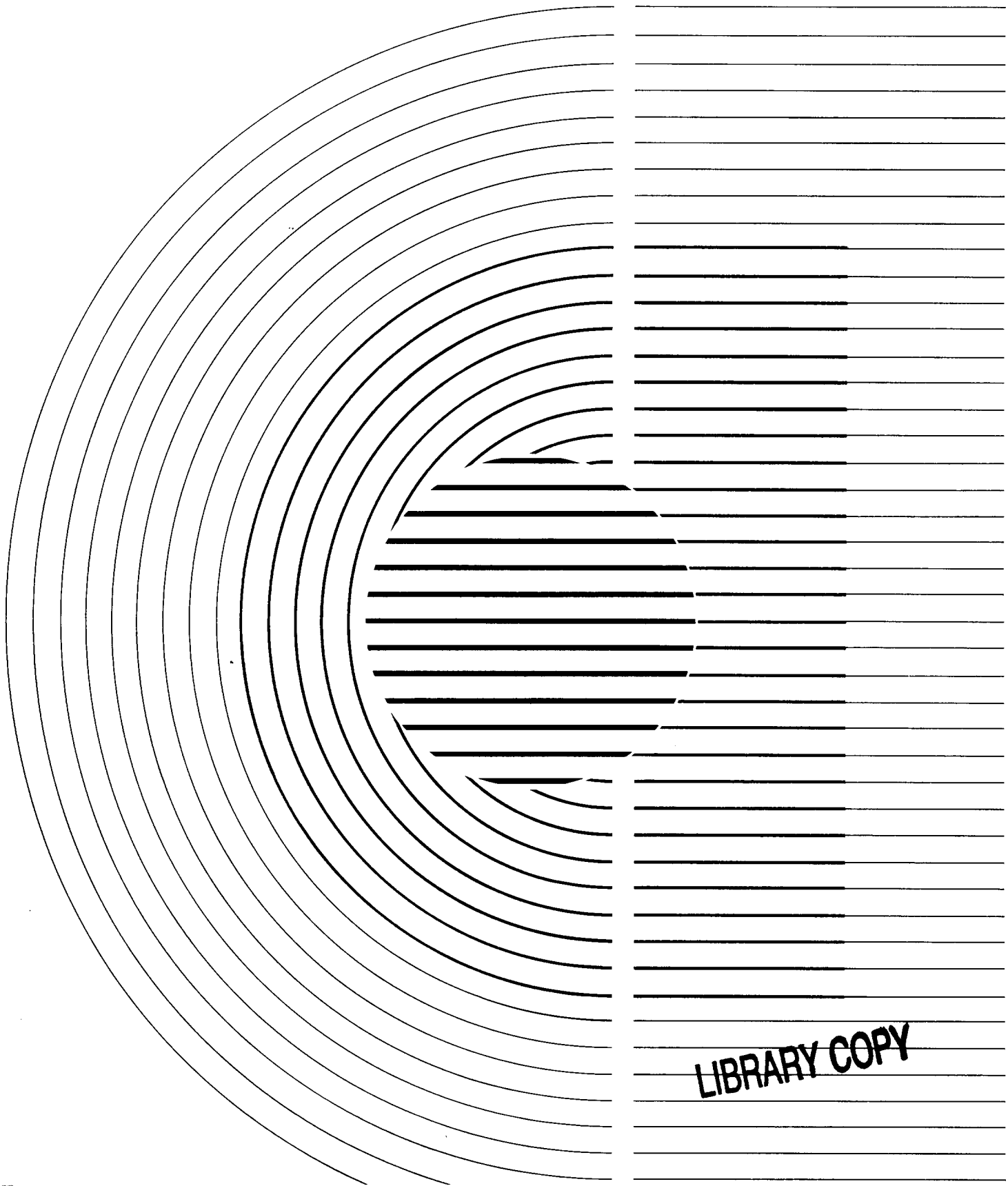
adaptec, inc.

ACB-2010A
User's Manual



1.0 INTRODUCTION

1.1 SCOPE AND PURPOSE OF MANUAL

The purpose of this manual is to guide the system integrator through a successful installation of Adaptec's ACB-2010A board. This includes both hardware and software installation, as well as troubleshooting information.

1.2 REFERENCE DOCUMENTS

* IBM PC or XT Guide to Operation Manual
* IBM DOS Reference Manual Version 2.0, 2.1, or 3.0
* Appropriate Disk Drive OEM Manual

1.3 OVERVIEW OF PRODUCT

The Adaptec ACB-2010A is a high performance 5 1/4" and 3 1/2" Winchester Disk Controller for the IBM PC or XT and equivalent personal computers. The ACB-2010A is an extention of Adaptec's ACB-2002 and ACB-2002A board. Both the ACB-2002A and ACB-2010A have Adaptec's BIOSinstalled, while the ACB-2002 requires the system integrator to supply his own BIOS.

The Adaptec ACB-2010A controller provides the highest performance available today for the IBM PC/XT marketplace. In addition,it is fully hardware and software compatible with the IBM XT hard disk controller.

The Adaptec ACB-2010A Winchester Disk Controller has the following features:

- Fully IBM hardware compatible. It plugs directly into the IBM PC/XT chassis without modification.

- Fully IBM software compatible. It operates with all IBM PC/XT DOS hard disk drivers and application programs.

- Controls both 5 1/4" and 3 1/2" ST-506 type Winchester disk drives. This allows the system integrator to interchange drives to optimize space requirements.

- On-board primary format utility. There is no need to send a software formatter on a floppy with every controller.

- On-board Adaptec copyrighted BIOS. There is no need to write a special BIOS or software driver.

- 2 to 1 interleaving of the disk. 2 to 1 achieves the maximum rate of DMA transfers that the IBM PC bus can accept. Also, this interleave factor can be varied from 2 to 9.

- User defined drive parameters. This gives you the ability to install any drive onto the controller without BIOS or firmware changes, i.e. device independence. This gives flexibility in the choice of drives and ease of mixing drives in manufacturing.

- Auto-configuration of drive. The controller writes the drive parameters onto the drive during format and reads them on power-up. This allows formatting on one controller and no need to reinitialize on another ACB-2010A controller. This is ideal for field upgrade of drives with no user intervention.

- Large disk (logical) partitioning. This allows you to use up to eight 32MB logical units on one or two physical drives, bringing the maximum total capacity from 32MB to 256MB using DOS. This reduces your drive count as well as allows you to put larger memory capacity onto the PC/XT. A customer supplied loadable device driver is needed for systems using more than 64MB of total capacity or for 3 to 8 logical units.

- Hard sector removable drive support. This allows you to use the Iomega Beta-5, Syquest 312 and DMA 360 drives with the ACB-2010A. This gives you flexibility to mix hard and soft sectored drives together on the same controller.

- Adaptec defect handling. This eliminates the limitations of DOS in formatting large capacity drives by handling defects at the controller level instead of the operating system level. This scheme uses sector level defect skipping that reduces the amount of memory and time required to handle defects. Also, this gives you higher performance by maximizing memory capacity and speed when defects are present.

- Four standard drive tables in BIOS. This gives the option of using jumpers instead of user defined drive parameters.

- Support of 2 ST-506 type drives. The drives do not need to be the same in capacity or manufacturer. This allows the maximum expansion of hard disks on the IBM PC/XT.

- Support of wedge servo drives such as Quantum, Syquest, Microscience International, and Tulin. This gives you drive flexibility and no need to order special controller firmware.

- 13 microsecond high performance seek step rate. This achieves maximum performance of the drive by reducing the seek access time. Many drives that are now on the market take advantage of this feature.

- Support of drives with up to 16 heads and 1024 cylinders. High capacity drives can be used for more memory when needed.

- Power-on diagnostics and self diagnostics for controller self checking. This gives a high confidence level that the controller is functioning properly.

- Seek and data check recovery. This reduces the probability of erroneous data.

- 32-bit Error Correction Code (ECC) on both ID and data fields. This corrects up to 11 bit burst errors, and guarantees data integrity.

1.4 HARDWARE AND SOFTWARE REQUIREMENTS

The ACB-2010A can be installed in any IBM PC/XT or equivalent IBM compatible computer. The successful installation of the Adaptec ACB-2010A requires the following hardware and software.

Hardware

1. IBM PC or XT or equivalent IBM compatible computer with:
   a. One 5 1/4" floppy diskette drive
   b. One available system expansion slot
   c. Room for one 5 1/4" or 3 1/2" Winchester (hard) disk drive

2. 5 1/4" or 3 1/2" Winchester disk drive(s) having the industry standard ST506 interface.

3. External power supply or power booster to support the power required by the Winchester disk drive. If using an IBM XT or a very low power drive in the IBM PC, this is not required.

4. 20-pin and 34-pin flat ribbon cables to connect the drive to the controller.

Software

1. IBM PC/XT DOS version 2.0 or newer revisions.

2. (Optional) A customer supplied loadable device driver is needed for 3 to 8 logical units or for systems using more than 64MB of total capacity.

1.5 SPECIAL APPLICATIONS FIRMWARE

APPLICATION	**COMMENTS**
AT&T 6300	Requires AT&T motherboard boot ROM revision 1.2 or later
COMPAQ DESKPRO	Requires BIOS P/N 400082-00B or later.
8 MHz PC's	Same as Compaq Deskpro
PC/IX Operating System	Works without firmware change.
DMA 360 and Syquest 312	Requires firmware revision 400062-00B or later

1.6 QUICK INSTALLATION

For those of you that cannot wait to use your ACB-2010A controller, the following steps will get you up and running. This installation is for one drive with capacity of 10 MB. After you install it, please read the complete User's Manual so you can use ALL of the capabilities of the ACB-2010A.

STEP 1
Be sure that you have all the required hardware and software as detailed in section 1.4, i.e. an IBM PC/XT , DOS 2.0, or newer revisions, drive, power supply and cables.

STEP 2
Become aquainted with the ACB-2010A board, looking at the location of jumpers and connectors. See figure 2.1.

STEP 3
Configure the drive to be "drive 0" by setting the switches on the drive. Be sure that the drive is terminated. See figure 2.2.

STEP 4
Configure the controller so it matches your drive as follows:

DRIVE VENDOR AND CAPACITY	INSTALL JUMPERS
Miniscribe 10 MB	M-N and O-P
Syquest 5 MB	M-N
Miniscribe 16MB	O-P
Seagate 10MB	none
Microscience 10 MB	none
Syquest 10 MB, DMA 10 MB	E-F
Iomega 5 MB	C-D, and M-N
ALL OTHERS	A-B

See section 2.5.2, 2.5.2.1 and 2.5.2.2.

STEP 5
Refer to figure 2.4. Connect the drive to the controller using your 34 pin and 20 pin cables. Drive 0 uses the connectors nearest to the edge of the board, J0 and J2. See section 2.5.3.

IMPORTANT: BE SURE THAT PIN 1 OF THE CONTROLLER GOES TO PIN 1 OF THE DRIVE. WHEN MOUNTING IN THE PC, PIN 1 IS FACING DOWN.

STEP 6
If using 3 1/2" or 5 1/4" half height drives no extra power supply is needed. If using a 5 1/4" full height drive in a IBM PC attach an additional power supply. If using an IBM XT no additional supply is needed. See section 2.5.4.

STEP 7
Mount the drive and controller inside the PC. Turn power ON. IF ANY PROBLEMS ARISE, SEE CHAPTER 4 TO TROUBLESHOOT.

STEP 8
Boot from floppy drive A using the Supplemental DOS diskette that contains DEBUG. See Section 3.2.

TYPE		COMMENTS
A>DEBUG	<CR>	<Carriage return>
-G=C800:CCC	<CR>	<carriage return>
3		(interleave factor)
0		(drive ID)
Y		(use Adaptec defect handling)
N		(do not enter defect locations)
N		(or 'Y' if you are using one of the drives in STEP 4)
1 <CR>		(number of logical units)
3 <CR>		(with A-B jumper or 5 without A-B jumper installed)
0 <CR>		(landing zone, not used)
8 <CR>		(ECC correction span)
133 <CR>		(Write pre-comp not used, max. cylinder+1)
133 <CR>		(reduced write current, not used)
4 <CR>		(head count, or use 2)
132 <CR>		(number of cylinder,132 hex=306 decimal)

WAIT until format and verify is complete press CTRL and BREAK (scroll lock) keys at same time

STEP 9
TURN THE SYSTEM OFF. INSTALL THE DOS SYSTEM DISKETTE WITH "FDISK" AND "FORMAT" INTO DRIVE "A". THEN TURN THE SYSTEM BACK ON, THUS COLD BOOTING. Type FDISK and answer questions, then run FORMAT. See section 3.3.

2.0 HARDWARE INSTALLATION

2.1 INTRODUCTION

This section describes the steps necessary to install the ACB-2010A board into the computer. First the operating enviroment, unpacking procedure, and board layout are described. This section also describes the integration of the drive and controller into the computer.

2.2 ENVIRONMENT REQUIREMENTS

The ACB-2010A will perform properly over the following range of conditions:

	Operating	Storage
Temperature F/C	32/0 to 131/55	-40/-40 to 167/75
Humidity	10% to 95%	10% to 95%
Altitude, feet	Sea level to 10,000	Sea level to 20,000
MTBF, Hours	20,000 POH @ 55 C	

2.3 UNPACKING

The carrier is responsible for damage incurred during shipment. In case of damage, have the carrier note the damage on both the delivery receipt and the freight bill, then notify your freight company representative so that the necessary insurance claims can be inititated.

After opening the shipping container, use the packing slip to verify receipt of the individual items listed on the slip. Retain the shipping container and packing material for possible later reuse should return of the equipment to the factory be necessary.

NOTE:
THE ACB-2010A, LIKE ALL ELECTRONIC EQUIPMENT IS STATIC SENSITIVE. PLEASE TAKE THE PROPER PRECAUTIONS WHEN HANDLING THE BOARD. KEEP THE BOARD IN ITS CONDUCTIVE WRAPPING UNTIL IT IS CONFIGURED AND READY TO BE INSTALLED IN YOUR SYSTEM.

2.4 BOARD LAYOUT

The ACB-2010A is shown in Figure 2-1. This figure shows the location of the firmware, BIOS, jumpers and connectors. Note that pin 1 of the connector is located closest to the PC bus edge connector.

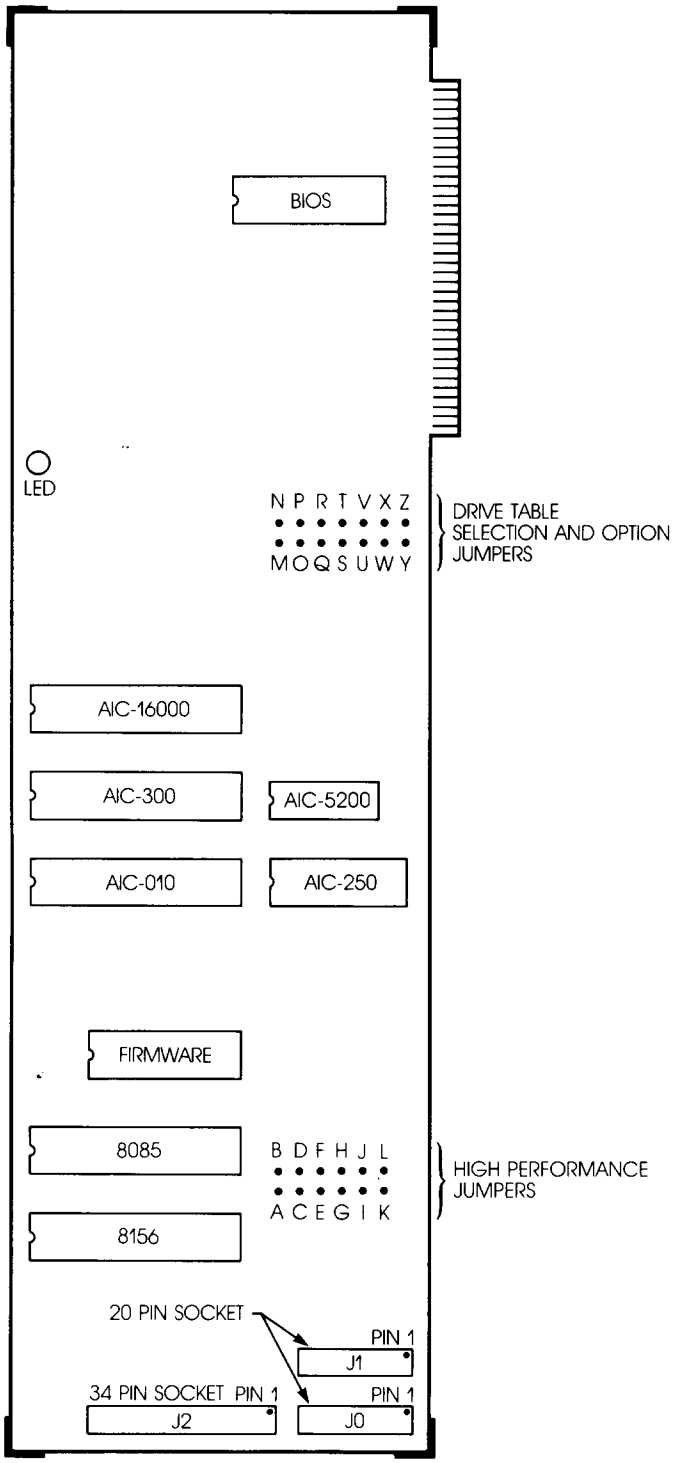


Figure 2-1. Board Layout

2.5 INTEGRATION INTO THE SYSTEM

To install the Adaptec ACB-2Ø1ØA board into your system you must first configure the drive(s), set the controller jumpers and connect the drive cables properly. This section describes all the necessary steps needed to successfully install this hardware.

In order to configure the drives, you need the Disk Drive OEM Manual that was supplied with your drive. (If you do not have this manual call your Drive vendor for assistance.) This manual is required to obtain the drive characteristics for your particular drive. The controller must match the drive parameters, i.e. number of heads, number of cylinders, step pulse rate, etc. in order to function successfully. The drive parameters are divided into two categories; one being the drive changeable parameters and two, the controller changeable parameters.

2.5.1 DRIVE SELECTION AND TERMINATION

The drive changeable parameters are the drive selection switches (or jumpers) and the drive termination. These parameters allow a drive to be selected as drive Ø, 1, 2 or 3. This is accomplished by changing the drive address selection switches or jumpers.

NOTE:
SOME DRIVE MANUFACTURERS HAVE DESIGNATED THE DRIVE ADDRESSES TO BE 1,2,3,4 INSTEAD OF Ø,1,2,3. DO NOT SET THE DRIVE AS A RADIAL SELECTED DRIVE. RADIAL SELECTION WILL SET ALL DRIVE OUTPUT SIGNALS TO BE ACTIVE, EVEN IF THE DRIVE IS NOT SELECTED. IN THIS CASE, THE DRIVE LED WILL BE ON AT ALL TIMES.

Use the two lowest drive addresses available as drive "Ø" and drive "1" to be seen by the controller.

Before the drives can be cabled to the controller the drive cable terminator must be properly set. The terminator is used to reduce signal "ringing" in the cables. The terminator, as its name implies, must be at the end of each cable in order to have the controller and drive communicate properly. The controller has a permanent terminator built-in. The disk drives, since they can be connected in a daisy chain configuration (see Figure 2-3), have a removable terminator. This is usually a 16-pin DIP resistor package. The last physical drive in the chain must have its terminator installed.

Example 1: When one drive and one controller are used, both must be terminated.

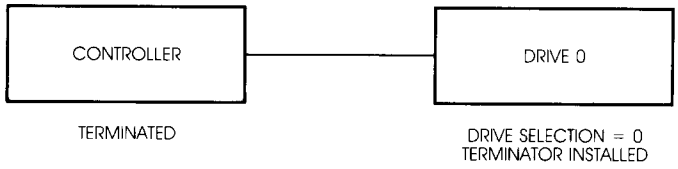


Figure 2-2. One Drive, One Controller Termination Example

Example 2: When two drives and one controller are used, only the last one in the chain is terminated.

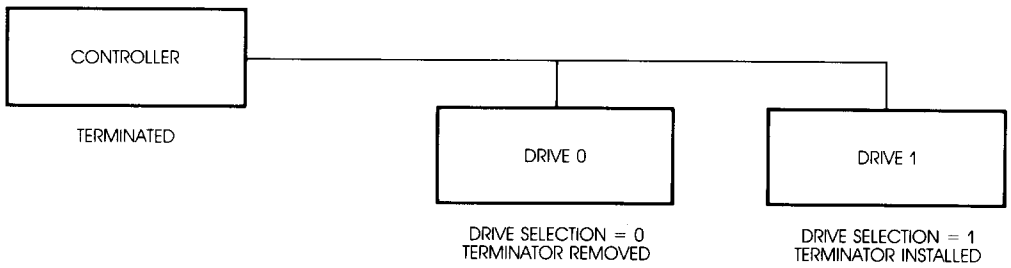


Figure 2-3. Two Drive, One Controller Termination Example

Now select the proper drive addresses and remove or install the required terminators for your system.

2.5.2 CONTROLLER JUMPER SELECTION

The controller changeable parameters are defined as the variables that can be changed to accommodate the different drive characteristics. These parameters can easily be changed by jumper(s) or defined by the user (see Chapter 3) for the drive being used.

The parameters shown in Table 2-1 need to be taken from the Disk Drive OEM Manual and specifications. Table 2-2 shows the drives supported by the BIOS and selected by the jumpers. If the drive you are using is not selected by jumpers , Table 2-1 must be completed. Table 2-1 will be used in Section 3.2 when the user defined drive parameters are discussed.

Table 2-1. Drive Table

	Drive Ø	Drive 1	
Drive Manufacturer and Model	_____	_____	
Unformatted Drive Capacity	_____	_____	MB
Wedge Servo Format used (Y/N)	_____	_____	
Minimum Step Pulse rate for buffered Step rate; 3 mSec for non-buffered	_____	_____	uSec
Write Precompensation starts	_____	_____	cylinder
Reduced Write Current starts	_____	_____	cylinder
Number of Data Heads	_____	_____	heads
Number of Cylinders	_____	_____	cylinders

These parameters make up what is called a drive table.

2.5.2.1 DRIVE TABLE SELECTION JUMPERS

The ACB-2010A has drive tables for the most commonly used drives. These tables reside in the Adaptec ACB-2010A BIOS EPROM. See Appendix A for a description of the BIOS.

The drive tables in the ACB-2010A BIOS support the following drives: 10MB half height-Miniscribe 3012H or equivalent, 5MB Syquest SQ-306, Iomega Beta-5 or equivalent, 20MB-Miniscribe 4020H or equivalent, 10MB full height-Seagate ST412 or equivalent (see Table 2-2). These drive tables are selected by jumpers onthe board. Otherdrives can be attached to the ACB-2010A by use of the user defined parameters described in the software installation section.

NOTE:
THE ACB-2010A IS SHIPPED ALREADY CONFIGURED TO BE USED WITH A SEAGATE ST412 OR EQUIVALENT 10 MB DRIVE. (SEE TABLE 3 OF TABLE 2-2.)

Table 2-2. ACB-2010A Default Drive Tables

	Table 0	Table 1	Table 2	Table 3
Drives Supported (or equivalent)	Miniscribe 3012H	Syquest SQ-306, Iomega Beta-5	Miniscribe 4020H	Seagate ST412 (Microsci., Tandon, Cogito, IMI,CMI)
Unformatted Drive Capacity	12.75MB	6.38MB	20.0MB	12.17MB
Wedge Servo Format	no	yes	no	no (yes for Microsci.)
Step Pulse Code (Rate)	5 (70 uSec)	5 (70 uSec)	5 (70 uSec)	5 (70 uSec)
Ship/Land Zone (+ cyl. above max cylinder)	0	0	0	0
Write Precomp Cylinder	613 (not used)	307 (not used)	128	128
Reduced Write Current Cyl.	613 (not used)	307 (not used)	481 (not used)	307 (not used)
Number of Data Heads	2	2	4	4
Number of Cylinders	612	306	480	306

If needed, see Appendix C for equivalent hexidecimal values.

These four tables are selected by jumpers M-N, O-P for drive 0 and Q-R, S-T for drive 1. Table 2-3 defines the jumper selection of each drive and table.

Table 2-3. Jumper Selection of Drive Tables

Table for Drive Ø	Installed	Removed
Ø	M-N and O-P	---
1	M-N	O-P
2	O-P	M-N
3	---	M-N and O-P

Table for Drive 1	Installed	Removed
Ø	Q-R and S-T	---
1	Q-R	S-T
2	S-T	Q-R
3	---	Q-R and S-T

2.5.2.2 HIGH PERFORMANCE JUMPERS

The ACB-2Ø1ØA also has jumpers for a high performance step rate of 13 microseconds, 2ØØ microseconds step rate, or 3 milliseconds, non-buffered step rate, removable disk operation for Syquest, Iomega and DMA drives, and self diagnostics.

The 13 uSec step rate is selected by jumper A-B in conjunction with a seek step pulse code of 3 (see software installation Section 3.2.2). If two drives are used, and the A-B jumper is installed, only the drive that uses code 3 will be stepped at the 13 uSec rate. The default tables use seek step pulse code 5, or 7Ø microseconds. Performance of drives given in Table 2-2 can be improved if formatted using the A-B jumper and drive parameters inputted as noted in section 3.2.

A 2ØØ uSec step rate is selected by jumper A-B in conjunction with a seek step pulse rate of 4.

A 3 mSec step rate is selected by jumper A-B in conjunction with a seek step pulse code of Ø. This is used for older, non-buffered step rate drives.

The Iomega Beta-5 hard sectored drive is selected for drive Ø by installing jumper C-D and drive 1 by installing I-J. These are used in conjunction with jumpers M-N installed for drive Ø and Q-R installed for drive 1. When these jumpers are not installed the controller defaults to the soft sectored ST5Ø6 type drive defined by Table 2.2 or the user defined parameters. Section 3.2.1 must be followed when using the Iomega Beta-5 drive.

The Syquest 312 or DMA 36Ø 1Ø MB drive is selected for drive Ø by installing jumper E-F and drive 1 by installing G-H. When these jumpers are not installed the controller defaults to the soft sectored ST5Ø6 type drive defined by table 2.2 or the user defined parameters. Also, section 3.2.2 must be followed when using the DMA 36Ø and Syquest drives.

The controller self diagnostics are run when jumper K-L is installed. See Chapter 4 for the description of the self diagnostics.

Table 2-4. High Performance Jumpers

Jumper	Installed	Removed
A-B	13 uSec high performance step rate (when used with step code 3) or 200 uSec step rate (when used with step code 4) or 3 mSec step rate (when used with step code 0)	70 uS step rate (when used with step code 5) or 3ms (when used with step code 3).
C-D	Drive 0 is hard sectored Iomega Beta-5 (when used with jumper M-N installed)	Soft sectored ST506 type drive.
E-F	Drive 0 is Syquest 312 or DMA 360 drive, 10 MB drive.	Soft sectored ST-506 type drive.
G-H	Drive 1 is Syquest 312 or DMA 360 drive, 10 MB drive.	Soft sectored ST-506 type drive.
I-J	Drive 1 is hard sectored Iomega Beta-5 (when used with jumper Q-R installed)	Soft sectored ST-506 type drive.
K-L	Self Diagnostics	---

NOTE:
JUMPER E-F IS NOT A WEDGE SERVO JUMPER AS IN THE ACB-2002A. THE ACB-2010A FORMAT ALREADY ALLOWS FOR WEDGE SERVO DRIVES, WITHOUT A JUMPER.

2.5.3 DRIVE AND CONTROLLER CABLING

Now that the drive and controller are configured, they can be connected together. The controller has three cable connectors J0, J1 and J2. Their function, suggested connector plug and maximum cable length are described in Table 2-5.

Table 2-5. Controller Connector Definitions

Connector	Signals	Cable
JØ	Data	2Ø-pin flat ribbon cable Connected to drive Ø
J1	Data	2Ø-pin flat ribbon cable Connected to drive 1
J2	Control	34-pin flat ribbon cable Connected to both drives Ø and 1

Connector	Recommended Plug	Maximum Length
JØ	3M Part # 3421	2Ø feet (6 meters)
J1	3M Part # 3421	2Ø feet (6 meters)
J2	3M Part # 3414	2Ø feet (6 meters)

The connector locations and pin orientation for ACB-2Ø1ØA connectors are shown in Figure 2-1.

NOTE:
WHEN MOUNTING IN THE IBM PC/XT, PIN 1 OF THE CONNECTOR AND CABLE WILL BE FACING DOWN. THE TWO CONNECTORS JØ AND J2, ALONG THE OUTSIDE EDGE OF THE BOARD, ARE USED WHEN ONLY 1 DRIVE IS PRESENT. ALL THREE CONNECTORS JØ,J1 AND J2 ARE USED WHEN 2 DRIVES ARE PRESENT. REMEMBER THAT THE LAST PHYSICAL DRIVE IN THE CHAIN MUST HAVE THE TERMINATOR INSTALLED.

Connect the cables as shown in Figure 2-4.

2.5.4 DRIVE POWER REQUIREMENTS

The IBM PC internal power supply does NOT have sufficient current to power most hard disk drives in addition to its present load. Either an external power supply or a power booster may be required. Many 3 1/2" and 5 1/4" half height drives do not need an extra power supply. The IBM XT has sufficient power and no extra power supply is needed. If needed, install and test the supply and drive separately at this time.

NOTE:
BE SURE TO FOLLOW THE DISK DRIVE OEM MANUAL'S RECOMMENDATIONS WHEN GROUNDING THE DRIVE. IF PROPER GROUNDING IS NOT FOLLOWED, RANDOM FORMAT, WRITE AND READ ERRORS MAY OCCUR.

Next mount the ACB-2010A controller board and disk drive in the PC.

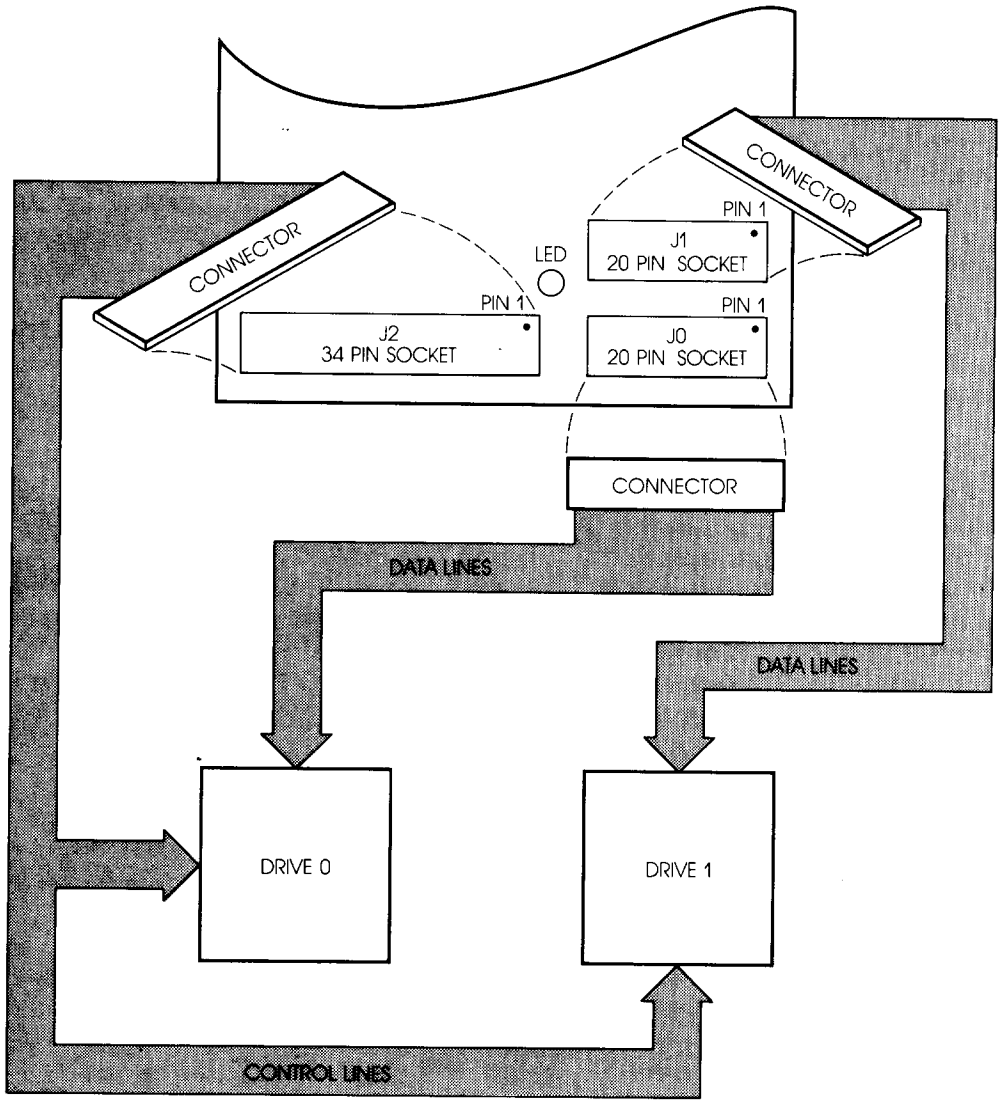


Figure 2-4. Controller and Drive Cabling

3.0 SOFTWARE INSTALLATION

3.1 INTRODUCTION

Now that the hardware has been installed, the computer can be powered on and the software installed. This section describes the software steps that need to be taken to successfully use the ACB-2010A controller and hard disk with your computer.

If your IBM PC contains a 64K PC1 motherboard with 64K bytes maximum memory (manufactured prior to the IBM XT), you must first install a software patch to recognize the ACB-2010A or any hard disk controller. This patch is discussed in Appendix B. No such patch is required if your IBM PC contains a PC2 motherboard or if you have an IBM XT.

IF THERE ARE ANY PROBLEMS WHEN THE PC IS POWERED ON OR DURING THE SOFTWARE INSTALLATION, PLEASE REFER TO SECTION 4 FOR TROUBLESHOOTING PROCEDURES.

3.2 ACB-2010A PRIMARY FORMATTER

At this point, the disk must be formatted with a primary format. Primary formatting is not supported by DOS 2.0; however, it is supported by the ACB-2010A BIOS through "DEBUG". Unlike other controllers, the ACB-2010A needs no extra software to perform the primary formatting. The primary format defines address fields and data fields on each track of the disk. After this is completed, bad blocks can be flagged and a directory created by a DOS "FORMAT" command.

NOTE:
A CUSTOMER SUPPLIED DEVICE DRIVER IS NEEDED IF MORE THAN 2 LOGICAL UNITS ARE USED OR MORE THAN 64MB OF HARD DISK CAPACITY IS USED. ADAPTEC DOES NOT SUPPLY SUCH A DRIVER.

To use the primary formatter, perform the following steps:

1) Boot DOS 2.0 or newer revisions from the DOS SUPPLEMENTAL PROGRAMS diskette.

2) Type "DEBUG", the computer will respond with a "-". (NOTE: Underlined characters are user inputs , <CR> means carriage return and parentheses mean comments.)

A>DEBUG <CR>
- (DEBUG prompt)

3) Type the following sequence:

-G=C800:CCC <CR>

*** Adaptec ACB-2010A Format Program ***
*** Enter Interleave (2-9) = n <no CR>
(where "n" can be any number between 2 and 9)

2 to 1 is the optimum interleave factor for the IBM PC/XT. This typically will give the highest performance on the IBM PC/XT. The optimum interleave factor is a function of the number of devices making requests on the bus, and the number of blocks transferred at one time by the applications software. Experimentation with different interleave factors is the best way of determining the optimum interleaving factor for your application.

*** Enter drive ID (0/1) = 0 or 1 <no CR>

This value specifies which physical drive is to be formatted. It follows the hardware switch setting on the drives.

*** Should we use Adaptec defect handling (Y/N)? Y or N <CR>

An "N" response will not use Adaptec's sector level and alternate track defect handling capability. At verify time, defects will be noted as being present but the track will not be reformatted. The defects will be handled by the IBM PC DOS FORMAT program.

A "Y" response will enable the Adaptec defect handling capability. This will make use of spare sectors on the drive, assigning good spare sectors for defective ones. If an entire track or more than 1 sector on a track is defective, it will be assigned an alternate track, starting at the maximum cylinder. This scheme presents to DOS a so-called "perfect" disk having no defects. This will allow the maximum usable memory and speed for

drives with defects. This is ideal for using tape backup with the large capacity drives. The host or tape controller does not need to keep track of defects on the disk. Thus it simplifies their function and gives a tape image backup of the "perfect" disk. IBM PC/XT media compatibility is not met when using Adaptec's defect handling scheme.

NOTE:
ADAPTEC DEFECT HANDLING MUST BE USED FOR MORE THAN 1 LOGICAL UNIT OR DRIVES WITH GREATER THAN 16MB.

A "Y" response will generate the following prompt: If no defect list is available, press 'N'. If entering a defect list, it may be put in a separate file or entered from the key board.

*** Do you wish to enter defect locations (Y/N)? Y or N <CR>

If no defect list is entered, the controller will flag only defects in data and ID fields. These defects are not necessaily all the defects on the drive's defect map,since some defects reside in gaps between data and ID fields.

*** Enter defect list file name or press "carriage return" to input from console - DEFECT LIST FILE or <CR>

If using a defect list that resided in a file, the defects must be listed in ascending order. That is, lowest cylinder, head and byte count to the highest cylinder, head and byte count. The cylinder, head and byte count are separated by "/" marks. For example, Ø31/2/1E35 means cylinder Ø31 hex, head 2 and 1E35 hex bytes from index. The file is ended by a carriage return as shown below.

If entering from the keyboard, press <CR> and the following will be shown:

*** Enter defect locations in ascending order cyl/hd/byte offset format:

For example:

Ø31/2/1E35 <CR>
Ø33/4/225A Ø38/ØA/235 <CR>
<CR>

See section 3.3 for more information about Adaptec defect handling.

*** Should we use the default parameters (Y/N)Y or N
<CR>

The default parameters refer to the current drive table selected by the jumpers for that drive (Ø or 1), see Tables 2-2 and 2-3.

NOTE:

IF THE DRIVE HAS ALREADY BEEN FORMATTED ONCE, THE DEFAULT PARAMETERS ARE THE ONES WRITTEN ON THE DRIVE. 'N' MUST BE USED IF FORMATTING THE DRIVE FOR THE SECOND TIME. IF YOU HAVE PERFORMED THE QUICK INSTALLATION IN SECTION 1.6, YOU MUST USE 'N' WHEN FORMATTING FOR THE SECOND TIME.

You have two choices: "Y" for jumper default drive parameters or "N" for user defined drive parameters. Use 'Y' for Iomega Beta-5 and 'N' for DMA 36Ø and Syquest 312.

3.2.1 JUMPER DEFAULT DRIVE PARAMETERS ("Y" RESPONSE)

NOTE:
IF THE PRIMARY FORMAT FAILS AT ANY TIME, SEE SECTION 4.3 FOR TROUBLESHOOTING PROCEDURES.

A "Y" will invoke the default drive table selection as defined by the jumpers M-N, O-P, C-D, E-F for drive Ø and jumpers Q-R, S-T, G-H, I-J for drive 1 (see Section 2.5.2.1, and 2.5.2.2). This will start the primary format and display the following.

```
*** Sending Drive Init---ØC ***
*** Sending Write Buffer-ØF ***
*** Format in progress...Ø4 ***
    See section 3.3 for the description of the defect
    handling during format and verification.
*** Track verification - logical unit ØØ.
*** Format complete, press CTRL-BRK *** CTRL-BRK
```

Press the CONTROL and BREAK keys at the same time. The screen will show:

```
AX=... BX=... CX=... DX=... SP=... SI=... DI=...
DS=... ES=... SS=... CS=... IP=... NV...
C8ØØ:...       RET
```

The primary format is now complete. If needed, repeat step #3 of Section 3.2 for drive 1.

Continue with Section 3.4.

3.2.2 USER DEFINED DRIVE PARAMETERS ("N" RESPONSE)

NOTE:
IF THE PRIMARY FORMAT FAILS AT ANY TIME, SEE SECTION 4.3 FOR TROUBLESHOOTING PROCEDURES.

An "N" will invoke the user-defined drive parameters feature described below and will ignore the jumper default drive table selection. This feature accepts drive parameters through software and stores the new user defined drive parameters on the disk drive. After this is done, the drive parameters will be read during power-up, i.e. auto-configured, from the drive rather than from the BIOS drive tables.

NOTE:
THE FOLLOWING PARAMETERS ARE FOR THE ST412 DRIVE AND ARE SHOWN FOR EXAMPLE ONLY. INSERT YOUR DRIVE PARAMETERS FROM TABLE 2-1 IN PLACE OF THESE. ALSO DOS VERSION 2.Ø AND 2.1 DOES NOT ALLOW DEFECTS ABOVE 16 MB, OR DRIVE CAPACITIES ABOVE 32 MB FORMATTED. THE ADAPTEC ACB-2Ø1ØA CONTROLLER BOARD ALLOWS YOU TO GO FROM 16 MB TO 64 MB WITH NO SPECIAL SOFTWARE.

*** Reply to the following questions in HEX only
NOTE: USE HEXIDECIMAL VALUES TO ANSWER ALL QUESTIONS. SEE APPENDIX C TO CONVERT FROM DECIMAL TO HEXIDECIMAL NUMBERS.

*** Number of logical units for this drive (1-8) =M <CR>

The ACB-2Ø1ØA allows you to partition a single physical drive into many equal logical units. The units can be up to 32MB each (a restriction of DOS format) having a maximum of 8 units for one or two physical drives. In the example for the ST-412 drive, if M=2, the 1ØMB physical drive will be divided into two equal logical units of 5MB each. Other examples are: One 256MB drive may be divided into 8 logical units of 32MB each; two 128MB drives may be divided into 4 logical units each, 32MB per logical unit; one 128MB drive may be divided into 8 logical units of 16MB each.

NOTE:
THE SYSTEM INTEGRATOR MUST WRITE OR BUY HIS OWN OPERATING SYSTEM'S I/O DRIVER TO USE MORE THAN 64MB OR MORE THAN TWO LOGICAL UNITS. ADAPTEC DOES NOT SUPPLY THIS DRIVER.

*** Step pulse rate (Ø-7) = 5 <CR>

The step pulse rate is defined in Table 3-1. Many drives that are currently available will provide high performance, i.e. lower access times, when used with option 3 and the A-B jumper installed. If a slower non-buffered step rate drive is used, option Ø and jumper A-B are required. Refer to the Disk Drive OEM Manual or Table 2-1 for the fastest buffered seek step rate.

Table 3-1. Seek Step Pulse Rates

Code	Seek Step Pulse Rate
Ø	3.Ø milliseconds (requires jumper A-B installed)
1	Reserved
2	Reserved
3	3.Ø milliseconds (high performance 13.Ø microseconds with A-B jumper installed)
4	2ØØ microseconds (requires jumper A-B installed)
5	7Ø microseconds
6	Reserved
7	Reserved

*** Landing zone = Ø <CR>

This value specifies the number of offset cylinders from the highest cylinder position to the parked position. The parked position is defined to be an area that has no user data information and physically resides beyond the maximum cylinder defined for the drive. The default is Ø, that is, the maximum cylinder value. To use the landing zone, you must use the utility described in Appendix D.

*** ECC correction span = 8 <CR>

This value specifies the ECC (error correction code) correction span, minimum of 1 bit and maximum of 11 bits. The recommended value is 8, which is the correction span used by the IBM XT controller. This ECC capability by the controller corrects for minor media defections on the disk drive. The probability of correcting data properly increases as the ECC correction span decreases.

```
*** Write pre-comp cylinder = 80  <CR>
    NOTE: 80 HEX
```

This value is specified in the Disk Drive OEM Manual or Table 2-1; in this case it is cylinder 128 (80 hex). If the drive does not use write precompensation, this value is set to the total number of cylinders plus one. Minimum value = 0 and maximum value = 400 hex.

```
*** Reduce write current cylinder = 133  <CR>
    NOTE: 133 HEX
```

This value is specified in the Disk Drive OEM Manual or Table 2-1. In this case, reduced write current is not used by the drive so it is set to the total number of cylinders plus one (133 hex = 307 decimal). Minimum value = 0 and maximum value = 400 hex.

```
*** Head count = 4  <CR>
    This question accepts 1 digit only, 1 thru F hex.
*** Cylinder count = 132  <CR>
    NOTE: 132 HEX
```

See the Disk Drive OEM Manual or Table 2-1 for these values. In this case, the drive has 4 data heads and 306 cylinders (132 hex). Minimum value of cylinders = 1, maximum = 400 hex.

Now all values are complete and the primary formatting begins.

```
*** Sending Mode Select--15 ***
*** Sending Write Buffer-0F ***
*** Format in progress...04 ***
    See section 3.3 for the description of the defect
    handling during format and verification.
*** Track verification  -  logical unit 00.
*** Track verification  -  logical unit XX.
*** Format complete, press CTRL-BRK *** CTRL-BRK
```

Press the CONTROL and BREAK keys at the same time. The following printout will result.

```
AX=... BX=... CX=... DX=... BP=... SI=... DI=...
DS=... ES=... SS=... CS=... IP=... NV...
C800:...
```

Now the primary format is complete. If needed, repeat step #3 of Section 3.2 for drive 1. Continue with Section 3.4.

3.3 ADAPTEC DEFECT HANDLING

The primary format program writes 17 sectors, consisting of ID field and data field, onto each track of the disk drive. It then reads the ID address mark, ID field and data address mark. If any of these cannot be read, the controller reformats the track with 18 sectors per track and a minimum interleave factor of 3. The defective sector is skipped and the spare sector used instead. The track is then read and reformatted again if needed. If two sectors are defective, the track is marked as defective and an alternate track is assigned. This alternate track is the last track of the last cylinder of the physical drive. If more than 1 alternate track is needed, the next to last track is used, and so on.

If this occurs during format, the following text will appear on the screen:

```
*** Defect found in logical unit=XX, bad cylinder =
    XXXX, head=XX, sector=XX.
***  Controller error code=XX, BIOS error code=XX.
***  Alternate track assigned...
```

Controller error and BIOS error codes are found in Section 4.

The verify program checks the ECC in the ID field and the ECC in the data field. If an ECC error occurs, the controller reformats the track or assigns an alternate track as explained above, then reverifies. If this occurs, the following text will appear on the screen.

```
***  Defect found in logical unit=XX, bad cylinder=
     XXXX, head=XX, sector=XX.
***  Controller error code=XX, BIOS error code=XX.
***  Reformatting track...
```

3.4 PARTITION AND FORMAT DESCRIPTION

NOTE:
IF "FDISK" OR "FORMAT" FAIL, SEE SECTION 4.4 FOR TROUBLESHOOTING PROCEDURES.

This description applies to the following cases:

A. One logical unit on one physical drive.

B. Two logical units on one physical drive.

C. One logical unit on each of two physical drives.

Logical drive C: is always the first logical unit on drive Ø. Logical drive D: is the second logical unit on drive Ø or for two physical drives it is the first logical unit on drive 1.

The disk must now be partitioned for DOS 2.Ø and the format verified.

1. POWER DOWN THE SYSTEM. DO NOT WARM BOOT. The controller and drive must be powered OFF then ON in order to read the disk parameters from the hard disk drive. Failure to do so will result in all drives showing 1Ø MB available, not the expected capacity as inputted at primary format.

2. Insert a copy of DOS 2.Ø that contains "FDISK" and "FORMAT" in floppy drive A, power ON and boot the operating system.

3. Type FDISK and Select option 1: Create a DOS partition (See Chapter 4 of DOS Manual). To check that the drive was formatted properly, display the partition data. The number of cylinders displayed should be one less than the number of cylinders (decimal equivalent) inputted in the ACB-2Ø1ØA Format Program, divided by the number of logical units on the drive (1 or 2).

   If needed, repeat FDISK for drive D using option 5.

4. When complete, type FORMAT C:/S. If needed, repeat for drive D, using FORMAT D:.

This will create a DOS directory, verify the primary format and flag any bad (defective) sectors. If the Adaptec defect handling scheme was used, there will be no bad sectors. From this point on, you can boot from the hard disk, copy files and operate your software applications.

YOU ARE UP AND RUNNING!

DMA	3
IRQ	5
I/O PORTS	320 - 323
BIOS ADDRESS	C8000 - C9FFF

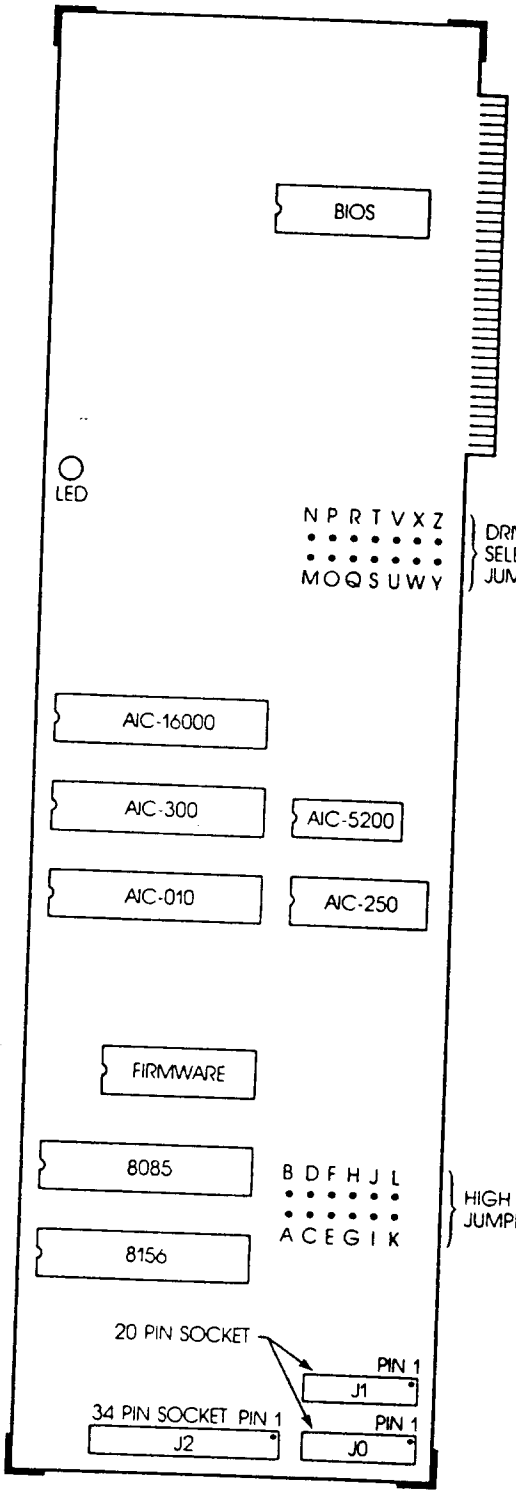
2010A

DECIMAL (411501 BIOS)/ST225

DEBUG
G=C800:CCC

```
INTERLEAVE.............2
DRIVE ID...............0
DEFAULT PARAMETERS.....N
LOGICAL UNITS..........1
STEP PULSE.............3
HEADS..................4
CYLINDERS.............615
WRITE PRECOMP.........300
REDUCED WRITE.........615
CYL/HD or HD/CYL.......C
DEFECT FILE NAME......<CR>
DEFECT LOCATIONS.....

CORRECT?..............Y
```



	CAP	CYLS	HDS	INSTALL
Miniscribe 3012	10MB	612	2	M-N O-P
Syquest SQ306	5MB	306	2	M-N E-F
Miniscribe 4020	16MB	480	4	O-P
Seagate ST412	10MB	306	4	NONE

	INSTALLED	REMOVED
A - B	3 = 13uS	3mS
	4 = 200us	
	0 = 3mS	
		5 = 70uS

C - D	Iomega Beta 5, drive 0
E - F	Syquest, DMA, drive 0
G - H	Syquest, DMA, drive 1
I - J	Iomega Beta 5, drive 1
K - L	Self Diags

* HEX * (ST225)
DEBUG
G=C800:CCC

```
Interleave.............2
Drive ID...............0
Use Defect Handling.....Y
Enter Defect Locations..Y
Default Parameters......N
No. of Logical Units....1
Step Rate..............3
Landing Zone............0
Ecc Correction.........8
Write Precomp.........12C
Reduced Write.........268
Heads..................4
Cylinders.............267
```