

Adaptec

ACB-2320

ACB-2322

ACB-2322A-8

User's Manual

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SECTION ONE: 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-232X board. This includes both hardware and software installation, as well as basic troubleshooting information.

1.2 Reference Documents

- * IBM PC AT Guide to Operations Manual
- * IBM DOS Reference Manual Version 3.0 or Higher
- * IBM PC AT Technical Reference Manual
- * Appropriate Disk Drive User's Manual

1.3 Overview of Product

The Adaptec ACB-232X is a series of high-performance ESDI Hard Disk and Floppy Disk Controllers for the IBM PC AT and equivalent personal computers.

- * The ACB-2320 is an ESDI hard disk controller.
- * The ACB-2322 is an ESDI hard disk and floppy disk controller.
- * The ACB-2322A-8 is for 15 MHz ESDI hard drives and also includes a floppy disk controller.

The ACB-232X is software and hardware compatible with the IBM PC AT hard disk controller interface.

The Adaptec ACB-232X ESDI Controllers have the following features:

- * IBM hardware compatible. Plugs directly into AT bus compatible systems without modification. Register (port) compatible to the IBM AT controller, giving true compatibility.
- * IBM software compatible. Runs software that communicates through the AT system BIOS or directly to the controller registers, thus, the highest AT compatibility is achieved.
- * Supports two enhanced small disk interface (ESDI) drives. Runs High Performance 10 MHz ESDI drives from all major ESDI manufacturers. (The ACB-2322A-8 supports 15 MHz ESDI drives.) Supports two drives that are different capacity, different access time and different manufacturers without controller modification.
- * Drives with up to 16 heads and 4096 cylinders are supported by the controller through the registers. Provides both the highest capacity and highest performance.
- * Highest AT ESDI performance. The combination of non-interleaved operation, low controller overhead, and 36 sectors per track give the ACB-232X the highest transfer rate available today. This is from 900 Kilobytes per second to as high as

1.1 Megabyte per second data transfer depending on system configuration, thus the highest system performance in multi track data transfers.

- * Non-interleaved operation. This gives the ability to read one track of data in one disk revolution, the maximum rate that the drive can give data to the controller. This provides the fastest controller/drive performance.
- * Hard sectored and soft sectored ESDI drive support. This achieves a level of flexibility to match your drive manufacturer with your drive requirements, most notably, Maxtor's high capacity soft sectored drives.
- * Support for 32 to 36 sectors per track. This provides flexibility to use any number of sectors that the drive supports. Most importantly, with 36 sectors per track, this maximizes the capacity and transfer rate of the drive giving 6% capacity and speed improvement over 34 sectors per track. For example, a 170 MB unformatted drive will provide 8.4 MB additional capacity and 60 KB/s more data transfer speed. (The ACB-2322A-8 supports up to 52 sectors per track.)
- * Optional on-board Adaptec ACB-BIOS. This provides the most functionality of any AT controller. The copyrighted ACB-BIOS contains the low level format, defect management, data verification, auto configuration of any drive without changing AT system BIOS, large disk partitioning and DOS device driver. The ACB-BIOS functions are also accessible by your customized redirected I/O drive configuration program.
- * ACB-BIOS low-level primary format. This provides the ability on the controller to format the drive without the need of system diagnostics or changing the AT system BIOS.
- * ACB-BIOS ability to read ESDI drive parameters. This reads the drive characteristics directly from the drive, reducing the possibility of using the wrong number of heads, cylinders, sectors, etc.
- * ACB-BIOS ability to read ESDI manufacturer's defect list. This reads the manufacturer's flagged bad areas on the disk, eliminating the need to enter them manually.
- * ACB-BIOS ability to add grown defects, save and protect all defect lists. This gives the ability to run additional defect tests and add the defects to those the manufacturer found. Also the controller saves and protects both the manufacturer's and grown lists from accidental erasure, thus the highest data reliability.
- * ACB-BIOS sector-level defect mapping. This flags a sector on the disk to be unusable and reports to the operating system its location, giving system level data integrity.
- * ACB-BIOS data verification using worst case data patterns. This tests the disk with the worst possible combinations of data before valuable user data is placed on the disk. This provides the highest data reliability.
- * ACB-BIOS auto configuration of any ESDI drive, not in AT system BIOS. This allows any ESDI drive to be formatted and used without changing the AT system BIOS drive tables. This simplifies the cumbersome task of changing EPROM drive tables to add ESDI. The controller writes the drive parameters onto the drive during format and reads them on power up. This is ideal for field upgrades since

the controller does not need to be hardware configured to the specific drive. This achieves the highest drive flexibility possible.

- * ACB-BIOS large disk logical partitioning. Since all ESDI drives are greater than the 32 MB limitation set by DOS 3.0, 3.1 and 3.2, this allows you to divide the drive into volumes of any size up to 32 MB each. Up to 16 volumes can be defined on one drive or 24 volumes on two drives, maximizing the drive capacity under a DOS environment.
- * ACB-BIOS downloadable DOS driver. The ACB-BIOS has a device driver that is downloaded to a floppy. This allows access to 16 or 24 32 MB volumes defined by the Large Disk Logical Partitioning. This gives all of the software necessary to go beyond 32 MB right on the controller, thus reducing your support and eliminating the need to write a device driver.
- * XT height board. This allows use in both XT and AT height machines, thus giving you flexibility in choosing your machine's enclosure.
- * High component integration using Adaptec ICs. Adaptec is committed to IC development in order to integrate and to reduce the price of both boards and ICs. Adaptec's ICs are used in all Adaptec boards and in most integrated drives on the market; therefore, Adaptec components are proven in reliability and in high volume production.
- * Use of surface mount technology. Adaptec is committed to the leading edge of technology. Surface Mount Technology allows greater functionality in smaller spaces, as well as higher reliability.

The ACB-2322 has these additional features:

- * Support of two IBM AT-type floppy disk drives. Compatible with the most popular IBM floppy capacities. This includes 360 KB and 1.2 MB floppy capacities for 5 1/4" floppy compatibility. Also supports 3 1/2" floppies that use the 5 1/4" floppy drive interface.
- * Analog floppy data separator. This gives much higher data integrity than digital data separators. Thus floppy data reliability and data retrievability are improved over previous AT floppy controllers.

1.4 Hardware and Software Requirements

In order to install an Adaptec ACB-232X into an IBM PC AT-compatible computer, the following are required:

1. IBM PC AT-compatible computer.

Note: Compatible computers are defined to have I/O bus speeds of 6 MHz with one I/O wait state, 8 MHz with one I/O wait state or 10 MHz with two I/O wait states. I/O bus speed is not the same as CPU or memory speeds. For example, a 16 MHz 286 or 386 machine typically runs the I/O bus at 8 MHz with one I/O wait state.

2. PC or MS-DOS Version 3.0 or higher. System and supplemental program diskettes. The ACB-2322 will also run with non-DOS operating systems and networks. Please refer to the appendix for operation with Interactive System Unix

- V/386, SCO Xenix V.2.x , Novell NetWare 2.x, OS/2 and other operating systems.
3. A diagnostic program diskette that allows the PC AT-compatible computer's configuration RAM to be set up (such as the diagnostics diskette IBM supplies with its PC ATs.)
 4. Adaptec ACB-2322 hard disk and floppy disk controller, or Adaptec ACB-2320 hard disk controller for systems that include a floppy controller.
 5. An ESDI Winchester disk drive.
 6. 5 1/4" or 3 1/2" floppy disk drive.
 7. 20- and 34-pin flat or twisted ribbon cables for hard disk.
 8. 34 pin twisted ribbon cable for floppy disk (ACB-2322 only).

SECTION TWO: HARDWARE INSTALLATION

2.1 Introduction

This section describes the steps necessary to install the ACB-232X board into the computer. First, the operating environment, unpacking procedure and board layout are described. This section also describes the integration of the drive and controller into the computer.

2.2 Environmental Requirements

The ACB-232X will perform properly over the following range of conditions:

	Operating	Storage
Temperature:	0° to 55°C (32° to 131°F)	-40° to 75°C (-8° to 167°F)
Humidity (Non condensing):	0% to 95%	10% to 95%
Altitude (Feet):	Sea level to 10,000	Sea level to 20,000
MTBF (Hours):	80,000 at 55°C	

2.3 Unpacking Procedure

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 initiated.

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 or distributor be necessary.

CAUTION: The ACB-232X 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 ready to be configured and installed in your system.

2.4 ACB-2322 Board Layout

The ACB-2322 is shown in Figure 2-1. This figure shows the location of the controller microcode, ACB-BIOS, jumpers and connectors. Note that Pin 1 of the connectors is identified by a square solder pad on the solder side of the board. The dimensions of the board are:

Width: 3.9 Inches

Length: 13.0 Inches

Height: 0.75 Inches

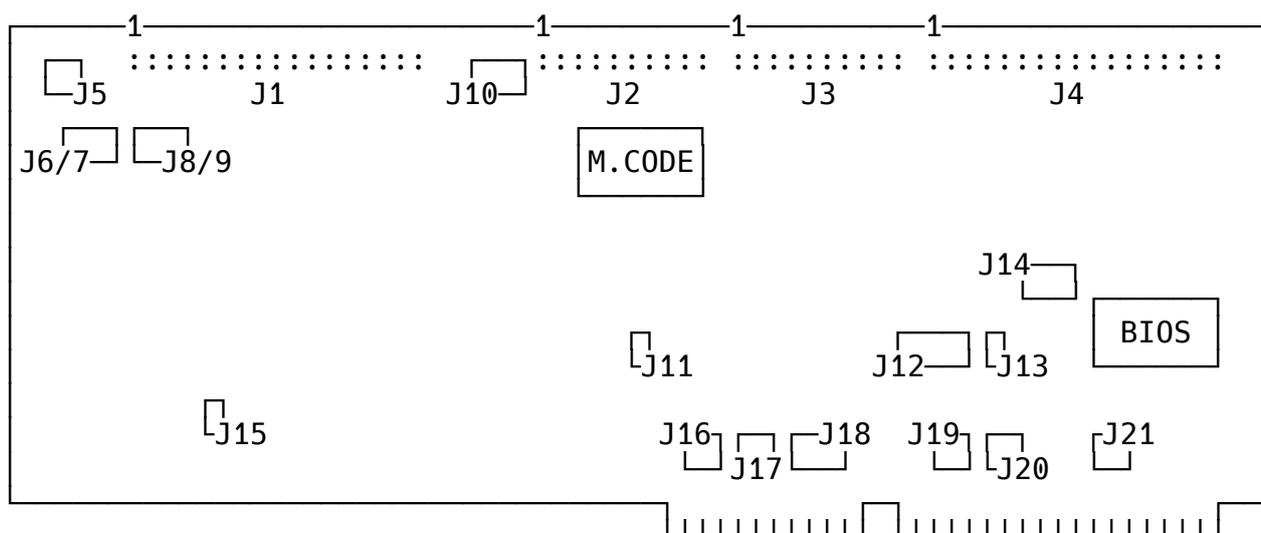


FIGURE 2-1. ACB-2322 BOARD LAYOUT

2.5 ACB-2320 Board Layout

The ACB-2320 is shown in Figure 2-2. This figure shows the location of the controller microcode, ACB-BIOS, jumpers and connectors. Note that Pin 1 of the connectors is identified by a square solder pad on the solder side of the board. The dimensions of the board are:

Width: 3.9 Inches

Length: 8.0 Inches

Height: 0.75 Inches

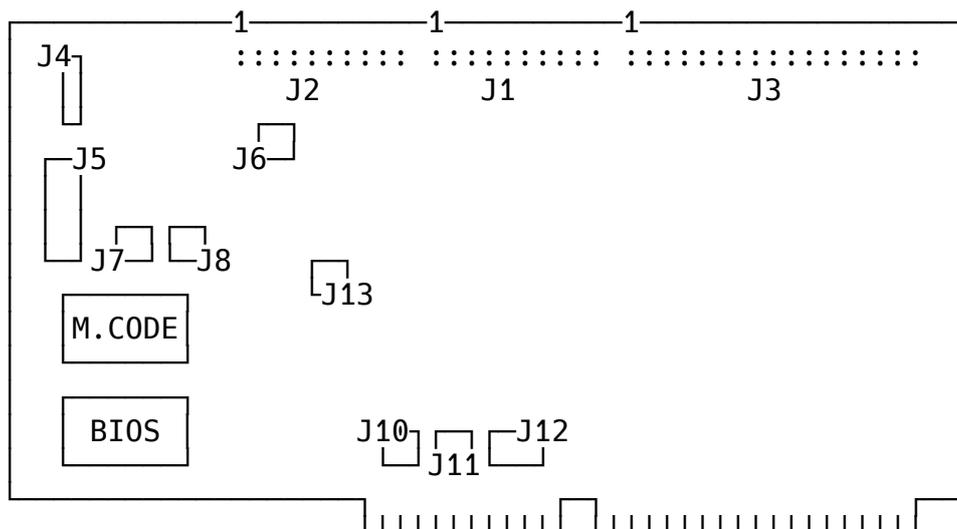


FIGURE 2-2. ACB-2320 BOARD LAYOUT

2.6 System Requirements

The ACB-232X was designed to be installed in an IBM PC AT-compatible personal computer; thus, it requires the same system resources as the IBM AT hard disk controller.

TABLE 2-1. ACB-232X SYSTEM MEMORY MAP

I/O Ports

Hard Disk

- Primary 1F0,1F1,1F2,1F3,1F4,1F5,1F6,1F7,3F6,3F7
- Secondary 170,171,172,173,174,175,176,177,376,377

Floppy Disk

- Primary 3F0,2F1,3F2,3F3,3F4,3FF5
- Secondary 370,371,372,373,374,375

If the BIOS is enabled:

BIOS Address

- Primary 16 Kbytes C8000H-CBFFFH
- Secondary 16 Kbytes CC000H-CFFFFH

Temporary Drive Parameters Table Interrupt locations are 60H through 67H

Drive Power

The IBM PC AT internal power supply does have sufficient current to power most hard disk drives in addition to its present load. Check with your drive vendor for an accurate estimate of its specific power requirements.

TABLE 2-2. ACB-2322 POWER REQUIREMENTS
(Typical)

+5V Power ----->	1.7 Amp
P5V Power ----->	Not Used
+12V Power ----->	90mA
P12V Power ----->	50mA

TABLE 2-3. ACB-2320 POWER REQUIREMENTS
(Typical)

+5V Power ----->	1.1 Amp
P5V Power ----->	Not Used
+12V Power ----->	Not Used
P12V Power ----->	Not Used

CAUTION: The values for the power requirements were determined by actual measurements in an IBM PC AT while the controller was reading a hard disk. If these values are to be used to design the controller into a specific application, at least 20% should be added to these listed values as a safety margin.

2.7 Integration Into the System

To install the Adaptec ACB-232X 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 to successfully install this hardware.

Step 1 Controller Jumper Setup and Definition

Before the Adaptec ACB-232X can be used, some initial setup may be required.

Table 2-4 defines, in detail, connectors and jumper blocks for the ACB-2322.

Table 2-5 defines, in detail, connectors and jumper blocks for the ACB-2320.

TABLE 2-4. ACB-2322 CONTROLLER JUMPER DEFINITIONS

Note: Jumper positions and pin numbers are defined from left to right, or top to bottom, where applicable per Figure 2-1. An asterisk () denotes jumpers that are installed for a standard configuration.*

J1	Floppy Disk control and data cable (34-pin), Both drives	
J2	Hard disk data cable (20-pin), Second drive (Drive 2)	
J3	Hard disk data cable (20-pin), First drive (Drive 1)	
J4	Hard disk control cable (34-pin), Both drives	
J5	Drive activity LED – Pins 1,4 are +5 Volts, Pins 2,3 are Signal Ground	
J6	Manufacturing Test Points (not with ACB-2322A-8)	
J7	Manufacturing Test Points (not with ACB-2322A-8)	
J8	Manufacturing Test Points (not with ACB-2322A-8)	
J9	Manufacturing Test Points (not with ACB-2322A-8)	
J10	Manufacturing Test Points	
J11	Adaptec ACB-BIOS address selection	
	* Position 1 and 2	Jumpered for BIOS address C8000 – CBFFF
	Position 2 and 3	Jumpered for BIOS address CC000 – CFFFF
	No jumper	ACB-BIOS disabled

Note: Install only one jumper on J11. No jumper should be installed if ACB-BIOS Disabled

TABLE 2-4. ACB-2322 CONTROLLER JUMPER DEFINITIONS (Continued)

Note: Jumper positions and pin numbers are defined from left to right, or top to bottom, where applicable per Figure 2-1. An asterisk () denotes jumpers that are installed for a standard configuration.*

J12	BOARD CONFIGURATION JUMPERS
	Position 1 Hard Disk Port Addresses Not installed: primary address 1F0 -1F7 Installed: secondary address 170 – 177
	Position 2 Floppy Disk Port Address Not installed: primary address 3F0 – 3F7 Installed: secondary address 370 – 377
	Position 3 Bus Wait State Not installed: Enabled Installed: Disabled
	Position 4 Not Used
	Position 5 Not Used
	Position 6 Serial Monitor Mode Not installed: Disabled Installed: Enabled (2400 baud)
	Position 7 Manufacturing Test Point
J13	Serial Monitor Output
J14	Manufacturing Test Points
J15	Manufacturing Test Points (not with ACB-2322A-8)
J16	Not Used
J17	Not Used
J18	Controller's system interrupt selection
	* Pins 1 and 2 jumpered for IRQ14
	Pins 2 and 3 jumpered for IRQ15
	Pins 3 and 4 DO NOT USE
J19	Floppy Disk DMA Acknowledge signal selection
	* Pins 1 and 2 jumpered for DACK2
	Pins 2 and 3 jumpered for DACK3
J20	Floppy Disk Interrupt Request signal selection
	* Pins 1 and 2 jumpered for IRQ6
	Pins 2 and 3 jumpered for IRQ10
J21	Floppy Disk DMA Request signal selection
	* Pins 1 and 2 jumpered for DREQ3
	Pins 2 and 3 jumpered for DREQ2

TABLE 2-5. ACB-2320 CONTROLLER JUMPER DEFINITIONS

Note: Jumper positions and pin numbers are defined from left to right, or top to bottom, where applicable per Figure 2-1. An asterisk () denotes jumpers that are installed for a standard configuration.*

J1	Hard disk data cable (20-pin), First drive (Drive 1)	
J2	Hard disk data cable (20-pin), Second drive (Drive 2)	
J3	Hard disk control cable (34-pin), Both drives	
J4	Drive activity LED – Pins 1,4 are +5 Volts, Pins 2,3 are Signal Ground	
J5	BOARD CONFIGURATION JUMPERS	
	Position 1	Hard Disk Port Addresses
	Not installed:	primary address 1F0 – 1F7
	Installed:	secondary address 170-177
	Position 2	Not Used
	Position 3	Bus Wait State
	Not installed:	Enabled
	Installed:	Disabled
	Position 4	Not Used
	Position 5	Not Used
	Position 6	Serial Monitor Mode
	Not installed:	Disabled
	Installed:	Enabled (2400 baud)
	Position 7	Manufacturing Test Point
J6	Manufacturing Test Points	
J7	Serial Monitor Output	
J8	Manufacturing Test Points	
J9	Not Used	
J10	Not Used	
J11	Not Used	
J12	Controller's system interrupt selection	
	* Pins 1 and 2	jumpered for IRQ14
	Pins 2 and 3	jumpered for IRQ15
	Pins 3 and 4	DO NOT USE
J13	Adaptec ACB-BIOS address selection	
	* Position 1 and 2	Jumpered for BIOS address C8000 – CBFFF
	Position 2 and 3	Jumpered for BIOS address CC000 – CFFFF
	No jumper	ACB-BIOS disabled

Note: Install only one jumper on J13. No jumper should be installed if ACB-BIOS Disabled

Step 2 Hard Disk Cabling, Drive Selection and Termination

The drive changeable parameters that must be set are the drive selection switches (or jumpers) and the drive termination. The drive selection switches and cabling select the address (drive address 1-4) to which the drive will respond. This is accomplished either by setting both drives to be the second lowest address and using a twisted 34-pin cable, or by setting the drive address to the lowest two addresses and using a flat cable.

A. Twisted 34-Pin Cable

The typical AT 34-pin cable has three connectors. Between the first (middle) drive connector (for drive D) and the second drive connector (for drive C) wires 25 through 29 are twisted, thus inverting the drive selection wires. This type of twisted cable allows both drives to have their drive selection switches (or jumpers) to be the same. Both drives must be set to the SECOND lowest drive address. The controller will see the two drives to be drive 1 and drive 2, depending on the position of the connector that is used.

B. Flat 34-Pin Cable

In some cases a 34-pin flat (non-twisted) cable is used. This cable does not invert the drive selection wires but relies on the drive addresses to be unique for each drive. Now drive 1 must have its drive selection switches (or jumpers) set to be the lowest drive address (typically 1). Drive 2 must have its selection switches (or jumpers) set to be the second lowest drive address (typically 2). The controller will see the two drives to be drive 1 and drive 2, independent of the position on the connector that is used.

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 into it. The disk drives, since they can be connected in a daisy-chain configuration, have a removable terminator. This is usually a 16-pin DIP resistor package located on the drive PCB. The last physical drive in the chain must always have its terminator installed. When two drives are connected to the same controller, only the last one in the daisy chain is terminated. The other drive must have the terminator resistor removed.

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

Step 3 (ACB-2322 Only) Floppy Disk Cabling, Drive Selection and Termination

The typical AT 34-pin floppy disk cable has three connectors. Between the first (middle) drive connector (for drive B) and the second drive connector (for drive A) wires 10 through 16 are twisted, thus inverting the drive selection wires. This type of twisted cable allows both drives to have their drive selection switches (or jumpers) to be the same. Both drives must be set to the SECOND lowest drive address (typically 1 since floppy drives are addressed as 0-3). The controller will see the two drives to be drive 0 and drive 1, depending on the position of the connector that is used.

Termination of the floppy disk drives is the same as the hard disk drives in step 2.

FIGURE 2-3. ACB-2322 CONTROLLER AND DRIVE CABLING-TWISTED CABLE (HARD DISK CABLES)

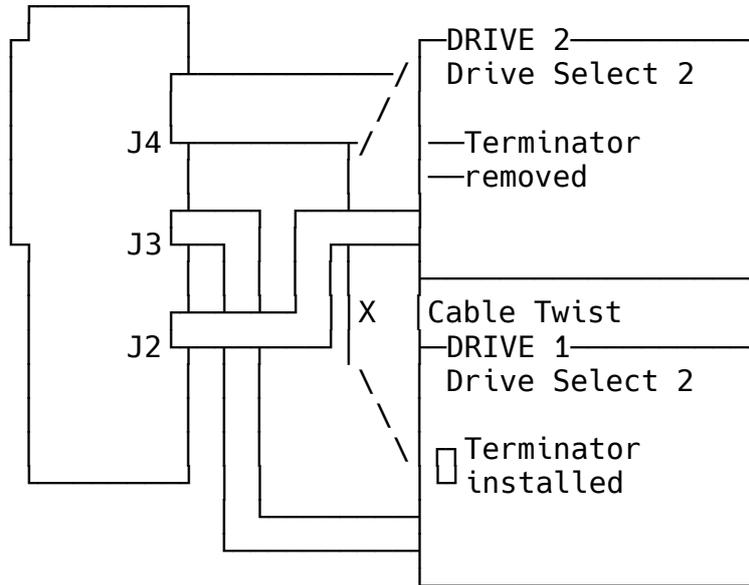


FIGURE 2-4. ACB-2322 CONTROLLER AND DRIVE CABLING-FLAT CABLE (HARD DISK CABLES)

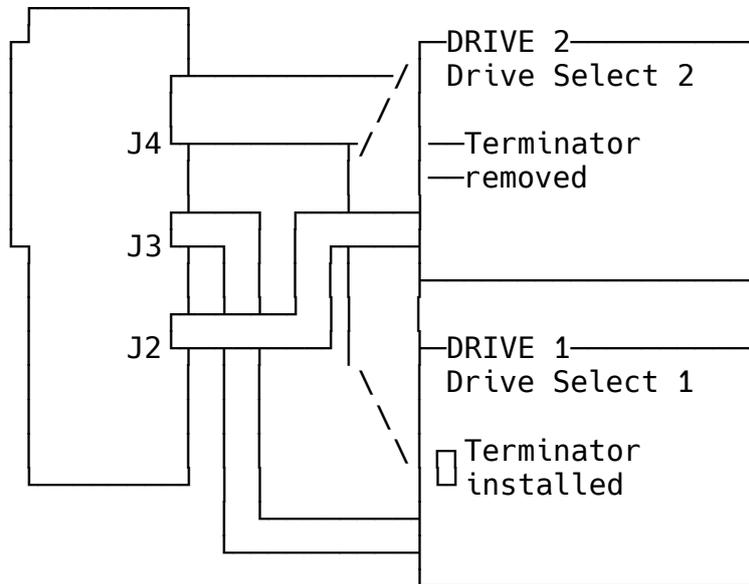


FIGURE 2-5. ACB-2320 CONTROLLER AND DRIVE CABLING-TWISTED CABLE (HARD DISK CABLES)

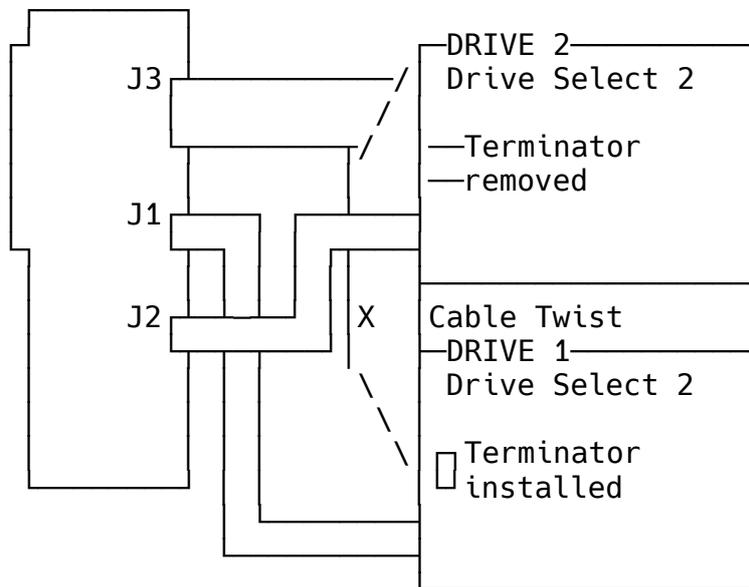
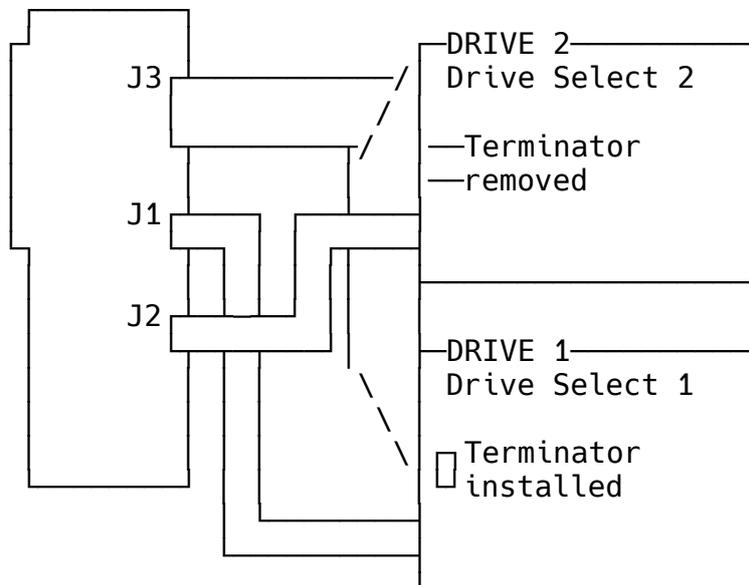


FIGURE 2-6. ACB-2320 CONTROLLER AND DRIVE CABLING-FLAT CABLE (HARD DISK CABLES)



Step 4 Mounting the Drives and Controller in the PC AT

Now that the drives and controller are configured, they can be connected and installed in the system.

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The controller has four cable connectors: J1, J2, J3, and J4. Their function, suggested connector plugs and maximum cable length are described in Table 2-6.

TABLE 2-6. ACB-2322 CONTROLLER CONNECTOR DEFINITIONS

<i>Connector</i>	<i>Signals</i>	<i>Cable</i>
J1	Control/Data	34-pin flat ribbon cable. Connected to both floppy drives 0 and 1.
J2	Data	20-pin flat ribbon cable. Connected to ESDI drive 2.
J3	Data	20-pin flat ribbon cable. Connected to ESDI drive 1.
J4	Control	34-pin flat ribbon cable. Connected to both ESDI drives 1 and 2.

<i>Connector</i>	<i>Recommended Plug</i>	<i>Maximum Length</i>
J1	3M Part #3414	20 feet (6 meters)
J3	3M Part #3421	20 feet (6 meters)
J2	3M Part #3421	20 feet (6 meters)
J4	3M Part #3414	20 feet (6 meters)

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The controller has three cable connectors: J1, J2, and J3. Their function, suggested connector plugs and maximum cable length are described in Table 2-7.

TABLE 2-7. ACB-2320 CONTROLLER CONNECTOR DEFINITIONS

<i>Connector</i>	<i>Signals</i>	<i>Cable</i>
J1	Data	20-pin flat ribbon cable. Connected to ESDI drive 1.
J2	Data	20-pin flat ribbon cable. Connected to ESDI drive 2.
J3	Control	34-pin flat ribbon cable. Connected to both ESDI drives 1 and 2.

<i>Connector</i>	<i>Recommended Plug</i>	<i>Maximum Length</i>
J1	3M Part #3421	20 feet (6 meters)
J2	3M Part #3421	20 feet (6 meters)
J3	3M Part #3414	20 feet (6 meters)

Attach the cables to the controller, making sure that the pin 1 indicator on the cable goes to pin 1 on the controller.

Now the controller must be installed into a 16-bit slot on the PC AT motherboard. Next, mount the drive(s) in any available drive bay in the AT. Consult your PC AT owner's manual for details of performing the installation of options into the motherboard expansion slots and for instructions on mounting a hard disk and floppy disk in the system.

SECTION THREE: SOFTWARE INSTALLATION

3.1 Introduction

The following procedure will guide you through the preparation of a single hard disk using DOS. A CDC Wren III HH is used as an example drive that when formatted, gives 94 Megabytes of disk capacity. At the end of this procedure, the ESDI drive will be formatted with two 33.5 megabyte volumes and one 27 megabyte volume.

This software installation process allows an entire ESDI drive to be used under DOS 3.0, 3.1, 3.2 and 3.3. These all have a 33.5 MB limitation for one logical drive. Under DOS 3.3, DOS FDISK permits using drives greater than 33.5 MB by creating an Extended Partition that is divided into logical drives. Under DOS 3.0, 3.1, and 3.2, the Adaptec Volume Partitioning Program plus the Adaptec Device Driver allows using drives greater than 33.5 MB by dividing the drive into volumes of capacities up to 33.5 MB. The drive can also be formatted by the controller to be used by non-DOS operating systems and device drivers.

Caution: If you encounter any problems while attempting to perform this installation, refer to Chapter 4, Troubleshooting.

3.2 Adaptec ACB-232X Software Installation Flowchart

The software installation process is best described by the following flowchart. This process is consistent across the entire ACB-23XX Family of AT controllers.

Note that three possible paths may be taken. All paths follow the same first 7 steps.

Path 1 through 7 and 8A through 12A is used for DOS 3.3.

Path 1 through 7 and 8B through 18B is used for DOS 3.0, 3.1 and 3.2, and for drives with more than 1024 cylinders under DOS.

Path 1 through 9A is used for UNIX, XENIX, Novell, OS/2 and 3rd-party partitioning software.

3.3 Adaptec ACB-232X Format Procedure for a Single hard DISK Drive

Step 1 Setting Up the PC/AT Configuration RAM for a Single Hard Disk With the Appropriate Drive Type

After you have completed the hardware installation of your ACB-232X and hard disk drive, turn the system power switch on. Boot from the PC/AT diagnostics diskette or any diskette that contains software for configuring the PC/AT SETUP parameters (CMOS RAM).

Note: When booting the PC/AT with an UNFORMATTED hard disk installed, the system may report a "1790" disk failure. Ignore the message, press F1 to continue.

Invoke the SETUP RAM configuration software (i.e., option four in the IBM PC/AT diagnostics program). Then follow the SETUP program's menu to set up your system for a single hard disk. Be sure to choose a drive type that is a subset of the actual disk parameters. The number of cylinders indicated by the drive type specified must be less than the actual number of cylinders on your drive. For example, with the IBM/AT, use drive type 1 (smallest available drive type) regardless of the actual drive configuration. This is necessary for proper operation of the PC/AT power-on diagnostics.

After the PC/AT internal configuration has been set up, reboot the system with DOS Version 3.0 or higher.

Step 2 Use DEBUG to enter the Adaptec Disk Preparation Program

Put a disk with a copy of DOS' DEBUG program into the floppy drive and invoke the program by typing DEBUG at the DOS prompt, and press return (see screen dump below). At the debug prompt, type G=C800:5 and press return. This will invoke Adaptec's Disk Preparation Program.

Step 3 Start the Adaptec Primary Format

Next, select Option 0 to format the drive. If the drive has been previously formatted with an ACB-2322 controller, the saved cylinder and head count will be displayed. With an unformatted drive, the number of cylinders, heads and sectors are read from the ESDI drive.

If the number of cylinders and heads displayed does not match what is expected, type an N, exit the program and check the ESDI drive jumper configuration. Enter Y to continue formatting the drive. An example of what you should see on the screen is shown below.

Note: One cylinder on the drive is reserved for use by the controller. The controller automatically subtracts this cylinder from the total number of available cylinders on the drive.

```
A>DEBUG <CR>
-G=C800:5 <CR>
```

```
Adaptec ESDI Disk Preparation Program V 1.0
Copyright (c) 1987 Adaptec, Inc. All rights reserved.
```

Choose:

- 0 - to primary format the drive
- 1 - to create DOS & Adaptec logical partitions
- 2 - to select another drive,
(drive 0 is currently selected)
- 3 - to generate Adaptec logical partition device driver
- 4 - to generate Adaptec auto-configuration device driver
- 5 - to end this program

Enter your selection : 0 <CR>

Drive 0 has 1022 cylinders, 5 heads, 36 sectors

All data in it will be LOST!!! continue (y/n)? Y <CR>

Step 4 Choose to ERASE or NOT ERASE the Adaptec Saved Defect List

If your drive was previously formatted with Adaptec's ACB-232X, the saved defect list will now be displayed. NORMALLY DO NOT ERASE THE SAVED DEFECT LIST. It is your choice to ERASE or NOT ERASE the Adaptec saved defect list. If you choose to erase, say if the controller, drive or cables were incorrectly set or defective, then ONLY the Adaptec saved list will be erased. The manufacturer's defect is always PROTECTED from erasure.

Step 5 Enter Any More Defects

Next, the program will prompt you for the drive defect format. If you have no additional defect locations to enter, then select Option 0. Otherwise, choose the defect format that matches the list of defects you wish to enter.

```
Saved defect list (cyl/physical sector) :
  Surface 0:
            994/10  208/28  (for example)
  Surface 1:
  Surface 2:
  Surface 3:

Want to ERASE saved defect list (y/n) ?  N  <CR>

Please specify additional defect format:

  0 - No Additional Defects
  1 - Cyl/Head/byte offset
  2 - Head/Cyl/byte offset
  3 - Cyl/Head/Logical Sector

your selection :  0  <CR>
```

Step 6 Select Interleave Factor

Now select an interleave by typing the desired interleave factor (1 to 12) and pressing return. An interleave factor of one is used in the example below. If you have entered a defect list, it will be displayed on the screen for you to verify. Note that the defect locations have been translated into cylinder/logical sector format. Surface numbers correspond to head numbers.

Step 7 Primary Format the Drive, Automatic Data Verification and Automatic Flagging of Bad Sectors

Check to be sure that all of the parameters that you have entered are correct, then enter Y to continue. Enter Y to primary format the drive. The controller will now perform the primary format. The program formats the drive from high cylinder to low cylinder, marking the defects as bad sectors. After formatting each track, the program will write and verify the track with worst case data patterns. Any defective sectors found during this write/verify process that are not in the defect list will be added to the defect list. The same track is reformatted with the newly found defective sectors marked bad. The track is then written and again verified against defects. The process is repeated for every track on the drive. ECC retries are disabled during this verification.

When the controller has finished formatting the drive, you should see "Format complete!" displayed at the bottom of the screen, indicating a successful format. An example of what you should see on the screen is shown below.

Note: If the format operation does not complete properly, (i.e., Format complete! is not displayed after formatting) see Chapter 4, Troubleshooting.

Interleave (1 to 12) : 1 <CR>

Total defect list (cyl/sector) :

Surface 0:
 944/10 208/28 (for example)
Surface 1:
Surface 2:
Surface 3:

Are the above correct (y/n) ? Y <CR>

Will format the drive. Continue (y/n) ? Y <CR>

Formatting Drive ...

Head XX Cyl XXXX

Format complete !

Steps 8A-12A Logical Partitioning Using DOS 3.3
(See Steps 8B-18B for DOS 3.0, 3.1 and 3.2)

Step 8A Create One Volume for the Entire Disk

Now that the drive has been primary formatted, it is necessary to configure the drive as a single DOS 3.3 volume. From the main menu, choose Option 1 ("To create DOS & Adaptec logical partitions (volumes)") to create a volume on the drive.

Adaptec's volume partition menu will then be displayed on the screen. Choose Option 0 to create a volume, and select volume number 1 (drive C:) as the volume number to be created. Enter the total number of cylinders available (displayed on the program menu) as the number of cylinders to be used by this volume. An example, using 1022 cylinders, of what should be displayed on the screen is shown below.

```
Volume Partition Program
Drive 0 has 1022 cylinders, 5 heads, 36 sectors
Vol # Drive Start End Vol # Drive Start End

1      C                9
2                10
3                11
4                12
5                13
6                14
7                15
8                16
```

```
Choose : 0 - to create a volume
         1 - to delete a volume
         2 - to FDISK a volume
         3 - to return to main program
enter your selection : 0 <CR>
volume number : 1 <CR>
Volume 1 always starts from cyl. 0
number of cyl. (each cyl. will have 90 KB):1022 <CR>
```

Adaptec's Volume Partitioning Program will ask you to verify that what you have entered is correct before it writes these parameters on disk. If you are satisfied with the parameters that are displayed, then type Y and press return.

Note: Cylinders are numbered beginning with 0; thus, in the example below, the 1022 available cylinders used in partition 1 are labeled as cylinders 0 through 1021.

```
Volume Partition Program
Drive 0 has 1022 cylinders, 5 heads, 36 sectors
Volume Partition Program
Drive 0 has 1022 cylinders, 5 heads, 36 sectors
Vol # Drive Start End Vol # Drive Start End

1      C      0  1024   9
2                10
3                11
4                12
5                13
6                14
7                15
8                16
```

```
Are the above correct (y/n) ? Y <CR>
```

Step 9A Exit Adaptec Disk Preparation Program

Exit the Adaptec primary format routine by first selecting option 3 to return to the main menu, and then selecting Option 5 to end the program (exit to DOS).

Step 10A Preparing the Disk for Use by DOS 3.3 With the DOS FDISK Program

At this point, the primary format of your hard disk is complete. The disk must now be FDISK partitioned by DOS 3.3.

Insert a diskette containing a copy of the DOS 3.3 FDISK and FORMAT programs in the floppy disk drive. Use FDISK to create one primary DOS partition of any size up to 33.5 MB. DOS 3.3 automatically limits the primary partition to be 33.5 MB. Next, select the extended partition and use the remaining number of cylinders for the extended partition. Lastly, divide the extended partition into logical drives D:, E:, F:,... of any desired size. Return to DOS 3.3 when finished.

Step 11A Use DOS FORMAT to High Level Format Drive C:, D:, E:, F:,....

Use FORMAT C:/S to format and copy the DOS 3.3 system to drive C:. Use FORMAT D:, FORMAT E:, FORMAT F:, to format the remaining logical drives.

Step 12A Now reboot system from drive C:

The disk preparation is now complete and you are ready to reboot and copy programs to drive C:, D:, E:, F:,....

Steps 8B-18B Logical Partitioning Using Adaptec Logical Partitioning Program and DOS 3.0, 3.1 or 3.2

With DOS Version 3.0, 3.1 and 3.2, the amount of hard disk storage accessible by the operating system is limited to two physical volumes of up to 32 MB each. Thus, to fully utilize the capacity of drives with more than 32 MB, the Adaptec Volume Partitioning Program allows a single drive to be logically divided into as many as 16 volumes of up to 32 MB each. The loadable device driver, supplied in the Adaptec ACB-BIOS, then provides DOS with the ability to access all of the logical drives.

The following procedure describes the steps necessary to format your hard disk with multiple Adaptec logical partitions. It also describes how to load the Adaptec device driver from the ACB-232X ACB-BIOS onto your bootable floppy and hard disk.

Step 8B Creation of Multiple Volumes on a single Physical Disk

Steps 1 through 7 have given us a hard disk that has a primary format but must be divided into volumes that are less than, or equal to, the DOS 3.0, 3.1 and 3.2 limitation of 32 MB.

To calculate the exact number of cylinders to use for your volume, given the maximum DOS volume to be 32 MB, record the number of kilobytes-per-cylinder displayed by the program. Divide this number into the amount of storage you desire to get the correct number of cylinders needed. Remember, 1 megabyte = 1024 kilobytes. Thus, if your drive has 90 KB per cylinder and you want to create a 32 MB partition ($32 \times 1024 = 32,768$ KB), then the number of cylinders needed would be $32,768 \text{ KB} / 90 \text{ KB} = 364$ cylinders.

Now select option 1 to create DOS & Adaptec logical volumes. Next, create a volume of up to 32 MB, say using 364 cylinders for the first two volumes and 294 cylinders for the last volume. Create a volume by selecting option 0. The first volume starts at cylinder 0 and ends at cylinder 363.

```

-----
Volume Partition Program
Drive 0 has 1022 cylinders, 5 heads, 36 sectors
Vol #  Drive  Start  End    Vol #  Drive  Start  End
-----
1         C         0  363    9
2
3
4
5
6
7
8

```

```

Choose : 0 - to create a volume
         1 - to delete a volume
         2 - to FDISK a volume
         3 - to return to main program
enter your selection : 0 <CR>
volume number : 1 <CR>
volume 1 always starts from cyl. 0
number of cyl. (each cyl. will have 90 KB): 364 <CR>

```

```

Are the above correct (y/n) ? Y <CR>
-----

```

Adaptec's Volume Partitioning Program will ask you to verify that what you have entered is correct before it writes these parameters to the hard disk. If you are satisfied with the parameters that are displayed, then type "Y" and press return.

Proceed for volume 2 and 3 given the above starting and ending cylinder values. Option 0, for volume 2, start at cylinder 364, and go for 364 cylinders.

Check correctness? Y. Option 0, for volume 3, start at cylinder 728, and go for 294 cylinders. Check correctness? Y.

The second volume starts at cylinder 364 and ends at 727. The last volume starts at cylinder 728 and ends at 1021.

Step 9B Use Adaptec FDISK to FDISK volume 2 (Volume 1 will later be FDISKed by DOS).

The Adaptec FDISK option must now be used to create an active partition in the volume. Choose to FDISK a volume option by typing 2 and pressing return. The program will ask you which volume you would like to FDISK. Choose volume 2.

```
Volume Partition Program
Drive 0 has 1022 cylinders, 5 heads, 36 sectors
Vol # Drive Start End Vol # Drive Start End

1 C 0 363 9
2 364 727 10
3 728 1021 11
4 12
5 13
6 14
7 15
8 16
```

```
Choose : 0 - to create a volume
         1 - to delete a volume
         2 - to FDISK a volume
         3 - to return to main program
enter your selection : 2 <CR>Volume Partition Program

volume number : 2 <CR>
```

Step 10B Create a DOS Partition for the Entire Volume 2, and Format the Partition (Volume)

Choose option 0 to create a DOS partition. Make it the same size as the volume. In this case, choose partition 1 to start at cylinder 364 and go for 364 cylinders. Next check for correctness, then answer Y, then if you are sure again answer Y. The Adaptec FDISK program will automatically DOS FORMAT the drive at this time.

```
Part # Start End Mode O.S. Status
1
2
3
4
```

```
Choose : 0 - to create a DOS partition
         1 - to activate a partition
         2 - to delete a partition
         3 - to format a DOS partition
         4 - to return to volume partition program
please enter your selection : 0 <CR>
```

Part #	Start	End	Mode	O.S. Status
1				
2				
3				
4				

creating a partition
partition number : 1 <CR>
starting cyl. : 364 <CR>
number of cyl. (each cyl. will have 90 KB) : 364 <CR>

Step 11B Now Activate Partition #1 for Volume 2. Then repeat Steps 9B, 10B and 11B for volume 3.

Now select option 1 to activate partition # 1. The display will match your selection.

Next, return to the volume partition program by choosing option 4 and repeating Steps 9B, 10 B and 11B. Values for volume 3, partition 1 are: starting cylinder is 728 and number of cylinders is 294. Next check for correctness, then answer Y, then if you are sure again answer Y.

Lastly, return to the volume partition program by choosing 4, then to the main menu by choosing 3.

```

-----
Part #   Start   End     Mode      O.S. Status
  1      364    727    unformatted  not active
  2
  3

```

Are the above correct (y/n) ? Y <CR>

Will format the partition. All data will be LOST !!! continue (y/n)?

Y <CR>

Head XX Cylinder XXXX

```

Part #   Start   End     Mode      O.S. Status
  1      364    727    formatted   not active
  2
  3

```

Choose : 0 - to create a DOS partition
 1 - to activate a partition
 2 - to delete a partition
 3 - to format a DOS partition
 4 - to return to volume partition program
 please enter your selection : 1 <CR>

activating a partition
 partition number : 1 <CR>

You have now completed the creation of a logical Adaptec volume with an active partition. Remember, Adaptec volumes can only be accessed by DOS through the use of the Adaptec device driver.

Step 12B Copy the Adaptec Device Driver from the ACB-BIOS to the floppy

The volume partition can now be used by DOS if the Adaptec device driver is installed.

From the main program menu select Option 3 ("Generate Device Driver").

Option 3 will allow you to load a copy of the Adaptec device driver onto a floppy diskette. Insert a bootable floppy diskette with at least 5 KB of available storage into drive A: . Next, enter the name you wish to use for the device driver at the prompt. In the example below, the name "ADAPTEC" is given for the device driver file name.

enter file name: A:\ADAPTEC <CR>

A copy of the Adaptec device driver will now be written on your floppy diskette.

Step 13B Exit the Adaptec Disk Preparation Program

Now, exit the Adaptec Disk Preparation Program by selecting Option 5 from the main menu. Control will be returned to DOS, and you should see the DOS "A:>" prompt.

Step 14B Use DOS FDISK to FDISK C: only

At this point, the primary format, volume partition and high level format for D: and E: are complete. Only Drive C: needs to be FDISKed by DOS 3.0, 3.1 or 3.2.

Insert a diskette containing a copy of the DOS, FDISK and FORMAT programs in the floppy disk drive. Use FDISK to create one DOS partition for fixed disk Drive 1. Return to DOS when finished.

Step 15B Use DOS FORMAT to High Level Format Drive C:/S only.

Use FORMAT C:/S to format and copy the DOS system to drive C:.

Step 16B Copy the Adaptec Device Driver from the floppy to drive C:

Use COPY A:ADAPTEC C: to copy the device driver to C:.

Step 17B Create CONFIG.SYS on drive C:

In order for DOS to use the Adaptec device driver, it must be installed when the system boots. This is accomplished by using any text editor or COPY CON to create a CONFIG.SYS file that contains the command:

DEVICE=file name, where "file name" is the name given to the Adaptec device driver (ADAPTEC in the example above). If you already have a CONFIG.SYS file for your system, then simply add this line to the file.

Step 18B Now reboot system from drive C:

The disk preparation is now complete and you are ready to reboot and copy programs to drive C:, D:, and E:

Now, whenever you boot from your hard disk, the system will boot from drive C: and the Adaptec device driver will be automatically installed.

SECTION FOUR: TROUBLESHOOTING

4.1 Introduction

This section describes the procedures needed to troubleshoot problems that may arise when installing the Adaptec ACB-232X controller board. These are the most commonly found problems and are not inclusive of every application.

CAUTION: When troubleshooting problems, use the most basic system configuration. That is, one hard disk drive on the ACB-232X and all other devices such as printers, modems, etc. removed. Once the system works for the basic configuration, add drives and devices to the system one at a time and retest after each addition.

If these procedures fail to give a solution to your problem, recheck your steps, read the entire manual, document the problem and check with the technical support department where you bought the controller.

4.2 Adaptec ACB-2322 Troubleshooting Checklist

- Gets a 1790 at boot-up
A 1790 Error is normal for an unformatted drive. just press F1 to continue.
- Can't read floppy or boot to drive A
For the ACB-2322, check floppy cables. Be sure J1 goes to both drives. Be sure that Pin 1 on the controller is connected to Pin 1 of the drive. If only one drive is being used, only the last connector on the twisted cable should be used.
- Excessive defects, or fails to format
Make sure the drive is ESDI compatible. Check with the drive manufacturer.
- Won't boot to C
Check to see that the SETUP program and CMOS RAM show drive type 1 is selected.
- Incorrect drive parameters
Check that the hard drive jumpers are correct for sector size, hard or soft sectors, power-on spin-up and drive select.
- Miscellaneous errors, or no format routine
Check jumpers on controller.
- No drive attached error
Check hard disk cables; for the ACB-2322, be sure J3 goes to Drive 1, J2 goes to Drive 2, and J4 goes to both drives. Be sure that Pin 1 on the controller is connected to Pin 1 of the drive. If only one drive is being used, only J3 and J4 should be used.
For the ACB-2320, be sure J1 goes to Drive 1, J2 goes to Drive 2, and J3 goes to both drives. Be sure that Pin 1 on the controller is connected to Pin 1 of the drive. If only one drive is being used, only J1 and J3 should be used.
Do not use a floppy cable on the hard drive.
- Intermittent operation errors; or Read/Write errors
Check that the terminator on each drive is set properly (see Section 2.6, Step 1).
- Hard disk won't power up
Check that the power supply can support the added current required by the drive. Be sure that the +5V and +12V voltages are correct. Consult with the drive vendor for the correct drive power requirements.
- DOS sees no drive (DOS version <3.3)
You must always create a volume after the low-level format has finished. If DOS FDISK shows only 1 or 2 cylinders, you did not create a volume.

- **DOS doesn't see Adaptec partitions**
When using Adaptec partitioning, remember to Activate each partition after using Adaptec's "FDISK".
- **DOS drive storage smaller than expected**
The cylinders above 1024 cannot be accessed by DOS. Adaptec's Partitioning and Driver must be used.
- **System hang or boot problems**
Try installing the BUS WAIT STATE jumper. The DTK 10MHz system needs this jumper installed on the controller.
- **Long boot timeouts**
Some AT systems will continue to retry booting to the hard drive even though it has not been formatted yet. You will have to allow this re-trying to continue for up to two minutes before the system will boot to the floppy drive. Then you can proceed to Debug and format the drive.
- **Recal error**
"Recal error" is usually caused by improper cabling, or Drive Select jumpers.
- **System hang after memory manager or cache program starts**
Install the autoconfiguration driver for conflicts with cache programs or expanded memory. See Appendix VI for details.
- **If none of the above steps cure the problem, then swap out components in this order:**
Replace the cables with a known-good set of cables.
Swap the drive with a known-good drive.
Swap the ACB-232X controller with another ACB-232X controller.

4.3 Controller Error Codes

Tables 4-1 through 4-5 specify class 00, 01, 02, 03, and 04 error codes which may be returned by the ACB-2322. Note that the most significant bit (the address valid bit) of the one-byte error code may be set in some cases. Thus, 80-8F, 90-9F, A0-AF, B0-BF, and C0-CF are also valid errors corresponding to error codes 00-0F, 10-1F, 20-2F, 30-3F, and 40-4F, respectively.

TABLE 4-1. Class 00 Error Codes (Drive Errors)

<i>Code</i>	<i>Error</i>
00	No Error Occurred During Last Command
01	No Index Signal Found
02	No Seek Complete Found
03	Write Fault Found
04	Drive Not Ready
05	Not Assigned
06	No Track 00 Signal
07	Not Assigned
08	Seek Operation Not Yet Complete
09	Not Assigned
0A	Not Assigned
0B	ESDI Interface Fault
0C	ESDI Seek Fault
0D	ESDI Parity Error
0E	Bad ESDI Configuration
0F	Not Assigned

TABLE 4-2. Class 01 Error Codes (Data Recover Errors)

<i>Code</i>	<i>Error</i>
10	ID ECC Error
11	Uncorrectable Data ECC Error Found
12	ID Address Mark Not Found (sector not found)
13	Data Address Mark Not Found
14	Sector Not Found (no ID errors found)
15	Seek Error (wrong cylinder)
16	No ID AM and ID ECC error (sector not found)
17	Not Assigned
18	Corrected ECC Error(s)
19	Access to Sector Flagged As Bad
1A	Format Error Detected
1B-1F	Not Assigned

TABLE 4-3 Class 02 error Codes (System-Related Errors)

<i>Code</i>	<i>Error</i>
20	Invalid Command
21	Illegal Parameter (cyl., head, sector)
22	Not Assigned
23	Cylinder Overflow (during command)
24	Format Command With the Wrong Number of Sectors Per Track
25-2F	Not Assigned

TABLE 4-4. Class 03 Error Codes (Diagnostics Errors)

<i>Code</i>	<i>Error</i>
30	Internal CPU RAM Failed
31	Controller ROM Checksum Error
32	ECC Diagnostic Failed
33	SERDES RAM Failed
34	Disk Buffer RAM Failed
35	Buffer Controller Registers Failed
36	Drive Interface IC Failed
37	Host Interface IC Failed
38	CPU Self-Test Failed
39-3F	Not Assigned Q

TABLE 4-5 Class 04 Error Codes (Timeouts and Misc. Errors)

<i>Code</i>	<i>Error</i>
40	Data Time-Out
41	Format Time-Out
42	SERDES Time-Out
43	Selection Time-Out

4.4 BIOS Error Codes

Table 4-6 specifies error codes that may be returned during format or verify.

TABLE 4-6 BIOS Error Codes

<i>Code</i>	<i>Error</i>
01	Bad Command Passed to Disk I/O
02	Address Mark Not Found
04	Requested Sector Not Found
05	Reset Failed
07	Drive Parameter Activity Failed
09	Attempt to DMA Across 64K Boundary
0A	Access to Bad Sector
0B	Bad Track Flag Detected
10	Bad ECC on Disk Read
11	ECC Corrected Data Error
20	Controller Timeout
40	Seek Operation Failed
80	Attachment Failed to Respond
BB	Undefined Error Occurred
FF	Sense Operation Failed

SECTION FIVE: APPENDICES

I Installing SCO Xenix

Adaptec ACB-23XX controllers are fully compatible with SCO Xenix V.2.2 and newer. The following instructions describe the process for installing the Xenix operating system on a disk subsystem using an Adaptec AT disk controller.

The following items are required to successfully perform this installation:

- 1) SCO XENIX V.2.2 or newer. Operating system software and documentation
- 2) DOS 3.1 or newer, Operating system software and documentation
- 3) PC AT-compatible computer
- 4) Adaptec ACB-23XX disk controller
- 5) Hard disk drive (ESDI for use with ACB-232X, RLL for ACB-237X)

Installing the Disk Subsystem

First, the hard disk and controller must be installed in the AT and formatted for use by the Adaptec controller. See Sections 2 (Hardware Installation) and 3 (Software Installation) of the Adaptec ACB-23XX User's Manual.

During the software installation process (Section 3 of the ACB-23XX User's Manual), it is necessary to create a volume on the hard disk. At this point, a single partition must be created that contains all of the available cylinders on the drive. (Follow the instructions given for preparing a disk for use with DOS 3.3.)

When the hard disk has been successfully formatted with a single volume for the entire disk, you are ready to proceed with the installation of the Xenix operating system.

Installing the XENIX Operating System

To install Xenix, follow the installation instructions given in the SCO XENIX System V Operating System Run Time Environment (HW) reference manual. The instructions are given in Chapter 2, "Installation Procedure"> During this installation process, the dkinit program (invoked by hdinit) is used to set the parameters for the hard disk. At this point, be sure to select option 1 (Display current disk parameters) and verify that the values displayed for cylinders, heads and sectors/track are correct. If the parameters are not correct, please retry this installation procedure. If correct, continue with the Xenix installation as directed.

If any problems are encountered during the Xenix installation, please see Section 2.7 of the SCO Xenix, Run Time Environment (HW) reference for troubleshooting information.

II Installing ISC Unix

Adaptec ACB-23XX controllers are fully compatible with ISC UNIX SYSTEM V 386/ix, and newer. The following instructions describe the process for installing the ISC Unix operating system on a disk subsystem using an Adaptec AT disk controller.

The following items are required to successfully perform this installation:

- 1) ISC UNIX 386/ix, or newer. Operating system software and documentation.
- 2) PC AT-compatible computer.
- 3) Adaptec ACB-23XX disk controller
- 4) Hard disk drive (ESDI for use with ACB-232X, RLL for ACB-237X).

Installing the Disk Subsystem

First, the hard disk and controller must be installed in the AT and formatted for use by the Adaptec controller. See Sections 2 (Hardware Installation) and 3 (Software Installation).

During the software installation process (Section 3 of the ACB-23XX User's Manual), it is necessary to create a volume on the hard disk. At this point, a single partition must be created that contains all of the available cylinders on the drive. (Follow the instructions given for preparing a disk for use with DOS 3.3.

When the hard disk has been successfully formatted with a single volume for the entire disk, you are ready to proceed with the installation of the Xenix operating system.

Installing the UNIX Operating System

To install Unix, follow the installation instructions given in the ISC Unix 386/ix User's Manual titled "Using 386/ix Products Managing 386/ix Products. The instructions are given in Section 3, "Installation Procedure".

III Installing OS/2

OS/2 Installation Procedure and Adaptec ACB-23XX Compatibility with MS OS/2 and IBM OS/2

OS/2 Compatibility

Adaptec ACB-23XX controllers have been tested successfully with IBM OS/2 version 1.0. However, due to a problem discovered with Microsoft's version of OS/2, any 1:1 interleave hard disk controller is not compatible with the current MS OS/2 revision 1.0. A specific revision of the Microsoft OS/2 hard disk device driver is required for reliable operation of any ACB-23XX product with MS OS/2 1.0.

New DISK01.SYS required for MS OS/2 Operation

The name of the device driver that must be replaced is DISK01.SYS. This device driver is available from Microsoft, although a specific revision number of the file was not available at the time this note was written. However, the driver can be referenced as the latest revision of DISK01.SYS. For those on the Microsoft developers program, it is also available on the Microsoft developers bulletin board as DISK01.NEW. Also, the new revision of the device driver will be supplied in the next release of OS/2 from Microsoft. This driver was originally made available to correct problems observed when MS OS/2 was used on Compaq 386 machines with a 1:1 interleave, ESDI hard disk subsystem. The failure mode, observed when using the DISK01.SYS supplied with MS OS/2 1.0, was a random rebooting of the system during, and/or after, reading data from the hard disk.

Microsoft OS/2 versions 1.0 and 1.02, with the replacement disk device driver (described above), have been tested with the ACB-23XX controllers and were found to be fully compatible.

Windows Compatibility

Microsoft Windows 286 and Windows 386 have both been tested and are fully compatible with Adaptec's ACB-23XX products. Both software packages work whether invoked from the DOS operating system, or from the DOS compatibility window under the OS/2 operating system.

OS/2 Installation

Disk preparation under OS/2 is very similar to DOS disk preparation. OS/2 uses the FDISK.COM and FORMAT.COM programs to create and format OS/2 partitions on the fixed disk. The following instructions outline basic fixed disk preparation, and OS/2 installation.

First, the hard disk and controller must be installed in the AT and formatted for use by the Adaptec controller. See Sections 2 (Hardware Installation) and 3 (Software Installation) of the Adaptec ACB-23XX User's Manual. You will need the DOS operating system and DEBUG utility to successfully complete this installation. OS/2 does not have a DEBUG-like utility.

During the software installation process (Section 3 of the ACB-23XX User's Manual), it is necessary to create a volume on the hard disk. At this point, a single partition must be created that contains all of the available cylinders on the drive. (Follow the instructions given for preparing a disk for use with DOS 3.3).

When the hard disk has been successfully formatted with a single volume for the entire disk, you are ready to proceed with the installation of the OS/2 operating system.

Finally, insert the OS/2 installation diskette in the floppy drive, and press Ctrl+Alt+Del to reboot the system. The OS/2 operating system will boot and the installation program will automatically guide you through the FDISK and FORMAT procedures for your fixed disk, as well as completing the OS/2 installation.

IV Installing Novell 2.0A

Novell 2.0a Software Patch for use with Adaptec ACB-23XX Disk Controllers

This software patch allows Novell Advanced NetWare to operate with the Adaptec ACB-23XX family of products. The patch provides support for hard disks with greater than 17 sectors per track. This patch may be used with the following versions of Novell NetWare. Novell 2.0a /SFT-1, and /SFT-2

The Files to be modified

For the /SFT versions of Novell 2.0a, the following files, found on the Installation diskette, must be modified:

COMPSURF.EXE

INSTALL.EXE
DISKED.EXE
LOADER.DAT, and

The following additional files, found on the Genos-4 diskette, must also be modified:

NET\$OS.OBJ
PREPARE.EXE

Patching the Files

Using an editor capable of modifying executable files, (Norton Utilities, AT86, etc.) the following strings of machine code must be changed in each of the files listed above for your version of Novell 2.0a. The procedure for making these changes consists of: first loading the file into memory, then searching the file for the hexadecimal string to be modified, and finally, changing the appropriate bytes as shown below. Note that some of these strings may appear more than once in a single file.

ORIGINAL
HEX STRING CHANGE TO NEW HEX STRING FOR:

17 sect/trk	26 sect/trk	34 sect/trk	35 sect/trk	36 sect/trk
8AC1241F	8AC1241F	8AC1243F	8AC1243F	8AC1243F
FE22	FE34	FE44	FE46	FE48
EE22	EE34	EE44	EE46	EE48
3C12	3C1B	3C23	3C24	3C25
B911	B91A	B922	B923	B924
B96400BAF701	B90002BAF701	B90002BAF701	B90002BAF701	B90002BAF701

The last change listed is in the LOADER.DAT file only.

80E11F	80E11F	80E13F	80E13F	80E13F
--------	--------	--------	--------	--------

You must still modify your system BIOS to provide a drive type table with the correct number of cylinders and sectors per track for Novell 2.0a to run. After low-level format, the Adaptec BIOS must be disabled by removing the BIOS address selection jumper from the controller (i.e, remove any jumper from J11 on ACB-2322). Novell 2.0a does not support a disk with capacity greater than 250 MBytes. The system BIOS drive type table must specify less than 250 MBytes worth of storage. Use the following to calculate the maximum number of cylinders that may be specified:

$$\text{MAXIMUM NUMBER OF CYLINDERS} = \frac{512,000}{\text{SECTORS PER TRACK} * \text{HEADCOUNT}}$$

Unpredictable results may occur when attempting to use a disk with greater than 250 MBytes of storage.

V Installing Novell 2.1

Tech Note DISK MANAGER-N

Ontrack's DISK MANAGER-N (DMN) is a software package that allows the preparation and installation of disk drives as Novell file servers. With DMN's preparation software a disk can be installed 28 times faster than with Novell's Compsurf. DMN also provides for the installation of disk drives not listed in the file server computer's BIOS. This allows users to select disk drives of their own choice.

Up until now, DMN would only run with NetWare compatible controllers. We are very pleased to announce that this is no longer the case. DISK MANAGER-N Version 2.3 due to be released in April, 1988 will contain support for the following Adaptec controllers:

ACB-2370 RLL

ACB-2372 RLL w/floppy

ACB-2320 ESDI

ACB-2322 ESDI w/floppy

DMN is compatible with Advanced NetWare 2.0A and 2.1 and Entry Level Systems 2.0 and 2.1.

Due to the limitation of 1024 cylinders on any given drive the maximum capacity is 286 MB/disk.

ONTRACK's next release DMN version 3.0 due in June will alleviate the 1024 cylinder barrier.

If you have any questions, please feel free to give us a call at 1-800-752-1333.

VI Adaptec Autoconfiguration

Auto-configuration for non-listed drive types.

In DOS 3.X, Interrupts 60-67 are available for use as vectors to user programs.

Adaptec 23XX controllers use the memory space occupied by Int 60-67 as a data area, instead of for vector pointers. We store the drive parameters there, in a table. Sixteen bytes (Int 60-63) are for drive 1, and 16 bytes (Int 64-67) are for drive 2. these tables contain the true cylinder, head and sector count for each drive. This feature allows the user to install hard drives that do not match the standard list of drive types in the AT BIOS.

Occasionally, products such as expanded memory or disk caching, will want to use Interrupts 60-67 as vectors to their code. This will conflict with our use of these locations, because our drive table will be overwritten by their pointers.

For this special case, we have included an auto-configuration driver in your controller BIOS. This driver can be downloaded from your controller and put into a CONFIG.SYS file on your hard drive. At system boot, DOS will execute the device driver. With the driver installed, we do not use Int 60-67 to store the drive parameter table. Instead, the standard hard drive interrupts 41 and 46 are used as vectors to point to our drive table, which is now in a protected memory location reserved by DOS.

When to use the auto-configuration driver.

If you have created volumes using Adaptec's partitioning, and put the partitioning driver into a CONFIG.SYS file, then you do not need the autoconfiguration driver. (It is included in the partitioning driver.)

If you did not use Adaptec's partitioning driver, you may want to copy the auto-configuration driver into a CONFIG.SYS file on your boot disk. This will ensure that no software will conflict with your hard disk table. However, if you have no software that used Int 60-67, you can run without a device driver installed.

The following have been reported to need Int 60-67 locations:

Superpck Cache	Triangle CICS/PC Emulator
Desqview	Columbia Kermit
IBM Displaywrite 3	Wang Terminal-Emulator cards

How to use the auto-configuration driver

The auto-configuration driver is accessible by using the DEBUG program from your hard drive or your DOS floppy.

At the prompt enter:

```
A>DEBUG <CR>
-G=C800:5 <CR>
```

The Adaptec Disk Preparation Menu will come up on the screen. Choose option 4, "to generate Adaptec auto-configuration device driver". Now you can copy the driver into a file that you name. If your C drive is already formatted, you can copy the driver to C. (If not, then copy the driver to a file on your A: floppy. After your C drive is formatted, then copy the driver from A, over to the C drive.)

```
enter file name: C: ADAPTEC.DVR <CR>
```

A copy of the driver will now be written onto the specified drive. Now create or modify your CONFIG.SYS file to include the driver. If you have an already existing CONFIG.SYS file on your hard drive, then modify the file to have DEVICE = ADAPTEC.DVR as the first statement. If you do not have an existing CONFIG.SYS file, then create one in the following way:

```
C>COPY CON CONFIG.SYS <CR>
DEVICE = ADAPTEC.DVR <F6> <CR>
```

Now your drive table will be located in a protected area at boot time.

VII Driver and Operating System Support

Adaptec's ACB-23XX Family O/S Support Status

VENDOR	O/S	REVISION	AVAIL.	SUPPORT
Interactive Systems Corporation 2401 Colorado Ave. Santa Monica, CA 90404 213-453-8649	Unix 386/ix	1.03	Now	ACB-23XX
		1.04	Now	
Santa Cruz Operation 400 Encinal St. P.O. Box 1900 Santa Cruz, CA 95061-9990 408-425-7222	SCO XENIX V /286/386	2.2	Now	ACB-23XX
Microsoft Corp. 16011 N.E. 36th Way Box 97017 Redmond, WA 98073-9717 206-882-8080	PC/MS DOS	3.X	Now	ACB-23XX
	MS/OS/2 with DISK01.SYS	1.0	Now	ACB-23XX
Microport Systems 10 Victor Square Scotts Valley, CA 95066 800-722-UNIX 800-822-UNIX (In CA)	MS OS/2	1.02	Call Microsoft	ACB-23XX
		System V/386	2.2RLL	Now
Ontrack Computer Systems 6200 Bury Drive Eden Prairie, MN 55346 612-937-5815	Novell	2.0a	April	ACB-23XX
		2.1	April	
The Software Link 3577 Parkway Ln. Atlanta, GA 30092 404-448-5465	PC-MOS		Now	ACB-23XX max. 35 s/trk
IBM Corp. Old Orchard Rd. Armonk, NY 10504 914-765-1900	OS/2 Std.	1.0	Now	ACB-23XX
	OS/2 Std.	1.1	Now samples	ACB-23XX

VIII Using More Than 1024 Cylinders

Formatting and accessing drives with greater than 1024 cylinders using Adaptec's ACB-23xx controllers.

Adaptec ACB-23XX BIOS No. 412801-00C and later revisions contain a hard disk format utility that includes support for drives with greater than 1024 cylinders. The user interface for this utility is identical to that supplied in previous revisions of the BIOS. However, there are several steps that are required to make access to the cylinders beyond 1024 possible. Please read the Adaptec User's Manual for your controller, and become familiar with the format utility contained in the Adaptec controller BIOS (located at C800:5), before attempting to format your hard disk.

The first step in this installation is to format the hard disk. Follow the instructions exactly as they are presented in the User's Manual for initiating the format.

When the format completes it is then necessary to volume partition the drive. This is accomplished by selecting option 1 from the format utility main menu. The first 1024 cylinders on the drive may be partitioned exactly as described in the User's Manual.

Since DOS is not able to address the cylinders above 1024, cylinders 1024 and greater can only be accessed from an Adaptec Partition, using the Adaptec Partition Device Driver. This means that in order to access these cylinders, they must be included in a volume created in the Adaptec Volume Partition program (option 1 in the BIOS format routine). Create as many 32 MB or less volumes to include each of these cylinders in a partition. Then select the option to FDISK each of the volumes. Under the FDISK menu, you will need to create a single partition that uses all of the cylinders allocated to each volume. This process will also format the partition for use by the Adaptec device driver. When the partition format completes, select the appropriate option to activate the partition. When each of the Adaptec volumes has been created and prepared using FDISK, they will be accessible by the device driver.

At this point, the low-level format and volume partitioning of the hard disk will be complete. Exit the format utility and follow the instructions in the User's Manual for preparing the first 1024 cylinders of the disk for DOS using the FDISK.COM and FORMAT.COM utilities.

After the DOS format has been completed and the system transferred to the hard disk, be sure to transfer the Adaptec partition device driver from the controller BIOS onto the hard disk and create the appropriate entry in the system CONFIG.SYS file. Please see the User's Manual for complete instructions on installing the device driver in your system.

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