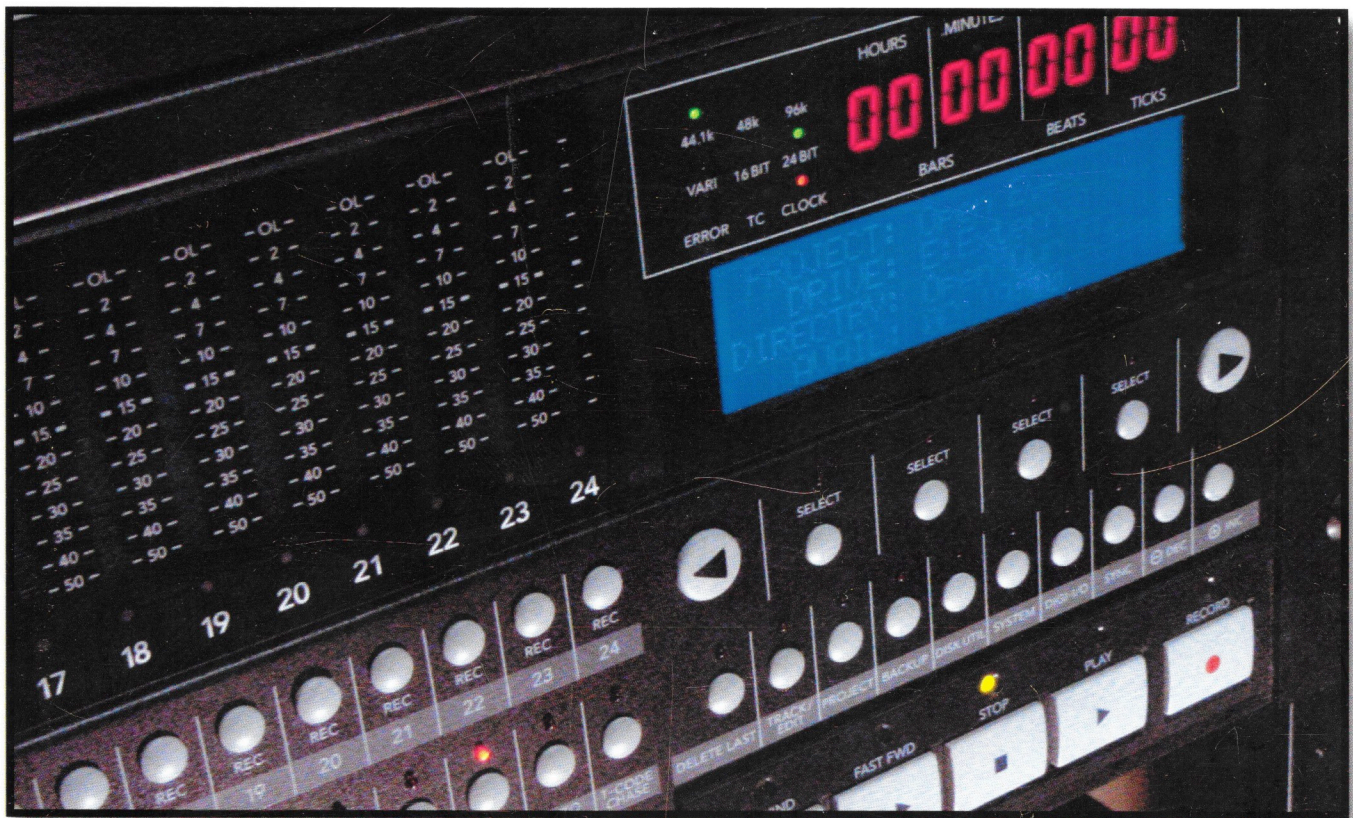


Last **The MACKIEtm**

Hard Disk Recorder Manual



Confessions of a Long Time User

Mike Rivers

The Last* Mackie™ Hard Disk Recorder Manual

Confessions of a Long Time User

Mike Rivers

*Well, probably

About this Book

Since its introduction in the Fall of 2000, the Mackie HDR24/96 and its younger sibling the MDR24/96 have had several software updates; some to fix bugs, others adding new capabilities. Documentation beyond version 1.2 has been sparse, hence the genesis of this book. At this writing, current software is HDR Version 1.4 and MDR Version 1.3.

This book isn't intended to replace existing Mackie documentation nor is it an official or sanctioned Mackie publication. Rather, it explains new functions and features and their applications in more detail than can be gleaned from release notes. You'll also find operating tips, troubleshooting hints, modifications, some history, and a little philosophy. It's written for users who are running the latest software or are planning to update, brand new users, and those giving a new home to an "experienced" Mackie hard disk recorder.

To preserve my fumbling fingers, in most places I've dropped "24/96" and refer to the recorders as "HDR" and "MDR." I also use "HDR" to mean both HDR and MDR when something is applicable to both models.

About the Author

I've been around and about audio and recording for more than 40 years. On a lark (well, and to make a little money) I joined Mackie as manager of the Technical Documentation Department just in time to get the initial instruction manuals together for the release the HDR24/96. I liked the HDR well enough to become a user myself. As a civilian (having resumed retirement) I've been assisting HDR users informally and figured it was about time to gather years answers and solutions into one place - here.

Acknowledgements and Credits

Special thanks go to the HDR engineering team, particularly Bob Tudor, Dana Bourke, and Brian McCully who taught me enough about the workings of the recorder to edit and write a coherent set of manuals. Thanks also to the Mackie Technical Support Team for their problem-solving help, and to my Mackie Tech Pubs team mates Steve Eborall and Dave Franzwa who taught me what a Mackie manual should look like. Users on the Mackie forum offered both problems and solutions, making this book possible as well as necessary. Finally, thanks to Greg Mackie, a visionary and a friend who encouraged me to join the team and contribute to a great product.

Cover design and graphics are by Edward Bolda of Spyder Byte Studios, an MDR user himself. I'm responsible for all the typos and bad grammar.

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The Last Mackie Hard Disk Recorder Manual HDR24/96 and MDR24/96

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Major Changes and New Features of the HDR24/96 and MDR24/96 Since Version 1.2

Other than release notes, detailed documentation stopped with the release of Version 1.2. Here's what's new since then:

- Use of Broadcast Wave as the native recording format. This brings the recorders closer in line with the evolving AES-31 standard for digital audio file transportability.
- New Project file format and disk directory structure, providing compatibility with the next generation (but now discontinued) Mackie hard disk recorder, the SDR24/96.
- New method (replacing the HDR Playlist) for naming and saving alternate versions of the project. The MDR now has the capability of saving and loading alternate project versions. (formerly an HDR-only feature)
- Track rendering added to the MDR.
- Importing Audio added to the MDR. Imported Broadcast Wave files can be automatically placed at their original time-stamped position or at the current time position.
- Support for new Mackie hardware – OPT●24 I/O card, Serial●9 remote control card, and HDR Pro™ Pro Tools® direct export and import.

That looks like a mighty short list, but these are important changes that affect the way you (and the recorder) work. This first section describes the new features and explains how new changes affect old functionality.

Broadcast Wave Files

Mackie hard disk recorders now use Broadcast Wave files as the native recording format. The Broadcast Wave file format maintains compatibility with the original Wave format but includes a time stamp in the file header. This allows a device or program that recognizes the time stamp to place an imported audio file at its originally recorded time position. The HDR's audio files can be used by practically any device or software that uses either standard or Broadcast Wave audio files. The file name extension .WAV has been retained.

Broadcast Wave files are particularly useful when moving a project from the recorder to a DAW. Under previous software versions, the only sane way to assure that all the portions and punch-ins of a track remained intact when transported to another work environment was to render the track (formerly only a function available on the HDR), creating a new file representing the complete track. With time stamping, you can transfer all the individual files comprising a track to a DAW just as they were recorded, and instruct them to jump to their time-stamped (usually called "original") time positions. Everything will fall into place. This works in the other direction too. Segments of a track recorded or edited on a DAW that uses the Broadcast Wave format can be imported to the HDR as individual files. On command, they'll snap to their true relative positions on the track, preserving the original recorded sequence and timing.

Although the audio software industry is moving toward the adoption of Broadcast Wave as a universally accepted file format, not every DAW supports it yet. While most programs that don't support Broadcast Wave won't choke when importing HDR files, you won't be able to spot them automatically. For that, we still have Track Rendering, which is now a feature of the MDR as well as the HDR.

New Project File Structure

Each HDR Project has its own folder on the disk. Along with one or more folders containing the audio files, through Version 1.2, there was a single file (PROJECTNAME.HDR) describing how audio recordings are used – which chunk of audio to play when, and on which track. The HDR allowed saving of edit data for multiple versions of the Project, called Playlists, in this .HDR file.

Due to its limited editing capability, the MDR created only a single Playlist, although it has always supported multiple Playlists to the extent that when playing a project on an MDR that was recorded on an HDR, the Playlist which was active when the project was last saved was the one the MDR used for playback. On an MDR, the active Playlist is always updated with information about new recordings made in the project, however you couldn't switch Playlists or save an alternate Playlist on the MDR.

The Mackie SDR24/96, designed by a different team than HDR, uses a different format for the Project file. With Version 1.3 of the operating system, this new format has been adopted for the HDR and MDR, allowing projects to be seamlessly interchanged among all three Mackie recorders.

In Version 1.3 and above, the HDR's Playlist function is gone. It's been replaced by one or more Project files residing in the Project Folder. HDR users will note that there is no longer a Playlist function on the menu bar, nor a Playlist Manager or ALT-P shortcut key. While it's unlikely that you'll do enough editing on an MDR to warrant saving multiple project versions, when working on a project recorded on an HDR which includes several alternate versions, you can now select among them on the MDR. This enhances the transportability of projects between an HDR and MDR.

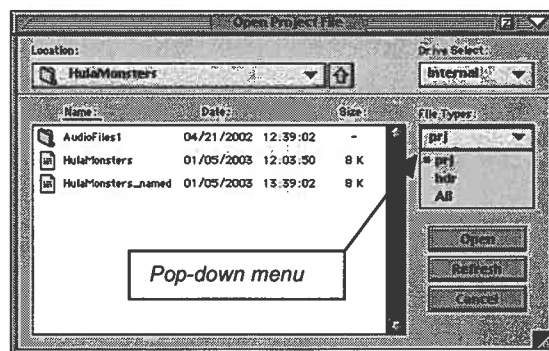
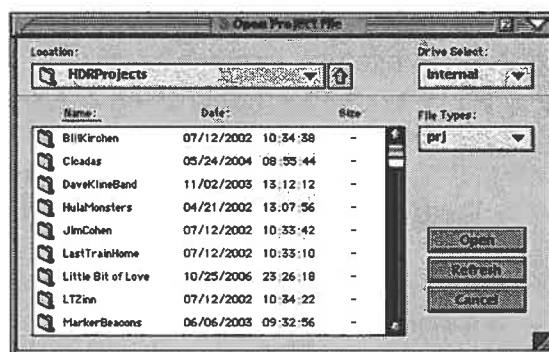
Project listings look a little different now, both on the GUI (HDR monitor) and front panel LCD menus. Previously, there was only one Project file, so the operating system opened the selected Project using the Playlist that was active when the Project was last saved. In Version 1.3, the Project folder can contain many Project files. Opening a Project now requires two steps. First, locate and select the Project folder, then select the Project file you wish to open (even if there's only one). As before, the last Project saved will open automatically when powering up the recorder. but switching between versions of a Project or opening a different Project than the one last saved requires an extra step.

Opening an Existing Project – The GUI View

This now looks and works differently from Version 1.2 since the project file you're seeking is now inside the Project Folder, one level further down from the HDRProjects folder. The GUI Open Project window is a good place to get a sense of how things are organized. MDR users can follow along.

The HDRProjects folder contains a folder for each Project on the disk. This hasn't changed. Double-clicking on a Project folder opens it to display its entire contents.

Each Project folder contains an AudioFiles1 folder (more than one if it's a busy project), Imported and Rendered folders if these have been created, and the Project files (what you're really looking for).



Note the pop-down File Types menu to the right of the file list. This allows you to mask the list of Project files so only the .PRJ (new) or .HDR (old) project files are shown, or to display all files. This masking is significant when opening projects from the GUI since the file name extension is not displayed.



If the File Type mask is set to “prj” (the default) when attempting to open an older project that was saved under Version 1.2 or lower, you won’t see its name listed. Don’t panic! Select “All” or “hdr” from the File Types pull-down menu and the old project name will appear.

Opening an Existing Project – The Front Panel LCD View

When opening a project using the LCD, after selecting **Project ► Open** and selecting the internal or external disk drive, you’ll first scroll through the Project Folder names. Select the Project folder using the **NEXT** button, then scroll through the folder’s contents. You’ll see the whole nine yards - AudioFiles, Imported, and Rendered folders (if present) as well as the project file names.

Select Project File?			
HulaMonsters			
<<	>>	Cancel	NEXT

Unlike with the GUI, the file name extension is displayed on the LCD so you’ll see the .PRJ files and, if they’re present, the old format .HDR files as well.

Open Which Project?			
HulaMonsters.prj			
<<	>>	Cancel	Open

Working With Old Format Projects - Conversion to the New Format



While you can select an old format project in Version 1.3 and above, you can’t actually open it. Upon selecting an old format Project file (PROJECTNAME.HDR), you will be prompted to convert it to the new format. Just do it. Canceling the file conversion won’t open the project, it simply aborts the Project Open process. The conversion is painless.

Converting to the new format creates a new .PRJ file with the same name as the original project. If the original Project had more than one Playlist, upon conversion, there will be a new .PRJ file created for each Playlist. The audio files are untouched (they aren’t converted to Broadcast Wave in this process), and the original PROJECTNAME.HDR and MKIETEMP.HDR files remain intact. The old .HDR file isn’t updated automatically when you save the project (the .PRJ file is, of course), but there’s a command to save the project in the old format if it needs to go back to a recorder running the older software for some additional work.



One thing we lost with the new Project file format is the automatic creation of an equivalent to the old MKIETEMP.HDR file. This was a copy of the last saved Project file, which at times has been a life saver, recovering a project where the primary Project file became corrupt.

Starting a New Project

This procedure is unchanged from earlier software versions. When you begin a new Project, a new folder is created along with a new .PRJ file, both carrying the name of the new project.

Saving a Project

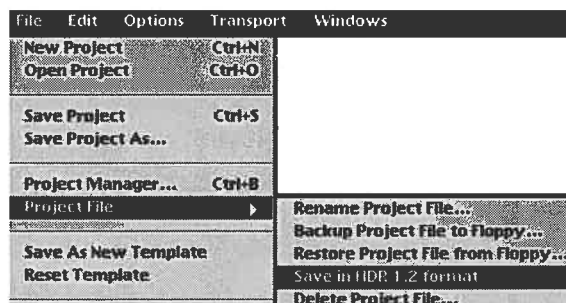
Saving a project also works just as in previous software versions. As before, audio files are automatically saved and the Project file is updated as soon as recording stops. However (as before) editing operations are not saved until you save the Project using Save from the LCD Project menu, *Save Project* from the GUI File menu, or with the keyboard shortcut Ctrl-S.

Save Project As (New Function)

Version 1.3 adds the new function Save Project As, which replaces the HDR's Save Playlist. Both the HDR and MDR now allow saving multiple versions of the project. Select *Save Project As* from the GUI File Menu or from Page 2 of the LCD Project menu. Entering a new project name creates a new .PRJ file in the Project folder.

Save in Version 1.2 Format

In order to provide backward compatibility with recorders running Version 1.2 or below, the current Project can be saved in the old .HDR file format. This command is on the third page of the LCD **PROJECT** menu, or in the Project File menu under the GUI File menu.



 If an old format Project file of the same name exists, you'll be asked if you wish to overwrite it. This is the way to update an old format file so that the latest version of the Project can be opened by a recorder running older software. **BUT** if the overwritten project contained multiple Playlists, those will go away. Best to Save Project As a new name, then save that in the old format.

Backing Up the Project File (New HDR Feature)

The HDR has a new GUI-only feature which allows you to make a copy of the Project file (but not the audio files) on a floppy disk, and to restore the Project file from the floppy disk if necessary. You'll find it in the Project File menu under the File menu. A backup may help you to recover from a corrupted project file on the hard drive in the same manner as you could use the MKIETEMP.HDR file in older software versions. Unfortunately this feature is not available on the MDR.

Need I remind you to back up your projects? Even the audio?

Good. I didn't think so.

Deleting Projects and Project Folders

There are now two levels of deletion – Delete Folder and Delete Project File.

Delete Folder is like the old Delete Project. Delete the folder and everything is gone – the audio files, the Project files, the Rendered and Imported folders – everything about the project goes in one shot. Well, in theory anyway. But sometimes it doesn't quite work as planned. See page 71 for tales and details.

PROJECT MENU			[1]->
New	Open	Save	Delete Folder

The Delete button in the HDR GUI Project Manager window retains its original function of deleting the entire Project folder and all of its files and sub-folders, including the audio files. Use these tools only when the job's complete, backed up, and delivered (or you've decided to scrap it entirely).

Delete Project File deletes only the selected .PRJ file, leaving everything else intact. Use this function to reduce clutter and confusion when

<- PROJECT MENU			[3]
Delete Proj File	Purge Audio	Save 1.2 Fmt	

you have obsolete versions of the project. The Project file is relatively small, so deleting it doesn't reclaim a significant amount of disk space. This function is the equivalent of deleting a Playlist using the Playlist Manager in earlier HDR versions.

The GUI *Delete Project File* function is located in the Project File menu under the File menu. After deleting a project file, you may need to Refresh the GUI file listing in order to see your handiwork.

Importing Audio Files (A New MDR feature)

The HDR GUI menu has always offered the ability to import audio files from another project or external source. Audio file importing is now available on the MDR, and by using the front panel LCD interface of the HDR as well. Audio files can be imported into a track of the current project from any folder on the internal or external disk drive.

The process of Importing using the GUI is unchanged from the previous version. Imported audio files appear as entries on the Regions list which you then drag to a track at the desired position.

An added feature that comes along with the use of Broadcast Wave files is that selecting the region and right-clicking brings up a menu which now includes the Restore Time Stamp function. If the file that region represents has a time stamp, selecting this function from the menu (or its keyboard shortcut Ctrl-Shift-T) zaps the selected region to its original time stamped position.

Importing Audio Using the Front Panel LCD (MDR and HDR)

The LCD file import procedure works a bit differently. Imported audio goes directly to a track, either at the current time (cursor) position or, if the imported file is time stamped (Broadcast Wave or AIFF), at its original time-stamped position. Since a source file might come from anywhere, you will most often import it at the cursor position and juggle it into place later.

1. Open the project into which you want to import audio. Press **TRACK (TRACK/EDIT)** on the MDR). Select the 2nd page and select **Imprt Audio**.

<-TRACK EDIT MENU				[2]
		Set	Imprt	
Mute	Render	Virtl	Audio	

2. Select the audio file to import using the << >> buttons to page through folders. Use the **Open** button to select the folder, then select the file to import. If you're importing a file from another HDR/MDR project, it will be in that project's AudioFiles folder.

Import File				[1]->
C:..objects/GuitarRiffs/AudioFiles1				
Track 01_tk1.wav				
<<	>>	Up	Open	

The **Up** button moves up one folder level. The full path name truncates to the left (as in the example above) if it's too long to fit in the display, so you can always see the name of the folder that's currently open.

If the file you want to import is from a project located on the other drive, switch to the second page of the **Import File** menu to select the drive.

<- Import File		[2]
Current Drive c:		
Select Drive		
Internal	External	

A typical selection sequence is:

HDR Projects -> GuitarRiffs -> AudioFiles1 -> TRACK 01_TK1.WAV

3. When the name of the file you wish to import is displayed, press **Open** and you will be prompted to select the track in which you want it to appear. Select the track using the track arming (Record Ready) button.

Where to Insert?	
Track 01_tk1.wav	
(trackselect = record)	
TimeStamp	Cursor

4. Press either the **TimeStamp** or **Cursor** button to import the file. The transport controls are active during this operation so you can play the project and park the transport fairly close to the correct Cursor import location. Expect to do a little tweaking later to get it right on.

After importing the file, you are returned to the file selection menu. You can import additional files from the same folder by selecting them using either the << >> or **(-)DEC/(+)INC** buttons.



Audio can be imported from anywhere on the internal or external disk drive. If you have a library of files (drum loops, for example) that you use in several projects, it's handy to create a dedicated folder on an HDR drive (either internal or external) and stash them there. If you're transferring files via FTP, use your FTP client to create their folder.

Alternately, if your computer is set up to accommodate a removable HDR drive, copy your drum loops from the computer to a folder on that drive and just pop it in to the recorder when you want to import one of your "library" files into a project. This is a good use for one of those old "small" disk drives that you don't want to use for recording.



Save the project immediately after importing audio files. Importing is an editing operation, not a recording operation, so your work isn't automatically saved. While imported files remain in the Project's

Imported folder, if you power off the recorder or switch projects before saving, they won't play the next time you open the project. This is because the current Project file doesn't get updated with information about those files until you save it. Forget this and you'll have to re-import the files to their track positions.

Some Curious Things About Importing Audio:

- Files must have unique names on the disk so that the operating system (OS) can tell them apart. Since the HDR derives its audio file names from the name of the track, when importing files from other HDR projects, you could easily have more than one file with the same name. This is no problem as long as they remain in their own project's AudioFiles folders, but put them together in the same Imported folder and the OS needs a way to tell what's what.

The Mackie OS deals with this by appending a sequential number to the end of what would otherwise be a duplicate file name in order to make it unique. Here's an example:

Let's say you're creating a new drum track and want to borrow patterns from the kick track of two other projects. Import the kick track named KICK_TK1.WAV from the first project. Now, select the second project containing the other kick drum part you want to use. This one is also named KICK_TK1.WAV, but when you import it, rather than clobber the existing file of the same name (or complain to you about it), when copied to the project's Imported folder, it will automatically be renamed KICK_TK11.WAV. A similarly named kick track from a third "source" project would be renamed KICK_TK12.WAV when imported.

It's important to understand this renaming process if you use the HDR's GUI for importing files so you'll know which Kick is which when dragging imported files into a track from the Regions list.

When using the LCD for file import operations, the files are still renamed using this convention whenever necessary, but you won't normally see the modified file names unless you stumble across them in another import operation or use FTP to transfer them to a computer.

- Both standard Wave and Broadcast Wave file formats have room for quite a bit of information in their header area (the non-audio part of the file). The HDR can be a bit fussy about extraneous data that it doesn't understand. If you receive an error message when importing a file created on your computer (Error 50 is typical), this may be the reason. After a couple of unsuccessful retries (hey, it never hurts) try opening the file on your computer using a different audio editing program, then re-save it. This may remove the troublesome header data and allow a successful import.
- It's possible to import a file that has a different sample rate and/or word length (bit depth) than the current project. The recorder will neither prevent you from doing this nor give an error or warning message. If the word length is different, it will play just fine. If the **sample rate** is different, the imported file will not play back at the correct pitch and speed. Be careful!
- An audio file is time-stamped with the time it's recorded and that time remains with the file, at least as long as it's on the HDR. If you move a region or copy it to another track, the time stamp isn't updated with its new position. If you import it into a DAW at the time stamp position, it will probably not go to where you want it. Rendering the track or the region will update the time stamp.



Here's a space-saving tip. When importing a file from a DAW to one specific project, if an Imported folder under the Project folder doesn't already exist, use your FTP client program to create it (location and case is important! See the File Hierarchy on page 78) before transferring the file from the computer to the HDR. Then transfer the file to the newly created Imported folder. Why? The first thing the import process does is make a copy of the file you select for importing and put that copy in the project's Imported folder (which will be created if it doesn't already exist). If you put the file directly into the folder where the recorder expects it, there's no need for an extra copy, saving some disk space.

Purging Unused Audio Files



Purging in Version 1.3 and later works differently than before and is potentially more dangerous than with the previous software versions. This explanation is going to get confusing because of the two different uses of the term "Project." As a refresher, there's the top level Project folder which contains one or more Project files representing differently edited versions of the top level Project. Each top level Project folder includes one or more AudioFiles folders which contain all of the recordings used the various Project files under the top level Project folder. Got it? OK, fasten your seat belt.

Formerly, each version of a project was saved as a Playlist in a single Project file. If a chunk of audio was used in *any* Playlist in that Project, it would be safe from deletion when purging. An audio file would only be deleted when purging if it was no longer referenced in any Playlist for that project.

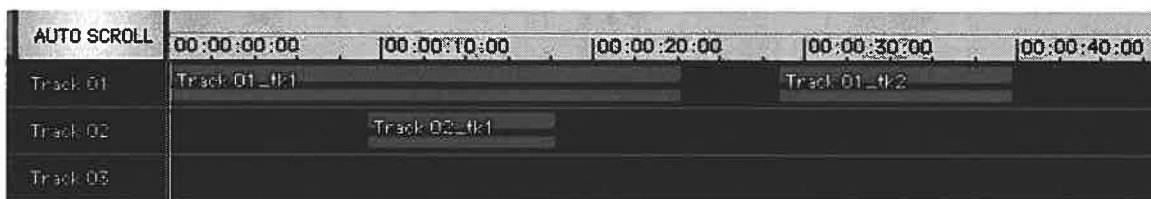
Things are different now that each version of the Project has its own Project file. A Project file is a selfish thing, caring only about audio files that it needs and is unaware of other Projects under the top level Project folder which may use other audio files in the shared AudioFiles folder. The Purge function only protects files used in the *currently open* Project (version). Files in the AudioFiles folder used in alternate versions can be permanently deleted if you're not very careful.

When purging files using the HDR's GUI, you'll be shown a list of the files that it thinks can be purged. You can still (as with previous versions) choose to purge all the files on the list or retain some of them. Don't leap before you look carefully. There may be some files in that list that are used in a different project version which you may still want to use. It's easy to just say "sure" (followed by language not acceptable in a scholarly publication such as this).



Using the Purge command from the LCD menu is particularly dangerous. All audio files that are not used in the ***currently open*** project version will be purged when you say "go." You don't get a chance to review what's about to happen. Purging before you finish mixing can be hazardous to your mental and perhaps physical health.

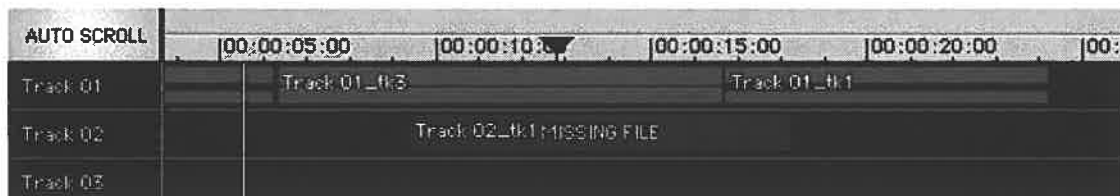
This is what happens if you purge carelessly. Here's the original recording pass:



You decide that the little section at the beginning of Track 2 isn't working, so you delete it, save the project with a new name thinking that you can always go back to the initial project version if needed, and you continue working. At the end of

the session, you save the Project under its current working name. Disk space is running low and you've recorded a lot of scratch takes, so you decide to purge the unused audio files. Since the TRACK 02_TK1.WAV file that you edited out of the original take isn't used in the current project, it will be deleted.

When the client comes back next week and asks to listen to that very first take in Track 2, you open the original version of the project that you had saved just in case, and OOPS!:



The place where that segment of the track used to be is shown, but it's corresponding audio file isn't there. This is why purging before you're really sure you're really finished with the project is a risky prospect.

You have been warned!

Rendering Tracks (New MDR feature)

While the HDR has always had the ability to render tracks, this is a new feature for the MDR, so some explanation is in order.

Each time you stop recording, a WAV file for each track recorded during that pass is saved. Additional recordings on the track such as punch-ins are saved as new WAV files rather than modifying or appending to the track's original file. Furthermore, when making a continuous recording such as a live concert, the audio files are automatically saved every fifteen minutes and a new set of files is opened. After a lot of punching-in or at the conclusion of a long recording, you will have many audio files associated with each track of the Project. The recorder knows how to keep track of them, but your DAW program may not.

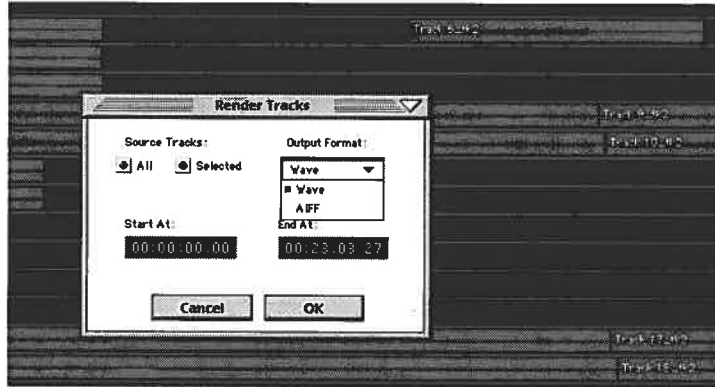
Rendering creates one file that contains all of the audio for a track just as you hear it, including all edits and punches. A Rendered folder is created in the Project folder the first time you render tracks in that Project. That's where you'll find the rendered files when you want to move them to a DAW or import them into another project.

Rendering Tracks from the HDR GUI (A refresher)

Select *Render Tracks* from the Edit menu. You can either choose individual tracks for rendering or select All. A pull-down menu allows you to select either Broadcast Wave or AIFF format for the rendered files. Default start and end times are the beginning and end of the selected track or the longest track of a selected group, but you can change those times in order to render only a portion

of the tracks, for example a four bar drum phrase, or a single song from an extended concert recording.

In the example, note the slightly staggered breaks in tracks 9, 10, 17, and 18 near the right edge of the screen. This is a concert recording with tracks longer than fifteen minutes which were automatically split into separate files by the recorder. Rendering will make those whole and will make importing to a DAW more convenient.



Rendering Using the Front Panel LCD

This requires several more steps than using the GUI, but it's the only way to do it on an MDR. You can of course use this procedure on the HDR also.

Select **Render** from Page 2 of the **TRACK/EDIT** menu. Select the tracks you wish to render using the Track Arming buttons. You can

START:00:00:00:00			
END:00:23:15:08			
(trackselect = record)			
Start	End	Cancel	Render

render multiple tracks in a single pass. Starting and ending times for rendering are selected by parking the transport at the beginning of the section to be rendered and pressing the **Start** button under the LCD label, then moving the transport to the end of the section and pressing the **End** button. Once the tracks and times selected, pressing the **Render** button does the deed.

Note: If you have more than one virtual take for a track, the one that's active when you begin the rendering operation is the one that will be rendered. Be sure you render the correct take. The rule is "What you hear is what you get."



Use the LOC1 and LOC2 buttons to set the Start and End Render times. Set LOC1 to the beginning of the song or section you want to render, set LOC2 to the end. Then use those buttons to park the transport at the render start and end points. The transport controls are active while this menu is open, so you can locate start and end points by ear as well.



Rendering can create some pretty large files, particularly if you're rendering a lot of tracks from a long show. It's easy to run out of disk space. If you're in a crunch, you can render a few tracks at a time, copy them off to a computer, delete them from the recorder's disk drive (you'll have to use FTP for this), and then render some more. The software insists that the

Rendered folder stay with the project, so you can't render tracks to the recorder's other disk drive.

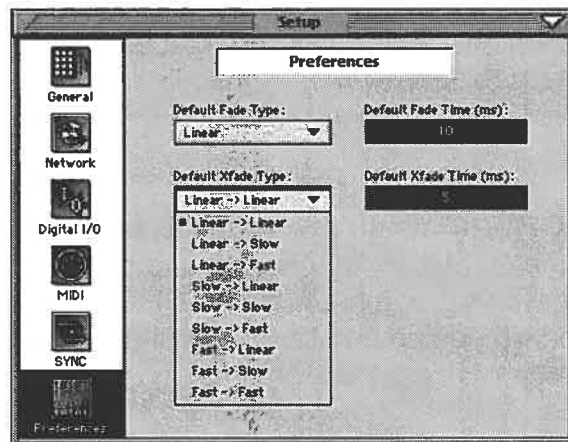
It's worth noting, too, that the HDR's operating system imposes a maximum size limit of 2 gigabytes for a rendered file (or for that matter, any file). This represents about four hours at 48 kHz, 24-bit word length. If you've recorded a 7 hour rave show, best to render the tracks in two or more sections.



Check your gas gage! Available disk space expressed as time is displayed in the LCD. If you're rendering a 24-track project, a glance at the available recording time (with no track arming buttons pressed) will tell you if there's enough disk space to render. If the project is 40 minutes long, you'll need at least 40 minutes of disk space available for the rendered files. If it's only a 15-track project, pressing 15 track arming buttons will show the time available for rendering fifteen tracks. Better allow a few minutes for breathing room.

Defaults for Fades (New HDR feature)

Formerly, defaults for fade-in, fade-out, and crossfade shape and length were fixed. To change them, you had to open the Region Editor or drag the fade area at the edge of the region. Version 1.3 added a new function to the HDR Setup Preferences window which allows you to set the default length for each fade time as well as the default fade type.



The default fade type is set by clicking the box and selecting your choice from the pull-down menu. The default fade time (0 to 50 milliseconds) is set by clicking in its window and dragging the mouse pointer up or down. Unlike most other numerical settings on the HDR which can be edited by clicking on the number and typing in a new value, dragging is the only way to set this one. This sure had me baffled for a while.

Official Accessories and Upgrades

Since the introduction of the HDR and MDR, Mackie has released several new hardware options. Some have been discontinued though they may still be available from dealers or can be purchased second-hand. Occasionally a second-hand recorder will have one or more of these new accessories installed, so it's good to know what you have.

OPT•24 Digital I/O Card

The OPT-24 is a 24-channel I/O card that uses the ADAT™ fiber optic (lightpipe) interface. Unlike the standard I/O cards, it's installed in the ACC1 (ACC on the MDR) PCI slot, interfacing directly with the motherboard. When installed, the OPT-24 card appears in the Digital I/O Setup menu as three 8-channel I/O devices. Each bank of eight inputs can be selected between the OPT-24 and whatever card is installed in that bank's I/O card cage slot. Outputs of the OPT-24 (as well as cards installed the I/O card cage) are active all the time, so there's no output selection.

OK, I lied about the OPT-24 appearing in the Digital I/O Setup menu. With HDR OS Version 1.4, the recorder can use the OPT-24 as the *only* installed I/O interface. With an OPT-24 installed with but no cards in the I/O card cage, the Digital I/O Setup menu will not show that the OPT-24 is present, but it will still work.

The OPT-24 is a great addition to a recorder that does double duty - in the studio connected to a digital console and on the road, plugged into a PA console or a bank of mic preamps. With an OPT-24 plus three AIO-8 analog I/O cards (standard equipment with the MDR) installed in the card cage, you'll have convenient access both to analog inputs in the field and digital I/O back at the studio.

With this dual I/O configuration, analog outputs can be used as direct-from-track sends to analog signal processors during mixdown. When mixing on a digital console equipped with both analog and digital inputs, you can connect a compressor to a track's analog output and bring the compressed output into the mix using a line level analog input on the console. Be aware that the latency between optical and analog outputs (and inputs, too, on most consoles) is different. Don't put the same track coming through both a digital and analog paths into the mix without compensating for the different delay times.

Serial•9 Transport Control Card

The Serial-9 card replaces the MIDI I/O card and adds an RS-422 interface with the Sony P-2 (commonly called "Sony 9-pin") machine control protocol. This is the industry standard for controlling multiple machines in a video editing environment. Sony 9-pin protocol is defined for both the Device mode (responds to incoming commands) and Controller mode (sends commands). The Serial•9

card is jumper-configurable to be either, but in the HDR/MDR, it only functions in the Device mode - you can control the recorder from a video editor or a VCR, but you can't use the HDR as the master controller of a video editing system. Basic transport controls, locate commands, and starting time code are supported, but not track arming or jog/shuttle control.

The Serial-9 card also includes a MIDI interface, so you don't lose that capability when it's installed. There are two 9-pin D-subminiature connectors on the rear of the card. The one on the bottom is for MIDI connections and uses the same breakout adapter as the standard HDR/MDR MIDI card. The connector on the top is for the P-2 serial control.

HDR Pro™ Pro Tools® Direct Import/Export

HDR Pro is actually a different version of the HDR operating system software, identified as Version 1.4, Build 419. This is an "unlisted" version. It comes on floppy disks along with the HDR Pro kit and is not downloadable from the Mackie web site. Guard your Build 419 floppy disks carefully and make a backup copy.

The HDR Pro kit also includes a Firewire enclosure for the HDR removable disk drives (but not a removable drive – you need to provide that yourself) which offers a convenient means of accessing an exported project from a computer running ProTools.

Once the Build 419 software is loaded and authorized, two new items become active in the File menu – *Import ProTools* and *Export ProTools*. The Export function creates a ProTools session file on the external drive which, when attached to the computer through the Firewire docking station, can be opened from ProTools. It includes all the tracks recorded on the HDR as well as edits. Conversely, the Import ProTools function imports a ProTools session from the external drive into an HDR project.

Understand that every digital audio workstation handles crossfades differently. Expect that crossfades (this includes edit boundaries) performed on one system may sound different on another system. There's no audio data lost when transferring a project in either direction, but you may need to tweak edits after an import. For this reason, you probably should avoid multiple import/export cycles. If you want to keep your HDR edits intact, first render the track or portion with the edits, replace the original recorded and edited section with its rendered equivalent, and then export.

THE FINE PRINT: At the time of this writing, HDR Pro only works with ProTools versions 3, 4, and 5, and only on a Macintosh computer running OS9. There are some workarounds for later versions, but before you invest, check with Mackie Tech Support to confirm that it will work for you.

BIOS Upgrade for Large Drive Support

Between the mother board, operating system, and BIOS used in the original HDR, the largest disk drive supported is 32 GB. At design time, that was state-of-the-art, but today drives of this size or smaller are becoming scarce, while projects and our storage needs are becoming larger. In 2003, Mackie, working with eSupport (a company that supports the Award BIOS used in the recorder), released an updated BIOS which supports drives up to 120 GB. Because the new BIOS uses a different chip than the original part, the upgrade can't be performed using a flash loader, the chip itself must be replaced.

A BIOS Upgrade Kit is available from the Mackie Parts Department or it can be ordered through friendly a dealer. It's not free (\$49 at this writing) but it's probably the best investment you can make to extend your recorder's service life. The kit includes the new BIOS chip, an electrostatic grounding wrist strap, and complete installation and setup instructions.

Officially, this BIOS upgrade is only for supporting larger external drives. Also, officially this upgrade is only for the HDR although MDR owners can purchase the kit. Unofficially, drives are drives and motherboard are motherboards. An upgraded HDR or MDR works fine with internal and external drives up to 120 GB.



After replacing the BIOS chip, it's necessary to review and modify some of the settings stored in CMOS memory which establish certain conditions upon start-up. In order to do this, you need a monitor to display the settings and a keyboard to page through the menus and make changes. That's no problem on the HDR since monitor and keyboard ports are included, but there are no such ports on the MDR. Don't give up hope, though. There are a couple of solutions in the Unauthorized Modifications section of this book (pages 57 and 65).

Instructions for installing the BIOS upgrade call for clearing the CMOS before reviewing and changing the settings. This is not really necessary since by the time you receive it, the BIOS chip (where CMOS memory is located) will have been disconnected from power long enough so that it will wake up with its default settings. If you want to be sure, you can take a shortcut and use the CLEAR CMOS jumper (Page 33).

While you have the cover off, give your recorder a good cleaning. Vacuum out all the dust and cat hair, and if the recorder is a few years old, you might as well replace the CPU battery too. (Page 42)

Other Firmware Updates

While these aren't new, they weren't very well publicized. Second generation owners may have machines which can benefit from these updates.

Frequent Error 43 Messages When Booting?

HDRs before serial number CD11218 can benefit from a firmware update. Updating the EPROM on the "Brain" board to Version 1.2 (no relation to the OS version 1.2) or newer can reduce the occurrence of Error 43 messages. This is usually a factory or authorized field service center update, but if your recorder has an earlier firmware version, contact Mackie Tech Support and see what they can do for you. This EPROM is a critical component that makes an HDR different from an MDR and Mackie controls the licensing of the firmware. Obtaining a new chip is not as simple a request as it may seem. 'nuff said about that.

It's not clear (to me, anyway) just what this update fixes other than frequent occurrence of the Error 43 messages, but if your machine hasn't been updated, it's worth looking into.

MACKIE DIGITAL SYSTEMS
HDR 24/96
loading, please wait

To determine your recorder's Brain EPROM version, look at the initial message displayed on the LCD when booting. If the last line says "loading" with a lower case "l" it's the old version. The new version uses an upper case "L" in this line.

MDR BIOS Firmware Update (not Large Drive Support)

This is for MDRs below Serial Number EV10227. It's an update to the standard BIOS firmware code. There are no specific functions or failures that this fixes, it's just a general system stability improvement. The update utility can be found on the Mackie web site or on the CD included with this manual. The BIOS flash loader floppy disk that's created from the self-extracting disk image file also loads the correct CMOS settings for the original BIOS, so it can be used to restore those settings if necessary. It also works in the HDR.



You must be running operating system Version 1.2 or later in order to use this BIOS update. You're probably there already. If not, first update the OS.

To update the BIOS, on a Windows computer, first run the MDRBIOS1_0.EXE program file to create a bootable floppy disk containing the flash loader and the new BIOS code. If you have a Mac, use the file MDR_BIOS_UTILITY_1_0.HQX, following the OS installation instructions for Mac users to create the bootable floppy. Insert the floppy into the recorder's drive, power up the recorder and the update program will start automatically.



Don't try this during a thunderstorm or if you have any reason to suspect an imminent power failure. If you have a battery backup UPS, even if you need to borrow it from your computer, it's a very good idea

to power the recorder through the UPS while performing this update. If you turn the power off (or the power fails) before the procedure is complete and the firmware code is not fully loaded, it's likely that the CPU will no longer know how to boot from a floppy, requiring replacement of the BIOS chip.

After booting from the BIOS Flash Update floppy disk, keep your eye on the floppy drive activity indicator light. It will stay lit for about a minute while the program is running and the new BIOS code is loading. There is no useful status information displayed on the LCD. You'll see the notorious Error 43. Don't let this bother you – of course the host didn't boot, because you're not running the recorder's operating system.

The floppy disk light will go out when the program has done its thing. At this point, remove the floppy, wait about ten seconds more, then turn the recorder power off. You may have to hold the power button for several seconds before it switches off. The BIOS update is now complete. Power it up to be sure it boots properly.

Tips and Things You May Have Missed

These are things which have been documented previously, either in the Quick Start Guide or HDR24/96 Technical Reference, but they come up frequently on the Mackie User's Forum, suggesting that either:

- They weren't clearly explained in the first place
- They're too hard to find in the documentation
- Your own copies of the documentation are too hard to find

Project Names

When opening a new Project, you're limited to a 16-character name. It's possible, however, to use up to 20 characters when renaming a Project or saving a version as a new Project. This is because folder names are limited to 16 characters, but file names (the .PRJ files) can be longer.

Changing Several (or all) Virtual Takes Simultaneously

Suppose after recording a good take, you want to record a second take, maybe for good luck or because you'd like to try to fix a few rough spots with edits rather than punching in on the original recording. There's a shortcut on the HDR for switching to another Virtual Take on all or a group of selected tracks:

Select the tracks you want to switch – Ctrl+click on each track, or Ctrl+A to select all tracks. Then, while holding the Ctrl key, click on the Take number of any track and select a new virtual Take from the pulldown menu. All the selected tracks will switch to the new Take.

Sorry, there's no equivalent shortcut with the MDR. You just have to push buttons a lot, but it goes pretty quickly.

What's Saved and When

Recordings are saved automatically as soon as you press the Stop button. If you forget to save the project before powering down or opening another project, you won't lose any recorded audio. If you're doing a long, continuous recording, each fifteen minute segment of audio is saved automatically. If you lose power during a concert recording, the most you'll lose is the last fifteen minutes.

Edits are saved only when you save the Project, so once you start editing, get in the habit of saving frequently. Cues (HDR only) and LOC points are saved when (and only when) you save the Project, so if you've been setting cues or LOCs while tracking that you expect to use later on, remember to save. When something needs saving, you're usually prompted to save the project before you open another project, but not always. You're never prompted to save before switching off the power unless you use the Shutdown command from the File menu (and honestly I don't think anyone actually does that). Get into the habit of saving often, and always before you leave a project.

Basic digital settings such as sample rate, word length (bit depth) and word clock source are saved when you save a project. A newly created project will open with the same settings as the last project that was saved. Typically these are “house standards” so this is logical, but watch out if you start a new project after working on one with different settings than you normally use.

If the project you last saved is no longer on the disk (perhaps it was on an external drive that went home with the client or was put back on the shelf), the recorder looks for a project named Startup, and if it exists, opens it. If the Startup project isn’t found, a new one is created and opened.

But . . . if you’ve deleted the Startup project and the recorder must create a new one, it will have the factory default settings of 16 bits and 44.1 kHz (among others). If you then open a new project, it will use those settings. If that’s not your house standard (and few people record at 16-bit resolution these days), be sure to change what’s necessary before you start recording into the new project.

The moral of this story is to keep a “house standard” Startup project on the internal disk. You needn’t record any audio into this project, so it won’t take up much space. Saving a Startup project with your “house” settings will assure that when not starting the day with the last project saved, you’ll at least start with your normal settings. It might save you from an embarrassing OOPS! some day.

Track names are stored within a Template. If you use descriptive track names, they will be used for each new project until you either change them and save as a new Template or you restore the factory template settings. There are several other settings that mainly have to do with the appearance and behavior of the graphic editing functions. These are saved in the files NEWTEMPLATE.TXT and GLOBALS.TXT and are retained until you change them. See Appendix F.

Organizing Songs in a Single Folder

One of the most requested upgrades that never happened was for a file management system that would allow you to group related songs as separately named Projects together in a single folder. A typical application for this is a band’s CD project with each song being separate project in a folder named for the band.

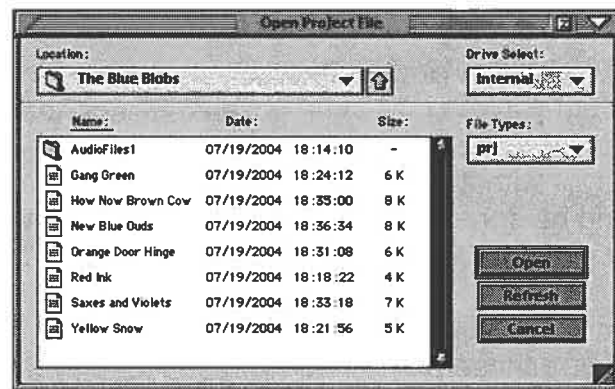
Here’s an example of how you can do this working within the system:

It’s easiest if you start with a list of song titles the band plans to record. The next several steps are just housekeeping. You won’t be recording anything yet.

1. Open a new project named for the band – The Blue Blobs. This creates a folder named The Blue Blobs and also a Project file named THE BLUE BLOBS.PRJ. You won’t actually record anything in this Project file, but keep it around. It might come in handy later.

2. Select *Save Project As* from the File menu. Enter the name of the first song – Gang Green. This will create a new Project file named GANG GREEN.PRJ in the The Blue Blobs folder.
3. Repeat this process for the next song. Again, *Save Project As*, this time entering the name of the next song, How Now Brown Cow. This creates a new Project file named HOW NOW BROWN COW.PRJ. in the The Blue Blobs folder.
4. Continue through the song list, creating a new empty project for each song. Don't close the project or open a new project, just keep saving it as a different name for each song. Now you're ready to start recording.

Say the band wants to work on Orange Door Hinge first. From the File menu, select *Open Project*. Under HDRProjects, select The Blue Blobs (you're probably already there), and you'll see the list of song titles you entered in the previous steps, each one being a separate Project. Open Orange Door Hinge and start recording. Remember to save it before going on to the next song.



There's only one AudioFiles folder for the whole top level project (a second one might be created if the project gets large) and all recordings for the whole CD will be in that folder. If the project remains on the HDR, this is not a problem - to the recorder they're all just files and it knows how to keep track of them. But when moving whole songs to a DAW, sorting out which WAV files belong to which song can get really hairy. Unless you keep very careful notes when tracking, you won't know if the file named TRACK 5_TK8.WAV is the first pass on Track 5 of the eighth song, or a punch-in on Track 5 of the fifth song, or something else.



One way to mitigate this mess is to modify the track names in each song so they remind you of the song's name. A good time to do this is when you're creating the set of new Projects for each of the songs you plan to record. Edit the track name before you *Save Project As*. For example, add GRN to the beginning of each track name of the song Gang Green. Since track names stick with the Project, and audio files take the current name of the track at the time they're recorded, files in the AudioFiles folder belonging to the song Gang Green will all have names starting with GRN, for example GRN_BASS_TK1.WAV.

Suppose you've created what you thought were all the Projects you'd need for this band and then they come up with another song to record. Simply open the (still empty) project named The Blue Blobs, the one created when you first started the project. Save that as the name of the new song and you'll have a new Project file.

Honestly, my preference is to open a new project for each song, but if you're accustomed to a computer-like folder organization, give this method a try. You have all the tools available to do the same thing on the MDR but it takes a whole lot of button pressing. Also, you can't easily name tracks to give each song's file names a unique identifier. Use your judgment and horse sense.

Multiple Instruments Recorded on the One Track (A neat HDR trick)

"Track cramming" is the technique of recording different instruments on one track when you're short of tracks and the instruments aren't playing at the same time. Say you need to record tambourine and shaker in a few spots in the song, but never with them playing simultaneously. You can do your overdubs on one track and be done with it, but if you'll be transferring files over to a DAW (where you may not be limited to 24 tracks) and have an HDR, you can work a little smarter.

Let's say you do the tambourine overdubs first. Name the track Tambourine and record those parts. While the shaker player is tuning up, change the name of the track to Shaker and record the shaker parts. When you're finished with those overdubs, rename the track Tamb&Shakr so you'll know what's on there.

By doing this, your tambourine recordings will carry the file names

TAMBOURINE_TK1.WAV
TAMBOURINE_TK2.WAV
TAMBOURINE_TK3.WAV

while the shaker recordings will have the file names

SHAKER_TK4.WAV
SHAKER_TK5.WAV

Etc.

The _TK numbers are consecutive, following the order in which you record them. If you decide that you need another blast of tambourine after you've recorded all the shaker parts, rename the track Tambourine again and you'll be recording the file TAMBOURINE_TK6.WAV. If you're importing the project into a DAW with plenty of tracks, you can put all the Tambourine files on one track and all the Shaker files on another track.

Concert Recording – A Novelette

Recording live shows is a popular application for the HDR. It's easy to carry in, set up and operate without a lot of haywire, doesn't occupy a lot of table space, sounds darn good, and can record a full concert or at least a full set without changing "tape." Bringing home a good recording of a live show isn't automatic, however. It requires thorough planning and preparation, as well as some luck and a great performance. Books larger than this have been written on the topic, but here are a few things to think about. Tailor them to your own needs.

Interfacing

Your first hurdle is getting signals into the recorder. This often involves sharing the PA facilities. If it's your PA system and you're the operator, you can work out all the details before the gig, but often you'll have to work with the house or band's engineer and equipment. Since you'll be dealing with analog signals (multi-channel digital outputs from a PA console are still pretty rare) you'll need AIO-8 analog I/O cards in your recorder. Alternately you might have digital I/O cards and outboard A/D converters, possibly with mic preamps.

Be sure you have all the cables you need. 24 channels worth of cables isn't something you can pick up at Radio Shack before the gig. Let me again emphasize the importance of tightening the screws that secure the D-subminiature plugs to the connectors on the I/O cards. If the screws aren't snug, the connectors can work loose and you could lose the signal to some channels. See the section on connectors on Page 95 for the gory details.

In the studio, we'll often put a plug halfway into the console's channel insert jack to get the console's mic preamp signal directly to the recorder. (Inserting a plug half-way into the jack taps the post-preamp signal without interrupting the signal path.) In a live sound setup, it's fairly common for the engineer to be using at least some of those channel inserts for signal processors, so don't assume that they will be available to you.

This practice is reasonably safe in the studio where everything is under control, but a concert venue or club is rarely a well controlled environment. A passerby bumping a "halfway-in" plug could take that channel out of both the PA system and your recording. You'll be mighty unpopular with the house engineer when he discovers that it was *your* plug that did the damage. Unless you're setting things up yourself and are fully responsible for the PA system, this is not the ideal way to take a recording feed.

If you must use channel inserts to feed your recorder, invest in a set of stereo-to-mono 1/4" phone jack adapters. This adapter has a TS ("unbalanced") jack on one end and on the other end, a TRS ("stereo" or "balanced") plug with the tip and ring connections tied together. Plugging it fully into a common 1/4" TRS insert jack gives you an unbalanced phone jack to feed the recorder inputs while

maintaining the signal path through the console channel. Radio Shack sells 'em – catalog number 274-1520 at the time of this writing.

Larger sound reinforcement consoles often have independent direct or subgroup bus outputs which usually make fine recording sources. Inquire about this when doing your pre-production research. Be sure to determine the type of connectors used for the direct outputs and bring the appropriate cables or adapters. Direct outputs (or insert sends for that matter) don't always come directly from the mic preamp. Sometimes they go through the equalizer section first, and might even go through the channel fader. If you can't get detailed technical information about the console from your venue contact, at least determine its make and model, then start web-surfing for a description, or better, a manual with a block diagram. Check it out on-site by while you're setting up by listening to what comes from the output you're using to feed the recorder as you tweak the channel's EQ controls and fader.

Unless the console has enough balanced direct or bus outputs to feed your recorder (insert sends are balanced only on the largest of consoles), your recording source will almost always be unbalanced. This is no problem given the relatively short cables (20 feet or so) between the console and the recorder, but be sure they're wired correctly. It's best to have the ring tied to ground when connecting the AIO-8 to an unbalanced source. A set of properly wired cables with 25-pin D-subminiature cables on one end and unbalanced (TS) plugs on the other is what you really need. Adapters add one more potentially weak link to the chain, so avoid stacking adapters on top of adapters if at all possible.

When taking your inputs from the PA console, it's unlikely that the signal level will be high enough to push the recorder's meters much above an eyeball average of about -10 dBFS. This is good in that you need not worry about overloading the recorder, but if the PA engineer is conservative about setting preamp gains, you may have lower levels than usual to deal with when mixing. This is seldom a problem, but you have to take what you can get. Beggars can't be choosers.

Your greatest concern when recording from the house console is that the signal to your recorder is almost totally under control of the PA operator. Most skilled live sound engineers don't fiddle with preamp trims once they get the gain into the ballpark, but when the fader is all the way up and the kick drum still isn't loud enough, he'll likely crank the preamp trim to get more level in his mix. Since it's fairly common in live sound engineering to run the preamps fairly close to clipping, in his effort to give the audience what they want to hear (remember that the audience, not your recording, is his primary responsibility) you might find yourself recording a clipped or otherwise distorted signal. Take heed if you're also the PA operator, and take heed if you aren't.

The best, though most expensive approach is to split the microphone outputs right at the stage or the console and use your own preamps. Good mic splitters

are expensive, as are good preamps, but for serious live multitrack recording, there's no better way to achieve both top quality sound and reliability.

Monitoring

You should have some way of hearing the signal that's actually being recorded. While it's tempting to trust that if can hear it in the PA and the meters are moving, your recording will be OK, there's a certain amount of risk with that approach. When the band's playing at full volume, you can't always hear in the PA speakers that a mic preamp is clipping, if a cable has developed a crackle, you don't know if you're recording a sound that you can use (has the mic stand drooped so the snare mic is pointing at the drummer's ankle and the house engineer has just cranked up the overheads?), or if something has just gone wrong.

The ideal monitoring situation is to find a room in the venue where you'll be out of the way and out of the noise, set up a small mixer and a pair of speakers, and treat the remote recording like a studio session. That's not always possible or practical and you'll have to use headphones to monitor the recording, but you need to make provisions for monitoring. I use a Mackie 1402-VLZ Pro. Since I may be recording more than the fourteen channels than the mixer can accommodate, during setup I'll swap cables around, checking every channel I'm sending to the recorder, soloing it in the headphones to assure that there are no technical problems. I'll leave the most important channels connected to the mixer for a rough mix during the show. I record my monitor mix on a stand-alone CD recorder for backup purposes or so I can hand the band a rough CD at the end of the show. You can kill both of those birds with a fairly unsophisticated laptop computer, and also use it to take notes during the show.

Got Disk Space?

Being able to record a whole concert on one or two disk drives is a godsend compared to lugging eight or ten reels of 2" tape, but make sure you have enough disk space to do the job. Depending on the situation, you might opt for recording at 16-bit resolution rather than 24-bit. This instantly increases your available recording time by fifty percent. Given the level of background noise in a live situation, it's rare that there will be any tangible benefit to recording at higher resolution. Use your judgment and common sense.

My preference is to use the external drive for recording concerts. Maybe it's my tape upbringing, but removing the media from the recorder as soon as possible just seems safer to me. Before upgrading my HDR to accommodate a disk large enough to store a whole concert, I'd use a separate removable drive for each set. These days I've become bolder and lazier (and cheaper, too) and trust the recording to a single drive.

Project and File Management

I mix with a real mixing console and most of my live recording projects end up sounding pretty much like what went on at the concert, complete with applause,

introduction, and stage chatter between songs. For this reason, I'm content working with a continuous recording of the concert set from start to finish. With the editing capabilities of the HDR, making song introductions sound more coherent, removing dead air, cutting out material that deserves the axe (or to fit the program to a time constraint) is quick work. Then I just mix the set from beginning to end.

Production goals and facilities, however, are different for each of us and for each of our projects. If your first step toward mixing is transferring files from the recorder to a computer with the goal of mixing individual songs rather than a complete show, it's helpful to work with a set of files for each song, one file per track. There are several ways you can accomplish this.

If the band takes plenty of time between songs and you're at the recorder (rather than on stage playing), simply open a new project for every song. This will put each song's files in its own folder so they'll be easy to locate when transferring to the computer. When opening a new project using the front panel controls (even if you have an HDR, you probably won't haul a monitor and keyboard out to the remote gig) the default name (Project #0, Project #1, Project #3, etc.) will serve the purpose. There's no need to scroll through the alphabet to name the project when you're in a hurry to start recording again. With a little practice, starting a new project with the default name takes about ten seconds. A piece of white tape below the Project button will help your aim in low light, speeding up the process.

A new project opens with all the tracks disarmed, so you'll need to make a sweep along the track arming buttons before you start recording. You're under the gun here so don't waste time finding one or two tracks that you're not using. Arm them all, and once the recorder is running, disarm the unused ones.

Here's another way to create a uniquely identifiable set of files for each song. Since audio files are saved automatically whenever recording stops and new files (with new names) are created when recording starts again, simply stop the recorder and restart it between songs. While all the files for the concert set will be contained in a single AudioFiles folder (or two or three if it's a long concert), you'll be able to identify which files go together by the "TK#" part of their names. Here's what you'll find in the project's Audio Files folder:

AudioFiles		
<i>Song 1</i>	<i>Song 2</i>	<i>Song 3</i>
TRACK 1_TK1.WAV	TRACK 1_TK2.WAV	TRACK 1_TK3.WAV
TRACK 2_TK1.WAV	TRACK 2_TK2.WAV	TRACK 2_TK3.WAV
TRACK 3_TK1.WAV	TRACK 3_TK2.WAV	TRACK 3_TK3.WAV
ETC_TK1.WAV	ETC_TK2.WAV	ETC_TK3.WAV
TRACK 24_TK1.WAV	TRACK 24_TK2.WAV	TRACK 24_TK3.WAV

The rub is that with each recording pass, the Project file grows larger and requires more time to update itself as the show progresses. During this “housekeeping” time, you’re dead in the water – you can’t start recording again until it’s ready. This can take as long as five seconds before you can resume recording near the end of the concert set, which seems like an eternity when the drummer start the count-off while the audience is still applauding the last number. Learn your machine, learn how the band works, and choose the procedure that makes the most sense.



It’s not necessary to actually stop the transport in order to stop recording. Punching out and in again will leave a gap between songs and start a new set of files. The “One Button Punch” mode is very handy for this. Using a foot switch for punching in and out (this is always a one-button punch) is another fumble-free way to break up a long recording. If you’re doing double duty as both tape-op and band member, a footswitch is very handy.

Any time you stop recording during a concert, there’s always the chance that you’ll miss something important. The safest way to divide a long, continuous recording into manageable song-length pieces is to keep the recorder running and when you get home, render the tracks one song at a time. It’s tedious but it won’t take very long if you’ve kept good notes and know the starting and ending times for each song.

Remember that rendering requires at least as much disk space as the original recording. You’ll almost certainly need a larger disk drive than the standard 20 GB if you use this method. It’s one more good reason to upgrade the recorder’s BIOS.

Document, Document, Document

You have nothing on the disk but the music. Notes you take during the recording will be of great value at mixdown time when you’re trying to figure out what happened and why something sounds the way it does. Make a track list. Note whether the source is a microphone or DI. It doesn’t hurt to note what type of microphone was used just in case you like it (or hate it). List each song by name and its starting time. If there’s a change from the standard track layout (the guitar player switches to trombone and plays into one of the background vocal mics) note that. Note who’s singing. If you hear an obnoxious noise, jot it down. Use a laptop computer, use a palmtop, use a notebook and a pencil (no batteries to go dead), but take notes.

If you have a Windows laptop computer and a MIDI interface for it (I use a simple USB interface with built-in cables and connectors), check out the program MTC_TO_CLIPBOARD.EXE on the companion CD to capture the recorder’s time to the Windows clipboard with a hot key. Paste it into your log. Cool!

Opening An SDR24/96 Project on an HDR

The SDR24/96, being smaller, lighter, and less expensive than the HDR or MDR, has become popular among HDR users as the “second recorder” to take on remote recording gigs without having to dismantle the studio. All three models share the same project and audio file formats, so it should be straightforward to move a project from the “remote” recorder to the studio recorder for editing and mixing. But, as always, there’s a but.

The HDR can only open a project on a removable drive if that drive has previously been Verified (Disk Utility menu). Without verification, the HDR sees it as a backup drive and will only allow you to copy a project from it to the other drive. The SDR doesn’t use drive verification, so the Verify function isn’t available on the its menu.

If you plan to record directly to the SDR’s external drive, first Format and Verify the drive in the HDR. The SDR will ignore the “brand” that’s placed on the drive when the verification test has passed, but the HDR will then be able to open the recorded project directly. Similarly, when using an external drive to move a project from the SDR’s internal drive over to an HDR for further work, copy it to a drive that’s been formatted and verified in the HDR.



The Verification procedure doesn’t check for existing data (like the project you just recorded) before starting to work. It writes its test files wherever it pleases, assuming that the disk has just been formatted and is blank.



Don’t run the Verify utility on any drive containing valuable recordings.

They will be trashed.

Mixdown to the HDR

This is sort of a poor man’s substitute for automation. If you have a pair of empty tracks in your project, route the stereo mix from your console to those tracks and use the HDR as a mixdown recorder. Since punch-ins are virtually seamless, to change something in the middle of the mix, just punch in over your original mix. Forget to un-mute the triangle two bars from the end of the song? Back up a few bars, roll and punch, this time keeping your finger on that un-mute button.

This is also a convenient way to do alternate mixes. If you want a mix with the lead vocal up a dB or two, copy the basic mix tracks to a pair of virtual takes and punch in the vocal sections of those alternate tracks with the vocal-up mix.

Typically you’ll want to move the mix to a computer, perhaps for some touch-up work, or to burn a CD. The simplest way to accomplish this is to connect the

outputs of those tracks to a pair of inputs on the computer's sound card and record it into the computer in real time. If you record to a stereo audio file, you're ready to burn.

Being computer-smart, however, you'll probably prefer to transfer files from the recorder to your computer rather than recording in real-time. If you've made any punches or edits in your mix tracks, first Render them, then import the rendered files. (This is one reason why a real-time transfer might actually be quicker.)

CD-burning programs almost always expect to work with a stereo file. What you get from the HDR is two mono files, one for each channel of the stereo mix. What to do, what to do?

Some DAW programs allow you to open a new stereo project and import left and right tracks individually. That's the easy way if your program has this capability. Otherwise, you'll need to open a new multitrack project on your DAW, import the left and right mix tracks into two separate tracks, pan one fully left, the other fully right, set the gains to unity, and mix them to a new stereo file.

AC Power Backup

It's a very, very good idea to power your recorder from an uninterruptible power source (UPS) to avoid losing power unexpectedly. The label on the rear of the recorder says 200 W, but with an internal and external disk drive, three analog I/O cards, and the disk drive busy, it barely draws 1 amp. A 300 VA UPS (which is about as small as you can buy) is adequate for keeping the HDR powered up long enough to shut down safely. If you're purchasing a UPS to power a studio computer or digital console as well, budget 250 VA for the recorder.

Don't depend on a UPS to continue a session when the power fails. Save what you have, shut down, and make a pot of tea. Remember also to take your UPS along when you go out on a remote. In real life, people trip over power cords! A 300 VA UPS is small and light enough to be carried in one hand.

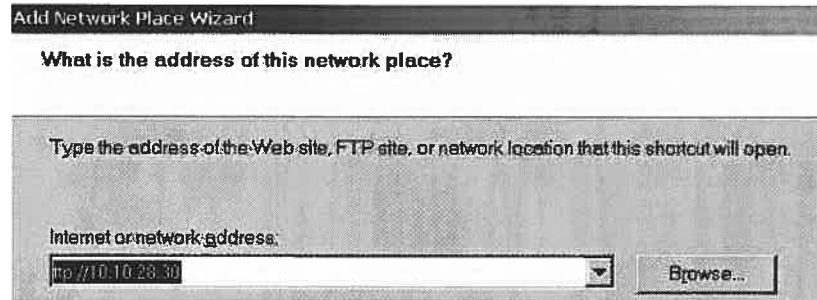
A Handy FTP Trick for Windows Users

While there are several good FTP client programs, here's a trick that you might find handy. Windows 2000 and XP have a "My Network Places" folder which allows file sharing between networked computers. Configure your recorder as a Windows "Network Place" and you can drag and drop files between its disk drive and your computer. Here's how:

From the My Network Places folder, select Add Network Place and follow the Wizard instructions. When asked for the Internet or network address, enter the recorder's IP address like this:

ftp://10.10.28.20 (don't forget the ftp://)

That's the default IP address, but use the address for your recorder if you've changed it from the factory setting. There's lots more info on networking in the HDR Technical Reference if you're lost at this step.



Click the "Log in anonymously" check box, and name the new Network Place appropriately ("Mackie HDR" is good). You can also create a second Network Place for the recorder's external drive. Use the IP address **ftp://10.10.28.20/e** (or whatever IP address you've assigned to the recorder).

The name you choose for the recorder will then appear as a folder under "My Network Places" in Explorer. After starting the FTP server on the recorder, you will be able to drag HDR files to your computer's disk drive or even open them directly from your DAW program.



While this is a really cool trick that can simplify some of your work, don't try to get too clever with it. It's tempting, particularly if you're an MDR user, to pop open a DAW program, start the FTP server, and edit a track right in the project's AudioFiles folder. There are certain restrictions on what you can and can't get away with here which are discussed in some detail in the HDR Technical Reference.

The simple rule (and I may have not discovered *all* the rules) is that if you shorten a file, the recorder can still find it. But if you lengthen it at all (in time, not necessarily in file size) the Project file will see it as being inconsistent with what it thinks should be there. You may see an error message, or the track simply won't play.

If you've edited a track in a way that prevents it from being recognized in the project, you can recover by Importing (**TRACK/EDIT** menu) the edited file into the track where it belongs. If your DAW writes Broadcast Wave files, it's a cinch to position it correctly when importing. Otherwise, you may have to do some juggling to get the audio lined up correctly.

Troubleshooting, Maintenance, and Repairs

The Mackie hard disk recorder is a computer at heart, using an Intel Celeron™ 486 MHz CPU and mother board with IDE (ATA-100) disk drives. The non-standard parts are the audio components, the front panel display and controls, synchronization (word clock) card, and the “Brain” which contains the firmware that makes it an HDR or MDR. The operating system and application software are Mackie’s own. While there are certain components which only Mackie can repair or replace, you can do a fair amount of diagnosis and repair on your own. It’s worth learning a bit about what makes the recorder tick, or not tick.

Stuff You Should Have Handy

We’re venturing into geek territory here, so you should have some geeky things on hand. You’re essentially troubleshooting a PC and many of the techniques we’ll describe here involve disassembly and substitution. The work will flow smoother if you don’t have to go on a scavenger hunt in the middle of the job. Start your basic collection now so you’ll have what you need when you need it:

- A #2 Phillips screwdriver. Better, one of those cheap PC tool kits. Still better, a power screwdriver. There are a whole lot of screws in the case.
- An IDE disk drive ribbon cable. If you’ve bought more than one retail-packaged disk drive, chances are you already have a spare cable. There’s nothing special about these. It’s OK if you cable has a connector in the middle for a second drive.
- A voltmeter. Lab accuracy isn’t necessary, but it’s useful to know that voltages are present where they’re supposed to be, and in the ballpark.
- A functional IDE (ATA-100) disk drive. Yes, really. The one in the closet that became too small for your last computer will almost certainly do. You won’t be doing any serious recording on it, just using it for test.
- A disk drive power splitter – this is a Y cable that divides a computer DC power connector into two branches so you don’t have to dig too far down into the works to power your test disk drive.
- A few good floppy disks.

The first step in troubleshooting anything is to narrow down the problem.



Take all the common sense precautions when working inside your recorder. While you're pretty well protected from electrical shock hazard, working under the hood with tools when power is applied puts you at risk of shorting something out and causing some damage before you can say OOPS! Also, when handling electrostatic-sensitive parts such as ICs and memory modules, ground yourself so you don't zap anything. Heed the ominous safety warnings printed on the inside front cover of the Mackie manual.

We'll start with some non-invasive surgery then work up to the blood and gore.

Accessing the CMOS Setup Menu

"Check the CMOS settings" is a common suggestion when the HDR starts to get flaky. Pressing the DEL key a few seconds after powering up the recorder and before it starts booting from the disk drive brings up a menu from which you can view and edit the CMOS settings. Obviously, this requires a keyboard and monitor connected to your recorder. Appendix C contains a complete list of the settings for both the standard and large disk drive support (upgrade) BIOS.



There's an option on the CMOS Setup menu to use the default BIOS settings. Some of those defaults are incorrect for the HDR/MDR. If you select that option, your recorder won't work properly. Refer to the printed list to be sure all settings are correct.

If you have an MDR, the official, safe and recommended procedure when the CMOS settings are suspect is to ship the recorder back to Mackie for service. There are, however, a couple of alternatives. Easiest is to boot up with the automatic-running MDR BIOS Update disk (page 17) in the floppy drive. Running this program will restore the CMOS settings.



This BIOS Update utility doesn't work with the upgraded (large capacity disk drive) BIOS chip. It detects that the chip installed in the recorder is different than the type it's set to reprogram, and it aborts. No harm will come from attempting to run it, but it won't do any good either.

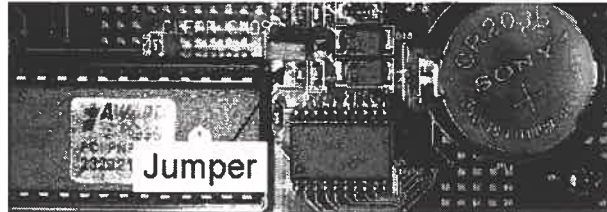


Occasionally, (often as a result of a dying CMOS backup battery on the motherboard) the CMOS data will become corrupt in a way that prevents the recorder from booting from the floppy disk drive. One thing that can happen is that the order of boot drives (which is specified in the CMOS setup) changes so it won't look at the floppy drive first when searching for an operating system. If this has occurred, clearing the CMOS settings will usually restore floppy disk booting. Otherwise you'll have to resort to drastic measures. Check Pages 56 and 65 in the Unauthorized and Unexpurgated section.

Clearing the CMOS Settings – Starting From Scratch

On rare occasions, the CMOS memory can become sufficiently scrambled that the CPU won't boot at all. Assuming that the BIOS chip itself hasn't failed, it can be reset to standard defaults. This will allow the CPU to boot. Then you can access the CMOS setup menu and make the necessary changes.

The CMOS will revert to its default settings if you disconnect power from the recorder, remove the CPU battery (Page 42), and let it rest overnight. But there's a quicker way.



The CLEAR CMOS jumper is an emergency recovery feature, put there primarily to bail you out if you've configured the BIOS to require a password before changing the CMOS settings and you've forgotten the password, but it also works to recover from certain mysterious disasters. Locate the CLEAR CMOS jumper on the motherboard, between the battery and the BIOS chip. There are three pins on the motherboard associated with this jumper. In its normal position, the jumper connects the two pins nearest the BIOS chip. You'll see the third pin open next to the jumper.

Unplug the power cord from the recorder and open the case (page 47). Move the jumper to its alternate position, connecting the two pins toward the battery. Leave it for about ten minutes, then return the jumper its original position. If everything else is healthy, when powered up, the recorder will boot, though you may be asked to press F1 to load the defaults. If so, do it.



You must change some of the CMOS settings from the defaults after restoring it to the "clear" state. Go back to the beginning of this section and do what you gotta do.

Reloading the Operating System

In the early HDR days, reloading the OS was the equivalent to "Take two Aspirin and call me in the morning." Reloading the software seemed to fix more problems than it had a right to, making one wonder if the operating system files were easily corrupted. Some users even reloaded the software regularly as preventive maintenance. The current software versions are far less prone to corruption (if that's what it really was) and are very stable, however, sometimes reloading is worth a shot before Tech Support wakes up. Reloading the operating system is of course necessary when upgrading, replacing, or reformatting the internal disk drive. Here's a brief overview (or refresher, if you're an old hand at this). More detailed instructions are in Appendix E.

The HDR and MDR software is installed from two floppy disks packed along with the recorder, however unless yours is a recent production unit, chances are the supplied disks are for version 1.2 or earlier. Mackie distributes the current OS on their web site in the form of downloadable files which are used to create the installation disks. Running the downloaded file (there's both a Windows and Macintosh version) extracts the data to two floppy disks from which you install the new software. The companion CD includes the self-extracting disk image files for HDR 1.4 and MDR 1.3 versions along with instructions for creating the installation disks from them. Proceed when you have OS Installation Disks 1 and 2 in hand.

Insert Installation Disk 1 in the recorder's floppy disk drive, power it up, and wait a minute or so for the prompt on the LCD to insert Disk 2. After loading Disk 2, you have one more chance to cancel the installation. Tell it to proceed. When it's finished, remove the floppy disk, and reboot.

Note: Floppy diskettes aren't as robust as they used to be, or so it seems. If you get an error message during the installation, it usually means a floppy disk didn't read correctly. Try building new installation disks from the image files, this time using brand new floppy diskettes instead of ones you've had lying in a drawer for ten years. No foolin'. This has fixed me up every time.



Installing the software, even when upgrading to a new version, doesn't affect the project data and audio files, but Murphy's lawyer is always looking for new clients. **It's highly advisable to back up projects stored on the internal hard drive before performing a software installation.**

Power Supply

A completely dead recorder – no lights, no display, no motors (disk drives or fans) running - almost always points to the power supply. Check the obvious first – that the power cord isn't partially dislodged from its socket (on either end) and that the line voltage switch hasn't slipped into the wrong position.

The power supply has an anti-surge protection circuit which can kick in if there has been a very short interruption in power, but one long enough so that the recorder shuts down. When power comes back, it's often accompanied by a voltage surge. To reduce the risk of damage due to this surge, the power supply won't start up again until it thinks things are safe and giving all the symptoms of a dead power supply. Before digging in too deeply, particularly if you suspect a power interruption or surge, unplug the recorder so that power is completely removed. Let it rest unplugged for 10 minutes or so, then reconnect the power and switch it on. If there was no internal damage, it will come back to life.

If you have a voltmeter, open the case (page 47) and check the power supply output voltages. The main power connector to the motherboard is pretty well buried, but you can do a quick check at any of the many plastic 4-pin power

connectors scattered throughout the chassis. There's a convenient one at the top right edge of the front panel. With the negative meter lead connected to the chassis, you should measure 5Vdc at the red lead and 12Vdc at the yellow lead.

If you're in a 230 volt country and the switch has inadvertently been changed to the 115 volt position, you may have some internal power supply damage. Follow your nose after the smoke has cleared.

Power on/off switching takes a rather circuitous route. The front panel POWER button is connected to the motherboard where, via some on-board logic (a CMOS setting is involved), it controls the power supply through a wire in the mother board power connector. Another wire in this connector ("standby power") provides 5 volts to the motherboard for the power switch logic. It's unswitched and it's live whenever the power supply is connected to the AC line. If the recorder doesn't power up, the power supply could have died, but it's also possible that the POWER switch itself has failed, its connector has come loose from the motherboard, or there's a fault in the motherboard itself.

Plug a light into the same power strip as the recorder. Switch on the light and watch it as you plug in the recorder's power cord. If the light flickers ever so slightly (from the power supply's inrush current) that's an clue that at least the standby power section of the power supply is working.

The HDR/MDR uses a standard AT style computer power supply, but because of the way the chassis wiring is dressed, replacing the power supply isn't as simple as in a standard computer. You must disassemble nearly the entire recorder to route all the necessary leads, so we won't go into detail about doing a power supply transplant. If you're quite sure that the power supply is dead and you feel confident, go for it. Otherwise it's time for a trip to the hospital.

The only fuse in the recorder is one that's inside the power supply case. If you're brave enough to tackle a power supply replacement you might first open the power supply case and check that fuse. Typically, however, when this internal fuse blows it's because something in the power supply circuitry has failed. Computer power supplies are so inexpensive that they're rarely repaired.

Connections

Poor connections are a leading cause of problems, not just in the HDR, but with almost any piece of electronic hardware. When the recorder shows signs of life but is missing audio on some (but not all) channels, start troubleshooting at the I/O interface. If an analog connector is not well secured, the weight of the cable can cause it to become partially dislodged, resulting in the loss of signal from one or (usually) more channels. Optical connectors can work loose too, but that will be more evident since you'll lose all eight channels of a group together.

Substitution is a good troubleshooting technique to use when you've lost audio. By moving an input or output cable to another card, you can determine if the problem is with the cable or in the recorder. If the symptom follows the cable, suspect the cable. If it remains with the channel when using a different cable, swap I/O cards to determine if the problem is related to a card or stays with the channel. An I/O card that doesn't work in any slot is almost certainly defective. It's an easily replaceable part, but you'll have to order it from Mackie or find one from another source. It's unlikely you'll be able to repair an I/O card yourself.

Ribbon Cables

Many an HDR problem has been fixed by unplugging and re-plugging internal ribbon connectors (and there are plenty of them!). They have a knack for losing contact pressure after a while, becoming contaminated with dirt, or just working loose. Occasionally a wire in a ribbon cable will break or make intermittent contact at the stress point where it's attached to the connector. When that happens, it's time for a new cable.

The best first aid for ribbon connectors is to push on them (toward the circuit board). If that doesn't help, disconnect and re-connect them. Use care and common sense here, pulling on the body of the connector rather than yanking on the ribbon. Sometimes you can't avoid that, but support the junction between the ribbon and the connector as best you can, and be gentle. You don't want to create a second problem by damaging a previously good cable or connector.

Note that ribbon cables going to the Mackie-built boards and also the motherboard end of the hard drive cables have latches. It's necessary to release them by squeezing the top ends of the latch toward the center of the connector and holding them while pulling the connector away from the board.

Second-level first aid for ribbon cable connections is a dose of contact cleaner. Caig ProGold™ is safe and does a good job of both cleaning and lubricating the contacts. A little is good. More is not better.

The Notorious Error 43

This is the most common HDR error message, (possibly the only one with a number, though there are rumors of an Error 50 sighting) and it's also the most mysterious. You wait and wait for the recorder to start, and your heart sinks as you see this message on the LCD.

System Error 43 -
No Communication w/Host
Contact:
Mackie Technical Support

Error 43 means that the operating system or the application software didn't load. The "Brain" (I didn't make that up – it's what Mackie calls the board with the firmware on it) is trying to establish communication with the mother board (the

“Host”) and the host didn’t wake up. It’s the antithesis of the friendly “AUDIO ENGINE STARTED” message displayed when the boot-up process is going well.

The first thing to do when this error message appears and the recorder fails to start is to try rebooting. Sometimes it works, but often as not, there’s actually something wrong. The usual suspects are a flaky ribbon cable connection, a defective or failing hard drive, an actual failed component, or corrupted software.

The easiest fix is to reload the operating system. If that doesn’t work, open the case, unplug, and re-plug ribbon cables. You might find one that’s making poor contact. There are many reasons why a computer doesn’t boot. A dead mother board isn’t totally out of the question, but it’s not very common. An incorrect CMOS setting can also cause this error, as can any faulty circuit card. The HDR firmware searches for a functional video (graphics) card and won’t boot without it, so a faulty graphics board could be the source of the problem.

System Error 43 only tells you that something didn’t happen. It’s not a diagnostic code, so it doesn’t (and can’t) point to the specific condition that’s causing the problem. You just have to poke around. Maybe you’ll find the cause, maybe not.

Internal Hard Drive Problems

Look and listen for clues. Watch the monitor closely while the recorder is booting. If you have an MDR and want to dig into this, it’s easy and non-destructive to temporarily install a graphics board and connect a monitor so you can observe the boot-up sequence. (See page 58) As the BIOS finds disk drives while going through its startup routine, the monitor will display something like:

Detecting Primary IDE Drive: Maxtor 6L020J1

The model number will be different depending on the drive installed, but the manufacturer’s name should be readable. Partially garbled text could indicate a stuck bit either in the drive interface or the mother board disk controller. If you’re lucky it could point to a faulty disk drive ribbon cable, as was the case with one of my recorders. It identified the drive as “Eaotgr 6L0:0B1” which was clearly not what it was. Replacing the ribbon cable between the motherboard and the drive cured the problem.

Listen to the drive. You should hear a faint whine when it’s spinning, intermittent quiet ticking when it’s reading or writing, and it should make no clanks, grunts, or grinds. It’s easier to hear with the case open. Use a screwdriver as a stethoscope, touching the blade end to the top of the drive and holding the handle up to your ear. If the drive sounds OK, press on.

Try Another Drive

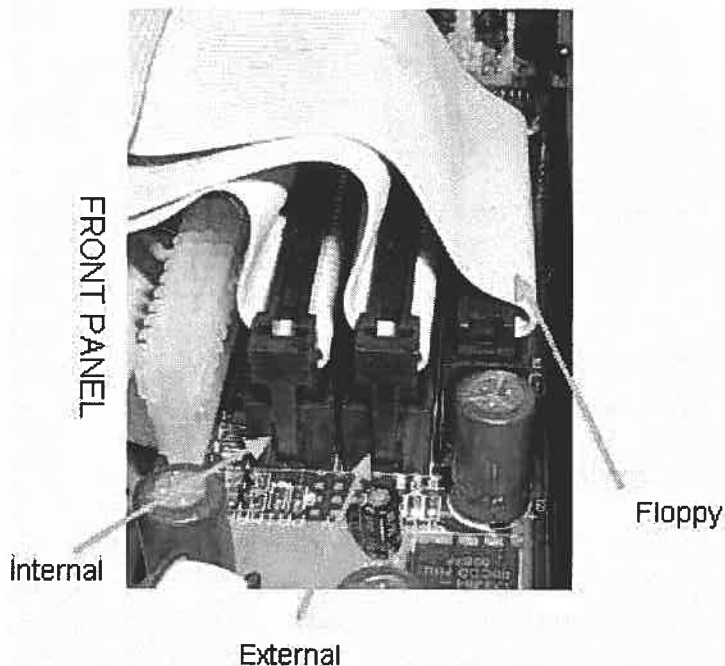
If the internal hard drive is suspect, you can temporarily install another one to check your diagnosis.



Warning! You're about to venture into the innards of the recorder. While there's nothing forthcoming that's dangerous, if you slip up, you could cause some damage that might invalidate the warranty or make your recorder more difficult to service by the factory, thereby increasing repair costs. Be cautious when working under the hood.

Removing the drive from its moorings or even removing its ribbon cable is a bit of a project (we'll address that later), but for test purposes you don't have to do either. You can temporarily install a substitute drive, laying it board side up on top of the internal drive. You'll need the IDE (ATA-100) drive and ribbon cable from your troubleshooting gear shopping list. For test purposes, the capacity and speed of the drive aren't important. A few gigabytes will do.

Open the case (Page 47) and locate the motherboard end of the disk drive cables. They're in a bundle between the memory sockets and the front panel. The one closest to the memory sockets (with the smaller connector) is for the floppy drive, the center one goes to the external drive bay, and the one closest to the front panel connects to the internal drive.



Unplug all three cables from the mother board.

Connect the new ribbon cable from the internal hard drive connector on the motherboard to the temporary hard drive, then reconnect the floppy drive cable to the motherboard. You can leave the external drive cable off for now. It will just get in the way. Move the power connector from the internal hard drive to the substitute drive or use your power splitter cable to borrow disk drive power from a more convenient connector. Format and install the operating system on the temporary drive (Page 33) using an Installation Disk 1 modified to run the Mackie format utility (Page 45).

If the recorder boots and appears to function normally with the substitute drive, your problem is likely to be either a bad internal drive cable or defective internal drive. To determine which, connect your substitute cable to the internal drive. This requires some wrestling and tiny fingers, but it's possible to remove the

connector without removing the whole internal drive assembly. If the recorder works with the original drive and the new cable, replace the cable. If the original drive doesn't work with the new cable, try an alternate procedure for formatting and checking the internal drive (Page 46) before replacing the drive.

There's no shame in chickening out at any time if you feel you're getting in too deep. Not being able to put things back together correctly can be embarrassing if you ultimately have to send the recorder in for service.

Removable Drive Problems

Trouble with a removable drive can be the result of a defective drive, the carrier, the drive bay inside the recorder, or the cable between the motherboard and the drive bay. If another removable drive works in the recorder, you've eliminated everything internal and you can focus your troubleshooting efforts on the drive or carrier. Swapping the drive in the carrier is straightforward, but before you try another drive, re-seat the ribbon cable inside the carrier. If replacing the drive solves the problem, suspect the drive. If another drive installed in the same carrier has the same problem, suspect the carrier.

If you regularly swap drives in and out of one carrier and it appears that there's a problem with the carrier, first suspect the carrier's ribbon cable. This is a known failure point. Unfortunately, the solution is to replace the carrier. Buy two or three. Then you won't have this problem again, at least not very soon.

More insidious, however, is a failure of the external drive bay. The drive bay looks innocent enough, just a frame with a connector, but there's a circuit board with a handful of components on the back of the assembly, and these have a way of failing. You can determine if the drive bay has failed by bypassing it.

The easiest way to bypass the drive bay and cable is to use a new ribbon cable to connect your "test" drive directly to the motherboard. Refer to the picture of the drive cables. Unplug the floppy and external drive cables from the motherboard and connect the new ribbon cable from the motherboard to the external drive. You can leave the floppy drive cable disconnected for this test.

A convenient place to put the external drive while you're testing is on top of the internal drive. Remove the 4-pin power connector from the circuit board behind the front panel, connect it to the Y power adapter cable, connect one branch of the Y to the circuit board and the other branch to the external drive.

Power up the recorder, then Format and Verify your test drive using the **DISK UTIL** menu. If all goes well with the formatting, copy a small project to the substitute external drive. If you can access that project (try both playback and recording), your problem is with either the external drive bay or the ribbon cable connecting it to the motherboard.

Replacing the external drive bay involves taking the recorder almost completely apart. You must remove the motherboard as well as the front panel, and it isn't a job for the squeamish. If you decide to tackle it, replace both the drive bay and the cable. You'll kick yourself if you replace one but not the other and it still doesn't work after reassembly - and you can't test the recorder without mostly re-assembling it. You can order a replacement drive bay from Mackie, but other than that the color doesn't match, a Lian Li RH-58 mobile rack is a perfectly good substitute. You may even have one left over from a carrier purchase.

Stripping it Down – Removing and Swapping Cards

Occasionally a faulty bus card (one that's plugged into the mother board) can prevent a computer from booting. Removing as much hardware as possible is a common PC troubleshooting technique and it can work with the HDR as well. The recorder will boot up without the MIDI or the Network Interface cards, so it's safe to remove those temporarily for troubleshooting. If it boots without those cards, replace them one at a time to locate the culprit.

Without the Sync (word clock and SMPTE time code) card, the recorder will go most of the way through the boot-up process but the LCD will present a "PCI Hardware" error message rather than the normal operating display. If the recorder gets any closer to the operating state without the Sync card (of course it won't actually work without it), it's likely that this card is defective.

Without the graphics card, the HDR will begin to boot (a good sign, if it didn't get that far with the card installed) but will hang at the "Loading please wait" LCD message and go no further. If the BIOS boot-up messages are readable on the HDR's monitor, chances are the graphics card is OK. If, on the other hand, it appears get further along in the boot-up process without the graphics card than with it, suspect a faulty graphics card.

The HDR expects a particular type of graphics card in order operate (you can't install drivers for a different card). Mackie can provide an exact replacement (ATI Radeon 7000 32MB SDR AGP VGA), but any commonly available Radeon 7200 series card works fine.

Mackie changed graphics cards during the production cycle of the HDR. The ATI Rage series used in early production doesn't work properly with the newest software. If you have an early HDR and you're just upgrading from Version 1.2, you'll need to replace that graphics board. You can tell which card you have by looking at the back panel. The newer one has an S-Video connector as well as the D-subminiature VGA monitor connector.

Persnickety Disk Drives

The Mackie operating system seems to be more fussy about disk drives than a common PC. I've had a hard drive fail in the recorder, put it in my computer to confirm the problem, and find that it works just fine there. I have no clear

explanation for this, but apparently something becomes corrupted on an otherwise good drive that even reformatting with the Mackie utility can't fix.

Curiously, a faulty external drive can affect the recorder even when you're working on the internal drive. When my recorder began to freeze randomly and failed to reboot, I discovered that removing the external drive or swapping it with a different drive fixed the problem. The "defective" external drive performed normally when installed in a computer. I could play audio files from it, write to it, and even running a thorough diagnostic showed no problems. But it still caused the HDR to become unstable.

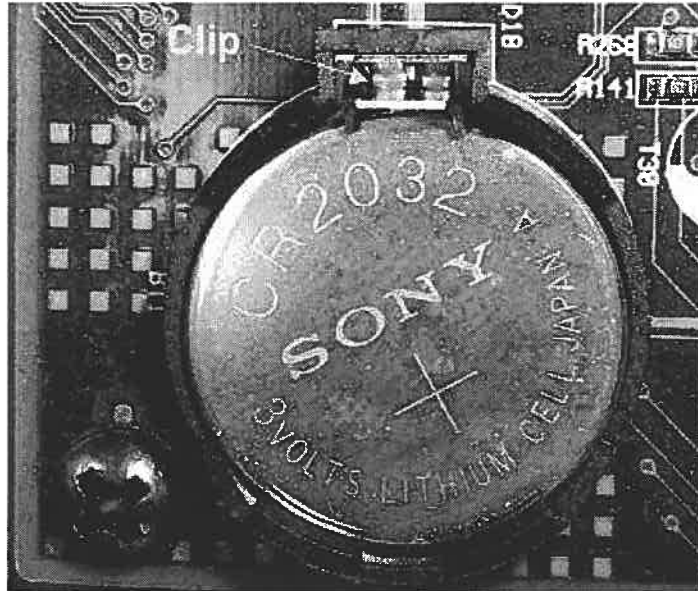
I reformatted the drive in the computer (of course I had tried reformatting it in the HDR several times to no avail), popped it into the HDR's drive bay, booted up, and it's been working fine ever since. This was not a unique occurrence – other users have "fixed" a hard drive the same way – however what problem was actually fixed remains a mystery. If it's not convenient to pop your troublesome external drive into a computer, you can boot the HDR from a DOS floppy disk and use the SCANDISK and FORMAT utilities to check it out and reformat it. See page 46 for details.

Mackie recorders also seem to be fussy about the floppy disks used to load the operating system. It's not uncommon to build a set of software disks and find that one or the other doesn't load properly, particularly after they've been stored for a while. Try a brand new floppy.

Maintenance, Preventive and Otherwise

Replacing the CPU Battery

The motherboard has a long life lithium battery which keeps the CMOS memory (where the BIOS configuration settings are stored) alive. "Long" is usually about five years, but they've been known to fail sooner. Flaky operation can sometimes be an indication of a low battery. It's a common part, type CR2032 or DL2032, available at any electronics store and some camera stores.



The battery is located in the front left corner of the motherboard when viewed from above with the front panel toward you. It's the shiny disk about the size of a nickel.

To release the battery, push the little retaining clip toward the rear of the chassis. The battery will pop up far enough so that you can lift it out of the holder. Stick a piece of tape on the top of the battery to use as a lifting handle if your fingers are too fat to grab it. Drop the replacement battery into the holder with the positive (+) side up and press it down until the clip snaps and the cell is secure.

The CMOS settings will be retained for a couple of minutes without the battery, so if everything was OK before replacement and you work quickly, you probably won't need to reset anything, but it never hurts to check.



Unfortunately replacing the CPU battery won't make the recorder's clock/calendar keep time more accurately. It never keeps very good time, even with a fresh battery.

Disk File Maintenance - Too Full, Fragmented Files or Too Many Edits

When a project gets very busy – a lot of punch-ins and a lot of edits, particularly on a disk drive that you're using for multiple projects – playback performance can suffer, resulting in random skips or mutes. It takes a lot to make this happen but every piece of hardware has its limits.

In the early days of personal computers, we learned that lost speed could be regained by defragmenting the drive. Since files are written to the disk wherever the operating system can find some free space, after extensive recording, the

disk heads may need to make fairly large jumps to get from one chunk of a track's audio data to another. You'd expect that moving all the files closer together on the disk so it won't have to work so hard might improve playback performance. In practice, we haven't found this to be so, however if you want to try, the most reliable way to do this is to copy a project to a freshly formatted disk using the Backup function.

This won't change the order that files are located on the disk – they're copied in the same order as they're read off the original disk. The files on the copy, however, will be written to a contiguous area of the disk surface, so there will be less thrashing around when moving through the project's edits and punches.

A more effective way to reduce the disk and CPU workload is to replace an extensively punched and edited track with its rendered equivalent. Rather than playing portions of many files scattered throughout the disk, the HDR then only has to stream one file to play the track, a task that it can do without breaking a sweat.



A convenient way to manage the use of rendered tracks in your project is to import the track's rendered version into a new virtual take of that track and make this the active take. All the pieces of the original track as well as all the edit data will be retained should you need to go back to them, but current edit list in the Project file will now point to one single file rather than having several pointers to files scattered hither and yonder when playing the track.

Keep it Clean

Few of us work in a dust-free environment, and over time dust will find its way into the recorder. It gets sucked in through cracks and slots by the fans and accumulates on the components inside the case. A layer of dust on an IC reduces its ability to radiate heat and can cause it to run hotter than normal. Dust can reduce a fan's cooling power or, in extreme cases, cause a fan to stop turning entirely.

Good Housekeeping

Open the case periodically and clean up the accumulated dust, rocks, and dog hair. A small paint brush and a vacuum cleaner are good tools for this. Loosen the crud with the brush and suck it up with the vacuum. Check to be sure the fans are still turning, and that they coast to a stop when power is removed rather than come to a grinding halt. Note that the motor on the standard CPU fan "cogs" and when it gets slow enough, will stop quickly, but you'll be able to tell by turning it by hand when stopped if it's free or if it's gummed up.

Don't leave the removable drive bay open. If you don't have a drive in it, replace the cover that originally came with the recorder. We know you didn't lose it.

Cleaning the Floppy Drive

If your floppy is flaky, try using a cleaning kit - a non-abrasive cleaning disk and a bottle of solvent. Moisten the cleaning disk with the solvent, insert it into the drive, and power up the recorder. It will attempt to boot from the bogus floppy disk (and will eventually fail) but the solvent will soften accumulated crud, the cleaning disk will carry it away, and the drive's ability to read may improve. Follow the kit's instructions. A few seconds should do it.

I'm passing this suggestion along based on the recommendation of a few Mackie User's Forum members who have found it helpful. I've always blamed my own floppy problems on the fact that the disk I'm trying to read from came from a dusty corner of my desk, is probably 15 years old, and may have literally been through the ringer. Doing what I've told you to do - writing to a new floppy disk - has always resulted in a successful read, so I've not had the opportunity to try cleaning the floppy drive myself. If it's not broken, I don't try to fix it. Typically a floppy cleaning kit costs about \$10. That's only a little cheaper than a new floppy drive, but cleaning takes a whole lot less time than replacement.

Unauthorized Unexpurgated Modifications

Recording engineers have a history of modifying and updating their gear, both to make it perform better and to adapt it to changing needs. Here are some things which have solved problems for me, made my work easier or more productive, and increased the useful life to my recorder. Some of these procedures get down to the real nitty-gritty – cutting wires, soldering, chopping holes – all warranty-voiding stuff. Others apply tools that Mackie gave you but which aren't explained in the standard user documentation. Proceed at your own risk. Nothing here is officially supported by Mackie (though Tech Support may talk you through some of these procedures), but they all work and nothing's blown up yet.

Reformatting the Internal Hard Drive



DANGER! DANGER! Formatting a disk drive erases all of its data !!!!!!!!!!!!!!!!!!!!!

This includes all project folders and their files, and in the case of the internal disk drive, the operating system.



Reformatting the Mackie Way

Mackie protects you from formatting the internal drive by configuring the distribution version of the OS so that this function does not appear on a menu. The company doesn't want you to risk blowing away good data until a real person tells you in no uncertain terms that whatever was on the disk before you start will not be there when you finish.

The option to allow formatting of the internal drive can be switched on by editing a configuration file named TOOLS.INI located in the System folder of the operating system Installation Disk 1.

Insert Disk 1 in the floppy drive on a computer, open the System folder, and from there, open the file TOOLS.INI using a text editor. In a standard Windows setup, double-clicking on the file name will open it in Notepad, which is fine for the job. Mac users with a floppy drive can fend for yourselves. Mac users who don't have a floppy drive can visit a friend with a PC.

The last line in the standard version of the file is:

`format:off`

Using the text editor, change “off” to “on” and then save the file back to the floppy disk. Your new TOOLS.INI file should look like this: (The MDR version is identical except for the first line.)

```
version:HDR 1.4 Build 420
target:HDR
enterLED:18C
enterSWITCH:2C
cancelled:18D
cancelSWITCH:2B
format:on
```

After modifying the TOOLS.INI file, put Installation Disk 1 in the recorder's floppy drive and reboot. After the disk loads, you'll see this message on the LCD:

Format your internal		
drive and erase all your		
files?		
	Skip	Format

Selecting **Format** does the deed. Follow the prompts, insert Disk 2 when requested, and you'll end up with a clean disk with a fresh copy of the operating system.

Selecting **Skip** bypasses the format operation and continues with the software installation without reformatting. This is relatively safe. Only the operating system software will be replaced and your data should remain intact. Just remember that you have a loaded gun here, so watch your trigger finger lest you push the wrong button and format when you intend to only re-load the operating system.



Even though installing a new copy of the operating system software (without formatting) is not supposed to affect the project data, I'll once again strongly advise backing up any projects saved on the internal drive before installing the OS.

Formatting the DOS Way

The Mackie format is a “quick” format. It refreshes the file allocation table on the disk. It doesn't actually erase any files, though it makes them impossible for the OS to locate. Sometimes, however, it leaves behind traces of projects, or worse, corrupt data which can cause mysterious problems. If reformatting using the Mackie utility doesn't cure your disk ills, you can put a real he-man format on it using a real DOS program.

The HDR, being a PC at heart, will run any utility that will run on a PC. If you have a Windows 95 or 98 startup floppy disk that you just never had the heart to throw away, put it into the HDR's floppy drive, power up, and you'll be running the DOS operating system with all of its tools. If you don't have a Windows disk, you can create a workable substitute from the self-extracting disk image file DOSBOOT.EXE on the companion CD. You'll need a monitor and keyboard attached to your recorder in order to proceed.

Once the DOS floppy is booted, at the command prompt (A:\>), type

FORMAT C: <enter>

Heed the warnings –This will **POSITIVELY, ABSOLUTELY** wipe the disk clean. Confirm that you really want to format the disk and let it run. A full format checks the entire disk surface so it takes quite a bit longer than the Mackie format, about twelve minutes for a 20 GB disk, the bigger the longer.



After formatting is complete, you'll of course have to re-install the operating system. Even though you've just formatted the drive, you must still run the Mackie formatter prior to the OS installation. In addition to formatting, this installs a boot patch, a small program which, at startup, makes Mackie OS load. When re-installing the operating system, use your modified Disk 1 (Page 45) and tell it to format.

You can also format the external drive with the DOS format program. This is often helpful for cleaning up stray pieces of old projects that the Mackie format left behind. DOS designates the external drive as D (it's E in the Mackie OS), so the command to format the external drive is

FORMAT D: <enter>.

There's no need to run the Mackie format on the external drive after a DOS format, but remember to run the Verify routine so you can use it for recording or playback as well as backup.

Opening the Case

Unplugged? Good!

There are no secret panels or tricky moves required to open the case, just a lot of screws – ten round-head screws around the rear edge, four flat-head screws in each side, and four flat-head screws along the top front edge of the cover. It's helpful to loosen (but not remove) the three large screws on each side that go through the rack ears. If you're not worn out after all of that screwing, lift the rear edge of the top cover slightly and slide it backward to remove it.

It's important to replace all the screws when you're ready to put the recorder back into service. Leaving the cover loose will compromise the EMI shielding.

Adding Memory

Unlike conventional computers, the stock HDR really doesn't work substantially better with more memory installed. The current software runs just fine with the standard 128 MB memory, however, if you've upgraded to the new BIOS and are using large disk drives, you can do some things with your recorder which *do*

require more memory. One is rendering tracks that exceed two hours in length. Try this with the standard 128K memory and it will appear to be working, but the recorder will crash when you try to access the rendered file. I suspect this is because the waveform graphic drawing data (which is created even on the MDR, though it isn't used) is stored in memory, and with a long file, memory runs low. Increasing memory to 256 MB fixes this problem.

You can either install a second 128 MB memory module or replace the existing 128 MB module with a new 256 MB module. My recommendation is the latter, saving the original module for a rainy day when your memory dies and you need to get the recorder up and running for a session.

The motherboard takes PC-100 SDRAM memory modules ("sticks") in the 168-pin DIMM configuration. With the preponderance of more advanced memory today, this type is becoming a bit hard to find. It's not extinct, at least as of this writing, but it tends to cost more per megabyte than newer types which are incompatible with the HDR's motherboard. Memory designated "PC-133, PC-100 compatible" will usually work. Buy it while you can.

If you've ever installed memory in a computer, you can probably skip this next section. If not, read on.

Locate the memory sockets on the motherboard. This is the group of three long sockets near the front of the recorder. The frontmost socket contains a 128 MB memory module. The other two should be empty. Very early units may have two 64 MB modules, one in each of the first two sockets. This is OK. You can continue to use them or replace them – your choice.

IS THE POWER OFF? ARE YOU GROUNDED?

If you're not wearing a ground strap, before handling either the old or new memory modules, touch something grounded to discharge any static electricity you may have accumulated – even on a damp day! Conventional advice is to touch the case, however, with the power cord is disconnected, the case isn't grounded – duh! Find something that IS grounded to discharge yourself.

To remove the existing memory, flip the retaining levers at both ends of the socket outward and downward. This will pop the module up and out of the socket. Before taking it too far away, note how the notches on the connector edge of the memory module line up with the projections in the socket. Those notches prevent you from installing the module incorrectly.

If you're replacing the existing memory, install the new module in the same socket as the original module. If you're adding new memory, install it in the next socket toward the rear. Don't leave an empty socket between memory modules.

Flip the white latches outward and orient the memory so the notches in the module match the keys in the socket. Using both hands, press the module fully into the socket. This will take quite a bit of pressure but nobody's broken a motherboard yet. When the module is fully seated, the latching clips will flip up to their vertical position, locking it in place. Give them a little push just to seat them solidly.

If anything doesn't line up – the notches on the socket edge or the latching tabs into the notches on the vertical edges of the memory module – either you're trying to install the module the wrong way or you bought the wrong type of memory.

While the cover is still off, power up the recorder to be sure it boots. If you have a monitor connected, you'll see the total amount of memory displayed on the initial BIOS boot screen - it goes away quickly, so look sharp!. It won't be exactly 256,000, but it will be greater than 128,000. There are no settings to change when adding or replacing memory – the BIOS takes care of it. If it works, button up the recorder and you're good to go. If it doesn't boot, you probably have installed an incompatible type of memory. This is rarely harmful, it just doesn't work. Remove the newly installed memory and confirm that the recorder boots with the original memory configuration

As fast as things change in the computer industry, recommending a specific manufacturer and part number for a memory module is futile. By the time you read this, that part will have been discontinued or replaced by a "compatible" part which may or may not be. It's best to buy from a major retailer where you can return the module if it doesn't work. (Hint: Say it doesn't work in your *computer*.)

Reducing Mechanical Noise

We work hard to make our control room as quiet as possible, and in a nice quiet room, mechanical noise from the HDR is clearly audible and can be distracting (and even get recorded if you work with a microphone close to the recorder). One solution is to put the recorder in a soundproof box, or put it in an adjacent room with a hole through the wall for cables (a good case for owning a remote control unit). There are, however, a few things that you can do to quiet it down.

There are three sources of mechanical noise in the HDR – the power supply fan, the CPU fan, and the disk drive(s). Of the three, the CPU fan is the greatest offender since it runs continuously and its noise spectrum falls in a particularly annoying range.

The CPU Fan

Computer catalogs are full of fancy CPU fans, some of which claim to be low noise, but most are really designed to be no noisier than a standard fan while providing extra cooling required by hot-rodded computers. The HDR is very conservatively designed and runs cooler than most personal computers, so

installing a high grade fan that claims to reduce noise level by a couple of dB is rarely an effective modification. There are cooling “systems” (incorporating large, slow speed fans or heat pipes) that indeed run noticeably quieter than a standard fan, but I haven’t yet found a practical way to fit one to the HDR’s case.

If you want to try replacing the fan with one that’s quieter (and just about any aftermarket fan will be, at least a little – the one Mackie uses is a very basic model), choose a 12 volt fan for a Celeron Socket 370 CPU. You will probably have to cut and splice the leads rather than using the off-the-shelf fan power connector, as in the HDR the fan doesn’t connect to the motherboard.

Reducing the CPU fan speed by lowering its supply voltage is quite effective in reducing the noise. In addition to slowing the air flow (less turbulence), reducing the speed moves the noise spectrum down into a range where the ear is less sensitive. Even though absolute sound pressure level (SPL) isn’t substantially reduced, the noise is less bothersome. In three years using two recorders with their fans running at reduced speed here, nothing has fried, so I feel safe in recommending this approach. Hack at your own risk, of course.

You’ll need:

- A 5.1 volt, 1 watt Zener diode – 1N4733A or equivalent, Radio Shack #276-565
- A few inches of 3/16” diameter heat shrink tubing (Radio Shack)
- A soldering iron and some soldering skill
- Wire cutters



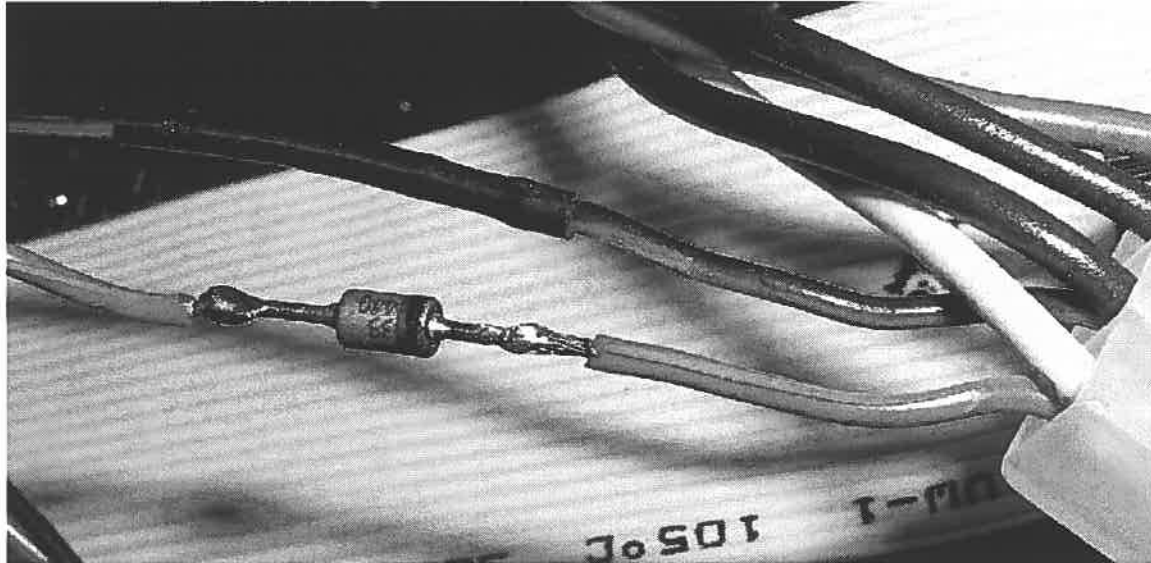
You’ll be cutting, stripping and soldering right over the motherboard. Protect it from stray wire strands and solder blobs which could be very harmful to your recorder, either immediately or at some time in the future when you’re least expecting trouble. A sheet of paper or a cloth towel covering the motherboard where you’re working is helpful, but take care when removing it so you don’t dump whatever it caught on to the board!!!!

Of course you should unplug the recorder, too.

Un-bundle the group of wires that contain the red and black pair leading to the CPU fan. Separate the fan wires for a couple of inches at the power connector end to give yourself some working room. Unplugging the power connector on the small circuit board with the Remote connector at the rear of the panel will allow you to move the wire bundle into the clear.

Cut the red fan wire about an inch from the power connector. Strip and tin the end attached to the power connector.

Clip the leads of the diode to about 3/8". Note that one end of the diode has a band around it to indicate polarity. Solder the end of the diode with the band to the red wire that's attached to the connector.



Cut about 1 inch off the fan end of the red wire so that the wires will lay together neatly when the trimmed red wire is soldered to the other (un-banded) end of the diode. Strip and tin the wire. Separate the fan wires further if necessary and slip the heat shrinkable tubing over the fan end of the red wire.

Solder the fan end of the red wire to the free end of the diode.

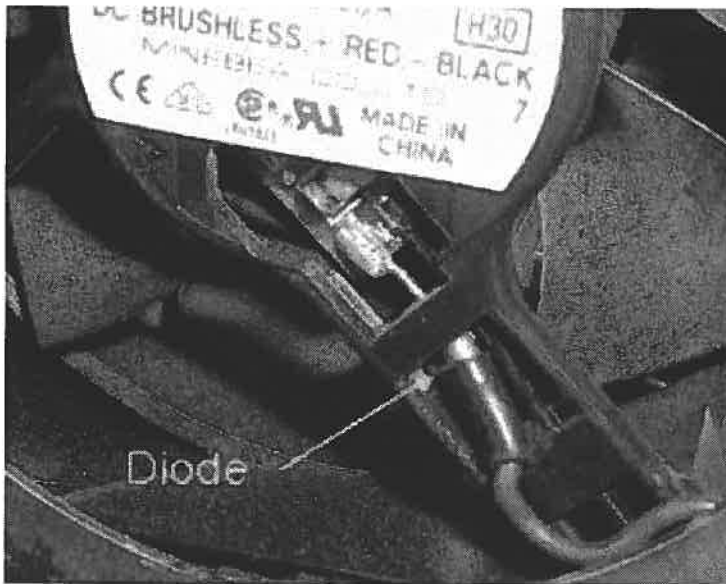
Power up the recorder and verify that the CPU fan is running. Enjoy the quiet. If you have a volt meter, measure the voltage between the fan end of the diode and the chassis. It should be around 7 volts. If it's closer to 11 volts, you installed the diode backwards.

When all is well, slide the heat shrink tubing so that it covers the diode and exposed solder connections. Shrink it with a light duty heat gun, a hair dryer, or, with great care, a cigarette lighter. Tie up the loose ends, clean up the shards, and if you disconnected it, remember to re-connect the power connector to the Remote board.

The Power Supply Fan

You can perform the same speed modification to the fan in the power supply, but because of the way that things are packed inside the case, it's more difficult than working on the CPU fan. Removing the four screws on the rear panel that are at the corners of the power supply will allow you to lift it out far enough to do a little surgery.

Without removing the power supply completely, which is difficult enough that I don't recommend doing it other than when it fails (in which case you can replace it with a quiet-rated unit), you can't really open up the case to get to the fan power leads. However, peeling off the label covering the fan hub exposes the motor terminals. With care and small tools, you can install a Zener diode right on the fan itself. The Radio Shack package gives you two diodes, so if you've done the CPU fan modification, you already have all the parts.



Another worthwhile fan modification involves a little body work. The sheet metal guard across the power supply fan is there to prevent you from using it as a salami slicer, but its rather large area and sharp edges cause turbulence, which in turn creates noise. Removing the guard will further reduce the fan noise. The best hand tool for the job is called a nibbling tool or "nibbler," available at good hardware stores or on-line tool suppliers for about \$10. It's like a metal punch that removes a small chunk of metal with each squeeze of its handles.

If you're nimble, place the recorder on its back with the fan guard hanging over the edge of a table and work from underneath. That will keep the metal nibbles from falling into the power supply (but don't let one fall into your eye!). Alternately, you can wrestle the power supply out of the way, let the chips fall into the chassis, and clean up afterward.



Why use a Zener diode to drop the voltage to the fan rather than a resistor? A Zener has a fixed voltage drop across it regardless of the current flowing through it (at least until you exceed its power rating and it burns up), while the voltage drop across a resistor follows Ohm's Law and varies in direct proportion to the current. As the fan bearings get gummed up (and they will, eventually) the fan will draw more current when starting and running. With a Zener, the fan will always get 7 volts at whatever current it wants, and, unless it's completely stuck, will still start reliably. A resistor in series with the fan will drop more voltage when the fan tries to draw more current. In the worst case, this may not leave sufficient voltage to start the fan. No fan means overheating, which means trouble.

I chose 7 volts as a suitable operating voltage by connecting the CPU fan to a variable power supply and adjusting the voltage for a good compromise between noise level and reliable startup. At 7 volts, I could drag the fan with a finger to simulate a clogged bearing and it would still start reliably. Over a period of several hours, I measured only a 2°C difference in the CPU heat sink temperature between running the fan at its normal voltage and at 7 volts. Since the temperature is well below the maximum rating for the CPU, a two degree rise seemed perfectly safe. The bonus is that a 5.1V is a very common value for a Zener diode and the part is quite easy to obtain.

I wasn't quite so scientific with the power supply. I measured the temperature of the exhaust air before and after installing the 5.1V Zener and found essentially no difference.

Quieter Disk Drives

Mackie chose the original equipment disk drives based on throughput performance and reliability, with quiet operation being secondary. When the recorder first went into production, there weren't a lot of choices. Today there are many disk drives that meet all performance requirements, all of them quieter than the original factory drives. In your quest for a quieter control room, consider replacing the internal drive (and external drives) with quieter models. Stay tuned for some tips on disk drive replacement.

Changing Some MDR Operating Defaults

There are a number of "sticky" settings accessible via the HDR GUI that affect the way the recorder operates. When you change these settings, you're actually storing new values in one of two configuration files. You can change some of these same settings on the MDR by editing two files, GLOBALS.TXT and NEWTEMPLATE.TXT. Both are located in the System/Prefs folder of the internal disk drive, and both are in plain readable text format. You'll need an FTP connection to your computer and a text editor (Windows Notepad is fine).

Here are some things that are safe to change and how to do it:

Track Names (Good HDR Tip, Too)

With the HDR, you can name tracks using the keyboard. Saving a project with custom track names as a *New Template* (an HDR-only feature) causes those track names to be used for each new project until you either reset the template to the factory defaults or re-save the template with a different set of track names. Track names are stored in the NEWTEMPLATE.TXT file.

If you work entirely on the MDR (including using it for playback during mixing), there's no compelling reason to change track names from the factory defaults since you'll never see them. But once you start moving audio files from the recorder to a computer, you'll be dealing with file names (which are derived from

track names) and you'll find that the factory default names can be a bit inconvenient. Here's why:

The HDR creates a unique file name for each chunk of recorded audio by using the track name followed by the underscore (_) character, and then the consecutive recording pass (take) number on that track. The default name for the first recording on Track 1 is TRACK 1_TK1.WAV.

File browsing programs alphabetize lists of names by translating text characters into numbers (ASCII values) and sorting them in numerical order. The underscore character has a higher ASCII value than the digits 0 through 9. As a result, when looking at the AudioFiles folder with an FTP client program or browsing a list of files you've transferred to the computer, Track 10 (TRACK 10_TK1.WAV) appears at the top of the alphabetical list, while Track 1 (TRACK 1_TK1.WAV) follows Track 19. Track 2 comes after Track 24, and Track 9 is all the way at the bottom of the list. Pretty goofy, huh?

Naming all the tracks using two digits (with a leading zero for Tracks 1 through 9) will make them appear in numerical order. On the HDR GUI track screen, simply change the track names (Track 1 becomes Track 01) and Save as a *New Template*. It's more complicated for the MDR. Here's how to do it:

Connect to the HDR using your FTP program, switch to the /System/Prefs folder, locate the NEWTEMPLATE.TXT file and transfer it to your computer. Open it with a text editor and edit the list of track names in that file. Note that in the file, tracks are numbered 0 to 23. See Appendix F for a sample NEWTEMPLATE.TXT.

Here's what you should end up with:

```
0,Track,name:Track 01  
1,Track,name:Track 02  
and so on.
```

Don't change the "0,Track,name:" part of the line. That's a command to the operating system and it must be in the proper format. Other entries in the NEWTEMPLATE.TXT file (the ones beginning with "editor" and "locator" have to do with the graphic interface on the HDR. Leave those alone.

Use FTP to rename the original NEWTEMPLATE.TXT on the recorder's disk drive for safekeeping (NEWTEMPLATE_ORIG.TXT is good), then move the modified NEWTEMPLATE.TXT file from the computer back to the recorder's disk drive, replacing the original file.



If you're working on a project where each song has the same instrumentation, you can create a custom NEWTEMPLATE.TXT file with track names corresponding to instruments. Since the recorder doesn't care about extraneous files on the disk as long as it finds the file it's looking for with the name it expects, you can make several different template files with track names appropriate for a garage band, a bluegrass band, a singer/songwriter, etc. and keep them handy on the recorder's internal drive.

For example, to record a band called the Chicken Spankers (I did, once, but that was before I had the HDR), I'd modify the NEWTEMPLATE.TXT file with tracks named with the band's instrumentation, name it CHICKENSPANKERS.TXT, and stash it on the recorder's internal disk drive. When the band arrives for a session, using the HDR's FTP server and my FTP client program, I'll go to the C:/System/Prefs folder, rename NEWTEMPLATE.TXT in the to NEWTEMPLATE_STD.TXT (to save it for later), then rename CHICKENSPANKERS.TXT to NEWTEMPLATE.TXT. NOW my files will carry the names I've assigned as track names for the band.

```
0,Track,name:01-Mandolin
1,Track,name:02-Banjo
2,Track,name:03-Fiddle
3,Track,name:04-Guitar
4,Track,name:05-GtrVocal
5,Track,name:06-BanjoVocal
etc.
```

When the next band comes in, I'll rename the current NEWTEMPLATE.TXT file to CHICKENSPANKERS.TXT, then rename NEWTEMPLATE_STD.TXT to NEWTEMPLATE.TXT TO restore my standard file naming convention.

One caution for MDR users - Since track names aren't displayed, be sure you know the name that corresponds to each track number so you don't confuse yourself later by recording the guitar on the track named Banjo. By the way, if the project is moved to an HDR, your track names will show up in the GUI.



Wouldn't it be handy if you could save several template files and select the appropriate one from a list when the client walked in?

Unfortunately, Mackie didn't implement it this way. Renaming the one you want to use to NEWTEMPLATE.TXT is as good as it gets. This sounds like a lot of fooling around, but it's really quite simple.

Thumbs down, too, to the mixed single- and double-digit factory default track names. When you reset the template to defaults from HDR File menu or reload the operating system, that's what you'll get. Keep a copy of your modified NEWTEMPLATE.TXT (and GLOBALS.TXT, too) handy on your computer so you can FTP it over to the recorder after reloading the OS.

MDR One Button Punch

The default operating mode for the MDR (and the HDR, too) requires holding the Play button while pressing the Record button in order to start recording on armed tracks. The HDR has a *One Button Punch* mode (Transport menu) that allows you to enter Record by pressing just the Record button once the transport is rolling.

You can switch the MDR to the one-button punch mode by modifying the GLOBALS.TXT file. Use FTP to copy GLOBALS.TXT from the recorder's System/Prefs folder to your computer, open it with a text editor, and find the One Button Punch entry. It's located about half way down the list:

locator,One Button Punch:0

A value of 0 (the default) means that One Button Punch is off. Change the value to 1 to turn this feature on. Then save the file and send the modified version back to the recorder via FTP to replace the original file.

SMPTE Output Level

The SMPTE time code output level can be set to either -10 dBV (the default) or +4 dBu. Depending on what you're driving with the time code, you may want to change this to optimize sync performance. A level of -10 dBV is generally appropriate when recording time code on a track of an analog tape deck. Computer interfaces and professional synchronizers may prefer a higher level.

In the HDR, this can be selected from the Setup Sync menu. It can be changed on the MDR by editing a command line in the GLOBALS.TXT file. Transfer a copy of GLOBALS.TXT to your computer, open the file with a text editor, and locate the line:

digital,SmpteOutLevel:0

A value of 0 sets the output level at the SMPTE jack to -10 dBV. Change 0 to 1 to set the SMPTE output level to +4 dBu.

Delayed (Soft) Power-Off

You expect the recorder's power to go off when you press the POWER button, but this could cause a minor catastrophe if someone inadvertently bumps the button in the midst of a recording, particularly during a live recording where there are no retakes. Power control is actually a function of the motherboard, and its operation can be changed so that the recorder doesn't shut down until the POWER button has been held for several seconds. By delaying the shutdown, you have time to say "Oops! Wrong button!" and no harm is done.

To change to delayed power off, access the CMOS setup menu by pressing the DEL key while the recorder is booting. When the setup menu appears, select Power Management Setup and scroll down to the "Soft-Off by PWR-BTTN"

selection. The default is Instant-Off. Use the (+) key on the number pad to change this to Delay 4 Sec. (it's actually more like five seconds). Press the ESC key to get back to the main menu, then F10 to save the settings.

I think this is a very important change, and I've noted it in the listing for the CMOS settings in Appendix C. If you're impatient and not clumsy, leave it as is.

Changing CMOS Settings on the MDR

Sometimes it's necessary to check and/or change CMOS settings, but the MDR has no keyboard (no DEL key to press) and no graphics card (you can't see the menus). It's not difficult to temporarily connect a keyboard and monitor for the purpose of setting the CMOS parameters and other cool things such as using DOS to format the disk drives (Page 46). Don't get your hopes up too high, though. This won't convert your MDR into an HDR.

Accessing the Keyboard Connector

There's a keyboard connector on the motherboard, but it's hidden behind the rear panel. The good news is that all that's necessary to access that connector is to cut through a thin plastic outer trim plate - there's a matching hole already punched in the metal. A #11 X-acto™ blade is ideal for cutting the plastic. The Mackie "Running Man" logo points right toward the center of the connector, giving you a good aiming target.

Power Off? Good!

Punch through the plastic near the center of the connector, cut your way out to the edge (you'll feel when you reach the edge of the hole in the metal), then cut a round opening in the plastic using the hole in the metal panel to guide the knife blade. Take care not to shave the metal and leave chips inside the chassis.

You can judge the depth of your cut by feel, but it's safer if you watch what you're doing. For a clear view of the keyboard socket and your knife point, remove the small circuit board with the Remote and Footswitch connectors. First remove the ribbon cable going to the Sync card that lays across the Remote board and fold it out of the way, then remove the ½" hex nut on the Footswitch jack and single Phillips head screw securing the circuit board. Lift the board out of the way.



HDR owners already know this, but the keyboard connector is the old, large diameter AT style. If you're borrowing a keyboard from a modern computer, you'll need an adapter between its PS/2 plug and the MDR socket.

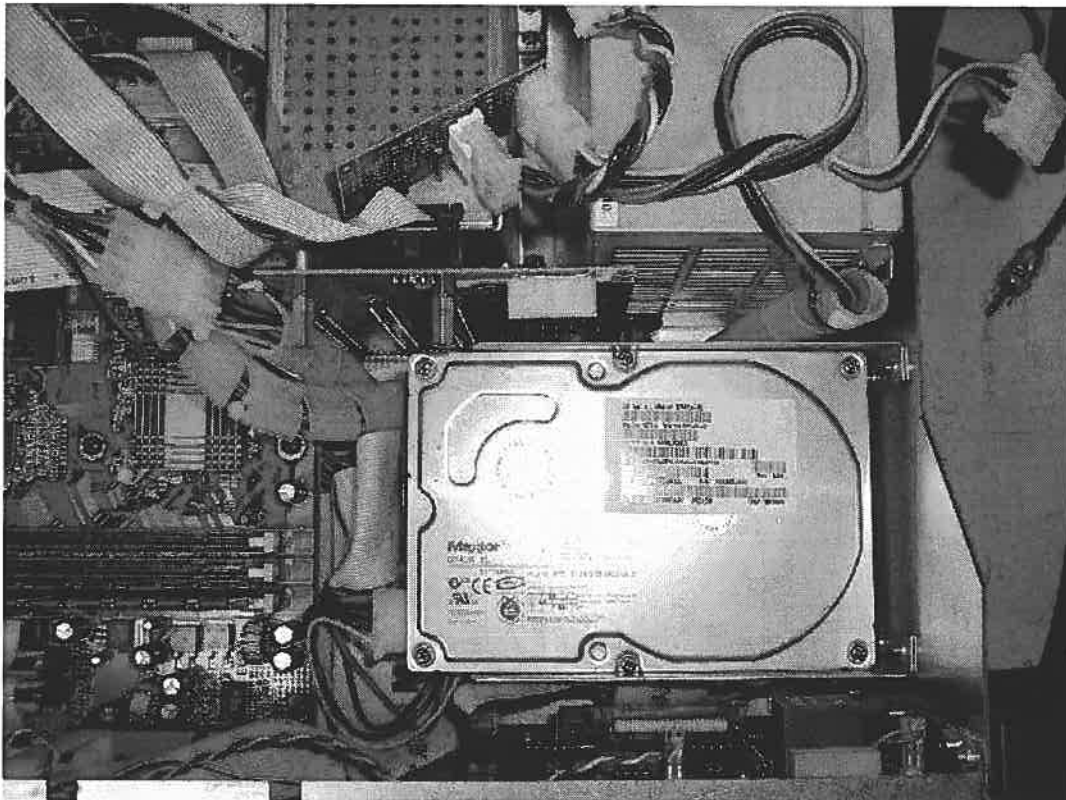
Connecting a Monitor

You'll need to install a graphics board so you can connect a monitor to the MDR. Although the MDR motherboard has a connector for an AGP graphics card (as used in the HDR), you can't easily install one since the MDR's rear sheet metal panel has no cutout for the AGP connector bracket. Any PCI graphics board, however, will allow you to view the CMOS setup menu. Remove the blank panel covering the ACC slot in the rear, plug a graphics card into the matching PCI slot on the motherboard, connect a monitor, and you're in business. Running with a PCI graphics card installed doesn't seem to affect the MDR's operation, but it's probably best to remove it when you're finished with the CMOS settings or other "eyeballs required" dirty work.

Replacing the Internal Hard Drive

Replacing the internal disk drive isn't much different than replacing the drive in a computer. It's just a little harder to get to.

The first step is to clear a path so you can extract the disk assembly.



Remove the two uppermost ribbon cables and the power cable from the “Brain” board located behind the front panel on the right. Remove the power cable from the backplane board attached to the back of the I/O card cage. If your recorder has a small daughter board attached to the I/O card cage backplane, remove the two Phillips head screws securing it to the stand-offs (you’ll need a stubby screwdriver for this) and set it aside. In the photo here, the daughter board is shown removed and laying on top of the I/O card cage. Dress all of the cables out of the way so you’ll have clear access to the drive.

Later production recorders used the a different version of the I/O card cage backplane which incorporates the daughter board’s function.

The drive is mounted in a frame which is attached to the recorder by four flat-head Phillips screws on the right side of the chassis and two on the bottom of the chassis, about five inches in from the right edge. Remove the two bottom screws first, then remove the four screws from the side.

You’ll now be able to lift out the whole disk drive assembly. It’s easiest to get the drive most of the way out before removing its cables. Resist the temptation to shout “It’s a boy!” as you remove (not cut) the umbilicals.

Once the mounting frame is out of the chassis, remove the drive from the frame by removing the two screws on each side.

Drive Address Jumpers

Before installing the replacement drive, set the address jumper(s) to configure it as a Master. Typically you’ll find a set of four or five pairs of pins and one or two movable jumpers adjacent to the large ribbon connector on the rear edge of the drive. These are used to set the drive address and some other things. There’s usually a label attached to the drive which shows how to position the jumpers. If there’s no label, check the documentation that came with the drive or visit the drive manufacturer’s web site. Today most drives come from the factory set for Cable Select addressing which sometimes works in the HDR and sometimes doesn’t – it seems to depend on the particular make and model of drive. Master always works and there’s no reason to set the internal drive otherwise. It’s too hard to reach the jumper once the recorder is re-assembled if it’s set incorrectly.

Replacement is just the reverse of removal. As usual, check your work. Make sure you’ve re-connected all the cables, left no screws lying loose in the bottom of the cabinet, and power it up.

You’ll have to format a new drive and install the operating system software, so refer to the instructions for that, beginning with modifying the TOOLS.INI file on the software installation Disk 1 if you haven’t already done so. (see Page 45)

Drives Larger than 30 GB

As originally built, the recorder's hard drive size is limited to 32 GB. You can't partition a larger drive or use a boot sector patch supplied by the disk drive manufacturer. Those won't fool the Mackie operating system.

Many 40 GB (though not usually larger) drives have a jumper which makes the drive look like one with a smaller capacity so that it can be used with systems such as the HDR that don't support larger drives. When configured for reduced capacity, some drives will appear as a 30 GB drive, others as 8 GB, and still others as about 2 GB. Obviously only the first option is really acceptable. The problem is that you can't tell (other than from someone else's experience using the identical drive in the HDR) what you'll end up with until you try it. Among several major brand 40 GB drives that I've purchased over-the-counter at retail stores, I've never been lucky enough to find one that formatted to 30 GB. Others have had better success than I. Be warned.

With the Large Capacity Drive Support BIOS upgrade (page 16), you can install an internal drive as large as 120 GB. While officially Mackie supports only larger capacity external drives with this BIOS upgrade, internal or external, they're all the same to the BIOS and operating system.

The price of larger drives, particularly when you look at the cost per gigabyte, has fallen dramatically over the past few years, while the price of smaller drives, because they're less in demand today other than as OEM components, has not. Unless you've developed a consistent source for reliable 20 or 30 GB drives at a very good price, the \$49 cost of the BIOS upgrade will pay for itself in just a couple of drive purchases.

Here's a friendly bit of advice: Don't try to make too many modifications at once. If you're upgrading the BIOS and plan to install a larger internal drive, first replace the BIOS chip, set up the CMOS configuration properly, then verify that the recorder works properly with the original drive. Once you're satisfied that the BIOS installation is OK, then dig in and replace the disk drive.

Approved Disk Drives (and why there aren't any)

Mackie has long been asked for a list of "approved" disk drives, and they've never provided one. Initially they tested several drives, selected a couple to use in manufacturing, and as far as they're concerned, those were the only approved disk drives, both for internal and external use. It's no secret. They use IBM Deskstar and Maxtor Diamond Max OEM models. Mackie contracted with the manufacturers to buy those drives in quantity over a several year period, under the condition that they'd get the same drive each time they placed an order.

You, as a retail customer however, can't always be sure of purchasing any two identical drives. At the time the HDR first went into production, it was typical for a dealer (particularly on-line dealers) to sell you whatever they had in stock that

was the at least the capacity and speed you ordered, regardless of make and model. Also, production changes meant that the drive that you bought today might be different from the drive of the same make and model that you bought last month, and it just might not work reliably in your recorder even though there's nothing technically wrong with the drive. Your dealer expects that the drive will be used a computer (for which drives are tested extensively) – he doesn't even know what an HDR is. A hard disk recorder is different from a personal computer in some aspects and sometimes things just don't work.

During the first year or two of the HDR's life, it was a real drive jungle out there. Since the HDR's reputation hinged on its reliability and the integrity of its recordings, Mackie strongly discouraged the use of anything but genuine bought-from-Mackie drives.

The grapevine was the place to learn which drives worked and which ones didn't. In reality, it was rare that one didn't work at all, but occasionally one wouldn't pass the real time recording verification and could only be used as a backup drive. Worse was the occasional drive that would format, verify, and still not record or play back reliably.

One name-brand drive that I purchased formatted and verified with no problems, recorded and played back fine, but when used to back up a project, reported "Disk Full" and quit after transferring just a few hundred megabytes. That one went back to the store. Another one consistently failed verification. I discovered that for the first ten power on/off cycles, this drive performed a read test after every write cycle as a health check. This slowed the throughput to the point where the HDR deemed it too slow for recording. A few more presses of the POWER button and it passed verification. Three years later it's still in service.

Fortunately, the drive situation is much better today. I can't recall a report of a new major brand disk drive purchased since at least mid-2002 that didn't work just fine, so I believe we're over the hump. While Mackie still does not publish a list of "approved" disk drives, if you stick to a major brand from a reliable supplier, you needn't worry about poor performance or reliability when using an aftermarket disk drive.

As a historical note, Mackie's original HDR24/96 product announcements stated that it used a 7200 RPM disk drive. Many early customers were surprised, when checking under the hood, to find a 5400 RPM drive inside. Initially Mackie engineers believed that a faster drive was necessary in order to achieve 24-track throughput, but it turned out that a 5400 RPM drive worked just fine, cost less, generated less heat, and ran quieter than 7200 RPM drives of the day. Today most new drives are 7200 RPM or faster, run cooler and quieter than older 5400 RPM drives and cost less.

External Drives – Rolling Your Own

One of the nicest features of the Mackie hard disk recorders is the removable (external) disk drive. You can purchase a completely assembled, tested, and formatted external drive from Mackie as the model M●90 (which, by the time you read this might be an “M●135” since later production HDR24/96 recorders have been shipping with 30 GB internal drives) but many people build their own both to save money and, with the BIOS upgrade, to use larger external drives. Any drive that will work internally will work as an external drive, so you have plenty of choices.

Lian Li RH-58 and RH-40 mobile racks (as the removable carrier and drive bay assembly is called in the computer world) are fully compatible with the Mackie recorders. Other similar-looking carriers may or may not work, and some have been reported cause electrical or physical damage to the drive bay. These Lian Li models have an aluminum base plate which provides good heat sinking. Avoid the cheaper all-plastic carriers. If you're inclined to assemble your own removable drives, use the genuine article. It's not that expensive, it fits the recorder properly, it works, and it provides adequate cooling for any modern 7200 RPM drive. While it's rare to find these Lian Li products in retail stores, there are several on-line suppliers.

The retail version of the RH-58 has two small fans at the front of the carrier. They aren't necessary for cooling the drive in the HDR, but they do make noise. Trace the wires running along the side of the frame from the fans to the rear panel and unplug the fan power connector. Leave the fans in place - they serve as EMI shielding. Mackie buys a factory-modified version of the Model RH-58 which is black rather than the more common computer-putty color, and which has no cooling fans, but includes an EMI shield.

The RH-40 has no fans and I think it looks a little nicer than the RH-58 (and besides, it's a little cheaper). The larger flat surface in front is a convenient place to stick a label describing the drive's contents.

The RH-58 is almost always sold as a set – the removable carrier and the internal drive bay. The RH-40 is more often sold as the carrier by itself, though this is probably just the way dealers stock them. It doesn't hurt to buy one complete RH-58 set. You'll have a replacement if your recorder's internal drive bay fails (this does indeed happen) or you can mount it in a computer for really efficient transfer of files from the recorder. You probably, however, don't want to accumulate too many spare drive bays.

I've never found an alternate source for the nifty padded storage box that Mackie supplies with the M●90, but for shelf storage (either in a carrier or nude), I've been happy with plastic “school pencil boxes” sold by the office superstores for less than a dollar. They don't provide any padding, but they keep the dust away, and they're molded so that they can be stacked a few high without toppling over.

The Lian Li products don't come with very clear instructions, but mounting a drive in the carrier is pretty straightforward. Here are a few tips:

Check the drive address jumpers first. Since the external drive is connected to the second IDE controller, it (like the internal drive) should be configured as a Master. Many retail packaged drives come from the factory set for Cable Select, so you may have to move a jumper.

Many users have been stymied trying to get the cover off the removable carrier. To remove the cover, slip a fingernail or a small screwdriver blade inside the little curved tab on the left side of the cover and pry it outward just a bit to release the latch. There's an arrow next to the word OPEN showing where to push and in which direction. With the latch out of the way, swing the front handle upward and the cover will slide back. Keep some tension on the tab and slide the cover back another half-inch. The latch will then be fully released. You can then let go of the tab and slide the cover back all the way to remove it. Take a look at the latching mechanism. Once you see how it works, it will be easier to open the next time. And be careful - that latch tab is fairly thin plastic and can break if pushed out too far.

The ribbon cable inside the carrier that connects to the drive is somewhat fragile. Avoid stressing it any more than necessary. To install the drive with minimum strain on the cable, start with the carrier and the disk drive laying end to end on a table, with the drive facing circuit board side up. Prop the rear edge of the drive up on the rear edge of the carrier and connect the ribbon and power connectors.

Now, flip the drive over. Put the rear end of the drive into the carrier first, then slide it back until the front end drops in. It's a pretty snug fit and there's a little ledge on the inside front of the carrier that the drive will hang on if you don't slide it back far enough. You'll know you it's fully seated when all the screw holes in the sides line up.

Don't cheat! Put in the screws, at least two per side. They're important to get good heat transfer from the drive to the case.

Before using a new disk drive, it must be formatted and, if you're planning to use it for recording or playback, verified. Verification is a good test and takes only a couple of minutes. Do this as soon as you assemble the drive so you won't forget. I like to patch a signal to all 24 channels, start recording on a new external drive, and fill up the disk as a test before using it for a real project.

Vari- Speed?

Variable speed recording was a “coming soon” feature in early HDR24/96 advertisements that never came to be. It’s still one of the most requested updates.

Recording and playback speed is determined by the frequency of the sample clock. If you’ve inadvertently changed the sample rate mid-project or imported a file at the incorrect sample rate, you’ve surely noticed the resulting change in pitch and speed. That’s a clue as to how to change the record or playback speed of the HDR. All you have to do is provide it with a word clock that’s different from the standard 44.1 or 48 kHz sample rate.

The HDR will lock to a word clock signal that’s within 10% of the selected sample rate. This equates to a pitch change of a bit more than a half-step. It isn’t enough for a tricky effect, but will allow you to temporarily retune the project to accommodate that unplanned-for accordion overdub.

Connect an adjustable word clock generator to the recorder’s BNC word clock input. The Termination switch on the sync card can be either in or out, whatever works. From the Sync menu, set the clock source to Word Clock (BNC). If all is well, the VAR LED will be on, indicating an external clock source. If the generator frequency is within locking range, the CLOCK LED will be on. Start playback and adjust the clock frequency for the desired pitch. Go too far off frequency and the CLOCK LED will blink, indicating a loss of synchronization, at which point, the recorder will do its best to return to normal speed.

So where do you find a variable frequency word clock source? Since one of the characteristics of a good word clock generator is frequency accuracy and stability, there aren’t many adjustable word clock generators. One that’s fairly easy to find is the BRC remote controller for the Alesis ADAT recorder. In the variable speed mode, the frequency of its word clock output follows the speed setting. I’ve used a 35+ year old Wavetek function generator from my electronics workbench. Such a generator can be purchased for as little as \$10 at a hamfest (a swap meet for electronics buffs) or for not very much more from dealers specializing in used electronic test equipment. There are several on-line resources. You need a generator capable of providing a square wave output of around 5 volts and that covers the frequency range of at least 39 to 53 kHz.

It’s a real credit to the designers of the clock synchronization circuitry in the HDR that this trick works as well as it does. When I first experimented with a variable speed kludge, I expected that it would work but would sound dreadful due to jitter in the output waveform of the generator that I was using as a word clock source. I was pleasantly surprised that it didn’t sound all that bad. You don’t want to record a whole project with a clock source this crummy, but it will get you through an overdub of an instrument which can’t be tuned to match the track.

MDR Large Capacity Disk Drive BIOS Upgrade – Yes You Can!

The replacement BIOS to support larger disk drives is officially only for the HDR. The MDR uses the identical motherboard and BIOS, suggesting that it should work in the MDR also, and it does. The practical reason for HDR-only support is that it's necessary, after installing the new BIOS chip, to make changes from the default CMOS settings. This requires a keyboard and monitor. Since the MDR has neither, the BIOS update cannot be performed without physically modifying the recorder. Because of concerns for liability (both for you and your recorder) Mackie doesn't officially support such modification.

But unless you eagerly skipped directly to this section, you know better. As described in the section on checking the CMOS settings (Page 56), it's quite easy to modify the MDR to connect a keyboard and monitor for the purpose of accessing the CMOS menu. However, if you would rather not to modify your recorder there's a simpler way to load the proper CMOS settings for the large drive support BIOS. Go ahead and order the BIOS upgrade kit. It's worth it.

An Automatic CMOS Setter-Upper (bootable floppy disk) – MDR and HDR

Using a file on the companion CD, you can create a floppy disk that boots on power-up (just like the Mackie OS installation disks) and automatically runs a program that loads the correct CMOS settings. No keys to press, no screen menus to page through. It works on the HDR as well as the MDR.

You'll need a Windows computer and a blank floppy disk. Apologies to you Mac-only users. Given that most newer Macintosh computers don't have floppy drives, I figured that you'd have to go to a neighbor or the library to hunt up a PC anyway, so I didn't attempt to create a bulletproof self-extracting Mac disk image file for this tool.

Insert a blank floppy disk in the computer's drive and run the program CMOSUTILS.EXE from the CD. Click on all the OK buttons (don't worry about the message saying the program isn't authorized for distribution – that's meant to embarrass me, not warn you) and in a few minutes you'll have your CMOS setup disk. Don't forget to label it, and after you're finished with it, save it for a rainy day.



The floppy disk contains a basic DOS operating system, a program called CMOS.COM which reads data from a file on the disk and sends it to the HDR's CMOS memory, and a batch file named AUTOEXEC.BAT which runs automatically on boot-up to start the loader program. For convenience, there are also data files with the CMOS settings for the original BIOS in the event that you need to restore those settings.

After installing the Large Drive Support BIOS chip according to the instructions in the kit, insert the CMOS Loader floppy disk in the MDR's drive, power up, and

watch the floppy disk activity light. When the light goes off, power down the recorder, remove the floppy, and reboot. You'll have the correct CMOS settings for the new BIOS.



It's important to shut down the recorder at the right time since the CMOS loading program will attempt to reboot the computer after making the changes. If you leave the floppy disk in the drive, it will just reboot itself and re-load the CMOS memory, over and over, and over. There's no harm in that, but you don't want to shut down the computer at the *wrong* time, while it's in the midst of writing to CMOS memory. That could scramble the memory contents and prevent the recorder from booting again.

If that happens, you can restore the factory default settings by removing the CPU battery overnight or moving the Clear CMOS jumper. (Page 33). You'll need to reload the CMOS settings again, but hopefully you'll not make the same mistake the next time around.



You may be reluctant to cut a hole in your recorder for keyboard access but by temporarily installing a PCI graphics card in the ACC slot (no cutting required) and connecting a monitor, you can watch the program's progress and be sure to shut it down at the proper time.

The CMOS Setup Disk - Details and Alternate CMOS Settings

The disk that you create using the self-extracting file on the CD loads the CMOS data for the large drive support BIOS with (just because I think it's such a good idea) the power switch action set to the "Delay 4 Seconds" option (Page 56). If you haven't already made this change in your recorder, be warned that you'll have to hold the Power button for several seconds before it will turn off.

If you have an HDR or have modified your MDR so that you can attach a keyboard and monitor, you can defeat the automatic operation and run the CMOS loader program manually. Rename AUTOEXEC.BAT to AUTOEXEC.BA (this will prevent it from being recognized as a self-running program) or simply press the F5 key while the floppy is booting to bypass the AUTOEXEC.BAT file commands and go straight to the DOS command prompt (A:\>). Then type:

```
CMOS /LOAD BIGCMOS.DTA <enter>
```

(or use an alternate data file name – see the next page)

Since this program can load any previously saved CMOS data, I've included four different data files which you may find useful. If you want the disk to run automatically and load a different CMOS configuration, edit the floppy's AUTOEXEC.BAT file so that it loads data from a different file. You can drag AUTOEXEC.BAT to the Windows Notepad to edit it, but don't click on it or it will try to run on your PC – not a good thing! You can also edit this file on a Mac. Here are the data files on the disk and what they're used for:

BIGCMOS.DTA – This is the one that loads automatically if you use the disk that's created from the self-extracting file on the CD. Use it for either the MDR or HDR with the upgraded BIOS. It will set the recorder for delayed power off.

STDCMOS.DTA – This loads the CMOS for the standard (original) BIOS, but with the delayed power switching. You can use this to change your standard MDR to delayed power switching without cutting a hole for the keyboard, or for resetting the CMOS as a maintenance procedure.

BIGCMOSQ.DTA – Same as BIGCMOS.DTA but with the normal "instant" power off.

STDCMOSQ.DTA – Same as STDCMOS.DTA but with the normal "instant" power off.



Important! Don't load the wrong data file for your BIOS. Loading the large drive support BIOS settings into the original BIOS chip (or vice versa) will scramble its brains and will require clearing the CMOS settings and reloading the correct ones. **Equally important!** – Keep this floppy disk away from your PC unless you're editing it. If it's in the computer's floppy drive when you power up the PC, it will boot (rather than your normal operating system) and attempt to load your computer with the Mackie BIOS settings. This will almost certainly keep your computer from booting again.

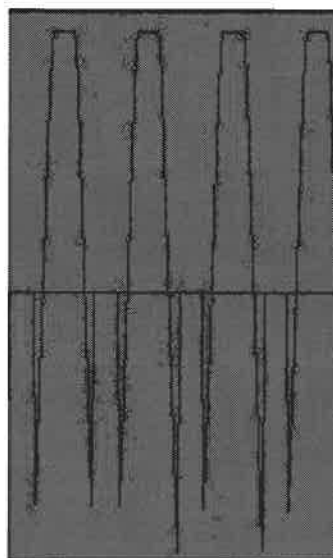
Mysteries and Unexplained Quirks

While some oddness and just plain ol' bugs have been fixed by various software updates, there are still a few quirks which, particularly when encountered for the first time, can be surprising or disturbing. Mostly, the solution or work-around for these is "don't do that," though sometimes it helps to know that these seeming abnormalities are, er . . . well . . . um . . . perfectly normal.

This is by no means a comprehensive list of known and unknown bugs, anomalies, and issues, but they're ones that at least have rational explanations and seem to be universally recognized but still universally considered quirky.

Visible Wrapping on Overload

Have you ever noticed a waveform that looks like this when zooming in on the graphic display? This started out life as a sine wave, but it was clipped due to recording at too high a level. The clipping (flat tops) on the positive half of the cycle are evident and look as expected, but the negative half of the cycle, which, for a sine wave, should look exactly like the positive half, is actually flipped over halfway down. This looks as if it should sound awful.



Since the digitized audio is actually clipped, distortion is indeed audible. The good news is that it doesn't sound as bad as it looks. The "wrapping", or inversion during the negative half of the cycle, is strictly a graphic display problem. The audio is actually clipped symmetrically.

What makes this particularly interesting is that some early generation A/D converters would actually do this to the audio. A digitized value, in trying to exceed the largest possible number for the word length (all bits on), would overflow into the sign bit instead of being truncated, causing the audio data to change polarity. That really did sound as bad as it looks. Fortunately those days are about over.

Consider this a blessing in disguise. Wrapping is easy to spot. If you don't notice the red overload indicators when tracking but notice some "wrapped" waveforms, back off the record level to avoid clipping.

Note that when feeding the recorder a digital input, you won't see this wrapping because the input (from your digital source) will never be greater than digital full scale. But if you overload the A/D converter, it will still be clipped. **TURN IT DOWN!!!**

Response Time Lags

Punch-in Lag

Whenever you stop recording, the HDR must perform some housekeeping tasks (it's re-writing the Project file) before it's ready to be a recorder again. This is a "dead zone" that limits the shortest piece of recorded audio you can leave untouched between a punch-out and a following punch-in. When attempting to punch around a word or a very short phrase - keeping a short piece of the original recording but replacing what came before and after it - you may find yourself missing the punch-in no matter how fast your finger is on the button.

This isn't simply a lag before recording starts – during this dead time, the HDR doesn't even recognize that you've pressed the Record button. Hit the button before it's ready and it won't enter Record. You'll need to get a feel for this dead time if your work requires rapid-fire punches.

When punching in on a single track following a punch-out, the minimum dead time is around 300 milliseconds. This lag increases when punching on multiple tracks, and where there are a lot of punches and edits on the track. The worst case I was able to observe (a totally unrealistic situation, but this was a lab experiment) was around 5 seconds.

You can of course accomplish a tight "punch-around" in two passes, but when it comes to doing punches as reconstructive surgery (as opposed to punching to build up a track, which is usually done at a more relaxed pace) it's best to get yourself out of the analog recorder mindset and start thinking in the non-destructive digital recorder mode. Rather than fixing the track with a punch, consider recording a replacement segment as a virtual take, on another track, or even on the original track, editing later to use as much or as little of the replacement as you need. But if you want to hear the final fixed version before moving on, it will take a little longer than what would otherwise be a quick-fix operation.

The benefit of non-destructive punching is never having to say "Oops! Let's take it again, this time from the beginning of the phrase." This may be of little consolation, particularly if you're accustomed to working with a recorder or DAW which doesn't have this limitation, but this isn't going to change. You just have to learn to work with it, or around it.

Monitor (Playback) Dropout Following a Punch-Out

When punching out, it's common to drop out of Record but continue rolling for a few seconds before stopping so that the punch is heard in context, or, if another punch is coming up very soon, just continue playnig until it's time to punch in again. On the HDR, although the recording is unaffected - punch-ins and punch-outs occur exactly where you pushed the button - the punched-in track is muted during the post-recording housekeeping. This can be disconcerting to the singer

in the vocal booth who, when hearing her track go dead momentarily, thinks you accidentally erased a word. It's hard to resist the urge to stop, rewind, and listen whenever the punch doesn't sound right in the headphones. Checking each punch can really slow down a session.

Like the punch-in delay, the length of time the playback is muted after a punch-out depends on the number of recorded tracks, the number of punches and edits within the tracks, and the number of tracks on which you're punching. When punching on a single track, the mute is rarely noticeable (generally it'll be during a breath pause), typically less than 50 milliseconds. But when doing a 24-track punch-out on fragmented tracks, I've observed as much as 4 seconds of silence before monitoring returns. This is one of those quirks that really, really annoys some users, while others have never encountered it. It all depends on the nature of your work.

The simplest work-around for this problem is to simply stop the transport at the punch-out point. It can be a bit jarring, but often not as annoying as hearing the track mute and then suddenly start playing again. (I had to punch out like this on my first multitrack analog recorder in order to avoid clicks.) I usually try to punch out at the end of a phrase where there's a natural pause, even if I intend to edit later to preserve more of the original take. Because I tend to work this way all the time and don't try to impress my clients with heroic punches, I rarely find this quirk to be a hindrance.

Punching performance is an area where Mackie's otherwise well executed concept of "works just like an analog recorder" falls down. Perhaps it's more accurate to say that it *does* work just like an analog recorder – you have to learn how it responds when punching and work accordingly. Sell your clients on the positive features of your recorder rather than making excuses for it.

The Disappearing Track Trick

This quirk, which seems to be unique to the HDR, comes in two flavors. In one variation, you can see a track on the graphic display but you don't hear it playing. In the other variation, you can hear the track but it's disappeared from the graphic display. While I've never experienced either of these anomalies in operation, nor have I been able to coax my HDR into doing this in the lab, it's been reported by enough knowledgeable users so I believe it's real.

This doesn't seem to be a permanent condition. Usually grabbing the track (or clicking where the track should be if it disappeared) with the hand tool, moving it slightly, and then un-doing the move will put things right. If not, saving the project, closing it, and re-opening it will restore the missing audio or graphics.

Keep calm, say something comforting to the client, and move on.

The Project That Won't Go Away

This is one of my biggest peeves. You create a new project, do a little work on it, decide to abandon it, and delete it. If you then try to create a new project with the same name, you can't. The HDR tells you that a project by that name already exists. But you can neither open nor rename it. It's like it's there, but it really isn't. What has happened is that the .PRJ file and all the audio files have been deleted, but the directory entry (folder name) still exists on the drive. Sometimes you can delete it by using an FTP client, but at times it will appear to be deleted (FTP doesn't give an error message when attempting to delete the directory) but it's still there. I've even had some of these hang around on the internal drive after using the Mackie disk format and re-installing the operating system.

The only sure-fire alternative to just living with it is to attack the problem with tools that let you work directly on the disk itself. Boot up your DOS floppy (with keyboard and monitor connected of course), locate the rogue directory, and remove it. Refer to Appendix B so you'll know what's where. Here's how:

From the "A prompt", switch to the drive with the directory you want to delete:

C:\ <enter> (or D:\ <enter> if the project is on the removable drive)

Look at the directory listing so you'll know where to go next:

DIR <enter>

The low level DOS tools use only eight characters for file and directory names, keeping track of longer file and directory names by appending a number preceded by a tilde (~) after the first six characters. The directory "HDR Projects" will appear in the listing as "HDRPRO~1" This is where you'll find all the Project folders. Change to that directory by typing:

CD HDRPRO~1 <enter>

Now, find the directory you want to delete. If there are too many directories to fit on one screen, you can display one screen's worth at a time by adding /p to the directory listing command:

DIR /P <enter>

Tapping the space bar will advance to the next screen and display more directory names.

If your cancerous carbuncle project has a short name (less than six characters) it will be easy to locate in the list, but if it's longer and you have several similarly-named projects, you must be *very* careful to identify the correct one. If you have projects named Test Recording Bass, Test Recording guitar, Test Recording Drums, etc. you would see these listed as:

```
TESTRE~1
TESTRE~2
TESTRE~3
```

There's no way to tell which number corresponds to which project. You can get a clue by switching to each of these directories (CD TESTRE~1 <enter>), list the contents, and see what's in there. If you've already attempted to delete the project by normal means (and you wouldn't be here if you hadn't), the directory will be empty. This is the one you want to remove.

If you've moved down a level to locate the directory name to remove, switch back to the HDR Projects directory before either looking at the contents of another project directory or doing the deletion.

CD .. <enter> (that's dot dot) moves you up one level.

When you're back in the HDRPRO~1 directory, you'll be ready to remove the offending directory.



If you're sure of what you're doing, execute the Remove Directory command:

```
RD TESTREC~1 <enter>
```

This will remove it. If you removed the wrong directory, you will have irretrievably deleted the entire project so be sure you know what you're doing.

YOU HAVE BEEN WARNED!!!!

When the dirty work is over, remove the DOS floppy, boot up the recorder, and you'll be pleased to find that you can use that project name again.

Note: You can't remove a directory that isn't empty. If you see that message, you'll need to go down another level and clean it out. Change to the project directory and DIR to list its contents. You'll probably find that there's an AudioFiles folder AUDIOF~1 remaining. Remove that directory (RD AUDIOF~1), then double-dot to get back to the HDRPRO~1 directory and remove the bogus project directory.

A Verrrry Interesting Tale of Digital I/O Woe and Intrigue

The most curious problem I've encountered (so far) in my time with the HDR involves the PDI-8 AES/EBU I/O card. In the early digital days, adding a known amount of high frequency boost (called "emphasis") during digital A/D conversion, was fairly standard practice. Engaging emphasis turns on a flag in the channel status block of the digital data stream (the Emphasis bit) so the D/A converter knows to apply a corresponding high frequency cut. This restores flat frequency response and reduces high frequency noise in the process.

Nobody records with emphasis today, but many playback systems retain the de-emphasis capability in order to accommodate older recordings. The PDI-8 card doesn't use emphasis, but the card's interface chip is capable setting the emphasis flag if told to do so. The emphasis flag is supposed to remain off at all times - but the plot thickens.

I got a call for help from a client with a digital console and an HDR equipped with PDI-8 cards. Inputs to the HDR came from outboard A/D converters, and the recorder's outputs went to AES/EBU inputs on the console. Occasionally he'd power up his system and find that tracks which sounded great the day before now sounded dull. Another time they'd sound fine again. He was certain that his mix hadn't changed, and that the automation wasn't playing tricks on him.

After repeated power cycling of the HDR, we managed to make the problem appear. Sending a swept a tone through the whole chain from A/D converter input through the recorder and console to the monitor output showed a definite high frequency rolloff. The problem occurred on all eight channels of two of the three PDI-8 cards, not always the same cards (so we couldn't pin it down to a failure of a single card or I/O slot), and never with all three cards simultaneously.

Replacing a PDI-8 card with an AIO-8 (analog) card and playing back the sweep recorded through the PDI-8 showed no high frequency rolloff. This pointed to the PDI-8 card, specifically its output half, as the culprit. Although I couldn't prove it at the time, I suspected that the card was occasionally initializing incorrectly and turning on the Emphasis flag. The console saw the flag, knew what it meant, and appropriately rolled off the high frequency response. The client, deciding he'd rather switch than fight, ultimately resolved his problem by switching to OPT-8 cards in his recorder and using ADAT Lightpipe I/O to his console.

Fast-forward a couple of years when I obtained a PDI-8 card of my own, and by this time had acquired a piece of test equipment that allows me to view the actual bits in the channel status block. Sure enough, every now and then when I fired up my recorder with the PDI-8 installed, I saw that the Emphasis flag was set.

The moral of this story: Your ears don't lie. Pay attention to what they're telling you.

Not Quite the End

We never stop learning about these computer-based things. There will always be more questions, more puzzles, and hopefully more answers. One thing of which we can be reasonably sure is that there won't be any more software or hardware updates for the HDR and MDR. It is what it is, and when it's good, it's very, very good.

I finished writing this book in September 2004 with hopes of answering many of the questions that keep coming up about these recorders. I thought it was almost finished in June, but you know how these things go. Further, I know that in reality it will never be finished until the last HDR is extinct, and I don't expect that to be for quite some time yet.

See you on line, and I hope your recorder has a long and productive life.

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If I missed anyone, brand names mentioned in this book are trademarks or registered trademarks of their respective companies and are hereby acknowledged.

Appendix A – LCD Menu Trees for New Functions

PROJECT Menu Tree

PROJECT Page 1			
New			
	Internal/External	<< >> selects drive	
	NEXT		
		sample rate mode	<< >> toggles 48/96
		Project Name	<< >> moves cursor (-)DEC/(+)INC scrolls through character set
		Cancel	Back to Project menu
		New	Opens project
Open			
	Internal/External	<< >> selects drive	
	NEXT		
		Select project folder	<< >> scrolls through folders
		Cancel	Back to Project menu
	NEXT	Select project (*.prj)	<< >> scrolls through files and folder in Project folder
		Cancel	Back to Project menu
		Open	Opens selected project
Save	Saves current project		
Delete Folder	Internal/External	<< >> selects drive	
	NEXT		
		Select folder for deletion	<< >> scrolls through folders
		Cancel	Back to Project Menu
		Del	Deletes entire project folder after confirm

PROJECT Page 2			
Rename			
	Internal/External	<< >> selects drive	
	NEXT	Select project folder	<< >> scrolls through folders
		Select project file (*.prj)	<< >> scrolls through projects in that folder
		Cancel	Back to Project menu page 1
		OK	<< >> moves cursor (-)DEC/(+)INC scrolls through character set
		OK	Saves new name
		Cancel	Back to Project menu page 1
Save As			
	<< >>	<< >> moves cursor (-)DEC/(+)INC scrolls through character set	
	Cancel	Back to Project menu page 2	
	OK	Saves project with new name	
Template Reset			
	Cancel	Back to Project menu page 2	
	OK	Sets template to factory defaults	
Template Save	Note: While this is on the MDR24/96 menu, there really isn't anything that you can change that would be saved as a template. See Technical Reference Appendix B		
	Cancel	Back to Project menu page 2	
	OK	Saves current parameters as the template for new projects	

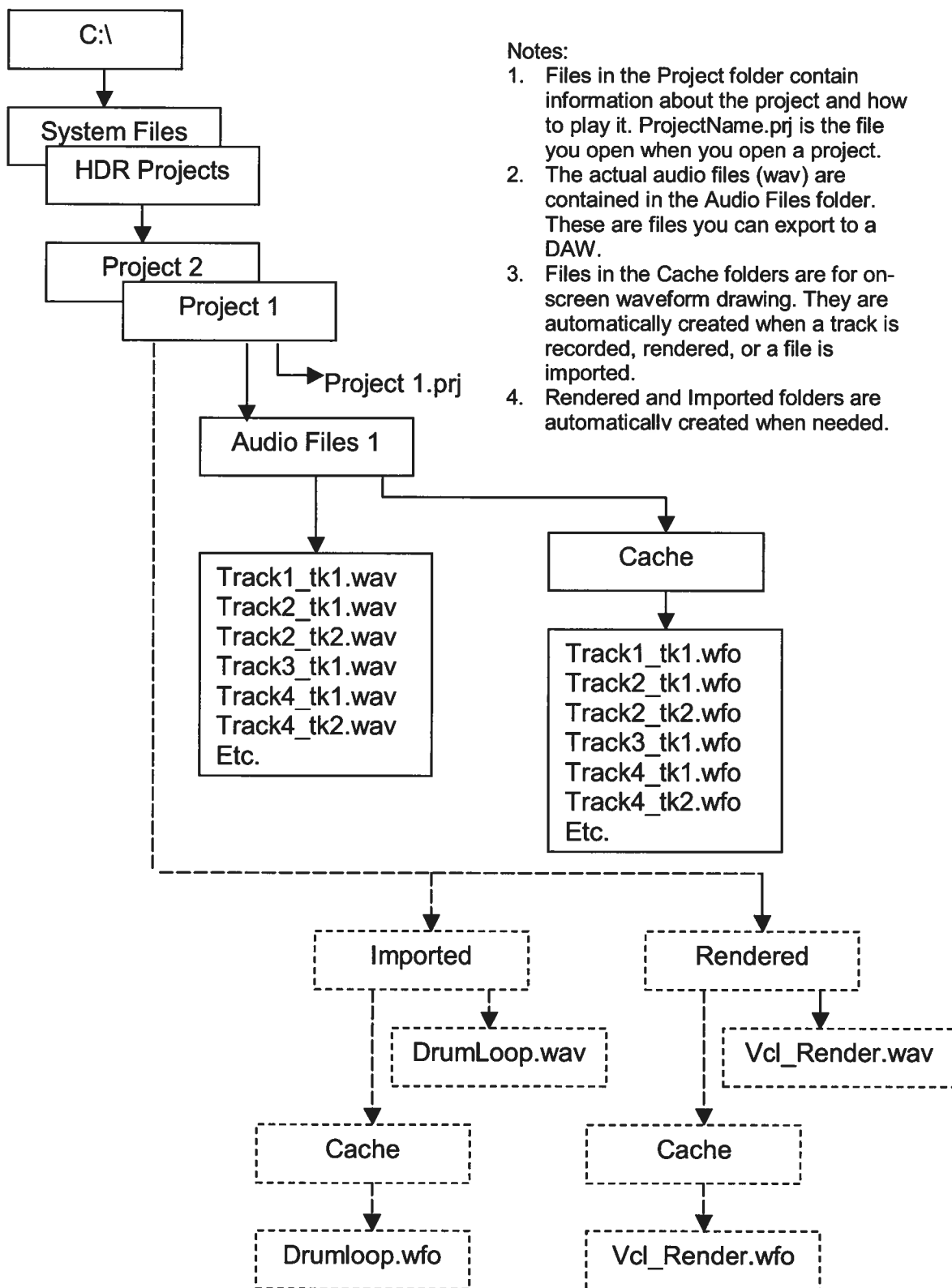
PROJECT Page 3			
Delete Project File	Internal/External	<< >> selects drive	
	NEXT	Select project folder	<< >> scrolls through folders
		Select project file (*.prj)	<< >> scrolls through projects in that folder
		Cancel	Back to Project menu page 1
		Del	Deletes selected project after confirm
Purge Audio			
	OK	Deletes audio files from the current project	
	Cancel	Back to Project Menu page 3	
Save 1.2 Fmt			
	(no prompts) Creates an old format (*.hdr) project file to allow current project to be opened by an HDR or MDR running Version 1.2 or lower		

Track (Track/Edit) Menu Tree

TRACK/EDIT Page 1		
Cut		
	Start	Mark cut start time
	End	Mark cut end time
	Cut	Cut leaving a hole
	Join	Cut and slide to fill hole
Copy		
	Start	Mark segment start time
	End	Mark segment end time
	Cancel	Forget it - Back to Track menu Page 1
	Copy	Copy marked segment to clipboard
Paste		
	Start	Mark location for pasting
	Paste	Paste over whatever's there
	Insert	Insert and move everything else over to make room
Undo-Redo		
	#	Sequence number in history list (info only)
	Undo	Undo last operation
	Redo	Redo what was last undone
	Exit	Back to Track menu Page 1

TRACK/EDIT Page 2			
Mute			
	Toggle with Track Arm buttons		Track Arm LED indicates track muted
	OK		Back to Track menu Page 2
Render			
	Start		Inserts time code for start of rendering
	End		Inserts time code for end of rendering
	Cancel		Forget it - Back to Track menu Page 2
	Render		Do it on tracks selected with Track Arm
Set Virtl (Virtual Take)			
	<< >> (-)DEC/(+)INC		<< >> selects track to change virtual take (-)DEC/(+)INC sets virtual take number
	OK		Back to Track menu Page 2
Imprt Audio			
	Import File		
		<< >>	Scrolls through files or folders
		Up	Move up one folder level
		Open	Selects file or folder
	Select Drive (Page 2)		
		Internal	Selects Internal drive
		External	Selects External drive

Appendix B – Folder and File Hierarchy



Appendix C HDR24/96 and MDR24/96 CMOS Setup

Setup for Standard BIOS

Standard CMOS Setup

Date: Set to current date

Time: Set to current time

HARD DISKS	TYPE	SIZE	CYLS	HEAD	PRECOMP	LANDZ	SECTOR	MODE
Primary Master	Auto	0	0	0	0	0	0	Auto
Primary Slave	None	0	0	0	0	0	0	----
Sec Master	Auto	0	0	0	0	0	0	Auto
Sec Slave	None	0	0	0	0	0	0	----

Drive A: 1.44M, 3.5 in.

Drive B: None

Base Memory: 640K

Extended Memory: 130048K

Other Memory: 384K

Total Memory: 131072K

Video: EGA/VGA

Halt On: All but keyboard

BIOS Features Setup		Chipset Features Setup		Power Management Setup	
Virus Warning	Disabled	SDRAM RAS-to-CAS Delay	3	ACPI Function	Disabled
CPU L1 Cache	Enabled	SDRAM RAS Precharge Time	3	Power Management	User Define
CPU L2 Cache	Enabled	SDRAM CAS Latency Time	3	PM Control By APM	Yes
CPU L2 Cache ECC Checking	Enabled	SDRAM Precharge Control	Disabled	Video Off Method	DPMS
Quick Power On Self-Test	Enabled	DRAM Data Integrity Mode	Non-ECC	Video Off After	Suspend
Boot Sequence	A, C, SCSI	System BIOS Cacheable	Disabled	Modem Use IRQ	NA
Swap Floppy Drive	Disabled	Video BIOS Cacheable	Disabled	Standby Mode	Disabled
Boot Up Floppy Seek	Disabled	Video RAM Cacheable	Disabled	Suspend Mode	Disabled
Boot Up NumLock Status	On	8-Bit I/O Recovery Time	1	HDD Power Down	Disabled
Typematic Rate Setting	Disabled	16-Bit I/O Recovery Time	1	PCI/VGA Act-Monitor	Disabled
Typematic Rate (Chars/Sec)	6	Memory Hole At 15M-16M	Disabled	Soft-Off by PWR BTTN	Instant-Off*
Typematic Delay (Msec)	250	PCI 2.1 Compliance	Enabled	PWR Lost Resume State	Keep Off
Security Option	Setup	AGP Aperture Size (MB)	64	Resume on Ring	Disabled
PCI/VGA Palette Snoop	Disabled	CPU/PCI Clock (MHz)	Default	Resume on LAN	Disabled
OS Select for DRAM > 64MB	Non-OS2	Spread Spectrum	Enabled	Resume on Alarm	Disabled
HDD S.M.A.R.T. Capability	Disabled				

* Mike's recommended setting: Hold 4 Sec

PNP/PCI Configuration

Resources Controlled By	Manual	Assign IRQ for VGA	Disabled
Reset Configuration Data	Disabled	Assign IRQ for USB	Disabled
		PCI Slot 1 Use IRQ	Auto
IRQ-3 Assigned to	PCI/ISA PnP	PCI Slot 2 Use IRQ	Auto
IRQ-4 Assigned to	PCI/ISA PnP	PCI Slot 3 Use IRQ	Auto
IRQ-5 Assigned to	PCI/ISA PnP	PCI Slot 4 Use IRQ	Auto
IRQ-7 Assigned to	PCI/ISA PnP		
IRQ-9 Assigned to	PCI/ISA PnP	Used MEM Base Address	N/A
IRQ-10 Assigned to	Legacy ISA		
IRQ-11 Assigned to	PCI/ISA PnP		
IRQ-12 Assigned to	PCI/ISA PnP		
IRQ-14 Assigned to	PCI/ISA PnP		
IRQ-15 Assigned to	PCI/ISA PnP		
DMA-0 Assigned to	PCI/ISA PnP		
DMA-1 Assigned to	PCI/ISA PnP		
DMA-3 Assigned to	PCI/ISA PnP		
DMA-5 Assigned to	PCI/ISA PnP		
DMA-6 Assigned to	PCI/ISA PnP		
DMA-7 Assigned to	PCI/ISA PnP		

Note: IRQ-10 is assigned to Legacy ISA (the MIDI card)

Integrated Peripherals Setup

IDE HDD Block Mode	Enabled	KBC Input Clock	8 MHz
IDE Primary Master PIO	Auto	Onboard FDC Controller	Enabled
IDE Primary Slave PIO	Auto	Onboard Serial Port 1	3F8/IRQ4
IDE Secondary Master PIO	Auto	Onboard Serial Port 2	2F8/IRQ3
IDE Secondary Slave PIO	Auto	UART2 Mode Select	Normal
IDE Primary Master UDMA	Auto		
IDE Primary Slave UDMA	Auto	Onboard Parallel Port	Disabled
IDE Secondary Master UDMA	Auto		
IDE Secondary Slave UDMA	Auto		
On-Chip Primary PCI IDE	Enabled	Keyboard/Mouse Power On	Disabled
On-Chip Secondary PCI IDE	Enabled		
USB Keyboard Support	Disabled		
Init Display First	AGP		

Note: Parallel port is DISABLED

Setup for Large Drive Support BIOS

Standard CMOS Setup

Date: Set to current date

Time: Set to current time

HARD DISKS	TYPE	SIZE	CYLS	HEAD	PRECOMP	LANDZ	SECTOR	MODE
Primary Master	Auto	0M	0	0	0	0	0	Auto
Primary Slave	None	0M	0	0	0	0	0	----
Sec Master	Auto	0M	0	0	0	0	0	Auto
Sec Slave	None	0M	0	0	0	0	0	----

Drive A: 1.44M, 3.5 in.

Drive B: None

Video: EGA/VGA

Halt On: All, But Keyboard

Base Memory: 640K

Extended Memory: 261120K

Other Memory: 384K

Total Memory: 262144K

(With 256 MB memory installed)

BIOS Features Setup			
Virus Warning	Disabled	Video BIOS Shadow	Enabled
CPU Internal Cache	Enabled	C8000-CBFFF Shadow	Disabled
External Cache	Enabled	CC000-CFFFF Shadow	Disabled
CPU L2 Cache ECC Checking	Enabled	D0000-D3FFF Shadow	Disabled
		D4000-D7FFF Shadow	Disabled
Quick Power On Self-Test	Enabled ¹	D8000-DBFFF Shadow	Disabled
Boot Sequence	A, C, SCSI	DC000-DFFFF Shadow	Disabled
Swap Floppy Drive	Disabled		
Boot Up Floppy Seek	Disabled		
Boot Up NumLock Status	On		
Gate A20 Option	Fast		
Typematic Rate Setting	Disabled		
Typematic Rate (Chars/Sec)	6		
Typematic Delay (Msec)	250		
Security Option	Setup		
PCI/VGA Palette Snoop	Disabled		
OS Select for DRAM > 64MB	Non-OS2		
Report No FDD for Win95	Yes		

¹ Instructions call for this to be initially Enabled. Once everything is working properly, the recommended setting is Disabled (same as standard BIOS)

Chipset Features Setup		Power Management Setup			
Auto Configuration	Enabled	Power Management	User Define	**Reload Global Timer Events**	
EDO DRAM Speed Selection	60 ns	PM Control By APM	Yes	IRQ [3-7, 9-15]. NMI	Disabled
EDO CASx# MA Wait State	2	Video Off Method	DPMS	Primary IDE 0	Disabled
EDO RASx# Wait State	2	Video Off After	Suspend	Primary IDE 1	Disabled
SDRAM RAS-to-CAS Delay	3	Modem Use IRQ	NA	Secondary IDE 0	Disabled
SDRAM RAS Precharge Time	3	Doze Mode	Disable	Secondary IDE 1	Disabled
SDRAM CAS Latency Time	3	Standby Mode	Disable	Floppy Disk	Disabled
SDRAM Precharge Control	Disabled	Suspend Mode	Disable	Serial Port	Enabled
DRAM Data Integrity Mode	Non-ECC	HDD Power Down	Disable	Parallel Port	Disabled
System BIOS Cacheable	Disabled	Throttle Duty Cycle	62.5%		
Video BIOS Cacheable	Disabled	PCI/VGA Act-Monitor	Disabled		
Video RAM Cacheable	Disabled	Soft-Off by PWR BTTN	Instant-Off ²		
8-Bit I/O Recovery Time	1	Power On by Ring	Disabled		
16-Bit I/O Recovery Time	1	IRQ 8 Break Suspend	Disabled		
Memory Hole At 15M-16M	Disabled				
Passive Release	Enabled				
Delayed Transaction	Disabled				
AGP Aperture Size (MB)	64				

² Mike's recommended setting: Delay 4 Sec

PNP/PCI Configuration

PNP OS Installed	No	Used MEM Base Addr	N/A
Resources Controlled By	Manual		
Reset Configuration Data	Disabled		
		PCI Latency Timer (CLK)	40
IRQ-3 Assigned to	PCI/ISA PnP		
IRQ-4 Assigned to	PCI/ISA PnP		
IRQ-5 Assigned to	PCI/ISA PnP		
IRQ-7 Assigned to	PCI/ISA PnP		
IRQ-9 Assigned to	PCI/ISA PnP		
IRQ-10 Assigned to	Legacy ISA		
IRQ-11 Assigned to	PCI/ISA PnP		
IRQ-12 Assigned to	PCI/ISA PnP		
IRQ-14 Assigned to	PCI/ISA PnP		
IRQ-15 Assigned to	PCI/ISA PnP		
DMA-0 Assigned to	PCI/ISA PnP		
DMA-1 Assigned to	PCI/ISA PnP		
DMA-3 Assigned to	PCI/ISA PnP		
DMA-5 Assigned to	PCI/ISA PnP		
DMA-6 Assigned to	PCI/ISA PnP		
DMA-7 Assigned to	PCI/ISA PnP		

Note: IRQ-10 is assigned to Legacy ISA (the MIDI card)

Integrated Peripherals Setup

IDE HDD Block Mode	Enabled	Onboard Parallel Port	Disabled
IDE Primary Master PIO	Auto		
IDE Primary Slave PIO	Auto		
IDE Secondary Master PIO	Auto		
IDE Secondary Slave PIO	Auto		
IDE Primary Master UDMA	Auto		
IDE Primary Slave UDMA	Auto		
IDE Secondary Master UDMA	Auto		
IDE Secondary Slave UDMA	Auto		
On-Chip Primary PCI IDE	Enabled		
On-Chip Secondary PCI-IDE	Enabled		
USB Keyboard Support	Disabled		
Init Display First	AGP		
KBC Input Clock	8 MHz		
Onboard FDC Controller	Enabled		
Onboard Serial Port 1	3F8/IRQ4		
Onboard Serial Port 2	2F8/IRQ3		
UART Mode Select	Normal		

Note: Parallel port is DISABLED

Appendix D – I/O Cards

Since many readers are second-generation owners or are looking for a used HDR or MDR, I thought it would be helpful to describe the various input and output options available for the recorder. This is an update to the similar appendix in the HDR24/96 Technical Reference.

The I/O card cage in the rear panel of the recorder accommodates three interface cards, each having eight channels of input and output. Mackie offers four different I/O cards. You don't have to install the same type of card in all three slots – you can mix cards for connecting different types of equipment. The cards are simple to install, (just two screws), so it's handy to have an assortment to accommodate new or "visiting" gear.

The HDR, MDR, and Mackie d8b console all use the same I/O cards, so when searching the experienced-gear market, don't ignore people selling accessories for the d8b. They might have the I/O card you need.

The HDR comes from the factory strictly a la carte – it's shipped with the I/O card cage empty, and it's up to the purchaser to select cards to suit his needs. It's reasonable to expect a second-hand HDR to include some cards, but they may or may not suit *your* needs. Be prepared to do some horse-trading, or start an I/O card collection of your own. The MDR came from the factory with three analog I/O cards installed. Since many MDR owners sold or traded those cards for digital cards to interface with a digital console, a used MDR may or may not have the original analog cards (but expect it to have *some* cards).

The OPT●24 card described on page 14 is new since the last documentation update. This card is fairly rare, having come along late in the recorder's life, but one occasionally shows up for sale or even installed in a used recorder.

Your deck of basic I/O cards includes:

AIO●8	Analog, 8 channels, balanced, +4 dBu nominal operating level
OPT●8	Digital, 8 channels, ADAT Optical format
DIO●8	Digital, 8 channels, both ADAT Optical and TDIF format
PDI●8	Digital, 8 channels (4 stereo pairs), AES/EBU format, or four channels in the AES/EBU "double wire" format at 96 kHz sample rate.

The recorders have no built-in I/O routing capability, so there's a one-to-one correspondence between inputs and recorder tracks. A mic preamp connected to Input 1 of Card 1 can only record on Track 1. If you want to use the same preamp to record on another track, you'll have to re-patch it to a different I/O card input. Alternately, you could do all your recording on, for example, Track 1, then move the recording to another track to make room for the next recording pass.

With exception of the OPT-24 card which runs “on top of” cards installed in the I/O cage, and the DIO-8 card, which allows you to have TDIF in and ADAT out or vice versa, a track’s input and output must have the same format. You can’t, for example, record direct from a mic preamp through an analog card while monitoring through a digital console unless you have both AIO-8 and OPT-24 cards installed in your recorder.

When operating in the double clock speed mode (88.2 or 96 kHz sample rates), each I/O slot provides only four channels rather than eight, and tracks 13-24 go away. The PDI-8 is the only card that fully supports those sample rates.

AIO-8 Analog I/O

The AIO-8 provides 8 channels of analog input and output. Connections are via two female 25-pin D-Subminiature connectors, one for inputs, one for outputs.

Inputs and Outputs

AIO-8 inputs are differential (balanced) with a nominal input sensitivity of +4 dBu. A +4 dBu sine wave at the input will indicate between –15 and –20 dB on the front panel record level meters and –20 dB on the HDR’s GUI meters. The difference is due to the lower resolution of the LED meters. When connected to a source with a nominal -10 dBV operating level, expect the LED meters to read between –25 and –30 dB. An input level of just over +23 dBu corresponds to digital full scale. That’s a lot, and many preamps or mixers can’t quite make it.

Because of its moderate input impedance and fairly low sensitivity, the AIO-8 card is not suitable for direct connection to an instrument pickup, but it will work fine with the line output of most electronic keyboards or instrument processors. When connecting an unbalanced source to the AIO-8 input, the low side of the AIO-8 input should be connected to ground so the signal appears between the low and high input terminals.

The card is calibrated for unity throughput gain. A recording will play back at the same level as the input source.

Outputs are single-ended, impedance balanced. This means that they allow good common mode rejection of cable-induced noise when connected to a balanced input. An added bonus is that the outputs can be connected to unbalanced inputs without affecting the output level or risking damage to the output circuitry.



Certain balanced input configurations require a differential source (which the AIO-8 card isn’t) in order to achieve full gain and headroom. We rarely see this design on new equipment, but if you have an older budget priced console, you might want to check this out. If the console performs as expected (normal gain and headroom) with an unbalanced source connected to its balanced inputs, it will work fine with the AIO-8.

Signal Polarity

Signal polarity is preserved through the card and the recorder. A positive-going waveform at the input will be recorded on disk as a positive-going data, and its playback will be positive-going. As long as your cables are wired correctly, you need not worry about polarity inversion of your audio signal.

Throughput Delay (Latency) – A Short Essay

Unlike pure analog hardware, a digital audio device requires some processing time before an input signal reaches the output. The latency of the AIO-8 card – the throughput delay from signal input to monitor output with the recorder in the Input or Auto Monitor mode (this passes the signal through both the analog-to-digital and digital-to-analog converters on the card) – is 64 samples, 32 for A/D conversion and 32 for D/A conversion. This represents around 1.33 milliseconds at the 48 kHz sample rate, or 1.45 milliseconds at 44.1 kHz.

This isn't enough delay to throw a musician off time when playing to a headphone mix, however, latency can cause another problem. We all hear our own voice acoustically (through the bones in our head), but most singers working in the studio also like to hear their voice in the headphones. When the phones are fed using the recorder's monitor output (typically how a console monitor mix is derived), his voice will be delayed in the headphone mix by the amount of latency through the recorder's signal path. This delay puts the headphone signal path slightly out of phase with the "acoustic" path, resulting in a comb-filtering effect when the two signals are mixed acoustically at the singer's ear.

His voice will sound fine to you in the control room (and to anyone else listening to the headphone mix) since you're hearing only the delayed vocal without the acoustic sound of the singer's voice mixed in. And of course the playback will sound fine. However, the singer might complain that his voice sounds odd in the cans, and he's not imagining it.

The solution is to create a headphone mix for the singer which uses the output of the vocal mic preamp directly, rather than the mic signal delayed through the recorder. This is simple when using an analog console, but not so easy when connecting a mic preamp directly to the recorder and taking the headphone feed after the recorder's delay. A digital console adds even more delays. Beware!

I encourage you to experiment with this. It's a lot easier to hear this yourself than to explain it. You can simulate the comb filtering effect easily by making a copy of a track, offsetting it from the original by 64 samples or so, mixing the two tracks in mono at equal level, and listening to what happens when you mute an un-mute one track.

The Patchbay Advantage

When people get into digital audio, they tend to forget about the ease with which analog devices can be interconnected. How often have you had a Lightpipe cable in one hand and a ¼" phone plug in the other, wondering how you're going to patch that compressor into the recording path? It's a puzzle with digital connections, but simple when you're connecting analog devices. You'll find that a patchbay is very useful if your recorder is equipped with AIO-8 cards. You can easily connect your favorite mic preamp to any track just by moving a single patch cable, or patch a compressor or equalizer between the preamp and the recorder.

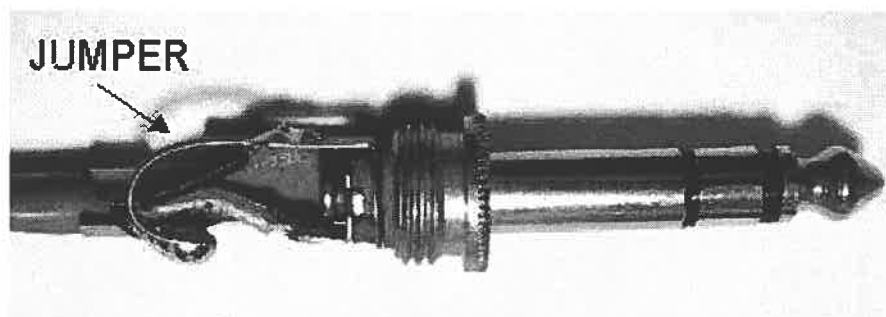
When it comes time for mixdown, having the recorder's outputs and console inputs on a patchbay will again make connecting in-line signal processors simple or patch a track to two channels of the console for different processing in different parts of the song. Read up on patchbays if you have AIO-8 cards in your recorder. They can be very liberating.

Connector Connections

The D-subminiature connectors used on the AIO-8 follow the wiring convention used on TASCAM and Fostex recorders and consoles. Pre-made cable assemblies (snakes) are available from several sources with D-subminiature connectors on the recorder end and your choice of connector types on the outboard end. Commercially, this is usually called a "TASCAM analog DB-25 cable" (because they used this wiring convention first). If you want to roll your own, see the HDR Technical Reference for the DB-25 pinout.

If you need unbalanced connections and are making your own cables, I recommend wiring the AIO-8 channels using two conductor shielded cable, then unbalance the wiring at the outboard end of the cable by connecting the cold lead of the channel pair to the sleeve (ground) of an unbalanced plug. That way you'll be ready to convert to balanced connections without a major rewiring job.

If you're buying pre-made cables and need unbalanced connections, buy balanced cables with soldered rather than molded ¼" TRS plugs. A few minutes with a soldering iron to connect a jumper between the ring and sleeve terminals of the TRS plug will make it unbalanced, and you can just snip out the jumper when switching to balanced wiring.



96 kHz Recording with the AIO-8?

Just as I was finishing up this book, a posting on the Mackie User's Forum caught my attention. An HDR user described how he had opened a new project at 96 kHz and proceeded to record some 96 kHz tracks using his AIO-8 cards. I knew the recorder will go into this mode without complaining, but I never suspected that it would actually work. I had experimented with this out of curiosity when Version 1.2 of the operating system (the first version supporting the double clock speed), was released. At that time, I discovered that while it appeared to work, it didn't, really. But this guy sounded like he knew what he was talking about, so I tried it again, this time with Version 1.4 loaded on the HDR, and doggone if I could record and play back up to 12 tracks at 96 kHz sample rate using the analog inputs and outputs! But before you think this is a news flash about an un-announced feature, hold on.

At first I thought that perhaps it was actually recording 48 kHz but simply putting the wrong sample rate in the file header, but importing a track recorded in this manner into my DAW confirmed that it was really a 96 kHz file. However, it's still nothing to get excited about.

The A/D converters in the AIO-8 are 48 kHz devices (Cirrus Logic 4390 and 5360 chips, should you want to look them up), both having built-in low pass input and output filters at 21.7 kHz. Even though the chips will actually run at the higher clock rate, because the filter's cutoff frequency is fixed, you lose the extended bandwidth which is the principle advantage to recording at 96 kHz. By 23 kHz, the input signal (as indicated on the meters, and as recorded) is more than 60 dB down. In addition, since the recorder's clock is running at twice the normal rate, the converters are "overclocking" and are prone to errors. Bottom line is that it doesn't sound any better when operated in this mode, and it might even sound worse than when operated at 44.1 or 48 kHz.

This is, and will remain a curiosity, not a genuinely useful feature. I thought you'd like to know about it in case you've stumbled on this yourself and wondered why Mackie never advertised 96 kHz operation with analog I/O.

OPT-8 8-Channel ADAT Optical Digital I/O

The OPT-8 provides 8 channels of 24-bit digital input and output on a pair of TOSLink fiber optic connectors, using the ADAT Optical (Lightpipe) data protocol. Because of its low cost (it's the least expensive of the litter) and popularity of the interface format, the OPT-8 is a good choice for interfacing the HDR with a digital console or for recording straight from a multi-channel mic preamp with ADAT Optical output. The OPT-8 passes data at 44.1 and 48 kHz sample rates and depends on outboard A/D and D/A converters to talk to the analog world.

Optical Connections

The OPT-8 has one TOSLink connector for input and one for output and uses inexpensive plastic fiber optic cables. The official maximum recommended length is 10 meters, though longer cables are available and usually work OK.

max 10 meters



In the dark about which Lightpipe cable or connector is the input and which is the output? Switch on the power and look at the connector or cable end. If there's a red light glowing, it's an output. If it's dark, it's an input (or it's disconnected at the other end). Connect light to dark. It's perfectly OK to make Lightpipe connections with the equipment powered up. Too bad the optical transmitters aren't color coded - you'll still have to figure out which group of 8 channels you have in your hand.

The OPT-8 output, in accordance with the ADAT protocol, provides embedded timing information from which word clock can be derived by an input device. The OPT-8 input, however, does not have the capability to derive a word clock from the Lightpipe input. The preferred word clock setup is to use an external word clock connection between the HDR and the device(s) connected to the OPT-8. Anything else may lead to misclocking, resulting in random pops and clicks. If you want to connect, for example, three 8-channel mic preamps with Lightpipe outputs to your recorder, all three preamps, in addition to the recorder, must be synchronized to a master word clock.

HDR-to-ADAT Word Clock Synchronization

When transferring a multitrack recording between an Alesis ADAT recorder and the HDR, the HDR, since it's unable to extract word clock from the ADAT input, must serve as the word clock master for the ADAT. With the OPT-8 Output connected to the ADAT Input, setting the ADAT's Clock Source to Digital Input will synchronize the two word clocks. Be sure the ADAT and HDR are set for the same sample rate.

An ADAT recorder (or three) may seem like old school, but they're dirt cheap and a set of ADAT tapes makes a fine backup or archive copy of an HDR project.

Signal Polarity

Signal polarity is preserved through the OPT-8. If it appears that you have a polarity-inverted recording, check for miswiring on the analog side of your A/D or D/A converters or check the polarity of your microphone.

There is another polarity issue however. The original ADAT (often called the “blackface” because later models have silver front panels) inverts the polarity of the audio signal in the digital domain when writing to tape and inverts it again (back to normal) at the analog output. If you’re digitally transferring a recording to the HDR which was made through the analog inputs of an original ADAT, since the signal polarity on the tape is inverted, the signal on HDR will be inverted.

You can straighten it out by using the polarity (phase) switches on your console or, if mixing in a DAW, by inverting the track waveform. It pays to listen to a track both ways. Some things actually sound better in a mix with the polarity inverted.

Throughput Delay (Latency)

There’s practically none – only 1 sample in each direction, a total round trip of just under 21 microseconds at 48 kHz. This doesn’t, however, eliminate the potential for comb filtering in the headphones as explained in the AIO-8 card section. You still have to get in and out of the OPT-8 through A/D and D/A converters, and those have their own latencies. When using the OPT-8, the total delay between signal input and monitor output depends almost entirely on your outboard equipment.



Where you’ll benefit from the very small throughput delay of the OPT-8 is when bouncing tracks digitally. The bounced track will line up more closely with the original source tracks, but will still be offset by whatever delay your digital console causes plus the two samples for the OPT-8.

Word Length

The OPT-8 is strictly a 24-bit device. If you want to transfer an old ADAT project to the HDR and add some new tracks to it, to get the maximum resolution with your new recordings, set up a new 24-bit HDR project and transfer your lower resolution ADAT recordings in as 24-bit data. The tracks transferred from the ADAT will contain zeros in their lowest order bits, but you’ll lose nothing in the process and you are assured full resolution for new tracks.

The OPT-8 provides no output dithering, so when digitally transferring a 24-bit project to a recorder which uses a shorter word length (an ADAT, for example), the data will be truncated. This isn’t the end of the world, but truncation may cause a bit more degradation than can be attributed to just the lower resolution. In practice, a 24-bit recording truncated to 20 bits sounds fine. And a truncated 16-bit ADAT backup copy is much better than no backup at all, so don’t let this stop you from using the tools you have available for making backups.

PDI-8 AES/EBU Digital I/O

The PDI-8 is a general purpose digital I/O interface which provides four pairs of channels in the AES/EBU (IEC-60958) format. The PDI-8 is the only Mackie digital I/O card designed to support 88.2/96 kHz sample rates.

Inputs and Outputs

The PDI-8 has a single 25-pin D-subminiature connector which incorporates both inputs and outputs. Inputs and outputs are differential and balanced, in compliance with the AES3 standard. At 44.1/48 kHz sample rates, each input and output carries a pair of channels. At 88.2/96 kHz, the four channel pairs become four single channels in the double wire ("double wide") format.

The output voltage and impedance (5V peak-to-peak, 110 ohms), comply with the AES/EBU standard. The card will also interface with most coaxial S/PDIF inputs or outputs, but it may be necessary to use a 75-to-110 ohm transformer to match both level and impedance. Canare BCJ-XJ-TRA and Neutrik NA-BFX (AES/EBU-to-S/PDIF) and Canare BCJ-XP-TRA and Neutrik NZ-BMX (S/PDIF-to-AES/EBU) are suitable. Those have BNC connectors on the 75 ohm side, so you'll probably also need BNC-to-RCA adapters. A hard-wired "Pin 2 hot" XLR-to-RCA adapter may also work, depending on the S/PDIF device. Try the cheap approach first.

Signal Polarity

Signal polarity is preserved when going in and out through the PDI-8

Throughput Delay (Latency)

Delay through the PDI-8 is 2 samples in each direction, about 42 microseconds at 48 kHz, 21 microseconds at 96 kHz. As with other digital I/O cards, the total delay time from microphone input to monitor output is largely a function of the A/D and D/A converters.

Word Length

Input and output is 24-bit. The output is always a 24-bit word regardless of the word length selected for the project. Input can be any word length up to 24 bits. If a project is recorded at 16-bit resolution, the output will be 24 bits with the eight low order bits filled with zeros.

Channel Status Bits

Consumer (S/PDIF) and professional (AES/EBU) devices make different use of the non-audio bits in the digital data frame. The PDI-8 inputs aren't fussy and will accept either format. The Setup menu for the PDI-8 allows you to select the output format for each channel pair. If your device doesn't recognize data from a PDI-8 output, try changing this setting. The audio data is the same for either format, so don't worry about compromising "professional" sound quality by selecting the Consumer channel status format.

The PDI-8 does not recognize the Emphasis flag in an incoming digital data stream. If your source is a digital recording made on an early generation DAT recorder that used emphasis (most that used it didn't let you turn it off), HDR tracks copied from that recording through a PDI-8 will not be de-emphasized and will sound too bright. Be aware of this when working with old digital recordings. You may want to bite the bullet and make an analog transfer. See my digital tale of woe on page 71 for more about digital audio emphasis.

Sample Rate Conversion

The PDI-8 can re-clock an incoming digital signal, converting the incoming sample rate to the sample rate at which the HDR is operating. This function is enabled from the Digital I/O setup menu. Sample rate conversion was originally intended for applications such as copying tracks digitally from a 48 kHz DAT recording into a 44.1 kHz project, or from a CD (44.1 kHz) into a 48 kHz project. Another application is when simultaneously recording from several independent digital sources which don't have the ability to synchronize their word clocks. One example is a set of four stereo mic preamps with AES/EBU outputs and no word clock inputs.



The lower four bits get sacrificed when sample rate conversion is enabled. While the recorded word length is 24-bits, the four lowest order bits of the re-clocked signal are set to zero. This doesn't matter at all if the source is a CD or DAT since they're 16-bit sources. In reality, even with a 24-bit source, losing the four least significant bits will rarely make an audible difference since few A/D converters are capable of accurate resolution beyond 21 bits or so.

Connector Pinout



The pinout of the PDI-8's D-subminiature connector (see the Technical Reference) is different from that on the AIO-8 card. An analog XLR snake won't work at all. In fact, the difference in wiring almost completely protects you from connecting digital signals to analog inputs and vice versa if you inadvertently connect the wrong snake to an I/O card. Since the PDI-8 shares one connector for inputs and outputs, the outboard end will have four male and four female XLR connectors. That's an easy way to tell that you have a proper cable assembly in hand.

I strongly recommend using pre-made AES/EBU snakes for your PDI-8 card. The AIO-8 pinout is compatible with the Yamaha YGDAI CD8 series, but not with the Otari or iZ RADAR recorders or the Otari digital format converter. When building your own AES/EBU cables, understand that digital signal transmission behaves more like radio signals than audio. Using cable with a characteristic impedance of 110Ω and low capacitance (both functions of the cable's physical construction) is important to minimize clock jitter. Belden 1805A is an 8-pair digital cable specifically designed for digital audio transmission and is a good choice.

DIO-8 Combination ADAT Optical and TDIF (TASCAM) Digital I/O

The DIO-8 is a dual port 8-channel interface that provides both ADAT Optical (Lightpipe) and TDIF (TASCAM Digital Inter Face) inputs and outputs. The format is selectable from the Digital I/O Setup menu, and the input and output formats need not be the same. The card can also operate as format converter for digital copying between an ADAT and a DTRS recorder without recording on the HDR.

This is a legacy card, originally designed for Mackie by Apogee Digital to provide digital I/O for the d8b console. DIO-8 cards often show up at a bargain price, but unless you need TDIF capability, it may not be such a bargain. For various reasons, I recommend using OPT-8 cards for digital interfacing in a new installation and reserve the DIO-8 for when you need TDIF I/O.

Inputs and Outputs

The DIO-8 has two sets of connectors, a pair of TOSLink fiber optic connectors for the Lightpipe interface and a single 25-pin D-subminiature connector for the bi-directional TDIF interface. In addition, it has a BNC SYNC connector which provides a DTRS clock output for devices which require it. DTRS clock is the same frequency as the sample rate, but is 90 degrees out of phase with the standard word clock, relative to the data.

The DIO-8 Lightpipe interface is functionally similar to the OPT-8 with the exception of signal polarity addressed below. Refer to the OPT-8 section on ADAT synchronization (Page 89) for the correct connections when transferring audio between an ADAT and the HDR. Like the OPT-8, the DIO-8 cannot derive word clock from a Lightpipe input.

When using the TDIF I/O connection with a TASCAM DA-88, -98, or -38, set the recorder to use external clock and connect the SYNC output BNC connector of the first DIO-8 (not the Word Clock output) to the external clock input on the recorder. With the newer generation TASCAM recorders (DA-78, DA-78/HR, DA-98/HR, and MX-2424), use the WORD CLOCK for data synchronization.

BNC
cable

Signal Polarity

Some history: To provide compatibility between the Mackie d8b console (the DIO-8's original application) and the first generation ADAT recorder, the DIO-8 was designed so that it inverts the signal polarity going both in and out, emulating the action of the ADAT analog inputs and outputs (page 90). This made pretty good sense in the early ADAT days, but it can become quirky in a contemporary setup. Here's an example of why:

Suppose your recording path is as follows:

Microphone → Digital console → DIO-8 → HDR disk.

DIO-8: BNC @ sync output to
DA 88 external clock input

ADAT lightpipe
cable from
machine room to
002 Digi

A positive-going waveform at the microphone input will be inverted by the DIO-8, resulting in a negative-going waveform recorded to disk.

With a playback path of:

HDR disk → DIO-8 → Digital console → Monitors

polarity will be inverted again by the DIO-8 on the way out of the recorder and everything will be fine.

Suppose, however, that like many studios today, you don't use a console. If you record directly from a mic preamp with a Lightpipe output to the HDR through a DIO-8 card, the recording will be inverted on the HDR's disk. When you move the project's audio files over to your DAW for final editing, processing, and mixing, the DAW sees and plays them just as they are, with the audio polarity inverted.

Things can get even more confusing if you have a mixture of DIO-8 and OPT-8 cards in your recorder, or if you have a Mackie d8b console equipped with DIO-8 cards and use OPT-8 cards in your recorder (or vice versa – there was a run on HDRs with DIO-8 cards because a blowout deal practically giving these cards away with the purchase of a recorder). Think of the possibilities. With a DIO-8 anywhere in the chain, keep accurate notes of the session setup, paying particular attention to the complete signal path for each input.

Does absolute audio polarity really matter? Not always. It definitely matters if you invert the polarity of one channel of a stereo pair. On certain program material, polarity inversion is nearly impossible to detect by ear, but sometimes it's quite audible, particularly if you compare it both ways. That's why polarity switches on a console are such a useful thing – try listening to a full, boomy bass drum while flipping the polarity. Accurate session notes should tell you when you should invert polarity on playback, but use your ears, too.

Another polarity quirk with the DIO-8 is that signal polarity is inverted in this same manner through the TDIF port. This is inconsistent with any generation of DTRS recorder and is a mistake that was never corrected.

Curiously, Alesis released the next generation ADAT-XT which doesn't record with inverted polarity just prior to Mackie's release of the d8b console – clearly a case of bad timing or an ear not close enough to the ground.

Throughput Delay (Latency)

Throughput delay for the Lightpipe I/O is 6 samples in each direction. For the TDIF I/O, it's 1 sample.

Word Length

Unless you have a DIO-8 with first generation firmware, the card passes 24 bits in and out. These were updated in production by the time the first HDR24/96 was sold but there may still be some 16-bit cards out there on the used market.

DIO-8 Firmware Versions

There have been three major firmware versions for the DIO-8. A paper label on the card's EEPROM indicates its firmware version.

Version 1 (M-108C, V 1.01) – 16-bit only, SYNC output is in phase with the word clock (incorrect according to the TASCAM standard).

Version 2 (Version 2, 127 Ver 2) – 24-bit throughput, SYNC output phase with respect to word clock is still incorrect.

Version 2.1 (Ver 2.1) – 24-bit throughput, SYNC output phase corrected to work properly with the older DTRS recorders.

When connecting TDIF ports between two DIO-8 cards (for example an HDR and d8b console), the cards must both be running the same firmware version. Mackie Tech Support can provide you with current version EEPROMs if needed.

Mackie plans no future updates of this card, so we'll never see the oft-requested addition of a switch to invert polarity or not. It is what it is.

D-Subminiature Connectors – A General Note



It's very important to secure the cable plugs to the sockets using the retaining screws (sometimes called jack screws). If the connectors aren't seated firmly and secured, the weight of an 8-wire snake can easily cock the plug slightly, causing some pins to break contact and lose signal in one or more channels.



Two different threads are used for D-Subminiature connector jack screws. The standoffs on the Mackie cards have 2.5 mm metric threads. Many plugs, particularly those used on pre-made snakes, have jack screws with 4-40 threads. A 4-40 screw will engage the threads in the metric standoff, go in about 1½ turns, and will feel tight, but it really isn't. The connector can wobble – check for this. Some pre-made cables come with two sets of screws to accommodate the two standard threads. Use the ones that fit correctly.

All standoffs for these connectors have 4-40 male threads on the end that attaches to the panel, so you may find it convenient, as I have, to swap the standoffs on your cards with ones that accommodate the more common 4-40 screws.

Appendix E – Updating or Reloading the OS Software

Latest versions:

MDR 1.3 Build 408

HDR 1.4 Build 420

Locate the two self-extracting disk image files on the CD.

For the MDR	For the HDR	Extracts to:
MDR1_3B408D1.EXE	HDRB420D1.EXE	Disk 1
MDR1_3B408D2.EXE	HDRB420D2.EXE	Disk 2



These files are not copies of the operating system disks. They are executable programs which, when run, write files to floppy disks which then become the software installation disks. Don't simply copy the files on the CD or downloaded from the Mackie web site to floppy disks and then try to load the HDR OS from them. It won't work. This is one of the most common mistakes made by people who don't read *all* the instructions. Mackie distributes the operating system on their web site as a single ZIP file containing both executable files. I've unzipped them to the CD for your convenience.

For Macintosh users: The following instructions for creating software installation disks from the distribution files are for the Windows versions. Given that most recent Mac computers don't have a floppy drive and that it's so easy to find a Windows computer these days (if you don't have one, ask a neighbor) I've included only the Windows instructions here. Macintosh files and instructions for their use are on the CD. Since the Mac distribution files create the same installation disks, once you have those in hand, the software installation instructions on the next page apply.

For HDR-Pro Users: HDR Version 1.4 Build 419 is a special software version for the HDR-Pro. It's packaged with the HDR-Pro kit as two installable floppy disks. If you have those disks, go directly to the installation procedure (Step 5). If you've lost them or they've become damaged, you'll need to request replacements from Mackie. As they're not available for general downloading, I didn't include them on the CD.

Creating the Installation Floppy Disks

1. Label one double sided, high-density 1.44MB PC-formatted floppy disk as "Disk 1" and a second as "Disk 2". I strongly recommend using new floppy disks. They really do work better than those dusty old AOL disks.

2. Double-click on the "...d1.exe" file on the CD. The WinImage™ Self-Extractor dialog box will appear. Check the two boxes for *Writing on Floppy* and *Formatting*. Click "OK".

3. When prompted, insert the disk labeled Disk 1 into the computer's floppy drive and click "OK." If the disk isn't blank, you will get a reminder that all data on the disk will be overwritten. Click **YES**.

4. The extraction program will read the source file from the CD and write its contents to the floppy disk. When the operation is complete, remove Disk 1 and insert Disk 2. Repeat steps 2 and 3 using the "....d2.exe" file. Remove Disk 2 when the operation is complete.



Warning: Rebooting your computer with a Mackie software installation disk in the floppy drive can create problems with your PC. (It will try to install the HDR software!) Remove the Mackie OS disk promptly so you don't forget about it.

Software Installation

5. With the recorder powered off, insert installation Disk 1 into the recorder's floppy drive, then power up the recorder. Follow the progress and prompts on the front panel LCD screen. (The HDR monitor won't display anything useful.)

Note: If you're not using virgin installation disks, but have modified Disk 1 to enable formatting and are just stopping by here for a refresher, this is where you'll see the option to format the internal drive. Check page 43 to be sure you know what you're doing.

6. When prompted, insert Disk 2 into the floppy drive and select **Continue**.

7. The loader program copies files from the floppy disks to the internal hard drive, but it doesn't actually install anything until you say so. When both installer disks have been successfully copied to the hard drive and their checksums verified, you will be prompted to install the software. Press **OK** to continue with the installation or **Cancel** to clean up and quit.

8. When the installation process is complete, remove the disk from the floppy drive, power the recorder off and back on again. If the recorder boots up normally, the installation was successful. Pressing the About button on the second page of the LCD System menu displays the version of software. Verify that you're now running the version you think you just installed.

It's rare that the installation process will appear to complete and the recorder won't boot. If that happens, try repeating the installation. The extraction process usually catches defective floppy disks, and there are checksums to assure that what's on the floppy was correctly copied to the internal hard drives, but sometimes things just foul up. If you're re-installing the software *because* the recorder won't boot and it still doesn't boot after a fresh installation, then chances are something else is wrong.

Appendix F – Files Defining the Recorder's Operating Defaults

The files GLOBALS.TXT and NEWTEMPLATE.TXT, located in the System/Prefs folder on the internal disk drive, determine many of the operating defaults when you power up the recorder and when you open a new project. The ones shown here are from my recorder at the time I wrote this book, and may not be identical to yours, but they'll be pretty close. They're a bit cryptic, but you can get an idea from them of what information is retained from session to session.

GLOBALS.TXT

The first entry in this file is the name of the last project saved, and the one that the recorder will attempt to open when it's powered up. It changes each time you save a different project. This is the file to modify to change the one-button punch mode on the MDR. GLOBALS.TXT also contains the TCP/IP (network) parameters.

It pays to save a copy of GLOBALS.TXT with your preferences so you can send it over to the HDR via FTP to replace the default version that gets loaded when you reload the operating system.

```
session,LastSessionFile:C:\HDRProjects\Startup\Startup.prj
session,BackupSrcDrive:0
session,BackupDestDrive:1
session,FileFormat:0
session,AudioFileFormat:0
gui,mousespeed:2
gui,win32frames:0
network,tcpaddress:10.10.28.30
network,SubnetMask:255.255.0.0
network,tcpgateway:10.10.10.10
network,networkbus:0
network,rm48mode:1
network,FTPOutSpeed:1
locator,Generate MTC:1
locator,Generate SMPTE:1
locator,Send MMC:0
locator,Record Safe:0
locator,MMCA:0
locator,MMCB:0
locator,MMCC:0
locator,Chase TC:0
locator,TimeCodeSrc:0
locator,One Button Punch:1
locator,Use PreRoll:0
locator,PreRollOffset:0
locator,AutoPlay:0
locator,StopMTCChase:25
mixerui,Peak Hold:1
mixerui,Meter Mode:2
mixerui,Solo Latch:0
mixerui,FootSwitch:1
mixerui,FootSwitch Remote:0
editor,ColorScheme:0
editor,View Envelopes:1
editor,View Waveforms:1
editor,View X-Hairs:1
```

```
editor,fadeTime:10
editor,fadeType:0
editor,XfadeTime:10
editor,XfadeType:0
digital,SampleClockSrc:0
digital,Half96KClockIn:0
digital,Half96KClockOut:0
digital,SmppteOutLevel:1
allowmids,locator:1
allowmids,save:0
allowmids,editorUI:0
allowmids,prefs:0
iocard,rateconvert1:0
iocard,userbits1:0
iocard,rateconvert2:0
iocard,userbits2:0
iocard,rateconvert3:0
iocard,userbits3:0
iocard,rateconvert4:0
iocard,userbits4:0
iocard,UV22mode:0
```

NEWTEMPLATE.TXT

This is the file that contains the track names, which become part of the recorded audio file names.

```
editor,NudgeIncrement:4
editor,NudgeRegionMode:1
editor,RippleEdit:0
editor,AutoXFade:1
editor,Grid Setting:0
editor,Enable Snapping:1
editor,Snap To Cues:0
editor,Snap To Grid:1
editor,TimeBarViewMode:1
locator,Tempo:120000
0,Track,name:Track_01
1,Track,name:Track_02
2,Track,name:Track_03
3,Track,name:Track_04
4,Track,name:Track_05
5,Track,name:Track_06
6,Track,name:Track_07
7,Track,name:Track_08
8,Track,name:Track_09
9,Track,name:Track_10
10,Track,name:Track_11
11,Track,name:Track_12
12,Track,name:Track_13
13,Track,name:Track_14
14,Track,name:Track_15
15,Track,name:Track_16
16,Track,name:Track_17
17,Track,name:Track_18
18,Track,name:Track_19
19,Track,name:Track_20
20,Track,name:Track_21
21,Track,name:Track_22
22,Track,name:Track_23
23,Track,name:Track_24
```

Appendix G - What's On the CD?

Windows, unless otherwise noted. PDFs should open on Windows or Mac

File Name	What it does	How to use it
Documentation		
HDR_TechRef.pdf	The HDR Technical Reference. Useful for MDR users too.	If you have Adobe Acrobat™ installed, just click on it. Otherwise, install the Acrobat reader first. See the Adobe web site: http://www.adobe.com/products/acrobat/readstep2.html
HDR_OG.pdf	HDR Quick Start Operating Guide	
HDR_Editing_Guide.pdf	HDR Editing Guide	
MDR_OG.pdf	MDR Quick Start Operating Guide	
Mac_OS_Install.pdf	How to create HDR/MDR OS installation disks on a Macintosh computer	
System Software and Firmware		
HDRB420d1.exe	Self-extracting file to create Disk 1 of the HDR OS software V1.4	On a Windows PC, put a blank floppy disk in the drive and click on the file name. See Appendix E for instructions on installing the software.
HDRB420d2.exe	Self-extracting file to create Disk 2 of the HDR OS software V1.4	
MDR1_31b408d1.exe	Self-extracting file to create Disk 1 of the MDR OS software V1.3	
MDR1_31b408d2.exe	Self-extracting file to create Disk 2 of the MDR OS software V1.3	
HDR1_4B420.hqx	Self-extracting file for HDR OS software V1.4 for Macintosh	See Mac_OS_Install.pdf
MDR1_3b408_Installers.hqx	Self-extracting file for MDR OS software V1.3 for Macintosh	See Mac_OS_Install.pdf
MDRBIOS1_0.exe	Self-extracting file to	On a Windows PC, put a blank

File Name	What it does	How to use it
	create a bootable floppy disk which updates BIOS firmware in early production MDRs	floppy disk in the drive and click on the file name. See page 17 for instructions of updating the BIOS firmware
MDR_BIOS_Utility_1_0.hqx	Self-extracting file to create a bootable floppy disk which updates BIOS firmware in early production MDRs	On a Mac, refer to the instructions for extracting the OS self-extracting file to a floppy disk (Mac_OS_Install.pdf). Substitute the file name MDRBIOS1_0.IMG for the OS disk images. See page 17 for instructions of updating the BIOS firmware

File Name	What it does	How to use it
Utilities		
cmosutils.exe	Self-extracting file to create a bootable floppy disk which automatically loads all CMOS settings. Contains data files for CMOS settings for both the standard and the large drive support (upgrade) BIOS. The default setup is for the large drive support BIOS.	On a Windows PC, put a blank floppy disk in the drive and click on the file name to create a bootable disk. To load the CMOS settings for the Large Drive Support BIOS, insert the disk in the HDR's floppy drive, power up the recorder, and let it run. Remove the disk when the drive activity light goes out. See pages 65 and 66 for instructions on using the disk in the manual mode and for modifying this disk for alternate CMOS settings.

File Name	What it does	How to use it
DOSboot.exe	Self-extracting file to create a bootable floppy disk with a Format utility	On a Windows PC, put a blank floppy disk in the drive and click on the file name. Insert the disk in the floppy drive, power up the recorder, and enter DOS commands at the A:\> prompt. The disk contains FORMAT which will completely erase and reformat the internal or external hard drives.
mmc_v0_69b.zip	Bob Smith's nifty MIDI remote control program for the MDR or HDR. (Windows)	Create a folder on your computer for the program. Use WinZip to extract the program files to this folder. Click on SETUP.EXE to install the program. After the installation is complete, for convenience, create a shortcut to MMC.EXE on the Windows desktop. Connect MIDI IN and OUT cables between the recorder and your computer's MIDI interface. (Connect INs to OUTs) Start the program. Dig it. Tips: HDR settings: Generate MTC <on>, MMC Device ID: 0 for all three groups.

File Name	What it does	How to use it
MTC_to_Clipboard_Install.exe	Captures incoming MIDI time code to the Windows clipboard. Someone wrote this little program for me after I mentioned on a forum that it would be neat to have something like this. I've lost track of the author but thought this was too good not to include. (he did tell me it was OK to share) If you wrote it and get in touch, I'll e-mail you a beer.	Run the program to install it. Connect a cable from MIDI OUT of the recorder to a MIDI interface on the computer. Set the recorder to Generate MTC. Select your favorite hot key and start the program. When something happens that you want to note in a log, hit the hot key, then paste the clipboard contents into your note file. It appears in text in standard time code format. Works with any program that understands the Windows clipboard.

Credits

Mackie documentation (manuals and installation instructions), MDR BIOS update code, and operating system files are copyright by Mackie and are reproduced on the CD with permission. Other programs are freeware, shareware, beerware or obsoleteware, with authorship acknowledged where known.

Undocumented Files

Last, but certainly not least, here's something for the diehard computer geeks. The files on the CD with the extension .RAW are raw disk image files. They can be used to create OS and utility floppy disks using any program that can read a raw disk image and write it to a floppy. Linux, Unix, and even Mac OS-X users have the tools to do this built into the operating system. You should be able to figure out what's what from the file names and this list. Have fun!

Appendix H – Some Resources

Where do you get stuff, or learn stuff? As I've said before, computer parts disappear from the market very quickly (as do web sites) so these resources won't last forever. They've been reliable sources and have the right stuff, so I'm including them here.

Removable Disk Drive Carrier and Docking Bay

Lian Li RH-40 and RH-58 carriers and bays have been fairly consistently available from the following two US companies:

Cyberguys – <http://www.cyberguys.com>

Directron – <http://www.directron.com>

In Europe, try

RL Supplies - <http://rlsupplies.co.uk/>

PC-100 SDRAM memory

There are many sources. I have always found that whatever Micro Center has for sale in this category when I've needed it has worked. R&D Dynamics is a local guy (to me) who sells a lot of memory, knows his stuff, and can usually come up with the right thing at a good price.

<http://www.microcenter.com>

<http://www.raddyn.com>

Disk Drives

Wherever you find them. Maxtor, Western Digital, Seagate, IBM, Hitachi – they're all good brands and current models all work. Almost any week, Best Buy, Office Depot, or Staples will have an appropriate sized drive on sale with a good rebate that makes storage so cheap that it's hard to resist picking one up even if you don't have an immediate need for it. A word about buying with rebates - They've always worked for me, but you have to follow instructions, mail the paperwork in on time, and wait a couple of months for the check to arrive. All of those retailers will give you an extra copy of the sales receipt for the rebate application. Also, generally rebates are limited to one per rebate period, so you can't get a bunch of drives at the same time at the rebate price.

4-40 Jackscrew Posts for D-Sub Connectors

If your cables have 4-40 screws, you can replace the nuts on the I/O cards with ones that have 4-40 threads. Cyberguys has them, catalog number 161 0285. They call it a "Cable End Nut/Washer kit," six to a package.

<http://www.cyberguys.com>

Firewire Removable Drive Docking Bay

If you have a computer with a Firewire port, this is a great way to transfer files between your recorder and computer. Connect the drive bay to the computer's Firewire port, plug an HDR external drive into the bay, and it appears as another drive on your computer. This is essentially the hardware half of the Mackie HDR Pro setup. You can build your own using a Firewire drive case and an RH-58 drive bay, or you can buy one assembled and ready to go, hand made in zip code 02190 by one of the Mackie User Forum regulars. External drive cases are also available with a USB2 interface

<http://www.firedock.com>

The Mackie User's Forum

While I expect Mackie's excellent Tech Support to be around for a while, a lot of great support comes from users like you and me. I encourage those of you who aren't already regulars to visit the Mackie Users Forum, on line at

<http://forums.mackie.com>

or as a link from the Mackie main web page, <http://www.mackie.com>.

When new problems are encountered and solutions discovered, that's frequently where you'll hear about them first. Often problems have been solved by putting heads together. And you might find a user nearby with whom to trade parts, or even tracks. The forum is a wonderful resource. Check it out.

Mackie Technical Support

When you need their help, give them a ring. They know their stuff.

800-258-6883 (ask for Digital Support)

425-487-4337 (if you're not in the US, it's still usually worth springing for a call)

8 AM to 5 PM Pacific time, sometimes earlier, sometimes later.

techmail@mackie.com (usually takes at least a day for a response)

Contacting the Author

I'm really Mike Rivers. E-mail at mrivers@d-and-d.com or mm1100@yahoo.com
Drop me a note to let me know if you find this book helpful. I'll try to keep a list in case there are important updates or errors you should know about.

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Learn your Mackietm Hard Disk Recorder *Inside and Out*

^{Last}
The Mackie Hard Disk Recorder Manual takes over where Mackie's documentation for the HDR24/96 and MDR24/96 recorders leaves off. Features added since publication of the last manuals are explained. The maintenance and troubleshooting procedures, operating tips, and modifications will help you keep your HDR or MDR ticking for a long time.

Author Mike Rivers, writer and/or editor of much of the existing Mackie documentation for these recorders, has been assisting users on the Mackie User's Forum for years. Finally, he's brought a wealth of his tips and clear explanations together in one place.

"I was going to buy this book just to say 'thanks' to Mike for all his help, but WOW! It's more than I expected. Every HDR and MDR user should have a copy."

"... thought my MDR was at the end of the line. Not so! Thanks, Mike."

"Upgraded my MDR to take large disk drives painlessly. Thanks for the advice and tools."

"Now I know what Error 43 really means."

