Syntonyx

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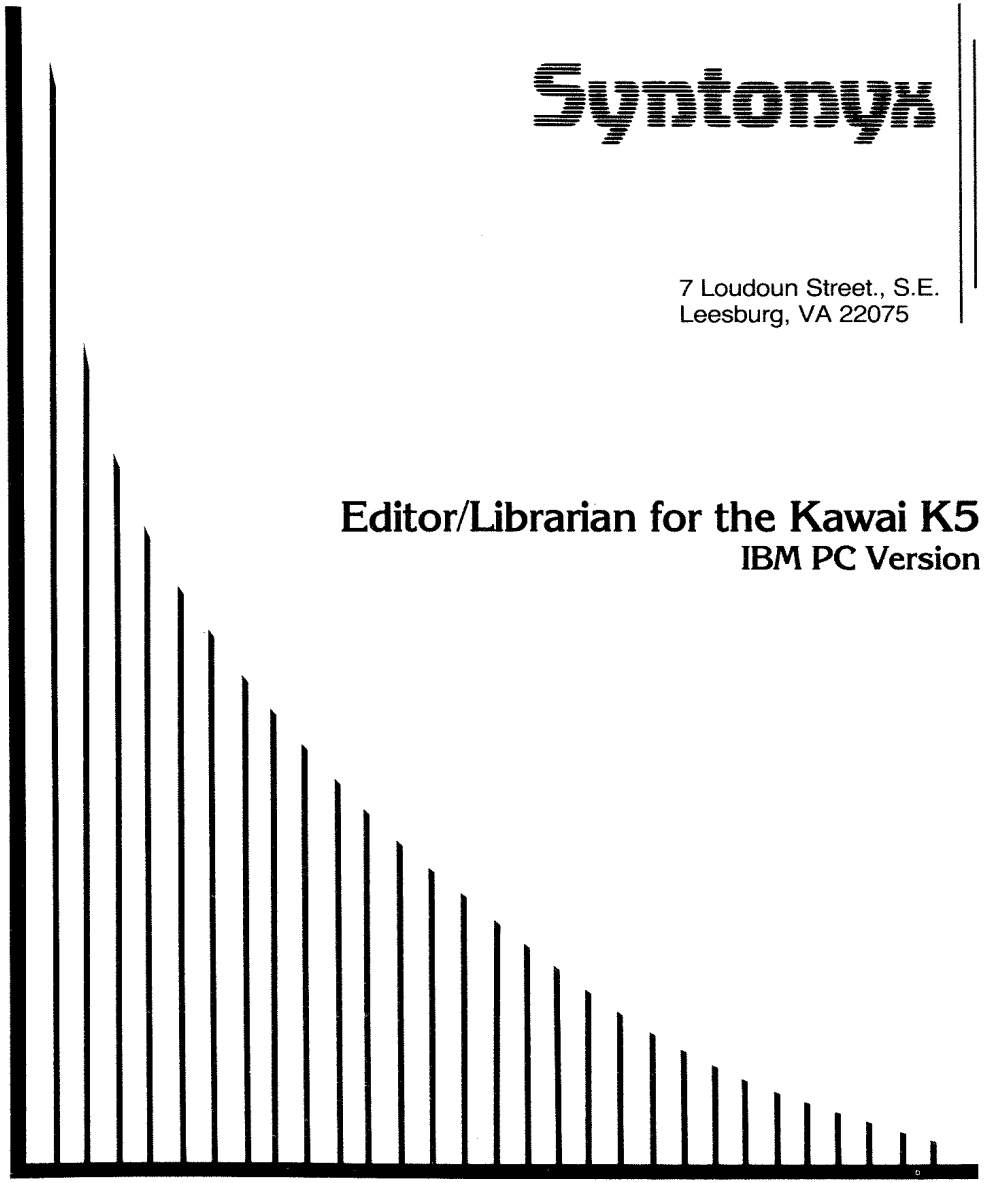
Editor/Librarian for the Kawai K5

IBM PC Version



OVERTONE

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OVERTONE

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1. INTRODUCTION

OVERTONE™ transforms your computer into a complete sound development workstation for the Kawai K5 additive synthesizer. We assume you have a working knowledge of the K5 and any pertinent theoretical information. If not, we suggest you go through the K5 Owner's Manual, especially the tutorials, and get some hands-on experience before proceeding further.

1.1 Basic Functions

OVERTONE's basic functions may be grouped into three main categories: Library Management, Patch Editing and Sample File Processing.

1.1.1 Library Management

The Library Management functions let you maintain all your K5 single and multi patches in disk files. To create your initial library, you upload full 96-patch *pages* from the K5 INT and EXT memories (for as many cards as you have). The page layouts are saved and you can edit them or create new ones, rearranging patches any way you want. You can then download patches one at a time or in full 96-patch pages. *OVERTONE keeps track of where single patches are assigned and automatically adjusts multi patches to keep them consistent!* When editing, you can merge voice components from different patches or request a standard "clean slate" voice initialization to serve as a starting point for a new voice. Disk Directory and Card Layout screens let you view and manipulate the current setup at any time.

OVERTONE patch files use the standard Kawai format, with some minor extensions to support added multi patch functions. Existing patch libraries using Kawai format are supported.

1.1.2 Patch Editing

The Patch Editing functions give you convenient access to all of the parameters used to define single and multi patches on the K5. Parameters are grouped into screens using the familiar K5 components (DFG, DHG, etc.). However, the graphic displays, mouse or keyboard control, and large screen make editing much easier than using the K5's buttons, dial and tiny LED display.

Editing of the DHG (which alone accounts for 318 of the 492 K5 single voice parameters) has received special consideration. Standard spectra (square, sawtooth, triangle and variable pulse) may be specified. You can even draw the desired spectrum with the mouse. "Block" harmonic operations have been extended to include left and right shifting and octave transpositions. If the BOTH option is specified, S1 and S2 spectra are displayed superimposed in TWIN mode or concatenated in FULL mode, giving you the total picture of your sound.

The complete multi patch definition is contained on a single screen, once again providing the total picture at a glance. The single patches referenced by a multi are stored by *name* rather than bank locations, and the librarian automatically adjusts multi patches to the K5 bank configuration currently in use. Therefore, your multis stay valid no matter where you put them. If you have ever worked with multi patches on the K5, you know how valuable this feature is.

OVERTONE's Audition feature lets you record a sequence by actually playing it on the K5, pitch-bend, mod-wheel, pedals and all. As you edit, parameter changes are sent to the K5 immediately, so you simply make your changes and, with a single click or keystroke, play back the recorded sequence. Because the entire MIDI stream is recorded, you can hear the effect of controller changes on your sound. When auditioning multis, the sequence is played on all appropriate MIDI channels so that you hear the full multi-timbral effect of your sound.

1.1.3 Sample File Processing

Finally, OVERTONE lets you process sampled sounds contained in Sound Designer™ or SampleVision™ disk files. You can request the FFT spectrum corresponding to any time point within the sampled sound. OVERTONE analyzes the raw FFT results and derives the DHG harmonic intensities. By comparing spectra at different times, you can get an idea of how to define the individual DHG envelopes. You can display the overall envelope of the sampled sound as a guideline for graphically defining the DDA.

1.2 System Requirements

OVERTONE operates on an IBM PC, XT, AT or true compatible, running under DOS 2.00 or later. OVERTONE just barely fits on a 448K machine with DOS 2.00 and no resident utilities installed, but we recommend you have 640K of RAM.

Two floppy disks (5.25" or 3.5") or one floppy plus hard disk are required. Both graphics and mouse support are provided by the MetaWINDOW™ driver (supplied with OVERTONE), which supports a wide variety of adapters (CGA, EGA, Hercules and lots more), monitors and mice. Appendix A includes a complete list of the supported devices. The use of a mouse (two or three button) is strongly encouraged, although it is not required.

Two basic types of MIDI interfaces are supported:

- MPU compatibles, including
  - Music Quest MIDI CoProcessor
  - Roland MPU-401
  - Voyetra OP-4000 and OP-4001
- Adapters that use the IBM COM port architecture, including those manufactured by
  - MidiMusic, Richardson, TX
  - Noteworthy Systems, Boulder, CO.
  - Optronics Technology, Leesburg, VA
  - Standard Computer Products, Plymouth, MI

For either type of interface, you may specify an arbitrary hardware address and interrupt request number (IRQ). More information can be found in Appendix A.

2. GETTING STARTED

Section 2.1 explains the relationship between OVERTONE and your K5 and establish some ground rules. *Even if you are an experienced user, please read this section.*

Section 2.2 gives step by step instructions for installing OVERTONE on your system. The installation procedures involve setting up one or two directories and copying files from the distribution diskette.

Section 2.3 walks you through your first OVERTONE session. It tells you how to set up the K5 and its MIDI linkage to your PC, and create your initial library files from patches stored in the K5 and/or any K5 cards you may have. You will also learn how to use Kawai format patch files you may have obtained through outside sources.

2.1 OVERTONE and the K5

OVERTONE gives you control over just about everything the Kawai designers made possible through the K5's MIDI implementation. Unfortunately there are some things that could not be done. To get around these limitations OVERTONE maintains its own information about the K5's configuration. As long as you let OVERTONE make any changes to the K5, this information will be valid. However, if you edit or move patches locally using the K5's buttons, OVERTONE's information will no longer match what is really in the K5.

Resynchronizing OVERTONE and the K5 is a simple procedure, but it does take several minutes to complete. If you want to avoid this hassle, we suggest that you do not make changes to the K5 without using OVERTONE!

2.1.1 OVERTONE Patch Libraries

An OVERTONE patch library is a set of files within a DOS directory. Each file may contain one single patch, one multi patch or one *page layout*. (A page layout is simply a set of 96 patch names arranged in the same format as the K5's INT and EXT memories.) If you have a lot of patches you can use multiple DOS directories.

With OVERTONE, you maintain all of your K5 patches by operating on the patch files in the library. You create your initial library by uploading the K5 INT and EXT memories for all the K5 cards you own. This causes all your patches and current page layouts to be saved on disk. When you want to send a specific set of patches back to the K5, just create a page layout that looks the way you want and OVERTONE will download all 96 patches to either the K5 INT or EXT memory, according to the specified layout. You can define as many page layouts as you like, and OVERTONE keeps track of the layouts currently associated with the INT and EXT pages on the K5, automatically updating them as you download patches.

OVERTONE patch libraries are almost identical to the standard Kawai format patch files, with two exceptions. First, OVERTONE uses a single file to save each page layout, while Kawai uses two files, one for the singles and one for the multis. Second, OVERTONE appends to each multi patch file the names of the single patches used by the multi, while Kawai does not. OVERTONE provides facilities for converting Kawai format libraries.

2.1.2 Patch Edit Buffers

OVERTONE maintains a temporary copy of all of the parameters for the patch or page layout you are currently editing in a special memory area called an *edit buffer*. There are three such buffers, one for a single patch, one for a multi patch and one for a page layout, and you can freely switch between them during an OVERTONE session. It's up to you to load what you want into each buffer, make any changes and save the buffer back to disk and/or the K5 when you are finished.

There are several ways to load edit buffers. If you are creating a new sound from scratch, you can ask OVERTONE to preset the buffer to a set of standard initialization parameters with most options turned off or set to a neutral value. If you just want to use OVERTONE to edit a patch on the K5 directly, you can use the LAYOUT screen to upload the buffer from an individual patch on the K5. But most of the time, you will load the buffer from a patch or page layout contained in your disk-resident library. In the case of single patches you can also merge components (DFG, DHG, DDA, etc.) from different patches into the buffer.

When you look at an OVERTONE patch editing screen, the parameters you see are the parameters currently in the edit buffer. As you make changes to the screens, OVERTONE updates the edit buffer and also sends the changes to the K5 to allow you to audition the patch while you edit. You can save the patch currently in the edit buffer back to disk with a single keystroke or click, or send it to the K5 using the LAYOUT screen.

As with patch files, you must save the page layout buffer back to disk if you want to keep it. The exception to this occurs when you edit either of the layouts currently associated with the INT or EXT memories in the K5. In these cases, OVERTONE interprets changes to the LAYOUT screen as requests to update the K5, sends the indicated patches to the K5, and automatically saves any changes to these special page layouts.

2.1.3 Patch Names and File Names

OVERTONE assumes that patch names are unique and stores each patch as an individual file on disk. Patch filenames are always eight characters long and correspond exactly with K5 patch names, with some translation of special characters to conform to

DOS file naming conventions. If you edit a patch but don't change the patch name, the patch file will be replaced with the edited version when you save. If you modify the patch name field, the patch will be saved in a file corresponding to the new name. These name restrictions also apply to page layout files to ensure consistency with Kawai format library files.

OVERTONE uses the following filename extensions: SIN for singles, MUL for multis and LYT for page layouts. OVERTONE can convert Kawai patch list files with the LIS and LIM filename extensions into page layout files.

Note that when you upload a page from the K5, patches whose names already exist in the library are *not* saved to disk. OVERTONE always assumes that the patch in the library is the most current version.

2.1.4 K5 Edit/Audition Synchronization

In order to audition a patch being edited, the current parameters of the patch must be sent to the K5. OVERTONE always uses patches SID-12 and MID-12 for this purpose. When auditioning a multi patch, any single patches not already found in the K5 are automatically downloaded into patches SID-11 through SIC-09, as needed. You should avoid using these bank addresses for patches you want to keep available in the the K5 more or less permanently. If you ever need to use all 48 internal singles, say for a performance, just download the page layout you want before taking the K5 on the road.

While using OVERTONE to edit a single patch, parameter changes made in the edit buffer are immediately sent to the K5. If you are curious, you can place the K5 in local EDIT mode and watch the changes to the audition patch (SID-12) as they are being made. You can even edit SID-12 using the K5 controls and OVERTONE will copy the changes to the edit buffer. This is *not* true for multi patches, since the K5 does not send parameter changes for multis. Obviously, if you make changes to a patch on the K5 while OVERTONE is not running, the saved version of the patch in your library will no longer be consistent with the changed version in your K5.

If you use the K5 buttons to switch banks or select a different patch, OVERTONE will download the current edit buffer to the audition patch, and will remember to reselect SID-12 or MID-12 the next time you make a parameter change or try to audition. You

can use the SYSTEM and LINK buttons on the K5 while OVERTONE is running without causing any problems. You can also use the MIDI button, but you need to be especially careful when changing MIDI parameters. More on this later.

However, you should generally avoid using the SAVE, LOAD and WRITE, buttons on the K5. These functions modify the K5's memory, giving OVERTONE no indication of what you have done. This is just about guaranteed to invalidate OVERTONE's own record of the current INT (or EXT) page layout, creating confusion and possibly errors when resolving multi patches. In the case of SAVE, simply tell OVERTONE that you are using a new layout for the EXT memory. In the case of LOAD or WRITE you will have to resynchronize by performing an upload of the K5 INT memory.

2.2 Installing OVERTONE

2.2.1 The Distribution Diskette

OVERTONE is distributed on a single 5.25" or 3.5" diskette. The distribution diskette contains a READ.ME file, the OVERTONE executable files and screen font files to support the various types of graphics adapters.

If you are using a graphics adapter other than CGA, EGA or Hercules, you will need to know which font file to use. This information as well as descriptions of all the other files on the distribution diskette can be found in the READ.ME file. The READ.ME file may also contain information on changes made to OVERTONE since this document went to press.

2.2.2 Diskette Based Systems

You will need at least two diskette drives to run OVERTONE. Drive A will be used for your *program diskette* and Drive B will be used for your *data diskette*. Place the distribution diskette in Drive A and a blank formatted diskette in Drive B. At the **A** prompt, type...

COPY A:*.* B:

That's all there is to it. This will serve as your working program diskette and also your backup. However, if you are using an exotic display adapter, you will also have to copy the appropriate font file to your new working program diskette. Just determine the file you need by looking at the READ.ME file. Font file names are of the form **SYSTEMxx.FNT**, where **xx** is a two-digit number. When you are ready, type...

COPY A:\FONTS\SYSTEMxx.FNT B:

Note: When you run OVERTONE, the configuration files will be automatically stored on the working program diskette, so you will have to leave the program diskette in Drive A during the entire time OVERTONE is running. Remove your new working program diskette from Drive B and label it.

To setup a data diskette for OVERTONE, place a blank formatted diskette in Drive B and use MKDIR to create a subdirectory to hold

your patches. Use any name you want. Let's say you chose the name \PATCHES\. You would type...

MKDIR B:\PATCHES

The reason for doing this is that there is a fixed limit on the number of files in the root directory on a diskette (roughly 100), and you will exceed this limit very quickly. There is no limit on the number of entries in a subdirectory. Each single patch requires about 1000 bytes and each multi about 400 bytes, so there should be room for at least three K5 cards worth of patches on a single 5.25" diskette. A 3.5" diskette holds about six cards, and an AT format high density 5.25" diskette holds about twelve cards.

If you have one of the higher capacity diskette formats, you could probably keep your \PATCHES\ directory on the working program diskette itself without any problems, unless you have an enormous number of patches.

2.2.3 Hard Disk Based Systems

Use MKDIR to create an \OVERTONE\ subdirectory on your hard disk, to contain the OVERTONE programs and configuration files. This subdirectory will take the place of a working program diskette. You may place this subdirectory at any level you want. Use CHDIR to select the directory below which you want to install OVERTONE, and type...

MKDIR OVERTONE

Note: Before you run OVERTONE, you will always have to make this subdirectory the **current** *directory, so that OVERTONE will be able to locate its configuration files.* Now, place the OVERTONE distribution diskette in Drive A and type...

CHDIR OVERTONE
COPY A:*.*

If you are using an exotic display adapter, you will also have to copy the appropriate font file from the distribution diskette to your \OVERTONE\ directory. You would type...

COPY A:\FONTS\SYSTEMxx.FNT

sustituting the appropriate number for **xx**, as indicated in the READ.ME file.

If you don't anticipate using too many patches, you can now use MKDIR to create a \PATCHES\ directory on your hard disk. However, if you will have a large number of patches, you might consider using diskettes for your patch library. Here's why...

On most hard disks, the minimum space reserved for any file is 4096 bytes. This is true whether you actually need 1 byte or 4096. If you have, say, 300 patches in your library, you would be chewing up close to 1.2 megabytes of hard disk space, even though less than one fourth of the space is actually used. For diskettes, the minimum reserved space is only 1024 bytes, so there is much less wasted space if you use diskettes. On the other hand, diskettes are slower. Refer to section 2.2.2 if you haven't already.

Of course, you don't need to keep all of your patches in a single directory. You might keep your most active patches in a directory on your hard disk, and use diskettes for your archives and backups. OVERTONE lets you freely switch between directories, so you can organize your patch directories and diskettes almost any way you want.

Finally, you may want to create a batch file in your root directory to automatically perform the appropriate CHDIR command before running OVERTONE. We suggest you use the following sequence, assuming \OVERTONE\ is the current directory...

```
COPY  OV.BAT \OV.BAT
CHDIR \
```

Now use your favorite editor to insert the required CHDIR command, probably something like...

```
CHDIR \OVERTONE
```

as the first line in the file. You might also want to add any required command line paramters to this file to make sure they are always correctly specified. Typing the **OV** command will now work no matter which directory is currently selected.

2.3 Running OVERTONE

This section tells you how to run OVERTONE for the first time. We suggest that you first read through the section to get an idea of what to expect, then run the program and follow the procedures.

2.3.1 On Your Mark ...

OVERTONE requires full two-way MIDI communications with the K5, including System Exclusive messages, in order to upload, download, edit and audition patches in the K5. Before you run OVERTONE, you should first make sure the K5 and MIDI connections are properly setup. Here is what you need to do:

- Make sure the PC and the K5 can talk and listen to each other. You may plug in directly, or through a MIDI patch bay.
- If you are using a K5m, make sure that your controller keyboard and the K5m can *both* transmit to the PC, so that you may perform your audition sequences. To do this, you'll probably need a MIDI patch bay, merge box or some other way to switch the MIDI signals going to the PC.
- Make sure the K5 Memory Protect Switch is OFF. Otherwise, you won't be able to audition or send patches to the K5. OVERTONE will let you know if you forget.
- Make sure the audio output from the K5 is connected so you can hear it.
- Turn on the K5, if you haven't already. Then select the MIDI Basic page on the K5 (press the MIDI button), and set the parameters as follows:

- System TRS MIDI Channel	Anything
- System RCV MIDI Channel	Anything
- OMNI	ON
- PGM	SINGLE
- Exclusive TRS Switch	ON
- Exclusive RCV Switch	ON

- Finally, press the MIDI button again to display the K5's MIDI Select page. Make sure the PGM parameter is ON for both transmit and receive. OVERTONE needs to be able to send patch changes to the K5, and must be informed if you have selected a different patch on the K5.

OVERTONE will automatically figure out which MIDI channels you are using for the K5, so you can use any channels you want. The K5 will remember the settings of the first four MIDI parameters; *however, the Exclusive Transmit and Receive Switches are always initialized OFF when the K5 is powered up. You will have to remember to turn these ON every time you power up the K5.* We would like to have been able to take care of this annoying little problem for you, but the K5's MIDI implementation made it impossible.

2.3.2 Get Set ...

If you don't tell it otherwise, OVERTONE will assume you are using a standard MPU MIDI interface, and will try to figure out what type of graphics and mouse hardware you are using. This should work fine in most cases. If you find that it doesn't work for you, OVERTONE's command line parameters can be used to specify your hardware configuration. *If you are using anything other than an MPU you will have to use the /I parameter to specify your MIDI interface. If you are using COM ports for your mouse or MIDI interface, you will need to use parameters to tell OVERTONE which ports go with which devices.* Refer to Appendix A for a complete list of supported devices and parameter codes.

You are almost ready to begin. First, make sure your MIDI interface is installed and operational, and recheck your K5/MIDI setup as described in section 2.3.1. If you have a mouse, make sure it is connected. If you normally use a Microsoft compatible mouse driver, make sure it is installed.

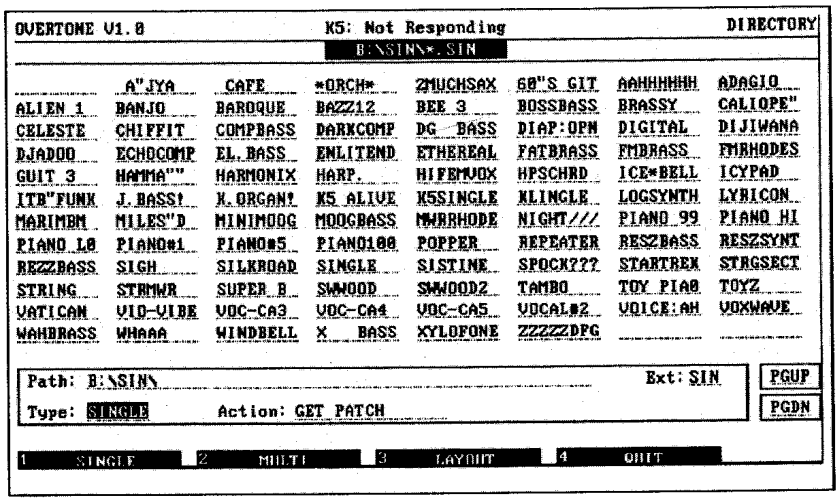
Prepare your program and data diskettes as described in Section 2.2, if you haven't already. If you have files containing sampled sounds in either Sound Designer or Sample Vision format, make sure you have the appropriate directory or diskette(s) handy. Access the directory/diskette in which you installed OVERTONE.

2.3.3 GO!

Now type the **OV** command at the DOS prompt, including any setup parameters you may need. The MetaWINDOW Graphics Driver will be loaded for you, and OVERTONE will begin. If command line syntax errors or various other errors are found, OVERTONE will tell you and then terminate. You will have to correct any problems before proceeding further.

If all goes well, OVERTONE will save your configuration in a special file named OV.CFG, and use it every time you start up the program. If you should make changes to your system at some later date, all you will have to do is run OVERTONE once with the new parameter setting(s), and your OV.CFG file will be automatically updated.

The OVERTONE Logo screen will appear as soon as loading has completed. Read it now (probably the only time you will ever do this). The Logo screen will eventually go away of its own accord, or you can press any key to make it go away instantly. In either case, it will be replaced by the DIRECTORY screen, used to access all of the files in your patch library. You will know it is the DIRECTORY screen by the label in the upper right hand corner of the screen. If the screen looks strange, you may need a special font file or OVERTONE may have guessed your graphics interface or monitor type incorrectly. You will probably need to use one or more command line parameters; press **Alt-Q** to return to DOS,



and try again.

The top center area of every OVERTONE screen (except SAMPLE) shows the current status of the MIDI connection. If OVERTONE and the K5 are able to exchange System Exclusive messages, you will see the MIDI channel numbers the K5 is currently using to transmit (**Xmit**) and receive (**Recv**) MIDI messages. If so, you may skip to the next section.

Otherwise, the words **Not Responding** will be displayed. There are a lot of reasons this could occur, but if everything is turned on and cabled properly, the most likely causes are: the K5 System Exclusive Transmit and Receive switches may be OFF; or if using a MIDI patch bay, the K5 may not be mapped to and from the PC. Check everything as described in section 2.3.2, and press **Alt-F10** to retry the connection. Repeat as often as you like. If you still can't get the K5 to respond, press **Alt-Q** to leave OVERTONE, and refer to Appendix B for more detailed troubleshooting procedures.

2.3.4 Basic Screen Operations

Chapters 3 and 4 will describe the procedures for using OVERTONE screens in more detail. For now, however, a few simple operations will suffice. First, notice the menu options displayed on the bottom of the screen. You will use these to move to other screens, either by typing the function key **Fn** whose number is displayed on the menu item, or by pointing the mouse cursor arrow to the item and clicking the RIGHT button. Screens have been grouped into three levels – the Master level, the Single level and the DHG Envelope level.

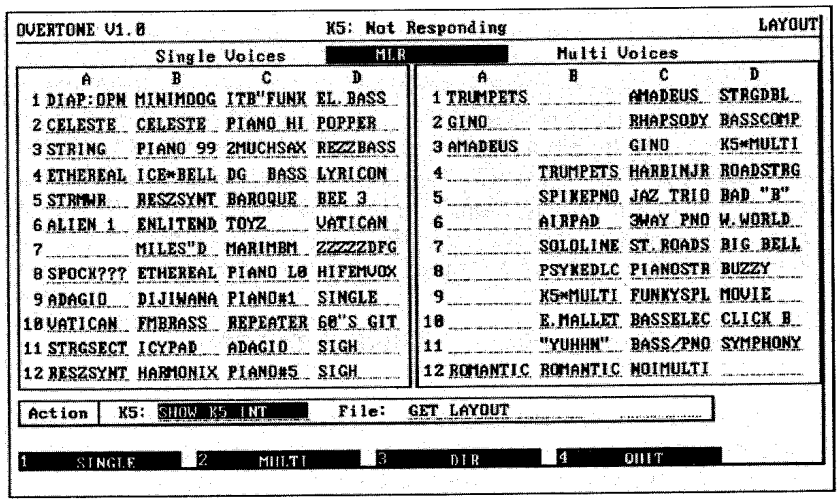
The menu selection generally allows you to get to other screens within the same level. To go back to the most recently displayed screen on the previous level, press the **Esc** key or click the LEFT mouse button while pointing to *any* menu item. No matter which screen you are on, the five choices at the Master level (SINGLE, MULTI, DIRECTORY, LAYOUT and QUIT) are always accessible by pressing **Alt-S**, **Alt-M**, **Alt-D**, **Alt-L** or **Alt-Q**.

Notice that the field labeled **Type** is displayed with inverse video, and if you are using a mouse, the cursor arrow points to this field. This is the way OVERTONE indicates the currently selected field on a screen. Try using the cursor keys and/or moving the mouse to select different fields, *but don't click any mouse buttons yet.* Clicking a mouse button (other than for menu movement) will alter the data in the selected field, and it's probably not a good idea to arbitrarily change things without knowing what they mean.

2.3.5 Creating Initial Libraries from the K5

Note: Even if you already have a library of Kawai format patch files, you must upload the K5 INT memory page, so that OVERTONE will know the current layout.

Since this is the first time you've run OVERTONE, you will need to specify where you want your new library stored. You should still be on the DIRECTORY screen, and the **Type** field should specify **SINGLE**. Move to the **Path** field and either type the path you wish to use or leave it blank to indicate the current directory. OVERTONE will remember this directory path and use it until you change it to something else. Press **F10** or click the MIDDLE mouse button to display the current single patches in this directory. (If you don't have a MIDDLE button, just click both LEFT and RIGHT buttons simultaneously.) There shouldn't be any filenames yet, unless you have specified an existing Kawai library.



Move to the LAYOUT screen using the menu. The LAYOUT screen serves two main functions. First it lets you create and edit page layout files, and second it controls the movement of patches between OVERTONE and the K5. Notice that the **K5 Action** field is highlighted. It is a multiple choice field, and you can scan through the choices by pressing the grey Plus or Minus keys on the numeric keypad, or by clicking the RIGHT or LEFT mouse buttons. Select the **UPLOAD FROM INT** action, and either press **F10** or click the MIDDLE button to make things start to happen.

Uploading will begin, starting with SIA-01. As each patch is uploaded, it is saved to disk (unless it is already there) and its name is displayed in the corresponding field on the LAYOUT screen. Be careful not to hit any key or click a mouse button now, because this will terminate the upload in progress. When all 96 patches have been uploaded, the current layout is saved in a special file, used as OVERTONE's own record of the K5's INT memory. This special layout file will be updated automatically whenever you use OVERTONE to move patches to the K5.

You should also save this layout to disk with a unique name, so that you can recall, edit and use the layout at some later time. Enter the name in the **Layout** field, move to the **File Action** field, select the **SAVE LAYOUT** action and then press **F10** or click the MIDDLE mouse button.

To see the effects of what you've just done, move back to the DIRECTORY screen. You should see a sorted list of all the single patches you just uploaded. The **Type** field should already be highlighted. Select the **MULTI** value and press **F10** or click the MIDDLE button to display the multis. Do the same for the layouts. There will only be one layout, the one you just created.

If you have one or more external cards, you can upload them too. First, move back to the LAYOUT screen. For each card, simply insert the card in the K5 slot and perform the **UPLOAD FROM EXT** and **SAVE LAYOUT** actions. However, if you already have a Kawai format library containing pairs of patch list files that *exactly* match your card layouts, you can shortcut this process by converting your library directly, as described in the next section.

2.3.6 Converting Existing Kawai Libraries

Skip to the next section if you don't have an existing Kawai library. If you do, read on. In order to properly cross reference the multi and single patches in your library, OVERTONE needs to process patches one page at a time. You define a page layout by specifying an LIM file and a corresponding LIS file. OVERTONE will use these to create an LYT file containing the full page layout, and will automatically update each MUL file referenced by the LIM file, appending a list of the single patch names used by that multi. (Single patches are not affected by the conversion.)

If you would like to examine the contents of your library now, return to the DIRECTORY screen. Type the path containing your Kawai library in the **Path** field. Now, move to the **Type** field, select

the **SINGLE** option and Press **F10** or click the MIDDLE button to display your existing single patches. Repeat using the **MULTI** option for your existing multi patches. Use the **LAYOUT** option but enter the appropriate filename extension (LIS or LIM) in the **Ext** field for your Kawai patch list files.

When you have decided on an LIS/LIM pair go to the LAYOUT screen, select the **CONVERT KAWAI LIB** action, and press **F10** or click the MIDDLE button. You will be prompted for the names of the selected LIS and LIM files, as well as the name of the new page layout file. The screen will display the new combined layout, and conversion will begin. Each multi will be highlighted as it is being converted, and the message "Converting Kawai Multi Patches" will be displayed. The conversion is complete when all previously unconverted multis on the page have been processed. Repeat for any other page layouts you wish to convert. If a particular multi patch is referenced by more than page layout, the *first* mapping takes precedence.

2.3.7 Wrapping Things Up

You now have a patch library to work with, and in the process have learned how to perform some basic operations with OVERTONE. Before leaving this session you may want to create a printed copy of the results of your work. Make sure your printer is ready, select the **PRINT** option on the DIRECTORY and/or LAYOUT screens and press **F10** or click the MIDDLE button.

To leave OVERTONE and return to DOS, either select the **QUIT** menu item from the Directory or Layout screens, or simply press **Alt-Q** from any screen.

3. GETTING AROUND

This chapter describes generic techniques used throughout OVERTONE for selecting screens, performing functions and entering data. In order to support the widest possible range of hardware configurations, while providing the basic graphics capabilities required for K5 spectra and envelopes, we chose not to implement a full windowing environment. Instead, we have selected the most useful features of that environment (mouse control, graphic display and editing, etc.) and adapted them as required.

3.1 Screens and Fields

OVERTONE is controlled using a set of eleven unique screen layouts, of which eight are used for editing the individual K5 patch parameters. Assuming you are familiar with the K5 voice architecture, these screens will be fairly self-explanatory. The three remaining screens are the Disk Directory, the Page Layout and the Sample File Processing screens. Information on using individual screens is provided in Chapter 4.

3.1.1 Screens

Each screen is identified by name in the upper right hand corner. Editing screens also include the name of the patch currently being edited. Movement between screens is controlled by menus displayed on the bottom line of each screen. You may select a screen for viewing by either pressing one of the Function Keys, or by moving the mouse cursor (displayed as an arrow on the screen) to the desired selection and clicking the RIGHT button. Screens have been grouped into three levels — the Master level, the Single level and the DHG Envelope level.

The menu selection generally allows you to get to other screens within the same level. To go back to the most recently displayed screen on the previous level, press the **Esc** key or click the LEFT mouse button while pointing to *any* menu item. No matter which screen you are on, the five choices at the Master level (SINGLE, MULTI, DIRECTORY, LAYOUT and QUIT) are always accessible by pressing **Alt-S**, **Alt-M**, **Alt-D**, **Alt-L** or **Alt-Q**.

A screen may contain text, graphics and fields. Fields are used to enter and display data, to select an action, and to perform that action. The width of each field is shown by underlining. The currently selected field on a screen is indicated by displaying that field in inverse video. Text identifiers for fields are shown in mixed upper and lower case, while character data values within fields are always translated to upper case. Boxes are generally used to group related fields on a screen.

A field is selected by using the cursor arrow keys, or by moving the mouse to the desired field. For single patch editing screens, pressing **Tab** key switches the currently selected field between the S1 and S2 parameter groups. Otherwise **Tab** moves to the leftmost

field on the next (previous) line on the screen. The value in a field can be changed in several ways using mouse buttons or the PC keyboard, depending on the type of data the field contains. Details on the various types of fields are given in section 3.2.

Graphic displays are used for all spectra (DHG and Sample), all envelopes (DFG, DHG, DDF, DDA and Sample), keyboard scaling (KS), and the digital formant filter (DFT). Whenever you change data items that are reflected in any of the graphic displays, you must either press the **F10** key or click the MIDDLE mouse button (click LEFT and RIGHT mouse buttons simultaneously if you are using a two-button mouse) to tell OVERTONE to redraw the display with the new parameters. The display is *not* automatically redrawn except in the case of individual DHG spectrum values. If a redraw is needed, you are informed by an indicator displayed on the screen.

Finally, the graphic displays of the DHG and Sample spectra can be modified by using the mouse to draw the desired results, as can the DDA envelope display on the Sample screen. Details of these procedures are provided in Chapter 4.

3.1.2 Fields

Fields are used for data entry and display, and in some cases to select and/or execute an action. Fields that only represent data have underlines made up of widely spaced dots, while those associated with actions have underlines made up of closely spaced dots. Both of these types will be discussed in this section.

Data fields may contain numeric, multiple-choice or character values. For numeric fields, you may type the desired value directly into the field, or you may use the grey **Plus** and **Minus** keys on the numeric keypad to increment or decrement the value. If using a mouse, the RIGHT button increments and the LEFT decrements the value. Holding either of these keys or buttons will cause the value to continue changing until the key or button is released. As you continue holding, the effective time between clicks is reduced to a minimum value. The field will continue to change at this fast rate until you release the button.

Multiple choice fields are restricted to specific values, which you may select using the increment and decrement functions described above. You may not type explicit values into multiple-choice fields.

Character fields are used only for patch names, file names and extensions, and directory paths. You must type the desired string directly. The **Backspace** key may be used to correct typing errors; however **Ins** is not used at all and **Del** clears the entire field. Use the **Enter** key to indicate that you are finished typing data into the field. The increment and decrement functions do not apply to character fields.

If a field has an action associated with it, as indicated by solid underlines, you cause the action to be performed by selecting the field, setting the desired value in the field as described above, and then either pressing the **F10** key, pressing the MIDDLE button or pressing both RIGHT and LEFT mouse buttons simultaneously.

Most of the action fields are of the multiple choice variety, and these serve the same purpose as Pull-Down menus in windowing systems. However certain data fields may also have an associated action, for example, causing the associated graphic display to be redrawn. The specific actions taken depend on the field, and these actions are described in Chapter 4 under the discussions of the individual screens.

3.2 Summary of PC Keyboard Operations

Keystroke	Function
F1 through **F7**	Used to move between screens, as indicated by the small numbers next to the menu items displayed at the bottom of each screen
F8	Used to tell OVERTONE to play back the saved audition sequence
Alt-F8	Used to tell OVERTONE that you want to define a new audition sequence by performing it on the K5, or an alternate keyboard if you have one connected
F9	Used to save the patch currently in the edit-buffer to disk, and also to the K5, if the edit buffer was originally uploaded from the K5.
F10	Used to cause an action specified in an action field to be performed, or to redraw a graphic display after changing one or more data fields associated with the display
Alt-F10	Used to tell OVERTONE to try to establish communications with the K5
Alt-S	Used to go immediately to the SINGLE BASIC screen
Alt-M	Used to go immediately to the MULTI screen
Alt-D	Used to go immediately to the DIRECTORY screen
Alt-L	Used to go immediately to the LAYOUT screen
Alt-Q	Used at any time to exit from OVERTONE and return to DOS
Esc	Used to move to the most recently displayed screen on the previous level
Cursor Arrows	Used to move between fields on a screen. The currently selected field is displayed in inverse video

Keystroke	Function
Tab	On single patch edit screens, used to move between S1 and S2 for the currently selected parameter. On the multi patch edit screen, used to move to the patch name field of the next or previous line of the multi
Home	Used to select the first field on a screen
End	Used to select the last field on a screen (usually the Audition Box)
PgUp	Used only on the Directory screen to display the previous page of a multi-page directory
PgDn	Used only on the Directory screen to display the next page of a multi-page directory
Backspace	Used in character fields to backspace and erase a character
Ins	Not used
Del	Used to clear the currently selected field
Grey Plus	Used to increment a numeric field or select the next choice in a multiple choice field. On the K5 Internal or External LAYOUT screens, causes the current edit buffer to be uploaded from the corresponding location in the K5.
Grey Minus	Used to decrement a numeric field or select the previous choice in a multiple choice field. On the K5 Internal or External LAYOUT screens, causes the current edit buffer to be downloaded to the corresponding location in the K5.
Enter	Used to signal the end of a data string being entered into a field. Moving to a different field accomplishes the same function
Numbers	Used to enter values into numeric or character data fields
Characters	Used to enter character data. For patch names, you are restricted to the Kawai K5 character set (i.e. 1-9, A-Z, the characters - : / * ? ! # & ( ) " + . = and space).

3.3 Summary of Mouse Operations

Action	Function
Select Screen	Move the mouse to the desired menu item and click the RIGHT button to go to the next screen. Click the LEFT button anywhere on the menu line to return to a higher level screen or menu
Edit Field	Move the mouse to the desired field to select it. Click the RIGHT button to increment or select the next item, click the LEFT button to decrement or select the previous item. Click the MIDDLE button (or LEFT and RIGHT buttons simultaneously) to execute an action associated with the field or cause a graphic display to be redrawn after modifying parameters.
Edit K5 Layout	When either **K5 INTERNAL** or **K5 EXTERNAL** is displayed on the LAYOUT screen, select the desired K5 bank location using the mouse or cursor keys. Typing a patch name causes the specified patch to be downloaded to the corresponding location in the K5. Clicking the LEFT button causes the selected patch to be read from disk and downloaded to the K5. Clicking the RIGHT button causes the corresponding patch in the K5 to be uploaded into the edit buffer and saved to disk. Clicking the MIDDLE button (or LEFT and RIGHT buttons simultaneously) causes related patches in the layout to be highlighted.
Edit Harmonics Graphically	Holding the LEFT button while moving the mouse will draw the desired portions of the spectrum. During graphic editing a crosshair cursor is displayed and the arrow disappears. Click the RIGHT button at any time to audition the sound using the current spectrum. Click the MIDDLE button to save the revised spectrum in the edit buffer, send the changes to the K5 and exit from graphic spectrum edit mode.

Action	Function
Edit DDA Graphically	Move the crosshair cursor to the desired location for an envelope segment and click the RIGHT button to capture the rate and level. Repeat for up to seven more points. Points will be assigned to segments based on their relative positions. Click the LEFT button to remove a point. Click the MIDDLE button to save the revised DDA in the edit buffer, send the changes to the K5 and exit from graphic envelope edit mode.
Audition a Patch	Move the mouse cursor to the Audition box, and click the RIGHT button to play the saved sequence or the LEFT button to tell OVERTONE that you want to save a new audition sequence
Save a Patch	Move the mouse cursor to the Save box and then click the MIDDLE button to save the patch currently in the edit-buffer to disk. If the edit buffer was uploaded directly from the K5, the patch is also downloaded to its original location in the K5.
MIDDLE Clicking	Clicking the MIDDLE button is equivalent to pressing the **F10** key, and in general causes some action to be performed, depending on the currently selected field.
Multi Clicking	Multi clicking, sometimes called *dual clicking* or *chording*, simply means clicking both the LEFT and RIGHT mouse buttons at the same time. It is always interpreted the same as clicking the MIDDLE button. Use this technique if you are using a two-button mouse.
Double Clicking	Double clicking, i.e. clicking mouse buttons twice in rapid succession, is not used by OVERTONE.

4. GETTING SERIOUS

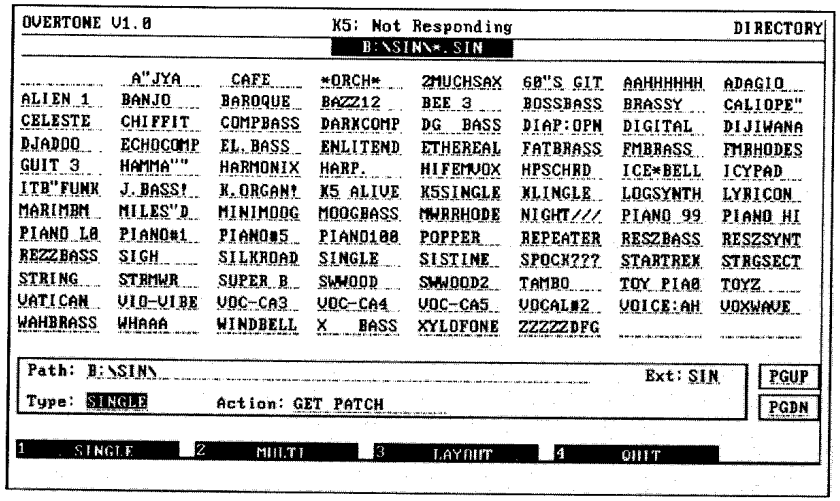
This chapter provides specific information on using each of the eleven OVERTONE screens. We assume you are already familiar with all of the data items corresponding to the K5 patch parameters. We do not discuss these here, except where our treatment of the parameter requires further explanation. We do describe in some detail the fields and functions unique to OVERTONE. You will find that our screens correspond closely with the familiar K5 voice components, and you should have no trouble locating any parameter you may be interested in.

The **Save** function is invoked by pressing **F9** or selecting the **Save** field and clicking any of the mouse buttons. It always causes the current contents of the single or multi patch edit buffer to be written to disk under the current patch name. If the edit buffer was originally uploaded from the K5 (see section 4.2.3), **Save** also downloads the edit buffer to the patch address from which it was originally loaded in the K5.

The **Aud** function actually consists of two operations: recording the audition sequence as you play it on the K5; and playing back the recorded sequence. If no sequence has been recorded, **aud** will be displayed. Press **Alt-F8** or select the **Aud** field and click the LEFT button to tell OVERTONE to start recording the sequence. You may play anything you want, including pitch bends, mod wheel, etc., up to the limits of available memory. Use the same procedure to replace the recorded sequence with a new one. Press **F8** or select the **Aud** field and click the RIGHT button to playback the sequence.

Finally, remember that pressing **Alt-D** and **Alt-L** take you immediately to the DIRECTORY and LAYOUT screens. Also, remember that if you are using a two-button mouse, any operation requiring a click of the MIDDLE button may be performed by clicking LEFT and RIGHT buttons simultaneously.

4.1 The Directory Screen



The DIRECTORY screen provides access to the patches and page layout files in your K5 library. Use the **Type** field to select which type of files you want displayed. This is a multiple choice field, and the choices are Single, Multi, Layout, Other and Sample. Use **Path** and **Ext** fields to specify the drive:path and the filename extension corresponding to the specified type. They are character fields and you should be sure to press the **Enter** key to signal that you are finished typing. OVERTONE always remembers the most recently used path and extension for each type.

After you have specified the directory you want, select any of these three fields and press **F10** or click the MIDDLE button. OVERTONE will read the directory from disk, translate special characters in the filenames to the K5 character set (for single, multi or layout files only), sort alphabetically and then display the filenames. The path and extension currently displayed are indicated at the top of the screen. The display page has room for 96 names. If your library is larger than this, you may press the **PgUp** or **PgDn** keys, or move to the **PgUp** or **PgDn** fields and click the MIDDLE mouse button.

4.1.1 Library Actions

Use the **Action** field to perform the basic library options on your patches and to setup the single and multi patch edit buffers. The field is a multiple choice field, and the choices are described individually below. Most of the actions require a filename to operate on. To select a filename use the cursor keys or move the mouse up into the directory display area. The field at which you are positioned will be highlighted. When you have found the file you want, press **F10** or click the MIDDLE mouse button. The selected name will appear immediately to the right of the **Action** field. Now select the desired action and press **F10** or click the MIDDLE button. to perform the action. For actions that do not require a patchname, simply press **F10** or click the MIDDLE button on the action field. Here are the actions:

GET PATCH – Reads the selected patch into the OVERTONE edit buffer. This will be a single or multi patch depending on which directory is being displayed.

NEW PATCH – Initializes the single or multi edit buffer to a standard configuration, providing a clean slate for building a new voice.

DELETE PATCH – Deletes the selected file from the library.

PRINT DIRECTORY – Sends a copy of the current directory to the printer.

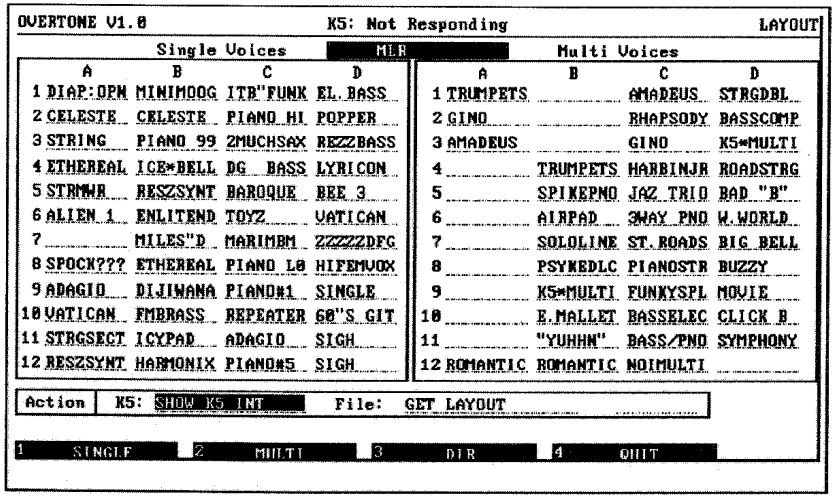
GET PATCH xxx – For single patches only, reads the parameter *subset* specified by **xxx** into the single patch edit buffer. The choices are: LFO, KS, DFT, DDA, DDF, DHG and DFG.

The most common action will probably be **Get Patch**, and this is the default selection whenever you come to the DIRECTORY screen. If you want to access the **Get xxx** actions, pressing the **Grey Minus** key or clicking the LEFT mouse button will get you there faster.

4.1.2 Menu Selections

The menu selections at the bottom of this screen let you go to the SINGLE BASIC edit screen, the MULTI edit screen, or the LAYOUT screen. There is also a QUIT option to let you return to DOS. If you press **Esc** or click the LEFT mouse button anywhere in the menu area, you will go back to the most recently used single or multi patch editing screen. For example, if you were using the DHG Spectrum screen and pressed **Esc**, you would come to the DIRECTORY screen. Pressing **Esc** from the DIRECTORY would then take you back to the DHG Spectrum screen.

4.2 The Page Layout Screen



The LAYOUT screen displays a single *page* of 96 K5 patch names organized just like the K5's INT and EXT memory pages — 48 singles and 48 multis arranged into eight banks of 12 patches each. The display can represent one of two things: a patch layout file you are editing, or the current layout in your K5 INT or EXT memory. There are two **Action** fields, one for file related actions and one for K5 related actions. Their use will determine what is currently displayed and what will happen when you edit the display. The current status of the layout is always indicated directly above the display, which you may simply think of as a page layout edit buffer.

4.2.1 File Actions

The file related actions are described first. These let you define and save page layout files, and convert existing Kawai libraries for use with OVERTONE. Select the desired action in the usual manner and press **F10** or click the MIDDLE button to perform the action. OVERTONE responds as follows:

GET LAYOUT – Reads the layout file whose name is in the **Layout** field into the page layout buffer, displays it, and resolves all multi patch references to single patches. To do this, it must read all multi patch files, and this takes a few seconds. Note that layout file names are restricted to the Kawai character set and are automatically translated to valid DOS filenames.

NEW LAYOUT – Clears the page layout buffer and the display. Use this action to start a new layout from scratch.

CONVERT KAWAI LIB – Asks you to enter the names of a Kawai LIS file and a Kawai LIM file. This pair of files defines a complete page layout, and the combined layout will be displayed on the screen. One by one, OVERTONE will note the single patch locations in each multi, find the corresponding patch names using the current layout, and append these patch names to each Kawai multi file making them compatible with OVERTONE's enhanced multi patch capabilities. Multi patches that have already been converted are not modified. Finally, OVERTONE asks you to enter a new name in the **Layout** field, and the combined layout is saved.

SAVE LAYOUT – Writes the current page layout buffer as shown in the display to the layout file whose name is currently in the **Layout Name** field.

PRINT LAYOUT – Sends a copy of the current layout to the printer.

4.2.2 K5 Actions

The K5 related actions control movement of patches between your library and the K5's INT or EXT memories. There are three types of actions, **UPLOAD**, **DOWNLOAD** and **SHOW**, and they can be applied to either the INT or EXT memories on the K5. OVERTONE operates as follows:

UPLOAD xxx – Reads all 96 patches in the INT or EXT pages from the K5, stores them on disk if they are not already there, saves this layout as OVERTONE's record of the current INT or EXT memory in the K5, and displays it as the current page layout edit buffer.

DOWNLOAD xxx – Reads all 96 patches specified in the current layout from your library, resolves all multi patches with the correct single patch locations for this layout and sends the patches to the INT or EXT pages in the K5.

SHOW K5 INT – Displays OVERTONE's most recent record of the K5 INT memory and loads the page layout edit buffer. The display title will read **K5 INTERNAL**.

SHOW K5 EXT – Displays OVERTONE's most recent record of the K5 EXT memory and loads the page layout edit buffer. The display title will read **K5 EXTERNAL**. Because the EXT memory depends on which card you have inserted in the K5 slot, you have to tell OVERTONE which layout to use, either by first performing an **UPLOAD EXT** or by specifying the name of previously saved layout file. OVERTONE will update the currently assigned layout file if you make any editing changes. If you switch cards during a session, you need only specify the new EXT layout name.

SHOW UNATTACHED – Highlights all of the single patches in the current layout that are *unattached*, i.e. not referenced by any multi patches in the layout.

SHOW INCOMPLETE – Highlights all of the multi patches that are currently *incomplete*, i.e. missing one or more required single patches.

4.2.3 General Layout Editing Functions

To edit a layout, simply select the desired patch location using the cursor keys or the mouse, and type the name of the patch you want in that location, or clear the location to delete a patch. Use the **Enter** key when finished typing or clearing the patch name, and the layout is automatically updated. If you replace or delete a single patch currently required for one or more multis, you will receive a warning, and will have the option to continue anyway or to undo the change. If you insert a multi patch into the layout and the required singles are not already there, they are automatically inserted into blank locations in the layout starting with single patch location D-12 and continuing with D-11, D-10, etc.

When designing a layout, we suggest you start with the multis you want and let OVERTONE insert the singles you need. Then rearrange the attached singles and add any unattached singles. When finished making changes, use the **SAVE LAYOUT** file action to write the modified layout back to disk.

OVERTONE constantly keeps track of the relationships between the single and multi patches in the currently displayed layout. The first time you load a layout during a session, this is a five-step process. For each multi, OVERTONE must read the multi file, determine the single patches required, automatically insert any missing singles into unused locations in the layout, find the current single patch locations, and insert the locations into the multi. As you edit the layout, OVERTONE considers the impact of your changes and informs you if you do something that would force any inconsistencies. OVERTONE also takes into account any changes you make to multi patches from the MULTI screen, since these may affect the current layout.

Finally, OVERTONE provides several additional features to help in editing layouts. Positioning to any *single* patch and pressing **F10** or clicking the MIDDLE button highlights all of the multis that reference the selected single. Positioning to any *multi* patch and pressing **F10** or clicking the MIDDLE button highlights all of the singles referenced by the selected multi. The highlights disappear as soon as you do something else with the layout.

4.2.4 K5 Layout Editing Functions

Whenever the LAYOUT screen indicates **K5 INTERNAL** or **K5 EXTERNAL**, OVERTONE assumes that the displayed layout represents the K5 itself. In these two cases, changing a patch name in any location on the LAYOUT screen causes the specified patch to be sent to the K5 as soon as you press the **Enter** key. This is the way you rearrange individual patches in the K5.

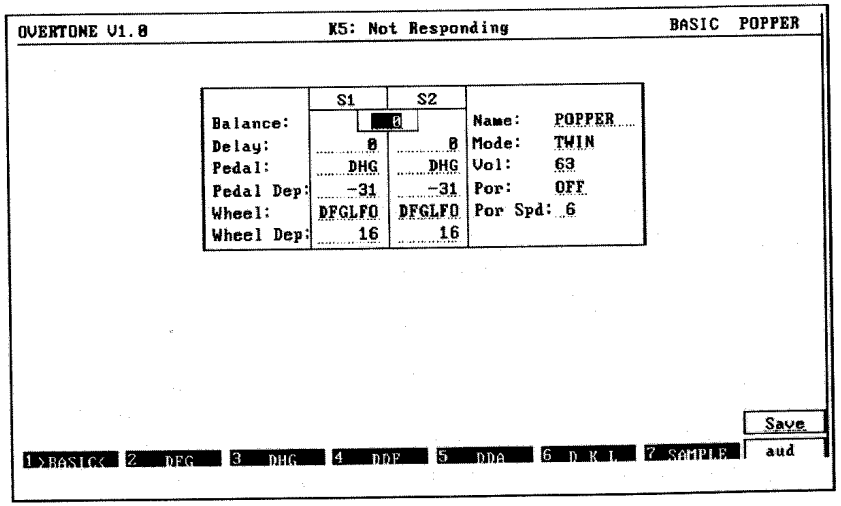
If you simply want to send one patch to the K5 (perhaps you've edited it and don't want to download all 96 patches), select the patch on the LAYOUT screen and press the **Grey Minus** key or click the LEFT button. The patch will be read from disk and sent to the correponding bank address in the K5.

If you want to upload a single patch from the K5, select the patch location on the LAYOUT screen and press the **Grey Plus** key or click the RIGHT button. The patch will be uploaded to the current edit buffer and saved to disk, and the layout will be updated if necessary. If a single patch upload replaces a patch used by one or more multis, you will receive a warning message and will have the chance to cancel the operation or continue.

4.2.5 Menu Selections

The menu selections at the bottom of this screen let you go to the SINGLE BASIC edit screen, the MULTI edit screen, or the DIRECTORY screen. There is also a QUIT option to let you return to DOS. If you press **Esc** or click the LEFT mouse button anywhere in the menu area, you will go back to the most recently used single or multi patch editing screen.

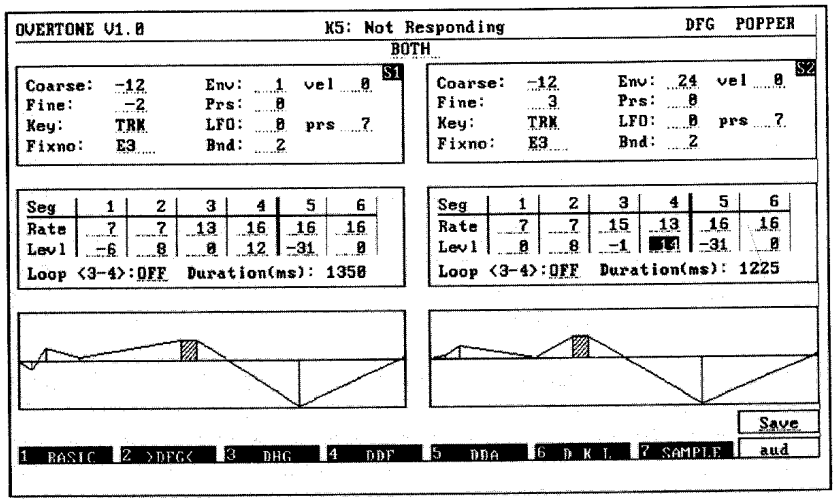
4.3 The Single Basic Screen



This screen contains the same information as its K5 counterpart. The only significant field from OVERTONE's standpoint is the patch name. This name always determines the disk file name under which the patch will be saved. Any valid K5 characters may be used. The Kawai special characters are not all compatible with DOS file naming conventions, so OVERTONE translates them as needed.

The menu selections from this screen let you move to any of the other single patch editing screens, including the SAMPLE screen. This same menu appears on all the single patch editing screens.

4.4 The DFG Screen



This screen displays the DFG information, including envelope parameters, for both S1 and S2 sound sources, combining four K5 displays into one screen. The current voice selection is displayed at the top center of the screen, just below the K5 status information. It is a multiple choice field that may take on one of three values: **s1/S2**, **S1/s2** or **BOTH**.

This field indicates whether changes you make to the S1 or S2 DFG parameters are independent of each other, or are to be applied to both S1 and S2. We make the distinction between **s1/S2** and **S1/s2** only to show which one (the one using upper case) would currently be selected if you were to look at the K5 LED display. This has no effect on OVERTONE's operation at all. However, when **BOTH** is displayed, changes made to S1 parameters *are* echoed in S2 and vice versa, just as in the K5.

In addition to the numeric values for the K5 parameters, graphs of both DFG envelopes are displayed. The graphs are drawn approximately to scale based on the rate values. In the K5, the rate values used to specify segment durations vary roughly exponentially. Thus a rate value of 12 represents about one tenth of a second, while a rate value of 31 is about twenty-four seconds. OVERTONE adds up the total duration of all segments and scales the envelope graph proportionally. The derived duration in milliseconds is also displayed for your information.

The sustain level is shown by a fairly narrow shaded segment. When playing a note on the K5, the duration of the sustain level will depend on how long you hold the note before releasing it. For our calculation of the envelope duration, we assign this segment a duration of zero. Thus our duration value actually represents the length of the sound with no sustain level.

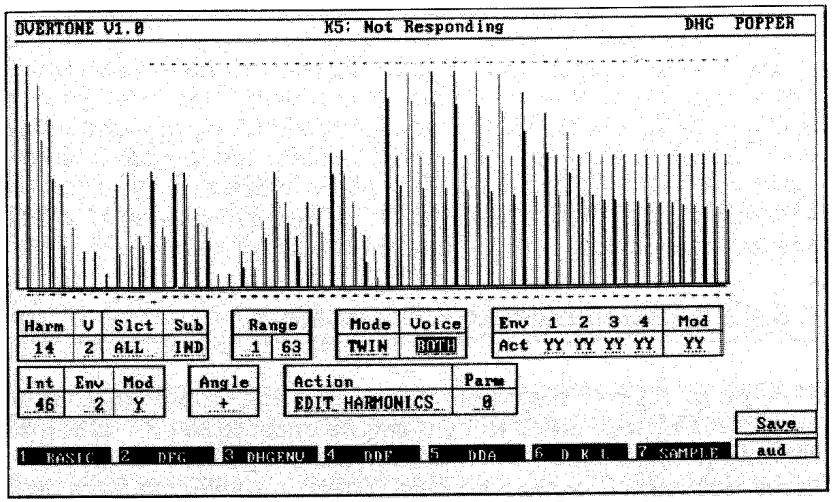
The DFG screen also has a **Loop 3-4** parameter. If this is set ON, there is no sustain level; instead, the frequency varies smoothly between the levels indicated by segements 3 and 4 according to the rates assigned to these segments, for as long as the note is held. On the DFG envelope display, this is indicated by a curved line straddling the boundary between segments 3 and 4, similar to the way it is shown in the K5 Owner's Manual. In this case, the shaded sustain segment is not drawn.

The relationships between rate values and segment durations in the K5 were derived experimentally. For a given rate value, durations were observed to vary somewhat depending on the type of envelope and the settings of different parameters in the patch. The values used in OVERTONE are compromise values. They appear to provide reasonable approximations, but should not be considered to be precise.

Whenever you modify any of the numeric values defining an envelope, the word **REDRAW** will overlay the current graph. Make as many changes to the numeric values as you like and when you want to look at the revised graph, simply press **F10** or click the MIDDLE button while positioned to any of the numeric envelope fields. We found that redrawing the graphs every time a parameter changed introduced irritating delays, especially when continuously updating values.

The overall operating characteristics of the DFG screen serve as a model for the DHG Envelope, DDF and DDA screens. None of these other envelopes has the **Loop 3-4** function, and the DDA envelope has seven segments rather than six, but in general, the same assumptions apply. You can get to any of the other single patch editing screens from this screen.

4.5 The DHG Spectrum Screen



This screen combines most of the K5's DHG editing functions for both S1 and S2 onto a single screen. This includes graphic display and mouse driven editing of the individual harmonic intensities, and all of the block harmonic editing functions found on the K5 (ALL, ODD, EVN, OCT, 5TH) as controlled by the RANGE, SELECT and ANGLE parameters.

In addition we have added standard waveform generation for square, sawtooth, variable duty-cycle pulse and triangle waves, and spectrum shift functions. When BOTH voices are selected, the DHG spectrum shows all 126 harmonics, interspersed in TWIN mode or left-to-right in FULL mode. As with the other OVERTONE screens, BOTH implies that all changes appply to S1 and S2. *The only exception is FULL mode, in which case the harmonic parameters are always independent.*

The only DHG parameters not found on this screen relate to the four DHG envelopes. They include the envelope rates, levels, maxseg and shadow indicators, and control over the five envelope modulation sources (VEL, PRS, KS, LFO and EFF). Please refer to section 4.6 for information on the DHG Envelope screens.

We have grouped the fields on the DHG screen into four functional areas, described in the sections which follow.

4.5.1 Harmonic Data Parameters

Each harmonic has three basic data parameters associated with it – the intensity level **Int**, the assigned envelope **Env** and the modulation indicator **Mod**. These parameters have exactly the same meaning as they do on the K5, but with considerably more utility. In OVERTONE, the effect of modifying any of these fields depends on the settings of the harmonic selection parameters, described in the next section. In addition, while editing harmonic intensities using the mouse, the INT parameter shows the intensity level associated with the current mouse position.

4.5.2 Harmonic Selection Parameters

This group of parameters determines which harmonic or block of harmonics is to be affected by changes made to the **Int**, **Env** and **Mod** parameters. The main selection control parameter is actually the **Sub** (short for Subset) field. This is a multiple choice field that can take on the six values IND, ODD, EVN, OCT 5TH or ALL. When IND is selected, the **Harm** field specifies the number of the individual harmonic whose data is related to the three harmonic data fields. This works just like the K5, and is the default state.

Selecting any of the other five choices for the **Sub** field indicates that you want to operate on a whole set or *block* of harmonics. The block is defined as the set of harmonics that are...

- Even, odd, octave, fifth or all harmonics, depending on the selected value for the **Sub** parameter
- Either LIVE (non-zero), DEAD (zero) or ALL as specified by the **Slct** parameter
- Within the specified **Range**, shown both graphically and numerically
- In sound source S1, S2 or BOTH, depending on the **Voice** parameter

As soon as you select a **Sub** value other than IND, a message is displayed informing you that a block harmonic operation is in progress. changes made to any or all of the three harmonic data fields will be made to every harmonic meeting the selection criteria. The **Angle** parameter determines how changes made to the **Int** parameter will be applied to the selected block of harmonics, just as it does in the K5. After you have made all the changes you want, tell OVERTONE you are finished by pressing **F10** or clicking the MIDDLE button. The DHG graphic display will be updated to reflect the changes made.

There is one more parameter in this group, the **V** parameter, located right next to the **Harm** parameter. This parameter takes on a value of 1 or 2 and indicates whether the displayed harmonic data parameters refer to S1 or S2. This is only relevant when **Voice** is set to BOTH, in which case you would use the **V** parameter to tell OVERTONE which voice's harmonic data parameters you want to see displayed. This is not a true K5 parameter and has no effect on the patch itself.

4.5.3 Master Envelope and Modulation Indicators

These indicate which of the four DHG envelopes (and their assigned harmonics) will be active and whether any modulation at all will be permitted for sound sources S1 and S2. Each of these five fields can take on one of four values, YY, YN, NY and NN. The first digit corresponds to S1 and the second to S2. So a value of YN for **Env 1** means that DHG envelope 1 is active for S1 and not active for S2. If you were to set the **Voice** parameter to S2 or BOTH, you would notice that all the harmonics assigned to envelope 1 would be displayed at zero levels.

4.5.4 Special Actions

Besides the block harmonic actions described above, there are ten special actions that affect the entire DHG spectrum. The effect of these actions are limited by the **Range** and **Voice** parameters, but not by **Sub** or **Slct**. The actions are selected by choosing among the multiple valued **Action** field, specifiying the **Parm** field for those actions that require a special parameter and pressing **F10** or clicking the MIDDLE button. The most commonly used action will probably be mouse editing of the spectrum, and this is the default choice. You will find that the four Shift operations can be selected quickest by using **Grey Plus** key or clicking the RIGHT button. The **Grey Minus** key or the LEFT button are the best choices for selecting the standard waveforms. The possible actions are...

EDIT HARMONICS – Lets you edit the harmonics using the graphic display of the spectrum and the mouse, if you have one. As soon as you press **F10** or click the MIDDLE button, the crosshair cursor will appear in the envelope area, indicating graphic edit mode. As you move the mouse, notice that the **Harm** and **Int** fields change continuously. This tells you where you are in the spectrum. If you have specified FULL and BOTH, the **V** parameter changes when you move from S1 to S2 or back.

The dots below the harmonics show the envelope assigned to each harmonic and the dots above show whether modulation is on or off, as with the K5's DHG display. There is a lot of information in a small space, so look carefully.

If you press and hold the LEFT button while moving the mouse (not too fast!) you will see the individual harmonics change as you pass over them. Click the RIGHT button to send the changes to the K5 and audition the patch. When you are finished editing, click the MIDDLE button. Your changes will be saved in the edit buffer and sent to the K5. (You may notice a slight delay if you have made a lot of changes. The "Sending Changes to K5 ..." message will go away when it is OK to continue.)

RIGHT SHIFT – Moves all of the harmonics specified by the **Range** to the right by the number specified in the **Parm** field. You should enter the **Parm** value before doing the shift action.

LEFT SHIFT – Same as above, but to the left.

RIGHT OCT SHIFT – Moves all of the harmonics specified by the **Range** to the right by the number of *octaves* specified in the **Parm** field. In the process, harmonics are spread apart to preserve the frequency relationships between the harmonics, and thus the timbre.

LEFT OCT SHIFT – Same as above, but to the left. Also, harmonics are squeezed out, rather than spread apart as in the right octave shift, once again to try to preserve the timbre.

CLEAR SPECTRUM – Sets all harmonics in the **Range** to zero.

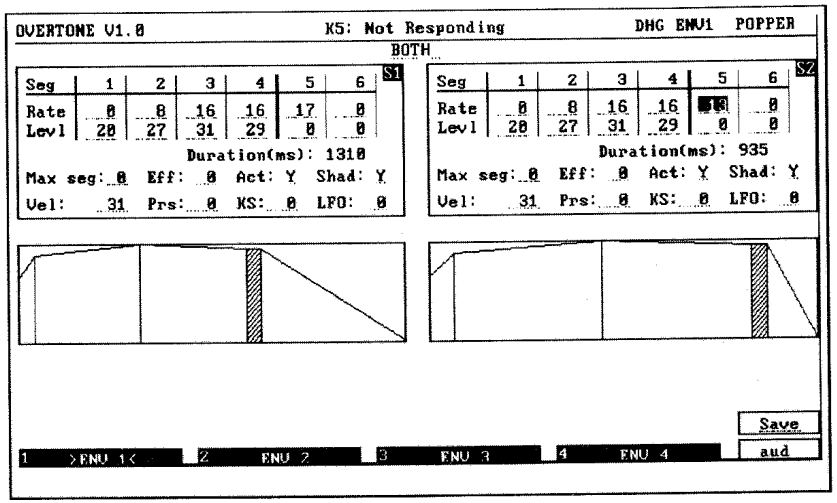
LOAD TRIANGLE – Fills the **Range** with the spectral components of a triangle wave.

LOAD PULSE – Fills the **Range** with the spectral components of a variable duty-cycle pulse wave. The duty-cycle is specified in the **Parm** field as a number between 0 and 100. A 50 percent value is exactly the same as a square wave. Values on either side of 50 create the same result, depending on how far they are away from 50. Values of 0 or 100 both set all harmonics at the maximum level. Try a few values and you will pick up the pattern. Try 20 and 80, and notice that they are identical.

LOAD SAWTOOTH – Fills the **Range** with the spectral components of a sawtooth wave.

LOAD SQUARE – Fills the **Range** with the spectral components of a square wave.

4.6 The DHG Envelope Screens

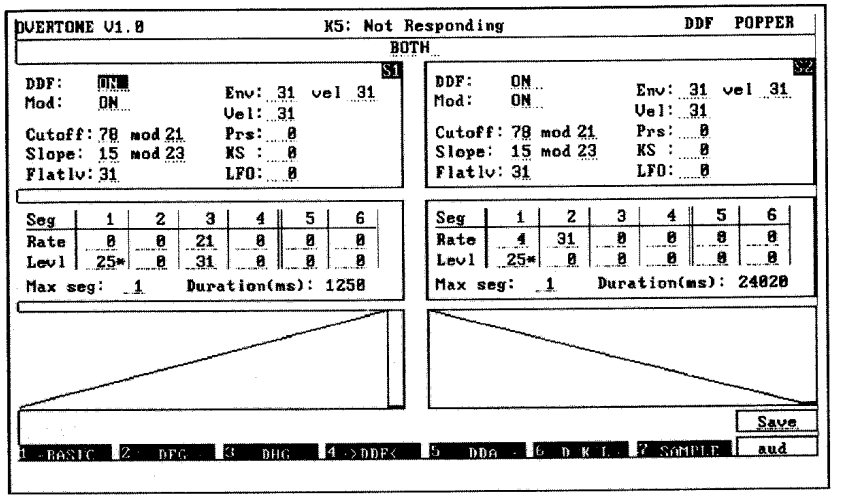


There are four of these screens, one for each of the DHG envelopes. All four are identical in appearance and they operate very much like the DFG and the rest of the screens on which envelopes are displayed. Each screen displays envelopes for both S1 and S2.

Take special note of the **Vel**, **Prs**, **KS**, **LFO** parameters. These parameters actually apply to all four envelopes; they are not really dependent on the individual envelopes. We display them on this screen because they affect the way the envelopes react to the four modulation sources. Changing one of these parameters on *any* of the DHG ENV screens changes the value on all of them.

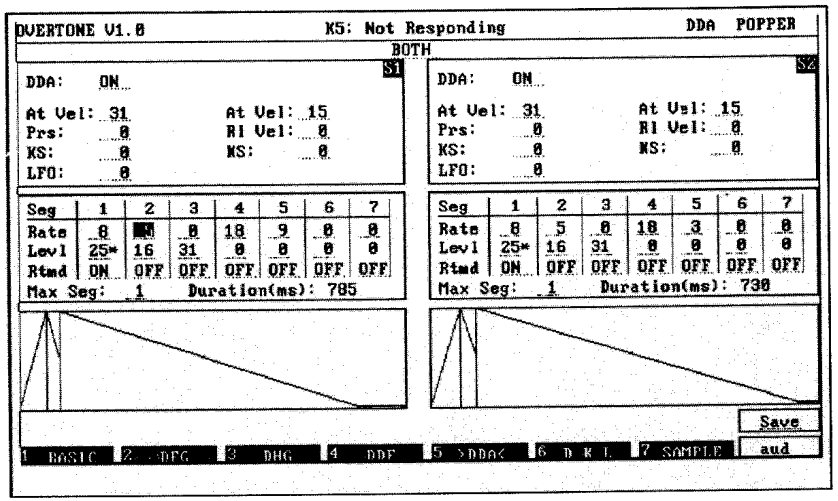
The DHG Envelope screens are only accessible from the DHG Spectrum screen or from each other. You will notice the special menu selection. Pressing **Esc** or clicking the MIDDLE button will always return you to the DHG Spectrum screen.

4.7 The DDF Screen



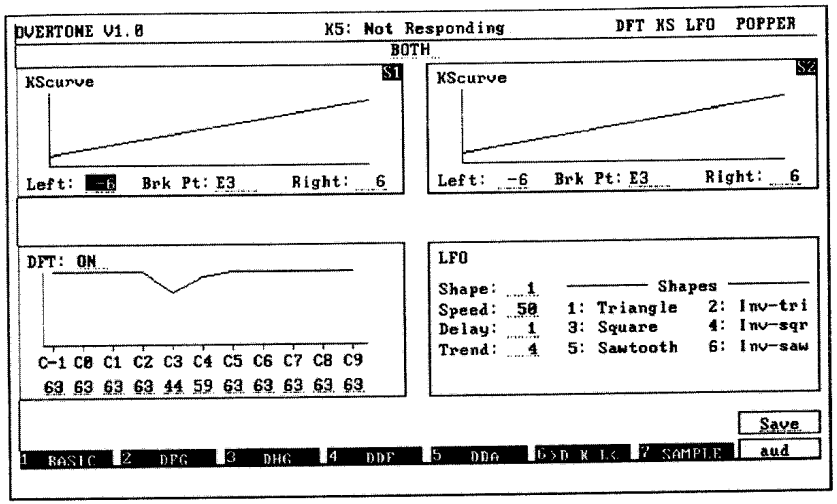
This screen displays the filter parameters and envelopes for both S1 and S2. It is similar in appearance and operation to the DFG and the rest of the screens on which envelopes are displayed. You can get to any of the other single patch editing screens from this screen.

4.8 The DDA Screen



This screen displays the DDA parameters and envelopes for both S1 and S2. It is similar in appearance and operation to the DFG and the rest of the screens on which envelopes are displayed. You can get to any of the other single patch editing screens from this screen.

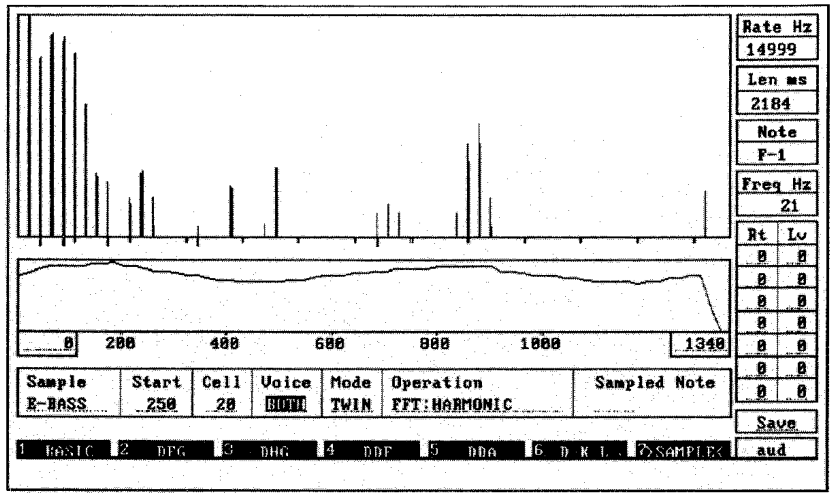
4.9 The DFT/KS/LFO Screen



This screen combines the DFT, LFO and KS parameters onto a single screen. The DFT and KS parameters are also displayed graphically. The same **REDRAW** conventions used for envelopes are used here. You must press **F10** or click the MIDDLE button after modifying the numeric fields to cause the displays to be redrawn.

The KS information is shown for both S1 and S2. The K5 has only one DFT and one LFO. The DFT filter is applied to the signal that results from the final combination of the S1 and S2 sound sources. The LFO can be used as a modulating source for any or all of the following: the DFG, the DHG envelopes, the DDF and the DDA. You will have to go to those screens to indicate how you want the LFO to be used. You can get to any of the other single patch editing screens from this screen.

4.10 The Sample File Processing Screen



This screen lets you process files containing sampled sounds in either Sound Designer or Sample Vision format, in order to extract spectrum and envelope information from the sampled sound and transform it to DHG and DDA parameters for the K5.

The screen displays three basic types of information: data and control parameters pertinent to sample file processing; the graphic display of the extracted DHG parameters (works the same as on the DHG screen); and finally, graphic and numerical display of the values defining the DDA envelope. The DHG and DDA information is recorded in the current single patch edit buffer, so what you see displayed on this screen is the same as what you would see on the individual DHG and DDA screens.

4.10.1 Sample File Processing

To process a sample file, you must first specify the sample file name in the **Sample** field. You may simply type the name of the sample and OVERTONE will append the filename extension and path previously specified for samples on the DIRECTORY screen. If you have *selected* a sample file on the DIRECTORY screen, it will automatically be displayed when you go to the SAMPLE screen. Otherwise, OVERTONE remembers the name of the most recently used sample file and uses it.

The **Action** field lets you select and perform eight different functions, the first three of which are concerned with sample file processing. These functions are described below. More detail on the mathematical aspects of OVERTONE's sample processing can be found in Appendix C.

EXTRACT ENVELOPE – This function reads the entire sample file and displays a graph of the overall amplitude envelope of the sound. This is done by dividing the total duration of the sound into a number of *cells* and determining the maximum signal level in each cell. The envelope display is simply a plot of the maximum values for each cell. The **Cell** parameter lets you specify the width of each cell in milliseconds, and defaults to 10. Larger values give a smoother looking envelope, smaller values show more detail. The envelope display is helpful in understanding the time behavior of the sampled sound, and you may also use it directly as a guideline in creating your DDA envelope. You should usually extract the envelope of a new sample before doing any other analysis.

FFT HARMONIC – Use this function for sampled sounds that you suspect will contain well defined harmonically related components. If you can perceive a definite pitch in the sound, this function should give good results.

The function causes the DHG spectrum to be replaced with a spectrum derived from an FFT analysis of the sound at the point in time (in milliseconds) specified by the **Start** parameter. In natural sounds, the spectrum changes over time, and you need to specify which part of the sampled sound you want OVERTONE to analyze.

To be able to determine the relative levels of the harmonic components in the spectrum, OVERTONE needs to know the fundamental frequency of the sound. The FFT analysis alone does not provide this information. If you know in advance the note which was originally sampled, you may enter it in the **Sampled Note** field and OVERTONE will use this information to determine the fundamental. If you don't know the sampled note, OVERTONE will analyze the FFT results to try to determine the fundamental.

FFT NON-HARMONIC – Use this function for noise, and percussion type sounds. The derived DHG is interpreted simply as a 63 (or 126) band spectrum analyzer. The width of each band depends on the sampling rate and the number of bands, and is reported in the **Freq** field. In this mode, there is no true fundamental.

For both types of FFT analysis, the results of the analysis also depend on the **Voice** and **Mode** fields, and they function the way you would expect. OVERTONE also reports the sampling rate **Rate** in Hz at which the sample was originally recorded, the length **Len** of the sampled sound in milliseconds. The **Note** and **Freq** fields show the note name and corresponding frequency used for the fundamental, i.e. the first harmonic, regardless of how the fundamental was determined.

4.10.2 Graphic Editing of the DHG Spectrum

OVERTONE lets you edit the displayed spectrum graphically, using the same mouse based techniques used on the DHG screen. The **Voice** and **Mode** fields control whether S1, S2 or BOTH sets of harmonics are displayed, and also whether the harmonics are to be interspersed or juxtaposed in the display.

Select the **EDIT HARMONICS** action and press **F10** or click the MIDDLE button to perform this function. The graphic mouse cursor will appear in the spectrum area, as with the DHG screen. However, no numerical feedback on mouse position is provided since the **Harm**, **Int** and **V** fields do not appear on this screen. The spectrum editing functions are provided here primarily to let you do an eyeball edit of major spectral features. If you need to do any precise editing, we suggest that you return to the DHG screen.

4.10.3 Graphic Editing of the DDA

The DDA envelope is really just a seven-segment approximation to the amplitude envelope of the sound, extracted from the sample file as described in section 4.10.1. However, the DDA envelope is different in one important respect, namely the time at which the note is released. In the K5, this time is not specified within the patch. When you release a note during performance, the K5 responds by immediately beginning the fifth segment of the envelope, arriving at Level 5 after the time specified by Rate 5 has elapsed. In the sampled sound, the recorded note was actually released at a *particular* time, and you have to identify this time so that OVERTONE can properly define the start of the release phase of the sound.

OVERTONE lets you define a set of DDA parameters by selecting up to *eight* points within the SAMPLE screen's envelope display area with your mouse. The time at which the *fifth* point occurs is used as the release point. The level of the fifth point is ignored,

and is assumed to be the same as the level of the fourth point, i.e. the *sustain level*.

The numerical values displayed to the right of the envelope graph correspond to the Rate and Level values shown in the graph. They are intended to report the status of your editing, not to display the DDA itself. When you first display the SAMPLE screen, these values may not correspond to the DDA in the edit buffer.

The small boxes appearing at the lower left and lower right of the envelope display are the lower and upper limits, in milliseconds, of the current display. If you modify them, the envelope will be clipped and scaled. Try it and see what happens. The display limits are automatically reset whenever you perform the **EXTRACT ENVELOPE** function, described above.

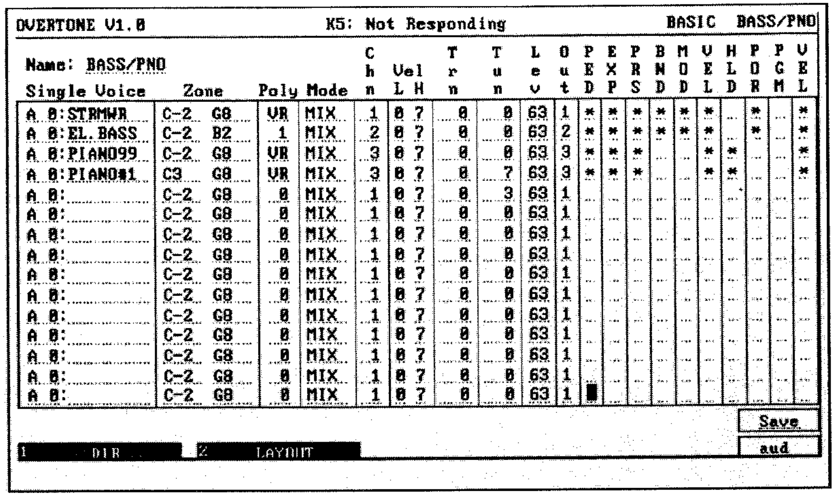
Select the **NEW DDA** function to define a new DDA envelope using your mouse. First, make sure the display limits are set to values appropriate for the scale and duration of the envelope you want to define. You can use the values determined by extracting the envelope, or enter them manually. Press **F10** or click the MIDDLE button. The existing numerical values for the DDA will be zeroed and the mouse cursor will appear in the envelope area, drawn as a cross to indicate graphic edit mode.

Move the mouse cursor to the desired endpoint for the first DDA segment and click the RIGHT button. If you have previously extracted the sample envelope, use it as a guide. (You can do a much better job of fitting the seven segments by eye than OVERTONE could ever do, and this is why we implemented this feature!) The point you pick will be converted to the closest Rate/Level combination, and will be indicated by a small square on the display.

In the same way, you can put up to seven more points on the display anywhere you want. If you want to erase a point, position to the point and click the LEFT button. (Remember that the fifth point is really just the release time!) When you are finished entering points, click the MIDDLE button. The screen will be redrawn with lines connecting the new envelope segments and the sustain segment, if any, is shown in the usual way. The numeric data values for the DDA will appear under the **Rt** and **Lv** fields.

If you want to change an existing DDA, select the **EDIT DDA** action and press **F10** or click the MIDDLE button. The current DDA envelope will be redrawn with the small squares at the individual envelope points. You can then erase and replace points just as described above.

4.11 The Multi Patch Screen



OVERTONE V1.0 K5: Not Responding BASIC BASS/PNO

Name: BASS/PNO

Single Voice	Zone		Poly	Mode	Chn	Vel L	Vel H	Trn	Tun	Lev	Out	PED	EXP	PRS	BND	MOD	VEL	HLD	POR	PGM	VEL
A 0:STRMWR	C-2	G8	VR	MIX	1	0	7	0	0	63	1	*	*	*	*	*	*		*		*
A 0:EL.BASS	C-2	B2	1	MIX	2	0	7	0	0	63	2	*	*	*	*	*	*		*		*
A 0:PIANO99	C-2	G8	VR	MIX	3	0	7	0	0	63	3	*	*	*			*	*			*
A 0:PIANO#1	C3	G8	VR	MIX	3	0	7	0	7	63	3	*	*	*			*	*			*
A 0:	C-2	G8	0	MIX	1	0	7	0	3	63	1										
A 0:	C-2	G8	0	MIX	1	0	7	0	0	63	1										
A 0:	C-2	G8	0	MIX	1	0	7	0	0	63	1										
A 0:	C-2	G8	0	MIX	1	0	7	0	0	63	1										
A 0:	C-2	G8	0	MIX	1	0	7	0	0	63	1										
A 0:	C-2	G8	0	MIX	1	0	7	0	0	63	1										
A 0:	C-2	G8	0	MIX	1	0	7	0	0	63	1										
A 0:	C-2	G8	0	MIX	1	0	7	0	0	63	1										
A 0:	C-2	G8	0	MIX	1	0	7	0	0	63	1										
A 0:	C-2	G8	0	MIX	1	0	7	0	0	63	1										
A 0:	C-2	G8	0	MIX	1	0	7	0	0	63	1										

1 DIR 2 LAYOUT Save aud

This screen combines all of the information needed to define a multi patch onto a single screen. Except for the **Single** field, all of the other fields are identical to those in the K5. To save screen space, we use an * to indicate the ON condition for all of the parameters that appear on K5 Multi Windows 3 and 4. A blank in these fields means that the function is disabled.

On the K5, you specify single patches to be included in the multi by scanning through the Bank and Patch number fields. The K5 responds by filling in the patch names corresponding to those locations, as you scan.

In OVERTONE, you enter the patch names you want by typing them directly into the **Single** field. Because OVERTONE knows the current layout of the K5 INT memory, it can immediately determine whether the specified patch is or is not available. If it is already there, OVERTONE fills in the appropriate Bank and Patch number field. If not, it displays patch number A-0 for your information. If and when you want to audition the multi you are editing, OVERTONE will automatically read any unresolved patches from your library, download them to the K5 using patches SID-11, SID-10, etc. as needed, stash the new addresses into the multi (you will see the screen change), and finally, send the multi itself down to patch MID-12 in the K5 to be auditioned.

When you save your multi to disk, the names of the singles are saved along with the other multi parameters. The bank addresses are really only relevant when you are downloading the multi to the K5 singly or as part of a full page download. OVERTONE handles all of these operations from the LAYOUT screen.

APPENDICES

Appendix A — Supported Hardware

Appendix B — MIDI Troubleshooting

Appendix C — The FFT and Sample Files

Appendix A — Supported Hardware

This appendix describes the OV command line options used to specify your MIDI, graphics and mouse hardware configuration. Each of these is discussed in a separate section of the appendix.

MIDI Interfaces

The table below shows the types of MIDI interfaces supported by OVERTONE. The general form of the command line option is **/I:mmm:xxx:n**. The **mmm** parameter is required and is a 3-character string indicating which of the two basic interface types is being used. The **xxx** parameter is optional and is used to specify *in hexadecimal* the base hardware address of the MIDI interface. The **n** parameter may only be used in conjunction with the **xxx** parameter, to specify the interrupt request number used by the MIDI interface. Only numbers from 2 through 7 are allowed. Some interfaces permit you to set these values via switches, others may have nonstandard values hardwired. Check the manual that came with your MIDI interface to determine the proper settings to use.

Option	MIDI Interface	Port	IRQ
/I:MPU	MPU-401 (Standard)	330	2
/I:MPU:330	MPU-401 (Standard)	330	2
/I:MPU:330:2	MPU-401 (Standard)	330	2
/I:MPU:xxx:n	MPU-401 (Other)	???	?
/I:COM	Serial Port (COM2)	2F8	3
/I:COM:2F8	Serial Port (COM2)	2F8	3
/I:COM:2F8:3	Serial Port (COM2)	2F8	3
/I:COM:3F8:4	Serial Port (COM1)	3F8	4
/I:COM:xxx:n	Serial Port (Other)	???	?

Graphics Adapters

The table below lists the options used to specify each of the supported graphics adapters and monitors. Choose the option that most closely matches your hardware.

Option	Graphics Device	Resolution	Colors
/A	AT&T & Compaq III	640 x 400	mono
/A:1	AT&T & Compaq III	640 x 400	mono
/A:2	AT&T DEB Graphics	640 x 200	16
/A:3	AT&T DEB Graphics	640 x 400	16
/C	IBM Color Graphics	640 x 200	2
/C:1	IBM Color Graphics	640 x 200	2
/D	Sigma Design Color-400	640 x 400	16
/D:1	Sigma Design Color-400	640 x 400	16
/E	IBM EGA	640 x 200	16
/E:3	IBM EGA	640 x 200	16
/E:1	IBM EGA	640 x 350	mono
/E:4	IBM EGA	640 x 350	16
/E:5	IBM MCGA	640 x 480	2
/E:6	IBM EGA	640 x 350	2
/E:7	IBM VGA	640 x 480	16
/G	MDS Genius Display	736 x 1008	mono
/H	Hercules	720 x 348	mono
/L	Tseng Labs EVA/480	640 x 480	16
/O	Toshiba 3100	640 x 400	mono
/S	STB GraphicsPlus-II	640 x 352	mono
/S:1	STB GraphicsPlus-II	640 x 352	mono
/S:3	STB GraphicsPlus-II	640 x 200	4
/S:5	STB GraphicsPlus-III	640 x 400	mono
/T	Tecmar Graphics-Master	720 x 352	mono
/T:1	Tecmar Graphics-Master	720 x 352	mono
/T:2	Tecmar Graphics-Master	720 x 704	mono
/T:3	Tecmar Graphics-Master	640 x 200	16
/T:4	Tecmar Graphics-Master	640 x 400	16

Graphics Adapters (continued)

Option	Graphics Device	Resolution	Colors
/U	Video-7 Vega Deluxe	640 x 480	16
/U:1	Video-7 Vega Deluxe	640 x 480	16
/V	Everex Edge	640 x 200	16
/V:1	Everex Edge	640 x 200	16
/V:2	Everex Edge	640 x 400	16
/W	WYSE WY-700 Display	640 x 400	mono
/W:1	WYSE WY-700 Display	640 x 400	mono
/W:2	WYSE WY-700 Display	1280 x 400	mono
/W:3	WYSE WY-700 Display	1280 x 800	mono
/X	IBM 3270 PC	720 x 350	mono
/X:1	IBM 3270 PC	720 x 350	mono

Mouse Adapters

The table below lists the basic mouse types supported by OVERTONE. If you have Microsoft compatible driver software, we suggest you load it prior to running OVERTONE, and you will not need to specify any of the mouse options. Otherwise, choose one of the options from the the table.

Option	Mouse Configuration
/1	Mouse Systems Mouse - COM1
/2	Mouse Systems Mouse - COM2
/M	Microsoft Mouse - Bus Version
/M:1	Microsoft Mouse - Serial COM1
/M:2	Microsoft Mouse - Serial COM2
/M:D	Microsoft Mouse Driver

Appendix B — MIDI Troubleshooting

The **K5 Not Responding** status message is displayed on an OVERTONE screen whenever OVERTONE sends the K5 a request for patch data or machine ID, and the K5 does not answer within a reasonable time. This appendix is intended to help you find out why. The following table gives the six basic areas in which problems may occur. The sequence traces the path of the original request message through the MIDI network to the K5, checks the various K5 settings, and finally traces the response back to the PC.

If after checking all the problems in the table you are still not successful, call us and our technical support staff will try to help you. Make sure you have complete information on your hardware and software environment ready when you call.

AREA	CAUSES AND CORRECTIVE ACTIONS
MIDI adapter not initialized	OVERTONE may not have been able to initialize the adapter. We assume you have an MPU compatible adapter at port address 330H, interrupt request 2. If you have any other configuration, you must specify it using the **/I:type:port:irq** command line parameter. If you have already done this, you may have given the wrong port address or interrupt request. If your adapter works with other software, these are the most likely causes for unsuccessful initialization. Check the Owner's Manual and the switch settings on your adapter and make sure you've got it right. If the adapter doesn't work with other software either, you may have a hardware conflict with some other board in your PC that shares the same address or interrupt request, or the adapter itself could be defective.
Request never gets to the K5	MIDI OUT from the adapter must be connected to MIDI IN on the K5. A cable could be loose or defective. If using a patch bay, the routing may be specified incorrectly or the patch bay could be filtering System Exclusive messages.

PROBLEM	CAUSES AND CORRECTIVE ACTIONS
The K5 is "hung up"	The K5 may occasionally get confused during patch data transmission and stop responding. Turn the K5 off and back on again, then make sure the parameters are set as described below.
Bad K5 setup	This is the most common problem. Make sure the K5 is powered on. Press the MIDI button and then set the OMNI = ON, PGM = SINGLE, EXCLUSIVE TRS = ON, and EXCLUSIVE RCV = ON. Press the MIDI button again and set PGM = ON for both TRANSMIT and RECEIVE. Make sure the Memory Protect switch is OFF.
Response never gets to the PC	MIDI OUT from the K5 must be connected to MIDI IN on the PC. A cable could be loose or defective. If using a patch bay, the routing may be specified incorrectly or the patch bay could be filtering System Exclusive messages. Streams from a K5m and a controller keyboard could be merged incorrectly.
MIDI adapter not interrupting	OVERTONE depends on the MIDI adapter to interrupt it whenever MIDI data is available. If the interrupt request number was incorrectly specified, or multiple devices are trying to use the same interrupt request, OVERTONE may never know that the K5 has transmitted a response. Make sure the specified interrupt request corresponds to the switch settings on your adapter. If multiple devices are sharing an interrupt request, OVERTONE will chain to the interrupt handler(s) supporting those devices if the interrupt isn't from your MIDI adapter. However, we have no way of guaranteeing that those interrupt handlers will not leave the PC's priority interrupt controller disabled, possibly preventing further MIDI interrupts.

Appendix C — The FFT and Sample Files

This appendix gives some background on the FFT procedure and how it is used in OVERTONE to extract DHG spectra from sample files. It also contains some practical advice on using the sample processing features of OVERTONE.

FFT Definitions and Background

For our purposes, a *sample* is simply a digital recording of sound. A sample is made up of some number (the *sample size*) of *sample points* obtained by repeated observations of the audio signal level at a regular rate (the *sampling rate*). The duration of a sample is closely related to the sample size and the sampling rate. An example will make this clear. A sampling rate of 40 KHz means you are recording 40,000 sample points per second, or one every 25 microseconds. So a two-second sample would have to contain 80,000 sample points, and so forth.

The Fast Fourier Transform or FFT is a mathematical procedure which can analyze a selected portion of a sample (the *sampling window*) and determine the relative amounts of signal energy contained in each of a set of frequency ranges or *bins*. The number of bins produced by the FFT depends on the number of sample points in the sampling window. To illustrate, let us continue our example. Suppose we choose a sampling window containing 2048 sample points. At the 40 KHz sample rate, the sampling window would cover a 51.2 millisecond (2048 times 25 microseconds) piece of the sample. Since the FFT always produces half as many bins as there are sample points in the sampling window, our example would result in 1024 bins.

The frequency range corresponding to each bin depends on the number of bins and the sampling rate. The maximum frequency an FFT is able to determine is exactly half the sampling rate, or 20 KHz in our example. The frequency range for each bin is simply this maximum frequency divided by the number of bins, which comes out to 19.5 Hz. If you were to cut your sampling rate to 20 KHz, the maximum frequency would be 10 KHz, but the bin width would be 9.7 Hz. In general the FFT will usually produce the best results if you choose a sampling rate about two times the highest frequency you suspect is contained in the input signal.

To illustrate, suppose you were sampling the low string on a cello. This is note C1, with a fundamental frequency of 65.4 Hz. The 64th harmonic of this note corresponds to C7 with a frequency of 4186 Hz. You could sample this sound at 10 KHz and cover the full spectrum of the sound, yet each bin of a 1024-bin FFT would cover a frequency range of only 4.9 Hz. Thus most of the energy in the fundamental would be shown in the 13th bin, the first partial in the 26th bin, and so on.

FFT vs. DHG — Harmonics and Noise

To support the Kawai K5, however, a simple FFT is not enough. The DHG component of the K5 sound generator requires a spectrum giving the relative power levels of the fundamental frequency and each of the 62 (or 125) partials. The FFT gives us the power distribution in a set of bins whose width depends on the sampling frequency, but this tells us nothing about the fundamental frequency of the sampled sound. To create a DHG spectrum, we need to know the fundamental and then perform a mathematical transformation and scaling on the FFT results. (We found that 1 dB corresponds to roughly 3 units on the DHG scale)

If you don't tell us anything about the sample, OVERTONE will attempt to determine the fundamental frequency by analyzing the FFT output, and will use this to calculate the DHG spectrum. If you tell OVERTONE which note the sample corresponds to, we will use that note as the fundamental. This all works fine if your sampled sound is really made up of a fundamental and a set of harmonically related frequencies.

But what if it's not? There are a lot of useful sounds that don't fit this neat pattern. By definition, pure (white) noise contains power at all frequencies. White noise rarely occurs naturally, but most percussive sounds and a lot of other interesting effects contain one or more frequency bands within which all frequencies, not just the harmonics, are present. Other sounds, like bells for example, contain distinct frequencies that are not necessarily harmonically related. The problem is that the K5 can only deal with harmonic frequencies and has no internal noise source. How do you synthesize a sound that has a non-harmonic or noise spectrum using the K5?

In OVERTONE, if you tell us the sampled sound is non-harmonic, we map the entire FFT spectrum into 63 (or 126) bins and copy the bins directly to the DHG harmonics. The frequency of the last bin is one half the sampling rate, and the frequency of the first bin is this value divided by 63 (or 126). The DHG simply represents the raw FFT results. If you play the note corresponding to the first bin (we tell you what it is) you should get an approximation to the original sound. But because the K5 is only playing harmonic frequencies, you lose all the frequencies in between.

Don't despair, there are a few tricks you can try. If the spectrum rolls off at the higher frequencies, you can specify some lower note, tell OVERTONE to use this as a "fundamental" and recalculate the FFT as if it were harmonically related to that low note. You can assign the same spectrum to both S1 and S2, and then detune to fill in some of the spaces. You can even build a multi patch, and with detuning, fill in even more of the spectrum.

FFT vs. Time — Envelopes and Spectra

Before your synthesized sound will resemble the original sample, you'll have to get a suitable DDA envelope. OVERTONE lets you extract the envelope from your sample file and use this as a guideline. Alternatively, you can copy a DDA from some other patch that you know is similar to the sampled sound.

You have probably seen the 3-D FFT diagrams used to show the spectrum of a sound as it changes over time. In OVERTONE, we extract and analyze a 2-D FFT spectrum at as many individual points in time as you want. But for the K5, you will have to pick one (maybe even do some editing) to find one that best represents the overall sound, and then use the K5's DHG envelopes to tell the K5 how the spectrum changes over time.

For the DHG envelopes, we suggest you start by looking at the DDA envelope to determine the overall duration of the sample and to identify four or five points at which you want to see a spectrum. Get the spectrum corresponding to the initial attack into the S1 DHG. Now get the spectrum at a different time point into the S2 DHG. On the DHG screen, you can show the S1 and S2 spectra interspersed using the TWIN/BOTH option so that you can compare them. After you've done this a few times, you should have a reasonable feel for how the spectrum changes and can use this information to program the DHG envelopes and assign them to ranges or individual harmonics. You might also try putting the spectrum corresponding to the attack phase of the sound in S1, and the basic overall sound spectrum in S2. Then use the separate S1 and S2 DDA's to crossfade the two.

In Conclusion ...

We have tried to provide some essential background information on the FFT and a few suggestions on using OVERTONE's sample analysis functions. As you can imagine, we have barely scratched the surface of an extremely complex subject. If you are up on your advanced calculus and are interested in the FFT, you can get more information in **The Fast Fourier Transform** by E. Oran Brigham, or **Digital Spectral Analysis with Applications** by S. Lawrence Marple, Jr. Both are published by Prentice Hall, Englewood Cliffs, New Jersey.

For information on synthesis techniques we highly recommend **A Synthesist's Guide to Acoustic Instruments** by Howard Massey, Alex Noyes and Daniel Shklair, published by Amsco Publications, New York, New York. This book discusses every major class of acoustic instruments and how to synthesize them, including 3-D spectrum displays needed to define your DHG parameters. As you read how these sounds have to be handled on subtractive and FM synthesizers, you will appreciate the simplicity and elegance of additive synthesis on the K5.

Another good resource is **The Secrets of Analog and Digital Synthesis** by Steve DeFuria, published by Hal Leonard Books, While this book only devotes two pages to additive synthesis per se, the basic techniques for selecting waveforms and using envelopes and filters serve as great starting points for sound design. Just stash a sawtooth or square in the DHG and put together the rest of the sound. Then make the sound come alive by manipulating the DHG and its envelopes. The K5 gives you a whole new dimension in sound design.

Both of these books are available in music stores or from the **Mix Bookshelf Catalog**, Mix Publications, Emeryville, California.