Tektronix®

8560
MULTI-USER SOFTWARE DEVELOPMENT UNIT

INSTALLATION GUIDE
SERVICE

INSTRUCTION MANUAL

Tektronix®
COMMITTED TO EXCELLENCE

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

8560
MULTI-USER SOFTWARE DEVELOPMENT UNIT

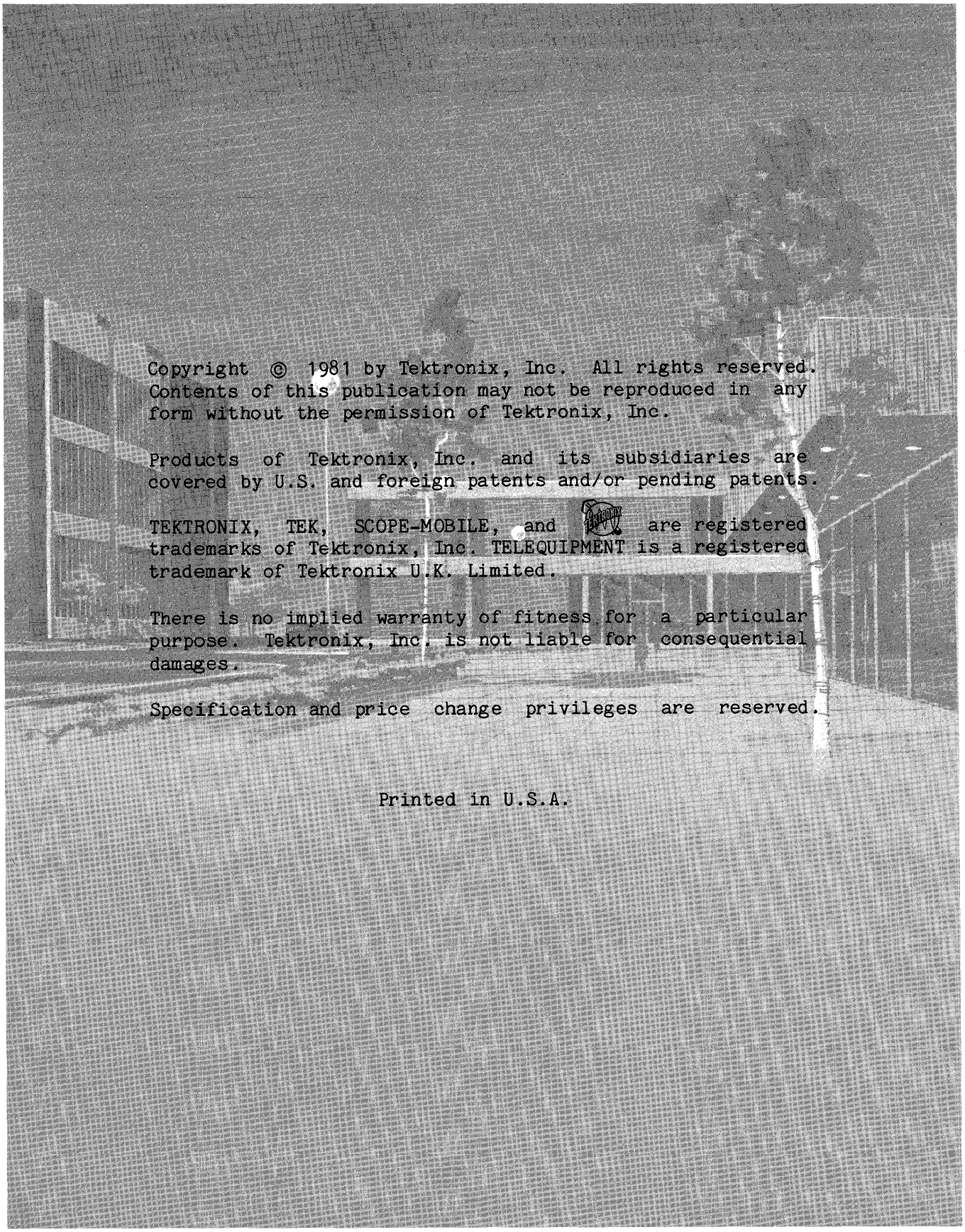
INSTALLATION GUIDE
SERVICE

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

070-3899-00
Product Group 61

Serial Number _____

First Printing NOV 1981



Printed in U.S.A.

PREFACE

INTRODUCTION

This manual tells you how to install a TEKTRONIX 8560 Multi-User Software Development Unit (MUSDU). Since the manual is an Installation Guide, and not a User's Manual, it contains only those operating instructions necessary to perform system verification procedures.

The 8560 MUSDU should be installed by a Tektronix Field Service Specialist. Tektronix, Inc. is not obligated to furnish service to repair damage resulting from attempts by unauthorized personnel to install this equipment. Please contact your nearest Tektronix Field Service office for installation and additional information.

ABOUT THIS MANUAL

This manual is divided into five sections, which provide the following information:

Section 1	A general description of the 8560 Multi-User Software Development Unit.
Section 2	Instructions for unpacking the 8560 MUSDU and setting up your work site.
Section 3	Location and description of the various controls, connectors, and indicators, and procedures for verification of proper performance of the 8560 MUSDU.
Section 4	Switch and jumper settings for the 8560 MUSDU circuit boards.
Section 5	Interconnection of the 8560, 8540 and peripheral equipment to obtain a desired system configuration.

NOMENCLATURE

Throughout this manual, the following terminology is used for the sake of brevity:

Term	Meaning
8560 or MUSDU	8560 Multi-User Software Development Unit
8540	8540 Integration Unit
Terminal, or System Terminal	The terminal used for command entry, and connected to the 8540 Integration Unit or to the 8560 MUSDU.

The terms LSI-11/23 and DEC are used in this manual. LSI-11/23 and DEC are registered trademarks of the Digital Equipment Corporation, Maynard, Massachusetts.

CHANGE INFORMATION

Change notices are issued by Tektronix, Inc., to document changes to the manual after it has been published. Change information is located at the back of this manual, following the yellow tab marked "CHANGE INFORMATION & TEST EQUIPMENT". When you receive the manual, you should enter any change information into the body of the manual, according to instructions on the change notice.

REVISION HISTORY

As this manual is revised and reprinted, revision history information is included on the text and diagram pages. Original manual pages are identified with an '@' symbol at the bottom inside corner of the page. When existing pages are revised, the '@' symbol is replaced with a revision date (REV OCT 1981). New pages added to a section, whether they contain old, new, or revised information, will be identified with the '@' symbol and a date (@ OCT 1981).

DOCUMENTATION OVERVIEW

Support documentation for the 8560 Multi-User Software Development Unit consists of both user's and service manuals. User's manuals contain operating instructions, and are provided with the equipment as a standard accessory. Service manuals provide the information necessary to perform system testing, to isolate hardware problems in the equipment, and to maintain and repair system components. Service manuals are available as optional accessories, and may be ordered from Tektronix, Inc.

CONTENTS

Page

SAFETY SUMMARY

Operators ix
Servicing xi

Section 1 GENERAL DESCRIPTION

Introduction 1-1
What is an 8560? 1-1
  Configuration 1-2
  Software 1-2
  Hardware 1-2
    8560 MUSDU Backplane 1-4
    LSI-11/23 Processor 1-4
    System Memory 1-4
    Mass Storage 1-4
    PMS Controller 1-5
    Utility Board 1-5
    I/O Processor 1-5
    Communications Adapters 1-6
Peripheral Equipment 1-6
Specifications 1-7

Section 2 UNPACKING YOUR 8560 MUSDU

Introduction 2-1
Site Preparation 2-1
  Space Requirements 2-1
    Maintenance Access 2-3
  Power Requirements 2-5
  Environmental Considerations 2-5
Unpacking the 8560 2-6
  Removing the 8560 from the Carton 2-6
  Storage and Reshipment 2-7
    Head Locking Device 2-7
    Storage 2-7
    Reshipment 2-7
Preparing Your 8560 For Operation 2-8
    Installing Options 2-10
    Releasing the Read/Write Head Shipping Lock 2-10
    Removing the Hard-Disc Rotor Restraint 2-12
    Head Restraint 2-12
  Rack-Mount Procedure 2-14
  Selecting the Proper Primary Voltage 2-15

CONTENTS (cont)

Page

Section 3 8560 MUSDU VERIFICATION

Introduction 3-1
Controls, Connectors, and Indicators 3-1
Front Panel Controls and Indicators 3-1
DC ON/OFF Switch 3-2
DC ON Indicator 3-2
RESTART Switch 3-2
RUN/HALT Switch 3-3
AC ON Indicator 3-3
PROCESSOR BUSY 3-3
Rear Panel Controls and Connectors 3-3
Power Cord Receptacle 3-3
Line Fuse 3-3
Primary Voltage Selector Switch 3-4
POWER Switch 3-5
HSI I/O Ports 0--7 3-5
Line Printer Ports 1 and 2 3-5
8560 Set-Up 3-5
Attaching a System Terminal 3-5
HSI I/O Port Specifications 3-6
Attaching an 8540 Integration Unit 3-7
Attaching a Line Printer 3-8
RS-232-C Port Specification 3-8
Verification 3-9
Power-Up Procedure 3-9
System Verification Procedure 3-10

Section 4 8560 MUSDU BOARD CONFIGURATION

Introduction 4-1
Jumpers and Straps 4-1
Jumpers 4-1
Straps 4-2
LSI-11/23 Processor 4-2
64K Memory Boards 4-3
Memory Range Selection 4-3
I/O Memory 4-3
RAM Test Jumpers 4-4
PMS Controller Board 4-5
M1220 Interface Card 4-6
Utility Board 4-7
Line Printer Interface 4-8
Baud Rate Selection 4-8
Interface Address Jumpers 4-9
Interrupt Vector Address Jumpers 4-9

CONTENTS (cont)

Page

Debug ROM Control Jumper 4-9
Power Up/Down Control Jumper 4-9
Strap Configuration 4-9
I/O Processor Board 4-10
Device Registers 4-11
Interrupt Vectors 4-11
I/O Adapter Board 4-13
I/O Connector Board 4-13

Section 5 SYSTEM CONFIGURATION

Introduction 5-1
8560/8540 System 5-1
Software Interface Requirements 5-1
Hardware Interface Requirements 5-3
System Terminal Requirements 5-4
Terminal Connected to the 8540 Integration Unit 5-4
Terminal Connected to the 8560 MUSDU 5-5
Line Printer 5-6
RS-232-C Interface Configurations 5-7

CHANGE INFORMATION

ILLUSTRATIONS

Fig. No.		Page
1-1	Block diagram of 8560 Multi-User Software Development Unit	1-3
2-1	Dimensions of the 8560 MUSDU	2-2
2-2	Air flow through the 8560 MUSDU	2-3
2-3	Circuit board clearance requirements	2-4
2-4	Removing the 8560 MUSDU top cover	2-9
2-5	Removing the 8560 circuit board restrainer	2-9
2-6	Removing the hard-disc drive unit	2-11
2-7	Location of Driver Interface board retaining screws	2-13
2-8	Hard-disc drive rotor shipping restraint	2-14
2-9	Rack-mount guide orientation	2-15
2-10	Selecting the primary power voltage range	2-16
3-1	8560 MUSDU Front Panel Controls and Indicators	3-2
3-2	8560 Rear Panel Controls and Connectors	3-4
3-3	Location of jumpers on the I/O Adapter board	3-7
4-1	Jumper configuration for the LSI-11/23 Processor board	4-2
4-2	64K RAM board jumper and strap locations	4-4
4-3	PMS Controller board jumper locations	4-5
4-4	M1220 Interface Card jumper locations	4-6
4-5	Utility board jumper and strap locations	4-7
4-6	I/O Processor board jumper locations	4-10
4-7	Device Register jumper positions	4-11
4-8	Interrupt Priority jumper arrangement	4-12
4-9	Jumper configurations for interrupt priority levels	4-12
4-10	Location of jumpers on the I/O Adapter board	4-13
5-1	Typical 8560 system configuration	5-2
5-2	High-Speed Interface (HSI) lines between the 8560 and the 8540	5-3
5-3	Typical RS-232-C system terminal interface with the 8560 MUSDU ...	5-5
5-4	Typical line printer interface with the 8560 MUSDU	5-6
5-5	RS-232-C interface lines between the 8560 and the 8540	5-7

TABLES

Table No.		Page
1-1	Electrical Characteristics	1-7
1-2	Environmental Characteristics	1-7
1-3	Physical Characteristics	1-8
3-1	User-Selectable Interface Connector Pin Assignments	3-6
3-2	RS-232-C Interface Connector Pin Assignments	3-8
4-1	Baud Rate Selection	4-8
4-2	Interrupt Priority Assignments	4-12
5-1	8540 Integration Unit, Pin Configuration for RS-232-C Ports	5-4

OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

As Marked on Equipment


DANGER high voltage.


Protective ground (earth) terminal.


ATTENTION - Refer to manual.

SAFETY PRECAUTIONS

Grounding the 8560 MUSDU

The 8560 Multi-User Software Development Unit is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the equipment's power input terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

Use only the power cord and connector specified for your 8560.

Use only a power cord that is in good condition.

Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your 8560. Be sure the fuse is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate the 8560 MUSDU in an atmosphere of explosive gases.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove covers or panels from the 8560 MUSDU. Do not operate the 8560 without the covers and panels properly installed.

SERVICING SAFETY SUMMARY
FOR QUALIFIED SERVICE PERSONNEL ONLY

(Refer also to the preceding Operators Safety Summary)

Do Not Service Alone

Do not perform internal service or adjustment on the 8560 MUSDU unless another person capable of rendering first aid and resuscitation is present.

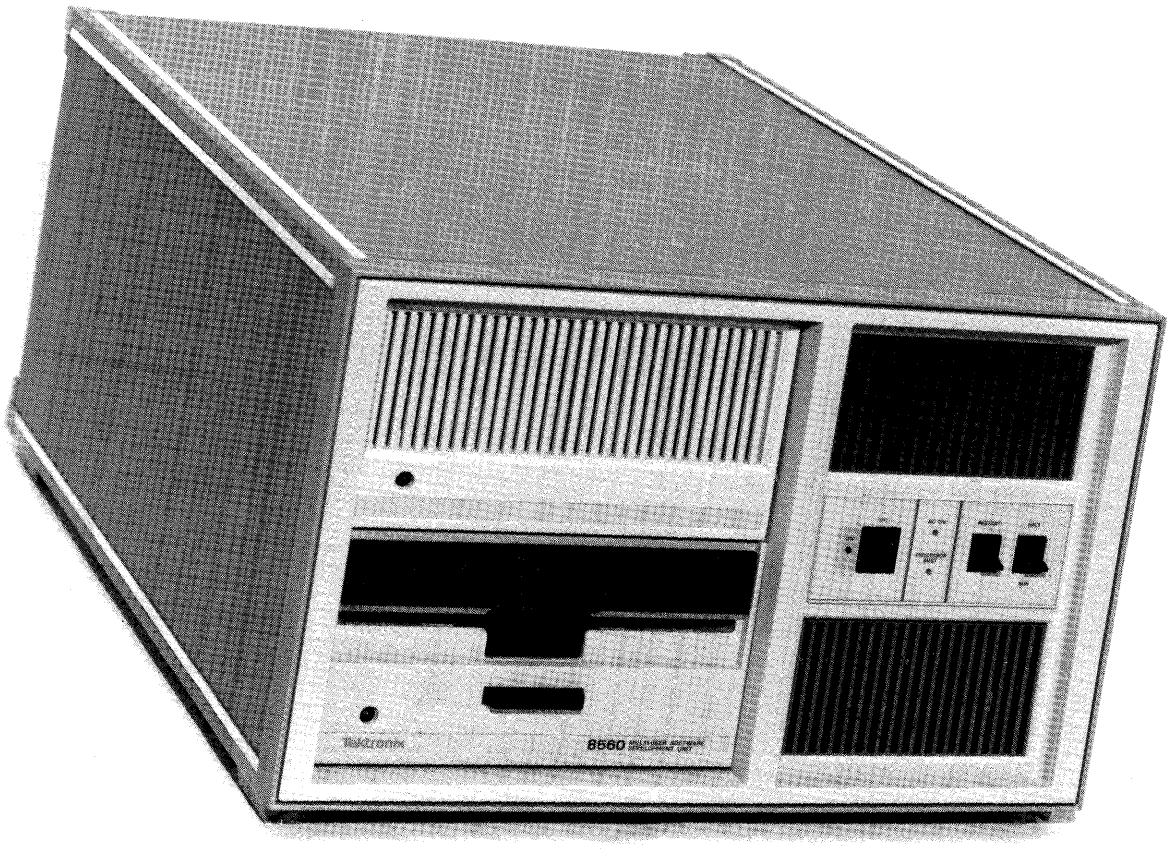
Use Care When Servicing With Power On

Dangerous voltages exist at several points in the 8560. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

The 8560 is designed to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.



8560 Multi-User Software Development Unit

3899-1

@

Section 1

GENERAL DESCRIPTION

INTRODUCTION

This section provides a general description of the TEKTRONIX 8560 Multi-User Software Development Unit (MUSDU) and its functional relationship to the 8540 Integration Unit and supporting peripheral equipment.

WHAT IS AN 8560?

The 8560 MUSDU is a self-contained, rack-mountable processor controller. It normally operates with one or more (up to eight) user workstations, each consisting of an 8540 Integration Unit and its associated system terminal. The resulting integrated development system allows the users to create, edit, assemble and load user-written programs. The 8560 can also be configured to permit direct connection of local or remote CRT terminals; in this configuration, the 8560 can be used as a general-purpose computer. The 8560 MUSDU utilizes a modified version of the Bell Telephone Laboratories UNIX(tm) Version 7.0 operating system.

Special interface ports are provided on the 8560 to accommodate one or two line printers.

In its normal configuration as the center of an integrated development system, the 8560 MUSDU can help the user to develop and debug software by providing those tools most required in any development system:

- An editor, which allows user to create the text of a program.
- An assembler to change a program into machine language.
- A compiler, which allows the use of a high-level language for easier program development.
- A debugging capability to monitor and evaluate a program as it is being run.

CONFIGURATION

The 8560 MUSDU is contained entirely in one cabinet. The I/O ports on the rear panel, designated "HSI I/O", are normally assigned as High Speed Interface (HSI) ports, using RS-422 protocol. Any of these HSI ports may be jumper-selected to RS-232-C protocol, to permit direct connection of a system terminal to the 8560. Two dedicated RS-232-C ports are also provided to accommodate line printers.

SOFTWARE

The operating system software for the 8560 is contained on the 8-inch fixed disc drive. The operating system used is a modified version of the Bell Telephone Laboratories UNIX(tm) Version 7.0 operating system. The operating system, designated TNIX, is also contained on a set of 8-inch flexible discs provided with the 8560, to permit reloading of the fixed disc when required.

The TNIX Operating System enables the 8560 MUSDU to function as a host computer to the 8540 Integration Unit. The 8540 uses a ROM-based operating system, OS/40, to perform prototype development operations such as emulation and program execution. The OS/40 system interfaces with TNIX for system operations such as editing, assembly, compiling, and communications.

For a complete description of the OS/40 Operating System, refer to the 8540 Integration Unit System Users Manual. The TNIX Operating System used in the 8560 MUSDU is described in the 8560 Multi-User Software Development Unit System Users Manual.

HARDWARE

As previously stated, the 8560 Multi-User Development Unit is a general purpose computer. The 8560 consists of the following major components:

LSI-11/23 — The LSI-11/23 microprocessor and related support devices form the CPU for the 8560 MUSDU. All system operations and communication functions are performed by the LSI-11/23.

System Memory — A 64K-word RAM board that provides temporary storage for 8560 operations. An additional 64K-word RAM (optional) may be installed in the 8560 to increase temporary storage capacity to 128K words.

PMS Controller — The Peripheral Mass Storage (PMS) Controller board operates the flexible disc drive, and, through an auxiliary circuit board, operates the Winchester-technology fixed hard-drive.

Mass Storage — Mass storage for the 8560 is provided by two built-in disc storage units:

A double-sided, double-density, flexible disc drive with 1.2M byte storage capacity.

An 8-inch fixed disc drive with 35.6M byte storage capacity.

Utility Board — This board performs various general purpose functions and provides support circuitry for the 8560 MUSDU.

I/O Processor — The Input/Output Processor (IOP) board supports four full-duplex I/O channels, and provides limited processing capability associated with I/O processing. An additional IOP board (optional) may be installed to expand I/O capabilities of the 8560.

Figure 1-1 is a block diagram of the 8560 Multi-User Software Development Unit.

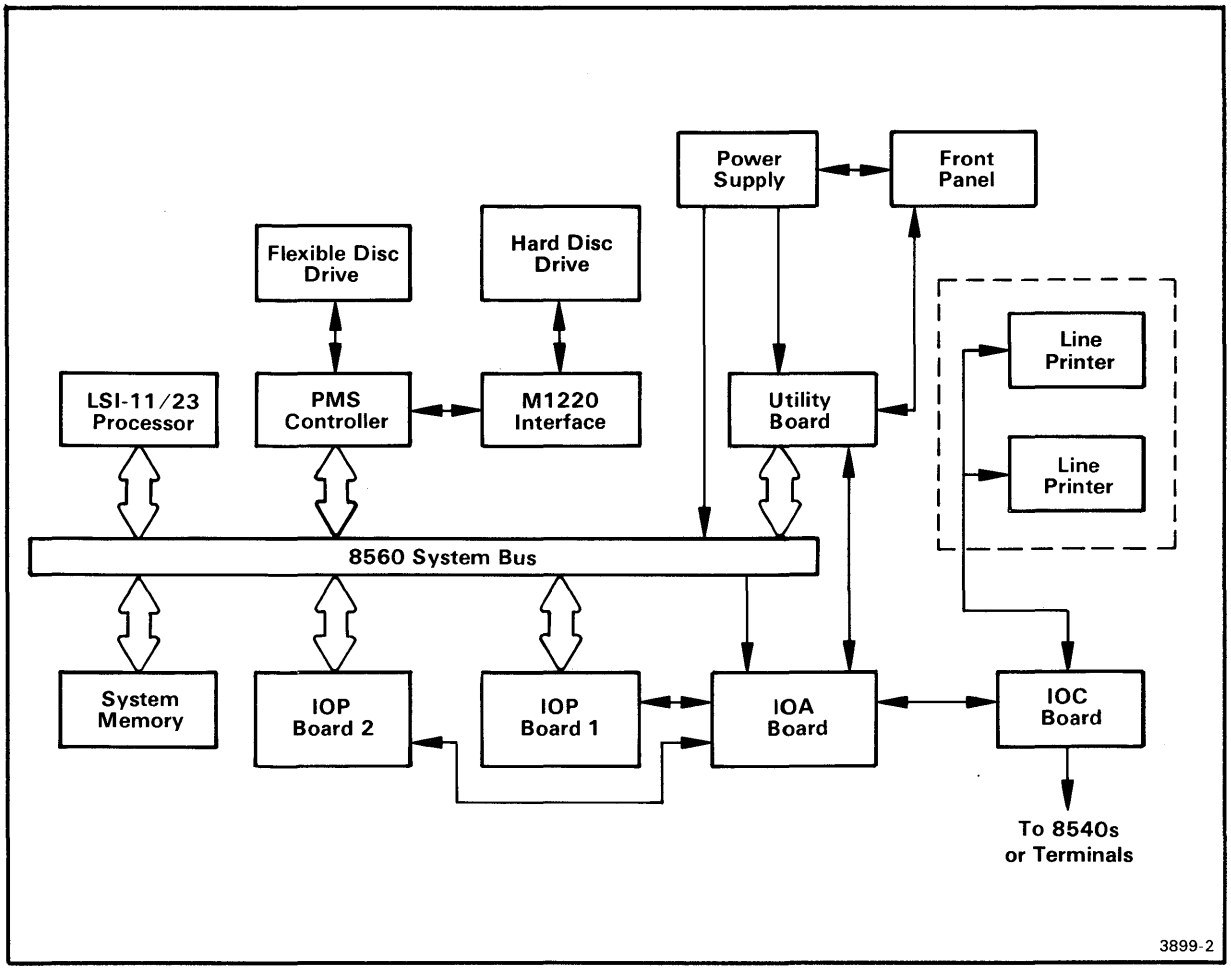


Fig. 1-1. Block Diagram of 8560 Multi-User Software Development Unit.

8560 MUSDU Backplane

The 8560 backplane carries the LSI-11/23 processor's Q-bus to all the circuit boards in the MUSDU, and also provides the necessary interconnections between circuit boards and any I/O devices in the system. I/O signals are distributed between the circuit boards and the I/O destination by the backplane. Therefore, each circuit board that processes I/O functions is assigned a dedicated slot in the backplane.

LSI-11/23 Processor

The Digital Equipment Corporation's LSI-11/23 microcomputer is the 8560's main controller. The LSI-11/23 is contained on one dual-height, multi-layer, plug-in circuit board (DEC M8186). The LSI-11/23 includes such features as:

- Asynchronous bus operation, which allows the processor and system components to run at their highest possible speed.
- Memory management for 128K bytes of multi-user program space.
- 16-bit word or 8-bit byte addressable locations
- Direct Memory Access (DMA) to allow peripheral devices to access memory without interrupting processor operation.

System Memory

The 8560's System Memory is a stand-alone, single-board, 64K-word dynamic RAM. A second 64K-word RAM board may be installed to expand system memory capacity. Each board contains a jumper option to allow the board to be configured as either the upper or lower 64K bank of LSI-11/23 memory.

Mass Storage

To provide the large amount of peripheral mass storage required, one flexible disc drive and one 8-inch hard disc drive are used in the 8560 MUSDU. The flexible disc drive provides approximately 1.2M bytes of formatted capacity on a double-sided, double density, 8-inch disc. Either single density or double density read/write format may be selected. Primary mass storage for the 8560 MUSDU is provided by a Winchester-technology, fixed hard-disc drive which provides appproximately 35.6M bytes of formatted capacity.

PMS Controller

The PMS Controller board operates both mass storage drive units. However, in order to interface the PMS Controller with the hard disc drive, an auxiliary circuit board, the Micropolis 1220 Interface Card (M1220IFC) is installed piggy-back on the PMS Controller board.

The PMS Controller uses a Z80A microprocessor with 8K of ROM and 1K of RAM, to control all its hardware and software functions. An additional 8K of ROM is provided on the M1220IFC board. The PMS Controller provides the interface between the LSI-11/23 System Memory and the selected mass storage device. It also assigns I/O output lines, and controls memory mapping functions, monitor status, and error indications.

The M1220IFC board assumes control of the PMS Controller's Z80A microprocessor bus when data is being transferred between the LSI-11/23's Main Memory and the hard-disc memory.

Utility Board

The Utility board provides support for functions not supported by other boards in the 8560 MUSDU. Features supplied by the Utility board include:

- Two RS-232-C interface ports
- LSI-11/23 Line-Time Clock (LTC) function
- Bootstrap ROM
- Debug ROM
- Front Panel functions (RESTART, RUN/HALT)
- Bus termination resistors
- LSI-11/23 power up/down sequencing

I/O Processor

The I/O Processor (IOP) is a single board that provides four full-duplex, serial-interface channels. In the standard configuration, one I/O Processor board is installed in the 8560 MUSDU. An optional second I/O Processor may be installed to increase the 8560's I/O capabilities.

The IOP uses memory queues in the system memory to communicate with the LSI-11/23. The IOP provides I/O processing capability that would otherwise be assigned to the LSI-11/23.

Communications Adapters

Two small circuit boards are used in the interface between the I/O Processor and external devices:

- The I/O Adapter (IOA) board permits selection of either RS-422 or RS-232-C protocol for the HSI I/O ports, and performs the necessary translation to RS-422 or RS-232-C compatible voltage levels.

- All I/O connectors are mounted on the I/O Connector (IOC) board, located on the rear panel of the 8560 mainframe. In addition to the eight (four optional) HSI I/O connectors, there are two dedicated RS-232-C connectors for interface with line printers.

PERIPHERAL EQUIPMENT

In addition to the one or more 8540 Integration Units used with the 8560, the 8560 MUSDU will accommodate the following peripheral devices:

- A system terminal may be connected to any vacant HSI I/O port that has been configured for RS-232-C operation. A system terminal can also be connected to an 8540 Integration Unit that is attached to the 8560 MUSDU.

- High-speed line printers may be connected to either of the two line printer ports.

SPECIFICATIONS

Table 1-1
Electrical Characteristics

Characteristic	Performance Requirement	Supplemental Information
Supply Voltage	115 Vac Nominal (90--132 Vac) or 230 Vac Nominal (180--250 Vac)	
Line Frequency		48 to 66 Hz
Line Current		8 Amps (max) at 115 Vac 4 Amps (max) at 230 Vac
Power Dissipation		430 Watts (max)

Table 1-2
Environmental Characteristics

Characteristic	Description
Temperature	
Operating	10° C to 40° C (50° F to 104° F)
Storage	-10° C to 65° C (14° F to 149° F)
Humidity	
Operating	20% to 80% relative non-condensing
Storage	8% to 90% relative non-condensing
Altitude	
Operating	2 500 m (8,000 ft) maximum (a)
Storage	15 000 m (50,000 ft) maximum

(a) Derate maximum operating temperature by 1° C for each 300 m above 2 400 m.

Table 1-3
Physical Characteristics

Characteristic	Description
Net Weight	34 kg (75 lb)
Overall Dimensions	
Height	267 mm (10.5 in)
Width	432 mm (17.0 in)
Depth	597 mm (23.5 in)

@

Section 2

UNPACKING YOUR 8560 MUSDU

INTRODUCTION

This section discusses the steps to follow when unpacking and installing an 8560 MUSDU. The following subjects are covered:

- Site preparation, including space and power requirements.
- Unpacking the 8560, including storage and reshipment.
- Preparing the 8560 for operation.

SITE PREPARATION

The first consideration in selecting a suitable installation site is space. Two other important criteria that must be considered are power requirements and environmental conditions. These factors are discussed in the following paragraphs.

SPACE REQUIREMENTS

Dimensions of the 8560 MUSDU are shown in Fig. 2-1.

Here are some of the things you should consider when setting up an 8560:

- Adequate clearance must be allowed for ventilation of the 8560 (see Fig. 2-2).
- Clearance must be allowed at the rear of the unit to permit proper cable dress.
- Space may be required for one or two line printers and perhaps a system terminal.
- Desk space may be required near the system terminal for reference documents and other papers.

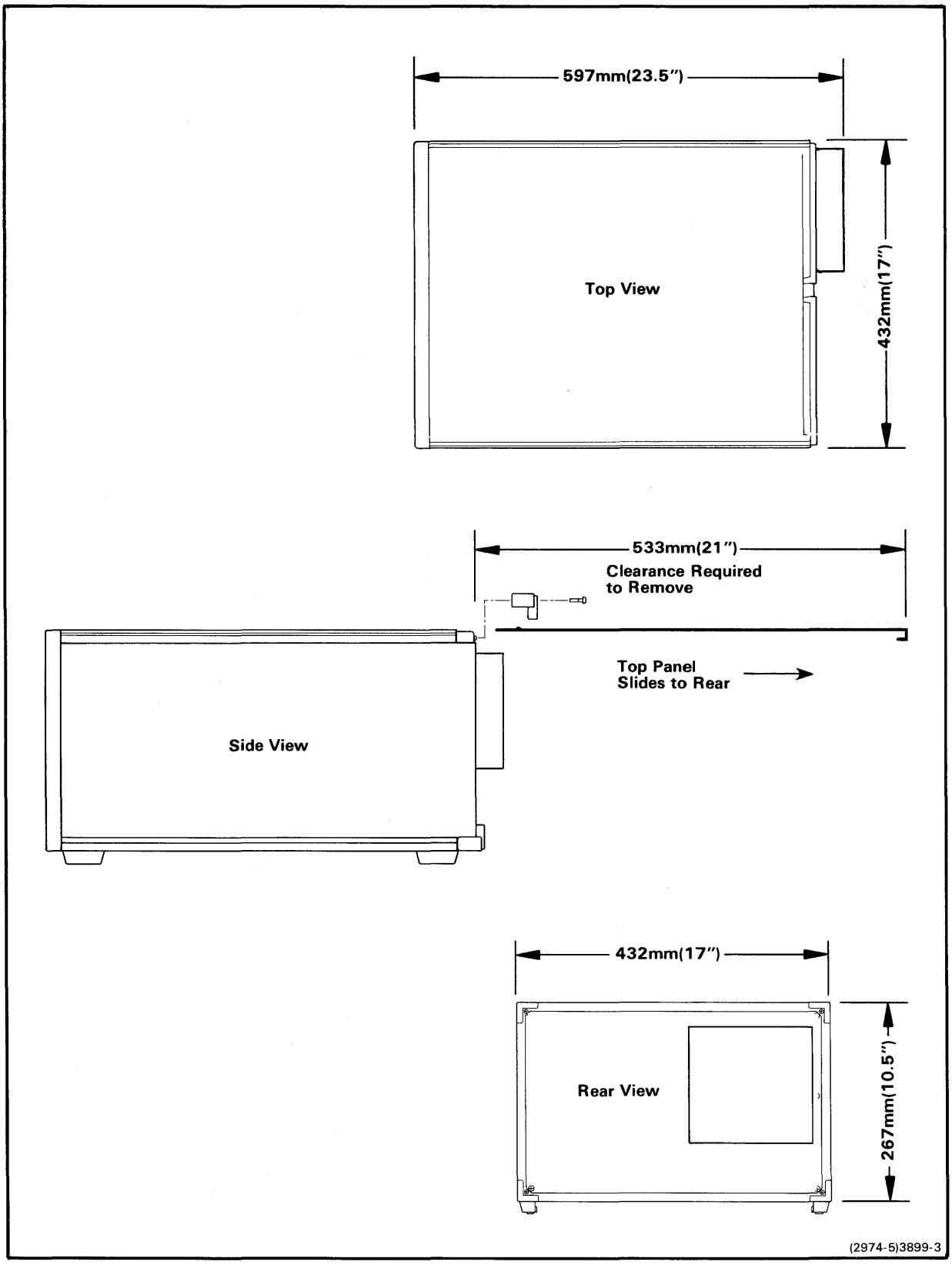


Fig. 2-1. Dimensions of the 8560 MUSDU.

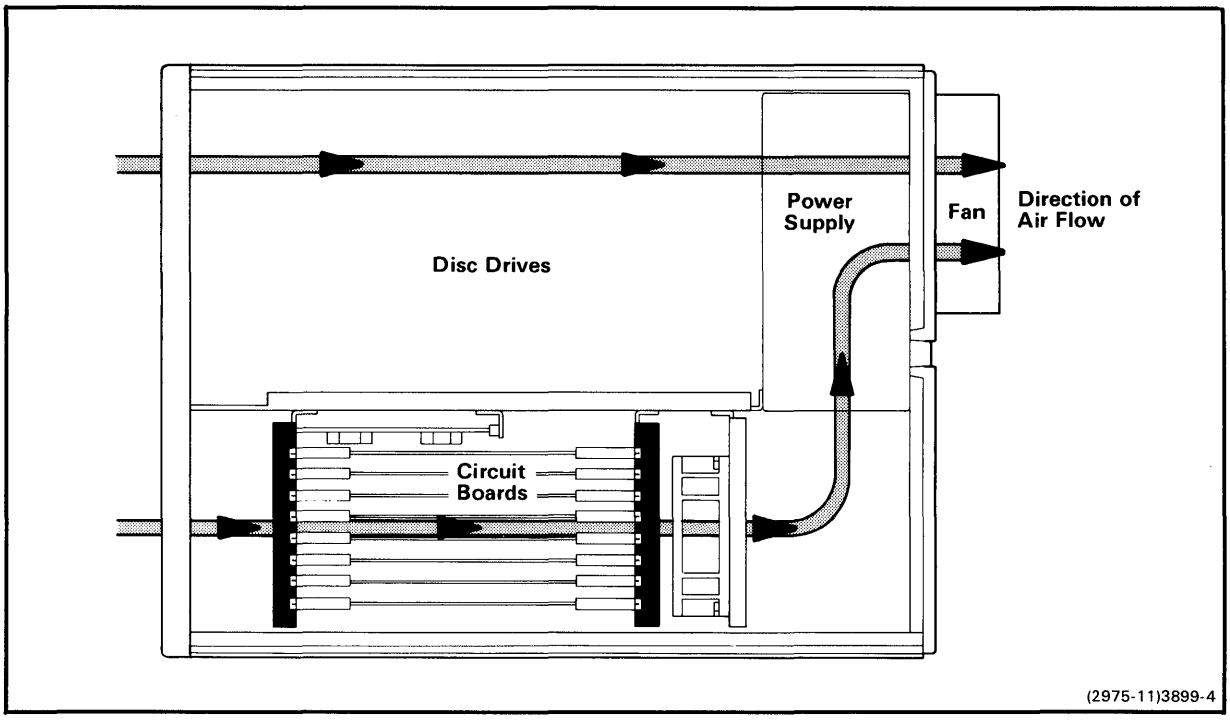


Fig. 2-2. Air flow through the 8560 MUSDU.

Maintenance Access

You will need to gain access to the inside of the 8560 for servicing and troubleshooting.

- Be sure to allow adequate space behind the unit to permit removal of the sliding top cover and side panels. (If sufficient space behind the unit is not available, it will be necessary to turn the unit around, or remove it from the installation site, to remove the top cover and side panels.)

- Allow adequate clearance above the 8560 to permit inspection and removal of circuit boards, as shown in Fig. 2-3.

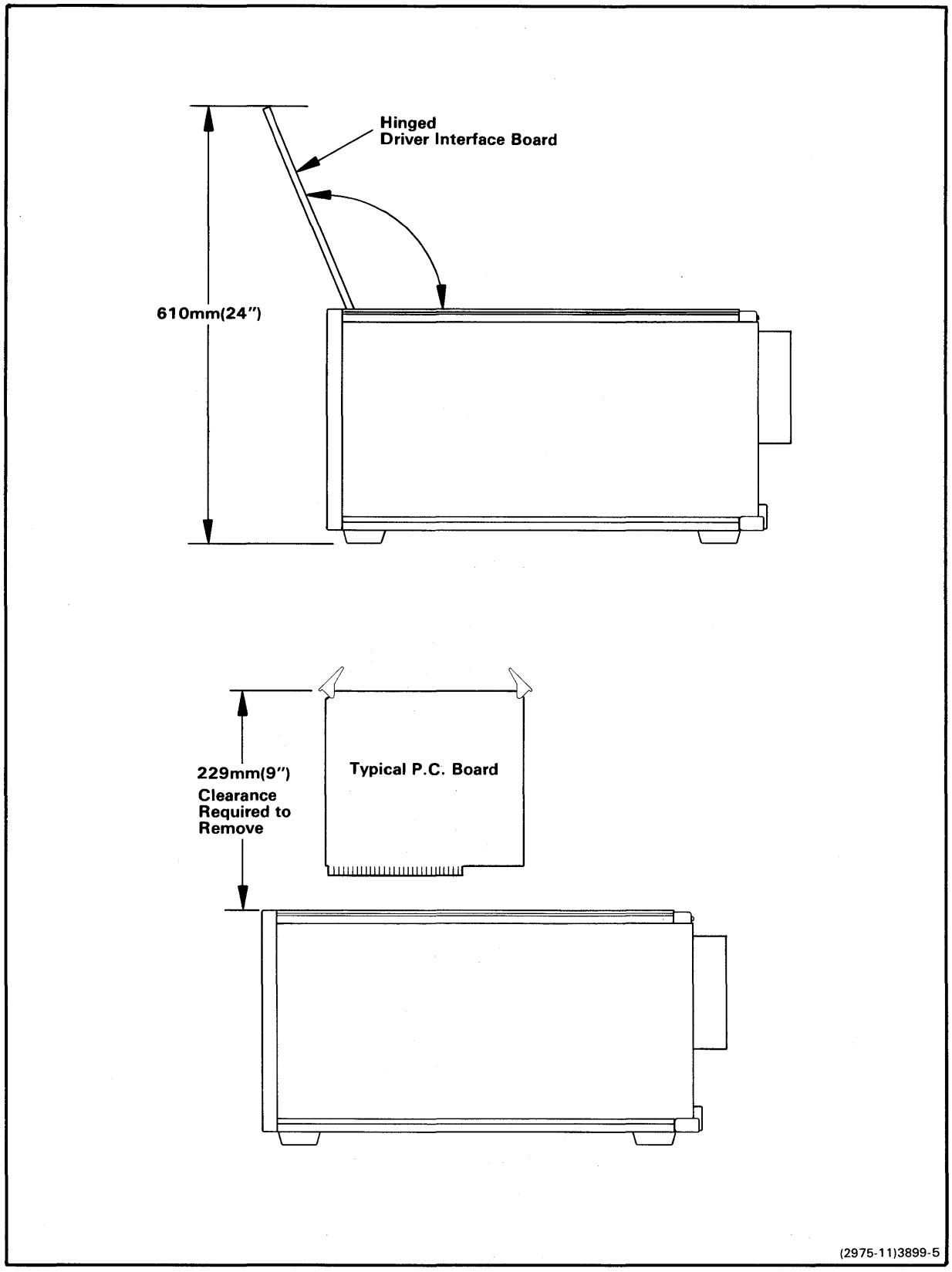


Fig. 2-3. Circuit board clearance requirements.

POWER REQUIREMENTS

Primary power requirements for the 8560 MUSDU are as follows:

Line Voltage	115 Vac Nominal (90--132 Vac) or 230 Vac Nominal (180--250 Vac)
Line Frequency	48 to 66 Hz
Line Current	8 Amps (maximum) @ 115V 4 Amps (maximum) @ 230V
Power Dissipation	430 Watts (maximum)

When preparing the site for the 8560, observe the following electrical guidelines:

1. Any peripheral components installed in the area must share common ground and neutral lines to avoid noisy grounds and ground loops.
2. All units must be properly grounded.
3. Power for the installation site should be on a separate service circuit breaker.

ENVIRONMENTAL CONSIDERATIONS

The following considerations should be taken into account when preparing the installation site:

- The area selected for the 8560 installation should be air-conditioned and dust-free.

CAUTION

Static discharge may damage components of the 8560. Follow standard anti-static procedures when installing an 8560 MUSDU.

- The area should be as static-free as possible. If carpet is used, the carpet must be static-free and treated with anti-static chemicals as often as required.
- The 8560 should be installed on a static-free work surface.
- At least 6 inches' clearance must be maintained at the rear of the 8560 to allow adequate air circulation.

UNPACKING THE 8560

Before you unpack the 8560, examine the carton for external damage. If any damage is detected:

- Immediately notify the carrier who delivered the 8560, and request an inspection.
- Contact your nearest Tektronix Field Engineering Office or sales representative.
- Do not throw away any cartons or other shipping materials.
- DO NOT ATTEMPT TO REPAIR THE INSTRUMENT.

CAUTION

The hard-disc drive in the 8560 can be severely damaged by excessive rough handling of the 8560. Exercise reasonable care when lifting or moving your 8560 MUSDU. DO NOT DROP the unit onto the bench top or other surface after it has been removed from its shipping carton.

REMOVING THE 8560 FROM THE CARTON

The 8560 MUSDU is packed in a heavy-duty cardboard container, surrounded by foam packing material. Inside the container, a piece of cardboard covers the top of the unit. The power cord and any options rest on this cardboard.

When you open the carton, remove the power cord and any other material that may be on the cardboard, and set these items aside. Remove the cardboardd and set it aside.

WARNING

Be careful when lifting the 8560 out of the carton. The 8560 weighs 34 kg (75 lb). Don't hurt yourself - get some help.

Remove the 8560 and surrounding foam. Set the packing material aside. Don't lose this packing material - you'll need it again if you ever need to ship the 8560.

STORAGE AND RESHIPMENT

When a precision electronic instrument, such as the 8560, is to be placed in storage or reshipped, it's best to repack it as it was originally shipped from the factory. For this reason, you should save the carton and packing material in which your 8560 was shipped. To repack the 8560, simply reverse the unpacking instructions. The following paragraphs describe further considerations that pertain to storage or reshipment of your 8560.

Head Locking Device

To minimize the possibility of damage to the read/write heads during storage and reshipment, a head-locking device is provided on the hard-disc drive assembly. This device must be set to the "LOCK" position before the 8560 is packed for storage or reshipment. Refer to the procedure, "Releasing the Read/Write Head Shipping Lock", later in this section, for information on how to access the locking device.

Storage

Observe the following considerations whenever you place the 8560 in storage:

- Provide adequate protection from dust.
- Do not exceed the humidity or temperature limitations of the instrument. (These limitations are listed in the Specifications, in Section 1 of this manual.)
- Store the carton upright. Do not compress the carton or stack heavy objects on top of it.

Reshipment

If the 8560 must be shipped to the factory or service center, the following steps should be taken:

- Note the serial number of the unit on the back panel and any other relevant numbers or symbols needed for identification. (This information is required for any related correspondence, which should be sent separately.)
- Wrap the unit in durable waterproof material such as heavy polyethylene, and tape securely. This step should be performed only in a dry atmosphere, and only when the unit is cool to the touch.
- Pack the unit in a sturdy box (heavy cardboard is acceptable for land shipment), lined with 76 mm (3 in) of medium density foam or expanded polystyrene.

- Cables, adapters, and other accessories should be wrapped separately and attached by tape to the inner liner at a break in the foam, or taped to a separate platform mounted above the foam or polystyrene (as used in the original shipping package). In the latter case, a sheet of 25 mm (1 in) minimum thick foam should be taped above the cable package.

- Seal the carton with reinforced packaging tape and identify the sender, the unit number, and the serial number on the outside of the carton.

- Notify the factory or your sales representative of your intent to ship the instrument, and await their acknowledgement before you actually ship your 8560.

PREPARING YOUR 8560 FOR OPERATION

After removing the 8560 MUSDU from its shipping carton, set it on a flat surface, preferably the site you have selected for the installation. Examine the outside of the 8560 for any damage that may have been incurred during shipment. If damage is found, follow the procedures given earlier in this section.

Inside the 8560, an aluminum circuit board restrainer covers the circuit boards that are installed in the card cage. This restrainer holds the circuit boards securely in place during shipment. The following steps tell how to remove the 8560 MUSDU top cover and the circuit board restrainer:

1. Turn the 8560 around so that the rear panel is facing you. Remove the two upper cover retainers, as shown in Fig. 2-4. Slide the top cover back and off the 8560 cabinet.

   Examine the inside of the 8560 for any loose circuit boards or other components, cables, or connectors. If any damage is apparent, follow procedures given earlier for reporting damage.

CAUTION

In the following step you will remove small machine screws from the inside of the 8560. Do not drop these screws into the 8560. Severe electrical damage can result if these items are left inside the unit.

2. Using a Phillips screwdriver, loosen the two screws on one end (either end) of the restrainer assembly.

3. Remove the two screws on the other end of the restrainer and carefully remove the retainer clip (see Fig. 2-5).

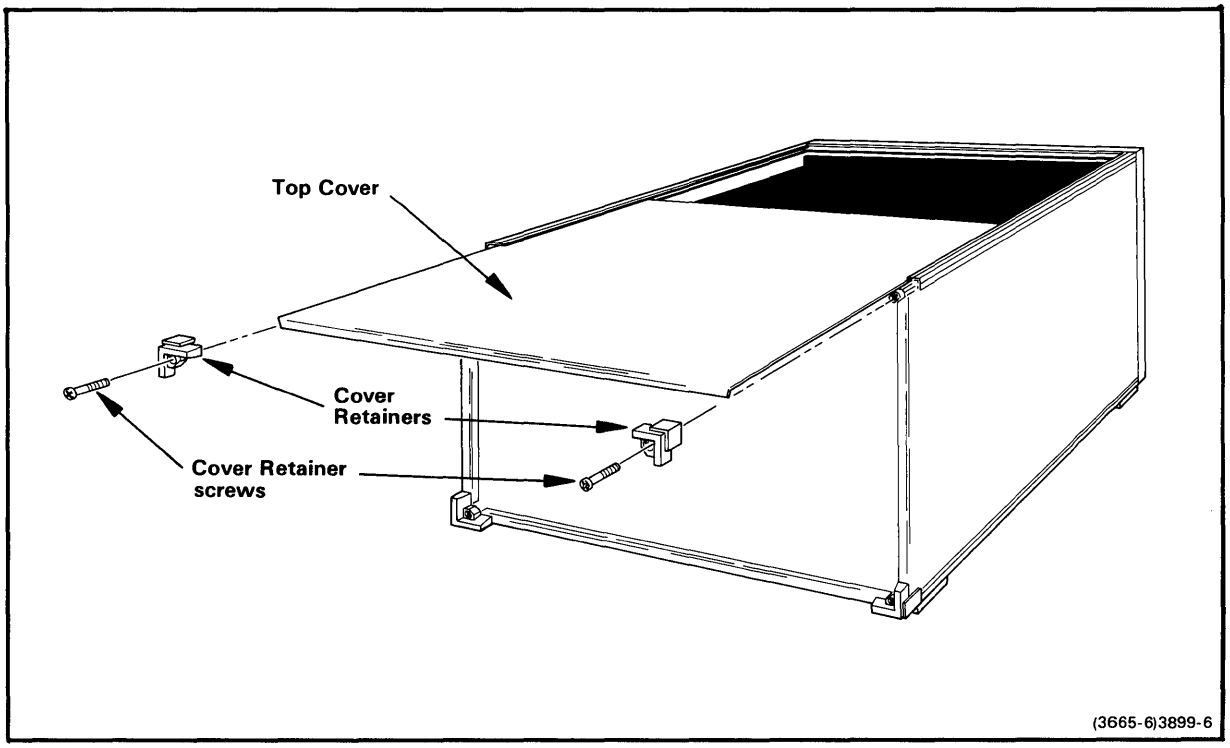


Fig. 2-4. Removing the 8560 MUSDU top cover.

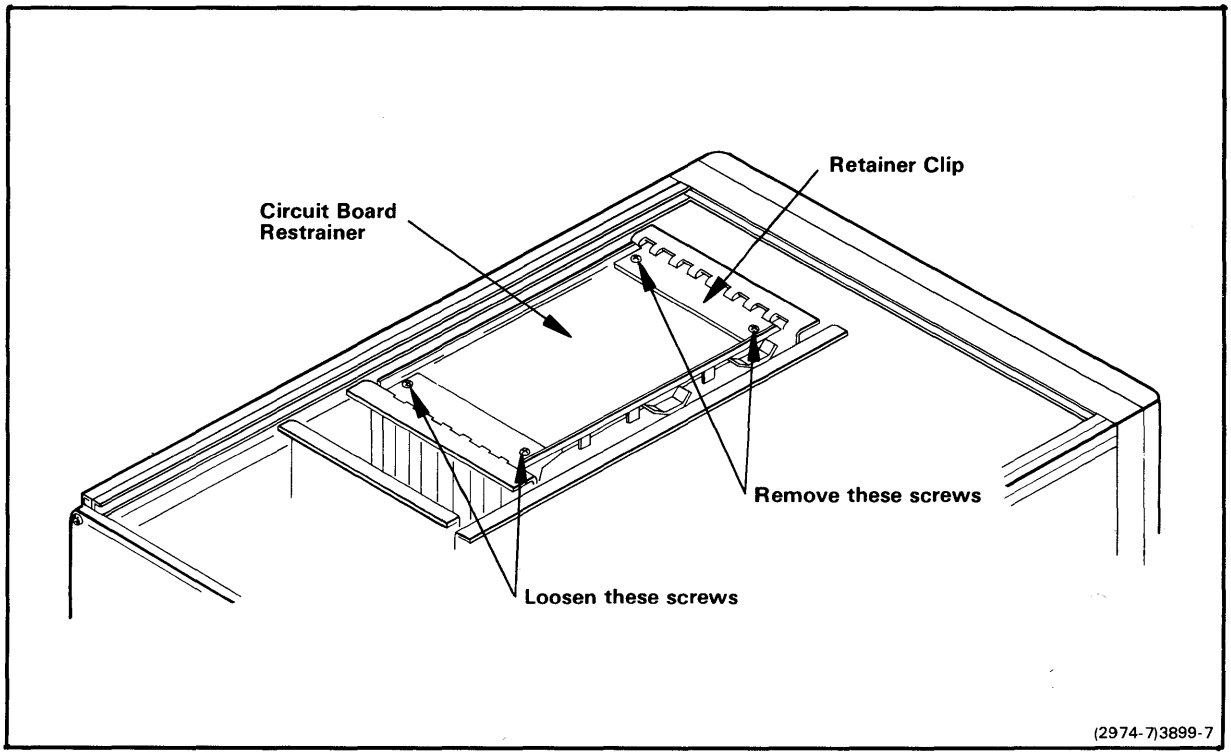


Fig. 2-5. Removing the 8560 circuit board restrainer.

4. Remove the restrainer from the 8560 card cage.

NOTE

It is not necessary to replace the circuit board restrainer in the 8560 unless the 8560 is to be stored or shipped.

5. Reassemble the circuit board restrainer and store it with the packing materials, for use in case the unit is stored or shipped.

6. Do not replace the top cover at this time.

Installing Options

Information concerning the installation of options is provided in the Installation Manual for the specific option.

Releasing the Read/Write Head Shipping Lock

The read/write heads in the hard-disc drive unit are locked in place for protection during shipment. The locking device must be released before power is applied to the 8560 MUSDU.

1. Remove the two lower cover retainers (refer back to Fig. 2-4). Then remove both side panels.

2. Remove all of the circuit boards from the card cage.

3. Using a Phillips screwdriver, remove the three mounting screws on the outside of the hard-disc drive, and the front inside screw. Refer to Fig. 2-6.

4. Using a stubby Phillips screwdriver, remove the two inside screws that are accessible through the card cage.

5. At the rear of the unit, disconnect the power cable and the M1223-1 interface cable.

6. Close the door on the flexible disc drive.

7. Lift the hard-disc drive slightly, then carefully slide it out, about 3 inches, through the front-panel opening in the cabinet.

8. The nylon locking device is located on the bottom of the disc-drive unit, near the front of the assembly. Using the special tool provided, or an equivalent wide-bladed tool, turn the screw 90 degrees clockwise, to the UNLOCK position.

9. Carefully slide the unit back into the cabinet through the front-panel opening until the front panel of the hard-disc drive unit is aligned with the front panel of the flexible disc unit.

10. Install the six mounting screws removed in steps 3 and 4.

11. Connect the power and interface cables to the unit.

12. Install all circuit boards that were removed earlier. Be sure that circuit boards are returned to their original slots in the card cage.

13. Install the side covers and the two lower cover retainers. Tighten the retainer screws securely. Do not install the top cover at this time.

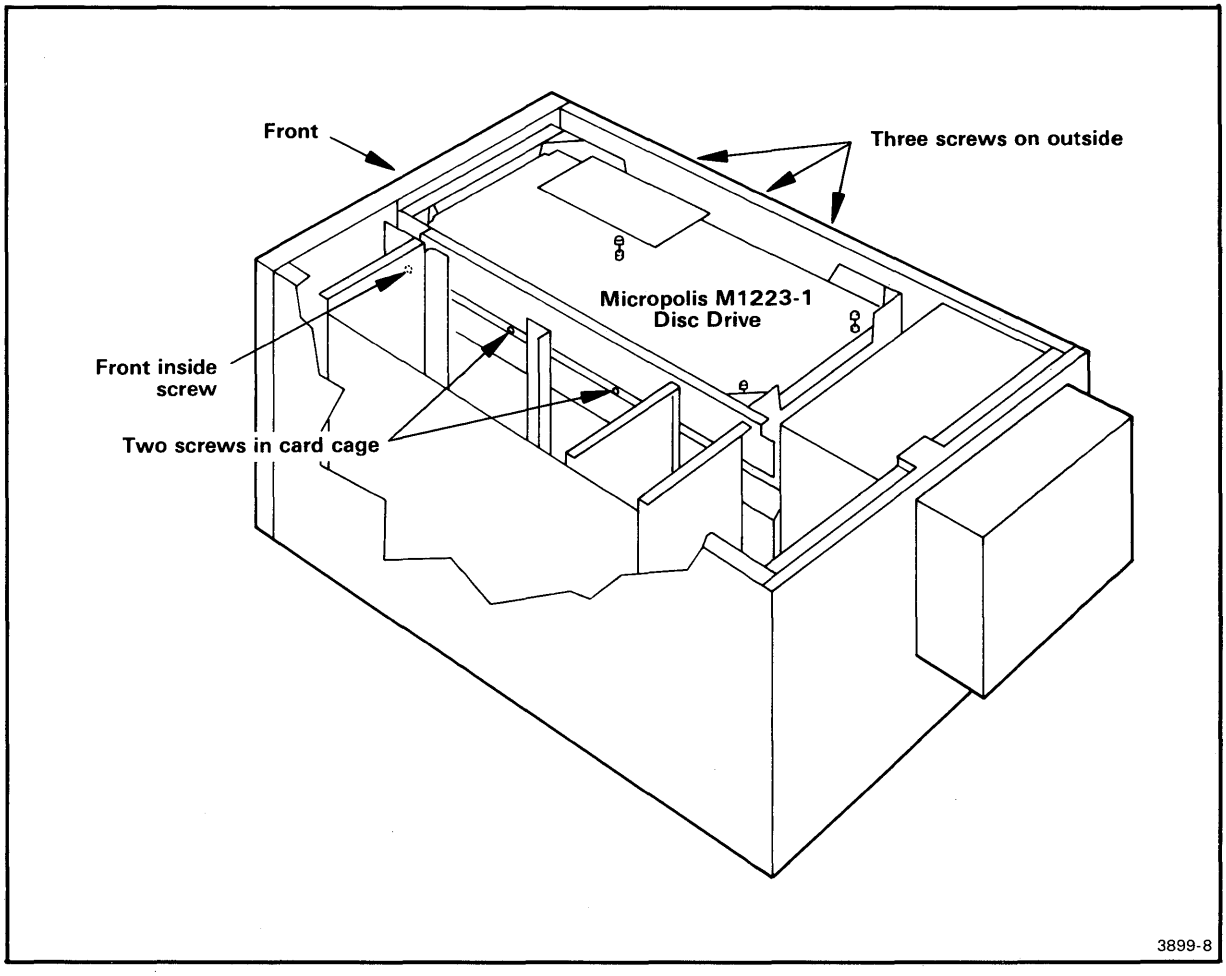


Fig. 2-6. Removing the hard-disc drive unit.

Removing the Hard-Disc Rotor Restraint

Movement of the disc rotor in the hard-disc drive unit during shipment is prevented by a rubber shipping restraint. This restraint and its associated caution tag must be removed before power is applied to the 8560 MUSDU.

1. Using a flat-blade screwdriver, loosen the three captive retaining screws on the hinged Driver Interface board (see Fig. 2-7).

2. Swing the hinged board up to allow access to the hard-disc drive rotor (see Fig. 2-3).

3. Carefully untwist the tie wire and remove the caution tag from the disc brake arm (see Fig. 2-8).

4. Remove the rubber shipping restraint. Store this restraint with the packing materials.

NOTE

The rubber shipping restraint must be installed on the disc rotor anytime the 8560 MUSDU is shipped or stored.

5. Lower the hinged board to its normal position, then tighten the three captive screws.

6. Install the top cover and the two upper cover retainers. Tighten the retainer screws securely.

Head Restraint

To prevent damage to the read/write heads in the flexible-disc drive assembly, a cardboard head restraint is installed in the disc slot during shipment or storage of the 8560 MUSDU. Before you operate the 8560, remove this restraint; pull outward on the cardboard tab that protrudes through the front panel of the flexible-disc drive unit. Store the cardboard head restraint with the other packing materials, for use in case the unit is stored or shipped.

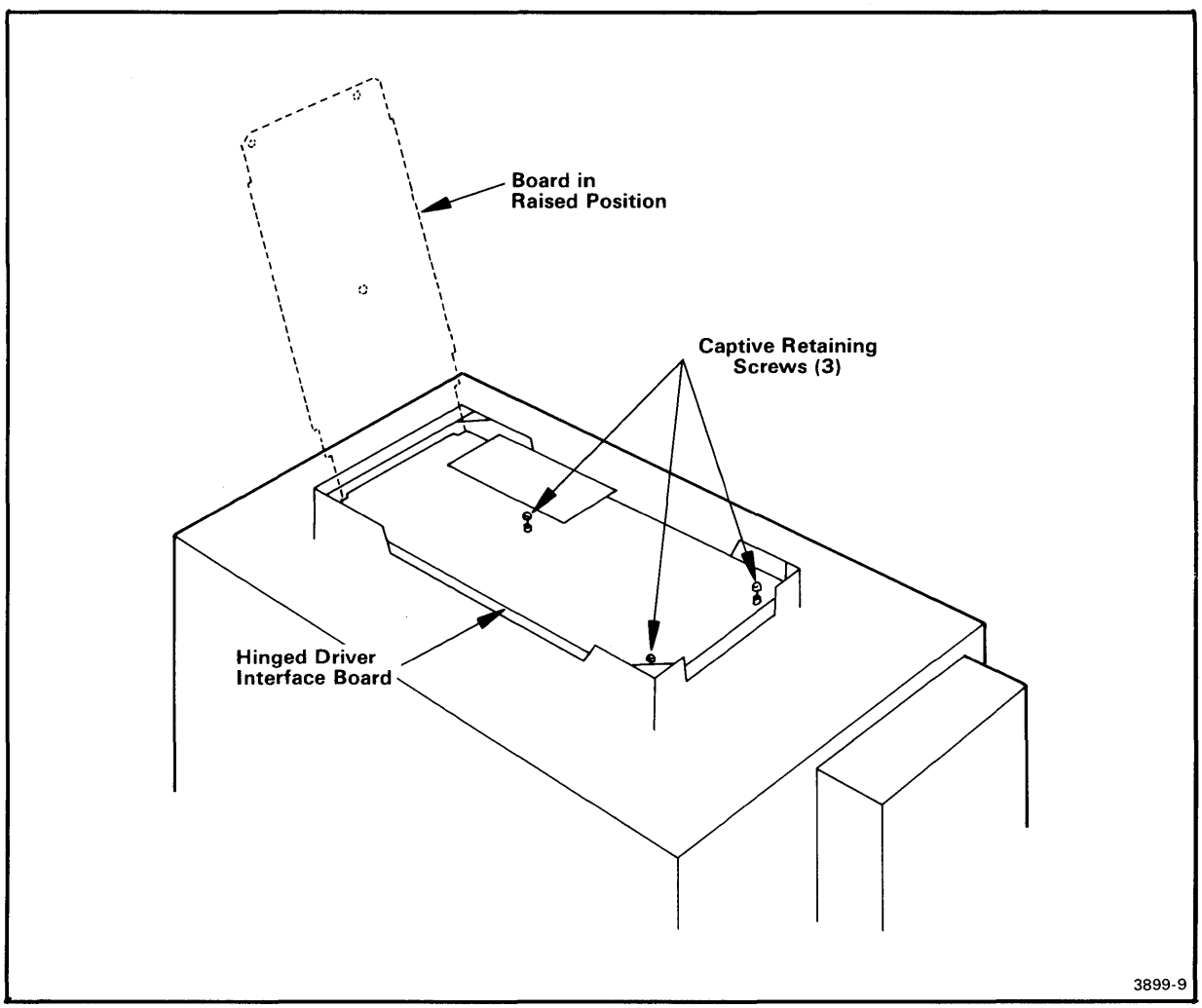


Fig. 2-7. Location of Driver Interface board retaining screws.

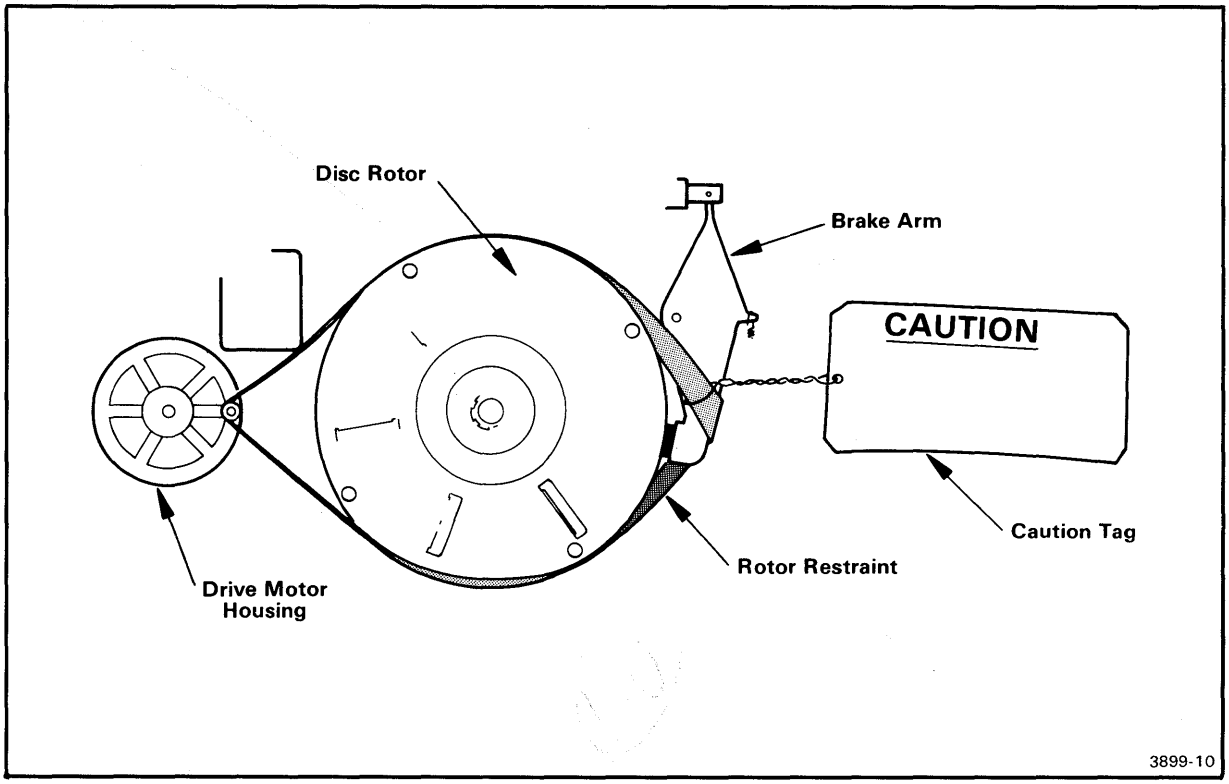


Fig. 2-8. Hard-disc drive rotor shipping restraint.

RACK-MOUNT PROCEDURE

If the 8560 includes the rack-mount option, you'll find rack-mount hardware in the bottom of the 8560 shipping carton. The rack-mount slides are already mounted to the sides of the 8560. The slide guides must be installed in the equipment rack.

Figure 2-9 illustrates the guide orientation. Install the guides in the rack with the hardware provided. Tighten all screws securely. When the guides are mounted, slide the 8560 into the rack, keeping cable dress in mind.

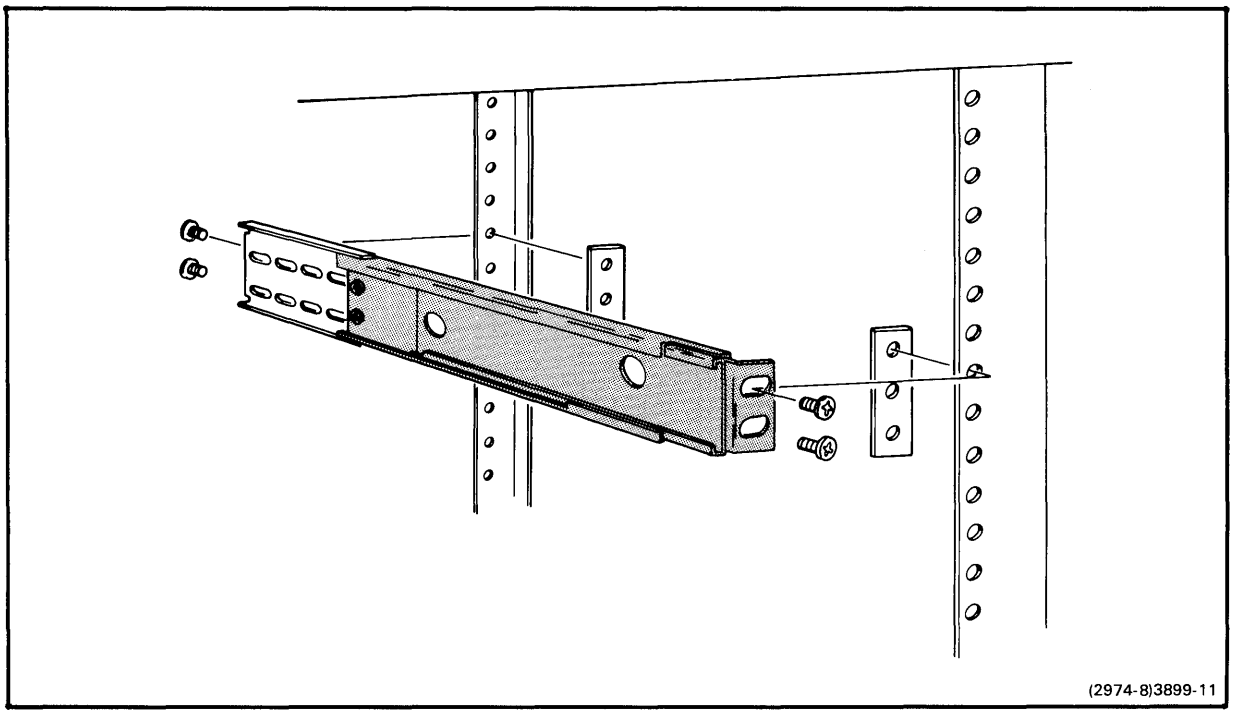


Fig. 2-9. Rack-mount guide orientation.

SELECTING THE PROPER PRIMARY VOLTAGE

Each 8560 has been configured to connect to the primary power source available at its installation site. If, for any reason, it becomes necessary to change to a different power source, use the following procedure to adapt the 8560 to the new input power.

1. Refer to Fig. 2-10. Notice the small plate at the lower left part of the rear panel (as you face the rear of the unit). Remove the screw holding this plate.

2. The power range selector switch is located under the plate. This switch selects operation at either 115 or 230 volts (nominal), as marked. Set the switch to the correct primary power range.

CAUTION

The fuse rating depends on the primary power source being used. For 115-Volt operation, use a 3AG, 8 A, 250 V, fast-blow fuse. For 230-Volt operation, use a 3AG, 4 A, 250 V, fast-blow fuse. The proper fuse must be used.

3. Install a fuse with the proper rating into the line fuse holder.

4. Replace the switch cover plate so that the new voltage range is indicated.

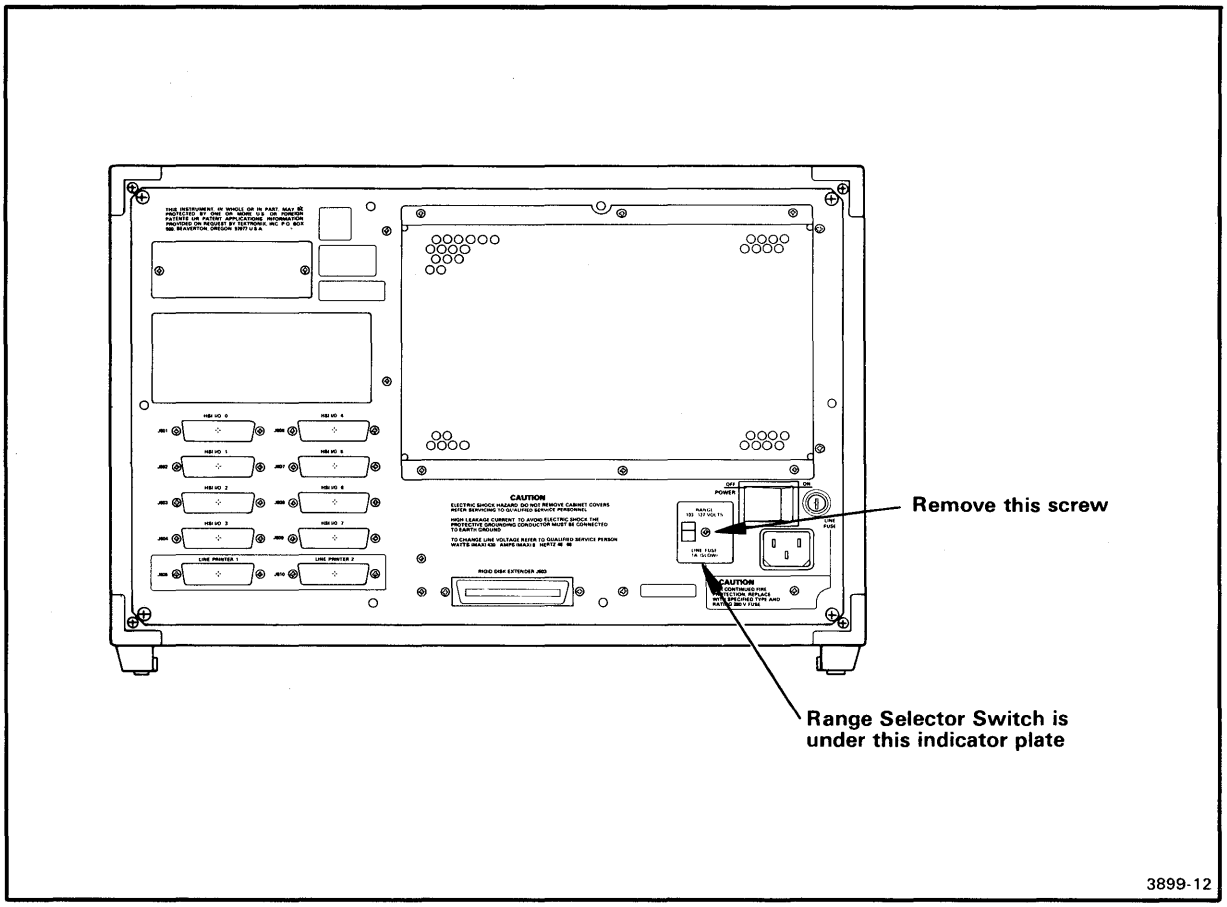


Fig. 2-10. Selecting the primary power voltage range.

Section 3

8560 MUSDU VERIFICATION

INTRODUCTION

At this point, you have unpacked the 8560 MUSDU and verified that it is properly configured for the available primary power source. This section tells you how to verify the operation of the 8560. To perform this verification, you will need a system terminal. Instructions for attaching a TEKTRONIX 8540 Integration Unit and a line printer are also included in this section.

This section is divided into three parts:

- The first part helps you locate and identify the various controls, connectors, and indicators on the front and rear panels.
- The second part tells you how to set up the 8560 MUSDU for operation and how to attach a system terminal, an 8540 Integration Unit, and a line printer to the 8560.
- The third part describes how to run the diagnostic tests. Diagnostics used for this verification are intended only to establish that the 8560 will power up and run selected basic diagnostic tests satisfactorily. To verify that the 8560 will perform all its operating functions, refer to the complete diagnostic test program, described in the optional 8560 Multi-User Software Development Unit Service Manual.

CONTROLS, CONNECTORS, AND INDICATORS

The following paragraphs describe briefly the controls, connectors, and indicators on the front and rear panels of the 8560 Multi-User Software Development Unit.

FRONT PANEL CONTROLS AND INDICATORS

There are three switches on the 8560 front panel: the DC ON/OFF switch, the system RESTART switch, and the RUN/HALT switch. There are also three indicators on the front panel: DC ON, AC ON, and PROCESSOR BUSY. Front panel controls and indicators are identified in Fig. 3-1.

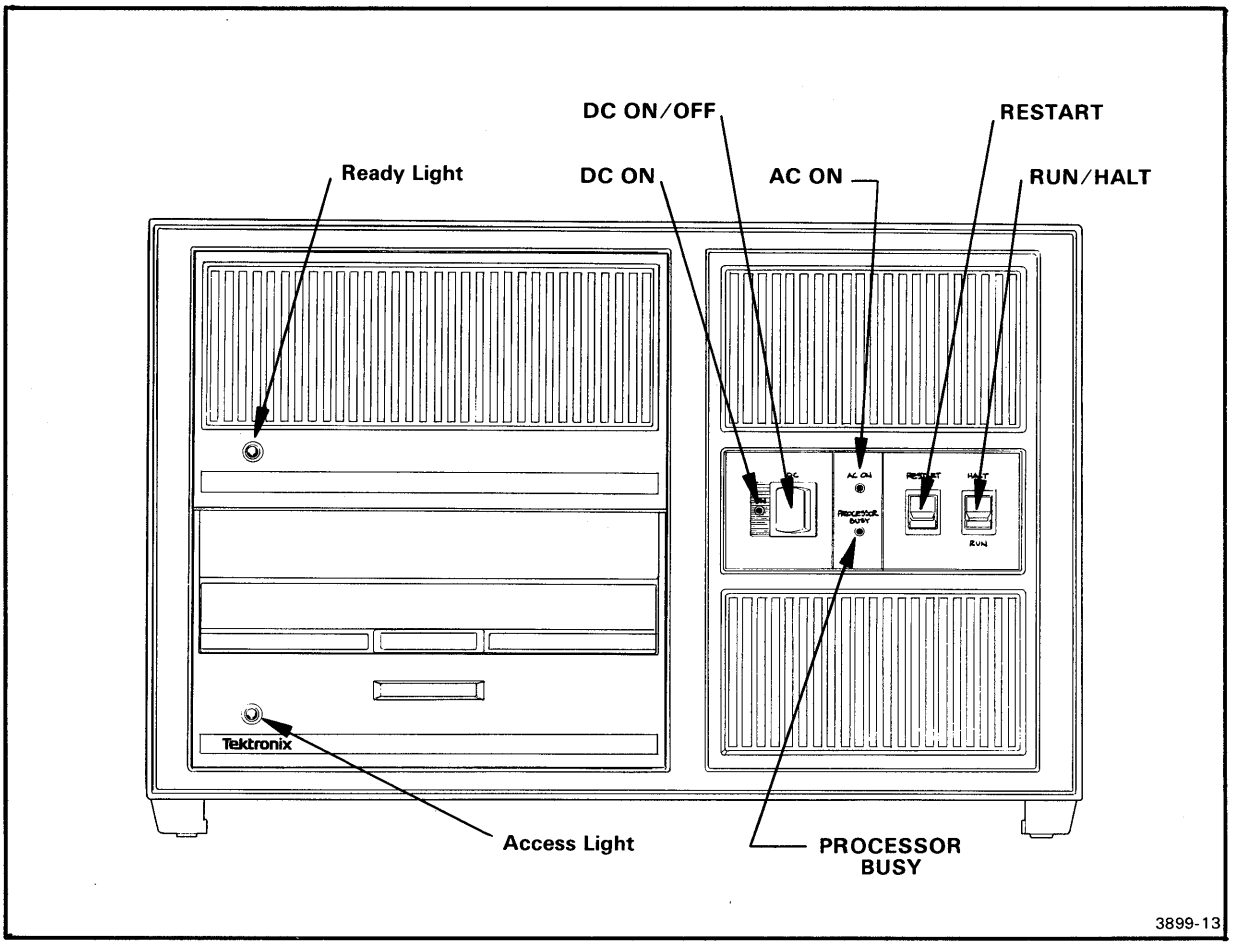


Fig. 3-1. 8560 MUSDU Front Panel Controls and Indicators.

DC ON/OFF Switch

This two-position rocker switch controls dc power to the 8560's logic circuits.

DC ON Indicator

The DC ON indicator illuminates when +5 Vdc power is present in the 8560.

RESTART Switch

This switch is a two-position, spring-return toggle switch. When the RESTART switch is toggled upward, the 8560 MUSDU will either halt or re-boot, depending on internal board configuration and the position of the RUN/HALT switch.

RUN/HALT Switch

The RUN/HALT switch selects the 8560 operating mode: RUN for normal program execution, HALT for special operations controlled by peripheral devices. For additional information about the RUN/HALT switch, refer to your 8560 MUSDU System Users Manual.

AC ON Indicator

This indicator illuminates whenever the rear panel POWER switch is in the ON position and primary ac power is applied to the 8560.

PROCESSOR BUSY

The PROCESSOR BUSY indicator is normally illuminated during program execution, but is off when the processor is halted, or waiting for an interrupt after executing a Wait for Interrupt (WAI) command.

REAR PANEL CONTROLS AND CONNECTORS

The rear panel contains primary power components and all I/O interface connectors. Rear panel controls and connectors are identified in Fig. 3-2.

Power Cord Receptacle

The line cord connects to this receptacle to supply primary ac power to the 8560.

CAUTION

Connect the line cord only to the line voltage indicated on the voltage selector switch cover plate.

Line Fuse

Use only a fuse rated as indicated on the voltage selector switch cover plate:

- For 115 Vac operation, use a 3AG, 8 Amp, 250 Volt, fast-blow fuse.
- For 230 Vac operation, use a 3AG, 4 Amp, 250 Volt, fast-blow fuse.

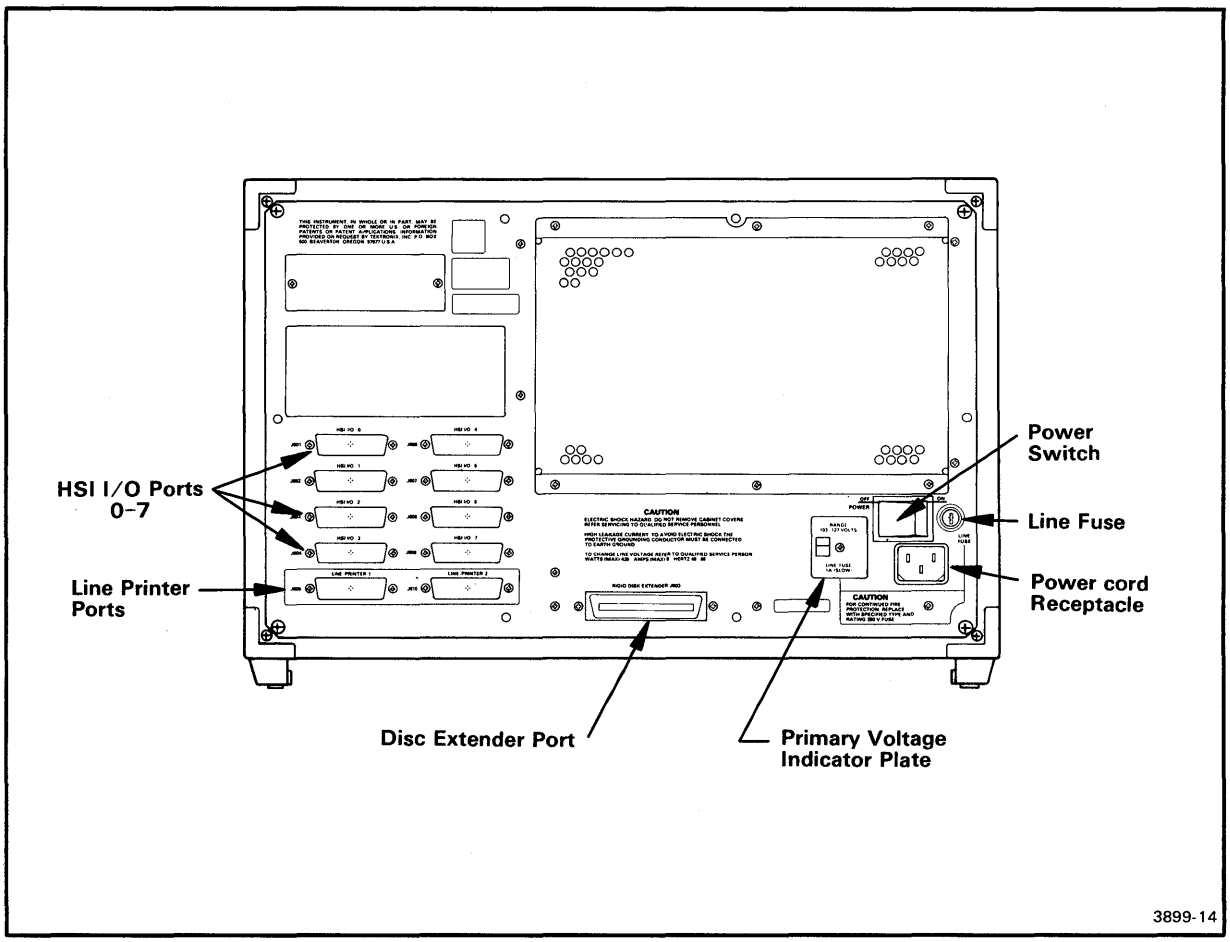


Fig. 3-2. 8560 Rear Panel Controls and Connectors.

Primary Voltage Selector Switch

The voltage range of the primary power source for the 8560 is selected with this switch. A cover plate over the switch indicates which of the two possible voltage ranges is selected: 90--132 Vac or 180--250 Vac.

CAUTION

If you change the primary voltage range, be sure to change the line fuse to the value indicated on the reinstalled cover plate.

POWER Switch

This two-position rocker switch controls input ac power to the 8560 MUSDU. When primary power is applied and the POWER switch is ON, the AC ON indicator on the front panel will be illuminated.

HSI I/O Ports 0--7

These ports are normally configured for RS-422 High-Speed Interface with 8540 Integration Units. Any of ports 0--7 may be reconfigured to RS-232-C protocol with internal jumpers.

NOTE

Standard equipment configuration includes only ports 0--3. Ports 4--7 are optional.

Line Printer Ports 1 and 2

These are dedicated RS-232-C I/O ports for attaching line printers to the 8560 MUSDU.

8560 SET-UP

Verify that the power input range switch is set to the proper primary voltage, then plug the power cable into the correct primary power source.

ATTACHING A SYSTEM TERMINAL

Any of the HSI I/O connectors may be used as a direct interface to a system terminal. However, the HSI I/O port to be used must be configured for RS-232-C protocol. To set the internal jumpers for RS-232-C operation:

1. Turn the 8560 around so that the reear panel is facing you. Remove the two upper cover retainers, then slide the top cover back and off the 8560 cabinet.

2. On the I/O Adapter board, locate the jumper for the HSI I/O port to be used for your system terminal. Refer to Fig. 3-3.

3. Move the jumper to its lower position.

4. Install the top cover and top cover retainers.

Now connect the RS-232-C cable from the system terminal to the selected interface connector on the 8560 rear panel. Refer to Fig. 3-2 for connector locations.

HSI I/O Port Specifications

Each HSI I/O port is a 25-pin female connector. The normal configuration for these ports supports a modified RS-422 High-Speed Interface (HSI).

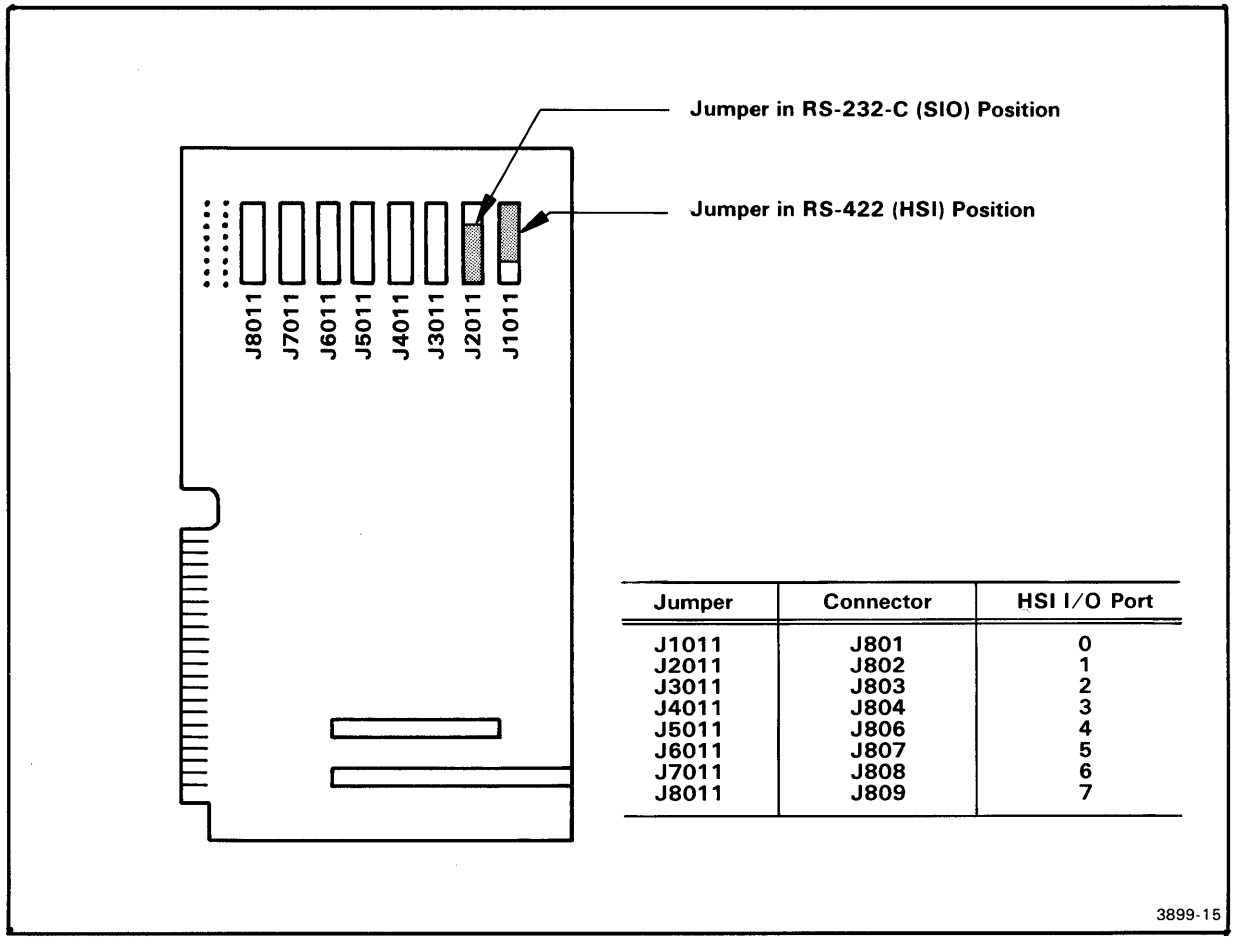
NOTE

The connectors for HSI I/O ports 0--7, while designed to support either RS-232-C or RS-422 signals, do not conform to the EIA RS-422 pinout specification.

As discussed earlier, any HSI I/O port may be reconfigured for RS-232-C protocol. Table 3-1 describes the interface connector pin assignments. In the RS-232-C configuration, only the positive side of the balanced signals is used. Jumpers for selecting the interface are located on the I/O Adapter board. Refer to the table in Fig. 3-3 for identification of these jumpers.

Table 3-1
User-Selectable Interface Connector
Pin Assignments

Pin No.	Description	Symbol	Comments
1	Shield		
7	Signal Ground		
2	Transmit Data	Tx	Data received by
11	Transmit Data	Tx'	8560 MUSDU
3	Receive Data	Rx	Data transmitted by
12	Receive Data	Rx'	8560 MUSDU
20	Data Track Ready	DTR	
13	Data Track Ready	DTR'	
5	Clear to Send	CTS	
25	Clear to Send	CTS'	
6	Data Set Ready	DSR	Always transmitted On
18	Data Set Ready	DSR'	Always transmitted On
8	Carrier Detect	DCD	Always transmitted On
9	Carrier Detect	DCD'	Always transmitted On



Jumper	Connector	HSI I/O Port
J1011	J801	0
J2011	J802	1
J3011	J803	2
J4011	J804	3
J5011	J806	4
J6011	J807	5
J7011	J808	6
J8011	J809	7

Fig. 3-3. Location of jumpers on the I/O Adapter board.

ATTACHING AN 8540 INTEGRATION UNIT

To attach an 8540 Integration Unit to the 8560 MUSDU, connect an RS-422 cable between the HSI port (J100) on the 8540 rear panel, and one of the HSI I/O ports on the 8560 rear panel.

NOTE

For use with an 8540 Integration Unit, the 8560 HSI I/O port must be configured for RS-422 protocol.

ATTACHING A LINE PRINTER

A line printer with standard RS-232-C interface protocol may be connected to either of the two Line Printer connectors on the rear panel of the 8560 MUSDU.

RS-232-C Port Specification

Each RS-232-C Line Printer port is a 25-pin female connector. These two dedicated ports are normally configured for RS-232-C protocol for line printer interface.

NOTE

The line printer ports are preset at the factory for a baud rate of 2400. If a different baud rate is required, the Utility board must be reconfigured. Refer to Section 4 of this manual for information about setting line printer port baud rates.

Table 3-2 lists pin assignments for the RS-232-C line printer connectors. Pin assignment for these connectors is derived from the EIS RS-232-C pinout specification.

Table 3-2
RS-232-C Interface Connector
Pin Assignments

Pin No.	Description	Symbol	Comments
1	Protective Ground		
2	Transmit Data	Tx	Data received by 8560
3	Receive Data	Rx	Data sent by 8560
4	Request to Send	RTS	
5	Clear to Send	CTS	
6	Data Set Ready	DSR	Always transmitted ON
7	Signal Ground		
8	Data Carrier Detect	DCD	Always transmitted ON
15, 17	External Clock		
20	Data Terminal Ready	DTR	

VERIFICATION

The 8560 MUSDU is now ready for operation. The remainder of this section describes the power-up procedure for the 8560, and how to verify system operation using the disc-based diagnostics.

Two levels of diagnostics are used to verify operation of the 8560: ROM-based and disc-based. The ROM-based diagnostics are run automatically each time the unit is powered up or reset. The disc-based diagnostics are contained on a separate flexible disc, and can be run only when they have been loaded into the 8560. Components of the 8560 that are tested by diagnostics are listed below, in the order tested:

RAM
ROM
LSI-11/23 CPU
Line Time Clock
Line Printer Ports
I/O Processor
PMS Controller

Before beginning the 8560 power-up procedure, turn on the system terminal and allow it to warm up.

POWER-UP PROCEDURE

The primary power switch is located on the rear panel of the 8560 MUSDU. The DC ON/OFF switch is located on the front panel. Refer to Figures 3-1 and 3-2.

When the terminal is warmed up, perform the following procedure:

1. Turn on the POWER switch. The AC ON indicator on the front panel will illuminate.

2. Move the DC ON/OFF switch to the ON position. The DC ON iand PROCESSOR BUSY indicators will be illuminated.

After dc power has been applied for approximately 30 seconds, the LED on the hard-disc drive will illuminate, indicating that the hard-disc drive is at operating speed.

If the PROCESSOR BUSY light goes out completely, or if an error message is displayed on an installed terminal or line printer, the 8560's internal ROM-based power-up diagnostics have detected a fault in the unit. Refer to the optional 8560 Multi-User Software Development Unit Service Manual for troubleshooting procedures. For more information about troubleshooting your 8560 MUSDU, contact your local Tektronix Service Center.

SYSTEM VERIFICATION PROCEDURE

When you have successfully completed the power-up procedure, you're ready to run the 8560 disc-based diagnostics. The following information provides only a procedure to verify system operation; it is not intended as a detailed description of the 8560 diagnostics.

Perform the following procedure to verify system operation:

1. Insert the 8560 System Diagnostics disc (label side up) into the 8560's flexible disc drive.

2. Close the door on the disc drive.

3. Toggle the RESET switch.

4. Within 20 seconds, the 8560 will begin a preliminary read of the disc.

5. The system terminal will display the following information:

   8560 DIAGNOSTIC DISC V x.x

   NOTE

   This message is transmitted at the 2400 baud. If your terminal is not operating at 2400 baud, the message will not be readable.

6. If the terminal is not set for 2400 baud, press the BREAK key one or more times until the following message is displayed:

   NEW BAUD RATE SELECTED

7. The 8560 will begin reading the disc again. Within 12 seconds, if more than one system terminal is on-line, the terminal may display the following information:

   PRESS RETURN TO SELECT TERMINAL

9. If this message appears, press the RETURN key. The 8560 diagnostics will now display the Option Menu (see Display 3-1).

```
******8560 Diagnostics - Version 1.0 - loaded******

Option menu
-----------

0 - Run all tests [default]
1 - Test 8560 RAM
2 - Test 8560 ROM
3 - Test 8560 processor
4 - Test 8560 line-time clock
5 - Test 8560 printer ports
6 - Test 8560 IOP channels
7 - Test disc drives
H - Help

Type in option (0 - 7 or H)
?
```

Display 3-1

10. As soon as the system terminal displays the Option Menu, press the RETURN key. The terminal will now display the Loop Control Menu (see Display 3-2).

```
Loop control menu
-----------------

1 - Do not loop on test [default]
2 - Loop on test
3 - Loop until error
H - Help

Type in loop control (1 - 3 or H)
?
```

Display 3-2

11. As soon as the Loop Control Menu is displayed, press the RETURN key. The terminal will display the Display Mode Menu (see Display 3-3).

```
Display mode menu
-----------------

1 - Display run-time status [default]
2 - No run-time display
H - Help

Type in mode (1 - 2 or H)
?
```

Display 3-3

12. As soon as the Display Mode Menu is displayed, press the RETURN key. The terminal will display the run-time status, then will display the Display Output Menu (see Display 3-4).

```
Display output menu
-------------------

1 - Display on terminal [default]
2 - Display on printer 1
3 - Display on printer 2
H - Help

Type in display output (1 - 3 or H)
?
```

Display 3-4

13. Press the RETURN key again and the diagnostics will begin to execute.

The 8560 disc-based diagnostics require about two minutes to execute. At the end of that time, the system terminal will display either:

8560 verification passed

or

8560 verification failed

If the "8560 verification failed" message is displayed, the diagnostics detected a fault in the 8560 MUSDU. In that case, refer to the optional 8560 Multi-User Software Development Unit Service Manual, or to your Tektronix Service Center, for detailed diagnostic troubleshooting procedures.

This completes the 8560 MUSDU verification procedure.

Section 4

8560 MUSDU BOARD CONFIGURATION

INTRODUCTION

This section provides information about the various jumpers and straps located on circuit boards in the 8560 MUSDU. Only those jumpers and straps that specifically relate to installation or verification of the 8560 are discussed in detail. Other jumpers and straps are used primarily for testing, and are described in detail in the optional 8560 Multi-User Software Development Unit Service Manual.

JUMPERS AND STRAPS

The standard circuit boards for the 8560 MUSDU are configured for specified operating characteristics with certain jumpers and straps. The following paragraphs describe these jumpers and straps, and tell how to configure them to select the desired circuit functions.

NOTE

All jumpers and straps on 8560 circuit boards are set at the factory for proper operating configuration. However, before applying power to the 8560, you should check the circuit boards to verify that jumpers are correctly installed.

JUMPERS

A "jumper" consists of a set of jumper pins on a circuit board, and a jumper block. A jumper block normally bridges two adjacent square pins on the circuit board. In certain applications, a larger jumper block may be used to configure several sets of jumper pins simultaneously.

- A single-position jumper station consists of only two pins. The jumper block is either installed or removed.
- A multi-position jumper station is made up of three or more pins, arranged so that the jumper block may be installed in any of two or more positions, or may be removed.

Jumpers are identified with "Jxxxx" reference numbers.

STRAPS

A "strap" is a wire (or specially designed circuit board run) that connects one through-hole or circuit point on a circuit board with another through-hole or circuit point. Certain circuit board runs are designed to be cut, in conjunction with strapping options, to achieve a desired configuration. These are referred to as "cuttable runs".

Straps are identified with "Wxxxx" reference numbers.

LSI-11/23 PROCESSOR

There are no user-definable jumpers, straps, or switches on the LSI-11/23 Processor board. To verify correct jumper configuration on this board, refer to Fig. 4-1.

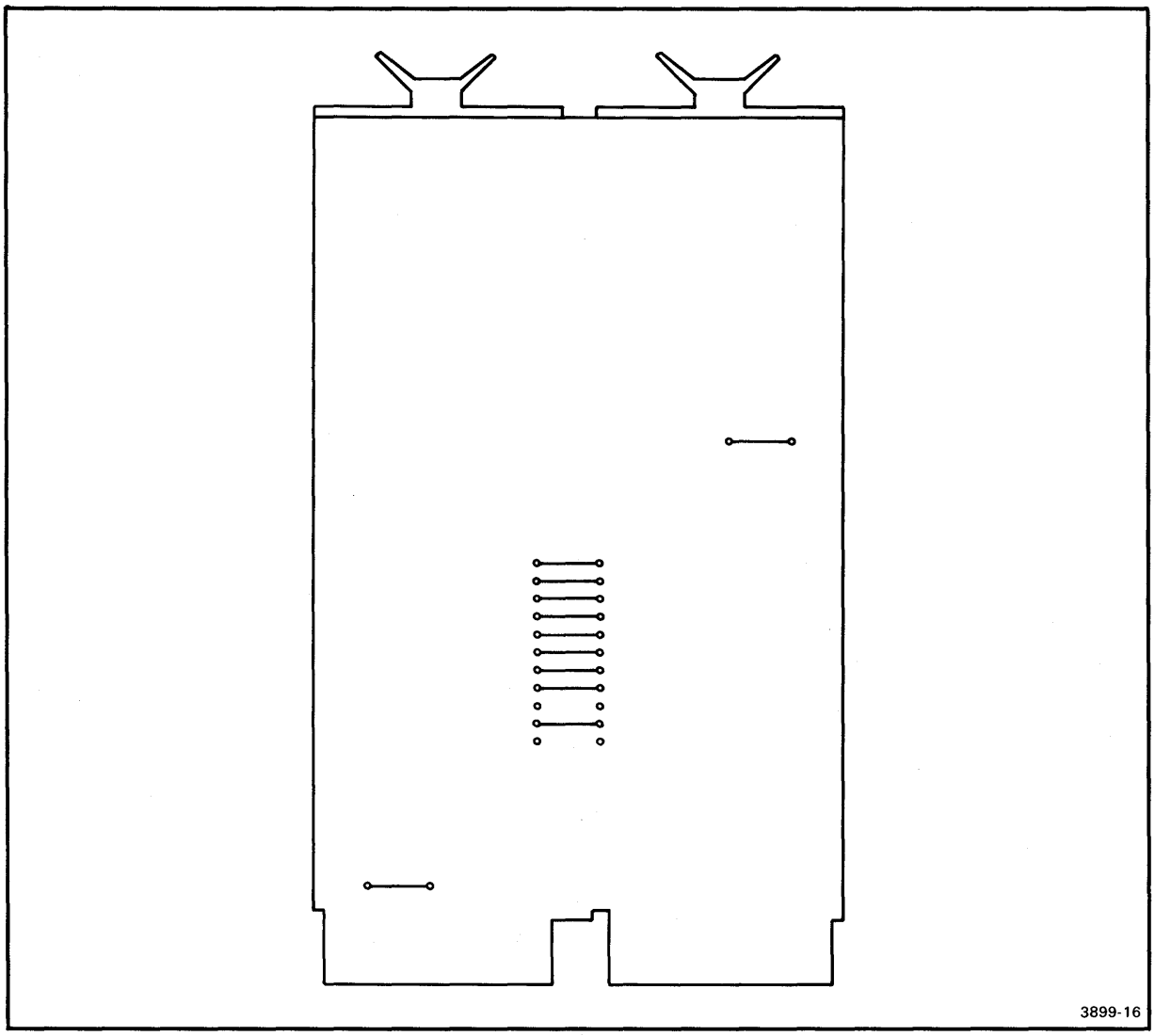


Fig. 4-1. Jumper configuration for the LSI-11/23 Processor board.

64K MEMORY BOARDS

The system memory in the 8560 MUSDU consists of either one or two 64K-word dynamic RAM boards. If two RAM boards are used, one board supports the lower 64K words of memory and the second (optional) board supports the upper 64K words. Jumpers on the memory boards must be installed according to the memory configuration in your system. Refer to Fig. 4-2 for locations of jumpers and straps on the 64K RAM boards.

MEMORY RANGE SELECTION

If only one memory board is installed, jumper J6112 must be in the CA--CC position. This configuration assigns the lower 64K of memory addresses to the board.

If two memory boards are used, jumper J6112 must be in the CA--CC on one board (lower 64K), and in the CA--CB position on the other board (upper 64K).

I/O MEMORY

Jumper J5161 must be installed across pins CF--CG on the 64K RAM boards. With the jumper installed at this location, 2K of the upper portion of memory is assigned to I/O operations.

NOTE

Jumper J5161 must be properly installed for the 8560's TNIX operating system to operate properly.

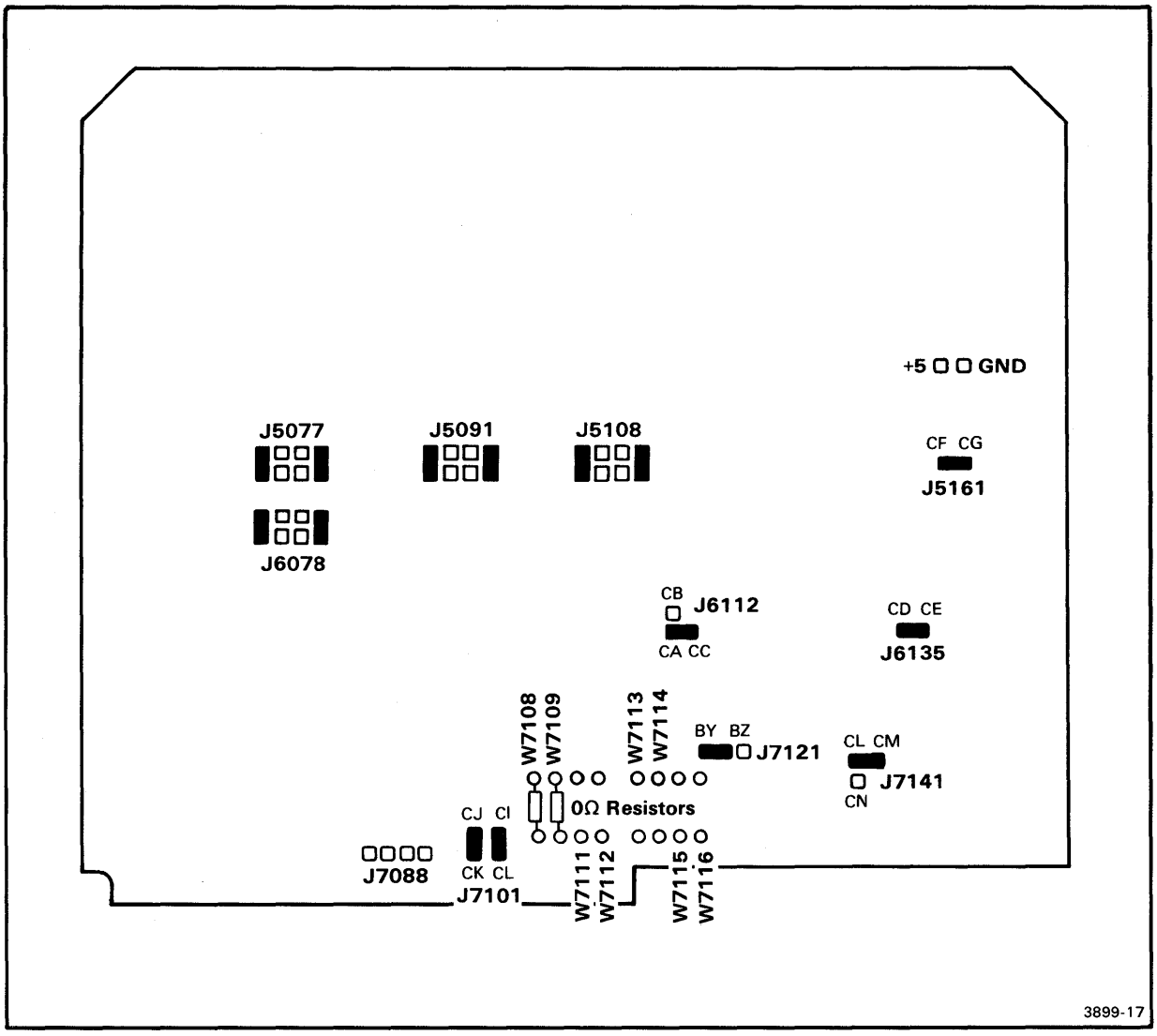


Fig. 4-2. 64K Memory board jumper and strap locations.

RAM TEST JUMPERS

With the exception of J6112, all jumpers on the 64K RAM board are preset at the factory for normal operation. These jumpers are for test purposes only, and should not be changed.

There are no user-definable straps on the 64K RAM boards.

PMS CONTROLLER BOARD

The Head Unload Delay jumper (J1040) on the PMS Controller board must be installed for proper operation of the flexible disc drive. The jumper is preset at the factory in its normal (vertical) position, which enables a delay of approximately three seconds in the head unloading sequence. With the jumper in the horizontal position, this delay is omitted.

NOTE

If the delay is omitted, some chattering of the head will be observed during the head unload sequence.

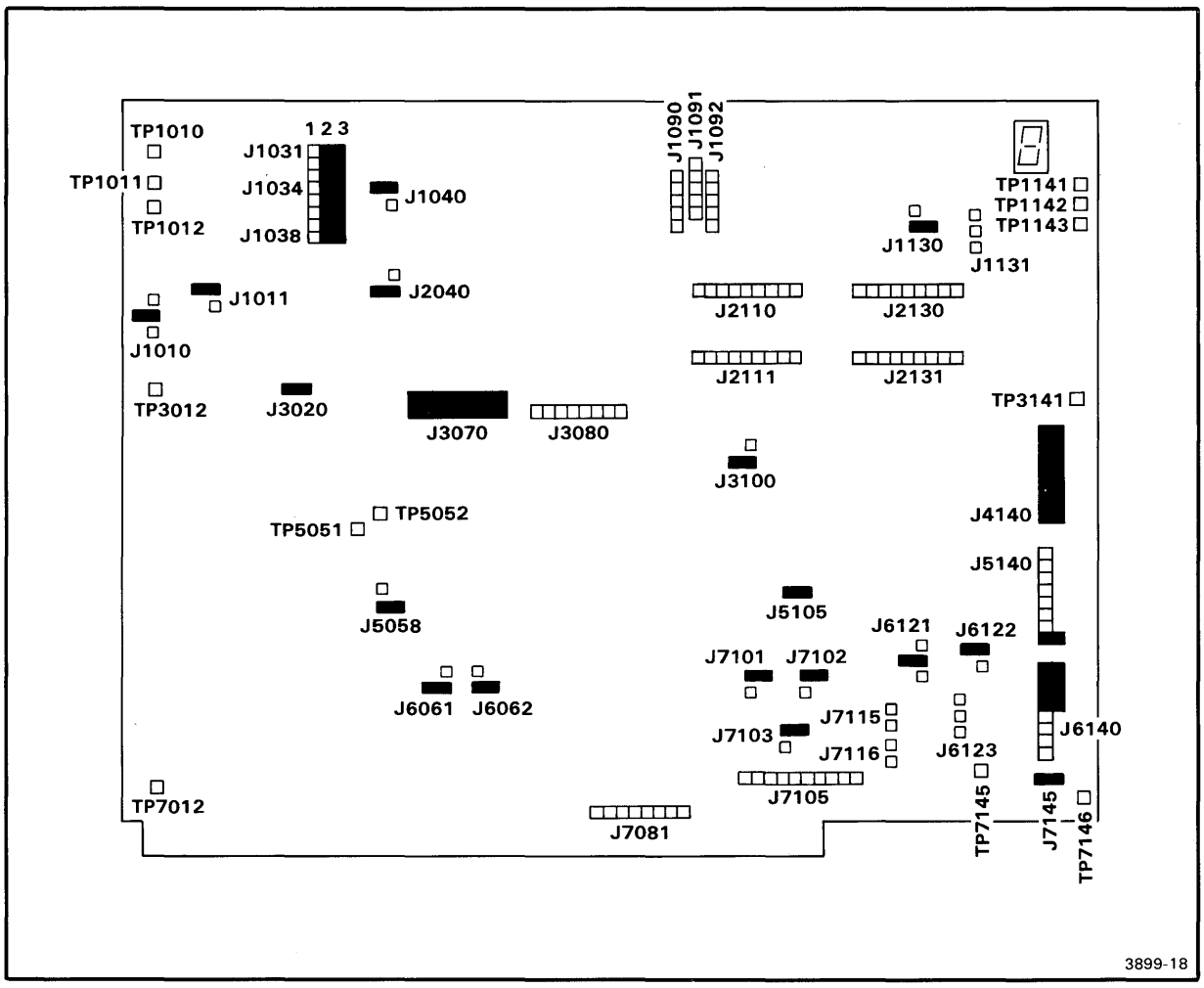


Fig. 4-3. PMS Controller board jumper locations.

All other jumpers on the PMS Controller board are preset at the factory for normal system operation. These jumpers are for test purposes only, and should not be changed from their preset positions. Normal jumper configuration for the PMS Controller board is shown in Fig. 4-3.

M1220 INTERFACE CARD

All jumpers on the auxiliary M1220 Interface Card (IFC) are preset at the factory for normal operation, and should not be changed. Figure 4-4 shows normal jumper configuration for the M1220 IFC.

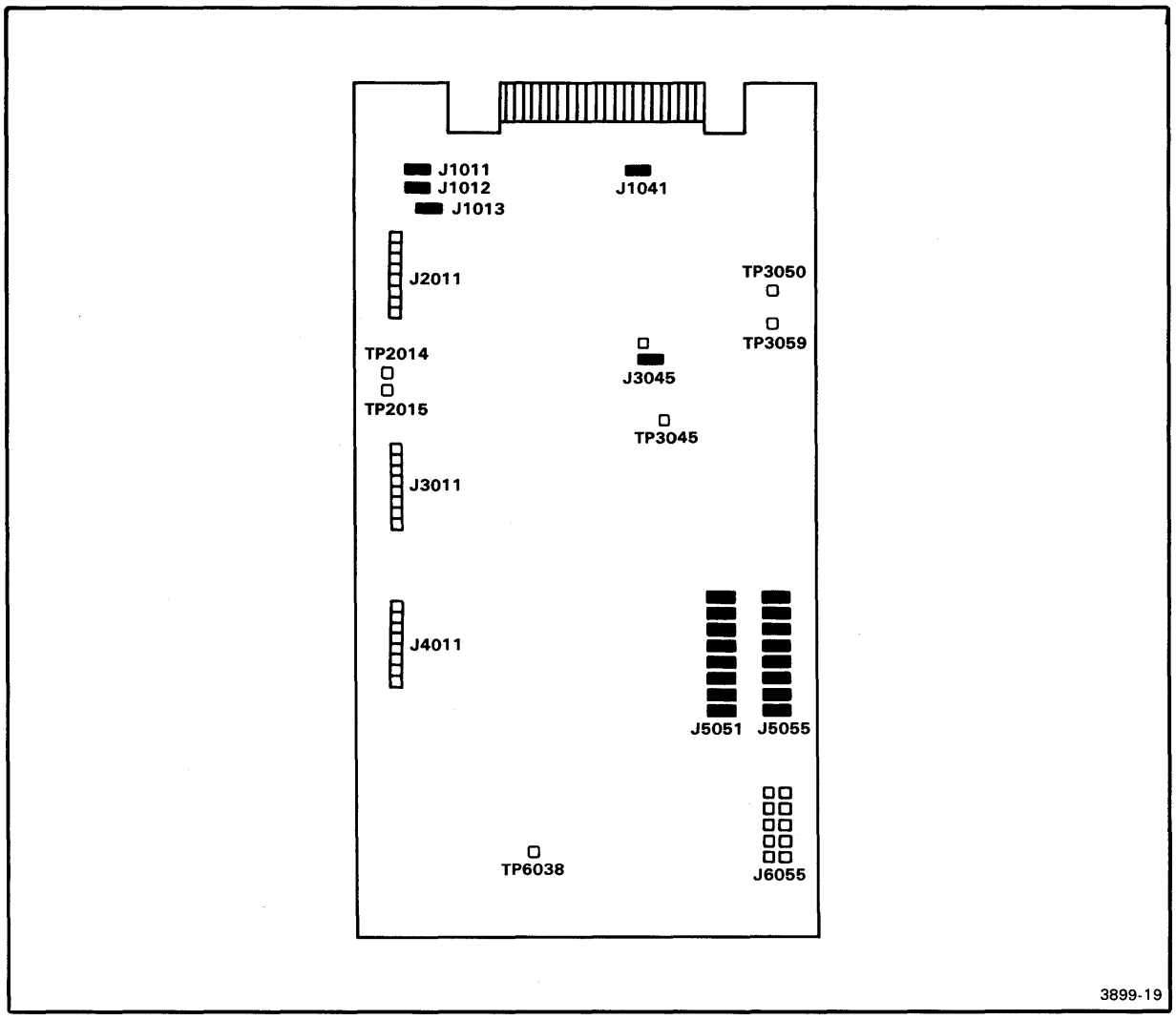


Fig. 4-4. M1220 Interface Card jumper locations.

UTILITY BOARD

Figure 4-5 shows the locations of jumpers and straps on the Utility board.

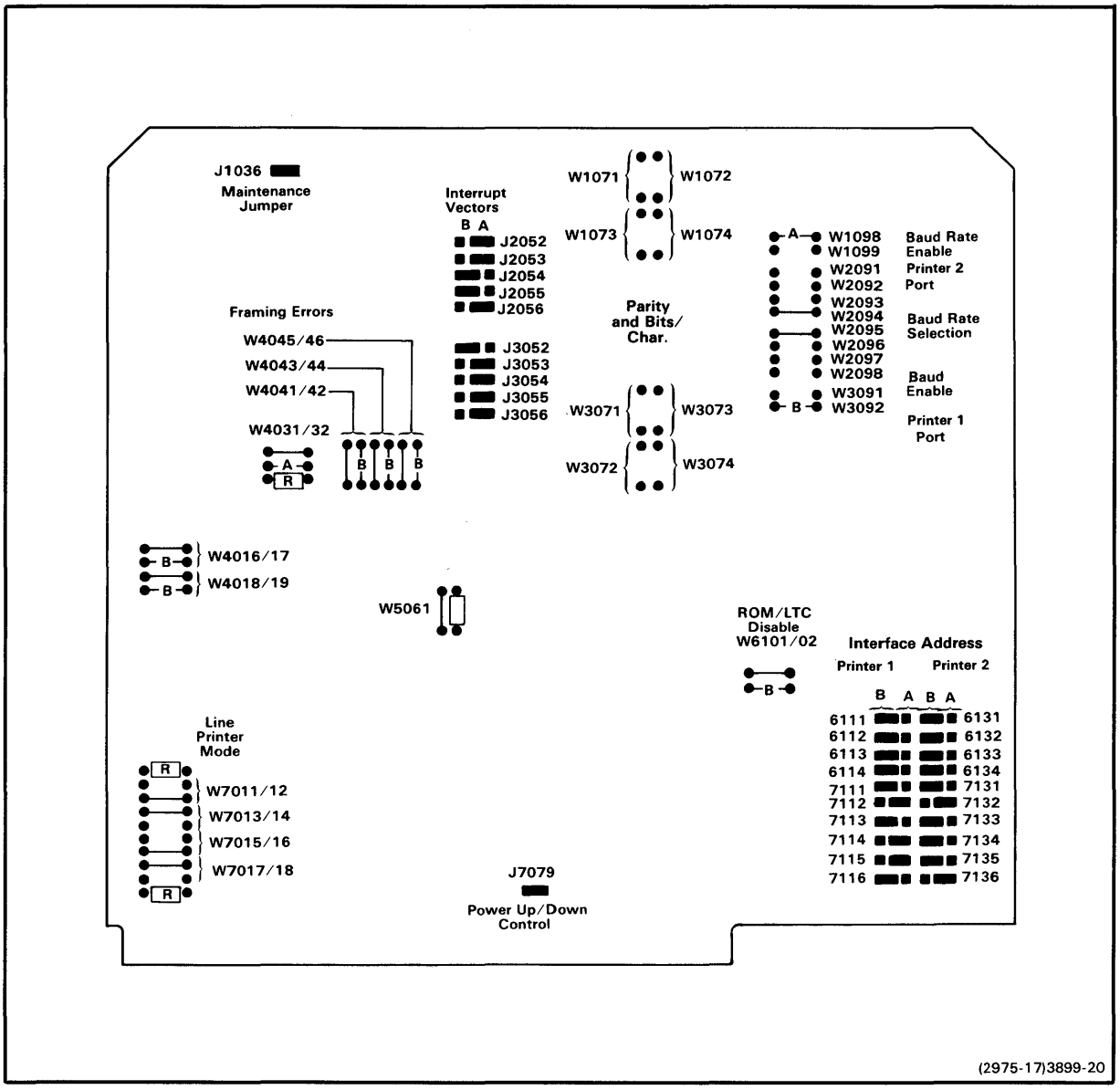


Fig. 4-5. Utility board jumper and strap locations.

LINE PRINTER INTERFACE

Baud Rate Selection

The baud rate for the two dedicated RS-232-C Line Printer interfaces is factory set at 2400 baud. If a different baud rate is required, strapping options on the Utility board permit you to select of a specific baud rate. The Utility board can also be configured to accept an external TTL-level clock signal between 0 and 320 kHz (the external clock frequency is 16 times the baud rate). Table 4-1 lists the strapping options for baud rate selection.

Table 4-1
Baud Rate Selection

Interface 1 Straps - W2095	W2096	W2097	W2098	Baud Rate
Interface 2 Straps - W2094	W2093	W2092	W2091	
In	In	In	In	Ext. Clock
In	In	In	Out	Ext. Clock
In	In	Out	In	50
In	In	Out	Out	75
In	Out	In	In	134.5
In	Out	In	Out	200
In	Out	Out	In	600
In	Out	Out	Out	2400
Out	In	In	In	9600
Out	In	In	Out	4800
Out	In	Out	In	1800
Out	In	Out	Out	1200
Out	Out	In	In	2400
Out	Out	In	Out	300
Out	Out	Out	In	150
Out	Out	Out	Out	110

Interface Address Jumpers

Jumpers that define interface address words for the Line Printer ports are installed at the factory in the proper configuration for normal operation. These jumpers should be in the configuration shown in Fig. 4-5.

Interrupt Vector Address Jumpers

Jumpers that define interrupt vector address words for the Line Printer ports are installed at the factory in the proper configuration for normal operation. These jumpers should be in the configuration shown in Fig. 4-5.

DEBUG ROM CONTROL JUMPER

For normal system operation, jumper J1036 must be installed.

POWER UP/DOWN CONTROL JUMPER

For normal system operation, jumper J7079 must be installed.

STRAP CONFIGURATION

All straps on the Utility board are preset at the factory for normal system operation and should not be altered. For information about these straps and alternate configurations, contact your Tektronix Field Service representative.

I/O PROCESSOR BOARD

The interface circuitry in the 8560 MUSDU includes either one or two I/O Processor (IOP) boards. One of these boards controls I/O functions through HSI I/O ports 0--3, and the second board (optional) controls HSI I/O ports 4--7. Figure 4-6 shows the jumpers on the IOP board positioned for normal operation. Except for the jumpers discussed in the following paragraphs, jumpers on the IOP board are preset at the factory and should not be changed.

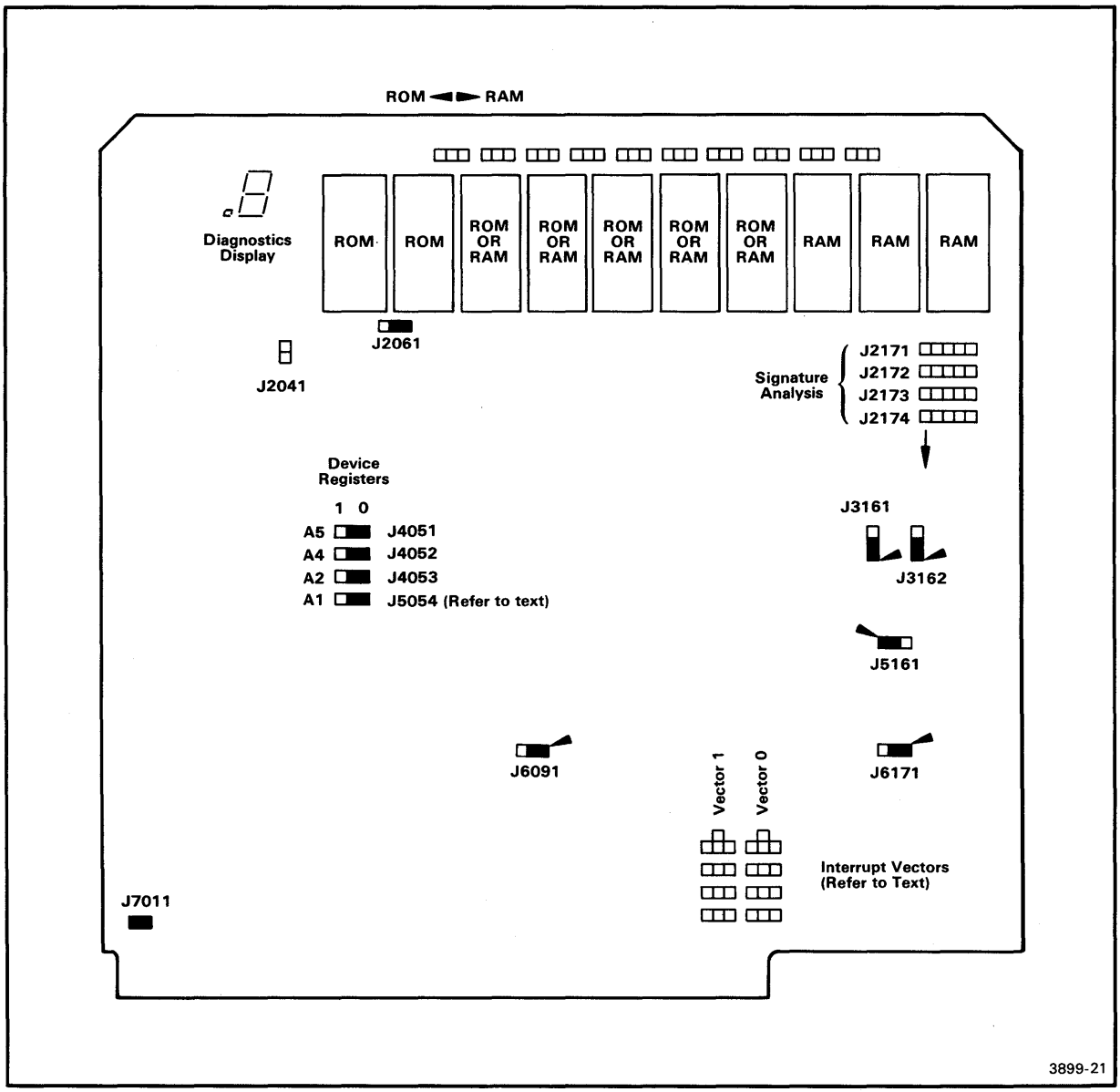


Fig. 4-6. I/O Processor board jumper locations.

DEVICE REGISTERS

An I/O Processor board is designated as either IOP 1 or IOP 2 by configuration of the device register address jumpers. If only one IOP board is is used in the 8560, it must be configured as IOP 1 and installed in the IOP 1 slot in the 8560 card cage. Figure 4-7a illustrates the jumper configuration for IOP 1.

If your 8560 utilizes two IOP boards, one of these boards must be configured as IOP 1 and installed in the IOP 1 slot, as above. The second board must be configured as IOP 2 and installed in the IOP 2 slot in the card cage. See Fig. 4-7b.

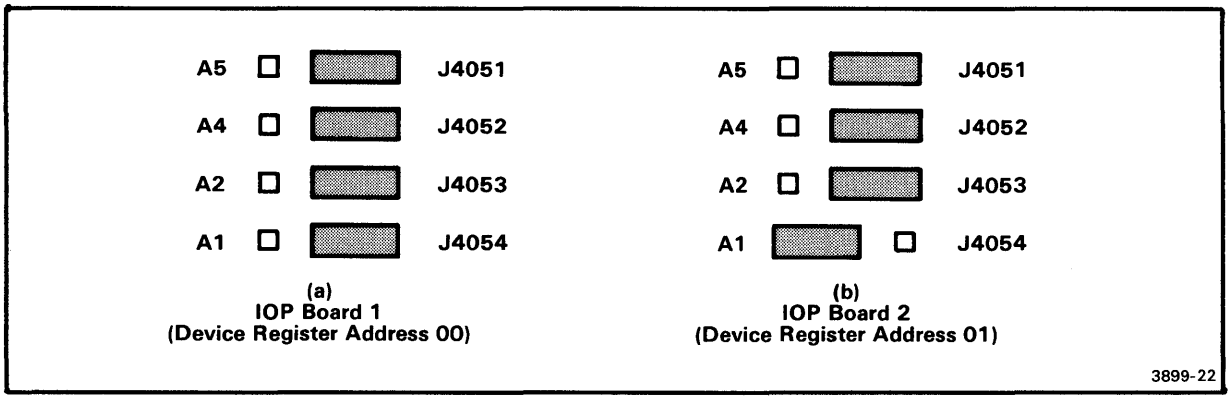


Fig. 4-7. Device Register jumper positions.

INTERRUPT VECTORS

Two independent interrupt vectors that interface with the LSI-11/23 Processor board are generated on the IOP boards. The two interrupt vector circuits can be independently jumpered to select a level of interrupt priority. One set of jumpers determines which interrupt lines will be asserted, and the other set of jumpers selects which lines will be monitored, when intercepting a grant from the LSI-11/23 Processor. Table 4-2 describes the various priority levels. Figure 4-8 shows the jumper arrangement for Vectors 1 and 2, and Fig. 4-9 illustrates jumper configurations for priority levels 4, 5, and 6.

Priority level 7 is assigned for LSI-11/23 use only and is not user-definable.

Table 4-2
Interrupt Priority Assignments

Priority Level	Interrupt Lines Asserted	Interrupt Lines Monitored
4	BIRQ 4	BIRQ 5, 6
5	BIRQ 4, 5	BIRQ 6
6	BIRQ 4, 6	BIRQ 7
7	BIRQ 4, 6, 7	---- ----

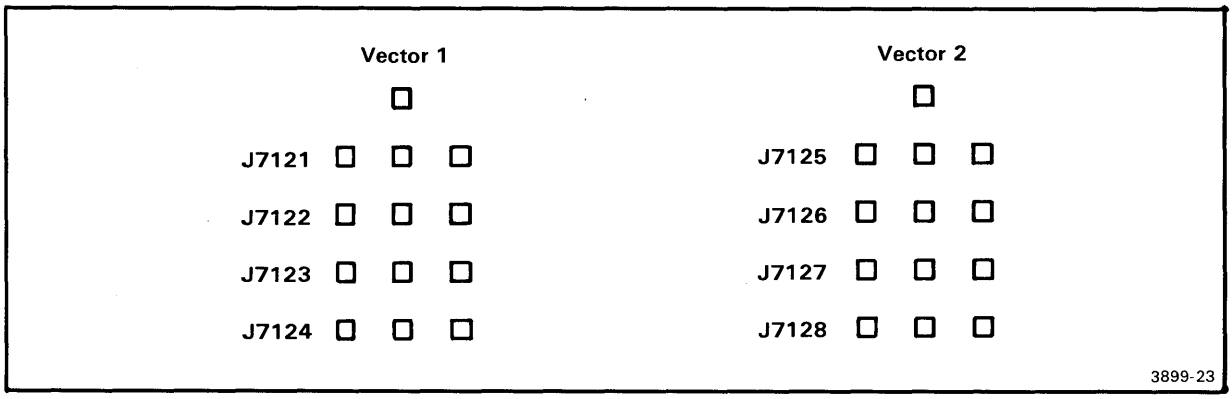


Fig. 4-8. Interrupt Priority jumper arrangement.

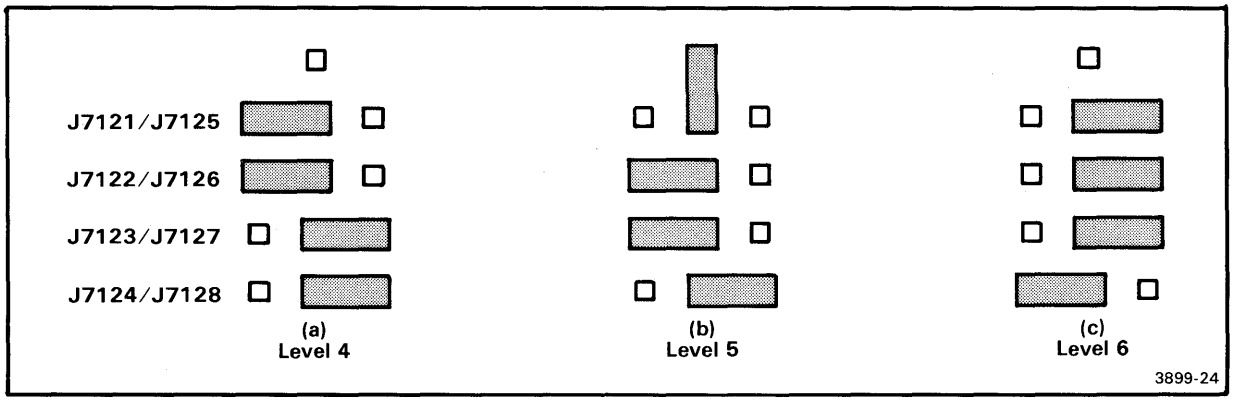
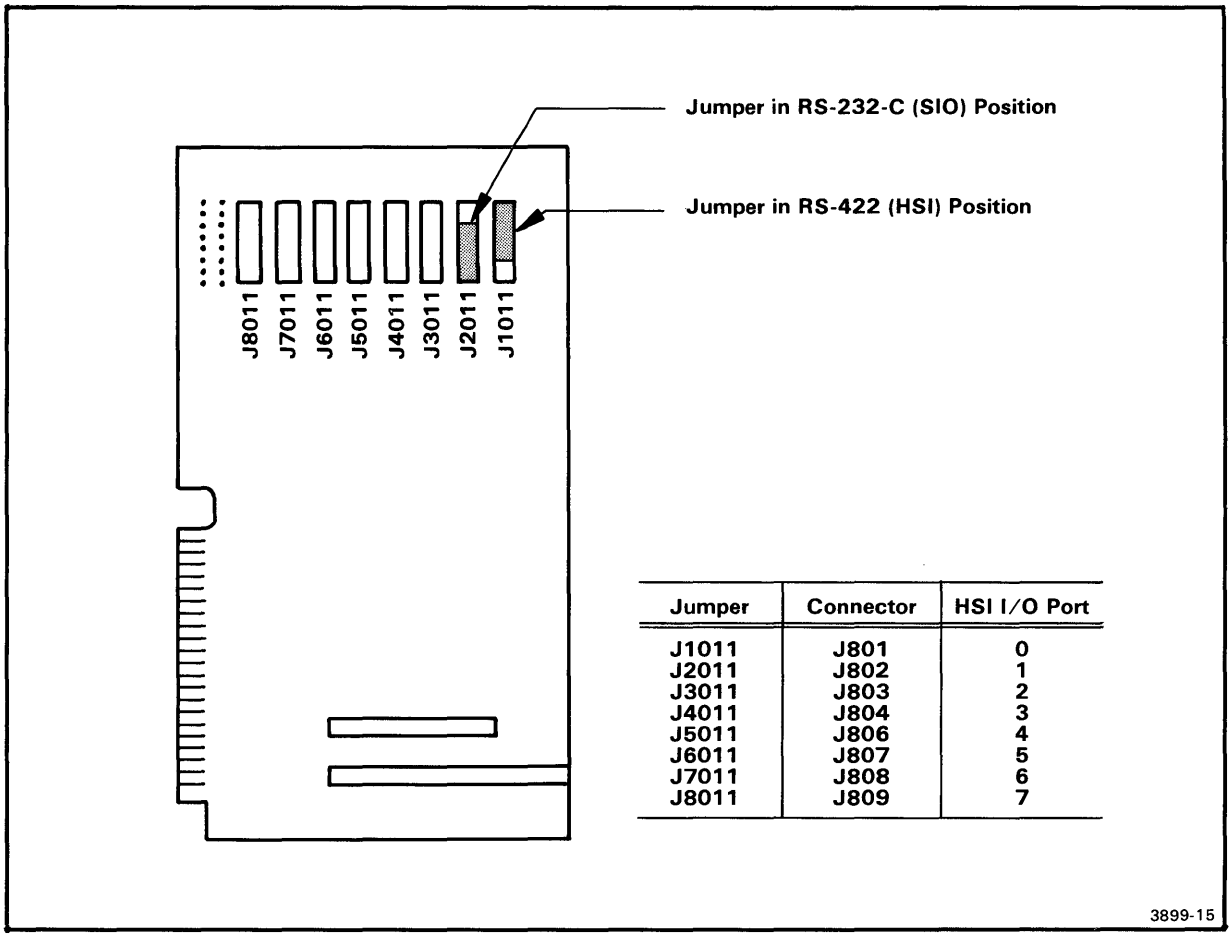


Fig. 4-9. Jumper configurations for interrupt priority levels.

I/O ADAPTER BOARD

Jumpers on the I/O Adapter board allow you to designate the HSI I/O connectors on the 8560 rear panel for either RS-422 (HSI) or RS-232-C (SIO) I/O protocol. Figure 4-10 illustrates the location of the jumpers on the board. The table in Fig. 4-10 defines the relationship between the jumpers and the rear panel connectors.



Jumper	Connector	HSI I/O Port
J1011	J801	0
J2011	J802	1
J3011	J803	2
J4011	J804	3
J5011	J806	4
J6011	J807	5
J7011	J808	6
J8011	J809	7

Fig. 4-10. Location of jumpers on the I/O Adapter board.

I/O CONNECTOR BOARD

Straps, or "cuttable runs", on the I/O Connector board connect the interface cable shields to the 8560 system ground. For special system configurations requiring an ungrounded shield at the 8560 end of the cables, these runs must be cut. For further information about these straps, contact your Tektronix Field Office or representative.

There are no jumpers or switches on the I/O Connector board.

Section 5

SYSTEM CONFIGURATIONS

INTRODUCTION

The 8560 Multi-User Software Development System is normally operated with one or more user workstations. It can also be configured to operate directly from a terminal as a general-purpose computer. Within the limits of its input/output capabilities, the 8560 can support both of these configurations simultaneously. The 8560 MUSDU can also accommodate up to two line printers.

8560/8540 SYSTEM

A user workstation for the 8560 typically consists of a TEKTRONIX 8540 Integration Unit and a system terminal. Figure 5-1 illustrates interconnections for a representative 8560/8540 multi-user system. The standard 8560 MUSDU will support up to four 8540 user workstations or, alternatively, a combination of up to four 8540 workstations and independent system terminals. With the optional second I/O Processor board, the 8560 will support up to eight workstations.

SOFTWARE INTERFACE REQUIREMENTS

The 8560 MUSDU utilizes the TNIX Operating System. The 8540 Operating System, OS/40, is designed to interface with the 8560's TNIX Operating System.

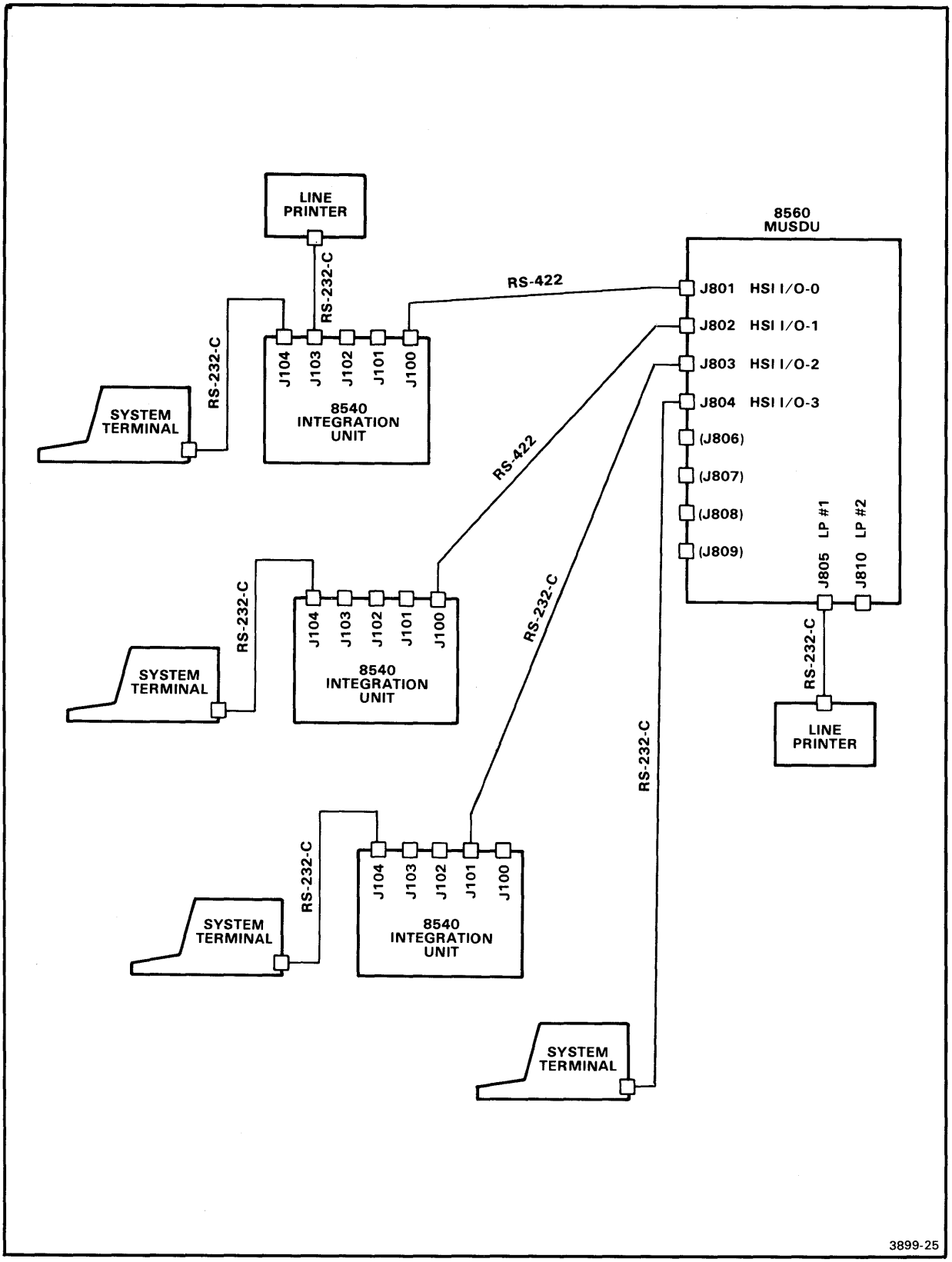


Fig. 5-1. Typical 8560 system configuration.

HARDWARE INTERFACE REQUIREMENTS

To set up an 8560/8540 system, interconnecting cables must be installed between the 8560 and the 8540, and between the 8540 and the system terminal. Figure 5-2 identifies the interconnecting signal lines for an HSI interface between the 8560 and the 8540. System terminal interconnections are discussed in the following paragraphs. 8540 interconnections are also described in detail in the 8540 Integration Unit Installation Guide.

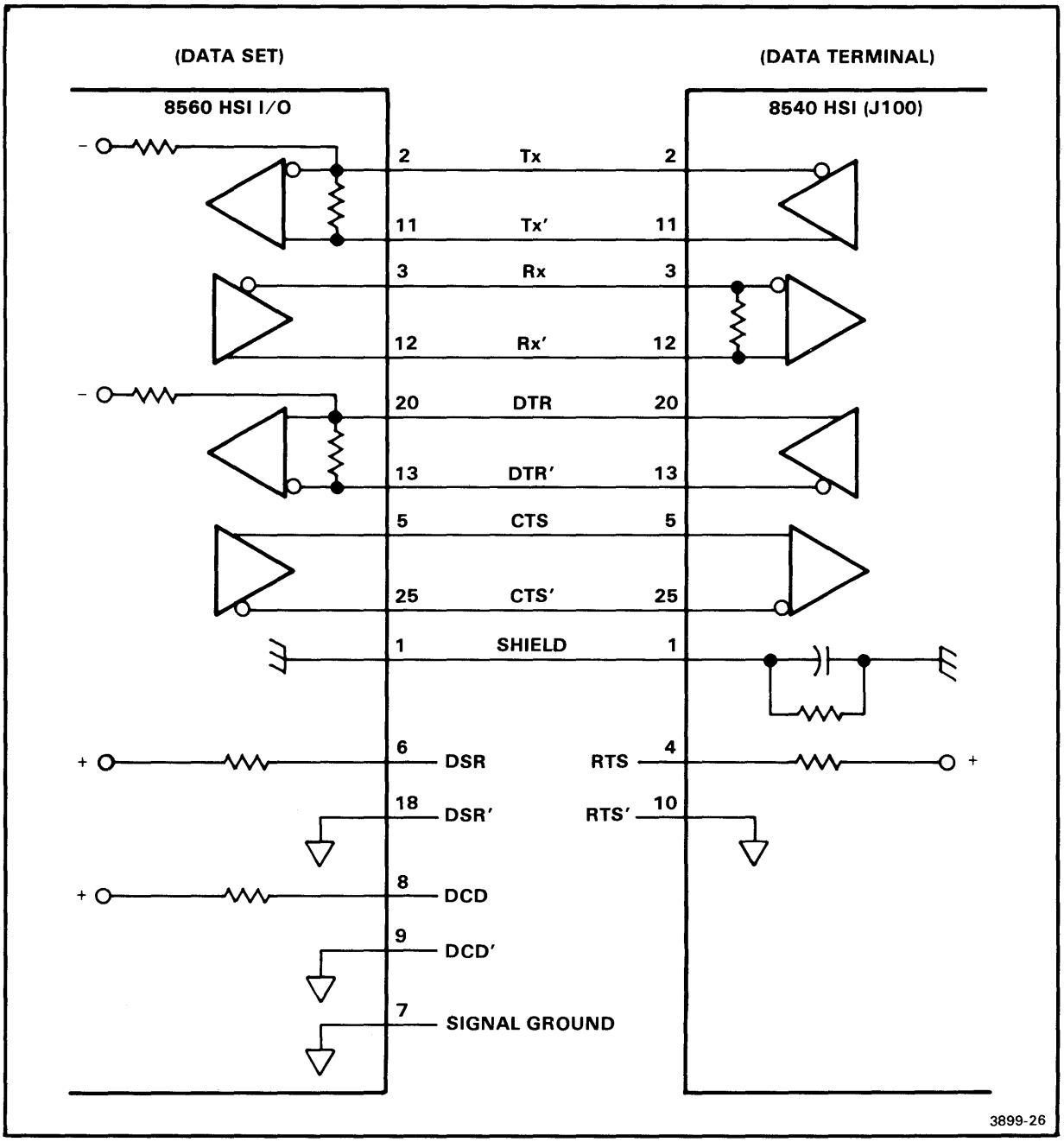


Fig. 5-2. High-Speed Interface (HSI) lines between the 8560 and the 8540.

SYSTEM TERMINAL REQUIREMENTS

Any terminal that utilizes RS-232-C interface, such as the TEKTRONIX CT 8500, 4024, or 4025, may be used with either the 8560 MUSDU or the 8540 Integration Unit. System terminal connections for both configurations are illustrated in Fig. 5-1.

Terminal Connected to the 8540 Integration Unit

If the terminal is used with an 8560/8540 system configuration, the terminal is connected to the TERMINAL connector (J104) on the rear panel of the 8540. This is a 25-pin, RS-232-C-compatible female connector. The signals used by the 8540 are shown in Table 5-1. If your terminal uses a different signal arrangement, a "null" modem may be required to adapt your terminal to the 8540. If a TEKTRONIX CT 8500, 4024, or 4025 terminal is used, a null modem is not necessary.

Table 5-1
8540 Integration Unit
Pin Configuration for RS-232-C Ports

	Remote Port		Auxiliary Port	Terminal Port
Pin No.	J101 25-pin Male	J102 25-pin Female	J103 25-pin Female	J104 25-pin Female
1	Shield	Shield	Shield	Shield
2	Tx	Tx	Tx	Tx
3	Rx	Rx	Rx	Rx
4	RTS	RTS	RTS	RTS
5	CTS	CTS	CTS	CTS
6	DSR	DSR	DSR	DSR
7	LOGIC GND	LOGIC GND	LOGIC GND	LOGIC GND
8	DCD	DCD	DCD	DCD
17	-----	-----	EXT CLK	-----
20	DTR	DTR	DTR	DTR

Terminal Connected to the 8560 MUSDU

If the terminal is connected directly to an 8560 MUSDU HSI I/O port, the internal jumper for that port must be repositioned to provide the RS-232-C interface protocol. Refer to Section 3 of this manual for information about interface selection. Figure 5-3 shows the interconnecting signal lines between a typical system terminal and the 8560 MUSDU.

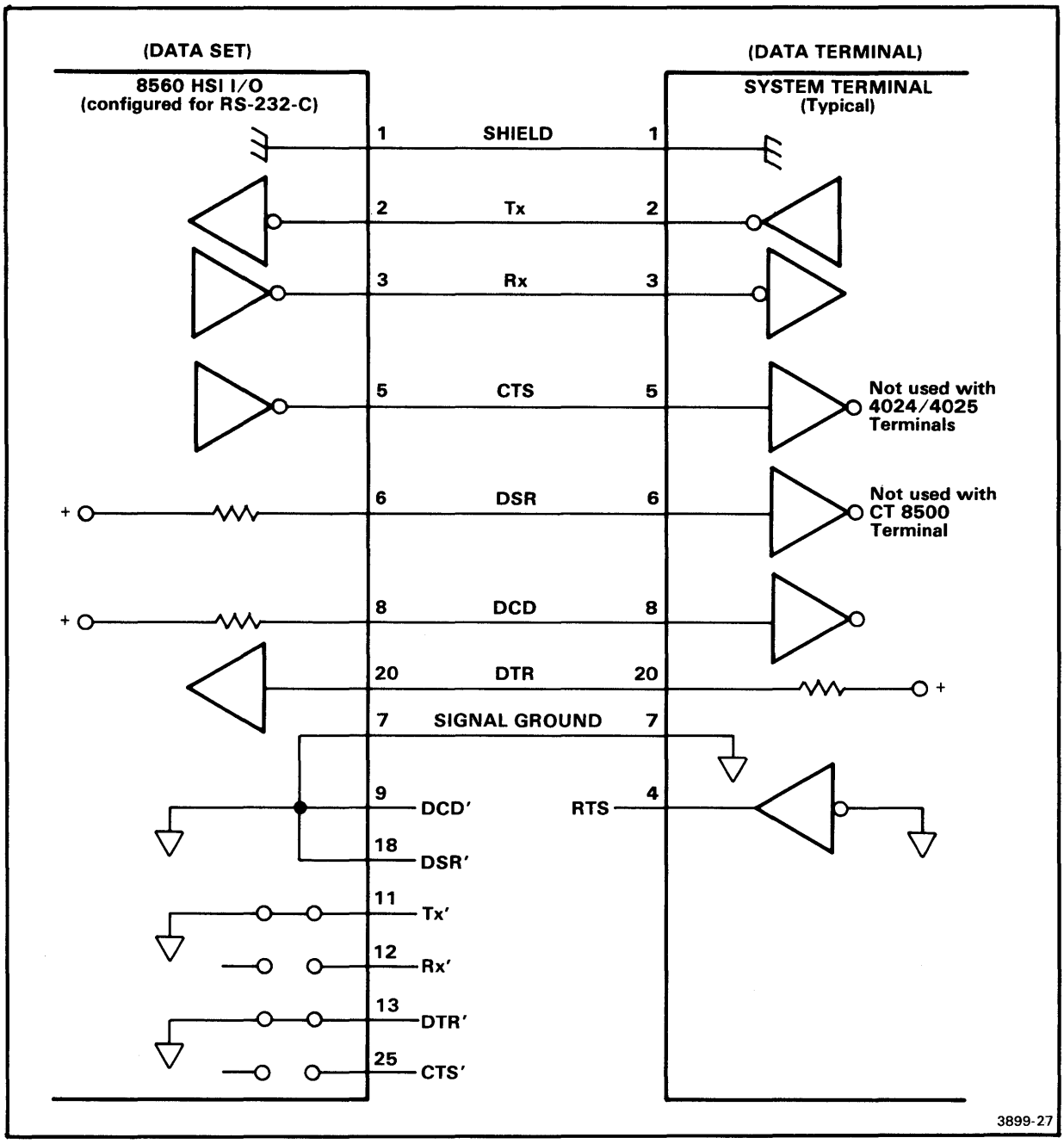


Fig. 5-3. Typical RS-232-C system terminal interface with the 8560 MUSDU.

LINE PRINTER

A line printer may be connected directly to either of the LINE PRINTER connectors (J805 or J810) on the 8560, or to the AUXILIARY port (J103) on the 8540. Figure 5-4 illustrates interconnecting signal lines between an 8560 MUSDU and a typical line printer.

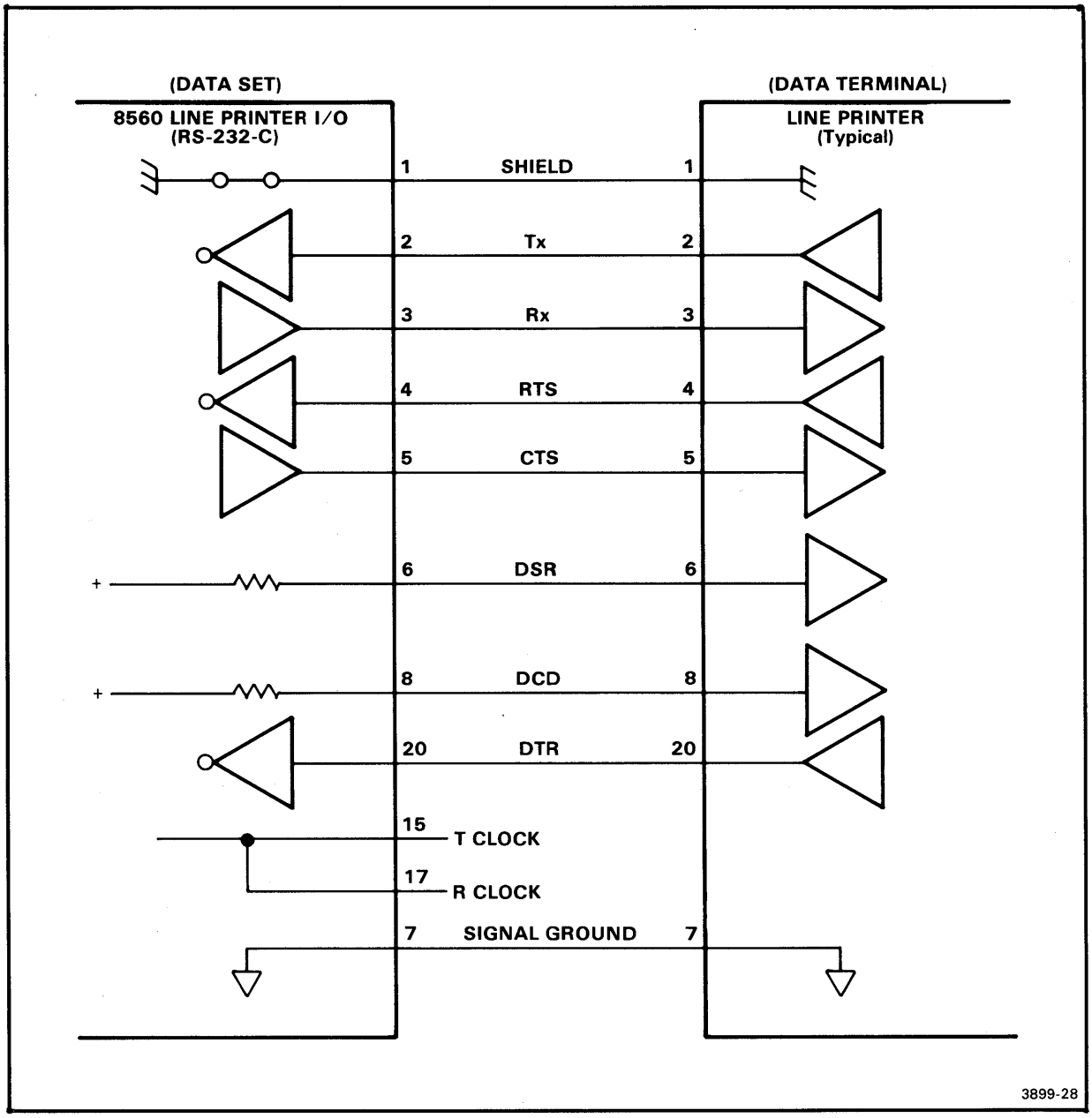


Fig. 5-4. Typical line printer interface with the 8560 MUSDU.

RS-232-C INTERFACE CONFIGURATIONS

The 8560 and 8540 can also communicate through the REMOTE port J101 on the 8540. This is an RS-232-C-compatible interface, and with a maximum baud rate of 9600. Pin assignments for J101 are listed in Table 5-1. Information on configuring the 8560 HSI I/O ports for RS-232-C operation is also provided in Section 3 of this manual. Interconnecting signal lines for this interface configuration are described in Fig. 5-5.

Communications through this interface are established and maintained by the COM command. This command is described in the 8540 Integration Unit System Users Manual.

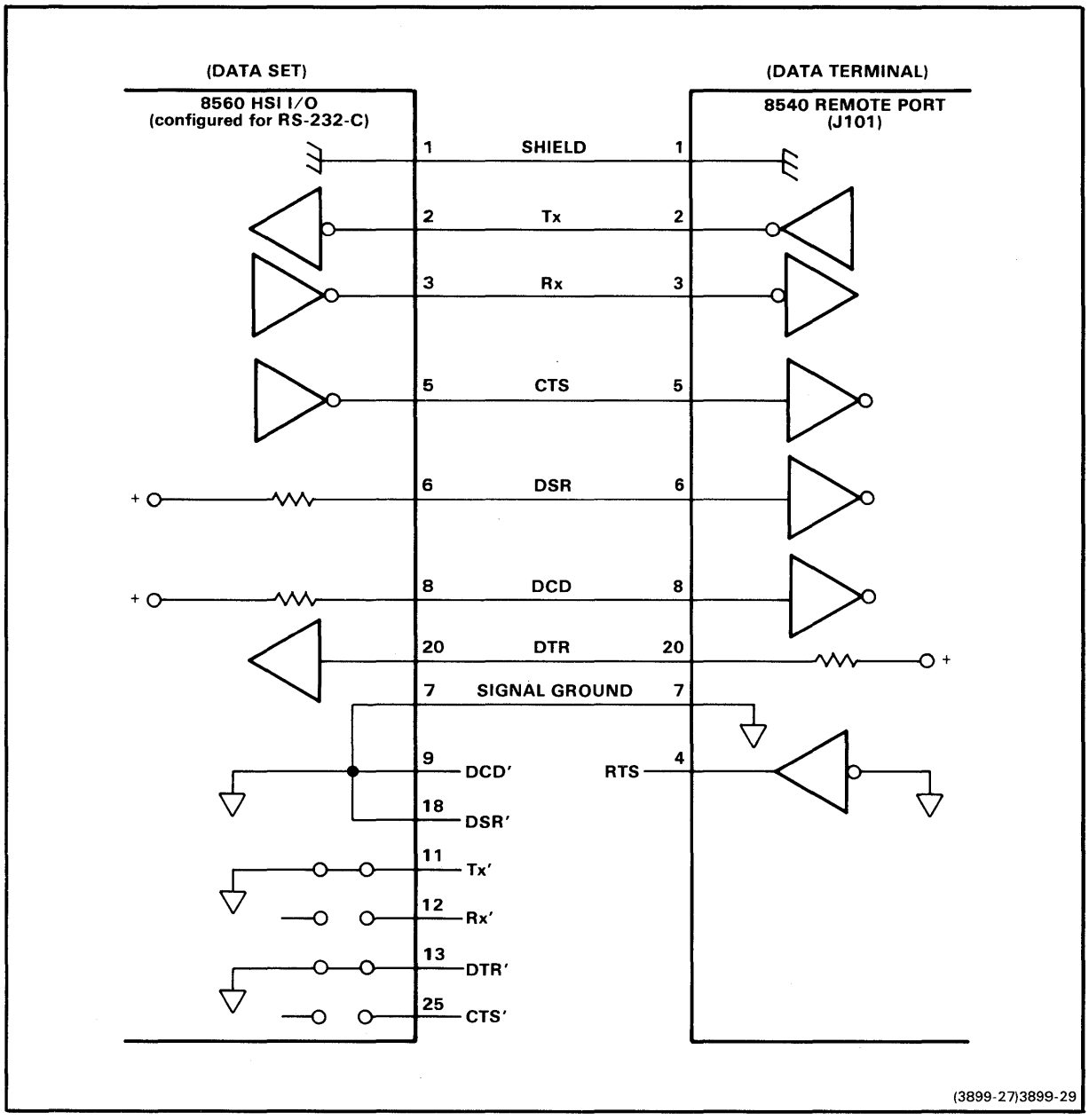


Fig. 5-5. RS-232-C interface lines between the 8560 and the 8540.

Tektronix®
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 2-3-82 Change Reference: C1/282

Product: 8560 MUSDU: Installation Guide Service Manual Part No.: 070-3899-00

DESCRIPTION

TEXT CORRECTIONS

Page 2-10, under the heading "Releasing the Read/Write Head Shipping Lock"

ADD THE FOLLOWING INFORMATION:

NOTE

The installation procedure in Section 2 requires that the Micropolis Disc Drive read/write head shipping lock be released prior to 8560 operation.

Some early versions of the Micropolis drive do not contain a shipping lock.

If, during installation, you find the label "Head lock is not functional" across the shipping lock access hole, the shipping lock is not connected, and need not be released. If no label is present, release the shipping lock as outlined in the 8560 Installation Guide.

Page 3-9, under the heading "POWER-UP PROCEDURE"

ADD THE FOLLOWING INFORMATION:

Installing an Additional IOP Board

If an additional 8560 I/O Processor board is installed to increase the number of HSI ports to eight, changes have to be made in the 8560 operating system. Those changes should be made at this point in the installation. (See the 8560 Board Configuration section for jumper changes in the I/O Processor boards.)

After installing the second I/O Processor board, power up the 8560. During the boot procedure, you will be asked if you want to remain a single user. Respond with a "y" followed by <CR>. You will then be in a single-user mode with super-user privileges. The prompt will be a "#".

DESCRIPTION

Enter the following commands on the system terminal connected to the 8560:

```
#chmod 622 /dev/tty[4-7]
#ed /etc/ttys
1,4t4
5s/0$/4/
6s/1$/5/
7s/2$/6/
8s/3$/7/
w
q
#
```

The 8560 operating system is now configured to operate with eight HSI ports. Reboot the 8560, and continue with the System Verification Procedure.

Tektronix®
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 2-9-82 Change Reference: C2/282

Product: 8560 MUSDU: Installation Guide Service Manual Part No.: 070-3899-00

DESCRIPTION

TEXT CORRECTIONS

SECTION 2 UNPACKING YOUR 8560 MUSDU

Page 2-12 Delete all of the text and the heading pertaining to the subject, "Removing the Hard-Disc Rotor Restraint"

Page 2-13 Delete the illustration and caption for Figure 2-7

Page 2-14 Delete the illustration and caption for Figure 2-8

Tektronix
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 3-11-82 Change Reference: C3/382

Product: 8560 MUSDU: Installation Guide Service Manual Part No.: 070-3899-00

DESCRIPTION

ALTERNATE INSTRUCTIONS FOR RELEASING THE READ/WRITE HEAD SHIPPING LOCK

The installation procedure in Section 2 requires that the Micropolis disc drive read/write shipping lock be released prior to 8560 operation. For this operation you need a special tool that is included with your packaging material. A wide-bladed screw driver that has a blade length of at least 10 inches can be used if the special tool is mislaid. In that case, however, extreme care must be taken not to damage the locking mechanism since it is made from soft material.

Remove the shipping lock as follows:

1. Remove the 8560 cabinet bottom cover (see instructions given in Section 2 of the installation manual for the top cover)

2. Turn the 8560 on its side.

3. Locate the 1/2 inch round hole in the bottom of the Qume flexible disc drive. (Facing the bottom of the box, the hole is located near the right front corner).

4. Insert the tool through the hole in the Qume drive into the unlocking screw located at the bottom of the Micropolis drive.

5. Unlock the heads of the Micropolis drive by turning the unlocking screw 90 degrees clockwise to the UNLOCK position.

6. Re-install the bottom cover.

070-2775-00D