2. Select a Sample to Convert.
3. Select Convert from the Sample List Menu (*A*-C).
4. Select **IFF_8SVX** for the file format.
5. Click **OK.**
6. A Save File Requester will appear. Enter a directory and file name for the new 8 bit sample.
7. Click **OK**.

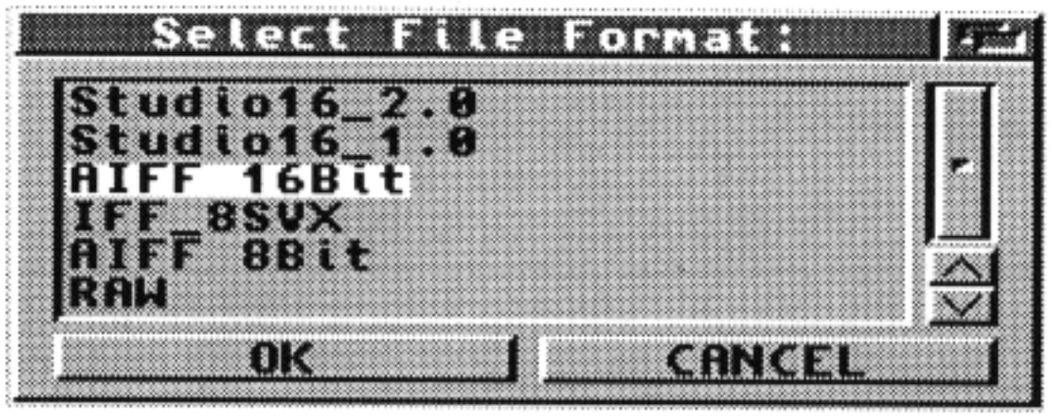

Figure 3-6. Convert Sample

8. The original 16 bit sample remains on disk. To delete it, use Sample List.
9. You can now load the new 8 bit file into other programs. You can even load in back into Studio 16, but because converting a 16 bit sample to an 8 bit format drops bits, the sample won't sound as good as it did before the conversion.

NOTE See the Reference Section on Sample List for a description of the available file formats and more detailed instructions on converting.

Converting files to IFF 8SVX can be useful if you need to conserve disk space and you're working with samples that don't require a high SNR (Signal-to-Noise Ratio). Sound effects like explosions will likely sound the same whether they're 8 bit or 16 bit files. Both 8 and 16 bit files can play simultaneously, if they have the same sampling rate. Plus, the 8 bit file will only take up half of the disk space it did when it was a 16 bit file. (Note that this is true for both the AD516 and the AD1012, because samples recorded with the 12 bit AD1012 are stored in a 16 bit format.)

Quit Studio 16

To quit Studio 16, select **Quit** from the Project Menu. Before clicking OK, you should check the Sample List for any samples in the RAM: directory. These samples should be moved to a directory on your hard disk before turning off your Amiga; otherwise, they will be lost.

To save the position of all the open windows and their settings select SaveSetup from the Project Menu before selecting **Quit**.

Hard Disk Drives

Studio 16 usually uses a hard disk to store audio files. Although it is possible to use RAM for sample storage (add RAM: path to Sample List), this is not common. Hard disks are preferred because they can store large amounts of data relatively cheaply.

About Hard Drive Specifications

Hard disks are primarily rated by their "average seek time". This is the average time it takes the read/write head to move between two random tracks. For example, the hard drive in an Amiga 3000 is often an "11 ms, 105 MB SCSI Quantum." This translates to a drive that holds 105 megabytes of data, is manufactured by Quantum, and has an average seek time on reads of 11 milliseconds. This is a little deceiving because the Quantum drive has a track buffer that makes reads appear faster than writes. The average write seek time on the same drive is 19 ms.

A second parameter of drives is the "data transfer rate" from the drive once the seek is completed. The hard disk controller you use can affect this as much as the drive itself. In general, slow data transfer rates are only important on optical drives. For example, a fast drive with an A3000 hard disk controller may run at 1.9 MB per second. However, a typical Magneto-optical drive runs at 100K per second for writes, and 300K per second for reads.

How Fast Does My Hard Drive Need To Be?

Studio 16 will work with almost any drive you can buy these days. However, the faster the better. For example, the A3000 105 MB Quantum with an average seek time on reads of 11ms and 19ms on writes is fast enough for about 6 tracks at a 44.1KHz sampling rate using the AD516.

But even slower drives will work. For example, the "SyQuest" removable media drive has an average seek time of 26ms. It is possible to do multiple tracks with this drive. However, you may have to reduce your sampling rate or the number of tracks you are playing back. Note that the AD516 is much more efficient than the AD1012. As a rule you can play more tracks at faster rates with the AD516.

Removable Media Drives

SyQuest and Bernoulli make popular removable media disk drives. In testing, we found that you can play multiple tracks off these drives, although you may have to reduce the sampling rate or the number of simultaneous tracks. You may also need to increase the "Channel Buffer" in Preferences.

Optical Drives

Although we haven't tested it in house, we have reports from AD1012 owners recording and playing one channel of audio with a Ricoh 600MB magneto-optical drive. This drive has an average seek time of 33.7ms with read and write rates of 300K/second and 100K/second respectively. In order to work, the "Channel Buffers" in Preferences were increased to 1MB. Note that performance will be improved with the AD516.

Other users report to playback 2 tracks with a Maxtor Tahiti II - 1 GB magneto-optical drive using the AD1012 in an A3000. Access time for this drive is 90-120 ms.

For more information on the above drives, contact the manufacturers, listed in Appendix C.

Hard Drive Space Requirements

Memory usage is entirely based on the sampling rate of a sample. The following chart provides a Meg per Minute guide for common sampling rates when recording 16 bits. The formula used to derive the chart is: MB = Sampling Rate × 2 × 60 sec/min ÷ 1024byte/k ÷ 1024k/MB. Or, more simply, 1 second of sound = 2 × Sampling Rate.

When recording in stereo, double the space requirements listed below.

Sampling Rate	**Space for 1 minute** (1 track - 60 seconds)	**Space for 30 minutes** (1 track - 1800 seconds)
11,000	1.3 MB	37.8 MB
22,000	2.5 MB	75.5 MB
32,000	3.7 MB	109.8 MB
44,100	5.0 MB	151.4 MB
50,000	5.7 MB	171.6 MB

Fragmented Hard Drives

As drives are used, they tend to become cluttered. The operating system starts to spread files out across tracks that are not close to each other. As a result, it takes longer to read the files because the hard drive must seek farther between tracks. This is called "fragmentation" and becomes a particular problem as the hard disk becomes full. If your hard disk or audio partition is fragmented, you may have trouble playing sounds. You can purchase programs that will "optimize" or "de-fragment" your hard disk. They scan your hard disk and rearrange the data so that all the data for a particular file is near each other.

Disk Errors

Hard drives aren't fool proof, and it is almost inevitable that you will at some point encounter a disk error. This can manifest itself as a "Read" or "Write" error. Or, occasionally as a "Can't Validate Drive" error. Sometimes clicking "retry" or "cancel" on the DOS requester presenting the error will cause the error to disappear. However, if this happens you should start to worry because the error will probably reappear later, and can mean a failing hard drive.

Of course your best advice is to backup your hard drives. They can be backed up to a SCSI tape drive or a SCSI optical drive. However, due to the time and expense involved, many people don't bother. Just be warned that a hard disk "crash" is more than a possibility, it is very likely that it will happen to you eventually. For more information on preventing disk errors, and recovering data after a disk error, refer to Chapter 7 - Troubleshooting.

If your hard drive crashes, and you're not sure what to do, take your Amiga to your Amiga dealer. Their service department should be experienced in attempting to restore data from corrupt hard drives.

SMPTE

Introduction to SMPTE Time Code

SMPTE (Society of Motion Pictures Television Engineers) time code is a standard way to keep track of time or position on tape. SMPTE (pronounced "simp-tee") time code is most common in video production, but is also used in film and music production. In general, SMPTE time code specifies position and timing information in terms of frames. The format is:

HH:MM:SS:FF (HOURS:MINUTES:SECONDS:FRAMES)

(01:12:06:02 refers to 1 hour, 12 minutes, 6 seconds, and 2 frames)

Time code is used to synchronize events. With Studio 16 you can specify a sound to trigger at a specific time code. For example, you may find that a door begins to open at exactly 1 minute, 2 seconds, and 15 frames into your tape. You can set up Studio 16 to trigger an opening door sound effect at 00:01:02:15 with the Cue List.

In Studio 16 you have the added benefit of working with what we call SMPTE Plus. If activated in the Cue List, a fraction of a frame can be used, as in 00:01:02:15.50. This would be 1 minute, 2 seconds, and 15½ frames.

SMPTE time code is used to synchronize events in music and video production. For example, a musician with a multi-track tape recorder may want to synchronize it with a MIDI sequencer. This can be accomplished by "striping" time code onto the multi-track, and then running the time code out of the multi-track, and into the computer. The computer can then run a MIDI sequencer capable of "slaving" to the tape by following the time code. Studio 16 and the Bars&Pipes sequencer allow you to accomplish this without an external multi-track. Studio 16 can act as a digital multi-track tape deck, and it will sync to Bars&Pipes through "internal" time code.

VITC or LTC SMPTE

There are two types of SMPTE time code: LTC (Longitudinal Time Code) and VITC (Vertical Interval Time Code, pronounced "vit-see"). LTC is written on the audio track of the tape deck, and VITC is embedded into the video signal. VITC has the advantage of being available constantly, even when the video deck is paused. Whereas, LTC requires that the deck be playing for time code to be available. However, LTC time code is less expensive, and works on any audio tape recorder--not just video decks. Both LTC and VITC store the same basic information--the

frame number that specifies where the tape decks record/play heads are currently located.

Both the AD516 and AD1012 include a LTC SMPTE reader. If your deck outputs VITC, there are translators available that will convert the time to LTC which is read by the AD516 or AD1012. See Appendix C for a supplier.

Frame Rate

One final aspect that needs to be specified when selecting a time code format is the frame rate, or number of frames per second. SMPTE supports the following:

24 fps	Motion Pictures
25 fps	European Video
29.97 fps, non-drop frame	USA color video
30 fps, non-drop frame	USA B&W video or music
30 fps, drop frame	USA color video

When SMPTE was first introduced in 1967, it was at 30 frames per second and used for black and white TV. However, when NTSC color TV was introduced, it used the slightly slower rate of 29.97 frames per second. This is approximated in "drop frame" SMPTE by dropping 108 frames every hour. Drop frame is used so "real time" or "clock time" will match the time code marked on the tape. But because drop frame can cause problems because of the missing frames 29.97 non-drop is often used.

Striping Time Code

In order to use time code, you must first "stripe" your tape. That is, you record time code onto the entire tape area you are planning to use. Depending on the camera or video deck you use, this may be automatic or manual. Or, you may have a dedicated "Time Code Out" jack on your deck.

Studio 16's internal SMPTE generator does not output time code for striping.

To stripe LTC onto your tape, you will need an LTC generator. Time code generators can be part of a video cameras or a video deck. Or, they can be dedicated generating boxes, or software programs, namely the SunRize SMPTE Output module. Appendix C lists manufacturers of LTC generators.

Contact your dealer or SunRize for more information on SunRize's SMPTE Output module that outputs LTC time code for striping tapes.

SMPTE for Video Applications

Time code is essential in any kind of professional video production. It allows precise specification of video and audio edits. With Studio 16, you use SMPTE time code in conjunction with the Cue List to synchronize audio effects, music, and narration with

the video tape. These audio clips reside on your hard disk until you create the final master tape. During your edit sessions, the Cue List will track your tape's time code and trigger sound effects as specified. You will be able to listen to the audio coming off the computer as you watch the video.

SMPTE for Music Applications

SMPTE time code was originally designed for video applications but with the success of MIDI (Musical Instrument Digital Interface) it became apparent that it would be useful to use SMPTE time code to time MIDI sequencers and to communicate with other MIDI devices. MIDI quickly adopted a MIDI Time Code format. MIDI Time Code is easily converted to SMPTE Time Code and vice versa. To drive external MIDI equipment you may need a SMPTE to MIDI time code converter. Appendix C lists a source for such a device. MIDI time code is used as a timing source for sequencers, to sync two tape decks together or to sync a tape deck with a MIDI sequencer among other things. When Studio 16 is used along with Bars&Pipes Professional, you get complete sequencing capabilities as well as hard disk recording. Your MIDI sequences can have vocal tracks and guitar solos without having to use an expensive multi-track tape deck that tracks MIDI time code.

Cue List Tutorial

The Time Line Cue List is a fast, flexible tool you can use to arrange sounds for a variety of projects. To introduce you to some of the Time Line Cue List's capabilities, we'll walk through two different projects:

- Adding sound effects to a cartoon
- Recording a multitrack session

As you work through the tutorials just relax, have fun, and experiment.

Cartoon Soundtrack

For our first tutorial we'll be doing the soundtrack for the last scene of an imaginary cartoon. In this scene there are three characters: a bird, a cat and a dog. They are performing a play in front of an audience.

In the play, the cat has been chasing the bird. The bird is now inside the house where the dog lives. This is where our tutorial soundtrack begins.

- In an attempt to get the bird, the cat has disguised himself as a traveling salesman and he knocks on the door. (DoorKnock)
- The dog growls at the sound of the knocking. (Dog)
- The cat opens the door. (OpenDoor)
- The bird, seeing his chance to expose the cat while the dog is right there, flies past the cat, (FlyBy) knocking off part of the disguise (Ricochet).
- The dog, now recognizing the cat, punches the cat (Punch).
- The cat's tongue goes in and out like a cuckoo clock as he recoils from the blow (Cuckoo).
- Silly music kicks in (CartoonMusic).
- The curtain falls with a crash (Crash).
- The audience applauds (Applause).
- The bird pops his head through the curtain and smiles (SqueakPop). The picture freezes and fades to black.

OK, that's the scene. It actually goes by pretty quickly. Keep in mind that the samples included for the tutorial were sampled at a sampling frequency of 9600Hz in 8 bits. This is very low quality but it lets us fit more samples on the distribution floppy disk, and it gets the idea across.