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Installation and Setup Information for Caviar Series 3.5-Inch Hard Drives

DRIVE	AC280	AC2120	AC1170	AC2170	AC2200	AC1210	AC2250	AC1270
Capacity (MB)	85.3	125	170.6	170.6	212.6	212.6	256.0	270.4
DRIVE	AC2340	AC1365	AC2420	AC1425	AC2540	AC2635	AC2700	AC2850
Capacity (MB)	341.3	365.4	425.3	426.8	540.8	639.9	730.8	853.6
DRIVE	AC21000	AC21200	AC31000	AC31200	AC31600	AC32100	AC32500	AC33100
Capacity (MB)	1083.8	1281.9	1083.8	1281.9	1624.6	2111.8	2559.8	3166.7

Setting the Drive Jumpers

All Caviar drives have a jumper block (J8) located between the 40-pin data connector and the 4-pin power connector on the drive. These jumpers select options on the hard drive. The Caviar drive is factory set for a single drive installation.

All newer Caviar drives are shipped with a jumper shunt in the neutral storage position (across pins 5 and 3) for future dual drive use. See Figure 1.

If you are installing the Caviar drive as the only EIDE drive in your system, leave the jumper shunt in the neutral storage position or remove the jumper and store it in a safe place for future use. **Jumper shunts are not required for single drive installations.**

In dual drive installations, jumper shunts are required to designate which drive is master and which is slave.

Refer to Figure 1 for an illustration of all jumper settings.

- If you have a dual installation (two EIDE drives or one EIDE drive and one IDE drive), you must designate one of the drives as the master and the other as the slave. The jumper pins on block J8 need to be configured for the dual installation.
- For a non-Western Digital drive, consult its installation guide for master/slave configurations. See the *Non-Western Digital Drives* section on page 4 of this document.

To designate the Caviar drive as the master, place a jumper shunt across pins 5-6.

To designate the Caviar drive as the slave, place a jumper shunt across pins 3-4.

To install a jumper shunt on the J8 jumper pins:

1. Refer to the previous descriptions and Figure 1 to determine your configuration.
2. Carefully place the shunt over the two pins specified in Figure 1.
3. Push the shunt into place until it is flush against the base of the jumper block.

Note: Designation of a drive as either master or slave is determined by jumper configuration, not by the order in which it is cabled to the other drive.

Drive Rails

Some computer systems have 5.25-inch drive bays that require unique sliding drive rails to complete the hard drive installation. Each system manufacturer has a different type of drive rail and for this reason, rails are not included with Western Digital hard drives.

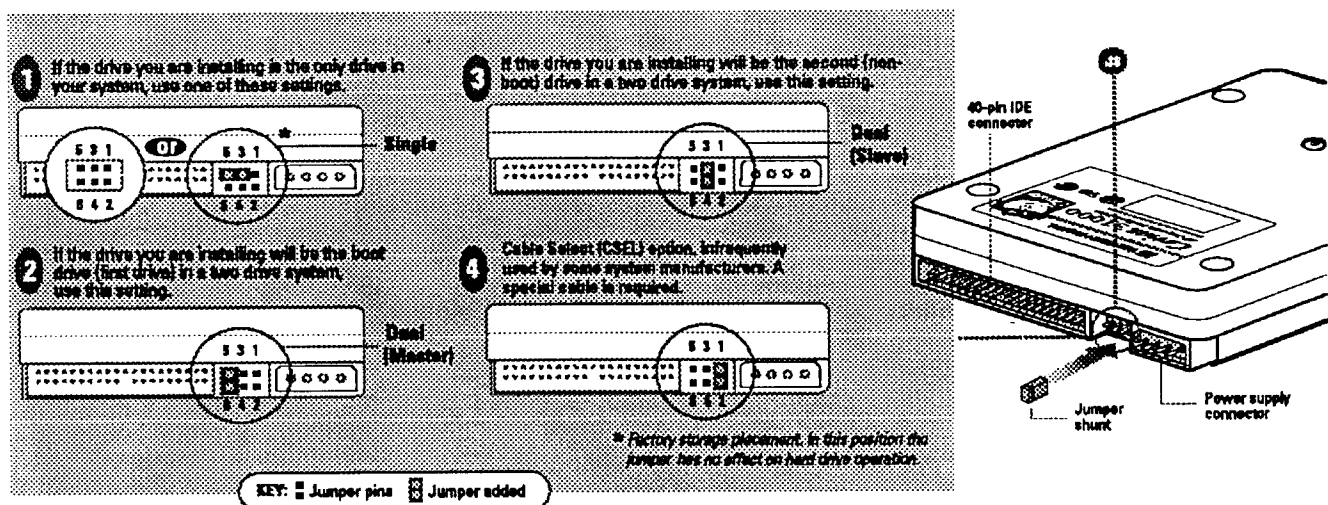


Figure 1. Jumper Settings for Western Digital Hard Drives

If your system requires drive rails, you must contact the computer system manufacturer directly to obtain the rails for your particular system. The following is a list of the most common system and BIOS manufacturers and their corresponding phone numbers.

System Manufacturers:

AST	(800) 727-1278
Compaq	(800) 652-6672
Dell	(800) 624-9896
Digital	(800) 354-9000
Gateway 2000	(800) 846-2000
IBM	(800) 772-2227
NEC	(800) 388-8888
Packard Bell	(800) 733-4411

BIOS Manufacturers:

AMI	(770) 263-8181
Award	(415) 968-4433
Micro Firmware (Phoenix BIOS's only)	(405) 321-8333
MR BIOS	(508) 686-6468
Phoenix	(617) 551-4000

Preparing the Caviar Drive for Use

Your Caviar drive has been low-level formatted at the factory. The hard drive is ready to set up and is defect-free. The drive must be partitioned and high-level formatted so it can accept files. This section provides guidelines for preparing your drive. Consult your operating system documentation for complete information on preparing the drive for use with your operating system.

The computer system provides an initial setup utility that you access with a series of key strokes or run from a floppy diskette or CD ROM. System setup procedures vary from system to system, but each setup procedure allows you to tell the system what type of hardware you are using. Follow the setup instructions in your computer system manual.

One step in the setup procedure asks you to specify the type of hard drive used in your system.

Drive	Recommended Parameters*	Maximum Total Sectors
Caviar AC280 **	980 x 10 x 17	166,628 **
Caviar AC2120 **	872 x 8 x 35	244,182 **
Caviar AC1170	1010 x 6 x 55	333,300
Caviar AC2170	1010 x 6 x 55	333,300
Caviar AC2200 **	989 x 12 x 35	415,408 **
Caviar AC1210	989 x 12 x 35	415,380
Caviar AC2250	1010 x 9 x 55	499,950
Caviar AC1270	917 x 12 x 48	528,192
Caviar AC2340	1010 x 12 x 55	666,600
Caviar AC1365	708 x 16 x 63	713,664
Caviar AC2420	989 x 15 x 56	830,760
Caviar AC1425	827 x 16 x 63	833,616
Caviar AC2540	1048 x 16 x 63	1,056,384
Caviar AC2635	1240 x 16 x 63	1,249,920
Caviar AC2700	1416 x 16 x 63	1,427,328
Caviar AC2850	1654 x 16 x 63	1,667,232
Caviar AC21000	2100 x 16 x 63	2,116,800
Caviar AC21200	2484 x 16 x 63	2,503,872
Caviar AC31000	2100 x 16 x 63	2,116,800
Caviar AC31200	2484 x 16 x 63	2,503,872
Caviar AC31600	3148 x 16 x 63	3,173,184
Caviar AC32100	4092 x 16 x 63	4,124,736
Caviar AC32500	4960 x 16 x 63	4,999,680
Caviar AC33100	6136 x 16 x 63	6,185,088

* The parameters shown are in order of cylinders, heads, and maximum sectors per track.
 ** The total sectors for these drives are not the product of the recommended parameters.

Table 1. Recommended Drive Parameters

There is no standard drive type for these Caviar drives. Use the setup utility to examine the available drive tables.

Choose a drive type that comes as close as possible to the recommended parameters listed in Table 1.

Note: Do not exceed the "maximum total sectors" as shown in Table 1 above.

The system's Basic Input/Output System (BIOS) may request values for write precompensation and landing zone. Refer to Table 1 or the drive label for cylinder, head, sector information. The CMOS precompensation and landing zone values should be set to the number of cylinders. See your system manual for BIOS restrictions. The drive's controller electronics eliminate the need to specify these parameters and will ignore this information.

To calculate the number of sectors a drive type supplies, multiply the number of cylin-

ders by the number of heads by the number of sectors on each track. For example, a drive type with 1010 cylinders, 6 heads, and 55 sectors supplies 333,300 sectors (1010 x 6 x 55). Use the values for cylinders, heads, and sectors shown in Table 1.

BIOS Barriers

There are two system BIOS issues that might affect the installation of your Western Digital hard drive. One of these is the 528 MB barrier imposed by system BIOSs manufactured prior to 1994. The other is the 2.1 GB BIOS barrier that might occur in systems manufactured before early 1996.

The 528 MB Barrier: The 528 MB capacity barrier is due to addressing variations between the ATA and the INT13 interfaces. The ATA interface (between the hard drive and the BIOS) accommodates a cylinder number of 16 bits and a head number of 4 bits. The INT13 interface (between the BIOS and DOS) allows 10 bits for the cylinder

number and 8 bits for the head number. These incompatibilities limit the two interfaces to the lowest common denominator. Therefore, the address is limited to 10 bits for the cylinder number, 4 bits for the head number, and 6 bits to identify sectors. The resulting drive geometry is 1024 x 16 x 63 x 512 bytes/sector = 528.48 MB.

- Many systems with AUTO setup options for drive type selection make use of the Identify Drive command to automatically determine the number of cylinders, heads, and sectors per track. Those drives that exceed 528 MB (AC2540, AC2635, AC2700, AC2850, AC21000, AC21200, AC31000, AC31200, AC31600, AC32100, AC32500 and AC33100), return default cylinder counts that are greater than the DOS limitation of 1024 cylinders. Many systems truncate this to 1024 cylinders to achieve the maximum usable drive space under DOS (528 MB).
- Other systems, which do not accommodate drives with capacities greater than 528 MB, truncate to much lower cylinder counts, giving you much less than 528 MB. This usually can be resolved by entering your CMOS system setup and selecting USER DEFINED, rather than AUTO drive types, on systems that have these options. Using the USER DEFINED settings, you can manually specify 1024 cylinders, 16 heads, and 63 sectors per track, which gives you 528 MB of usable drive space.
- Most newer systems (1994 and later) are capable of using the full capacity of these drives with the help of a translating BIOS. A translating BIOS alters the drive parameters reported to DOS so that the cylinder count is within the 1024 cylinder limitation. This is usually done by increasing the number of heads seen by DOS and reducing the corresponding cylinder count.

For example, on the AC2540 drive, a translating BIOS sets the parameters of the drive to the full 1048 cylinders by 16 heads by 63 sectors per track, but presents a drive to DOS as 524 cylinders by 32 heads by 63 sectors per track.

If your system's BIOS does not support drives that exceed 528 MBs, you need a translating BIOS (either a BIOS chip upgrade or the addition of a BIOS upgrade add-in card) or software which can overcome the barrier by emulating a translating BIOS.

As shown in the chart of hard drives, which appears on the first page of this document, Western Digital offers a number of drives whose capacity exceeds 528 MB. These drives are shipped with installation software that allows you to access your drive's full capacity for DOS and Windows applications. For information on using this software, see the Installation Guide that is included with these drives.

The 2.1 GB Barrier: Some translating BIOSs are limited to 4095 cylinders. The resulting geometry of 4095 cylinders, 16 heads, 63 sectors and 512 bytes/sector means that these BIOSs can only recognize drive capacities up to 2.1 GB.

The problem is further compounded by the number of BIOS manufacturers and BIOS upgrades. Depending on the method of implementing the translating BIOS, there are several scenarios that may occur when drives larger than 2.1 GB (AC32500 and AC33100) are installed in a system.

- Many system BIOSs limit higher capacity drives to 2.1 GB.
- Other system BIOSs may truncate the cylinder number to 12 bits ($2^{12} = 4096$ cylinders), thereby limiting drive capacity to approximately 400 MB. A loss of 2.1 GB on a 2.5 GB drive!
- Some systems hang at boot time when the BIOS detects a drive with 4096 or more cylinders. This makes it impossible to boot to the floppy drive or enter CMOS setup, thereby eliminating the possibility of using software device drivers to correct the problem.

While the newest systems will undoubtedly implement the necessary BIOS changes, system BIOSs manufactured before early 1996 may require a fix in order to achieve the full use of drive capacities exceeding 2.1 GB.

Western Digital recommends that its customers revise the CMOS setup according to the instructions in the Installation Guide and then install the software utility provided. If the system locks up, then alternate solutions are described in the BIOS Barriers product bulletin or the Installation Guide.

Automatically Partitioning and Formatting the Drive

Partitioning allows you to divide your drive into multiple sections which function as separate drives. Formatting creates the root directory, file allocation table, and other basic configurations.

There are two ways to format and partition your hard drive. You can use the installation software that you received with your drive or you can use the DOS utilities.

Note: Western Digital recommends that you back up the data on your existing hard drives before formatting or partitioning your new drive.

Installation Software: We strongly recommend using the installation software to speed up and simplify the partitioning process. Also, if your system BIOS does not allow you to access the full capacity of your drive, the software will resolve this problem.

Ontrack Disk Manager and EZ-Drive cannot co-exist in the same system. If you are installing EZ-Drive on a system that already has Ontrack Disk Manager, you must convert the existing Ontrack Disk Manager partitions to EZ-Drive. Only the latest version(s) of EZ-Drive will convert multiple Ontrack Disk Manager partitions to EZ-Drive. Check the BBS or on-line services for the latest version of EZ-Drive.

To convert Ontrack Disk Manager partitions to EZ-Drive partitions:

1. Insert the EZ-Drive diskette and select *Fully Automated Installation* from the main menu.
2. EZ-Drive will detect Ontrack Disk Manager partitions and ask if you want to convert the partitions to EZ-Drive.

EZ-Drive will then convert the Ontrack Disk Manager partitions to EZ-Drive partitions.

Note: Even though EZ-Drive will make every effort to convert your Ontrack Disk Manager partitions without data loss, Western Digital recommends that you back up your data before selecting this option.

To Install EZ-Drive: If you have EZ-Drive software, select *Custom Installation* and follow the prompts.

To Install Ontrack Disk Manager: If you have Ontrack Disk Manager software, select *Advanced Disk Installation*, then select the *Automatic Partition Selection* menu. Follow the prompts.

Using DOS to Partition Your Drive: Your version of DOS determines how the drive is partitioned. We recommend that you upgrade to version 5.0 or later. Newer versions automatically partition and format the drive during DOS installation without requiring you to manually run the FDISK and FORMAT utilities.

Manually Partitioning and Formatting the Drive

Manual partitioning and formatting is another drive preparation option, however, it is more involved.

Manually Partitioning Your Hard Drive Using FDISK: Use the DOS FDISK.EXE utility to display a series of menus that help you partition your hard drive for DOS. FDISK.EXE

automatically assigns drive IDs to the partitions. DOS versions 3.3 and higher allow you to create a primary partition, create an extended partition, change the active partition, delete a partition, and display partition data. Refer to your operating system manual for more information on partitioning drives.

1. Insert your DOS system diskette into drive A.
2. Reboot the system by simultaneously pressing CTRL, ALT, and DEL. Make sure the DOS diskette with FDISK.EXE (located on the diskette) is inserted in drive A.
3. Type **FDISK** at the A: prompt.
4. Press the ENTER key.
5. Follow the default options. For more information, refer to your DOS manual.

Formatting the Drive using FORMAT: If your Caviar drive is replacing the existing drive, you must also manually format your drive if you have an older version of DOS (earlier than 5.0). To manually format your drive and make the drive bootable, you must type the following: **FORMAT C:/S**

Newer versions of DOS automatically format during DOS installation. **You do not need to perform a low-level format.**

If you are installing the Caviar as a second hard drive, you need to use FDISK and FOR-

MAT utilities unless you plan to reinstall DOS on the first hard drive using DOS 5.0 or higher.

When using FDISK, make sure that you have selected the second drive. Do not delete any partitions that already exist on the first drive. **Doing so will result in lost data.**

When using FORMAT, make sure that you select the proper drive letter in the FORMAT command line. Format the next drive letter after your last existing partition. **Formatting a partition that already contains data will result in the loss of that data.**

If you designated other drives or partitions during the FDISK.EXE routine, you must format those drives as well.

For example, type **FORMAT D:** at the A: prompt, and then press ENTER. Continue the format process until you have formatted all drives. When the formatting process is complete, copy all DOS files from the floppy onto your hard drive. For more information on formatting, refer to your operating system documentation.

Booting the System

After you have properly formatted your drive(s) and copied the operating system, you are ready to use the computer. Boot the

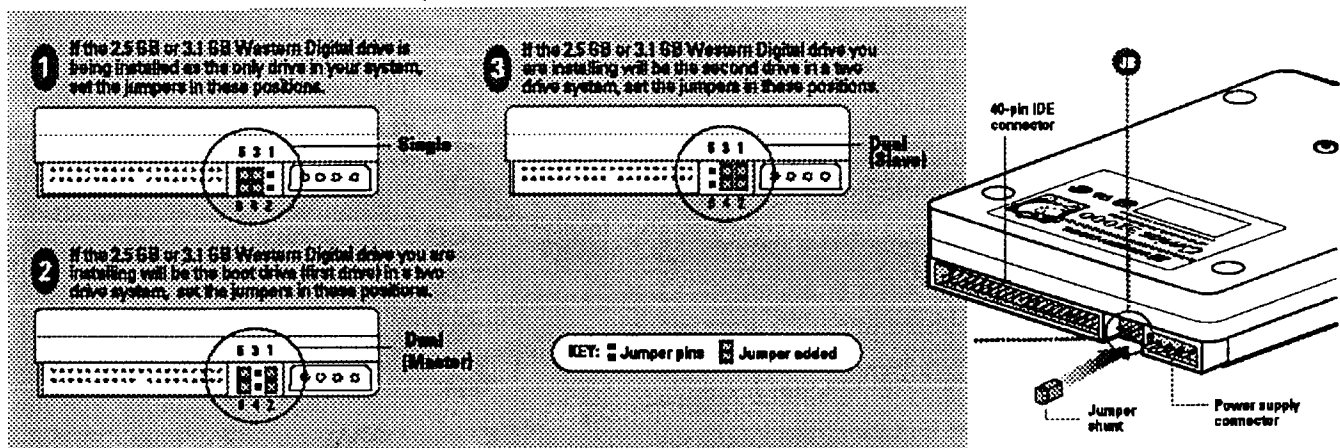


Figure 2. Jumper Settings for 2.5GB or Larger Hard Drives

system from the active operating system drive, usually C. *Be sure to remove any diskettes from drive A before booting.* To boot the system:

1. Simultaneously press CTRL, ALT, and DEL.
2. The system should respond, and the monitor should display **C>** after you have entered the current date and time.

Refer to your system documentation for more information on booting the system.

If the system will not boot, or if you are unable to access the new drive, refer to your operating system documentation. Verify that you ran the system utilities correctly, specified the correct drive tables, designated an active partition, and partitioned and formatted the hard drive correctly. If your system still won't boot, you may have improperly installed or connected the drive. Refer to the *Troubleshooting* section of this document for more information.

Hard Drives Larger Than 2.1 GB

This section pertains to the 2.5 GB and 3.1 GB drives only. These drives have more than 4095 cylinders. Some system BIOSs CANNOT properly recognize hard drives that have more than 4095 cylinders.

You will know if your system BIOS has this limitation after installing your drive. On the initial boot your system may A) lock up, or B) show a much smaller drive capacity.

A) If your system does not respond after two minutes (i.e., locks up), follow these steps:

1. Turn your system power off, check the IDE interface and power supply cables.
2. Check jumper settings.
3. Turn your system power on.
4. Try to enter your CMOS setup.

If your system still doesn't respond, it may be because you have a system BIOS that doesn't support drives with more than 4095 cylinders. If this is the case, these solutions are available:

1. Use EZ-Drive installation software.
If your system locks up before you can enter CMOS, you may need to turn your system power off and disconnect the IDE cable from the system to access your CMOS setup.
 - Enter your CMOS setup. Refer to your system manual for instructions.
 - Select the Hard Disk Type option for the new Western Digital hard drive. Select a *user defined* drive type and enter: 1023x16x63.
 - Reconnect your IDE cable to the system.

These new settings will allow your system to boot so that you can install EZ-Drive to access the full capacity of your drive.

- Or -

If you don't have a *user defined* drive type, use option 2 or 3 below. This option changes the parameters reported to the BIOS. In the future, if you move this drive to another sys-

tem, you must put the jumper back to the standard position.

2. Rejumper the drive as shown in Figure 2 on the previous page, and install EZ-Drive.

Note: These special jumper settings WILL NOT work for OS/2 Warp, Novell NetWare, or Unix.

- Or -

3. Upgrade your BIOS.
A properly upgraded BIOS will support the drive. Contact your system manufacturer. See page 2 for a list of common system and BIOS manufacturers and their phone numbers.

B) Smaller Drive Capacity Reported: If your drive shows a much smaller capacity than it actually is, install EZ-Drive to get around the system BIOS limitation.

Non-Western Digital Drives

If you are installing your new Western Digital hard drive with a non-Western Digital hard drive, you may have to contact the other manufacturer for master/slave jumper configuration information.

Note: Drives on the secondary IDE port conform to the same requirements for master/slave configuration as the primary IDE port.

As of the date of this publication the phone numbers are:

Conner	(408) 456-3200
IBM	(914) 765-1900

DRIVE	AC280	AC2120	AC1170	AC2170	AC2200	AC1210	AC2250	AC1270
Capacity (MB)	85.3	125	170.6	170.6	212.6	212.6	256.0	270.4
CMOS (MB)	81	119	162	162	202	202	239	257
CHKDSK (MB)	85.3	125	170.6	170.6	212.6	212.6	256.0	270.4
DRIVE	AC2340	AC1365	AC2420	AC1425	AC2540	AC2635	AC2700	AC2850
Capacity (MB)	341.3	365.4	425.3	426.8	540.8	639.9	730.8	853.6
CMOS (MB)	325	348	405	407	515	610	696	814
CHKDSK (MB)	341.3	365.4	425.3	426.8	540.8	639.9	730.8	853.6
DRIVE	AC21000	AC21200	AC31000	AC31200	AC31600	AC32100	AC32500	AC33100
Capacity (MB)	1083.8	1281.9	1083.8	1281.9	1624.6	2111.8	2559.8	3166.7
CMOS (MB)	1033	1222	1033	1222	1549	2035.6	2441.2	3020.0
CHKDSK (MB)	1083.8	1281.9	1083.8	1281.9	1624.6	2111.8	2559.8	3166.7

Table 2. CMOS and CHKDSK Megabytes for Caviar Drives

Maxtor (408) 432-1700
 Quantum (408) 894-4000
 Seagate (408) 438-8222

Using the Drive

It is extremely important to regularly back up the data on your hard drive. Data can be damaged or lost due to a number of unanticipated factors.

Consult your operating system documentation for back-up instructions and procedures.

Troubleshooting

This section lists procedures to resolve problems you may encounter when installing the Caviar hard drive.

- Refer to your system documentation to be sure that you followed the setup procedures correctly.
- Make sure that you partitioned and formatted the EIDE drive and any additional drive with the EZ-Drive or Ontrack Disk Manager installation software or DOS FDISK.EXE and FORMAT.COM utilities. (If you are making this drive bootable, remember to specify the /S parameter.) Refer to your operating system documentation to check these procedures.
- If using DOS 3.3 and above, be certain to make one partition active during formatting.
- Check the physical installation of your system. Make sure:
 - The jumper selections on the drive are correct for your installation.
 - The cables are correctly connected and seated.
 - The adapter card, if required, is properly seated, connected, and configured.
 - Power is properly connected to your system and the system is plugged in.

- There is not an ST506 AT controller in the system. Another 16-bit (AT) hard drive controller cannot be used in the same system as the Caviar drive.

A short list of commonly asked questions along with their solutions follows.

Q: I get the message "HDD Controller Failure" after installing my Western Digital hard drive.

A: This is a normal occurrence and may happen when you first boot the system after installing the hard drive. Press F1 to continue. If the message continues to display, retrace the steps outlined for CMOS setup, cabling, and jumper configuration.

Make sure these instructions have been done correctly. Then follow the instructions for using EZ-Drive (or Ontrack Disk Manager) or FDISK and FORMAT to install the operating system.

Q: Do I need to run FDISK and FORMAT?

A: Not if you installed EZ-Drive or Ontrack Disk Manager software.

BUFFER TO HOST DATA TRANSFER RATE (MB PER SECOND)			
DRIVE	SUSTAINED	BURST (PIO) *	BURST (DMA) **
Caviar AC280	4.5	NA	NA
Caviar AC2120	4.5	NA	NA
Caviar AC1170 ***	5.75	11.1	NA
Caviar AC2170	5.0	NA	NA
Caviar AC2200	5.0	NA	NA
Caviar AC1210	5.75	11.1	13.3
Caviar AC2250 ***	5.75	11.1	NA
Caviar AC1270	6.0	11.1	13.3
Caviar AC2340 ***	5.75	11.1	13.3
Caviar AC1365	5.26	11.1	13.3
Caviar AC2420	5.75	11.1	13.3
Caviar AC1425	5.26	11.1	13.3
Caviar AC2540	6.0	11.1	13.3
Caviar AC2635	5.26	11.1	13.3
Caviar AC2700	5.26	11.1	13.3
Caviar AC2850	5.26	11.1	13.3
Caviar AC21000	12.5	16.6 (Mode 4 PIO)	16.6 (Mode 2 DMA)
Caviar AC21200	12.5	16.6 (Mode 4 PIO)	16.6 (Mode 2 DMA)
Caviar AC31000	5.26	11.1	13.3
Caviar AC31200	5.26	11.1	13.3
Caviar AC31600	12.5	16.6 (Mode 4 PIO)	16.6 (Mode 2 DMA)
Caviar AC32100	12.5	16.6 (Mode 4 PIO)	16.6 (Mode 2 DMA)
Caviar AC32500	12.5	16.6 (Mode 4 PIO)	16.6 (Mode 2 DMA)
Caviar AC33100	12.5	16.6 (Mode 4 PIO)	16.6 (Mode 2 DMA)

* Maximum PIO Burst Rate is specified via the use of the IORDY (I/O Channel Ready) signal.
 ** Maximum DMA Burst Rate is specified using both the DMARQ and DMACK signals.
 *** Some earlier versions of these drives do not support burst PIO rates.

Table 3. Data Transfer Rates for Caviar Drives

DRIVE	SEEK TIME (ms)
Caviar AC280	17
Caviar AC2120	15
Caviar AC1170	13
Caviar AC2170	14
Caviar AC2200	14
Caviar AC1210	13
Caviar AC2250	13
Caviar AC1270	11
Caviar AC2340	13
Caviar AC1365	10
Caviar AC2420	13
Caviar AC1425	10
Caviar AC2540	11
Caviar AC2635	10
Caviar AC2700	10
Caviar AC2850	10
Caviar AC21000	sub 11
Caviar AC21200	sub 11
Caviar AC31000	10
Caviar AC31200	10
Caviar AC31600	sub 10
Caviar AC32100	sub 12
Caviar AC33100	sub 12
Caviar AC32500	sub 12

Table 4. Caviar Seek Times (ms)

Q: What is a megabyte?

A: Hard drive suppliers define a decimal megabyte as 1,000,000 bytes (10^6). Alternatively, a binary megabyte is defined as 1,048,576 (2^{20}). This is why different utilities will display different numbers of megabytes available for the same drive. The values in Table 2 below are determined by defining a megabyte as follows:

Capacity	Megabytes
CMOS (MB)	binary megabytes
CHKDSK (MB)	decimal megabytes

Q: Do I have to do anything to my original hard drive when adding yours to it?

A: Yes, one hard drive must be designated as a master, and the other as a slave. Consult your original hard drive's documentation for master/slave jumper positions. See "Non-Western Digital Drives" on page 5. If disk compression software was used on the original hard drive, consult your disk compression documentation before adding another drive.

Q: What should I check if my system will not start after I turn the power on?

A: Ensure that:

1. The IDE controller card, if installed, is properly seated and connected.
2. The connections at both ends of the hard drive cable are secure and correctly oriented.
3. The jumper selections on your hard drive(s) are correctly set for your installation.
4. The drive is connected to the computer's power supply via the 4-pin power connector.

Q: I can't boot DOS from my newly installed hard drive or access the hard drive after I've completed the software installation.

A: Check the system to make sure:

1. You entered the correct hard drive parameters during your system setup procedure.
2. Some CMOS system setup utilities might have a boot sequence option. If yours does, verify that the boot sequence is A:

then C:. Not all CMOS setup utilities have this option.

3. You correctly partitioned (via the operating system FDISK utility) and formatted (via the operating system FORMAT utility) your newly installed hard drive.
4. You made your primary drive bootable (formatted with /S option).
5. During the FDISK procedure you marked your bootable partition active.

Q: My drive will not spin up or spins down after a few seconds.

A: Ensure that:

1. Your power connector is in securely and working properly.
2. The orientation of pin socket 1 on the 40-pin IDE cable matches pin 1 on the connector.
3. The drive type in your CMOS setup is correct.

Q: I don't see the full capacity of my hard drive when installing DOS. I am limited to 528 MB partition.

A: There are two issues affecting the installation of your hard drive: 1) hard drives that have more than 4095 cylinders (drives larger than 2.1 GB); and 2) most system BIOSs dated before 1994 don't recognize drives greater than 528 MB. To overcome this limitation, either install EZ-Drive or upgrade your system BIOS. Phone numbers for common BIOS manufacturers are on page 2.

If you installed EZ-Drive and then incorrectly booted to your DOS installation diskettes, you may have accidentally used DOS to overwrite your EZ-Drive partitions.

Q: Will my system BIOS support my Western Digital 2.1 GB or larger hard drive?

A: Some system BIOSs cannot recognize drive capacities greater than 2.1 GB. The 2.1 GB BIOS limitation does not apply to the AC32100, however, it may affect the AC32500 or AC33100 in some systems. Your drive comes with software that enables you to overcome this BIOS limitation. Refer to

the explanation of "BIOS Barriers" in this document and consult your Installation Guide for solutions to any particular BIOS limitation your system may be experiencing.

Q: What is the data transfer rate of my Caviar hard drive?

A: Refer to Table 3.

Q: The reported capacity of my hard drive is MUCH smaller than Table 2 shows it should be.

A: Your system BIOS improperly handles hard drives that report greater than 1024 cylinders. Use the supplied installation software to get the full capacity of your drive.

Q: What will happen if I install EZ-Drive on a hard drive that has Ontrack Disk Manager?

A: Even though EZ-Drive will attempt to convert the Ontrack Disk Manager partitions to EZ-Drive partitions, we recommend that you backup your files before installing EZ-Drive.

Q: How much memory does EZ-Drive use?

A: 5 KB.

Q: What is the average access or seek time of my Caviar hard drive?

A: Refer to Table 4.

Q: How can I get 32-bit disk access in Windows?

A: Use the 32-bit disk access driver included on the software installation diskette. Install the driver by running EZ-Drive's SETUP.EXE program, or use the DMCFG program if you have Ontrack Disk Manager.

Q: I am installing a new Western Digital drive onto a second IDE controller card (secondary port). How do I jumper it?

A: Refer to the standard jumpering options shown in Figure 1. If it's the only drive on the cable, jumper it as single. If it is paired with another IDE device, jumper it as master or slave.

Q: Will my drive work with Windows 95?

A: Yes. Your drive has been thoroughly tested in Western Digital's FIT Lab and is compatible with Windows 95.

Q: I have a 2.5 GB or larger drive. Can I create one partition only?

A: No. DOS has a 2.1 GB partition limitation. You must have at least two partitions to access the full capacity of your drive.

Q: My existing drive was installed using Ontrack Disk Manager. My new drive came with EZ-Drive. Can I just leave my existing drive as is and install EZ-Drive on my new drive?

A: No. Ontrack Disk Manager and EZ-Drive cannot coexist in the same system. If you install EZ-Drive on your new drive, you must convert the Ontrack Disk Manager partitions on your existing drive to EZ-Drive partitions. Your Installation Guide provides instructions.

Q: I've read the entire Troubleshooting section and I still cannot correctly install my drive.

A: If none of the solutions presented in this section are solving your problem there are other options available: 1) Read the README.CAV text file on the EZ-Drive or Ontrack Disk Manager diskette for additional troubleshooting information; 2) Check Western Digital's on-line services for a more comprehensive list of frequently asked questions. 3) Contact your dealer, or 4) Have the EZ-Drive diskette available and contact Western Digital Technical Support.

Technical Support

If you have further questions, contact your dealer or Western Digital Technical Support. The matrix on the following page is provided to streamline your phone support access. If you have a Hayes-compatible modem (2,400 to 28,800 baud), you can access the Western Digital Bulletin Board at (714) 753-1234. The format is 8 data bits, 1 stop bit, no parity. The Technical Support Fax number is (714) 932-4012.

Documentation Resources

These reference documents can be obtained by calling Western Digital at the service and literature numbers listed in the next column.

- BIOS Barriers Product Bulletin (79-880099-000)
- Caviar Series AC2850, AC21000, AC31000, AC21200, AC31200, AC31600, AC32100, AC32500 and AC33100 Installation Guide (79-870027-001)

On-line Services

On-line services include general product and contact information, downloadable drivers, and frequently asked questions.

Internet:
www.wdc.com

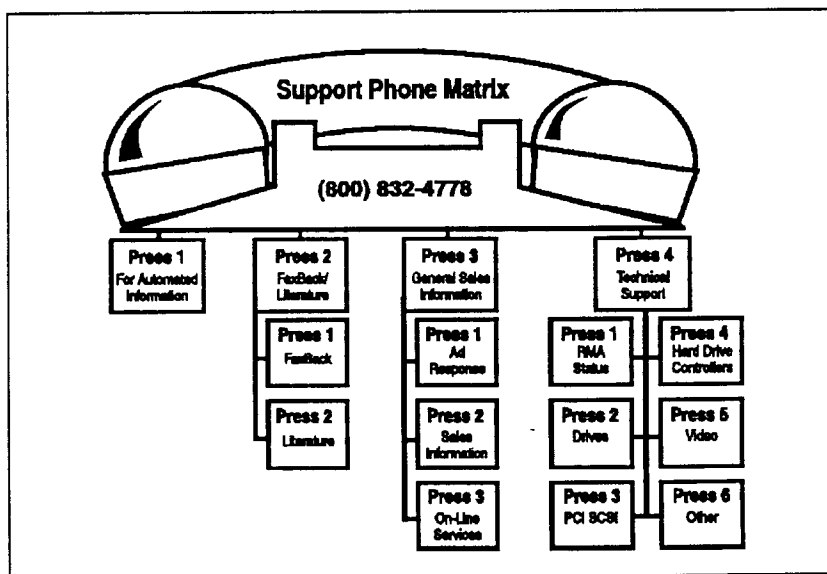
FTP Site:
ftp.wdc.com

America Online:
Keyword: Western Digital

Microsoft Network:
Keyword: WDC

Western Digital
8105 Irvine Center Drive
Irvine, California 92718

For Service and Literature:
(714) 932-4900 (Inside the U.S.)
(714) 932-5000 (Outside the U.S.)
DocuFAX: (714) 932-4300



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Caviar®

	AC32100	AC32500
Form Factor	3.5-inch	3.5-inch
Interface	AT-EIDE	AT-EIDE
Formatted Capacity	2.1 GB	2.5 GB
Average Seek Time	Sub 12 ms	Sub 12 ms
Data Transfer Rate	16.6 MB/s PIO Mode 4 16.6 MB/s DMA Mode 2	16.6 MB/s PIO Mode 4 16.6 MB/s DMA Mode 2
Spindle Speed	5200 RPM	5200 RPM
Buffer	128 KB	128 KB
MTBF	300,000 hours	300,000 hours
Warranty	3 years	3 years

* Western Digital defines a gigabyte (GB) as 1,000,000,000 bytes.

- Reliable Supplier**

The AC32100 and AC32500 leverage Caviar's successful architecture which incorporates Western Digital's proprietary chip set. This single architecture approach enables Western Digital to achieve the highest level of flexibility and ease of qualification in the industry and to maintain its excellent record for time to market. Substantially improved yields, rapid cost reductions, higher productivity and asset management leadership are the direct result of this innovative design philosophy.

- Just In Time (JIT)**

Customers can receive products within 24 hours after placing an order. This "Just In Time" approach gives customers the flexibility of on-demand product availability without the cost of maintaining a high volume of inventory.

- Customer-focused**

We've built a reputation as a customer-oriented company. Western Digital is the first U.S.-headquartered, multinational company to have been awarded company-wide ISO 9001 registration, linking all Western Digital organizations with a consistent global standard for quality processes and customer satisfaction.

- The World's Most Recommended Hard Drives**

Our hard drives have received so many awards that it's difficult to mention them all. PC World has awarded our hard drives with their World Class Award for three years in a row. And Computer Reseller News has declared Western Digital drives their Channel Champions for three consecutive years also. Everyone from editors of computer magazines to PC manufacturers to retail customers have recognized the excellence of our drive products. We think you'll agree.

APPLICATIONS AND OPERATING SYSTEMS	STORAGE REQUIRED
Windows 95, Windows NT, OS/2	50-150 MB
Business, graphics and utility software	150-500 MB
Games/education	100-400 MB
USER DATA: 3 YEAR LIFE	
Graphics, presentations, spreadsheets, etc.	300-600 MB
Image scanning	100-300 MB
MULTIMEDIA AND INTERNET	
Sound - 30-40 min high fidelity	225-450 MB
Video - 30-40 min. compressed	270-540 MB
On-line services, Internet: downloaded files	100-500 MB

Why a Higher Capacity Hard Drive is Important --- This chart illustrates how much hard drive space an average computer user would require over a three-year period (over 2 GB). A Western Digital high-capacity, high-performance hard drive lets users efficiently run more of today's software --- and tomorrow's.



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AMERICA ONLINE: WESTERN DIGITAL
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79-850057-000 S0986 2/96

Caviar®

2.1 and 2.5 GB EIDE

Hard Drives



*The Quality and Capacity Choice from
the Company that Makes the World's
Most Recommended Hard Drives*

Just when a gigabyte seemed like a lot of storage, Western Digital breaks the 2 GB barrier for storage capacity with the introduction of the AC32100 (2.1 GB) and AC32500 (2.5 GB). The exploding need for mass storage and retrieval is insatiable. To meet the ever-increasing demand for data storage, drive capacity needs to be measured in gigabytes rather than megabytes.

BENEFITS

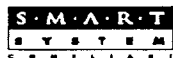
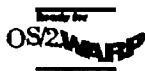
- **High Capacity and Superior Performance**
The AC32100 and AC32500 break the 2 GB barrier and deliver the performance and reliability you've come to expect. These drives offer a high data transfer rate, low seek times, a 5200 RPM spindle speed and cache buffering. They are the perfect solution for today's storage-intensive applications — from operating system applications such as Windows 95, Windows NT and OS/2 Warp to consumer and business applications. Increased storage capacity is also essential for multimedia, gaming, and information retrieval from on-line sources such as the Internet, America Online, CompuServe, Prodigy, and Microsoft Network.
- **Exceptional Quality and Reliability**
Western Digital offers a 3-year warranty and a Mean Time Between Failures (MTBF) of 300,000 hours of trouble-free operation.
- **100% Guaranteed Compatibility**
The AC32100 and AC32500 have been thoroughly tested in Western Digital's exclusive Functional Integrity Testing Lab (FIT Lab). The FIT Lab's extensive test base of computer systems, operating systems and storage devices ensures the highest standards of reliability, quality and compatibility. Choose the hard drive that's guaranteed.
- **Comprehensive Customer Support**
Our technical support staff is available 6 days a week to answer questions and assist in making buying decisions. User guides, support utilities, and drivers for many of our products are available through our electronic bulletin board. An automated fax line will send requested literature any time, day or night. On-line services (Internet, America Online, and Microsoft Network) provide general product and contact information, down-loadable drivers, and answers to frequently asked questions.

TARGET APPLICATIONS

- Pentium 150 and 166 MHz-based systems
- High-performance desktop PCs
- PC network servers
- VESA and PCI local buses
- Capacity-intensive consumer and business applications, multimedia and gaming

CAVIAR**AC21600,****AC32100,****AND****AC32500***1.6, 2.1, and 2.5**Gigabyte, 3.5-Inch,**Low-Profile,**Enhanced IDE Drives*

Designed for

**PHYSICAL SPECIFICATIONS**

	WDAC21600	WDAC32100	WDAC32500
Interface	40-pin EIDE	40-pin EIDE	40-pin EIDE
Formatted Capacity ¹	1624.6 MB	2111.8 MB	2559.8 MB
Actuator Type	Voice Coil	Voice Coil	Voice Coil
Number of Disks	2	3	3
Number of Heads	1	5	6
Bytes per Sector	512	512	512
User Sectors per Drive	3,173,184	4,124,736	4,999,680
Servo Type	Embedded	Embedded	Embedded
ECC	Reed Solomon	Reed Solomon	Reed Solomon
Dedicated Landing Zone	Yes	Yes	Yes
Actuator Latch/Auto Park	Yes	Yes	Yes

PHYSICAL DIMENSIONS

- Height	1.00 Inch, ± 0.02
- Length	5.75 Inches, ± 0.02
- Width	4.00 Inches, ± 0.02
- Weight	1.1 lb (.50 kg) $\pm 10\%$

PERFORMANCE SPECIFICATIONS

Recommended Setup:	AC21600: 3148x16x63 AC32100: 4092x16x63 AC32500: 4960x16x63
Seek Times:	
- Average Seek Read ²	sub 12 ms
- Average Seek Write ²	sub 14 ms
- Track to Track	3.0 ms
- Full Stroke Seek	22 ms
Average Latency	5.76 ms
Rotational Speed	5200 RPM
Data Transfer Rate:	
- Buffer to Host	16.6 MB/s (Mode 4 PIO) ³ 16.6 MB/s (Mode 2 DMA) ⁴
- Media to Buffer	95 Mbits/s max
Read Cache	Adaptive
Write Cache	Yes
Buffer	128 KB
Interleave	1:1
Spindle Start Time	10.8 sec typical
Start/Stop Cycles	40,000 minimum
Master/Slave Support	Yes
LBA Support	Yes
IO/DY Support	Yes
Error Rate:	
- Non-Recoverable	<1 in 10 ¹³ bits read

WARRANTY

The warranty on Western Digital Caviar AC21600, AC32100 and AC32500 drives is three (3) years.

**ENVIRONMENTAL SPECIFICATIONS⁵**

Shock:	
- Operating	10G (2 per sec max)
- Non-Operating	150G (3 drops/axis max)
Half sine wave of 3 ms duration, measured without isolation.	
Vibration:	
- Operating	5-20 Hz, .037 inches (dbl amp) 20-300 Hz, .75G (0 to peak)
- Non-Operating	5-20 Hz, .195 inches (dbl amp) 20-500 Hz, 4G (0 to peak)
Operating Temperature & Humidity:	
- Temperature	5° C to 55° C
- Humidity	8-80% RH non-condensing
- Thermal Gradient	10° C/hour max
Non-Operating Temperature & Humidity:	
- Temperature	-40° C to 60° C
- Humidity	5-95% RH non-condensing
- Thermal Gradient	20° C/hour max
Acoustics:	
- Idle Mode	37 dBA typical ⁶
Reliability:	
- MTBF	300,000 POH

POWER REQUIREMENTS (typical)

Voltage:	5V $\pm 5\%$, 12V $\pm 8\%$
Read/Write/Idle	5.1W
Standby/Sleep	0.6W
Spinup	12.4W

¹ Western Digital defines a megabyte (MB) as 1,000,000 bytes, and a gigabyte (GB) as 1,000,000,000 bytes.

² Average Seek Time is determined by dividing the total time required to seek between all possible ordered pairs of track addresses by the total number of these ordered pairs at nominal environmental conditions.

³ Max PIO Burst Rate is specified at 16.6 MB/s using the IORDY signal.

⁴ Max Multi-word DMA Burst Rate is specified using the DMARQ and DMA CK signals.

⁵ No non-recoverable errors during operating tests or after non-operating tests.

⁶ Sound power level.

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DOC/FAX: 714.932.4300 INTERNET: www.wdc.com

CAVIAR**AC21600,****AC32100,****AND****AC32500***1.6, 2.1, and 2.5**Gigabyte, 3.5-Inch,**Low-Profile,**Enhanced IDE Drives*

The Caviar® AC21600, AC32100 and AC32500 Enhanced IDE (EIDE) hard drives are high-performance solutions designed to meet the requirements of today's most powerful systems. These drives are based on our successful proven design concepts. By combining enhanced electronics with new head and read-channel technology, Caviar has achieved its highest performance to date and leads the market in areal density.

High-speed host data transfers, advanced caching, increased rotational speeds, and low mechanical latency combine to give the AC21600, AC32100 and AC32500 the level of performance demanded by today's systems. These drives support host data transfers of 16.6 MB/s Mode 4 PIO and 16.6 MB/s Mode 2 multi-word DMA enabling VESA or PCI local bus EIDE integration.

These Caviar drives are ideal storage solutions for systems running Windows 95, Windows 3.x, Windows NT, OS/2 Warp, Novell NetWare, or Unix operating systems on 486, Pentium, Pentium Pro, PowerPC or RISC-based processors. System integration of the AC21600, AC32100 and AC32500 requires either BIOS or device driver support for EIDE hard drives with capacities greater than 528 MB.

The AC21600, AC32100 and AC32500 drives have an added feature, Self-Monitoring, Analysis, and Reporting Technology (S.M.A.R.T.). When used with a S.M.A.R.T. application, the drive can alert the host system of a negative reliability status condition. The host system can then warn the user of the impending risk of data loss and advise the user of appropriate action.

The AC21600, AC32100 and AC32500 drives

FEATURES

- **CacheFlow4™** – Increases performance by adapting read and write operations on-the-fly and works in conjunction with the advanced disk caching capabilities of today's major operating systems. New random write caching improves random write performance.
- **High-Speed Host Transfers** – Enables the maximum disk performance under local bus environments through the use of 16.6 MB/s Mode 4 PIO and 16.6 MB/s Mode 2 multi-word DMA.
- **S.M.A.R.T.** – A technology to assist the user in preventing possible system down time due to hard drive failure.
- **Logical Block Addressing (LBA)** – An alternative addressing methodology of identifying a given location on an EIDE drive that permits disk sizes greater than 528 MB.
- **Low Power Consumption** – Saves energy, money, and the environment.
- **Exceptional Quality** – Guaranteed compatibility and automatic defect management allows easy installation. A three-year warranty and 300,000 MTBF means years of trouble-free operation.

support advanced power management capabilities that can reduce power requirements over 85 percent.

Western Digital's award-winning Caviar drives are designed and manufactured to the highest standards of quality and reliability. This is demonstrated by their three-year warranty, 300,000 hours Mean Time Between Failure, and guaranteed compatibility.

 **WESTERN DIGITAL**