Service Guide

Z-171 PC Series

ZENITH | data systems

The purpose of this page is to make sure that all service bulletins are entered in this service guide. When a service bulletin is received, mark the guide and list the information in the record below.

Record of Field Service Bulletins

SERVICE BULLETIN NUMBER	DATE OF ISSUE	CHANGED PAGE(S)	PURPOSE OF SERVICE BULLETIN	INITIALS

Zenith Data Systems Corporation
St. Joseph, Michigan 49085

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Introduction and General Information

This service guide is intended to aid the service technician in the installation and repair of a Z-170 Computer. This guide provides information to service the computer to the circuit board or subassembly level only.

The abbreviated installation procedure contained in this guide provides basic information on installing this computer. If further information is required, refer to the other publications listed below.

Basic operating instructions are also provided to aid the service technician who is not familiar with this computer model.

Related Publications

595-3532   *Z-170 PC Portable Computer Owner's Manual*
595-3440   *Z-170 Series Technical Reference Manual*
585-174   *Z-170 Schematics and Parts List*

Options and peripheral equipment for this computer have separate manuals which are not listed here.

List of Tools and Equipment

The tools and equipment required to service the computer include:

1   flat-blade screwdriver
1   #2 phillips-head screwdriver
1   oscilloscope
1   VOM (volt-ohm meter) or a DVM (digital voltmeter)

Introduction to the Computer

The computer is equipped with a built-in LCD (liquid crystal display), built-in keyboard, and two floppy disk drives. The available options include expansion up to 640K of user memory, an internal modem, a RGB video board and battery pack.
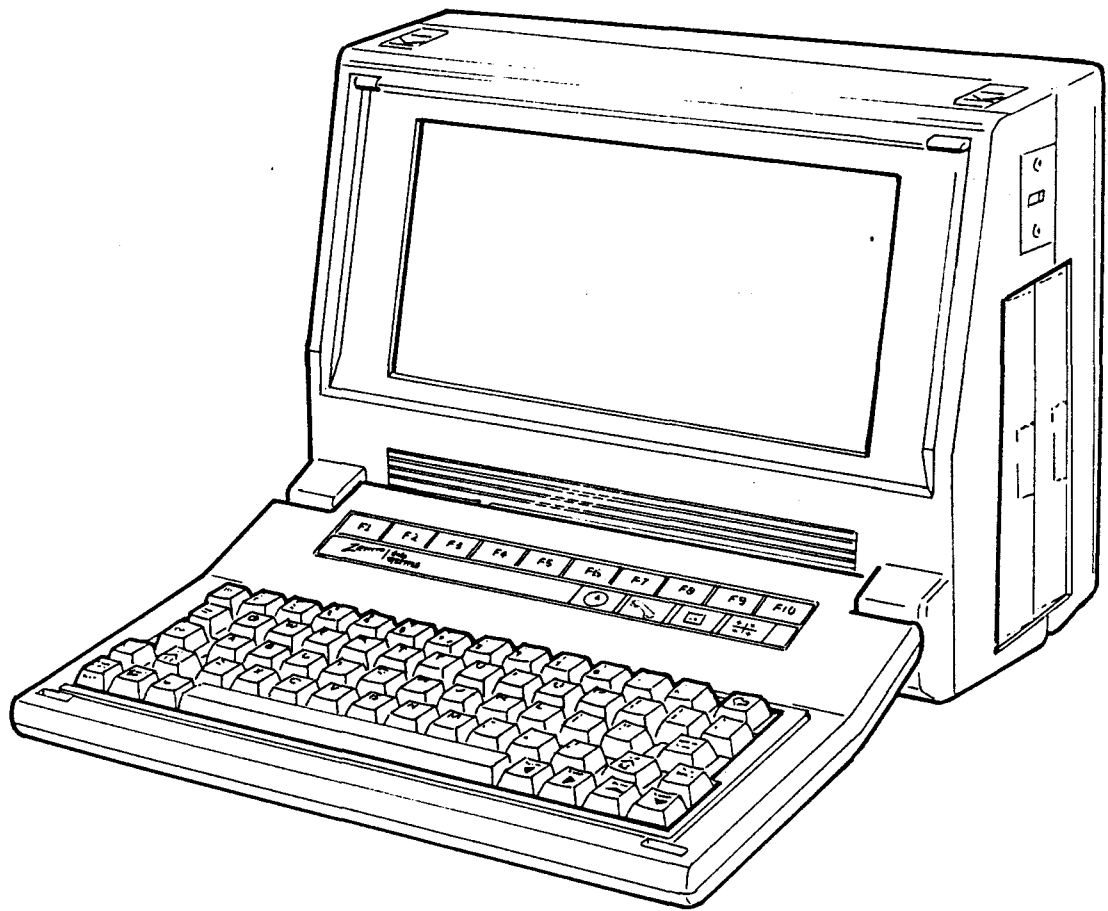
Figure 1-1:   Z-170 Computer

Front View

The following components are illustrated in Figure 1-1.

- Keyboard — The keyboard has 77 keys for data entry and control functions. The lower portion consists of 63 keys and forms a typewriter-type keyboard. The upper portion consists of the 10 user function keys and 4 unique icon keys.

- Screen — The screen is a 25-line electroluminescent LCD that is compatible with the IBM PC color graphics adapter in text and graphics mode.

Right View

The disk drives are illustrated in Figure 1-2.

- Disk drives — The computer has one or two floppy disk drives installed. The front of the drive may differ slightly from that illustrated in the figure.

- Disk access indicators — The indicator light acknowledges when the disk drive has been selected.
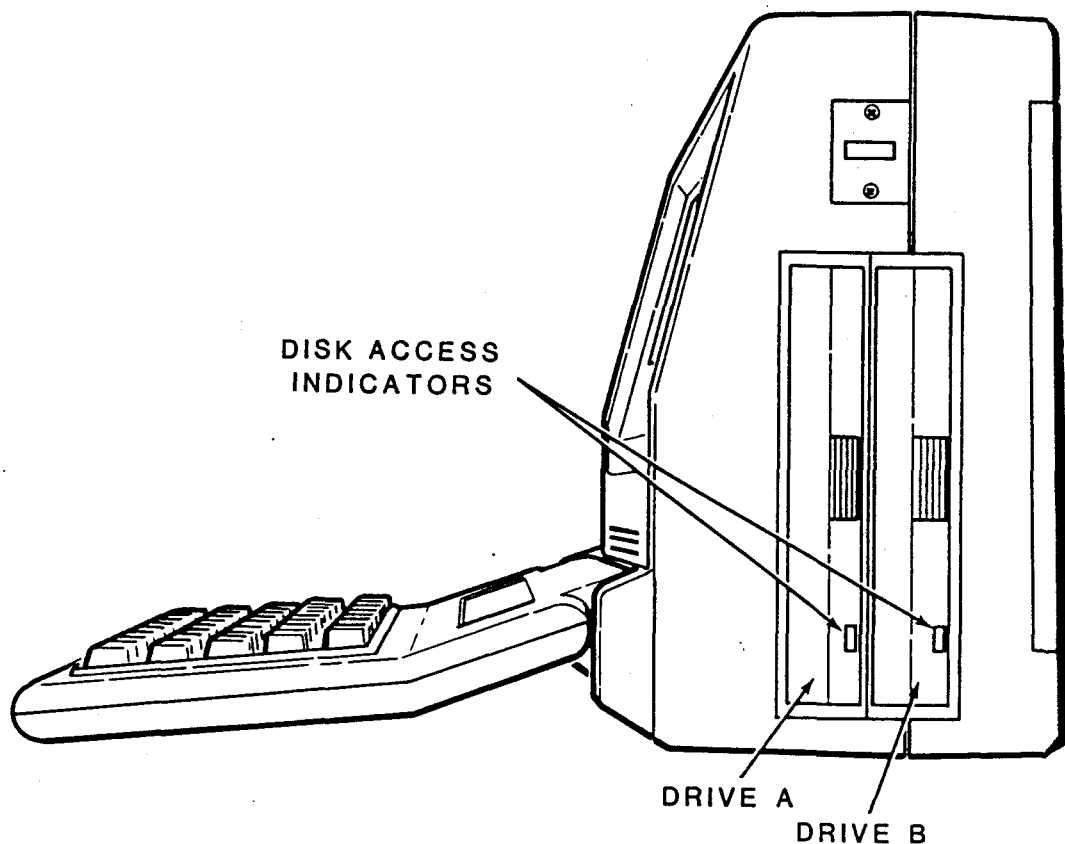
Figure 1-2:   Right View

Left View

The following components are illustrated in Figure 1-3.

- Backlight dial — Adjusts the intensity of light behind the screen. This dial is also used as a contrast control to improve the visibility of the display.

- On/off switch — Use this switch to turn the computer on and off.

- AC adapter connector — Used for AC operation. Plug the external AC adapter connector into this jack.

- Battery compartment — The optional battery pack is stored inside this compartment.
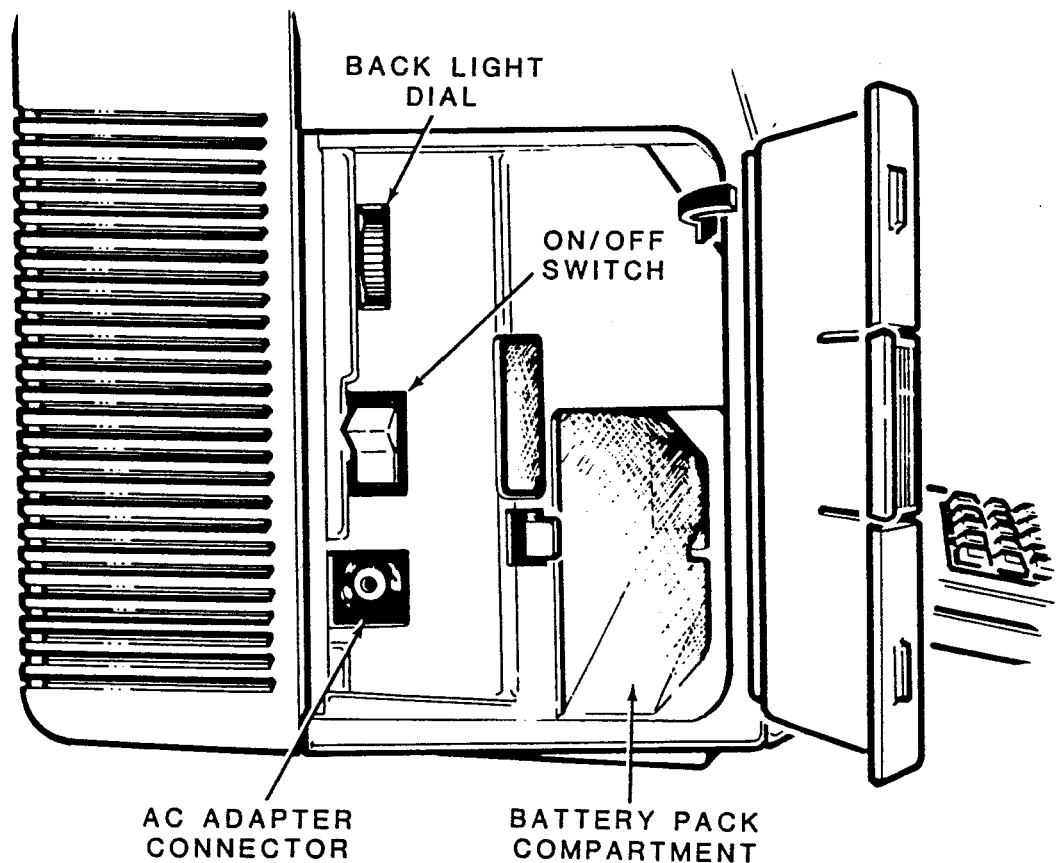
Figure 1-3: Left View

Rear View

The following connectors are illustrated in Figure 1-4. For a more detailed description of the connectors and their pinouts, refer to Chapter 2, "Installation."

- Parallel connector — Parallel Centronics-type output for a parallel printer or other peripheral.

- Serial connector — RS-232C DTE input/output for a printer, modem, or other serial peripheral or communication device.

- Bus expansion connector — Bus signals for use with an expansion chassis.

- Phone/modem connector — Input/output for a phone or external modem.
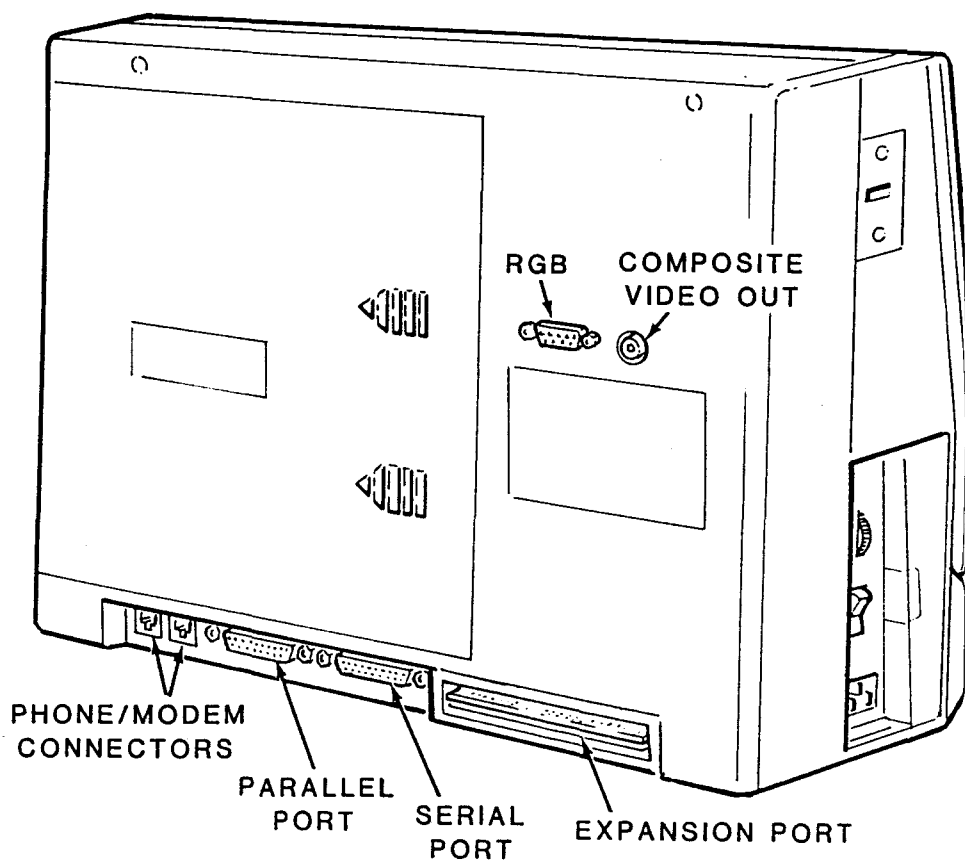
Figure 1-4: Rear View

Introduction and General Information

- Composite video connector — Composite video output for an external monochrome video monitor. This connector is supplied with the optional video board.

- RGB video connector — Red, green, blue, and intensity output for an external RGB (color) monitor. This connector is also supplied with the optional video board.

Specifications

CPU
    Processor .... 80C88 CMOS 16-bit processor.
    Type .... 16-bit internal.
    Clock speed .... 4.77 MHz.

Memory .... 4K non-volatile RAM; 256K dynamic RAM expandable to 640K.

Display .... 80 × 25 character (640 × 200 pixel) LCD display. Compatible with the IBM PC color graphics adapter in text and graphics modes.

Sound .... 8 ohm, 2-inch speaker.

Input/Output
    Serial I/O .... Asynchronous serial RS-232C (DB-25 connector) port — 1 start bit; 7- or 8-bit word length; 1 or 2 stop bits; selectable baud rates of 110, 150, 300, 600, 1200, 2400, 4800, or 9600; RD, CTS, DSR, CD signals recognized; TD, RTS, DTR signals controlled; full- or half-duplex operation.
    Parallel I/O .... Centronics-compatible parallel output port (DB-25 connector).
    Video .... Composite video signal (RCA phono jack) and RGB color video signals (9-pin D-type connector).

Expansion .... Bus interface to optional expansion chassis.

Modem .... RJ-11 modular connector.

Disk drives .... 5.25-inch double-sided, one-third height double-density

Introduction and General Information

floppy disk drives, 360K formatted capacity each drive, 48 tpi, 9 sectors/track. Write-protection recognized. Operating system: MS-DOS (PC-DOS compatible) version 1.25 and higher.

Keyboard .... 63-key QWERTY arrangement with 4 cursor control keys. Also included are the 10 touch control function keys and 4 icon keys.

Power requirements .... +12.8 VDC at 2.5 amperes (32 watts).

External AC adapter
    Input voltage .... 115 VAC (95–130 VAC); 220 VAC (190–260 VAC); jumper selectable.

    Frequency .... 60 Hz (48–62 Hz); 50 Hz (48–62 Hz).

    Current .... 4 amperes maximum continuous (full load, 115 VAC).

    Output voltage .... +12.8 VDC.

Environment
    Operating .... 50–90 degrees Fahrenheit (10–32 degrees Celsius).

    Storage .... −40 through +125 degrees Fahrenheit (−40 through +51 degrees Celsius).

    Humidity .... 20–80% relative humidity (non-condensing).

Dimensions .... 9.5″ × 13.0″ × 6.0″ (24.1 cm × 33.0 cm × 15.2 cm) with keyboard closed. 13.4″ deep (34.0 cm) with keyboard open.

Weight
    With 2 drives .... 14.4 lbs. (6.54 kg).
    With battery .... 16.0 lbs. (7.26 kg).
    With internal modem .... 14.7 lbs. (6.67 kg).

Definition of System Model Numbers

The Z-170 is a member of the Z-100 PC series of computers. The full model number designates the configuration of the computer. An example of the full model number is listed in Figure 1-5 and each portion of the number is defined.

Drive type
F = Floppy disk drives
W = Winchester/rigid disk drives

CRT type (built-in)
A = Amber
G = Green
L = Liquid crystal display

Selling organization
H = Heath Company
Z = Zenith Data Systems
Any other letter indicates
sale by a non-Zenith subsidiary
or company.

Number of floppy disk drives
0 = No drives
1 = One floppy disk drive installed
2 = Two floppy disk drives installed

ZFL-171-21

Series type
11 = Low-Profile Z-100 (non-PC)
12 = All-in-One Z-100 (non-PC)
13 = Z-130 Portable Series
14 = Z-140 Desktop Series
15 = Z-150 Desktop Series
16 = Z-160 Desktop Series
17 = Z-170 Portable Series

User memory size
2 = 128K
3 = 192K
4 = 256K
5 = 320K

Floppy disk drive type/Clock speed
0 = Full height, 5 MHz
1 = Half height, 5 MHz
1 = Third height, 5 MHz (Z-170 Series)
8 = Half height, 8 MHz

Figure 1-5: Model Numbers

Theory of Operation

The following section describes the internal boards and other major components of the computer system. A brief description of the function of each main circuit is provided. Refer to Figure 1-6 for the system block diagram.

```
                          ┌──────────┐
                          │  POWER   │
                          │  SUPPLY  │
                          └────┬─────┘
                               │
                          ┌────┴─────────┐
                          │    POWER     │
                          │ DISTRIBUTION │
                          │    BOARD     │
                          └──────┬───────┘
                                                    ┌─────┐
                                                    │ LCD │
  ┌──────────────┐   ┌──────┬───────┬──────────┐    └─────┘
  │   SERIAL,    │   │      │       │ DISPLAY   │
  │  PARALLEL,   │   │ I/O  │       │ MEMORY    │   ┌──────────┐
  │AND EXPANSION │   │      │       │ INTERFACE │   │ OPTIONAL │
  │ CONNECTORS   │   │      │       │           │   │  VIDEO   │
  └──────────────┘   │      │  CPU  │           │   │  BOARD   │
                     │      │       │           │   └──────────┘
  ┌──────────┐       │      │       │           │
  │  DISK    │       │      │       │           │   ┌──────────┐
  │ DRIVE A  │       │ FLOPPY DISK  │ KEYBOARD  │   │ OPTIONAL │
  └──────────┘       │ CONTROLLER   │ PROCESSOR │   │ MONITOR  │
  ┌──────────┐       │      │       │           │   └──────────┘
  │  DISK    │       └──────┴───────┴───────────┘   ┌──────────┐
  │ DRIVE B  │                 │                    │ KEYBOARD │
  └──────────┘            ┌────┴────┐               └──────────┘
                          │ MEMORY  │
                          └─────────┘
```

Figure 1-6:   Block Diagram

Main logic board — The heart of the computer. It contains the circuitry required for operation of the computer except for the memory, LCD driver, and power supply. The functional areas of the main board are described in the following paragraphs.

CPU — An 80C88 microprocessor that performs the logic functions of the computer and controls the operation of all other sections of the computer.

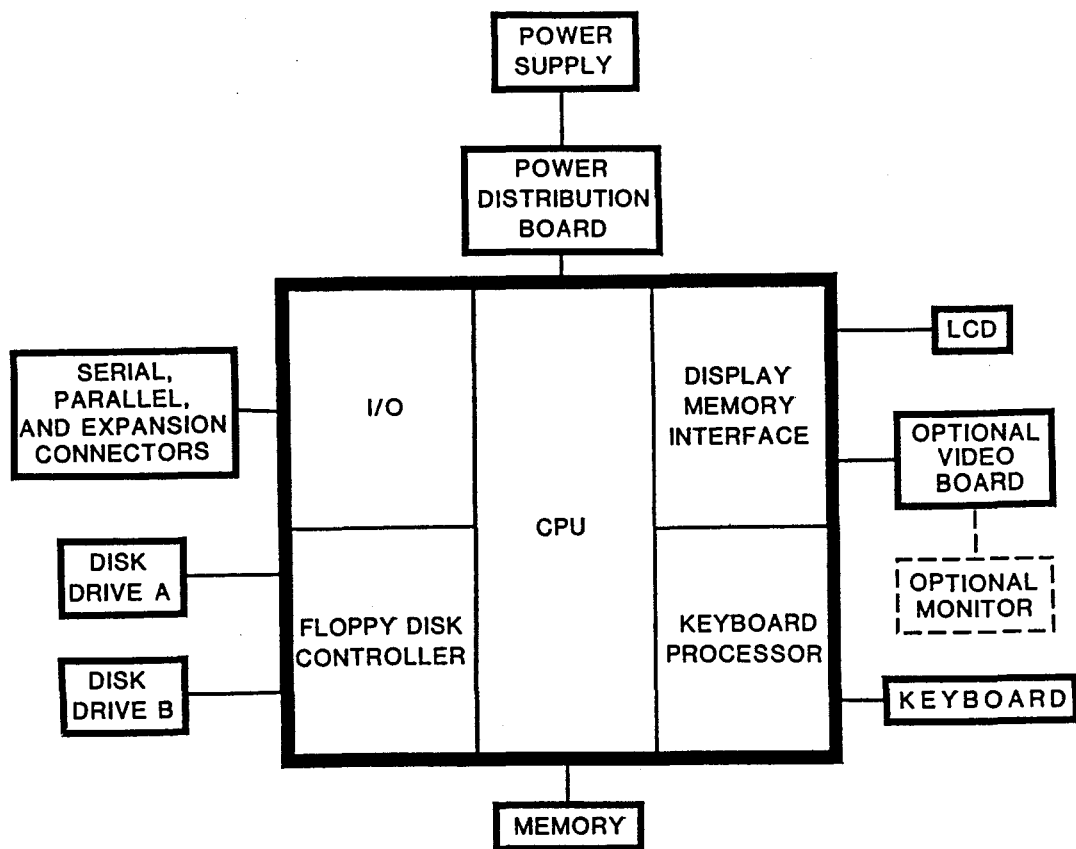Control signals and timing — Responsible for generating the signals and clock pulses that are required for proper coordination of the computer.

Disk drive control — Composed of both digital and analog sections which are responsible for encoding and decoding all information to and from the floppy disk drives and for controlling the operation of the drives themselves.

Input/output circuits — Provides for the interfacing between the CPU and external peripherals.

Keyboard processor — Uses an 80C39 microcontroller to perform the keyboard scan functions and acknowledge interrupts to the CPU.

DC power board — Distributes the power supply voltages to the LCD assembly, disk drives, main logic board, and the RGB video board.

LCD decoder/driver board — Generates an 80-column by 25-line display of the information written to it by the main logic board. This board also generates both the IBM compatible low-resolution and the high-resolution graphics on the LCD.

High-resolution video logic board— Produces both composite and RGB high-resolution outputs which are available at the back panel video connectors of the computer for connection to an external composite or RGB monitor. This optional card is plugged into the main logic board.

System RAM card — Contains the system RAM. This memory is used to store all programs and data that are in process. It can be configured with 64-kilobit and/or 256-kilobit memory devices providing several sizes of system memory ranging from 128K to 640K.

Disk drives — Used to access the information stored on the floppy disk.

Installation

This chapter discusses the basic installation of the computer. For the purposes of this discussion, installation is defined as connecting the computer to power and peripherals in preparation for use.

Preparing the Computer for Installation

Opening/Closing the Computer

Refer to Figure 2-1 for the location of the keyboard latches. To open the computer, press down on the front edges of the latches and slide the latches toward the back of the computer. Gently swing the keyboard down into the horizontal position. To close the computer, swing the keyboard up. Hold it in the closed position and slide the latches towards the front of the computer until they lock into place.
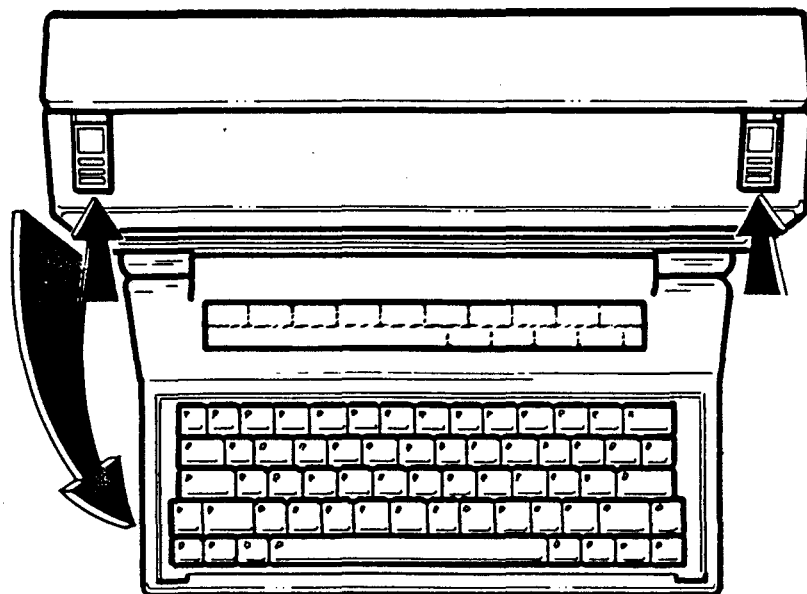
Figure 2-1: Opening/Closing the Computer

Shoulder Strap Removal

Removal of the shoulder strap is recommended for ease in connecting the peripherals. To remove the strap, pull up on the latch on each side of the case as shown in Figure 2-2. Slide the latching assembly down to unhook the strap and set it aside. To reinstall the strap, pull up on the latch and insert the hooked portion into the opening on the side of the computer.

1. LIFT UP

2. UNHOOK

Figure 2-2:   Shoulder Strap Removal

Installation of Internal Options

A number of options may be installed inside the computer. These include: a modem board, RGB video board, and additional memory. The instructions for installing them are covered in related publications (see Chapter 1).

Connectors

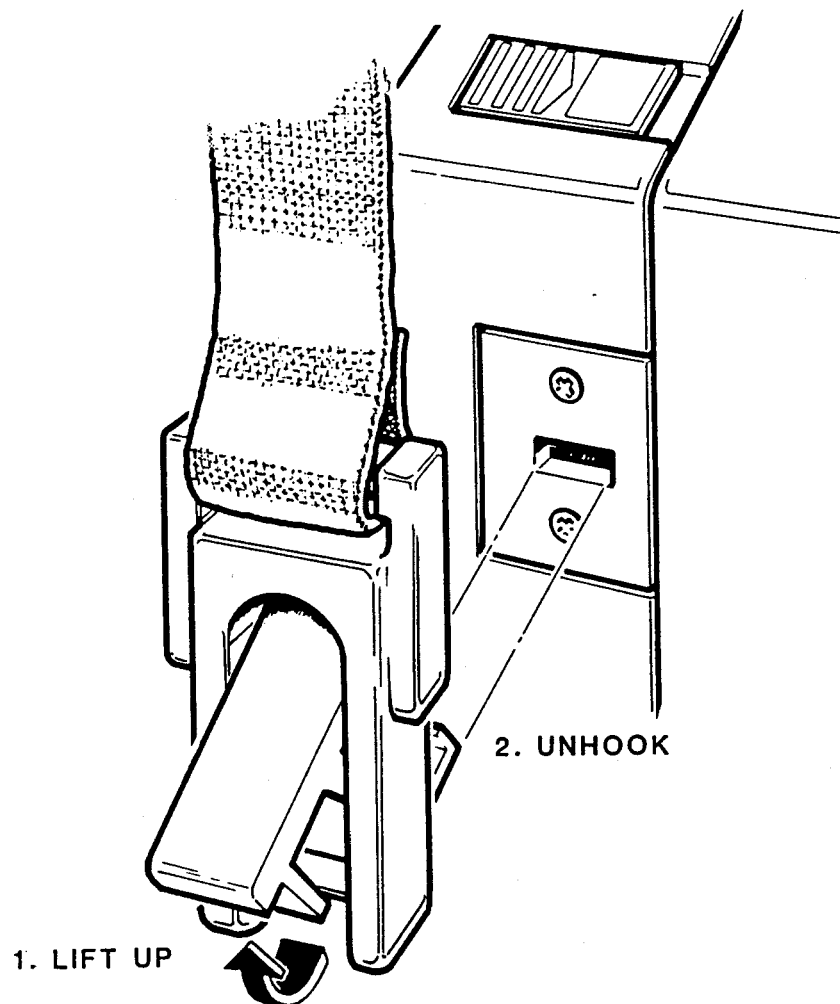The connectors are illustrated in Figure 2-7. These connectors are used to allow communication between the computer and various external devices. The pinout of each connector is listed in Table 2-1 through Table 2-5.

Bus expansion connector — This port provides the necessary data, address, and control signals for use with an expansion chassis.

Table 2-1:   Bus Expansion Connector Pinout

PIN NUMBER	SIGNAL NAME	DESCRIPTION
1	NC	No connection.
2	D7	Data bit 7.
3	D6	Data bit 6.
4	D5	Data bit 5.
5	D4	Data bit 4.
6	D3	Data bit 3.
7	D2	Data bit 2.
8	D1	Data bit 1.
9	D0	Data bit 0.
10	I/O CHRDY	Input/output channel ready. Used by slower I/O devices to ensure data is not lost during read and write operations. May be held low (not ready) up to 10 clock cycles (210 ns).
11	AEN	Address enable. Assigns control of read and write operations to DMA controller.
12	A19	Address bit 19.
13	A18	Address bit 18.
14	A17	Address bit 17.
15	A16	Address bit 16.
16	A15	Address bit 15.
17	A14	Address bit 14.
18	A13	Address bit 13.
19	A12	Address bit 12.
20	A11	Address bit 11.
21	A10	Address bit 10.
22	A9	Address bit 9.
23	A8	Address bit 8.

Installation

Table 2-1 (continued):   Bus Expansion Connector Pinout

PIN NUMBER	SIGNAL NAME	DESCRIPTION
24	A7	Address bit 7.
25	A6	Address bit 6.
26	A5	Address bit 5.
27	A4	Address bit 4.
28	A3	Address bit 3.
29	A2	Address bit 2.
30	A1	Address bit 1.
31	A0	Address bit 0.
32	GND	Ground.
33	DRV RST	When high, resets or initializes system logic.
34	+5 VDC	+5 VDC bus.
35	IRQ2	Interrupt request 2. Used by the real-time clock.
36	GND	Ground.
37	DRQ2	DMA request 2. Assigned to floppy disk controller.
38	GND	Ground.
39	NC	No connection.
40	GND	Ground.
41	GND	Ground.
42	MEMW*	Memory write. When low, causes data on data bus to be stored in memory.
43	MEMR*	Memory read. When low, causes memory to drive data onto the data bus.
44	IOW*	I/O write. When low, instructs an I/O device to read data on the data bus.
45	IOR*	I/O read. When low, instructs I/O device to drive its data onto the data bus.
46	DMACK3*	DMA acknowledge 3. Assigned to external drive controller.
47	DMARQ3	DMA request 3. Assigned to external drive controller.
48	DMACK1*	DMA acknowledge. Available for user assignment.
49	DMARQ1	DMA request 1. Available for user assignment.
50	DMACK0*	DMA acknowledge 0. Assigned for timer number 1. Initiates memory refresh.
51	CLK	4.77 mHz system clock.

Table 2-1 (continued): Bus Expansion Connector Pinout

| PIN NUMBER	SIGNAL NAME	DESCRIPTION
52	IQ7	Interrupt request 7. Assigned to parallel interface.
53	IQ6	Interrupt request 6. Assigned to floppy controller.
54	IQ5	Interrupt request 5. Assigned to external drive controller.
55	IQ4	Interrupt request 4. Assigned to serial port (configurable).
56	IQ3	Interrupt request 3. Assigned to serial port (configurable).
57	DMACK2*	DMA acknowledge 2. Assigned to floppy controller.
58	TC	Terminal count. Goes high when terminal count for any DMA channel is reached.
59	ALE	Address latch enable. Generated by bus controller to indicate valid processor addresses to the I/O channel.
60	+5 VDC	+5 VDC bus.
61	MCLK	A 14.31818 MHz oscillator.
62	GND	Ground.

PIN 1
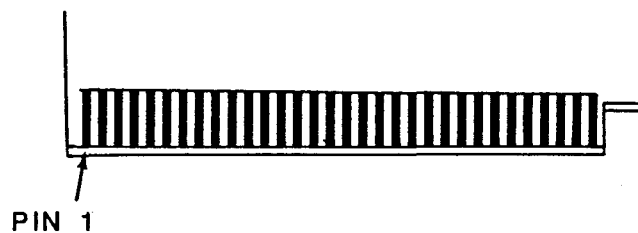
Figure 2-3: Expansion Connector

Installation

Serial connector — This is an RS-232C DTE port used for connecting serial devices. It can also be used to connect the computer as a terminal for a larger system.

Table 2-2: Serial Connector Pinout

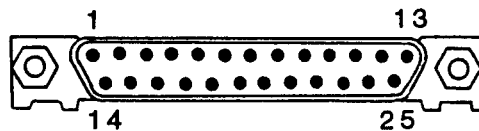| PIN NUMBER	SIGNAL	DESCRIPTION	DATA FLOW
1	GND	Ground.	—
2	SOUT	Transmit data.	Out
3	SIN	Receive data.	In
4	RQS	Request to send.	Out
5	CLS	Clear to send.	In
6	DSR	Data set ready.	In
7	GND	Signal ground.	—
8	CD	Carrier detect.	In
20	DTR	Data terminal ready.	Out
22	RI	Ring indicate.	In

Figure 2-4:   Serial Connector

Parallel connector — This port is a Centronics-type parallel output for a printer or other device that uses parallel input signals. The operating system contains the necessary software to properly configure the port for use with parallel-driven printers or other peripherals.

Table 2-3: Parallel Connector Pinout

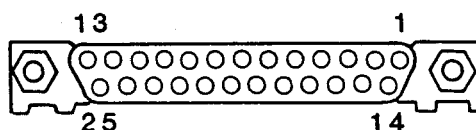| PIN NUMBER	SIGNAL	DESCRIPTION	DATA FLOW
1	STB*	Strobe.	Out
2–9	D0-D7	Data bit 0–7.	Out
10	ACK*	Acknowledge.	In
11	BUSY	Data bus is occupied.	In
12	PE	Paper end (out of paper).	In
13	SLCT	Select.	In
14	AUTO FDXT*	Auto feed.	Out
15	ERROR	Error.	—
16	INIT*	Initialize printer.	Out
17	SLCTIN*	Select input.	Out
18–25	GND	Ground.	—

Figure 2-5: Parallel Connector (Receptacle)

Installation

RGB color video connector — This 9-pin D connector provides the necessary RGB and intensity signals to drive a color monitor. It is provided with the optional color video board.

Table 2-4: RGB Video Connector Pinout

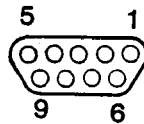| PIN NUMBER	SIGNAL	DESCRIPTION	DATA FLOW
1–2	GND	Ground.	—
3	R	Red.	Out
4	G	Green.	Out
5	B	Blue.	Out
6	I	Intensity.	Out
8	H	Horizontal Sync.	Out
9	V	Vertical/composite Sync.	Out

Figure 2-6: RGB Connector

Composite video connector — This RCA phono jack supplies a video output signal for use with an external monochrome monitor. This connector is provided with the optional color video board.

Phone/modem connector — This jack is used for the internal 300/1200 baud, Hayes-compatible modem. It connects to a modular-type telephone cable and may also be used as an external modem using an RS-232C port.
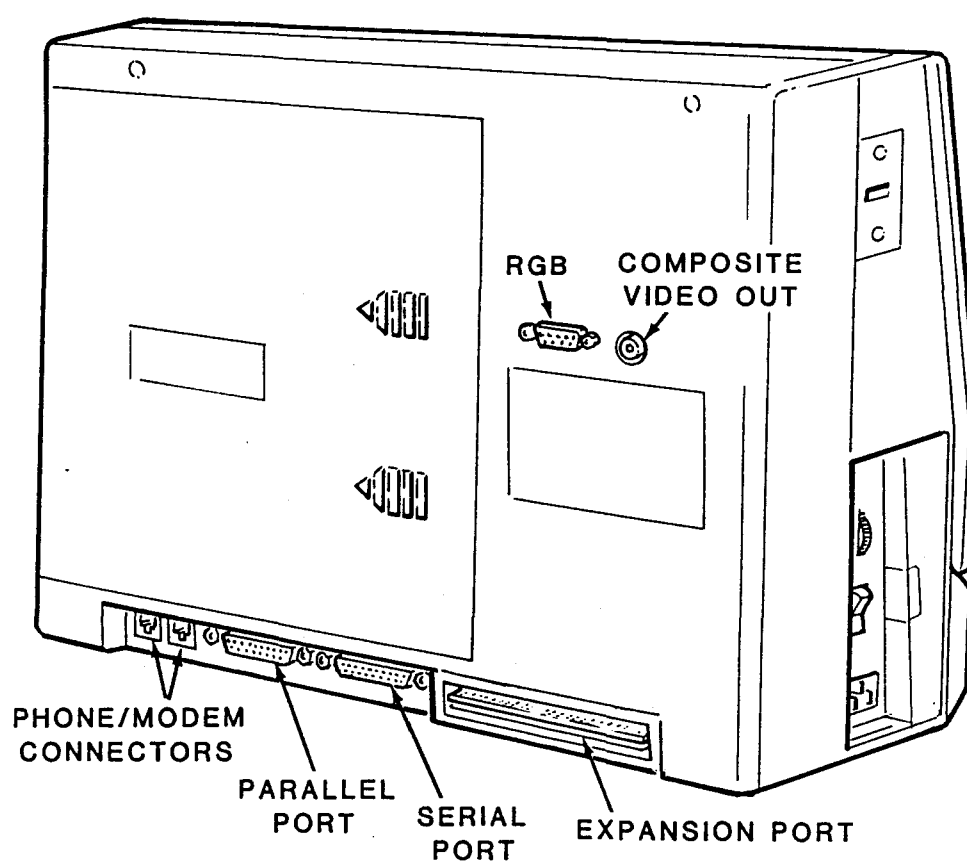
RGB   COMPOSITE
       VIDEO OUT

PHONE/MODEM
CONNECTORS

PARALLEL
PORT   SERIAL   EXPANSION PORT
        PORT

Figure 2-7:   Rear Panel Connectors

Installation

Connecting the Peripherals

Refer to Figure 2-7 for the following discussion.

Place the computer where it is to be used. Position the computer for easy access to the back panel.

- If an external monitor is to be used, unpack it and place it in a convenient viewing location. Make sure that there is access to all the monitor controls and connectors.

  — For RGB monitors: Connect one end of the cable to the RGB 9-pin, D-type connector on the back of the computer. Connect the other end of the cable to the connector on the monitor.

  — For monochrome monitors: Connect one end of the cable to the composite video out jack on the back of the computer. Connect the other end of the cable to the video input jack on the monitor.

- For printers and modems: Connect one end of the cable to either the serial or parallel connector, depending on the configuration of the device. Connect the other end of the cable to the printer or modem. The computer controls the following settings through software and are selected by accessing the MS-DOS Configur program.

  Type — Determines device type being confugured-serial or parallel.

  Baud rate — Determines the speed at which a serial device and computer communicate.

  Data bits — Determines the number of bits the device expects the computer to use to represent a character.

  Stop bits — Informs the device that the end of a character has been reached.

  Handshaking — Establishes communication between the computer and the device.

NOTE: For information on selecting these settings, refer to the *Z-170 PC Portable Computer Owner's Manual.*

Final Connections

Make sure that the line select switch, located in the external AC adapter, is properly set for the AC power source. Refer to Figure 2-8.

WARNING: The AC adapter contains dangerous high-voltages. Use extreme care when opening this unit.

1.   Make sure that the AC adapter is disconnected from the AC power source and the computer.

2.   Remove the 4 screws from the cover and lift the cover off the power supply.

3.   Locate the voltage selector jumper.

4.   Select the appropriate setting.

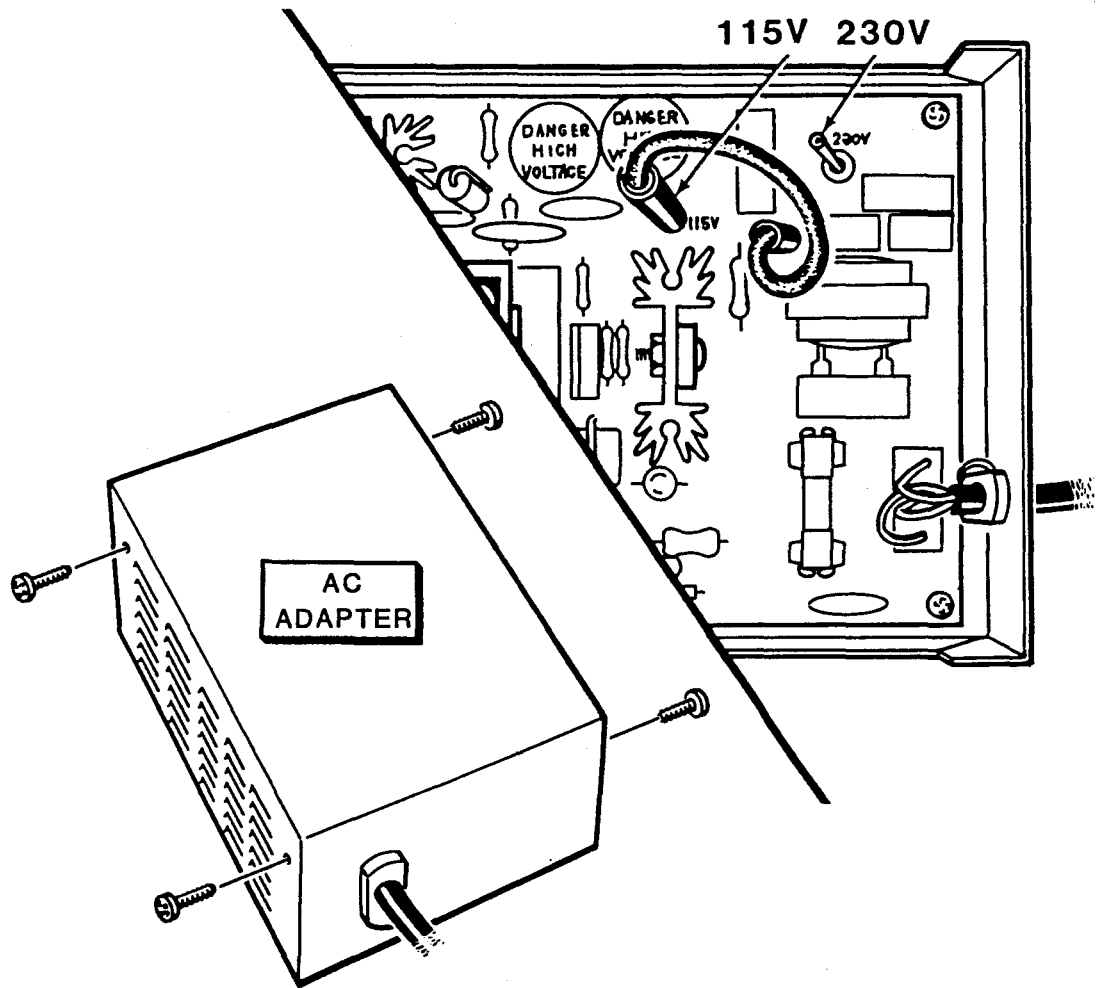5.   Return the cover and install the screws.

Installation

Figure 2-8:   Power Supply Voltage Selector

NOTE: If several peripherals are to be used, a switched, multiple outlet box or power strip may be convenient to control the power to all system components at the same time. If a switched outlet box or power strip is used, make sure that it is properly rated for the system's power requirements.

● Turn all power switches OFF before connecting the computer or any peripherals to an AC power source.

● Place peripherals in their operating positions and plug their respective power cords into an AC power source.

● The computer is powered by an external AC adapter or an optional battery pack. Plug the appropriate end of the AC adapter into the computer's power socket and plug the other end into the AC power source or install the optional battery pack (see "Disassembly/Reassembly," Chapter 4).

Before Powering Up the System

1. Remove the cardboard shipping insert from the disk drive(s). Keep the shipping inserts. They should be re-inserted whenever the computer is moved.

2. Verify that the AC adapter is plugged into both the computer and the AC power source or the battery is fully charged.

Operation

This chapter provides a brief description of general computer operation. It is not intended to be complete, but only serve as a quick reference guide to the operation of the computer. For a description of the operation of the computer see the owner's manual.

Power Up

Turn on the computer. When the computer is first turned on, the power-up diagnostics will be executed. These diagnostics check the communication between the internal circuits of the computer. Most major failures can be detected at this time. Verify correct computer operation before connecting any peripherals.

Factory assembled computers are set to display the world map. This feature can be altered by changing the start-up action on the setup menu. Refer to "Configuration" Chapter 5 for information.

If no disk is in the drive and the computer is set to autoboot, the following error message will appear on the screen about 20 seconds after turning on the power to the computer.

+++ DISK ERROR: DRIVE NOT READY! +++

This is a normal error message and simply indicates that no disk was placed in the drive. If the message appears with the disk in the drive, check the orientation of the floppy disk. A discussion on floppy disks follow.

Operation

Disk Drives

The disk drives are illustrated in Figure 3-1.

● Type of disk — The disk required for this computer is a soft-sectored, 5.25-inch, one-third height double-density floppy disk.

● Identification — On two-drive systems, the front drive is designated as drive A and the rear drive as drive B. If the computer has only one drive, it is designated as drive A. The disk drives are illustrated in Figure 3-1.
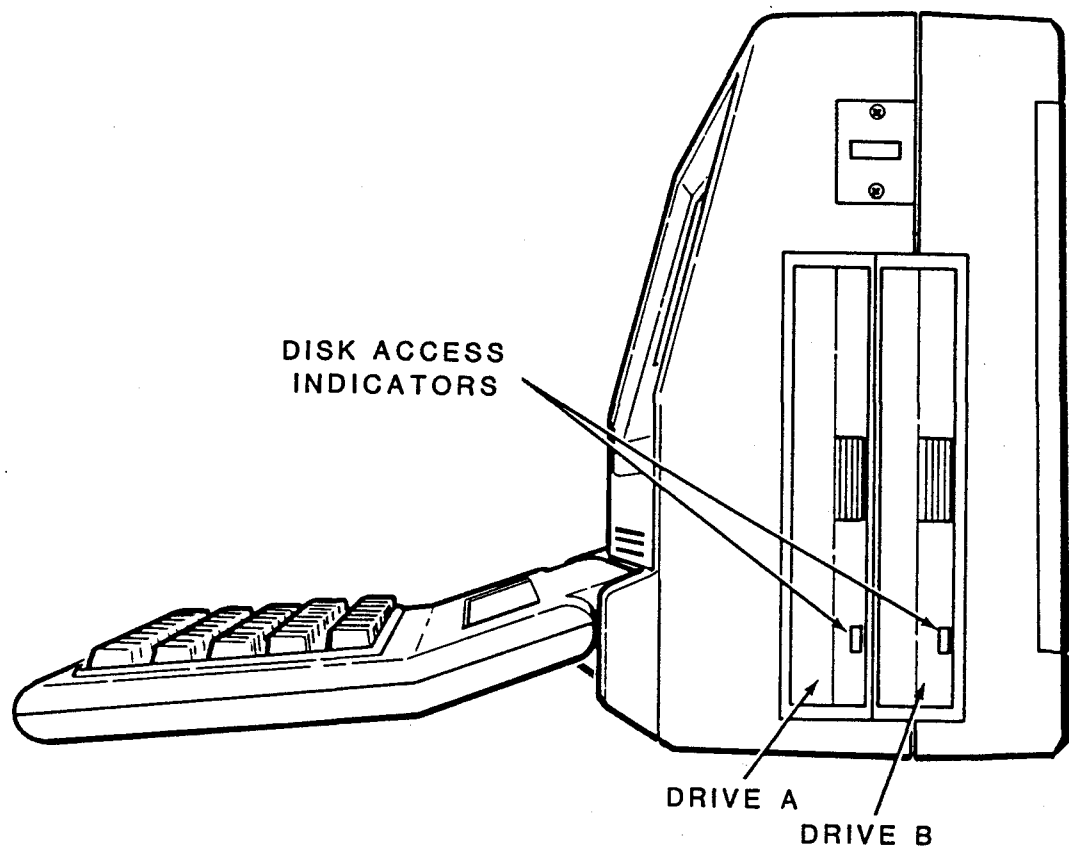

DISK ACCESS
INDICATORS

DRIVE A

DRIVE B

Figure 3-1: Disk Drives

- Disk load slot — Insert the floppy disks in this slot with the write-protect notch down. If the disk is not oriented correctly, the unit will not operate properly and the disk and/or disk drive may be damaged. If the disk meets resistance while inserting it into the drive, check to make sure that the cardboard inserts have been removed, that there is not a disk already in the drive, or that the label on the disk is not peeling off and interfering with the guides built into the drive. It should slide smoothly into the drive.

- Disk drive door — The door is spring-loaded and will pop open by pressing the middle of the drive door. To close, press the middle of the door until it snaps shut. Closing the door engages the drive hub into the disk and allows the drive to operate. If the drive door closes with difficulty, examine the edge of the center hole of the disk for damage and check the disk orientation in the drive.

- LED disk access indicator — This light indicates that the computer is attempting to read from or write to the disk. The read/write operation will be successful only if the disk is inserted properly and the disk drive door is closed.

Disk Care

To avoid damaging the disks, note the following precautions.

When preparing a label for a disk, write on it **before** placing it on the disk. If a label that is already on the disk must be written on, use a felt-tip pen. Ballpoint pens and pencils may exert enough force on the disk to crease the Mylar (thus destroying its usefulness) and should not be used to mark labels once they are on a disk.

Handle the disk in the same manner as an audio record. It should be stored in its protective envelope in an upright position and away from heat or direct sunlight. **Do not** bend the disk or use paper clips on it. **Do not** touch the exposed areas of the disk.

Do not expose disks to magnetic fields or X-ray sources. Magnets and magnetized objects can erase information stored on disks. X-rays may also erase data.

Computer Controls

Keyboard

The keyboard consist of two sections. The lower section contains 63 keys laid out in a QWERTY-type typewriter keyboard arrangement. The upper section consist of 14 touch control keys. The 10 function keys are user defined by software. The 4 icon keys initiate functions unique to this computer. An illustration of the keyboard, with the keys being explained outlined in black, accompanies each discussion.

All keys except the SHIFT, CTRL, ALT, CAPS LOCK, and NUM LOCK keys generate repeat entries. When the key is held down, the letter (or other symbol) will start repeating. The longer the key is held down, the faster the repeat entry is generated.
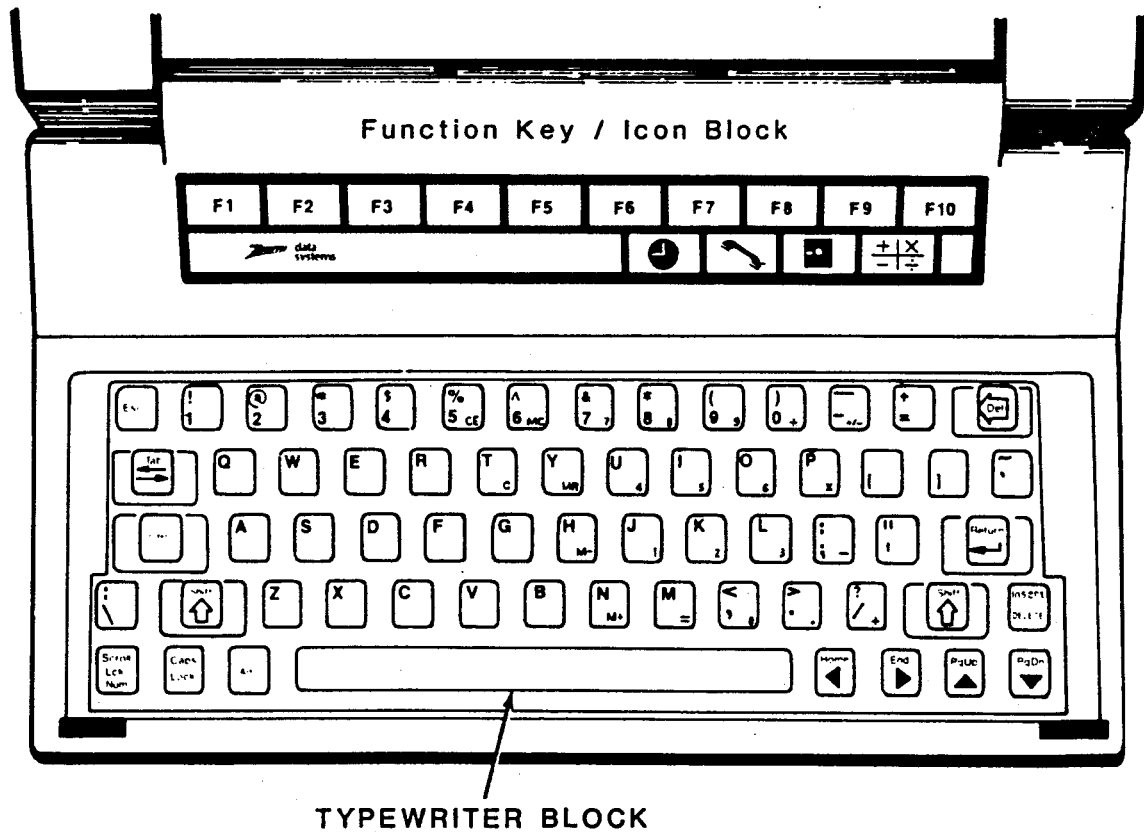

TYPEWRITER BLOCK

Figure 3-2:   Keyboard

To be completly PC-compatible, some of the keys of the computer have to have multiple functions. The keystrokes required to duplicate the functions of a Z-100 PC keyboard are listed in Table 3-1.

Table 3-1: Cross-Reference Table

Z-100 PC COMPUTER SERIES KEYS PRESSED	Z-170 PC PORTABLE COMPUTER KEYS PRESSED
Unshifted – ←	←
Unshifted – →	→
Unshifted – ↑	↑
Unshifted – ↓	↓
Unshifted – NUM LCK	NUM LOCK
Unshifted – DEL	DELETE
Unshifted – HOME	Right SHIFT + HOME
Unshifted – END	Right SHIFT + END
Unshifted – PgUp	Right SHIFT + PG UP
Unshifted – PgDn	Right SHIFT + PG DN
Unshifted – SCROLL LCK	Right SHIFT + SCROLL LOCK
Unshifted – Insert	Right SHIFT + Insert
SHIFT – ←	Left SHIFT + ←
SHIFT – →	Left SHIFT + →
SHIFT – ↑	Left SHIFT + ↑
SHIFT – ↓	Left SHIFT + ↓
SHIFT – NUM LOCK	Left SHIFT + NUM LOCK
SHIFT – DELTE	Left SHIFT + DELETE
SHIFT – HOME	Left SHIFT + Right SHIFT + HOME
SHIFT – END	Left SHIFT + Right SHIFT + END
SHIFT – PGUP	Left SHIFT + Right SHIFT + PG UP
SHIFT – PGDN	Left SHIFT + Right SHIFT + PG DN
SHIFT – SCROLL LCK	Left SHIFT + Right SHIFT + SCROLL LOCK
SHIFT – INSERT	Left SHIFT + Right SHIFT + INSERT

Operation

Icons

Most of the icon functions are available without booting a disk operating system. Some of the icon keys have two different functions, which are explained in the following discussion.

Clock/Calendar Icon

Pressing this key displays the clock, calendar, and world map. At this point the set-up options may be accessed or the time in another time zone may be displayed.

Phone Icon

Pressing this key displays a personal phone directory. The computer will dial a number picked from this directory. This key may also be used to turn the computer into a terminal for interfacing with another computer.

Disk Icon

When the computer is first turned on, the world map is displayed if the computer is not set to autoboot. In this case, pressing this key will initiate the boot sequence. While a program is being run, it can be interrupted by pressing another icon key. Pressing the disk icon key will return the user to the previous place in the program.

Calculator Icon
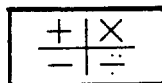
Pressing this key will activate the four- function calculator. This icon also implements the 10-key keypad labeled in blue letters. Refer to the Calculator Keyboard Operation section in this chapter.
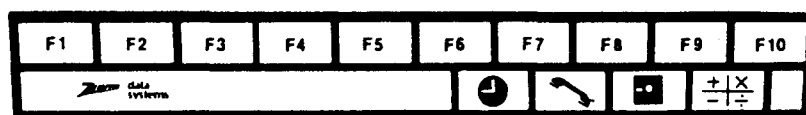
Figure 3-3:   Icon/Function Block

Alphabetic Keys

The keyboard contains the standard 26 letters of the alphabet arranged as they are on a typewriter. These keys allow entry of upper- or lowercase letters. When the SHIFT key is held down or the CAPS LOCK key is engaged, uppercase letters will be entered.

These keys (enclosed by the dark lines) are shown in Figure 3-4.

NOTE: The CAPS LOCK key shifts only the letter keys. Other keys are not affected.
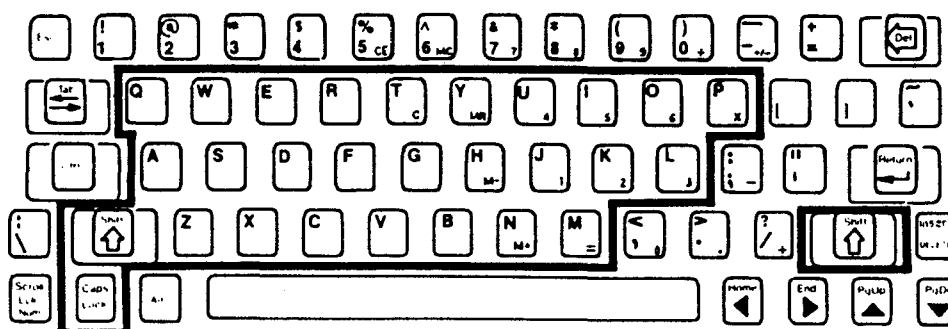

Figure 3-4:   Alphabetic Keys

Nonalphabetic Keys

The nonalphabetic keys are shown in Figure 3-5. These include numbers, punctuation marks, and special characters. The lower marking on each key is generated when an individual key is pressed. The upper marking on the key is generated when a SHIFT key is pressed. The CAPS LOCK key does not shift these keys.
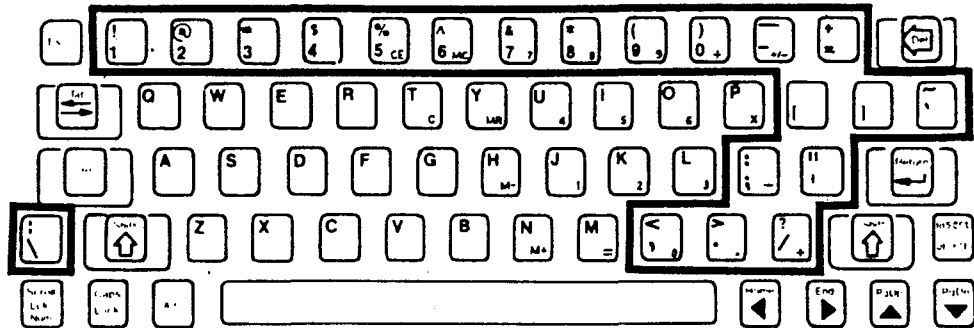

Figure 3-5: Nonalphabetic Keys

Common Control Keys

Refer to Figure 3-6 for the following discussion which describes the most common function for each key. However, software may direct any key to cause some other function to occur. Any key that has a special function is usually described in the documentation that accompanies the software.

The space bar functions just as it does on a typewriter. Enter blank spaces by pressing this bar.

The DEL key often duplicates the function of the BACK SPACE key. Move the cursor to the left using this key.

The TAB key causes the the cursor to move to the next tab column.

The RETURN key moves the cursor to the left side of the display, or informs the computer that an entry has been completed. In most cases, the software provides a line feed when this key is pressed, moving the cursor to the next lower line.
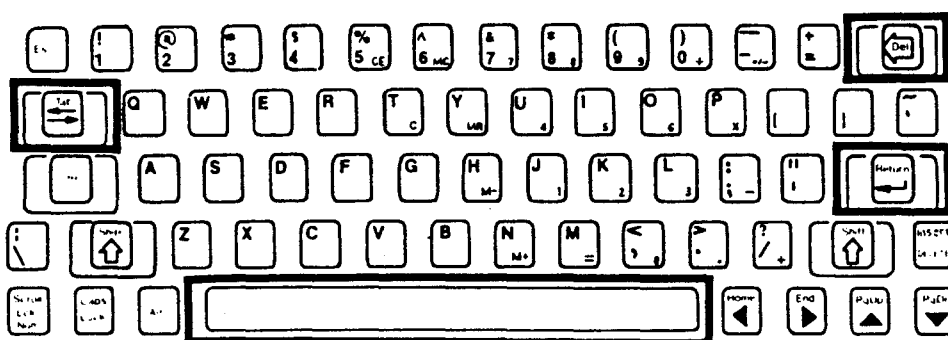

Figure 3-6:   Common Control Keys

Special Function Keys

Figure 3-7 illustrates the special function keys.

The function keys F1 through F10 make up the row above the icons. They are used for special purposes by some programs. The computer uses these keys to perform tasks such as changing the active calendar date, moving the Time Zone display, and calling the Setup menu. The meanings appear over the keys on the bottom line of the display.

NOTE: The right shift key is used to obtain the upper function of the following keys.

The HOME/←, END/→, PGUP/| ↑ , PGDN/ ↓ keys are for cursor control. These keys are used to control cursor movement and screen presentation by some programs.

The INSERT/DELETE key is used in applications which require insertion and deletion operations.

The SCROLL LOCK/NUM LOCK key is used to control screen scrolling or activate the calculator keypad, the block of keys labled with blue numbers.
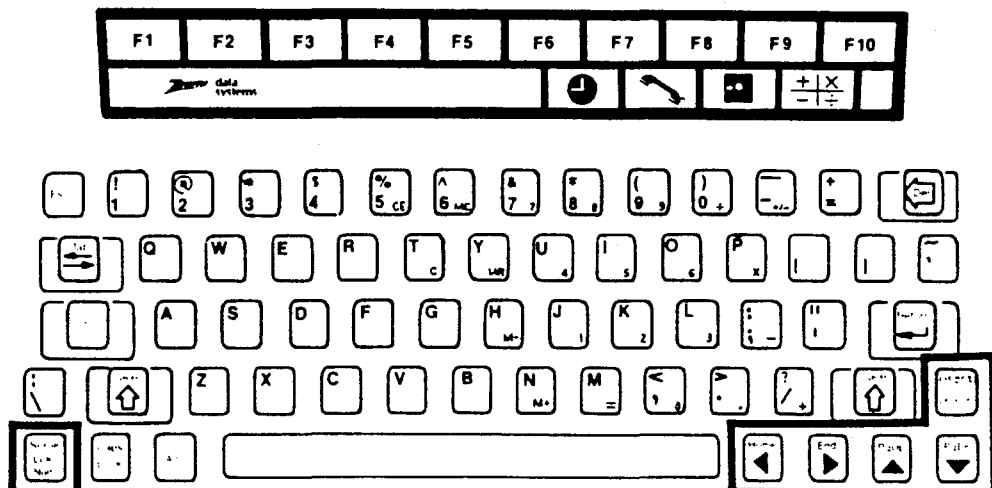
Figure 3-7: Special Function Keys

Control Keys

Figure 3-8 shows the control keys which are used in combination with other keys to perform a desired function.

The ESC key is used to stop the execution of a program, or to perform special functions when pressed with another key.

The CTRL key is used to perform special functions when pressed at the same time as another key.

The ALT key is used to enter special commands when pressed at the same time as another key.

Figure 3-8: Control Keys

Operation
___

Control Key Combinations

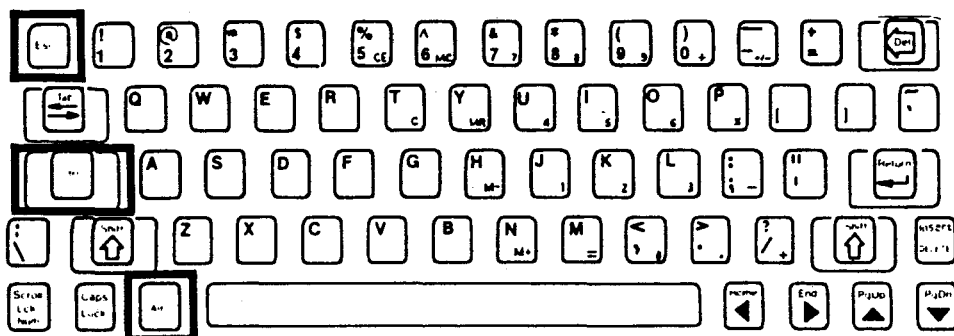The following keys functions are activated by pressing the key simultaneously with the control key. The keys are labeled on the front edge of the key as illustrated in Figure 3-9.

The CTRL-BREAK key combination is used to interrupt program execution and is not always active.

The CTRL-PRTSC key combination is used to send the contents of the screen to a printer (if the printer is properly configured).

The CTRL-PRT ON key combination is used to send everything that is going to the screen to the printer as well.

The CTRL-PAUSE key combination is used to hold the display of text on the screen.
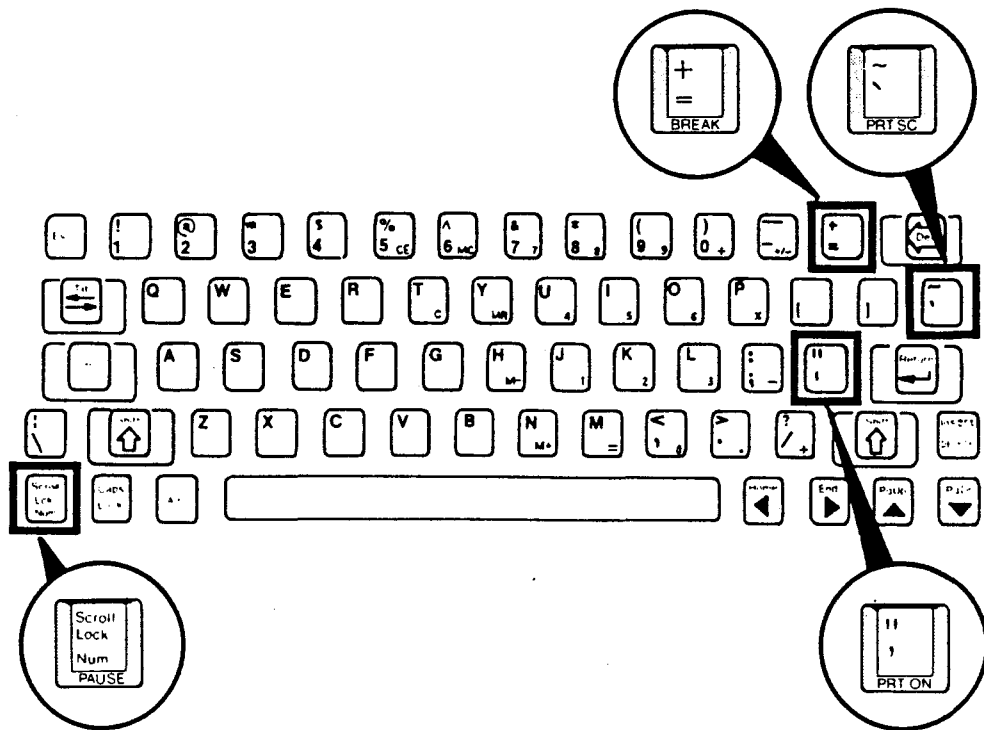
Figure 3-9: Control Key Combinations

Calculator Keyboard Operation

Figure 3-10 illustrates the calculator keypad.

The computer includes a four-function, 16-digit calculator that may be used while a program is running. The calculator is activated by pressing the calculator icon key. Pressing the disk icon key will return the user to the program.

The calculator keys are labeled in blue on the keyboard. The numbers may also be activated by pressing the NUM LOCK key. However, the calculator memory keys (M +, M −, MR, MC, CE, C) will not be activated.

Figure 3-10:   Calculator Keypad

Resetting the Computer

There are two ways to reset the computer: through the keyboard, or by switching the power off and then on again.

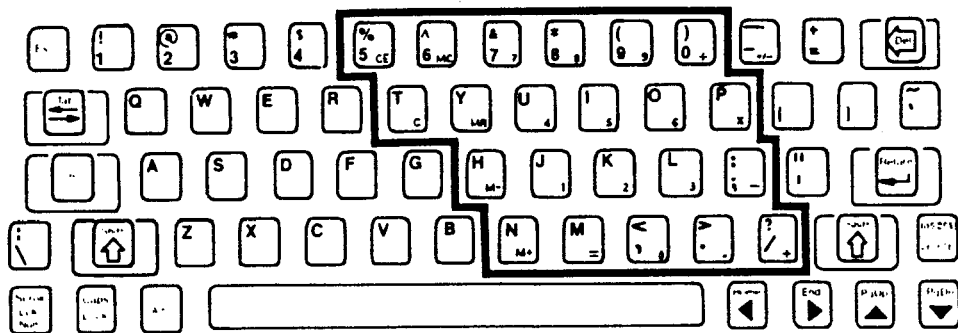To reset the computer through the keyboard, press the **CTRL**, **ALT**, and **DEL** keys at the same time. This will reset the computer to the point just after the power-up test. If the system is set to autoboot, the operating system will be reloaded into the computer memory.

The computer can also be reset by switching the power switch off and then on again. This has the same effect as the keyboard reset, but also forces the computer through the power-up test.

CAUTION: Switching the power off or resetting the computer will cause all of the data, not stored on disk, to be lost.

Defeating the Autoboot Feature

The computer may be set to autoboot or to display the world map. To change from one action to another, access the setup menu and change the start-up action. Refer to "Configuration", Chapter 5 for complete instructions.

Disassembly/Reassembly

This chapter contains the disassembly/reassembly instructions for the computer. Figure 4-1 is an exploded view of the computer that provides an over-all scheme of how the major components interconnect.
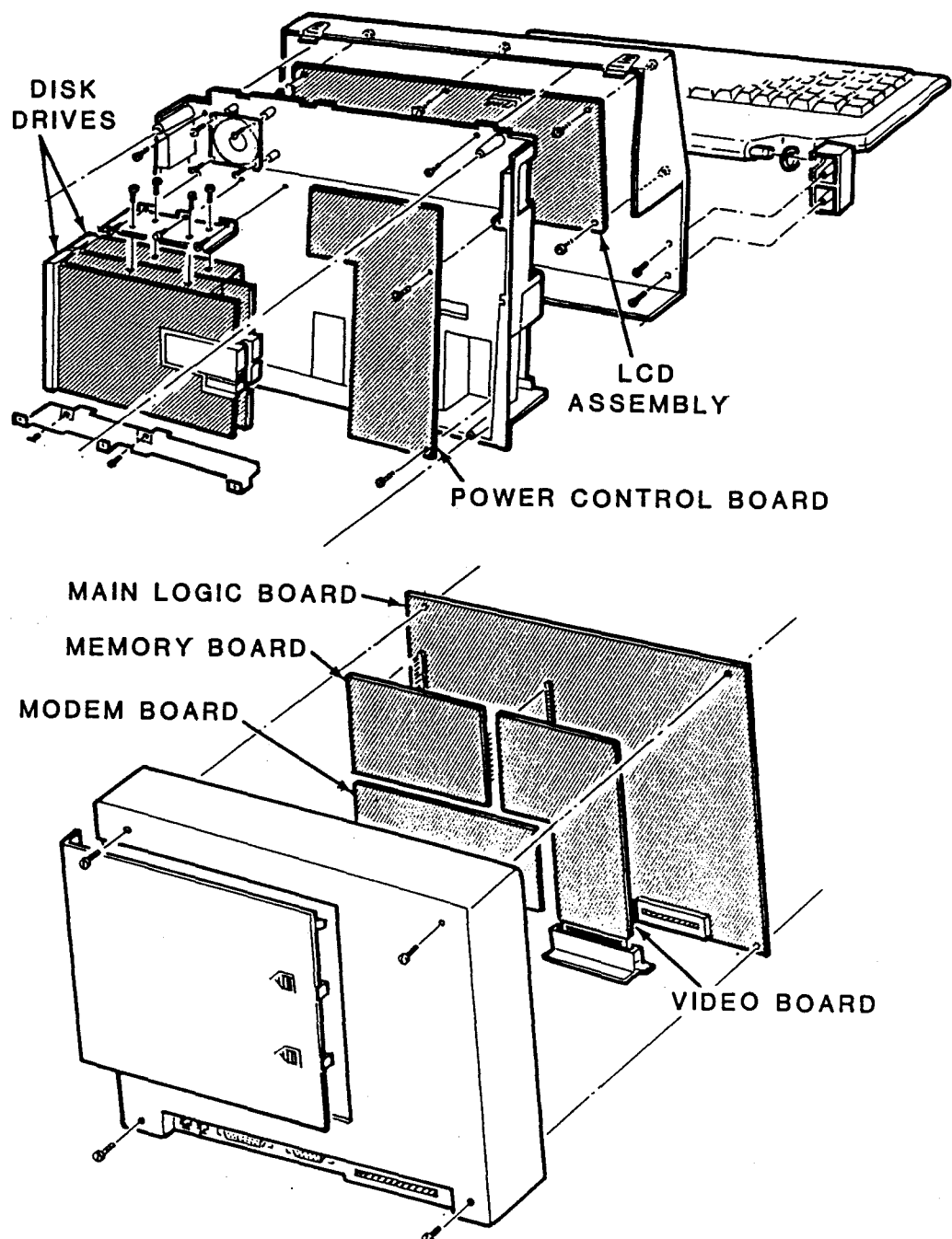
DISK
DRIVES

LCD
ASSEMBLY

POWER CONTROL BOARD

MAIN LOGIC BOARD

MEMORY BOARD

MODEM BOARD

VIDEO BOARD

Figure 4-1: Exploded View

Disassembly Procedures

WARNING: Make sure the power switch is OFF and the line cord is removed before beginning the disassembly/reassembly procedures.

CAUTION: Many integrated circuits are electrostatic-sensitive and can be damaged by static electricity if they are handled improperly. Once you remove an IC or a board from its protective foam packing, envelope, or computer, **do not** lay the IC or board down or let go of it until it is installed in the computer. When you bend the leads of an IC, hold the IC in one hand and place your other hand on the work surface before you touch the IC to your work surface. This will equalize the static electricity between the work surface, you and the IC.

Carry Strap

Refer to Figure 4-2 for the following procedures.

1. To unlatch the carry strap, place finger under the connector and pull the locking tab out approximately one-quarter inch.

2. Slide the connector down and away from the computer.

3. Reverse the previous steps for reassembly.

1. LIFT UP

2. UNHOOK

Figure 4-2:   Carry Strap

Rear Access Panel

Refer to Figure 4-3 for the following procedures.

1. With the keyboard in the closed position, place the computer face down on a soft clean surface.

2. To unlatch the rear access panel, place a thumb on each of the arrow indicators. Apply slight downward pressure and push the panel in the direction of the arrows, approximately 3/8 of an inch, until the locking tabs have cleared the enclosure.

3. Lift the panel straight up and off the computer.

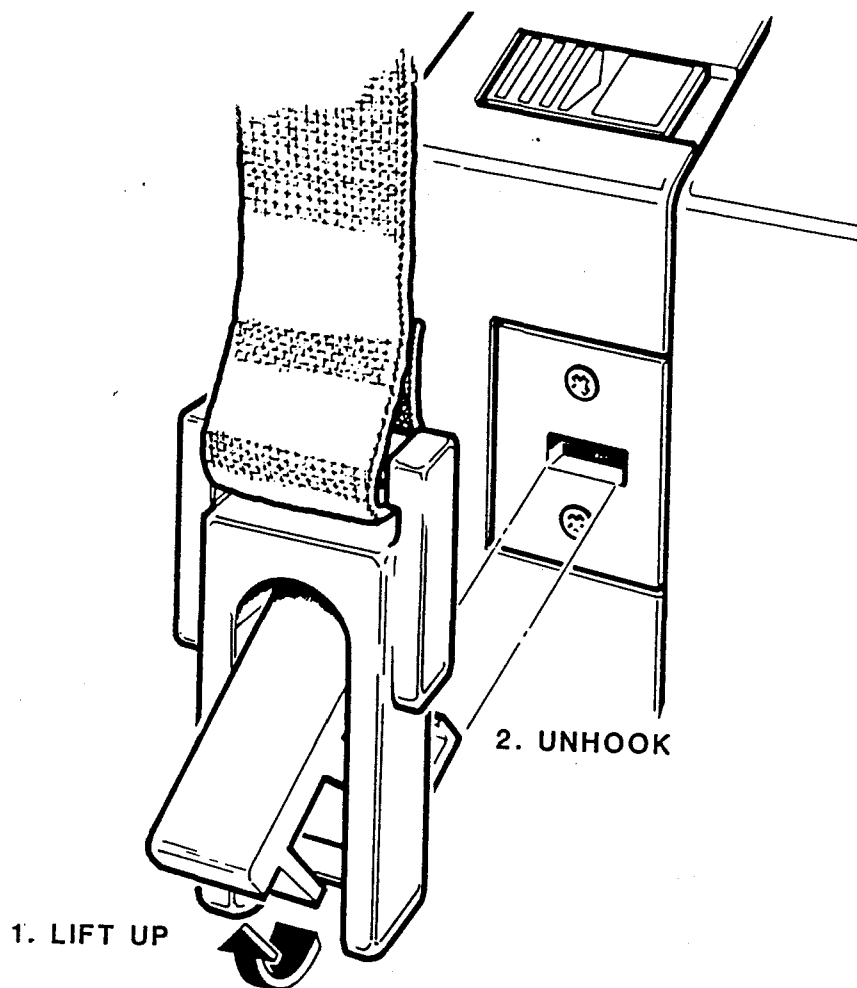Reverse the previous steps for reassembly.
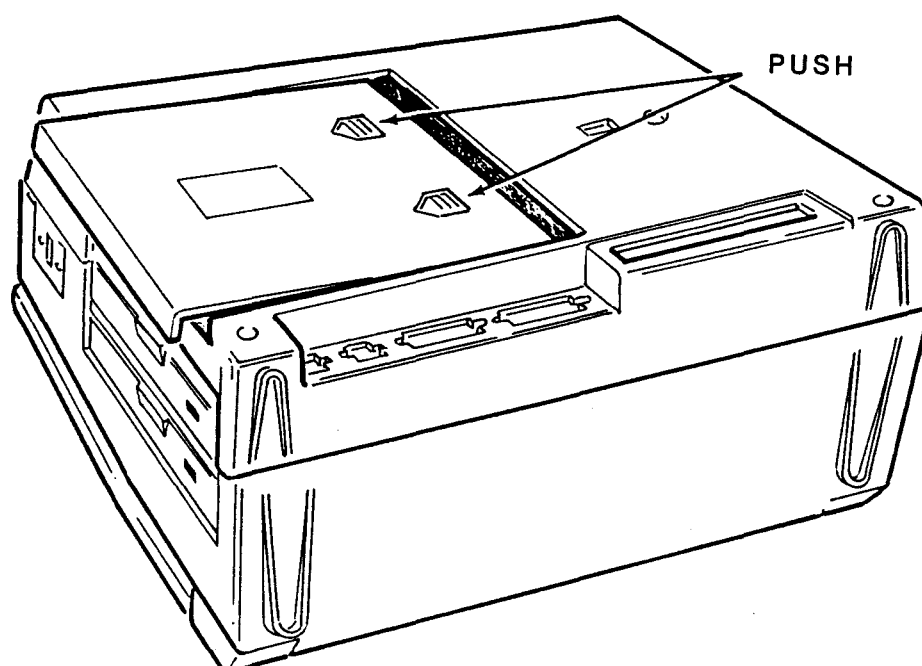
Figure 4-3: Rear Access Panel

Back Cover

Refer to Figure 4-4 for the following procedures.

1. With the keyboard in the closed position, place the computer face down on a soft clean surface.

2. If the computer is equipped with the optional RGB video board, remove the 2 screws at **A** that secure the RGB connector.

3. To remove the cover, remove the four screws at **B** that secure the cover and carefully lift the cover from the computer.

NOTE: The four screws that hold the back cover on, also secure the main logic board. When the cover is removed, the main logic board will stay in place as long as the computer is in the face down position.

NOTE: Upon reassembly, assure that all ribbon cables and wires are properly placed to avoid pinching.

Reverse the previous steps for reassembly.

Disassembly/Reassembly
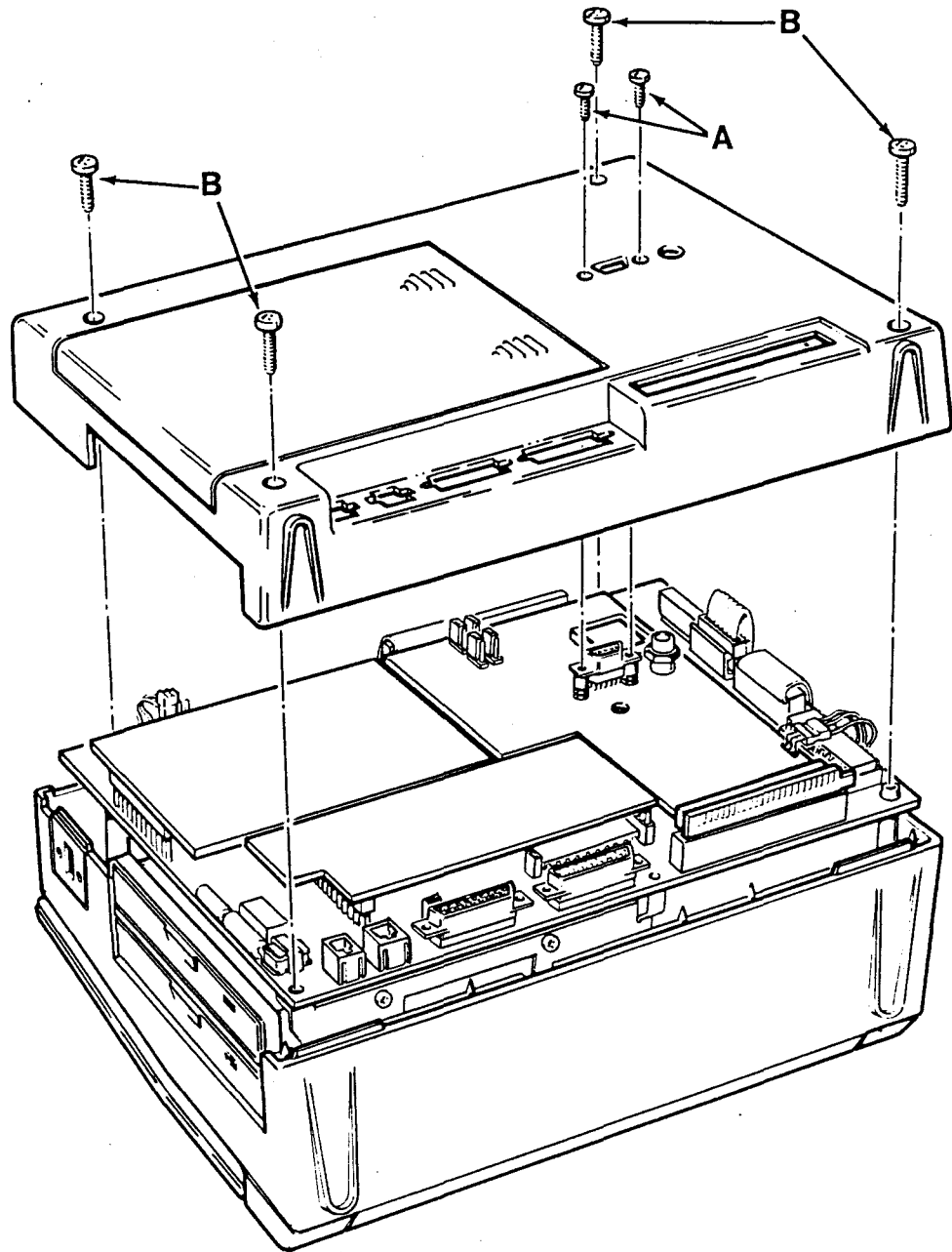
Figure 4-4:   Back Cover

Memory Board

To make sure that no damage will occur to the memory board connectors, remove the back cover before disassembly. Refer to Figure 4-5 for the following procedures.

1.   Grasp both ends of the board near the connectors.

2.   Carefully lift the board straight, up applying even pressure at both ends.

NOTE: When replacing this board make sure that the contact pins of the memory board and the main board are properly aligned before fully inserting the board.

Reverse the previous steps for reassembly.

Figure 4-5:   Memory Board

Disassembly/Reassembly
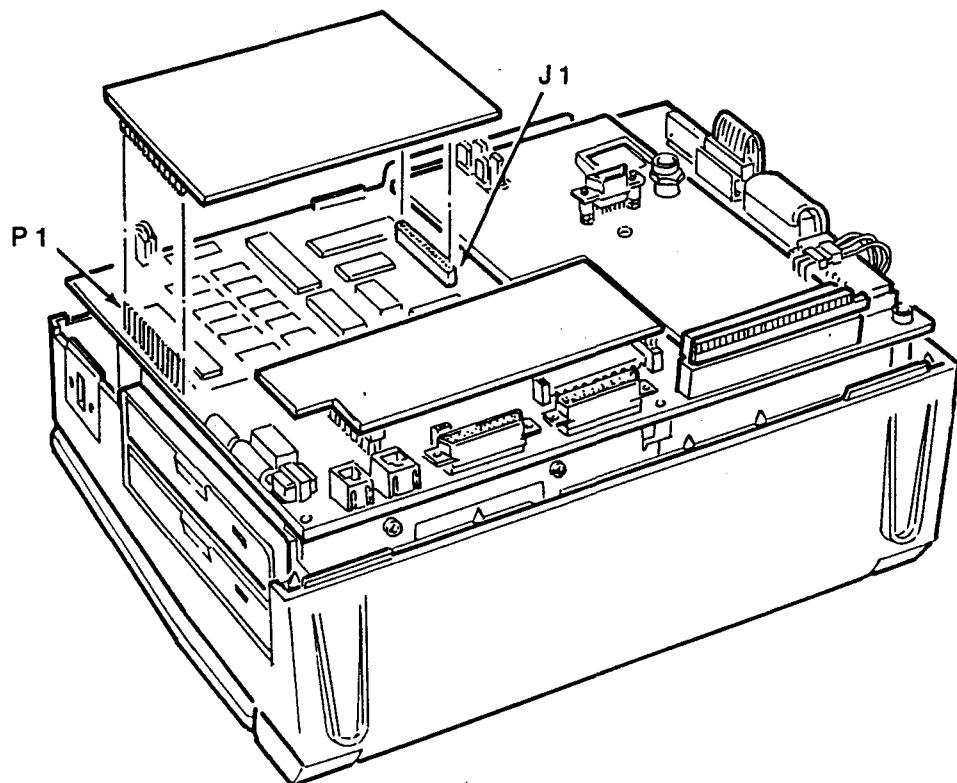
Main Logic Board

To access the main logic board, remove the back cover and the optional RGB video board, if so equipped. Refer to Figure 4-6 for the following procedures.

1.   Unplug the four ribbon cables (J3, J4, J5, J7), the power cable (J6), and the speaker cable (J12).

2.   Grasp the board at the top and bottom edges.

3.   Carefully lift the board from the computer.

NOTE: Determine that all of the necessary wires and connectors are accessible before reassembly.

Reverse the previous steps for reassembly.
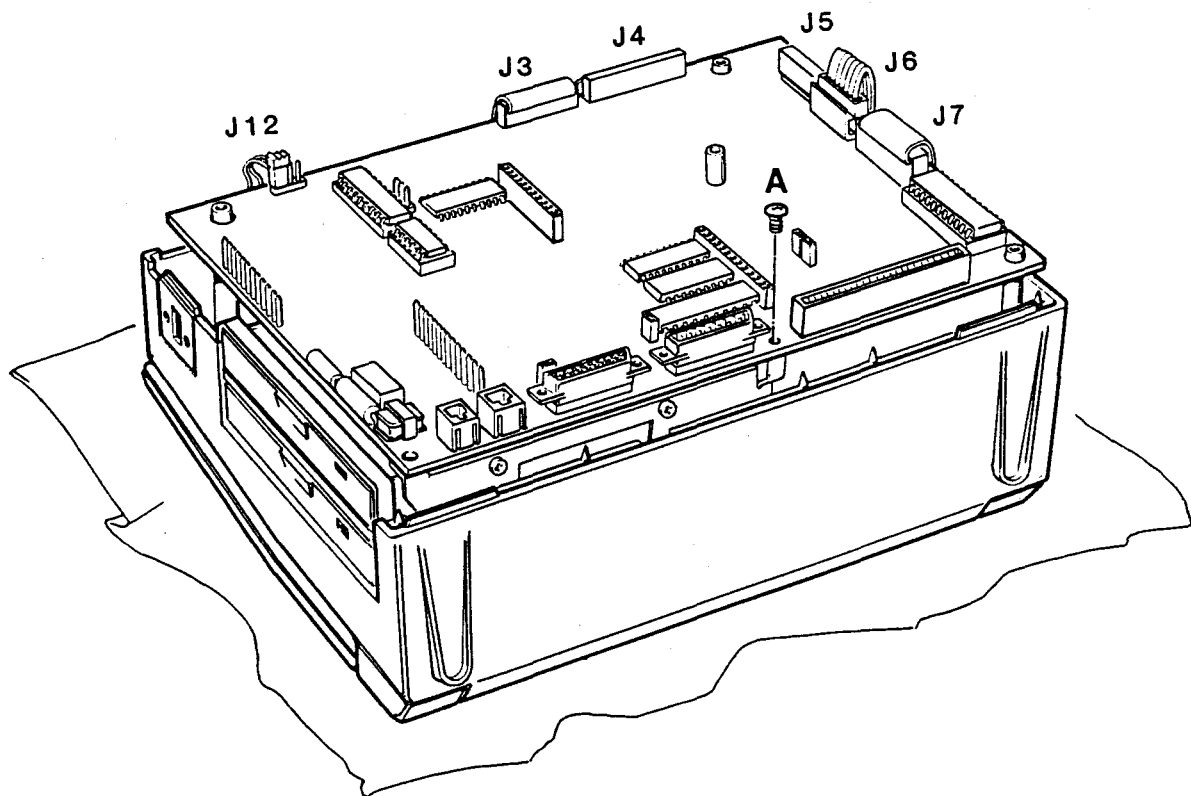
Figure 4-6:   Main Logic Board

Disk Drive Assembly

To access the disk drive assembly remove the back cover and the main logic board. Refer to Figure 4-7 for the following procedures.

1.   Unplug the drive power cable (P6) from the power control board and the 2 ribbon cables.

2.   To loosen the disk drive assembly, remove the five screws at **A** that secure the disk drive assembly to the computer.

3.   Lift the disk drive assembly away from the computer.

Reverse the previous steps for reassembly.
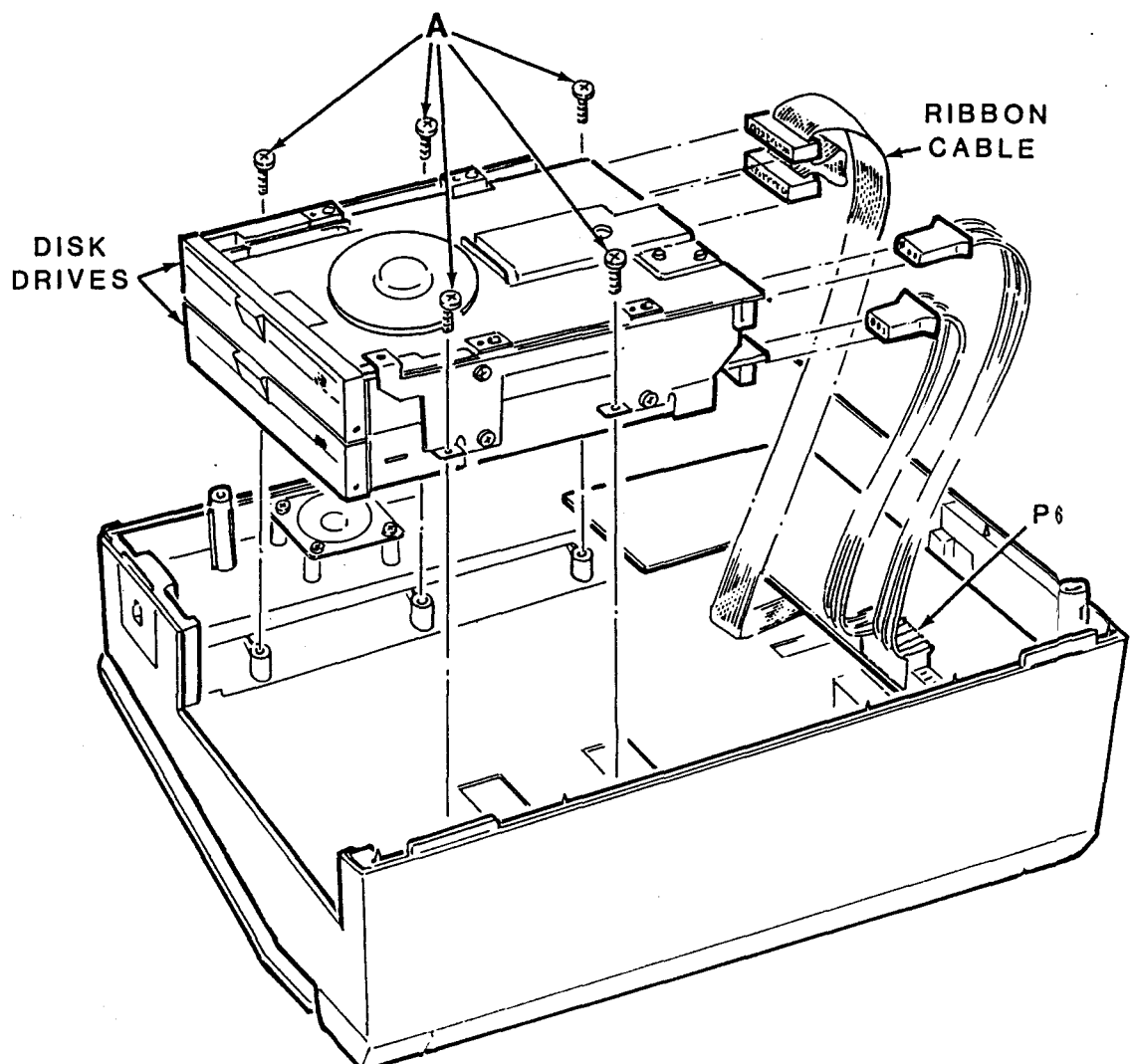
Figure 4-7:   Disk Drive Assembly

Disassembly/Reassembly

DC Power Board

To access the DC power board, remove the back cover and the main logic board. Refer to Figure 4-8 for the following procedures.

1. Unplug the two DC power cables (P3, and P5).

2. Remove the three screws at **A** that secure the power control board to the chassis.

3. Remove the board by sliding the board towards the disk drives until the contrast knob and the power switch clear the enclosure. Then lift straight up.

NOTE: Keep track of which wires go on which connectors for reassembly.

Reverse the previous steps for reassembly.
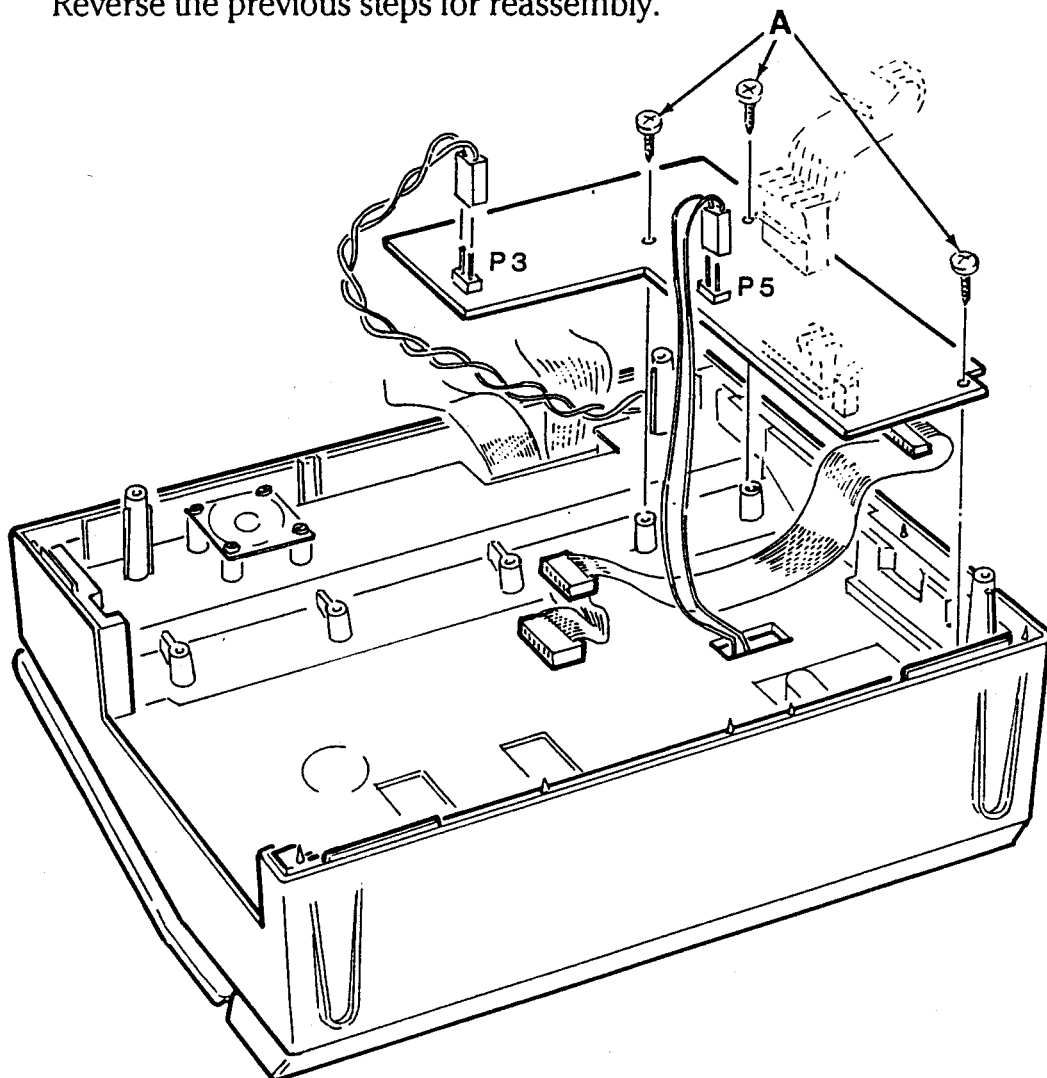
Figure 4-8:   DC Power Board

LCD Driver Assembly Board

To access the assembly, remove the back cover, the main logic board, the disk drives, and the power control board. Refer to Figure 4-9 for the following procedures.

1.   Remove the 6 screws at **A** that secure the support panel to the frame.

2.   Carefully lift the panel straight up while feeding the wires through the appropriate holes.

3.   Remove the 6 screws at **B** that secure the display.

4.   Lift the unit from the front cover.

NOTE: The LCD is sensitive to direct heat and intense sunlight. Use extreme care during handling or storage.

NOTE: When reassembling the support panel make sure that all necessary wires and cables are routed through the appropriate holes.

Reverse the previous steps for reassembly.
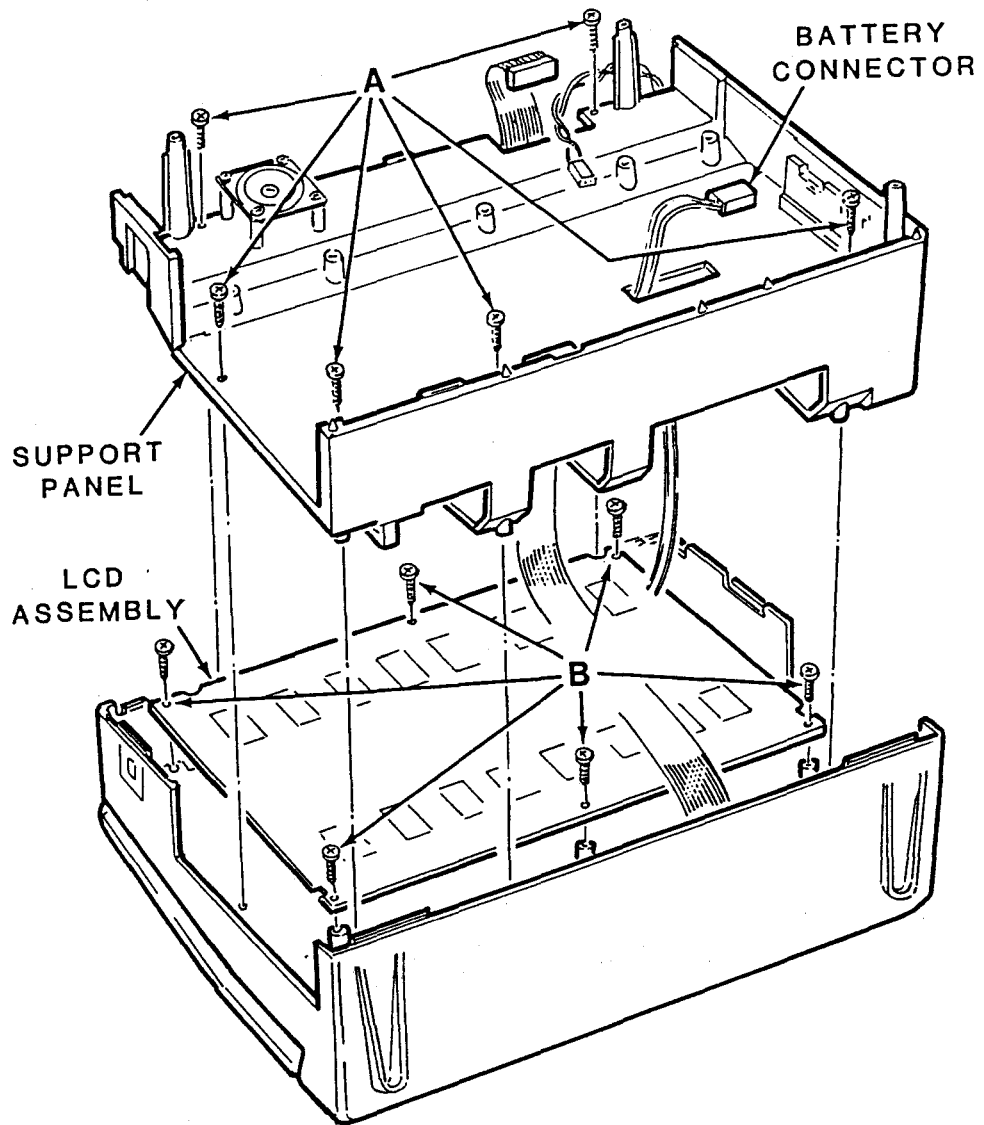
Figure 4-9: LCD Board

RGB Video Board

To access the optional RGB video board, remove the back cover. Refer to Figure 4-10 for the following procedures.

1.   Unplug the power connector (P1).

2.   Unplug the board from the expansion chassis connector (J8), and lift from the assembly.

Reverse the previous steps for reassembly.
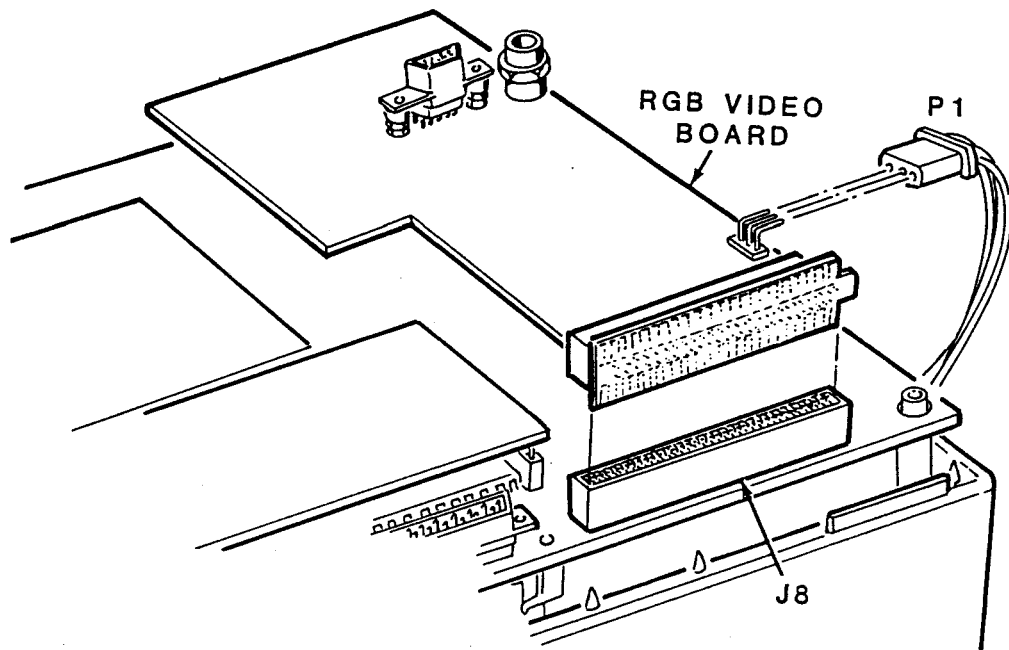
Figure 4-10:   RGB Video Board

Modem Board

To make sure that no damage will occur to the optional modem board, remove the back cover before disassembly. Refer to Figure 4-11 for the following procedures.

1. Grasp both ends of the board near the connectors.

2. Carefully lift the board straight, up applying equal pressure to both ends.

NOTE: When replacing this board make sure that the contact pins of the memory board and the main board are properly aligned before fully inserting the board.
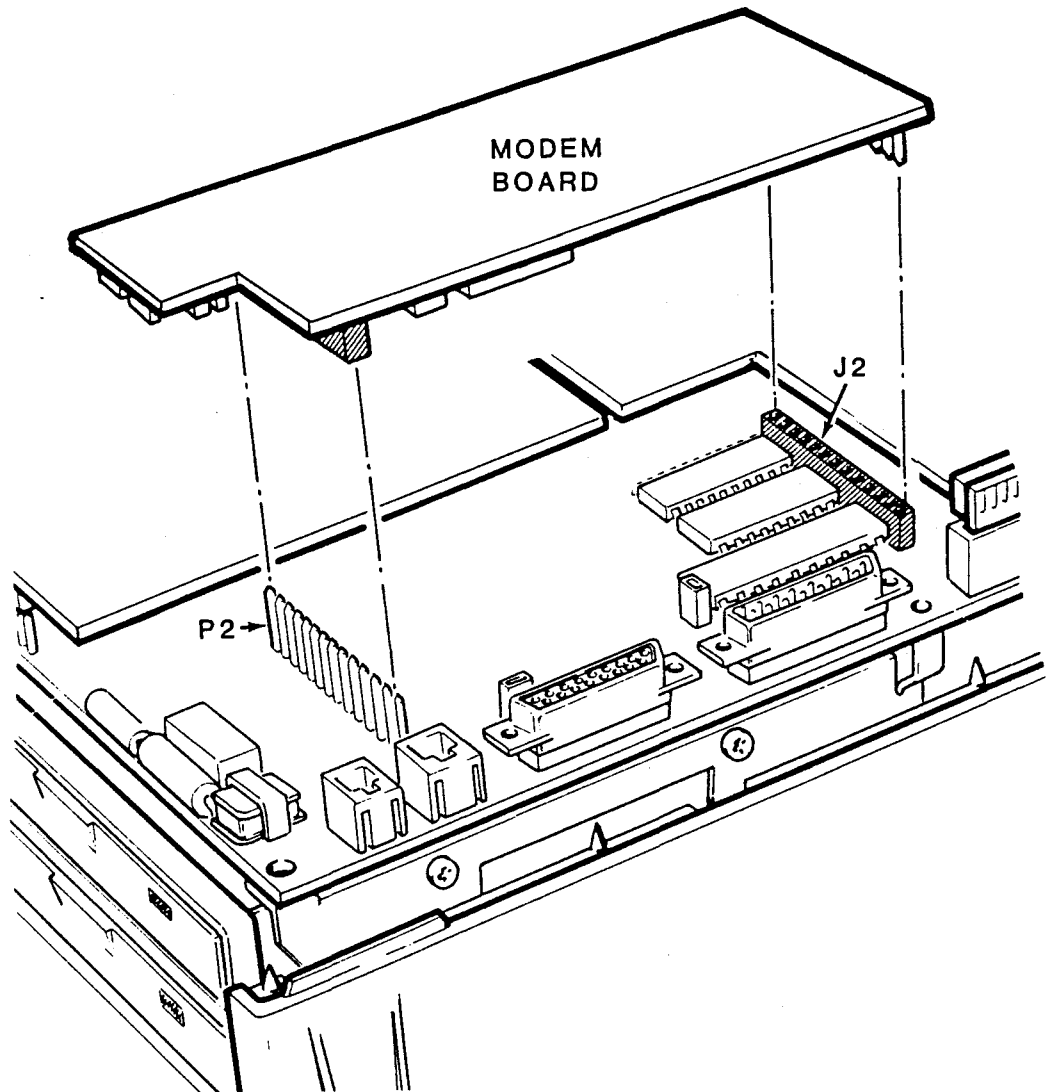
Figure 4-11:   Modem Board

Battery Pack

Refer to Figure 4-12 for the following procedures for installation of the optional battery pack.

1.   Locate the battery compartment positioned near the power switch.

2.   Remove the cover by pressing down on the locking tab (A) and pulling out on the cover.

3.   Insert the battery pack into the unit and push until the tab (B) locks.

Reverse the previous steps for reassembly.

B

PUSH TO REMOVE BATTERY

INSET

A

SQUEEZE
TO OPEN
DOOR

RECHARGEABLE BATTERY PACK

Figure 4-12:   Battery Pack

Disassembly/Reassembly
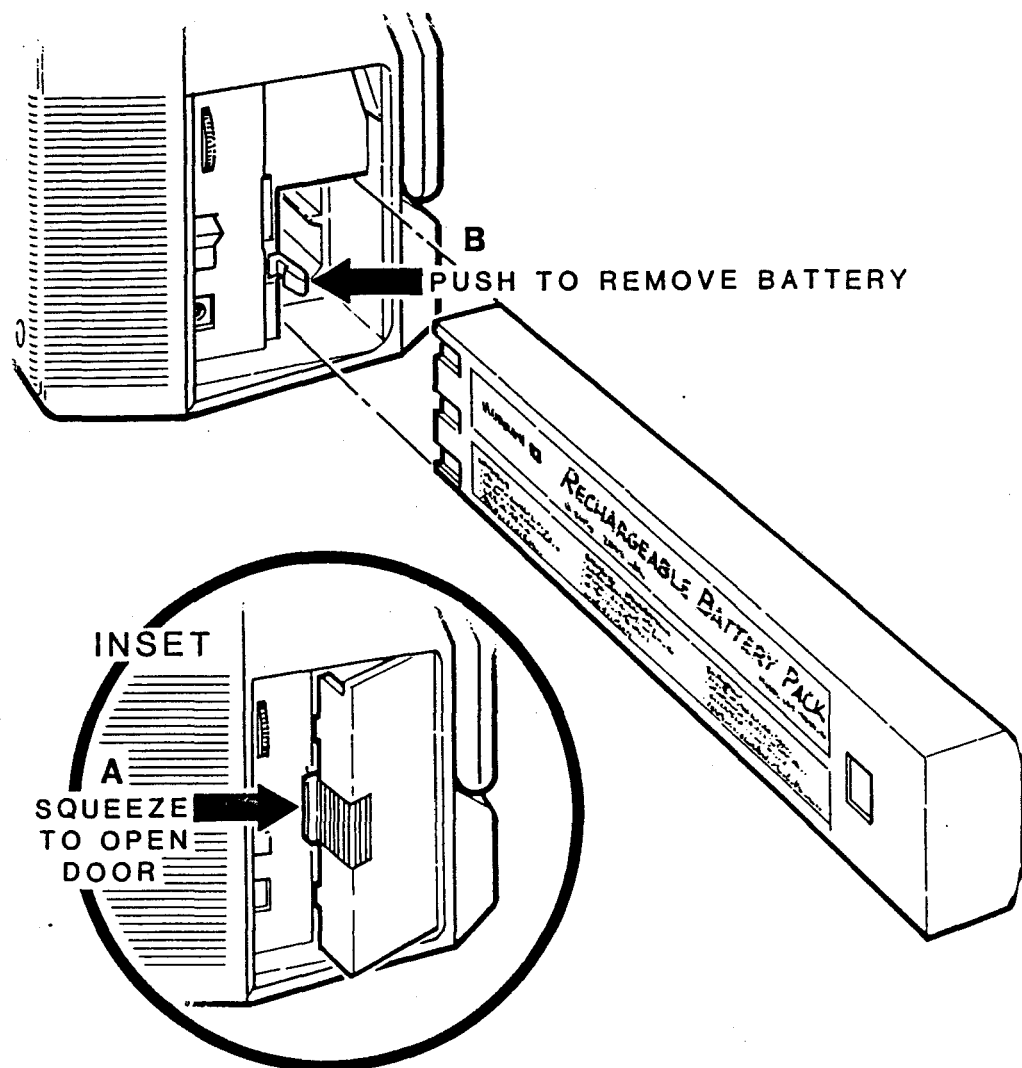
Keyboard

NOTE: The only components contained in the keyboard assembly are the touch control keys and the keypad. The keyboard processor and additional hardware are incorporated in the main logic board.

To access the keyboard mounting screws, remove the back cover, the main logic board, the disk drives, the power control board, and the optional battery pack, if so equipped. Refer to Figure 4-13 for the following procedures.

1.   Remove the 6 screws at **A** that secure the support panel to the frame.

2.   Carefully lift the panel while feeding the wires through the appropriate holes.

3.   Turn the computer upright, release the keyboard latches and lay the keyboard in the down position.

4.   Remove the 6 screws at **B** that secure the 2 hinge retainers and separate the keyboard from the computer.
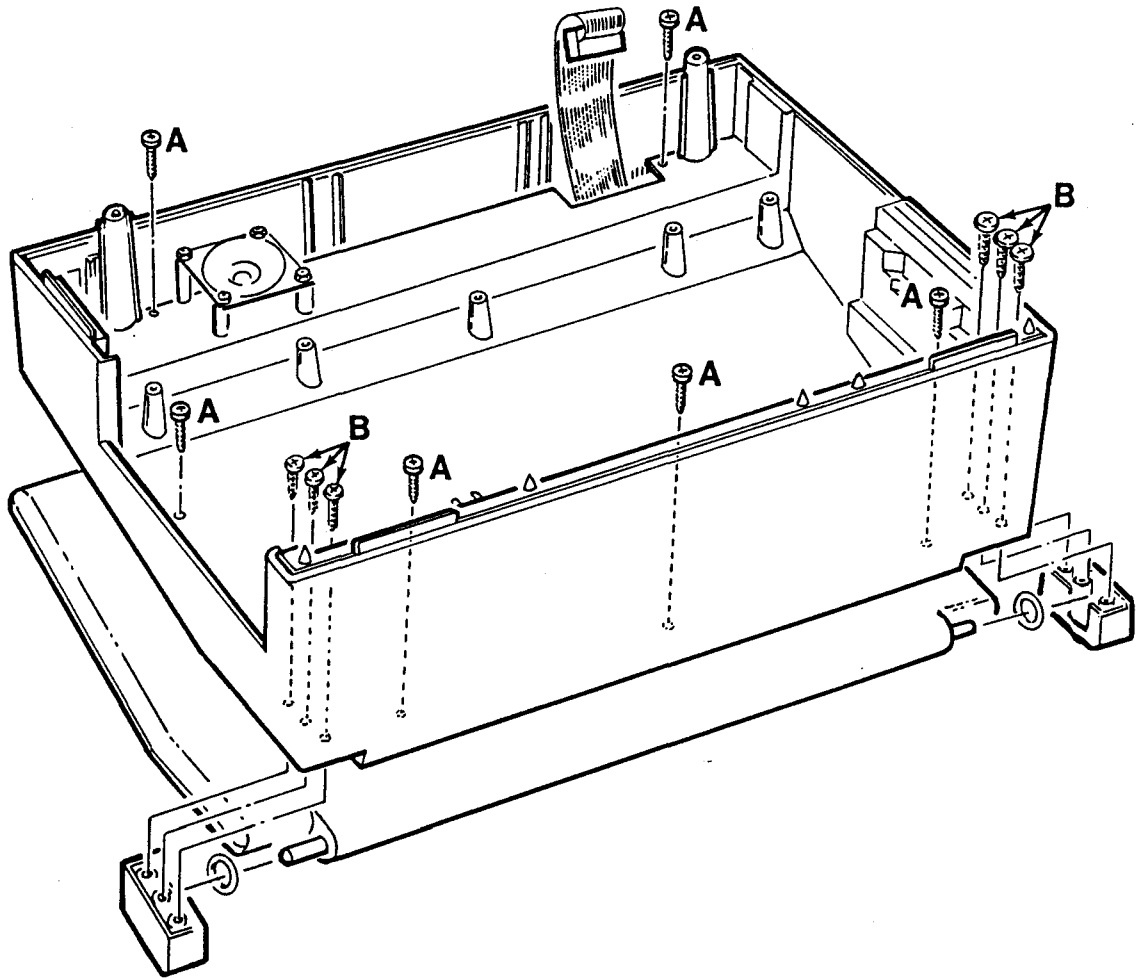
Figure 4-13: Keyboard

Refer to Figure 4-14 for the following procedures for separating the keyboard halves.

5.   Remove the two rubber O-rings from the keyboard hinge pins.

NOTE: The case is secured by some small tabs in the center of the back and at the center of the two sides. Be very careful not to break these off while trying to separate the case halves.

6.   Insert a small flat-bladed screwdriver in the center of the back of the keyboard between the two halves.

7.   Carefully pry the keyboard case halves apart while working the screwdriver around the edges.

Disassembly/Reassembly

8. Lay the top half of the keyboard assembly face down on a soft surface.

9. To access the keypad, remove the 6 screws at C that secure the keyboard to the case.

NOTE: The Function/Icon Block is permanently wired to the keyboard.

10. Carefully turn the keypad over making certain that there is no stress applied to the Function/Icon Block cable.

NOTE: When reassembling the support panel make sure that all necessary wires are routed through the appropriate holes.

Reverse the previous steps for reassembly.
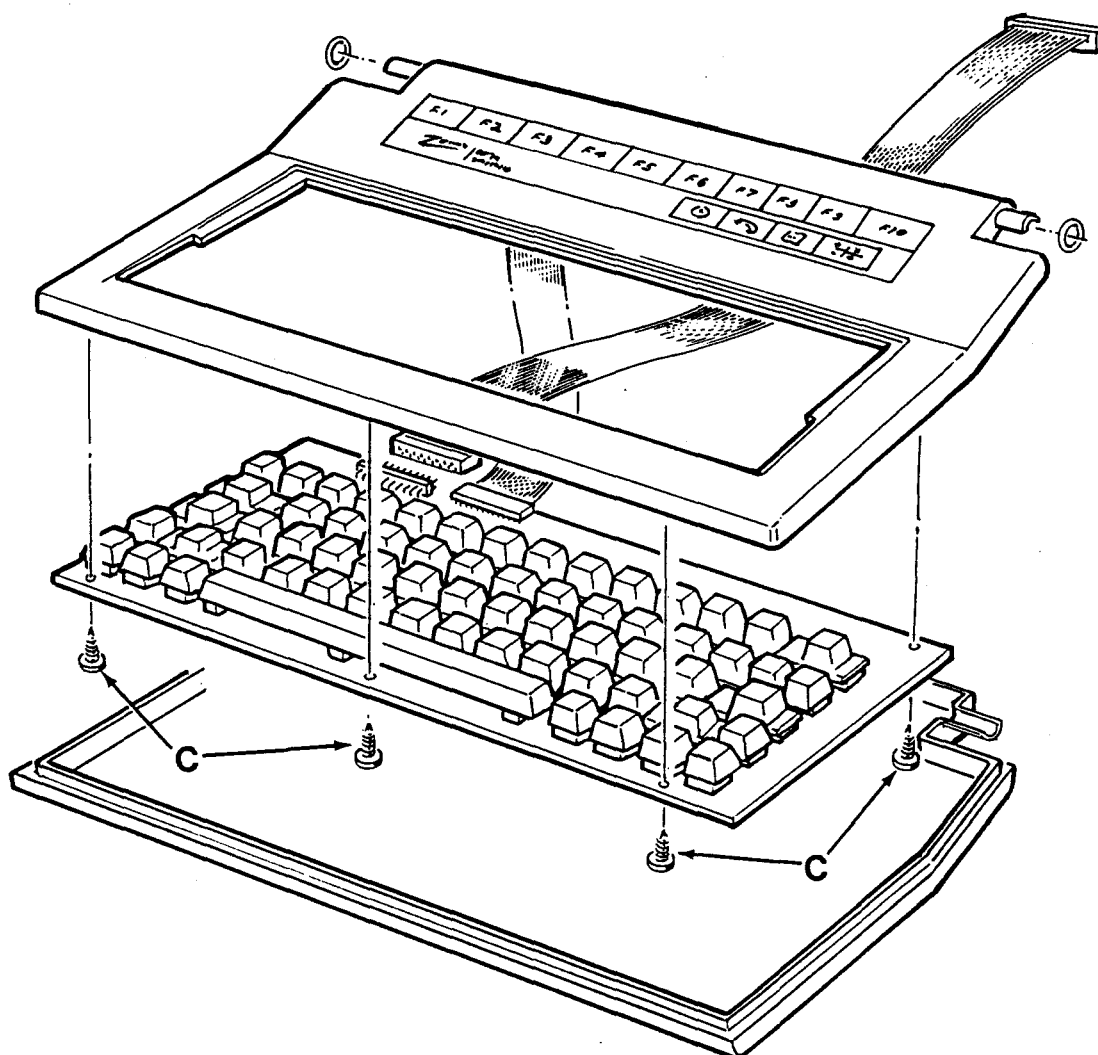
Figure 4-14: Disassembly of the Keyboard

Configuration

This chapter describes the configuration jumpers found on the main logic board, the memory board, and the RGB video video board. Chapter 4, "Disassembly/Reassembly" contains the procedures required to access these boards. Refer to Figure 5-1 for the location of the boards.
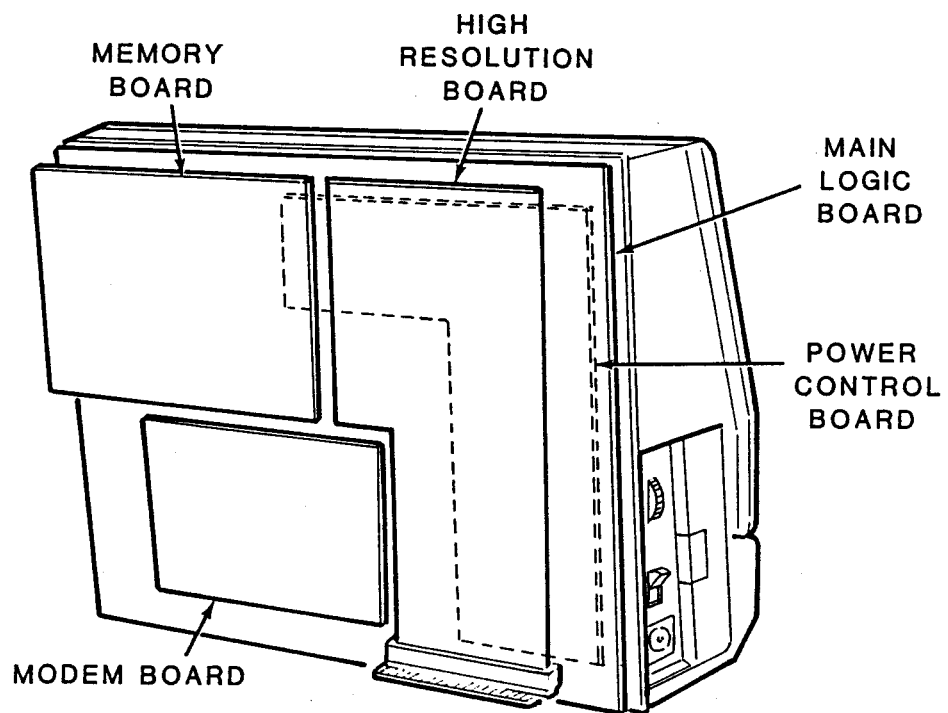
Figure 5-1: Circuit Board Locations

Configuration

Setup Menu

Previously, the computer's configuration was controlled by hardware jumpers and switches on the various circuit boards. Now with the Setup menu, most configuration information can be programmed into the system with this ROM-based program. The information that is entered is stored in the nonvolatile RAM for future use and can easily be altered if the system configuration changes.

To access the Setup menu, press the **clock/calendar** icon key to call up the world map display. Next, press the Setup (F10) key to display the Setup menu illustrated in Figure 5-2.

CLOCK	PRINTER	SERIAL PORT
Time: 14:22:00	Type: PARALLEL	Baud rate: 1200
Date: 07/05/84		Data bits: 8
Format: 24 hr.		Stop bits: 1
Time Zone: 19		Parity: None
New York Caracas		Handshake: XON/XOFF
DISPLAY	**MODEM**	**INTERNAL MODEM**
Ext. Mono. Adapter: OFF	Location: INTERNAL	Baud rate: 1200
		Data bits: 8
Screen Saver: ON		Parity: None
START-UP		
Action: World Map		
<SKIP SKIP> CHANGE	System version 2.0	EXIT

Figure 5-2: Setup Menu

Movement between the fields is accomplished by pressing the <SKIP (F1) key or the SKIP> (F2) key. To make a selection, move the cursor to the desired item where it will be shown on the screen in reverse video. The Change (F4) key is used to change the selection. The available variables are stored in the ROM. Continue to press the Change key until the desired value is displayed. The following discussion describes the options available for each field.

Clock

Time — Set the hour, minutes, and seconds separately. The hour will appear in either 12-hour or 24-hour format. The seconds are always set to 00 when F4 is pressed.

Date — Set the month, day, and year separately. The computer automatically adjusts for months with fewer than 31 days and leap years.

Format — Set the time to a standard 12-hour format or to a 24-hour format.

Time zone — Set this to the appropriate time zone. Table 5-1 lists the 24 time zones. The zone number reflects the difference in hours between that time zone and Greenwich Mean Time. However, there may be some deviations. The computer divides the world into 24 equal time zones which may cause a 15 – 30 minute variation. Note that the computer also does not allow for daylight saving time.

Configuration

Table 5-1: Time Zones

ZONE	LOCATION
0	London, Lisbon, Reykjavik.
1	Berlin, Paris, Rome.
2	Cairo, Athens.
3	Moscow, Iraq.
4	Iran, Afghanistan.
5	Pakistan.
6	India, Nepal.
7	Thailand, Viet Nam.
8	China, Phillipines.
9	Japan, Korea.
10	Sydney, Guam.
11	Solomon Is., New Caledonia.
12	New Zealand, Fiji.
13	Nome, Midway, West Samoa.
14	Anchorage, Hawaii, Tahiti.
15	Pitcairn, Marquesas Is.
16	Los Angeles, Vancouver.
17	Denver, Edmonton, Mazatlan.
18	Chicago, Winnepeg.
19	New York, Cuba, Bogota.
20	Halifax, Carcas, Santiago.
21	Rio de Janeiro, Greenland.
22	Trinidad, Falkland Is.
23	Azores, Cape Verde.

Display

External monochrome adapter (ext. mono. adapter) — Set to OFF unless an external monochrome monitor is to be used.

Graphics cursor — Set to OFF for normal IBM compatibility.

Screen saver — Set to ON. When turned on, the screen saver function will turn off the LCD if an entry from the keyboard is not made for 15 minutes. This will lengthen the life of the LCD and the battery pack. To turn the display back on, press any key on the keyboard.

Start Up

Action — Set to World Map if the world map display is to be called up when the computer is first turned on. If Boot is chosen, then the computer will automatically try to boot the disk operating system.

Printer

This feature is not currently supported by the computer. Use the MS-DOS Configur program.

Modem

Location — Set to EXTERNAL if an external modem is to be used. If the optional internal modem is to be used, set to INTERNAL and check the internal modem settings.

Internal Modem

Baud rate — Set for the desired baud rate at which the computer is to transfer data. The standard baud rates are 110, 300, 600, 1200, 2400, and 9600.

Data bits — Set this value for the number of bits required by the device to represent a character. Eight bits is the most common.

Parity — Set this value to accommodate the device's requirements for parity processing. The choices are none (disabled), odd, or even.

Main Logic Board

CAUTION: This board contains electrostatic-sensitive devices. Exercise extreme care when handling these devices to prevent damage.

The main logic board contains seven programmable jumpers that are used to select different operating conditions. Refer to Table 5-2 for an explanation of the purpose of each jumper and to Figure 5-3 for the jumper locations.

Table 5-2: Main Logic Board Jumper Settings

JUMPER	SETTING	DESCRIPTION
JMP1	Closed	Printer port interrupt.
JMP2	Open	Test purposes only.
JMP3	Closed	Printer port select.
JMP4	Closed	Serial port select.
JMP5	Open	Test purposes only.
JMP6	Open	80C39 external ROM.
JMP7	Closed	Serial port interrupt.
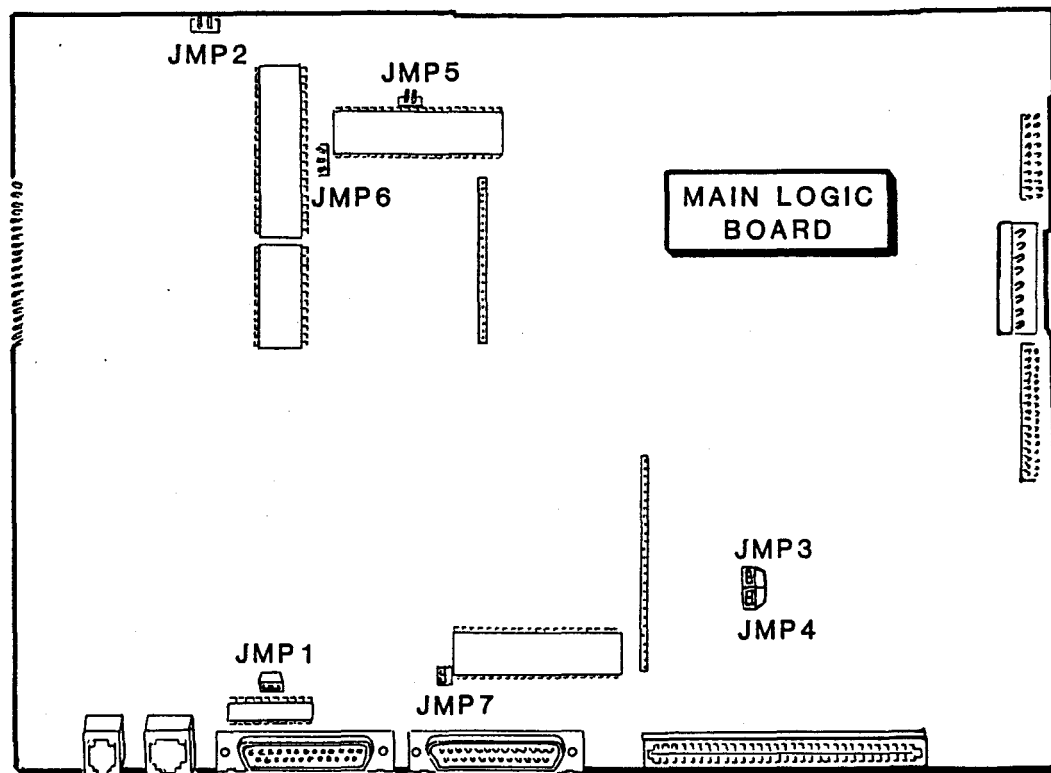
Figure 5-3: Main Logic Board Jumper Locations

Memory Board

The memory board has five jumpers that are used to select the base size and the configuration of the total amount of installed memory. Jumper 5 has two positions; up and down. Jumpers 6, 7, 8, and 9 each have three positions; left, right, and open (no jumper installed or on one pin only). Refer to Figure 5-4 for the location of these jumpers.
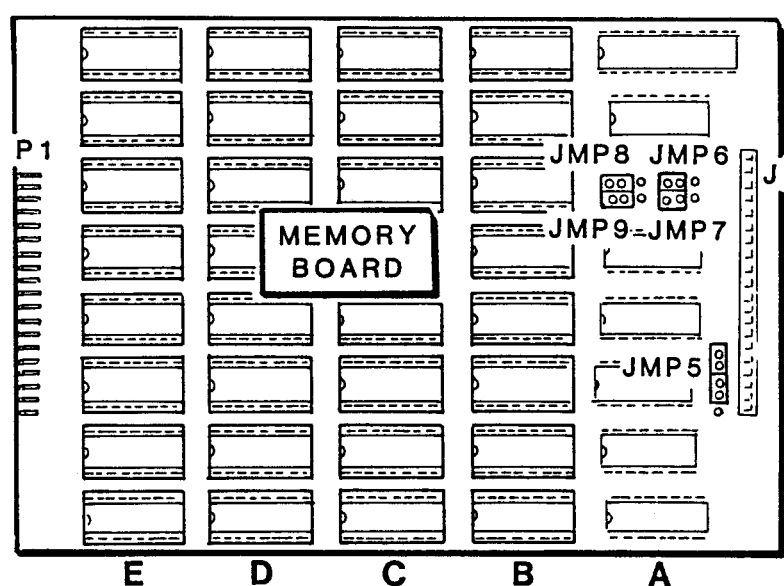
Figure 5-4: Memory Board Jumpers

In addition to 64-kilobit chips, 256-kilobit devices may be used to expand the user memory; however, only one type of chip may be installed in a bank. Refer to Table 5-3 for the jumper settings necessary to obtain a specific memory size and Figure 5-4 for the location of each jumper.

Configuration

Table 5-3: Memory Board Jumper Configurations

MEMORY SIZE IN KILOBYTES	JUMPER				
	5	6	7	8	9
64	Up	Open	Open	Left	Open
128	Up	Open	Left	Left	Open
192	Up	Open	Left	Left	Left
256	Up	Left	Left	Left	Left
256[1]	Down	Open	Open	Right	Open
320[1]	Down	Open	Open	Right	Right
384[1]	Down	Right	Open	Right	Right
448[1]	Down	Right	Right	Right	Right
512[1]	Up	Open	Right	Right	Open
576[1]	Up	Open	Right	Right	Right
640[1]	Up	Right	Right	Right	Right

1. A 256-kilobit device is used to obtain these memory sizes, as shown in Table 5-4.

The memory board chips are layed out in 5 banks labeled A, B, C, D, and E. Bank A is closest to the J1 connector and contains the data latch and other logic devices to control the board. Banks B, C, D, and E hold the memory chips. The computer is shipped with eight 256K chips in bank E. Additional upgrades are installed in bank D, C, then B.

Table 5-4: Memory Chip Size

MEMORY SIZE IN KILOBYTES	BANKS			
	E	D	C	B
64	64	—	—	—
128	64	64	—	—
192	64	64	64	—
256	64	64	64	64
256	256	—	—	—
320	256	64	—	—
384	256	64	64	—
448	256	64	64	64
512	256	256	—	—
576	256	256	64	—
640	256	256	64	64

RGB Video Board

The RGB video board has six jumpers which are used to select various characteristics such as the polarity of the sync signals. Jumpers 1, 2, 4, and 5 each have two positions; up and down. Refer to Table 5-5 and Figure 5-5 for information on setting these jumpers.

Table 5-5:   RGB Video Board Jumper Configuration

JUMPER	SETTING	DESCRIPTION
JMP1	Up	Determines the horizontal sync polarity.
JMP2	Up	Selects the video sync source.
JMP3	Open	Test purposes only.
JMP4	Up	Determines the video sync polarity.
JMP5	Up	Selects either vertical only or a composite sync signal.
JMP6	Open	Test purposes only.

Configuration
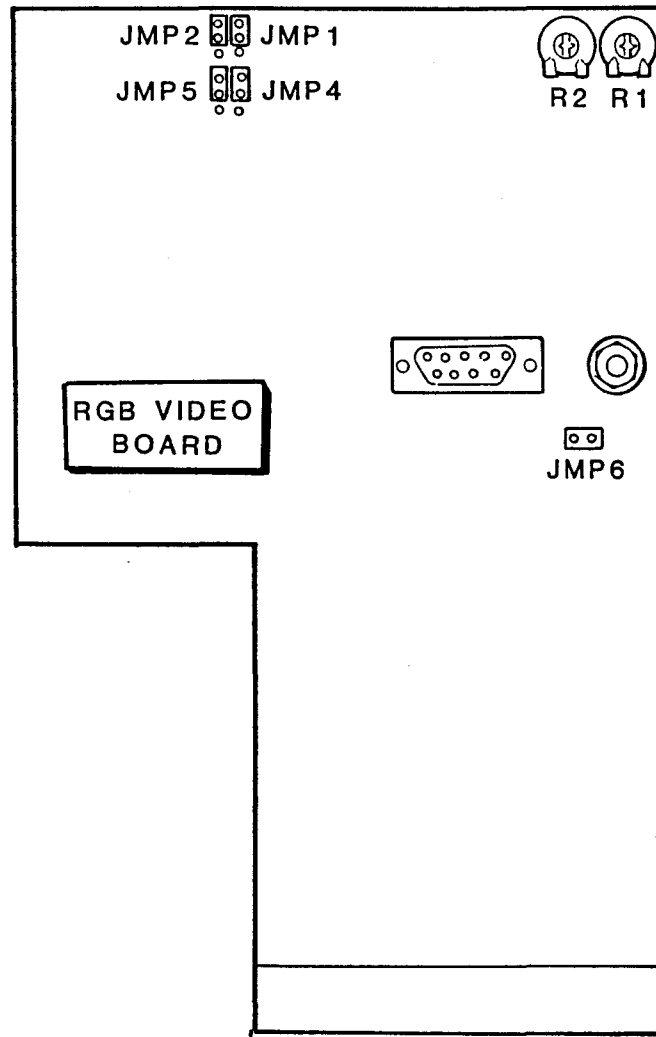
Figure 5-5:   RGB Video Board Jumper Locations

The two potentiometers, R1 and R2, adjust the black level and contrast of the external monitor. Normally these adjustments can be made with the monitor controls. If the desired results are not obtainable with the monitor controls, correct setting of the potentiometers will require an oscilloscope. Connect the common lead of the oscilloscope to the ground jacket and the test probe to the inner connection of the monochrome video jack as shown in Figure 5-6. Adjust R1 and R2 to obtain the trace shown in Figure 5-7. Note that these controls interact.

CONNECT OSCILLOSCOPE
COMMON LEAD HERE

CONNECT TO COMPOSITE
VIDEO CONNECTOR

CONNECT OSCILLOSCOPE
TEST PROBE HERE
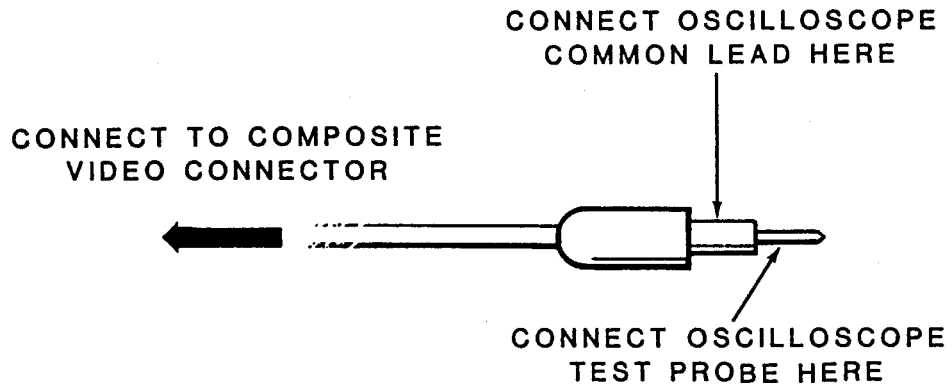
Figure 5-6:   Video Test Connection

OSCILLOSCOPE SETTINGS: VERTICAL   HORIZONTAL
                        500mV/DIVISION   10µS/DIVISION

WHITE LEVEL
1.0VOLTS

BLACK LEVEL
0.3VOLTS
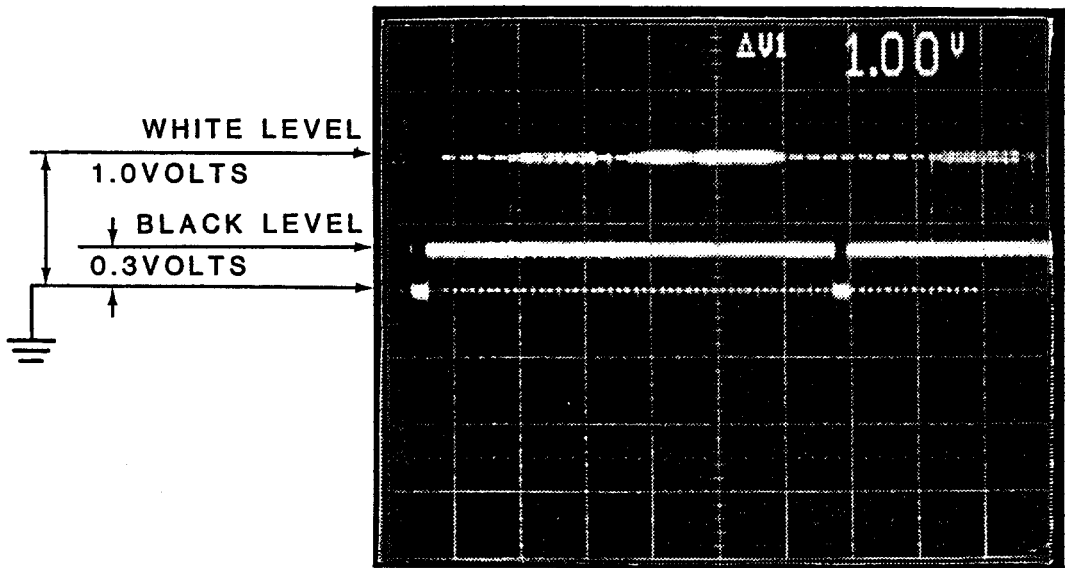
Figure 5-7:   Video Waveform

Disk Drive Configuration

The following information provides programming information on the drive(s) in your computer. Refer to Figure 5-8 and Table 5-6 to configure the drive(s).
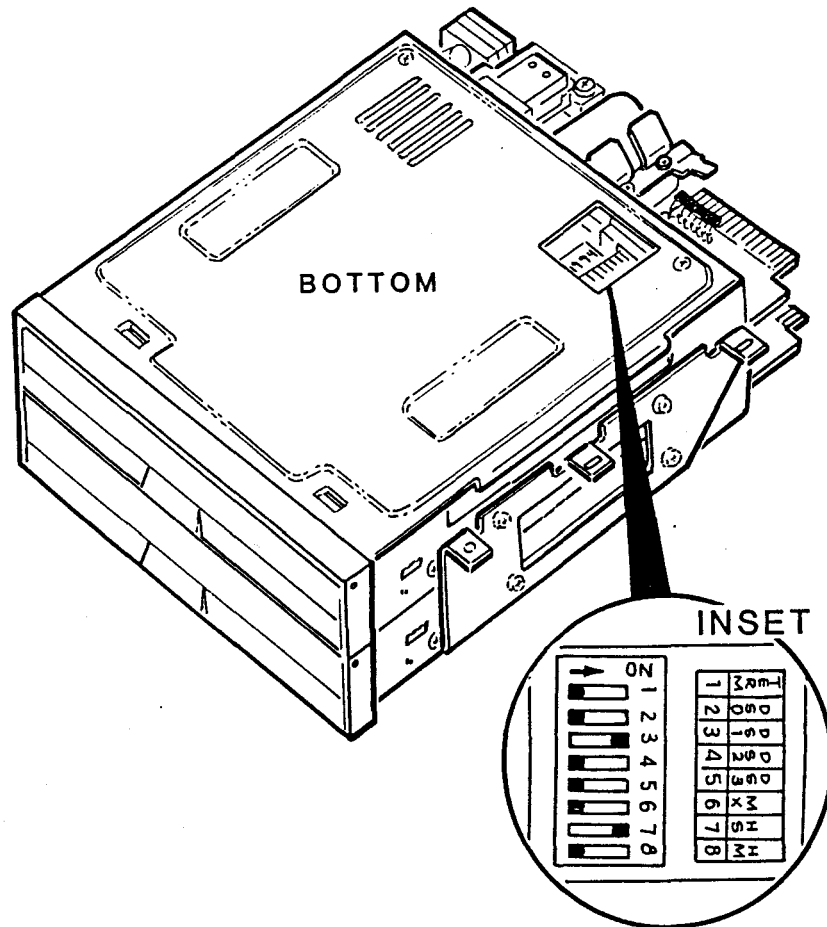
Figure 5-8:   Disk Drive Configuration

Table 5-6:   Floppy Disk Drive Configuration

DRIVE	TERM (1)	DS0 (2)	DS1 (3)	DS2 (4)	DS3 (5)	MX (6)	HS (7)	HM (8)
A (0)		On		Off	Off	Off	On	Off
B (1)		Off	On	Off	Off	Off	On	Off

System Checkout and Troubleshooting

This chapter outlines a troubleshooting approach which is intended to isolate a defective circuit board or other major assembly. This procedure can also be used to determine whether all major modules of a new computer are functioning properly.

Zenith Data Systems does not support service beyond the assembly or module level. However, detailed circuit descriptions, schematics, and complete parts lists are available in other publications referred to in Chapter 1 of this manual.

System Checkout Procedure

The system checkout procedure is a systematic approach for verifying proper operation of each module of the computer. The approach uses the following sequence.

1. Disconnect all peripherals from the computer.

2. Verify general power is connected to the computer.

3. Verify operation of the power supply.

4. Verify operation of the LCD.

5. Verify operation of the the floppy disk drives.

6. Verify operation of the real-time clock.

7. Verify operation of the optional RGB video board.

8. Verify operation of the optional modem board.

9. Use disk-based diagnostics (CB-5063-28) to verify specific operation.

System Checkout and Troubleshooting

The system checkout procedure forces the technician to check all areas of the computer. Many faults present visual indications (video problems, error messages, etc.) of the problem. Experienced technicians may be able to interpret these indications without using this whole procedure. Error messages, described in Table 6-1 can isolate defective modules.

Table 6-1: Error Messages

MESSAGE   POSSIBLE PROBLEM

+ + +CPU failure! + + +
+ + +ERROR: ROM checksum failure! + + +
> These two messages indicate that the CPU logic may be malfunctioning. Replace the main logic board.

+ + +ERROR: RAM failure! address:XXX:YYYY, Bit: n, Chip XXX + + +
> These messages indicate that the CPU is unable to read or write to the RAM or video RAM. Check to see if the memory board is properly seated. The chip number displayed is the number of the chip that has failed. Replace the chip.

+ + + Error: Timer Interrupt failure! + + +
> This message indicates the possible failure of interrupt control and/or timing logic on the main board. Refer to Chapter 5 and make sure the configuration switches and jumpers are correctly set for the options that may be connected to the computer. Also, check that the timer chip is properly installed. If that does not correct the problem, replace the main board.

+ + +DISK ERROR: Drive not ready! + + +
> This message usually appears when the system attempts to boot the operating system from a disk and there is not a disk in the disk drive. This message may also appear due to a faulty disk or floppy disk controller circuit on the main board. Check to make sure that the cardboard inserts have been removed from the disk drives. Be sure that there is a disk in the drive, that it is inserted correctly and that the drive latch is closed. If a disk is properly inserted in the drive, try another disk or try booting from the other disk drive.

System Checkout and Troubleshooting

Table 6-1 (continued):   Error Messages

MESSAGE   POSSIBLE PROBLEM

+++DISK ERROR: Bad disk controller! +++
+++DISK ERROR: DMA overrun error! +++
> These messages usually indicate a malfunction of the disk controller circuit, but may also appear because of other defective circuits in the system. If any nonstandard boards have been installed, they should be suspected first.

+++DISK ERROR: Sector not found! +++
+++DISK ERROR: CRC error! +++
+++DISK ERROR: Invalid address mark detected! +++
> These messages normally indicate that an operating system was not found on the selected drive disk, or there may be a faulty drive. First try a different disk. If this error occurs often, it may be necessary to have the drive aligned or the disk controller circuit checked.

Set Up

Refer to Chapter 1 for a list of the tools and equipment required for the following procedure.

1.   Disconnect all peripherals from the computer.

2.   Remove any circuit boards not supplied by Zenith Data Systems.

3.   Verify that power (120 VAC) is available at the power outlet being used by the computer.

4.   Plug the AC adapter into the computer and then into the power outlet.

If no failures are found, a standard computer will not require any disassembly when using the troubleshooting procedure. If a problem is discovered, it will be necessary to disassemble the computer to further troubleshoot the system. Refer to Chapter 4 for the necessary disassembly instructions.

System Checkout and Troubleshooting

CAUTION: Be sure the power switch is OFF, the line cord is removed, and all peripheral equipment is disconnected before removing any boards or disassembling the computer.

NOTE: If a problem is found, many of the steps refer to the DC power board for troubleshooting. However, to troubleshoot many of these problems, the main board must be connected to the DC power board by J5 and J6 on the main logic board. Also, the J4 connector must be left connected in order to provide control signals to the disk drives. Refer to Figure 6-1.
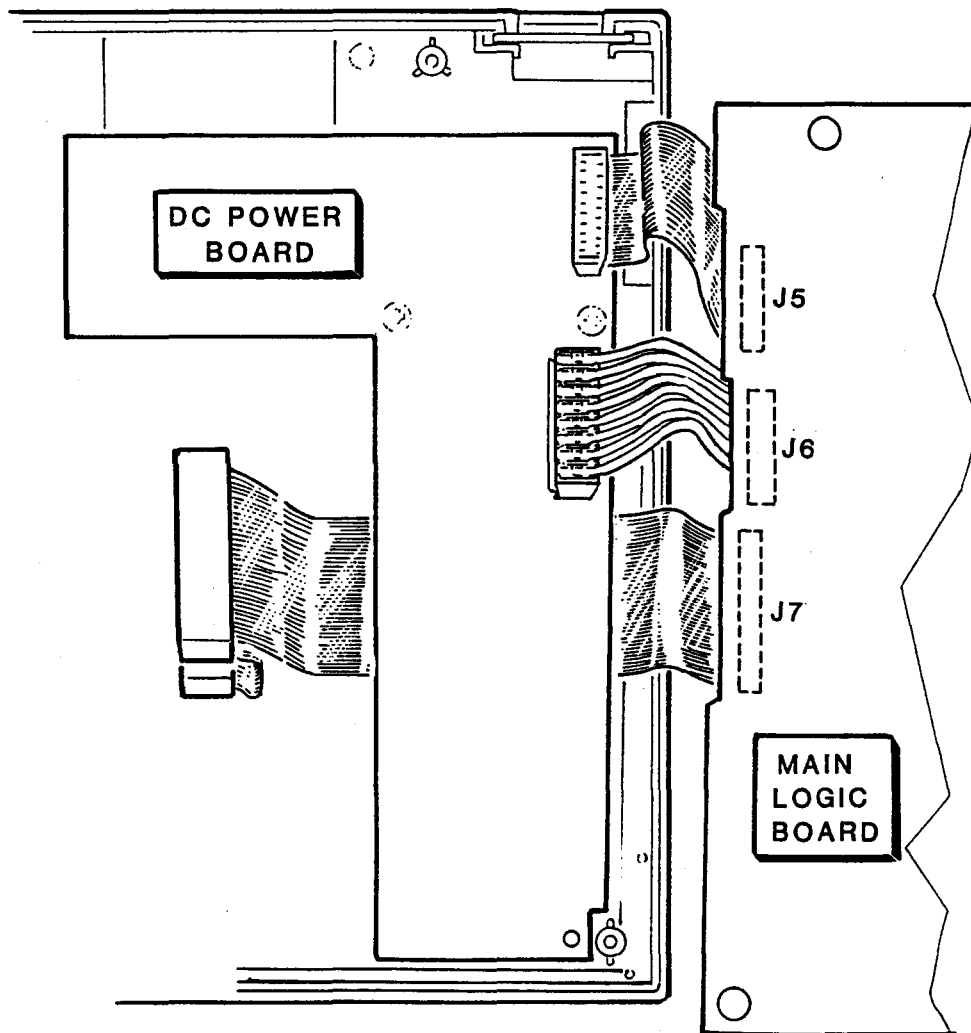

Figure 6-1:   DC Power Board Cable Connections

Troubleshooting Procedure

The following procedure is in a question and answer form, with a yes or no answer derived from most steps.

When the answer to the question is a yes, the YES column will indicate which step to proceed to. If the answer is a no, the NO column will indicate which step to proceed to. See step 1 for an example.

When a dash (—) is listed in the column, the fault has been identified and/or corrected, or no action is required. In these cases the text will indicate which step to proceed to in order to retest the fault area. See step 1c for an example.

NOTE: The computer has a screen saver function that turns off the screen if an entry is not made through the keyboard for a short time. While using the AC adapter, the screen will remain on for approximately 10 minutes. While using the battery, the screen will remain on for approximately 1.5 minutes. Press any key to re-activate the screen. This function can be defeated by accessing the setup menu and turning the screen saver to OFF.

Step 1: General Power

STEP	PROCEDURE	YES	NO
1	Switch on the power switch. Does the screen light?	2	1a
1a	Adjust the contrast knob. Does the screen light now?	2	1b
1b	Is the AC adapter plugged into an operating outlet?	1d	1c
1c	Switch off the computer power switch, plug the computer into an operating outlet, and return to step 1.	—	—

System Checkout and Troubleshooting

STEP	PROCEDURE	YES	NO
1d	Disconnect the AC adapter from the computer. Use a DVM or a VOM to check the output voltage of the AC adapter. Does the output voltage equal approximately 15 VDC?	1h	1e

WARNING: The AC adapter contains circuitry capable of generating dangerous high voltages. Use extreme care when opening this unit. Refer to "Final Connections", Chapter 2 for instructions on how to open the unit.

STEP	PROCEDURE	YES	NO
1e	Unplug the unit and remove the cover. Is the fuse blown?	1f	1g
1f	Replace the fuse and return to step 1.	—	—
1g	Is the voltage selector jumper properly set?	1i	1h
1h	Select the proper setting and return to step 1.	—	—
1i	Replace the AC adapter and return to step 1.	—	—
1j	Check the ELON signal from the main logic board. Use a DVM or VOM to measure the voltage at pin 15 of connector J5. Is the voltage greater than 3 VDC?	1i	1k
1k	Replace the main logic board and return to step 1.	—	—
1l	Check the power output from the DC power board to the LCD by using an oscilloscope. Measure the waveform at the two leads of capacitor C1 as illustrated in Figure 6-2. Does the waveform approximate		

the one shown in Figure 6-3 and is value
equal approximately 300 VAC peak to
peak at 500 cycles/second?   1n   1m

CAUTION: Do not remove the P3 connector when the power is on. To
do so will damage the LCD assembly.

1m   Replace the DC power board and return
                  to step 1.   —   —

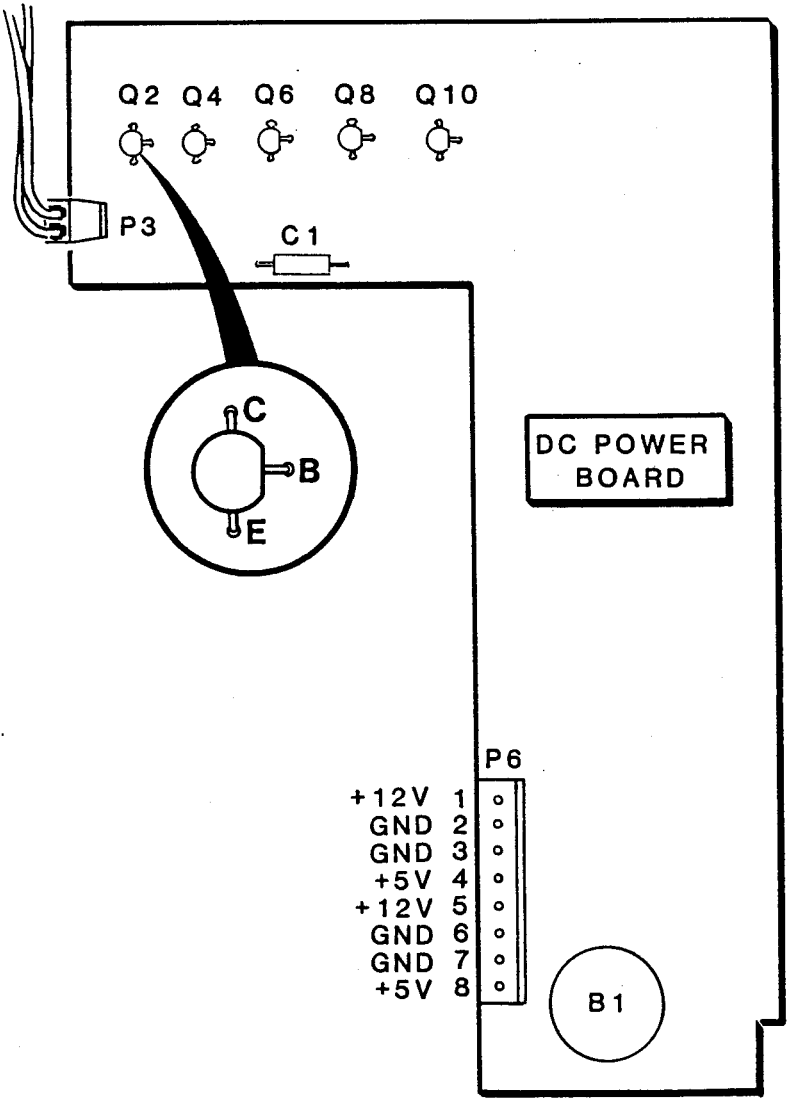1n   Replace the backlight and return to step
                  1.   —   —

Figure 6-2:   DC Power Board

System Checkout and Troubleshooting

OSCILLOSCOPE SETTINGS: VERTICAL HORIZONTAL
50V/DIVISION 500µS/DIVISION
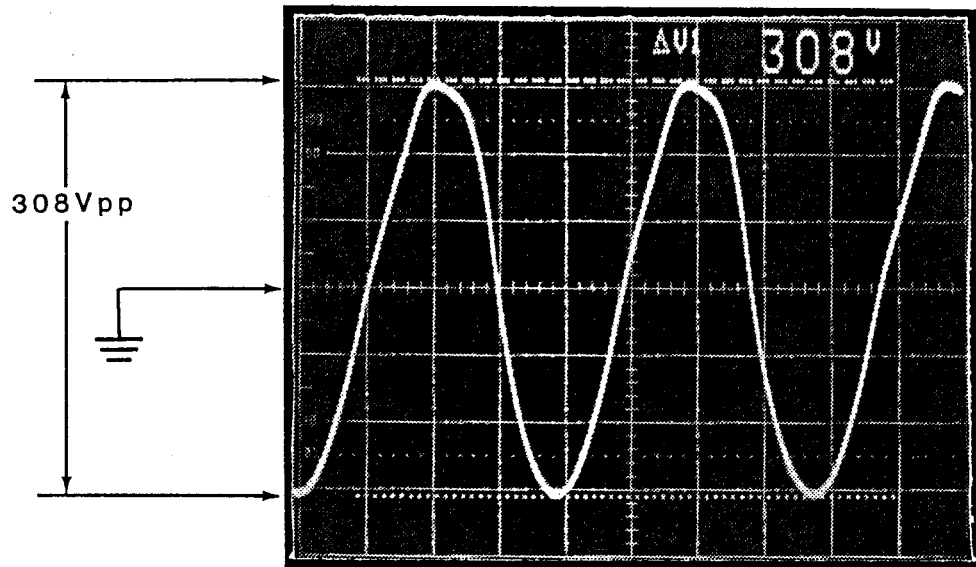
Figure 6-3: LCD Power Input Waveform

Step 2: LCD

STEP	PROCEDURE	YES	NO
2	Is the screen scrambled?	2a	3
2a	Is the AC adapter properly connected?	2b	1b
2b	Change the main logic board and return to step 2.	—	—

Step 3: Disk Drives

STEP	PROCEDURE	YES	NO
3	Insert a disk in drive A. Does the computer access the disk drive correctly?	3a	3b
3a	Insert a disk in drive B. Does the computer access the disk drive correctly?	4	3b

3b	Check the disk drive power cables. Are they installed properly?	3d	3c
3c	Install the cables and return to step 3.	—	—
3d	Is the drive configured properly?	3f	3e
3e	Refer to "Configuration", Chapter 5 for the proper settings. Return to step 3.	—	—

3f   Change the Setup menu to set the computer to autoboot. Check the control signals from the main logic board by performing the following procedure. Remove the J5 connector. Prompt the computer to boot drive A by turning the unit OFF and then ON. While the computer is trying to boot drive A, use a DVM or VOM, to measure the voltages at the following pins of connector J5.

Pin 1 ´   + 5 VDC
Pin 3   + 5 VDC

	Are these voltages correct?	3g	3h

3g   Boot a MS-DOS disk in drive A. To prompt the computer to select drive B, press the **RETURN** key after the date and time prompts. Enter **B:** and press **RETURN.** enter **DIR** and press **RETURN.** While the computer is trying to read disk B, use a DVM or VOM to measure the voltages at the following pins of connector J5.

Pin 5   + 5 VDC
Pin 7   + 5 VDC

	Are these voltages correct?	3i	3h

System Checkout and Troubleshooting

3h	Replace the main logic board and return to step 3.	—	—
3i	Reconnect the J5 connector and access the DC power board. Using a DVM or VOM, check the voltages on the P6 connector for the voltage readings shown in Figure 6-2. Prompt the computer to read drive A, as described in step 3f and measure the voltages at pins 1-4. Prompt the computer to read drive B, as described in step 3g and measure the voltages at pins 5-8. Are these voltages correct?	3k	3j
3j	Replace the DC power board and return to step 3.	—	—
3k	Replace the drive in question and return to step 3.	—	—

Step 4: Real-Time Clock

STEP	PROCEDURE	YES	NO
4	Turn on the computer and press the clock icon. Does the clock keep accurate time?	5	4a
4a	Replace the small battery, B1 on the DC power board, illustrated in Figure 6-2. Return to step 4.	—	—

Step 5: RGB Video Board

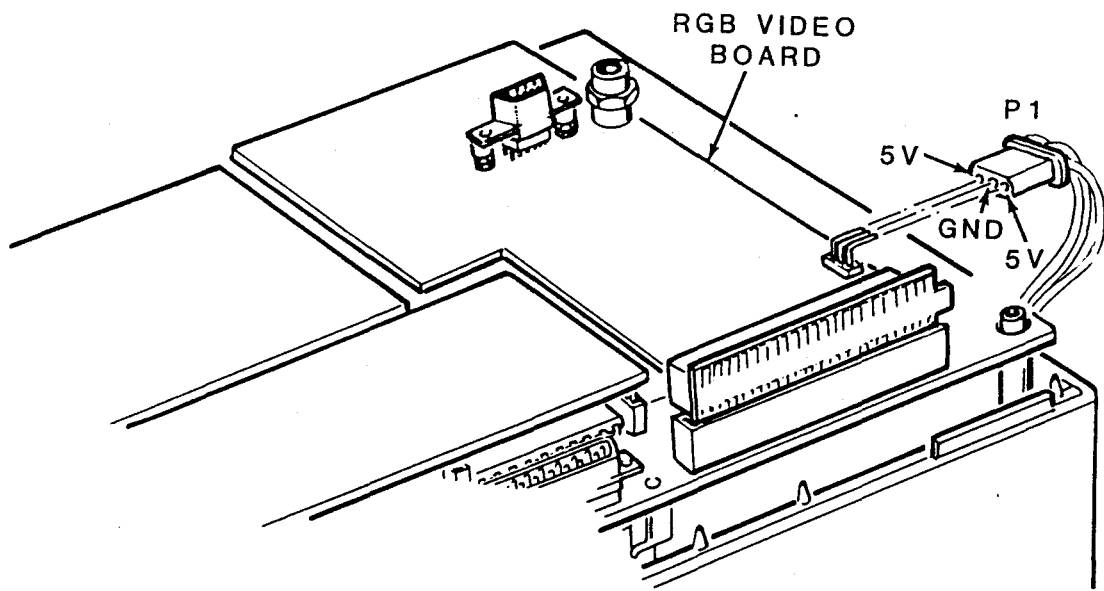| STEP	PROCEDURE	YES	NO
5	Connect a known good monitor to the computer. Is anything (including an un-readable display) shown on the screen?	6	5a
5a	Are all of the video cables installed properly? Is the monitor connected to power and switched on and is the computer connected to the AC adapter?	5c	5b
5b	Connect the cable, connect the AC adapter, and/or switch on the monitor and then return to step 5.	—	—
5c	Is the black level (brightness control) on the monitor turned down?	5d	5e
5d	Increase the brightness and return to step 5.	—	—
5e	Access the video board. Is the video board seated properly?	5g	5f
5f	Switch off the power, seat the board, switch the power back on, and return to step 5.	—	—
5g	Is the AC adapter connected properly to the computer?	5h	1b
5h	Measure the voltage at connector P1, of the video board, as illustrated in Figure 6-3. Does the voltage of the two outside pins equal approximately 5 VDC?	5j	5i
5i	Replace the DC power board and return to step 5.	—	—

System Checkout and Troubleshooting

Figure 6-4: Video Board

STEP	PROCEDURE	YES	NO
5j	Using an oscilloscope, view the output of the composite video connector. Refer to the RGB video board section in Chapter 5 for the waveform and adjustment procedures. Does the output approximate the waveform shown?	5l	5k
5k	Replace the video board. Does anything appear on the screen?	5	5l
5l	Return the monitor to the shop for service. When the monitor is repaired or a functional monitor is obtained, proceed to step 5.	—	—

Step 6: Modem Board

STEP	PROCEDURE	YES	NO
6	Is the optional modem board operating correctly?	—	6a
6a	Access the setup menu. Are the modem settings correct?	6c	6b
6b	Select the proper settings and return to step 6.	—	—
6c	Replace the modem board and return to step 6.	—	—
6d	Replace the main board and return to step 6.	—	—

STEP 7: Battery Test

STEP	PROCEDURE	YES	NO
7	The battery will have to be fully charged for the following test. A battery will require at least 8 hours of charging (longer if the computer is being used during charging) to become fully charged. Has the battery been fully charged?	7b	7a
7a	Install the battery in the computer. Plug the AC adapter into the computer and then into the power outlet. The computer should be left OFF to obtain minimum charging time. Let the battery charge for at least 8 hours. Return to step 7.	—	—
7b	Remove the battery from the computer. Using a DVM or VOM, measure the voltage across the two terminals. Is the voltage greater than 12 VDC?	7c	7d

7c   Refer to Figure 6-4 for the test arrangement. While using a DVM or VOM to monitor the voltage across the two terminals of the battery, place a 10Ω, 5 watt resistor across the terminals for approximately 10 seconds. Did the voltage drop below 12 volts?   7d   7e

7d   Replace the battery and return to step 7.

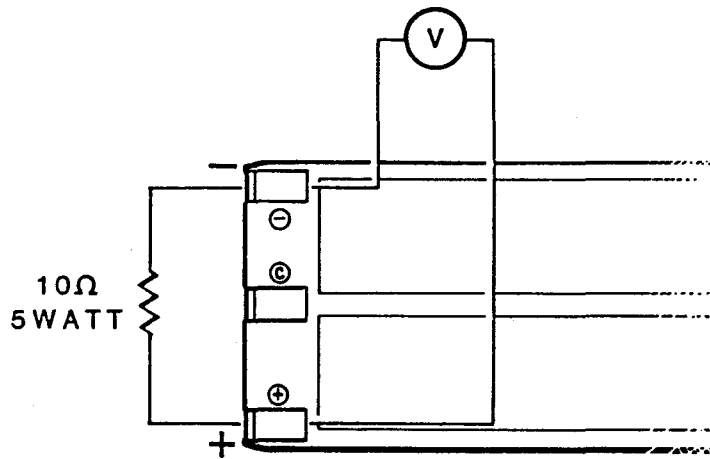7e   The battery is considered to be good. Install the battery into the computer.   —   —

Figure 6-5: Battery Test

Final Checks

Before returning the computer to the customer, ensure that the computer is operating properly by performing the following checks:

1.   Make sure all circuit boards and connectors are properly installed.

2.   Make sure all wires are routed properly to prevent pinching, contact with sharp edges, or contact with hot surfaces (high wattage resistors).

3.   Make sure all switches and jumpers are properly configured.

4.   Make sure all screws, mounts, barriers, and covers are installed in their proper location and tightened securely.

5.   Turn the computer ON and carify that the unit will pass the power-up test.

6.   Run the disk-based diagnostic test on the computer.

7.   Load and run MS-DOS.

8.   Connect all peripherals and verify their correct operation.

9.   Run the unit for an hour or more to check for thermal or intermittent problems.

Parts List

The parts lists in the following table provide information on the major assemblies that are considered to be field-replaceable. For complete parts lists of all parts, along with exploded views and schematics, refer to the *Z-170 Schematics* package.

Table 7-1: Z-170 Parts List

PART	REPLACEMENT PART NUMBER
Computer housing front	HE-092-0872
Computer housing rear	HE-092-0873
Computer chassis	HE-092-0874
Hinge block (left)	HE-094-0655-1
Hinge block (right)	HE-094-0656-1
Keyboard latch	HE-094-0657
Battery door	HE-094-0658-1
Disk drive control cable	HE-134-1629
LCD control cable	HE-134-1632
Main board power cable (20C)	HE-134-1635
Main board power cable (8C)	HE-134-1636
Disk drive power cable	HE-134-1637
Disk drive assembly	HE-150-0219
External AC power supply	HE-150-0220
Main logic board	HE-150-0221
Memory board	HE-150-0222
Speaker	HE-150-0227
Keyboard assembly	HE-181-5971
LCD panel	HE-181-6060
DC power board	HE-181-6128
Shoulder strap	HE-267-0027