

## SndSampler™ Version 2.8

By A. Glenn and M. Q. Edison

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SndSampler™ version 2.8 is **shareware**. If you like it and want to keep it, please register by sending \$12 in U.S. funds (cash OK, but we're not responsible if it gets stolen!) and a self-addressed, stamped envelope (if possible) to: Alan Glenn, 4516 Cruz Drive, Midland, MI 48642, U.S.A. Comments and bug reports are also welcome. If you report a reproducible bug that we haven't found yet, you'll get **free registration!** When reporting bugs, try to be as specific as possible, i.e. what were you doing exactly, where were the start and end pointers, was the sound compressed, what was the sample size and number of channels, what kind of Mac do you have, what system version, etc. Send bug reports by e-mail to **alang@mediastation.com** for faster response! If you have access to the internet, the latest version of SndSampler™ can be found at **<http://gramercy.ios.com/~ronday/>** often much sooner than it appears on the Mac archives and on-line services.

Again, SndSampler™ is shareware. **You are allowed to use it on a trial basis for 30 days.** After that, you must either register or delete all copies of SndSampler™ in your possession. You are also allowed to freely distribute UNREGISTERED copies of SndSampler™. As a matter of fact, we strongly encourage this. However, you must include all accompanying files and the original folder. And it probably goes without saying that you may not alter any of the materials which accompany SndSampler™, or the application itself.

### How To Register

1. **Fill out the handy form** at the end of this document.
2. Please use the form if at all possible.
3. The form makes it easy for you to provide us with the information we need. Please use it if you can.
4. Send \$12 in U.S. funds to the above address. Please include the registration form also.
5. Include a **self-addressed, stamped envelope** if you want to get your registration code by mail.  
(If you can't include a SASE, please add \$1 U.S. for postage and handling.)
6. That's all you need to do to get registered and get your free sounds!

### Network Notes

As of this version, SndSampler™ should not be launched over a network, i.e. the actual application should reside on the hard drive of the computer from which it is launched. At any rate, your registration is for you and you alone and does not permit multiple simultaneous users. Each new user must register his or her own copy.

### Quick Reference: Changes From Earlier Versions

- Supports AIFF files.
- Now can extract sound tracks from QuickTime movie files (requires QuickTime 1.6 or later).

- Now can read sound directly off an audio CD (requires QuickTime 1.6 or later).
- Allows recording directly to an AIFF file.

- Can import Windows .wav files and possibly others (requires QuickTime 2.1 or later).
- Contains special code to work with the Pro Audio Spectrum PAS16 sound card.
- The display window can now be resized, and is separate from the stat window.
- New functions: Pitch Bend, Import, Resample, Play File.
- Improved functions: Dynamic Pan, Flange.
- The Invert function has been removed, but you can accomplish the same thing by amplitude x -1.
- Now saves the input device parameters and allows you to choose input sources.
- Clicking on the Sound Length number will display it and the start and end points in units of time.
- Can fix corrupted sounds.
- As always, miscellaneous bugs have been swatted, sprayed, squashed, and stomped on.
- BE CAREFUL: sometimes we change the default buttons on alert boxes.

### Introduction

SndSampler™ is the ultimate tool for recording and editing Macintosh 'snd' resources. SndSampler™ is simple enough for the novice but contains powerful features which will appeal to the sound-editing professional. SndSampler™ works with 8- or 16-bit, mono or stereo Macintosh sound files. SndSampler™ should work on any Mac running System 7.0 or later. It is helpful, but not necessary, for your Mac to have a sound input device. Of course you won't be able to record sounds without a sound input device, but you can still edit existing sounds.

Please note: if your Mac doesn't have 16-bit audio hardware, you must have Sound Manager 3.0 or later installed in order to play 16-bit sounds. Otherwise your Mac will emit horrible screeching noises. System 7.5 and later have Sound Manager 3.0 built-in. Also, some Macs don't offer stereo playback. Many models will only play the left channel of a stereo sound. Check to see what your Mac hardware offers if you are having problems with stereo sounds. If you don't have stereo output capability, Sound Manager 3.0 will mix the left and right channels during playback. If you haven't already, you really ought to get yourself a copy of Sound Manager 3.0. Or you can get System 7.5 (although we think it's too bloated—but that's another story). As of SndSampler™ version 2.5, the latest version of Apple's Sound Manager is 3.1.

Sample rates of up to 65,535 Hz are supported by SndSampler™ and the Mac OS. Sound resources can be a maximum of 16 megabytes (we've tested this—Apple has set a 16 megabyte limit on resources) and AIFF files can be a maximum of 2 gigabytes. 2 gigs is a limit imposed by the Mac OS (it's the maximum positive value represented by a four-byte long integer, for you propeller heads out there). That should be more than enough, though: it's equivalent to over three hours of CD-quality stereo sound, which is much more than you should ever need to store in a single file.

SndSampler™ is shareware. If you like it and want to keep it, please register by sending \$12 in U.S. funds (cash OK) and a self-addressed, stamped envelope (SASE)—if you want your registration code by mail—to: Alan Glenn, 4516 Cruz Drive, Midland, MI 48642, U.S.A. If you can't send a SASE (and don't have e-mail) because for example you live in a country other than the U.S., please add \$1 U.S. for postage. Please support the shareware concept by registering. Comments and bug reports are also welcome.

Registering for version 2.x will also get you some nifty **FREE SOUNDS** to use with SndSampler™!

### Navigating The Registration Dialog

When you register you will receive a unique code which you can enter in this dialog. If you enter the correct code here, the dialog will no longer appear when you launch. If you launch SndSampler™ from a locked disk, however, the registration information will not be recorded and the dialog will continue to appear. After you get your code

correctly entered, make a backup copy of the registered software. That way you won't have to enter it again if your Mac goes whacko and eats up SndSampler™.

**WARNING:** do not attempt to defeat this dialog by deleting certain resources from the application's resource fork. These resources are essential for the proper operation of SndSampler™. Without them, the program may unexpectedly quit at any time.

There will also be an annoying little dialog which pops up sometimes when you make a significant menu choice. This is intended to encourage registration, since after you register the annoying little dialog doesn't pop up any more. Again, do not attempt to get around this by deleting the dialog resource, because without it the application may unexpectedly quit at any time.

### **Why Doesn't SndSampler™ Have Lots of Fancy Graphics?**

SndSampler™ is intended to be a tool, not a game. It doesn't need a lot of fancy graphics. All it needs to do is get the job done. Many applications will use lots of unnecessary graphics to make the windows look pretty. These graphics are disk and RAM hogs. We have kept out the graphics to keep the application size as small as possible and also to give you as much free RAM as possible to work with your sounds. We think you'll agree that this is more important than making pretty windows. Another reason not to put a lot of extaneous artwork in the program is so that it will be useable on a black-and-white Mac. Which it is.

### **General Info**

SndSampler™ is an application program which allows you to record and edit Macintosh sound ('snd ') resources. SndSampler™ will allow you to extract sound resources from any kind of file, including applications. You can also save your sound resources into any kind of file, including applications. Starting with version 2.2, SndSampler™ also supports the AIFF sound file format. SndSampler™'s "native" format is still the 'snd ' resource, however.

### *The Windows*

SndSampler™ has two main display windows: the sample window and the stat window. The sample window is by default the one on the top (which is where we prefer to keep it). The first thing you see in the sample window is a big rectangle, which is for viewing a graphical representation of your sound plotted as amplitude versus time, something like you might see on an oscilloscope. (When displaying a stereo sound, SndSampler™ will alternate between drawing the left and right channels, so what you see will be kind of an average of the stereo signals.) You can resize this window however you like. Sometimes when you change the size of the window the sound will show a different-looking waveform, especially when you make the window smaller. This works best on musical instrument samples. Try extracting some musical instrument sounds from QuickTime Musical Instruments (available with QuickTime 2.0 and later) or from a game or from some of those new After Dark™ screen-saver modules that play music. Resizing the window can reveal the many different symmetries inherent to the particular sound being viewed.

Below the sample window is the stat window, which displays the sound's numerical descriptions. First, the stat window shows you how many frames are in the entire sound. A frame can be thought of as one digital sample of an analog sound, taken at a specific instance in time. For 8-bit mono sounds the sample frame size is 1 byte (1 byte = 8 bits). For 8-bit stereo the frame size is 2 bytes (the first byte for the left channel, the second byte for the right channel). For 16-bit mono the frame size is 2 bytes (two bytes for one sample). For 16-bit stereo the frame size is 4 bytes (you get the idea). The sound length value will not change until you do something which changes the size of the entire sound, either by saving it or by doing some other operation like echo or reverb. If you click on this number, it will change to display the sound's playing time, either in milliseconds (millisecond = ms = 1/1000th of a second), or, if it is long enough, in seconds. Click again to return to the frame display. The start and end points will also convert to time when you click on the sound length.

## SndSampler™ / 5

Next, going down, the start and end positions of the sample are given in sample frames. The portion of the sound which falls between the start and end positions is called the “selected portion” of the sound. When you save, the selected portion of the sound will become the new sound. In other words, you will only be saving the selected portion of the sound.

Next comes the sample rate. This is how many digital samples were taken of the analog sound signal per second. kHz = kilohertz = thousand samples per second. Lowering this value makes the sound become slower and deeper and makes the playing time longer, while raising it makes it chipmunk-like and makes the playing time shorter. The sampling rate can be no higher than 65 kHz. Changing the value in this box simply changes the rate at which the sound will be played back. It does not affect the sound data in any way. Also, note that when you enter any of the values 5, 7, 11, 22, or 44, SndSampler™ will set the sample rate to Apple’s pre-defined values of 5563.6363, 7418.1818, 11,127.27273, 22,254.54545, and 44,100 Hz, respectively. For more information on how to change the sample rate, see the Header and Resample sections below. Note that when you change the number displayed here, it will be immediately changed in the sound. Other changes, such as the format, don’t take effect until the sound is saved.

Next comes the resource size. This is the actual disk space, in bytes, which would be taken up by your sound if it were to be saved immediately as a sound resource file. The AIFF file size will be similar. Notice how it changes when you choose to compress, and how it changes continuously when you drag the start or end pointer.

Now going up and to the right the stat window shows what format sound resource you are dealing with. This can either be format 1 (Normal), or format 2 (HyperCard). Apple considers format 2 sounds to be obsolete. (We have found that the Sound Managers 3.0 and later will sometimes not play a HyperCard sound correctly, especially if it is 16-bit stereo.) The actual format of the sound in memory will not be changed when you click one of these buttons. It will only be changed when the sound is saved.

Next we have the compression option. We recommend that you do not compress your recordings, because when compressed they sound just plain awful. Apple’s 3:1 and 6:1 compression algorithms are destructive, or “lossy,” i.e. they discard sound data, which makes the sample sound lousy. Only 8-bit mono sounds can be compressed by SndSampler™. When a compressed sound is opened, it must be expanded before it can be edited. Even if it cannot be expanded, however, you can still Save As and Save In. As with the format, the sound data will not actually be compressed until you save.

The window’s title bars are also informative. The title bars show the name of the ‘snd ’ resource (usually the same as the name of the System Sound File from which it came, or, in the case of an AIFF, the file name), and the bit resolution and whether the sound is mono or stereo.

If the windows ever start acting funny and you can’t get to the resize icon or something, simply trash the file “SndSampler™ Prefs” in the Preferences folder inside your System Folder.

### On the Importance of Free Disk Space

It is important that you launch SndSampler™ from a disk with plenty of free space. There are two reasons for this. First, SndSampler™’s Undo function works by saving the sound to disk before altering it, thereby allowing you to restore the unaltered sound by reading it back from disk. If there isn’t enough free space on the disk to save the sound, the Undo function will not work. The second reason is that in order to make the most effective use of its allotment of RAM, SndSampler™ must sometimes write the sound out to disk, rearrange the application RAM, and then read the sound back in. So if there isn’t very much room left on the disk, SndSampler™ won’t be able to make the best use of its RAM. A good rule of thumb is that you should launch from a disk with at least three times as much free space as the size of the sounds you are going to work with. So, if you’re going to work with a 100K sound, you should have at least 300K free on the disk. You might be able to get away with less free space, but we recommend this amount to be safe.

### **Menus**

## *File*

### New

This function allows you to record a new sound. First, you will see the input device dialog, which offers you a number of options which depend on the chosen input device. If the input device dialog does not seem to adequately display or understand the features offered by the chosen input device, click Bypass. When this button is pressed, SndSampler™ will not attempt to alter the input device parameters and the input device will remain in its default state. Normally, however, you should click OK.

One particular option of interest is the “Record directly to file” check box. If you check this box, then you will have to specify a file to which the sound input device will write the sound data. The file will be AIFF format. This gives you the ability to record more sound data than you can store in RAM. When recording to the file is finished, SndSampler™ will attempt to open it. It may not be able to if you have recorded more data than can fit in RAM. When recording really huge sounds that won't fit in the available RAM, we recommend the following procedure. First, record the sound directly to a file. Then restart your Mac with virtual memory turned on, so that you can edit the sound file you have just recorded (the sound must fit into RAM in order for it to be edited). Of course you could simply turn on virtual memory from the start, which has the effect of fooling SndSampler™ into thinking it has enough RAM to record a really huge sound. We don't recommend this, though, because the overhead involved in using virtual memory may cause you to lose some sound samples on slower Macs.

Power Mac notes: we have done some testing on a Power Mac 8500 and it appears that this machine will not record compressed samples, even though the OS tells SndSampler™ that it *will* record compressed samples. Basically, SndSampler™ asks the Mac OS whether the input device can record compressed samples, and, in the case of the 8500, the OS replies “Yes” even though the input device will not record compressed samples. So if you click one of the compression buttons on a Mac of this type, it won't record compressed samples. The 8500 (and possibly others) also does not appear to support Automatic Gain Control. The AGC check box will be dimmed on those Macs which do not support it.

After the input device dialog is gone, you will see the sound recording dialog, with three buttons marked in tape recorder fashion. The far left button with the red circle is the record button. Press the record button to begin recording. The middle button is the pause button. Press the pause button once to pause recording, and press it once again to resume recording. The far right button is the stop button. Press this when you are finished recording. If you are recording directly to a file, there will be a 3 second pause before you can click the OK button. This is to allow Apple's Sound Manager time to finish writing all the sound data to disk before proceeding. In addition, the input level is shown directly above the buttons. Only one input level bar will be active if you are recording mono sound. Keyboard shortcuts are: press the space bar to begin recording; once recording has commenced, press the space bar to pause and re-start recording; and press the escape key to stop recording.

Be sure to turn off speech recognition before attempting to record a sound.

### Open

Allows you to load a 'snd' resource from any file's resource fork. Also allows you to open the following file types: AIFFs, QuickTime movies, and audio CD tracks. (QuickTime 1.6 or later must be installed for you to open QuickTime movies and audio CD tracks. However, testing has shown that QuickTime's conversion capabilities are less than robust in versions earlier than 2.1. We recommend that you upgrade.) Note that if one of these file types contains sound resources in its resource fork, these will be opened instead of the sound data

in the data fork. If there is more than one 'snd ' resource available, you will be presented with a dialog box which allows you to choose one resource to load. The resources are listed in the order in which they appear in the resource file, **not** in order of resource ID. So if you open a sound, alter it, and then save it, it will move to the end of the list the next time you open the file. The dialog box features a Play button, which allows you to listen to a sound before loading it. To play the sound, SndSampler™ calls the Mac OS routine SndStartFilePlay. Unfortunately, this routine is a little buggy, and will not always play a 'snd ' resource from disk. If the sound is corrupted, it may even crash the system. What's worse is the fact that Apple has mentioned this routine's bugginess in Inside Macintosh, and, as such, probably has no plans to fix it. Also, if your Mac doesn't support play from disk, the Play button will be disabled. Your Mac must have the Apple Sound Chip to support play from disk. Another reason the button might be disabled is if there isn't enough free

memory to play the sound from disk. Also, as a convenience (i.e. so you don't have to go to ResEdit), you are allowed to delete sounds from the file's resource fork. Be careful when deleting a sound, however, as the action cannot be undone, and the sound will be gone forever.

Incidentally, the key shortcuts work a little differently here than elsewhere in the program. Pressing the space bar is the same as clicking the Play button. Then, if you press the space bar while a sound is playing, the sound will stop (not restart from the beginning). If you press the escape key, the results will be the same as if you had clicked the Cancel button. The same goes for cmd-period: it's as if you clicked the Cancel button. Any sounds which are playing will of course stop when you leave this dialog.

Beginning with version 2.1, SndSampler™ is also able to fix corrupted sound resources. It can't always fix every problem, but it can fix a lot of the common problems we have encountered. If SndSampler™ finds a problem with the sound, it will ask you if you want to fix it. If you choose to fix, it will do its best to correct whatever problems may exist. If the sound doesn't seem right after it has been fixed, DON'T SAVE! This means that SndSampler™ wasn't really able to fix the sound, but only thought that it was able to. If you know your way around 'snd ' resources, you may be able to use the Hex Editor (see below) to fix a corrupted sound. AIFF's should never be corrupted, because they are converted to valid 'snd ' resources when they are opened. (Of course, the AIFF file could be corrupted, but SndSampler™ will tell you if it is before the sound is loaded into memory.)

You can also drag and drop any file onto the SndSampler™ icon and SndSampler™ will attempt to open the file.

### Import

The Import function allows you to try to convert an arbitrary file to one of the sound file types that SndSampler™ supports. Import will bypass any 'snd ' resources which may reside in the resource fork of the file you are converting. The Import function is based on QuickTime's ability to convert many different files into movie files. Usually, the file will first be converted into a QuickTime movie. Then you have the option of converting the movie into an AIFF or a System 7 sound file. QuickTime 2.1 allows SndSampler™ to convert Windoze .wav files and also others. Apple is always expanding QuickTime's conversion capabilities, so when in doubt, try to import! Note: QuickTime 1.6 or later is required to import files, and also to open QuickTime movies and audio CD tracks. QuickTime 2.1 or later must be installed in order for you to convert Windoze .wav files. Note that you can use SndSampler™'s Import function to convert any file into a movie file, as long as QuickTime allows it. For example, you could convert a text file into a QuickTime movie using SndSampler™'s importing capabilities. You couldn't open the resulting movie file with SndSampler™, because it wouldn't have an audio track in it (and SndSampler™ only works with audio data). But you would still have the QuickTime movie which you made from the text file. Try it!

If you drag and drop a file onto the SndSampler™ icon, the application will attempt first to open any 'snd ' resources contained inside the file. Then, if there aren't any sounds inside the file, and if the file is an AIFF, a QuickTime movie, or an audio CD track, it will open the file as described above. Finally, if these procedures don't come up with a useful result, SndSampler™ will attempt to Import the file using QuickTime's file importing capabilities.

### Save

This function will save the selected portion of the sound in the current file. The current file is the file you last opened the sound from or saved the sound as. If the file was opened from an AIFF, it will be saved as an AIFF. The Save function does not ask you to specify a filename or a folder. It just goes ahead and saves your sound.

There will be a warning alert, however, if the current file is not a System Sound File (type 'sfil'), i.e. one of those files which have a speaker icon on the desktop, or if it is not an AIFF. This is so you don't accidentally overwrite a critical sound which you have extracted from a game or other application. Applications have a curious way of crashing if you're not careful when you change their resource forks.

Note: because saving the sound may change it, you are allowed to Undo the Save. When you Undo the Save, though, the contents of the file you saved in are not changed. The home file, i.e. the currently active sound file, will still hold whatever sound data you saved into it. If you Undo a Save, only the sound itself will be restored to its state immediately previous to the Save. Also, when you Redo the Save, the file contents are not altered. Only the sound resource itself is changed back to the way it was immediately after the Save.

Unknown sounds cannot be saved as AIFFs.

### Save As

Saves the selected portion of the sound as either a System 7 Sound File or an AIFF file. The specified file becomes the current file. You may Undo a Save As. Note that the previous home file becomes the new home file. So if you open file X, change it, and Save As file Y, when you choose Undo Save, the home file will revert to X. File Y will still exist, and will still hold the data you saved into it.

### Save In

This function allows you to save the selected portion of the sound in another file's resource fork. When this function is selected, you will have the option of giving the 'snd ' resource a new name, changing the resource ID, and also of specifying whether or not the new resource should replace an existing 'snd ' resource with the same ID. If you don't want SndSampler™ to replace a resource with the same ID, then if there is already a sound there with the same ID it will choose a new ID at random which is not used by any other 'snd ' resource in the chosen file. Note that Save In does not alter the current sound. The resource which has been saved will be altered, but not the original sound. Neither does Save In change the home file. Thus if you open a sound from a System Sound File, alter it, and then choose Save In and specify a game application, the home file will remain as the System Sound File. So when you next choose Save, you will be saving to the System Sound File, not to the game.

### Revert To Saved

Restores the sound to its state immediately following the last Save or Save as. Note that if you have never saved the sound, e.g. you pasted in a whole new sound from the clipboard, you won't be able to Revert because the sound has never been saved.

### Quit

Quits the application. When quitting, SndSampler™ will attempt to delete the undo file (unless it knows that there was an Undo error). It will also attempt to copy the application's clipboard sound to the Finder's clipboard. If the clipboard sound is dangerously large, you will get a warning alert which allows you to tell SndSampler™ not to copy the sound to the Finder's clipboard (unless you turn off the warning with the Clipboard option). Note that unless you allow the warning dialog, the clipboard sound will be copied to the Finder's clipboard when you quit, even if you choose not to have the clipboard copied on an application switch. The only way to stop it from being copied is to allow the warning dialog, which then lets you choose not to copy to the Finder's clipboard when you quit.

### *Edit*

### Undo

The Undo function allows you to restore the sound to its state just prior to the last Undo-able operation (most operations are Undo-able). The method behind this function involves saving the entire sound in the data fork of one of two special invisible undo files (imaginatively titled "SndSampler™ Undo 1" and "SndSampler™ Undo 2") whenever an Undo-able operation is performed. Then, when Undo is chosen, the sound will revert to its state just before the last Undo-able operation was performed. When you Undo, the main window control buttons will be set so as to reflect the state of the sound data as it appears in the file in which it was last saved. This is to help you remember what the sound was like when it was saved. As an example, suppose you open a sound which has been saved at 3:1 compression, click on No Compression, then do something which is Undo-able, such as change the amplitude. If you then decide to Undo Amplitude, the compression buttons will indicate 3:1 compression, rather than No Compression as you selected just prior to the Undo-able operation. This is because

3:1 is how the sound was originally saved. The control buttons (both compression and format) don't really do anything to the sound until you save. In addition, the start and end pointers will be restored to where they were just prior to the Undo function. After you Undo an operation, you have the ability to Redo it. The text of the Undo menu choice will change from "Undo xxx" to "Redo xxx."

If for some reason SndSampler™ says it can't delete the existing undo files when it starts up, you'll have to get rid of them yourself. SndSampler™ tries to delete these files when it quits and, if they're still there, when it starts up. If it can't delete them, it will try to make them visible so you can drag them to the trash. However, there is the possibility that SndSampler™ won't be able to make them visible. In this case, just use ResEdit or something like that to make the files visible again (use Get File/Folder Info in ResEdit), and then drag the visible undo files to the trash. If you

don't have ResEdit (although all Mac owners should have it) and can't find any other way to make the undo files visible, you'll have to remove all important files from the SndSampler™ folder and then drag the whole folder to the trash. Note that the Undo function will be inoperable if SndSampler™ is launched from a locked disk. In addition, the Undo function won't work if there isn't room on the disk to store the undo data. It is not a good idea to launch SndSampler™ from a disk with not very much free space on it.

If you don't like the way the Undo operation works, you can turn it off. Look at the Options menu for more details. Why would you want to turn it off? Well, if you're working with really huge files, it might take a lot of time to save the whole sound to the undo file. In this case you might want to turn Undo off. In fact, when you start working with really big sounds, the time spent saving the undo data will probably be much longer than the time taken to do whatever operation is being performed on the sound. Why does SndSampler™ save the whole sound, you ask? Why doesn't it just save the part which is being changed. A good question. The simple and truthful answer is that it's much easier to program it to simply save the whole sound. We may change this in the future.

Special note: **DON'T MONKEY AROUND WITH THE UNDO FILES!** Sure, they show up when you are opening a file. And if you try to open them with SndSampler™, it will tell you that there aren't any sound resources in the file. Which there aren't. But the undo files are extremely important to the proper operation of SndSampler™. So don't go opening them up with other applications or storing 'snd' resources in them. You can't do anything useful with the undo files, but you sure can do some destructive things. So don't.

### Cut, Copy

These two functions copy the selected portion of the sound to the **application's** clipboard. This sound data can then later be inserted or mixed at a different point in the same sound, or in another sound altogether. The clipboard sound data can also be transferred to the **Finder's** clipboard, which will then make it available to other applications which deal with sound resources, such as ResEdit. Cut and copied sounds are always format 1, and are always uncompressed. So if for example you open a 3:1 compressed format 2 sound, then copy it, then delete the entire sound, and then paste the copied sound, it will be format 1 and uncompressed. To make it format 2, 3:1 compressed again, just click the appropriate buttons in the stat window and then save (since it won't get compressed and the format won't be changed until you save). Another point of interest is that the sound header of the copied sound may be different than that of the original sound. The cut or copied sound will always have the minimum required header, i.e. if you open an 8-bit mono sound which has an extended sound header, the cut or copied version of the sound will have a standard sound header.

Please note the following: using your clipboard sound in another application will require that the sound be copied to the Finder's clipboard. This will occur when you switch applications, and also when you quit SndSampler™ (unless you specify otherwise—see the Options menu below). The Finder's clipboard is not intended to hold a large amount of data, however, and the Mac's system software is not prepared to deal with a large clipboard.

In particular, **if you copy a large sound (or large anything) to the Finder's clipboard, low-memory applications may crash after launch.** For example, if you copy a 500K sound to the Finder's clipboard, and then try to launch an application whose memory allocation is set to around 500K, the application may crash, or even crash the system. SndSampler™ will warn you when you are copying a dangerously large sound (>200K) to the Finder's clipboard. You can use the clipboard options to select if and when you want to copy the application's clipboard to the Finder's clipboard. Note that you can clear the Finder's clipboard with the appropriate choice from the Options menu. (Programmer's note: the Clear Finder Clipboard function simply calls ZeroScrap.) As of version 2.4, SndSampler™ can no longer warn you about copying large sounds when

you simply switch applications. It will only warn you when you quit.

Paste

This function should actually be called Replace, but in the interest of compatibility with other applications it has been named Paste. The selected portion of the sound is replaced with the clipboard sound. If there is no existing sound, this function will take the clipboard sound and make it the existing sound.

Select All

Will select the entire sound.

Delete

Will delete the selected portion of the sound. It's the same as pressing the delete key.

Insert Start, Insert End

These functions will insert the clipboard sound at either the start or end points of the existing sound, respectively.

Mix Start, Mix End

These functions will mix the clipboard sound with the existing sound at either the start or end points of the existing sound, respectively. The resulting sound will be lengthened if necessary.

Play Clipboard Sound

Lets you listen to the clipboard sound, in case you've forgotten what it is. You can't do anything else while the clipboard sound is playing. Press the escape key or cmd-period to stop the clipboard sound from playing. Clicking the mouse will also stop playback.

Clear Clipboard

Clears the application's clipboard. This will make more memory available for other operations, because any sound in the application's clipboard is stored in RAM. If you are getting inexplicable "out of memory" problems, try clearing the clipboard. Sometimes there can be something in there you didn't expect, since SndSampler™ will load any sound in the Finder's clipboard when it starts up.

*Sound*Play

Plays the selected portion of the existing sound. You have to wait until the sound is finished until you can do anything else. You can stop the sound at any time by pressing the escape key, hitting cmd-period, or clicking the mouse. You can also play the sound by pressing the **space bar**. If you press the space bar while the sound is playing, the sound will start over again from the beginning. A thin moving line will show you the progress of your sound when it is playing.

Play File

Plays a sound file of your choosing. The file must be an AIFF or a System 7 sound file (sfil). The sound will not be loaded into RAM, which is good for playing a sound which is too big to fit into the available RAM. And currently loaded sounds will not be affected. While the file is being played, a small dialog will pop up which shows some information about the sound in the file. The dialog will be up for a minimum of 3 seconds, even if the sound is shorter than that. Note that you will not get to see all the information about a System 7 sound file (sfil) unless you have Sound Manager 3.0 or later installed. A shortcut for this menu choice is **cmd-space bar**.

Amplitude

Allows you to multiply or divide the amplitude of the selected portion of the sound by an amount that you type in. Use whole numbers with no decimal points for the least distortion. You can use decimal points if you want, however. The amplitude function allows you to save three

of your favorite parameters. The first two choices in the submenu are predefined to “times 2” (cmd-2) and “divide by 2” (cmd-1, think “1/2” to remember it). The next three are yours to define. You can change the names of these user-definable functions to make it easy to pick the one you want from the submenu. The first user-definable function has a command key (cmd-G, think “Gain” to remember it) associated with it. You’ll probably want to put your most often-used amplitude factor here, so you can invoke it with a quick keypress.

### Normalize

This function will multiply your sound’s amplitude by the largest value it can without causing clipping. You can choose to only multiply by integer values (for no distortion) or fractional values (which will give some distortion but which will better increase the amplitude). The multiplication factor will be shown before the sound is redrawn. If the sound’s amplitude could not be increased, you will hear a system beep and the sound will not be altered. Note that this function only works on the selected portion of the sound.

### Fade In

Ramps the sound's relative amplitude from 0 to 1 over the selected portion. So, if you want to fade in the first 200 samples of the sound, set the start pointer at 0, the end pointer at 200, and choose Fade In. Then you can restore the end pointer to its previous position. Note that you should **select only the portion that you want to fade**. If you leave the entire sound selected, then the entire sound will be faded. This may take some getting used to. The command key for this is "U," for "Up."

### Fade Out

Ramps the sound's relative amplitude from 1 to 0 over the selected portion. Otherwise, works identically to Fade In. This one's command key is "D," for "Down."

### Zero Endpoints

This function reduces to zero volume the first and last sample of the selected portion of the sound in order to help eliminate clicks and pops. Then, to help even more, it takes the next respective sample and adjusts it so the sound's first (or last) three samples form a linear ramp to zero. This function won't get rid of the click the Mac sometimes makes when turning on or off the sound circuitry. A good way to see if there is a click at the beginning or end of your sound is to play it several times in quick succession (pressing the space bar while the sound is playing will start it over from the beginning). If the click isn't always there, then you know it is not due to your sound. Another good way to get rid of clicks is to do a very small fade in at the beginning and a very small fade out at the end.

### Extend

Allows you to add zero-amplitude samples to the end or the beginning of the sound. Note that the extra samples will be added at the *very* beginning or *very* end, *not* where you have set the start and/or end pointers.

### Header

Allows you to edit certain information in the 'snd ' resource header. In particular, it allows you to enter a more exacting sample rate than in the sample rate box on the main window. You may enter a number which includes one decimal point. Note that this will only change the rate at which the sound is played back. The sound data is not altered in any way. Also note that there is possibly an important parameter left out: the AIFF sample rate available in compressed and extended sound headers as an extended floating-point value. Not to worry, however.

SndSampler™ fills in this parameter based on what you have entered in the sample rate box. Now, you can also change the type of sound header. Standard sound headers are allowed only for 8-bit mono sounds, while Extended and Compressed headers will support 16-bit and/or stereo sounds, although a Compressed header is required for a compressed sound. Changes to the header type will take effect immediately. Note that when a sound is copied to the clipboard,

a new header is created for it. This header will be whichever is most appropriate for the sound data. In other words, if an 8-bit mono sound is copied to the clipboard, it will have a Standard sound header. If any other type of sound is copied, it will have an Extended sound header (it won't be a Compressed sound header because clipboard sound data is never compressed). Then, if this sound later replaces the whole existing sound, the new header type will reflect whatever it was in the clipboard. Other operations do not change the sound header. For example, if a 16-bit sound is downsized to 8 bits, the header will not change from Extended to Standard: it will remain Extended. Conversely, though, if you upsize an 8-bit sound with a Standard sound header, the header must become Extended, since Standard sound headers do not support 16-bit sound data. Confused? You're not alone.

### Resource

This function allows you to alter the sound resource ID, the sound resource attributes, and also to modify the sound channel initialization option and the sound command. For more information on initialization options and sound commands, see Inside Macintosh: Sound. Most users will only want to change the ID and won't need to adjust the other parameters. We recommend that you always set the initialization option to zero (Clear) and the sound command to a bufferCmd. The resource ID should probably be somewhere from 128 to 32767. **DON'T** set the resource ID to zero. The Mac OS will not allow you to double-click on a sound resource file which has a resource ID of zero. (This is probably because it uses the much-maligned SndStartFilePlay procedure—described above—and this procedure will not play a resource of ID 0.)

### Hex Editor

The hex editor allows you to alter any byte in the sound resource. (You can't edit AIFF file data with SndSampler™.) **BE CAREFUL!** You can easily muck things up very badly if you don't know what you're doing. You can edit any sound with the hex editor, even if SndSampler™ can't decode it. (This of course allows you to fix it if you know your way around 'snd' resources.) Use the delete key to delete a data byte, and use the tab key to insert a new data byte immediately prior to the selected byte. The first actual sound sample will be shown in bold. If you are editing a stereo sound, this will be the left half of the stereo frame. Note that for a 16-bit sound, each sample is two bytes, so the first and second bytes will be shown in bold. You may notice that if you open a format 1 sound, for example, then click on the format 2 button, and then look at the sound with the hex editor, the sound is still format 1 (the first two bytes of the resource are **00 01**). This is because SndSampler™ does not actually change the format of the sound until you save. This is also true of some other parameters. Note also that the sound will be re-initialized after hex editor changes, so that your format buttons etc. will reflect the new state of the sound. If you mess it up, it's best not to let SndSampler™ fix the sound. To paraphrase a once-popular advertising slogan: just Undo it!

## *FX*

### Echo

This function gives your sound depth by adding a fading echo effect through an FIR (Finite Impulse Response) filter. This function operates only on the selected portion of the sound. Also, the Echo effect allows you to customize parameters. You can choose values for both the decay constant  $k$  and the echo delay (in milliseconds or sample frames). The decay constant  $k$  is taken from  $e^{-kn}$ , which is the amplitude factor of echo number  $n$ . The total number of echoes  $N$  is chosen by the application such that echo number  $N$  will have an amplitude factor which will reduce the sound amplitude to nearly zero. If you're not mathematically inclined, just remember this: increasing  $k$  will cause your echoes to die away faster, while decreasing  $k$  will give you more echoes and they will last longer. The delay indicates how far apart each echo will be. If the Auto Extend box is checked, then SndSampler™ will increase the length of your sound so that you don't lose any of the echoes. SndSampler™ will generally make your sound REALLY big when doing echoes, and this will require more free RAM than otherwise.

Note that the best way to figure out exactly what the user-adjustable parameters can do (for this and the other fx) is to play around with them. When you do find some effects that you like, you can save them. SndSampler™ gives you five slots to fill with your own favorite echo effect parameters. You can change the names of these user-definable echo effects to make them easier to select from the submenu. For example, if you find an effect which makes the sound sort of robotic, you can type "Robotic echo" in the name box. Then the Echo submenu will show the name "Robotic echo." You can do the same thing with Reverb, Chorus, and Flange (see below). The first user-definable function has a command key (this one is cmd-E, for "Echo") associated with it. You can put your most often-used effect here, so that you can invoke it with a quick keypress.

### Reverb

The Reverb function imposes an orchestra hall type of echo on the selected portion of your sound. You can choose to use the allpass filter, which directly implements an allpass reverberation IIR (Infinite Impulse Response) filter of the equation

$$y(n) = -g * x(n) + [1 - g^2] * [x(n - D) + y(n - D)]$$

where  $y$  = output,  $x$  = input,  $g$  = gain factor ( $< 1$ ),  $n$  = current sample number, and  $D$  = delay in samples. Or, you can choose the comb filter, which has the equation

$$y(n) = x(n - D) + g * y(n - D).$$

You can specify both  $g$  and  $D$  ( $D$  can be in samples or milliseconds). The gain factor  $g$  controls the ratio of direct sound to reverberated sound. Larger  $g$  = more direct sound, less reverberation. Note that you will probably want to make  $g$  smaller for a comb filter effect, since it can be quite loud and harsh. Note also that  $g$  can be negative. If you check Auto Extend, SndSampler™ will make your sound longer if necessary in order to not lose any

reverb, and will increase the length of the selected portion of the sound to include the delayed samples. Note that this function operates only on the selected portion of the sound. Also note that the larger the selected portion of the sound, the more free memory required to make the reverb effect. More complicated reverbs can be created by using different parameters and

then mixing together the results. For example, commercial reverb generators will commonly do three of four comb filters in parallel, mix this result together, and then do an allpass reverb on the mixed data. (And they'll probably add a little bit of echo, too.)

Special note: SndSampler™ will *always* extend your reverb sound by at least the length of the delay, regardless of whether or not you have selected Auto Extend. However, sharp-eyed users may notice that if you choose a comb filter and don't check Auto Extend, the sound does not appear to increase in length. The reasons for this are complicated, and if you are really interested in why this happens, write to us at the above address. Rest assured, however, that SndSampler™ is not making a mistake when this happens. It is *not* a bug! (So don't try to get free registration for reporting it.)

The command key for the first Reverb effect is cmd-R (for “**R**everb”).

#### Chorus

Chorus adds a delayed version of the selected portion of the current sound to the current sound to make it sound like there is more than one voice making the sound. You can choose the number of voices (delayed versions) to add to the original sound. Note that as you add more sounds, the resulting sound will tend to get louder. (The process will also become really s-l-o-w as you add more voices. Super slow for more than four.) The delay value is a starting point for how much the other voices will be delayed. The speed factor determines how fast the variable delay will vary. You can type any number here, including numbers as high as 100,000 and as small as 0.0001 (although those numbers give lousy results). Feel free to experiment with the settings, although we have set the default values to what we consider to be the best-sounding effect. Note that 100% is the default setting for the speed factor. The Auto Extend function works as above. Note also that a lot of the Chorus parameters as determined by SndSampler™ are random! So if you don't like what happens to your sound with Chorus, try it again. The result will be different each time.

The command key for the first Chorus effect is cmd-K (think “**K**horus”; cmd-C was already taken by Copy.)

#### Flange

This function is very similar to Chorus, and in fact uses almost the same program code as Chorus. Flange perpetrates a kind of phasey, in-and-out effect on the selected portion your sound. The gain factor represents the relative amplitudes of the original and delayed sounds which are adjusted so that they add up to 1. In other words, if you type 0.6 here, the delayed sound will be multiplied by 0.6, and the original sound will be multiplied by 0.4. Yes, you can enter numbers bigger than one, but we don't recommend it. (You'll want to try it for yourself, of course.) The speed factor and the delay parameters have the same function as in Chorus. The speed factor is particularly important in the Flange operation, because the default parameters of Flange are adjusted so that the effect will perform one “cycle” over the length of the selected portion of the sound. So if you have a really long sound, the effect will be rather slow. The Flange effect is also adjusted so that the flanged portion of the sound will join up nicely with the non-flanged portion. If you want the flanged and the non-flanged portions to join up nicely, always use an integral multiple of 100% for the speed, i.e. 200%, 300%, 400%, etc. We also recommend a rather small delay, between say 1 and 10 milliseconds. Otherwise you will start getting some pitch shift along with the flange. Also, as you flange a larger and larger portion of the sound, you will probably want to increase the speed.

The command key for the first Flange effect is cmd-F (for “**F**lange”).

#### Backwards

Reverses the selected portion of the sound so that it plays backwards. This function can produce interesting effects when combined with reverb or echo. (See the cool effects listing below.)

#### Stereo To Mono

Makes a mono sound out of a stereo sound. Operates on the entire sound.

#### Mono To Stereo

Changes a mono sound to a stereo sound. You can pan by moving the slider left and right. This function splits the sound into two parts, so there will probably be a noticeable decrease in volume. Operates on the entire sound.

Dynamic Pan

Allows you to dynamically change the stereo field of a monophonic sound. When choosing Dynamic Pan you will be presented with a dialog which displays the selected portion of the sound. (This is similar to the Pitch Bend effect as described below.) Below that is a box with a line drawn between two points at either end. By clicking somewhere in the box, you can make new points. Each point represents a certain position in the stereo field. Left is at the top and is represented by +1. Right is at the bottom and is represented by -1. The sound will be altered so that its position in the stereo field appears to move linearly between any two points you have made. You can click in an existing point to drag it to a new position, or you can enter numbers directly in the text boxes at the bottom of the dialog. **Cmd-delete** will delete the currently selected point (the one which is white). **Cmd-left arrow** and **cmd-right arrow** will move among the points. (If you just type an unmodified delete or arrow you will move the cursor in the active text box.) Note that the two end points can only be moved up or down, and you can't put any points at an equal horizontal position with the end points. Also, you can't delete the two end points. Even if you haven't selected the entire sound, the portions of the sound that are not selected will still be changed to stereo. The portion which precedes the start pointer will have a stereo value which is identical to that of the first point. The portion of the sound which follows the end pointer will have the same stereo value as that of the last point. For maximum speed, select only the portion of the sound you want to dynamically pan, and only use **two** points. Three or more points will slow it down dramatically.

Resample

This function allows you to change the sample rate of a sound while not changing the way it sounds when played back. The Resample function uses linear interpolation to calculate new values for each individual sample so that when the whole sound is played back, it still sounds like it did before. The new sound will take up more or less disk space, depending on whether the new sample rate is higher or lower than the original sample rate. Resampling affects the entire sound, regardless of the locations of the start and/or end pointers. If moving the slider doesn't give you the sample rate you want, you can type it in the text box. Remember, though, that the farther away you get from the original sample rate, the more distortion there will be in the resulting sound.

*A note about sample rates on the Macintosh...*

Apple specifies sample rates in sound resources as fixed-point binary numbers. A fixed-point number on the Macintosh only has 32 bits of resolution. Sample rates such as 22,254.54545... Hz (Apple's standard 22 kHz rate) can only be approximated with a fixed-point number. For most applications, this won't cause a problem. However, if you are upsampling by a factor of 2 from Apple's `rate11kHz` (which is actually 11,127.27272 Hz, as represented by the fixed-point value `$2B77.45D1`) you will not come up with Apple's `rate22kHz`. Multiplying `rate11kHz` by 2 results in a rate which is 1/65,536 shy of `rate22kHz` (which is actually 22,254.54546 Hz, as represented by the fixed-point value `$56EE.8BA3`). SndSampler™ recognizes this, and when upsampling from `rate11kHz` by a factor of two it will force the resulting sample rate to be `rate22kHz`. Conversely, when downsampling by a factor of 2 from `rate22kHz`, SndSampler™ will force the new sample rate to be `rate11kHz`. SndSampler™ doesn't do anything special with `rate5kHz` or `rate7kHz` because these are not used very much. By far the most popular sample rates are 11 and 22 kHz.

Remember that typing 11 or 22 (etc.) in the Sample Rate box in the main window will force the playback rate to be `rate11kHz` and `rate22kHz`, respectively. This will not change the sound data, but will only change the rate at which Apple's Sound Manager (part of your system software) plays back the sound.

Pitch Bend

Allows you to dynamically change the pitch of the sound. When choosing Pitch Bend you will be presented with a dialog which displays the selected portion of the sound. Below that is a box with a line drawn between two points at either end. By clicking somewhere in the box, you can make new points. Each point represents a certain pitch change away from the current pitch. The actual pitch change values are displayed in semitones, with +12 semitones being one octave higher and -12 semitones being one octave lower. Each note on a standard musical scale can be thought of as being a certain number of semitones away from the other notes. For example: C + 1 semitone = C# = Db, C# + 1 semitone = D, D + 1 semitone = D# = Eb, D# + 1 semitone = E, E + 1 semitone = F, F + 1 semitone = F#, F# + 1 = G, G + 1 = G#, G# + 1 = A, A + 1 = A# = Bb, A# + 1 = B, and B + 1 = C. The pitch of the sound will change linearly between each point you create. You can click in an existing point to drag it to a new position, or you can enter numbers directly in the text boxes at the bottom of the dialog. **Cmd-delete** will delete the currently selected point (the

one which is white). **Cmd-left arrow** and **cmd-right arrow** will move among the points. (If you just type an unmodified delete or arrow you will move the cursor in the active text box.) Note that the two end points can only be moved up or down, and you can't put any points at an equal horizontal position with the end points. Also, the pitch change must remain between +12 and -12. What SndSampler™ actually does is change the sample rate to simulate a pitch shift, so that when the pitch goes higher it will sound more chirpy and when it goes lower it will sound slowed-down and play for a longer time. The Pitch Bend effect also requires lots of RAM. There may need to be as much free RAM in SndSampler™'s heap as 3 times the size of the selected portion of the sound. Pitch Bend can be kind of slow, too.

#### Downsize

Halves the sound's bit resolution, i.e. 16-bit --> 8-bit.

#### Upsize

Doubles the sound's bit resolution. The low-order 8 bits are cleared to zero. Note: this function will not make your awful-sounding 8-bit recordings into wonderful CD-quality 16-bit samples. They will still sound like 8-bit samples. This function is provided mainly to make it easier to mix 8- and 16-bit sounds. Actually, mixing an 8-bit sound with a 16-bit sound is strongly discouraged, since they are stored in two entirely different formats. Try it if you don't believe us.

#### *Options*

#### Sound Color

Allows you to choose a new color for the sound waveform display.

#### Sound Click

Allows you to choose either a double-click or an option-(or ctrl or cmd)-click to select the end pointer. If you choose either of these options, you will select the position of the start pointer with a single click. You may also choose the nearest click option, where a single click will move the pointer which is closest to where you clicked.

#### Undo

Allows you to turn the Undo feature on or off.

#### Clipboard

Allows you to tell SndSampler™ when to copy its own clipboard to the Finder's clipboard. Also, this option will allow you to turn off SndSampler™'s warnings when the sound you are copying to the Finder's clipboard is dangerously large (>100K).

#### Drag and Drop

Allows you to choose how SndSampler will handle files which are dropped onto its icon. This also affects what happens to SndSampler™ AIFF files that are double-clicked. Both methods will produce the same result. The only difference is that any file can be dropped onto the SndSampler™ icon. SndSampler™ will only respond to double-clicked files (and only AIFFs) if SndSampler™ created or saved them. One thing to note: if you set this option to "play," and then if you launch SndSampler™ by dropping an AIFF or sound file onto its icon, it will play the files (all of them sequentially) and then quit. The same will happen for double-clicked AIFFs. This allows you to use SndSampler™ as a convenient tool for the playing of AIFF and System 7 sound files, since it will automatically quit when it is finished.

#### Clear Finder Clipboard

Clears the Finder's clipboard (by calling ZeroScrap). A convenient way to get rid of a large sound you may have copied to the Finder's clipboard, before it causes a system crash.

*Windows*

Sample Window

Selects the sample window.

### Stat Window

Selects the stat window.

## **Cool Things To Try**

### *Simple Stereo Chorusing*

1. Change a mono sound into a stereo sound with the slider all the way left
2. Copy the new sound
3. Undo mono to stereo
4. Change the mono sound to stereo with the slider all the way right
5. Move the start pointer to around 100 or so
6. Mix start
7. Move start pointer back to the beginning

### *Shifting Echo*

1. Change a mono sound into a stereo sound with the slider all the way left
2. Echo the entire sound with a delay slightly longer than twice the sound's duration (use frames)
3. Move the start pointer to just before the first echo
4. Copy
5. Revert to saved
6. Change to a stereo sound with the slider all the way right
6. Repeat step 2
7. Move the start pointer to just after the original sound
8. Mix start
9. Move the start pointer back to the beginning

### *Reverse Echo Fade-In*

1. Reverse the entire sound
2. Echo the entire sound
3. Reverse again
4. Listen to that cool f-ect!

## **Keyboard Shortcuts**

- Space bar: plays the existing sound; starts recording a sound; pauses and re-starts recording.
- Cmd-space bar: plays a file from disk.
- Escape key: stops a sound from playing; stops recording.
- Cmd-period: stops a sound from playing.
- Delete: deletes the selected portion of the sound if there are no active text boxes.
- Left arrow, right arrow: move the start pointer.
- Up arrow, down arrow: move the end pointer.

## Mouse Shortcuts

- Drag the triangles to move the start and end pointers.
- Single-click on the sound to move the start pointer.
- Double-click (or option-click—see the Options menu) to move the end pointer.
- Click on any unused portion of the stat window to deactivate an active text box.
- When a sound is playing, click once to stop it.

## Troubleshooting Guide

If you're having problems with SndSampler™, try these steps:

1. Replace the malfunctioning copy with a fresh backup copy.
2. Replace the malfunctioning copy with a fresh, **unregistered** backup copy.
3. Try downloading the software again. Occasionally it can be corrupted during transfer.
4. Trash the file "SndSampler™ Prefs" from the Preferences folder in your System Folder.
5. If all else fails, drop us a DETAILED note (e-mail hopefully) and we'll do what we can to help.

## Legal Notice

This product is sold as is. The authors make no claims about its correctness for or suitability for a specific purpose. The authors accept no responsibility whatsoever for damages of any kind, be they direct, incidental or otherwise, incurred by the user while using, or not using, any version of SndSampler™. We think that covers everything pretty well, don't you?

## REGISTRATION FORM: SndSampler™ v2.8

Name

Address

E-mail

Where did you get this software?

How will you use this software?

What kind of Mac(s) do you have?

Comments, as in "What can we do to make this application more useful?"

Please mail the completed form along with \$12 in U.S. funds (checks drawn on a U.S. bank, please)—and a **self-addressed, stamped envelope** (SASE) if you want your code sent by U.

S. mail—to:

Alan Glenn

4516 Cruz Dr.

Midland, MI 48642

U.S.A.

Please note: if you need your code sent by paper-and-stamp mail, i.e. you don't have e-mail, and you can't send a SASE (because for example you live in a country other than the U.S.), **please add \$1 U.S. for postage**. Also, **please do not send** your registration via **registered mail!** Registered mail is that which requires us to go down to the post office and sign for the letter, and this is not something we can always do. So please don't send your letters this way!

*Thanks for supporting shareware software!*