

MINDSET SERVICE GUIDE

April 1984

WARRANTY SERVICE POLICY

Dealer shall provide service to the User upon request whether the User purchased the product from the Dealer or not. Said service shall be performed only by specially trained personnel of the Dealer and shall be prompt and of the highest quality. MINDSET shall assist the Dealer in the efficient service procedures and policies. Dealer shall keep on hand at all times accessories and equipment sufficient to meet the needs of the Users as well as a complete and adequate supply of spare parts to properly service the products.

Warranty service shall be based upon a subassembly or board replacement concept with the exception of certain socketed parts. Component level warranty repairs by Dealer's service personnel not covered in the Service Training Program are not authorized and will not be reimbursed by MINDSET.

WARRANTY

MINDSET provides the consumer with a warranty period extending 90 days from date of purchase. Warranty claims will be valid only for service performed during the 12 months after date of shipment from MINDSET. Given MINDSET's 3 month warranty to consumer customer's after date of purchase, this will allow 9 months to the Dealer for "shelf-life" coverage.

NOTICE

Every effort has been made to insure that this manual accurately documents the servicing of MINDSET products. However, due to the ongoing modification and update of the products, MINDSET Corporation cannot guarantee the accuracy of printed material after the date of publication, nor can MINDSET Corporation accept responsibility for errors or omissions.

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT

WARNING:

The Mindset Personal Computer has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC rules. Only peripherals (computer input/output devices) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception. If peripherals not offered by Mindset are used with this equipment, it is suggested to use shielded grounded cables with in-line filters if necessary.

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SPECIFICATIONS
for the
MINDSET PERSONAL COMPUTER

SPECIFICATIONS

MINDSET SPECIFICATIONS

SYSTEM UNIT

Physical

Weight	6 lbs.
Width	16.0"
Depth	12.2"
Height	2.8"

Electrical

Voltage	110 VAC, 60 HZ
Power	50 Watts
Internal	+5 volts, 1500 ma
	+12 volts, 150 ma
	-12 volts, 10 ma
	Trklchrg, 160 ma

Performance

Clock	6 MHZ
Cycle Time	166 ns

KEYBOARD

Physical

Weight	3 lbs
Width	16.0"
Depth	7.0"

Electrical

Voltage	+12 volts, 200 ma
---------	-------------------

EXPANSION UNIT

Physical

Weight	7.5 lbs (1 drive)
	11.0 lbs (2 drives)
Width	16.0"
Depth	12.2"
Height	2.5"

Electrical

Voltage	+5 volts, 1000 ma (256K RAM)
Drive	+5 volts, 600 ma
	+12 volts, 250 ma (not running)
	650 ma (running)

SPECIFICATIONS

OPTION MODULES

Physical	
Length	3.1"
Width	4.1" single, 8.2" double
Height	1.1"
Electrical	
Printer	+5 volts, 110 ma
RS-232C	+5 volts, 120 ma
	+12, -12 volts, 10 ma
Stereo	+5 volts, 120 ma
	+12, -12 volts, 10 ma
300 Modem	+5 volts, 200 ma
	+12 volts, 15 ma
	-12 volts, 50 ma
1200 Modem	Trklchrg 30 ma
	+5 volts, 450 ma
	+12 volts, 30 ma
	-12 volts, 10 ma

CARTRIDGES

Physical	
Length	3.8"
Width	3.2"
Height	1.0"
Electrical	
ROM	+5 volts, 80 ma
NVRAM/ROM	Trklchrg 10 ma
	+5 volts, 40 ma
RAM	Trklchrg 30 ma

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CHAPTER ONE

INTRODUCTION

CHAPTER ONE
INTRODUCTION

1.1 SCOPE OF MANUAL

The MINDSET Service Manual is a troubleshooting, maintenance, and repair manual for the MINDSET Personal Computer. It is designed to be used as a reference manual for the following information:

- o Performance Specifications
- o Troubleshooting the MINDSET Computer
- o Repair and Replacement Procedures
- o Parts Catalog
- o Diagnostic Procedures
- o Service Administration Procedures

1.2 MINDSET SERVICE POLICY

The MINDSET Computer is designed to allow easy subassembly or module replacement. Service performed on the MINDSET Personal Computer is limited to subassembly and module replacement, with the exception of certain socketed chips.

*** CAUTION ***

Due to the complexity of the individual circuit boards, MINDSET recommends that soldered component level replacement not be attempted. Soldered component level warranty repair is not authorized by MINDSET Corporation and if performed will void all warranties in effect.

INTRODUCTION

1.3 ABOUT THE CHAPTERS

This manual is divided into six chapters and several appendices. The following are brief descriptions of information contained in the chapters and appendices.

Chapter One - INTRODUCTION, contains a description of this manual and how it is organized. Identifies major parts of the MINDSET Personal Computer. Lists tools and associated manuals for the Service Technician.

Chapter Two - GENERAL DESCRIPTION, provides descriptions of the MINDSET Computer hardware, including the Expansion Unit, option modules and cartridges.

Chapter Three - DIAGNOSTICS, provides information on diagnostic programs available for the MINDSET and how to run and interpret them.

Chapter Four - FAULT ISOLATION, describes troubleshooting the MINDSET hardware, including a troubleshooting flowchart.

Chapter Five - REMOVAL AND REPLACEMENT PROCEDURES, discusses the procedures for board, subassembly, and module replacement. Discusses general maintenance procedures.

Chapter Six - ADMINISTRATION, covers procedures for warranty repair, ordering spare parts, returning defective parts, and other administrative functions for the Service Technician.

Appendices - The various appendices are:

A-GLOSSARY, provides definitions of terms and abbreviations.

B-PARTS LIST, includes spare parts list and a complete illustrated parts catalog.

C-SERVICE BULLETINS, provides a place to keep your copy of all bulletins from MINDSET Technical Support.

INTRODUCTION

1.4 REQUIRED TOOLS AND EQUIPMENT

The following tools and supplies are required to perform warranty service on the MINDSET Computer:

- o MINDSET Dealer Spare Parts Kit
- o 1/4" x 3" Slotted Screwdriver
- o #1 Phillips Screwdriver
- o #2 Phillips Screwdriver
- o IC Puller
- o Isopropyl Alcohol Cleaning Solution
- o Commercial Floppy Drive Head Cleaning Diskette
- o Cotton Swabs
- o Digital Multimeter (Fluke 8022B or equivalent)
- o Diagnostic Program Diskette
- o Diagnostic Program Cartridge
- o Formatted Scratch Diskette
- o MINDSET Service Manual

1.5 OTHER MINDSET MANUALS

The following are other MINDSET Manuals that are available for the MINDSET Personal Computer:

- o MINDSET Operation Guide
- o MINDSET Introductory Guide to MS-DOS
- o MINDSET MS-DOS Reference Manual
- o MINDSET GW BASIC

It is recommended that the Service Technician be thoroughly familiar with the MINDSET Operation Guide and MS-DOS. The Service Technician should be familiar with general commands used with GW BASIC, such as LOAD, RUN, SAVE, and LIST.

INTRODUCTION

1.6 IDENTIFYING PARTS OF THE MINDSET COMPUTER

The major components of the MINDSET Personal Computer are the System Unit and the Keyboard. The following paragraphs provide basic descriptions of these components. The location of switches, connectors and indicators are shown. In addition the MINDSET Options are described.

1.6.1 MAIN COMPONENTS

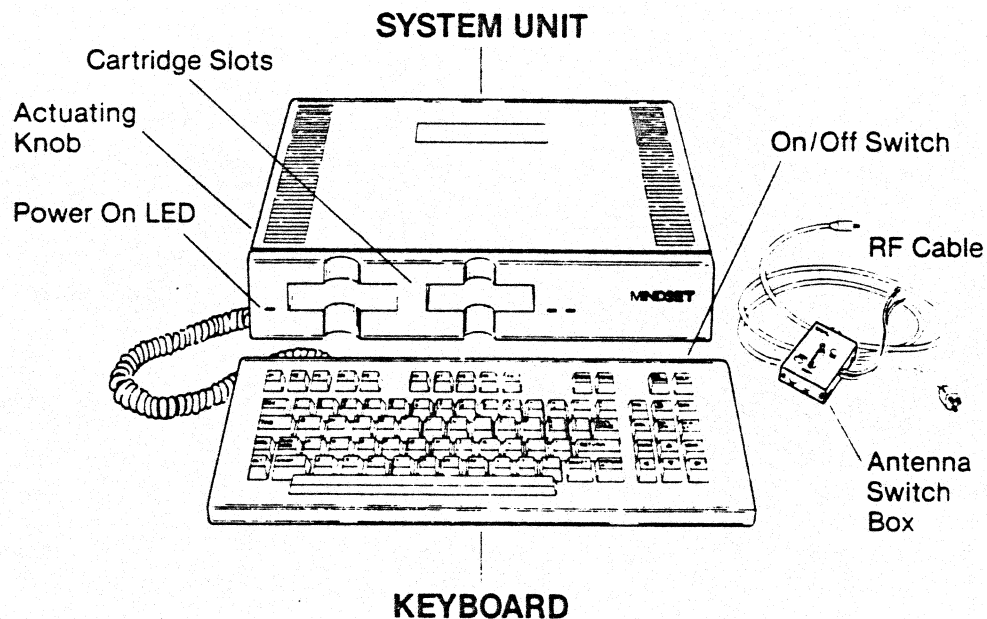


Figure 1-1. The MINDSET Personal Computer.

The System Unit is the heart of the MINDSET Computer. A color television may be attached to the MINDSET with the supplied Switch Box and RF cable. A composite video or RGB monitor may also be attached to the MINDSET through standard interface connectors.

System Unit - Houses the System Printed Circuit Assembly and the Power Supply. On the System board are the 80186 processor, 32K user RAM, 32K Display RAM, 32K ROM, Sound Processor, and associated electronics.

Cartridge Slots - Receives MINDSET Cartridges.

INTRODUCTION

- Actuating Knob** - Allows easy installation and removal of cartridges while protecting the electrical connections from wear.
- Antenna Switch Box** - Allows connection of a television set to the MINDSET with the RF cable.
- On/Off Switch** - Turns on the MINDSET computer.

The MINDSET Keyboard is custom designed for the MINDSET Computer. The keyboard has 84 full function keys and a six-foot coiled cable. The keyboard has connectors on each side for a MINDSET Mouse and MINDSET Joystick.

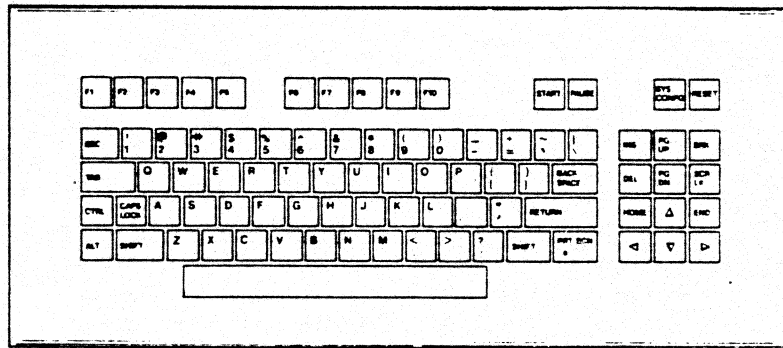


Figure 1-2. MINDSET Keyboard

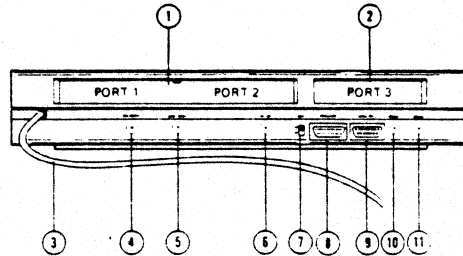
Like most computers, the MINDSET Keyboard works like a typewriter. However, there are two keys which provide special functions. In the descriptions below you must hold the first key down while pressing the second special key.

ALT - SYS CONFIG Causes the MINDSET to display the System Configuration menu on the screen from which you select the system operating parameters or characteristics. Pressing the SYS CONFIG key alone does nothing.

ALT - RESET Causes the MINDSET to perform a System Reset. The System Reset restarts the computer and will load a program according to the system configuration. Pressing RESET alone does nothing.

Please refer to the Operation Guide for further information about setting up and using the MINDSET Personal Computer.

1.6.2 BACK-PANEL CONNECTORS AND PORTS



- | | |
|-----------------------------|-----------------------|
| 1—Double-width I/O Module | 7—Channel 3/4 Switch |
| 2—Single-width I/O Module | 8—RGB Video Connector |
| 3—AC Cord | 9—Ext Sync Connector |
| 4—Audio Left | 10—Aux In Connector |
| 5—Composite Video Connector | 11—Aux Out Connector |
| 6—TV/RF Connector | |

Figure 1-3. Back-panel Identification

Double-width port - Accepts a double-width module, such as the Modem Modules, or two single-width modules.

Single-width port - Accepts a single-width module, such as the RS-232-C, Printer, or the Stereo Sound Module.

AC Cord - Provides power to the MINDSET.

Audio Left - Connects to an amplifier for audio output.

Composite Video - Connects to a composite video monitor for black & white or color display.

TV/RF - Connects to a color TV for color video display and sound.

Channel 3/4 - Selects the proper channel (3 or 4) for use with a color television set.

RGB Video - Connects to an RGB monitor for color video display.

Ext Sync - For future enhancement options.

Aux In/Out - For future enhancement options.

1.6.3 CARTRIDGES

The two cartridge slots on the front of the MINDSET are designed to accept MINDSET Cartridges. There are three types of MINDSET Cartridges:

- o ROM Cartridge
- o NVRAM Cartridge
- o ROM/NVRAM Cartridge

MINDSET ROM cartridges contain programs such as GW BASIC. A NVRAM cartridge has 8K bytes of Non-Volatile RAM. The cartridge has a self-contained battery that allows it to retain the data for up to five months. The battery is automatically recharged when installed in either cartridge slot.

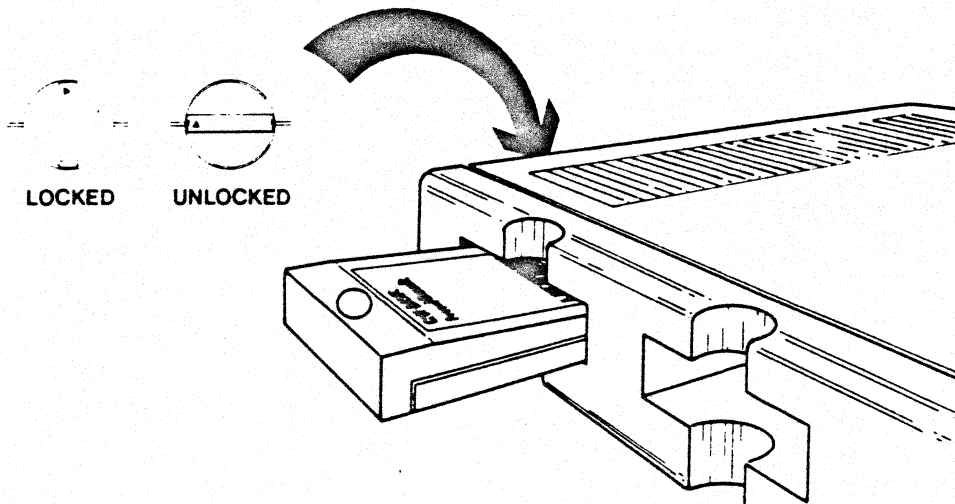


Figure 1-4. Loading a Cartridge

Cartridges may be installed or removed only while the On/Off switch on the keyboard is turned to the OFF position. To remove a cartridge, turn the actuating knob counterclockwise to the unlocked (horizontal) position and remove it. To install a cartridge, be sure the actuating knob is unlocked, then install the cartridge until flush with the front panel, and then turn the actuating knob in the direction of the arrow to the locked (vertical) position. Never force the actuating knob. If it will not turn with minimum force then check to see that the cartridge is properly installed. See the MINDSET Operation Guide for further information regarding cartridges.

1.6.4 INPUT/OUTPUT PORTS

The I/O (input/output) Ports are designed to accept MINDSET option modules. Three ports are available at the back of the System Unit and an additional three ports are available at the back of the Expansion Unit. Option Modules, available from MINDSET, come in single-width or double-width sizes. Ports 1 and 2 can be used for one double-width module, while any port can support a single-width module.

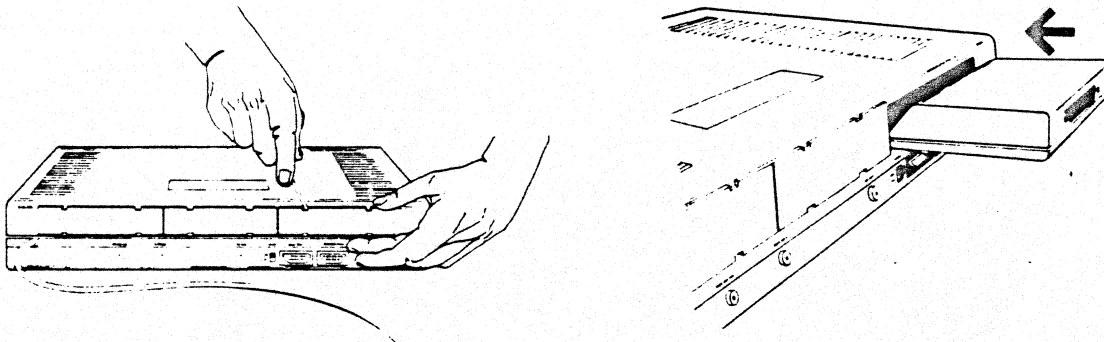


Figure 1-5. Installing Option Modules

To install a module, turn off the System Unit and unplug the power cord. Remove the port cover by inserting a small flat bladed screwdriver or similar object between the top cover and one of the slots provided. This will release the plastic lock tab and allow you to pull out the module cover. Do not pry the port cover at another place other than the slots or you may break the plastic cover.

Insert the module into the module port, the narrow edge first, so that the module label faces down. Gently push until the plastic lip on the bottom of the module snaps into place. Next, attach the device cable for whatever peripheral device you want connected to your system.

When a port is not being used the cover must be replaced. The covers are required for FCC certification and also to keep out dust and foreign particles.

*** CAUTION ***

Before removing or installing a module be sure to turn off the power to the MINDSET and remove the power cord from the outlet. Installing or removing the module while power is on may cause damage to the computer and the module.

1.6.5 MINDSET COMPUTER OPTIONS

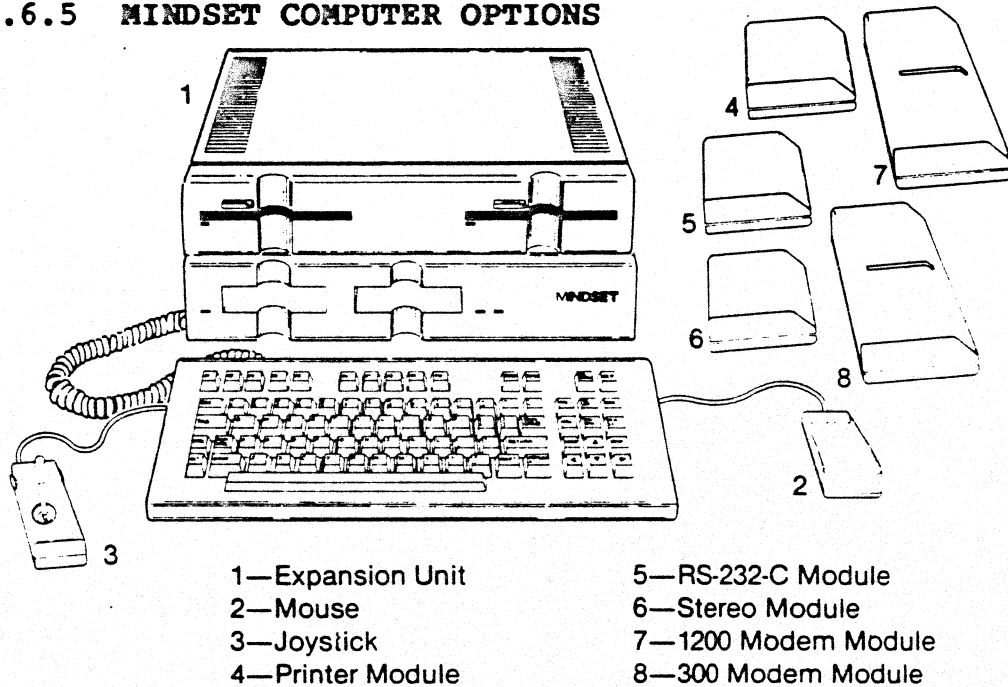


Figure 1-6. MINDSET Options

- Expansion Unit I - Contains 96K bytes of user RAM, 1 built-in double-sided/double-density 360K floppy drive, and 3 I/O ports.
- Expansion Unit II - Contains 224K of user RAM, 2 built-in 360k floppy drives, and 3 I/O ports.
- MINDSET Mouse - The Mouse is a precision graphics input device. It is used for cursor movement, menu selection, drawing and various graphic applications. It attaches to the side connector on the keyboard.
- MINDSET Joystick - The Joystick is a hand-held cursor position control unit for use with education and entertainment programs. It attaches to the keyboard connector.

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Printer Module - Provides a convenient interface for a parallel printer. Uses a single width port.

RS-232-C Module - This option provides an interface to many peripheral devices which have the RS-232-C interface. Devices such as serial printers, and plotters can be connected. Uses a single-width port.

Stereo Sound Module - This module allows the MINDSET to play sound on a stereo amplifier. Uses a single-width port.

1200 Modem Module - Allows telecommunications at 1200 baud. Uses a double-width port.

300 Modem Module - Allows telecommunications at 300 baud. Uses a double-width port.

1.6.6 INSTALLING THE EXPANSION UNIT

Before installing the Expansion Unit, unplug the power cord. Then remove the plastic hatch cover on the System Unit's top cover.

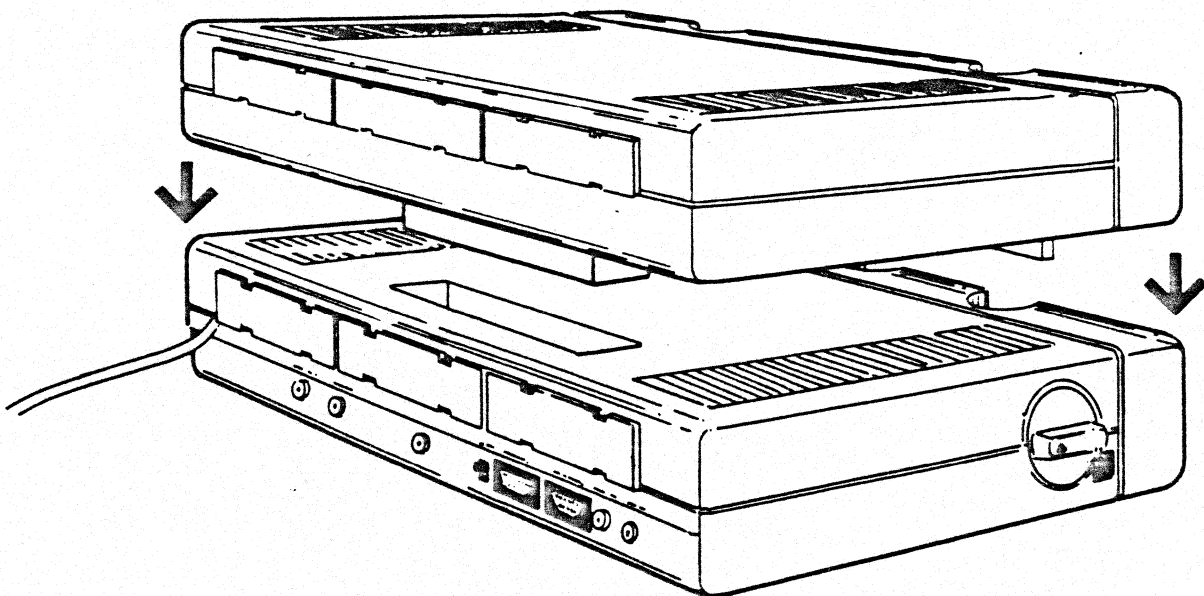


Figure 1-7. Attaching the Expansion Unit

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To install the Expansion Unit, simply align it on top of the System Unit and press lightly down (the mere weight of the Expansion Unit will almost cause it to seat itself). When the unit is properly installed there is about 3/8" between the two units. Never use excessive force when installing the Expansion Unit. If any difficulty arises, remove the Expansion Unit and inspect the pins on the bottom. Be sure none of them are bent. If the covers of the System Unit and Expansion Unit are not properly installed the Expansion Unit may not properly align.

CHAPTER TWO

GENERAL DESCRIPTION

CHAPTER TWO
GENERAL DESCRIPTION

2.1 SCOPE OF CHAPTER

This chapter describes the hardware of the MINDSET Personal Computer. Block diagrams are used to help explain the architecture of the MINDSET computer.

2.2 OVERVIEW OF THE HARDWARE

The MINDSET Computer has two main parts, the System Unit and the Keyboard. In addition, an Expansion Unit may be added to the MINDSET System Unit. A brief discussion of the key features of these follows.

2.2.1 THE SYSTEM UNIT

The MINDSET Personal Computer is a 16-bit computer that uses advanced technology to provide sophisticated bit-mapped graphics. Sound capabilities are enhanced with custom chips. Speed and reliability are significantly improved over 8086/8088 based systems. The modular design of the MINDSET Personal Computer makes it easy to service. Key features of the System Unit are:

Main Processor o Advanced performance Intel 80186

Coprocessors o Supervisory Processor
o Sound Processor (custom)
o Display Processor (VLSI custom graphics)
o Graphics Processor (VLSI custom graphics)

Video o Built-in TV/RF Modulator
o Composite Video
o RGB Video
o External Sync

Memory o 32k Bytes User RAM
o 32k Bytes Video RAM
o 32k ROM Operating System

I/O o 3 I/O Ports
o Option Modules:
Parallel Printer
RS-232-C
Stereo Sound
1200 Baud Modem
300 Baud Modem
o 2 Cartridge Slots for:
ROM Cartridge
NVRAM Cartridge
ROM/NVRAM Cartridge

GENERAL DESCRIPTION

- Miscellaneous
- o Real Time Clock
 - o Built-in Self Diagnostics
 - o Built-in Configuration program
 - o Aux-In and Aux-Out

2.2.2 KEYBOARD

The MINDSET Keyboard is custom designed for MINDSET. The MINDSET keyboard is attached to the System Unit by a coiled six-foot cable. It is very light and can easily be placed in the operators lap. In addition the keyboard has connectors for a MINDSET Joystick and Mouse. The main features of the keyboard are:

- o 84 Keys (total)
- o Auto Repeat
- o Programmable (soft keys)
- o 10 Function Keys
- o MINDSET Joystick and Mouse Connectors
- o System On/Off Power Switch

2.2.3 EXPANSION UNIT

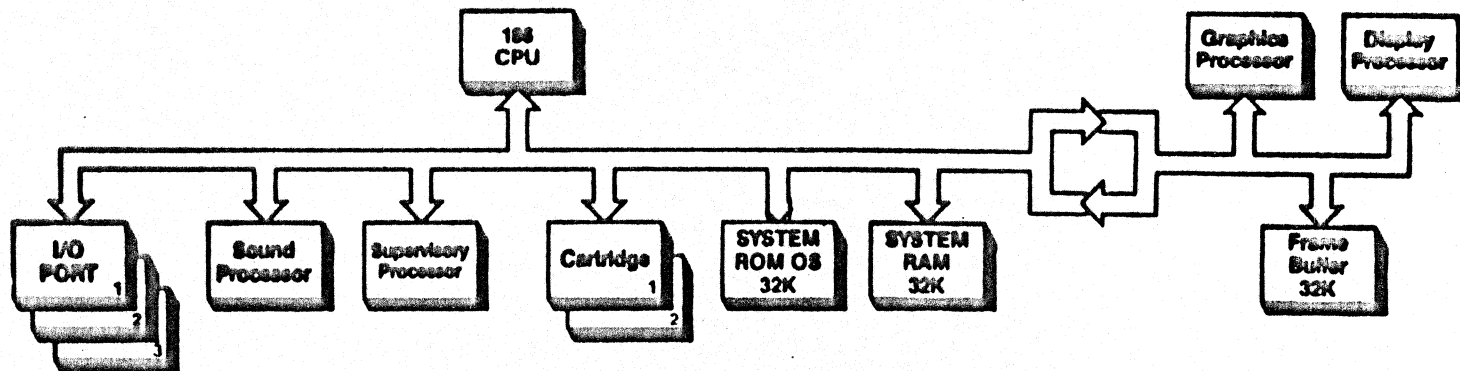
The Expansion Unit provides up to two floppy disk drives with controller, 96K bytes of user RAM, and three additional I/O ports. In addition, 128K bytes of RAM may be added for a total of 256K bytes of user RAM (including the System Unit). The Expansion Unit is easily attached to the top of the System Unit; no cables are required. Up to 25 pounds may be placed atop the Expansion Unit. Key Features of the Expansion Unit are:

- o 96K of RAM
- o Floppy Disk Controller (Intel 8272)
- o 1 Built in Floppy Drive. 360K Bytes, double-sided, double-density format.
- o 3 I/O Ports
- o Options: 128K Bytes of RAM
2nd Floppy Disk Drive

2.3 SYSTEM ARCHITECTURE

Simplified block diagrams of the MINDSET Personal Computer are used to describe the computer's hardware. Each section of System Unit and Expansion Unit shown in the diagrams are explained. Figure 2-1 illustrates the System Unit while figure 2-2 shows the System Unit with the Expansion Unit attached.

SYSTEM ARCHITECTURE



GENERAL DESCRIPTION

Figure 2-1. System Unit Architecture

GENERAL DESCRIPTION

2.3.1 SYSTEM UNIT DESCRIPTION

As shown in figure 2-1 the MINDSET computer is made up of 10 functional blocks which are linked to the System Bus or the Graphics Bus. The System Bus provides 16 data and 20 address multiplexed lines, while the Graphics Bus provides 16 data lines. A discussion of each functional block follows.

186_CPU

The MINDSET Computer system is based on Intel's third generation 16-bit 80186 microprocessor. The Very Large Scale Integration (VLSI) of the 186 reduces the chip-count of the MINDSET Computer and improves the reliability. The 186 CPU features 14 registers, a programmable interrupt controller, DMA controllers, and a bus bandwidth interface speed of 4 Mbyte/sec. It is object code compatible with 8086/8088 software while adding 10 additional machine instructions.

I/O_PORTS

The 3 Input/Output Ports enable the system to accept information from an I/O device or to transmit information to an I/O device such as a printer or modem. The three I/O Ports can support three single-width I/O modules or one single-width I/O modules and one double-width module. Optional Modules installed in the MINDSET are automatically detected by the Operating System.

SOUND_PROCESSOR

The Sound Processor of the MINDSET Computer provides sound for both music and game play. The 80186 microprocessor directs the Sound Processor by placing values in the registers of the Sound Processor. The optional Stereo Module contains a second Sound Processor which is identical to the on-board Sound Processor.

The MINDSET ROM OS provides four basic modes to enable a programmer to control the on-board Sound Processor and the optional Stereo Module. Three voice modes and a direct mode provide programming tools to produce a wide range of sounds.

SUPERVISORY_PROCESSOR

The Supervisory Processor is an Intel 8042 microprocessor. It handles the keyboard, the internal clock, the indicator lights (LED's), the beeper (an audio prompt available to application programs), the system configuration screen (a menu from which the system configuration and parameters are established), and other miscellaneous signals.

GENERAL DESCRIPTION

CARTRIDGES

The MINDSET Computer provides compact, convenient program and data storage in the form of removable memory cartridges. These cartridges can contain NVRAM, ROM, or both types.

NVRAM Cartridges are powered by a rechargeable internal battery. The system recharges this battery each time the cartridge is plugged into the computer. The battery can maintain the RAM contents for up to 5 months without recharging. Recharging a completely discharged cartridge takes 24 hours. The computer can be either turned on or off during the charging.

ROM_OS

The Read Only Memory Operating System of the MINDSET Computer directly supports all hardware and device access. The MINDSET Computer ROM OS is accessed via software interrupts, and is entry point compatible with the IBM PC ROM OS. Consequently, many programs designed to run on the IBM can run on the MINDSET Computer. The ROM also contains entry points which implement the raster op functions.

SYSTEM_RAM_32K

The MINDSET Computer base unit includes 32K bytes of user-addressable Random Access Memory on the system board. This RAM is solely available to the user and does not share this memory area for graphics or other system dedicated hardware.

GRAPHICS_PROCESSOR

The Graphics Processor addresses the Frame Buffer memory and does the pixel mathematics necessary in the creation and movement of graphic objects.

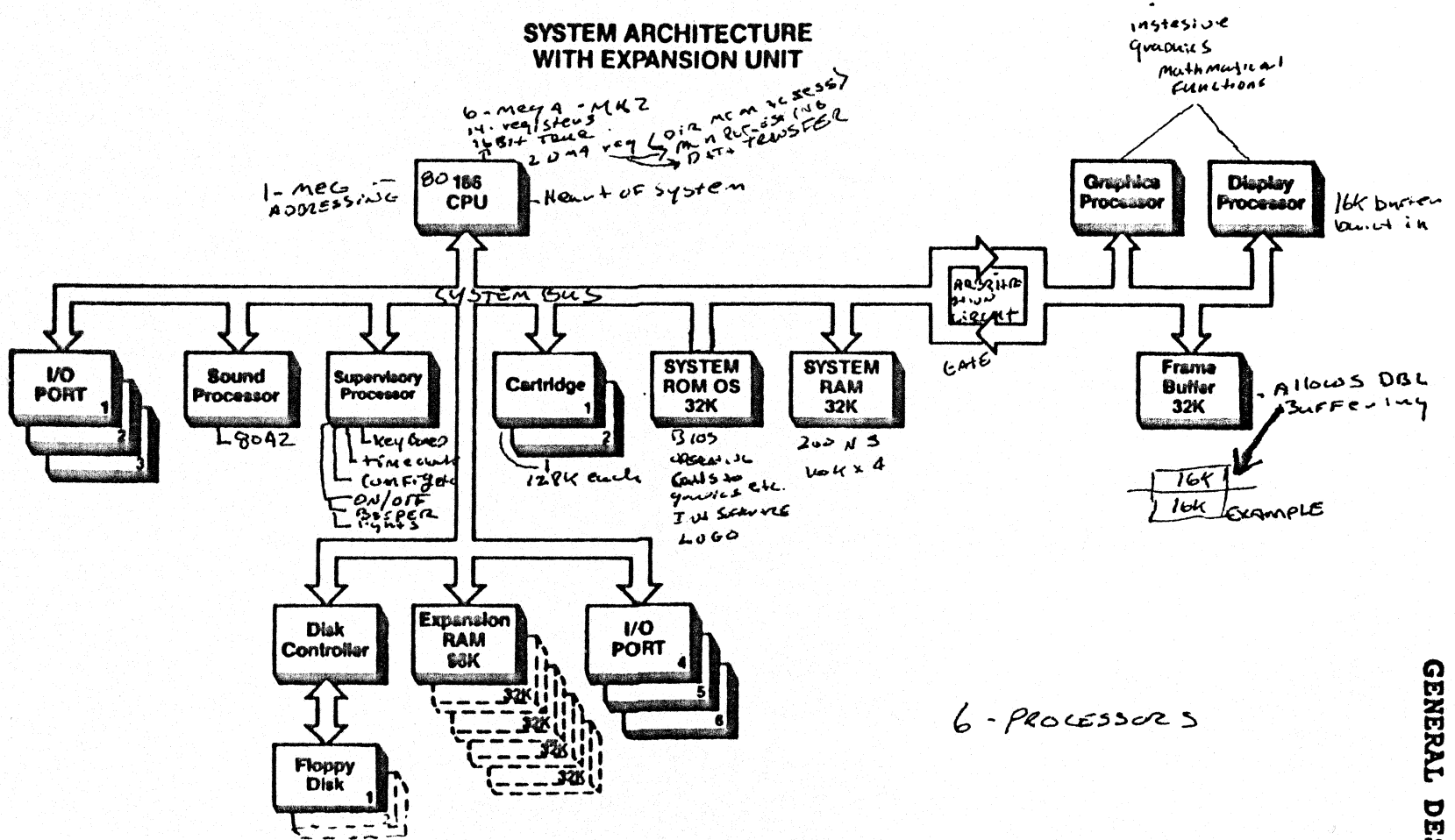
DISPLAY_PROCESSOR

The Display Processor retrieves the encoded pixel information from the Frame Buffer, decodes it, selects the appropriate color information, and provides the appropriate signals to drive a display device.

FRAME_BUFFER

The base unit includes 32K bytes of RAM in the Frame Buffer to support the Display Processor. The Frame Buffer is also accessible by the 186 and the Graphics Processor.

SYSTEM ARCHITECTURE WITH EXPANSION UNIT



GENERAL DESCRIPTION

Figure 2-2. System Architecture with Expansion Unit

GENERAL DESCRIPTION

2.3.2 EXPANSION UNIT

As shown in Figure 2-2 the Expansion Unit attaches directly to the main System Bus. The Expansion Unit has additional user RAM, a Disk Controller, 1 or 2 Floppy Drives, and 3 I/O Ports. Refer to figure 2-2 for the following discussions.

DISK_CONTROLLER

The Disk Controller is an Intel 8272 Floppy Disk Controller on a chip. It controls all disk operations including data transfers between the drive and system memory.

FLOPPY_DISK_DRIVE

The Floppy Disk Drive provides mass storage capabilities for the MINDSET. The drive is double-sided, double-density, and operates with standard soft-sector 5.25" diskettes. A diskette can store up to 360K bytes of data. The Expansion Unit contains one drive while an additional drive may be added. Unique drive addresses are established through the disk controller rather than the physical address jumpers in the disk drive.

EXPANSION_RAM

The Expansion Unit contains 96K bytes of RAM. Up to 128K may be added to the Expansion Unit (in 32K byte increments). Total user RAM, including the System Unit and Expansion Unit, is 256K bytes.

I/O_PORTS

The Expansion Unit has 3 additional I/O Ports. Three single-width modules or one single-width and one double-width module may be installed in the Expansion Unit.

CHAPTER THREE

DIAGNOSTICS

CHAPTER THREE DIAGNOSTICS

3.1 SCOPE OF CHAPTER

This chapter describes both the Self Diagnostics and the Advanced Diagnostics. The Self Diagnostics are built into the MINDSET Computer, while the Advanced Diagnostics are loaded into the MINDSET memory via diskette or cartridge. Procedures for running and interpreting test results are provided in this chapter.

3.2 SELF-DIAGNOSTICS

When the MINDSET Personal Computer is turned on the red LED on the System Unit will light up. The MINDSET power-up screen appears (see figure 3-1).

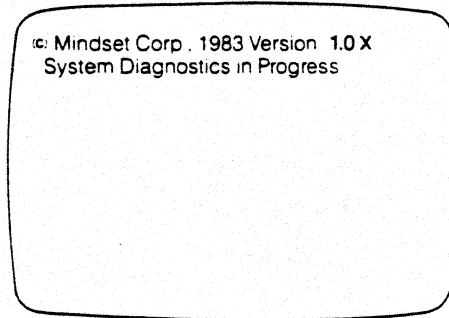


Figure 3-1. The MINDSET Power-up Screen

The message indicates that the MINDSET Computer is running the self-diagnostics. These diagnostics are designed to test the most critical circuits in the computer. The diagnostic program is located within the ROM on the System Unit Printed Circuit Assembly (PCA). Possible error messages that may occur during the self-diagnostics are:

- o System RAM Test Failed
- o System ROM Test Failed
- o Cartridge ROM Test Failed
- o Display RAM Test Failed
- o Expansion RAM Test Failed
- o System Timer Test Failed
- o DMA Controller Test Failed
- o Printer Module Test Failed
- o RS-232-C Module Test Failed
- o Real Time Clock Test Failed
- o Modem Module Test Failed
- o Graphics Coprocessor Test Failed
- o Display Processor Test Failed

DIAGNOSTICS

The self-diagnostics take 10-15 seconds to complete. A successful result of the self-diagnostics allows the MINDSET to do one of the following:

- o If no cartridges are installed and no bootable floppy diskettes are installed, the MINDSET logo appears on the screen. After 12 seconds it begins to rotate.
- o If a cartridge or bootable diskette is installed the MINDSET will access one of these depending on system configuration.

NOTE:

If the MINDSET attempts to access a non-bootable diskette during power-up the results will be an error message:

Non-System disk or disk error..
Replace and strike any key when ready

This means that a diskette without MS-DOS or a corrupted version of MS-DOS is present in the floppy disk drive.

Further details regarding the power on sequence is included in Chapter Four, Fault Isolation.

The Self Diagnostics will trap and indicate most system failures. However, these diagnostics are not the final word in deciding what, if anything, is wrong with the computer. MINDSET has provided, in addition to the Self Diagnostics, a set of Advanced Diagnostics which provide a more thorough test of specific areas of the computer. These diagnostics are available on diskette or cartridge.

NOTE:

The MINDSET Computer should not be turned on immediately after turning off the computer. After turning off the computer, wait at least 5 seconds before turning it back on.

3.3 ADVANCED DIAGNOSTICS

The Advanced Diagnostic programs are provided on diskette or cartridge. There are four separate tests:

- o I/O Trap Test
- o Expansion RAM Test
- o Floppy Drive Test
- o Keyboard Test

Chapter Four, Fault Isolation, has a troubleshooting flowchart which directs the Service Technician as to when to run these tests.

CARTRIDGE

The instructions included in this chapter are described for the diskette version and will include the DOS commands. The instructions for cartridge are identical except that the DOS commands are to be ignored. To run the cartridge version simply set the load priority to Cartridge Slot 1 (via the SYS CONFIG key). Insert the diagnostic cartridge into slot 1 and power on the MINDSET. The diagnostic menu will appear on the screen immediately after the Self-Diagnostics are completed.

DISKETTE

To begin the diagnostics, boot the Advanced Diagnostic from drive A. The A> prompt appears on the screen. The diagnostics are loaded into the MINDSET by entering 'DIAG' and then pressing the RETURN key. Upper or lower case characters may be entered.

```
A> DIAG [Return]
```

The screen displays:

```
DIAGNOSTICS: Enter code to make selection
D=disk drive tests
K=keyboard tests
M=memory tests
T=I/O trap tests
```

To run one of the four tests, simply press the corresponding key and the test is ready to start. Refer to the following sections for further instructions on each test.

3.3.1 I/O TRAP TEST

The I/O Trap test checks the MINDSET ROM and associated circuits for proper address vectoring. This test should be the first one run before all other tests. If the I/O Trap test fails, other test indications may not be valid until this error is corrected. This test is a pass or fail test which is easy to run. To execute this test:

- 1 - Boot the Diagnostic Floppy Diskette.
- 2 - With the A> prompt on the screen type 'Diag' and press RETURN. The diagnostic menu will appear on the screen.
- 3 - Select 'T' from the diagnostic menu.

The screen displays:

```
I/O TRAP TEST
Test in Progress
```

- 4 - After about 10 seconds the screen displays:

```
Test Complete
```

Should an error be detected during the test an error message will be displayed. For example:

```
Trap FAILED to occur for OUT XXXX
      or
Trap FAILED to occur for IN XXXX
```

XXXX is a hexadecimal address.

If the test fails, the problem is most likely in the System ROM (U59/U60) or the 80186 microprocessor(U78). If after replacing these, the test continues to fail, then the System Unit PCA should be replaced.

To exit the I/O Trap Test press 'x' and the diagnostic menu will reappear on the display.

DIAGNOSTICS

3.3.2 EXPANSION RAM TEST

The purpose of this test is to check the RAM throughout the System Unit and the Expansion Unit. A failure is displayed by designating the failing chip, i.e., U82. To run the RAM test:

- 1 - Boot the Diagnostic Floppy Diskette.
- 2 - With the A> prompt on the screen type 'Diag' and press RETURN. The diagnostic menu will appear on the screen.
- 3 - From the diagnostic menu select 'M'

The screen displays:

```
A = Automatic
M = Manual
R = Data Retention testing
```

- 4 - Press 'A' for automatic testing. ('M' and 'R' options will be discussed later in this section).

The screen displays:

```
Enter RAM Memory Size code:
0=128K 1=160K 2=192K 3=224K 4=256K
```

- 5 - Enter 0-4 depending on the number of 32K memory banks installed in the Expansion Unit. Enter '0' for no add-on Segments, '1' for one add-on Segment, etc. The test will write a marching bit pattern throughout selected memory.

The screen displays:

```
Test with Data Pattern=0000
Segment 0400 0800 0C00 1000 1400 .... 3C00
Test with Data Pattern=0001
Segment 0400 0800 0C00 1000 1400 .... 3C00
Test with Data Pattern=0002
(etc).
```

DIAGNOSTICS

The test will run indefinitely until it finds an error or it may be stopped by pressing the ESC key. After pressing the ESC key the test will end after the last memory segment is checked for the current bit pattern. Then press 'x' to return to the diagnostic menu. After each complete pattern is tested a pass count will be displayed.

Upon finding an error the screen will display:

--> Fault in chip U82

The test will continue to run after displaying the error. When a memory failure occurs, note the chip designation (i.e., U82) on a piece of scratch paper. Turn off the computer and **remove the power cord from the wall outlet.** Remove the top cover of the Expansion Unit and replace the failing RAM chip. There are sixteen socketed chips with unit designations as shown in figure 3-2.

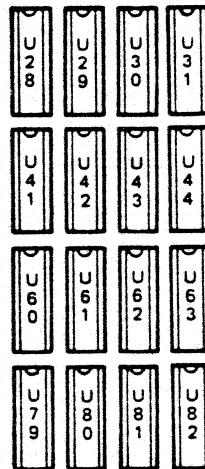


Figure 3-2. Expansion RAM Memory Chip Locations

The M (manual) and R (retention) options at the beginning of the RAM test are not normally used except in special situations. The 'M' option allows a technician to loop on writing a specific pattern to one memory location. The 'R' option runs identical to automatic testing, but inserts a delay before reading back a data pattern. This test takes longer to run, but could possibly find some difficult errors which do not appear with normal testing. These options are available in order to provide a complete diagnostic tool, but most problems can be resolved by using the Automatic option.

3.3.3 KEYBOARD TEST

The Keyboard test provides a test of all 221 keys including the shifted, control, and alternate keys. The Mouse and Joystick are included with the Keyboard test. For proper testing procedure the Keyboard test should be ran once without a Mouse or Joystick and then ran a second time with them installed. Before installing a Mouse or Joystick turn off the power switch on the rear of the keyboard.

To run the tests:

- 1 - Boot the Diagnostic Floppy Diskette.
- 2 - With the A> prompt on the screen type 'DIAG' and press RETURN.
- 3 - Select 'K' from the menu. The test instructions will appear on the screen. To start the test press any key.
- 4 - Check each key by depressing the key and look for the indicator to appear on the screen next to the coinciding character. If the indicator appears at the wrong character or no indicator appears on the screen then the key is probably not working. However, continue testing the rest of the keys and note which key(s) fails.
- 5 - The Mouse and Joystick tests follow the key checks. These may be by-passed with CNTRL-PAGE UP keys. The system will return to the main diagnostic menu after bypassing these tests.
- 6 - Turn off the computer and Install the optional MINDSET Mouse in the right keyboard connector and Joystick in the left keyboard connector. Turn on the computer and restart the Keyboard Diagnostic.
- 7 - Use the keyboard diagnostic to spot check several keys for proper operation while the Mouse and Joystick are installed. Then use the CNTRL-PAGE UP keys to start the Mouse and Joystick tests. The instructions for the test appear on the screen.

The troubleshooting procedures for the keyboard are covered in Chapter Four.

3.3.4 FLOPPY DRIVE TEST

The Floppy Drive diagnostic checks the main functions of the drive: Read/Write, Seek, and Restore. Before running the disk drive diagnostic prepare a diskette by performing MS-DOS Format.

***** CAUTION *****

The drive diagnostic will write over any information on the diskette, so be sure the diskette does not have any important information stored on it.

To run the drive diagnostic:

- 1 - Boot the Diagnostic Floppy Diskette.
- 2 - With the A> prompt on the screen type 'Diag' and press RETURN. The diagnostic menu will appear on the screen.
- 3 - From the diagnostic menu select 'D'

The screen displays:

```
DISK DIAGNOSTIC
Specify drive (A or B): _
```

- 4 - Select the drive to be tested by pressing 'A' or 'B'. (A is the drive on the left and B is drive on the right as you face the front of the system).

The screen displays:

```
1= SHUGART SA455, 2= (other)
```

- 5 - Press '1' to select the SA455 Model.

The screen displays:

```
Place diskette in drive, then type any key _
```

- 6 - Insert the formatted blank diskette in the drive selected in step 4 and press any key.

The screen displays:

```
9 SECTORS, 2 SIDES
ENTER COMMAND CODE
S - seek time measurement
R - read sector W - write sector
V - verify disk X - exit
```


DIAGNOSTICS

7 - Press 'S' to select the seek time test.

The screen displays:

```
Track 1-77 SEEK Time (msec) =487
```

The typical seek time is between 465-505 ms.

8 - Press 'V' for the verify disk test. This test writes and reads a specified pattern to the disk on all tracks.

The screen displays:

```
DATA WORD = _
```

9 - Enter any 4 digits from 1-9 or A-F, i.e., 'FFFF'. The data pattern consists of 4 hexadecimal numbers. The data pattern usually is not important but is included to provide a complete diagnostic tool. After entering the data pattern press the Return key:

```
DATA WORD = ffff[Return]
```

The screen displays:

```
Writing Data...
```

The disk activity LED should light while the data pattern is being written to the disk. This takes about 1 minute. Once the data pattern is written the test begins reading back the various sectors and will report any discrepancies. Total time for one pass is approximately 5 minutes.

The screen displays:

```
‡ SECTORS READ: 0040 Data errors = 0000
‡ SECTORS READ: 0080 Data errors = 0000
‡ SECTORS READ: 00C0 Data errors = 0000
  (etc)
COMPLETED PASS 1
```

After each pass the data pattern is automatically incremented by 1.

If any errors are found during the Verify test proceed to the troubleshooting flowchart in Chapter Four. Note: there are no adjustments or serviceable parts in the floppy drive.

CHAPTER FOUR

FAULT ISOLATION

CHAPTER FOUR
FAULT ISOLATION

4.1 SCOPE OF CHAPTER

This chapter will provide the Service Technician with troubleshooting procedures. First, general troubleshooting techniques are discussed. Then, a complete troubleshooting flowchart for the MINDSET computer and options are provided. Following the flowchart are helpful descriptions for the power-up sequence, voltage checks, disk cleaning and other maintenance procedures.

4.2. GENERAL TROUBLESHOOTING TECHNIQUES

Troubleshooting the MINDSET Personal Computer is very simple compared to many of today's personal computers. The Service Technician need only identify and replace a defective part. There are no electrical or mechanical adjustments required. The illustrated parts lists in Appendix B is an invaluable aid in identifying the replaceable parts in the MINDSET.

Identifying the defective part could be a long and tedious task. However, the Troubleshooting Flowchart in this chapter is designed to decrease the time and possible frustration of locating a defective part. The flowchart is designed to "divide and conquer" problems. It does this by first identifying the major failing assembly (i.e., Expansion Unit) and proceeding toward the smallest failing part (i.e., a socketed RAM chip). It will indicate when to run Advanced Diagnostics, replace a part, look for a symptom, etc.

Once the defective part is located or isolated, Chapter Five provides the easiest and fastest method of replacing the failing part.

In addition to the Troubleshooting Flowchart some knowledge of the computers's power-on sequence can help in isolating defective parts. When the MINDSET is initially powered on it proceeds to turn on LEDs, starts the self-diagnostics and accesses the disk drive(s). In case of problems, a careful eye will be able to spot inconsistent sequences. A discussion at the end of this chapter will provide an understanding of the power on sequence.

FAULT ISOLATION

4.3 TROUBLESHOOTING FLOWCHART INTRODUCTION

In case of hardware failures the Troubleshooting Flowchart is designed to help isolate and identify a failing part in the MINDSET Personal Computer. The Flowchart is 17 pages long and is divided into logical pages. Each page of the Troubleshooting Flowchart is a separate section which addresses a particular problem. The header at the top of each page identifies the problem in question. The first page of the flowchart (TS-1) is the place to start with all problems. The first page can be thought of as the "direction finder" and will direct the Service Technician to the appropriate page for the problem.

It is important when using the flowchart to start on page TS-1. The pages following TS-1 (TS-2 through TS-17) are designed with this in mind. The pages following the flowchart are detailed procedures. These will be called out by the flowchart.

As with any flowchart of this nature it is designed to assist a Service Technician who is unfamiliar with the equipment. It is highly recommended that the Service Technician use this chart until considerable experience with the MINDSET has been gained.

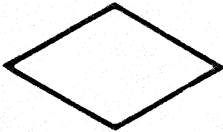
FAULT ISOLATION

Symbols used in the flowchart:



Operation_Box

Briefly describes actions that are to be performed.



Decision_Diamond

Asks a question and points to two possible routes which depend on the result of the question.



Off_Page_Connector

Points to the page to continue at.



On_page_connector

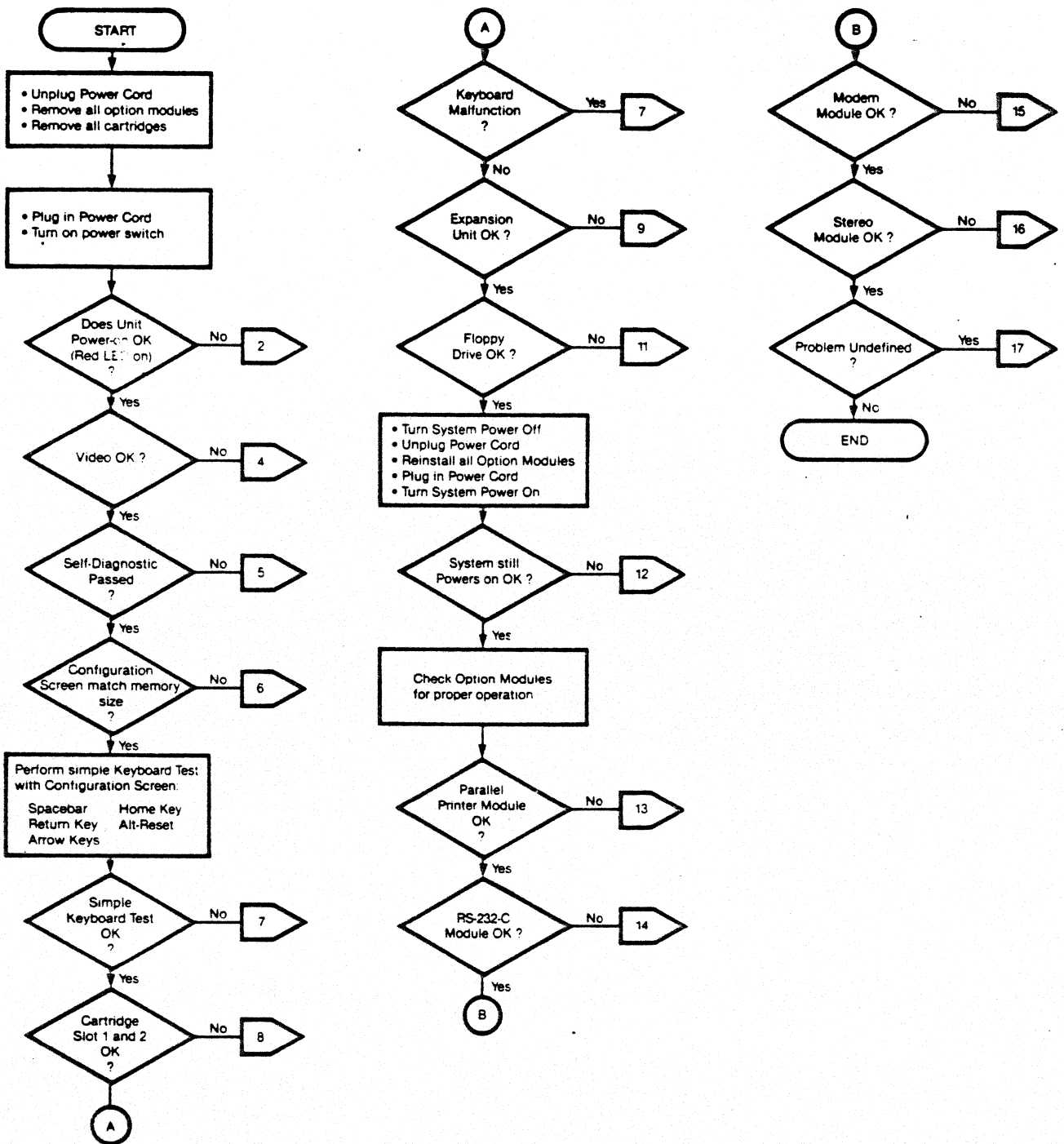
Points to the next place on the same page to proceed to.



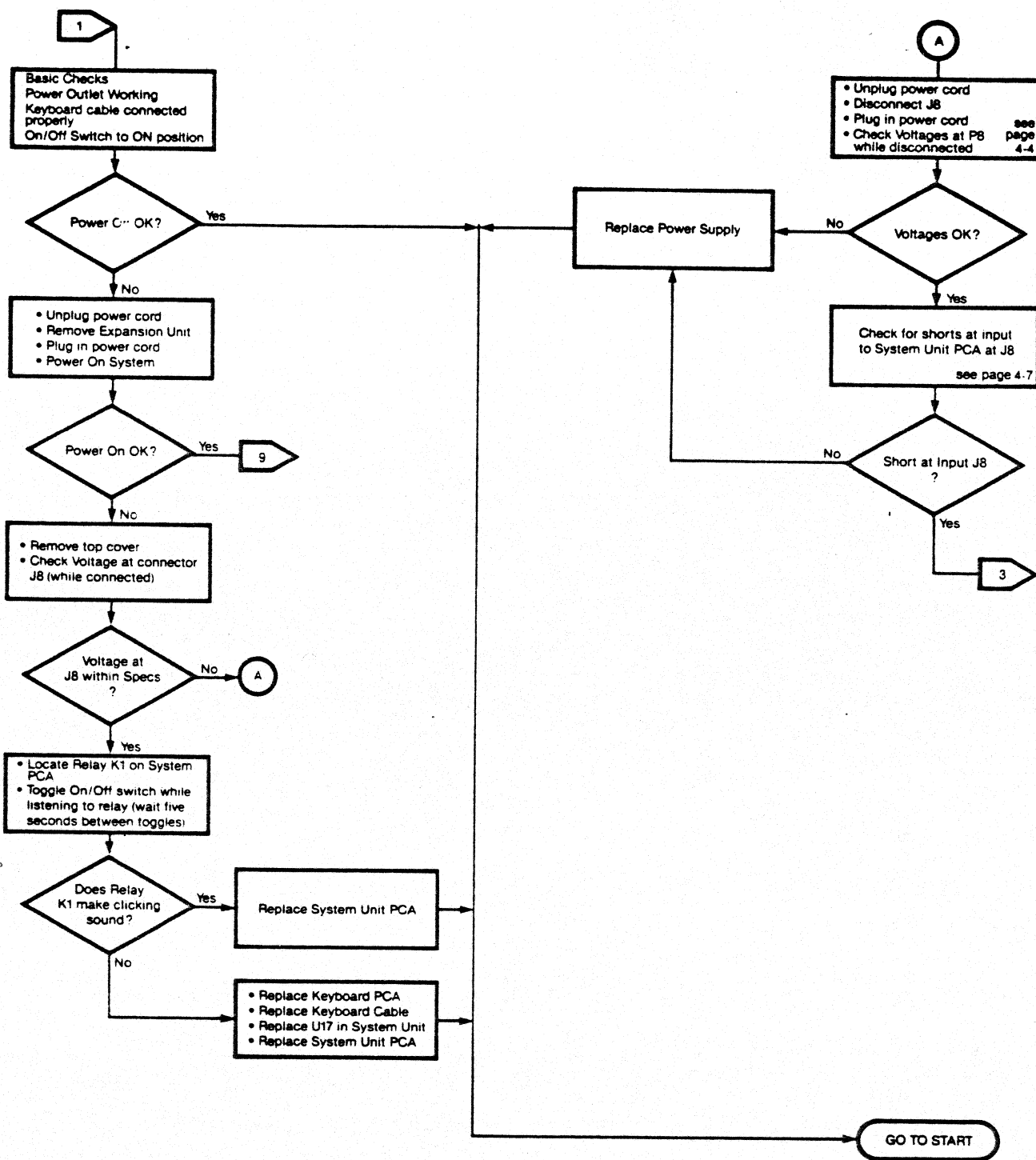
Terminator

End of current operation and direction to next operation or the END.

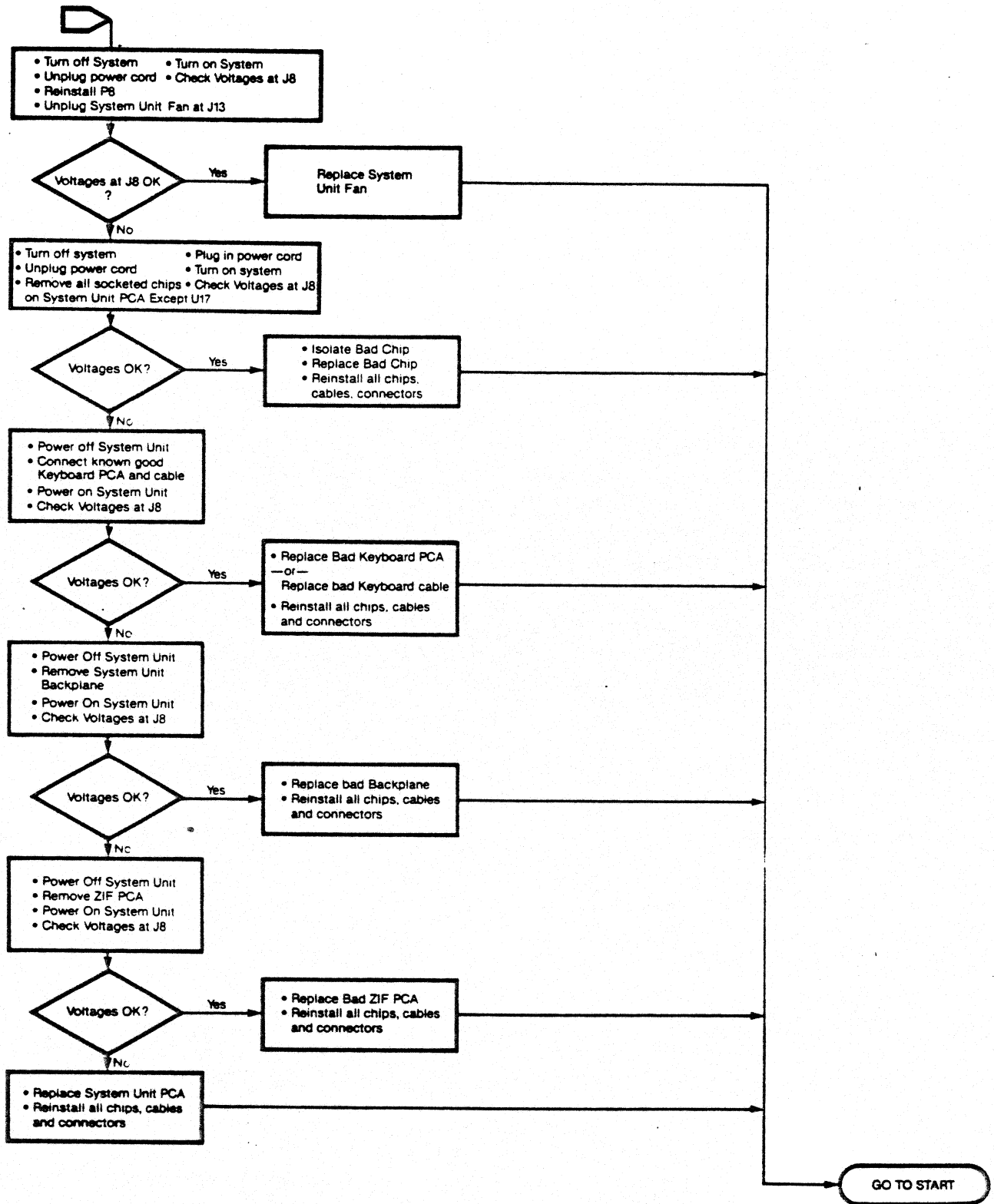
MINDSET SERVICE TROUBLESHOOTING



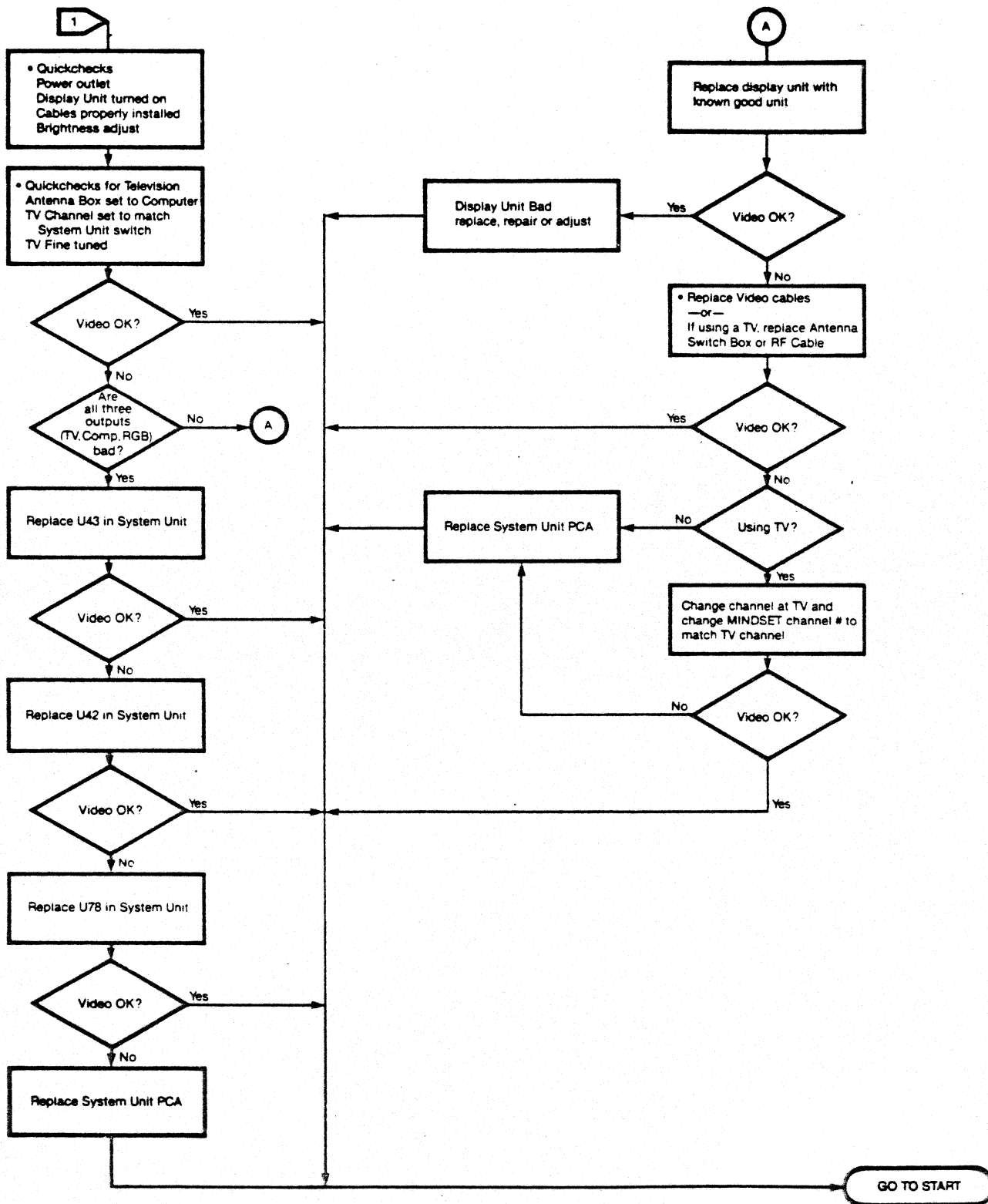
POWER PROBLEM (red LED not on)



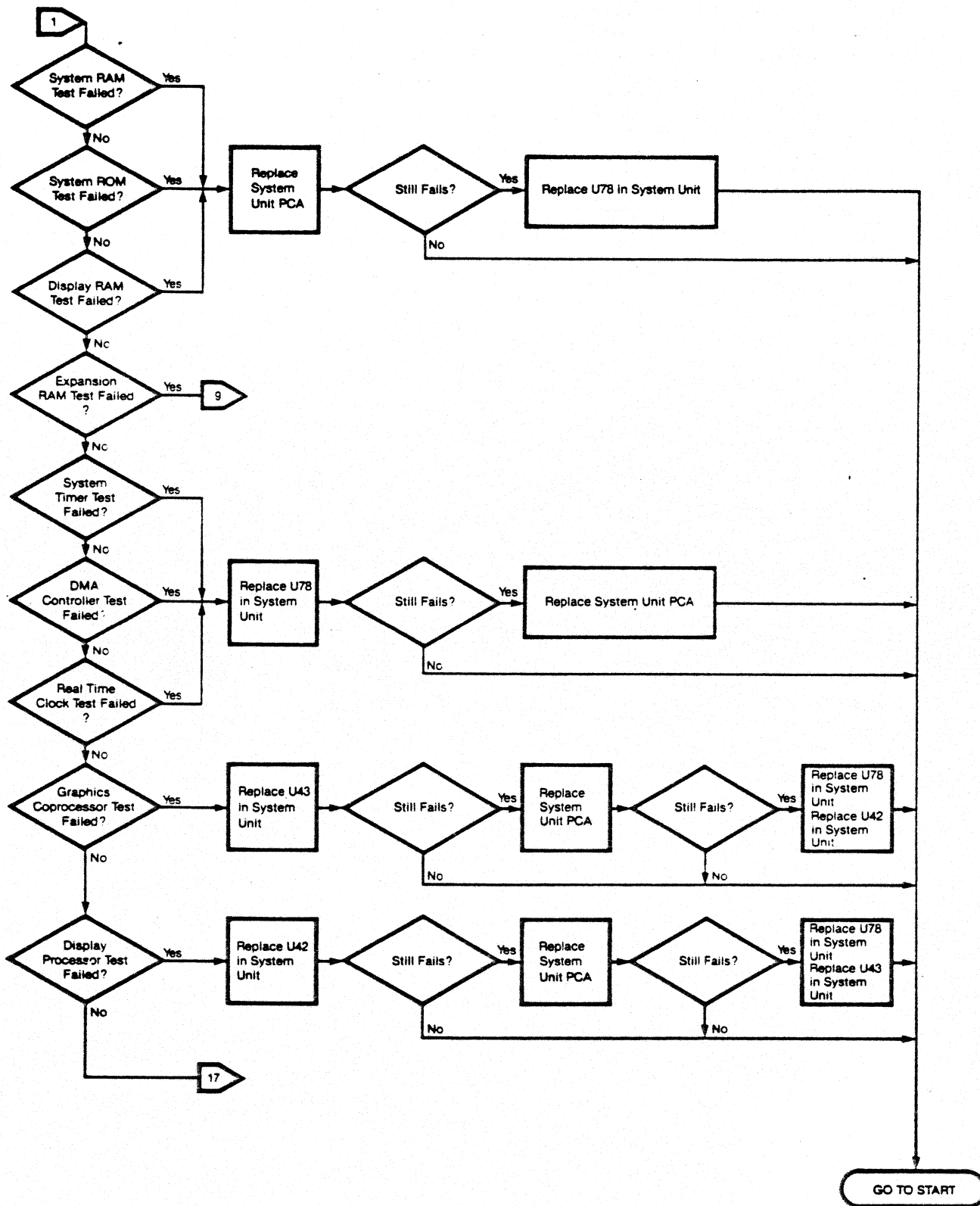
POWER ISOLATION — SYSTEM UNIT



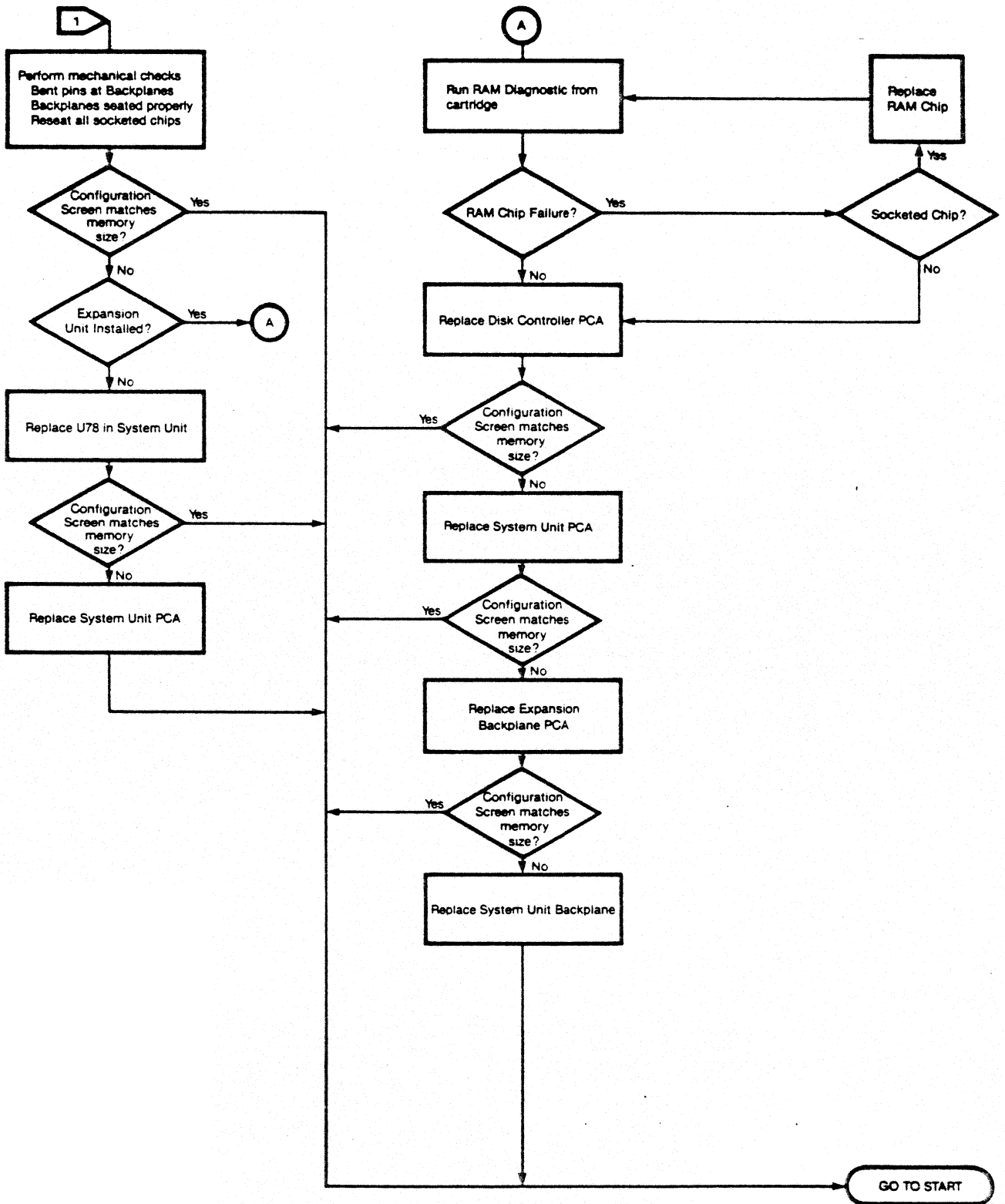
VIDEO PROBLEM



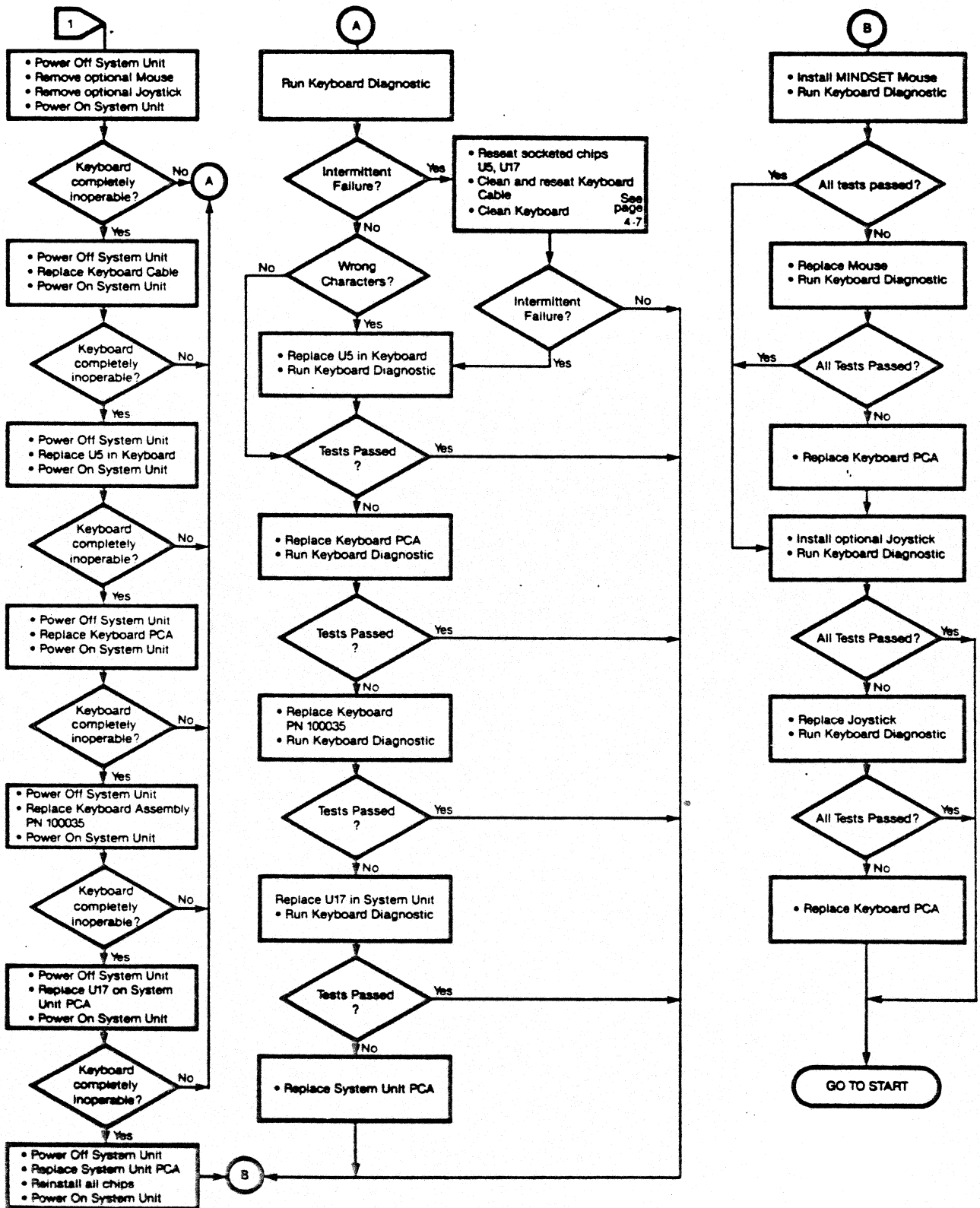
SELF DIAGNOSTIC FAILURE



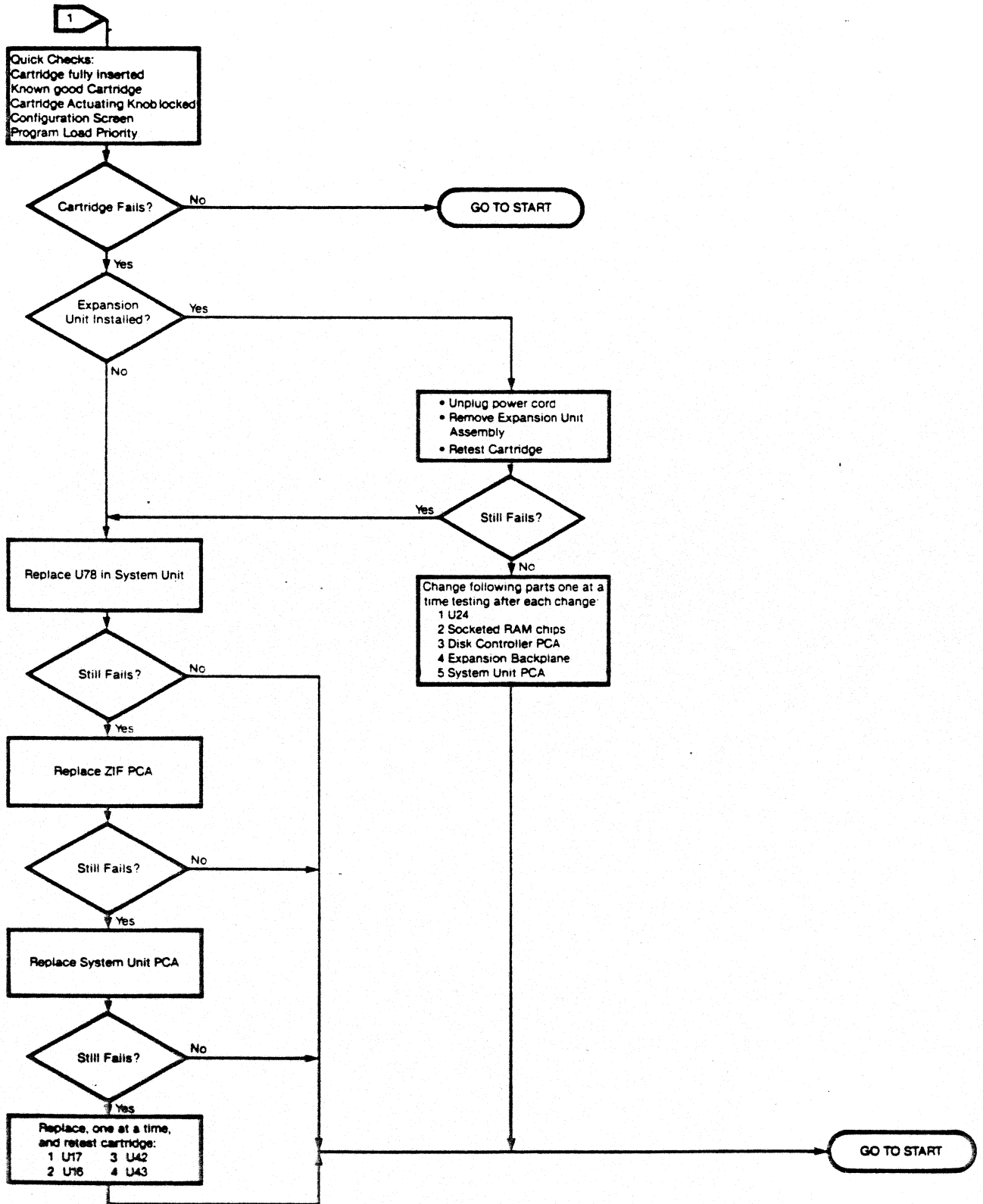
CONFIGURATION SCREEN PROBLEM



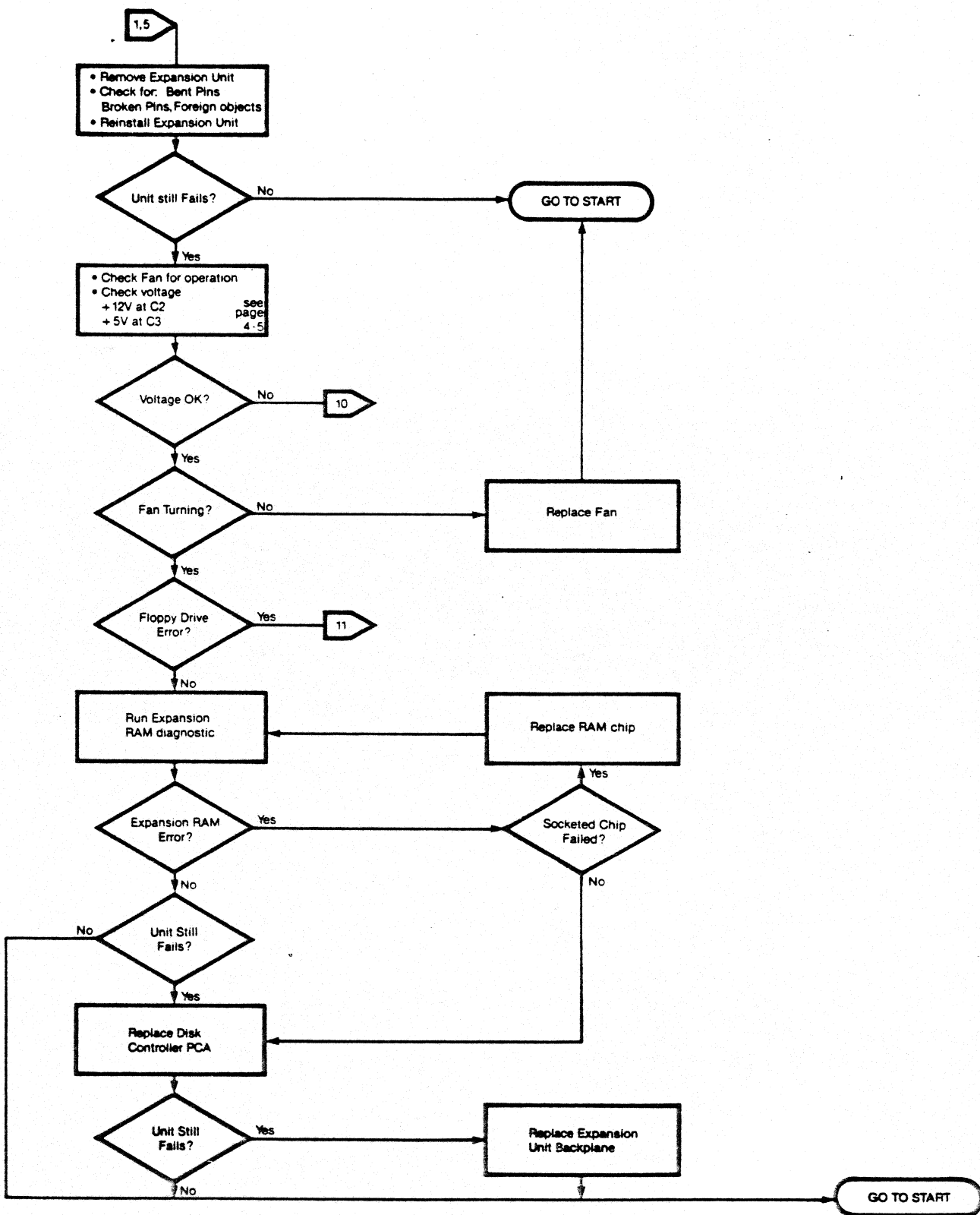
KEYBOARD PROBLEM



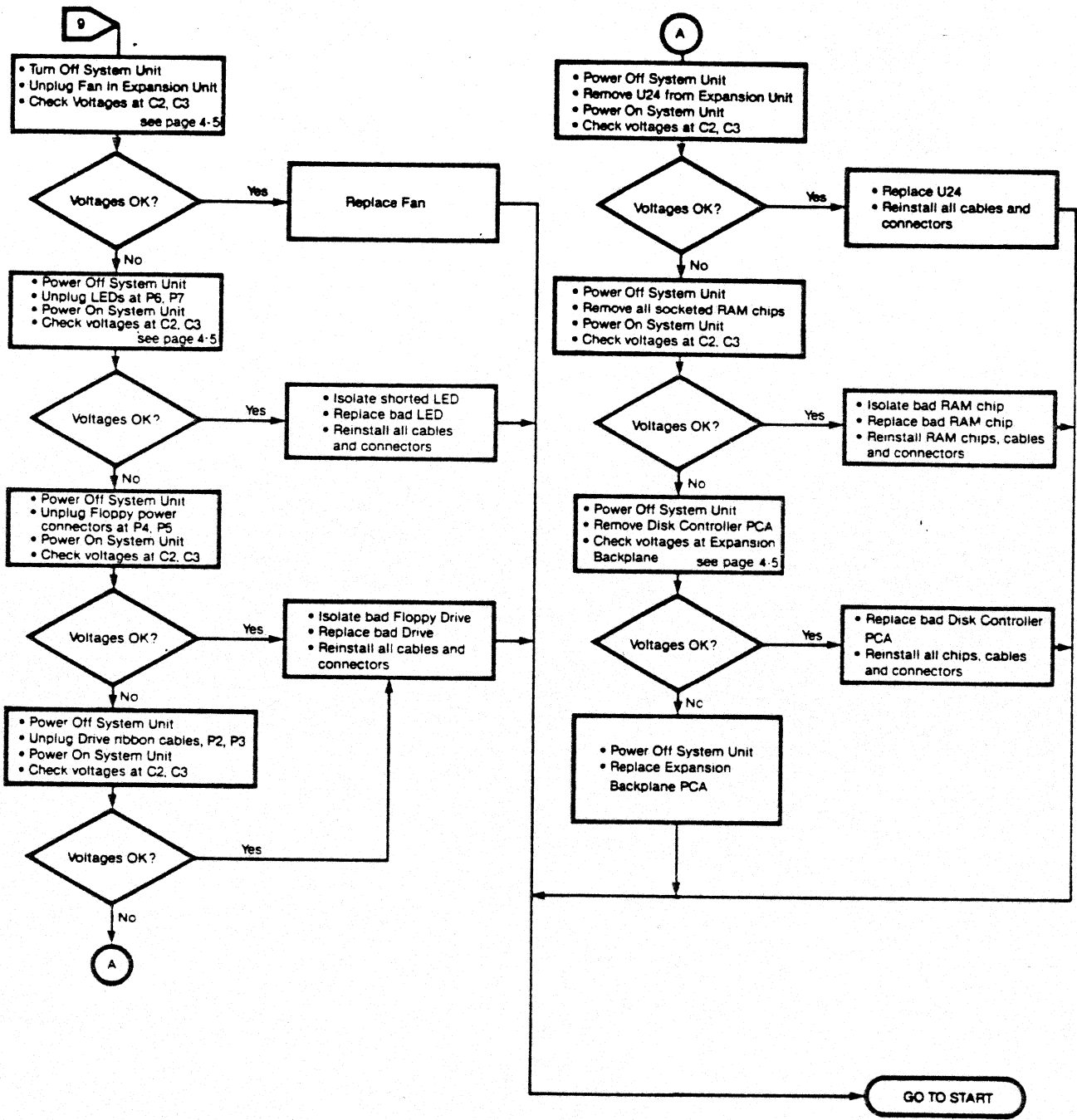
CARTRIDGE PROBLEM



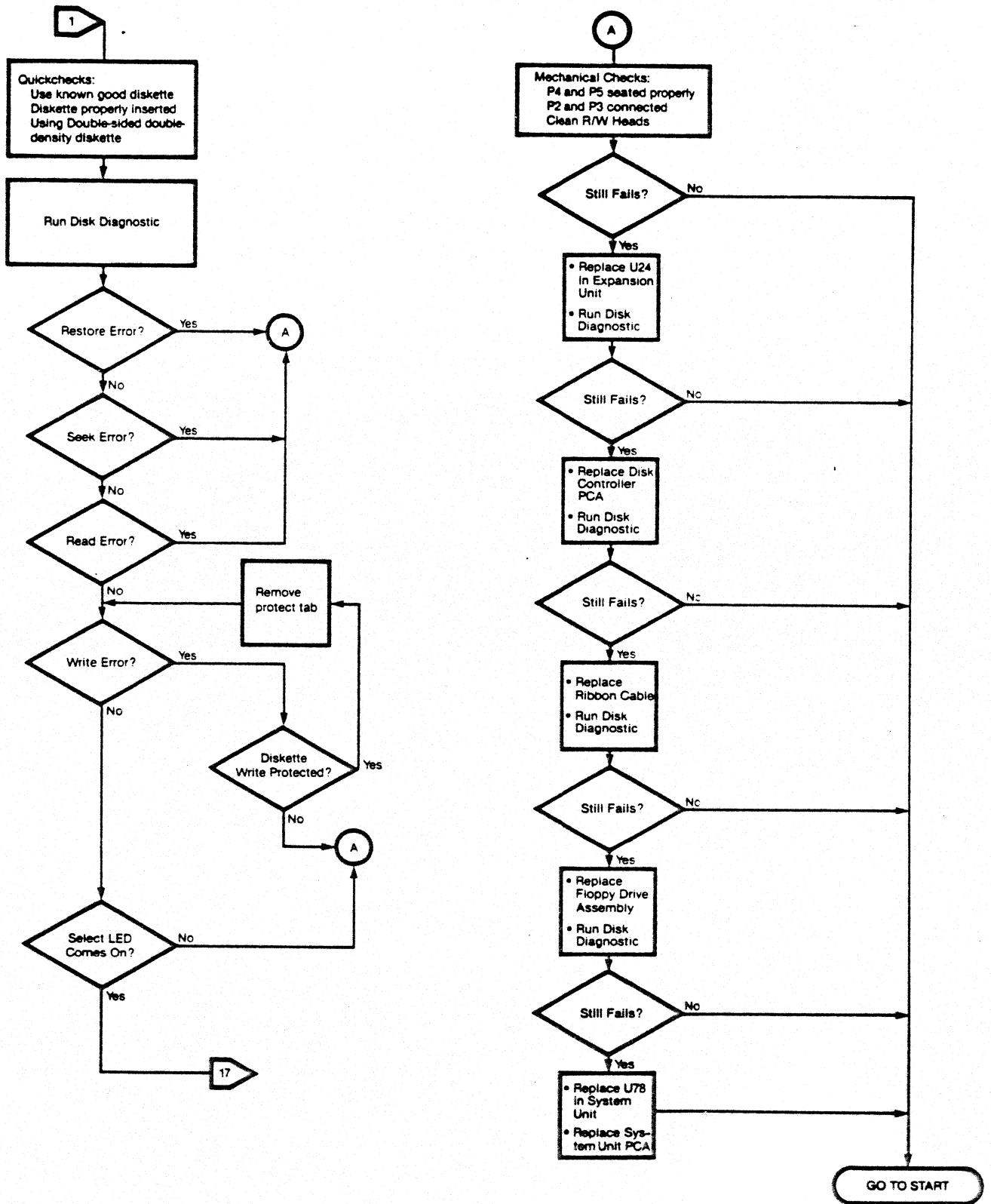
EXPANSION UNIT PROBLEM



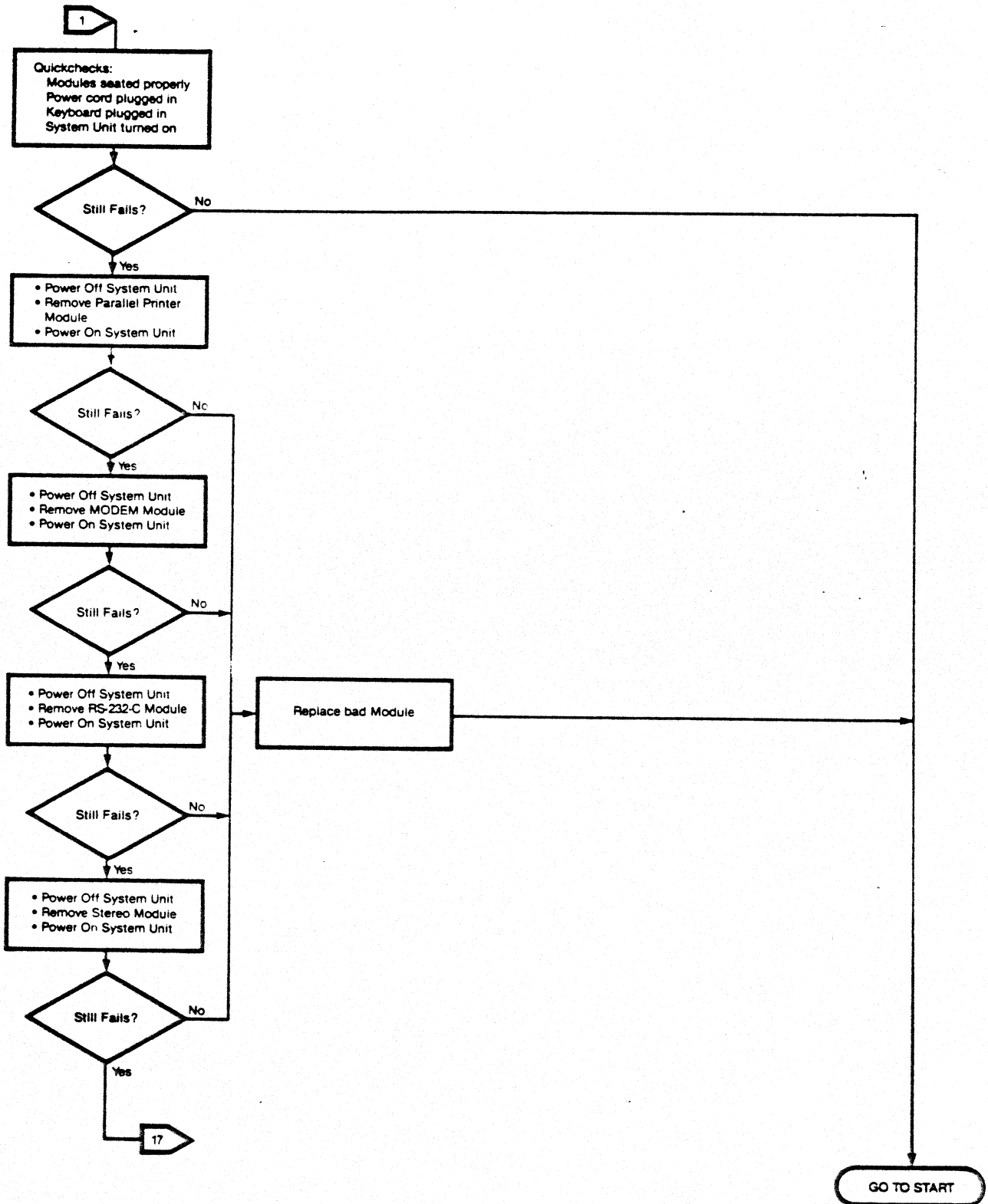
POWER ISOLATION—EXPANSION UNIT



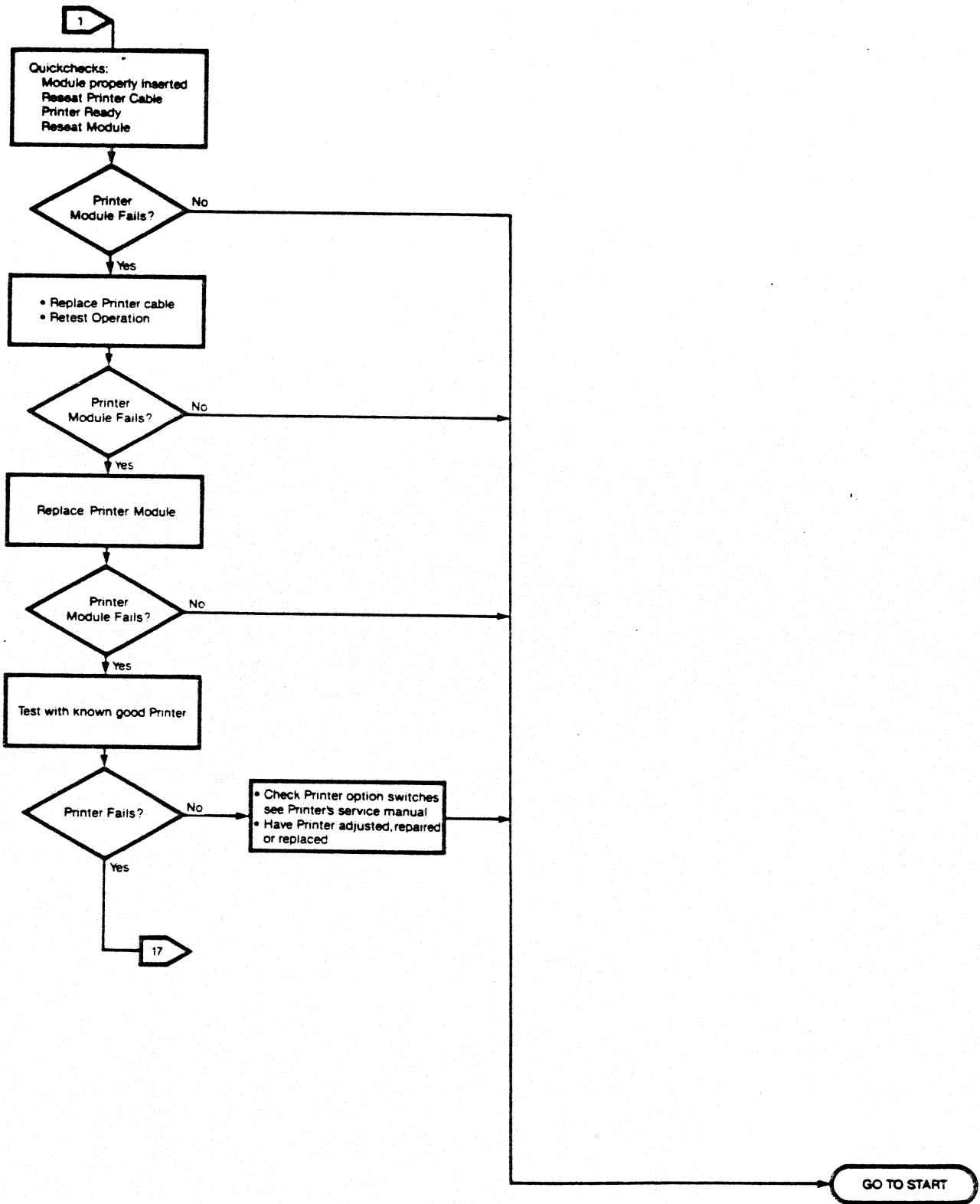
FLOPPY DRIVE PROBLEM



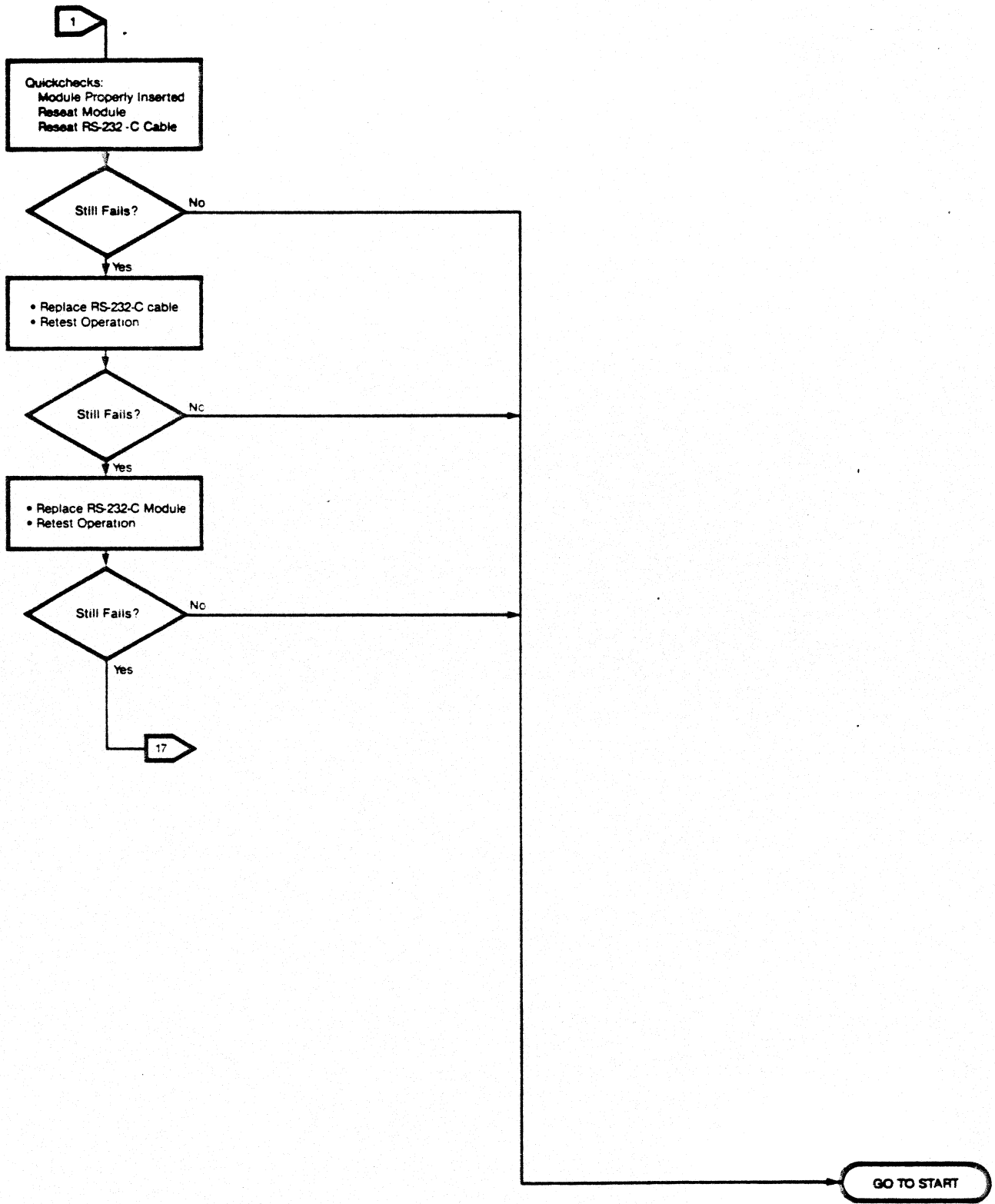
POWER PROBLEM—OPTION MODULE(S) INSTALLED



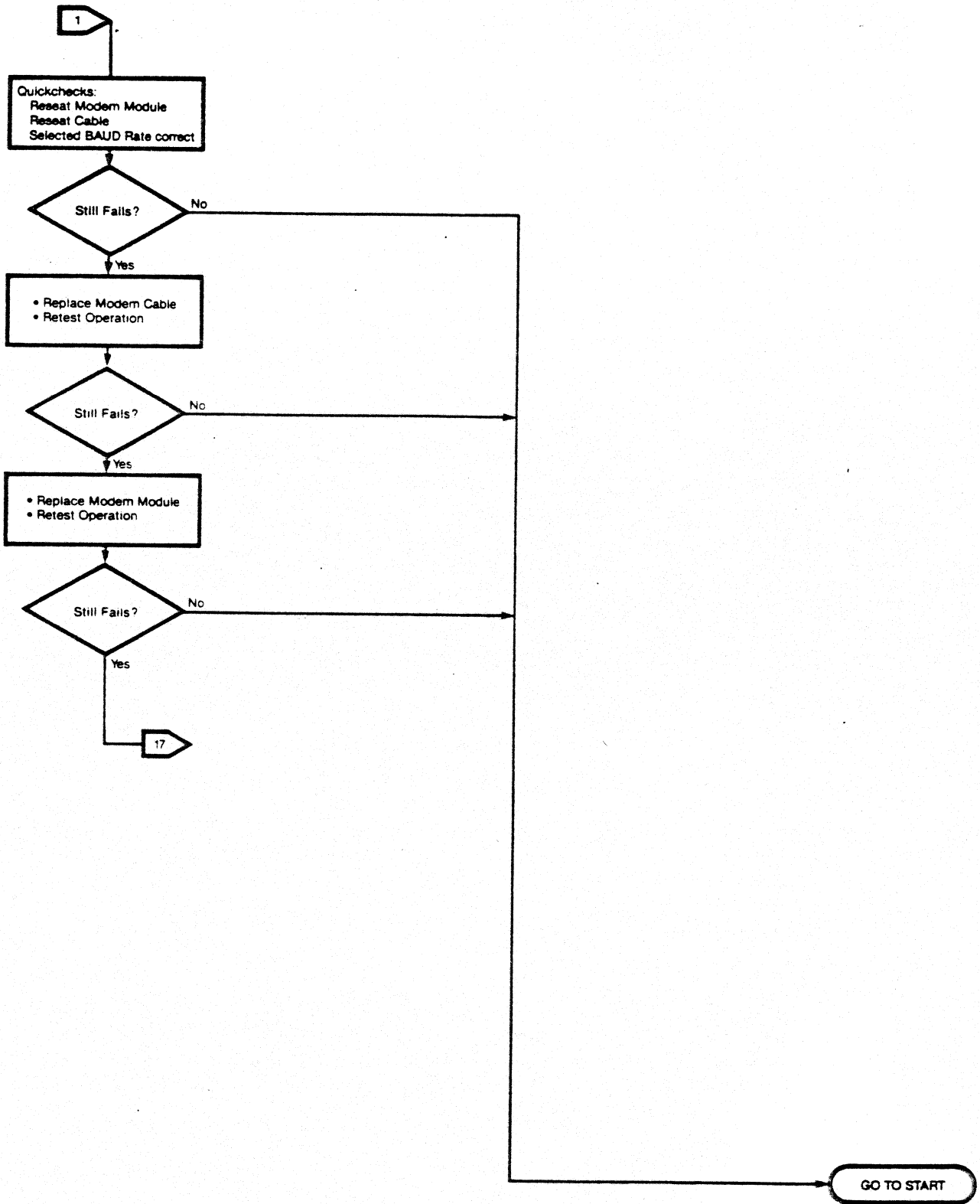
PARALLEL PRINTER MODULE PROBLEM



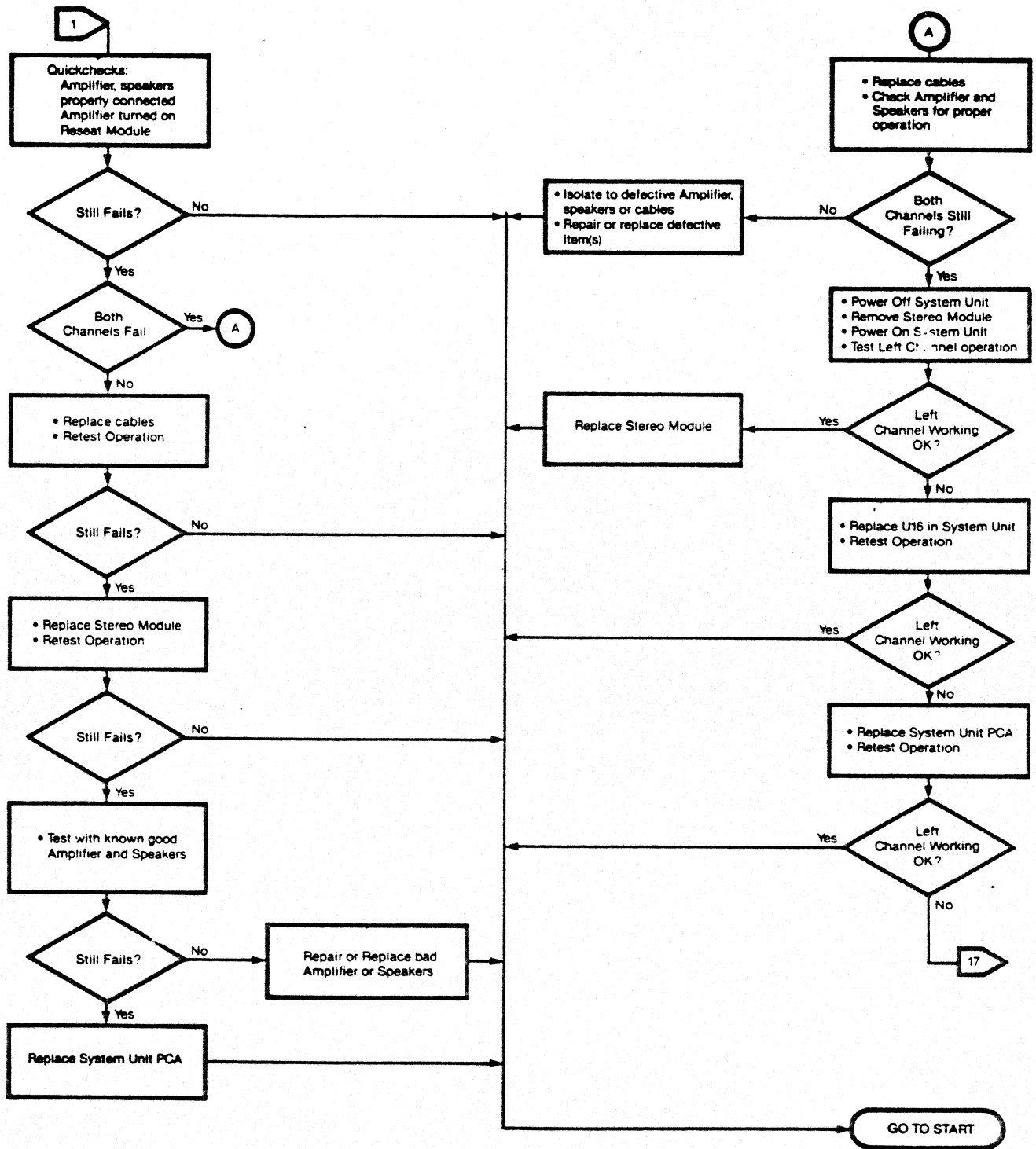
RS-232-C MODULE PROBLEM



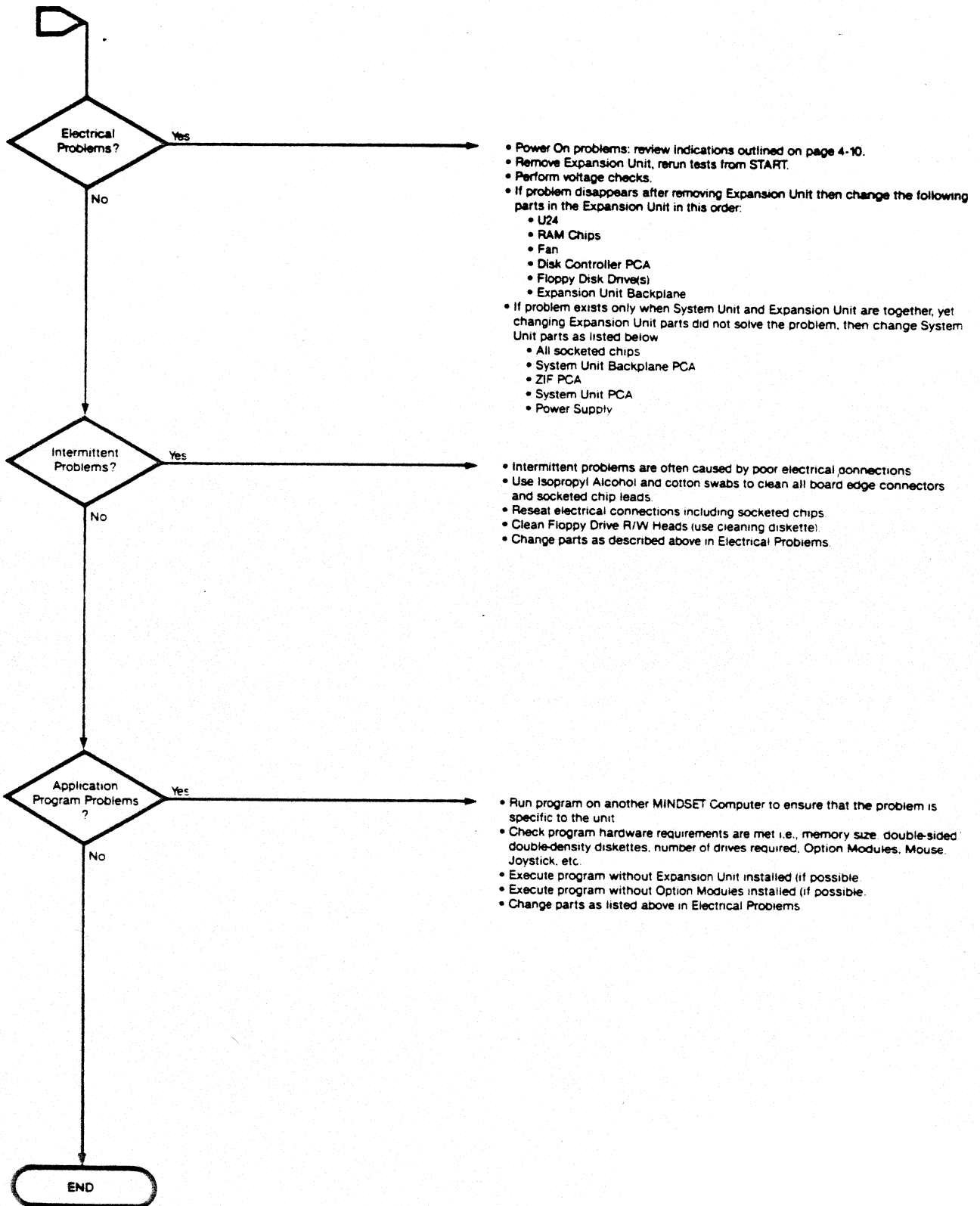
MODEM MODULE PROBLEM



STEREO MODULE PROBLEMS



PROBLEM UNDEFINED



FAULT ISOLATION

4.4 CHECKING VOLTAGES

To check the voltages in the Mindset Computer you will need an accurate voltmeter, preferably a digital voltmeter. The voltages are checked in the System Unit at connector J8. The Power Supply voltage may be checked independently from the System Unit PCA by disconnecting J8 and making the voltage checks at the P8 plug. The chart below describes the voltages and tolerances.

Voltage	Pin	Color	Max	Min	Tolerance
Ground	2,5	Green, Blue	-	-	-
+12 volt	3	Orange	12.6	11.4	5%
+5	1	Red	5.125	4.875	2.5%
-12	4	Brown	-12.6	-11.4	5%
Trkl Chg	6	White	5.125	4.875	2.5%

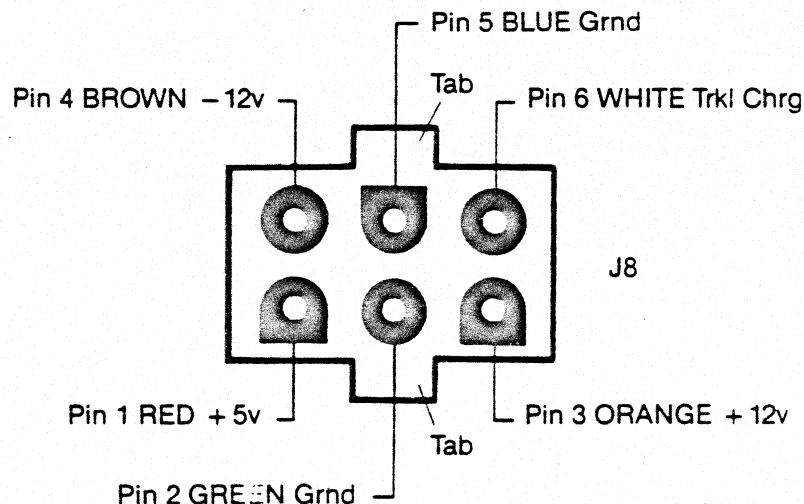


Figure 4-1. Checking Voltages in the System Unit.

The method of measuring the voltages at the System Unit are:

- 1) Turn off the power and remove the power cord from the power outlet.
- 2) Connect the voltmeter to appropriate pins shown in figure 4-1. Using clip leads will make it easy to perform the next several steps.
- 3) Set the voltage range on the meter to the setting above the voltage to be checked.

FAULT ISOLATION

- 4) Plug in the System Unit power cord.
- 5) The voltages should appear at this time without turning on the power switch at the keyboard.
- 6) Record the voltages. The Trkl Chg voltage should be a little high, about 5.2 volts.
- 7) Turn on the power switch at the keyboard. The voltages should remain the same as in step 5, except the Trkl Chg will be normal.

*** CAUTION ***

There are no field adjustments for the power supply. If voltages are not within tolerance then the power supply must be replaced.

CHECKING VOLTAGES IN THE EXPANSION UNIT

Voltages can be measured at two convenient places in the Expansion Unit. The Disk Controller PCA offers the easier of the two while the Expansion Unit Backplane PCA provides the second place. See figure 4-2 for the locations. The voltage tolerances are identical to those stated above for the System Unit. See Chapter Five for removing the Expansion Unit Top Cover.

*** CAUTION ***

Care must be taken when checking the voltages so that other devices or surfaces are not contacted with the leads of the voltmeter.

FAULT ISOLATION

To check either +5 volts or +12 volts on the Floppy Controller PCA, set the voltage range on the voltmeter and simply place the leads of the voltmeter across the appropriate capacitor as shown in 4-2. Power on the System and read the voltage. The additional voltages can be checked at the top of the Backplane at P1 as shown in figure 4-2.

Checking Voltages on the Disk Controller Board:

+12 volts	- check across capacitor C2
+5 volts	- check across capacitor C3

Checking Voltages on the Expansion Backplane:

Ground	- pin 2
+12 volts	- pin 27
-12 volts	- pin 28
+5 volts	- pin 4
Trkl Chg	- pin 29

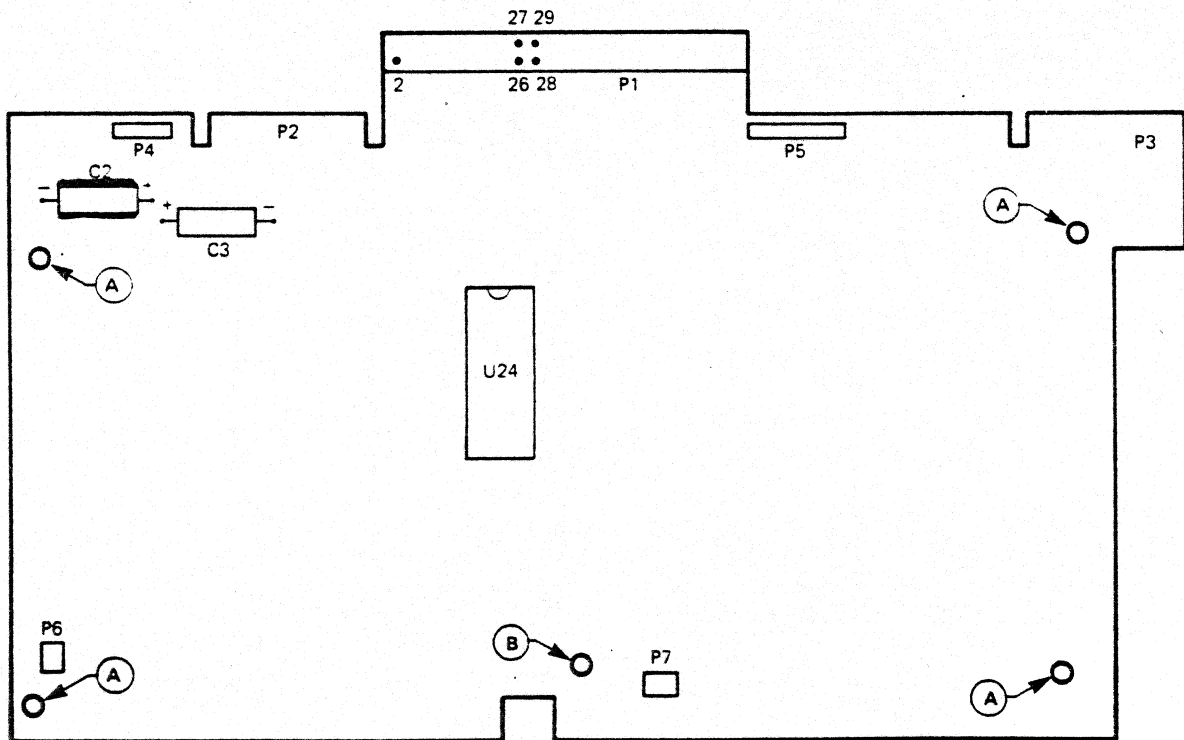


Figure 4-2. Checking Voltages in the Expansion Unit

FAULT ISOLATION

4.5 CHECKING FOR ELECTRICAL SHORTS

The System Unit PCA can be checked for electrical shorts as follows:

1. Unplug the power cord from AC outlet.
2. Unplug the connector P8 from J8.
3. Set the multimeter to 'resistance', and check the resistance across the pins at connector J8 on the System Unit PCA.

The resistance measured should be as follows:

Pin 1 to pin 2	-	20 M ohms (approx).
Pin 3 to pin 2	-	capacitance effect.
Pin 4 to pin 2	-	20 M ohms (approx).
Pin 6 to pin 2	-	capacitance effect.

Any zero reading indicates a direct short associated with the System Unit PCA. In that case, remove the socketed chips, ZIF PCA, Backplane PCA. Recheck the resistance. If the short remains, the System Unit PCA should be inspected carefully for any metallic foreign objects or evidence of any liquid spilled on the board. Remove the board and check the underside. If nothing is found the board must be replaced.

FAULT ISOLATION

4.6 FIELD REPLACEABLE UNITS

All replaceable units are listed and illustrated in Appendix B. The internal parts of the power supply are not serviceable or replaceable (including the AC line fuse). The Service Technician need not unsolder any parts in the MINDSET in order to replace any parts or assemblies. At the time of publication the BIOS ROM chips are socketed and can be replaced. See the latest Service Bulletins for any changes in replaceable parts.

4.7 FIELD ADJUSTMENTS

There are no field adjustments for the MINDSET Computer. There are adjustable potentiometers located in the Expansion Unit and the Power Supply. However, special test equipment and procedures are required. The pots are sealed at the factory and should not be adjusted in the field.

The Floppy Disk Drives have internal jumpers that control addressing, data formats, etc. which are factory set. Drive A and B will have identical jumper settings (addressing is under control of the Floppy Controller PCA). Do not attempt to change any of the jumpers in the field.

FAULT ISOLATION

4.8 FLOPPY DRIVE HEAD CLEANING

The low profile design of the floppy disk drives makes it difficult to clean the read/write heads by direct application of a cleaning solution. It is highly recommended that a head cleaning diskette be used for this purpose to clean both upper and lower read/write heads. Follow the instructions with the cleaning kit.

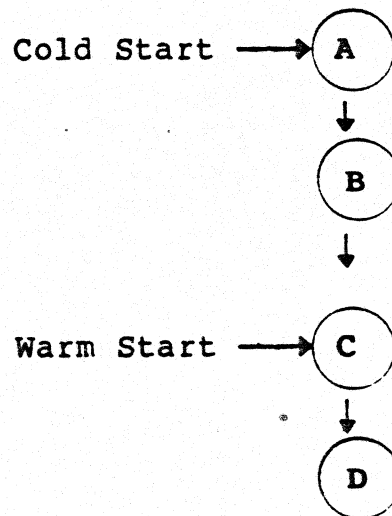
4.9 CLEANING THE KEYBOARD AND CONNECTOR

1. Disassemble Keyboard (refer to 5.4)
2. Remove keyboard from base, and clean any foreign material or liquid from base.
3. Wipe the keyboard surfaces with a clean dry cloth to remove any moisture or liquid.
4. Using DRY AIR ONLY, blow in between keytops to remove any foreign material.
5. Remove connector J4 (see 5.4.1) and clean the contacts with isopropyl alcohol. Allow to dry and reinstall the cable.
6. Reassemble the Keyboard.

4.10 POWER-UP PROBLEMS

The following information will help the Service Technician to understand the power-up sequence. A thorough and detailed knowledge of the visual things to look for during the power up sequence will help determine if the sequence is proper.

The MINDSET power-up sequence can be described as four major operations. The first two (A and B) operations are described here as a "cold start" and the second two (C and D) operations as a "warm start". The cold start operation occurs whenever the power switch is turned to the ON position for the first time since the power cord was installed in the AC outlet. The warm start occurs whenever the power switch is turned on after a cold start has previously occurred or a Reset from the keyboard is initiated.



Each of the following four pages describe each operation. The left column describes the visual indications while the right column describes the operation of the MINDSET.

FAULT ISOLATION

COLD START OPERATION A

<u>Indication</u>	<u>Machine Function</u>
<ul style="list-style-type: none">o Relay 'click' sound	<ul style="list-style-type: none">o Operator plugs in AC cord and turns on the keyboard switch
<ul style="list-style-type: none">o Red LED Power Light On	<ul style="list-style-type: none">o System reset
<ul style="list-style-type: none">o Screen goes blank	<ul style="list-style-type: none">o System RAM testedo System Timer testedo DMA function testedo Checksum System ROMo Frame Buffer RAM testedo Graphics and Display processors testedo Expansion RAM tested
<ul style="list-style-type: none">o Display reappears. If an error has been uncovered, the system displays: "XXXXXXX test failed Press any key to continue" If no errors have been found, the system displays: "(c) Mindset Corp., 1983 Version 1.0x System Diagnostics in Progress" in 40 column format	<ul style="list-style-type: none">o BIOS Initializationo I/O Port test and slot identificationo Disk Controller tested
<ul style="list-style-type: none">o Drive B RED LED on momentarily	<ul style="list-style-type: none">o Test for Drive B

FAULT ISOLATION

COLD START OPERATION B

Indication

- o Configuration screen replaces Diagnostics Message.
- o Screen displays "default" values in 40 column format.

Default values are:

- TV - Beeper Off
- Load Priority of Cart 1 (#1)
 Cart 2 (#2)
 Disk (#3)
- Time Settings:
 SUN 01/01/01 01:01:XX
 (Seconds, Minutes Active)
- RAM size should reflect actual System RAM
- Power Fail message in lower right of screen (this means AC to machine has been interrupted)

Machine Function

- o Brings up Configuration screen

- o System in Configuration Loop waiting for keyboard input to change configuration

ALT-RESET

or

CTRL-ALT-RESET

must be pressed to exit screen.

FAULT ISOLATION

WARM START OPERATION C

<u>Indication</u>	<u>Machine Function</u>
	o On signal from keyboard switch
	or
o Screen goes blank momentarily	ALT-RESET begins system diagnostics over again
o Display reappears. If an error has been uncovered, the system displays: "XXXXXXX test failed. Press any key to continue" If no errors have been found, the system displays: "(c) Mindset Corp.,1983 Version 1.0x System Diagnostics in Progress" in display format selected in B	All tests performed in Section A are repeated - Reset - RAM - Timer - DMA - ROM - Frame Buffer - Graphics and Display processors - Expansion RAM - BIOS - I/O - Disk Controller
o Drive B light comes on momentarily	- Check for Drive B

FAULT ISOLATION

WARM START OPERATION D

Indication

- o Displays start-up message associated with software being loaded into memory.
- o If no bootable software is installed, then MINDSET Logo is displayed on screen
- o Drive A light comes on when accessed - if no diskette installed, light remains on for 8-9 seconds

Machine Function

- o Search for bootable software beginning with highest priority device.
- o Begin boot sequence
- o If Drive A is accessed, retry 4 times to read information
- o Display MINDSET Logo (from System ROM) if no bootable software installed
- o Rotate Logo after 10 - 15 seconds.
- o Sequence complete
A Reset will cause warm start.

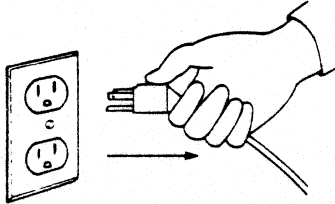
CHAPTER FIVE

PARTS REMOVAL AND REPLACEMENT

CHAPTER FIVE REMOVAL AND REPLACEMENT PROCEDURES

5.1 SCOPE OF CHAPTER

The procedures described in this chapter will assist in performing disassembly procedures and replacement of defective parts. The disassembly/assembly procedures should be performed in the order shown. Upgrade instructions are presented for Expansion RAM and an add-on Disk Drive.



*** CAUTION ***

Before performing any of the following procedures you must turn the System Unit OFF and remove the power cord from the electrical outlet. Failure to do so may cause damage to the computer and any new parts that are installed while the power cord is installed in an outlet.

Even though the System Unit power switch (located on the keyboard) is turned to the OFF position, small voltages (TRKL CHRG) are still present throughout the System Unit and Expansion Unit. This is the reason that the power cord must be removed before performing any removal or installation of parts, including Option Modules. However, cartridges may be removed/installed while the power cord is installed, but the power switch must be to the OFF position.

5.2 SYSTEM UNIT ASSEMBLY/DISASSEMBLY

The System Unit is made up of 7 major parts:

- o System Unit PCA
- o ZIF Board
- o System Unit Backplane
- o Power Supply
- o Front Panel
- o Top Cover
- o Base

The disassembly/assembly procedures should be performed in the orders shown below. Some parts will not fit together properly unless the steps are followed as outlined.

REMOVAL/REPLACEMENT

INITIAL PREPARATION FOR DISASSEMBLY

1. Turn OFF the System Unit (switch on rear of Keyboard).
2. Remove any cartridges and diskettes.
3. Unplug the power cord from the electrical outlet.
4. Remove all Option Modules in System and Expansion Unit.
5. Unplug the Keyboard at the System Unit. Place the Keyboard and cable aside.
6. Unplug any video display unit cables and power cord and set the display unit aside.
7. Remove the Expansion Unit if installed.






SYSTEM UNIT TOP COVER REMOVAL/REPLACEMENT

1. Perform preparation steps above.
2. Place the System Unit upside down on a flat surface.
3. Remove the 5 phillips-head thread-forming screws located in the deep sockets (screw B). Refer to figure 5-1 for locations. After removing the screws keep them in a safe place such as a paper cup.
4. Using a small magnetic screw driver remove the machine-screw as shown in figure 5-1.

~~machine-~~ ^{THREAD FORMING}

#C

REMOVAL/REPLACEMENT

- (A)  X3 4-40x 1/4 Machine Screw
- (B)  X5 6-19x 1/2 Thread Forming
- (C)  X1 2-28x 5/16 Machine Screw *THREAD FORMING*
- (D)  X2 6-32x 3/8 Machine Screw
- (E)  X2 6-32x 3/8 Machine Screw

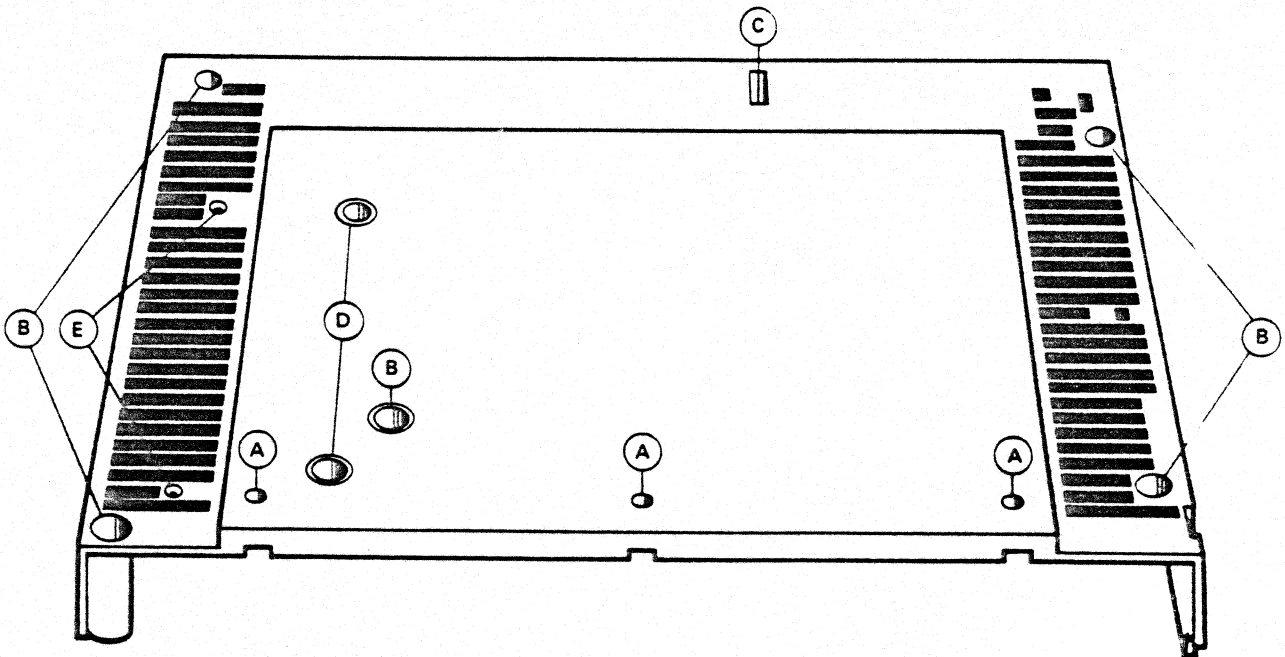


Figure 5-1. System Unit Cover Screws

REMOVAL/REPLACEMENT

5. Place the System Unit in its normal upright position. Grasp the Top Cover from the rear, tilt up and slide it back and remove it.

To install the Top Cover, reverse the steps above. Be sure to use the same screws. Tighten all screws lightly. To install the small machine screw, use a magnetic screw driver. The small machine screw is slightly tricky to install. It must be installed in order for the System to fit together properly.

TIP: If a magnetic screw driver is not available, use a piece of tape to adhere the screw to the blade. This will aid in starting the screw.

5.2.1 SYSTEM UNIT BACKPLANE PCA

REMOVAL

1. Perform preparation and remove the Top Cover (5.2).
2. Remove the System Backplane PCA by lifting up gently on the board. The board is held in place by a connector and plastic guide ribs.

INSTALLATION

*** CAUTION ***

The Backplane PCA is keyed to be inserted only one way. Observe the key location and the matching missing pin prior to inserting the board. Failure to do so may cause damage to the pins and the connector.

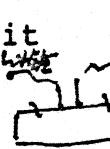
Red mark top side of Board

To install the board, line-up the pins on the connector and locate the PCA into the plastic ribs. Press down with even pressure making sure that all pins are in alignment.

REMOVAL/REPLACEMENT

5.2.2 POWER SUPPLY

REMOVAL

1. Perform preparation and remove the Top Cover (5.2).
2. Unplug the Power Supply cable at J8 on the System Unit PCA by squeezing the two plastic taps and pull it up ^{Blk}
3. Unplug the fan cable at ~~J13~~ ^{J11} on the System Unit PCA. 
REMOVE GROUND STRAP
4. Turn the System Unit upside down on a flat surface. Place a 1/2" (approx) pad under the Power Supply. A pad of note paper or similar item will do.
5. Remove the 2 phillips pan-head machine screws and the 2 phillips flat-head machine screws. The Power Supply is now free from the base and should be sitting on the pad.
6. Lift slightly on the front of the System Unit and slide the Power Supply toward the rear of the System Unit so that it will clear the Front Panel.
7. Lift the System Unit up and away from the Power Supply.

POWER SUPPLY INSTALLATION

1. Place the Power Supply into position in the base of the System Unit.
2. Install the power cable into J8 on the System Unit PCA.
3. Install the fan cable into J13 on the System Unit PCA.
4. While holding the Power Supply in place carefully turn the System Unit upside down. Slide a 1/2" pad under the Power Supply. This will aid in lining up the holes.
5. Line-up the 4 holes and install the 2 phillips flat-head machine screws and the 2 phillips pan-head machine screws. The flat-head screws are located into the 2 outer most holes.
6. Place the System Unit upright. The Top Cover may now be installed (5.2).

REMOVAL/REPLACEMENT

5.2.3

*PROTECTIVE
WARRANTY
ORIG*

ZIF PCA AND FRONT PANEL - *COMES OUT AS AN MECHANICAL ASSEMBLY*

NOTE:

Due to the mechanical interconnection of the ZIF Board and Front Panel they are removed and installed as a complete assembly. After removal they may be separated.

REMOVAL

1. Perform preparations and remove the Top Cover (5.2).
2. Carefully place the System Unit upside down on a flat surface.
3. Loosen (but do not remove) the 4 Power Supply mounting screws. This will make it easier to remove the Front Panel.
4. Remove the 3 phillips pan-head machine screws that hold the Front Panel in place. They are located on the bottom of the Front Panel (see figure 5-1).
5. Place the System Unit upright.
6. Gently lift the ZIF PCA until it separates from J10 (see figure 5-3 for location of J10).
7. Lift the Actuating Knob until it clears the housing. Slide the knob and ZIF key to the left until completely removed from the Front Panel. Do not attempt to remove the tinnerman clip from the Actuating Knob.
8. Lift the Power Supply slightly and slide the Front Panel forward and remove it. Remove the ZIF PCA.

*** CAUTION ***

- * The 3 LEDs on the System Unit PCA are now exposed and care must be taken not to bend or break them.

REMOVAL/REPLACEMENT

ZIF/FRONT PANEL INSTALLATION

1. Loosen the 4 Power Supply screws (it is not necessary to remove them). See figure 5-1 for screw locations.
2. Assemble the Front Panel and ZIF together by installing the ZIF Key through the Front Panel and the ZIF board.
3. Lift the front of the Power Supply and slide the Front Panel into place on the base.
4. Before plugging in the ZIF connector, install the cartridge actuating knob onto the key making sure that the doubled end goes underneath the tinnerman clip. With the knob turned fully counterclockwise, the red arrow on the knob should be pointing straight up.
5. While positioning the actuating knob into the base housing, insert the ZIF PCA into the J10 connector.
6. Check the position of the 3 LEDs, making sure they match the positions in the Front Panel.
7. Install the 3 pan-head screws in the bottom of the Front Panel.
8. Tighten the 4 Power Supply screws.
9. Install the Top Cover (5.2).

5.2.4 SYSTEM UNIT PCA

REMOVAL

1. Perform preparation and remove the Top Cover (5.2).
2. Remove the Power Supply (5.2.2).
3. Remove the ZIF Board and Front Panel (5.2.3).
4. Remove the pan-head machine screw located at the topside, center and toward the front of the System Unit PCA.
5. Free the plastic rib tabs around the perimeter of the System Unit PCA.
6. Lift the board from the front until it clears the rear posts and remove the board.

REMOVAL/REPLACEMENT

SYSTEM UNIT PCA INSTALLATION

1. Insure that the metal gaskets are in place around the phono jacks at the rear of the System Unit PCA.
2. Place the System Unit PCA into position in the base by tilting it down toward the rear and lowering it into place.
3. Latch the plastic rib tabs into place around the perimeter of the board.
4. Install the pan-head machine screw into the center hole.
5. Reinstall the Front Panel, ZIF Board and Power Supply.
6. Install the Top Cover.

5.2.5 SYSTEM UNIT FAN ASSEMBLY

REMOVAL

1. Perform preparation and remove the Top Cover (5.2).
2. Unplug the Fan cable at J13 on the System Unit PCA.
3. Remove the two screws on either side of the Fan Assembly. Lift the Fan Assembly up and away from the Power Supply.

REPLACEMENT

1. Place the Fan Assembly into position on the Power Supply.
2. Install the two screws on both sides of the Fan Assembly.
3. Install cable at J13 on the System Unit PCA.
4. Reinstall the top cover (5.2).

REMOVAL/REPLACEMENT

5.2.6 80186 (U78)

REMOVAL

1. Perform preparation and remove the Top Cover (5.2).
2. Refer to figure 5-3 to locate U78 on the System Unit PCA.
3. To remove the chip, first place a thumb on the aluminum cover (to prevent it from springing into the air) and release the hold-down latch by pivoting toward the front of the board.
4. Remove the aluminum cover and pull out the 80186 underneath the cover.

INSTALLATION

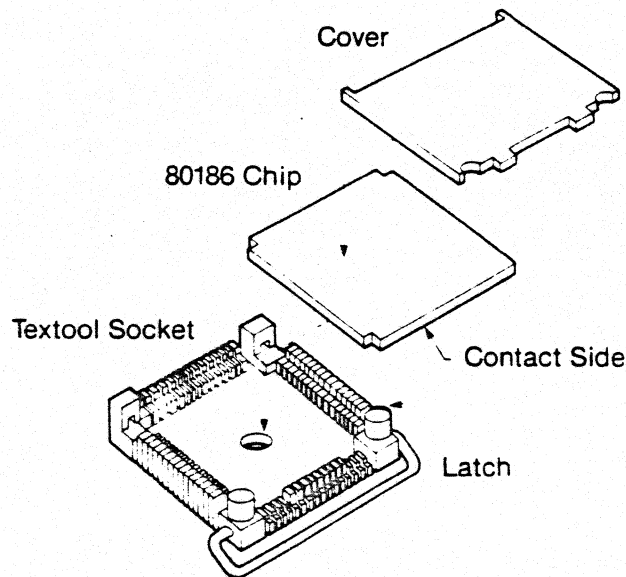


Figure 5-2. 80186 Installation



1. To install the chip, locate the one un-notched edge of the chip and match it with the Textool un-notched edge. Place the chip into position, making sure the contacts are facing down.
2. Place the aluminum cover over the chip and snap the hold down latch into place. Apply pressure to the cover to aid in installing the latch.

REMOVAL/REPLACEMENT

5.2.7 SOCKETED CHIPS

REMOVAL

1. Perform preparation and remove the Top Cover (5.2).
2. Refer to figure 5-3 to locate socketed chips in the System Unit or to 5-4 for the Expansion Unit.
3. A chip puller is recommended to remove a socketed chip. However, a small flat-bladed screw driver can be used by carefully prying each end slightly and carefully working the chip out of the socket.

- (A)  X1 6-32x 3/8 Machine Screw
- (B)  X1 6-19x 1/4 Thread Forming

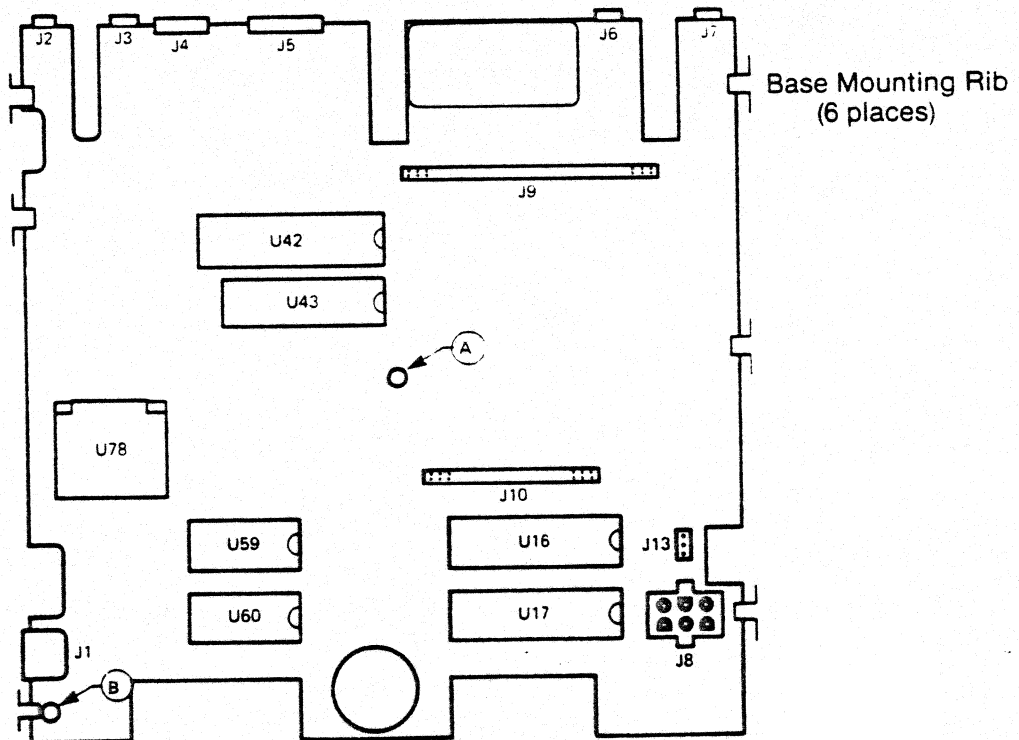


Figure 5-3. System Unit Socketed Chip Locations

REMOVAL/REPLACEMENT

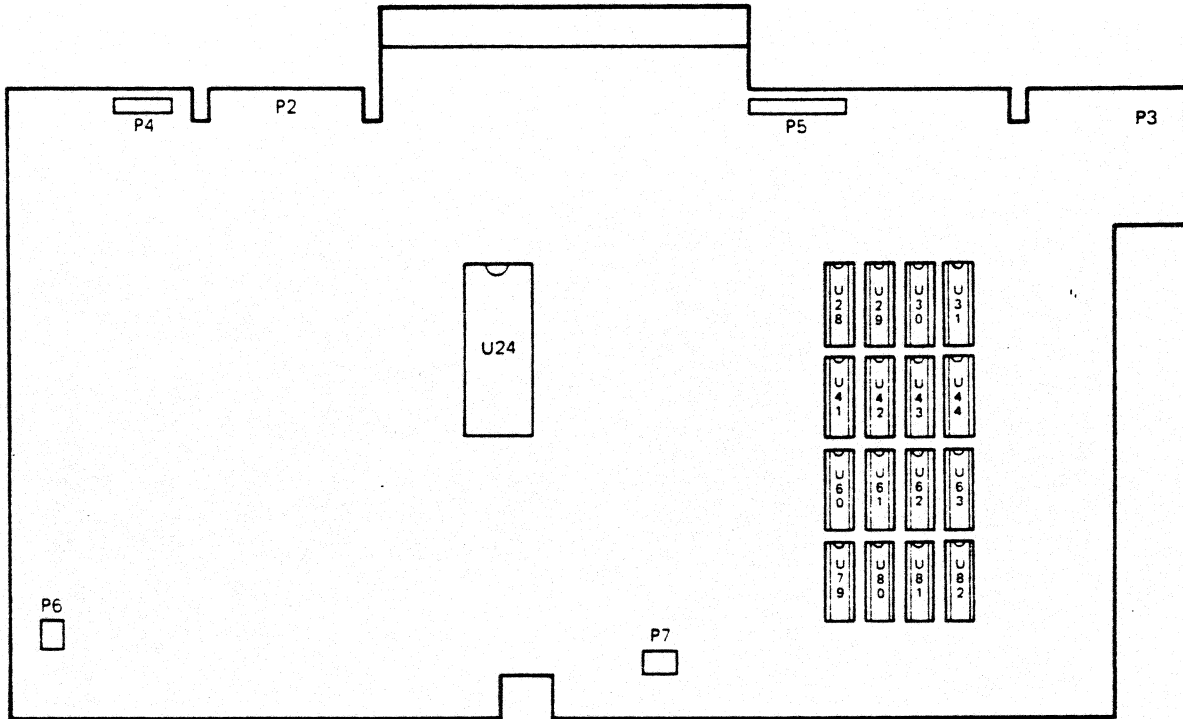


Figure 5-4. Expansion Unit Socketed Chip Locations

REMOVAL/REPLACEMENT

SOCKETED_CHIP_INSTALLATION

1. Before installing a socketed chip, be sure that all pins are straight. Use a pair of flat surface needle nose pliers or similar tool to straighten the pins.
2. Carefully check for pin 1 location of the chip and the socket. Pin 1 is designated as shown in figure 5-5.

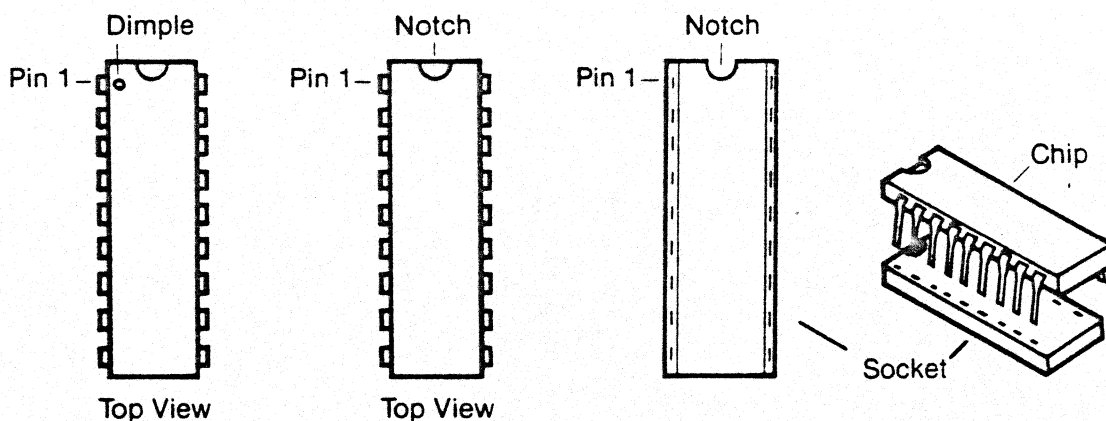


Figure 5-5. Socketed Chip - Pin One Location

3. Carefully insert the chip, inspecting the pins during installation. After installation, double-check all pins. Be absolutely sure that pin 1 is correctly oriented.

*** CAUTION ***

A chip installed backwards will not work and will probably be destroyed when power is applied. Also, this may cause damage to other components in the computer.

5.3 EXPANSION UNIT DISASSEMBLY/ASSEMBLY

The Expansion Unit is made up of 6 major parts (7 with optional drive):

- o Disk Controller PCA
- o Expansion Backplane PCA
- o Fan Assembly
- o Floppy Drive (1 or 2)
- o Expansion Unit Front Panel
- o Base

REMOVAL/REPLACEMENT

The 2 LEDs are always installed, even if only 1 Drive exists. When only one drive is installed the right diskette slot is blocked by a plastic panel (which may be permanently removed). Two power cables are always available on the Disk Controller PCA, even though only one drive exists. The two mounting brackets on each drive are considered part of the drive assembly and are shipped with the drives.

Before performing any disassembly, be sure to complete the Initial Preparation steps. Follow all steps in the order presented.


INITIAL PREPARATION FOR DISASSEMBLY


1. Turn OFF the System Unit (switch on rear of Keyboard).
2. Remove any cartridges and diskettes.
3. Unplug the power cord from the electrical outlet.
4. Remove any Option Modules in System or Expansion Unit.
5. Unplug the Keyboard at the System Unit. Place the Keyboard and cable aside.
6. Unplug any video display unit cables and power cord and set the display unit aside.
7. Remove the Expansion Unit from the System Unit by lifting straight up. Place the Expansion Unit upside down on a clean flat surface.


EXPANSION UNIT TOP COVER REMOVAL


1. Perform the preparation steps above.
2. Remove the 6 screws from the bottom of the Expansion Unit as shown in figure 5-6 (screws B, C and D).
3. Hold the top cover in place and turn the unit upright.
4. Lift the top cover from the rear and remove it.


REMOVAL/REPLACEMENT


(A)  X3 4-40x 3/8 Machine Screw

(C)  X3 6-19x 1/2 Thread Forming

(B)  X2 4-40x2 1/4 Thread Forming

(D)  X1 2-28x 5/16 Thread Forming

(E)  X4 6-32x 3/8 Machine Screw

(F)  X4 6-32x 3/8 Machine Screw

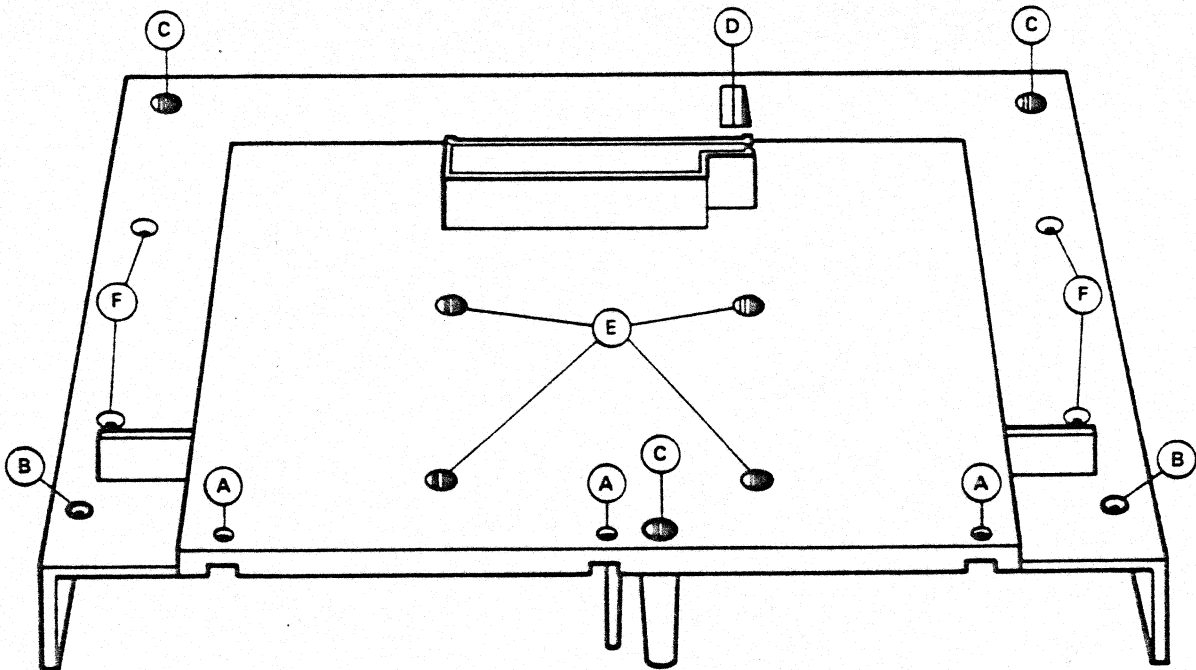


Figure 5-6. Expansion Unit Cover Screws

EXPANSION UNIT TOP COVER INSTALLATION

1. Place the Top Cover on the Expansion Unit.
2. While holding the cover in place, carefully turn the Expansion Unit upside down.
3. Install the 6 screws as shown in figure 5-6.

*** CAUTION ***



The small machine screw ('D' in figure 5-6) of the Expansion Unit is very important for proper fitting of all covers and the Backplane circuit boards. Do NOT leave this screw out during reassembly.

5.3.1 DISK CONTROLLER & BACKPLANE

REMOVAL

1. Perform preparation and remove the Top Cover (5.3).
2. Unplug the P4 power cable (and P5 if 2 drives are installed) at the Floppy Drive.
3. Unplug the floppy ribbon cable at P2 (and P3 for second drive).
4. Unplug the 2 LEDs at P6 and P7.
5. Remove the 5 screws holding the Disk Controller PCA in place. Refer to figure 5-7.
6. Lift the Disk Controller PCA slightly and unplug the fan power connector at P5.
7. Lift the Disk Controller PCA and Expansion Backplane out together as one unit. Then separate the two boards by unplugging at connector P1.

REMOVAL/REPLACEMENT

- (A)  X4 6-32x 1/4 Machine Screw
- (B)  X1 6-19x 3/8 Thread Forming

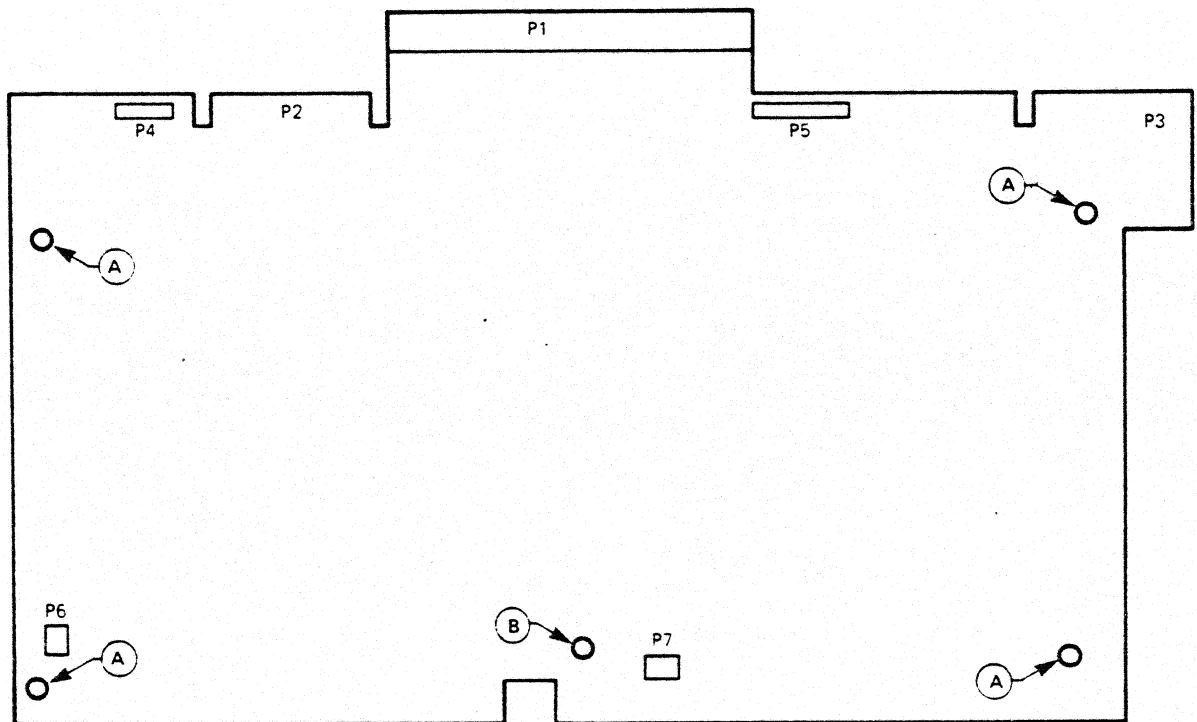


Figure 5-7. Disk Controller PCA Removal/Replacement

DISK_CONTROLLER_PCA_&_BACKPLANE_INSTALLATION

1. Before installing the Disk Controller PCA, connect the Backplane PCA to it by carefully plugging it into P1.
2. Place the two boards together into position in the Expansion Unit, guiding the Backplane into the plastic guides in the base of the Expansion Unit. Be sure that the two LED cables are free from being caught in between the Front Panel and the Floppy Controller PCA.

REMOVAL/REPLACEMENT

3. Install, but do not tighten, the thread-forming screw located at the front center of the Disk Controller PCA.
4. Connect the Fan cable P5, the floppy power connector P4 (and P5 for second drive), the ribbon cable P2 (and P3 for second drive), and the 2 LEDs P6 and P7.
5. Start the remaining 4 screws then tighten all 5 screws.

5.3.2 EXPANSION UNIT FRONT PANEL & LEDS

REMOVAL

1. Perform preparation and remove the Top Cover (5.3)
2. Unplug the LEDs at P6 and P7 from the Disk Controller.
3. Pull off the Floppy load levers. Use a small flat-bladed screwdriver and pry the lever off near the shaft. Use caution to prevent scratching the Front Panel.
4. Place the Expansion Unit upside down on a flat surface.
5. Remove the 3 screws holding the Front Panel in place.
6. Place the Expansion Unit upright and remove the Front Panel along with the 2 LEDs.

INSTALLATION

1. Install the two LEDs into the Front Panel. Note: even though a second drive is not installed, the second LED should be installed (add-on drives do not include one).
2. Set the Front Cover into place on the Expansion Unit making sure the LED cables are free and above the board.
3. Turn the Expansion Unit upside down and install the three machine screws.
4. Turn the Expansion Unit upright and connect the LEDs. Inspect the LED cables, making sure they do not block the diskette slots.
5. Install the Top Cover (5.3).

REMOVAL/REPLACEMENT

5.3.3 EXPANSION UNIT FAN ASSEMBLY

REMOVAL

1. Perform preparation and remove the Top Cover (5.3).
2. Remove the Disk Controller and Backplane PCAs (5.3.1).
3. Remove the 2 machine screws located at the top-rear of the Fan Assembly. Lift the Fan Assembly up and out of the plastic guides.

INSTALLATION

1. Place the Fan assembly into position in the plastic guides.
2. Install the 2 machine screws.
3. Install the Disk Controller and Backplane PCAs (5.3.1).
4. Install the top cover (5.3).

5.3.4 FLOPPY DISK DRIVE

REMOVAL

1. Perform preparation and remove the Top Cover (5.3).
2. Remove the Disk Controller and Backplane PCAs (5.3.1).
3. Remove the diskette load lever on the front panel. Use a small flat bladed screwdriver to pry it off. Be careful not to scratch the front panel.
4. Place the Expansion Unit upside down on a flat surface.
5. Place a note pad under the drive to be removed.
6. Remove the four machine screws (see figure 5-6, remove two 'E' and two 'F' screws for the particular drive).
7. Slide the disk backward until the shaft is clear of the Front Panel and remove the drive.

INSTALLATION

1. While guiding the loading shaft through the hole in the Front Panel, place the Floppy Drive into position in the Expansion Unit.
2. Start the four machine screws (2 of 'E' and 2 of 'F' in figure 5-6) and tighten them down.
4. Install the Disk Controller and the Backplane (5.3.1).
5. Install the Diskette Load Lever onto the shaft by pressing it into place.
6. Install the Expansion Unit Top Cover (5.3).

5.4 KEYBOARD DISASSEMBLY/ASSEMBLY

The Keyboard Assembly is made up of 5 major parts:

- o Keyboard (keycaps and integral circuit board)
- o Keyboard PCA
- o Keyboard Cable
- o Top Cover
- o Base




INITIAL PREPARATION

1. Turn OFF the System Unit (switch located on rear of the Keyboard).
2. Unplug the AC power cord from the electrical outlet.
3. Disconnect the Keyboard Cable from the System Unit by squeezing the lock tab and pulling the connector out. In the same way, remove the cable from the keyboard.

KEYBOARD TOP COVER REMOVAL

1. Perform the preparation steps in 5.4 above.
2. Place the keyboard upside down on a flat surface.
3. Remove the 6 screws (see figure 5-8).

REMOVAL/REPLACEMENT

- (A)  X4 6-19x $\frac{5}{16}$ Thread Forming
- (B)  X1 6-19x $\frac{1}{2}$ Thread Forming
- (C)  X1 4-24x $\frac{3}{8}$ Thread Forming

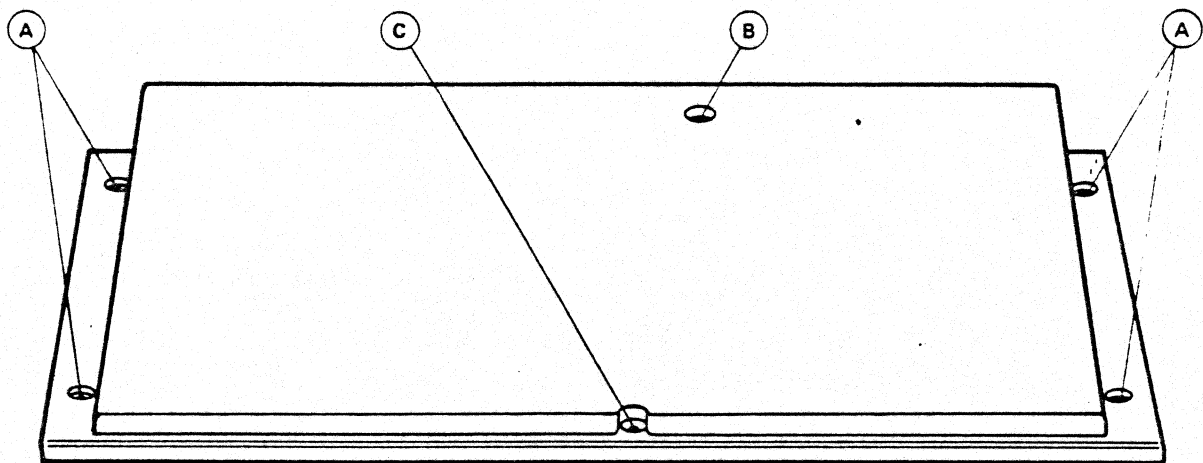


Figure 5-8. Keyboard Cover Disassembly

KEYBOARD COVER INSTALLATION

1. Line up the top cover with the base, checking that the keytops are centered in the Top Cover opening.
2. Start the 2 center screws ('C' and 'B' in figure 5-8).
3. Install the 4 outer screws, but do not tighten them.
4. Check that the keytops are centered in the top cover and then tighten all six screws.

*** CAUTION ***

Be sure to use the correct screws as shown in figure 5-8. Using the wrong screws may damage the covers. Do not overtighten the screws.

REMOVAL/REPLACEMENT

5.4.1 KEYBOARD (keycap and integral circuit board)

REMOVAL

1. Perform the preparation steps in 5.4.
2. Lift the Keyboard assembly just enough to gain access to the ribbon cable underneath.
3. Grasp the ribbon cable by the extreme edges adjacent to the connector and pull the cable out of the connector (see figure 5-9). Lift the Keyboard up and out.

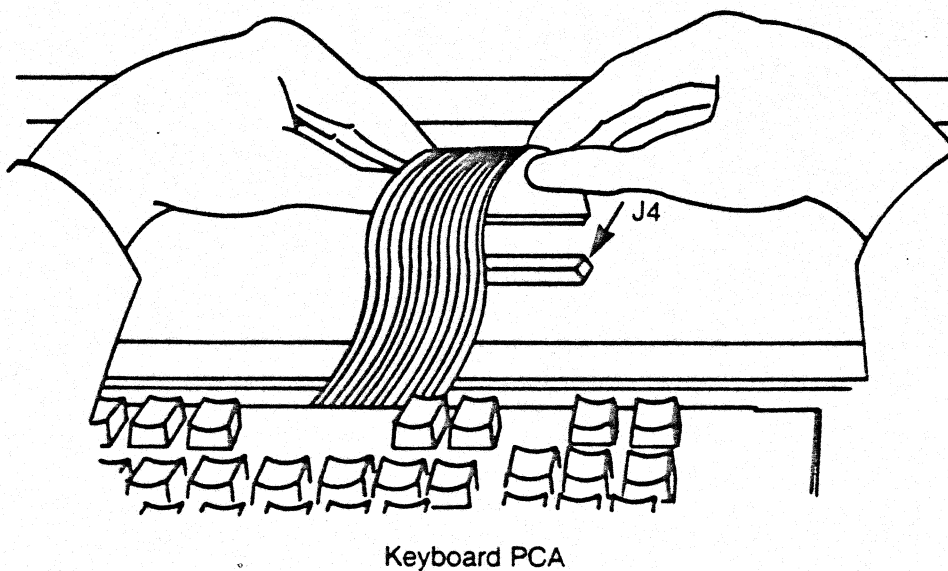


Figure 5-9. Keyboard Removal/Replacement

REMOVAL/REPLACEMENT

INSTALLATION

1. Hold the Keyboard in place, just above the Keyboard PCA.
2. Grasp the ribbon cable on both edges and insert into the connector located on the Keyboard PCA. A gentle rocking action will help to insert the ribbon cable into the connector. The cable is fragile; do not use excessive force to insert it into the connector (see figure 5-9).
3. Position the Keyboard into the plastic ribs in the base and install the top cover as outlined in 5.4.

5.4.2 KEYBOARD PCA

REMOVAL

1. Perform preparation (5.4).
2. Remove the Keyboard (5.4.1).
3. Remove the thread forming screw (see figure 5-10).
4. Remove the Keyboard PCA by lifting from the front and pulling forward and away from the base.

INSTALLATION

1. Place the Keyboard PCA into place in the Keyboard Base. The PCA should fit underneath the two ribs at the rear of the Base. Check that the two locating pins align with the holes in the PCA (figure 5-10).
2. Install the thread forming screw as shown in figure 5-10.
3. Install the Keyboard (5.4.1).
4. Install the Top Cover (5.4).

REMOVAL/REPLACEMENT

5.4.3 KEYBOARD PROCESSOR (U5)

REMOVAL

1. Perform the preparation and remove the Top Cover (5.4).
2. Pull the Keyboard up far enough to gain access to U5. It is not necessary to unplug the ribbon cable.
3. Use a chip puller to remove U5 (see figure 5-10).

INSTALLATION

1. Install the chip in the socket (see 5.2.6 for cautions).
2. Place the Keyboard in position in the plastic ribs of the base.
3. Install the top cover (5.4).

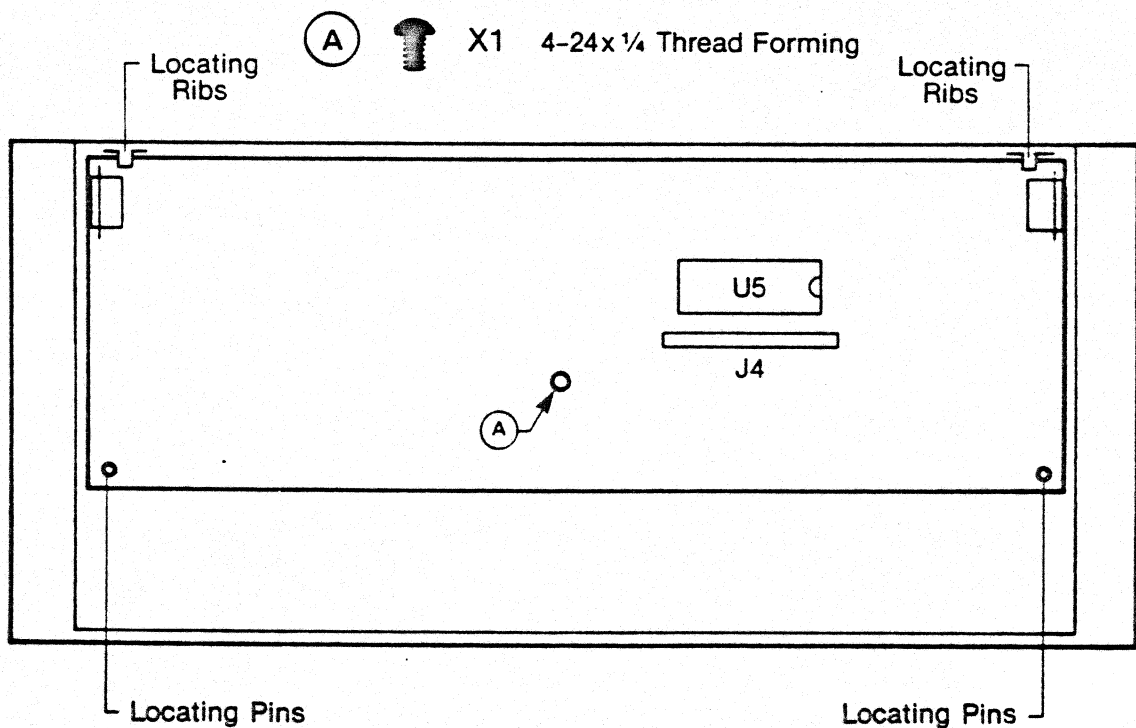
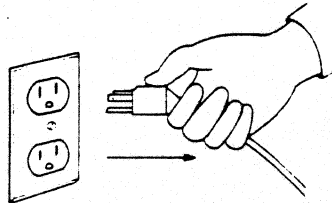


Figure 5-10. Keyboard PCA Removal/Replacement

5.5 ADDING MEMORY TO THE EXPANSION UNIT

A Memory Upgrade Kit, available from MINDSET, is composed of 4 4416-20 RAM chips (32K). All 16 chips or any multiple of 4 may be installed at one time. To install the chips:

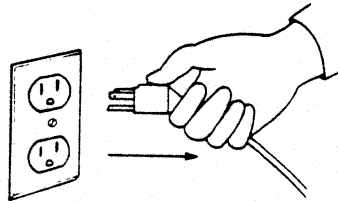
1. Remove any diskettes or cartridges.



2. Turn off the power switch at the keyboard and remove the System Unit power cord. Remove any video display unit.
3. Remove the Expansion Unit from the System Unit.
4. Carefully place the Expansion Unit upside down on a flat surface. Remove the 6 cover screws (refer to figure 5-6).
5. While holding the Top Cover in place turn the unit upright. Remove the cover by lifting from the rear.
6. Locate the 16 sockets located on the Disk Controller PCA (figure 3-2). The sockets are arranged in 4 rows by 4 columns. The chips must be installed in the rightmost unused column of sockets (viewed as you face the front).
7. Install the 4 chips in the appropriate column of sockets. See figure 5-5 for proper orientation of pin one. Install additional Upgrade Kits in the next column to the left. The leftmost column (highest memory addresses) is the last column to be filled.
8. Reinstall the Top Cover. Install the Expansion Unit onto the System Unit. Install the video display unit. Plug in the power cord and turn on the System Unit.
9. When the configuration screen appears it should reflect the new memory size as shown in the lower left corner of the display screen.

REMOVAL/REPLACEMENT

5.6 ADDING A FLOPPY DRIVE TO THE EXPANSION UNIT



1. Perform preparation and remove the Expansion Unit Top Cover (5.3).
2. Remove the Disk Controller and Backplane PCA as stated in 5.3.1.
3. Break off the plastic molding in the Front Panel's right diskette slot and punch out the hole for the shaft.
4. Install the new Floppy Disk Drive as stated in 5.3.4 and the Diskette Lever (do not install the Top Cover yet).
5. Reinstall the Disk Controller and Backplane PCAs (5.3.1).
6. Reinstall the Top Cover (5.3.).
7. Install the video monitor and test the new drive with the Advanced Diagnostics (3.3.4).

CHAPTER SIX

ADMINISTRATION

CHAPTER SIX ADMINISTRATION

6.1 SCOPE OF CHAPTER

This chapter will provide administration procedures. Ordering and returning spare parts, performing Warranty Service, and part pricing is covered. Required Authorized MINDSET Dealer parts list is also provided.

6.2 MINDSET WARRANTY

MINDSET provides the consumer a 90-day parts and labor warranty which is available within 12 months from the date of shipment from MINDSET. This provides the Dealer with 9 months of shelf-life coverage.

As an example, if the Consumer purchases the product within the first 9 months since shipment from MINDSET then warranty reimbursement to the Dealer is available for a full 90 days from date of purchase. If however, the Consumer purchases the product after 11 months since shipment from MINDSET then the Dealer will receive warranty reimbursement for the first month. The Dealer will be obligated to cover the remaining two months of the Consumer's warranty.

To receive warranty service the product must be brought to the Authorized MINDSET Dealer. Warranty will be provided only if proof of purchase is presented by the Consumer. Proof of purchase will be the store's sales invoice issued at the time of purchase. The Consumer need not have purchased the product at the store where warranty service is requested.

6.3 SERVICE ADMINISTRATION

The Dealer is required to furnish documentation that the MINDSET product is within the warranty period by providing proof of purchase with the Service Claim form. Documentation shall include:

- o Completed Service Claim Form
- o Proof of Purchase (copy of dated invoice)
- o Defective part (if designated for return)

Certain spare parts that are replaced must be returned to MINDSET with the above documentation in order to qualify for warranty reimbursement. These special parts are designated in the Spare Part Price lists with a 'R' in the rightmost column.

ADMINISTRATION

The Service Claim and returned parts must be received by MINDSET within 30 days of warranty service to qualify for warranty reimbursement.

WARRANTY REIMBURSEMENT

Labor reimbursement rates are listed in the Spare Part Price tables in this chapter. The times allotted for parts replacement include diagnostic and part replacement.

To determine the labor reimbursement use only the defective part(s) that were found to be defective and were actually replaced. Replacement of parts which are found not to be defective are not qualified for labor reimbursement and should be returned to the Dealer's Spare Parts Kit.

MINDSET will reimburse the Dealer for warranty work actually performed by the Authorized Dealer within the warranty period as described in 6.2. Repairs made to MINDSET products outside the applicable warranty period will not be subject to reimbursement. Warranty work must be performed by Service Technicians who have attended the MINDSET Service Training Course. Repair methodology must be consistent with the methods described in this manual and discussed during the Service Training Course.

PARTS RETURN

Only defective parts that are designated with an 'R' in the rightmost column of the Spare Part Prices list must be returned to MINDSET. All other defective parts are to be scrapped and should be disposed of appropriately. Parts that have an exchange value as listed in the fourth column of the Spare Parts Prices lists must be returned in order to receive the exchange price. The part must not have any evidence of misuse or unauthorized repair such as caused by resoldering of electrical components.

A defective 80186 Microprocessor must be returned to MINDSET before a replacement is shipped from MINDSET.

Returned parts must be packed in the original carton or at least comparable cartoning with the appropriate packing materials. The part should be sent to the following address:

MINDSET Corporation
Service Support Department
965 Maude Avenue
Sunnyvale, CA 94086

ADMINISTRATION

AUTHORIZED DEALER SPARE PART PRICES

The following tables provide a list of all replaceable parts in the MINDSET Personal Computer. For an illustrated list of many of the parts and subassemblies refer to Appendix B.

The tables are logically divided as follows:

- System Unit Assembly
- Keyboard Assembly
- Expansion Unit Assembly
- Floppy Disk Assembly, Right
- Miscellaneous Parts

The Floppy Disk Assembly, Left, is included in the Expansion Unit list (the Left Drive is drive A, and the Right is B).

The tables are divided into 7 columns as follows:

Part No. - Lists the MINDSET part number. Use this number when returning or ordering spare parts.

Name - The "legal" MINDSET name assigned to the part.

Price - This is the price of the part to authorized MINDSET Dealers.

Exchg - The exchange price of certain parts. This lowered price is available when the defective part is returned to MINDSET. Items with no exchange price listed do not have any exchange value.

Lb - The labor in tenths of an hour allotted for warranty reimbursement determination.

ExtLb - The extended labor value. This is the amount allotted for the service performed for the associated part.

R - An R in this column indicates that the part is a Return Item. In order to receive reimbursement these parts must be returned to MINDSET (along with the Claim Form and Proof of Purchase).

NOTE:

Return Items are important in order that MINDSET perform failure analysis on these parts. Please return the defective part whether or not it is for warranty purposes.

ADMINISTRATION

AUTHORIZED DEALER SPARE PART PRICES

SYSTEM UNIT

Part No.	Name	Price	Exchg	Lb	ExtLb	R
100031-001	Backplane PCA, System Unit	42.04		.4	16.80	R
100036-001	Base, System Unit	11.56		.5	21.00	
100037-001	Top Cover, System Unit	11.50		.2	8.40	
100038-001	Front Cover, System Unit	4.02		.3	12.60	
100039-001	Cover, Expansion Interface	1.72		.0		
100040-001	Cover, Module Opening	1.06		.0		
100041-001	Actuating Knob, ZIF	.78		.1	4.20	
100061-001	ZIF PCA	38.32		.4	16.80	R
100062-001	System Unit PCA	481.00	216.45	.5	21.00	R
100117-001	ZIF Key	.72		.1	4.20	
100387-001	RFI Gasket	1.00		.0		
100390-001	System Unit Fan Assembly	16.10		.3	12.60	
243002-001	Power Supply	96.60		.2	8.40	R
274002-403	Screw, PNH, 4-40x1/4	.05		.0		
274002-605	Screw, PNH, 6-32x3/8	.05		.0		
274003-605	Screw, FLH, 82^ 6-32x3/8	.05		.0		
274004-204	Screw, PNH, 2-28x5/16	.05		.0		
274004-603	Screw, PNH, 6-19x1/4	.05		.0		
274004-608	Screw, PNH, 6-19x1/2	.05		.0		
276001-001	Foot, White	.06		.0		

KEYBOARD ASSEMBLY

Part No.	Name	Price	Exchg	Lb	ExtLb	R
100033-001	Top Cover, Keyboard	4.12		.1	4.20	
100034-001	Base, Keyboard	5.64		.2	8.40	
100035-001	Keyboard	47.02		.3	12.60	R
100064-001	Keyboard PCA	79.32	47.50	.3	12.60	R
100195-001	Cable, Keyboard	12.12		.0		R
274004-403	Screw, PNH, 4-24x1/4	.05		.0		
274004-604	Screw, PNH, 6-19x5/16	.05		.0		
274004-605	Screw, PNH, 6-19x3/8	.05		.0		
274005-405	Screw, 82^ FLH, 4-24x3/8	.05		.0		
276001-001	Feet, White	.05		.0		

ADMINISTRATION

AUTHORIZED DEALER SPARE PART PRICES

EXPANSION UNIT ASSEMBLY

Part No.	Name	Price	Exchg	Lb	ExtLb	R
100017-002	Floppy Disk Assy, Left	247.02	179.00	.5	21.00	R
100040-001	Cover, Module Opening	1.06		.0		
100048-001	Base, Expansion Unit	11.56		.5	21.00	
100049-001	Top Cover, Expansion Unit	11.72		.1	4.20	
100050-001	Front Cover	4.02		.2	8.40	
100051-001	Floppy Lever	.58		.0		
100068-001	Disk Controller PCA 96K	157.00		.4	16.80	R
100068-002	Disk Controller PCA 256K	321.06	160.52	.5	21.00	R
100069-001	Expansion Backplane PCA	45.02		.4	16.80	R
100157-001	LED Assy	3.28		.2	8.40	
100158-001	Floppy Disk Assy, Right	247.88		.5	21.00	R
100235-001	Fan Assy, Expansion Unit	13.58		.2	8.40	
274002-405	Screw, PNH, 4-40x3/8	.05		.0		
274002-603	Screw, PNH, 6-32x1/4	.05		.0		
274002-605	Screw, PNH, 6-32x3/8	.05		.0		
274003-605	Screw, FLH, 82^ 6-32x3/8	.05		.0		
274004-204	Screw, PNH, 2-28x5/16	.05		.0		
274004-605	Screw, PNH, 6-19x3/8	.05		.0		
274004-608	Screw, PNH, 6-19x1/2	.05		.0		
274005-420	Screw, FLH, 82^ 4-20x 2 1/4	.05		.0		
274008-403	Screw, PNH, 4-40x1/4	.05		.0		

FLOPPY DISK ASSEMBLY, RIGHT

Part No.	Name	Price	Exchg	Lb	ExtLb	R
100051-001	Floppy Lever	.58		.0		
100072-001	Signal Cable Assy	1.16		.3	12.60	
100115-001	Knob Extender	.46		.3	12.60	
100129-001	Bracket, Right Outside	4.44		.2	8.40	
100130-001	Bracket, Upgrade	2.42		.2	8.40	
246002-001	Floppy Disk Drive	239.00	179.00	.5	21.00	R
274001-001	Screw, PNH, M3.0x6	.05		.0		
279009-002	Lockwasher, Split #4	.05		.0		

ADMINISTRATION

AUTHORIZED DEALER SPARE PART PRICES

MISCELLANEOUS

Part No.	Name	Price	Exchg	Lb	ExtLb	R
100233-001	32K RAM Upgrade Kit	41.00		.4	16.80	
250302-001	IC, 8272 Controller	20.70		.3	12.60	
252004-005	ROM OS Lo	13.80		.3	12.60	R
252004-006	ROM OS Hi	13.80		.3	12.60	R
252005-001	IC, RAM 4416-20	10.25		.3	12.60	
253001-001	IC, 80186 Processor	103.50		.4	16.80	R
253002-001	IC, KP Custom	13.32		.4	16.80	R
253003-001	IC, SG Custom	13.32		.4	16.80	R
253004-001	IC, RHB Custom	93.96		.4	16.80	R
253005-001	IC, RP Custom	63.96		.4	16.80	R
253007-001	IC, Keyboard Processor	14.14		.3	12.60	R
263003-001	Switch Box, TV	2.02		.1	4.20	
267001-001	RF Cable	.75		.1	4.20	

ADMINISTRATION

6.4 SPARE PARTS INVENTORY REQUIREMENTS

In order to provide the Consumer with the highest level of support each retail store is required to have the following parts and amounts in stock at all times. This list of parts is based on the first 100 systems installed. For each additional 100 systems the inventory should be increased appropriately.

Part No.	Name	QTY	Price	Ext Price
100031-001	System Unit Backplane	1	42.04	42.04
100035-001	Keyboard	2	47.02	94.04
100040-001	Module Opening Cover	5	1.06	5.30
100041-001	Actuating Knob, ZIF	2	.78	1.56
100051-001	Floppy Load Lever	5	.58	2.90
100061-001	ZIF PCA	2	38.32	76.64
100062-001	System Unit PCA	2	481.00	962.00
100064-001	Keyboard PCA	2	79.32	158.64
100068-001	Disk Controller PCA	2	157.00	314.00
100069-001	Expansion Backplane	1	45.02	45.02
100072-001	Floppy Signal Cable	1	1.16	1.16
100158-001	Floppy Disk Drive, Right	2	239.00	478.00
100195-001	Keyboard Cable	2	12.12	24.24
100235-001	Fan Assy, Expansion Unit	2	13.58	27.70
100390-001	Fan Assy, System Unit	2	16.10	32.20
250302-001	IC, 8272 Controller	2	20.70	41.40
243002-001	Power Supply	3	96.60	289.80
252004-005	ROM OS Lo	2	13.80	27.60
252004-006	ROM OS Hi	2	13.80	27.60
252005-001	IC, 4416-20 RAM	2	10.25	20.50
253001-001	IC, 80186 Processor	1	103.50	103.50
253002-001	IC, KP Custom	2	13.32	26.64
253003-001	IC, SG Custom	2	13.32	26.64
253004-001	IC, RHB Custom	2	93.96	187.92
253005-001	IC, RP Custom	2	63.96	127.92
253007-001	IC, Keyboard Processor	2	14.14	28.28
263003-001	Switch Box	2	2.02	4.04
267001-001	RF Cable	2	.75	1.50
276001-001	Foot, White	4	.06	.24
			Total----	3,179.02

ADMINISTRATION

6.5 SERVICE CLAIM FORM

All parts returned to MINDSET for repair or Warranty Reimbursement must be accompanied with a filled out and signed Service Claim Form. Warranty Reimbursement claims must have proof of purchase attached to the Service Claim Form. Proof of purchase is the Dealer's sales invoice dated on the same day of the sale of the product. The Service Claim Form is required for reimbursement of labor even if no parts are returned. Proof of purchase is required for labor only claims.

The Service Claim Form has five duplicate pages. All pages except for the last, "Customer", are to be returned to MINDSET. The green copy is for the Dealer's record.

The Service Claim form is filled out as follows:

Date: Date of service performed.

Dealer Name: Store name and address. Provide the "Bill To" address if different from the Ship To address.

Customer Name: Provide the Consumer's name and address which should be the same as the sales invoice.

Defect and Action: Provide a description of the failure and the action taken to make the repair.

Part No.: The 9-digit code from the Spare Part Price lists.

Description: Use only the names from the Spare Part Price lists.

Unit Serial No.: Use the full serial number of the product. Serial Numbers are found on the underside of MINDSET products.

Parts and Labor: Fill in the figures from the Spare Part Prices lists. Credit per Unit is the dollar value. Determine the Extension by multiplying Credit X Quantity.

Add up all totals. The Service Claim Form must be signed by an Authorized MINDSET Service Technician (Dealer Technicians who have completed the MINDSET Service Training Course).

APPENDICES

- A GLOSSARY
- B PARTS CATALOG
- C SERVICE BULLETINS

APPENDIX A

GLOSSARY

APPENDIX A

GLOSSARY

ASCII - American Standard Code for Information Interchange. A computer industry standard code which is used to represent alphanumeric characters. This 7-bit code is used for data processing, data transmission and associated equipment.

Boot or Bootstrap - The process of loading a disk operating system into the computer's memory. Usually refers to booting a diskette during startup or reset. Sometimes called Initial Program Load (IPL).

BASIC - Beginners All-purpose Symbolic Instruction Code. A programming language that uses common English words.

Baud - The number of signal elements transmitted per second by a Modem. In low speed Modems the bits per second and baud rate are usually equal, in high speed Modems they usually are not.

BIT - BInary digiT. The smallest piece of information that a digital computer can operate on. A bit can represent one of two values, 1 or 0.

Byte - a group of eight bits make up one byte.

Composite Video - A video signal designed to be transmitted over coaxial cable. The signal contains the complete video signal and synchronization pulses.

CPS - Characters Per Second. A speed rating usually applied to printers. Typical speeds range from 35-55 CPS.

CPU - Central Processing Unit. The CPU is the heart of the computer. The CPU, memory and input/output sections are the three major subsystems of a computer.

Cursor - An indicator (a small block of light on a display unit) that shows where data entered from the keyboard will appear.

Data - All information entered into or used by the computer.

GLOSSARY

Default - The choice of options a computer has when not instructed otherwise.

Disk Drive - A device which moves a read/write head across the surface of a recording disk or diskette to read and record information.

Diskette - The storage media for Floppy Disk Drives. A small disk which can retain computer data via magnetic impulses recorded on the surface of the diskette.

DMA - Direct Memory Access. A method of transferring data directly between an I/O device and the computer's memory.

DOS - Disk Operating System. A disk-based program that controls hardware and software operations in a computer.

EPROM - Erasable Programmable Read Only Memory. An Integrated Circuit Chip which can store Non-volatile programs and data. The data can be changed only with special programming equipment.

Floppy Disk Drive - See disk drive above.

Formatting - The preparation of a diskette for use.

IC - Integrated Circuit. A small package of electronic circuits usually housed in plastic.

Input/Output or I/O - One of the three major subsystems of a computer. I/O refers to interface devices that transmit information to and from the computer (printers, disk drives, etc.)

IPL - Initial Program Load. See Boot.

Isopropyl Alcohol - A distilled alcohol mixed with other chemicals. Excellent for cleaning gold contacts on circuit boards.

Joystick - An input device consisting of a lever that can be tilted in different directions to tell the computer to move an object displayed on the TV or monitor.

K - Roughly means the value 1000. However, in actual computer terms 1 K = 1024, 2 K = 2048, 4 K = 4096, etc.

GLOSSARY

LED - Light Emitting Diode. An indicator commonly used with digital electronics.

LSI - Large Scale Integration. An IC with a high density of transistor circuits. See VLSI.

Macro - A group or string of frequently used instructions or commands that can be accessed by a single command.

Memory - A device into which you can copy and store data and from which you can retrieve the data at a later time.

Microprocessor - A complete processor (CPU) contained in one or a few LSI circuits.

MODEM - An acronym for MODulate/DEModulate. A device which sends and receives computer data across phone lines.

Mouse - A small hand-held device which attaches to a computer and is used to control the Cursor or make selections on a video screen.

MS-DOS - Microsoft Disk Operating System. A licensed software package that is compatible with many computers, including the Mindset. See DOS.

NVRAM - Non-Volatile Random Access Memory. The Mindset NVRAM cartridge contains this type of memory. User data stored in this cartridge is retained by an internal battery.

Parallel communication - Data transmission using multiple lines, one for each bit (i.e., 1 byte uses 8 lines).

PCA - Printed Circuit Assembly.

Peripheral - An external input or output device that can be connected to a computer.

Program - A set of instructions which can be executed by the computer to perform a task or solve a problem.

PROM - Programmable Read Only Memory. An IC which stores computer programs and/or data. Can be programmed with special equipment. Once the information is written into the PROM it cannot be changed.

GLOSSARY

RAM - Random Access Memory. A volatile storage device used for memory in computers and computer devices.

RF - Radio Frequency. A high frequency signal such as those used for television signal transmission.

RGB - Red, Green, Blue. Refers to an RGB Monitor which receives video on separate input lines for each of these colors. Produces high quality video displays.

RS-232-C - A standard serial transmission protocol used by all computers for transmitting serial information such as data across telephone lines.

Scratch Diskette - A formatted diskette without any data or programs stored on it. One is used during diagnostic tests.

Sector - A portion of a track on a diskette.

Track - Data is recorded on a diskette in concentric rings called tracks. Typically, there are 35-77 tracks on a diskette. The actual number depends on the DOS being used.

VLSI - Very Large Scale Integration. An IC which has a very high density of electronic circuits. For instance, the MINDSET graphics chip has approximately 50,000 transistors. See LSI.

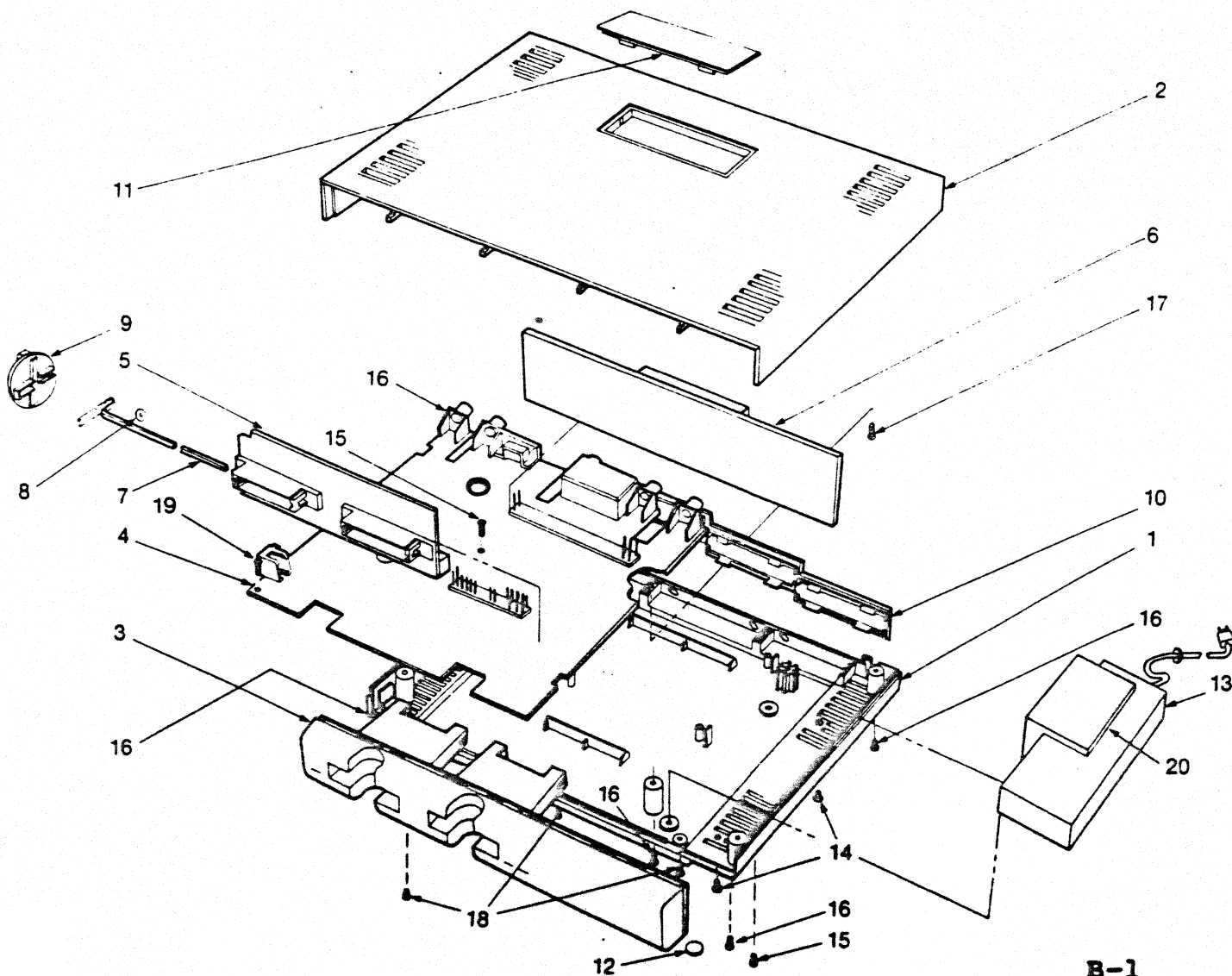
ZIF Board - Zero-Insertion Force Board. A Mindset circuit board which resides inside the System Unit. It has a special socket to receive Mindset cartridges without removing power from the computer.

APPENDIX B

ILLUSTRATED PARTS CATALOG

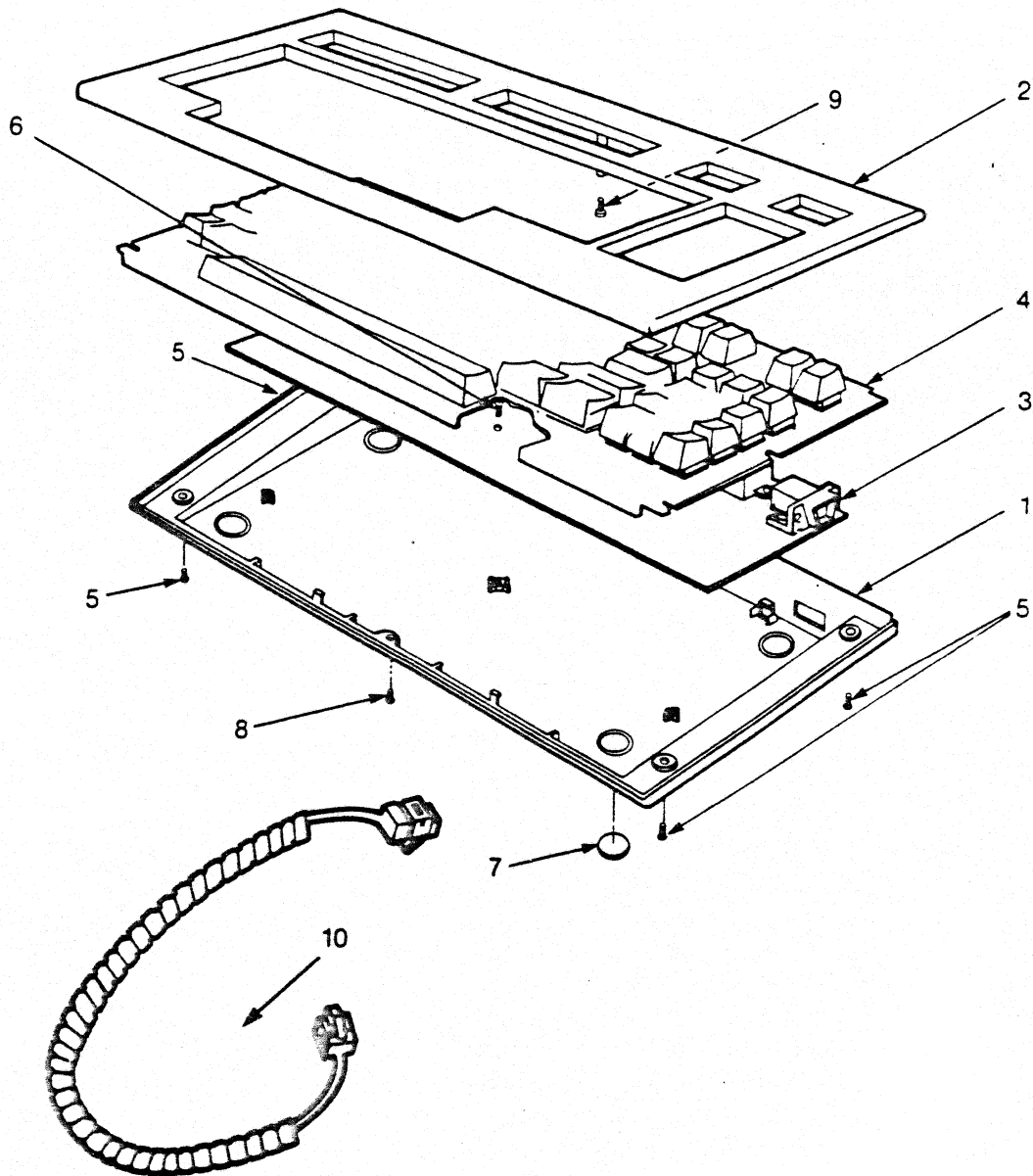
SPARE PARTS LIST SYSTEM UNIT

ITEM	PART NUMBER	NAME	QTY
1.	100036-001	Base, System Unit	1
2	100037-001	Top Cover, System Unit	1
3	100038-001	Front Cover, System Unit	1
4	100062-001	System P.C. Assy	1
5	100061-001	ZIF P.C. Assy	1
6	100031-001	Backplane P.C. Assy	1
7	100117-001	ZIF Key	1
8	274007-001	Tinnerman Clip	1
9	100041-001	Actuating Knob, ZIF	1
10	100040-001	Cover, Module Opening	3
11	100039-001	Cover, Interface	1
12	276001-001	Foot, White	4
13	243002-001	Power Supply	1
14	274003-605	Screw, FLH 82°, 6-32x3/8	2
15	274002-605	Screw, PNH, 6-32x3/8	3
16	274004-608	Screw, PNH, 6-19x1/2	5
17	274004-204	Screw, PNH, 2-28x5/16	1
18	274002-403	Screw, PNH, 4-40x1/4	3
19	274004-603	Screw, PNH, 6-19 x 1/4	1
20	100390-001	System Unit Fan Assembly	1



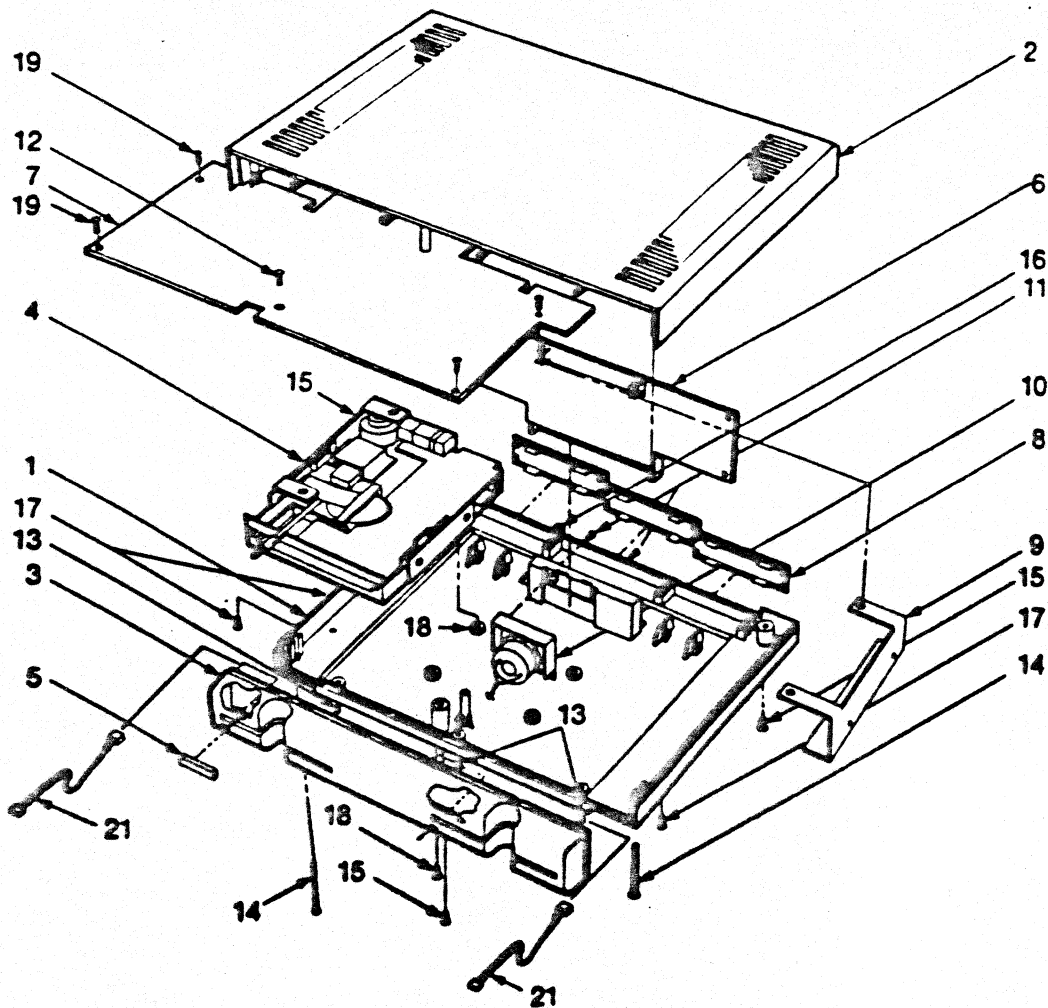
**SPARE PARTS LIST
KEYBOARD**

ITEM	PART NUMBER	NAME	QTY
1	100034-001	Base, Keyboard	1
2	100033-001	Top, Keyboard	1
3	100064-001	Keyboard P.C. Assy	1
4	100035-001	Keyboard	1
5	274004-604	Screw, PNH, 6-19x5/16	4
6	274004-403	Screw, PNH, 4-24x1/4	1
7	276001-001	Feet, White	4
8	274005-405	Screw, FLH 82°, 4-24x3/8	1
9	274004-605	Screw, PNH, 6-19x3/8	1
10	100195-001	Cable, Keyboard	1



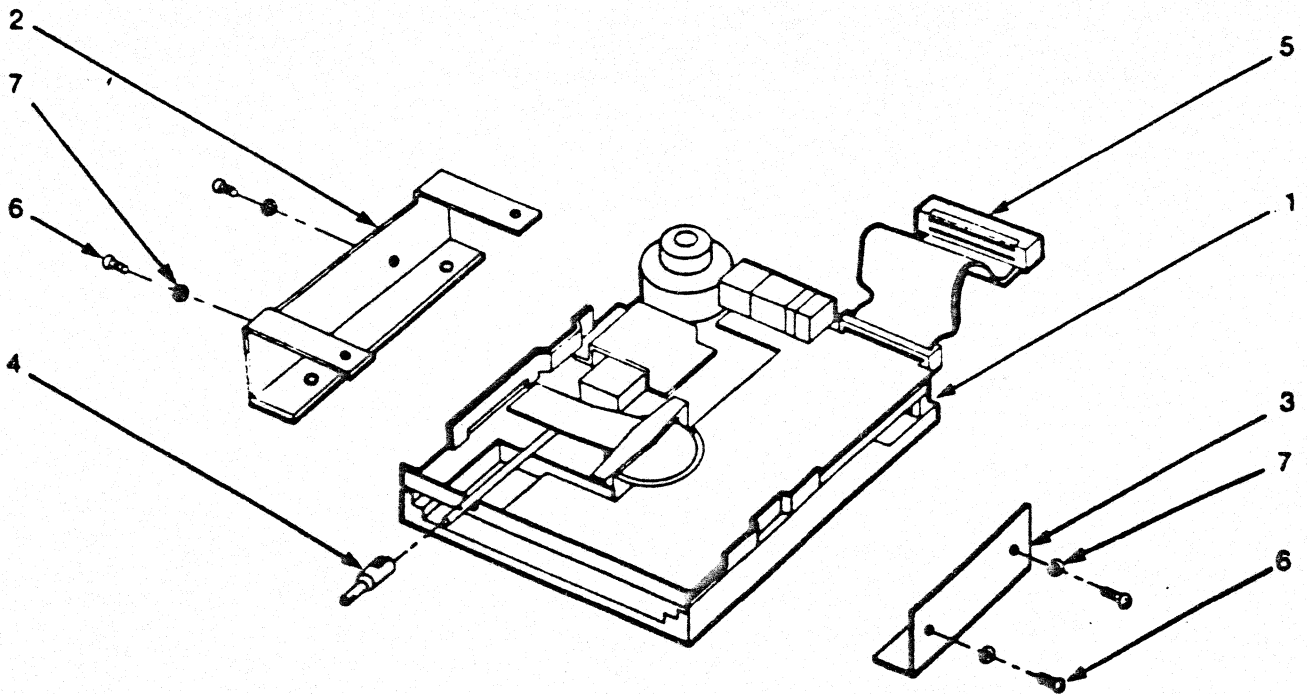
**SPARE PARTS LIST
EXPANSION UNIT ASSEMBLY**

ITEM	PART NUMBER	NAME	QTY
1	100048-001	Base, Expansion Unit	1
2	100049-001	Top Cover, Expansion Unit	1
3	100050-001	Front Cover	1
4	100017-002	Floppy Disk Assy, Left	1
5	100051-001	Floppy Lever	1
6	100069-001	Expansion Backplane P.C.	1
7	100068-001	Disk Controller P.C. Assy	1
8	100040-001	Cover, Module Opening	3
9	100129-001	Bracket, Right Outside	1
10	100235-001	Fan Assy	1
11	274008-403	Screw, PNH, 4-40x1/4	2
12	274004-605	Screw, PNH, 6-19x3/8	1
13	274002-405	Screw, PNH, 4-40x3/8	3
14	274005-420	Screw, FLH 82°, 4-20x2 1/4	2
15	274004-608	Screw, PNH, 6-19x1/2	3
16	274004-204	Screw, PNH, 2-28x5/16	1
17	274003-605	Screw, FLH, 82°, 6-32x3/8	4
18	274002-605	Screw, PNH, 6-32x3/8	2
19	274002-603	Screw, PNH, 6-32x1/4	4
20	100158-002	Floppy Disk Assy, Right	Option
21	100157-001	LED Assy	2



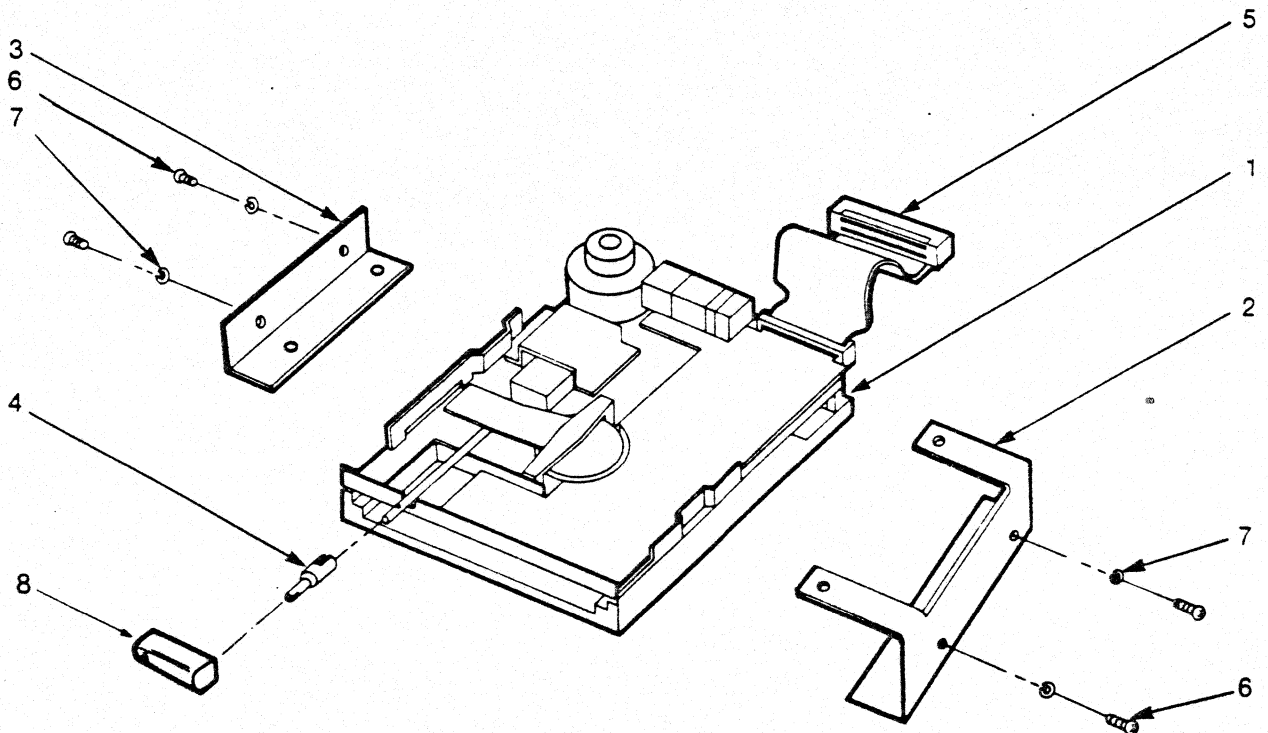
**SPARE PARTS LIST
FLOPPY DISK ASSEMBLY, LEFT**

ITEM	PART NUMBER	NAME	QTY
1	246002-001	Floppy Disk Drive	1
2	100128-001	Bracket, Left Outside	1
3	100016-001	Bracket, Inside	1
4	100115-001	Knob Extender	1
5	100072-001	Signal Cable Assy	1
6	274001-001	Screw, PNH, M3.0x6	4
7	279009-002	Lockwasher, Split #4	4



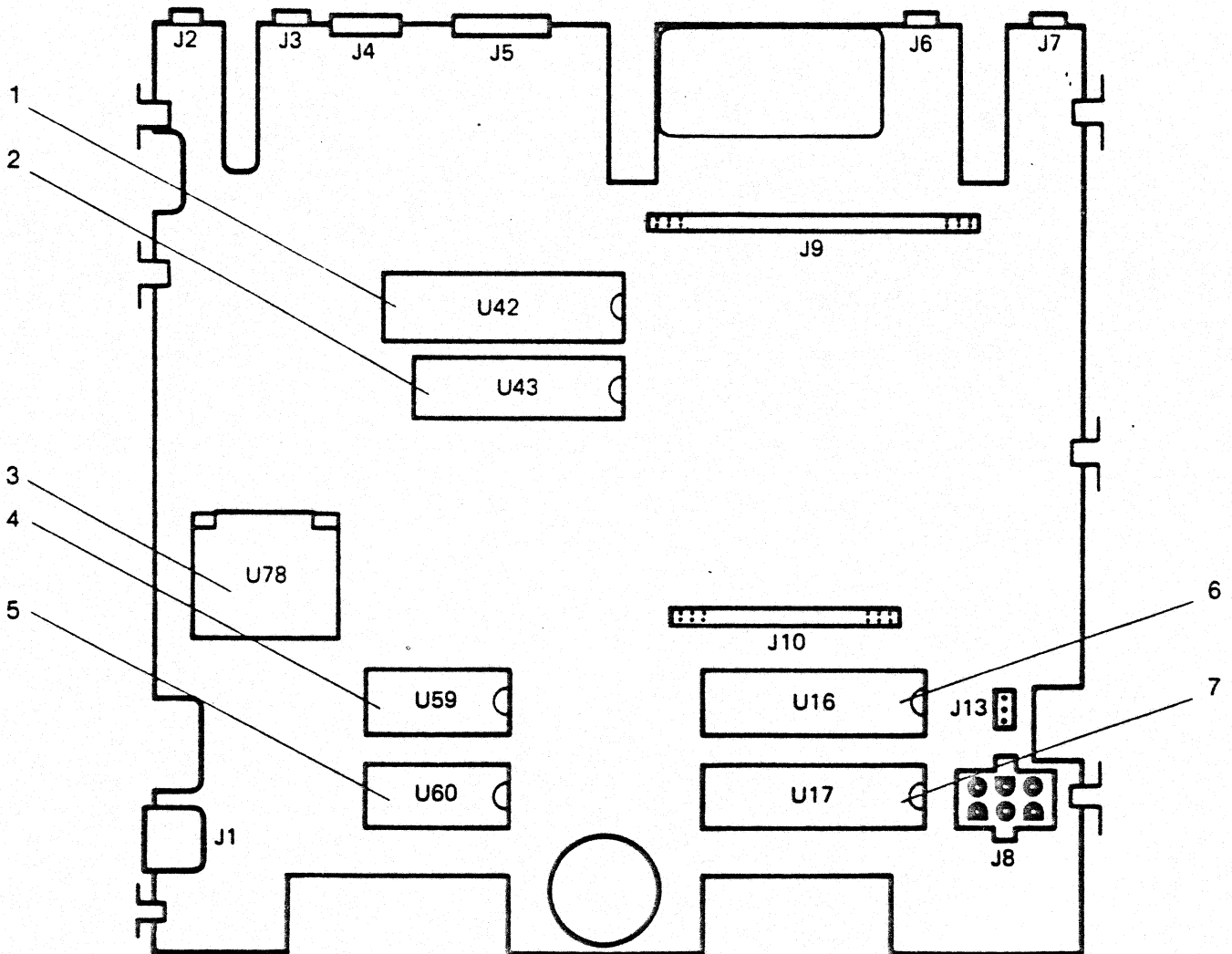
**SPARE PARTS LIST
FLOPPY DISK ASSEMBLY, RIGHT**

ITEM	PART NUMBER	NAME	QTY
1	246002-001	Floppy Disk Drive	1
2	100130-001	Bracket, Upgrade	1
3	100129-001	Bracket, Right Outside	1
4	100115-001	Knob Extender	1
5	100072-001	Signal Cable Assy	1
6	274001-001	Screw, PNH, M3.0x6	4
7	279009-002	Lockwasher, Split #4	4
8	100051-001	Floppy Load Lever	1



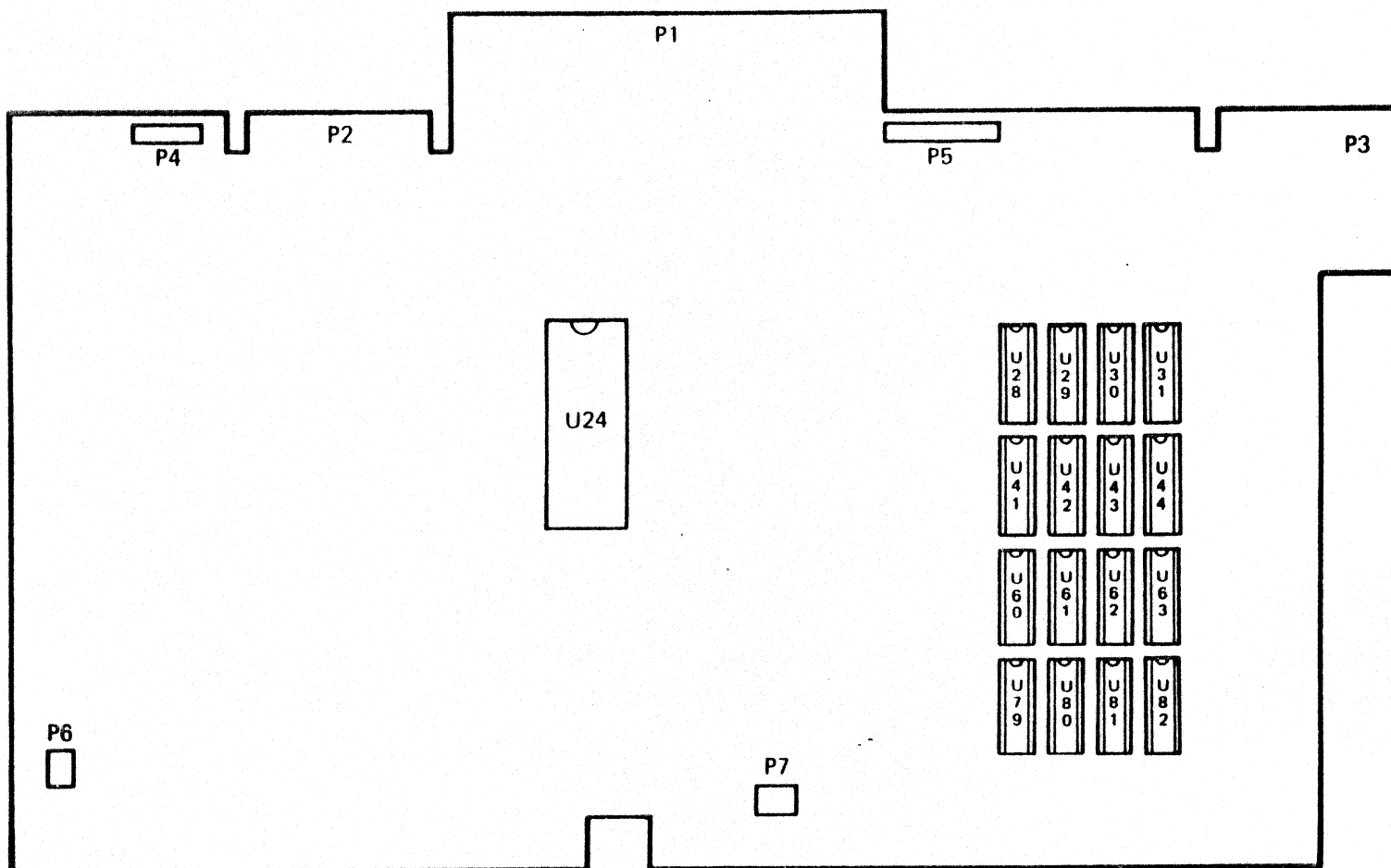
SYSTEM PRINTED CIRCUIT ASSEMBLY

ITEM	PART NUMBER	NAME	QTY
1	253005-001	IC, RP CUSTOM	1
2	253004-001	IC, RHB CUSTOM	1
3	253001-001	80186 MICROPROCESSOR	1
4	252004-005	ROM OS LO	1
5	252004-006	ROM OS HI	1
6	253006-001	IC, SOUND PROCESSOR	1
7	253002-001	IC, KP PROCESSOR	1



DISK CONTROLLER PRINTED CIRCUIT ASSEMBLY SPARE PARTS LIST

ITEM	PART NUMBER	NAME	QTY
U24	250302-001	IC, FLOPPY DISK 8272	1
U28-U82	252001-001	IC, 4416-20	OPTION (16)



APPENDIX C

SERVICE BULLETINS

DEALER SERVICE TRAINING

Welcome to MINDSET Dealer Service Training!

Is a computer with as much power as the MINDSET going to be easy to service?

The answer is YES!!!

MINDSET has taken great care in engineering its product. During this one day training session you will see that the MINDSET Personal Computer has been designed to provide a powerful, reliable and serviceable computer.

We at MINDSET are very proud of our product and we expect that after today's training you will feel the same way.

Enjoy the Course!

DEALER SERVICE TRAINING

COURSE OUTLINE

I INTRODUCTION

- A) Course objectives
- B) Company History
- C) The MINDSET Personal Computer Overview

II SYSTEM OPERATION

- A) Set up procedures
- B) MS-DOS / GW BASIC

III DIAGNOSTICS LAB

- A) Built-in Diagnostics
- B) Advanced Diagnostics

IV DISASSEMBLY/ASSEMBLY LAB

V TROUBLESHOOTING LAB

VI ADMINISTRATION PROCEDURES

- A) Administration Procedures
- B) Action Center

VI SUMMARY

MINDSET DEALER SERVICE TRAINING

COURSE OBJECTIVES

By the conclusion of this course you will be able to:

1. Install and operate the MINDSET Computer using a TV, Composite Video and an RGB monitor.
2. Describe the Mindset hardware, including the various parts and the system architecture.
3. Disassemble and Reassemble the entire MINDSET Computer including the Expansion Unit and Keyboard.
4. Run the MINDSET Advanced Diagnostics from diskette and cartridge.
5. Using the MINDSET Troubleshooting Guide, find and repair at least 4 "bugs".
6. Describe the MINDSET Warranty including shelf life coverage.
7. Fill out administrative forms required for parts ordering and returning parts for credit.
8. Describe support services available from MINDSET including the Technical Support and Sales Support Hot Lines, Service Bulletins, and the Service Manual.
9. Describe the company history of MINDSET.
10. Describe the features of the MINDSET Personal Computer that make it different and attractive compared to competitor's products.

MINDSET Corporation

MINDSET Corporation was incorporated in September 1982 in Sunnyvale, California. Its charter was to enter the personal computer market with significant technological advances while making use of the existing base of application programs.

The company's first product is the MINDSET Personal Computer, a transportable microcomputer with enhanced computing power for image processing and bit-mapped color display.

The MINDSET is a superior, general purpose personal computer. It is a productivity tool, uniquely capable of creating visual communication displays, with broad application among the professions that analyze, educate, communicate, and persuade.

The MINDSET machine creates a new class of personal computer hardware. It provides an optimum target machine for the newly emerging class of graphics-intensive productivity software. Further, it provides a suitable host for professional graphics software applications.

The MINDSET's hardware centers on an Intel 80186 microprocessor, augmented by two custom MINDSET-designed coprocessors. The 80186 is an advanced member of Intel's 16-bit microprocessor family. It and the MS-DOS operating system were chosen for compatibility with the immense library of standard business/productivity software created for the IBM Personal Computer.

The MINDSET Personal Computer is an advanced graphics computer with a full color range. It is designed to take advantage of the large installed base of today's productivity software, and to become the optimum target personal computer for the emerging class of personal graphics software.

Importance of Graphics

Traditionally, the utility of personal computers has been limited to the manipulation of text and numbers. And traditionally, the personal computer user interface has been limited to fairly low resolution and static black and white displays. Recently, advances in personal computer hardware and software technologies have made significant improvements possible in the area of user interface. These improvements, in turn, have increased the overall utility of the personal computer to the consumer.

Many of the advances in the user interface fall under the broad label of "graphics". Much of the original work in graphics interfaces was done initially at Xerox Parc and brought to market in the Xerox Star, Apple Lisa, and most recently Macintosh. In software, graphics-rich programs like Microsoft's Windows, which emphasize the movement of windows and icons, illustrate the application of graphics.

"Graphics" is a term encompassing several elements which together result in an improved user interface and increased personal computer productivity. These elements are color, motion and resolution.

Color is the way we see the world. Color can be used to code and label. It can be used to identify files, subtitles, headings, warning messages and it is infinitely more useful in the creation of business graphics and charts for presentation purposes. Color brings an important aspect to the personal computer display, and at the same time, color is the most realistic reflection of the world we live and work in.

Motion is the ability to move and transfer information and objects on the screen. Ideally, we would like to create motion which duplicates the speed and smoothness of moving information across a desktop. In personal computing, motion allows us to complete tasks faster and more efficiently. We can cut and paste papers together easily, we can reorder chapters in a book or combine graphs with text. In addition, we can simulate real world situations and analyze changes in "what if" scenarios. Smooth motion also better captures the user's imagination for education and entertainment purposes. The speed at which all of this is done reflects motion. The faster the speed or motion, the closer the personal computer comes to simulating our thoughts.

Resolution allows us to represent images clearly. The clearer the resolution, the higher the accuracy of object representation. As symbols and icons become increasingly

important to improvements in the user interface, resolution becomes correspondingly important.

Graphics, in addition to improving the user interface, is simulating the development of new applications for personal computing. For instance, the combination of advanced graphics with color makes a new level of business presentations a reality. In addition, improvements in color and resolution allow broader use of computer-aided design techniques. Other areas in which advanced graphics will have significant impact are in education and entertainment.

To summarize, computer graphics is central to the growing use of personal computers for two major reasons. One, it provides a powerful method of linking the human with the computer, and two, it allows ideas and information to be represented, manipulated, and communicated in ways that mere words cannot.

MINDSET Objectives

The first objective for MINDSET was to design an architecture with which a computer could be built that could achieve a leapfrog level of performance consistent with available technology and at the cost goals of a personal computer. The specific performance area chosen by MINDSET was graphics.

The second objective was to build a machine that would run the industry standard software in a media-compatible mode. MINDSET felt that today's software base could not be ignored, but that it could be leveraged to form the basis of a new class of graphics software.

A third objective was to provide a personal computer which would run tomorrow's software in a superior manner. Specifically, MINDSET saw the growing popularity of integrated productivity software which made ample use of icons, windows, etc., to provide user-friendly interfaces.

The fourth MINDSET objective was to provide a machine which had the performance capability to bring a new class of professional graphics software into the personal computer marketplace. This is software that had only been available on large, expensive graphics systems; specifically, presentation-level graphics, artists' packages, animation programs, etc.

The final MINDSET objective was to design an extensible architecture that would not only support the software standards of today, but also be general purpose and flexible enough to adapt to the undefined standards of tomorrow.

MINDSET Personal Computer
Dealer Service Training

Lab Project Title: Self and Advanced Diagnostics
Name: _____ Date: _____

Objective: To gain experience executing the MINDSET Personal Computer Self and Advanced Diagnostics, and interpreting the results and indications.

References: MINDSET Personal Computer Service Manual.

Introduction: The MINDSET Self Diagnostics provide an excellent "quick check" of the MINDSET Personal Computer, and can be very effective in determining the source of a problem or verifying the correct operation of the machine.

The Advanced Diagnostics provide more detailed testing of specific areas of the system, as well as the keyboard and disk.

Understanding the functions that the diagnostics perform, and what can be expected from them is a key element in properly servicing the MINDSET Personal Computer.

Procedure:

I. Self Diagnostics

A. System Unit Self Diagnostics Execution

1. Remove power cord from A.C. outlet.
2. Disconnect the Expansion Unit from the System Unit, and remove any cartridges installed in the System Unit.
3. Plug power cord into A.C. outlet.
4. Power ON System from the keyboard switch, and record visual and audible results.

3V RAM-CHANGED *Relay Click sound*

Relay Click sounds *30s* *Diags Normal* *TIME AND DATE CHANGED* *RED LED Lights*

POWER FAIL *POWER light on* *SCREEN goes blank*

CONSOLE

5. Turn the keyboard power switch to OFF, wait five seconds, and turn switch to ON.

6. Observe the indications of the System.

The difference between steps 4 and 6 are the System Diagnostics performing a "cold" start of the diagnostic, and a "warm" start of the diagnostic.

7. Compare the results of steps 4 and 6 to the "Power Up System Diagnostics" indications, found in Section 4 of the Service Manual.

B. Expansion Unit Self Diagnostics

1. Remove power cord from the A.C. outlet.

2. Reinstall the Expansion Unit onto the System Unit. Remove any diskettes installed in the disk drives.

3. Plug power cord into the A.C. outlet, and power ON the System at the keyboard.

4. Observe the self test indications, and record your results below:

Make
RAM is up to 256k

Config SCREEN

Brighter - A light unit

5. Turn the keyboard power switch to OFF, wait five seconds, and turn switch to ON.

6. Observe the indications of the System.

Again, the differences are the "cold" start indications, compared to the "warm" start indications.

7. Compare the results obtained in steps 4 and 6 to the "Power Up System Diagnostics" indications, found in Section 4 of the Service Manual.

C. Self Diagnostics and Boot Operation.

1. Install a MS-DOS bootable diskette into Drive A.
2. Power OFF System at the keyboard, wait five seconds, then power ON System.
3. Observe the indications as the System advances through the Self Diagnostics and into the loading operation.
4. Remove the diskette from Drive A, and perform steps 2 and 3 again. Pay particular attention to the Drive A select light.
5. Compare these indications to the "Power On Self Diagnostics" indications found in Section 4 of the Service Manual.
6. Reinstall the floppy diskette, and press the Reset key while holding down the ALT key. Observe the indications.

Question: What is a key visual difference between the "cold start" system diagnostics indications, compared to the "warm" start indications?

Answer: *↓ SYSTEMS DIAG ↓ DOS*

II. Advanced Diagnostics

A. Diagnostics Preparation

1. Ensure that the MINDSET System contains the Expansion Unit with at least one drive, and completes the System diagnostics successfully.
2. Read the introduction to the Advanced Diagnostics in the Service Manual, found in Section 3.3

B. I/O Trap Test

1. Review the operating procedures for the I/O Trap test, located in the Service Manual at Section 3.3.1.
2. Load and execute the I/O Trap test, using 3.3.1 for specific instructions.

Question: Why is it important to run this test first?

*test main mem
system RAM*

Answer: test main SYSTEM OPERATING

C. Expansion Ram Test

1. Review the operating procedures for the Expansion Ram test, located in the Service Manual at Section 3.3.2.
2. Execute the Expansion Ram test, using 3.3.2 for specific instructions.

Question: How much of the overall System memory can be replaced to component (chip) level?

Answer: 128K

Question: In the case of a failing Ram chip that is soldered in place, what is the repair action?

Answer: REMOVE BOARD

D. Keyboard Test

1. Review the operating procedures for the Keyboard test, located in the Service Manual at Section 3.3.3.
2. Execute the Keyboard test, using 3.3.3 for specific instructions.

Question: To bypass the key test to perform only the mouse/joystick test, what key combination is pressed?

Answer: CTRL PAGE UP

E. Floppy Drive Test

1. Review the operating procedures for the Floppy Drive test, located in the Service Manual at Section 3.3.4.
2. Execute the Floppy Drive test, using 3.3.4 for specific instructions.

Contact your instructor when one pass is complete.

MINDSET Personal Computer
Dealer Service Training

Lab Project Title: Disassembly/Reassembly

Name: _____ Date: _____

Objective: To gain hands-on experience disassembling and reassembling the Expansion, Keyboard, and System Units of the MINDSET Personal Computer, based on procedures in the Service Manual.

References: MINDSET Personal Computer Service Manual.

Equipment Required:

- . MINDSET Personal Computer with Keyboard and Expansion Unit
- . #1 Phillips screwdriver
- . #2 Phillips screwdriver
- . IC puller or equivalent

I. Expansion Unit Disassembly/Reassembly

A. Disassembly

1. Read Section 5.1 of the Service Manual and perform preparation steps as stated.
2. Remove the Expansion Unit from the System Unit.
3. Remove the Expansion Unit top cover, as outlined in 5.3 of the Service Manual.
4. Remove the Disk Controller PCA and the Expansion Backplane PCA, as outlined in 5.3.1.
5. Remove the Expansion Unit Front Panel and LED's, as outlined in 5.3.2.
6. Remove the Expansion Unit Fan Assembly, as outlined in 5.3.3.
7. Remove the left hand (Drive A) Floppy Disk Drive, as outlined in 5.3.4.

8. Remove the Disk Controller chip, U24, and one Ram chip, using 5.2.7 as a location and procedural guide.

B. Reassembly

1. Each disassembly procedure of the Service Manual is followed by a reassembly procedure. Reassemble the Expansion Unit component in the following order:
 - . Ram Chip
 - . Disk Controller Chip
 - . Floppy Disk Drive
 - . Fan Assembly
 - . Front Panel
 - . Disk Controller and Expansion Backplane PCA's
2. Ask your instructor to perform a visual check before installing the top cover.
3. Install the top cover.

II. Keyboard Unit Disassembly/Reassembly

A. Disassembly

1. Disconnect the Keyboard and cable from the System Unit, as outlined in 5.4.
2. Remove the Keyboard top cover, as outlined in 5.4.
3. Remove the Keyboard (part # 100035), as outlined in 5.4.1.
4. Remove the Keyboard PCA, as outlined in 5.4.2.
5. Remove the Keyboard Processor chip, U5, as outlined in 5.4.3.

B. Reassembly

1. Reassemble the Keyboard, using the procedures found in Section 5.4 for each keyboard component. Reinstall in the following order:
 - . Keyboard Processor Chip (U5)
 - . Keyboard PCA
 - . Keyboard (100035)
 - . Top Cover

. Cable

III. System Unit Disassembly/Reassembly

A. Disassembly

1. Read the introduction Section 5.2, then remove the top cover of the System Unit.
2. Remove the System Unit Backplane PCA, as outlined in 5.2.1.
3. Remove the Power Supply, as outlined in 5.2.2.
4. Remove the ZIF PCA and Front Panel, as outlined in 5.2.3.
5. Remove the System Unit PCA, as outlined in 5.2.4.
6. Remove the Fan from the Power Supply, as outlined in 5.2.5.
7. Remove the 80186 chip, U78, from the System PCA. Refer to Section 5.2.6 for instructions.
8. Remove the Sound Processor chip, U16, from the System Unit PCA, using 5.2.7 as a guide.

B. Reassembly

1. Reinstall all components, using the reinstallation procedures of the Service Manual. Using 5.2, reinstall the System Unit components in the following order:
 - . Sound Processor (U16)
 - . 80186 chip (U78)
 - . System Unit PCA
 - . Fan Assembly to the Power Supply
 - . Power Supply
 - . ZIF PCA
 - . Front Panel
 - . System Unit Backplane PCA
2. Ask your instructor to perform a visual check of the System Unit prior to installing the top cover.
3. Install the top cover.

4. Hook up the Keyboard to the System Unit, and install the Expansion Unit.

IV. Testing

A. Self Diagnostics

1. Plug in the System, and execute Self Diagnostics.
2. Record any errors detected.

B. Advanced Diagnostics

1. Load and execute the Advanced Diagnostics in this order:
 - a. I/O Trap Test
 - b. RAM Test 1 pass (Automatic mode)
 - c. Disk Diagnostic 1 pass
 - d. Keyboard, Joystick, Mouse Test
2. Record any errors found.

Inform your instructor when you have completed this lab.

MINDSET Personal Computer
Dealer Service Training

Lab Project Title: Measurements Lab

Name: _____ Date: _____

Objective: To become familiar with test points and procedures used to measure voltage and resistance in the MINDSET Personal Computer as part of a normal fault isolation process.

References: MINDSET Personal Computer Service Manual.

Equipment Required: MINDSET System with Expansion Unit, Digital Voltmeter or equivalent.

Introduction: This lab allows you to gain experience locating voltage and resistance measurement points, and performing the measurements on a good working system. These skills learned will be used later in the Troubleshooting Lab.

I. Voltage Measurement

A. Expansion Unit test points.

1. Power off the System and remove the Expansion Unit top cover.
2. Reinstall the Expansion Unit onto the System Unit and power on the System.
3. Using 4.4 for reference, measure the voltage at the Disk Controller PCA. Record results below:

+5v _____ +12v _____

Question: Are the voltage readings within tolerance?

Answer: _____

4. Using 4.4 as a reference, measure the voltage at Connector P1.

+5v _____ +12v _____
-12v _____ TRKL CHG _____

Question: Are the voltage readings within tolerance?

Answer: _____

5. Power off System and reinstall Expansion Unit top cover.

B. System Unit test points.

1. Remove the System Unit top cover.
2. Locate connector J8.
3. Perform the voltage checks as described in 4.4, and record the values below:

KEYBOARD_SWITCH_OFF

+5v _____ +12v _____
-12v _____ TRKL CHG _____

KEYBOARD_SWITCH_ON

+5v _____ +12v _____
-12v _____ TRKL CHG _____

4. Power off the System and remove the power cord from the A.C. Outlet.
5. Remove the connector P8.
6. Plug power cord into A.C. Outlet and measure voltages at connector P8 as described in 4.4. Record values below:

+5v _____ +12v _____
-12v _____ TRKL CHG _____

C. System Unit Electrical Short Check.

1. Remove power cord from A.C. Outlet.
2. Perform resistance measurements as outlined in 4.5. Record values below:

Pin 1 to Pin 2 -----

Pin 3 to Pin 2 -----

Pin 4 to Pin 2 -----

Pin 6 to Pin 2 -----

Question: Do the values recorded differ greatly from the values stated in 4.5?

Answer: -----

Question: What is meant by the term "Capacitance effect"?

Answer: -----

3. Reinstall P8, the System Unit top cover, and the Expansion Unit. Test System for correct power up indications.

MINDSET Personal Computer
Dealer Service Training

Lab Project Title: Troubleshooting the MINDSET

Name: _____ Date: _____

Objective: Diagnose, isolate, and repair malfunctions in the MINDSET Personal Computer, using the Troubleshooting Flowchart, diagnostics, and available tools located in the Service Manual.

References: MINDSET Personal Computer Service Manual.

Equipment Required:

- . MINDSET Personal Computer with Keyboard and Expansion Unit
- . Tools for disassembly/reassembly

Introduction: This lab session provides the opportunity to put into practice the skills learned to this point, and to gain confidence in using the Troubleshooting Flowchart. Your instructor will place bugs into the System for you to analyze and diagnose. If, at any point, you do not understand why the System is displaying a symptom, ask your instructor to explain the indications.

I. Troubleshooting the MINDSET

A. System Preparation

1. Ensure correct operation of the System by executing Self Diagnostics and Advanced Diagnostics.
2. Inform your instructor that you are ready to begin troubleshooting.

B. Recording Results

1. Analyze your problem, and record result on the troubleshooting form provided.
2. Once identified, discuss results of your analysis with your instructor.
3. Request another bug (your instructor will be glad to break your machine again).

TROUBLESHOOTING ANALYSIS

SYMPTOMS:

Power On Self Diagnostics: _____

Configuration Screen: _____

Advanced Diagnostics: _____

Program Execution: _____

ANALYSIS:

Flowchart Indications: _____

Voltage Check: _____

Other Indication: _____

RESULT:

Bad Component(s): _____

ADDITIONAL COMMENTS:

PRODUCT COMPARISON CHART APPLE IIe vs. MINDSET

FEATURE	APPLE IIe	MINDSET
PROCESSOR:	6502A 8 bit internal 8 bit external	80186 16 bit internal 16 bit external
RAM STANDARD/MAXIMUM:	64K/128K	64K/288K
ROM STANDARD/MAXIMUM:	16K	32K
OPERATING SYSTEM:	Apple DOS 3.3 CP/M,	MS-DOS 2.0 optional
KEYBOARD LAYOUT:	63 Keys Attached 10 Function keys	84 Keys Detached 10 Function keys
MONITOR:		
Monochrome	included	
TV interface		standard
RGB interface	option	standard
Composite interface	option	standard
SCREEN RESOLUTION:	280 x 192	320 x 200 320 x 400 640 x 200 640 x 400
STORAGE OPTIONS:	5 1/4" Diskette 160K (SS/DD) Cassette	5 1/4" Diskette 360K (DS/DD) 2 Drives 2 Cartridge
LANGUAGE OPTIONS:	BASIC, Pascal FORTRAN, LOGO, Assembler	GW BASIC Pascal C Assembler
GRAPHICS:	16 colors, Std.	16 colors, std. 512 color Palette speed & motion
AUDIO:	Optional 1 voices	Optional 3 channels max. 6 voices /channel
COMMUNICATION OPTIONS:	RS-232, TTY Applenet	RS-232-C Serial Async. HDLC Bisynchronous