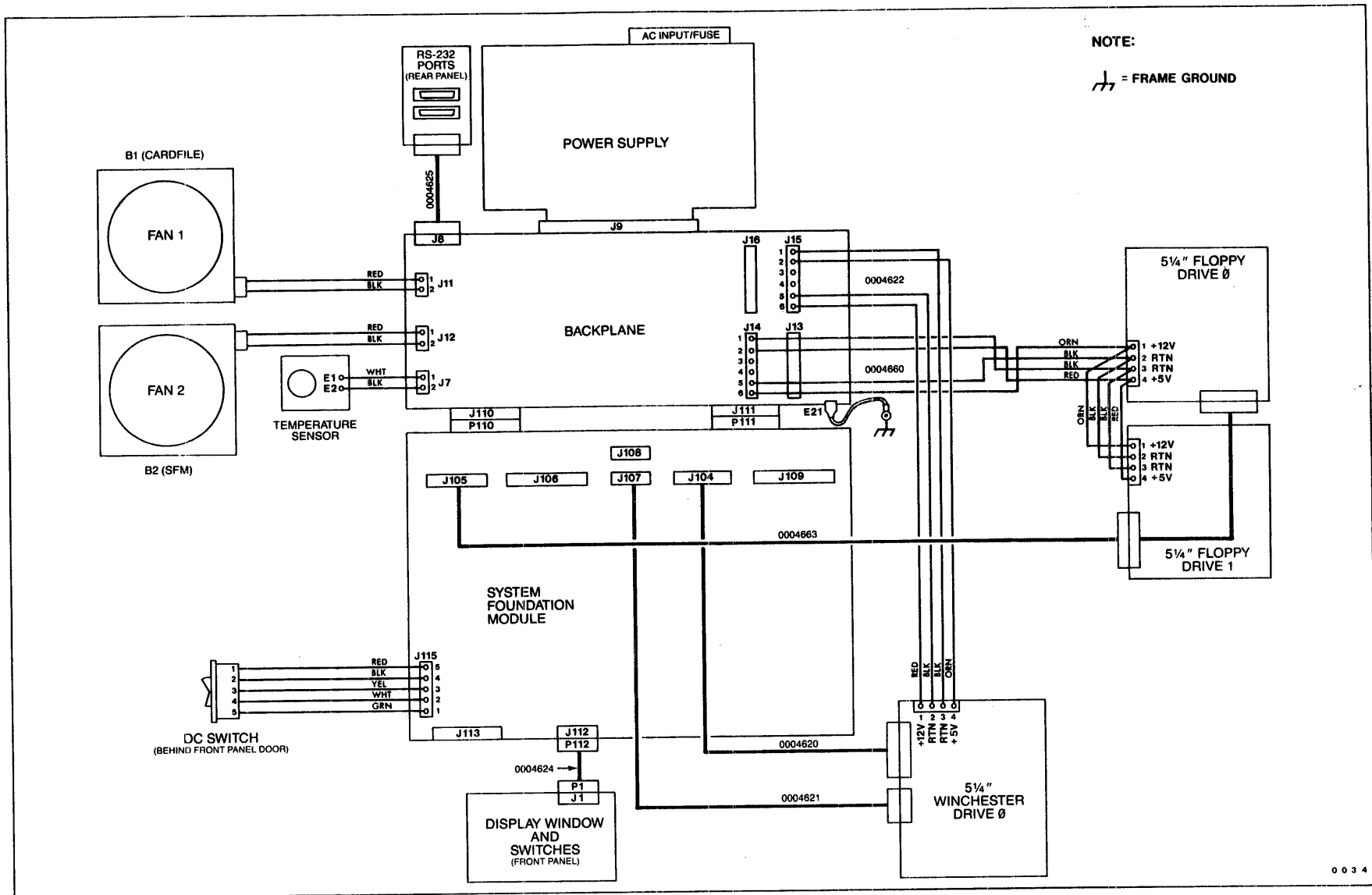
Fig. 10-17 SMS 1000 Model 40 cabling diagram. Single Winchester and dual 5 1/4" floppy configuration (1002103).
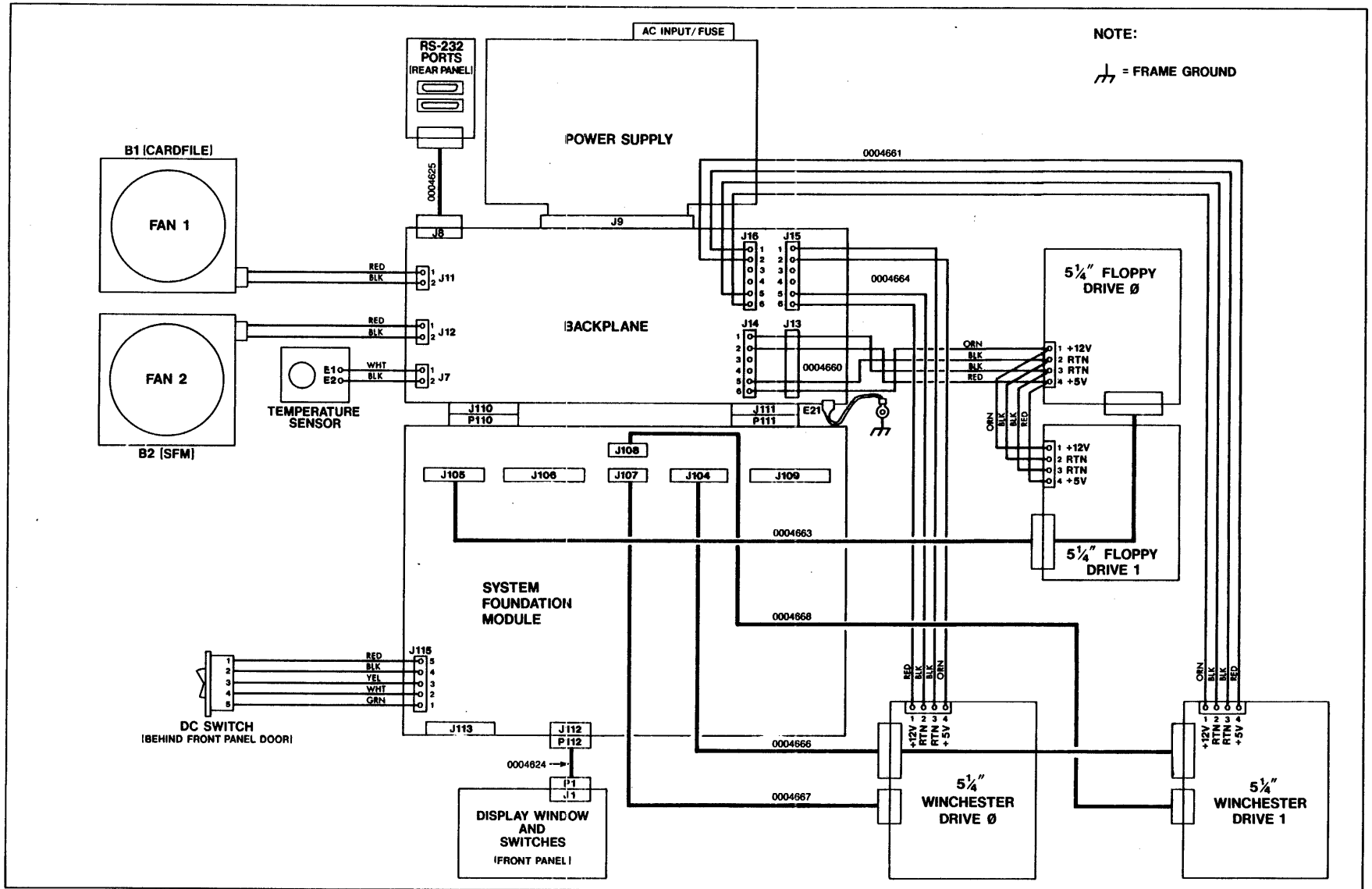
Fig. 10-18   SMS 1000 Model 40 cabling diagram. Dual Winchester
and dual 5 1/4" floppy configuration (1002104).
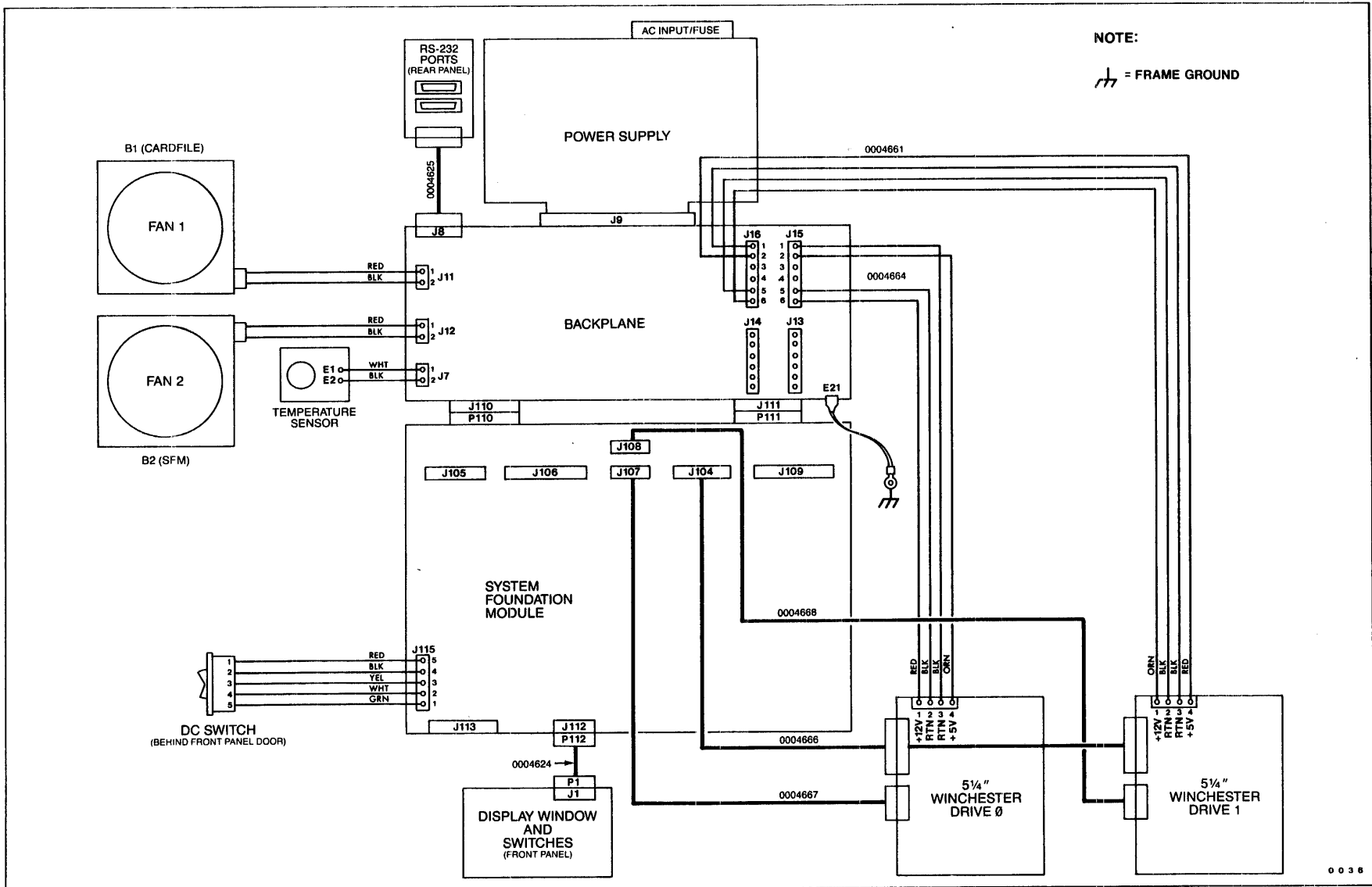
Fig. 10-19   SMS 1000 Model 40 cabling diagram.   Dual
Winchester configuration (1002105).
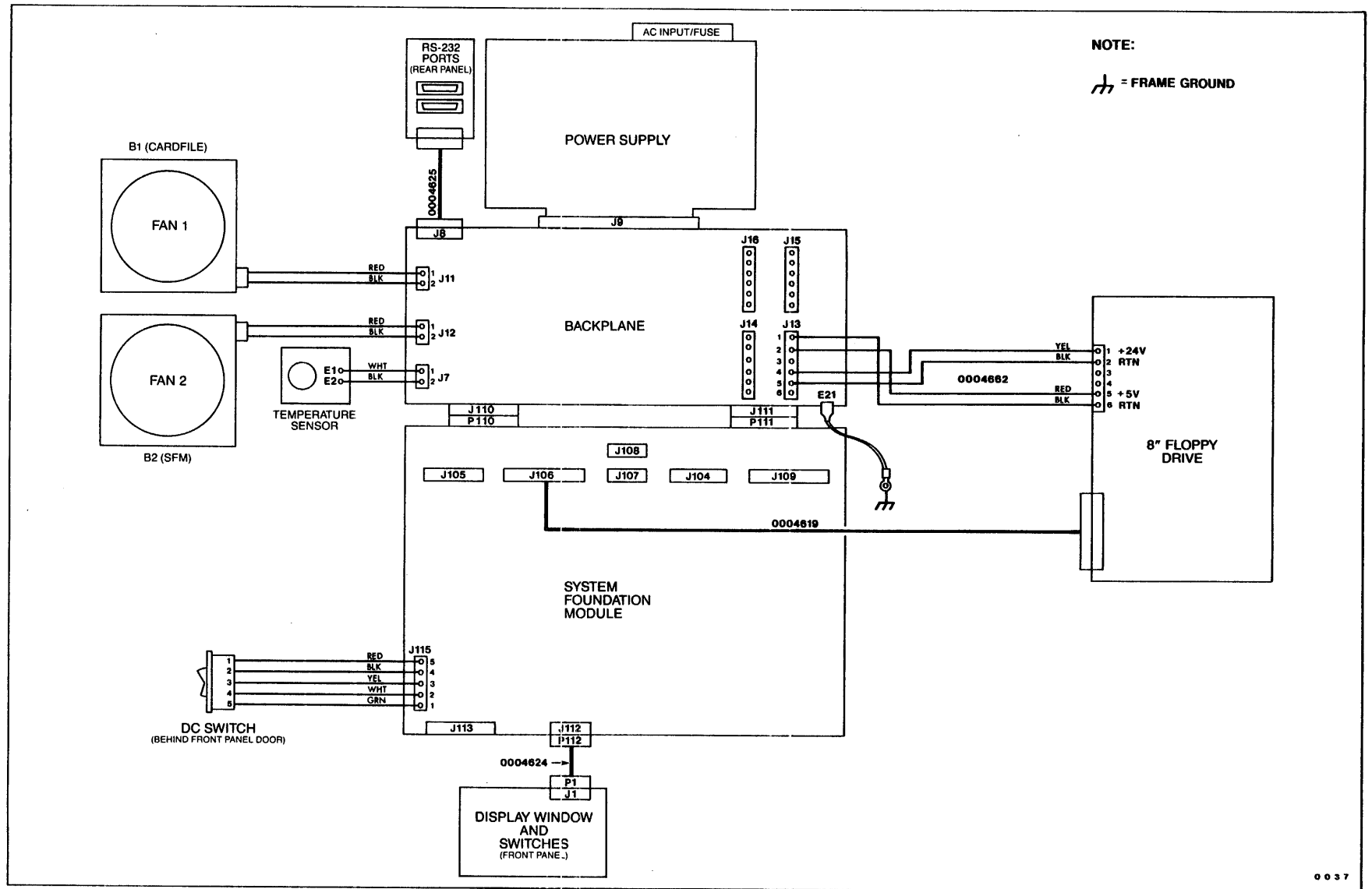
Fig. 10-20   SMS 1000 Model 40 cabling diagram.   8" floppy
configuration (1002106).
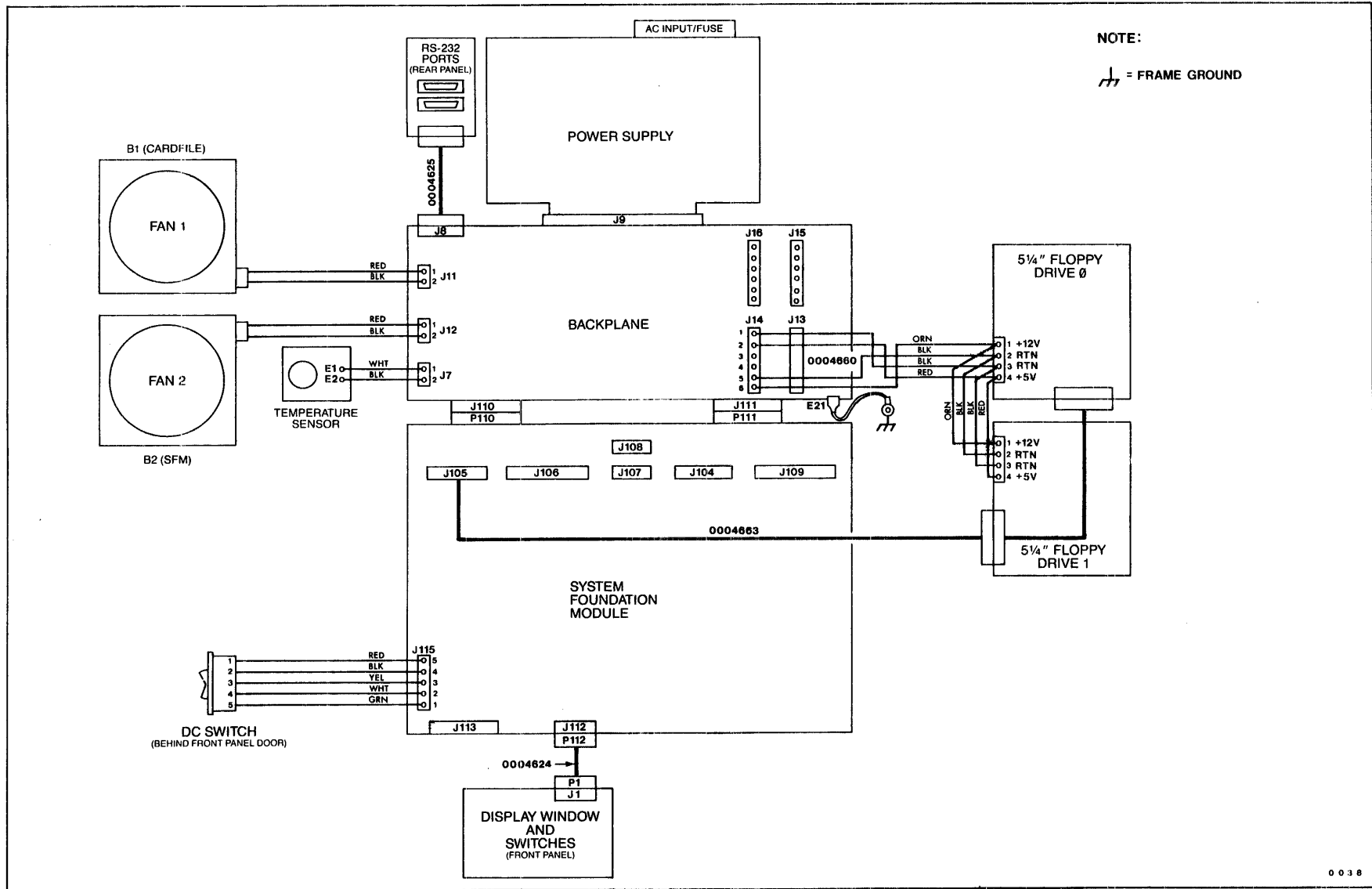
Fig. 10-21   SMS 1000 Model 40 cabling diagram.   Dual
5 1/4" floppy configuration (1002101).

APPENDIX A

SENSE MONITOR:

SUMMARY OF COMMANDS

GENERAL. This appendix contains two command summaries for each of the four SENSE menu groups. The first summary for each group is a table that provides a general description of each command in the menu. A complete listing of each command in the menu then follows the table.

ACCESS LEVEL. The ACCESS LEVEL subcommand of the SPECIAL command in the CONFIGURATION menu permits restricting access to the system to three levels of users. The complete listings in this appendix specify access levels as USER, SYS MGR, or TECH to indicate an end user, system manager, or technician, respectively. ALL indicates that the command is available to all users.

SENSE also limits the menu display depending on your system configuration. For example, the commands for 5-1/4" floppy disk drives do not appear when your system is equipped with only an 8" floppy disk drive.

TABLE A-1

SENSE MONITOR:

STATUS MENU COMMAND SUMMARY

COMMAND	FUNCTION
SYSTEM	Displays either the system logo or a 16-character status message in the front panel display window. NOTE: This display does not appear on a video display terminal.
IDENTIFY	Displays system serial number and shipment date.
ENVIRONMENT	Displays current system temperatures and voltage levels.

<u>COMPLETE MENU STRUCTURE</u>	<u>ACCESS LEVEL</u>

STATUS MENU

SYSTEM	ALL
<compact status>	
IDENTIFY	ALL
<banner>	
FIRMWARE V<n.n>	
SFM S/N <nnnn>	
SHIP <mm/dd/yy>	
ENVIRONMENT	ALL
TEMPERATURE	
DRIVES: <fff>F/<cc>C	
CARDS: <fff>F/<cc>C	
POWER SUPPLY	
+5V: <d.d>V	
+12PV:<dd.d>V	
+12CV:<dd.d>V	
-12V:-<dd.d>V	
+24V: <dd.d>V	

TABLE A-2

SENSE MONITOR:

OPERATION MENU COMMAND SUMMARY

<u>COMMAND</u>	<u>FUNCTION</u>
BACKUP WINCHESTR	Copies the contents of a selected Winchester disk to a specified removable-cartridge Winchester disk, floppy diskette, or tape.
RESTOR WINCHESTR	Restores data copied, by a previous BACKUP command, to a removable-cartridge Winchester disk, floppy diskette, or tape, to a specified Winchester disk.
IDENTIFY	Displays the format (sector size, recording density, etc.) of the specified disk.

FORMAT FLOPPY   Formats the diskette in the specified
                        drive.

BOOT HOST CPU   Runs the bootstrap program, which
                        loads and starts the LSI-11 CPU.

WINCHESTR MGT   Invokes a submenu of infrequently used
                        commands. These subcommands enable
                        you to format Winchester disks and
                        enter flaw management information for
                        Winchester disks.

        COMPLETE MENU STRUCTURE   ACCESS LEVEL

OPERATION MENU

        BACKUP WINCHESTR   SYS MGR
             BACKUP W0
                  BACKUP W0->T0
                        READY?
             BACKUP W1
                  BACKUP W1->T0
                        READY?

        RESTOR WINCHESTR   SYS MGR
             RESTOR W0
                  RESTOR W0<-T0
                        ARE YOU SURE?
             RESTORE W1
                  RESTOR W1<-T0
                        ARE YOU SURE?

        IDENTIFY   ALL
             IDENTIFY F0
                  <Disk-format parameters>
             IDENTIFY F1
                  <Disk-format parameters>
             IDENTIFY W0
                  <Disk-format parameters>
             IDENTIFY W1
                  <Disk-format parameters>
             IDENTIFY C0
                  <Disk-format parameters>

        FORMAT FLOPPY   ALL
             FORMAT FLOPPY F0
                  <Parameter list appears here>

```
                    READY?
            FORMAT FLOPPY F1
                    <Parameter list appears here>
                    READY?
        BOOT HOST CPU                           ALL
            Are you sure?
    WINCHESTR MGT                               TECH
        FORMAT
                FORMAT WO?
                        <Parameter list appears here>
                        Are you sure?
                        Save flaw tbl?
                        Clear flaw tbl?
                        Formatting WO.
                        <Flaw management message sequence>
                FORMAT W1?
                        <Parameter list appears here>
                        Are you sure
                        Save flaw tbl?
                        Clear flaw tbl?
                        Formatting W1.
                        <Flaw management message sequence>
                FORMAT CO?
                        <Parameter list appears here>
                        Are you sure?
                        Save flaw tbl?
                        Clear flaw tbl?
                        Formatting CO.
                        <Flaw management message sequence>

    FLAW MGT WO
        RAW FLAW MGT
            Entries= <system displays current number of entries
                        in flaw table, unless number is zero, in
                        which case this line is replaced by the
                        message: "Tbl empty">
            NEXT?
                    Cyl#=     xxxx
                    Head#=    xxxx
                    BytDsp=   xxxx
                    BitCnt=   xxxx
                    Entry#=   xxxx
            PREVIOUS?
                    Cyl#=     xxxx
                    Head#=    xxxx
                    BytDsp=   xxxx
                    BitCnt=   xxxx
                    Entry#=   xxxx
            NEW?
                    Cyl#=
                    Head#=
```

```
                    BytDsp=
                    BitCnt=
                    Cyl#=    xxxx
                    Head#=   xxxx
                    BytDsp=  xxxx
                    BitCnt=  xxxx
                    Are you sure?
                    BadSct#=xxxx
                    [BadSct#=xxxx]
                    LBN#=xxxxxxx
                    [LBN#=xxxxxx]
                    Entry#= xxxx
              DONE/BLD TBL?
              <Flaw management message sequence.  System goes
                    through the following steps in building
                    the flaw table:>
                    Phase #1 [System sorts raw flaw table]
                    Phase #2 [Construct sector flaw records]
                    Phase #3 [Sort revectoring table]
                    Phase #4 [Allocate primary replacement blks]
                    Phase #5 [Alloc. secondary replacement blks]
                    #Groups=xx [Calc. no. of replacement blks]
                    #RawFla=xx [Calc. no. of raw flaw records]
                    #SctFla=xx [Calc. no. of sect flaw records]
                    Update tbls [Wrt updated support tbls to dsk]
                    Reload FlaTbls [Reload all revectoring tables]
              REMOVE?
                    Cyl#=    xxxx
                    Head#=   xxxx
                    BytDsp=  xxxx
                    BitCnt=  xxxx
                    Entry#= xxxx
                    Are you sure?
              CLEAR?
                    Are you sure?

        SECTOR FLAW MGT
              Entries= <system displays current number of entries
                        in flaw table, unless number is zero, in
                        which case this line is replaced by the
                        message: "Tbl empty">
              NEXT?
                    Cyl#=    xxxx
                    Head#=   xxxx
                    Sector#=    xxxx
                    Entry#= xxxx
                    GrpDsp=+xxxx
              PREVIOUS?
                    Cyl#=    xxxx
                    Head#=   xxxx
                    Sector#=    xxxx
```

```
                    Entry#= xxxx
                    GrpDsp=+xxxx
            NEW?
                    Cyl#=
                    Head#=
                    Sector#=
                    Cyl#=    xxxx
                    Head#=   xxxx
                    Sector=  xxxx
                    Are you sure?
                    GrpDsp=+xxxx
                    LBN#=xxxxxxx
                    BytDsp=xxxx
                    Entry#=xxxx
            DONE/BLD TBL?
                    <System displays the following in-process
                    messages when updating the revectoring table
                    during SECTOR FLAW MGT:>

                    Sorting  [Sort revectoring table]
                    Update tbls  [Write updated support tables
                                      to disk]
                    Reload tbls  [Reload all revectoring tbls]
            REMOVE?
                    Cyl#=    xxxx
                    Head#=   xxxx
                    Sector=  xxxx
                    Entry#=  xxxx
                    Are you sure?
                    Done (no errs).
            CLEAR?
                    Are you sure?
    BLOCK FLAW MGT
            NEXT?
                    LBN#=xxxxxxxxxx
                    Entry#=xxxx
            PREVIOUS?
                    LBN#=xxxxxxxxxx
                    Entry#=xxxx
            NEW?
                    LBN#=
                    Are you sure?
                    Cyl#=    xxxx
                    Head#=   xxxx
                    BytDsp=  xxxx
                    BitCnt=  xxxx
                    BadSct#=xxxx
                    GrpDsp=+xxxx
                    Entry#=xxxx
            DONE/BLD TBL?
                    Are you sure?
```

```
            REMOVE?
                    LBN#=xxxxxxxxxx
                    Entry#=xxxx
                    Are you sure?
            CLEAR?
                    Are you sure?
   FLAW MGT W1 (same as for W0)
   FLAW MGT C0
        C0 READY?
        (otherwise same as for W0)
```

TABLE A-3

SENSE MONITOR:

EVALUATION MENU COMMAND SUMMARY

COMMAND	FUNCTION
SPECIFY CONTROLS	Specifies the devices to be tested and the number of times an evaluation test is to be repeated.
SYSTEM EXERCISE	Enables or disables tests to write on storage devices.
DISK EXERCISES	Specifies the type of test to be performed.
DEMO	Smart terminals only. Provides a "tour" of the complete menu system.

COMPLETE MENU STRUCTURE	ACCESS LEVEL

EVALUATION MENU

```
    SPECIFY CONTROLS                       TECH
        SPECIFY LIMITS
            PASS LIMIT
                Limit=
            HARD ERR LIMIT
                Limit=
            SOFT ERR LIMIT
                Limit=
```

```
SPECIFY DRIVES
        W0
                Disable?
                Enable?
        W1
                Disable?
                Enable?
        C0
                Disable?
                Enable?
        F0
                Disable?
                Enable?
        F1
                Disable?
                Enable?
        T0
                Disable?
                Enable?
DISK RANGES
        SET W0 RANGE
                MIN CYL
                        Min cyl#=
                MAX CYL
                        Max cyl#=
                MIN HEAD
                        Min head#=
                MAX HEAD
                        Max head#=
        SET W1 RANGE
                MIN CYL
                        Min cyl#=
                MAX CYL
                        Max cyl#=
                MIN HEAD
                        Min head#=
                MAX HEAD
                        Max head#=
        SET C0 RANGE
                (same as above)
        SET F0 RANGE
                (same as above)
        SET F1 RANGE
                (same as above)

DATA PATTERNS
        PATTERN 1
                Byte#1=
                Byte#2=
                Byte#3=
        PATTERN 2
```

```
                              Byte#1=
                              Byte#2=
                              Byte#3=

          MODES
                    AUTO FLAW MODE
                              DISABLE?
                              ENABLE?
                                        VrfyLim=
                    ERROR LOGGING
                              DISABLE?
                              ENABLE?
                    ERROR LOG WRAP
                              DISABLE?
                              ENABLE?
                    ERROR RECOVERY
                              ECC CORRECTION
                                        DISABLE?
                                        ENABLE?         [Default setting]
                              AUTO RETRY
                                        DISABLE?
                                        ENABLE?         [Default setting]

     SYSTEM EXERCISES
          WRITE ON WINCH?
                    <evaluation parameter list>
                    Are you sure?
          READ-ONLY WINCH?
                    <evaluation parameter list>
                    Are you sure?

     DISK EXERCISES
          RANDOM WRITE?
          <evaluation parameter list>
          Are you sure?
     RANDOM READ?
          <evaluation parameter list>
     RANDOM SEEK?
          <evaluation parameter list>
     READ-ONLY SCAN?
          <evaluation parameter list>
     WRITE/SCAN?
          <evaluation parameter list>
          Are you sure?

     TAPE EXERCISES
          DISK->TAPE
                    <evaluation parameter list>
                    Ready?
          DISK<-TAPE
                    <evaluation parameter list>
```

```
                    Ready?
                    Are you sure?
            DISK<->TAPE
                    <evaluation parameter list>
                    Ready?
                    Are you sure?

    LOGS

        COMMON ERROR LOG
                WO
                        <log parameter list>
                        NEXT?
                        PREVIOUS?
                        CLEAR?
                        SAVE?
                        RESTORE?
                W1
                        (same as above)
                CO
                        (same as above)
                FO
                        (same as above)
                F1
                        (same as above)
                TO
                        (same as above)


        TAPE STATUS LOG
                CURRENT
                        REWRITES/REREADS
                                Count=
                        UNDERRUNS
                                Count=
                TOTAL
                        REWRITES/REREADS
                                Count=
                        UNDERRUNS
                                Count=
                CLEAR?
                SAVE?
                RESTORE?

    SPECIAL
        MENU DEMO
        DISPLAY SECTOR
                WO?
                        <evaluation parameter list>
                        Even boundary?
                        Odd boundary?
                        Cyl#=
                        Head#=
```

```
                Sector#=
        W1
                (same as above)
        C0
                (same as above)
        F0
                (same as above)
        F1
                (same as above)
        T0
                (same as above)
```

TABLE A-4

SENSE MONITOR:

CONFIGURATION MENU COMMAND SUMMARY

COMMAND	FUNCTION
FLOPPY FORMATS	Specifies the format to be used by the formatting commands in the OPERATION menu.
BOOTSTRAP	Specifies search sequence for boot devices.
POWER ON/RESTART	Specifies actions to be taken when the system is powered on or reset, such as whether to auto-boot or enter the SENSE menu system.
SERIAL PORTS	Specifies BAUD rates, parity bit setting, terminal type, etc. for serial ports A0 and A1.
DEVICE PARAMETERS	Invokes a submenu of commands used for installing disk drives. These commands specify various characteristics, or parameters, of the drives, such as number of cylinders, number of heads, etc.
ADDRESSES	Modifies hardware addresses for the boot prom, controller, and/or port base for special applications.
SPECIAL	Permits setting up such parameters as user access level, clock speed, etc.

COMPLETE MENU STRUCTURE   ACCESS LEVEL

CONFIGURATION MENU

        FLOPPY FORMATS   SYS MGR
                F0 FMT   (5-1/4" floppy)
                        DEC PC?
                F0 FMT   (8" floppy)
                        RX01?
                        RX02?   [Default setting]
                        IBM 1D?
                        IBM 2D/FW?
                        OTHER
                                IBM 1D/256
                                IBM 1D/512?
                                IBM 2D/128?
                                IBM 2D/256?
                                IBM 2D/512, 15SPT
                                RX03
                F1 FMT
                (same as for F0 . . . see above)

        BOOTSTRAP   SYS MGR
                AUTOBOOT TIMEOUT
                        DELAY (SEC)=0?
                        DELAY (SEC)=5?
                        DELAY (SEC)=10?   [Default setting]
                        DELAY (SEC)=20?
                        DELAY (SEC)=30?
                        DELAY (SEC)=45
                        DELAY (SEC)=NL
                BOOT DRV#1
                        BOOT DRV=W0?   [Default setting]
                        BOOT DRV=W1?
                        BOOT DRV=C0?
                        BOOT DRV=F0?
                        BOOT DRV=F1?
                BOOT DRV#2
                        BOOT DRV=W0?
                        BOOT DRV=W1?
                        BOOT DRV=C0?
                        BOOT DRV=F0?   [Default setting]
                        BOOT DRV=F1?
                BOOT DRV#3
                        BOOT DRV=W0?   [Default setting]
                        BOOT DRV=W1?
                        BOOT DRV=C0?

```
                      BOOT DRV=F0?
                      BOOT DRV=F1?
              BOOT DRV#4
                      BOOT DRV=W0?
                      BOOT DRV=W1?
                      BOOT DRV=C0?
                      BOOT DRV=F0?              [Default setting]
                      BOOT DRV=F1?
              FIRST DU#
                      DU#=            [Model 40, 41 and 50 default = 0]]


      POWER-ON/RESTART                          SYS MGR
              STARTUP MODE
                      LOOP UNTIL ERR?
                      OPERATE MENUS?
                      BOOTSTRAP HOST?
              WINCHESTR SPINUP
                      DELAY (SEC)=0?
                      DELAY (SEC)=5?
                      DELAY (SEC)=10?
                      DELAY (SEC)=20?           [Default setting]
                      DELAY (SEC)=30?
                      DELAY (SEC)=45?
                      DELAY (SEC)=90?
              RE-LOAD EEPROM
                      Are you sure?
              CPU TYPE                          TECH
                      LSI-11?                    [Default setting]
                      VAX?
              SYSTEM TYPE                        TECH
                      SYSTEM?           [Default for Model 40 & 50]
                      SUBSYSTEM?            [Default for Model 41]


      SERIAL PORTS                              ALL
              SERIAL PORT A0
                      BAUD RATE
                              BAUD=9600?        [Default setting]
                              BAUD=19200?
                              BAUD=300?
                              BAUD=600?
                              BAUD=1200?
                              BAUD=2400?
                              BAUD=4800?
                      DATA BITS
                              DATA BITS=7?
                              DATA BITS=8?       [Default setting]
                      PARITY BIT
                              PARITY=NONE?       [Default setting]
                              PARITY=ODD?
                              PARITY=EVEN?
                      STOP BITS
```

```
                        STOP BITS=1?          [Default setting]
                        STOP BITS=2?
              SERIAL PORT A1
                    (same as for A0)
              CONSOLE SETTING
                    CONSOLE ENAB/DISAB
                        DISABLE?              [Model 41 default]
                        ENABLE?               [Model 40 & 50 default]
                    CONSOLE PORT
                        CONSOLE=A0?           [Default setting]
                        CONSOLE=A1?
                    BREAK
                        BREAK=NOP?
                        BREAK=HALT?           [Default setting]
              TERMINAL TYPE
                    TERM=DUMB?
                    TERM=SMART?
              ONLINE DELAY
                    DELAY (SEC)=0?
                    DELAY (SEC)=5?
                    DELAY (SEC)=10?           [Default setting]
                    DELAY (SEC)=20?
                    DELAY (SEC)=30?
                    DELAY (SEC)=45
                    DELAY (SEC)=NL

      DEVICE PARAMETERS                       TECH
          F0 CONFIGURATION
              DEVICE PRESENT
                      DISABLE?
                      ENABLE?
              SIZE STRAPPING
                      SIZE=5"?
                      SIZE=8"?                [Default setting]
              CAPACITY
                      #HEADS
                          #HEADS=             [Default is 0]
                      #CYLS
                          #CYLS=              [Default is 77]
              TIMINGS
                      STEP (MSEC)
                          STEP=               [Default is 3]
                      SETTLE (MSEC)
                          SETTLE=             [Default is 15]
                      MOTOR ON
                          MOTOR ON=           [Default is 700]
          F1 CONFIGURATION
                (same as for F0)
          W0 CONFIGURATION
              DEVICE PRESENT?
                      DISABLE?
```

```
                        ENABLE?
                CAPACITY
                        #HEADS
                                #HEADS=          [Default is 0]
                        #CYLS
                                #CYLS=           [Default is 0]
                PHYS INTRLV
                        INTRLV=                  [Default is 1]
                OFFSETS
                        CYL OFFSET=
                                CYL OFF=         [Default is 1]
                        HEAD OFFSET=
                                HEAD OFF=        [Default is 4]
                PRECOMP
                        DISABLE?
                        ENABLE?                  [Default setting]
        W1 CONFIGURATION
                (same as for W0)
        C0 CONFIGURATION
                (same as for W0)
        T0 CONFIGURATION
                DEVICE PRESENT?
                        DISABLE?                 [Default setting]
                        ENABLE?

ADDRESSES                               TECH
        PORT VECTOR BASE
                VECTOR=300              [Default setting]
                VECTOR=310
                VECTOR=320
                VECTOR=330
                VECTOR=340
                VECTOR=370
                VECTOR=270
        BUS ADDRESSES
                BOOT PROM ADDR
                        DISABLE?
                        17775000?
                        17766000?       [Model 41 default]
                        17773000?       [Model 40 & 50 default]
                DU DEVICE ADDR
                        17772150?       [Model 40 & 50 default]
                        17760334?       [Model 41 default]
                        17760340?
                        17760344?
                        17760350?
                        17760354?
                        17772154?
                PORT BASE ADDR
                        DISABLE?        [Model 41 default]
                        17776500?       [Model 40 & 50 default]
```

```
                        17776540?
                        17776600?

        SPECIAL
                ACCESS LEVEL
                        USER?
                        SYS MGR?
                                PWkey=
                                NewPWkey=
                        TECH?
                                PWkey=
                                NewPWkey=
                BANNER                          SYS MGR
                        DISABLE?
                        ENABLE?                 [Default setting]
                                NewBanner=      [Up to 16 characters]
                FAN SPEED                       TECH
                        LOW?
                        MED?                    [Default setting]
                SHIP                            TECH
                        DATE=
                        S/N=
                CLOCK                           TECH
                        CLOCK SPEED
                                SPEED=60?         [Default setting]
                                CLOCK OFF?
                                SPEED=50?
                                SPEED=800?
                        CLOCK CSR
                                DISABLE?          [Default setting]
                                ENABLE?
```

APPENDIX B

SPECIFICATIONS FOR
SMS 1000
PERIPHERAL DEVICES

TABLE B-1

5 1/4-INCH WINCHESTER DRIVES

DRIVE TYPE	UN-FOR-MAT-TED CAP-ACI-TY (MB)	FOR-MAT-TED CAP-ACI-TY (MB) (MAX)	AVG. AC-CESS TIME (MS)	MAX. XFER RATE (KB/SEC)	NO. OF HDS	NO. OF CYL	SEC-TORS PER TRACK	BYTES/SEC-TOR (MAX)	BYTES/TRACK (FOR-MAT-TED)	ROTAT-ION-AL LAT-EN-CY (MS)
ST212 (SEAGATE) (550 TPI) NOTE: PRECOMP ENABLED	12	11.0	65	625	4	306	18	512	9K*	8.33
ST213 (SEAGATE) (588 TPI) NOTE: PRECOMP ENABLED	12	11.2	65	625	2	615	18	512	9K*	8.33
ST412 (SEAGATE) (345 TPI) NOTE: PRECOMP ENABLED	12	11.0	85	625	4	306	18	512	9K*	8.33
ST419 (SEAGATE) (345 TPI) NOTE: PRECOMP ENABLED	19	16.5	85	625	6	306	18	512	9K*	8.33
CM5619 (COMPUTER MEMORIES INC.) (345 TPI) NOTE: PRECOMP ENABLED	19	16.5	72	625	6	306	18	512	9K*	8.33
ST225 (SEAGATE) (580 TPI) NOTE: PRECOMP ENABLED	25	22.6	85	625	4	615	18	512	9K*	8.33

TABLE B-1
5 1/4-INCH WINCHESTER DRIVES (continued)

DRIVE TYPE	UN- FOR- MAT- TED CAP- ACI- TY (MB)	FOR- MAT- TED CAP- ACI- TY (MB) (MAX)	AVG. AC- CESS TIME (MS)	MAX. XFER RATE (KB/ SEC)	NO. OF HDS	NO. OF CYL	SEC- TORS PER TRACK	BYTES/ SEC- TOR (MAX)	BYTES/ TRACK (FOR- MAT- TED)	ROTAT- ION- AL LAT- EN- CY (MS)
Q540 (QUANTUM) (591 TPI) NOTE: PRECOMP ENABLED	42	37.1	45	625	8	512	18	512	9K*	8.33
V170 (VERTEX) (960 TPI) NOTE: PRECOMP DISABLED	70	62.6	30	625	7	987	18	512	9K*	8.33
XT-1085 (MAXTOR) (980 TPI) NOTE: PRECOMP DISABLED	85	75.5	30	625	8	1024	18	512	9K*	8.33
XT-1140 (MAXTOR) (980 TPI) NOTE: PRECOMP DISABLED	140	122.4	30	625	15	918	18	512	9K*	8.33
DMA-360 DMA SYSTEMS REMOVABLE-CARTRIDGE WINCHESTER DRIVE (612 TPI) NOTE: PRECOMP ENABLED	12	10.6	107	625	2	612	18	512	9K*	8.64
SYQUEST MODEL SQ312RD REMOVABLE-CARTRIDGE WINCHESTER DRIVE (741 TPI) NOTE: PRECOMP DISABLED	12.7	11.2	135	625	2	615	18	512	9K*	8.46

LEGEND: KB = 1024 bytes (i.e. kilobyte)
          MB = 1,048,576 bytes (i.e. megabyte)
          MS = millisecond
* - Tracks with reserved replacement blocks have 8.5K byte/track.
NOTE: In general, in drives with oxide media, precomp is enabled.
       In drives with plated media, precomp is disabled.

TABLE B-2
1/4-INCH-CARTRIDGE STREAMING TAPE DRIVE

TYPE	RECORD- ING DENS- ITY (BPI)	NO. OF TRACKS	NORMAL TAPE SPEED (IPS)	FAST TAPE SPEED (IPS)	DATA XFER RATE (KB/SEC)	CAPACITY (MB MAX)
TANDBERG TDC 3309 with TDC 3350 CONTROLLER/FORMATTER BOARD (QIC-02 interface).	8000	9	90	90	90	60

MEDIA TYPES (all media QIC-24 compatible): (1) 3M DC300XL or DC300XL+ (450 foot); (2) DC600A (600 foot); (3) DEI 137m (450 foot); (4) DEI 169m (555 foot); or equivalent.

LEGEND

BPI = Bits Per Inch
IPS = Inches Per Second
  m = metre

TABLE B-3

STANDARD 5 1/4" DISKETTE FORMATS

FORMAT and DENSITY	SECTOR/ TRACK	NO. OF HDS.	BYTES/ SECTOR	FORMATTED CAPACITY (MB)	TRACKS/ INCH (TPI)	NO. OF CYL
DEC RX50	10	1	512	0.4	96	80
DEC RX50/DS	10	2	512	0.8	96	80

TABLE B-4

STANDARD 8" DISKETTE FORMATS

FORMAT and DENSITY	SECTOR/ TRACK	NO. OF HEADS	BYTES/ SECTOR	FORMATTED CAPACITY (MB)	NO. OF CYL.
DEC RX01	26	1	128	0.25	77
DEC RX02	26	1	256	0.5	77
DEC RX03	26	2	256	1.0	77
IBM SINGLE	26	1	128	0.25	77
IBM SINGLE	26	2	128	0.5	77
IBM DOUBLE	16	1	512	0.6	77
IBM DOUBLE	16	2	512	1.2	77
IBM DOUBLE	15	2	512	1.1	77

LEGEND

KB = 1024 bytes (i.e. kilobyte)
MB = 1,048,576 bytes (i.e. megabyte)
MS = millisecond

APPENDIX C

TABLE C-1
SMS 1000 Models 40 and 50: TABLE OF MAJOR SYSTEM COMPONENTS

==

PART NUMBER	DESCRIPTION

==

Part Number	Description
9001385-0001	12MB Winchester. ST212, or equivalent.
9001468-0001	12MB Winchester. ST213, or equivalent.
9001006-0001	12MB Winchester. ST412, or equivalent.
9001336-0001	25MB Winchester. ST225, or equivalent.
9001081-0001	42MB Winchester. Q540, or equivalent.
9001135-0001	70MB Winchester. V170, or equivalent.
9001331-0001	85MB Winchester. XT1085, or equivalent.
9001136-0001	140MB Winchester. XT1140, or equivalent.
9001292-0001	10MB Cartridge Winchester. DMA 360, or equivalent.
9001524-0001	12MB Removable-cartridge Winchester drive, SyQuest Model SQ312RD, or equivalent.
9001525-0001	SyQuest Model SQ200 cartridge for SyQuest SQ312RD removable-cartridge Winchester drive.
9001315-0001	60MB-capacity 1/4" streaming tape drive. Model TDC 3309/3350 Mk. II, or equivalent.
9001258-0001	1MB 8" floppy drive. TM848-2E, or equivalent.
9001256-0001	0.8MB 5 1/4" floppy drive. JU465, or equivalent.
1002086-0001	SMS 1000 Foundation module (Models 40 and 50)
9001076-0001	325 watt power supply (Model 40)
9001305-0001	500 watt power supply (Model 50)
0004686-0001	Front-panel-display kit
0004567-0001	Fan assembly
0004530-0001	SMS 1000 Model 40 backplane (five slot)
0005007-0001	SMS 1000 Model 50 backplane (twelve slot)

==

APPENDIX D

DECIMAL-OCTAL-HEXADECIMAL

CONVERSION TABLE

DECIMAL	OCTAL	HEXADECIMAL
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	10	8
9	11	9
10	12	A
11	13	B
12	14	C
13	15	D
14	16	E
15	17	F
16	20	10
17	21	11
18	22	12
19	23	13
20	24	14
21	25	15
22	26	16
23	27	17
24	30	18
25	31	19
26	32	1A
27	33	1B
28	34	1C
29	35	1D

DECIMAL	OCTAL	HEXADECIMAL
30	36	1E
31	37	1F
32	40	20
33	41	21
34	42	22
35	43	23
36	44	24
37	45	25
38	46	26
39	47	27
40	50	28
41	51	29
42	52	2A
43	53	2B
44	54	2C
45	55	2D
46	56	2E
47	57	2F
48	60	30
49	61	31
50	62	32
51	63	33
52	64	34
53	65	35
54	66	36
55	67	37
56	70	38
57	71	39
58	72	3A
59	73	3B
60	74	3C
61	75	3D
62	76	3E
63	77	3F
64	100	40
65	101	41
66	102	42
67	103	43
68	104	44

DECIMAL	OCTAL	HEXADECIMAL
69	105	45
70	106	46
71	107	47
72	110	48
73	111	49
74	112	4A
75	113	4B
76	114	4C
77	115	4D
78	116	4E
79	117	4F
80	120	50
81	121	51
82	122	52
83	123	53
84	124	54
85	125	55
86	126	56
87	127	57
88	130	58
89	131	59
90	132	5A
91	133	5B
92	134	5C
93	135	5D
94	136	5E
95	137	5F
96	140	60
97	141	61
98	142	62
99	143	63
100	144	64
101	145	65
102	146	66
103	147	67
104	150	68
105	151	69
106	152	6A
107	153	6B

DECIMAL	OCTAL	HEXADECIMAL
108	154	6C
109	155	6D
110	156	6E
111	157	6F
112	160	70
113	161	71
114	162	72
115	163	73
116	164	74
117	165	75
118	166	76
119	167	77
120	170	78
121	171	79
122	172	7A
123	173	7B
124	174	7C
125	175	7D
126	176	7E
127	177	7F
128	200	80

APPENDIX E

ERROR MESSAGES

SELF-TEST ERRORS

GENERAL. Each time power is applied to the SMS 1000 system, or the RESTART and "*" buttons are pushed at the same time on the system front panel, the 80188 processor on the System Foundation Module is reset and a self test of major hardware components is started. During this self test an LED on the front edge of the Foundation Module (see Figure 1-4) will go on and will remain on for the duration of the test. If the test is successful and no errors are found, the LED goes out at the completion of the test. If an error is detected during the test, the LED remains on. Note, however, that the self test takes a very short time (roughly one second) and, if no errors are detected, it is possible to overlook the flashing of the LED.

USE OF ODT. In the event of a self-test failure not caused by the 80188 itself, the LED remains on and the 80188 writes the corresponding fatal-error code to the SA register (see first column of Table E-1 for a listing of these error codes). At the same time, the system halts and enters ODT so that the contents of the SA register can be read. The SA register address is the IP register address + 2. The IP register is SMS-factory configured at 17772150. The SMS configured address of the SA register is therefore 17772152.

PROCEDURE FOR FINDING ERROR CODE. If an error is encountered in self test, do the following:

      1. Enter the following on your terminal:

                @17772152/

      2. As soon as the "/" is entered (no carriage return is necessary) the system responds by printing the contents of the SA register after the "/". If, for example, there were a "Channel 0 test error", which has an error code of 104004 (see Table E-1), the query would appear as follows:

                @17772152/104004

Therefore, as long as an error is not caused by the 80188 or the console device, the user can examine the contents of the SA register to determine the nature of the error. If the LED remains on and the user cannot examine the SA register from the console device, it is an indication that the 80188 or the console is bad.

ERROR CODES DISPLAYED ON FRONT PANEL. During the hardware self test sequence that takes place at initial startup or RESTART, certain errors are reported on the front-panel display by means of the message:

Self Test Err nn

where nn can be any of the decimal error codes shown in the second column of Table E-1. Note that these error codes correspond to the same error events whose codes are detected by use of the ODT facility described earlier in this section.

The following table (Table E-1) summarizes the self-test errors and their meanings.

TABLE E-1

SELF-TEST ERROR CODES AND THEIR MEANINGS

ODT ERROR CODE (OCTAL)	ERROR CODE DISPLAYED ON FRONT PANEL (DECIMAL)	ERROR TYPE OR DESCRIPTION
100011	9	Host access (protocol dependent)
100012	10	Credit limit exceeded
100013	11	Bus master error (DMA)
100016	14	Invalid connection identifier
100023	19	INIT sequence error
100024	20	Protocol incompatibility
104000	256	EEPROM checksum error
104001	257	First EPROM checksum error
104002	258	Second EPROM checksum error
104003	259	RAM error
104004	260	Channel 0 test error (Serial Port A0)
104005	261	Channel 1 test error (Serial Port A1)
104006	262	DMA-to-system-memory failure
104007	263	DMA-from-system-memory failure
104008	264	80188 test failure

SYSTEM-OPERATION ERRORS

OPERATOR-DEPENDENT ERRORS. There are two types of exception events that cause the display of error messages on the console or on the

front panel 16-character display readout. See Tables E-2 and E-3 for a list of these messages and their meanings. The first type is the result of an operator giving invalid or inconsistent commands, e.g., attempting to perform a FORMAT FLOPPY with the drive not ready. The system handles this kind of event by outputting a message to the console's status field or to the front panel display and either prompting the user again or aborting the process altogether.

CONTROLLER-DEPENDENT ERRORS. The second type of exception is detected by the controller and can occur as the result of either hardware failures, or environmental failures such as, for example, failure to insert a diskette at the correct time, inserting an unformatted diskette when the system expects a formatted diskette, or write protecting the Winchester during a restore operation.

DISPLAY OF ERROR PARAMETERS. In the case of the console, errors are handled by displaying a complete set of error parameters in the console status field. In the case of the SMS 1000 front panel display, an error message first appears, after which successive error parameters are displayed by repeated pressing of the left or right arrow key.

HARD AND SOFT ERRORS. If an internal error-limit variable has been exceeded, the system will query the operator for the desired course of action. In the EVALUATION menus, limit variables can be specified for hard and soft errors. A soft error is detected when retries are required by the controller in order to successfully complete the command. Note that ECC correction implies the occurrence of a soft error. A hard error occurs when the controller detects a non-recoverable failure. Aside from EVALUATION menu activity, the default soft error limit is statically set to no limit, while the default hard error limit is set to one.

ERROR-MESSAGE STRUCTURE.

For both the console and the front panel display, error-message information is presented in the format given below. In the case of the console, all information is displayed at once on the CRT screen. With the front panel 16-character display, only the first line appears automatically, after which successive lines appear each time the right-arrow key is pressed. Note the following:

1. ERROR MESSAGE FORMAT. The following is the format of the error messages that appear on your terminal or front-panel display:

        <error-string>
        <error-status>
        ACTION?
                RESTART?
                MENU?

RESUME?

A description of these messages is given in the following steps.

2. ERROR-STRING MESSAGE. The SMS 1000 system develops 11 possible
error messages of up to 16 characters each. They are general in
nature and some of them can result from a number of different types
of errors.   The various controller events that could cause each of
these messages are given in a table (Table E-2) at the end of this
list.   The 11 <error-string> messages are:

        "DRIVE NOT READY"
        "DRIVE WRITE PROT"
        "BAD SCT DATA"
        "BAD MEDIA"
        "INCORRECT FORMAT"
        "CONTRLR TIMEOUT"
        "SOFT ERROR"
        "BAD DISK CMD"
        "CONTRLR ERROR"
        "HOST ERROR"
        "ERROR"

3. DISK-RELATED ERROR-STATUS MESSAGES. The   format   of   error-status
messages for disk error events is:

        e<error code><device identification>c<cylinder
            number>h<head number>s<sector number>

    where:

            Error code ("e") is a decimal value as given
            in Tables E-2 and E-3 below.

            Device identification can be W0, W1, C0, F0 or F1.

            Cylinder number, head number and sector number
            ("c", "h", "s") provide the disk address of the
            error location.

An example of a typical error message would be:

        Bad media
        e70 W0c108h12s14

4. TAPE-RELATED ERROR-STATUS MESSAGES. The   format   of   error-status
messages for tape-related error events is:

        e<error code>T0:<status byte 0[in hex]>H<status
            byte 1[in hex]>H

where:

Error code ("e") is a decimal value defined
in Tables E-2 and E-3.

TO: is a delimiter indicating that the tape drive
is the source of the error.

Status byte is an eight-bit status message,
displayed in hex ("H"), that indicates the
source of the error. Two status bytes are
displayed.

A typical tape-related error-message sequence would appear as follows:

Tape error
e128TO:12H34H

EXPLANATION OF TAPE STATUS BYTES 0 AND 1.

All bits in both status bytes 0 and 1 are normally 0. A 1 in one of
the eight positions indicates a specific error condition. The meaning of the bits in status bytes 0 and 1 is given in the following
tables.

EXPLANATION OF TAPE STATUS BYTE 0

BIT NUMBER	MEANING OF A "1" IN THIS POSITION
7	Status byte 0 contains information. This bit is 1 if at least one of the other bits in the byte is 1.
6	Cartridge not in place. Set while no cartridge is in drive. Reset when cartridge is inserted.
5	Drive not selectable/Drive error. Possible drive defect, or error in communication link between formatter and drive.
4	Cartridge is write protected.
3	Cartridge full. End of media detected. Not set during a normal read operation.
2	Unrecoverable data error. The bit is set after 16 rewrite attempts or 24 reread attempts.

1   Bad block not located. Set in read mode only.

0   File mark detected.

EXPLANATION OF TAPE STATUS BYTE 1

BIT NUMBER	MEANING OF A "1" IN THIS POSITION
7	Status byte 1 contains information. Indicates that at least one of the other bits in byte 1 is 1.
6	Illegal command.
5	No data detected. Set if drive has not been able to detect data for at least 45 inches of track.
4	Marginal block(s) detected. May indicate that the cartridge in question is approaching the end of its useful life.
3	Drive is at the beginning of media. Drive is positioned at the Beginning of Tape (BOT, track 0). Remains set until the tape moves away from BOT area or a Reset occurs.
2	Bus parity error.
1	End of recorded area
0	Reset/Power-up sequence

----

5. "ACTION" OPTIONS. In the error message format given in Step 1 (above), the options listed under "ACTION?" are: "RESTART?", "MENU?", and "RESUME?". These options are discussed in the following steps:

    (1) RESTART. In the event of an error, it may be possible to restart processing from some earlier predefined point in the program. This option is not displayed in the menu unless the appropriate checkpoints are present in the program.

    (2) MENU. This option should be invoked when you wish to quit the current operation and return to the next higher level of the menu system.

    (3) RESUME. Selecting this command when an error has been

found during SCAN exercises, BACKUP, RESTORE, COPY, or RESUME means
that the sector address is incremented and an attempt is made to
continue the operation. This option should be selected when there
is a strong need to keep on going beyond a particular bad sector, as
when backing up a Winchester, etc. This option has little benefit
if the error continually re-occurs; e.g. "Drive not ready", or "TAPE
ERROR" during backup. In these situations, the RESTART option may
be more useful. Selecting the RESUME option during the random
evaluation exercises causes the last server command to be reissued,
using the disk address that was generated by the error event. If
the error event was the result of a hard error on the disk, reissu-
ing the server command will likely result in another error event.

MAPPING ERROR MESSAGES TO CONTROLLER EVENTS

The following table (Table E-2) maps the 11 basic system error
messages to the possible controller events that could cause them.
Note that the controller events are listed by their decimal error
numbers, and are explained in the next table (Table E-3).

TABLE E-2

ERROR MESSAGES AND CONTROLLER EVENTS

DISPLAYED ERROR-MESSAGE	POSSIBLE CONTROLLER EVENT(S) THAT COULD CAUSE THE ERROR MESSAGE (LISTED BY DECIMAL EVENT CODE. SEE FOLLOWING TABLE (TABLE E-3).)
"DRIVE NOT READY"	64
"DRIVE WRITE PROT"	88
"BAD SCT DATA"	76*
"BAD MEDIA"	70*, 71*, 75*, 115, 117
"INCORRECT FORMAT"	66, 67, 72, 73, 74
"CONTRLR TIMEOUT"	69, 77, 78, 79, 87, 97, 100
"SOFT ERROR"	85
"BAD DISK CMD"	34, 35, 36, 37, 38, 39, 40, 41 42, 43, 51, 52, 54, 57, 126
"CONTRLR ERROR"	68, 96, 98, 99, 104, 105 106, 107, 108, 109, 110 111, 112, 116

```
"HOST ERROR"                    114, 118
-------------------------------------------------------------
"ERROR"                         ALL OTHER EVENT CODES
-------------------------------------------------------------
```

NOTE: "*" following event code 70, 71, 75 and 76 indicates that the Support Monitor Subsystem's autoflaw manager is invoked when one of these events is reported by the controller, if the autoflaw mode is enabled for evaluation exercises.

```
-------------------------------------------------------------
```

CONTROLLER-EVENT CODES AND ERROR MESSAGES

The following table (Table E-3) lists controller event codes and their corresponding explanations. The codes are listed first in decimal, which is the form in which they are displayed on the console or front-panel display, and then both their hex and octal equivalents are given.

TABLE E-3

CONTROLLER-EVENT CODES AND THEIR MEANINGS
(CODES ARE DISPLAYED IN DECIMAL)

CONTROLLER-EVENT CODE			MEANING
DEC.	HEX	OCTAL	

USER-ERROR EVENTS

DEC.	HEX	OCTAL	MEANING
13	0D	15	Carriage retry
15	0F	17	Access retry
23	17	27	Tape drive in exception state
24	18	30	Power-up or reset occurred
25	19	31	File mark detected
26	1A	32	Marginal block(s) detected
27	1B	33	Beginning of tape
30	1E	36	Tape read/write retried
31	1F	37	Tape buffer underrun/overflow
34	22	42	Invalid command
35	23	43	Illegal unit
36	24	44	Invalid cylinder number
37	25	45	Invalid head number
38	26	46	Invalid sector number
39	27	47	Illegal number of bytes/sector

DEC.	HEX	OCTAL	
40	28	50	Too many Winchester cylinders
41	29	51	Too many Winchester heads
42	2A	52	Illegal no. of floppy sides specified
43	2B	53	Format not supported by this system
51	33	63	Illegal test number specification
52	34	64	Media overflow
54	36	66	Sector size not supported.
57	39	71	Non-existent or reserved drive strapping

SYSTEM-ERROR EVENTS

58	3A	72	Invalid buffer descriptor
59	3B	73	Invalid byte count
60	3C	74	Invalid logical block number
61	3D	75	Host credit exceeded
64	40	100	Drive not ready
66	42	102	Deleted data address mark encountered
67	43	103	Data address mark mismatch
68	44	104	Write error
69	45	105	Format pass timeout
70	46	106	No sector ID address marks found on track
71	47	107	No good sector ID found on track
72	48	110	Sector length not initialization value
73	49	111	Cylinder no. mismatch: positioning error
74	4A	112	Sector ID/head (side) number mismatch
75	4B	113	Sector ID not found on track
76	4C	114	Data field CRC/ECC error
77	4D	115	Internal byte processor timeout error
78	4E	116	Track write timeout
79	4F	117	Data late
85	55	125	Winchester data corrected (ECC)
87	57	127	No track 0
88	58	130	Tape drive not ready
89	59	131	Bad block not located
90	5A	132	Unrecoverable data
91	5B	133	End of tape
92	5C	134	Tape drive error
93	5D	135	Cartridge not in place
94	5E	136	End of recorded area
95	5F	137	No data detected on tape

DEC. HEX OCTAL

```
------------------------------------------------------------
                   CONTROLLER/HARDWARE-ERROR EVENTS
------------------------------------------------------------
```

DEC.	HEX	OCTAL	
96	60	140	Default error: execute self test
97	61	141	Carriage registration timeout error
98	62	142	No Winchester seek complete
99	63	143	Immediate seek complete
100	64	144	Seek-complete timeout
104	68	150	80188 self-test failure
105	69	151	Program checksum error
106	6A	152	80188 system RAM error
107	6B	153	Buffer RAM failure
108	6C	154	Millisecond clock too slow
109	6D	155	Millisecond clock too fast
110	6E	156	Port failure
111	6F	157	Byte processor hung in execute-self-test data loop
112	70	160	Computed-write ECC error
114	72	162	Host DMA timeout
115	73	163	No stable ECC residue
116	74	164	Byte processor error
117	75	165	Failed to determine disk format
118	76	166	Host CPU error
119	77	167	Tape drive operation timeout
122	7A	172	Illegal tape command sequence
123	7B	173	Tape drive bus parity error
126	7E	176	Invalid RS-232 DL port number

```
------------------------------------------------------------
```

NOTE: Where disk- or tape-related errors are involved, the most significant binary bit of the error code is 0 if no retry was done. If the error persists after retry, the most significant binary bit of the error code becomes 1. Thus, error code 71 (i.e. 47H, or 0100 0111) becomes 199 (i.e. C7H, or 1100 0111) if the error persists after retry.

```
------------------------------------------------------------
```

(IMM/)

APPENDIX F

DESCRIPTION OF SMS 1000 MODEL 41
DATA STORAGE SUBSYSTEM

GENERAL

The SMS 1000 Model 41 (Figures 1-1 and F-1) provides a packaged mass-storage subsystem for MicroVAX II and LSI-11 users who have specialized needs that do not permit the location of mass-storage components within the actual frames of their systems. In exactly the same manner as the Model 40, the Model 41 can be configured with a wide variety of peripherals that can be rapidly tested, checked or configured by means of the SENSE monitor. The Model 41 connects to its host system by means of a simple dual cable set and a dual-width interface card that plugs into the host backplane (see Figure F-1). Thus, all Model 41 peripherals and their associated MSCP controller are fully accessible to the host bus system.

The Model 41 is fundamentally a Model 40 with a backplane modified to contain only two A-B slots. The first receives an interconnection card that is part of the cable set that goes to the host, as shown in Figure F-1. The second slot is reserved for future expansion.

CONTENTS OF APPENDIX

This Appendix covers the following topics:

1. Equipment supplied

2. Discussion of differences between Model 40 and Model 41.

3. Installation and operation of Model 41

4. Backplane jumper strapping

EQUIPMENT SUPPLIED

The following table describes both the basic SMS 1000 MODEL 41 system that is common to all configurations and also describes the user-selectable peripherals that are available with this system.
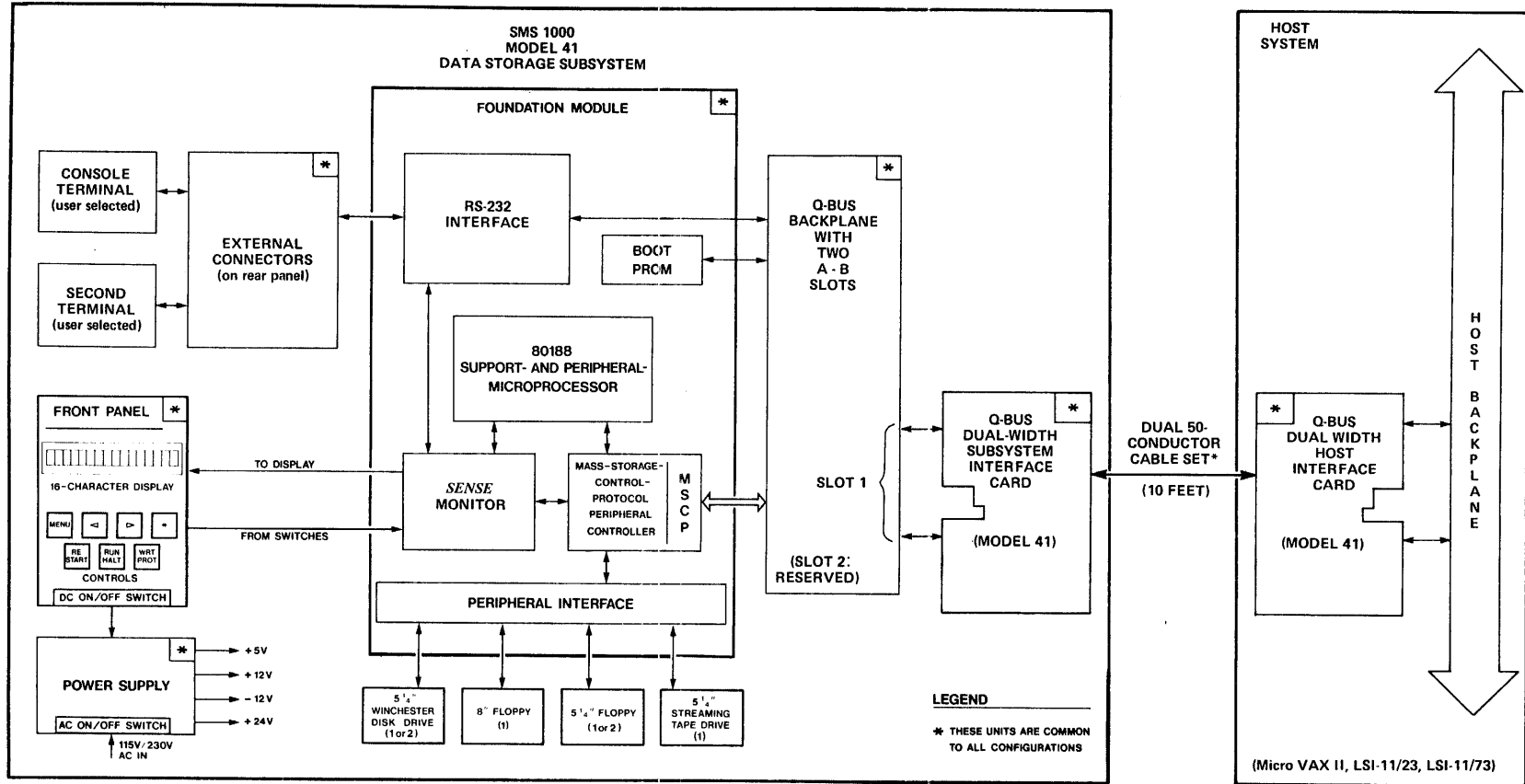

SMS 1000 MODEL 41   F-1

Fig. F-1   SMS 1000 Model 41 Subsystem Functional Block Diagram

TABLE F-1

EQUIPMENT SUPPLIED

NAME	PART NO. OR DESIGNATION	DESCRIPTION
		BASIC SUBSYSTEM
Q-bus backplane	0004530-0002	This is a 22-bit bus. It contains two dual-width A-B slots. 18-bit addressing is selectable by opening four jumpers on the backplane.
Front Panel	0004559-0001	Contains 16-character readout and seven pushbutton switches that provide communication with the SENSE Monitor. Also contains d-c ON/OFF switch (behind door).
Rear panel assembly	0004840-0001	Contains AC power switch, RS-232 connectors, and cable clamp and connectors for the cable set that connects the Model 41 to the host. Jumpers behind the rear panel permit optional selection of the 20-ma current-loop mode in conjunction with user-supplied equipment.
Interconnection cable set	0004842-0001	Ten-foot long cable set for connection between rear panel and host. At the host end, the cable set makes connection with an extender card that plugs into the host backplane.

Dual-width extender card (host)	0005089-0001	Dual-width extender card that plugs into host backplane. Mates with interconnection cable set from Model 41.
Floor-mount, table-mount or rack-mount system enclosure	0004562-0001	Provides mounting locations for all components of the system, including various choices of peripherals. Also contains cooling fans. Rack-mount configuration includes slides.
Foundation module	1002086-0001	Contains peripheral control circuits; two RS-232 serial ports; Q-bus control circuits; and all circuits necessary to run the SENSE monitor.
Power supply	9001076-0001	Switch-selectable for input a-c power of 115 or 230 volts. Provides +5, +12, +24 and -12 volts to the SMS 1000. Power-supply fuse is accessible through opening on rear panel.

USER-SELECTABLE PERIPHERALS

8" Floppy (slimline)	9001258-0001	Tandon Model TM848-2E, double sided/double density, or equivalent.
5-1/4" Floppy (slimline)	9001256-0001	Shugart Model 465, double sided/ 96 TPI, or equivalent.

5-1/4" Winchester hard-disk drive	9001006-0001	12 MB. Full height. Computer Memories Inc. (CMI) Model CM5412; or equivalent.
	9001385-0001	12MB. Half height. Seagate Model ST212 or equivalent.
	9001336-0001	25MB. Half height. Seagate Model ST225 or equivalent.
	9001081-0001	42 MB. Quantum Model Q540, or equivalent.
	9001331-0001	85 MB. Maxtor Model XT-1085, or equivalent.
	9001136-0001	140 MB. Maxtor Model XT-1140, or equivalent.
5-1/4" Cartridge- type streaming tape drive (slimline)	9001315-0001	Tandberg TDC 3309 9-track drive with TDC 3350 QIC-02 controller and formatter board.
	9001056-0001	DC600A-type 1/4"-inch data cartridge for use with streaming tape drive

SYSTEM CHARACTERISTICS

The following table lists various physical and operational charac-
teristics of the SMS 1000.

TABLE 1-2

SYSTEM CHARACTERISTICS

CHARACTERISTIC	DESCRIPTION

Rack-mount system	
Height	5.25 inches
Width	19 inches
Depth	25 inches (27 inches including bezel)
Weight	50-60 lbs., based on configuration

Table-mount system	
Height	6.55 inches
Width	19.8 inches
Depth	26.65 inches (including bezel)
Weight	50-60 lbs., based on configuration

Floor-mount system	
Height	25 inches
Width	10 inches (at base)
Depth	25 inches (27 inches including bezel)
Weight	65-75 lbs., based on configuration

Operating temperature	10 deg C to 35 deg C

Storage temperature	-20 deg C to 50 deg C

Humidity	20 percent to 80 percent

Altitude	Sea level to 50,000 feet

Supply voltage and current	90 volts to 130 volts AC, 6 amps; or 180 volts to 250 volts AC, 3 amps, depending upon switch setting

	on power supply. Input a-c line is fused. The a-c input receptacle includes a line filter.
Supply frequency	47 Hz to 63 Hz without degradation of operation
DC power supply output voltages	+5 volts at 45 amps. +12(C) volts at 4 amps to backplane (cardcage). +12(P) volts at 10 amps to peripherals. -12 volts at 4 amps. +24 volts at 2.5 amps for peripherals and fans. Supply has automatic short-circuit protection. All d-c voltages are regulated. Maximum peak-to-peak ripple and noise is 50 millivolts for +5 volts, and 100 millivolts for all other voltages, when measured under a constant load of at least 250 watts. Maximum power output is 325 watts.
DC ON/OFF switch	Located behind door on front panel. Controls all d-c power to system.
Cooling	Two fans, each under independent front-panel control, can be set at either a low or medium speed. Also, a third (and highest) speed for either fan can be selected by means of a jumper setting on the backplane.
R-F Interference	Meets or exceeds FCC Class A requirements.

DIFFERENCES BETWEEN MODEL 40 AND MODEL 41

The following are the differences between the Models 40 and 41:

1. BACKPLANE. The Model 41 can operate only as a data storage subsystem. Its backplane, therefore, contains no CPU or memory and functions primarily as an extension of the host bus. In all other respects such as, for example, distribution of d-c power and communication between the various components of the subsystem, it functions in the same manner as the Model 40 backplane.

2. FOUNDATION MODULE. The SMS 1000 Model 41 uses the same System Foundation Module as the Model 40. There are only two minor differences in how this module is used. The first is that because the Model 41 has no CPU it does not use the Line Time Clock circuits of the Foundation Module. The second is that with no CPU present, the CPU-running signal line (SRUNL) to the Foundation Module is open (i.e. the system is shipped with jumper W12 on the backplane not connected).

INSTALLATION AND OPERATION OF SMS 1000 MODEL 41

INSTALLATION.

In general, site selection and unit-location requirements for the Model 41 are the same as those for the Model 40. Installation instructions are as follows:

1. LOCATION. Locate your Model 41 within ten feet of its host system. Remove all power from both the host system and the Model 41. Loosen the interconnection cable clamp on the rear panel of the Model 41.

2. CABLES. Use the supplied interconnection cable set, consisting of two cables. One cable is marked with the number "5122-0002" and has the designation "J1" marked on each of its two connectors. The other cable is marked with the number "5122-0004" and has the designation "J2" marked on each of its two connectors.

3. Connect the J1 cable (5122-0002) between the connector marked "J1" on the Model 41 rear panel and the connector marked "J1" on the supplied host extender card. The connectors are keyed so that J1 cannot be inserted backwards and cannot be accidentally connected to J2.

DETAIL A

DETAIL B

NOTES: 1. CAUTION: DUAL WIDTH Q-BUS MODULES PLUGGED INTO C-D CONNECTOR SLOTS 1 OR 2 MAY BE DAMAGED.

2. IF JUMPER W5 IS CONNECTED, FULL POWER IS APPLIED TO CARDCAGE AREA FAN B1 (VIA J11)

3. IF JUMPER W6 IS CONNECTED , FULL POWER IS APPLIED TO PERIPHERAL AREA FAN B2 (VIA J12)

4. CORRESPONDING PINS OF J13, J14, J15 AND J16 ARE ALL CONNECTED IN PARALLEL

W10

W11

W8

W9

JUMPERS FOR SELECTING 18 BIT ADDRESSING

W12 (out for model 41)

TO FANS (see notes)

J11 J12

FOR INTERFACE CARD

TP3 -12V

TP6 +12V(P)

TP4 GND

E21 FRAME GROUND

TP1 +12V(C)

TP5 +24V

TP2 +5V

J1B

J1A

J7 TO CARDCAGE TEMPERATURE SENSOR

J2B

J2A

RESERVED

W12 W4 W3 W2 W1

J16

J15

J14

J13

W5 (FAN SPEED
W6 (JUMPERS (see notes)

J8 TO REAR PANEL

E16   E2

E16 E14 E10 E8 E6 E12 E4 E2

E1 - E16 BUS PRIORITY SETTING JUMPERS

E15   E1

E15 E13 E9 E7 E5 E11 E3 E1

DETAIL B
DETAIL A

F1 2 AMPS (FOR USE WITH 20 ma CURRENT LOOP)

J111 TO FOUNDATION MODULE

J9 TO POWER SUPPLY

J110 TO FOUNDATION MODULE

J13, J14, J15, J16 DC POWER TO ANY PERIPHERAL
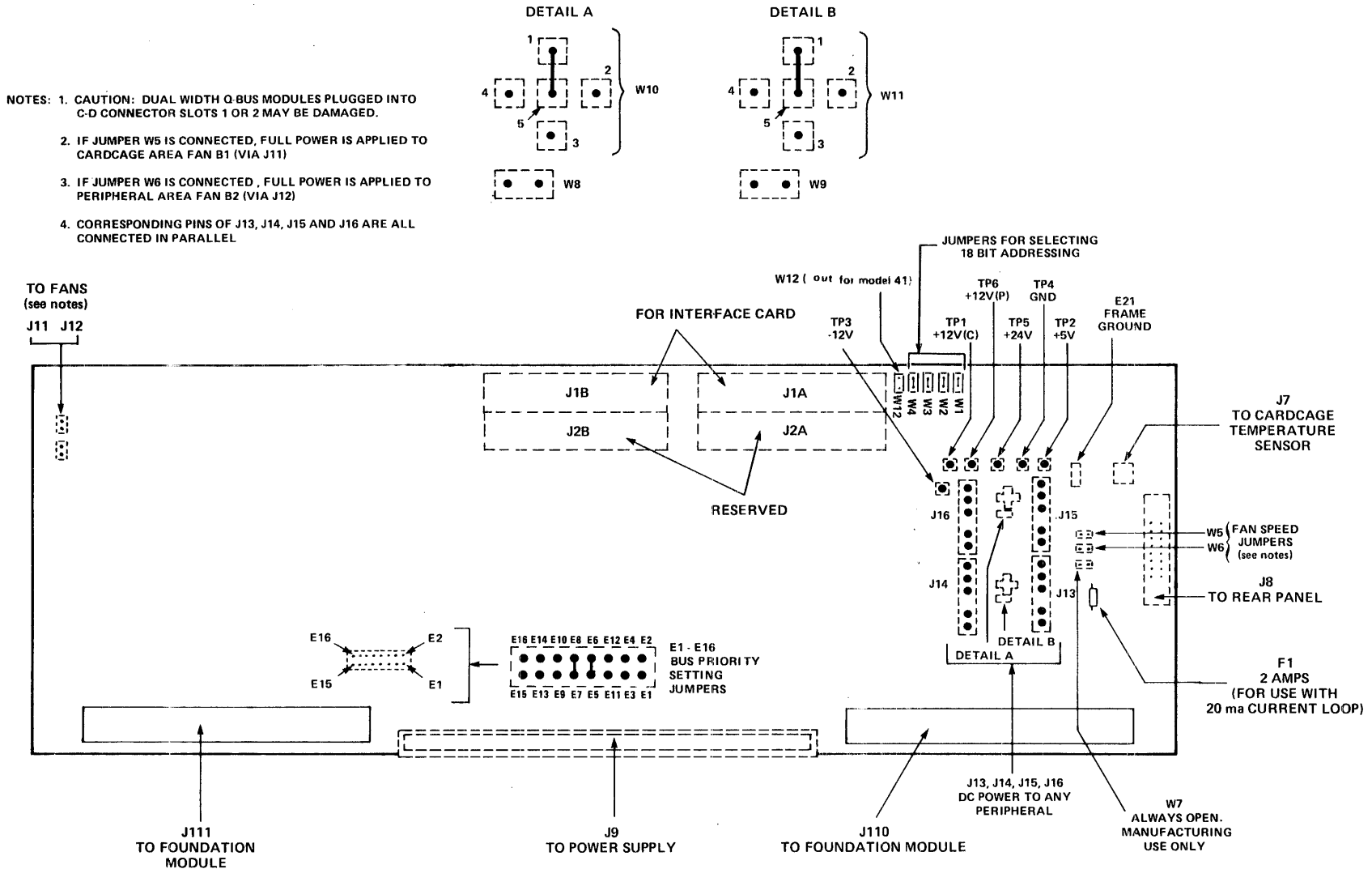
W7 ALWAYS OPEN. MANUFACTURING USE ONLY

Fig. F-2   SMS 1000 Model 41 Backplane

4. Connect the J2 cable (5122-0004) between the connector marked "J2" on the Model 41 rear panel and the connector marked "J2" on the host extender card.

5. Tighten the interconnection cable clamp on the rear panel of the Model 41.

6. Plug the host extender card into the selected host backplane slot.

7. APPLYING POWER. You are now ready to apply power to both the host and to the Model 41 subsystem. Remember the special operation requirements given in the following note.

IMPORTANT

It is important to remember that the host cannot operate properly if it is powered up and the Model 41 is not. This is because a deenergized unit on the bus pulls down the various bus lines. If you have a need to power down the Model 41 subsystem at a time when it is necessary to keep the host system running in order to accomplish tasks not associated with the Model 41, you must first disconnect the cables either at the host or Model 41 end before actually powering down the Model 41. Note, also, that if the host is deenergized it is still possible to run the SENSE menu system in the Model 41 because these commands operate independent of the bus.

8. RESTART PRECAUTIONS. If you press the Model 41 front-panel RESTART and "*" buttons simultaneously, in addition to restarting the Model 41 you will also halt host operation because both units share the same bus. If you need to restart the Model 41 while the host is running an application, you should first disconnect the cables between the two units.

CONFIGURING THE MODEL 41.

As it is shipped from the factory, the Model 41 subsystem is configured with certain default parameters whose values differ from those used in the Model 40. Those parameters are listed here so that if it becomes necessary to reconfigure (for example, after reloading EEPROM from EPROM) you will know the exact Model 41 par-

ameters that need to be entered. Reconfiguration is done by means of the CONFIGURATION portion of the SENSE menus. See Sections 5 and 9 of this manual. The Model 41 configuration settings are:

1. SYSTEM/SUBSYSTEM. Set SYSTEM TYPE in the CONFIGURATION menus from SYSTEM to SUBSYSTEM. The Model 41 default is SUBSYSTEM (refer to SYSTEM TYPE command in Section 9).

2. FIRST DU#. The MODEL 41 default is FIRST DU#=0. When assigning DU numbers for Model 41 peripherals, remember that, in general, the Model 41 DU numbers should not duplicate those used in the host system. Also, note that requirements for DU number assignment may differ between various operating systems. For setting the FIRST DU# parameter, refer to the BOOTSTRAP portion of the CONFIGURATION menus in Section 9.

3. BOOT PROM ADDRESS. The Model 41 configuration setting is 17766000. See the ADDRESSES portion of the CONFIGURATION menus in Section 9.

4. CONSOLE. For the Model 41 the default for the CONSOLE ENAB/DISAB option is DISABLE. See the CONSOLE SETTING portion of the CONFIGURATION menus.

5. PORT BASE ADDRESS. For the Model 41 the configuration default for the PORT BASE ADDRESS option is DISABLE. See the BUS ADDRESSES portion of the CONFIGURATION menus.

6. DU DEVICE ADDRESS. For the Model 41 the configuration default for the DU DEVICE ADDRESS option is 17760334. See the BUS ADDRESSES portion of the CONFIGURATION menus.

BACKPLANE JUMPER STRAPPING

The Model 41 backplane as shipped from the SMS factory is fully
configured and no user strapping is required. The strapping
information is given here only to document this default (as-
shipped) configuration. The jumper connections are as follows
(see Figure F-2):

<div align="center">

E5 TO E6
E7 TO E8

NO CONNECTION TO THE FOLLOWING PINS: E1, E2, E3, E4,
E9, E10, E11, E12, E13, E14, E15, E16

W1: IN
W2: IN
W3: IN
W4: IN
W5: IN
W6: IN
W7: OUT
W8: OUT
W9: OUT
W10/1 TO W10/5
W11/1 TO W11/5
W12: OUT

</div>

APPENDIX G

DESCRIPTION OF SMS 1000 MODEL 50

GENERAL

The SMS 1000 Model 50 is a complete microcomputer system whose basic structure and architecture is the same as that of the SMS 1000 Model 40. The significant differences between the two models are:

1. BACKPLANE. The Model 50 backplane has 12 slots (as opposed to six in the Model 40). Slots 1, 2 and 3 of the backplane have been modified to permit the use of special quad-wide CPU boards. Because of the special wiring required to accommodate this type of quad board, dual-width boards plugged into any of these three C-D slots may be damaged. The A-B connectors in slots 1, 2 and 3 function in the same manner as those in a standard Q-bus backplane. In all other respects the Model 50 backplane operates in the same manner as the Model 40. Note, however, the special Model 50 backplane priority-strapping instructions given later in this Appendix.

2. POWER SUPPLY. The Model 50 has a 500 watt power supply (as opposed to a 325 watt supply in the Model 40) in order to support its larger backplane. Because of this, the power-supply fuses are larger than those in the Model 40. Fuse-replacement procedures for the Model 50 are given later in this Appendix.

EQUIPMENT SUPPLIED

The following table describes the basic SMS 1000 Model 50 system components that are common to all configurations.

TABLE G-1

EQUIPMENT SUPPLIED

NAME	PART NO. OR DESIGNATION	DESCRIPTION

BASIC SYSTEM

| LSI-11 Q-bus backplane | 0005007-0001 | This is a 22-bit bus. It contains twelve quad-wide slots that, with the exception of slots 1, 2 and 3, can accommodate any Q-bus-compatible card of dual or quad width. Slots 1, 2 and 3 have restricted C/D connectors. |

CAUTION: Dual-wide boards plugged into C/D connectors in slots 1, 2, or 3 may be damaged.

18-bit addressing is selectable by opening four jumpers on the backplane.

| Front Panel | 0004559-0001 | Contains 16-character readout and seven pushbutton switches that provide communication with the SENSE Monitor. Also contains d-c ON/OFF switch (behind door). |

| Rear Panel Assembly | 0004900-0001 | Contains AC power switch and external connectors. Removable panels permit addition of extra connectors, depending upon configuration. Jumpers behind the rear panel permit optional selection of the 20-ma current-loop mode in conjunction with user-supplied equipment. |

| Floor-mount, table-mount or rack-mount system enclosure | 0004910-0001 | Provides mounting locations for all components of the system, including various choices of peripherals. Also contains cooling fans. Rack-mount configuration includes slides. |

| Foundation module | 1002086-0001 | Contains peripheral control circuits; two RS-232 serial ports; Q-bus control circuits; and all circuits necessary to run the SENSE monitor. |
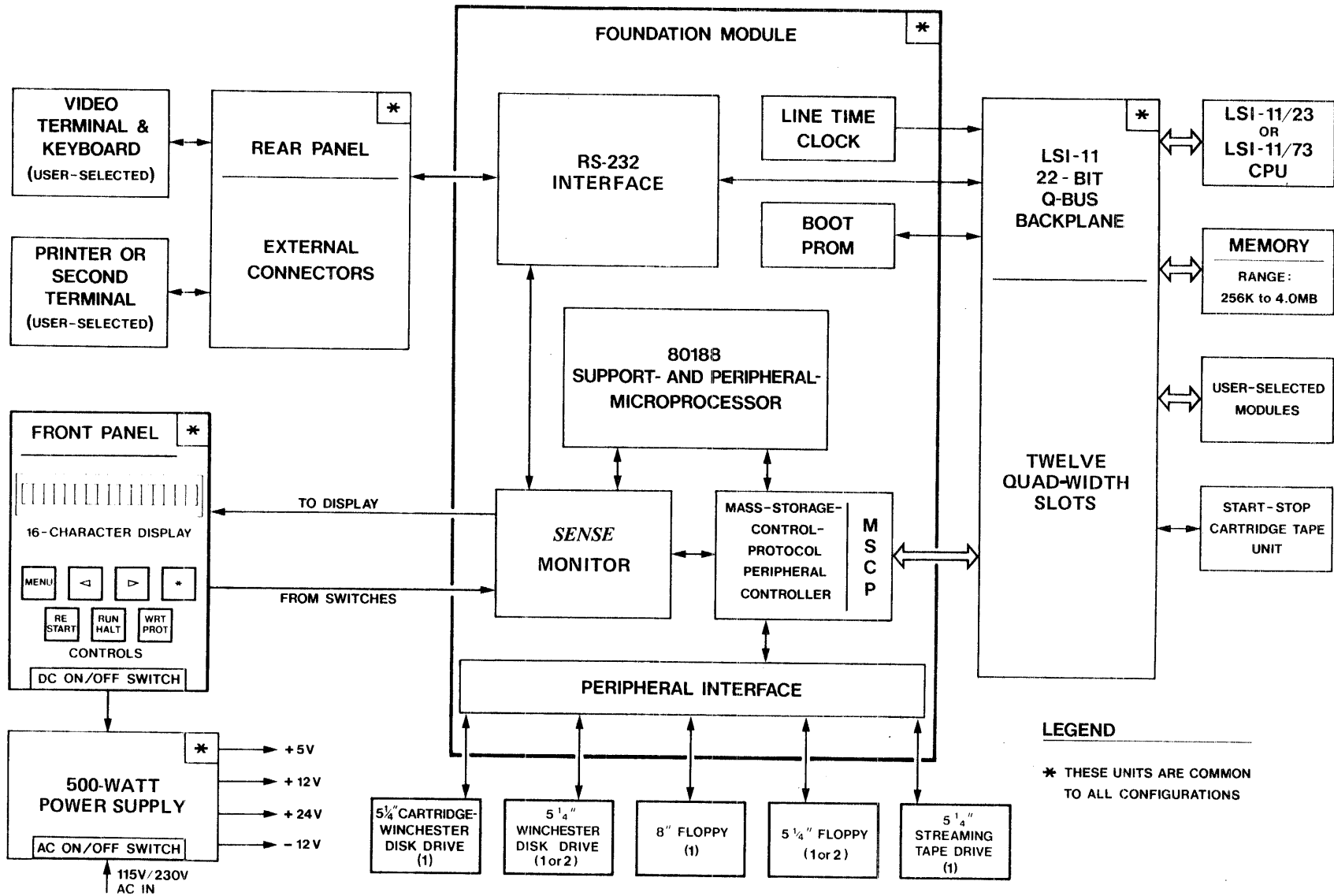
Fig. G-1   Functional Block Diagram of SMS 1000 Model 50

Power supply (500 watt)	9001305-0001	Switch-selectable for input a-c power of 115 or 230 volts. Provides +5, +12, +24 and -12 volts to the SMS 1000. Power-supply fuse is located in compartment in power-switch housing on rear panel.

SYSTEM CHARACTERISTICS

The following table lists various physical and operational characteristics of the SMS 1000 Model 50.

TABLE G-2

SYSTEM CHARACTERISTICS

CHARACTERISTIC	DESCRIPTION

Rack-mount system	
Height	10.5 inches
Width	19 inches
Depth	25 inches (27 inches including bezel)
Weight	60-70 lbs., based on configuration

Table-mount system	
Height	11.9 inches
Width	21.5 inches
Depth	26.7 inches (including bezel)
Weight	65-75 lbs., based on configuration

Floor-mount system	
Height	25.2 inches
Width	14 inches (at base)
Depth	25 inches (27 inches including bezel)
Weight	75-85 lbs., based on configuration

Operating temperature	10 deg C to 35 deg C
Storage temperature	-20 deg C to 50 deg C
Humidity	20 percent to 80 percent
Altitude	Sea level to 50,000 feet
Supply voltage and current	90 volts to 130 volts AC, 10 amps; or 180 volts to 250 volts AC, 5 amps, depending upon switch setting on power supply. Input a-c line is fused. The a-c input receptacle includes a line filter.
Supply frequency	47 Hz to 63 Hz without degradation of operation
DC power supply output voltages	+5 volts at 75 amps. +12(C) volts at 4 amps to backplane (cardcage). +12(P) volts at 10 amps to peripherals. -12 volts at 4 amps. +24 volts at 2.0 amps for peripherals and fans. Supply has automatic short-circuit protection. All d-c voltages are regulated. Maximum peak-to-peak ripple and noise is 50 millivolts for +5 volts, and 100 millivolts for all other voltages, when measured under full load. Maximum power output is 500 watts.
DC ON/OFF switch	Located behind door on front panel. Controls all d-c power to system. System has negligible power consumption with ac on and dc off.

Cooling	Three fans, each under independent front-panel control by means of SENSE Monitor commands, can be set at either low or intermediate speed. Also, a third (and highest) speed for any fan can be selected by means of jumper settings on the backplane.

R-F Interference	Meets or exceeds FCC Class A requirements.

INSTALLATION INFORMATION

In general, installation and operation requirements for the Model 50 are essentially the same as those for the Model 40. The only dif- ference involves the selection of power-supply fuses that correspond to the a-c input voltage in use.

SELECTION OF 115-VOLT OR 230-VOLT A-C POWER

The SMS 1000 MODEL 50 system can operate on either of two ranges of input voltage: (1) 90 to 130 volts ac, nominally 115 volts; or (2) 180 to 250 volts ac, nominally 230 volts. Either type of operation can be selected by making a corres- ponding setting of a rotor-type cam that actuates voltage-selection switches within the fuse compartment. Note, also, that for each supply voltage there is a correct size of power-supply fuse that must be used. These will be described in the following procedure. See Figures G-2 or G-3 for location of the fuse- and voltage-selection compart- ment. To make the fuse selection and voltage setting, proceed as follows:

CAUTION

An incorrect voltage setting can damage your SMS 1000 Model 50. Before applying power, be sure you know what the line voltage is, that you have made the corresponding voltage set- ting on the Model 50, and that you have the correct power-supply fuse installed.

1. REMOVAL OF POWER. Turn off the SMS 1000 Model 50 a-c switch on the rear panel and then remove all input power by unplugging the a-c power cord from the receptacle at the rear of the enclosure.

DANGER

Potentially lethal voltages can be
encountered in the power supply for
as long as two minutes after a-c power
is removed from it. Therefore, wait
at least two minutes after removing
power before working on it.

2. FUSE SELECTION. Using a small screwdriver, carefully pry
open the fuse- and voltage-select door at the rear of the
enclosure, as shown in Figures G-2 or G-3. There is a slot
for prying open the door at its left edge.

3. Using a small screwdriver, carefully pry out the white
plastic fuse holder from the fuse compartment. If the system
is to be set for 115-volt operation, the fuse must be a Buss
type ABC (ceramic body), or equivalent, rated at 10 amps. If
the system is to be set for 230-volt operation, the fuse must
be the same type, but rated at 5 amps.

4. Place the correct fuse in the fuse holder, replace the
holder in the fuse compartment, and press the holder all the
way to the end of its travel.

5. VOLTAGE SELECTION. Carefully remove from the compartment
the irregular-shaped cam having the markings "115Vac" and
"230Vac". Note that the shafts on each end of the cam are of
different diameters and that they fit into corresponding-width
slots. Thus, the cam cannot be re-installed backwards.

6. Turn the cam so that, depending upon the system operating
voltage desired, either of the two "115Vac" cam markings, or
either of the two "230Vac" cam markings, is facing you after
the cam is replaced in its slots.

7. After the cam has been replaced, with the desired voltage
marking facing outward, firmly close the compartment door. Be
sure that it is fully closed and that the selected voltage
setting can be seen through the opening in the door after clo-
sure.

8. Reconnect the a-c power cord to its receptacle on the rear
panel. Power can now be re-applied to the system.

FRONT VIEW

5.23

19.00

DOOR

9.30

4.80

7.30

BALL CASTERS (6)

SIDE VIEW

25.05

1.60

AIR EXHAUST VENTS

19.43

5.50

6.25

HINGED FRONT-PANEL
DOOR IN THE OPEN
POSITION

AIR INTAKE VENTS

0.19

REAR VIEW

11.04

1/4 TURN
FASTENERS

AC INPUT
AND FUSE

24.93

2.85

1.15

8.00

14.00

NOTES:

1. Both side covers are removable by
   loosening three screws per cover.
   Cover lifts up, then off.

2. Entire unit rolls on six ball casters.
   Bottom of pedestal is 0.19 inches
   above the floor.

3. All dimensions in inches.

Fig. G-2   SMS 1000 Model 50 Outline drawing: Floor-mounted systems

TOP VIEW

17.97

10.91

FAN   FAN

19.00

SLIDES

SIDE VIEW

1.60   25.05

REAR VIEW

17.34

AC ON-OFF → ON [ ] OFF

FUSE

AC INPUT RECEPTACLE

2.75

17.02

NOTES:

1. THIS UNIT FITS INTO ANY 19" EIA STANDARD (RS-310) OR
   RETMA RACK WITH A 17.75" MINIMUM OPENING
2. ALL DIMENSIONS ARE IN INCHES

FRONT VIEW

10.50 MAX.

5.23

2.75

FRONT-PANEL
DOOR
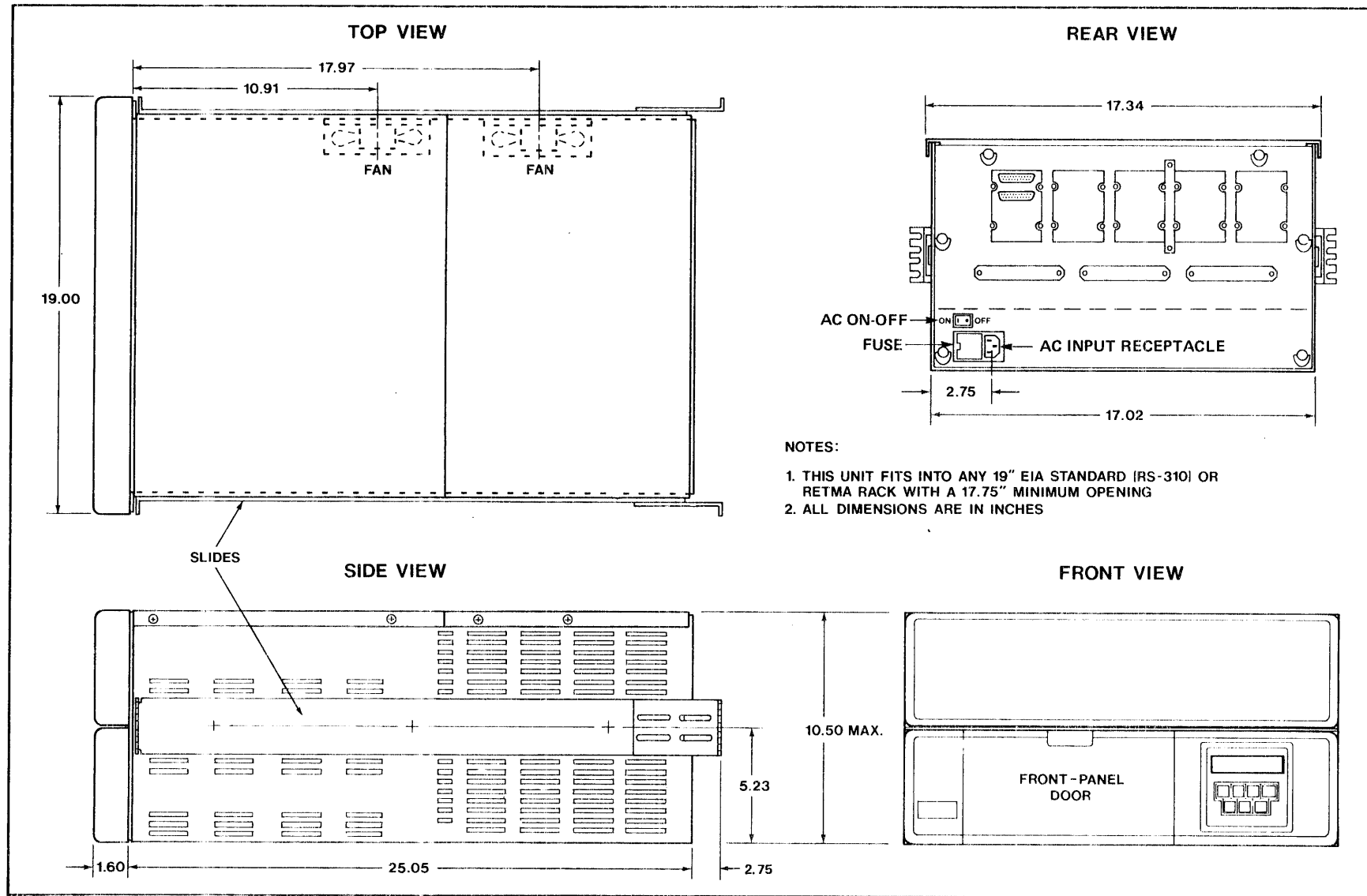
Fig. G-3   SMS 1000 Model 50 Outline drawing: Rack-mounted systems

CONFIGURING YOUR MODEL 50

With the exception of the following bus-priority procedure, the Model 50 configuration instructions are the same as those for the Model 40. The Model 50 backplane is shipped from the factory wired in the Option 1 (as-shipped) configuration shown below. Strapping information is given here only to document the various alternate options.

ASSIGNING BUS PRIORITY: STRAPPING E1-E16 ON SMS 1000 MODEL 50 BACKPLANES

The SMS 1000 Model 50 backplane priority-assignment jumper pins, E1 through E16 (see Figure G-4) can be strapped to implement any of three possible priority schemes. These are:

1. SMS AS-SHIPPED CONFIGURATION:

> (1) HIGHEST PRIORITY: CPU (J1A/B on backplane)
>
> (2) SECOND HIGHEST PRIORITY: Foundation Module
>
> (3) NEXT HIGHEST PRIORITY: Backlpane slots J2A/B, through J12C/D, in the sequence shown in the following diagram:
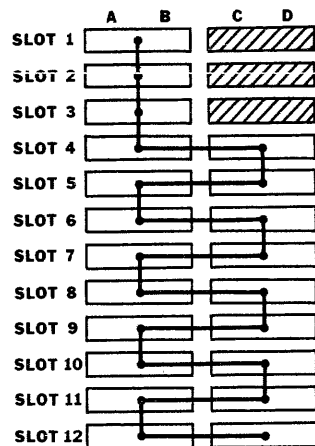
CAUTION
DUAL-WIDTH Q-BUS MODULES
PLUGGED INTO C-D CONNECTOR
SLOTS 1,2 OR 3 MAY BE DAMAGED.

IMPORTANT

Note the serpentine priority-assignment path
in the above diagram. The CPU (whether dual
or quad) in backplane Slot 1 always has the

highest priority. All backplane slots are
listed in order of descending priority. That
is, J7C/D has a higher priority than J7A/B;
J2A/B has a higher priority than J3A/B, etc.
Note that J1C/D, J2C/D and J3C/D are not
included in this priority scheme.

The SMS-shipped jumper connections are as follows (refer to
Figure G-4 for the location of bus-priority jumper pins):

```
 E1 TO E2
 E3 TO E4
 E5 TO E6
 E7 TO E8
 E9 TO E10
E11 TO E12
E13 TO E14
E15 TO E16
```

2. FIRST OPTIONAL CONFIGURATION:

(1) HIGHEST PRIORITY: CPU (J1A/B on backplane)

(2) SECOND HIGHEST PRIORITY: Backplane slots
    J2A/B, J3A/B, J4A/B, J4C/D

(3) NEXT HIGHEST PRIORITY: Foundation Module

(4) LOWEST PRIORITY: Backplane slots J5A/B
    through J12C/D, in the order shown in the
    above diagram.

To implement this priority scheme, make the following connec-
tions:

```
 E1 TO E9
 E2 TO E8
 E3 TO E11
 E4 TO E6
 E5 TO E12
 E7 TO E10
E13 TO E14
E15 TO E16
```

3. SECOND OPTIONAL CONFIGURATION:

(1) HIGHEST PRIORITY: CPU (J1A/B on backplane)

(2) SECOND HIGHEST PRIORITY: Backplane slots
      J2A/B through J7A/B, in the order shown in the
      above priority diagram.

(3) NEXT HIGHEST PRIORITY: Foundation Module

(4) LOWEST PRIORITY: Backplane slots J8A/B
      through J12C/D, in the order shown in
      the above priority diagram.

To implement this priority scheme, make the following
connections:

$$
\begin{array}{lll}
\text{E1} & \text{TO} & \text{E14} \\
\text{E2} & \text{TO} & \text{E8} \\
\text{E3} & \text{TO} & \text{E16} \\
\text{E4} & \text{TO} & \text{E6} \\
\text{E5} & \text{TO} & \text{E15} \\
\text{E7} & \text{TO} & \text{E13} \\
\text{E9} & \text{TO} & \text{E10} \\
\text{E11} & \text{TO} & \text{E12}
\end{array}
$$

STRAPPING BACKPLANE JUMPERS

The following table describes the as-shipped (default) strap-
ping for backplane jumpers W1 through W11.

JUMPER DESIGNATION	SMS AS-SHIPPED CONNECTION	REMARKS
W1	IN	Opening W1, W2, W3 and W4 enables 18-bit addressing
W2	IN	
W3	IN	
W4	IN	
W5	IN	Fan 1: highest speed
W6	IN	Fan 2: highest speed

Fig. G-4   SMS 1000 Model 50 Backplane
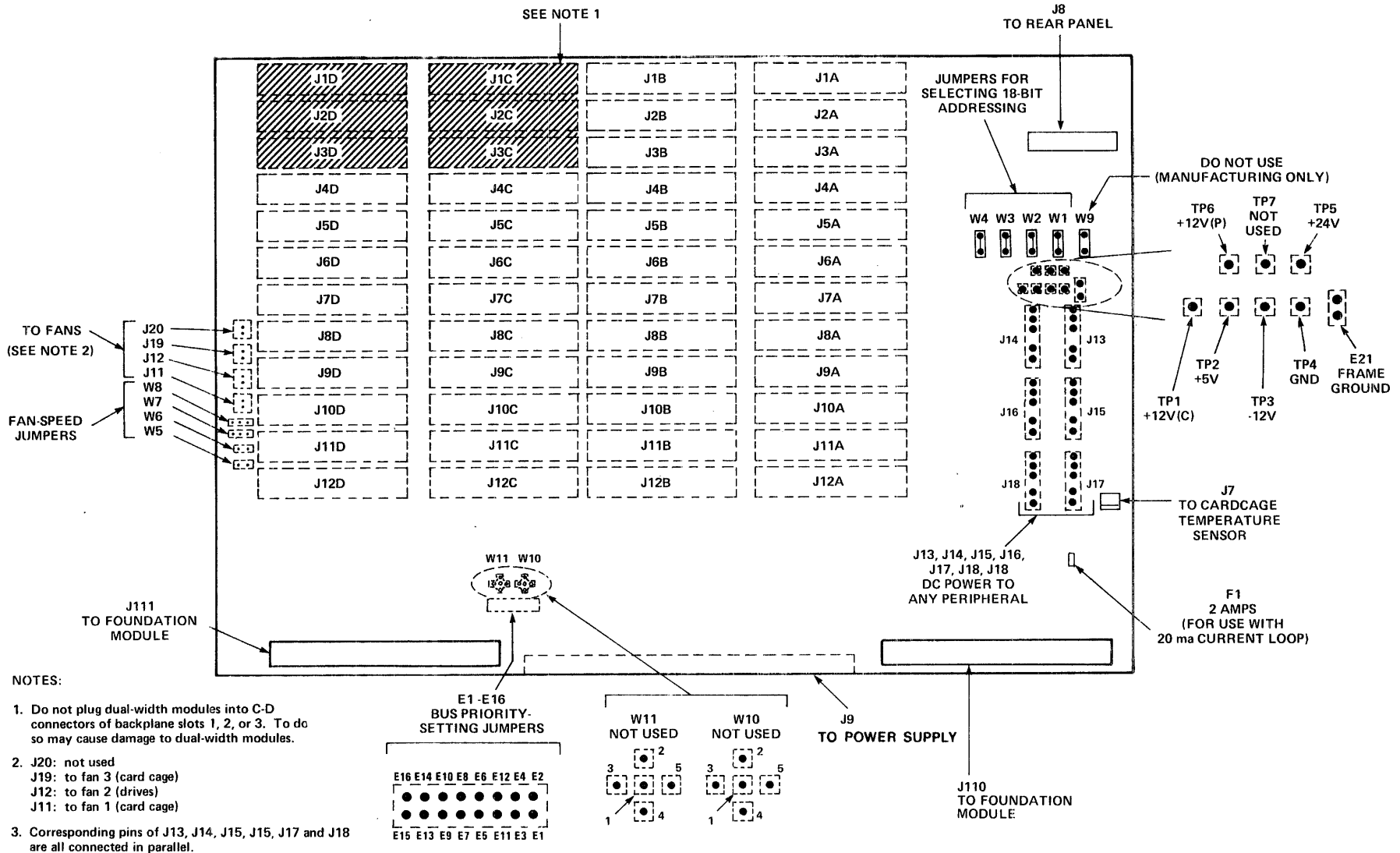
NOTES:

1. Do not plug dual-width modules into C-D connectors of backplane slots 1, 2, or 3. To do so may cause damage to dual-width modules.

2. J20: not used
   J19: to fan 3 (card cage)
   J12: to fan 2 (drives)
   J11: to fan 1 (card cage)

3. Corresponding pins of J13, J14, J15, J15, J17 and J18 are all connected in parallel.

W7 pins 1 & 2	IN	Fan 3: highest speed
W8	OUT	Not used
W9	OUT	Manufacturing use only
W10	OUT	Manufacturing use only
W11	OUT	Manufacturing use only

MAINTENANCE INFORMATION

With the exception of the following fuse-replacement procedure, the maintenance instructions for the SMS 1000 Model 50 are the same as those for the Model 40.

POWER SUPPLY FUSE REPLACEMENT

There is only a single user-replaceable fuse in the power supply. CAUTION: before replacing any fuse, always be sure that the problem that caused the fuse to blow has been corrected. To replace the fuse, proceed as follows:

1. Turn off the system a-c switch (on the rear panel) and then remove all a-c input power by unplugging the power cord from its receptacle.

DANGER

Potentially lethal voltages can be encountered in the power supply for as long as two minutes after a-c power is removed from it. Therefore, wait at least two minutes after removing power before working on it.

2. Using a small screwdriver, carefully pry open the door of the fuse- and voltage-select compartment on the rear of the enclosure. There is a slot for prying open the door, at its left edge. Be careful not to disturb the voltage-selection cam at the left side of the compartment. See Figures G-2 or G-3 for compartment location.

3. Using a small screwdriver, carefully pry out the white plastic fuse holder from the fuse compartment.

4. Replace the defective fuse in the fuse holder with a Buss type ABC (ceramic body), or equivalent, rated at 5 amps if the system is operating at 230 volts, or 10 amps if the system operates at 115 volts.

CAUTION

Replace a blown fuse only if you have found and corrected the fault that caused it to blow. Be sure to re-install only a correct-amperage fuse corresponding to the supply voltage in use. Too large a fuse will provide ina-dequate protection. Too small a fuse may fail unnecessarily.

5. Replace the fuse holder in the fuse compartment, making sure that the arrow on the front of the fuse holder points up. Then press in the fuse holder all the way to the end of its travel.

6. Close the fuse-compartment door, making sure that, after it is closed, the correct a-c operating voltage shows through the opening in the door.

7. Replace the a-c power cord in its receptacle.

MODEL 50 INTERCONNECTION WIRING DIAGRAMS

Figures G-5 through G-24 show the interconnection of SMS 1000 Model 50 system components for a wide range of peri-pheral combinations. Note that all connecting cables between components of the system are identified by their SMS part numbers. For major system component part numbers, refer to Appendix C.
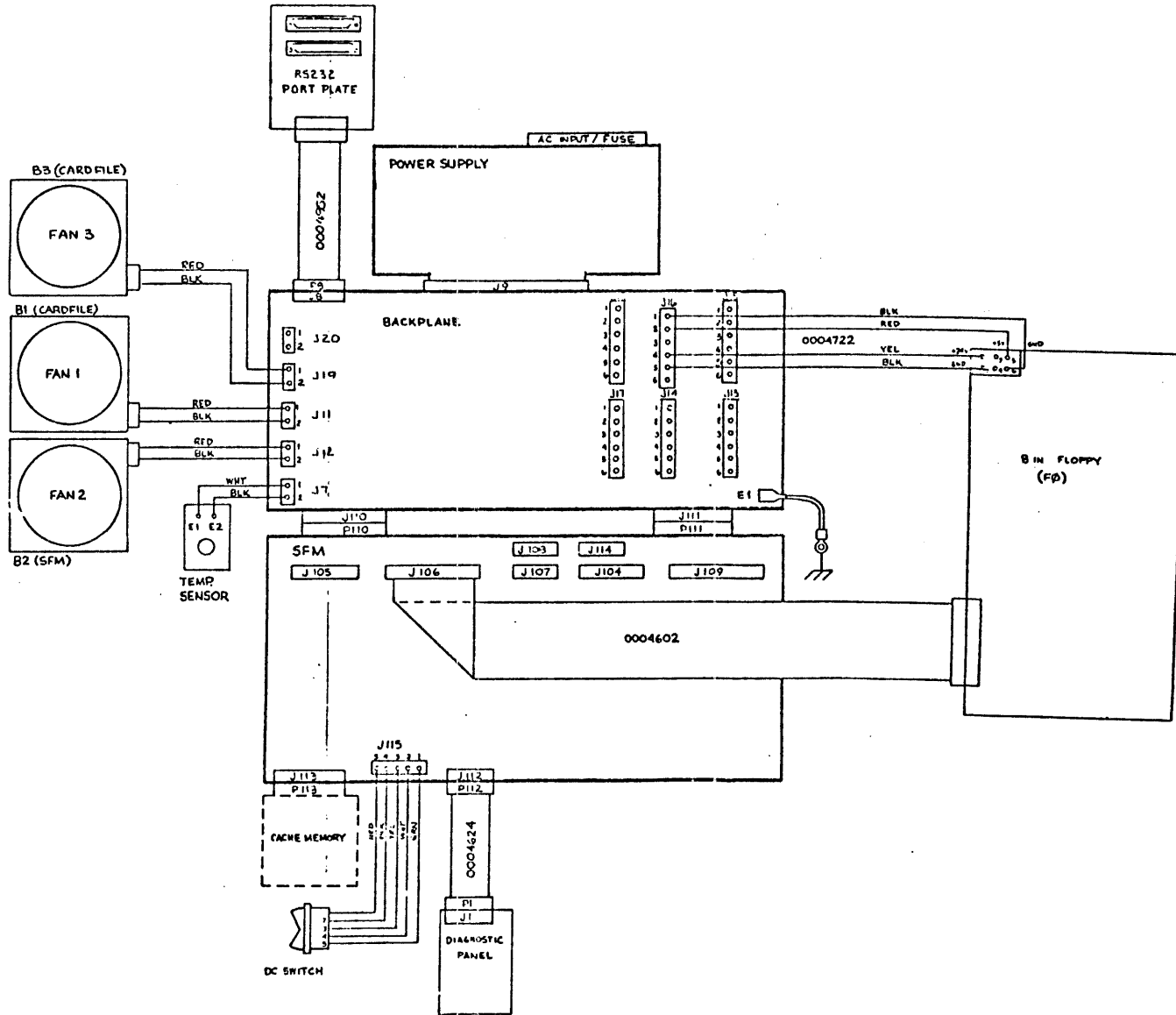
Fig. G-5   SMS 1000 Model 50 cabling diagram. Single 8" floppy
configuration. (1002249)
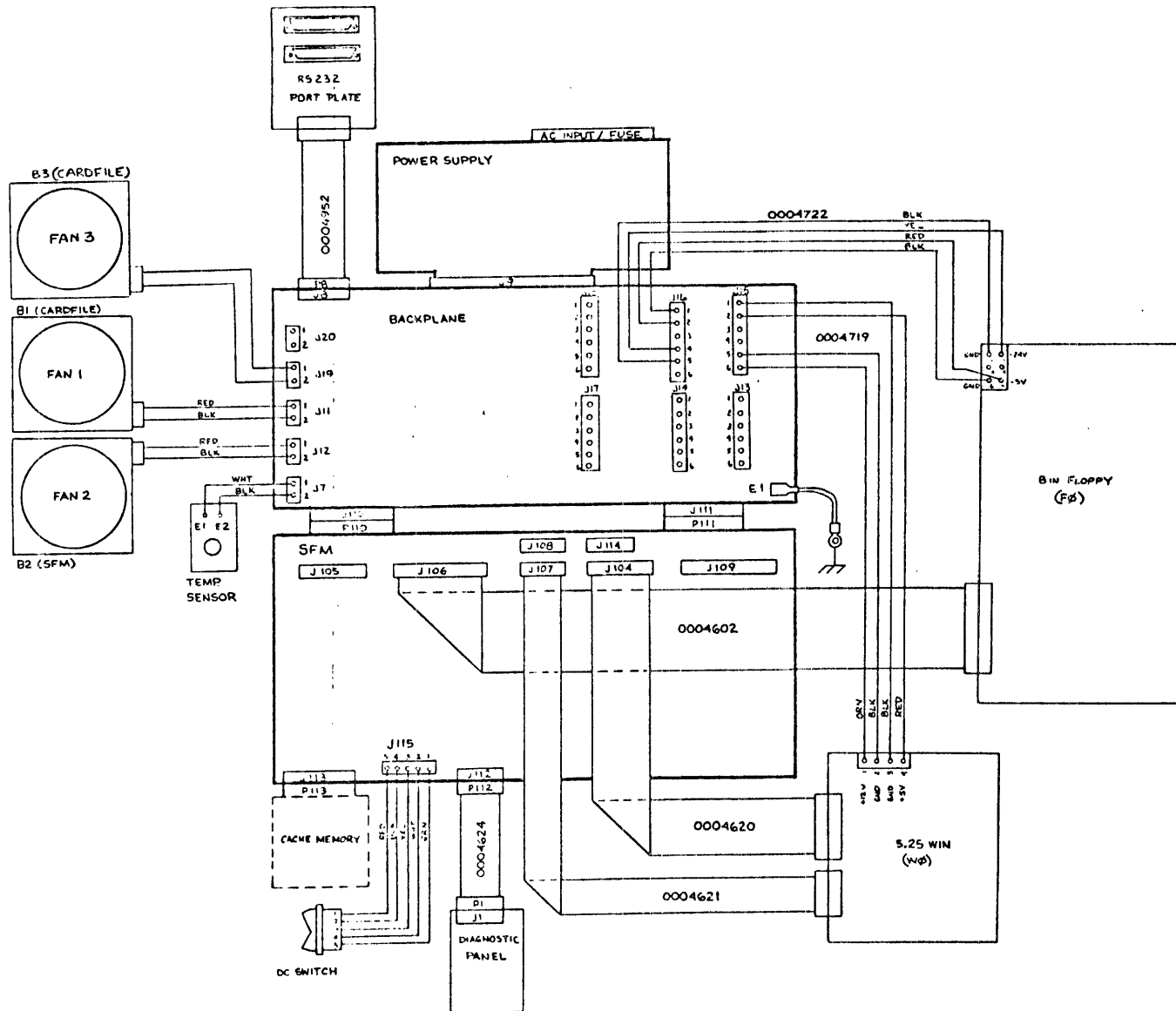
Fig. G-6   SMS 1000 Model 50 cabling diagram. Single 8" floppy
and single Winchester configuration. (1002250)
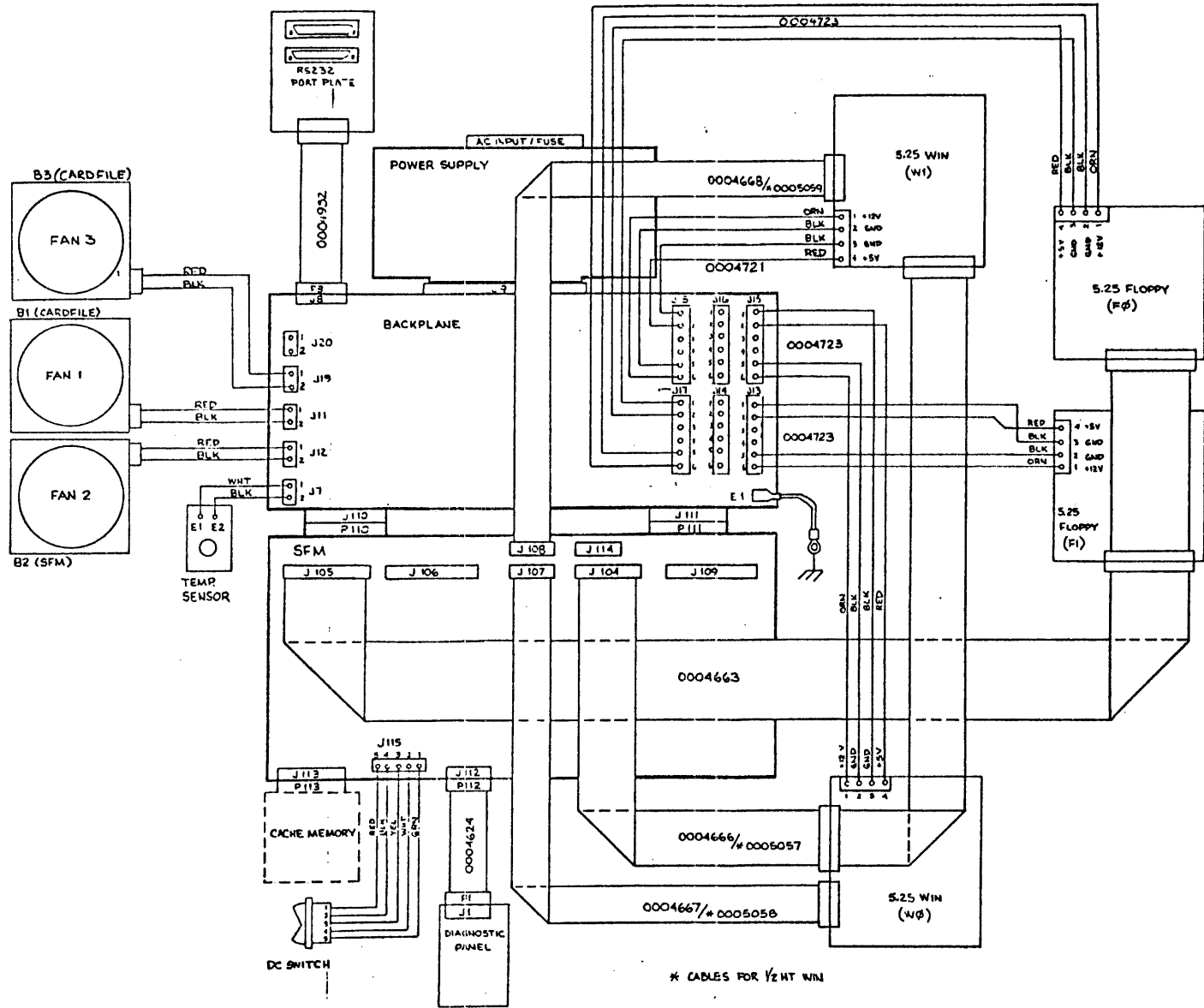
Fig. G-7   SMS 1000 Model 50 cabling diagram.   Single 5 1/4"
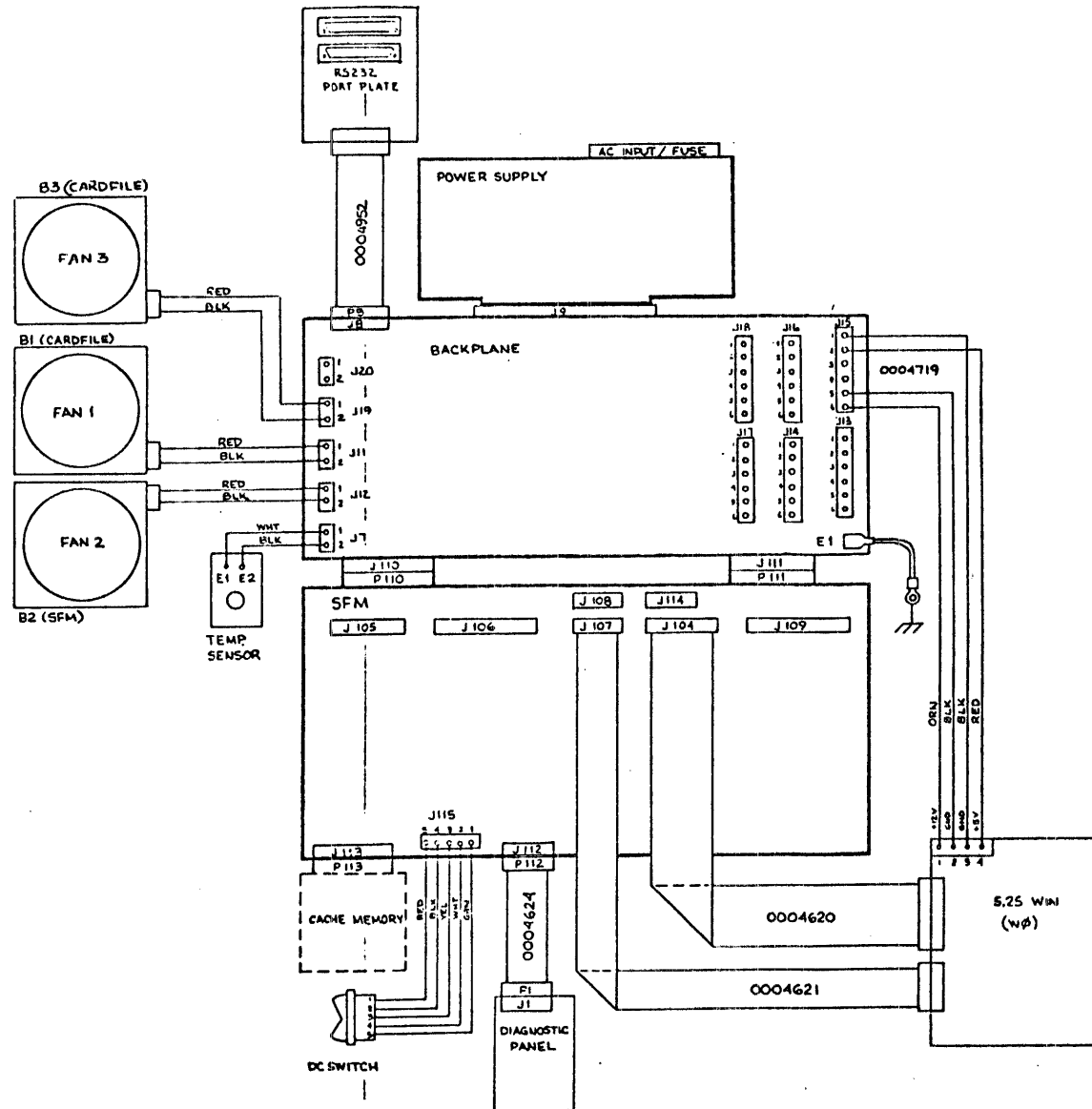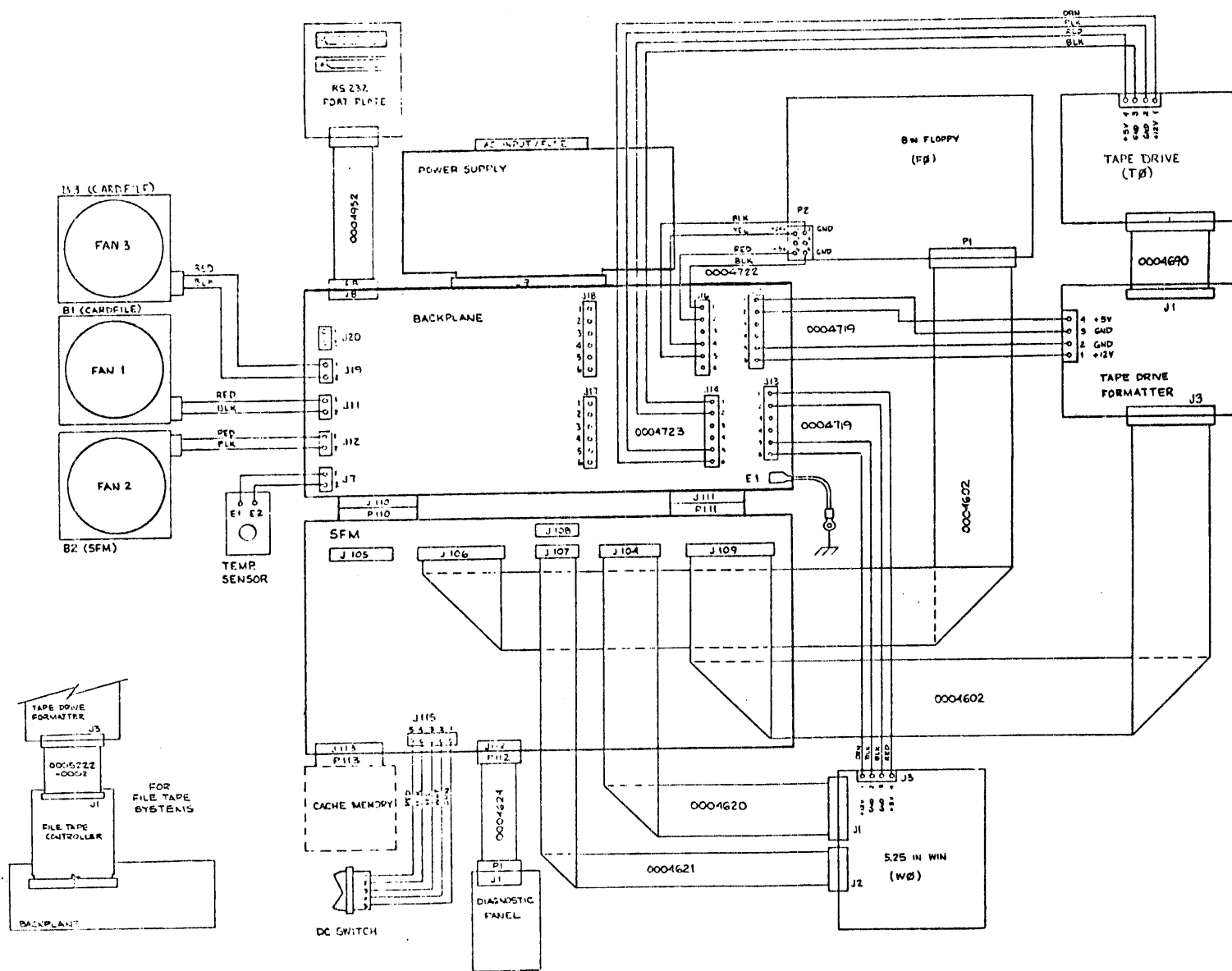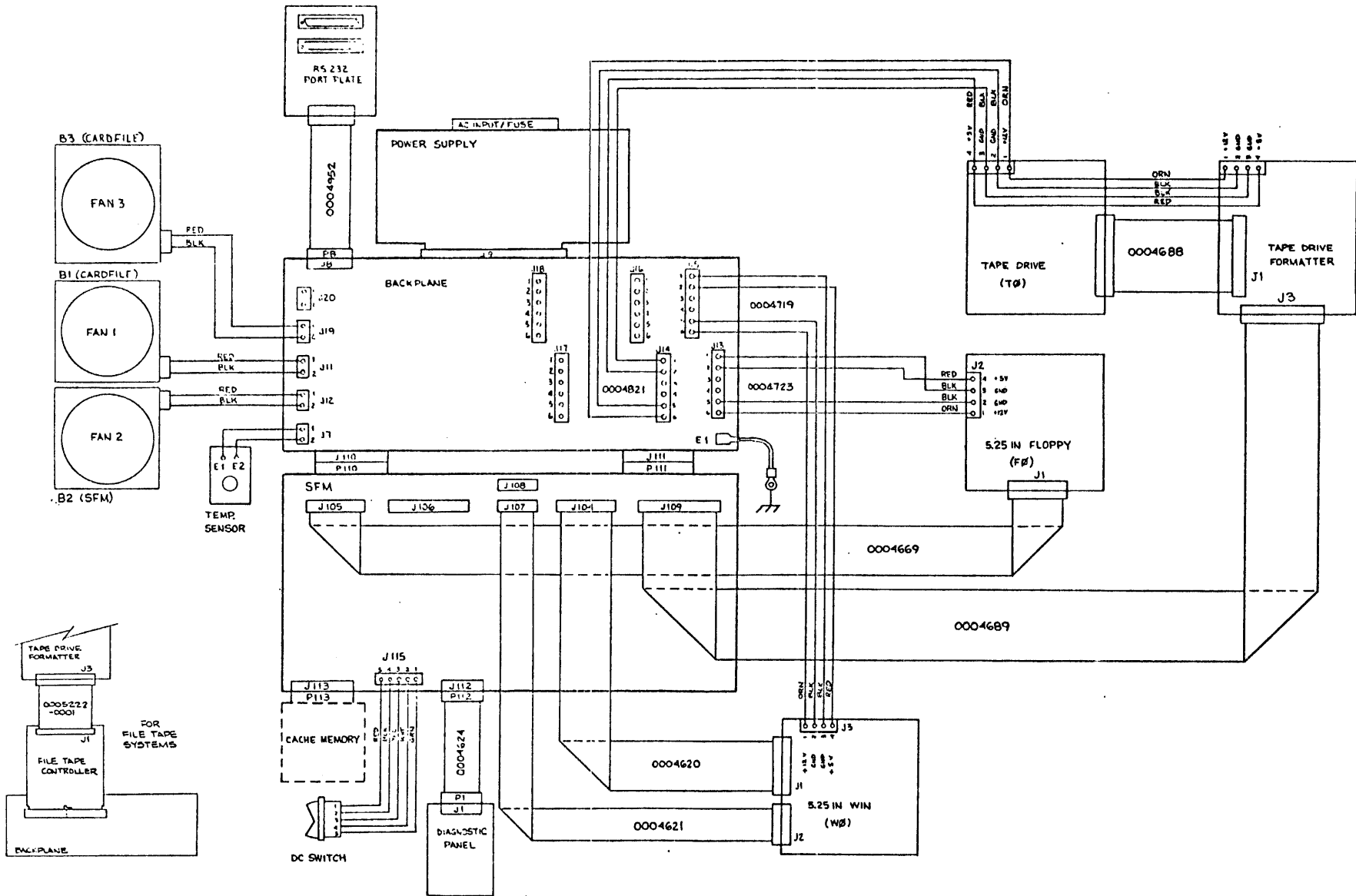   floppy and single Winchester configuration. (1002252)
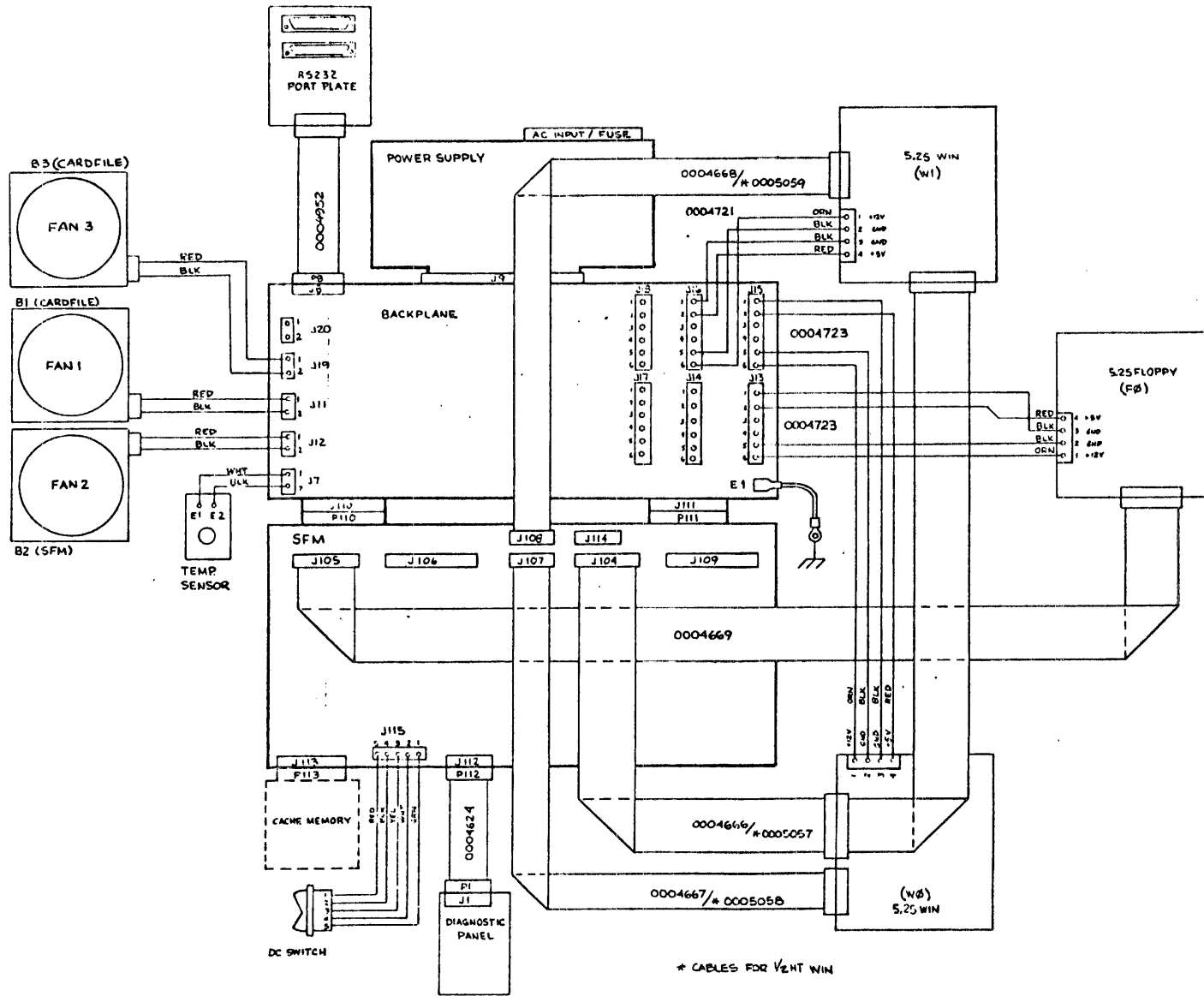
Fig. G-8   SMS 1000 Model 50 cabling diagram.   Single 5 1/4"
            floppy and dual Winchester configuration. (1002253)
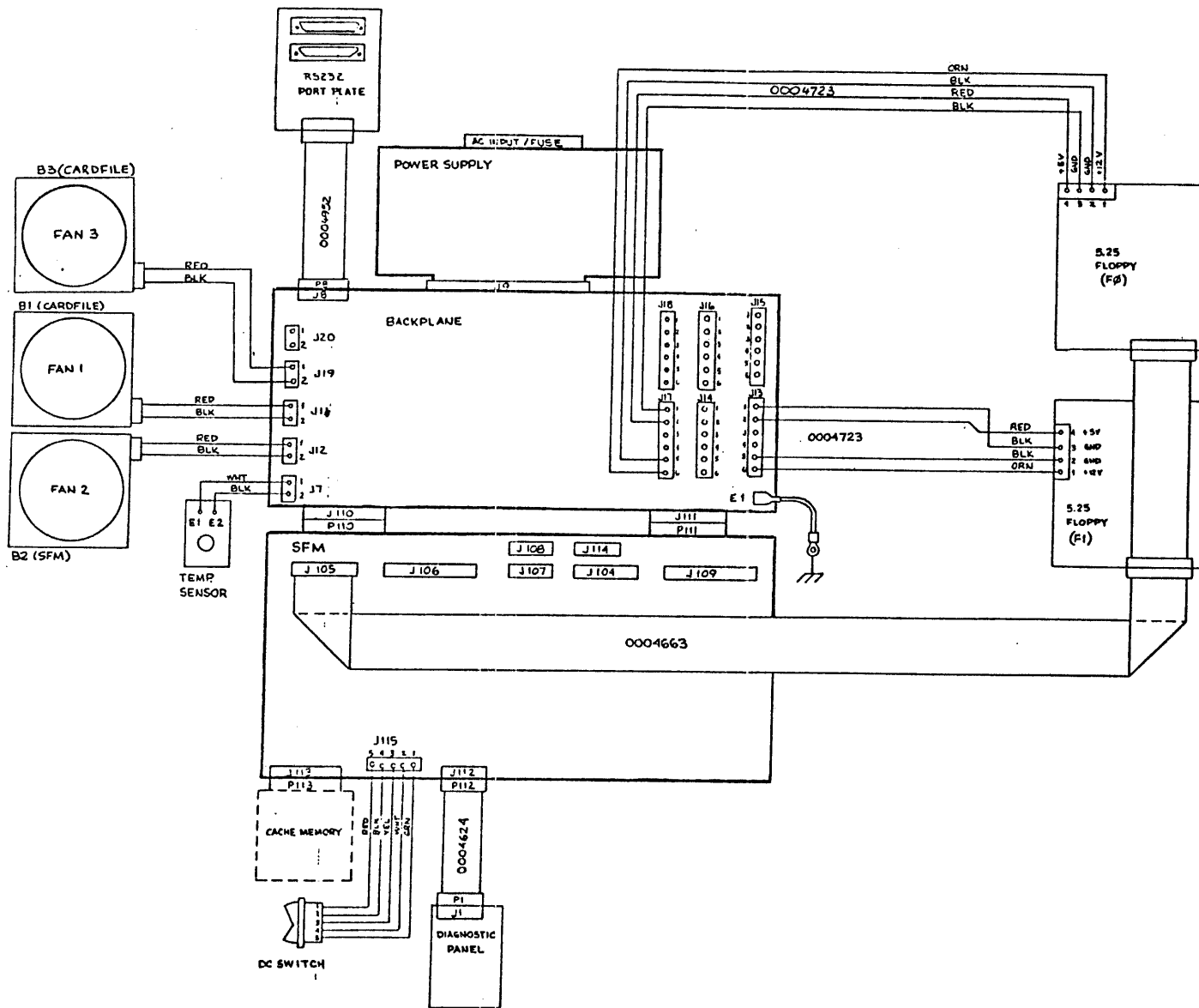
Fig. G-9   SMS 1000 Model 50 cabling diagram.   Dual 5 1/4" floppy configuration (1002254)
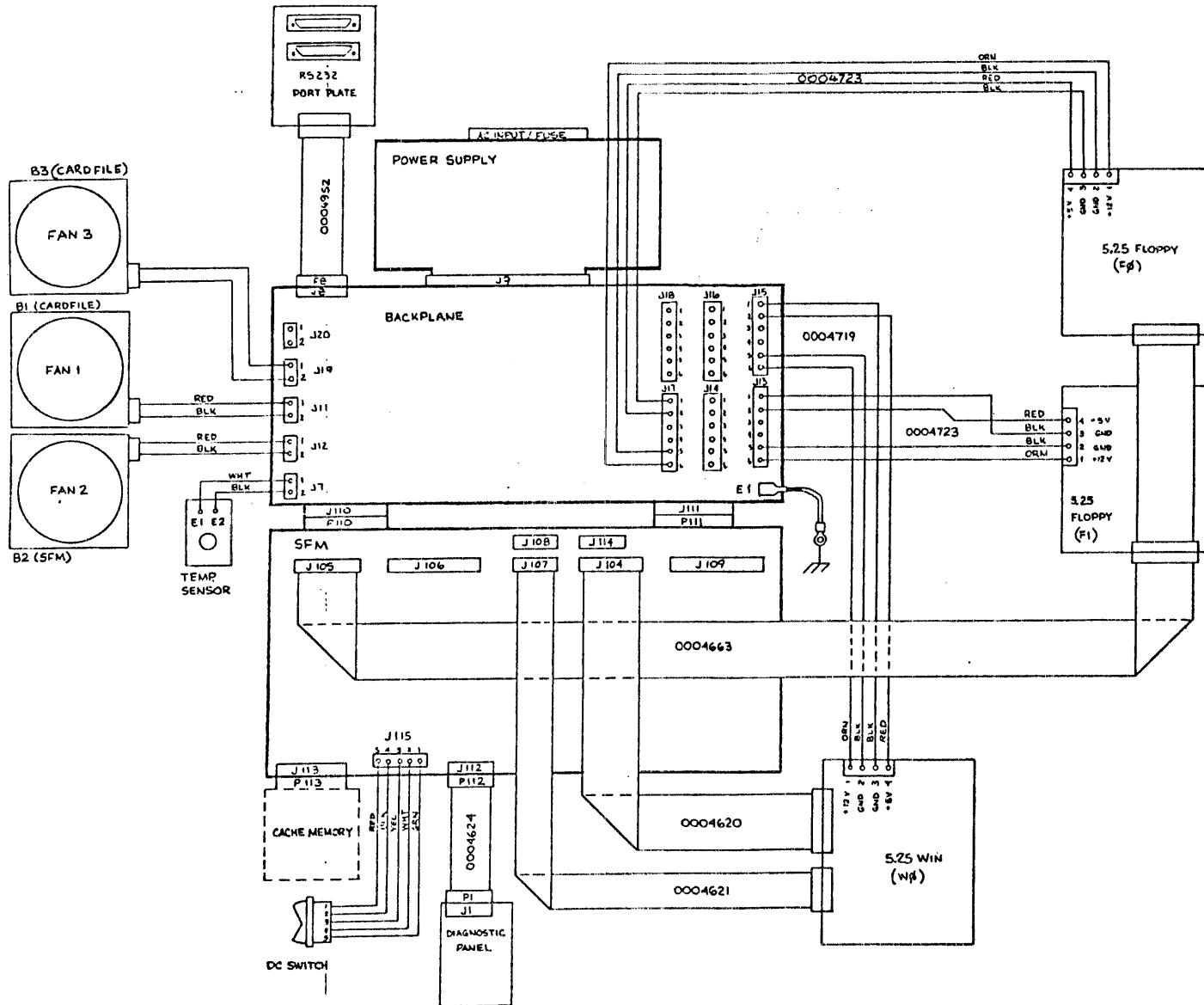
Fig. G-10   SMS 1000 Model 50 cabling diagram.   Dual 5 1/4" floppy
and single Winchester configuration. (1002255)
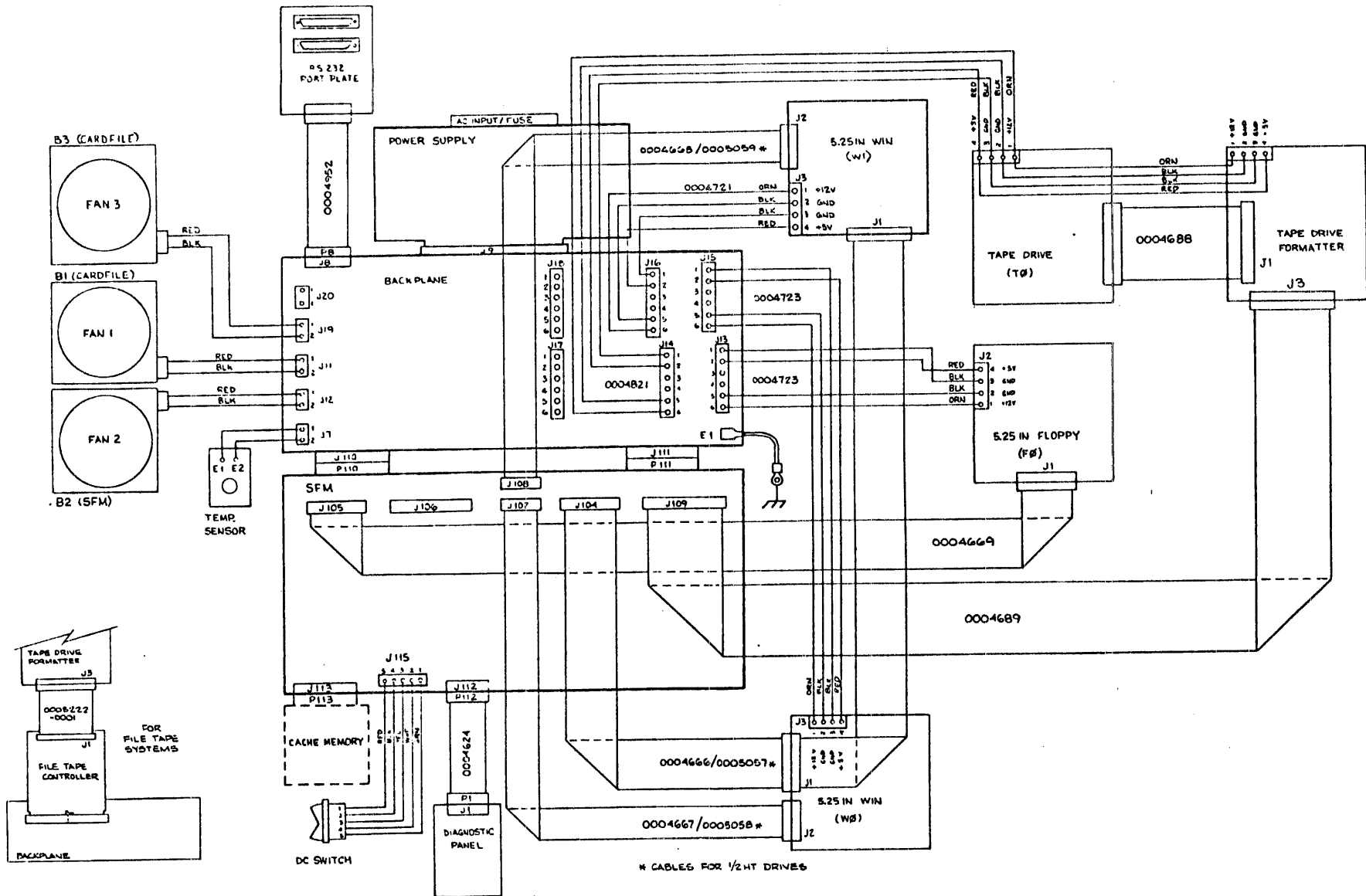
Fig. G-11   SMS 1000 Model 50 cabling diagram.   Dual 5 1/4" floppy
and dual Winchester configuration. (1002256)

Fig. G-12   SMS 1000 Model 50 cabling diagram.   Single Winchester
configuration. (1002257)
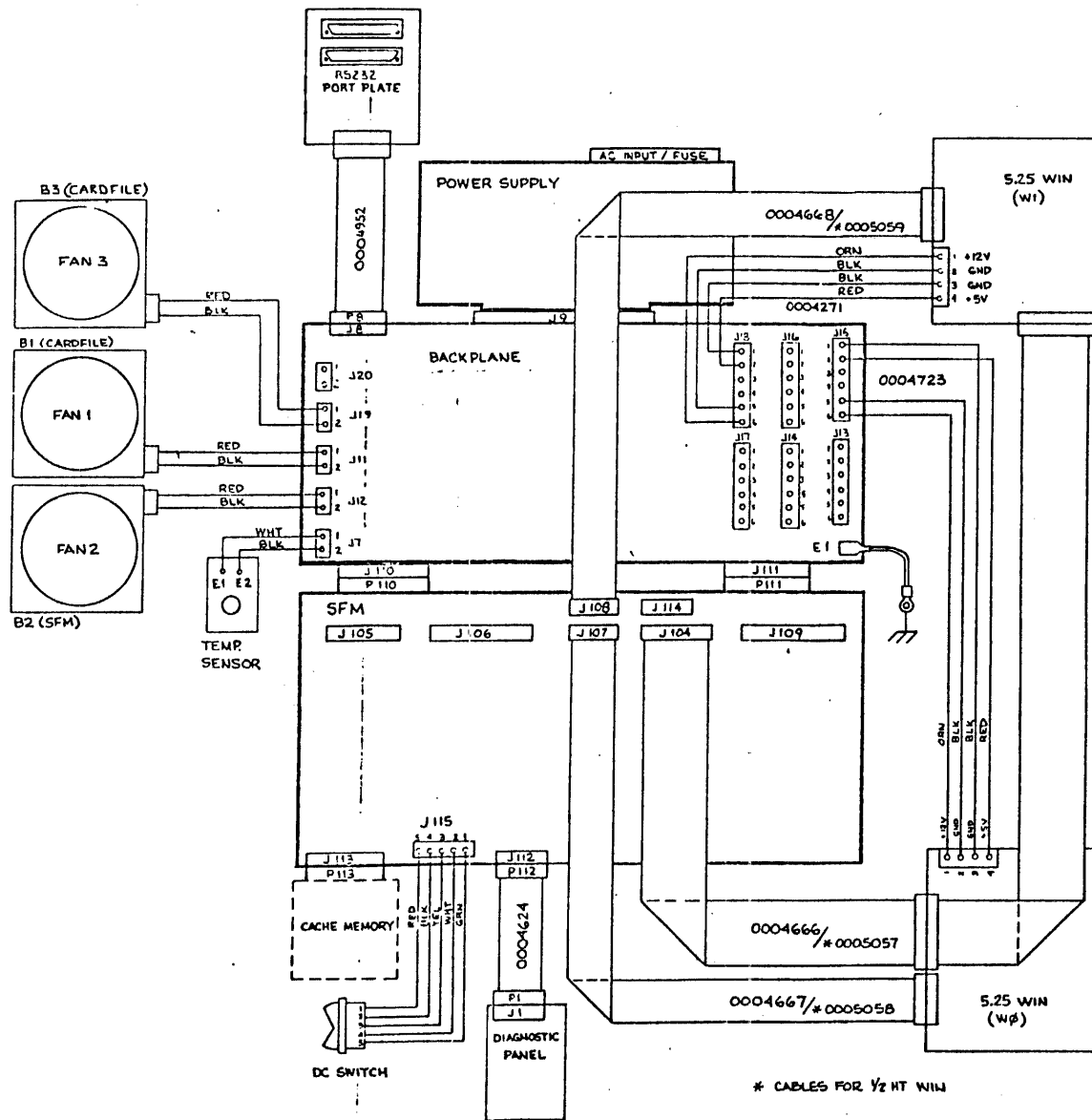
Fig. G-13   SMS 1000 Model 50 cabling diagram.   Dual Winchester
configuration.   (1002258)

Fig. G-14   SMS 1000 Model 50 cabling diagram. 8" floppy, stream-
ing tape, and single Winchester configuration.
(1002259)

Fig. G-15 SMS 1000 Model 50 cabling diagram. 5 1/4" floppy, streaming tape and single Winchester configuration. (1002260)

RS 232
PORT PLATE

B3 (CARDFILE)

FAN 3

B1 (CARDFILE)

FAN 1

FAN 2

B2 (SFM)

TEMP. SENSOR

POWER SUPPLY

AC INPUT/FUSE

0004952

BACKPLANE

J20

J19

J11

J12

J7

E1 E2

J8 / F8

J9

J18

J17

J16

J14

J15

J13

0004821

0004723

0004723

0004668/0005059 *

J2
5.25IN WIN
(W1)

J3
0004721 ORN 1 +12V
         BLK 2 GND
         BLK 3 GND
         RED 4 +5V

J1

TAPE DRIVE
(T0)

0004688

TAPE DRIVE
FORMATTER
J1

J3

ORN
BLK
RED

RED J2
BLK
BLK
ORN

J2 RED 1 +5V
    BLK 2 GND
    BLK 3 GND
    ORN 4 +12V

5.25 IN FLOPPY
(F0)
J1

E1

SFM

J110 / P110

J105

J106

J107

J104

J109

J108

J111 / P111

0004669

0004689

TAPE DRIVE
FORMATTER
J3

0006222
-0001
J1

FILE TAPE
CONTROLLER

BACKPLANE

FOR
FILE TAPE
SYSTEMS

J113 / P113

J115

CACHE MEMORY

J112 / P112

0004624
P1 / J1

DIAGNOSTIC
PANEL

DC SWITCH

ORN
BLK
BLK
GND
J3

J1
0004666/0005057 *

5.25 IN WIN
(W0)
J2

0004667/0005058 *

* CABLES FOR 1/2 HT DRIVES

Fig. G-16   SMS 1000 Model 50 cabling diagram.   5 1/4" floppy,
streaming tape and dual Winchester configuration.
(1002261)
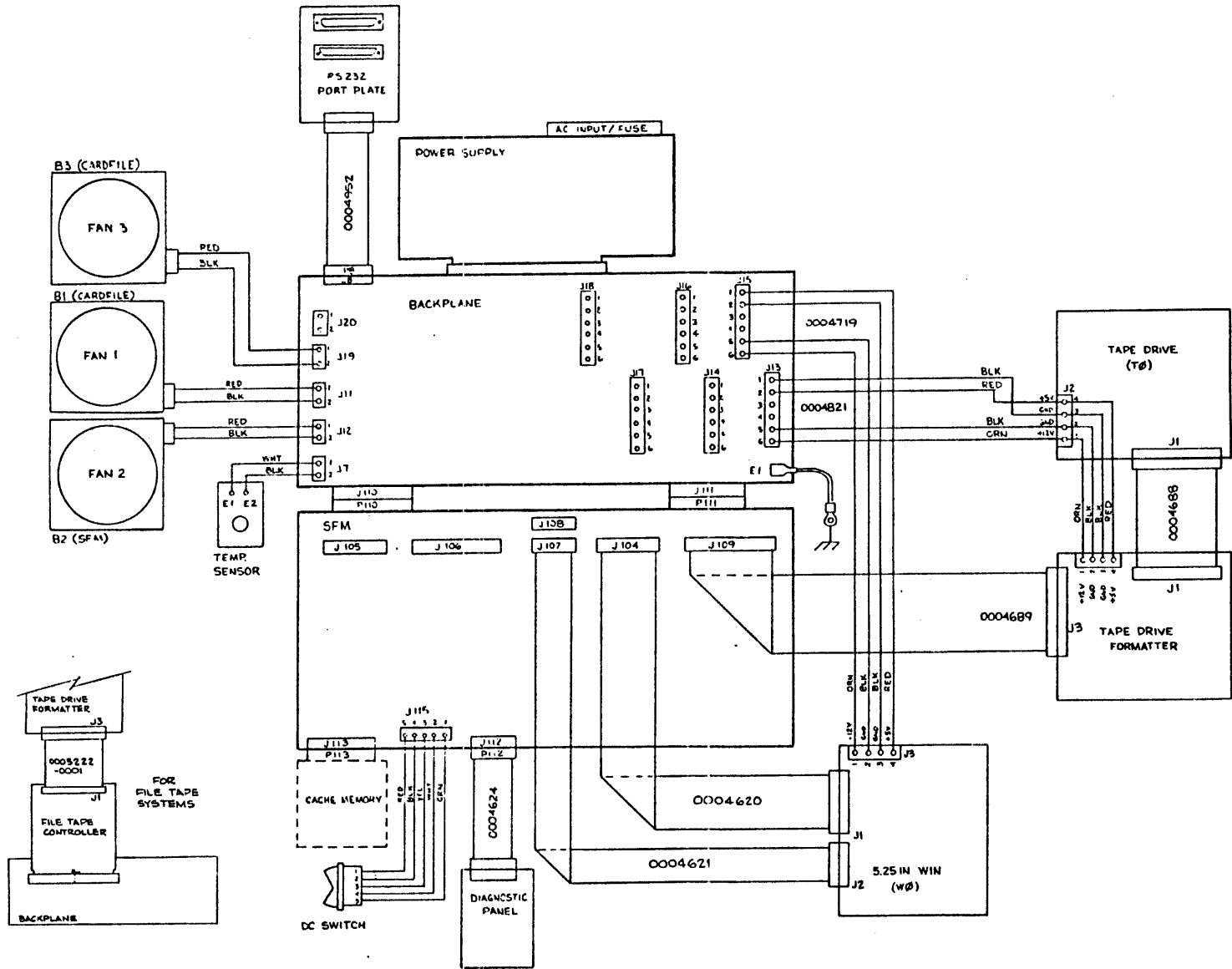
Fig. G-17   SMS 1000 Model 50 cabling diagram.   Streaming tape and
single Winchester configuration. (1002262)
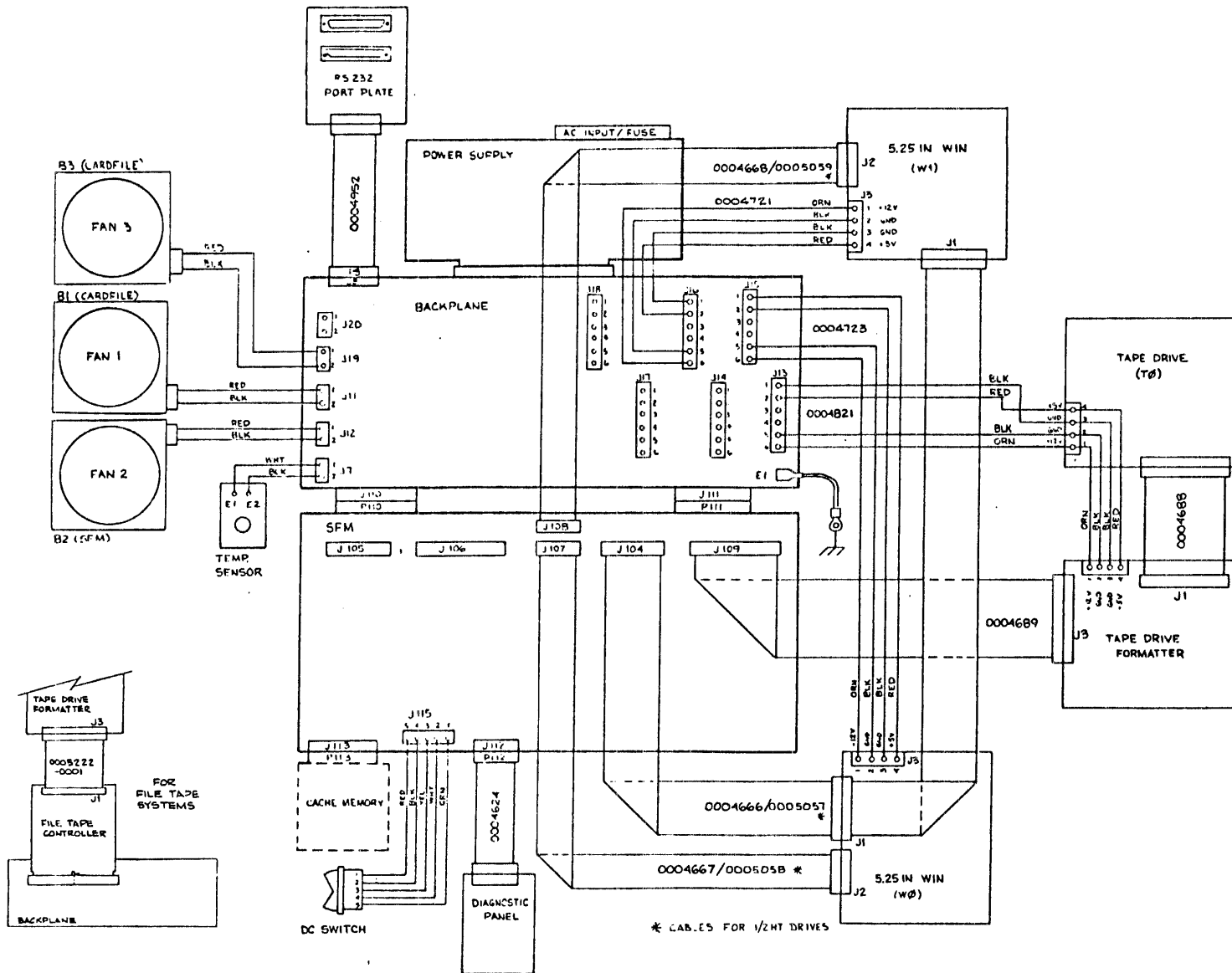
Fig. G-18   SMS 1000 Model 50 cabling diagram. Streaming tape and
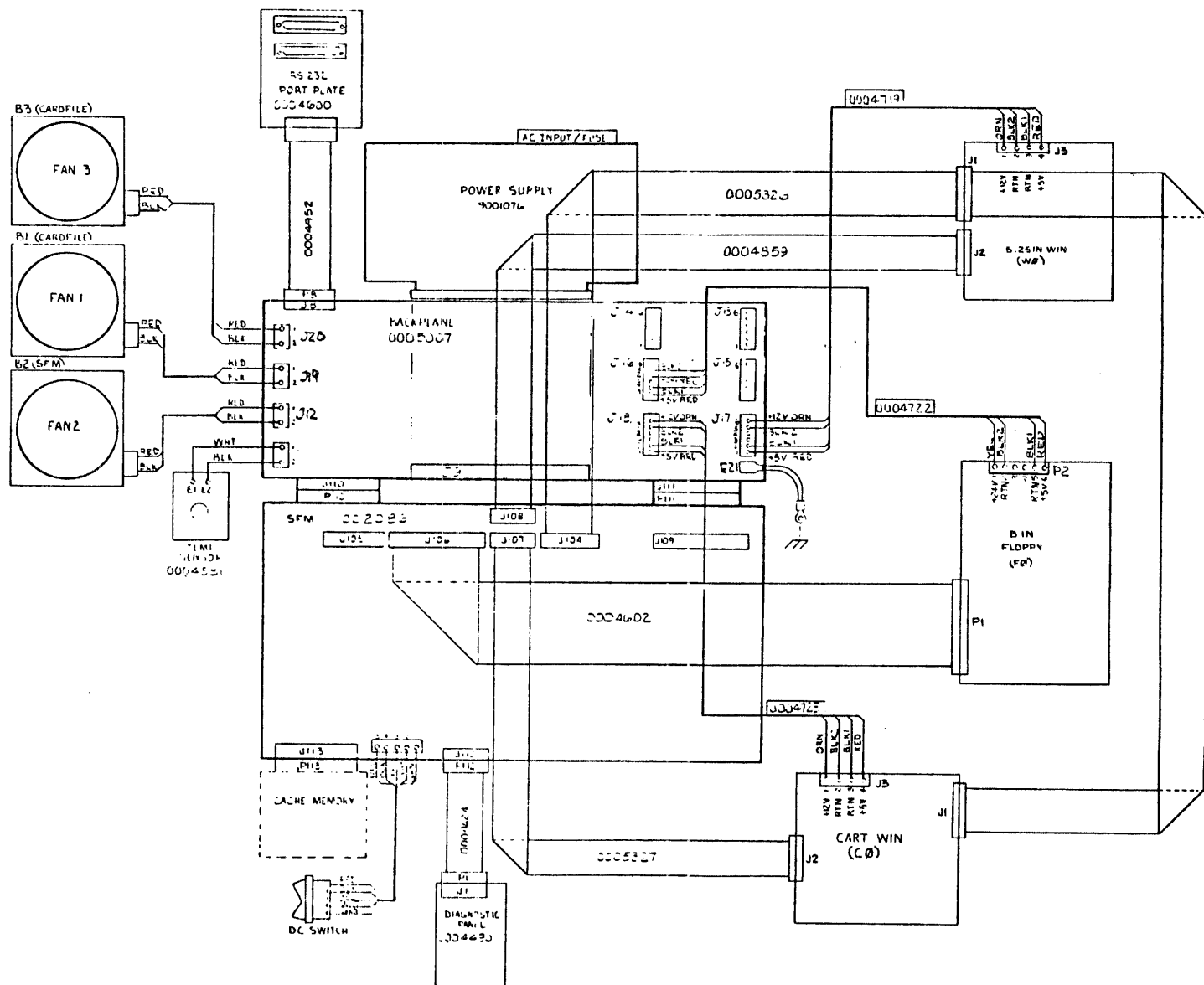dual Winchester configuration. (1002263)

Fig. G-19   SMS 1000 Model 50 cabling diagram. 8" floppy, car-
tridge Winchester and single fixed-disk Winchester
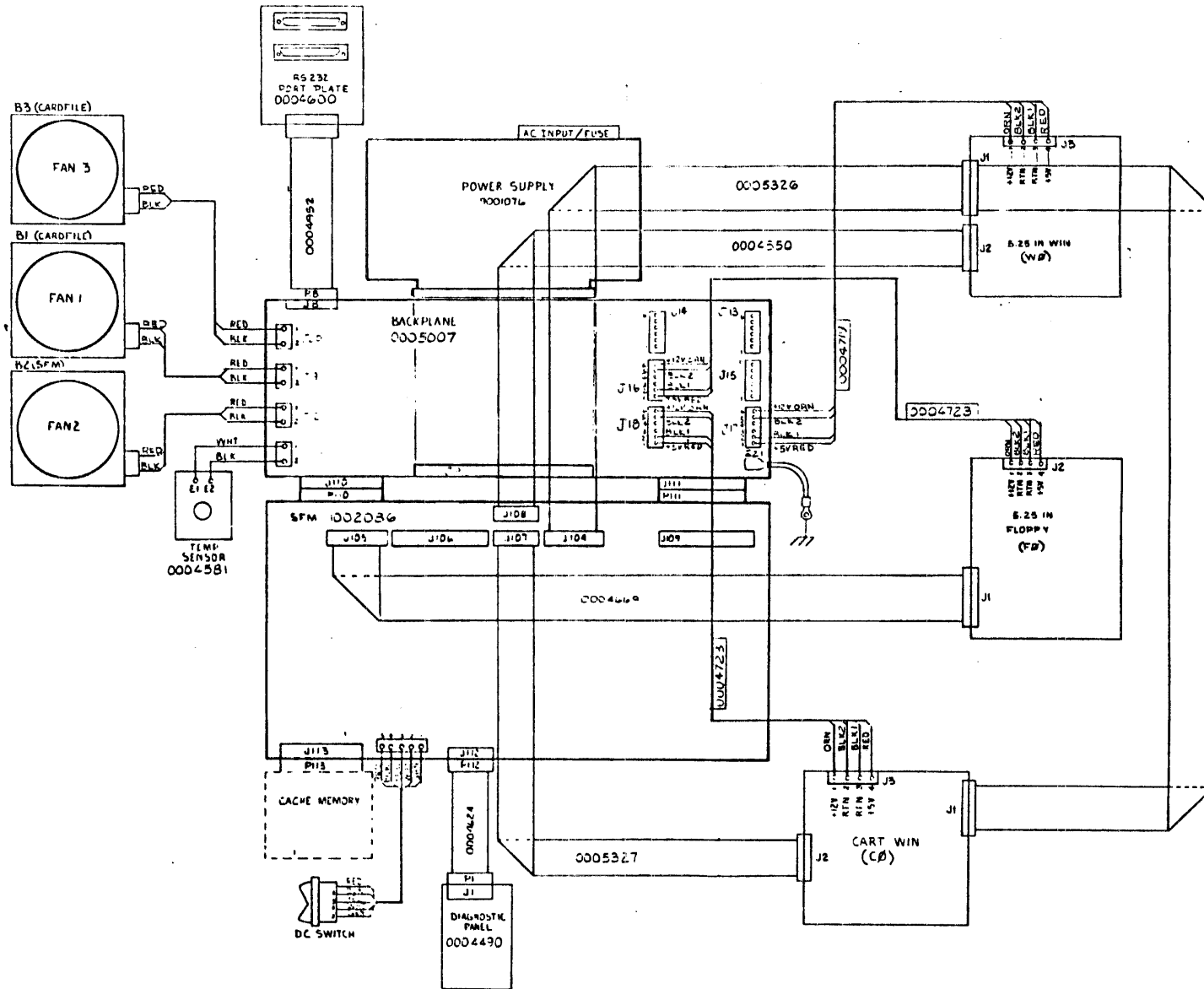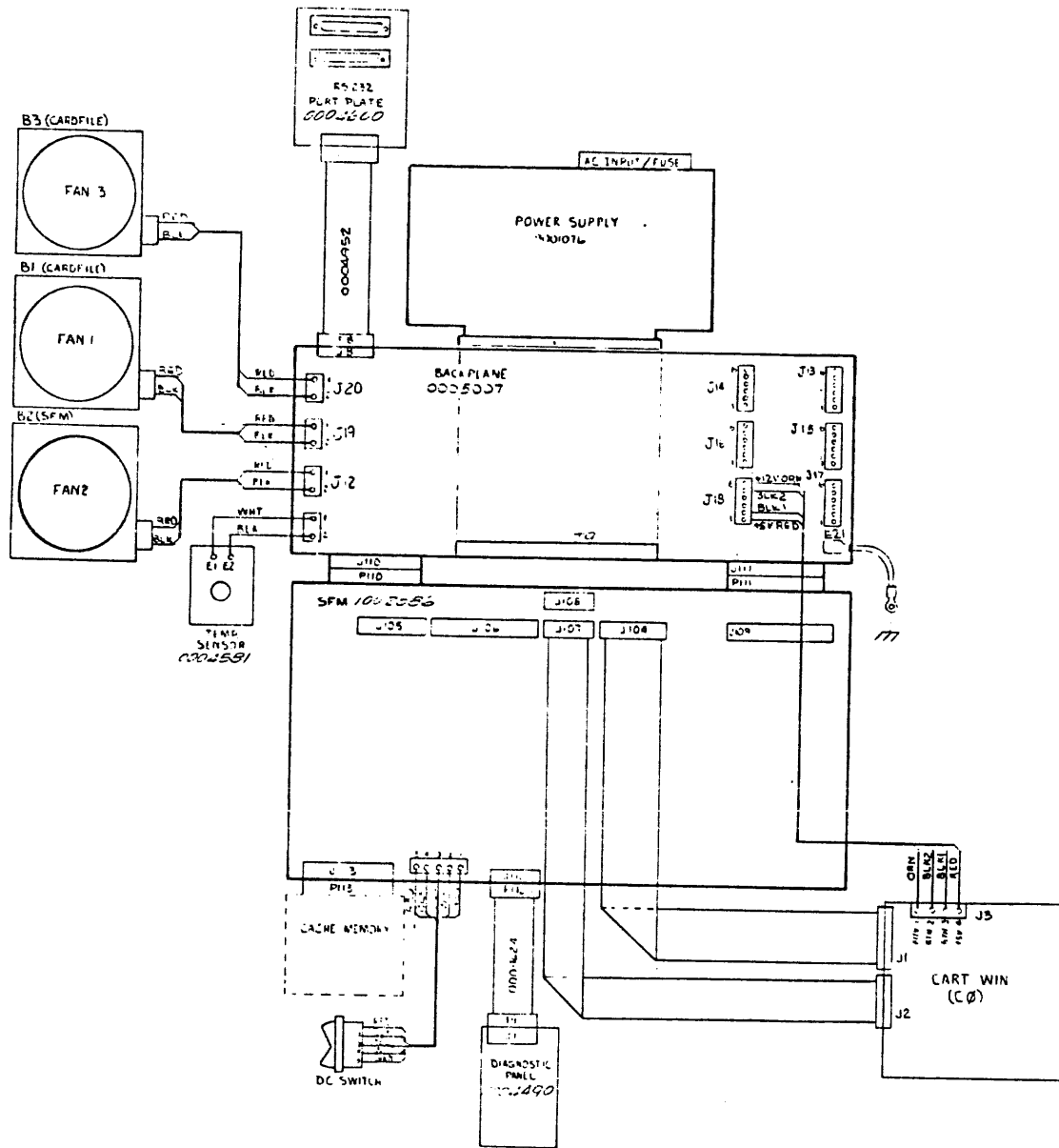configuration. (1002264)

Fig. G-20   SMS 1000 Model 50 cabling diagram.   5 1/4" floppy, cartridge Winchester and single fixed-disk Winchester configuration. (1002265)

Fig. G-21   SMS 1000 Model 50 cabling diagram. Single cartridge-
Winchester configuration. (1002266)

Fig. G-22   SMS 1000 Model 50 cabling diagram. Single cartridge-
             Winchester and single fixed-disk Winchester configur-
             ation. (1002267)
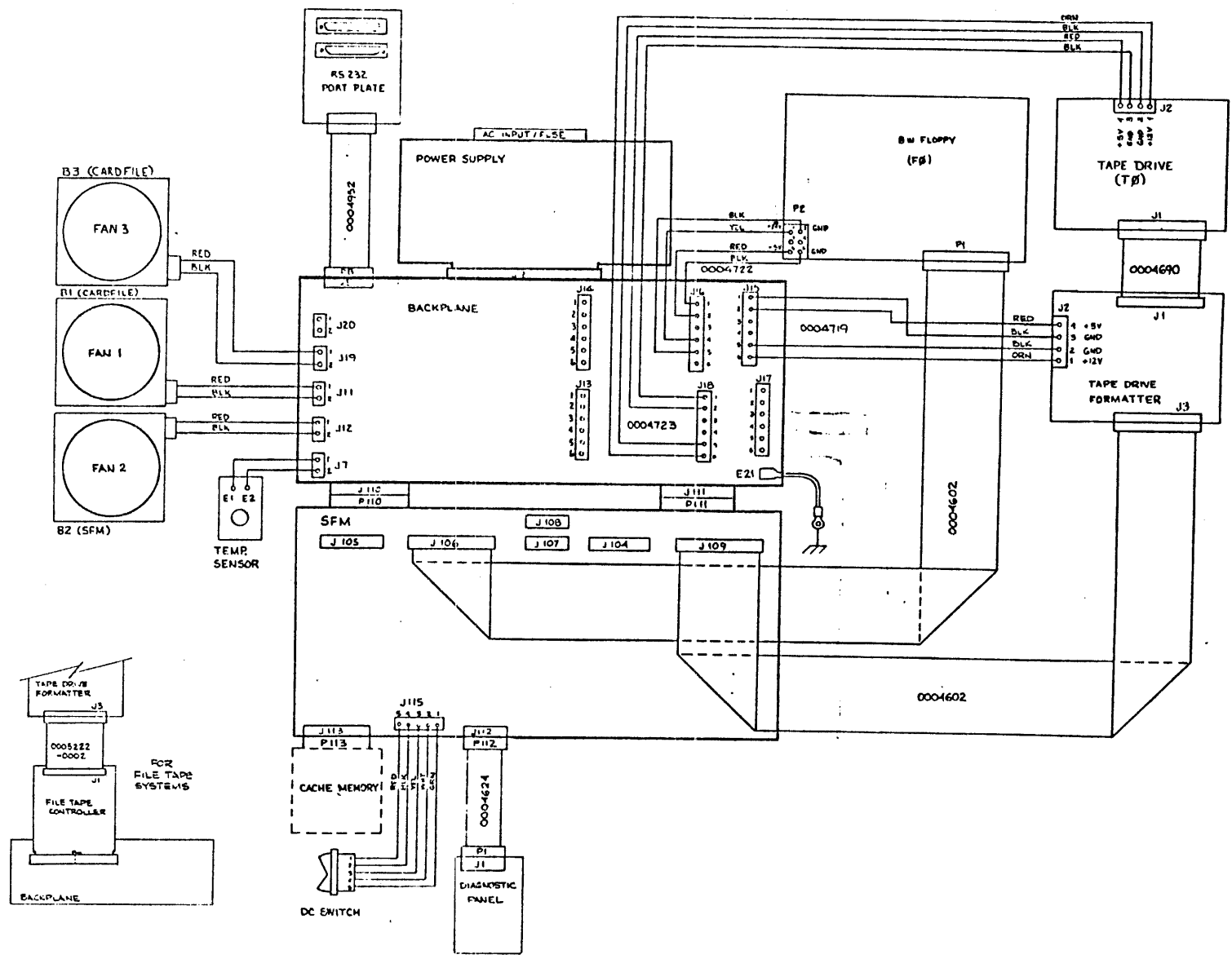
Fig. G-23   SMS 1000 Model 50 cabling diagram.   8" floppy and
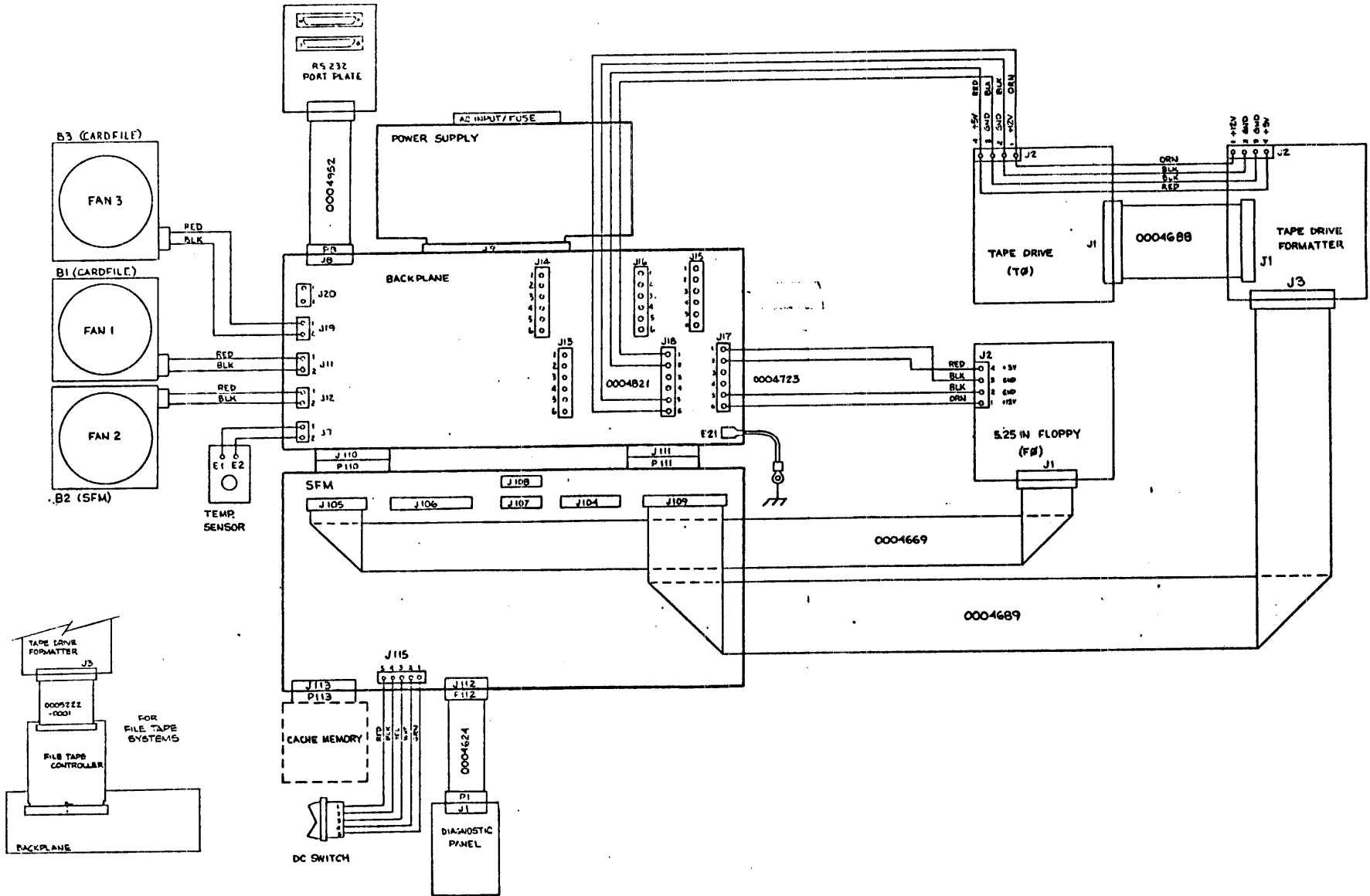streaming-tape configuration. (1002282)

Fig. G-24   SMS 1000 Model 50 cabling diagram.   5 1/4" floppy and streaming-tape configuration. (1002283)

APPENDIX H

DESCRIPTION OF SMS 1000 FILE TAPE OPTION

GENERAL

The SMS 1000 system can be configured with one of two possible
tape-backup options. One option is streaming tape backup.
This allows offline image copies to be made of the system hard
disks, using SENSE. The other option is an online combined
file tape backup and image backup capability, termed the "file
tape option". Besides the image backup tape function, the file
tape option allows the tape drive to back up files indivi-
dually. This function is also sometimes called an online file
archive, conventional, or start/stop tape facility.

Both these options incorporate a Tandberg TDC-3309 9-track
streaming tape drive, which is mounted inside the SMS 1000.
Tape load and unload access to the tape drive is provided
through the SMS 1000 front panel door. A procedure for insert-
ing and write protecting tape cartridges is given in Section 5
of this manual. Strapping information for the tape drive is
given in Section 4.

When the tape drive is used for the offline image backup func-
tion only (i.e. streaming tape option), a TDC-3350 QIC-02
controller/formatter board is equipped in the SMS 1000, as in-
dicated in equipment supplied Tables 1-1, F-1, or G-1, as
applicable. Controller/formatter board connector J3 is cabled
to system foundation module connector J109 (via cable part
number 0004602), and connector J1 is cabled to signal connector
J1 of the tape drive (via cable part number 0004690).

However, when the file tape option is specified, an additional
board is added into the above configuration. This board is the
file tape interface module (part number 9001425-0001).

As shown in Figure H-1, the dual-height file tape interface
module is plugged into one of the SMS 1000 Q-bus backplane
slots at the factory, and the system interrupt scheme is confi-
gured accordingly. Since the module is a dual-height board, a
SMS 1000 Bus-Grant Continuity Card (part number 004670) will
generally be installed in the remaining two unused slot connec-
tors. Refer to Section 4 for information on the Bus-Grant
Continuity Card.

CAUTION

The file tape interface module can be plugged into any backplane slot except C-D connectors of slots 1 and 2 on Model 40/41 systems, or slots 1 through 3 on model 50 systems. These systems are marked with a CAUTION label on the left side of the card cage supporting structure (see Figure 1-5B or G-4, as applicable).

Note that if the file tape interface module is removed from the SMS 1000 backplane at some stage, it must be replaced with a SMS 1000 Bus-Grant Continuity Card (part number 004670). When the file tape interface module is reinstalled in its factory-assigned slot, the Bus-Grant Continuity Card should be removed. If the interface module must be relocated to a different slot due to a system configuration change, the SMS 1000 bus priority jumpers may require reconfiguration. Configuration of the bus priority jumpers is described in Section 4.

As shown in Figure H-1, connector J1 on the file tape interface module is cabled to TDC-3350 controller/formatter board connector J3 (via cable part number 0005222-0001). Cable 0004602, which is associated with the streaming tape option, is not equipped when file tape option is specified. Table H-1 summarizes the equipment supplied for the file tape option.
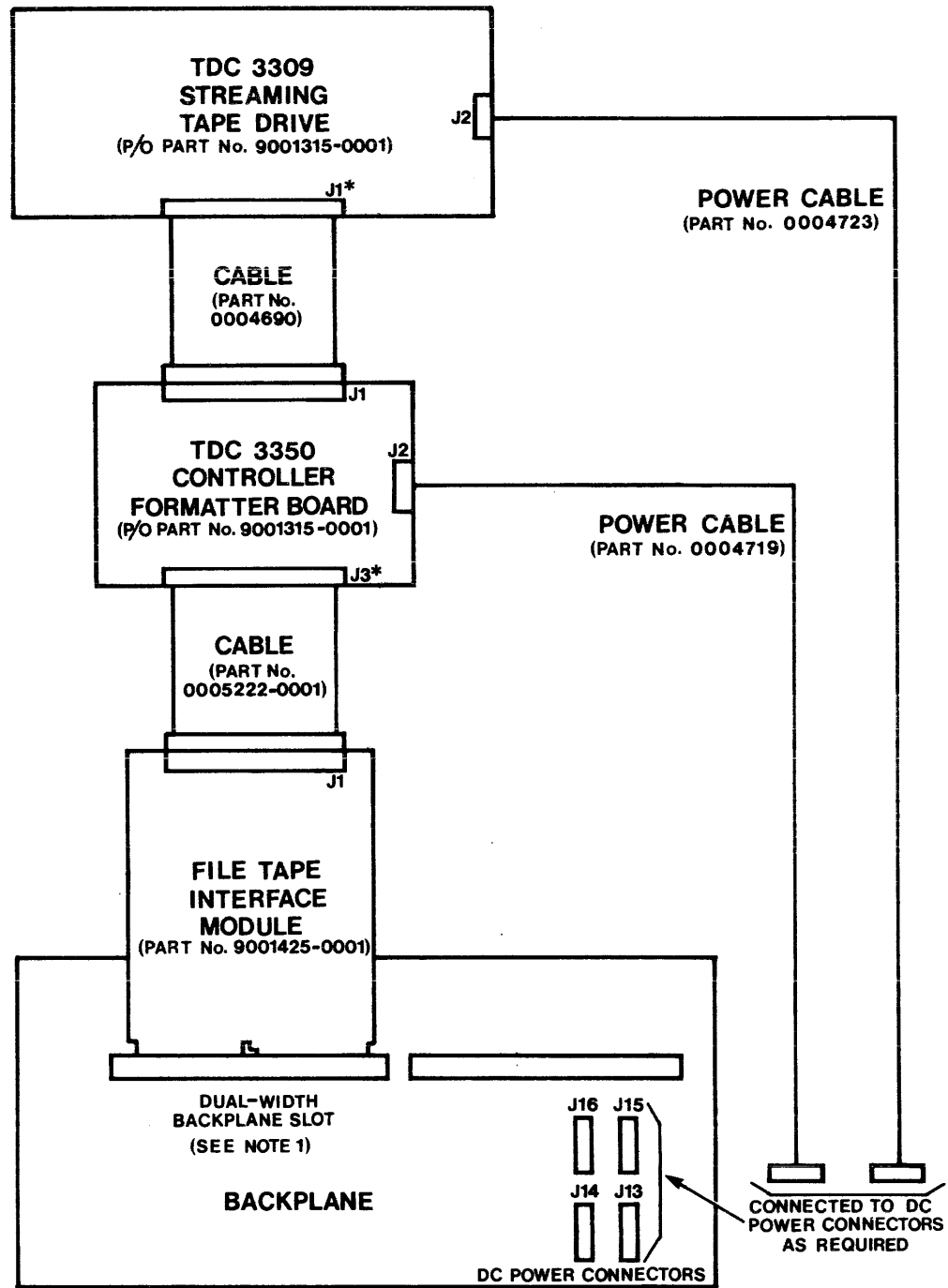
NOTES:

* = Edge connector

1. CAUTION: The dual-width file tape interface module may be damaged if plugged into C-D connectors of slots 1 or 2 (see text).

Figure H-1. SMS 1000 File Tape Option. Cabling Diagram.

TABLE H-1

SMS 1000 FILE TAPE OPTION
EQUIPMENT SUPPLIED

PART NUMBER	DESCRIPTION
9001315-0001	Tandberg TDC-3309 9-track streaming tape drive with TDC-3350 QIC-02 controller/ formatter board.
0004723	Power interconnect cable (installed between a backplane DC power connector and connector J2 of TDC-3309 tape drive).
0004690	Cable assembly (installed between TDC-3350 controller/formatter board and TDC-3309 tape drive).
0004719	Power interconnect cable (installed between a backplane DC power connector and connector J2 of TDC-3350 controller/ formatter board).
9001425-0001	File tape interface module.
0005222-0001	Cable assembly (installed between file tape interface module and TDC-3350 controller/formatter board).

FILE TAPE INTERFACE MODULE DESCRIPTION

The file tape interface module (part number 9001425-0001) is a dual-height board that can interface a wide variety of 1/4" cartridge streaming tape drives, having QIC-02 standard electrical interface, to a LSI-11 Q-bus. In the SMS 1000, it interfaces the optional Tandberg TDC-3309 9-track streaming tape drive to the SMS 1000 Q-bus. Besides providing an online disk image backup capability, the module contains the logical functions needed to perform online backup of individual files. From the software perspective, the module emulates a standard DEC TSV05 tape subsystem, thereby providing conventional software interface through DEC-standard software I/O drivers.

The interface module is a self-contained file-oriented tape peripheral controller. A set of built-in diagnostics are included to verify proper operation of the module whenever it is initialized or first powered up.

APPENDIX H: SMS 1000 FILE TAPE OPTION DESCRIPTION

Internal operation of the file tape interface and the associ-
ated tape drive is transparent to the user. User operational
interface to the tape facility is provided through standard DEC
operating system utilities, which are described in the applica-
ble DEC software manuals. Some of these manuals are listed
under related publications in Section 1. Use of specific util-
ity commands to operate the SMS 1000 file tape facility is
described later in this appendix. When using these commands,
the tape drive is accessed by specifying device type "MS".

CONFIGURING THE FILE TAPE INTERFACE

The file tape interface module is configured for normal oper-
ation when the SMS 1000 is shipped from the factory.
Configuration of the module is performed solely by installation
or removal of jumpers. Typically, the jumpers will not be
changed by the user unless:

    * A non-standard tape drive is to be used (i.e.
      having different characteristics than the
      Tandberg TDC-3309)

    * The file tape interface interrupt priority
      must be changed

    * Operating system software has been, or will be,
      generated with a device address and/or
      interrupt vector that is different than the
      default.

Additionally, one jumper provides an internal diagnostic loop
enable capability. The jumper can be installed temporarily to
allow loop diagnostic testing of the interface for hardware or
software debugging activities. However, this feature precludes
normal operation of the module. Rather, it is intended for use
by technical support personnel only and, typically, will not be
of interest to the user.

Figure H-2 shows the jumper pin locations on the interface
module. Table H-2 summarizes the jumper options available.
The default jumper configuration, equipped in the SMS 1000 at
the factory, is noted in the "DEFAULT SETTINGS" column of the
table and in Figure H-2.

Tables H-3 through H-8 indicate the jumper setup details for
available strapping options.
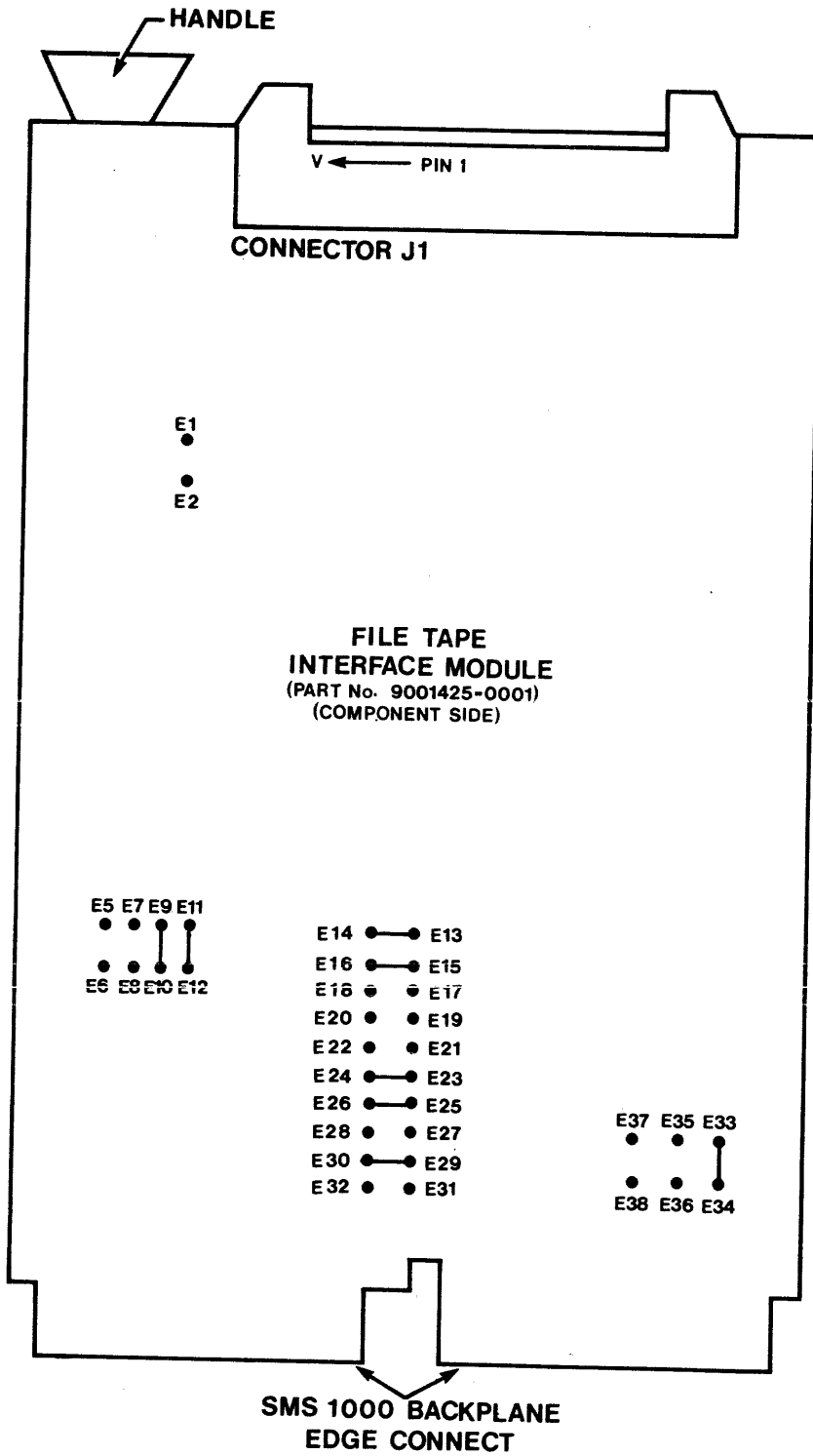
APPENDIX H: SMS 1000 FILE TAPE OPTION DESCRIPTION

Figure H-2. File Tape Interface Module Jumper Locations.

TABLE H-2

FILE TAPE INTERFACE MODULE
JUMPER OPTION SUMMARY
(See Figure H-2)

JUMPER PINS	USED FOR:	DEFAULT SETTINGS
E1-E2	Not used	OUT
E5-E6	Not used	OUT
E7-E8	Diagnostic loop enable	OUT
E9-E10	Device address select Bit 0	IN
E11-E12	Device address select Bit 1 defined as	IN

E9-E10   E11-E12 = Address(8)
  IN   IN   = 172520
  IN   OUT   = 172524
  OUT   IN   = 172530
  OUT   OUT   = 172534

E13-E14	Drive configuration (Bit 2) (refer to Table H-7)	IN
E15-E16	Extended Features Enable	IN
E17-E18	Drive configuration (Bit 1) (refer to Table H-7)	OUT
E19-E20	Drive configuration (Bit 0) (refer to Table H-7)	OUT
E21-E22	Interrupt vector Bit 7	OUT
E23-E24	Interrupt vector Bit 6	IN
E25-E26	Interrupt vector Bit 5	IN
E27-E28	Interrupt vector Bit 4	OUT
E29-E30	Interrupt vector Bit 3	IN
E31-E32	Interrupt vector Bit 2 (for interrupt vector bit definition, refer to Table H-4)	OUT
E33-E34	Interrupt priority level 5	IN
E35-E36	Interrupt priority level 4	OUT
E37-E38	DMA block mode enable	OUT (disabled)

When strapping options are to be changed, BERG 76264-101 (or equivalent) jumper plugs are added or removed from the appropriate pin location(s) shown in Figure H-2. If these or similar jumpers are not available, use number 30 wire wrap between the designated jumper pins.

DEVICE ADDRESS and INTERRUPT VECTOR values for the interface module are selected by jumpering pin groups E9 through E12 and E21 through E32, respectively, as shown in Tables H-2 through H-4. Factory-preset default values are 172520 (octal) for the device address, and 224 (octal) for the interrupt vector. As shown in Table H-3, three alternate device address assignments are available, namely: 172524, 172530, and 172534 (all values octal). The interrupt vector can be set to any number within the range of 0 through 374 (octal), as determined by the vector address (byte) bit/pin arrangement shown in Table H-4. Note, however, that the least significant digit of the vector must be either 0 or 4, since bits 1 and 0 of the vector address byte are not configurable (i.e. always zero). Changing the default device base address or interrupt vector is done merely by adding or removing jumpers, as defined by Tables H-3 and H-4.

For example, the default device address is 172520 (octal), which is selected by installation of jumpers on pins E11-E12 and pins E9-E10, as given in Table H-3. If the address was to be changed from this value to 172534 (octal), both jumpers would be removed (i.e. from E11-E12 and E9-E10).

If default interrupt vector 224 (octal) is to be changed to 104 (octal), a bit equivalency for address vector 104 is determined, namely 010001-- (for bits 7 through 2 of the vector address byte, respectively). In turn, Table H-4 shows that jumpers would be installed on pins E21-E22, E25-E26, E27-E28, and E29-E30. Jumpers would be removed from E23-E24 and E31-E32.

WARNING

Any change to the factory-preset default device address or interrupt vector jumper configuration may necessitate a change in system software.

TABLE H-3

FILE TAPE INTERFACE MODULE
DEVICE ADDRESS CONFIGURATION
(See Figure H-2 and Table H-2)

ADDRESS OPTION (octal)	JUMPER PINS E11-E12	E9-E10
* Default standard address - 172520	IN	IN
1st alternate address - 172524	OUT	IN
2nd alternate address - 172530	IN	OUT
3rd alternate address - 172534	OUT	OUT

* = Factory-preset default

TABLE H-4

FILE TAPE INTERFACE MODULE
INTERRUPT VECTOR CONFIGURATION
(See Figure H-2 and Table H-2)

VECTOR (octal)	VECTOR ADDRESS BYTE-SELECTION BITS/JUMPER PINS					
0-374	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2
	E21-E22	E23-E24	E25-E26	E27-E28	E29-E30	E31-E32
* 224	Octal values: 2		2		4	
	Binary equivalent: 1	0	0	1	0	1
	Jumper settings: OUT	IN	IN	OUT	IN	OUT

where OUT = 1, and IN = 0
* = Factory-preset default
Bits 0 and 1 of the vector address byte are always zero
and not configurable.

DEVICE INTERRUPT PRIORITY is configured by jumpering pins E33-E34 and E35-E36, as shown in Table H-5. The interface module supports the four level device interrupt scheme compatible with the LSI-11 CPU. However, the interface module only generates interrupts at priority levels 4 or 5. The factory-preset default interrupt level is level 5, which is selected by installation of a pin jumper at pins E33-E34, and absence of a jumper at E35-E36.

If interrupt priority level 4 operation is desired, it can be configured as indicated in Table H-5.

TABLE H-5

FILE TAPE INTERFACE MODULE
INTERRUPT PRIORITY LEVEL CONFIGURATION
(See Figure H-2 and Table H-2)

PRIORITY LEVEL	JUMPER PINS	
	E33-E34	E35-E36
* Interrupt priority level 5	IN	OUT
Interrupt priority level 4	OUT	IN
* = Factory-preset default		

The EXTENDED FEATURES mode of operation is selected by installing a jumper on pins E15-E16, as shown in Table H-6. The interface module extended features option is normally enabled in the SMS 1000, as a factory-preset default.

When the extended features option is enabled, 22-bit addressing is provided. This allows the interface module to access memory devices having addresses in the upper region of the Q-bus memory map (i.e. address 200000 octal and above) during DMA operations. When the option is disabled, 16-bit addressing is provided, which limits the address range to 177777 octal maximum.

TABLE H-6

FILE TAPE INTERFACE MODULE
EXTENDED FEATURES CONFIGURATION
(See Figure H-2 and Table H-2)

EXTENDED FEATURES	JUMPER PINS E15-E16
* Enabled	IN
Disabled	OUT

* = Factory-preset default

The DRIVE TYPE option is configured by jumpering pins E13-E14, E19-E20, and E17-E18, as shown in Table H-7. The interface module can be configured to interface with a number of different tape drive units. In the SMS 1000, the Tandberg TDC-3309 9-track drive is standard. For this reason, the factory-preset default arrangement is for a cartridge 9-track drive. Besides the TDC-3309 drive, the default setting can accomodate any QIC-02 standard, QIC-24 format 9-track tape drive. As given in Table H-7, the default drive type has been set up by installation of a pin jumper on pins E13-E14, and absence of jumpers on E19-E20 and E17-E18.

If a different drive is to be used, the drive must be compatible with the QIC-02 electrical interface standard, and must be compatible with either QIC-11 or QIC-24 standard tape formats. Cartridge tape drives must also operate at 90 ips. Additionally, the tape drive must correspond to one of the configurable drive types given in Table H-7. Provided the tape drive meets these criteria, configuration of the interface module is accomplished by merely installing and/or removing jumpers, as indicated in Table H-7, for the applicable device type.

TABLE H-7

FILE TAPE INTERFACE MODULE
DRIVE TYPE CONFIGURATION
(See Figure H-2 and Table H-2)

DRIVE TYPE	JUMPER PINS		
	E13-E14	E19-E20	E17-E18
* Cartridge 9-track	IN	OUT	OUT
Cartridge 4-track	IN	OUT	IN
Cartridge reserved (not used)	IN	IN	OUT
Cartridge 12-track	IN	IN	IN
Reserved (not used)	OUT	OUT	OUT
Rosscomp 190 MB	OUT	OUT	IN
Reserved (not used)	OUT	IN	OUT
Cassette 20 MB	OUT	IN	IN

* = Factory-preset default

The DIAGNOSTIC ENABLE option controls loop mode or power up/initialize operation of the interface module's built-in internal diagnostics. The option is configured by installation or absence of a jumper at pins E7-E8, as shown in Table H-8. The factory-preset default is to disable the loop diagnostic capability, by absence of a jumper at E7-E8. With this setup, the interface module's internal diagnostics are only executed once during system power up or reinitialization (i.e. hard or soft reset).

When the interface module is installed in the SMS 1000 system, system power up or reinitialization causes the internal diagnostics to be executed. A comprehensive suite of six internal self tests are performed. When the tests are completed successfully, the green indicator LED on the module will light. Once self test pass status is received, the module is ready to accept commands from the system CPU. If a failure is encountered during the self tests, the LED indicator will remain unlit, and an error message will be displayed on the system console.

APPENDIX H: SMS 1000 FILE TAPE OPTION DESCRIPTION

Diagnostic loop mode can be enabled by installing a jumper at
E7-E8, as indicated in Table H-8. If this mode is enabled,
diagnostics are performed continuously from initial power up.
This mode precludes normal operation of the interface module,
and is intended as a debugging aid only. This mode will not be
required for user operations in most cases.

With diagnostic loop mode enabled, the green LED indicator on
the interface module will be unlit when self tests begin execu-
tion, and will light when self tests are completed
successfully. In this case, each successful re-execution of
the diagnostics will cause the LED to blink at a consistent
rate. If a failure is encountered, the LED will not light, and
the self test that failed will be re-executed continuosly. When
a hard failure is encountered, the LED will not light at all.
If a soft or intermittent failure is encountered, the LED will
light at erratic intervals.

WARNING

    If loop diagnostic mode is enabled for
    debugging or any other reason, ensure
    that it is disabled (by removing jumper
    from E7-E8) before normal operation of
    the SMS 1000 is resumed. Keeping loop
    diagnostic mode enabled will preclude
    normal operation of the file tape device.

TABLE H-8

FILE TAPE INTERFACE MODULE
DIAGNOSTIC ENABLE CONFIGURATION

(See Figure H-2 and Table H-2)

DIAGNOSTIC ENABLE	JUMPER PINS E7-E8
* Disabled	OUT
Enabled	IN

* = Factory-preset default

CONFIGURING THE ASSOCIATED TAPE DRIVE

The file tape interface module provides a standard QIC-02
electrical interface compatible with many currently available
tape drive units. However, the tape drive must be correctly
strapped to operate properly with the module. In SMS 1000 sys-
tems shipped with the standard Tandberg TDC-3309 drive, this
strapping has already been performed by the factory. If a
drive is being added to an existing SMS 1000 system, the strap-
ping will have to be added. In this case, the drive must be
strapped to respond as the first tape drive in the system.

For the Tandberg TDC-3309, this is accomplished by configuring
the drive as "drive 1". Other drive types may designate the
first drive as "drive 0". For strapping of the TDC-3309, refer
to the strapping information in Section 4 of this manual. For
other drives, refer to the relevant tape drive manual for
strapping information.

Note that the TDC-3350 controller/formatter board must be used
with the TDC-3309 tape drive. Strapping instructions for the
controller/formatter board are also given in Section 4.

TAPE DRIVE CABLING REQUIREMENTS

The file tape interface module connects to the Tandberg TDC-
3350 controller/formatter board, or other compatible QIC-02
standard device, through a 50-conductor ribbon cable (part
number 0005222-0001). This cable is normally supplied with the
SMS 1000 system when the file tape option is included. To con-
nect the cable, proceed as follows:

> Install the cable (part number 0005222-0001) between
> connector J1 of the interface module and connector
> J3 of the TDC-3350 controller/formatter, ensuring
> that the red lead of the cable (connector pin 1) is
> aligned with the arrow on interface module connector
> J1 (refer to Figure H-2). The cable connector that
> is connected to the TDC-3350 board is keyed for cor-
> rect pin orientation.

Figure H-3 is an interconnect diagram of the cable connection.
Table H-9 defines the QIC-02 interface signals associated with
pin assignments of interface module connector J1.

In unusual circumstances, the 50-conductor cable can be obtain-
ed from an independent source, Table H-10 gives a list of
required materials (or equivalent) to construct the cable.
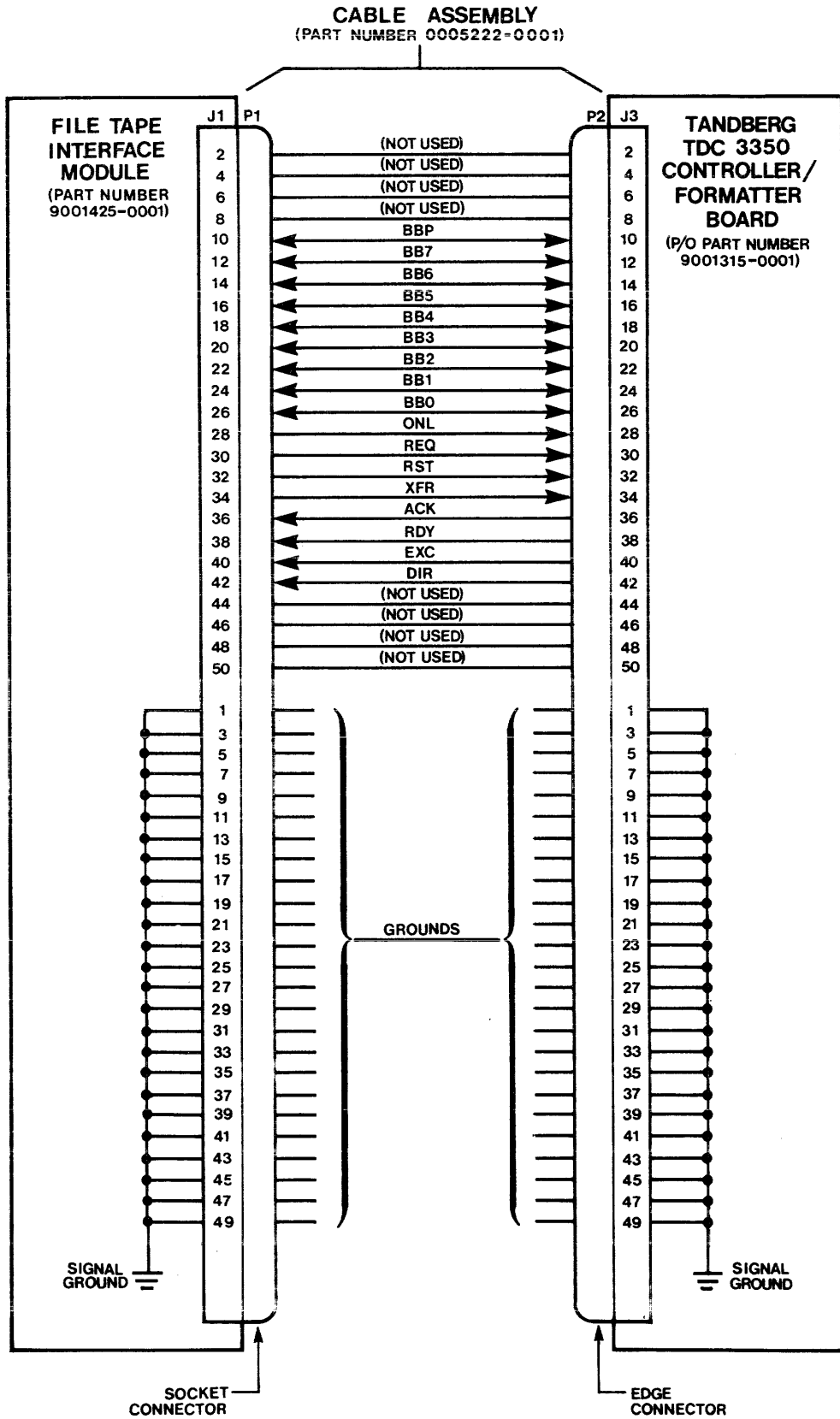
Figure H-3. File Tape Interface Module Cabling Interconnect
Diagram.

TABLE H-9

FILE TAPE INTERFACE MODULE
CONNECTOR J1 I/O PIN ASSIGNMENTS
(Refer to Figure H-3)

PIN	MNEMONIC	DESCRIPTION
10	BBP	HOST BUS ODD PARITY - reserved for optional odd bus parity
12	BB7	HOST BUS BIT 7 - MSB of 8-bit bi-directional data bus
14	BB6	HOST BUS BIT 6
16	BB5	HOST BUS BIT 5
18	BB4	HOST BUS BIT 4
20	BB3	HOST BUS BIT 3
22	BB2	HOST BUS BIT 2
24	BB1	HOST BUS BIT 1
26	BB0	HOST BUS BIT 0 - LSB of 8-bit bi-directional data bus
28	ONL	ON LINE - This signal is grounded by the interface module to indicate that it is always on-line.
30	REQ	REQUEST - Signal generated by interface module indicating that command data have been placed on the host bus, or status data have been accepted from the host bus.
32	RST	RESET - Signal generated by interface module to reset the connected tape drive unit.
34	XFR	TRANSFER - Signal generated by interface module indicating that write data have been placed on, or read data have been taken from, the host bus.
36	ACK	ACKNOWLEDGE - Signal generated by tape drive indicating that it has taken write data from, or placed read data on, the host bus.

TABLE H-9 (CONTINUED)

PIN	MNEMONIC	DESCRIPTION
38	RDY	READY - Signal generated by tape drive indicating that: 1. command data have been taken from the bus, 2. status data have been placed on the bus, 3. a rewind, retension, or erase command has been completed, 4. a buffer is ready to be filled, or a write file mark command can be issued by the interface module (in write mode), 5. a write file mark command has been completed, 6. a buffer is ready to be emptied in read mode, or 7. the tape drive is ready to receive a new command.
40	EXC	EXCEPTION - Signal generated by the tape drive to indicate that an exception condition exists within the drive.
42	DIR	DIRECTION - Signal generated by the tape drive to control the direction of data transfer on the host bus. False (high) indicates a data transfer from the interface module to the tape drive; true (low) indicates a data transfer from the drive to the interface module.

NOTE: All odd pins of connector J1 are grounded.

TABLE H-10

INTERFACE MODULE/TAPE DRIVE
INTERCONNECT CABLE PARTS LIST

(Refer to Figure H-2)

QTY	DESCRIPTION	MFR	PART NUMBER
1 EACH	50-pin socket connector	3M	3425-3000
1 EACH	50-pin edge connector	3M	3415-0001
4 FEET	50-conductor ribbon cable	3M	3365-50

HOW TO OPERATE THE FILE TAPE FACILITY

Operational characteristics of the Tandberg TDC-3309 tape drive
(with TDC-3350 controller/formatter), and other QIC-02 compati-
ble cartridge tape drives supporting QIC-24 tape format, limit
the file tape interface module from fully emulating the DEC
TSV05 subsystem. A few operating system utility commands are
not supported. This portion of the appendix describes those
limitations and points out some typical procedures for oper-
ation of the file tape facility. Note that although SMS 1000
system supports XXDP+ diagnostic programs, which are part of
the standard DEC operating system utilities, the file tape
facility does not. The file tape interface module provides its
own built-in diagnostic routines that are performed when the
system is powered up or reinitialized.

IMPORTANT

> The following information does not des-
> cribe all possible usage options for your
> operating system. Additionally, the
> information suggests some typical methods
> of use, but is not intended as a compre-
> hensive tutorial of operating system
> capabilities. Therefore, the manuals for
> your specific operating system should be
> referenced as required.

OPERATION WITH RT-11

The file tape facility supports a comprehensive set of file and
device-oriented backup utilities for RT-11. These include the
backup utility program (BUP), the device utility program (DUP),
the peripheral interchange program (PIP), and the source and
binary compare utilities (SRCCOM AND BINCOM). Although there
are several methods of using the tape facility, the following
paragraphs outline the optimal method of use based on the file
tape interface module architecture. It should be noted that
COPY and PIP utilities under RT-11 do not support multi-volume
operations. Upon detecting the end of a tape, PIP will prompt
with a "Pip-F-device full!" message.

BACKUP UTILITY PROGRAM (BUP). BUP is a specialized file trans-
fer program used to back up or restore large files or volumes.
Using this utility, an RL02 or equivalent disk can be backed up
in less than three minutes. The program's design makes effec-
tive use of the file tape facility's streaming mode. The

following examples show keyboard monitor and applicable command
string interpreter (CSI) commands to perform device and file
backup and restore operations:

Keyboard	CSI
Backing up a device from tape:	.RUN BUP
.BACKUP/DEVICE DU: MS:	*MS:=DU:/I
Restoring the device from tape:	.RUN BUP
.BACKUP/DEVICE/RESTORE MS: DU:	*DU:=MS:/I/X
Backup of a file:	.RUN BUP
.BACKUP DU:FILENAME.EXT MS:	*MS:=DU:FILENAME.EXT
Restoring a file:	.RUN BUP
.BACKUP/RESTORE MS:FILENAME.EXT DU:	*DU:=MS:FILENAME.EXT/X

Multi-volume backup operations should be performed as follows:

.BAC/DEV DU: MS:

Mount output volume in MS0; Continue? Y

MS0:/BUP Initialize; Are you sure? Y

?BUP-I-Creating volume 1

Mount output volume in MS0; Continue? Y

MS0:/BUP Initialize; Are you sure? Y

?BUP-I-Creating volume 2

BUP-I-Copy operation complete

DEVICE UTILITY PROGRAM (DUP). DUP is used to initialize and
create files. Although DUP doesn't make full use of file tape
interface features, it provides several alternate backup meth-
ods. The following examples show the various DUP functions
supported by the file tape facility:

Keyboard   CSI

Initializing the tape:
                                            .RUN DUP
  .INITIALIZE MS: *MS:/Z

Copying a device to a file:
                                            .RUN DUP
  .COPY/DEVICE/FILE DU: MS:DU.DSK   *MS:DU.DSK=DU:*.*/I/F

Restoring a device from a file:
                                            .RUN DUP
  .COPY/DEVICE/FILE DU: MS:DU.DSK DU: *DU:*.*=MS:DU.DSK/I/F

Initialize bootable tape:
                                            .RUN DUP
  .INITIALIZE/FILE:MBOT16.BOT MS: *MS:=DU:MBOT16.BOT/Z

An alternative to BUP for storing multi-volumes on tape:

                                            .RUN DUP
  .COPY/DEVICE/FILE DU0: MS:DU0.DSK   *MS:DU0.DSK=DU0:*.*/I/F
  .COPY/DEVICE/FILE DU1: MS:DU1.DSK   *MS:DU1.DSK=DU1:*.*/I/F
  .COPY/DEVICE/FILE DY1: MS:DY1.DSK   *MS:DY1.DSK=DY1:*.*/I/F

Restoration of multi-volumes can be selective:

                                            .RUN DUP
  .INITIALIZE/NOQUERY DU: *DU:/Z/Y
  .COPY/DEVICE/FILE MS:DY1.DSK DU: *DU:*.*=MS:DY1.DSK/I/F

PERIPHERAL INTERCHANGE PROGRAM (PIP). PIP is a file transfer
and file maintenance utility program. Like DUP, the PIP utili-
ty does not buffer its I/O data sufficiently to take advantage
of the file tape interface's streaming feature. However, all
PIP functions are supported by the file tape facility except
the VERIFY or /H switch option. Source and binary compare
utilities can be used to provide the verify function, when re-
quired. An example of PIP commands to copy various types of
files to and from the tape facility are as follows:

Keyboard   CSI

Copying all MAC files to tape:
                                            .RUN PIP
  .COPY DU:*.MAC MS:/POS:-1   *MS:/M:-1=DU:*.MAC

Copying entire tape to disk:
                                            .RUN PIP
  .COPY MS:*.*/POS:0 DU:*.*   *DU:*.*=MS:*.*/M:0/W

Selective copy of a tape file to disk:
```
                                    .RUN PIP
 .COPY MS:ONEFIL.MAC/POS:0 DU:      *DU:*.*=MS:ONEFIL.MAC/M:0/W
```

Operations involving multiple file transfers to tape should in-
clude the position switch setting of minus one (-1). This
eliminates excess tape positioning performed by PIP at the end
of each file transfer.

SOURCE AND BINARY COMPARE PROGRAMS (SRCCOM and BINCOM). Source
and Binary Compare programs SRCCOM and BINCOM, respectively,
perform a comparison of two ASCII or two binary files (respec-
tively) and list the differences between them. The utilities
can also be used to perform a file verification function, which
is unsupported under PIP. A usage example for each utility
follows:

Keyboard   CSI

Verification of ASCII files:
```
                                   .RUN SRCCOM
 .DIFF MS:*.MAC DU:*.MAC            *TT:=MS:*.MAC,DU:*.MAC
```


Verification of binary files:
```
                                   .RUN BINCOM
 .DIFF/BINARY MS:*.SAV DU:*.SAV    *TT:=MS:*.SAV,DU:*.SAV
```


CREATING BOOTABLE RT-11 TAPES. Creating bootable RT-11 tapes
is desirable when the file tape facility is used as the primary
system backup device. These tapes typically contain executable
programs allowing the user to format Winchester disks, perform
initial loading of the operating system, and/or restore system
backups. The following example command file will create a
bootable tape containing all required files. To use the exam-
ple, substitute the files required for your system, and specify
the correct device (disk) designations for your system. The
tape generated can be used as one method to add the BUP utility
onto a disk, thus allowing restoration of a previously gener-
ated BUP backup tape. It could also be used to run standalone
programs, such as diagnostics or applications.

Command File Example

```
ASSIGN DUn DIS
ASSIGN MS TAP
!
! LOGICAL NAME 'DIS:' MUST BE ASSIGNED TO SOURCE DISK
! LOGICAL NAME 'TAP:' MUST BE ASSIGNED TO TAPE BEING BUILT
!
! INITIALIZE BOOTABLE TAPE
!
INITIALIZE/NOQUERY/VOLUMEID/FILE:DIS:MBOT16.BOT TAP:
RTV5
DIS MT 1/2
!
! BUILD THE TAPE - FILE ORDERING IS IMPORTANT!
! COPY MDUP FILES
!
COPY/SYS DIS:MSBOOT.BOT TAP:MSBOOT.BOT/POS:-1
COPY/SYS DIS:MDUP.MS TAP:MDUP.MM/POS:-1
COPY/SYS DIS:MDUP.MS TAP:MDUP.MT/POS:-1
COPY/SYS DIS:MDUP.MS TAP:MDUP.MS/POS:-1
!
!COPY MONITOR FILES
!
COPY/SYS DIS:SWAP.SYS TAP:SWAP.SYS/POS:-1
COPY/SYS DIS:RT11SJ.SYS TAP:RT11SJ.SYS/POS:-1
!
! TT MUST FOLLOW MONITOR
!
COPY/SYS DIS:TT.SYS TAP:TT.SYS/POS:-1
!
! COPY ALL DISK HANDLERS
!
COPY/SYS DIS:DL.SYS TAP:DL.SYS/POS:-1
COPY/SYS DIS:DY.SYS TAP:DY.SYS/POS:-1
COPY/SYS DIS:DU.SYS TAP:DU.SYS/POS:-1
COPY/SYS DIS:MS.SYS TAP:MS.SYS/POS:-1
COPY/SYS DIS:VM.SYS TAP:VM.SYS/POS:-1
COPY/SYS DIS:NL.SYS TAP:NL.SYS/POS:-1
!
! COPY SYSTEM UTILITIES
!
COPY DIS:PIP.SAV TAP:PIP.SAV/POS:-1
COPY DIS:DUP.SAV TAP:DUP.SAV/POS:-1
COPY DIS:DIR.SAV TAP:DIR.SAV/POS:-1
COPY DIS:IND.SAV TAP:IND.SAV/POS:-1
COPY DIS:BUP.SAV TAP:BUP.SAV/POS:-1
COPY DIS:STARTS.COM TAP:STARTS.COM/POS:-1
!
! COPY STANDALONE DISK FORMATTER/DIAGNOSTIC
!
```

    COPY DIS:RLO2DG.SYS TAP:RLO2DG.SYS/POS:-1

Note that the COPY commands in the above example use the quali-
fier /POS:-1. This keeps the tape from rewinding between each
file, making the data transfer operation much faster. Copy
operations from tape to disk should use the qualifier /POS:0.
This qualifier causes the tape to rewind initially, and preclu-
des tape rewinds between file transfers.

The following bootable tape command file example can be used to
build a bootable image of any standalone RT-11 type program.
Bootable programs copied to tape using the example will be
self-starting, and will prompt the user shortly after the boot
operation is started.

        Command File Example For Bootable Standalone Programs

    ASSIGN DUn DIS
    ASSIGN MS TAP
    !
    ! LOGICAL NAME 'DIS:' MUST BE ASSIGNED TO SOURCE DISK
    ! LOGICAL NAME 'TAP:' MUST BE ASSIGNED TO TAPE BEING BUILT
    !
    ! INITIALIZE BOOTABLE TAPE
    !
    INITIALIZE/NOQUERY/VOLUMEID/FILE:DIS:MBOT16.BOT TAP:
    RTV5
    DIS MT 1/2
    !
    ! COPY STANDALONE PROGRAM ONTO TAPE RENAMING IT MSBOOT.BOT
    ! SO MBOT16.BOT CAN FIND AND BOOT IT.
    !
    COPY/SYS DIS:PROGR.BOT TAP:MSBOOT.BOT/POS:-1

Tapes generated by these command files will be bootable using
available hardware bootstraps. Once a tape containing MSBOOT
is successfully booted, it will give the following prompt:

    MSBOOT V05-00
    *

If the tape has been booted to load a standalone program, the
appropriate program name would be entered in response to the
'*' prompt. In response, MSBOOT will search the tape for the
desired program, load it into memory, and transfer program con-
trol to the starting address of the program. If the tape was
booted to load system software or perform a backup operation,
the user must enter 'MDUP.MS' to the '*' prompt. The file tape
facility will respond by loading MDUP.MS from the tape and
prompt with:

        MDUP V05.01
        *

The user can initialize the target disk by entering 'DUn:/Z',
or cause MDUP to restore the disk by entering 'DUn:A=MS:',
where 'DUn:' is the target disk designation. MDUP restores a
minimal RT-11 system from the file tape facility and attempts
to boot it. Once this minimal system is running, other files
on the tape facility can be restored using the COPY command:

        COPY/SYS/NOREPLACE MS:*.* DUn:
                                    or
        COPY MS:INFILE.EXT DUn:

At this point, the BUP utility can be used to restore backup
tape files to the appropriate devices.

Any RT-11 structured STANDALONE PROGRAM can be setup as an
MSBOOT bootable program. When such a program is to be execu-
ted, the MSBOOT program searches the input device to locate and
read the specified file into memory. After successfully load-
ing the program, MSBOOT starts the loaded program at the
relative start address minus 2, which is specified in block 0
offset 40 of the program image. Therefore, the program must be
designed such that the bootable program start address is prece-
ded by by a valid one word instruction, such as HALT, NOP, etc.
An alternate method is to modify location 40 of the program as
follows:

        .R SIPP
        *Program.SAV
        Base?
        Offset?   40
          Base   Offset   Old   New?
          000000   000040   xxxxxx   xxxxxx+2
          000000   000042   xxxxxx   <CTRL>Y
        *<CTRL>C
        .

Note that this method requires that the program's location be
restored before execution under an RT-11 monitor.

If you are attempting to create a bootable tape, containing
only the desired program as described the above Command File
Example, it is not necessary to change the start address.

As described previously, all RT-11 utility switch options are
supported except the PIP verify function, switch option /V.
This option requires the backspace command, which is not cur-

rently supported by the file tape facility. Instead, the
source and binary compare utilities can provide this function
when required.

NOTE

The file tape facility is fast and reli-
able for disk backup. However, when used
with utilities not designed for high data
transfer rates, the tape drive may not
stream continuously. If the tape drive
stops and starts during backup or restore
operations, the cause is probably slow
software execution, rather than any char-
acteristic of the file tape facility.

OPERATION WITH RSX-11M

All volume manipulation utilities supported under the multiuser
RSX-11M operating system are compatible with the file tape
facility. However, the backup and restore utility /VERIFY
switch is unsupported, because the file tape interface module
will not support backspace operations. If verification is
attempted, the file tape facility will generate an error mes-
sage.

PERIPHERAL INTERCHANGE PROGRAM (PIP). Following is an example
of a typical PIP file copy operation:

```
>ALL MS0:                            ;Allocate MS0:
>INIT MS0:XXX                        ;Initiate volume XXX
>MOU MS0:XXX                         ;Mount volume XXX
>PIP                                 ;Invoke PIP
PIP>MS0:=DU0:[*,*]*.*;*              ;Copy all files to tape

MTAACP - MOUNT NEXT VOLUME ON MS0:   ;This message only
                                     ;appears if another
                                     ;tape is required to
                                     ;complete the file
                                     ;transfer.
   PIP>                              ;Normal termination
```

BACKUP AND RESTORE UTILITY (BRU). Both online and standalone
versions of the BRU utility (BRUSYS.SYS and BRU64K.SYS, respec-
tively) are compatible with the file tape facility. Following
are typical examples of backup and restore commands using BRU:

Backing up the system device:

>BRU/REWIND/MOUNT/VERIFY SY: MS:

Restore to a like device:

>BRU/REWIND/VERIFY/INITIALIZE MS: DU:

Restoring a file:

>BRU/REWIND/VERIFY MS:[1,51]BRU64K.SYS DU:

Backing up an account:

>BRU/REWIND/MOUNT DU:[1,54] MS:

Appending an account to a previously generated backup tape:

>BRU/REWIND/MOUNT/APPEND DU:[1,54] MS:

Preparing for account restore:

>PIP [ggg,mmm]*.*;*/DE

Restoring account:

>BRU/REW MS: DU:[ggg,mmm]

Comparing previous restore for verification:

>BRU/COMPARE/REW MS: DU:[ggg,mmm]

An example of multivolume BRU:

>BRU/REW/MOU/ DU: MS:

BRU - Starting Tape 1 on MS0:

BRU - End of Tape 1 on MS0:

BRU - Mount Tape 2 on MS0:

BRU - End of Tape 2 on MS0:

BRU - Completed

BRU>

CREATING A STANDALONE BRU TAPE. The following example assumes
that standalone backup and restore program BRU64K.SYS and
BRU64K.STB, its symbol table file, are located in UIC [1,51]:

Build image of standalone program:

    >VMR [1,51]BRU64K

Write bootable image:

    VMR>SAVE MS:BRU64K

CREATING A BOOTABLE BRU TAPE. The MS: boot program on LSI-
11/23 and 11/73 CPU boards will not boot RSX standalone BRU
tapes, because the program loads the tape boot block into
memory and looks for a NOP (240) in location 0. RSX standalone
boot blocks have a BR+20 (410) in location 0 so the program
will assume it is not bootable. To use either processor's boot
program, the boot block must be patched to contain a NOP (240)
in location 0 and a BR+16 (407) in location 2. The following
example shows one method of patching to generate a bootable
tape:

```
    >VMR                                ;Invoke VMR
    ENTER FILENAME:  BRU64K             ;Create a bootable image
    VMR>SAV MS:BRU64K                   ;Save image on tape
    VMR><CTRL>Z                         ;Exit VMR
    >FLX                                ;Invoke FLX
    FLX>MS:[*,*]/DO/LI                  ;Directory of MS0:

    DIRECTORY       MS:[0,0]
    30-JAN-86


    MFRH$/LN8.LAL           257.          15-JAN-86 <40> [40,40]

    TOTAL OF 257. BLOCKS IN 1. FILES

    FLX>DU0:[1,51]/IM=MS:[*,*]*.LAL/DO  ;Copy the image from
                                          tape to disk
    FLX><CTRL>Z                         ;Exit FLX
    >RENAME *.LAL;* BRU64K,SAV/AB       ;Give the file a name
    >ZAP                                ;Invoke ZAP
    ZAP>DU0:[1,51]BRU64K.SAV/AB         ;Open the file
     0/                                 ;Dump location zero
    000: 000000/  000410                ;It contains a BR+20
     240                                ;Change loc. 0 to 240
     407                                ;Change loc. 2 to 407
     X                                  ;Exit ZAP
    >FLX                                ;Invoke FLX
    FLX>MS:/ZE/DO                       ;Initialize the tape
```

```
FLX>MS:/IM/DO=DU0:[1,51]BRU64K.SAV/RS   ;Copy the patched
                                         ;file
FLZ><CTRL>Z                              ;Exit FLX
>                                        ;Done
```

RESTORING A BOOTABLE TAPE. After the CPU has been booted from power up or reinitialized, enable the line clock. Additional information will then be displayed. Refer to Section 7.5 of the RSX-11M Utilities manual for further operating instructions. Since the default vector address established for the MS device is incorrect in the boot program, it is important to enter the following command when using the file tape facility as one of the BRU devices:

```
MS:/VEC=224
```

DISK SAVE AND COMPRESS UTILITY (DSC). The disk save and compress utility (DSC) and standalone versions (DSCSYS.SYS/ DC64K.SYS) can be used with the file tape facility to save and restore disk volumes. The following RSX commands are examples of how to use DSC with the tape facility:
Compressing disk to tape:

```
>DSC MS:/RW=DU:
```

Restoring tape to disk:

```
>DSC DU:=MS:/RS
```

Comparing input and output volumes:

```
>DSC DU:=MS:/RW/CMP
```

OPERATION WITH RSTS

The file tape facility supports the full range of backup programs under the RSTS timesharing environment. The backup package of programs allows the user to preserve and recall files stored under one or more user accounts.

SAVE AND RESTORE UTILITY (SAV/RES). All tape options of the save and restore function are supported by the file tape facility. An example of SAV/RES operation is as follows:

```
Option: SAVRES <CR>

SAV/RES Function: SAVE <CR>
```

APPENDIX H: SMS 1000 FILE TAPE OPTION DESCRIPTION

   From RSTS disk? DU0: <CR>

   *** Pack ID/default Save Set Name is "NAME"

   To device? MS0: <CR>

   *** Save Set Name is "NAME"

   Expiration Date <dd-mm-yy>? <LF>

   Verify (Yes or No)? No <LF>

   Proceed (Yes or No)? Yes <CR>

   *** Initiating first SAVE volume

   *** Begin SAVE from DU0: to MS0: at hh:mm AM/PM

The SAVRES utility now performs the save operation. After
completion, the utility reports results and timing information.
If a restore operation is required, it would be performed as
above except 'RESTORE' would be entered to the function request
prompt.

BACKUP UTILITY. BACKUP is a menu driven utility allowing the
user to backup any number of individual accounts or files. All
basic functions provided by the utility are supported by the
file tape facility. However since the backspace command is not
supported by the file tape interface, BACKUP will report an
error after execution if the the index file contains more than
approxiamately 160 entries. Even though an error is reported,
the tape generated will be good. The index file may be dumped
and accounts restored as required. An error is also encounter-
ed at the end of tape during a multivolume backup. The message
"retry legal" will be displayed. When this error message is
received, enter "RETRY <CR>". In turn, the backup utility will
rewind the tape, search forward, verify the next record, and
request the next volume.

RSTS/E PERIPHERAL INTERCHANGE PROGRAM (PIP). All PIP functions
are supported by the file tape facility. A few examples of
typical PIP operation follow:

   *MS0:/ZE   ;Zero MS0:

   *MS0: = SY:[1,2]   ;Copy all files in account [1,2]
                              ;onto tape


```
*SY[1,1] = MSO:[1,2]*.SAV  ;Copy all files with .SAV
                           ;extension in account [1,2]
                           ;from tape to system disk
                           ;account [1,1]
```

The following DCL commands demonstrate additional RSTS/E tape operations:

```
>INIT MSO:                  ;Initialize the tape
Density will be 1600
Tape will be in DOS format
Any existing files on the tape will be deleted
Proceed (Y or N)? Y
>COPY SY:[2,3] MSO:[2,3]   ;DCL logs files copied

[File SY:[2,3]ERRLOG.FIL copied to MSO:[2,3]ERRLOG.FIL]
       "            "             "
       "            "             "
[File SY:[2,3]ERRDIS.HLP copied to MSO:[2,3]ERRDIS.HLP]

>
```

PIP does not support multivolume tapes when in DOS format. If this is attempted, the following scenario results:

```
>PIP
*MSO:/ZE
Really zero MSO:/PARITY:ODD/DENSITY:1600 ? Y
*MSO:[*,*]=SY:[*,*]*.*
```

Upon reaching end of tape, PIP will prompt with:

```
?No room for user on device - MSO:[*,*]file.ext
```

The following command sequences show typical examples of multi-volume operation in ANSI mode:

```
>INIT MSO:
Density will be 1600
Tape will be in ANSI format
Any existing file will be deleted
Proceed (Y or N)?    Y
>
>PIP
*MSO:[*,*]=SY:[*,*]*.*                  ;Copy all files

%End of ANSI magtape output volume   ;End of tape
%has been reached
```

```
        %Please type the device name and       ;New, initialized
        %unit number of the drive where        ;tape must be
        %the next volume may be found?         ;inserted
        MSO:
        *                                       ;Normal completion
```

OPERATION WITH MICROVMS

The file tape facility supports file backup and restore
operations, provided that the System Program Development option
(SYSP) has been included in your version of MicroVMS. Included
in the SYSP option is the Magnetic Tape Ancillary Control Proc-
ess (MTACP), which is required to support the tape facility as
a file structured device. The copy function of MicroVMS is not
supported since no driver for TS-11 type devices is provided by
DEC in baseline MicroVMS.

Some default files, such as SYSLOGIN.COM, equate the INIT com-
mand to INIT/NOHIGHWATER. Since magnetic tapes do not support
this option, an error occurs during initialization as follows:

```
        $ INIT MSA0: LABEL<CR>
        %INIT-F-ILLOPT, qualifier(s) not appropriate to this
        %device
```

If this occurs, the SYSLOGIN.COM file can be modified, or the
INIT/HIGHWATER command can be used to override the defaults as
follows:

```
        $ INIT/HIGHWATER MSA0: LABEL<CR>
```

MICROVMS BACKUP. The MicroVMS backup facility can be used to
backup entire disks, accounts, or individual files. Backup re-
quires that the tape be mounted foreign, which can be
accomplished as follows:

```
        $ MOUNT/FOR MSA0:
        %MOUNT-I-MOUNTED, mounted on _MSA0:
        $
```

By default, the BACKUP utility uses three data buffers during
backup operations. Each of these is 8 kB in size. The utility
also performs a cyclic redundancy check (CRC) on save-set data.
The following command shows a method for disk image backup
using defaults:

```
        $ BACKUP /REWIND /IMAGE
        _From:  DUA0:
        _To:    MSA0: LABEL /SAVE_SET
```

A major improvement in performance can be obtained by invoking
the '/NOCRC' switch, since CRC is performed by the file tape
facility automatically. This eliminates software CRC calcul-
ation on save-set data, thus reducing software execution time.
In turn, the tape facility can stream without interruption,
reducing the time required for backup operations. The /NOCRC
switch is invoked as follows:

```
$ BACKUP  /REW  /IMAGE  /NOCRC
_From:    DUA0:
_To:      MSA0: LABEL  /SAVE_SET
```

Additional speed improvements can be obtained by increasing the
number of buffers used to five, using the '/BUFFER' switch.
The size of blocks written to tape can also be increased from 8
kB to 65 kB using the '/BLOCK_SIZE=65354' switch, as follows:

```
$ BACKUP  /REW  /IMAGE  /NOCRC  /BUFFERS=5  /BLOCK_SIZE=65354
_From:    DUA0:
_To:      MSA0: LABEL  /SAVE_SET
```

Using a standalone backup kit, the image save-sets created by
the previous command sequences can be restored to disk as fol-
lows:

```
$ BACKUP
_From:    MSA0: LABEL  /SAVE_SET
_To:      DUA0:
```

Refer to the MicroVMS users manual for further information on
using the backup command.