



User's Manual

For the Z-100 family of computers.

Full IBM PC emulation
for your Z-100.



CORPORATION
948 Cherry Street, Kent, Ohio 44240
(216) 673-5155 / 800-UCI-COMPUTER

Contents Copyrighted
UCI Corporation
Kent, Ohio

January, 1985
Revision 1

Table of Contents

	Page
INTRODUCTION.....	3
CONFIGURATION.....	4
5MHz and 8MHz.....	4
16 Color Video.....	4
Single Dot and Double Dot Video Characters.....	4
48TPI and 96TPI Disk Drives.....	5
IBM Type Monitors.....	5
INSTALLATION.....	6
Disassembly of the z-100.....	7
Cabinet Removal.....	7
Low Profile Front Panel Assembly Removal.....	8
Floppy Systems.....	9
Winchester Systems.....	10
All in One Front Panel Assembly Removal.....	11
Floppy Systems.....	12
Winchester Systems.....	13
Keyboard and Video Board Removal.....	14
EasyPC Installation.....	16
System Board Installation.....	16
Video Board Installation.....	20
Speaker Installation.....	22
Floppy Controller Board Installation.....	23
OPERATION.....	25
Power Up and Booting.....	25
Power Up.....	25
Booting.....	25
z-100 Mode.....	25
PC Mode.....	26
Floppy Booting.....	26
Winchester Disk Preparation.....	26
MS-DOS 150 Set Up.....	27
Manual Booting.....	29
Auto Booting.....	30
PC-DOS Set Up.....	30
Manual Booting.....	32
Auto Booting.....	32
COM1, COM2 and Parallel Printer Ports.....	33
Add-on S-100 Board Products.....	33
EasyPC Command Summary.....	34
THEORY OF OPERATION.....	35
System Board.....	35
Floppy Controller Board.....	37
Video Master Board.....	40
Keyboard.....	44
FLOPPY DISK CONTROLLER CALIBRATION.....	46
TROUBLESHOOTING.....	49
APPENDICES.....	51
Keycode Table.....	51
Specifications.....	54
Block Diagrams.....	57
Component Layout.....	61
96TPI Disk Drive Set Up.....	64
EasyPC Address Map.....	65
IBM Type Monitor Set Up.....	67
DIP Switch 101 Pictorial.....	68
UCI EXPANDABLE RAM Memory Board Configuration.....	69
WARRANTY.....	Inside Cover

Table of Figures

Figure		Page
1	Single Dot Video ROM Jumper.....	4
2	Z-100 Cabinet Removal.....	7
3	Low Profile Front Panel Assembly Removal.....	8
4	Low Profile Cable Disconnect Floppy Systems Only.....	9
5	Low Profile Cable Disconnect Winchester Systems Only..	10
6	All-In-One Front Panel Assembly Removal.....	11
7	All-In-One Cable Disconnect Floppy Systems Only.....	12
8	All-In-One Cable Disconnect Winchester Systems Only..	13
9	Keyboard Shell Removal.....	14
10	Keyboard and Video Board Removal.....	15
11	IC Locations Z-100 Motherboard.....	17
12	IC Installation Instructions.....	18
13	EasyPC System Board IC Locations.....	19
14	System and Video Master Board Installation.....	21
15	Cable Assembly.....	21
16	Cable and Speaker Installation.....	22
17	Floppy Disk Controller Board Installation.....	24
18	Keyboard Key Changes for PC Mode.....	51
19	Floppy Disk Controller Block Diagram.....	57
20	Video Master Board Block Diagram.....	58
21	System Board Block Diagram.....	59
22	Vectored Interrupts Block Diagram.....	60
23	Video Master Board Component Layout.....	61
24	Floppy Disk Controller Board Component Layout.....	62
25	System Board Component Layout.....	63
26	96TPI Foil Cut.....	64
27	96TPI Hardware Jumper.....	64
28	IBM Monitor Foil Cut.....	67
29	IBM Monitor Hardware Jumper.....	67
30	DIP Switch 101 Settings.....	68
31	UCI EXPANDABLE RAM Memory Board Foil Cut.....	69
32	UCI EXPANDABLE RAM Memory Board Jumper.....	70

INTRODUCTION

The EasyPC gives the Z-100 user the best of two worlds: all of the capabilities and features of the Z-100 and the ability to run virtually the entire library of PC programs. Features by mode include:

Z-100 Mode

- Identical in operation to Z-100
- All Z-100 software supported
- No degradation in speed or performance
- No additional memory required

PC Mode

- Supports most PC software including copy protected software
- Supports PC color graphics, keyboard, timer, and sound generation
- Supports Winchester disk operations
- Supports COM1, COM2, and parallel printer ports through ROM BIOS
- No additional memory required

The EasyPC consists of two S-100 circuit boards and a piggyback board. Yet its design requires only one extra slot. The following parts should be included in your EasyPC package.

- 1 System Board
- 1 Video Master Board
- 1 Floppy Disk Controller Board
- 1 Cable Assembly
- 1 Speaker
- 1 Keyboard Overlay
- 1 74LS74 (integrated circuit)
- 1 74S244 (integrated circuit)
- 1 User's Manual

Note: Do not discard the packaging material: the box, foam, or black conductive bags. If there is ever any reason for you to ship the product back to UCI, repack it exactly as you received it. This will guarantee no electrical or physical damage is done in shipping.

During the installation procedure, you will be required to partially disassemble your computer before you can install the EasyPC. Please refer to the installation section of this manual.

CONFIGURATION

The EasyPC can run at 5 or 8 MHz, with single or double dot video characters, with 48 TPI or 96 TPI floppy disk drives (PC operating systems do NOT support 96TPI drives.) and with IBM type monitors. In addition, all 16 video colors are available if desired. Refer to discussion below to configure the board set to your particular system.

5 AND 8 MHz Operation

The EasyPC was designed to operate at either the 5 MHz or the 8 MHz speed. Onboard logic automatically adjusts the EasyPC to the speed of your Z-100 system. It is not necessary to set any hardware jumpers on any of the three boards. The EasyPC will function with both the 5MHz and 8MHz motherboards manufactured by Zenith as well as any of the speed kits retroactively installed such as the UCI Speed Up Module. This includes kits with frequencies under 8 MHz which are popular in the field.

16 Color Video

The EasyPC's Video Master board is capable of producing all 16 IBM color signals. With the standard Zenith Z-100 cabling, only 8 colors are possible. For users who desire the full color range, UCI offers a 16 color cable assembly that is simple to install. For more information contact UCI.

Single or Double Dot Video Characters

The Video ROM on the Video Master Board contains both the single and double dot video characters. The double dot characters are recommended for systems with low resolution composite monitors and the Zenith All-In-One models. For such systems the double dot characters provide a more legible screen. The EasyPC is shipped set for the double dot characters. No change on the Video Master board is required.

For systems with RGB color monitors, the single or double dot characters can be used. To display the single dot characters a hardware jumper must be soldered to the Video ROM. To do so, remove U7 (the only 24 pin IC on the board) from the Video Master board. Solder a small insulated wire from pin 21 to pin 12 as shown below. With a small screwdriver extend pin 21. Reinsert the ROM back into the Video Master board but do not insert pin 21. The system is now configured for single dot characters. The procedure can be reversed if you decide to display the double dot characters again.

CONFIGURATION

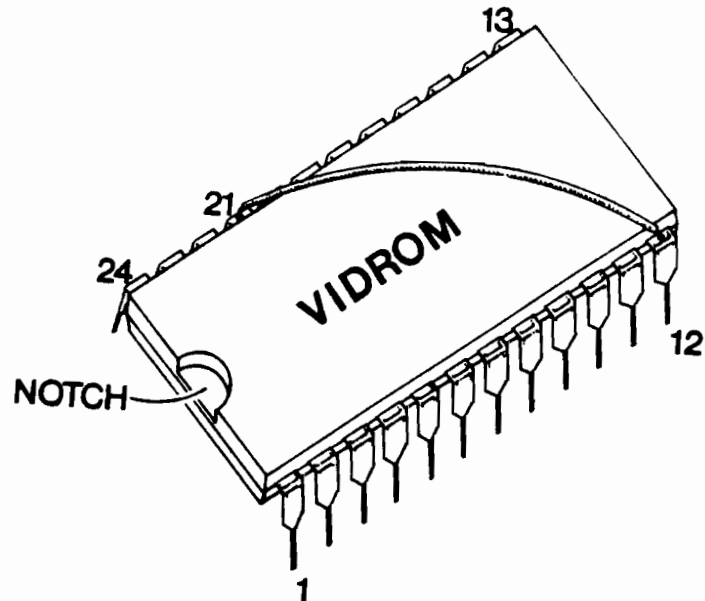


Figure 1
Single Dot Video Characters ROM Jumper

Disk Drives 48TPI or 96TPI

The EasyPC Floppy Controller board can support both 48TPI and 96TPI drives. In the PC mode however, the MS-DOS or PC-DOS operating system can NOT access 96TPI drives. If your system has 96TPI drives, when operating in the PC mode, data will be stored on half of the drive. Any disks formatted for 48TPI drives can not be read on the system.

The Floppy Disk Controller board comes from the factory set up for 48TPI drives (most disk drives are 48TPI). In order for it to function with 96TPI drives under the Z-100 mode, the board must be jumpered. Please refer to Appendix E for set up instructions.

Non-Zenith Monitors

If your system does not use one of the Zenith/Heath monitors, but an IBM or similar monitor, the horizontal and vertical sync signals on the Video Master board must be inverted before the EasyPC can function properly. If this is the case with your Z-100 system, refer to Appendix G for set up procedures.

INSTALLATION

Installation of the EasyPC requires:

1. The disassembly of your Z-100 system
2. The removal and discard of the Zenith Z207 floppy disk controller board
3. The swapping of two ICs on the motherboard.
4. The insertion of two S-100 cards (Video and Floppy Controllers) and one piggyback System board
5. The installation of speaker and cable assembly

The step by step instructions for both the Low Profile and All-In-One models are described in the following pages.

Note: Be sure your computer operates properly before you begin these instructions.

INSTALLATION

DISASSEMBLY of the Z-100

Cabinet Removal

1. Disconnect all line cords and peripherals to your computer.
2. Move the metal slides on each side of the computer toward the back 1/4 inch (see illustration). For the All-In-One model a flat headed screwdriver is needed.
3. Lift cabinet top off and set it aside.

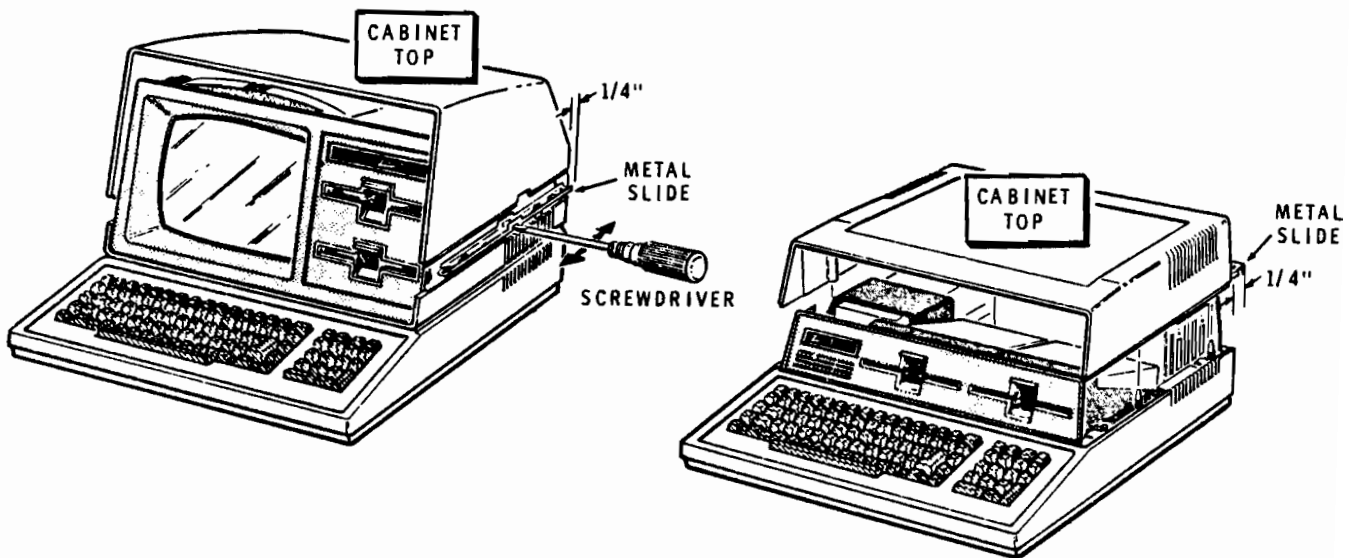


Figure 2
Z-100 Cabinet Removal

INSTALLATION

DISASSEMBLY of the Z-100

Low Profile Front Panel Assembly Removal

1. For Low Profile models remove the four screws labeled A and two locking pins labeled B.

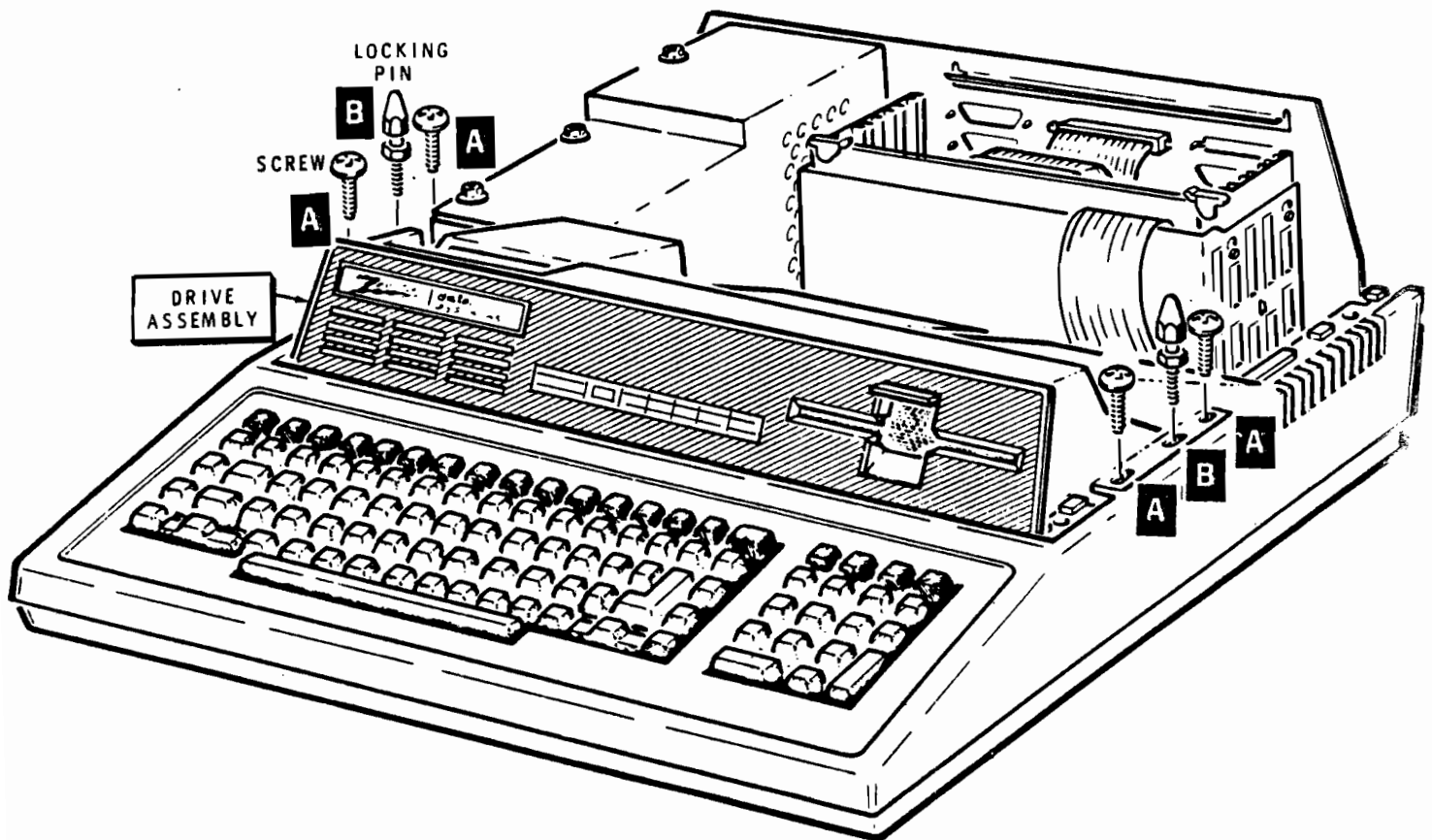


Figure 3
Low Profile Front Panel Assembly Removal

INSTALLATION

DISASSEMBLY of the Z-100

Low Profile Front Panel Assembly Removal Continued

2. Lift front panel assembly and move it forward slightly to reach the connectors.

For floppy disk systems only, remove:

- flat cable from disk drives and
- power supply cable(s) at disk drives.

Set assembly aside and proceed to Keyboard and Video board removal on page 14.

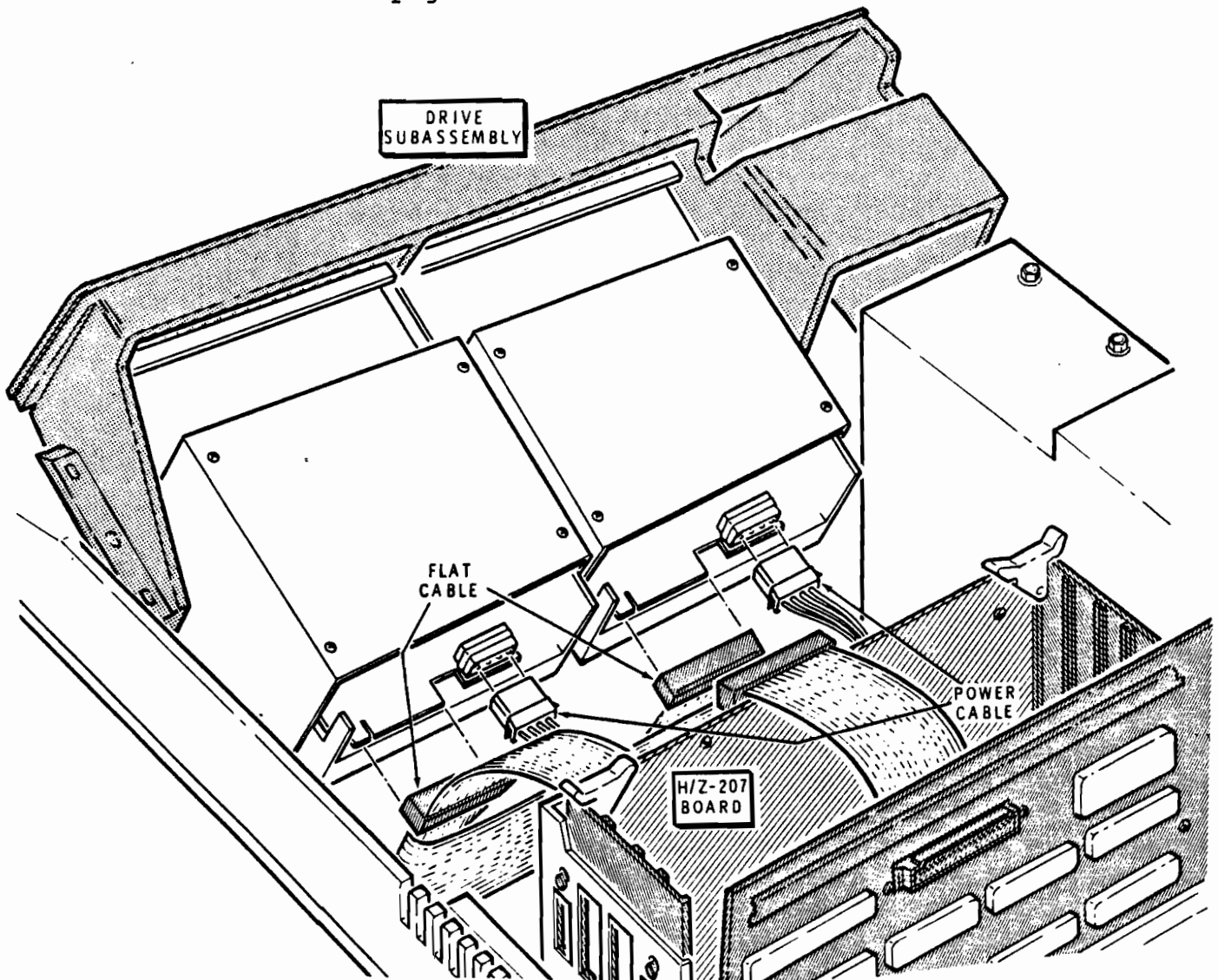


Figure 4
Low Profile Cable Disconnect
Floppy Disk Systems Only

INSTALLATION

DISASSEMBLY of the Z-100

Low Profile Front Panel Assembly Removal Continued

For Winchester disk systems only, remove:

- the two flat cables from the Winchester controller card
- the power cable from the Winchester controller card
- the flat cable from the floppy disk controller card
- the power supply cables at the drives

Set assembly aside and proceed to Keyboard and Video board removal on page 14.

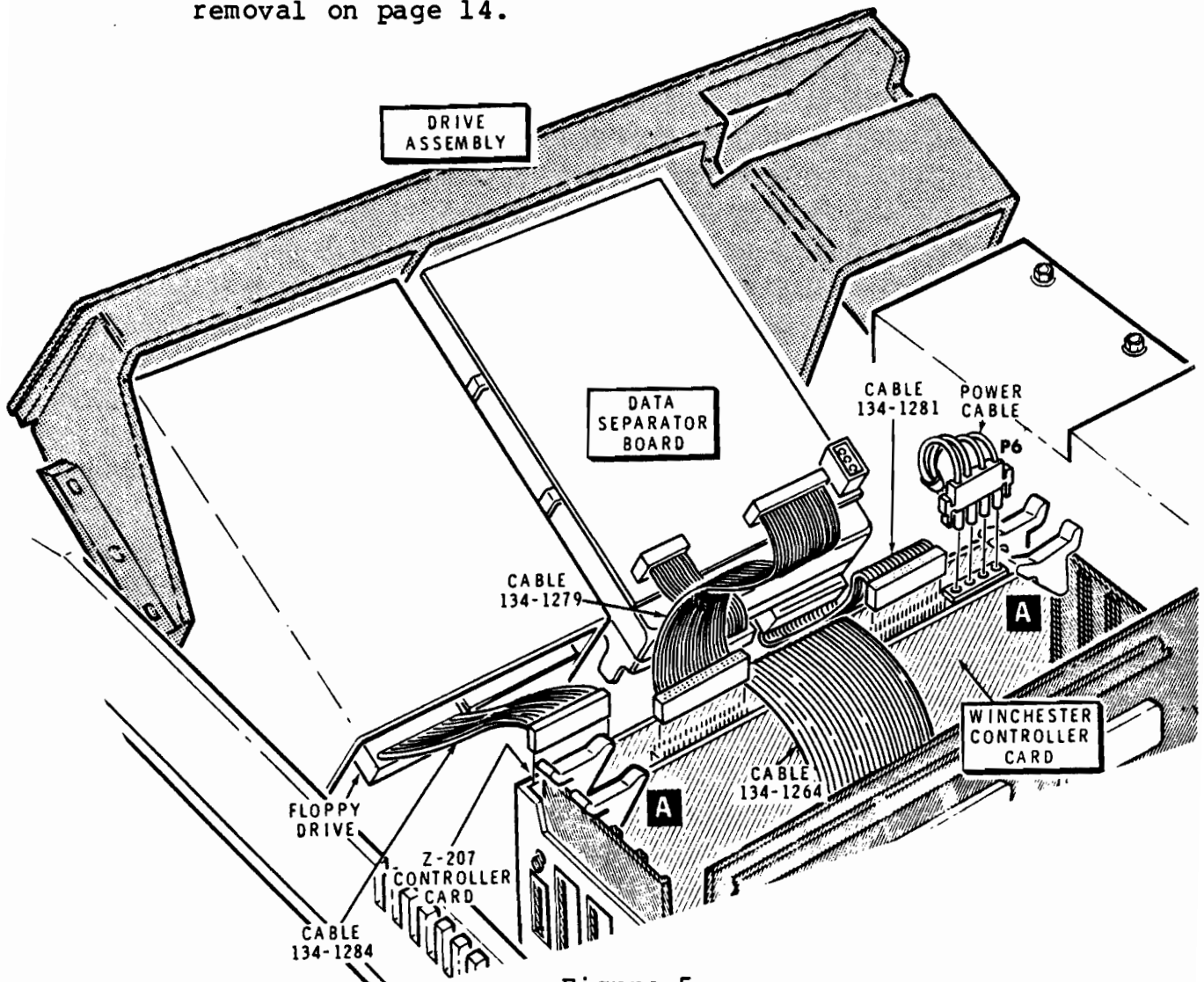


Figure 5
Low Profile Cable Disconnect
Winchester Systems Only

INSTALLATION

DISASSEMBLY of the Z-100

All-in-One Front Panel Assembly Removal

1. For the All-In-One models remove the one screw labeled A and four screws labeled B.

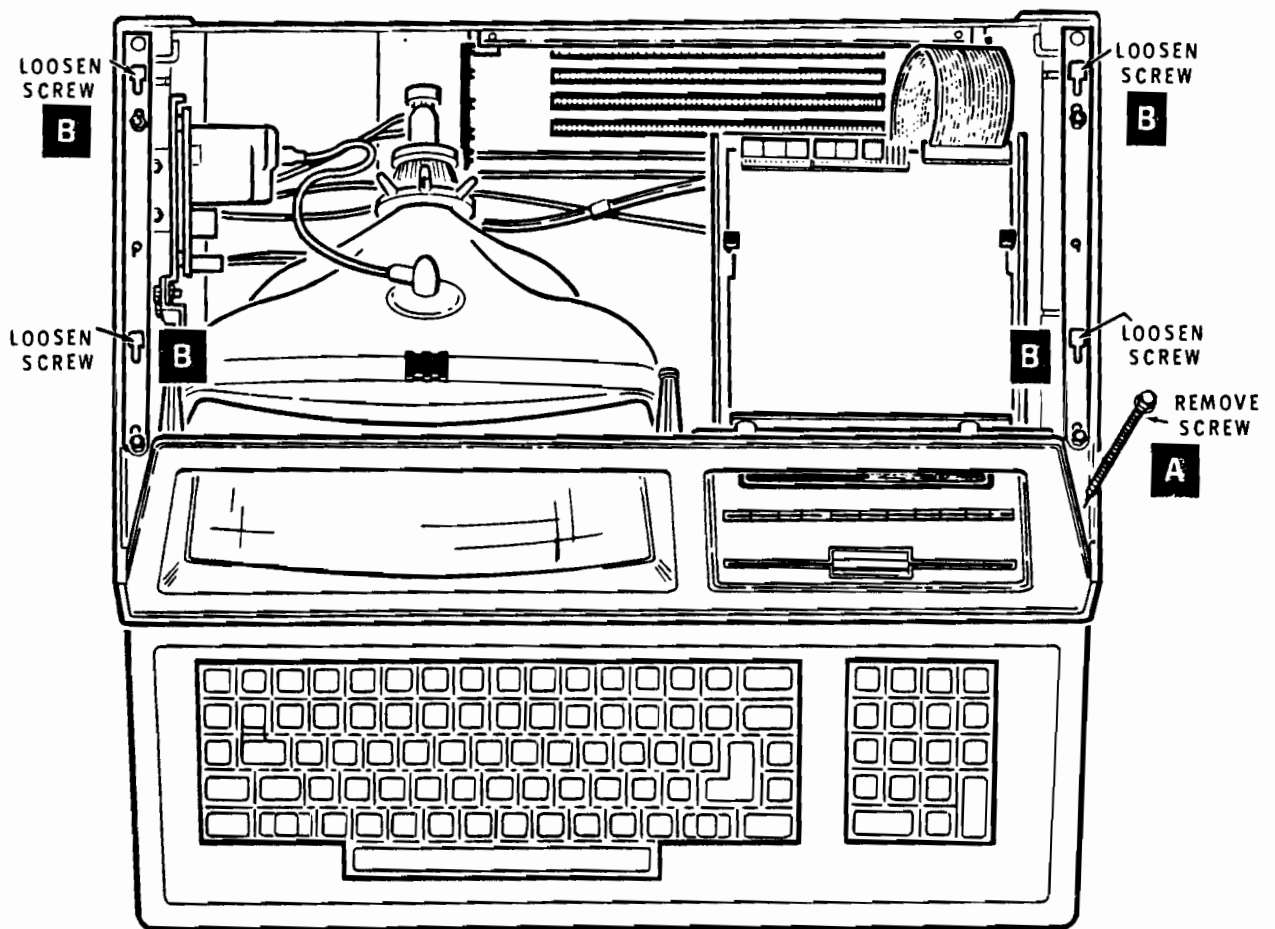


Figure 6
All-In-One Front Panel Assembly Removal

INSTALLATION

DISASSEMBLY of the Z-100

All-in-One Front Panel Assembly Removal Continued

2. Lift the display and disk drive assembly up and forward slightly to reach connectors.

For floppy disk systems only, remove:

- the flat cable from floppy disk controller card,
- the power supply cable(s) at the drive(s), and
- video signal/power cable on the video deflection board.

Set assembly aside and proceed to Keyboard and Video board removal on page 14.

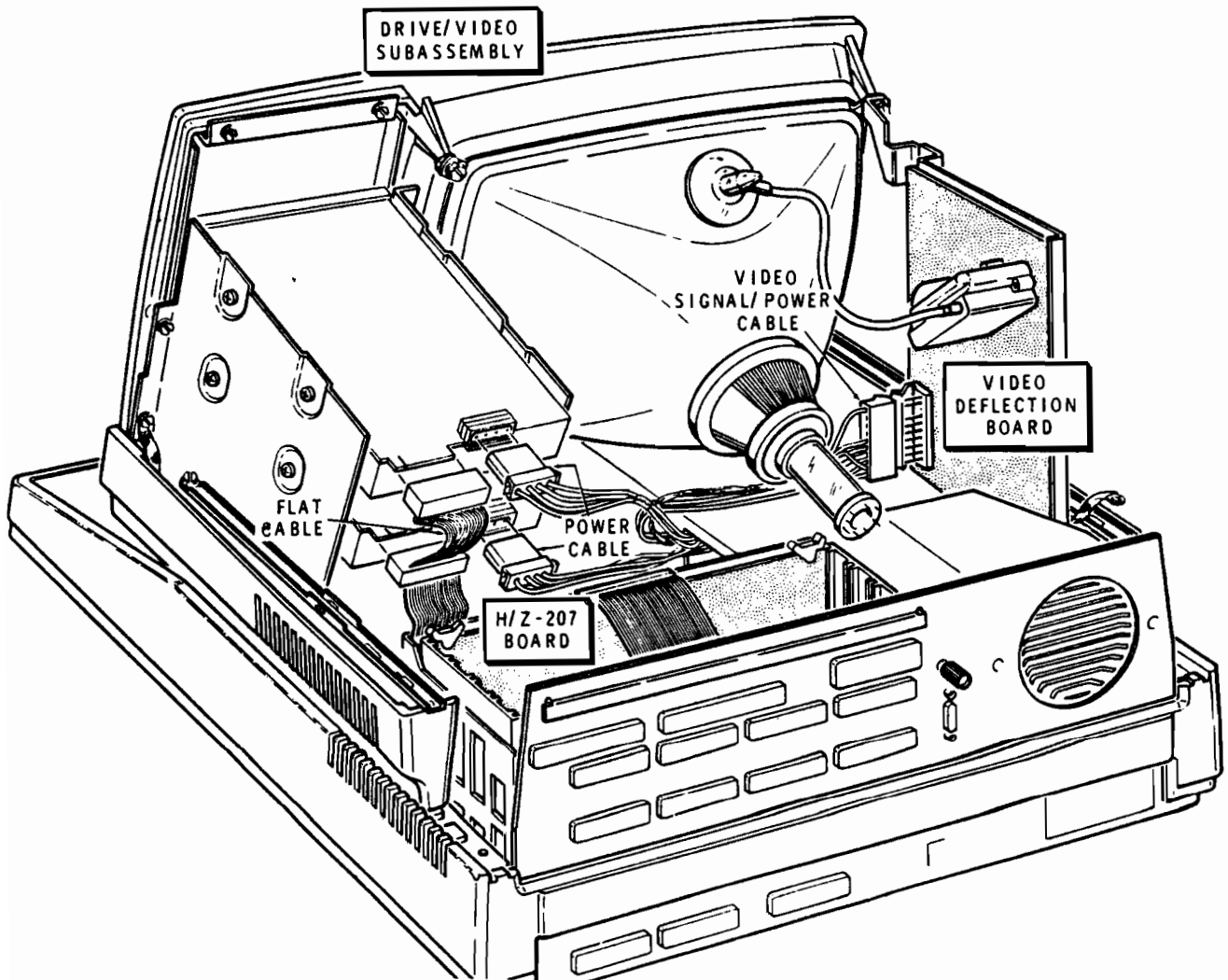


Figure 7
All-In-One Cable Disconnect
Floppy Disk Systems Only

INSTALLATION

DISASSEMBLY of the Z-100

All-in-One Front Panel Assembly Removal Continued

For Winchester disk systems only, remove:

- the two flat cables and one power cable from the Winchester controller card
- the flat cable from the floppy disk controller card
- the power cables from the drives
- the video signal/power cable on the video deflection board

Set the assembly aside

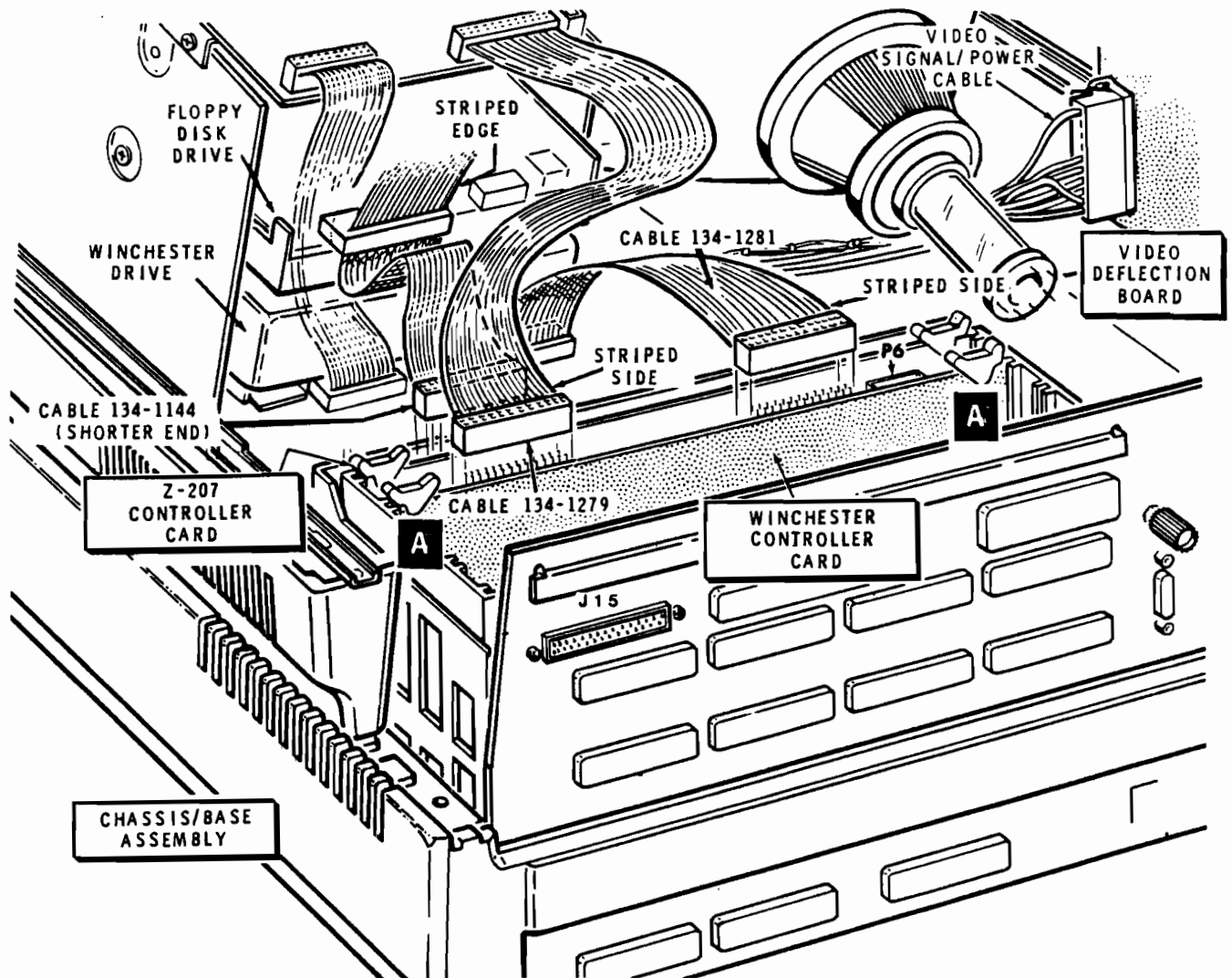


Figure 8
All-In-One Cable Disconnect
Winchester Disk Systems Only

INSTALLATION

DISASSEMBLY of the Z-100

Keyboard and Video Board Removal

1. Remove the two screws labeled A near the top of the keyboard.
- For Low Profile models only remove the two locking pins labeled B at the rear of the computer.
2. Lift off the keyboard shell and set it aside.

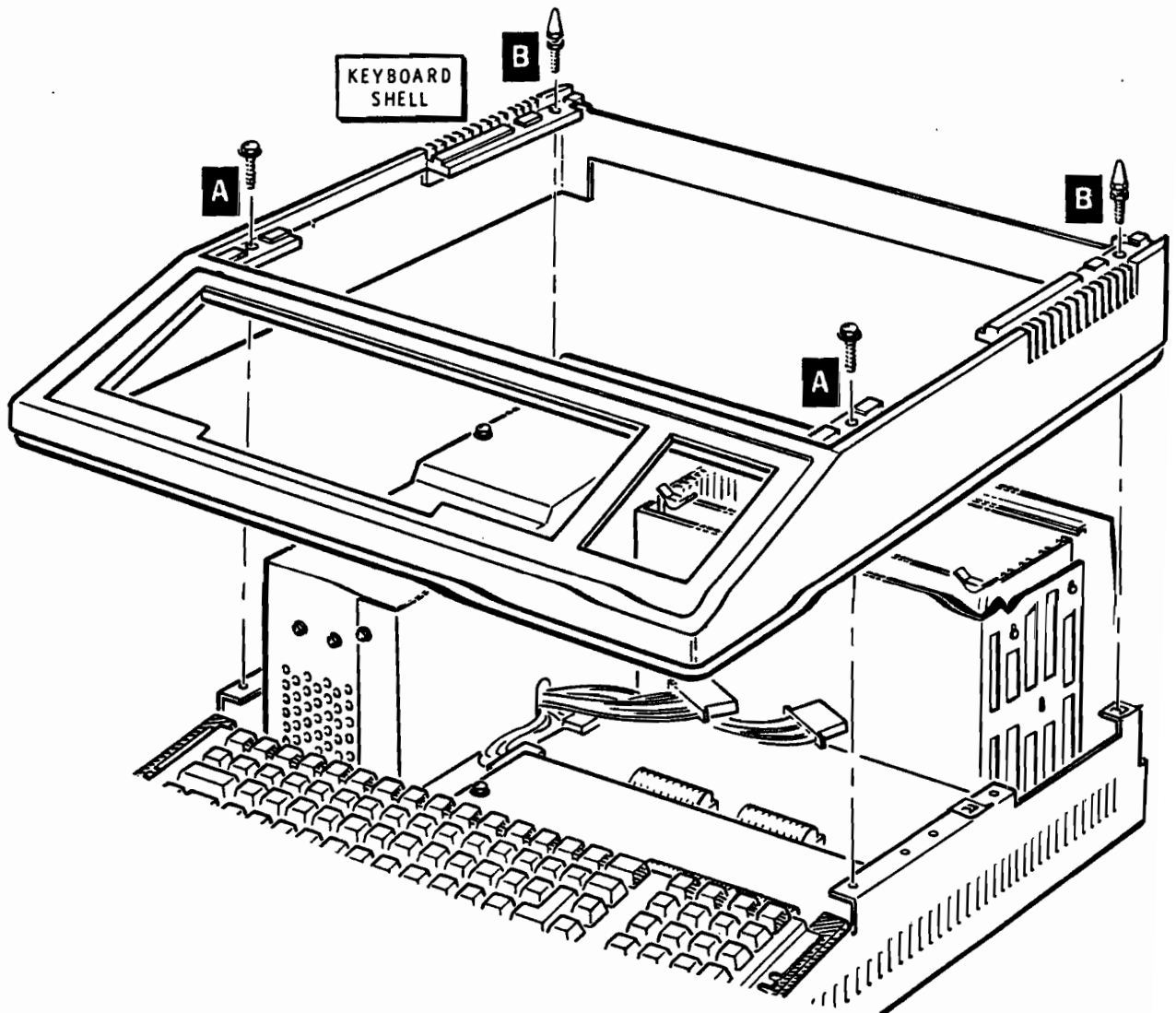


Figure 9
Keyboard Shell Removal

INSTALLATION

DISASSEMBLY of the Z-100

Keyboard and Video Board Removal Continued

3. Move the keyboard forward
4. Remove the three screws labeled A holding the video board, disconnect P301, P303 and P302 (for All-In-One models only) from the left side of the video board, unplug the two cables from the motherboard, and set the video board aside.

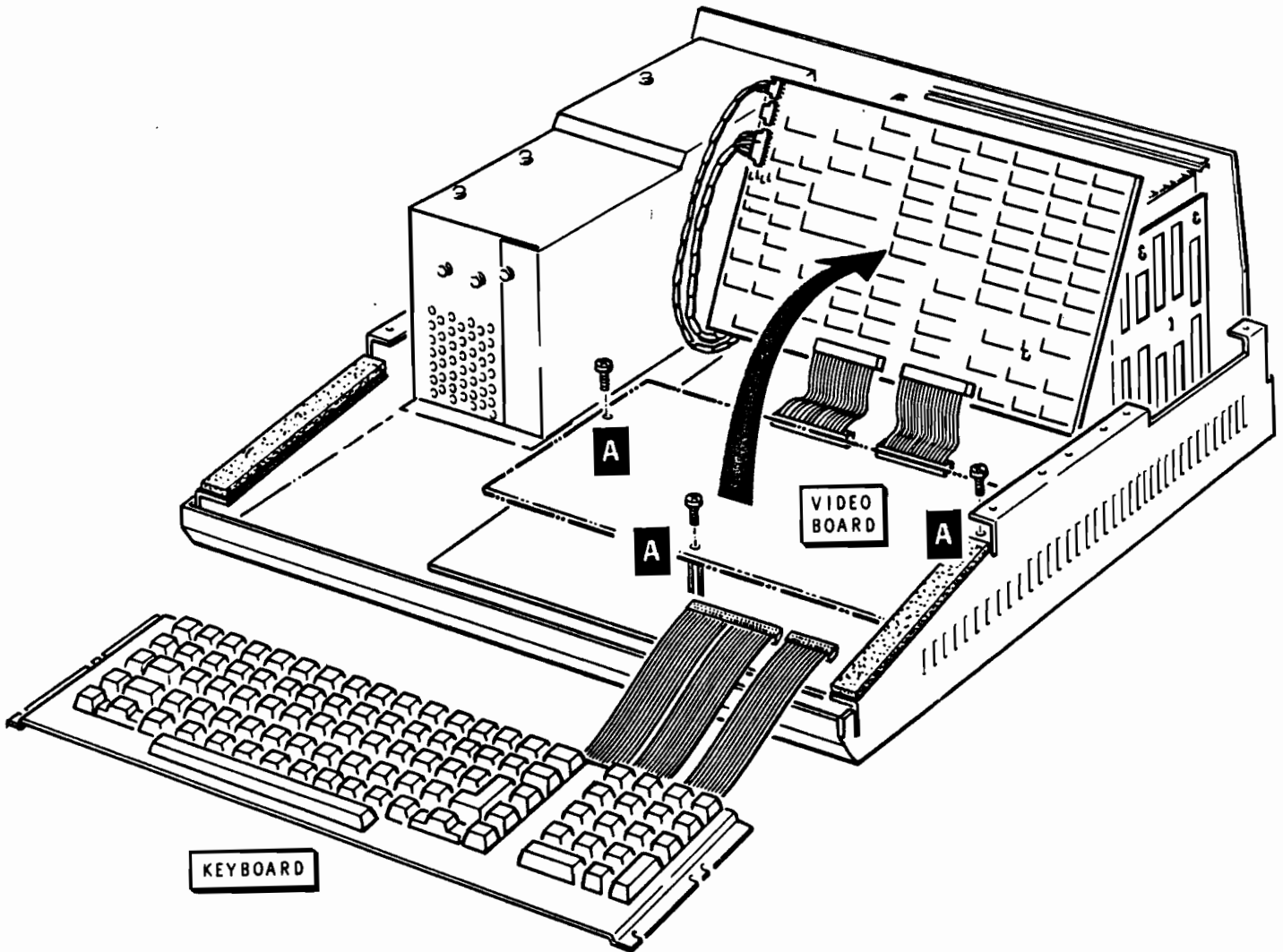


Figure 10
Keyboard and Video Board Removal

EasyPC INSTALLATION

System Board Installation

The EasyPC system board will piggyback the Z-100 motherboard.

Remove the following nine IC's from the motherboard. See figure 11 on page 17.

	<u>Notation</u>	<u>Description</u>
1.	U164	74LS240
2.	U196	74LS373 or 74ALS373
3.	U197	74LS373 or 74ALS373
4.	U208	8259A
5.	U211	8088
6.	U213	74LS373 or 74ALS373
7.	U217	74LS244 or 74ALS244
8.	U219	74S74
9.	U241	74LS244 or 74ALS244

Lay aside the ICs removed from U196, U197, U213, U217, U219, and U241. These 6 chips will not be used in the EasyPC installation. They are spares.

EasyPC INSTALLATION

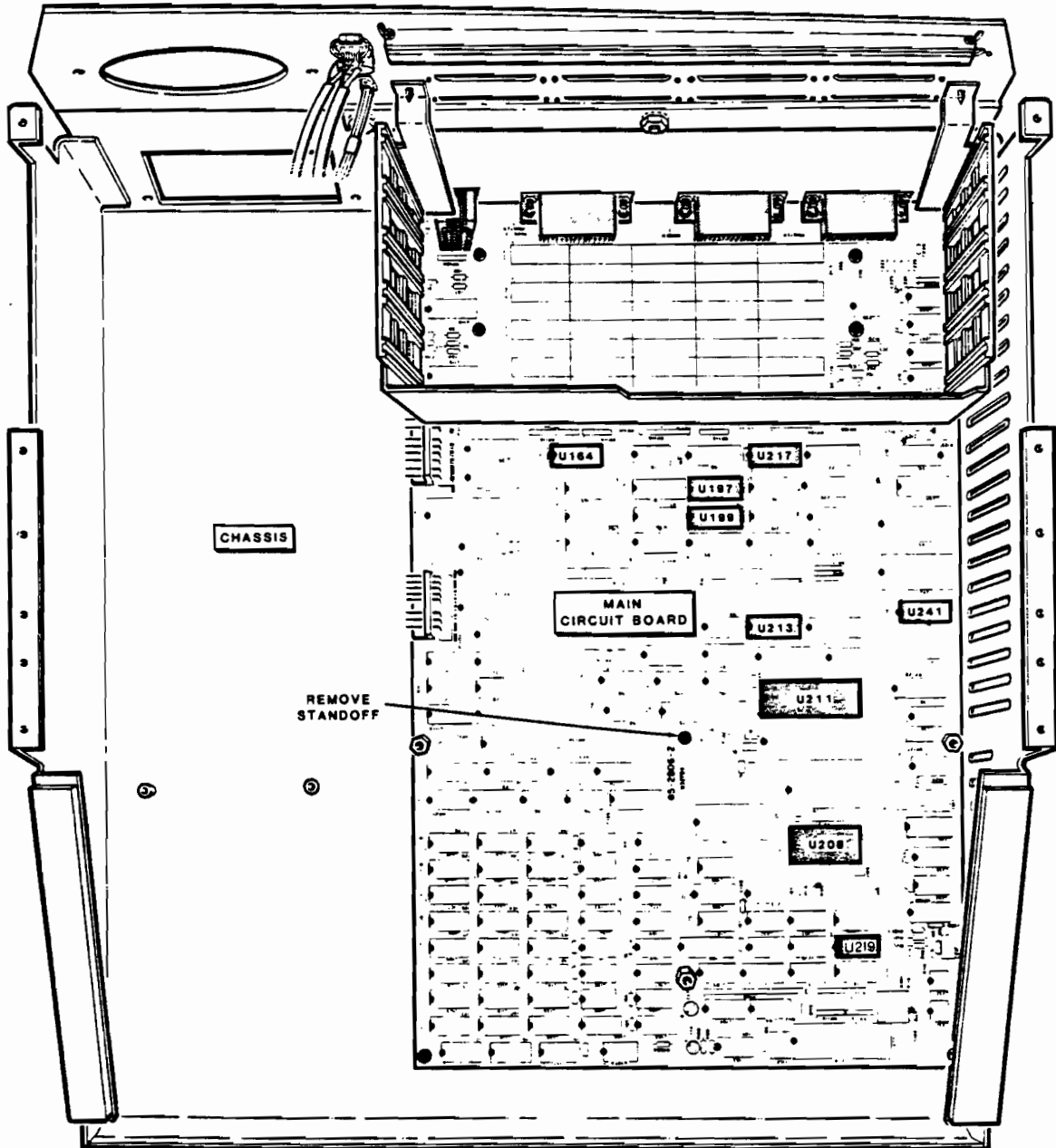


Figure 11
IC Locations Z-100 Motherboard

EasyPC INSTALLATION

System Board Installation Continued

Insert the two ICs provided with your EasyPC as follows:

74LS74 into U219

74S244 into U241

The proper orientation is critical for successful operation. The notch or dot on top of the IC must be aligned with the notch on the socket on the motherboard. Follow the IC instructions presented below.


IC INSTALLATION

CAUTION: Integrated circuits (ICs) are complex electrical devices that perform many complicated operations in a circuit. These devices can be damaged during installation. Read all of the following information before you install the ICs.


Some of the IC pins may have become bent during their removal. If this is the case, they will not line up with the holes in the IC socket. Before you install an IC, make sure all of its pins are straight.

Once you remove an IC from its socket or protective foam packing, DO NOT lay the IC down or let go of it until it is installed in its socket. When you bend the leads of an IC, hold it in one hand and place your other hand on your work surface before you touch the IC to your work surface. This will equalize the static electricity between the work surface and the IC.

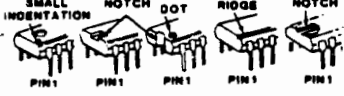
The pins on ICs that have not been installed before (U219 and U241), may be bent out at an angle, so they do not line up with the holes in the IC socket. DO NOT try to install an IC without first bending the pins as described below. To do so may damage the IC pins or the socket, causing intermittent contact.


IC LEADS

Before you install an IC for the first time, lay it down on its side as shown below and very carefully roll it toward the pins to bend the lower pins into line. Then turn the IC over and bend the pins on the other side in the same manner.



Before you install an IC, you must first identify its pin 1 end. Compare the IC to the drawing below. Then determine which end of the IC is the pin 1 end.



Position the pin 1 end of the IC over the index mark as shown below. Then start the IC pins into the socket. Make sure all of the pins are started; then push the IC firmly into the socket. NOTE: An IC pin can become bent under the IC and it appear as though it is correctly installed.

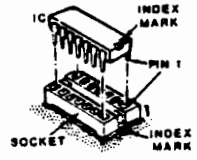


Figure 12
IC Installation Instructions

EasyPC INSTALLATION

System Board Installation Continued

Insert each of the three remaining ICs removed from the motherboard into its proper sockets on the System board. U164 from the motherboard should be inserted into U164 on the System board, U208 into U208, and U211 into U211. The notation on the System board is the same as on the motherboard.

Again proper orientation is critical for successful operation. The notch or dot on the IC should be towards the top of the board for U164, and U208. The notch or dot on the top of the IC should be on the right for U211. Refer to the diagram below for guidance.

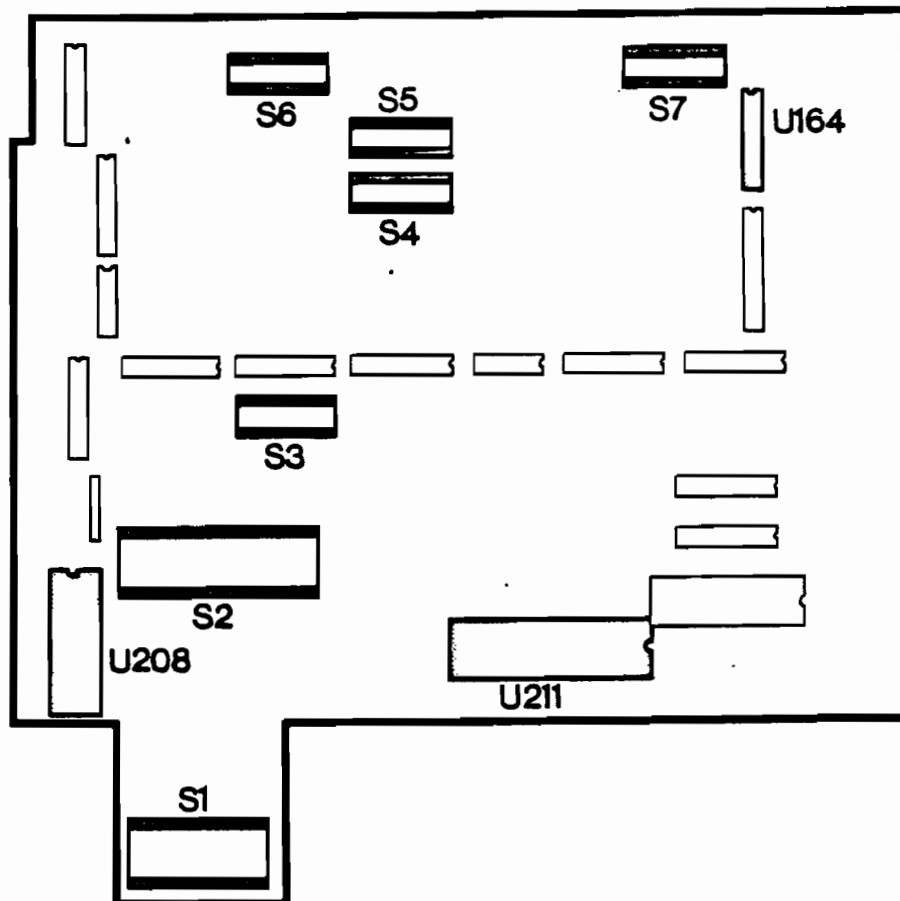


Figure 13
EasyPC System Board IC Locations

EasyPC INSTALLATION

System Board Installation Continued

After insertion of the ICs, check the interconnect strip pins to make sure none are bent. (Bent pins will cause insertion and operation problems. If pins are bent carefully straighten them with a pair of pliers.) Flip the system board over and insert interconnect strips S1 through S7 into the matching empty sockets on the motherboard. The system board was designed to align exactly with the motherboard. Extra care should be exercised to insure proper alignment. This is the most difficult step in the EasyPC installation. Begin by tilting the system board 45 degrees and aligning S6 and S7 towards the rear of the Z-100 chassis. Move forward to S5, S4, S3, S2 and finally S1. After you are sure the alignment is correct, firmly push each of the seven interconnects into the socket below it on the motherboard. See figure 14 on below for details. The system board is now completely installed.

Video Master Board

Video Master Board (Refer to figure 14)

1. Insert the EasyPC Video Master board into a free S-100 slot.
2. Connect the 7-conductor video RGB cable from J9 on the rear panel to P4 connector on the Video Master board.
3. Connect the shielded composite video cable from J14 on the rear panel to P3 connector on the Video Master board.
4. Locate the PC end (see figure 15) of the cable assembly provided.
5. Connect the 10 position female plug S2 on the PC end of the cable assembly to P2 on the Video Master board. Likewise connect the 4 position female plug S1 to P1 on the Video Master board.
6. For All-In-One models only, connect the 5 position female plug from P101 on the video deflection board to P5 on the Video Master board. (Note: This plug was previously connected to P302 on the Zenith video logic board.)
7. Connect the 10 position female plug S303 and the 4 position plug S301 on the Z-100 end of the cable assembly to P303 and P301 on the Zenith video logic board. See figure 16 on page 22.
8. Reassemble the Zenith video logic board into the system.

EasyPC INSTALLATION

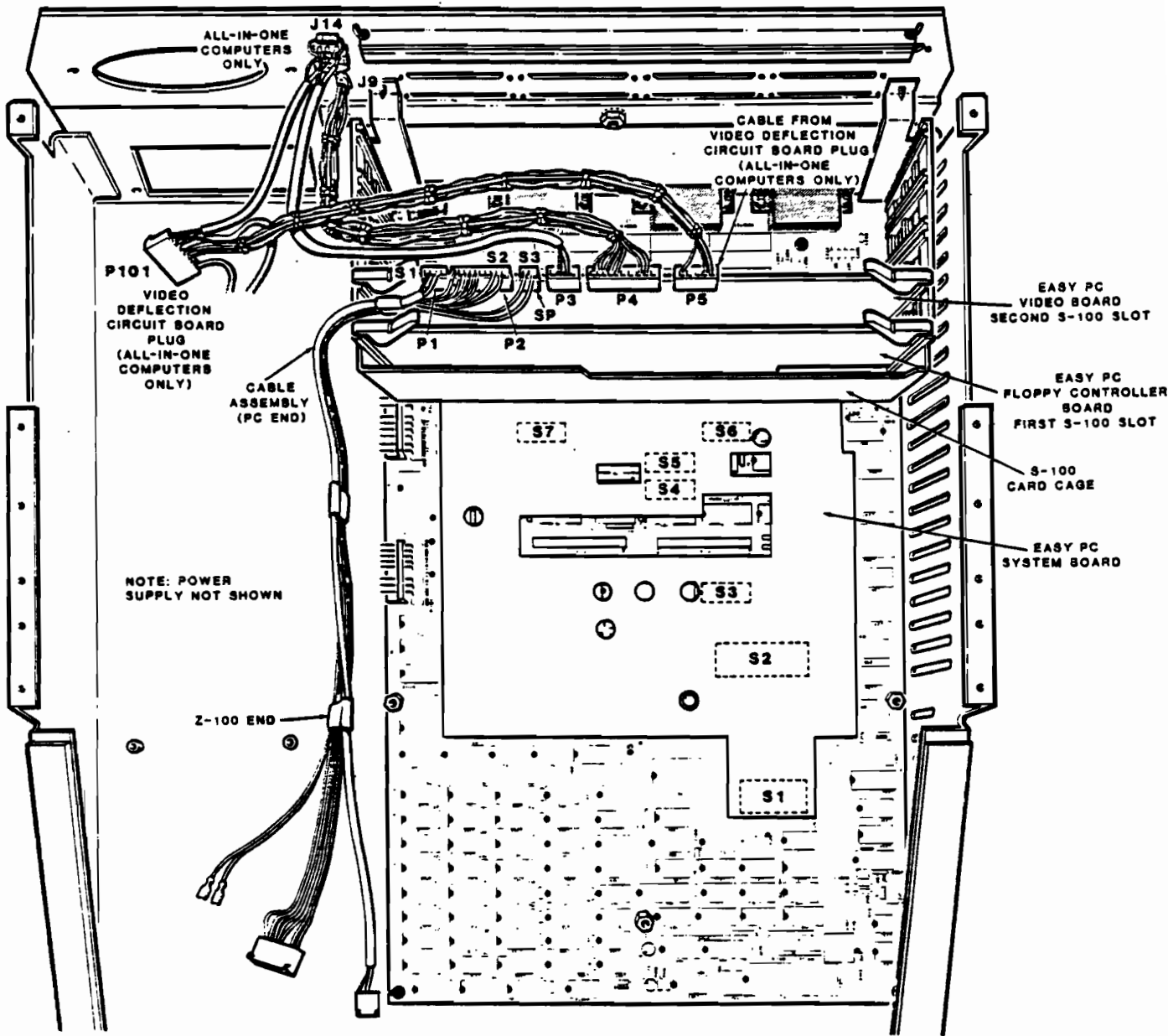


Figure 14
System and Video Master Board Installation

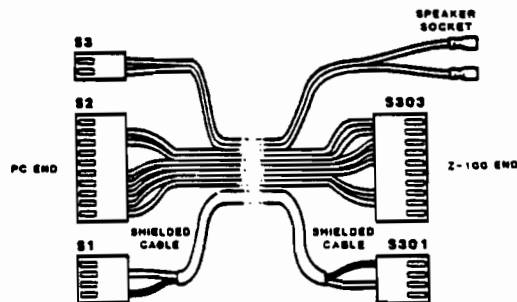


Figure 15
Cable Assembly

EasyPC INSTALLATION

----- Video Master Board Installation Continued

Reconnect the 40-conductor flat cables from P304 and P305 on the video logic board through the opening on the installed System board to P104 and P106 on the motherboard. Place video logic board on its stand offs and replace the three screws removed during disassembly.

Speaker Installation

1. Push the quick disconnect terminals of the cable assembly onto the lugs of the speaker.
2. Peel off the protective paper covering the adhesive foam on the back of the speaker.
3. Locate the speaker in the open space in front of the power supply on the chassis floor.
4. Press the speaker, face up, firmly down on the chassis floor. Take care not to damage the speaker cone.
5. Insert the 2 position female plug on the opposite end of the cable assembly onto SP (speaker out) on the EasyPC Video Master board. This completes the installation of the speaker.

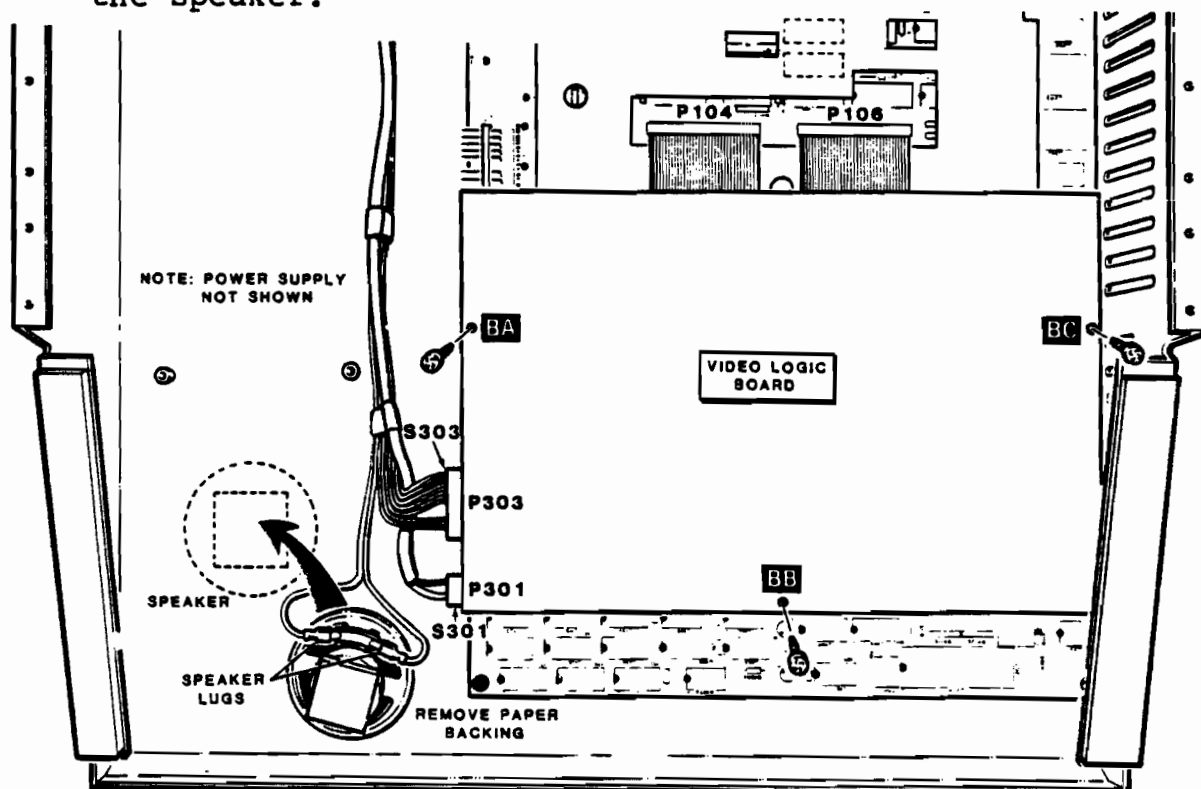


Figure 16
Cable and Speaker Installation

EasyPC INSTALLATION

Floppy Controller Board Installation

The controller board supports up to four 5 1/4" drives and four 8" drives (Z-100 mode). Caution must be exercised when installing disk drives. Be sure that the entire system has only one resistive terminator for the 5 1/4" drives and only one resistive terminator for the 8" drives. More than one terminator can cause overloading of the buffer which drives the step, direction, head select, and write data lines. Remove any extra terminator packs from drives before using the system.

Consult the Z207 manual for further detail of operation.

1. Insert the EasyPC Floppy Disk Controller board into the first S-100 slot on the motherboard (See figure 17 on page 24).
2. Reassemble the Z-100 keyboard, the keyboard shell and the front panel assembly (see disassembly section for details).
3. Connect the floppy drive cable to P2 on the EasyPC Floppy Controller Board.
4. If your system has an 8" drive, connect the 50-conductor cable from J16 on the rear panel to P1 on the Floppy Controller board.

This completes the installation of the EasyPC Floppy Controller board. Reassemble the cabinet top and place the keyboard overlay provided with the product on the keyboard chassis above the top row of keys. Your EasyPC is now ready for operation.

EasyPC INSTALLATION

Floppy Controller Board Installation Continued

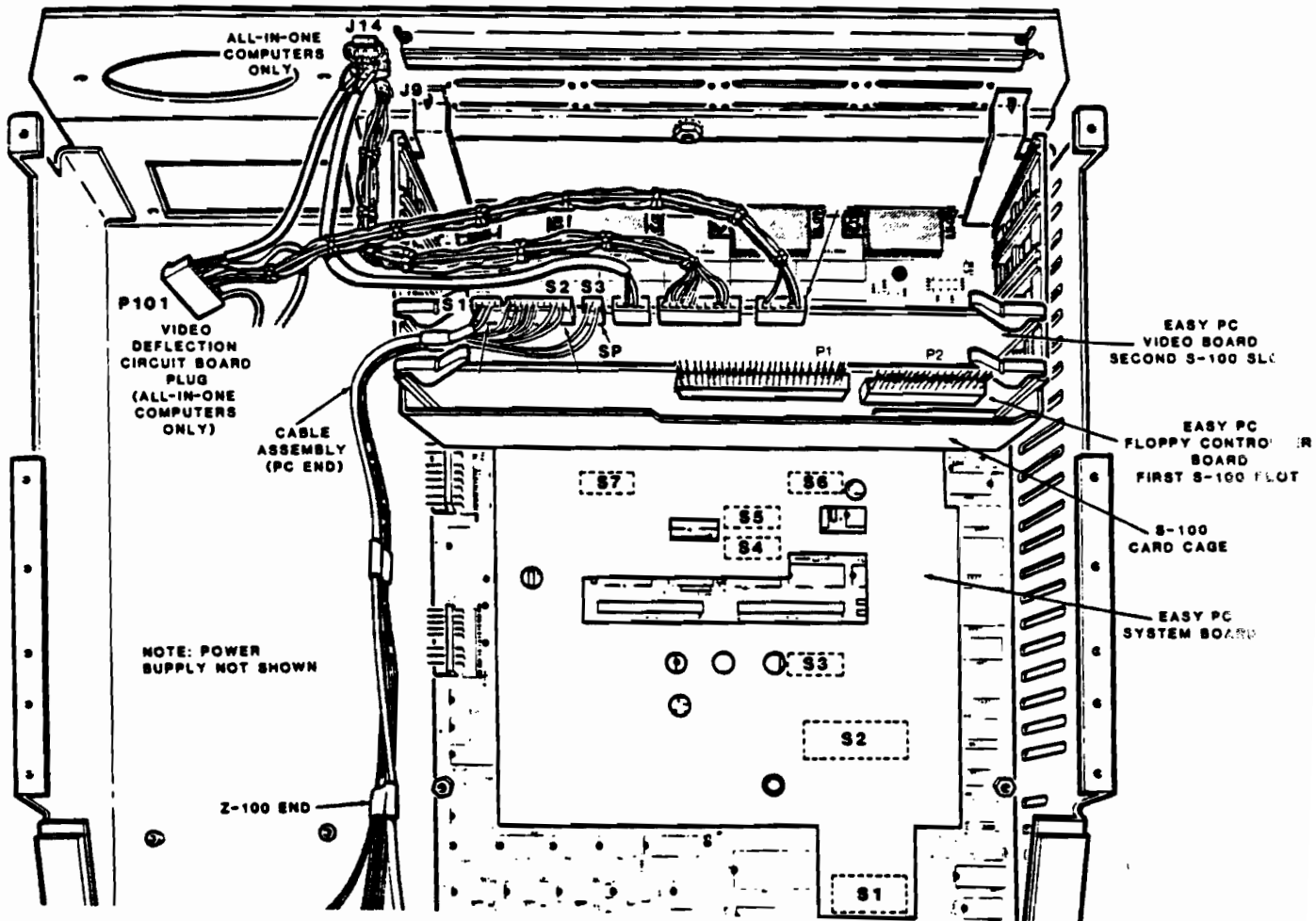


Figure 17
Floppy Disk Controller Board Installation

OPERATION

Operation of the EasyPC is quite simple. Follow the steps below.

Power Up and Booting

1. Turn system power on.

The system will sound a short beep on the Z-100 buzzer and a long beep on the EasyPC speaker while displaying the EasyPC screen.

EasyPC

BY UCI CORP

SELECT MODE

(Z100 = Z, PC = I)

If the tones are not heard or the screen is not displayed, refer to the troubleshooting section of this manual.

2. Select the mode you wish to operate, the Z-100 or PC.

If your Z-100 is set up for auto boot (section 3 of switch 101 is off), the sign-on screen will be displayed only for 15 seconds, then if no mode is selected the system will automatically switch to the mode determined by section 6 of switch 101 on the motherboard. If your system is set up for manual boot (section 3 of switch 101 is on), the sign-on screen will be displayed until a mode is selected.

To select the Zenith Z-100 mode just press the "z" key during the time the sign-on screen is displayed. The system will switch into the Z-100 monitor and the familiar hand prompt will appear in the upper left hand corner of the screen. If autobooting, the system will automatically boot from the floppy disk or the Winchester drive as before the EasyPC was installed.

If any other key is pressed the system will switch into the PC mode.

3. Booting in the Z-100 mode.

In the Z-100 mode, your computer's operation is identical to its operation prior to installation of the EasyPC. You may boot manually or automatically depending on how your system is configured. Refer to the Z-100 user's manual if further operating instructions are needed.

OPERATION

Booting in the PC Mode Continued

4. Booting in the PC mode.

In the PC mode, your system can boot PC-DOS or MS-DOS (not included with the EasyPC) from either a floppy disk or a Winchester disk.

For floppy disk systems:

After selecting the PC mode, the system will display a prompt:

```
UCI>B
```

Insert the diskette with the operating system into the disk drive and enter an "F" for floppy boot.

```
UCI>BF
```

The EasyPC will read the diskette and provide the system prompt. If you fail to insert the proper diskette or any diskette at all, the system will wait 2 to 3 minutes for you to do so. After this period of time, if no disk or a non-bootable disk, is inserted into the disk drive, an IPL device error will appear on your monitor. Should this happen, simply reset the system and reboot in the PC mode with the proper diskette. Once the system is booted, your Z-100 will react to normal PC operating commands. Please note that some of the keys on the keyboard have been "remapped". Refer to the keyboard overlay to determine their new operation.

For Winchester disk systems:

For systems with Winchester disk drives, a number of features are available that make booting and disk access quite versatile. These include:

- The ability to create a partition on the disk drive for PC software while maintaining data, files and programs used by other operating systems on the remaining partitions
- Flexibility in assigning the size of storage on the disk drive for PC software
- The ability to assign up to 4 separate drives for PC programs (MS-DOS for the 150)
- The ability to auto boot from a designated drive.

OPERATION

Winchester Booting in the PC Mode Continued

Before the Winchester drive can be used with the EasyPC system, it first must be prepared, partitioned and formatted. Three steps are involved:

- Assigning a partition on the drive for PC software using MS-DOS or Z-DOS for the Z-100
- Subpartitioning the partition assigned for PC software using MS-DOS for the 150 or PC-DOS utilities
- Formatting the PC portion of the Winchester drive for storage of PC software

There are two PC operating systems available for Winchester support, MS-DOS for the 150 and PC-DOS. MS-DOS for the 150 has the utilities that permit the subpartitioning of the Winchester into as many as 4 drives. PC-DOS utilities permit only one drive. Installation procedures for Winchester support on the EasyPC for both the MS-DOS for the 150 and the PC-DOS operating system are presented below. Please refer to the appropriate section for your particular system.

MS-DOS for the 150

1. Turn off the computer, remove cabinet top and locate DIP switch S101 on motherboard (Switch is on the right side in front of the S-100 card guide chassis.) Set positions 0, 1, 2, 3 and 6 to the on position (see Appendix H).
2. Turn your system on, and after the display of the sign on screen, select the Z-100 mode by pressing the "z" key.
3. Insert a Z-DOS or MS-DOS for Z-100 operating system diskette and boot the computer system.
4. If your Winchester drive has not yet been installed and prepared for the Z-100 mode, you must first do so. Follow the Z-100 Winchester installation procedure found in the Z-217 Winchester controller manual. If your Winchester has already been installed proceed to the next step.
5. Using the PART utility create a partition on your drive for PC-DOS. Assign the partition name UCI and the operating system name UCI. The ROM BIOS only recognizes the UCI;UCI name. Refer to the PART command

OPERATION

MS-DOS Winchester Booting in the PC Mode Continued

in the Z-DOS or MS-DOS users manual if more guidance is needed.

Note: Before you repartition your Winchester drive, you may want to run the Z-100 BACKUP utility.

6. Reset the system by pressing CTRL and Reset. After display of the sign-on screen select the PC mode. Your system will respond with:

```
UCI>B
```

Insert an MS-DOS for the 150 system diskette into the floppy drive. Type an "F" for floppy and return to boot the system.

```
UCI>BF (Return)
```

The light on your Winchester drive will come on briefly before the floppy boots the system. The drive is assigning UCI;UCI to be the drive for PC-DOS.

7. After the MS-DOS sign-on and the system prompt appears, change the floppy diskette to the diskette containing the Winchester utilities.

Run the PREP command in order to initialize the partition of the hard disk set aside for PC software. Data and files on other partitions will not be affected. Type PREP and return. For the operational details of this command see the DOS user's manual.

8. After PREP, reset and reboot the system using the system floppy disk.

Again insert the floppy diskette containing the Winchester utilities. The PART command allows you to partition up to 4 drives on the PC segment of the hard disk previously set aside for PC software. The size of the segment is exactly as what was specified above using Z-DOS or MS-DOS for the Z-100. If you desire to allocate more memory than the amount designated, you must return to step 5 and proceed from there.

The PREP command also permits the selection of a default boot partition.

Again see the DOS user's manual for the details of executing this command.

OPERATION

MS-DOS Winchester Booting in the PC Mode Continued

9. Each of the drives created in step 8 must have its working surface prepared through the FORMAT command before it can be used.

Reset the system and select the PC mode. Insert the system floppy and boot the system.

For the first partition drive run the FORMAT command.

```
A>FORMAT X: or
A>FORMAT X:/s
```

X is the name of the Winchester drive
/s is an option for copying the system files
from the floppy disk onto the newly
formatted disk

For variations in the FORMAT commands see the DOS user's manual

For the remaining drives, run the ASGNPART command before formatting. ASGNPART is similar to the activity of inserting a floppy diskette into a drive.

10. Turn off computer and set DIP switch S101 for either auto or manual booting and default boot device (See Zenith hardware documentation manual). If auto booting from Winchester, you can choose to boot in either the Z-100 or PC mode by setting position 6 on DIP switch S101.

Position 6 On	Z-100 mode
Off	PC mode

Manual Booting

If your system is set for manual booting, after selecting the PC mode, the system will provide the following prompt:

```
UCI>B
```

Type "F" for floppy booting

```
UCI>BF (Return)
```

Type "W" for Winchester booting. If the Winchester has been partitioned into more than one PC drive, specify the partition number also separated by a colon.

OPERATION

MS-DOS Winchester Booting in the PC Mode Continued

UCI>BW:l (Return)

If there is more than one physical Winchester drive on the system, specify the drive number also. (The system supports up to 2 drives per controller and up to 2 controllers)

UCI>BW0:l (Return)

In the PC mode, the manual boot screen can be displayed at any time by pressing the CTRL, ALT and INSERT keys simultaneously. The system retains and displays the last booting command. You can change or edit the command by typing over it.

Auto Booting

If your system is configured for auto booting, 6 seconds after the appearance of the EasyPC sign-on screen, the system will boot from the default drive in the default mode. If you desire to switch to the other mode, press the key that selects the mode before the 6 second sign-on has elapsed. This interrupts the auto boot sequence and switches the system into the desired mode.

In the PC mode, the auto boot sequence can be started at any time by pressing the CTRL, ALT, and DEL keys simultaneously.

PC-DOS Winchester Booting

PC-DOS

- 1-5. Follow steps 1-5 listed in MS-DOS above.
6. Reset the system by pressing CTRL and Reset. After display of the sign-on screen select the PC mode. Your system will respond with:

UCI>B

Insert a PC-DOS system diskette into the floppy drive. Type a "F" for floppy and return to boot the system.

UCI>BF (Return)

OPERATION

PC-DOS Winchester Booting in the PC Mode Continued

The light on your Winchester drive will come on briefly before the floppy boots the system. The drive is assigning UCI;UCI to be the drive for PC-DOS.

7. After the PC-DOS sign-on and the system prompt appears, change the floppy diskette to the diskette containing the Winchester utilities.

The FDISK (Fix Disk) command allows you to prepare a single drive on the PC segment of the hard disk previously set aside for PC software. The size of the drive is exactly as what was specified above using Z-DOS or MS-DOS for the Z-100. If you desire to allocate more memory than the amount designated, you must return to step 5 and proceed from there.

See the DOS user's manual for the details of executing this command.

8. The drive created in step 7 must have its working surface prepared through the FORMAT command before it can be used.

Reset the system and select the PC mode. Insert the system floppy and boot the system.

Run the FORMAT command.

```
A>FORMAT X: or
A>FORMAT X:/s
```

X is the name of the Winchester drive
/s is an option for copying the system files
from the floppy disk onto the newly
formatted disk

For variations in the FORMAT commands see the DOS user's manual

9. Turn off computer and set DIP switch S101 for either auto or manual booting and default boot device (See Zenith hardware documentation manual). If auto booting from Winchester, you can choose to boot in either the Z-100 or PC mode by setting position 6 on DIP switch S101.

Position 6 On	Z-100 mode
Off	PC mode

OPERATION

PC-DOS Winchester Booting in the PC Mode Continued

Manual Booting

If your system is set for manual booting, after selecting the PC mode, the system will provide the following prompt:

```
UCI>B
```

Type "F" for floppy booting

```
UCI>BF (Return)
```

Type "W" for Winchester booting.

```
UCI>BW (Return)
```

In the PC mode, the manual boot screen can be displayed at any time by pressing the CTRL, ALT and INSERT keys simultaneously. The system retains and displays the last booting command. You can change or edit the command by typing over it.

Auto Booting

If your system is configured for auto booting, 6 seconds after the appearance of the EasyPC sign-on screen, the system will boot from the default drive in the default mode. If you desire to switch to the other mode, press the key that selects the mode before the 6 second sign-on has elapsed. This interrupts the auto boot sequence and switches the system into the desired mode.

In the PC mode, the auto boot sequence can be started at any time by pressing the CTRL, ALT, and DEL keys simultaneously.

OPERATION

Ports, Key Changes and Add-On S-100 Products

COM 1, COM 2, and Parallel Printer Ports

The EasyPC, in the PC mode via the ROM BIOS, can utilize the COM1, COM2, and parallel ports in the PC-DOS or MS-DOS for the 150 operating system. Refer to the user's manual of your particular operating system for details.

Key Changes

When your Z-100 operates in the PC mode, some of the keyboard keys are "remapped" to emulate a PC keyboard. In the PC mode refer to the keyboard overlay to determine the keys new function. Appendix A lists all keyboard codes.

Add-On S-100 Board Products

The EasyPC will function with any of the add-on S-100 board products available for the Z-100 provided their I/O port address does not conflict with the port address used by the EasyPC. The UCI EXPANDABLE RAM memory board, if jumpered, will operate at 5 MHz with the EasyPC. Refer to Appendix I for details.

Boards that are not S-100, but plug into one or more of the sockets on the Zenith motherboard may be in conflict with the EasyPC System board. If this is the case, the add-on board can not be installed on the same system as the EasyPC.

OPERATION

EasyPC Command Summary

EasyPC Command Summary

Description -----	Command -----
Select Mode:	
Z-100 Mode	Z
PC Mode	I or any key but Z
Booting:	
Z-100 Mode	
Floppy	B (Return)
Winchester (Manual)	W (Return)
PC Mode	
Floppy Drives Only	UCI>BF (Drive A) UCI>BF1 (Drive B)
Winchester (Manual)	UCI>BF (Floppy Drive A) UCI>BF1 (Drive B) UCI>BW (Winchester) UCI>BW:l (Winchester, Partition 1) UCI>BW0:l (Winchester, Drive 0, Partition 1)
Manual Boot Screen	CTRL, ALT, INSERT
Auto Boot Sequence	CTRL, ALT, DEL

THEORY OF OPERATION

The EasyPC system consists of the System board, the Floppy Disk Controller board, and the Video Master board.

The System Board

The System board contains all the logic to switch the Z-100 between its virgin mode and the PC mode. It also contains an address mapping ROM, a BIOS ROM, a keyboard mapping circuit, and an interrupt controller steering circuit.

Z-100 Virgin Mode

In the Z-100 virgin mode, all signals merely pass through the System board back to the motherboard. The 24 address bits enter the system board from the input side of headers S3, S4 and S5. They go through latches U213, U196, U197 and address ROM U9 (bits A1-A7) back to the output side of S3, S4, and S5 into the motherboard. Address ROM, U9, provides mapping only in the PC mode.

The 8 DI bits enter the system board from the input side of header S6, are buffered by U217 and leave the board from the output side of S6.

The primary interrupts enter the System board from header S1 and are applied to two buffer chips, U4 and U10. U10 is used in the PC mode only and is turned off in the virgin mode. The primary interrupts are buffered by U4 and are applied to the interrupt inputs of U208. All the rest of the pins of U208 are directly connected to S1 so that there is no change in the configuration of the primary interrupt controller chip in the virgin mode.

The S-100 bus interrupts also enter the system board via header S7, are buffered by U164 and leave the board via header S7 back to the motherboard.

PC Mode

In the PC mode the low order address bits (A1-A7) during I/O operations are mapped by the address ROM U9 into PC compatible addresses. A PAL, U6, detects the I/O instructions and enables U9 to do the address mapping. The upper 16 address bits (A8-A24) are not touched in either the PC mode or the virgin mode.

The DI bits are routed by U217. During any keyboard or BIOS ROM access operations, U217 is turned off so that external data entering into the System board is stopped at U217. If the operation is a BIOS ROM access, U6

THEORY OF OPERATION

----- System Board Continued

(ZPAL) will turn on the BIOS ROM which then will put its data on the data bus. If the operation is a keyboard access (IN 60H), U3 (KBDROM), the keyboard ROM will be turned on. This ROM maps the keyboard codes into PC compatible keyboard codes. Note that the keyboard ROM is activated during inputs only. All output to the keyboard ports 60H-63H as well as all inputs to ports 61H-63H are redirected to the S-100 bus. Thus, during power up, reset or in the PC mode, the Z-100 will execute instructions from the UCI BIOS ROM and will respond to key codes translated by the KBDROM.

The sum of the S-100 interrupts and the primary interrupts are steered via U240 and U10 into the vectored interrupt inputs of the primary interrupt controller U208. Thus the Z-100 responds to a set of new interrupt levels which are required for the PC mode.

VI	Usage
----	-----
NMI	Parity Error
0	Timer
1	Keyboard
2	Not Used
3	COM 2
4	COM 1
5	Fixed Disk
6	Diskette
7	Parallel Port

Interrupts from the COM1, COM2 and Parallel ports are brought to jumper J3. For communication programs which require external interrupts (system ROM BIOS does not use interrupts for these ports), the user must hard wire jumper J4 and cut jumper J3 as follows:

Cut	J3-3	COM1
	J3-4	COM2
	J3-5	Keyboard
	J3-6	Parallel Port
Jump	J4-4	COM 2
	J4-5	COM 1
	J4-8	Parallel Port

In operations other than the BIOS ROM access, the keyboard access, and the interrupt process, all signals merely pass through the system board as discussed in the virgin mode of operations.

THEORY OF OPERATION

System Board Continued

Mode Switch Port

The System board responds to a software selectable mode switch (port 0FFH). This port is an output only port. Three bits are currently assigned to switch the System board, the Floppy Disk Controller board, and the Video Master board between the virgin and the PC modes.

Bits	Usage
----	-----
0	Video Master
1	System Board
2	Floppy Controller

A "0" in the corresponding bit will switch the corresponding board into the PC mode while a "1" in the corresponding bit will switch the corresponding board into the virgin mode. The input portion of this port will read the default DIP switches of the motherboard (SW101).

The Floppy Controller Board

The EasyPC Floppy Controller board combines the circuitry of the Zenith Z207 floppy controller with UCI's PC compatible floppy controller circuitry into one board. A software selectable mode switch (0FFH) is provided between the two modes. The port responds to bit 2 of this output port. If bit 2 is low (0), the PC mode is selected. If bit 2 is high (1), the virgin mode is selected.

Z-100 Virgin Mode

In the virgin mode, the controller operates identical to the Z207 board except the DIP switch which selects the I/O base port address is eliminated. Since this board can only be used as a primary controller, there is no need to change the I/O port address. The selection between 48TPI/96TPI drives is done by hardware. It is factory preset to select 48TPI drives. See Appendix E for 96TPI drive set up.

PC Mode

In the PC mode the floppy disk controller operates in a very different manner from the Z207 controller. The 8287 controller supports high speed DMA transfer using a DMA controller chip, 8237A (U45), unlike the 1797 (U47) Z207 controller which uses I/O operations. The 8272A (U41) floppy controller is set up so that both I/O or DMA

THEORY OF OPERATION

Floppy Disk Controller Board Continued

transfers are supported. The 8272A controller is addressed at 3F4, 3F5. The DMA controller (8237A) is addressed at ports 000H-00FH. The DMA page register is addressed at ports 80H-83H.

The DMA page register, U52 contains the upper 4 bit address (segment page register). The 8237A transfers in a maximum of 64K. The DMA page register extends transfer across page boundaries to the full 1MB address space. During DMA operations, on board arbitration logic (U48, U51, U60), allows the board to behave as a highest priority temporary master (TMA). This logic permits the board to operate with other DMA devices such as the Z217 controller without bus conflicts. Upon a DMA request, U51 samples the DMA0-DMA3 lines to determine if any DMA device is active. If no current DMA operation is in action, it will request for DMA operation by asserting the S-100 hold request lines and the DMA0-DMA3 priority lines as the highest priority device. Any other DMA device will be prevented from obtaining the bus until the floppy DMA transfer is done and U51 releases the bus.

U 55 is an I/O decoder. It also contains the mode switch port. U59 controls the interaction between the 8237A and the 8272 controllers. It also controls the data bus direction. During DMA read (from floppy to memory), U58 is directed from the internal data bus to the S-100 D1 bus. During DMA write, U57 is directed from the S-100 D0 bus to the internal data bus.

U60 generates DMA signals such as PSYNC, PSTVAL and SWO. Other S-100 status and control signals are gated on to the bus at the appropriate time by U37, U62 and U63. Chips U54, U56, U52 and U50 drive the address lines during DMA operations. The 8237A gates the A8-A15 address lines onto the latch U56 during its early address cycle. It then puts the lower addresses onto buffer U54. At the same time, it will enable U52, the DMA page register. This puts 20 of the 24 bit addresses onto the S-100 bus. The upper 4 bits, A20-A23, are permanently set to 0 during DMA transfers.

On board decoding circuitry allows the controller to support up to 4 daisy chained 5 1/4" floppy drives in the PC mode. The controller does not support the 8" drives in the PC mode. To access the 8" drives, the mode port must be switched back to the virgin mode. Note that the virgin mode does not support DMA operations. Eight inch access must be done in the Z-100 I/O mode.

THEORY OF OPERATION

Floppy Disk Controller Board Continued

The following are the I/O port addresses and definitions of the floppy controller in the PC mode:

Port	Description
3F2	Digital Output Register
Bit 0-1	Drive Select
2	Reset (0 Reset)
3	INT and DMA Enable
4	Drive A Motor Enable
5	Drive B Motor Enable
6	Drive C Motor Enable
7	Drive D Motor Enable

Port	Description
3F4	8272 Main Status Register
Bit 0	Drive A Busy
1	Drive B Busy
2	Drive C Busy
3	Drive D Busy
4	FDC Busy
5	Non DMA Mode, Set if Non DMA in Execution Phase
6	0 = Input to FDC 1 = Output from FDC
7	Data Register Ready for I/O

3F5 8272 Data Register

Consult the 8272A data specification for additional information on the floppy controller chip.

Video Master Board

The EasyPC Video Master consists of a Motorola 6845 CRT controller, 16K bytes of directly addressable dynamic RAM storage, a character ROM to generate dot patterns for alphanumeric and graphics characters, a video multiplexing circuit to switch between the Z-100's virgin mode video or the on board PC mode video signal, an 8253 timer counter with a latch port to emulate PC timer and to generate sound effects. The EasyPC Video Master supports both RGB and composite video. A light pen interface is also provided (The light pen connector, external cable, voltage regulator and filter capacitors are not supplied with the board).

THEORY OF OPERATION

----- Video Master Board Continued

Mode Switch Port (0FFH)

A software addressable mode switch port (0FFH) switches the board between the virgin mode and the PC mode. Bit 0 of this port controls the switching. Bit 0 low (0) switches the board to the PC mode while bit 0 high (1) switches it to the virgin mode. On power up (reset) the ROM BIOS automatically switches it to the PC mode.

Virgin Mode

In the virgin mode, the RGB signal from the Z-100 video board enters the EasyPC Video Master board via P2 and passes through a buffer U2. This RGB signal comes out through P4 into the RGB monitor connector. Thus the RGB signal in the virgin mode merely passes through (buffered) the EasyPC Video Master board.

The composite video signal from the Z-100 video board comes into the EasyPC Video Master via P1. This signal then passes through an analog multiplexer switch U1. This switch multiplexes the PC mode and the virgin mode signal onto the transistor driver (Q1) of the composite video output. In the virgin mode, the PC mode signal is turned off while the Z-100 video is turned on. Thus the Z-100's video signal passes through U1 into the video driver Q1 and exits the board through the composite video connector P3.

PC Mode

In the PC mode, the Z-100 virgin video signals from U2 and part of U1 are turned off. The RGB signal now comes from U4 and the composite video signal now comes from U34 through the second half of U1. The source of all video signals is the CRT controller U51. Consult manufacturer's specification for further detail on operation and programming of this chip.

The following table describes the I/O port address and their usage in the PC mode.

Port	Description
-----	-----
3D0	6845 Registers
3D1	6845 Registers
3D4	6845 Index Register
3D5	6845 Data Register
3D8	Video Mode Register

THEORY OF OPERATION

 Video Master Board Continued

3D9	Color Select Register
3DA	Video Status Register
3DB	Clear Light Pen Latch
3DC	Preset Light Pen Latch

1. Video Mode Register (3D8H)

Bit	Description
---	-----
0	0 = 40 x 25 Alphanumeric Mode 1 = 80 x 25 Alphanumeric Mode
1	0 = Alphanumeric Mode 1 = 320 x 200 graphics Mode
2	0 = Color 1 = Black and White
3	0 = Disable Video Signal 1 = Enable Video Signal
4	1 = 640 x 200 Black and White Graphics Mode
5	0 = Non-blink Mode 1 = Enable Blink Attribute (In Alphanumeric Mode Only)
6	Not Used
7	Not Used

2. Color Select Register 3D9H

Bit	Description
---	-----
0-3	- Selects Border Color in the 40 x 25 Alphanumeric Mode - Selects Background Color in the 320 x 200 Graphics Mode - Selects Foreground Color in the 640 x 200 Graphics Mode Bit 0 - Blue Bit 1 - Green Bit 2 - Red Bit 3 - Intensified Color
4	- Selects Background Colors in the Alphanumeric Mode - Selects an Alternate Intensified Set of Colors in the Graphics Mode
5	- Used Only in the 320 x 200 Color Graphics Mode to Select the Foreground Colors

THEORY OF OPERATION

----- Video Master Board Continued

Bit 5 = 0

Color Set 1

C0 C1
1 0 Green
0 1 Red
1 1 Brown

Bit 5 = 1

Color Set 2

C0 C1
1 0 Cyan
0 1 Magenta
1 1 White

3. Video Status Register 3DAH

Bit	Description
---	-----
0	Display Enable (Regen Buffer Accessible)
1	Light Pen Latch Set (Cleared by Output to 3DBH)
2	Light Pen Switch 0 = Switch is On 1 = Switch is Off
3	1 = Vertical Sync On
4-7	Not Used

4. Display Memory Buffer

The display memory occupies memory space between B800H and BBFFFH (16K Bytes) and is used to contain video information. It is organized in the following manner:

a. 40 x 25 Alphanumeric Mode

Memory is organized as 1000 words, each word with one byte of character code and one byte of attribute code.

The display character is generated by the on-board character generator ROM which contains dot patterns for 256 characters. Each character has a 5 wide by 7 high single dot font with one descender in an 8 wide by 8 high character space. The attribute byte

THEORY OF OPERATION

----- Video Master Board Continued

is the same as described in the 160 x 100 color-graphics mode.

b. 80 x 25 Alphanumeric Mode

The 80 x 25 alphanumeric mode operates in the same way as the 40 x 25 alphanumeric mode except that the display memory uses 2000 words each with one byte of character code and one byte of attribute code.

c. 320 x 200 Color Graphics Mode

In this mode, memory is organized as two banks of 8000 bytes each. The even rows (rows 0,2,4,...198) occupy the first block of memory from B8000H to B9F3FH. The odd rows (rows 1,3,5,...199) occupy the second block of memory from BA000H to BBF3FH. The rest of the memory is not used. Each row is specified by 80 bytes. Each byte contains four dots on the screen. Each dot is specified by two color bits (CB0, CB1).

CB0	CB1	Description
0	0	Foreground = One of 16 Selected Background Colors
1	0	Selects First Color of Preselected Color Set
0	1	Selects Second Color of Preselected Color Set
1	1	Selects Third Color of Preselected Color Set

Each byte is arranged as follows:

Bit 0-1	Fourth Dot
2-3	Third Dot
4-5	Second Dot
6-7	First Dot

	Color Set 1	Color Set 2
1st Color	Green	Cyan
2nd Color	Red	Magenta
3rd Color	Brown	White

The background colors are selected by the color select register of port 3D9H.

THEORY OF OPERATION

Video Master Board Continued

d. 640 x200 Black and White Graphics Mode

In this mode, the memory is organized as contiguous 16000 words of one byte each. Each byte contains eight dots on the screen.

Bit 0	8th Dot
1	7th Dot
2	6th Dot
3	5th Dot
4	4th Dot
5	3rd Dot
6	2nd Dot
7	1st Dot

This mode supports black and white graphics only.

5. Timer-Counter

An 8253 programmable timer-counter is provided on the EasyPC Video Master board to support PC mode timer and sound effect operations. The 8253 is addressed at port 20H-23H. Channel 0 is used for the time of day clock and generates vector interrupt level 0. Channel 1 is not used since there is no external memory refresh necessary in the Z-100. Channel 2 is used to generate tone for the speaker circuit. The 8253 is driven by the S-100 system clock (2 MHz) divided by 2 to form a 1 MHz input.

6. Speaker Control Port

A latched I/O port at address 61H is used to control the speaker circuit. Bit 0 high turns on the tone generator (8253 channel 2) while bit 1 enables the speaker itself. Bits 2-7 are not used by this board.

EasyPC Keyboard

The EasyPC keyboard operations makes use of the 8041 keyboard processor on the Z-100 motherboard in the event driven mode and a keycode translation ROM (KBDROM) on the system board to generate PC compatible codes. Each time a key is operated (down or up), the keyboard processor reads the key operation and generates a keyboard interrupt (VI1). The system reads the keyboard data by issuing an input from port 60H. The keyboard processor generates a downcode (0-7FH) when a key is depressed and an upcode (80H-FFH) when a key is released. The upcode and downcode are translated into PC compatible

THEORY OF OPERATION

EasyPC Keyboard Continued

codes as shown in the keycode table.

The keyboard is an input only port. Any output to port 60H will be directed to the S-100 bus. At the present, there is no hardware support for output at port address 60H. The keyboard processor is preset to operate in the following mode:

1. Keyclick Off
2. Event Driven Mode
3. Interrupt Enabled

The keyboard processor can be programmed by sending instructions to its physical port addresses of 0F4-0F5H. It is not recommended to change the mode of the keyboard processor as the ROM BIOS is set to operate in this mode.

In the event-driven mode, the 8041 does not generate repeated key operations. It is the responsibility of the software to emulate such function. The ROM BIOS supplied will generate repeated key codes at the rate of nine times a second with a 2 second lag between the first depression of any key (except such keys as shift and control) and the subsequent repeated key codes. (Note that port 61H is on the Video Master board.)

CALIBRATION

The EasyPC Floppy Controller board contains the hardware for both the Zenith Z207 Controller card and the PC Controller card. Calibration of the Z207 circuitry has been set at the factory to operate properly with Zenith Data Systems and Heath disk drives. Unless your board is accidentally uncalibrated, or you are not using Zenith equipment, you will not need to calibrate the card. If calibration is required follow the procedures below.

Equipment Needed

The following equipment is needed to precisely calibrate your Floppy Controller board.

- A digital voltmeter (DVM) with at least four-digit readout.
- A 10 MHz bandwidth, calibrated, laboratory-quality oscilloscope with a sweep speed of 50 ns/division and a vertical deflection of 2 V/division and a low capacitance (X10) probe.
- A frequency counter capable of six-digit accuracy at 4 MHz.
- A blank 5.25" diskette and an 8.0" diskette if you are using 8" drives in your system.
- A S-100 extender board

Precompensation Calibration

Two values of precompensation are needed: one for the 5.25" drives and one for the 8" drives. Accordingly, there are two precompensation adjustment screws on the Floppy Controller board. Potentiometer R24 is used to set the higher value of precompensation, and potentiometer R20 is used to set the lower precompensation.

Perform the calibration as follows:

1. Turn the computer off and remove the Floppy Controller board.
2. Turn R20 fully counterclockwise and R24 fully clockwise.
3. Insert the S-100 extender card into the S-100 bus. Insert the Floppy Controller into the S-100 extender card and turn the power on. Allow the computer to warm up for five minutes.
4. Attach the oscilloscope's probe to U23 pin 5 and the probe's ground clip to GND, U23 pin 9.

CALIBRATION

Precompensation Calibration Continued

5. Determine the values of write precompensation that the 5.25" and 8" drives need. The manufacturers of the drives should supply this information with their product. If the value of precompensation is higher for the 5.25" drives, or if you only have 5.25 drives, go to Step 9. If the value of precompensation is higher for the 8" drives, or if you only have 8" drives, go to Step 6.
6. Format a blank 8" diskette in any of the 8" drives by running the `FORMAT` program provided on your operating system diskette.
7. While `FORMAT` is running, turn R20 to adjust the pulse width displayed on the oscilloscope to the value of write precompensation needed by your 8" drives. If you do not have 5.25" drives, you have completed the precompensation calibration; proceed to Data Separator Calibration. If you have 5.25 drives, continue with the next step.
8. Format the 5.25 diskette. While `FORMAT` is running, turn R24 to adjust the pulse width displayed on the oscilloscope to the value of write precompensation needed by your 5.25" drives. Proceed to Step 13.
9. Format a blank 5.25" diskette in any of the 5.25" drives by running the `FORMAT` program provided on your operating system diskette.
10. While `FORMAT` is running, turn R20 to adjust the pulse width displayed on the oscilloscope to the value of write precompensation needed by your 5.25" drives. If you do not have 8" drives, you have completed the precompensation calibration; proceed to Data Separator Calibration. If you do have 8" drives, go to the next step.
11. Format the blank 8" diskette.
12. While `FORMAT` is running, turn R24 to adjust the pulse width displayed on the oscilloscope to the value of write precompensation needed by your 8" drives.
13. Remove the oscilloscope probe.

This completes the precompensation calibration.

CALIBRATION

Data Separator Calibration

Data Separator Calibration

Perform the calibration as follows:

1. Turn the computer on. Allow at least five minutes for the Floppy Controller board to reach operating temperature.
2. Make sure the disk drives are not selected.
3. Set the DVM's voltage range to 2 V. Attach the common lead to U33 pin 7 (GND) and the positive lead to U33 pin 13.
4. Adjust R14 for a reading of 1.4 V.
5. Remove the voltmeter test leads.
6. Set the six-digit frequency counter to count 4 MHz.
7. Attach the shield lead to U33 pin 7 (GND) and the signal lead to U33 pin 8.
8. Adjust R13 for a reading of 4.0 MHz.
9. Repeat steps 2 through 8 until there is no further improvement and the 1.4 V and 4 MHz readings occur simultaneously. There will be some interaction between these adjustments.
10. Remove the test leads.
11. Remove the Floppy board from the extender card and insert into the S-100 bus.

This completes the data separation calibration procedure.

Note: Format the blank diskettes used in this procedure again before you use them for recording files.

TROUBLESHOOTING

----- Simple Trouble Shooting Guide

Problem	Resolution
1. No short beep on power up or reset.	<p>System board may be installed incorrectly. Check to see if the alignment is correct and that interconnects S1 through S7 are firmly seated.</p> <p>After checking:</p> <ol style="list-style-type: none">Remove all S-100 boardsTurn power back onListen for short beep <p>If no beep, check the following ICs on the motherboard for proper part numbers.</p> <p>U164 - 74LS240 (on System board) U195 - 74LS240 U219 - 74LS74 U241 - 74S244</p> <p>For 8 MHz operation only:</p> <p>U221 - 74ALS1032</p> <p>(Note: LS is not the same as ALS or S.)</p> <p>Again turn power back on, if no beep, the CPU 8088 may be too slow. Replace the CPU with the faster version 8088-2. If the problem is still not corrected, replace the System board.</p>
2. No sign on logo is displayed	<p>The ROM BIOS automatically after power up, or reset, does a system test and generates a tone pattern if error is detected.</p> <ol style="list-style-type: none">one long, one short - DMA Controllerone long, two short - Timerone long, three short - Floppy Controllerone long, four short - Video Controller

TROUBLE SHOOTING

Simple Trouble Shooting Guide Continued

- e. one long,
five short - Winchester Controller
(if present)
 - f. one long - System OK
3. Floppy Booting Problems
- a. IPL error and long beep
 - Possible bad disk
 - Check Floppy Disk Controller
 - b. No system (or similar messages)
 - Non-system disk is used
 - c. FD error
 - Possible bad disk
 - Check Floppy Disk Controller
 - d. Drive light on and no activity or just no activity.
 - Check disk cable for correct alignment
 - Bad drive
 - Bad Floppy Disk Controller
4. Video Board Problems
- a. No color
 - Check video cable
 - Replace Video Controller
 - b. Only one mode
 - Replace Video Controller
 - c. Garbage on screen
 - Video signal too low, replace Video Controller
5. Speaker - no tone
 - Check speaker and cable
 - Replace video controller timer chip
6. Timer does not increment
 - Replace System board interrupt controller
 - Replace video controller timer chip
7. Sticky keys
 - Check keyboard cable
 - If Z-100 mode works, replace System board
8. NMI interuppts
 - System memory too slow
 - Parity error in memory

APPENDIX A

Keyboard Key Changes and Keycode Table

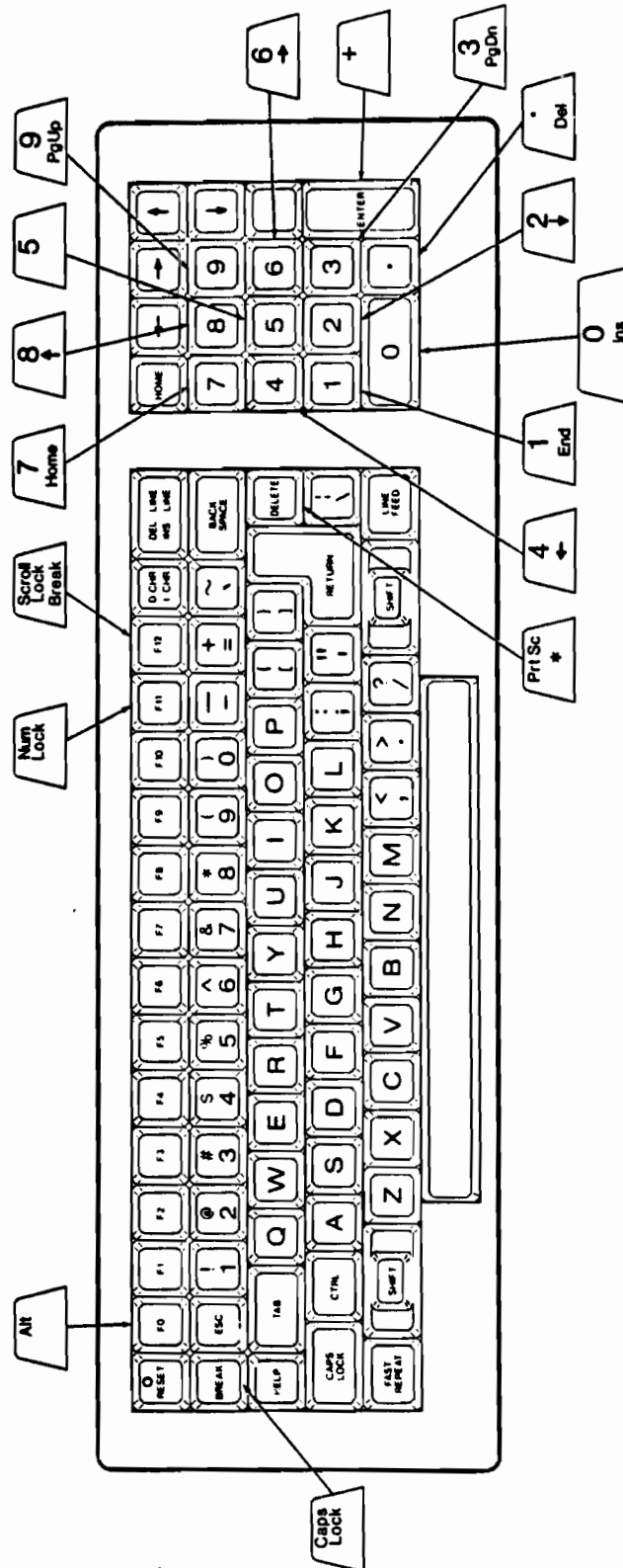


Figure 18
Keyboard Key Changes for PC Mode

APPENDIX A

Keycode Table

Key	Upcode	Downcode	Original Key
ESC	129	1	ESC
!/1	130	2	!/1
@/2	131	3	@/2
#/3	132	4	#/3
\$/4	133	5	\$/4
%/5	134	6	%/5
^/6	135	7	^/6
&/7	136	8	&/7
*/8	137	9	*/8
(/9	138	10	(/9
)/10	139	11)/10
/-	140	12	/-
+/=	141	13	+/=
Backspace	142	14	Backspace
Tab	143	15	Tab
Q	144	16	Q
W	145	17	W
E	146	18	E
R	147	19	R
T	148	20	T
Y	149	21	Y
U	150	22	U
I	151	23	I
O	152	24	O
P	153	25	P
[154	26	[
]	155	27]
Return	156	28	Return
Ctrl	157	29	Ctrl
A	158	30	A
S	159	31	S
D	160	32	D
F	161	33	F
G	162	34	G
H	163	35	H
J	164	36	J
K	165	37	K
L	166	38	L
:/;	167	39	:/;
"/'	168	40	"/'
~/`	169	41	~/`
Shift L	170	42	Shift L
/\	171	43	/\
Z	172	44	Z
X	173	45	X
C	174	46	C
V	175	47	V
B	176	48	B

APPENDIX A

 Keycode Table Continued

Key	Upcode	Downcode	Original Key
---	-----	-----	-----
N	177	49	N
M	178	50	M
</,	179	51	</,
>/.	180	52	>/.
?//	181	53	?//
Shift R	182	54	Shift R
PRTSC/*	183	55	Delete
Alt	184	56	F0
Space	185	57	Space
Caps Lock	186	58	Caps Lock
Caps Lock	186	58	Break
F1	187	59	F1
F2	188	60	F2
F3	189	61	F3
F4	190	62	F4
F5	191	63	F5
F6	192	64	F6
F7	193	65	F7
F8	194	66	F8
F9	195	67	F9
F10	196	68	F10
Num Lock	197	69	F11
Scroll Lock/ Break	198	70	F12
7/Home	199	71	Home
7/Home	199	71	7
8/↑	200	72	8
2/↓	201	73	2
-	202	74	-
4/←	203	75	4
4/←	203	75	→
5	204	76	5
6/→	205	77	6
6/→	205	77	
+	206	78	Enter
1/End	207	79	1
2/↓	208	80	2
2/↓	208	80	↓
2/↓	208	80	Line feed
3/PGDN	209	81	3
0/INS	210	82	0
./Del	211	83	.
	212	84	Help
	213	85	Fast Repeat.
	214	86	DEL/INS Line
	215	87	DEL/INS Char
Not Used		88 to 126	
Invalid Key	255	255	

APPENDIX B

Hardware Specifications

The following is a discription of the EasyPC hardware by printed circuit board.

The EasyPC System Board

- Two sided 9"x 9" PC board which fits onto the Z-100 motherboard
- Sockets for 3 IC chips transferred from Z-100 motherboard
- Address Map ROM maps PC I/O ports into Z-100 I/O ports
- Keyboard Map ROM translates Z-100 key codes into PC key codes
- System boots up in the EasyPC BIOS ROM supplied
- Mode Switch Port allows software to select between Z-100 or PC modes
- Supports PC game control port

The EasyPC Video Master Board

- Multilayer 5 1/2" x 10" PC Board (S-100) which requires one slot in Z-100
- In Z-100 Mode buffered Z-100 RGB video and composite video outputs
- In PC Mode:
 - 40 x 25 and 80 x 25 alphanumeric and character graphics
 - 320 x 200 medium resolution color graphics and 640 x 200 high resolution black and white graphics
 - Supports both upper and lower case characters
 - Supports reverse video, blinking, and highlighting in black and white mode
 - Supports 16 foreground and 8 background colors for each character
 - Supports blinking per character
 - 16K bytes of video storage
 - Supports one of 16 colors for screen's border
 - Supports one of 4 foreground colors and one of 16 background colors per picture element in the 320 x 200 mode
 - Contains character generator ROM for dot patterns of 256 characters
 - Provides multiplexing between Z-100 video output and PC output
 - Provides composite video output
 - Provides speaker port to generate PC sound effects
 - Provides timer interrupt for PC timer operations
 - Supports PC light pen (light pen upgrade kit not included)

APPENDIX B

Hardware Specifications Continued

The EasyPC Floppy Master Board

- 5 1/2" x 10" multilayer board which replaces Z-207 floppy disk controller board
- Combines Z-207 floppy disk controller functions with PC floppy disk functions
- Supports both 5 1/4" and 8" floppy drives in Z-100 mode
- Supports all 5 1/4" PC formats
- Software switchable in/out from either mode
- DMA controller on board for high speed transfers in PC mode
- Conforms to S-100 standard as highest priority temporary master during DMA transfers

The EasyPC BIOS ROM

- Initializes all EasyPC system I/O ports
- Initializes and sizes system memory
- Prompts user for mode select
- Switches to Z-100 BIOS ROM if Z-100 mode is selected
- Boots PC-DOS from either 5 1/4" floppy disk or Winchester disk
- Supports COM1, COM2, and parallel printer operations
- Provides built in error detection and diagnostics

The EasyPC Speaker

- Provides full PC audio reproduction
- 2" 8 Ohm Speaker
- Foam-backed adhesive for easy mounting on Z-100 chassis

Keyboard Overlay

- Provides easy identification of key functions in the PC mode

Cable Assembly provided for EasyPC Video Board and speaker

APPENDIX B

----- Electrical Specifications

I. EasyPC System Board

Power	+5 V DC +/- 5% 600 MA Max (via Header Pins)
Loading	Add Maximum of 2 TTL Inputs to Existing Z-100 Interface Lines
Temperature	0 - 70 Degrees Centigrade Operating in Z-100 (Internal Temperature)

II. EasyPC Floppy Controller Master Board

Power	+7V TO 11V DC @ 1.5 A Max +14V TO 18V DC @ 30 MA Max
Loading	Maximum of 4 TTL Inputs to S-100 Bus Maximum Drive of 24 MA Sink, 15 MA Source (Typical LS Buffer Chips)
Temperature	0 - 70 Degrees Centigrade Operating in Z-100 (Internal Temperature)
Output	Up to Four 5-1/4 Inch Drives Daisy Chained Up to Four 8 Inch Drives Daisy Chained (Only One Active Terminator Allowed)

III. EasyPC Video Master Board

Power	+7V to 11V DC @ 1.5 A Max +14V to 18V DC @ 30 MA Max
Loading	Maximum of 4 TTL Inputs to S-100 Bus Maximum Drive of 24 MA Sink, 15 MA Source (Typical LS Buffer Chips)
Temperature	0 - 70 Degrees Centigrade Operating in Z-100 (Internal Temperature)
Output	One RGB Output at TTL Level One Composite Output @ 2V PP 75 Ohm Impedance

APPENDIX C

EasyPC Block Diagrams

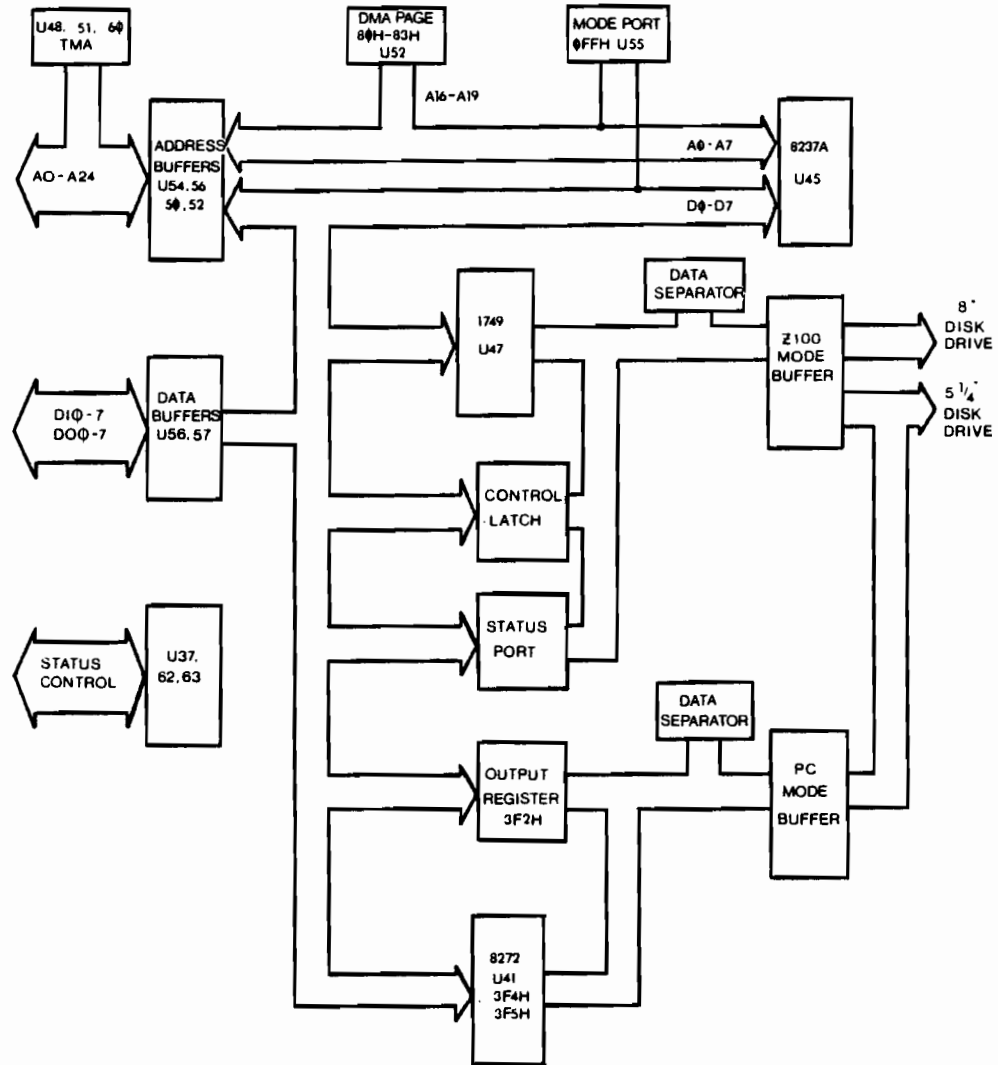


Figure 19
Floppy Disk Controller

APPENDIX C

EasyPC Block Diagrams

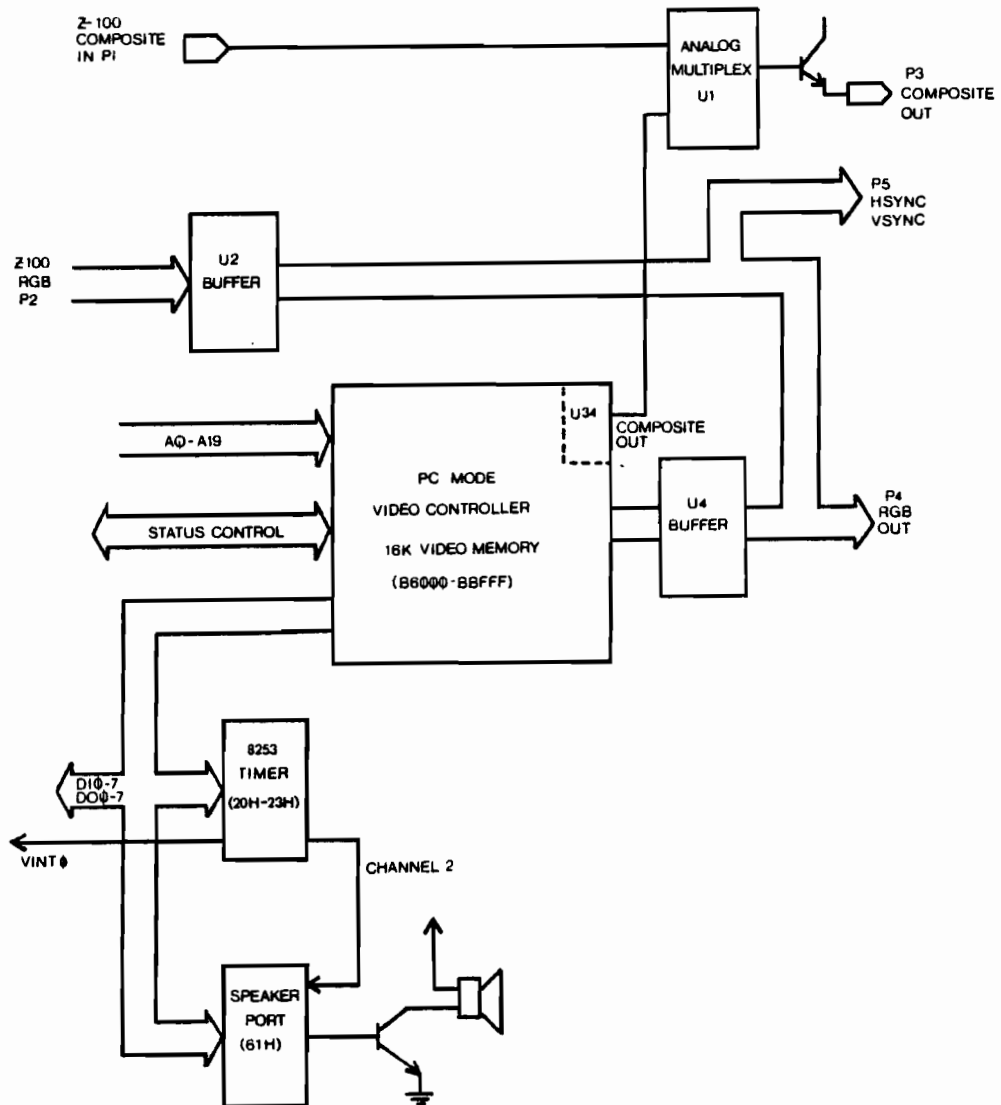


Figure 20
Video Master Board

APPENDIX C

EasyPC Block Diagrams

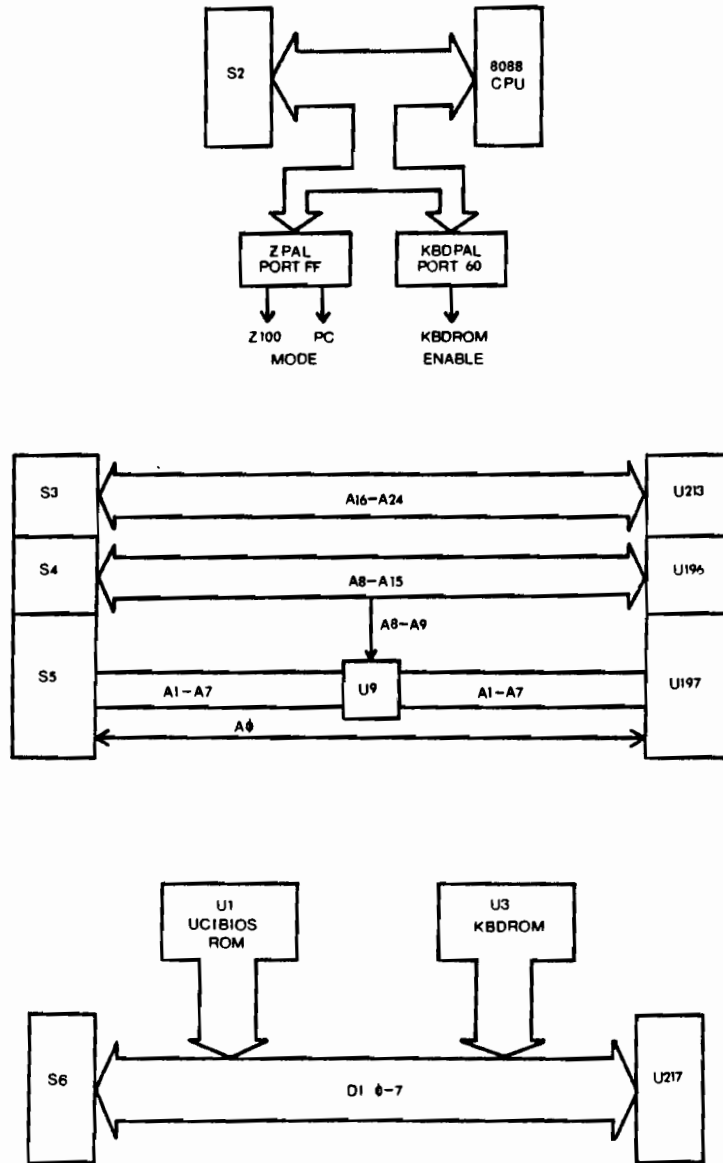


Figure 21
System Board

APPENDIX C

EasyPC Block Diagrams

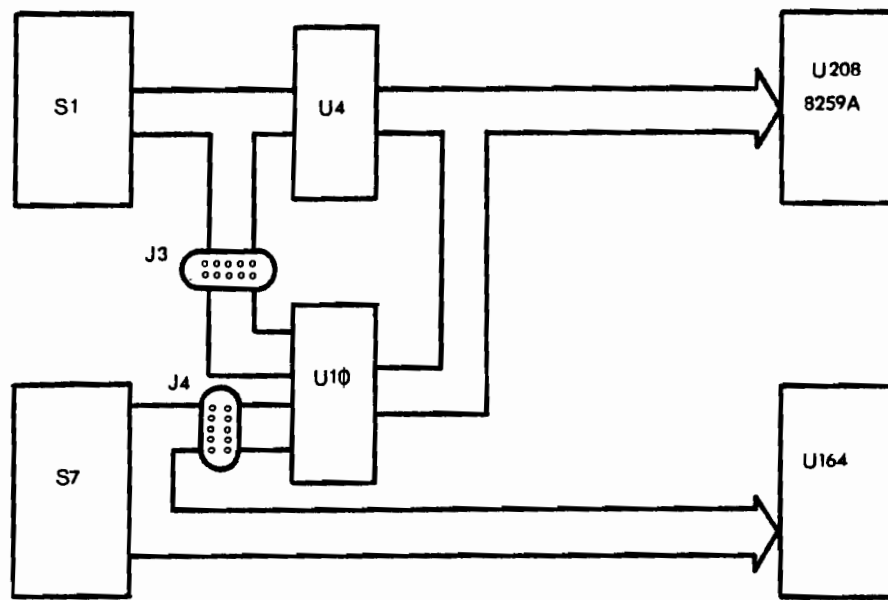


Figure 22
Vectored Interrupts

APPENDIX D

EasyPC Component Layout

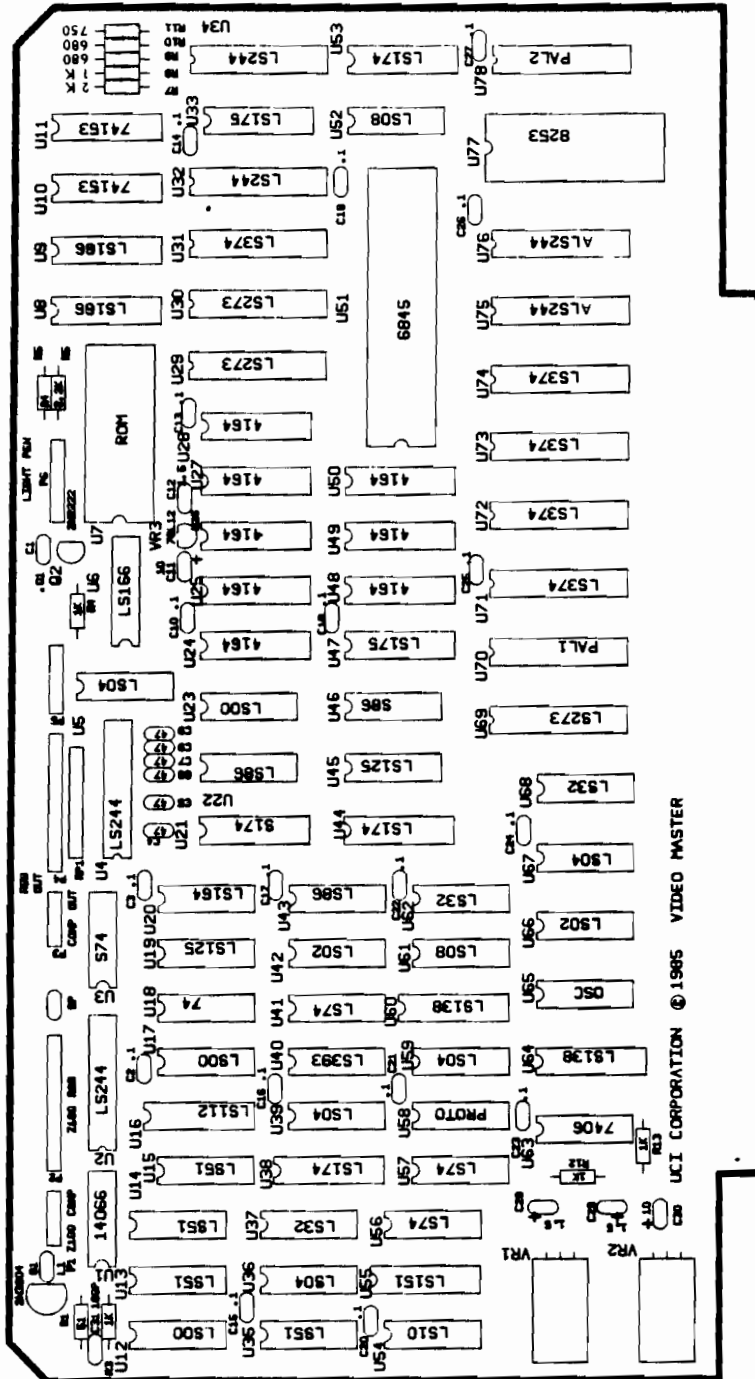


Figure 23
Video Master Board

APPENDIX D

EasyPC Componet Layout

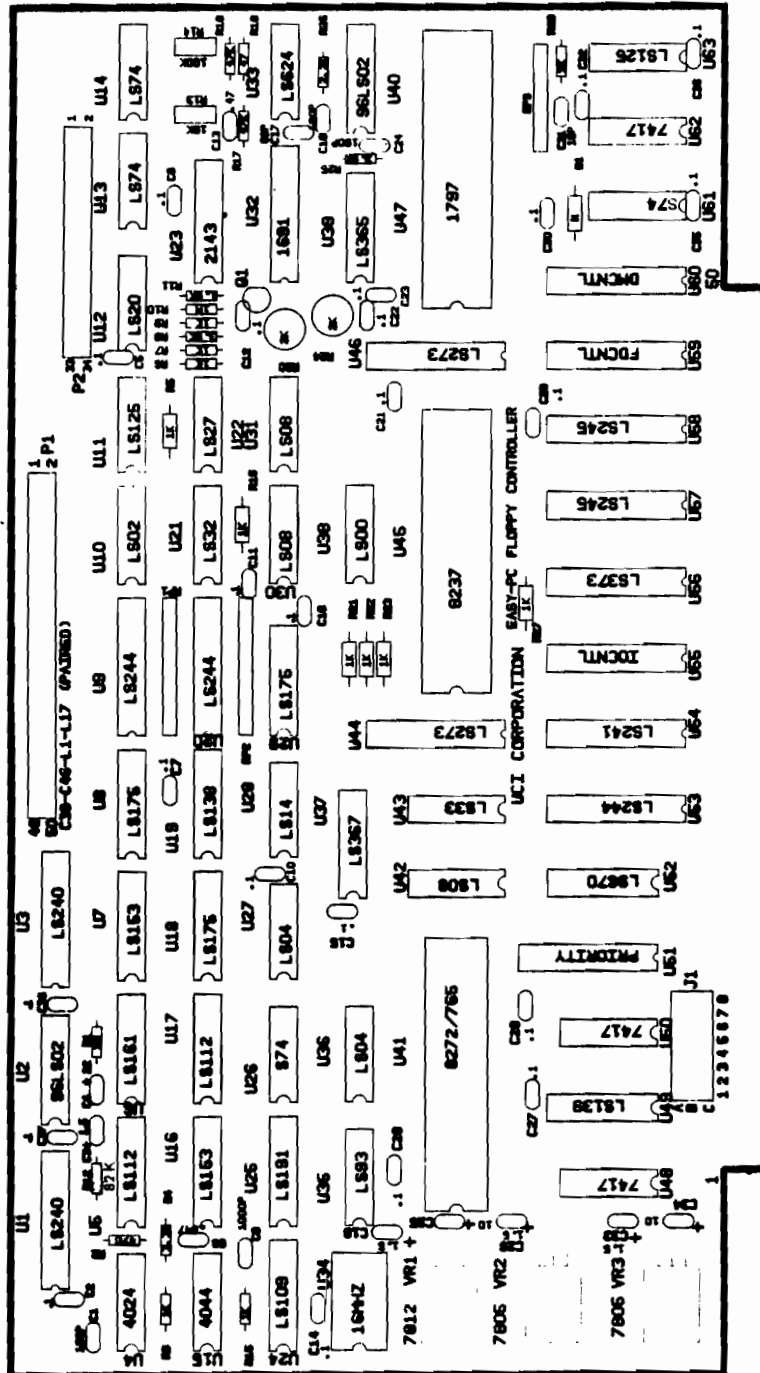


Figure 24
Floppy Disk Controller Board

APPENDIX D

EasyPC Component Layout

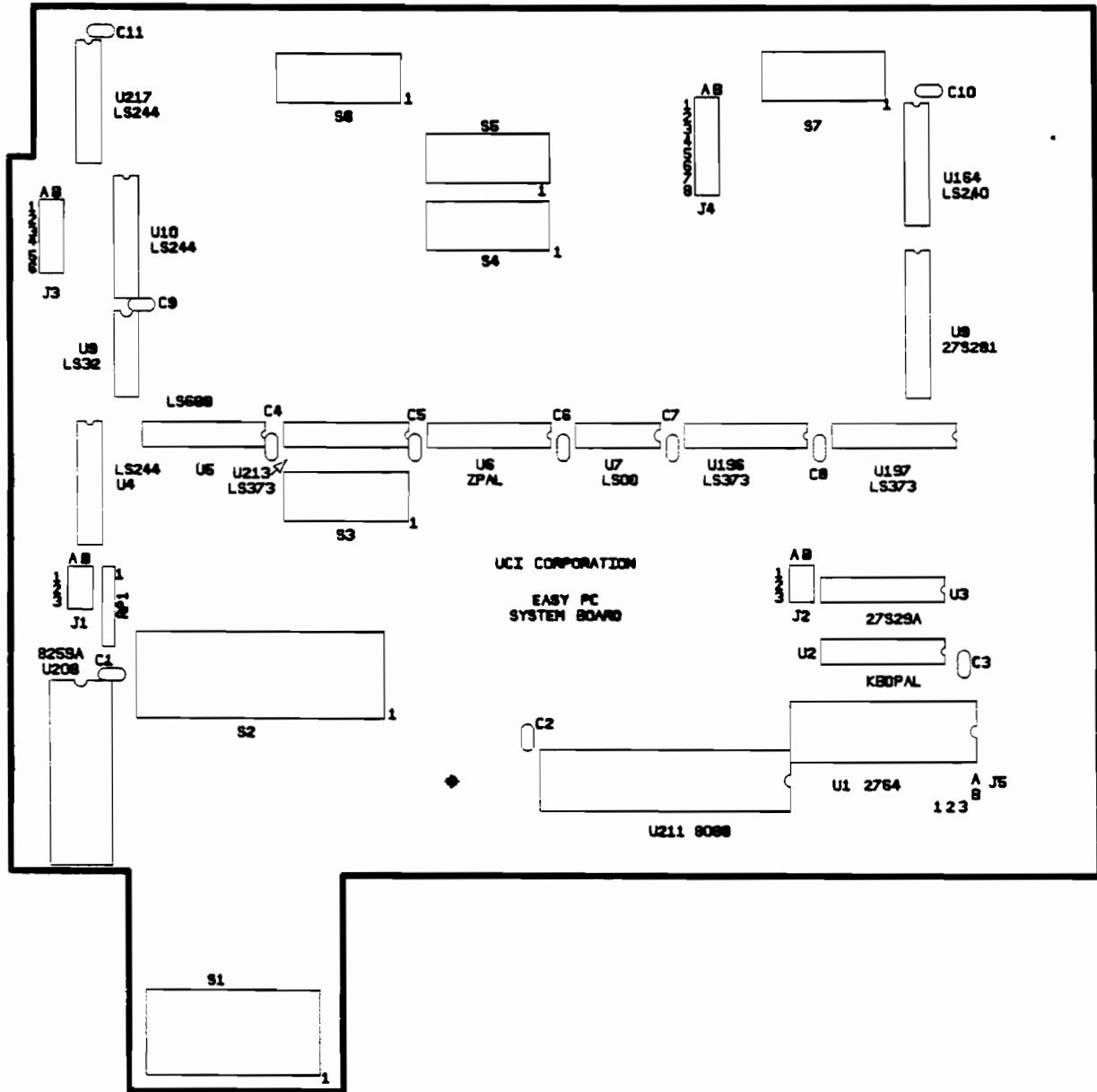


Figure 25
System Board

APPENDIX E

96TPI Disk Drive Set Up

For Zenith Z-100 systems that utilize 96TPI drives, the Floppy Disk Controller must be jumpered for successful operation in the Zenith mode. MS-DOS for the 150 and PC-DOS do not support 96TPI drives. Therefore in the PC mode, data is stored as if the drives were 48 TPI or on half the disk.

To set the Floppy Controller Card for 96TPI drives a foil cut and a wire jumper is required. Follow the steps below.

1. Locate U39 on the front of the Controller board.
2. Flip the board over and locate the same U39 on the back
3. Locate pin number 1 on U39 on the back of the board (Pin 1 has a square IC pad.)
4. Count 6 pins to the left. The foil trace running from pin 6 to pin 8 must be cut with a sharp knife. Be sure the cut is clean through the foil. See illustration below.

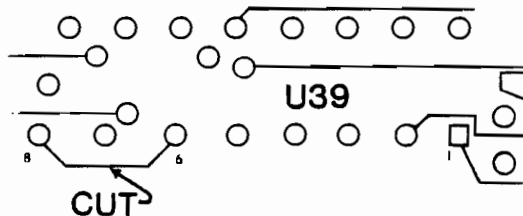


Figure 26
96TPI Foil Cut

5. Using an insulated wire, solder pin 6 of U39 to pin 16 of U39. This connects pin 6 to +5 volts. Again see the diagram below.

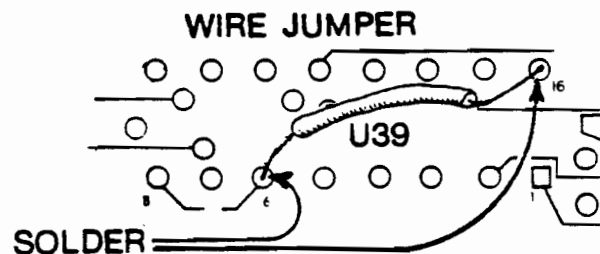


Figure 27
96TPI Hardware Jumper

6. This completes the 96 TPI set up. Install the Floppy Disk Controller board into the Z-100 system as described in the installation section of this manual.

APPENDIX F

 EasyPC Address Map

IBM Address	Physical Address	Description
-----	-----	-----
000-00F	000-00F	EasyPC DMA Controller (8237A)
3D0-3DF	010-01F	EasyPC Video Controller
040-043	020-023	EasyPC Timer (8253A)
201	025	EasyPC Game Port
080-083	02C-02F	EasyPC DMA Page Register
	030-03F	
	040-04F	* Secondary Multiport Card
	050-05F	
	060	
061	061	EasyPC Speaker Port
062-067	062-06F	
	070-07F	* Primary Multiport Card
3B0-3BF	080-08F	EasyPC Monochrome Display/Printer
	090-097	
	098-09F	* Memory Expansion
	0A0-0A3	* Network Card
	0A4-0A7	* Gateway
	0A8-0AB	
	0AC-0AD	* Secondary Winchester
320-321	0AE-0AF	* Primary Winchester
	0B0-0B7	* Primary Floppy Disk Controller
	0B8-0BF	* Secondary Floppy Disk Controller
	0C0-0C7	
3F0-3F7	0C8-0CF	EasyPC Floppy Disk Controller
	0D0-0D7	
	0D8-0DB	* Video Controller (6821)
	0DC-0DD	* CRT Controller (6845)
	0DE	* Light Pen
	0DF	
378-37B	0E0-0E3	EasyPC Parallel Printer
	0E4-0E7	* Timer (8253)
3F8-3FB	0E8-0EB	EasyPC COM 1 Port
3FC-3FF	06C-06F	EasyPC COM 1 Port
2F8-2FB	0EC-0EE	EasyPC COM 2 Port
2FC-2FF	06C-06F	EasyPC COM 2 Port
020-021	0F2-0F3	EasyPC Interrupt Controller (8259A)
060	0F4	EasyPC Keyboard Input
	0F4	* Keyboard Output
	0F5	* Keyboard Status/ Control
	0F6-0FA	
	0FB	* Timer Status (8253)
	0FC	* Memory Control Latch
	0FD	* High Address Latch
	0FE	* Processor Swap Port
	0FF	* Dip Switch Input
	0FF	EasyPC Mode Switch Port

* = Original Z-100 Port

APPENDIX F

EasyPC Address Map Continued

IBM Address	Physical Address	Description
-----	-----	-----

For use with D-G Electronics Multifunction Card, J6 on the System board must be cut between A and B and jumpered between B and C.

3F8-3FF	068-06F	EasyPC Serial Port 1
2F8-2FF	068-06F	EasyPC Serial Port 2

APPENDIX G

IBM Type Monitor Set Up

Since the EasyPC was designed for the Zenith/Heath family of computers, it was assumed most Z-100 owners used one of the monitors manufactured by Zenith. If your system uses one of the IBM type monitors, two hardware jumpers on the Video Master board are require to inverse the horizontal and vertical sync signals. The EasyPC will not function properly unless these changes are made. Carefully follow the steps below.

1. Locate U4 (74LS244) and U5 (74LS04) on the front of the Video Master board.
2. Flip the board over and locate the same U4 and U5 on the back.
3. Locate pin number 1 on each IC (pin 1 has a square IC pad).
4. Counting clockwise locate pin 12 on U5 and pin 11 on U4. Cut the foil trace running between these two pins with a sharp knife (see figure 28). Likewise cut the foil trace running from pin 13 on U4 to the feed through hole next to pin 1 on U5.

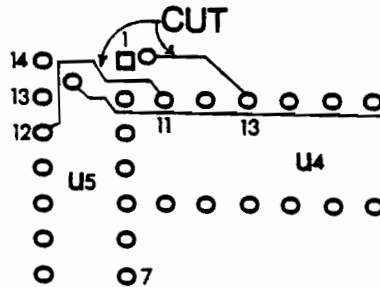


Figure 28
IBM Monitor Foil Cut

5. Solder an insulated wire from pin 13 of U5 to pin 11 of U4. Likewise solder an insulated wire from pin 1 of U5 to pin 13 of U4 (see figure 29).

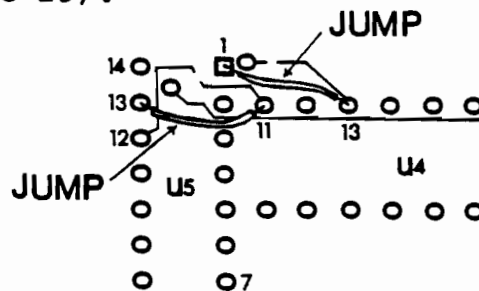


Figure 29
IBM Monitor Hardware Jumpers

6. This completes the IBM monitor set up. Install the Video Master board as described in the installation section of this manual.

APPENDIX H

DIP Switch 101 Settings

DIP Switch 101, on the Z-100 motherboard, selects the following functions during power-up or master reset. Set the switches for your system and preferences. 0 = on and 1 = off.

Switch 101 Section	Description
0	Default boot device
1	Default boot device
2	Default boot device
3	1 = Auto boot, 0 = Manual boot
4	Not used
5	Not used
6	1 = PC mode, 0 = Z-100 mode
7	0 = 60 Hz, 1 = 50 Hz; for video vertical scan frequency.

Sections 0, 1, and 2 should be set to reflect the type of drive that the system is to be booted from:

Switch Section	Device Type
2 1 0	5-1/4" floppy disk drive (internal)
0 0 1	8" floppy disk drive (external)
0 1 0	5" Winchester disk (internal)

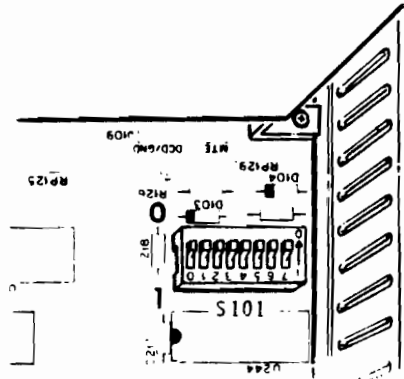


Figure 30
DIP Switch 101 Pictorial

APPENDIX I

----- UCI EXPANDABLE RAM Memory Board Configuration

In order for UCI's EXPANDABLE RAM memory board to function with the EasyPC at 5 MHz, a cut and a jumper must be added to the memory board. Follow the steps below.

1. Locate memory chip U68 right above the heat sink in the lower left corner of the board.
2. Flip the board over and locate U68 on the back of the board.
3. Below U68 are three feed through holes in a single line. A foil trace runs between the left feed through hole to the center hole. Cut this trace (see figure 31).

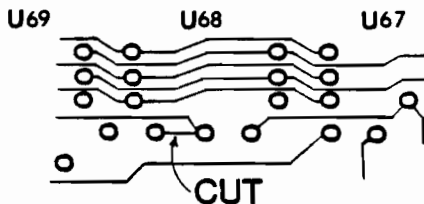


Figure 31
EXPANDABLE RAM Memory Board Cut

4. Solder a jumper from the center feed through hole to the right feed through hole as shown in figure 32.

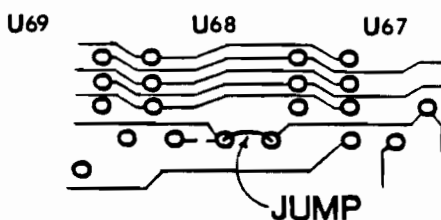


Figure 32
EXPANDABLE RAM Memory Board Jumper

5. This completes the memory board configuration. Install the board back into your system

LIMITED WARRANTY

UCI Corporation warrants its products to be in good working condition and free from defects in materials and workmanship for a period of one (1) year from date of purchase by original purchaser. Should this product fail to operate as specified in its product manual during this warranty period, UCI Corporation will, at its option, repair or replace the product at no additional charge.

Repair parts and replacement parts will be furnished on an exchange basis and will be either reconditioned or new. All replaced parts and products become the property of UCI Corporation. This warranty does not include service to repair damage to the product resulting from accident, disaster, misuse, abuse, or unauthorized modification of the product.

In no event will UCI Corporation be liable for damages deemed to have occurred through the installation or use of the EasyPC unit.

UCI Corporation
948 Cherry St.
Kent, Ohio 44240
(216) 673-5155
(800) 824-2667

