ALTOS

586/986

DIAGNOSTICS

Diagnostics

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Introduction 1

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This manual provides information necessary to execute and understand the Altos 586/986 Computer System Diagnostic Executive Programs (ADX). The ADX diagnostic package consists of a series of menu-driven utility and verification programs. The verification programs test the:

1. Central processing unit (CPU)
2. Random Access Memory (RAM)
3. Internal communications structure (bus arbitration)
4. Floppy diskette drive
5. Hard disk drive
6. Magnetic tape unit

The ADX programs reside on the 586/986 ADX master diskette that is shipped with each system.

The Altos 586/986 Computer System ADX Diagnostic Manual comprises the following seven chapters:

1. **Chapter 1, Introduction** provides general information regarding the Altos ADX package and other diagnostic capabilities that accompany the 586 Computing System. This chapter also supplies a recommended execution sequence for the ADX programs and the initial instructions required to load the ADX programs from the Altos-supplied ADX diskette.
2. **Chapter 2, Clock Verification** supplies information required to set and verify the system real time clock.
3. **Chapter 3, Floppy Diskette** Drive gives loading and execution instructions for the copy and format utility programs and the verification program for the floppy diskette drive.
4. **Chapter 4, Hard Disk** provides the information that is required to load, execute and understand the utility and verification programs associated with the hard disk.
5. **Chapter 5, Random Access Memory** describes the loading and execution procedures for the RAM verification programs.

6. **Chapter 6, Serial Input/Output** supplies information regarding the serial port I/O verification programs.

7. **Chapter 7, Magnetic Tape** provides the loading and execution instructions for the magnetic tape verification programs.

In addition to the ADX information presented in chapters 1 through 7, other diagnostic information is covered in Appendix A. Appendix A deals with the 586/986 Computing System Power-up Diagnostics residing in the 586/986 system monitor program. Although this program is not part of the ADX package, it does provide further diagnostic capabilities.

Review this manual before attempting to load or execute the ADX programs.

RECOMMENDED TEST SEQUENCES

Each of the ADX programs may be executed independently as required by the user. However, upon receipt of a new 586 Computer System, there is a recommended test sequence that verifies proper machine operation. This series of tests should be executed prior to any attempt to install an operating system.

The test sequence should proceed as follows:

1. Power-up test executes automatically each time the 586 is powered up. For more information regarding Power-up diagnostics, refer to Appendix A.

2. Load and execute the floppy verification tests as described in Chapter 3. After these tests run successfully, make two backup copies of the ADX diskette. Store the ADX master diskette in a secure location and proceed with the rest of these tests with one of the copies.

3. Load and execute the RAM verification test as described in Chapter 5. Two complete passes of the "Repeat March Test and Refresh Test" option should be run.

4. Load and execute the Hard Disk Read/Write Error Test option in the Hard Disk Verification program. Instructions for using this program are located in Chapter 4.

This series of tests provides a basic system checkout.

DATA ENTRY CONVENTIONS

To communicate instructions that enable the reader to load and execute the ADX programs, certain data entry conventions are used throughout this manual. These include:

1. Information that the user is to enter in response to a prompt appears in boldface type; for example, enter Y, or by naming the key to press: Press the **Escape key.** <CR> indicates that the Return key should be pressed. For example:

   Reply Y or N <CR>

2. Alphabetic data may be entered in upper- or lowercase; thus, either **C<CR>** or **c<CR>** is acceptable.

3. Pressing the Return key usually enters the data that has been previously entered. Occasionally, the data is automatically entered when a key is pressed to make a selection from a menu and no <CR> is required. Entering <CR> as a response to a prompt has the effect of entering a Ø for a numerical prompt, or No to a Y/N prompt.

4. To erase the last character typed, use Control-H.

5. To erase an entire entry, use the Rubout or Delete key.

LOADING THE ADX PROGRAMS

The following information describes the step-by-step procedures required to load the ADX programs into the 586/986 Computing System.

1. Turn the system and terminal power on/off switches to on.

2. Press the Space bar within two seconds after the following message appears on the display screen:

   PASSED POWER-UP TEST
   ALTOS COMPUTER SYSTEMS - 586
   Monitor Version X.X
   Press any key to interrupt boot

3. When the following prompt appears, insert the floppy diskette into the disk drive (figure 1-1), close the drive door and press the number 2 key.

   Enter [1] to boot from Hard Disk
   Enter [2] to boot from Floppy Disk
   Enter [3] to enter Monitor

   Enter options:

The ADX program will be read from the diskette and loaded into memory. The Altos Diagnostic Executive master menu will be displayed as follows:

```
bp586 vx.x

A L T O S   D I A G N O S T I C   E X E C U T I V E

ACS586/986 - Vx.x

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Master Diagnostic Menu
  (A)  Clock Verification      (E)  Hard Disk Verification
  (B)  Floppy Copy             (F)  RAM Verification
  (C)  Floppy Format           (G)  Serial Verification
  (D)  Floppy Verification     (H)  Tape Verification
Enter:
```
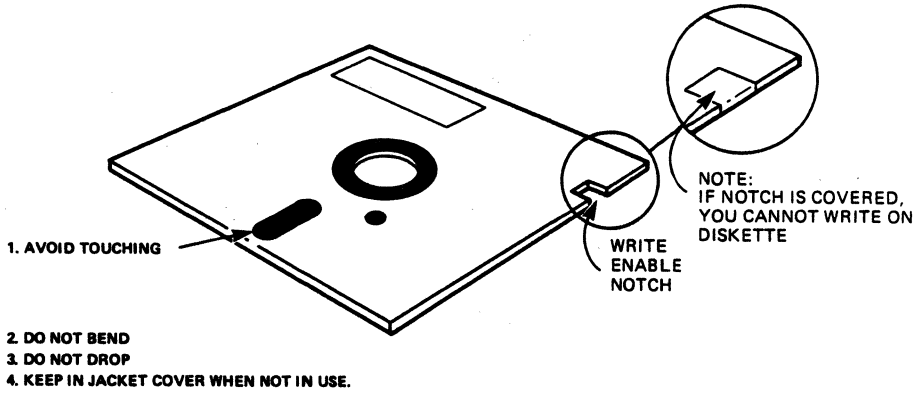

A brief description of the diagnostic programs and utilities follows:

CLOCK VERIFICATION	Allows real-time clock to be set, then displays data entered. Verifies whether or not clock is functioning.
FLOPPY COPY	This utility copies the diskette verbatim. The program does not verify.
FLOPPY FORMAT	This utility formats the diskette in either MP/M, Xenix, or ADX diagnostic format.
FLOPPY VERIFICATION	Basic test for diskettes and diskette drives. The basic mechanical functions of the drive and its media integrity are tested for validity.
HARD DISK VERIFICATION	A collection of hard-disk utility and test routines. Utilities include the formatter, a routine to flag bad sectors. Diagnostics include quick tests, fault isolation tests, and long exercise routines.
RAM VERIFICATION	Memory test routine. This program exercises the main CPU (8086 central processing unit), tests the refresh circuitry, conducts fault isolation tests, verifies long exercise routines, and parity checking.



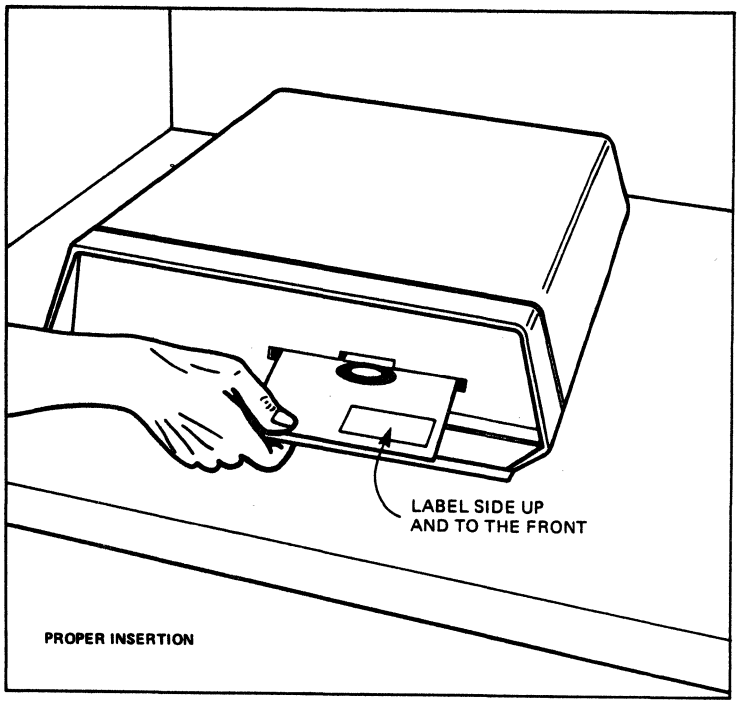


Figure 1-1. Inserting Floppy Diskette

SERIAL VERIFICATION	Serial I/O ports tested and verified. If the console port (1) is bad, other ports cannot be tested.
TAPE VERIFICATION	Verifies that the optional Magnetic Tape Unit (MTU) is properly installed and functioning by exercising the tape drive mechanism and performing write/read functions.

To load and execute any of the programs listed on the Master Diagnostic Menu, refer to the appropriate chapter as listed in the table of contents.

SPECIAL FEATURES

Special features have been added to the ADX package. They are designed to give the user greater control and flexibility. These special features include the capability to disconnect the console terminal while executing a test and the ability to stop and restart any given test.

Terminal Disconnect/ Reconnect

The user has the option of disconnecting the terminal and reconnecting it without disrupting the integrity of the test in progress. This is accomplished by entering **control P** (**^P**), which causes the following display:

[Disconnect]

To reconnect the terminal to the system, enter a **control P** (**^P**) and the terminal is reinstated to the system (see reconnect display below). This action is necessary if there is only one terminal connected to the system at a time. If more than one terminal is on the system, then the terminal connected to the highest numbered port (or the first terminal connected to the system) is designated as the 'master terminal'. It receives all test data during ADX operation. If the master terminal is removed, the terminal connected to the lowest port number becomes the master terminal and receives all pertinent data from the test.

[Reconnect]

Test Start/Stop

The user may stop and restart any of the tests. The user simply enters a **control-S** (**^S**) and the test stops (this is visually apparent on the screen/printer). To restart the test, enter a **control Q** (**^Q**) and the test starts. This routine does not harm the integrity of the test.

Clock Verification 2

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GENERAL INFORMATION

This routine verifies whether or not the system real-time clock is functioning and allows it to be set. The system realtime clock reflects the year/month/date, hour/minute/second, and day of the week. After the clock is set, the clock data is displayed on the screen. Re-enter the clock data if an illegal entry message appears or if the clock is not advancing one second at a time.

A backup battery provides the power to run the clock during a power outage or when the system is turned off. The clock must be reset during the following instances: (1) leap year - will not automatically display 29 days in the month of February, (2) year end - will not automatically advance from December 31, 1983 to January 1, 1984.

To use the Clock Verification programs load the ADX diskette as described in Chapter 1. When the Master Diagnostic Menu is displayed on the terminal screen, select option A. The following display appears:

ACS586 Real Time Clock Verification VX.X

Real Time Clock Main Menu
(A) Display Clock (B) Terminate this Test
(B) Set Clock
Enter:

DISPLAY CLOCK

Entering option A on the Real-Time Clock Verification menu displays the system Real-Time Clock in the following format:

Time - 9 jun 1983 thr 15:7:58
Time - 9 jun 1983 thr 15:7:58
Time - 9 jun 1983 thr 15:7:59
Time - 9 jun 1983 thr 15:7:59
Time - 9 jun 1983 thr 15:8:0

This display continues to update every half second. Press the ESCAPE key to return the program to the Clock Verification Menu.

SETTING THE REAL TIME CLOCK

To set the clock, enter option B from the menu. The prompts require the year/month/date, hour/second/minute, in two-digit numerical entries. The day of the month is entered as a digit 1 through 7, for example:

1 = Monday
2 = Tuesday
3 = Wednesday
4 = Thursday
5 = Friday

6 = Saturday
7 = Sunday
any other = illegal entry

After making the proper entries, the program displays the clock as it was set. If an error was made, select B to reset the clock correctly.

TERMINATE TEST

Selecting option C, Terminate this test, causes the following prompt to be displayed:

Insert ADX Diskette and hit <CR> to return to Main Menu

Following these instructions reboots the system and returns the program to the Master Diagnostic Menu.

Floppy Diskette Drive 3

CONTENTS

The ADX programs for the floppy diskette drive include utility programs and one diagnostic program. These programs are as follows:

1. Floppy copy (utility)

2. Floppy format (utility)

3. Floppy verification (diagnostic)

To use the floppy ADX programs load the ADX diskette as described in Chapter 1. When the Master Diagnostic Menu is displayed on the terminal screen, proceed to the appropriate section in this chapter and follow the instructions.

FLOPPY COPY

To proceed with the floppy copy utility program as described below, it is assumed that the ADX diskette has already been loaded as described in Chapter 1. If this is not the case, do so before continuing with this section.

To use the floppy copy utility program, perform the following steps:

1. Enter **B** at the Master Diagnostic Menu Prompt. The following display appears on the screen:

ALTOS COMPUTER SYSTEMS

(A) DISKETTE Copy routines (B) Terminate this test Enter:

2. Enter option A at the prompt. The following display appears on the screen:

***** ACS586 DISKETTE COPY ROUTINES VERSION VX.X *****

Hit ESCAPE key to terminate this test
This routine is done in two parts.

Insert the diskette to be copied from
Press any key when ready

3. Insert the diskette to be copied from into the disk drive. Press the **Space Bar** to start the copy process. The display shows that the utility is copying (reading into memory) the diskette from track Ø(H) to 27(H), the first portion to be copied. Once this is complete, the following display appears on the screen:

Insert the diskette to be copied to
Press any key when ready

4. Insert a formatted diskette (which will be copied onto) in the disk drive. Press the **Space Bar.** The utility now transfers (writes from memory) the data onto the diskette, again showing the track position from Ø(H) to 27(H). Once this is complete, the following display appears on the screen:

Insert the diskette to be copied from
Press any key when ready

5. Re-insert the original diskette (which contains the information to be transferred) into the disk drive. Press the **Space Bar.** The utility now reads the second half of the diskette, showing position from 28(H) to 4F(H). Once this is complete, the following display appears on the screen:

Insert the diskette to be copied to
Press any key when ready

6. Re-insert the diskette, that is to receive the information into the diskette drive. Press the **Space Bar.** The utility is writing the second half of the information to the diskette, showing the position from 28(H) to 4F(H). Once this is complete, the following display appears on the screen:

Diskette copy completed

Hit Escape Key to terminate this test.
This routine is done in two parts.

Insert the diskette to be copied from
Press any key when ready

After the copy routine is complete, the program returns to the following menu:

ALTOS COMPUTER SYSTEMS

(A) Diskette Copy routines (B) Terminate this test

If additional diskettes need to be copied, option A can be re-selected.

Selecting option B, Terminate this test, causes the following prompt to be displayed:

Insert ADX Diskette and hit <CR> to return to Main Menu

These instructions reboot the system and return the program to the Master Diagnostic Menu.

After creating a copy of a diskette, it is recommended that the Floppy Verification diagnostic be run to check out the new diskette.

FLOPPY FORMAT

This procedure is used to format blank diskettes and must be accomplished prior to performing any Floppy Copy operations.

To proceed with the floppy format utility program as described below, it is assumed that the ADX diskette has already been loaded as described in Chapter 1. If this is not the case, do so before continuing with this section.

To use the floppy format utility program, perform the following steps:

1. Enter **C** at the Master Diagnostic Menu Prompt. The screen displays the following:

```
*** ACS586 FLOPPY FORMAT Vx.x ***

Select Format
  (A)  MP/M System      (C)  ADX system diskette
  (B)  XENIX System     (D)  Terminate Test
Enter:
```

2. Enter the appropriate letter for the type of format to be placed on the disk. Note that the Floppy Verification program described in this manual uses the common MP/M format. Select A for MP/M operating systems. Select B for XENIX operating systems. Select C to format a blank disk which will later have the ADX program copied onto it. The following display appears on the screen:

```
Do you want track verification?  [y/n]?
```

If the response is yes each sector is verified during the format process. The following prompt displays:

```
Press <ESC> to terminate this routine

Insert Diskette to be formatted in Drive Ø
Ready to start?  (y or Y for yes)
```

When the response is entered, the display is scrolled up two lines and the following information is added to the display:

cylinder
xx

The xx represents the number of the cylinder that is being formatted at any given time.

Upon successful completion of the formatting routine, the display is scrolled up to include the following:

```
Format Completed

Select Format
  (A)  MP/M System        (C)  ADX system diskette
  (B)  XENIX System       (D)  Terminate Test
Enter:
```

The track verification prompt affects the execution time of the formatting routine. With a no response, completion of the routine takes approximately one minute. A yes response increases the execution time to approximately four minutes.

Each time the format routine is completed, the Select Format menu reappears, allowing the user to format whatever number of floppy disks that may be required.

To terminate the format utility, select option **D** from the menu. The following message is displayed:

Insert ADX diskette and hit <CR> to return to Main Menu

This action causes the system to reboot and returns the program to the Master Diagnostic Menu.

FLOPPY VERIFICATION

The Floppy Verification program verifies the floppy disk control circuit on the CPU board, the floppy disk drive, and the media integrity of the diskette under test.

To proceed with the floppy verification program as described below, it is assumed that the ADX diskette has already been loaded as described in Chapter 1. If this is not the case, do so before continuing with this section.

To use the floppy verification program, perform the following steps:

1. Format a blank diskette as described in section 3.2 as a blank diskette is required for this test.

2. Enter **D** at the Master Diagnostic Menu prompt. The terminal will display the Floppy Verification menu:

***** ACS586 Floppy Disk Verification vx.x *****

ALTOS COMPUTER SYSTEMS

(A) Floppy disk Test and Analysis (B) Terminate this test Enter:

3. Enter option A. The following is displayed:

****** Hit ESC to exit this test ******

Do you wish to write on media [y/N]?

This question allows selection of a destructive or non-destructive test. An **"N"** response starts a non-volatile read test. The following messages appear:

Load diskette in the drive to be tested

Hit any key when ready to start

When any key is pressed, the following message appears just under the "Hit any key..." prompt:

Pass = 1
READ PHASE
x

This indicates that the diskette is being read, and it is in the first pass. The x represents the track number being read at any given point during the test. This test continues until the Escape key is pressed. Pressing the escape key terminates the test, displays the test results, and returns the program to the Floppy Disk Verification menu (note the display that follows).

Pass = 2
READ PHASE
15
Total Passes = 2
****** READ PHASE ERROR CNT = 0 WRITE PHASE CNT = 0 ******

***** ACS586 Floppy Disk Verification vx.x *****

ALTOS COMPUTER SYSTEMS
Floppy Disk Test and Analysis

****** Hit ESC to exit this test ******

Do you wish to write on media [y/N]?

If the **"Y<CR>"** option is selected, the following prompts appear:

Load diskette in the drive to be tested

Hit any key when ready to start

CAUTION

If a destructive test is chosen (i.e., if Y is entered) the data on the disk being tested is lost.

The following message appears:

Is diskette really scratch [y/N]?

If the **N** (no) option is selected, the following prompt re-appears:

Load diskette in the drive to be tested

Hit any key when ready to start

If **Y** is selected the following message appears on the screen just under the last message:

Pass=1
WRITE PHASE
x

This is the start of the diskette test. First a data pattern is written on all portions of the diskette (the x under the word WRITE represents the track number that is being written to at that moment). Then the entire diskette is read and compared.

During the read phase of the test, the track indicator block shifts down, and the words READ PHASE are displayed just under WRITE PHASE.

The "WRITE PHASE" and "READ PHASE" messages indicate the start of each portion of the operation. The "WRITE PHASE" is the input of a pattern onto the diskette. The "READ PHASE" is the verification process, which checks if the data was actually input to the diskette surface. The test continues to alternate between these two phases until the Escape key (ESC) is pressed. This action returns the program to the Floppy Verification menu.

A minimum complete test cycle consists of one write phase and one read phase. When the "WRITE PHASE" message displays for the second time, this minimum test is complete.

If an error message is suspected to have been caused by bad media, try another diskette to see whether it is the diskette or the drive. A sample portion of the errors found in a test is shown below:

```
Pass = 1
WRITE PHASE
read/write error cylinder=0 head=0 sector=1 status=40
read/write error cylinder=0 head=0 sector=2 status=40
read/write error cylinder=0 head=0 sector=3 status=40
read/write error cylinder=0 head=0 sector=4 status=40
read/write error cylinder=0 head=0 sector=5 status=40
read/write error cylinder=0 head=0 sector=6 status=40
read/write error cylinder=0 head=0 sector=7 status=40
read/write error cylinder=0 head=0 sector=8 status=40
read/write error cylinder=0 head=0 sector=9 status=40

read/write error cylinder=3 head=0 sector=1 status=40
read/write error cylinder=3 head=0 sector=2 status=40
read/write error cylinder=3 head=0 sector=3 status=40
read/write error cylinder=3 head=0 sector=3 status=40
read/write error cylinder=3 head=0 sector=5 status=40
read/write error cylinder=3 head=0 sector=6 status=40
read/write error cylinder=3 head=0 sector=7 status=40
read/write error cylinder=3 head=0 sector=8 status=40
read/write error cylinder=3 head=0 sector=9 status=40


Total Passes = 1

**** READ PHASE ERROR CNT = 0  WRITE PHASE ERROR CNT = 3F ****
```

To terminate the Floppy Verification test, select option B on the Floppy Disk Verification menu. The following menu is displayed:

Insert ADX Diskette and hit <CR> to return to Main Menu

Following these instructions reboots the system and returns the program to the Master Diagnostic Menu.

Hard Disk 4

CONTENTS

The Hard Disk Verification routines are a collection of utility and diagnostic programs. To execute Hard Disk Verification, follow the ADX loading procedures described in Chapter 1. When the Master Diagnostic Menu appears, enter option **E**. After approximately 10 seconds, the terminal displays the following sign-on message and menu:

```
*** ACS586 Disk Verification vx.x ***

Specify the HARD DISK to be used
(A) First Disk      (B) Second Disk
Enter:
```

To use the hard disk programs, the intelligent I/O controller must be initialized. This task is accomplished by performing the following steps:

1. Press A to select the internal hard disk drive. Option B should be selected if a peripheral disk is to be tested. The following menu is displayed on the screen:

```
Specify the SYSTEM MODEL number
(A) ACS586-10 (4 hd, 306 cyl)   (C) ACS586-30 (6 hd, 512 cyl)
(B) ACS586-20 (6 hd, 306 cyl)   (D) ACS586-40 (8 hd, 512 cyl)
```

2. Select the appropriate model number option for the 586 system being tested. The serial number/identification plate on the bottom of the system provides the model number.

Table 4-1. Hard Disk Specifications

Model	Storage Capacity (unformatted)	Number of Cylinders	Number of Heads
586-10	12.76 megabytes	306	4
586-20	19.14 megabytes	306	6
586-30	31.99 megabytes	512	6
586-40	42.66 megabytes	512	8

For example, select **A** to test a 586-10 system drive.

3. When the model number is selected (e.g., select option A for the 586-10), the system recalibrates itself according to the information supplied. The terminal displays the following message:

idc loaded

and presents to the following Hard Disk Test Facility Menu:

```
**** Hard Disk Test Facility 1983 ****

(A) Format Disk Drive
(B) Verify Addresses for all Sectors
(C) Seek test with optional Verify
(D) Write entire Disk
(E) Read entire Disk
(F) Set Flag Byte for a Specific Sector
(G) Hard Disk Write/Read Error Test
(H) Miscellaneous Functions
(I) Drive unit reselection
(J) Terminate this test series
Enter:
```

Menu Descriptions

The following is a brief description of each menu function. To execute a test refer to the appropriate section in this chapter.

A. Format Disk Drive. The hard disk is formatted prior to shipment from the factory. Formatting places the cylinder and sector addressing on the disk, and blocks out the data areas that can be written to on the disk. It is usually not necessary to reformat a hard disk in the field. Formatting destroys any prior data (user files, flagged bad sectors) on the disk. If it is necessary to reformat the hard disk, the "Flag Bad Sector" program must also be run.

B. Verify Addresses for All Sectors. This reads the addressing information (drive, head, cylinder, sector, buffer, etc.) on the disk to verify its availability and integrity. No data is read or destroyed in this program. This is a good, quick test of format integrity.

C. Seek Test with Optional Verify. This test permits specification of two cylinders that the disk controller accesses alternately and continually. The main use of this test is for cylinder address/data fault isolation. It is typically run while using electronic test equipment.

D. Write Entire Disk. This writes a user- or factory-specified pattern to all sectors of the disk. This test can be used to erase an entire disk.

E. Read Entire Disk. This reads data from every sector on the disk, and compares that data to a user- or factory-specified pattern. It is normally used after the "Write Entire Disk" program to verify successful data retention.

F. Set Flag Byte for a Sector. This program flags a sector as bad (not to be used for storing data). All known bad sectors are flagged prior to shipment from

the factory. This feature can be used in the field if a bad spot develops on the disk, or if the disk has been re-formatted.

G. Hard Disk Write/Read Test. This test writes a user- or factory-specified pattern over one cylinder, or the entire disk, reads it back, and compares the data for integrity. The test can also be used as an exerciser to work the disk for an extended period of time (i.e., overnight). It reports on the test results at the end of the period and/or at the end of each pass.

H. Miscellaneous Functions. There are two miscellaneous functions. The first suppresses or enables the display of the disk status error message. This can be disabled while running some repetitive operations for the purpose of checking the drive with electronic test equipment. The second function displays the contents of a selected sector on the screen in hexadecimal and ASCII.

I. Drive Unit Reselection. This returns to the reconfiguration options of the test to allow any necessary changes to be made.

J. Terminate this test series. This option reboots the system to exit the Hard Disk Verification test series and returns the program to the Master Diagnostic Menu.

FORMAT DISK DRIVE

The hard disk is formatted prior to shipment from the factory. Formatting places the cylinder and sector addressing on the disk and blocks out the data areas. This must be done before any data can be written on the disk. It is not usually necessary to run this program in the field. Formatting/reformatting destroys any prior data on the disk.

One of the major repercussions of formatting/reformatting is that any flag indicators of known bad sectors are erased. These bad sectors are flagged prior to shipment and are noted on the error map provided with the hard disk. Sectors previously marked as bad are considered valid after formatting. Unless these sectors are re-flagged as bad sectors, data written to them may be lost.

To execute the format utility, the Hard Disk Verification option must be loaded as described at the beginning of this chapter. Proceed as follows to format the hard disk:

CAUTION

This format utility changes data on the hard disk and may cause loss of user data.

1. Select program **A**, the following display appears:

***** DO NOT RUN THIS TEST WITHOUT PERMISSION FROM YOUR - LOCAL ALTOS - DEALER *****
Do you want to continue?

The distributor will attempt to determine whether formatting the hard disk is actually necessary. Call ALTOS customer service only if your distributor suggests it.

If not reformatting the disk, enter **N** or **<CR>** to return to the Hard Disk Verification Menu.

To reformat the hard disk, follow the instructions provided by your Altos dealer. Performing these instructions will cause the following prompt to be displayed at the terminal.

***** THIS TEST WILL ERASE FILES ON THE HARD DISK. *****
Do you want to continue? [Y/N]?

To continue, enter Y.

The format process then starts. Each cylinder number is shown on the screen as it is formatted.

When the disk has been formatted, the following message appears on the screen:

entire disk formatted

The program then returns to the Hard Disk Verification menu.

To ensure data integrity, flag any bad sectors before inputting any data to the newly-formatted hard disk. Flagging the bad sector can be accomplished by using the **Set Flag Byte for a Sector** option from the Hard Disk Test Facility menu. The original error map for the hard disk is taped to the disk drive or placed inside the chassis. It should only be removed by a qualified technician.

VERIFY ADDRESSES FOR ALL SECTORS ON DISK

This test reads the addressing information for every sector of every cylinder on the disk to verify its availability. No data is read; nothing is written or erased.

The identification area of every sector on the hard disk contains addressing information which consists of the head, drive, and sector numbers. This test reads and verifies those numbers. If that information cannot be read, that particular portion of the sector should not be used and should be flagged as bad.

The identification area also contains flag byte information (where sectors can be flagged as bad), and a Cyclic Redundancy Check (CRC) value. The CRC is a value developed by the circuitry when it writes data on the sector. When data is read from the sector, a CRC value is again generated and compared to the stored value as a check on data integrity.

To execute the address verification program, the Hard Disk Verification option must be loaded as described at the beginning of this chapter. Proceed as follows to execute the address verification program:

1. Select program **B** from the Hard Disk Test Facility menu. The screen displays:

   Press any key when ready to start the test.

The verification process then starts. Each cylinder number is shown as it is verified.

When verification is complete, the message

sector verification complete

displays on the screen and the program returns to the Hard Disk Verification menu.

NOTE

- The "Set Flag Byte" program can be used to flag bad sectors. Sectors listed as "Expected Errors," however, should not be flagged, since they have already been flagged as bad.

SEEK TEST WITH OPTIONAL VERIFY

The primary use of this test is for head/sector address fault isolation. It is typically run in conjunction with the use of electronic test equipment to check details of circuit functioning.

Two cylinders are alternately and continually accessed by the disk controller during program execution. The user selects the two cylinders to be accessed. The test verifies the address information (head Ø and sector Ø) of each cylinder specified, unless verification is disabled.

To execute the seek test, the Hard Disk Verification option must be loaded as described at the beginning of this chapter. Proceed as follows to execute the seek test:

1. Select option **C**, the screen displays:

   Press any key when ready to start this test

After a key is pressed the program prompts the user to specify two cylinder addresses to set the test boundaries.

Enter SEEK first cylinder number:

2. Enter the first cylinder number to be used. For example, for a drive with 3Ø6 cylinders enter from **Ø** to **3Ø5**, then **<CR>**. The next prompt is:

Enter SEEK last cylinder number:

3. Enter the second cylinder, then **<CR>**.

Proceeding with the example, the maximum seek distance is from Ø to 3Ø5. The minimum seek distance can be obtained by specifying the same cylinder. Normally, there is no reason to do this.

The next prompt is:

Do you want test verification of cylinder numbers [y/N]?

Normally, yes (**Y**) is selected. As the program accesses each cylinder, it reads and verifies the sector Ø address information. Disabling the verification, by selecting **N**, enables the test to run faster. This is done only when using electronic test equipment to check part of the seek process where maximum speed is desired and the verification of address does not matter.

The seek process starts as soon as "Y" or "N" is entered. The cylinder numbers are alternately displayed (under the message "Hit ESC to end this test") as each seek is performed.

The seek test continues until the Escape (**ESC**) key is pressed, returning the program to the Hard Disk Test Facility menu.

WRITE ENTIRE DISK

This program writes a user or factory specified pattern to all sectors on the disk. The companion program, "Read Entire Disk," verifies the data retention of the disk.

To execute the Write Entire Disk program, the Hard Disk Verification option must be loaded as described at the beginning of this chapter. Proceed as follows to execute the write program:

1. Select option **D** on the Hard Disk Test Facility menu, the screen displays:

   ***** THIS TEST WILL ERASE FILES ON THE HARD DISK *****
   Do you want to continue [y/N]?

If **N** is selected, the program returns to the Hard Disk Test Facility menu. If **Y** is selected, the screen displays:

Do you want to WRITE a specific pattern [y/N]?

If **N** or **<CR>** is entered the default pattern (E5E5) is selected.

If **Y** is selected, the program prompts you to choose a pattern.

Select pattern:

Patterns can be specified by entering:

***1 - for a 256 byte hexadecimal (ØØ-FF) pattern**
OR - select a one- or two-byte pattern (≤4 chars), interpreted in hexadecimal

(Press <CR> after entering the pattern.) If a pattern is not acceptable, a message appears on the display.

Specifying ***1<CR>** selects a 256-byte block of all hexadecimal values from ØØ-FF as the pattern.

The one- or two-byte patterns can be specified. Enter one to four hexadecimal characters (Ø through F), for example, A55A.

The pattern buffer is a four-position right-justified buffer with leading zeros. Therefore, an entry of E5 results in a pattern of ØØE5.

When the pattern has been selected by specification or by default, the program expands it to fill a 512-byte sector and writes it to all sectors. It displays the cylinder number, from Ø to 3Ø5, as it writes to the

disk. Once the entire disk has been written to, the following is displayed on the terminal screen:

Entire disk write completed

READ ENTIRE DISK

This program reads a user or factory specified pattern from all sectors on the disk. This companion program to the Write Entire Disk program can verify the data that was previously written to the disk.

To execute the Read Entire Disk program, the Hard Disk Verification option must be loaded as described at the beginning of this chapter. Proceed as follows to execute the read program:

1. Select option **E** on the Hard Disk Test Facility Menu, the screen displays:

```
Hard disk READ display options are:
  (A)  Don't display data if any error.
  (B)  Display only if CRC error.
  (C)  Display only if COMPARE error.
  (D)  Display if COMPARE or STATUS error.
Enter:
```

Selecting options **A** or **B** results in the immediate execution of the Read Entire Disk program. The number of the cylinder being read is displayed below the menu.

Selection of options **C** or **D** displays the following prompt:

```
Specify patterns by entering:

*1 - for a 256 byte hexadecimal (ØØ-FF) pattern
OR - select a one- or two-byte pattern (≤4 chars),
     interpreted in hexadecimal.
Select pattern:
```

Press <CR> after entering pattern. If a pattern is not acceptable, a message is displayed.

Specifying ***1** selects a 256-byte block of all hexadecimal values from ØØ-FF as the pattern.

The one or two byte patterns can be specified. Enter the same one to four hexadecimal characters (Ø through F) that were specified during the Write Entire Disk program. Failure to use the same pattern will result in COMPARE errors.

When the pattern has been selected, the program expands it to fill a 512-byte buffer for comparison. Then it reads each sector and compares the pattern to the data.

The program displays each cylinder number as it reads the disk.

If an error occurs the following is displayed on the screen:

**** COMPARE ERROR ****
disk I/O error command=xx drive=x head=x cylinder=xxx sector=xx status=xx

The display screen then fills with the first half of the data buffer showing the data read from the disk.

When the screen is first filled with the first half of the buffer data, it displays:

Hit any key to display the other half

When the screen fills again with the second half of the buffer data, it displays:

Hit any key to continue

Continue the display by pressing any key. To exit, press the ESC key and the program returns to the Hard Disk Verification Menu.

SET FLAG BYTE FOR A SPECIFIC SECTOR

This utility flags a sector as bad, that is, one not to used for storing data. Usually, any bad sectors are flagged before shipment of the system. This utility can be used in the field in case a bad spot develops on the disk, or when the disk has been re-formatted and it is necessary to re-flag known bad sectors. The flag location is in the identification area, which also holds the sector addressing and the CRC characters.

Sectors to be flagged can be specified in two ways:

1. as shown on the error map provided with your system - by track, head, byte count, and length in bits

2. by entering a specific cylinder, head, and sector address. (This is the way the program normally displays errors.)

For information on removing the error map from a system, see the note at the end of this section.

To execute the Set Flag Byte program, the Hard Disk Verification option must be loaded as described at the beginning of this chapter. Proceed as follows to execute the Set Flag Byte program.

1. Select option **F** on the Hard Disk Test Facility menu, the screen displays:

***** THIS TEST WILL ERASE FILES ON THE HARD DISK. *****
Do you want to continue [y/N]?

If **N** is selected, the program returns to the Hard Disk Test Facility menu. If **Y** is selected, this prompt is displayed:

Hard Disk FLAG BAD SECTOR options are:

(A) Disk Error Map (B) Cylinder, Head, Sector
Enter:

Enter **A** or **B**

For option A, read the information off the disk error map and enter it in the same form. The following prompt appears:

Enter cylinder number: xx <CR>
Enter Head number: x <CR>
Enter Byte count: xx <CR>
flagging sector x
Bad Sectors have been flagged

Then the screen displays:

Hard Disk FLAG BAD SECTOR options are:
(A) Disk Error Map (B) Cylinder, Head, Sector
Enter:

For option B, you can enter the information in the form used by error messages given by other Hard Disk Verification programs. The prompts are as follows:

Enter cylinder number: xx <CR>
Enter Head number: x <CR>
Enter Sector count: xx <CR>
flagging sector x
Bad Sectors have been flagged

Hard Disk FLAG BAD SECTOR options are:
(A) Disk Error Map (B) Cylinder, Head, Sector
Enter:

Press ESC to terminate the test.

When a bad sector has been flagged, reselect option A or B. When all bad sectors have been flagged, exit this test by pressing ESC.

NOTE

The Hard Disk Error Map is taped to the drive inside the system when it is shipped from the factory. Any bad sectors shown on the map are flagged before shipment of the system. The only time this map would be needed to flag sectors is after reformatting the hard disk or for verification that all bad sectors have been flagged. The program flags bad sectors but does not allocate alternate sectors to be accessed in their place. This function is handled differently by various operating systems.

HARD DISK WRITE/ READ ERROR TEST

This test writes a specified pattern over the entire disk, reads it back, and compares it. The test can be used as an exerciser in order to work the disk for a long time (such as overnight). The results are reported at the end of the test.

This test has two phases. The first writes and reads a variety of patterns to all sectors of the disk. This phase continues until terminated by simultaneously pressing the Control key and A key (shown in test as CNTL-A). The program then immediately aborts the test and begins the second phase.

In the second phase, the program fills the disk with E5E5 and automatically flags all "bad sectors." It displays the final error count.

Explanation of test result terminology:

Soft Error. An unsuccessful attempt to read data, shown as a CRC error. The operation is retried. If the operation succeeds on the first or second retry, each prior failure is counted as a "soft error."

Hard Error. If the third retry at a read fails, the sector is considered to have a "hard error."

Bad Sector. A sector that has a hard error is flagged as a "bad sector," and is not to be used for data storage. This is done in the final phase of the test.

When program **G** is selected, the screen displays:

***** THIS TEST WILL ERASE FILES ON THE HARD DISK *****
Do you want to continue [y/N]?

If **N** is selected, the program returns to the Hard Disk Verification menu. If **Y** is selected, the following message is displayed:

Press any key to start

When a key is pressed, the following options are shown.

Hard disk Reliability error display options:
(A) Display error summary at end of each pass
(B) Display error summary only at the end of the test
Enter:

Option A displays the soft and hard error statistics at the end of each pass.

Option B displays the hard and soft error statistics only after the test is terminated using a Control-A. Selection of option B also allows the test to be run without a terminal. The terminal may be disconnected after the test is started by using the procedure described in Chapter 1 of this manual. In this manner the test may be run for long periods of time without tying up a terminal. To terminate the test, follow the reconnect instructions described in Chapter 1.

Selection of option A results in the following prompt:

Display data if a CRC error [y/N]?

If **Y** is selected the data buffer is displayed on the screen in the event of a CRC error.

The next prompt (first prompt if option B was selected from the Error Display Options menu) is:

Do you want to test cylinders individually? [y/N]?

If **N** is selected, the program uses a pre-defined data pattern (DB6C) that is rotated three times for each pass; i.e., in sequence DB6C, B6CD, 6CDB, and CDB6 are each written to and read from the cylinder(s) being tested.

If **Y** is selected, the following is displayed on the screen if the entire disk is being tested:

As many as four (4) patterns may be specified, as follows:
Enter one or two byte pattern interpreted in hexadecimal
Select Pattern #1:
Select Pattern #2:
Select Pattern #3:
Select Pattern #4:

One to four hexadecimal characters may be entered for each pattern (e.g., Select Pattern #1: **a <CR>**). When the fourth pattern is entered, the test begins.

If **Y** is specified for the "Do you want to write a specific pattern?" prompt and a single cylinder is being tested the following prompt appears at the terminal:

Select Pattern:

A one to four hexadecimal character should be entered and followed by <CR>. The next prompt to appear is:

Enter cylinder to be tested

The program begins to execute after the cylinder number and <CR> are entered.

This program continues writing and reading until stopped by pressing the CNTL-A. The test aborts immediately and displays:

Pass count: 1

Soft error statistics:

Pattern	write fault	CRC error	RNF	bad sector	cmp error
DB6CH	0	0	0	0	0
B6CDH	0	0	0	0	0
6CDBH	0	0	0	0	0
CDB6H	0	0	0	0	0

Hard error statistics:

Pattern	write fault	CRC error	RNF	bad sector	cmp error
DB6CH	0	0	0	0	0
B6CDH	0	0	0	0	0
6CDBH	0	0	0	0	0
CDB6H	0	0	0	0	0

Hit any key to display more information

Pressing a key displays the following summary:

Heads = x Cylinders = xxx as specified for this drive
No soft errors recorded
No hard errors recorded
Hit any key to continue

Pressing a key causes the test to continue. If a specific cylinder is being tested, you are asked "Do you want to test another cylinder? [y/N]? If you select **Y**, you are requested to:

Enter cylinder to be tested.

If you select **N** above, the test summary displays:

This disk has no hard or soft errors.

If errors did occur the program flags as bad any sectors that had hard errors or soft errors that occurred more than three times. The following message is displayed:

..... Bad sectors have been flagged.

A pause of several minutes occurs while the program writes a pattern of hexadecimal E5E5 to all sectors. The last message is:

..... Disk Reliability Test Terminated.

The program then returns to the Hard Disk Verification menu.

MISCELLANEOUS FUNCTIONS

This program provides two functions. The first suppresses or enables the display of the disk status error message for Hard Disk Verification programs. This display is ordinarily enabled, but may be disabled when running some repetitive operation while checking the disk drive with electronic test equipment. The second function displays the contents of a selected sector on the screen in hexadecimal and ASCII.

To execute the Miscellaneous Functions program, the Hard Disk Verification option must be loaded as described at the beginning of this chapter. Proceed as follows to execute the Miscellaneous Functions program.

1. Select option **H** on the Hard Disk Test Facility menu, the screen displays:

Miscellaneous Menu

(A) Select Disk Error STATUS display option
(B) Display a Sector
(C) Terminate this test
Enter:

If **A** is selected, this prompt shows:

Do you want the Disk Error STATUS message displayed [y/N]?

Reply **Y** or **N** to enable or supress display of status errors for Hard Disk Test Facility programs. The program then returns to the Miscellaneous menu.

If **B**, Display a Sector, is selected from the Miscellaneous menu, you are prompted - one line at a time - to enter the cylinder, head, and sector numbers. Press Return after each entry. The menu prompts are as follows:

```
*     DISPLAY HARD DISK SECTOR     *

Enter cylinder number:
Enter head number:
Enter sector number:
```

where

Cylinder number value ranges from 0-305.
Head number value ranges from 0-3 for 10-megabyte disk drives.
Sector number ranges from 0-15.

The contents of the sector are then displayed on the screen. They are shown in hexadecimal on the left, ASCII on the right if displayable. Sixteen bytes are shown per line. Hexadecimal numbers on the left aid in locating the exact displacement of any byte in the sector, from 0 to 01F0H. (Only the first half of the sector contents are displayed on the screen; press any key to display the second half. The displacement numbers for the second half are a duplicate of the first half.) A sample is shown below:

```
Enter cylinder number:  12
Enter head number:  1
Enter sector number:  3
0000:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
0010:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
0020:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
0030:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
0040:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
0050:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
0060:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
0070:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
0080:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
0090:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
00A0:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
00B0:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
00C0:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
00D0:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
00E0:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
00F0:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
Hit any key to display the other half

00B0:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
00C0:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
00D0:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
00E0:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
00F0:   E5E5E5E5 E5E5E5E5 E5E5E5E5 E5E5E5E5  *................*
```

After the second half displays, the program returns to the Miscellaneous Menu. Select option **C** to return to the Hard Disk Test Facility menu.

DRIVE UNIT RESELECTION

This selection returns to the initial prompts of Hard Disk Test Facility menu to allow reselection and definition of the disk to be tested without rebooting the test. This is typically used when errors were made when the disk was first defined.

To invoke, enter option **I** on the Hard Disk Test Facility Menu.

Select the appropriate options for your hard disk.

Specify the HARD DISK to be used
(A) First Disk (B) Second Disk
Enter:

Specify the SYSTEM MODEL number
(A) ACS586-1Ø (4 hd, 3Ø6 cyl) (C) ACS586-3Ø (6 hd, 512 cyl)
(B) ACS586-2Ø (6 hd, 3Ø6 cyl) (D) ACS586-4Ø (8 hd, 512 cyl)

The program returns to the main Hard Disk Test Facility menu.

TERMINATE TEST SERIES

Selecting option J, Terminate this test, causes the following prompt to be displayed:

Insert ADX Diskette and hit <CR> to return to Main Menu

Following these instructions reboots the system and returns the program to the Master Diagnostic Menu.

Random Access Memory (RAM) Verification 5

CONTENTS

GENERAL INFORMATION

RAM verification routines are designed and written to test on-board RAM in the 586/986 system. It is assumed that the person running the routine has a conceptual knowledge of the computer domain.

RAM Verification executes a variety of dynamic tests to validate the integrity of the 586/986 microprocessor (Intel 8Ø86) and the on-board dynamic RAM.

RAM verification routines assume that the hardware passed the Power-Up monitor self test. It also assumes that the initial (lower) RAM used for program code and/or data variables is secure and error-free for at least brief periods of time. The loading of RAM586 causes the destruction (write over) of all of the initial proprietary inputs (i.e., segment register file, reset bootstrap program jump, monitor, user interrupt routines, etc.) that were loaded upon system "boot up" and allows the system and memory to be fully checked out. It creates a modified version of the monitor, allowing all of the normal proprietary operating primitives to be used during normal system and memory testing. As the user completes the RAM verification, the system automatically reboots the original proprietary information (the monitor) into the appropriate memory locations.

To execute RAM verification, follow the ADX loading procedures described in Chapter 1. When the Master Diagnostic Menu appears, enter option F. After approximately 1Ø seconds, the terminal displays the following menu:

***** ACS586 RAM Verification Vx.x *****

***** Hit ESC to stop test *****

Memory Test Menu
- **(A) Select Memory to be Tested (default = lower 1/2 megabyte)**
- **(B) RAM March Test**
- **(C) RAM Refresh Test**
- **(D) Repeat March Test**
- **(E) Repeat Refresh Test**
- **(F) Repeat March Test and Refresh Test**
- **(G) Terminate this test**

Enter:

These tests validate the RAM and refresh circuitry in the system. The tests validate the primary and expansion RAM. Press the **Escape Key** to return the program to the RAM Verification Menu.

SELECT MEMORY TO BE TESTED

This option allows the user to select upper, lower, or a full megabyte of memory to be tested. To use the Select Memory option, enter A on the Memory Test Menu. The following display appears at the terminal:

```
Memory Size Menu
  (A)  Lower 1/2 megabyte    (C)  Full 1 megabyte
  (B)  Upper 1/2 megabyte
Enter:
```

When the area of memory to be tested is selected, the program returns to the Memory Test Menu.

RAM MARCH TEST

This test writes alternate patterns of 0000H (0000) and FFFFH (1111) into the RAM.

To execute the RAM March test, perform the following steps:

1. Select option B on the Memory Test Menu. The test begins immediate execution. The following is displayed at the terminal:

```
Doing Memory March Test
Ascending Order
Passed Segment no. 7
Descending Order
Passed Segment no. 7
Memory March Test Passed
```

The test starts by writing zeros and ones, in ascending order within the RAM, validates them, and displays each 64K segment passed. Then it reverses the process by writing zeros and ones in decending order, further validating the RAM's integrity. Should an error occur, the test displays the error and attempts to complete the algorithm.

When the test is complete, the program returns to the Memory Test Menu.

RAM REFRESH TEST

This test verifies that the refresh circuitry is working properly and that data placed into the on-board RAM is retained with integrity.

To execute the RAM Refresh test, perform the following steps:

1. Select option C on the Memory Test Menu. The test begins immediate execution. The following is displayed at the terminal:

```
Doing Memory Refresh Test
Pattern = 5555
Passed Segment no. 7
Pattern = AAAA
Passed Segment no. 7
Memory Refresh Test Passed
```

This test writes a hex pattern (5555) into RAM, waits 1Ø seconds and verifies the pattern. The second pass writes the compliment (AAAA) hex pattern into the RAM, waits 1Ø seconds and verifies the results. This test also reports any errors found during the test. After the test is complete, the program returns to the Memory Test Menu. The RAM Refresh test can be interrupted and cancelled by pressing the Escape key.

REPEAT MARCH TEST

This test is the same as the RAM March test except that it executes continuously until terminated by pressing the Escape key. By running this test for an extended period of time, suspected intermittent memory failures may be isolated. To load and execute the Repeat March test, select option D from the Memory Test Menu. Test execution begins immediately and the following is displayed on the terminal screen:

```
*** Pass 1 ***

Doing Memory March Test
Ascending Order
Passed Segment no. 7
Descending Order
Passed Segment no. 7

Doing Memory March Test
Ascending Order
Passed Segment no. 7
Descending Order
Passed Segment no 7
Memory March Test Passed

Total Passes = 1

Total no. of March Errors = Ø

Total no. of Refresh Errors = Ø
```

By pressing the Escape key the Repeat March test is terminated and a test summary is displayed. The program then returns to the Memory Test Menu.

REPEAT REFRESH TEST

This test is the same as the RAM Refresh test except that it executes continuously until terminated by pressing the Escape key. By running this test for an extended period of time, suspectd intermittent memory failures may be isolated. To load and execute the Repeat Refresh test, select option E from the Memory Test Menu. Test execution begins immediately and the following is displayed on the terminal screen:

```
*** Pass 1 ***

Doing Memory Refresh Test
Pattern = 5555
Passed Segment no. 7
Pattern = AAAA
Passed Segment no. 7
Memory Refresh Test Passed

*** Pass 2 ***

Doing Memory Refresh Test
Pattern = 5555

Total Passes = 2

Total no. of March Errors = 0

Total no. of Refresh Errors = 0
```

By pressing the Escape key the Repeat Refresh test is terminated and a test summary is displayed. The program then returns to the Memory Test Menu.

REPEAT MARCH TEST AND REFRESH TEST

This test continuously executes both the RAM March and Refresh tests described earlier in this chapter. The test can be terminated by pressing the Escape key. By running this test for an extended period of time, suspected intermittent memory failures may be isolated. To load and execute the test, select option F from the Memory Test Menu. Test execution begins immediately and the following is displayed on the terminal screen:

```
*** Pass 1 ***

Doing Memory March Test
Ascending Order
Passed Segment no. 7
Descending Order
Passed Segment no. 7
Memory March Test Passed
```

Doing Memory Refresh Test
Pattern = 5555
Passed Segment no. 7
Pattern = AAAA
Passed Segment no. 7

***** Pass 2 *****

Total Passes = 1

Total no. of March Errors = Ø

Total no. of Refresh Errors = Ø

By pressing the Escape key the test is terminated and a test summary is displayed. The program then returns to the Memory Test Menu.

TERMINATE TEST

Selecting option G, Terminate this test, causes the following prompt to be displayed:

Insert ADX Diskette and hit <CR> to return to Main Menu

Following these instructions reboots the system and returns the program to the Master Diagnostic Menu.

Serial Verification 6

CONTENTS

The Serial Verification program has two tests which verify that serial I/O communication is functioning. This is vital because most communication with the system is via serial channels (i.e., terminal, printer, etc.).

The serial verification routine is initiated in the following manner:

1. Load the ADX diskette as described in Chapter 1.

2. Select the serial verification program option from the Master Diagnostic Menu. When the program is loaded, the screen scrolls up and the serial verification menu appears as illustrated below.

```
*** ACS 586 Intelligent Serial Channel Verification VX.X ***

Test Menu
  (A)  Select Terminal Port          (C)  Barber Pole Test
  (B)  Echo Test                     (D)  Terminate this Test
Enter:
```

Choose option A to select the port that is to be tested. The following options will be displayed on the screen:

```
          Terminal Port Selection Menu
            (A)  Port 1          (F)  Port 6
            (B)  Port 2          (G)  Port 7
            (C)  Port 3          (H)  Port 8
            (D)  Port 4          (I)  Port 9
            (E)  Port 5          (J)  Port 10
```

Select A to test Port 1 first. If the console port (port 1) does not check out, none of the other ports can be verified. The following displays:

```
Connect a Display to Port 1
Test will continue on Port 1

Test Menu
  (A)  Select Terminal Port      (C)  Barber Pole Test
  (B)  Echo Test                 (D)  Terminate this Test
Enter:
```

NOTE

Press the ESC KEY to terminate the test.

If B is selected on this Test Menu, an echo test commences. Any keyboard character will "echo" or be displayed on the screen when a key is pressed.

When ESC is pressed, the Test Menu appears again.

If C is selected from the Test Menu, all keyboard characters are displayed in a continuous diagonal pattern (i.e., barber pole). To terminate this test press ESC. The Test Menu will appear again.

Each port can be tested in the same manner as Port 1. If only one terminal is available the test sequence is as follows:

1. Select the port to be tested from the Terminal Port Selection Menu (this example is for Port 2 so option B is chosen). The following display appears at the terminal:

   Connect a Display to Port 2
   Test will continue on Port 2

2. Disconnect the terminal signal cable from the Port 1 jack to the Port 2 jack on the system back panel. When the cable is connected the test menu will appear as illustrated below.

Test Menu
(A) Select Terminal Port (C) Barber Pole Test
(B) Echo Test (D) Terminate this Test
Enter:

3. Select the desired test from the Test Menu.

4. To terminate a test, press the Escape key. The test is terminated and the program returns to the Test Menu.

To exit the Serial Verification program and return to the Master Diagnostic Menu, select option D, Terminate this test, on the Test Menu. The folowing prompt appears on the display:

Insert ADX Diskette and hit <CR> to return to Main Menu

Following these instructions reboots the system and returns the program to the Master Diagnostic Menu.

Magnetic Tape Unit 7

CONTENTS

To use the tape unit ADX programs load the ADX diskette as described in Chapter 1. When the Master Diagnostic Menu is displayed on the terminal screen, select the Tape Verification option. The following menu is displayed on the screen:

```
** ACS586 Tape Diagnostic Menu (vX.X) **

(A)  Write/Read and Verify Test

(B)  Space Forward and then Space Reverse

(C)  Repeat Tests A and B plus Force Backspace,
     CRC, Loss of Carrier Error(s),

(D)  Retension (Fast Forward then Rewind)

(E)  Terminate this test

Enter:
```

Proceed to the appropriate section in this chapter for instructions to load and execute each test.

WRITE/READ AND VERIFY TEST

This program writes a unique pattern in 100 4-Kbyte records on each track. After writing to the track, the program rewinds the tape, reads the data just written and verifies it.

To execute the Write/Read and Verify program, the Tape Verification option on the Master Diagnostic Menu must be loaded as described at the beginning of this chapter; then proceed with the following steps:

1. Select option A from the Tape Diagnostic Menu. The test begins immediate execution.

Upon completion the test summary is displayed as follows:

```
Track:  0      Pattern:  3333
** Rewinding Tape ...
** Operation Completed **
** Writing Record 1 ...
** Operation Completed **
** Writing Record 2 ...
** Operation Completed **
** Writing Record 3 ...
** Operation Completed **
** Rewinding Tape ...
** Operation Completed **
** Reading Record 1 ...
** Operation Completed **
** Reading Record 2 ...
```

```
** Operation Completed **
** Reading Record 3 ...
** Operation Completed **

** Pass Count = 1, I/O Error = Ø, Hard Error = Ø,
   Retries = Ø **
```

The Write/Read and Verify program can be terminated prior to completion by pressing the Escape key. The program returns to the Tape Diagnostic Menu.

SPACE FORWARD THEN SPACE REVERSE TEST

This program writes three records on the tape, then reverses three records. Next, it moves the tape forward two records to the beginning of the third record. At this point, the program reads the next record on the tape. If the program reads the third record, the test passed. If any other record was read, the test failed.

To execute the Spacing test program, the Tape Verification option on the Master Diagnostic Menu must be loaded as described at the beginning of this chapter; then proceed with the following steps:

1. Select option B from the Tape Diagnostic Menu. The test begins immediate execution.

Upon completion the test summary is displayed as follows:

```
** Rewinding Tape ...
** Operation Completed **
** Writing Record 1 ...
** Operation Completed **
** Writing Record 2 ...
** Operation Completed **
** Writing Record 3 ...
** Operation Completed **
** Reversing Tape, 3 record(s) **
** Operation Completed **
** Forwarding Tape, 2 record(s) **

** Operation Completed **
** Writing Record 3 ...
** Operation Completed **
** Reversing Tape, 3 record(s) **
** Operation Completed **
** Forwarding Tape, 2 record(s) **
** Operation Completed **
** Reading Record 3 ...

** Operation Completed **
** Spacing Operation Completed **
```

**** Pass count = 1, I/O Error = Ø, Hard Error = Ø, Retries = Ø ****

The tape spacing program can be terminated prior to completion by pressing the Escape key. The program returns to the Tape Diagnostic Menu.

REPEAT TESTS A AND B PLUS, FORCE BACKSPACE, CRC, LOSS OF CARRIER ERROR

This program repeats both tape tests A and B from the Tape Diagnostic Menu. In addition to repeating tests A and B, this program also tests the error circuitry for the following:

1. Backspace error - one record is written on tape, then is reversed two records. This goes past the beginning of the tape and generates an error.

2. CRC error - occurs when the length is specified as being shorter than 4K per second, i.e., 2 bytes result in an error.

3. Loss of Carrier error - occurs when the length is specified as being greater than 4K per record, i.e., at least 1Ø bytes or more result in an error.

To execute this program, the Tape Verification option on the Master Diagnostic Menu must be loaded as described at the beginning of this chapter; then proceed with the following steps:

1. Select option C from the Tape Diagnostic Menu. The test begins immediate execution.

Upon completion the test summary is displayed.

The test may be terminated prior to completion by pressing the Escape key. The program returns to the Tape Diagnostic Menu.

RE-TENSION

This program goes to the end of tape and then rewinds automatically, which adjusts the tension of the tape. The purpose of this test is to re-tension the cassette tapes that have been stored for some time, which could result in read/write errors due to improper tensioning of the tape.

To execute the Re-tension program, the Tape Verification option on the Master Diagnostic Menu must be loaded as described at the beginning of this chapter; then proceed with the following steps:

1. Select option D from the Tape Diagnostic Menu. The test begins immediate execution and displays the following:

```
** High Speed Skip to End of Tape ...
** Operation Completed **
** Rewinding Tape ...
** Operation Completed **

** Pass Count = 1,  I/O Error = Ø, Hard Error = Ø,
   Retries = Ø **
```

Upon completion, the program returns to the Tape Diagnostic Menu.

TERMINATE TEST

Selecting option E, Terminate this test, causes the following prompt to be displayed:

Insert ADX Diskette and hit <CR> to return to Main Menu

These instructions reboot the system and return the program to the Master Diagnostic Menu.

ALTOS 586 Monitor A Program (Version X.X)

CONTENTS

MONITOR OVERVIEW

The system, or resident, monitor is a collection of programs, remaining permanently in memory (on board EPROM), providing initial system validation, as well as the overall coordination and control of the operating system.

The main function of the Monitor is to provide a down-load capability and disk boot facility. This allows the user to load operating systems/programs into the system. The Monitor, within its structure and capability will:

First, it performs an initial system validation (Power-up test) that exercises all of the major components (except the diskette drive) in the system. This test establishes a working plateau from which the user can work.

Second, the drivers perform the tasks of checking port status, inputting data and handling basic error recovery and notification. The I/O service routine pre-processes data so that all devices appear identical to the user's programs, thus simplifying both high and low level coding.

Physical Location

The monitor is located at fixed locations FE000(H) to FFFFF(H) and 400(H) to FFF(H) (Intel interrupt vectors are located at 000(H) to 3FF(H)). The object programs remain resident in the upper portion of the monitor, starting with the highest address, and working backwards (see Figure A-1). These programs cannot be written into any memory location other than the section specified. The hardware reserved locations are allocated for specific hardware routines. The object and hardware reserved locations are in EPROM (Eraseable Programmable Read Only Memory), and cannot be overlayed.

Monitor Start Up

The Monitor is executed whenever a system power up or reset is accomplished. The power up sequence starts with a series of tests that initially validate the system. These tests are as follows:

(1) Firmware EPROM Checksum-a byte is assigned as a checksum offset. This test does an add on all bytes, including the checksum, and verifies that the checksum is zero.

(2) Map RAM data bus ripple-this test ripples a "one" bit across the data bus at location 0 of the map RAM and verifies.

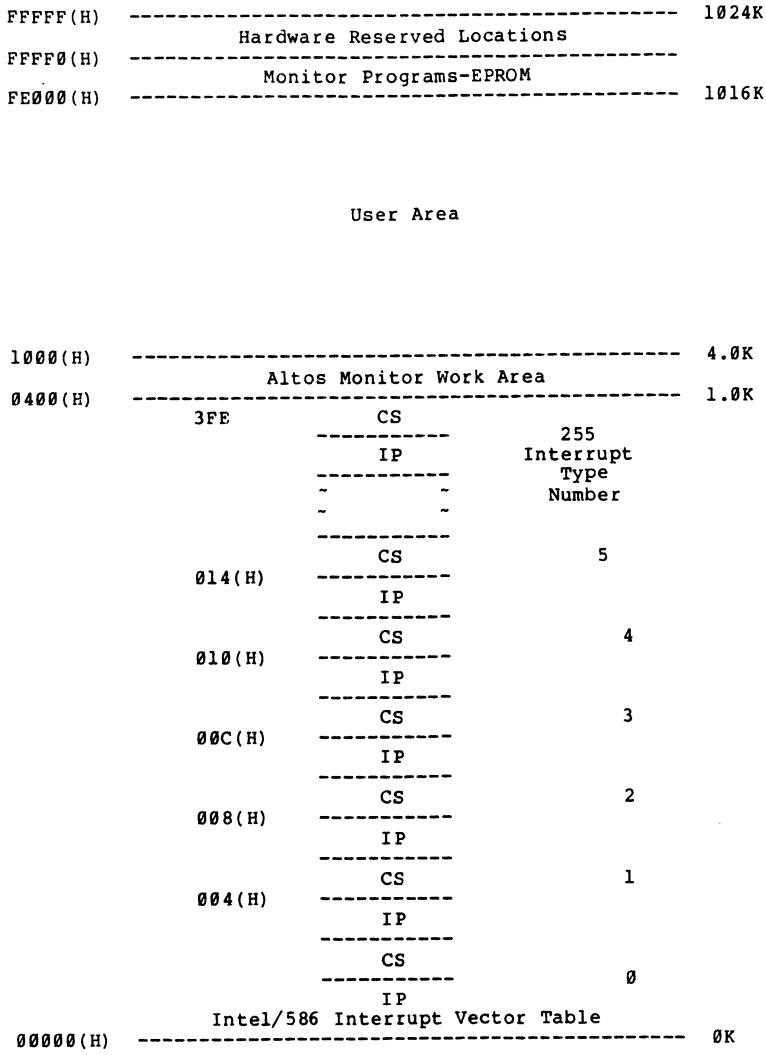

Figure A-1. Memory Map Altos 586

(3) Map RAM address bus ripple-this test writes a background pattern (0000H), starting at location 0, while rippling a one across the address bus. The test, for all locations, will:

a. read and verify all are 0's
b. write FFFFH into the same location
c. read and verify all are 1's

(4) Map RAM content march-writes a background pattern (0000H) into all locations. Starting at location 0, in ascending order and for each location, the test will:

a. read and verify all are 0's
b. write FFFFH into same location
c. read and verify all are 1's

(5) Main RAM data bus ripple-algorithm same as #2 above. All bits in main RAM are rippled.

(6) Main RAM address bus ripple-the main RAM is divided into 4 banks of 64K words. Each bank is tested in exactly the same way. Starting at location 0, it writes a background pattern (0000H) while rippling a one across the address bus to all locations. The test will:

a. read and verify that the pattern is 0000H
b. write the complement (FFFFH)
c. read and verify the complement

(7) Main RAM content march. Similar to test 4.

(8) 8254 timer. The test initializes all three counters to zero and starts the counters. It then stops the counters and verifies that all counters contain values other than zero.

(9) 8259 Interrupt controller. The timer is set up to issue an interupt. This test makes sure that an interrupt is indeed obtained.

A system reset will simply reinitialize the I/O ports and reset the memory map leaving the users RAM intact.

Once these functions have been performed, the screen will scroll and the following message will appear in approximately 4 seconds:

```
PASSED POWER-UP TEST
ALTOS COMPUTER SYSTEMS-586
Monitor Version X.X
Press any key to interrupt boot
```

If no key is typed within 4 seconds, a default hard disk boot will be performed. If any key is typed, the following message will appear on the screen:

```
Enter [1] to boot from Hard Disk
Enter [2] to boot from Floppy Disk
Enter [3] to enter Monitor

Enter option:
```

Entering a 3 will get you into the Monitor commands and the Monitor prompt will appear on the screen:

```
<A,B,D,G,I,K,L,M,O,R,S,X>
```

The Monitor prompt displays all of the commands that are now available. The following sections will describe each of the different commands in detail.

MONITOR COMMANDS

The Monitor Commands are one character command names followed by option dependent operands. These operands are address or word values. The word values are limited to four characters and address values are usually two word values. Any byte operand values are also limited to a maximum of two characters. All operand numerical inputs must be hexidecimal. Any inputs, other than hexidecimal, will cause the system to error, sound the console bell and and place an asterisk on the screen. This error routine will also initiate, when necessary, during the processing of a command (see Read Intel Format Hex Data). The prompt will then return and request further inputs from the user.

The Monitor Commands are as follows:

A	ALTER MEMORY
B	BREAKPOINT
D	DISPLAY MEMORY
G	GO TO
I	PORT INPUT
K	DISK I/O
L	LOAD BOOT
M	MOVE MEMORY
O	PORT OUTPUT
R	REGISTER

S SINGLE STEP INSTRUCTION

X READ HEX (DOWN LOAD)

Address Values

An address value is a pair of word values that are used to load the segment register and base registers. The word values must, in all cases, be seperated by a colon. If the segment value is not specified in any command, it will default to zero.

<address>=(<segment address><:>)<displacement address>

i.e.:

G FF11:00AC

Will set the CS register to FF11, the IP register to 00AC.

G F114

Will set the CS register to 0000, the IP register to F114.

The 586 implements straigth forward direct memory addressing by adding a 16-bit displacement (two object code bytes) to the Data Segment register. This 16-bit address displacement, when stored in program memory, has the low-order byte preceding the high-order byte. The base segment address must be supplied by the Data Segment register when addressing data memory.

Word Values

Word values are only four hexidecimal digits (the results of an arithmetic expression consisting of + and - and hexidecimal numbers). Leading zeros are not required, even if the first valid character is an alphabetic character between "A" and "F".

i.e.:

D FF11:00AC+00FB,25-1A

Will display 11 decimal bytes of memory starting at FF2B7.

Byte Values

Byte values are any two valid hexidecimal digits. If less than two digits are entered, the higher order nibble will default to zero. Leading zeros are not required for byte values.

i.e.:

D FFF0,4

Will display four bytes of memory at location 0FFF0.

Program Down Load

Read Intel Format Hex Data

Channel 1 (port 2) is read continuously for Intel format hexidecimal data. The data is then placed in memory stream based on the control information within the data. If a checksum failure is detected during an input operation, the console bell will sound, and an error indicator (asterisk) will be displayed. If no errors are detected, the data stream will be read until the ending record is read from the port. This, then, reverts control to the user console. If the data stream contained a start address record, the CS and IP register save areas will be updated with that address. This will cause control to be passed to the loaded program from any user specifeid, subsequent Go command.

X The Monitor will respond with

"Ready"

when this command is entered.

Load Bootstrap Command

L<space>(<drive>)<CR>

NOTE

The space in the command is given by the Monitor.

The first sector, of the user specified disk, is read into memory. The header record, in the first sector, contains the base paragraph address for the command to be loaded. The base address is then extracted from the header record. The bootstrap program is then read into that location. Stream control, of the Load Bootstrap Command, is then passed to the first byte of the loaded program. If the drive is not ready, the Monitor is re-entered and an error is displayed.

Drive = Ø-3, Floppy Disks Ø-3
4-5, Hard Disks Ø,1

Boot Format

The bootstrap format, for each system offered, is as follows:

Floppy Disk

CP/M-86,MP/M-86

512 bytes/sector 9 sectors/tracks

4th byte, 1st sector low byte of Load Seg. Add.
5th byte, 1st sector high byte of Load Seg. Add.
1Øth byte, 1st sector =Ø

129th byte, 1st sector to end of 2nd track data

1st track is cyclinder 0, head 0
2nd track is cyclinder 0, head 1

OASIS

256 bytes/sector 16 sectors/track

4th byte, 1st sector low byte of Load Seg. Add.
5th byte, 1st sector high byte of Load Seg. Add.
10th byte, 1st sector =1

11th byte, 1st sector to end of 1st track data

UNIX

512 bytes/sector 9 sectors/track

4th byte, 1st sector low byte of Load Seg. Add.
5th byte, 1st sector high byte of Load Seg. Add.
10th byte, 1st sector =2

1st byte, 1st sector to end of 3rd sector data

Hard Disk

512 bytes/sector 16 sectors/track

CP/M-86,MP/M-86

4th byte, 1st sector low byte of Load Seg. Add.
5th byte, 1st sector high byte of Load Seg. Add.
10th byte, 1st sector =0

129th byte, 1st sector to end of 1st track data

OASIS

4th byte, 1st sector low byte of Load Seg. Add.
5th byte, 1st sector high byte of Load Seg. Add.
10th byte, 1st sector =1

11th byte, 1st sector to end of 1st track data

UNIX

4th byte, 1st sector low byte of Load Seg. Add.
5th byte, 1st sector high byte of Load Seg. Add.
10th byte, 1st sector =2

1st byte, 1st sector to end of 3rd sector data

NOTE

The Monitor will start execution at CS=Load Segment, IP=Ø immediately after system boot.

SYSTEM COMMANDS

Perform Disk I/O

K<space><IOPB address><CR>

The I/O operation, described in the IOPB (input/output parameter block) at its user specified address, is performed and updated with the status of the operation. No user notification will be returned. The success/failure must be determined by inspecting the IOPB manually through the use of the Display Memory Command. This operation will allow the user to see if the correct parameters were placed into the IOPB. (See section 5.9 for format of the IOPB).

Byte or Word I/O Command

I<space><B>or<W><space><portno><space><or><CR>

This command reads the word or byte of data from the specified port and displays the result to the user.

O<space><B>or<W><space><portno><space><data><CR>

This command writes the word or byte of data, specified by the user, to the selected I/O port.

Go to Address Command

G<space>(<starting address>)<CR>

The command transfers program control by setting the CS and IP registers to a newly specified value. If no starting address is supplied, control is transfered to the current settings of the CS and IP registers as defined in the register save area. (see R command).

RAM BASED DEBUGGER

A debugger is a development tool that is used in removing errors from object programs. This tool allows the user to single step a code segment or control execution by means of a breakpoint. The single step allows the user to view registers/memory between execution routines, etc. The breakpoint allows the user to control execution by placing a software interupt into the object code at locations specified by the user. This transfers control to the debugger and replaces the orginal object code at the location modified to contain the special code and allows the user to view the state of the machine. It is possible to define locations to jump to, follow a system reset or monitor call, that are outside of the PROM based monitor.

Step a Single Instruction

S<space>(<starting address>)<CR>

This command transfers control to the target address, if any, and executes a single instruction at that location. If no address is supplied, the system executes the next instruction pointed to be CS:IP pair. The Monitor receives control following execution of the instruction, and displays the CS:IP register pair. (See R command.)

Set Breakpoint Command

B<space><CR>
or
B<space>(<address>)<CR>
or
B<space><-breakpoint number><CR>

The user has three options available to him with this command:

(1) If no operands are specified in this command, the contents of the Breakpoint Table will be displayed on the terminal. This table consists of a breakpoint number and the address of the location to be breakpointed during the execution of a Go command.

(2) If an address is specified, it is set into the Breakpoint Table in the first available slot (assuming there is space available in the table). (The Breakpoint Table has a maximum of eight slots/breakpoints pending at any one time.) The targeted memory locations will not be altered until the user specifies a Go instruction. The Breakpoint instruction (INT 3) will then be inserted into the program. This states that any subsequent addressing of that location will cause a program interrupt and reentry to the Monitor.

(3) The third option available with this command is to remove a breakpoint instruction from the table. This may be done to free up a slot in the breakpoint table, or just because the particular breakpoint has no further applicability. This is accomplished by entering a minus sign followed immedediately by the breakpoint location to be removed from the table. The number may be obtained from the display (see option (1) of this command).

NOTE

Setting a TRAP flag in the register save area will also cause Breakpoints to occur. In this case, a Breakpoint will occur following the execution of each instruction.

Display and Alter Register Contents

R<space><CR>
or
R<space>(<register name>)

If no operands are specified, it will display the contents of all of the registers, including the flag bytes. This display represents: (1) the values of the registers at the last breakpoint instruction and; (2) the values that will be reloaded into the registers, prior to control being passed to the Go or Step instruction.

If an operand is specified, it must be the name of one of the system registers (i.e., AX for AX register, FL for Flag, etc.). The Monitor will display the current value of the register and prompt for a new value to be supplied. If only a carriage return is entered in response to this request, the register will not be changed.

Alter Memory Command

A<space><starting address><CR>
and
A<space><CR>

The Monitor will display the address, current contents of the address and prompt for new data. If the contents of the addresses are satisfactory and no new data is to be entered, press a <space> or <CR>. New data entries must be entered in hexidecimal followed by a <space> or <CR>. The user enters this data into the address and simply slides the old data out. The Monitor will continue to display characters until terminated by a non-hex character. A data byte comparison is done, following the data substitute operation, ensuring that the substitute operation was successful. If the substitute operation was not success, an error message is displayed to the user.

Display Memory Command

D<space><starting address><space><number of bytes><CR>

Starting address-hex address of first byte to be displayed.

Number of bytes-hex number of bytes to be displayed.

The Monitor will automatically format the data into groups of sixteen bytes. Each line will display the address of the first byte displayed on the line. Each line is broken into groups of four bytes with the ASCII data displayed to the right of each group. If the user wishes to interrupt a long display operation, simply press any key and the display will terminate.

Move Memory to Memory Command

M<space><from address><space><to address><space><length><CR>

This command moves the amount of memory specified to the designation address specified. If the "from address" is omitted, a zero is assumed.

MONITOR SYSTEM CALLS

The Monitor provides the low level drivers to drive the Altos 586 hardware devices from external programs coded in both high level and low level languages. The drivers perform the tasks of checking port status, inputting data and handling basic error recovery and error notification.

The interface to each driver routine is a defined protocol which is intended to remain static. This isolates the user programs from changes in the low level hardware and allows some degree of device independence.

The interface chosen for the Altos system is to provide the user with a known entry point to the Monitor service routines and then expect parameters to be passed in registers BX and CX.

The user should call the Monitor at location FE00:0000 with a Far call in order to set the CS register correctly. Following the Monitor Processing of the request, a Far return is executed to return control to the caller. The DS and ES registers are saved over any call to the Monitor for service, however no other registers are saved. Any register data that is required over a Monitor call should be saved prior to the call instruction being executed.

Register BX on entry to the Monitor must contain one of the following codes. An invalid code will not be detected and will cause unpredictable results. Register CX generally contains either parameter, or a parameter address. Byte values are returned from the Monitor in register AL, word values in AX. Other registers used are DX and ES.

00 = Return control to Monitor
01 = Return status of I/O channel port selected by CX
02 = Return character from I/O channel selected by CX
03 = Write character in DL to I/O channel selected by CX
04 = Set channel attributes (in DX) for I/O channel selected by CX
05 = Return I/O channel attributes in AX for I/O channel selected by CX
06 = Write CRLF to I/O channel selected by CX
07 = Write string pointed to by ES:DX to I/O channel in CX

08 = Perform disk I/O from IOPB pointed to by ES:CX
09 = Not used
10 = Return default ops console in AL and top of Memory pointer in ES:DX
11 = Return boot code in AL
12 = Cold boot from disk seleted by CX
13 = not used
14 = not used
15 = Reinitialize Monitor

MONITOR CALL (MONITOR CODE 00)

Returns control back to the Monitor and issue the prompt for Monitor commands discussed earlier in this document.

CONSTAT (MONITOR CODE 01)

The Monitor will select the register CL indexed I/O port and test to see if it has a character waiting to be read. If there is a read pending, 0FF(H) will be returned in register AL; if no character read is pending, 000(H) is returned. No validity checks are performed on the console index, thus an invalid index will cause unpredictable results.

CONIN (MONITOR CODE 02)

The Monitor will select the register CL indexed I/O channel port and read a character from that location. If no character is available, the Monitor will wait until a character is available before returning control to the caller.

CONOUT (MONITOR CODE 03)

The Monitor will select the register CL indexed I/O channel port. The character supplied in register DL will be written to the console. If the channel is unavailable, the Monitor will wait until it is able to output the character.

GETATTRIB (MONITOR CODE 04)

Return I/O channel attributes in AX register for I/O channel index in CL register.

SETATTRIB (MONITOR CODE 05)

Set I/O channel attributes from DX register for I/O channel index in CL and reinitialize that channel.

NOTE

Channel Indexes vary from 0 to 5. Channel 0 is the operators console. Channels 1-5 are the serial ports of the corresponding numbers. Only channels 0 and 1 are initialized by the monitor. The system timer should be initialized before the Setattrib can be instituted to channel 5. Channels 2 through 5 should be initialized before issuing any system calls to those channels.

CRLF (MONITOR CODE 06)

The Monitor will select the register CL indexed I/O channel and write a carriage return and line feed to that device. If the console is busy, the Monitor will wait until it is available, write the sequence and then return to the caller.

WRITEBUF (MONITOR CODE 07)

The Monitor will select the register CL indexed I/O channel and write the string of characters, pointed to by ES:DX, to that console. The string of characters is delimited by a byte of 000H as a terminator. Control will return immediately upon handing off the buffer to the intelligent serial channel.

DISKIO (MONITOR CODE 08)

The Monitor will check the IOPB address (see Figure A-2 for IOPB format) in register ES:CX to determine the disk drive address. If the address is less than 4 (base 10), then the floppy disk I/O routine will be called to process the request. If the drive number is equal to, or greater than 4 and less than 6 (base 10) then the hard disk I/O routine will be called to process the request.

The Monitor will proceed to seek to the selected track, select the head and sector indicated in the IOPB and issue the command from the IOPB to the device.

If the result of the status and operation is non zero, the Monitor will retry the operation and the number of times specifeid in the IOPB. If after the number of retries is specified, a successful operation has not occured, control is returned to the caller with the status field containing the final error status.

Following the successful read or write of a sector the count field of the IOPB is reviewed to see if all sectors specifed have been read and written. The count must not exceed the boundry of one track because no seek is performed after the first seek to the track and head indicated in the IOPB. A full track may be read, however, be seeking to the first sector on a track and then suppling a count large enough to include all other sectors on the track.

CONDEF (MONITOR CODE 10)

Returns default operators console index being used by the Monitor in Al and top of memory in ES:DX.

BOOTCODE (MONITOR CODE 11)

Returns the Monitor boot code in AL (01H = Hard Disk, 02H = Floppy Disk).

DISKBOOT (MONITOR CODE 12)

Boots system from disk selected by CX.

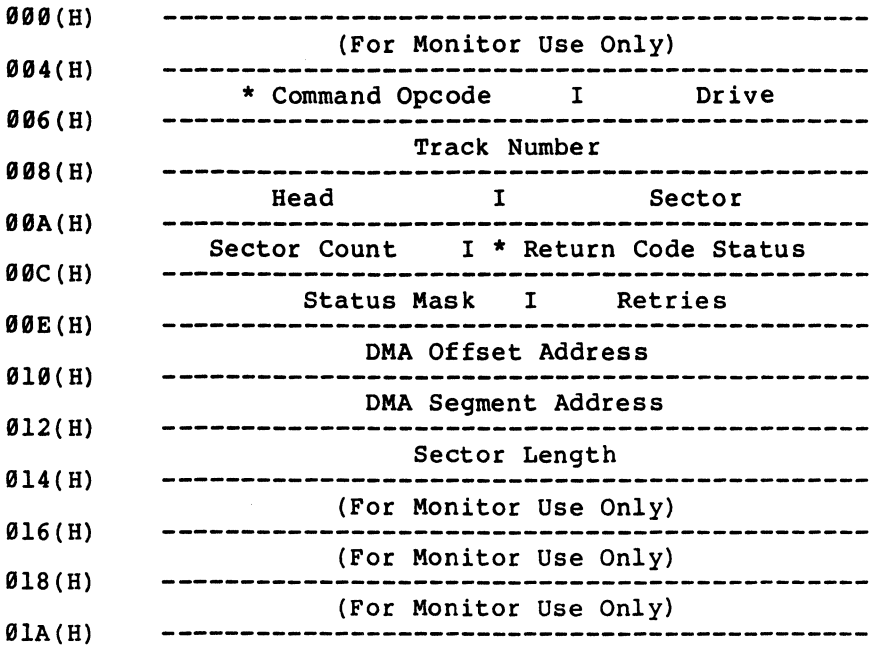

Figure A-2. IOPB Mapping for Altos 586

*Note: Consult the System Specification in the Manual for the Command and Status Formats.

SYSINIT (MONITOR CODE 15)

Reinitializes Monitor system. This command is used to bring the Monitor functions back to life after the monitor RAMS have been written over. This is the same as physically doing a reset.

MONITOR CONTROL BLOCKS

MONITOR RAM LOCATIONS 00400-00FFF

ccb - **8089 Channel Control Block**

```
00400     .blkb  8
          .blkb  8
```

scb - **8089 System Configuration Block**

```
00410     01        System Operating Command
          00        Reserved
          00        ccb address
          04
          00
          00
```

00416-004E9 Floppy and I/O Channel Control Blocks

MONITOR PROM LOCATIONS FE000-FFFFF

```
;----------------------------------------;
;    The following block is the System   ;
;    Configuration pointer required      ;
;    by the 8089 device.  The 8089       ;
;    looks at this location following    ;
;    the first CA after reset, to        ;
;    determine the  start of the         ;
;    channel control block chain.        ;
;----------------------------------------;
```

FFFF0 **Power up and Reset Entry Address**

scp - 8089 System configuration pointer

FFFF6	01	16 bit data bit
	FF	Intel Format
	10	&SCB
	04	
	00	
	00	

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