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DESKTOP COMPUTER SYSTEMS

**Z-100
USER'S MANUAL
WINCHESTER
SUPPLEMENT**



Desktop Computer

Z-100 Series User's Manual Winchester Supplement

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Introduction

With the addition of the internal Winchester drive, your Z-100 Desktop Computer from Zenith Data Systems achieves a level of performance rarely encountered in desktop computers.

The Winchester drive is an option that will allow you to store the equivalent of several dozen floppy diskettes inside your Computer, ready for immediate access in your daily business needs. Besides additional on-line capacity of stored records, the speed at which that information may be accessed is increased by a factor of ten to twenty.

This manual has been prepared as a supplement to the "Operation" and "Disk Operating System" sections of your Z-100 Series Desktop Computer User's Manual.

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Hardware Features

After you read pages 1.13 and 1.14 of the Operation section of the User's manual, you will notice an important difference between your Desktop Computer and the two-drive unit described in the manual.

One of the two disk drives has been replaced by a Winchester drive. In place of the Diskette Load Slot, Disk Drive Door, and LED Disk Access Indicator, you will see only an LED Disk Access Indicator.

You need to know and understand a couple of important facts about the care of your Winchester drive.

- Never drop your Winchester drive system or subject it to any other physical shock. If the Computer is accidentally dropped, even from only two to three inches, the Winchester drive may fail to operate. If this occurs you should contact your local ZDS representative for service.
- The built-in disk of your Winchester drive cannot be physically removed from the drive. However, information can be removed, stored, and replaced with other data. You will learn how to do this later in this supplement and in the Winchester section of your operating system manuals.

WINCHESTER DISK DRIVES

A Winchester Disk Drive System, such as the one in your Z-100 Desktop Computer, is only one of a family of disk systems generally called "hard disks."

The disk itself is a carefully machined and polished non-magnetic metal platter that is coated with a magnetic material, similar to that used by floppy disks and audio and video tape. Hard disks come in a variety of sizes, capacities, and configurations. Many have multiple disks and some are even removable, being enclosed in "disk packs," or "cartridges."

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Hardware Features

The “read/write” head (which records and “reads” information to and from the surface of the disk) “floats” on a cushion of air above the disk as it turns. The distance between the head and the surface is so small that even a tiny smoke particle could cause irreparable damage to the disk. For this reason, most disks, including your Winchester disk system, are sealed against contamination.

In contrast to the floating head of a hard disk, the head of a floppy disk drive actually rides on the surface of the disk. The read/write heads of both systems have the same function and are described on page 1.16 of your User’s Manual.

The organization of the individual hard disk is similar to a floppy disk and is also described on page 1.16 of your User’s Manual. However, a hard disk system may have more than one platter, and the system may use each side of each platter. Therefore, each side will have its own read/write head. Each head is in alignment with the heads for the other platters or sides, and all are moved together. Refer to Figure 1.

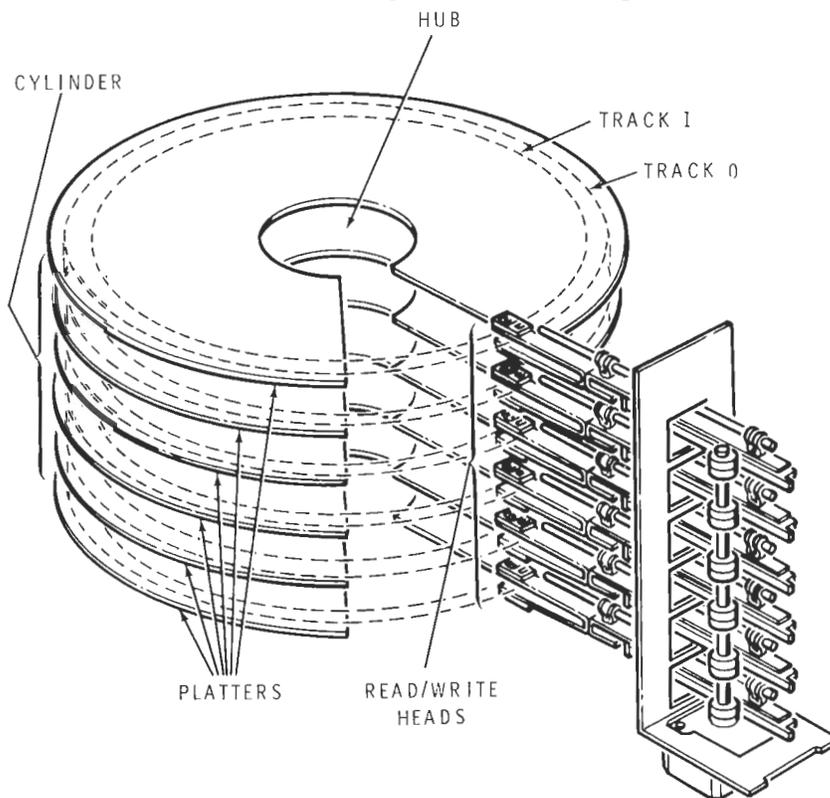


Figure 1
The Elements of a Hard Disk

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Hardware Features

A track is that portion of the disk that passes under a read/write head. If you have four read/write heads on four different platter sides, you will have four tracks that are passing under the heads at one time. These four tracks make up a "cylinder." A cylinder has as many tracks as there are heads in any particular hard disk system.

In addition to being divided into cylinders, tracks and sectors, a hard disk may be "partitioned." A partition is a group of tracks or cylinders that you use as a "logical" drive for a particular application or operating system.

A logical drive acts like a floppy disk. Because a partition is considered to be a logical drive, it will be treated the same as any individual floppy disk drive. It will be uniquely identified with a drive name, such as A or B. It may contain an operating system, such as CP/M®-85 or Z-DOS™, or may be used strictly for data storage.

The Winchester design in your Desktop Computer uses a single head per platter side and is totally sealed. But before you can use it, the disk surfaces must be prepared (formatted — like a floppy disk) and partitioned. You will find a diskette packed with your system that contains four utility programs: PART, PREP, SHIP, and VERIFY. You will use these programs to prepare and partition your system a little later in this documentation.

POWER UP

A Desktop Computer shipped from the factory is set up to "boot" from the Winchester disk. However, the first time you use your system, the Winchester will not be ready to use because it will not yet contain an operating system. It is also possible that it may not have been prepared or partitioned, although this will normally be done before the Winchester

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™Z-DOS is a trademark of Zenith Data Systems Corporation.

WINCHESTER SUPPLEMENT

Hardware Features

drive is shipped from the factory. Use the following procedure to start your system for the first time or whenever you do not want to "boot" from your Winchester drive.

If your Computer is set for auto boot and you do not see the hand prompt when you reset or turn on the system, disable the normal power-up sequence by pressing the **DELETE** key immediately. Once the screen warms up, it will display the message:

Boot Abort

and you will see the "hand prompt." You will also see the power-on indicator (in the RESET key) light.

You may now boot from the floppy disk drive and run the programs on either the Customer Demonstration Disk or the Utilities disk.

To use either diskette, follow these general instructions:

- Make sure your Computer is turned on and the hand prompt is showing. If your system is set for auto boot, remember to press the **DELETE** key to disable the power-up sequence from trying to access the Winchester disk. If your system does not display the hand prompt, refer to the "In Case of Difficulty" section on page 1.25 of the User's Manual.
- Refer to page 1.13 of the User's Manual and insert either the Customer Demonstration diskette or the Winchester Utilities diskette (with the label closest to you and facing up) into the floppy disk drive in your system. NOTE: Remove the tab that is covering the write protect notch if one is present on the Customer Demonstration diskette.

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Hardware Features

- Close the disk drive door and press the **B** key and then the **F1** key. You will see the following on the screen:

Boot f1

Press the **RETURN** key. The disk access indicator for the floppy disk drive will glow. After a moment, the first messages will appear on the screen.

- If you are using the Customer Demonstration diskette, turn to page 1.20 in your User's Manual for the messages and instructions.
- If you are going to use the Winchester Utilities diskette, read the next section, a discussion of how to use these four utilities.

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The Utilities

Four utility programs — PART, PREP, SHIP, and VERIFY — are supplied on a minimum system Z-DOS diskette. Two copies of the diskette are supplied, so you need not worry about “backing up” your diskette before you use it. Note, however, that the system on this diskette *is not* designed for normal Z-DOS use, and should be used only for these utilities.

The PREP utility is supplied so that you may initialize the surface of your Winchester disk should the need ever arise. It will also allow you to check for bad sectors and “lock out” any that are found. In addition, PREP will pre-allocate two “standard” partitions (described later) for immediate use.

The VERIFY utility is supplied so that you may check the surface of your Winchester disk for bad sectors and “lock out” any that are found. Where PREP destroys the data you have stored on your disk, VERIFY does not.

The PART utility is supplied so that you can redefine the partitions of your Winchester disk if those that are preset do not meet your needs.

The SHIP utility is supplied so you can place the heads in your system over an unused portion of the Winchester disk. This utility should be used whenever you move your Desktop Computer, even a short distance.

You should read pages 2.5 to 2.7 of the Z-100 Series User's Manual and then boot your Winchester Utilities disk as described in the “Power Up” section of this supplement. When you see the Z-DOS prompt on your screen, you are ready to run PREP, PART, SHIP or VERIFY.

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The PREP Utility

The surface of the Winchester disk must be initialized before you can use it in a system. This is similar to the **FORMAT** command and procedure discussed in the **Z-100 Series User's Manual**, except that typical operating system information (headers, labels, boot code and directories) for a specific system is not written onto the disk. In addition, PREP will test the surface and set up standard partitions. Two are set up — approximately equal in size — so it is not necessary to run the **PART** utility unless you want to use some other partitioning arrangement. Also, the disk will normally have been prepared at the factory as part of the final testing procedure, so you should not need to use PREP.

You need to be aware that while PREP does test the surface of the disk for retention of data, it will also destroy any data that you have recorded on the Winchester disk system. If you do not want to destroy the data on your disk, but still want to test the disk for data retention capabilities, you may run the **VERIFY** utility. This utility does not destroy the current data and partitions that are set up on your Winchester disk, but it does test for and flag those sectors that are bad so that they can be "locked out" later. See "The **VERIFY** Utility" for a discussion of this process.

Before you can run the PREP utility, you must install a jumper on the Winchester disk controller card in your Desktop Computer. If the jumper is not installed, your Winchester disk cannot be accidentally initialized. Therefore, the jumper (not installed) acts as a safety feature for any files that may be on the disk. If you wish to run PREP, refer to Appendix B (at the back of this Supplement) to install or remove the jumper.

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The PREP Utility

FEATURES OF PREP

The PREP utility enables you to:

- Initialize the surface of your Winchester disk.
- Test the data retention capabilities of your Winchester disk.
- Isolate questionable disk sectors.
- Divide the surface of the Winchester disk into two equal partitions (normally with one used for Z-DOS and one for CP/M).

PREP OPERATION

If your Winchester disk does not contain initialization information (for instance, the disk may not have been initialized or the information may be incorrect or damaged), PREP will prompt you to enter characteristics in order to identify the type of Winchester disk you have in your Desktop Computer. Then PREP will display messages that tell you what is happening as it “prepares” and tests your disk. A chart of typical Winchester disk parameters is supplied in Appendix A along with the specific answers that you should enter for each of the five prompts.

CAUTION: Using PREP will destroy all the files that may exist on your Winchester disk. Winchester disks supplied by Zenith Data Systems or Heath Company will normally have been prepared with PREP at the factory. If your disk has been prepared, you will need to use PREP only if you consistently encounter an unreasonable number of disk access errors. Do not use PREP until you have backed up the information on your Winchester disk to floppy disks.

- To start the PREP utility, type:

PREP

and press the **RETURN** key. You will see a display similar to the one illustrated in Figure 2.

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The PREP Utility

PREP version 1.00

Copyright(C) 1982, Zenith Data Systems

The PREP utility helps you to:

- initialize surface of Winchester disk
- test data retention capabilities of Winchester disk media
- isolate questionable disk sectors
- divide the surface of Winchester disk into two partitions of equal size (one Z-DOS partition and one CP/M partition)

PREP may prompt you to specify five Winchester disk characteristics in order to identify the type of Winchester drive you have installed. Then PREP displays messages as it operates on the disk.

CAUTION: Using PREP will destroy all files on your Winchester disk. Winchester disks supplied by Zenith or Heath are normally prepared by PREP before they are shipped. Users of these disks will need to use PREP only if they are consistently encountering an unreasonable number of disk access errors. Do not use PREP until you have transferred your Winchester disk files to floppy disks.

Do you wish to proceed with PREP (Y/N)?

Figure 2

The Introductory Display for PREP

At the bottom of the display, you will see:

Do you wish to proceed with PREP (Y/N)?

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The PREP Utility

If you press the **N** key, the program will be halted and control of the Computer will be returned to Z-DOS. If you press the **Y** key, PREP will continue operation.

- To exit PREP, press the **N** key. The Z-DOS system prompt will be displayed.
- To continue with PREP, press the **Y** key. You will see:

Please type P to proceed

This display gives you one last chance to change your mind. The reason for this second prompt is the nature of PREP. *PREP will destroy any and all information that has previously been recorded on the Winchester disk.*

- To continue with PREP, press the **P** key. If you press *any other* key, PREP will be stopped and you will see the Z-DOS system prompt.

If the disk has been previously prepared and PREP detects no errors in the boot code or “superblock” (explained later), then the following five disk parameter questions will be skipped and the tests will be run. However, if the disk has not been previously prepared or if an error is detected in the boot code or superblock, then you will be asked to enter five disk parameters. Your answers will depend upon the type of Winchester drive installed in your Desktop Computer. You will find a list of possible drives and the appropriate responses for each question listed in a table in Appendix A of this supplement.

In the examples that follow, the responses supplied are for the Miniscribe 2012 (the standard 10 megabyte drive supplied in Winchester versions of the Desktop Computer).

The screen will display:

Enter number of heads in hex:

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The PREP Utility

- Enter 4 (the hexadecimal equivalent of the number of read/write heads) and press the **RETURN** key. Next, the screen will display:

Enter number of cylinders in hex:

- This number is equal to the total number of tracks divided by the total number of read/write heads. Enter 132 (the hexadecimal equivalent of the number of cylinders) and press the **RETURN** key. The screen will now display:

Enter reduced write current cylinder in hex:

- Toward the hub of a hard disk, where the circumference of each track is smaller, some Winchester systems require that less electrical current be applied to the write head to avoid having magnetic pulses overlap adjacent tracks. The Miniscribe Mod II 2012 does not require reduced write current. Therefore, a value greater than the largest cylinder number will be entered. Enter 200 (the number in hexadecimal of the cylinder where the current applied to the write head is reduced to avoid overwriting track bounds) and press the **RETURN** key. Next, the screen will display:

Enter pre-comp cylinder in hex:

- Disk storage devices operate by creating magnetically polarized areas on the disk surface that correspond to the presence or absence of "bits" (the smallest unit of measure in computer data and memory) in the information being stored. Since "like" charges repel and "unlike" charges attract, it is possible for the charged areas on the disk surface, which represent the data, to "shift" slightly if they are closely spaced after being recorded. If such a shift occurs, reduced reliability will result.

Precompensation refers to the intentional shifting of data during the recording process so the combined result of precompensation and the natural shift (which cannot be prevented) places the data in the desired position. On

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The PREP Utility

the outer tracks of the disk, the spacing between bits is great enough so no significant shifting occurs and precompensation is not required. However, since the inner tracks have a smaller circumference, the bits are closer together and precompensation is required to maintain acceptable reliability. Enter 80 (the cylinder number where precompensation must start) and press the **RETURN** key. Next, the screen will display:

Enter step rate code in hex:

- Enter 1 (the rate code in hexadecimal at which the read/write heads “step” between tracks) and press the **RETURN** key.

Now that you have supplied the necessary information for your hard disk, the program will initialize the surface of the disk for the tests that follow. The initialization process is similar to that used by the Z-DOS and CP/M-85 FORMAT utility in that the surface of each disk is organized into tracks and sectors. In addition, a “map” is also prepared for keeping track of any sectors that are found to be bad.

During the initialization process, you will see the following display on the screen:

Initializing the disk...

If you have not installed the jumper on the controller board, the system will immediately display:

Error during formatting of the drive.

and return to the Z-DOS prompt; the disk will not be affected. Remember, to run the PREP utility, you must install the jumper on the controller board as explained in Appendix B.

When the disk has been fully initialized, you will see:

...completed

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The PREP Utility

Now the disk will be tested seven times. Each test is known as a “pass.” The seven passes of the test that are now performed are conducted to check the integrity of the disk’s storage capacity. During each pass, PREP will “write” a pre-determined code in each sector (the LED drive access light will flicker) and then will “read” back that code to verify that it remained correct (the LED drive access light will appear to be constantly on). PREP will keep you informed of its progress by displaying the message:

Media test in progress. Pass *n*

where *n* represents the current pass number. This phase of PREP takes about an hour and a half because of the large number of sectors on the Winchester disk system.

PREP uses a different code on each pass it makes through the test. If PREP finds questionable areas on the disk, it stores the address where the error occurred, and later places these addresses into a bad sector table.

When PREP has finished the seven passes, two “superblocks” and two bad sector tables are recorded on the disk. While it is doing this, you will see:

Initializing the disk...completed

A “superblock” is a portion of the disk surface (on cylinder 0) that is used to keep track of the disk “partition” names, the operating system name assigned to each partition, a flag that is used to show whether the partition has been formatted or not, and a pointer (or number) for the first sector of that partition. The superblock is recorded twice on the Winchester disk. Each copy is written with a different disk head so that the copies are physically isolated from each other. If something occurs to damage one copy of the superblock, the other may remain usable.

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The PREP Utility

During the test passes, PREP kept a record of any bad sectors. After the tests are finished and the superblocks have been written, PREP will write the bad sector table. As with the superblock, the table is recorded twice, each with a separate read/write head. The bad sector tables are used to “flag” all known bad sectors and “lock them out,” or prevent them from being used by the system for data storage. It is normal to have a small number of bad sectors out of the five to twenty *thousand* located on the typical Winchester disk.

When the tests are completed, PREP will return control to the minimum Z-DOS system and you will see the Z-DOS prompt. Remember, since this is a minimum operating system, do not use it for normal operation.

- Remove the Format Enable jumper as explained in Appendix B of this Supplement. *Do not* proceed with any other operations until you have removed the jumper and replaced it in its proper place on the board.

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The VERIFY Utility

The VERIFY utility enables you to verify the integrity of your Winchester disk. However, the tests performed by the system are not “destructive.” That is, they will not destroy the data that is recorded on your disk.

Several things could cause a sector to “go bad” during normal operation of your system. They include subjecting the Computer system to a physical shock (most common cause of sector failure), power failure during the middle of a disk operation (unlikely), or electronic component failure (very rare). When a power failure causes a sector to go bad, you may be able to recover the use of that sector by reformatting the partition, just as you would reformat a floppy disk. However, you will want to use the BACKUP utility before you do this. See the discussion on BACKUP and RESTORE found later in this supplement.

When a bad sector is located by the VERIFY utility, its location will be stored in memory. At the end of the test, those sectors that are found to be bad are added to the bad sector table that was established by the PREP utility. However, the bad sector(s) located by VERIFY will *not be* “locked out” until you run your Z-DOS or CP/M-85 FORMAT program and reformat the partition.

One advantage of VERIFY is that you can use the utility to check your disk if you *suspect* that you have one or more bad sectors. If none are found, the system will let you know, and you can continue to use your programs without having to go through the BACKUP and RESTORE processes described later in this supplement.

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The VERIFY Utility

VERIFY OPERATION

- To use the VERIFY utility, boot the Utilities disk and type:

VERIFY

and press the **RETURN** key. You will see a display similar to that shown in Figure 3.

```
VERIFY version 1.00
Copyright(C) 1982, Zenith Data Systems
```

The VERIFY utility helps you to:

- Locate sectors that have failed since you last ran PREP

Do you wish to proceed with VERIFY (Y/N)?

Figure 3

The VERIFY initial display

At the bottom of the display, you will see:

```
Do you wish to proceed with VERIFY (Y/N)?
```

If you press the **N** key, the program will be halted and control of the Computer will be returned to Z-DOS. If you press the **Y** key, VERIFY will continue operation.

- To exit VERIFY, press the **N** key. The Z-DOS system prompt will be displayed.
- To continue with VERIFY, press the **Y** key. You will see:

```
Enter bad sector address, or zero to end:
```

WINCHESTER SUPPLEMENT

The VERIFY Utility

Some operating systems will display bad sectors that are detected during normal operation. This prompt will allow you to enter the sector addresses that your system has detected and add those to the bad sector table. Note, however, that particular sectors may be identified by the operating system with a logical address within a partition and may not represent the same real sector as identified by VERIFY. *Both CP/M-85 and Z-DOS report the same address as identified by VERIFY and not a logical address within the partition.*

- To enter a bad sector address, type the address number and press the **RETURN** key. The prompt will reappear, allowing you to continue to enter additional bad sector addresses.
- To end entering bad sector addresses, press the **Q** key and then the **RETURN** key. The system will start testing the disk and will display:

Beginning verification...

When the test is finished, the display will add:

...completed

to the end of the verification message. If no bad sectors were located, the system will display:

No bad sectors located.

and then return to Z-DOS and display its prompt.

If bad sectors were found, then the system will display:

Bad sectors located. Tables modified.

This message tells you that there were bad sectors located on your Winchester disk. However, they have only been flagged at this time and you may continue to access them, though you will probably experience difficulties when your programs attempt to use those sectors.

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The VERIFY Utility

You should now back up your Winchester disk with the BACKUP utility and then reformat your disk partitions using the appropriate operating system(s). This operation will "lock out" the bad sectors so that you may be assured of continued high performance from your Winchester system.

While this discussion has stressed what to do with bad sectors, the actual need for this utility (as well as the other utilities on this disk) will be minimal once your system has been in use for a month or two. Failures due to contamination from smoke and dust particles found in the air around your Computer are rare because the Winchester disk is entirely sealed. However, a small number of sector failures is normal when a disk is new. Manufacturers consider a Winchester disk to be acceptable if it has less than 20 errors. It is not unusual for a drive to develop several additional bad sectors during the first month or two of regular operation.

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The PART Utility

The PART utility enables you to change the names, number, and sizes of Winchester disk partitions. It also allows you to specify which partition you want accessed when your Computer boots up.

PARTITIONS

Winchester disks distributed by Zenith Data Systems and Heath Company have a very large storage capacity when compared to floppy disks. To make practical use of all this storage space, partitions divide the disk space into more manageable sizes. You can establish up to 16 partitions on your Winchester disk. Each partition will be treated like an individual disk. Therefore, you may have different operating systems (for example, Z-DOS and CP/M) on different partitions. However, you may not have two different operating systems on the same partition.

Each of the two standard partitions that exists on your Winchester disk when it is shipped from the factory occupies approximately one half of the total available Winchester disk space. Each has been assigned a distinct name: CPM and Z-DOS. Both represent popular operating systems that are sold by ZDS for the Z-100. Therefore, you do not need to run PART before you can use your Winchester disk. If two equal partitions meet your needs, then proceed to the "Installing Operating Systems" section. Note that there is no requirement that requires you to use Z-DOS and CP/M on these partitions, in spite of the names given to them.

CAUTION: If you make any changes to the number or size of the partitions on your Winchester disk with either PART or PREP, you may destroy existing data on the disk. Therefore, if you have previously used the drive for data storage, you should back up all necessary files from each partition before using the PART program.

WINCHESTER SUPPLEMENT

The PART Utility

NOTE: The capacity of your Winchester disk is affected by a number of factors that were discussed in the hardware section of this supplement. Also affecting the total usable capacity is the number of sectors that were locked out during the operation of the PREP utility.

FEATURES OF PART

The PART utility enables you to establish and/or change the following:

- The name of each partition.
- The name of the operating system to be used with each partition.
- The percent of disk space allocated to each partition.
- The name of the partition that is selected when you boot your computer system.

PART OPERATION

In this part of the Winchester supplement, you will learn how to use the PART utility. If you are going to establish several new partitions or rearrange existing partitions, then you will enter partition and operating system names and establish the amount of disk space for each partition. If you are setting up a new default boot drive, then you will only have to specify the desired partition.

When you see the Z-DOS prompt on your screen as described previously, you may start PART.

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The PART Utility

To start the PART utility, type:

PART

and press the **RETURN** key. The screen illustrated in Figure 4 will be displayed.

```

PART version 1.00
Copyright(C) 1982, Zenith Data Systems

The PART utility helps you to:

• change the arrangement of your Winchester disk partitions and/or
• select a partition (default boot partition) to which you can
  boot up without specifying the partition name

PART displays a table showing the names of each partition (a
partition name and a system name) and the amount of disk space
allocated to each partition (in percentages and in kilobytes). PART
also dynamically calculates and totals the size of all partitions
as you specify each partitions allocation percentage

CAUTION: Using PART can destroy all files on your Winchester disk.
Do not use PART until you have transferred copies of your Winchester
disk files to floppy disks.

Proceed (Y/N)?
```

Figure 4
The Introductory Display for PART

At the bottom of the display, you will see:

```
Proceed (Y/N)?
```

If you press the **N** key, the program will be halted and control of the Computer will be returned to Z-DOS. If you press the **Y** key, PART will continue operation.

WINCHESTER SUPPLEMENT

The PART Utility

CAUTION: The PART utility may destroy some of the information that you have stored on your Winchester disk. Do not use PART until you have transferred your existing Winchester disk files to floppy disks.

If you have existing files on your Winchester disk that need to be transferred to floppy disks, you should press the **N** key to stop PART. Then use the appropriate utility (supplied with your operating system) to back up the files on your Winchester disk.

NOTE: You can use PART to select a different “default boot partition” without destroying software or data. However, you should not attempt to do this if you are unsure about the procedure. To be safe, back up your important disk files first.

You may now use the following procedure if you are setting up your Winchester disk for the first time, if you have backed up all important files, or if the existing files on the Winchester disk are unimportant.

- To exit PART, press the **N** key. The Z-DOS system prompt will be displayed.
- To continue with PART, press the **Y** key. The screen will clear and you will see a display similar to that illustrated in Figure 5.

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The PART Utility

| Partition Name | Operating System Name | Percentage | Kilobytes |
|---|-----------------------|--------------|-----------|
| 1. Z-DOS | Z-DOS | 50 | 5000 |
| 2. CPM | CPM | 50 | 5000 |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| 13. | | | |
| 14. | | | |
| 15. | | | |
| 16. | | | |
| Total Utilization (Allocated/unallocated) | | 100/0 | 10000/0 |
| Default boot partition number: 1 | | <Z-DOS;Z-DOS | > |

B - Modify default boot partition
P - Partition maintenance
E - Exit

Choose desired option. <B, P or E>_

Figure 5
Sample Initial Display

WINCHESTER SUPPLEMENT

The PART Utility

The display illustrated in Figure 5 shows the partition name, operating system name, percentage of disk space, and size in kilobytes for each partition. The total percentage, and the number of kilobytes currently allocated and not allocated on the disk, are shown at the bottom of the table.

You will also see the number of the partition that is assigned to be the default boot partition (if one is assigned), its name and operating system. Below that there is a short "menu" that will allow you to select a different default boot partition, change the arrangement of your Winchester disk partitions, or exit from the PART utility. Your choice is entered by pressing the **B**, **P**, or **E** key.

The display is similar to the one that will appear the first time you run PART on a new Heath/Zenith Data Systems Z-217 Winchester disk, or immediately after you have run the PREP utility. If you have already used PART, then portions of your display may vary from the one illustrated in Figure 5.

Modifying the Default Boot Partition

The "default boot partition" is the one that will be selected when you boot your system without specifying a partition name (as with an auto boot operation). (In order to select any other partition during the boot process, you must specify the partition name, and sometimes the system name, in the boot command.)

- Press the **E** key to modify the default boot partition. The menu that was displayed at the bottom of the screen as shown in Figure 5 will disappear. The cursor will move to the current default boot partition number as shown in Figure 6.

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```

.
.
.
Total Utilization (Allocated/unallocated)      100/0      10000/0
Default boot partition number: _

      B - Modify default boot partition
      P - Partition maintenance
      E - Exit
Enter the number of the default boot partition.

```

Figure 6

Entering a Default Boot Partition

When the cursor moves to the default boot partition number, you will see the current partition number and name disappear. You may now enter the number of the partition that you want to be selected by the boot process. You will also see a prompt to, "Enter the number of the default boot partition," at the bottom of the screen.

- Enter the number of the partition that you want to establish as the default boot partition, and press the **RETURN** key. The number must be in the range 1 to 16 and have a partition name established in the table. Once you enter the number and press **RETURN**, the partition and system names will be displayed between the angle brackets.

A disk that has just been prepared with the PREP utility will be set up with two partitions. The default boot partition will be set to 1 (Z-DOS). To change the default boot partition to partition 2 (CPM), enter:

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and press the **RETURN** key. Your screen will be similar to that illustrated in Figure 7.

```

.
.
.
Default boot partition number: 2  <CPM;CPM  >
  B - Modify default boot partition
  P - Partition maintenance
  R - Restore to original partitions
  E - Exit
Choose desired option. <B, P, R or E>
```

Figure 7

Display After Selecting a Default Boot Partition

If you try to enter a number for which there is no established partition on the table, the Computer will simply not accept your entry and the cursor will remain at the number position until you enter a valid number and press **RETURN**.

To retain the current default boot partition number press the **RETURN** key. The number and names of the current default boot partition will be redisplayed, and the cursor will move to the "Choose desired option" prompt at the bottom of the display as shown in Figure 7.

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If you do not want to have a default boot partition, press the **SPACE BAR**. Your screen will be similar to that illustrated in Figure 8.

```
Default boot partition number: is undefined
B - Modify default boot partition
P - Partition maintenance
R - Restore to original partitions
E - Exit
Choose desired option. <B, P, R or E>
```

Figure 8

Display After Selecting no Default Boot Partition

Instead of a partition number and name, the message, “is undefined,” will be displayed. Now when you boot the system, you will have to enter bootup commands that specify partition names (and possibly also operating system names) in order to boot up with any partition.

Partition Maintenance

This description of the “Partition Maintenance” section will show you how to add partitions, remove partitions, change the names of partitions, and change the percentage of space allocated to each partition. After you have finished with partition maintenance, you will then be prompted to select a default boot partition just as if you had selected that option from the initial menu.

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- To select the partition maintenance option, press the **P** key whenever your display is similar to Figure 5, 7, or 8. Your screen will be similar to the one illustrated in Figure 9.

| Partition Name | Operating System Name | Percentage | Kilobytes |
|---|-----------------------|--------------|-----------|
| ----- | ----- | ----- | ----- |
| 1. <u>Z</u> -DOS | Z-DOS | 50 | 5000 |
| 2. CPM | CPM | 50 | 5000 |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| 13. | | | |
| 14. | | | |
| 15. | | | |
| 16. | | | |
| Total Utilization (Allocated/unallocated) | | 100/0 | 10000/0 |
| Default boot partition number: 1 | | <Z-DOS;Z-DOS | > |

Minimum allocation = 2%

Figure 9
Initial Partition Maintenance Display

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The cursor will be positioned over the first character of the first partition's partition name in the table. The partition name may be up to 16 characters in length and may contain any printing character except the semicolon (;). The following are all valid partition names:

CP/M_ACCOUNTING
DATABASE
WORD/PROCESSING
George
Spread-sheet
Z-DOS_ACCOUNTING
Thelma
BASIC

The Partition Name

At this time, you may choose to change the partition name, delete the partition, or leave it alone.

To change the partition's name, type the new name. If you use lower case letters, they will be converted to upper case. While entering the new name, you will see several things happen.

- The old partition name will be erased when you press the first letter of the new name.
- The **BACK SPACE** key will operate normally, moving one character to the left and erasing the character under the cursor. When you use the **BACK SPACE** key to erase the first letter of the new name that you have typed, the letter will be removed and the old partition name will reappear.

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The PART Utility

- If you press only the **RETURN** key, the partition name will remain unchanged while the cursor moves to the next column, the operating system name.
- If you press the semicolon key or the **TAB** key and then press the **RETURN** key, the partition name will disappear while the other features of that partition remain the same. However, after you have finished making all the entries for this partition, the old partition name will reappear.

NOTE: Avoid giving two partitions the same partition names unless you plan to give them different operating system names. Even though PART will not flag the error immediately, you will see the “duplicate name error” message after you make the default boot partition entry.

- If you want to delete all the entries for this partition, press the **SPACE BAR**. The remaining information in the table will move up one row. If you remove a partition that was assigned as the default boot partition, then the “is undefined” message will be displayed for the default boot partition until a new default boot partition is selected. If you then attempt to bypass setting the default boot partition, the “boot partition error” message will be displayed until you properly specify a default boot partition.
- If you do not want to make a change to the partition name, do not make any entries; press the **RETURN** key.
- If you wish to alter the partition name, type the new name and press the **RETURN** key.

Once you press the **RETURN** key, the cursor will move to the next column, the operating system name.

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The PART Utility

An operating system name may be up to 10 characters in length and may contain any printing character except the semicolon (;). NOTE: Z-DOS requires that you use "Z-DOS" (as it is spelled here) as the operating system name for those partition(s) that you plan to use with Z-DOS. At the present time, you may use any name you choose for the CP/M operating system, or you may optionally choose to use no name. Operating system names are not mandatory except in the case of Z-DOS. However, if you use the same partition name for more than one partition, each partition must then have a different operating system name. The following are typical examples of operating system names:

CPM
Z-DOS
USER-DOS
OTHER-DOS

At this time, you may choose to change the operating system name or leave it alone.

To change the operating system name, type the new name. If you use lower case letters, they will be converted to upper case. While entering the new name, you will see several things happen.

- The old operating system name will be erased when you press the first letter of the new name.
- The **BACK SPACE** key will operate normally, moving one character to the left and erasing the character under the cursor. When you use the **BACK SPACE** key to erase the first letter of the new operating system name that you have typed, the letter will be removed and the old operating system name will reappear.
- If you press only the **RETURN** key, the operating system name will remain unchanged while the cursor moves to the percentage column.

The Operating System Name

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The PART Utility

- If you press the semicolon key or the **TAB** key and then press the **RETURN** key, the operating system name will disappear while the other features of that partition remain the same. However, after you have finished making all the entries for this partition, the old operating system name will reappear.

NOTE: Avoid giving two partitions the same operating system names unless you give them different partition names. Even though PART will not flag the error immediately, you will see the “duplicate name error” message after you make the default boot partition entry.

- If you do not want to make a change to the partition name, do not make any entries; press the **RETURN** key.
- If you wish to alter the operating system name, type the new name and press the **RETURN** key.

Once you press the **RETURN** key, the cursor will move to the percentage column.

The Percentage Column

The amount in the percentage column indicates the percent of the total available disk space that has been allocated for that partition. It is expressed as a whole number in the range from the minimum allocation figure displayed at the bottom of the screen (see Figure 9) to 100. With the cursor in the percentage column, you may enter a new figure or leave it alone.

PART will automatically calculate the number of kilobytes that are represented by the figure that you enter, and record that quantity in the next column. The total disk space that is allocated (to be used) and not allocated (not to be used) in percent and kilobytes will also be calculated and displayed at the bottom of the table.

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If you enter a figure for one of the first 15 partitions that will bring the total disk space used to 100 percent, then the cursor will move to the next partition's row in the table (whether this partition has been established or not). But if you are entering a figure for the 16th partition, then the cursor will move to the default boot partition selection position as illustrated in Figure 6.

If you enter a figure for one of the first 15 partitions that will bring the total disk space used to less than 100 percent, then the cursor will move to the next partition's row in the table (whether this partition has been established or not) *and* the total allocation figures will display the amount of "unallocated" space in reverse video (dark characters on a light background).

If you establish 16 partitions on your disk, and have not allocated all of the available disk space by the time you enter the percent figure for the 16th partition, PART will automatically allocate the remaining disk space to the 16th partition. If you have established fewer than 16 partitions, it is possible to exit PART with a portion of your disk not allocated to any partition. The only way that you can then access that portion of the Winchester disk is to allocate that percentage to a partition through subsequent use of PART.

If you attempt to enter a figure that will bring the total disk allocation to more than 100 percent, PART will lower your entries (starting with the bottom of the table) so that the total never exceeds 100 percent. In some cases, you may find that some partitions (at the bottom of the table) end up with zero percent of the disk allocated to them.

The minimum allocation figure, which will vary depending on the disk capacity, will always be displayed at the bottom of the screen whenever you can enter a percent figure. If you enter a figure lower than the minimum allocation figure for

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your disk, you will not be able to complete the operation until you have entered a value that is equal to or greater than the minimum figure. While entering the new figure, you will see several things happen.

- The old percent figure will be erased when you press the first number of the new figure.
 - The **BACK SPACE** key will operate normally, moving one character to the left and erasing the character under the cursor. But, when you use the **BACK SPACE** to erase the first number entered, the amount will remain blank (unlike the partition and operating system names which reappear). If you press the **RETURN** key at that point, the old value will be restored when the screen is redrawn.
 - If you press only the **RETURN** key, the value will remain unchanged while the cursor moves to the next row's partition name (if you are currently working on one of the first 15 partitions) or the default boot partition area (if you are currently working on the 16th partition).
- If you do not want to make a change to the current figure, do not make any entries; press the **RETURN** key.
- If you wish to alter the value, type the new value and press the **RETURN** key.

Once you press **RETURN**, the cursor will move to the partition name position for the next partition, unless you have just finished with the last (16th) partition in the table, in which case the cursor will move down to the default boot partition entry position.

NOTE: If you have two partitions with identical names, and one is the default boot partition, PART will always select the partition with the lowest partition number in the table as the default boot partition (even if the highest partition number was

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previously selected). For example, if you have two Z-DOS partitions, one in partition number 2 and one in partition number 5, PART will always select partition number 2 as the default boot partition even you attempt to select partition number 5.

You may continue to modify, delete or leave unchanged the remaining partitions, and when you have finished with all the previously allocated partitions, you may enter new partitions. When all partitions have been selected, then enter your choice of the default boot partition (or leave it undefined).

If you find the cursor in the partition name column of an unused partition (one for which there is no information) and you do not want to establish any more partitions, press the **RETURN** key. The cursor will advance directly to the default boot partition area where you can establish the default boot partition of your choosing.

Finishing PART

After you complete any PART operation (such as "Modify default boot partition" or "Partition maintenance"), the menu at the bottom of the screen will display four options as illustrated in Figure 8. The first two options, B and P, have already been discussed.

NOTE: If you have created an error condition, the E option may not be displayed. Therefore, you must select an operation and correct the error.

Now is a good time to review your choices. If you do not like what you see on your display, you may restore the partition table to its original condition upon starting PART or, if everything meets your satisfaction, you may exit PART and record your choices permanently.

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- To restore the partition table to its original condition, press the **R** key. The screen will redisplay the original table. You may now reenter your choices. NOTE: The menu will no longer display the "R – Restore original partitions" option.
- To begin the exit process, press the **E** key. The screen will show you two choices:

M - Make changes and exit

A - Abort, make no changes and exit

Choose desired option. (M or A)

If you press the **M** key to make the changes (you have selected) to the Winchester disk, you need to be aware that any data you have on the disk could be lost. Make sure that you have backups of your files before you select this option.

- Press the **M** key to complete the changes and record them on the Winchester disk.
- Press the **A** key to exit PART without making any changes to the current partitioning arrangement on the Winchester disk.

After either operation, the Z-DOS prompt will be displayed. Remember this is not a complete version of Z-DOS; do not use it for normal operation.

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Installing Operating Systems

The operating systems currently available for the Z-100 from Zenith Data Systems are Z-DOS (Zenith Disk Operating System) and CP/M-85 (Control Program for Microcomputers). This section of the Winchester Supplement will let you initially install either operating system on your Winchester and prepare it so that you may boot directly from the Winchester disk.

For the moment, assume that you are going to use the Winchester disk as it is shipped from the factory. There are two partitions: one called Z-DOS and one called CPM. First you will use PART to establish the default boot partition for one of the two operating systems. Then you will install Z-DOS and CP/M.

ESTABLISHING THE DEFAULT BOOT PARTITION

- Use your Utilities disk and run PART as previously described.
- Press the **B** key to select option B of the menu to establish the default boot partition.

You may press the **1** key to select the Z-DOS operating system or the **2** key to select the CP/M operating system as the default system to be used when booting from the Winchester disk.

- Press the **E** key to quit PART and press the **M** key to make the changes and exit to the operating system.

NOTE: Before you attempt to install *any* operating system on your Winchester disk system, you must remove the Winchester Utilities disk and reboot your system using the operating system that you wish to install. For instance, if you wish to install CP/M, you will have to boot your system with CP/M Distribution Disk I. If you wish to install Z-DOS, you will have to boot your system with Z-DOS Distribution Disk I.

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Z-DOS

NOTE: Unless you have previously duplicated your Z-DOS Distribution Disks with the MAKE utility, your Desktop Computer will start a duplication process when you boot from your Z-DOS Distribution Disk I. Use the following instructions to install Z-DOS on your Winchester system.

- Turn on your Computer (if it is not already on), place your Z-DOS Distribution Disk I (you must have Z-DOS BIOS version 1.10 or later) in the floppy disk drive, and close the door.
- If your Computer is not set up to boot from the floppy disk, press the **DELETE** key to stop any auto boot process. Then press the **B** key and then the **F1** key, followed by the **RETURN** key.

In a moment, the Z-DOS initial messages will appear and you will be asked to enter the date. If your disks have not been previously duplicated using the automatic MAKE utility installed on your distribution disks, you must press the **CTRL** and **C** key simultaneously. You will be asked if you want to discontinue the batch process. Press the **Y** key and then the **RETURN** key. The Z-DOS prompt will appear.

- Type

```
FORMAT E: /S/V
```

and press the **RETURN** key. The E represents the first Z-DOS Winchester partition (under Z-DOS, drives A and B are assigned to the built-in floppy disk, drives C and D are assigned to the external 8" drives if present, and drives E and F are assigned to the two Winchester partitions). The /V switch will locate any bad sectors and lock them out of the system. The /S switch will establish the operating system on the disk. You will see:

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Format version 1.6

Will format partition assigned drive E:
Strike any key when ready

- Press any key. You will see the Winchester disk access light come on while the disk is being formatted. When it has completed the operation, you will have created a minimum operating system on the Winchester disk. A message will be displayed informing you of the total number of bytes on the partition, the number of bytes used by the system, and the number of free bytes for your files. If any sectors were locked out, that information will also be displayed.

- Type the following:

```
COPY A: *.* E:
```

The E: in the command represents the first Winchester drive partition.

- Press the **RETURN** key. You will see each file displayed as it is transferred and the total number of files copied. Repeat the COPY command for each Z-DOS distribution diskette.

NOTE: If you copied the Z-DOS Distribution Disks directly to your Winchester disk system, you need to delete one file to prevent the automatic duplication process from taking place every time you boot your Winchester disk.

- Type:

```
ERASE E: AUTOEXEC. BAT
```

- and press the **RETURN** key.

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Installing Operating Systems

Booting from the Winchester

NOTE: This boot procedure assumes that you have assigned a Z-DOS partition as the default boot partition. If you have not assigned any partition as the default boot partition, read the section entitled, "Booting from the Winchester — No Default Boot Partition."

At this point, you may boot your Computer from the Winchester disk. Use the same procedure to boot your Computer as you would if you were using a floppy disk. The only difference is that the Winchester cannot be removed from the system, and so it is ready to go when you turn on or reset your Computer.

If your Computer is not set up to boot from the Winchester disk, you will have to press the **DELETE** key to stop any auto boot process and then press the **B** key and then the **F3** key, followed by the **RETURN** key. The Winchester LED disk access indicator will light and in a moment, the Z-DOS initial messages will appear, along with the Z-DOS prompt. You have booted your system from the Winchester. You may now use any Z-DOS program or utility you want.

CP/M-85

You should become somewhat familiar with various CP/M utilities and options by reading about them in your CP/M-85 documentation. To prepare the Winchester CP/M partition and use it to boot up CP/M, proceed with the following instructions.

- Turn on your Computer (if it is not already on), place your CP/M-85 Distribution Disk I (you must have CP/M version 2.2.101 or later) in the floppy disk drive, and close the door.

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- Reset your Computer by pressing the **CTRL** and **RESET** keys at the same time and then releasing them. If your Computer is set up for auto boot, press the **DELETE** key to disable this feature. You should see the hand prompt in the upper right-hand corner of the screen.
- Press the **B** and **F1** keys. Your screen will display:

Boot f1

Press the **RETURN** key. The floppy disk drive LED access indicator will come on and in a moment your screen will display a message similar to:

CP/M-85 VERSION 2.2.101 01/28/83

A>

The **A>** is the CP/M system prompt. You must now “assign” your system to work with the CP/M partition.

- If you *do not* have 8” diskettes connected or turned on, type the following:

```
ASSIGN C: =CPM
```

- If you *do* have 8” disk drives connected to your system and turned on, type:

```
ASSIGN E: =CPM
```

ASSIGN is a CP/M command that will let you access a partition by name. In this case, you want to be able to set up the partition that has been named CPM by the PREP utility. If you are going to work with a different CP/M partition at this time, you would use that partition’s name in place of CPM as illustrated. The reason two different disk names (C: or E:) are shown is that CP/M is a dynamic

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operating system and assigns disk designators at the time of bootup. Two names are assigned by CP/M to each of the floppy disk systems that are connected to the system. The names A: and B: are always assigned to the built in drive (even if only one is present as is the case with the Winchester system). If external 8" drives are present, then C: and D: are assigned to those drives and E: and F: are assigned to the Winchester disk. If no 8" system is present, then C: and D: are assigned to the Winchester disk.

- Press the **RETURN** key. The CP/M prompt will reappear. You are now ready to format the partition.

- Type:

FORMAT

and press the **RETURN** key. The following will be displayed:

CP/M-85 Format Version 2.2.101

This program is used to initialize a disk.

All information currently on the disk will be destroyed.

Is that what you want? (y/n)

- Press the **Y** key. The display will show:

Which drive do you wish to use for this operation?

- You will enter either C or E as you did in when you selected the CP/M partition with the ASSIGN command. Your display will show:

Will format partition assigned to drive C:

Press RETURN to begin, anything else to abort.

The C will be replaced by an E if you entered an E instead of a C for the previous prompt.

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- Press the **RETURN** key. The Winchester disk access indicator will light while the partition is being formatted. When the process is finished, you will see:

```
Do you have any more disks to format? (y/n)
```

- Press the **N** key. The CP/M prompt will reappear. Now you will place the CP/M BIOS on the disk.
- Type the following:

```
MVCPM217
```

and press the **RETURN** key. You will see the following:

```
MVCPM217 VERSION 2.2.101  
  
CONSTRUCTING 64k CP/M vers 2.2  
READY FOR "SYSGEN" OR  
"SAVE 38 CPM64.COM"  
A>
```

You must now perform the SYSGEN operation before you attempt *any* other command.

- Type the following:

```
SYSGEN
```

and press the **RETURN** key. You will see displayed:

```
CP/M-85 SYSGEN VER 2.2.101  
SOURCE DRIVE NAME (OR RETURN TO SKIP):
```

- Press the **RETURN** key. The information is stored in memory as a result of the MVCPM217 operation. The display will now show:

```
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

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- Press the **C** or **E** key as you have done for the **FORMAT** command. You will see a display similar to:

DESTINATION ON C, THEN TYPE RETURN

The **C** will be replaced with an **E** if you had pressed the **E** key. Since the disk is permanently mounted, press the **RETURN** key.

CP/M will place the operating system on your Winchester disk. You will see:

FUNCTION COMPLETE

DESTINATION DRIVE NAME (OR RETURN TO REBOOT):

- Press the **RETURN** key. The CP/M-85 prompt will appear on your screen.
- Type the following for non-8" systems:

```
PIP C: =A: *.* [RV]
```

or the following for 8" systems:

```
PIP E: =A: *.* [RV]
```

and press the **RETURN** key. The PIP utility is similar to the **COPY** utility in Z-DOS. With CP/M you will see the name of each CP/M file as it is copied. When it is finished, you will see the CP/M prompt appear once again. You have completed the preparation of the CP/M partition for booting.

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Booting from the Winchester

NOTE: This boot procedure assumes that you have assigned a CP/M partition as the default boot partition. If you have not assigned any partition as the default boot partition, read the section entitled, "Booting from the Winchester — No Default Boot Partition."

At this point, you may boot your Computer from the Winchester disk. Use the same procedure to boot your Computer as you would if you were using a floppy disk. The only difference is that the Winchester cannot be removed from the system and so it is ready to go when you turn on or reset your Computer.

If your Computer is not set up to boot from the Winchester disk, you will have to press the **DELETE** key to stop any auto boot process and then press the **B** key and then the **F3** key, followed by the **RETURN** key. The Winchester LED disk access indicator will light and in a moment, the CP/M-85 initial messages will appear, along with the CP/M prompt. You have booted your system from the Winchester and may now use any CP/M-85 compatible program or utility of your choosing.

Booting from the Winchester — No Default Boot Partition

If you have not established a default boot partition, you may boot from any partition by following this sequence of operations:

- Press the **B** key and the **F3** key in sequence.
- Type a colon (:) and the name of the partition that you wish to boot the computer from, and then press the RETURN key.

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If you typed the correct name of the partition and there is an operating system on that partition, your Computer will boot from that partition.

If you did not type the correct name of the partition, or if you did not type the name of any partition, an error condition will be created and you will see on your screen:

Error - Partition not found. Type RETURN to continue.

- Press the **RETURN** key. Now the system will display all of the valid partition names and operating system labels that were assigned by PREP or when you used the PART utility.

You may boot your system from any partition that contains an operating system by typing the partition name (for instance, Z-DOS) and pressing the **RETURN** key.

If you have selected a partition that has not been formatted, the hand prompt will reappear on your screen. The system may be booted as previously described.

If you have selected a partition that has been formatted, but did not contain an operating system, the operation of your Desktop Computer will be the same as if you had attempted to boot your system from a formatted disk that had no operating system on it. Consult your respective operating system manual for more information.

OTHER OPERATING SYSTEMS

From time to time, Zenith Data Systems will release additional operating systems that you may want to use with your Winchester drive. Documentation will be included with those systems that will tell you how to install them on your Winchester drive.

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Installing Application Packages

Do not attempt to follow the software installation procedure described in your software documentation. In most cases, the documentation was written for a one or two-drive floppy disk system.

You may establish one or more Winchester partitions with the PART utility for use with Z-DOS, CP/M-85, and/or other operating systems. In the following discussion, references will be made to partition numbers which correspond to those used by the PART utility.

Disk Drive Name Assignment

Under **Z-DOS**, drive name E is assigned to the first Winchester Z-DOS partition and drive name F will be assigned to a second Winchester Z-DOS partition if it is available.

When Z-DOS is booted from a floppy disk, the first two available Z-DOS partitions (having the lowest partition numbers) can be accessed by the system. If you choose to boot from a Winchester partition, then it, and if available, the next higher numbered Z-DOS partition can be accessed by the system. Note that in both cases, partitions with other operating systems may reside between the Z-DOS partitions; selected Z-DOS partitions do not need to share a common border.

Most Z-DOS-based application software is set up to operate in the dual floppy disk environment where drive A represents the first 5.25-inch floppy disk drive and drive B represents the second. Therefore, once your software is installed (placed) on a Winchester partition, you will need to remap (with the Z-DOS MAP command) drive names A and B to the respective partition(s). Note that you may remap both drive names to the same partition. You can use a BATCH file for this purpose automatically upon power-up if you name it AUTOEXEC.BAT. Or, you may assign some other easily-remembered name to a BATCH file for that purpose. Refer to your Z-DOS documentation for details.

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Installing Operating Systems

Under **CP/M**, drive names are assigned *dynamically* upon bootup. The names assigned to the first partition is dependent on the powered-up state of any 8-inch floppy disk system that may be attached to your computer. The following discussion assumes that you are booting your CP/M system from the 5.25-inch floppy disk drive.

If there is no 8-inch system, or if you have an 8-inch system attached but not powered-up, your computer will boot CP/M and assign drive name C to the lowest numbered CP/M partition and drive name D to the next higher numbered CP/M partition if one is present. If you have an 8-inch floppy disk system attached to your computer *and* it is on, then your computer will boot CP/M and assign drive name E to the first CP/M partition and drive name F to the second.

Since CP/M is dynamic, you do not need to be concerned with “mapping” the various Winchester partitions, as with Z-DOS. Instead, when you boot CP/M from the Winchester CP/M partition of your choice, that partition is automatically assigned drive name A. The CP/M command, ASSIGN, can then be used to assign drive name B to a *second* partition (you can not assign more than one drive name to the same partition). The entire process can be automated by using a SUBMIT file and setting the partition (with the CONFIGUR program) to execute the SUBMIT file from a “cold” boot. Refer to your CP/M documentation for details.

NOTE: If your CP/M application software requires the use of two logical disk drives, then two Winchester CP/M partitions will also be required to use the software.

Select Your Target Partition(s) and Space Needed

Now, you must select the appropriate Z-DOS or CP/M partition(s) that you will use for your working copy of the software application package. The software package may include program files, data files, operating system files, and/or computer language files. You will need to make sure that the amount of space required to store and maintain these files is less than the amount of space available on the target Winchester

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Installing Operating Systems

disk partition. Use the Z-DOS DIR command or the CP/M STAT command to determine the amount of space required for your files and the Z-DOS CHKDSK command (or CP/M STAT command) to determine the amount of space available on your selected partition(s).

Generally, one partition may be used to hold all of your files, or you may choose to store selected data files in a second partition. Drive name considerations need to be considered as outlined under Drive Name Assignment.

Prepare to Copy Your Files

After you have selected the target partition(s), determine the names of the files that are to be transferred from the distribution disk(s) to the partition(s). Use the Z-DOS or CP/M DIR command to list the names of the files. *Exclude* any Z-DOS files named COPYFILE.DAT, as they are batch files used by the Z-DOS MAKE utility for installing the software on floppy disk systems.

Copy the Files

If you are using Z-DOS, boot from the Winchester disk partition of your choice and use the Z-DOS COPY command to transfer your selected files from the distribution disk(s) to your Winchester partition(s). With a distribution disk in drive A (the 5.25-inch floppy disk drive), the form of the command is:

```
COPY A:filename.ext x:
```

where *x* is the drive name of the target partition (E or F) and *filename.ext* is the name of the file to be copied. Use the COPY command for all the files that are to be transferred from the distribution disk(s) to the Winchester partition(s). Note that you may use wild cards in the filename and extension to copy multiple files.

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If you are using CP/M, boot from the 5.25-inch floppy disk system and assign a drive name to your target partition with the CP/M ASSIGN command. Use the PIP command (place it on your Winchester partition if it is not there) and transfer your selected files from the distribution disk(s) to the partition. With a distribution disk in drive A (the 5.25-inch floppy disk drive), the form of the command is:

```
x:PIP x:=A:filename.ext
```

where *x* is the drive name of the target partition and *filename.ext* is the name of the file on the distribution disk in drive A to be copied. Use the PIP command for all the files that are to be transferred from the distribution disk(s) to the Winchester partition(s). Note that you may use wild cards in the filename and extension to copy multiple files.

Complete the Process

When you have finished copying all of the selected files to your Winchester partition(s), store the distribution disk(s) in a safe place.

Consult the documentation that comes with your software to determine if you need additional software files (such as Z-DOS or CP/M utilities or perhaps a computer language like Z-BASIC or BASIC-80) to operate your program(s). If you need additional files, such as those mentioned, then transfer them from the appropriate distribution disk(s).

When you are finished, you have completed the installation procedure for a working copy of your software. You may now proceed with the normal operation of your software as described in its documentation.

NOTE: If the software is dependent upon specific drive names, you may have to remap (under Z-DOS) your partition names, or (under CP/M) boot from the selected partition and assign a drive name to a second partition. See the discussion under Disk Drive Name Assignment.

WINCHESTER SUPPLEMENT

Backing up the Winchester Disk

Because it is possible to store the equivalent of several dozen floppy disks on the Winchester disk, two commands, BACKUP and RESTORE have been added to the Z-DOS and CP/M-85 operating systems to aid you in backing up your Winchester Z-DOS partitions. You may elect to copy only certain files, files updated recently, or the entire partition. The basic operation of BACKUP is to create a directory of the specified files and then copy them to a "single" file. The "single" file may actually be several files that each contain a sequentially numbered extension such as BACKFILE.000, BACKFILE.001, and so on. The system backs up your files "end to end" to save floppy disk space.

The operation is further enhanced by providing an automatic FORMAT procedure for the floppy disks, protection against unwanted "overwriting" of existing files on the Winchester, verification, and so on. For complete details of the features and operation of BACKUP and RESTORE, refer to your Z-DOS or CP/M-85 software documentation for the Winchester disk.

Z-DOS

In this supplement, you will learn just one of several methods of backup for your Z-DOS partition. To backup the entire Z-DOS partition use the following instructions.

- Have a good supply of 5-1/4" or 8" disks on hand that may be used for backups.
- Boot the Winchester system and at the Z-DOS prompt, type:

```
BACKUP E:*. * A:BACK1 /F/V
```

WINCHESTER SUPPLEMENT

Backing up the Winchester Disk

for 5-1/4" disks, or

```
BACKUP E: *.* C:BACK1 /F/V
```

for 8" disks.

The E designates the first Winchester disk Z-DOS partition. If you want to back up the second Z-DOS partition, replace the E with F. The wild card symbols *.* indicates "copy all files," and the A:BACK1 is the "single" file name mentioned earlier. If you are using 8" disks, substitute the A with C. The /F switch is used to automatically format the floppy disks. The /V switch is used to verify that the copy is valid and is identical to the original.

The system will prompt you to put the floppy disks into the disk drives as needed. When the process is finished, the Z-DOS prompt will reappear.

To obtain additional information on the BACKUP command, type:

```
BACKUP ?
```

and press the **RETURN** key. Your display will show you the exact syntax and an explanation of the switches that may be used.

Restoration of the original files to the Winchester disk is also somewhat selective or automatic. Again, you will find full details in your Z-DOS Winchester documentation.

- To restore the "single" file to the Winchester drive from your master backup floppy disks, type:

```
RESTORE A:BACK1 E: *.* /O/V
```

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Backing up the Winchester Disk

Use the drive names as described in the BACKUP operation. The /O switch will automatically overwrite existing Winchester disk files with floppy disk files of the same name. The system will prompt you to place the floppy disks into the drives as needed. When the operation is complete, the Z-DOS prompt will reappear.

To obtain additional information on the RESTORE command, type:

```
RESTORE ?
```

and press the **RETURN** key. Your display will show you the exact syntax and an explanation of the switches that may be used.

CP/M-85

In this supplement, you will learn just one of several methods of backup for your CP/M-85 partition. To backup the entire CP/M-85 partition use the following instructions.

- Have a good supply of 5-1/4" or 8" disks on hand that may be used for backups.
- Boot the Winchester system and at the CP/M-85 prompt, type:

```
BACKUP C:BACK1=A:*. * [V]
```

The A: represents the Winchester disk CP/M-85 partition. If you want to back up the second CP/M-85 partition, replace the A: with B: (it must be assigned to logical drive B). The wild card symbols *.* indicates "copy all files," and the A:BACK1 is the "single" file name mentioned earlier. The floppy drive name C represents the floppy disk drive that you are using as a destination (for most sys-

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Backing up the Winchester Disk

tems, the 5-1/4" drive. However, you may also use the external 8" drive system). The V switch is used to verify that the copy is valid and is identical to the original.

NOTE: Do *not* use an extension on the "single" file name. It will be ignored and the screen will display a warning message.

The system will prompt you to put the floppy disks into the disk drives as needed. When the process is finished, the CP/M-85 prompt will reappear.

To obtain additional information on the BACKUP command, type:

```
BACKUP ?
```

and press the **RETURN** key. Your display will show you the exact syntax and an explanation of the switches that may be used.

Restoration of the original files to the Winchester disk is also somewhat selective or automatic. Again, you will find full details in your CP/M-85 Winchester documentation.

- To restore the "single" file to the Winchester drive from your master backup floppy disks, type:

```
RESTORE A: *. * = C: BACK1 [O; V]
```

Use the drive names as described in the BACKUP operation. The O switch will automatically overwrite existing Winchester disk files with floppy disk files of the same name. The system will prompt you to place the floppy disks into the drives as needed. When the operation is complete, the Z-DOS prompt will reappear.

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Backing up the Winchester Disk

To obtain additional information on the RESTORE command, type:

```
RESTORE ?
```

and press the **RETURN** key. Your display will show you the exact syntax and an explanation of the switches that may be used.

This completes the abbreviated instructions in this supplement to the Z-100 Series Desktop Computer User's Manual. If you have any questions concerning any of the operations described herein, refer to your respective operating system manual for complete details or contact Software Consultation by writing to:

Zenith Data Systems Corporation
Software Consultation
Hilltop Road
St. Joseph, MI 49085

or calling (616) 982-3860 for operating systems, languages, and utilities (like PART, PREP, SHIP, and VERIFY); or (616) 982-3884 for application packages and SoftStuff products. Consultation is available from 8:00 AM to 7:30 PM (Eastern Time) on regular business days. Sorry, but we are not able to evaluate or assist in the debugging of any programs you may develop.

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The SHIP Utility

The SHIP Utility is provided so that you may place the heads of your Winchester system over a non-vital area of the disks. Then if the system is accidentally jarred during movement, damage will be limited to an area that is not used by your Computer. The floating head design of Winchester drives makes them very sensitive to physical shocks, which can damage the surface of the disks. Therefore, you should use this utility whenever you move your Winchester disk system, even from one table to another.

To operate the SHIP utility, boot your Winchester Utilities disk and type:

```
SHIP
```

and press the **RETURN** key. You will see a display similar to the one illustrated in Figure 10.

```
SHIP version 1.00  
Copyright(C) 1983, Zenith Data Systems
```

```
The SHIP utility helps you to:
```

- Position the read/write heads of the Winchester disk at a safe location for subsequent transportation of the Winchester disk unit.

```
SHIP will prompt you to specify a cylinder address  
to identify where the read/write heads should  
be moved.
```

```
Enter shipping cylinder address in hex:
```

Figure 10
The Display for SHIP

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The SHIP Utility

At the bottom of the display, you will see:

Enter shipping cylinder address in hex:

You will need to enter a number that corresponds to the address (location) of the shipping position of the read/write heads.

- Enter 14F (the address in hexadecimal for a Miniscribe Mod II 2012 that corresponds to the shipping position of the heads) and press the **RETURN** key. If you do not have this model, refer to Appendix A for the addresses of the shipping position for typical Winchester drives.

The system will correctly position the heads over unused disk space.

- Remove any floppy disk in the system and turn off your Computer. You may now unplug the power cord and move your system.

When you start your system after running this utility, the Desktop Computer will automatically move the heads back to the correct position over the disks.

NOTE: Do *not* copy this utility to a regular Z-DOS disk. It will modify the operating system in your Computer's memory; you will have to reboot your system if you want to perform *any* other functions with the Z-DOS operating system.

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Appendix A

This appendix lists some of the models of Winchester disk systems that can be used with the Z-217 controller installed in your system. The model normally supplied in 10 megabyte Winchester configurations is the Miniscribe Mod II 2012 (indicated by the asterisk in the chart). If you have a different drive, use the corresponding figures to answer the prompts presented by the PREP and SHIP utilities. If you have any questions concerning which system is installed in your Desktop Computer, consult your dealer. All amounts are listed in hexadecimal.

| Manufacturer and Model | No. of Cylinders | No. of Heads | Write Current Cylinder | Precomp Cylinder | Step code | SHIP Cylinder Address |
|------------------------|---------------------------------|--------------|------------------------|------------------|-----------|-----------------------|
| Seagate | | | | | | |
| ST-506 | 99 | 4 | 80 | 40 | 96 | 9A |
| ST-706 | 132 | 2 | 200 | 80 | 1 | 131 |
| ST-406 | 132 | 2 | 200 | 80 | 1 | 131 |
| ST-412 | 132 | 4 | 200 | 80 | 1 | 131 |
| ST-419 | 132 | 6 | 200 | 80 | 1 | 131 |
| ST-251 | 820 333* | 6 | | | | |
| Miniscribe | | | | | | |
| Mod II 2012* | 132 | 4 | 200 | 80 | 1 | 14F |
| Mod IV 4020 | 1E0 | 4 | 200 | 80 | 1 | 209 |
| Mod III 3012 | 264 | 2 | 300 | 80 | 1 | 28D |
| 3425 | 264 | 4 | 300 | 80 | 1 | 290 |
| | ok to use 267 (615 vs 612 cyls) | | | | | |
| IMI | | | | | | |
| 5006H | 132 | 2 | 200 | D6 | 1 | 148 |
| 4012H | 132 | 4 | 200 | D6 | 1 | 148 |
| 5018H | 132 | 6 | 200 | D6 | 1 | 148 |
| Tandon | | | | | | |
| TM 602S | 99 | 4 | 80 | 40 | 96 | 9A |
| TM 603S | 99 | 6 | 80 | 40 | 96 | 9A |

This information is provided from Manufacturer's specifications and is subject to change without notice.

* ST 251 has 820 cyl, only use 606 (251E hex)
820 = 333

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Appendix B

The information in this appendix will provide you with the necessary information to enable your system for proper PREP operation. Please note that you normally will never have to perform this operation; VERIFY and PART should be sufficient in most instances. However, if you must run PREP, proceed with the following instructions.

- Remove any disk that may be in the floppy disk drive and turn off the power.
- Using instructions provided in Appendix I of the Z-100 Series User's Manual, remove the cabinet top.
- Carefully remove any cable(s) that may prevent you from removing the Z-217 Winchester Controller card from the card cage. One such cable may be the external 8-inch floppy disk cable leading from the Z-207 Controller card to the back panel of your Computer. Note any cables you remove and how they are positioned on their respective boards so that you can replace them later.

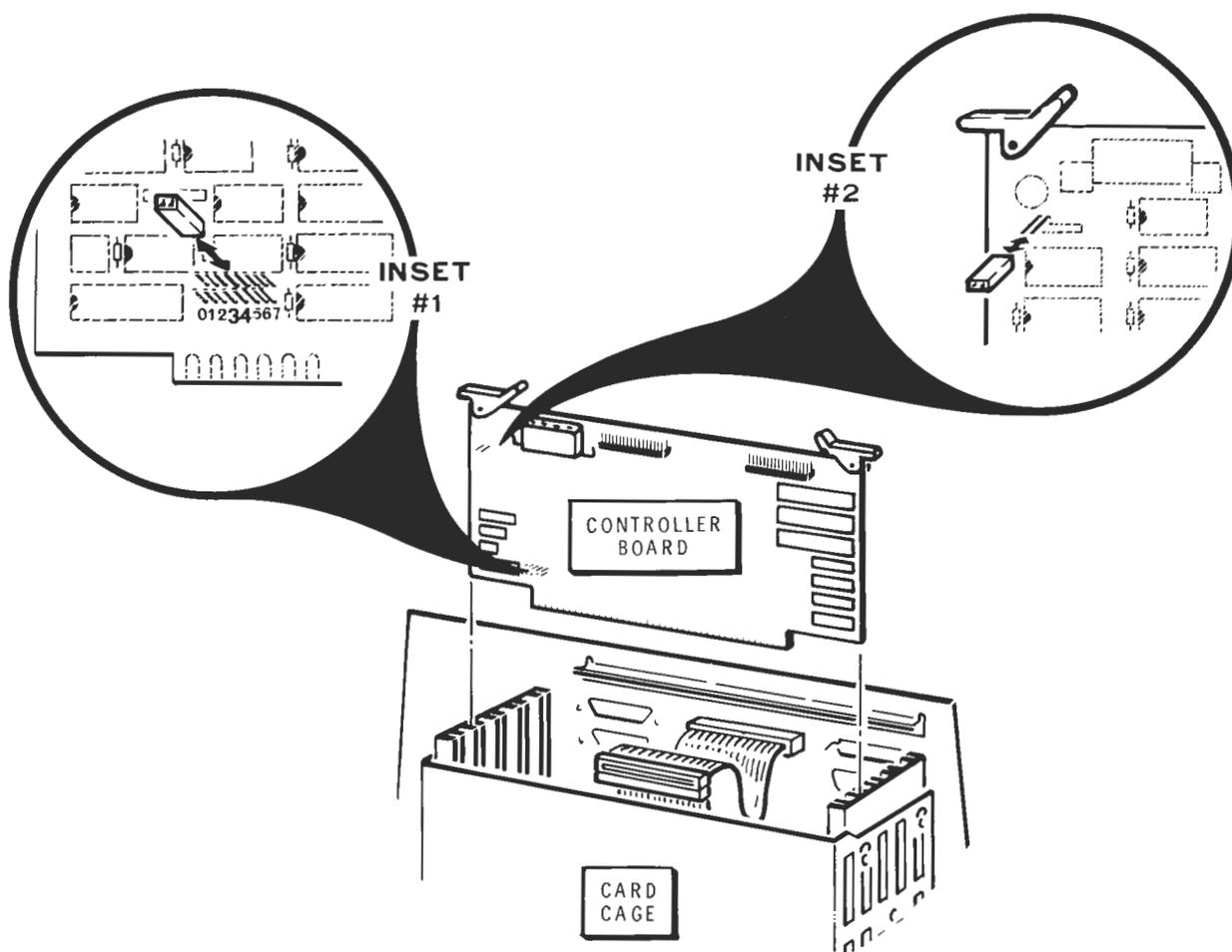
NOTE: In the next step, you may have to carefully remove the two flat ribbon cables that go from the Z-217 Winchester Controller card to the Winchester drive. You will have to do this if the cables are not long enough to prevent strain on them when you remove the controller card from the card cage. If you do remove the cables, note the position of each cable and the position of the colored edge of the cable with respect to the connector and card. You will need to reconnect these cables when you re-install the card.

- Refer to Figure 11 and gently lift the Z-217 controller board free of the S-100 bus and straight up until it almost clears the card cage.

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Appendix B

- Remove the jumper from the interrupt plugs (see inset 1 of the Figure).
- Place the jumper over the Format Enable plugs on the upper left corner of the board (see inset 2 of the Figure).
- Replace the board by gently pushing it straight down into the card cage. Make sure that it slides down the guides provided and is completely pushed down into its socket.

**Figure 11**

The Winchester disk controller board

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Appendix B

- Replace any cables that you have disconnected and make sure that all cards are fully seated into their connectors on the main board of the Computer.
- Replace the top cover of your Computer and make sure that it is completely latched into position.
- Replace the power cord. Your system is now ready to use with the PREP utility.

CAUTION: Do *not* leave the jumper in place for normal operation. If you do, it is possible that the Winchester disk can automatically initialize itself if it receives a “glitch” from some obscure source. To remove the jumper reverse the above procedure.

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Z-217 WINCHESTER DISK CONTROLLER

Product Specification

Zenith Data Systems

November 30, 1982

D. Langer

ENGINEERING SPECIFICATION FOR Z-217 DISK CONTROLLER

I. BASIC DESCRIPTION

The Z-217 disk drive controller is a two board pair that is used to control a maximum of two rigid 5-1/4 inch Winchester disk drives. It is designed to reside on the IEEE 696 (S-100) bus that is used in the Z-100 ("Z Machine"). A single 34 conductor cable connects the two boards together. Another 34 conductor cable connects the main board to the disk drives (daisy chain). In addition to these cables, two other cables are used for data transmission to and from the Winchester drives (one per drive).

II. DATA SEPARATOR

The Winchester data separator uses a conventional phase locked loop. This board also contains the ECC logic and the write logic. Maximum record length (including ECC bytes) is 526 bytes if the following parameters are to be maintained:

| | |
|-----------------------------|-------------------------|
| Maximum correction span | = 8 bits |
| Single burst detection span | = 32 bits |
| Double burst detection span | = 2 bits |
| Non-detection probability | = 2.3×10^{-10} |
| Miscorrection probability | = 1.25×10^{-4} |

III. MAIN PROCESSOR

The main processor uses a 2900 bit slice processor as its cpu. The data path is eight bits wide while the microsequencer word length is forty-eight bits wide. The system, as implemented, has the ability to perform all logical operations (AND, OR, XOR, INV) as well as mathematical operation such as add, subtract, multiply and divide. The processor interprets all commands received from the host, executes them, and then returns status to the host. The processor also performs all motion control commands for the disk drives as well as calculating the error correcting code (ECC) and actually performing error correction.

IV. IEEE 696 (S-100) INTERFACE

Slave Interface

The Z-217 uses 2 I/O ports. The upper eight addresses are optionally used in decoding the port address and must be at a logic "0" to access this board. This option can be disabled by moving two jumpers. The lower eight address lines are decoded for port addressing via a PAL. Vectored interrupts are used. The Z-217 can cause any one of the 8 possible vectored interrupts by changing one jumper.

Master Interface

The Z-217 performs direct memory access (DMA) as an S-100 Temporary Master. It conforms to all IEEE 696 (S-100) requirements for a Temporary Master. One wait state is automatically added during read cycles to allow it to work in the Z-100. The TMA arbitration level is DIP switch selectable to all 16 priority levels. Full 24 bit addresses are used with the capability to DMA across 64K boundaries.

Interrupt Handling

In burst mode, the Z-217 gets off the bus when INT* is asserted. The interrupt service routine should check to see if the Z-217 has a TMA in progress. If so, the service routine should halt the TMA by sending a PAUSE command to the Z-217 before acknowledging the interrupt. Then, the interrupt can be acknowledged and serviced. When interrupt servicing is complete, the service routine should send a CONT command to the Z-217 to allow TMA to resume.

In byte mode, the PAUSE and CONT commands are still executed by the Z-217, but they are not needed unless software timing loops are being used or critical real time processing is being performed. In byte mode, the Z-217 will not arbitrate for the bus when INT* is asserted.

Board Requirements

The controller board occupies one standard five inch high slot. It uses no +/-16 voltage or +8 voltage. The +5 voltage supplies all power to this board. Maximum current requirement is 2.5 amperes.

The data separator board is 5 1/2" by 7" and is mounted on top of the Winchester disk drive. It uses a maximum of 1.0 amps of +5 volts and a maximum of 0.1 amps of -16 or -5 volts (jumper selectable).

V. COMMAND PHILOSOPHY

There are two levels or types of commands associated with this controller. The first level is a direct command that is executed immediately and is written directly into the controller's command register. This first type of command is used to invoke the second type of command. The second type of command is the primary communication mode between the controller and the operating system. In this mode, commands are placed in a buffer in memory and the controller is then given a direct command that tells it to fetch the commands from the buffer. It does this via Temporary Master Access (TMA - as known as Direct Memory Access or DMA) which allows it to bring the command into its internal command buffer. Status is returned the same way, via TMA, upon command completion. An interrupt is also generated upon command completion to notify the host processor that command execution is done.

VI. DISK FORMAT

The format used for the rigid disk is eighteen sectors of 512 bytes each. MFM encoding is used. The actual track layout is:

| | |
|------------------|---------------------------|
| Gap1 | 16 x 4E |
| Repeat 18 times: | |
| SYNC | 11 x 00 |
| ID | 1 x A1 (missing clock) |
| AM | 1 x FE |
| CYL | 2 x cylinder number |
| HDSEC | 1 x head/sector number |
| ECC | 4 x error correcting code |
| Gap2 | 3 x 00 |
| SYNC | 11 x 00 |
| ID | 1 x A1 (missing clock) |
| AM | 1 x F8 |
| DATA | 512 x XX (user data) |
| ECC | 4 x error correcting code |
| Gap3 | 13 x 4E |
| Gap4 | 230 x 4E (nominal) |

This format allows for a speed tolerance of +/-2.21%

VII. DATA TRANSFERS

All data transfers are via TMA. Programmed I/O is not possible. The controller has a 2K x 8 on board buffer for handling data. An entire sector is loaded into the buffer before it is transferred to allow the ECC correction to be applied to it and any correctable errors corrected before it is entered into system memory. During writing to the disk, an entire sector is also loaded to insure that all data is available when it is needed. A minimum of a three to one interleave may be used.

VIII. DIRECT ACCESS REGISTERS

The entire controller only occupies two I/O ports. Writing to the command port puts commands into the controller's command register while reading from this port yields data concerning the hardware status of the controller. Writing to the reset port causes a hardware reset to be executed. Reading from the interrupt acknowledge port resets the interrupt latch and reads status.

IX. DIRECT MODE COMMANDS

The controller responses to the following direct mode commands:

- 08 SETUP - the following three bytes (MS byte first, LS byte last) specify the TMA address to be used for commands. This address remains the same until changed by another SETUP command. This command **MUST** be issued prior to the first EXECUTE command.
- 10 EXECUTE - fetchs command from memory buffer.
- 18 PAUSE - stops TMA (if in progress) until CONT is received.
- 20 CONT - restarts TMA when TMA was stopped by a PAUSE.

X. CONTROL BLOCK COMMANDS

The controller responds to the following commands when they are the first byte in the control block in system memory:

TYPE 0

- 00 RECAL causes the selected drive to step outward one cylinder at a time until cylinder zero is reached. TMA address is not used.
- 01 STATUS returns status for selected drive at TMA address. Returned status format is the same as the TYPE 2 command format.

TYPE 1

- 10 WRITE writes the specified number of sectors from the specified drive into the specified TMA address. ECC is performed. Maximum sector count is 256.
- 11 READ reads the specified number of sectors from the specified drive into the specified TMA address. ECC is performed. Maximum sector count is 256.
- 13 SEEK positions heads of specified drive to specified logical address.

TYPE 2

- 20 FORMAT formats the specified drive
- 21 FORMAT TRACK formats specified track only
- 22 SET DRIVE set drive parameters

TYPE 3

- 30 WRITE ABS writes one sector using absolute addressing
- 31 READ ABS reads one sector using absolute addressing
- 33 SEEK ABS positions heads of specified drive to specified cylinder

XI. FORMAT OF COMMANDS

TYPE 0 AND TYPE 1

| | byte # | 1 | 7 | 1 | 6 | 1 | 5 | 1 | 4 | 1 | 3 | 1 | 2 | 1 | 1 | 1 | 0 | 1 | |
|---|--------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|
| | 1 | 1 | Command OP Code | | | | | | | | | | | | | | | 1 | |
| | 2 | 1 | Drive Select 1 MS Byte - Logical Sector No. | | | | | | | | | | | | | | | 1 | |
| C | 3 | 1 | Middle Byte - Logical Sector Number | | | | | | | | | | | | | | | 1 | |
| O | 4 | 1 | LS Byte - Logical Sector Number | | | | | | | | | | | | | | | 1 | |
| M | 5 | 1 | Sector Count | | | | | | | | | | | | | | | 1 | |
| M | 6 | 1 | MS Byte - Data TMA Address | | | | | | | | | | | | | | | 1 | |
| A | 7 | 1 | Middle Byte - Data TMA Address | | | | | | | | | | | | | | | 1 | |
| N | 8 | 1 | LS Byte - Data TMA Address | | | | | | | | | | | | | | | 1 | |
| D | 9 | 1 | MS Byte - Next Command Address | | | | | | | | | | | | | | | 1 | |
| | 10 | 1 | Middle Byte - Next Command Address | | | | | | | | | | | | | | | 1 | |
| | 11 | 1 | LS Byte - Next Command Address | | | | | | | | | | | | | | | 1 | |
| | 12 | 1 | Flags | | | | | | | | | | | | | | | 1 | |
| | 13 | 1 | Error Code | | | | | | | | | | | | | | | 1 | |
| S | | | | | | | | | | | | | | | | | | | |
| T | 14 | 1 | Drive Select 1MS Byte-Log Sector # of error | | | | | | | | | | | | | | | 1 | |
| A | | | | | | | | | | | | | | | | | | | |
| T | 15 | 1 | Middle Byte-Log Sector # of error | | | | | | | | | | | | | | | 1 | |
| U | | | | | | | | | | | | | | | | | | | |
| S | 16 | 1 | LS Byte-Log Sector # of error | | | | | | | | | | | | | | | 1 | |

Note: Only Type 0, 1 and 3 commands can be chained.

Flag byte: bit # if set
 7 - interrupts enabled
 6 - use burst mode TMA
 5 - ignor PAUSE and CONT commands
 4 -
 3 -
 2 - disable retries
 1 - disable ECC
 0 - chain next command immediately

TYPE 2

| | byte # | 1 | 7 | 1 | 6 | 1 | 5 | 1 | 4 | 1 | 3 | 1 | 2 | 1 | 1 | 1 | 0 | 1 |
|---|--------|---|-----------------|---|----|---|-----|---|-----|---|-----|---|------------|---|---|---|---|---|
| | 1 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| | 2 | 1 | Drive Select | | | | | 1 | N/A | | N/A | 1 | Max Head # | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| C | 3 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| O | 4 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| M | 5 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| M | 6 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| A | 7 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| N | 8 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| D | 9 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| | 10 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| | 11 | 1 | N/A | 1 | ** | 1 | N/A | 1 | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| | 12 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| S | 13 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| T | | | | | | | | | | | | | | | | | | |
| A | 14 | 1 | Head # of Error | | | | | 1 | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| T | | | | | | | | | | | | | | | | | | |
| U | 15 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |
| S | | | | | | | | | | | | | | | | | | |
| | 16 | 1 | | | | | | | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | |

** Cell size

0 = 512 bytes/logical sector

1 = 1024 bytes/logical sector

TYPE 3

| byte # | 1 | 7 | 1 | 6 | 1 | 5 | 1 | 4 | 1 | 3 | 1 | 2 | 1 | 1 | 1 | 0 | 1 |
|--------|----|------------------------------------|-----|-----|-------|---|-------------------|---|---|---|-------------|---|---|---|---|---|---|
| | 1 | Command OP Code | | | | | | | | | | | | | | | 1 |
| | 2 | Drive Select | | | 1 N/A | | N/A | | 1 | | Head Select | | | 1 | | | |
| C | 3 | Cylinder Number High | | | | | | | | | | | | | | | 1 |
| O | 4 | Cylinder Number Low | | | | | | | | | | | | | | | 1 |
| M | 5 | 1 | N/A | N/A | N/A | 1 | Sector Number | | | | | | | | | | 1 |
| M | 6 | MS Byte - Data TMA Address | | | | | | | | | | | | | | | 1 |
| A | 7 | Middle Byte - Data TMA Address | | | | | | | | | | | | | | | 1 |
| N | 8 | LS Byte - Data TMA Address | | | | | | | | | | | | | | | 1 |
| D | 9 | MS Byte - Next Command Address | | | | | | | | | | | | | | | 1 |
| | 10 | Middle Byte - Next Command Address | | | | | | | | | | | | | | | 1 |
| | 11 | LS Byte - Command Address | | | | | | | | | | | | | | | 1 |
| | 12 | 1 | * | 1 | Flags | | | | | | | | | | | | 1 |
| S | 13 | Error Code | | | | | | | | | | | | | | | 1 |
| T | 14 | 1 Head of Error | | | 1 | | Sector # of Error | | | | | | | | | | 1 |
| U | 15 | Cylinder # of Error High | | | | | | | | | | | | | | | 1 |
| S | 16 | Cylinder # of Error Low | | | | | | | | | | | | | | | 1 |

0 = disable interrupt
 *1 = enable interrupt

XII. FORMAT OF STATUS REGISTER

| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------|---|------|------------|-----------------|-------|-------------------|--------|------|
| Interrupt | | Busy | Burst Mode | TMA in Progress | Error | Immed. Mode Error | Paused | Done |

XIII. FORMAT OF STATUS RETURNED BY 01 COMMAND

| byte # | 1 | 7 | 1 | 6 | 1 | 5 | 1 | 4 | 1 | 3 | 1 | 2 | 1 | 1 | 1 | 0 | 1 | | |
|--------|---|---|---|---|---|---|---|---|---|---|---|---|----|---|----|---|----|-----------------------|---|
| 1 | 1 | | | | | | | | | | | 1 | B2 | | B1 | | B0 | 1 | |
| 2 | 1 | | | | | | | | | | | | | | | | | Max Cylinder # HI | 1 |
| 3 | 1 | | | | | | | | | | | | | | | | | Max Cylinder # LO | 1 |
| 4 | 1 | | | | | | | | | | | | | | | | | RWC Cylinder # HI | 1 |
| 5 | 1 | | | | | | | | | | | | | | | | | RWC Cylinder # LO | 1 |
| 6 | 1 | | | | | | | | | | | | | | | | | Precomp Cylinder # HI | 1 |
| 7 | 1 | | | | | | | | | | | | | | | | | Precomp Cylinder # LO | 1 |
| 8 | 1 | | | | | | | | | | | | | | | | | Current Cylinder # HI | 1 |
| 9 | 1 | | | | | | | | | | | | | | | | | Current Cylinder # LO | 1 |
| 10 | 1 | | | | | | | | | | | | | | | | | Step Rate | 1 |
| 11 | 1 | | | | | | | | | | | | | | | | | Reserved | 1 |
| 12 | 1 | | | | | | | | | | | | | | | | | Interleave Factor | 1 |
| 13 | 1 | | | | | | | | | | | | | | | | | Cell Size | 1 |
| 14 | 1 | | | | | | | | | | | | | | | | | Max Head # | 1 |
| 15 | 1 | | | | | | | | | | | | | | | | | Fill Char | 1 |
| 16 | 1 | | | | | | | | | | | | | | | | | Reserved | 1 |

B0 = Drive Ready
 B1 = Accessed
 B2 = Seek Complete

STEP RATE is equal to the value times 20 us

CELL SIZE 1 = 512 bytes/sector
 2 = 1024 bytes/sector

FILL CHAR is the character used during format to fill the data fields.

XIV. ERROR CODES

TYPE 0

- 00 - No error
- 01 - Drive not ready
- 02 - No seek complete
- 03 - No Track 0
- 04 - No Index
- 05 - No Drive Selected

TYPE 1

- 10 - Header Address Mark not found
- 11 - Seek error (bad cylinder number in header)
- 12 - Sector number not found
- 13 - ECC error in header
- 14 - Data Address Mark not found
- 15 - Non-correctable ECC error in data field
- 16 - Correctable ECC error in data field
- 17 - Write fault

TYPE 2

- 20 - Illegal op code
- 21 - Illegal disk address
- 22 - Format protected
- 23 - Write protected

TYPE 3

- 30 - Miscellaneous error

TYPE 4

- 40 - Error during diagnostic

XV. CONNECTOR PINOUTS

Controller Board

P1 - 100 Pin Bus Interface

| | | | | | | | |
|----|---------|----|--------|----|--------|-----|-------|
| 1 | N/U | 26 | PHOLDA | 51 | N/U | 76 | PSYNC |
| 2 | N/U | 27 | N/U | 52 | N/U | 77 | PWR* |
| 3 | XRDY | 28 | N/U | 53 | GND | 78 | PDBIN |
| 4 | VI0* | 29 | A5 | 54 | N/U | 79 | A0 |
| 5 | VI1* | 30 | A4 | 55 | DMA0* | 80 | A1 |
| 6 | VI2* | 31 | A3 | 56 | DMA1* | 81 | A2 |
| 7 | VI3* | 32 | A15 | 57 | DMA2* | 82 | A6 |
| 8 | VI4* | 33 | A12 | 58 | SXTRQ* | 83 | A7 |
| 9 | VI5* | 34 | A9 | 59 | A19 | 84 | A8 |
| 10 | VI6* | 35 | DO1 | 60 | SIXTN* | 85 | A13 |
| 11 | VI7* | 36 | DO0 | 61 | A20 | 86 | A14 |
| 12 | N\U | 37 | A10 | 62 | A21 | 87 | A11 |
| 13 | N\U | 38 | DO4 | 63 | A22 | 88 | DO2 |
| 14 | DMA3* | 39 | DO5 | 64 | A23 | 89 | DO3 |
| 15 | A18 | 40 | DO6 | 65 | N/U | 90 | DO7 |
| 16 | A16 | 41 | DI2 | 66 | N/U | 91 | DI4 |
| 17 | A17 | 42 | DI3 | 67 | N/U | 92 | DI5 |
| 18 | SDSB* | 43 | DI7 | 68 | N/U | 93 | DI6 |
| 19 | CSDB* | 44 | SM1 | 69 | N/U | 94 | DI1 |
| 20 | GND | 45 | SOUT | 70 | GND | 95 | DI0 |
| 21 | N/U | 46 | SINP | 71 | N/U | 96 | SINTA |
| 22 | ADSB* | 47 | SMEMR | 72 | RDY | 97 | SWO* |
| 23 | DODSB* | 48 | SHLTA | 73 | INT* | 98 | N/U |
| 24 | I | 49 | N/U | 74 | HOLD* | 99 | N/U |
| 25 | PSTVAL* | 50 | GND | 75 | RESET* | 100 | GND |

N/U = Not Used

J1 - 34 Pin Drive Daisy Chain

All odd pins are ground

| | | | |
|----|----------------|----|-----------------|
| 2 | /RWC | 20 | /Index |
| 4 | /Head Select 2 | 22 | /Ready |
| 6 | /Write Gate | 24 | /Step |
| 8 | /Seek Complete | 26 | /Drive Select 1 |
| 10 | /Track 000 | 28 | /Drive Select 2 |
| 12 | /Write Fault | 30 | /Drive Select 3 |
| 14 | /Head Select 0 | 32 | /Drive Select 4 |
| 16 | /+5 Volts | 34 | /Direction In |
| 18 | /Head Select | | |

J2 - 34 Pin Data Separator Interface

All odd pins are ground

| | | | |
|----|----------|----|-------------|
| 2 | D0 | 20 | /Byteclk |
| 4 | D1 | 22 | Byte Strobe |
| 6 | D2 | 24 | /ECC Time |
| 8 | D3 | 26 | /AM Found |
| 10 | D4 | 28 | /Read Gate |
| 12 | D5 | 30 | /Write AM |
| 14 | D6 | 32 | /Write Gate |
| 16 | D7 | 34 | Reserved |
| 18 | /Precomp | | |

J3 - 4 Pin D. C. Power

| | |
|---|----------|
| 1 | +5 Volts |
| 2 | Ground |
| 3 | Ground |
| 4 | +5 Volts |

Data Separator Board

J1 - 34 pin Controller Interface

All odd pins are ground

| | | | |
|----|----------|----|-------------|
| 2 | D0B | 20 | /Byteclk |
| 4 | D1B | 22 | Bytestb |
| 6 | D2B | 24 | /Ecctime |
| 8 | D3B | 26 | /AM Found |
| 10 | D4B | 28 | /Read Gate |
| 12 | D5B | 30 | /Write AM |
| 14 | D6B | 32 | /Write Gate |
| 16 | D7B | 34 | Reserved |
| 18 | /Precomp | | |

J2 & J3 - 20 Pin Drive Radial Interface

| | | | |
|----|-----------------|----|-------------|
| 1 | /Drive Selected | 11 | GND |
| 2 | GND | 12 | GND |
| 3 | N/C | 13 | +Write Data |
| 4 | GND | 14 | -Write Data |
| 5 | N/C | 15 | GND |
| 6 | GND | 16 | GND |
| 7 | N/C | 17 | +Read Data |
| 8 | GND | 18 | -Read Data |
| 9 | N/C | 19 | GND |
| 10 | GND | 20 | GND |

J4 - 3 Pin D.C. Power

| | |
|---|-----------|
| 1 | +5 Volts |
| 2 | Ground |
| 3 | -16 Volts |

XVI. JUMPER SETTINGS

Controller Board

J11 UP = 2K
 Down = 1K *

J12 In = Format Enabled
 Out = Format Protected *

J30, J31 Left = 16 bit port addressing *
 Right = 8 bit port addressing

J10 Vector interrupt level = No jumper installed *

Data Separator Board

JP4 Read Enable In = Read Gate Asserted (for calibration)
 Out = Normal Operation *

JP3 Test = 625KHz to 9602 (for calibration)
 Normal = Read Data to 9602 *

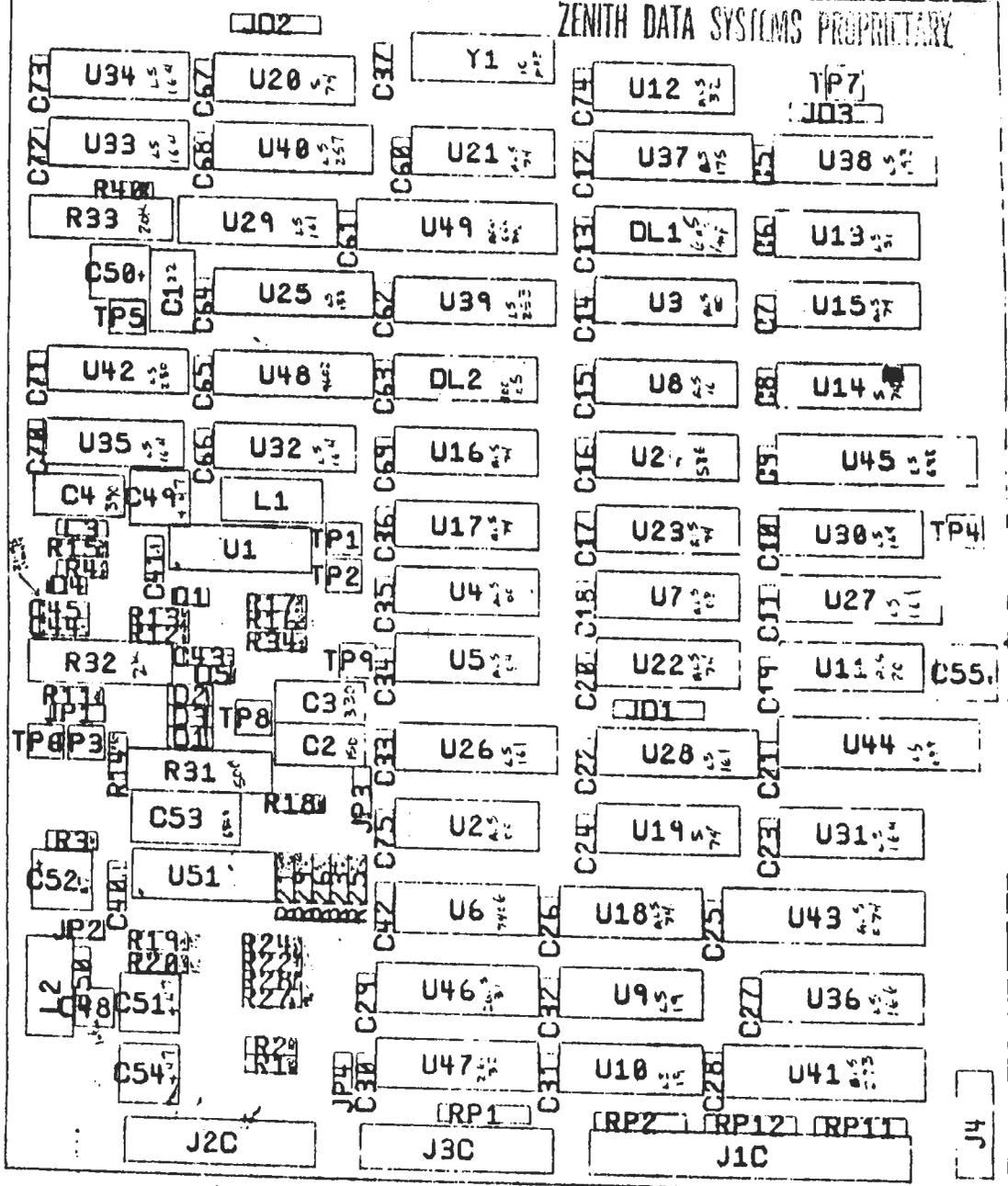
JP1 Test = Calibration for VCO
 Normal = Phase Lock Enabled *

XVII. SWITCH SETTINGS

DS1 1 2 3 4 Arbitration priority
 1 1 1 1 = lowest priority (0)
 1 1 1 0 = middle priority (8) *
 0 0 0 0 = highest priority (15)

where 0 = switch closed
 1 = switch open

* = Position for normal operation in Z-100.



Z-217

Winchester System

Service Installation Manual

NOTE: You cannot finish the installation of this product without using two of the Winchester utilities supplied. Therefore, you should obtain permission from your customer to use the utilities and have him sign the End User Licensing Agreements supplied with this product.



NOTE: This manual incorporates FSB-Z100-032.

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INTRODUCTION

IMPORTANT NOTICE

This Manual is intended for the **Service Technician's use only**.

Due to the critical steps required to install the Winchester System, this procedure must be performed by a qualified technician.

If you receive this Manual, contact your nearest Zenith Data System Service Center for assistance. Do not attempt to install it yourself.

This Manual shows you how to replace one of the existing floppy disk drives with a 12 megabyte, 5-1/4" Winchester disk drive.

The instructions in this Manual covers two models of the Z-100 Computer: the All-in-One Computer and the Low-Profile Computer.

During the installation procedure, you will be required to partially disassemble the Computer, re-

move one of the existing drives (assuming the Computer has two floppy drives) and make some changes to the Computer so you can install the Winchester System.

The surface of the Winchester disk must be initialized before it can be used in a system. Instructions for using the PREP Utility are provided toward the rear of this Manual.

PARTS LIST

Unpack the parts and check each part against the following list. The key numbers correspond to the numbers on the "Parts Pictorial" (Illustration Book, Pages 1 and 2). Return any part that is packed in an individual envelope with the part number on it to its envelope after you identify it. Leave it there

until it is called for in a step. Do not discard any packing material until you account for all of the parts.

Do not unpack the Winchester drive until you are directed to install it.

| KEY No. | ZDS Part No. | QTY. | DESCRIPTION |
|---------|--------------|------|-------------|
|---------|--------------|------|-------------|

CABLE ASSEMBLIES

| | | | |
|----|-------------|---|--------------------------------------|
| A1 | HE 134-1279 | 1 | 34-pin separator/controller cable |
| A2 | HE 134-1280 | 1 | 20-pin separator/drive cable |
| | - or - | | |
| | HE 134-1389 | | |
| A3 | HE 134-1281 | 1 | 34-pin drive/controller cable |
| A4 | HE 134-1284 | 1 | 34-pin floppy drive/controller cable |

WINCHESTER DRIVE

| | | | |
|--|------------|---|-----------------------|
| | HE 150-156 | 1 | Winchester Disk Drive |
| | - or - | | |
| | HE 150-164 | | |

METAL PARTS

| | | | |
|----|-------------|---|---------------------------|
| B1 | HE 200-1434 | 1 | All-in-One drive chassis |
| | - or - | | |
| | HE 200-1452 | | |
| B2 | HE 204-2672 | 2 | All-in-One drive brackets |
| B3 | HE 204-2675 | 1 | Left Low-Profile bracket |
| B4 | HE 204-2676 | 1 | Right Low-Profile bracket |
| B5 | HE 205-1922 | 1 | Shield plate |

HARDWARE

| | | | |
|----|-------------|----|---------------------------|
| C1 | HE 250-1418 | 4 | 4-40 × ¼" hex head screw |
| C2 | HE 250-1422 | 4 | 6-32 × ¼" flat head screw |
| C3 | HE 250-1428 | 16 | 6-32 × ¼" screw |
| C4 | HE 250-1264 | 4 | 6-32 × ⅜" hex head screw |
| C5 | HE 254-6 | 4 | #6 lockwasher |

CIRCUIT BOARDS

| | | | |
|--|-------------|---|----------------------------|
| | HE 181-3919 | 1 | Wired data separator board |
| | HE 181-5068 | 1 | Wired controller board |

| KEY No. | ZDS Part No. | QTY. | DESCRIPTION |
|---------|--------------|------|-------------|
|---------|--------------|------|-------------|

INTEGRATED CIRCUITS

| | | | |
|----|--------------|---|-------------|
| D1 | HE 444-87-5 | 1 | Monitor ROM |
| | or later | | |
| D2 | HE 444-129-1 | 1 | PAL |

MISCELLANEOUS

| | | | |
|----|-------------|----|---|
| E1 | HE 75-103 | 1 | Insulator paper |
| E2 | HE 203-2159 | 1 | All-in-One decorative panel |
| E3 | HE 203-2160 | 1 | Low-Profile decorative panel |
| E4 | HE 208-50 | 3 | Clips |
| | HE 344-169 | 3' | Wire |
| E5 | HE 390-2488 | 1 | Warning label |
| E6 | HE 413-48 | 1 | Lens |
| E7 | HE 490-5 | 1 | Nut starter |
| | HE 490-189 | | IC puller |
| | | 1 | Software package |
| | | | consists of: |
| | | 1 | <i>End User's License Agreement (return portion)</i> |
| | | 1 | <i>End User's License Agreement (retained portion)</i> |
| | | 1 | <i>Warning envelope (contains a floppy disk)</i> |
| | | 1 | <i>Winchester Supplement Manual</i> |
| | | 1 | <i>Z-217-1 Technical Manual</i> |
| | | 1 | <i>Z-217-2(1) Technical Manual</i> |
| | | 1 | <i>Z-217-2(1) Winchester manufacturer's technical information</i> |
| | | 1 | <i>ZDS Warranty</i> |

NOTE: Since this kit is made up of parts for two different models of the Z-100 Computer, you will have some parts left over.

*NOTE: Although more than one drive make and model can be used in this modification, drive specific information is given for the Miniscribe 2012 only in this manual.

PRELIMINARY INFORMATION

Requirements

You will need the following tools and test equipment to install the Winchester System:

- 1/4" nut driver
- Phillips screwdriver
- 1/4" flat blade screwdriver
- Longnose pliers
- Diagonal cutters
- Wire stripper (or knife)
- 25 to 40 watt, pencil-type soldering iron
- Utility knife
- Volt-ohmmeter(VOM)

NOTE: You will need the volt-ohmmeter during the "Replacement Tests" to make a resistance measurement on the Computer's top case.

NOTE: The Winchester drive is fragile, and should be protected against shocks and accidental drops. Keep it in its shipping carton until you are instructed to install it.

ROM Version Tests

Perform the following steps to determine the ROM version:

- Turn on the Computer.
- At the prompt, press the V key. If the auto-boot function is enabled, turn the computer on and press the DELETE key, then V key. You should now see a message on the monitor resembling the one shown in Pictorial 3-1. This message tells you what version of the monitor ROM is presently installed in the Computer.



Pictorial 3-1

Hand prompt

- Enter the ROM version here _____
- Turn off the computer.

Modifications

There are several modifications you may have to make as you install the Winchester System. These could include:

- Replacing the power supply.
- Replacing the ROM and PAL IC's.
- Modifying the main circuit board.
- Replacing several cabinet parts.

All of the parts required to replace the ROM and PAL IC's, and to modify the main circuit board, are included with the Winchester controller parts. Determine which modifications the Computer needs by performing the "Replacement Tests."

If the computer is an All-in-One Model with standard drives, proceed to the instructions that begin on Page 4-1. If the computer is a Low-Profile Model with standard drives, proceed directly to Page 5-1.

ALL-IN-ONE MODEL

Because there are several modifications you may have to make to install the Winchester System, it is necessary to perform the "Replacement Tests." These checks show you which modifications are required. The following chart summarizes the checks and lists any additional parts that may be required.

| <u>IF</u> | <u>THEN</u> | <u>PARTS REQUIRED</u> |
|--|-------------------------------|--|
| The power supply does not have a connector for the Winchester controller | Replace the power supply | Power supply HE 234-320 |
| The ROM version is not 2.0 or higher | Replace the ROM and PAL IC's | ROM IC HE 444-87-5 PAL IC HE 444-129-1 (both supplied) |
| The main circuit board part number is (HE) 181-3630 | Modify the main circuit board | — |
| If the center base is non-conductive | Replace the center base | Center base HE 92-793 |
| If the top cover is non-conductive | Replace the top cover | Top cover HE 92-792 |
| If the base is non-conductive | Replace the base | Base HE 92-791 |

Replacement Tests

WARNING: When the line cord is connected to an AC outlet, hazardous voltages can be present inside the computer.

Refer to Illustration Book, Page 3, Pictorial 4-1 for the following steps.

- Unplug the line cord from the AC outlet.
- Carefully remove all cables from the rear of the Computer.
- Carefully pull the rubber plug out of each metal slide. Set the rubber plugs aside.
- Use a small flat-blade screwdriver to move the metal slides all the way toward the front and then $\frac{1}{4}$ " toward the back as shown.

- Carefully lift the top case straight up and set it aside.

Refer to Illustration Book, Page 4, Pictorial 4-2 for the following steps.

- Locate the power supply and look for an unconnected cable and plug labeled P6 (not P3), as shown in the inset drawing.

If you find this unconnected cable, you will not have to replace the power supply.

If your power supply does not have this unconnected cable and plug, you must replace the power supply.

- Refer back to the ROM version number you wrote down on Page 3-1.

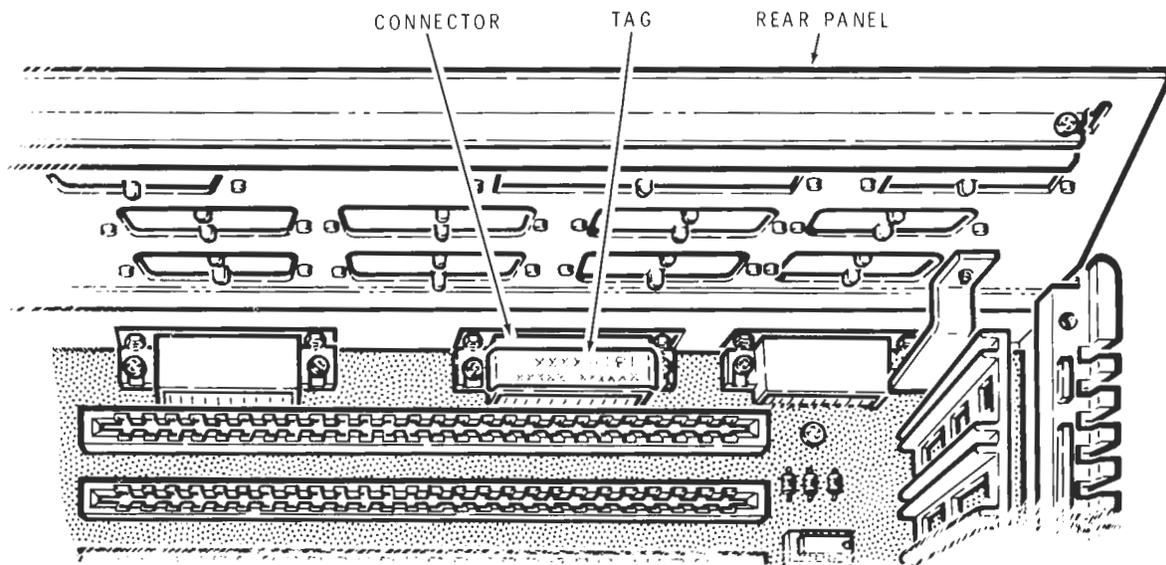
If you wrote down 2.0 or higher, you do not have to replace the ROM and PAL IC's.

If you wrote down any ROM version below 2.0, you will have to replace the ROM and PAL IC's.

- Refer to Detail 4-2A and locate the tag on the indicated connector.

If the part number on this tag is 181-4106 or higher, you will not have to modify the main circuit board.

If the part number on this tag is 181-3630, you will have to modify the main circuit board.



Detail 4-2A

Connector identification

- Refer to Illustration Book, Page 4, Detail 4-2B and turn the top case so the four locking pins are pointing up.

NOTE: In the following test, you will use a VOM (volt-ohmmeter) to measure the resistance of the cabinet's top case. If you measure 1000 ohms or less, the cabinet parts are already coated with a shielding metallic coating. But if the VOM indicates an infinite resistance, you will have to replace the top case, base and center cabinet parts with new ones that have a shielding coating on them. If the cabinet parts are not shielded, the Computer may cause serious RFI (Radio Frequency Interference) problems during operation.

- Set the VOM to measure resistance, and so you can easily read 1000 ohms.

- Connect the VOM's leads to two of the locking pins, as shown in Detail 4-2B, and measure the resistance.

If you measure 1000 ohms or less, the cabinet already has a metallized coating and you will not have to replace it.

If you measure an infinite resistance, you will have to replace the cabinet parts. (Refer to the chart at the beginning of this section.)

This completes the "Replacement Tests". You should now know which modifications are required on the Computer. The chart on Page 4-1 lists the part numbers for many of the new parts. After you have all of the parts required, proceed to "Modifications."

Modifications

NOTE: Because the Computer may not require all of the following modifications, you will occasionally be given alternative directions. Be sure to follow these directions carefully.

DISASSEMBLY

Refer to Illustration Book, Page 5, Pictorial 4-3 for the following steps.

- Use a flat-bladed screwdriver to loosen the 6-32 \times 1- $\frac{7}{8}$ " screws at AG, AH, AI, and AJ. Loosen the screws only until they disengage from the chassis. It is not necessary to completely remove these screws. NOTE: You will have to insert the screwdriver blade down into the square holes in the slides to gain access to these screws.
- Remove the #8 \times 1- $\frac{1}{2}$ " hex head sheet metal screw at AK and set it aside. You will reinstall this screw later.

Refer to Illustration Book, Page 6, Pictorial 4-4 for the following steps.

- Carefully lift up on the drive/video subassembly and reposition it toward the front of keyboard as far as the cables will allow.
- Unplug the power cable from each disk drive (plugs P4 and P5).
- Carefully unplug the flat cable from the Z-207 circuit board.

CAUTION: Be careful not to damage the neck of the CRT when you perform the following steps. If the CRT becomes damaged, a violent implosion could result.

- Carefully unplug the signal/power cable from the video circuit board.
- Carefully lift up on the drive/video subassembly and set it aside.

If you determined that you must replace the power supply and/or modify the main circuit board, proceed to "Removing the Power Supply."

If you do not have to replace the power supply or modify the main circuit board, skip "Removing the Power Supply" and proceed directly to "Disassembly Continued."

REMOVING THE POWER SUPPLY

NOTE: Perform the following steps only if you determined that you must replace the power supply and/or modify the main circuit board.

Refer to Illustration Book, Page 7, Pictorial 4-5 for the following steps.

- Remove the #6 \times $\frac{1}{4}$ " sheet metal screws from locations AA, AB, AC, and AD and set them aside.
- Remove the 6-32 \times $\frac{1}{4}$ " screws and #6 lockwashers from locations AE and AF and set them aside.

- Lift the power supply part way out of the chassis. Then refer to inset drawing #1 on the Pictorial and unplug cables P101 and P102 from the main circuit board.
- Refer to inset drawing #2 on the Pictorial and remove the large orange and large black wires from the Signal/Power connector J101.

This completes the removal of the power supply. You will reinstall the power supply later. Proceed to "Disassembly Continued."

DISASSEMBLY CONTINUED

NOTES:

1. If you determined that you must replace the ROM and PAL ICs, modify the main circuit board, and/or replace the center base, proceed with the following steps.
2. If you do not have to replace the ROM and PAL ICs, modify the main circuit board, or replace the center base, proceed directly to "Replacing the Disk Drive."

Refer to Illustration Book, Page 7, Pictorial 4-6 for the following steps.

- Remove the two #8 × 3/4" self-tapping screws from locations AL and AN.
- Lift the base upward and toward the back of the chassis until the base clears the controls,

and connectors on the rear of the chassis. Then set it aside.

NOTES:

1. If you determined that you must replace the ROM and PAL ICs and/or modify the main circuit board, proceed with the following steps.
2. If you do not have to replace the ROM and PAL ICs or modify the main circuit board, proceed directly to "Reinstalling the Base."

Refer to Illustration Book, Page 8, Pictorial 4-7 for the following steps.

- Carefully set the keyboard in front of the chassis as shown. Then carefully unplug the flat cables from P105 and P107 on the main circuit board. Set the keyboard aside temporarily.
- Remove the three 4-40 × 1/4" screws at locations BA, BB, and BC in the video circuit board.
- Swing the video circuit board up and toward the rear as shown.
- Unplug the cables from video circuit board plugs P301, P302, and P303.
- Unplug the two flat cables from main circuit board plugs P104 and P106.
- Remove the video circuit board and set it aside.

NOTES:

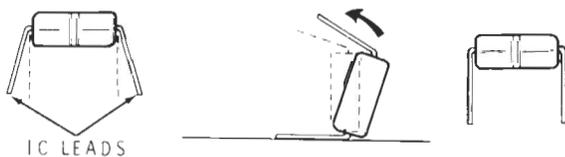
1. If you determined that you must replace the ROM and PAL ICs, proceed with the following steps.
2. If you do not have to replace the ROM and PAL ICs, but do need to modify the main circuit board, skip the following steps and proceed directly to "Modifying the Main Circuit Board."

Refer to Illustration Book, Page 8, Pictorial 4-8 for the following steps.

CAUTION: This computer contains ESD (Electrostatic Sensitive) devices. Exercise extreme care in handling these devices to prevent damage.

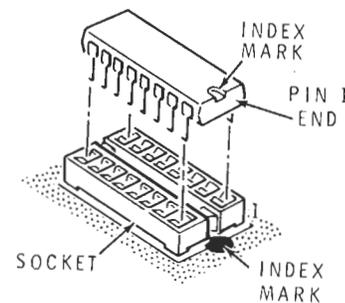
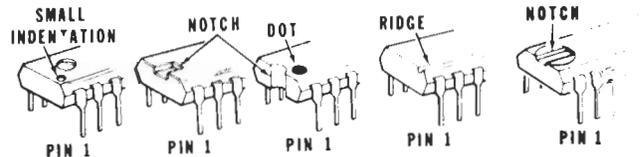
The pins on the ICs may be bent out at an angle, so they do not line up with the holes in the IC socket. Do not try to install an IC without first bending the pins as follows. To do so may damage the IC pins or the socket and cause intermittent contact.

Before you install an IC, lay it down on its side as shown in Detail 4-8A and very carefully roll it towards 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.



Detail 4-8A
IC pins

Make sure that the pin 1 end of the IC is positioned over the index mark on the circuit board (see Detail 4-8B). Also make sure that all of the pins are started into the socket. NOTE: An IC pin can become bent under the IC and it will appear as though it is correctly installed in the socket.



Detail 4-8B
Pin 1 identifications

- Position the chassis so the front is toward you.
- Locate the ROM integrated circuit (U190) and the PAL integrated circuit (U161) on the main circuit board.
- Use an IC puller as shown in the inset drawing to remove ROM and PAL IC's from the main circuit board. Set these IC's aside; they will not be needed again.
- Install the new ROM (HE 444-87-5) on the main circuit board at U190. Make sure you position the pin 1 end of the IC toward the index mark on the circuit board.
- Similarly, install the new PAL (HE 444-129-1) on the main circuit board at U161.
- Locate programming jumper J102 on the main circuit board. Then unplug it from the 0 position and reinstall it in the 1 position, toward the edge of the main board.

NOTES:

1. If you determined that you must modify the main circuit board, proceed to "Modifying the Main Circuit Board."
2. If you do not have to modify the main circuit board, skip "Modifying the Main Circuit Board" and proceed directly to "Reinstalling the Video Logic Circuit Board."

MODIFYING THE MAIN CIRCUIT BOARD

NOTE: Perform the following steps only if you determined that you must modify the main circuit board.

Refer to Illustration Book, Page 9, Pictorial 4-9 for the following steps.

- By lifting the inner part of the card pullers, carefully unplug the Z-207 controller card from the main circuit board. Then slide it up and out of the card cage. Set the controller card aside temporarily.
- Use the same procedure to remove any other cards that may be in the Computer.
- Remove the four 4-40 × ¼" screws at locations P, R, S, and T which secure the card cage to the main circuit board and chassis.
- Remove the two #6 × ¼" sheet metal screws at locations AU and AV which hold the card cage to the rear of the chassis.
- Lift the card cage up and remove it from the chassis. Set the card cage aside temporarily.

Refer to Illustration Book, Page 9, Pictorial 4-10 for the following steps.

- Remove the nine 4-40 × ¼" screws at locations A, B, C, D, E, F, G, H, and J which secure the main circuit board to the chassis.
- Remove the three long spacers at locations K, L, and N.

Refer to Illustration Book, Page 10, Pictorial 4-11 for the following steps.

- Carefully lift the main circuit board up and out of the chassis and position it component-side-down as shown in Pictorial 4-11.
- Refer to the inset drawing on the Pictorial and carefully cut the foil trace at U168 pin 11 exactly as shown. Use an X-acto® knife or similar tool. **Be careful not to cut any other foil.**
- Prepare the following three wires. First cut the wire to the proper length and remove approximately $\frac{1}{8}$ " of insulation from each end. Then twist together the small strands at each wire end and melt a small amount of solder on each wire end to hold the strands together.

6½" wire

8½" wire

2½" wire

- Look carefully at the Pictorial and solder one end of the 6½" wire to U152 pin 1. Use only as much solder and heat as necessary to ensure a good connection. Cut off any excess bare wire end.
- Solder the remaining end of the 6½" wire to U130 pin 8.
- Similarly, solder one end of the 2½" wire to U130 pin 9.
- Solder the remaining end of the 2½" wire to the indicated foil at R104.

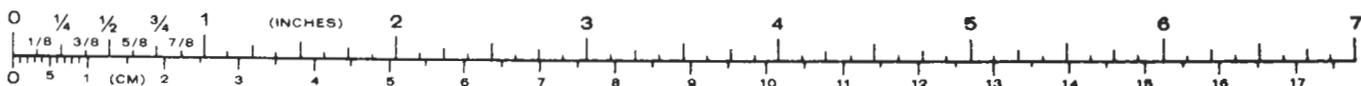
- Solder one end of the 8½" wire to the U130 pin 10.
- Similarly, solder the remaining end of the 8½" wire to U225 pin 3.
- Position the three wires against the circuit board as shown in the Pictorial.

Carefully inspect the circuit board for the following most commonly made errors.

- Unsoldered connections.
- Poor solder connections.
- Solder bridges between foil patterns.
- Protruding leads which could touch together.

Refer to Illustration Book, Page 11, Pictorial 4-12 for the following steps.

- If the power supply is still in the Computer, connect power supply leads P1 and P2 to P101 and P102 on the main board before installing the board.
- Position the main circuit board inside the chassis and line up the studs on the chassis with the mounting holes in the circuit board. Be sure the connectors along the back edge of the circuit board protrude through their corresponding holes in the rear of the chassis.



NOTE: Refer to the "Parts Pictorial" (Illustration Book, Page 1) when the following steps call for hardware.

- **Do not tighten hardware in the next two steps until told to do so.**
- Use nine 4-40 × ¼" screws to secure the main circuit board to the chassis at locations A, B, C, D, E, F, G, H, and J.
- Use three long spacers to secure the main circuit board to the chassis at locations K, L, and N.
- Tighten the hardware installed in the previous steps.

Refer to Illustration Book, Page 11, Pictorial 4-13 for the following steps.

- Position the card cage onto the main circuit board and against the rear of the chassis as shown.

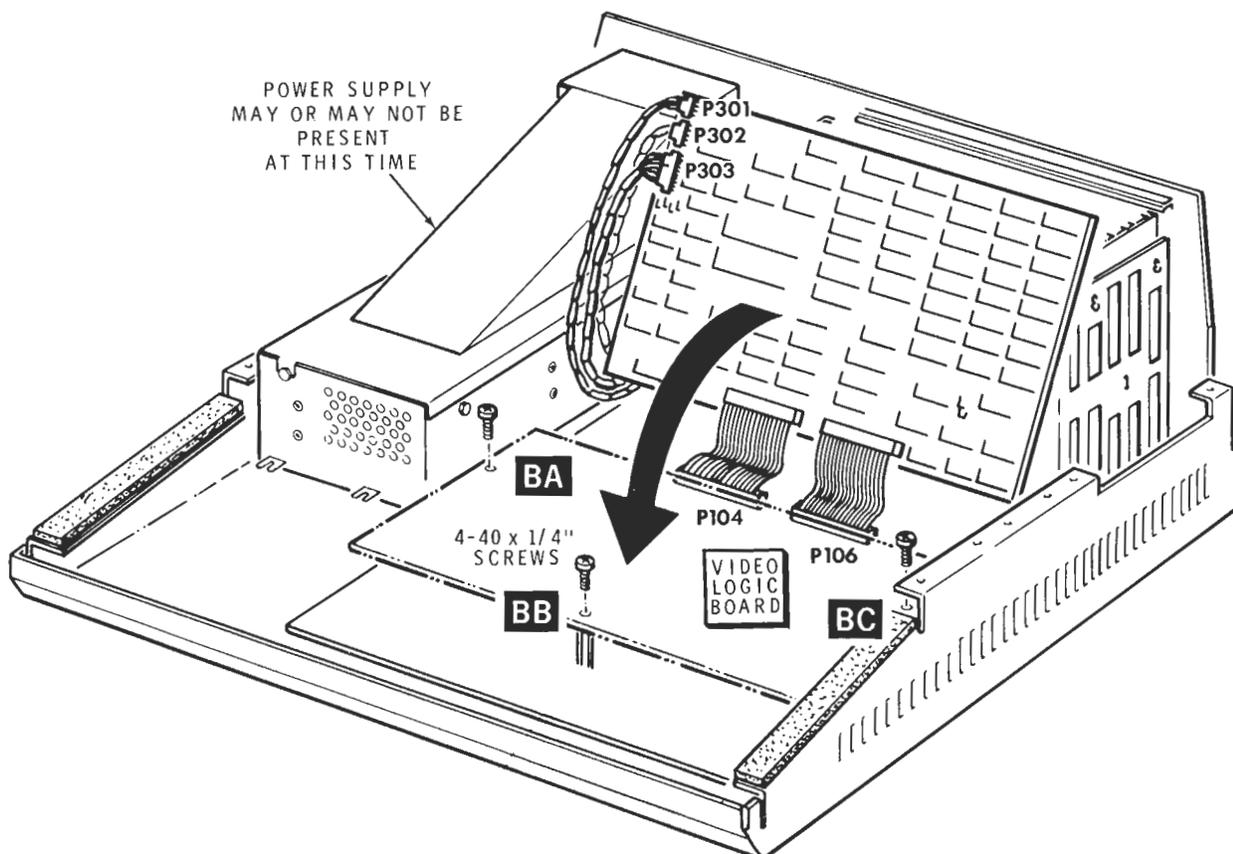
- Use two #6 × ¼" sheet metal screws to secure the card cage to the rear of the chassis at locations U and V.
- Use four 4-40 × ¼" screws to secure the card cage to the main circuit board and chassis at locations P, R, S, and T.
- Position the Z-207 controller card with the component side toward the front of the chassis as shown and slide it into the first set of slots in the card racks. Then push the card down until it seats into the socket on the main circuit board.
- Reinstall any other cards that you may have removed from the Computer.

This completes the modification of the main circuit board. Proceed to "Reinstalling the Video Logic Circuit Board."

REINSTALLING THE VIDEO LOGIC CIRCUIT BOARD

Refer to Pictorial 4-14 for the following steps.

- Position the video logic circuit board onto the main circuit board as shown in the Pictorial.
- Connect the flat cables coming from the video logic circuit board to plugs P104 and P106 on the main circuit board as shown. Be sure the sockets and plugs line up properly before you push the sockets onto the plugs.
- Locate the 7-wire cable coming from the rear of the chassis. Then push the 10-pin socket on the end of this cable onto plug P303 on the video logic circuit board. Be sure the slotted side of the socket is away from you (toward the circuit board).
- Similarly, push the 5-pin socket on the end of the 3-wire cable, coming from the rear of the chassis, onto plug P302 on the video logic circuit board.
- Similarly, push the 4-pin socket on the end of the shielded cable, coming from the rear of the chassis, onto plug P301 on the video logic circuit board.
- Swing the video logic circuit board down onto the main circuit board. Then use three 4-40 × 1/4" screws to secure the video logic circuit board to the spacers that are mounted on the main circuit board at BA, BB, and BC.



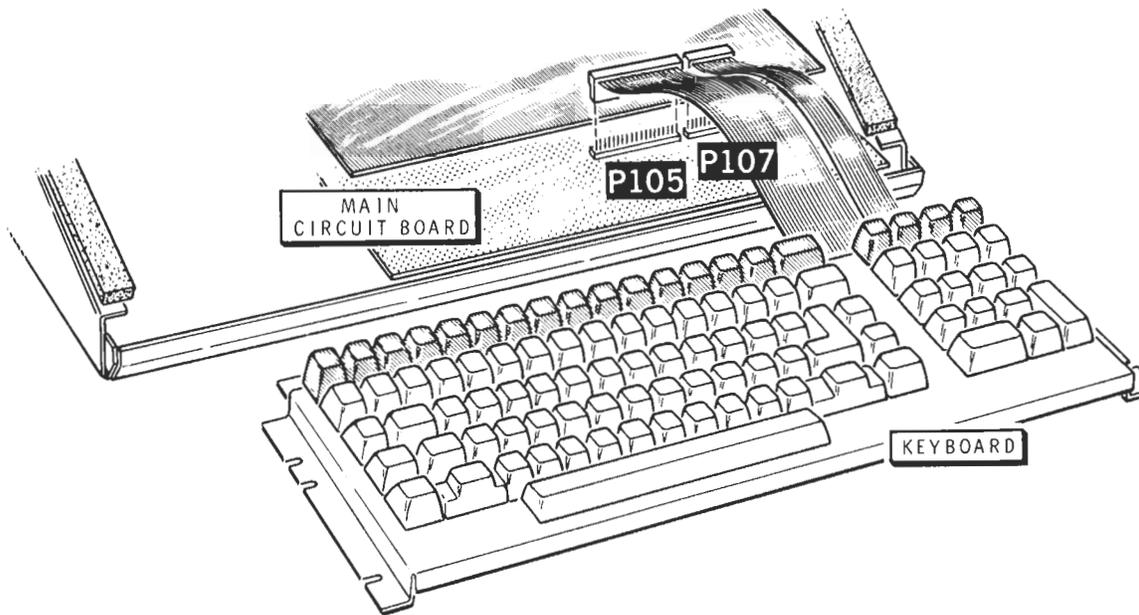
Pictorial 4-14

Video logic board installation

REINSTALLING THE BASE

Refer to Pictorial 4-15 for the following steps.

- Position the keyboard in front of the chassis. Push the larger socket on one of the flat cables coming from the keyboard onto plug P105 on the main circuit board.
- Similarly, push the other socket on the flat cable coming from the keyboard onto plug P107 on the main circuit board.
- Check plugs P105 and P107 again to make sure you have them properly connected.



Pictorial 4-15
Keyboard cable connections

Refer to Pictorial 4-16 for the following steps.

- Set the keyboard on top of the chassis flanges that have the foam tape. Form the flat cables into a loop behind the keyboard.

NOTE: If you determined that you must replace the base, be sure to use the new base in the next step.

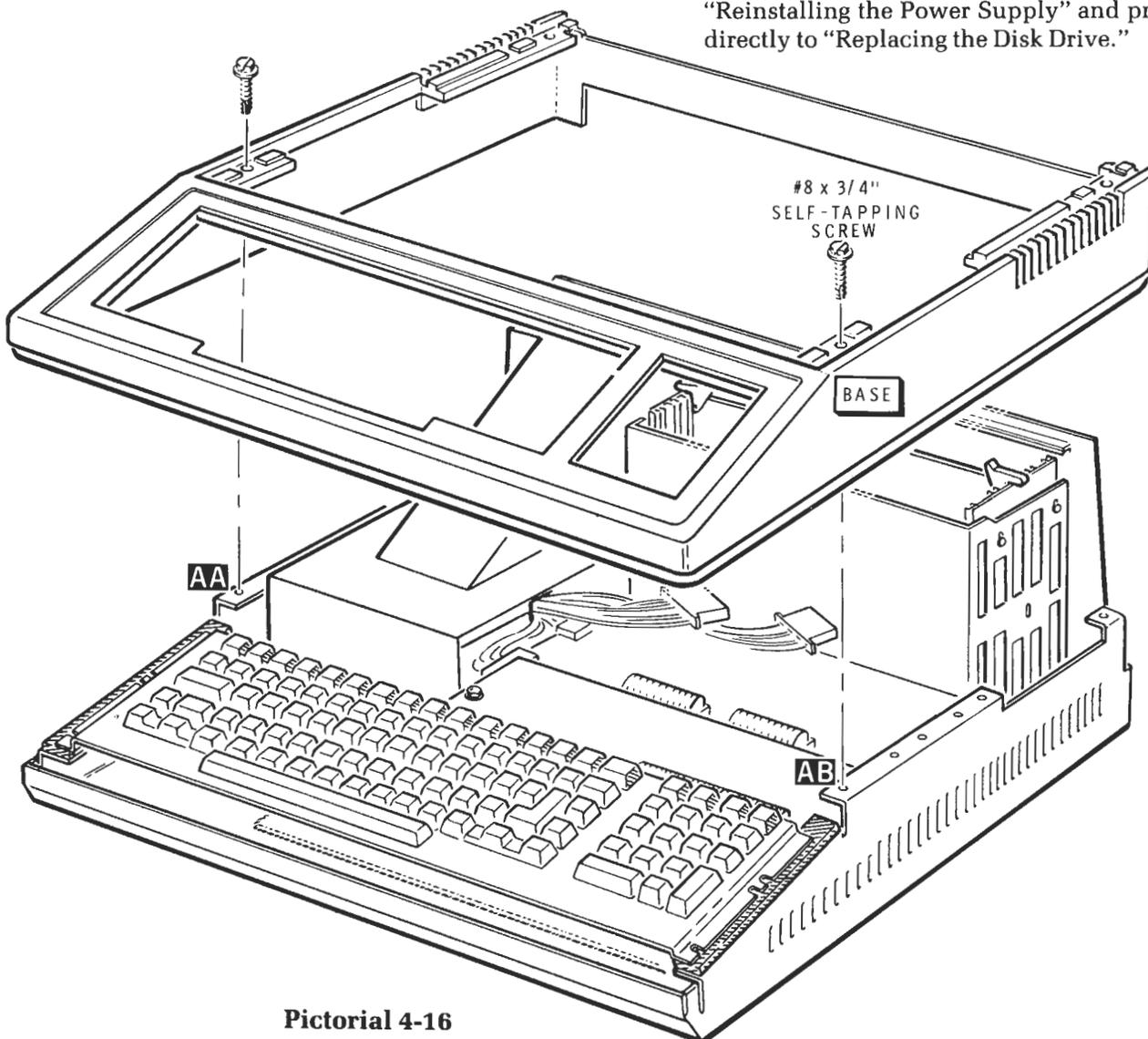
- Set the base over the chassis and keyboard and center the keyboard in the base.

NOTE: There are nipples on the base for the notches on the keyboard to set onto. It is important that the keyboard notches line up over the base nipples.

- Use two #8 × 3/4" self-tapping screws to secure the base to the chassis at AA and AB.

NOTES:

1. If you removed the power supply, proceed to "Reinstalling the Power Supply."
2. If you did not remove the power supply, skip "Reinstalling the Power Supply" and proceed directly to "Replacing the Disk Drive."



Pictorial 4-16
Keyboard and base installation

REINSTALLING THE POWER SUPPLY

Refer to Illustration Book, Page 12, Pictorial 4-17 for the following steps.

NOTE: If you determined that you must replace the power supply, be sure you install the new power supply in the next step.

- Lower the power supply part way into the chassis at the location shown. Then refer to inset drawing #1 and push the 10-pin socket, coming from the power supply, that has the blue, yellow, and red wires onto plug P102 on the main circuit board. Be sure the slotted side of the socket is up (away from the main circuit board).
- Similarly, push the 10-pin socket, coming from the power supply, that has the red and black wires onto plug P101 on the main circuit board. Be sure the slotted side of the socket is up.
- Lower the power supply the rest of the way into the chassis. Be careful not to pinch any wires between the power supply and the chassis.
- Use four #6 × ¼" sheet metal screws to secure the power supply to the rear of the chassis at AA, AB, AC, and AD.
- Use two 6-32 × ¼" screws and two #6 lockwashers to secure the power supply to the bottom of the chassis at AE and AF.
- Locate the large orange and the large black wire coming from the power supply and the 10-pin plug coming from the rear of the chassis and

the video circuit board. Then refer to inset drawing #2 on the Pictorial and push the spring connector on the end of the black wire into the indicated hole in the socket until it locks into place. Be sure the slotted side of the socket and the tab side of the spring connector are up as shown.

- Similarly, push the spring connector on the end of the orange wire into the indicated hole in the 10-pin socket until it locks into place.

This completes the reinstallation of the power supply. Proceed to "Replacing the Disk Drive."

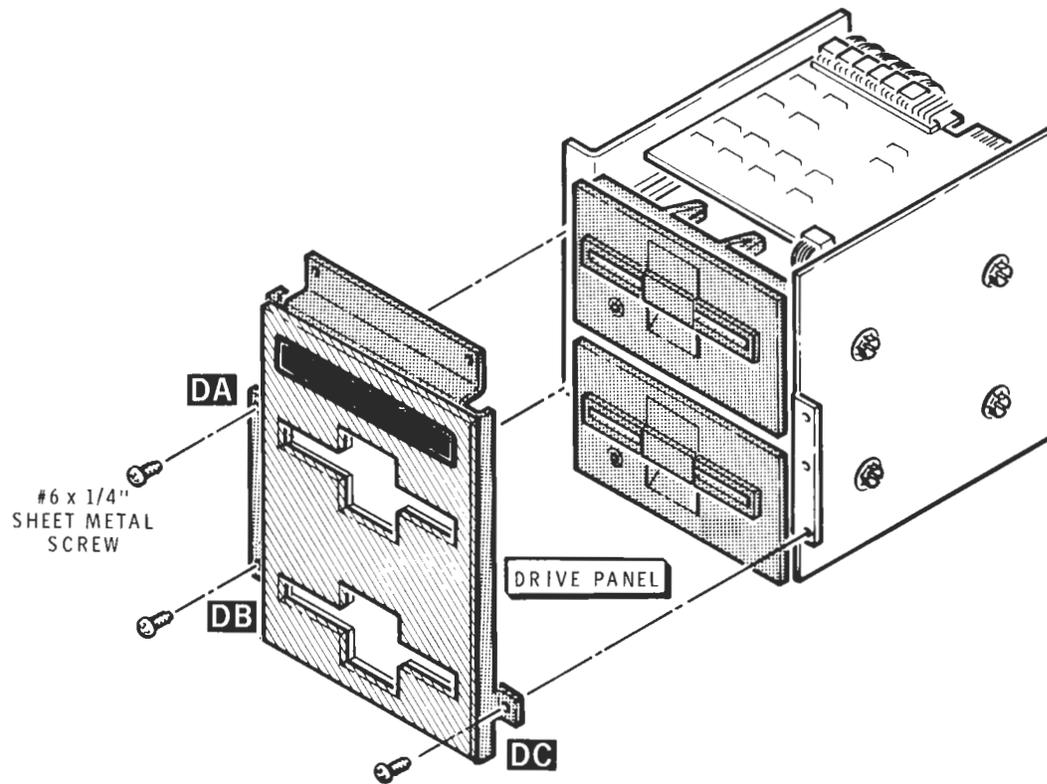
REPLACING THE DISK DRIVE

Refer to Illustration Book, Page 13, Pictorial 4-18 for the following steps.

- Place a soft cloth on the work area to prevent scratches.
- Position the drive/video subassembly as shown, with the CRT face down.
- Remove the six 6-32 × ⅜" hex head screws at locations CA, CB, CD, CE, CF, and CG. Set the screws and the ground strap aside temporarily.
- Remove the four 6-32 × ½" screws and #6 flat washers at locations CH, CI, CJ, and CK from the bottom of the drive assembly chassis as shown in the Pictorial. Set the screws and flat washers aside temporarily.
- Lift the drive assembly chassis up and away from the center base.

Refer to Pictorial 4-19 for the following step.

- Remove the three #6 × 1/4" sheet metal screws from locations DA, DB, and DC. Then remove the drive panel and discard it. You will install a new drive support panel and drive front panel.



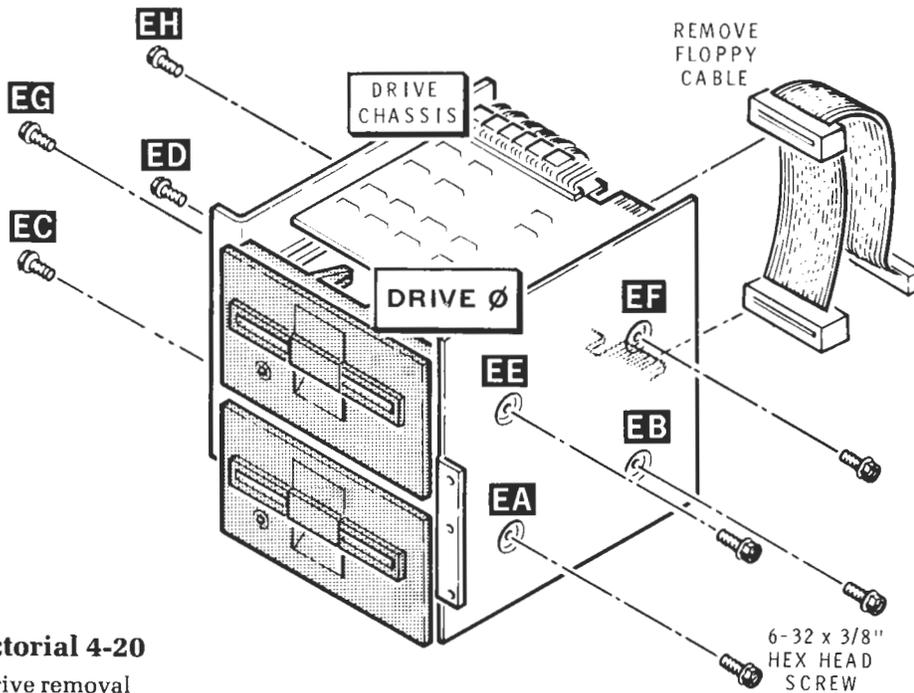
Pictorial 4-19
Drive front panel removal

Refer to Pictorial 4-20 for the following steps.

- Position the drive chassis as shown in Pictorial 4-20.
- Unplug the floppy cable from the disk drives, if you have not already done so. Set the cable aside.
- Remove the eight 6-32 x 3/8" hex screws (if the Computer has two floppy disk drives) at locations EA, EB, EC, ED, EE, EF, EG, and EH, or remove the four 6-32 x 3/8" hex screws EA, EB, EC, and ED if the Computer has one floppy disk drive.
- Note the position of the upper floppy disk drive, this is "drive 0". If there is more than

one drive in the Computer, mark the upper drive "drive 0" before you proceed to the next step. It is important that you do not get the drives mixed up. If there is only one drive, it is already drive 0 regardless of its position.

- Remove drive 0, that you identified and marked in the previous step, and set it aside temporarily. You will reinstall this drive later.
- If there is a second drive, (the lower drive in the chassis) remove it at this time.
- After you have removed either one or both drives, discard the drive chassis. You will install both the Winchester drive and drive 0 (previously marked) in the new drive chassis supplied with this kit later.



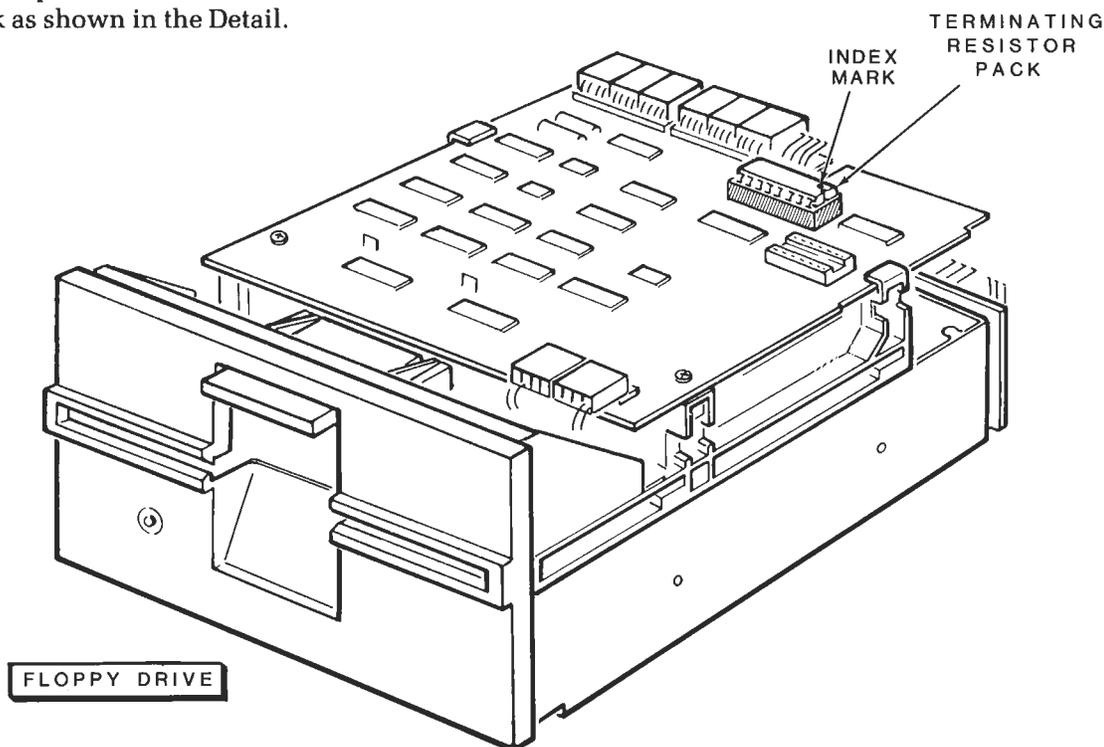
Pictorial 4-20
Drive removal

NOTE: Perform the next two steps only if the system has two drives.

- Position drive 1 (marked in an earlier step) as shown in Detail 4-20A. Then locate the terminating resistor pack and unplug it from its socket. Set this drive aside; it will not be needed again.
- Position drive 0 (marked in an earlier step) as shown in Detail 4-20A. Then install the terminating resistor pack in the indicated socket. Be sure to position the index mark on the resistor pack as shown in the Detail.

NOTES:

1. If you determined that you must replace the center base, proceed to "Replacing the Center Base."
2. If you do not have to replace the center base, skip "Replacing the Center Base" and proceed directly to "Reinstalling the Drive Chassis."



Detail 4-20A

REPLACING THE CENTER BASE

Perform the following steps only if you determined that you must replace the center base.

Refer to Illustration Book, Page 14, Pictorial 4-21 for the following steps.

- Remove the four #6 × 5/8" self-tapping screws (two on each side) that hold the slide rails to the center base. Then unhook the two springs and set the slide rails and hardware aside temporarily.
- Remove the two #6 × 5/8" self-tapping screws at BL and BN. Then set the screws, solder lugs, and springs aside temporarily. NOTE: Do not unhook the springs from the solder lugs.
- Remove the two 6-32 × 7/8" screws from locations BR and BP. Then remove the mask bracket and set it and the screws aside temporarily.
- Remove the 6-32 × 1 7/8" screws from locations AG, AH, AI, and AJ and the #8 × 1 1/2" sheet metal screw from location AK. Set these screws aside temporarily. NOTE: These are the screws that hold the center base to the base and chassis.
- Remove the two #8 × 1/2" sheet metal screws from locations BT and BS. Set these screws and the ground strap aside temporarily.
- Pull the center base away from the CRT front panel assembly. Then discard the center base. NOTE: The video driver circuit board will remain fastened to the front panel assembly. Be careful you do not damage this assembly while you perform the following steps.

Refer to Illustration Book, Page 14, Pictorial 4-22 for the following steps.

- Position the new center base as shown in the Pictorial.
- Use a #6 × 5/8" self-tapping screw and pre-tap holes BL and BN.
- Mount the #6 solder lugs, that have the springs attached to them, at locations BL and BN.
- Position the mask bracket with the pressed-in nuts up as shown and mount it at BP and BR with two 6-32 × 7/8" screws. Turn the screws in only about 1/4".
- Use a #8 × 1/2" sheet metal screw to pre-tap holes BS and BT.
- Mount the circuit board and shield onto the center base at BS and BT with two #8 × 1/2" sheet metal screws. Push the shield forward before you tighten the hardware.

Refer to Illustration Book, Page 15, Pictorial 4-23 for the following steps.

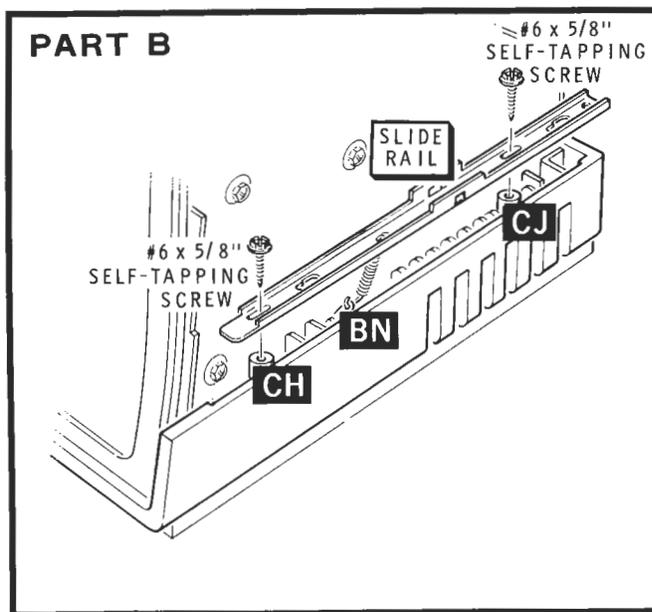
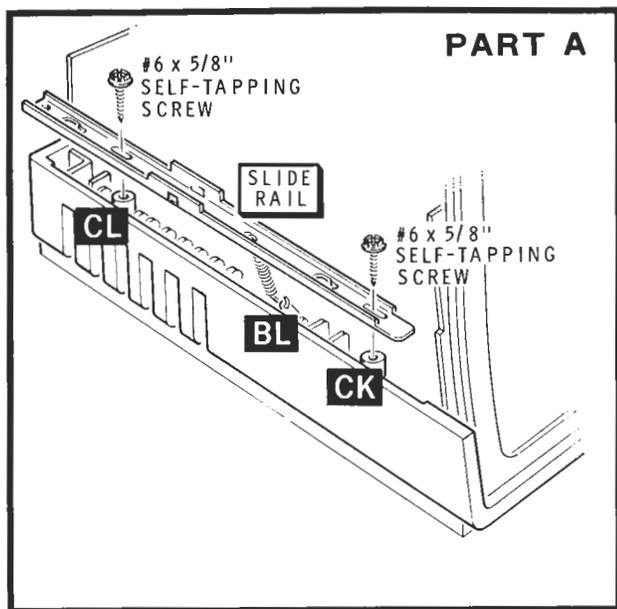
- Place a cloth on your work surface and lay the CRT mask face down.
- Slide the mask bracket over the mask at BP and BR. Also make sure that the circuit board and shield is on the inside of the support bracket that is mounted at the upper right hand corner of the CRT. Push the base down as far as it will go and tighten the screws at BP and BR.

Refer to Pictorial 4-24 for the following steps.

- Position one of the slide rails near the left side of the center base as shown in Part A. Then hook the free end of the spring into the indicated hole in the rail.
- Use two #6 × 5/8" self-tapping screws to mount the slide rail to the center base as shown. Tighten these screws until they are just snug; then loosen them 1/2 turn.

- Similarly, use two #6 × 5/8" self-tapping screws to secure a slide rail to the right side of the center base as shown in Part B.
- Check the operation of the slide rails. If they are hard to move, loosen the screws that secure them to the center base until they move easily.

This completes the replacement of the center base. Proceed to "Preparing The Drive Chassis."



Pictorial 4-24
Slide rail installation

PREPARING THE DRIVE CHASSIS

Refer to Illustration Book, Page 16, Pictorial 4-25 for the following steps.

- Position the new drive chassis as shown in Pictorial 4-25.
- Locate drive Ø that you set aside earlier. Mount drive Ø in the bottom of the drive chassis. Then use four 6-32 × ¼" screws to secure the drive as shown.

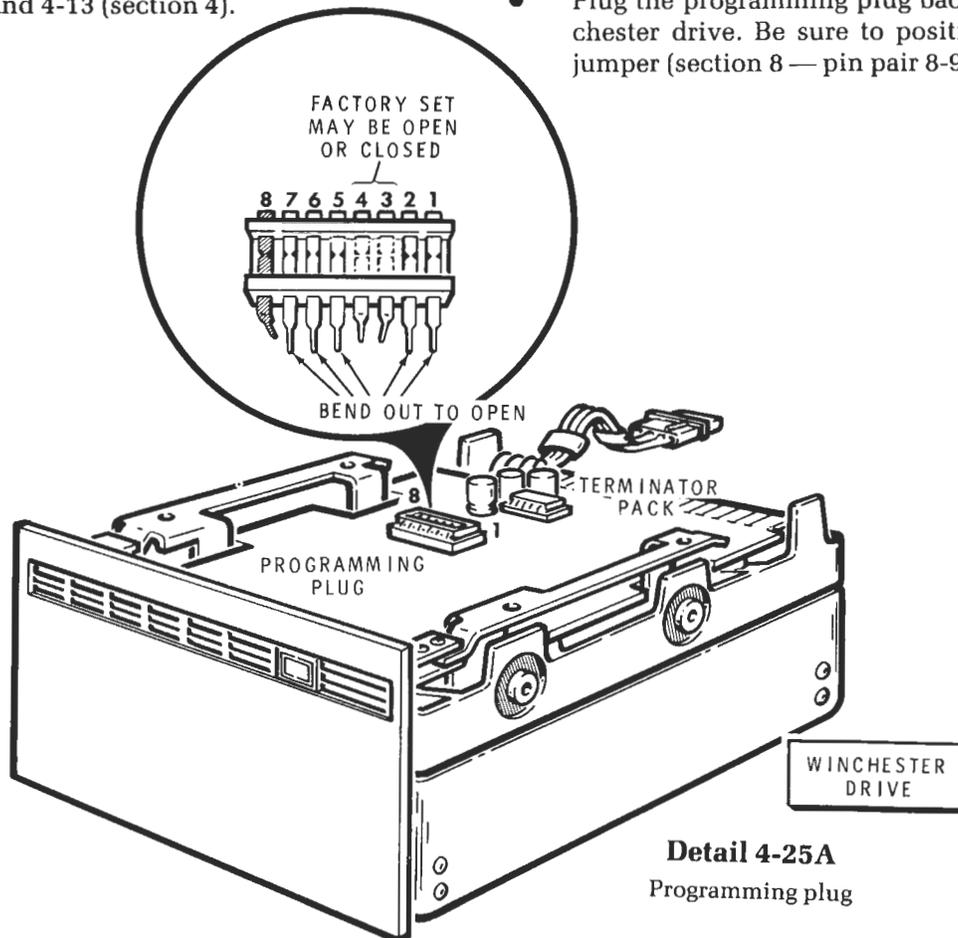
CAUTION: The Winchester drive is fragile and can be damaged easily by shocks or dropping. Be sure that you do not subject the drive to any unnecessary shocks or drop it.

- Refer to Detail 4-25A. When you unpack the Winchester drive, you will see that the 16-pin programming plug has all pin pairs shorted with the possible exception of pin pairs 3-14 (section 3) and 4-13 (section 4).

- Use a felt tip marker or something similar to mark the programming plug at pin pair 8-9 (section 8). You will use this mark as a reference when you configure this drive.

One or two Winchester drives can be used in a Z-100 computer. The first Winchester drive will be hardware unit 1 and the second Winchester drive will be hardware unit 2. If you use one Winchester drive in a system, the hardware unit number must be number 1.

- To program the programming plug, refer to Detail 4-25A and unplug the programming plug from the Winchester drive.
- Refer to the inset drawing in Detail 4-25A and Table 4-1 and bend the appropriate pins out to the "open" position. Bend only one side of each appropriate pin pair out to open the circuit.
- Plug the programming plug back into the Winchester drive. Be sure to position the marked jumper (section 8 — pin pair 8-9) as shown.



Detail 4-25A
Programming plug

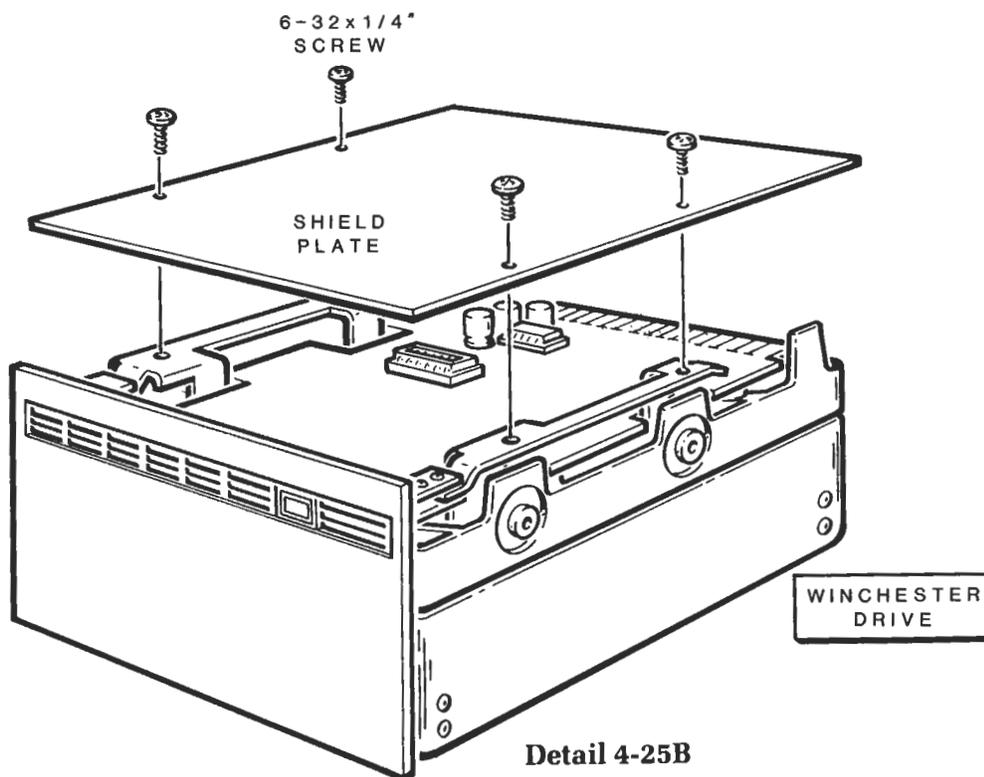
Table 4-1. Winchester Disk Drive Configuration

| Pin Pair | Section Number | Hardware Unit Number | |
|----------|----------------|----------------------|-------|
| | | 1 | 2 |
| 1-16 | 1 | Open | Open |
| 2-15 | 2 | Short | Short |
| 3-14 | 3 | Factory Set* | |
| 4-13 | 4 | Factory Set* | |
| 5-12 | 5 | Open | Open |
| 6-11 | 6 | Open | Open |
| 7-10 | 7 | Open | Short |
| 8-9 | 8 | Short | Open |

*Pin pairs 3-14 and 4-13 (section 3 and 4) are set at the factory; the programming plug is properly configured for the drive it is installed in. If you change or move programming plugs, you should check the following portion of this table and properly set these two sections according to the phase code of the disk drive. The phase code is printed on a label on the disk drive case.

| Pin Pair | Section Number | C | Phase Code | | |
|----------|----------------|------|------------|-------|-------|
| | | | D | E | F |
| 3-14 | 3 | open | open | short | short |
| 4-13 | 4 | open | short | open | short |

- Refer to Detail 4-25B and mount the shield plate to the Winchester drive as shown. Use four 6-32 × ¼" screws. NOTE: The shield plate will fit correctly only one way.
- Refer to Pictorial 4-25 and carefully position the Winchester drive at the top of the drive chassis and secure it in place with four 6-32 × ¼" phillips head screws as shown.
- Use two 6-32 × ¼" screws to mount a drive bracket to either side of the drive chassis as shown.
- Similarly, mount the remaining drive bracket to the other side of the drive chassis.



Detail 4-25B

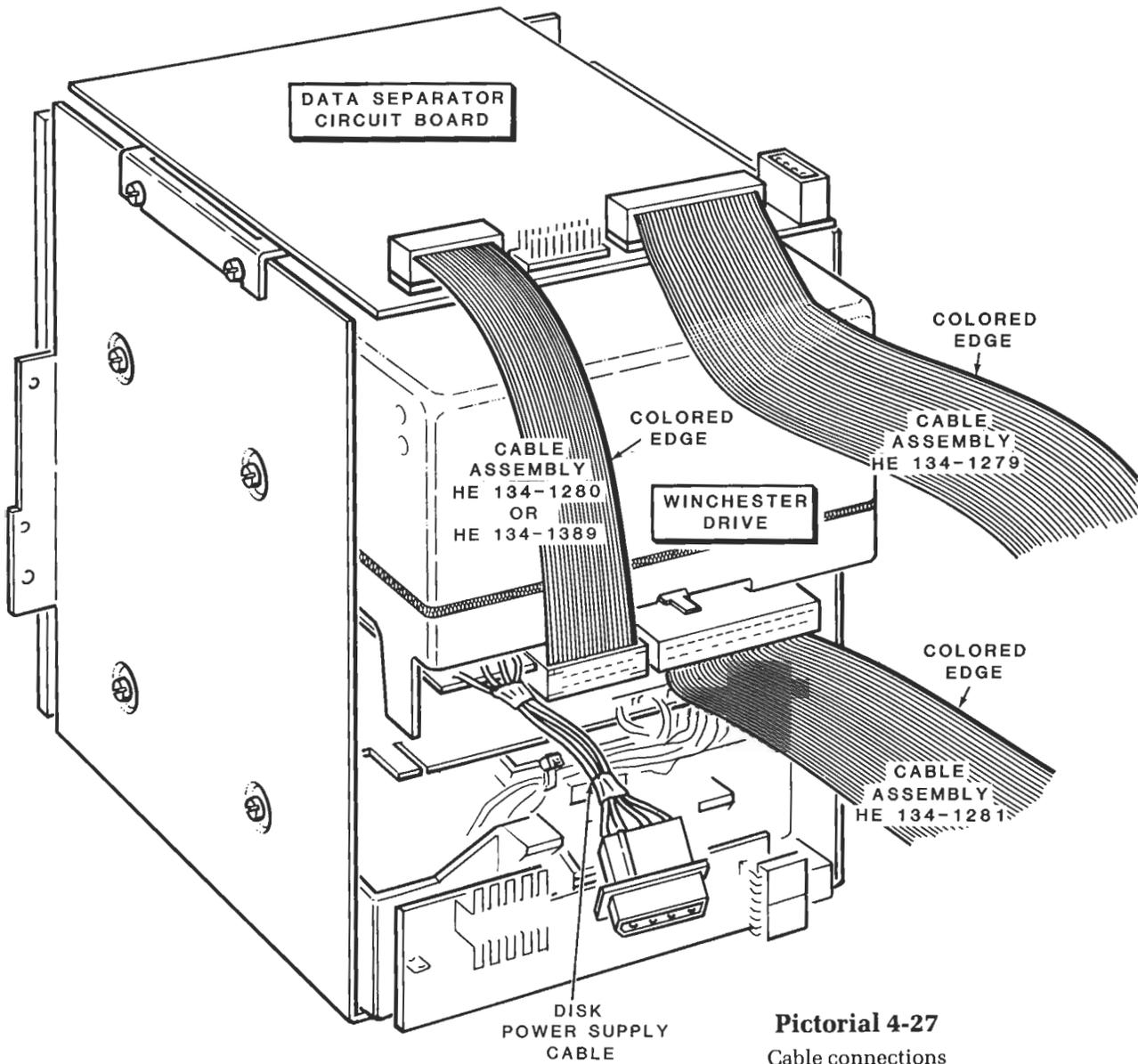
Refer to Illustration Book, Page 16, Pictorial 4-26 for the following steps.

- Carefully peel the backing paper from the insulator. Then press the insulator onto the top of the Winchester Drive in the area shown. Line up the back edge of the insulator with the back edge of the Drive shield.
- Carefully peel the backing paper from the warning label (HE 390-2488). Then press the label onto the back of the Winchester Drive on a flat surface.
- Position the data separator circuit board as shown on the top of the previously installed brackets. Then secure it in place with four 4-40 \times $\frac{1}{4}$ " hex head screws.
- Refer to the inset drawing and insert the Z-217 controller card in any vacant slot in the card cage. Slot 2 is recommended.

Refer to Pictorial 4-27 for the following steps.

NOTE: Each cable assembly is identified by a part number stamped on the plastic end connector. Be certain that you connect the correct cable assembly as indicated by the steps. Also make certain that the color strip on the cable is positioned as shown in the Pictorial.

- Connect either end of the cable assembly HE 134-1279 to the data separator circuit board as shown. The remaining end of the cable assembly will be connected later.
- In a similar manner connect cable assembly HE 134-1281 to the Winchester drive as shown in the Pictorial. The free end of this cable will be connected later.
- Connect one end of cable assembly HE 134-1280 (or HE 134-1389) to the data separator circuit board. Connect the remaining end of the cable to the Winchester drive as shown in the Pictorial.
- Connect cable HE 134-1284 to the floppy disk controller card.



Pictorial 4-27
Cable connections

REINSTALLING THE DRIVE CHASSIS

Refer to Illustration Book, Page 16, Pictorial 4-28 for the following steps.

- Position the All-in-One decorative panel as shown in the Pictorial. Then push the lens into the indicated hole of the panel. Be sure to push the lens as far as possible into the hole.
- Position the decorative panel near the drive chassis as shown. Then use three #6 × ¼" sheet metal screws to secure the panel to the drive chassis.

Refer to Illustration Book, Page 17, Pictorial 4-29 for the following steps.

- Position the video/drive subassembly as shown in the Pictorial.
- Position the drive chassis onto the subassembly as shown. Then use four 6-32 × ½" screws and four #6 flat washers to secure the drive chassis to the subassembly at CH, CI, CJ, and CK.
- Use six 6-32 × ⅜" hex head screws to secure the drive chassis at CA, CB, CD, CE, CF, and CG. Also be sure to mount a ground strap at CA. Use the nut starter (supplied) to start the screws located between the CRT and the drive chassis.

Refer to Illustration Book, Page 18, Pictorial 4-30 for the following steps.

- Locate DIP switch S101 on the main circuit board.

NOTE: DIP switch S101 is an eight section switch which determines what drive the Computer will boot from when power is applied. You can select both the drive as well as an auto-boot function upon power up.

| <u>SECTION</u> | <u>DESCRIPTION</u> |
|----------------|---------------------------------------|
| 0 | 5¼" Floppy Disk Drive (Internal)* |
| 1 | 8" Floppy Disk Drive (External)* |
| 2 | 5½" Winchester Disk Drive (Internal)* |
| 3 | 1 = Auto-boot, 0 = Manual Boot |
| 4 | not used, set at 0 |
| 5 | not used, set at 0 |
| 6 | not used, set at 0 |
| 7 | 0 = 60Hz, 1 = 50Hz operation |

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

As shipped from the factory, the Computer is set to auto-boot on the 5¼" disk drive. If this is satisfactory, you need not make any changes to the switch settings.

To auto-boot from the Winchester drive, set switch S101 on the main board as follows:

| <u>SECTION</u> | <u>POSITION</u> |
|----------------|-----------------|
| 0 | 0 |
| 1 | 1 |
| 2 | 0 |
| 3 | 1 |

To manually boot from the Winchester, set switch S101 as shown above except set section 3 to the 0 position.

To retain the boot from the 5¼" disk drive, but not have auto-boot enabled, set section 3 of S101 to the 0 position. No other switch section changes are required.

* Default boot drive.

Cable Connections

Refer to Illustration Book, Page 19, Pictorial 4-31 for the following steps.

- Set the drive/video subassembly onto the chassis/base assembly as shown.
- Connect the free end of cable HE 134-1284, coming from floppy drive 0, to the Z-207 controller card as shown.
- Connect the free end of cable HE 134-1279 to the Winchester controller card as shown.
- Connect the free end of cable HE 134-1281 from the Winchester drive to the Winchester controller card as shown.

Refer to Illustration Book, Page 20, Pictorial 4-32 for the following steps.

- Connect the power cables to the two drives at P4 and P5.
- Connect the power cable to the Winchester controller card at P6 as shown.
- Connect the power cable to the data separator board at P3 as shown.
- Remove the protective paper from each of the three clips. Then press the clips onto the card cage as shown in inset drawing #1 on the Pictorial.
- Route the power cables as shown in inset drawing #2 and position them inside the clips as shown.

Refer to Illustration Book, Page 21, Pictorial 4-33 for the following steps.

- Reposition the video/drive subassembly all the way onto the base assembly as shown.
- Use four 6-32 \times 1 $\frac{7}{8}$ " screws to secure the drive/video subassembly to the base at locations AG, AH, AI, and AJ. Be sure the ground strap is also fastened into place at AG.
- Use a #8 \times 1 $\frac{1}{2}$ " hex head sheet metal screw to secure the drive/video subassembly to the base at location AK. Also be sure to fasten the ground strap at this location.
- Refer to the inset drawing on the Pictorial and push the signal/power plug onto the video circuit board plug as shown.

REINSTALLING THE TOP CASE

Refer to Illustration Book, Page 21, Pictorial 4-34 for the following steps.

NOTE: Perform the next step only if you determined that you must replace the top cover.

- Remove the four threaded locking pins from the old top case, and install them in the new top case.
- Reinstall the new top case onto the Computer. Set it straight down into its position. Slide the latches all the way to the front if they do not snap into place.

This completes the modification of the All-in-One Computer. Proceed to "The PREP Utility" on Page 6-1.

LOW-PROFILE MODEL

Because there are several modifications you may have to make to install the Winchester System, it is necessary to perform the "Replacement Tests." These checks show you which modifications are required. The following chart summarizes the checks and lists any additional parts that may be required.

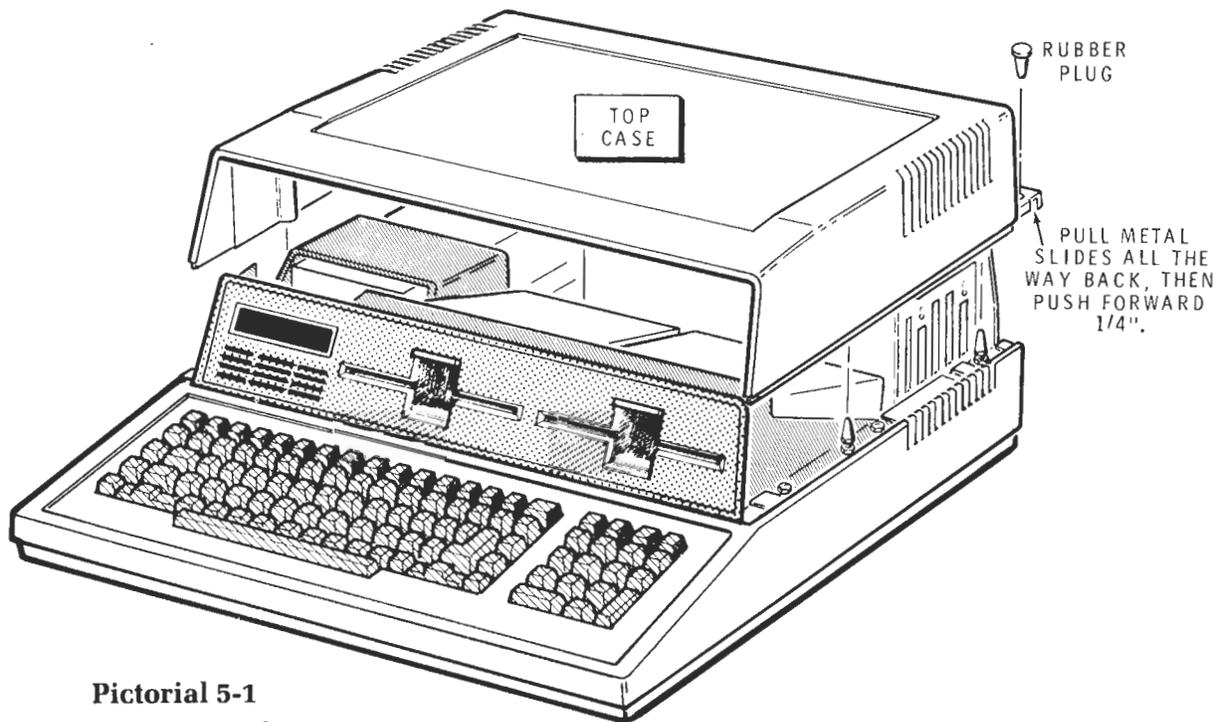
| <u>IF</u> | <u>THEN</u> | <u>PARTS REQUIRED</u> |
|--|-------------------------------|--|
| The power supply does not have a connector for the Winchester controller | Replace the power supply | Power supply HE 234-432 |
| The ROM version is not 2.0 or higher | Replace ROM and PAL IC's | ROM IC HE 444-87-5 PAL IC HE 444-129-1 (both supplied) |
| The main circuit board part number is (HE) 181-3630 | Modify the main circuit board | — |
| If the top cover is non-conductive | Replace the top cover | Top cover HE 92-790 |
| If the base is non-conductive | Replace the base | Base HE 92-791 |

Replacement Tests

WARNING: When the line cord is connected to an AC outlet, hazardous voltages can be present inside the Computer. Be sure to unplug the line cord from the AC outlet.

Refer to Pictorial 5-1 for the following steps.

- Unplug the line cord from the AC outlet.
- Carefully remove all other cables from the rear of the Computer.
- Carefully pull the rubber plug out of each metal slide. Set the rubber plugs aside.
- Use a small flat-blade screwdriver to move the metal slides all the way toward the front and then $\frac{1}{4}$ " toward the back as shown.
- Carefully lift the top case straight up and set it aside.



Pictorial 5-1
Top case removal

Refer to Illustration Book, Page 22, Pictorial 5-2 for the following steps.

- Locate the power supply and look for an unconnected cable and plug labeled P6 as shown in the inset drawing.

If you find this unconnected cable, then you will not have to replace the power supply.

If the power supply does not have this unconnected cable and plug, you must replace the power supply.

- Refer back to the ROM version number you wrote down on Page VI.

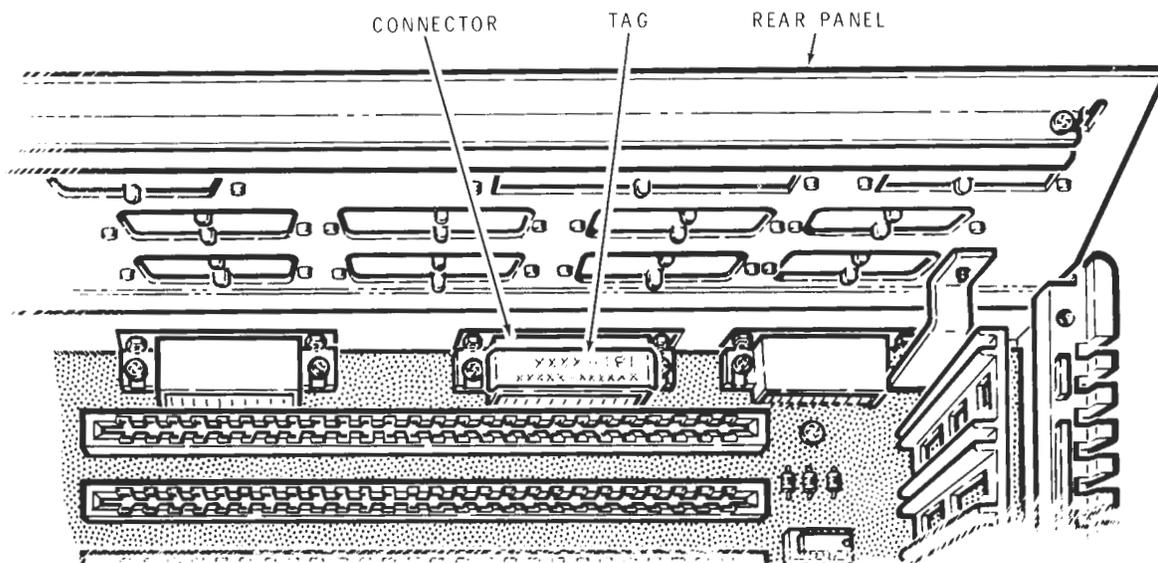
If you wrote down 2.0 or higher, you do not have to replace the ROM and PAL IC's.

If you wrote down any ROM version below 2.0, you will have to replace the ROM and PAL IC's.

- Refer to Detail 5-2A and locate the tag on the indicated connector.

If the part number on this tag is 181-4106 or higher, you will not have to modify the main circuit board.

If the part number on this tag is 181-3630, you will have to modify the main circuit board.



Detail 5-2A

Connector identification

- Refer to Detail 5-2B and turn the top case so the two metal slides are facing upward as shown.

NOTE: In the following test, you will use a VOM (volt-ohmmeter) to measure the resistance of the cabinet's top case. If you measure 1000 ohms or less, the cabinet parts are already coated with a shielding metallic coating. But if your VOM indicates an infinite resistance, you will have to replace the top case and base parts with new ones that have a shielding coating on them. If the cabinet parts are not shielded, the Computer may cause serious RFI (Radio Frequency Interference) during operation.

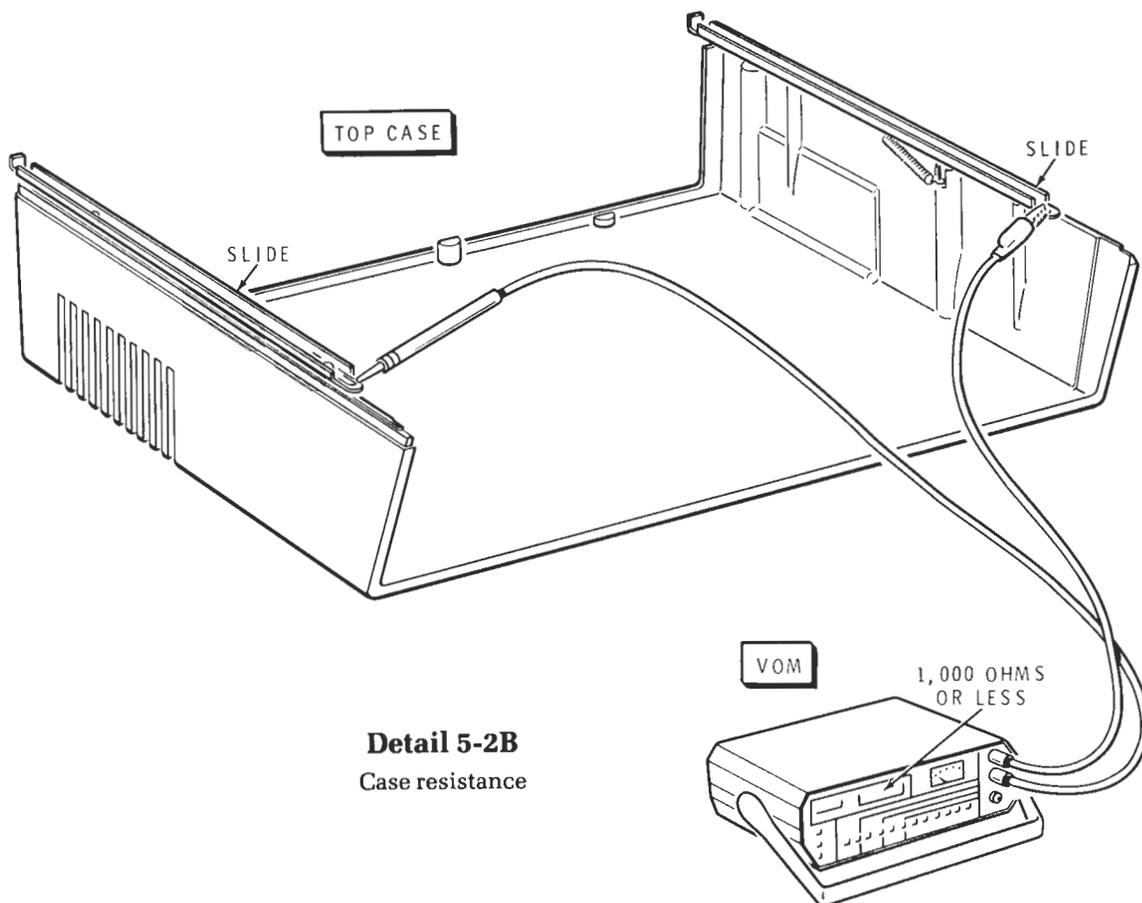
- Set your VOM to measure resistance and so you can easily read 1000 ohms (such as the R \times 10 range).

- Connect the VOM's leads to the two slides, as shown in Detail 5-2B, and measure the resistance.

If you measure 1000 ohms or less, the cabinet already has a metallized coating and you will not have to replace it.

If you measure an infinite resistance, you will have to replace the cabinet parts. (Refer to the chart at the beginning of this section.)

This completes the "Replacement Tests." You should now know which modifications are required on the Computer. The chart on Page 5-1 lists the part numbers for many of the new parts. After you have all of the parts required, proceed to "Modifications."



Detail 5-2B
Case resistance

Modifications

NOTE: Because the Computer may not require all of the following modifications, you will occasionally be given alternative directions. Be sure to follow these directions carefully.

Refer to Illustration Book, Page 23, Pictorial 5-3 for the following steps.

- Remove the locking pins from locations AF and AG and the four #8 × 5/8" self-tapping screws from locations AE, AG, AH, and AK. Set this hardware aside.
- Carefully lift the drive subassembly up and to the front of the Computer about 2 inches and set it back down.
- Unplug the flat cable from each disk drive.
- Disconnect the power cable from each disk drive.
- Lift up on the drive subassembly and set it aside.

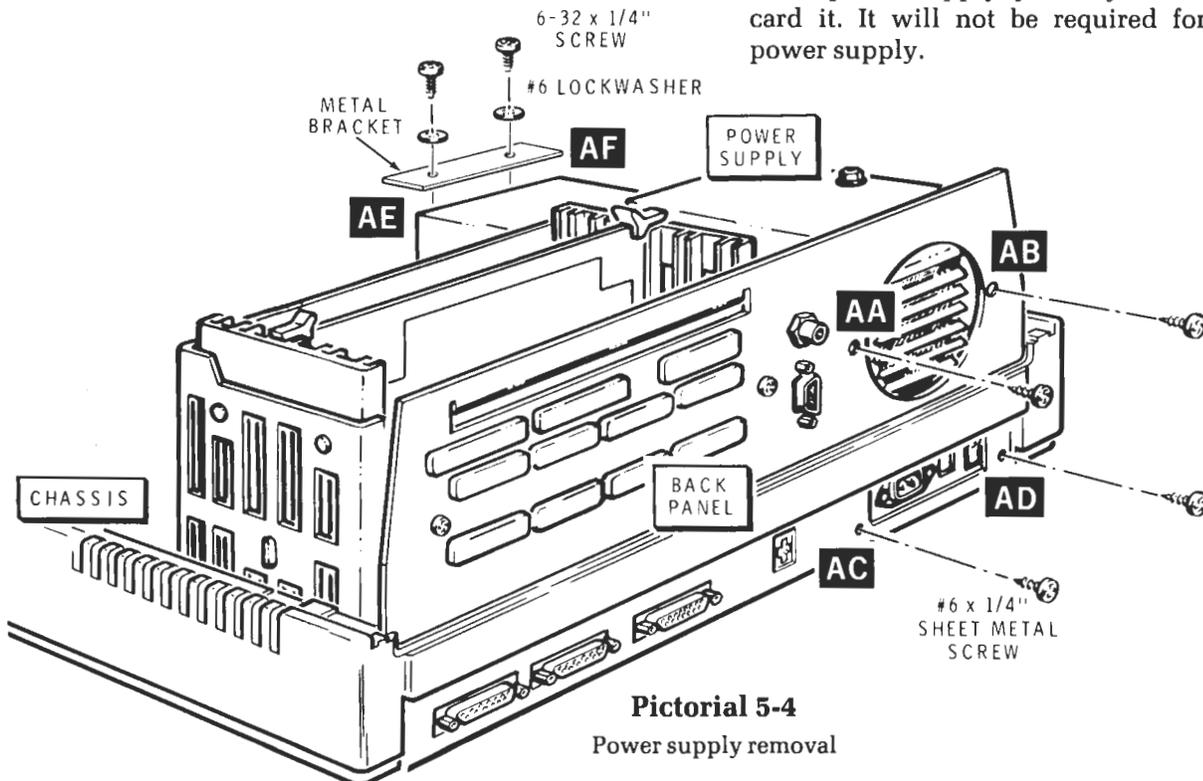
NOTES:

1. If you determined that you must replace the power supply, proceed to "Removing the Power Supply."
2. If you do not have to replace the power supply, skip "Removing the Power Supply" and proceed directly to "Disassembly Continued."

REMOVING THE POWER SUPPLY

Refer to Pictorial 5-4 for the following steps.

- Remove the four #6 × 1/4" sheet metal screws from locations AA, AB, AC, and AD and set them aside.
- Remove the 6-32 × 1/4" screws and #6 lockwashers from locations AE and AF and set them aside.
- If there is a metal bracket securing the front of the power supply, you may remove and discard it. It will not be required for the new power supply.



Pictorial 5-4
Power supply removal

Refer to Illustration Book, Page 24, Pictorial 5-5 for the following steps.

- Carefully unplug the flat cable from the Z-207 Controller Card and set it aside.
- Unplug the two power supply cables from main circuit board plugs P101 and P102.
- Lift the power supply up and out of the Computer.

This completes the removal of the power supply. You will reinstall the power supply later. Proceed to "Disassembly Continued."

DISASSEMBLY CONTINUED

NOTES:

1. If you determined that you must replace the ROM and PAL ICs, modify the main circuit board, and/or replace the base, proceed with the following steps.
2. If you do not have to replace the ROM and PAL ICs, modify the main circuit board, or replace the base, proceed directly to "Replacing the Disk Drive."

Refer to Illustration Book, Page 25 Pictorial 5-6 for the following steps.

- Remove the two #8 × 5/8" self-tapping screws from locations AL and AN and set these screws aside.
- Remove the two locking pins from locations AP and AR and set them aside.
- Lift the base upward and toward the back of the chassis until the base clears the covers and

connectors on the rear of the chassis. Then set it aside.

NOTES:

1. If you determined that you must replace the ROM and PAL ICs and/or modify the main circuit board, proceed with the following steps.
2. If you do not have to replace the ROM and PAL ICs or modify the main circuit board, skip the following steps and proceed directly to "Reinstalling the Base."

Refer to Illustration Book, Page 25, Pictorial 5-7 for the following steps.

- Carefully set the keyboard in front of the chassis as shown. Then carefully unplug the flat cables from P105 and P107 on the main circuit board. Set the keyboard aside temporarily.
- Unplug the power supply cables from main circuit board plugs P101 and P102, if this has not already been done. (See Pictorial 5-5 on Page 24.)
- Remove the three 4-40 × 1/4" screws at locations BA, BB, and BC in the video circuit board and set them aside.
- Swing the video circuit board up and toward the rear as shown.
- Unplug the two cables from video circuit board plugs P301 and P303.
- Unplug the two flat cables from main circuit board plugs P104 and P106.
- Remove the video circuit board and set it aside.

Refer to Pictorial 5-8 (Illustration Booklet, Page 26) for the following steps.

NOTES:

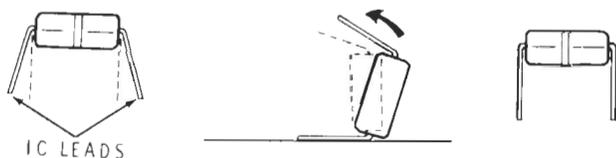
1. If you determined that you must replace the ROM and PAL ICs, proceed with the following steps.
2. If you do not have to replace the ROM and PAL ICs, but do need to modify the main circuit board, skip the following steps and proceed directly to "Modifying the Main Circuit Board."

Refer to Detail 5-8A and 5-8B as you read the following information.

CAUTION: This computer contains ESD (Electrostatic Sensitive) devices. Exercise extreme care in handling these devices to prevent damage.

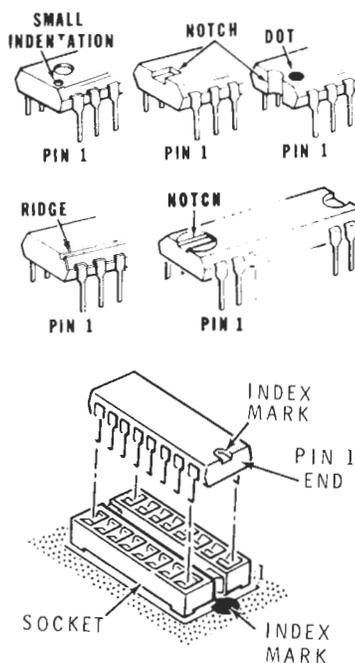
The pins on the IC's may be bent out at an angle, so they do not line up with the holes in the IC socket. Do not try to install an IC without first bending the pins as follows. To do so may damage the IC pins or the socket and cause intermittent contact.

Before you install an IC, lay it down on its side as shown in Detail 5-8A and very carefully roll it towards 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.



Detail 5-8A
IC pins

Make sure that the pin 1 end of the IC is positioned over the index mark on the circuit board (see Detail 5-8B). Also make sure that all of the pins are started into the socket. **NOTE:** An IC pin can become bent under the IC and it will appear as though it is correctly installed in the socket.



Detail 5-8B
Pin 1 identifications

- Position the chassis so the front is toward you as shown in the Pictorial.
- Use an IC puller as shown in the inset drawing to remove the ROM and PAL IC's from the main circuit board. Set these IC's aside; they will not be needed again.
- Install the new ROM (HE 444-87-5) on the main circuit board at U190. Make sure you position the pin 1 end of the IC toward the index mark on the circuit board.
- Similarly, install the new PAL (HE 444-129-1) on the main circuit board at U161.
- Locate programming jumper J102 on the main circuit board. Then unplug it from the 0 position and reinstall it in the 1 position.

NOTES:

1. If you determined that you must modify the main circuit board, proceed to "Modifying the Main Circuit Board."
2. If you do not have to modify the main circuit board, skip "Modifying the Main Circuit Board" and proceed directly to "Reinstalling the Video Logic Circuit Board."

MODIFYING THE MAIN CIRCUIT BOARD

NOTE: Perform the following steps only if you determined that you must modify the main circuit board.

Refer to Illustration Book, Page 26, Pictorial 5-9 for the following steps.

- By lifting the inner part of the card pullers, carefully unplug the Z-207 controller card from the main circuit board. Then slide it up and out of the card cage. Set the controller card aside temporarily.
- Use the same procedure to remove any other cards that may be in the Computer.
- Remove the four 4-40 × ¼" screws at locations P, R, S, and T which secure the card cage to the main circuit board and chassis. Set these screws inside temporarily.
- Remove the two #6 × ¼" sheet metal screws at locations U and V which hold the card cage to the rear of the chassis. Set these screws aside temporarily.
- Lift the card cage up and remove it from the chassis. Set the card cage aside temporarily.

Refer to Illustration Book, Page 27, Pictorial 5-10 for the following steps.

- Remove the nine 4-40 × ¼" screws at locations A, B, C, D, E, F, G, H, and J which secure the main circuit board to the chassis. Set these screws aside temporarily.
- Remove the three long spacers at locations K, L, and N which secure the main circuit board at the chassis. Set these spacers aside temporarily.
- Unplug the power supply cables from plugs P101 and P102 on the main circuit board, if this has not already been done.
- Carefully lift the main circuit board up and out of the chassis and position it component-side-down as shown in Illustration Book, Page 28, Pictorial 5-11.

Refer to Illustration Book, Page 28, Pictorial 5-11 for the following steps.

- Refer to the inset drawing on the Pictorial and carefully cut the foil trace at U168 pin 11 exactly as shown. Use a utility knife or similar tool. **Be careful not to cut any other foil.**
- Prepare the following three wires. First cut each wire to the proper length and remove approximately $\frac{1}{8}$ " of insulation from each end. Then twist together the small strands at each wire end and melt a small amount of solder on each wire end to hold the strands together.
 - 6½" wire
 - 8½" wire
 - 2½" wire
- Cut the bare ends of the three prepared wires to $\frac{1}{8}$ ".
- Look carefully at the Pictorial and solder one end of the 6½" wire to U152 pin 1. Use only as much solder and heat as necessary to ensure a good connection. Cut off any excess bare wire end.
- Solder the remaining end of the 6½" wire to U130 pin 8.
- Similarly, solder one end of the 2½" wire to U130 pin 9.
- Solder the remaining end of the 2½" wire to the indicated foil at R104.
- Solder one end of the 8½" wire to U130 pin 10.
- Similarly, solder the remaining end of the 8½" wire to U225 pin 3.
- Position the three wires against the circuit board as shown in the Pictorial.

Carefully inspect the circuit board for the following most commonly made errors:

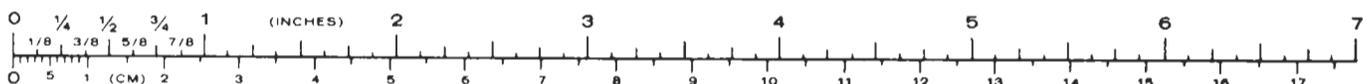
- Unsoldered connections.
- Poor solder connections.
- Solder bridges between foil patterns.
- Protruding leads which could touch together.

Refer to Illustration Book, Page 29, Pictorial 5-12 for the following steps.

- Position the main circuit board inside the chassis and line up the studs on the chassis with the mounting holes in the circuit board. Be sure the connectors along the back edge of the circuit board protrude through their corresponding holes in the rear of the chassis.

NOTE: Refer to the Illustration Book, Page 1, "Parts Pictorial" when a step calls for hardware.

- **Do not tighten hardware in the next two steps until told to do so.**
- Use nine 4-40 \times $\frac{1}{4}$ " screws to secure the main circuit board to the chassis at locations A, B, C, D, E, F, G, H, and J.
- Use three long spacers to secure the main circuit board to the chassis at locations K, L, and N.
- Tighten the hardware installed in the previous two steps.
- If you did not remove the power supply from the chassis, push the 10-pin socket that has the blue, yellow, and red wires, coming from the power supply, onto plug P102 on the main circuit board. Be sure the slotted side of the socket is up (away from the circuit board).
- Similarly, push the 10-pin socket that has the red and black wires, coming from the power supply, onto plug P101 on the main circuit board. Be sure the slotted side of the socket is up.

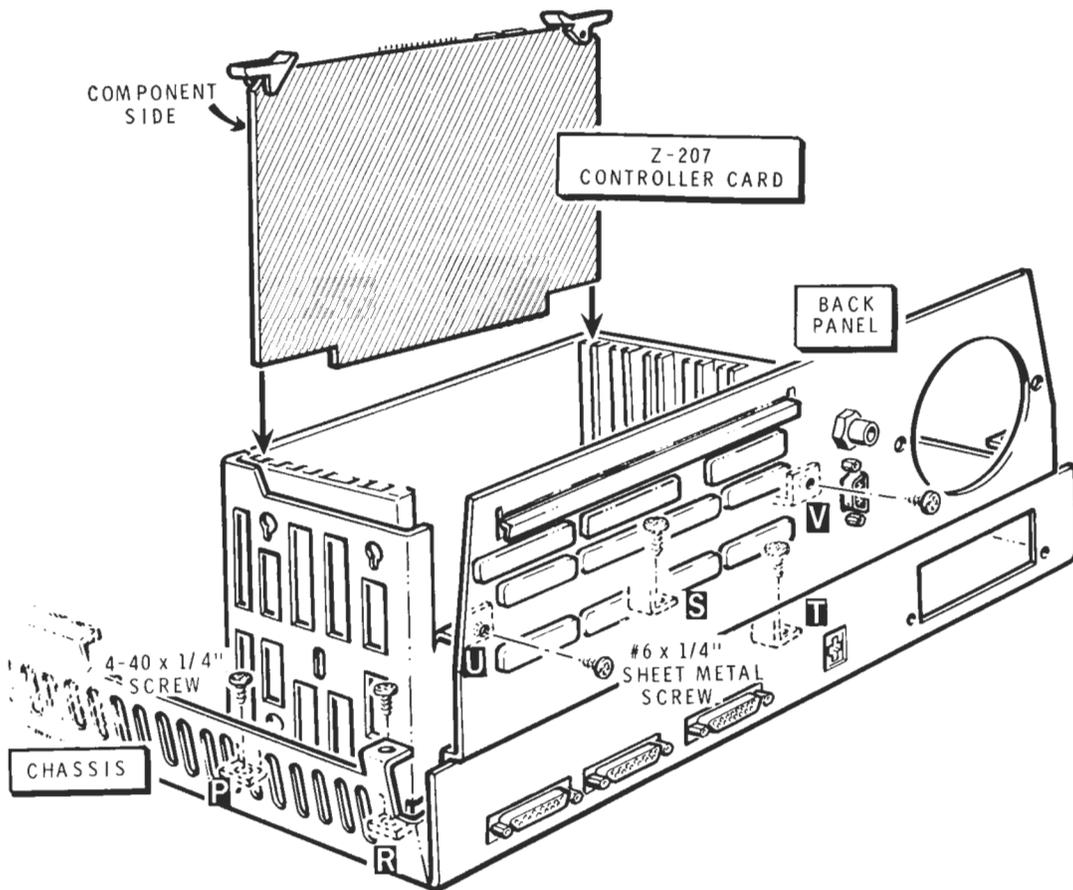


Refer to Pictorial 5-13 for the following steps.

- Position the card cage onto the main circuit board and against the rear of the chassis as shown.
- Use two #6 × 1/4" sheet metal screws to secure the card cage to the rear of the chassis at locations U and V.
- Use four 4-40 × 1/4" screws to secure the card cage to the main circuit board and chassis at locations P, R, S, and T.

- Position the Z-207 controller card with the component side toward the front of the chassis as shown and slide it into the first set of slots in the card racks. Then push the Card down until it seats into the socket on the main circuit board.
- Reinstall any other cards that you may have removed from the Computer.

This completes the modification of the main circuit board. Proceed to "Reinstalling the Video Logic Circuit Board."

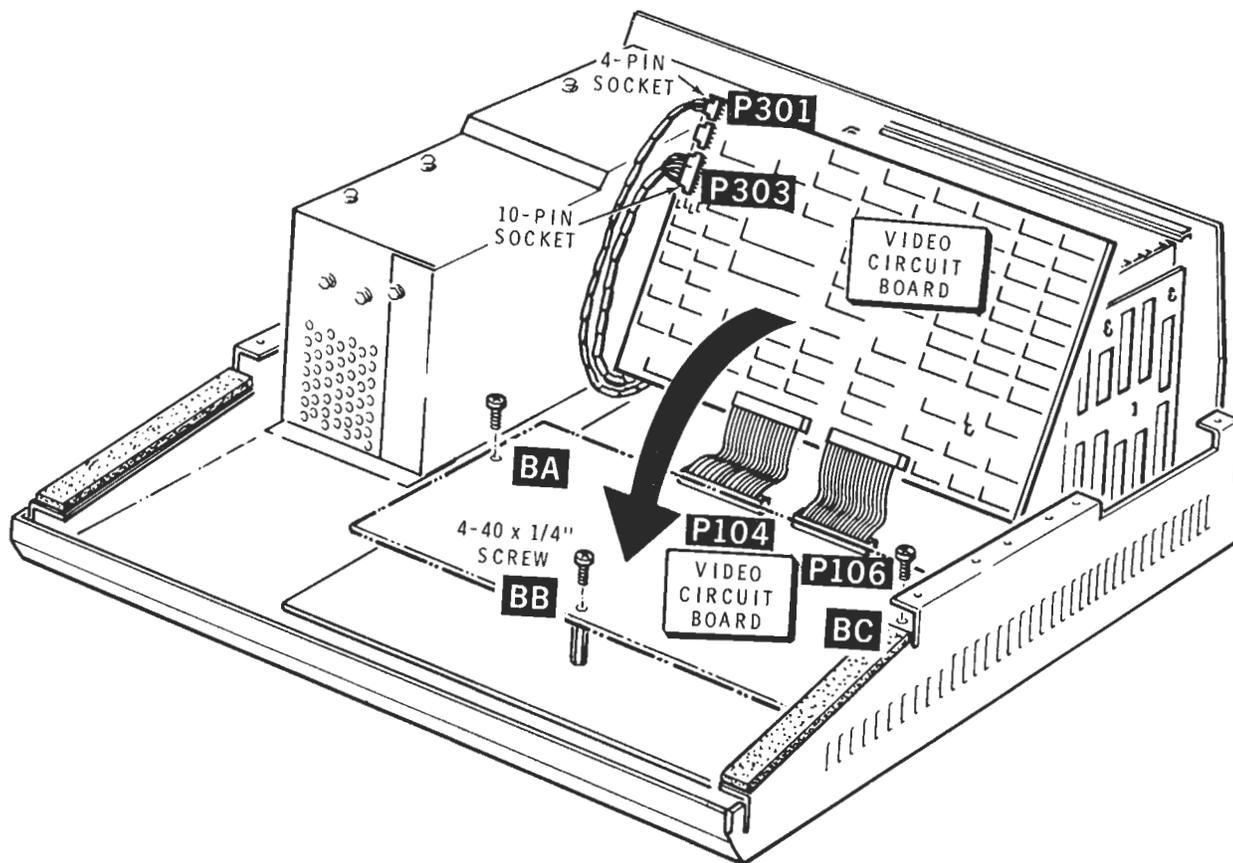


Pictorial 5-13
Controller card installation

REINSTALLING THE VIDEO LOGIC CIRCUIT BOARD

Refer to Pictorial 5-14 for the following steps.

- Position the video logic circuit board onto the main circuit board as shown in the Pictorial.
- Connect the flat cables coming from the video logic circuit board to plugs P104 and P106 on the main circuit board as shown. Be sure the sockets and plugs line up properly before you push the sockets onto the plugs.
- Locate the 7-wire cable coming from the rear of the chassis. Then push the 10-pin socket on the end of this cable onto plug P303 on the video logic circuit board. Be sure the slotted side of the socket is away from you (toward the circuit board).
- Similarly, push the 4-pin socket on the end of the shielded cable, coming from the rear of the chassis, onto plug P301 on the video logic circuit board.
- Swing the video logic circuit board down onto the main circuit board. Then use three 4-40 × ¼" screws to secure the video logic circuit board to the spacers that are mounted on the main circuit board at BA, BB, and BC.



Pictorial 5-14
Video logic board installation

REINSTALLING THE BASE

Refer to Pictorial 5-15 for the following steps.

- Position the keyboard in front of the chassis. Push the larger socket, on one of the flat cables coming from the keyboard, onto plug P105 on the main circuit board.
- Similarly push the other socket, on the flat cable coming from the keyboard, onto plug P107 on the main circuit board.
- Check plugs P105 and P107 again to make sure you have them properly connected.

Refer to Pictorial 5-16 for the following steps.

- Set the keyboard on top of the chassis flanges that have the foam tape. Form the flat cables into a loop behind the keyboard.

NOTE: If you determined that you must replace the base, be sure to use the new base in the next step.

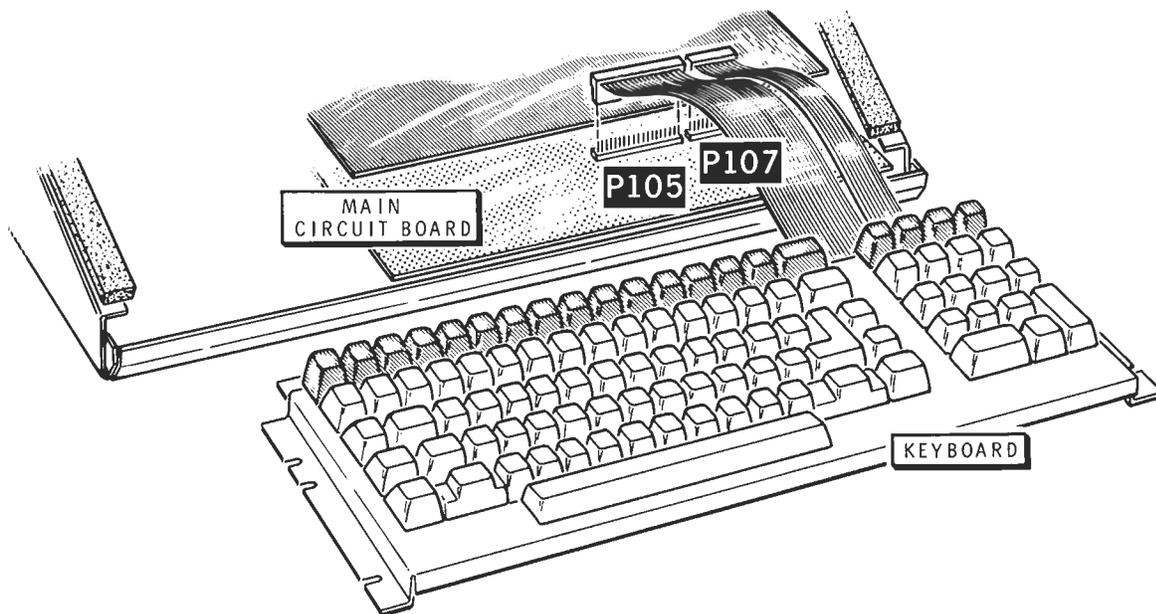
- Set the base over the chassis and keyboard and center the keyboard in the base.

NOTE: There are nipples on the base for the notches on the keyboard to set onto. It is important that the keyboard notches line up over the base nipples.

- Use two #8 × 5/8" self-tapping screws to secure the base to the chassis at AL and AN.
- Use two locking pins to secure the base to the chassis at AP and AR.

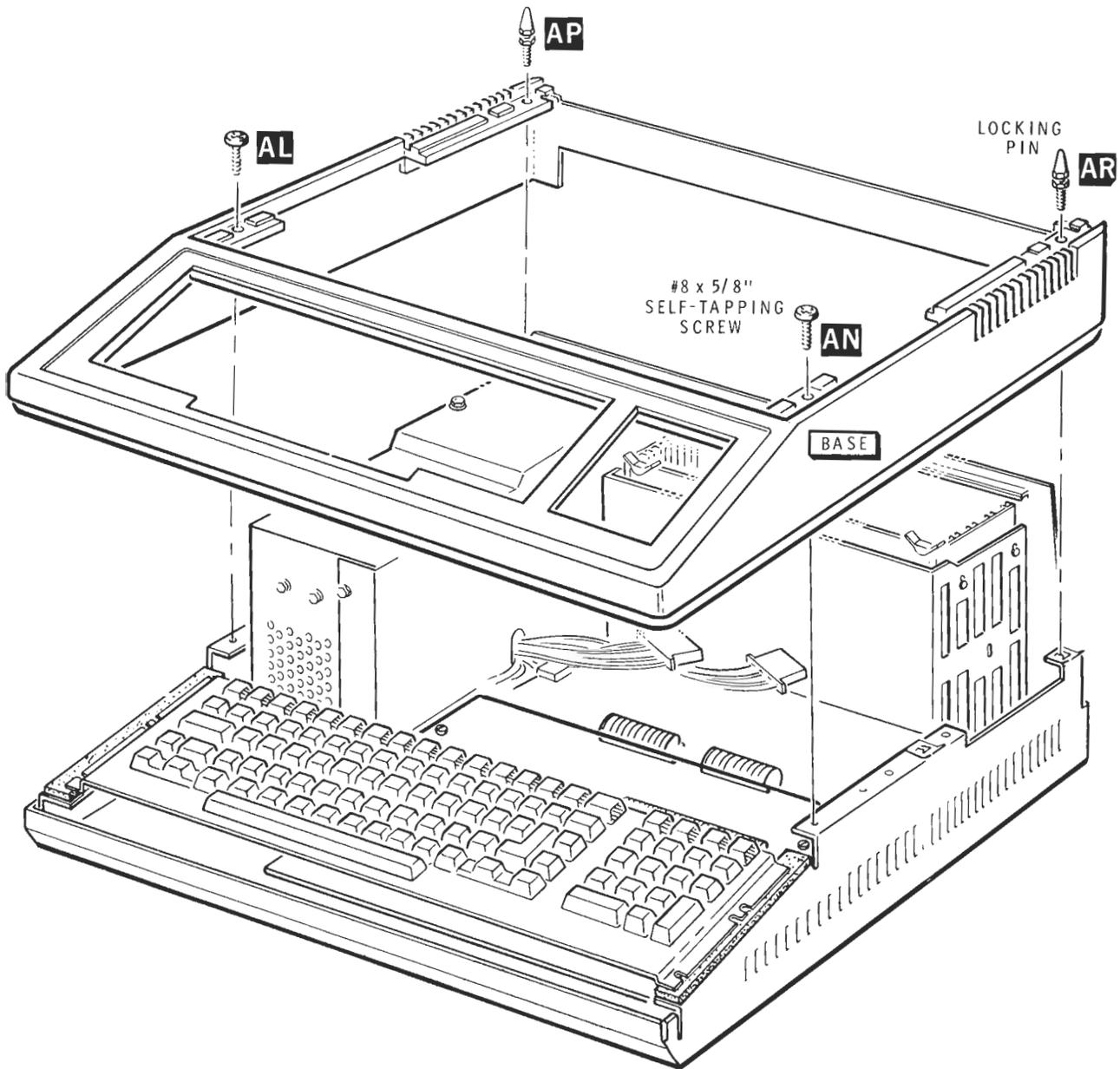
NOTES:

1. If you removed the power supply, proceed to "Reinstalling the Power Supply."
2. If you did not remove the power supply, skip "Reinstalling the Power Supply" and proceed directly to "Replacing the Disk Drive."



Pictorial 5-15

Keyboard cable connections



Pictorial 5-16
Keyboard and base installation

REINSTALLING THE POWER SUPPLY

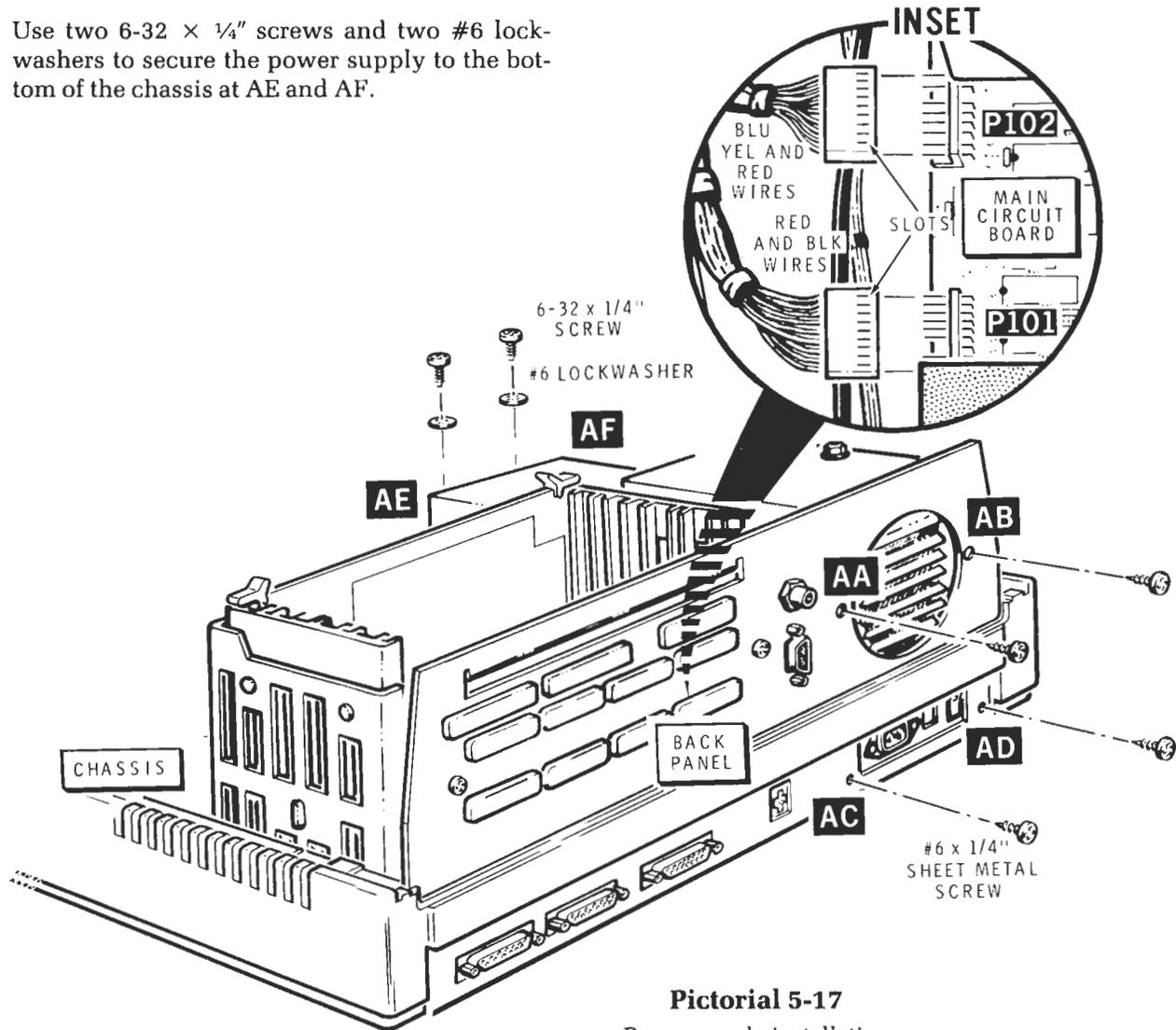
Refer to Pictorial 5-17 for the following steps.

NOTE: If you determined that you must replace the power supply, be sure you install the new power supply in the following steps.

- Lower the power supply into the chassis in the area shown. Be careful not to pinch any wires between the power supply and the chassis.
- Use four #6 × 1/4" sheet metal screws to secure the power supply to the rear of the chassis at AA, AB, AC, and AD.
- Use two 6-32 × 1/4" screws and two #6 lockwashers to secure the power supply to the bottom of the chassis at AE and AF.

- Refer to the inset drawing on the Pictorial and push the 10-pin socket, that has the blue, yellow, and red wires, coming from the power supply, onto plug P102 on the main circuit board. Be sure the slotted side of the socket is up (away from the main circuit board).
- Similarly, push the 10-pin socket that has the red and black wires, coming from the power supply, onto plug P101 on the main circuit board. Be sure the slotted side of the socket is up.

This completes the reinstallation of the power supply. Proceed to "Replacing the Disk Drive."

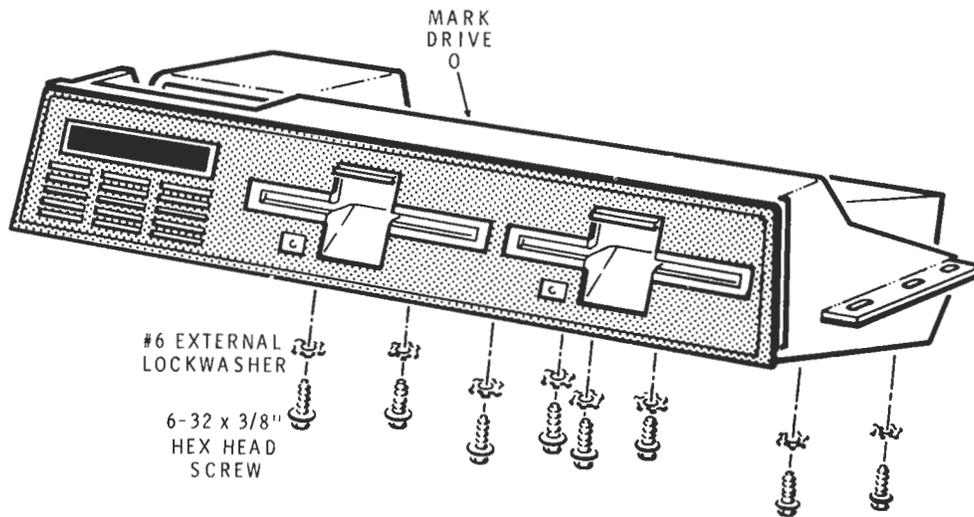


Pictorial 5-17
Power supply installation

REPLACING THE DISK DRIVE

Refer to Pictorial 5-18 for the following steps.

- Position the drive assembly as shown in the Pictorial.
- If your system has only one floppy disk drive, mark the drive "drive 0." If your system has two floppy disk drives, mark the drives "drive 0" and "drive 1." Be sure to mark the drives properly. It is important that you do not get the two drives mixed up. NOTE: In a 2-drive system, normally the left-hand drive is drive 0.
- Turn the drive shelf over and remove the eight 6-32 \times $\frac{3}{8}$ " hex head screws and #6 external tooth lockwashers that secure the drives to the shelf (if the system has two floppy disk drives), or remove the four 6-32 \times $\frac{3}{8}$ " hex head screws and #6 external tooth lockwashers (if the system has only one disk drive). Set this hardware aside temporarily.



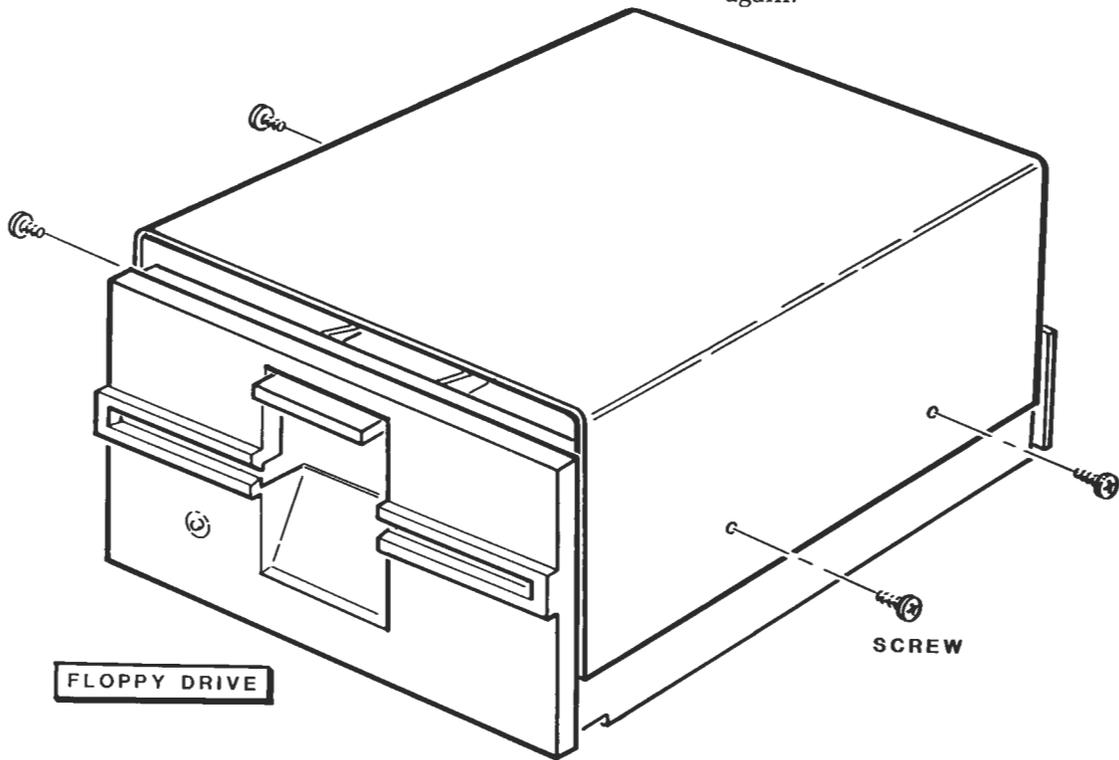
Pictorial 5-18
Disk drive installation

Refer to Illustration Book, Page 30, Pictorial 5-19 for the following steps.

- Remove the two drives (or drive if your system only has one) from the drive shelf. NOTE: The drives fit tight and you may have to carefully tug and pull on them.
- Remove the front panel by prying at one end. Discard this front panel; you will install a new one later.

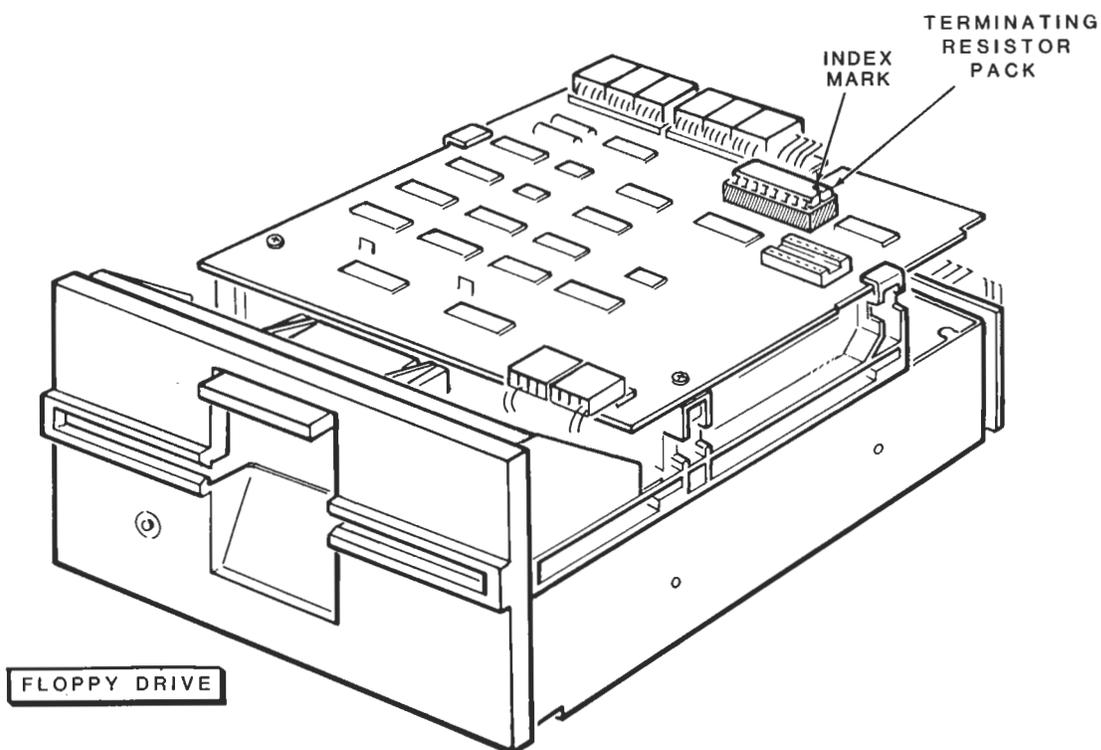
NOTE: Perform the next five steps only if your system has two drives.

- 1. Refer to Detail 5-19A and remove the metal cover from the two drives. NOTE: The cover may or may not be held in place with two screws. Other types of covers may require you to bend out tabs before you can remove it.
- 2. Position drive 1 (marked in an earlier step) as shown in Detail 5-19B. Then locate the terminating resistor pack and unplug it from its socket.
- 3. Reinstall the cover on drive 1. Then set this drive aside; it will not be needed again.



Detail 5-19A

- 4. Position drive 0 (marked in an earlier step) as shown in Detail 5-19B. Then install the terminating resistor pack in the indicated socket. Be sure to position the index mark on the resistor pack as shown in the Detail.
- 5. Reinstall the cover on drive 0.
- Reinstall drive 0 in the right-most position of the drive shelf. Align the front of the drive so that it is flush or a little behind the front edge of the drive shelf. Then use four 6-32 \times $\frac{3}{8}$ " hex head screws and #6 lockwashers to secure the drive from the underside of the shelf.



Detail 5-19B

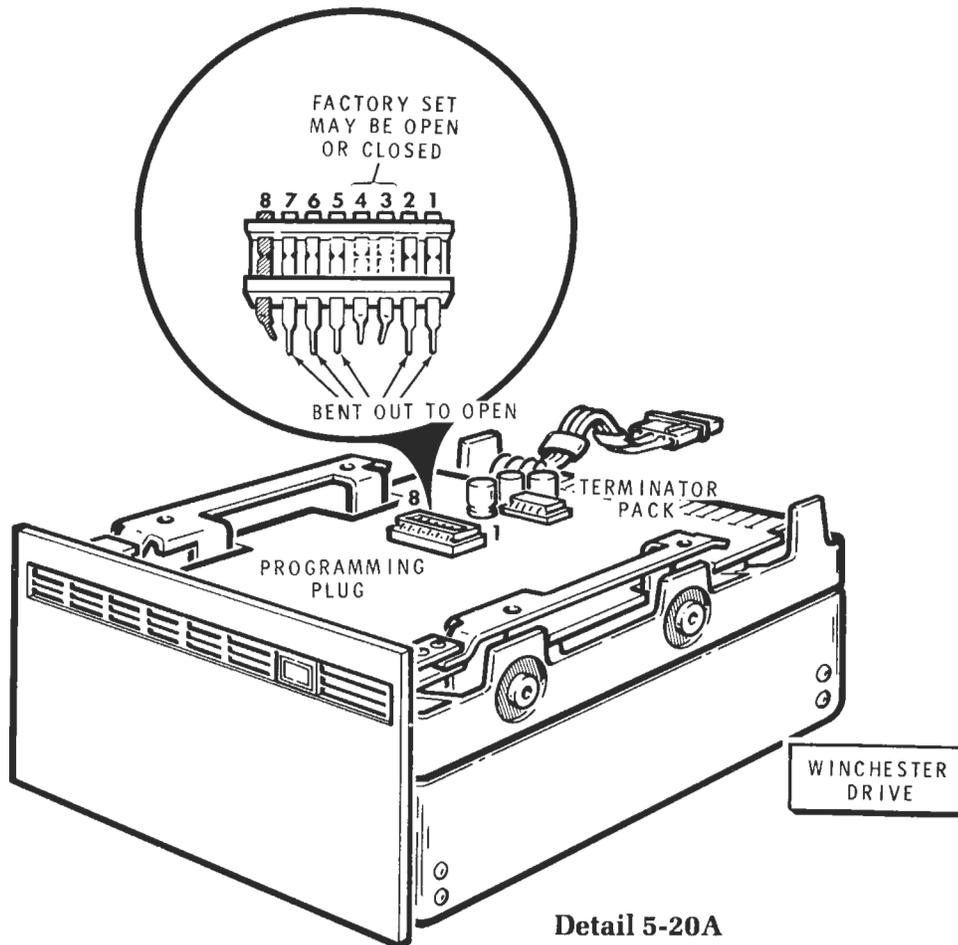
Refer to Illustration Book, Page 30, Pictorial 5-20 for the following steps.

CAUTION: The Winchester drive is fragile and can be damaged easily by shocks or dropping. Be sure that you do not subject the drive to any unnecessary shocks or drop it.

- Refer to Detail 5-20A. When you unpack the Winchester drive, you will see that the 16-pin programming plug has all pin pairs shorted with the possible exception of pin pairs 3-14 (section 3) and 4-13 (section 4).
- Use a felt tip marker or something similar to mark the programming plug at pin pair 8-9 (section 8). You will use this mark as a reference when you configure this drive.

One or two Winchester drives can be used in a Z-100 computer. The first Winchester drive will be hardware unit 1 and the second Winchester drive will be hardware unit 2. If you use one Winchester drive in a system, the hardware unit number must be number 1.

- To program the programming plug, refer to Detail 5-20A and unplug the programming plug from the Winchester drive.
- Refer to the inset drawing in Detail 5-20A and Table 5-1 and bend the appropriate pins out to the "open" position. Bend only one side of each appropriate pin pair out to open the circuit.
- Plug the programming plug back into the Winchester drive. Be sure to position the marked jumper (section 8 — pin pair 8-9) as shown.



Detail 5-20A
Programming plug

Table 5-1. Winchester Disk Drive Configuration

| Pin Pair | Section Number | Hardware Unit Number | |
|----------|----------------|----------------------|-------|
| | | 1 | 2 |
| 1-16 | 1 | Open | Open |
| 2-15 | 2 | Short | Short |
| 3-14 | 3 | Factory Set* | |
| 4-13 | 4 | Factory Set* | |
| 5-12 | 5 | Open | Open |
| 6-11 | 6 | Open | Open |
| 7-10 | 7 | Open | Short |
| 8-9 | 8 | Short | Open |

*Pin pairs 3-14 and 4-13 (section 3 and 4) are set at the factory; the programming plug is properly configured for the drive it is installed in. If you change or move programming plugs, you should check the following portion of this table and properly set these two sections according to the phase code of the disk drive. The phase code is printed on a label on the disk drive case.

| Pin Pair | Section Number | Phase Code | | | |
|----------|----------------|------------|-------|-------|-------|
| | | C | D | E | F |
| 3-14 | 3 | open | open | short | short |
| 4-13 | 4 | open | short | open | short |

Refer to Pictorial 5-20, Illustration Book, Page 30.

- Mount a right side bracket (HE 204-2676) onto the right side of the drive as shown. Use two 6-32 × ¼" flat head screws.
- Similarly, mount the left side bracket (HE 204-2675) onto the left side of the drive.
- Carefully peel the backing paper from the insulator. Then press the insulator onto the top of the Winchester Drive in the area shown. Line up the back edge of the insulator with the back edge of the Drive shield.

Refer to Illustration Book, Page 30 Pictorial 5-21 for the following steps.

- Position the drive as shown in the Pictorial.
- Carefully start the prepared Winchester drive into the left-most position of the drive shelf and rock it into position. NOTE: You must insert this drive from the front of the drive shelf.

- Align the front of the drive so it is flush or a little behind the front edge of the shelf. Then use four 6-32 × ⅜" hex head screws and #6 external tooth lockwashers to secure the drive in place from the bottom of the drive shelf.
- Position the data separator circuit board as shown on the top of the previously installed brackets. Then use four 4-40 × ¼" screws to secure it in place at FA, FB, FC, and FD. Do not overtighten these screws.
- Carefully peel the backing paper from the warning label (HE 390-2488). Then press the label onto the drive shelf in the area shown.
- Refer to the inset drawing and insert the Winchester controller card in any vacant slot in the card cage. Slot 2 is recommended.

Refer to Illustration Book, Page 31, Pictorial 5-22 for the following steps.

NOTE: Each cable assembly is identified by a part number stamped on the plastic end connector. Be certain in each step that you connect the correct cable assembly. Also make certain that the color stripe on the cable is positioned as shown in the Pictorial.

- Connect either end of cable assembly HE 134-1280 to the data separator circuit board as shown.
- Connect the remaining end of the cable assembly HE 134-1280 (or HE 134-1389) to the Winchester drive as shown.
- Connect either end of cable assembly HE 134-1279 to the data separator circuit board as shown. The free end of this cable will be connected later.
- Connect the indicated end of cable assembly HE 134-1281 to the Winchester drive as shown in the Pictorial. The free end of this cable will be connected later.
- Connect the end of cable assembly HE 134-1284 to the floppy disk drive.

Refer to Illustration Book, Page 31, Pictorial 5-23 for the following steps.

- Locate DIP switch S101 on the main circuit board.

NOTE: DIP switch S101 an eight-section switch which determines what drive the Computer will boot from when power is applied. You can select both the drive as well as an auto-boot function upon power up.

| <u>SECTION</u> | <u>DESCRIPTION</u> |
|----------------|---------------------------------------|
| 0 | 5¼" Floppy Disk Drive (Internal)* |
| 1 | 8" Floppy Disk Drive (External)* |
| 2 | 5½" Winchester Disk Drive (Internal)* |
| 3 | 1 = Auto-boot, 0 = Manual Boot |
| 4 | not used, set at 0 |
| 5 | not used, set at 0 |
| 6 | not used, set at 0 |
| 7 | 0 = 60Hz, 1 = 50Hz operation |

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

As shipped from the factory, the Computer is set to auto-boot on the 5¼" floppy disk drive. If this is satisfactory, you need not make any changes to the switch settings.

To auto-boot on the Winchester drive, set switch S101 as follows:

| <u>SECTION</u> | <u>POSITION</u> |
|----------------|-----------------|
| 0 | 0 |
| 1 | 1 |
| 2 | 0 |
| 3 | 1 |

To manually boot from the Winchester, set switch S101 as shown above, except set section 3 to the 0 position.

To retain the boot from the 5¼" floppy disk drive, but not have auto-boot enabled, move section 3 of S101 to the 0 position. No other switch section changes are required.

Cable Connections

Refer to Illustration Book, Page 32, Pictorial 5-24 for the following steps.

- Position the drive subassembly about 2" in front of its normal position.
- Connect the free end of cable HE 134-1279 to the Winchester controller card as shown.
- Similarly, connect the free end of cable HE 134-1281 to the Winchester controller card as shown.
- Similarly connect the free end of cable HE 134-1284, coming from the floppy disk drive, to the Z-207 floppy controller card.
- Connect the power cable coming from the power supply to the Winchester controller card at P6.

Refer to Illustration Book, Page 32, Pictorial 5-25 for the following steps.

- Plug the power cables into the two drives at P4 and P5 as shown.
- Plug connector P3 coming from the power supply into the socket on the data separator circuit board at P3.

* Default boot drive

Refer to Illustration Book, Page 33, Pictorial 5-26 for the following steps.

- Set the drive assembly all the way into the Computer as shown. Be careful not to crimp any cables in the process.
- Use four #8 × 5/8" self-tapping screws to secure the drive assembly to the chassis at AE, AG, AH, and AK.
- Use two locking pins to secure the drive assembly to the chassis at AF and AJ.

NOTES:

1. If you determined that you need to replace the top case, proceed to "Preparing the Top Case."
2. If you do not need to replace the top case, skip "Preparing the Top Case" and proceed directly to "Reinstalling the Top Case."

PREPARING THE TOP CASE

Refer to Illustration Book, Page 33, Pictorial 5-27 for the following steps.

- Position the top case as shown in the Pictorial.

- Remove the two #6 × 5/8" self-tapping hex head screws from each slide rail. Then unhook the spring from each side of the cabinet and set the slides and hardware aside.
- Set the old top case aside; it will not be needed again.
- Position the new top case as shown in the Pictorial so the tapered sides (front) are toward you.
- Position a slide rail on one side of the top case as shown. Then use two #6 × 5/8" self-tapping hex head screws to secure the slide rail to the top case (through the long slots in the rail). Tighten the screws so that the rail can still slide back and forth without binding.
- Install a spring from hole AL in the slide to slot AN in the top case.
- Similarly, install the other slide rail on the top case with two #6 × 5/8" self-tapping hex head screws.
- Install the remaining spring from hole AP in the rail to slot AR in the top case.

This completes the top case preparation, proceed to "Reinstalling the Top Case."

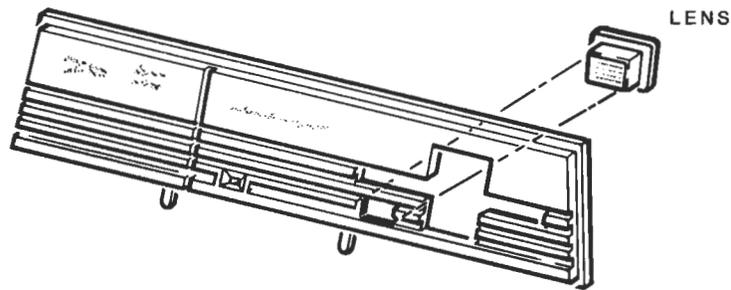
REINSTALLING THE TOP CASE

Refer to Illustration Book, Page 33, Pictorial 5-28 for the following steps.

- () Position the Low-Profile decorative panel as shown in Detail 5-28A. Then press the lens into the indicated hole of the panel. Be sure to push the lens into the hole as far as possible.
- () Position the Low-Profile decorative panel as shown in the Pictorial. Then position the two studs along the bottom edge of the panel so they are between the base and the drive assembly as shown.

- () Hold the decorative panel in place and set the top case straight down onto your Computer. When you have the top case installed correctly, it will hold the decorative panel in place. Slide the latches all the way toward the front of the Computer, if they do not snap into position.
- Pull the slide rails all the way toward the back of the Computer. Then push a rubber plug into the hole in the end of each slide rail.

This completes the modification of the Low-Profile Computer. Proceed to "The PREP Utility" on Page 6-1.



Detail 5-28A

THE PREP UTILITY

The surface of the Winchester disk must be initialized before it can be used in a system. This is similar to the FORMAT command and procedure discussed in the Z-100 Series User's Manual, except that typical operating system information (headers, labels, boot code, and directories) for a specific system is not written onto the disk. In addition, PREP will test the surface and set up standard partitions. Two are set up — approximately equal in size — so it is not necessary to run the PART utility unless some other partitioning arrangement is needed.

You need to be aware that while PREP does test the surface of the disk for retention of data, it will also destroy any data that may be recorded on the Winchester disk system. If you do not want to destroy the data on the disk, but still want to test the disk for data retention capabilities, you may run the VERIFY utility. This utility does not destroy the current data and partitions that are set up on the Winchester disk, but it does test for and flag those sectors that are bad so that they can be “locked out” later.

Before you can run the PREP utility, you must install a jumper on the Winchester disk controller circuit board in the Desktop Computer. If the jumper is not installed, the Winchester disk cannot be accidentally initialized. Therefore, the jumper (not installed) acts as a safety feature for any files that may be on the disk. If you wish to run PREP, refer to Pictorial 6-1 to install or remove the jumper.

Features of PREP

The PREP utility enables you to:

- Initialize the surface of the Winchester disk.
- Test the data retention capabilities of the Winchester disk.
- Isolate questionable disk sectors.
- Divide the surface of the Winchester disk into two equal partitions (normally with one used for Z-DOS and one for CP/M).

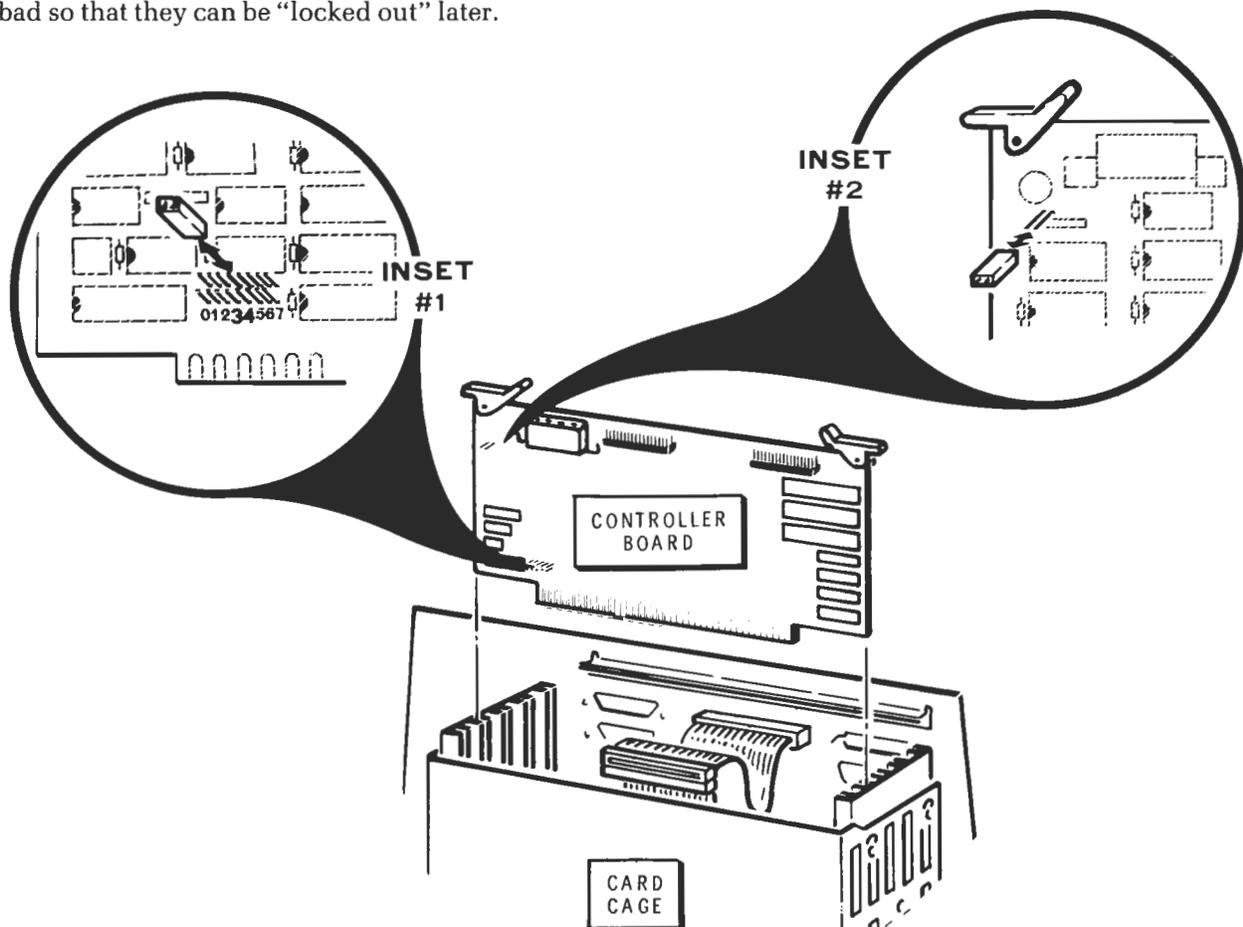


Figure 6-1

The Winchester disk controller board

PREP Operation

NOTE: PREP takes approximately 1-1/2 hours.

If the Winchester disk does not contain initialization information (for instance, the disk may not have been initialized or the information may be incorrect or damaged), PREP will prompt you to enter characteristics in order to identify the type of Winchester disk that is in the Computer. Then PREP will display messages that tell you what is happening as it “prepares” and tests the disk.

CAUTION: Using PREP will destroy all the files that may exist on the Winchester disk. Winchester disks supplied by Zenith Data Systems Corporation or Heath Company may have been prepared with PREP at the factory. If the disk has been prepared, you will need to use PREP only if you consistently encounter an unreasonable number of disk access errors. Do not use PREP until you have backed up the information on the Winchester disk to floppy disks.

To run PREP, refer to Pictorial 6-1, and proceed with the following discussion.

- Remove the Winchester disk controller circuit board from the Z-100 card cage. You may have to disconnect some cables to do this.
- Remove the jumper from interrupt plugs 3 & 4 (see inset #1) where it is normally stored.
- Place the jumper over the format enable plugs on the upper left corner of the board (see inset #2).
- Replace the board in the card cage and reconnect any cables that had to be disconnected to remove the board. Make sure that all cables and boards are fully seated in their respective connectors.
- Connect the line cord and apply power to the Computer.
- If the Computer is a Low-Profile Model, be sure to connect the monitor to the Computer and turn it on.
- Insert the new utilities disk in drive 0.
- Boot the floppy drive. NOTE: If the Computer is configured to auto-boot from the Winchester drive, you may have to press the **DELETE** key.

- To start the PREP utility, type:

PREP

and press the **RETURN** key. You will see a display similar to the one illustrated in Figure A.

PREP version 1.00

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The PREP utility helps you to:

- initialize surface of Winchester disk
- test data retention capabilities of Winchester disk media
- isolate questionable disk sectors
- divide the surface of Winchester disk into two partitions of equal size (one Z-DOS partition and one CP/M partition)

PREP may prompt you to specify five Winchester disk characteristics in order to identify the type of Winchester drive you have installed. Then PREP displays messages as it operates on the disk.

CAUTION: Using PREP will destroy all files on your Winchester disk. Winchester disks supplied by Zenith or Heath are normally prepared by PREP before they are shipped. Users of these disks will need to use PREP only if they are consistently encountering an unreasonable number of disk access errors. Do not use PREP until you have transferred your Winchester disk files to floppy disks.

Do you wish to proceed with PREP (Y/N)?

Figure A

The Introductory Display for PREP

At the bottom of the display, you will see:

Do you wish to proceed with PREP (Y/N)?

If you press the **N** key, the program will be halted and control of the Computer will be returned to Z-DOS. If you press the **Y** key, PREP will continue operation.

- To exit PREP, press the **N** key. The Z-DOS system prompt will be displayed.
- To continue with PREP, press the **Y** key. You will see:

Please type P to proceed

This display gives you one last chance to change your mind. The reason for this second prompt is the nature of PREP. PREP *will destroy any and all information that has previously been recorded on the Winchester disk.*

- To continue with PREP, press the **P** key. If you press *any other* key, PREP will be stopped and you will see the Z-DOS system prompt.

If the disk has been previously prepared and PREP detects no errors in the boot code or “superblock” (explained later), then the following five disk parameter questions will be skipped and the tests will be run. However, if the disk has not been previously prepared or if an error is detected in the boot code or superblock, then you will be asked to enter five disk parameters. Your answers will depend upon the type of Winchester drive installed in the Desktop Computer.

In the examples that follow, the responses supplied are for the Miniscribe 2012. For the correct responses for other approved drives are supplied in Table 6-1.

The screen will display:

Enter number of heads in hex:

- Enter **4** (the hexadecimal equivalent of the number of read/write heads) and press the **RETURN** key. Next, the screen will display:

Enter number of cylinders in hex:

- This number is equal to the total number of tracks divided by the total number of read/write heads. Enter **132** (the hexadecimal equivalent of the number of cylinders) and press the **RETURN** key. The screen will now display:

Enter reduced write current cylinder in hex:

- Toward the hub of a hard disk, where the circumference of each track is smaller, some Winchester systems require that less electrical current be applied to the write head to avoid having magnetic pulses overlap adjacent tracks. The Miniscribe Mod II 2012 does not require reduced write current. Therefore, a value greater than the largest cylinder number will be entered. Enter **200** (the number in hexadecimal of the cylinder where the current applied to the write head is reduced to avoid overwriting track bounds) and press the **RETURN** key. Next, the screen will display:

Enter pre-comp cylinder in hex:

- Disk storage devices operate by creating magnetically polarized areas on the disk surface that correspond to the presence or absence of “bits” (the smallest unit of measure in computer data and memory) in the information

Table 6-1. Winchester Disk Drive Parameters

| Manufacturer and Model | Number Cylinders | Number Heads | Wr. Curr Cylinder | Precomp Cylinder | Step Code | SHIP Cylinder |
|------------------------|------------------|--------------|-------------------|------------------|-----------|---------------|
| Miniscribe Mod II 2012 | 132 | 4 | 200 | 80 | 1 | 14F |
| CMI 5412 | 132 | 4 | 200 | 80 | 1 | 131 |
| CMI 5619 | 132 | 6 | 200 | 80 | 1 | 131 |
| Seagate ST-412 | 132 | 4 | 200 | 80 | 1 | 131 |

being stored. Since “like” charges repel and “unlike” charges attract, it is possible for the charged areas on the disk surface, which represent the data, to “shift” slightly if they are closely spaced after being recorded. If such a shift occurs, reduced reliability will result.

Precompensation refers to the intentional shifting of data during the recording process so the combined result of precompensation and the natural shift (which cannot be prevented) places the data in the desired position. On the outer tracks of the disk, the spacing between bits is great enough so no significant shifting occurs and precompensation is not required. However, since the inner tracks have a smaller circumference, the bits are closer together and precompensation is required to maintain acceptable reliability. Enter 80 (the cylinder number where precompensation must start) and press the **RETURN** key. Next, the screen will display:

Enter step rate code in hex:

- Enter 1 (the rate code in hexadecimal at which the read/write heads “step” between tracks) and press the **RETURN** key.

Now that you have supplied the necessary information for the hard disk, the program will initialize the surface of the disk for the tests that follow. The initialization process is similar to that used by the Z-DOS and CP/M-85 **FORMAT** utility in that the surface of each disk is organized into tracks and sectors. In addition, a “map” is also prepared for keeping track of any sectors that are found to be bad.

During the initialization process, you will see the following display on the screen:

Initializing the disk...

If you have not installed the jumper on the controller board, the system will immediately display:

Error during formatting of the drive.

and return to the Z-DOS prompt; the disk will not be affected. Remember, to run the PREP utility, you must install the jumper on the controller board as explained earlier.

When the disk has been fully initialized, you will see:

...completed

Now the disk will be tested seven times. Each test is known as a “pass.” The seven passes of the test that are now performed are conducted to check the integrity of the disk’s storage capacity. During each pass, PREP will “write” a predetermined code in each sector (the LED drive access light will flicker) and then will “read” back that code to verify that it remained correct (the LED drive access light will appear to be constantly on). PREP will keep you informed of its progress by displaying the message:

Media test in progress. Pass *n*

where *n* represents the current pass number. This phase of PREP takes about an hour and a half because of the large number of sectors on the Winchester disk system.

PREP uses a different code on each pass it makes through the test. If PREP finds questionable areas on the disk, it stores the address where the error occurred, and later places these addresses into a bad sector table.

When PREP has finished the seven passes, two "superblocks" and two bad sector tables are recorded on the disk. While it is doing this, you will see:

```
Initializing the disk...completed
```

A "superblock" is a portion of the disk surface (on cylinder 0) that is used to keep track of the disk "partition" names, the operating system name assigned to each partition, a flag that is used to show whether the partition has been formatted or not, and a pointer (or number) for the first sector of that partition. The superblock is recorded twice on the Winchester disk. Each copy is written with a different disk head so that the copies are physically isolated from each other. If something occurs to damage one copy of the superblock, the other may remain usable.

During the test passes, PREP kept a record of any bad sectors. After the tests are finished and the superblocks have been written, PREP will write the bad sector table. As with the superblock, the table is recorded twice, each with a separate read/write head. The bad sector tables are used to "flag" all known bad sectors and "lock them out," or prevent them from being used by the system for data storage. It is normal to have a small number of bad sectors out of the five to twenty *thousand* located on the typical Winchester disk.

When the tests are completed, PREP will return control to the minimum Z-DOS system and you will see the Z-DOS prompt. Remember, since this is a minimum operating system, do not use it for normal operation.

- Turn the Computer off.
- Unplug the Format Enable jumper on the controller circuit board and reinstall it in its storage position (refer back to Pictorial 6-1) between pins 3 and 4 of the upper row of interrupt pins.

This completes "The PREP Utility." Proceed to "The SHIP Utility."

THE SHIP UTILITY

The SHIP Utility is provided so that you can place the heads of the Winchester system over a non-vital area of the disks. Then if the system is accidentally jarred during movement, damage will be limited to an area that is not used by the Computer. The floating head design of Winchester drives makes them very sensitive to physical shocks, which can damage the surface of the disks. Therefore, you should use this utility whenever you move the Winchester disk system, even from one table to another.

To operate the SHIP utility, boot the Winchester Utilities disk and type:

SHIP

and press the **RETURN** key. You will see a display similar to the one illustrated in Figure B.

```
SHIP version 1.00
Copyright (C) 1983, Zenith Data Systems
```

The SHIP utility helps you to:

- Position the read/write heads of the Winchester disk at a safe location for subsequent transportation of the Winchester disk unit.

SHIP will prompt you to specify a cylinder address to identify where the read/write heads should be moved.

Enter shipping cylinder address in hex:

Figure B

The Display for SHIP

At the bottom of the display, you will see:

Enter shipping cylinder address in hex:

You will need to enter a number that corresponds to the address (location) of the shipping position of the read/write heads.

- Enter **14F** (the address in hexadecimal for a Miniscribe Mod II 2012 that corresponds to the shipping position of the heads) and press the **RETURN** key. Refer to Table 6-1 for other makes of drives. Make a notation in the User's Manual if a different drive is used so that your customer knows the correct SHIP address for his machine.

The system will correctly position the heads over unused disk space.

- Remove any floppy disk in the system and turn off the Computer. You may now unplug the power cord and move the system.

When you start the system after running this utility, the Computer will automatically move the heads back to the correct position over the disks.

NOTE: Do *not* copy this utility to a regular Z-DOS disk. It will modify the operating system in the Computer's memory; you will have to reboot the system if you want to perform *any* other functions with the Z-DOS operating system.



Data Separator Modifications & Alignment

1. Change resistors R20 and R21 from 1500 ohms to 150 ohms (6-1500-12) in each case.
2. Change resistors R26 and R27 from 511 ohms to 332 ohms (6-3320-12).
3. Change resistors R28 and R29 from 8250 ohms to 825 ohms (6-8250-12).
4. Pull the chip 74ALS74 at U16. Install 74AS74 (443-1209) at U16.
5. Label board as 181-6120
6. Realign the board for its various parameters per standard alignment procedure.

Alignment procedure

See next page.

The alignment procedure on page 6-6 of the ZW-100 Service Manual (#585-32) has been revised. Here is the new procedure:

Equipment Required

- Dual Trace Oscilloscope (100 MHz or better).
- Frequency Counter (20 MHz, four digits, 0.05% accuracy or better).
- Small flat-blade screwdriver.
- Power source and power connector.

Procedure

- Prior to applying power, turn R31 FCCW (viewed from the board edge). Then turn R31 CW four revolutions.
- Apply power to the data separator board and allow it to warm-up ten minutes.
- Remove the jumper at JP1.
- Install a jumper at JP4.
- Move jumper JP3 to the TEST position.
- Connect the oscilloscope to TP7 and adjust R33 for a positive pulse width of 250 nS at the 0.4 volt level (see the drawing at the right.)
- Install the jumper at JP1 in the TEST position.
- Move the jumper at JP3 back to its normal position.
- Connect the frequency counter to TP2 and adjust R32 for a frequency of 10.00 MHz, $\pm 0.1\%$.
- Move the jumper at JP1 to its normal position.
- Set the dual-trace oscilloscope sweep rate to 20 nS/Div. and the vertical attenuators to 2 V/Div.
- Connect one vertical input of the dual-trace oscilloscope to TP4; the other input to TP1. Sync the oscilloscope to the signal on TP4.
- Slowly adjust R31 so the 2 volt level on the rising edge of the TP1 signal occurs 3 nS to the left of the center of the pulse at TP4 (see the display drawing at the right).

