

> > > R E A D T H I S F I R S T

### System Changes

This disk includes new versions of these programs (compared to version 2.4c):

OS9 Hard disk drivers (BBFHDISK, etc)  
EZGen installation utility

The other programs on the disk are the same as version 2.4c. If you are upgrading from an earlier version of CoCo XT, you can use the OS9 IDENT command to determine which modules have changed since your old version.

Version 2.4 also introduced new versions of the CLKGET utility and the BASIC driver/formatter programs. The new versions are included on the Version 2.5 disk.

### Important Controller Information

The newer Western Digital controllers sometimes used with CoCo XT and CoCo XT-RTC units must be modified if you will be using XT-ROM. You must install a 28 pin socket at the location marked U7, and a 74LS244 IC in the location marked U8. Then install a wire jumper across the two points marked R23. DO NOT desolder or clip pins on any IC's on the controller if they are marked WD10C20 or WD10C22 -- this will destroy your controller.

### Easier Installation

Burke & Burke's EZGen utility is now included with the CoCo XT and CoCo XT-RTC. This utility makes it much easier to install a hard disk system.

To add the hard disk software to your existing boot file, you will need:

- 1) A backup copy of your CoCo XT or CoCo XT-RTC Master Disk, with no write protect label (COCO XT DISK)
- 2) A freshly formatted floppy disk (NEW DISK)
- 3) Your current OS9 System Disk (SYSTEM DISK)

When you have the above items ready, perform the following steps:

- 1) Boot OS9 from the SYSTEM DISK as you normally would.
- 2) Create a copy of your OS9 system on the NEW DISK. For Level 1, Version 1.XX or Level 2 OS9, put the NEW DISK in drive 1 and use:

```
OS9:load copy rename
OS9:cobbler /dl
OS9:
```

If you run Level 1, Version 2.XX OS9, use the CONFIG program instead of COBBLER to create a similar disk.

DO NOT PUT ANY COMMANDS ON THE NEW DISK AT THIS TIME. Put a label on the NEW DISK and leave it in drive 1.

3) Put the COCO XT DISK in drive 0, and set your execution directory as follows:

```
OS9:chx /d0/cmds
OS9:
```

4) Use the DDMAKER program to create a hard disk device descriptor named "/HD" on the COCO XT DISK. DDMAKER will ask you several questions about your drive. Use the tables at the end of this section, or in Appendix A of the CoCo XT manual, to choose the correct answers.

```
OS9:ddmaker hd
OS9:
```

For most applications you should set up the drive for slot 3, drive 0, and a step rate of 5. Use 32 for the minimum segment size and 22 for the format interleave.

5) Use EZGen to add the hard disk driver and descriptor to the OS9 boot file that you created in step #2.

NOTE: The name of the device driver must match the name that you built into the device descriptor while running DDMAKER.

Example (Level 2 OS9, /d0 = COCO XT DISK, /dl = NEW DISK):

```
OS9:ezgen -d /dl/os9boot
```

```
EZGen Version 1.06
Copyright 1988 by Burke & Burke
All Rights Reserved
```

```
Special processing for OS9Boot enabled.
Creating work file '/dl/ezgen.3' . . .
EZGen> link rbf
EZGen> next
EZGen> insert /d0/cmds/hd.dd
EZGen> insert /d0/modules/bbfhdisk.dr
EZGen> quit
Creating contiguous '/dl/os9boot' from '/dl/ezgen.3' . . .
Creating empty file . . .
Looking for xxx contiguous clusters . . .
Copying data to file . . .
Allocating clusters . . .
```

```
Updating file descriptor sector $xxxx . . .
Recording new location of standard boot . . .
Exiting . . .
```

OS9:

Please refer to the EZGen manual in the HELP directory of the CoCo XT Master disk for further information about EZGen commands.

6) Level 2 users must prepare the new disk for booting by placing the SYSTEM DISK in drive 0 and entering:

```
OS9:chx /d0/cmds
OS9:makdir /dl/cmds
OS9:copy /d0/cmds/shell /dl/cmds/shell #20k
OS9:copy /d0/cmds/grfdrv /dl/cmds/grfdrv #20k
OS9:
```

7) Remove the SYSTEM DISK from drive 0, and put the NEW DISK in drive 0. Then press RESET to reboot the system.

NOTE: If you get a "BOOT FAILED" message at this point, please refer to the "Boot Failures" section of these notes.

8) To format the drive, put the SYSTEM DISK back in drive 0 and enter the following commands:

```
OS9:chd /d0
OS9:chx /d0/cmds
OS9:format /hd
.
.
.
OS9:
```

The formatter will ask you several questions. Respond to all questions with "Y". Physical formatting takes about 6 minutes, and logical verification takes about 45 minutes, for a 20 Meg drive.

9) When formatting is complete, copy all of the files on your SYSTEM DISK to the hard disk:

```
OS9:load copy
OS9:dsave -s20 /d0 /hd ! shell
.
.
.
OS9:
```

10) Place the NEW DISK in drive 1, and the CoCo XT DISK in drive 0. Then use EZGen to change the name of your hard disk from "/hd" to "/h0", and also to install a default descriptor that refers to the hard disk:

```

OS9:chx /d0/cmds
OS9:ezgen -d /d1/os9boot
.
.
EZGen> -l hd
EZGen> -r h0
EZGen> -l dd
EZGen> -u /d0/cmds/hd.dd
EZGen> -r dd
EZGen> q
.
.
OS9:

```

You may get a "248 error". This means that there is not enough contiguous space on the NEW DISK for EZGen to create a new OS9Boot file. You can solve this by copying the OS9Boot file to another disk, deleting it from the NEW DISK, and then copying it back. When this has been done, repeat the EZGen step above.

11) Your hard disk system is now installed and ready for operation. The NEW DISK is your new OS9 System Disk. Place the NEW DISK in drive 0, and reboot by pressing RESET, to bring up the new system.

### Single Drive Installation

Use EzGen to install the hard disk modules even if you have only a single floppy disk. Single-drive installation requires the same items as the two-drive procedure above.

- 1) Boot OS9 from the SYSTEM DISK as you normally would.
- 2) Create a copy of your OS9 system on the NEW DISK. To do this, follow the example below:

```

(SYSTEM DISK in drive 0)
OS9:load copy rename load unlink makdir cobbler
(NEW DISK in drive 0)
OS9:cobbler /d0
OS9:unlink cobbler
OS9:makdir /d0/cmds
OS9:unlink makdir
OS9:

```

If you run Level 1, Version 2.XX OS9, you can use the CONFIG program instead of COBBLER to create a similar disk.

DO NOT PUT ANY COMMANDS ON THE NEW DISK AT THIS TIME. Put a label on the NEW DISK and remove it from drive 0.

- 3) Use the DDMAKER program to create a hard disk device descriptor named "/HD" on the NEW DISK. DDMAKER will ask you several questions about your drive. Use the tables at the end of this section, or in Appendix A of the CoCo XT manual, to

Recording new location of standard boot . . .  
 Exiting . . .

OS9:unlink ezgen  
 OS9:

Please refer to the EZGen manual in the HELP directory of the CoCo XT Master disk for further information about EZGen commands.

6) Level 2 users must prepare the new disk for booting by copying two files:

(SYSTEM DISK in drive 0, NEW DISK ready)  
 OS9:chx /d0/cmds  
 OS9:copy -s /d0/cmds/shell /d0/cmds/shell #20k  
 OS9:copy -s /d0/cmds/grfdrv /d0/cmds/grfdrv #20k  
 OS9:

7) Continue with steps 7-11 of the two-drive procedure. Before step 10, you will need to load EZGen into memory from the COCO XT DISK.

DDMAKER Cheat Sheet

	WD1002-WX1/ WDXT-GEN(2); ST-225 20 Meg	WD1002-27X/ WD1004-27X; ST-238 30 Meg	Adaptec 2072/ Seagate ST-11R; ST-238 30 Meg
Question	-----	-----	-----
Driver name	Use BBFHDISK for level 2, BB1FHDISK for L1, V2, and BBXFHDISK for L1, V1.		
Slot #	Use the appropriate slot number (normally 3)		
Step Rate	5	5	5
Tracks / surface	612	940	612
Precompensation	300	450	300
Number of surfaces	4	4	4
Sectors / track	32	32	48
Park track	670	1022	670
Verify writes	Enable or disable this feature as you like.		
Segment size	Use 32 here for all drives & all OS9 versions		
Interleave	22	22	33

NOTE: If your equipment is not listed here, check Appendix A of the CoCo XT manual or call the hard drive manufacturer.

Boot Failures

Here are the most common causes for Level 2 BOOT FAILED messages.

choose the correct answers.

```
(COCO XT DISK in drive 0)
OS9:load /d0/cmds/ddmaker
(NEW DISK in drive 0)
OS9:chd /d0;chx /d0/cmds
OS9:ddmaker hd
OS9:
```

For most applications you should set up the drive for slot 3, drive 0, and a step rate of 5. Use 32 for the minimum segment size and 22 for the format interleave.

4) Load the EZGen command and copy the desired device driver from the COCO XT DISK to the NEW DISK.

NOTE: The name of the device driver must match the name that you built into the device descriptor while running DDMAKER.

Example using Level 2 "bbfhdisk.dr" driver:

```
(COCO XT DISK in drive 0, NEW DISK ready)
OS9:load /d0/cmds/ezgen
OS9:copy -s /d0/modules/bbfhdisk.dr
/d0/bbfhdisk.dr
OS9:
```

5) Use EZGen to add the hard disk driver and descriptor to the OS9 boot file that you created in step #2.

NOTE: The name of the device driver must match the name that you built into the device descriptor while running DDMAKER.

Example (Level 2 OS9):

```
(NEW DISK in drive 0)
OS9:ezgen -d /d0/os9boot

EZGen Version 1.06
Copyright 1988 by Burke & Burke
All Rights Reserved
```

```
Special processing for OS9Boot enabled.
Creating work file '/d1/ezgen.3' . . .
EZGen> link rbf
EZGen> next
EZGen> insert /d0/cmds/hd.dd
EZGen> insert /d0/bbfhdisk.dr
EZGen> quit
Creating contiguous '/d0/os9boot' from '/d0/ezgen.3' . . .
Creating empty file . . .
Looking for xxx contiguous clusters . . .
Copying data to file . . .
Allocating clusters . . .
Updating file descriptor sector $xxxx . . .
```

- 1) No CMDS directory on the boot disk
- 2) SHELL and GRFDRV not present in cmds directory on boot disk
- 3) Incorrect file attributes -- the 'e' attribute MUST be set on both SHELL and GRFDRV
- 4) Hard drive device descriptor is "/hd" or "/d0", but hard drive has not yet been formatted
- 5) Level 2 OS9 "boot order" bug.

Many Level 2 OS9 users have had problems when installing new device drivers. The problems are often solved by changing the order of the modules in OS9Boot. Some users call this the "boot order" bug.

Many Color Computer experts believe that the "boot order" bug is actually caused by slight timing variations in the CoCo 3, Multi-PAK, and external devices. The CoCo XT and CoCo XT-RTC circuit boards include circuitry to protect against these timing problems, but many older floppy controllers do not.

You can use EZGen to rearrange your boot file if you suspect boot order problems. A sequence that works for many users is:

- 1) Put the CoCo XT disk in drive 0, and the BOOT FAILED disk in drive 1

- 2) Enter the commands:

```
OS9: chx /d0/cmds
OS9: ezgen -kd /d1/os9boot
```

- 3) When you see the EZGen> prompt, enter the commands:

```
EZGen> link cc3io
EZGen> save /d1/x
EZGen> delete
EZGen> link rbf
EZGen> insert /d1/x
EZGen> $del /d1/x
EZGen> quit
```

Try booting the disk again. If you still get BOOT FAILED, check your work. If you are still stuck, call Burke & Burke for technical assistance.

### New Device Drivers

The OS9 hard disk formatting routine has been modified to skip over defective tracks on the hard disk. OS9's FORMAT command will mark off the bad tracks when you perform a PHYSICAL VERIFY.

You do not need to reformat your hard drive in order to use the new drivers. Just use OS9GEN or CONFIG to create a new boot disk that includes new device descriptors and the new driver of your choice.

Use only a current version of DDMAKER to create device descriptors for use with the new device drivers. Releases of CoCo XT software previous to version 2.0 used a different device descriptor format that is incompatible with Version 2.3

Page 3-6 of the manual should indicate that the slot number is stored at device descriptor offset \$16 (IT.DNS), not offset \$15.

Beginning with Version 2.0, the hard disk interface may be installed in any slot. Versions of the CLKSET, CLKGET and RTC utilities are provided for use with each slot.

### Improved Clock Support

The CLKGET utility has a new command line option. If you use the command line:

```
clkget -d &
```

in your startup file, CLKGET will set your system clock as usual; it will also automatically correct your system clock once every 8 minutes. A new version of CLKGET has been provided on the Version 2.4 release disk.

Burke & Burke has included a listing of a short machine language program that reads and sets the time under BASIC. The program is in the file "CLKIO.SRC" on the BASIC portion of the CoCo XT-RTC disk. WARNING -- THIS PROGRAM IS NOT SUITABLE FOR USE WITH OS9.

If your controller is installed in Multi-PAK slot #3, you should use the utilities named CLKSET3, CLKGET3, and RTC3. You can rename these utilities to CLKSET, CLKGET, and RTC in your commands directory.

Similarly, four real-time clock libraries are provided under RS-DOS -- one for each slot. These libraries are called RTCLIB1.BIN, RTCLIB2.BIN, RTCLIB3.BIN, and RTCLIB4.BIN.

The RS-DOS RTCLIB routine has been modified to correctly check the number of days per month when setting the date from a BASIC string variable.

### New Version of XTFMT

Versions of XTFMT previous to Version 2.2 did not initialize the hard disk controller prior to formatting the drive. The default 10 Meg parameters were used instead. This only causes problems on drives that have not been pre-formatted.

The Version 2.5 XTFMT.BIN program initializes the controller and skips over defective hard disk tracks, formatting the drive as specified in the device descriptor.



New Version of XT.DR & XTDSKINI.DR

Version 2.4 of HYPER-I/O device drivers XT.DR and XTDSKINI.DR would not correctly initialize newer hard disk controllers like the WDXT-GEN2. This caused the controller to use the default 10 Meg parameters.

The Version 2.5 drivers correctly initialize both old and new controllers.

Hard Disk Controller Information

The model numbers of hard disk controllers supported by Version 2.5 are:

Western Digital WD1002-WX1	(MFM)
Western Digital WD1002A-WX1	(MFM)
Western Digital WDXT-GEN	(MFM)
Western Digital WDXT-GEN2	(MFM)
Western Digital WD1002-27X	(RLL)
Western Digital WD1002A-27X	(RLL)
Western Digital WD1004-27X	(RLL)
Seagate Technology ST-11R	(RLL)
Adaptec 2072	(RLL)

Controllers made by Everex, OMTI, and several other vendors have also been used successfully with the CoCo XT.

The Western digital controllers use 32 or 48 sectors per track.

The Adaptec and Seagate RLL controllers use 48 sectors per track, and do not have a W9 jumper. Newer Western Digital RLL controllers provide jumpers W1 and W2 (both in for 32 SPT) in place of W9.

If you are using the Western Digital WD1002-27X hard disk controller, you can emulate 32 sectors per track by installing jumper W9 and using 1.53 times the normal number of tracks in your device descriptor. Use 940 tracks for the ST-238R hard drive. The park track should also be increased by a factor of about 1.53, but must not exceed 1023.

If you are using the Western Digital WD1002A-27X hard disk controller, you can emulate 32 sectors per track by installing jumpers W1 and W2. The 1.53 track scaling factor still applies. Remove both jumper W1 and jumper W2 to operate at 48 sectors per track, with the normal number of tracks.

Backing Up your Hard Disk

The HDB and HDR utilities on the CoCo XT disk can be used to back-up and restore your hard disk to multiple floppy disks. These utilities make an EXACT copy of your hard disk, so all boot files, HYPER-I/O MSA's, and other special files are preserved intact.

These utilities have been modified to recover from read or write errors encountered during execution. Burke & Burke has also added a new data compression option, selected by specifying "-c" on the command line. Data compression reduces the number of disks required by 20-30%, but roughly doubles the time required for the backup.

Other backup utilities are faster or easier to use than HDB, but may "lose" the OS9 Boot file or other special files. If you use Burke & Burke's XT-ROM boot ROM, be sure to use BootPort to save the hard disk boot to a floppy disk before using any non-HDB backup utility.