

EMULATOR II

Operation Manual Hard Disk Supplement

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BACKGROUND: WHY HARD DISKS?

The standard Emulator II comes with two floppy disk drives for saving and loading Bank information. Replacing the second floppy drive with a Hard Disk drive offers two big advantages:

- Greater storage. The Hard Disk holds 23 Banks, the floppy 1 Bank.
- Faster access time. A Bank can be saved from the Emulator II to the Hard Disk in 4 seconds (as opposed to 1 minute for saving to a floppy), or loaded from the Hard Disk to the Emulator II in 2 seconds (as opposed to approximately 30 seconds for loading from a floppy).

What this means is that you can have a large library of banks stored in the Hard Disk, and that any of these Banks can be loaded into the Emulator II almost instantaneously.

That's the good news, but there is a catch: ***Hard disks are fragile.*** Dropping an Emulator II with the power on will probably destroy the Hard Disk. Furthermore, in tests conducted at the factory, hard disk failures would occur if the Emulator II was dropped from heights of as little as 8 inches even with power off.

CAUTION: Hard Disk owners are boldly going where few have gone before. Hard disks in general inhabit safe, predictable computer installations where they lead a climate-controlled life free of the perils of a rock and roll band on the road. Although some portable computers do include hard disks, these are usually treated with kid gloves compared to music gear.

E-mu's durability tests for Hard Disk equipped Emulator II's have been positive, and so we are making the Hard Disk available as an option. Studio musicians will appreciate having 23 Banks "on-call" at all times, and touring performers will enjoy not having to deal with the 30 second Bank load time for floppies.

Please note, however, that we are offering the hard disk for experimental usage only and cannot be responsible for any losses or damages, including consequential losses or damages, due to Hard Disk failures.

THE HARD DISK PERSONALITY

In most cases, you can treat the Hard Disk just like a super-floppy; transferring data to and from the Emulator II is straightforward.

However, over time the Hard Disk can develop errors (particularly if system abuse occurs). This is analogous to what happens if you play a record over and over and over again, and eventually, a pop or scratch develops. In fact, just like records that come with a scratch or two, many brand new Hard Disks already have errors when they're shipped. This usually makes people cringe - what, buy a product with known defects?!? But consider that a typical Hard Disk holds 10,000,000 bytes of data. If a few bytes are

missing here and there, no big deal you still have plenty of bytes left over. All you need to do is instruct the computer not to write data over the bad bytes, and all is well.

Any new hard disk will come with an error log that contains a list of all known errors; this information, along with operating system software necessary to format the Hard Disk, is stored in the Emulator II's Hard Disk software diskette (supplied with the Hard Disk upgrade). Should additional errors occur over time, the disk's error log can be updated to include these new errors, and the computer instructed not to write over the bad bytes.

Like a floppy disk, the Hard Disk must be formatted initially to accept data. However, a hard disk must also be formatted if the hard disk "crashes" (which can occur if, say, power is interrupted in the middle of a write-to-hard-disk operation).

This supplement will cover hard disk basics, and then discuss the Hard Disk functions that are accessed via the Disk module. These functions cover almost all of your day-to-day use of the Hard Disk. The final part will describe Hard Disk functions accessed via the Special module, which are much less commonly used. These will be discussed in reverse numerical order (SPECIAL 22, SPECIAL 21, etc.) since for some reason, this seems to present everything in the most logical order.

POWER-ON WITH HARD DISK SYSTEMS

The floppy disk is Drive 1, the Hard Disk Drive 2. When you first turn on power, the Emulator II will test the floppy drive. If there is no floppy disk in Drive 1, the Emulator II will boot (load its operating system software) from the Hard Disk. This is the preferred mode of operation, as referring to the Hard Disk for the operating system software greatly speeds up overall Emulator II operation (i.e. there is virtually no delay when switching from module to module within the Emulator II).

The Hard Disk takes a while to "warm up" whenever it is turned on. Upon turn - on, the Hard Disk's green "activity" LED will light, indicating that the Hard Disk is testing itself. After about 30 seconds, the red "ready" light will come on, indicating that all systems are go.

If there is a floppy disk in Drive 1, the Emulator II will boot from the floppy. This allows you to easily boot the machine if the Hard Disk is malfunctioning for any reason.

Example:

Suppose power is interrupted to the Emulator II Hard Disk, and the system "crashes." You could re-boot from the Hard Disk software floppy, thus loading software with which you can re format the Hard Disk.

HARD DISK SUPPLEMENT TO THE DISK MODULE SECTION

All disk module functions (except GET BANK DISK 2 and SAVE BANK (TO DISK)) relate exclusively to the floppy disk. The Hard Disk may be ignored if desired, in which case the Emulator II operates just like an Emulator II with a single floppy disk drive.

Note: The Hard Disk can neither read nor write Library disk data, so all Library functions must be handled through floppies.

Module: **DISK 2**
Function: **Getting a Bank from the Hard Disk**

This function loads Banks from the Hard Disk into the Emulator II.

1. GET BANK DISK 1 reads a Bank from the floppy drive. To get a Bank from the Hard Disk, enter the Disk module and key in 2 (GET BANK DISK 2).
The display says:

```
Get HD Bank #  
(02-24)/Slider A
```

Move Slider A to catalog the Hard Disk Banks. When the display shows the Bank to be loaded, press ENTER. Alternately, enter a two-digit Bank number from 02 to 24 (leading zeroes must be entered) from the keypad. There is no need to press ENTER if you enter the Bank number directly.

2. After completing step 1, the display will say:

```
Loading Bank Get Fnn  
NameOf Preset
```

...where nn is the Bank number. Loading is complete in about 2 seconds.

Module: DISK 7
Function: Saving a Bank to Hard Disk

This function saves a Bank from the Emulator II onto the Hard Disk.

1. While in the Disk module, key in 7 with the keypad. The display then asks whether you want to save to floppy or Hard Disk:

Save Bank
(01) or (02-24)

Pressing 01 saves the Bank to floppy disk, as described under Disk 7 in the Reference Section of the Emulator II Owner's Manual. Pressing 02 to 24 saves the Bank to the Hard Disk under the designated Bank number. In this case, the display will say:

Fnn Name Of Preset
Overwrite? Y/N

...where nn is the selected Bank number. "NameOfPreset" will be the Bank's default Preset if a Bank has already been written to the Hard Disk in this location, or a Null Preset if the Bank is empty.

Note: Error conditions can occur if you attempt to load a Bank from a location where no bank is saved. See "Important Note" under SPECIAL 22 for more information.

2. If you do not want to overwrite the existing Bank, press **NO** to stop the writing process and return to the Disk module menu. Press **YES** to overwrite the old Bank with the new Bank; the display says:

Writing Bank

The Hard Disk verifies the write operation, then returns to the Disk module menu when all is complete. This entire operation takes about 4 seconds. If there is an error, an error message will appear in the display. We will describe how to deal with errors later on.

Module: DISK 8

Function: Formatting Floppies in a Hard Disk System

As with a dual floppy Emulator II, selecting DISK 8 (the formatting function) formats the floppy disk. However, you may load formatting software from either the Hard Disk or the floppy.

1. After selecting Disk 8 and specifying whether you want to format a Library or Performance disk, the display asks:

Use Floppy Software
& Erase Mem? Y/N

The usual answer is NO, since you want to use the Hard Disk --not the floppy software when formatting the floppy. This makes the floppy compatible with the Hard Disk.

Note: If you originally booted from the floppy disk instead of the Hard Disk, a NO response will copy the original floppy operating software to the new floppy.

2. To format a disk that is compatible with non-Hard Disk machines, answer YES.

Note: The floppy in Drive 1 should contain the desired operating system software for the disk that you are about to format.

Example: If you are formatting a disk that will be played back on a non-Hard Disk drive Emulator II with Revision 2.2 software, make sure the operating system on the floppy in Drive 1 is standard (non-Hard Disk) Rev. 2.2 software.

HARD DISK SPECIAL FUNCTIONS

If the operating system currently in memory is Hard Disk compatible (which it will be if you booted from the Hard Disk, or from a floppy with Hard Disk operating system software), the Special module will contain a number of functions that relate specifically to the Hard Disk. This section describes the various functions.

Module: SPECIAL 22
Function: Formatting

Just as a floppy disk must be formatted in order to receive Emulator II data, so must the Hard Disk. Formatting, which erases any existing Hard Disk data, occurs for one of two reasons:

- The Hard Disk has not been used previously and must be prepared for operation. However, NEVER format a Hard Disk before first checking whether or not there are any existing Banks on the Hard Disk that should be saved.
 - The Hard Disk has crashed for whatever reason, and is inoperable. Formatting will re-initialize the Hard Disk and erase any existing Banks. Hard Disk crashes are not frequent occurrences, which may lull you into a false sense of security. However, Murphy's Law dictates that a crash will occur at the worst possible moment and when you least expect it, so ALWAYS maintain floppy disk backups of any Banks stored on the Hard Disk.
1. Assuming that the machine has been booted from the Hard Disk (or if the Hard Disk is inoperable, from a floppy containing the proper Hard Disk operating system software). Enter the Special module and move Slider A until you hit the last listing. At the time of this writing, the last line says "HD Lap 10 Rev 2.2," which translates as follows:

HD	=	Hard Disk
Lap	=	Manufacturer code
10	=	Hard Disk capacity in Megabytes
Rev 2.2	=	Software revision.

In the future, other manufacturer codes, disk capacities, and software revisions may be used instead of the examples given above. The point of checking this line is to make sure that the Hard Disk software floppy has the same identifier written on its label.

2. Enter 22 via the keypad. The display says:

Format Hard Disk
DESTROYS ALL!Y/N

DESTROYS ALL! Does not mean that Godzilla will appear outside your window, but rather, that any data on the Hard Disk will be erased during the formatting process. Press NO if you want to exit this function; to continue formatting, press YES. The display asks you to:

Insert Error Log
&HD Sftwe Floppy

Insert the special Hard Disk software floppy (supplied with the Hard Disk upgrade) into Drive 1, as this floppy contains the Hard Disk formatting software and also contains the error log (which as you recall, contains information about which parts of the Hard Disk should not be used for storing data). Note that this error log is also typed on a piece of paper affixed to the disk.

3. After inserting and latching the floppy in Drive 1, press ENTER. The error log saved on the floppy will load into memory, and the formatting process will begin. After formatting is complete, the display asks:

Reload Backup
Floppies Y/N?

This routine makes it easy to transfer a bunch of Banks stored on floppy disk over to the newly formatted Hard Disk. To load up the Hard Disk, press YES. The display says:

Insert Floppy Disk
02 and Press Enter

Insert the floppy containing the Bank that you want to appear on the Hard Disk as Bank 02, and then press ENTER. Since the display likes to keep you posted on what it's up to, the following message will appear:

Reading the Backup
Floppy

After the floppy data is loaded, the display then says:

Writing Backup
Data to HardDisk

When the operation is complete, you will be asked to insert floppy disk 03 (i.e. the floppy containing the Bank which you want to appear on the Hard Disk as Bank 03). Repeat the same ritual described above for loading floppy 02. The Emulator II will keep asking you for disks until the Hard Disk is all filled up with Banks.

4. If you answered NO at the beginning of step 3, the display tells you that the Emulator II is...

**Saving All Banks
As Null Presets**

...which fills up the Hard Disk with null Presets. This operation takes about two minutes, so you have enough time to dust off the Emulator II keyboard, tidy up the studio a bit, or make a quick phone call.

Important Note: Errors

If you choose to load the Hard Disk from floppies, but exit the Disk module before all Presets have been loaded, look out!!

Calling up non-existent Banks will cause crashes until data is loaded into those Banks. A simple way to insure that this doesn't happen is to first load the Hard Disk with null Presets, then load Banks into the Hard Disk by 1) loading Banks into the Emulator II (from floppy disks) and 2) saving Banks to the Hard Disk. Note that this is more time-consuming than the "Reload Backup Floppies" routine described earlier.

If an error occurs during formatting, the display will slowly scroll out the message "D-I-S-K R-E-A-D E-R-R-O-R." This looks like one of those Time Square message boards and is rather entertaining. The message will continue to be sent until the end of the formatting process even after formatting has moved along to sections of the Hard Disk that do not contain errors.

Module: SPECIAL 21
Function: Show Hard Disk Error Location

This function pinpoints where an error has occurred on the Hard Disk.

1. To locate where an error has occurred, after formatting is complete load each Bank from the Hard Disk into the Emulator II memory. As soon as a problem occurs when loading a Bank, select SPECIAL 21 (Show HDErrLoc) to pinpoint the source of the error. SPECIAL 21 must be initiated immediately after the problem occurs, or you will get an “Invalid ErrData” message instead.
2. After keying in 22, the display will show three sets of numbers: A three-digit “cylinder” number, followed by a one-digit “head” number, followed by a five-digit “byte” number. These identify where the error is located on the Hard Disk. The ENTER light will be flashing, and the display says:

Save to Hard Disk
Error List Y/N

We haven't figured out why you would ever want to press NO, so press YES. This saves the error data to the Hard Disk. You are then asked...

Log Error on
FloppyDisk? Y/N

At this point, your Hard Disk software floppy should still be in Drive 1. If the floppy has been formatted with the Hard Disk software, it will contain an error log and pressing YES will update this log with the new error. If the floppy is not formatted for this function, a log will be created on the disk with just this one error.

3. After an error has been detected, the Hard Disk can still be used although you will not be able to access the Bank containing the error. To access all Banks, you will need to re-format the disk and re-load the Banks. After re-formatting, the bad section will be marked as “off limits” and the Hard Disk will operate normally.

Note: People sometimes wonder if having an error in a Bank reduces the quality or usefulness of the Bank. This is not a concern. Hard disks are engineered with a certain amount of redundancy so that should an error occur, there will be additional memory available to take its place.

After formatting the disk, you might want to send the Emulator II on an Error Scan hunt to make sure all error logs are accurate; see next section.

Module: SPECIAL 20

Function: Error Scan

This function causes the Hard Disk to go out and seek errors, and this information is used for updating data logs.

1. Enter the Special module and key in 20. The display asks:

Use Floppy Disk
Error Log ? Y/N

If you enter YES, the Emulator II assumes that all errors already listed on the floppy log are indeed errors and checks the remaining areas of the Hard Disk. If you answer NO, the Emulator II assumes that all errors already listed on the Hard Disk error log are indeed errors and checks the remaining areas of the Hard Disk. YES is generally the preferred response.

Whichever way you answer, the display then asks:

Error Scan Takes
8 mins OK? Y/N

If you decide you really don't have eight minutes, press NO and exit the function. Otherwise, press YES. The Hard Disk's green light will indicate that the Hard Disk is active and scanning for errors. Eight minutes is a goodly amount of time, so don't spend it staring at the Emulator II you're better off writing a post card or two to some friends, or catching up on phone answering machine messages.

After the scan is over, the Emulator II will not tell you whether it found any errors. Sorry about that -- it seems that hard disks embarrass easily, and they hate to admit they're not perfect. However, they do keep track internally of any errors they have found, and you can save this new error log on the Hard Disk when the display asks:

Write Err Log to
Hard Disk? (Y/N)

No one has ever answered NO to these questions, since it seems kind of silly to send the disk on an error scan and then not have it make a note of any errors it finds. So, press YES. This error information will be taken into account next time you format the disk, and the Hard Disk will ignore those sections of the disk containing errors.

Whether you answer YES or NO, the display then asks:

Write Error Log
To Floppy? (Y/N)

If you select NO, the error scan operation is complete. If YES, the error log is written on to the Hard Disk software floppy, which at this point should still be in Drive 1.

Module: SPECIAL 19
Function: Enter Error List

This is not a common operation, except at the factory where an error log is created for the first time. However, if a catastrophic disk crash occurs where the error log list has been lost, this procedure is necessary for re-creating the error log.

Note: Hard disks come with an error log as provided by the manufacturer. This information is supplied by E-mu with the hard disk (also see Hard Disk software label). This, plus any additional errors that are discovered, consult the error log.

1. Enter the Disk module and enter 19. The display asks:

Use Floppy Disk
Error Log? (Y/N)

Normally the answer is NO, since you will probably be using the factory-supplied list of Hard Disk errors. If you already have a floppy disk with operating software that contains the error log, you would enter YES.

2. After entering NO, the display prompts you to enter the supplied data in the following format:

of Defects in
List? (00-99)

(00 - 99) - Enter the total number of defects listed. The display now says:

Dfcf nn Head#?
(0-3)

...where nn is a defect number; enter the head # data (0-3) from the defect list.

The display now asks...

```
Dfct nn Cyl#?  
(0- three digit number)
```

Enter the cylinder number listed for that defect. The display now asks:

```
Dfct nn Byte-IX?  
(00000-20K)bbbb
```

Enter the byte number listed for that defect. Continue cycling through these messages until the entire error list has been entered.

3. After all errors have been noted, press ENTER. The display now says:

```
Write Error Log to  
Hard Disk? (Y/N)
```

If your next operation is to format the Hard Disk, which happens 90% of the time, press NO. If the Hard Disk is already formatted, press YES to update the existing error log. In either case, you next have the option to write the error log to floppy disk when the display says...

```
Write Err Log to  
Floppy? (Y/N)
```

Make sure that your Hard Disk software floppy is in Drive 1, and then press YES. After formatting the Hard Disk, this software can then be loaded into the Hard Disk to create an up-to-date error log.

Module: SPECIAL 18
Function: Auto Hard Disk Backup

Enter the Special module and key in 18 to save everything on the Hard Disk to floppies. All you have to do is get your floppies ready, read the display, and follow instructions.

(Someday, robots will do this type of thing...).

Module: SPECIAL 17
Function: Copy Hard Disk Software

This function is available primarily for updating the Hard Disk operating system as updates become available.

1. Enter the Special module and key in 17 with the keypad. The display says:

Copy will Erase
Memory OK? Y/N

If you press YES and carry on with the software writing process.

BE VERY CAREFUL

Triple check that the software being loaded on to the Hard Disk is the proper Hard Disk software. If you accidentally write non-Hard Disk software on to the Hard Disk, it will get amnesia and not even remember that it's a Hard Disk.